AFRL-RH-WP-TR-2010-0043

Strategy Planning Visualization Tool (SPVT) for the Air Operations Center (AOC)

Volume I: SPVT Summary and COA Sketch

Christopher Calhoun
SRA International, Inc.
5000 Springfield St.
Dayton OH 45431

Donald Monk
Collaborative Interfaces Branch
Warfighter Interface Division

December 2009

Final Report for July 2004 to December 2009

Air Force Research Laboratory
711th Human Performance Wing
Human Effectiveness Directorate
Warfighter Interface Division
Collaborative Interfaces Branch
Wright-Patterson AFB OH 45433-

Notice and Signature Page

Using Government drawings, specifications, or other data included in this document for any purpose other than Government procurement does not in any way obligate the U.S. Government. The fact that the Government formulated or supplied the drawings, specifications, or other data does not license the holder or any other persons or corporations; or convey any rights or permissions to manufacture, use, or sell any patented invention that may relate to them.

This report was cleared for public release by the 88th Air Base Wing Public Affairs Office and is available to the general public, including foreign nationals.

Qualified requestors may obtain copies of this report from the Defense Technical Information Center (DTIC) (http://www.dtic.mil).

AFRL-RH-WP-TR-2010-0043 HAS BEEN REVIEWED AND IS APPROVED FOR PUBLICATION IN ACCORDANCE WITH ASSIGNED DISTRIBUTION STATEMENT.

FOR THE DIRECTOR

//signed//
Donald L. Monk
Program Manager
Collaborative Interfaces Branch

//signed//
Michael A. Stropki
Chief, Warfighter Interfaces Division
Human Effectiveness Directorate
711th Human Performance Wing
Air Force Research Laboratory

This report is published in the interest of scientific and technical information exchange, and its publication does not constitute the Government's approval or disapproval of its ideas or findings

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
31-12-2009	Final	16 Jul 2004 – 31 Dec 2009

4. TITLE AND SUBTITLE
Strategy Planning Visualization Tool (SPVT) for the Air Operations Center (AOC) Volume I: SPVT Summary and COA Sketch

5a. CONTRACT NUMBER
FA8650-04-C-6537

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER
63231F

6. AUTHOR(S)
Christopher Calhoun*
Donald Monk**

5d. PROJECT NUMBER
2830

5e. TASK NUMBER
30

5f. WORK UNIT NUMBER
28303012

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
SRA International, Inc.*
5000 Springfield St.
Dayton OH 45431

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Air Force Materiel Command
Air Force Research Laboratory
711th Human Performance Wing
Human Effectiveness Directorate
Warfighter Interface Division
Collaborative Interfaces Branch
Wright Patterson AFB OH 45433-7022

10. SPONSOR/MONITOR'S ACRONYM(S)
711 HPW/RHCP

11. SPONSORING/MONITORING AGENCY REPORT NUMBER
AFRL-RH-WP-TR-2010-0043

12. DISTRIBUTION AVAILABILITY STATEMENT
Approved for Public Release; Distribution is Unlimited.

13. SUPPLEMENTARY NOTES
88ABW PA Cleared 31 Mar 2010, 88ABW-2010-1743.

14. ABSTRACT
The purpose of this program is to transition innovative work support within the AOC. The idea is to allow decisions to be made and plans to be formulated more quickly by providing users with intuitive, high-level visualizations of mission effects, interrelationships and mechanisms. The end result will be improved planning and assessment within the air tasking order (ATO) cycle.

15. SUBJECT TERMS
AOC, Strategy, Planning, JAST, COA Sketch, IOPC-X, Collaboration, LiveSpaces, SPVT

16. SECURITY CLASSIFICATION OF: Unclassified			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Donald Monk
U	U	U	SAR	355	19b. TELEPONE NUMBER (*Include area code*)

This page blank intentionally.

TABLE OF CONTENTS

LIST OF FIGURES

This page left blank on purpose.

PREFACE

The Strategy Planning Visualization Tool (SPVT) project was performed under the direction of Mr. Donald Monk of the Air Force Research Laboratory's 711th Human Performance Wing Human Effectiveness Directorate (711 HPW/RHCP). The effort was accomplished under Contract Number FA8650-04-C-6537, Human Effectiveness in the Air & Space Operations Center (AOC).

ACKNOWLEDGMENTS

SRA International and Mr. Monk offer their sincere thanks to those individuals and organizations who participated in and otherwise advanced the research and concepts herein including 505th CCW @ Hurlburt Field, Checkmate, ACC/A8R and S&ASRWG, SAIC, Mr. David Hess and Dr. James Welshans from Teledyne CollaborX, Mr Clay Olschner (V2V Inc.), Dr. Janet Miller (711 HPW/RHXB, Commander's Predictive Environment program – SMART), IWPC (GDAIS), Capt. DuBose and Mr. Matt Trippy ESC 950th ELSG Joint IO Planning Capability (IOPC-X), Mr. Ed Juersivich (Joint Forces Command, JFCOM, Engineering Staff Section, J7, Virtual Integrated Support for the Information Operations Environment (VisIOn), Technical Integrative Product Team, Maj. Stewart Greathouse (608 AOC, USAF ret), and Col Michael Tichenor (Chief Combat Plans Division, 608 AOC, Barksdale AFB, LA) and Lt Col Melvin Deaile (Chief Strategy Division, 608 AOC, Barksdale AFB, LA) for providing warfighter support to the collaboration event, to Mr. Bryan Bartels (USSTRATCOM JFCC Global Strike/J0-I) and Mr. Dan "Ammo" Clevenger (NMI) for providing United States Strategic Command (USSTRATCOM) Integrated Strategic Planning & Analysis Network (ISPAN) subject matter expert (SME) representation at the collaboration event.

This page left blank on purpose.

1.0 SUMMARY

The Air Force Research Laboratory's (AFRL) 711th Human Performance Wing Human Effectiveness Directorate (711 HPW/RHCP) created the Human Effectiveness in the Air & Space Operations Center (HE in the AOC) program to address warfighter work challenges experienced in the AOC Strategy Division (SD). The research goal was to develop a thorough understanding of warfighter information and decision requirements within the SD and to organizations within and beyond the AOC in order to better support warfighter decision making, affordances and interactions.

Phase I of HE in the AOC was conducted by ManTech Aegis and involved a decision-focused analysis of AOC SD personnel. The resulting AOC Cognitive Work Requirements product served as a jumpstart for formalizing user information and decision requirements. Phase II of HE in the AOC consisted of parallel efforts. One effort, Strategy Planning Visualization Tool (SPVT), was tasked with bringing decision-centered visualization support to the Strategy Division Strategy Planning Team (SPT), while the parallel effort, Operational Effects Assessment Visualization Tool (OEAVT), was tasked with bringing decision-centered visualization support to the Strategy Division Operational Assessment Team (OAT). OEAVT was performed by Science Applications International Corporation (SAIC) under a separate contract.

SPVT extended the information contained in the AOC SD Phase I Cognitive Task Analysis (CTA) by conducting analyses and performing additional interviews with warfighters. The interaction with warfighters was used to ensure the team had a solid understanding of the CTA, to further develop upon knowledge of work in the AOC SD and to refine concepts and prototypes. The effort yielded an extensive body of knowledge for the AOC SD and resulted in two prototypes, transitioning into Air Force programs of record.

2.0 INTRODUCTION

The primary dimensions addressed under SPVT's decision-centered analysis in the AOC SD included the following:

- How decisions are made in performing work
- How work products are developed
- How work is managed
- The types of collaborations and interactions that are necessary

This knowledge came in part from the Phase I AOC Cognitive Work Requirements which were used as a basis for the cognitive and collaboration work requirements for the work-centered support visualization efforts described herein.

Products from SPVT were designed to operate with the related and envisioned information, applications, systems, and infrastructure planned to be delivered with the AOC Block 10.2 and Joint capabilities, such as:

- Information Warfare Planning Capability (IWPC)
- Information Operations Planning Capability – Joint (IOPC-J)
- Virtual Integrated Support for the Information Operations Environment (VisIOn)
- Global Operations Center Collaborative Environment (GOC-CE)
- Theater Battle Management Core Systems (TBMCS)/Theater Battle Operations Net-centric Environment (TBONE)
- Modernized Integrated Database (MIDB)
- Joint Targeting Tool (JTT)

SPVT was comprised of several tasks. The initial sequence of tasks followed a human-centered systems engineering process from user requirements to system concept and definition through system prototype and evaluation. The initial task focused on understanding ***(Section 3.1) User Information and Decision Requirements*** in the work context for AOC SD personnel (see Section 3.1). The understanding was accomplished across the SD for the SPT, Strategy Guidance Team (SGT) and OAT.

The first task to leverage user requirements understanding was the ***(Section 3.2) Common Effects Picture (CEP)***. CEP started as a dashboard or high-level visualization concept for senior AOC leaders such as an AOC Director or Joint Forces Air Component Commander (JFACC) to quickly assess the battlespace and develop understanding. The task evolved by incorporating one- and two-level decomposition (drill-down) into more detailed views on the information. These additional views were intended to provide the senior leaders a capability to understand, when necessary, the elements comprising a particular condition or state and to serve as the operating environment for the supporting staff.

The CEP concept was used as a launch pad for the ***(Section 3.3) Global Effects Management – Synchronization (GEM-S)*** task. The joint community expressed an interest in a concept to

visualize Department of Defense (DoD) operations and effects by organization, important operational dependencies and relationships, and timing, all on a global scale. While conceptually the prototype provided an informative view onto operations at a large scale, the care and feeding of the tool through data feeds and manual inputs appeared to be a major undertaking. GEM-S, however, brought forth several visualization concepts for portraying operational effects. These concepts carried forward to other technology concepts.

The next task, the ***(Section 3.4) Joint Air Operations Plan (JAOP) Air Operations Directive (AOD) Status Tool (JAST)*** was the product of a need to complete a significant feedback path from Combat Operations (CO) to the SD. The SD produces the AOD which is used to develop the daily Air Tasking Order (ATO). Often, information regarding whether a mission on the current ATO was 1) scheduled, and 2) executed, is unknown through SD's next iteration of the AOD. The missing information requires the SD to re-plan a mission or missions whose execution status is unknown in order to ensure the tactical goal (effect) is achieved. The opportunity to complete this feedback path was realized with the inception of TBONE.

The SPVT team re-engaged supporting work in the AOC SD, but this time with a renewed sensitivity to the data feeds supporting a prototype technology. The team's focus turned to assisting the strategy planner in capturing and formulating data and information which heretofore had been a very manual and inefficient process. Early in the planning process and when an operation changes significantly, the SD is tasked with developing one or more Courses of Action (COA). The COA Development process is often associated with the term 'Bunch of Old Guys Sitting Around the Table' (BOGSAT). While the deployment of IWPC to all Combatant Commands (COCOMs) late in the SPVT project offered support to the manual process, much effort would continue along the previous path. Figure 1 illustrates SPVT's work-centered approach which focused on replacing multiple inputs/outputs/tools and data translations with a single unified workspace that satisfied work objectives. ***(Section 3.5) COA Sketch*** offered a fresh approach to COA Development, as well as support to other upstream and downstream elements of the JAOP process such as Mission Analysis.

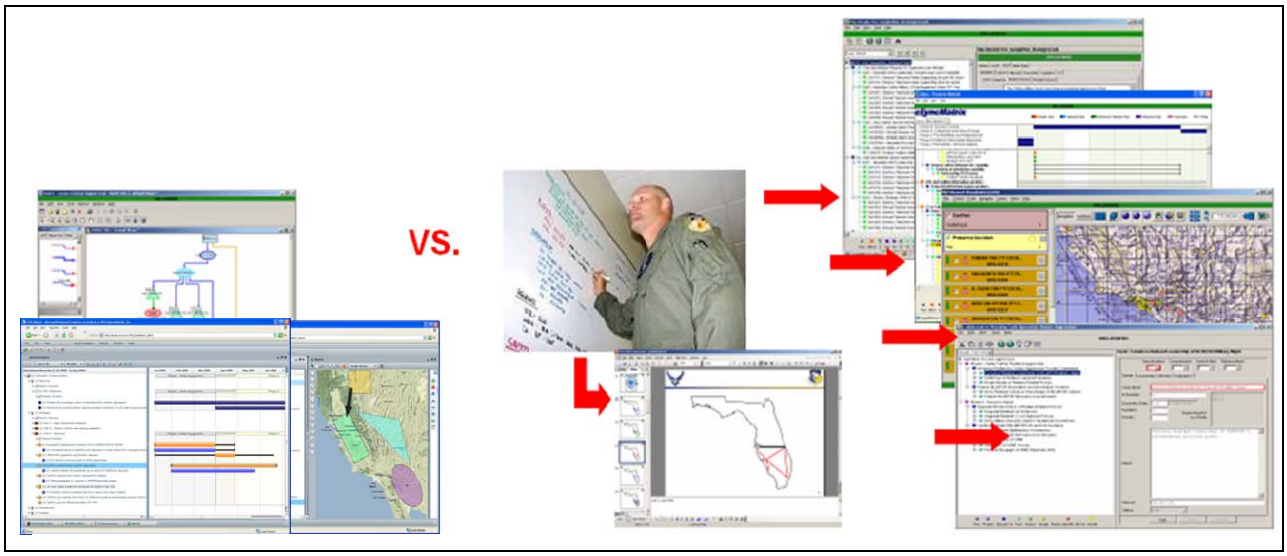


Figure 1 SPVT Work-Centered Focus to Concept Design and Refinement

COA Sketch continued to evolve while ***(Section 3.6) TENEO*** was brought to the SPVT program for evaluation as a capability enhancement to IWPC. TENEO was a rapid prototype for validation of planned Air Tasking Orders. TENEO demonstrated a solid concept of importing an ATO for playback and threat ring display against the ATO missions. TENEO, however, was initially intended only as a proof of concept with software methods not designed for integration with other applications. IWPC program office was interested in determining whether TENEO was mature enough to integrate quickly with IWPC.

Once COA Sketch gained momentum as a prototype, more attention was paid to the anticipated data model requirements. A risk reduction effort to explore the feasibility of a net-centric, ontology-based, pluggable architecture to support a suite of technologies, ***(Section 3.7) Information Operations Planning Capability – Experiment (IOPC-X)***, provided a perfect venue against which to build a data model for COA Sketch. Further, IOPC-X was soliciting technologies to apply within the "to be" architecture and COA Sketch fit that plan well.

Maturation of COA Sketch and IOPC-X required access to operationally-relevant, planning mission data sources such as MIDB, JTT and Friendly Order of Battle (FrOB). Interfaces to these databases were developed and used to various extents.

The final task focused on supporting the Strategy Division through improved human-machine and human-human information exchanges. Specifically, the Australian Department of Defence Defence Science and Technology Organisation (DSTO) provided LiveSpaces, a technology focused on support for ***(Section 3.8) Collaboration in the AOC Context,*** the type often found in Command and Control environments. Key elements of the LiveSpaces environment were instantiated for evaluation within an AOC Strategy Planning context. LiveSpaces elements which were not immediately available to instantiate for various programmatic reasons), were augmented through development of similar capability plug-ins. One important characteristic of the LiveSpaces environment was the ability to quickly and easily develop capability extensions. This feature alone, aside from LiveSpaces ability to effectively support intense collaboration, provided an excellent framework from within which Research & Development activities are easily supported.

Ultimately, the combination of requirements elicitation, concept generation and refinement, and prototype development and evaluation resulted in a large body of knowledge for the AOC SD, several conceptual prototypes, one risk reduction, one technology demonstration and two technologies transitioned to United States Air Force (USAF) and United States Strategic Command (USSTRATCOM) programs of record.

The tasks collectively provide a solid work-centered analysis of AOC SD processes and decisions with several technologies designed to support the various aspects of the analysis. Each task is described in more detail in the following section.

3.0 METHODS, ASSUMPTIONS, AND PROCEEDINGS

3.1 USER INFORMATION AND DECISION REQUIREMENTS

Initial understanding of AOC high level needs were taken from the ManTech AOC Cognitive Work Analysis (CWA) generated in Phase I (prior to, but overlapping the SPVT contract). The SPVT project built upon the CWA analysis via a thorough modeling of the AOC Strategy Division processes. This effort provided an enterprise level view of the AOC, AOC personnel, processes and information flow and exchange requirements. The effort ensured traceability to all sources for future validation and clarification of need.

The analysis included a literature review of Air Force doctrine, pamphlets and other materials as well as interviews with subject matter experts (SMEs). The following high-level requirements were generated during this phase of the SPVT effort.

- Assist with COA development by allowing Strategy Planners to follow current work processes
- Visually represent COAs while maintaining relational context to the temporal and textual plan elements
- Import or directly reference political, environmental, geospatial, logistical, informational, temporal and guidance layered data elements from existing tools within the AOC or GSP environments
- Maintain available relationships to other data elements both internal and external to COA Sketch for all imported or directly referenced data elements
- Assist with notional Allocation Planning
- Provide Apportionment level estimation and situational awareness based upon the notional allocation
- Provide temporal estimation capabilities based upon the notional allocation scheme
- Allow planners to designate areas of effect in a geographical or conceptual context
- Allow multiple users to collaborate on the development of one or more COAs
- Format briefing material for the JFACC COA Decision Brief
- Interface to current planning tools in order to automate the transfer of nominated and selected COAs

Appendix A contains more than 500 AOC operational requirements that were generated during the SPVT program. This list of requirements is organized chronologically by task or event (JAST, CEP, WAW, COA Sketch and high-level COA Sketch). Initial requirements were used as a baseline set for all future AOC SPVT efforts to provide a solid understanding of the doctrinal point of view of the AOC and SPT to the SRA SPVT project team. Each subsequent task built on the requirements foundation. The analysis was particularly useful to members of the SRA elicitation teams when performing CTA interviews of SMEs.

3.2 COMMON EFFECTS PICTURE

The initial application of the user requirements analysis followed a request to develop a rapid prototype for a "dashboard" to support a commander and staff. The Common Effects Picture or CEP was designed to roll up effects from planning and execution through the operational level. CEP provided a visualization to help senior decision makers manage effects based operations.

The task focused on requirement's analysis of a Commander's decision making, based in part on the previous "JFACC Cognitive Analysis" CTA performed by Aptima under a separate contract. Key requirements included the following:

- The JFACC must be able to determine the impact and effects of past, current and projected actions at any given point in time
- The complexity of the problems that the JFACC faces cannot be easily achieved with a single visualization or presentation
- The JFACC requires actionable information – the approach herein was to elevate previous information related an actionable level

Visualization concepts from CEP are shown in Figures 2 and 3. The command-centric (JFACC level) visualization shown in Figure 2 provides the high-level "at a glance" view of air operations. The Projected Plan Activity visualization shown in Figure 3 provides the actionable information necessary to for a 48 hour and beyond view on operations.

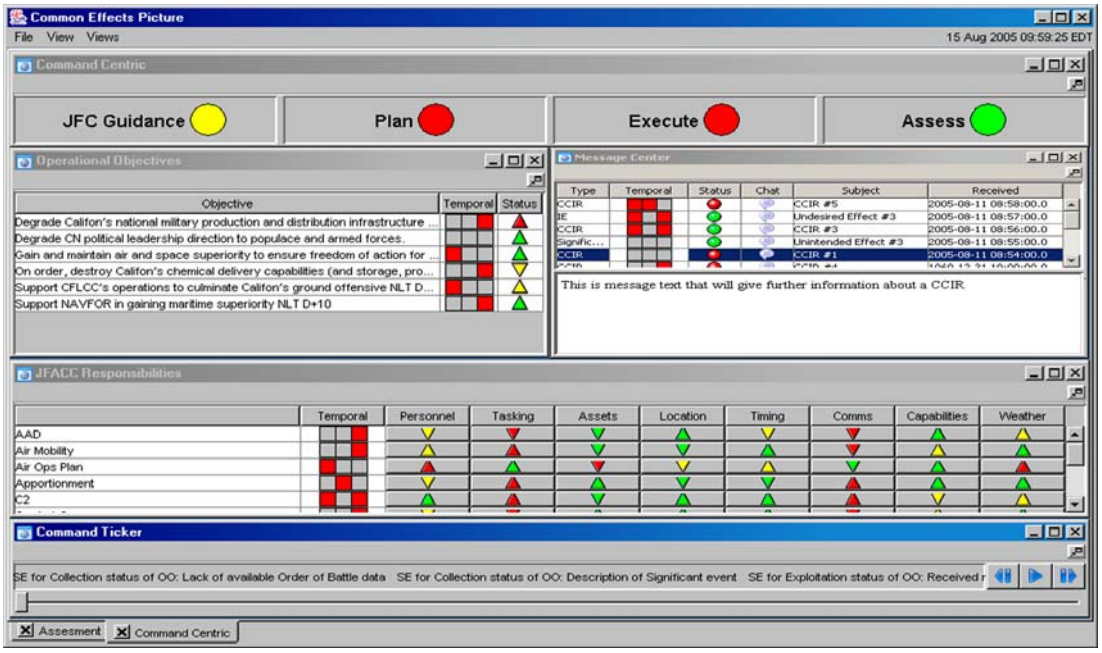


Figure 2 CEP Command-Centric Visualization

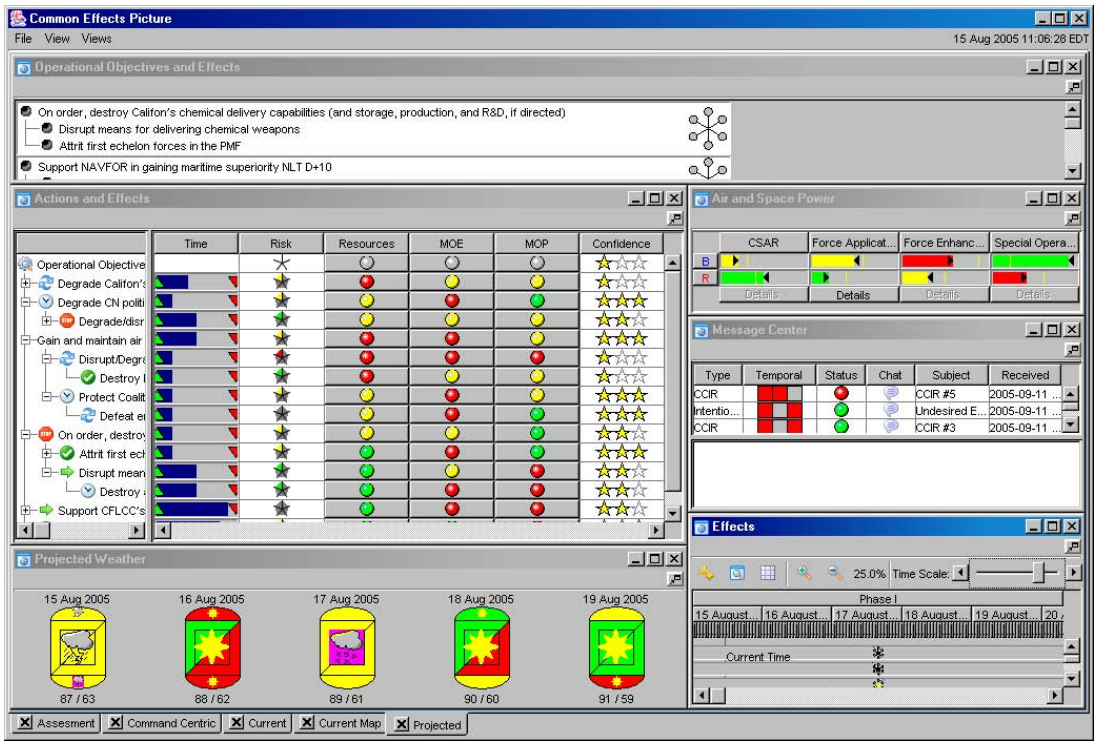


Figure 3 CEP Projected Plan Activity Visualization

Prototypes were developed incrementally as the requirements analysis continued. These incremental CEP prototypes were then used to stimulate inputs from representative warfighters and SMEs from the AOC Strategy Planning community during sidebar elicitations at Checkmate 2006 and Global Cyberspace Innovation Center (GCIC) sponsored Warfighter Assessment Workshops. The concepts were well-received by the warfighter communities and were further steered by Lt. Gen. Charles R. Heflebower (Ret.), one of the senior mentors.

3.3 GLOBAL EFFECTS MANAGEMENT SYNCHRONIZATION

The Joint Information Operations Warfare Capability (JIOWC) was interested in exploring visualization concepts for an effects management concept termed GEM-S. Initial concepts were drawn from the CEP and presented to the JIOWC in February 2006 as a concept supporting the GEM-S. Subsequent design iterations for the GEM-S prototype were based on CEP and evolved over several months based on close interaction with operational users and stakeholders from the JIOWC. The following paragraphs describe the features GEM-S is intended to support. The spirit of these design features carry through most aspects of SPVT and thus are described in detail through this section.

GEM-S is a planning, assessment and campaign monitoring capability designed to operate as a thin client over a service oriented architecture. It provides a collaborative environment for users operating at multiple levels of command and across multiple communities of interest. GEM-S provides support for kinetic and non-kinetic operations, and includes unique capabilities which enable users to create and share user-defined displays, develop and modify plans from geospatial

and temporal perspectives, and create and assess lines of effect. Innovative views also provide tailored campaign situational awareness for planners, analysts and commanders. The primary visualization and information components unique to GEM-S include Operations, Activities & Actions (OAA), Lines of Effects (LOE), IO Assessment and Information Ticker views and are best described in the following operational context.

Once an operation is underway, operations assessors begin performing assessments at all levels of the campaign. By opening each plan element and Measure of Effectiveness (MOE), planners and assessment analysts document the current plan element state, assessment trend and assessed effect status. Selecting an assessment status presents the user with two measurements; Magnitude Score and Direction Score. The effect Magnitude refers to the "mass" of the effect achieved when compared to the desired amount. The effect Direction refers to the positive or negative achievement of the desired effect.

Campaign situational awareness is afforded through several innovative views. The OAA view displays an array of information about plan contributions and dependencies as well as current status and trend information (see Figure 4). Each of the strategic prioritized effects is displayed at the top of the screen. The colored circles to the left indicate the current state of each plan element. A green circle indicates operations supporting this effect are currently being executed, yellow indicates operations are planned but not yet in progress, and red indicates the supporting operations have yet to be planned. The colored triangles next to the circles indicate the current status and trend of the plan element. An upward pointing triangle indicates an improvement trend, a downward a worsening trend and to the side indicates no change. The color within the triangle indicates the current assessment of that effect, with gradients of red, yellow and green indicating various degrees of positive or negative effect. This same methodology is repeated for the other levels of command. Note the triangles in the center matrix also indicate which Prioritized Effects List (PEL) effects they are supporting.

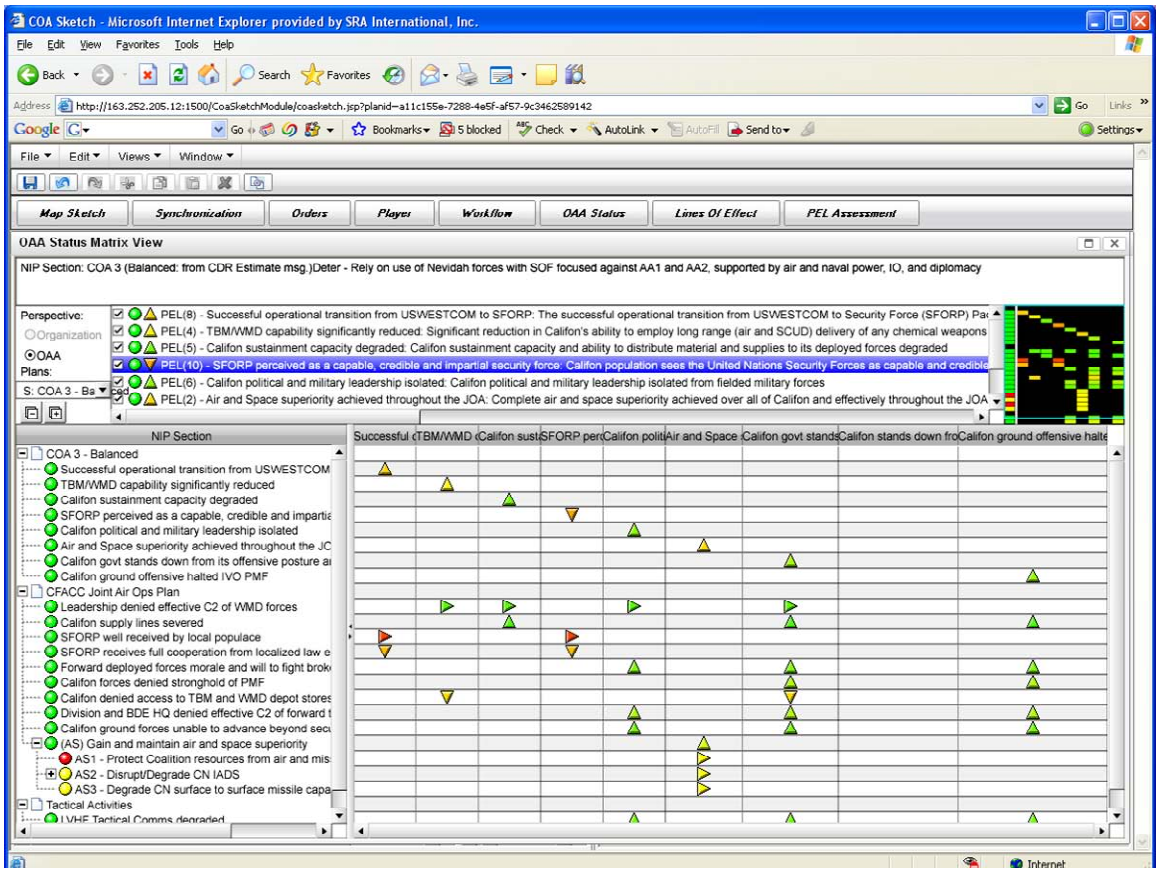


Figure 4 GEM-S Operations, Activities and Actions (OAA) view

The LOE view (see Figure 5) allows the planners to establish supporting relationships that show how each lower level effect, objective or task contributes to the desired effects at the higher level. The LOE view enables one to display these often complex contributions and dependencies. The same four levels of command within the Synchronization View are represented here. Once these relationships have been established joint planners may apply weighting factors to determine the contribution of each supporting effect. This weighting will play a significant role during the ops assessment process by dictating how much each individual lower level assessment is able to influence the success or failure of higher-level effects.

Upon selecting the "Lines of Effect" check box, these relationships are displayed, linking each lower level effect or objective to the high level effect to which it contributes. Note also that the varied line thickness between the elements represents the weighting established earlier in the planning process. A user who wishes to view a single line of effect can simply go to the fly-over view at the top left and mouse over each plan level to select the specific effect of interest. Once the desired element is selected, only the plan elements to which that effect depends or contributes are displayed. This function may be performed at any plan level of the campaign hierarchy. Real time information updates are capable through the Information Ticker (scrolling text) at the bottom, center of the view.

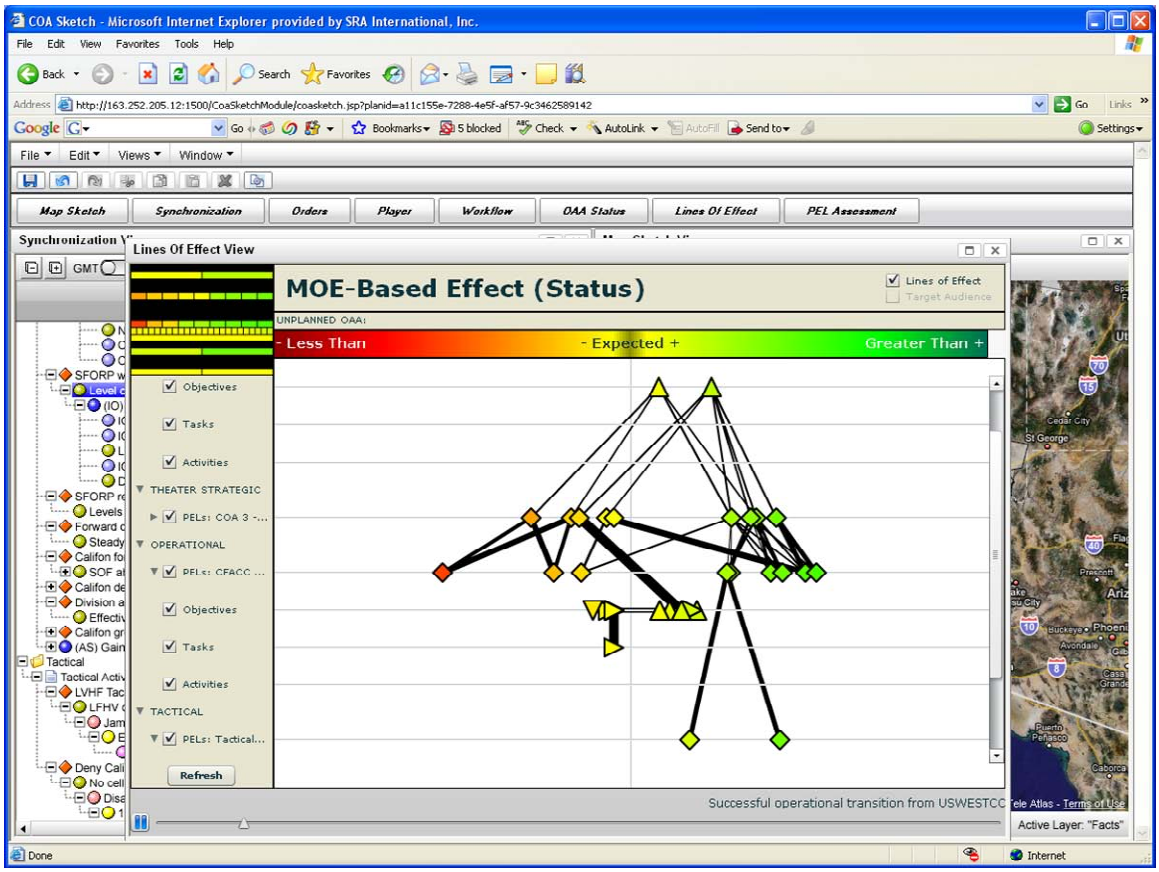


Figure 5 GEM-S Lines of Effect (LOE) view

The view which completes GEM-S is the PEL Assessment (see Figure 6). This view is intended to show a top level status of the entire campaign by displaying the current assessed status of every desired effect in the campaign… at each level of command. The PEL Assessment approach provides a means for commanders to obtain immediate high-level awareness of the success level for each desired effect. At each selected campaign level, diamond shapes represent each effect present. Each effect consists of two values: Effect Magnitude and Effect Direction. The PEL Assessment view captures both values on orthogonal axes.

The vertical axis represents the magnitude score while the horizontal axis represents the direction score. Note the exponential values at the top for the "viral" magnitude score previously discussed. Each of the effects is plotted on this view using the scores found on the status tab of each effect measure. Commanders and other decision makers may quickly see which effects are on track and which require further attention.

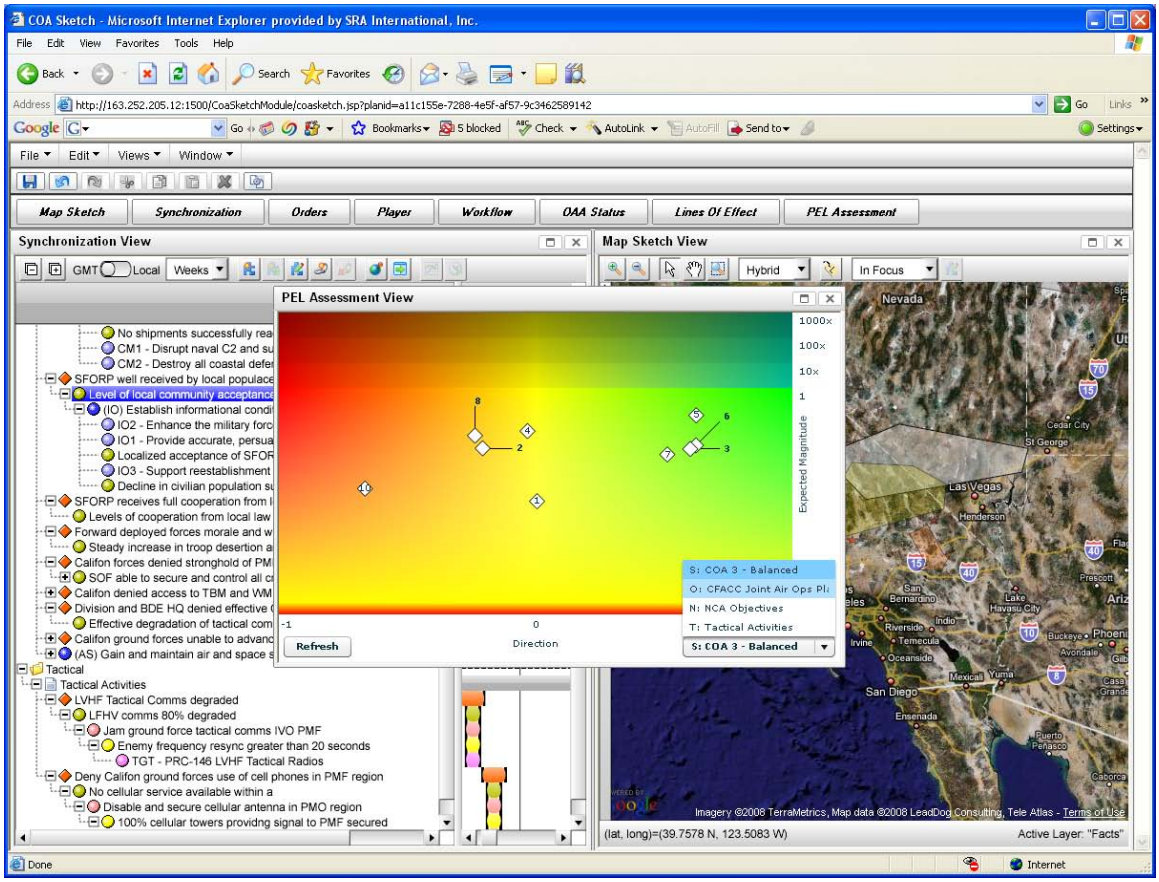


Figure 6 GEM-S PEL Assessment view

Appendix A Volume II contains detailed theoretical and operational descriptions of the GEM-S IO Assessment view (developed by SAIC under subcontract to SRA).

3.4 JAOP AOD STATUS TOOL (JAST)

JAST was the product of a need to complete a key feedback path from Combat Operations Division to the Strategy Division. The Planning and Execution Status Bar, as described in the IWPC CPT Software User's Manual (SUM) supports the planning process by providing useful combat planning and execution status data correlated to a published Joint Air Operations Plans (JAOP) and the daily Air Operations Directives (AOD). The SD produces the AOD which is used to develop the daily ATO. Often, information regarding whether a mission on the current ATO is 1) scheduled, and 2) executed, is unknown through SD's next iteration of the AOD. The missing information requires the SD to re-plan a mission or missions whose execution status is unknown in order to ensure the tactical goal (effect) is achieved. The opportunity to complete this feedback path was realized with the inception of TBONE.

The design of IWPC version 4.2b called for TBONE to be (1) a receiver of IWPC strategy planning products (e.g. JAOP and AOD), and (2) a source of plan status data to include publishing the plan and tracking status for plan elements as they move through targeting, allocation, execution and assessment. JAST was the interface to bring the

TBONE combat operations data back into the strategy planning world of IWPC. JASP was the interface to bring the TBONE targeting, allocation, and execution data back into the strategy planning world of IWPC. The IWPC CPT requirements in Table 1 are shown with the JAST requirements analysis.

Table 1. JAST Planning and Execution Status Requirements

Requirement ID	Description
CPT-PE-0001	The application shall provide the user the capability to track the status of Air Tasking Orders (ATO) planned and executed for each Air Operations Directive (AOD) or Joint Air Operations Plan (JAOP).
CPT-PE-0002	The application shall provide the user with the capability to load planning and execution status associated with an AOD.
CPT-PE-0003	The application shall provide the user with the capability to request updates to planning and execution assessment data
CPT-PE-0004	The application shall provide the user with the capability to view planning and execution status data for each effect
CPT-PE-0005	The application shall automatically provide the user with the ability of keeping track of what planning and execution status data has been viewed and unviewed for each effect
CPT-PE-0006	The application shall provide the user with the capability of copying planning and execution status data
CPT-PE-0007	The application shall provide the user with the capability to clear out the tracked unviewed planning and execution status for each and all effects.

The IWPC Execution Status and Assessment data interfaces leverage the TBONE Services and data model. The services and supporting Java 2 Platform Enterprise Edition (J2EE) components for this component of the IWPC interface to TBONE is provided through JAST.

JAST provides the following capabilities back to IWPC:

- JAOP/AOD Element Timing
- JAOP/AOD Associated Target Status
- JAOP/AOD Decision Point Status
- JAOP/AOD Mission Status

These capabilities are shown in Figure 7, where each tabbed section contained detailed information on Timing, Targets, Decision Points and Missions. The data handled by JAST provided interesting user interaction design, in that JAST was intended to provide “updated” information. A user interface, itself, is unaware whether a user has processed new information. Therefore, users were required to acknowledge (interact with JAST) when new information was

presented. One example is shown at the bottom of Figure 7, where light blue backgrounds on icons represents an information update is available.

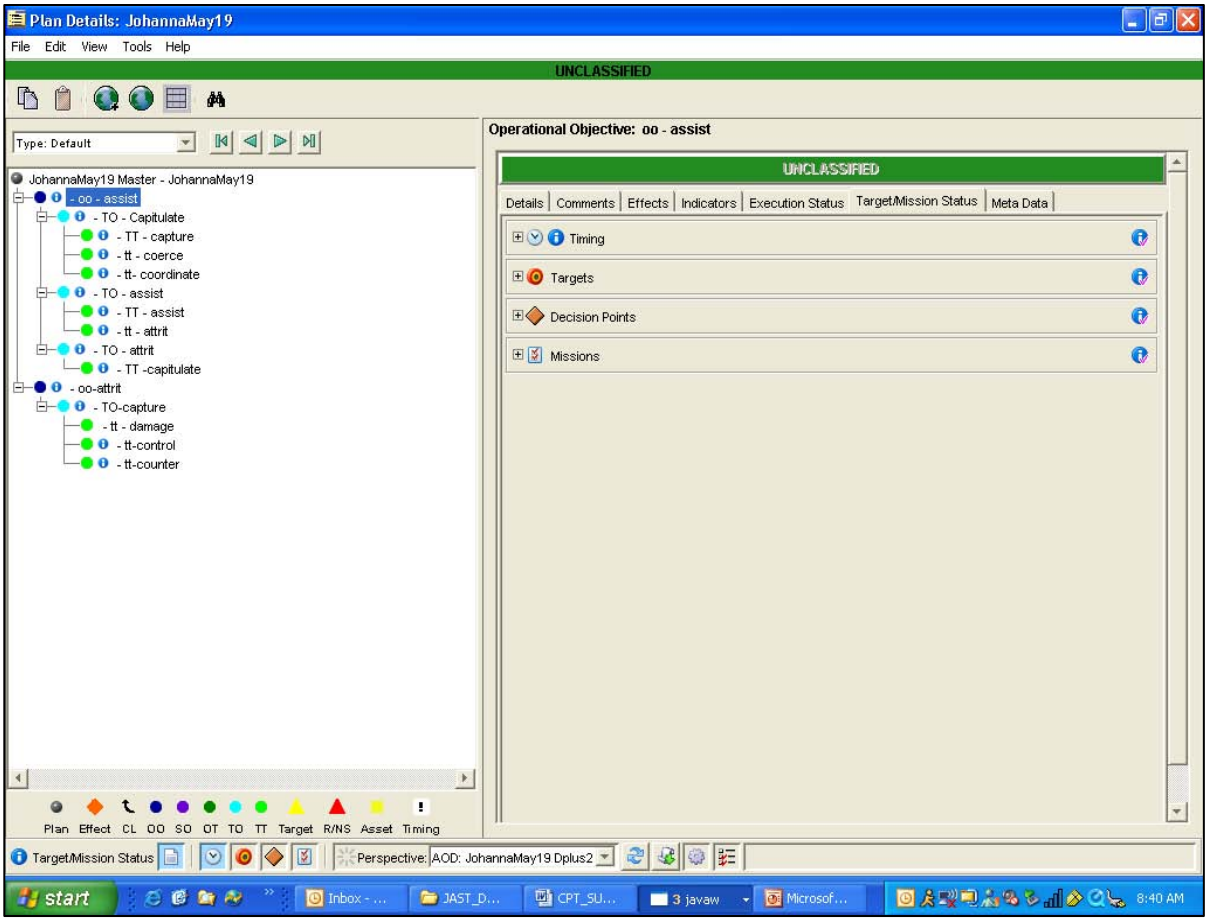


Figure 7 JAST implementation in the IWPC CPT Module

JAST is designed as a Service Oriented Architecture (SOA). JAST complies with the J2EE 1.4 specification and thus is scalable and secure. Termination of the TBONE program, however, just prior to IWPC deployment meant JAST had to be disabled within IWPC 4.2, i.e. no data feed existed to populate JAST. To support JAST integration with IWPC, the following items were delivered initially in October of 2005 with software updates (based on changes to the IWPC Software Developer Toolkit, SDK) as required through December 2006.

- JAST IWPC Client Software
- JAST Software and Subsequent Updates
- eSync/Collaborative Planning Tool (CPT) Software Users Manual (JAST enhanced)
- JAST Code Interface Control Document (ICD) Update

Appendix A and B contain the CPT SUM (Sections 5.3.8 – 5.3.10.8) and eSync SUM (Sections 5.3.3.8 – 5.3.3.10.10), respectively. Each SUM was modified to account for inclusion of JAST-related information within IWPC (Note: these SUMs were provided to the IWPC prime contractor as examples of where JAST reference material best fit, however, additional technical

editing was conducted by the prime and thus these documents do not represent the SUMs delivered with IWPC v 4.2e). The SUMs provide an excellent detailed, functional overview of JAST capabilities within the respective IWPC capability module.

3.5 COURSE OF ACTION (COA) SKETCH

Course of Action (COA) Sketch is a concept that was focused on the concept of "visually" developing the plan in the AOC Strategy Division context. The visual plan development concept evolved from a workshop sponsored under the SPVT contract to explore human-centered work aids for Strategy Planners conducting COA development. Major Stewart Greathouse (USAF ret) provided the structure for core elements. Visual plan development work methods previously included strategy planners drawing the plan on a whiteboard or map and subsequently moving those thoughts and artifacts to other existing planning tools which supported only a structured, hierarchical plan.

COA Sketch allows users to create planning elements within both a geographic and temporal context (see Figure 8). Further, strategy planners are able to visually initiate the planning process and drive a more collaborative and cohesive interchange, enabling understanding of horizontal and vertical nesting of objectives, priority effects, and operations. COA Sketch is a multi-user tool with attribute level locking and near real-time data updates which enables several users to work on a single plan simultaneously, and further, observe how others are contributing to plan development.

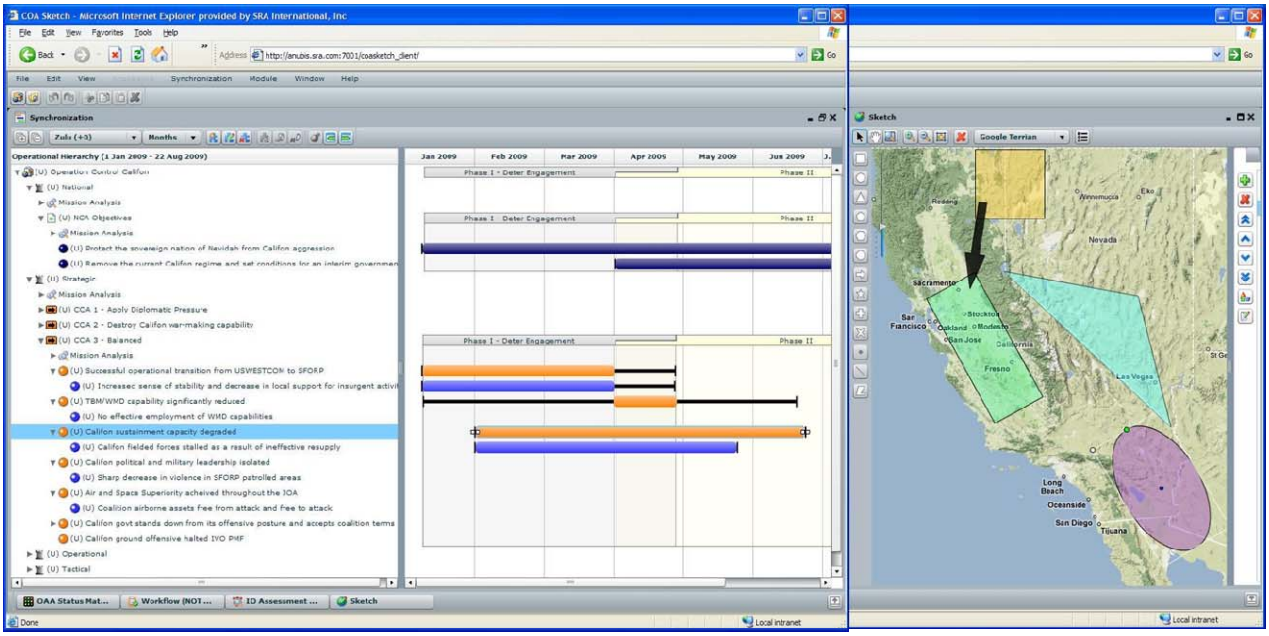


Figure 8 COA Sketch Workspace, Sketch & Synchronization views

COA Sketch emphasizes moving unstructured data from the selected human-to-human collaboration environment into structured information sets realized within Community of Interest (COI) specific supporting tools. In this case, "tools that collaborate" such as COA Sketch share

unstructured data captured from the human-to-human collaboration environment and provide structure, augmentation and presentation of the data such that users can generate a shared or common understanding from multiple perspectives on the data.

Findings from interviews with AOC SMEs indicated that the Subject Matter Analysis and Research Toolkit (SMART) tool showed great promise for the discovery, organization and sharing of information for personnel conducting Intelligence Preparation of the Operational Environment and other Mission Analysis activities. SMART also provides search and tagging capabilities for structuring data from unstructured data elements. Machine-to-Machine (M2M) transfer of the tagged artifacts between the SMART and COA Sketch tools completes one aspect of tool collaboration. Further, SME feedback suggested that the COA Sketch tool's ability to capture geospatial artifacts previously only found in whiteboard sketches and translated into PowerPoint slides would benefit all SD planners.

Current human-to-human collaboration tools generate unstructured data while community of interest (COI) specific tools are usually designed using object-oriented techniques focused on a particular COI. A COI focus helps ensure the data captured is well structured. To begin, one must establish a taxonomy of COI-defined entities and data formats for the exchange of information between candidate applications such as SMART and COA Sketch. Current industry and DoD trends include the use of web services for data exposure and interchange, and therefore loosely coupled integration through web service interfaces. Proof-of-concepts were performed, allowing the interactive capabilities of SMART and COA Sketch to facilitate production of end product focused objects and attributes during the collaboration. The goal of these extensions was to provide the end user the ability to associate unstructured data elements to COA Sketch Mission Analysis entities using SMART's tagging capability. Figure 9 provides a high-level graphical use case demonstrating this type of interoperability. More detailed use cases are provided in Appendix B COA Sketch Use Cases.

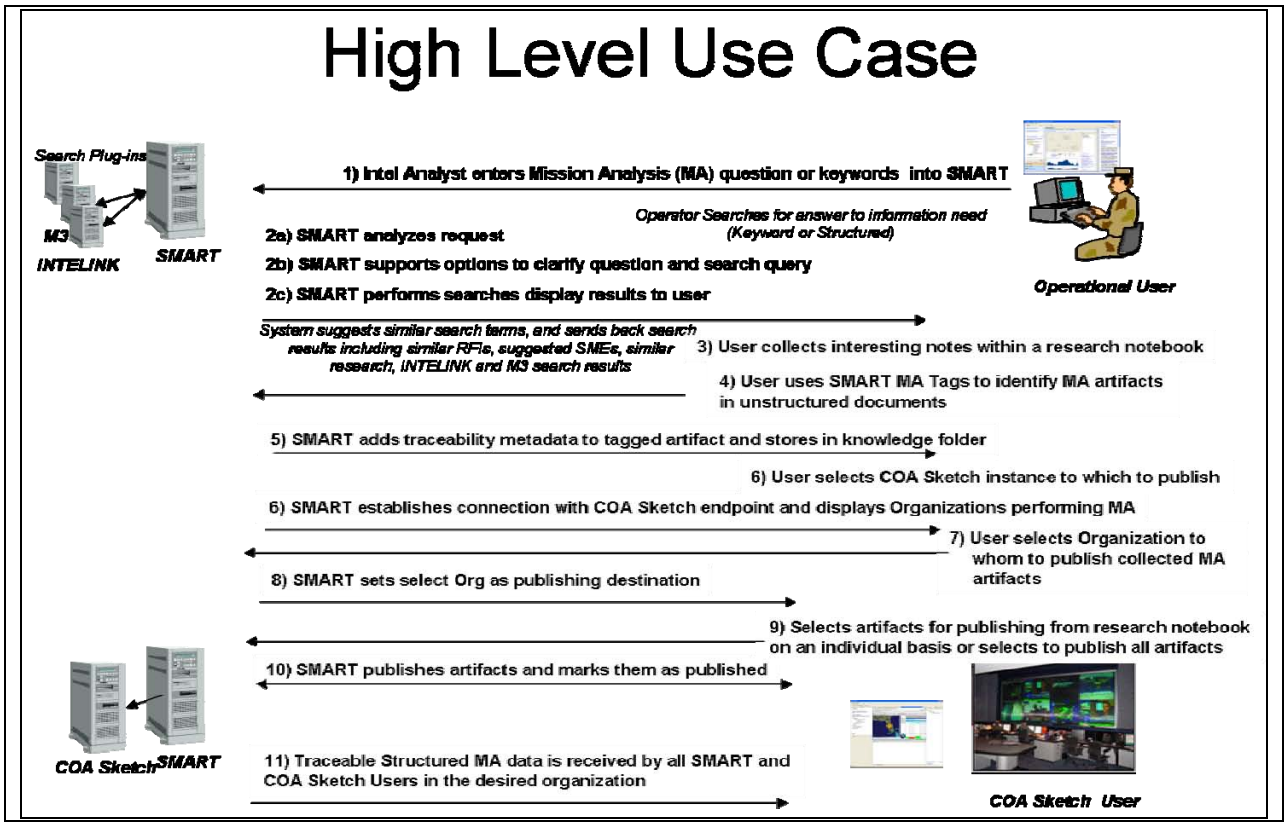


Figure 9 High level use case for unstructured to structured data processing

COA Sketch provides the following benefits:

- Machine to machine exchange of data & graphics to enable collaborative planning by all AOC teams
- Planners support in developing COAs with a series of visualizations and workspace tools
- The ability to develop plans using true geographic information (versus PowerPoint)
- A graphic & collaborative framework in which to develop & coordinate the JAOP
- Decentralized execution while informing senior decision makers
- Increased awareness of operations that transcends multiple AORs and enables timely & informed decision making

COA Sketch is a thin-client technology comprised of several modules or views designed to provide decision support to the Strategy Division when considering combat options. The main views include Map Sketch, Synchronization, Mission Analysis, and Plan Player. Each view provides a specific perspective on plan data. COA Sketch provides the user the flexibility to choose appropriate views and spatially arrange them to best support work.

Table 2 summarizes implemented and pending COA Sketch's main features.

Table 2. COA Sketch Main Features

High-Level Feature	Function
Administrative Manage	user accounts and privileges
Collaborative Environment	Attribute level locking on data fields enables multiple persons to work at the same time and to view plan updates in near real time
Mission Analysis	Develop mission analysis artifacts
Plan COA (Synchronization)	Create and modify plan elements, COAs, and associated objects
Plan Player	Display temporal execution of plan elements across Synchronization and Sketch views
Situational Reference Point (not fully implemented)	Save a workspace view/layout for reference or use at a later time
Sketch Create	and associate plan objects geographically to Synchronization View plan elements
Work Flow (not fully implemented)	Complete work method templates for specified strategy roles

Most noteworthy for COA Sketch, and an indicator of SPVT's ability to address warfighter needs, was the program's transition to the USSTRATCOM Integrated Strategic Planning & Analysis Network (ISPAN) program of record in September 2009. COA Sketch was also integrated into the IOPC-X database ontology which allows data to be exchanged freely with other IOPC-X Capability Modules (see Section 3.7 for a description of IOPC-X). Sections 3.5.1 through 3.5.4 describe the process through which COA Sketch evolved and the high level capabilities.

3.5.1 COA SKETCH ASSESSMENT EVENTS

The initial COA Sketch design was derived from user information and decision making requirements described in Section 3.1. COA Sketch was subsequently refined through feedback from a series of interviews and evaluations conducted with AOC SD SMEs. While many important contributions to COA Sketch design and development were obtained through numerous opportunistic interview and evaluation sessions with one or two SMEs, two particularly significant events provided substantial advances in concept and capability.

The first significant evaluation event served as an opportunity to expose warfighters to early COA Sketch concepts. The event, termed Warfighter Assessment of Innovative Technologies and Concepts (WAITnC), was conducted 17-21 September, 2007 at the Ryan Center, Langley AFB, VA. More than twenty warfighters provided representation from several operational squadrons with experience across the Strategy Plans Team and Operational Assessment Team. Technologies from several USAF sponsored programs provided the technology base against

which the warfighters could generate assessments. Senior JFACC mentor Lt Gen (USAF ret) Joe Hurd provided a commander's perspective on the event.

SPVT sponsored two technologies, COA Sketch and Strategy Air Allocation Planner (SAAP), for the WAITnC event. SPVT objectives for the event included: 1) evaluate the technologies throughout the JAEP process to identify gaps in capability; 2) verify accuracy of respective use cases against implementation; 3) identify mismatches between support for user information and decision making requirements as implemented in each technology; 4) identify performance improvement/degradations with respect to time on task; and 5) establish criteria for product quality. An objective specific to COA Sketch was vetting the work flow management concept and to SAAP was determining overall technology benefit to the warfighter.

The WAITnC event provided an opportunity to mature the COA Sketch and SAAP conceptual designs. Development at this early conceptual design phase consisted mainly of representing capabilities through interactive user interfaces with minimal effort given to generate, store and otherwise manipulate data. This approach maximized support to warfighter information and decision aiding requirements while minimizing software development effort, thus helping ensure future program effort was focused on developing the right capabilities. Further, these interactive user interfaces provided SMEs a richer environment in which to evaluate and evolve concepts. A SAAP interactive user interface is shown in Figure 10. Warfighters were able to select menu options, manipulate controls, and adjust the values, as if interacting with a "live" system.

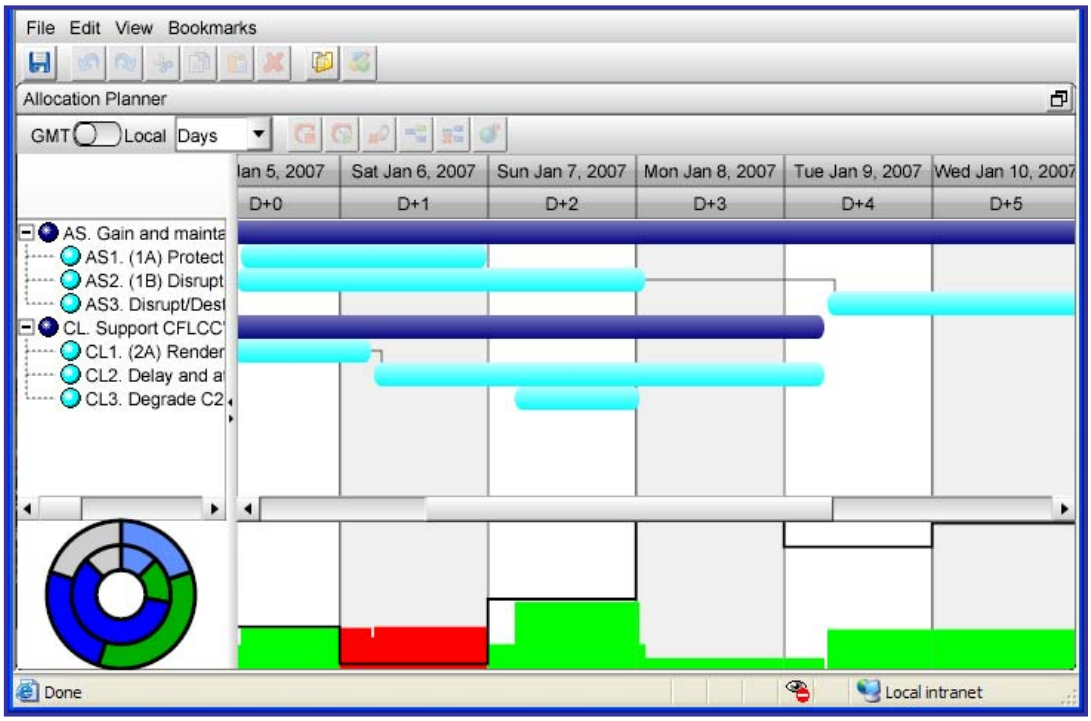


Figure 10 Strategy Air Allocation Planner concept

Warfighter feedback during WAITnC verified the appropriateness and accuracy of the approach and method. Specific functionality such as Map Sketch integration with Synchronization was well-received and prioritized higher relative to SAAP functionality. This may have been due in

part to the lack of Combat Plans Division representation at this event and therefore a lack of immediate proponents (i.e. users/beneficiaries of the technology) for the SAAP technology.

The second significant evaluation event served as an opportunity to exercise COA Sketch and its inherent collaboration features within a distributed AOC Strategy Planning scenario. The Collaboration event was a culminating activity for SPVT. COA Sketch had matured significantly over the previous two years and relative to that presented at the WAITnC. The COA Sketch technology was much more complete from user interface through data storage, although software development was not production ready or capable. For the Collaboration event, however, COA Sketch had emerged as a thin client technology with user interfaces developed from state of the art software (Adobe Flash/Flex). The advanced interfaces provided a powerful medium through which COA Sketch concepts were communicated.

The collaboration event was conducted 14-18 September, 2009 across distributed sites with eight experienced strategy planners, operational assessment personnel and intelligence analysts (see Section 3.8 for a more detailed description of the Collaboration in the AOC Context assessment event). Planners aggregate disparate unstructured sets of data back into a PowerPoint presentation and the Information Warfare Planning Capability (IWPC) planning tool to re-associate context and meaning from the COA development process. While IWPC acts as a repository for the aggregation of much of this data into a structured data format, the tool is not commonly used interactively during the development of a COA. The fidelity of the IWPC data model is also lacking, textual descriptions are commonly used vs. discrete elements and attributes throughout the tool, forcing human cognition of meaning vs. system processing into human perceivable contextual relationship visualizations. It is this disconnect between the human work process and available tools which is addressed with the integration of COA Sketch and other work-centered tools that collaborate into the collaboration environment.

COA Sketch was particularly well-suited to participate as a technology in the collaboration event because the COA Sketch design was enhanced to enable multiple, distributed users to work simultaneously on a plan. Collaborating tools such as COA Sketch allow computer systems to provide human automated assistance in the knowledge gathering process. This assistance can occur while enhancing the knowledge with automated traceability to sources for human confidence determination, and thereby, support human trust in the automation. Visual thinking also is more readily supported since associated metadata on the knowledge set was machine correlated to multiple information portrayal options provided by the systems.

The COA Sketch technology was well-received at the Collaboration event. At the time of the event, representatives from the ISPAN program were actively engaged in identifying technologies which could quickly benefit the strategy planning capability within ISPAN. One projected way ahead included applying COA Sketch user interfaces, in whole or part, as an alternate view onto ISPAN data. More details on the collaboration event can be found in Appendix E.

3.5.2 COA SKETCH USE CASES

SRA's Human-Centered Systems Engineering Process was used to generate use cases which formed the basis for the COA Sketch functional design. Initial use cases were based largely on

the user requirements analysis conducted early in the SPVT program. The use cases were subsequently refined during design review meetings with an integrated development team including software and human factors engineers. Operational expertise was added through inputs from a combination of in-house and external SMEs. Mr. Clarence "Clay" Olschner contributed substantially to use case refinement and verification. COA Sketch's high-level use case is shown in Figure 11.

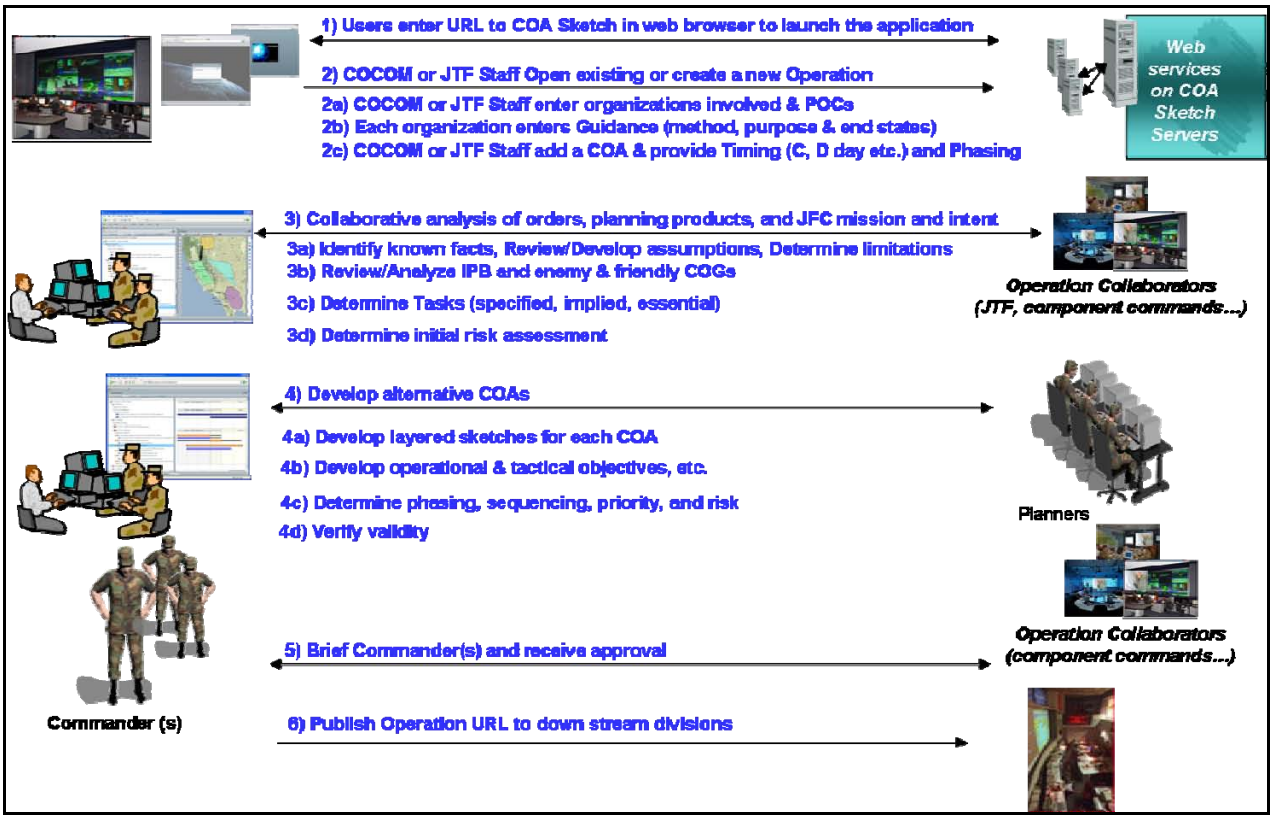


Figure 11 COA Sketch High-Level Use Case

The COA Sketch SUM contains a brief description of the software, installation instructions and a reference guide. The COA Sketch SUM is provided in Appendix C.

3.5.3 COA SKETCH CONOPS

A brief scenario best provides an overview of COA Sketch features. When an operation is first created, planners identify initial timing, phasing and tasked mission. These elements are further refined later in the planning and execution process. As the planning staff continues with Mission Analysis they identify planning assumptions, limitations, centers of gravity as well as specified and implied tasks. To make this effort a bit easier and more accurate, COA Sketch provides some helpful features. COA Sketch includes a workflow manager which steps users through common processes, such as Mission Analysis. Another helpful feature provides planners with a means to add items to the Mission Analysis portion of the campaign directly from the planning orders from which they originated via web services and a related AFRL technology known as SMART.

Once Mission Analysis is complete, planners begin to develop courses of action to satisfy National objectives. COA Sketch supports four planning levels, enabling vertical collaboration of the entire planning and execution effort. As many COA candidates as desired may be created, with the selected COA being designated as the "Plan" for each level of command. To satisfy National objectives, the Joint planning staff develops the Commander's prioritized effects list, or PEL, for a campaign.

PEL effects speak to each of the national objectives and can range from defeating fielded forces, to isolating leadership to winning the hearts and minds of the people. These high level effects are also assigned Measures of Effectiveness which are used later to assess campaign success. Other details such as a description and planning status may also be added. Using the Map Sketch feature (see Figure 12), planners may draw map shapes and annotations and assign them to specific plan elements. These areas can be linked to any portions of the plan, from Assumptions and Limitations, to desired effects, objectives and tasks. For example, an influence operations area, a named area of interest or a no fly zone may be associated with any plan element. Users may also create new plan elements directly from the Map Sketch view. The user selects the desired map layer, draws and positions the shape, and selects the type of plan element. The new plan element is immediately added to the plan.

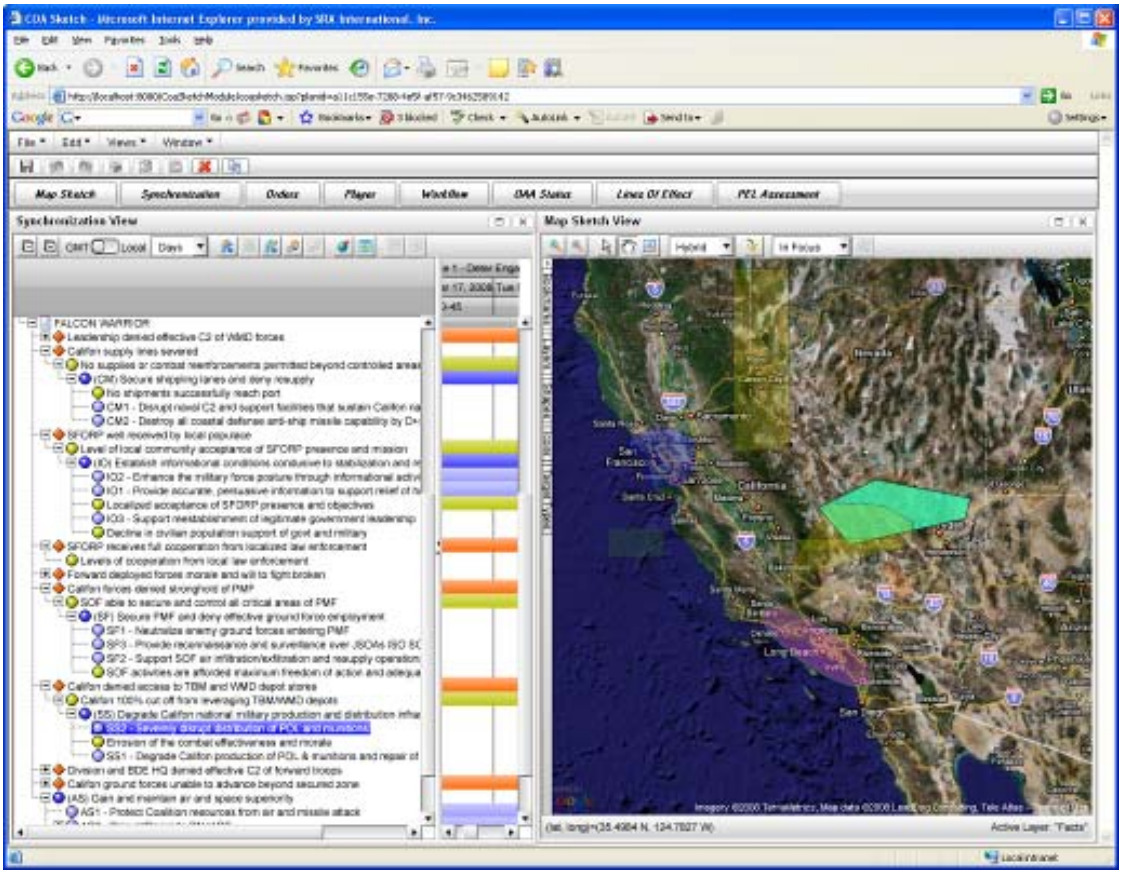


Figure 12 COA Sketch Plan and Map Sketch view

During this time, participating components begin to develop courses of action to achieve the Joint Commander's desired effects. COA Sketch supports COA analysis and comparison by

offering a collection of intelligent forms, tables and matrices to guide the planning staff through the process. Once a COA has been selected the Joint Commander's PEL effects are decomposed into operational effects, objectives and tasks.

So now plans have been developed at various command levels, assigned effectiveness and performance measures, and developed lines of effect by establishing relationships between the higher and lower level effects and objectives. Next, the planner integrates and synchronizes the various desired effects and activities and begins to establish initial strategic and operational timing and phase alignment. To modify plan timing, the planner simply uses the mouse to adjust the element start time and duration. Note that the plan element MOEs also has timing attributes to identify optimal measurement opportunities.

To visualize how the plan will "play out" over the duration of the campaign, COA Sketch offers a Plan Player. This feature provides planners a capability to visualize, brief or rehearse planned events across the operational timeline. The Map Sketch view is included during playback to add fidelity and will display the associated shapes and annotations as they occur in the timeline.

COA Sketch also provides several multi-user collaboration features. First, users can build and edit plans simultaneously within COA Sketch with planning efforts from both Joint and Component levels integrated. Second, plan integrity is maintained by assigning role-based permissions and locking individual plan elements during modification. Thus, users can work on a plan simultaneously at the data attribute level. Finally, COA Sketch enables real-time update notification. That is, users are notified when plan updates occur and can see the updates within COA Sketch.

3.5.4 COA SKETCH ARCHITECTURE

The COA Sketch system architecture is shown in Figure 13. A more detailed description of COA Sketch data transactions can be found in Section 3.7 Information Operations Planning Capability – Experiment (IOPC-X). Refinements to this architecture can be found in the final report for another 711 HPW Human Engineering Directorate program, Commander's Predictive Environment (CPE). IOPC-X was a risk reduction experiment developed under the HE in the AOC – SPVT program to serve as a persistent data store capability for COA Sketch. Updates to the IOPC-X data store are broadcast to JMS listeners. COA Sketch maintains a listener for IOPC-X update events and repeats them to thin clients attached to the Blaze DS data source. Appendix B Volume IIcontains the IOPC-X SDK which addresses the COA Sketch data model in more detail.

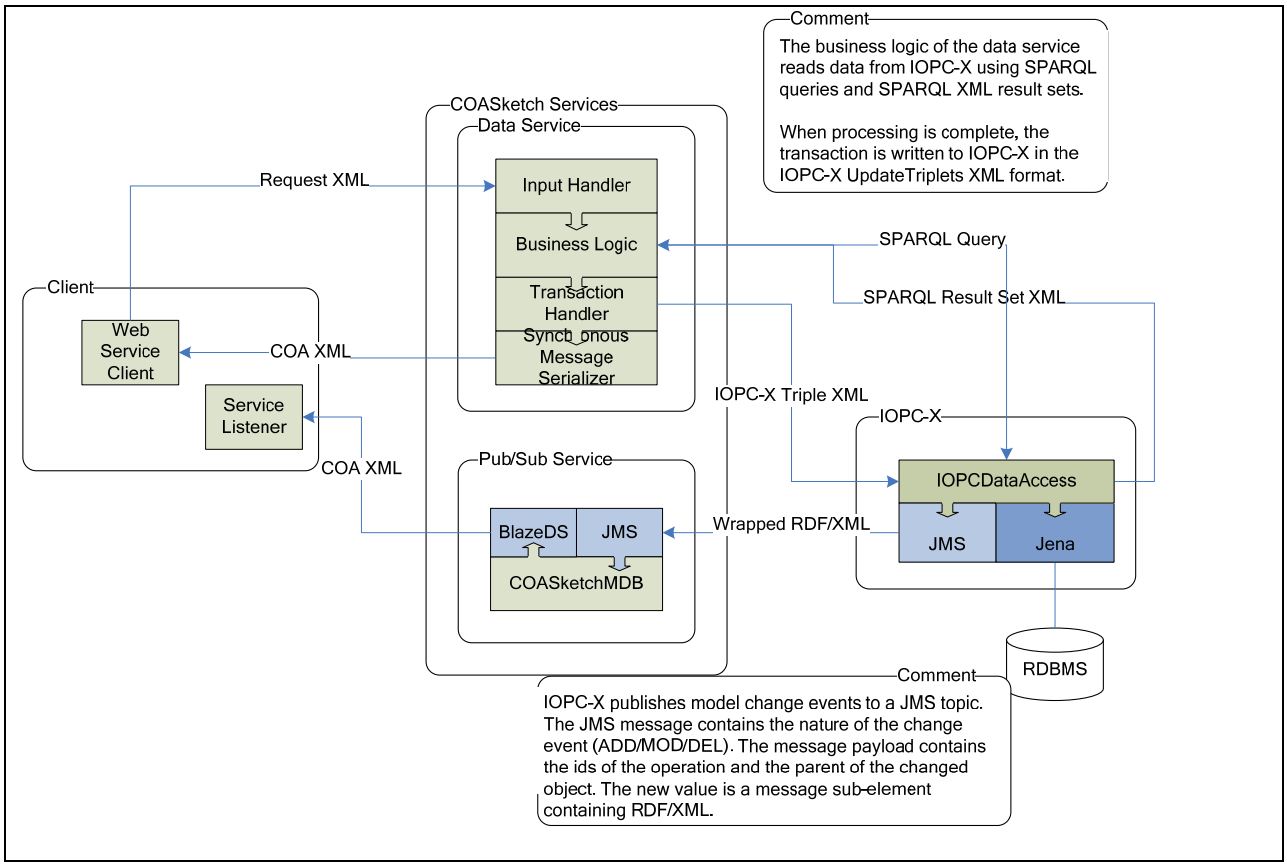


Figure 13 COA Sketch / IOPC-X System Architecture

3.6 TENEO

The ESC ISRSG/KIS and JIOC teams wanted to explore migrating code from an in-house project to support the maturing Information Operations (IO) Planning Capabilities programs, IWPC and Information Operations Navigator (ION). These programs were being installed at various COCOM locations and specific areas of common capability between current Air Force and future COCOM needs were identified. The common capabilities included Intelligence Preparation of the Battlespace (IPB); IO Strategy and Candidate IO Campaign Targets (Strategy/Targets); IO Mission Planning (IO Missions); and Mission Execution Monitoring and Assessment (Assessment).

The purpose of the code migration was to leverage work already performed in the area of visualizations of Air Operations in support of Strategic Planning to further the IO Planning Capabilities program. The candidate software provided the following functionality in support of Strategy Planning needs:

- Data import and filtering (e.g. ATO, intelligence data, etc)
- Data display on user-selected map backgrounds
- User-selected layering of the capability displays (i.e. ability to de-clutter)

- Visualization of notional operational effects of employing capabilities against specific targets, shown in a time-ordered sequence with playback (e.g. nodes affected and when)
- Visualization of temporal and spatial integration of capabilities into Operation Plan (OPLAN) "What if" analysis by changing some data variables and producing different display results
- On-line help files, some with capability specifications or OPLAN references

The following features were incorporated into the Teneo prototype: 1) launch Teneo from the IWPC main menu, 2) allow the user to view targets from IWPC through a special layer inside Teneo, 3) pass messages from IWPC via a rudimentary publish-subscribe ("pub-sub") framework using web services, 4) retrieve target data via a web service interface from IWPC and MIDB based on a user-defined geographic area of interest, 5) retrieve ATOs via a web service interface developed from a .NET adapter for TBONE, and 6) repaired the existing United States Message Traffic Format (USMTF) parser to expect any number. Finally, the IWPC architecture (Teneo enhanced) was evaluated to understand the effectiveness of an integration effort. Modifications to the existing architecture were proposed to improve, for example, web services.

The purpose was to evaluate the client software and the architecture as a whole. The technical (Analysis) Report and Software Product Specification were delivered in June of 2007.

3.7 INFORMATION OPERATIONS PLANNING CAPABILITY - EXPERIMENT

IOPC-X was a risk reduction capability to develop a modern SOA-based architecture for IWPC and to refine future technical and operational requirements. Primary operational and technical direction was provided by the Joint Forces Command (JFCOM) Engineering Staff Section (J7) VisIOn Technical Integrative Product Team. The IOPC-X environment enabled demonstrating COA Sketch as a plug-in capability to the SOA-based IWPC. The resulting IOPC-X prototype provided the following:

- A software Net-Centric infrastructure prototype enabling integration of new capability modules (CM)
- A pluggable infrastructure of core IWPC tools and IO analysis capabilities
- Alignment with the Net-Enabled Command Capability (NECC) and Net-Centric Core Enterprise Services (NCES) standards and capabilities

A use case diagram is provided in Figure 14. A detailed description of this task is provided in Appendix C Volume II.

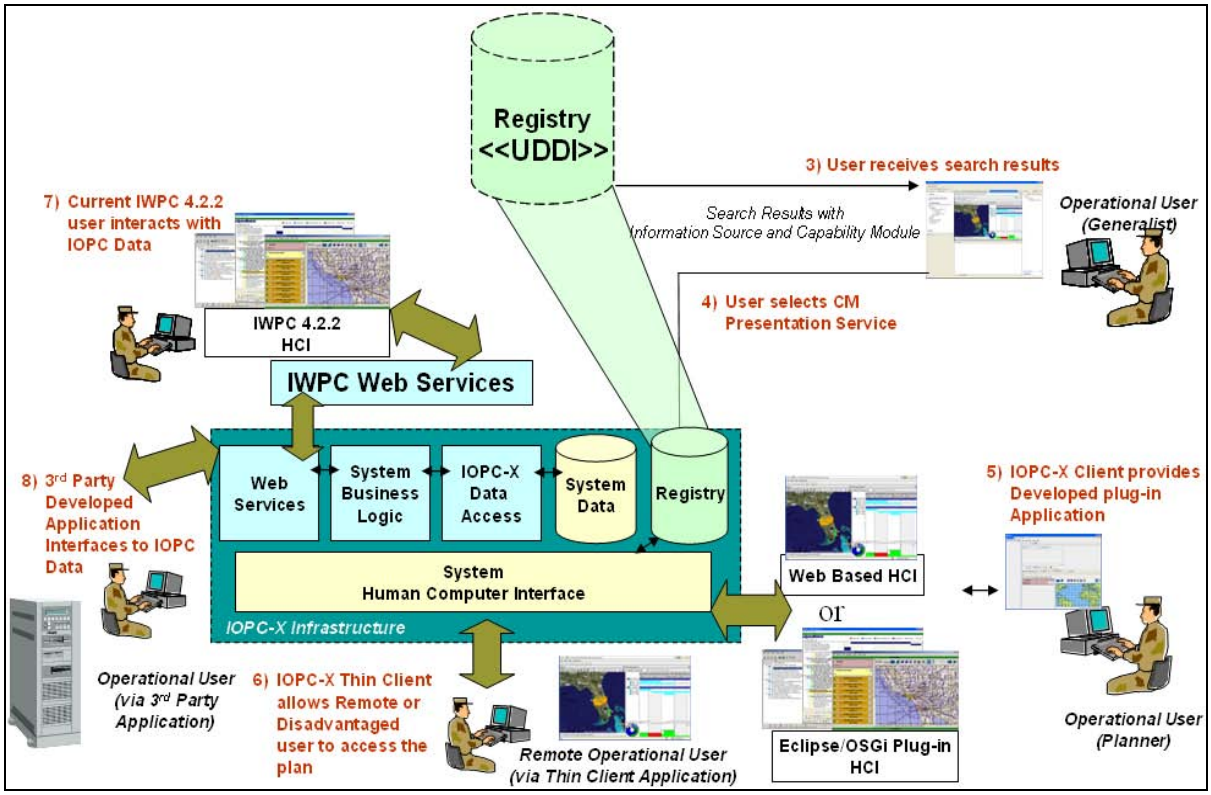


Figure 14 IOPC-X Operational Use Case

The IOPC-X SDK in Appendix B Volume II contains an overview of the IOPC-X Architecture and summarizes the Net-Centric Standards that were used. The standards for IOPC-X are registered with DoD Information Technology Standards Registry (DISR) and follow the guidance provided in the Net-Centric Operational Warfare Reference Model (NCOW-RM). Reasoning and correlation of the standards followed are detailed in the appropriate sections of the SDK.

The SDK includes a discussion of the Plug-in Infrastructure based on the Eclipse Rich Client Platform (RCP) and Registration of the plug-ins for discovery of the CMs. The SDK moves from the client side to discussion of the J2EE Enterprise JavaBeans™ (EJB™) 3.0 compliant data access tier and its use of the JENA library set and Oracle database for Ontological persistence of information. With understanding of the data access tier, the SDK returns to discussion of the middle tier to cover the IOPC-X Web Services which act as a Façade onto the J2EE™ session bean discussed in the data access tier section.

Security considerations are discussed in their appropriate sections. Throughout the SDK, Sequence diagrams are provided to visually reflect uses of the IOPC-X interfaces being discussed. IOPC-X specific, as well as open source code, examples and tutorials have been provided or referenced to ensure complete understanding of how to properly build IOPC-X compliant components. The supporting Unified Modeling Language (UML) design diagrams and Javadocs™ have been provided as sections to the SDK.

3.7.1 IOPC-X ARCHITECTURE OVERVIEW

Figure 15 illustrates the IOPC-X architecture components. The IOPC-X architecture is a fully Net-Centric compliant design which leverages a J2EE™ EJB™ 3.0 compliant infrastructure for ease in Authentication, Authorization and Scalability. The J2EE™ session beans are also exposed via Web Service interfaces. The ontology-based backend leverages the JENA library set in order to address the requirements of the Net-Centric Data Strategy.

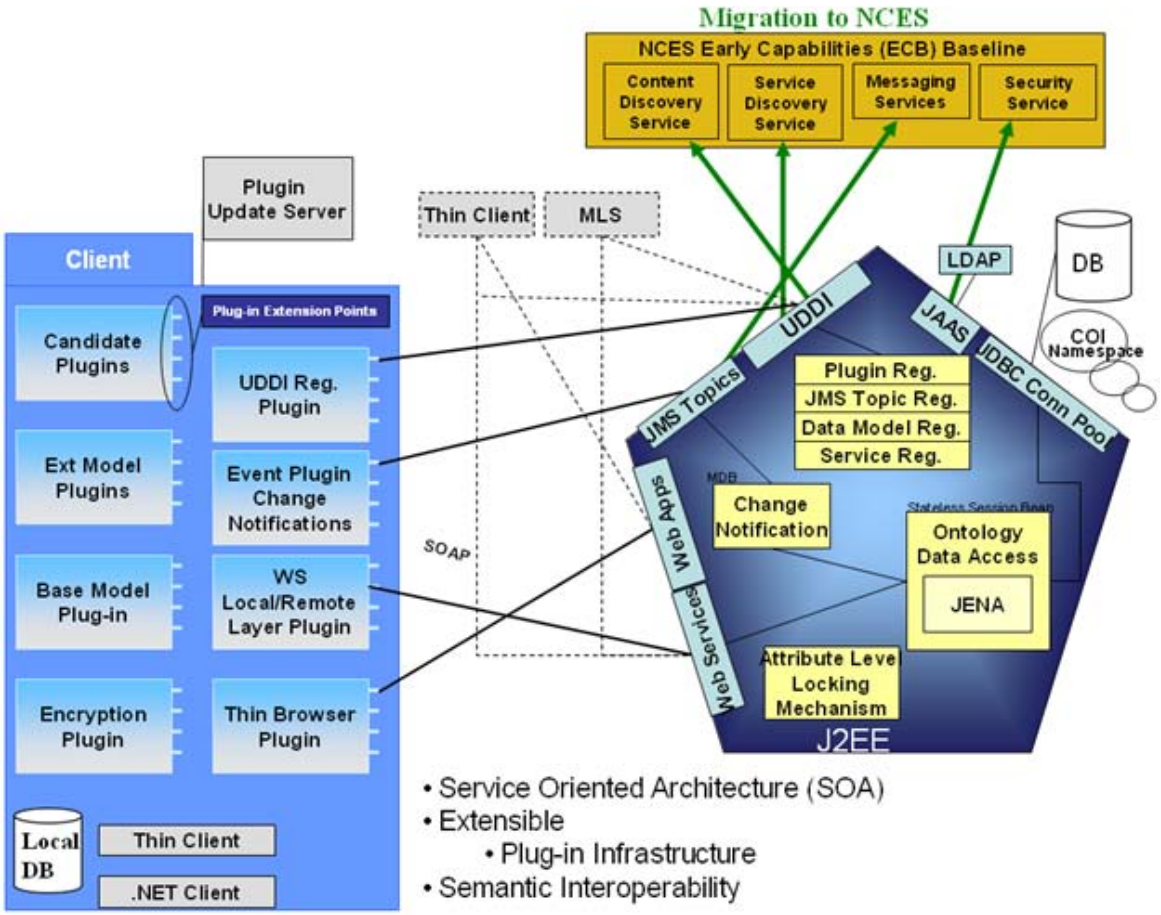


Figure 15 IOPC-X Architecture Components (Migration to NCES)

The client architecture supports an evolutionary development path and re-use of existing Java™ and .Net developed "Fat Clients." The IOPC-X design includes an Open Services Gateway Initiative (OSGi) compliant plug-in infrastructure based upon the Eclipse RCP.

IOPC-X client components included the following:

- IOPC-X RCP Workbench which acts as a 'baseline' IOPC-X installation. All client plug-ins will use the workbench as their target platform. The workbench initializes the main client window, menus, and toolbars, providing a predictable environment for the plug-ins.
- The Data Access plug-in provides a locally replicated copy of the ontology in an effort to reduce memory consumption and network traffic. The plug-in has the same interface as

the web service, but references its own ontology and prevents all plug-ins from having to maintain a separate instance of the ontology and keep track of updates. However, use of this plug-in is not mandatory and a client plug-in could reference the web service interface directly.

- The Login & Security plug-in provides authentication routines and login handling in the workbench. This plug-in provides the login information to any other plug-ins that need to access it (such as the Data Access plug-in).
- The Dynamic update plug-in provides client updates transparently. No additional software needs to be written to allow dynamic update – this capability is provided by the workbench and the OSGi framework.

3.7.2 EXTERNAL INTERFACES

A key element for demonstrating the IOPC-X framework and COA Sketch was access to and the use of operationally relevant data sources. This was accomplished in part through design and development of net-centric data transfer interfaces from the IWPC. To further enhance data exchanges, interfaces to additional external systems of record, MIDB, JTT and the TBMCS FrOB Service were investigated for web service interface design and development under the IOPC-X solution.

Technical interchange meetings were conducted as required to facilitate understanding and integration of the chosen systems of record. Unfortunately, interface implementation for the most operationally relevant system of record for demonstration purposes, MIDB, was fraught with difficulties due to ongoing and numerous changes to the MIDB software interfaces, as well as, downsizing of external support personnel from the MIDB System Program Office (SPO). MIDB was undergoing a significant redesign and development efforts throughout the attempted integration and IOPC-X could not keep pace with those changes under the originally planned budget. JTT likewise was in the middle of its Netcentric Key Performance Parameter (KPP) interface updates and proved to be a moving target with emerging and changing interface definitions. While rudimentary transfer of information from the TBMCS FrOB service was accomplished, lack of budget and further SME feedback, noting that the FrOB service was not actually being leveraged to the intended extent, finalized the development of this interface prior to integration into the COA Sketch user interface. All data transfer interfaces are documented in the COA Sketch UML Design bundle were designed as web service interfaces that incorporated the relevant guidance and standards defined in the DoD NCOW-RM.

Appendix D contains the Use Cases and Requirements artifacts for the external interfaces. Also provided under separate cover in electronic format is the generated experimental code base.

3.8 COLLABORATION

3.8.1 COLLABORATION IN THE AOC CONTEXT

The Air Force is increasingly using dynamic effects-based approaches for monitoring, assessing, planning and executing military operations. These approaches levy new demands on personnel in the AOC and in reach-back organizations. In-depth collaboration requiring immediate shared

access and manipulation of information about the operational environment, mission execution and assessment is necessary between these personnel who are often located in physically disparate locations. The required information to support effects-based approaches consists not only of data, but also of context. Understanding, updating and synchronization activities performed, and monitoring effects upon this systems-of-systems, requires a tailorable collaboration environment – one that supports a natural collaborative workflow between both collocated and remote users in support of near real-time coordinated production of AOC work products.

An investigation into the leading collaboration tools in industry and government determined that none of the major players in the COTS arena, including the designated (DoD CIO MEMORANDUM, Feb 02, 2009) DoD Enterprise Collaboration Services provided by DISA and known as E-CollabCenter and Defense Connect Online (DCO) are extensible enough for use in the development of concepts to, for example, facilitate production of end product focused objects and attributes during collaboration. This finding brought to focus the Australian Department of Defence, DSTO "LiveSpaces" for use as a collaboration tools framework. LiveSpaces is founded on human-centered design principles, and, while LiveSpaces is not thin client based like other offerings, the architecture is extensible and supports ubiquitous design (early proof of concepts have established and extended the LiveSpaces environment).

> *"A LiveSpace is a technology-enhanced collaboration space for a team of people. The purpose of a LiveSpace is to integrate technologies that help people work together: To bring these technologies together into a supporting system that becomes part of the background, rather than the more common situation where these technologies appear as a set of disparate, idiosyncratic and quirky hardware gadgets and software applications." (Phillips, 2008).*

SPVT conducted a collaboration technology assessment event to provide the AFRL a better understanding of distributed collaboration technology effectiveness in a USAF AOC Strategy Division planning context. The event was held September 14-18, 2009 at distributed locations – SRA in Dayton, OH and Louisianan State University – Shreveport (LSU-S) in Shreveport, LA.

SPVT Collaboration event participants provided a breadth of experience across the AOC strategy, operational assessment, combat operations, influence operations and intelligence roles. Participants were a mix of active duty and retired USAF personnel and government contractors. The event also afforded the opportunity to showcase AFRL "tools that collaborate." AFRL technologies such as COA Sketch and SMART support the AOC strategy planning process as well as collaborative interactions for multiple, concurrent users within and across those technologies.

The collaboration study focused on the information exchanges of AOC strategy planners and intelligence analysts within a work centered collaboration environment. In theory, by allowing the manipulation, tracking and production of work product objects and attribute details during collaboration within the intuitive extended LiveSpaces environment, effective distributed communication can occur. The LiveSpaces environment removes the dependency for a single person (recorder) tasked to capture, the sometimes rapid-fire and numerous details of the

collaborative effort into the final work product, often resulting in improved throughput and a higher level of accuracy.

For the purposes of assessing the project's hypothesis,

> *"The collaboration environment enables a distributed strategy plans session which is as effective as that developed by collocated planners,"*

two questions had to be answered. First, how well did the collaboration technology, i.e. LiveSpaces environment, support individual and team strategy planner work? Second, how well did the software tools support strategy planner work (assuming these tools "collaborate")?

Appendix E contains a more in-depth analysis and overview of the collaboration assessment event.

3.8.2 COLLABORATION IN A DISTRIBUTED WORKSHOP

The culminating event for SPVT collaboration was conducting a distributed workshop for The Technical Cooperation Program Technical Panel 2 on Command Information Interfaces (TTCP C3I TP2) using LiveSpaces collaboration environment. The meeting focused on the discussion of results from recent US AFRL, Australian (AU) Defense Science and Technology Organization (DSTO) and Defence Research and Development Canada (DRDC) experiments involving LiveSpaces technology. This activity was preceded by four preliminary activities to progressively build upon establishing the final meeting space. The four preliminary activities and one final activity are summarized in chronological order including the coordination tasks required between SRA, AU DSTO and CA DRDC in order to successfully conduct each activity.

Activity 1 – Establish Communications

Preparations for the TTCP C3I TP2 workshop began with Activity 1 on October 20, 2009. Several tasks were required leading up to and through this activity in which the goal was to establish a LiveSpaces and Defense Connect Online (DCO) connection between Australia and US AFRL (at SRA Dayton) over the open internet.

Updated LiveSpaces software and documentation was provided to SRA from AU DSTO. The update included the procedure to federate LiveSpace servers. SRA test the federated servers internally with excellent results. Next, SRA configured their internal network (Adroit) to allow only AU DSTO Internet Protocols (IPs) access. SRA set up a federated server where the primary LiveSpaces server was in Australia (AU DSTO) and SRA was the secondary LiveSpaces server. No encryption or Virtual Private Network (VPN) setup was used for Activity 1.

The LiveSpaces functionality test for Activity 1 was completed successfully. Audio was initially conducted via telephone. However, AU DSTO experienced an echo, so the teams switched to the Skype Voice Over Internet Protocol (VOIP) with better results. No other issues were experienced.

Activity 2 – Exercise Communications

Activity 1 continued October 22, 2009 with a goal of exercising the LiveSpaces and DCO technologies to ensure a robust connection (meeting place). The DCO connection was successful. Capabilities within each technology performed well. No encryption was established for this activity. However, Activity 3 planned to establish encryption, so following Activity 2 SRA began coordinating a firewall-to-firewall VPN with AU DSTO through their system administrator.

Activity 3 – Establish VPN

Activity 3 was conducted on November 4, 2009 with a goal of establishing a secure VPN connection between AU, US, and CA. A successful connection would be followed by demonstrating that LiveSpaces and DCO work over the connection as was performed in Activity 2. In preparation for this activity, the AU DSTO system administrator coordinated extensively with the SRA system administrator. While the VPN was not completely configured for this event, the secure connection was established the day after Activity #3.

Activity 4 – Test Meeting Protocol

On November 5, 2009, Activity 4 was conducted to work through the distributed meeting protocol. US AFRL, AU DSTO and CA DRDC were all represented. The first action item included testing the firewall-to-firewall VPN. The test was successful. Next, the TP2 team reported on preparations for and the success of Activities 1 through 3. This discussion included the reporting on the advantages and disadvantages in going from the open internet connectivity to Secure VPN connectivity (with respect to security, performance, limitations, etc). Activity 4 concluded with the TP2 team coordinating a final date for the distributed workshop.

Activity 5 – Conduct Distributed Meeting

The final activity, Activity 5, was a demonstration that a virtual distributed meeting/workshop could be conducted between the TP2 members utilizing LiveSpaces, DCO, and other technologies over secure VPN and/or the open internet. SRA supported the meeting through a LiveSpaces federated site at the SRA Dayton facility for US AFRL. Preparations for this activity included unsuccessfully establishing a firewall-to-firewall VPN working between SRA and CA DRDC (Note: CA DRDC used a FreeBSD-based FOSS firewall called ‘pfSense’ and no support instructions existed for establishing a VPN with the SRA Sonic Wall firewall. The VPN connection between SRA and AU DSTO was successful, however, as was the connection between AU DSTO and CA DRDC).

The TP2 workshop was represented by US AFRL, AU DSTO and CA DRDC and conducted November 23, 2009, through LiveSpaces and DCO with audio teleconference as required (outside DCO). Each represented organization reported on recent collaboration technology experiment results or other relevant activity. Preliminary human performance and technical results were described for the Collaboration in the AOC Context task. AU DSTO initiated a relatively high bandwidth video to test overall system response and performance. The TP2 members in attendance discussed observed collaboration system effectiveness and performance issues for LiveSpaces and DCO, as well as related advantages, disadvantages, benefits and costs, as appropriate.

The TTCP C3I TP2 workshop was considered a success with respect to the initial goal of conducting a virtual distributed meeting/workshop utilizing LiveSpaces, DCO and other technologies.

4.0 RESULTS AND DISCUSSION

4.1 USER INFORMATION AND DECISION REQUIREMENTS

The SPVT program's human-centered focus ensured warfighter interests were at the heart of research and design decisions. The Phase I cognitive work requirements analysis and Phase II user information and decision requirements analysis resulted in the team's solid grounding in work context for AOC SD personnel. While most efforts were targeted at building knowledge of work for the SPT within the SD, information was also acquired on SGT and OAT, as well as the Combat Plans Division.

The foundation for user requirements was generated early and built upon incrementally through each task. The initial analysis of doctrine and related information was used to initiate discussions with warfighters regarding work aids, information and decision requirements. One elicitation opportunity occurred at the Warfighter Assessment Workshop (WAW) in April 2006 and resulted in 50 requirements. Twelve high-level COA Sketch requirements were generated from aggregation of WAW requirements and other sources such as found with the AOC Strategy and Assessment Requirements sub-Working Group. Additional requirement analyses were conducted for CEP and JAST, resulting in 59 and 303 requirements, respectively. More detailed COA Sketch requirements later evolved from the aggregate of these requirement analyses. The core requirements discussed here included over 500 AOC operational requirements, which are documented in Appendix A.

4.2 COMMON EFFECTS PICTURE

CEP provided senior leaders and their staff a capability to understand the operational environment and, when necessary, the elements comprising a particular condition or state. The concepts comprising CEP were well-received by the warfighter communities and were further steered by Lt. Gen. Charles R. Heflebower (Ret.), one of the senior mentors. CEP addressed a warfighter information visualization need, but the lack of data feeds to supply the technology forced this effort to be set aside in favor of a subset of the concept which could be addressed through existing or planned data feeds. Strategic Lines of Effect visualization was chosen as a key subset of the CEP to pursue further. Many CEP concepts were matured and revisited in other SPVT concepts such as GEM-S and COA Sketch.

4.3 GLOBAL EFFECTS MANAGEMENT SYNCHRONIZATION

GEM-S resulted in several innovative visualization concepts for effects management on a global scale. Some concepts were based on earlier CEP designs and some concepts evolved from interaction with the JIOWC user community. The GEM-S prototype was developed with a fully interactive user interface, although with no data storage or handling capabilities.

The prototype capabilities were well received and, conceptually, the GEM-S prototype provided an informative view onto operations at a large scale. Of primary operational concern, however,

were the data sources required to feed GEM-S. A single data source clearly was not possible across multiple agencies, organizations and programs, and, while a suite of data sources was a more likely scenario, the challenge remained to access numerous stove-piped systems, inconsistent formats and manual records. Ultimately, the data required to support and maintain GEM-S was considered an unattainable task and further development stopped as a standalone capability.

4.4 JAOP AOD STATUS TOOL (JAST)

JAST was the product of a need to complete a significant information feedback path from CO to the SD by providing useful combat planning and execution status data correlated to a published Joint Air Operations Plans (JAOP) and the daily Air Operations Directives (AOD). Termination of the TBONE program, however, just prior to IWPC deployment meant JAST had to be disabled in the IWPC v4.2 (i.e. the required data feed to populate JAST did not exist). JAST was fully integrated with IWPC software and deployed to warfighters, however, the capability was simply never "turned on" and thus users were never made aware that the capability exists should appropriate data feeds become available in the future.

4.5 COURSE OF ACTION (COA) SKETCH

Course of Action (COA) Sketch was focused on the desire to support "visually" developing a strategy plan. The work-centered focus brought together essential warfighter strategy planning processes into a single technology with the capability to expose in real-time work products to other warfighters. While warfighters were excited with the prospect of working on a plan simultaneously at the attribute level and developing artifacts within that same environment, the real power of COA Sketch became evident when warfighters validated that the capability supported their work (rather than the warfighters having to develop new work methods which so often happens with technology-focused capabilities).

Key COA Sketch features were the familiar hierarchical plan structure and corresponding synchronization view. A map sketch view with objects linked to the plan and synchronization views provided a complete temporal and geospatial picture of the plan. Built on a common data model, manipulations in one view were manifest in other views – emphasizing the multiple perspectives on data design objective.

COA Sketch concepts were further validated with respect to supporting strategy planning work with transition to two programs. The first transition occurred November 2008 when COA Sketch was integrated into the IOPC-X database ontology which allows data to be exchanged freely with other IOPC-X Capability Modules. The database ontology was a risk reduction effort to better understand how well ontologies provided data storage and manipulation. The IOPC-X program moved from a USAF-focused effort to a Joint program, VisIOn, opening the opportunity for exposure of COA Sketch to other services. COA Sketch was the primary planning module for use in VisIOn, which continues to explore alternative database ontology methods to serve as the data storage and manipulation foundation upon which COA Sketch can operate.

In September 2009, the second transition occurred. The USSTRATCOM multi-service strategy planning program of record, ISPAN, requested COA Sketch as a means to enhance visual plan development within the ISPAN planning component. The ISPAN program was actively engaged in identifying technologies which would quickly benefit the strategy planning capability within ISPAN. COA Sketch offered the ability to accelerate ISPAN user interface development by applying COA Sketch user interfaces, in whole or part, as an alternate view onto ISPAN data.

4.6 TENEO

Teneo was a prototype and was not intended for production use. While the concepts that Teneo presented were excellent, the implementation had some problems. Teneo was meant to be a prototype and not intended for release or integration. The software was developed very quickly for a specific audience and, as such, made many assumptions. These assumptions precluded any error handling or concern for the needs of a generic user. Errors were generally handled by application failure and subsequently, exiting the program. As a prototype, code comments were neither present nor expected and the provided documentation reflected the concepts of Electronic Warfare (EW), rather than providing insight into the software development. The evaluation resulted in the recommendation to completely redesign and rewrite Teneo.

4.7 INFORMATION OPERATIONS PLANNING CAPABILITY - EXPERIMENT

IOPC-X was a risk reduction capability to develop a modern SOA-based architecture for IWPC to refine future technical and operational requirements. COA Sketch and SMART were integrated as capabilities within the IOPC-X framework. The IOPC-X prototype was used in the Pirate's Daggers Exercise 2008 to demonstrate the SOA architecture and the plug-in infrastructure.

Determining the best way ahead for COA Sketch/IOPC-X capability framework requires more research. An end-to-end review of COA Sketch/IOPC-X is highly recommended prior to full-scale design for the potential next generation platform, COA Sketch/aXiom. At a minimum the data model, and particularly the date and constraint model, should be reviewed with the goal of expressing queries and pattern matches concisely. This effort should produce a flatter, more redundant, class model with fewer classes and less nesting of objects.

The COA Sketch/IOPC-X Web Service Description Language (WSDL) interface will need to be reviewed along with the data model. The current design is a general purpose Create, Update, Delete model. System-level study is needed to determine if more business-level tasks can be defined at the web service layer. In addition, the serialization constraints inherent in the current data model need to be removed. Many object classes cannot currently be serialized as stand-alone objects – they require additional document portions. This approach must be redesigned so that the data model objects can be used in a more encapsulated fashion.

Finally, the lack of support for ontological data formats (SPARQL and SPARQL result-set XML) in the client application is a shortfall. The data interchange between some plug-ins such as COA Sketch and server is problematic. Pushing the responsibility for query execution and processing to the client tier goes against the theory of N-tiered architectural design and violates

the assumption of a course-grained, optimistic system. Expectations for the capabilities of an ontological data access client must be recalibrated and agreed upon. One might consider the COA Sketch service the true ontological client and the COA Sketch thin client merely a display layer. In any case, SPARQL result sets are not ideal for passing data in a client / server system. Other ontological technologies such as RDF/XML may be more suitable, but replacing a well-known and understood technology like WSDL with RDF/XML requires more research.

4.8 COLLABORATION IN THE AOC CONTEXT

Effects-based approaches for monitoring, assessing, planning and executing military operations levy new demands on personnel in the AOC and in reach-back organizations. Collaboration requiring immediate shared access and manipulation of information about the operational environment, mission execution and assessment is necessary between these personnel who are often located in physically disparate locations. A natural, collaborative workflow is necessary to support effects-based approaches which demand human interaction with both data and context.

The SPVT collaboration assessment event demonstrated “true” distributed operations for a USAF Strategy Planning context. The LiveSpaces technology proved to have great potential for use in distributed planning operations, although operational instabilities masked system effectiveness. A LiveSpaces enhancement, federated LiveSpaces, was available following the collaboration assessment. Post-event tests demonstrated the LiveSpaces federated servers greatly improved performance, in particular, LivePoint functionality. The custom audio and video capabilities improved slightly with remaining performance issues due to component design rather than the LiveSpaces environment.

Several discussion points brought forth by the users were artifacts of the non-federated LiveSpaces environment. Additional discussion points were attributable to known human interface design issues which were magnified by interactions with the aforementioned environment instabilities. Major points included the need for a LivePoint mouse pointer “label”; system control procedures and mechanisms, i.e. how to establish, maintain and coordinate system control as well as identification of who is in control; and creating a frame of reference for Screen Sharing, i.e. who is sharing with whom.

5.0 SUMMARY

SPVT was a multi-year effort focused on improving warfighter effectiveness in the AOC Strategy Planning context through work-centered understanding of warfighter information and decision requirements. The primary dimensions addressed included: how decisions are made in the Strategy Division in performing work; how work products are developed; how work is managed; and the types of collaborations and interactions that are necessary.

SPVT tasking followed a human-centered, systems engineering process, beginning with defining operational user information and decision making requirements through a combination of modeling work-relevant documentation and interviewing warfighters (on site with warfighter in role and off site with warfighter role playing). Findings from the ***User Requirements Analysis*** drove the next set of activities. (Note the team continued to build on the user information requirements as new documentation and warfighter interviews became available.) Initial concepts focused on developing an effects-based dashboard, ***Common Effects Picture (CEP)***, suitable for the Commander to obtain a quick and accurate assessment of the battlespace. A key characteristic of CEP was transparency from the highest level of information aggregation into the supporting data, methods and analyses.

A logical extension of CEP was to a joint service effects management system, ***Global Effects Management – Synchronization (GEM-S)***, an envisioned single collection point for organizing and deconflicting multi-service global operations. GEM-S provided a venue to explore interface and visualization concepts for the many interactions among agencies, activities and effects.

Following the goal to support the Strategy Division, the next SPVT task focused on enhancing the AOC planning system of record, IWPC, by bringing near real-time ATO execution information from Combat Operations directly to the Strategy Division rather than waiting on slow and sometimes incomplete reports from the Operations Assessment Team. The ***JAOP AOD Status Tool (JAST)*** was integrated with IWPC 4.2.5 eSync/CPT capability modules and instantiated through a series of basic visualizations.

Building on supporting the Strategy Planner, ***Course of Action Sketch (COA Sketch)*** took a previously text-based, manual, single person bottlenecked process and transformed it to a graphical, human-supported automation, collaborative technology. COA Sketch provides a human-focused electronic work environment for the warfighter to flexibly and adaptively collaborate in JAOP development. Strategy planners have the capability to capture the plan as it is developed. And while simple in concept, COA Sketch brought together capabilities warfighters most desired during strategy planning such as Shared awareness; Graphics that are data aware; Collaborative development; and Support for development toward a team mental model. COA Sketch transition to two separate programs provided the validation that decision-centered visualization support to the AOC Strategy Planner was accomplished.

While COA Sketch was an evolving technology, ***TENEO*** was brought to the SPVT program for evaluation as a capability enhancement to IWPC. TENEO included several planning capabilities similar in concept to COA Sketch but much less robust from a software development perspective. The impetus for the project was to determine whether TENEO capabilities were

mature enough to integrate with IWPC. The short answer was "no" and the customer, after learning of COA Sketch, proposed the following opportunity.

As COA Sketch continued to mature, more emphasis was placed on developing the underlying data model and architecture. ***Information Operations Planning Capability – Experiment (IOPC-X)*** was a risk reduction effort to develop a net-centric data strategy and architecture. IOPC-X evolved to the JFCOM sponsored VisIOn program and simultaneously was soliciting capabilities to plug into the future architecture. COA Sketch met the desired operational strategy planning requirements and was transitioned.

Maturation of COA Sketch and IOPC-X required access to operationally-relevant, planning mission data sources such as MIDB, JTT and FrOB. The ***External Interfaces*** task explored connection to these databases.

Collaboration in the AOC Context focused on supporting the Strategy Division through improved human-machine and human-human information exchanges. Specifically, the tested capability, LiveSpaces, supports ***Intense Collaboration*** (the type often found in Command and Control environments). The final event for SPVT included application of LiveSpaces during the TTCP C3I TP2 Distributed Workshop, in which representatives from three countries engaged in collaboration activities.

The ***Human Effectiveness in the Air & Space Operations Center*** program addressed warfighter work challenges through decision-centered visualization support to the AOC Strategy Division. The program started with developing a thorough understanding of the warfighter information and decision support requirements, individual, machine and team interactions. A strong initial cognitive work analysis set the foundation for subsequent program activities, a series of decision support visualization concepts with increasing capability and fidelity. The effort sponsored by the AFRL 711 Human Performance Wing/Human Effectiveness Directorate yielded an extensive body of knowledge for the AOC SD, numerous concepts available to other USAF and Joint programs, and resulted in three transitioned products, one to the ESC IWPC program, the USSTRATCOM ISPAN program, and one to the JFCOM VisIOn program.

BIBLIOGRAPHY

Chairman of the Joint Chiefs of Staff (2006). *National Military Strategic Plan for the War on Terrorism.* Retrieved from http://www.defenselink.mil/qdr/docs/2005-01-25-Strategic-Plan.pdf

Cognitive Systems Engineering Center (2004). Strategy Division Working Group Conference Knowledge Elicitation Report.

Cognitive Systems Engineering Center (2004). Spiral 1: Aerospace Command & Control Cognitive Analysis Report.

Cognitive Systems Engineering Center (2004). Spiral 2 Aerospace Command & Control Cognitive Analysis Report.

Cognitive Systems Engineering Center (2004). Next Generation Intelligence Preparation of the Battlespace – Work Domain Analysis Report

Commanders Handbook for Strategic Communications, (2008), JFCOM Joint Warfighting Center.

Croker, S. (2004). Effects Based Assessment. May 2004 PowerPoint presentation.
Croker, S. (2004). Sample AOD – Air Operations Directive for ATO E (begins on D+4). Personal communication 26 June 2004.

Department of Defense (2003). Joint Tactics, Techniques, and Procedures for Intelligence Support to Targeting (Joint Publication 2-01.1).

Department of Defense (2003). Joint Task Force Headquarters Master Training Guide (CJCSM 3500.O5A).

Department of Defense (2003). Joint Task Force Component Commander Master Training Guide (CJCSM 3500.XX).

Department of Defense (2002). Command and Control for Joint Air Operations (Joint Publication 3-30).

Department of Defense (2002). Joint Doctrine for Targeting (Joint Publication 3-60).

Department of Defense (2002). Joint Doctrine for Campaign Planning (Joint Publication 5-00.1).

Department of Defense (2001). Unified Action Armed Forces (UNAAF) (Joint Publication 0-2).

Department of Defense (2001). Doctrine for Joint Operations (Joint Publication 3-0).

Department of Defense (2000). Joint Operations Planning and Execution Systems (JOPES) Volume I: Planning Policies and Procedures (CJCSM 3122.01).

Department of Defense (1999). Joint Doctrine for Countering Air and Missile Threats (Joint Publication 3-01).

Department of Defense (1997). Joint Doctrine Encyclopedia

Department of Defense (1995). Doctrine for Planning Joint Operations (Joint Publication 5-0).

Deputy Chief of Staff, United States Air Force (1994). *JFACC Primer*. United States Air Force Plans and Operations Headquarters: Washington, DC. Retrieved from http://www.fas.org/man/dod-101/usaf/unit/docs/JFACC-94-Complete.pdf

Drew, D.M., & Snow, D. M. (2006). *Making Twenty-First-Century Strategy: An Introduction to Modern National Security Processes and Problems*. Air University Press: Maxwell Air Force Base, Alabama.

Echevarria, A.J. (2002). Clausewitz's Center of Gravity: Changing Our Warfighting Doctrine-Again! Strategic Studies Institute: Carlisle, PA.

Eggleston, R.G. (2003). Work-centered design: A cognitive engineering approach to system design. Proceedings of the Human Factors and Ergonomics Society 47th Annual Meeting.

Elm, W.C., Potter, S.S., Gualtieri, J.W., Roth, E. M., & Easter, J.R. (2003). Applied cognitive work analysis: A pragmatic methodology for designing revolutionary cognitive affordances. In E. Hollnagel (Ed) Handbook for Cognitive Task Design. London: Lawrence Erlbaum Associates

Fayette, D. & McCrabb, M.B. (2003). AFRL/IF Support to AOC Block 30. PowerPoint presentation provide by Don Monk.

Gibson, J. J. (1979). The Ecological Approach to Visual Perception. Boston: Houghton Mifflin.

Gilmour, D.A., McCrabb, M.B., Wagenhals, L. W. & Wentz, L.K. (2003). Developing an Operational Architecture View of an Effects Based Joint Air Estimate Process. Presented at an EBO Workshop at George Mason University, March 2003.

Gualtieri, J. W., Roth, E. M., & Eggleston, R. G. (2000). Utilizing the abstraction hierarchy for role allocation and team structure design. Proceedings of HICS 2000 - 5th International Conference on Human Interaction with Complex Systems (pp. 219-223). Urbana-Champaign, IL: Beckman Institute.

Hunerwadel, J.P. (2002). Planning to Win: A Study in Strategy and Operational Art. Air & Space Power Chronicles.

Joint Chiefs of Staff (1995). *User's Guide for JOPES (Joint Operation Planning and Execution System)*. Retrieved from http://www.dtic.mil/doctrine/jel/other_pubs/jopes.pdf

Joint Chiefs of Staff (2000). *Joint Vision 2020*. Washington, DC: US Government Printing Office. Retrieved from http://www.iwar.org.uk/military/resources/aspc/pubs/jv2020.pdf

Joint Chiefs of Staff (2004). Joint Publication 1-02: Department of Defense Dictionary of Military and Associated Terms. Retrieved from: http://www.asafm.army.mil/pubs/jp1-02/jp1-02.pdf

Joint Chiefs of Staff (2004). *The National Military Strategy of the United States of America: A Strategy for Today; A Vision for Tomorrow.* Retrieved from http://www.defenselink.mil/news/Mar2005/d20050318nms.pdf

Joint Chiefs of Staff (2006). *Joint Publication 3-0: Joint Operations*. Retrieved from http://www.dtic.mil/doctrine/jel/new_pubs/jp3_0.pdf

Joint Chiefs of Staff (2006). *Joint Publication 5-0: Joint Operation Planning*. Retrieved from http://www.dtic.mil/doctrine/jel/new_pubs/jp5_0.pdf

Joint Chiefs of Staff (2008). *Chairman of the Joint Chiefs of Staff Instruction 3100.01B: Joint Strategic Planning System*. Retrieved from http://www.dtic.mil/cjcs_directives/cdata/unlimit/3100_01.pdf

Joint Chiefs of Staff (2008). *Chairman of the Joint Chiefs of Staff Manual 3500.04E*. Retrieved from http://www.dtic.mil/doctrine/training/cjcsm3500_04e.pdf

Joint Warfighting Center (2006). *Commander's Handbook for an Effects-Based Approach to Joint Operations*. Standing Joint Force Headquarters:Norfolk, Va. Retrieved from http://www.au.af.mil/au/awc/awcgate/jfcom/ebo_handbook_2006.pdf

Joint Warfighting Center. (2004). *JWFC Pamphlet 4: Doctrinal Implications of Operational Net Assessment*. Joint Doctrine Series. Suffolk, VA: JFCOM.

Krawchuck, F.T. (2008). Collaborative strategic planning and action: A new approach. *Parameters*. Summer 2008, pp. 67-78.

Maxwell AFB, AL: College of Aerospace Doctrine, Research and Education.

Maybury, M. (2002). Defense Collaborative Tool Suite Description. MITRE Corporation.

McCrabb, M. (2002). Concept of Operations for Effects-Based Operations 2002.

Olschner, C. (2004). Development of Objectives Tasks and Measures of Effectiveness. (STR - 813). 505th Training Squadron: Hurlburt AFB, FL

Olschner, C. (2004). Planning and Assessing Joint Air Operations. (STR - 802). 505th Training Squadron: Hurlburt AFB, FL.

Olschner, C. (2004). Situation and COA Development. (STR - 807). 505th Training Squadron: Hurlburt AFB, FL.

Phillips, M. (2008). Livespaces Technical Overview. AR- 014-287: Command, Control, Communications and Intelligence Division, DSTO Defence Science and Technology Organisation, Australia.

President of the United States (2006). *National Security Strategy of the United States of America*. Retrieved from http://georgewbush-whitehouse.archives.gov/nsc/nss/2006/nss2006.pdf

Pronobis, M., Fayette, D., Starczewski, E., Hubbard, R., & Schuh, D. (2004). AFRL/ESC JEFX04 Initiative: Initial PBA/EBO Integration. PowerPoint presentation provided by Don Monk.

Rasmussen, J. (1986). Information processing and human-machine interaction: An approach to cognitive engineering. North Holland Series in System Science and Engineering, Elsevier Science Publishing Co., Inc., New York, New York.

Rasmussen J., Pejtersen, A. M., & Goodstein, L. P. (1994). Cognitive Systems Engineering. New York: Wiley & Sons.

Roberts, M. (2003). Assessment 101. College of Aerospace Doctrine, Research and Education.

Roth, E. M. & Mumaw, R. J. (1995). Using Cognitive Task Analysis to Define Human Interface Requirements for First-of-a-Kind Systems. Proceedings of the Human Factors and Ergonomics Society 39th Annual Meeting, (pp. 520 – 524). Santa Monica, CA: Human Factors and Ergonomics Society.

Smith, S.D. (2002). Sharpening the Theater Engagement Plan (TEP) focus: The impact of higher order beliefs and values. [Paper.] Newport, RI: Naval War College.

Snodgrass, M. (2003). C4ISR Summit 2003: Transforming C4ISR Into Decision Superiority for Effects Based Operations. PowerPoint presentation provided by Don Monk.

Strange, J. (2004). Center of Gravity Analysis. Presentation at Checkmate Strategy Conference.

Strategic Studies Institute (1995). *World View: The 1995 Strategic Assessment from the Strategic Studies Institute*. Edited by Earl H. Tilford. Retrieved from http://www.strategicstudiesinstitute.army.mil/pubs/display.cfm?pubid=334

Thompson, R. (2004). Planning Construct for Effects-Based Air Operations. Presentation at Checkmate Strategy Conference.

United States Air Force (2000). Air Warfare: Air Force Doctrine Document 2-1. (http://www.epublishing.af.mil/pubfiles/af/dd/afdd2-1/afdd2-1.pdf)

United States Air Force (2002). Operational Procedures – Aerospace Operations Center: Air Force Instruction 13-1AOC. (http://www.e-publishing.af.mil/pubfiles/af/13/afi13-1aocv3/afi13-1aocv3.pdf)

United States Air Force (2002). Air Force Operational Tactics, Techniques and Procedures for an Air and Space Operations Center (AFOTTP 2-3.2).

United States Air Force (2002). Air Force Operational Tactics, Techniques and Procedures for Command and Control Nodes (AFOTTP 2-3.1).

United States Air Force (2002). Air Force Operational Tactics, Techniques and Procedures for an Air and Space Strategy (AFOTTP 2-1.1).

United States Department of Defense (2006). *Quadrennial Defense Review Report*. Retrieved from http://www.defenselink.mil/qdr/report/Report20060203.pdf

United States Intelligence Community (1947). *National Security Act of 1947*. Retrieved from http://www.intelligence.gov/0-natsecact_1947.shtml

United States Marine Corp (1997). Campaigning (MCDP 1-2).

United States Marine Corp (1997). Introduction to the Study of Strategy (MCDP 1-1).

United States Marine Corp (1997). Planning (MCDP 5).

United States of America Department of Defense (2008). *National Defense Strategy of The United States of America*. Retrieved from http://www.defenselink.mil/pubs/2008NationalDefenseStrategy.pdf

USNORTHCOM (2009). About USNORTHCOM. Retrieved from http://www.northcom.mil/About/index.html

Vicente, K. (1999). Cognitive Work Analysis. Mahwah, NJ: Lawrence Erlbaum Associates.

Vicente, K. and Rasmussen, J. (1992). Ecological interface design: Theoretical Foundations. IEEE Transactions on Systems Man and Cybernetics, 22, 589-606.

Warfare Studies Institute (2003). Joint Air Estimate Planning Handbook. College of Aerospace Doctrine, Research and Education: Maxwell AFB, AL.

White, R.C. (2002). AOC Block 10 and 10 +System Baselines. Prepared for AC2ISRC/CC, Langley AFB, VA.

White, R.G. (2001). Concept of Operations for Aerospace Operations Center (AOC). Prepared for AC2ISRC/CC, Langley AFB, VA.

White, R.G. (2002). AOC Block 10 and 10 +System Baselines. PowerPoint presentation provided by Don Monk.

Woods, D. D. and Hollnagel, E. (1987). Mapping cognitive demands in complex problem-solving worlds. International Journal of Man-Machine Studies, 26, pp. 257-275.

Woods, D. D. & Roth, E. M. (1988). Cognitive engineering: Human problem solving with tools. Human Factors, 30 (4), pp. 415-430.

Warfare Studies Institute (2005). *Joint Air Estimate Planning Handbook*.

ACRONYMS

711 HPW/RHCP	711 Human Performance Wing/Human Engineering Directorate, Warfighter Interfaces Division, Collaborative Interfaces Branch
ACC	Air Combat Command
AFRL	Air Force Research Laboratory
AOC	Air & Space Operations Center
AOD	Air Operations Directive
ATO Air	Tasking Order
BOGSAT	Bunch of Old Guys Sitting Around the Table
CEP	Common Effects Picture
CM Capability	Modules
CO Com	bat Operations
COA	Course of Action
COCOM Co	mbatant Command
CPT	Collaborative Planning Tool
CTA	Cognitive Task Analysis
CWA Cognitive	Work Analysis
DCO	Defense Connect Online
DISR	DoD Information Technology Standards Registry
DoD	Department of Defense
DRDC	Defence Research and Development Canada
DSTO	Defence Science and Technology Organisation
EJB Enterprise	JavaBeans
EW Electronic	Warfare
FrOB	Friendly Order of Battle
GCIC	Global Cyberspace Innovation Center
GEM-S	Global Effects Management-Synchronization
GOC-CE	Global Operations Center Collaborative Environment
HE in the AOC	Human Engineering in the AOC
HPW Hum	an Performance Wing
ICD	Interface Control Document
IPB	Intelligence Preparation of the Battlespace
IO Inform	ation Operations
ION Inform	ation Operations Navigator
IOPC-J	Information Operations Planning Capability – Joint
IOPC-X Inform	ation Operations Planning Capability – Experiment
ISPAN	Integrated Strategic Planning & Analysis Network
IWPC Inform	ation Warfare Planning Capability
J2EE	Java 2 Platform Enterprise Edition
JAOP	Joint Air Operations Plan
JAST	JAOP AOD Status Tool
JFACC	Joint Forces Air Component Commander
JFCOM Joint	Forces Command
JIOWC	Joint Information Operations Warfare Capability
JTT	Joint Targeting Tool

KPP	Key Performance Parameter
LOE	Lines of Effects
MIDB Modernized	Integrated Database
MOE Measure	of Effectiveness
NCES	Net-Centric Core Enterprise Services
NCOW-RM	Net-Centric Operational Warfare Reference Model
NECC Net-Enabled	Command Capability
OAA	Operations, Activities & Actions
OAT Operation	al Assessment Team
OEAVT	Operational Effects Assessment Visualization Tool
OPLAN Operation	Plan
OSGi	Open Services Gateway Initiative
PEL	Prioritized Effects List
RCP	Eclipse Rich Client Platform
Ret Retired	
SAIC	Science Applications International Corporation
SD Strategy	Division
SDK	Software Development Toolkit
SGT	Strategy Guidance Team
SME	Subject Matter Expert
SOA	Service Oriented Architecture
SPO	System Program Office
SPT	Strategy Planning Team
SPVT	Strategy Planning Visualization Tool
SUM	Software User's Manual
TBMCS	Theater Battle Management Core Systems
TBONE	Theater Battle Operations Net-centric Environment
TTCP C3I TP2	The Technical Cooperation Program Technical Panel on Command Information Interfaces
UML	Unified Modeling Language
USAF	United States Air Force
USMTF	United State Message Traffic Format
USSTRATCOM	United States Strategic Command
VisIOn	Virtual Integrated Support for the Information Operations Environment
VPN	Virtual Private Network
WAW Warfighter	Assessment Workshop
WSDL	Web Service Description Language

APPENDIX A – SPVT REQUIREMENTS

The following 503 AOC operational requirements were generated during the SPVT for the AOC program. This list of requirements is organized chronologically by task or event (JAST, CEP, WAW, COA Sketch and high-level COA Sketch). This effort provided an enterprise level view of the AOC, AOC personnel, processes and information flow and exchange requirements. The effort ensured traceability to all sources for future validation and clarification of need.

Initial understanding of AOC high level needs were taken from the ManTech AOC Cognitive Work Analysis (CWA) generated in Phase I (prior to, but overlapping the SPVT contract). The SPVT project built upon the CWA analysis via a thorough modeling of the AOC Strategy Division processes. The analysis included a literature review of Air Force doctrine, pamphlets and other materials as well as interviews with current and retired warfighters and subject matter experts (SMEs).

Initial requirements were used as a baseline set for all future SPVT efforts to provide a solid understanding of the doctrinal point of view of the AOC and SPT to the SRA SPVT project team. Each subsequent task built on the requirements foundation. The analysis was particularly useful to members of the SRA elicitation teams when performing CTA interviews of SMEs.

SPVT for the AOC Requirements Analysis

JAST Requirements (303) – August 2005	
No.	**Requirement**
1	Strategy Planning Capability shall reflect status on the JAOP based upon identified changes/additions/removal of MOE
2	Strategy Planning Capability shall reflect status on the JAOP based upon identified changes/additions/removal of MOP
3	Strategy Planning Capability Shall reflect status on changes(additions/removals) in effects listed within the JAOP
4	Strategy Planning Capability shall reflect status on the JAOP based upon assumptions of adversary's most likely and potentially dangerous COAs.
5	Strategy Planning Capability shall provide status on the start and end time of operations
6	Strategy Planning Capability shall reflect status of the JAOP due to new/change/removal of EEIs
7	Strategy Planning Capability shall reflect status of AOD based upon changes in timeframe listed within the AOD
8	Strategy Planning Capability shall reflect status due to BNDRY line and FSCL changes and timing
9	Strategy Planning Capability shall have the ability to relay and interpret JFLCC requests for air, space, and IO support.
10	Strategy Planning Capability shall have the ability to provide feedback on air operations to the JFLCC.
11	Strategy Planning Capability shall have the ability to ensure the new Tgt does not have any excessive CD issues.
12	Strategy Planning Capability shall reflect status due to threats
13	Strategy Planning Capability shall indicate status of support elements from outside the air component
14	Strategy Planning Capability shall reflect status upon the JAOP due to changes in Coalition unity
15	Strategy Planning Capability shall reflect status on the JAOP based identified changes of elements in the enemy system
16	Strategy Planning Capability shall reflect status upon the JAOP when an

	advantage/disadvantage of the selected COA comes to realization
17	Strategy Planning Capability shall reflect changes in status to the JAOP/AOD due to pre-planned and immediate tasking becoming attainable
18	Strategy Planning Capability shall reflect changes in status to the JAOP/AOD due to dissemination of CEASE BUZZER/CEASE MUSIC Calls to all airborne EA assets
19	Strategy Planning Capability shall reflect status on Operational Tasks pertaining to the re-role of AI/ATK missions to CAS
20	Strategy Planning Capability shall reflect changes in status to the JAOP/AOD due to dissemination of NO JAM request to all EA units
21	Strategy Planning Capability shall reflect changes in status to the JAOP/AOD due to ATO/ACO changes input into daily log using ATO/ACO.
22	Strategy Planning Capability shall reflect status on Operational Tasks concerned with the ability to remain in close contact with the ASOC
23	Strategy Planning Capability shall reflect status due to defensive CAP manning and position changes
24	Strategy Planning Capability shall reflect changes in status to the JAOP/AOD due to WOCs coordinated changes with the JAOC
25	Strategy Planning Capability shall reflect status upon the STO/CW COAs that directly support the operation objectives defined in the JAOP
26	Strategy Planning Capability shall reflect status change onto the JAOP based upon STO/CW development and implementation
27	Strategy Planning Capability shall reflect status on the AOD based upon TETT input
28	Strategy Planning Capability shall reflect status on changes in apportionment
29	Strategy Planning Capability shall reflect status due to ability to analyze data from NRT tactical feeds and ISRD MEC counterparts to define and display the current enemy picture in NRT
30	Strategy Planning Capability shall have the ability to integrate naval air, naval fires, and amphibious operations into theater air operations and monitor and interpret the maritime battle situation for the JAOC
31	Strategy Planning Capability shall reflect status due to ability to maintain real time mission support coordination with the JSOACC
32	Strategy Planning Capability shall reflect status due to external COP architecture requirements
33	Strategy Planning Capability shall reflect status due to GCCS/SAA COP CST connections between nodes and the UB configuration

34	Strategy Planning Capability shall reflect status due to ability to provide feedback on status of dynamic and ad hoc CR.
35	Strategy Planning Capability shall reflect status due to Requirement
36	Strategy Planning Capability shall indicate when and if the AOD Breakout meeting with TETT has/will take place
37	Strategy Planning Capability shall reflect status due to ensure sufficient internal Unified Build (UB) masters, processors, and clients are planned to support the JAOC requirements while allowing support to subordinate UB masters
38	Strategy Planning Capability shall reflect status due to risks related to prevention of fratricide
39	Strategy Planning Capability shall reflect status due to ability to coordinate with subordinate units of the TACS and PEDs /ISR architecture.
40	Strategy Planning Capability shall Coordinate Airspace requirements.
41	Strategy Planning Capability Shall reflect status change based on MARLO integration into the JAOP
42	Strategy Planning Capability shall have the ability to monitor recovery efforts; to plan, coordinate, and execute joint search and rescue (SAR) and CSAR operations; and to integrate CSAR operations with other evasion, escape, and recovery operations within the geographical area assigned to the joint force
43	Strategy Planning Capability shall reflect status due to ability to coordinate with the RCC/JSRC
44	Strategy Planning Capability shall have the ability to coordinate with users, workgroup managers, and CFP personnel to resolve computer software and hardware problems.
45	Strategy Planning Capability shall reflect status due to ability to coordinate operational and intelligence inputs from the JSOACC into the Tgt process
46	Strategy Planning Capability shall reflect status due to the ability to execute the RSTA Annex and the ATO.
47	Strategy Planning Capability shall have the ability to manage user computer software configurations and tactical LAN systems.
48	Strategy Planning Capability shall reflect status due to ability to maintain a close and continuous flow of information between themselves and ISRD intelligence analysts to ensure a common view of the battlespace and consistent threat presentation is provided to the JAOC and tactical units.
49	Strategy Planning Capability shall reflect status due to proper computer information pipeline requirements (NIPRNeT, SIPRNeT, EMAIL, COALITION LAN, TBMCS, etc.);
50	Strategy Planning Capability shall reflect status due to ability to overcome language barriers

	with remote allied/coalition forces
51	Strategy Planning Capability shall have the ability to resolve problems and to maintain efficient operation of the TBMCS network.
52	Strategy Planning Capability shall reflect status due to TBMCS network status and limitations.
53	Strategy Planning Capability shall have the ability to manage the installation and operation of TBMCS equipment and its network.
54	Strategy Planning Capability shall reflect status due to JAOC network requirements
55	Strategy Planning Capability shall Receive a copy of MARFOR aviation decision support products from the MAW TACC current ops to assist in monitoring the MARFOR plan.
56	Strategy Planning Capability shall reflect status due to WOCs changes to scheduled missions, refueling, SCLs, etc.
57	Strategy Planning Capability shall reflect status upon the AOD due to evaluation of related MOEs
58	Strategy Planning Capability shall indicate completion status of steps/tasks within the JAEP process
59	Strategy Planning Capability shall reflect status on the fulfillment of Essential Elements of Information(EEIs)
60	Strategy Planning Capability shall reflect changes in status to the JAOP/AOD due to dynamically adjusting ISR assets
61	Strategy Planning Capability shall reflect status due to availability of collected data for mission analysis.
62	Strategy Planning Capability shall reflect status upon the evaluation of tactical engagement results and effects
63	Strategy Planning Capability shall reflect status upon the AOD due to a change or addition of an operational or tactical air objective
64	Strategy Planning Capability shall reflect status on to the JAOP due to changes in desired end state
65	Strategy Planning Capability shall reflect status on re-attack decisions in the JAOP
66	Strategy Planning Capability shall reflect status upon desired effects identified in the JAOP
67	Strategy Planning Capability shall indicate changes within other components plans to ensure smooth coordination of air, space, and surface operations.
68	Strategy Planning Capability shall reflect status of the expected collateral damage of targets listed within the JAOP

69	Strategy Planning Capability shall reflect status on the JAOP based upon LOE status against targets
70	Strategy Planning Capability shall reflect status on the JAOP by tracking phasing
71	Strategy Planning Capability shall reflect status on changes in legality, political, and moral constraints factors in the JAOP
72	Strategy Planning Capability shall reflect status changes in the JAOP based upon logistics
73	Strategy Planning Capability shall reflect status to changes in sequence related to critical tasks listed in the AOD
74	Strategy Planning Capability shall reflect status due to ground situation
75	Strategy Planning Capability shall reflect status due to ATO sortie execution
76	Strategy Planning Capability shall reflect status due to dynamic adjustments/changes to the RSTA Annex
77	Strategy Planning Capability shall reflect status due to Tgt changes within the ATO cycle
78	Strategy Planning Capability shall reflect status on the JAOP due to effects assessment considerations
79	Strategy Planning Capability shall reflect status upon the confidence levels assigned to assessment of the status of operational air objectives included in the JAOP/AOD
80	Strategy Planning Capability shall provide status upon time constraints based upon Mission Guidance
81	Strategy Planning Capability shall reflect status upon the JAOP due to location of conflict
82	Strategy Planning Capability shall reflect status upon measures and indicators identified in the JAOP
83	Strategy Planning Capability shall reflect changes in force availability, timing, bed down and sustainment requirements
84	Strategy Planning Capability shall reflect status in change in the Ends, Means, Ways, and Risk associated with the selected COA
85	Strategy Planning Capability shall reflect changes in status to the JAOP/AOD due to immediate EW requests from Air Force, joint, or combined forces; coordinated with the Army BCD and joint Service LNOs for support requests.
86	Strategy Planning Capability shall reflect status upon a prioritized AOD task by tracking the status of the linked nominated Tgt
87	Strategy Planning Capability shall reflect status on the priority of Tgt linked to associated prioritized tasks outlined in the AOD

88	Strategy Planning Capability shall reflect status based on changes to the Tgt plan that will effect the AOD
89	Strategy Planning Capability shall reflect status of AOD based upon changes in effects listed within the AOD
90	Strategy Planning Capability shall have the ability to receive requests from the MAW TACC current ops for additional joint sorties
91	Strategy Planning Capability shall reflect status due to Tgt re-nomination identified to the CPD MAAP Team for potential sourcing on the next ATO.
92	Strategy Planning Capability shall reflect status due to operational effects of recommended changes when supporting dynamic Tgt/TSTs.
93	Strategy Planning Capability shall reflect status due to near term and future ATO re-strike recommendations provided by the ISRD Tgt/CA Team via MISREP
94	Strategy Planning Capability shall reflect status due to JFC campaign plan and component plans.
95	Strategy Planning Capability shall provide status changes based upon location changes of action(s)
96	Strategy Planning Capability shall reflect status upon JAOP changes due to Combat Support factors
97	Strategy Planning Capability shall provide indications of fulfillment of CCIRS
98	Strategy Planning Capability shall reflect status on completion on collection plan for Area of Interest
99	Strategy Planning Capability shall reflect status upon measures of merit (MOMs) identified in the JAOP
100	Strategy Planning Capability shall reflect status upon target sets identified in the JAOP
101	Strategy Planning Capability shall reflect status upon perishable TST in the JAOP
102	Strategy Planning Capability shall provide status on changes in "acceptable risk" of the Commander's Intent
103	Strategy Planning Capability shall reflect status onto JAOP changes based upon indications of incorrect Assumptions considered estimation process
104	Strategy Planning Capability shall reflect changes in status to the JAOP/AOD due to real-time changes to the ATO, including responding to emergency AR, CSAR, TST, CASREQ etc.
105	Strategy Planning Capability shall reflect changes in status to the JAOP/AOD due to frequency deconfliction issues with Frequency/Spectrum Manager, EWCC, BCD, and other applicable agencies

106	Strategy Planning Capability shall inform user when Tgt in TNL correlating back to the AOD are imported into an ATO
107	Strategy Planning Capability shall reflect status on to the JAOP due to disparities occurring between actual and expected results of an operational air objective
108	Strategy Planning Capability shall reflect status due to ability to ensure deconfliction and tasking of space assets
109	Strategy Planning Capability shall provide status on changes (additions/removals) to possible COAs during the JAEP process
110	Strategy Planning Capability shall have the ability for BCD to coordinate ground force priorities, requests, and items of interest
111	Strategy Planning Capability shall have the ability to coordinate and obtain results of flying operations from other agencies within the JAOC
112	Strategy Planning Capability shall reflect status due to Tgt being re-nominated
113	Strategy Planning Capability shall reflect status due to diverts/aborts of C2 aircraft
114	Strategy Planning Capability shall reflect status due to ability to pass C2 assets contact/Tgt information.
115	Strategy Planning Capability shall reflect changes in the JAOP due to ID of key decision points and events
116	Strategy Planning Capability shall provide status on changes in Reason within the Mission Statement
117	Strategy Planning Capability shall reflect status upon the JAOP changes based upon area ADP (AADP)
118	Strategy Planning Capability shall reflect status on changes in TPFDD requirements
119	Strategy Planning Capability shall reflect status on change in C2 relationships of assigned, attached, transient and available forces
120	Strategy Planning Capability shall reflect status upon the JAOP based upon air and space power changes due to unforeseen limitations and capabilities
121	Strategy Planning Capability shall reflect changes in status to the JAOP/AOD due to ODO's Receipt of Dynamic Tgt information and priorities/targeting for planned ATO missions when the situation warrants
122	Strategy Planning Capability shall reflect changes in status to the JAOP/AOD due to immediate electronic support requests
123	Strategy Planning Capability shall reflect status as to whether the JIPTL representing Tgt from the AOD has been approved by the JFACC/JFC

124	Strategy Planning Capability shall reflect status due to ability to coordinate theater space support requests to reachback organizations as required
125	Strategy Planning Capability shall reflect status due to Validate and distribute ATO change messages
126	Strategy Planning Capability shall reflect status due to effective recommendations for WTP
127	Strategy Planning Capability shall reflect status due to ability to F2T2
128	Strategy Planning Capability shall have the ability to maintain total awareness on the battle situation and unit's status.
129	Strategy Planning Capability shall reflect status of JTCB changes to nominated Tgt listed within the AOD
130	Strategy Planning Capability shall reflect status on Tgt imported into the ATO that correlate back to the AOD
131	Strategy Planning Capability shall reflect status due to Input ATO changes into TBMCS.
132	Strategy Planning Capability shall reflect status due to changes to leaflet and PSYOP broadcast missions
133	Strategy Planning Capability shall have the ability to pass on critical information to/from their respective WOC concerning air raid warnings, unexpected changes, diverting aircraft, and airfield status.
134	Strategy Planning Capability shall reflect status due to changes in employment of offensive WPN systems.
135	Strategy Planning Capability shall reflect status onto the JAOP based on changes to the strategy-to-task matrix
136	Strategy Planning Capability shall reflect status upon the AOD due to a phase shift for the component;
137	Strategy Planning Capability shall monitor approaching key decision points within the JAOP and the selected path going forward
138	Strategy Planning Capability shall reflect status for Operational Tasks based on data from the CAS cell in coordination with the BCD
139	Strategy Planning Capability shall have the ability to Monitor weather, airfield status, support facilities, etc.
140	Strategy Planning Capability shall reflect status due to mission deviations and changes
141	Strategy Planning Capability shall reflect changes in status to the JAOP/AOD due to mission not having all the support required

142	Strategy Planning Capability shall reflect changes in status to the JAOP/AOD due to SODO adjustments to offensive resources to ensure mission success
143	Strategy Planning Capability shall reflect status based on changes to JFC and JFACC guidance into the JAOP
144	Strategy Planning Capability shall reflect status upon Tgt nominations in accordance with the AOD
145	Strategy Planning Capability shall have the ability to coordinate the real-time employment of all IO assets, except for EW, assigned or made available to the JFACC.
146	Strategy Planning Capability shall reflect status due to friendly and enemy battlespace changes that affect the ISR plan
147	Strategy Planning Capability shall have the ability to monitor the execution of the ATO for the assigned assets they represent
148	Strategy Planning Capability shall reflect status due to synchronize and deconflict PSYOP into the air and space campaign
149	Strategy Planning Capability shall reflect status due to Exchange Operational and Intelligence data.
150	Strategy Planning Capability shall reflect status due to significant changes in the EOB
151	Strategy Planning Capability shall reflect status on Tgt plan based on the correlation of the plan to the guidance used in the AOD
152	Strategy Planning Capability shall reflect status due to ability to find a strike package able to prosecute the Tgt
153	Strategy Planning Capability shall have the ability to monitor Dynamic Tgt management using an automated tool such as ADOCS ITM or like systems and other CT
154	Strategy Planning Capability shall have the ability to ensure each mission has all the support available and that each tasking reflects an effective and tactically prudent us of that asset.
155	Strategy Planning Capability shall reflect status due to airspace changes/additions
156	Strategy Planning Capability shall reflect status on change in JAOP's JFACC objectives due to evaluation of overall theater campaign plan
157	Strategy Planning Capability shall reflect status upon tactical engagements identified in the AOD
158	Strategy Planning Capability shall provide status on the status of JFACC approval of Mission Statement
159	Strategy Planning Capability shall reflect status upon JAOP changes based upon Operation Risk Analysis factors

160	Strategy Planning Capability shall reflect status onto JAOP changes based upon changes in credibility of facts considered during COA analysis
161	Strategy Planning Capability shall reflect change of status on the JAOP due to changes in force protection requirements
162	Strategy Planning Capability shall reflect status upon the JAOP due to Information and Space Operations changes
163	Strategy Planning Capability shall show status of usage of excess sortie generation capability (airman *reserve* sorties)
164	Strategy Planning Capability shall reflect status upon the JAOP based upon the ability to integrate with the capabilities of the other services, nations and components that apply airpower
165	Strategy Planning Capability shall provide status on effects to include level of disruption, distribution and duration of the effect
166	Strategy Planning Capability shall reflect changes in status to the JAOP/AOD due to changes in the ATO for EW assets
167	Strategy Planning Capability shall reflect changes in status to the JAOP/AOD due to problems with ASM of EW/SEAD assets.
168	Strategy Planning Capability shall reflect changes in status to the JAOP/AOD due to required changes to the ISR plan of other JAOC, Component and CFC intelligence organizations
169	Strategy Planning Capability shall have the ability to coordinate with the DTC
170	Strategy Planning Capability shall provide status upon the JAOP/AOD elements due to coordinated mission changes from the ALDO and the Airlift Operations Officer
171	Strategy Planning Capability shall reflect changes in status to the JAOP/AOD due to subordinate TACS elements, through their respective duty officers, assessments of EW/SEAD effectiveness
172	Strategy Planning Capability shall reflect changes in status to the JAOP/AOD due to aircrew availability, airfield status, weather, and status of alert jets and change to contingencies plans as determined by the WOCS
173	Strategy Planning Capability shall have the ability to inform WOCs for each asset of changes in the ATO
174	Strategy Planning Capability shall reflect changes in status to the JAOP/AOD due to major changes in EW asset utilization, availability, or other significant impacts on the EW mission areas
175	Strategy Planning Capability shall reflect status due to changes in ALDO monitored inter- and intra-theater air movement.

176	Strategy Planning Capability shall reflect status on the AOD based upon JIPTL non-compliance
177	Strategy Planning Capability shall provide status as to how component's requirements within the AOD have been met through the Tgt plan
178	Strategy Planning Capability shall reflect status due to ability to integrate national, space-based and theater assets into PR execution.
179	Strategy Planning Capability shall reflect status due to ability to collect and exploit required MASINT
180	Strategy Planning Capability shall reflect status due to changes in tasking or requests for additional MAW fighter sorties to the MAW TACC current ops.
181	Strategy Planning Capability shall reflect status due to tactics changes affecting air and space operations
182	Strategy Planning Capability shall have the ability to ensure that all SOF Tgt, SOF teams, and SOF air taskings/missions are deconflicted, properly integrated, and coordinated during all planning and execution phases
183	Strategy Planning Capability shall Accept immediate airspace control means requests (ACMREQ), enter the information in the AD module of TBMCS, and conduct deconfliction as required
184	Strategy Planning Capability shall reflect status due to changes in airspace for C2 assets for TLAM launches
185	Strategy Planning Capability shall reflect status due to changes in status of ATO assigned assets that impact ATK coordinator/SODO/SADO operations
186	Strategy Planning Capability shall reflect status due to ability to delegate air defense responsibilities to subordinate TACS units
187	Strategy Planning Capability shall reflect status on the JAOP due to OAT recommendations for branch/sequel planning considerations
188	Strategy Planning Capability shall reflect status onto the JAOP due to evaluation of collection strategies
189	Strategy Planning Capability shall reflect changes in status to the JAOP/AOD due to immediate SEAD requests from Air Force, joint or combined forces; coordinated with the BCD and joint service LNO for support requests.
190	Strategy Planning Capability shall reflect changes in status to the JAOP/AOD due to SODO's prosecuting personnel recovery missions using the dynamic Tgt process, providing the firepower and suppression necessary for mission success.
191	Strategy Planning Capability shall reflect changes in status to the JAOP/AOD due to SODO's approved changes to the ATO

192	Strategy Planning Capability shall reflect changes in status to the JAOP/AOD due to base capabilities
193	Strategy Planning Capability shall reflect JFACC approval of the ATO in reflection of Tgt listed in the ATO that reflect the AOD
194	Strategy Planning Capability shall reflect status changes to the AOD based upon changes brought up during the JFACC Strategy Update Briefing
195	Strategy Planning Capability shall provide status on responsible party ensuring AOD guidance to ISRD Tgt Development Cell targeteers
196	Strategy Planning Capability shall reflect status due to Tgt ability to collect CD and fratricide assessments for assigned targets.
197	Strategy Planning Capability shall reflect status due to adjustments and improvements in airspace control procedures.
198	Strategy Planning Capability shall maintain current status of the GPS constellation and impacts to theater operations
199	Strategy Planning Capability shall have the ability to raise JFACC concerns or PSYOP objective/tasking to the JFC for consideration, planning, and execution.
200	Strategy Planning Capability shall reflect status due to SEAD
201	Strategy Planning Capability shall reflect status due to ability to coordinate airspace deconfliction Joint Special Operations Air Component Commander (JSOACC)
202	Strategy Planning Capability shall have the ability to coordinate Airlift support for JFACC operations.
203	Strategy Planning Capability shall reflect status due to ability to monitor and rapidly adjust ISR platforms/sensors, collection tracks, and associated PED nodes in response to emerging threats/Tgt, environmental factors, changes in mission priorities, and/or operational changes.
204	Strategy Planning Capability shall reflect status due to EW/SEAD Tgt issues
205	Strategy Planning Capability shall reflect status due to a WPN platform being diverted from its original Tgt
206	Strategy Planning Capability shall reflect status due to space environmental impacts
207	Strategy Planning Capability shall reflect status due to what support is available at divert fields
208	Strategy Planning Capability shall reflect status due to C2 issues
209	Strategy Planning Capability shall reflect status due to communication issues
210	Strategy Planning Capability shall reflect status due to ability to advise C2 assets when aircraft under their control have been tasked/retasked

211	Strategy Planning Capability shall reflect status on changes of world opinion
212	Strategy Planning Capability shall reflect status upon the JAOP due to adversary's use of WMD
213	Strategy Planning Capability shall reflect status due to status of divert airfields
214	Strategy Planning Capability shall reflect status on the AOD due to priority shifts
215	Strategy Planning Capability shall reflect status on the AOD due to changes in environmental factors
216	Strategy Planning Capability shall reflect status change to the plan based upon Combat support considerations
217	Strategy Planning Capability shall reflect status upon the JAOP/AOD due to changes after PIR review of JFACC guidance
218	Strategy Planning Capability shall reflect status of Tgt listed in AOD after action has been taken against them
219	Strategy Planning Capability shall reflect status on the AOD/JAOP due to changes in the IPB
220	Strategy Planning Capability shall reflect status on the AOD due to changes in MOEs.
221	Strategy Planning Capability shall reflect status on the AOD due to changes in JFACC objectives
222	Strategy Planning Capability shall reflect status of deficiencies/inadequacies in intelligence support that is used in the AOD/JAOP
223	Strategy Planning Capability shall reflect status on the AOD due to changes in the JIPTL
224	Strategy Planning Capability shall reflect status on the AOD with respect to the changes in predicted adversary activity in the battlespace
225	Strategy Planning Capability shall reflect status upon Tgt listed in the AOD based upon TST and dynamic targeting situations
226	Strategy Planning Capability shall reflect changes due to COA comparison factors/elements
227	Strategy Planning Capability shall reflect status of inefficiencies noted
228	Strategy Planning Capability shall reflect status of last minute ATO changes due to Review
229	Strategy Planning Capability shall reflect status of enemy attack
230	Strategy Planning Capability shall reflect status of ATO flow change due to offensive and defensive air-to-air battlespace situation.
231	Strategy Planning Capability shall reflect status of required support

232	Strategy Planning Capability Shall reflect status upon problems enforcing positive control measures
233	Strategy Planning Capability shall reflect status upon problems due to computer and communications failure
234	Strategy Planning Capability shall reflect status of deviations in the ATO
235	Strategy Planning Capability shall reflect status due to issues or changes with Command and Control(C2) assets
236	Strategy Planning Capability shall reflect status upon the AOD's prioritized task against the Tgt list
237	Strategy Planning Capability shall reflect status due to re-role, diverts, TST missions information changes
238	Strategy Planning Capability shall reflect status due to ATACMS airspace issues
239	Strategy Planning Capability shall reflect status due to changes made to plan recommended to the SADO
240	Strategy Planning Capability shall reflect status due to information gathered during INLFIGHTREP
241	Strategy Planning Capability shall reflect status due to changes in overall employment of air defense WPN systems.
242	Strategy Planning Capability shall reflect status due to the ability to assess available fighter and air defense missile assets
243	Strategy Planning Capability shall reflect status due to International airspace issues
244	Strategy Planning Capability shall reflect changes due to status of offensive assets
245	Strategy Planning Capability shall reflect status due to condition and status of patriot battery
246	Strategy Planning Capability shall reflect status on the impact of space forces on theater air operations.
247	Strategy Planning Capability shall reflect status due to deployment of air assets, ground alert and airborne, for SCUD missions.
248	Strategy Planning Capability shall refelct status on the ability to manage theater digital data link interface systems and other automated air displays.
249	Strategy Planning Capability shall reflect status on ability to administer C2 systems operating systems.
250	Strategy Planning Capability shall reflect status due to changes in predicted enemy COA.

251	Strategy Planning Capability shall reflect status on ability to setup and maintain C2 systems servers.
252	Strategy Planning Capability shall reflect status due to impending enemy ATK
253	Strategy Planning Capability shall reflect status due to changes in Ground/Air Control Measures(ACM) and Fire Support Coordination Measures (FSCM)
254	Strategy Planning Capability shall reflect weather effects on operations as directed by the CCO.
255	Strategy Planning Capability shall reflect status due to abillity to advise Battle Coordination Detachment(BCD) when clear to fire
256	Strategy Planning Capability shall reflect status due to the ability to correlate the ATO to the air picture being displayed on the GCCS.
257	Strategy Planning Capability shall reflect status due to the ability to ensure accurate display of Common Operating Picture(COP) on the Combat Operations floor.
258	Strategy Planning Capability shall reflect status on the ability to provide support through ground maneuver.
259	Strategy Planning Capability shall reflect status due to implementation of required changes to data filtering approved by the Joint Interface Control Officer (JICO)
260	Strategy Planning Capability shall reflect status due to significant Combat Operations issues logged for debrief to units/Combat Plans
261	Strategy Planning Capability shall reflect situational awareness of locations.
262	Strategy Planning Capability shall reflect status on the ability to deconflict real-time, areas of surveillance responsibility.
263	Strategy Planning Capability shall reflect status due to Defensive Counter Air(DCA)/Offensive Counter Air(OCA) issues
264	Strategy Planning Capability shall reflect status on availability of munition types to apply against Tgt, taking into account collateral damage concerns.
265	Strategy Planning Capability shall reflect status due to inappropriate Standard Conventional Loads(SCLs), inadequate tanker offloads
266	Strategy Planning Capability shall reflect status on the ability to coordinate changes to C2 systems through the CFP.
267	Strategy Planning Capability shall reflect status due to how Air Defense Combat Air Patrol (CAP) management problems/impacts to air operations.
268	Strategy Planning Capability shall reflect status due to brevity code word changes

269	Strategy Planning Capability shall reflect status due to joint weapon capabilities
270	Strategy Planning Capability shall reflect target status.
271	Strategy Planning Capability shall reflect status on all statuses managed by Defensive Duty Officers (DDOs)
272	Strategy Planning Capability shall reflect status due to the abilities to accommodate specific aircraft missions (AWACS, DCA, F-15, etc.).
273	Strategy Planning Capability shall reflect status due to tanker issues
274	Strategy Planning Capability shall reflect status due to execution/notification of TBM warning
275	Strategy Planning Capability shall reflect status due to the ability to coordinate units entering/exiting the interface.
276	Strategy Planning Capability shall reflect status due to the ability to coordinate changes in Area of Responsibility(AOR) for surveillance as the tactical situation dictates
277	Strategy Planning Capability shall reflect status due to ability to setup and maintain C2 system workstation hardware in a timely manner.
278	Strategy Planning Capability shall reflect status due to interface anomalies (i.e. dual designations, duplicate tracks, false Tgt, runway tracks, ID, and category conflicts).
279	Strategy Planning Capability shall reflect status on the ability to coordinate with the JSOTF and JPOTF LNO for employment of excess JSOTF PSYOP assets.
280	Strategy Planning Capability shall reflect status on the ability to coordinate space FE support for theater operations.
281	Strategy Planning Capability shall reflect status due to direct engagement of identified hostile surface Targets.
282	Strategy Planning Capability shall reflect statuses through the use of TBMCS.
283	Strategy Planning Capability shall reflect status of the ability to display and maintain air situational data and update air base, flight facility, and TACS status as required.
284	Strategy Planning Capability shall reflect status due to the engagement of identified hostile aircraft.
285	Strategy Planning Capability shall reflect status due to the ability to maintain intelligence feeds (TIBS/TDDS) flowing via ADSI.
286	Strategy Planning Capability shall reflect status due to defensive operations equipment problems/issues
287	Strategy Planning Capability shall reflect status due to diverts/aborts of DCA aircraft
288	Strategy Planning Capability shall reflect status due to potential deviations from the ATO.

289	Strategy Planning Capability shall reflect status due to the ability to delegate authorities (ie. Border crossing, ID, declaration and engagement authorities, to subordinate elements of the TACS)
290	Strategy Planning Capability shall reflect status on the ability to perform detection and monitoring of critical class track activity and emergency situations, as well as defensive and special missions.
291	Strategy Planning Capability shall reflect status due to host nation defense/issues.
292	Strategy Planning Capability shall reflect status on mission details.
293	Strategy Planning Capability shall reflect status upon the JAOP/AOD due to unit status as provided by the Operations Duty Officer
294	Strategy Planning Capability shall reflect status due to problems/impacts to air operations with regard to airborne C2 support
295	Strategy Planning Capability shall reflect status on guidance governing mission support requirements
296	Strategy Planning Capability shall reflect status due to ATO flow correctly mirroring current air situation for DCA/OCA assets.
297	Strategy Planning Capability shall reflect status due to associated MISREP availability
298	Strategy Planning Capability shall reflect status due to changes to SPINS
299	Strategy Planning Capability shall reflect status due to significant problems or limitation requiring an adjustment to operations.
300	Strategy Planning Capability shall reflect status on the ability to remain current on the air and ground situation
301	Strategy Planning Capability shall reflect status on ability to prepare materials for the shift debriefs
302	Strategy Planning Capability shall reflect status on the ability to push ATO to EMC
303	Strategy Planning Capability shall reflect status on Intel information

Common Effects Picture (59) – February 2006	
No.	**Requirement**
1	Need to know what the enemy commander is thinking
2	Anticipate relationships and decide how effects are related to actions

3	Tools to support planning, execution and assessment of EBO
4	Unified campaign, not a separate one for each service
5	Must anticipate future events
6	Continuously updated information
7	Staff is aware of JFACC decision points
8	Facilitate prediction: reevaluating as things go along
9	Facilitate prediction: anticipate events beforehand
10	Facilitate prediction: anticipating enemy options
11	Information must be available when needed
12	Staff capability to push information to JFACC
13	How is he doing operationally
14	What effects he is creating - intended, unintended, cascade
15	Ahead or behind and what is next
16	Develop standard presentations and MOEs
17	Information must be actionable
18	Needs operational data, not tactical data
19	System: easy to learn
20	System: play well with other services
21	System: consider from a "command-centric" viewpoint
22	System: Goal understanding from "supported role"
23	System: synthesize data from different technologies/formats
24	Operational anticipation is state of battle space in terms of enemy and allied capability
25	Anticipation based on: intent - our own or enemies
26	Anticipation based on: history - events from the past
27	Anticipation based on: rate/trend - events in/out of focus area
28	Depict current state plus rate/trend information
29	Depict current events plus events that may impinge

30	Depict trend may require evolution of states
31	Depict implications of intent (possibly)
32	Depict system dynamics including allied and enemy and actions to influence events that are likely to unfold with consideration given to time constraints
33	Need to answer: what is MES/OO/TO/TT for red and blue
34	Need to answer: purpose of the campaign
35	Need to answer: how the campaign is conducted
36	Need to answer: what is victory or the outcome
37	Need to answer: what are the phases of the campaign
38	Is the enemy achieving his objectives?
39	Role of supported versus supporting
40	Job is to ANTICIPATE - set conditions for success
41	OA needs rolled up to the JFC
42	Need to create a Blue view of Red
43	Have time relevant information and scaled properly
44	Effect type - direct, indirect, cascading
45	Effect numbered
46	Effect geo-spatial
47	Effect temporal
48	Effec t priority
49	Effect dependencies
50	Effect weight of effort
51	Effec t risk
52	Effect link to Indirect Effects
53	Indicato rs: Numbered
54	Indicato rs: Status
55	Indicators: Location (lat, long)

56	Indicato rs: Type
57	Indicato r Rank
58	Indicator Scale - Operational, Tactical, Strategic, Execution
59	Indicator EBO Type - complex, cascading, direct, indirect

Warfighter Assessment Workshop (50) – April 2006

No.	Requirement
1	A strategy planning tool shall provide Execution Assessment data including JIPTL Targets, Missions flown and Status for both the missions and targets, correlated to the JAOP
2	A strategy planning tool shall help identify gaps in the plan
3	A strategy planning tool must provide Execution Assessment data related to support for other components, for example, through Air Support Requests (ASRs)
4	A strategy planning tool must provide non-kinetic Execution Assessment data
5	A strategy planning tool must provide easy ingestion and propagation of Execution Assessment data for quick look target(HVT)
6	Execution Assessment Data must provide detailed information about the actual mission performed versus the planned mission
7	A strategy planning tool shall provide Assessment data from OAT in addition to Execution Assessment data correlated to the JAOP
8	A strategy planning tool must provide Execution Assessment data with target details including BE#, DMPI, and a link to the target folder
9	A strategy planning tool must provide Execution Assessment data with the capability to define user-specified, critical events, that when realized, alert the user. Two critical events include a re-roll and a TST (which often dictates a re-roll)
10	A strategy planning tool must provide Execution Assessment data for Missions including mission date/time, shall be available
11	A strategy planning tool must provide Execution Assessment data for Missions in a spreadsheet view with Excel-based functionality. Columns selectable by user.
12	A strategy planning tool must provide the ability to monitor status of key (user defined) targets.
13	A strategy planning tool must provide dockable windows to permit user configurable displays
14	A strategy planning tool must provide Execution Assessment mission data to include individual

	mission start and stop times within the eSync module
15	A strategy planning tool must provide more than one method, for example, flowcharting, wizard and menu driven methodologies, when creating alerts for Execution Assessment data
16	A strategy planning tool must provide Lines of Effects data that can be categorized into user defined categories beyond just Military means, such as with PMESII
17	A strategy planning tool must provide Lines of Effects information through clear and simple visualizations when viewed by a commander.
18	Leveraging of mouse over and drill down techniques could reduce complexity and user cognitive load.
19	A strategy planning tool must provide Lines of Effects information with references to COG that includes tailorable types and associated icons, ones which address PMESII elements
20	A strategy planning tool must provide Lines of Effects information for essential tasks through a symbol other than a triangle (target is implied)
21	A strategy planning tool must provide Lines of Effects information for Supported Component through ordinal relationships such as top LOE is the Supported Component
22	A strategy planning tool must provide capability to generate in a briefing level representation Lines of Effects information in the Supported Commander's (or other as required) desired briefing format
23	A strategy planning tool must provide Lines of Effects information with respect to a maritime component
24	A strategy planning tool must provide Lines of Effects information that references WOE, initially through raw DMPI/sortie equivalent (DSEs)
25	A strategy planning tool must provide data supporting COG or SOSA information within Lines of Effects
26	A strategy planning tool containing complex Lines of Effects information must include a training component as part of its design
27	A strategy planning tool must provide a "Return to Home" with the Lines of Effects view
28	A strategy planning tool must limit access to a defined set of users for Lines of Effects information manipulation
29	A strategy planning tool must provide "unknown" PMESII elements within Lines of Effects view in gray color
30	A strategy planning tool must provide clear identification of meaning and perspective for color coding and states used
31	A strategy planning tool must specify End-state focus (campaign versus phase) for provided

	Lines of Effects information
32	A strategy planning tool must allow for easy switching of End-state focus (campaign versus phase) for provided Lines of Effects information
33	A strategy planning tool must provide differentiation between WOE and priority within Lines of Effects information
34	A strategy planning tool must provide a capability to reprioritize Plan elements and attributes within Lines of Effects information
35	A strategy planning tool must provide Lines of Effects information with TO "bars" labeled according to the plan with capability for user comments
36	A strategy planning tool must provide Lines of Effects information at user selectable levels of detail, including at a minimum a Campaign/End-state view with drill-down through Phases to TT/ATO levels.
37	A strategy planning tool must provide a Lines of Effect based planning interface in order to develop the JAOP and provide a product which replaces the AOD as the output from SPT to MAAP
38	A strategy planning tool must provide Lines of Effects information demonstrations through real-world examples
39	A strategy planning tool must allow entry of End-state information into machine and human understandable format without adding complexity to the current entry methodology i.e. textual descriptions, within the Lines of Effects
40	A strategy planning tool must provide trend information within Lines of Effects
41	A strategy planning tool must provide Lines of Effects information through mappings between COGs and Tos with progress indicators against Tos
42	A strategy planning tool must provide PMESII elements mapped to OO level and higher
43	A strategy planning tool must provide Decision Point information from Execution Assessment view within Lines of Effects
44	A strategy planning tool must provide information supporting anticipatory or predictive analysis
45	
46	A strategy planning tool must provide Lines of Effects information that is filterable by WOE, priority, and plan elements
47	A strategy planning tool providing Lines of Effects information must include both graphical and text representations
48	A strategy planning tool providing Lines of Effects information must show inter-related tasks simultaneously

49	A strategy planning tool providing Lines of Effects information must provide a drill-down feature for MOEs/MOPs and indicators
50	A strategy planning tool must allow for development and leveraging of a Prioritized Effects List (PEL)

COA Sketch Requirements (85) – February 2007	
No.	**Requirement**
1	Strat Planner can enter mission tasks
2	Strat Planner can enter mission statement
3	Strat Planner can enter Laws of Armed Conflict
4	Strat Planner can enter Rules of Engagement
5	Strat Planner can input a document as analysis evidence
6	User can review documents used as analysis evidence
7	Strat Planner can enter Center of Gravity
8	Strat Planner can enter Critical Capabilities
9	Strat Planner can enter Critical Requirements
10	Strat Planner can enter Facts
11	Strat Planner can enter Assumptions
12	Strat Planner can enter Risks
13	Strat Planner can enter Commander's Intended Methods
14	Strat Planner can enter Commander's Indented Purpose
15	Strat Planner can enter Commander's Intended End States
16	Strat Planner can create new operation planning project
17	Strat Planner can open existing operation planning projects
18	Strat Planner can save current operation planning project under a new name
19	Strat Planner can delete an existing operation planning project
20	Strat Planner can archive an existing operation planning project

21	Strat Planner can create new Course of Action
22	Strat Planner can delete an existing Course of Action
23	Strat Planner can enter the Validity of a Course of Action
24	Strat Planner can enter the Suitability of a Course of Action
25	Strat Planner can enter the Feasibility of a Course of Action
26	Strat Planner can enter the Acceptability of a Course of Action
27	Strat Planner can enter the Distinguishability of a Course of Action
28	Strat Planner can enter the Completeness of a Course of Action
29	Command staff can promote COA to Operational Plan
30	Command staff can demote Operational Plan to COA
31	Command staff can enter Commander's Estimated Course of Action
32	Strat Planner can enter Objectives
33	Strat Planner can enter Tasks
34	Stat Planner can enter Actions
35	Strat Planner can enter Effects
36	Strat Planner can enter Activities
37	Strat Planner must associate a Level of War with each Strategy Object
38	Strat Planner must provide a short name for each Strategy or Mission Analysis Object
39	Editing users can associate time intervals with each Strategy or Mission Analysis Object
40	Editing users can associate 2-D spatial regions with each Strategy or Mission Analysis Object
41	Editing users can associate 2-D spatial regions with specific time intervals on a Strategy or Mission Analysis Object
42	Coordinates of spatial regions will be stored using a single, well-defined coordinate system (e.g.WGS84)
43	Maps and Images that are not suitable for targeting will have a non-removable watermark stating this fact.
44	Strat Planner can convert Strategy or Mission Analysis Objects to compatible types of object
45	Assessor can create Measures of Effectiveness

46	Assessor can create Measures of Performance
47	Assessor can create Indicators
48	User identity must be authenticated before performing any system action
49	User must have authorized security role to perform any system action
50	User will authenticate using DoD Common Access Card
51	Editing Users can gain exclusive write access to portions of system data.
52	Editing Users cannot hold exclusive write access indefinitely
53	System visually identifies new or changed information the user has not previously viewed
54	Editing Users can undo/redo changes they have made to system data
55	Users can view change history of a planning project object
56	Editing users can specify which groups of users can view data they have created
57	Strat Planners can enter Phases of a Course of Action
58	Editing users can specify timing intervals relative to other dates or intervals
59	Editing users can specify alpha-times as fixed times or relative to other dates or intervals
60	Users can temporarily configure timeline views to be relative to any alpha-time without changing persistent data
61	Users can temporarily configure timeline views to be presented in ZULU or local time.
62	Time views will not display calendar data unless the time data has been linked to a specific date.
63	Users can temporarily hide and show map objects individually or by layer group without changing persistent data
64	Editing users can alter the appearance of individual map objects.
65	Editing users can alter the default appearance of map objects by category
66	Users can temporarily alter the order of map object layers without changing persistent data
67	Users can temporarily alter the visibility of specific objects in the synchronization view without changing persistent data
68	Users can temporarily alter the visibility of objects in the sync view based on time intervals without changing persistent data
69	Uses can temporarily alter the ordering of objects in the sync view without changing persistent

	data
70	Users can temporarily alter the units of time used to display the sync view without changing persistent data
71	Editing users can constrain the start or stop time of a timeline to specific intervals of time
72	Users can navigate between views using the currently selected object
73	User security roles shall be defined in terms of AOC teams
74	Users can view the security roles they are authorized as
75	Strat Planners can enter COA Statement
76	Strat Planners can enter End States or End State Conditions
77	Users can export and import operations and COAs to and from client-side files
78	System Admins can register deployment with NCES registry
79	Editing users can upload map layer or map icon data
80	Users can export map data to GIS formats
81	Strat Planners can set the type of operation expected to be performed during a phase
82	Strat Planners can set the expected level of effort associated with executing an strategy object
83	Users can view sync view as a phase table
84	Users can temporarily re-order COAs and plans in the sync tree to make comparisons without changing persistent data
85	Strat Planners can associate different names with the same object in different time frames

High-Level COA Sketch (12) – April 2007	
No.	**Requirement**
1	COA Sketch shall assist with COA development by allowing Strategy Planners to follow current work processes
2	COA Sketch shall visually represent COAs while maintaining relational context to the temporal and textual plan elements
3	COA Sketch shall import or directly reference political, environmental, geospatial, logistical, informational, temporal and guidance layered data elements from existing tools within the AOC or GSP environments

4	COA Sketch shall maintain available relationships to other data elements both internal and external to COA Sketch for all imported or directly referenced data elements
5	COA Sketch shall assist with notional Allocation Planning
6	COA Sketch shall provide Apportionment level estimation and situational awareness based upon the notional allocation
7	COA Sketch shall provide temporal estimation capabilities based upon the notional allocation scheme
8	COA Sketch shall allow planners to designate areas of effect in a geographical or conceptual context
9	COA Sketch shall allow multiple users to collaborate on the development of one or more COAs
10	COA Sketch shall format briefing material for the JFACC COA Decision Brief
11	COA Sketch shall interface to current planning tools in order to automate the transfer of nominated and selected COAs
12	COA Sketch shall interface to existing systems of record for Targeting, Execution and Assessment in order to exchange data.

APPENDIX B – COA SKETCH USE CASES

Use Case Document

FOR

COA SKETCH

Prepared by:

SRA International, Inc.
5000 Springfield Street
Dayton, OH 45431

19-Nov-2009

Changes Table

Date	Version	Made by	Description
5/23/07	1.3	J. Culbertson	Draft copy
4/23/08	1.4	J. Culbertson	Added title page, changes table, and "Missing Use Cases" table.

Mission Analysis Use Cases

Use Case 2.2: Strategy Planner enters Mission Tasks into the system

User Story / Context of Use:

- During Mission Analysis, Strategy Planners will need to analyze the Commanders Guidance, Planning Order and Warning Orders to determine what the tasks are so the goals that are accomplished are the goals set out by the Joint Force Commander (JFC). The Strategy Planners need to determine both the specified and the implied tasks then determine which of these tasks are mission essential. Capturing this data up front and making it available to the team greatly enhances situational awareness and results in improved analysis by the Warfighter.
- Specified tasks are those which are specifically assigned by the JFC, usually in a joint COA, OPLAN, OPORD or campaign plan.
- While a specified task could appear almost anywhere in the JFC's plan, the best places to look are in "Tasks for Subordinates" and "Coordinating Instructions".
- Implied tasks are additional major tasks, which are not specifically stated. They are candidates for essential tasks and for inclusion in the mission statement.
- To derive implied tasks we focus on analyzing JFACC specified tasks, JFC mission, intent and concept and specified tasks to the other components.
- As a technique, look for implied tasks by examining these three questions:
  - "In this situation, what other major tasks would a JFACC normally perform?" e.g., if air and space superiority are not specified tasks from the JFC, they are necessary in most situations, and therefore would be implied tasks.
  - "What in the JFC mission, intent, or concept implies a major (but unstated) task for the JFACC?" e.g., if the JFC has a mission to deter war, but that is not a specified JFACC task; won't the JFACC have to contribute to deterrence?
  - "What task to another component is likely to require significant support from the JFACC?" For example, if there is to be an amphibious landing, the JFACC is likely to need to support both preparation for and execution of that landing.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Strategy Planner
Supporting Actors: COA Sketch
Preconditions:

- A project is open in COA Sketch.

Triggers:

- The Strategy Planner has determined all task information and now wishes to enter it into the system.
- The Strategy Planner needs to determine all task information and wishes to use the system to aid in capturing this data.

Guarantees:

- The following task information will be stored within the COA Sketch system:
  - Name of task

    - Description of task
    - Is task specified or implied?
    - Is the task mission essential?
    - If valid, start/stop times
    - If valid, sketch view data
- The task information will be made available to all team members via any view that displays the data.

Main Success Scenario:

1. The user chooses to enter a new Mission Task in COA Sketch.
2. The system prompts user for Mission Task data.
3. The user enters all available data and saves the Mission Task.
4. The system stores the entered data as a new Mission Task.

Alternative 1 – User modifies Mission Task:

1. The user selects a current Mission Task in COA Sketch.
2. The system displays the data for the selected task.
3. The user modifies the existing data and saves the Mission Task.
4. The system updates the Mission Task to contain the new changes.

Requirements:

Use Case 2.3: Strategy Planner enters Mission Statement into the system

User Story / Context of Use:

- During Mission Analysis, the service component commander's mission statement will be written or a mission statement could be passed on to the Strategy Division via the JFC's guidance. Capturing the Mission Statement means it is available throughout COA development, planning, and re-planning processes. This process enables better situational awareness and a focused plan.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Strategy Planner
Supporting Actors: COA Sketch
Preconditions:

- A project is open in COA Sketch.

Triggers:

- The Strategy Planner has received the JFC or component commander mission statement and now wishes to enter it into the system.
- The Strategy Planner aids the component commander in building the mission statement and will use the system to aid in capturing this data.

Guarantees:

- Mission Statement additions or modifications will be reflected in the Mission Analysis View.
- The Mission Statements will be shared with all team members via the Mission Analysis view.
- All documents relating to the Mission Statements will be available.
- If there are multiple Mission Statements each will be viewable and identified by source.

Main Success Scenario:

1. The user chooses to enter a new Mission Statement in COA Sketch.
2. The system displays the Mission Statement editor window.
3. The user enters relevant data and saves the Mission Statement.
4. The system stores the entered data as a new Mission Statement.

Alternative 1 – User modifies Mission Statement:

1. The user selects a current Mission Statement in COA Sketch.
2. The system displays the Mission Statement editor window and loads the data for the selected Mission Statement.
3. The user modifies the existing data and saves the Mission Statement.
4. The system updates the Mission Statement to contain the new changes.

Requirements:

Use Case 2.4: Strategy Planner enters Law of Armed Conflict (LOAC) and/or Rules Of Engagement (ROE) information into the system

User Story / Context of Use:

- Judge Advocate General (JAG) Liaisons will capture LOAC and ROE information into the system during mission analysis. This will make the information available during the COA development, planning, and re-planning processes.
- The Law of Armed conflict defines the conduct and responsibilities of belligerent nations, neutral nations and individuals engaged in warfare, in relation to each other and to *protected persons*, usually meaning civilians.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: JAG Liaison
Supporting Actors: COA Sketch
Preconditions:

- A project is open in COA Sketch.

Triggers:

- The Strategy Planner has received the LOAC and/or ROE information and now wishes to enter it into the system.

Guarantees:

- The LOAC and/or ROE information will be stored within the COA Sketch system.
- The LOAC and/or ROE information will be made available to all team members via the Mission Analysis view.
- ROE data consists of when, where and how force can be used.
- If JAG Liaison associated a geographic context, then a Generic Object will be created with the *tag* "LOAC" or "ROE".
    - The Generic Object will be associated back to, and provide direct access to, the Mission analysis LOAC or ROE data.

Main Success Scenario:

1. The user chooses to enter LOAC and ROE information in COA Sketch.
2. The system displays the LOAC/ROE.
3. The user enters the LOAC/ROE information.
4. The system stores the LOAC and ROE.

Alternative 1 – User modifies LOAC and ROE data:

1. The user selects LOAC and ROE information in COA Sketch.
2. The system displays LOAC and ROE information editor window and loads the data for the selected LOAC and ROE.
3. The user modifies the existing data and saves the LOAC and ROE information.
4. The system updates the LOAC and ROE information to contain the new changes.

Requirements:

Use Case 2.5: Strategy Planner enters Commander's Intent into the system (method, purpose, end states)

User Story / Context of Use:

- The Strategy Planner will capture the Commander's method, purpose, and end state intent into the tool to provide the team with access to this information. This information aids the team in maintaining situational awareness of the Commander's intent throughout the COA development, planning, and re-planning processes.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Strategy Planner
Supporting Actors: COA Sketch
Preconditions:

- A project is open in COA Sketch.

Triggers:

- The Strategy Planner has received the Commander's Intent and now wishes to enter it into the system.

Guarantees:

- The Commander's Intent will be stored within the COA Sketch system.
- The Commander's Intent will be made available to all team members via the Mission Analysis view.
- System will prompt for all relevant data, including: Method, Purpose, and End States for each phase.

Main Success Scenario:

1. The user chooses to enter the Commander's Intent into COA Sketch.
2. The system displays the Commander's Intent.
3. The user enters relevant data. Relevant data includes:
    a. Method
    b. Purpose
    c. End states (for each phase)
4. The system stores the changes.

Alternative 1 – User modifies Commander's Intent:

1. The user selects the current Commander's Intent in COA Sketch.
2. The system displays the Commander's Intent editor with the current data.
3. The user modifies the displayed data and saves the changes.
4. The system stores the changes.

Requirements:

Use Case 2.9: User Adds/removes document to list of documents gathered for Analysis

User Story / Context of Use

- During Mission Analysis the user will have the opportunity to review and analyze many documents. The COA Sketch system will permit the user to store any and all documents related to the analysis.

Scope: User to COA Sketch Interaction
Level: User Goal
User Impact:

- Allows user to incorporate electronic documents into the COA Sketch system.
- These documents can then be used to add information such as facts, assumptions, specified tasks, etc. to COA Sketch tools.
- Any information added to COA Sketch tools will be traceable from the tool directly to the original document.

Primary Actor: Strategy Planner
Supporting Actors: COA Sketch
Preconditions:

- A project is open in COA Sketch.

Triggers: The Strategy Planner receives a document for analysis.
Guarantees:

- The document will be stored in the COA Sketch system.
- The document will be available to the team members via the Mission Analysis view.
- All data will maintain traceability information to the original document (document name, page number, selected text, date created, edits, creator of object etc.).

Main Success Scenario:

1. User receives guidance document.
2. User chooses to add document to document list.
3. The system requests the location/url, file name, user-defined name, and type (Warning order, etc) of the document.
4. The user indicates the location/url, file name, user-defined name, and type of the document
5. The system verifies that the document location and file name is valid.
6. The system verifies that the user-defined name is valid.
7. The system verified the type of document is valid.
8. The system stores the collected information.
9. They system displays confirmation to the user that the document was successfully added.

Alternative 1 – User deletes document from system:

1. User opens document list.
2. User selects document.
3. User deletes document from list.

Alternative 2 – File location error:

5. System cannot verify document location and filename.
6. System displays error message.
7. Return to Step 3.

Alternative 3 – User does not enter a document type:

5. System detects no file type entered.
6. System prompts for file type.
7. User enters file type or cancels prompt.
8. The system stores the collected information.
9. They system displays confirmation to the user that the document was successfully added.

Alternative 4 – User does not enter a valid filename:

7. System detects invalid filename.
8. System informs user of reason for invalid filename.
9. System prompts for valid filename.
10. The system verifies that the user-defined name is valid.
11. The system stores the collected information.
12. They system displays confirmation to the user that the document was successfully added.

Requirements:

Implementation ideas:

- Add
  - Drag document onto "list" icon
  - Right-click, "Add to list"
- Delete
  - Right-click on document in list, select delete.
  - Drag document from list to trashcan.
  - Delete document from Windows Explorer type app.
- Mark as
  - Right-click, "Mark as…"
  - Drag onto listing of document "types"
- A Windows Explorer-like app solves all of these document management problems.

Use Case 2.10: User opens a document that has been saved in the system

User Story / Context of Use:

- In the process of Mission Analysis the user has created a repository of guidance and related documents.
- When searching for specific guidance, creating briefings, creating a mission statement or other tasks the user will want to view the full list of documents prior to selecting one to view.
- After selecting a document the COA Sketch system will open the document.

Scope: User to COA Sketch Interaction

Level: User Goal

Primary Actor: Strategy Planner

Supporting Actors: COA Sketch

Preconditions:

- A project is open in COA Sketch.

Triggers: User needs to search guidance document for information.

Guarantees:

- The COA Sketch system will store a list of documents.
- The user will be able to access the list of documents.
- The user will be able to open documents.

Main Success Scenario:

1. User chooses to view documents list.
2. User opens document list.
3. System displays document list.
4. User selects document.
5. System opens document.

Alternative 1:

Requirements:

Implementation ideas:

- Provide "open folder" icon to access list. Clicking folder will open Windows Explorer type view of document list.

Use Case 2.11: User creates COA Sketch object from selected document

User Story / Context of Use:

- In the process of COA development/analysis the user will create briefings, a mission statement and other tasks based on guidance documents stored in COA Sketch.
- When viewing guidance documents, the user will have the ability to create an object by transferring information directly from the document into the COA Sketch tools.

Scope: User to COA Sketch Interaction

Level: User Goal

Primary Actor: Strategy Planner

Supporting Actors: COA Sketch

Preconditions:

- A project is open in COA Sketch.
- User has opened document from list.

Triggers: User needs to search guidance document for information.

Guarantees:

- The COA Sketch system will store a list of documents.
- The user will be able to access the list of documents.
- The user will be able to open documents.
- The user will be able to interact with documents to create objects.

Main Success Scenario:

1. User selects data from document.
2. User selects to create object with selected data.
3. System shows selected data.
4. System creates object.
5. System stores traceability data (document name, page number, selected text, date created, edits, creator of object etc.).

Alternative 1 – User edits object data:

1. User selects object for data editing.

2. System displays editing fields.
3. User edits data.
4. System saves new data and closes editor.

Requirements:

Implementation ideas:

- Highlight text in document, right-click, select "Move to Facts", "Move to Assumptions", "Create Tactical Task" etc.
- Highlight text, click and drag into list, map, Synch view…
- Right-click existing object, select "Delete" from menu.

Use Case 2.12: User views traceability of Mission Analysis object

User Story / Context of Use:

- In the process of Mission Analysis (MA) the user will create briefings, a mission statement and other tasks based on guidance documents stored in COA Sketch.
- When viewing guidance documents, the user will have the ability to create an object by transferring information directly from the document into the COA Sketch tools.
- Any object created by the system may be questioned in the future. To verify accuracy and currency of data all created objects will maintain traceability to their source.

Scope: User to COA Sketch Interaction

Level: User Goal

Primary Actor: Strategy Planner

Supporting Actors: COA Sketch

Preconditions:

- A project is open in COA Sketch.
- The MA View is open.

Triggers: User needs to find guidance document used to create object.

Guarantees:

- The COA Sketch system will store a MA objects.
- The user will be able to view traceability of MA objects.
- The user will be able to open documents referenced in the traceability data.
- The system will store traceability data (See Use Case: User creates COA Sketch object from selected document)

Main Success Scenario:

1. User chooses to view a MA object.
2. User selects to view traceability info of MA object.
3. System displays traceability data for MA object.
4. User selects to close traceability data.
5. System closes traceability data.

Alternative 1 – User opens document after viewing traceability information:

5. User chooses to open document from traceability info.
6. System opens original document.

Requirements:

Implementation ideas:

1. Right-click on object, Select "View Traceability".
2. Provide traceability data in editing windows.
3. To open document, double-click on document title wherever traceability information is displayed.

Use Case 2.15: User creates centers of gravity (COG)

User Story / Context of Use:

- COG determination should be done at the JFC or higher level and passed to the components; however, component staffs should be prepared to provide their input.
- An awareness of the COGs will help shape what you want to affect/attack and what you need to protect/defend. Further, it helps to determine the tasks the airman is to accomplish, as they will be analyzed as an input to the next phase, COA development.

Scope: User to COA Sketch Interaction
Level: User Goal
User Impact:
Primary Actor: Strategy Planner
Supporting Actors: COA Sketch
Preconditions:

- A project is open in COA Sketch.

Triggers: The Strategy Planner wishes to develop COGS.
Guarantees:

- Documents with potential COG-related data will be stored in the COA Sketch system.
- User will be able to access these documents.

Main Success Scenario:

1. User chooses to enter COGs.
2. System prompts for data.
3. User enters COG data.
4. System saves COG data.

Alternative 1 – User cancels COG entry:

4. User cancels COG data entry.

Alternative 2 – User views COG:

1. User chooses to view COGs.
2. System displays COGs.

Alternative 3 – User modifies COG entry:

1. User chooses to view COGs.
2. System displays COGs.
3. User modifies COG entry.
4. System saves COG data.

Alternative 3 – User cancels modification of COG entry:

1. User chooses to view COGs.
2. System displays COGs.
3. User modifies COG entry.
4. User cancels COG data modification.

Requirements:
Current techniques:

Implementation ideas:

1. An approach may be to organize the analysis on Political, Military, Economic, Social, Infrastructure, and Information (PMESII), using questions similar to those used to identify "facts". However, the focus in this case is on the sources of strength essential to the accomplishment of our mission and the vulnerabilities through which the adversary may affect those strengths.
2. Whiteboard-type capability to build a concept map (Systems of Systems approach) of CC-CR-CV. More complete analysis. Would like to bring COGs and Capabilities/Will together (provide a better understanding). Rank order capabilities/vulnerabilities according to degrees (most-least vulnerable, most-least capable). Top 5.
3. Include both strategic and operational COGs. Step planner through assessment process CC-CR-CV for each.

Use Case 2.16: User creates critical capabilities

User Story / Context of Use:

- COG determination (including critical capabilities) should be done at the JFC or higher level and passed to the components; however, component staffs should be prepared to provide their input.
- However, an awareness of the COGs will help shape what you want to affect/attack and what you need to protect/defend. Further, it helps to determine the tasks the airman is to accomplish, as they will be analyzed as an input to the next phase, COA development.

Scope: User to COA Sketch Interaction
Level: User Goal
User Impact:
Primary Actor: Strategy Planner
Supporting Actors: COA Sketch
Preconditions:

- A project is open in COA Sketch.

Triggers: The Strategy Planner wishes to develop Critical Capabilities.
Guarantees:

- Documents with potential Critical Capability related data will be stored in the COA Sketch system.
- Critical Capabilities may consists of: name, alliance, description etc.
- User will be able to access these documents.

Main Success Scenario:

1. User analyzes JFC documents and other information for friendly critical capabilities.
2. User selects data to save as critical capability.
3. User enters data as critical capability.
4. System stores critical capability data.

Alternative 1 – User associates critical capability to COG:

1. User selects critical capability data.
2. User associates data with COG.
3. System stores association between CC and COG.

Requirements:
Current techniques:
Implementation ideas:

1. An approach may be to organize the analysis on PMESII, using questions similar to those used to identify "facts". However, the focus in this case is on the sources of strength essential to the accomplishment of our mission and the vulnerabilities through which the adversary may affect those strengths.
2. Whiteboard-type capability to build a concept map (Systems of Systems approach) of CC-CR-CV. More complete analysis. Would like to bring COGs and Capabilities/Will together (provide a better understanding). Rank order capabilities/vulnerabilities according to degrees (most-least vulnerable, most-least capable). Top 5.
3. Include both strategic and operational COGs. Step planner through assessment process CC-CR-CV for each.

Use Case 2.17: User creates critical requirements

User Story / Context of Use:

- COG determination (including critical requirements) should be done at the JFC or higher level and passed to the components; however, component staffs should be prepared to provide their input.
- However, an awareness of the COGs will help shape what you want to affect/attack and what you need to protect/defend. Further, it helps to determine the tasks the airman is to accomplish, as they will be analyzed as an input to the next phase, COA development.

Scope: User to COA Sketch Interaction
Level: User Goal
User Impact:
Primary Actor: Strategy Planner
Supporting Actors: COA Sketch
Preconditions:

- A project is open in COA Sketch.

Triggers: The Strategy Planner wishes to develop Critical Requirements.
Guarantees:

- Documents with potential Critical Requirement related data will be stored in the COA Sketch system.
- Critical Requirements may consists of: name, alliance, vulnerability, description etc.
- User will be able to access these documents.

Main Success Scenario:

1. User analyzes JFC documents and other information for critical requirements.
2. User selects data to save as critical requirements.
3. User enters data as critical requirements.
4. System stores critical requirements data.

Alternative 1 – :

1.

Requirements:
Current techniques:

Implementation ideas:

1. An approach may be to organize the analysis on PMESII, using questions similar to those used to identify "facts". However, the focus in this case is on the sources of strength essential to the accomplishment of our mission and the vulnerabilities through which the adversary may affect those strengths.
2. Whiteboard-type capability to build a concept map (Systems of Systems approach) of CC-CR-CV. More complete analysis. Would like to bring COGs and Capabilities/Will together (provide a better understanding). Rank order capabilities/vulnerabilities according to degrees (most-least vulnerable, most-least capable). Top 5.
3. Include both strategic and operational COGs. Step planner through assessment process CC-CR-CV for each.

Use Case 2.19: User identifies and creates facts

User Story / Context of Use

- Users need to identify facts related to the mission and facts can come in a variety of different documents. Users need to analyze Orders, planning products and JFC mission and intent to identify facts.
- Facts are statements of known data concerning the situation, including adversary and friendly dispositions, available air capabilities/forces, unit strengths, and material readiness.
- When a Fact is identified the user needs to include it in a list of Known Facts for later use.

Scope: User to COA Sketch Interaction
Level: User Goal
User Impact:

- This step is concerned with gathering as much information about the situation as possible for analysis. The JFACC staff should analyze not only the JFC's intent, but the intent at all levels of command up to and including the President of the United States (POTUS). The staff must ensure they completely understand the JFC's intent, mission, limitations, risk, the joint operating area (JOA), missions of other components, and at least a general timeline. A clear understanding of the JFC's mission is vital to the air component's ability to support the overall effort.
- It is critical for the user to identify facts and assumptions and determine the differences between them.

Primary Actor: Strategy Planner
Supporting Actors: COA Sketch
Preconditions:

- A project is open in COA Sketch.

Triggers: The Strategy Planner wishes to identify Facts.
Guarantees:

- The user will be able to store the Facts in the COA Sketch system.
- The Facts will be available to the team members via the Mission Analysis view.
- The COA Sketch system will maintain traceability to the source document.

Main Success Scenario:

1. The user chooses to enter a new fact.
2. The system prompts user for fact data.
3. The user enters all available facts.
4. The system stores the entered data as a fact.

Requirements:

Current techniques:

Implementation ideas:

- Drag and drop items from guidance documents into "Facts" list.

Use Case 2.20: User identifies and creates assumptions

User Story / Context of Use

- Users need to identify assumptions related to the mission and assumptions can come in a variety of different documents. Users need to analyze Orders, planning products and JFC mission and intent to identify assumptions.
- Assumptions are suppositions about the current or future situation that are necessary to continue planning and are assumed to be true in the absence of facts.
- When an Assumption is identified the user needs to include it in a list of Assumptions for later use.

Scope: User to COA Sketch Interaction

Level: User Goal

User Impact:

- This step is concerned with gathering as much information about the situation as possible for analysis. The JFACC staff should analyze not only the JFC's intent, but the intent at all levels of command up to and including the POTUS. The staff must ensure they completely understand the JFC's intent, mission, limitations, risk, the joint operating area (JOA), missions of other components, and at least a general timeline. A clear understanding of the JFC's mission is vital to the air component's ability to support the overall effort.

Primary Actor: Strategy Planner,

Supporting Actors: COA Sketch

Preconditions:

- A project is open in COA Sketch.

Triggers: The Strategy Planner wishes to identify Assumptions.

Guarantees:

- The user will be able to store the Assumptions in the COA Sketch system.
- The Assumptions will be available to the team members via the Mission Analysis view.
- The COA Sketch system will maintain traceability to the source document.

Main Success Scenario:

1. The user chooses to enter a new assumption.
2. The system prompts user for assumptions.
3. The user enters all available assumptions.
4. The system stores the entered data as assumptions.

Alternative 1 – User changes assumption to fact:

1. User accesses assumptions list.

2. User changes assumption to fact.
3. System removes object from assumption list.
4. System moves object to facts list.

Requirements:
Current techniques:
Implementation ideas:
- Drag and drop items from guidance documents into "Assumptions" list.

Use Case 2.21: User identifies and creates limitations

User Story / Context of Use
- Users need to identify limitations related to the mission and limitations can be identified in a variety of different documents. Users need to analyze Orders, planning products and JFC mission and intent to identify limitations.
- Limitations on our operations include constraints, restraints, and other factors (e.g., weather, terrain, etc.). Constraints are things which you *must* do, and restraints are things which you *must not* do. For example, if a combined staff to include other nation participation is directed, that is a constraint. An example of a restraint might be a prohibition from overflying certain territory.
- When a limitation is identified the user needs to include it in a list of Known Limitations for later use.
- Limitations on our operations include constraints, restraints, and other factors (e.g., weather, terrain, etc.). Constraints are things which you *must* do, and restraints are things which you *must not* do. For example, if a combined staff to include other nation participation is directed, that is a constraint. An example of a restraint might be a prohibition from overflying certain territory.

Scope: User to COA Sketch Interaction
Level: User Goal
User Impact:
Primary Actor: Strategy Planner
Supporting Actors: COA Sketch
Preconditions:
- A project is open in COA Sketch.

Triggers: The Strategy Planner receives a Warning Order, Planning Order, Alert Order, JFC OPLAN or OPORD and wishes to identify Facts.
Guarantees:
- The user will be able to store the Limitations in the COA Sketch system.
- The Limitations will be available to the team members via the Mission Analysis view.
- Limitations can be identified as constraints, restraints or other factors.
- The COA Sketch system will maintain traceability to the source document.

Main Success Scenario - Constraints:
1. User analyzes guidance documents for constraints.
2. User selects constraints in COA Sketch system.
3. User enters constraints into COA Sketch system.
4. System creates constraint in limitations list.

5. System stores traceability data.

Alternative 1 - Restraints:

1. User analyzes guidance documents for restraints.
2. User selects restraints in COA Sketch system.
3. User enters restraints into COA Sketch system.
4. System creates restraints in limitations list
5. System stores traceability data.

Alternative 2 - Other:

1. User analyzes guidance documents for Other limitations.
2. User selects other limitations in COA Sketch system.
3. User enters Other limitations into COA Sketch system.
4. System creates Other limitations in limitations list
5. System stores traceability data.

Requirements:

Current techniques:

Implementation ideas:

- Drag and drop items from guidance documents into "Limitations" list.

Use Case 2.22: User analyzes the tasks, operational environment and resources to form an initial risk assessment

User Story / Context of Use

- Given the capabilities of the adversary, the tasks which must be accomplished and the air forces available to do them, the staff can prepare an initial risk assessment. For example, if the adversary has a significant offensive air and missile capability, how great is the risk of deploying our aircraft within range of enemy aircraft and missiles prior to deploying our Patriot assets?
- If there is an immediate need for interdiction and CAS in order to help stop an invasion, this may require moving assets forward in the deployment plan ahead of some air defense or other assets scheduled for early deployment.
- In this situation, is the JFACC (and JFC) willing to take risks from an air defense viewpoint? How many days of deployment do we need to have completed before we can prevent enemy air/missile from inflicting significant casualties on the Coalition?
- Commanders, not staffs, bear the authority and responsibility for making the tough decisions when risk must be accepted in one area or another.
- The job of staffs is to anticipate and communicate those risk considerations as early as possible so the JFACC can decide how best to minimize and prepare for the risks.

Scope: User to COA Sketch Interaction

Level: User Goal

Primary Actor: Strategy Planner

Supporting Actors: COA Sketch

Preconditions:

- A project is open in COA Sketch.

Triggers: The Strategy Planner wishes to perform a risk assessment.

Guarantees:

- The user will be able to store the initial risk analysis in the COA Sketch system.

- The initial risk analysis will be available to the team members via the Mission Analysis view.

Main Success Scenario:

1. The user chooses to enter new risk data.
2. The system prompts user for risk data.
3. The user enters all available risks.
4. The system stores the entered data as a risk assessment.

Alternative 1:

Requirements:

Current techniques:

Implementation ideas:

1. Geospatial and synchronization views of enemy capabilities along with friendly capabilities over time.
2. Mission, casualties, and time – methods of evaluating risk. Show alternative

Plan/Operation Use Cases

Use Case 3.1: Create new operation

User Story / Context of Use:

- When a Strategy Planner or team is ready to begin the planning process, the Strategy Planner will need to create a new operation within the tool. After creating the operation the team will have access to tools that will aid in Mission Analysis, COA Development and COA Analysis.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Strategy Planner
Supporting Actors: COA Sketch
Preconditions: COA Sketch is open.
Triggers: Strategy Planner would like to create a new operation.
Guarantees:

- A new operation will be created and stored within the system.
- An operation will define operation level default values for the following attributes, some of which maybe over written as indicated in the appropriate use cases:
    - name
    - D-day
    - C-day
    - M-day
    - Other user defined alpha-days
    - Phases
  - Title
  - Duration
  - Start Date
    - ATO information
  - Duration (every 8 hours, 24 hours, etc…)
  - Start Time (00:00, 08:00, 12:00, etc…)
  - GMT/ZULU or local

Main Success Scenario:

1. The user selects to create a new plan from COA Sketch.
2. The system prompts the user for an operation name.
3. The system determines the operation name is unique and persists the data.
4. The system will set the following data by default:
    - D-Day will be set as the default date and the actual date will be left unspecified.
    - C-Day will be set as D+0.
    - M-Day will be set as D+0.
    - The time zone will default to ZULU.
5. The system restores the initial program state.

Alternative 1 (Operation name is not unique, user overwrites old operation):

3. The system determines that the operation is not unique and prompts the user to either rename the new operation or ask to overwrite the existing operation.

4. The user elects to overwrite the existing operation.
5. The system persists the new operation data with the elected name, effectively deleting the operation previously stored with that name.

Requirements:

1. COA Sketch shall allow users to store the collection of information gathered during the planning process.

Use Case 3.2: Save Existing operation as new operation

User Story / Context of Use:

- When a Strategy Planner or team is ready to begin the planning process, the Strategy Planner will need to create a new operation within the tool. The Strategy Planner may do this by opening an existing operation and saving it as a new one. This may save a lot of the team's time by re-entering some of the same information that could apply to the new operation as well.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Strategy Planner
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- At least one operation already exists.

Triggers: Strategy Planner would like to create a new operation from an existing one.
Guarantees: A new operation will be created and stored within the system that contains all the information from the already existing operation.
Main Success Scenario:

1. The user chooses to save operation as new operation.
2. The system prompts for new operation's name.
3. The user provides the new operation's name.
4. The system determines that the provided operation name is unique.
5. The system saves the current operation as a new operation under the provided name.

Alternative 1 (overwriting an existing operation):

3. The user provides an existing operation's name.
4. The system determines that the provided operation name is not unique.
5. The system prompts for confirmation to overwrite existing operation.
6. The user accepts overwriting the existing operation.
7. The system overwrites the existing operation with the current operation's data.

Alternative 2 (avoiding overwriting an existing operation):

3. The user provides an existing operation's name.
4. The system determines that the provided operation name is not unique.
5. The system prompts for confirmation to overwrite existing operation.
6. The user declines overwriting the existing operation.
7. The system returns to step 2.

Requirements:

2. COA Sketch shall allow the user to edit and save the current planning process information.

Use Case 3.3: Open existing operation

User Story / Context of Use:

- As planning can be a very long lived process, after a days worth of work the team member ends their day and saves the operation. To be able to return to previously saved point in the development process a planner will need to reopen the plan to continue its development.
- After completing a plan, the developers save their work from the terminal they are working on. They then schedule a review meeting to cover each of the COAs described in the operation at a later time in a different location. They will need to be able to open for viewing and review the operation and COAs developed prior.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member, Reviewer
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- COA Sketch must have a operation already stored in the system to be opened.

Triggers: Team member or reviewer wants to open up a saved operation.
Guarantees:

- The existing operation will be opened in the tool.

Main Success Scenario:

1. The user chooses to open an existing operation.
2. The system displays a list of available operations.
3. The user chooses one of the available operations.
4. The system opens the selected operation.

Requirements:

2. COA Sketch shall allow the user to edit and save the current planning process information.

Use Case 3.4: User views/modifies Operation details

User Story / Context of Use:

- A Strategy Planner may not initially know certain details pertaining to a operation, such as how long a particular phase will last. After determining this information, from an order or planning calculation, they will wish to share this knowledge with the rest of the team.
- After any portion of development within a operation, or to double check data entry on the details of a operation a Strategy Planner may wish to view the operation details for accuracy or critique.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Strategy Planner
Supporting Actors: COA Sketch
Preconditions:

- A plan is open in COA Sketch.

- An operation is open that has at least one COA.

Triggers: Strategy Planner would like to set up or change the battle rhythm or important military dates associated with a plan.

Guarantees:

- The following are the attributes of a operation that may be edited via this view:
  - Name
  - D-Day
  - C-Day
  - M-Day
  - Phases
    - Title
    - Duration, in days
    - Start Date, which references an Alpha Day
    - By default, the first new phase will begin on D+0 and end 24 hours later. All new phases will by default be added to the end of the phases and will begin directly after the last phase and last 24 hours.
    - Removing a Phase:
      - All following phases will be adjusted to replace the removed phase. If the removed phase lasted 50 days, but began 30 days before the second phase, all phases will be adjusted 30 days.
      - Removing the last phase will not result in any changes
  - Mission Statement
  - ATO information
    - *Duration (every 8 hours, 24 hours, etc…)*
    - *Start Time (00:00, 08:00, 12:00, etc…)*
    - GMT/ZULU or local
- The system will store new important date information.
- The system will update plan timing information that may exist due to changes made in either dates or battle rhythm.
- The new Phase timing information will be stored within the COA Sketch system.
- All visualizations depending upon this information will be updated to reflect the changes.

Main Success Scenario:

1. The user chooses to edit the operation details.
2. The system displays the operation editor.
3. The user modifies the available data.
4. The user indicates they are completed in making changes to operation details.
5. The system stores the changes and adjusts the affected views and objects.

Requirements:

3. COA Sketch shall save system displays and details of a planning process to aid the user in re-immersing themselves back into the planning process.
4. COA Sketch shall save system displays and details of a planning process to brief or show team members context of the planning process.

Use Case 3.5: Delete/Archive Operation

User Story / Context of Use:

- After beginning a new operation, the team is instructed that they will no longer be responsible for the operation. Thus to alleviate storage the user decides to delete a operation.
- Once a operation has been fully developed, executed and completed, it is no long necessary to keep this data available for review and modification. Thus the user selects to delete the operation from view so that it isn't listed in the active operation list referenced in opening an existing operation.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- An operation is open.

Triggers:

- A team member selects an operation for deletion.

Guarantees:

- The Operation is deleted without affecting any other operations.

Main Success Scenario:

1. The user chooses to delete the current operation.
2. The system prompts the user for permanently deleting the operation.
3. The user selects permanent deletion.
4. The system deletes the operation.

Alternative 1 (User cancels delete):

3. The user elects to cancel the delete.
4. The system reverts to its previous state.

Alternative 2 (User chooses to archive instead of fully purge the deleted operation):

3. The user selects archiving,
4. The system moves the operation from the list of available operations to the list of archived operations, leaving the operation data in the database unmodified.

Requirements:

3. COA Sketch shall save system displays and details of a planning process to aid the user in re-immersing themselves back into the planning process.
4. COA Sketch shall save system displays and details of a planning process to brief or show team members context of the planning process.

Use Case 3.6: Open Archived Operation

User Story / Context of Use:

- After marking a operation to be deleted and archived, a new approach to an existing operation might be brought up in relation to such operation. Thus for investigation the team finds it necessary to load the archived plan to see how it was previously implemented.

- After having deleted a operation and archiving it, a team member realizes that they are not done with the operation and must reopen it for continued work.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member
Supporting Actors: COA Sketch
Preconditions:
- COA Sketch is open.
- A operation has been archived

Triggers:
- A team member selects to restore a operation from the archived operations.

Guarantees:
- The archived operation is opened in the state it was prior to being archived.
- The operation is added to the list of available operations to open.

Main Success Scenario:
1. The user selects to open an archived operation.
2. The system displays a list of available operations.
3. The user chooses one of the available operations.
4. The system opens the selected operation.

Requirements:
3. COA Sketch shall save system displays and details of a planning process to aid the user in re-immersing themselves back into the planning process.
5. COA Sketch shall save system displays and details of a planning process to brief or show team members context of the planning process.

Use Case 3.21: Operation Timing Storage (for future implementations)

User Story / Context of Use:
- While determining the validity of the timing of alpha days such as C-Day and M-Day as well as defining the phases required as well as each phase's duration, the user may wish to set aside some determined timing data so that it may be referred back to or re-set. This will allow the user the ability to play around with dates and timing without fear of losing other potentially valid or useful timing data.
- The user may wish to see how the plan is affected by using different Alpha Days and Phase Timing schemas that have been pre-determined.
- The user may determine that a pre-determined Alpha Day and Phase Timing are no longer valid and should be removed from the system.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member
Supporting Actors: COA Sketch
Preconditions:
- COA Sketch is open.
- An Operation is open.

Triggers:

- A team member selects to store the alpha days and phase timing for later use.
- A team member selects to set current timing to reflect a stored timing.
- A team member wishes to discard stored timing data

Guarantees:

- Alpha Days and phase timing will be stored separately for the Operation Default
- Stored Timing is retrieve-able and can be re-set as the Operation's default timing
- Stored Timing can be removed from the system.
- Stored Timing Schemas will be stored as read only
  i. This is not to be confused with the Operation's T iming, which is always modifiable.
- Stored Timing will save the following information for later use:
  i. mDay offset from D-Day
  ii. cDay offset from D-Day
  iii. Other defined alpha days (future spiral implementation)
  iv. All Phase information
  v. A User defined name

Main Success Scenario (creating new stored timing):

1. The user indicates to store the current timing for later use
2. The system stores the data to mirror the Operation's default timing information.
3. The system provides the user a way to modify the designated name of the timing information
4. The system displays the newly stored information in the list with all other stored timing information for the Operation

Alternative 1 (User selects to set Operation Timing to reflect a stored timing)

1. The user selects to view all the stored timing data.
2. The user selects a stored timing to be restored.
3. The user indicates to restore the selected stored timing
4. The system modifies the Operation's timing to reflect the stored timing
5. The system removes existing Phases and creates new phases to reflect the ones in the stored timing.
6. All open displays will be updated to reflect the changes selected.

Alternative 2 (User chooses to delete a stored timing)

1. The user selects to view all the stored timing data.
2. The user selects a stored timing to be removed from the system
3. The user indicates to delete the selected stored timing
4. The system complies.
5. The list is updated to indicate that the stored timing no longer exists.

Use Case 3.24: User specifies an Alpha Day to be used for new timing of elements in COA Sketch by default and for use in Timing Views (potential future implementation)

User Story / Context of Use:

- During the beginning stages of planning, the user tends to use C-Day as the anchor date for planning. Once the plan starts to come to fruition, and D-Day is approaching, the user will now wish to refer to D-Day as the anchor date for planning.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Strategy Planner
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.

Triggers:

- A Strategy Planner wishes to view offsets with respect to a specific Alpha Date.

Guarantees:

- The Synchronization view will be updated to use the specified alpha Day with the Gantt view
- The Plan Player will be updated to display offsets in terms of the specified Alpha Day
- Any new timing not currently bound to other parent timing will reference the specified Alpha date as the start date
- (Future work) All timing currently referencing the old Specified date will now reference the new date and offsets will be determined (i.e. if the offset was on C-Day (D-30) and was set to be C +5, then the specified alpha day was changed from C-Day to D-Day, then element's timing would not be D-25.).

Main Success Scenario:

1. User views Operation Timing Properties.
2. System displays COA Timing properties to user.
3. User designates a different Alpha Day as the "anchor".
4. Views displaying general offset information will use this new Alpha Day to display offsets (Synch View, Plan Player).

NOTE: Need to update some Synch view use cases. The synch view display of timing should not be based upon d-day as the current date, but should designate the first day of the first phase as the current date. (Per discussion with Tim)

COA Development

Use Case 3.7: User creates a new Course of Action (COA)

User Story / Context of Use:

- The JFACC may issue clear and specific guidance on how the air COAs should vary. For example, he may wish to see the following COA variances developed:
    - focused primarily on disrupting the strategic direction of the enemy armed forces (enemy strategic COG);
    - focused primarily on denying the enemy success in his ground offensive (enemy operational COG);
    - Focused on protecting our ports and forces (our operational COG).

- If the JFACC has not specified how he wishes to vary the air COAs, the Strategy Division should propose broad alternatives and obtain the JFACC's direction before proceeding to the next step in the process.
- In general, air COAs may vary are with respect to **ends, ways, means, or risk**:
    - The **ends** that we can vary are the operational objectives or the degree to which they are achieved.
    - The **ways** that we can vary are the phase in which an operational objective is achieved as well as the choice of tactical objectives.
    - The **means** that we can vary are the level of effort of kinetic and non-kinetic resources that we will apply to achieving the objectives and the amount and type of resources brought to the conflict.
    - The **risk** of success/failure, force protection, or time utilized can vary; the JFC and JFACC choices on these risks are reflected in the combination of ends, ways, and means of a given COA.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Strategy Planner, Strategy Guidance
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- An operation is open in COA Sketch.

Triggers:

- The Strategy Planner has completed Mission Analysis and now wishes to begin COA Development
- The Strategy Planner wishes to use the system to aid in capturing COA Development data.

Guarantees:

- A new COA will be populated with operation level defaults if any have been previously defined.
    - Timing Defaults: By default, a new COA will reference the operation defaults for alpha days and phase timing. This may be overridden in the case that a COA varies by a difference in alpha days and phase timing.
- All COA use operation level default values but have the additional attributes or ability to have variant values to the following attributes:
    - A short name or description
    - A long description of the COA
    - Mission Statement
    - A distinction between "JFACC Direction" or "Ends, Ways, Means, and Risk"
    - Indication of whether or not operation default for timing is used (by default, the operation default will be used)
    - C-Day (by default, this is unused)
    - M-Day (by default, this is unused)
    - Other user defined alpha-days (by default, this is unused)
    - Phases (by default, this is unused)
        - Title
        - Duration

        - Start Date
        - By default, the first new phase will begin on D+0 and end 24 hours later. All new phases will by default be added to the end of the phases and will begin directly after the last phase and last 24 hours.
        - Removing a Phase:
            - All following phases will be adjusted to replace the removed phase. If the removed phase lasted 50 days, but began 30 days before the second phase, all phases will be adjusted 30 days.
        - Removing the last phase will not result in any changes
    - Indicators and comments to indicate if a COA is:
        - Suitable: if it accomplishes the mission
        - Feasible: if it may be accomplished with the available resources
        - Acceptable: if it is within given policy and guidance as well as deemed worth the associated risks
        - Complete: if it answers the questions: "Who?", "What?", "Where?", "When?", "Why?" and "How?"

Main Success Scenario:

1. The user chooses to create a new Course of Action
2. The system will display the COA Editor allowing the user to modify COA specific data. All shared and editable fields will be displayed using operation level default values.
3. The user accepts changes.
4. The system will display the new COA in the appropriate views (Synchronization and Sketch Views)

Alternative 1 (User selects an existing COA as a template for the new one):

2. The user will choose to use a template for the COA.
3. The system will display the list of available COAs, as well as the choice to start with a blank one.
4. The user chooses an existing COA as a template for the new COA.
5. The system will display the COA Editor allowing the user to modify COA specific data. The new COA's values will be duplicates of the templated COA's values.
6. The system will automatically apply the existing COAs plan elements, constraints, timing, targets, relationships, force analysis, phasing and sketch views to the new COA. This will create a completely separate COA from the existing COA.

Requirements:

5. COA Sketch shall allow a user to create COAs.

Use Case 3.8: User views/Edits COA Properties

User Story / Context of Use:

- Strategy Planners are responsible to develop COAs that are distinct from one another. One differentiating factor can be phase timing, D-Day, etc… After creating a particular attribute to a COA the need may arise for the team member to make adjustments, changes or report on the values associated with a particular COA.

Scope: User to COA Sketch Interaction

Level: User Goal

Primary Actor: Strategy Planner, Strategy Guidance

Supporting Actors: COA Sketch

Preconditions:

- COA Sketch is open.
- An operation is open that has at least one COA.

Triggers:

- The Strategy Planner has additional information for a particular COA that needs to be represented in the system.

Guarantees:

- The properties of a COA as defined in Use Case 3.7: User creates a new Course of Action (COA)

Main Success Scenario:

1. The user chooses to view or modify the properties of a COA.
2. The system displays the COA property editor.
3. The user inputs the their changes or simply views the data and indicates completion of the operation..
4. The system persists the changes to the COA and closes the editor.

Alternative 1 (User modifies a COA that has been designated as a Plan):

1. Follow steps 1-3 as Main Success Scenario.
2. The system persists the changes.
5. The system sets the values of the Plan to be the default Operation level values. For a listing of the data see use case "User Modifies Operation Details" guarantee section.

Alternative 2 (User modifies a COA's timing to be different than operation default):

1. Follow steps 1-2 in Main Success Scenario.
2. User chooses to enter in alpha days and phases specific only to this COA and not use the operation's default values.
3. The system checks for existing timing elements contained within the COA that uses the operation's default data. If timing elements exist, The system warns the user that this timing information will now reference the new timing information.
    a. If User cancels, no modifications to timing will take place. Return to step 3 of the Main Success Scenario.
    b. If user accepts, continue to step 4.
4. The system persists this choice and creates a new C-Day and M-Day for the COA and displays this data to the user. The Operation will always contain a single D-Day that is reference by all COAs.
        i. C-Day and M-Day will be set to mirror the Operation's default C-Day and D-Day timing
        ii. All existing timing elements will be mapped to use these alpha days instead of the operation default.
        iii. If the Operation has default phases, then the COA will by default also be set up with Phases that mirror the Operation's.
6. The system will display the new timing choices for the user to be able to view/modify
7. Return to step 3 of Main Success Scenario.

Alternative 3 (User modifies a COA's timing from individually defined to use the operation default):

1. Follow steps 1-2 in Main Success Scenario.

2. The user chooses to use the Operation's default alpha days and phases instead of using the COA's defined timing.
3. The system checks for existing timing elements contained within the COA that uses the COA's timing data. If timing elements exist, The system warns the user that this timing information will now reference the operation's default timing.
    a. If User cancels, no modifications to timing will take place. Return to step 3 of the Main Success Scenario.
    b. If user accepts, continue to step 4.
4. The system will update the COA so that it references the operation's default. The system will update all existing timing elements for the COA to be mapped using the alpha days and phases established as the operation default.
5. The system will display to the user that the operation default timing is now being used.
6. Return to step 3 of the Main Success Scenario.

Requirements:

6. COA Sketch shall allow the user to Edit COAs.

Use Case 3.9: User deletes a COA

User Story / Context of Use:

- After initial strategic planning and creation of several COAs, during evaluation of distinguishability of a particular COA from another the Strategy Planner has determined a COA is not feasible, suitable, acceptable, distinguishable or complete enough to warrant continued development and thus no longer needed in the system.
- When creating the initial set of COAs a user unintentionally creates a COA in the system beyond the number they were asked to prepare and they wish to remove said superfluous COA from the system.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Strategy Planner, Strategy Guidance
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- An operation is open that has at least one COA.

Triggers:

- The Strategy Planner determines that a particular COA is no longer needed.

Guarantees:

- The COA is removed from the operation.
- Deleting any COA will not affect the operation's default timing.

Main Success Scenario:

1. The user chooses to delete a COA.
2. The system prompts the user to confirm delete COA.
3. The user confirms the deletion of the COA.

4. The system determines all the COA and related data to remove, including all links to it in the operation. If the COA contained elements that were created in support of other Courses of Action, then it removes the reference to that data, but leaves the element untouched.
5. The system purges all of the data determined for deletion.

Alternative 1 (User cancels delete):

1. The user chooses to delete a COA.
2. The system prompts the user to confirm delete COA.
3. The user cancels the deletion of the COA.
6. The system reverts to its former state.

Alternative 1 (User deletes a COA that contains elements reference by other COAs):

1. Follow steps 1-4 of Main Success Scenario
2. The system determines that a COA element that directly supports the COA marked for deletion is referenced by another COA(s).
3. The system prompts the user to choose to delete the COA or to choose one of the reference COAs as the element's new COA to directly support.
    a. The user chooses to delete the element.
        i. The system adds the element and its children to the data to be purged by the system
        ii. Return to step 5 of the main success scenario.
    b. The user chooses to have the element directly support a different COA
        i. The system modifies the element and any child element that directly supports the COA selected for deletion. These elements will now directly support the COA that the user selected.
        ii. The system will skip this element and its children in the deletion process.
        iii. Return to Step 4 of the main success scenario.

Requirements:

6. COA Sketch shall allow the user to Edit COAs.

Use Case 3.10: User checks the validity of each COA: Suitable, Feasible, Acceptable, Distinguishable and Complete

User Story / Context of Use:

- As a planner is developing a COA they should be evaluating each as being suitable, feasible, acceptable, distinguishable and complete.
- After a COA has been completed and is being evaluated and presented it would be useful to point to the evaluation criteria and comments associated with each evaluation point.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Strategy Planner, Strategy Guidance
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- An operation is open that has at least one COA.

Triggers:

- The Strategy Planner has progressed into development to the point of checking the COA for suitability, feasibility, acceptability, distinctness and completeness.

Guarantees:

- To evaluate the validity of each COA there are five criteria for a COA to be considered "valid". JP 3-30 (p. III-11) says, "Planners determine the validity of each COA based on suitability, feasibility, acceptability, distinguishability, and completeness."
- The evaluation view will provide for inputs on the below listed points, and comments associate with the field for who, what, when, where, why, and how.
- A COA is:
  - suitable if it accomplishes the mission;
  - feasible if it may be accomplished with resources available;
  - acceptable if it is within given policy and guidance and worth the risks;
  - distinguishable if it is significantly different from other COAs; and
  - complete if it answers the questions: who, what, where, when, why, and how.

Main Success Scenario:

1. The user chooses to evaluate a COA.
2. The system displays the evaluation view.
3. The user inputs the evaluation of the COA and accepts changes.
4. The system persists the changes to the evaluation and closes the view.

Requirements:

.

7. COA Sketch shall provide user with a way to validate COAs based on Suitable, Feasible, Acceptable, Distinguishable, and Complete.

Use Case 3.11: Designate COA as Plan

User Story / Context of Use:

- After the preliminary COA development and an evaluation of the COAs the Strategy Planners will decide on a particular COA that will be the Plan for the operation, and thus further fleshed out.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Strategy Planner
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- A operation is open with at least one COA.

Triggers: User wishes to mark a particular COA as a Plan for the operation.
Guarantees:

- Updates operation wide default data to reflect all values of the designated COA. Through this designation all values that are shared between COAs and Operation level defaults will be set to have the same value of the designated plan. All other COAs will retain all the values they

currently have even if they were populated by operation defaults, as if they had overridden the operation defaults when created.

Main Success Scenario:

- User decides to designate a COA as a Plan for the operation.
- System marks COA as Plan.
- All operation data specific to the COA is considered default data to the operation. For listing of such data, see use case "User Modifies Operation Details" guarantee section.

Requirements:

6. COA Sketch shall allow the user to Edit COAs.

Use Case 3.12: Revert Plan to COA

User Story / Context of Use:

- After the preliminary designating a particular COA as a plan, it might be necessary after seeing further development, to wish to specify that this particular approach is no longer feasible/desirable for whatever reason. The user would like to make the previously marked plan as a regular COA.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Strategy Planner
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- A operation is open that has at least one COA.

Triggers: User wishes to mark a particular COA as a Plan for the operation.
Guarantees:

- Operation default values are left as they last were indicated. Most likely the values that were inherited on the last modification of the former plan or the values the COA held when it was marked as a Plan.

Main Success Scenario:

- User decides to revert a plan to COA status.
- System marks Plan as a COA.
- All operation data specific to the COA is considered default data to the operation. All operation data specific to the COA is left as it were and is treated as it would in being a COA. For listing of such data, see use case "User Modifies Operation Details" guarantee section.

Requirements:

6. COA Sketch shall allow the user to Edit COAs.

Use Case 3.20: User specifies that COA Timing will be used as Operation Default

User Story / Context of Use:

- The user has created a new Course of Action or Plan and has set Alpha Days and Phasing information that was specific to the COA/Plan only. However, the user has determined that it would be beneficial to have all Courses of Action at all levels of war to also use the same Alpha Days and Phasing as this COA/Plan by default. The user may wish to replace the timing for the whole operation, or just use the Course of Action's timing directly. By replacing the timing of the operation, it will allow the user to still maintain the Course of Action's ability to manipulate timing without it being reflected throughout the system. If the user determines to use the COA's timing directly, then the user anticipates that the COA's timing changes should also be reflected throughout the system as well.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Strategy Planner
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- At least one COA has been created. The COA is not using the operation's default timing elements.

Triggers:

- A Strategy Planner wishes that all default timing for new and existing COAs are now based upon the same timing as an existing COA.

Guarantees:

- The Alpha days for the operation default will be the same as the selected COAs.
- The selected COA will now be displayed as using the operation default.
- All COAs, Mission Analysis timing, and Plan Player comments will be updated to reflect the change in Alpha Days.

Main Success Scenario:

1. User views Operation Timing Properties.
2. User chooses to change the Operation's timing properties to be the same as a COA that has its own defined timing.
3. The system warns the user that all existing Mission Analysis, Player Comments, and COA Planning Elements will be affected by the change.
    - If User cancels, no modifications to timing will take place. Return to step 3 of the Main Success Scenario.
    - If user accepts, continue to step 4.
4. The system updates the Operation's default timing to reflect the same timing on the selected COA.
5. The system updates the COA to indicate that it is now using the operation's default.
7. The system updates displays to adjust timing elements and the display of Phase information that are using the operation's defaults.

Alternative 1 (User chooses to directly use COA Timing over Operation's timing):

1. User views Operation Timing Properties.
2. User chooses to change the Operation's timing properties so that it references a Course of Action's specified timing
3. The system displays the COAs that have specified timing to the user.
    a. The user chooses a COA.

b. The system warns the user that all existing Mission Analysis, Player Comments, and COA Planning Elements will be affected by the change.
    i. If User cancels, no modifications to timing will take place.
    ii. If user accepts, continue to step 4.
4. The system updates the display to indicate that the chosen COA's timing is used as default for the operation.

The system updates the timing in the displays in reaction to the timing and phase updates.

Use Case 3.22: User specifies a specific date for D-Day of a Course of Action

User Story / Context of Use:

- Sometime during the planning process, the Alpha Dates actual dates may be determined. In this case, the user will need to be able to apply actual dates so that they may analyze how the plan will work within the actual dates that have been given.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Strategy Planner
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- At least one COA has been created. The COA is not using the operation's default timing elements.
- If changing Operation's Default timing for D-Day, then Operation must be utilizing its own default timing and not referencing another COA's timing.

Triggers:

- A Strategy Planner needs to set D-Day to a specific date.

Guarantees:

- All dates that are relative to the COA's D-day (all dates within the COA) will be displayed relative to the new D-Day's position
- Views displaying date information may now be configured to display actual date information.
- All Courses of Action not using an actual date will have D-Day be displayed as the current date.

Main Success Scenario:

1. User views COA Timing Properties.
2. System displays COA Timing properties to user.
3. User chooses to edit the D-Day properties
4. The system displays D-Day properties to user.
5. The user indicates the actual date (Month, Day, and year) for D-Day.
6. The system stores the values and updates displays that display timing information to reflect. If a specified date has not been set on the Operation's default or any other COA using specified timing, then the default position that these dates will be displayed at will include D-Day being the current date. Note: This date is not stored, so the next time the user opens the system, the unspecified D-Day will always be displayed on the current date

Alternative 1 (User chooses to dismiss the use of specifying an actual date for D-Day and leave it as unspecified):

1. Follow steps 1-4 of the main success scenario.
2. The user indicates to no longer use an actual date for D-Day.
3. The system determines if the Operation Default or any other COA is using an actual date for D-Day.
    a. If not, the system will update views so that the actual date information is hidden. The system will align all D-Days throughout the system to be on the same day and update the view of the plan data to reflect this.
    b. If so, then the system will align the D-Day for the selected COA to be on the current date. Note: This date is not stored, so the next time the user opens the system, the unspecified D-Day will always be displayed on the current date.

Alternative 2 (User chooses to set an actual date for the Operation's Default D-Day):

1. User views Operation Default Timing Properties.
2. System displays Operation Default Timing properties to user.
3. See steps 3- 5 of main success scenario.
4. The system stores the values and updates displays that display timing information to reflect, including all Plan Player comments, Mission Analysis timing, and any COA timing that is using the default dates. If a specified date has not been set on any other COA using specified timing, then the default position that these dates will be displayed at will include D-Day being the current date. Note: This date is not stored, so the next time the user opens the system, the unspecified D-Day will always be displayed on the current date

Alternative 4 (User chooses to unset use of an actual date for the Operation's Default D-Day):

1. User views Operation Default Timing Properties.
2. System displays Operation Default Timing properties to user.
3. See steps 3- 4 of main success scenario.
4. The user indicates to no longer use an actual date for D-Day.
5. The system determines any other COA is using an actual date for D-Day.
    a. If not, the system will update views so that the actual date information is hidden. The system will align all D-Days throughout the system to be on the same day and update the view of the plan data to reflect this.
    b. If so, then the system will align the D-Day for the selected COA to be on the current date. Note: This date is not stored, so the next time the user opens the system, the unspecified D-Day will always be displayed on the current date.

Use Case 3.23: User designates an Alpha Hour for an Alpha Day

User Story / Context of Use:

- The user may wish to designate what time l-hour is for C-Day, or other designated Alpha Days.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Strategy Planner
Supporting Actors: COA Sketch

Preconditions:

- COA Sketch is open and an Operation is open.
- In the case of designating for a COA using specific timing, then there must be a COA that is using specific timing instead of the Operation's default.

Triggers:

- A Strategy Planner needs to set at what hour the alpha day should begin and designate a lowercase character for it.

Guarantees:

- All dates that are relative to the Alpha Day and displayed in any current views will be updated to reflect the change or designation of an alpha hour.

Main Success Scenario:

1. User views COA or Operation Timing Properties.
2. System displays COA or Operation Timing properties to user.
3. The user chooses to view the specific properties of an Alpha Day.
4. The system displays those properties.
5. The user chooses to assign an alpha hour to the Alpha Day.
6. The system provides the user the ability in select or input a lowercase character to designate the alpha day. If the Alpha day has a default designation, this is chosen for the user as a suggestion.
7. The user chooses the character to assign to the alpha hour.
8. The system checks the timing scheme to see if the alpha hour's time has already been designated for the Operation Default or the COA's specified timing, depending upon which timing scheme the user is editing. If it has, then it will display the designated time. Otherwise, it will display a designated default time.
9. The user may edit the timing of the alpha hour (hour, minute, second, millisecond).
10. The system will update the views to project the change in offsets of the values referencing the Alpha Day. If an alpha hour had not been set yet, then the system would have used a designated time as default (this is a System-level capability that is not displayed to the user). This time is replaced by the new alpha hour timing. If the alpha hour was designated to be used by another alpha day, then modifications to the alpha hour will also cause the system to update the views to project the change in offsets of the values referencing the other affected alpha days as well.

COA Sketch Object Use Cases

Use Case 3.13: Create Strategy Object or Generic Object

User Story / Context of Use:

- After creating a new COA, or gathering more intelligence associated with a developing COA, a Strategy Planner will need to have this information reflected as an action, intelligence or indicator. This can be the initially provided data on the situation or additional information from a TET Liaison, MAAP Liaison or other another team member. The user will need to be able to add this information into the COA.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Strategy Planner, TET Liaison

Supporting Actors: COA Sketch

Preconditions:

5. COA Sketch is open.
6. A operation is open with at least one COA.
7. A view in which COA Sketch elements are selectable is open.
8. The plan has at least one COA Sketch element.
9. If modifying causal links, a COA or plan has at least two plan elements where one plan element is a linked to the other.

Triggers:

10. A Strategy Planner needs to enter an action, Operational Objective, Tactical Objective, Tactical Task, etc… for a COA

Guarantees:

- Changes to the strategy object will be persisted. The following are the types of Strategy Objects in the system:
  - National Objectives
  - National Task
  - National Activity
  - Strategic Objectives
  - Strategic Tasks
  - Strategic Activity
  - Operational Objectives
  - Operational Tasks
  - Operational Activity
  - Tactical Objective
  - Tactical Tasks
  - Tactical Activity
- Every Strategic Object, Generic Object or Assessment, referred to as a COA Sketch Object, has the following attributes that can be modified by the user:
  - Short name
  - Description
  - Affiliation
    - Friendly/Neutral/Adversarial
  - Visual Characteristics
    - Border Thickness
    - Color
    - Transparency
  - Timing information (by default, this data is not filled out)
    - Start
    - Stop
    - Start no earlier than
    - Stop no later than
  - Map data
  - Dependencies
    - Only viewed and removed in property editor

- Causal links for Strategy Objects related to one another, Connections of an Assessment Object to a Strategy Object, and Connections of Generic Objects to other Generic Objects or Strategy Objects.
- Logging information
  - Creation Date
  - Creator (like username of the creator)
  - Modification Date*
  - Modifier*

    * For each modification

- Strategy Objects have all previous information except affiliation as well as:
  - ID Field
  - Priority
  - Targeting Information
  - Links to Parents/Child(ren)
    - These are causal links that have a label/explanation
  - Benefit
    - Name
    - Description
    - Value
      - High/Medium/Low
  - Comment(s)
  - Weight of effort
    - High/Medium/Low
      - *Definition of what classifies as such to be determined in SAAP uses cases.*
- Changes to Strategy Objects will be reflected in all applicable views. These changes include but are not limited to timing constraints, hierarchal relationships (parent/child) will be modified properly, alterations to other elements because of constraints (timing, etc…), targeting allocation in the allocation view, etc…
- Time sensitive attr ibutes, or attr ibutes th at ch ange over th e course of a Stra tegy Object, will be recorded and reflected in the views in which such changes are represented. As well, the history of such attributes will be stored and viewable. E.g. For the Operational O bjective "M aintain Air Superiority" for phase one becom es "Gain and Maintain Air Superiority" in phase 2, both names are clearly distinguishable for the time frames in which they are in effect.
- Changes to Strategy Objects will adjust related objects based on known and implied constraints, such as targets moving out of range, and impacts to all applicable views because of such adjustments will be updated.
- *Tagging data objects that are displayed upon the map will allow the team member to easily hide/show the information based upon a user defined tag.*
- *Allowing the user to create a hierarchy of tagging elements will better allow them to organize and categorize data in multiple useful ways. This will allow for easier access to associated data based upon the way the user and team works.*

Main Success Scenario:

1. The user chooses to create a Strategy Object or generic object.

2. The system prompts the user for information pertaining to the element or object being created (see guarantees for required data).
3. The user accepts the changes.
4. The system persists the data and updates all relevant views.

Alternative 2 (User creates an element using another as a template):

2. The user indicates to use another element as a template.
3. The system prompts the user for information pertaining to the element or object being created, pre-populating the fields with the data from the template element/object.
4. Follow steps 3-4 of the Main Success Scenario.

Alternative 3 (User cancels add new Strategy Object or Generic Object):

4. The user decides to cancel the creation of the element or object.
5. The system reverts to its state prior to invoking the creation.

Requirements:

8. c

Use Case 3.14: View/Modify Strategy Object's or Generic Object's Properties

User Story / Context of Use:

11. As a plan becomes more refined, it is important that the team member keeps track of these refinements and has the ability to make changes over time. As well input from a TET Liaison, team member or MAAP Liaison might need to be reflected. These changes will be important to the situational awareness of the team and also important to the overall completeness of the COA/JAOP/AOD that is currently being planned or re-planned. COA Sketch will also be able to aid the Strategy Planner in re-allocation issues due to changes made to targets or timing information in the element properties induced by these changes made to a Strategy Object.

Scope: User to COA Sketch Interaction

Level: User Goal

Primary Actor: Strategy Planner, TET Liaison

Supporting Actors: COA Sketch

Preconditions:

12. COA Sketch is open.
13. An operation is open that has at least one COA.
14. A view in which COA Sketch elements are selectable is open.
15. The plan has at least one COA Sketch element.
16. If modifying causal links, a COA or plan has at least two plan elements where one plan element is a linked to the other.
17. The target type or category must exist within the systems providing target data.
18. To view target data associated with a plan element, a COA needs to be open with at least one plan element that has targets associated with it.
19. To view targeting data, COA Sketch has a connection to the Targeting database

Triggers:

20. User needs to view or modify properties of a Strategy or Generic Object.

Guarantees:

- Changes to the Strategy or Generic Object will be persisted.

- The types of strategy objects are as defined in use case 7.9: Create Strategy Object or Generic Object
- Every Strategy or Generic Object has the attributes as defined in use case 7.9: Create Strategy Object or Generic Object.
- Changes to Strategy Objects will be reflected in all applicable views. These changes include but are not limited to timing constraints, relationships (parent/child) will be modified properly, alterations to other elements because of dependencies (timing, etc…), targeting allocation in the allocation view, etc…
- Time sensitive attr ibutes, or attr ibutes th at ch ange over th e course of a Stra tegy Object, will be recorded and reflected in the views in which such changes are represented. As well, the history of such attributes will be stored and viewable. E.g. For the Operational O bjective "M aintain Air Superiority" for phase one becom es "Gain and Maintain Air Superiority" in phase 2, both names are clearly distinguishable for the time frames in which they are in effect.
- Changes to Strategy Objects will adjust related objects based on known and implied constraints, such as targets moving out of range, and impacts to all applicable views because of such adjustments will be updated.
- *Tagging data objects that are displayed upon the map will allow the team member to easily hide/show the information based upon a user defined tag.*
- *Allowing the user to create a hierarchy of tagging elements will better allow them to organize and categorize data in multiple useful ways. This will allow for easier access to associated data based upon the way the user and team works.*

Main Success Scenario:

1. The user chooses to modify a Strategy Object or generic object.
2. The system enables the editing options for the selected element or object.
3. The user performs edits on or views the properties of the object.
4. The user indicates they are finished making changes.
5. The system persists the changes.

Requirements:

2. COA Sketch shall allow the user to edit and save the current planning process information.

Use Case 3.15: Convert COA Sketch Object to a different type of COA Sketch Object.

User Story / Context of Use:

- Throughout the COA Analysis process, the user may determine that an Operational Objective is actually a Tactical Objective or vice versa. The Strategy Planner may have used Generic Objects to represent generic actions and is now ready to further refine the plan to determine the type of plan object that it should represent.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Strategy Planner
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- A operation is open that has at least one COA.
- A COA Sketch Object exists.

Triggers: Strategy Planner wishes to refine plan element type.

Guarantees:

- User-defined Sketch Object will take on characteristics of chosen object type. For example, if a user converts a Generic Object to a Strategy Object, the object will now have all the fields associated with Strategy Objects. As well, if a Strategy Object is changed to a Generic Object all fields not shared between the two types will be lost.
- Relationships to other plan elements will be handled cautiously.

Main Success Scenario:

- The user chooses to convert an object to a different type by selecting the object and activating the object editor.
- The system will display the object editor with data from the current object.
- The user can change the object's properties in the object editor.
- The user indicates to save the changes.
- The system will store the changes and update all affected views, as well as informing other users of the change.

Requirements:

8. COA Sketch shall provide users a way to create/modify data associated with a COA or Plan.

Use Case 3.16: Create Assessment Object

User Story / Context of Use:

- The Operational Assessment Team requires Measures and Indicators in order to assess the performance and achievement of effects. To be able to capture and represent this, the user wishes to associate a measure or indicator with a particular Strategy Object.

Scope: User to COA Sketch Interaction

Level: User Goal

Primary Actor: Strategy Planner

Supporting Actors: COA Sketch

Preconditions:

- COA Sketch is open.
- An operation is open that has at least one COA.
- A Strategy Object exists.

Triggers: User wishes to add a new measure or indicator associated with a Strategy Object.

Guarantees:

- Assessment objects can be of the following types:
  - Measure of Effectiveness (MoE)
  - Measure of Performance (MoP)
  - Indicator
- Assessment objects represent the following data:
  - Related Strategy Object
  - Related Effect(s)

- Explanation/comment for the relationship/link to the related effects.
- A status/assessment field to indicate the level of achieve measure.

- A particular assessment object will only relate to one Strategy Object, but could be associated with several desired effects of that Strategy Object.

Main Success Scenario:

- User elects to associate an assessment object to a particular Strategy Object.
- The system prompts the user for data relating to the assessment object, including which effects of the Strategy Object it should relate to.
- The user enters relevant data and confirms the changes.
- The system persists the changes.

Requirements:

8.COA Sketch shall provide users a way to create/modify data associated with a COA or Plan.

Use Case 3.17: View/Modify Assessment Object properties

User Story / Context of Use:

- As plan execution, war gaming or other evaluation it becomes necessary to evaluate the performance of particular strategic elements on the associated effects that element would have. To be able to capture and represent this, the user wishes to make changes to a measure or indicator associated with a particular Strategy Object.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Strategy Planner
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- An operation is open that has at least one COA.
- A Strategy Object exists.
- An assessment object is associated with a Strategy Object.

Triggers: User wishes to modify data relating to an assessment object associated with a Strategy Object.

Guarantees:

- All guarantees from use case Create Assessment Object hold.

Main Success Scenario:

- User elects to view/modify an assessment object to a particular Strategy Object.
- The system displays the assessment object editor.
- The user views/modifies the changes and confirms completion of the operation.
- The system persists the changes.

Requirements:

8.COA Sketch shall provide users a way to create/modify data associated with a COA or Plan.

.

Use Case 3.18: Delete Assessment Object

User Story / Context of Use:

- After an assessment object has been associated with a Strategy Object, the users might deem that the assessment is unable to be ascertained, or is duplicated in another assessment object, or completely unnecessary.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Strategy Planner
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- A operation is open that has at least one COA.
- A Strategy Object exists.
- An assessment object is associated with a Strategy Object.

Triggers: And assessment object has been determined to be unneeded and thus the user wishes to delete the assessment object.
Guarantees:

- All guarantees from use case Create Assessment Object hold.

Main Success Scenario:

- User elects to delete an assessment object from a particular Strategy Object.
- The system prompts the user to confirm the deletion.
- The user confirms delete.
- The system persists the changes, removing the assessment object from the Strategy Object.

Alternative 1 (User cancels deletion):

3. The user elects to cancel the deletion of the assessment object.
4. The system reverts to its previous state, with the assessment object still associated with the Strategy Object.

Requirements:
8.COA Sketch shall provide users a way to create/modify data associated with a COA or Plan.

Use Case 3.19: Add COA Sketch Object Timing

User Story / Context of Use:

- All COA Sketch Objects (Mission Analysis data, Strategy Planning items, Assessment items) may have an element of timing. The user may wish to add these attributes into the tool so that they may use the visualizations to further analyze the Plan.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Strategy Planner, all Planners
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- An operation is open.
- A Mission Analysis, Strategy Object, or Assessment Object exists.

Triggers:

- A planner wishes to add a timing element to an existing Mission Analysis object, Strategy Object, or Assessment Object.

Guarantees:

- The timing information will be viewable in both textual and visual forms
- The user will be able to edit the following timing information:
    1. Start and Stop time
    2. Start after and Stop by time
- All timing information will be relative to an Alpha Day.

1. By default, the timing of a Mission Analysis object will be relative to the Operation's Default timing (D-Day). If Use Case 3.24 is implemented, then the timing will be relative to the designated Alpha Day.
2. By default, the timing of Strategy and Mission Analysis objects will be relative to the COA's default timing (D-Day), which may be defined or be using the Operation's default timing. If Use Case 3.24 is implemented, then the timing will be relative to the designated Alpha Day.
3. By default, the Start After and Stop By time will not be used.
4. By default, the Start date depends on whether or not a hierarchy is in place. If the COA Sketch Object is created in a hierarchy in which a parent or grandparent element has timing, the start date will be the same as the most immediate parent with timing. Otherwise, the start date will be the same as D-Day, or if Use Case 3.23 is implemented, then the timing will be relative to the designated Alpha Day.
5. By default, the Stop date depends on whether or not a hierarchy is in place. If the COA Sketch Object is created in a hierarchy in which a parent or grandparent element has timing, the stop date will be the same as the most immediate parent with timing. Otherwise, the stop date will be the 24 hours after the Start date.
6. Note: If the child object has multiple immediate parents with timing elements, the child will inherit the start date that occurs last. If the start date that occurs last is also after the stop date of any other parent, then the system will warn the user of the situation and the start date will be the same as D-Day and the Stop date will be 24 hours after the start date.

Main Success Scenario:

1. The user selects a COA Sketch Object.
2. The user chooses to add a timing element to the selected object.
3. The system determines what timing to use by default. The system creates a timing element referencing the D-Day alpha day and setting up the default information on it.
4. The system updates displays to depict the new timing element.

Alternative 1 (COA Sketch Object has multiple parents from multiple COAs, one of which is not using the default operation timing):

1. Perform steps 1-2 of the Main Success Scenario
2. The system determines that the COA Sketch Object is a child to two parents who both have timing.
3. The system determines that the parent's timing are referencing different Alpha Days
4. The system requires the user to determine which Alpha days to reference (i.e. the operation's defaults or the timing from COA X)
5. The user indicates the proper Alpha Days to use.

6. The system uses the indicated Alpha days to reference when setting up the default timing information by converting the Alpha Day difference.
    a. Determining Alpha day conversion between different COAs:
        i. D-Day is always the default day. Find the duration offset of the timing to be converted from D-Day. (i.e. if date is M+10, and M = D+30, then duration offset is +40.
        ii. Apply this duration offset as the new offset from the chosen timing's D-Day.
7. Return to step 4 of Main Success Scenario.

Plan Player Use Cases

Use Case 12.1: User chooses Map Sketch View player features

User Story / Context of Use:

- The Team Member or Reviewer may find it helpful to be able to "play" through the plan. This would allow them to view the plan as it goes through the Synchronization (Gantt chart) View and the Map Sketch View as the timing of different objects come into and out of focus.
- The Team Member or Reviewer will have several player features available to them for better enhancing the play mode:
  - View the Sketch Objects in a "Build" or "Compound" mode, which will continuously add, based on the chronological sequence, the plan element icons or shapes to the map. Once a plan element appears, it will always be present.
  - View the Sketch Objects in a "Parent Compound" mode, which is similar to "compound" mode, but in addition will hide children elements once all siblings have been achieved. If the parent element does not have an object representation on the Map Sketch View, the children will disappear.
  - View the Sketch Objects in a "Focus" mode, which will display the element only when the player focus overlaps the planned/executed time range of the object. In other words, when an object is out of the focus time range, it will be removed from the display.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member or Reviewer
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch Plan Player is visible.
- Play control is at pause.

Triggers: The Team Member or Reviewer wishes to modify the way player features function.
Guarantees:

- The player features selected will change the way the views interact while playing the plan.

Main Success Scenario:

1. The user chooses to view the Sketch in "focus" mode.
2. The system updates the Map Sketch View if necessary to only show elements in the current time focus.
3. The user plays the plan. (see Use Case 12.4)
4. The system updates the Map Sketch View as time plays on so that only elements in the current time focus are displayed

Alternative 1: Compound Mode

1. The user chooses to view the Sketch in "compound" mode.
2. The system updates the Map Sketch View if necessary to show elements in the past and current time focus.
3. The user plays the plan. (see Use Case 12.4)

4. The system updates the Map Sketch View as time plays on so that elements in the current time focus are displayed in addition to the ones in the past.

Alternative 2: Parent Compound Mode

1. The user chooses to view the Sketch in "de-clutter" mode.
2. The system updates the Map Sketch View if necessary to hide children elements once all siblings have been achieved in the past and current time focus.
3. The user plays the plan. (see Use Case 12.4)
4. They system updates the Map Sketch View, as time progresses, hide children elements once all siblings have been achieved in the past and current time focus.

Requirements:

1. COA Sketch shall display plan changes over time.
2. COA Sketch shall display geographical changes in the plan over time.
3. COA Sketch shall display sequence changes in the plan over time.
4. COA Sketch shall have several display features available to the user for better enhancing the display of the plan.

Use Case 12.2: User chooses Play Timing - Speed

User Story / Context of Use:

- The Team Member or Reviewer may find it helpful to be able to "play" through the plan. This would allow them to view the plan as it goes through the Synchronization (Gantt chart) View and the Map Sketch View as the timing of different objects come into and out of focus.
- The Team Member or Reviewer may wish to change the speed in which Player Mode performs. For every second real time, the player will advance the given time. This will allow Plan Player to be more useable to different audiences in the time frames available to them.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member, Reviewer
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch Plan Player is visible.
- Play control is at pause.

Triggers: The Team Member or Reviewer wishes to modify the speed of the presentation.
Guarantees:

- The temporal features selected will change the speed of the playback.
- Player will have a default speed of 2 hrs. Each second the user will see the next 2 hours (single hours would be skipped) of the plan.

Main Success Scenario:

1. The user chooses to change the speed of the playback.
2. The system displays the currently set speed.
3. The user modifies the playback step size to a number of weeks, days, or hours and indicates completion.
4. The system sets the new playback speed.

Alternative 1: Cancel Setting Play Speed

1. The user chooses to change the speed of the playback.
2. The system displays the currently set speed.
3. The user changes the speed
4. The user cancels changing the speed.
5. The system remains at the original speed in step 2.

Requirements:

1. COA Sketch shall display plan changes over time.
2. COA Sketch shall display geographical changes in the plan over time.
3. COA Sketch shall display sequence changes in the plan over time.
5. COA Sketch shall provide ability to display changes in the plan over time at multiple speeds.

Use Case 12.3: User chooses Play Timing – Focus Time Range

User Story / Context of Use:

- The Team Member or Reviewer may find it helpful to be able to "play" through the plan. This would allow them to view the plan as it goes through the Synchronization (Gantt chart) View and the Map Sketch View as the timing of different objects come into and out of focus.
- The Team Member or Reviewer may wish to change the time range of the focus.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member, Reviewer
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch Plan Player is visible.
- Play control is at pause.

Triggers: The Team Member or Reviewer wishes to modify the focus time range of Player Mode.
Guarantees:

- The temporal features selected will change the focus time range of the views during playback.
- The Player will have a default focus time range of 0 hours

Main Success Scenario:

1. The user chooses to change the time range of the current time focus.
2. The system displays the currently set time range.
3. The user modifies the time range size to a number of days or default.
4. The system sets the time range.

Alternative 1: Cancel Setting Time Range

1. The user chooses to change the time range of the current time focus.
2. The system displays the currently set time range.
3. The user changes the focus time range
4. The user cancels changing the time range.
5. The system remains at the original time range in step 2.

Requirements:

1. COA Sketch shall display plan changes over time.

2. COA Sketch shall display geographical changes in the plan over time.
3. COA Sketch shall display sequence changes in the plan over time.
6. COA Sketch shall be able to adjust the time range displayed geographically and sequentially over time.

Use Case 12.4: User Plays Plan

User Story / Context of Use:

- The Team Member or Reviewer may find it helpful to be able to "play" through the plan. This would allow them to view the plan as it goes through the Synchronization (Gantt chart) View and the Map Sketch View as the timing of different objects come into and out of focus.
- The focus time range is represented on the Synchronization View and is especially important when viewing the plan within a small time frame. While the plan is playing, it is the indicator that shows the user which time period of the plan is currently displayed.
- The user may also wish to pause the playback. This would allow the users the opportunity to discuss what is going on in the plan at the paused time.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: All Users
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch Plan Player is visible.
- Play control is at pause.

Triggers: The Team Member or Reviewer wishes to play the plan or COA.
Guarantees:

- COA Sketch will begin playing the plan based on the timing the user had selected.
- Pausing the playback of the plan will allow the user to easily begin playing at the point of pausing.
- The plan will not be editable while it is playing.
- The plan will be editable when it is paused.
- The user will not have access to hiding/showing objects in different views of COA Sketch while a plan is playing.
- The user will have access to hiding/showing objects in different views of COA Sketch while a plan is paused.

Main Success Scenario:

1. The user selects to play the plan.
2. The system plays the plan by:
   i. Displaying the current focus time range on the Player;
   ii. Starting play at the current focus time;
   iii. Moving forward at the set speed;
   iv. Updating the Map Sketch View as indicated in the presentation mode; (see Use Case 12.1)
   v. Updating the focus time indication on the Synchronization View.
3. The system does not allow the plan to be edited while playing and stops the play automatically at the end of the plan.

Alternative 1: Pause Play during Playback

1. The user selects to play the plan in Player Mode.
2. The system plays the plan as above.
3. The user selects to pause the plan.
4. The system halts playing the plan and leaves the current focus time range at the point where the pause occurred.
5. The system allows the plan to be edited

Requirements:

1. COA Sketch shall display plan changes over time.
2. COA Sketch shall display geographical changes in the plan over time.
3. COA Sketch shall display sequence changes in the plan over time.
7. COA Sketch shall provide a way to display the focus time while displaying plan changes over time.
8. COA Sketch shall be able to pause displaying plan changes over time.
9. COA Sketch shall allow the user to edit the plan while displaying plan changes over time
10. COA Sketch shall allow the user to change display of the plan while displaying plan changes over time.

Use Case 12.5: User Advances and Reviews the Plan

User Story / Context of Use:

- The Team Member or Reviewer may find it helpful to be able to "play" through the plan. This would allow them to view the plan as it goes through the Synchronization (Gantt chart) View and the Map Sketch View as the timing of different objects come into and out of focus.
- The Team Member or Reviewer may find it helpful to move forwards and backwards to more pertinent pieces and parts of the plan. This would allow them a more focused discussion of the plan over time.
- The Team Member of Review may find it helpful to move forwards or backwards to a particular date by selecting a phase, D+n, or a hard date.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: All Users
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch Plan Player is visible.
- The plan is currently playing.

Triggers: The Team Member or Reviewer wishes to advance or review the play through of the plan or COA.
Guarantees:

- COA Sketch will begin playing the plan based on the timing the user had selected.
- Reviewing the plan w ill allow th e user to step back through already played information and replay it quickly.
- Advancing the plan will allow the user to step ahead to skip past parts of the plan and begin playing the plan at a later time.

Main Success Scenario:

1. The user selects to advance or review the plan.
2. The system updates the Map Sketch View and the Synchronization View to the desired time in focus.
3. The user quits stepping back or forward in the plan.
4. The system continues playing the plan from the desired time in focus.

Alternative 1: Advance / Review Paused Plan

1. The user pauses the plan from playing. (see Use Case 12.4 Alternatives)
2. The system pauses playing the plan.
3. The user selects to advance or review the plan.
4. The system updates the Map Sketch View and the Synchronization View to the desired time in focus.
5. The user quits stepping back or forward in the plan.
6. The system remains paused at the desired time in focus.

Alternative 2: Move quickly to the beginning or end of a plan

1. The user selects to move to the beginning or end of the plan.
2. The system updates the Map Sketch View and the Synchronization View to the desired time in focus.

Alternative 3: Advance / Review by Selecting Date

1. The user pauses the plan from playing. (see Use Case 12.4 Alternatives)
2. The system pauses playing the plan.
3. The user selects to advance or review the plan to a specific date by selecting the phase; D+ a number; or a day, month, and year.
4. The system updates the Map Sketch View and the Synchronization View to the desired time in focus.
5. The system remains paused at the desired time in focus.

Requirements:

1. COA Sketch shall display plan changes over time.
2. COA Sketch shall display geographical changes in the plan over time.
3. COA Sketch shall display sequence changes in the plan over time.

11. COA Sketch shall allow the user to focus the timing in which the plan is being displayed overtime.

Use Case 12.6: User Adds a Comment

User Story / Context of Use:

- The Team Member or Reviewer may find it helpful to be able to "play" through the plan. This would allow them to view the plan as it goes through the Synchronization (Gantt chart) View and the Map Sketch View as the timing of different objects come into and out of focus.
- During play, the Team Member or Reviewer may wish to make a comment at a specific time during the plan. These comments could work as a reminder to the Team Member to modify something about the plan or the view of the plan. This will allow the Team Member or Reviewer to add input to the plan without having to exit out of play mode to immediately make the modifications.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member, Reviewer

Supporting Actors: COA Sketch

Preconditions:

- Plan Player View is open
- Play control is paused.

Triggers: The Team Member or Reviewer wishes to add a comment at a specific time in the plan.

Guarantees:

- The comment added will be associated to the time in which the time focus is currently set.
- If the focus time is set to a range, the note will be added at the beginning of the time range.
- More than one comment can be associated to the same time.

Main Success Scenario:

1. The user indicates they wish to add a note.
2. The system prompts user for the text of the comment.
3. The user enters comments and indicates they are finished.
4. The system associates the comment with the current time in focus and indicates to the user that a note is present.

Alternative 1: Cancel Adding Comment

1. The user indicates they wish to add a note.
2. The system prompts user for the text of the comment.
3. The user cancels the comment
4. The system returns to its previous state with no new note.

Alternative 2: Adding Comment without pausing

1. The user indicates they wish to add a note.
2. The system prompts user for the text of the comment while continuing to play the plan.
3. The user enters the comment and indicates they are finished.
4. The system associates the comment with the time in focus at initiation of the note and indicates to the user that a note is present.

Requirements:

1. COA Sketch shall display plan changes over time.
2. COA Sketch shall display geographical changes in the plan over time.
3. COA Sketch shall display sequence changes in the plan over time.

12. COA Sketch shall allow a user to add comments to the plan.
13. COA Sketch shall allow the user to associate comments to timing within the plan.

Use Case 12.7: User Removes a Comment

User Story / Context of Use:

- The Team Member or Reviewer may find it helpful to be able to "play" through the plan. This would allow them to view the plan as it goes through the Synchronization (Gantt chart) View and the Map Sketch View as the timing of different objects come into and out of focus.
- It also allows the Team Member or Reviewer the opportunity to provide input or insight by adding comments to the plan over time.
- These comments can then be looked back on later in order to be used as a reminder or as something requiring further clarification and modifications to the plan.

- Once a comment is no longer useful to the team, it may be removed from the system.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member, Reviewer
Supporting Actors: COA Sketch
Preconditions:

- Plan Player View is open.
- There is at least one comment.

Triggers: The Team Member or Reviewer would like to remove an existing comment.
Guarantees:

- The comment will no longer be available to the Team Member or Reviewer.

Main Success Scenario:

1. The user indicates they wish to delete a comment.
2. The system asks for confirmation in deletion.
3. The user confirms delete.
4. The system removes the comment.

Alternative 1: Cancel Deletion

1. The user indicates they wish to delete a specific comment.
2. The system asks for confirmation in deletion.
3. The user cancels the delete action.
4. The system does not remove the comment and returns to previous state.

Requirements:

1. COA Sketch shall display plan changes over time.
2. COA Sketch shall display geographical changes in the plan over time.
3. COA Sketch shall display sequence changes in the plan over time.

12. COA Sketch shall allow a user to add comments to the plan.
13. COA Sketch shall allow the user to associate comments to timing within the plan.

Use Case 12.8: User Views/Edits a Comment

User Story / Context of Use:

- The Team Member or Reviewer may find it helpful to be able to "play" through the plan. This would allow them to view the plan as it goes through the Synchronization (Gantt chart) View and the Map Sketch View as the timing of different objects come into and out of focus.
- It also allows the Team Member or Reviewer the opportunity to provide input or insight by adding comments to the plan over time. These comments can then be looked back on later in order to be used at a reminder or as something requiring further clarification and modifications to the plan.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member, Reviewer
Supporting Actors: COA Sketch
Preconditions:

- Plan Player View is open.
- There is at least one comment.

Triggers: The Team Member or Reviewer would like to view or edit an existing comment.

Guarantees:

- The comment will be made available for viewing or editing.
- All modifications to the comment will be reflected in the tool.

Main Success Scenario:

1. The user indicates they wish to view a comment.
2. The system displays the comment.
3. The user closes the comment view.
4. The system returns to previous state.

Alternative 1: View Multiple Comments

1. The user indicates they wish to view a comment.
2. The system displays the comment.
3. The user indicates they wish to view another comment.
4. The system displays the additional comment.
5. The user closes one comment view.
6. The system removes the appropriate comment view.
7. The user closes the remaining comment.
8. The system returns to previous state, with no comment views shown.

Alternative 2: Edit Comment

1. The user indicates they wish to view a comment.
2. The system displays the comment.
3. The user edits the comment and indicates completion.
4. The system saves the edited comment and returns to previous state.

Alternative 3: Cancel Editing Comment

1. The user indicates they wish to view a comment.
2. The system displays the comment.
3. The user edits the comment.
4. The user wishes to cancel saving the edited comment.
5. The system does not save the edited comment and returns to previous state.

Requirements:

1. COA Sketch shall display plan changes over time.
2. COA Sketch shall display geographical changes in the plan over time.
3. COA Sketch shall display sequence changes in the plan over time.
12. COA Sketch shall allow a user to add comments to the plan.
13. COA Sketch shall allow the user to associate comments to timing within the plan.

Use Case 12.9: User Sets Start or Stop Date

User Story / Context of Use:

- The Team Member or Reviewer may find it helpful to be able to "play" through the plan. This would allow them to view the plan as it goes through the Synchronization (Gantt chart) View and the Map Sketch View as the timing of different objects come into and out of focus.
- The Team Member or Reviewer may wish to change the start date or stop date of the player. This will allow them to focus on a subset of the plan.

- The Team Member of Reviewer may set the start and stop dates by selecting phases, D+n, or hard dates.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member, Reviewer
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch Plan Player is visible.
- Play control is at pause.
- The Player will have the default of playing the entire plan

Triggers: The Team Member or Reviewer wishes to modify the start or stop time of the playback
Guarantees:

- The Map Sketch View in either Compound or Parent Compound mode will only contain elements within the start and stop date, not the entire plan.

Main Success Scenario:

1. The user chooses to set the start or stop dates.
2. The system displays the currently set start and stop dates.
3. The user modifies the dates by selecting phases.
4. The system sets the start and stop dates and resets the player.

Alternative 1: Sets Dates by D+n

1. The user chooses to set the start or stop dates.
2. The system displays the currently set start and stop dates.
3. The user modifies the dates by selecting D + some number.
4. The system sets the start and stop dates and resets the player.

Alternative 2: Sets Dates by Hard Date

1. The user chooses to set the start or stop dates.
2. The system displays the currently set start and stop dates.
3. The user modifies the dates by selecting a month, day, and year.
4. The system sets the start and stop dates and resets the player.

Alternative 3: Resets to View Entire Plan

1. The user chooses to set the start or stop dates.
2. The system displays the currently set start and stop dates.
3. The user modifies the dates by selecting to view the entire plan.
4. The system sets the start and stop dates and resets the player.

Alternative 4: Cancel Set Dates

1. The user chooses to set the start or stop dates.
2. The system displays the currently set start and stop dates.
3. The user modifies the dates.
4. The user cancels changing the dates
5. The system keeps the original start and stop dates.

Requirements:

1. COA Sketch shall display plan changes over time.
2. COA Sketch shall display geographical changes in the plan over time.
3. COA Sketch shall display sequence changes in the plan over time.

4. COA Sketch shall allow the user to focus the timing in which the plan is being displayed overtime

Situational Reference Point Use Cases

Use Case 6.1: Add Situational Reference Point

User Story / Context of Use:
The user wants to add a Situational Reference Point so that current view can be restored at a later time.
Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: All Users
Supporting Actors: COA Sketch
Preconditions:
A plan is open in COA Sketch.
Triggers: User wants to add situation reference point
Guarantees:
Systems saves information about the current system settings and views such as current zoom level, map type, physical location, synchronization view settings and view, hidden and displayed objects, plan player and window layout are stored so that the user can return to the same location at a later time.
Main Success Scenario:
1. The user selects the "Add Situational Reference Point" option from COA Sketch.
2. The system prompts user for the name of the Situational Reference Point.
3. The user provides a name for the Situational Reference Point.
4. The user selects the location to the store the Situational Reference Point
5. The system stores the current zoom level, map type, physical location, synchronization view settings and view, and window layout and view as a new Situational Reference Point.

Alternative 1: User leaves name blank
1. The system prompts user for the name of the Situational Reference Point.
2. The user leaves the name blank.
3. The system alerts the user with a note that a Situational Reference Point must have a name.
4. User confirms the alert.
5. System is back at step 2, prompting the user for a Situational Reference Point name.

Alternative 2: User enters name already in existence
1. The system prompts user for the name of the Situational Reference Point.
2. The user enters a name that was used previously.
3. The system alerts the user with a note that a Situational Reference Point name already exists.
4. User confirms the alert.
5. System is back at step 2, prompting the user for a Situational Reference Point name.

Alternative 3: User cancels creation of SRP
1. The user selects the "Add Situational Reference Point" option from COA Sketch.
2. The user cancels creation of Situational Reference Point

Requirements:
1. COA Sketch shall save system displays of a COA Plan to aid the user in reimursing himself back into the plan.

2. COA Sketch shall save system displays of a COA Plan to brief or show team members context of a COA Plan.

Use Case 6.2: Remove Situational Reference Point

User Story / Context of Use:
The user wants to remove a Situational Reference Point that is no longer useful.
Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: All Users
Supporting Actors: COA Sketch
Preconditions:
A plan is open in COA Sketch.
A Situational Reference Point exists.
Triggers: User wants to remove Situational Reference Point
Guarantees:
The Situational Reference Point is removed.
Main Success Scenario:
1. The user chooses to delete a Situational Reference Point.
2. The system displays the Situational Reference Point list.
3. The user selects a Situational Reference Point for deletion.
4. The user selects to delete.
5. The system removes the Situational Reference Point.

Alternative 1: Remove SRP using an SRP Organizer
1. The user chooses to delete a Situational Reference Point.
2. The user selects the Situational Reference Points Organizer
3. The system displays the Situational Reference Point list.
5. The user selects a Situational Reference Point for deletion.
6. The user selects to delete.
7. The system removes the Situational Reference Point.

Alternative 2: User cancels delete
1. The user chooses to delete a Situational Reference Point.
2. The user selects the Situational Reference Points Organizer
3. The system displays the full Situational Reference Point list.
5. The user cancels.

Requirements:
1. COA Sketch shall save system displays of a COA Plan to aid the user in reimursing himself back into the plan.
2. COA Sketch shall save system displays of a COA Plan to brief or show team members context of a COA Plan.

Use Case 6.3: Go to Situational Reference Point

User Story / Context of Use:
The user wants to visit a Situational Reference Point that was created earlier.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: All Users
Supporting Actors: COA Sketch
Preconditions:
A plan is open in COA Sketch.
A Situational Reference Point exists.
Triggers: The user wants to visit Situational Reference Point created previously.
Guarantees:
The system restores the current zoom level, map type, physical location, synchronization view settings and view, and window layout
Main Success Scenario:
1. The user selects a Situational Reference Point from COA Sketch.
2. The system informs the user that all previously open windows will now close.
3 The user confirms.
2. The system closes all currently open windows
2. The system restores the current zoom level, map type, physical location, synchronization view settings and view, and window layout.

Alternative 1: User cancels opening an SRP
1. The user selects a Situational Reference Point from COA Sketch.
2. The system informs the user that all previously open windows will now close.
3. The user cancels.
4. The system stays in previous state.

Requirements:
1. COA Sketch shall save system displays of a COA Plan to aid the user in reimursing himself back into the plan.
2. COA Sketch shall save system displays of a COA Plan to brief or show team members context of a COA Plan.

Use Case 6.4: Organize Situational Reference Points

User Story / Context of Use:
The user wants to organize the Situational Reference Points already created.
Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: All Users
Supporting Actors: COA Sketch
Preconditions:
A plan is open in COA Sketch.
Situational Reference Points exist.
Triggers: The user wants to organize situational reference points.
Guarantees:
An "Organize Situational Reference Point" window is displayed along with all Situational Reference Points previously created by user.
Main Success Scenario:

1. The user chooses Situational Reference Point from Organize Situational Reference Points window in COA Sketch.
2. The user selects Situational Reference Point and indicates where they want it to be located.
3. The system displays the Situational Reference Point in the new location.

Alternative 1: User renames folder

1. The user chooses Situational Reference Point from Organize Situational Reference Points window in COA Sketch.
2. The user chooses to rename the Situational Reference Point.
3. The system prompts for a new name
4. The user updates the name of the Situational Reference Point.
5. The system shows the new name

Alternative 2: User deletes Situational Reference Point

1. The user chooses Situational Reference Point from Organize Situational Reference Points window in COA Sketch.
2. The user chooses to delete the Situational Reference Point
3. The system asks user to confirm deletion
4. The user confirms deletion
5. The system removes Situational Reference Point from list

Alternative 3: User creates new folder

1. The user chooses the "Create Folder" button from the Organize Situational Reference Points window in COA Sketch.
2. The system displays a new folder in the Situational Reference Points list with the name 'New Folder" highlighted and editable.
3. The user changes the name of the folder to desired name.
4. System displays new name for folder.

Alternative 4: User deletes Folder

1. The user chooses a folder from Organize Situational Reference Points window in COA Sketch.
2. The user chooses the folder to delete
3. The system asks user to confirm deletion
4. The user confirms deletion
5. The system removes the folder

Requirements:

1. COA Sketch shall save system displays of a COA Plan to aid the user in reimursing himself back into the plan.
2. COA Sketch shall save system displays of a COA Plan to brief or show team members context of a COA Plan.

Sketch View Use Cases

Italicized are future spiral requirements.

Use Case 4.1: Team Member Sets Default Visual Appearance by Category or Strategy Plan Level

User Story / Context of Use:

- A Team member may wish to set a default color, transparency, line style, line color, line width, or line transparency for a category of COA Sketch objects. As new map objects are created for these COA Sketch objects, they will have the set defined properties.
- A Team member may wish to set a default color, transparency, line style, line color, line width, or line transparency for a Strategy Plan Level of COA Sketch objects. As new map objects are created for these COA Sketch objects, they will have the set defined properties.
- *A Team member may wish to set a default color, transparency, shape, line style, line color, line width, or line transparency for a user defined tag of COA Sketch objects. As new map objects are created for these COA Sketch objects, they will have the set defined properties.* (In Future Spiral)
- Depending upon the zoom level displayed in the geographic region, some Strategy Plan Level information may only be useful when displayed at specific zoom levels. Because of this, the team members should be able to set what these levels are for a strategy element type. This will aid in a proper filter of the map to help with situational awareness and reduce cognitive load.
- Depending upon the zoom level displayed in the geographic region, some categories may only be useful when displayed at specific zoom levels. Because of this, the team members should be able to set what these levels are. This will aid in a proper filter of the map to help with situational awareness and reduce cognitive load.
- *Depending upon the zoom level displayed in the geographic region, some user-defined objects may only be useful when displayed at specific zoom levels. Because of this, the team members should be able to set these levels. The ability to do this at the tag-level will allow the user to reduce repetitive tasks. This will also aid in a proper filter of the map to help with situational awareness and reduce cognitive load.* (In Future Spiral)
- A Team member may wish to apply a user defined preference for map properties to only new map objects or apply it to existing map objects.

  Scope: User to COA Sketch Interaction, Changes made apply to all projects.
  Level: User Goal
  Primary Actor: Team Member
  Supporting Actors: COA Sketch
  Preconditions:
  - A project is open in COA Sketch.
  - The Sketch View is open.

  Triggers:
  - The Team Member wants to change their preferences used to set the map properties of a category or strategy plan level.

  Guarantees:
  - The strategy plan levels available for setting default map properties are: National Objectives

- National Task
- National Activity
- Strategic Objectives
- Strategic Tasks
- Strategic Activity
- Operational Objectives
- Operational Tasks
- Operational Activity
- Tactical Objective
- Tactical Tasks
- Tactical Activity

- The map properties available to set for the preference are:
  - fill color
  - fill transparency
  - border style
  - border color
  - border width
  - border transparency
  - minimum / maximum zoom levels. If zoomed in any closer than the maximum level, the object will be hidden. If "zoomed out" any further than the minimum level, the object will be hidden. Otherwise, the object is visible. If neither is set, the object is always visible.
  - (shape is intentionally left off the list because a shape is selected when placing a map object on the sketch view)
- The map objects will show up on the map only at the specified zoom levels.
- The user defined settings may be applied to already existing map objects or to only newly created map objects.

Main Success Scenario:

1. The user indicates the desire to set the map property preferences
2. The system displays a list of categories, strategy plan levels, *and user defined tags* that can be set
3. The user selects the type of element to update.
4. The user specifies if changes should be made to only new objects, only existing objects, or new and existing objects.
5. The system displays the current settings
6. The user updates map properties as desired and indicates they are done
7. The system updates the display of relevant map elements with the new visual properties.

Alternative 1: Cancel setting preferences

5. The user decides to cancel setting the map properties
6. The system remains at the previous settings

Requirements:

1. COA Sketch shall have several display features available to the user for better enhancing the display of the plan.

Use Case 4.2: Team Member Creates New Map Objects

User Story / Context of Use:

- The Team Member wants to place a Map Object (shape, icon, or target type) on the map to represent a new COA Sketch object. This will allow the Team Member or Reviewer to have both a temporal and geographical understanding of how the object affects the Strategic Plan.
- The Team Member may have created a COA Sketch object utilizing the synchronization view and now wishes to create an associated Map Object (a shape, icon, or target type). This will allow the Team Member or Reviewer to have both a temporal and geographical understanding of how the object affects the Strategic Plan.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- A project is open.
- The Sketch View is open.

Triggers: Team Member needs to create a new Map Object to represent some information.
Guarantees:

- No Map Objects can exist without being associated with one and only one COA Sketch Object
- A COA Sketch object can have more than one map object associated with it.
- The new Map Object w ill have timing information associated with it. By default, it will have the same timing as the COA Sketch object associated with it.
- The new Map Object will have geographical context associated with it.
- The Map Object will be added as an icon, shape, or target type to the Sketch View.

Main Success Scenario:

1. The user chooses to create a new shape or icon.
2. The system displays the available shapes or icons.
3. The user selects a sh ape or icon and places it on the m ap at the desired location and size.
4. The user selects the type of the COA Sketch object to be created
5. The system creates the COA Sketch obj ect. (See creatin g new COA objects in Plan_COA Use Cases_Spiral One and creating new m ission analysis objects in Mission Analysis Use Cases)
6. The system draws the shape according to the m ap property preferences for its category or strategy plan level.
7. The system associates the shape to the new COA Sketch Object

Alternative 1: Associate shape with existing COA Sketch object

1. The user chooses to create a new shape or icon.
2. The system displays the available shapes or icons.
3. The user selects a sh ape or icon and places it on the m ap at the desired location and size.
4. The user selects existing COA Sketch object to associate with the shape

5. The system draws the shape according to the map property preferences for its category or strategy plan level.
6. The system associates the shape to the existing COA Sketch Object, if there is another shape associated with the COA Sketch Object, it remains.

Requirements:

1. COA Sketch shall have several display features available to the user for better enhancing the display of the plan.

Use Case 4.3: Team Member Associates Map Objects to different Timings of COA

User Story / Context of Use:

- The Team Member may also use two or more shapes/icons to show how the focus of operations may shift within or across phases of the COA.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member
Supporting Actors: COA Sketch
Preconditions:

- A project is open in COA Sketch.
- The Sketch View is open.

Triggers:

- The Team member wants to use different shapes/icons to represent the same COA Sketch Object at different points in time.

Guarantees:

- The user can associate different map objects with different timing to one COA Sketch object.

Main Success Scenario:

1. The user selects to modify the timing of one Map Object.
2. The system displays the current timing of the Map Object.
3. The user adjusts the timing of the Map Object
4. The system updates to reflect the new timing

Alternative 1: User moves timing outside of the COA Sketch Object Timing

4. The system alerts the user the timing falls outside of the COA Sketch Object
5. The user selects to allow the COA Sketch Object to adjust to contain map object timing
6. The system adjusts the COA Sketch Object timing.

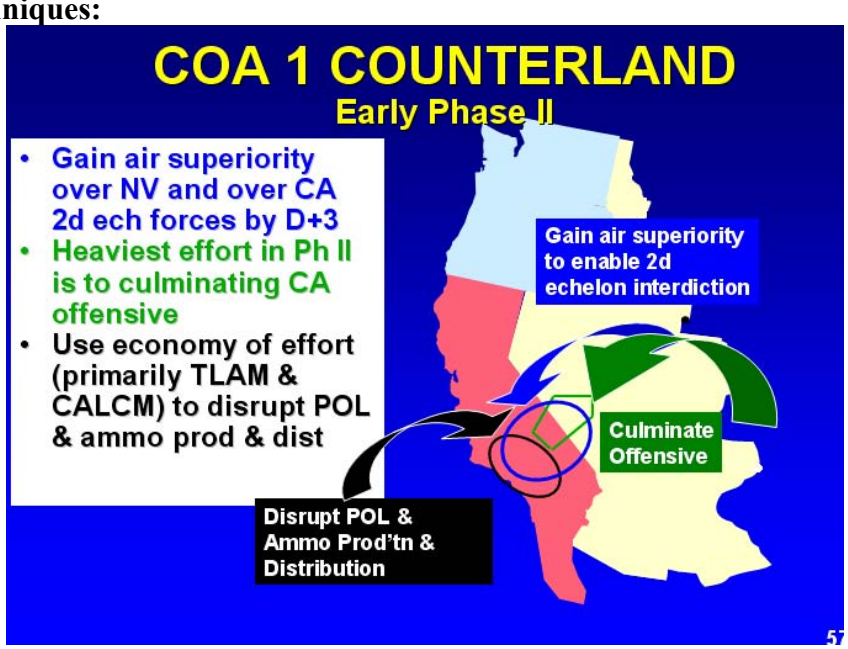
Alternative 2: User moves timing outside of the COA Sketch Object Timing -cancel timing change

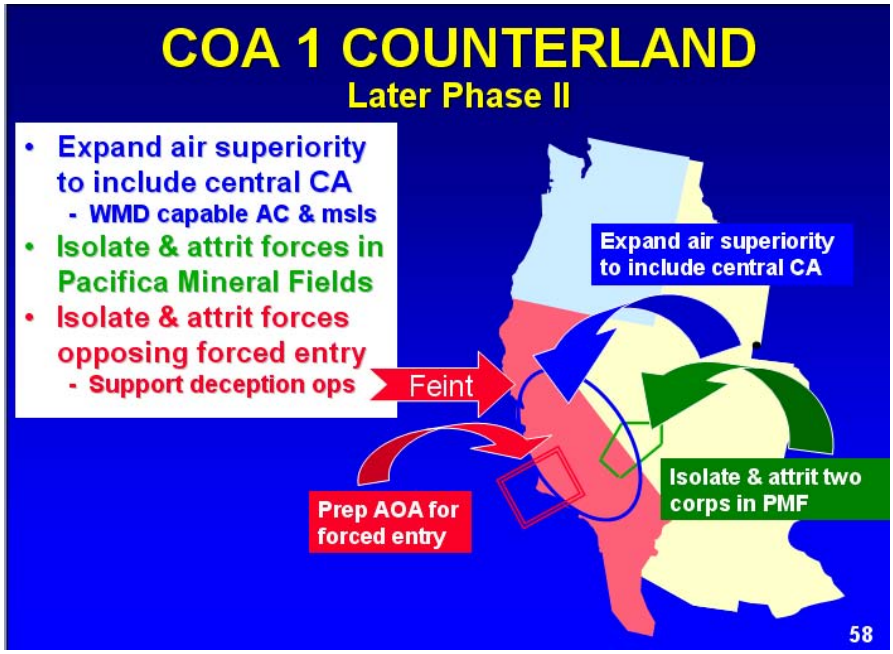
4. The system alerts the user the timing falls outside of the COA Sketch Object
5. The user selects to cancel the COA Sketch Object timing adjustment
6. The system returns the Map Object to its previous state.

Requirements:

1. COA Sketch shall have several display features available to the user for better enhancing the display of the plan.

Current techniques:





Implementation ideas:

1. Would like to express broad efforts through Operational objectives, e.g. showing air superiority status through changes in color of specified areas.
2. Show change in effects over time (playthrough).

Use Case 4.4: Team Member Selects Map Object on Sketch View

User Story / Context of Use:

- In order to create a more successful picture of the battle space and the plan, it will be important that team members have the ability to cut, copy, delete, modify, or view the properties of a COA Sketch Object or Map Object. This will help the team maintain

situational awareness and will lead to a better understanding of the COA being developed.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team member
Supporting Actors: COA Sketch
Preconditions:

- A project is open in COA Sketch that has at least one map object on the Sketch View to select.

Triggers: The user wishes to select map objects to cut, copy, delete, modify or view the properties of a COA Sketch or map object.
Guarantees:

- Only map objects associated with a single COA Sketch Object can be selected at one time. Multiple COA Sketch Objects can not be selected at once.

Main Success Scenario: (Only one Map Object associated with the COA Sketch Object)

1. The user selects an existing object on the map.
2. The system indicates the Map Object(s) and its COA Sketch object in all other open views (if it is visible without scrolling, un-hiding, etc.) is selected. (See selection use cases in Overall Use Cases_Spiral one)
3. The user chooses to edit the selected objects.
4. The system enables all COA Sketch object-specific and map properties editing options.

Alternative 1: Multiple Map Objects associated with one COA Sketch Object

5. The user chooses to only select the original object.
6. The system removes selection from the other map objects associated with the COA Sketch object.

Alternative 2: Multiple Map Objects associated with one COA Sketch Object

5. The user chooses to deselect one or more map objects
6. The system removes selection from the deselected map objects.

Requirements:
2.COA Sketch shall allow the user to edit objects on a map view.

Use Case 4.5: Team Member Modifies Map Specific Object Properties

User Story / Context of Use:

- In order to create a more successful picture of the battle space and the plan, it will be important that team members have the ability to modify map information in existing map objects. This will help the team maintain situational awareness and will lead to a better understanding of the COA being developed.
- *Due to the ever changing nature of each COA, and the situation dependent Operational Environmental, pieces and parts of information are important to determining Courses of Action and their underlying effects, it is important that associated data may be gathered and sorted in a user-defined way. This will allow for easier access to collected IPB and other important data.* (In Future Spirals)

- *Tagging data objects that are displayed upon the map will allow the team member to easily hide/show the information based upon a user defined tag.* (In Future Spirals)
- *Allowing the user to create a hierarchy of tagging elements will better allow them to organize and categorize data in multiple useful ways. This will allow for easier access to associated data based upon the way the user and team works.* (In Future Spirals)

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- A project is open in COA Sketch.
- At least one Map Object has been created.

Triggers: The team member wishes to modify information associated with a Map Object.
Guarantees:

- The Team Member will be able to update the map object.
- Visual Characteristic changes made will be reflected in the Sketch View.
- With one or all map objects associated with a COA Sketch Object selected in the Sketch View, a user can:
    - Modify associated COA Sketch Object specific properties (See use case User views/Edits COA Properties in Plan_COA Use Cases_Spiral One and editing mission analysis objects in Mission Analysis Use Cases)
    - Cut
    - Copy
    - Paste - Default for paste is paste a copy of the entire COA Sketch Object and all the selected shapes associated with it.
    - Delete Map Objects associated with COA Sketch Object
    - Set the map properties of all selected shapes:
        - Latitude, Longitude of location(s) (by moving, rotating, resizing)
        - fill color
        - fill transparency
        - border style
        - border color
        - border width
        - border transparency
        - minimum / maximum zoom levels. If zoomed in any closer than the maximum level, the object will be hidden. If "zoomed out" any further than the minimum level, the object will be hidden. Otherwise, the object is visible. If neither is set, the object is always visible.
        - (shape is intentionally left off the list because a shape is selected when placing a map object on the sketch view)
- To resize a Map Object(s), the user must have the Map Object(s) that is/are being resized selected.

- To paste a copy of the shape(s) with a new COA Sketch object (not a copy of the COA Sketch Object) or to paste a copy of the shape(s) and associate it with an existing COA Sketch Object, requires a "paste special" feature.
- *Tag information added will update the Sketch View depending upon what tags are being hidden/shown.*
- *Tag information added will update the Sketch View if a tag is added has visual characteristics associated with it and these changes are accepted by the team member.*
- *All tags added to the system will be available for all users to view and re-use.*
- *When the tag is added, it will be made readily available for use by other objects within the system.*
- *If the tag already exists within the system, the object will also exist within the created hierarchy for that tag.*
- *If a tag's hierarchy is modified, then all objects with that tag will also inherit that hierarchy.*
- *The team member will be able to view all tags associated with the plan element or Generic Object.*
- *If a tag is removed from the plan element, the tag may still exist within the system if other plan elements of Generic Objects are utilizing it.*
- *If a tag is removed from the system, all other objects associated with that tag will no longer have that association.*
- *If the tag already existed, the plan element will take on the characteristics of that tag.*
- *If the tag is edited and has other objects associated with it, depending upon user choices, the tag will become a brand new tag or all the objects will be associated to the new tag name.*
- *If the tag is removed, the tag will only be completely removed from the system if there are no other objects associated with the tag.*

Main Success Scenario:

1. The user indicates the desire to change a map specific property of a map object.
2. The system displays the current settings for the properties of the map object
3. The user updates a property
4. The system updates the display of the map object on the Sketch View to reflect the new property
   4.1. If the object is resized or moved and associated with a target type, the system queries target DB. (See targeting use cases in TargetingUseCase)

Requirements:

2.COA Sketch shall allow the user to edit objects on a map view.

Use Case 4.6: Team Member Hides/Shows Map Objects

User Story / Context of Use:

- The Team Member or Reviewer may wish to view the objects on the Sketch View in order to better understand the plan or aid in different processes within the Joint Air Estimation Process. Because of this, the Team Member or Reviewer may wish to

filter the Sketch View in multiple ways. The system should allow the operator to hide or show:

- Individual COA Sketch objects independently
- Objects by categories
- All map objects designated by particular shapes.
- All map objects designated by icons.
- All map objects associated with a particular target type.
- Individual Course of Action (COA) and its associated objects
- All map objects designated by a Strategy Plan Level (See Use Case 4.1: Team Member Sets Default Visual Appearance by Category or Strategy Plan Level for list of levels)
- Individual strategy elements and their children.
- *COA Sketch object based upon a user-defined tag. (In Future Spirals)*
- *Map objects related to another map object (In Future Spirals)*
- *All but the selected item(s). (In Future Spirals)*

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member
Supporting Actors: COA Sketch
Preconditions:

- A project is open in COA Sketch.
- The Sketch View is open.
- There is at least one object of the type desired to be shown/hidden on the Sketch View.

Triggers: The Team Member wishes to show or hide something displayed in the Sketch View.
Guarantees:

- The object(s) selected, in the category, with a specific shape, or with a specific icon will be hidden or shown.
- Hiding the object(s) will not remove the data from the COA Sketch System.
- As a project is played, objects that are hidden will remain hidden even when they go into the time focus of the play through.

Main Success Scenario:

1. The user toggles visibility of a selected Map Object.
2. The system hides/reveals the object affected by the user selection.

Alternative 1: The User hides/shows Category

1. The user toggles visibility of a Category.
2. The system hides/reveals the objects in the category affected by the user selection.

Alternative 2: The User hides/shows all Map Objects with a specific shape

1. The user toggles visibility of a shape. Custom polygon shapes will be grouped together as one shape type.
2. The system hides/reveals the objects with the shape of the user selection.

Alternative 3: The User hides/shows all Map Objects with a specific icon

1. The user toggles visibility of an icon.
2. The system hides/reveals the objects with the icon of the user selection.

Alternative 4: The User hides/shows all Map Objects associated with a specific target type

1. The user toggles visibility of an icon.
2. The system hides/reveals the objects with the icon of the user selection.

Alternative 5: The User hides/shows all Map Objects associated with a specific COA

1. The user toggles visibility of all Map Objects associated with a COA.
2. The system hides/reveals the objects associated with the selected COA.

Alternative 6: The User hides/shows all Map Objects of a Specified Strategy Plan Level

1. The user toggles visibility of all Map Objects of a specific Strategy Plan Level.
2. The system hides/reveals the objects associated with the selected level.

Alternative 7: The User hides/shows all children of a Specified Strategy Element

1. The user toggles visibility of all children of a specific Strategy Element.
2. The system hides/reveals the children objects associated with the selected strategy element.

Alternative 8: The User hides/shows all objects

1. The user chooses to hide or show the visibility of all objects.
2. The system hides/reveals all objects.

Requirements:

2.COA Sketch shall allow the user to edit objects on a map view.

Use Case 4.7: Team Member Reorders the Map Group Layers

User Story:

- The Sketch View contains various groups of information. Because these groups are ordered (layered), they could potentially block the information on lower groups on the map if they reside at the same location. The user may wish to view the obstructed data without hiding the groups blocking it. To do this, the user can reorder the groups to bring map objects from lower on the map to a more visible position.
- *User defined tags can be used to create new groups* (In Future Spirals)

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member, Reviewer
Support Actors: COA Sketch
Preconditions: Map Sketch View is open.
Triggers: Obstructed data needs to be viewed without hiding the other groups.
Guarantees:

- Groups are the categories, strategy plan levels, *and user defined tags*. (VFDD 3 – Layers) (In Future Spirals)
- The contents of the group will not be altered.
- The groups moved will be positioned at the correct location in the group ordering.
- Map objects that may be in more than one group will be displayed with its highest (most on top) group.

Main Success Scenario:

1. The user chooses to reorder the display of groups (layers)
2. The system displays the current group order

3. The user moves a group to the new location.
4. The system updates the Sketch View to reflect the new order.

Requirements:

Use Case 4.8: Team Member Zooms In/Out on Sketch View

User Story / Context of Use:

- The team member or reviewer will want to get a closer view of the map for more detailed planning and layout of Map Objects. The team member or reviewer will also want to get farther away to get a broader view of the Map Objects in the plan.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team member, Reviewer
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- The Sketch View is open.

Triggers: The team member or reviewer wants to get closer or farther away view of the map.
Guarantees:

- The maps appearance will reflect the change in zoom level.
- Map shapes will not change geographic location based on zoom level.

Main Success Scenario:

1. The user uses the zoom in/out options within COA Sketch.
2. The system zooms in or out by one step with the same center point

Alternative 1: User Selects Area to Zoom In On

1. The user selects an area on the map to zoom in
2. The system re-centers the map to the center of the selected region and zooms in to the zoom level to include only the selected region.

Requirements:

1. COA Sketch shall have several display features available to the user for better enhancing the display of the plan.

Use Case 4.9: Team Member Pans Sketch View

User Story / Context of Use:

- The Team Member or Reviewer may wish to view different regions on the Map Sketch View in order to better understand the plan or aid in different processes within the Joint Air Estimation Process. To accomplish this, they might want to move to include other areas on the map or to change the center point of the map.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member, Reviewer
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.

- The Sketch View is open.

Triggers: The team member or reviewer wants to view another part of the map at the same zoom level.

Guarantees:

- The maps appearance will reflect the change of center point.
- Map Objects will not change geo graphic location due to the m ap cente r point changing.

Main Success Scenario:

1. The user selects the pan option and indicates how the map should move
2. The system updates the view to match the user input.

Requirements:

1. COA Sketch shall have several display features available to the user for better enhancing the display of the plan.

Use Case 4.10: Team Member Changes Map Style

User Story / Context of Use:

- The team member or reviewer might want to change the appearance of the map. Example styles are: Satellite images, street maps, hybrid, (a mix of satellite images and street maps), and a gridline map.

Scope: User to COA Sketch Interaction

Level: User Goal

Primary Actor: Team Member, Reviewer

Supporting Actors: COA Sketch

Preconditions:

- COA Sketch is open.
- The Sketch View is open.

Triggers: The team member or reviewer wants to view the map in a different style.

Guarantees:

- The m aps appearanc e will be cha nged to th e selected style, if the im age data is available.
- Map shapes will not change geographic location due to the map style changes
- Map center point and zoom level will not change due to the style change.

Main Success Scenario:

1. The user selects the desired map style for the Sketch View.
2. The system displays the map in the selected style.

Alternative 1: No imagery Data Available at location

1. The user selects to view a style that includes imagery that is not available for the current area displayed on the map.
2. The system informs the user the imagery is not available and remains in previous style

Alternative 1: No imagery Data Available at current Zoom Level

1. The user selects to view a style that includes imagery that is not available for the current area displayed on the map map
2. The system informs the user the imagery is not available at the current zoom level
3. The user zooms out in the Sketch View

4. The system displays the satellite imagery when the user reaches a zoom level where imagery exists.

Requirements:

1. COA Sketch shall have several display features available to the user for better enhancing the display of the plan.

Use Case 4.11: User Imports Map Layer onto Map

User Story / Context of Use:

- The Team Member or Reviewer may wish to import a map layer compatible with the map server to enhance the Sketch View. This will help the team maintain situational awareness and will lead to a better understanding of the COA being developed.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member, Reviewer
Supporting Actors: COA Sketch
Preconditions:

- A project is open in COA Sketch.
- The Sketch View is open.

Triggers: Team Member or Reviewer would like to add a map server layer onto the map.
Guarantees:

- The system will allow compatible map layers of the map server to be imported and displayed on the map.
- Depending upon the zoom level displayed in the geographic region, some map layer data may only be useful when displayed at specific zoom levels. Because of this, the team members should be able to set what these levels are. This will aid in a proper filter of the map to help with situational awareness and reduce cognitive load.
- The system will display and hide a map layer according to the set zoom level.

Main Success Scenario:

1. The user selects to import a map layer and the zoom level it is to be displayed.
2. The system requests location of layer
3. The user sets location of layer to import.
4. The system imports the layer into the map server so that it is available for selection on the map

Alternative 1: Unable to Import Map Layer

4. The system alerts the user that the layer can not be imported.

Requirements:

1. COA Sketch shall have several display features available to the user for better enhancing the display of the plan.

Use Case 4.12: User Updates Minimum and Maximum Zoom Level of Map Layer

User Story / Context of Use:

- Depending upon the zoom level displayed in the geographic region, some map layer data may only be useful when displayed at specific zoom levels. Because of this, the team members should be able to set what these levels are. This will aid in a proper filter of the map to help with situational awareness and reduce cognitive load.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member, Reviewer
Supporting Actors: COA Sketch
Preconditions:

- A project is open in COA Sketch.
- The Sketch View is open.
- At least one map layer has been imported.

Triggers: Team Member or Reviewer would like to adjust the zoom levels a map layer is visible on the map.
Guarantees:

- The system will display and hide a map layer according to the set zoom level. If zoomed in any closer than the maximum level, the object will be hidden. If "zoomed out" any further than the minimum level, the object will be hidden. Otherwise, the object is visible. If neither is set, the object is always visible.
- If the layer is set to be always shown or always hidden, the zoom level values will be updated, however the always shown or always hidden setting will take precedent over the zoom settings for display of the layer.

Main Success Scenario:

1. The user selects to set the zoom levels a map layer is visible.
2. The system displays the current minimum and maximum zoom levels
3. The user updates the minimum and maximum zoom levels for the layer
4. The system hides or shows the map layer depending on the current zoom level and the set visible levels.

Alternative 1: Layer is set to always hide for user

5. The zoom levels are updated, but the layer is still not visible since the user has set it to always be hidden.

Alternative 2: Layer is set to always show for user

6. The zoom levels are updated, but the layer is visible regardless of the current zoom level since the user has set it to always be shown.

Requirements:

1. COA Sketch shall have several display features available to the user for better enhancing the display of the plan.

Use Case 4.13: Team Member Shows / Hides a Map Layer

User Story / Context of Use:

- A team member wants to show or hide a layer in the map. They may want to see more details of the layer by showing it, or hide the layer so they can focus on other pieces of data.

Scope: User to COA Sketch Interaction, Applies to user view only

Level: User Goal
Primary Actor: Team Member, Review
Supporting Actors: COA Sketch
Preconditions:

- A project is open in COA Sketch
- The Sketch View is open

Triggers: The user wishes to hide or show a layer.
Guarantees:

- The selected layer(s) will be shown, hidden, or use zoom levels.

Main Success Scenario:

1. The user chooses to show\hide map layer(s).
2. The system displays the list of layer(s) that can be shown or hidden. Layers that are not currently within the zoom range are indicated. It additionally indicates if a layer is set to be always shown, always hidden, or use zoom levels.
3. The user selects layer(s) to show, hide, or use zoom levels.
4. The system updates the map to show, hide, or use zoom levels for the selected layer(s).

Requirements:

Use Case 4.14: Team Member Views Latitude/Longitude Coordinates

User Story / Context of Use:

- A team member may wish to center or contain certain coordinates on the map with a shape or icon.
- A team member or reviewer may wish to see what coordinates an already existing shape or icon resides.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member, Review
Supporting Actors: COA Sketch
Preconditions:

- A project is open in COA Sketch
- The Sketch View is open

Triggers: The user wishes to see coordinates on the map
Guarantees:

- The coordinates in latitude/longitude will default to being represented using N,S,E,W instead of +-.

Main Success Scenario:

5. The user chooses to see the coordinates of a location on the map.
6. The system displays the coordinates of the location to the user

Requirements:

1. COA Sketch shall have several display features available to the user for better enhancing the display of the plan.

Use Case 4.15: Team Member Hides/ Shows Labels

User Story / Context of Use:

- The Team Member has the option of displaying labels on the objects on the map. This will help the team maintain situational awareness and will lead to a better understanding of the COA being developed.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member, Reviewer
Supporting Actors: COA Sketch
Preconditions:

- A project is open in COA Sketch.
- The Sketch View is open.
- There is at least one map object on the Sketch View

Triggers:

- The Team Member would like to see labels on the shapes to help distinguish what they are.

Guarantees:

- The COA Sketch Object name associated with the Map Object will be displayed in the label.
- If a COA Sketch Object has more than one map object associated with it, the same label will be displayed on all those map objects.

Main Success Scenario:

1. The user chooses to show the labels of all objects visible on the Sketch View.
2. The system displays the name of all the COA Sketch Objects associated with the currently visible Map Objects on the map.

Alternative 1: Hide Labels

1. The user chooses to hide the labels of all objects visible on the Sketch View.
2. The system hides the labels of all the COA Sketch Object on the map.

Requirements:

1. COA Sketch shall have several display features available to the user for better enhancing the display of the plan.

Use Case 4.16: Team Member Views/Hides Legend for Sketch View

User Story / Context of Use:

- The Team Member or Reviewer may require a list of used map properties set in the preferences (See Use Case 4.1: Team Member Sets Default Visual Appearance by Category or Strategy Plan Level for list of available map properties) that are displayed on the current Sketch View. This will aid the Team Member or Reviewer in better understanding of what the Sketch View is attempting to convey.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member, Reviewer
Supporting Actors: COA Sketch
Preconditions:

- A project is open in COA Sketch.
- The Sketch View is open.
- There is at least one Sketch Object on the Sketch View.

Triggers: Team Member or Reviewer would like to see or hide the legend for the Sketch View.

Guarantees:

- The legend will be displayed/hidden as the user has requested
- The legend will contain a description of all defined map property preferences of categories and strategy plan level currently displayed on the Sketch View.
- The legend will contain a description of user added entries.
- As objects on the map are hidden or displayed, the legend will update to reflect these changes to the Sketch View.
- *Unless changed by a Team Member, the icon or shape will be described in the legend by listing the user-defined tags. If the icon or shape represents a plan element that does not have a tag, the name of the plan element will be displayed.*

Main Success Scenario:

1. The user toggles the Legend in the Sketch View.
2. The system hides/reveals the Legend in the Sketch View.
3. The system filters the legend to only show entries relating to map objects that are visible.

Requirements:

1. COA Sketch shall have several display features available to the user for better enhancing the display of the plan.

Use Case 4.17: Team Member Adds Legend Entry for Sketch View

User Story / Context of Use:

- Because the user has the option of displaying multiple types of objects on the map, the user may add entries to the legend to provide a better short description for the different objects displayed.

Scope: User to COA Sketch Interaction

Level: User Goal

Primary Actor: Team Member

Supporting Actors: COA Sketch

Preconditions:

- A project is open in COA Sketch.
- The Sketch View is open.
- There is at least one Sketch Object on the Sketch View.

Triggers: The Team Member wishes to add the way a map property is described in the legend.

Guarantees:

- The legend will display the map property(ies) in the legend with the description the user has designated.
- A legend entry can have more than one map property to describe a single entry.

Main Success Scenario:

1. The user selects to add a legend entry.

2. The system prompts user to enter the map property/properties and what it is denoting.
3. The user adds the information and indicates completion
4. The system displays the new entry in the legend. The entry is not attached to any specific objects, so it will remain in the legend independent of what objects are visible

Requirements:

1. COA Sketch shall have several display features available to the user for better enhancing the display of the plan.

Use Case 4.18: Team Member Edits Legend Entry for Sketch View

User Story / Context of Use:

- Because the user has the option of displaying multiple types of objects on the map, the user may edit entries in the legend to provide a better short description for the different objects displayed.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member
Supporting Actors: COA Sketch
Preconditions:

- A project is open in COA Sketch.
- The Sketch View is open.
- There is at least one entry in the legend.

Triggers: The Team Member wishes to edit the way a map property is described in the legend.
Guarantees:

- The legend will display the map property/properties in the legend with the description the user has designated.
- A legend entry can have more than one map property to describe a single entry.
- An edited legend entry will always reference the same objects; it will appear and disappear in the legend as the objects are visible

Main Success Scenario:

1. The user selects to edit a legend entry.
2. The system displays the entry as it currently exists.
3. The user changes the map property/(ies) or description.
4. The system displays the updated entry in the legend if appropriate. The entry is only changed for the current user.

Requirements:

1. COA Sketch shall have several display features available to the user for better enhancing the display of the plan.

Use Case 4.19: Team Member Deletes Legend Entry for Sketch View

User Story / Context of Use:

- Because the user has the option of displaying multiple types of objects on the map, the user may find it necessary to delete entries in the legend. This will aid the Team Member or Reviewer in better understanding of what the Sketch View is attempting to convey.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member
Supporting Actors: COA Sketch
Preconditions:

- A project is open in COA Sketch.
- The Sketch View is open.
- There is at least one entry in the legend.

Triggers: The Team Member wishes to delete an entry in the legend.
Guarantees:

- The legend will remove the legend entry.

Main Success Scenario:

1. The user selects to delete a legend entry.
2. The system requests deletion confirmation
3. The user confirms deletion
4. The system deletes the entry in the legend.

Alternative 1: User cancels deletion

3. The user cancels deletion
4. The system returns to its previous state

Requirements:

1. COA Sketch shall have several display features available to the user for better enhancing the display of the plan.

Use Case 4.20: Team Member Restores Legend for Sketch View

User Story / Context of Use:

- The Team Member or Reviewer may wish to restore to the default legend containing categories and strategy play levels set in the preferences (See Use Case 4.1: Team Member Sets Default Visual Appearance by Category or Strategy Plan Level). This will aid the Team Member or Reviewer in better understanding of what the Sketch View is attempting to convey.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member, Reviewer
Supporting Actors: COA Sketch
Preconditions:

- A project is open in COA Sketch.
- The Sketch View is open.
- There is at least one Sketch Object on the Sketch View.

Triggers: Team Member or Reviewer would restore the legend for the Sketch View.
Guarantees:

- The legend will contain everything in the preference settings that is currently being displayed on the map.

Main Success Scenario:

1. The user selects to restore the legend.
2. The system requests confirmation on losing changes to legend
3. The user confirms losing changes
4. The system restores the legend to its default view.

Requirements:

1. COA Sketch shall have several display features available to the user for better enhancing the display of the plan.

Use Case 4.21: Locate COA Sketch Object in the Synch View

User Story: When the timing of a plan gets long, bars on the Synch View may not be visible and can get hard to find. It would be useful to have the system scroll to the bar associated with the COA Sketch object selected in Sketch View.
Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member, Reviewer
Support Actors: COA Sketch
Preconditions:

- Sketch View is open.
- There is at least one map object on the Sketch View

Triggers: The user would like to locate the selected map object's associated bar in the Synch View.
Guarantees:

- The Synch View will scroll to the selected bar.
- If the Synch View is closed, it will automatically open.
- If the COA Sketch object is hidden in the Synch View, the object will be shown.
- No timing data will be affected.

Main Success Scenario:

1. The user selects a map object on the Sketch View. (see Use Case 4.4: Team Member Selects Map Object on Sketch View)
2. The user selects to scroll to the COA Sketch Object in the Synch View
3. The system centers the Synch View on the bar representing that COA Sketch Object

Alternative 1: Synch View Not Open

3. The system determines the Synch View is closed and opens it before centering on the bar representing that COA Sketch Object.

Alternative 2: COA Sketch Object Hidden

3. The system determines the Synch View currently has the COA Sketch Object hidden, so it un-hides the category containing the COA Sketch Object before centering on the bar representing that COA Sketch Object.

Alternative 3: COA Sketch Object Collapsed

3. The system determines the Synch View currently has the COA Sketch Object not visible because its parent is collapsed, so it expands the hierarchy containing the

COA Sketch Object before centering on the bar representing that COA Sketch Object.

Requirements:

1. COA Sketch shall have several display features available to the user for better enhancing the display of the plan.

Collaborative Environment Use Cases

1. Collaborative Data Manipulation Scenarios

COA Sketch is based upon being a collaborative tool. Some goals of this tool is to allow collaboration and modification of mission data at any level, without applying unwanted rule sets on the user with respect to what data they are allowed to edit and when. By allowing users to modify data all the way down to the attribute level, this frees the team to be able to collaborate and plan in ways they may not have been able to in the past. This new functionality will hopefully aid the current planning process by providing more collaboration, more easily accessible and real-time data as it is being analyzed and determined. This does provide some interesting scenarios for the development team on potential conflictions of data and system interaction. This document will aid the COA Sketch design team in determining different options to aid us in selecting best choice for implementation.

Some requirements:

- COA Sketch shall allow multiple users to modify different attributes and fields in a project simultaneously.
- COA Sketch shall lock data for modification at the lowest level (attribute or field) in order to reduce locking data that other users may want to modify.
- COA Sketch shall inform users of what fields have been modified, added, or removed.
- COA Sketch shall automatically save modifications to projects.
- COA Sketch shall provide individual users a ways to "undo" and "redo" changes made by that user while providing a way to consider changes made by other users.
- COA Sketch shall provide user a way to "undo" and "redo" changes made by multiple users
- COA Sketch shall release modification locks on data when user indicates that modification has been completed.
- COA Sketch shall provide an alternative way to release modification locks on data.

Note: Italicized text indicates scenarios that we believe will be rarely used functionality.

Normal Change Case

We have attempted to indicate throughout the document how other users will view locks and changes. This may not have been pushed through to each scenario. Please make the assumption that any locks on any data will be visually indicated to all users. Please make the assumption that any changes (modifications, additions, deletions) will also be visually indicated to all users.

1. User-A starts to change Field-X
2. All users who currently view Field-X or view field-X before step 6 are notified (via a subtle signal: the text field background turns gray) that Field-X is being changed.
3. The field is locked for editing. Users other than User-A can't make changes to Field-X. (For exceptions, see scenarios in section 0, **Error! Reference source not found.**)
4. User-A completes changes to Field-X
5. The system stores the changes and adds the change to a "change history".

6. Users viewing Field-X immediately sees the change User-A made to Field-X
7. Users other than User-A that are viewing, or do view, Field X are notified (via a subtle signal) that Field-X has (or has not) been modified. (i.e: Field text changes to Bold. There would also be a user specified amount of time the text would remain bold to indicate that the change was "new" before reverting back to a normal font.)
8. Users viewing Field-X receive indication that they may once again make changes to Field-X. (Field is unlocked)
9. All users have access to the change history so they can "revert" changes.

Lock Management Concepts

Lock Time Out

System preferences should include the ability to set a lock time out. This option allows for locks to time out with less obtrusive messages while still providing the ability to potentially salvage unsaved changes.

1. See steps 1-3 of Normal Change Case.
2. User-A does not indicate that changes to Field-X are complete, therefore the system does not save changes or release locks.
3. User-A has been inactive (or doesn't type or interact with system) for a user-defined amount of time.*
4. User-A is informed by a subtle indicator that the lock may be taken away unless the user takes action within Y seconds*. User A is given these choices: Renew the lock by providing changes or let lock expire.
   - 4.1. The user decides to renew the lock.
     - 4.1.1. User-A begins modification (becomes active, or "types something") of Field-X.
     - 4.1.2. The system recognizes the activity of User-A and automatically renews the lock.
     - 4.1.3. See step 4 of normal change scenario.
   - 4.2. The user allows lock to expire (does nothing)
     - 4.2.1. User-A's display of Field-X indicates that the user no longer has the lock.
     - 4.2.2. All users currently viewing Field-X will receive indication that the field is no longer locked.
     - 4.2.3. User-A's display of Field-X remains unchanged until another user tries to edit Field-X.
       - 4.2.3.1. No other user edits Field-X.
         - 4.2.3.1.1. User-A can continue editing Field-X as if he had never lost the lock, thus keeping the previous changes even though the lock timed out.
         - 4.2.3.1.2. All users currently viewing Field-X will receive indication that the field is locked again by User-A.
       - 4.2.3.2. Another user edits Field-X.
         - 4.2.3.2.1. User-A receives display of a temporary Field-X1 that contains Field-X just as User-A had last modified it.

4.2.3.2.2. User-A can decide to discard changes in Field-X1, edit Field-X1, or apply them
4.2.3.2.2.1. User-A discards changes.
4.2.3.2.2.1.1. Field-X1 disappears and all changes to Field-X1 are lost.
4.2.3.2.2.2. User-A continues to edit Field-X1.
4.2.3.2.2.2.1. Field X-1 is updated to reflect User-A's modifications.
4.2.3.2.2.2.2. Return to step 4.2.3.2.2
4.2.3.2.2.3. User-A tries to save Field X-1 to field-X
4.2.3.2.2.3.1. The system attempts to retrieve lock for field-X
4.2.3.2.2.3.1.1. If lock is retrieved,
4.2.3.2.2.3.1.1.1. System locks field-X. All users viewing field-X will receive visual indication that the field is locked.
4.2.3.2.2.3.1.1.2. System saves data held in field-X1 over data stored in field-X and releases lock.
4.2.3.2.2.3.1.1.3. All users viewing field-X will receive visual indication that the field has changed and that the lock is released.
4.2.3.2.2.3.1.2. If lock is not retrieved,
4.2.3.2.2.3.1.2.1. System informs user that user-B has lock.
4.2.3.2.2.3.1.2.2. If user-A has lock requesting privileges, User-A can request the lock from User-B (See scenario 0, **Request Lock**)
4.2.3.2.2.3.1.2.3. Otherwise, user will need to wait until lock is released by User-B. Return to step 4.2.3.2.2

* The system would need to time the lock for a user-defined Z seconds, which needs to be at least Y seconds long. Once Z-Y seconds have passed, the server would alert the client that the lock may be released soon. The client would have Y seconds to detect activity by User-A before further action took place.

View lock holder

1. At least one user has locked at least one field for modification.
2. All users will receive a visual indication that the field(s) has been locked by another user(s).
3. User-A selects locked item(s)/field
4. User-A indicates they want to see who holds the lock on selected field(s)/item(s)
5. System displays lock holder(s) for selected item(s).

Request Lock

Reason for functionality: The ability to allow users to request locks that are held by other users could allow for longer "time outs", in that a user will have the ability to not lose a lock if they step away for a short period of time. However, if that short period of time becomes too long, for example, the user leaves work for the day, other users would need to have the ability to release locks so that work can continue. Because of this, we need to

consider what would happen when that lock is released to another user, even in what should be a rare case that the initial lock holder is or was actively modifying the field when the lock was taken.

1. *See steps 1-3 of Normal Change Case.*
2. *User-B has ability/permissions to request the lock, so the system displays this option.*
3. *User-B chooses to request the lock.*
4. *User-B waits for indication that they have the lock.*
5. *User-A is informed that User-B has requested the lock. User-A can do one of the following:*
    - *5.1. User-A does nothing*
        - *5.1.1. After Y seconds, User-A loses the choice to deny the lock and save changes.*
        - *5.1.2. User-A's unsaved changes are now displayed in a temporary Field-X1, visible only to User-A.*
        - *5.1.3. User-A may perform one of the following actions:*
            - *5.1.3.1. Discard unsaved changes displayed in Field-X1*
                - *5.1.3.1.1.System removes display of temporary Field-X1 and data held in that field is lost.*
            - *5.1.3.2. Request the lock back from User-B.*
                - *5.1.3.2.1.Return to step 3 of this scenario, replacing User-B with User-A and vice versa.*
            - *5.1.3.3. Wait until lock is released and reclaim's lock for editing on field-X*
                - *5.1.3.3.1.See steps in scenario 0 Lock Time Out, section 4.25.*
            - *5.1.3.4. Continue to edit field-X1.*
                - *5.1.3.4.1.The user will be able to continue editing in field-X1.*
                - *5.1.3.4.2.Return to step 5.1.3*
    - *5.2. User-A denies the lock request*
        - *5.2.1. User-A may continue editing (return to step 3 of scenario 0, Normal Change Case)*
        - *5.2.2. User-B is informed that the lock request has been denied.*
    - *5.3. User-A saves changes and relinquishes lock to User-B*
        - *5.3.1. The system saves the changes.*
        - *5.3.2. All users viewing field-X receive visual indication that field-x has changed.*
        - *5.3.3. The system locks the field for User-B*
        - *5.3.4. User-A, and all other users, receive visual indication that the field is locked.*
        - *5.3.5. User-B continues to modify (continue as User-A in step 4 of the normal change case).*
    - *5.4. User-A discards changes and relinquishes lock to User-B*
        - *5.4.1. The system discards all changes made by User-A.*
        - *5.4.2. User-A's view of Field-X is updated to reflect the last saved data.*
        - *5.4.3. The system locks the field for User-B*
        - *5.4.4. User-A, and all other users, receive visual indication that the field is locked.*
        - *5.4.5. User-B continues to modify (continue as User-A in step 4 of the normal change case).*

Creating new objects

A new object can be defined as either a new element to a list, which could be as simple as a text field, or as complex as one or multiple objects represented in a data model.

Add Object

1. User-A adds new Object-X.
2. If applicable, the system will prompt user for any required data necessary for the creation of Object-X (The system may also prompt for optional data as well.). User-A will comply or cancel.
    a. User-A Complies
        i. Continue to step 3.
    b. User-A Cancels
        i. No new object gets created. System removes prompt for required data.
3. The system creates Object-X. If object-X requires any additional objects to exist, the system creates those as well. The object(s) in question will have default values where required and will also be instantiated with the required data, if applicable, indicated by User-A.
4. All users viewing displays that are affected by new Object-X will immediately see the Object-X appear and it is visually indicated as modified to all users.

Removing existing objects

Remove Object

1. User-A indicates Object-X should be removed.
2. The system determines lock status of any data associated with Object-X (fields/attributes, children)
3. If **edits are being made** to Object-X or its associated data,
    3.1. If User-A **does not** have permission to take the lock(a) away
        3.1.1. The system alerts the user of the situation and does not remove Object-X
    3.2. If User-A **has** permission to request a lock
        3.2.1. If the User-A chooses not to take the locks away
            3.2.1.1. The object is not deleted and the views are not changed.
        3.2.2. If the User-A requests locks from other users holding locks on Object-X's associated data
            3.2.2.1. See scenario 0, **Request Lock**. All users who currently hold locks would need to comply with the request made by User-A.
                3.2.2.1.1. If users do not comply,
                    3.2.2.1.1.1. User-A is informed that the object cannot be removed.
                3.2.2.1.2. If users comply,
                    3.2.2.1.2.1. Continue to step 4.1
4. If **edits are not being made**,
    4.1. The system locks Object-X and all associated data/objects for User-A.
    4.2. The system determines what associated data also should be removed along with Object-X.

4.3. The system immediately deletes Object X and determined associated data/objects ready for removal.
4.4. Views of all users are updated to reflect that the object was removed.
4.5. Where possible, views should reflect the removal of the object and not just remove it.

Viewing changes

Opening a project

The idea of this concept is to allow users to just use the change history if they want to know what has changed since they last logged in (or any other defined amount of timing). Viewing visual change modification would then consist ONLY of changes made by users while viewing a project.

This approach will allow the visualizations to be established in a rule set more easily understood by users, but also allow for follow on spirals to be able to build upon this to develop a more intricate use of viewing change notifications for users between sessions as well.

1. User-A opens COA Sketch.
2. User-A opens an existing project within COA Sketch
3. The system determines User-A preferences for viewing existing changes.
4. If ability to view change notifications is disabled, do nothing.
5. The system will display all data changes made to user-A for the data required for requested views open during the session.

Mark as Viewed

If time does not permit for implementation, this functionality may be slated for future spirals.

1.The "normal change case", "Remove Object", or "Add object" scenario has occurred and some object or Field is being displayed as "new" or "changed" or "deleted".
2.User-B selects the data and marks it as "viewed".
3.The system displays the data as "no longer new", "no longer newly changed", or removes the "deleted" indicator.

Mark all data in a View as "viewed"

1. The "normal change case", "Remove Object", or "Add object" scenario has occurred and some object or Field is being displayed as "new" or "changed" or "deleted" within a view.
2. Step one may have occurred multiple times, so that at least 1 or more changes are indicated by the system to User-B in the same view.
3. User-B indicates that all change notifications for that view be reset.

4. System sets all data within view as “viewed”, thereby removing the visual change notifications from that view. All other views in which the data is displayed will also have the visual change notifications removed.

Mark all project data as viewed

1.The “normal change case”, “Remove Object”, or “Add object” scenario has occurred and some object or Field is being displayed as “new” or “changed” or “deleted”.
2.Step one may have occurred multiple times, so that at least 1 or more changes are indicated by the system to User-B.
3.User-B indicates that all change notifications for the project be reset.
4.System sets all “newly changed” and “new” objects as “viewed” for User-B. System removes all references to deleted items for User-B.

Viewing and closing or “touching” marks as “viewed”

1. The “normal change case”, “Remove Object”, or “Add object” scenario has occurred and some object or Field is being displayed as “new” or “changed” or “deleted”.
2. User-B Selects to view data that is marked as “New”, “newly changed”, or “deleted”.
3. If the data is marked as “new” or “newly changed”, it becomes marked as “viewed” If the indication is that the field is “deleted”, then the indication will disappear when unselected.

Undo/Redo scenarios

It has been determined that there is a need for a user to keep their own redo/undo stacks in place instead of only keeping track of this data via one huge history of actions that can be reverted. First off, a user having an “undo” button that could undo the last action made by ANY team member seems dangerous. If User-A makes a change that they wish to undo, but User-B makes several changes after User-A’s last change, then User-A could potentially and mistakenly undo all changes made by User-B! There is still a need for a collaborative reverting functionality and also to hash out particulars of undo/redo stacks where other users could make changes and invalidate the undo/redo stack.

Undo/redo information is captured on a per client session basis. Other potential options include a per view basis, providing an infinite stack of undo/redo maintained by the server, or providing a finite number of undo/redo actions to be available.

Undo Action.

User has made a change that he/she wishes to undo. The user will only want to undo his changes made and will not via this capability have the ability to undo someone else’s changes. In this scenario, the client will keep track of all of the user’s changes/additions/removals in an undo stack. The Client will determine other user’s actions that affect data on this stack so that the user wishing to “undo” will have the ability to determine what changes should be kept.

1. User-A has made a change or performed an action that can be undone. (see Normal change Scenario)
2. User-A selects to undo the last made change.
3. System will retrieve the lock for User-A for the field or fields affected by the action.
4. If the system retrieves the lock (see normal change case for not receiving the lock), then all users currently viewing the locked field(s) will receive an indication that the field is locked.
5. System will determine if the field or fields have been modified by other users.
    a. (most likely case)The Field(s) have not been modified by other users.
        i. The system performs the changes to the field(s).
        ii. The system saves these changes back to the project history.
        iii. All users currently viewing the field will see that the field has changed.
        iv. The change/action is moved from User-A's undo stack to the redo stack.
    b. The Field(s) have been modified by other users.
        i. The system informs User-A that another user has modified the field.
        ii. The system directs user to the change history in order to utilize the revert functionality.
        iii. *The change/action is removed from the undo stack.*
6. The system releases User-A's lock on the field(s).
7. If the Undo stack is empty, the system will remove the ability to undo from user-A
8. If the redo capability is not available and the redo stack is not empty, the system will provide User-A with the ability to redo.

Redo Action.

1. User A's last action was to undo a change or changes.
2. User A wishes to redo an action that was undone.
3. System will retrieve the lock for User-A for the field or fields affected by the action.
4. If the system retrieves the lock (see normal change case for not receiving the lock), then all users currently viewing the locked field(s) will receive an indication that the field is locked.
5. System will determine if the field or fields have been modified by other users.
    a. The field(s) has not been modified by other users.
        i. The system performs the changes to the field(s).
        ii. The system saves these changes back to the project history.
        iii. All users currently viewing the field will see that the field has changed.
        iv. The change/action is removed from User-A's redo stack is now added to the undo stack.
    b. The Field(s) have been modified by other users.
        i. The system informs User-A that another user has modified the field.
        ii. The system directs user to the change history in order to utilize the revert functionality.
        iii. *The change/action is removed from the redo stack.*
6. The system releases User-A's lock on the field(s).
7. If the redo stack is empty, the system will remove the ability to redo from User-A

8. System will determine if the undo stack is empty. If it is empty, the system will disable the undo capability.

Reverting Collaborative changes Scenarios

These scenarios involve reverting changes potentially made by one or more users, not necessarily made by the User performing the action in the scenario.

One item to consider would be how far back change history data is captured. There is a potential for a lot of data to be captured if we are dealing with keeping track of every object/attribute creation, modification, and deletion for every project. To handle this potential problem, we need to provide an administrator the ability to clear the change history.

Restore a Removed Object

Since all removed objects allow for a visual indication that the object has been removed, it provides a "special-case" scenario where the removed object can be brought back via the visual cue that it had been removed.

1. User-A receives a visual indication that Element-A has been removed.
2. User-A indicates that Element-A should be re-added back to the project.
3. The system restores Element-A.
4. Element-A will appear as no longer deleted, but as "modified" by all other users who are capable of viewing it.

View Change History/Revert due to Change History for a field

1. User-A selects a field and indicates to view change history of that field.
2. System displays a list of changes, organized by time and by the user associated with the change
3. User-A may select an item from the list of changes or close the display.
    a. User-A closes the display.
        i. The system closes the display.
    b. User-A selects an item.
        i. User-A indicates that the field be reverted to the selected item.
        ii. The system locks the field for User-A. (If lock is not attainable, then no action will take place – user will be notified)
        iii. The system will revert the changes to the selected item.
        iv. The system releases the lock for the field.
        v. All users viewing the field will be notified of the modification.
        vi. The display is updated to now include the new change by User-A.
        vii. User-A repeats step 3b.

View change history/Revert changes due to Change History for selected fields, element, element type, view, or project.

Note: "**Element type**" includes allowing the user to view changes for a specific type of object. For example, the user may want to see all the changes made to Facts or to COA 1. An **element** is anything that is displayed on a view that can represent different types of

information. For example, selecting an Operational Objective on the Sketch or Synchronization view is selecting all fields represented by that OO, maybe including its children. It includes multiple fields/attributes, maybe even multiple objects. This also allows for viewing deleted items.

1. User-A selects one of the following: individual fields, an element representing multiple fields (an object), an element type, indicates a view, or wishes to view ALL project data changes.
2. The system determines all of the fields involved with the selected fields, element, element type, or view. If viewing all project changes, the system will display a view of the change history for the project, ordered by timing, also displaying the name of the object, the field changed, the user responsible for the change, and the actual change.
3. The system displays a list, arranged by time (default), which includes the name of the field, the change, and the user who performed the change.
4. The user may do one of the following:
    a. User-A changes a field:
        i. User-A selects an item in the displayed list and indicates that the field be reverted.
        ii. The system locks the fields required to revert the changes requested. (If lock is not attainable, then no action will take place – user will be notified. Also see scenario 0, Request a lock)
        iii. The system reverts the field to the selected change. Users viewing the fields will have visual indication that the field has updated.
        iv. The system updates the displayed list to include the latest change by User-A
        v. Return to step 5 or continue to step 6.
    b. User-A reverts selected data to a specific time:
        i. User-A selects item representing the last change made that he/she wishes to keep.
        ii. User-A indicates to revert all changes in time made after the selected item.
        iii. The system locks the fields required to revert the changes requested. (If lock is not attainable, then no action will take place – user will be notified, also see scenario 0, Request a lock)
        iv. The system complies. The users viewing the fields will have visual indication that the field(s) was updated.
        v. The system updates the displayed list to include the latest changes by User-A. The system releases locks on this data.
        vi. Return to step 4 or continue to step 5.
5. User-A closes the display.

User filters change history view.

This functionality may be slated for future spirals.

In order to provide users with multiple ways to search through change history, the system will allow for the filtering of the data displayed in the change history view by timing, user responsible for the change, data element, element type, or data field that displayed changes in the change history view.

Collaborative Data-Level Permissions

This functionality may be slated for future spirals.
"Collaborative Data-Level Permissions", for the purpose of this document, has a purpose of locking and hiding specific project data until the data is available to share out with the rest of the team or users with roles allowing access to the project. The locking will be expanded to include editing (or "write access") to specific data within a project for an individual or group of individuals. The system will also provide the hide/show (or read-only access) to users, designated by someone who has write access to that data. The purpose of this is to allow work to be done by a single individual or by a team of users collaboratively without sharing unfinished work to others who are working outside of the process.

Snapshots

This functionality may be slated for future spirals.
The purpose of this functionality is to allow the user to take a picture, or "snapshot" of a view or group of views. This will allow users to capture information and data as it was, before it was modified and before the view was changed. Capturing this information will aid users in briefing as well as quickly viewing historical data.

Some proposed implementation methods of this include something as simple as capturing images of the views to the more complicated capability of being able of using the change history to revert a view to display data captured at a time in the past.

Reviewing/Mitigation

This functionality may be slated for future spirals.
Holding off until further clarifications from SMEs on what the requirements are elicited.

Workflow Use Cases

Use Case 5.1: Add Workflow Step

User Story / Context of Use:

- The workflow view provides a list of steps needed to complete a COA. Each workflow step will have an associated checklist of actions to complete and a percentage complete (of all actions items for the workflow step). A default workflow will appear in the workflow view.
- The User may need to add an intermediate step to the workflow to increase the level of detail or accuracy in the workflow to facilitate strategic planning.
- The user may add checklist items to the workflow step see Use Case 5.4 Edit Checklist- Add action item.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: All Users
Supporting Actors: COA Sketch
Preconditions:

- A project is open in COA Sketch and Workflow view is active.

Triggers: The User would like to add a workflow step.
Guarantees:

- New workflow step appears with correct name, position and % complete.
- The % complete will default to 0%.

Main Success Scenario:

1. The user indicates that they would like to add a workflow step.
2. The system requests workflow step information (workflow name, location and % complete).
3. The user enters the new workflow step information.
4. The system displays the newly added workflow step.

Alternative 1: The User Cancels add workflow step

1. The user indicates that they would like to add a workflow step.
2. The system requests workflow step information (workflow name, location and % complete).
3. The user indicates that they would like to cancel this action.
4. The system returns to the workflow view and it is unchanged.

Requirements:

Use Case 5.2: Remove Workflow Step

User Story / Context of Use:

- User might need to remove a step from the workflow because it is no longer needed or does not apply to the current COA.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: All Users

Supporting Actors: COA Sketch
Preconditions:

- A plan is open in COA Sketch and Workflow view is active.

Triggers: The User would like to remove workflow step.
Guarantees:

- Workflow step and associated check list is removed.
- The workflow step is not removed if user does not confirm the action.

Main Success Scenario:

1. The user selects a workflow step and indicates they would like to remove it.
2. The system prompts for confirmation that the user would like to remove the workflow step and the associated checklist.
3. The user confirms.
4. The system removes the workflow step.

Alternative 1: Cancel Workflow Remove.

1. The user selects a workflow step and indicates they would like to remove it.
2. The system prompts for confirmation that the user would like to remove the workflow step and the associated checklist.
3. The user indicates that they would not like to remove the workflow step.
4. The system returns to the Workflow view unchanged.

Requirements:

Use Case 5.3: Edit Workflow Step

User Story / Context of Use:

- User may need to edit workflow step to better describe the workflow. The user may change the name, position or % complete of the workflow step.
- The system will calculate a % complete for the workflow step based on the completion status of items in the checklist, however, this may not accurately reflect the user's perception of the % complete, so the user may change that percentage manually.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: All Users
Supporting Actors: COA Sketch
Preconditions:

- A plan is open in COA Sketch and Workflow view is active.

Triggers: The User would like to change an attribute of the workflow step.
Guarantees:

- The name, position and/or percentage complete of the workflow step is correctly modified.
- The name, position and/or percentage complete of the workflow step is unaltered if the user decides not to edit Workflow step.

Main Success Scenario:

1. The user indicates that they would like to edit the workflow step.
2. The system requests input for workflow name, position and percentage complete.

3. The user indicates desired changes to workflow name, position and percentage complete.
4. The system displays the workflow step with the correct workflow name, position and percentage complete.

Alternative 1: Cancel Edit Workflow

1. The user indicates that they would like to edit the workflow step.
2. The system requests input on workflow name and position.
3. The user decides to keep previous settings and indicates they would like to cancel action.
4. The system displays the workflow step as it was previously.

Requirements:

Use Case 5.4: Edit Checklist: Add Action Item

User Story / Context of Use:

- Each workflow step will have an associated checklist with specific action items. The User may need to add an action item to the default checklist, to better reflect the COA creation process.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: All Users
Supporting Actors: COA Sketch
Preconditions:

- A plan is open in COA Sketch and Workflow view is active.

Triggers: The User would like to add an action item to the checklist for a particular workflow step.
Guarantees:

- New action item appears for selected workflow step with correct name, position, status and percentage complete and a comment if applicable.
- The completion state of an action item may be one of the following: not started, started, complete (waiting approval), (requires) rework, approved, and not applicable.
- The default completion state will be not started.
- The default percentage complete will be 0%.

- New action item is not added if request is cancelled.

Main Success Scenario:

1. The user indicates that they would like to add an action item to the checklist.
2. The system requests the name, position, status, percentage complete and comment for the action item.
3. The user supplies the requested information.
4. The system displays the checklist with the new action item on the checklist.

Alternative 1: Cancel Add Action Item

1. The user indicates that they would like to add an action item to the checklist.
2. The system requests the name, position, status, percentage complete and comment of the action item.

3. The user decides not to add new action item and indicates they would like to cancel action.
4. The system displays the checklist as it was previously displayed.

Requirements:

Use Case 5.5: Edit Checklist: Remove Action Item

User Story / Context of Use:

- User may want to remove an Action Item from the list if it does not apply to the current plan.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: All Users
Supporting Actors: COA Sketch
Preconditions:

- A plan is open in COA Sketch and Workflow view is active.

Triggers: The User would like to remove an action item from the checklist.
Guarantees:

- The action item is removed from the checklist.

Main Success Scenario:

1. The user selects an action item and indicates that they would like to remove the selected action item from the checklist.
2. The system asks the user if they are sure.
3. The user confirms.
4. The system removes the item from the checklist and presents checklist without the specified action item.

Alternative 1: User Cancels Remove Item from Checklist

1. The user selects an action item and indicates that they would like to remove the selected action item from the checklist.
2. The system asks the user if they are sure.
3. The user does not confirm.
4. The system presents checklist as it was previously.

Requirements:

Use Case 5.6: Edit Checklist: Edit Action Item

User Story / Context of Use:

- User may need to edit checklist action item to better describe the workflow. The user may change the name, position, status, percentage complete or the comment of the checklist action item.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: All Users
Supporting Actors: COA Sketch
Preconditions:

- A plan is open in COA Sketch and Workflow view is active.

Triggers: The User would like to change an action item name or action item position in the checklist.

Guarantees:

- Action item appears for selected workflow step with correct name, position, status, percentage complete and comments of the checklist action item.

Main Success Scenario:

1. The user indicates that they would like to edit an action item**.**
2. The system opens the action item for editing.
3. The user changes one or more of the following: name, position, status, percentage complete and comments.
4. The system returns to the checklist and the desired changes are reflected.

Alternative 1: Cancel Edit Action Item

1. The user indicates that they would like to edit an action item**.**
2. The system opens the action item for editing.
3. The user makes changes and changes their mind, cancels action.
4. The system returns to the checklist and the checklist is unchanged.

Requirements:

Use Case 5.7: Change Action Item Status

User Story / Context of Use:

- Strategy planners can change the completion status for an action item at any time. They can choose a completion state, percent complete and add a comment as to the state of their work.
- The user may change their completion state of an action item to one of the following: The completion state of an action item may be one of the following: not started, started, complete (waiting approval), (requires) rework, approved, and not applicable.
- When an Action Items is marked as Complete, the work done needs to be approved. When the work is reviewed, the reviewer may choose to accept (approved) or reject (rework) the work .

Scope: User to COA Sketch Interaction

Level: User Goal

Primary Actor: All Users

Supporting Actors: COA Sketch

Preconditions:

- A plan is open in COA Sketch and Workflow view is active.

Triggers: The User would like to change the status of an action item.

Guarantees:

- The user may change their completion state of an action item to one of the following: not started, started, complete (waiting approval), (requires) rework, approved, and not applicable.
- The user may indicate a percent completion.

- If no percentage complete is indicated the default will be 0% for not started, 25% for started, 90% for complete, 75% for rework, 100% for approved and not applicable will not have a value for percentage complete.
- The user may add a comment to the action item.
- Only users with privileges can accept or reject a step.

Main Success Scenario:

1. The user selects an action item and indicates that they would like to change the status of that action item.
2. The system presents the action item status.
3. The user makes changes to the action item status (completion state, percent completion and comment) and confirms actions.
4. The system returns to the action item checklist and retains new settings.

Alternative 1: Cancel Change Action Item Status

1. The user selects an action item and indicates that they would like to change the status of that action item.
2. The system presents the action item status.
3. The user makes changes to the action item status (completion state, percent completion and comment) and indicates that they would not like to keep those changes.
4. The system returns to the action item checklist and retains original settings.

Requirements:

Use Case 5.8: View Checklist Status Breakdown

User Story / Context of Use:

- At any time, a superior or strategy planner may want to know what the status is of the planning process. They can view the completion status of the checklist. If more information is desired, the Action Item can be expanded to show each action item's completion status, percentage complete and comments.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: All Users
Supporting Actors: COA Sketch
Preconditions:

- A plan is open in COA Sketch and Workflow view is active.

Triggers: The User would like to view the details of the checklist.
Guarantees: The system will present the completion state, percent complete and any comments of all action items in the checklist.

Main Success Scenario:

1. The user requests action item status breakdown. The user selects the checklist that the user would like to see the breakdown of.
2. The system presents all of the action items with their completion state, percent complete and any comments associated with each action item.
3. The user indicates they have completed viewing.
4. The system returns to the checklist.

Alternative 1:

Requirements:

Administrative Use Cases

Use Case 16.1: User logs onto system

User Story / Context of Use:

- In order to assure security, the team members require each individual to have access depending upon their role within the COA and Allocation process. This will allow COA Sketch to ensure that each member has read and write access to the pieces and parts of the planning process in which they are involved.
  Scope: User to COA Sketch Interaction
  Level: User Goal
  Primary Actor: All Users
  Supporting Actors: COA Sketch
  Preconditions: User has an account on the COA Sketch system
  Triggers: The user needs to use the COA Sketch tool.
  Guarantees:
- With the correct username and password, user will be able to log onto the system.
  Main Success Scenario:
  1. User opens COA Sketch (in Internet Explorer).
  2. The system displays the login dialog.
  3. The User enters username/password and selects the log-in button.
  4. The browser submits the data securely to the system which will check the credentials and return whether the user can get access to the system or not.
  5. In the case that the user is allowed to access the system, the browser would load the COA Sketch default view.

  Alternative 1:
  4. The browser submits the data securely to the system which will check the credentials and return whether the user can get access to the system or not.
  5. In the case that the user isn't allowed to access the system, the browser would re-load the log-in screen, assuming that the user entered his username/password wrong. (Return to step 2)

  Requirements:
  - COA Sketch shall ensure that each member has read and write access to the pieces and parts of the planning process in which they are involved.
  - The system shall allow users with appropriate privileges to logon to the system

Use Case 16.2: User logs off from the system

User Story / Context of Use:

- In order to assure security, the team members need to be able to log off when their work is done.
  Scope: User to COA Sketch Interaction
  Level: User Goal
  Primary Actor: All Users
  Supporting Actors: COA Sketch

Preconditions: User has an account on the COA Sketch system
Triggers: The user wants to stop using the COA Sketch tool.
Guarantees:

- Any user that is logged in can log out.

Main Success Scenario:

1. User selects the "Log Out" option from the COA Sketch menu.
2. The system logs the user off and displays the login-screen so that another user can log in.

Alternative 1:

1. User clicks the "X" (Windows) close box in the upper right-hand corner of the window
2. User reboots from start menu
3. Task manager
4. Control-alt-delete
5. Close laptop
6. Lost power

Requirements:

- The system shall allow the user to logoff without shutting down the program.

Use Case 16.3: Open Administrative View

User Story / Context of Use:

- The Administrators of the system will require a way to have access to and to review different user accounts and administrative tasks. This view enables viewing/adding/editing/deleting Users, Locations and Internationalizations with their Icon-sets. The non-admin users can only access the Internationalizations and Icon-sets.

Scope: User to COA Sketch Interaction
Level: User Level
Primary Actor: Administrator
Supporting Actors: COA Sketch
Preconditions: COA Sketch is open

- The administrator is successfully logged in

Triggers: The Administrator would like to view the summary of tasks or review user account information
Guarantees:

- The Administrator will have access to all the administrative tasks by viewing this summary.
- The Administrator will have access to view existing user account information by viewing this summary.

Main Success Scenario:

1. The Administrator selects to open the Administrative View through COA Sketch.
2. The system displays the view, allowing the Administrators to manage locations, Internationalizations or Icons, and users.

Alternative 1:
Requirements:

- The system shall provide a separate, protected view for administration of the tool.

Use Case 16.4: Create new location

User Story / Context of Use:

- Administrators need to be able to create locations before adding new users.
- The location is needed to determine the default set of icons and which internationalization COA Sketch will be using.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Administrator
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- The Administrative View is open
- The administrator is successfully logged in

Triggers: The Administrator needs to create a new account for a team member or individual, or assign a different location to an existing user. The location must exist before it can be added to user accounts.
Guarantees:

- The Administrator will be able to create new locations.
- Following information needs to be collected:
    1. Enter Name of the location
    2. Enter latitude/longitude (or choose from the map by drawing a shape on the map view)
    3. Choose Internationalization (us-AF, us-NAVY, us-ARMY…) from a list

Main Success Scenario:

1. The Administrator has opened the Administrative View and selected to create a new Location.
2. The system displays the "Create new Location View" and allows the Administrator to create a new Location.

Alternative 1:

1. The Administrator has opened the Administrative View and chosen to create a new Location based on an existing one.
2. The system displays the "Create new Location View" and populates it with data from the existing Location.
3. The Administrator modifies the form and saves the Location under a new name.
4. The system verifies that the name is not in use and stores the Location under the given name.

Alternative 2:

1. The Administrator has opened the Administrative View and chosen to create a new Location based on an existing one.
2. The system displays the "Create new Location View" and populates it with data from the existing Location.
3. The Administrator modifies the form and saves the Location under a new name.
4. The system verification fails because the Location with that name exists already, and the system displays the error message to the Administrator.
5. The Administrator can choose to discard his changes or save the Location under a new name.

6. System repeats step 4 and tries to save the Location, or alerts the user that the name already exists.

Alternative 3:

1. The Administrator has opened the Administrative View and chosen to create a new Location based on an existing one.
2. The system displays the "Create new Location View" and populates it with data from the existing Location.
3. The Administrator modifies the form and saves the Location under a new name.
4. The system verification fails because the Location with that Latitude/Longitude exists already (or the lat/long is within close proximity to an existing location), and the system displays the error message to the Administrator.
5. The Administrator can choose to discard his changes or modify the longitude/latitude information.
6. System repeats step 4 and tries to save the Location, or alerts the user that the name already exists.

Alternative 4:

1. The Administrator has opened the Administrative View and chosen to create a new Location based on an existing one.
2. The system displays the "Create new Location View" and populates it with data from the existing Location.
3. The Administrator modifies the form and saves the Location under a new name.
4. The system verification fails because the Location with that Latitude/Longitude exists already (or the lat/long is within close proximity to an existing location), and the system displays the error message to the Administrator.
5. The Administrator can choose to disregard the system alert and save the location anyway, even though the coordinates are almost identical.
6. System stores the new location under the given name, or prompts user for a new name if a location with that name already exists.

Requirements:

- The system shall provide the administrator with an option to create a new location.

Use Case 16.5: View/Modify/Delete existing location

User Story / Context of Use:

- Administrators need to be able to see a list of already specified locations so that the locations can be modified or deleted.
- Administrators need to be able to modify an existing location to use a different internationalization (wording of dialogs, objects, etc.) and/or a different set of icons. They also might want to set a location as the new "default" that will be pre-selected when creating new users.
- Administrators might need to delete a location that is no longer useful.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Administrator
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- The Administrative View is open
- The administrator is successfully logged in.

Triggers: The Administrator wishes to view/modify/delete existing locations.

Guarantees:

- The Administrator will be able to view/modify/delete a location.

Main Success Scenario:

1. The Administrator has opened the Administrative View and selected to view the existing locations.
2. The system shows the "Display Location View".

Alternative 1:

2. The Administrator is viewing a location and chooses to modify it.
3. The system shows the "Edit Location View" and allows the Administrator to modify the settings and save the changes.

Alternative 2:

2. The Administrator is viewing a Location and decides to delete it.
3. The system will display a confirmation prompt to the user.
4. The Administrator chooses to confirm the Location deletion.
5. The system deletes the Location and returns to the "Display Locations View"

Alternative 3:

2. The Administrator is viewing a Location and decides to delete it.
3. The system will display a confirmation prompt to the user.
4. The Administrator chooses not to delete the location.
5. The system returns to the "Display Locations View" without deleting anything.

Requirements:

- The system shall allow the user to view, modify, or delete locations.

Use Case 16.6: Create new user account

User Story / Context of Use:

- Throughout the COA and Allocation process, new individuals with specific skills may need to be added to the team. Also, some members of the staff may be required to oversee or review what is going on throughout the planning process or see the end products (i.e. The COA brief or the Allocation Plan). The Administrator requires the ability to set up roles with specific privileges when authorizing these accounts. These roles guarantee that each individual would have the access they are required to have.

Scope: User to COA Sketch Interaction

Level: User Goal

Primary Actor: Administrator

Supporting Actors: COA Sketch

Preconditions:

- COA Sketch is open.
- The Administrative View is open
- The administrator is successfully logged in

Triggers: The Administrator needs to create a new account for a team member or individual

Guarantees:

- The Administrator will be able to create new accounts for other individuals.

- The Administrator will be able to set up read and write privileges and assign roles to the individual.
- The Administrator will be able to set up default location and internationalization for the individual.
- Following information needs to be collected:
    1. Name
    2. Username
    3. Password
    4. Password Confirmation
    5. Rank
    6. Title/Job Position
    7. Email
    8. Email Confirmation
    9. Phone
    10. Command Location (see the Location use cases)
    11. Personal Internationalization (user preference)
    12. Personal Icon-set
    13. Role (Admin, User, View only?, others?)

Main Success Scenario:

1. The Administrator chooses to create a new User Account from the "User Management View"
2. The system displays a blank form where the Administrator can enter the user details.
3. The Administrator fills in the form and saves the changes.
4. The system stores the information and allows the new user access to COA Sketch based on the Administrator input.

Alternative 1:

2. The system fails to display the blank form.
3. System defaults to the Administrative View

Alternative 2:

3. The administrator does not have all of the required information
4. Administrator cancels User Management View

Alternative 3:

4. The system fails to store the information from the form

Requirements:

- The system shall allow the administrator to add new users.

Use Case 16.7: View/Modify/Delete user account

User Story / Context of Use:

- The Administrator will need to have a way to modify existing account information about each user. This will allow the Administrator the ability to update information or include information that was missing when the account was initially created.

- The Administrator might want to deactivate a user account for various reasons, while keeping the user's information.
- Users of the system are expected to have turnover rates in employment or may just have a change in duty and job requirements. Any accounts that are no longer active or the user no longer requires access to the system should be able to be removed easily from the system.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Administrator
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- The Administrative View is open
- The administrator is successfully logged in

Triggers: The Administrator needs to view/edit/delete an account for a team member or individual
Guarantees:

- The Administrator will be able to view user accounts.
- The Administrator will be able to edit read and write privileges and assign roles to the individual.
- The Administrator will be able to edit the default location and internationalization for the individual.
- The Administrator will be able to delete the user account.
- Administrator will successfully delete a user account from system.
- Individual will no longer have access to the system through the deleted account.
- The Administrator will be able to change the user passwords.

Main Success Scenario:

1. The Administrator chooses to view user accounts.
2. The system shows the "User Management View"
3. The Administrator chooses to view a specific user account or a group of users.
4. The system displays the information based on the Administrator's choice.

Alternative 1:

4. The Administrator is viewing a user account and wishes to make some modifications.
5. The system displays the user details in a way that can be modified and saved.
6. The Administrator enters the desired information and stores the changes.
7. The system saves the changes and displays the changed user information.

Alternative 2:

4. The Administrator is viewing user details and chooses to delete the user account.
5. The system displays a confirmation dialog.
6. The Administrator confirms deleting the user.
7. The system deletes the user account and displays the "User Management View"

Alternative 3:

4. The Administrator is viewing user details and chooses to delete the user account.
5. The system displays a confirmation dialog.
6. The Administrator chooses to abort the action.
7. The system remains in the user details view without deleting the user account.

Requirements:

- The system shall allow the administrator to view user accounts, modify user information, or delete user accounts

Use Case 16.8: Add new internationalization

User Story / Context of Use:

- Users of the system will be able to create new internationalization settings and assign new icon-sets.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: All Users
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- The user is successfully logged in.

Triggers: User is viewing his/her account preferences and decides to create new internationalization settings and/or icon-set.
Guarantees:

- COA Sketch will display the internationalization editor and allow the user to save the changes as a new set.
- The access rights are set when the new Internationalization is created:
    1. The creator might not want to have editing permission after creating it.
    2. Everyone could be allowed to edit the internationalization.
    3. Only the administrators could be allowed to make changes.
    4. Only specific users (usernames) are allowed to make changes.

Main Success Scenario:

1. The User chooses to add a new Internationalization to COA Sketch.
2. The system displays the list of currently available Internationalizations and prompts the user to select to either create a "blank" new one or to modify an existing one and store it as a new version.
3. The User chooses to create a new Internationalization.
4. The system loads a blank form for the Internationalization and allows the user to save the content, once all the required data is entered.

Alternative 1:

2. The system displays the list of currently available Internationalizations and prompts the user to select to either create a "blank" new one or to modify an existing one and store it as a new version.
3. The User chooses to create a new Internationalization based on an existing one.
4. The system loads the selected Internationalization and allows the user to make changes and store it as a new Internationalization.

Alternative 2:

2. The system displays the list of currently available Internationalizations and prompts the user to select to either create a "blank" new one or to modify an existing one and store it as a new version.

3. The User chooses to abort the operation
4. The system reverts to the previous user view.

Requirements:

- The system shall allow any user to add a new Internationalization.

Use Case 16.9: View/Modify/Delete internationalization details

User Story / Context of Use:

- Users of the system will be able to view/edit/delete the internationalization settings and/or their current icon-set.
- In some cases the internationalization might use different wording (or a completely different language) and the Users might want to look it up for a specific term.
- Authorized users of the system will be able to delete obsolete internationalization settings and/or icon-sets.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: All Users
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- The user is logged in.
- User must be authorized to edit the internationalization

Triggers: User decides to view his/her account preferences.
Guarantees:

- COA Sketch will display the internationalization editor and allow the user to save the changes.
- If users are depending on a deleted internationalization, they will be automatically using the default internationalization.
- Default internationalization is read-only and can not be deleted.

Main Success Scenario:

1. The User chooses to view the Internationalization details.
2. The system displays the list of various Internationalizations currently available.
3. The User chooses one of the options.
4. The system displays the Internationalization settings.

Alternative 1:

4. The user is viewing a list of Internationalization settings and decides to modify a setting.
5. The User chooses to edit the Internationalization within COA Sketch.
6. The system displays the list of currently available Internationalizations and prompts the user to select the Internationalization for editing.
7. The User chooses one of the available Internationalizations.
8. The system loads the selected Internationalization and allows the user to save the content, once all the required data is entered.

Alternative 2:

4. The User is viewing a list of Internationalizations through COA Sketch and decides to remove one of the displayed items.

5. The system verifies that the Internationalization is no longer needed and that the user is authorized to delete it.
6. The system deletes the Internationalization and associated icons.

Alternative 3:

4. The User is viewing a list of Internationalizations through COA Sketch and decides to remove one of the displayed items.
5. The system verifies that the Internationalization is no longer needed and that the user is authorized to delete it.
6. The system verifies that the Internationalization is no longer needed and that the user is authorized to delete it.
7. The system displays a meaningful error message with details why the Internationalization can not be removed.

Requirements:

- The system shall allow authorized users to view, modify, or delete Internationalizations associated with their own preferences.

Use Case 16.10: Change User Password

User Story / Context of Use:

- Users of the system will be able to change their own password.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: All Users
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- The user is logged in.

Triggers: User decides to change his/her password.
Guarantees:

- COA Sketch will display the user details and allow entering a new password and password confirmation.
- To avoid typos, the password needs to be entered twice.

Main Success Scenario:

1. The user chooses to change his password.
2. The system displays the user details in a fixed view and the two password fields that the user can edit.
3. The user edits the password and password confirmation.
4. The system compares the two passwords and if they are identical, it changes the user's password.

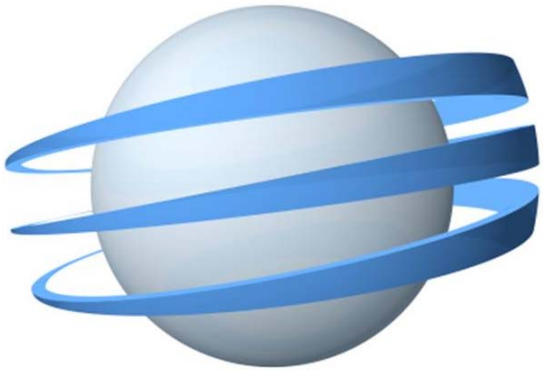
Alternative 1:

4. The system compares the two passwords and if they are not identical, it alerts the user, and prompts the user to re-enter the passwords (returns to step3)

Requirements:

- The system shall allow the authorized users to change their own passwords.

APPENDIX C – COA SKETCH USERS MANUAL



Course of Action (COA) Sketch
Software Users' Manual

Course of Action (COA) Sketch

Contract No. FA8650-04-C-6537

25 September 2009

Prepared by:
SRA International, Inc.
5000 Springfield St.
Suite 200
Dayton, OH 45431

Prepared for:
The Air Force Research Laboratory (AFRL)
Mr. Don Monk, AFRL 711 HPW/RHCP
2310 Eighth Street, Building 167
Wright Patterson AFB, OH 45433-7801

Table of Contents

Table of Figures

Scope

Identification

This document, Course of Action (COA) Sketch Software Users Manual (SUM), contains information necessary to operate the COA Sketch software. This SUM describes how campaign planners and analysts can plan and assess military operations using the COA Sketch capability modules.

This document is not intended to replace or supersede any Government Concept of Operations (CONOPS) or other guidelines and instructions. This document outlines one possible concept of how these modules can be used together to accomplish a variety of tasks typically performed by a planning staff operating at the operational level of war.

COA Sketch System Overview

The Course of Action (COA) Sketch application is comprised of several modules or views designed to aid Information Operations (IO) planning and in future enhancements, assessment. These modules include Sketch, Synchronization, Operations, Activities and Actions (OAA) Status, Lines of Effect (LOE), PEL Assessment, and Effect Status. Each view provides a specific perspective on plan data. COA Sketch provides the user the flexibility to choose appropriate views and lay them out in a manner which best supports their work.

COA Sketch is integrated into the Information Operations Planning Capability – Experiment (IOPC-X) database ontology which will ultimately allow data to be exchanged freely with other IOPC-X Capability Modules (CM). See **Error! Reference source not found.** for the deployment architecture.

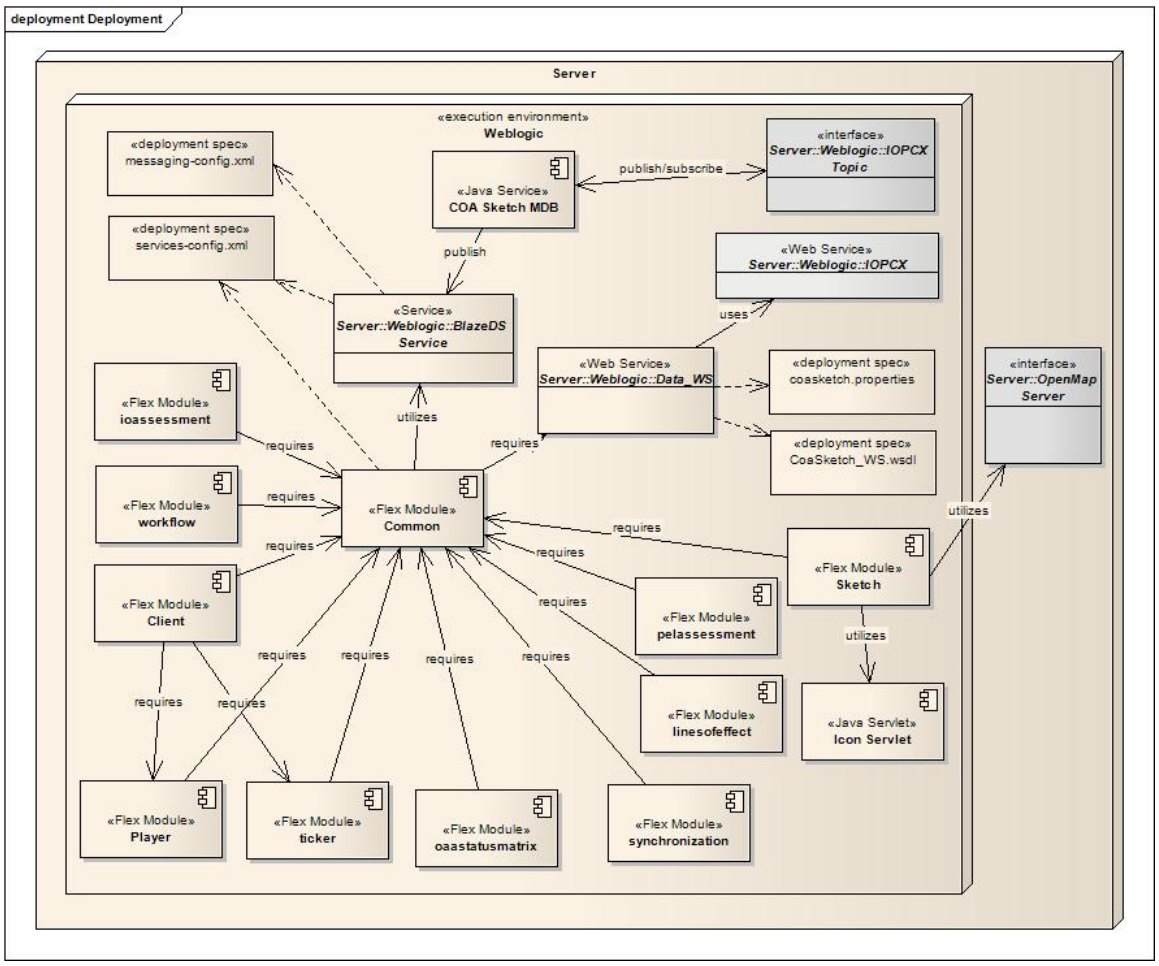


Figure C- 1. Deployment Overview

COA Sketch is being developed under the Strategy Planning Visualization Tool (SPVT) contract for the Air Force Research Laboratory (AFRL) Human Effectiveness Directorate (RH). Primary operational and technical direction for this task is provided by the JFCOM Engineering Staff Section (J7) IO Joint Management Office (JMO) and SPAWAR Systems Center, San Diego (SSC SD).

Document Overview

This document addresses the overall COA Sketch user interface and the various COA Sketch modules.

This SUM is designed to instruct users how to use the COA Sketch software from a day-to-day hands-on perspective. This document is organized as follows:

a. Section 1: Scope – states the purpose and focus of this SUM
b. Section 2: Referenced Documents – identifies other documents that are referenced throughout this document
c. Section 3: Software Summary – provides a detailed summary of the modules used in COA Sketch

d. Section 4: Access to the Software – details initial steps to install and access the software
e. Section 5: Processing Reference Guide – detailed description of how to use COA Sketch
f. Section 6: Future Enhancement – description of modules and capabilities partially implemented that are planned work to finish for COA Sketch.
g. Section 7: Notes
h. Appendix A: Acronyms and Terms

Referenced Documents

1. *IOPC-X SCOM.doc*, SRA International, Inc., Dayton, Ohio 45431
2. *COA Sketch Installation Guide.doc*, SRA International, Inc., Dayton, Ohio 45431
3. *GEMS-Final-Report-v1.0.doc*, Science Applications International Corporation, Beavercreek, Ohio 45431

Software Summary

This section identifies the specific modules that comprise COA Sketch and describes the individual modules at a high-level.

COA Sketch Capability Modules

COA Sketch is composed of the following modules:

- Workspace
- Synchronization
- Sketch
- Plan Player

Locking

COA Sketch is based upon being a collaborative tool. Some goals of this tool are to allow collaboration and modification of mission data at any level, without applying unwanted rule sets on the user. This functionality will hopefully aid the current planning process by providing more collaboration, more easily accessible and real-time data as it is being analyzed and determined.

Workspace

The COA Sketch Workspace provides a desktop where the operator will launch various modules. It provides a complete environment for interaction with the windowing system.

Synchronization

Synchronization module displays the relationships between multiple organizations, Courses of Actions, and other planning elements. Its temporal display communicates each element's overall contribution to the campaign.

Sketch

Sketch module provides the ability to develop plans using true geographic information. Users can associate areas on the map to Mission Analysis and Strategy elements to give more depth to their operations.

Plan Player

The Plan Player provides a means to view the plan as it goes through the Synchronization (Gantt chart) View and the Map Sketch View as the timing of different elements come into and out of focus.

Locking

COA Sketch is a collaborative tool. A goal of this tool is to allow collaboration and modification of mission data at any level, without applying unwanted rule sets on the user. To fulfill this requirement, COA Sketch has provided a locking mechanism that will allow the users to lock individual fields of elements as opposed to locking multiple pieces of data and associated data of the element being modified. By providing a fine-grained locking system, COA Sketch will aid the current planning process by providing more collaboration and more easily accessible and real-time data as it is being analyzed and determined.

Software Inventory

This paragraph has been tailored out.

Software Environment

This paragraph identifies the hardware, software, manual operations, and other resources needed for a user to run the software.

- Required Software:
  - The COA Sketch modules are integrated into Information Operations Planning Capability – Experiment (IOPC-X) and are deployed in the IOPC-X Server. Please refer to the IOPC-X Software Center Operator Manual (SCOM) for instructions describing the installation of the IOPC-X Server.
  - The COA Sketch client has been verified to work properly solely with the Internet Explorer 7 web browser (with Flash 9 or 10 installed). Avoid problems with other untested browsers by using Internet Explorer 7, since the system may not work properly on anything else.
- Other Facilities, Equipment, or Resources that Must Be Present: The IOPC-X Server must be installed on a Windows based system. COA Sketch requires access to the IOPC-X Server, which includes the Oracle Database and WebLogic Application Server. Specifics on the required resources are contained in the IOPC-X SCOM.

Software Organization and Overview of Approach

COA Sketch consists of several distinct modules accessed via a single Workspace. These modules are described individually as they relate to various processes associated with campaign planning and execution.

Contingencies and Alternate States and Modes of Operation

This paragraph has been tailored out.

Security and Privacy

Users may not make unauthorized copies of software or documents.

Assistance and Problem Reporting

If additional assistance is required after reviewing the COA Sketch SUM, contact the IOPC-X Program Office.

IOPC-X Program Office
AFRL/RHCP
2310 Eighth Street, Building 167
Wright Patterson AFB, OH 45433-7801
Commercial: (937) 255-8814
DSN: 785

Access to Software

Equipment Familiarization

This paragraph has been tailored out.

Access Control

Log on credentials; username and password are required to connect to the IOPC-X server. Users can not install the COA Sketch service without a valid account. These credentials will be provided by the IOPC-X Server administrator. The administrator will not only add users, but delete and change passwords when needed. Please see the installation guide for further information on installing COA Sketch and using the IOPC-X credentials.

Other than the control of the network in which COA Sketch service is installed, there is no access control in place for COA Sketch. Currently a user can log on to COA Sketch with a user name. The usernames are not controlled and are user-defined. There is currently no log on password required to use COA Sketch.

The COA Sketch client is accessible through a Uniform Resource Locator (URL) determined by your host location. Access to COA Sketch and associated modules are controlled via the host's accessibility.

Installation and Setup

Detailed installation and setup information of COA Sketch is addressed in COA Sketch Installation Guide.

Detailed installation and setup information of the IOPC-X Server is addressed in the IOPC-X SCOM.

Navigate to the Client

COA Sketch is a thin client application. The client is compliant with Internet Explorer 7 and requires Adobe Flash Player 9 or above.

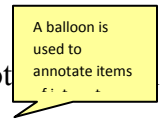
The COA Sketch client is accessible through a URL determined by your host location.
COA Sketch provides both Menu and Toolbar access to tool features and functionality. The icons used in both locations are the same. Icons in the toolbar are enabled or disabled depending upon support by the currently in-focus (selected) module. See Workspace Section, page C-15, for more details.

COA Sketch Reference Guide

This section provides the user with procedures for using the COA Sketch software. The use of the modules initiated from the COA Sketch Workspace is described in detail within this section.

Conventions

This section identifies text styles or diagram features that have special meaning in Section 5 of this document.



A callout is used to annot the display.

<directory pathname> Italicized text enclosed by angle brackets indicates a variable string. Replace the entire placeholder (including the brackets with the appropriate text.

Locking

Capabilities

This section describes the Locking feature of the COA Sketch software. The use of locking within COA Sketch is to prevent users from trying to edit the same element at the same time and causing the server to only accept one change. Since locking is controlled at a finer grained level than most applications, it requires some introduction as to what the different locking icons and procedures are and how they affect the user.

This locking capability allows the tool to save information immediately for all users to see. The data is saved for the user as the lock is released. Because of this, there is no need for a traditional 'save' or 'publish' capability as elements are saved automatically for the user.

Processing Procedures

Getting Started

If an element or some of the information owned by that element (i.e. a 'name' or 'description' field) is locked, an icon appears next to that item.

There are two icons, with a variation of each icon.

Solid black with a white border indicates if something is locked, but the current user does not own the lock.

Variation of this lock is a 25% transparency and this indicates some field associated to the element (like the 'name' field) is locked and the current user does not own the lock.

Solid black with a white border and a white clock on it indicates if something is locked and the current user owns the lock.

Variation of this lock is a 25% transparency and this indicates some field associated to the element (like the 'name' field) is locked and the current user owns the lock.

Locks are released within a form or window when the focus moves from the locked field. This can be accomplished by moving to a different field or selecting a different item. The user may also select a different module within the system. In most cases, a lock must be released before the user's modifications are saved.

Lock Alerts

The system allows a user to keep the lock on a field for 15 minutes. After the 15 minutes if no action is made the lock is released and a new user can lock the item for edits. The user will get an alert message after 10 minutes letting them know the lock will expire in 5 minutes. The user must renew the lock or release the lock before the lock expires or no changes will be saved.

Note: The locking timeout can be configured through IOPC-X.

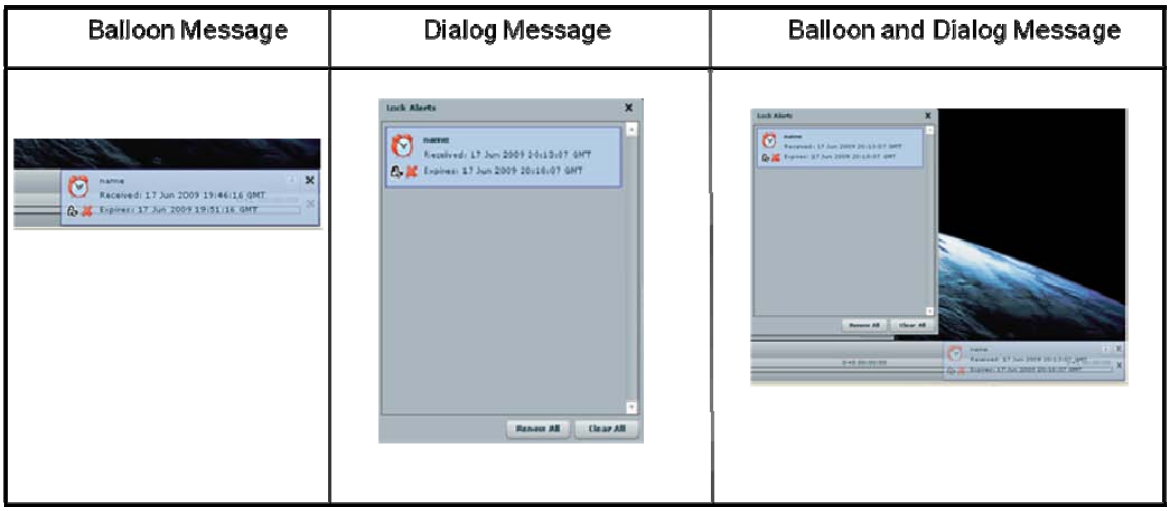


Figure C- 2. Lock Alerts

The alert message contains the following data:

- The name of the field that is locked
- The time the alert was sent to the user
- The time the lock will expire on the field

- A button allowing the user to renew the lock
- A button allowing the user to dismiss the lock alert

The Dialog message allows for a “Renew All” locks or “Clear All” alerts capability.

Setting Preferences

The user can set certain preferences on how the Locking Alerts are displayed. To set these preferences, select Preferences… under the View menu. Next, click on the Lock Alerts icon.

Figure C- 3. Lock Alerts Preferences

There are three choices for displaying the locking alerts.

- Alert Dialog –displays an Alert dialog box.
- Alert Balloon (Default) – displays a Balloon for a few seconds in the bottom right hand corner of the screen.
- Both – utilizes both the Dialog box and Balloon messaging.

Lock Alert Preferences are associated with the username entered upon login.

Workspace

Capabilities

The COA Sketch W orkspace provides a deskto p environment for the modules. It g ives the user the feel of a desktop application with the convenience of a thin cl ient web application. It is the central loc ation to aid Inf ormation Operation s (IO) planning and, in future enhancem ents, assessment for campaign planners and analysts.

Processing Procedures

The Workspace allows the user to create and manage operations. From within the Workspace, a user can view an operation in any combination of open modules. It also provides convenient windowing functions like minimize all, cascade, and tile.

Getting Started

The COA Sketch Workspace is accessible through a URL determined by your host location. See an IOPC-X System Administrator for more details. Once the COA Sketch Client URL has been loaded, and has entered the correct log on information a user can open an existing operation, create new operations, and view or manipulate the operation in any combination of COA Sketch modules.

Logging in to COA Sketch

Once the COA Sketch Client URL has been loaded the user will be prompted to enter a user name. User names may be any set of characters and are case-sensitive. If logging on for the first time, the user may choose his/her own username and type it in. The user designates him or her in the system by this username. The username is used by the system to track locking, preferences, as well as creation, deletion, and modification. Once logged on a user can open an existing operation or create new operations.

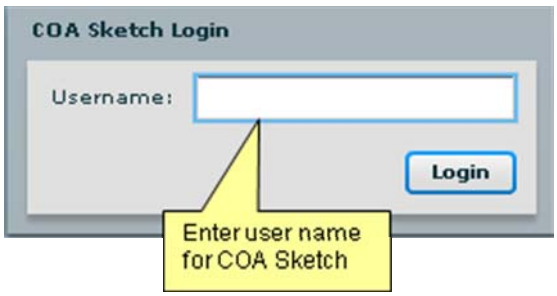


Figure C- 4. COA Sketch Log On

Note: There are no controls in place to ensure that a user has only one username, nor are there controls to ensure that a username is unique and not shared among different users. If a username is misspelled or uses different capitalization, a new user name will be created for the misspelled or incorrectly capitalized name.

Creating a New Operation

There are several ways to create a new operation:

- File menu
- Toolbar
- Operation Manager

File menu: Under the File menu, select New Operation…. See **Error! Reference source not found.**. A prompt will appear to name the new operation. Enter a name and click OK. The new operation will be opened automatically in the modules currently active in the Workspace and the Operation Editor will be displayed. See page C-22 for details on setting up the operation for use.

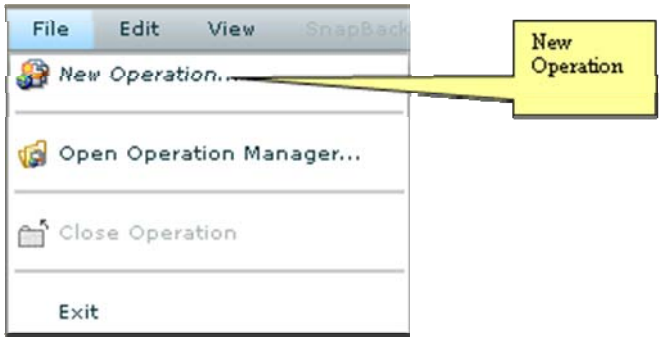


Figure C- 5. New Operation… File menu

Toolbar: Similarly, click the New Operation button on the Workspace Toolbar. See Figure C-6.

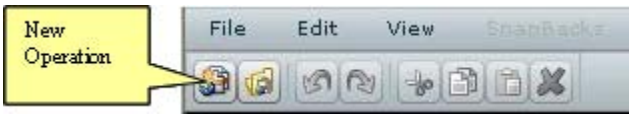


Figure C- 6. New Operation… Toolbar

Operation Manager: Under the File menu, select Open Operation Manager. From the Operation Manager you can also create a new operation by clicking the plus sign near the top of the manager. See Figure C-7.

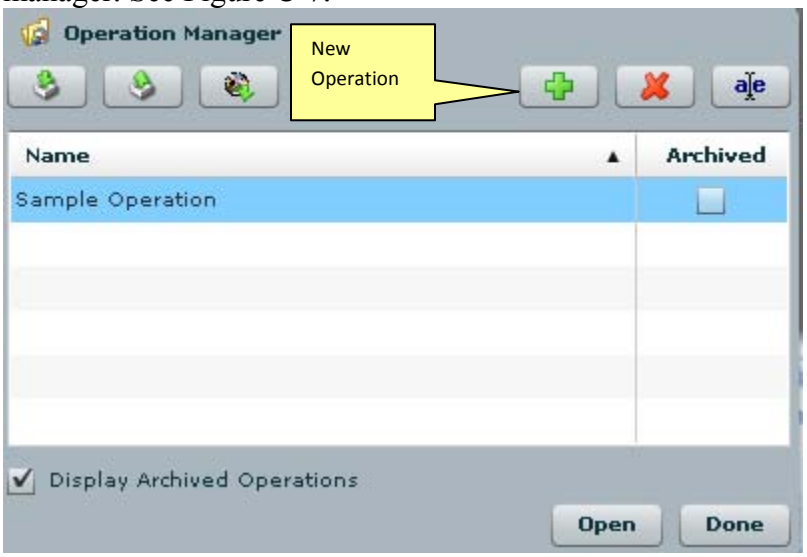


Figure C- 7. New Operation… Operation Manager

A prompt will appear for you to name the new operation. Enter a name and click OK. The Operation Manager does not automatically open the newly created operation; see page C-16 for further details on opening an operation.

Managing Operations

The Operation Manager allows the user to create, rename, delete, archive, and open operations. There are several ways to open the Operation Manager:

- File menu

- Toolbar

Under the File menu, select Open Operation Manager…

Figure C- 8. Open Operation Manager… File menu

Similarly, you can click the Open Operation Manager button on the Workspace Toolbar.

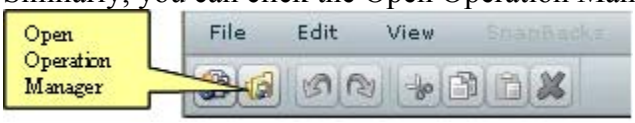


Figure C- 9. Open Operation Manager… Toolbar

To create a new operation in the manager, See page C-16.

Renaming or Deleting an Operation

To rename or delete an operation, select the operation in the table and click the appropriate button. See Figure C-10.When an operation is deleted it will be removed from the table and can no longer be opened.

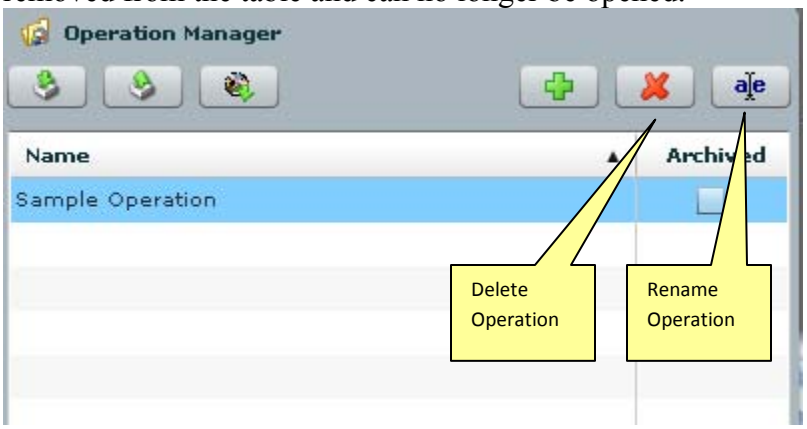


Figure C- 10. Rename/Delete Operation

Import/Export Operations

In the Operation Manager, a user can export an existing Operation to a file and can import an exported Operation or an IWPC 4.2 plan from file.

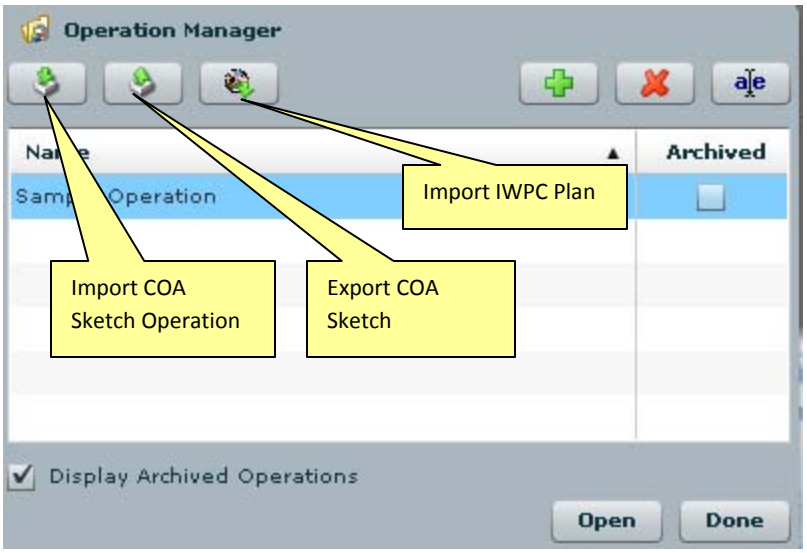


Figure C- 11. Import/Export Operations

Archiving an Operation

In the Operation Manager, a user can filter the list of displayed operations by choosing to hide operations that have been archived. See Figure C-12**.** for details. Currently, the archiving operations feature's only effect is if it is displayed in the list. No changes to the operation or how it is stored are made.

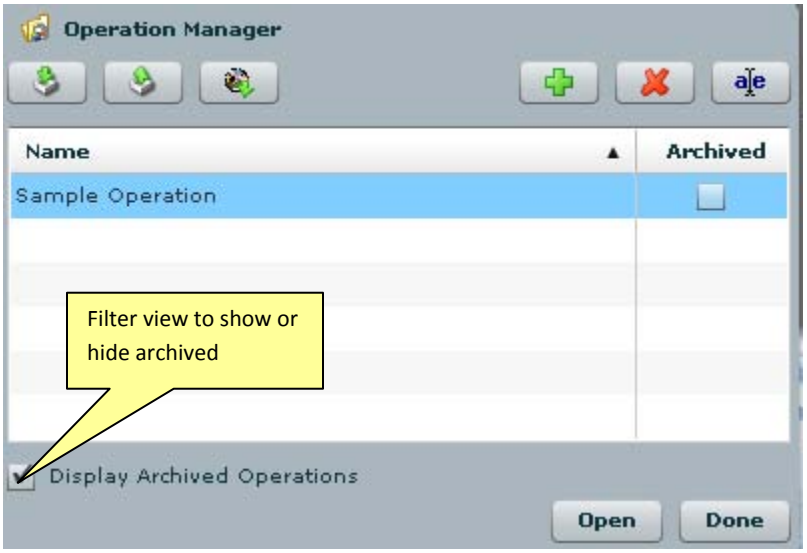


Figure C- 12. Archive Operations

Opening an Operation

To open an operation into the Workspace, select the operation in the table and either double click the operation or click the Open button. The Operation Manager will automatically close and the selected operation will be open in the modules currently active in the Workspace. Only one operation may be opened within a single instance of COA Sketch. If another operation was open, it will be closed before the selected operation is opened.

Opening a Module

From within the Workspace, there are several modules available to aid in IO planning and assessment. It is expected that different modules will be needed at different stages in the operation. To view a module, select it from the Module menu. The Workspace menus and toolbars adjust to contain the active module's items.

The Synchronization and Sketch modules are the fully implemented modules for this version of COA Sketch. All other modules listed are only partially implemented and planned work for future versions of the tool.

Note: The file menu updates as different modules are made active. The desired module view must be selected as the active module in order to see the module's menu.

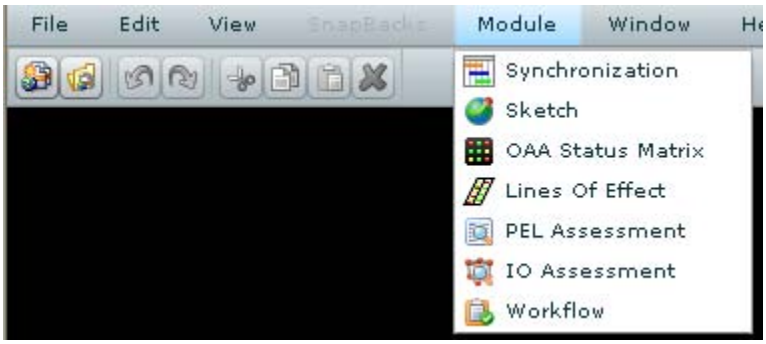


Figure C- 13. Module Menu

Once a module is selected, a window will open containing that module's view. The module will become the active module and be displayed on top of all other modules open. It will also be displayed as a module available in the status bar at the bottom of the COA Sketch desktop. Working in the Windowing System

Working in the Windowing System

Organizing Open Windows

Under the Window menu, there are several functions available to aid in organizing and accessing open modules and editors.

Cascade Windows stacks the windows on top of one another with each Title bar visible for selection by the user.

Tile Windows Horizontally lays out the windows to maximize the horizontal space available for each window.

Tile Windows Vertically lays out the windows to maximize the vertical space available for each window.

Minimize All shrinks all the open windows down onto the Module Bar at the bottom of the Workspace.

Restore All brings all the open windows from the Module Bar at the bottom of the Workspace back to their previous size and position.

Using the Task Bar

The Task Bar is located at the bottom of the windowing system and will appear above the Plan Player if the plan player is not hidden. The Task Bar will have a button available for every open Module and Editor. Clicking on the button will bring the Module or Editor in focus and in front of all other windows. The Task Bar also allows the user to hide or show all windows.

Figure C- 14. Task Bar

Setting Preferences

The user can set certain preferences on how the windowing system operates. To set these preferences, select Preferences… under the View menu. Next, click on the Desktop icon. See **Figure C-15**.

Figure C- 15. Desktop Preferences

Synchronization Module

Capabilities

Synchronization module displays the relationships between multiple organizations, courses of actions, and other planning elements. Its temporal display communicates each element's overall contribution to the campaign.

Processing Procedures

The Synchronization view displays text for mission analysis and plan artifacts in the left hand tree pane and in the right hand Gantt chart pane. Each element in the Gantt pane has the following attributes: timing, dependencies, constraints, and properties.

Getting Started

Setting up the Operation

In order to add items to the Synchronization module, the operation must be configured properly. When you create a new operation from the File menu or the toolbar button, the Operation editor is automatically displayed.

To manually display the Operation editor, select the Operation name in the tree pane of the Synchronization view and click the Edit Element button on the Synchronization toolbar. You may also right click on the Operation's name and choose "edit" from the drop down menu.

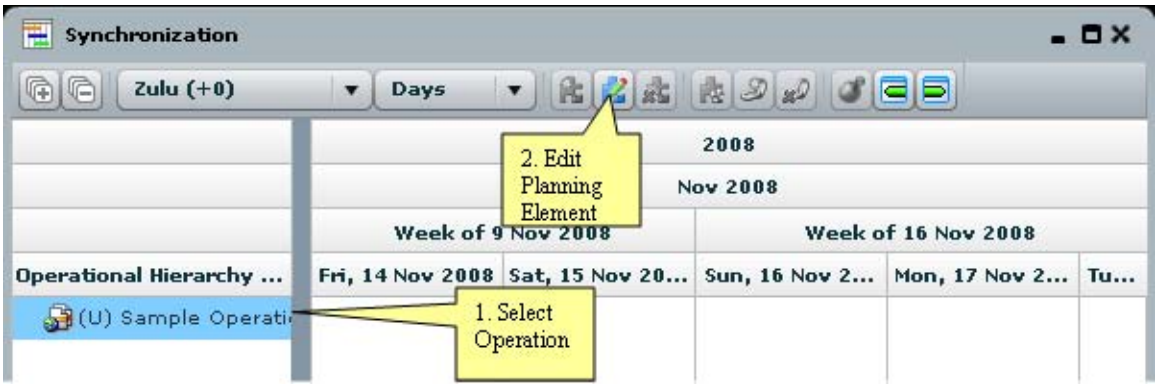


Figure C- 16. Edit Operation

Note: When you add a new Operation, default alpha days are also created.

- D-day will have an unspecified date and be the default for the Operation. The default day will be the automatic date referenced when new timing (phases or scheduled timing) gets created
- C-day will reference d-day with an offset of 0.
- M-Day will reference d-day with an offset of 0.

Alpha days can be updated in the Operation editor. See Section 0 for details on opening an element's editor.

On the Organizations tab of the Operation editor, click the plus button to add a new organization. With the organization highlighted, next click the Edit Organization button so that you can add a Planning Template in the Organization editor. See the following Figure C-17.

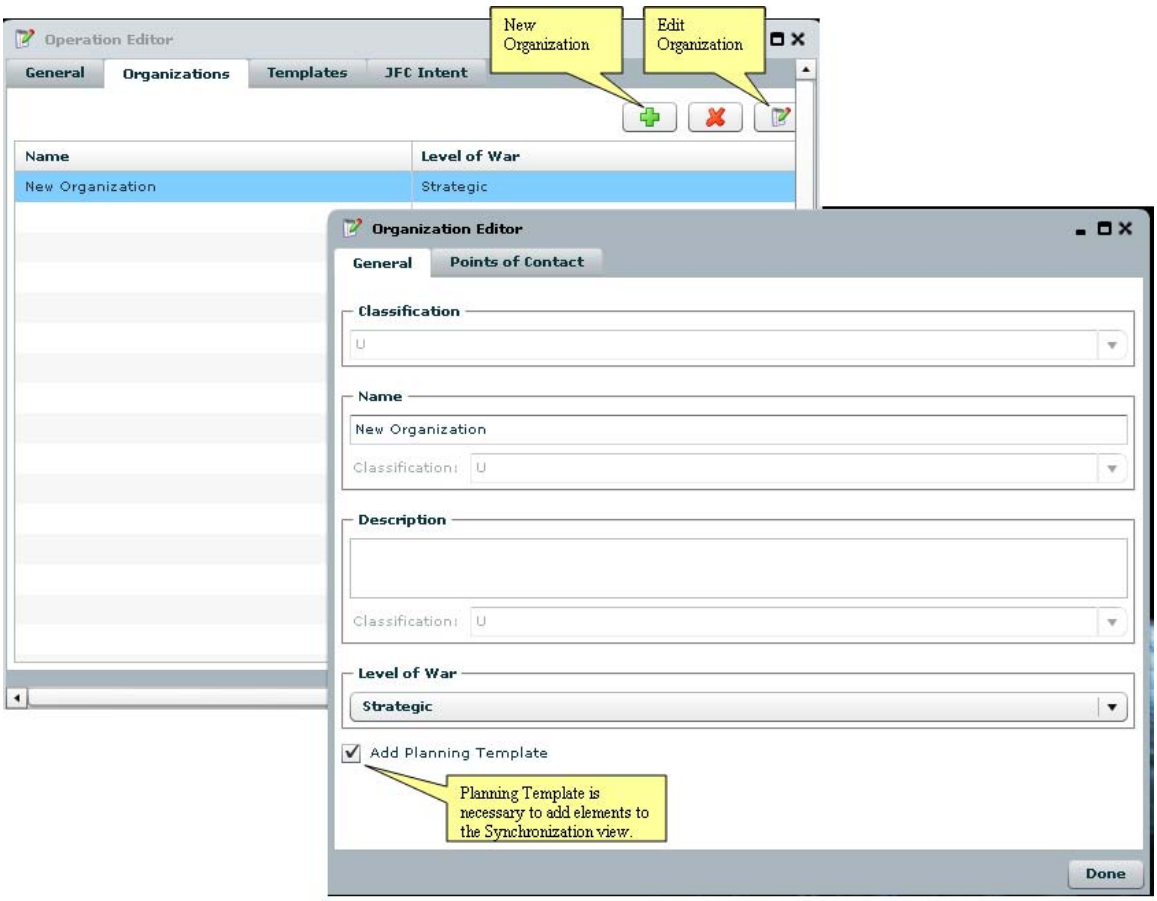


Figure C- 17. Adding an Organization with a Planning Template

You can adjust any of the organization properties like Name, Description, or Level of War from the Organization editor as well. Add as many organizations as necessary.

Note: The operation must have at least one organization with a Planning Template to begin planning.

Now the Operation should have at least one organization displayed with a Planning Template in the Synchronization view as shown in **Error! Reference source not found.**.

Figure C- 18. Operation with Organization and Planning Template

Creating a New Course of Action

Select the Organization name in the tree pane and click the New Element button on the Synchronization toolbar. See Section 0 for more details on adding new elements to the operation. Select Course of Action in the New Element dialog and click OK. A COA should now appear under the organization. You can edit the COA as described in Section 0.

Adding Elements to the Operation

The same steps are followed to add all categories of COA Sketch elements to the Synchronization module (and therefore the operation). Highlight the category or the parent element you wish to add a new COA Sketch element to. You can add the element by either:

- Synchronization menu
- Synchronization toolbar
- Right click menu

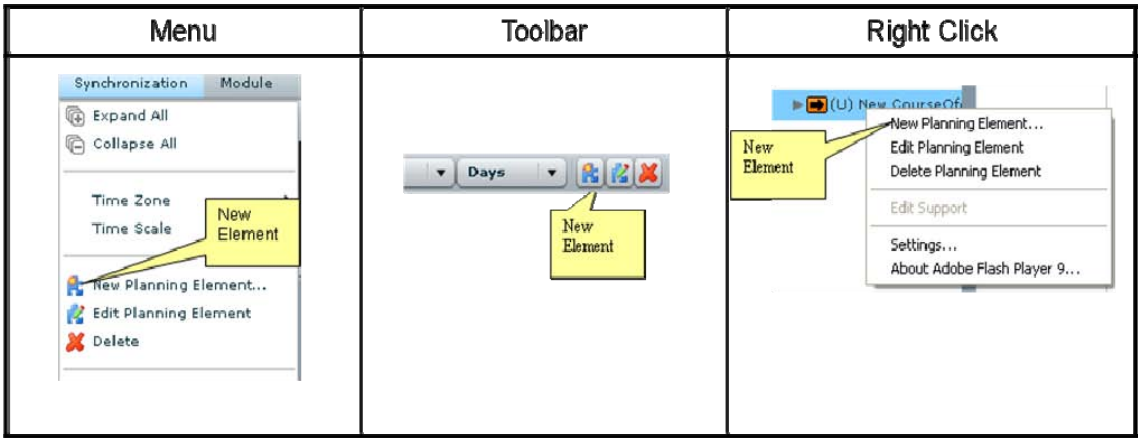


Figure C- 19. New Element Variations

After selecting one of the methods above, a New Element dialog (see Figure C- 20. New Element Dialog Box) will appear with a list of elements that can be added to the selected category or as a child to the selected existing element. Select the desired element and click OK. The new planning element will appear in the Synchronization tree pane.

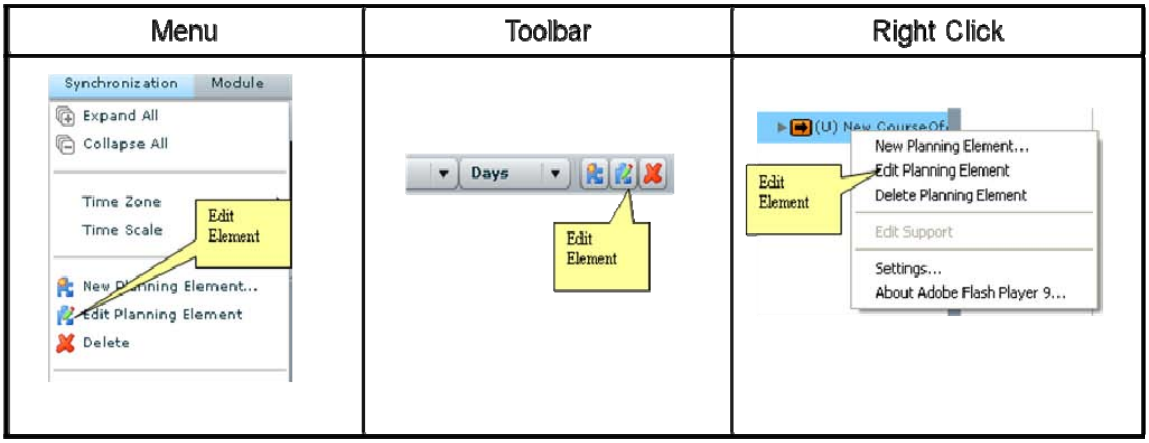
Figure C- 20. New Element Dialog Box

After selecting 'OK', the dialog box will disappear and the Synchronization module will be updated to show the new element. The editor for the element selected to be created will open for further modification unless the "Skip Configuration" box is checked. This checkbox is stored as a user preference and will remain in whatever state the user leaves it in.

Editing Elements

After a planning element has been added, the user may wish to update the properties of the element. The same steps are followed to edit all categories of planning elements in the operation. Highlight the planning element you wish to add edit. You can open the element editor by either:

- Synchronization menu
- Synchronization toolbar
- Right click menu



Edit Element Variations

Each type of element has a unique editor based on the properties associated with it.

Locate in Sketch Module

The user may quickly locate the shape(s) associated with a COA Sketch element from within the Synchronization module by selecting the element listed in the Synchronization module and then clicking the icon in the toolbar as shown in Figure C- 21. Locate in Sketch Module.

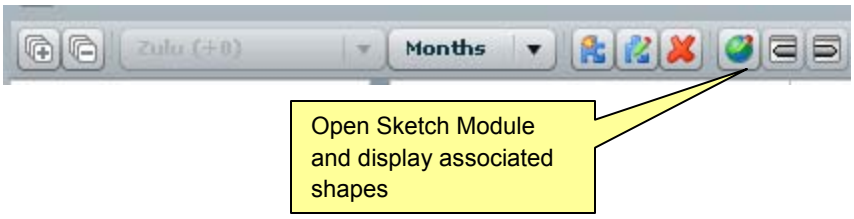


Figure C- 21. Locate in Sketch Module

Adding a Timing Element

In order to see a timing element in the Gantt chart of the Synchronization module, a scheduled timing must be added to the element's editor on the Timing tab or by the right click menu shown in

Figure C- 22Element right Click Menu. See page C-22 for details on opening the element's editor. The initial timing element starts at the default date, which is available in the Operation editor, and ends 24 hours later. When the timing element is selected in the list at the top of the Timing tab, you can edit the date information in the form below. You can also set this information directly in the Gantt chart. See page C-28 for more details on adjusting elements directly in the view.

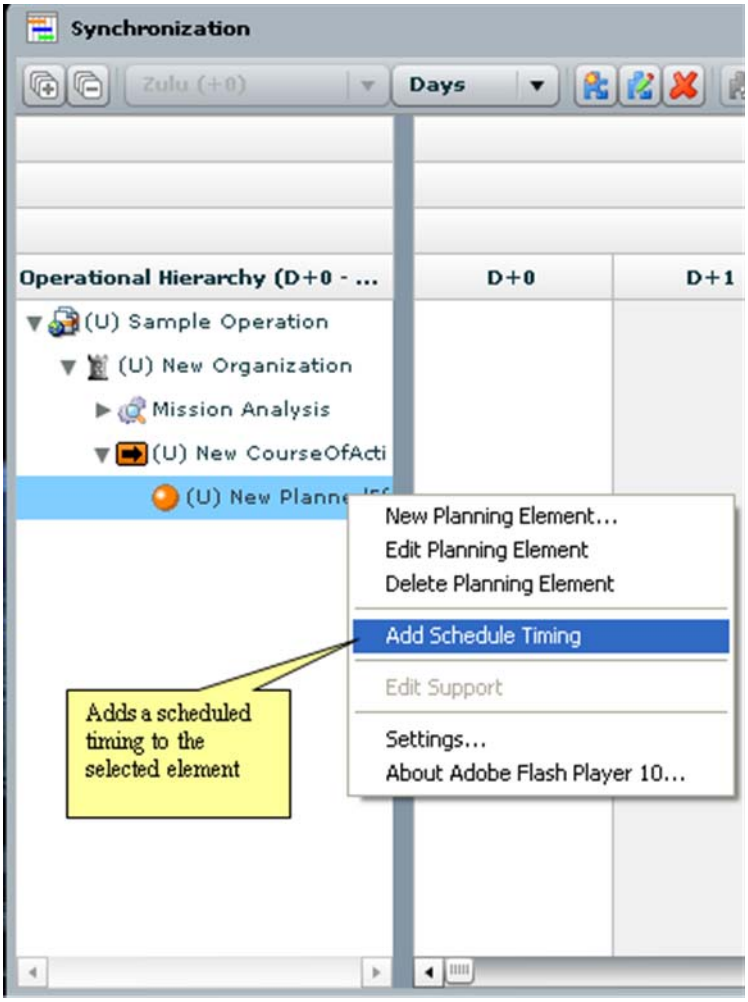


Figure C- 22. Element right Click Menu

Setting COA as Selected Plan

To set a COA as the selected plan, open the COA's editor (See page C-25 for details on opening the element's editor.) On the General tab, check the checkbox at the bottom of the tab to Mark as Selected Plan. The icon for the COA updates in the tree pane to show it is the selected plan.

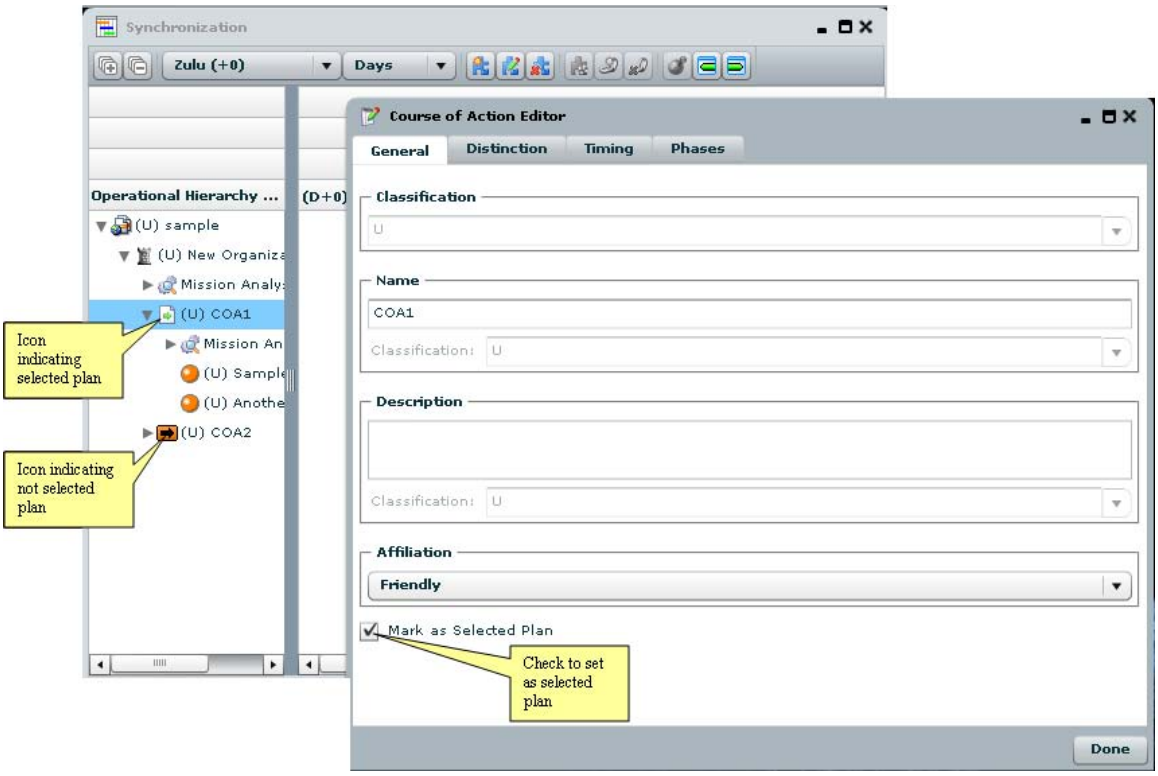


Figure C- 23. Selected Plan

Only one COA per organization can be marked as the selected plan. If you mark a second COA as the selected plan in an organization, the first will become unmarked so that the second one is now the one selected plan. You can unselect a COA as the plan by un-checking the checkbox on the General tab of the COA editor as well.

Deleting Elements

After planning elements have been added, the user may wish to delete an element. The same steps are followed to delete all categories of planning elements in the operation. Select the planning element from within the Synchronization view you wish to permanently delete from the operation. You can delete the element by either:

- Synchronization menu
- Synchronization toolbar
- Right click menu

Note: By Ctrl-Clicking you can select multiple elements to be deleted at one time.

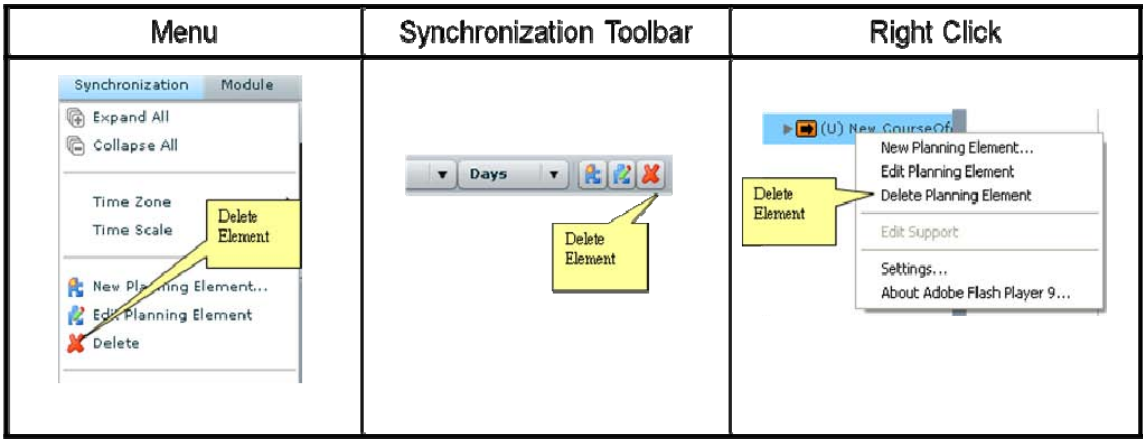


Figure C- 24. Delete Element Variations

The user will be prompted to confirm the deletion. Once a planning element has been deleted from the Synchronization module, it is deleted from the operation. It can never be retrieved. If the element had a shape associated with it on the Sketch module, the shape will be deleted as well.

Warning: Deleting a parent element also deletes all of its children.

Adjusting Elements in the View

Certain properties of the planning elements can also be adjusted directly in the Synchronization module without opening its editor.

Adjusting the Scheduled Timing

After a scheduled timing has been added in the element's editor (See Section 0) the timing element can be updated in the Gantt chart. This is done by dragging the edges of the element to the desired location. See **Figure C-25**.

- Dragging the entire element shifts it on the timeline
- Dragging the inner points reset the Start Date or Stop Date
- Dragging the outer points reset the Start After or Achieve By dates

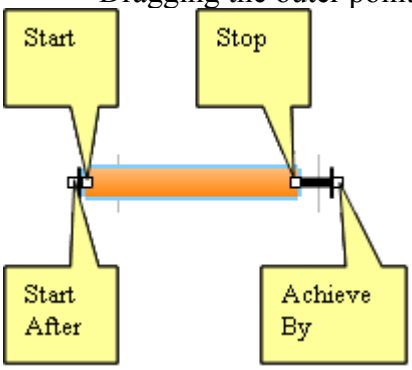


Figure C- 25. Scheduled Timing Dates

Timing can be adjusted by splitting the timing event or merging it with another timing event. To split a timing element right click on the element and select split. To merge elements ctrl click

the elements you want to merge and right click, select merge. See Figure C-26**.**

Note: Merging will merge all scheduled timings between the earliest and latest element clicked.

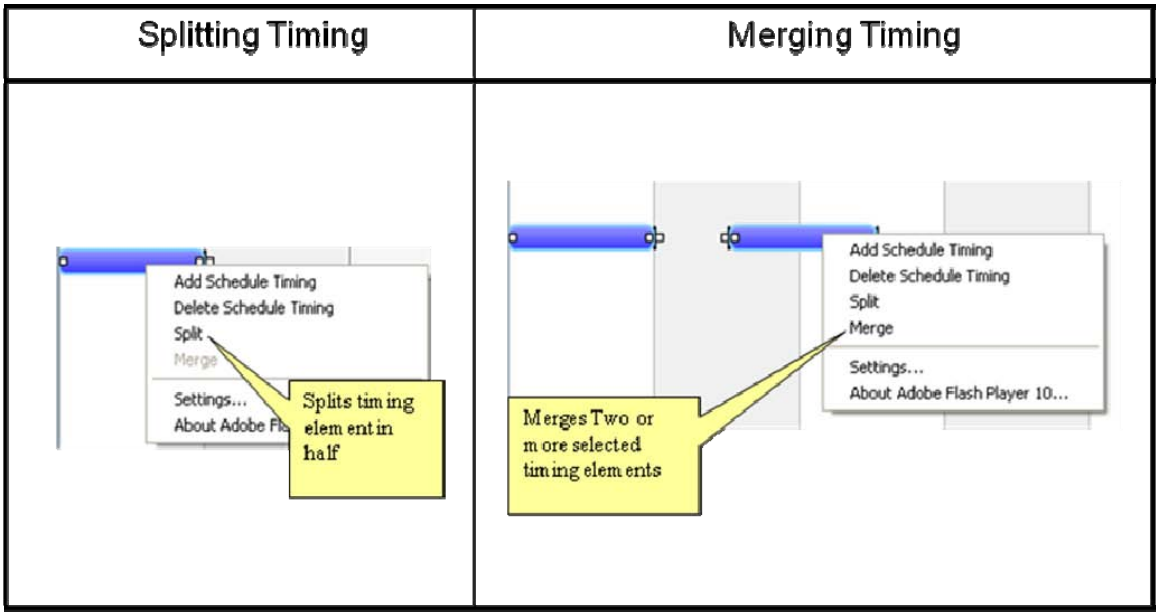


Figure C- 26. Split and Merge timing

Adding and Adjusting Phases

Phases can be added by opening the COA editor and clicking on the phase tab, (see page 26 for information on opening an editor). Phases may also be added by selecting a COA in the synchronization module and right clicking. Choose ‘Add Phase” from the right click menu.

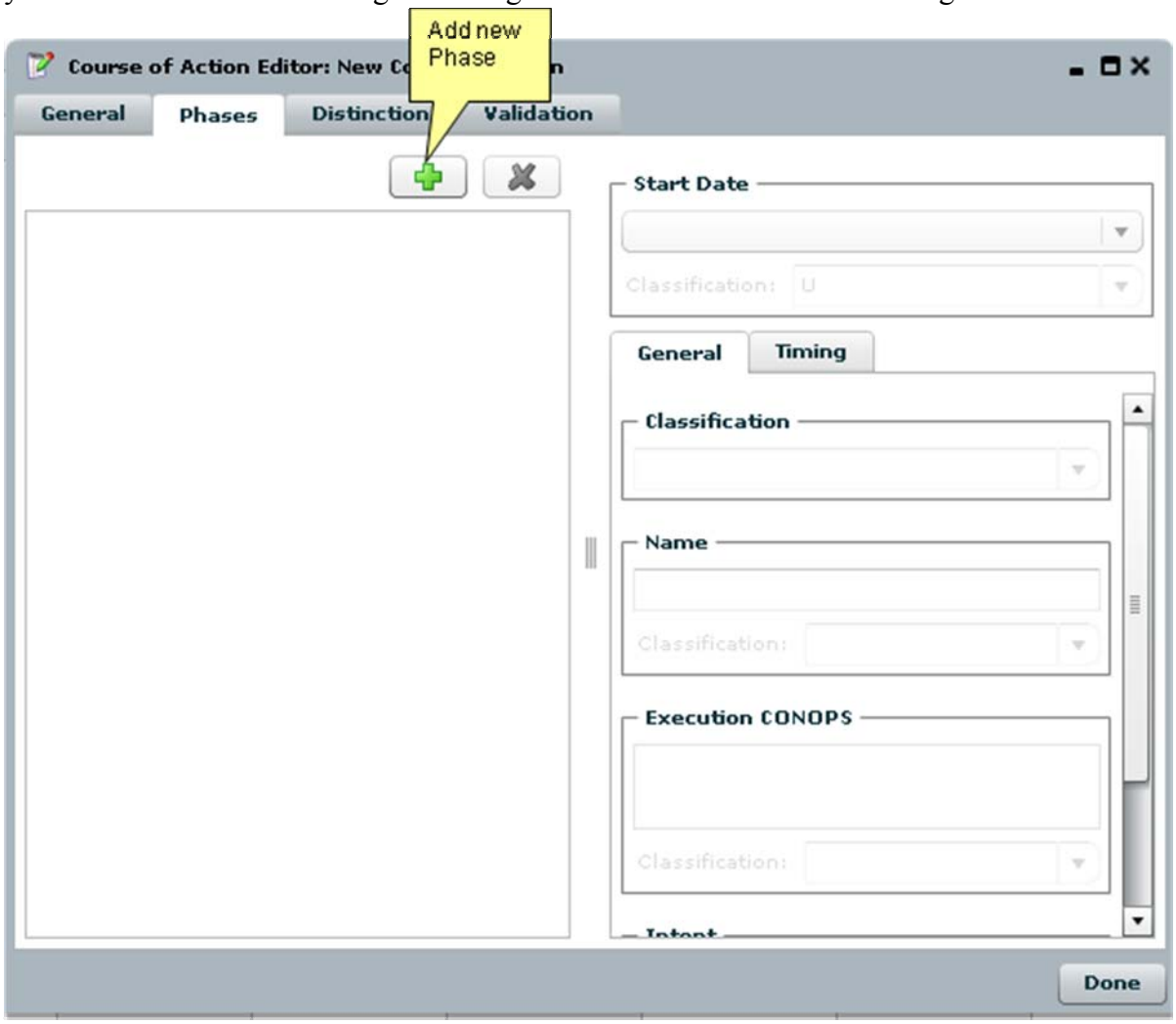


Figure C- 27. Phase Tab

Timing on phases can be adjusted by clicking on the Timing Tab within the Phase tab. The default timing of a phase is 30 days. The first phase will begin on the Default Date. Follow on phases will begin immediately after the last phase.

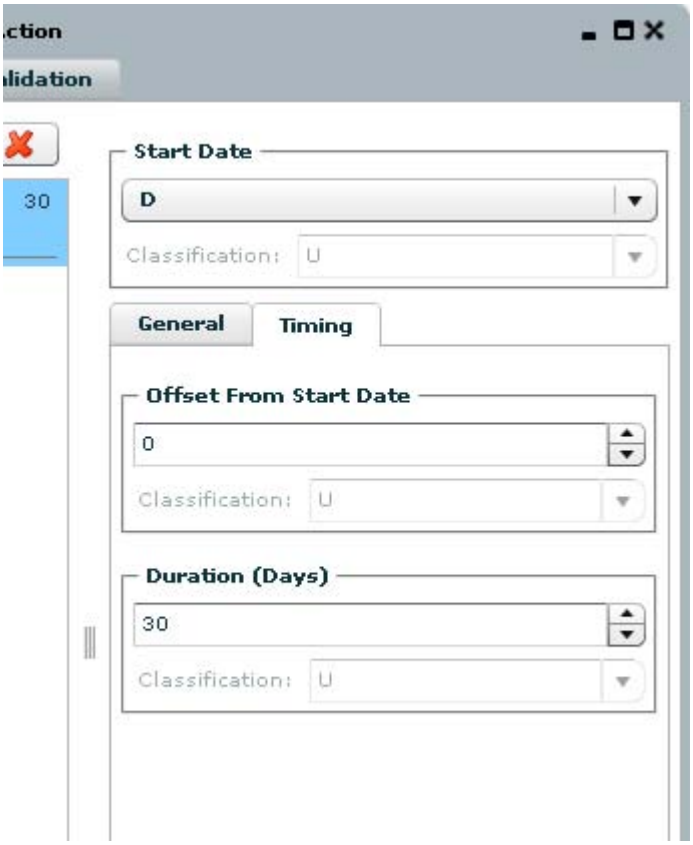


Figure C- 28. Timing Tab

After phases have been added in the COA's editor Phases tab, (See page C-25 for information on opening an editor) the phase elements can be updated in the Gantt chart. This is done by dragging the edges of the element to the desired location. When the Phases are selected, square icons are displayed and are used via the drag and drop method. The top square will adjust the end date of the Phase to the left of the icon. The bottom square will adjust the start date of the Phase to the right of the square icon.

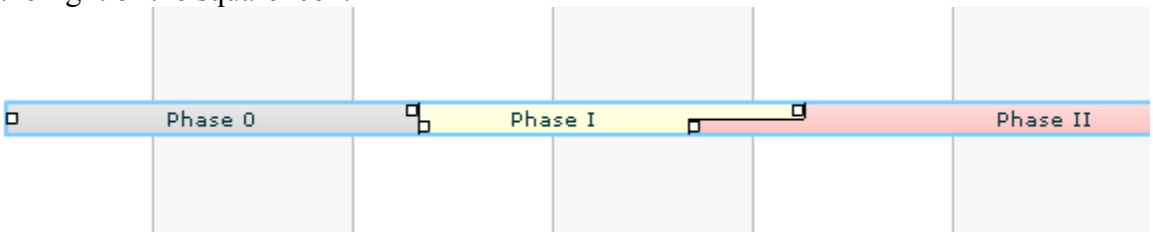


Figure C- 29. Phase bar in Gantt chart

Note: Phases are in whole day increments, so the view will automatically round to the nearest whole day.

Dragging Elements in the Tree Pane

After planning elements have been added to the operation, you can move them in the tree pane to create a new hierarchy of elements. Drag and drop the element to the desired location in the tree pane.
Note: If the CTRL key is held down while dragging a reference will be made to the object and the object will not be moved.

Setting Time Zone

The user may wish to switch to a different time zone. The time zone can be set in two ways:

- Synchronization menu selection.
- Synchronization Toolbar dropdown

The currently selected Time Zone shows a dot next to it in the menu and is displayed in the dropdown in the Synchronization toolbar. See **Error! Reference source not found.0** for more details.

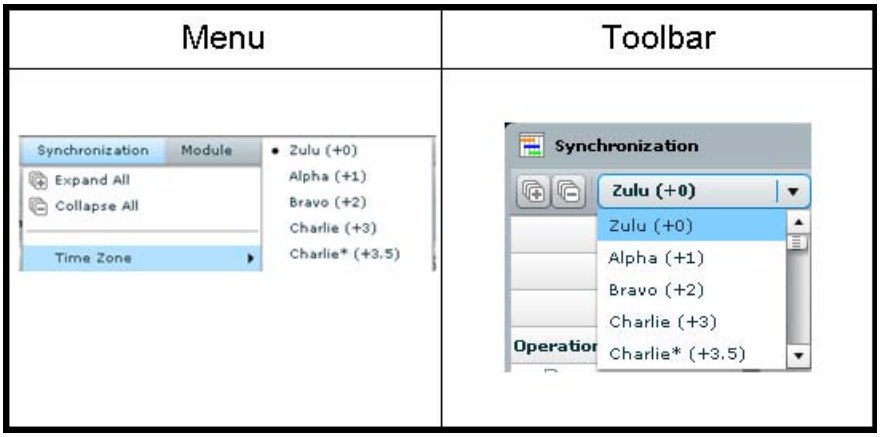


Figure C- 30. Time Zone

Available time zones were registered when COA Sketch was installed. See COA Sketch Installation Guide for details.
Note: Time zone cannot be set unless a specified date has been selected for the operation start date.

Configuring Time Scale

The user may wish to switch to a different time scale to change the timing headers on the Gantt chart. The time scale can be set in two ways:

- Synchronization menu selection.
- Synchronization Toolbar dropdown

The currently selected Time Scale shows a dot next to it in the menu and is displayed in the dropdown in the Synchronization toolbar. See **Figure C-31** for more details.

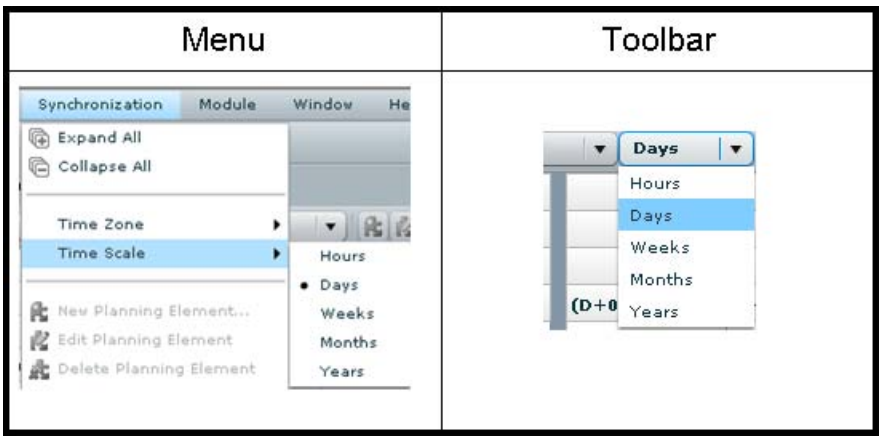


Figure C- 31. Time Scale

The user may also wish to remove some of the headers in the Gantt to better use the space. By right-clicking on the headers and choosing "" from the drop down menu, the user will be given the option to hide or show headers by checking and un-checking the checkboxes for the corresponding headers.

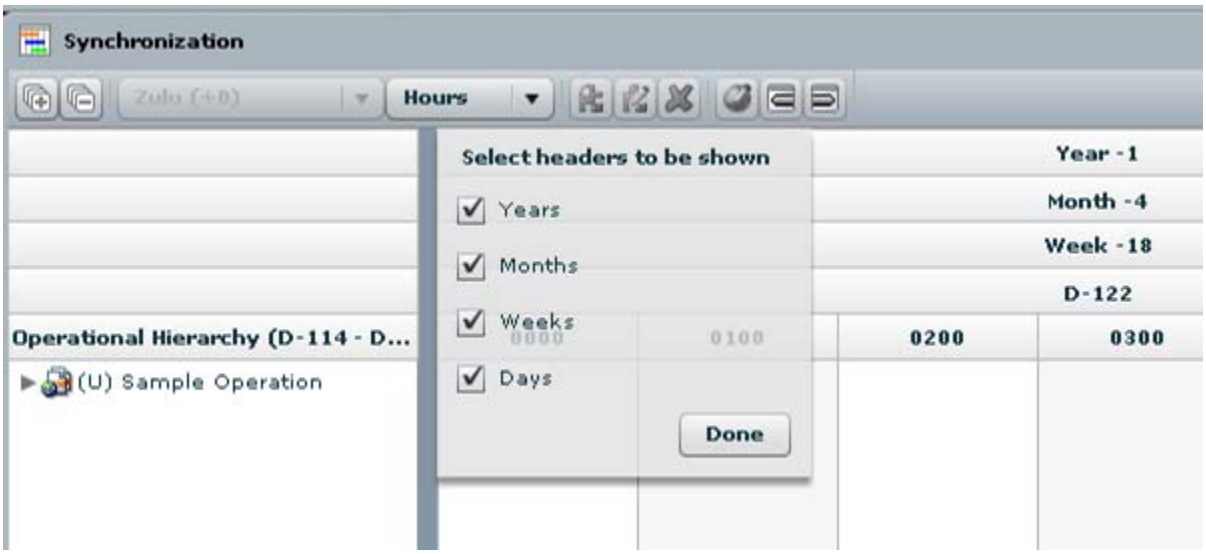


Figure C- 32. Viewing Options for Time Scale

Scrolling to the Ends of a Scheduled Timing

The user may wish to quickly scroll to the beginning or the end of a timing bar that extends out of the current visible area. This can be accomplished in two ways:

- Synchronization menu selections.
- Synchronization Toolbar buttons

Select the element you wish to jump to the beginning or the end of either in the tree pane or by clicking on the timing element. Make the appropriate selection shown in Figure C-33.
The Gantt chart will scroll to the edge of the timing bar of the selected element.

Note: If multiple schedule timing elements are present the beginning is the earliest timing element and the end is the latest timing element.

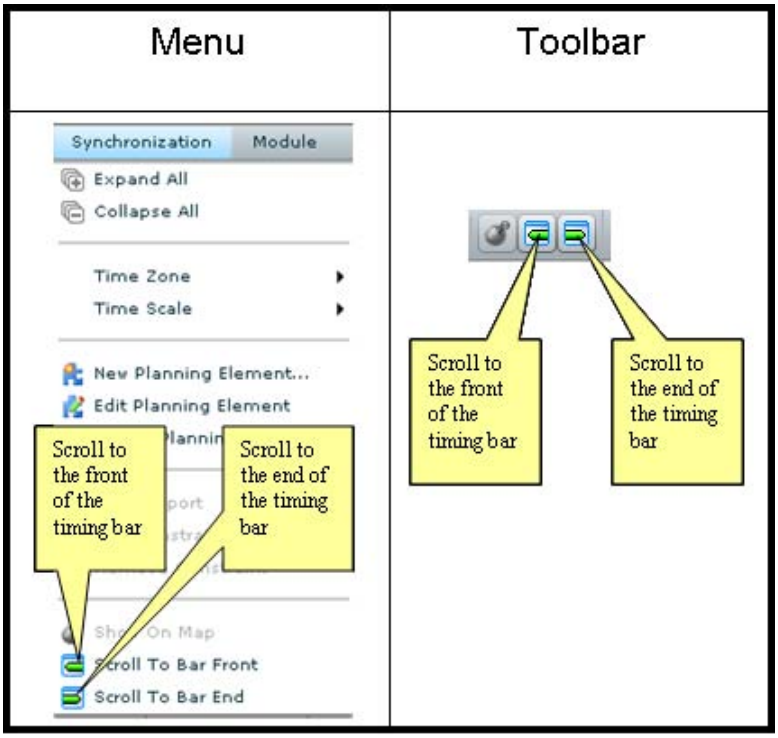


Figure C- 33. Scroll To Ends of Timing Bar

Expanding and Collapsing Tree

The user may wish to quickly expand or collapse the display of elements in the tree pane. This can be accomplished in two ways:

- Synchronization menu selections.
- Synchronization Toolbar buttons

Select the element you wish expand or collapse in the tree pane or by clicking on its timing element. Make the appropriate selection shown in **Figure C-34**. The tree pane and Gantt chart will expand or collapse the children (and their children and so on) of the selected element.
Note: If no element is selected the expand and collapse function will expand and collapse the root element in the tree.

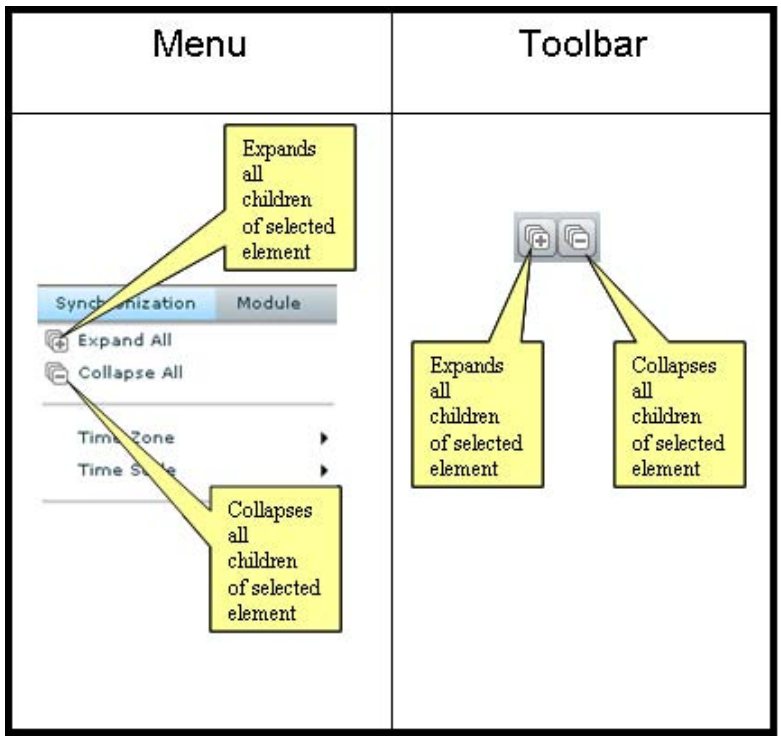


Figure C- 34. Expand and Collapse Elements

Sketch Module

Capabilities

Sketch provides the ability to develop plans using true geographic information. Users can associate areas on the map to new and existing Mission Analysis and Strategy elements to give more depth to their operations.

Processing Procedures

After creating COA Sketch elements in the Synchronization module, users can associate them with one or more shape or icon on the map. Sketch has the functionality to create new COA Sketch elements and associate them with one or more shape or icon on the map. Sketch also allows the user to create custom layers to help organize the map.

Getting Started

Setting the Map Source

The Map Sketch view is available to lay out COAs geographically and can work with a variety of map servers. Microsoft Aerial is the default map view that is opened in Map Sketch. If there is no access to the Internet, Open Map can be started on the IOPC-X Server. See the IOPC-X Administrator for starting the OpenMap server. The map source can be set in two ways:

- Sketch menu selection.
- Sketch Toolbar dropdown

The currently selected map source shows a dot next to it in the menu and is displayed in the dropdown in the Sketch toolbar. See Figure C-35 for more details.

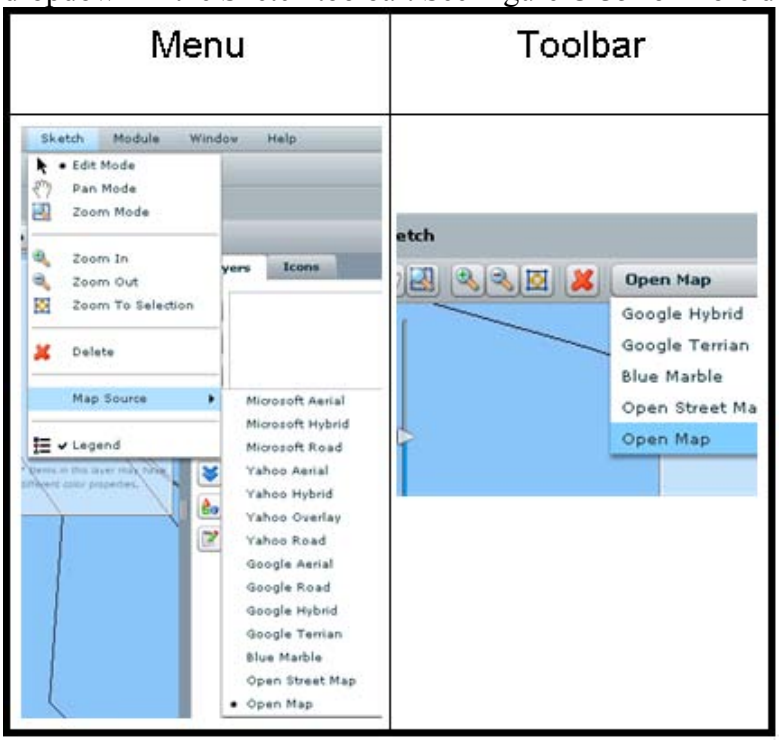


Figure C- 35. Map Source

Adding a Shape or Icon

Available shapes are located on the left pane of the Sketch module. See Figure C-36.

To draw a Basic Shape, select the type of shape you want from the side bar. Click and hold on the map while dragging across the map. The first location will be where you initially clicked and the second location will be where the mouse is when you let go. These two locations make a bounding box around the shape that you have drawn.

To draw a Special Shape, select the type of shape you want from the side bar.

- If drawing a point, just click on the location that you wish the point to exist.
- If drawing a line, click and hold the map while dragging across the map. The line will begin where you initially clicked and end at the location where the mouse is when you let go.
- If drawing a polyline, clicking on the map will add a new point to the polyline. Double click to add the last point of the polyline.
- If drawing a polyshape, clicking on the map will add a new point to the polyshape. The tool will automatically draw the last line between the last point and the first point. A double click will add the last point of the polyline.

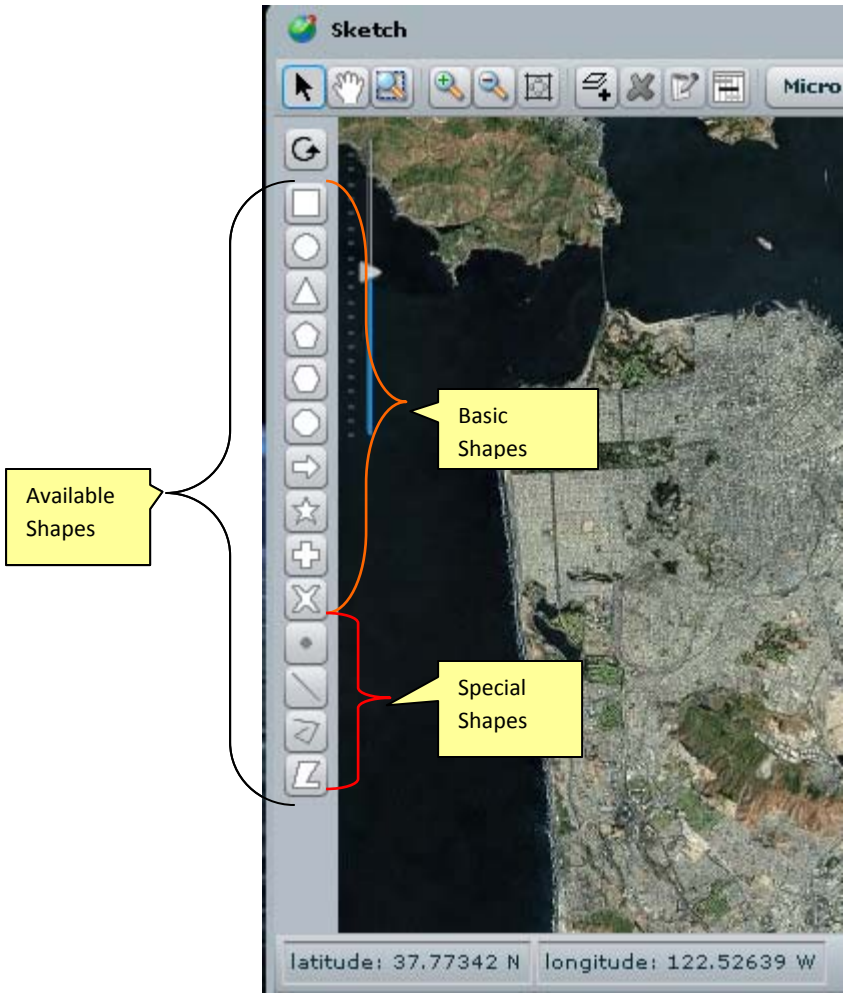


Figure C- 36. Available Shapes

Available icons are located in a tab to the right of the map, next to the Layers tab. See Figure C-37. To add an icon to the map, drag the icon from the tab onto the map at the desired location.

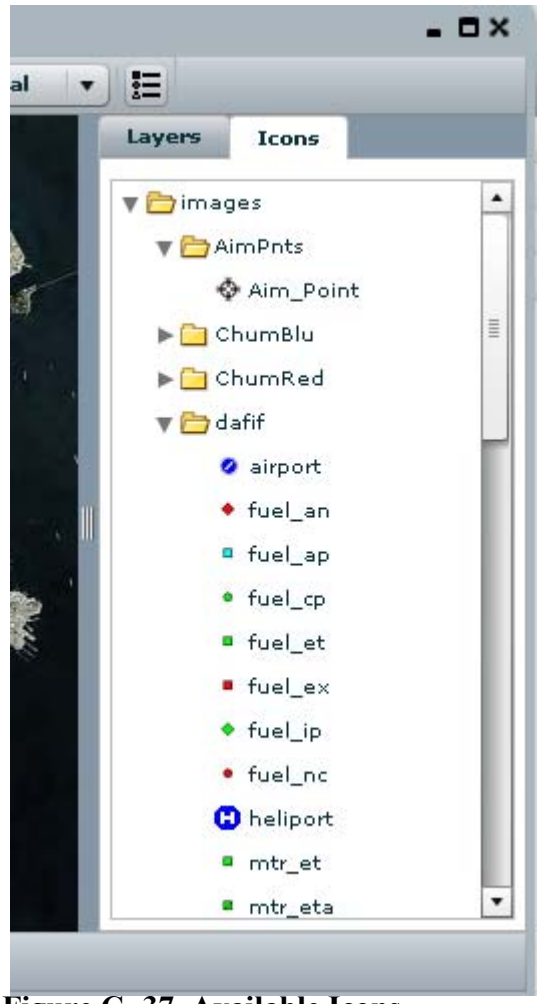


Figure C- 37. Available Icons

Icons are stored on the IOPC-X server. If you have trouble accessing the icons or wish to update what icons are available, see the COA Sketch Installation Guide.

After dragging or drawing the shape/icon, a COA Sketch Objects chooser will appear with all the COA Sketch elements currently in the operation. You can attach a shape to an already existing COA Sketch Object or create a new COA Sketch object to associate with the shape/icon. See **Figure C-38**.

Figure C- 38. New Shape Wizard

Shapes can be added by COA element type or by Operation hierarchy. See Figure C- 39. Adding Shapes. The 'Type' view will show all the existing elements based upon the different types of elements that are in the system. The "Hierarchy" view simply displays the same view that is shown in the synchronization module.

If you are adding a new element, you have already chosen the type of element you wish to create. The Type view will only show you elements that are of that type or elements that you can add the selected type to. If you are choosing an existing element, then the Type view will display all existing elements, sorted by their type.

Select the element you wish to associate with the new shape or select the element in the hierarchy tree and click finish. The new element will be either added as a child to the selected element or, if the element cannot have children, it will be added as a new element under the same element as the selected element.

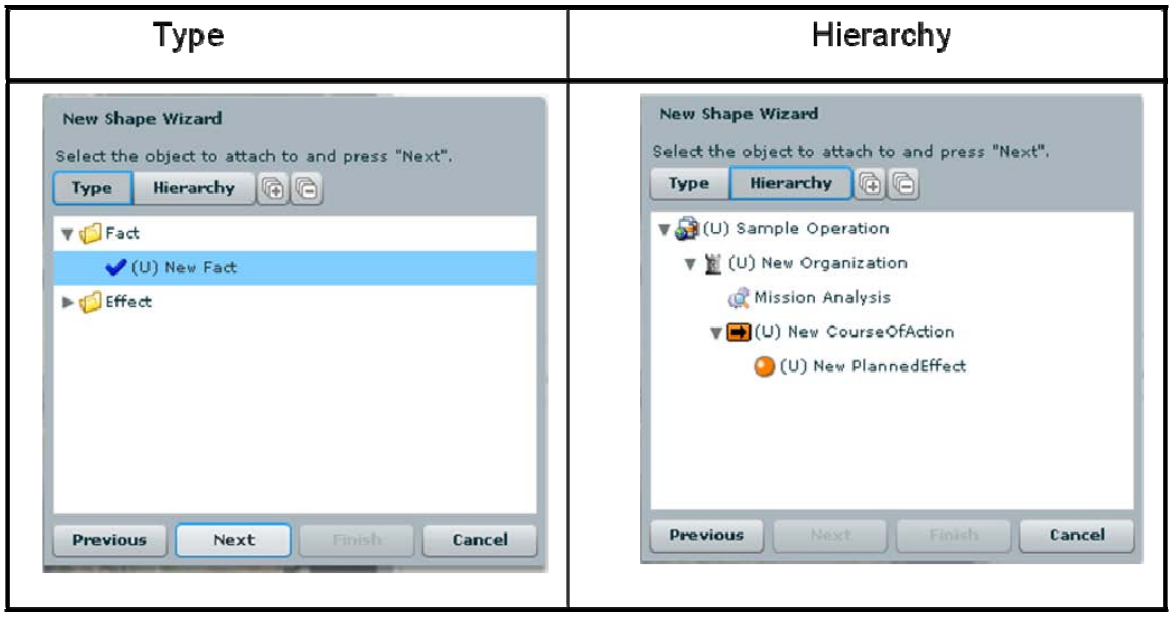


Figure C- 39. Adding Shapes

Once you have determined the shape association, you need to decide what layer to add it to. If no layers exist you will be prompted to create a new Layer. See Figure C- 40. Adding a Layer. When adding a new layer, you will have the option to "Share" your layer. By default, other users may not see layers you have created. Select the "Share" checkbox if you wish others to see your layer. If the desired layer already exists you can select the layer and click finish.

Note: Auto Layer creation is not available when creating a new layer while adding a new shape. Each new shape will need to be added to a custom layer initially. They may be removed after the shape has been created.

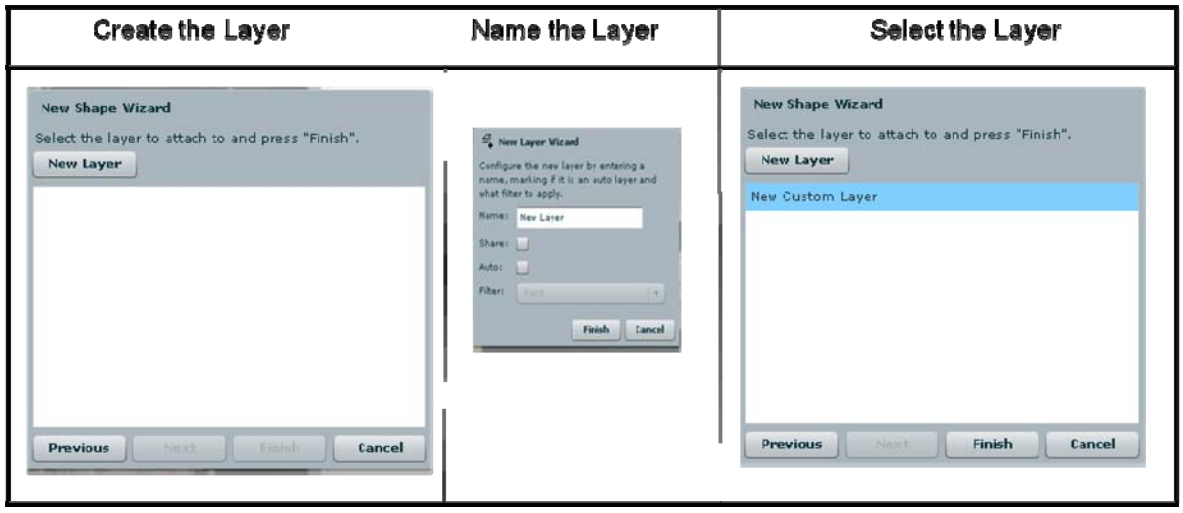


Figure C- 40. Adding a Layer

The shape will now appear on the map and will be added to the Layers tab under the category of object. See Figure C-41.

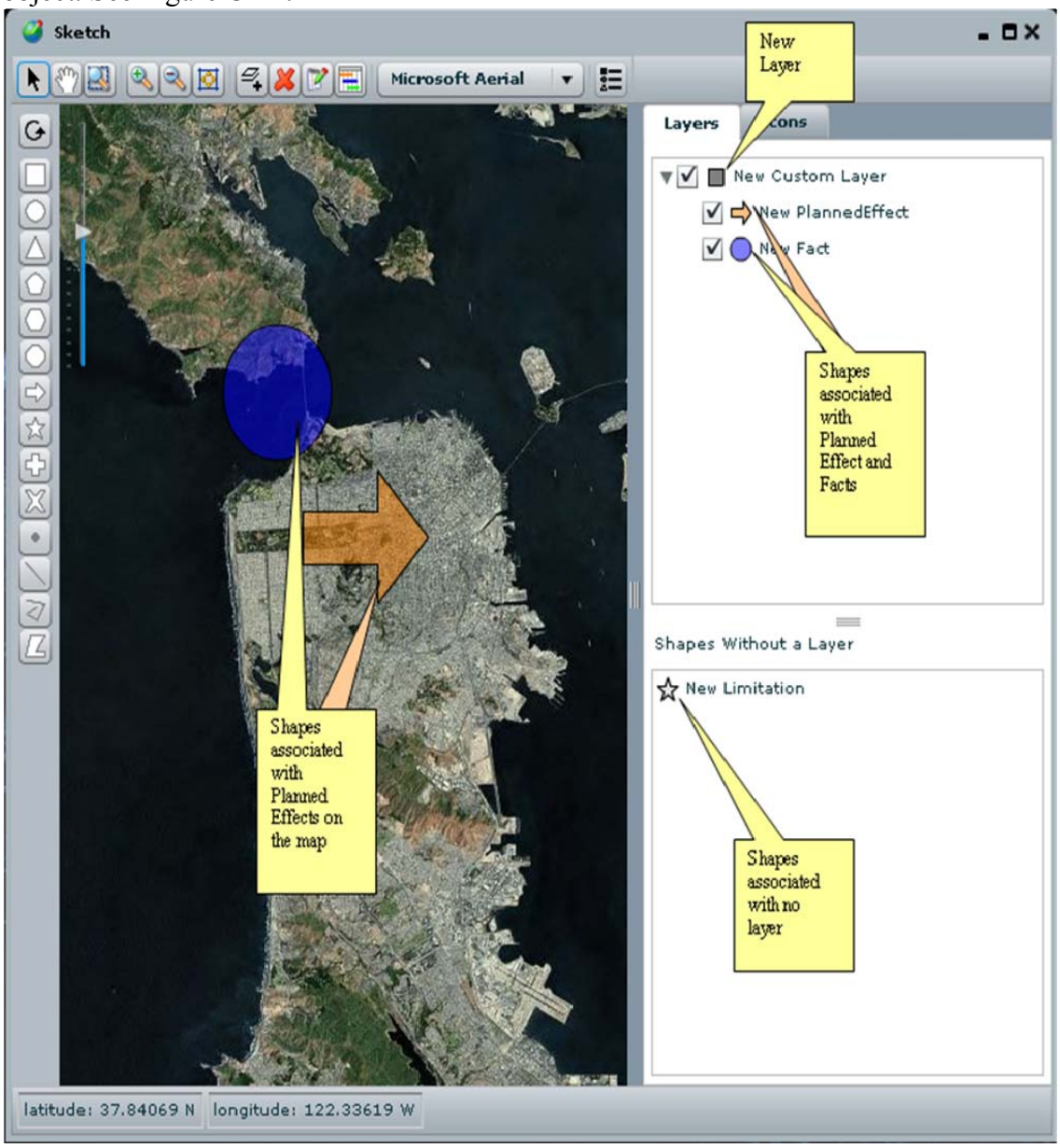


Figure C- 41. Sketch with Objects Added

Deleting Shapes from the Map

When you delete a shape from the map, only the shape is deleted. The Mission Analysis or Strategy element remains in the operation. To delete the entire element, see page C-26.

To delete a shape or icon, first select the shape on the map or in the Layers tab. You can delete the shape by either:

- Sketch menu
- Sketch toolbar

- Workspace toolbar
- Right click menu (in map and in Layers tab)

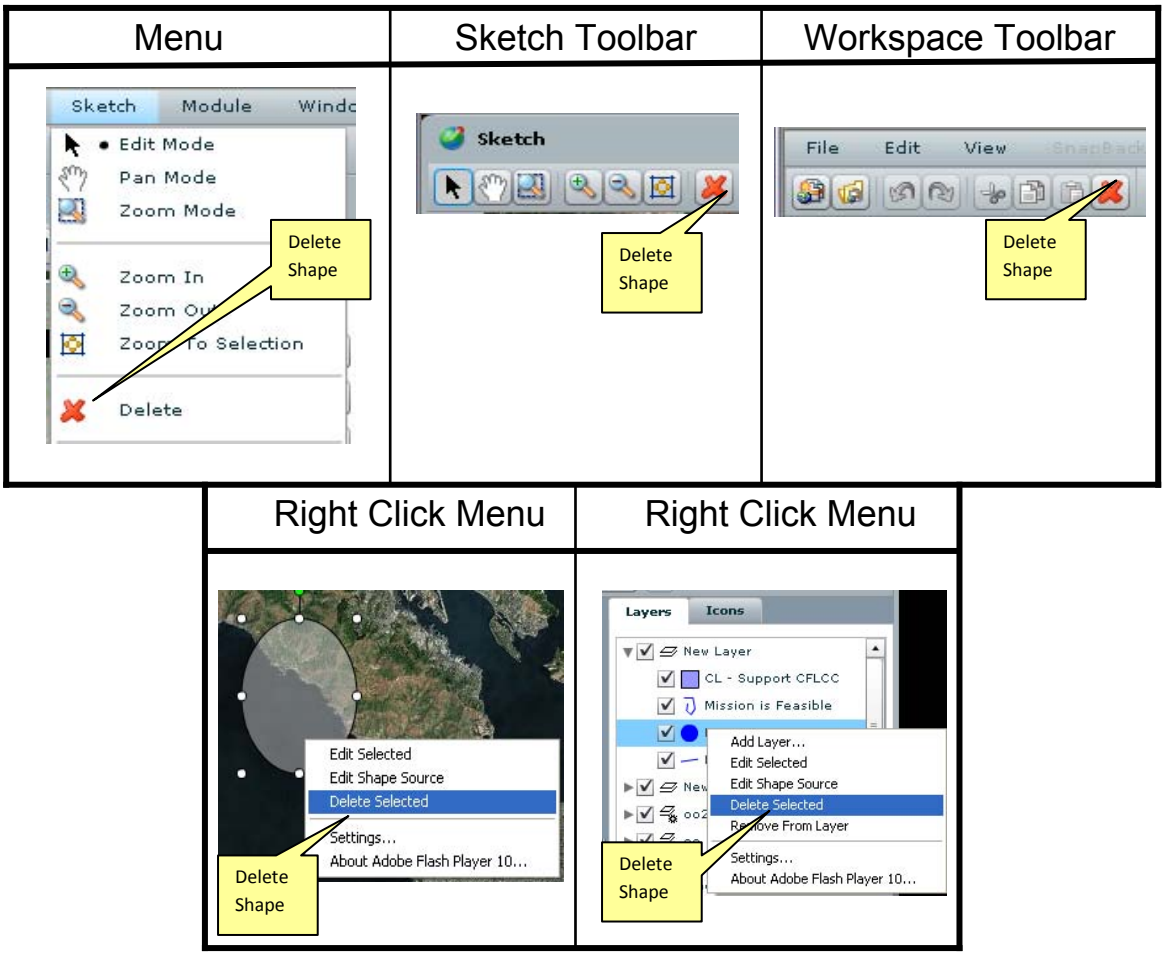


Figure C- 42. Delete Shape Variations

Manipulating shapes between layers

The user may remove shapes/icons from custom layers, move shapes between layers, and copy shapes to multiple layers.

To remove a shape/icon from a layer, first select the shape on the map or in the Layers tab. You can remove the shape/icon by either:

- Dragging and Dropping the shape off the layer and into the "Shapes Without a Layer" list. (The shape will only be displayed on this list if the shape is not listed in any other layer)
- Right click and choose "Remove From Layer" in drop down menu

To move a shape/icon to a new layer, first select the shape from either a custom layer or from the "Shapes Without a Layer" list. Drag and drop the shape/icon to the desired custom layer. The shape will be removed from it's initial layer and will be displayed in the desired layer.

To copy a shape/icon from a layer (custom or auto) to another custom layer, select the shape. While holding down the control key, select the shape and drag and drop it into the desired layer. The shape will now be displayed in both layers.

Editing COA Sketch Element Properties

The user may wish to update information about a COA Sketch element (i.e. Fact, Operational Objective, etc) via the Sketch module. To bring up the editor that will allow for modification of the element associated with the shape, select the shape either in the map view or in the Layers tab. Right click on the shape or shape element. Choose "Edit Shape Source" from the drop down menu. See **Error! Reference source not found.3** for further information.

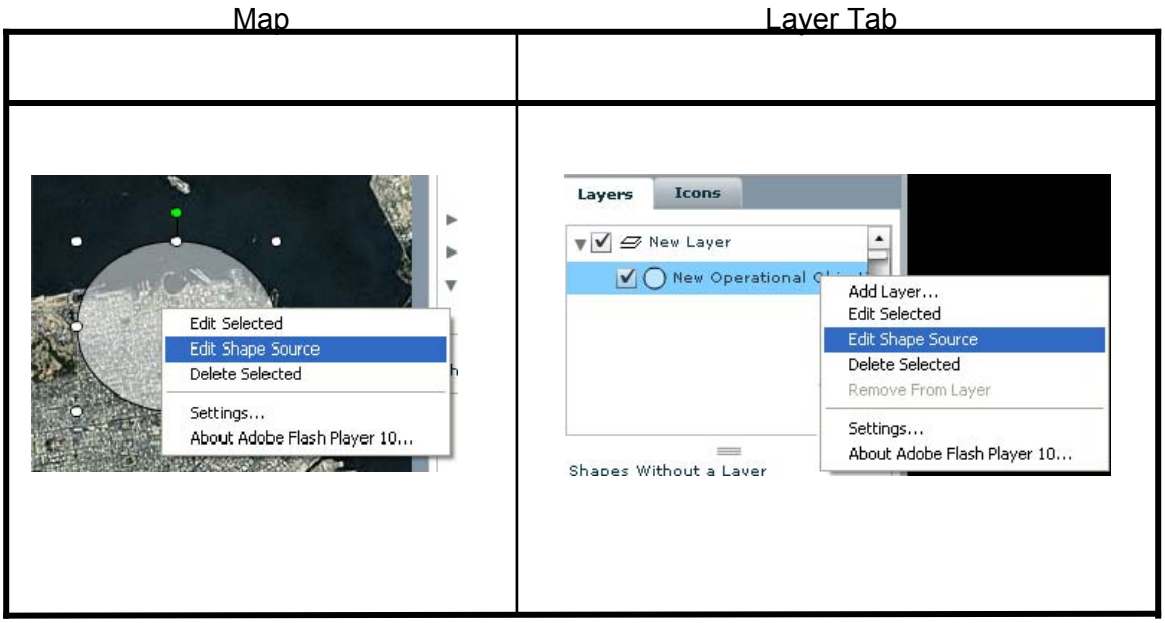


Figure C- 43. Edit COA Sketch element associated to Shape

Editing Shape Properties

The user may wish to update the fill color, transparency, line color, and other properties for an individual shape. There are three ways to view the shape editor, See Figure C-44.
First select the shape on the map or in the Layers tab. Then use one of these methods for opening the shape editor.

- Right Click on the Shape
- Double Click on the Shape
- Sketch Toolbar Button
- Right click the shape in the layer tab

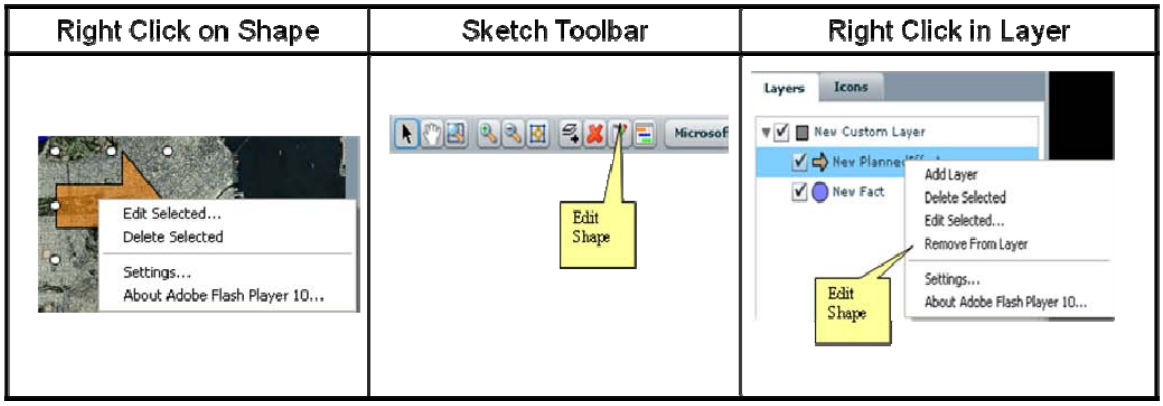


Figure C- 44. Edit Shape Properties

Shape editors are unique to the specific shape style, but **Figure C-45** shows a typical shape editor.

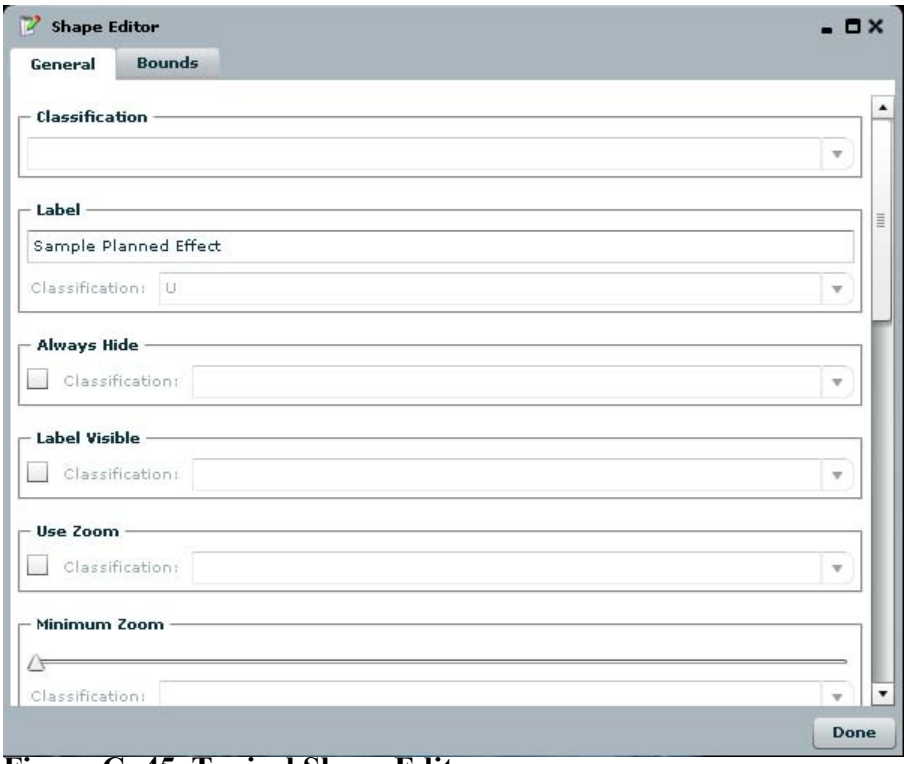


Figure C- 45. Typical Shape Editor

A shape's size can be edited by clicking and dragging on any of the Sizing Handles surrounding the shape. A shape may also be rotated by clicking and dragging the rotation angle. See Figure C-46. Shape Handles.

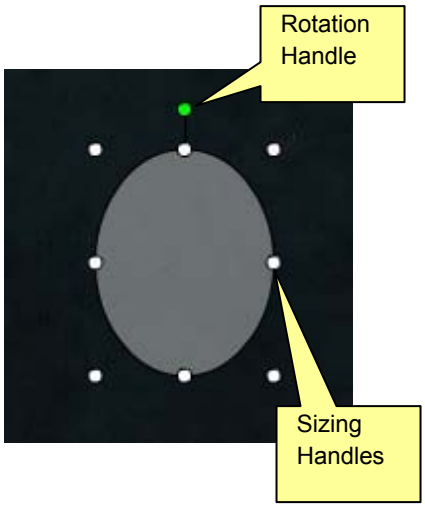


Figure C- 46. Shape Handles

Special shapes do not have the same shape handles as the basic shapes have. However, once selected, each point that makes up the special shape is displayed with a handle that will allow the location to be re-located and modified individually, as shown in Figure C-47.

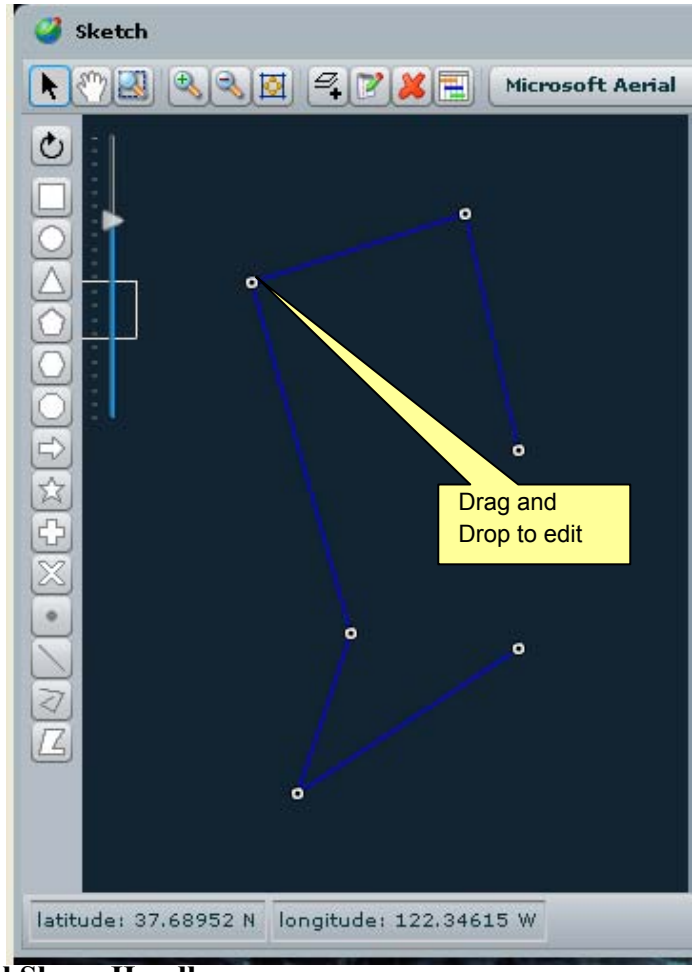


Figure C- 47. Special Shape Handles

Adding Custom Layers

Users may find it convenient to create custom layers as a way to group shapes. The custom layer's properties can be edited so that all the shapes in the layer have the same characteristics. If a shape appears in more than one layer, the top layer's properties take precedence.

To create a custom layer, click on the add layer button Map Sketch toolbar as shown in Figure C-48. Add Layer...

Figure C- 48. Add Layer

The create layer window opens; see Figure C- 49. New Layer Wizard. The New Layer Wizard has a few options.

- Share - When a user creates a new layer the layer will be private to the user who created it. If the user wants to allow other users to work or view the new layer then they may share it.
- Auto - If a user wants a layer to display a certain category of objects (objectives, facts, tactical tasks, etc.) the auto layer will display all shapes related to the selected object type. Auto layers are controlled by the system so the user can not manually add or remove shapes from the layer.
    - Filter – Will filter the shapes added to Auto layers by shape type. A user must choose a filter in conjunction with an auto layer.

Figure C- 49. New Layer Wizard

To edit a layer's properties, select the layer and click the Edit element button on the Map Sketch toolbar or right click on the layer name and choose edit from the drop down menu as shown in Figure C- 50. Edit Layer.

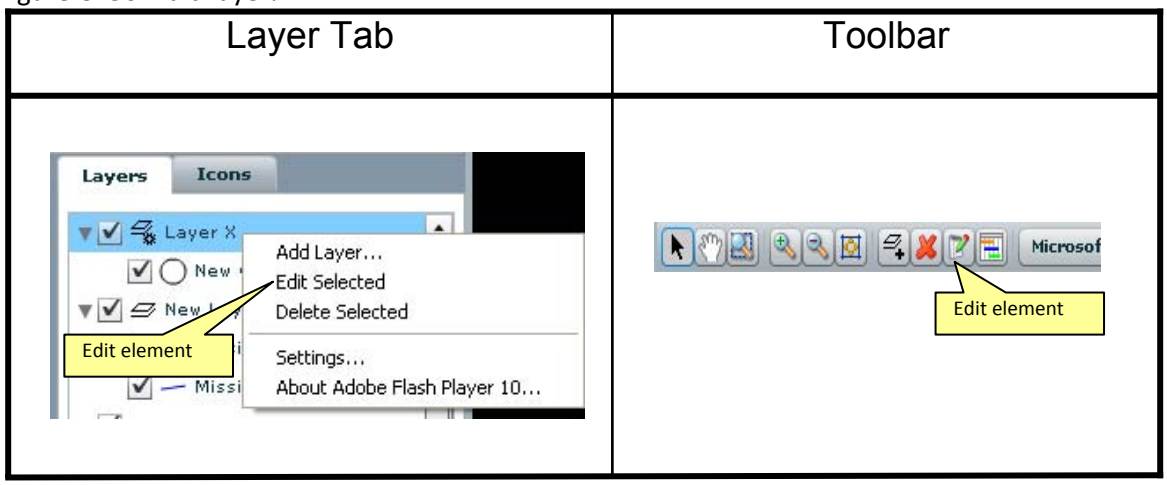


Figure C- 50. Edit Layer

Reordering Layers

The order of the layers in the Layers tab is important in determining the properties of a shape. The layer on the top takes precedence. For example, if a shape is in more than one layer that sets the fill color, the Layer on top of the list will determine the color of the shape. Properties of a layer can be overwritten for an individual shape in the shape's editor. See Section 0 for details on opening a shape's editor. To modify the order of the layers, select a layer in the Layer tab. Drag and drop the layer to the desired location in the list.

Viewing the Longitude and Latitude of the mouse position

The Longitude and Latitude display at the bottom left corner of the Sketch screen shows the user the coordinates of the mouse pointer in the current Map Sketch map source. See Figure C-51.

Figure C- 51. Longitude and Latitude

Zooming on the Map

Typical Zooming functionality can be performed on the map. The user can zoom in, zoom out, or zoom to a shape that is selected in the Layers tab. If a user has multiple shapes selected the zoom to will zoom to a center point between the selected shapes. You can access the zoom functionality by either:

- Sketch menu
- Sketch toolbar

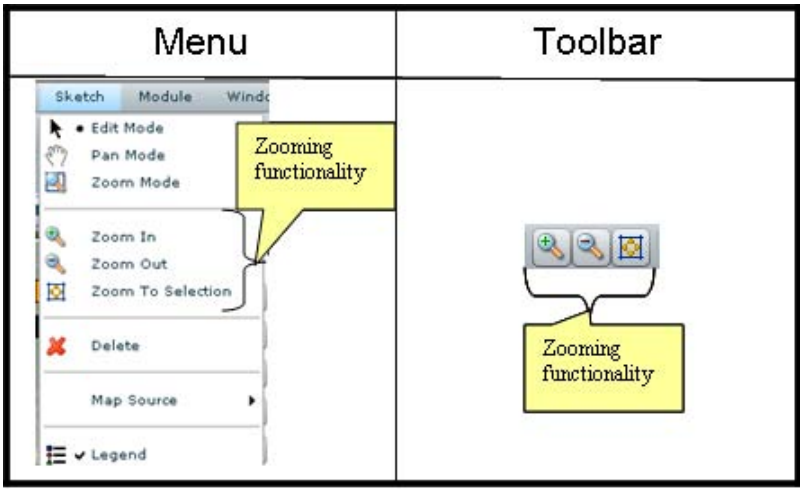


Figure C- 52. Zoom Functionality

Locate in Synchronization Module

The user may quickly locate the COA Sketch element associated with a shape from within the Synchronization module by selecting the shape and then clicking the icon in the toolbar as shown in Figure C-53.

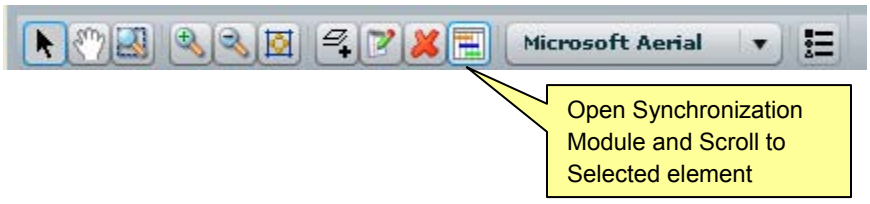


Figure C- 53. Locate in Synchronization Module

Plan Player

Capabilities

The Plan Player provides the user a means to view the plan as it goes through the Synchronization (Gantt chart) View and the Map Sketch View as the timing of different elements come into and out of focus

Processing Procedures

By default, the Player is displayed at the bottom of the Workspace. To hide or show the Player, go to the View menu. A checkmark next to Player indicates it is shown in the Workspace. No checkmark indicates it is hidden. Select Player in the View menu to toggle its display.

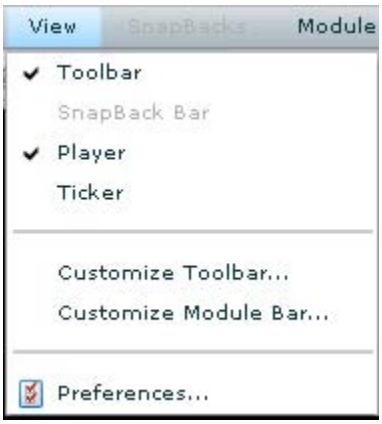


Figure C- 54. Open Player

Getting Started

Setting Up the Plan Player

In order to use the Plan Player, the timing preferences for the player must be configured. See Section 0 Plan Player Preferences.

Using the Plan Player

Once the Timing of the Operation has been set properly you can use the Plan Player to step through the plan. To start the Plan Player click on the Play button.

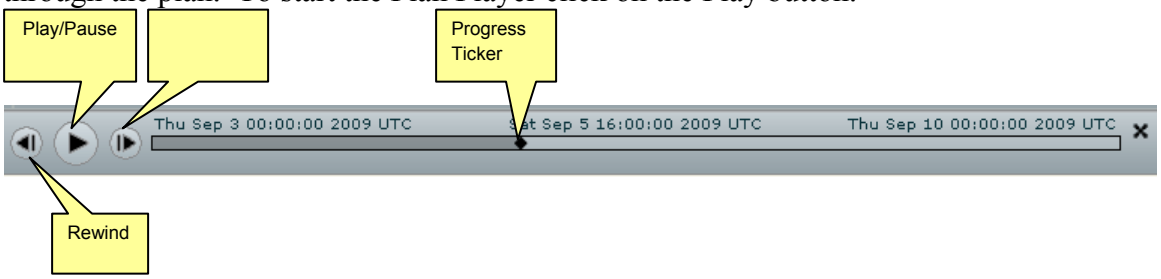


Figure C- 55. Plan Player Controls

If you wish to see portions of the plan that are ahead of the current Play position you can advance through the plan by the set step increments by clicking on the fast forward button. You may also drag and drop the progress ticker to the desired location.

If you wish to see portions of the plan that are behind the current Play position you can review the plan (by the set step increments) by clicking on the rewind button. You may also drag and drop the progress ticker to the desired location.

While the plan player is playing, the play button is toggled and replaced with a pause button.

Note: You cannot modify the Synchronization view or the Sketch View while the Plan Player is in play mode, the Plan Player must be in pause mode to modify these views.

Other attributes of the Plan player are the Start date, End date and Current date of Playback.

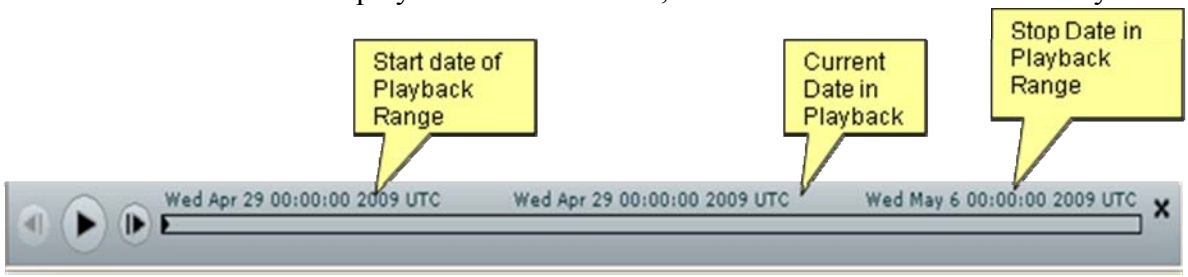


Figure C- 56. Plan Player

Plan Player Notes

During play, the Team Member or Reviewer may wish to make a note at a specific time during the plan. These notes work as a reminders to the Team Member to modify something about the plan or the view of the plan. This will allow the Team Member or Reviewer to add input to the plan without having to exit out of play mode to immediately make the modifications.

Adding Notes

A user can Right Click on the player while it is playing at the desired time location.

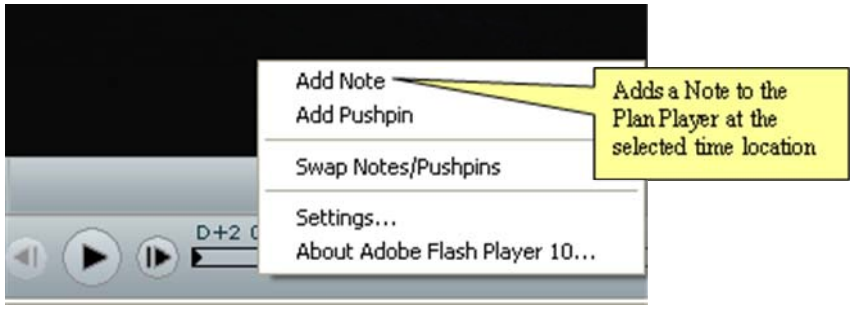


Figure C- 57. Right Click Add A Note

Adding a Note will open a Note text box seen in Figure C- 58. Entering a Note.

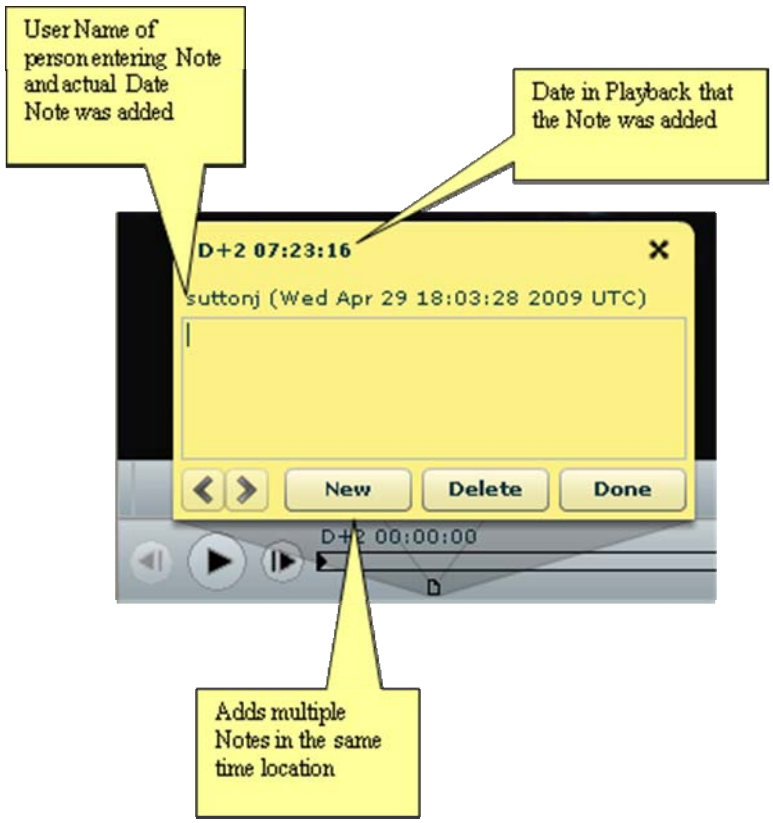


Figure C- 58. Entering a Note

By clicking the 'New' button you can add multiple notes in the same location. The note box will display the date and time the note was entered and the user name of the person who entered the note. Click 'Done' after you have finished entering the note.

Note: If the show notes during playback option is checked in the preferences and there are multiple notes in one location only the last entered note will be displayed during playback See page C-55 on how to set Plan Player preferences.

Once a Note is added a note icon appears on the player at the specified time.

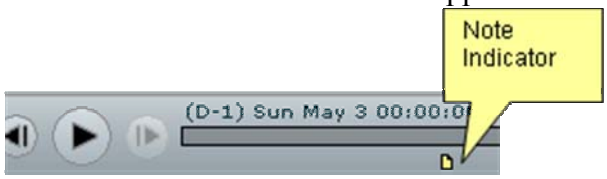


Figure C- 59. Note Indicator

Deleting Notes

Once a note is no longer useful to the team, it may be removed from the system. By opening the note and clicking the delete button of the desired note.

Note: Users can only delete Notes that they have created.

Figure C- 60. Delete Note

Plan Player Pushpins

During play, the Team Member or Reviewer may wish to make a note of a specific map location as well as which map view (i.e. Open Map, Microsoft Aerial) at a specific time during the plan. These pushpins work as location indicators that can be used to change the focus location of the Sketch View during playback.

Adding Pushpins

To add a pushpin to the Plan Player navigate to the location on the Map Sketch you wish to reference, right click on the Plan Player on the bar at the desired time along the play range and select Add Pushpin.

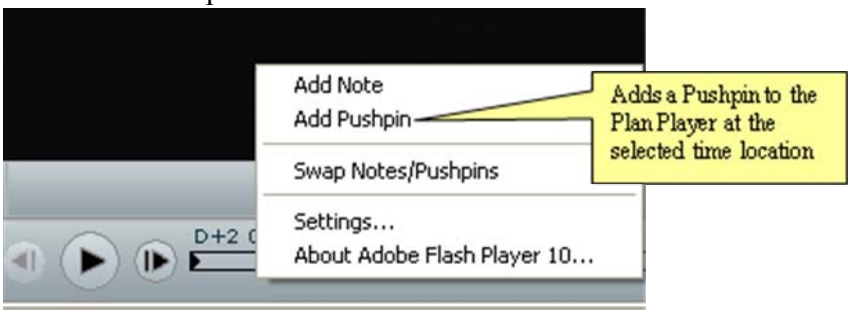


Figure C- 61. Add A Pushpin

Note: To add a pushpin the Map Sketch View must be open.

Deleting Pushpins

To delete a pushpin from the Plan Player right click on the pushpin and select Delete Pushpin

Figure C- 62. Delete A Pushpin

Swapping Notes and Pushpins

While the user is adding Notes and Pushpins they may wish to add both at the same location. To view whether a pushpin may be in the same location as a note right click on the Plan Player and select Swap Notes /Pushpins.

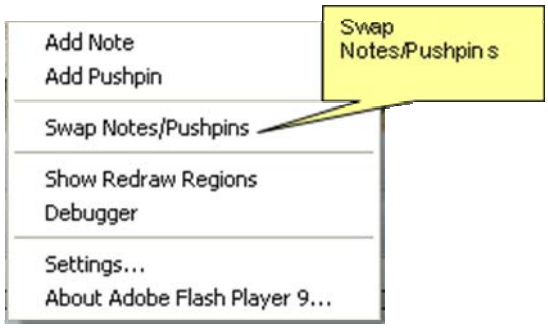


Figure C- 63. Swapping Notes and Pushpins

Setting Plan Player Preferences

The user can set the playback range, Playback Step Increment, whether the playback repeats, displays notes and goes to pushpins during playback, and what type of view display on the Synchronization chart is shown. To set these preferences, select Preferences… under the View menu. Next, click on the Player icon. These preferences are stored on a per user basis.

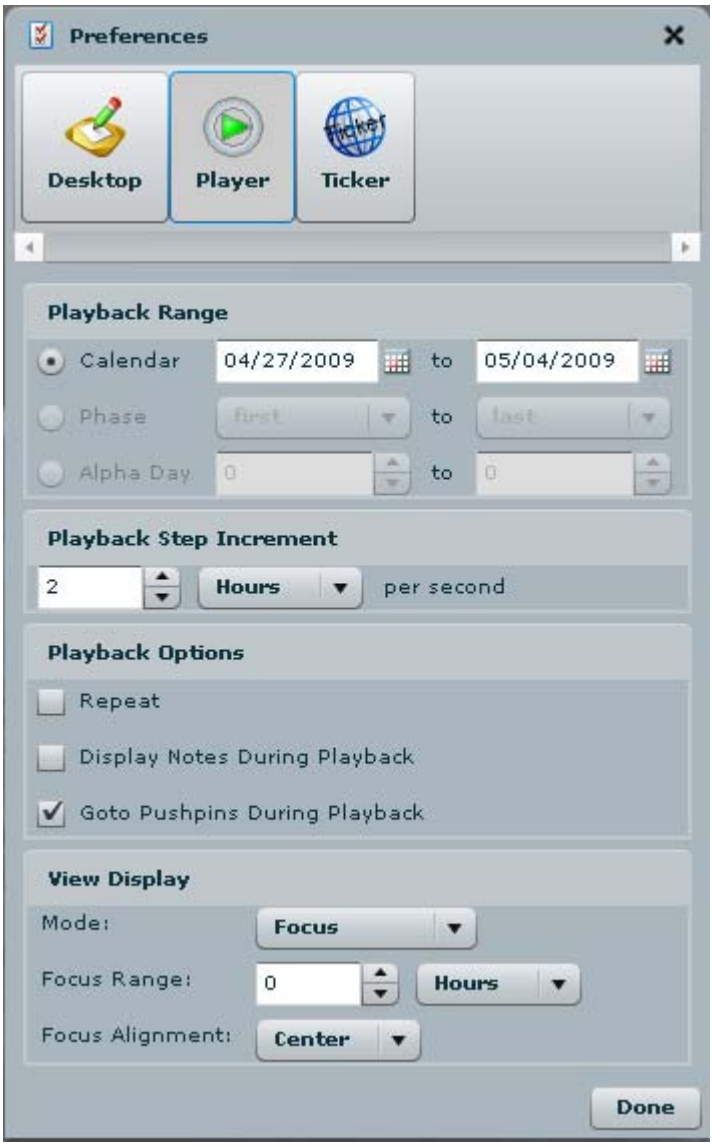


Figure C- 64. Player Preferences

The Playback Range will need to be modified in a new plan before the Plan Player can be run successfully. By default, the range uses Alpha Days. Phases may be used once a default set of phases have been set up on the Operation editor. Calendar dates may also be used once an alpha date has been set up in the Operation Editor. See 0 for further details on the Operation Editor.

Playback Step Increment allows the user to determine the interval of the play back step per second. For example, if the user intends to review a plan that lasts months, it may be more

beneficial to step through the plan's actions in terms of days or weeks instead of in terms of hours.

Playback Options include the ability to:

- Repeat through the play process automatically
- Use/Ignore pushpins during play back
- Display/Ignore notes during playback

Under 'View Display', the Focus mode will display items on the map only as they come into focus in the time displayed by the Synchronization module. When playing with Persistence mode, once map shapes appear, they will remain while in play back. The

Under 'View Display', Focus Range is used to determine the time range in which elements are active over time through play back. For example, if the range is set to two days, then the play back mode will display all elements whose activities intersect the two day range.

Under 'View Display', Focus Alignment is used to determine from where within the focus range the exact focus should be. In our example of a two day Focus Range, before would be the beginning of day one, center would be 24 hours later, and After would be at the end of the two days. If the start time was D+10 and you chose to align your focus After the Focus Range, then the modules and views would display all activities occurring D+8 through D+10 initially.

Related Processing

This paragraph has been tailored out.

Data Backup

It is expected that the System Administrator responsible for the IOPC-X Server and Database will provide regular backups of data to ensure protection against lost data. If there is any question on protecting IOPC-X data, please contact your System Administrator.

Recovery from Errors, Malfunctions, and Emergencies

This section details the error messages that one may encounter while using the COA Sketch application.

The following is a list of commonly encountered issues with COA Sketch.

Table C- 1. Encountered Issues and Resolutions

Issue Resolution	
Not receiving dynamic updates	Re-open COA Sketch in web browser. If that does not help, then see COA Sketch Installation Guide
Icons not available in Sketch	See COA Sketch Installation Guide
Menus all display as “null”	Internationalization is not correct, see COA Sketch Installation Guide.
Workspace Toolbar disappeared	Preferences became corrupt; please reregister the data model. Note: all data will be lost! See COA Sketch Installation Guide.
Time zones are not available	Preferences became corrupt; please reregister the data model. Note: all data will be lost! See COA Sketch Installation Guide.

Please see COA Sketch Open Problem Reports for more information on known issues.

Please see COA Sketch Enhancement Reports for more information on planned enhancements.

Messages

This paragraph has been tailored out.

Quick-reference Guide

This paragraph has been tailored out.

Future Enhancements

- Ticker
- Lines of Effect
- Operations, Activities and Actions (OAA) Status
- Effect Status

Ticker

Future Enhancement

Capabilities

The Ticker displays user-selected information continuously through a repeatable scroll pattern. Elements on the Ticker are deemed of high-importance and thus require frequent updates or monitoring.

Processing Procedures

By default, the ticker is set to be hidden on the Workspace. To hide or show the ticker, go to the View menu. A checkmark next to Ticker indicates it is shown in the Workspace. No checkmark indicates it is hidden. Select Ticker in the View menu to toggle its display.

Getting Started

Using the Ticker

To add elements to the Ticker, select a plan element in the Synchronization module and drag it to the Ticker. The item will be repeated (copied) to the Ticker. The information scrolls continuously while the "Play" icon is selected. The information pauses when the "Pause" icon is selected. To "Fast Forward" or "Rewind" information on the Ticker, grab the clock hand control and move counter-clockwise for information to scroll right (Rewind) or move clockwise for information to scroll left (Fast Forward). See Figure C- 65. Ticker. To remove a plan element from the Ticker, select the element on the Ticker and drag it to any area off the Ticker. The item will no longer be displayed.

Figure C- 65. Ticker

In the future, the triangle representing the planning element will display assessment information.

Setting Preferences

The user can set whether items dragged to the Ticker are inserted in the dropped location or at the end of the Ticker. Scrolling and speed can also be adjusted. To set these preferences, select Preferences… under the View menu. Next, click on the Ticker icon. See Figure C- 66. Ticker Preferences .

Figure C- 66. Ticker Preferences

Lines of Effect

Future Enhancement

Capabilities

The LOE view provides the hierarchical structure from a PEL through various plan levels down to tactical tasks. Symbol color indicates status. Lines visually depict relationships among the elements and plans. Each plan element has corresponding PEL number information.

Horizontal lines in the LOE View show four plan types: National Implementation Plan (NIP), Strategic, Operational, and Tactical. Within each plan type, the corresponding plan elements can be displayed and include PELs, Objectives, Tasks, and Activities. Plan elements are shown by expanding the plan, i.e., selecting the triangle next to the plan name. Symbols for a specific plan element line, such as Objectives, can be toggled "On" by selecting the checkbox for that line such that the check appears.

Filtering specific plan elements in the LOE View is accomplished by selecting sections in the Flyover view. The Flyover view is comprised of four sections, one for each plan type. For example, selecting a NIP PEL will display all lower-order effects and Operations/Tasks/Activities in the LOE. Individual effects or plan elements can be displayed or hidden by holding down the Control key and selecting the Flyover element with the mouse. A plan type with no plan elements will appear as a black square indicating no plan elements are available for selection or filtering.

The scale anchor points (Less Than, Expected, and Greater Than) can be moved along the horizontal axis by "grabbing" with the mouse and sliding left or right.

Selecting the "Lines of Effect" checkbox in the upper-right corner displays associations between plan elements. Lines are displayed when the check is present and removed when the check is absent.

Figure C- 67. Lines of Effect Mock Up is a representation of what LOE module would look like once implemented.

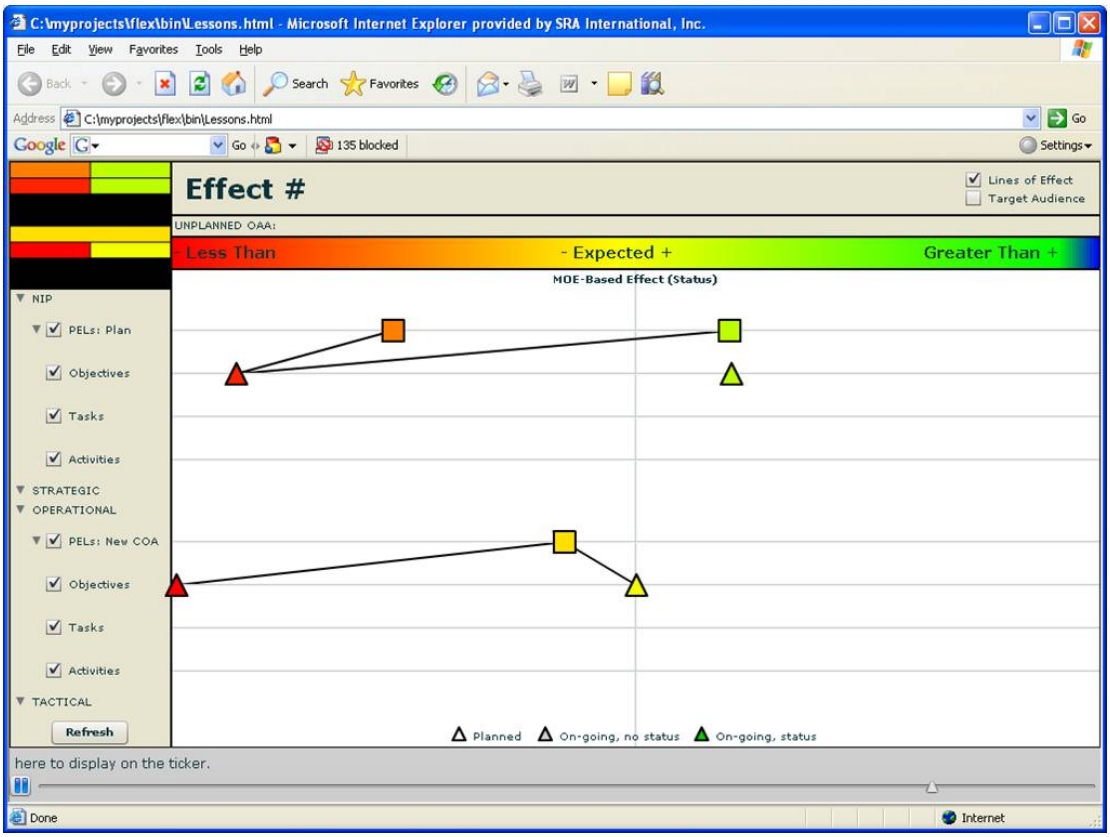


Figure C- 67. Lines of Effect Mock Up

Processing Procedures

Currently, the LOE View has not been implemented; however you can see the placeholder of the module in COA Sketch.

Getting Started

To see the LOE module placeholder, open Lines of Effect in the Workspace's Modules menu.

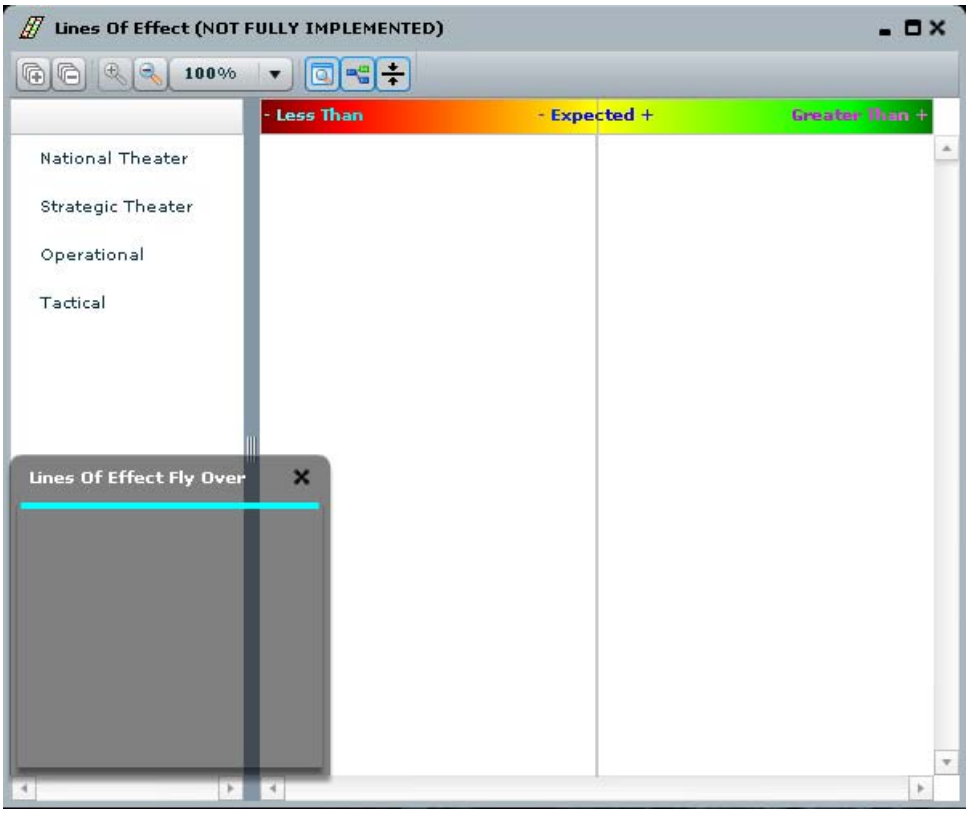


Figure C- 68. Lines of Effect Placeholder

OAA Status

Future Enhancement

Capabilities

The OAA Status View provides both plan element and effect status/trend information for a selected plan.

The operator selects an available plan from the drop-down box located on the right side of the view. The upper-left pane contains a list of PEL(s) for the selected plan. The first triangle icon indicates plan element status/trend and the second triangle icon indicates effect status/trend. Selecting a checkbox in the PEL pane creates a status/trend column in the bottom-right pane specific to that PEL. Additional PEL(s) columns are added as additional PEL are selected (checked). The lower-left pane contains all plan elements viewable through a tree Expand (select the "+" icon) and hidden through a Collapse (select the "-"icon). Expanding the plan produces corresponding effect status/trend indicators in the Effect pane. Figure C- 69. OAA Status Mock Up is a representation of what OAA Status module would look like once implemented.

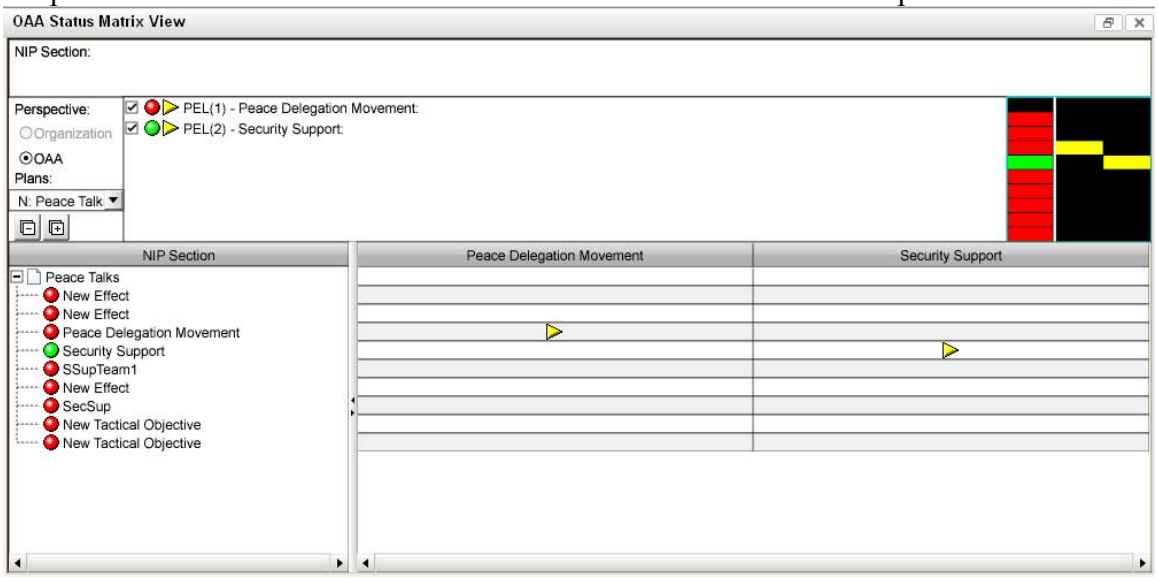


Figure C- 69. OAA Status Mock Up

Processing Procedures

Currently, the OAA Status Matrix View has not been implemented; however you can see the placeholder of the module in COA Sketch.

Note: the data displayed in the OAA Status Matrix is dummy data not related to the currently open operation.

Getting Started

To see the OAA Status module placeholder, open OAA Status Matrix in the Workspace's Modules menu.

Figure C- 70. OAA Status Matrix Placeholder

Effect Status

Future Enhancement

Capabilities

See GEMS-Final-Report for more details on IO Assessment View

Processing Procedures

Currently, the IO Assessment View has not been implemented; however you can see the placeholder of the module in COA Sketch.

Note: the data displayed in the IO Assessment is dummy data not related to the currently open operation.

Getting Started

To see the IO Assessment module placeholder, open IO Assessment in the Workspace's Modules menu.

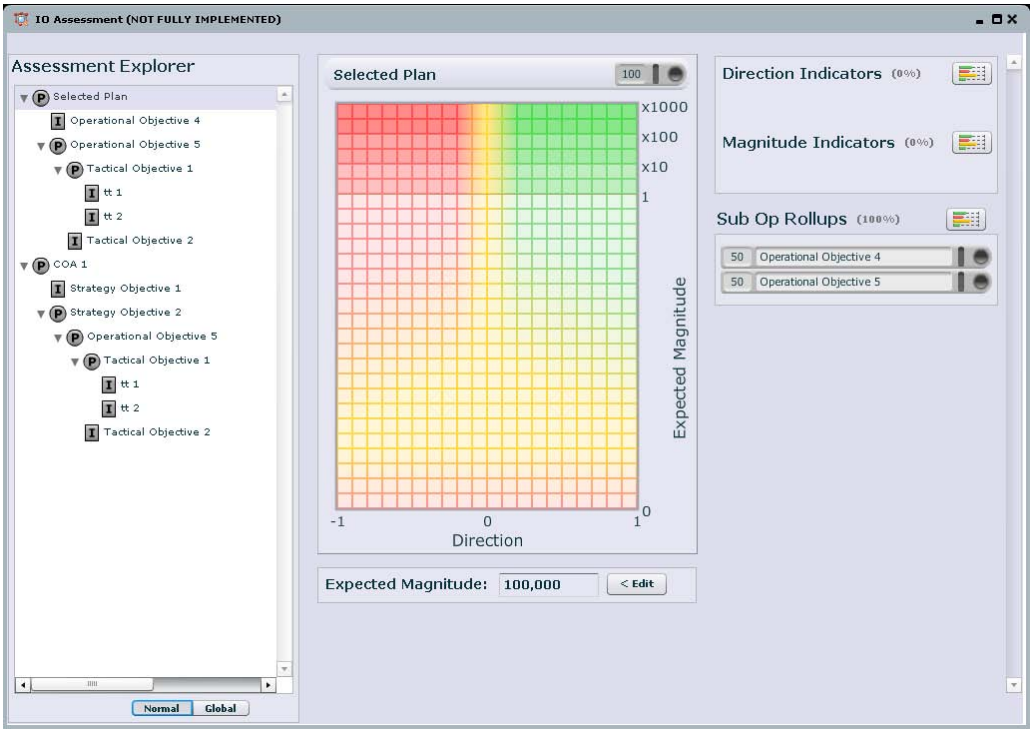


Figure C- 71. IO Assessment Placeholder

Notes

Log Files

The IOPCX_Server.out file is automatically generated during IOPC-X execution. It contains detailed information regarding errors and other events that may have produced output while IOPC-X modules are running. The log file is stored <*WebLogic IOPC-X Domain*> \servers\IOPCX_Server\logs. The default path of <*WebLogic IOPC-X Domain*> is something similar to C:\bea\user_projects\domains\IOPCX_Domain. This information is extremely valuable in troubleshooting possible issues that may arise.

Point of Contact

Please contact the IOPC-X Program Office with any suggestions for enhancements that you may have.

List of Acronyms

AFRL	Air Force Research Laboratory
AOC	Air Operations Center
CM Capability	Module
COA	Course of Action
CONOPS	Concept of Operations
IO Inform	ation Operations
IOPC-X	Information Operations Planning Capability – Experiment
JFCOM Joint	Forces Command
JMO	Joint Management Office
LOE	Lines of Effect
NIP National	Implementation Plan
OAA	Operations, Activities, and Actions
PEL	Prioritized Effect List
POC	Point of Contact
RDT&E	Research, Development, Test and Evaluation
RH Hu	man Effectiveness Directorate
SCIF	Sensitive Compartmented Information Facilities
SCOM	Software Center Operator Manual
SUM	Software Users Manual
SPVT	Strategy Planning Visualization Tool
SSC SD	SPAWAR Systems Center, San Diego
URL	Uniform Resource Locator

APPENDIX D – COA SKETCH EXTERNAL INTERFACES USE CASES

External Interfaces Use Cases and Requirements

Friendly Order of Battle (FRoB) Use Cases

Use Case x.1: User displays all friendly operating locations in a given area

User Story / Context of Use:

- In the course of developing a strategy, the Team Member or Reviewer may wish to know what friendly units are in a specific area in order to start developing possible maneuvers. The Team Member or Reviewer may wish to do this intuitively by designating an area of the map in the Sketch View. Since the Sketch View does not represent real-time tracking of individual friendly units, the way to do this will be by viewing friendly operating locations, from which the user can peruse associated friendly units.

Scope: User to COA Sketch Interaction
Level: User Level
Primary Actor: Team member, Reviewer
Supporting Actors: COA Sketch
Preconditions:

- The Sketch View is Open.
- COA Sketch has successfully connected to a system of record (SOR) and retrieved friendly operating location / unit data.

Triggers: The team member decides to view all friendly operating locations in a given area.
Guarantees:

- COA Sketch shows the user all the friendly operating locations within the requested area.

Main Success Scenario:

1. The user specifies an area in sketch view
2. The user selects a "display friendly operating locations" option
3. The user selects to display all operating locations
4. The system displays all friendly operating locations in the selected area

Requirements:

Use Case x.2: User displays specific friendly operating locations in a given area

User Story / Context of Use:

- In the course of developing a strategy, the Team Member or Reviewer may wish to know what friendly units are in a specific area in order to start developing possible

maneuvers. The Team Member or Reviewer may wish to do this intuitively by designating an area of the map in the Sketch View. Since the Sketch View does not represent real-time tracking of individual friendly units, the way to do this will be by viewing friendly operating locations, from which the user can peruse associated friendly units. Additionally, the user may have specific operations in mind, and may wish to filter operating locations to meet his/her needs. For example, the user may want to see only locations with a specific model of bomber available, or those with the bomber and a specific type of store item.

Scope: User to COA Sketch Interaction

Level: User Level

Primary Actor: Team member, Reviewer

Supporting Actors: COA Sketch

Preconditions:

- The Sketch View is Open.
- COA Sketch has successfully connected to a SOR and retrieved friendly operating location/unit data.

Triggers: The team member decides to view some friendly operating locations in a given area.

Guarantees:

- COA Sketch shows the user all the friendly operating locations of the requested type/types within the requested area.

Main Success Scenario:

1. The user specifies an area in sketch view
2. The user selects a "display friendly operating locations" option
3. The user selects the filters that he / she wishes to apply to the operating locations. This may include one or more of the following:
    - Minimum / maximum number of runways
    - Mobile / stationary locations
    - Whether the locations support air operations
    - Availability of specific items
    - The presence of certain types of friendly units
    - The country of ownership
    - The service in charge of the operating location
    - Availability on a specific date / dates

Alternate Scenario 1:

4. To perform an AND type of operation on filters, the user selects more than one filter option
5. Go to 6

Alternate Scenario 2:

4. To perform an OR type of operation on filters, the user selects a "select additional operating locations" options, then repeats the process from step 3
5. Go to 6

Alternate Scenario 3:

4. Where appropriate, options will have a NOT modifier that the user can select to ensure the operating location does not have the options included in that filter (i.e.

"NOT service = Army" would indicate all operating locations except those maintained by the Army)

5. Go to 6

Main Success Scenario:

6. The system displays the friendly operating locations of the type specified by the user in the selected area

Requirements:

Use Case x.3: User hides all friendly operating locations in a given area from the Sketch View

User Story / Context of Use:

- After viewing certain or all of the friendly operating locations in a given area, the user may decide to simplify the view by hiding them from certain portions of the map.

Scope: User to COA Sketch Interaction

Level: User Level

Primary Actor: Team member, Reviewer

Supporting Actors: COA Sketch

Preconditions:

- The Sketch View is Open.
- COA Sketch has successfully connected to a SOR and retrieved friendly operating location/unit data.
- Friendly operating locations have been added to the Sketch View.

Triggers: The team member decides to hide all friendly operating locations from a given area from the Sketch View.

Guarantees:

- COA Sketch hides all the operating locations within the requested area from the Sketch View.
- This process will alter neither the COA's nor the plan's list of unit numbers.

Main Success Scenario:

1. The user selects an area in sketch view
2. The user selects a "hide friendly operating locations" option
3. The user selects to hide all operating locations
4. The system hides all friendly operating locations within the area specified from the Sketch View

Requirements:

Use Case x.4: User hides specific friendly operating locations in a given area from the Sketch View

User Story / Context of Use:

- After viewing certain or all of the operating locations in a given area, the user may decide to simplify the view by hiding those they deem unnecessary from certain portions of the map.

Scope: User to COA Sketch Interaction

Level: User Level
Primary Actor: Team member, Reviewer
Supporting Actors: COA Sketch
Preconditions:

- The Sketch View is Open.
- COA Sketch has successfully connected to a SOR and retrieved friendly operating location/unit data.
- Friendly operating locations have been added to the Sketch View.

Triggers: The team member decides to hide specific types of friendly operating locations from a given area of the map.
Guarantees:

- COA Sketch hides from the Sketch View all the friendly operating locations of the indicated type within the requested area.
- This process will alter neither the COA's nor the plan's list of unit numbers.

Main Success Scenario:

1. The user select an area in Sketch View
2. The user selects a "hide friendly operating locations" option
3. The user selects filters, as described in x.2
4. The system hides friendly operating locations of the specified type within the area selected from the Sketch View

Requirements:

Use Case x.5: User manually selects friendly units

User Story / Context of Use:

- In the course of developing a strategy, the Team Member or Reviewer may wish to manipulate data relevant to specific friendly units. The Team Member or Reviewer may do this while browsing the friendly units associated with a specific operating location.

Scope: User to COA Sketch Interaction
Level: User Level
Primary Actor: Team member, Reviewer
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch has successfully connected to a SOR and retrieved friendly operating location/unit data.

Triggers: The team member decides to select specific friendly units.
Guarantees:

- COA Sketch hides from the Sketch View all the friendly operating locations of the indicated type within the requested area.
- This process will alter neither the COA's nor the plan's list of unit numbers.

Main Success Scenario:

1. The user select a friendly operating location
2. The user is presented with a list of friendly unit types associated with the selected operating location
3. The user selects one or more of the unit types from the list

Requirements:

Use Case x.6: User selects all friendly units in a given area

User Story / Context of Use:

- In the course of developing a strategy, the Team Member or Reviewer may wish to manipulate data relevant to all friendly units in a certain area. Rather than selecting each operating location in the area, then manually selecting each friendly unit in order to edit them, the Team Member or Reviewer may wish to do this intuitively by designating the area of the map in the Sketch View.

Scope: User to COA Sketch Interaction
Level: User Level
Primary Actor: Team member, Reviewer
Supporting Actors: COA Sketch
Preconditions:

- The Sketch View is Open.
- COA Sketch has successfully connected to a SOR and retrieved friendly operating location/unit data.

Triggers: The team member decides to select all friendly units in a given area.
Guarantees:

- COA Sketch selects all the friendly units within the user-specified area.

Main Success Scenario:

1. The user specifies an area in sketch view
2. The user selects a "select friendly units" option
3. The user chooses an option to select all friendly units
4. The system sets all friendly units in the chosen area as selected

Requirements:

Use Case x.7: User selects specific friendly units in a given area

User Story / Context of Use:

- In the course of developing a strategy, the Team Member or Reviewer may wish to manipulate data relevant to certain friendly units in a specified area. Rather than selecting each operating location in the area, then manually selecting the friendly units in question in order to edit them, the Team Member or Reviewer may wish to do this intuitively by designating the area of the map in the Sketch View.

Scope: User to COA Sketch Interaction
Level: User Level
Primary Actor: Team member, Reviewer
Supporting Actors: COA Sketch
Preconditions:

- The Sketch View is Open.
- COA Sketch has successfully connected to a SOR and retrieved friendly operating location/unit data.

Triggers: The team member decides to view all friendly units of the specific type/types in a given area.

Guarantees:

- COA Sketch shows the user all the friendly units of the requested type/types within the requested area.

Main Success Scenario:

1. The user specifies an area in sketch view
2. The user selects a "display friendly units" option
3. The user selects the user selects the filters that he / she wishes to apply to the friendly units. This may include one or more of the following:
    - Unit Type (Air, Electronic, Ground, etc.)
    - Service (Army, AF, etc.)
    - Parent country
    - Ship type
    - Aircraft type
    - Artillery type

Alternate Scenario 1:

4. To perform an AND type of operation on filters, the user selects more than one filter option
5. Go to 6

Alternate Scenario 2:

4. To perform an OR type of operation on filters, the user selects a "select additional friendly units" option, then repeats the process from step 3
5. Go to 6

Alternate Scenario 3:

4. Where appropriate, options will have a NOT modifier that the user can select to ensure the operating location does not have the options included in that filter (i.e. "NOT service = Army" would indicate all operating locations except those maintained by the Army)
5. Go to 6

Main Success Scenario:

6. The system selects the friendly units of the type(s) specified by the user in the selected area

Requirements:

Use Case x.8: User selects all friendly units that could operate/engage within a given area

User Story / Context of Use:

- The Team Member or Reviewer may wish to know what friendly units are available to operate in a specific area to get an idea of possible maneuvers, or to see if they will need to make changes to unit levels. The Team Member or Reviewer may wish to select the area of the map that they are interested in operating in, and should be able to get this list of friendly units.

Scope: User to COA Sketch Interaction
Level: User Level
Primary Actor: Team member, Reviewer
Supporting Actors: COA Sketch

Preconditions:

- The Sketch View is Open.
- COA Sketch has successfully connected to a SOR and retrieved friendly operating location/unit data.

Triggers: The team member decides to view all friendly units that could operate / engage in a given area.

Guarantees:

- COA Sketch selects all the friendly units capable of operating within the requested area.

Main Success Scenario:

1. The user specifies an area in sketch view
2. The user selects a "select friendly units within striking range" option
3. The user chooses an option to select all friendly units
4. The system selects all friendly units whose operating radius includes all of the selected area

Requirements:

Use Case x.9: User selects specific types of friendly units that could operate/engage within a given area

User Story / Context of Use:

- The Team Member or Reviewer may wish to know what friendly units of certain types are available to operate in a specific area to get an idea of possible maneuvers. The Team Member or Reviewer may wish to select the area of the map and be able to get this information.

Scope: User to COA Sketch Interaction

Level: User Level

Primary Actor: Team member, Reviewer

Supporting Actors: COA Sketch

Preconditions:

- The Sketch View is Open.
- COA Sketch has successfully connected to a SOR and retrieved friendly operating location/unit data.

Triggers: The team member decides to view all friendly units of the specific type/types that could operate / engage in a given area.

Guarantees:

- COA Sketch shows the user all the friendly units of the requested type/types capable of operating within the requested area.

Main Success Scenario:

1. The user specifies an area in sketch view
2. The user selects a "select friendly units within striking range" option
3. The user selects the filters that he / she wishes to apply to friendly units as described in x.7
4. The system selects all friendly units that match the filter(s) selected whose operating radius includes all of the selected area

Requirements:

Use Case x.10: User adds a friendly operating location

User Story / Context of Use:

- While developing a COA, a user may decide that part of what makes this COA unique will be the introduction of new operating locations. The most intuitive way to do this will be via the Sketch View.

Scope: User to COA Sketch Interaction
Level: User Level
Primary Actor: Team member
Supporting Actors: COA Sketch
Preconditions:

- The Sketch View is Open.

Triggers: The team member decides to add an operating location to the COA.
Guarantees:

- The current COA will include the user-added operating location.
- The COA is now clearly marked as having information not based on SOR data.
- The non-SOR data designation and the information causing this designation is included in data that is considered during the process described in COA Development use cases 3.11 and 3.12.
- The change is only to the current COA, and is not persisted to the SOR.

Main Success Scenario:

1. The user selects an "add operating location" option
2. The user selects the area on the Sketch View where he / she would like to add the operating location
3. The system prompts the user to enter data for the operating location including (some or all of these entries could be optional):
    - Location name
    - Number of runways
    - Mobile capability
    - Ability to support air operations
    - The service operating this location
    - The operating status
    - ICAO
    - Operating status
    - Parent country
4. The COA adds the operating location to the information about the friendly order of battle, and the COA is marked as having location / unit information not supplied by the SOR service

Requirements:

Use Case x.11: User removes a friendly operating location and its associated friendly units

User Story / Context of Use:

- While developing a COA, a user may add operating locations, only to change his / her mind later and decide to delete some or all of these operating locations.

Scope: User to COA Sketch Interaction
Level: User Level
Primary Actor: Team member
Supporting Actors: COA Sketch
Preconditions:

- The Sketch View is Open.

Triggers: The team member decides to remove an operating location from the COA.
Guarantees:

- The current COA will include the user-added operating location.
- If the deleted operating location is SOR-supplied, the COA is now clearly marked as having information not based on SOR data, if this was not already the case.
- The non-SOR data designation and the information causing this designation is included in data that is considered during the process described in COA Development use cases 3.11 and 3.12.
- The change is only to the current COA, and is not persisted to the SOR.

Main Success Scenario:

1. The user selects an operating location
2. The user selects a "delete operating location" option
3. The system warns the user that this will also delete all friendly units associated with this operating location, and prompts the user for confirmation
4. The COA removes the operating location and its associated friendly units from the information about the friendly order of battle. If the operating location was SOR-supplied, the COA is marked as having location / unit information not supplied by the SOR service if it did not already have this designation

Requirements:

Use Case x.12: User adds friendly units to a friendly operating location

User Story / Context of Use:

- While developing a COA, a user may decide that part of what makes this COA unique will be the introduction of new friendly units to an existing operating location in order to carry out certain operations.

Scope: User to COA Sketch Interaction
Level: User Level
Primary Actor: Team member
Supporting Actors: COA Sketch
Preconditions:

- The Sketch View is Open.

Triggers: The team member decides to add friendly units to an operating location.

Guarantees:

- The current COA will include the user-added unit data.
- The COA is now clearly marked as having information not based on SOR data.
- The non-SOR data designation and the information causing this designation is included in data that is considered during the process described in COA Development use cases 3.11 and 3.12.
- The change is only to the current COA, and is not persisted to the SOR.

Main Success Scenario:

1. The user selects the operating location
2. The user selects an "add friendly units to operating location" option
3. The user selects the unit type from a presented list of options
4. The system presents the user with a dialog with data fields relevant to the selected unit type that user fills in.
5. The COA associates the unit with the operating location, and updates the friendly order of battle data. The COA is marked as having location / unit information not supplied by the SOR service

Requirements:

Use Case x.13: User edits information for one type of unit

User Story / Context of Use:

- While developing a COA, a user may decide that part of what makes this COA unique will be changing the number of available friendly units, or other unit information in order to carry out specific types of operations that might otherwise not be possible.

Scope: User to COA Sketch Interaction
Level: User Level
Primary Actor: Team member
Supporting Actors: COA Sketch
Preconditions:

- The Sketch View is Open.
- Friendly units have been selected in ways described in use cases x.5 – x.9 above.
- All friendly units selected are of the same type (i.e. same model of aircraft).

Triggers: The team member decides to edit the information for the selected friendly units (which are of the same type) for the current COA.

Guarantees:

- The current COA will include the user-edited unit information.
- The COA is now clearly marked as having information not based on SOR data.
- The non-SOR data designation and the information causing this designation is included in data that is considered during the process described in COA Development use cases 3.11 and 3.12.
- The change is only to the current COA, and is not persisted to the SOR.
- The user will not be able to change one type of unit into another using this method: this data will not be editable.

Main Success Scenario:

1. The user selects an "edit unit information" option
2. The system presents the user with the editable data held in common. For example, a type of aircraft might present the following fields for editing:
   - Sortie rate
   - Quantity (this number is either entered directly, or more likely, the user enters a percentage to modify all currently selected friendly units by)
   - Comments
   - Turn time
   - Assigned crew quantity
   - Aircraft configuration
3. The COA updates its friendly order of battle data to reflect the changes made, and the COA is marked as having location / unit information not supplied by the SOR service

Requirements:

Use Case x.14: User edits information for multiple types of friendly units

User Story / Context of Use:

- While developing a COA, a user may decide that part of what makes this COA unique will be changing the number of available friendly units in order to carry out specific types of operations that might otherwise not be possible. For broad types of changes like this, the user will want to be able to edit many different types of troops simultaneously.

Scope: User to COA Sketch Interaction
Level: User Level
Primary Actor: Team member
Supporting Actors: COA Sketch
Preconditions:

- The Sketch View is Open.
- Friendly units have been selected in ways described in use cases x.5 – x.9 above.

Triggers: The team member decides to edit the information for the selected friendly units for the current COA.

Guarantees:

- The current COA will include the user-edited unit information.
- The COA is now clearly marked as having information not based on SOR data.
- The non-SOR data designation and the information causing this designation is included in data that is considered during the process described in COA Development use cases 3.11 and 3.12.
- The change is only to the current COA, and is not persisted to the SOR.

Main Success Scenario:

1. The user selects an "edit unit levels" option
2. The system presents the user with the editable data held in common. For multiple unit types, this is most likely to include only quantity information, which can be input either as a direct number, or more likely, as a percentage of the unit's current level

3. The COA updates its friendly order of battle data to reflect the changes made, and the COA is marked as having location / unit information not supplied by the SOR service

Requirements:

Use Case x.15: User reverts COA to SOR levels for operating locations and troop levels

User Story / Context of Use:

- After making modifications to operating locations and troop levels, the user may decide to scrap all changes that he / she has made. The user may have made other changes to the COA that he / she wishes to keep, so this approach is more logical than deleting the entire COA and starting a new one.

Scope: User to COA Sketch Interaction
Level: User Level
Primary Actor: Team member, Reviewer
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch has successfully connected to a SOR and retrieved friendly operating location/unit data.

Triggers: The team member decides to revert the friendly order of battle data to that supplied by the SOR.

Guarantees:

- The COA is now clearly marked as having information supplied by the SOR.
- The SOR data designation is included in data that is considered during the process described in COA Development use cases 3.11 and 3.12.

Main Success Scenario:

1. The user selects a "revert to SOR data" option
2. The system warns the user that he / she will lose all edited unit info and any user-added operating locations, and waits for confirmation
3. If the user confirms, the COA loses all user-supplied friendly unit and operating location data, and mirrors the most current data supplied by the SOR

Requirements:

Missing Cases
User views changes between COA and current SOR.
User submits changes to one or more Operating Locations to SOR.
User submits changes to one or more Units to SOR.
COA is updated with new data from SOR.

System Interface Use Cases

Use Case 17.1: MAAP liaison enters/modifies Resource and Asset information

User Story / Context of Use:

- In order to aid the Strategy Planner in determining how long it will take to accomplish each effect, the planner must rely on the resource and asset information inputted into the system by the MAAP liaison.
- The Strategy Planner will need to know exactly how many DMPI/Sortie equivalents (DSEs) are available per ATO cycle.
- The MAAP liaison may be able to supply this information directly or may use the COA Sketch system to determine what the values may be.
- If using the COA Sketch system to determine these values, the MAAP liaison will need:
  - to lookup a time range for how long the values being entered are valid;
  - the type, location, and number of available aircraft;
  - statistics on each aircraft weapons loads;
  - and provide a value for how many PGM and non-PGM assets it will take to engage a target successfully (or use the default).

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Resource Developer
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- A COA is open in COA Sketch.
- The MAAP view is open.

Triggers: The MAAP Liaison needs to enter or modify resource and asset information.
Guarantees:

- Additions or modifications to the asset and resource information will be reflected in the Allocation Planner.
- Additions or modifications to the asset and resource information will be reflected in the MAAP view.

Main Success Scenario:

1. The user chooses to edit Resource and Asset information.
2. The system opens the XYZ view to allow the user to enter the Resource and Asset information.

Alternative 1:
Requirements:

Use Case 17.2: MAAP Liaison enters/modifies values for the PGM and non-PGM to target values

User Story / Context of Use:

- In order to aid the Strategy Planner in determining how long it will take to accomplish each effect, the planner must rely on the resource and asset information put into the system by the MAAP Liaison.
- Part of this information includes determining estimations on how effective the available weaponry will be against a target.
- For an added level of granularity, the MAAP Liaison is able to give this estimation for each aircraft's PGM and non-PGM weaponry.
- However, if that level of granularity is not necessary, the MAAP Liaison may also set up a default value that all weapons will inherit.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: MAAP liaison
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- A COA is open in COA Sketch.
- The MAAP View is open.

Triggers: The MAAP Liaison would like to enter default values for PGM and non-PGM estimation for successful target engagement.
Guarantees:

- All new and existing available aircraft will use these default values to calculate DMPI/Sortie relationships unless a non-default value is provided.
- Additions or modifications to the default values will be reflected in the Allocation Planner.
- Additions or modifications to the default values will be reflected in the MAAP View.

Main Success Scenario:
Alternative 1:
Requirements:

Use Case 17.3: User retrieves asset and resource updates from MAAP system of record

User Story / Context of Use:

- As the selected COA becomes more solidified and resources and assets also become more solidified, all of this information is available in the MAAP system of record.
- As long as the COA Sketch system has access to this system, then it can save time and effort by automatically ingesting this information.
- This will free up MAAP Liaisons and Strategy Planners from manual re-typing information already entered into a system.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Strategy Planner, MAAP Liaison
Supporting Actors: COA Sketch, MAAP system of record
Preconditions:

- COA Sketch is open.

- A plan/COA is open in COA Sketch.
- The user knows the connection information required to establish communication with the MAAP data system of record OR this information has already been entered into the system.

Triggers: The MAAP Liaison/Strategy Planner would like to automatically ingest MAAP Data from the MAAP system of record.

Guarantees:

- If Probability of Arrival or Damage are available, the scores will be available to the Allocation Planner to estimate the number of successfully engaged targets.
- If Resource or Asset information is available, the data will be available to the Allocation Planner to determine the number of DMPI/Sortie equivalents DSEs per ATO period.
- Modifications to existing values that are currently used in the Allocation Planner will cause re-calculation in the Allocation Plan.
- Additions or modifications to this information will be reflected in the MAAP View.

Main Success Scenario:

Alternative 1:

Requirements:

Use Case 17.4: User analyzes the initial force structure for adequacy

User Story / Context of Use

- This is a "first look" at the forces which have either been tentatively assigned or which have been made available.
- The staff should consider the relationship between specified and implied tasks and available assets. From this they determine if they have the air capabilities to perform all the specified and implied tasks.
- If there are shortages, this is the time to identify additional or alternative resources needed for mission success. For example, if the tasks include supporting the ground commander and there are none or too few Close Air Support (CAS) assets, this is the time to identify that shortfall.
- It is also an appropriate time to examine tanker support to ensure enough assets are included.

Scope: User to COA Sketch Interaction

Level: User Goal

User Impact:

The adequacy of air, space, and information capabilities will be examined repeatedly and revised often, if circumstances allow, throughout the crisis action planning phase. Nonetheless, the sooner a significant shortfall in the resources is clearly identified, the more likely we will develop a plan that is feasible.

Primary Actor: Strategy Planner, Strategy Guidance

Supporting Actors: COA Sketch

Preconditions:

- A plan/COA is open in COA Sketch.
- The Mission Analysis View is open.

Triggers: The Strategy Planner receives a Warning Order, Planning Order, Alert Order, JFC OPLAN or OPORD and wishes to perform Mission Analysis.

Guarantees:

- The user will be able to store this analysis of forces in the COA Sketch system.
- The analysis of forces will be available to the team members via the Mission Analysis view.

Main Success Scenario:

1. User examines guidance documents for the air, space, and information capabilities the JFACC should expect to have available.
2. User considers the work required to accomplish the specified and implied tasks and weighs this against the capabilities identified in the documents to be made available.
3. User summarizes his analysis and prepares recommended changes to the force list.

Alternative 1:
Requirements:
Current techniques:
Implementation ideas:

1. Temporal and geospatial views of force deployment (friendly and adversary) will aid in initial force structure analysis.
2. Show operational reach of specified forces. Click on force in geospatial view and show operational reach (basic level range without air refueling).
3. Show missile range.
4. Fuel and re-supply capabilities of friendly air bases. Available ramp space, munitions storage, bunkers, hardened shelters, fuel hydrant system.
5. Ground radar coverage, SAMs, CRCs, air defense OPS center?
6. Compatible systems? Can AWACS feed into their system? Do they have ADSI system to integrate air and ground systems?

Use Case 17.5: Display indication targets have been assigned to a plan element

User Story / Context of Use:

- The Strategy planner or TET Liaison/team member will need to make sure that targets have been assigned to each plan element.
- The Strategy planner will want to make sure that all targets that may be affecting the achievement of each plan element and, therefore, the plan have been considered.
- The TET Liaison/team member will need to do the same, but may also want to know targets are planned against high level plan elements that need to be removed due to the addition of targets to low level plan elements.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Strategy Planner, TET Liaison
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- A plan/COA is open in COA Sketch.
- Synchronization View is open.
- There is at least one plan element with targets associated to it.

Triggers: The Strategy Planner/TET Liaison wants to check which plan elements have targets associated to them.

Guarantees:

- The user will be able to see at a glance what plan elements have targets associated with them.

Main Success Scenario:

Alternative 1:

Requirements:

Use Case 17.6: Get map layer data from IPOE system of record

User Story / Context of Use:

- The Intel Liaison or Strategy Planner may have access to the IPB system of record. If this access is available, it would greatly aid the Strategy Planner's success and the Intel Liaison's responsibilities if this information could be automatically ingested into the system. This ingestion should also include automatic updates to the data for better situational awareness.

Scope: User to COA Sketch Interaction

Level: User Goal

Primary Actor: Intel Liaison, Strategy Planner

Supporting Actors: COA Sketch, IPOE system of record

Preconditions:

- COA Sketch is open.
- The user knows the connection information required in establishing communication with the IPOE system of record OR this information has already been entered into the system.

Triggers: Helpful map layer data is available in the IPB system of record that the team would like to see in the Sketch View.

Guarantees:

- The map layer data will be ingested in to the system.
- The map layer data will be available to the plan/COA that the IPOE data is associated with.
- All team members will have access to the map layer data for the plan/COA the data is associated with.

Main Success Scenario:

1. The user chooses retrieve map layer data from IPOE.
2. The system prompts the user for the connection data for the IPOE system.
3. The user provides the credentials to connect to the IPOE system.
4. The system connects to IPOE and displays of list of records.
5. The user selects a record.
6. The system loads the map layer data from the selected IPOE record.
7. The system continues to receive notifications from IPOE when the loaded map layer changes so that it can retrieve the new changes.

Alternative 1:

Requirements:

Use Case 17.7: Get DMPI information due to area selected on map

User Story / Context of Use:

- The Team Member or Reviewer may wish to know what DMPIs, target types or categories, or total DMPI count is being engaged within a specific area of the map. The Team Member or Reviewer may wish to select the area of the map and be able to get his information.

Scope: User to COA Sketch Interaction
Level: User Level
Primary Actor: Team member, Reviewer
Supporting Actors: COA Sketch
Preconditions:

- The Sketch View is Open.
- The plan contains at least one plan element that has targets associated with it.

Triggers:
Guarantees:

- A view will open that will display the following information about any DMPI that falls within the user selected area:
  - Total DMPI Count
  - DMPI count by target type or category
  - Description of each DMPI

Main Success Scenario:
Alternative 1:
Requirements:

Use Case 17.8: User analyzes forces required and available for each COA

User Story / Context of Use:

- Analyze forces required and available for each COA. This initial force analysis should be refined as the enemy capabilities and intent and our operational concept are further developed.
- Nonetheless, an initial force analysis for each COA is essential.
  - What forces has higher HQ made available for planning?
  - What forces are required for each air COA?
  - When are forces available IAW the current TPFDD or deployment timetable?
  - When are forces required for each COA?

Scope: User to COA Sketch Interaction
Level: User Goal
User Impact: This is
Primary Actor: Strategy Planner, Strategy Guidance
Supporting Actors: COA Sketch
Preconditions:

- A plan/COA is open in COA Sketch.
- The Mission Analysis View is open.
- The COA Development view is open.

Triggers:

- The Strategy Planner has completed Mission Analysis and now wishes to begin COA Development
- The Strategy Planner wishes to use the system to aid in capturing COA Development data.

Guarantees:

- The user will be able to store the specified tasks in the COA Sketch system
- The specified tasks will be available to the team members via the Mission Analysis view.

Main Success Scenario:

Alternative 1:

Requirements:

Current techniques:

Implementation ideas:

1. Review based on the COAs developed (varies by COA)
    a. Force bed-down could
    b. Number and type of forces
    c. Force flow
2. The tool helps capture the desired force flow in temporal, geospatial, tabular, and spreadsheet forms for each COA (if they differ).

Use Case 17.9: Provide a selectable target list in a area to a user

User Story / Context of Use:

- In order to aid the Strategy Planner in determining how long it will take to accomplish each effect, the planner must rely on the resource and asset information inputted into the system by the MAAP liaison.
- The Strategy Planner will need to know exactly how many DMPI/Sortie equivalents (DSEs) are available per ATO cycle.
- The MAAP liaison may be able to supply this information directly or may use the COA Sketch system to determine what the values may be.
- If using the COA Sketch system to determine these values, the MAAP liaison will need:
    - to lookup a time range for how long the values being entered are valid;
    - the type, location, and number of available aircraft;
    - statistics on each aircraft weapons loads;
    - and provide a value for how many PGM and non-PGM assets it will take to engage a target successfully (or use the default).

Scope: User to COA Sketch Interaction

Level: User Goal

Primary Actor: Resource Developer

Supporting Actors: COA Sketch

Preconditions:

- COA Sketch is open.
- A plan/COA is open in COA Sketch.
- The MAAP view is open.

Triggers: The MAAP Liaison needs to enter or modify resource and asset information.

Guarantees:

- Additions or modifications to the asset and resource information will be reflected in the Allocation Planner.
- Additions or modifications to the asset and resource information will be reflected in the MAAP view.

Main Success Scenario:

1. The user chooses to edit Resource and Asset information.
2. The system opens the XYZ view to allow the user to enter the Resource and Asset information.

Alternative 1:
Requirements:

Use Case 17.10: Provide a target list and/or a number of targets in a area to a user

User Story / Context of Use:

- In order to aid the Strategy Planner in determining how long it will take to accomplish each effect, the planner must rely on the resource and asset information inputted into the system by the MAAP liaison.
- The Strategy Planner will need to know exactly how many DMPI/Sortie equivalents (DSEs) are available per ATO cycle.
- The MAAP liaison may be able to supply this information directly or may use the COA Sketch system to determine what the values may be.
- If using the COA Sketch system to determine these values, the MAAP liaison will need:
  - to lookup a time range for how long the values being entered are valid;
  - the type, location, and number of available aircraft;
  - statistics on each aircraft weapons loads;
  - and provide a value for how many PGM and non-PGM assets it will take to engage a target successfully (or use the default).

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Resource Developer
Supporting Actors: COA Sketch
Preconditions:

- COA Sketch is open.
- A plan/COA is open in COA Sketch.
- The MAAP view is open.

Triggers: The MAAP Liaison needs to enter or modify resource and asset information.
Guarantees:

- Additions or modifications to the asset and resource information will be reflected in the Allocation Planner.
- Additions or modifications to the asset and resource information will be reflected in the MAAP view.

Main Success Scenario:

1. The user chooses to edit Resource and Asset information.
2. The system opens the XYZ view to allow the user to enter the Resource and Asset information.

Alternative 1:

Requirements:

Use Case 17.11: Strategy Planner enters Apportionment Guidance data into the system.

User Story / Context of Use:

•During Mission Analysis and throughout the campaign, the JFC will provide apportionment guidance to the Strategy Team. This guidance will aid the team in determining exactly how much focus should be made on specific target and mission types. By entering this information into the system, the Strategy Planner will provide the system with information to aid the team in determining how well the current plan is following this guidance.

•The service component commander may wish to elaborate on the Apportionment Guidance set forth by the JFC. This guidance will aid the team in determining exactly how much focus should be made on specific target and mission types. By entering this information into the system, the Strategy Planner will provide the system with information to aid the team in determining how well the current plan is following this guidance.

Scope: User to COA Sketch Interaction

Level: User Goal

Primary Actor: Strategy Planner, Strategy Guidance

Supporting Actors: COA Sketch

Preconditions:

•A plan/COA is open in COA Sketch.

•The Mission Analysis View is open.

Triggers:

•The Strategy Planner has received the JFC's apportionment guidance and now wishes to enter it into the system.

•The Strategy Planner has received the service component commander's apportionment guidance and now wishes to enter it into the system.

Guarantees:

•The JFC's apportionment guidance will be stored within the COA Sketch system.

•The JFC's apportionment guidance will be made available to all team members via the Mission Analysis view.

•The service component commander's apportionment guidance will be stored within the COA Sketch system.

•The service component commander's apportionment guidance will be made available to all team members via the Mission Analysis view.

•Adding or updating this data will reflect the apportionment guidance comparison displayed in the Allocation Planner.

Main Success Scenario:

1. The user chooses to enter Apportionment Guidance data into the system.
2. The system displays an editor window for entering the Apportionment Guidance data.

3.
4. The user enters the data and saves the changes.
5. The system stores the changes.

Alternative 1:

1. The user chooses to modify Apportionment Guidance data.
2. The system displays the Apportionment Guidance editor window with the current Apportionment Guidance data.
3. The user modifies the data and saves the changes.
4. The system stores the changes.

Requirements:

Use Case 17.12: Import IWPC Plan Into COA Sketch

User Story: While using COA Sketch the user might want to view a plan inside of IWPC. This plan can be loaded and displayed as if it were a plan originating from COA Sketch.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Operator
Support Actors: COA Sketch, IWPC
Preconditions:

1. IWPC is functional
2. COA Sketch is configured with IWPC connection details.

Triggers: User decides to view IWPC plan in COA Sketch.
Guarantees:

- IWPC plan data will not stored in two places.

Main Success Scenario:

5. User activates the import function.
6. A list of IWPC plans is presented to the user.
7. The user selects a plan to import.
8. The system determines if the plan is been previously imported and saved.
9. If plan has not been imported, the plan data is loaded from IWPC.
10. COA Sketch a new plan process is created using the IWPC plan data.

Alternative 1:

1. If plan has been imported, the COA Sketch plan process is found.
2. The plan process is then loaded, pulling required data from IWPC.

Finish:

1. The plan process data is returned to the client.
2. The plan process data is parsed and data objects are created.
3. Objects with COA Sketch specific data are marked as new objects.

Use Case 17.13: Open COA Sketch Plan Process

User Story: User wants to view a persisted plan in the COA Sketch client.
Scope: User to COA Sketch Interaction
Level: User Goal

Primary Actor: Operator
Support Actors: COA Sketch, IWPC
Preconditions:

1. IWPC is functional
2. COA Sketch is configured with IWPC connection details.

Triggers: User decides to view a COA Sketch plan process.
Guarantees:

- Plan data will be saved as it is edited.

Main Success Scenario:

1. User activates the open function.
2. A list of plan processes is presented to the user.
3. The user selects a plan process to open.
4. When COAs are being loaded, the system checks if it is an IWPC plan.
5. If the COA is from IWPC, the plan data is loaded from there.
6. If the COA is not from IWPC, the COA data is loaded from the COA Sketch persistent store.
7. The plan process data is parsed and data objects are created.
8. Objects are marked as not new.
9. Phase data is selected by the system.
10. Skip to step 12.

Alternative 1:

10. If multiple Phase set exist in the COAs, a list of phase data sets is presented to the user.
11. The user selects the Phase set to use for the plan process.

Finish:

12. The phase data is set for the plan process.

Use Case 17.14: Export COA to IWPC as a New Plan

User Story: The user wants to share a COA that has been created with the users of IWPC.
Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Operator
Support Actors: COA Sketch, IWPC
Preconditions:

3. IWPC is functional
4. COA Sketch is configured with IWPC connection details.

Triggers: The COA Sketch COA is ready to be viewed by the users of IWPC.
Guarantees:

- Data that can be stored in IWPC will be removed from COA Sketch persistent store.
- Data stored in COA Sketch can be mapped to IWPC objects.

Main Success Scenario:

1. The user activates the export function.
2. The system determines which COAs can be exported- they have to be not empty and saved.

3. A list of exportable plans is displayed to the user.
4. The user selects the COA to export.
5. Basic export data and phases are sent to the service.
6. The plan process data for the COA is loaded.
7. A new IWPC plan is created from the COA, plan process and phase data.
8. When the COA data is added to the new IWPC plan, its non COA Sketch specific data is removed from the COA Sketch persisted store.
9. When the phase data is added to the new IWPC plan, the related plan process phase data is removed from COA Sketch persisted store.
10. When the COA element data is added to the new IWPC plan, its non COA Sketch specific data, and causal links are removed from the COA Sketch persisted store.
11. Assumptions are concatenated into a single assumption and set in the new plan. They also remain in the COA Sketch persisted store.
12. Facts are concatenated into a single fact and set in the new plan. They also remain in the COA Sketch persisted store.
13. Tasks are concatenated into specified, implied and essential tasks and set in the new plan. They also remain in the COA Sketch persisted store.
14. If the name is already used, an incremental number is appended to the name until a unique name is created and displayed to the user for approval.
15. The new plan is sent to IWPC for persisting.

Alternative 1:

6. The system could not export the data, for example the connection to IWPC could not be established.
7. The system informs the user the export failed
8. The COA remains in the COA Sketch persisted data store.

Use Case 17.15: Load Mission Statement from IWPC

User Story: When plan(s) are loaded from IWPC a mission statement must be defined for the plan process. The statement will be a concatenation of all unique statements from each plan.

Scope: COA Sketch plan service

Level: System Goal

Primary Actor: COA Sketch System

Support Actors: IWPC

Preconditions:

1. IWPC is functional
2. COA Sketch is configured with IWPC connection details.

Triggers: Plan is loaded from IWPC.

Guarantees:

- Each individual mission statement will not be altered during concatenation process.

Main Success Scenario:

1. The user selects to open a plan process.
2. The system loads all IWPC plans associated with the process.
3. The system compares the mission statements of all IWPC plans and creates a list of unique mission statements

4. The system prompts the user to select the mission statement for the plan process.
5. The system sets the plan process mission statement to the selected statement.
    i. Any newly created/exported COAs will have the mission statement set in the plan process.
    ii. The individual IWPC plans will remain unique unless the mission statement is edited in COA Sketch. If it is edited, all the exported COA mission statements will be updated with the new mission statement.

Use Case 17.16: Persist Mission Statement to IWPC

User Story: When the user persists the plan, the mission statement must be stored be to IWPC.
Scope: COA Sketch plan service
Level: System Goal
Primary Actor: COA Sketch System
Support Actors: IWPC
Preconditions:

3. IWPC is functional
4. COA Sketch is configured with IWPC connection details.

Triggers: Plan process has been persisted.
Guarantees:

- Mission statement will be stored back to IWPC.

Main Success Scenario:

1. Plan data loaded from IWPC.
2. Mission statement data is received.
3. Mission statement is marked as changed. If not changed then stop.
4. If changed set mission statement in each plan object.
5. Send plan changes back to IWPC.

Use Case 17.17: Persist Phase Changes to IWPC

User Story: Phases have changed and the plan(s) in IWPC need to be updated with the changes.
Scope: COA Sketch plan service
Level: System Goal
Primary Actor: COA Sketch System
Support Actors: IWPC
Preconditions:

5. IWPC is functional
6. COA Sketch is configured with IWPC connection details.

Triggers: Phases have changed when persisted.
Guarantees:

- Phase data is stored to IWPC.

Main Success Scenario:

1. Plan data is loaded from IWPC.
2. Phase changes are extracted from the persistence data.
3. The original phase objects are found.
4. Deleted phase are removed from the original set.

5. Phases are updated in the original set.
6. New phases are added to the original set.
7. For each plan, the phases are updated to match the updated set previously created.
8. The plan updates for each will be sent back to IWPC.

Use Case 17.18: Load Assumptions for IWPC Plan

User Story: Assumptions need to be loaded from an IWPC plan and made into a COA Sketch object.
Scope: COA Sketch plan service
Level: System Goal
Primary Actor: COA Sketch System
Support Actors: IWPC
Preconditions:

7. IWPC is functional
8. COA Sketch is configured with IWPC connection details.

Triggers: Plan is loaded from IWPC.
Guarantees:

- Assumption data is not lost during loading.

Main Success Scenario:

1. Plan is loaded from IWPC.
2. Assumption data is pulled from the plan.
3. RTF meta data is cleaned off.
4. If assumption is not an empty string, create new assumption for COA Sketch.

Use Case 17.19: Load Facts for IWPC Plan

User Story: Facts need to be loaded from an IWPC plan and made into a COA Sketch object.
Scope: COA Sketch plan service
Level: System Goal
Primary Actor: COA Sketch System
Support Actors: IWPC
Preconditions:

9. IWPC is functional
10. COA Sketch is configured with IWPC connection details.

Triggers: Plan is loaded from IWPC.
Guarantees:

- Fact data is not lost during loading.

Main Success Scenario:

1. Plan is loaded from IWPC.
2. Fact data is pulled from the plan.
3. RTF meta data is cleaned off.
4. If fact is not an empty string, create new fact for COA Sketch.

Use Case 17.20: Load Specified Tasks for IWPC Plan

User Story: Specified Tasks need to be loaded from an IWPC plan and made into a COA Sketch object.

Scope: COA Sketch plan service
Level: System Goal
Primary Actor: COA Sketch System
Support Actors: IWPC
Preconditions:

11. IWPC is functional
12. COA Sketch is configured with IWPC connection details.

Triggers: Plan is loaded from IWPC.
Guarantees:

- Specified Task data is not lost during loading.

Main Success Scenario:

1. Plan is loaded from IWPC.
2. Specified Task data is pulled from the plan.
3. RTF meta data is cleaned off.
4. If specified task is not an empty string, create new task for COA Sketch.
5. Essential tasks cannot be distinguished and are filtered out.

Use Case 17.21: Load Implied Tasks for IWPC Plan

User Story: Implied Tasks need to be loaded from an IWPC plan and made into a COA Sketch object.
Scope: COA Sketch plan service
Level: System Goal
Primary Actor: COA Sketch System
Support Actors: IWPC
Preconditions:

13. IWPC is functional
14. COA Sketch is configured with IWPC connection details.

Triggers: Plan is loaded from IWPC.
Guarantees:

- Implied Task data is not lost during loading.

Main Success Scenario:

1. Plan is loaded from IWPC.
2. Implied Task data is pulled from the plan.
3. RTF meta data is cleaned off.
4. If Implied Task is not an empty string, create new task for COA Sketch.
5. Essential Tasks cannot be distinguished and are filtered out.

Use Case 17.22: Persist Assumptions to IWPC Plan

User Story: The user has changed the assumptions and wants to persist them back to IWPC.
Scope: COA Sketch plan service
Level: System Goal
Primary Actor: COA Sketch System
Support Actors: IWPC
Preconditions:

15. IWPC is functional

16. COA Sketch is configured with IWPC connection details.

Triggers: Plan is persisted back to IWPC.

Guarantees:

- Assumption data from other plans will not be stored in current plan being persisted.

Main Success Scenario:

1. User alters the assumption pulled from IWPC.
2. User activates the persistence function.
3. The new value is stored in the corresponding plan object.
4. Changes are sent to IWPC.

Alternative 1:

1. User deletes the assumption pulled from IWPC or no assumption existed in plan to begin with.
2. User creates new assumptions in COA Sketch.
3. User activates the persistence function.
4. The COA Sketch assumptions are persisted.
5. The full list of assumptions is loaded.
6. The list is concatenated into a single assumption and stored in the corresponding plan object.
7. Changes are sent to IWPC.

Use Case 17.23: Persist Facts to IWPC Plan

User Story: The user has changed the acts and wants to persist them back to IWPC.

Scope: COA Sketch plan service

Level: System Goal

Primary Actor: COA Sketch System

Support Actors: IWPC

Preconditions:

17. IWPC is functional
18. COA Sketch is configured with IWPC connection details.

Triggers: Plan is persisted back to IWPC.

Guarantees:

- fact data from other plans will not be stored in current plan being persisted.

Main Success Scenario:

1. User alters the fact pulled from IWPC.
2. User activates the persistence function.
3. The new value is stored in the corresponding plan object.
4. Changes are sent to IWPC.

Alternative 1:

1. User deletes the fact pulled from IWPC or no fact existed in plan to begin with.
2. User creates new facts in COA Sketch.
3. User activates the persistence function.
4. The COA Sketch acts are persisted.
5. The full list of facts is loaded.
6. The list is concatenated into a single fact and stored in the corresponding plan object.

7. Changes are sent to IWPC.

Use Case 17.24: Persist Tasks to IWPC Plan

User Story: The user has changed the tasks and wants to persist them back to IWPC.
Scope: COA Sketch plan service
Level: System Goal
Primary Actor: COA Sketch System
Support Actors: IWPC
Preconditions:

19. IWPC is functional
20. COA Sketch is configured with IWPC connection details.

Triggers: Plan is persisted back to IWPC.
Guarantees:

- Task data from other plans will not be stored in current plan being persisted.

Main Success Scenario:

1. User alters the specified or implied task pulled from IWPC.
2. User activates the persistence function.
3. The new value is stored in the corresponding plan object.
4. Changes are sent to IWPC.

Alternative 1:

1. User deletes the specified or implied task pulled from IWPC or no task existed in plan to begin with.
2. User creates new tasks in COA Sketch.
3. User activates the persistence function.
4. The COA Sketch tasks are persisted.
5. The full list of tasks is loaded.
6. The list is concatenated into a three separate lists for specified, implied and essential and stored in the corresponding plan object. Type determines if a task is set as a specified or implied task. If a task is essential determines if it is added to the essential list.
7. Changes are sent to IWPC.

Use Case 17.25: Persist COA Elements

User Story: User added, updated and deletes COA elements from a plan loaded from IWPC.
Scope: COA Sketch plan service
Level: System Goal
Primary Actor: COA Sketch System
Support Actors: IWPC
Preconditions:

21. IWPC is functional
22. COA Sketch is configured with IWPC connection details.

Triggers: Plan is loaded from IWPC.
Guarantees:

- COA Sketch specific data will be removed when an element is deleted.

- Causal Links between IWPC and COA Sketch elements are store in COA Sketch persisted store.

Main Success Scenario:

1. New COA elements of a matching IWPC type will be added to the IWPC plan.
2. New COA elements of a matching IWPC type store COA Sketch specific data in the COA Sketch persisted store.
3. COA elements that are updated will have new values set.
4. Deleted COA elements are removed from the IWPC plan.
5. Deleted COA elements also remove COA Sketch specific data from the COA Sketch persisted store.
6. Deleted causal links change parent id to the IWPC plan element id.
7. Added causal links change the parent id to the id of the new parent id in the plan object.

Use Case 17.26: Rename IWPC Plan

User Story: User renames COA that was loaded from IWPC and the system needs to make sure a unique name is passed to IWPC on persist action.
Scope: COA Sketch plan service
Level: System Goal
Primary Actor: COA Sketch System
Support Actors: IWPC
Preconditions:

23. IWPC is functional
24. COA Sketch is configured with IWPC connection details.

Triggers: Plan is loaded from IWPC.
Guarantees:

- The start of the IWPC plan name will be what the user entered.

Main Success Scenario:

1. User enters a new name for a COA that was loaded from IWPC.
2. User persists the changes.
3. The new name is validates as unique.
4. If the name is not unique, an incremental number is appended to the end of the name. The number is incremented until a unique name is created.
5. The name of the plan is changed to the new name, approved by the system.

Use Case 17.27: IWPC Effect Timing

User Story: When persisting the d-day offset and duration of an effect to IWPC the smallest unit of time that can be used is days. COA Sketch can store time in milliseconds, so lose of precision is inevitable. The start time is moved to the beginning of the day it occurs and the end time is moved to the end of the day it occurs. From there the duration of the effect is calculated and the d-day offset is set based on the updated start time.
Scope: COA Sketch plan service
Level: System Goal
Primary Actor: COA Sketch System
Support Actors: IWPC

Preconditions:

25. IWPC is functional
26. COA Sketch is configured with IWPC connection details.

Triggers: Plan is loaded from IWPC.

Guarantees:

- Duration will be calculated based on the day an effect starts and the day it ends.

Main Success Scenario:

1. An effect has a change in its start of stop time.
2. If start time is after midnight then time is adjusted to midnight (start of the day).
3. If end time is before midnight then time is adjusted to midnight (start of next day).
4. Number of days between new start and new stop is calculated.
5. D-Day offset is found using the new start date.
6. D-Day offset and duration are persisted to IWPC.

IWPC Interaction User Level Use Cases

Use Case Y.1: Team Member Imports IWPC Plan into COA Sketch

User Story: While using COA Sketch, the user might want to view a plan created in IWPC. This plan can be loaded and displayed as if it were a plan originating from COA Sketch.

Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member
Support Actors: COA Sketch, IWPC
Preconditions:

1. IWPC is functional
2. COA Sketch is configured with IWPC connection details.

Triggers: User decides to view IWPC plan in COA Sketch.
Guarantees:

- IWPC plan data will not stored in two places.
- Tasks can no longer be distinguished as Essential.

Main Success Scenario:

1. User activates the import function.
2. A list of IWPC plans is presented to the user.
3. The user selects a plan to import.
4. The system determines the plan has not been previously imported and saved so a new project is created and displayed containing the IWPC plan data

Alternative 1: Plan has been previously imported

4. The system determines the plan has been previously imported so it finds and displays the existing project.

Alternative 2: Can Not Establish Connection with IWPC

1. User activates the import function
2. The system indicates a connection to IWPC could not be made, no import is performed.

Alternative 3: Import plan into existing Project?

1. User indicates they wish to import an IWPC plan into an existing project
2. ?

Use Case Y.2: Team Member Opens COA Sketch Project Containing an IWPC plan

User Story: User wants to view a saved project in the COA Sketch client.
Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member
Support Actors: COA Sketch, IWPC
Preconditions:

1. IWPC is functional
2. COA Sketch is configured with IWPC connection details.

Triggers: User decides to view a COA Sketch project.

Guarantees:

- If there are multiple IWPC plans, their Mission Statements will be concatenated to form one project Mission Statement.

Main Success Scenario:

1. The user activates the open function.
2. The system displays the list of projects.
3. The user selects a project to open.
4. The system displays the project, if a COA is from IWPC, the plan data is loaded from there.
5. The system sets the project phases to that of the plan from IWPC

Alternative 1: Multiple IWPC Plans in the project

5. The system displays the list of plan phases in the project.
6. The user selects which phase they wish to use for the project.
7. The system sets the project to the selected phase

Alternative 2: Can Not Establish Connection with IWPC

4. The system alerts the user that a connection to IWPC could not be made, and informs which COAs will not be loaded
5. The system loads the rest of the project
6. The system sets the project phase to the default?

Use Case Y.3: Team Member Exports COA to IWPC as a New Plan

User Story: The user wants to share a COA that has been created in COA Sketch with the users of IWPC.

Scope: User to COA Sketch Interaction

Level: User Goal

Primary Actor: Team Member

Support Actors: COA Sketch, IWPC

Preconditions:

1. IWPC is functional
2. COA Sketch is configured with IWPC connection details.

Triggers: The COA Sketch COA is ready to be viewed by the users of IWPC.

Guarantees:

- Data that can be stored in IWPC will be removed from COA Sketch persistent store.
- Data stored in COA Sketch can be mapped to IWPC objects.
- A plan can be exported to IWPC only once.

Main Success Scenario:

16. The user activates the export function.
17. The system displays a list of COAs that are not empty, and have not been previously exported.
18. The user selects the COA to export.

19. The system sends the data to IWPC and deletes it from the COA Sketch persistent store
20. IWPC creates a plan from the COA, project, and phase data.
    i. Assumptions are concatenated into a single assumption and set in the new plan. They also remain in the COA Sketch persisted store.
    ii. Facts are concatenated into a single fact and set in the new plan. They also remain in the COA Sketch persisted store.
    iii. Tasks are concatenated into specified, implied and essential tasks and set in the new plan. They also remain in the COA Sketch persisted store.
    iv. Timing elements are rounded to whole day increments. The start time is moved to the beginning of the day it occurs and the end time is moved to the end of the day it occurs. From there the duration of the effect is calculated and the D-day offset is set based on the updated start time.
    v. The project mission statement is stored in the IWPC plan.
2. The system ensures the name is unique.
3. IWPC saves the plan as the COA name
4. The system links the project to the IWPC plan.

Alternative 1 Name Already Exists, Accept increment

21. The system determines the name already exists in IWPC and appends an incremental number to the name until a unique name is created and displayed to the user for approval.
22. The user accepts the name
23. IWPC saves the plan as the name
24. The system links the project to the IWPC plan

Alternative 2: Name Already Exists, Write New One

6. The system determines the name already exists and appends an incremental number to the name until a unique name is created and displayed to the user for approval.
7. The user enters in a new name
8. Repeat to step 6 in Main Success Scenario

Alternative 3: Can Not Export to IWPC

9. The system could not export the data, for example the connection to IWPC could not be established.
10. The system informs the user the export failed
11. The COA remains in the COA Sketch persisted data store.

Use Case Y.4: Team Member Edits COA Sketch Project Containing an IWPC plan

User Story: User wants to edit a saved project in the COA Sketch client.
Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member
Support Actors: COA Sketch, IWPC
Preconditions:

1. IWPC is functional

2. COA Sketch is configured with IWPC connection details.
3. A project containing IWPC plan(s) is open

Triggers: User decides to edit a COA Sketch project.

Guarantees:

- Plan data will be saved as it is edited.

Main Success Scenario:

1. The user enters the data area he wants to edit
2. The system locks the data in that area
3. The user edits data in the plan.
4. The system sends the data to IWPC when the user is done editing the data.
5. IWPC saves the data.
6. The system unlocks the data.

Alternative 1: Mission Statement Edited

1. The user enters the mission statement editing area.
2. The system locks the mission statement data
3. The user edits the mission statement of the project.
4. The system sends the mission statement for each exported COA to IWPC when the user is done editing the mission statement.
5. IWPC saves the data in each plan.
6. The system unlocks the data.

Alternative 2: Phase Data Edited

1. The user enters the phase data editing area.
2. The system locks the phase data.
3. User edits the phase data in the project.
4. The system sends the new phase data for each exported COA to IWPC when the user is done editing the phase data.
5. IWPC saves the data in each plan.
6. The system unlocks the data.

Alternative 3: Task/Assumption/Fact Data Edited

1. The user enters the task/assumption/fact editing area.
2. The system locks the specific data.
3. The user edits the task/assumption/fact for a plan.
4. The system sends the updated task/assumption/fact text to IWPC when the user is done editing the data.
5. IWPC updates the task/assumption/fact in the correct plan.
6. The system updates the task/assumption/fact in persistent data storage.
7. The system unlocks the data.

Alternative 3: New Task/Assumption/Fact Added

1. The user enters a new task/assumption/fact.
2. The system locks the specific data.
3. The user edits the task/assumption/fact for a plan.
4. The system sends the new task/assumption/fact text to IWPC when the user is done editing the data.
5. IWPC adds (concatenates) the new task/assumption/fact to every exported plan
6. The system adds the new task/assumption/fact to persistent data storage.
7. The system unlocks the data

Alternative 4: IWPC Concatenated Task/Assumption/Fact Removed

1. The user deletes a IWPC generated task/assumption/fact.
2. The system locks the specific data.
3. The system rebuilds the concatenated task/assumption/fact from the existing COA Sketch tasks/assumptions/facts. If there aren't any, no new object is created.
4. IWPC updates the task/assumption fact for the plan.
5. The system unlocks the data

Alternative 4: Task/Assumption/Fact Removed

1. The user deletes a task/assumption/fact.
2. The system locks the specific data.
3. The system removes the task/assumption/fact from persistent data storage.
4. IWPC does not remove the task/assumption/fact from its concatenated list.
5. The system unlocks the data

Use Case Y.5: Rename IWPC Plan

User Story: User renames a COA that was loaded from IWPC.
Scope: COA Sketch plan service
Level: System Goal
Primary Actor: COA Sketch System
Support Actors: IWPC
Preconditions:

1. IWPC is functional
2. COA Sketch is configured with IWPC connection details.

Triggers: Plan is loaded from IWPC.
Guarantees:

- The start of the IWPC plan name will be what the user entered.
- The IWPC plan name will be unique

Main Success Scenario:

1. The user enters a new name for a COA that was loaded from IWPC.
2. The user completes setting the name.
3. The system validates the new name as unique.
4. IWPC renames the plan to the new name.
5. The system updates links from the project to the new name.

Alternative 1: Name Already Exists, Accept increment

3. The system determines the name already exists and appends an incremental number to the name until a unique name is created and displayed to the user for approval.
4. The user accepts name
5. IWPC renames the plan to the new name.
6. The system updates links from the project to the new name.

Alternative 2: Name Already Exists, Write New One

3. The system determines the name already exists and appends an incremental number to the name until a unique name is created and displayed to the user for approval.
4. The user enters in a new name
5. Repeat to step 3 in Main Success Scenario

Alternative 3: Can Not Save to IWPC

3. The system could not save the data, for example the connection to IWPC could not be established.
4. The system informs the user the rename failed
5. The system keeps the plan with the original name.

System Use Cases from Prototype

Import IWPC Plan Into COA Sketch

User Story: While using COA Sketch the user might want to view a plan inside of IWPC. This plan can be loaded and displayed as if it were a plan originating from COA Sketch.
Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member
Support Actors: COA Sketch, IWPC
Preconditions:

3. IWPC is functional
4. COA Sketch is configured with IWPC connection details.

Triggers: User decides to view IWPC plan in COA Sketch.
Guarantees:

- IWPC plan will not be altered until save is applied.

Main Success Scenario:

5. User activates the import function.
6. A list of IWPC plans is presented to the user.
7. The user selects that plan to import.
8. The system determines if the plan is been previously import and saved.
9. If plan has not been import, the plan data is loaded from IWPC.
10. COA Sketch plan process data is created using the IWPC plan data.

Alternative 1:

5. If plan has been import, the COA Sketch plan process is found.
6. The plan process is then loaded, pulling required data from IWPC.

Finish:

11. The plan process data is returned to the client.
12. The plan process data is parsed and data objects are created.
13. Objects with COA Sketch specific data are marked as new objects.

Open COA Sketch Plan Process

User Story: User wants to view a persisted plan in the COA Sketch client.
Scope: User to COA Sketch Interaction
Level: User Goal
Primary Actor: Team Member
Support Actors: COA Sketch, IWPC
Preconditions:

5. IWPC is functional
6. COA Sketch is configured with IWPC connection details.

Triggers: User decides to view a COA Sketch plan process.

Guarantees:

- No plan data will be altered until save is applied.

Main Success Scenario:

6. User activates the open function.
7. A list of plan process is presented to the user.
8. The user selects the plan process to open.
9. When COAs are being loaded they system checks if it is an IWPC plan.
10. If the COA is from IWPC, the plan data is loaded from there.
11. If the COA is not from IWPC, the COA data is loaded from the COA Sketch persistent store.
12. The plan process data is returned to the client.
13. The plan process data is parsed and data objects are created.
14. Objects are marked as not new.
15. Phase data is selected by the system.
16. Skip to step 12.

Alternative 1:

10. If multiple Phase set are available a list if presented to the user.
11. The user selects the Phase set to use.

Finish:

12. The phase data is set for the plan process.

Export COA to IWPC as a New Plan

User Story: The user wants to share a COA that has been created with the users of IWPC.

Scope: User to COA Sketch Interaction

Level: User Goal

Primary Actor: Team Member

Support Actors: COA Sketch, IWPC

Preconditions:

7. IWPC is functional
8. COA Sketch is configured with IWPC connection details.

Triggers: The COA Sketch COA is ready to be viewed by the users of IWPC.

Guarantees:

- Data that can be stored in IWPC will be removed from COA Sketch persistent store.
- Data stored in COA Sketch can be mapped to IWPC objects.

Main Success Scenario:

25. The user activates the export function.
26. The system determines which COAs can be exported.
27. A list of exportable plans is displayed to the user.
28. The user selects the COA to export.
29. Basic export data and phases are sent to the service.

30. The plan process data for the COA is loaded.
31. A new IWPC plan is created from the COA, plan process and phase data.
32. When the COA data is added to the new IWPC plan, its non COA Sketch specific data is removed from the COA Sketch persisted store.
33. When the phase data is added to the new IWPC plan, the related plan process phase data is removed from COA Sketch persisted store.
34. When the COA element data is added to the new IWPC plan, its non COA Sketch specific data, can causal links are removed from the COA Sketch persisted store.
35. Assumptions are concatenated into a single assumption and set in the new plan.
36. Facts are concatenated into a single fact and set in the new plan.
37. Tasks are concatenated into specified, implied and essential tasks and set in the new plan.
38. The name is validated.
39. If the name is already used an incremental number is appended to the name until a unique name is created.
40. The new plan is sent to IWPC for persisting.

Load Mission Statement from IWPC

User Story: When plan(s) are loaded from IWPC a mission statement must be defined for the plan process. The statement will be a concatenation of all unique statements from each plan.
Scope: COA Sketch plan service
Level: System Goal
Primary Actor: COA Sketch System
Support Actors: IWPC
Preconditions:

9. IWPC is functional
10. COA Sketch is configured with IWPC connection details.

Triggers: Plan is loaded from IWPC.
Guarantees:

- Each individual mission statement will not be altered during concatenation process.

Main Success Scenario:

6. All IWPC plans are loaded.
7. A list of unique mission statements is created from the mission statements from each plan.
8. One big mission statement is created by concatenating each unique statement together.
9. The big mission statement is set for the plan process being returned to the client.

Persist Mission Statement to IWPC

User Story: When the user persists the plan, the mission statement must be stored be to IWPC.
Scope: COA Sketch plan service

Level: System Goal
Primary Actor: COA Sketch System
Support Actors: IWPC
Preconditions:

11. IWPC is functional
12. COA Sketch is configured with IWPC connection details.

Triggers: Plan process has been persisted.
Guarantees:

- Mission statement will be stored back to IWPC.

Main Success Scenario:

6. Plan data loaded from IWPC.
7. Mission statement data is received.
8. Mission statement is marked as changed. If not changed then stop.
9. If changed set mission statement in each plan object.
10. Send plan changes back to IWPC.

Persist Phase Changes to IWPC

User Story: Phases have changed and the plan(s) in IWPC need to be updated with the changes.
Scope: COA Sketch plan service
Level: System Goal
Primary Actor: COA Sketch System
Support Actors: IWPC
Preconditions:

13. IWPC is functional
14. COA Sketch is configured with IWPC connection details.

Triggers: Phases have changed when persisted.
Guarantees:

- Phase data is stored to IWPC.

Main Success Scenario:

9. Plan data is loaded from IWPC.
10. Phase changes are extracted from the persistence data.
11. The original phase objects are found.
12. Deleted phase are removed from the original set.
13. Phases are updated in the original set.
14. New phases are added to the original set.
15. For each plan, the phases are updated to match the updated set previously created.
16. The plan updates for each will be sent back to IWPC.

Load Assumptions for IWPC Plan

User Story: Assumptions need to be loaded from an IWPC plan and made into a COA Sketch object.
Scope: COA Sketch plan service
Level: System Goal

Primary Actor: COA Sketch System
Support Actors: IWPC
Preconditions:

15. IWPC is functional
16. COA Sketch is configured with IWPC connection details.

Triggers: Plan is loaded from IWPC.
Guarantees:

- Assumption data is not lost during loading.

Main Success Scenario:

5. Plan is loaded from IWPC.
6. Assumption data is pulled from the plan.
7. RTF meta data is cleaned off.
8. If assumption is not an empty string, create new assumption for COA Sketch.

Load Facts for IWPC Plan

User Story: Facts need to be loaded from an IWPC plan and made into a COA Sketch object.
Scope: COA Sketch plan service
Level: System Goal
Primary Actor: COA Sketch System
Support Actors: IWPC
Preconditions:

17. IWPC is functional
18. COA Sketch is configured with IWPC connection details.

Triggers: Plan is loaded from IWPC.
Guarantees:

- Fact data is not lost during loading.

Main Success Scenario:

5. Plan is loaded from IWPC.
6. Fact data is pulled from the plan.
7. RTF meta data is cleaned off.
8. If fact is not an empty string, create new fact for COA Sketch.

Load Specified Tasks for IWPC Plan

User Story: Specified Tasks need to be loaded from an IWPC plan and made into a COA Sketch object.
Scope: COA Sketch plan service
Level: System Goal
Primary Actor: COA Sketch System
Support Actors: IWPC
Preconditions:

19. IWPC is functional
20. COA Sketch is configured with IWPC connection details.

Triggers: Plan is loaded from IWPC.

Guarantees:

- Specified Task data is not lost during loading.

Main Success Scenario:

6. Plan is loaded from IWPC.
7. Specified Task data is pulled from the plan.
8. RTF meta data is cleaned off.
9. If specified task is not an empty string, create new task for COA Sketch.
10. Essential tasks cannot be distinguished and are filtered out.

Load Implied Tasks for IWPC Plan

User Story: Implied Tasks need to be loaded from an IWPC plan and made into a COA Sketch object.
Scope: COA Sketch plan service
Level: System Goal
Primary Actor: COA Sketch System
Support Actors: IWPC
Preconditions:

21. IWPC is functional
22. COA Sketch is configured with IWPC connection details.

Triggers: Plan is loaded from IWPC.
Guarantees:

- Implied Task data is not lost during loading.

Main Success Scenario:

6. Plan is loaded from IWPC.
7. Implied Task data is pulled from the plan.
8. RTF meta data is cleaned off.
9. If Implied Task is not an empty string, create new task for COA Sketch.
10. Essential Tasks cannot be distinguished and are filtered out.

Persist Assumptions to IWPC Plan

User Story: The user has changed the assumptions and wants to persist them back to IWPC.
Scope: COA Sketch plan service
Level: System Goal
Primary Actor: COA Sketch System
Support Actors: IWPC
Preconditions:

23. IWPC is functional
24. COA Sketch is configured with IWPC connection details.

Triggers: Plan is persisted back to IWPC.
Guarantees:

- Assumption data from other plans will not be stored in current plan being persisted.

Main Success Scenario:

5. User alters the assumption pulled from IWPC.
6. User activates the persistence function.
7. The new value is stored in the corresponding plan object.
8. Changes are sent to IWPC.

Alternative 1:

1. User deletes the assumption pulled from IWPC or no assumption existed in plan to begin with.
2. User creates new assumptions in COA Sketch.
3. User activates the persistence function.
4. The COA Sketch assumptions are persisted.
5. The full list of assumptions is loaded.
6. The list is concatenated into a single assumption and stored in the corresponding plan object.
7. Changes are sent to IWPC.

Persist Facts to IWPC Plan

User Story: The user has changed the acts and wants to persist them back to IWPC.
Scope: COA Sketch plan service
Level: System Goal
Primary Actor: COA Sketch System
Support Actors: IWPC
Preconditions:

25. IWPC is functional
26. COA Sketch is configured with IWPC connection details.

Triggers: Plan is persisted back to IWPC.
Guarantees:

- fact data from other plans will not be stored in current plan being persisted.

Main Success Scenario:

5. User alters the fact pulled from IWPC.
6. User activates the persistence function.
7. The new value is stored in the corresponding plan object.
8. Changes are sent to IWPC.

Alternative 1:

1. User deletes the fact pulled from IWPC or no fact existed in plan to begin with.
2. User creates new facts in COA Sketch.
3. User activates the persistence function.
4. The COA Sketch acts are persisted.
5. The full list of facts is loaded.
6. The list is concatenated into a single fact and stored in the corresponding plan object.
7. Changes are sent to IWPC.

Persist Tasks to IWPC Plan

User Story: The user has changed the tasks and wants to persist them back to IWPC.

Scope: COA Sketch plan service
Level: System Goal
Primary Actor: COA Sketch System
Support Actors: IWPC
Preconditions:

27. IWPC is functional
28. COA Sketch is configured with IWPC connection details.

Triggers: Plan is persisted back to IWPC.
Guarantees:

- Task data from other plans will not be stored in current plan being persisted.

Main Success Scenario:

5. User alters the specified or implied task pulled from IWPC.
6. User activates the persistence function.
7. The new value is stored in the corresponding plan object.
8. Changes are sent to IWPC.

Alternative 1:

1. User deletes the specified or implied task pulled from IWPC or no task existed in plan to begin with.
2. User creates new tasks in COA Sketch.
3. User activates the persistence function.
4. The COA Sketch tasks are persisted.
5. The full list of tasks is loaded.
6. The list is concatenated into a three separate lists for specified, implied and essential and stored in the corresponding plan object. Type determines if a task is set as a specified or implied task. If a task is essential determines if it is added to the essential list.
7. Changes are sent to IWPC.

Persist COA Elements

User Story: User added, updated and deletes COA elements from a plan loaded from IWPC.
Scope: COA Sketch plan service
Level: System Goal
Primary Actor: COA Sketch System
Support Actors: IWPC
Preconditions:

29. IWPC is functional
30. COA Sketch is configured with IWPC connection details.

Triggers: Plan is loaded from IWPC.
Guarantees:

- COA Sketch specific data will be removed when an element is deleted.
- Causal Links between IWPC and COA Sketch elements are store in COA Sketch persisted store.

Main Success Scenario:

8. New COA elements of a matching IWPC type will be added to the IWPC plan.

9. New COA elements of a matching IWPC type store COA Sketch specific data in the COA Sketch persisted store.
10. COA elements that are updated will have new values set.
11. Deleted COA elements are removed from the IWPC plan.
12. Deleted COA elements also remove COA Sketch specific data from the COA Sketch persisted store.
13. Deleted causal links change parent id to the IWPC plan element id.
14. Added causal links change the parent id to the id of the new parent id in the plan object.

Rename IWPC Plan

User Story: User renames COA that was loaded from IWPC and the system needs to make sure a unique name is passed to IWPC on persist action.
Scope: COA Sketch plan service
Level: System Goal
Primary Actor: COA Sketch System
Support Actors: IWPC
Preconditions:

31. IWPC is functional
32. COA Sketch is configured with IWPC connection details.

Triggers: Plan is loaded from IWPC.
Guarantees:

- The start of the IWPC plan name will be what the user entered.

Main Success Scenario:

6. User enters a new name for a COA that was loaded from IWPC.
7. User persists the changes.
8. The new name is validates as unique.
9. If the name is not unique, an incremental number is appended to the end of the name. The number is incremented until a unique name is created.
10. The name of the plan is changed to the new name, approved by the system.

IWPC Effect Timing

User Story: When persisting the d-day offset and duration of an effect to IWPC the smallest unit of time that can be used is days. COA Sketch can store time in milliseconds, so lose of precision is inevitable. The start time is moved to the beginning of the day it occurs and the end time is moved to the end of the day it occurs. From there the duration of the effect is calculated and the d-day offset is set based on the updated start time.
Scope: COA Sketch plan service
Level: System Goal
Primary Actor: COA Sketch System
Support Actors: IWPC
Preconditions:

33. IWPC is functional

34. COA Sketch is configured with IWPC connection details.

Triggers: Plan is loaded from IWPC.

Guarantees:

- Duration will be calculated based on the day an effect starts and the day it ends.

Main Success Scenario:

7. An effect has a change in its start of stop time.
8. If start time is after midnight then time is adjusted to midnight (start of the day).
9. If end time is before midnight then time is adjusted to midnight (start of next day).
10. Number of days between new start and new stop is calculated.
11. D-Day offset is found using the new start date.
12. D-Day offset and duration are persisted to IWPC.

External Interfaces Requirements

This document is intended to list all system level requirements for WHAT the external interfaces system must do.

1. **General**
   - 1.1. The system shall connect to 3 external systems.
   - 1.2. The system shall allow for the specification of a geographic area of interest (AOI)
   - **1.3. Map**
     - 1.3.1. The system shall display AOIs on a map
     - 1.3.2. The System shall display Friendly Operating Locations on a map.
     - 1.3.3. The system shall display targets on a map
       - 1.3.3.1. Should there be mil standard symbols?
   - **1.4. Search**
     - 1.4.1. The system shall allow for searching of Friendly Operating Locations that match specified search criteria within in an AOI
     - 1.4.2. The system shall allow for searching of Friendly Units that match specified search criteria within an AOI
     - 1.4.3. The system shall allow for searching of Targets that match specified search criteria (type, last observed time range, etc.) within an AOI.
     - 1.4.4.
   - **1.5. Hide / Show**
     - 1.5.1. The system shall allow for limiting display of Targets within an AOI to only those that match search criteria.
     - 1.5.2. The system shall allow for displaying all Targets within an AOI.
     - 1.5.3. The system shall allow for limiting display of Friendly Operating Locations within an AOI to only those that match search criteria.
     - 1.5.4. The system shall allow an AOI and all associated Operating Locations, Targets to be hidden on the map.
     - 1.5.5. The system shall allow an AOI and all associated Operating Locations and Targets to be shown on the map.
     - 1.5.6. When showing or hiding AOIs the display of Friendly Operating Locations and Targets within an AOI to that match search criteria shall be maintained.
   - **1.6. Layering**
     - 1.6.1. The system shall allow for AOIs to be layered on top of each other.
     - 1.6.2. The system shall allow for viewing of filters applied to an AOI.
     - 1.6.3. The system shall allow for the order of the AOI layers to be changed.
   - 1.7. The system shall allow information to be displayed for selected Friendly Operating Locations, Units, Targets.
   - **1.8. Selection**
     - 1.8.1. The system will allow for selection of a Strategy Object.
     - 1.8.2. The system shall allow for the selection of a Center of Gravity
     - 1.8.3. The system shall allow for an AOI to selected
     - **1.8.4. Friendly Operating Locations**
       - 1.8.4.1.1. The system shall allow for all visible Operating Locations in an AOI to be selected with an AOI.

1.8.4.1.2. The system shall allow for the selection of a specific individual Operating Location within an AOI

1.8.4.1.3. The system shall allow for the selection of specific multiple Operating Locations within an AOI

1.8.4.1.4. The system shall allow for the selection of specific multiple Operating Locations within an AOI that matches search criteria.

1.8.4.2. Friendly Units

1.8.4.2.1. The system shall allow for the selection of a specific individual Friendly Unit within an AOI

1.8.4.2.2. The system shall allow for the selection of specific multiple Friendly Units within an AOI.

1.8.4.2.3. The system shall allow for the selection of all Friendly Units within an AOI

1.8.4.2.4. The system shall allow for the selection of Friendly Units that match search criteria within an AOI.

1.8.4.3. Targets

1.8.4.3.1. The system shall allow the user to select one or more targets.

1.8.4.3.2. The system shall allow for the selection of all Targets within an AOI

1.8.4.3.3. The system shall allow for the selection of Targets that match search criteria within an AOI.

1.9. Search for Friendly Operating Locations AOI

1.9.1. The system shall allow for the search of Friendly Operating Locations based on a specified geographic area AND any combination of restrictions including:

1.9.1.1. Time

1.9.1.2. Minimum / maximum number of runways

1.9.1.3. Mobile / stationary locations

1.9.1.4. Whether the locations support air operations

1.9.1.5. Availability of specific items

1.9.1.6. The presence of certain types of friendly units

1.9.1.7. The country of ownership

1.9.1.8. The service in charge of the operating location

1.9.1.9. Availability on a specific date / dates

1.9.2. The system shall allow for the specification of restrictions to be combined using a Boolean OR.

1.9.3. The system shall allow for the specification of restrictions to be combined using a Boolean AND.

1.9.4. The system shall allow for the specification of restrictions to be negated using NOT if appropriate. (For example negating the minimum number of runways may not make sense.)

1.10. Search for Friendly Units

1.10.1. The system shall allow for the search of Friendly Units within an AOI based on a specified geographic area AND any combination of restrictions including:

1.10.1.1. Time

1.10.1.2. Unit Type (Air, Electronic, Ground, etc.)

1.10.1.3. Service (Army, AF, etc.)

1.10.1.4. Parent country
1.10.1.5. Ship type
1.10.1.6. Aircraft type
1.10.1.7. Artillery type

1.10.2. The system shall allow for the specification of restrictions to be combined using a Boolean OR.

1.10.3. The system shall allow for the specification of restrictions to be combined using a Boolean AND.

1.10.4. The system shall allow for the specification of restrictions to be negated using NOT if appropriate. (For example negating the time may not make sense.)

1.11. Friendly Units able to Strike specified AOI

1.11.1. The system shall allow for finding all friendly units that are able to strike anywhere within a specified AOI.

1.11.1.1. The system shall allow for restricting the results of all friendly units that are able to strike anywhere within a specified geographic area to the filter criteria.

1.11.1.1.1. Time
1.11.1.1.2. Unit Type (Air, Electronic, Ground, etc.)
1.11.1.1.3. Service (Army, AF, etc.)
1.11.1.1.4. Parent country
1.11.1.1.5. Ship type
1.11.1.1.6. Aircraft type
1.11.1.1.7. Artillery type

1.11.1.2. The system shall allow for the specification of restrictions to be combined using a Boolean OR.

1.11.2. The system shall allow for the specification of restrictions to be combined using a Boolean AND.

1.11.3. The system shall allow for the specification of restrictions to be negated using NOT if appropriate. (For example negating the time may not make sense.)

1.12. Target Association with Strategy Object

1.12.1. The system shall allow for one or more targets to be associated with a strategy object.

1.12.2. The system shall allow for all targets that match search criteria within an AOI to be associated with a strategy object.

1.12.3. The system shall allow for one or more targets associations to be removed from a strategy object.

1.12.4. The system shall allow for associations between strategy objects and targets to be viewed.

1.12.5. The system shall allow for the status of each target associated with a strategy object to be viewed.

1.12.6. The system shall allow the user to view the percentage of targets associated with a strategy element that must be engaged to produce desired effects.

1.12.7. The system shall allow the user to enter/modify the percentage of targets associated with a strategy element that must be engaged to produce desired effects.

1.12.8. The system shall allow the user to view the number of DMPIs associated to targets that are associated to a strategy object.

1.12.9. ? The system shall be able to pull the status of targets in the SOR and determine if the Strategy Object target goal is being met by scheduled targeting.

1.12.10. ? The system shall be able to pull the status of targets in the SOR and determine if the Strategy Object target goal is being met by scheduled resource allocation.

1.12.11. ? The system shall be able to pull the status of targets in the SOR and determine if the Strategy Object target goal was met by an operation (using BDA).

1.13. Target Association with Center of Gravity

1.13.1. The system shall allow for one or more targets to be associated with a Center of Gravity.

1.13.2. The system shall allow for all targets that match search criteria within an AOI to be associated with a Center of Gravity.

1.13.3. The system shall allow for one or more targets associations to be removed from a Center of Gravity.

1.13.4. The system shall allow for associations between Center of Gravity and targets to be viewed.

1.13.5.

2. Data Modification

2.1. The system shall display all data that is inconsistent with SOR data due to modifications, additions, and deletions.

2.2. The system shall indicate what data in the COA is not consistent with data maintained in available SORs.

2.3. The system shall allow Friendly Operating Locations to be created in the COA.

2.4. The system shall allow Friendly Operating Locations to be modified in the COA.

2.5. The system shall allow Friendly Operating Locations to be deleted from the COA.

2.6. The system shall relate Friendly Operating Location data that was imported back to the SOR it originated from.

2.7. The system shall maintain SOR information for Friendly Operating Locations even if the user has overridden the SOR data.

2.8. The maintained SOR data shall continue to be updated from the SOR even if the user overridden the SOR data for the COA.

2.9. The system shall allow all Friendly Operating Location modifications to be reverted back to using SOR data rather than user specified data.

2.10. The system shall allow all Friendly Operating Location deletions to be restored using SOR data if the FOL was linked to a SOR (rather than user specified data).

2.11. The system shall allow for viewing of differences between SOR data and user modifications to the data.

2.12. The system shall allow modifications to specified (selected or all) Friendly Operating Locations to be exported so external tools can be used to import the modifications back into the SOR.

2.13. The system may allow specified Friendly Operating Locations additions to be exported.

2.14. The system may allow specified Friendly Operating Location deletions to be exported.

2.15. The system may allow Friendly Units to be added to a Friendly Operating Location in the COA.

2.16. The system shall allow Friendly Units to be modified in the COA.
2.17. The system shall allow Friendly Units to be deleted from the COA.
2.18. The system shall allow modifications to specified Friendly Units to be exported.
2.19. The system shall allow specified Friendly Unit additions to be exported.
2.20. The system shall allow specified Friendly Unit deletions to be exported.
2.21. The system shall allow all Friendly Unit modifications to be reverted back to using SOR data rather than user specified data.
2.22. The system shall allow all Friendly Unit deletions to be restored using SOR data (rather than user specified data).
2.23. The system shall allow for (selected) targets to be removed from the COA.
2.24. The system shall allow for targets to be added to the COA.
2.25. The system shall allow for targets to be modified in the COA.
2.26. The system shall allow all target modifications to be reverted back to using SOR data rather than user specified data.
2.27. The system shall allow all target deletions to be restored using SOR data rather than user specified data.

3. SOR Interface (TO BE COMPLETED)

3.1. What are the pieces of data we are required to retrieve / modify / delete / add for each SOR?
3.2. The system shall automatically update, in near real time, all data that is associated with a SOR when the SOR is updated. If the data has been manually changed after importing from a SOR, the manual changes will not be updated.
3.3. The system shall retrieve / modify / delete / export target data including
3.3.1. Type
3.3.2. Location
3.3.3. DMPI count
3.3.4. ? Last seen date / time
3.4. The system shall retrieve / modify / delete Friendly Unit information including:
3.5. The System shall retrieve / modify / delete Friendly Location information

Strategy Planning Visualization Tool (SPVT)
Collaboration Assessment Event

14 – 18 September 2009
Dayton, OH

Prepared for:
Mr. Don Monk
711 HPW/RHCP
Air Force Research Laboratory
Human Effectiveness Directorate

Mr. Craig Stansifer
711 HPW/RHXB
Air Force Research Laboratory
Human Effectiveness Directorate

Contract Number: FA8650-04-C-6537

Submitted by
Chris Calhoun
SRA International, Inc.

Stewart Greathouse
SG Consulting, LLC

December 31, 2009

Preface

The Human Engineering in the Air & Space Operations Center (HE in the AOC) Strategy Planning Visualization Tool (SPVT) Collaboration event was conducted under the direction of Mr. Don Monk of the Air Force Research Laboratory's 711th Human Performance Wing Human Effectiveness Directorate (711 HPW/RHCP). The SPVT Collaboration event was organized and executed by the prime contractor, SRA International, Mr. Stewart Greathouse of SG Consulting and Dr. James Welshans of Teledyne CollaborX. The event was held at SRA in Dayton, OH and Louisiana State University – Shreveport (LSU-S) in Shreveport, LA from 14 through 18 September 2009. The effort was accomplished under Contract Number FA8650-04-C-6537, AOC Visualization, Strategy Planning Visualization Tool (SPVT) Program.

ACKNOWLEDGMENTS

Mr. Monk and Mr. Stansifer offers their sincere thanks to Col Michael Tichenor, Chief Combat Plans Division, and Lt Col Melvin Deaile, Chief Strategy Division, 608 Air & Space Operations Center (AOC), Barksdale AFB, LA, for providing warfighter support to the event. Additional thanks goes to Mr. Bryan Bartels, USSTRATCOM JFCC Global Strike/J0-I, for providing USSTRATCOM ISPAN SME representation at the event. Finally, Mr. Monk, Mr. Stansifer and the SPVT Collaboration project team thank all of the participants for their contributions to this effort.

Table of Contents

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

The Human Engineering (HE) in the Air & Space Operations Center (AOC) project focused on developing work-centered strategy planning and operational assessment visualization tools and concepts. These efforts were designed to operate with the envisioned information, applications, systems, and infrastructure that will be delivered with the AOC Block 10.2 capabilities. The research performed and understanding gained through the collective HE in the AOC program efforts, have led to the need for a study of both human-to-human and toolset collaboration in support of the AOC strategy and operational assessment teams and their collocated and distributed collaborators, e.g. Intelligence, Surveillance & Reconnaissance Division (ISRD), reach back, and coalition partners.

The United States Air Force (USAF) is increasingly using dynamic Effects-based approaches for monitoring, assessing, planning and executing military operations. These approaches levy new demands on personnel in the Air and Space Operations Center (AOC) and in reach-back organizations. In-depth collaboration requiring immediate shared access and manipulation of information about the operational environment, mission execution and assessment is necessary between these personnel who are often located in physically disparate locations. The required information to support effects-based approaches consists not only of data, but also of context. Understanding, updating and synchronization activities performed, and monitoring effects upon this systems-of-systems, requires a tailorable collaboration environment – one that supports a natural collaborative workflow between both collocated as well as remote users in support of near real-time coordinated production of AOC work products.

2 BACKGROUND

The Net-centric strategy of the Department of Defense (DoD) lays out goals of easier sharing of semantic information that "Web 2.0" technologies readily support. This new premise based on a "need to share" vs. the classic DoD "need to know" has led to great advances in collaboration amongst soldiers and senior decision makers. For example, United States Strategic Command's (USSTRATCOM) commander has been known to use "BLOG" technology in order to promote understanding of his guidance and facilitate collaboration with and among his troops. These collaboration tools still require knowledge gathering and user cognition of the data elements in order to establish proper knowledge, and ultimately, understanding in situational context.

The future of strategy planning and assessment includes the need for distributed teams to collaborate on a strategy plan. The majority of work threads performed by Strategy Planners during COA analysis include manual methods of information exchange such as found on whiteboards or printed maps. These tools support stove-piped functions that cannot be associated electronically to elements of the plan and therefore minimize essential contextual relationships from which true information can be derived.

New collaboration technologies must move unstructured data from the selected human-to-human collaboration environment into structured information sets realized within Community of Interest (COI) specific supporting "tools that collaborate." Two tools developed by the HE in the AOC program and Commander's Predictive Environment, respectively, Course of Action (COA) Sketch and Subject Matter Analysis and Research Toolkit (SMART), share unstructured data captured from the human-to-human collaboration environment and provide structure, augmentation and presentation of the data such that users can generate a shared or common understanding from multiple perspectives on the data. These tools operate within an extensible technology environment designed for intense collaboration.

A work-centered collaboration environment is built on technologies which support individual and team work activities. Software tools operated within that environment must have the ability to share information and thus support user knowledge development. An investigation into the leading collaboration tools in industry and government has determined that none of the major players in the COTS arena, including the designated (DOD CIO MEMORANDUM, Feb 02, 2009) DoD Enterprise Collaboration Services provided by Defense Information Systems Agency (DISA) and known as E-CollabCenter and Defense Connect Online are extensible enough for use in development of concepts put forth in Section 4. This finding shifted focus to the Australian Department of Defence, Defence Science and Technology Organisation (DSTO) "LiveSpaces" technology for use as the collaboration tool framework. LiveSpaces is founded on human-centered design principles and the software is in the process of being placed in open source under the GNU Public License version 3 (GPLv3). LiveSpaces is mature, effective and extensible. While LiveSpaces is not as thin client based as other offerings, the architecture is extensible and supports ubiquitous design (early proof of concepts have established and extended the LiveSpaces environment).

3 METHODS, ASSUMPTIONS, AND PROCEDURESS

3.1 Collaboration

Collaboration through distributed work environments has improved significantly in recent years due to advances in technology as well as advances in understanding the associated cognitive requirements (Warner, Letsky, and Cowen, 2005). These advances, however, have not been fully realized with respect to the user experience and the ability for teams to effectively accomplish tasks. Further, the internationalization of project teams has resulted in a higher frequency of distributed work. The work associated with these distributed teams sometimes results in what has been coined "intense collaboration." Characteristics of intense collaboration include parallel (simultaneous) work activities, multiple and diverse understandings of the problem domain, high levels of uncertainty and products requiring inputs from multiple users (Kumar, Fenema, and Von Glinow, 2004).

3.2 Collaboration Environments

The Australian DSTO LiveSpace technology framework is designed to support human-to-human intense collaboration in a command and control environment, particularly within the construct of strategy planning activities at the beginning of an operation. DSTO describes the motivation for a LiveSpace:

> *A LiveSpace is a technology-enhanced collaboration space for a team of people. The purpose of a LiveSpace is to integrate technologies that help people work together: to bring these technologies together into a supporting system that becomes part of the background, rather than the more common situation where these technologies appear as a set of disparate, idiosyncratic and quirky hardware gadgets and software applications (Phillips, M., 2008).*

The LiveSpace moves the emphasis on work from the environment and associated technologies to accomplishing the task at hand. The main technologies constituting a LiveSpace include the following elements: individual and shared workstations, projector displays, smart whiteboards, video teleconferencing, video and audio switching, and automatic lighting control. The LiveSpace is built upon open source software using open development standards, and therefore, is extensible in that new hardware and software capabilities can easily be added.

The collaboration environment can be further enhanced through the introduction of strategy planning support tools which go beyond the traditional notion of simply operating within a collaboration framework. Rather, the goal herein is to also demonstrate "tools that collaborate." Strategy planning team interactions and effectiveness are improved through the collaborative technologies afforded by LiveSpaces and required at the data level among tools and the environment. COA Sketch and SMART are strategy planning support tools which provide unique perspectives on shared data.

3.2.1 Defense Connect Online (DCO)

The Defense Connect Online (DCO) approach to collaboration incorporates Adobe Connect and Jabber Chat. DCO accommodates multiple users and multiple sites and is excellent for structured presentations. Collaboration is very much presenter focused with a clear delegation of roles. In situations where more than one presenter is required or necessary, the presenter role must be assigned and sequential, much like passing the baton. In the DCO environment, a distinction exists between the presenter and participants.

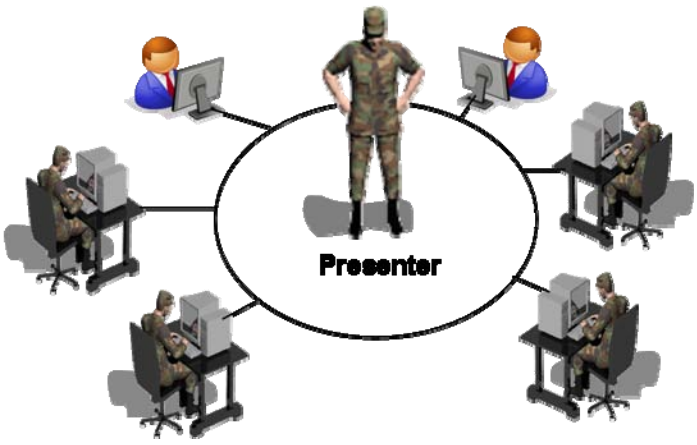


Figure 16. DCO Presenter-Focused Collaboration

"Adobe Connect is a personal web communication tool that enables you to have real-time, online meetings whenever you want. It also integrates the ability to share and annotate your screen, conduct a phone conference and broadcast live video from your web camera for efficient and productive online meetings" (DCO User Guide)

The DCO collaboration environment contains the following features:

1. Camera and Voice Pod
    a. Transmits audio and video
2. Attendee List
    a. Shows who is in the meeting room and their role
3. Chat Pod/Jabber
    a. Send and receive text messages
4. Share Pod
    a. Enables the presenter to display images and presentations
5. Poll Pod
    a. Allow for feedback from participants during a meeting
6. Whiteboard Pod
    a. Lets participants draw together in real time
7. File Share Pod
    a. Share files among the participants
8. Participant Control
    a. Allows Presenter and Participants to have private conversations

3.2.2 LiveSpaces

The LiveSpaces environment as configured for the assessment custom extensions contained the following features:

1. Camera Streaming and Audio Chat
2. Presence (User activity monitor)
3. Jabber Chat
4. Screen Sharing
    b. Make accessible to self another user's screen
    c. Make accessible to another user own screen
5. Electronic Whiteboard
6. File Sharing / Link Sharing
    d. Post and access link for team use
7. Shared Clipboard*
    e. Post or pull down information from a team notepad (text only)
8. Collaborative Editing*
    f. Three-tier team "document" space (Observe, Propose, Edit)
9. Live Point/Synergy*
10. Image Management*
11. Information Ticker*

Items marked with an asterisk (*) are capabilities not found in the DCO collaboration environment. Further LiveSpaces offers the ability to develop customizable "plug-ins" to the collaboration environment. The Information Ticker and Image Management features were two such extensions.

3.2.3 Collaboration Environment Decision Criteria

Several collaboration frameworks were evaluated based on the general criteria of being able to provide the services necessary for a collaboration space, for example, dynamic routing of video streams, screen sharing and information transfer. The frameworks were also evaluated based on extensibility, i.e. the ability to modify or integrate capability modules. A final consideration was the effort required to integrate a strategy planning product such as COA Sketch without a major code base rewrite.

The following collaboration frameworks were evaluated: Adobe Acrobat Connect (Defense Connect Online [DCO]), Cisco WebEx, Microsoft LiveMeeting, Skype, and LiveSpaces (Australian Department of Defence, DSTO).

High-level evaluation of the alternative packages suggested the following:

1. ***Adobe Acrobat Connect***: nice platform, but too restrictive
2. ***WebEx/WebEx Connect***: poor documentation and doesn't fully meet requirements
3. ***Microsoft LiveMeeting***: no integration points available
4. ***Skype***: nice platform, but requires an internet connection
5. ***LiveSpaces***: mature, extensible environment

LiveSpaces is an attempt to "support advanced meeting spaces and distributed multi-site collaboration." DSTO accomplished this by modeling the room as a collection of entities, whose

attributes can be manipulated. The main component is a compound object that contains the room model and a publish/subscribe message bus that is used to efficiently route messages to the clients. The integrated application would benefit from the capabilities of the room, most significantly from screen sharing and programmatic video routing. The accessible API could allow an application to fully participate as a 'member' of the room.

Successful employment of the LiveSpaces environment for similar Strategy Planning activities by the Australian Defense Technology and Science Office (DSTO), as well as other assessments such as the Intense Collaboration Workshop held by the TTCP C3I Technical Panel 2 and HUM Technical Panel 11 9-11 September 2008, show additional promise for its use in collaborative work product generation by both co-located and distributed teams. Use of multiple shared displays for synchronized operations awareness and vector checking as well as multi-user editing were anticipated to provide equal participation in work product development from both co-located and distributed locations. A key feature anticipated to provide ubiquitous operation of the environment was the LivePoint capability.

For these reasons, the Australian DSTO LiveSpace collaboration environment was selected for this assessment. LiveSpaces is a mature, effective and extensible solution and built on a human-centered design philosophy.

3.3 Collaboration Models and Requirements

A model of collaboration for the work environment was chosen to identify appropriate metrics for assessing user and team performance and to focus the scenario for application of those metrics. Several models of team collaboration exist. However, Warner, Letsky and Cowen's (2005) model of collaboration was chosen since it emphasizes a macrocognitive perspective and is based on four empirically supported collaboration stages:

1. Knowledge Construction
2. Collaborative Team Problem Solving
3. Team Consensus
4. Outcome, Evaluation and Revision

Each stage is further defined by one or more of the 16 macrocognitive processes described in Table 1. These processes account for individual as well as team activities.

Table 1 Sixteen macrocognitive processes proposed by Warner, Letsky and Cowen (2005)

Macro-cognitive Process	**Description**
Individual mental model construction	Individual team members use available information and knowledge to develop their mental picture of the problem situation
Knowledge interoperability	The act of exchanging useful, actionable knowledge among team members
Individual task knowledge development	Individual team members ask for clarification of data or information, or respond to clarification requested by other team members

Team knowledge development	All team members participate in clarifying information to build team knowledge
Individual knowledge object development	Pictures, icons, or standard text developed by an individual team member or the whole team to represent a standard meaning
Individual visualization and representation of meaning	Visualizations are used by individual team members to transfer meaning to other team members. Representations are methods (e.g. note pads) used by individual team members to sort data and information into meaningful chunks
Iterative information collection and analysis	Collecting and analyzing information to come up with a solution with no specific solution mentioned
Team shared understanding	The synthesis of essential data, information or knowledge, held collectively by some (complementary understanding) and/or all (congruent understanding) team members working together to achieve a common task
Develop, rationalize and visualize solution alternatives	Using knowledge to justify a solution
Convergence of individual mental models to team mental model	Convincing other team members to accept specific data, information or knowledge
Team negotiation	Team negotiation of solution alternatives ending in a final solution option
Team pattern recognition	The team as a whole identifies a pattern of data, information or knowledge
Critical thinking	The team works together toward a common goal, whereby goal accomplishment requires an active exchange of ideas, self-regulatory judgment, and systematic consideration of evidence, counterevidence and context in an environment where judgments are made under uncertainty, limited knowledge and time constraints
Shared hidden knowledge	Individual team members share their knowledge through prompting by other team members
Compare problem solution against goals	Team members discuss solution option against the goal
Analyze and revise solution options	Team members analyze final solution options and revise them if necessary

The 16 macrocognitive processes can be used to identify specific steps in collaboration which are directly supported through t ools and technologies. Unders tanding how well m acrocognitive processes are supported within the collaborati on environment provides a m eans of assessing individual a nd team collabora tion e ffectiveness. Expected m acro-cognitive pro cesses based on event triggers in the Pacifica scenario will be compared to observed processes.

For instance, within the construct of a strategy planning scenario, individuals develop sections of the Mission Analysis independently and reconven e with other team mem bers to build the "big picture." In this situa tion, understanding "Individual Mental Model Construction" focuses of an

individual's ability to create a knowledge structure of the system or environment which affects his/her activities during Mission Analysis. "Convergence of Individual Mental Models to Team Mental Model" focuses on the team's ability to bring together those individual's work into a coherent whole from which the team then works.

3.4 Collaboration Effectiveness Assessment

For the purposes of assessing the project's hypothesis,

> *"The collaboration environment enables a distributed strategy plans session which is as effective as that developed by collocated planners,"*

two questions must be answered. First, how well did the collaboration technology, i.e. LiveSpaces environment, support individual and team strategy planner work? Second, how well did the software tools support strategy planner work (assuming these tools "collaborate")?

Understanding how well the macro-cognitive processes from Table 1 are supported within the collaboration environment provides a means of assessing collaboration environment effectiveness. Unfortunately, measures of macrocognition are an emerging field of research, and therefore not clearly defined or easily accomplished. To the extent possible, measurements were conducted across the gamut of proposed macro-cognitive processes. Measurements involved defining work activities, performing work, then assessing whether those activities were achieved.

During individual and team mental model construction, a strategy planner may be required to maintain awareness of the anticipated location of friendly, adversary and unaligned forces. The planner can be expected to track information from several briefings and maintain communication with one or more distributed team members in order to stay aware of changing conditions. The planner's expected non-cognitive and cognitive tasks were defined prior to the warfighter assessment via SME input.

3.4.1 Macrocognitive Metrics

Work conducted in a strategy planning session is heavily cognitively focused with an emphasis on individual and team information gathering, analysis and knowledge building. Noble and Letsky (2003) detail a methodology and metrics for evaluation of collaboration effectiveness within a Command and Control (C2) environment. Their approach focused on the use of a Transactive Memory Model (detailed below).

Surveys and other instruments were conducted at specified scenario breakpoints. The intent was to produce as many quantifiable metrics as possible, such as the number of communication events to a specific team member or device, the time to create a product, or a planner's workload via the NASA TLX. Qualitative metrics, particularly those associated with cognitive tasks, were used to determine for instance, "how well" a planner understood the operational environment or who possessed knowledge important to his/her task. Qualitative metrics required interviews or survey instruments to capture the planner's thought processes and knowledge.

Measuring "tools that collaborate" was more easily accomplished, because objectives were better defined. That is, tools share data to facilitate strategy planner knowledge building. Knowing that data has been exchanged between two applications can easily be accomplished. Understanding how well each application takes advantage of that information exchange to support strategy planner knowledge building is more difficult and was not considered a part of this evaluation.

3.4.2 Transactive Memory Model

The transactive memory model (Figure 5) for collaboration has been developed and tested over the past fifteen years by a team of researchers, Moreland, Argote and Ingram, from the University of Pittsburgh, Carnegie Mellon University and Columbia University, respectively (Liang et al, 1995; Moreland and Myaskovsky, 2000; Argote and Ingram, 2000). Because of its emphasis on individual and team cognition and its strong empirical foundation, this model has been especially useful in identifying powerful collaboration metrics.

The transactive memory itself consists of the collection of individual understandings and the team mechanisms to exchange information and so update these individual understandings. The individual understandings include all of the understandings about teamwork and taskwork pointed out in the teamwork/taskwork model. These include understanding how to do the tasks required to perform the mission, understanding the status of the situation and task, understanding how the team is organized to function, and understanding how the team is actually functioning. It includes the common ground elements such as understanding of other team member's capabilities, workload, and knowledge.

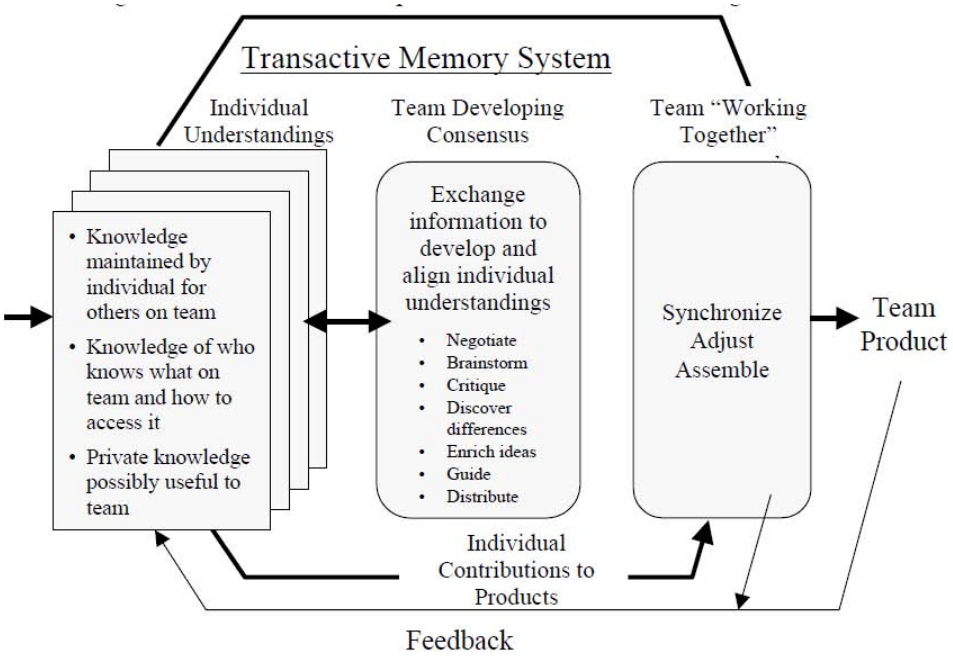


Figure 17 Transactive Memory Model

A key element of this model is its inclusion of the understandings found in the Teamwork and Taskwork model. Teamwork is defined as "the additional work that the team must do in order to function as a team" and Taskwork is defined as "the work that the team must do to accomplish its mission, ignoring the coordination and other additional work that arises from working as a team". The definitions of Taskwork and Teamwork parallel the definitions of Work and Meta-Work provided in Work Centered Design by Eggleston (2003) respectively. Work Centered Design (WCD) principles have been foundational in design principals used by the HE in the AOC program since 2004. Noble and Letsky's (2003) parallel approach provides proven metrics extended across distributed collaboration boundaries to assess overall collaboration effectiveness.

This methodology provides a solid measurement of the overall collaboration and toolsets abilities to ensure effective collaboration, but stops short of allowing association of benefits and detriments to particular tools. Therefore, the addition of work activity monitoring in the collaboration environment is important. By monitoring user activity during the specified measurement interval, correlation of user methodology to successes and failures can be inferred. Post mortem processing of this data correlated to interval survey results supplemented with follow-up user confirmation/clarification of inferred results allow for better understanding of individual capability contributions and issues.

3.4.3 Defining Work Activities

USAF military subject matter experts (SMEs) developed a strategy plan based on a pre-defined scenario which explores as many aspects as possible of the collaborative tools and technologies, while exploring system boundary conditions and affordances. The team matched activities from the strategy planning session to best demonstrate the primary aspects of the tools and technologies and stress the operational characteristics of distributed collaboration. Macrocognitive processes were associated with major elements of the scenario and an appropriate metric applied per the four collaboration stages described in Section 3.3.

Table 2 shows the majority of the work threads performed by Strategy Planners during COA analysis is primarily manual methods of information exchange such as whiteboards or printed maps. These methods support unstructured stove-piped functions that cannot be associated electronically to elements of the plan and therefore minimizes essential contextual relationships from which true information can be derived.

Table 2 Strategy Planner Work-Centered Cognitive Load – Meta-Work (gray cells) and Intrinsic Work (white cells)

Strategy Planner Goals	Strategy Planner Currently	Current IWPC Strategy Tool Provides
Understand cultures and politics	Uses life experience, education, briefings	

Understand battlespace	Is provided text, overlays or PowerPoint slides showing Restrictions, No-Fly areas, engagement zones etc.	XML Briefing Composer (XBC)/ Enhanced Visualization (eVis): Textual data and maps, overlays or PowerPoint slides, data bases that do not aggregate the information
Understand guidance and direction provided by higher level authorities	Reads text based documentation, maintains majority in head and shares interpretation verbally with others leveraging white boards for collaboration	Collaborative Planning Tool (CPT): Textual fields in which data from existing guidance may be captured and shared
Maintain awareness of anticipated location of friendly, adversary and unaligned forces	Receives PowerPoint presentation of information from ISRD, DIRMOBFOR Staff and others	CPT/Analyst's Collaborative Environment (ACE): Query tool and folder structure for searching MIDB for fixed target locations
Understand target systems	Must already be trained in understanding the interrelations among elements in all the different types of Target Systems	Tel-scope/eVis: Location, links and nodes, alternate targeting solutions
Understand weapon system	Uses life experience, education, Weapons School, briefings, threat study, etc	
Understand weather and environmental impact	Receives briefings on climate, reads reports	
Understand constraints and restraints	Uses life experience, education, briefings, text documents	CPT: Textual capture of data
Understand risk	Seeks out subject matter experts, reads text reports	
Ensure synchronization and synergy with other members of COA Development Team, superiors and other collaborators	Uses whiteboard, paper maps and verbal communication commonly leveraged, with key elements captured into PowerPoint by single individual who quickly becomes overwhelmed	Execution Monitoring Tool (EMT): Synchronization is provided using textual, concept map and Gantt style synchronization matrix view

Track sequence of actions required to take place in order over time with criteria for the start of sequel or branch operations	Use numbered textual descriptions with noted times	CPT/Electronic Synchronization Matrix (eSync): Hierarchical tree view of plan structure or concept map structure of plan available with temporal display using Gantt style synchronization matrix
Establish the required Apportionment levels for each COA vs. the available resources to be apportioned	Uses manual process used to filter target data; identify and count the number of desired mean points of impact (DMPI) of most likely target sets (targets of type). A Spreadsheet Leveraging known resource types or gap filling with proposed resources, a DMPI Sortie equivalent is calculated for each resource and an estimated Apportionment is derived for each COA	eVis: Geographic depiction of targets from MIDB and filtering of target types
Capture reasoning and intent of selected COAs to JFACC and subsequent Air Tasking Cycle process managers	Textual and PowerPoint depictions of each COA are generated	XBC: Automated PowerPoint generation for the textual plan descriptions captured

Planners work-around these limitations by aggregating disparate unstructured sets of data back into a PowerPoint presentation and the Information Warfare Planning Capability (IWPC) planning tool to re-associate context and meaning from the COA development process. While IWPC acts as a repository for the aggregation of much of this data into a structured data format, the tool is not commonly used interactively during the development of a COA. The fidelity of the IWPC data model is also lacking, textual descriptions are commonly used vs. discrete elements and attributes throughout the tool, forcing human cognition of meaning vs. system processing into human perceivable contextual relationship visualizations. It is this disconnect between the human work process and available tools which was addressed with the integration of COA Sketch and other work-centered tools that collaborate into the collaboration environment.

3.5 Building the Collaboration Environment

The assessment focused on distributed AOC strategy planning personnel in a work-centered and natural collaboration environment. The project leveraged the main LiveSpaces features and intended to identify opportunities for new features specifically tailored to support a USAF planning construct. For this study, some capabilities were omitted and some were changed, for example video teleconference was replaced with a less expensive alternative, webcams.

The LiveSpaces environment was configured for the assessment with the following features:

1. Camera Streaming and Audio Chat
2. Presence (User activity monitor)
3. Jabber Chat
4. Screen Sharing
    g. Make accessible to self another user's screen
    h. Make accessible to another user own screen
5. Electronic Whiteboard (see www.e-beam.com)
6. File Sharing / Link Sharing
    i. Post and access link for team use
7. Shared Clipboard
    j. Post or pull down information from a team notepad (text only)
8. Collaborative Editing
    k. Three-tier team "document" space (Observe, Propose, Edit)
9. Live Point/Synergy
10. Image Management
11. Information Ticker

LiveSpaces capabilities which were not instantiated for this assessment, a USAF distributed strategy planning context included the following:

1. Meta applications, room session management, and multi-media playback
2. Projector control and video switching
3. Ignite room control panel
4. Information Repository

While the aforementioned capabilities are important for a full implementation of LiveSpaces, this assessment had neither the resources to acquire the equipment necessary for a full system, nor the time to setup and conduct an assessment exercising the full system.

The suite of strategy planning tools available to the strategy planners included COA Sketch to support the Joint Air Estimation Process (JAEP) products through COA development and Subject Matter Analysis and Research Toolkit (SMART) to collect, organize and manage information relevant to Mission Analysis. Technologies such as COA Sketch and SMART support the AOC strategy planning process and have been instantiated through numerous subject matter expert (SME) interviews and collaborative interactions for multiple, concurrent users within and across those technologies. Further, the standard suite of Microsoft Office™ tools such as PowerPoint, Word and Excel were available on workstations.

COA Sketch provides an environment to develop planning elements within a geographic and temporal context (see Figure 3). Further, strategy planners are able to visually initiate the planning process and drive a more collaborative and cohesive interchange, enabling understanding of horizontal and vertical nesting of objectives, priority effects, and operations. COA Sketch is a multi-user tool with attribute level locking and near real-time data updates which enables several users to work on a single plan simultaneously, and further, observe how others are contributing to plan development. COA Sketch emphasizes moving unstructured data

from the selected human-to-human collaboration environment into structured information sets realized within Community of Interest (COI) specific supporting tools.

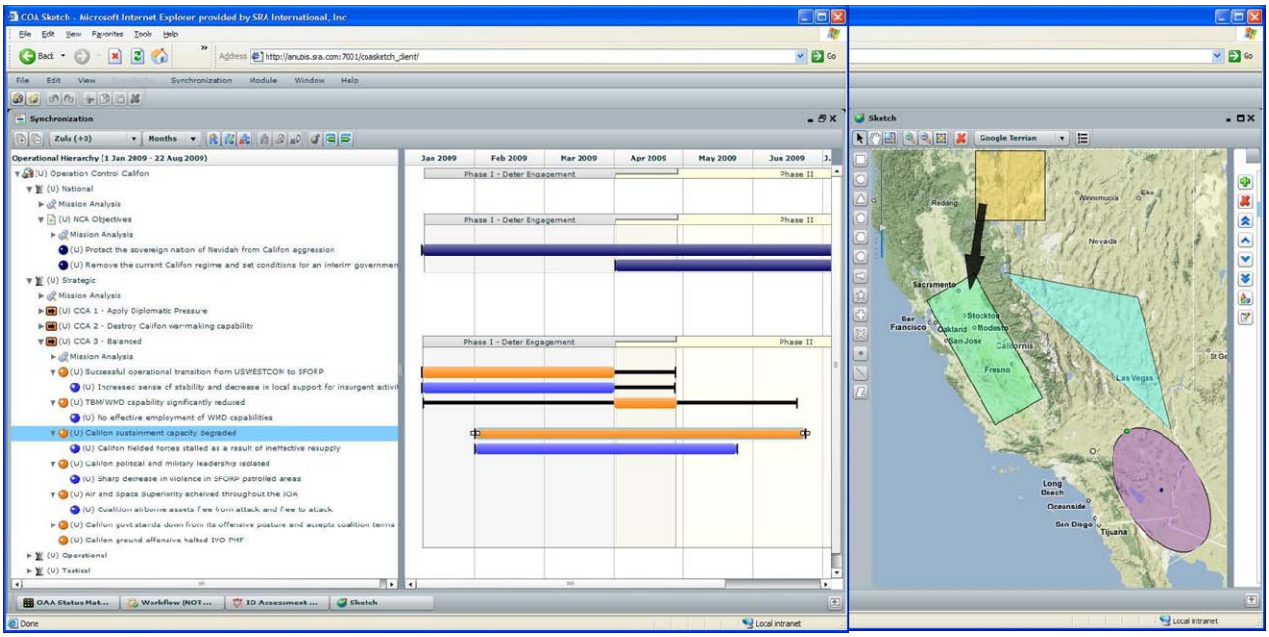


Figure 18 COA Sketch Workspace, Sketch & Synchronization views

SMART was developed under the Air Force Research Laboratory 711 HPW/RHX Commanders' Predictive Environment (CPE) project and is the culmination of an investigative effort initially conceived to ensure adequate context for person-to-person information requests. While retaining its original functions, SMART evolved to a research and analysis system to support human-centered semantic content authoring as a means to transition web content to semantic web content. Using SMART, one can embed domain-specific knowledge in both personally authored and retrieved documents. SMART aids users to locate both personal expertise (content authors) and knowledge stores (authored content) within accessible data repositories, to link concepts shared among disparate research threads, and to maintain, track, and integrate individual and collaborative lines of inquiry.

Efficient and effective prediction in an organization relies on efficient knowledge flow. The desire for efficient knowledge flow is echoed across the range of computer users, but especially by information analysts, whose daily efforts entail intensive search and filtering to distill the relevant from the prevalent (Badalamente, 2003). With the creation and deployment of advanced models to support decisions and predictions within operating environments such as threat models and behavior influence models, the need for seamless information access and fusion is reinforced as a means populate models, execute models, and maintain models. Seamless information access and rich, diverse information fusion and exchange is what the Semantic Web aims to provide (Shadbolt, 2006).

Earlier Subject Matter Expert (SME) evaluations including WAIT-C events led us to believe that the SMART tool shows great promise for use during Intelligence Preparation of the Operational Environment and other Mission Analysis activities. Of primary focus was participant usage of

the SMART search capabilities for discovery of information sources, notebook organization and sharing throughout teams and the use of the provided tagging capabilities for capturing of unstructured data elements into structured data. Participant feedback on the utility of Machine-to-Machine (M2M) transfer of the tagged artifacts between the SMART and COA Sketch tools also are a collection focus point.

Likewise it has been anticipated through equivalent SME feedback that the COA Sketch tool would most likely be embraced by participants in capturing geospatial artifacts previously only found in whiteboard sketches translated into PowerPoint slides.

3.6 SPVT Collaboration Technology Assessment Structure

The SPVT Collaboration technology assessment event was held September 14-18, 2009 at distributed locations – SRA in Dayton, OH, and Louisiana State University – Shreveport (LSU-S) in Shreveport, LA. The collaboration event was conducted to provide the Air Force Research Laboratory (AFRL) a better understanding of distributed collaboration technology effectiveness in a USAF AOC Strategy Division planning context.

SPVT Collaboration event participants represented a breadth of experience across the AOC including strategy, operational assessment, combat operations, influence operations and intelligence. The participants were a mix of active duty and retired USAF personnel and government contractors. Conducting a true distributed collaboration event enabled participation of SMEs from the 608 AOC who otherwise would have been unable to attend. Figure 1 shows the distribution of participants for the event and the event locations.

Figure 19 Collaboration Event Participants and Event Locations

The SPVT Collaboration event was structured around a USAF AOC Strategy Planning scenario. Eight SMEs participated in the event. Four SMEs were located at the Dayton site and four SMEs at the LSU-S site (see Figure 2). Two teams were established, each team containing two SMEs from each site to maximize the potential for collaboration. The teams conducted Mission Analysis and COA Development for a Pacifica scenario adapted to enhance collaboration touch points. Stew Greathouse (SG Consulting, LLC) developed a script and modification of the required Pacifica scenario to provide realistic battle rhythm and artifacts for the event. Mr. Greathouse also provided white cell support (J2 and JFACC) during the event, as required. SRA provided trainers, tech support, and facilitators at both sites. Training was provided to the LSU-S site via the Livespaces environment.

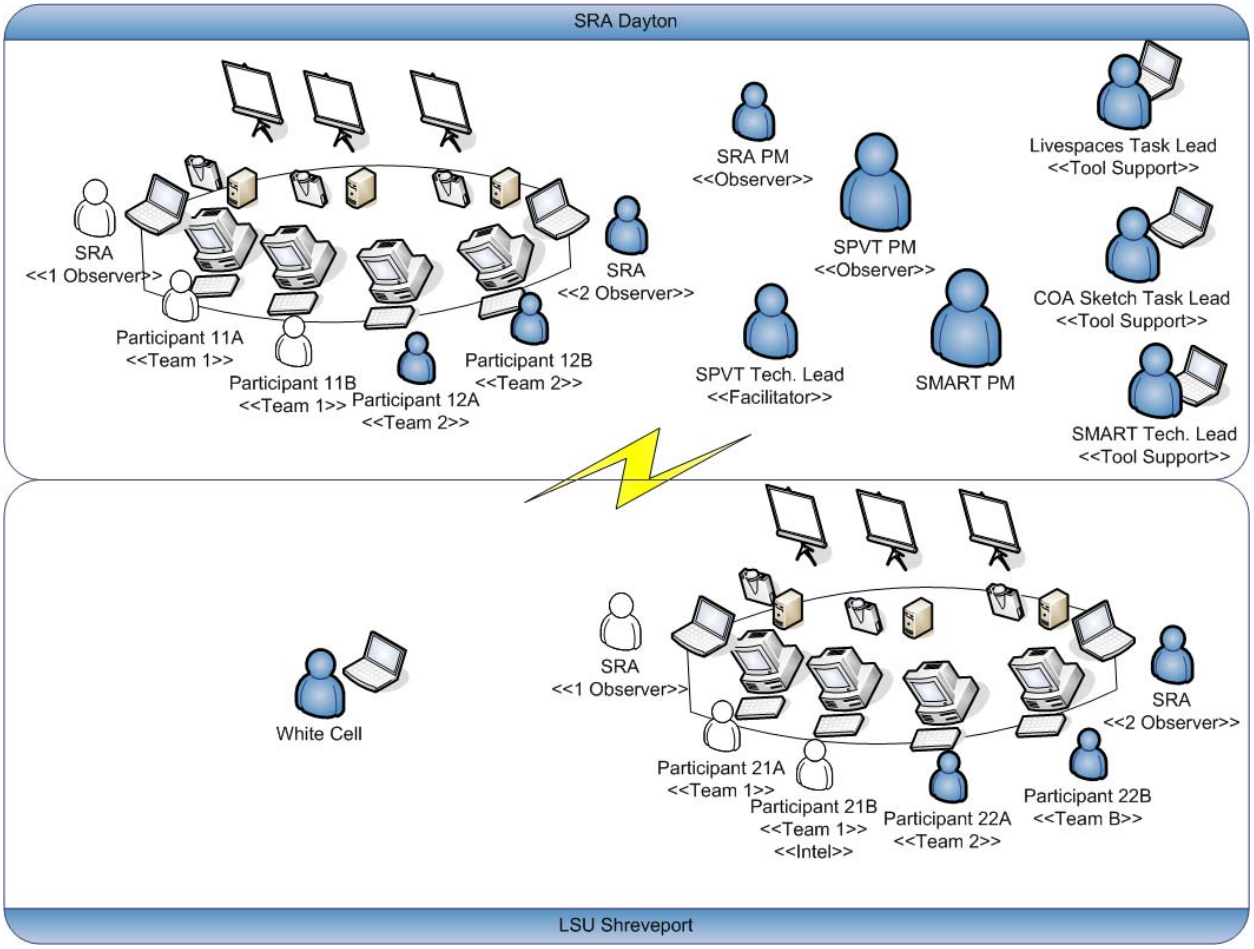


Figure 20 Collaboration Event Setup

The event was carried out over five days with Day One focused on setup (LSU-S site) and environment familiarization (Dayton site), Days Two through Four focused on continued familiarization, event execution and report out and Day Five on way ahead (subset of SMEs). The primary activities occurred on Days two through four. SME schedules did not line up exactly with the event script. Scheduling conflicts, particularly for 608 AOC participants, meant some SMEs arrived throughout Tuesday. The following outline reflects roughly the intended event script. Deviations from this script occurred as required to accommodate SME schedules.

Day 1 AM
Travel, Environment Familiarization

Day 1 PM
Environment Familiarization

- Training
  - COA Sketch
  - Livespaces
  - SMART
  - Other items
- Free Play / scenario discussion

Day 2 AM
Mission Analysis

- Exercise Control
  - Welcome
  - Focus on collaboration via JAEP
  - SMEs act as support staff
  - SMEs playing roles (JFACC, Chief of Strategy, etc) will do what their role requires to continue the assessment, but are not the focus of the assessment

- Start work
  - White Cell issues the Warning Order (Pacifica/5.0 White Cell Documents/ 2009 SRA WAIT-C CFC WARNORD_DRAFT.doc)
  - Players parse the Warning Order and look through their provided documents
  - The 'JFACC' provides guidance; emphasizes he expects five days operational warning (however the Draft Campaign plan mentions only 48 hours operational warning
  - The players (should) explore this disconnect and ultimately find the '2009 SRA WAIT-C CFC Campaign Plan FINAL' (in one player's document store)
    - ! This disconnect should have prompted the players to engage in the macrocognitive behavior – "Shared hidden knowledge"

Table 3 Mission Analysis Process Used During the Event

Type Mission Analysis	Item Source		Document
Input	JFC Mission	Provided	1. Player Generic Documents/2.0 JFC Plans/2009 SRA WAIT-C CFC Campaign Plan.doc
Input	JFC Intent	Provided	5.0 White Cell Documents/ 2009 SRA WAIT-C CFC WARNORD_DRAFT.doc
Input	Friendly COG	Provided	1. Player Generic Documents/2.0 JFC Plans/2009 SRA WAIT-C CFC Campaign Plan.doc

Type Mission Analysis		Item Source		Document
Input		Enemy COG	Provided	1. Player Generic Documents/2.0 JFC Plans/2009 SRA WAIT-C CFC Campaign Plan.doc
Input		Fact	Generated	Players cull from canon documents
Input		Assumptions	Generated	No template necessary
Input		JFACC Tasks	Provided	PACIFICA/1. Player Generic Documents/2.0 JFC Plans/2009 SRA WAIT-C CFC Campaign Plan.doc
Input		JFACC Guidance	Provided	Participation in the process
Output		Essential Tasks	Generated	
Output		JFACC Mission	Generated	
Output		MA Brief	Generated	
Output		JFACC Intent	Generated	
Output		JFACC Guidance	Provided	5.0 White Cell Documents/White Cell Inputs.doc

Day 2 PM

Mission Analysis Brief

- Mission analysis briefing prepared by the players (Mission Analysis Template_UP.ppt)
- Mission analysis briefing presented by the players

Commander Approves Mission Analysis

- Mission Statement
- Commander's intent
- JFACC issues COA Guidance and Commander's Comparison Criteria (White Cell Inputs.doc)
- JFACC requests that players provide a Center of Gravity Analysis of the Califon IADS (White Cell Inputs.doc)

Hotwash / Elicitations

- Site report out on environment challenges and affordances
- Players comments and observations

Day 3 AM

COA Development

- COA Comparison Criteria Discussion – The players ought to pick apart the criteria / or request further guidance. The basic guidance is one-word descriptions and leading questions (White Cell Inputs.doc)
- During COA development players start to look at the Califon IADS (IPOE.doc)
    - Elicit macrocognitive behavior "Individual mental model construction"
- COA Development begins via COA Sketch

Table 4 COA Development Process Used During the Event

Type COA	Development	Item Source		Document
Input		Enemy COAs	Provided	1. Player Generic Documents/1.0 Spin Up scenario/IPOE COA Sketch version of Califon COAS
Input		Staff Est	Provided	1. Player Generic Documents/3.0 Mission Analysis/ 2009 SRA WaitC Initial Force Structure.doc 1. Player Generic Documents/1.0 Spin Up scenario/FROB
Output		Crit Vuln	Generated	
Output		Alt COAs	Generated	
Output		OP & Tac Obj	Generated SME	Start
Output		COA Sketch	Generated COA	Sketch
Output		COA Statement	Generated COA	Brief
Output		Crit Events / Actions	Generated	1. Player Generic Documents/3.8 COA Analysis and Wargaming/ Wargaming WS.xls

Day 3 PM

COA Development (cont'd)

- COA Development continues

Hotwash / Elicitations

- Site report out on environment challenges and affordances
- Players comments and observations

3.7 Data Collection

Information capture for the event included: Subjective user surveys administered at the end of each session breakpoint, technology usage statistics (captured via computer instrumentation),

observer notes, and comments collected during a daily hotwash. The quantitative data on technology usage was collected for specific technologies at each workstation. The time reflected the "technology" was in focus. Data were collected on the collaboration environment, i.e. Livespaces, collaboration technologies, i.e. COA Sketch and SMART, and standard workstation applications, i.e. Internet Explorer, PowerPoint and other common desktop applications.

3.8 Livespace Configuration

The Livespace configuration consisted of three large public displays shared by the team at each site. Individual workstations were configured to access the shared displays as well as each other's individual workstation, when necessary. The LivePoint capability allowed for ready movement between user designated displays normally only consisting of the shared displays (see Figure 3). LivePoint allows user mouse and keyboard control to move to the selected machine simply by moving one's mouse through the edge of a local display and onto the display of the other computer.

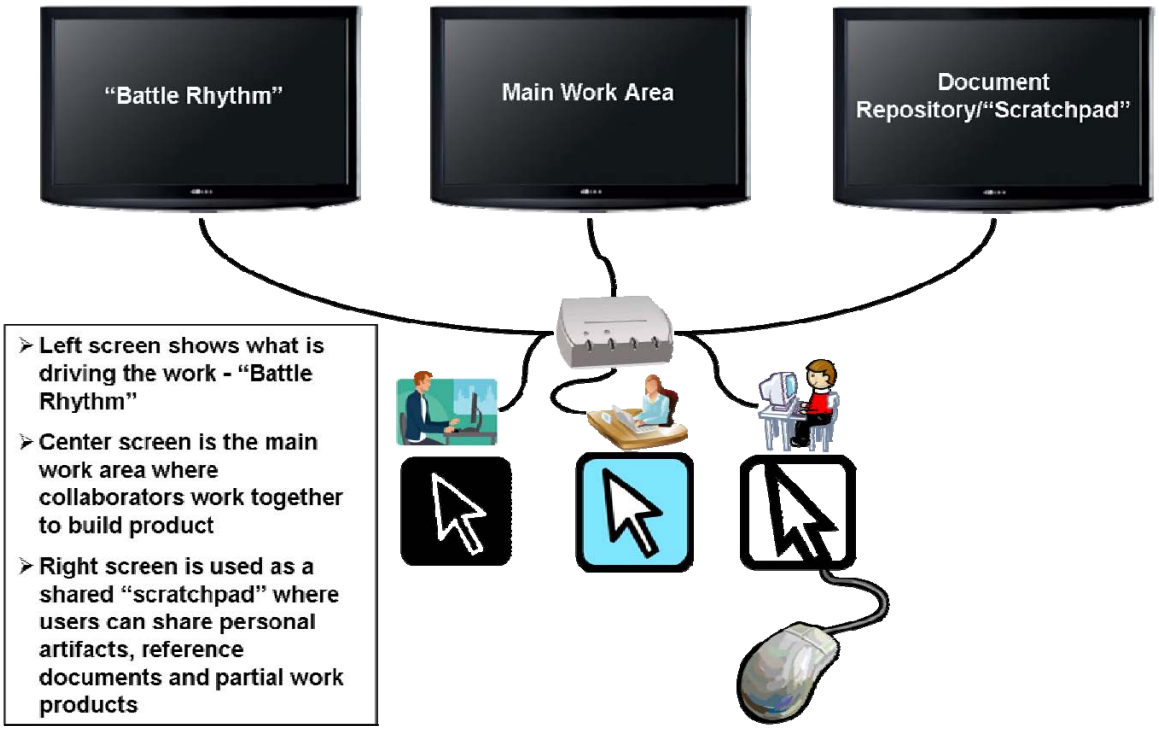


Figure 21 Typical LiveSpace Shared Display Configuration

The collaboration study focused on the information exchanges of AOC strategy planners and intelligence analysts within a work centered collaboration environment. In theory, by allowing these users to interact using the intuitive extended LiveSpaces environment and by allowing the manipulation, tracking and production of work product objects and attribute details during the collaboration, effective distributed communication would occur.

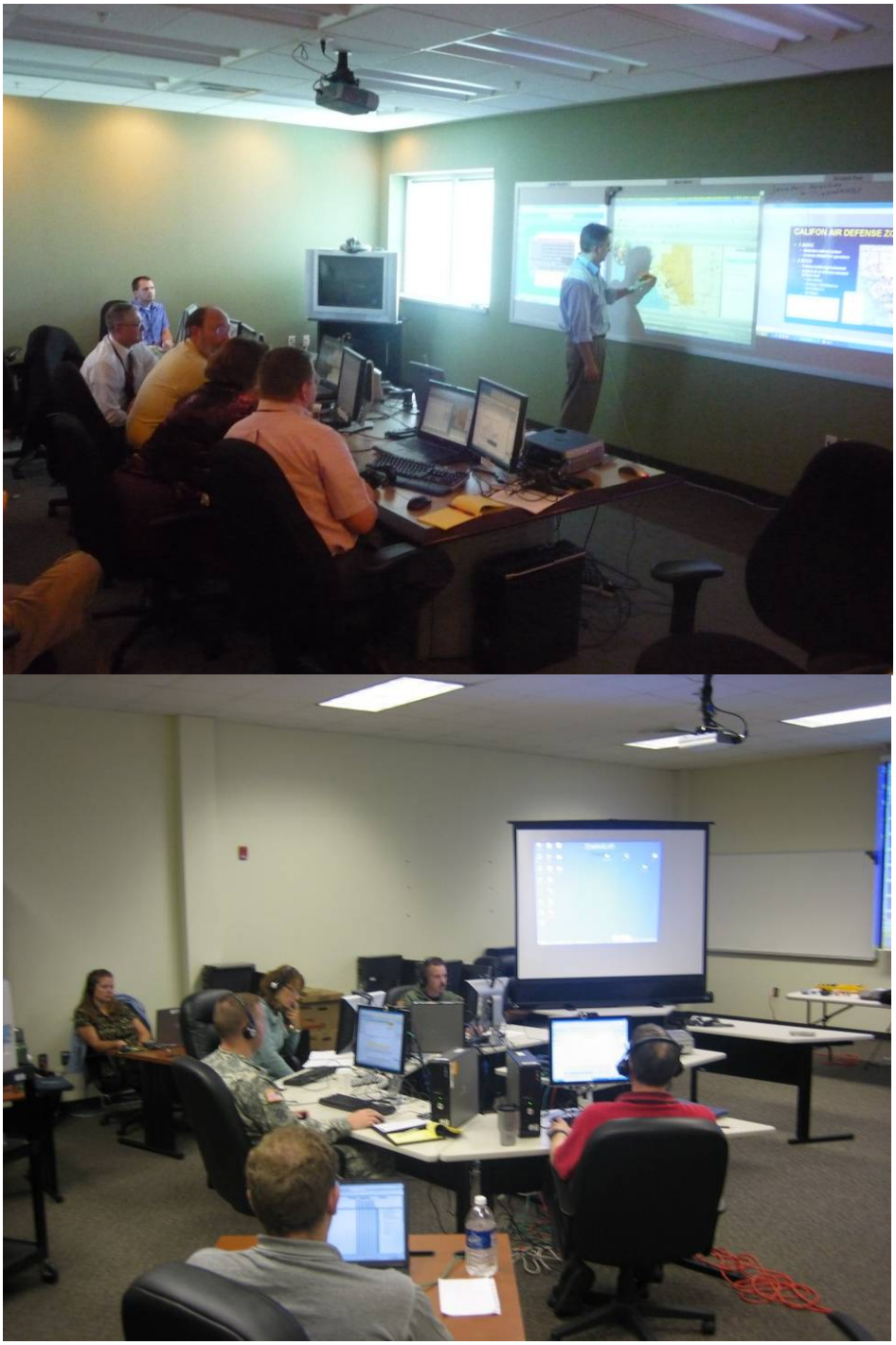


Figure 22 Collaboration Technologies in Use
(Top View SRA Dayton, Bottom View LSU Shreveport)

4 RESULTS AND DISCUSSION

4.1 Approach

This is the first time I've been on another person's computer in another city and another state. The capability is useful, despite some latency/bandwidth issues. I liked it enough to want more!"(comment from assessment participant)

Data collection consisted of user feedback on technology applicability and effectiveness, objective measures of technology use, and observations of technology use. The following sections describe in greater detail the measurement tools, data and analysis.

4.2 Subjective Data Collection Survey

Surveys were administered at the end of session breakpoints, i.e. following the morning session (am) and the afternoon sessions (pm). The intent was to quantify through qualitative instruments user perceptions regarding collaboration tool and environment effectiveness for the various aspects of the strategy planning scenario. Further, information probes, particularly those associated with cognitive tasks, were established to determine for instance "how well" a planner understood the operational environment or who possessed knowledge important to his/her task. Unfortunately, the discontinuity in Qualitative metrics required interviews or survey instruments to capture the planner's thought processes and knowledge. The survey questions are shown in Addendum A.

4.3 Survey Analysis

Survey results were collected for twenty participant-sessions and are summarized in Table 5. The data were summarized by event day and question. Specifically, average score was calculated for each day by question with attention to day to day changes in score. The survey analysis includes an interpretation of score for each question, major findings and selected individual comments. Experimenterss followed up with participants for clarification on responses and to address incomplete responses, as required.

Table 5 Survey Results by Player, Day and Question (1 – strongly disagree, 7 - agree)

Day Survey	**Question**									
Wed, D1	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
22A-1	5	5	5	5	6	4				
22A-x	2	2	3	3	5	4	6	4	3	5
22A-2	4	5	5	5	4	4				
22B	7	6	6	5	6	5	6	5	6	6
22B	7	7	7	7	7	7	7	7	7	7
21A-1	6	6	6	5	6	4	6			
21A-2	6	7	7	6						
21B-1	3	5	5	3	4	3	5	4	5	5
21B-2	6	6	6	6	5	4	6	6	4	6
11B	6	5	6	4	4	6	6	6	4	5

								3	
								3	6
						6	6	4	

12A	5 2 6 4 3 6 6 5 2 2								
12B	5 4 6 3 7 7 6 6								5
11A	5 5 5 6 2 2 6 5 6 7								
Average	**5.2 5.0 5.6**		**4.8**	**4.9**	**4.7**	**6.0**	**5.4**	**4.3 5.4**	
Thurs, D2	**1 2 3 4 5 6 7 8 9 10**								
11B	6 6 5 6 7 6 5 6 6 7								
11A	7 7 7 7 7 6 6 6 6 7								
12A	4 2 5 6 4 2						2 3 6		
12B	6 6 5 5 7 7 6 6								7
22B-1	6 5 6 5 7 6							6 6	
22B-2	6 7 6 6					7 7 7 7			
21A	6 5 6 6 4 4 5 6 6 6								
Average	**5.9 5.4 5.7**		**5.9**	**6.0**	**5.2**	**5.8**	**5.5**	**5.7 6.6**	
Delta, D2-D1	**0.7 0.4 0.1**		**1.1**	**1.1**	**0.5**	**-0.2**	**0.1**	**1.4 1.2**	

Major Subjective Survey Findings

The following items represent major findings identified in the analysis of the subjective survey results in Table 3. The survey questions in Section 4.2 focus on environment and tool (LiveSpaces, COA Sketch, SMART) utility and ease of use as well as assessment training and instructions.

- Individual capabilities improved due to 1) improved performance, and 2) experience with tool (suggests more training may have been helpful)
- The overall collaboration environment (LiveSpaces, COA Sketch and SMART capabilities) was rated lower than the average of the individual capability ratings – perhaps due to an interaction based on cognitive shifts between SMART and COA and LiveSpaces
- Instructions had largest Day-to-Day improvement due presumably to environment stability and easier time for players to focus on task
- SMART ("helpful in this session") was the only negative Day-to-Day survey response, most likely due to attempted application on COA (Day 2) with no clear direction for its use
- Large improvement Day-to-Day among tools with COA Sketch (helpful in session) due to correct application and more experience
- LiveSpaces was assessed equally well across Mission Analysis and COA Development (internal validity - no reason to believe a difference exists for these work processes)
- The environment improved Day-to-Day
- Lack of SME at LSU-S hurt training support (original plan was to conduct via LiveSpaces, but environment issues derailed that plan with no good contingency)
- COA was well-received despite some training issues
- Training on Day 1 was rated lowest, indicative of early frustrations with environment performance and some tool usability issues (SMART and LiveSpaces)

- Sub-teams where one member was better trained on a tool and passed along that knowledge to other team members performed better

Selected Individual Comments form Subjective Surveys
The following bullet lists represent Positive and Not-so-Positive individual written comments included in the subjective surveys. Most Positive comments were capability focused, whereas most Not-so-Positive comments were LiveSpace hardware and software technology stability focused.

Positive
- "Most useful workshop - focus on tool value and operational process"
- COA Sketch was the easiest application to use
- COA Sketch Synchronization was "awesome"
- Shared documents and highlighting was helpful (SMART)
- Searched for the "right mix" of attention to tools versus working collaboratively
- Primary data search (inter-document) worked well, but intra-document was less productive (SMART)
- Environment is good to bring transient users up to full SA quickly
- Working on COAs at the same time was helpful
- Political analyst thought SMART would be great for writing a report - highlight was a very nice feature
- SMART capabilities were very good, but some implementation was not intuitive; documentation location unknown

Not So Positive
- System instability disrupted work
- Tool interoperability needed improvement
- Needed more training time - too much functionality to learn in one day (perhaps more read ahead materials)
- LiveSpaces Clipboard was cumbersome
- The “big picture” objective was not clear (hid some macrocognitive functions)
- Manual copying and pasting into PPT is a "step backwards" - after using the environment
- Players had difficulty maintaining consistent work with frequent environment malfunctions
- Difficulty with audio - talking to person at side (collocated) and on headset at same time
- Need the video capability

4.4 Direct Observation Analysis
An experimenter was assigned to observe collaborative interaction for two participants during the assessment. Each experimenter wore a headset in order to monitor dialogue among the participants and recorded observations in a spreadsheet as the observations occurred. The spreadsheet was originally developed specifically for association with the predefined macrocognitive metrics. The goal was for the observer to record 1) the time of the observation, 2) the observed activity, 3) the participant(s), 4) the specific capability associated with a

technology (LiveSpaces, COA Sketch, SMART), 5) the observer, 6) codes to denote the presence of specific collaborative behaviors or attributes such as individual work or issue, and 7) one or more associated macrocognitive behaviors. Analysis of the observation data follows.

Figure 8 shows technology use (number of observed occurrences) across assessment planning activities (Mission Analysis, COA Creation, IADS COG Analysis). Much of the Mission Analysis was performed in SMART. Document highlighting for export to COA Sketch was a common work pattern with the SMART technology. Users commented on the desire to extend the highlight and publish capability to other JAOP-related activities. As expected, COA Sketch was the primary technology used to aid the COA Creation process. Both technologies wee equally useful during the IADS COG Analysis.

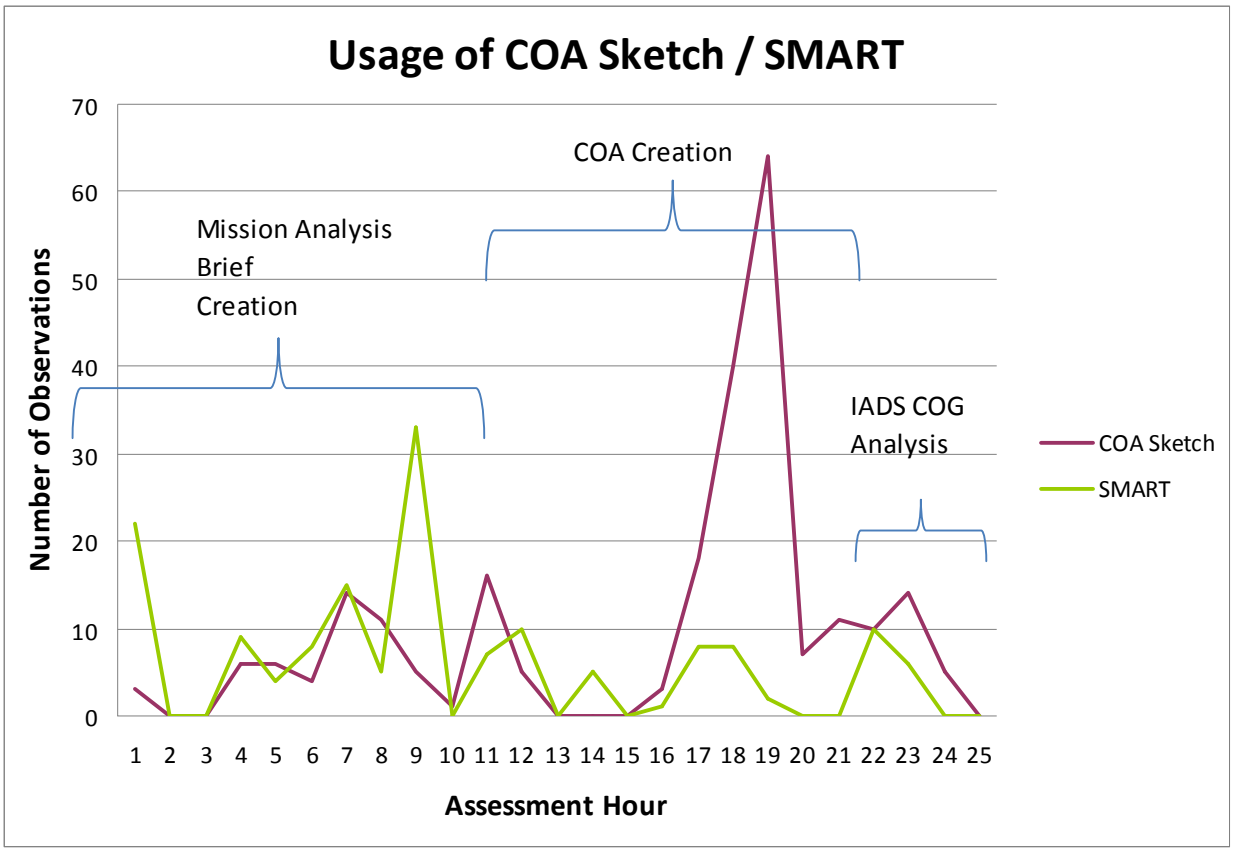


Figure 23 COA Sketch and SMART Use by Activity

Figure 9 shows LiveSpace capability use (number of observed occurrences) across assessment planning activities. Screen sharing proved to be the most used capability (by an order of magnitude). Screen sharing provided a real-time awareness of other on-going activities during the strategy planning sessions. Co-located team members tended to use the shared space to talk through discovered information and questions. The overview by the White Cell JFACC and other team members, both co-located and distributed, were commonly followed along with shared screens or clicking through elements in a shared application presentation, for example, COA Sketch.

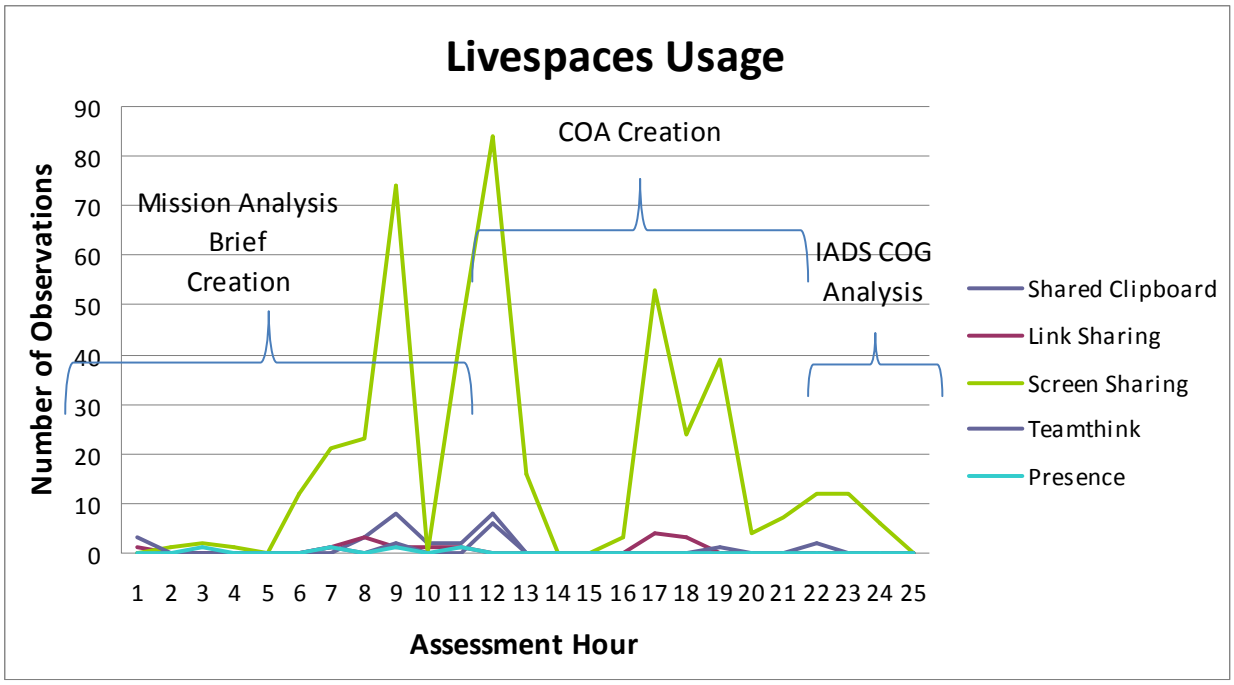


Figure 24 LiveSpace Capability Usage

Figure 10 shows LiveSpace capability use (number of observed occurrences) across assessment planning activities with a scale expanded to show differences between all capabilities other than Screen Sharing. In this case, Shared Clipboard was the second most used capability. Team Think and Link Sharing were the next most used capabilities, occurring at roughly equal but different times during the assessment, suggesting these capabilities may complement one another.

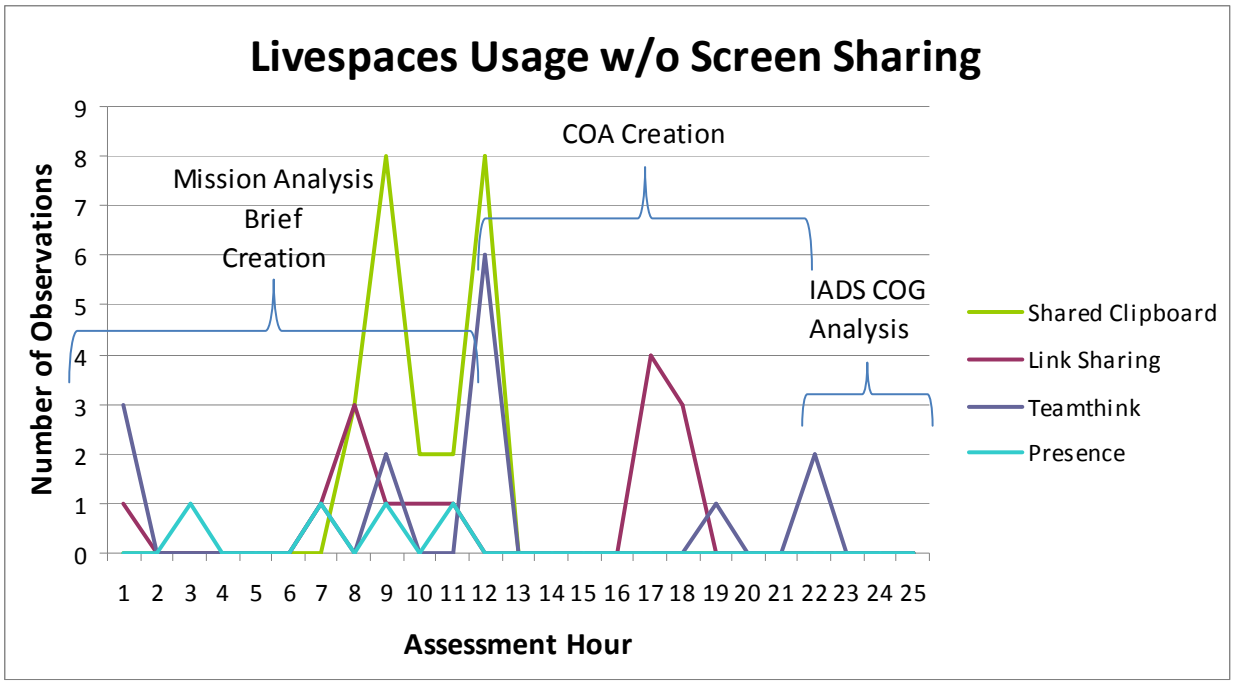


Figure 25 LiveSpace Capability Usage (expanded scale)

Figure 11 shows the number of observed performance issues in the collaboration environment as a function of time during the assessment. The graph shows the instances where interruptions in the LiveSpaces environment early in the assessment led to an inability to conduct work for two to three hours while the teams developed workarounds. Dependability of the collaborative infrastructure will need to be a primary focus. Post-event analysis determined that a federated LiveSpace capability would have greatly improved performance with respect to Live Point issues. Additional improvements, however, could be implemented through redundancy of capabilities, i.e. Audio and Text Chat. Continuity of operations is extremely important during strategy planning.

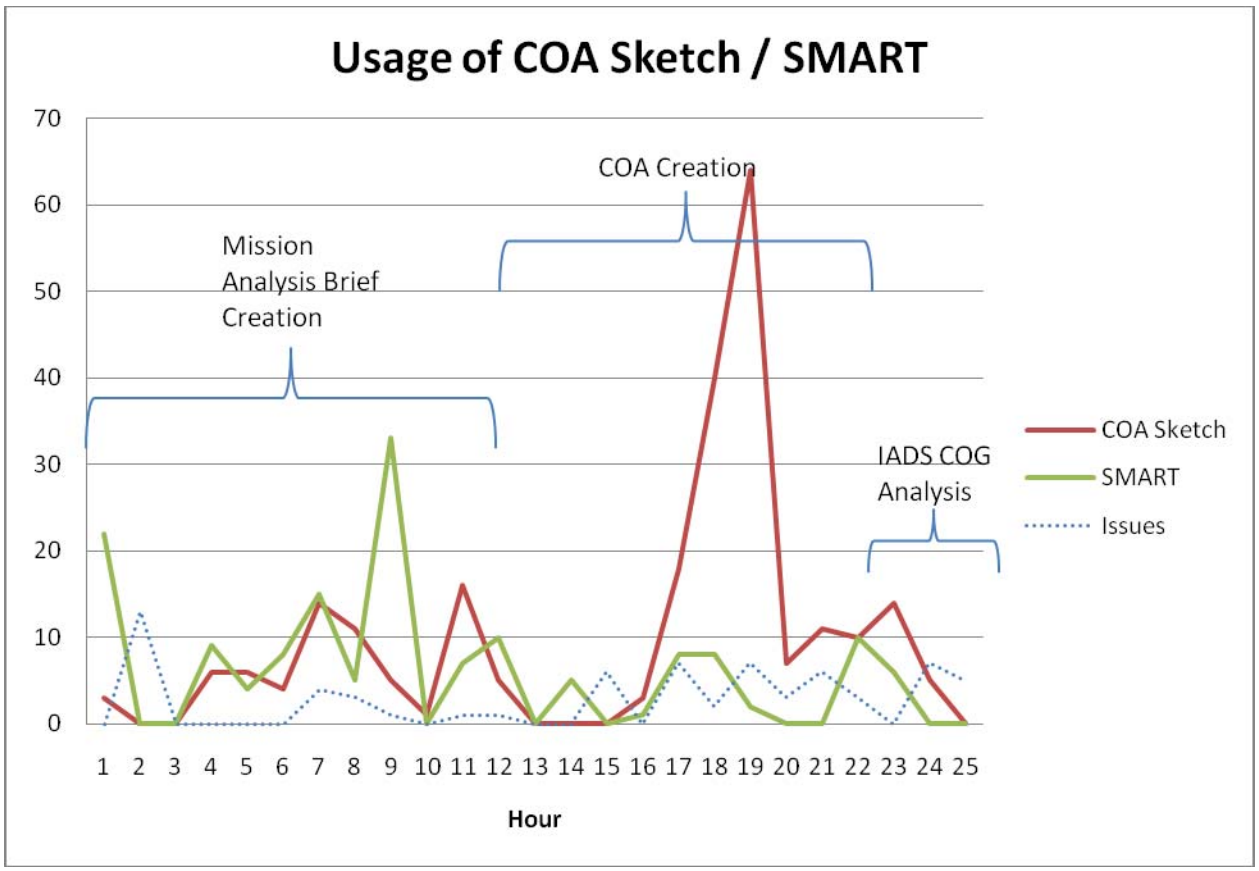


Figure 26 Technology Performance Issues During the Assessment

4.5 Macrocognitive Analysis

The team identified key elements of the pre-defined strategy planning scenario which could be associated with macrocognitive processes and applied per the four collaboration stages described in Section 3.3. Scenario stimuli were created for several macrocognitive processes such that when a specific event occurred during the scenario, the team could observe activity and determine whether the collaborative behavior occurred. Unfortunately, instabilities in technology performance resulted in the strategy planning teams creating workarounds which in some cases bypassed the scenario stimuli. Additionally, these instabilities sometimes disabled the technology medium through which the stimuli was to be communicated.

In one instance, a scenario stimulus to test the macrocognitive process "Individual visualization and representation of meaning" was presented by the JFACC to the team via a message ticker on the shared display. The information was noticed quickly by one team member and communicated to the rest of the team. Although only a single example of a scenario stimulus and a macrocognitive process demonstrating collaborative behavior, the approach proved useful and the environment affordances were observed.

Future studies could leverage the design for scenario stimuli and macrocognitive process probes. The observation data in Addendum B provides indicators of macrocognitive process behaviors, however, those indicators are inconsistent.

4.6 Overall Analysis

The analysis of surveys, interviews and observational data led to the following conclusions regarding the overall effectiveness of the collaboration environment:

- Participants believed tools facilitated ***team building***
- Participants believed the environment provided ***flexibility*** to pursue parallel operations
- Participants cited the need for establishing ***new concepts of operation*** for use of the environment
- While glimpses of intense collaboration were seen, the lack of true time pressure and experience level of key participants appeared to control the level of intensity
    - Indications are the environment was conducive to support intense collaboration
- Much of the mission analysis was performed using the SMART tool
    - *Highlighting* of documents for export to COA Sketch was a common work pattern
    - Users wanted to extend highlight and publish capability to capture JAOP information
- ***Screen sharing*** proved to be the most used capability
    - Used primarily as a real-time awareness of what else was being done.
    - Collocated team members tended to use the shared space to work through discovered information and questions
    - Overview by White Cell JFACC and other team members, both collocated and distributed, was commonly followed along with shared screens or clicking through elements in shared application presentation (COA Sketch)

> *"I could see things popping into COA Sketch, so we knew stuff was getting done and what others were doing, which de-conflicted team editing efforts"*

- ***COA Sketch*** became the centralized aggregation point for information and was only transferred to PowerPoint to fulfill the requirement for a briefing format
    - Users liked immediate display of what everyone was doing in the tool
    - Geospatial query of data such as provided by GCCS I3 would enhance utility
    - COA Sketch was cited as supporting 6 month to 2 year planning while also having the capability to support Crisis Action Planning
- ***Multi-user editing*** (both simultaneous and sequential) occurred
    - Teams frequently used a mixed simultaneous/sequential process with a gather and approve methodology
        - Putting information in the Shared Clipboard for sharing in PowerPoint
        - Use of shared notebooks in SMART
        - Distributed team updates to COA Sketch
    - Group collaboration to bring together independent products
    - Good central awareness and participation both locally and remotely for validation of facts
    - COA Sketch opened remotely using LivePoint & Screen Sharing to update PowerPoint brief

- Participants appeared to easily understand the ***LivePoint*** feature
    - The participants' early dependence on this feature was easily recognized when this feature was later unavailable
    - This feature was used by all participants once re-established
    - Structured "radio protocol" announcing taking over of shared displays was established as a process by the teams to de-conflict multi-user control conflicts
    - Users experienced lost cursors, but in most cases were able to recover without intervention
- Team members had a propensity towards ***collocated collaboration*** with "check-in" to remote organization
    - Likely a direct impact of the lack of clean audio. During times of good audio, the teams seemed to work together more frequently using the shared displays
    - This behavior was augmented by the real-time awareness through the common displays mentioned above
- Use of ***eBeam whiteboard*** both with projection and standalone worked just as well distributed as collocated and was embraced by the participants
    - "Note Taker" role still emerged in this instance to ensure ideas were available to everyone in a structured format (entered through COA Sketch)
- ***Dependability*** of the collaborative infrastructure was a primary focus
    - Overall system reliability suffered early in the assessment and improved with continued attention and improvements
    - Redundancy of capabilities (i.e. Audio and Text Chat) is critical to ensure continuity of operations
- Ease of use and configuration is important
    - ***Chat pre-populated with users*** was better than having to find users (versus past operational experiences). ***Established rooms*** for types of discussions also important
    - Good task for a coordination team or automation
    - Availability of a ***spellchecker*** would prove useful throughout the environment
    - Allowing Shared Clipboard data (beyond simply text) to follow LivePoint mouse vs. extra clicks of current shared clipboard was desired
    - Allowing multi-user concurrent edit into separate sections of a document was desired
- Video capabilities should include wide angle focus and wide angle (for group discussion) to provide a larger "context"

The following dialogue was provided by one of the participants, an intelligence analyst, with a focus on environment applications outside of AOC. These inputs include providing this type of workspace to convey a watch office (Operations Center) feel to one's desktop. Further, the capability to have a sidebar room present while attending a briefing is very good – permitting people to collaborate while digesting information.

> *"As so often the understanding of a country's current political situation involves--at a minimum--an awareness of its military situation, it becomes incumbent upon the political or leadership analyst to access the most up-to-date military information to prepare for meetings, briefings, and position papers. It would be especially helplful for the analyst*

working a regional hotspot, a country where a coup has just occurred, where there is a leadership crisis occurring--anything that requires the most timely information from extremely reliable sources. In such instances, the analyst will often call upon the expertise of military analysts who may not always be co-located, and this [environment] would make simultaneous communication with several people across time zones, agencies, bases, etc. much easier. In effect, this could add a "watch office" type of feel to an analyst's workstation, allowing instantaneous, "raw" information to be shared/digested, as well as access to the more formal finished reports, translated newspaper articles, etc. that the analyst is used to receiving.

As a rather simple--but important--example, this could save on driving time and the difficulty of traveling with classified information for in-town inter-agency meetings. So often, meetings occur in conference rooms where participants bring only a spiral notebook (for example) and have limited access to information. In cross-departmental meetings, this technology would allow the analyst to sit at his/her desk and take notes, look up something quickly, search archived papers/materials, and essentially have all kinds of information readily accessible should he/she be asked a question or to contribute something they were not already prepared to give. The chat room feature is wonderful, also, in this setting. I liken it to sitting in the back of a room during a briefing or meeting and bouncing off ideas/questioning the analysis to the person sitting next to me. It doesn't interrupt the flow of the meeting or the speaker, and is discreet.

I imagine this technology would allow the political analyst to access research papers and the like written by people at other agencies or bases. Oftentimes we had to wait for the published article to reach our office, which could be days or weeks depending on the classified mail system. This way, other peoples' analyses would be much more readily accessible. I always sought out my "competitor's" papers and views on an issue or brewing situation to see his/her chain of logic, sources, and conclusions."

5 SUMMARY

The SPVT Collaboration Assessment event set out to test the hypothesis that

> *"The [LiveSpaces] collaboration environment enables a distributed strategy plans session which is as effective as that developed by collocated planners,"*

The assessment was determ ined using a com bination of LiveSpaces, COA Sketch and SMART technologies. LiveSpaces contained an abbreviated set of full capabilities.

5.1 TRUE DISTRIBUTED OPERATIONS

The SPVT Collaboration Assessment event provided a true demonstration of distributed operations. Two separate teams of four strategy planners and intelligence analysts conducted JAEP activities in a USAF AOC strategy context.

5.2 COLLABORATION SYSTEM AFFORDANCES

The LiveSpaces, COA Sketch and SMART technologies proved to have great potential for use in distributed planning operations. The most used LiveSpaces capabilities were LivePoint and Screen Sharing. Primary interactions included moving to or exposing a display in order to facilitate discussion or to take command of an activity and monitoring other displays for individual or team situation awareness.

COA Sketch was the main aggregation point for work and work products. Teams developed geospatial products in COA Sketch. Mission Analysis artifacts were passed to COA Sketch through a web service to SMART. Users particularly liked observing updates to COA Sketch work products in near real time.

SMART quickly became the tool of choice for conducting mission analysis. The highlighting and source documentation features were most used, while auto-populating desired COA Sketch work products was most appreciated.

5.3 COLLABORATION SYSTEM WORK-CENTERED OPPORTUNITIES

Several known and some newly discovered human interface and work-centered design issues were documented during the assessment. These issues suggest a need for additional human factors research to refine the capabilities.

LiveSpaces was reported to be quickly and easily understood. Further, users commented on the transparency of the technology, that is the capability was minimally visually intrusive. In the case of LivePoint and Shared Screens (after initial setup), user operation became a part of the work. Users commented, however, the system may have been "too" transparent, indicated by "unlabeled" mouse operations on shared displays where users could easily become confused on

who was controlling the display. Further, control transfers to the active mouse on a shared display. So, a user conducting a task who pauses for a moment to collaborate with other team members could easily lose control of the display. The coordination between users was controlled through a "radio protocol" and worked effectively for this assessment scenario, but additional study could produce a more natural work method.

SMART received comments on specifically structuring information for use by other applications. Mostly, intelligence analysts used SMART to search and capture information for population in COA Sketch. Strategy planners were found occasionally using the SMART search capability to recall or identify information previously or reportedly available to the teams.

5.4 COLLABORATION SYSTEM RELIABILITY

Many discussion points brought forth by the users regarding the collaboration system were focused on software reliability. Unfortunately, the LiveSpaces software implemented for the SPVT Collaboration Assessment event was an important revision behind the current operational software. The event focused on connecting two LiveSpaces between distributed sites across the internet. Preliminary testing indicated bandwidth would be sufficient for the event. However, bandwidth requirements for the custom audio and video components employed in LiveSpaces scaled exponentially, resulting early in poor audio and throughout the event poor video.

Post-event communications with DSTO determined that a newer version of LiveSpaces better handled communications between distributed LiveSpaces by "federating" sites from a primary site. Subsequent tests proved the newer version of LiveSpaces would have significantly improved collaboration system performance.

5.5 COLLABORATION SYSTEM ASSESSMENT

In general, users were very positive about the potential the environment afforded. Users expressed concern initially over capability performance issues, but quickly worked beyond those issues, an indication that the technology affordances outweighed the operating cost. A detailed assessment of how powerful the technologies could be was difficult to obtain because multiple workarounds were in place. However, as users became more familiar with the technologies and the technologies became more stable, the underlying potential began to surface.

While a definitive response to whether the assessment hypothesis is "true" or "false" is difficult to determine quantitatively, many qualitative measures indicate the environment clearly supports distributed strategy planning, and with additional capability refinements and performance enhancements the environment would meet a present warfighter need. Warfighter comments on a survey (see below) offer one perspective on the collaboration environment that appeared to be shared across participants.

Additional Comments or Recommendations

LOVED "SCREEN SHARING"

LOVED "LIVEPOINT"

LOVED "LINK SHARING"

NEED VIDEO caps

NEED RELIABILITY of Systems

6 BIBLIOGRAPHY

Badalamente, R. V., Greitzer, F.L. (2005, May). Top Ten Needs for Intelligence Analysis Tool Development. *The 2005 International Conference on Intelligence Analysis.*

Bowman, C. (2002). *Operational Assessment—The Achilles Heel of Effects-Based Operations?* [Paper.] Newport, RI: Naval War College.

Clark, C. & Cook, T. (2008). A Practical Approach to Effects-Based Operational Assessment. *Air & Space Power Journal, 22(2)*, 82-101. [Summer Issue.].

Cardoso, J., ed. (2007). *Semantic Web Services: Theory, Tools and Applications.* Hershey: Information Science Reference.

Davis, P. (2001). *Effects Based Operations: A Grand Challenge for the Analytical Community*. Santa Monica, CA: RAND.

Diehl, J. & Sloan, C. (2005). Battle Damage Assessment: The Ground Truth. *Joint Force Quarterly, 37*, p.59-64.

Eggleston, R. (2003). Work-Centered Design: A Cognitive Engineering Approach to System Design. *Proceedings of the Human Factors & Ergonomics Society 47th Annual Meeting, 13-17 Oct, 2003 Denver, CO*.

Gouin, D, Fortin, R., Chouinard, L. (DRDC Valcartier), Dion, V. (ETS), St-Germain, V (Capt), Forest, A. (Lt), Dewar, C. (LCdr) (JIIFC Det). *Initial LiveSpaces deployment in JIIFC Det planning room (Star Top Road – Ottawa) Technical Note* DRDC Valcartier TN 2007-300 October 2007

JFCOM. (2004). *Commander's Handbook for Joint Battle Damage Assessment*. Suffolk, VA: Joint Warfighting Center.

Joint Warfighting Center (2006). *Commander's Handbook for an Effects-Based Approach to Joint Operations*. Standing Joint Force Headquarters:Norfolk, Va. Retrieved from http://www.au.af.mil/au/awc/awcgate/jfcom/ebo_handbook_2006.pdf

Kumar, Fenema, and Von Glinow, Intense Collaboration in Globally Distributed Teams: Evolving Patterns of Dependencies and Coordination. (June 2004). ERIM Report Series Reference No. ERS-2004-052-LIS. Available at SSRN: http://ssrn.com/abstract=594988.

Lingell, S., Rhodes, C., Cordova, A. Hagen, J., Kvitsky, J. & Menthe, L. (2008). *Methodology for Improving the Planning, Execution and Assessment of Intelligence, Surveillance, and Reconnaissance Operations*. Santa Monica, CA: RAND

Messer, K. (2008). Timing is Everything: Operational Assessment in a Fast-Paced Fight. *Air & Space Power Journal, 22(2)*, 51-60. [Summer Issue.].

Noble, D. & Letsky, M. (2003). Cognitive-Based Metrics to Evaluate Collaboration Effectiveness. Evidence Based Research, Inc. DTIC Accession Number ADA425450.

Phillips, M. (2008). LiveSpaces Technical Overview. AR- 014-287: Command, Control, Communications and Intelligence Division, DSTO Defence Science and Technology Organisation, Australia.

Ranly, N., Calhoun, C., Fitzhugh, E. & Stansifer, C. (2009). Toward the Development of a Framework to Faciliate Human-Centered Semantic Content Authoring. The Ninth Annual Symposium on Human Interaction with Complex Systems. August 19-21, Greenbelt, MA.

Rauch, J. (2004). *Assessing Air Power's Effects: Capabilities and Limitations of Real Time Battle Damage Assessment*. [Thesis.] Maxwell AFB, AL: Air University.

Shadbolt, N., Hall, W., Berners-Lee, T. (2006, May-June). The Semantic Web Revisited. *IEEE Intelligent Systems*, 21(3), 96-101.

Sopko, M. (1999). Combat Assessment: Analyzing the Results of the Air Campaign. *Air & Space Power Journal*, *13 (3)*. [Fall Issue]

SRA International. (2006-2008) Interviews with Operational Assessors in the 8th AF, 13th AF, 710th COS, and 505th CCW. [Personal Communications]. Work was accomplished under the AFRL/HE Commander's Predictive Environment (CPE) and Strategy Planning Visualization Tools (SPVT) programs.

Theole, B. (2004). *CFACC Operational Assessments in Operation Iraqi Freedom* [Briefing.] Kirtland AFB, NM: Office of Aerospace Studies.

Timmerman, T. (2003). *Assessing Effects-Based Operations: Crucial Feedback for the Air Component Commander*. Report No. AU/ACSC/03/1363E/2003-04. [Research Report.] Maxwell AFB, AL: Air Command & Staff College, Air University.

USAF. (2008). *AFPAM 14-123, Intelligence—Predictive Battlespace Awareness: Assessment*. Washington, DC: Secretary of the Air Force.

USAF. (2005). *AFI 13-1AOC, Volume 3, Operational Procedures—Air and Space Operations Center*. Washington, DC: Secretary of the Air Force.

USAF. (2006). *AFDD 2-1.9, Targeting*. Washington, DC: Secretary of the Air Force.

USAF. (2007). *AFDD 2, Operations and Organization*. Washington, DC: Secretary of the Air Force.

USAF. (2007). *AFTTP 3-3, Operational Employment—Air and Space Operations Center*. Washington, DC: Secretary of the Air Force.

USAF. (2008). AFPAM 14-114, Predictive Battlespace Awareness: Target Development. Washington, DC: Secretary of the Air Force.

USAF. (2008). AFPAM 14-123. Predictive Battlespace Awareness: Assessment. Washington, DC: Secretary of the Air Force.

Wagenhals, L. & Levis, A. (Aug 2006). *Dynamic Air & Space Execution and Assessment (DASEA) Critical Experiment (CE) Architecture. Version 1.1*. Rome, NY: AFRL/IFSA.

Warner, N., Letsky, M. & Cowen, M. (2005). Cognitive model of team collaboration: macrocognitive focus. Proceedings of Human Factors & Ergonomics Society 49th Annual Meeting. September, Orlando, FL.

7 ACRONYMS

ACC	Air Combat Command
AFRL	Air Force Research Laboratory
AMC	Air Mobility Command
AOC	Air & Space Operations Center
API Application	Programming Interface
BLOG Web	log
BOGSAT	Bunch of Old Guys Sitting Around the Table
CMS	Content Management System
COA	Course of Action
COI	Community of Interest
COTS Comm	ercial-off-the-Shelf
CRM Custom	er Relationship Management
DISA	Defense Information Systems Agency
DoD	Department of Defense
DSTO	Defence Science and Technology Organisation
GUID	Globally Unique Identifier
HE Hum	an Engineering
HPW Hum	an Performance Wing
HTML	Hypertext markup Language
ISRD	Intelligence, Surveillance & Reconnaissance Division
IWPC Inform	ation Warfare Planning Capability
JAEP	Joint Air Estimate Process
JAOP	Joint Air Operations Plan
HPW Hum	an Performance Wing
SMART	Subject Matter Analysis Research Toolkit
SME	Subject Matter Expert
SPVT	Strategy Planning Visualization Tool
UI User	Interface
USAF	United States Air Force
USSTRATCOM	United States Strategic Command
XML Extensible	Markup Language
WCSS	Work Centered Support Systems

8 SUBJECTIVE SURVEY

FEEDBACK FORM
SPVT Collaboration Exercise

Name: _____

Session: (circle one) Wed am Wed pm Thurs am Thurs pm

We value your feedback!

Instructions: Please rate the following statements with respect to the session you just completed on a 7-point scale with **1 representing the low or negative end** of the scale and **7 as the high or positive end** of the scale and provide comments to support your rating or any additional comments pertaining to the statement.

Scale:
1 = Strongly Disagree, 2 = Disagree, 3 = Moderately Disagree, 4= Neutral, 5 = Moderately Agree, 6 = Agree, 7 = Strongly Agree

Questions Ratings

1. I could effectively complete the tasks and scenarios using this suite of tools. 1 2 3 4 5 6 7

Why/Why not? : _____
_____
_____

2. I felt comfortable using this suite of tools to collaborate with my team. 1 2 3 4 5 6 7

Why/Why not? : _____
_____
_____

3. Livespaces was helpful in this session. 1 2 3 4 5 6 7

Why/Why not? : _____
_____
_____

4. I found Livespaces easy to use during this session. 1 2 3 4 5 6 7

Why/Why not?: _____
_____
_____

5. COA Sketch was helpful in this session. 1 2 3 4 5 6 7

Why/Why not?: _____
_____
_____

6. I found COA sketch easy to use during this session. 1 2 3 4 5 6 7

Why/Why not?: _____

_____

_____

7. SMART was helpful in this session. 1 2 3 4 5 6 7

Why/Why not? : _____

_____

_____

8. I found SMART easy to use during this session. 1 2 3 4 5 6 7

Why/Why not? : _____

_____

_____

9. The training I received on the tools was adequate for me to use them effectively during this session. 1 2 3 4 5 6 7

Comments: _____

_____

_____

10. The instructions for this study were clear and understandable. 1 2 3 4 5 6 7

Comments: _____

_____

_____

Additional Comments or Recommendations

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Thank you for completing this feedback form.n