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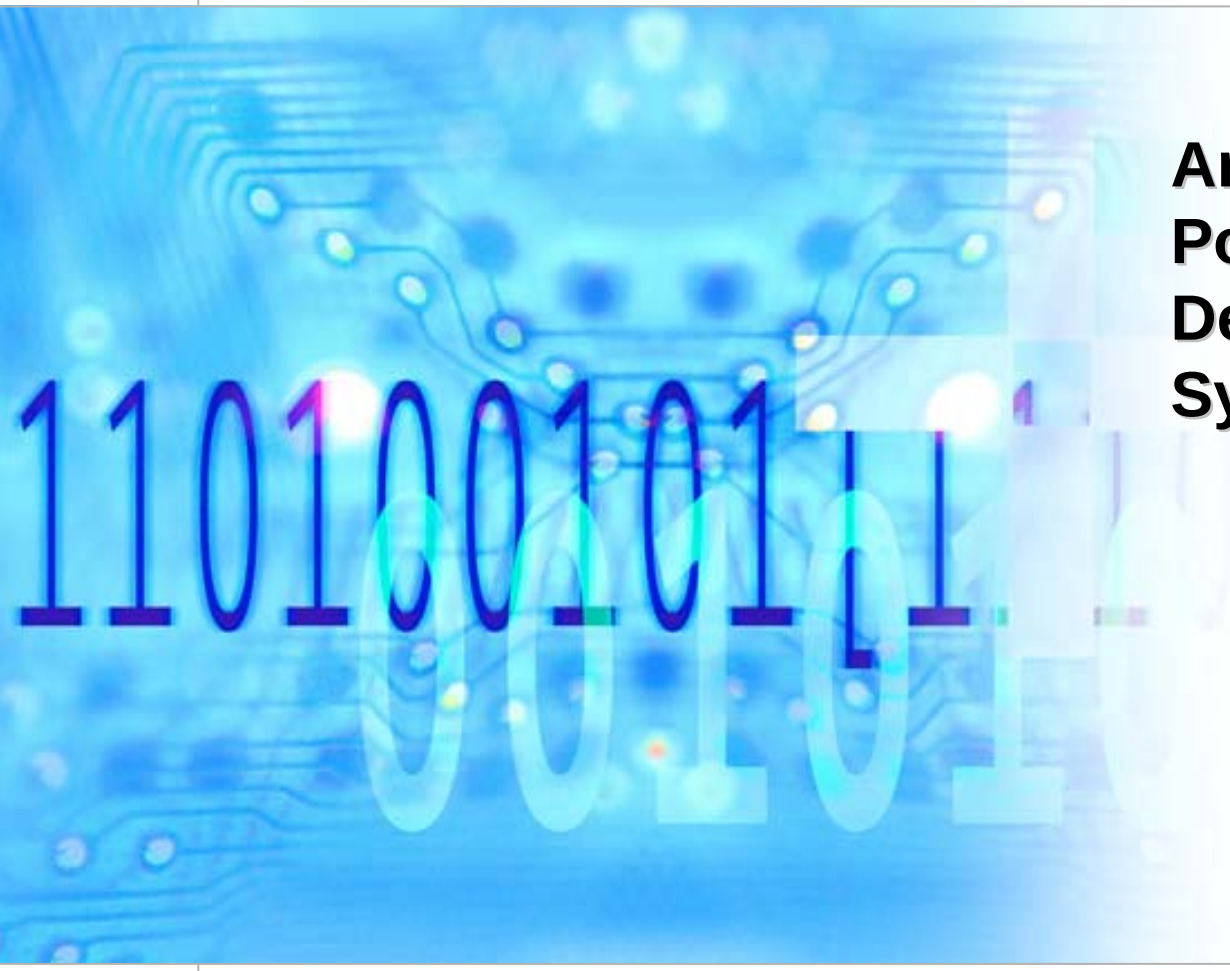

An Architecture for Policy-based C2 Decision Support Systems

Jim Jacobs

Raytheon

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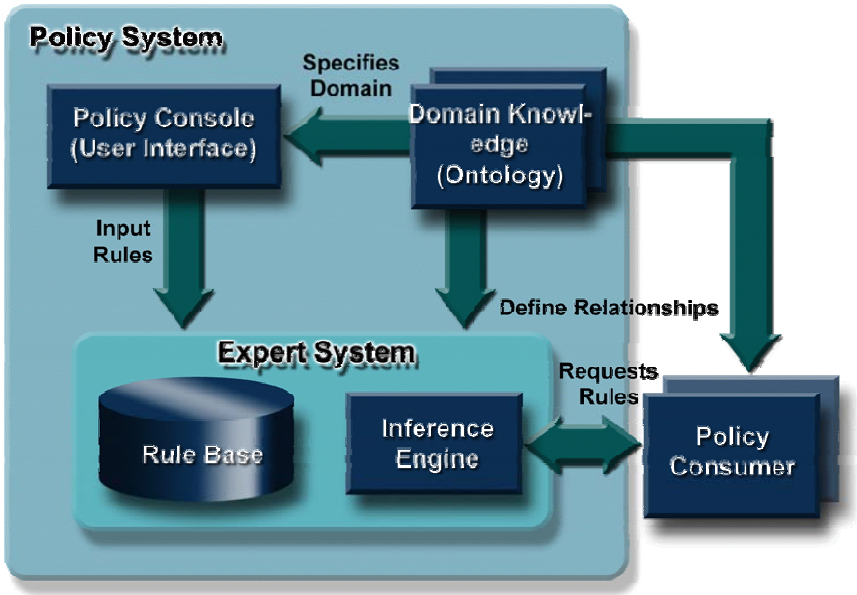
Ontology-based Policy Approach

- Policy creator and consumer share a common terminology
- Policy creator defines policy in those terms
- Consumer expresses conditions and receives response in those terms
- Inference capability allows detection of applicable policies which do not explicitly address the exact set of conditions specified by the querying consumer
- Specifying new terms and relationships allows new types of policy to be created and consumed.



Example: Policy-based Reasoning for Targeting Decision Support

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A Mission Problem...

Flooded by data, the targeting officer must make critical decisions rapidly in a complex and highly dynamic environment...

... and he must do so while considering a host of issues of varying relevance for a diverse set of forces

what's the effect of *this* data?

what if we take *this* action?

Improving Mission Effectiveness With Cognitive Systems

Support the targeting officer with situation awareness by...

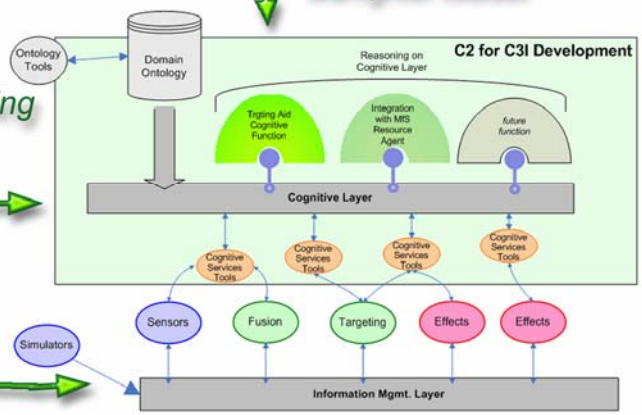
adding a cognitive decision aide...

to the existing warfighter toolset

using policy-based reasoning

adding the richness of semantic content...

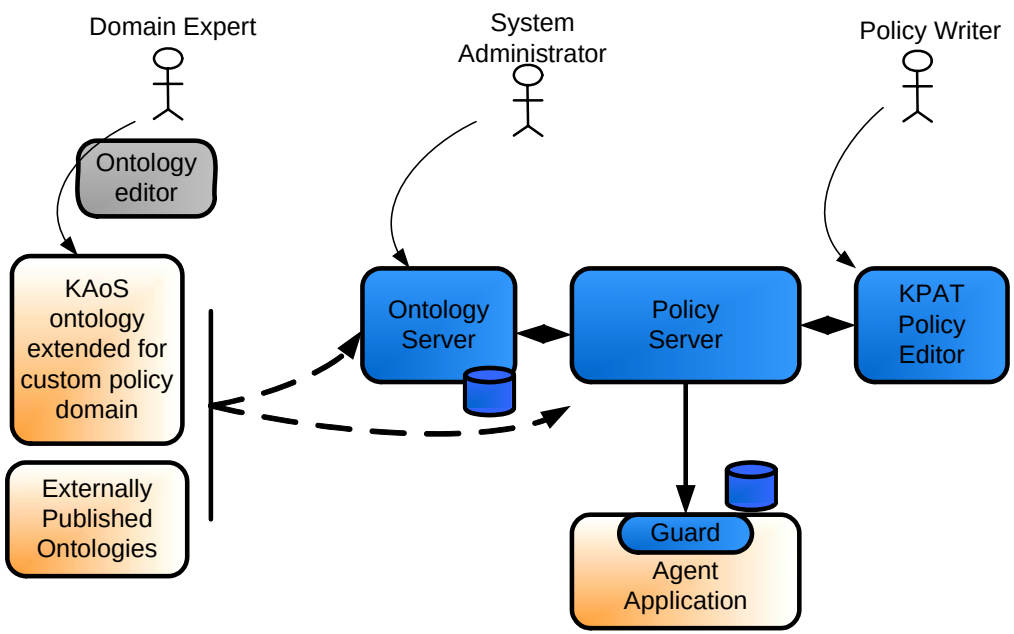
to the existing information networks



An Architecture for Policy-based C2 Decision Support Systems

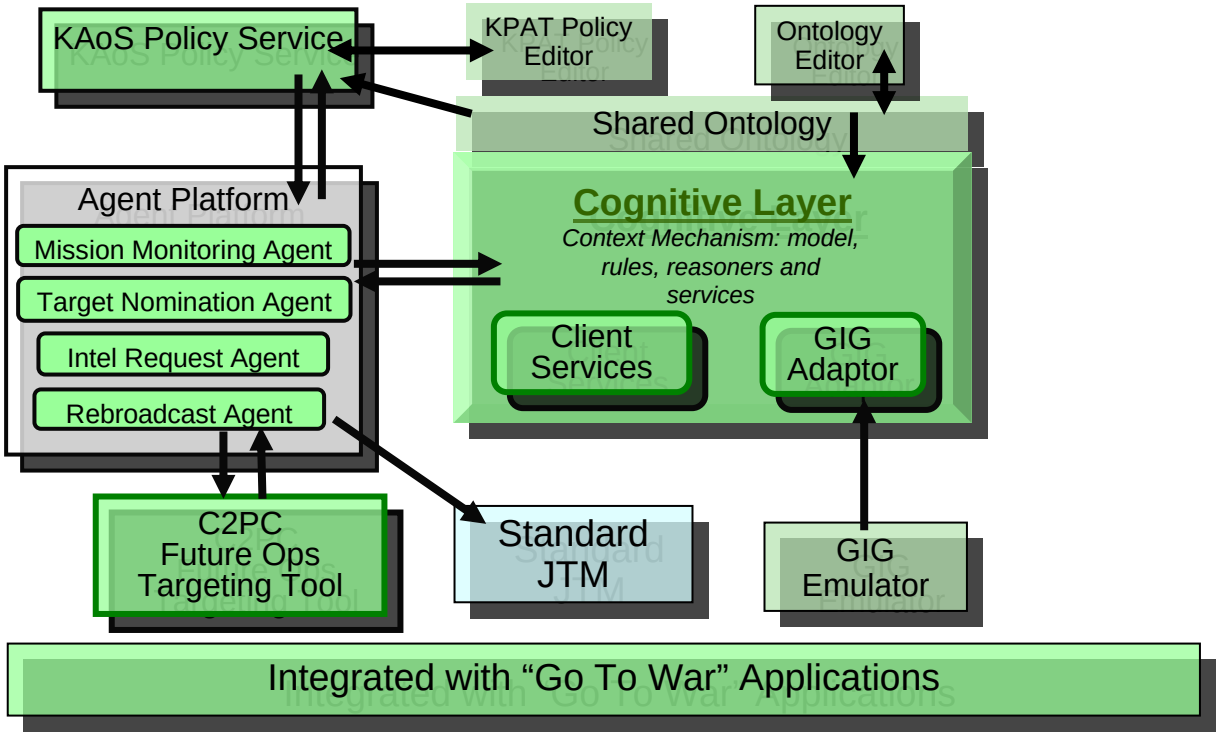
KAoS Service Overview

- General purpose ontology editor allows basic policy terms to be extended to a particular domain
- Disconnected operations supported by Ontology Server and specialized guard configuration
- KPAT editor provides edit capability in terms of the problem domain
- Policy server de-conflicts policy and distributes it to registered applications, tracking what each application has received.



Applications – C2 Targeting Decision Aid

- Agents brokering data from Cognitive Layer to Targeting Tool
- Ontology and Policies created to control agent behavior based on data content
- GIG Adaptor uses Jena with a separate, small ontology, SWRL rules, and SPRQL queries to identify new information in incoming GIG data stream



Adding Policy-based Filtering and Categorization to Existing HMI

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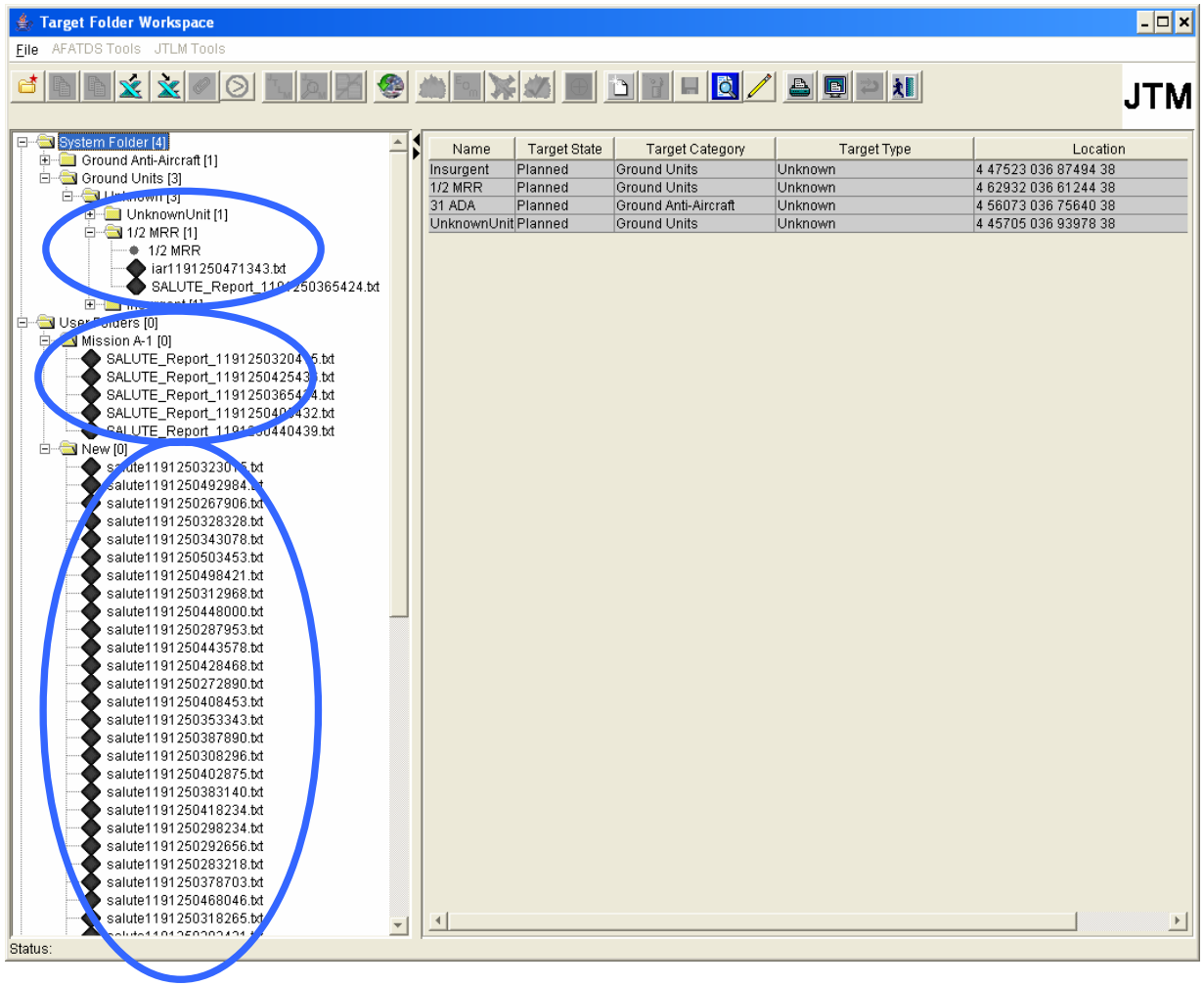
- Contrast the relevant reports delivered to the Mission A-1 and the 1st/2nd MRR folders with the full received set of reports
- Policies used to require creation of mission folders and routing of messages to folders



Cognitive System IRAD:
Making the Network System Smarter

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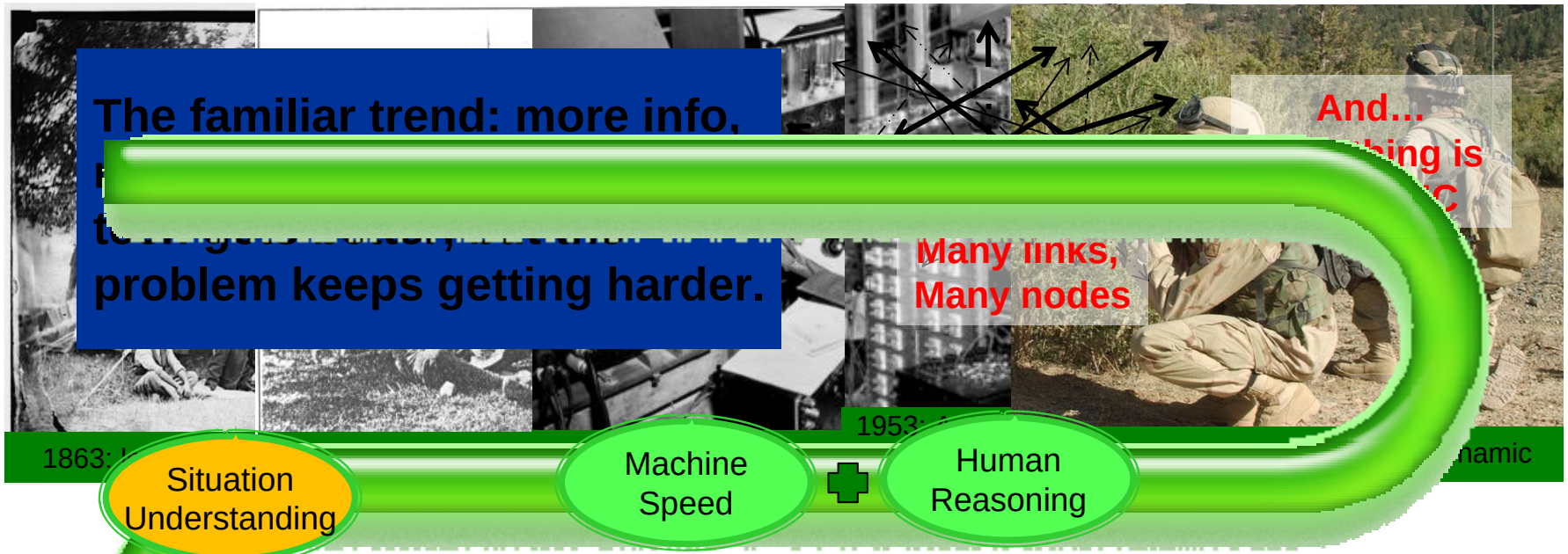

Dynamic Collaboration

Force Effectiveness

Solution: Use Cognitive Systems Technology to Make the Network Smarter.

Mission Assurance

Integrating Policy-based Reasoning to Support the Operation of a MANET

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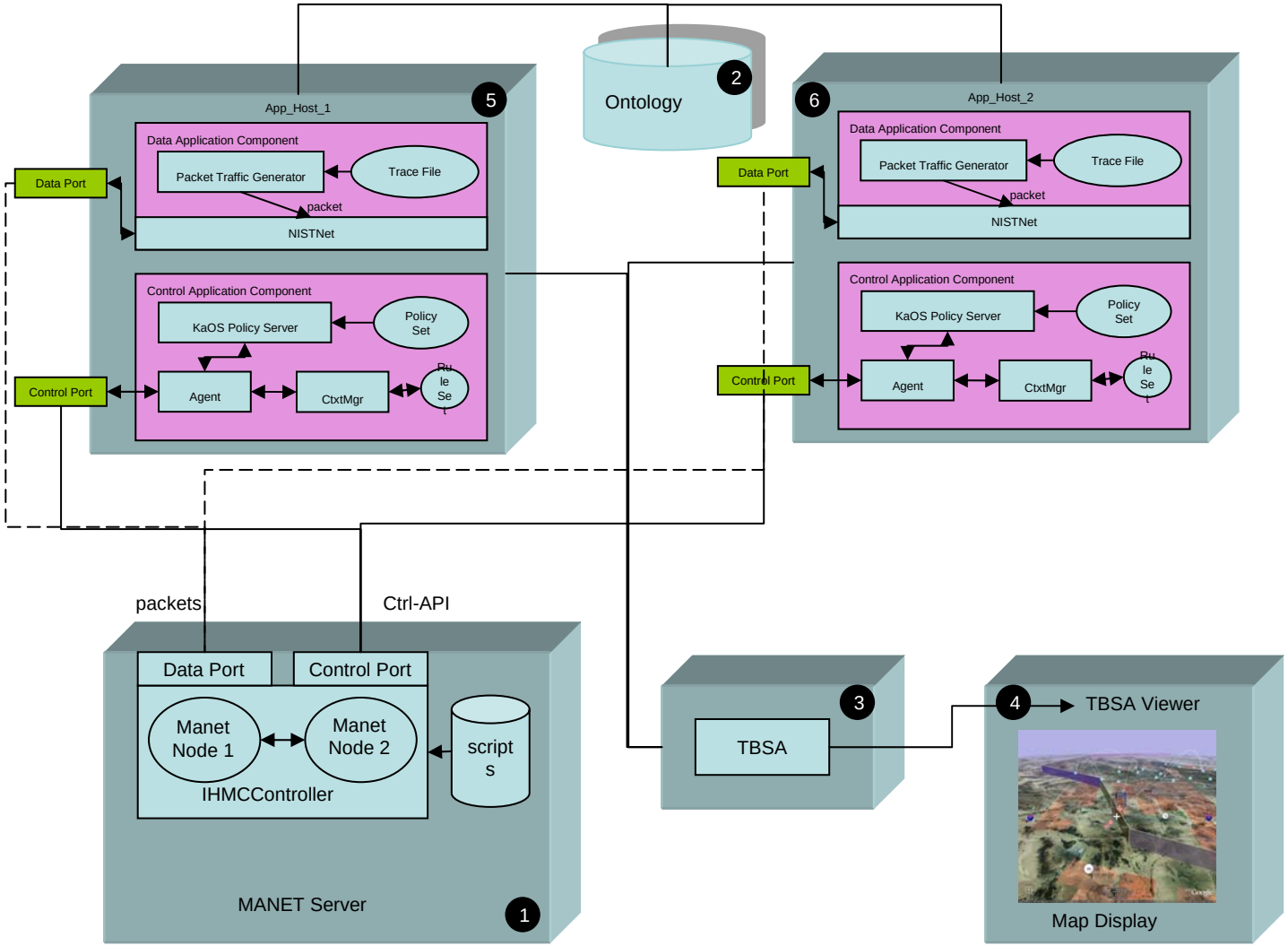
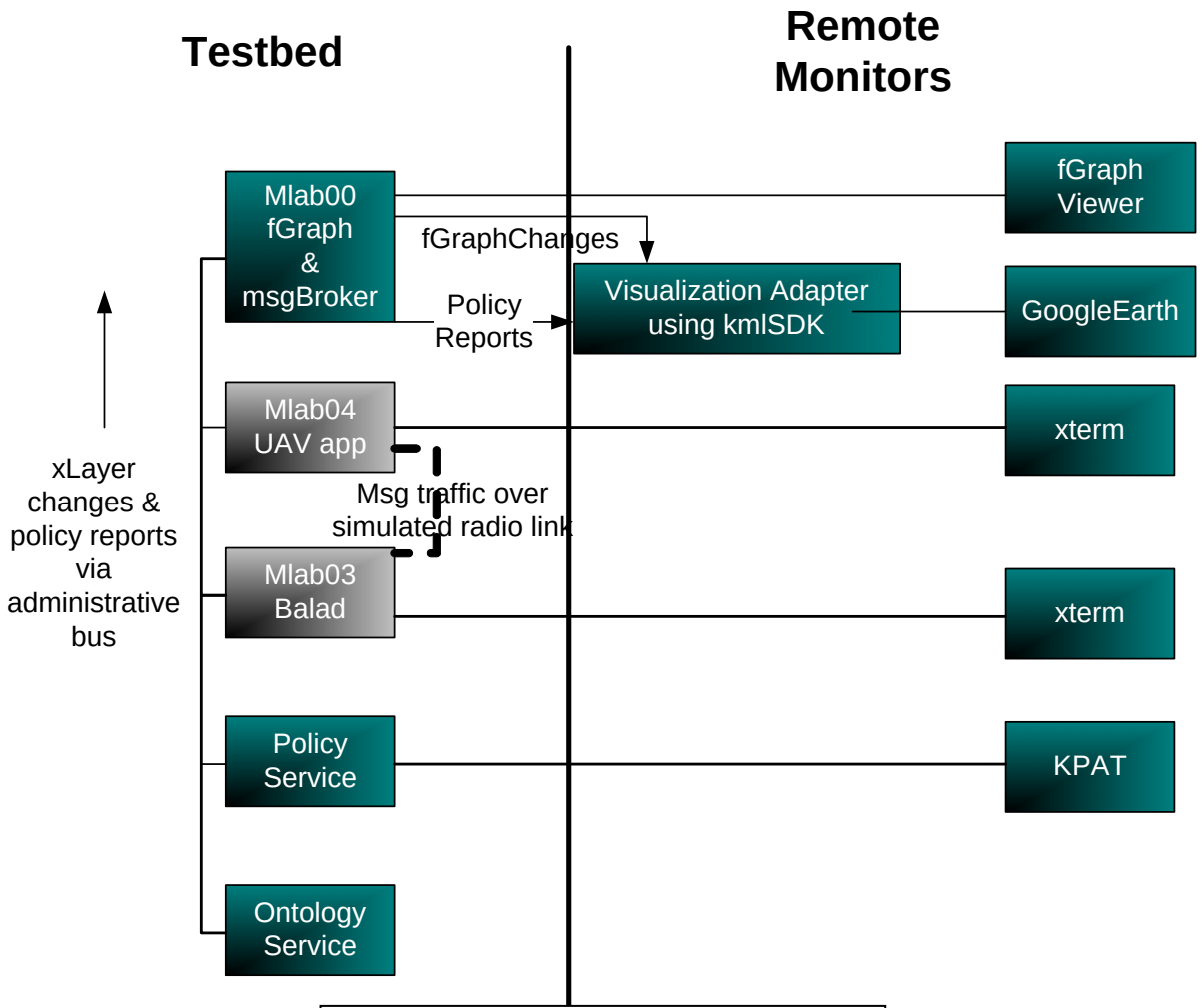


An Architecture for Policy-based C2 Decision Support Systems

RF Management Testbed Architecture

- Apps on communications testbed to left
- Agents in grey
- fGraph and msgBroker track agent location and communication parameters to compute and simulate link behavior between agents
- Ontology and Policy servers use the admin bus for this demo



Deployment Diagram

Operational Scenario: Redeploying UAV Asset for Emergency Aid

UAV Transitioning from Iraq to Turkey

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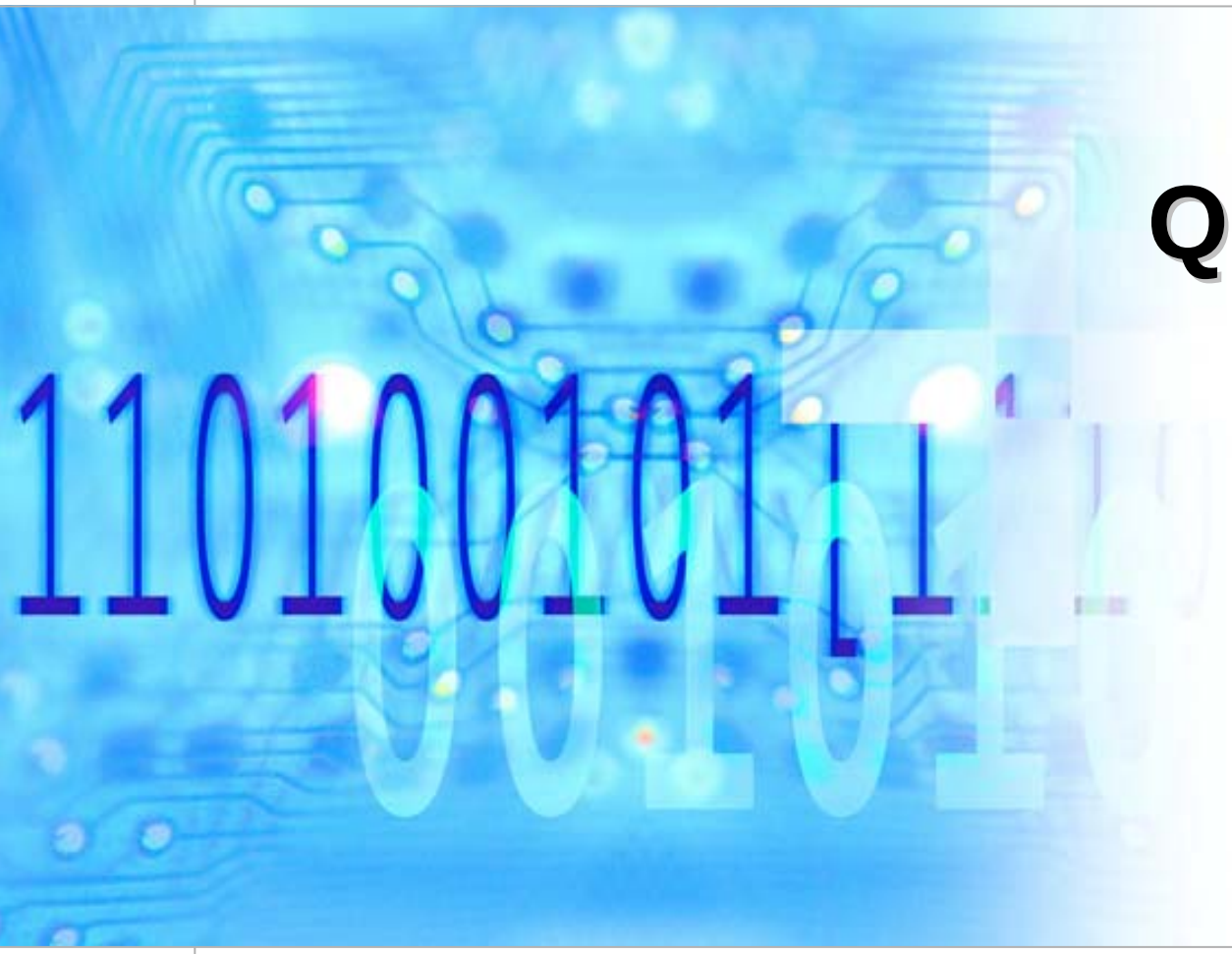

Questions?

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Backup

Cognitive System IRAD: Making the Network System Smarter

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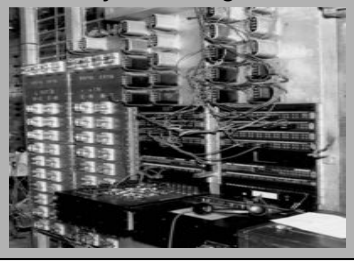
1863: lots of people, One weak, wired link

1917: lots of people, One weak, wireless link

1943: 1 person, 1 weak wireless link

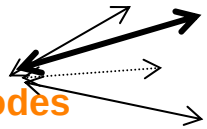
1953: Automated switching, many links, large staff

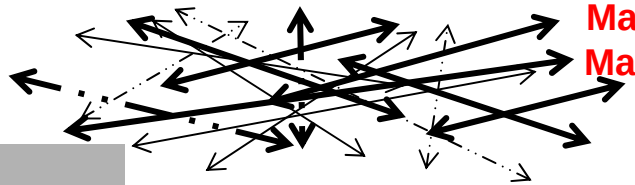


2003: 1 person, many links, all dynamic

1 link, 2 fixed nodes

Few links, Few fixed nodes



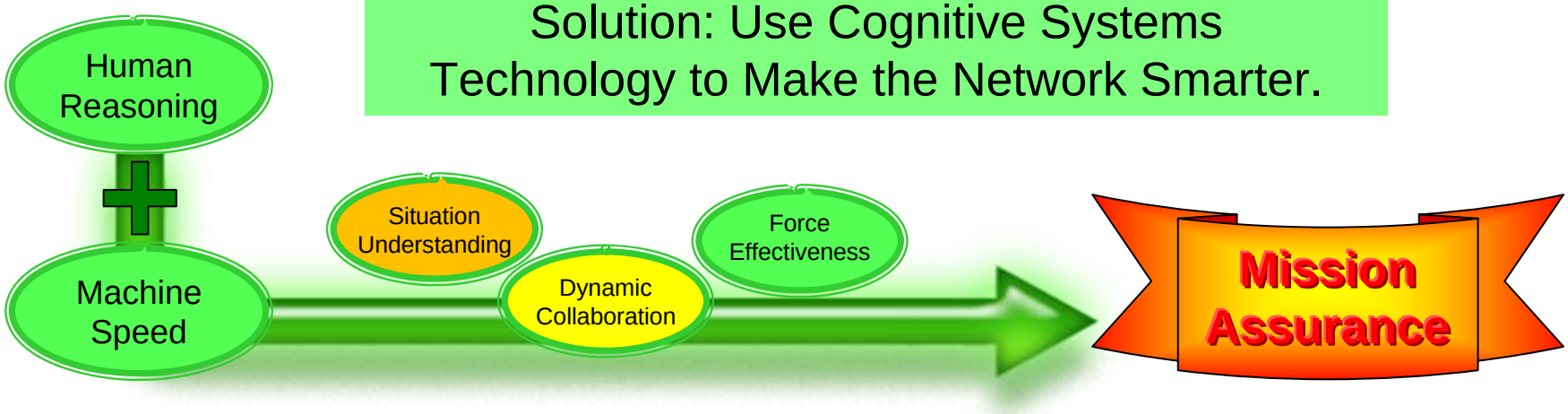


Many links, Many nodes

The familiar trend: more info, more places, more speed.
The tech gets better, but the problem keeps getting harder.

And… Everything is Dynamic

Solution: Use Cognitive Systems Technology to Make the Network Smarter.



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