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Omni Shoreham Hotel
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Supporting Collaboration in Collective Endeavours with a Model of Operations Intent and Effects

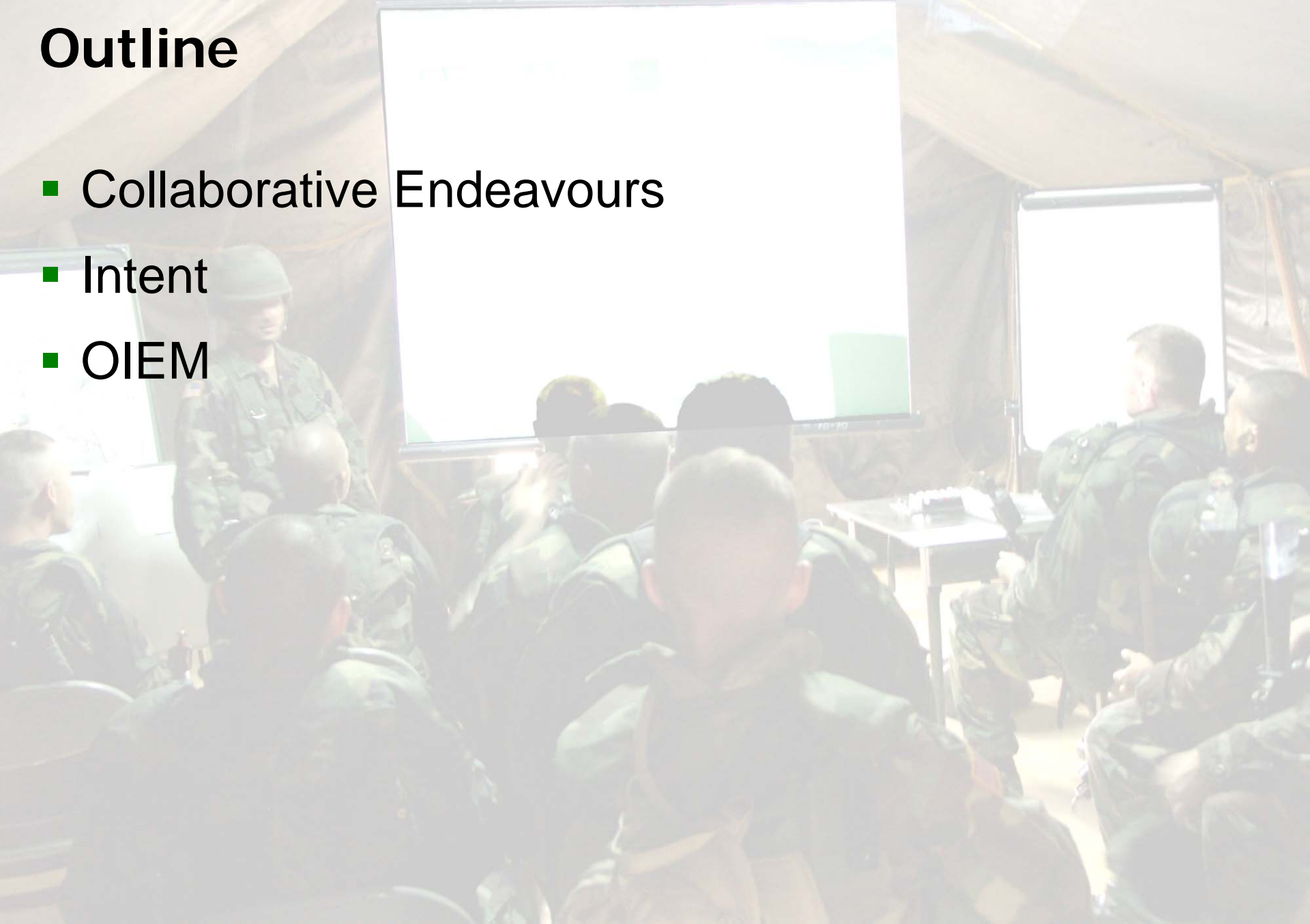
I-055

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Michael R. Hieb



Outline

- Collaborative Endeavours
- Intent
- OIEM



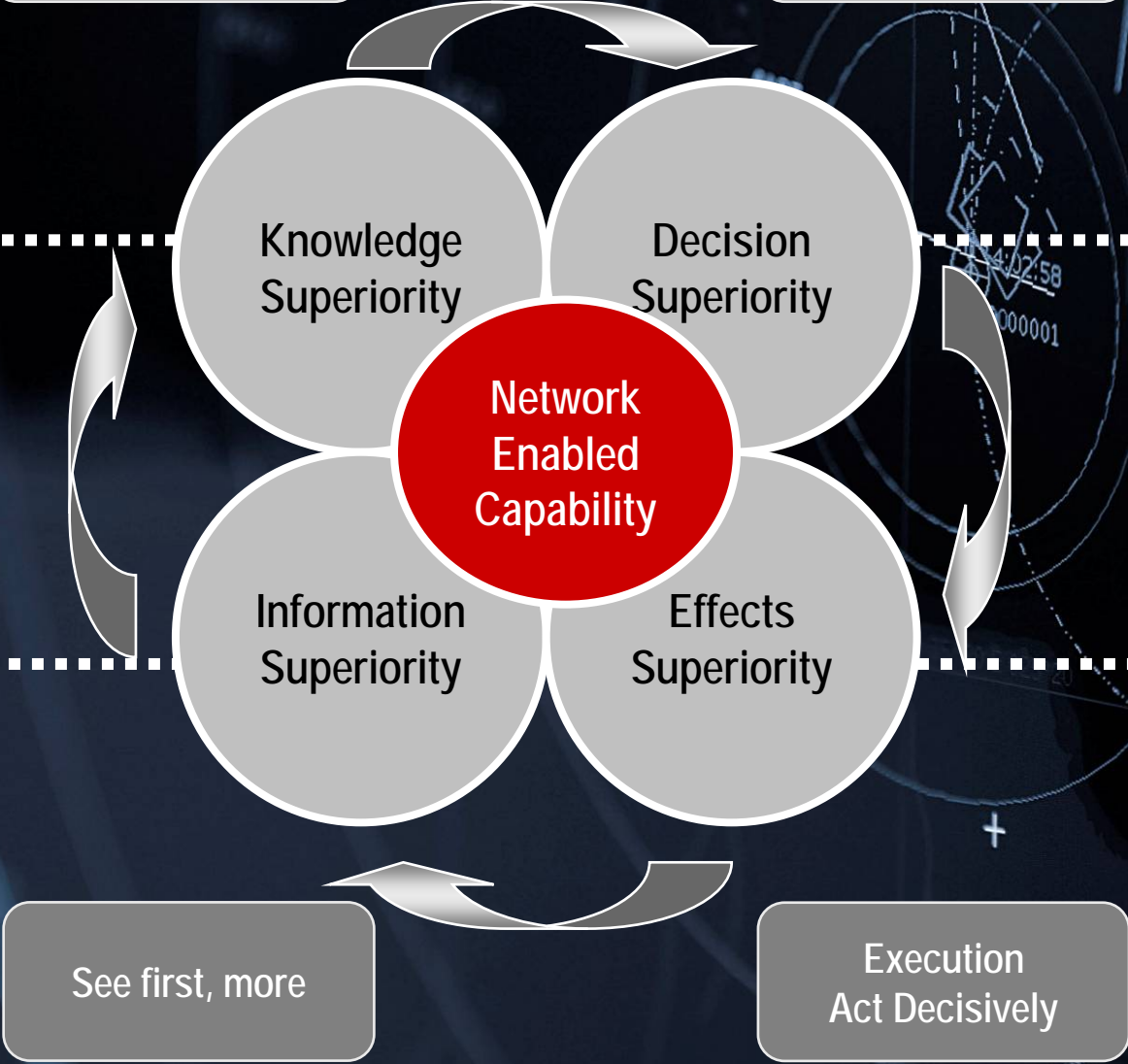
Cognitive Domain

Information Domain

Physical Domain

Sense making
Understand
Faster and Better

Planning
Decide
Faster and Better



Network Enabled Capabilities (After van Dam 2004)

Collaboration in Collective Endeavours

- Operational Systems and Simulations need
- Exchange of
 - Information
 - Knowledge
 - Decisions
- Coordination of
 - Decision Making
 - Effect implementation (Execution)

Intent

- The purpose of the task (the higher-level goals);
- The objective of the task (an image of the desired outcome);
- The sequence of steps in the plan;
- The rationale for the plan;
- The key decisions that may have to be made;
- Antigoals (unwanted outcomes);
- Constraints and other considerations.

Gary Klein (1998, p.225)

Intent

Intent

After Pigeau and McCann (2000,2006)

Explicit Intent

Publicly Communicated

Orders
Questions
Answers
Doctrine

Implicit Intent

Unvocalized
(and unvocalizable)

Personal Expectations
(based on Style and Experience)

Military Expectations
(based on training, doctrine, tradition etc.)

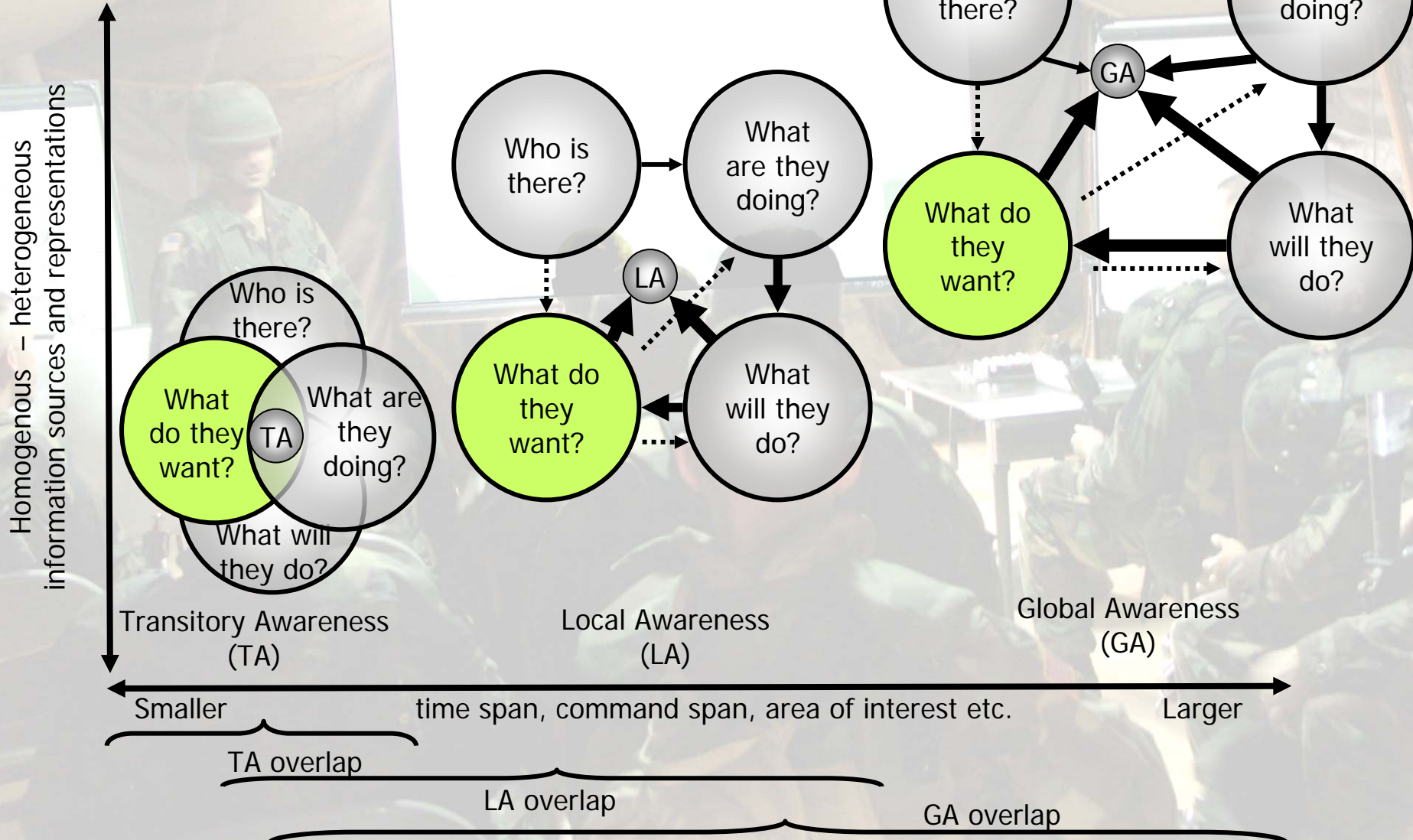
Cultural Expectations
(based on social values, cultural morals, national pride)

Intent a fundamental piece for collaborative endeavours

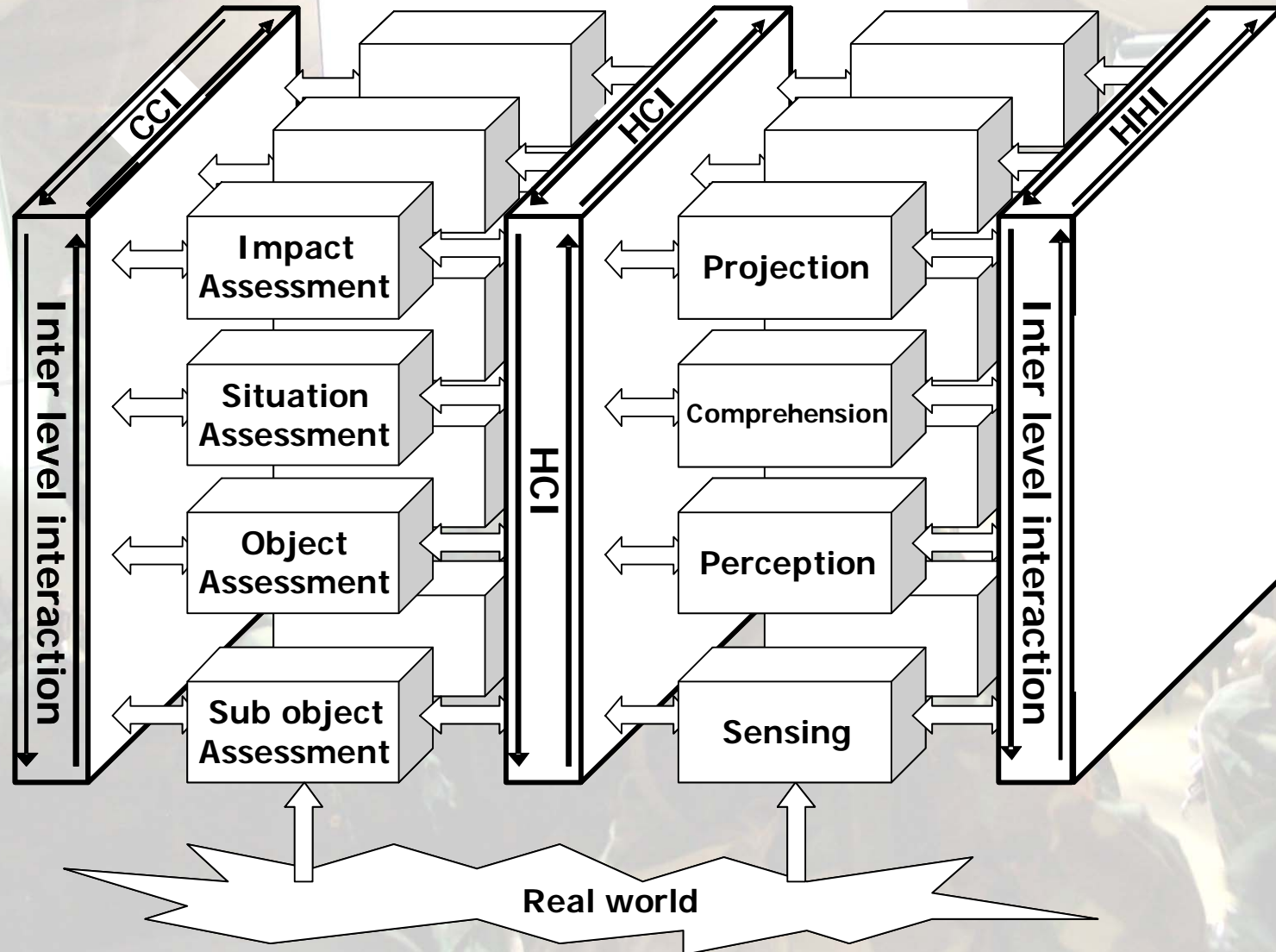
- **Explicit Intent** is a publicly stated intent for staff and subordinates to perceive, think about, and act upon.
- **Implicit Intent** is an internal expectation of Intent. Each person interprets the stated Intent from personal expectations based on their style and experience.
- **Commander's Intent** is an intent describing operations and it is a publicly stated description of the end-state as it relates to forces (entities, people) and terrain; the purpose of the operation; key tasks to accomplish and is developed by a small group, e.g. staff, and a commander.
- **Common or Shared Intent** is an intent that is shared and understood by all participants, i.e. there is no discrepancy between the intent of participating humans. Common Intent is an idealized view of intent.
- **Command Intent** is the realistic level of Common Intent, i.e. Intent for a specific operation is shared, but each participant may have other goals and intent besides those of the operation in focus.

Introducing Intent in Situation Awareness

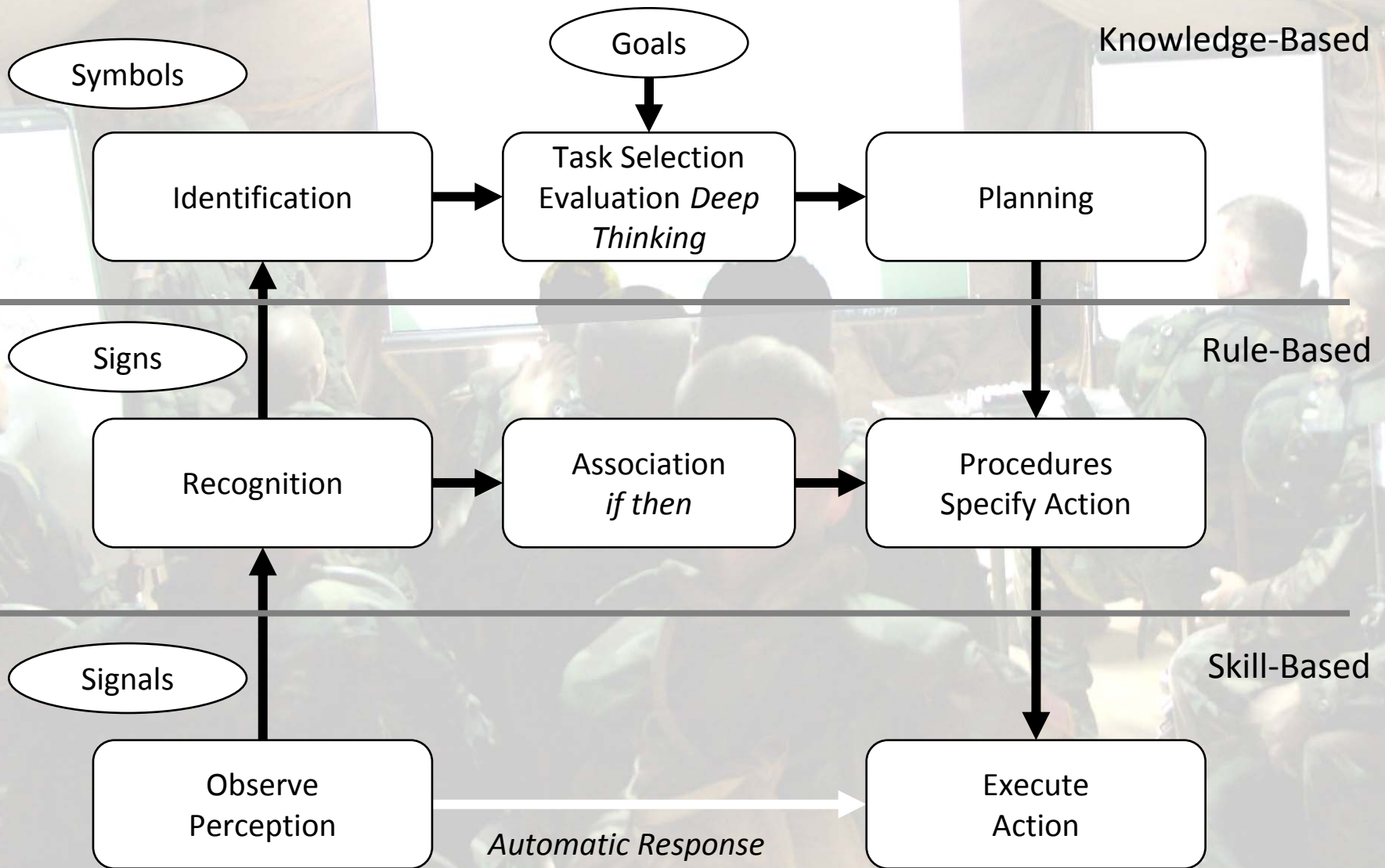
Expanded from Hone 2006 with adding Intent, i.e. "What do they want"



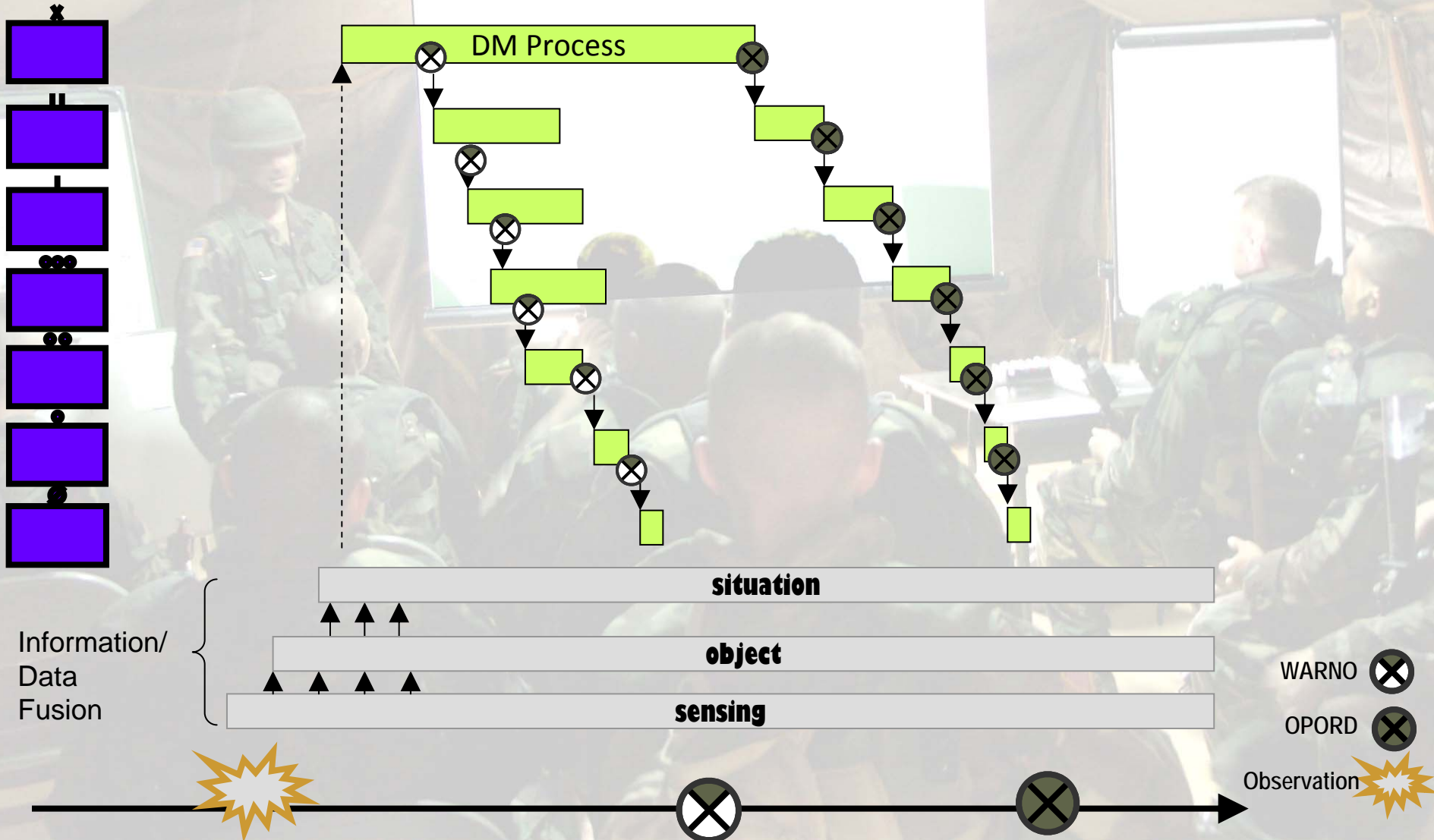
Situation Analysis Model for Semi-automatic, Automatic and Manual (SAM)² decision support



Adaption of Rasmussen's levels of decision making (1983) with articulation from Hughes and Rolek (1997)

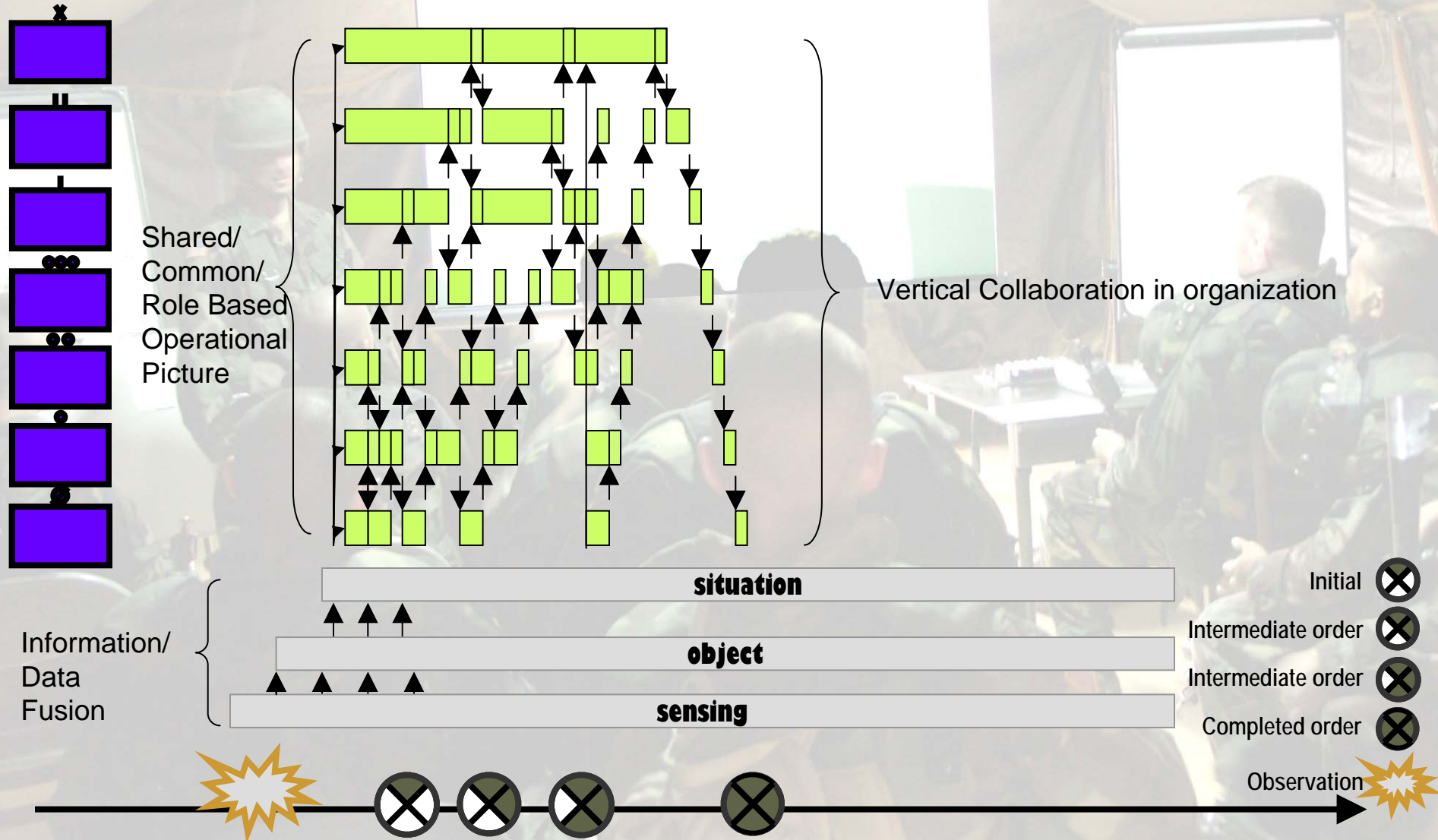


Traditional Military Planning Process



Integrated Dynamic Command and Control

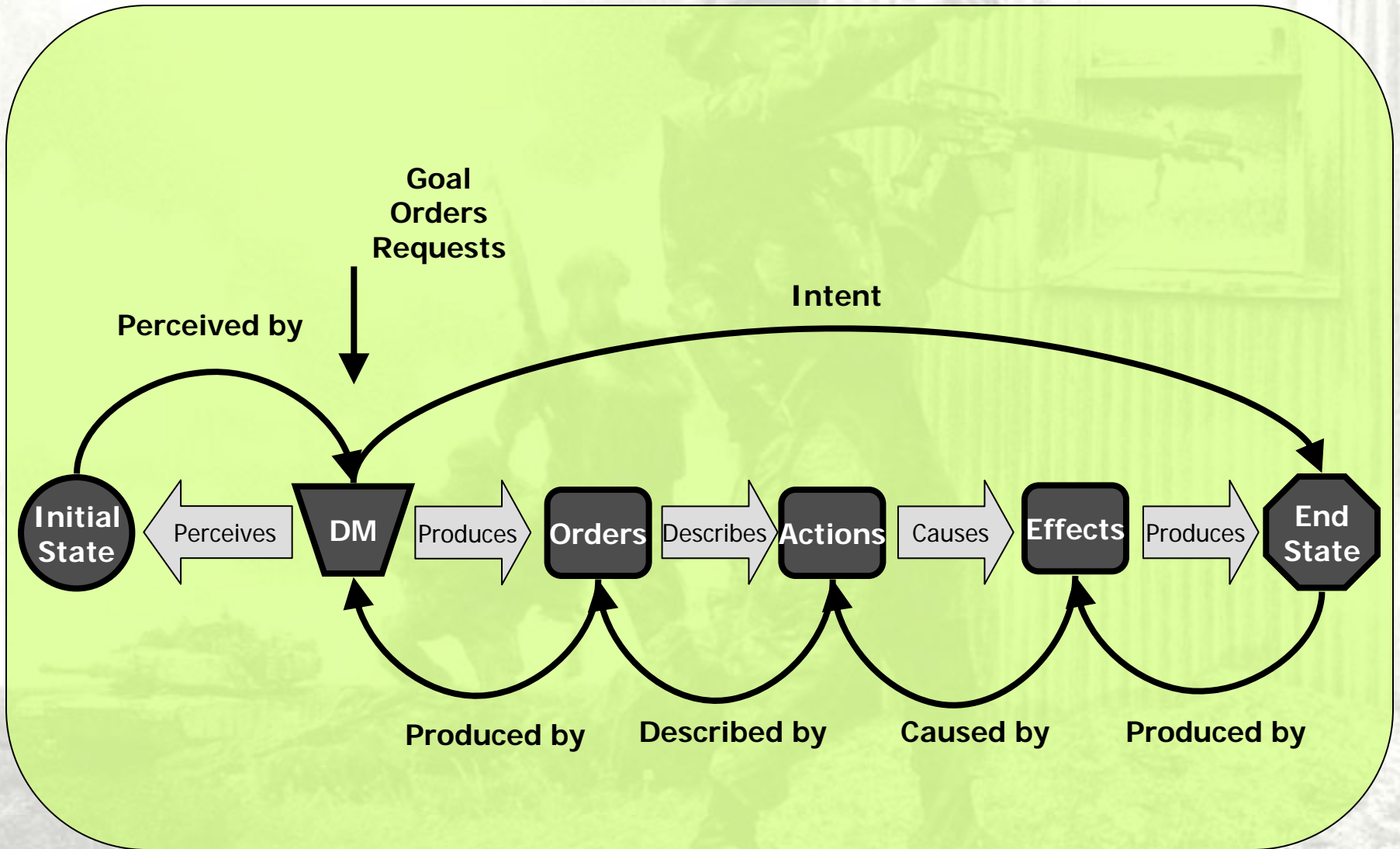
(Swedish Net-Centric Planning)



Motivation for OIEM

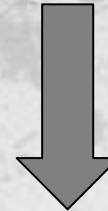
- Complex Endeavors require new understanding of missions and involves collaboration
- Self Synchronization
 - Self-directed teams
 - Subordinates take their own initiatives
 - Information needs to be shared
 - Autonomy is created by setting boundaries
- Understanding complex causes and effects
 - Ability to observe effects from actions
 - Actions need to be connected with kind of Effect they can deliver
 - moving towards Commander's Intention/End-State
 - and the opposite direction moving from the desired End-State to determine which Effects are required.

Operations Intent and Effects Model



NEC – Information flow

▪ **Dissemination**

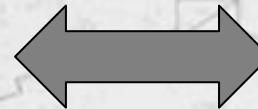


Orders

- OPOD
- WARNO
- FRAGO
- OPLAN

Requests

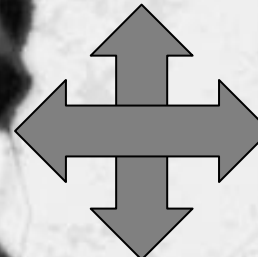
▪ **Exchange**



Operational Picture

- OPOD
- WARNO
- FRAGO
- OPLAN

▪ **Collaboration**



Command Intent

Effects

Actions

Reports

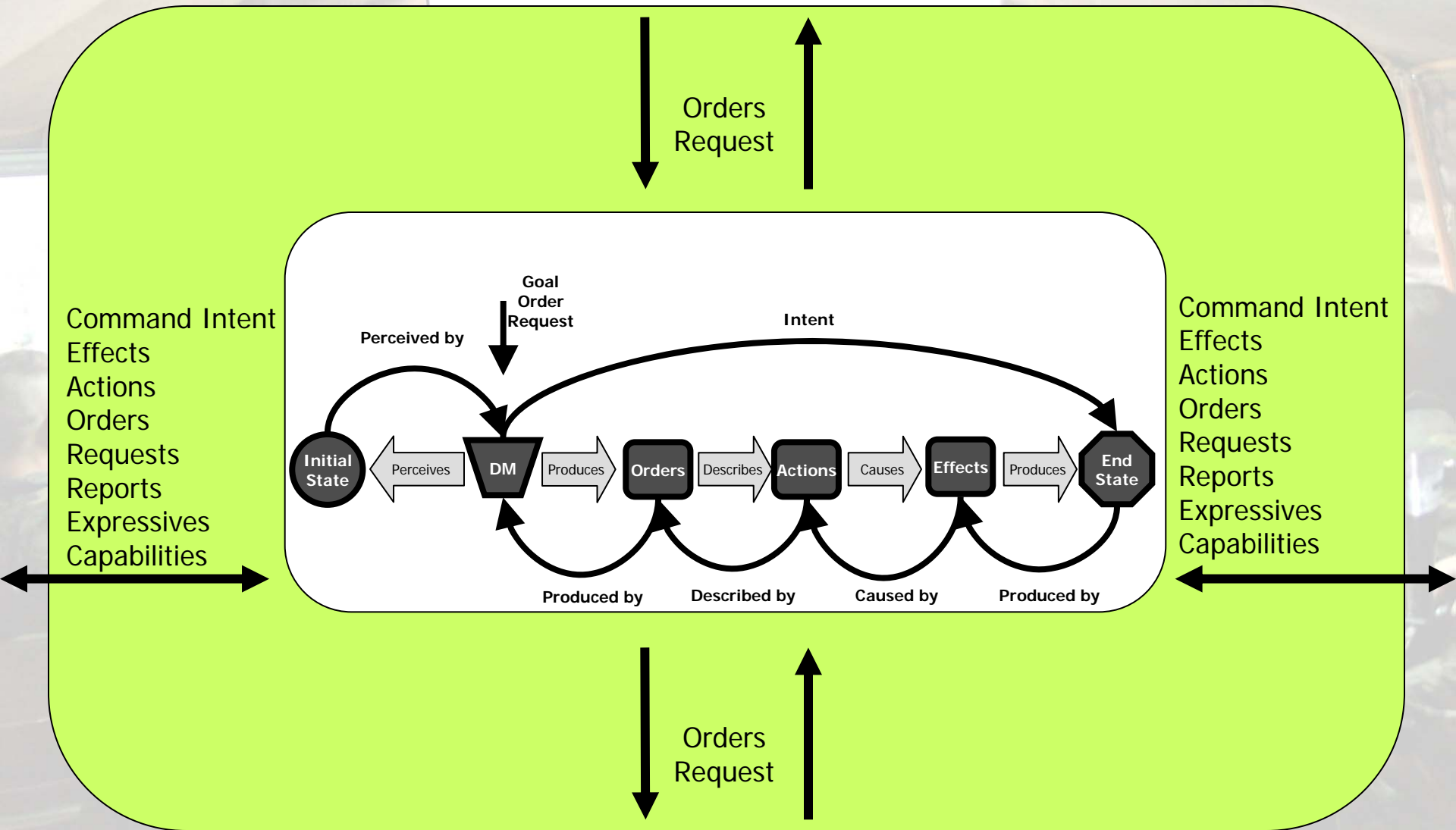
Expressives

Capabilities

Orders

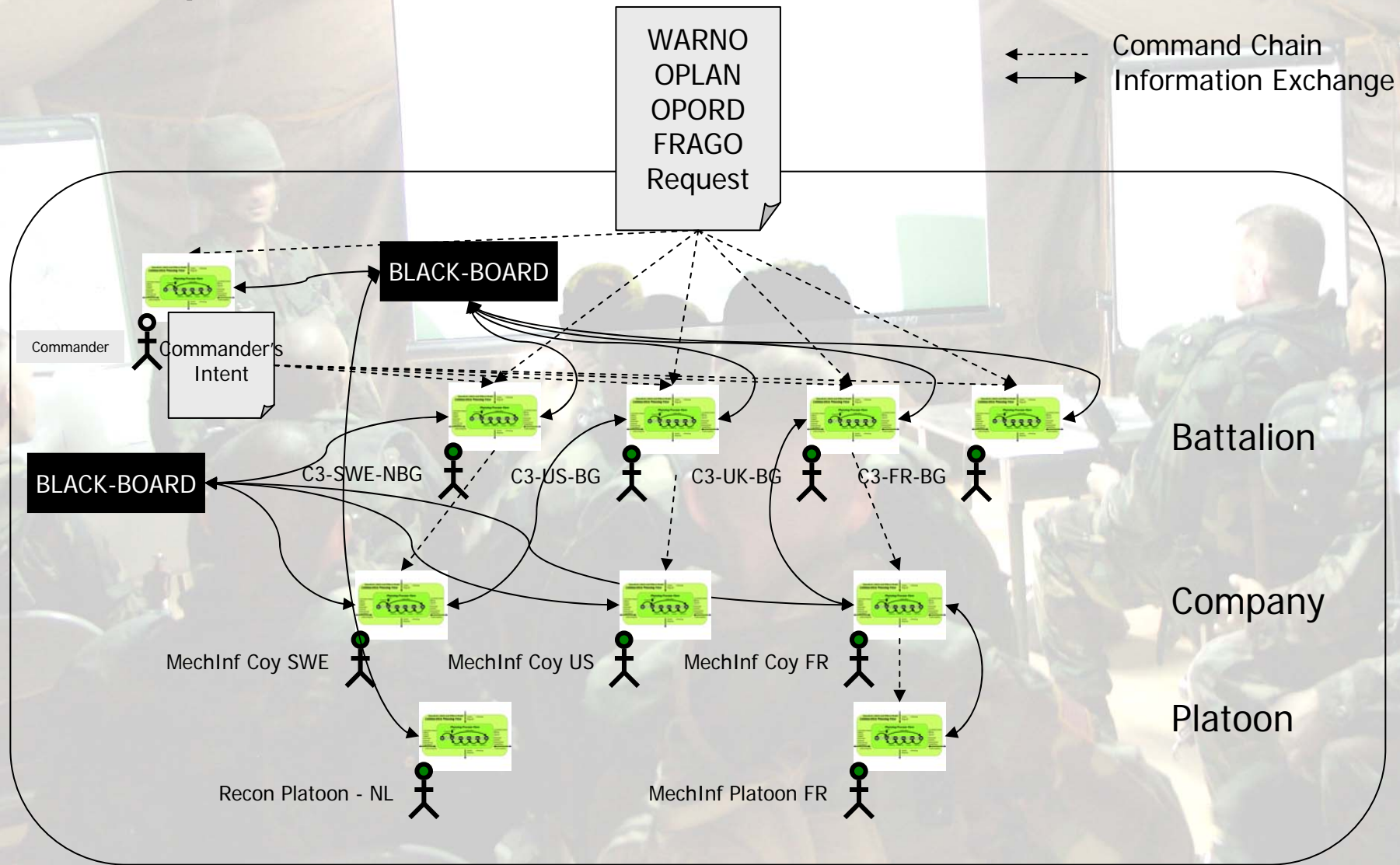
Requests

Operations Intent and Effects Model



From paper I-188 2008 ICCRTS

Multi-Level Development of Command Intent



The Challenge for OIEM

- Increase the ability to plan effective missions for a medium tactical unit (Battalion sized) unit
- Increase the ability for a medium tactical sized unit to conduct missions
- Increase the ability of subordinates to take their own initiative to accomplish their mission
- Specifically
 - Need a representation of the relationship between Effects and Actions
 - Need to communicate Effects, End-State and Courses of Action between HQ members and tactical commanders
 - Need for the tactical commander to communicate the resulting plan to the HQ and other units

Representing the OIEM in a machine and human interpretable format

- With a series of extensions to the Command and Control Lexical Grammar (C2LG) the relationship between Intent, Effects and Actions can be represented in both a human and machine interpretable format with preserved Semantics. (cf. I-188 2008 ...)
- The extended C2LG grammar below is simplified to show the basic principles.
- CI → End-State (Key-tasks) (Expanded-Purpose) (Expressives)
- End-State → Report | Effect
- Effect → Effect-Verb Start-When (End-When)
- Effect-Action → Effect Action Likelihood
- Action → Action-Verb Executer (Affected | Action) Start-When (End-When)
- Order → Verb Tasker Taskee (Affected | Action) Start-When (End-When) Why
- Why → CI | Order

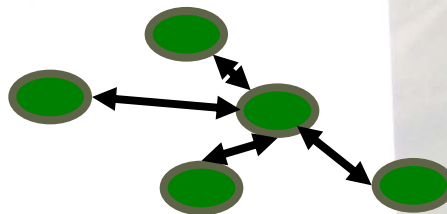
Summary

Supporting Collaboration in Collective Endeavours with a Model of Operations Intent and Effects

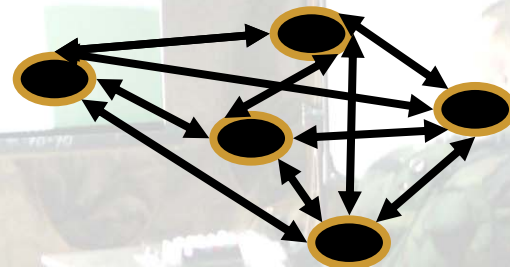
- The OIEM provides a way to identify and relate to the extensive information sharing needed amongst people and systems in Collective Endeavors.
- The OIEM captures the information flow from both traditional as well as collaborative decision making process in a unified model.
- Specific the model connects Intent, End-State, Effects, Actions and Orders together.
- The model is used as a base to expand the C2LG, which then preserve the semantic information interpretation between humans as well as amongst machines.

Cellular network (NEC)

**Cellular network with centralized information sharing.
No contact between other cells**



**Cellular network with decentralized information sharing.
Full contact between other cells**



**Cellular network with decentralized information sharing
Contact with no other than two cells**



**Heterogeneous Cellular network
A combination of two or more above**

