LS-141

C2 to Simulation Interoperability (C2SIM)

-

Benefits of C2SIM

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RÉPUBLIQUE FRANÇAISE
MINISTÈRE DE LA DÉFENSE

Lionel Khimeche
DGA/DS/CATOD
Lionel.khimeche@intradef.gouv.fr

Agenda

1. Definitions
2. Goals, Rationales & Benefits
3. Use-cases

Definitions

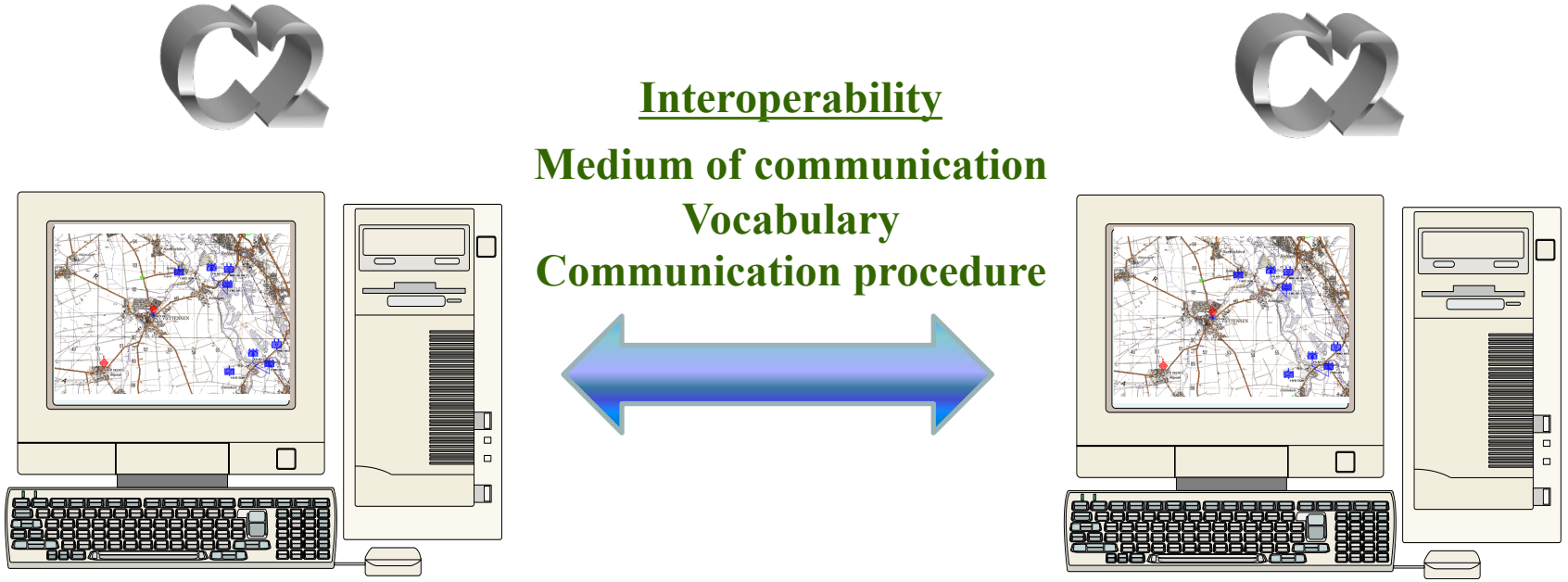
- **C2 systems** ease the commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission via situational awareness and shared common operational pictures .
  They provide a bi-directional flow of information between a commanding officer and subordinate military units.

- Without effective command and control systems, combat units had to be operated "the old way", relying on slow and unreliable voice communication and hand drawn maps

Definitions

- **Simulation** is the imitation of the operation of a real-world process or system over time. The act of simulating something first requires that a model be developed; this model represents the key characteristics or behaviors/functions of the selected physical or abstract system or process. The model represents the system itself, whereas the simulation represents the operation of the system over time. (Wikipedia)
  A method for implementing a model over time (MSCO)
- **Model:** A physical, mathematical, or otherwise logical representation of a system, entity, phenomenon, or process. (MSCO)

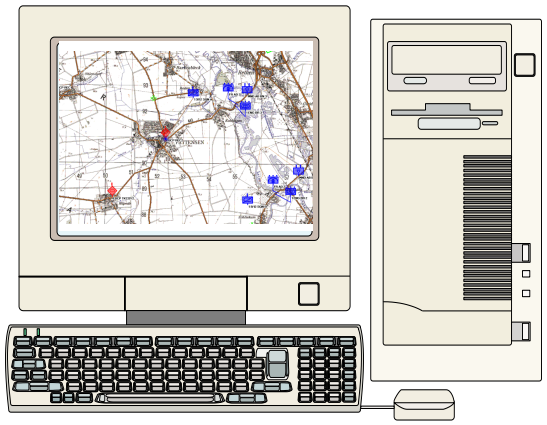
Bi-directional flow of information between C2



Bi-directional flow of information between C2 and SIM

C2

Simulation



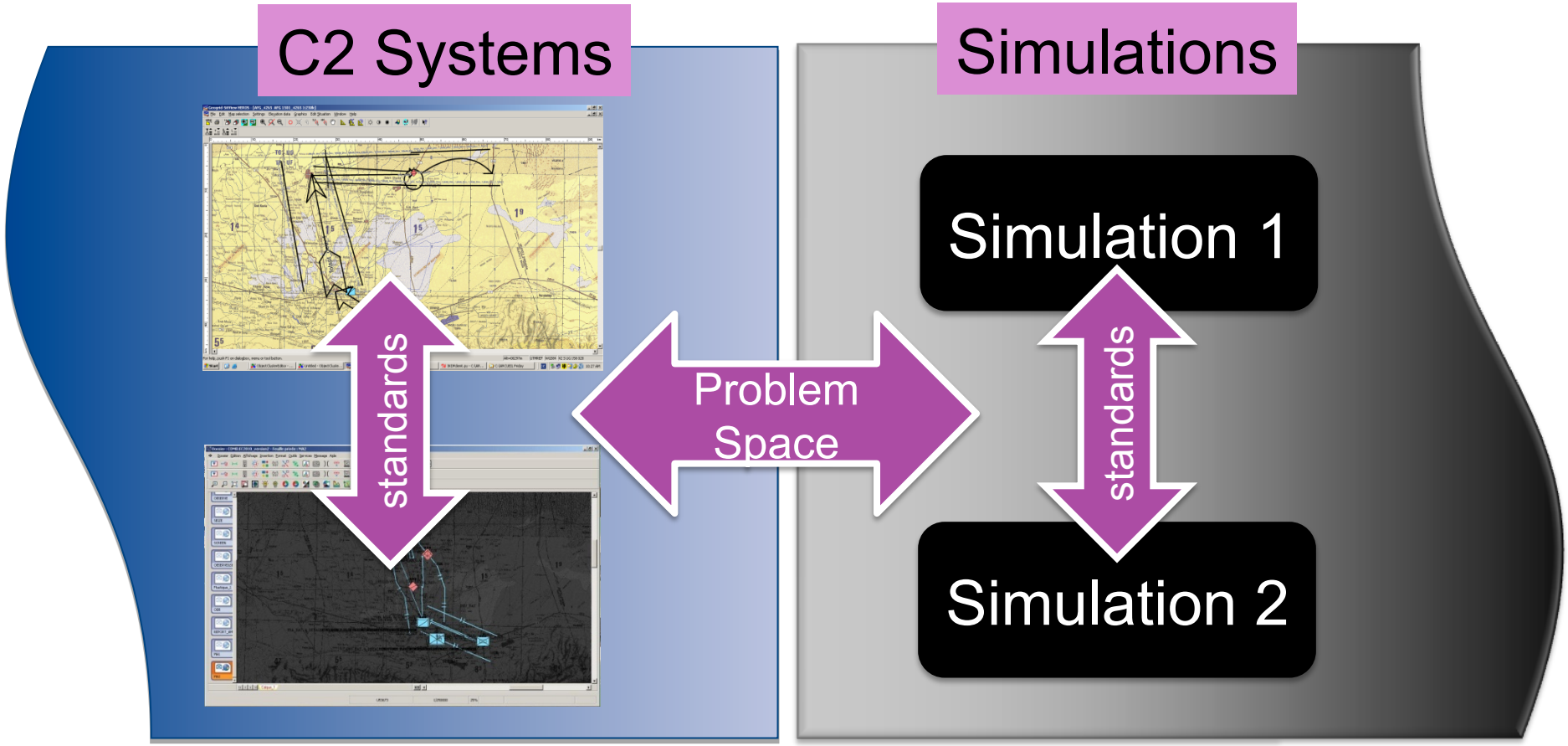
Interoperability

Medium of communication
Vocabulary
Communication procedure

COMMANDER

SUBORDINATE

Systems Interoperability



Current Interoperability status

- **Interoperability issues in the M&S and the C2 domains are addressed but separately**
  - **C2 to C2:** National C2 standards (MTF, SICAT)
  - **C2 to C2:** International C2 standards (AdatP3, MIP, JC3IEDM)
  - **SIM to SIM:** Simulation standards (DIS, HLA)

- **Need for a common approach to address C2SIM Interoperability**
  - **C2 to SIM:** Issue an international standard that is acceptable by both the M&S and C2 domains

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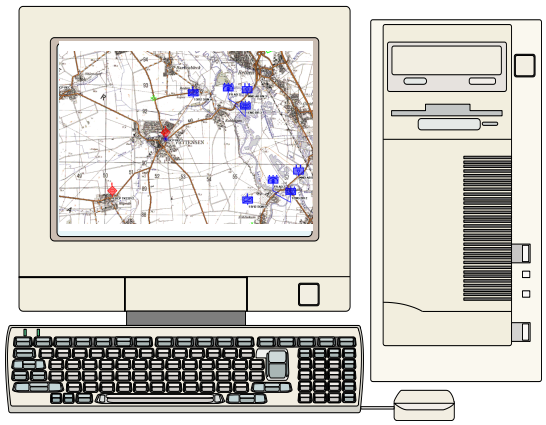
C2SIM GOALS

- **Develop a mechanism by which the connection between C2 and simulation systems becomes**
  - Automated or semi-Automated
  - Unambiguous
  - Easy to sustain
  - Independent of applications
  - Expandable to include new domains
  - Available in Theater
  - Persistent low cost
  - Applicable to different levels of command

Bi-directional flow of information between C2

Bi-directional flow of information between C2 and SIM



ORDERS
REQUEST
REPORTS

COMMANDER

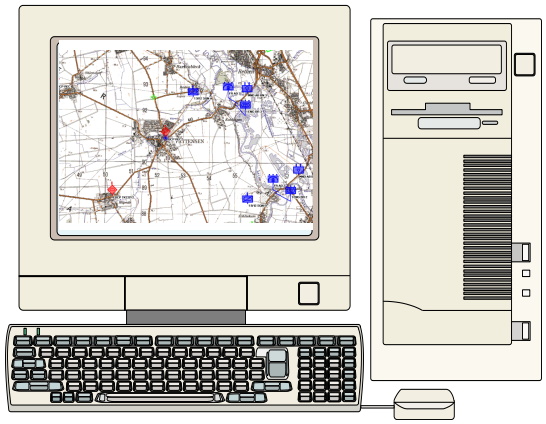
Swivel
Chair

SUBORDINATE

Information exchange between C2 and SIM

C2

Simulation



ORDERS
REQUEST
REPORTS

COMMANDER

SUBORDINATE

Automatic exchange

Rationale

Military requirements:

Enable and enhance command post forces readiness, support to operations and armed forces acquisition life cycle

Problem statement:

Need cost-effective, efficient, way to connect C2 system and simulation in order to:

- Enhance realism & overall effectiveness
- Decrease cost and risk
- Reduce preparation and response time
- Refine requirements and statement of needs

Solution:

Standardize exchange of digitized military information for C2-Sim interoperation

Benefits - Enhance realism and overall effectiveness

by faster, more consistent information exchange among systems

- Faster restart/backup system of systems
- Increase realism by approaching real life
- Better consistency of information between systems
- Reduce risk of mistakes: Automatic validation of messages according to receiver capabilities/format

Benefits – Decrease cost and risk

by reducing manual input, reduced number of supporting personnel and equipment

- Save resources with an automatic swivel Chair
- Save resources by reducing workload of required operators
- Save on development and maintenance of gateways

Benefits – Reduce preparation and response time

with rapid configuration, initialization of systems and validation of scenario

- Reduce time to feed systems with initial data (Theatre/ Battlefield)
- Faster validation of scenario to meet training objectives
- Offer a flexible process to back and forth information from systems to systems

Benefits – Refine requirements & statement of needs

- Develop C2 surrogate fed with simulation data
- Experiment new capabilities with end-users in the loop
- Assess different tactics and procedures with legacy systems in the loop
- Capitalize scenarios for further use during the CADMI V cycle acquisition process

Multiple Domains of benefits

Policy & Procedures	• Doctrine • Tactics, Techniques & Procedures • Rules of Engagement • CONOPS
Acquisition	• System Development • Test & Evaluation • Verification, Validation & Accreditation
Training	• C2IS Operator Training • Robotic System Operator Training • Command & Staff Training
Mission Rehearsal	• Force, Service Level • Coalition
Planning	• Course of Action Development • Course of Action Evaluation
Mission Execution	• Situation Awareness • Tasking • Decision Support Systems • Planning during operations
After Action Review	• Training • Mission Debrief • Doctrine Evaluation • COA Analysis

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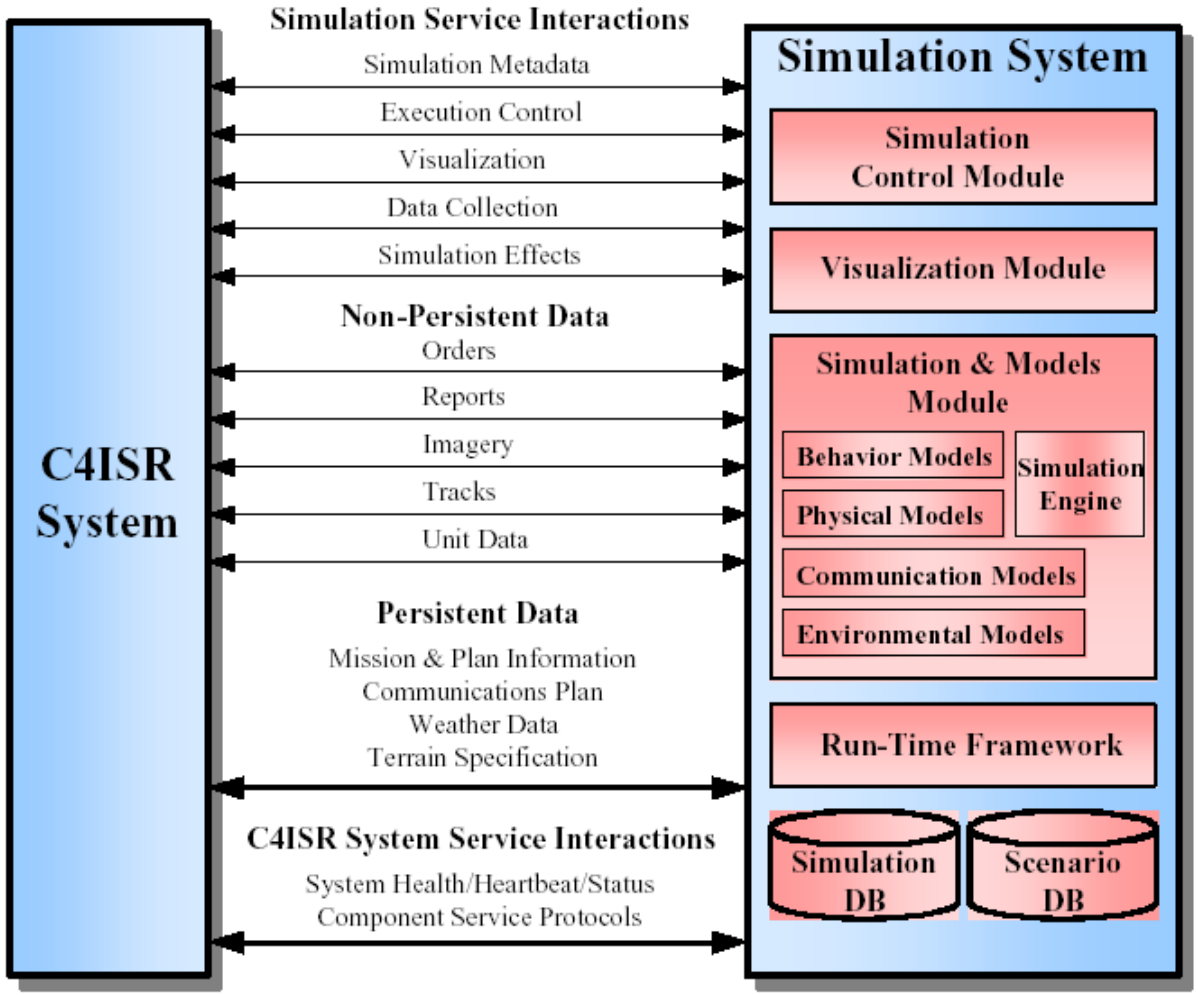
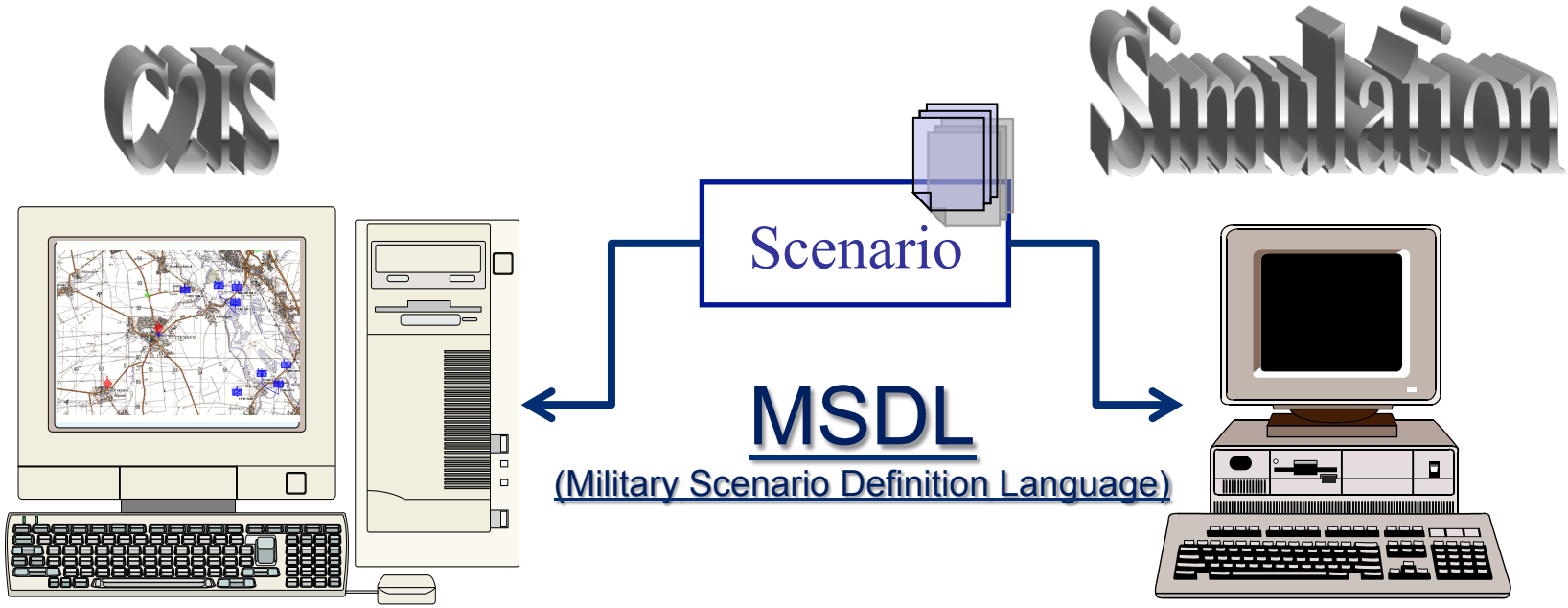
C2SIM Technical Reference Model



Systems Initialization



Sand Box

OOB

Initial Situation

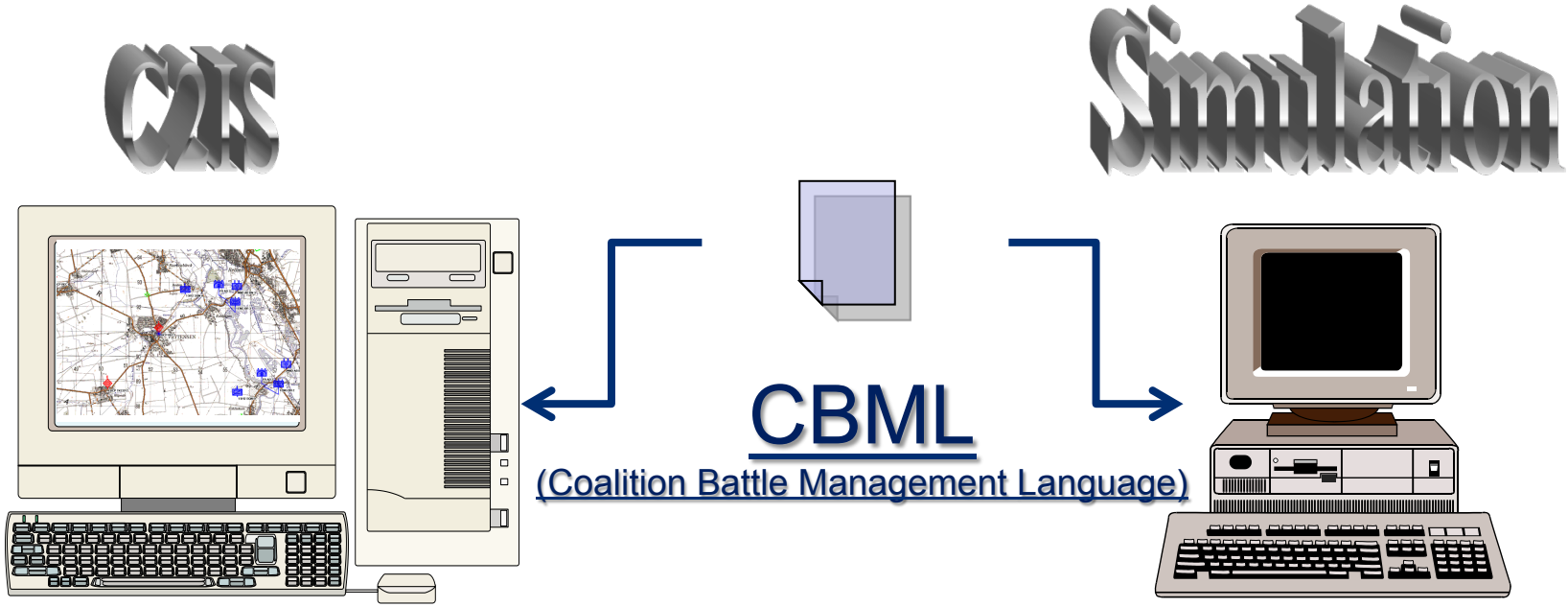
(Location, Logistics, Manning)

Weather conditions

Limits

Phase Lines

Systems Execution



Orders

Requests

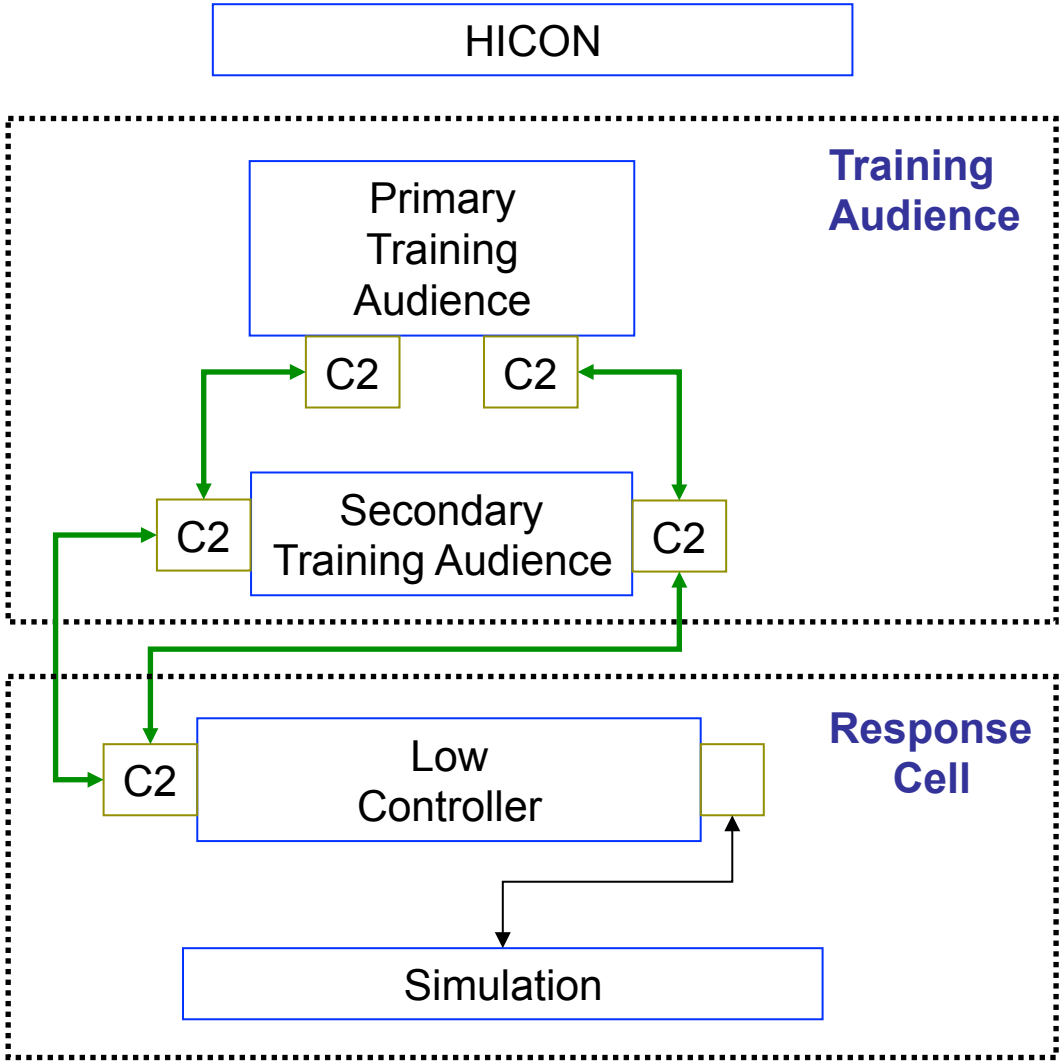
Reports

- On time, on event, on request -

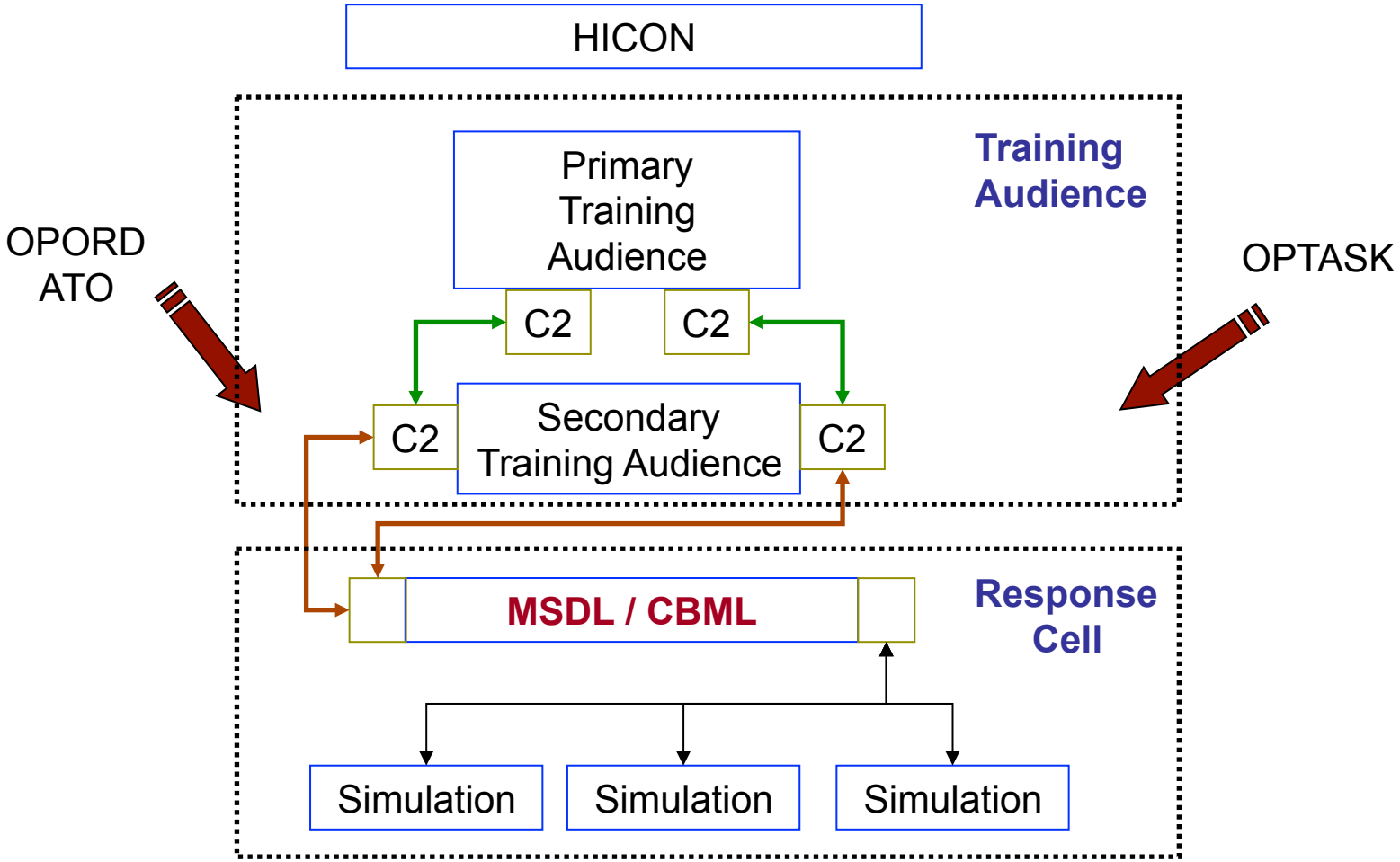
Use-Cases

- **Forces Readiness**
  - Command Post Training
  - Fault Tolerance
- **Support to Operations**
  - Briefing
  - Planning
  - Back-Brief
  - Mission rehearsal
- **Acquisition**
  - Assess new C2 capabilities and procedures

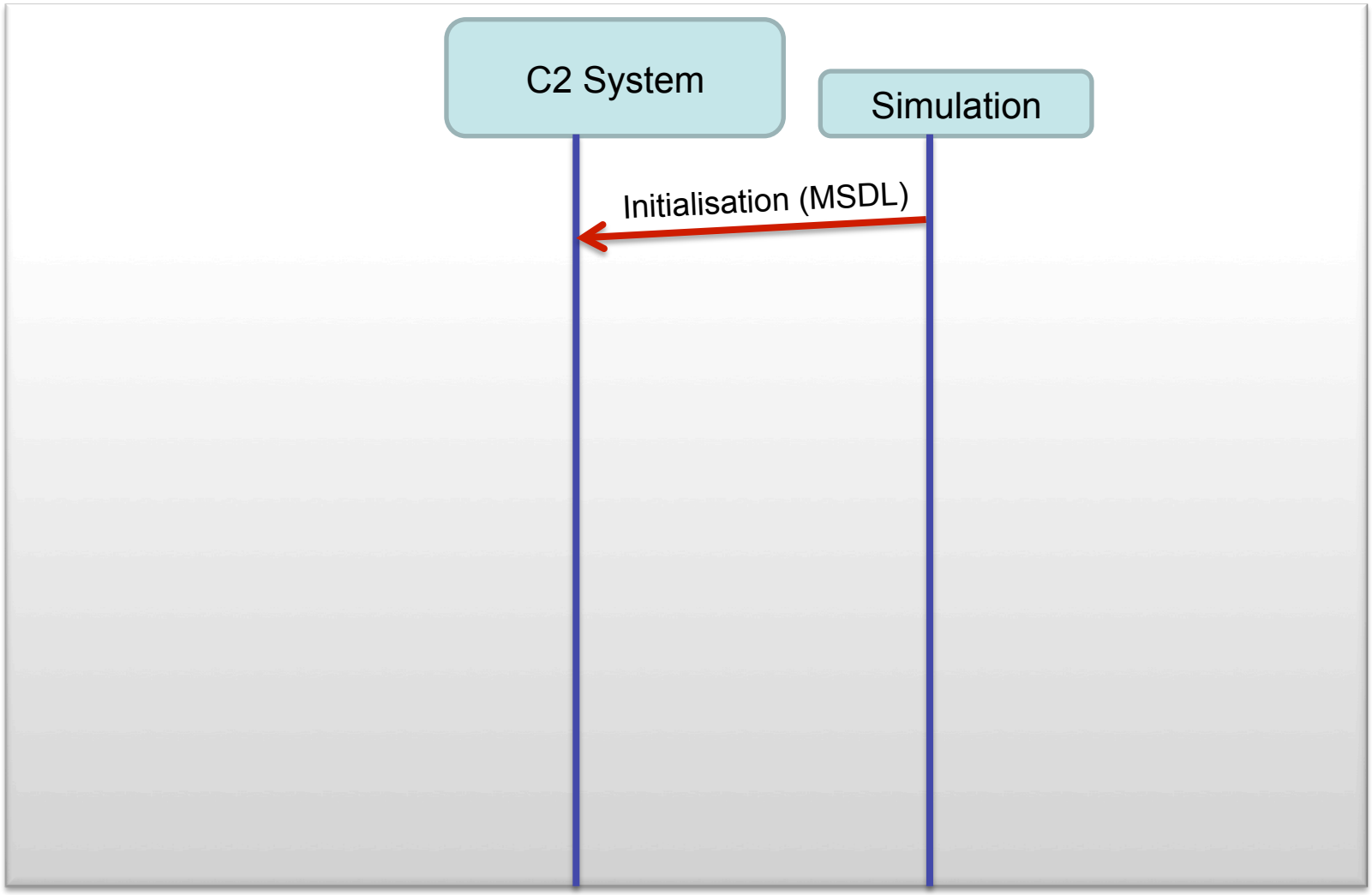
Forces readiness – CP Training – Current Situation



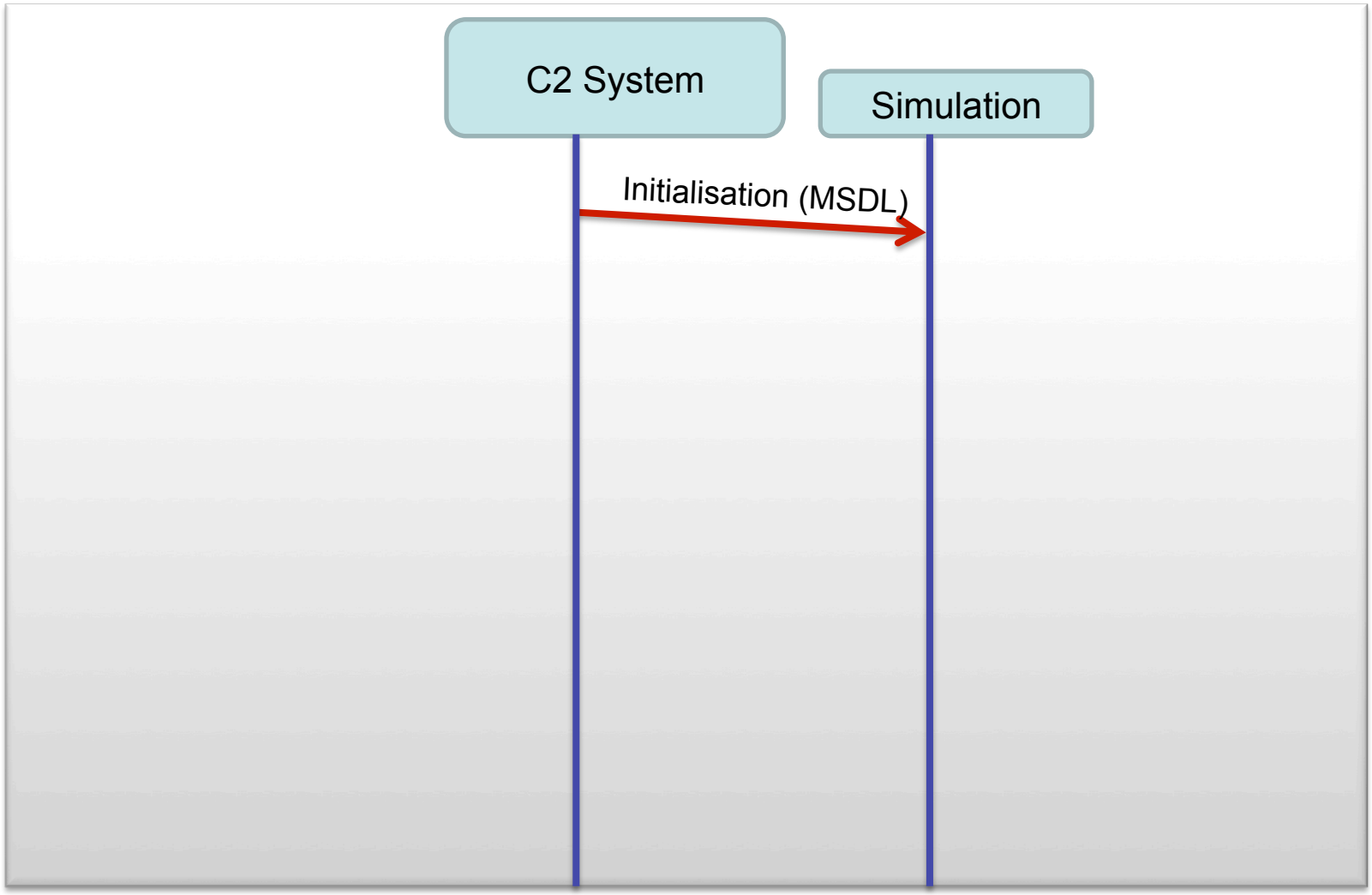
Forces readiness – CP Training – C2SIM Situation



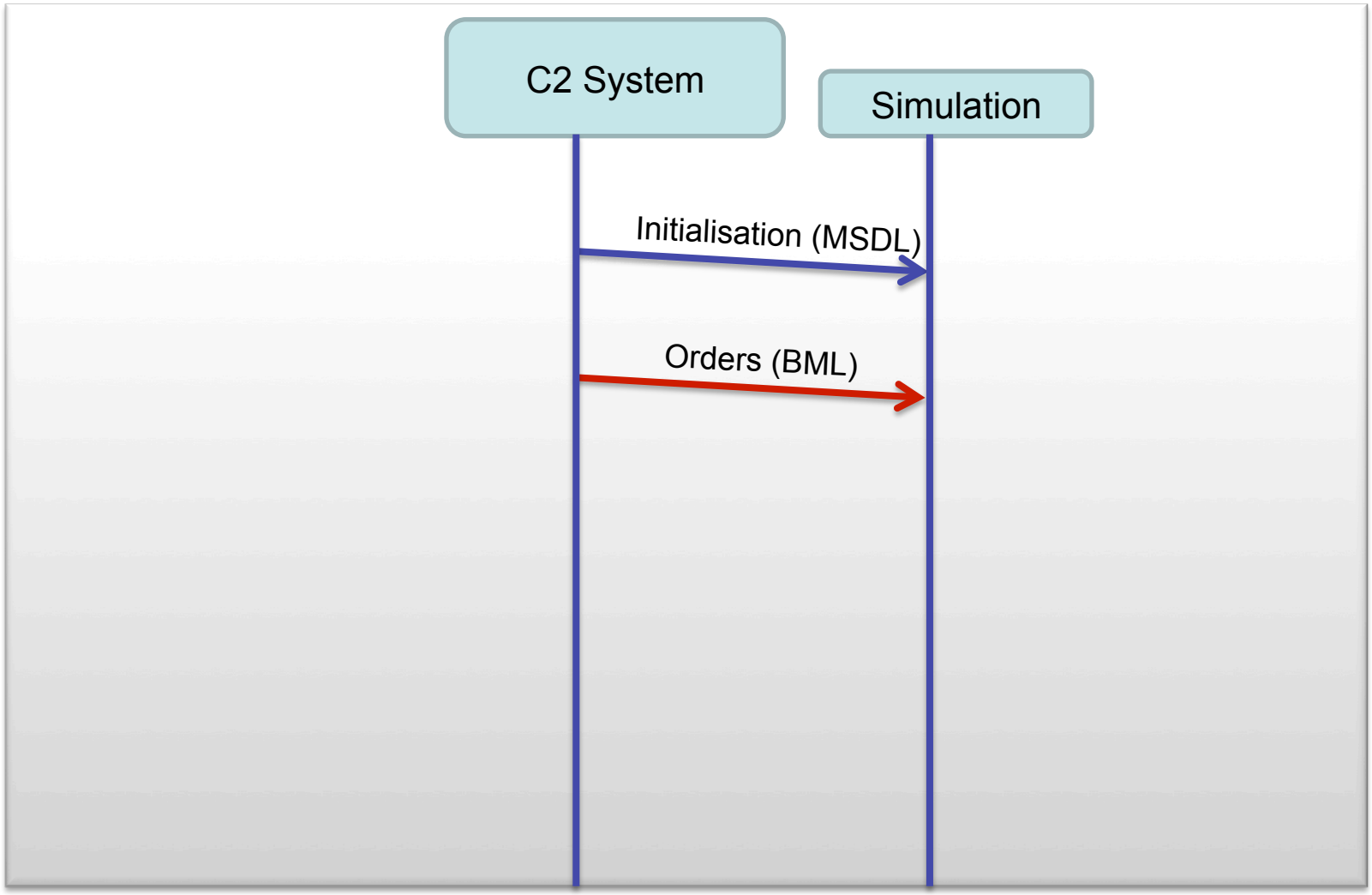
Forces readiness – Fault Tolerance



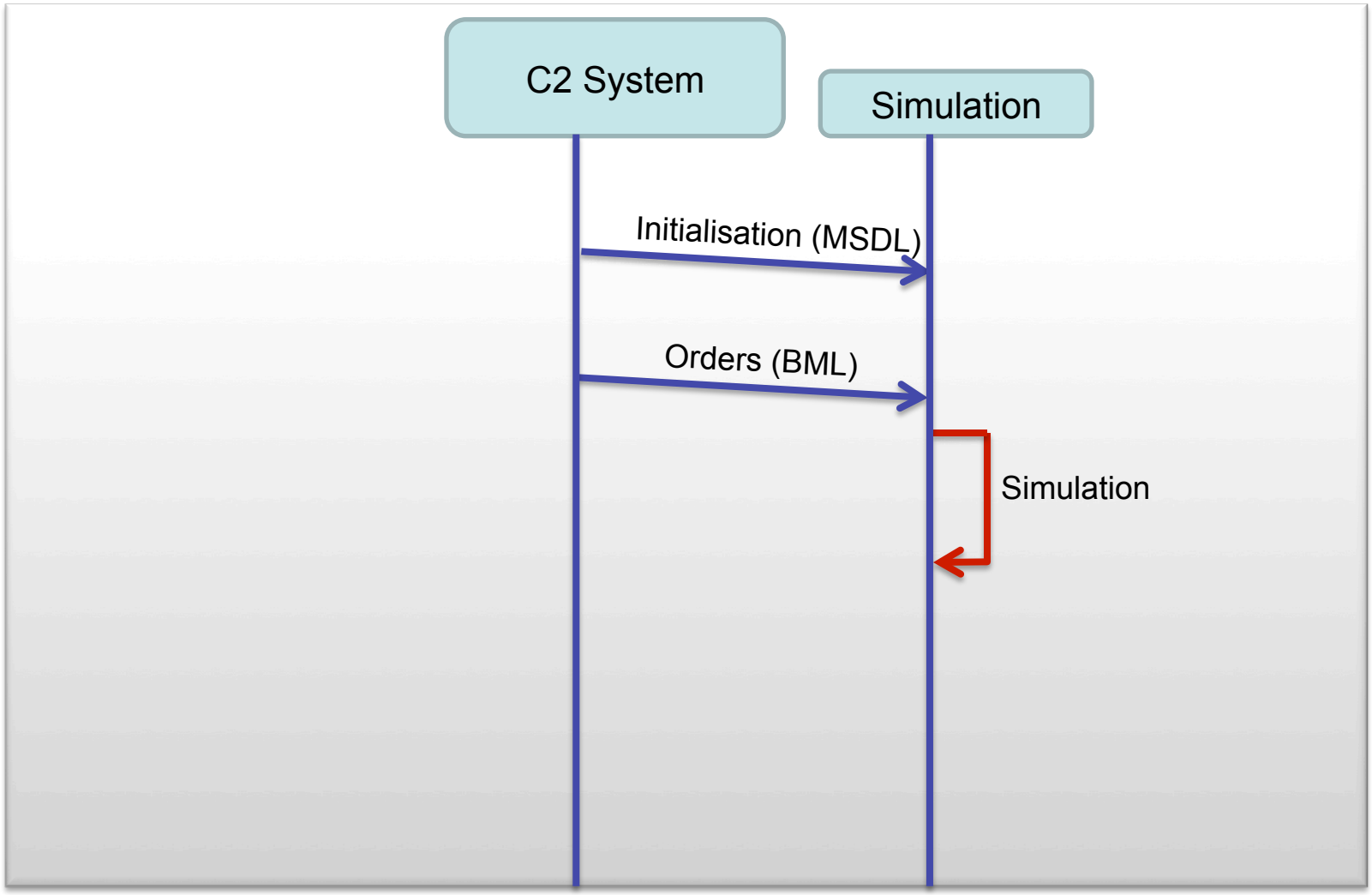
Forces readiness – Fault Tolerance



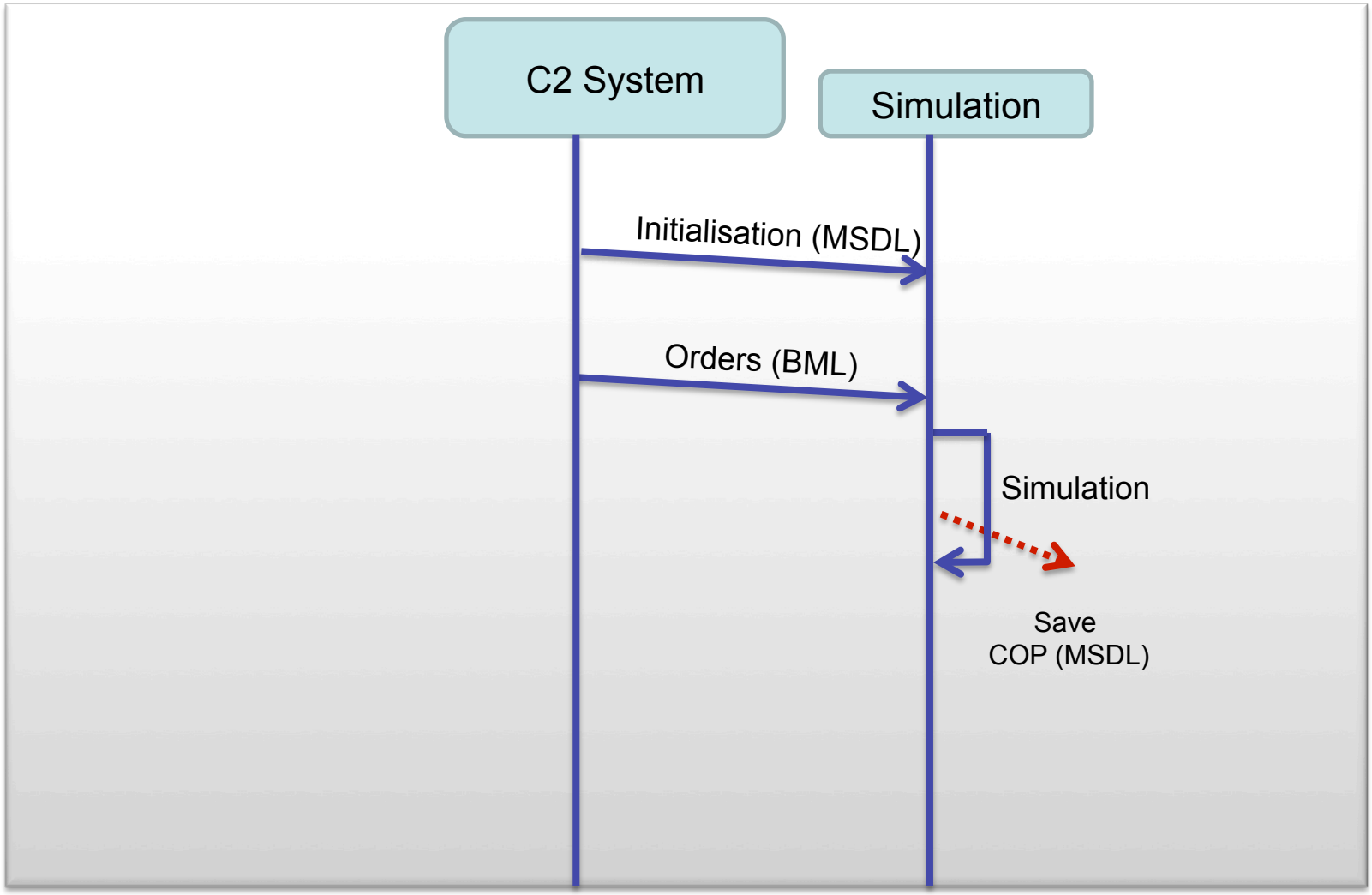
Forces readiness – Fault Tolerance



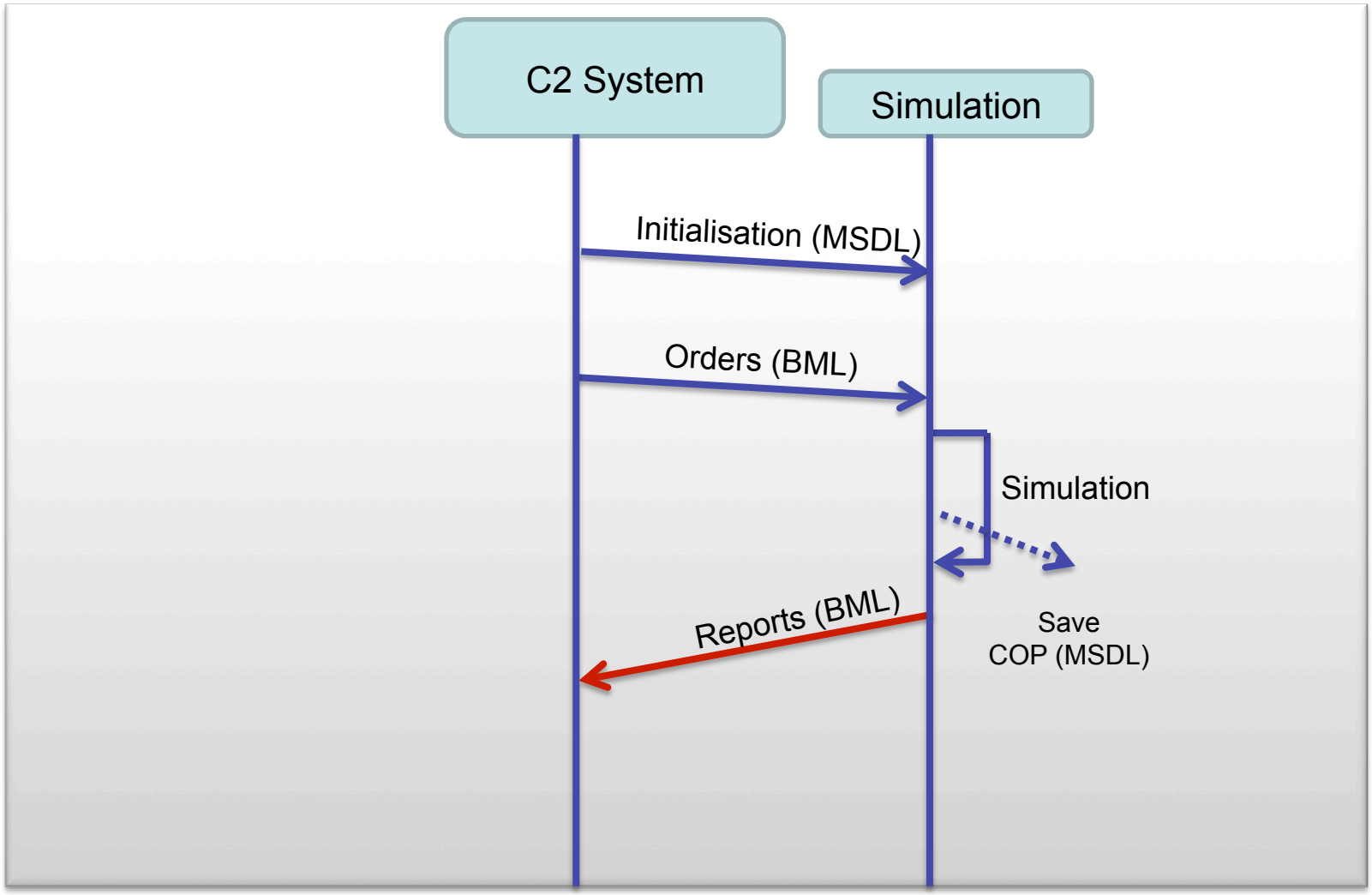
Forces readiness – Fault Tolerance



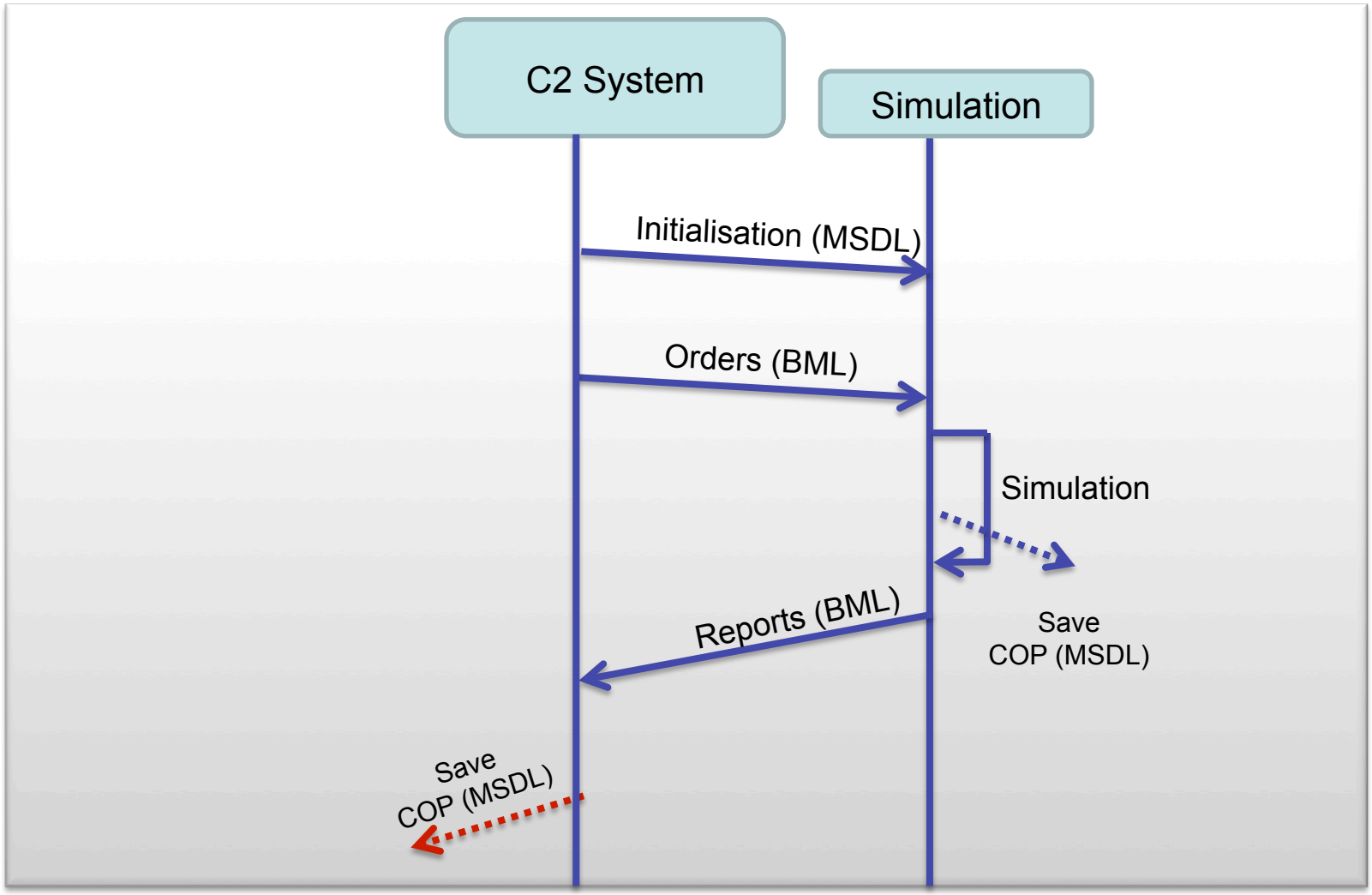
Forces readiness – Fault Tolerance



Forces readiness – Tolérance aux pannes

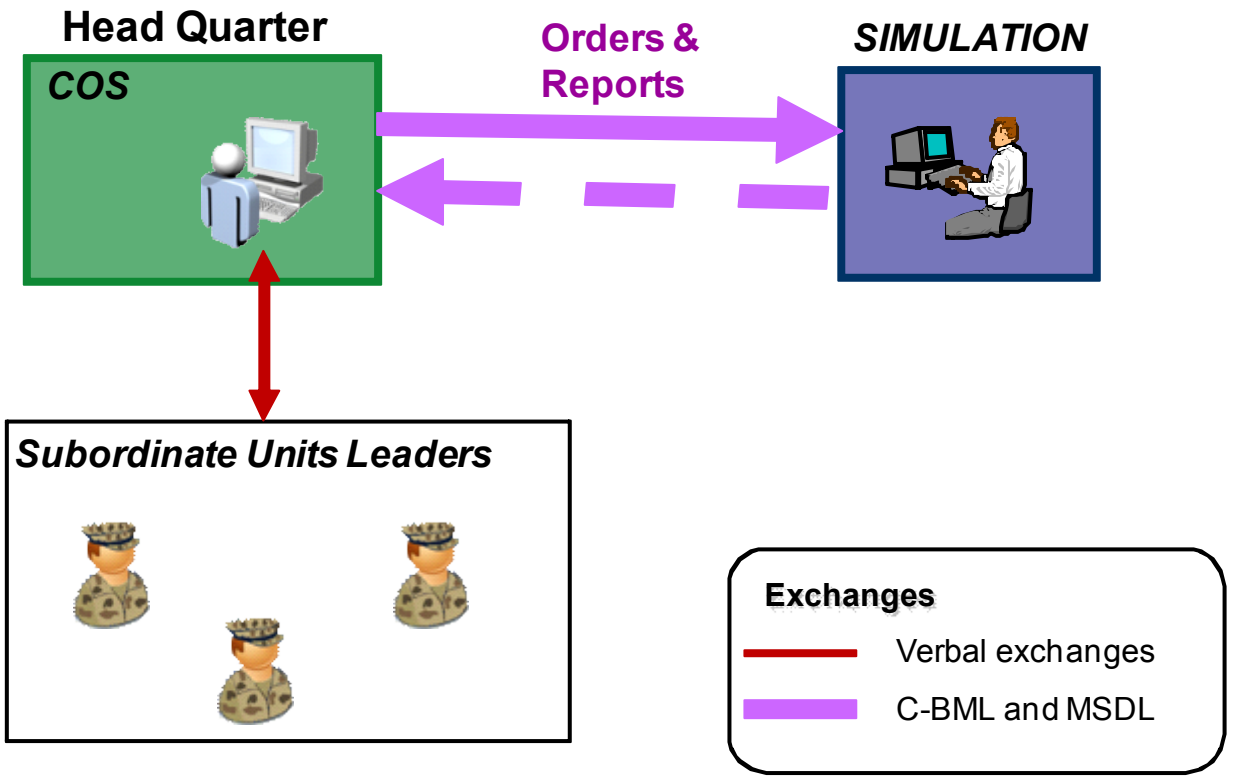


Forces readiness – Fault Tolerance



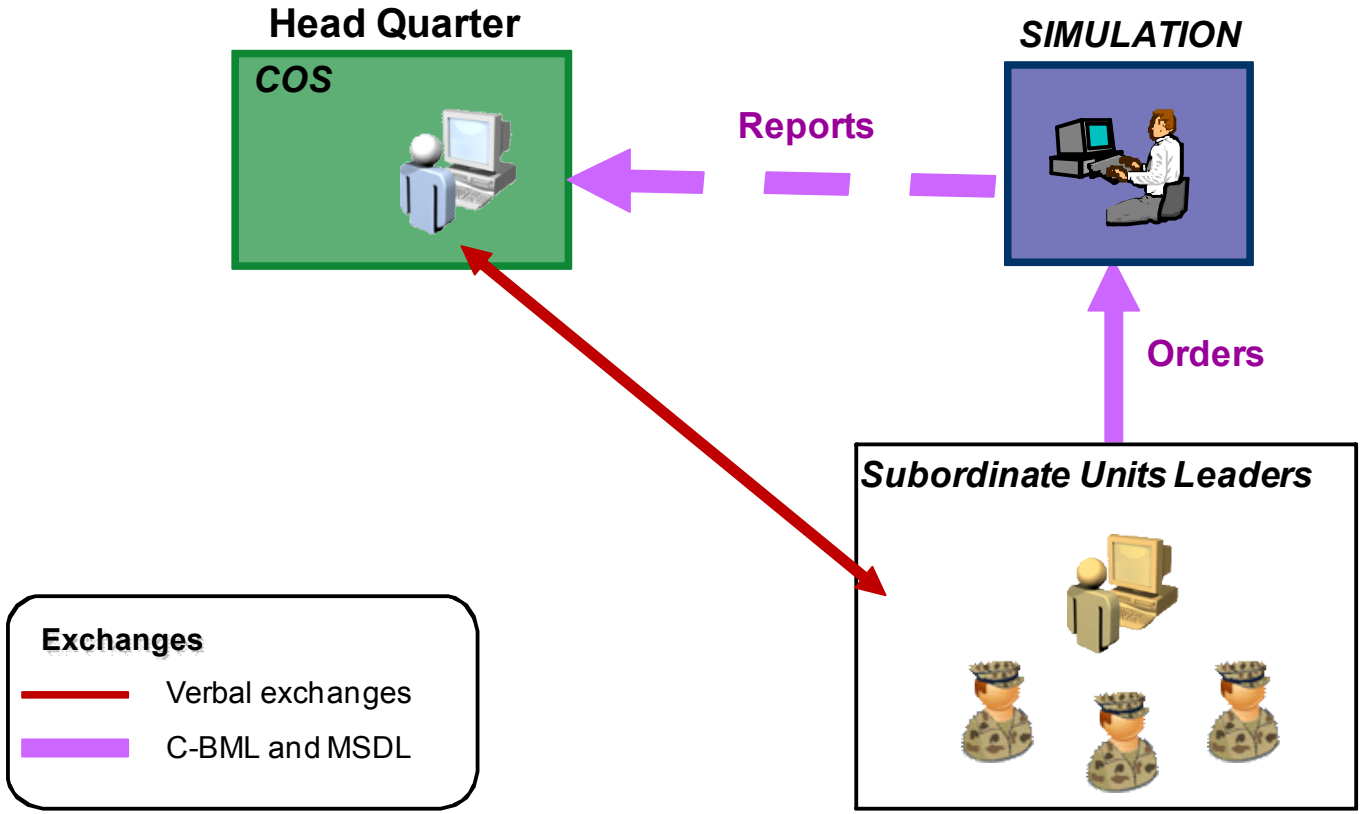
Support to Operations – Briefing

Provide quick and automatic reports in order to get an impression how the commander envisage the future operation



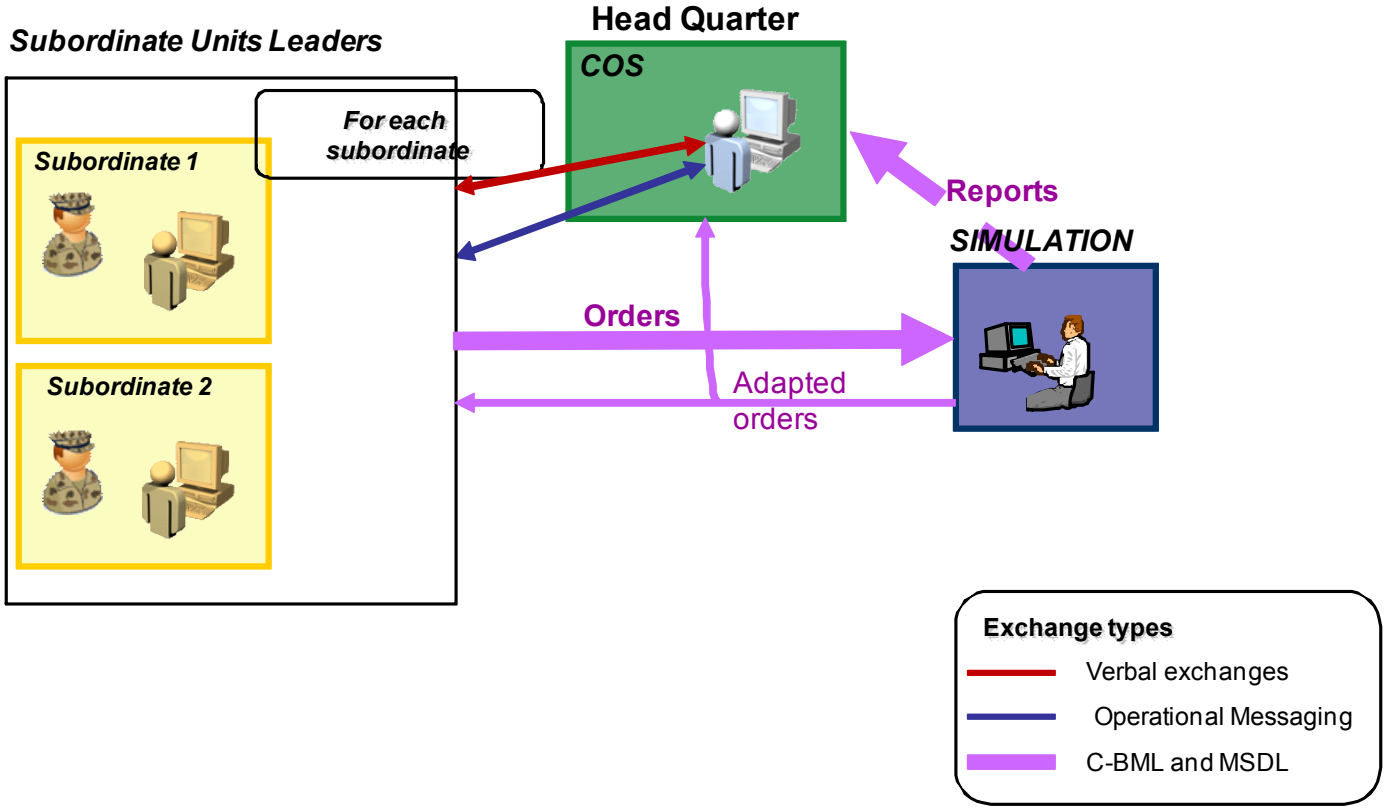
Support to Operations – Backbrief

Provide quick and automatic reports in order to get an impression how subordinates orders match with the commander's intent

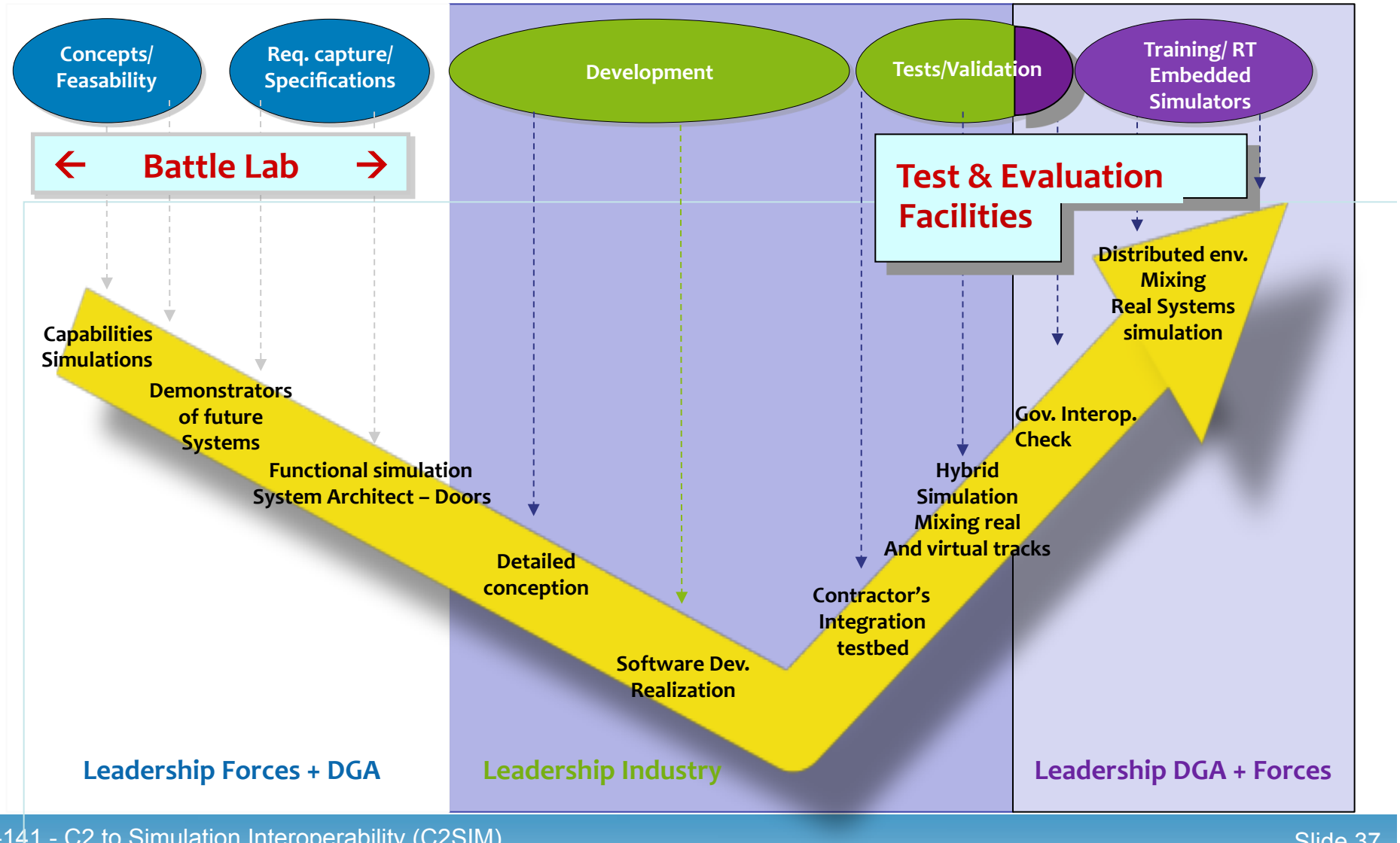


Support to Operations – Mission Rehearsal

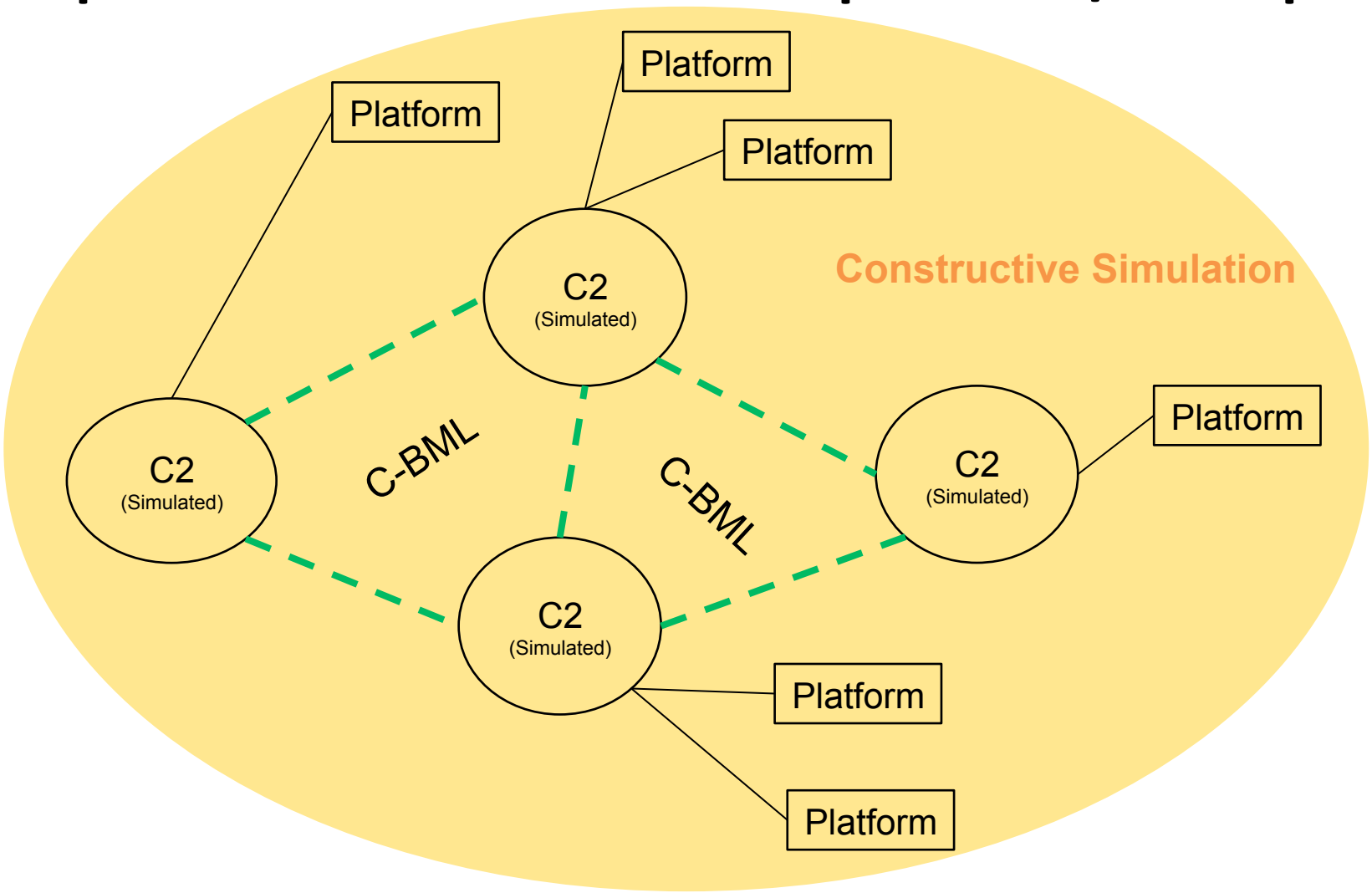
Subordinates gain accounted to execute the expected course of action and react to unexpected events



M&S along the Programs V-cycle



Acquisition – Assess new C2 capabilities/concepts

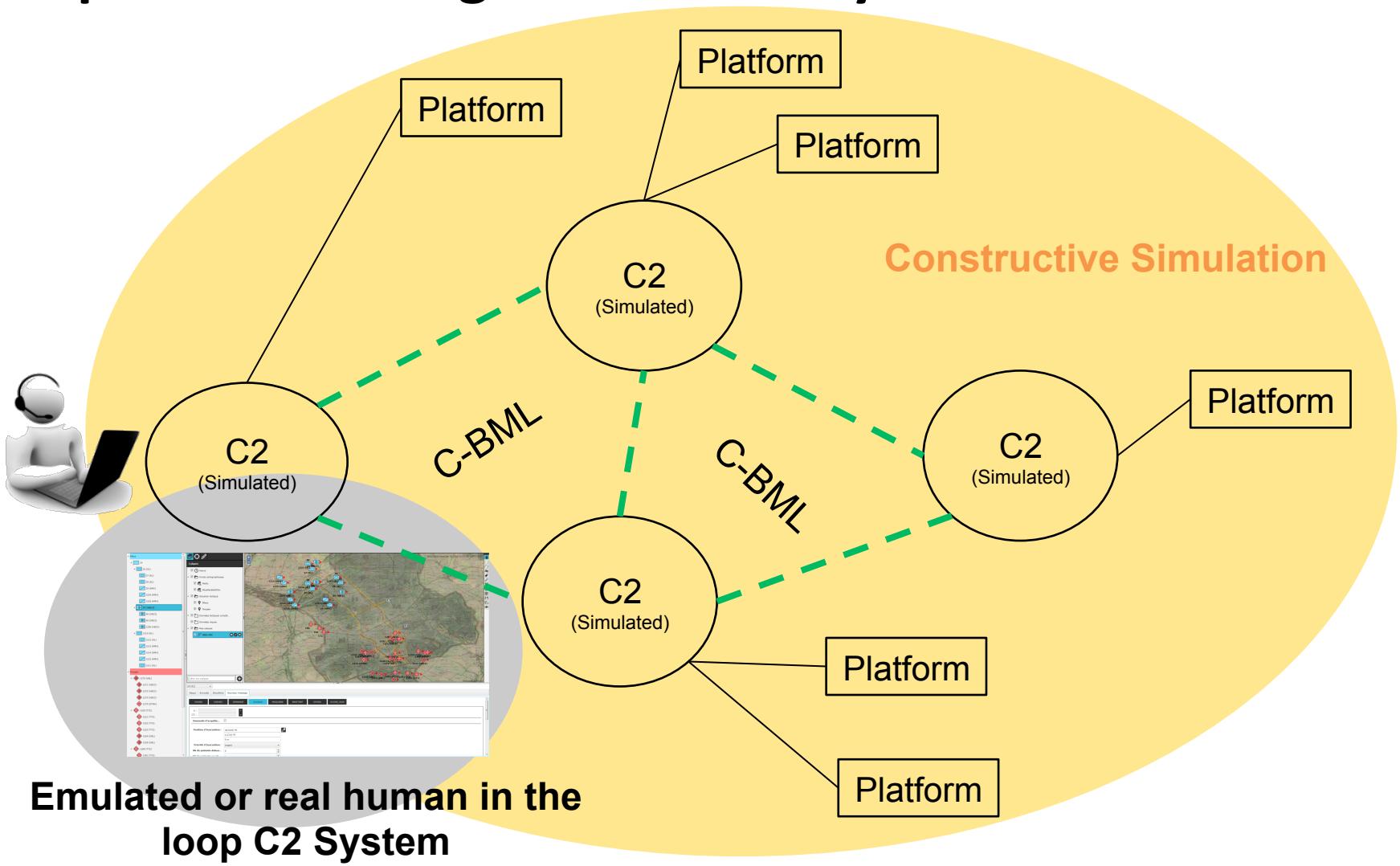


Descending and climbing the V-cycle

Concept – Assessment – Demonstration – Manufacture - In service

- **Initialization: Capability studies (new syst., improvement of existing syst., …)**
  - Capability simulations
- **Orientation: Feasibility studies and operational concept of use development**
  - Mock-up, Demonstrator, Experimentation
- **Elaboration: System and detailed Specifications development and validation**
  - Define and check performances against operational requirements
- **Realization: Components, systems and interoperability qualification**
  - Create a virtual T&E environment
- **Utilization : Provide education and training devices to support use of the new system**
  - an enabler to provide low-cost distributed simulations for armed forces end-users

Acquisition – Integrate new C2 systems within the M&S



Additional requirements

- Be routed via radio devices on the field
- Compliant with military standards, procedures and CP organization

Additional benefits

- VV&A process could be more efficient if one common language is used for military experts to understand model's behaviour based on formal inputs and outputs
- Simulated Forces can be substituted by a real force (vice versa) without any change or adjustment
- …

QUESTIONS