DEFENCE R&D DÉFENSE

Joint Command Decision Support System

Adel Guitouni, Micheline Bélanger, Donna Wood
Defence Research and Development Canada

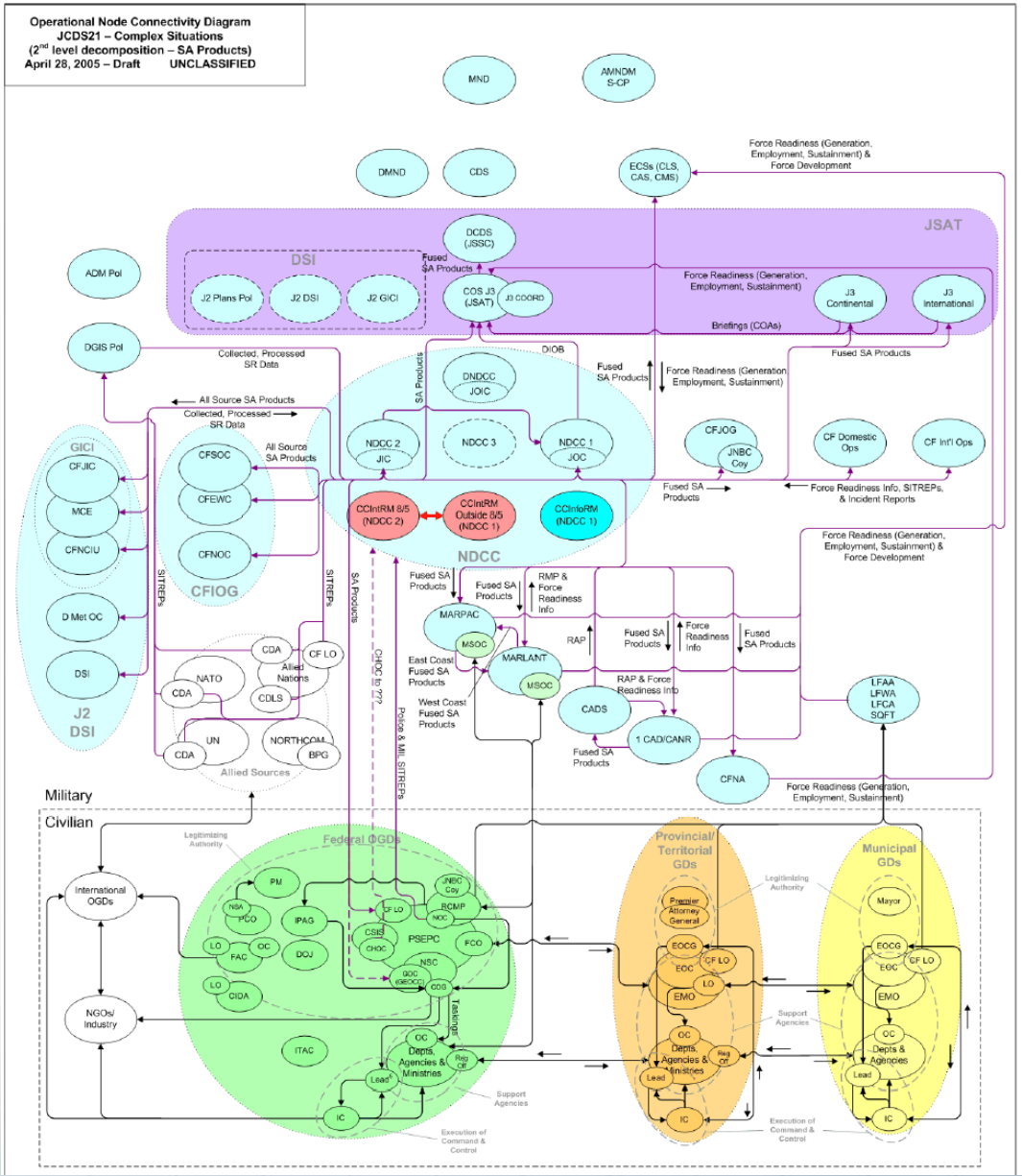
Agenda

- Joint Staff Decision Making Processes
- Joint Command Decision Support
- Joint Command Decision Support System (JCDS 21)
- Empirical Results
- Concluding remarks

Example of Information Sharing View of the Crisis and Emergency Management C2

Operational View 2:
Operational Node Connectivity Description

OV-2.3b Second Level of Decomposition– Information Sharing



Complex Decision-Making Environment

- Time sensitive response activities
- Simultaneous life-threatening incidents across multiple geographic locations
- Multiple stakeholders, multi-agency response teams and difficult interactions
- Distributed Command and Control on personnel, equipments and resources
  - Often cross multi-jurisdictional boundaries
- Multiple information feeds and communication channels, generally non interoperable
- Diversity of informal and formal business processes
- Complex set of policy constraints/restraints as well as multifora of legal issues
- Dynamic nature of crisis and emergency management situations
- Uniqueness of each and every event
- …

JCDS 21 Methodology

Understand Business processes *(Joint Command Decision in JIMP)*

Decision Support Requirements

Integrate Human and Organization Sciences

Design Decision Support System

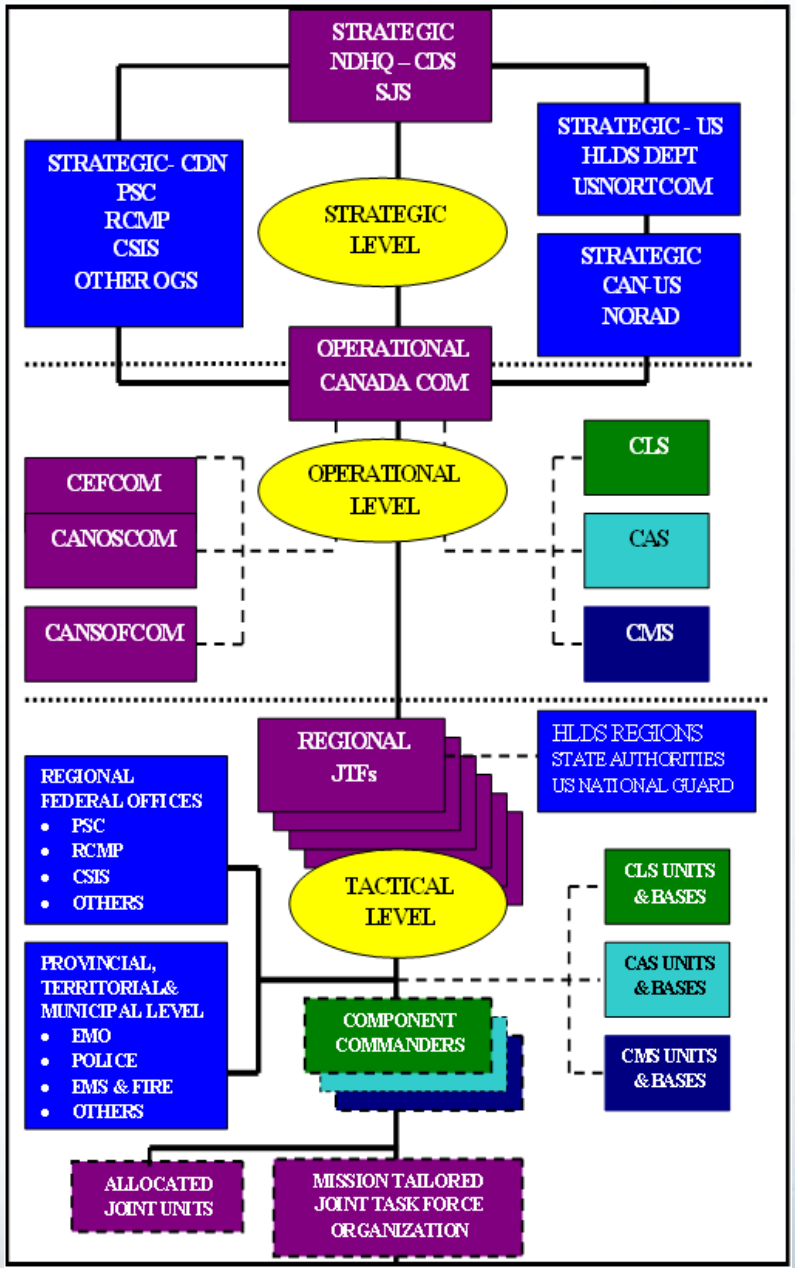
Decision Support Solutions

Design a SOS Integration Architecture

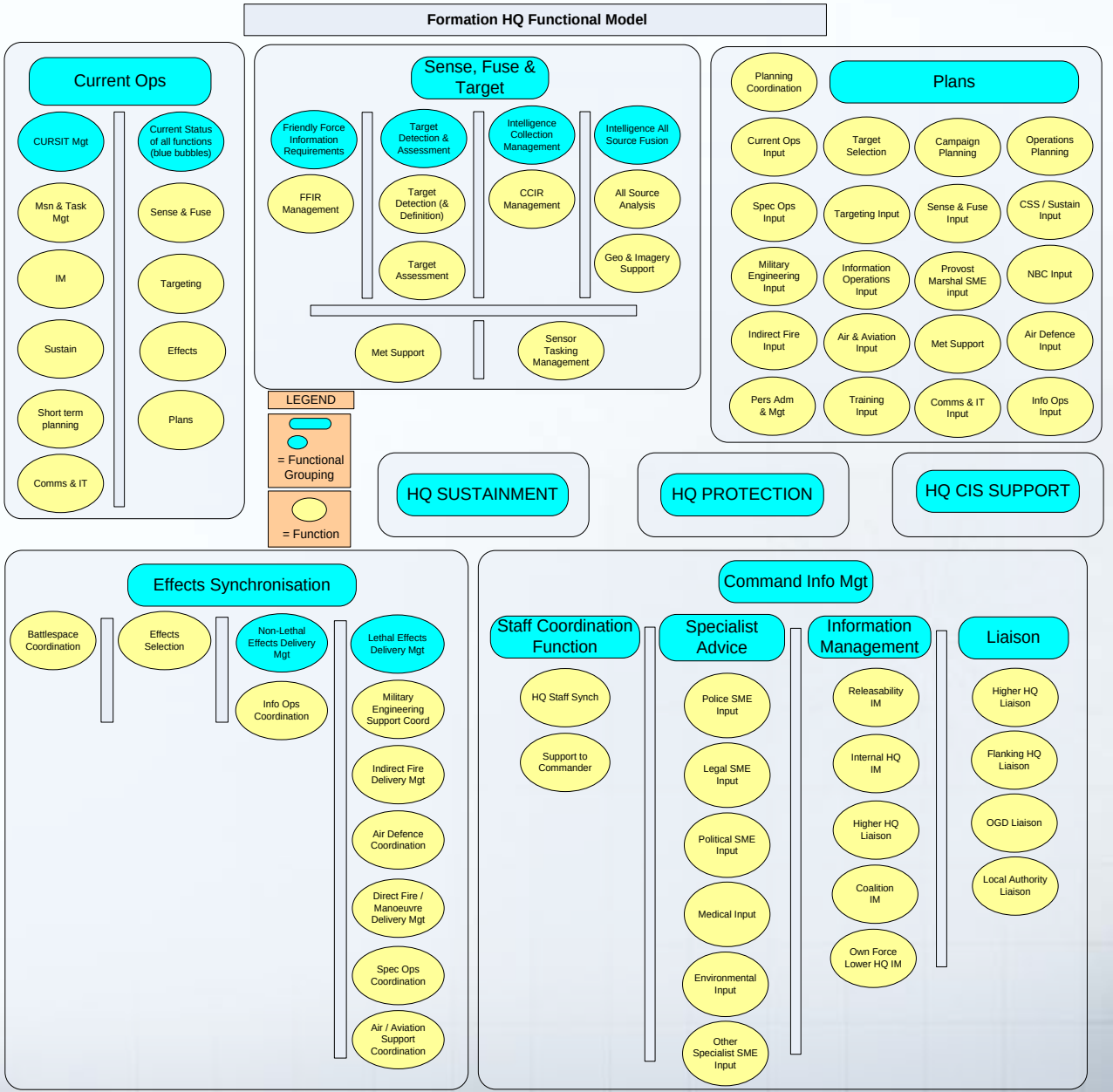
Service-oriented Architecture and other Systems Integration Standards

Metrics for Assessing Decision Improvements (MOEs/MOPs)

Level Structures for Targeted Commander



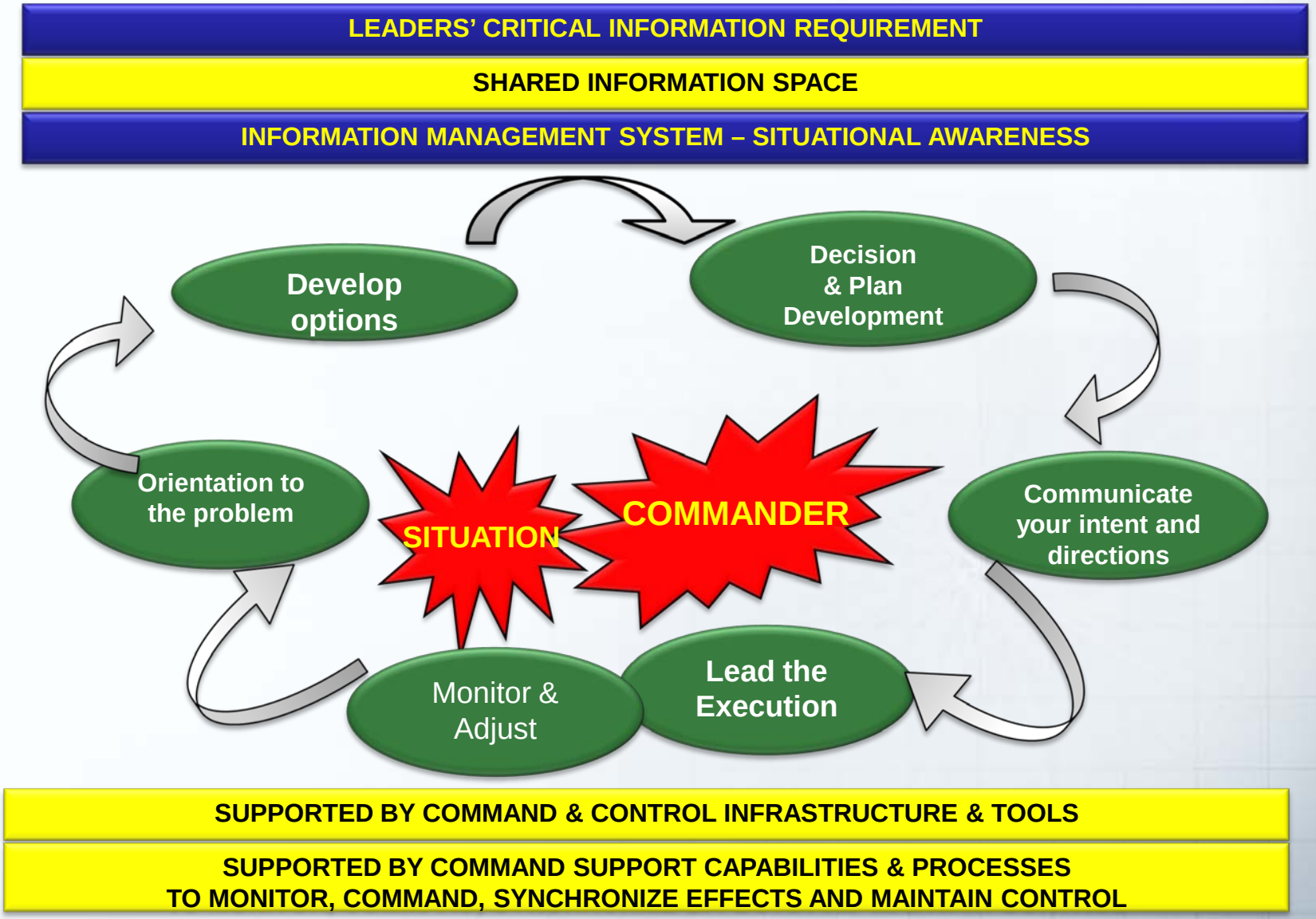
Headquarters Functional Model



Joint Staff Decision Making Processes

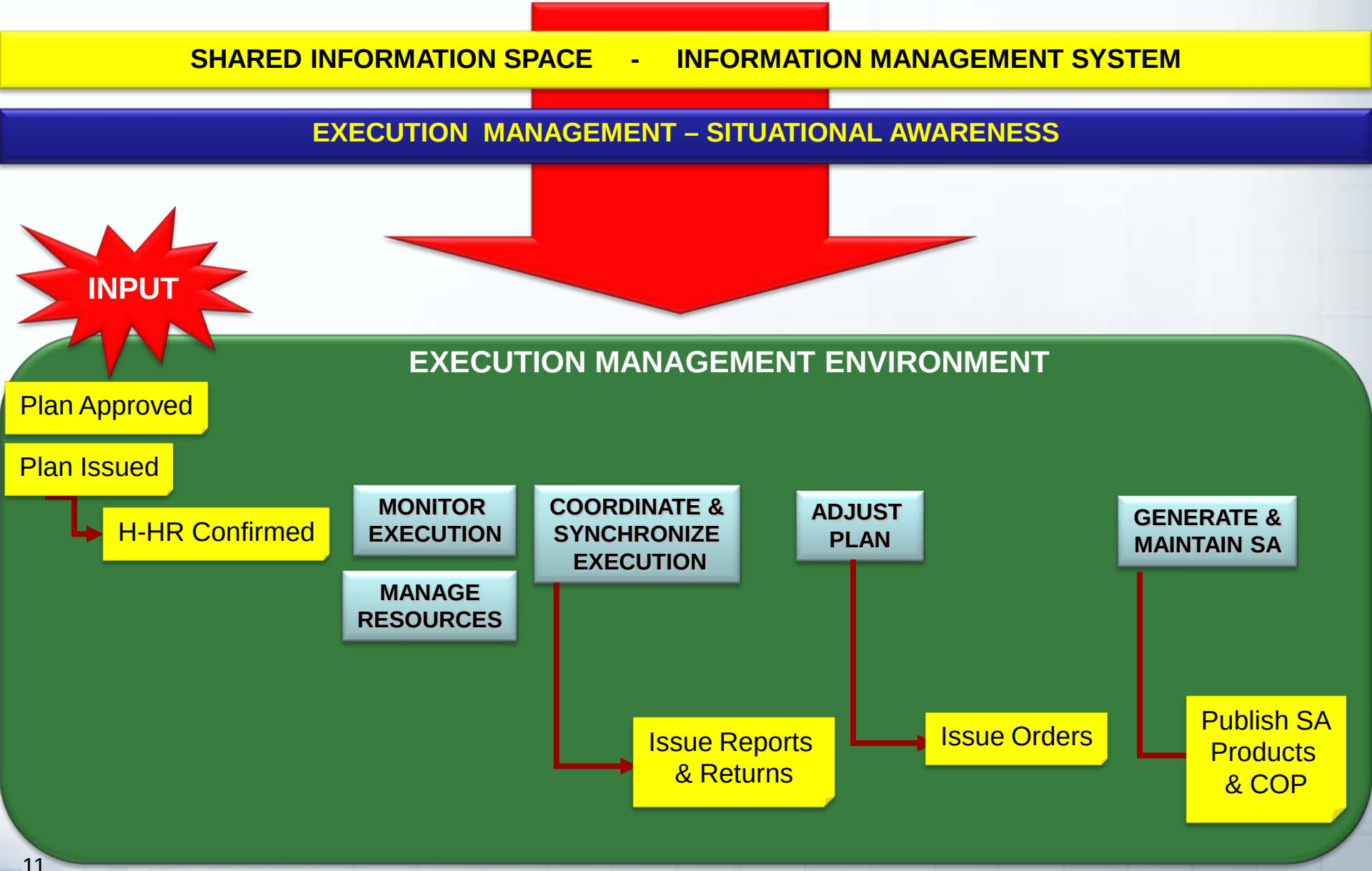
- The Command Process
- The Planning Process
- The Current Operations Process
- The Situational Awareness Process
- The Decision Making Process

Command Process



Planning Process Information Flow & Requirements

Current Operation Process



Situational Awareness Process

Decision Making Process

- The decision making process is all about the dynamic which exists between a Commander and his subordinates, the Commander and his Staff and the Commander and his superior(s).
- The information requirements needed in support of the decision making process to make timely and relevant decisions are:
  - SA information to include both baseline and targeted SA input and products;
  - Planning Information and Data Input & products;
  - Intelligence input and products;
  - Orders, instructions and guidance; and,
  - Decision Support Templates.
- How can we support Joint Commanders in their decision making process?

How to Design Decision Support Solutions?

Understand Business processes

(Joint Command Decision in JIMP)

Decision Support Requirements

Integrate Human and Organization Sciences

Design Decision Support System

Decision Support Solutions

Design a SOS Integration Architecture

Service-oriented Architecture and other Systems Integration Standards

Metrics for Assessing Decision Improvements (MOEs/MOPs)

Joint Command Decision Support Concepts

- Cohesive Visioning
- Integration
- Incremental Progress
- Understanding Human and Organizational Factors
- Enabling Individual and Collective Situation Awareness
- Facilitating Joint Reactive and Deliberative Planning and Decision Analysis
- Supporting Execution and Plan Management

Joint Command Decision Support Concepts (1/2)

- Cohesive Visioning
  - Joint Command Decision Support should be developed around agreed concepts, a shared vision and ongoing unity of effort
- Integration
  - Joint command decision support should be developed around a system-of-system vision integrating process, organization and technology enhancements and leveraging investments to achieve decision superiority.
    - Collaboration is one piece of the puzzle; program integration another.
- Incremental Progress
  - Joint Command Decision Support should be developed around continuous, successive enhancement and capability augmentation
- Understanding Human and Organizational Factors
  - Joint Command Decision Support should be conceived based on a sound appreciation of Human and Organizational sciences.
    - Supported cognitive capacity, shared situation awareness, common intent, trust in distributed teams and in automation, and communication and information strategies are key foundations joint decision effectiveness

Joint Command Decision Support Concepts (2/2)

- Enabling Individual and Collective Situation Awareness
  - Joint Command Decision Support should enable seamless individual and collective situation awareness

- Facilitating Joint Reactive and Deliberative Planning and Decision Analysis
  - Joint Command Decision Support should effectively support time-critical as well as deliberative collaborative joint planning, distributed team problem solving and options analysis

- Supporting Execution and Plan Management
  - Joint Command Decision Support should support execution oversight and facilitate plan repairs and timely corrective adjustments

JCDS should support the key C2 functions

Communication and Collaboration

Situation Awareness Support

Planning and Decision Support

Execution Management and Assets Monitoring

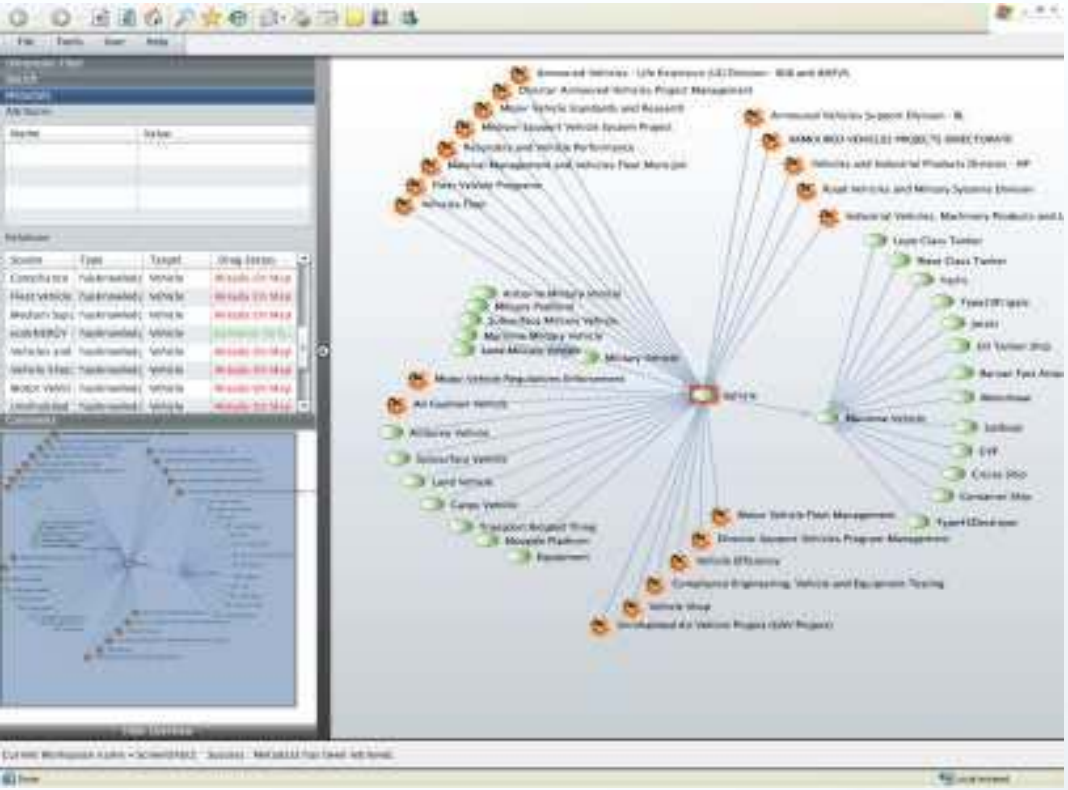
Integration through SOA

Experiments/Demonstration (Domestic Operations Context)

Information and Knowledge Management for Situation Awareness and Response Support

- Advanced Command Portal provides the foundation for a Command and Control Collaborative Environment, supporting shared situation awareness, information management, systems integration and collaborative work.
  - Information and Knowledge Management services
  - User-centric environment based on context and user-role management
  - Collaborative environment that facilitates information sharing and collaborative work

Information and Knowledge Management for Situation Awareness and Response Support



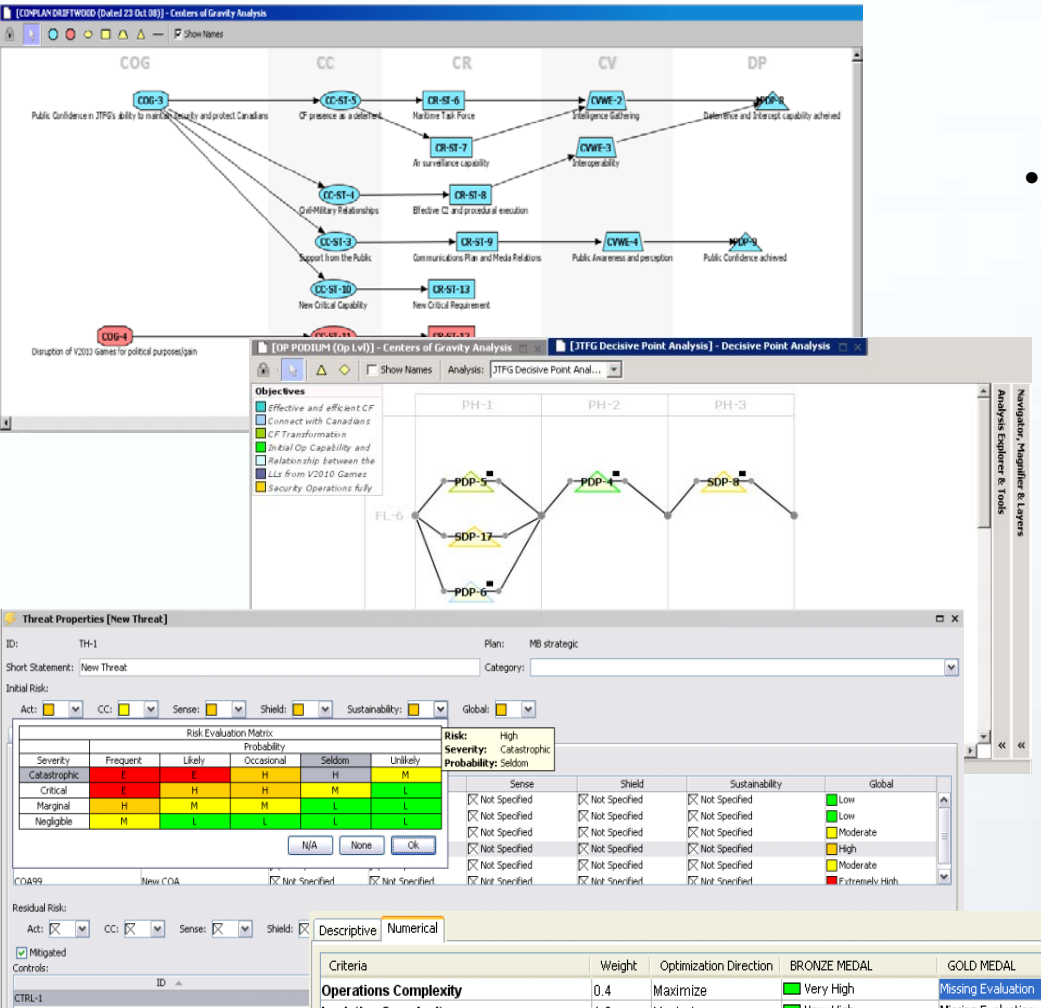
- KMapper supports time sensitive identification, localization, visualization and exploitation of knowledge assets related to the situation being faced.
  - Automated Knowledge Assets discovery and visualization services
  - Automated discovery of pertinent organizations, individuals and groups

Information and Knowledge Management for Situation Awareness and Response Support

• Total Resource Visibility Tool (TRV) is a decision support system for near real-time resource visibility, offering the ability to know the identity, location, status, and condition of assets in the logistics chain at the operational level.

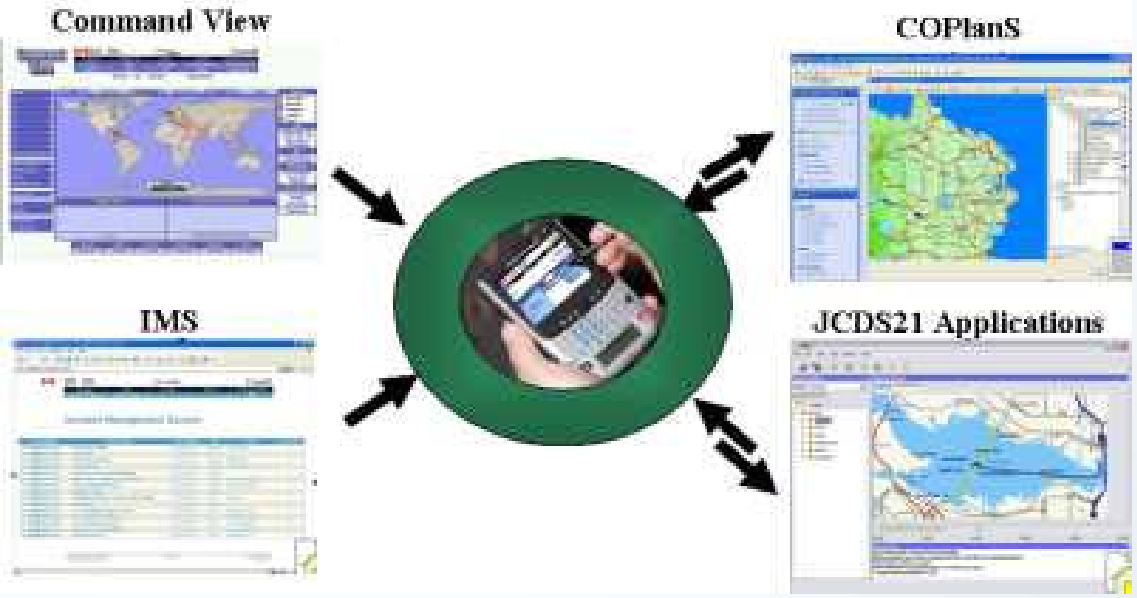
- Application and services to support assets monitoring (identity, location, status and condition of assets)
- Analysis tools of resources employment and usage, readiness and availability
- GIS visualization
- Data sources integration services.

Planning and Options Analysis



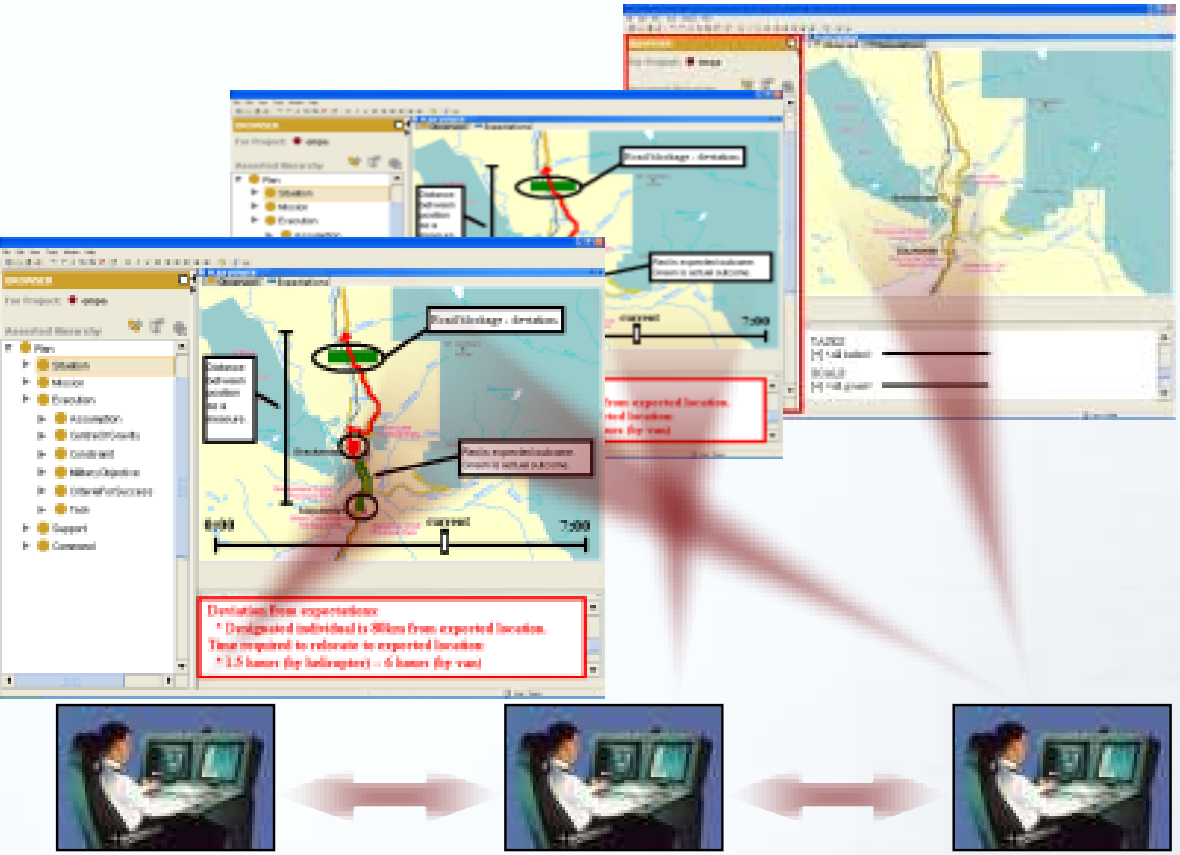
- Operations Planning Process Advanced Decision Support (OPP-ADS) is a suite of advanced decision-support tools to support the deliberate and time sensitive operational planning process
  - Situation Analysis
  - COA Development and Analysis
  - Center of Gravity Analysis
  - Risk Management
  - Decisive Point Analysis
  - Decision Criteria and Matrix Management
  - Dynamic Link Management
  - Plan Management
  - …

Planning, Option Analysis, Execution and Operation management



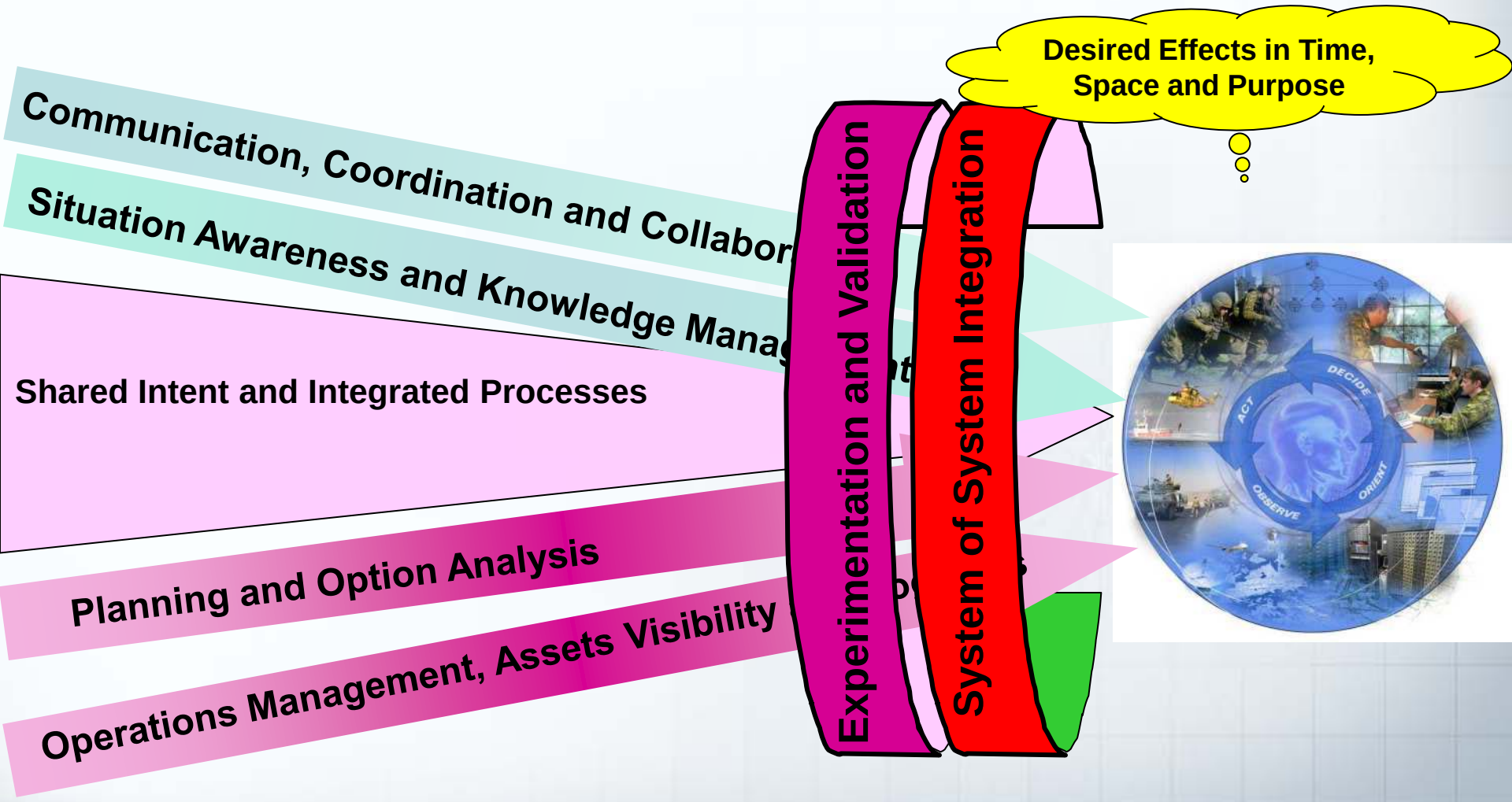
- Commander HandhEld Support System (CHESS) is a tool for real-time exchange of information with key DND systems through a wireless handheld device.
  - Multi-Networks Communication
  - Limited bandwidth and unstable connectivity information delivery services
  - Notification and alerts
  - Electronic documents management services
  - Access to CommandView and COPlanS

Execution and Operation Management

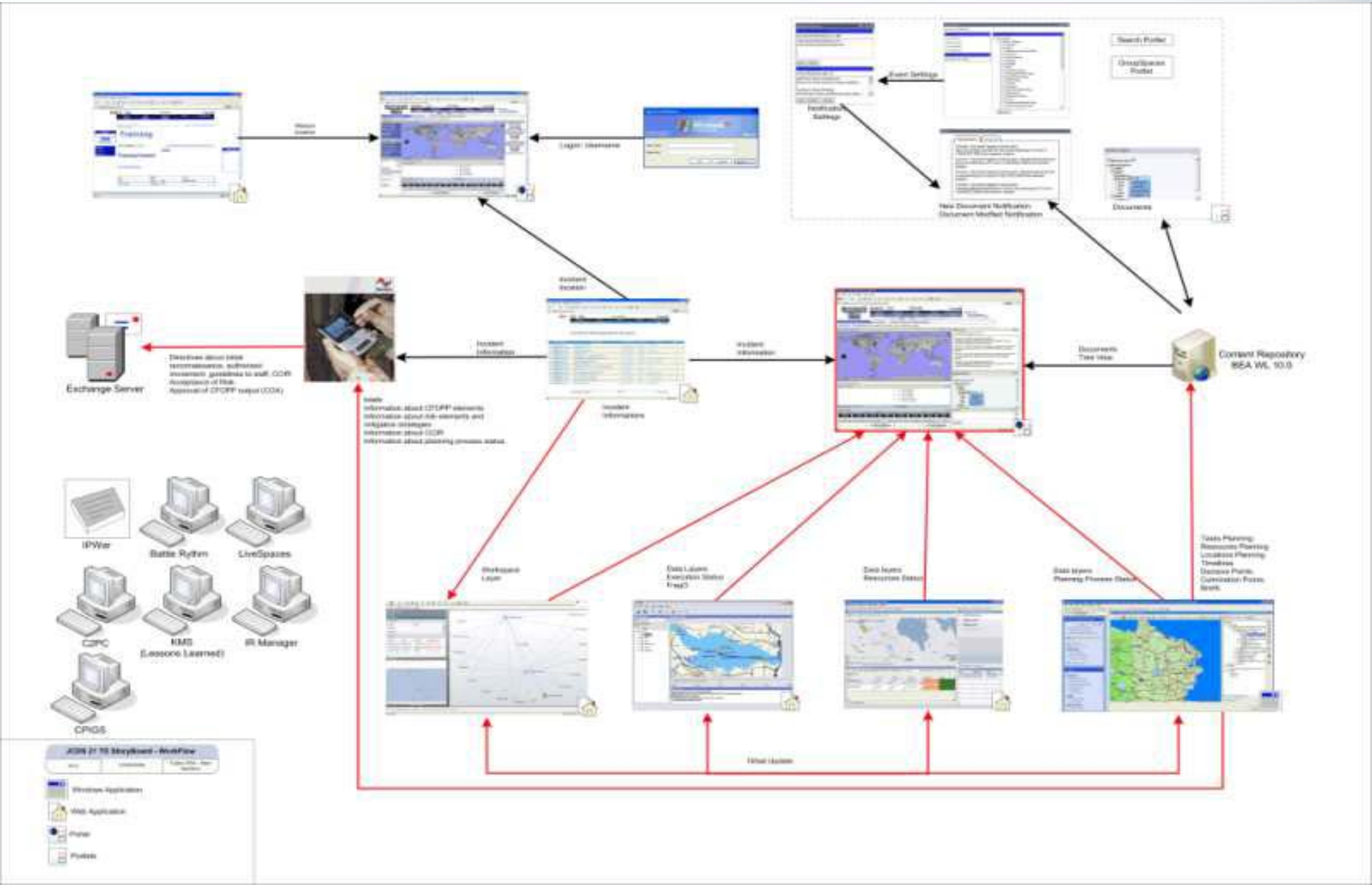


- Execution Management and Plan Adaptation (EMPA) is a distributed and multi-layered real-time monitoring of plan execution. Automated change detection. Decision aid for plan repair. Continuous forecasting.
  - Distributed, multi-layered execution management services
  - Automated execution monitoring algorithms

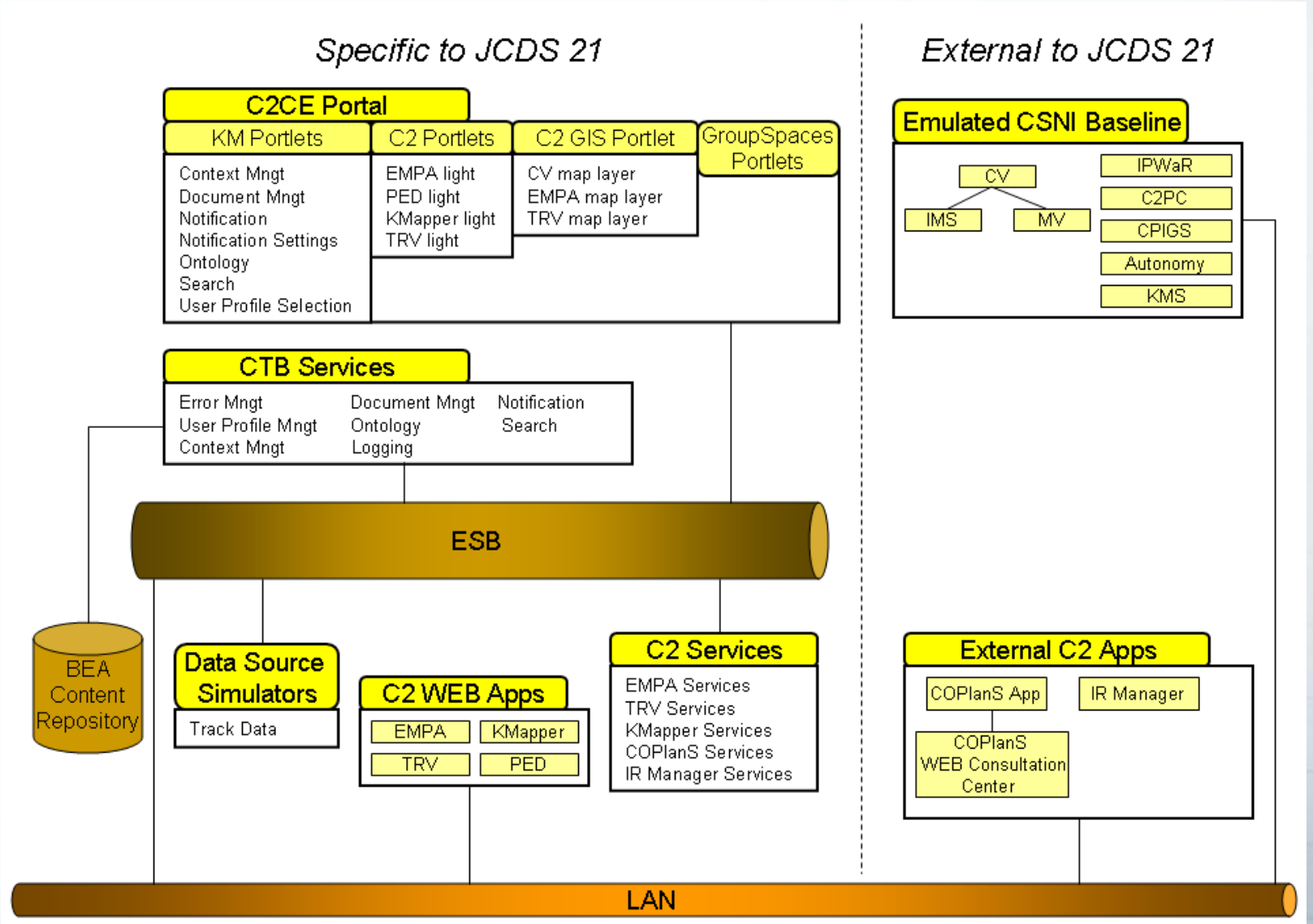
Decision Support System Integrated Approach



System of System Integration

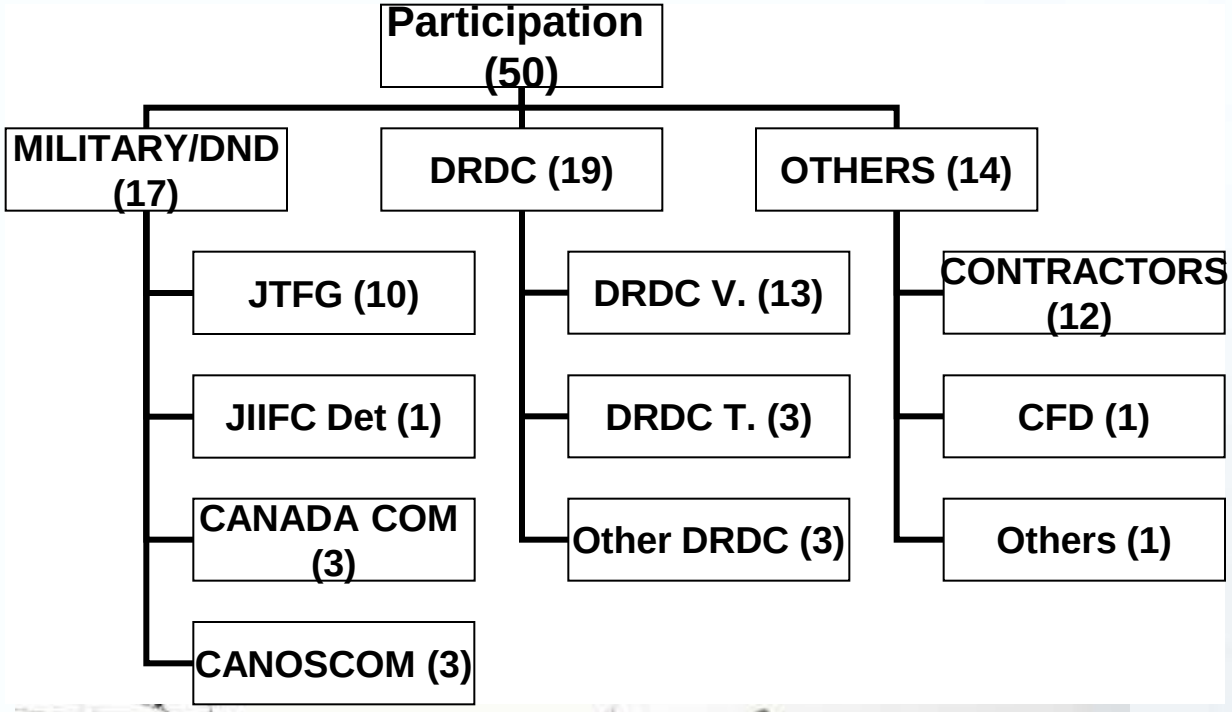


System of System Integration: SOA



JCDS 21 Service-Oriented Architecture (SOA)

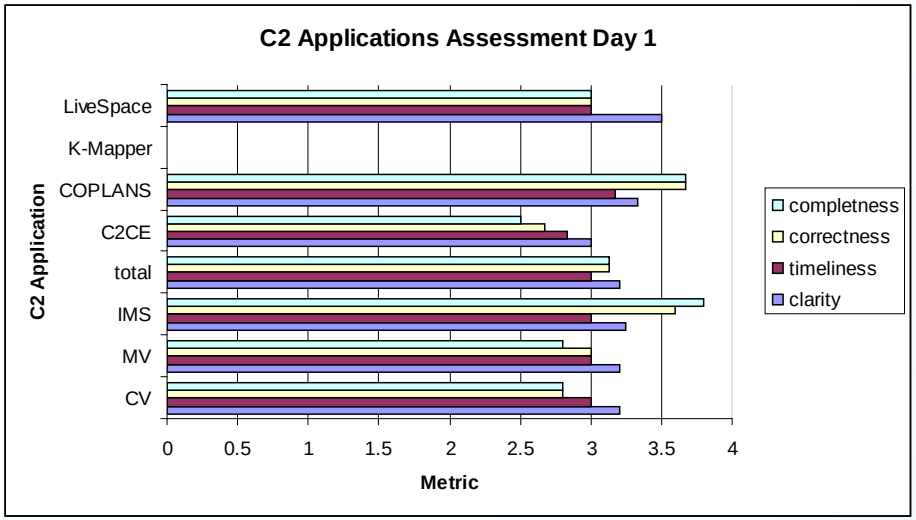
JCDS21 Final Experiment: Overview

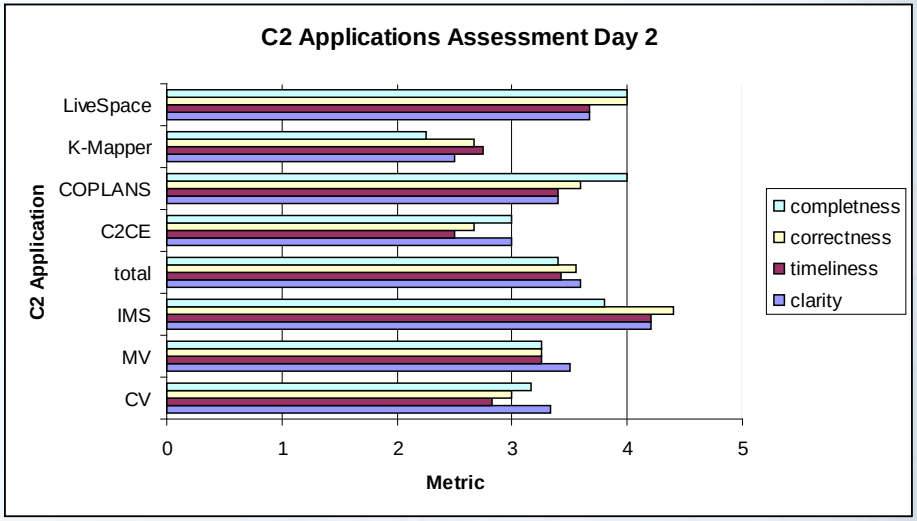


- Objectives:
  - Determine whether the Integrated Command and Control Collaborative Environment (IC2CE) supports and influences CF time-sensitive decision-making processes
  - Determine if the IC2CE improves shared situation awareness within the Command Post;
  - Determine if the IC2CE improves collaboration within the Command Post and with external agents
- Experiment 2 held in Star Top 20-24 October 2008
- Partnership effort:
  - SJS JIIFC Det
  - Canada COM
  - CANOSCOM
  - JTFG

Empirical Results

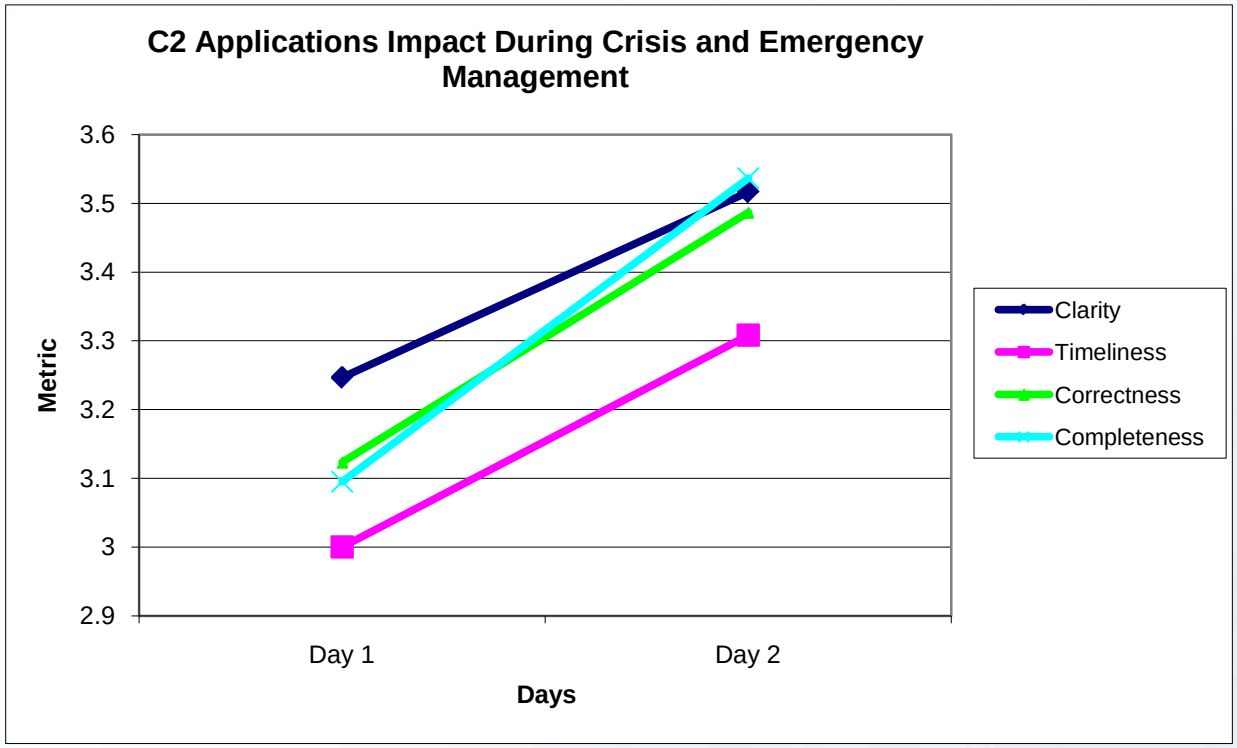
Assessment of JCDS 21 C2 Applications





- Empirical results suggest that the JCDS 21 C2 applications that the technologies and concepts were accepted by end-users
- Participants have assessed the technologies and concepts to be effective

Positive Impact of C2 Applications during Crisis and Emergency Management



Concluding remarks

- JCDS 21 demonstrated an integrated environment to support Joint Command Staff to support the Commander's decision cycle
- JCDS 21 solutions are guided by Human and Organizational Factors in Distributed Operational Teams
- JCDS 21 has developed a formal method for selecting collaboration enablers based on team characteristics, and applied Social Network Analysis to inter-agencies communication in a JIMP environment
- JCDS21 demonstrated a Joint, Net-Enabled Collaborative Environment able to achieve Decision Superiority. This environment includes:
  - knowledge and information management to supporting individual and collective situation awareness,
  - decision and planning aids and
  - execution support enablers to oversight and facilitate plan repairs and timely corrective adjustments


DEFENCE
R&D
DÉFENSE