Reference Architecture for MNE5 technical system

Final MNE 5 product

Summary

This document describes the architecture of the Multi National Experiment 5 (MNE5) technical system and is the highest level technical architectural document in MNE5. The purpose of the document is to provide a structure and rules for the rest of the technical architecture. This includes identification of technical system(s) with recommendations for provided capabilities, functional as non-functional. The document is owned by the Lead Technical Architect.

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14. ABSTRACT

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General

1.1 Background

Reference Architectures (RAs) are system- or aspect specific and provide a level of detail required to describe common behavior for more than one Target Architecture system.

In a large and complex system, which the MNE5 technical system is, there is a need for a Reference Architecture which can define and govern the more detailed architectural components. Definition and governance includes things like componentization, i.e. dividing the architecture into smaller parts and also specification of which standards etc shall be used.

1.2 Scope

This Reference Architecture is system-specific for the MNE5 technical system. This means that it describes a technical system, not a mission system or an aspect.

The focus is on functional views, not deployment views. This means that the RA will describe what functionality shall exist, but not how it is to be deployed in the experiments. However, the RA defines an example model, based on one experiment in MNE5, for how operational views are to be described.

The reason for not specifying all deployment views is that these will look very different depending on what type of experiment is currently ongoing. How systems are deployed in the various MNE5 experiments is to be described in the “mission” pillar of the architectural framework [1].

1.3 Short description of the “System in focus” or “Aspect in focus”

The MNE5 technical system aims at supporting concept development and experimentation in the realm of Comprehensive Approach (CA). MNE5 is a series of experiments running from 2007

through 2008. These experiments have a wide range in their set up and goals which mean that the technical system needed to support these experiments also will vary.

Different types of technical applications are needed in the experiments. To structure these applications, a model has been created with the following layers of functionality:

Community of Interest (COI) Services
Applications aimed at specific and limited user communities. These have few or no interactions with other applications.

Experiment
Services needed to support the experiment, such as analysis functions and scenario.

Common Services
Applications which have two or more users. I.e. are re-usable components which have the potential of being available in most experiments.

Core Services
A core set of applications which are needed to be able to perform an experiment. This includes user directories, web portal and collaboration applications etc.

Core Data model
A data model which contains the core data definitions used by the COMMON and CORE services.

Infrastructure & Network Services
The base computing infrastructure, including operating systems etc. as well as network and network services used to enable communication between the experiment sites.

Figure 1 shows a graphical representation of what is contained in these layers.

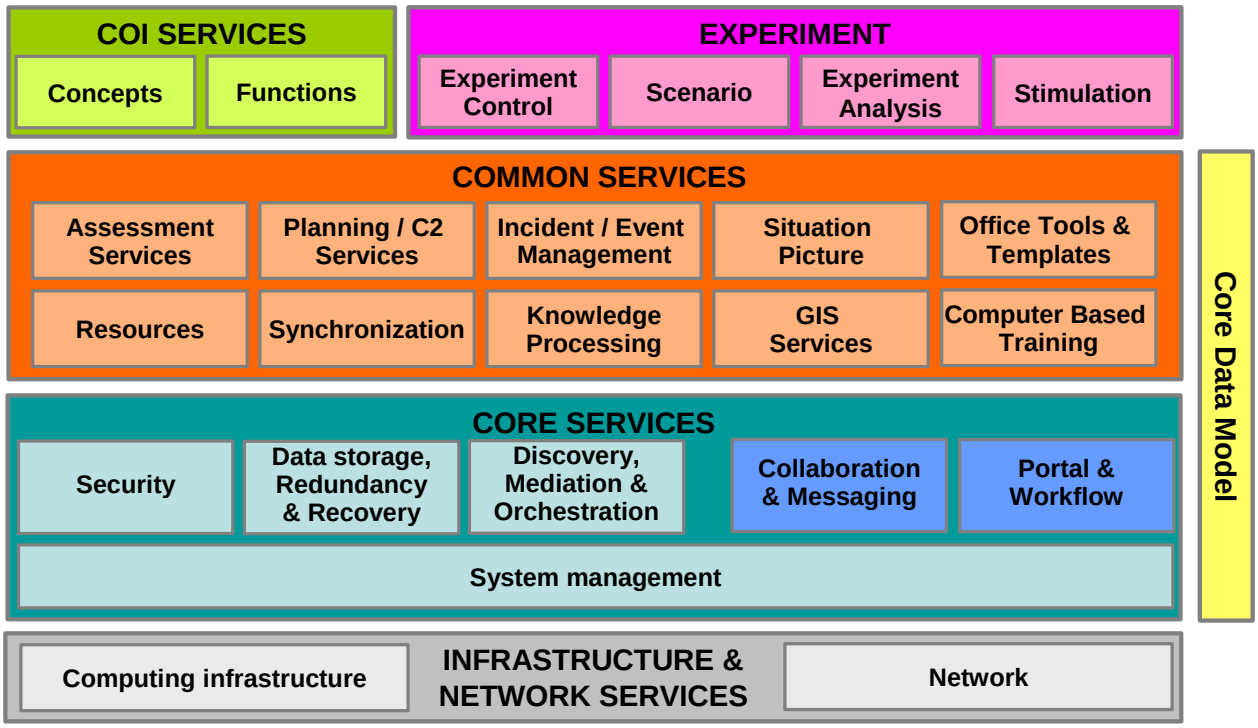

Figure 1 Architecture layers diagram

1.4 Architecture structure and related documents

1.4.1 Related documents

[1] MNE5 Architecture Description Framework 1.0

[2]

1.5 References

[3]

[4]

1.6 Abbreviations

MNE5 – Multi National Experiment number 5

CA – Comprehensive Approach

RA – Reference Architecture

TA – Target Architecture

OA – Overarching Architecture

2 DESCRIPTION

2.1 Technical System description

2.1.1 NSOV-1 Service taxonomy

The purpose of the Service Taxonomy subview is to organize knowledge according to the service perspective, and to facilitate harmonization of services across multiple domains (or across multiple architectures).

The services in MNE5 are divided into areas as depicted in Figure 1 Architecture layers diagram. This taxonomy has been specifically developed for MNE5, but is strongly influenced by how other architectures, both civilian and military, define service taxonomy.

Noteworthy is that the Experiment layer of the architecture exists. This layer contains experiment specific services which are not found in systems which are intended for use in live operations.

It is also important to know that the focus of the MNE5 architecture is on describing the components which are common for many users or experiments, not those components which are used in a limited scope. The results are that the COI level services are not described in as much detail as the COMMON or CORE (see Figure 1 Architecture layers diagram).

2.1.2 NSOV-2 Service definitions

The purpose of the Service Definitions subview is to strictly delineate and define services in order to understand the operational domain in terms of services supporting operational activities.

2.1.2.1 Experiment Services

Area	Service	Service description
Experiment	Scenario	▪ Scenario setup ▪ Where to put scenario data ▪ How to tag scenario data (live vs MNE5 specific) ▪ How to share scenario data
	Stimulation	▪ Injects (incidents etc) ▪ Ground truth ▪ Situational picture
	Experiment control	▪ Experimentation preparation and control
	Experiment analysis	▪ Linked to Analysis support in Systems Management ▪ Capture events/information within the system ▪ Central storage of log data for analysis

2.1.2.2 COI Services

Area	Service	Service description
CIP		▪
CIME		▪
MN IA Strat Planning		▪
MNIOIE (InfoOps)		▪

KS		▪
KD		▪
SHIFT		▪
EBAO	Red/Green teaming	▪
	Joint Action	▪
	Collaborative synch.	▪
		▪
Logistics		▪
Medical		▪
CBRN		▪
Security		▪

2.1.2.3 COMMON Services

Area	Service	Service description
Assessment services	Visualization of assessment results	▪ Map presentation (use of Situational Picture) ▪ Presentation of statistics from metrics and analysis ▪ Where you are on the timeline
	Modeling & Simulation	▪ Data model and interface for simulation ▪ Simulation tool(s) (which may be used in COIs) ▪ Course of action modeling & simulation (operation/mission) (related to Planning in C2 box) ▪ Effects Based Planning (EBP) modeling & simulation ▪ Assess impact on culture, system of the country (Also linked to KD)
	Metrics analysis	▪ Measures of effects and actions (MOE and MOP) ▪ Measures of culture, system of country (Also linked to KD)
	Statistics	▪ Making statistics from lower level commands ▪ Statistic algorithms ▪ Statistics about for example refugee camps, demographics
Incident/Event management (“business events”)	Routing, grouping and prioritization of incidents	▪
	Storage of incidents/events	▪
	Incident/events life cycle mgmt	▪
	Incident discovery	▪
GIS services (static information)	Description	▪ Maps (vector, raster), Geo info (road & infrastructure, buildings, elevation)
	Maps	▪ vector, raster
	Geo info	▪ road & infrastructure, buildings, elevation etc
Planning/C2 services	Description	▪ Planning (incl course-of-action/CoA), Execution ▪ Includes both military and Civilian planning ▪
	Planning	▪ Course-of-action/CoA ▪ Planning of resources, actions and effects (mapping) ▪ Security arena ▪ Integration between military and civilian planning tools ▪ Standardized interface for exchanging plan data (no standards exist at operational level) ▪ Assessment plan
	Execution	▪ Monitoring of course of actions ▪ Monitoring of resources, actions and effects (link with sync matrix) ▪ Manage resources (priority, mission orders/advices, reorganization orders/advices, logistics orders/advices, etc)

		▪ Link with assessment results (inputs and result)
Computer based training	Description	▪ On-line/Off line, Course management (schedules, user completion list)
Knowledge processing	Description	▪ Data/text mining, visualization of knowledge (data clusters, influence diagrams), Taxonomies ▪ Links to KD, Incident mgmt, C2, Assessment ▪ Scope: ▪ Management of information data flow ▪ Organization of knowledge requests ▪ Linked to Workflow in Portal
	Taxonomies	▪ For resources, incidents, actions, effects (JC3IEDM related + additional EBAO terms) ▪ Relationships between the above (actual relations stored in Synchronization service)
	Data/text mining	▪ Collect data from Incidents, ▪ Links to data ▪ Related to Information discovery in Core services
	Management of information data flow	▪ Visualization of knowledge processing /flow
Office tools & templates	Templates & forms	▪
	Language translation	▪
	Language dictionary	▪
	Common terms of references (jargon)	▪
Situational Picture (dynamic information)	Geo analysis	▪ Line of sight etc.
	Visualization	▪ Geo analysis, visualization, dynamic “layers: Area of interest info “theater” (ethnic population, cultural info, current ops, e.g track), weather
	Dynamic “layers	▪ Area of interest info “theater” ▪ ethnic population, cultural info ▪ Current ops, e.g. tracks, ▪ Weather
Synchronization	Description	▪ Relations between effects, actions, resources
Resources	Description	▪ Military ORBAT (whats in the field, what are you prepared to do, capabilities, organization), civilian assets, add/remove/change resources

2.1.2.4 CORE Services

Area	Service	Service description
Security	Cross-domain guard	▪ Allows filtered data flow between different domains of different classifications ▪ Messages (xml, JMS, content level…) ▪ Meta data filtering, who can initiate services ▪ Web browsing ▪ Collaboration & messaging ▪ Border protection / firewalls not included (network specific)
	Authentication & authorization	▪ Identity management ▪ Authorization management ▪ by name & role(s) ▪ Certificates & tokens (soft & hard) ▪ includes certificate authority & revocation ▪ Privilege enforcement for access

		▪ Person and machine audit logging
	Data level signing	▪ Hashes ▪ Data objects, web services, messages ▪ Signature verification
	Encryption	▪ Key management ▪ Messages ▪ (not network level, VPN) ▪ Streaming level ? ▪ Session (example – AES) ▪ SSL
Collaboration and messaging	Audio, video	▪ Multi-party ▪ VOIP PSTN ▪ Record & replay
	Presence	▪ User and role presence

	Conferencing (whiteboard, application sharing, presentation)	▪ Point to point
		▪ Conference / group
		  ▪ One to many
		  ▪ Many to many
		▪ Scheduling & invitation
		▪ Record & replay
		▪ Integration with document management

	E-mail, instant messages	▪ Text chat ▪ E-mail with attachments ▪ Internet e-mail capability ▪ Digital signatures
	Document management	▪ Metadata tagging ▪ Versioning ▪ Baselining
Portals and workflows	Discussion forum	▪ Wiki ▪ Blogs
	Calendar	▪ Group & individual
	Publishing	▪ Content management ▪ Syndications (RSS, ATOM, etc)
Data storage, redundancy, recovery	Storage management	▪ Archiving ▪ Back-up & recovery
	File storage	▪ Network accessible ▪ Group, personal
	Virtual database	▪ Distributed data sources? ▪ Web services?

Discovery, mediation, orchestration	Discovery	▪ Content search
		▪ Services
		▪ Users, organizations, roles
		▪ Metadata
		▪ Registries (and their management)
		  ▪ User
		  ▪ Service

	Mediation	▪ Message queuing ▪ Message transformation ▪ Routing ▪ Service (requests, data distribution, binding) ▪ ETL (extract, transport, load) ? ▪ B2B (business to business) support
	Replication & synchronization	▪ Registries ▪ Databases, data
System Management	Helpdesk	▪ Online ticketing integrated into portal environment ▪ System status display ▪ Information on minimum requirements for installing/running software
	Service	▪ Distribution and installation of software, including patches

	Deployment	▪ Software repository with approved versions
		▪ Configuration management
		  ▪ Software versioning
		  ▪ Hardware configuration
		  ▪ Services versioning

	Analysis support	▪ Logging ▪ Collection of service level (performance) metrics; QoS ▪ Collection of capacity measures for assessment
	System Supervision and Control	▪ Monitoring software, hardware, services, networks ▪ Service prioritization & allocation ▪ Security monitoring (IDS, etc) ▪ Policies ▪ Operations (action (start, stop, recovery, etc), service management) ▪ System dashboard (network operations center, MNE5 environment)

2.1.2.5 Infrastructure & Network Services

Area	Service	Service description
Computing infrastructure	Operating systems	▪ Client and server side operating systems such as Windows, Linux etc.
	Web Browser	▪ Web/HTTP browsers such as Internet Explorer and Mozilla Firefox
	Document, Presentation & Calculation editor	▪ Office tools such as Microsoft Word, Powerpoint and Excel.
Network	DNS	▪ Domain Name System servers and schema
	NTP	▪ Network Time Protocol
	VoIP	▪ Voice over IP system for tech support
	Network Management	▪ Network Monitoring using SNMP

2.1.3 NSV-1 Systems Interface Descriptions

The purpose of the System Interface Description is to illustrate which systems collaborate in which way to support the operational domain's information and information exchange needs as defined in the Operational View; most notably in NOV-2.
NSV-1 links together the Operational View and the System View by depicting which systems are resident at which system nodes. Systems nodes may in reality be operational nodes, and such duality is permissible.

The chapter contains references to Business Process Modeling diagrams which is the closest we get to an Operational View in the architecture. These diagrams describe the concepts of MNE5, the activities performed in these concepts, how they relate to each other and how they relate to technical systems.

To support the execution of the business processes, technical systems have been produced. These are described in chapter 2.1.3.2 Deployable Systems.

This Reference Architecture does not describe which technical systems are resident at which system nodes for each and every experiment in MNE5, but an example deployment model, for the MNE5 Enabling Capabilities experiment (ENCAP08) is described. Detailed descriptions of which systems are deployed in which system nodes for all experiments can be found in the Experiment Design Documents (EDD) of MNE5.

2.1.3.1 Business Process Modeling

The MNE5 process model, depicted in Figure 2, describes the MNE5 Comprehensive Approach focus areas. Each focus area is described with organizational entities and the processes these entities performs. Also relationships between the focus area processes are identified. These relationships often indicate a need for information sharing using information technology.

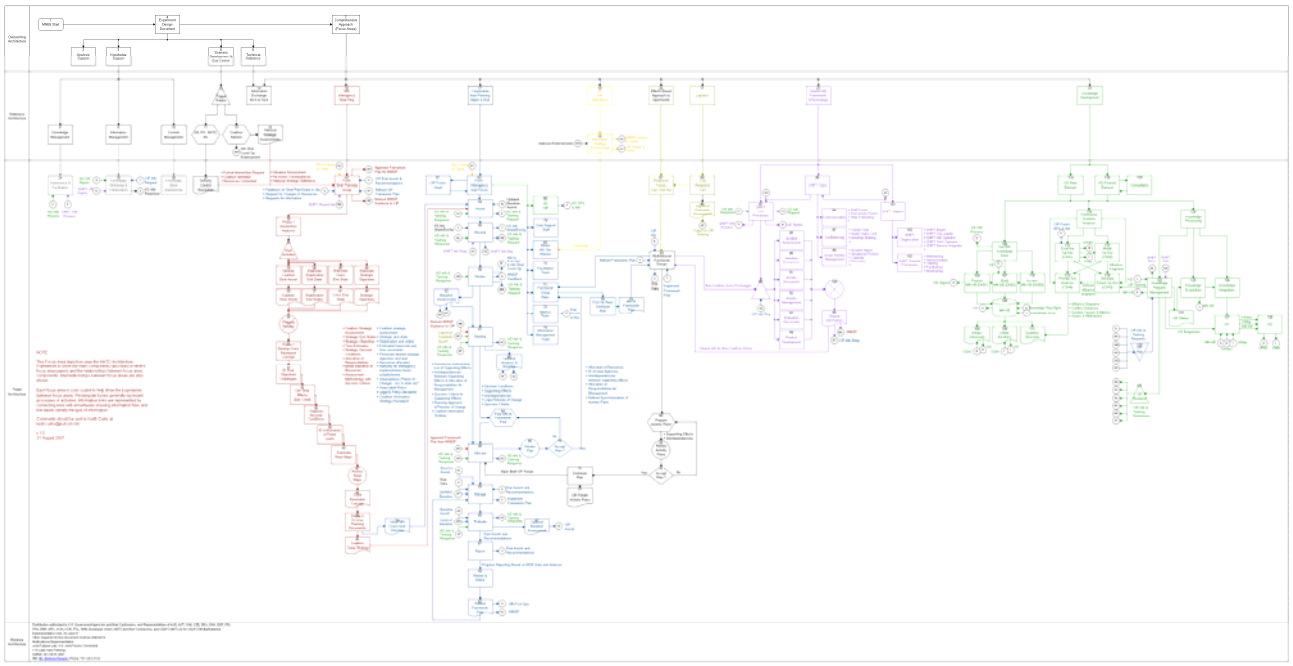

Figure 2 MNE5 process model

2.1.3.2 Deployable Systems

Deployable systems are what make up the technology in MNE5, they provide the services described in chapter 2.1.2 NSOV-2 Service definitions. Figure 3 Deployable components diagram, depicts the different systems divided into the different layers of the architecture where they belong. The figure also describes which products are used to realize the different systems.

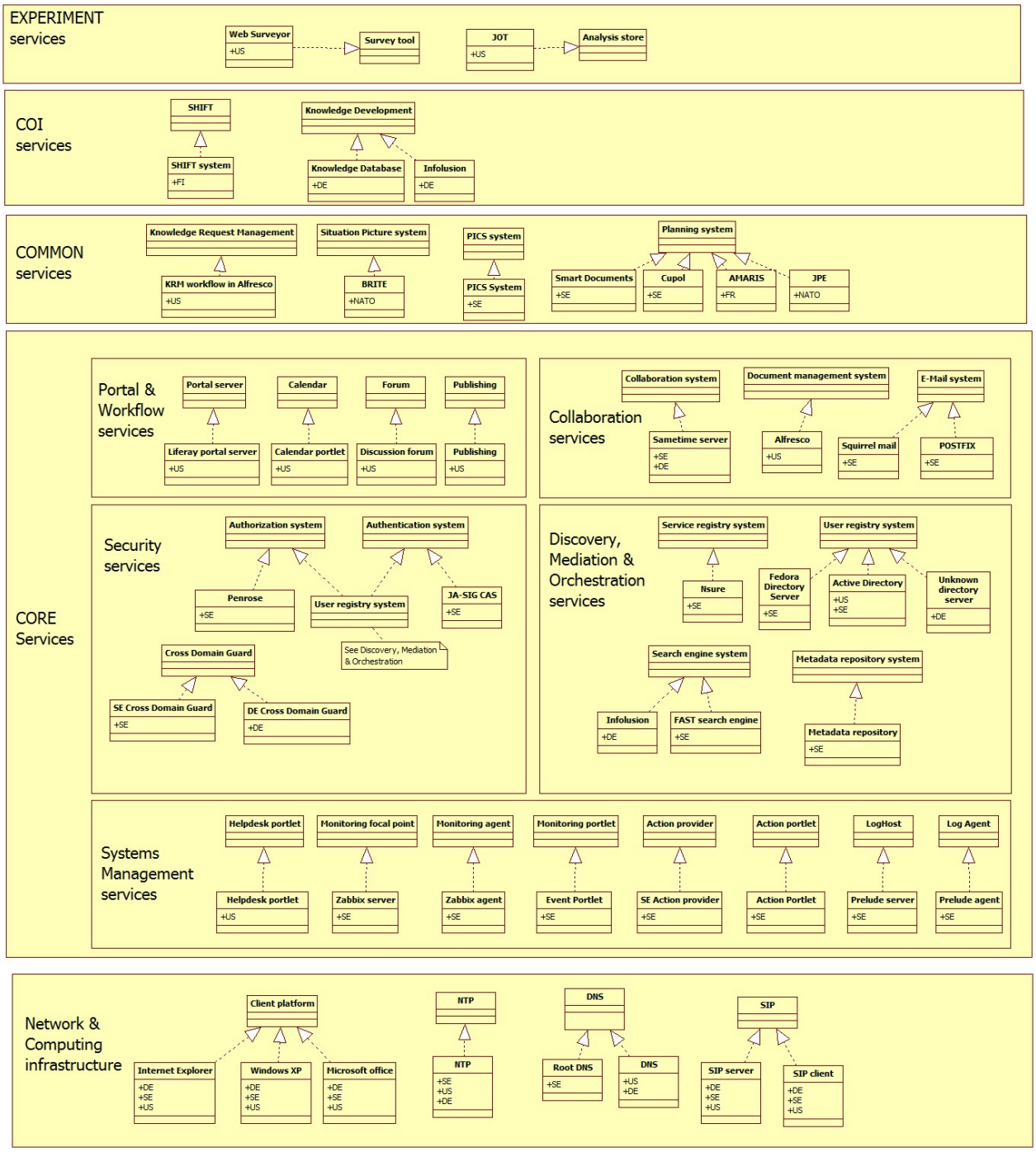

Figure 3 Deployable components diagram

Experiment layer systems

The Survey tool system provides functionality to allow the experiment audience to fill out surveys which the experiment analysts have created. This is vital in order to collect the overall experience of the experiment participants.

The Analysis store system stores all data collected during the experiments, for example chat logs, e-mail conversations etc.

COI layer system

The SHIFT system is one of the main components in MNE5. In SHIFT, government and non-government actors can meet and share information. SHIFT contains several subsystems which correspond to parts of the CORE services in the architecture, for example a Portal, Collaboration system, Document Management, Situational Picture and Incident management systems. It also has an infrastructure containing security and mediation services. SHIFT is mainly built with commercial products from IBM.

The Knowledge Development system provides aid to the Knowledge Development analysts so that they can be effective in understanding complex situations and theatre systems. The KD tool functionality includes a web crawling system, a semantic search engine (Infolution) and a reasoning tool. The Knowledge (i.e. documents) that the KD team produces are stored in a Knowledge Database, in this case the Alfresco document management system (see Collaboration services).

COMMON layer systems

The Knowledge Request Management system provides functionality to enter and manage Knowledge Requests which makes up one part of the Knowledge Support concept.

The Situation Picture system provides a view of the current situation in an area, displaying units, events and areas on a geographical map.

The Planning systems aid the planners in a Comprehensive Approach and Effects Based Approach to Operations process. In MNE5 there are several different planning tools with different levels of functionality and are aimed at different user audiences.

The Planning Information Common System (PICS) is a system which enables the planning tools to exchange information between each other, thus making it possible to have the same information available to all planners in a Comprehensive Approach.

CORE layer systems

In the Portal and Workflow area there is a Portal server system in where it is possible to deploy different kinds of functionalities, such as calendaring, forums and publishing.

In the Collaboration area there are several systems. The Collaboration system provides functionality for users to communicate with each other through chat, voice or video conference. A Document management system exist which allows users to store and share documents as well as handling versioning of the documents. The E-mail system allows users to send and retrieve e-mail messages.

The Security area provides experiment wide systems for Authentication (identity control) and Authorization (access control). Also, the Cross Domain Guard system enables information exchange over domain borders. In MNE5 information is transferred between the SHIFT and Coalition (MCWAN) domains.

In the Discovery, Orchestration and Mediation area the Service registry system enables systems to find each other, like a telephone book, thus eliminating the need for hard coding in addresses. The

User Registry and Organization registry systems provides access to information regarding the organizational structures and user information such as names, addresses etc.
The Search engine system enables the users to discover information in MNE5 and this system utilizes the Metadata repository as one source of data.

To enable management of the MNE5 technical system there are a set of Monitoring, Log systems and Action systems which enables the technical support organization to collect status information and take corrective actions if needed. Also, a Helpdesk system aids the support organization in handling the different incidents that the users identify.

Network and Computing Infrastructure layer systems

The Client platform system is what the users have before them in the experiments. This is built with standard off-the-shelf products and provided by each nation where users are located.

To create the networking infrastructure, a time synchronization system (NTP) and a Domain Name System (DNS) exist. The SIP system enables the technical support organization to communicate between each other if the ordinary collaboration system should fail.

2.1.3.3 Example Deployment Model (ENCAP08)

To provide an insight to which systems are deployed where an example deployment model is provided. This example is based on the final event in MNE5, the Enabling Capabilites 08 (ENCAP08) where a large portion of the available technology was demonstrated.

The overview diagram (Figure 4 ENCAP08 Deployment overview) depicts systems deployed in three different zones, the Coalition network (MCWAN) which is a protected VPN network used for secure information exchange, a Demilitarized zone (DMZ) which contains the systems which have access to the internet, like SHIFT and the third zone is the Internet where PCs which connect to SHIFT and open sources are located.

In ENCAP08 it is possible to exchange information between the DMZ and the Coalition network through Cross Domain Guards. The guards provide secure information transfer between different security zones.
Within the Coalition network there is a protection on a network level using ports and protocol protection, similar to a simple firewall. The DMZ is protected from the Internet using Firewalls.

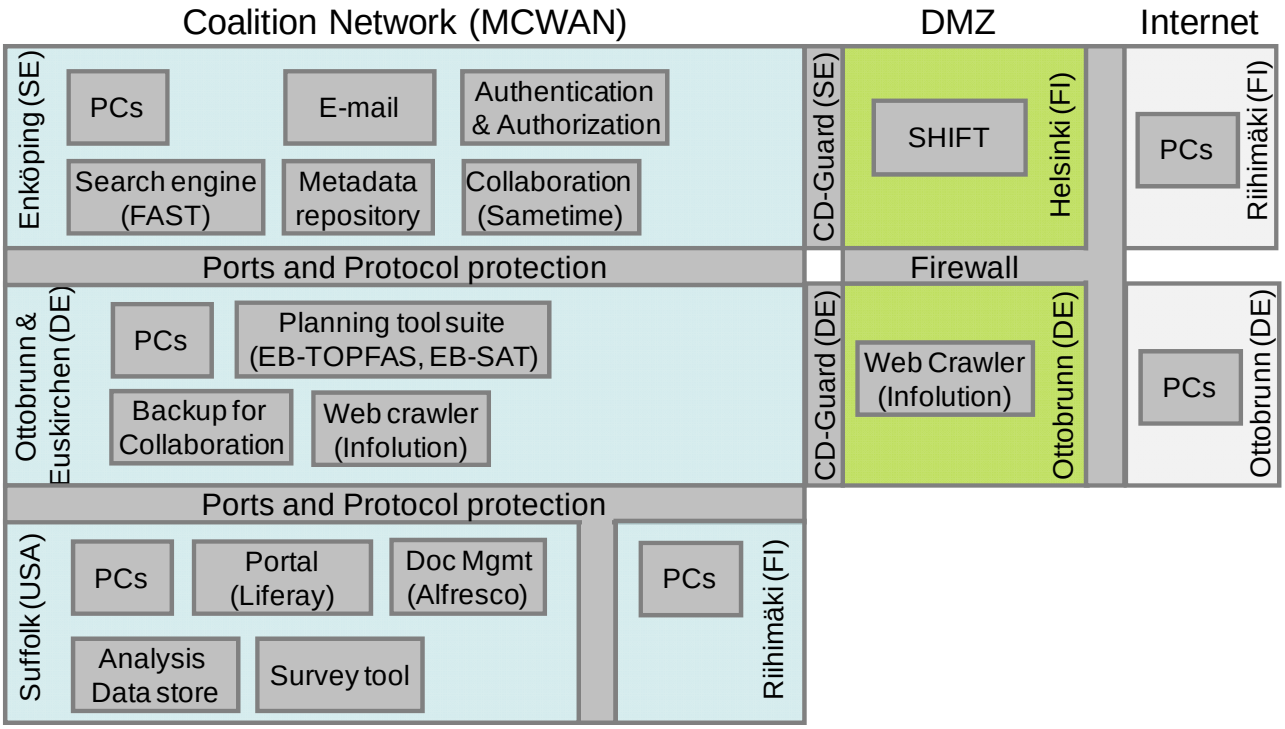

Figure 4 ENCAP08 Deployment overview

2.1.4 NSV-2 Systems Communications Description

The goal of Systems Communications Description is to provide a comprehensive specification of how systems are connected, what interfaces each system exposes (ports), the hardware interface used, and the protocols that govern transmission of data across the interface.
The NSV-2 subviews play an important role in implementing the NATO Network Enabled Capability strategy. They enable acquisition specialists and system engineers to quickly plan and visualize how communications between systems are to be implemented. When NAF is used as an analytical tool for existing systems, the NSV-2 subviews provide a detailed way to document the interfaces exposed by those systems.

This view contains an overview of all Service Definition documents, or other sources where information on the specific Services can be found. For information on which Systems provide or consume these Services, see section 2.1.5.
This section only describes services if they are used by multiple systems for information exchange, there are other services and standards used in MNE5, but they are described in the architectural document of each system.

2.1.4.1 Service Definitions for Experiment Services

Area	Service Definitions
Experiment	

2.1.4.2 Service Definitions for COI Services

Area	Service Definitions

CIP	
CIME	
MN IA Strat Planning	
MNIOIE (InfoOps)	
KS	
KD	
SHIFT	
EBAO	
Logistics	
Medical	
CBRN	
Security	

2.1.4.3 Service Definitions for COMMON Services

Area	Service Definitions
Assessment services	
Incident/Event management ("business events")	
GIS services (static information)	
Planning/C2 services	**Planning Information Common Service (PICS)** Enables exchange of planning information between planning tools. Developed specifically for MNE5, to support the Effects Base Approach to Operations (EBAO) process. (Ref to doc)
Computer based training	
Knowledge processing	
Office tools & templates	
Situational Picture (dynamic information)	
Synchronization	
Resources	

2.1.4.4 Service Definitions for CORE Services

Area	Service Definitions
Security	**Authentication Web Service** An MNE5 specific service to provide external authentication possibilities. Based on the Swedish NBD design (FMLS2010). (Ref to doc) **Authorization WS** An MNE5 specific service which provides external authorization management. Based on the Swedish NBD design (FMLS2010). (Ref to doc) **LDAP** Standard protocol (RFC XXXX) for authentication and authorization. Primarily used for integration of commercial products that cannot be adapted to the custom authentication and authorization services.
Collaboration and messaging	**XMPP** Standard protocol (RFC XXXX) which is used for text chat and presence information. **SIP** Session Initiation Protocol (RFC XXXX) used for initiating voice collaboration sessions. **SMTP** Simple Mail Transfer Protocol (RFC XXXX) used for transfer of asynchronous messages, i.e. E-mail. **WebDav**

	Standard for retrieving and updating documents in a document management system. (Ref to standard)
Portals and workflows	
Data storage, redundancy, recovery	
Discovery, mediation, orchestration	**UDDI** Standard (ref to standard) for enabling systems to look up services in a Service Oriented Architecture. **User registry Web Service** MNE5 specific service for browsing and administering a user directory. Based on the Swedish NBD design (FMLS2010). (Ref to doc) **Organization registry Web Service** MNE5 specific service for browsing and administering a organization directory. Based on the Swedish NBD design (FMLS2010). **LDAP** Standard protocol (RFC XXXX) for reading user and organizational data. Primarily used for integration of commercial products that cannot be adapted to the custom user and organization registry services. **Metadata Web Service** MNE5 specific service for adding and reading metadata. Enables sharing of metadata to enable information discovery without actually sharing the data itself. Is useful when having large amounts of data or when the data is secret. Based on the Swedish NBD design (FMLS2010). (Ref to doc)
System Management	**WSDM** Web Services Distributed Management (WSDM) a standard for enabling Monitoring and ability to perform Actions in a Web Services environment. Insert WSDM SD reference here. **File Transfer Protocol (FTP) Service:** Standard service for enabling file transfer. No MNE5 specific document is created for this service. For information on the FTP Service, go to http://www.w3.org/Protocols/rfc959/.

2.1.4.5 Service Definitions for Infrastructure & Network Services

Area	Service Definitions
Computing infrastructure	
Network	**Internet Protocol** Standard for enabling exchange of data packages on a network. (Ref to std) **NTP** Network Time Protocol, standard for distributing time information to enable synchronization of computerized clocks. (Ref to std) **DNS** Domain Name System, standard for looking up hosts on a network. (Ref to std)

2.1.5 NSV-3 System-to-System Matrix (S2 Matrix)

The Systems to Systems Matrix provides detail on the interface characteristics described in the NSV-1 subview for the architecture, arranged in matrix form.
An NSV-3 product allows a quick overview of all the interface characteristics presented in multiple NSV-1 diagrams. The matrix form can support a rapid assessment of potential commonalities and redundancies (or, if fault-tolerance is desired, the lack of redundancies).

System/Service Matrix. (currently in Excel spreadsheet.)

2.1.6 NSV-4 Systems Functionality Description

The primary purpose of the System Functionality Description is to:

- *Describe systems that are outlined in NSV-1 in more detail, both in terms of structure (functional decomposition of systems) and behavior (data flows between system components that realize certain system functions).*
- *Develop a clear description of the necessary system data flows between systems in accordance with NSV-11 data definitions.*
- *Clearly describe the allocation of system functions to specific systems, system components and/or system nodes and thus clearly delineate lines of responsibility.*
- *Analyze the construction of NSV-1 systems to provide a basis for the determination of the quality requirements for systems (refer to NSV-7) in support of the Operational View, and making decisions about streamlining, combining or omitting system functionality.*
- *Provide a necessary foundation for depicting the sequencing and timing aspect in NSV-10.*

This section is not applicable for this document, much of the information can be found in chapter 2.1.3.2 Deployable Systems. For even more details, refer to the system description documents which are provided by the different nations which provide the systems.

2.1.7 NSV-6 Systems Data Exchange Matrix

The Systems Data Exchange Matrix specifies the characteristics of the system data exchanged between systems. This product focuses on automated information exchanges (from NOV-3). Non-automated information exchanges, such as verbal orders, are captured in the Operational View only.
System data exchanges express the relationship across the three basic architecture entities of the System View (systems, system functions, and system data flows) and focus on the specific aspects of the system data flow and the system data content.
These aspects of the system data exchange can be crucial to the operational mission and are critical to understanding the constraints introduced by the implementation.

The systems data exchange matrix has not been developed for MNE5.

2.1.8 NSV-7 System quality requirements description

One of the primary purposes of a System Quality Requirements Description is to communicate which quality characteristics are considered most crucial for the successful achievement of the mission goals assigned to the system. These particular parameters can often be the deciding factors in acquisition and deployment decisions, and will figure strongly in systems analyses and simulations done to support the acquisition decision processes and system design refinement.

No system quality requirements description has been developed for MNE5.

2.1.9 NSV-8 Systems evolution description

A Systems Evolution Description, when linked together with other evolution products such as NCV-3a, NPV-1, NSV-9 and NTV-2, provides a clear definition of how the architecture and its systems are expected to evolve over time. In this manner, the product can be used as an architecture evolution project plan or transition plan.

There is no systems evolution development description for MNE5. This evolution is likely to happen in future MNE events.

2.1.10 NSV-9 Systems technology forecast

The purpose of the Systems Technology Forecast is to identify relevant emerging technologies, and to ensure that the architecture benefits from it, or is easily adapted to it. NSV-9 provides a summary of emerging technologies that impact the architecture and its existing planned systems. The focus will be on the supporting technologies that may most affect the capabilities of the architecture or its systems.

There is no systems technology forecast developed for MNE5.

2.1.11 NSV-10 Systems rules, sequence & timing description

Many of the critical characteristics of an architecture are only discovered when an architecture's dynamic behaviors are defined and described. These dynamic behaviors concern the timing and sequencing of events that capture system quality characteristics of an executing system. Behavior modeling and documentation is key to a successful architecture description, because it is how a future system behaves that is crucial in many situations. Although knowledge of the functions and interfaces is also crucial, knowing whether, for example, a response should be expected after sending message X to node Y can be crucial to successful overall operations.
Three types of models may be used to adequately describe the dynamic behaviour and performance characteristics of a System View. These three models are:

- *Systems Rules Model (NSV-10a)*
- *Systems State Transition Description (NSV-10b)*
- *Systems Event-Trace Description (NSV-10c)*

NSV-10b and NSV-10c may be used separately or together, as necessary, to describe critical timing and sequencing behavior in the System View. Both types of diagrams are used by a wide variety of different systems methodologies.
Both NSV-10b and NSV-10c describe systems responses to sequences of events.
Events may also be referred to as inputs, transactions, or triggers. When an event occurs, the action to be taken may be subject to a rule or set of rules as described in NSV-10a.

2.1.12 NSV-11 System data model

The purpose of a data model is to enable analysis, design and implementation of the data presentation, handling and storage functionality of an information system.

There is no common system data model for MNE5.

2.1.13 NSV-12 System communication quality requirements description

The purpose of the Systems Communication Quality Requirements description (NSV-12) is to specify specific quality requirements applicable to communications between systems.
Note that NSV-12 focuses on specific categories of quality requirements for systems communication. This focus is available to offer separate attention to certain communication aspects, other than already specified in the System to System Port Connectivity description (NSV-2b) or the System Connectivity Clusters subview (NSV-2c). At the moment two categories are supported:

- *NSV-12a: Electromagnetic Spectrum Description subview;*
- *NSV-12b: Bandwidth Description subview.*

Analogous to NSV-7 offering specification of quality requirements for systems defined in NSV-1 and NSV-4. NSV-12 offers specification of quality requirements for system communication aspects

defined in NSV-2 (albeit only specific categories of communications related quality requirements that are not already addressed in NSV-2 itself).

There are no system communication quality requirements developed for MNE5.

2.1.14 NSV-13 Service provision

The purpose of the Service Provision subview (NSV-13) is to illustrate which capability configurations provide which services.
The NSV-13 subview is a mapping of capability configurations, as defined in NSV-1, to services, as defined in NSOV-2.

This section is Not Applicable for this document. Service provisioning is to be described in the "mission" pillar of the architecture description framework.

2.1.15 NTV-1 Technical standards profile

The Technical Standards Profile (NTV-1) provides a list of standards guiding and constraining the implementation of systems as defined in the various subviews of the System View. The NTV-1 standards, preferably, are NATO standards, as this will allow NATO to review the conformance of system implementation with the policy related to mandatory interoperability standards.

There is no technical standards profile for MNE5.

2.1.16 NTV-2 Technical standards forecast

The purpose of the Technical Standards Forecast subview (NTV-2) is to identify emerging, obsolete and fragile standards, and to assess their impact on the architecture and its constituent elements. A forecast addressing emerging standards will give insight into the direction that the project will go.

There is no technical standard forecast for MNE5.

2.1.17 NTV-3 Standard configurations

The purpose of the Standard Configurations Description (NTV-3) is to describe all patterns, standard configurations and best practices that are applied to or emerge from the architecture effort, used or encountered in any of the subviews developed in the architecture effort.
NTV-3 is intended to capture and explicitly describe any pattern, configuration or best practice that is of value to the ongoing or to future architecture projects. It is also the intention of this subview to provide a single point to address and promote the use of patterns, standard configurations and best practices.

No standard configurations are identified.

3 Revision history

Date	Description	Signature
23 Apr 2007	First draft.	Niklas H
11 June 2007	More information in chapter 2.	Niklas H
12 Oct 2008	Major rework to reflect MNE5 final state.	Niklas H

Date	Description	Signature
10 Dec 2008	Inserted BPM diagrams. Updated KD tools description.	Niklas H