Command and Control Simulation for Domestic Operations

by

Kendall Wheaton, Walter Dyck, Major Daniel McNamara, Larry Cochran, Anet Greenley, Patrick Lachance, and Douglas Hales

Defence Research and Development Canada
Recherche et développement pour la défense Canada
Canada

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Who We Are:

- Representing
  - Defence R&D Canada
  - Canadian Forces Experimentation Centre
  - Lansdowne Technologies
  - CAE Professional Services
- Based in Ottawa, Canada
- Part of the Joint Command Decision Support 21st Century (JCDS 21) Technology Demonstration Project

CDS Statement

- Vision for an ‘Objective Force’
- Commitment in Principle to
  - EBO
  - Whole of Government Approach
  - Command Centricity
- Data management, knowledge creation and information sharing
  - key enablers to transformation of the Canadian Forces

JCDS 21 TDP

- JCDS 21 Aim is to demonstrate a joint net-enabled collaborative environment to achieve decision superiority.
- JCDS 21 was established to support the CF in developing operational and system requirements for a net-enabled collaborative environment to support strategic decision-making, within a joint, interagency, multi-national and public (JIMP) framework.

Objective

This paper will present an approach for the simulation of the C2 processes in two different contexts based on requirements analysis and architecture modeling.

Methodology: Applying an Architecture Framework to C2 Processes

- Architectures are a perspective of a systems-of-systems construct
- Operations Views (OVs), Systems Views (SVs) and Technical Views (TVs) are suitable for describing C2 processes
- US DoDAF is one of several options and was selected for this project
- Linking architecture products to a business process model will be described in this presentation

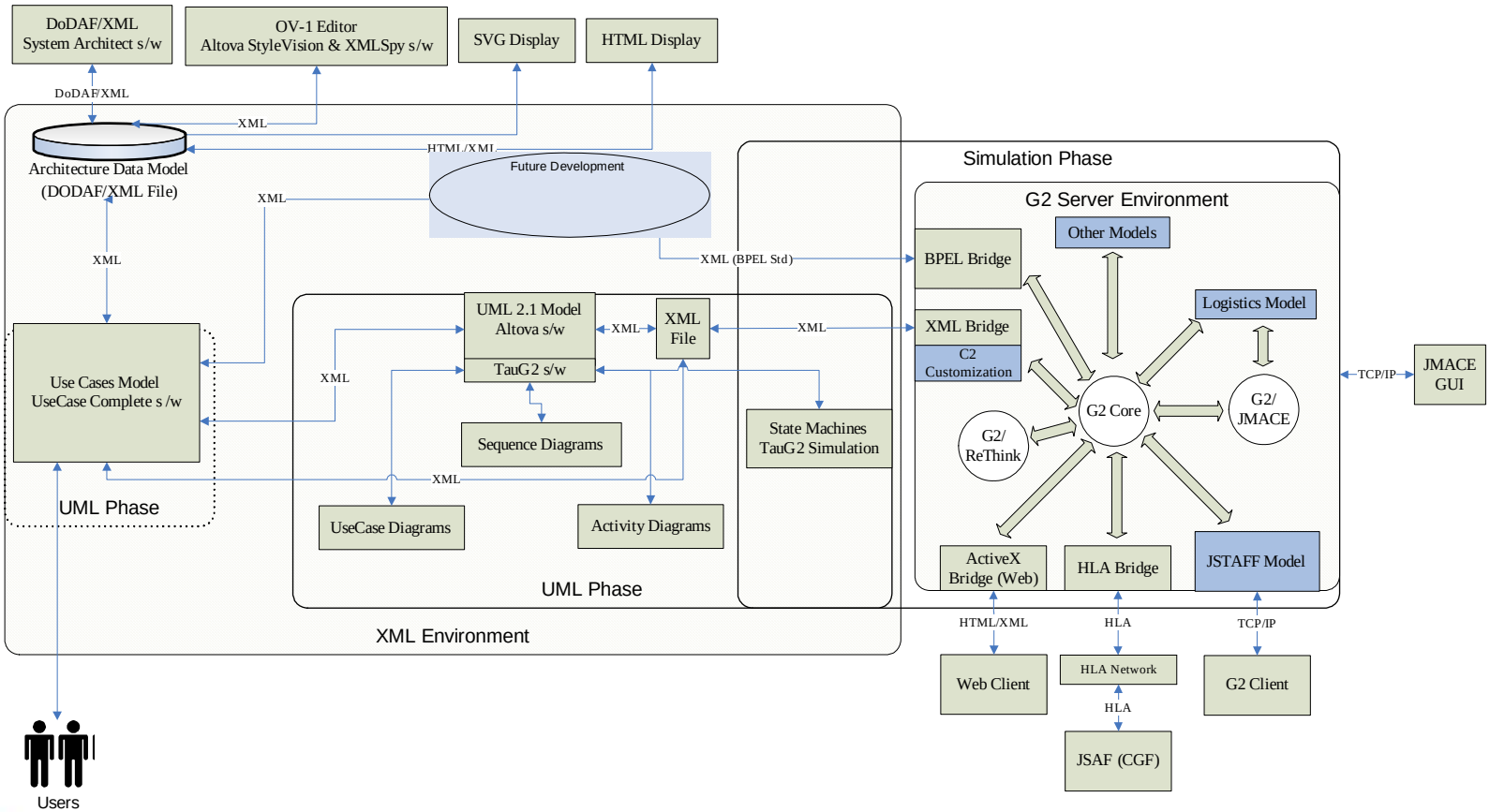
Business Process Modeling

- Business process modeling (BPM) can be used to represent the C2 processes in a headquarters.
- C2 processes were captured in an architecture data model in the form of Use Cases
  - identifying the actors, goals and activities involved in key C2 business processes within a military headquarters
- A flexible simulation framework was developed using a BPM application to represent the business processes identified in the initial phase of architecture development.

Executable Architectures

- Executable architectures are a symbiotic combination of an architecture framework and a simulation environment.
- The sequence of activities depicting organizational process and rule sets (know-how) is developed as a simulation model which can be executed to monitor and analyze behaviour over time, e.g. delays, resource usage, etc.
- Continuous co-evolvement of architecture and simulation requires use tools that move information easily between architecture views and simulation models
  - there are integrated tools such as CORE
  - or architecture information may be transferred to a standalone BPM tool using a standard such as UML

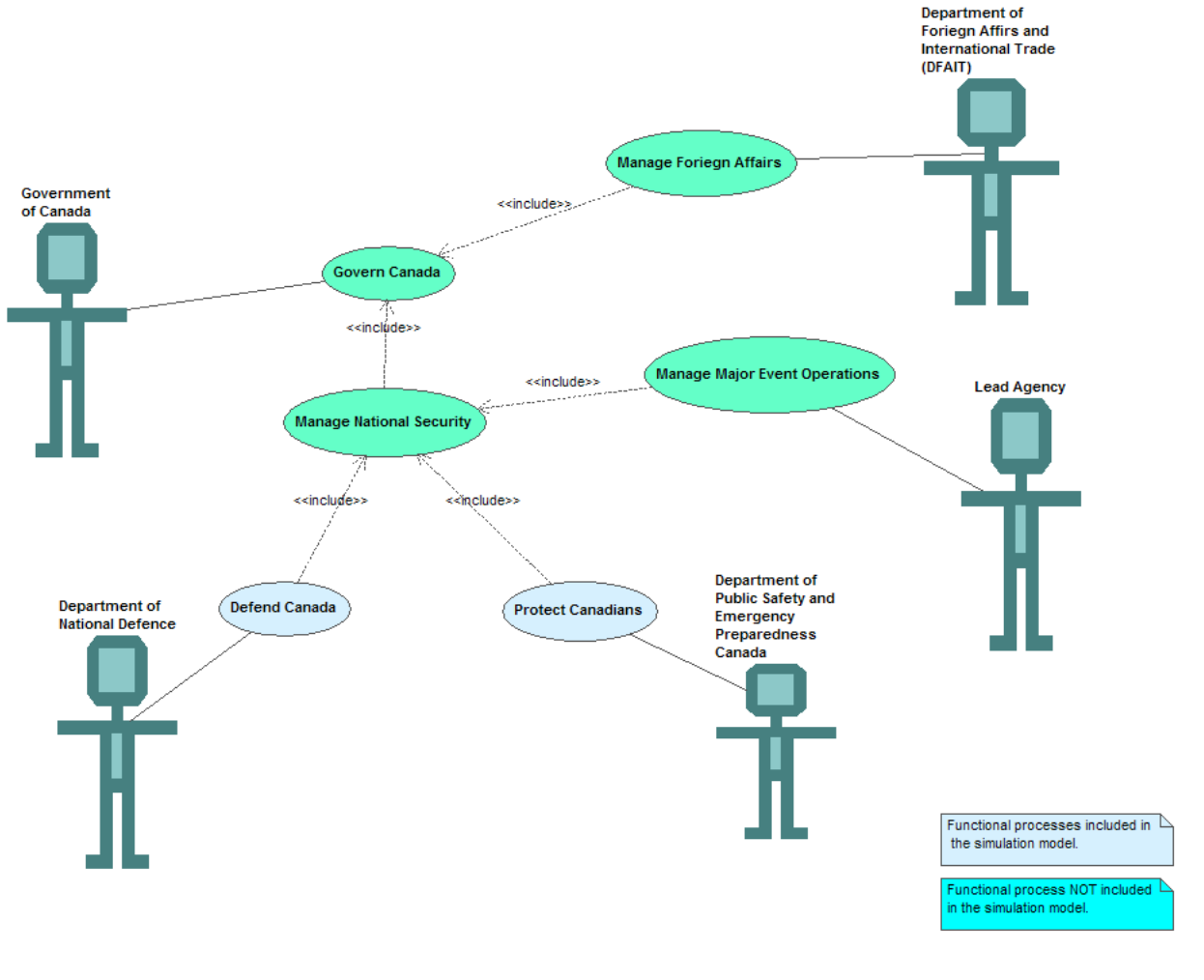
Process Development Schematic



Simulation of C2 Processes

- Simulations of C2 processes were developed to assist with the design of experiments for newly established operational headquarters and to assist scientists assess potential C2 gaps and deficiencies as well as validate Metrics.
- G2/ReThink software was the BPM application used to simulate the C2 processes.
- The C2 processes were documented through observation and/or interviews with operational level headquarters staff (military and other government departments) and the simulation was based upon the DoDAF architecture information.
- The next step was to create Use Cases based upon the observations and interviews which were then modeled using UML (which provided a common language to communicate the architecture information).
- The UML Use Cases were translated manually into the ReThink simulation - in future XML will be employed to automate the translation.

Notional Command Use Case Diagram

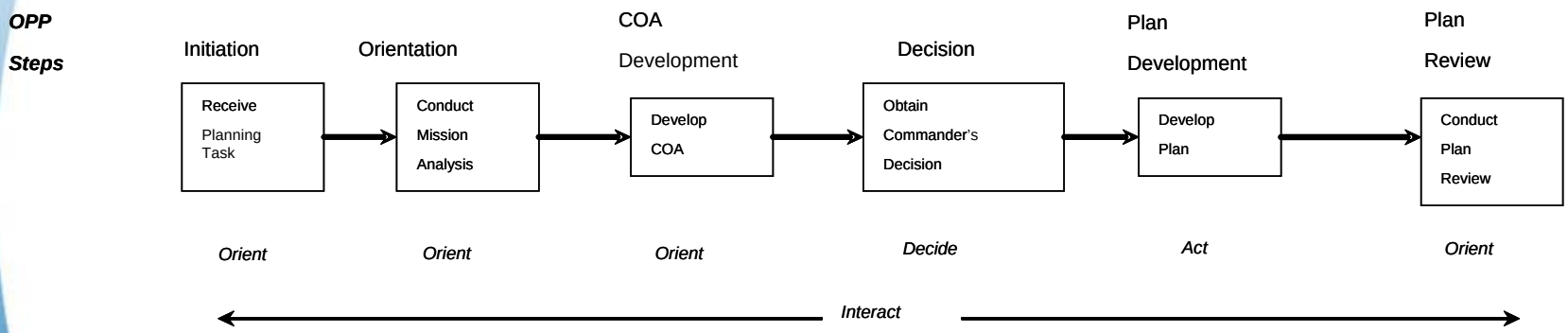


Simulation of Joint C2 in Domestic Operations
Operational Level Military HQ

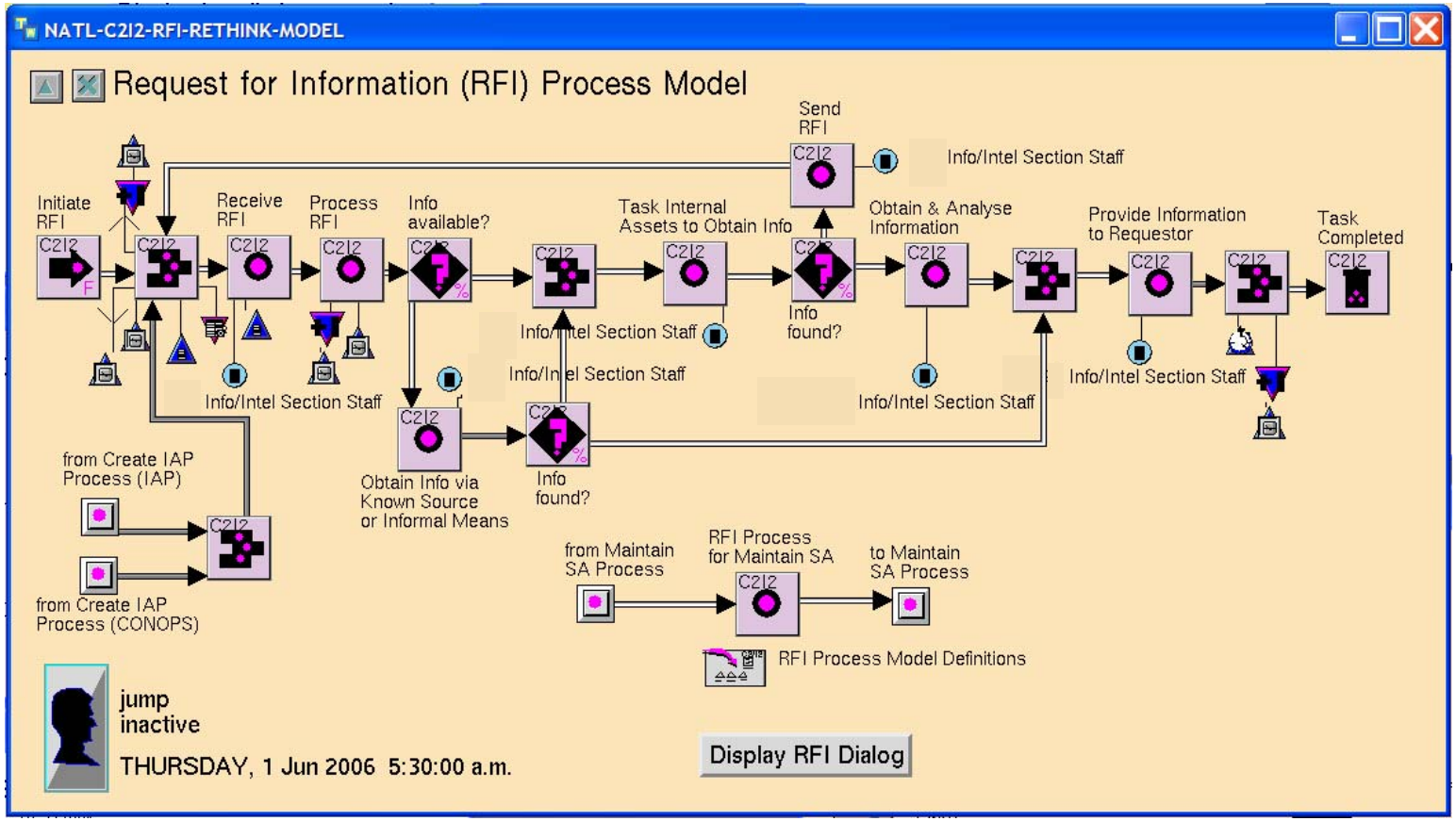
JCDS 21 documented joint operational C2 processes through observation and interviews with CF headquarters staffs. One of the key decisions was agreement on the critical business processes:

- Mission Planning - The main focus of the model involves the Operational Planning Process (OPP).
- Requests for Information (RFI) - Inputs such as government policy, intelligence products and task force situation reports were modeled.
- Common Information Environment (CIE) - A portal was conceived as the primary tool of the CIE. Related activities focused on two elements: (1) posting information, and (2) accessing (pulling) information.
- Battle Rhythm - Captured by modeling battle staff meetings to execute planning (OPP) and the daily Situation Report process which drives the daily briefings.

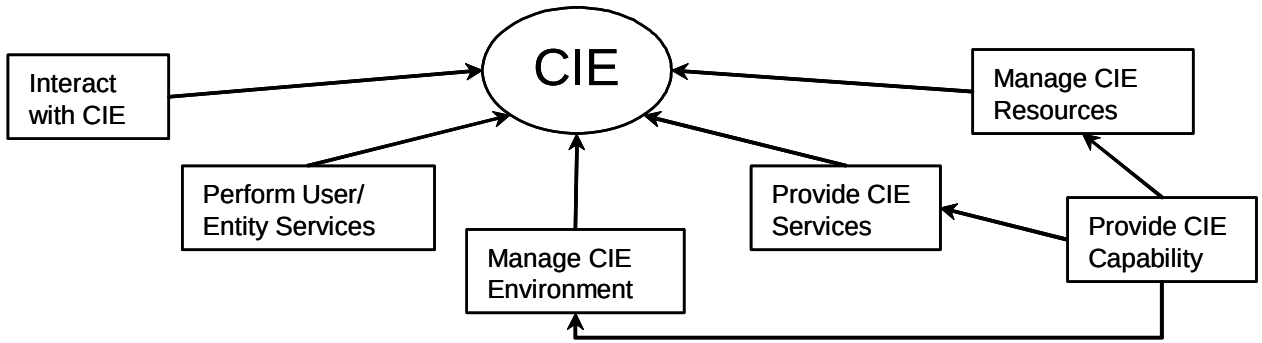
Mission Planning: the Operational Planning Process (Top Level)



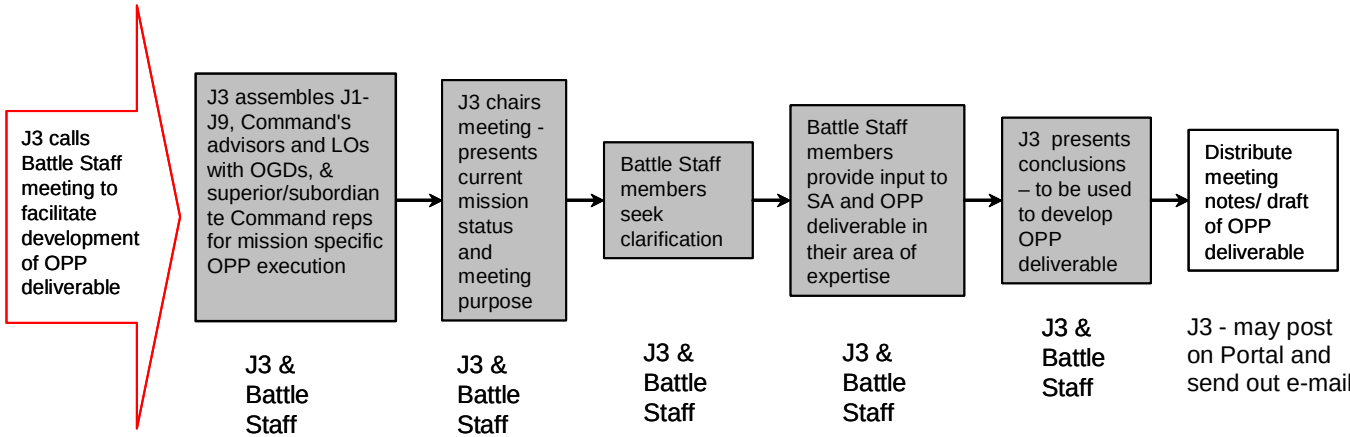
RFI Process Example in ReThink

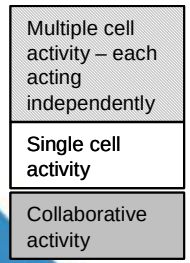


Provide Collaborative Information Exchange – Top Level



Battle Rhythm Process – Battle Staff Meetings



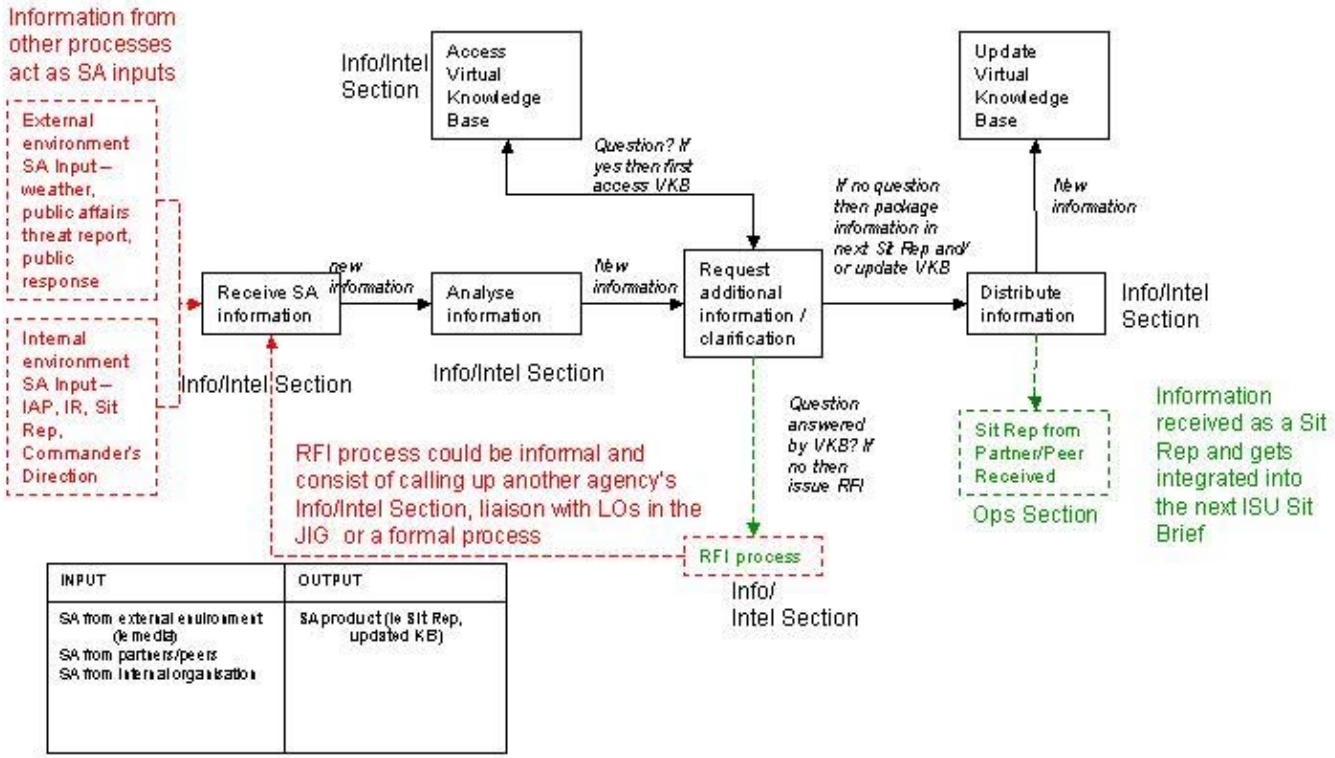


Simulation of Joint C2 in Domestic Operations
Tactical Level Interagency C2

- The work conducted by the Canadian Forces Experimentation Centre (CFEC) has focused on identifying Interagency business processes, creating models and simulating them.
- Several federal agencies provided input and participated in the development work of these processes, the initial business processes used in the study were:

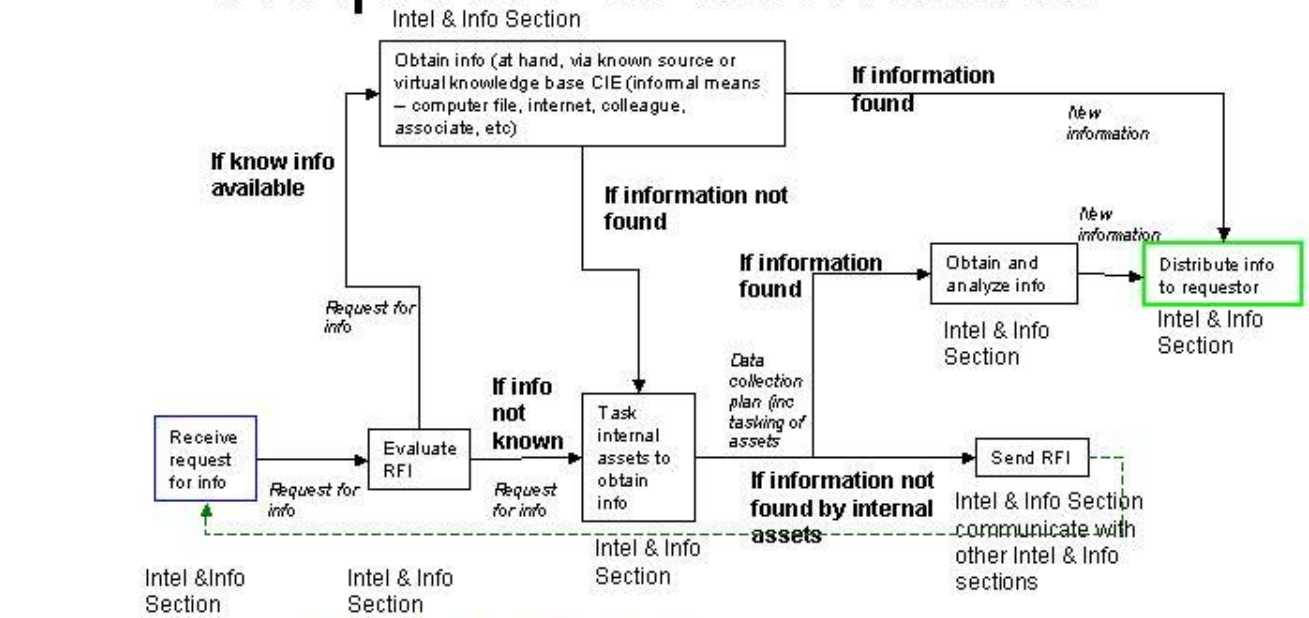
- SITREP
- Maintain Situational Awareness
- Request For Information
- Incident Report
- Incident Action Plan
- Request for Assistance
- Transfer of Authority
- Handover
- Incident Public Affairs

Maintain Situation Awareness (Monitor Situation – internal INT process)



Process Diagram for Interagency Maintain Situation Awareness

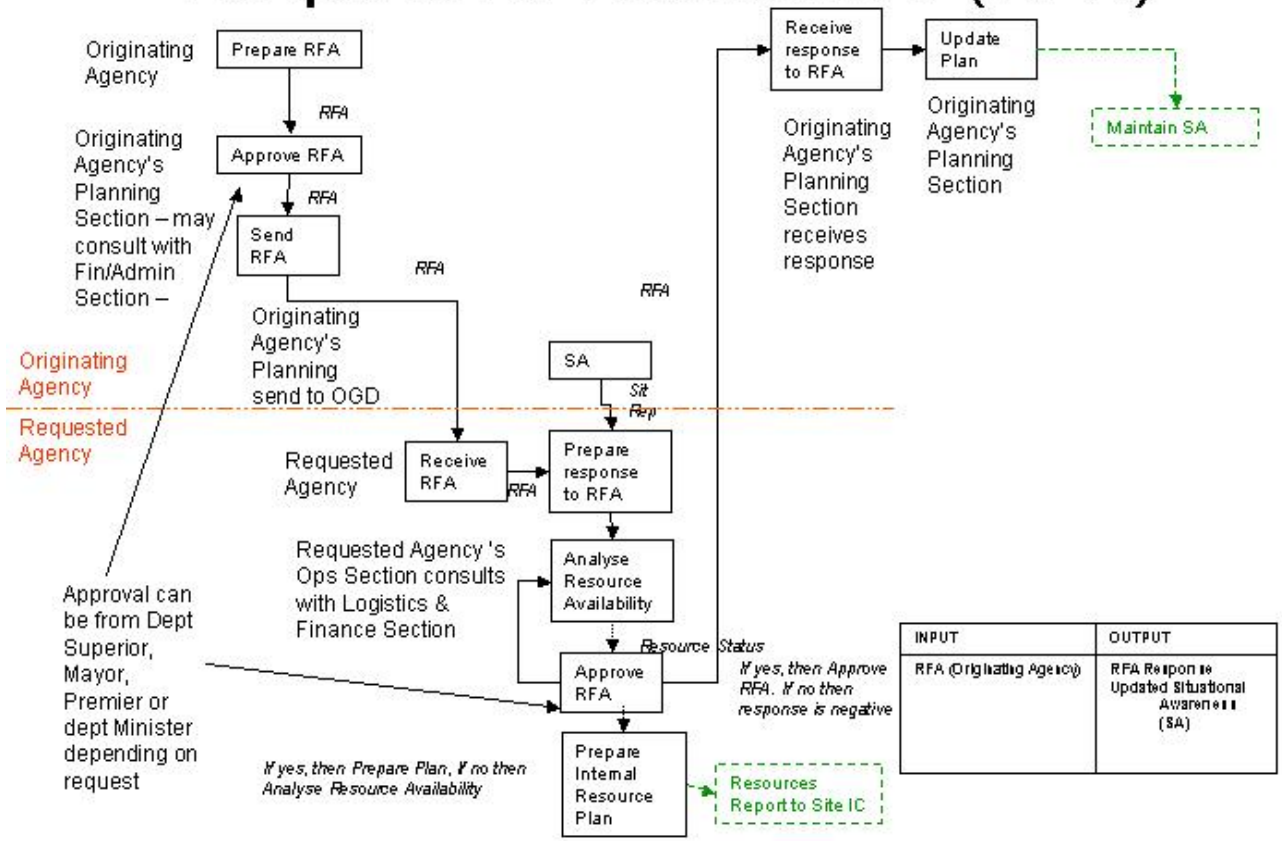
Request For Information



INPUT	OUTPUT
Request for information from partner/peer	RFI Response

Process Diagram for Interagency Request for Information

Request for Assistance (RFA)



Process Diagram for Interagency Request for Assistance

Scenario Development

- The development of a scenario for a Joint C2 DOMOPS model must provide adequate detail to make the events realistic in description and timing and describe sufficient severity to stimulate appropriate actor response.
- The scenario under development was based upon ARDENT SENTRY 06: an exercise which was to provide a forum in which selected senior officials, federal departments and agencies and provincial emergency management organizations could rehearse their roles and responsibilities in dealing with significant emergency events affecting the national interest.
- AS06 consisted of a number of events varying in severity and scope in multiple locations in both Canada and the US that revolved around several main threads:
  - Terrorist Threat to Critical Infrastructure
  - Maritime Proliferation Security Initiative
  - Explosion of Radiological Dispersion Devices
  - Pandemic Influenza
- An Exercise Management Tool has been developed to store and manage the MSEL automatically creating email or other injects from the MSEL and tracking and correlating the responses.

Status of Modeling Effort

- The simulation supports two distinct models:
  - a business process model of the joint, operational level headquarters and the Operational Planning Process
  - a business process model of national Major Event Security Operations and Integrated Security Unit (ISU)
- Both models will be tested, analyzed and refined in workshops and experiments using a scenario such as the one described earlier as a backdrop.
- The simulation will be used to validate the organizational tasks, workflow, associated resource pools and rule sets.
- Once the model is proven to be credible the next step is to conduct explorations, make modifications to the model and investigate options to resolve process issues.

Conclusion

- The paper describes a successful transition from architecture views to simulation models that can expand opportunities for concept development and experimentation.
- Two C2 simulations have been developed; one for a joint operational level military headquarters responsible for domestic operations (DOMOPS) and another for Interagency C2 of tactical level joint DOMOPS and emergency management.
- The simulations being created will support the process designer in developing an optimized process or a new process and will be used to plan experiments to support projects such as JCDS 21 demonstrate a joint net-enabled collaborative environment to achieve decision superiority in the future Canadian Forces.
- Plans for experiments are under development where realistic simulation of the key C2 processes will allow researchers to test hypotheses beforehand to optimize their designs. The modelling approach used for the JCDS 21 TD is being adapted to other C2 projects including a model of the National Air Planning Process and Joint Fire Support.

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