Supporting Collaborative Operations within a Coalition Personnel Recovery Center

Gerhard Wickler[1], Austin Tate[1] and Jeffrey Hansberger[2]

[1] AIAI, University of Edinburgh, UK
{g.wickler,a.tate}@ed.ac.uk
[2] USJFCOM/J9, Norfolk, VA, USA
Jeff.Hansberger@je.jfcom.mil

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Overview

- The I-X Framework:
  - The <I-N-C-A> Ontology and I-X Process Panels.
  - Intelligence through Hierarchical Task Refinement.
  - Other I-X Tools.
- The Co-OPR Application:
  - Personnel Recovery: Organization and Roles.
  - Personnel Recovery Centers: Layout and Tools.
  - Customizing I-X for Personnel Recovery
  - Experiments and Evaluation
- Conclusions and Future Research

"To-Do" Lists and I-X Process Panels

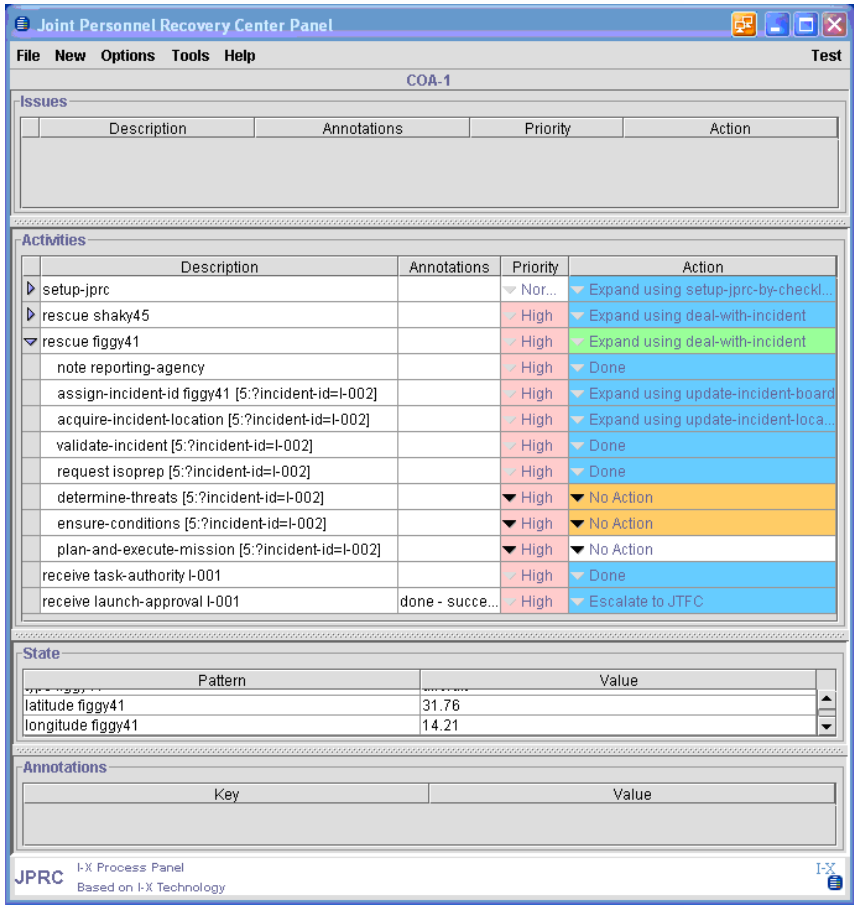
- organizing work: to-do lists
  - universally acknowledged to be useful
  - help people remembering what needs to be done
    - » ensure everything gets done
    - » provide overview of unaccomplished tasks
- the I-X framework
  - for creating applications in which multiple agents
    - » adopt a task-centric view of a situation
    - » must coordinate to perform their activities
- I-X Process Panels
  - principal interface to an I-X application
  - provide functionality of to-do list (amongst others)

I-X Process Panels and the <I-N-C-A> Ontology

- Process Panels reflect underlying ontology: <I-N-C-A>
- <I-N-C-A>: generic model for synthesis tasks
  - nodes: components of the artifact to be designed
  - constraints: required relations between nodes and environment
  - issues: points to be addressed before design is complete
  - annotations: additional information, e.g. rationale
- <I-N-C-A> for synthesizing plans (courses of action)
  - nodes: activities that are to be performed as part of the plan
  - constraints: temporal constraints, world state constraints, resource constraints, etc.
  - issues: flaws in the plan, opportunities
  - annotations: anything, e.g. rationale for activities

I-X Process Panel: Example

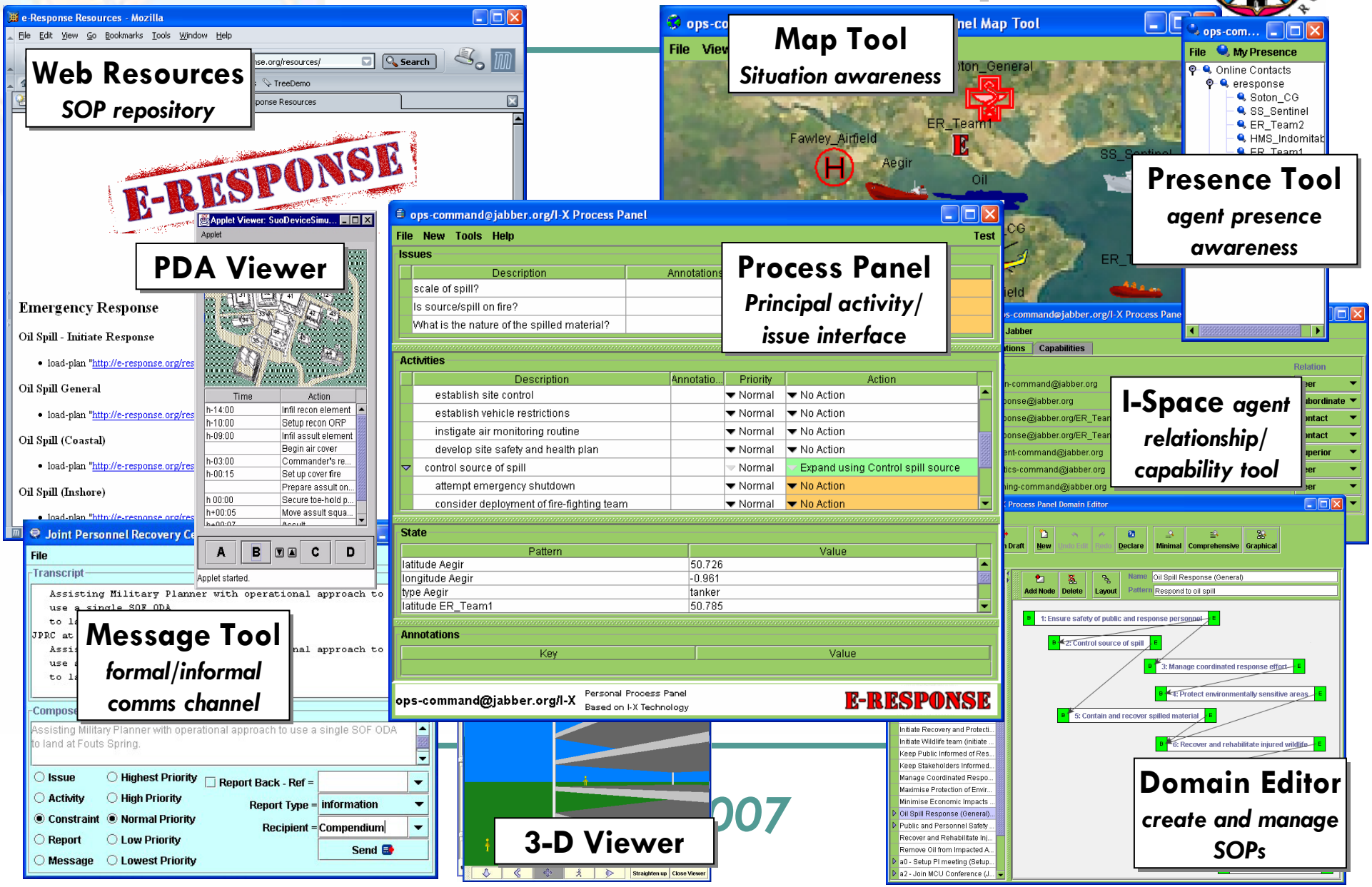
- issues: questions
- activities: items on the to-do list
  - described as verb plus parameters
  - can be annotated
  - have priority
  - actions suggested by I-X
    - » tick off
    - » refine task
    - » pass to others
    - » use custom handler
- state: world state information
- annotations: none shown here



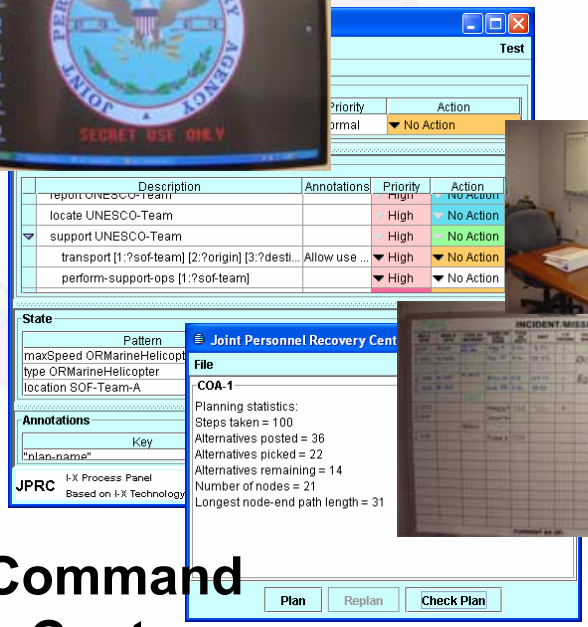
Hierarchical Task Refinement in I-X Process Panels

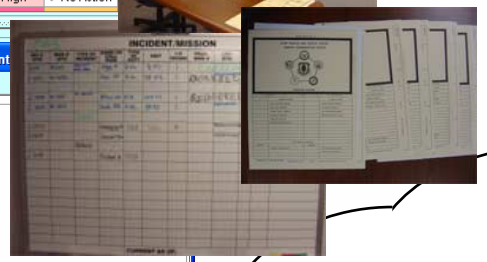
- I-X Process Panel matches task pattern against activities to identify applicable refinements
  - manual expansion through action menu
  - automated planning attempts to find possible completions of the current partial plan
  - option management allows exploration of "what if" scenarios
  - option evaluation matrix supports option comparison
- users may add activities at any level manually to adapt plan
- helps users by:
  - keeping track of (known) applicable methods
  - checking consistency of constraints associated with a plan
  - supporting option exploration and evaluation

The I-X Tool Suite for e-Response

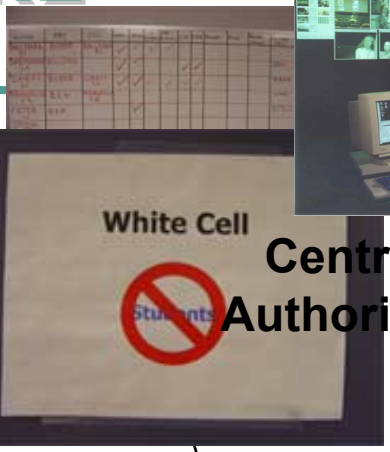


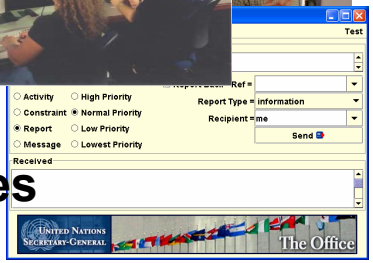
Co-OPR2





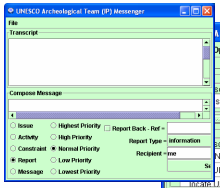
Command Centre

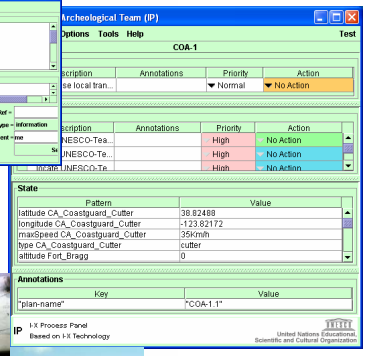




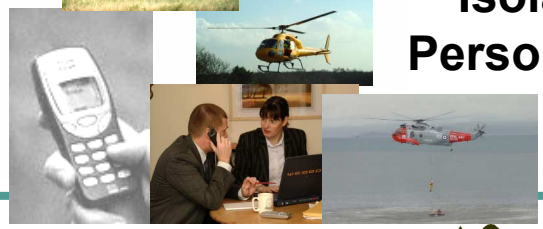
Central Authorities

Collaboration and Communication

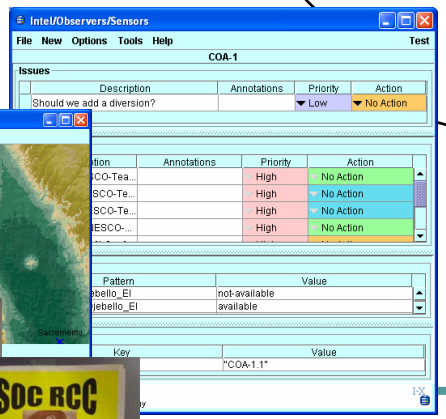


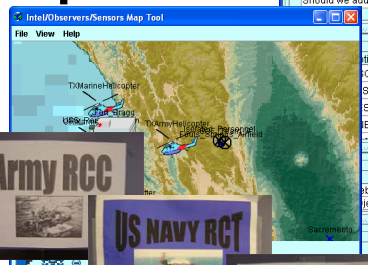


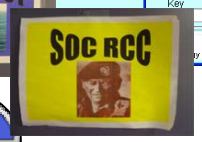
Isolated Personnel



Emergency Responders







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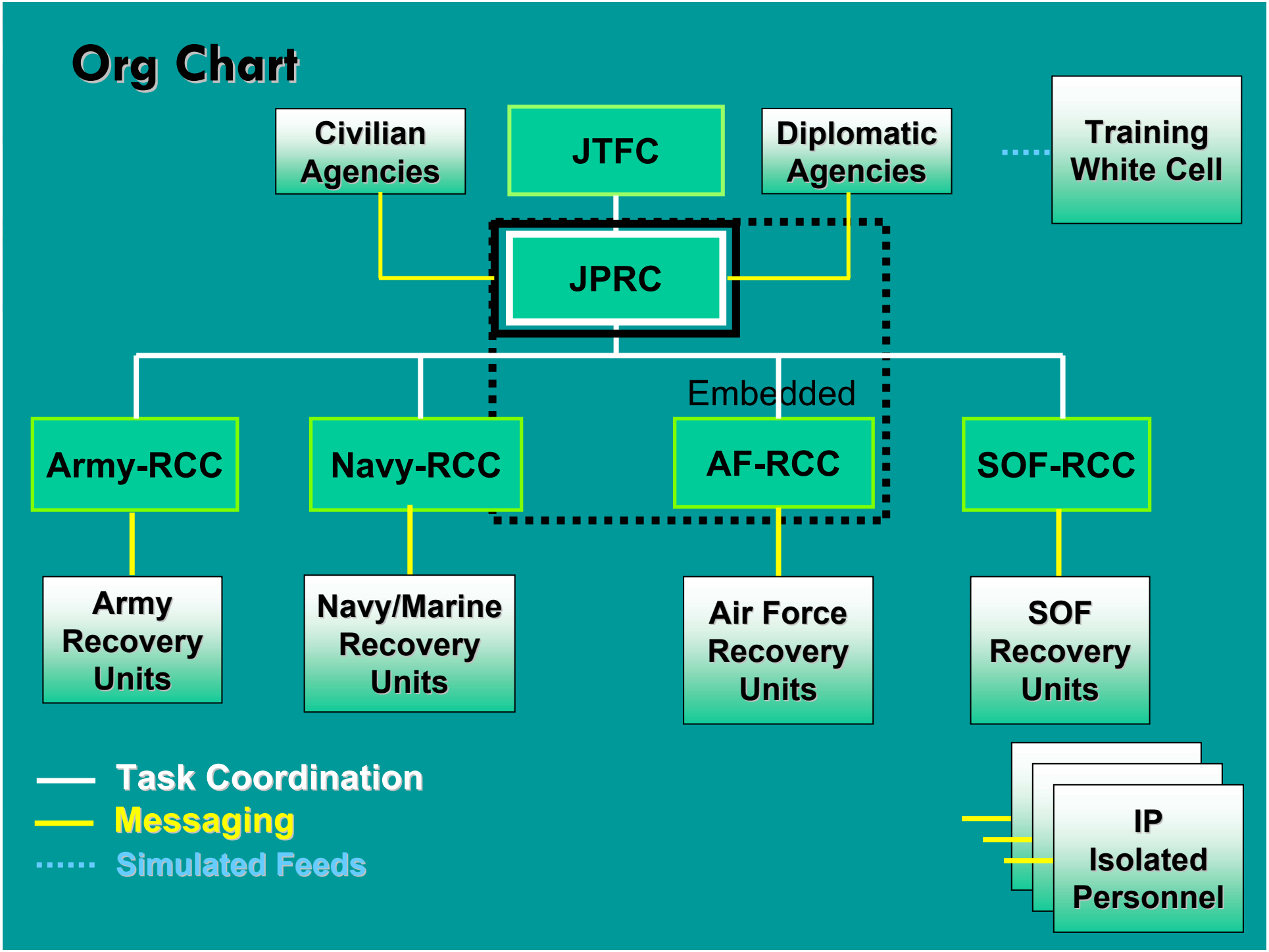
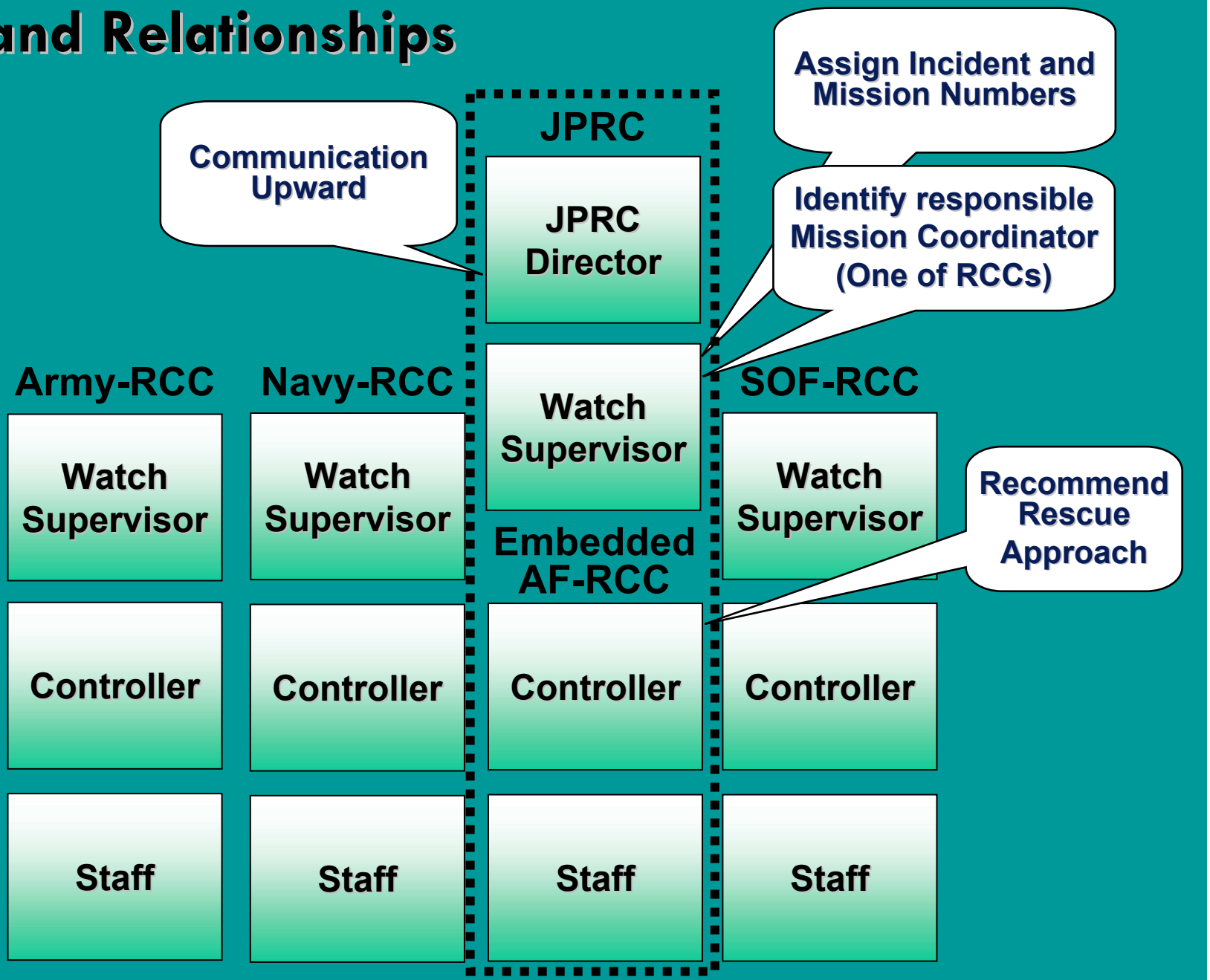
Org Chart

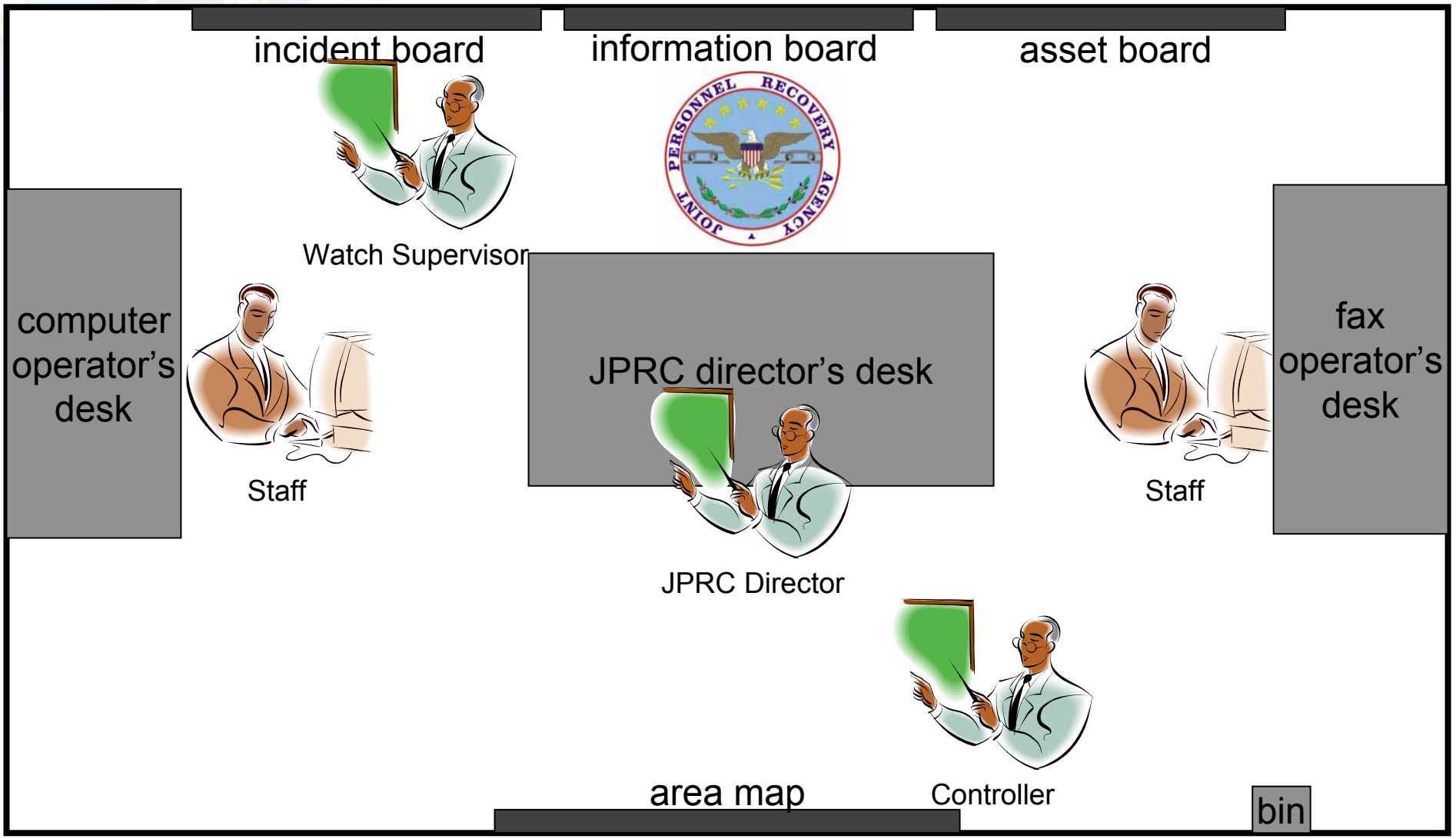

Civilian Agencies
JTFC
Diplomatic Agencies
Training White Cell
JPRC
Embedded
Army-RCC
Navy-RCC
AF-RCC
SOF-RCC
Army Recovery Units
Navy/Marine Recovery Units
Air Force Recovery Units
SOF Recovery Units
Task Coordination
Messaging
Simulated Feeds
IP Isolated Personnel

Roles and Relationships

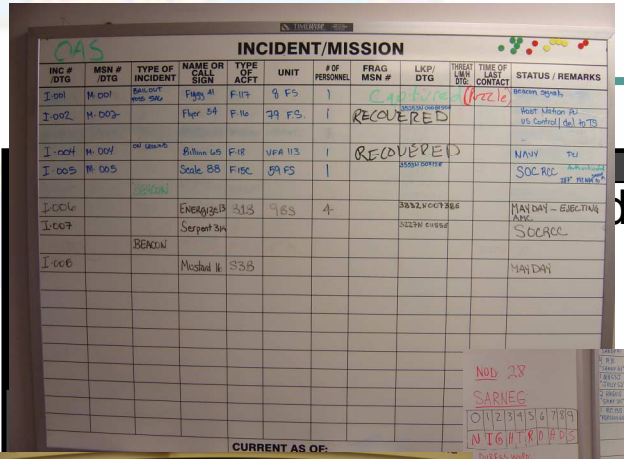


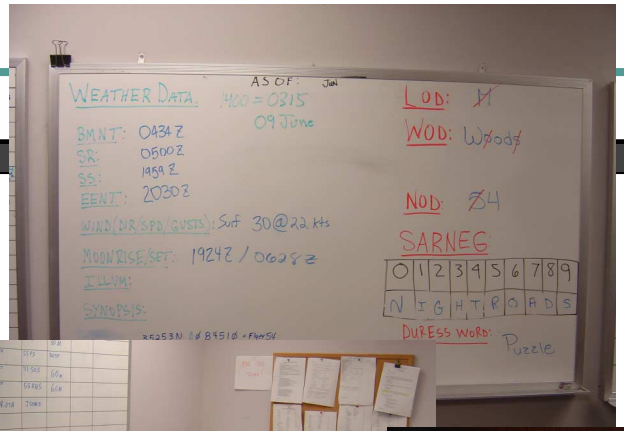
See JPRA/PRETC Field Training References Staff Roles and Responsibilities Pages M-1 to M-3

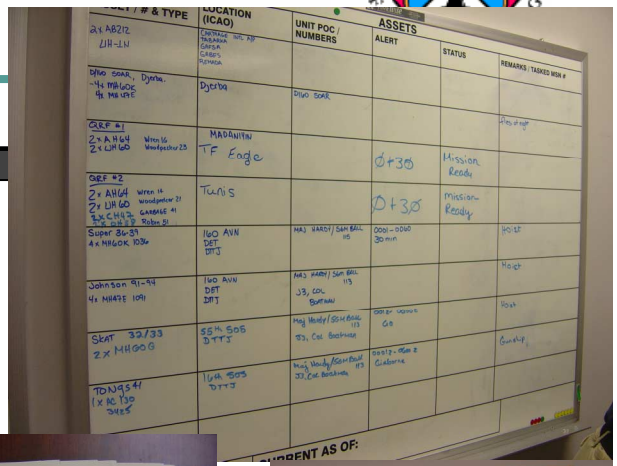
Typical Rescue Coordination Centre

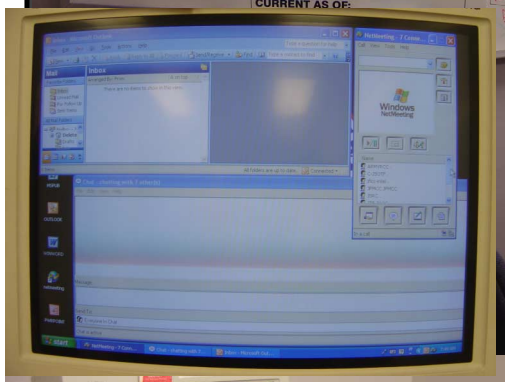


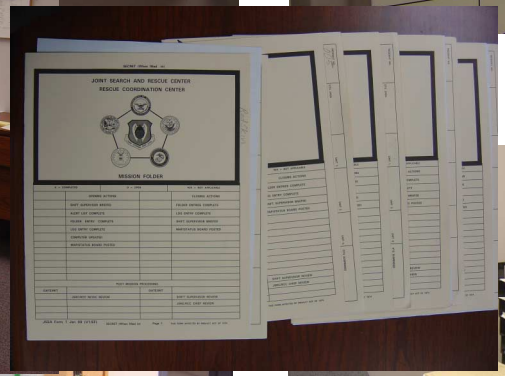
Typical Rescue Coordination Centre

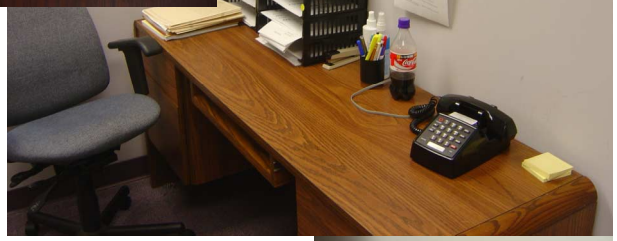




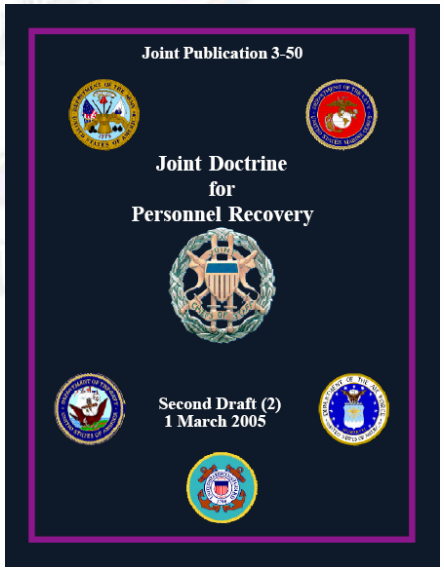


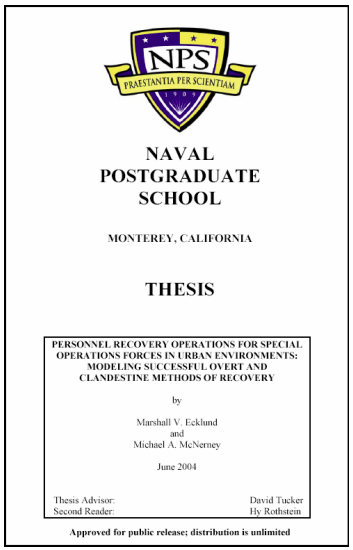


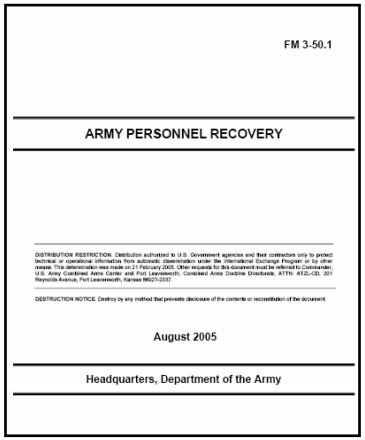


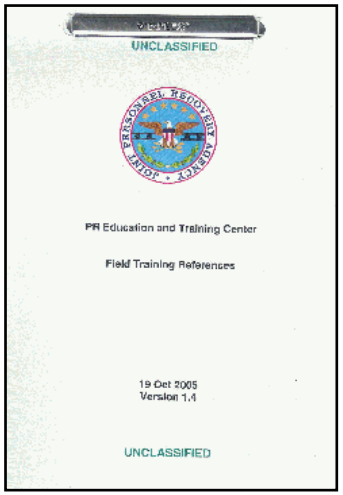


Knowledge Engineering

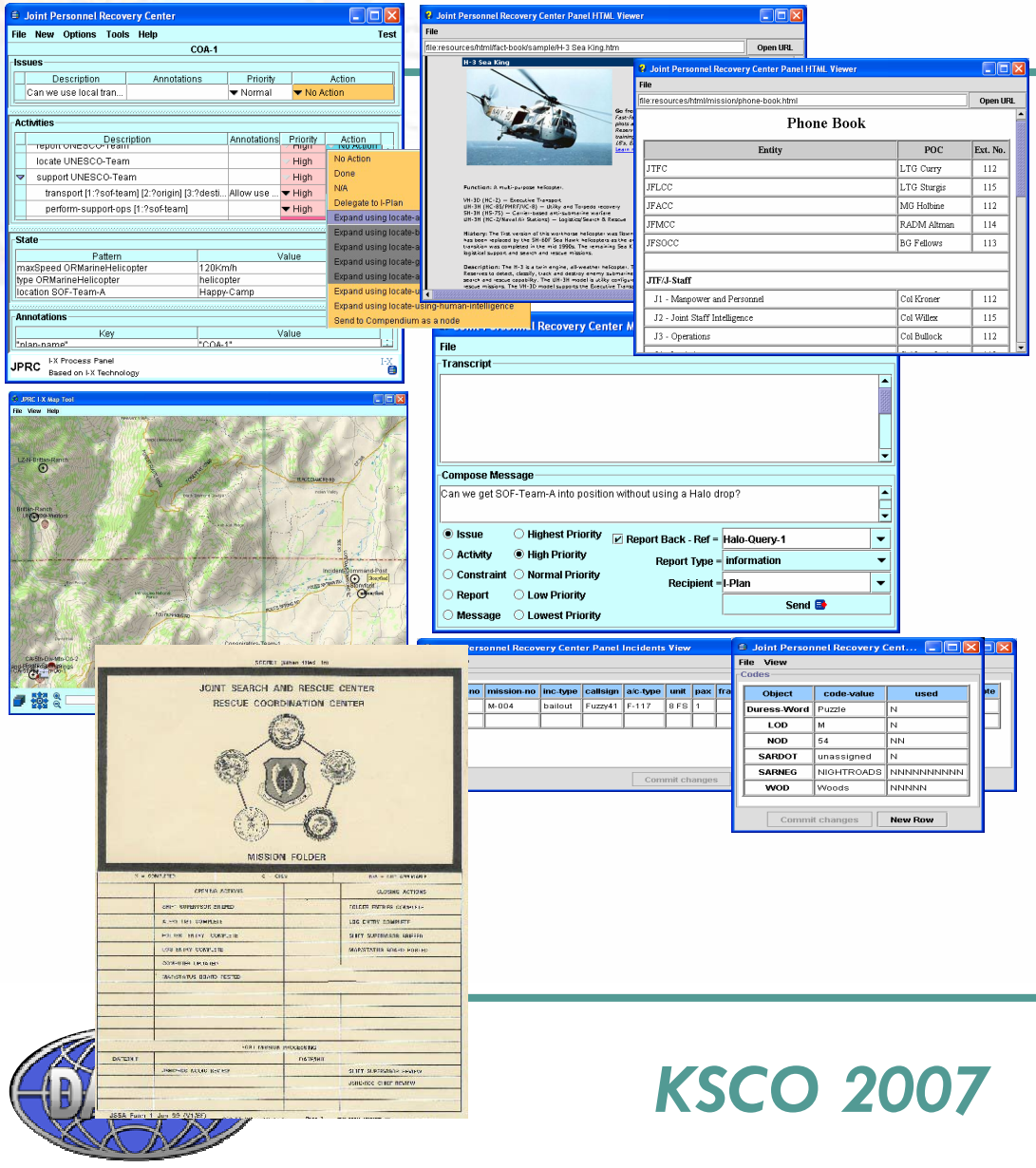








JPRC Using I-X



- Communications
  - Simple Chat
  - Structured chat
  - Information sharing
- Task Support
  - Checklists
  - To do list
  - Progress reporting
  - Plan option aids
- Whiteboards
  - Incident
  - Weather/Codes/Info
  - Assets
- Mapboards
- Web Resources
  - Fact Book
  - Phone List
  - Codes
- Mission Folders (to be active?)

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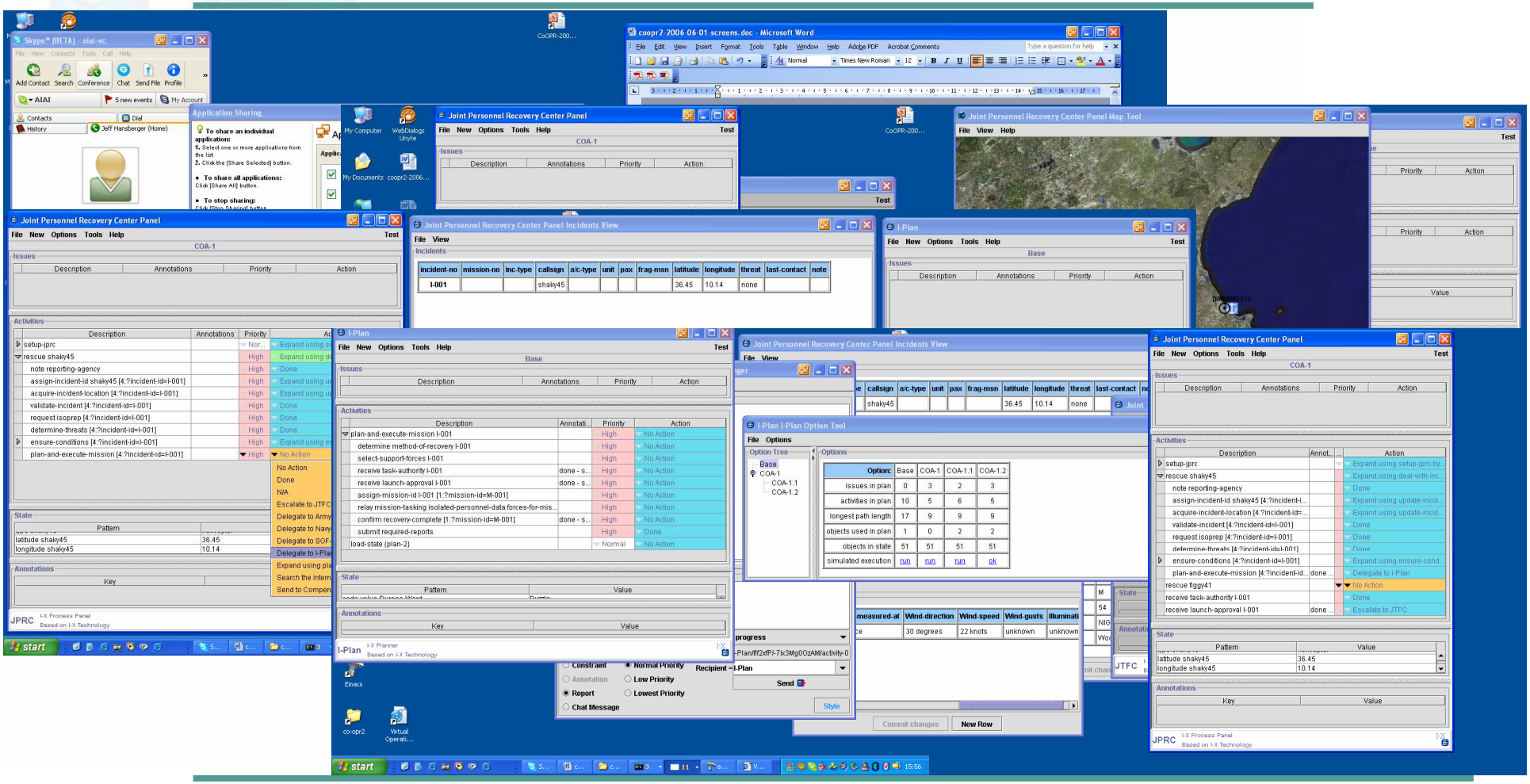
Experiments



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Evaluation and Results

- aim: show value of I-X technology
- evaluation methodology
  - role-play CPX (JPRC director, watch supervisor, controller)
  - analyze and categorize cognitive tasks: timing
- experimental results
  - use of SOPs encouraged a methodical approach
  - interruptions: quick resumption of activity

Phase	OODA	SHORe	"JPRC Experiment C" Analysis
1	*observe*	*stimulus*	*information-gathering*
2	*orient*	*hypothesis*	*sense-making*
3	*decide*	*option*	*decision-making*
4	*act*	*response*	

37	0:51:15		decision-making	request launch authority
38	0:53:00	JD	decision-making	mission establish
39	0:55:00	JD	decision-making	send plan to whitecell
40	0:55:45			[wait for confirmation from whitecell]
41	0:57:02	JD	housekeeping	updates state assuming mission complete
42	1:00:00	GW	housekeeping	rescue figgy, note reporting agency, establ
43	1:01:00	GW	information-gathering	request info - incident location
44	1:02:13	GW	information-gathering	receive location
45	1:02:36	GW	information-gathering	validate incident (WoD)
46	1:03:30	GW	information-gathering	awaiting message
47	1:04:00	GW	housekeeping	broadcast WoD update to all subordinates
48	1:04:46	GW	information-gathering	ISOPREP - VOC
49	1:06:58	GW	sense-making	identify threats - I-X mesgs
50	1:09:47	GW	sense-making	ensure conditions, ensure OSC
51	1:11:10			[interrupt] duress word
52	1:13:00	GW	sense-making	reviews plan (threats) so far

Conclusions

- I-X Process Panels: view as intelligent and collaborative to-do lists
  - intelligence: seamless integration through hierarchical task refinements modelled in I-DE
- Co-OPR application: lessons learned
  - evaluation now almost complete
  - early experiments show how I-X addresses some of the problems observed during a CPX
  - I-X naturally supports handover between shifts
  - some issues with the generic user interface need work