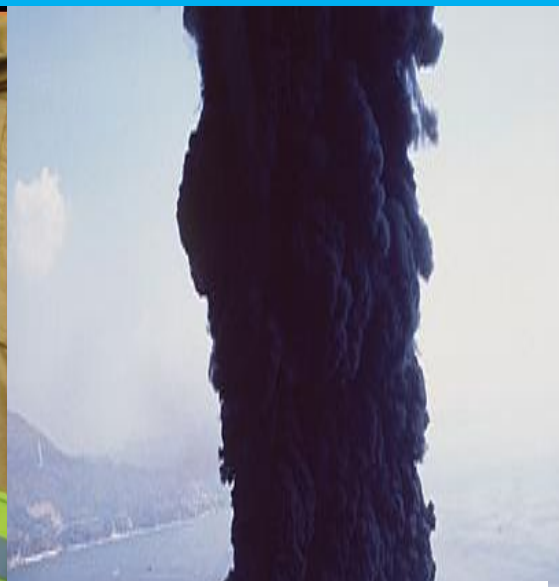
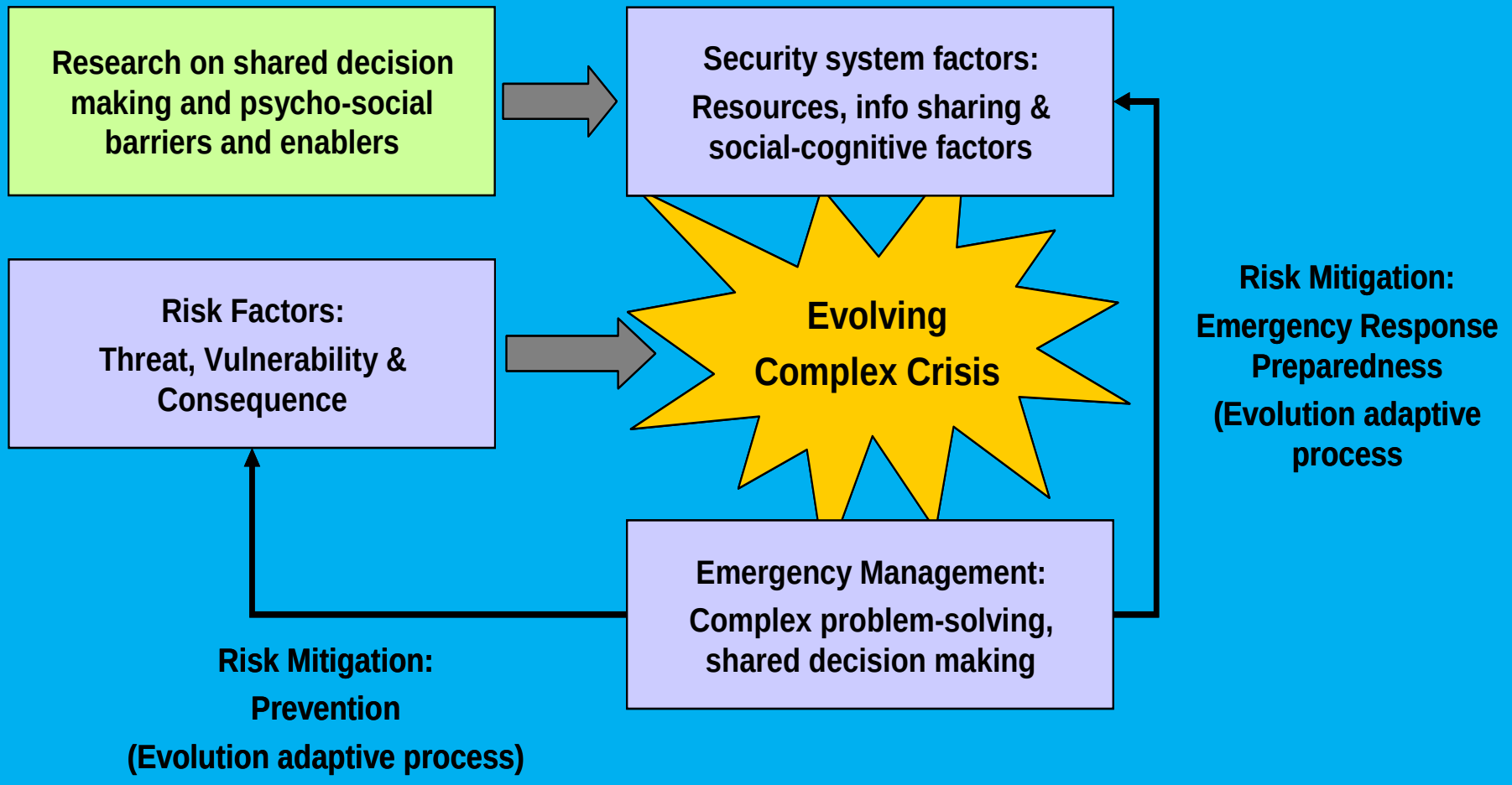
Human Adaptive Systems



NO PLAN SURVIVES CONTACT WITH A DISASTER IN THE MAKING

How to Contain Evolving Crises?

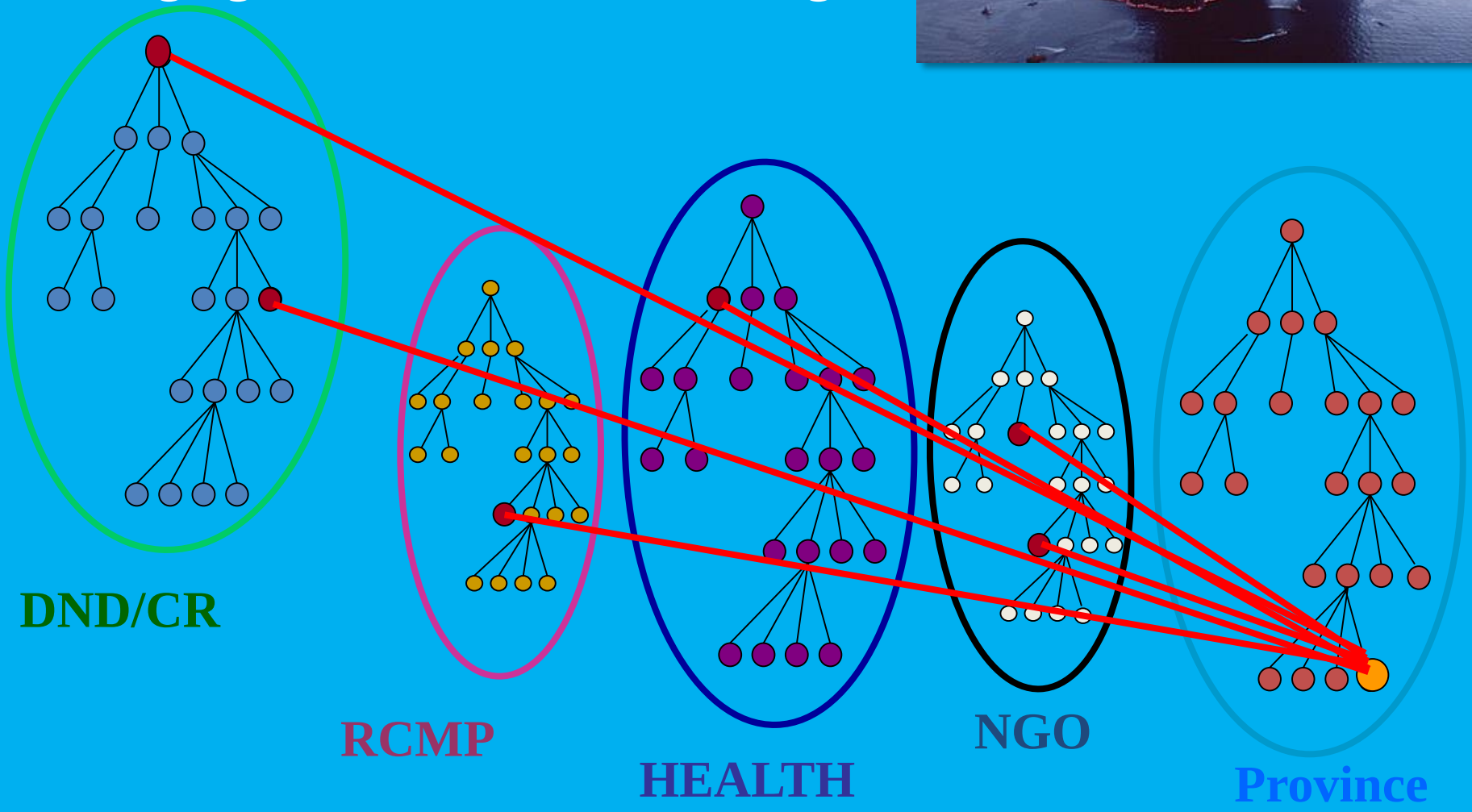


"EDGE OF CHAOS"

Enabling the transition from Hierarchy to ECOSYSTEM

The right resources to the right task at the right time and the right place

Emerging Leader/'Power to the Edge'



Adaptive Risk Management

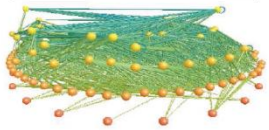
THEORETICAL FOUNDATIONS

F

Complex Systems

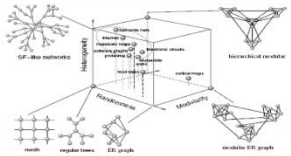
Cybernetics
Emergence
Self-organization
Pattern Formation

Complex Networks in Nature



Taken from: Martinez, N.D. (1991) Artifacts or Attributes - Effects of Resolution on the Little-Rock Lake Food Web, Ecological Monographs, 61, 367-392.

Complex Networks in Nature



Taken from: Valverde, S.(2005) Evolution and dynamics in information networks, Ph.D Thesis

Complex Adaptive Systems

Adaptiveness
Heterogeneity

Complex Networks Theory

(Statistical Network Properties)

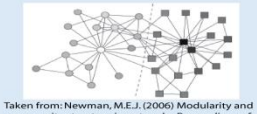
ARM TEST BED

Opportunistic Communications

Phase 3 — Test bed integration with research and industry partners

Phase 2 — Internet, Cellular Network

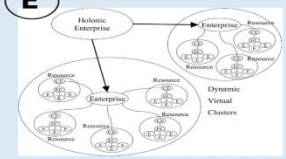
Phase 1 — Wireless Sensor Network, Opportunistic Devices



Taken from: Newman, M.E.J. (2006) Modularity and community structure in networks, Proceedings of the National Academy of Sciences of the United States of America, 103, 8577-8582

C

E Applications



Taken from: Ulieru, M., Brennan, R.W., & Walker, S. S. (2002). The holonic enterprise: A model for internet-enabled global manufacturing supply chain and workflow management. Integrated Manufacturing Systems, 13(8), 538-550.

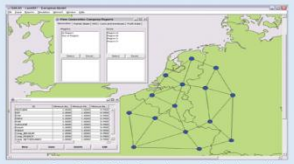
Multi-Agent Systems (MAS)

Notify
Self-organize
Evolve
Adapt
User Services
Regroup

Modeling and Simulation

Risk
Control
Robustness

D



Taken from: North, M. J., Conzelmann, G., Koritarov, V., Macal, C. M., Thimmapuram, P., & Veselka, T. (2007). Electricity Market Complex Adaptive System (EMCAS). Retrieved April 1, 2007, from http://www.dis.anl.gov/ceeesa/programs/emcas.html

Agent-Based Modeling (ABM)

Dynamic Knowledge Management

Data Servers

INDUSTRY DATA

Topological Resources and Data (Geographic Capacity)

Partnership Resources and Data (Intellectual Capacity)

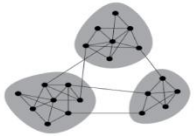
A

Opportunistic Communications

Taken from: Communication Research Labs Sweden AB, http://www.crl.se/

Mobile Asset Bandwidth Provision

Ecosystem Partner Locations



Taken from: Newman, M.E.J. (2006) Modularity and community structure in networks, Proceedings of the National Academy of Sciences of the United States of America, 103, 8577-8582

Communities of Networks

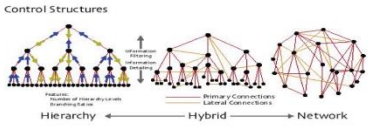
Critical Infrastructures

Taken from: The Virginia Lands Rights Coalition, http://www.vlrc.org

Power Grid Users and Electricity Suppliers

B

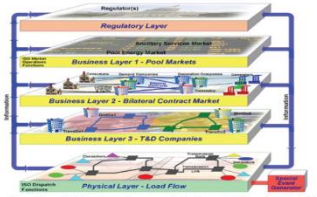
Dynamic Grouping of Skills in Organizations



Taken from: Bar-Yam, Y. (1997) Complexity Rising: From Human Beings to Human Civilization, a Complexity Profile: NECSI technical report. In Encyclopedia of life support systems. EOLSS Publishers, Oxford, UK

Hybrid Organizations

Holistic Security Ecosystems



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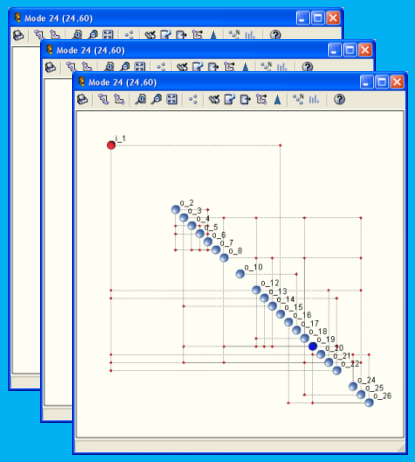
Our Goals

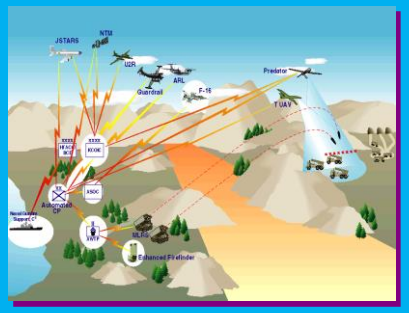
- Explore ways that can increase performance of emergency response organizations;
- Point to ineffective policies hindering intra- and inter-organizational collaboration;
- Suggest ways toward melting the hierarchical structures to enable individual innovative contributions of “emerging leaders”;
- Investigate the impact of ***professional, social and cultural aspects*** as well as of ***new technologies*** on the effectiveness of joint emergency response operations

MODELING PUBLIC SAFETY OPERATIONS

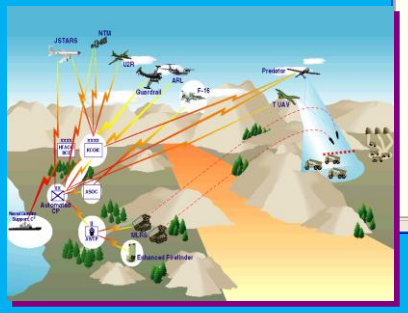
Complexity C_1



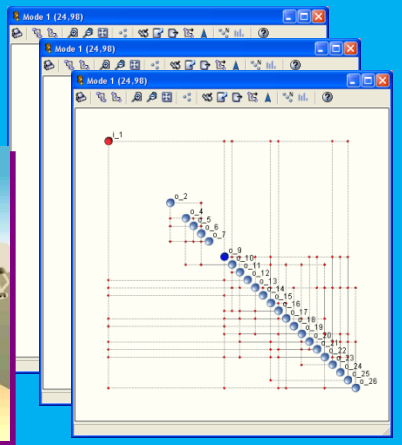
Scenario 1

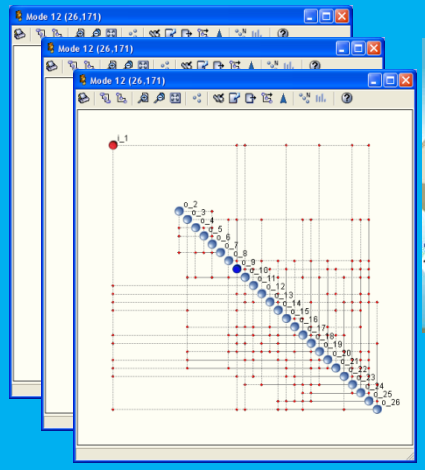


Scenario 2

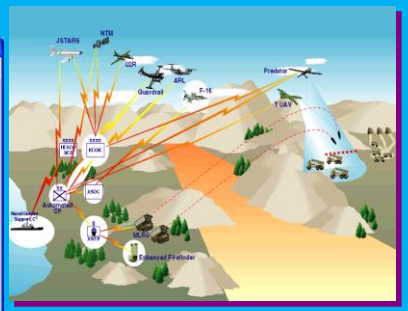


Complexity C_2

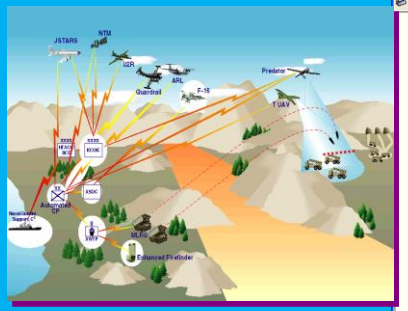




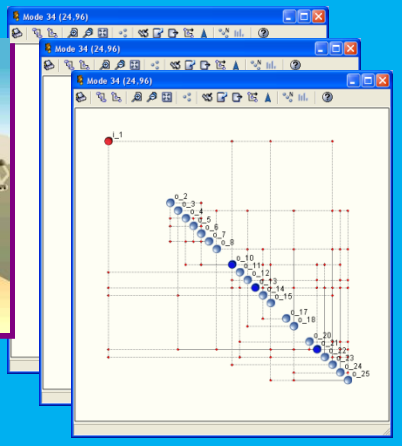
Complexity C_3



Scenario 3

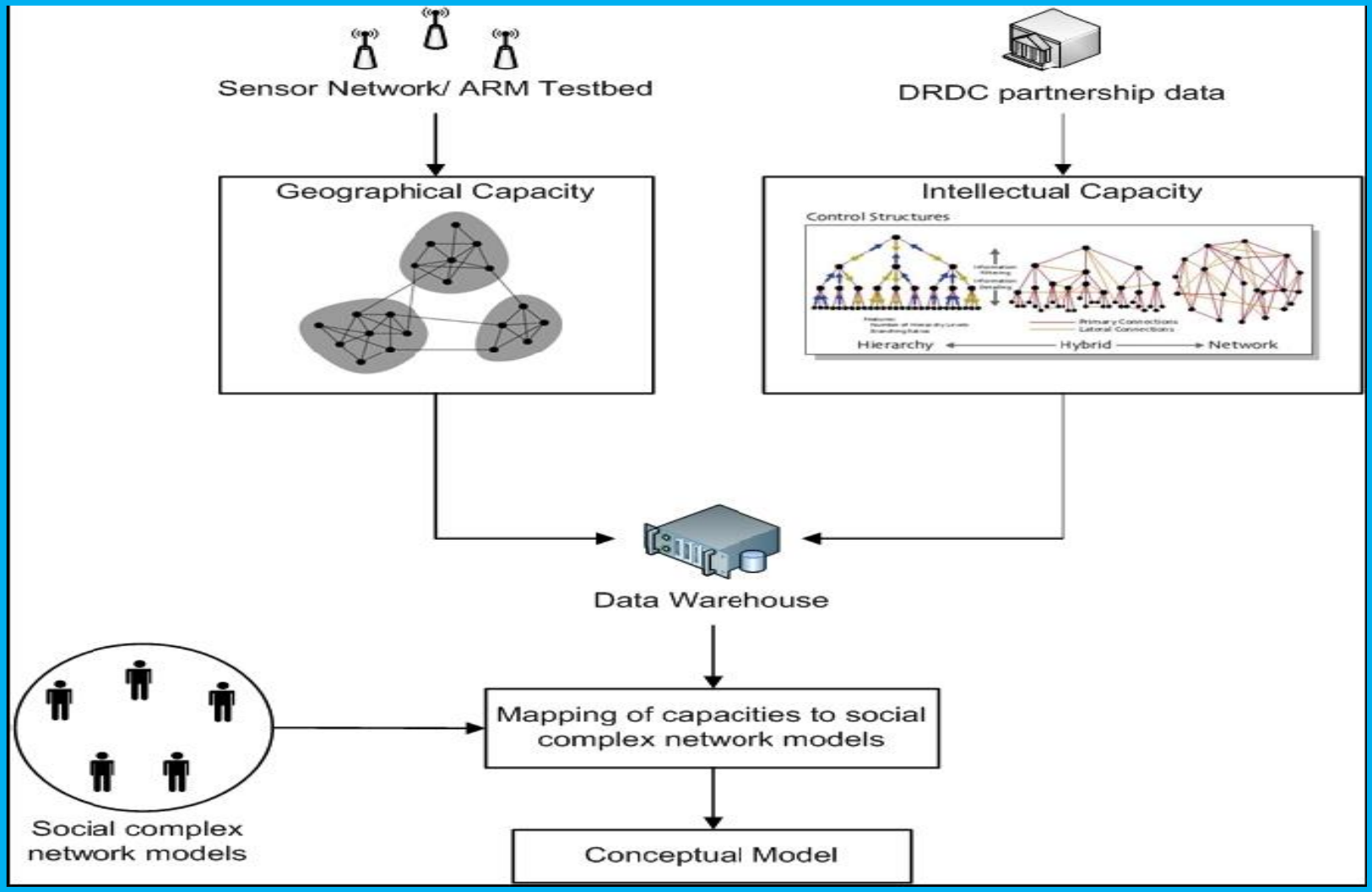


Scenario 4



Complexity C_4

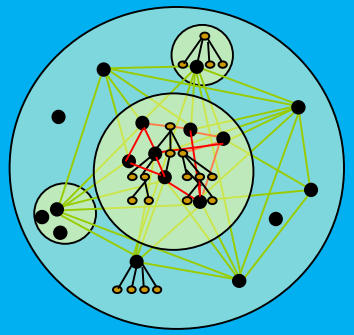
HSE Simulation Testbed



Adaptability Focused

Complex

NETWORK



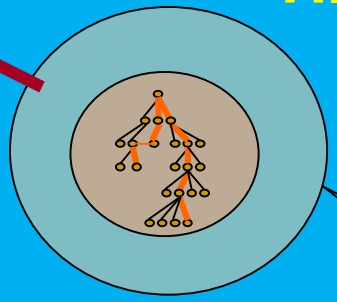
?

Orchestrated Action

Complicated

CULTURAL SHIFT IS DIFFICULT!

HIERARCHY



Take Me To Your Leader.

Improvised Action

Chaos

Known

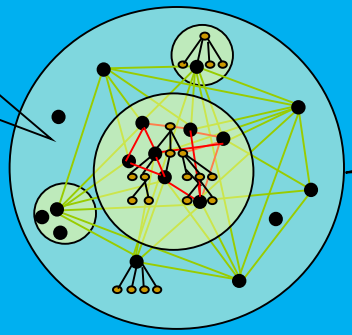
Stability Focused

Adaptability Focused

Complex

Complicated

Let's Do This.

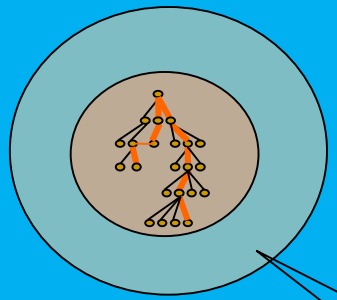


?

We'll get forgiveness later

Improvised Action

Orchestrated Action



Who's Authorization

Chaos

Known

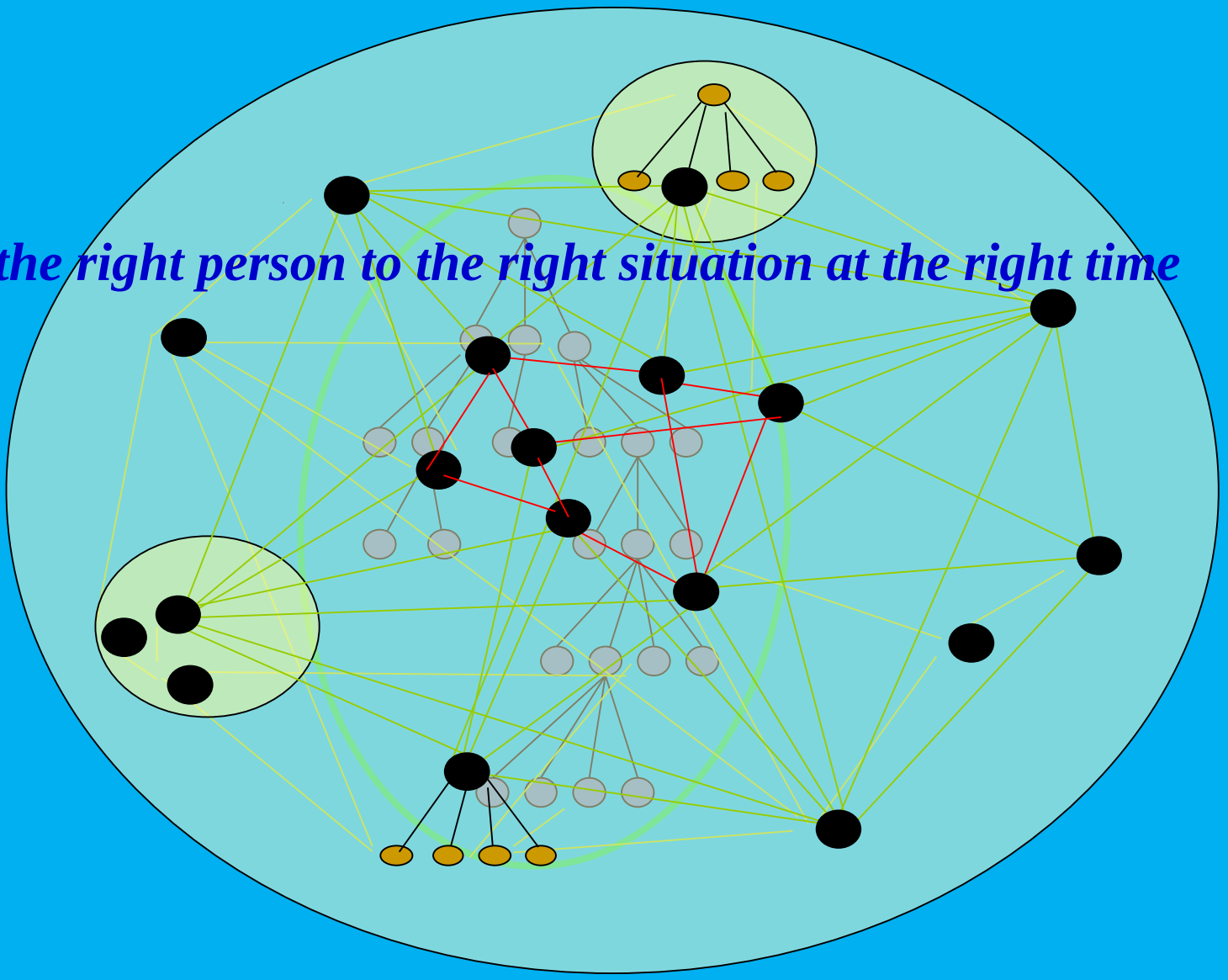
Stability Focused

Paradigm Shift

- Maria Theresa Order
- Austria's highest military decoration 1757 until the end of World War I
- **Given to commanders who disobeyed orders – and thereby WON battle**

Unleashing the Ecosystem

Linking the right person to the right situation at the right time



Brahms Geographical Viewer

File Help

Time: 13571 / 14704 (3:46:11)

☐ Show Agent Names

☐ Show Area Names

Agents:

- FireFighterLeader_1
- TransportLeader_1
- FireTugTeam_1
- PortLeader_1
- FireFighterTeam_4
- FireFighterTeam_3
- FireFighterTeam_2
- FireFighterTeam_1

Inspecting: FireFighterLeader_1

Location: FireStation_1

Activity:

wf_notifyProblemSolved
gl_updateCoordinator

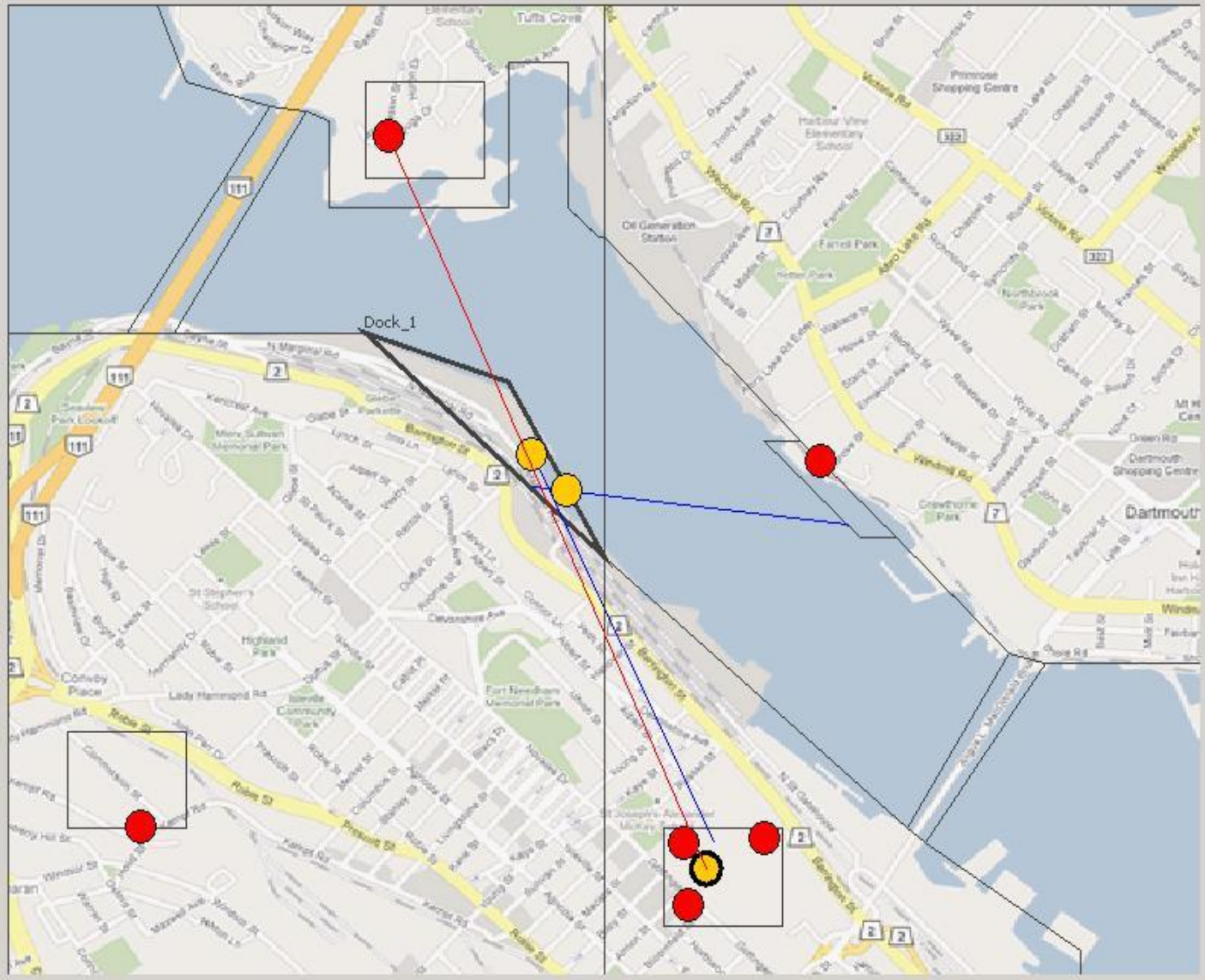
Beliefs:

- FireFighters.FireFighterLeader_1 is
- Extra.Problem_1.totalResourcesRe
- Extra.Problem_1 isCoordinatedBy P
- Extra.Problem_1.problemType = E
- Extra.Problem_1 involves Extra.Shi
- Extra.Problem_1.solved = false
- Extra.Problem_1.category = 1
- Extra.Problem_1.sourceLocation =
- Extra.Problem_1.totalResourcesDe

Areas:

- Dock_1
- CoastGuardHQ
- NEHarbour
- AtlanticOcean
- SWHarbour

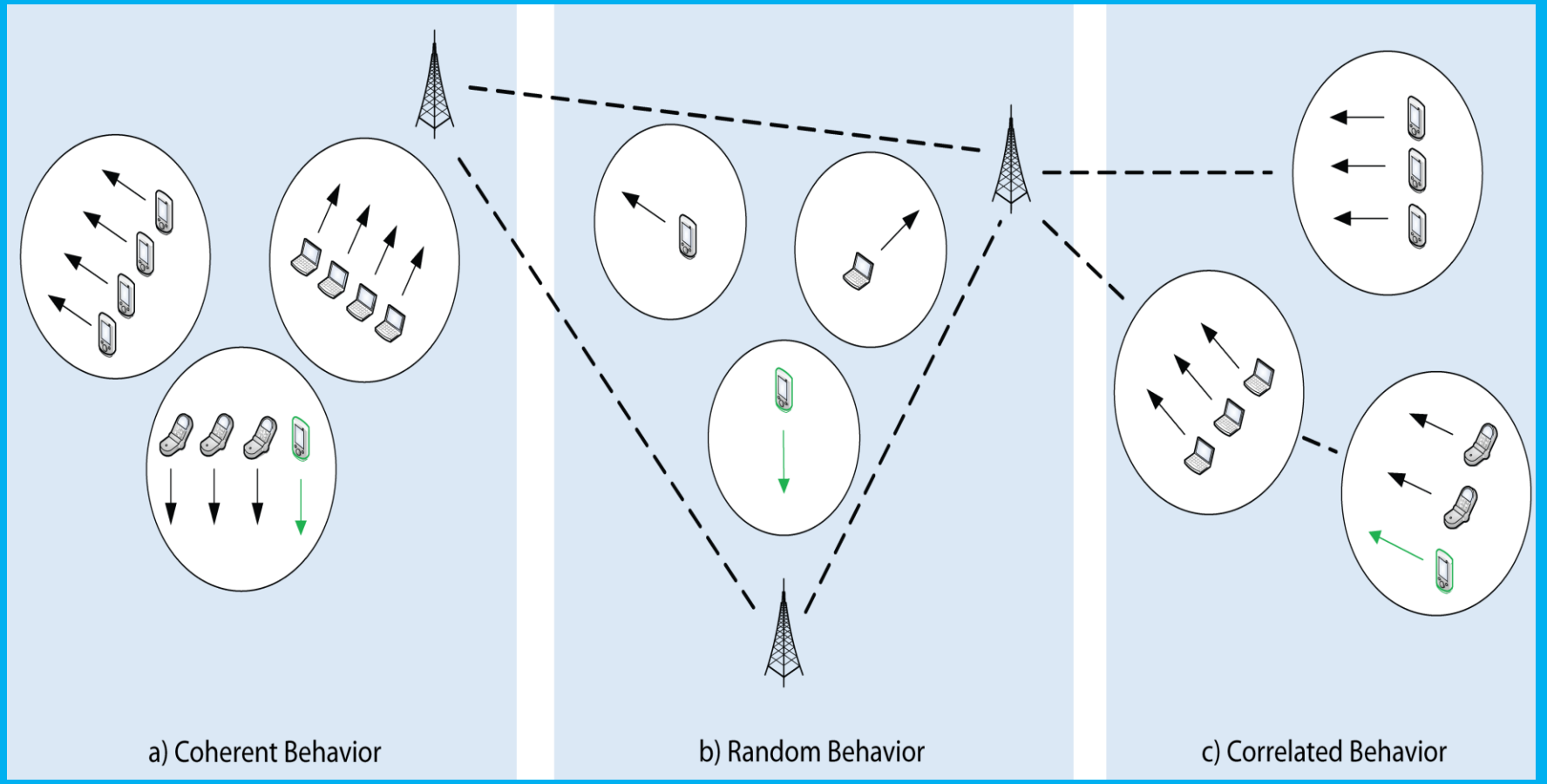
FireFighterLeader_1



Situational Awareness

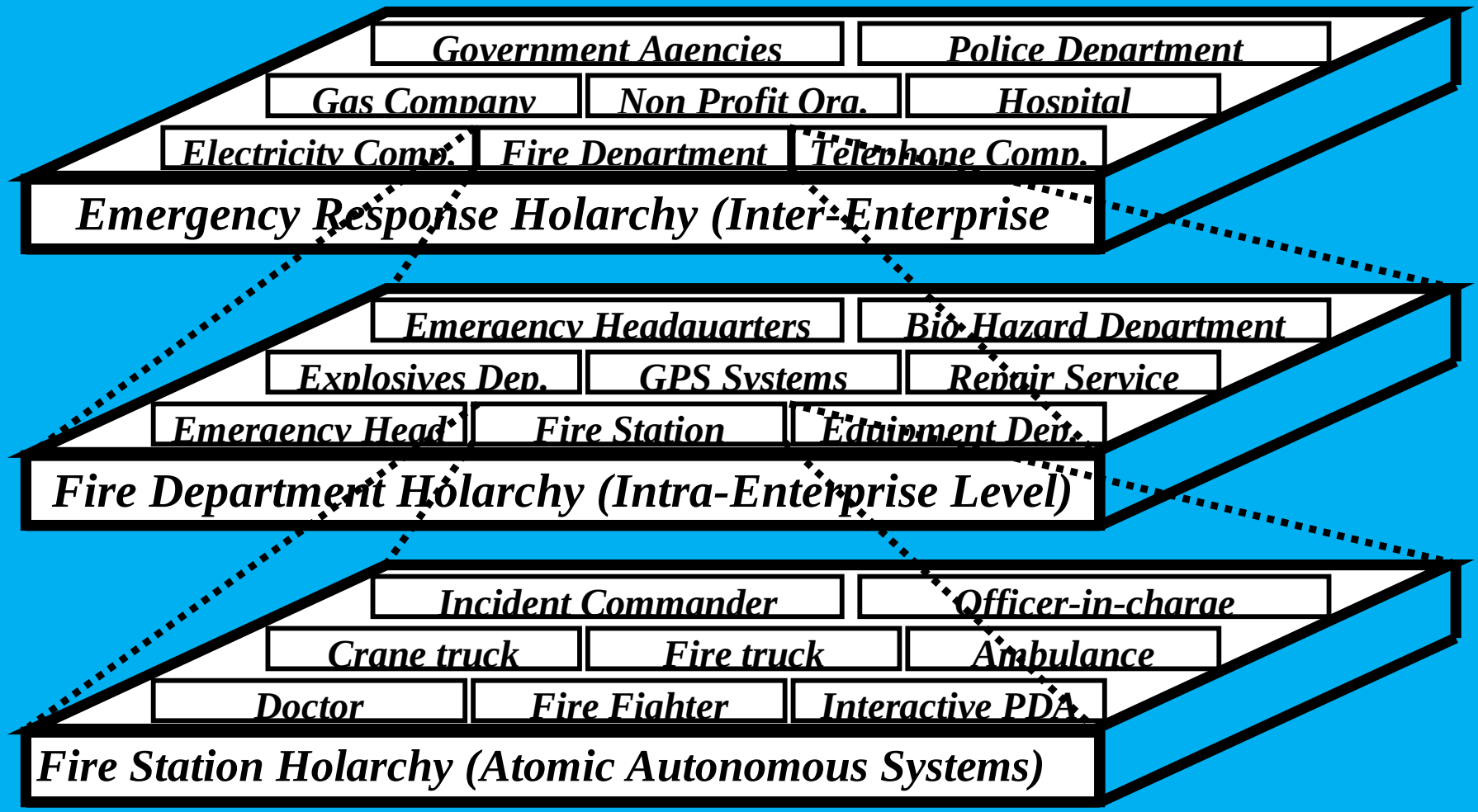
- ✓Realtime location of friendlies, threats or incidents.
- ✓Information to anticipate and prepare for situations
- ✓Responders altered with area specific threats
- ✓Reduced risk of personnel having inadequate training or experience for situation
- ✓Search profiles for specific skills or experience
- ✓Analysis and trends/data

How do complex systems self-organize?

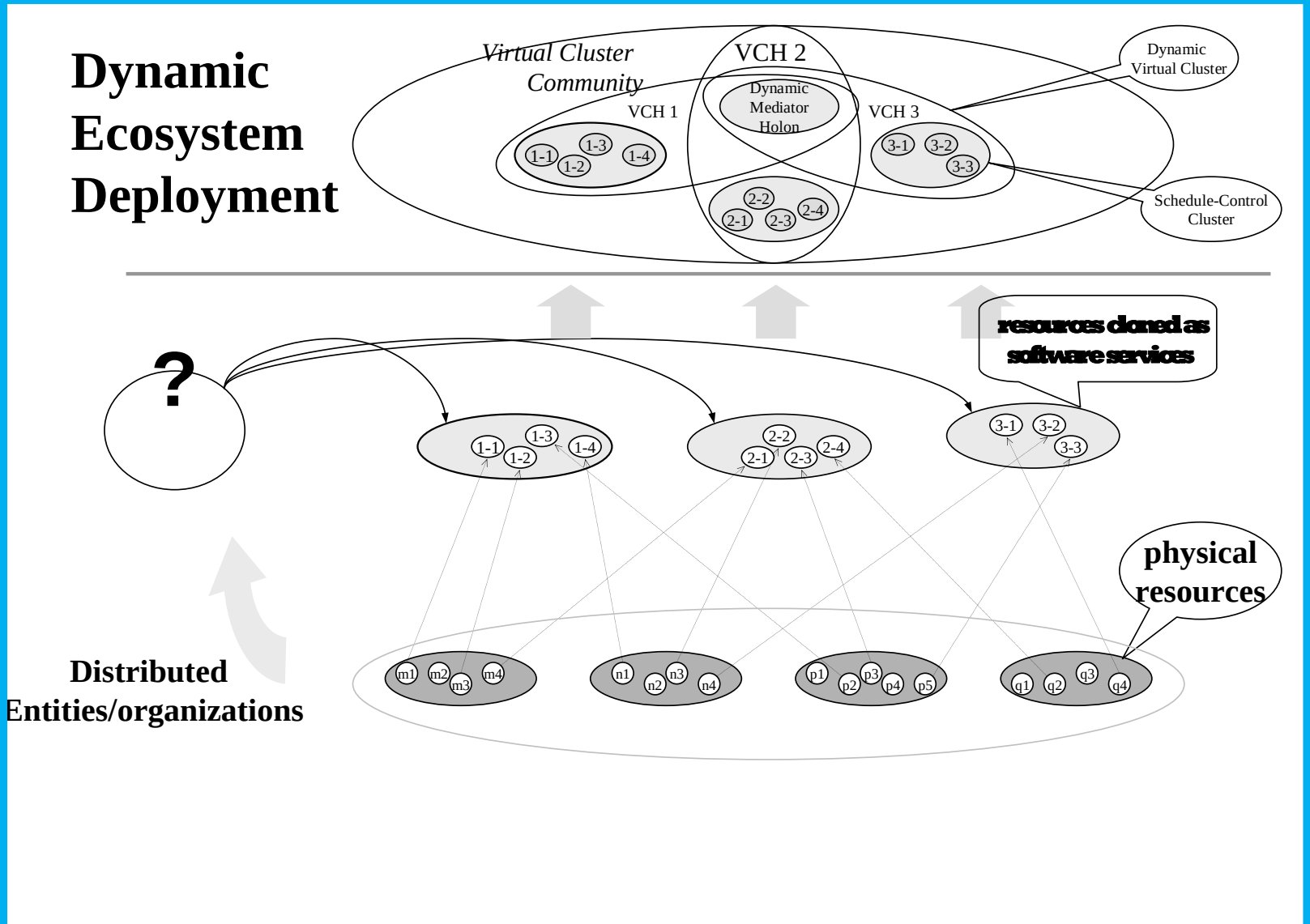


Micro/Macro – level behavior

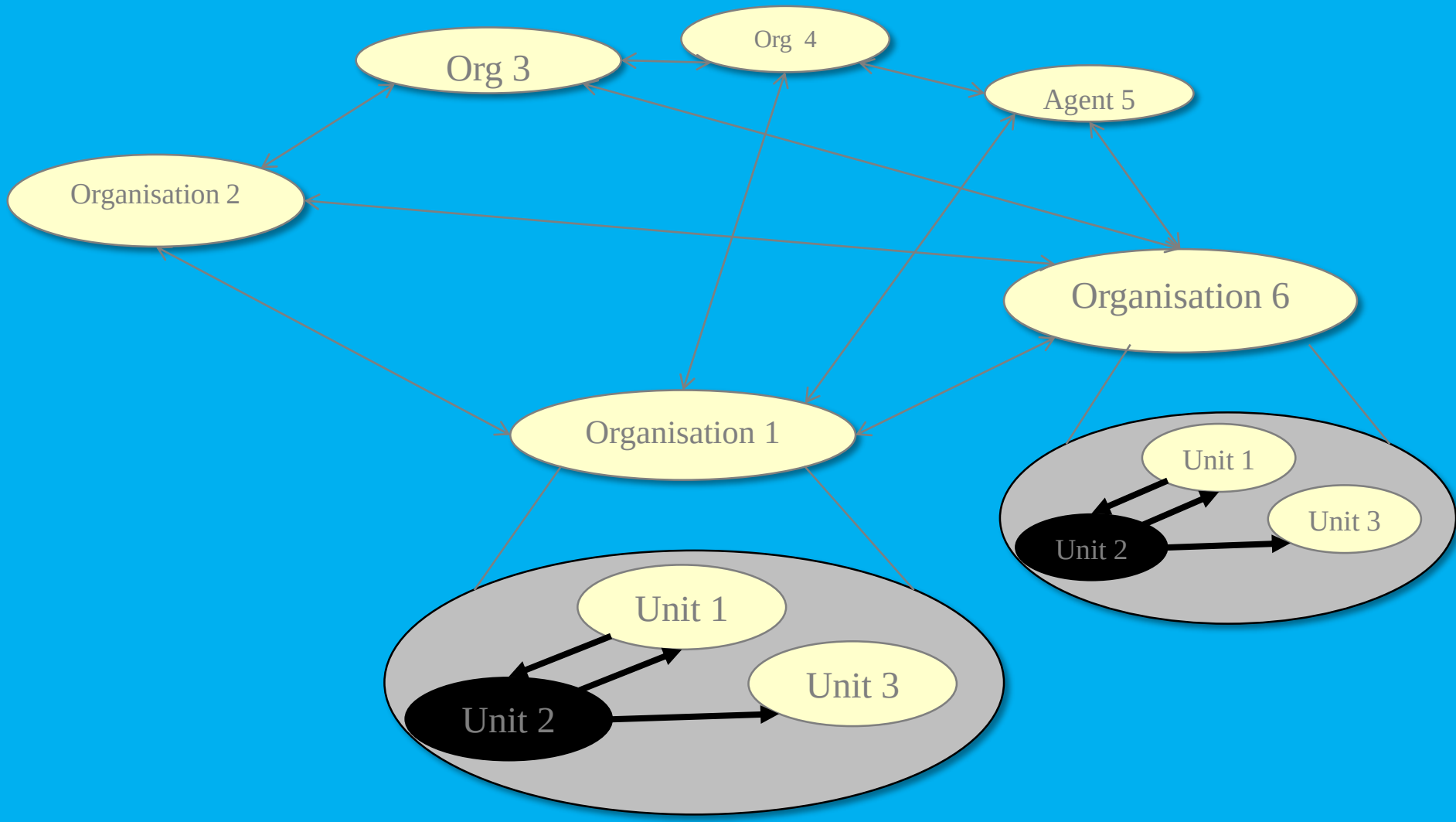
Holistic Security Ecosystem



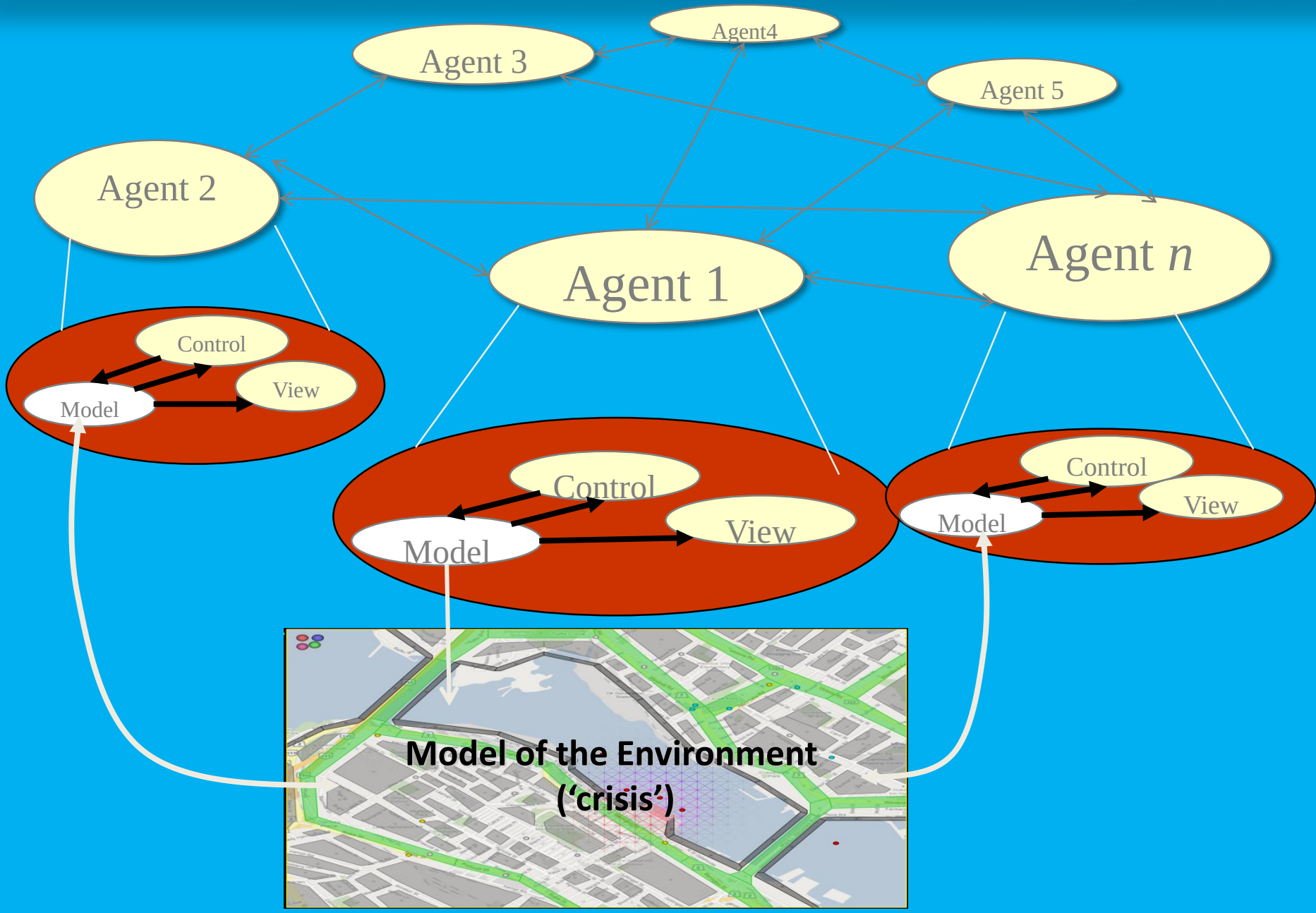
Adaptive Configurations and Rules



DECISION SUPPORT



Joint Force Alliance as Controller for the Evolving Crisis



HSE simulation environment

Increased Collaboration

- ✓All users are remotely connected facilitating easy information transfer and collaboration.
- ✓Search capabilities allow users to connect with others who have made similar inquires.
- ✓Temporary and permanent groups may be established for easy, remote information transfer.
- ✓Search profiles for specific skills or experience.

Brahms Geographical Viewer

File Help

Time: 13571 / 14704 (3:46:11)

Show Agent Names

Show Area Names

Agents:

- FireFighterLeader_1
- TransportLeader_1
- FireTugTeam_1
- PortLeader_1
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- FireFighterTeam_2
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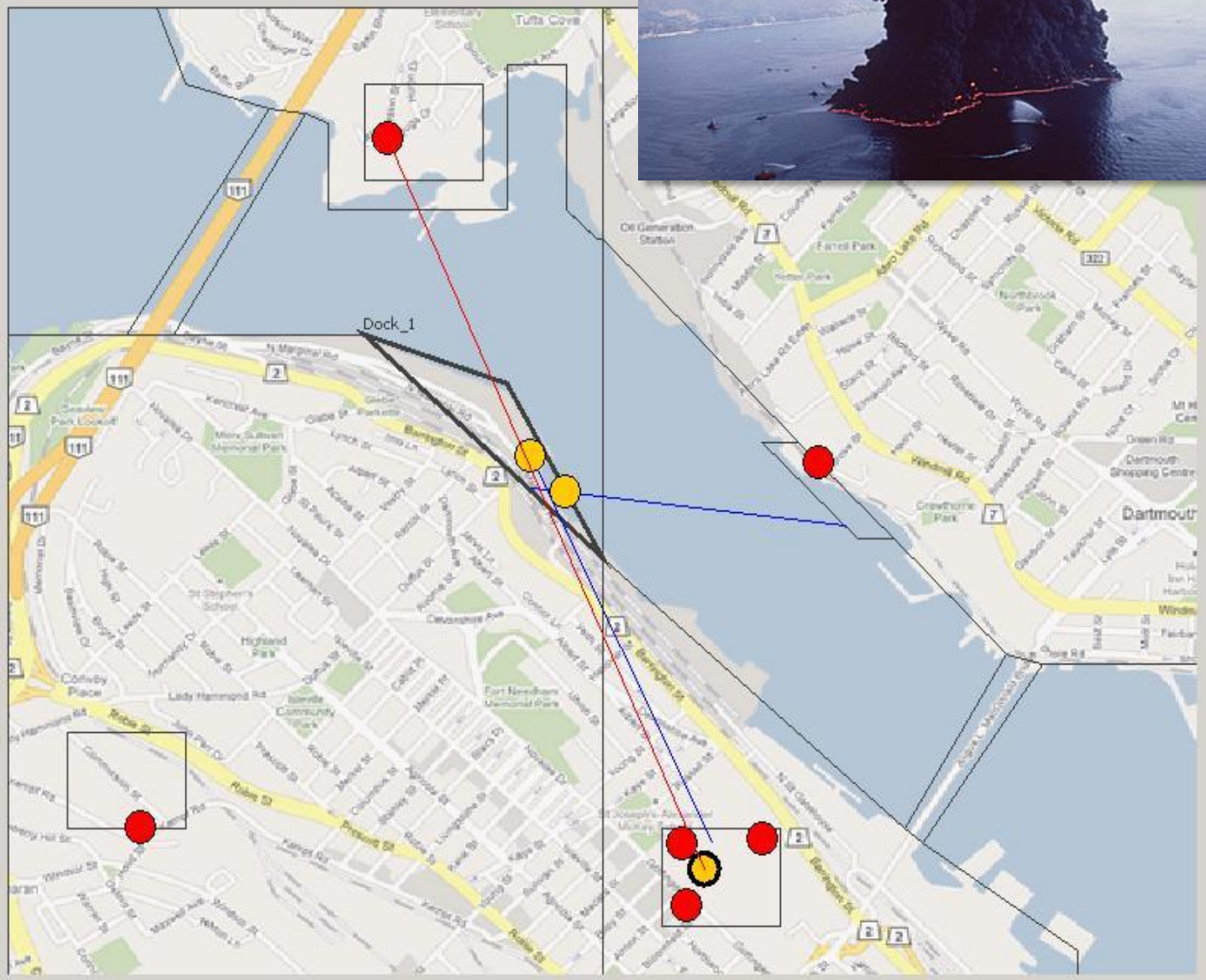
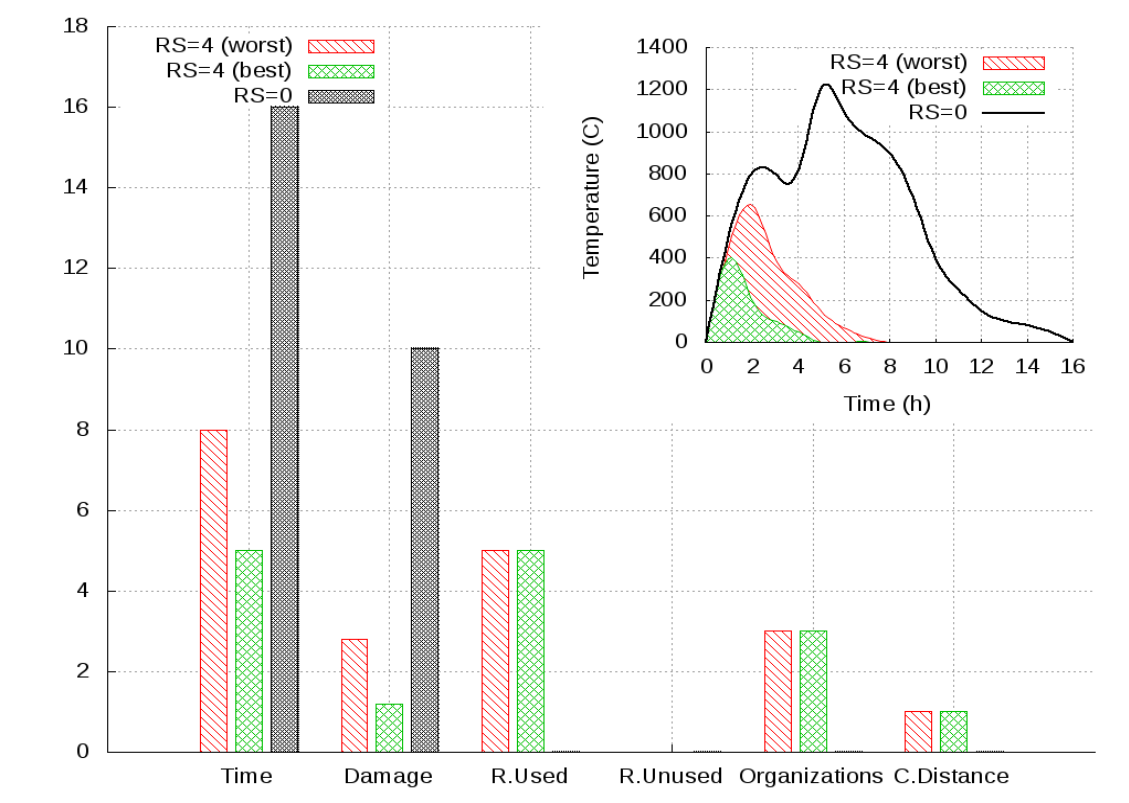
Areas:

- Dock_1
- CoastGuardHQ
- NEHarbour
- AtlanticOcean
- SWHarbour

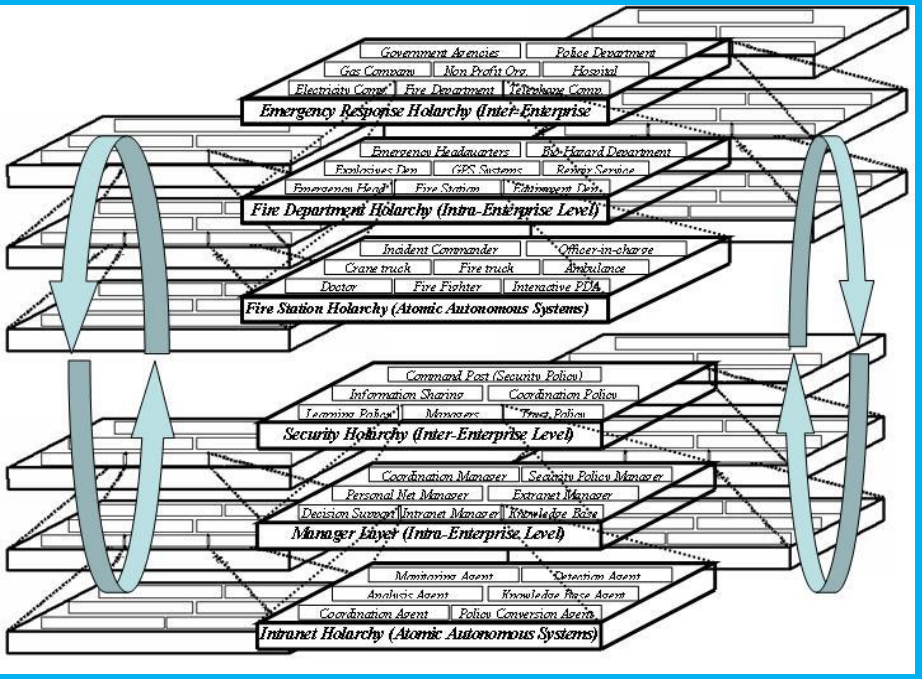
FireFighterLeader_1



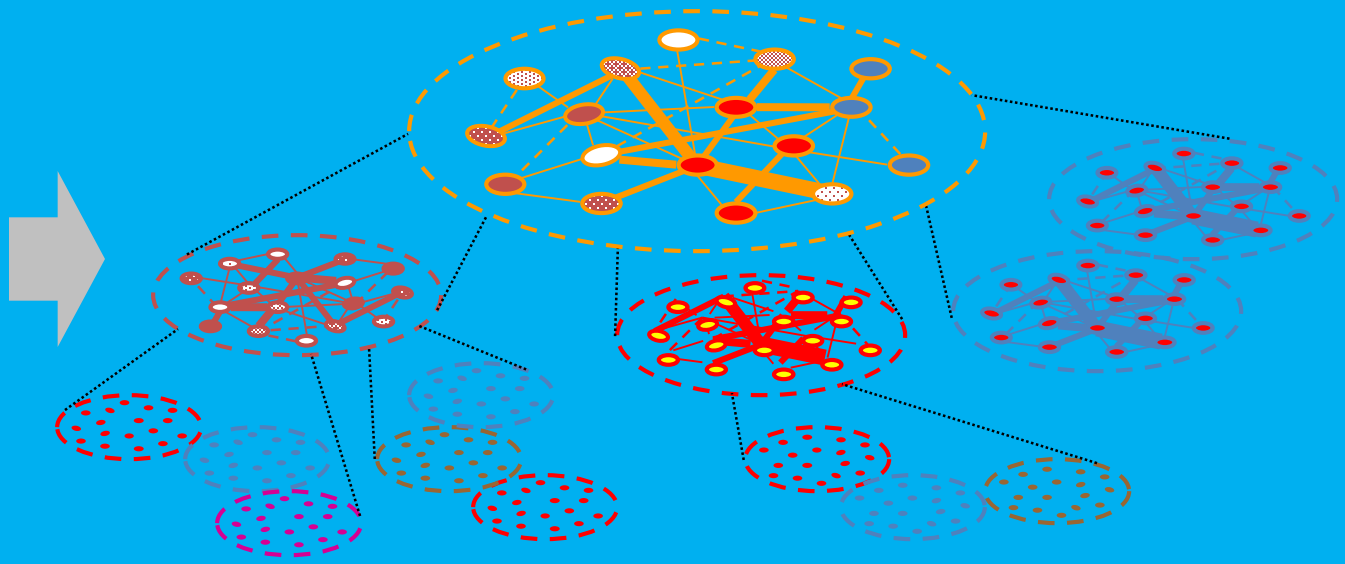
RESULTS: POINT TO INEFFECTIVE POLICIES



Variable	***RS1***	***RS2***	***RS3***	***RS4***
Obliged to promptly collect data	¬O	O	¬O	¬O
Prohibited from exclusion zone	P	P	¬P	P
Fire tug team owned by	CG	CG	CG	FF



EMERGENCE OF INSTITUTIONAL NORMS FROM INDIVIDUAL AGENT INTERACTIONS



Global Joint Force Alliance

TOP-DOWN HORIZONTAL INTEGRATION
S.O.S. Network Policies

Regional Joint Force Alliance

National Joint Force Alliance

National Joint Force Alliance

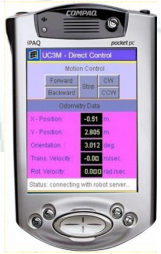
Individual Protocols

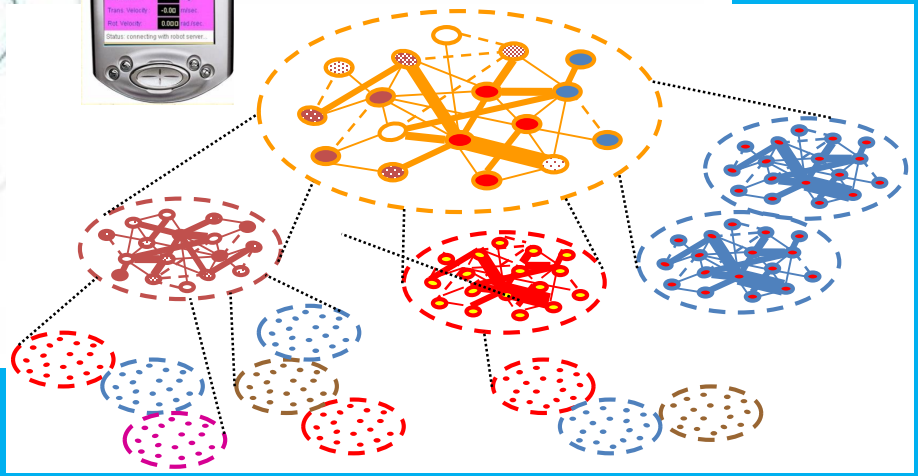
Individual Protocols

BOTTOM-UP VERTICAL INTEGRATION

National Joint Force Alliance
Partner organizations

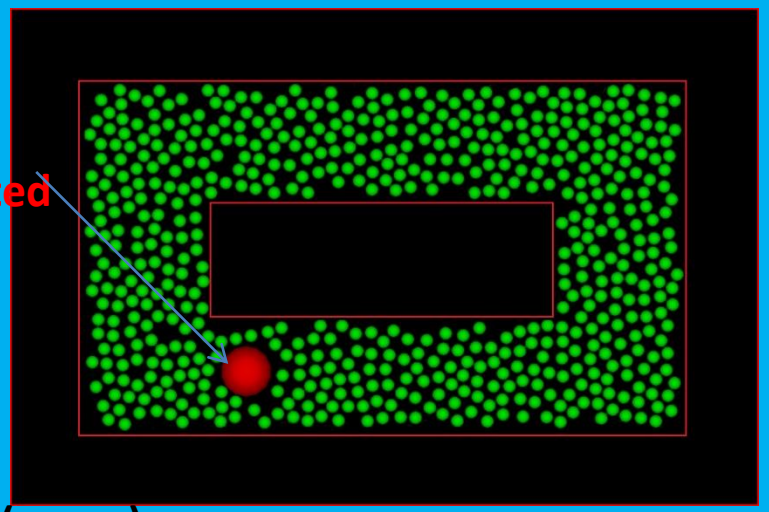
National Joint Force Alliance
Partner organizations

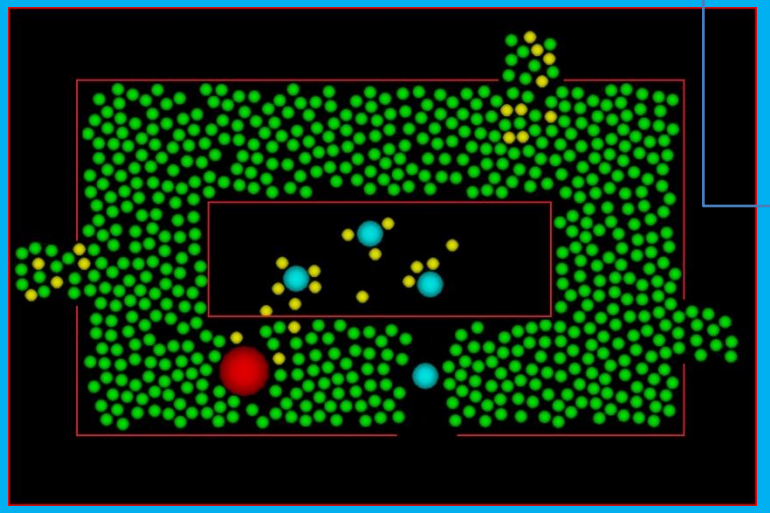




Stadium Evacuation

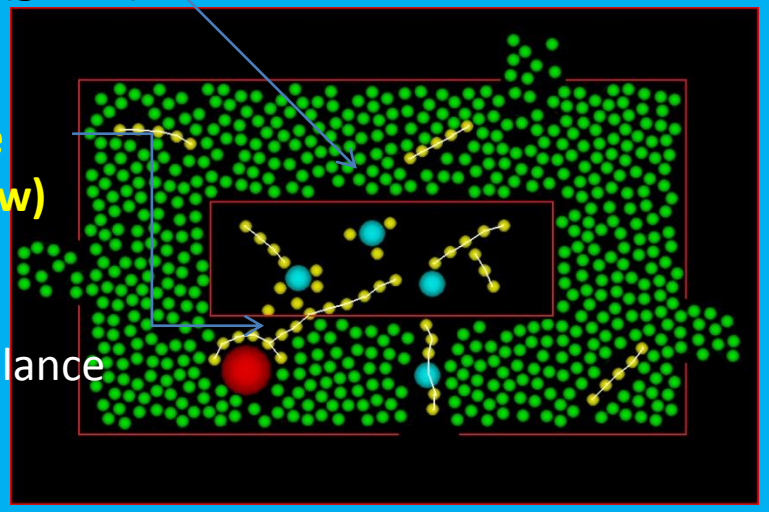
Self-Organising Security (SOS) via Mobile App





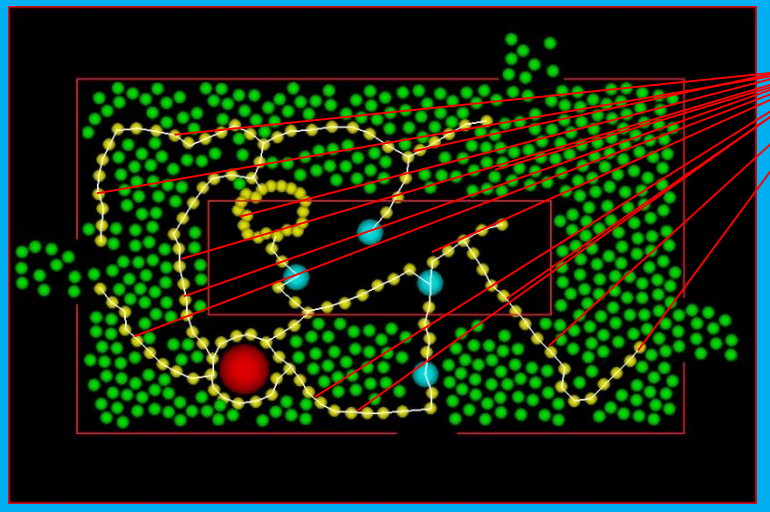
Bomb detected

Public (green)

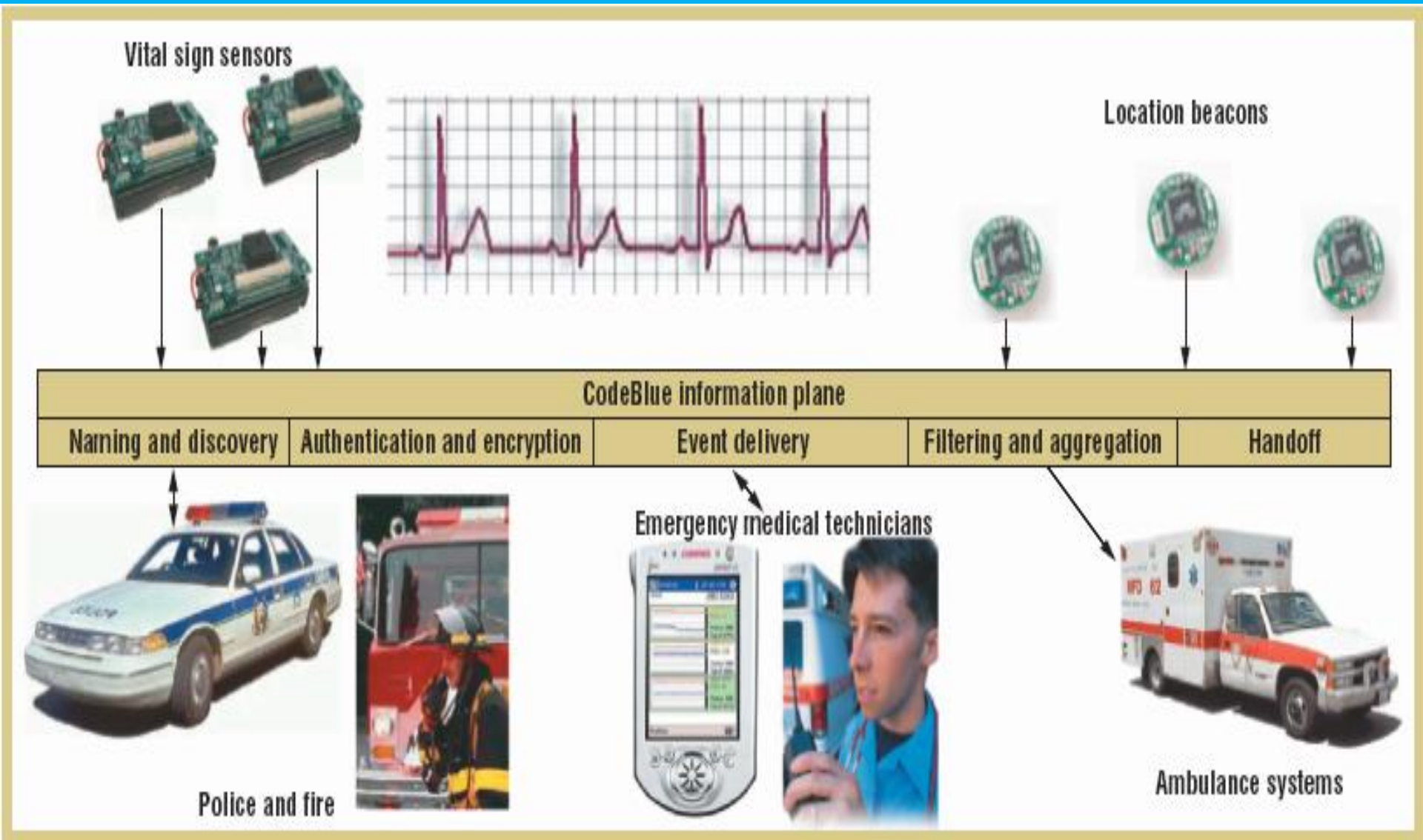


Police (yellow)

Ambulance (blue)



Emergency Response Middleware



Perhaps for version 2 - tbd

Public as Responder

- ✓ Capture image, video and audio via device. Append additional information and share.
- ✓ Identify: Image & face recognition capabilities
- ✓ Instant storage to the cloud
- ✓ All data tagged and easily searchable

POWERFUL SEARCH FUNCTIONALITY

- ✓Search (as authorized) all databases at once, or advanced search options
- ✓Type or Say queries, or Speak Search results
- ✓Search capabilities allow users to connect with others who have made similar inquires.
- ✓Search all discussions
- ✓Search profiles for specific skills or experience.
- ✓Search Persistency – 72 hr. no hit query

The Role of Social Media

Self-Organizing Security

SAFETY AND SECURITY WITH CITIZENS

Respond WITH rather than FOR people


“As for the future, your task is not to foresee it but to enable it.”
Antoine de Saint-Exupery