Building Information Systems For Network-Centric Warfare

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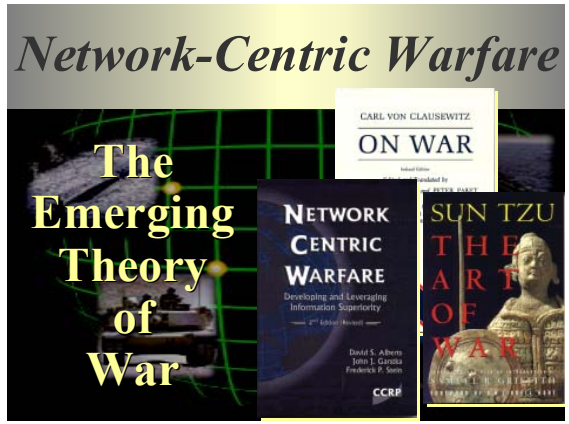
Net-Centric Warfare

- Seamless interoperability
  - The communications network is only the beginning!
- Permits sharing of
  - Information
  - Situational awareness
  - Commander's intent
- Leading to
  - Speed of command
  - Self-synchronization
  - Enemy lock-out
- Producing increased combat power



The Fortune Teller: Six 15-Year Predictions

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❶ **Seamless network connectivity**

The Fortune Teller: Six 15-Year Predictions

❶ Seamless network connectivity

❷ **Very many network participants**

The Fortune Teller: Six 15-Year Predictions

1. Seamless network connectivity
2. Very many network participants
3. **Bandwidth limits at the sharp end**

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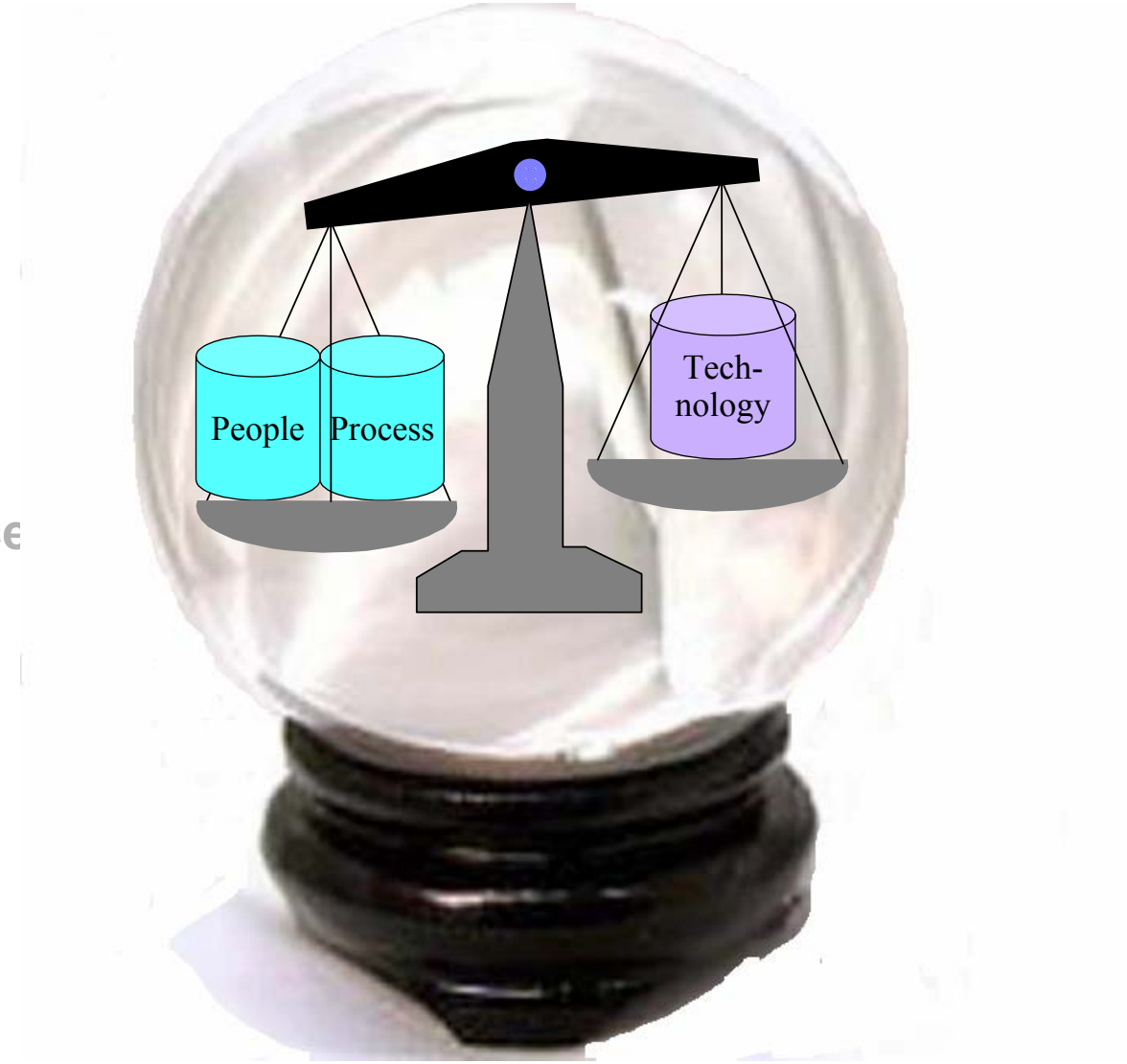

The Fortune Teller: Six 15-Year Predictions

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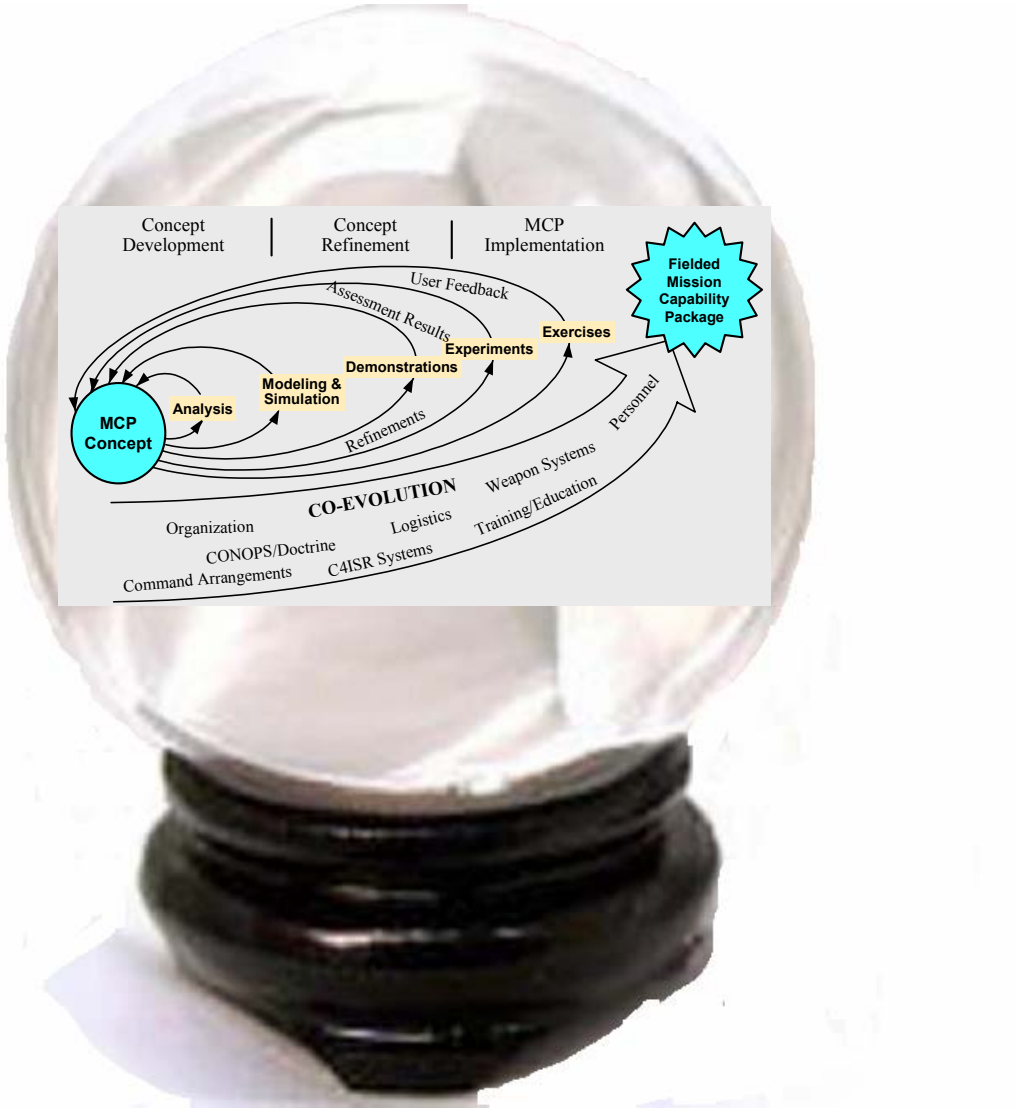
6. **Flexibility essential for quick coevolution**



Implications

1. Seamless network connectivity
2. Very many network participants
3. Bandwidth limits at the sharp end
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Implication: Enterprise Foundation Services

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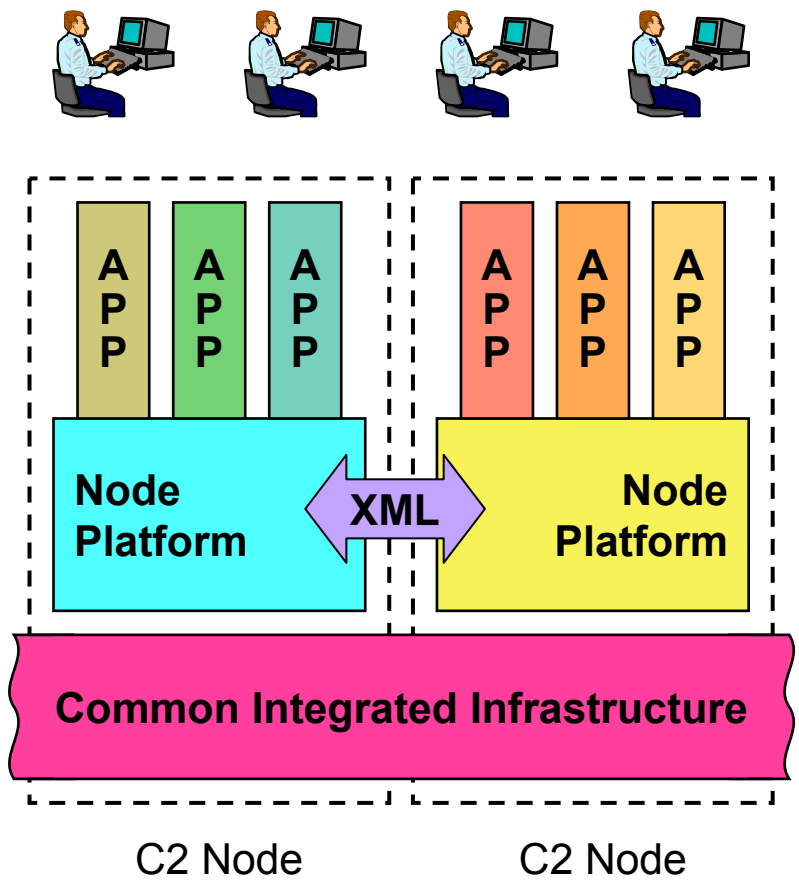

C2 Enterprise Reference Architecture (C2ERA)

Implication: Enterprise Foundation Services

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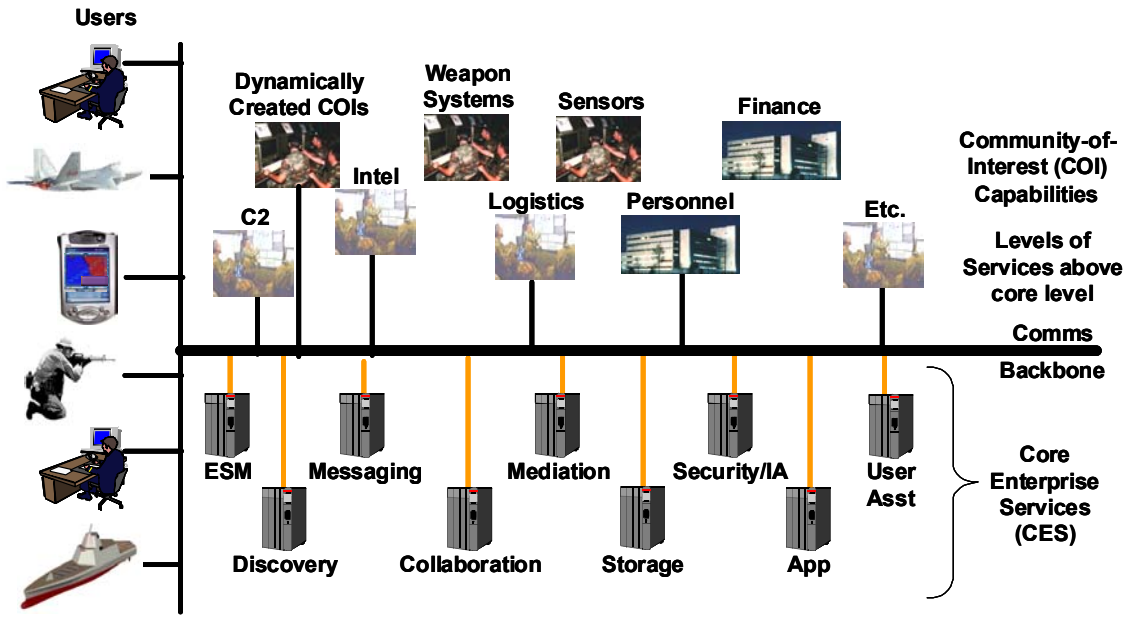

Global Information Grid (GIG)
Enterprise Services (GES)

Implication: Information Publish / Subscribe

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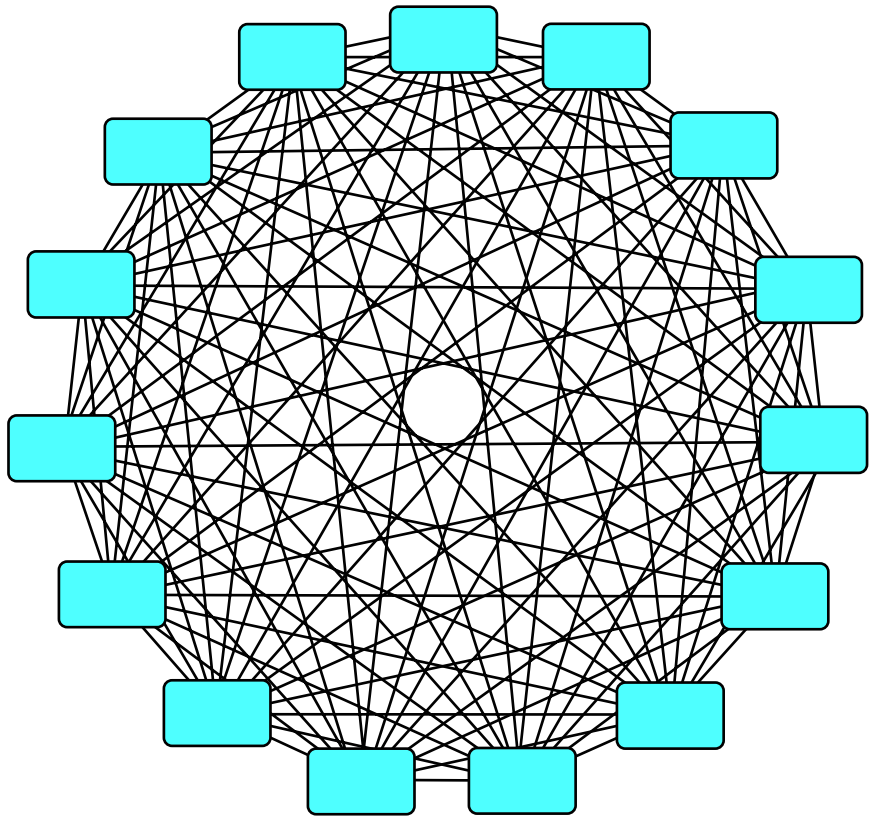

The N^2 problem

Implication: Information Publish / Subscribe

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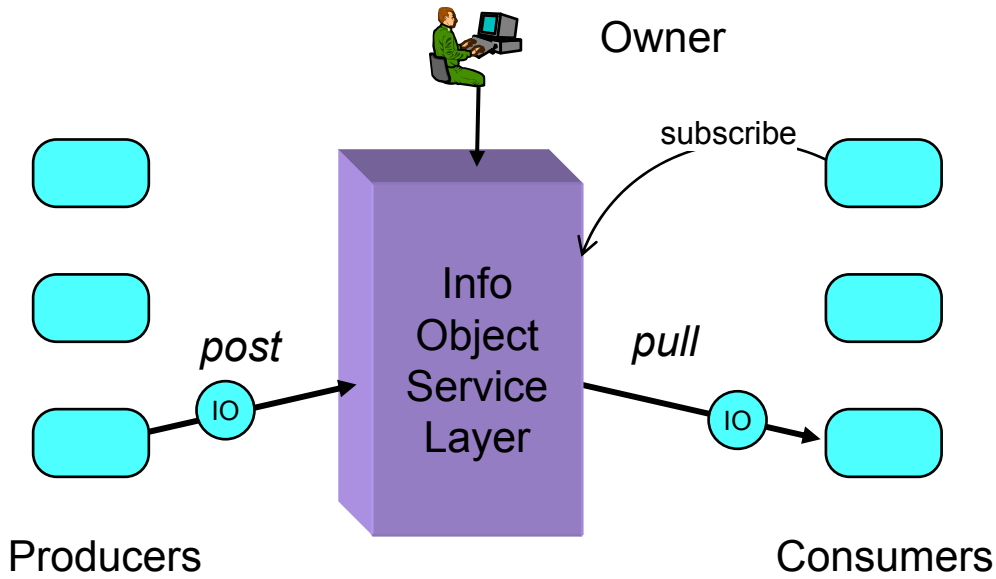

Information object publish/subscribe/query architecture

Implication: Dissemination Optimizatioin

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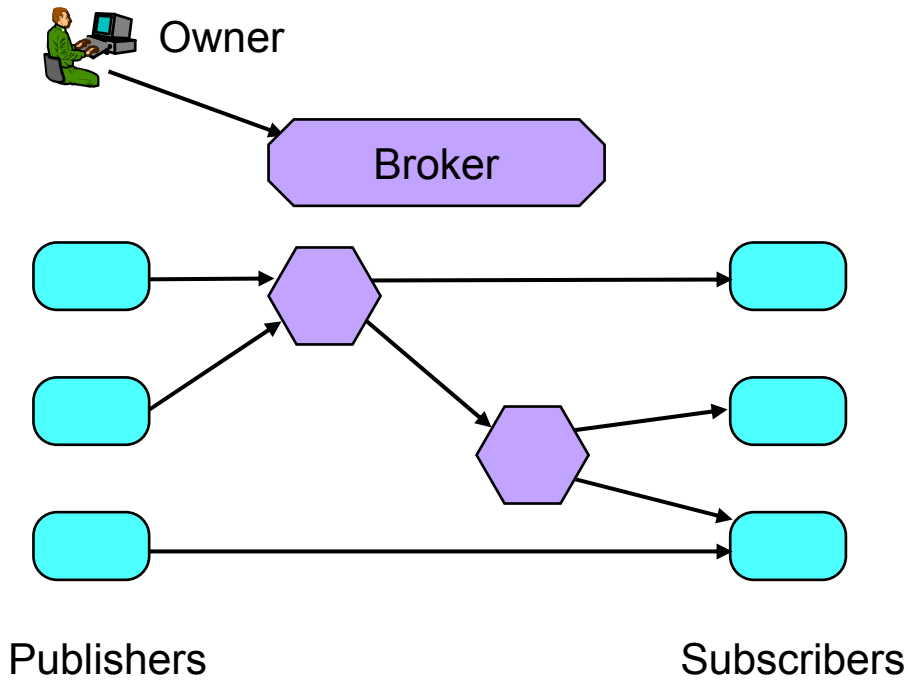

Caching and intermediate processing

Implication: Common Vocabularies

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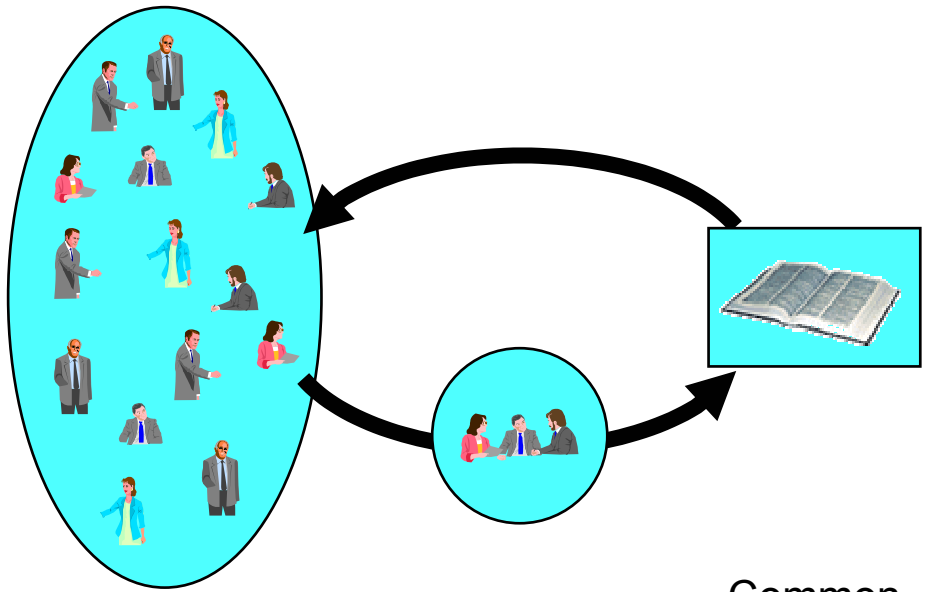

Implication: Operational Architectures

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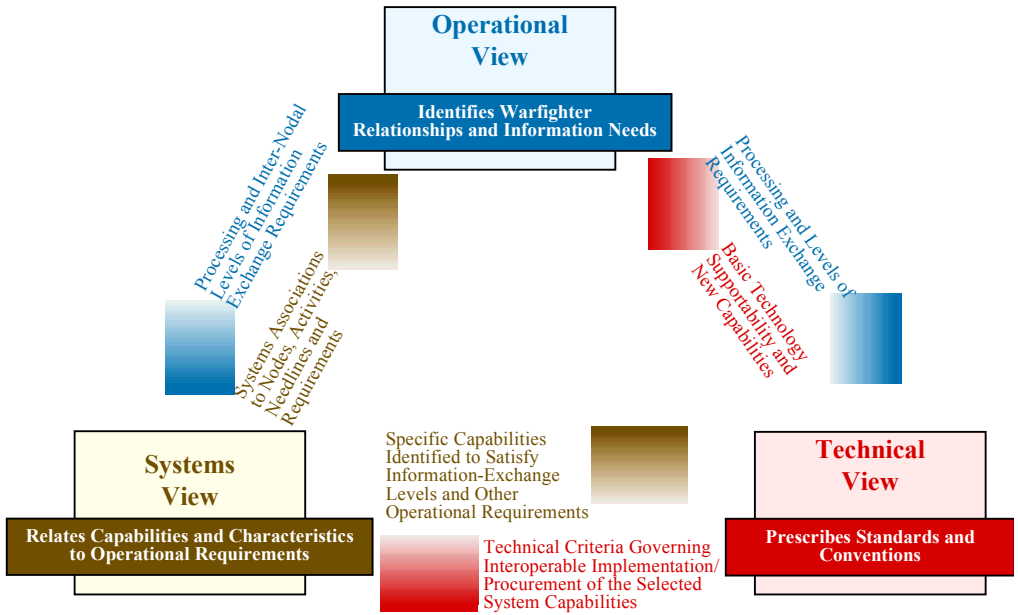

DoD Architecture Framework

Implication: Introspection For Smart Service Degradation

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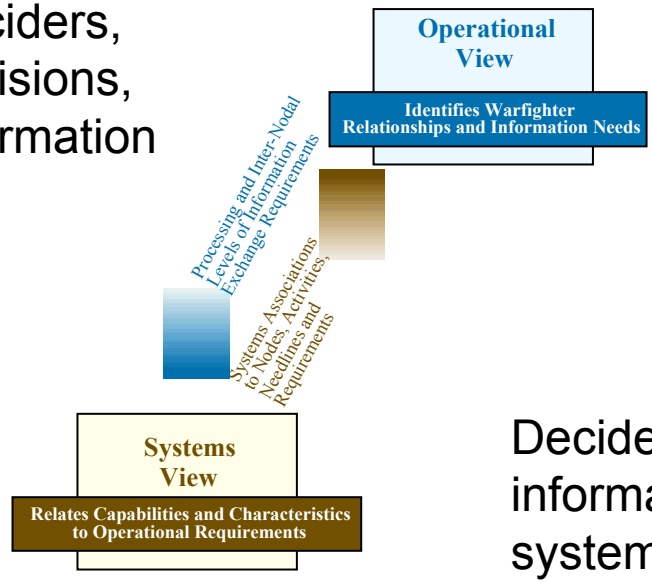
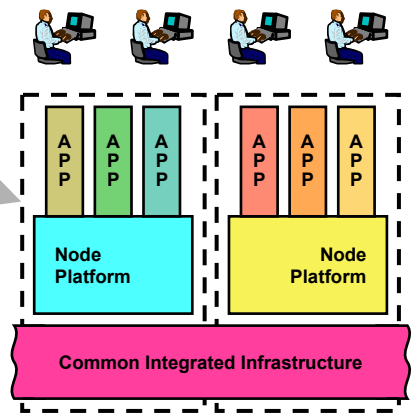
Deciders, decisions, information



Deciders, information, systems

Users and deployed systems



Implication: Information Preplanning

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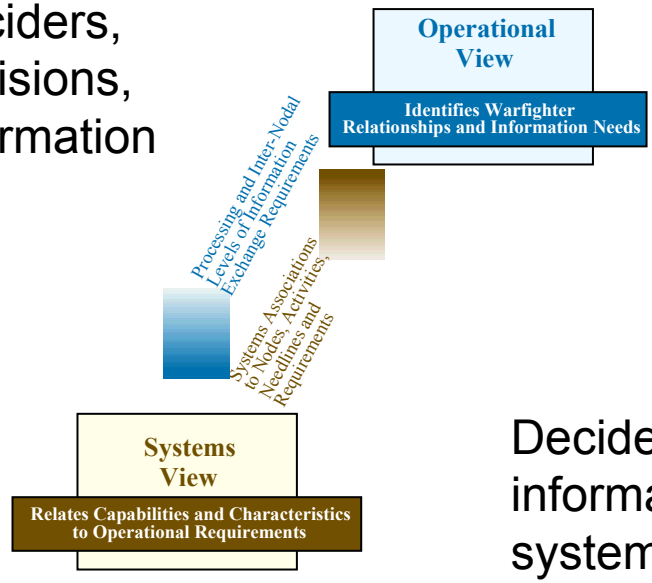
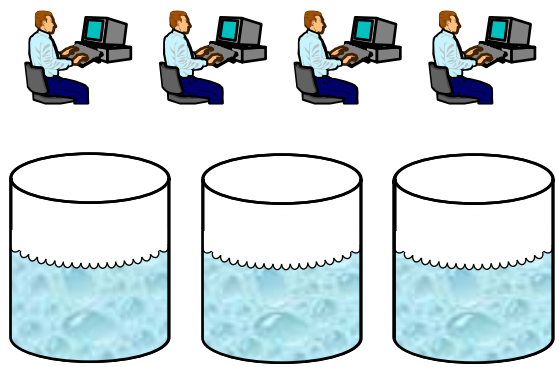


Deciders, information, systems

Users, systems, information resources



Implication: Accountable Data Owners

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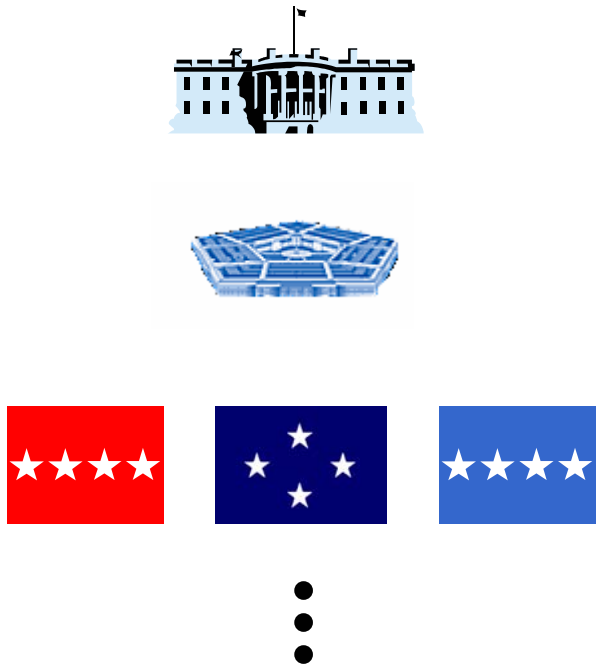
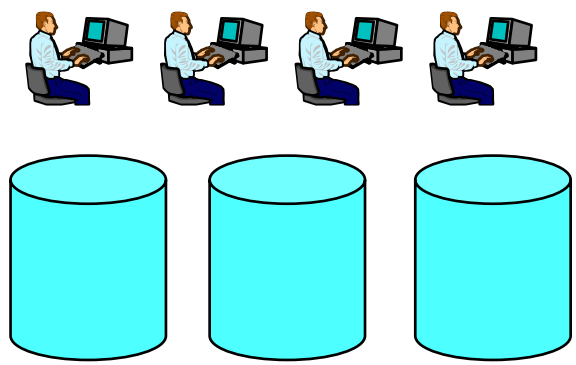


Users, systems, information resources



Implication: Need-To-Hide, Not Need-To-Know

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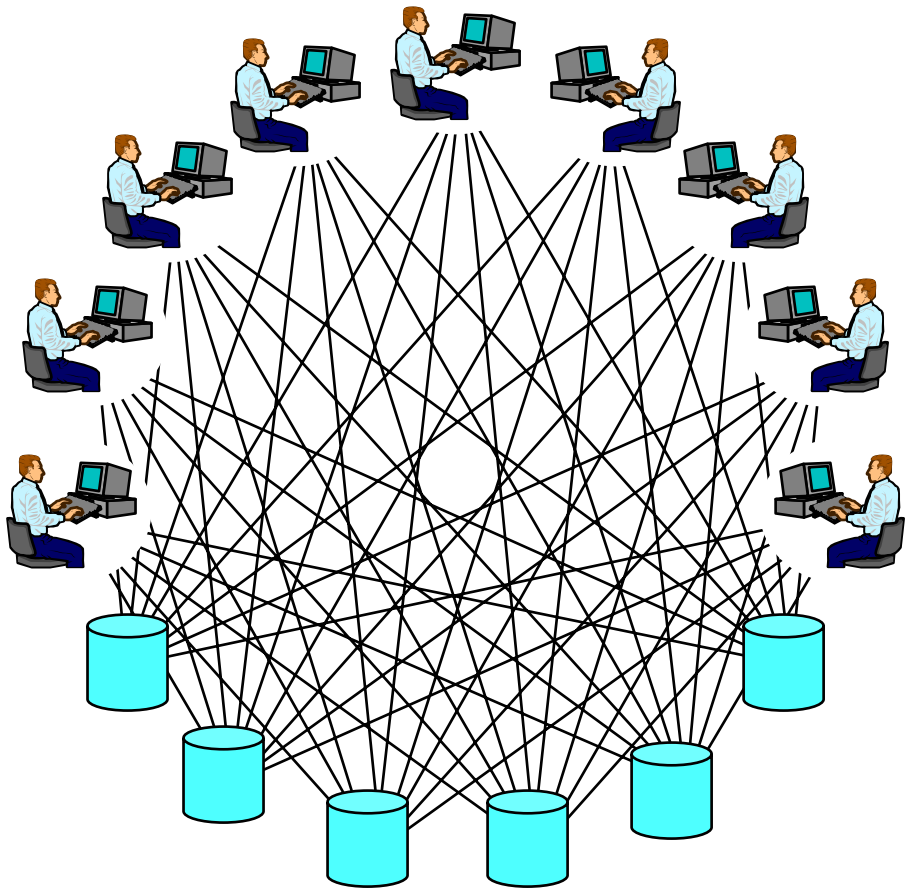

Pairwise “need to know” decisions

Implication: Need-To-Hide, Not Need-To-Know

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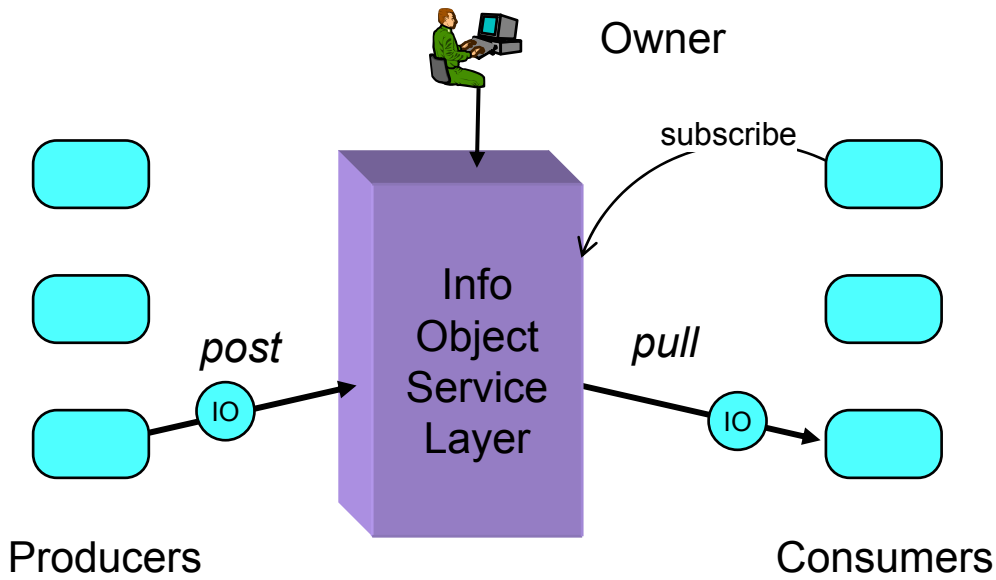
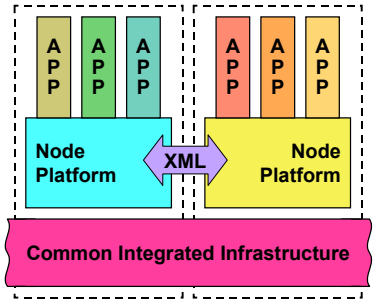
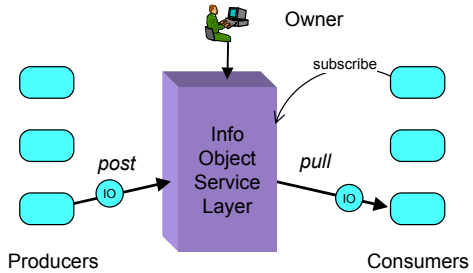


Information object publish/subscribe/query architecture

Each Implication Involves Shared Semantics

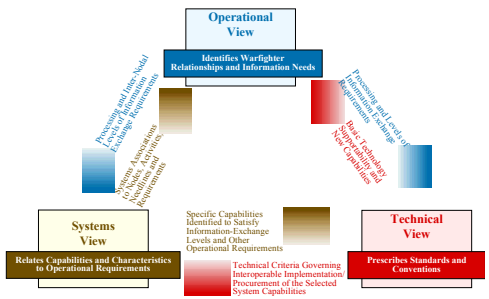


Web-based systems

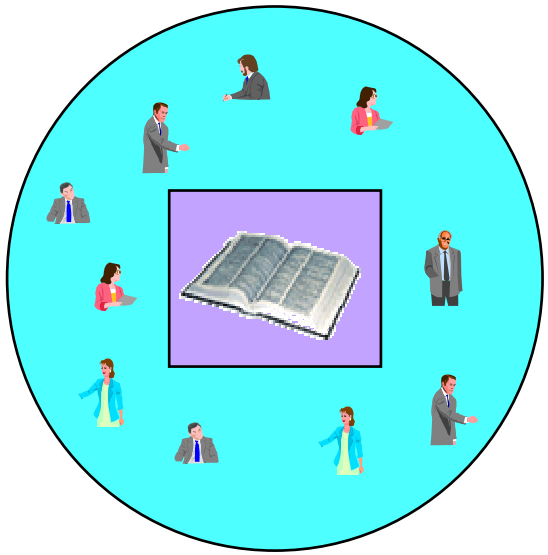


Info object services

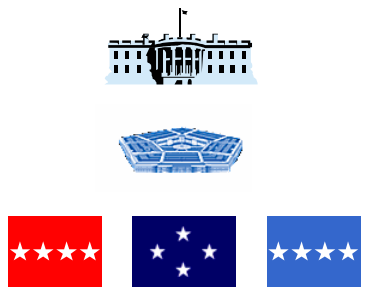
Information preplanning



Architecture descriptions

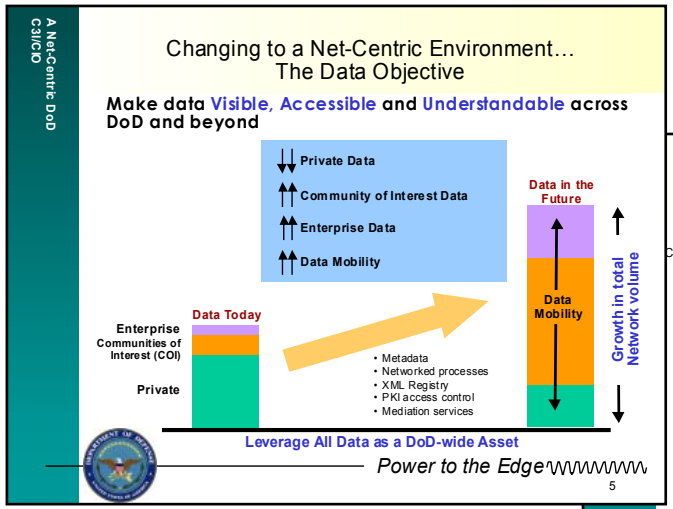


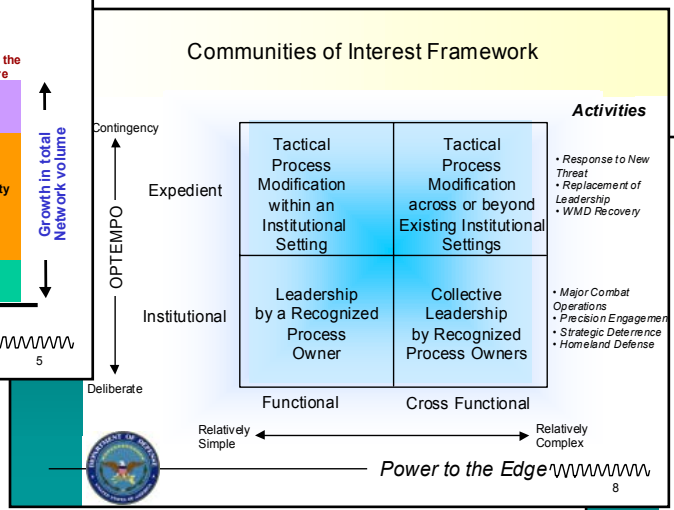
Community of Interest (COI)
Domain Vocabulary

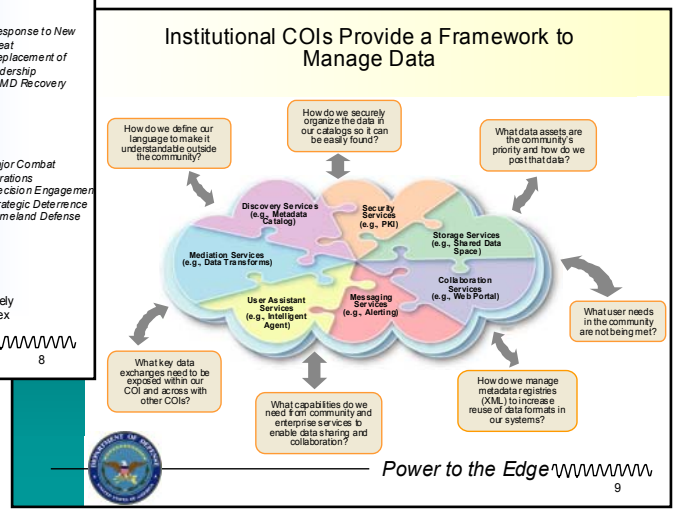


Data owners

Communities of Interest in the DoD Data Strategy

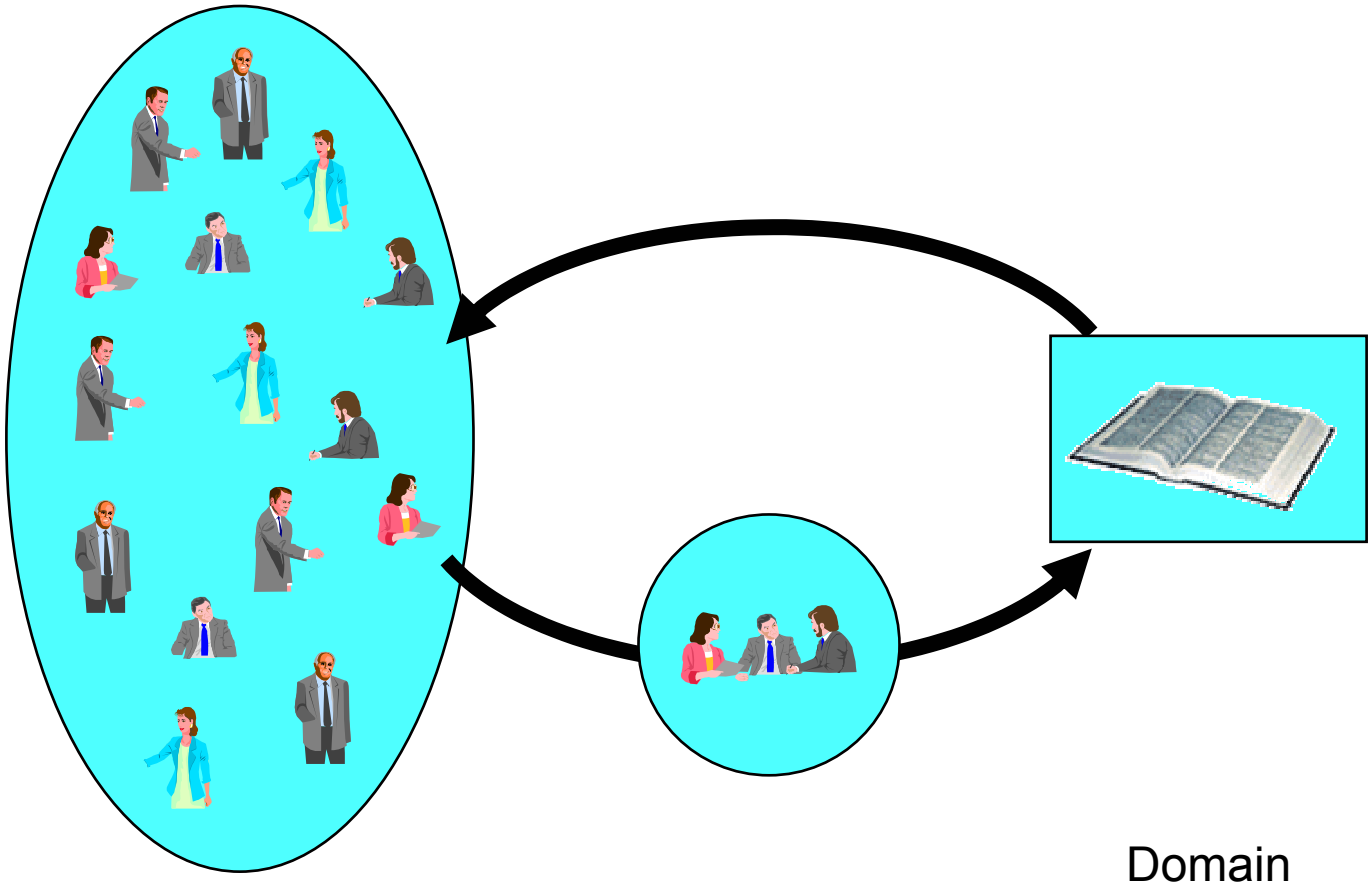






"COIs are collaborative groups of users who must exchange information in pursuit of their shared goals, interests, missions, or business processes, and who therefore must have shared definitions for the information they exchange."

Semantic COIs: Just For Vocabulary

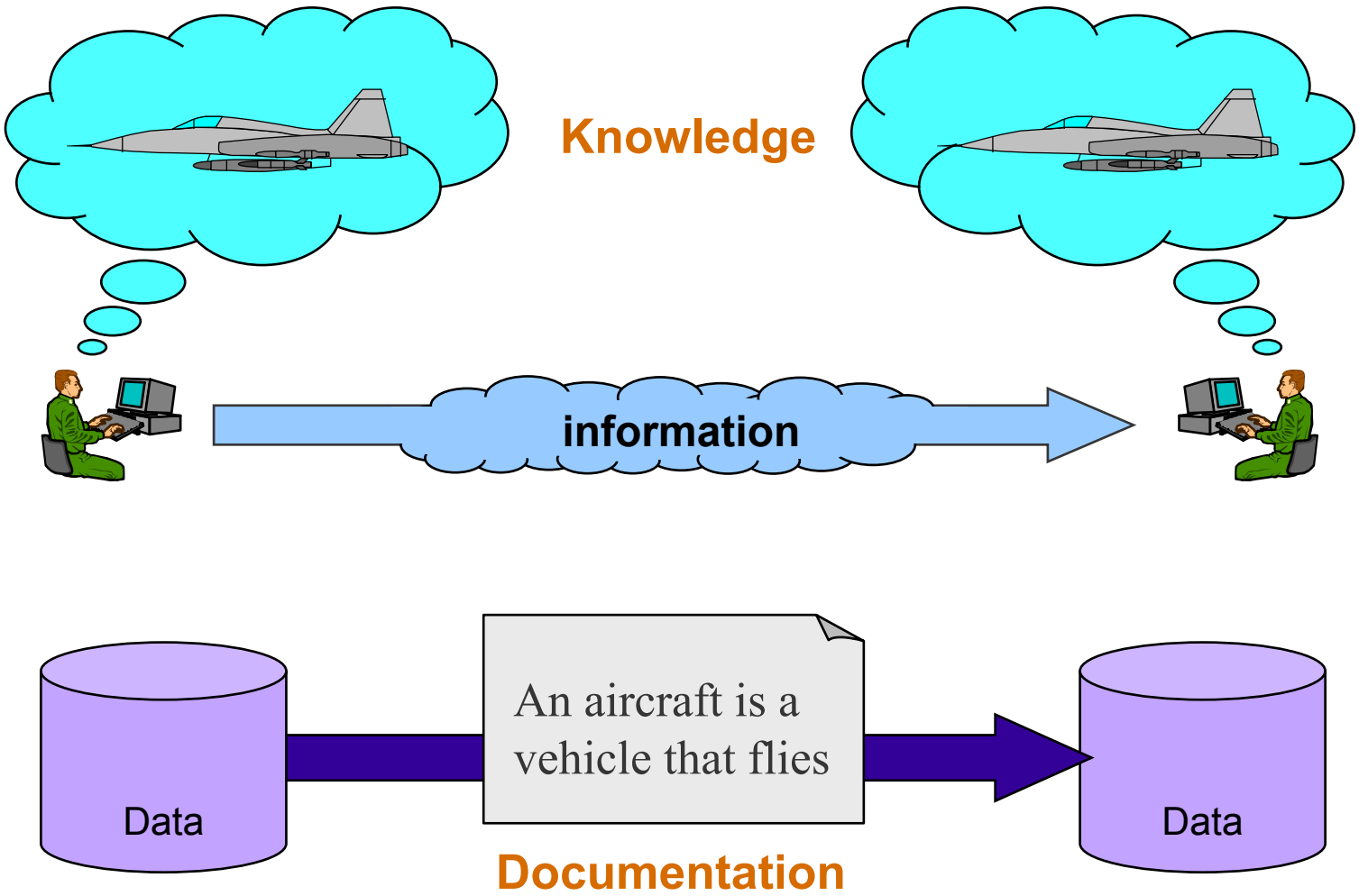


Community of interest

Semantics team

Domain vocabulary (ontology)

Shared Semantics = Shared Knowledge



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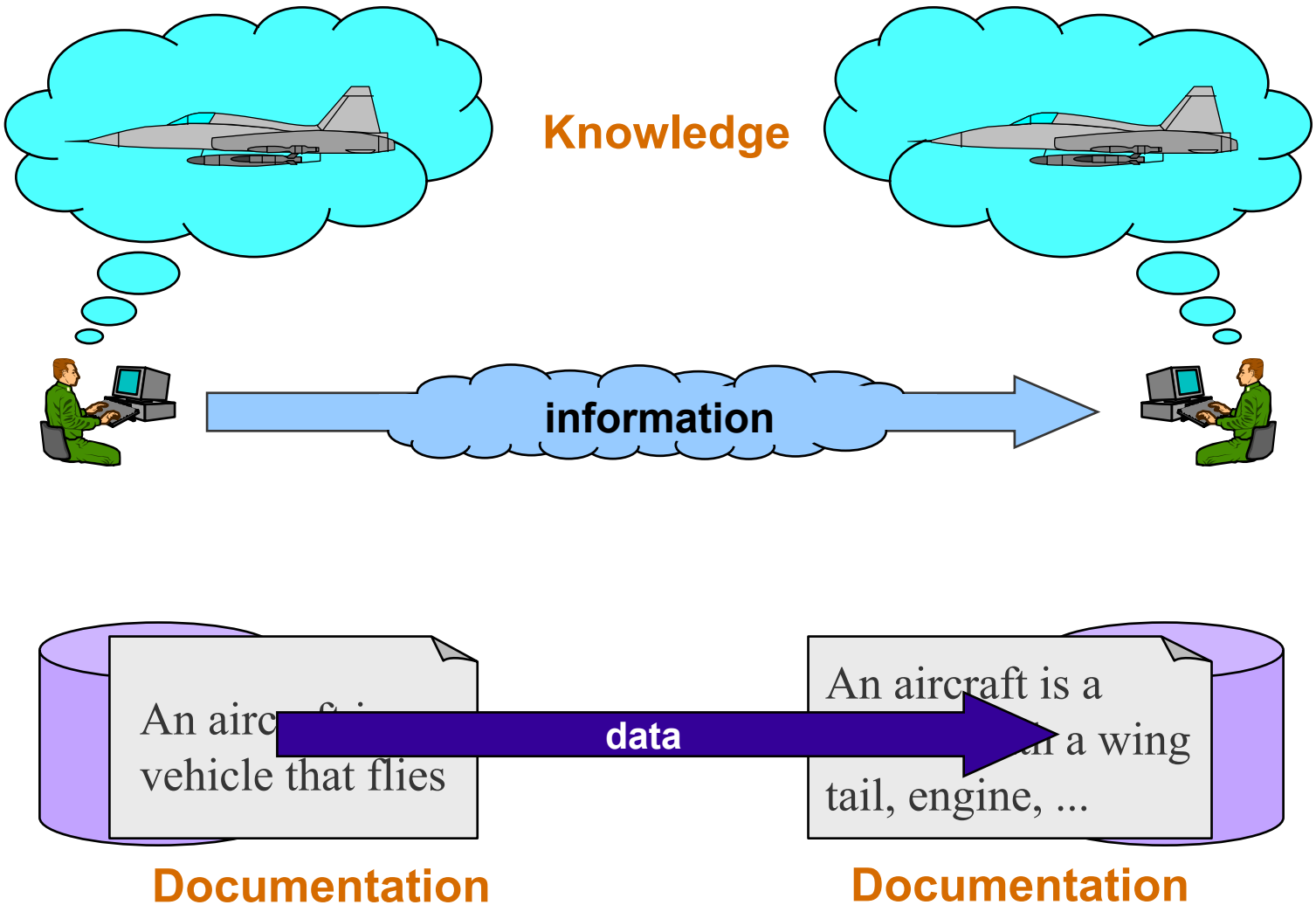
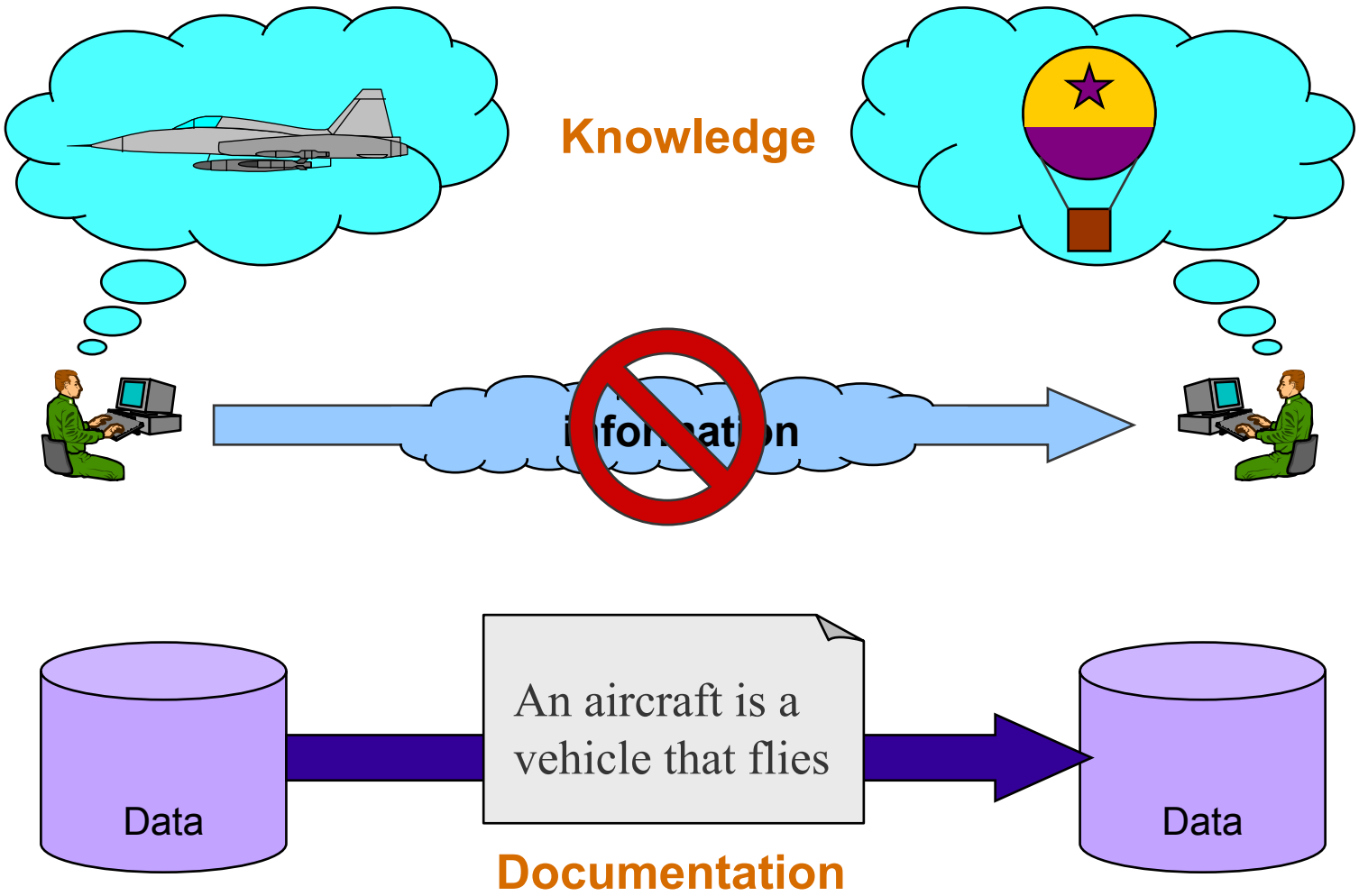


Shared Semantics ≠ Shared Knowledge



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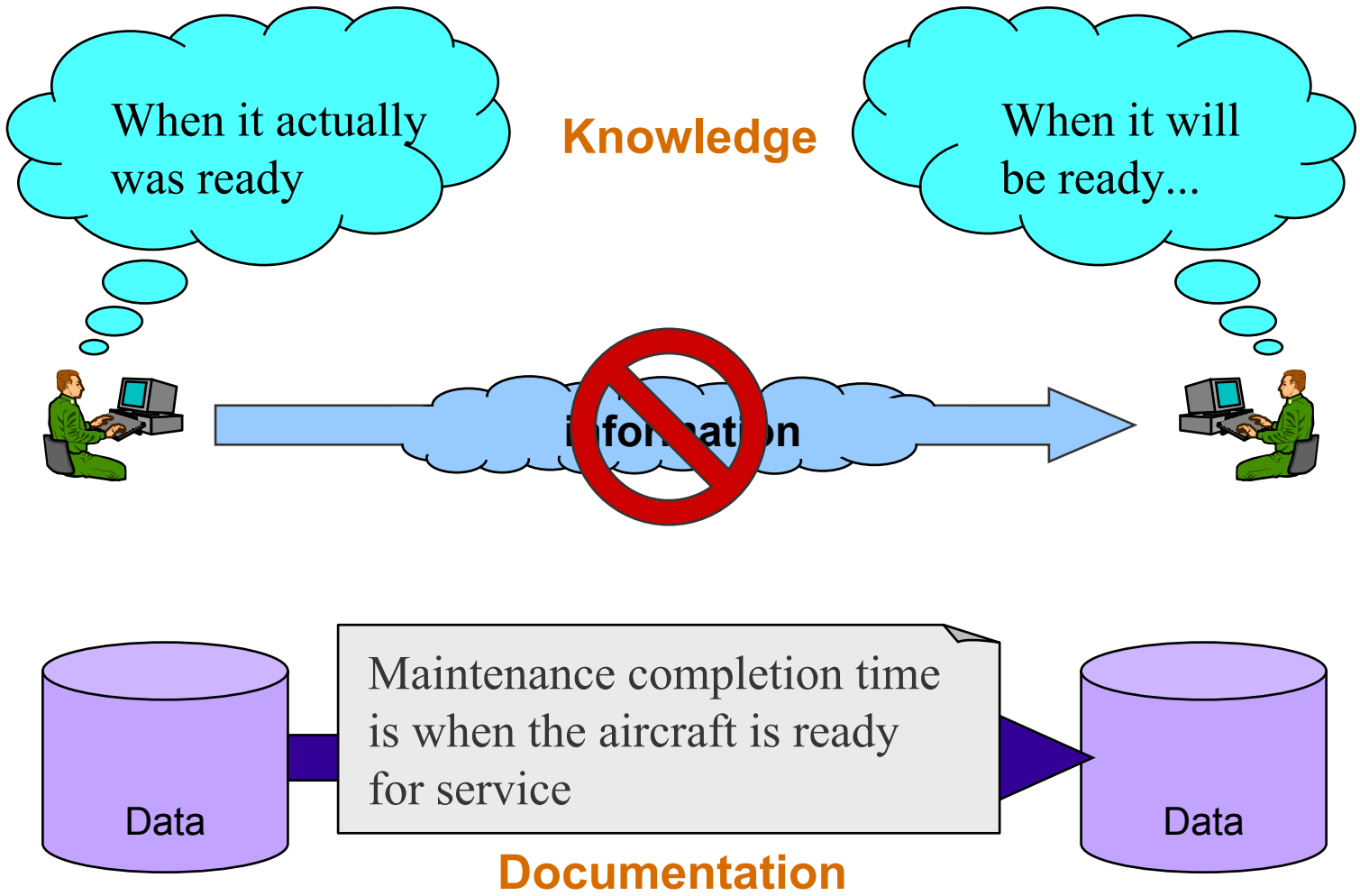
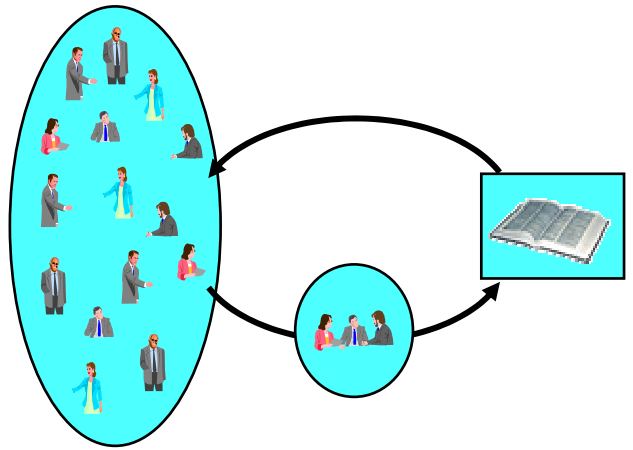


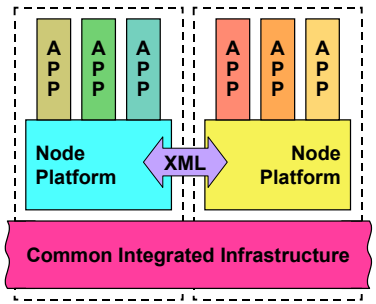
COIs: A Knowledge Management Problem

- **Shared semantics is a KM problem**
  - **Meaning begins and ends with human beings**
  - **Machines don't think**
- **A successful KM process will**
  - **Make explicit the definitions people need to know**
  - **Transfer that knowledge to the people who need it**
- **Documentation is valuable only when it helps with the above**

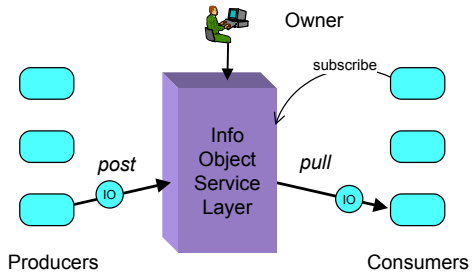


Think of a process to be performed
Don't think of a product to be produced

Different Roles Of People In The COI

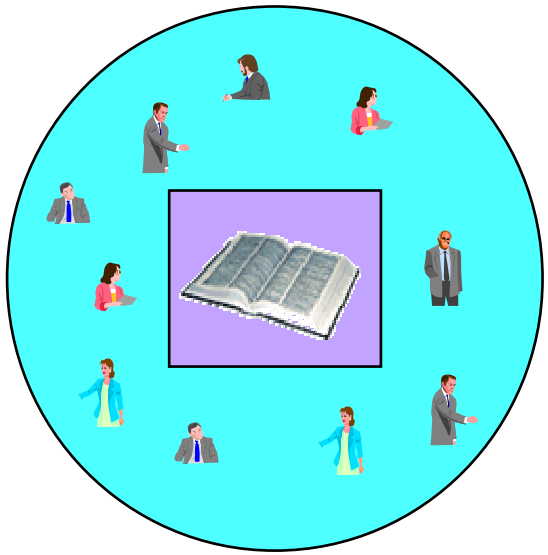


Builders



Users

Information planners



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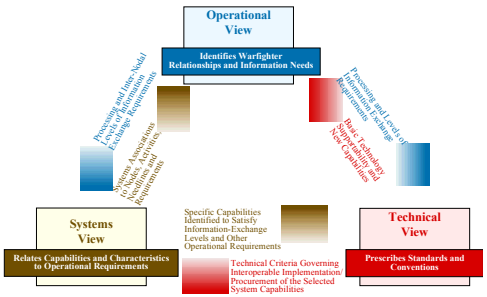
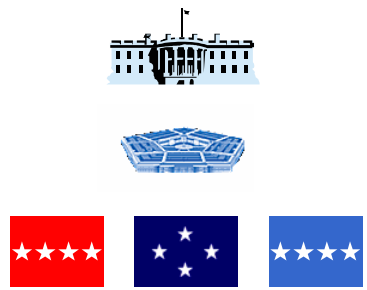
Domain Vocabulary

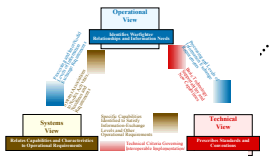


Architects



Data owners

Kinds Of Knowledge For Each Role



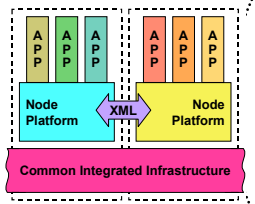
Architects

Common vocabulary: Dictionary of terms
What is an airplane? A flight?

Abstract models
What information do we need about flight schedules?

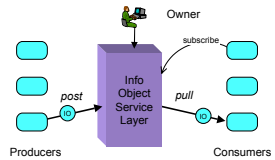
Concrete models
How does my program interface with the flight schedule data?

Physical representations
What is the flight schedule message format?

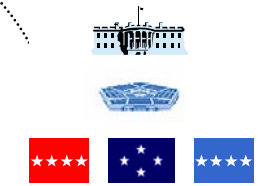


Builders

COI domain



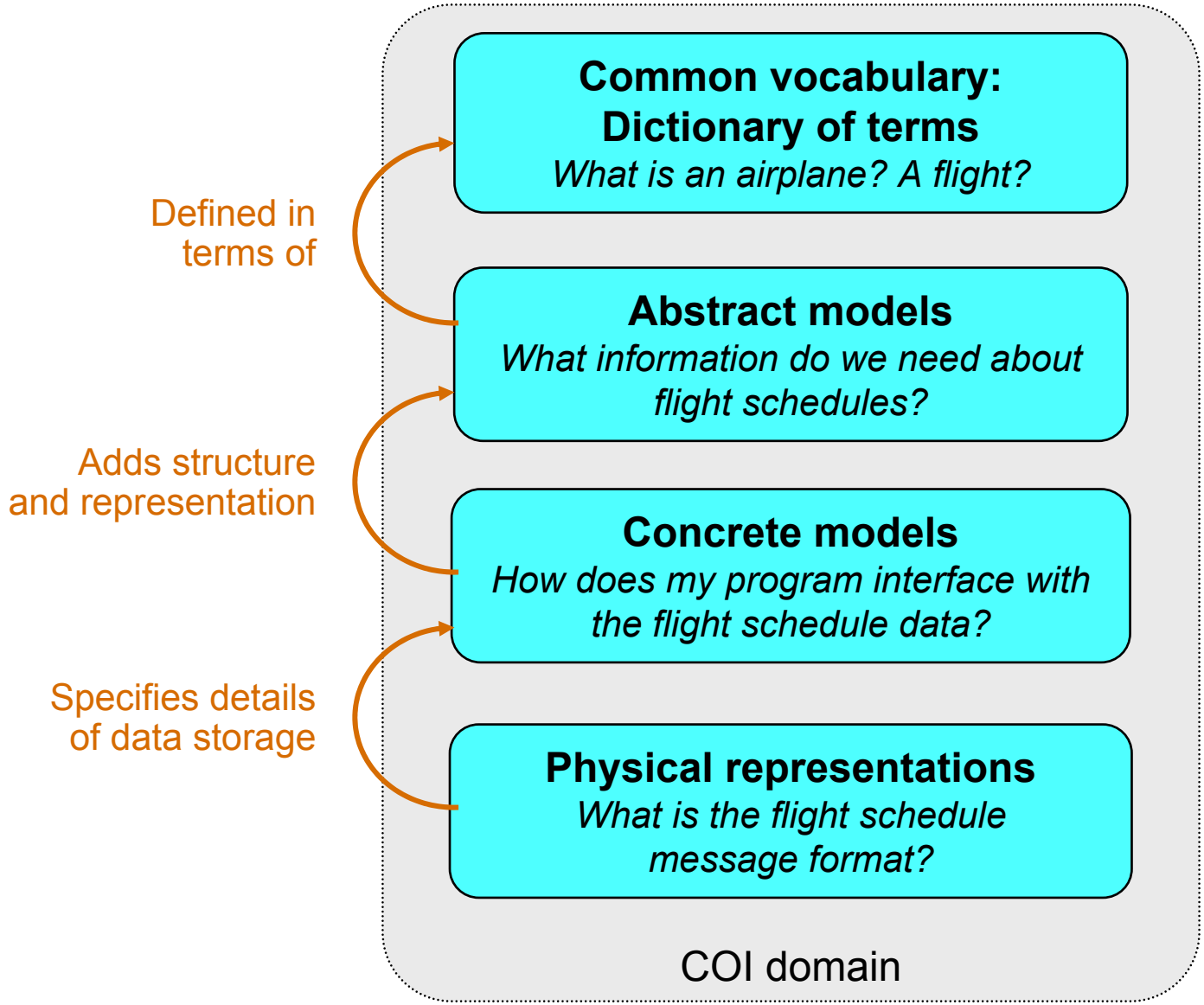
Users



Owners

Planners

Relations Between Kinds Of Knowledge



Structure Of Knowledge Within A Domain

COI Domain Common Vocabulary

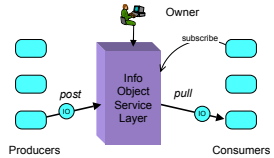
Abstract Model

Abstract Model

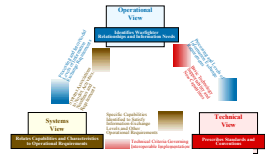
Concrete Model

Concrete Model

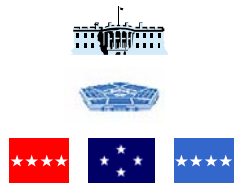
Source



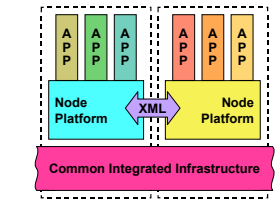
Users



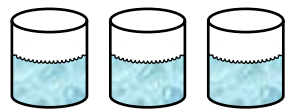
Architects



Owners



Builders



Planners

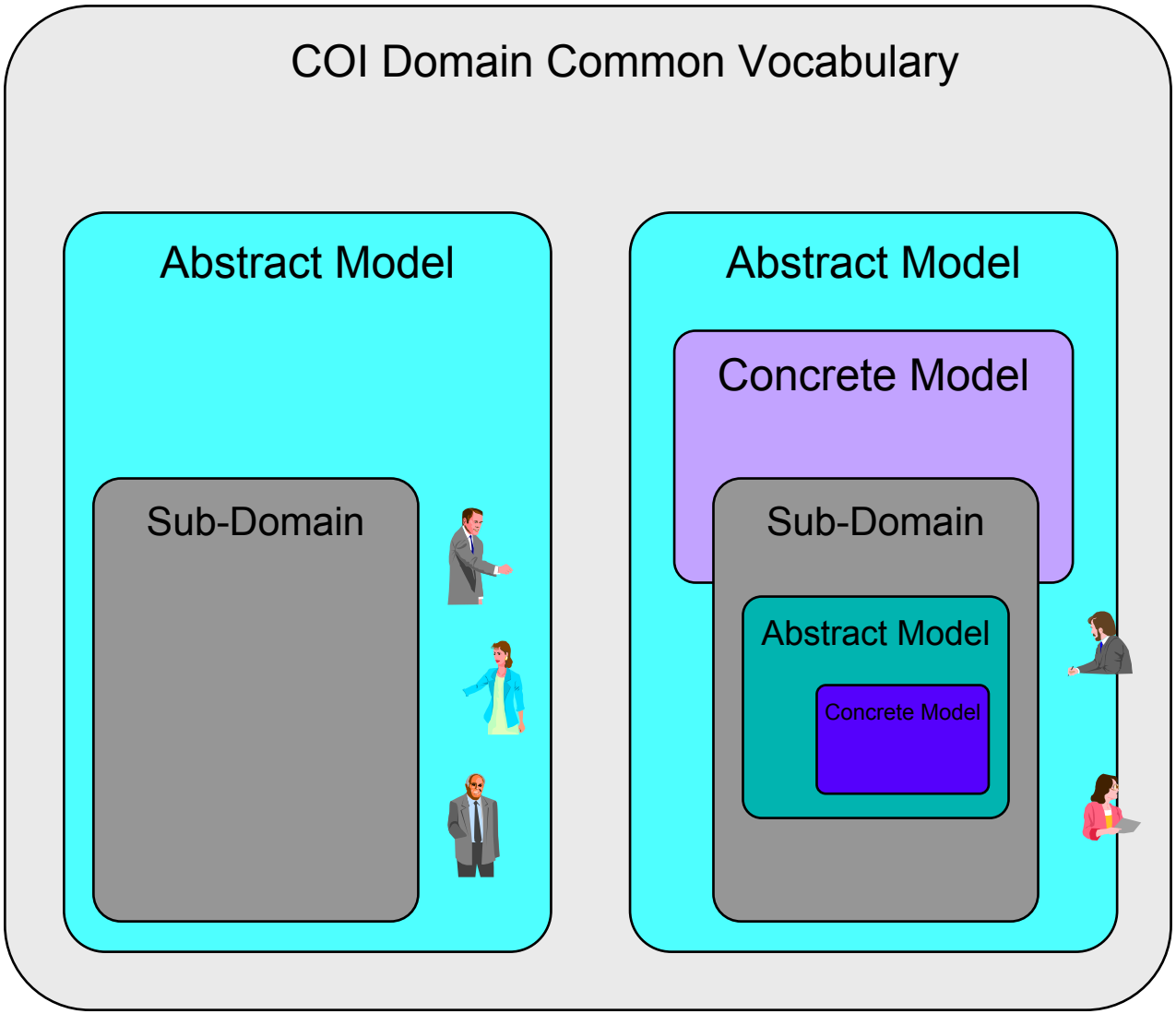
Hierarchy of COI Domains

COI Domain Common Vocabulary

Sub-Domain

Sub-Domain

Ontologies For Managing COI Knowledge



Summary

- Net-Centric Warfare
  - Theory of warfare
  - Seamless interoperability → increased combat power

Summary

- Net-Centric Warfare
- Predictions
  - Seamless networks
  - Very many network participants
  - Bandwidth limits, esp. near the sharp end
  - Information assurance still critical
  - Advantage comes from best use of IT
  - Flexibility essential for quick evolution

Summary

- Net-Centric Warfare
- Predictions
- Implications
  - Enterprise foundation services
  - Information publish/subscribe
  - Dissemination optimization
  - Common vocabularies
  - Operational architectures
  - Smart service degradation
  - Information preplanning
  - Accountable data owners
  - Need-to-hide, not need-to-know

Summary

- Net-Centric Warfare
- Predictions
- Implications
- **Shared Semantics**
  - **A knowledge-management problem**
  - **Same shared knowledge for different purposes**
  - **Establish agreement at different levels of detail**
  - **Communities of Interest for semantic agreement**