2006 CCRTS
THE STATE OF THE ART AND THE STATE OF THE PRACTICE

Situational Awareness Object (SAO),
A Simple, Yet Powerful Tool for Operational C2 Systems

Cognitive Domain Issues
C2 Experimentation
C2 Modeling and Simulation

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	Form Approved OMB No. 0704-0188
Report Documentation Page	

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1. REPORT DATE **JUN 2006**	2. REPORT TYPE	3. DATES COVERED **00-00-2006 to 00-00-2006**
4. TITLE AND SUBTITLE **Situational Awareness Object (SAO), A Simple, Yet Powerful Tool for Operational C2 Systems**		5a. CONTRACT NUMBER
		5b. GRANT NUMBER
		5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)		5d. PROJECT NUMBER
		5e. TASK NUMBER
		5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Alion Science and Technology,6449 Dehesa Rd,El Cajon,CA,92019**		8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSOR/MONITOR'S ACRONYM(S)
		11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT **Approved for public release; distribution unlimited**

13. SUPPLEMENTARY NOTES **The original document contains color images.**

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES **35**	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**			

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std Z39-18

Situational Awareness Object (SAO), A Simple, Yet Powerful Tool for Operational C2 Systems

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ABSTRACT

The U. S. Joint Forces Command (USJFCOM), J9 Modeling and Simulation (M&S) Support Team advanced the capability of distributed simulation in support of Urban Resolve 05 (UR05), a collaborative effort conducted by USJFCOM and the Institute for Defense Analyses (IDA). Using real-world data, the scenarios in UR05 realistically replicated current operations and situations faced by warfighters in Baghdad. Experiment subjects use Situational Awareness Objects (SAOs) to share their awareness of the battlespace regarding activities of the adversaries, blue forces and civilian population. SAOs are logged and support real-time, post-experiment evaluation and comprehensive after-action reviews. Throughout each JUO experiment, the SAOs structure evolved to include new options that were based on the operator's needs. The benefit of SAOs is that they are easy to create and modify to fit varied operational missions. They are shared instantly among operators with access to the database and they are displayed on the terrain map as symbolic objects. SAOs contain the author's identification, location coordinates, and time created or modified, SAO category, player's confidence level, free-text comments, associated tracks and the ability to attach graphics and text files to the object. USJFCOM's success in using SAOs to enable the JUO series of experiments and the enthusiasm and innovation that operators show in using them, indicates this simple, yet powerful tool would be useful if implemented in various operational C2 systems.
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ABOUT THE AUTHOR

Michael Anhalt is retired Navy Surface Line Commander with over 23 years of operational experience, including specialties in Amphibious Warfare, Surface, Undersea, and Strike Warfare, and tactical training. Thirteen years experience in planning and directing system-engineering efforts related to modeling & simulation and their integration with military command and control (C2) systems. He provides on-site technical support in planning for and conducting warfighting exercises and experiments, prototype development, and demonstration of advanced technologies for next generation C2 Systems and Command Centers. He holds a Master of Science degree in Educational Technology. Mr. Anhalt co-authored a paper selected for presentation at I/ITSEC 2005, "Developing Situation Awareness Metrics in a Synthetic Battlespace Environment", paper #2218.

Situational Awareness Object (SAO), A Simple Simulation Tool for Operational C2 Systems

Introduction

The U. S. Joint Forces Command (USJFCOM), J9 Modeling and Simulation (M&S) Support Team advanced the capability of distributed simulation in support of Urban Resolve (Phase I) in 2004 (UR04) and Urban Resolve (Current Operations) in 2005 (UR05). Both experiments were collaborative experiments conducted by USJFCOM and the Institute for Defense Analyses (IDA).

The M&S Team first implemented Situational Awareness Objects (SAOs) for UR04, an experiment designed to explore new approaches to urban combat in the 2018 period; to better understand the impact of new technology and to help with the development of command cells, tactics, techniques & procedures. SAOs were used again in conducting UR05.

Using real-world data, the scenarios in UR05 realistically replicated current operations and situations faced by warfighters in Baghdad. The experiment was designed to investigate potential improvements related to Command and Control (C2), organizational, and process improvements for integrating and employing forces, sensors, and systems in Baghdad to more effectively anticipate, preempt, and respond to enemy attacks as a basis for actionable recommendations.

The M&S team modified the Situational Awareness Object (SAO) process and tools for use in this new and challenging environment. Joint Semi-Automated Forces (JSAF) simulation was the centerpiece of the simulation federation for both the experiments. JSAF is an entity-level simulation designed for Human-In-The-Loop (HITL) involvement of simulation controllers. JSAF runs in real-time and many of its entity maneuvers and behaviors are cued, or directed, by the sim controllers. The experiment subjects, referred to as players, directed the maneuvers and activities of their simulated forces by giving orders to the sim controllers.

The UR05 player cells and functional positions are shown below.
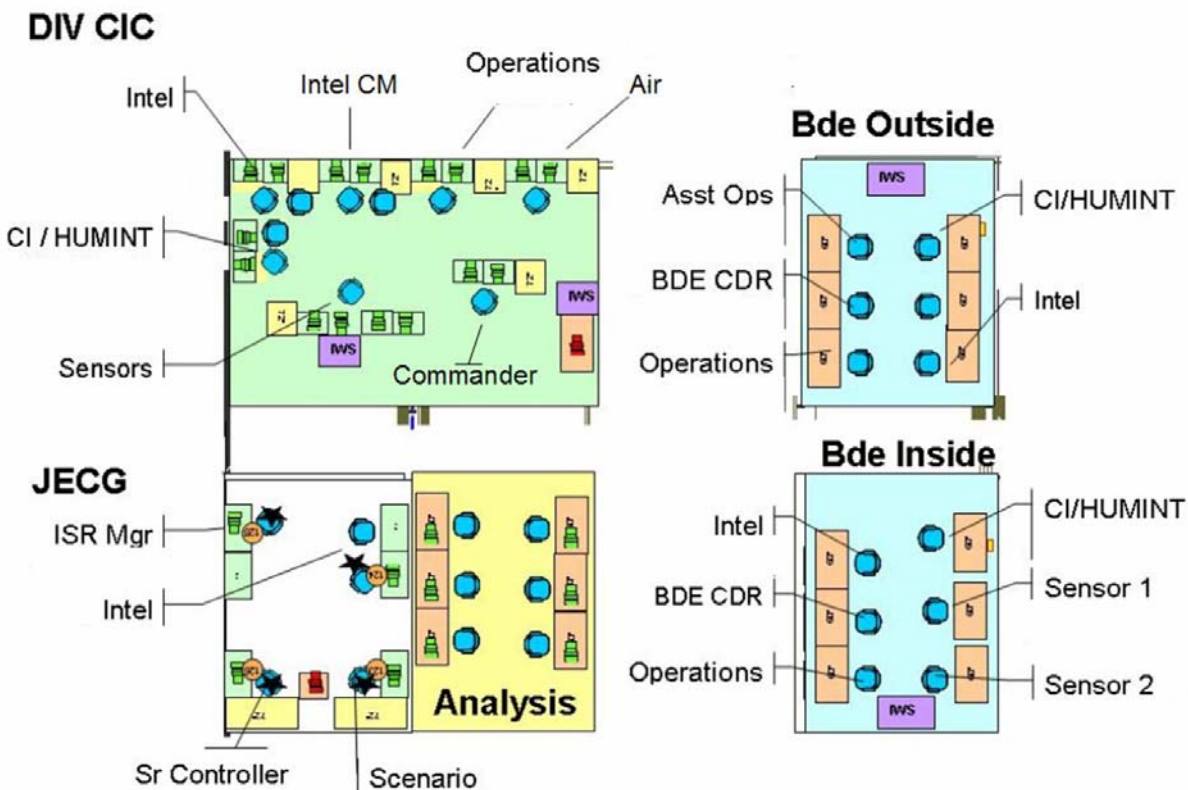
Figure 1 Urban Resolve Experiment Architecture

Players used Situational Awareness Objects (SAOs) to share their awareness and understanding of the battlespace regarding activities of the adversaries, blue forces and civilian population.

SAOs are compact packages of information symbolically displayed on the terrain map that contain the author's identification, location coordinates, time created (or modified), SAO category, player's confidence level, free-text comments, associated tracks and the ability to attach graphics and text files to the object.

The SAO Editor allowed players to create SAOs from a selection of optional attributes provided, as shown below, including a free text comment field. These preset options made it easy for operators to make entries and at the same time they provided standard attribute markings for the after-action review system callouts. The benefit of SAOs was that they were easy to create and modify to support varied tactical and operational objectives. Throughout each Urban Resolve experiment, the SAOs structure and formats evolved to include options based on the operator's needs.

The players created SAOs whenever they chose to during event run-time. Some were entered before run-time to share and display Intelligence Preparation of the Battlespace (IPB), such as Named Area of Interest (NAIs) and Targeted Areas of Interest (TAIs).
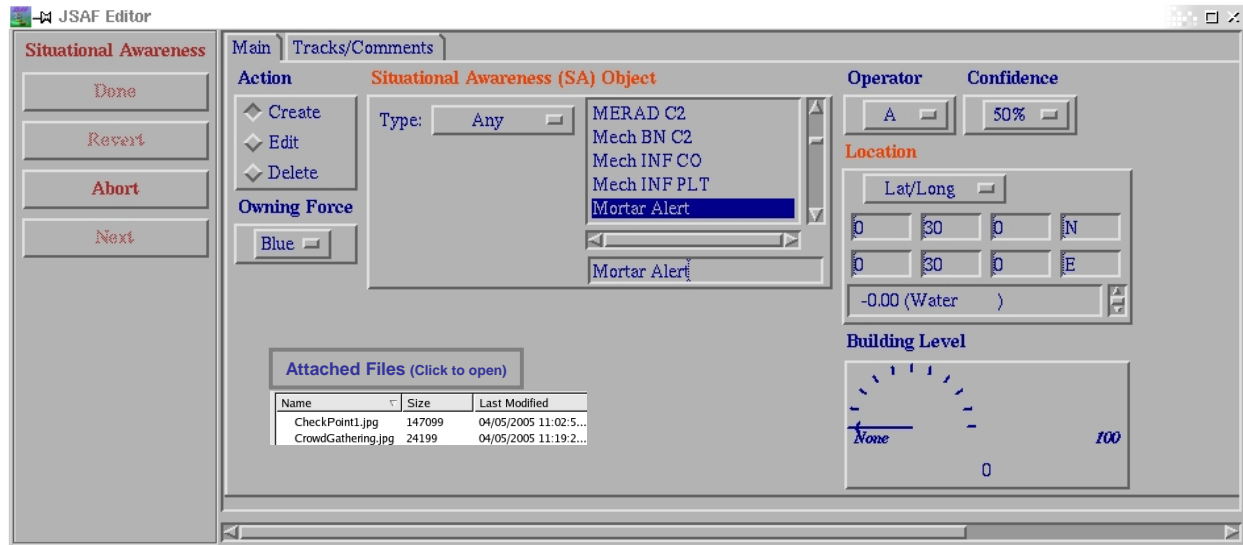
Figure 2 Situational Awareness Editor (Main Tab)

The SAO Editor Tracks Tab, shown below, lets players associate sensed tracks and other SAOs with the SAO being created. This feature allows players to capture their justification for creating SAOs. When any player selects an SAO, the SAO Editor opens and arrows on the map point to all the associated tracks, which helps to support collaboration and review. Further, if players return to an SAO after lapsed time, they can look for the arrows to see where the associated tracks have moved. Players have the ability to attach the SAO to a track object, so that SAO moves with the track.
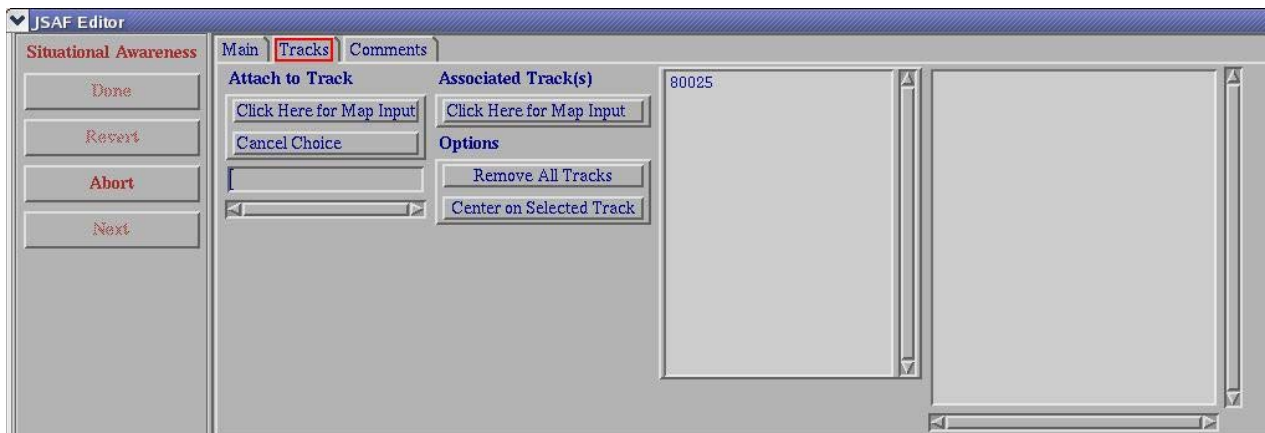
Figure 3 Situational Awareness Editor (Tracks/Comments Tab)

The SAOs were logged during each experiment event to supported both real-time experiment assessments and post-event comprehensive after-action reviews. Examples of player comments are shown below.

Where is the enemy?	What is the enemy doing?	What is the enemy going to do?
Appears to be a mortar site	Appears to be a group of insurgents placing a mortar pad	Expect a launch at sunset
Enemy Recon team on roof	Recon team is waiting until street clears	Recon Team will radio mortar team when all clear
Vehicles and Explosives in bldg	Explosives are being loaded into vehicles	Vehicles likely to move to FOB 3 during the night

Figure 3 SAO Comments

SAO objects are displayed on the JSAF map display. The red arrow below is an SAO and the red dot is a track object. The players can control the display of the attribute flags that they want to see next to the SAO. This display shows the SAO Editor open, with SAO #13 selected. The information about the selected SAO is shown in the Info Box to the right, as well as in the SAO Editor.
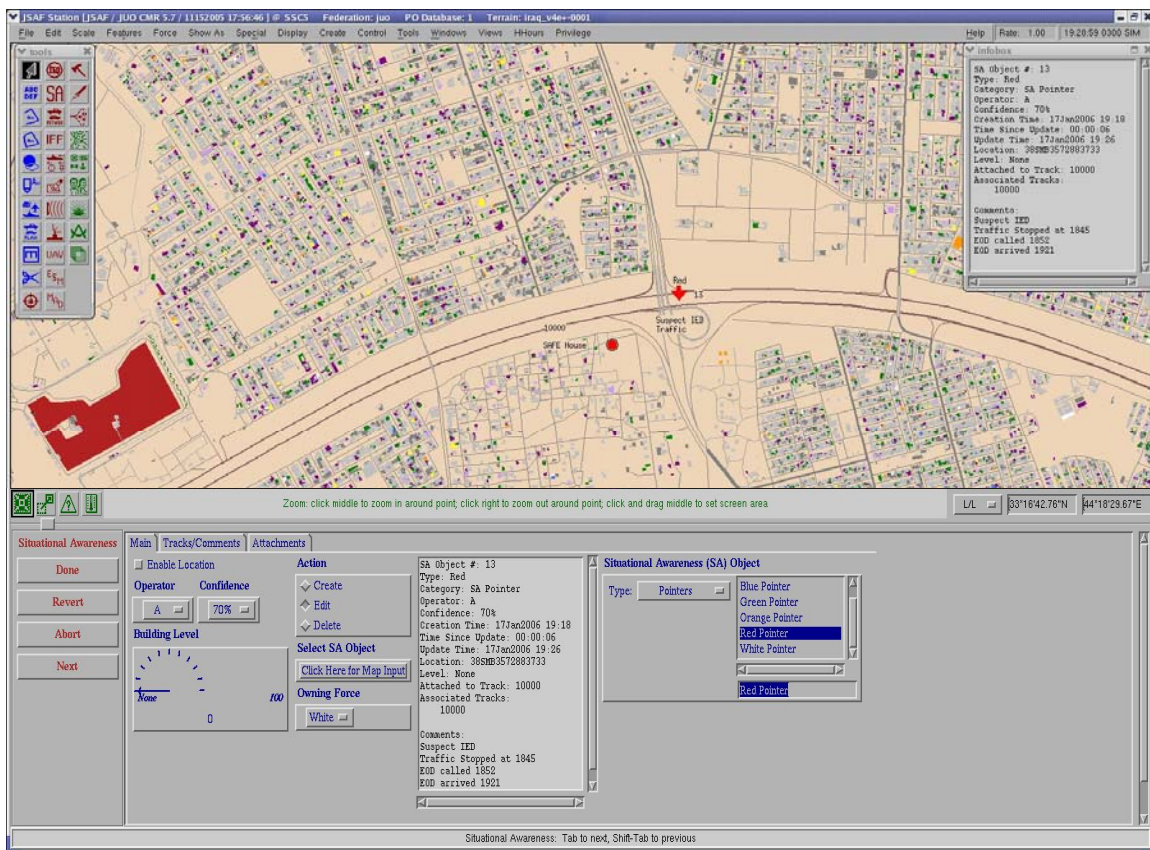

Figure 4 Map Display of SAOs and Track

The JSAF Info box shows a summary of the SAOs whenever the player clicks on the SAO map object. This functionality makes it more convenient to view SAO data without the need for opening the editor. The Info box shows data for tracks, entities and other map features as well, so it is simply an extension of an existing JSAF display device.
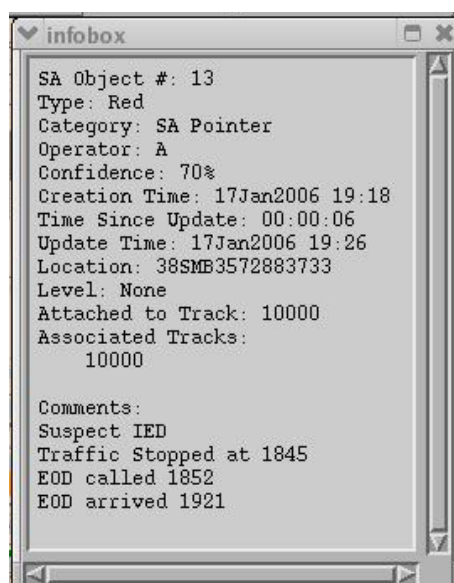
Figure 4 Information Box

The Situational Awareness Summary, shown below, is similar to the operational Global Command and Control System (GCCS) Track Summary, in that it shows the tracks and attributes in a tabular format. Players often keep this display open during operations for ready reference. They can sort by any of the columns and open the SAO editor by clicking on an SAO line item. The function that sets the SAO process apart from other display tools, such as overlay objects, is that the operator can easily find an SAO by clicking on the Center button at the left, which causes the map to center on the SAO. Often, players referred to SAOs by number in chat. This feature eliminates the need for players to type coordinates and long narrative descriptions in chat.

Figure 4 Situational Awareness Summary

Players use filters, as shown below, to select the types of SAOs they are interested in. In some experiment events, the Joint Exercise Control Group imposed filters to isolate one command cell from the other to replicate real-world communication limitations. For example, the Brigades

(Inside and Outside) could see their own SAOs, but they could not see each other's SAOs. Whereas, the Division headquarters could see them all.
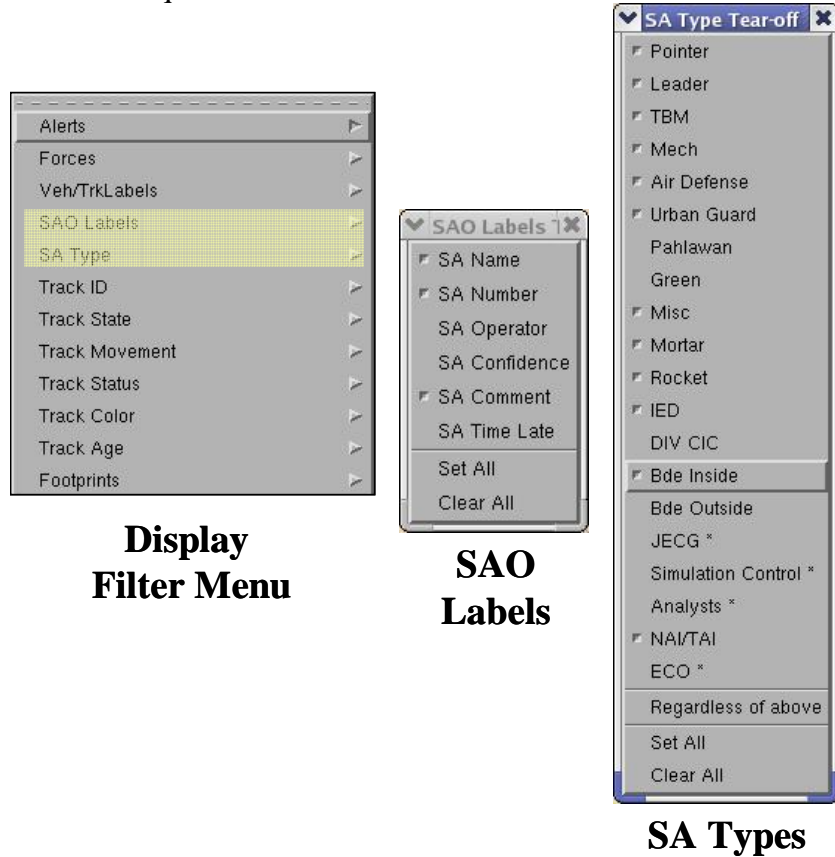

Display Filter Menu

SAO Labels

SA Types

Figure 4 SAO Filters

SAO Alerts were created to let the players choose the SAO categories for which they wanted to be alerted as they were created or modified by other players. Players kept this summary open and checked it occasionally to see if there was something going on that they were interested in.

Figure 4 SAO Alert Summary Display

SAOs allow operators to match information to a specific location in time. This function coupled with the ability to include an attachment with the SAO further helps operators manage

information. As shown below, an SAO referring to hostage-taking incident could include attachments with a photo of the suspect building where the hostages are being held, a floor plan of the building, a photo of the hostage and suspects, the ransom note and other related information.
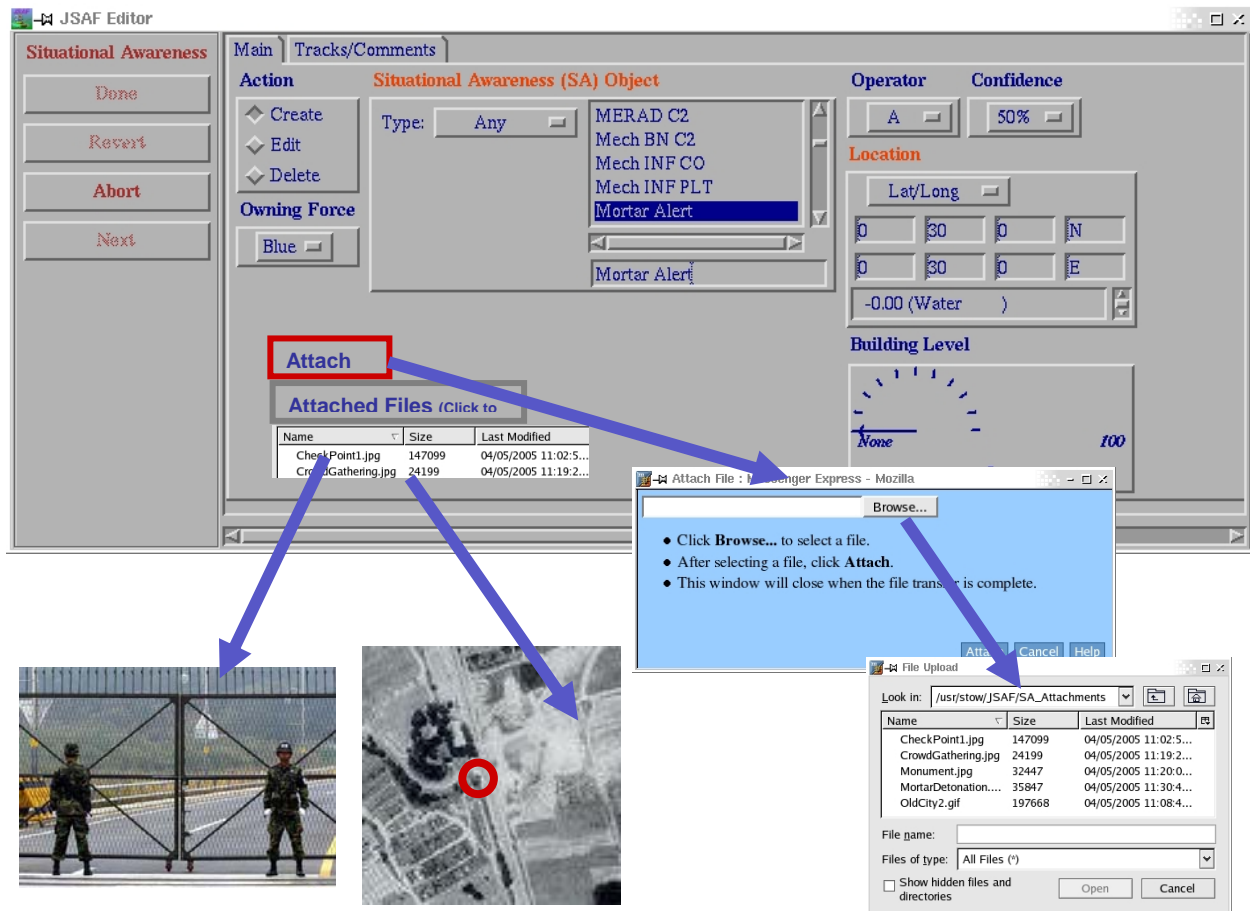
Figure 4 SAO Attach Feature

SAOs can be saved to spreadsheet at any time by anyone on a JSAF system. This is a convenient method for capturing a snapshot of SA. The spreadsheet is easily converted to a Comma Separated Values (CSV) file for use with Microsoft Excel or other spreadsheet applications. The spreadsheet can be modified, and then loaded back into JSAF. This offers a convenient method for preparing Named Areas of Interest (NAIs) and Target Areas of Interest (TAIs) type SAOs in advance for an event. The spreadsheet can be loaded in just prior to the event start time.

SAO NUMBER	SAO TYPE	CTP NAME	OPERATOR	OWNING FORCE	LOCATION	CONFIDENCE	ATTACHED FILES	COMMENTS	ASSOCIATED TRACKS	ATTACHED TO TRACK
5	SA NAI/TAI	Mortar	A	Blue	10GEV1843528583	100	Pic1.jpg	NAI Mortar Baseplate		
6	SA NAI/TAI	Safehouse	R	Blue	10GEU4186480416	50		TAI Leader Safehouse		
7	SA Pointer	White	B	Blue	10GET6766391668	70		NAI Assembly Plant for IEDs		
8	SA NAI/TAI	Safehouse	A	Blue	10GET4014680864	40	Pic8.jpg	NAI Possible Hide Site		
9	SA Green	Crowd forming	A	Blue	10GET5450871966	70		Crowd picketing factory		
10	SA Urban Guard	Unimog single	N	Blue	10GEV3933203048	100		Stopped and cleared at checkpoint charlie		
11	SA Urban Guard	UG Armed Pickup single	A	Blue	10GET7005778730	90		Observed 1623 Lost in Traffic		
12	SA Air Defense	Snow Drift Radar	T	Blue	10GET4965074078	80		Emission 1423		
13	SA Pointer	Red	M	Blue	38SMB3572883733	70		Suspect IED Traffic Stopped at 1845 EOD called 1852 EOD arrived 1921	10021	10021

Figure 4 SAO Spreadsheet

Processing of SAOs

SAOs are automatically transmitted over the network to the shared JSAF Track Database, where they are assigned unique and sequential SAO numbers. The SAOs in the track database are made available to all the JSAF machines, depending on the player filter settings. System administrators can clear, save and reloaded the SAOs from the database. The SAOs are also logged by the Future After Action Review System (FAARS).

The evolution of SAOs

The SAO evolved from the GCCS Over the Horizon Gold (OTHGold) JUNIT and Contact report environment. By original design, JSAF's goal was to stimulate operational GCCS Track Database as part of the DARPA Advanced Concept Demonstration (ACTD), Synthetic Theater of War (STOW) effort. The M&S team created a track database in JSAF to store, manage and transfer OTHGold Contact and JUNIT messages to GCCS via a gateway. This capability allowed detections from sensors in JSAF to appropriately evolve into tracks and be display on all the JSAF systems. GCCS-like Track Summaries were built into JSAF, along with filters to let operators control their displays. Own-Ship reporting was emulated by having each ship report into the Track DB every ten minutes, or so.

After the ACTD, JSAF ownership transitioned to USJFCOM, J9 Experimentation Directorate, where it was used for various HITL experiments, including Millennium Challenge 2002 (MC02) where 69 simulations were federated. The Navy, through the Navy Warfare Development Command, included in the exercise the participation of tactical training commands and ships located in port. JSAF stimulated GCCS and tactical data links. The success of this experiment firmly established JSAF as key training tool and furthered other C2 developments and improvements.

Prior to the implementation of SAOs, during each of the USJFCOM HITL experiments, analysts would gather around the players to listen to and observe their actions and communications to assess their understanding of what was going on in the battlespace. Because of the broad scope of these experiments, this analysis process was in some cases subjective and vulnerable to missed cues and actions.

Urban Resolve (Phase I) experiment went into planning early in 2004. In this experiment, players were would test various futuristic/concept Intelligence, Surveillance and Recognizance (ISR) capabilities and develop Concept of Operations (CONOPS) and Tactics Techniques and Procedures (TTPs). It was clear that the accurate evaluation of SA was going to be crucial in distinguishing subtle changes in player abilities under varied trial conditions. To achieve detailed data and to reduce the reliance on analysts, the concept of SAOs quickly evolved. The M&S team decided to create a tool that would let players record their own impressions during the trial. The tool had to be easy to use, benefit the players as well as the analysts and it had to be produce loggable data.

The GCCS-like JSAF track process provided the perfect foundation on which to build the SAO functionality. The database existed, the summary display process existed and there were already many filters in place to let operators tailor their workstation views.

Further, all the network latency issues, related to high numbers of Contact and JUNIT message traffic, were already resolved. The JSAF track database far exceeded GCCS in capacity.

The SAO Editor was designed to support expected operator inputs, with selectable options, based on the UR04 exercise constraints and objective. The SAO Summary table filters and Info box and map symbols with attribute flags were designed and implemented. During the workup period for the experiment, players were taught how to use the SAOs and their recommended changes to the SAO Editor and other displays were requested and encouraged. Changes were made over-night in many cases by software engineers. By the time the trials for record began, the players were very familiar with the use and value of SAOs. They began to accept SAOs as tools and exchanged information using SAO. They talked in terms of SAOs.

Following Urban Resolve (Phase I), USJFCOM prepared for UR05 Current Operations. The venue changed to Iraq. Instead of exploring future ISR capabilities, the trials dealt with current threats and operations in the Baghdad area and focused on the challenging problems of Mortars, Rockets and Improvised Explosive Devices (IEDs). The SAO menu options were modified to support the new environment and the operator's needs. Again, during the training and workup the players were encouraged to offer recommended changes.

In both exercises, analysts no longer needed to hover over the player's shoulders and take copious notes, since player observations were captured in SAOs and logged. Instead, they monitored SAOs and relied on the Future After-action Review System (FAARS) to provide real-time indication of player situational awareness. SAOs served as a tool for the analysts as well, and allowed analyst team to focus on observations that would compliment the SAO data.

It was interesting building SAO menu options. The M&S team made its best guess at what types of SAOs the players would need based on the exercise constructs, but operators always came up with change request that were quite innovative and enlightening. People think differently and assemble information differently, therefore the SAO Editor needed to expand to serve a variety of users. A notional SAO category decomposition for emergency management is shown below.

Response	Public

Facilities		Transportation	
	Hospital		Train Station
	Trauma Center		Ferry Landing
	Police Station		Airport Terminal
	Fire Station		Bus Terminal
	Morgue		Ship Terminal
	Emergency Helo Pad		
	Towing Vehicle		
Crime In Progress		Traffic	
	Robbery		Accident
	Assault		Stopped
	Murder		Slow
	Hostage Situation		Diverted
	Officer Down		
	Crime Scene	Flooding	
	Domestic Violence		Rising Water
	Crowd Control		Receding Water

Figure 4 Notional SAO Categories for Emergency Management

Reflecting on both the UR Phase I and UR05 Current Operations experiments, it was apparent that the types of SAO menu items influenced how readily the players assembled data and shared SA. Thus, it seems clear that the design of SAO Editor and menu options should focused on options that would help improve known SA deficiencies.

For example, if an enemy unit is comprised of five sub-elements and players have made SAO entries regarding the discovery and activity of three of the sub-elements, an alert could notify the player that three of the five sub-elements are present and so it likely that the other two sub-components are in the vicinity.

Recommendations for operational C2 systems
USJFCOM's success in using SAOs to enable the UR04 and UR05 experiments and the enthusiasm and innovation that operators show in using them, indicates this simple tool would be useful if implemented in various operational C2 systems and any collaborative decision-making system.

The SAO capabilities can be implemented using existing C2 system conventions in any system and environment. It is not important to duplicating the design and format of the JSAF SAO Editor, the SAO Summary and the filter process in Operational C2 systems. The important thing is to capture the functionality, build a pretty-good prototype, then use it and get feedback from operators. For best results, adopt an iterative process that enables direct support from software engineers.

Make the tools as simple as possible to use. Include relevant map symbols, with selectable attribute flags; give the operator the a ability to filter out SAOs that they do not want to see and provide an SAO summary table that allows operators to center on the selected SAO.

Study the operator missions and conduct a functional breakdown of information elements to create relevant SAO menu items.

To accelerate the refinement of effective menu items, create a function in the SAO Editor that will allow the operators to create their own new menu items. This approach will encourage innovation on the player's part and lead quickly to more useful and relevant SAOs.

Consider and plan for SAO management. Just as GCCS tracks are managed, there needs to be procedures in place to allow the deletion of SAOs. The USJFCOM players established business rules that declared, only the person who created the SAO could delete it. In an operational environment where many people may be involved with each SAO, procedures that are more restrictive will likely be required. One option is to let operators move SAOs into an inactive status, which would cause all operators on the network to be automatically notified. Give the operators a filter that allows them to select to view inactive SAO objects.

Conclusion
SAO functionality would be useful in C2 tools where multiple operators need to work together to share their impressions and understanding about geo-spatial activities in a time-critical environment. At the sensor level, detections and tracks are automatically generated and shared among operators. SAOs allow operators to share their understanding of those detections and tracks in a natural collaborative manner, and as a result, complex battlespace environments can be more accurately and readily understood.

The USJFCOM, J9 Modeling and Simulation (M&S) Support Team's implementation of the SAO process is not intended as the answer for everyone, but it serves as a pretty-good prototype that offers some suggestions and tools that have proven useful to decision-makers in a tactical environment.

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Introduction

- USJFCOM,J9 Modeling and Simulation (M&S) Support Team advanced the capability of distributed simulation in support of Urban Resolve series of experiments.

  - UR Phase 1

  - UR Current Ops

  - UR 1015

- Investigated potential improvements related to C4ISR, organizational, and process improvements for integrating and employing forces, sensors, and systems.

- Human-In-The-Loop (HITL) real-time collaborative experiments

- Situational Awareness Objects (SAOs) used to better understand the impact of new technology and development of command cells, tactics, techniques & procedures (TTPs).
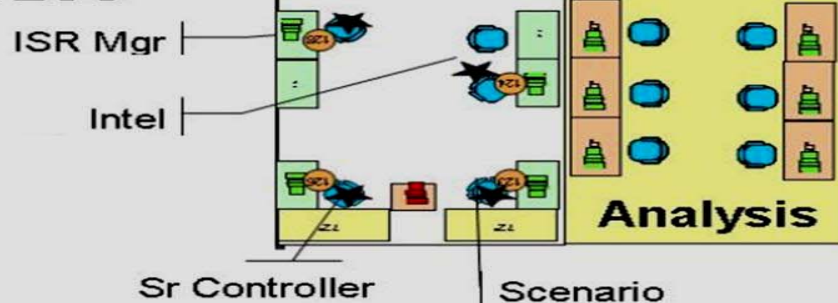
The Environment

- SAO tools developed in Joint Semi-Automated Forces (JSAF) simulation.

- JSAF is an entity-level simulation designed for HITL interactions.

- Runs in real-time

- Entity maneuvers and behaviors are cued, or directed, by the sim controllers and experiment participants.
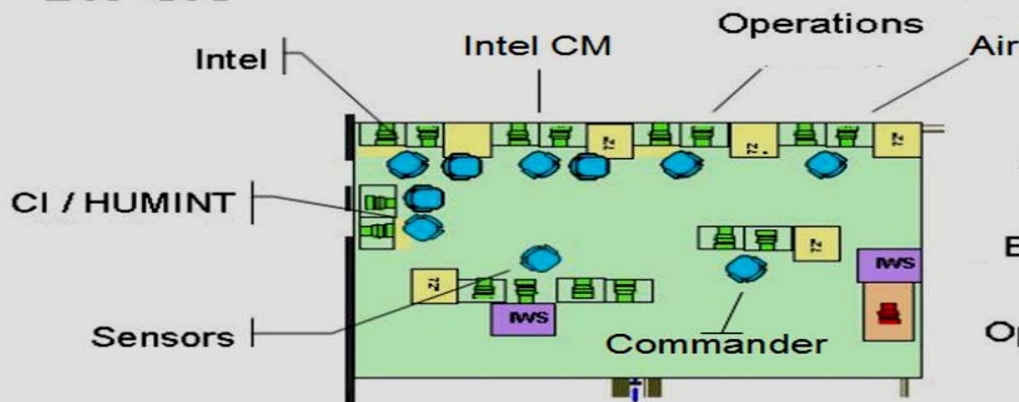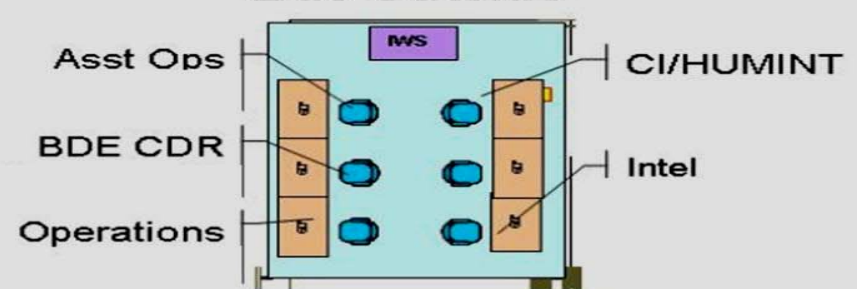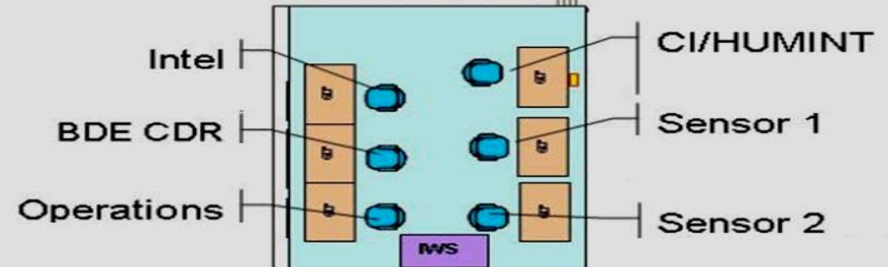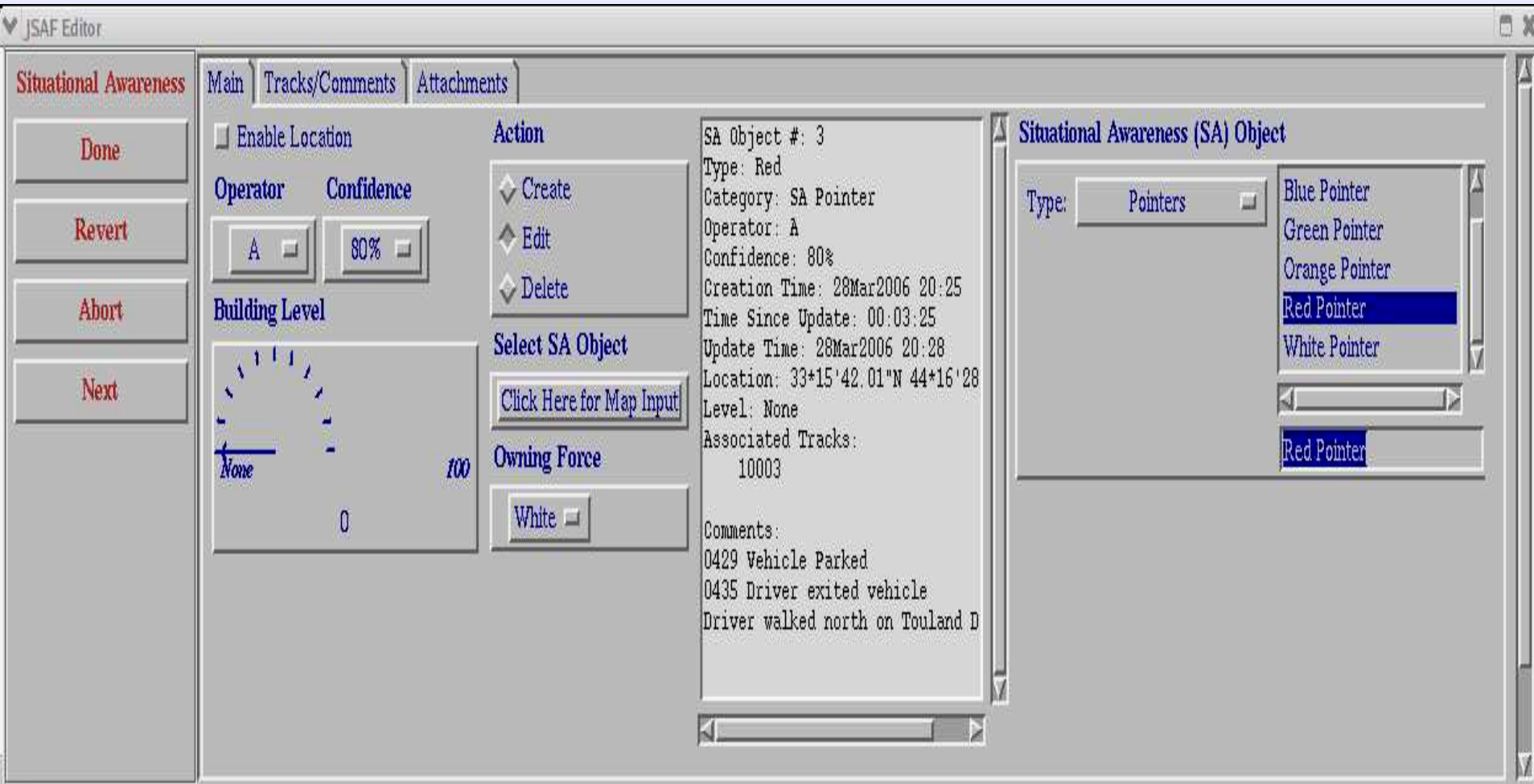
The SAO

■ Compact packages of information symbolically displayed on the terrain map.

■ Players to share awareness and understanding of the battlespace regarding activities of the adversaries, blue forces and civilian population.

■ Players created SAOs whenever they chose to during event run-time.

■ SAOs were entered before run-time to share and display

- Intelligence Preparation of the Battlespace (IPB)

- Named Area of Interest (NAIs) and Targeted Areas of Interest (TAIs).

The SAO Editor (Main Tab)

- Players create SAOs using an editor with selectable options.

- Options designed to support tactical and operational objectives.

- SAO formats evolved to include options based on player needs.

SAO Editor Tracks/Comments

- Players associate sensed tracks and other SAOs.

- Players attached SAOs to track objects, so that they moved with tracks.
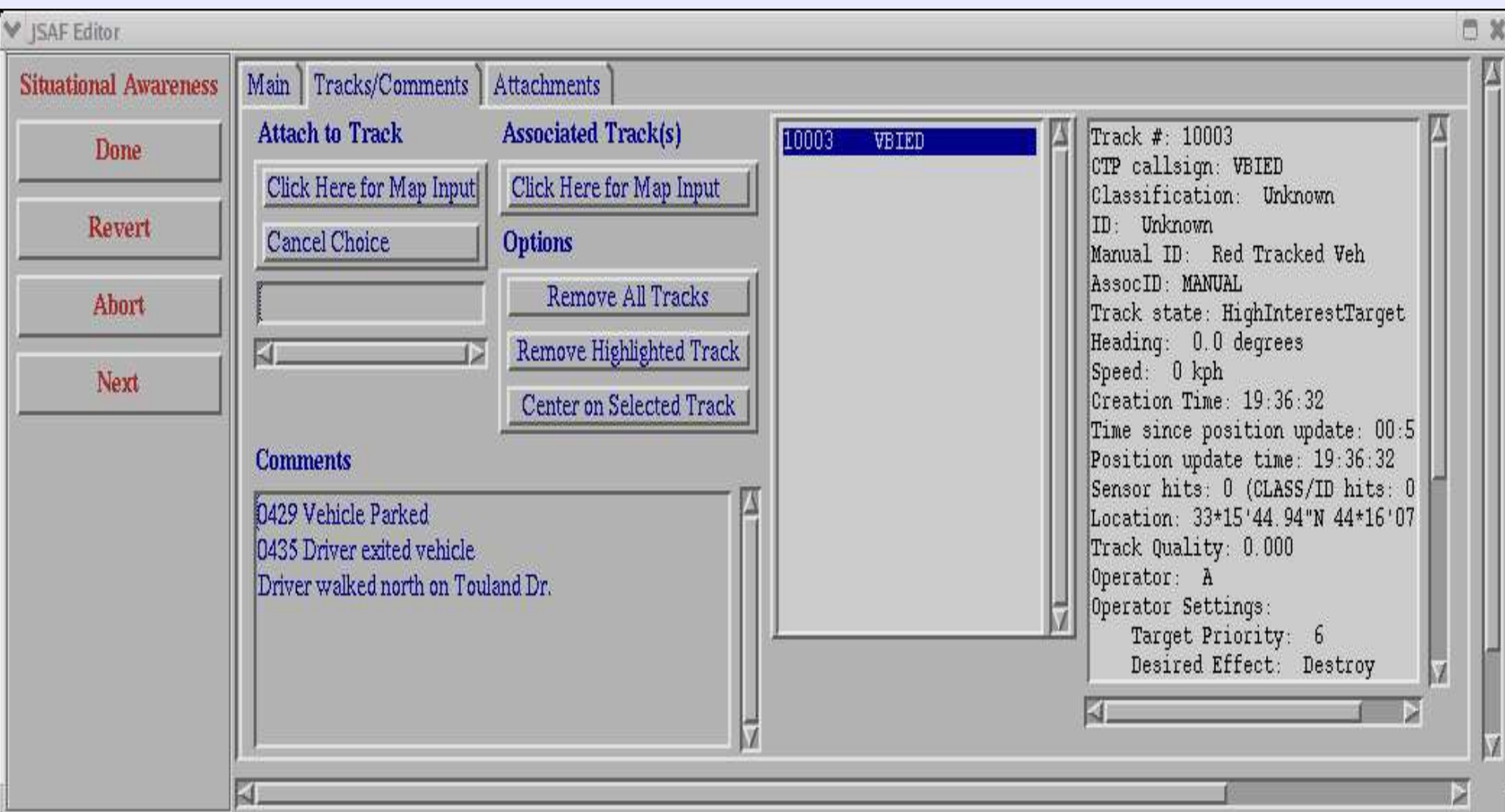
SAO Attach Feature

■ When players select an SAO, the SAO Editor opens and arrows on the map point to all the associated tracks, which helped to support collaboration and review.

■ Upon return to an SAO after lapsed time, arrows indicate where the associated tracks had moved.
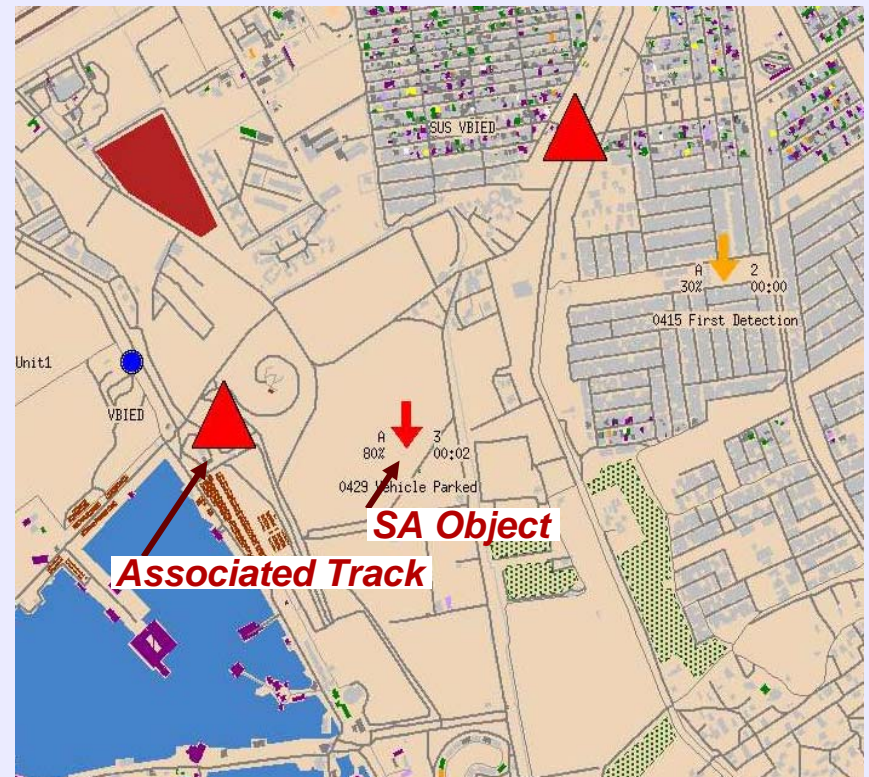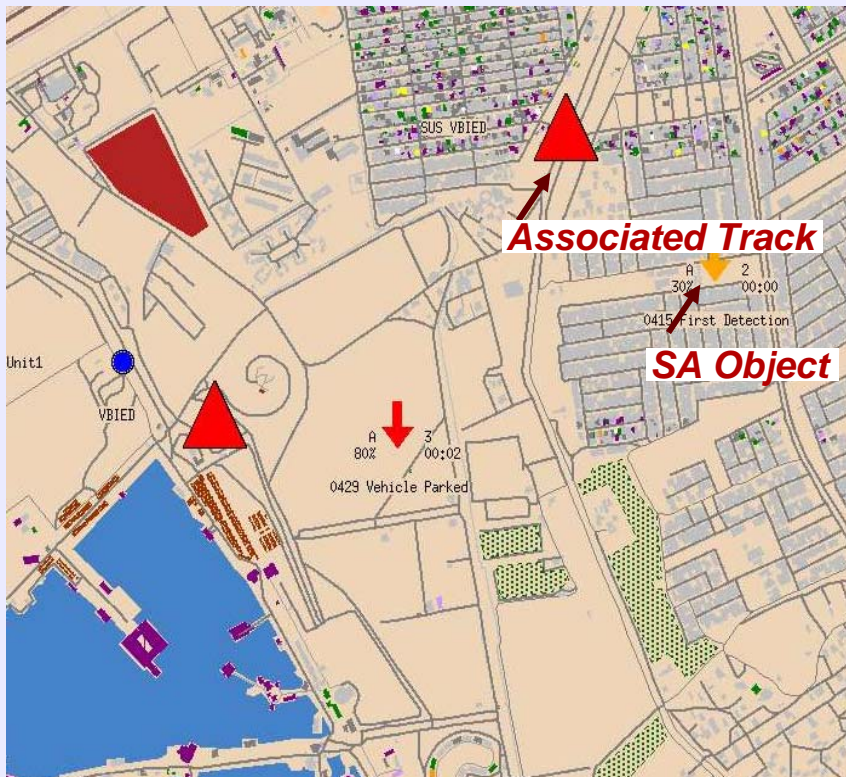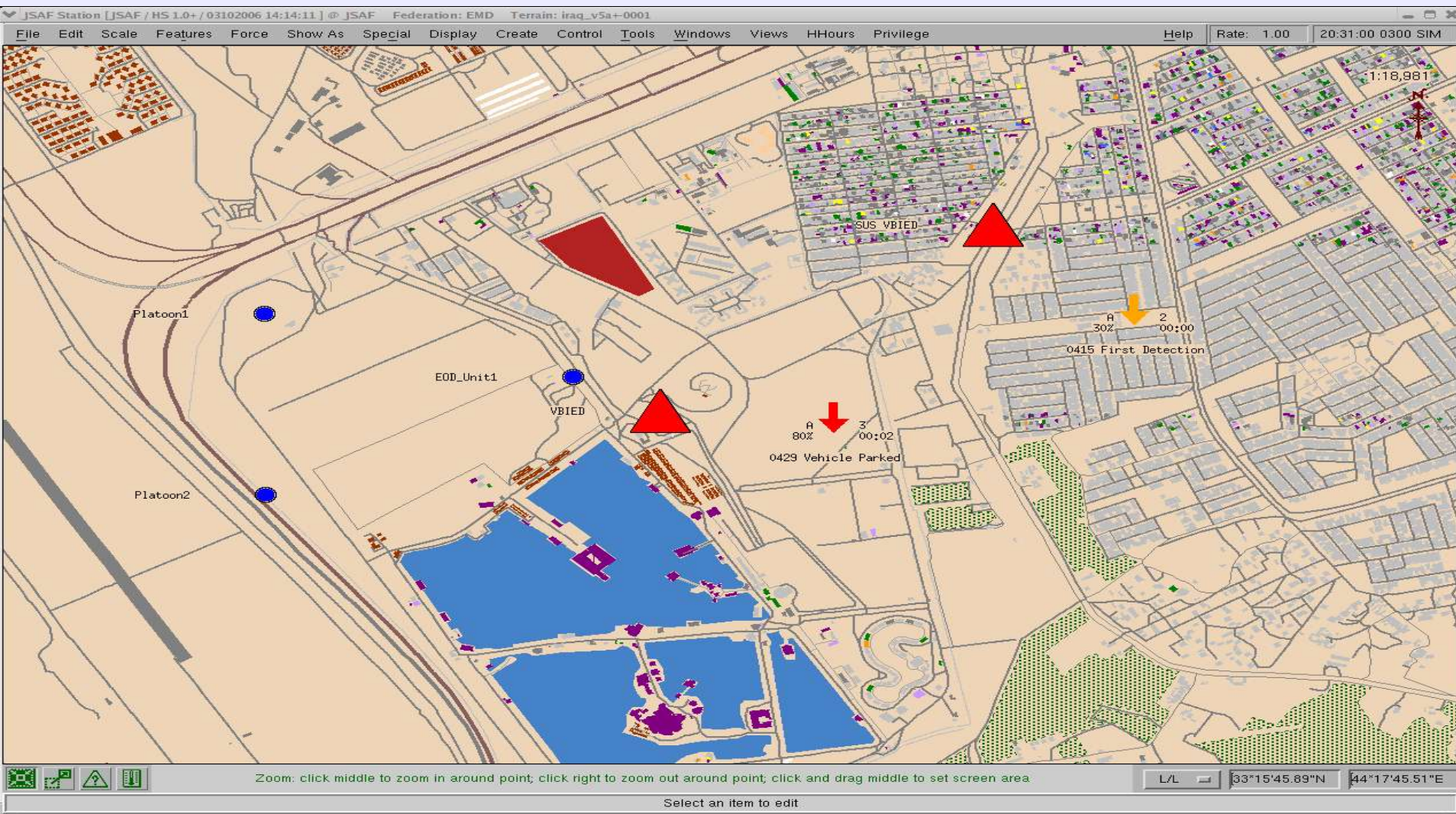
Logging SAOs

- SAOs were logged during each experiment event to supported both real-time experiment assessments and post-event comprehensive after-action reviews.

- SAO comments were evaluated by analysts to determine the SA level achieved by the players

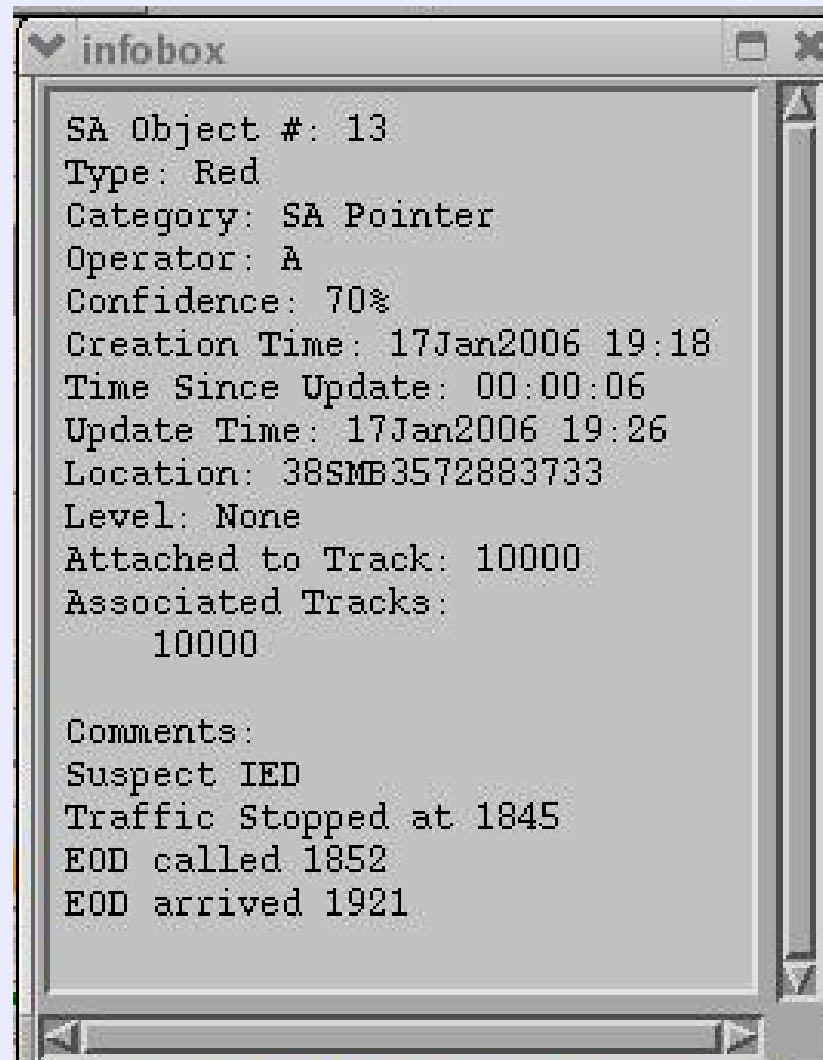| SA Level 1 Where is the enemy?	SA Level 2 What is the enemy doing?	SA Level 3 What is the enemy going to do?
Appears to be a mortar site	Appears to be a group of insurgents placing a mortar pad	Expect a launch at sunset
Enemy Recon team on roof	Recon team is waiting until street clears	Recon Team will radio mortar team when all clear
Vehicles and Explosives in bldg	Explosives are being loaded into vehicles	Vehicles likely to move to FOB 3 during the night

SAOs Displayed on the Map

- SAO objects are displayed on the JSAF map display.

- Players controlled the display of the attribute flags next to the SAO.

The Info Box

- Shows a summary of the SAOs when players clicks on the SAO.

```
infobox

SA Object #: 13
Type: Red
Category: SA Pointer
Operator: A
Confidence: 70%
Creation Time: 17Jan2006 19:18
Time Since Update: 00:00:06
Update Time: 17Jan2006 19:26
Location: 38SMB3572883733
Level: None
Attached to Track: 10000
Associated Tracks:
    10000

Comments:
Suspect IED
Traffic Stopped at 1845
EOD called 1852
EOD arrived 1921
```

The SAO Summary

■ Summary shows the tracks and related attributes in a table format.

Situational Awareness Summary

	SA #	Type	Category	Oper	Confidence	Creation Time	Time Late	Level	Assoc.Tracks	Comments
Center	12	Snow Drift Radar	SA Air Defense	A	80%	17Jan2006 08:1	00:05:13	0	No	Emission 1423
Center	7	White	SA Pointer	A	70%	17Jan2006 08:1	00:01:50	0	No	NAI Assembly Plant for IE
Center	5	Mortar	SA NAI/TAI	A	100%	17Jan2006 08:1	00:00:02	0	No	NAI Mortar Baseplate
Center	8	Safehouse	SA NAI/TAI	A	40%	17Jan2006 08:1	00:02:31	0	No	NAI Possible Hide Site
Center	11	UG Armed Pickup single	SA Urban Guard	A	90%	17Jan2006 08:1	00:07:14	0	No	Observed 1623 Lost in Traff
Center	10	Unimog single	SA Urban Guard	A	100%	17Jan2006 08:1	00:06:01	0	No	Stopped and cleared at che
Center	13	Red	SA Pointer	A	70%	17Jan2006 08:1	01:38:28	0	Yes	Suspect IED Traffic Stoppe
Center	6	Safehouse	SA NAI/TAI	A	50%	17Jan2006 08:1	00:00:55	0	No	TAI Leader Safehouse

Total = 8   Delete Selection   Refresh   Close

Filters

- Players use filters to select types of SAOs and labels they wanted to see.

Display Filter Menu

SAO Labels

SA Types

Alerts

■ SAO Alerts were created to let the players choose the SAO categories for which they wanted to be alerted as they were created, or modified, by other players.

	ID Number	ID / Category	Type	Switch	Create Time	Time Late	Oper
Center	SAO-00005	Mortar	NAI/TAI	SAO	07:20:10	00:00:33	A
Center	SAO-00006	SAFE House	NAI/TAI	SAO	07:20:10	00:00:33	R
Center	SAO-00012	Snow Drift Radar	Air Defense	SAO	07:20:10	00:00:33	T

Alert Summary Display

Clear All   Clear Selected   Use PVD Filters   Close

The Attach Feature

■ SAOs attach feature allows operators to match information to a specific location in time.

SAO Spreadsheets

- SAOs can be saved to spreadsheet at any time by anyone on a JSAF system.

SAO NUMBER	SAO TYPE	CTP NAME	OPERATOR	OWNING FORCE	LOCATION	CONFIDENCE	ATTACHED FILES	COMMENTS	ASSOCIATED TRACKS	ATTACHED TO TRACK
5	SA NAI/TAI	Mortar	A	Blue	10GEV1843528583	100	Pic1.jpg	NAI Mortar Baseplate		
6	SA NAI/TAI	Safehouse	R	Blue	10GEU4186480416	50		TAI Leader Safehouse		
7	SA Pointer	White	B	Blue	10GET6766391668	70		NAI Assembly Plant for IEDs		
8	SA NAI/TAI	Safehouse	A	Blue	10GET4014680864	40	Pic8.jpg	NAI Possible Hide Site		
9	SA Green	Crowd forming	A	Blue	10GET5450871966	70		Crowd picketing factory		
10	SA Urban Guard	Unimog single	N	Blue	10GEV3933203048	100		Stopped and cleared at checkpoint charlie		
11	SA Urban Guard	UG Armed Pickup single	A	Blue	10GET7005778730	90		Observed 1623 Lost in Traffic		
12	SA Air Defense	Snow Drift Radar	T	Blue	10GET4965074078	80		Emission 1423		
13	SA Pointer	Red	M	Blue	38SMB3572883733	70		Suspect IED Traffic Stopped at 1845 EOD called 1852 EOD arrived 1921	10021	10021

Processing SAOs

- SAOs are automatically transmitted over the network to the shared JSAF Track Database, where they are assigned unique and sequential SAO numbers.

- SAOs in the track database are made available to all the JSAF machines, depending on the player filter settings.

- System administrators can clear, save and reloaded the SAO database.

- SAOs are logged by the Future After Action Review System (FAARS).
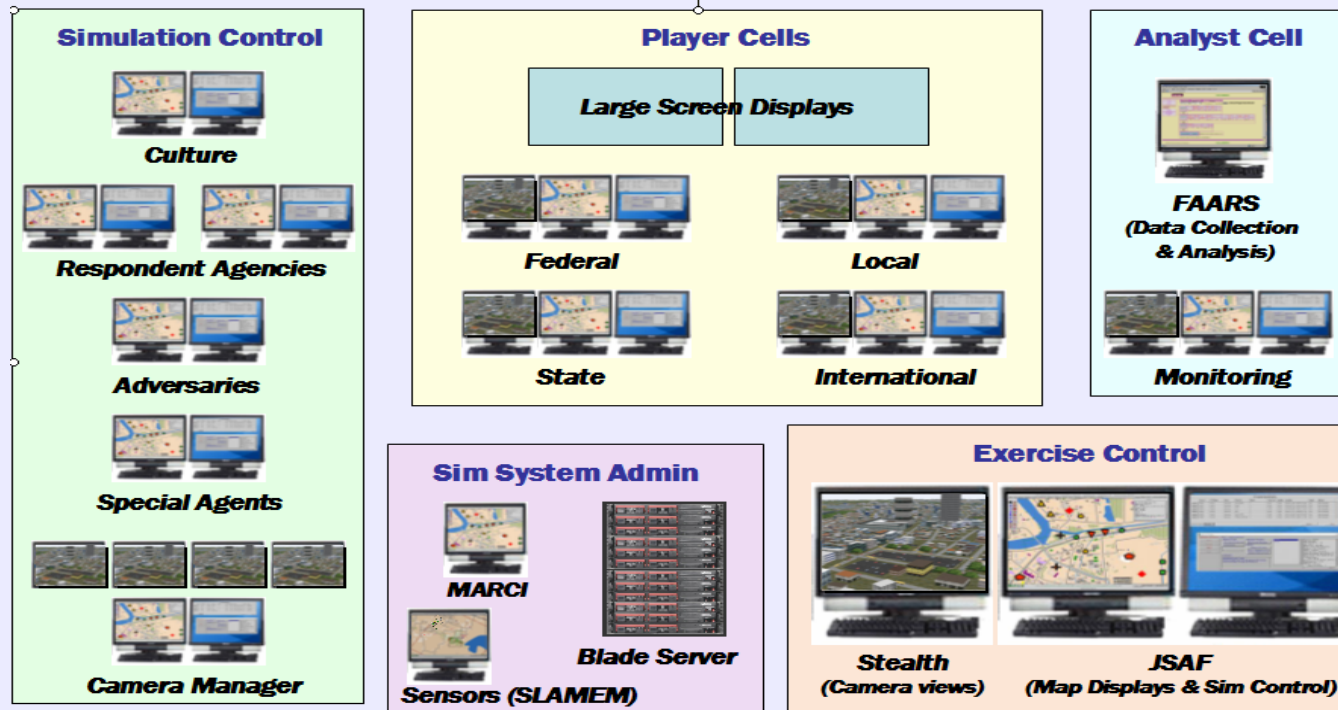
The SAO Evolution

■ Prior to the implementation of SAOs, during each of the HITL experiments, analysts gathered around the players to listen to and observe actions and communications

■ Because of the broad scope of these experiments, this analysis process was in some cases subjective and vulnerable to missed cues and actions.

■ It was clear that the accurate evaluation of SA was going to be crucial in distinguishing subtle changes in player abilities under varied trial conditions.

■ M&S team decided to create a tool that would let players record their own impressions during the trial.

■ The tool had to:

- Be easy to use,

- Benefit the players as well as the analysts

- Produce loggable data.

Adjusting SAOs to New Venues

▪ Following Urban Resolve (Phase I), USJFCOM shifted to UR05 Current Operations and then to UR2015.

▪ SAO menu options were modified to support the new environment and operator's needs.

▪ The types of SAO menu items influenced how readily the players assembled data and shared SA.

Response Facilities			Public Transportation		
	Hospital			Train Station	
	Trauma Center			Ferry Landing	
	Police Station			Airport Terminal	
	Fire Station			Bus Terminal	
	Morgue			Ship Terminal	
	Emergency Helo Pad				
	Towing Vehicle				

Crime In Progress			Traffic		
	Robbery			Accident	
	Assault			Stopped	
	Murder			Slow	
	Hostage Situation			Diverted	
	Officer Down				
	Crime Scene		Flooding		
	Domestic Violence			Rising Water	
	Crowd Control			Receding Water	

SAOs for the Analysts

- In Urban Resolve exercises, analysts no longer needed to hover over the player's shoulders and take copious notes, since player observations were captured in SAOs and logged.

- Instead, they monitored SAOs and relied on the Future After-action Review System (FAARS) to provide real-time indication of player situational awareness.

- SAOs allowed analyst team to focus on observations that would compliment the SAO data.

Relevance to Operational C2 Systems

- SAO capabilities can be implemented using existing C2 system conventions in any computer system and operational environment.

- Tools need to be simple to use.

- Include relevant map symbols, with selectable attribute flags

- Give the operator the a ability to filter out SAOs they do not want to see

- Provide an SAO summary table that allows operators to center on selected SAOs.

- Create a function in the SAO Editor that will allow the operators to create their own new SAO menu items.

- Consider and plan for SAO management. Just as GCCS tracks are managed, there needs to be procedures in place to allow the deletion of SAOs

Conclusion

■ USJFCOM's success in using SAOs to enable the Urban Resolve series of experiments and the enthusiasm and innovation that operators show in using them, indicates this simple tool would be useful if implemented in other simulation systems and various operational C2 systems, including GCCS.

■ SAOs allow operators to work together; sharing their impressions and understanding about geo-spatial activities in a time-critical environment.

■ Operators share their understanding of detections and tracks in a natural collaborative manner, and as a result, complex battlespace environments can be more accurately and readily understood.

■ USJFCOM, J9 implementation of the SAO process serves as a pretty-good prototype that offers some suggestions and tools that have proven useful to operators and tactical decision-makers.

Thank you