



**2006 CCRTS**  
**The State of the Art and the State of the Practice**

**Exercise Control Objects (ECOs),  
C2 for the Control Team**

**Cognitive Domain Issues  
C2 Experimentation  
C2 Modeling and Simulation**

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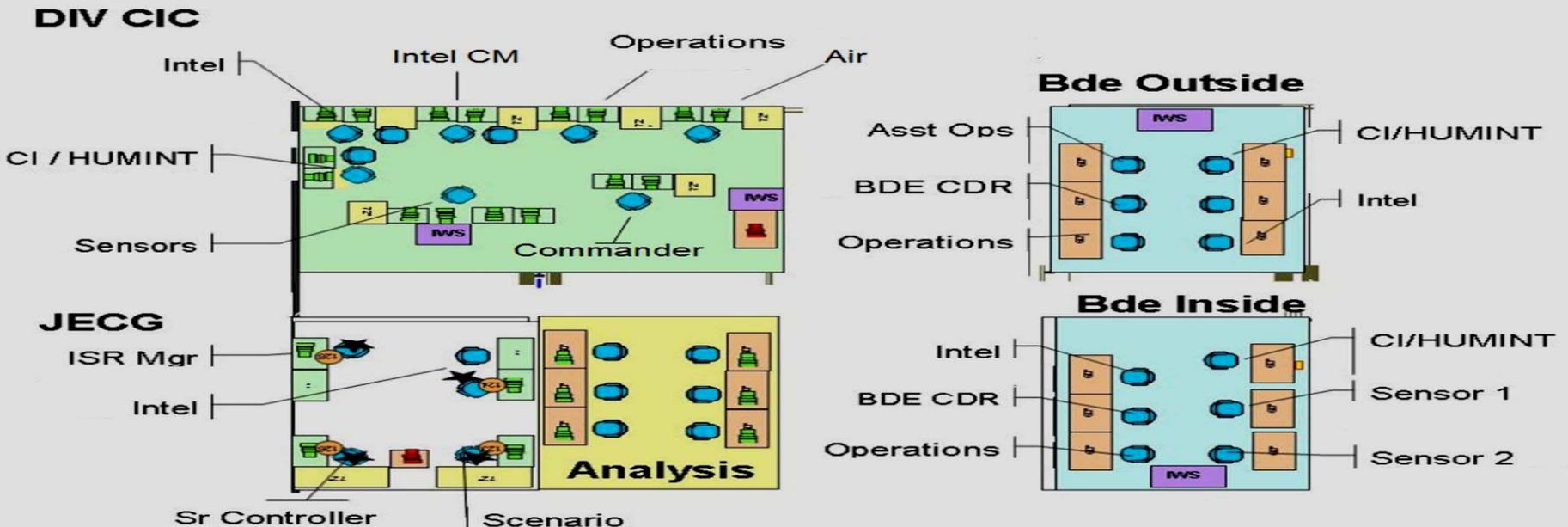
## *Introduction*



- 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.
- Simulation controllers share their intentions and actions regarding activities of the adversaries, blue forces and civilian population using ECOs.

## The Environment

- ECO 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.
- This direct control of the simulation makes it a preferred simulation for conducting dynamic exercises where players direct their forces at the direction of the players.



## The Venue

- Simulation teams controlled the events from USJFCOM in Suffolk VA.
- With support from team members located at:
  - Army Topographic Engineering Center (TEC), Fort Belvoir, VA.
  - Space and Naval Warfare Systems Center (SSC), San Diego, CA.



## Using ECOs

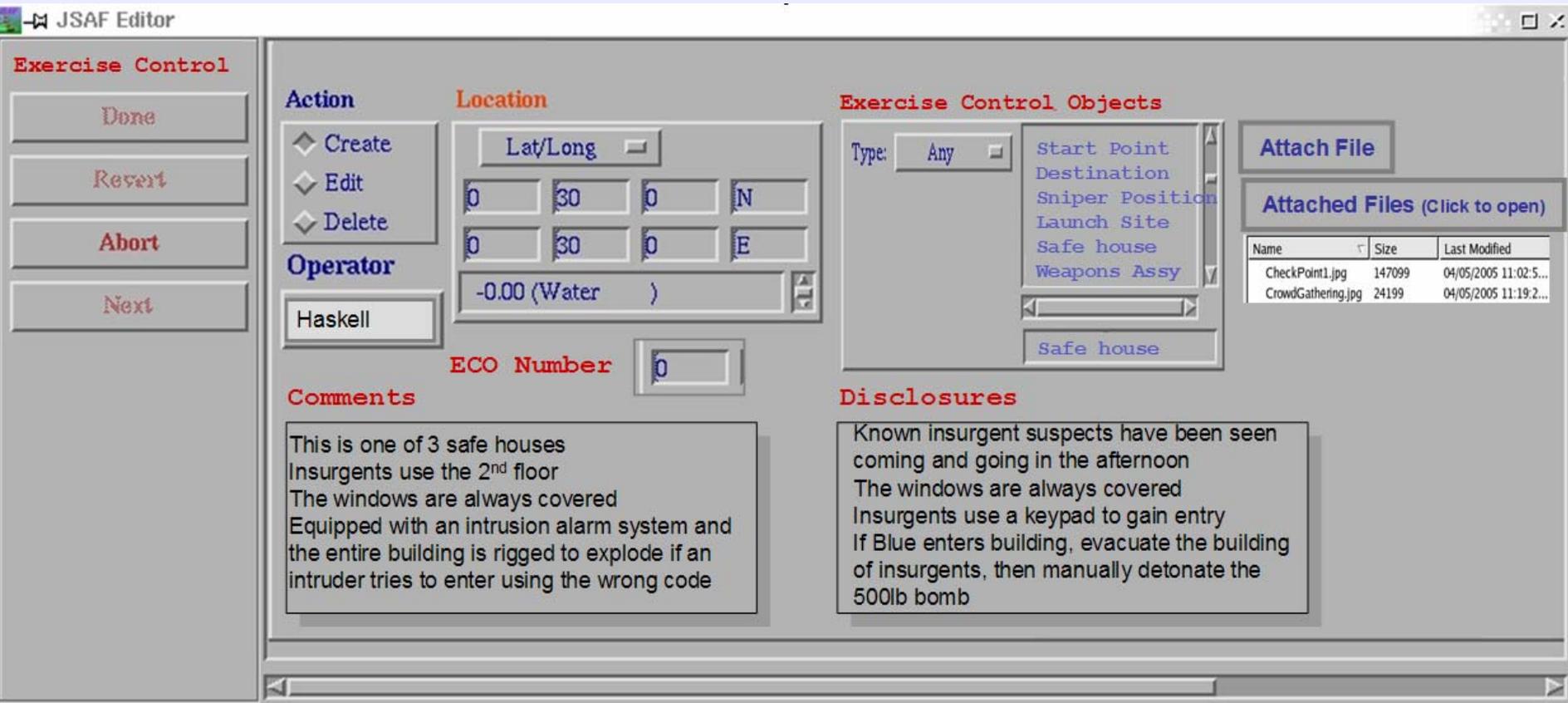
- Planners and controllers use ECOs to plan experiment events and control the conduct of experiments.
- Shared intentions and actions regarding activities of the adversaries, blue forces and civilian population using ECOs.
- Compact packages of information, created by sim controllers, symbolically displayed on the terrain map.



- Controllers and Operators created ECOs prior to exercises and whenever they chose to during event run-time.

# The ECO Editor

- Design being implemented in JSAF based on prototype used in UR05 and UR2015.
- Evolved out of the experience gained in using the Situational Awareness Editor
- Tailored specifically for the controllers, adds a free-text window for disclosures and an attach file feature.



# ECOs Displayed on the Map

- JSAF map display
- Exercise Control Summary at the bottom lists ECOs.
- Info Box shows key information about selected ECOs

The screenshot displays the JSAF Station software interface. The main window shows a map with several ECOs (Exercise Control Objects) marked with colored arrows and labels: ECO 1 (red arrow), ECO 2 (red arrow), ECO 3 (green arrow), ECO 5 (red arrow), ECO 8 (black arrow), SAO 20 (blue arrow), and SAO 21 (blue arrow). A red line connects ECO 1, ECO 2, and ECO 5. A blue ship icon is labeled T13425. The map scale is 1:3,300,000. The status bar shows coordinates 06°10'50.18"N and 122°49'38.19"E.

The info box for ECO 1 contains the following information:

```

SA Object #: 1
Type: End point
Category: SA ECO
Operator: M
Confidence: 50%
Creation Time: 22Jan2006 04:19
Time Since Update: 00:00:05
Update Time: 22Jan2006 04:27
Location: 05*10'19.55"N 121*19'18.20"E
Level: None

Comments:
Maneuver Red Sub to Here
Hold Sub at Snorkel Depth
Charge Batteries for 1 hour
Take no Aggressive Action
If Blue Ship comes within 2nm
Share Attachment; PeriscopePic1
with Red Team
    
```

The Exercise Control Summary table at the bottom lists the following ECOs:

	SA #	Type	Category	Oper	Confidence	Creation Time	Time Late	Level	Assoc.Tracks	Comments
Center	4	Black	SA Pointer	A	50%	20Oct2005 06:2		0	No	Missed Course Change
Center	5	End Point	SA ECO	M	50%	20Oct2005 06:2	00:51:39	0	No	Sub Snorkels
Center	3	Green	SA Pointer	A	50%	20Oct2005 06:2	00:19:47	0	No	EOD RHIB
Center	2	Red	SA Pointer	A	50%	20Oct2005 06:2	00:00:08	0	No	Sub Came to Surf
Center	1	Red	SA Pointer	A	50%	20Oct2005 06:2	00:00:01	0	No	Sub First Detection

At the bottom of the interface, there are buttons for: Total = 5, Use PVD Filters, Show Only Selected on PVD, Reset PVD Selection, Delete Selection, Refresh, and Close.

## The Exercise Control Summary

- Similar the GCCS Track Summary, shows the ECOs in a table format.

Situational Awareness Summary

### Exercise Control Summary

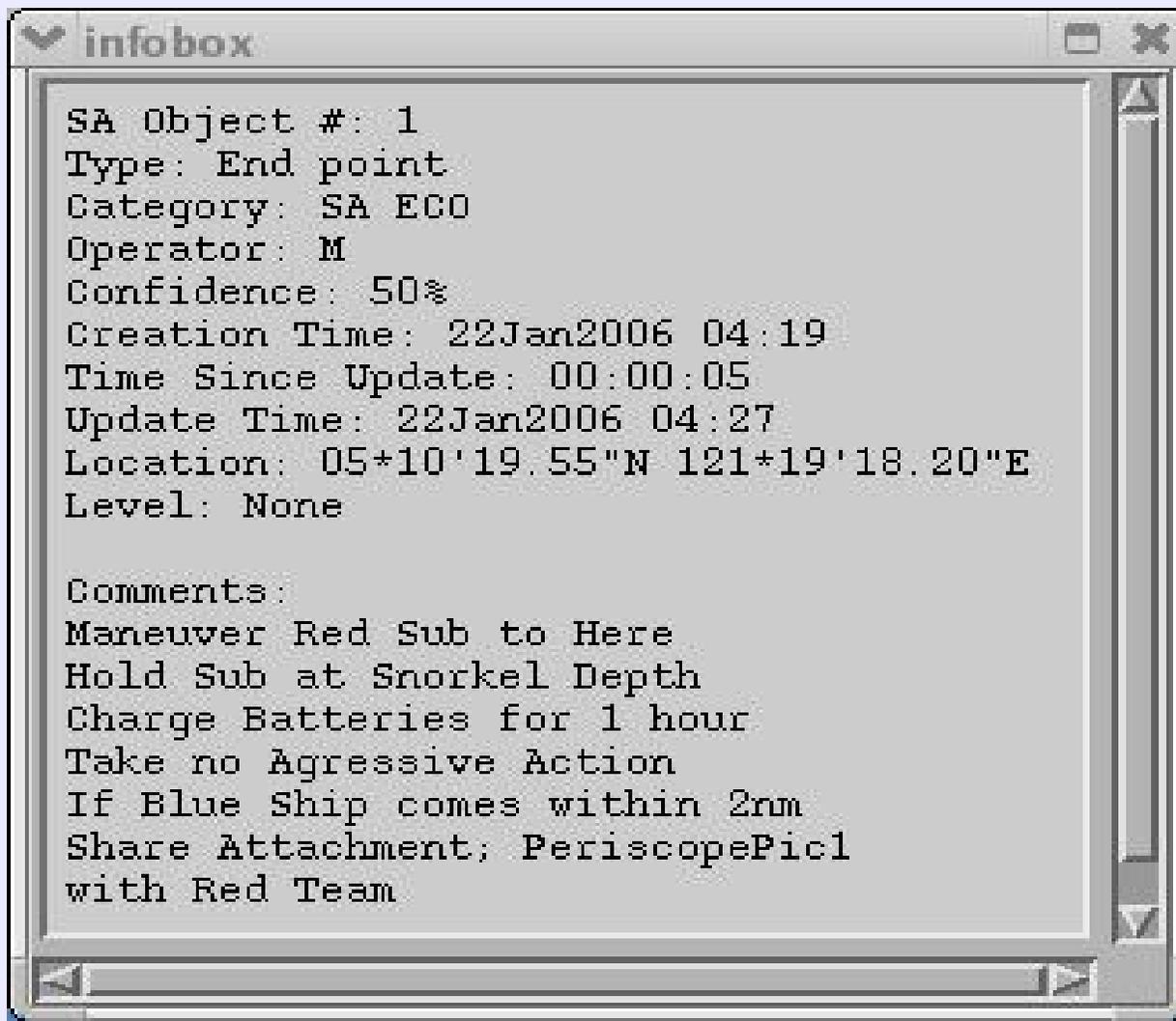
	SA #	Type	Category	Oper	Confidence	Creation Time	Time Late	Level	Assoc.Tracks	Comments
Center	12	Snow Drift Radar	SA Air Defense	A	80%	17Jan2006 08:1	00:05:13	0	No	Emission 1423
Center	7	White	SA Pointer	A	70%	17Jan2006 08:1	00:01:50	0	No	NAI Assembly Plant for IE
Center	5	End Point	SA ECO	M	100%	17Jan2006 08:1	00:00:02	0	No	Sub Snorkels
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

## *The JSAF Info Box*

- Shows the ECOs data when the controller clicks on ECO map object.
- Displays ECO information without the need for opening the ECO Editor.



## Filters

- Select types of SAOs and ECOs to view.
- Options tailored for SAOs and they include an ECO option.
- Follow-on filters in JSAF will expand the ECO filter options.



**Display  
Filter Menu**



**SAO  
Labels**



**SA Types**

## Alerts

- Controllers and players select types of data for which they want to be alerted.
- Controllers kept this summary open and checked it to see if something is going on that they missed.



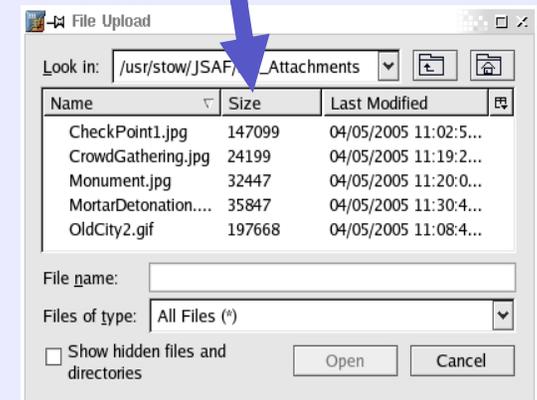
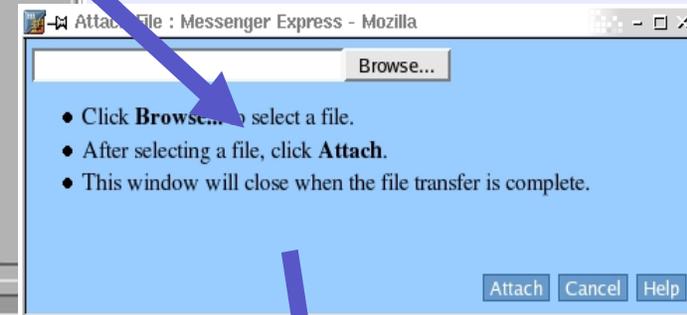
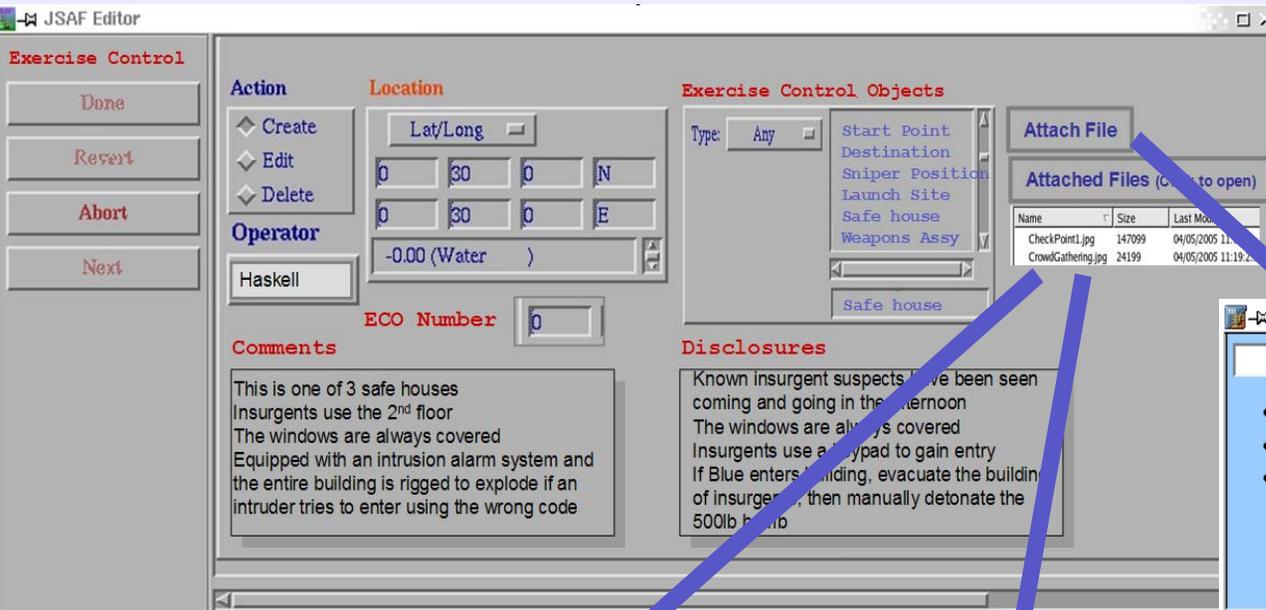
Alert Summary Display

	ID Number	ID / Category	Type	Switch	Create Time	Time Late	Oper
Center	ECO-00005	End Point	SAO ECO	ECO	07:20:10	00:00:33	M
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

Clear All      Clear Selected      Use PVD Filters       Close

# The Attach Feature

- Match information to a specific location in time.
- An ECO referring to hostage taking incident



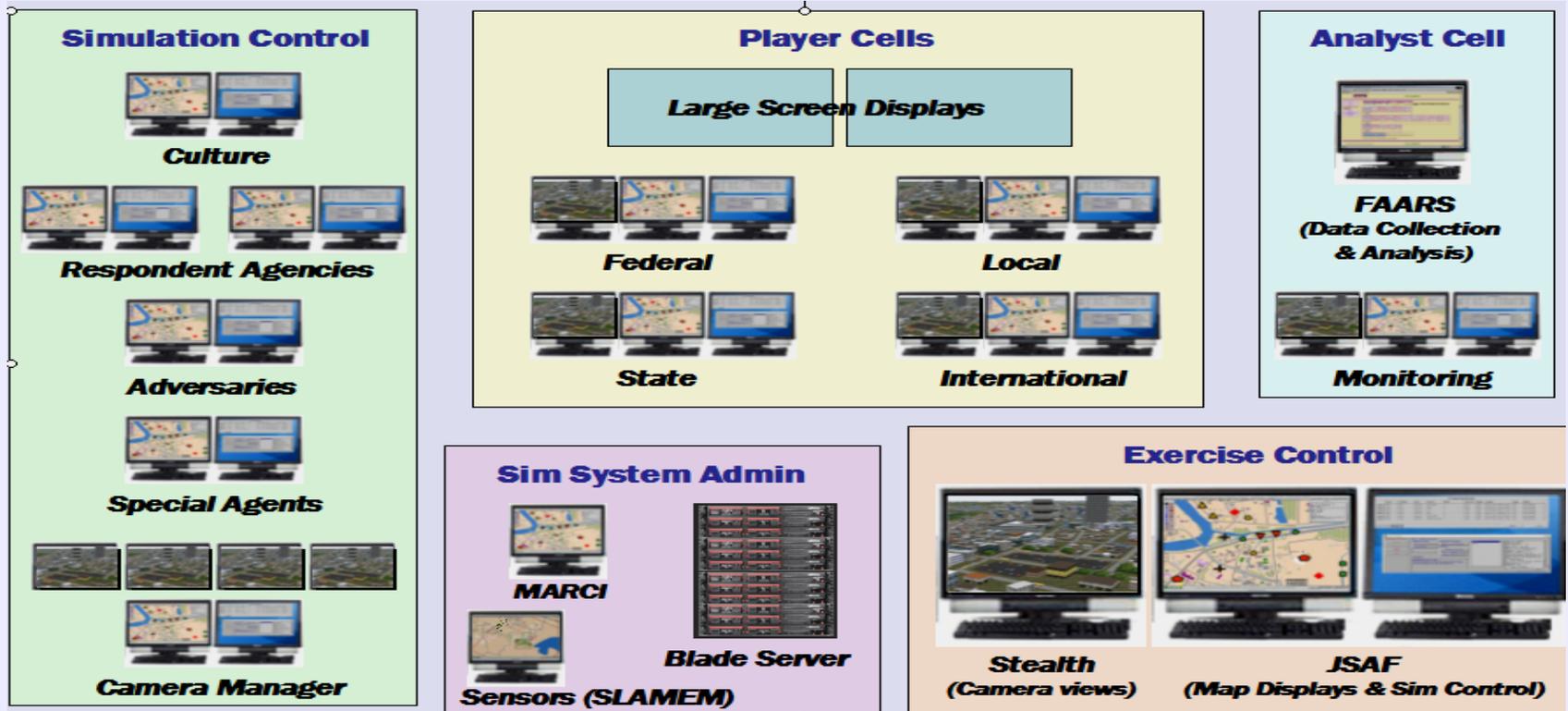
## *Using Spreadsheets*

- ECOs can be saved to spreadsheet at any time.
- Captures a snapshot of exercise control activity.

SAO NUMBER	SAO TYPE	CTP NAME	OPERATOR	OWNING FORCE	LOCATION	CONFIDENCE	ATTACHED FILES	COMMENTS	ASSOCIATED TRACKS	ATTACHED TO TRACK
5	SAO ECO	End Point		Blue	10GEV1843528583	100	Pic1.jpg	Move Sub Here		
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 ECOs

- ECOs automatically transmitted over the network to a shared database, and assigned unique and sequential ECO numbers.
- ECOs in the track database are made available to sim controller's JSAF machines, depending on the filter settings.
- System administrators clear, save and reloaded ECOs from the database.
- Logged by the Future After Action Review System (FAARS).



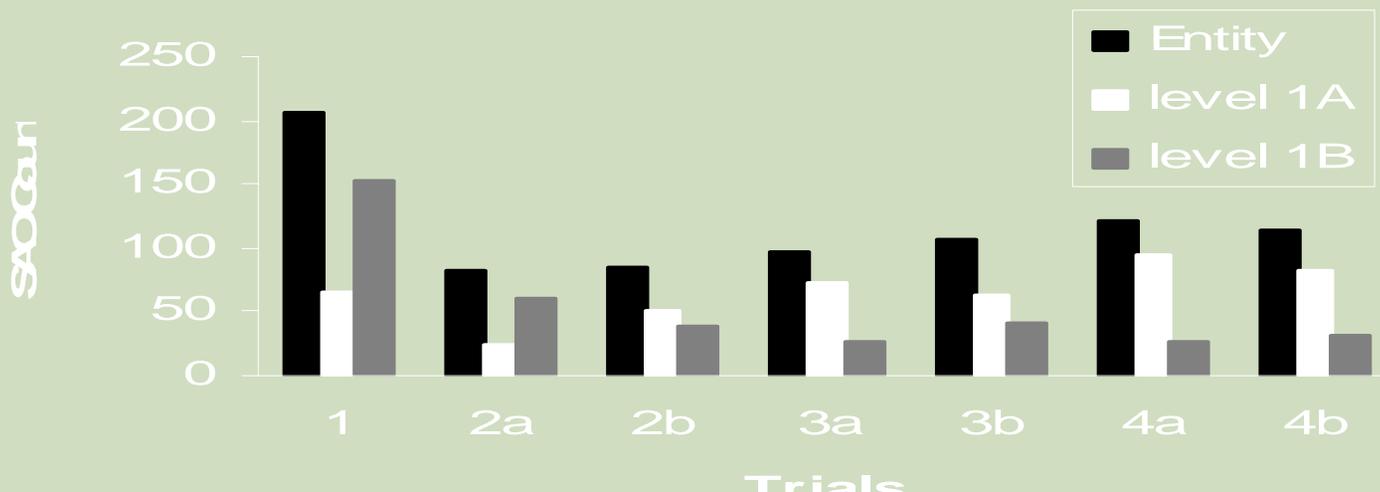
## *The Evolution of ECOs*

- ECOs were first implemented and used as Situational Awareness Object (SAOs).
- Players used Situational Awareness Objects (SAOs) to share real-time awareness of the battlespace
- Simulation Controllers saw the value of the SAO process and asked for ECOs



## ***ECO Design and Implementation***

- ECO Editor was designed to support expected controller inputs, with selectable options, based on the UR05 exercise constraints and objective.
- Summary tables, filters, Info box and map symbols with attribute flags were inherited from the JSAF SAO toolset.
- During the workup period, controllers learned how to use ECOs
- Their recommended changes to the ECO Editor and other displays were requested and encouraged.
- By the time the trials for record began, the sim controllers were very familiar with the use and value of ECOs.



## *Evolution- The Dark Ages*

- Prior to the implementation of ECOs, controllers relied on meetings and email from the exercise architects and the Exercise Control Group (ECG) to tell them what was expected regarding force placement and activities during the experiment.
- Controllers all independently translated coordinates and plotted descriptive overlays on the JSAF map, along with the placement of simulated forces.
- After several iterative attempts at capturing the experiment construct, the ECG would approve the plan.
- ECG would concurrently prepare an event activities document, similar to the military's Master Event Sequence List (MESL).
- Controllers used these MESL-like documents to determine times to invoke discrete events in simulation. They communicated with other sim controllers and the ECG by phone, chat or email to control exercise tempo, timing of events and make changes throughout the experiment run.
- Due to the complexity and broad scope of UR05 experiments, this approach was, in some cases, vulnerable to missed cues and incorrect actions.

## *Using ECOs to Prepare for an Exercise*

- With the advent of ECOs, experiment architects and the ECG used ECOs to draft the construct of the experiment, placing SAOs and moving them around until they were satisfied with their plan.
- They saved their SAOs to spreadsheet, using JSAF, and shared the spreadsheet.
- ECG used the spreadsheet to (cut and paste) details into the MESL.
- Sim controllers loaded spreadsheet file directly into their JSAF machines and begin to place simulated forces and schedule their activities.
- This process simplified the task of plotting, recording and exchanging coordinates, reducing the plan-to-practice process significantly, while it reduced plotting errors.
- Further, controllers could see the entire event displayed symbolically on their map and gained a better understanding of the scope and of activities adjacent to their area of responsibility.

## *Using ECOs During the Exercise*

- During the event, controllers used the MESLs and ECOs to manage events.
- Using chat they coordinated the transition from one MESL event to the next by referring to relevant ECOs by number.
- Because the ECO Summary Display allows controllers to locate and center on specific ECOs, it became much easier for them to locate key locations and activities.
- Controllers created ECOs during the events to share information and to provide a shared marker for other controllers to find.
- ECO process significantly reduced need for long chat messages and eliminated the need for controllers to exchange and find map locations by coordinates.
- Analysts found that ECOs helped them to keep track of the scenarios and better understand the activities of the experiment subjects as they reacted to dynamic events.

## *Summary*

- ECO process lets planners build and share exercises and experiment details directly on the map.
- ECOs, saved to spreadsheet and shared with controllers and the ECG for force lay-down and execution, saved time and reduced potential for plotting mistakes.
- Controllers collaborated in real-time using ECOs and could visualize the details and scope of ongoing events.
- Controllers easily located activities on the map using ECOs and used them for pointing tools they can reference in chat.
- ECOs logged by an after-action review system, ECOs provided a valuable link between controller's actions and players activity.

## *Summary (continued)*

- Just as sensor-level detections and tracks are generated and shared among tactical decision-makers using operational C2 tools, ECOs allow the Exercise Control Team to create and shape the tactical environment for exercises in a collaborative manner.
  
- The USJFCOM, J9 Modeling and Simulation (M&S) Support Team's implementation of the ECO process serves as a pretty-good prototype that offers some suggestions and tools that have proven useful to Exercise Controllers.

***Thank you***