

Enabling Agile Information Management Workflows For C2

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Overview

- Introduction

- Building Composite C2 Pictures
 - Modeling Approaches
 - Advantages of a Network Modeling Approach

- Example: Crisis Action Planning

- Summary

Introduction

- Military forces are being called upon to execute a broad spectrum of missions, both traditional and non-traditional
 - Agile C2 enables the execution of a varied set of missions, which may change during execution and bring together forces as need
 - All participants need a clear understanding of their role in achieving the mission objectives, often called the *commander's intent*
- To achieve agile C2, it must be possible to define, organize, and manage the composite information products that are needed through the course of a mission thread
 - The information and information sources that comprise the composite information products may change during mission execution
- Our work focuses on developing a pattern for an agile C2 system to manage the commander's intent over the execution of a mission

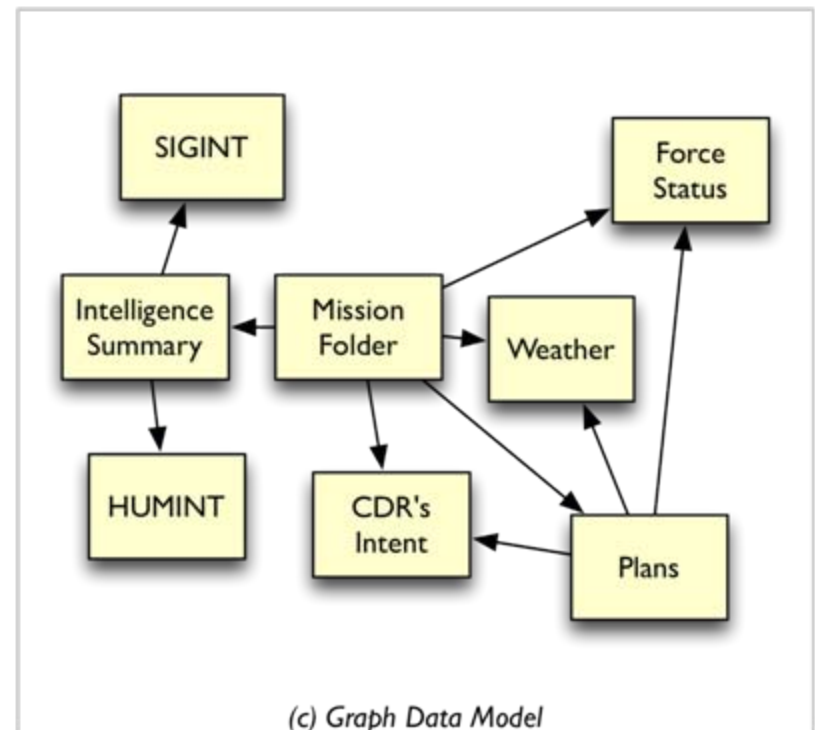
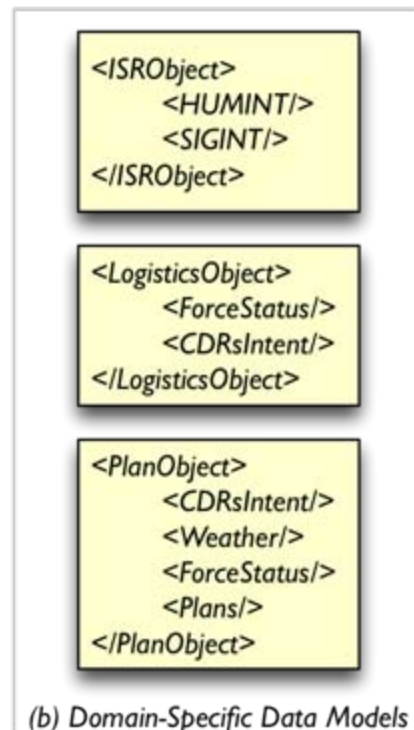
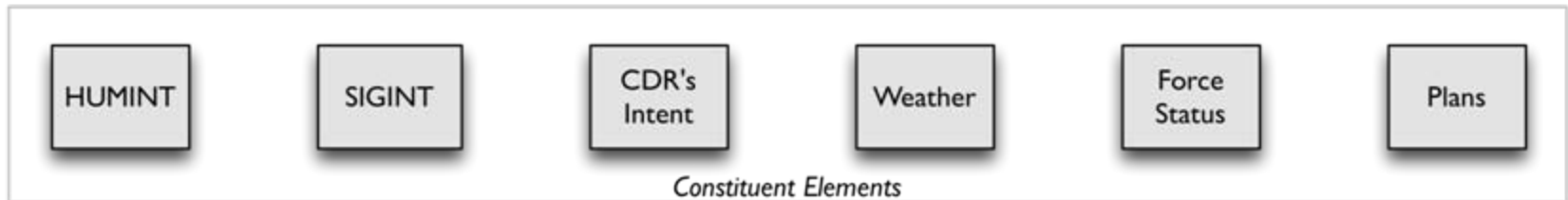
Operational State of the Practice

- Information products for different aspects of C2 are built independently
 - Force management
 - Situational monitoring
 - Planning
 - Decision-making support
 - Force direction
- Generally captured as static artifacts (briefings, documents, etc.)
- Interdependencies are poorly understood
 - e.g., Establishing impact of force readiness/availability on plan viability
- Cycle time to reconcile such interdependencies reduces C2 and force agility to respond to emerging events and threats

Building Composite C2 Pictures

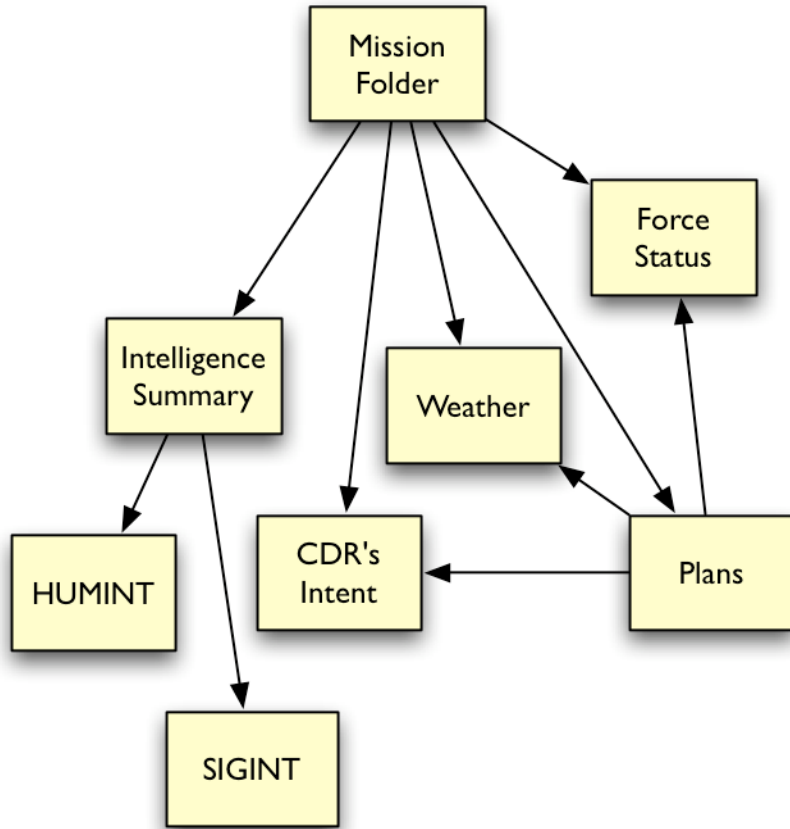
- Principles of *graph theory* and *scale-free networks* provide an effective foundation for development of scalable, agile, and flexible representations of multi-domain C2 data
- Barabasi has shown that scale free networks are pervasive in many domains, and can grow in unconstrained, unexpected ways
- We can leverage this insight to motivate the design of enterprise data modeling strategies that
 - Allow run-time evolution of a complex “business object” that captures many different pieces of information about a domain
 - Is transparent to change, so that systems and users relying on the business object can detect and understand impacts of those changes
 - Afford multiple perspectives and views on underlying data, so that collaborating users can access and use what they need

Approaches to Expressing Composite Data Objects

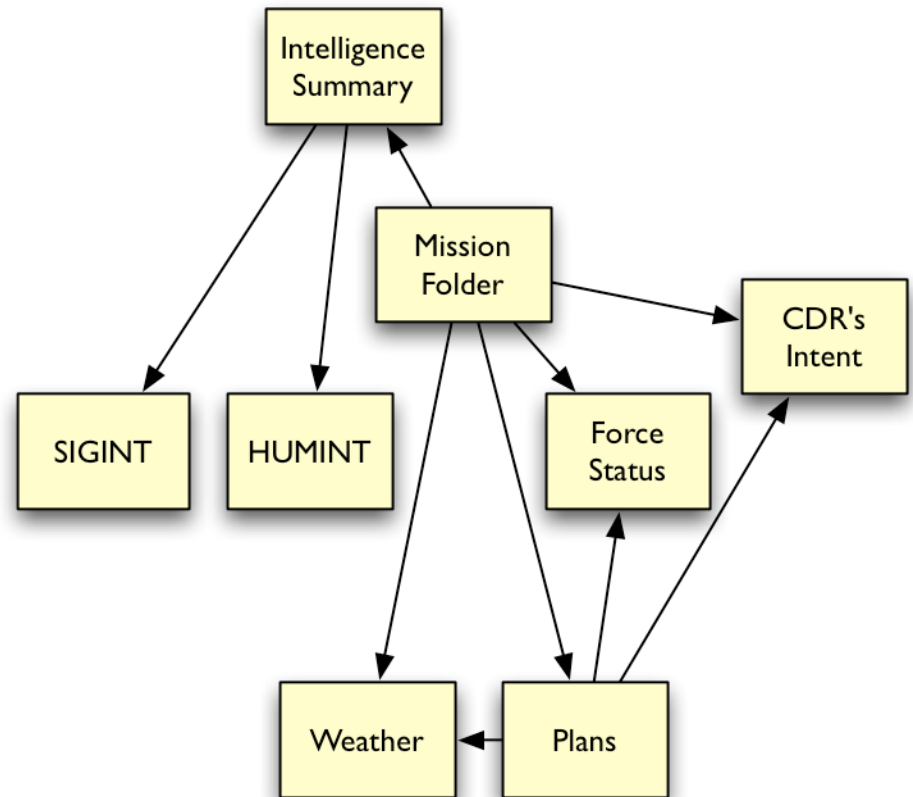


Multiple Perspectives on the same Data

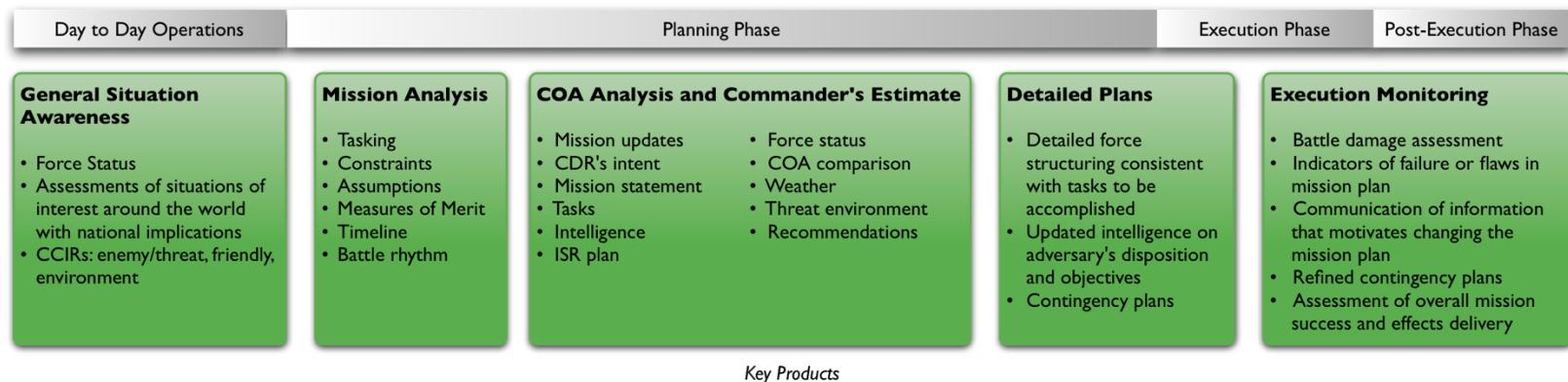
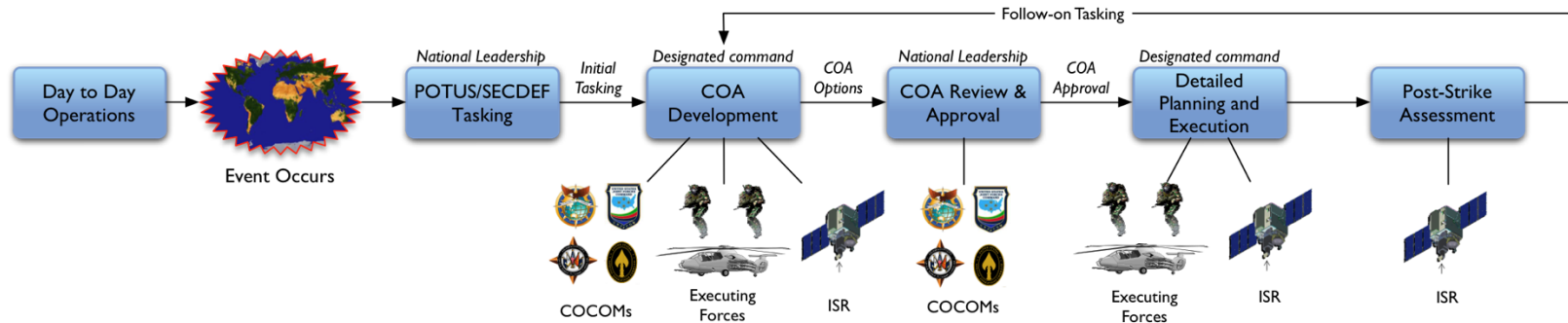
Business object from a mission folder-centric perspective



Business object from a Intelligence Summary perspective

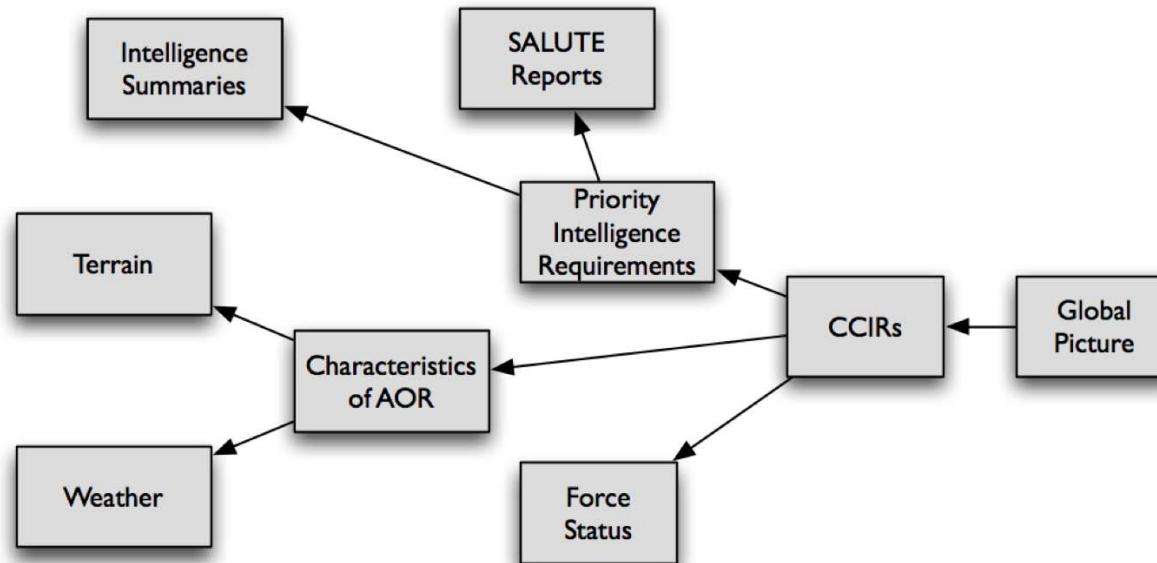


Example: Crisis Action Planning



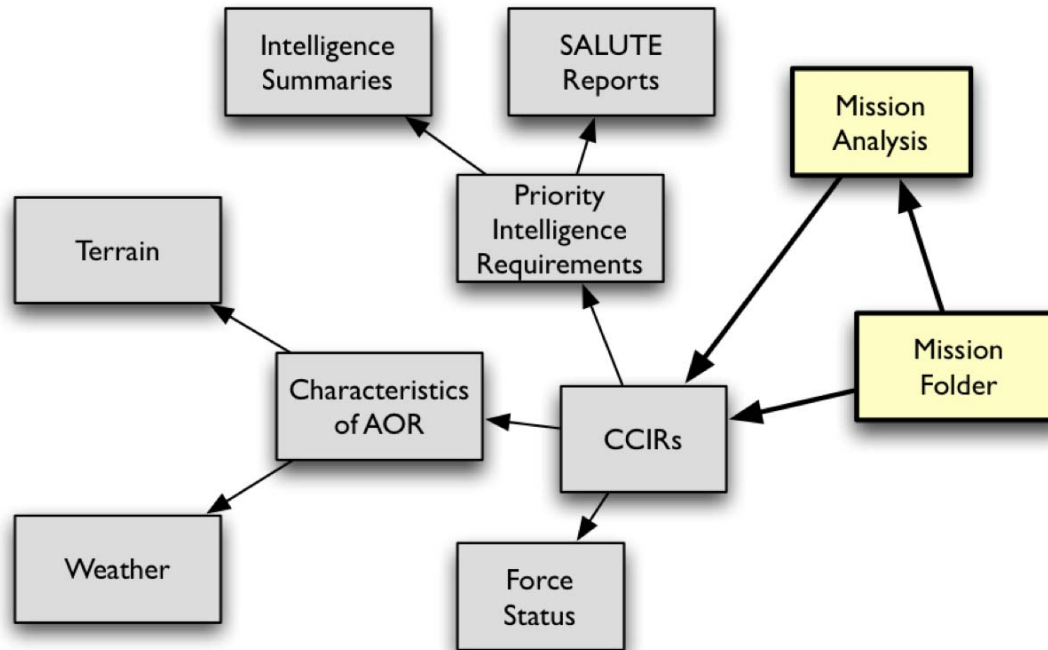
- U.S. DoD has defined a set of procedures for crisis action planning
 - Requires C2 agility to respond, as the participants, activities, and mission may change during execution
- The next set of slides illustrate how the commander's intent may grow over time, from event detection to plan execution

Commander's Critical Information Requirements



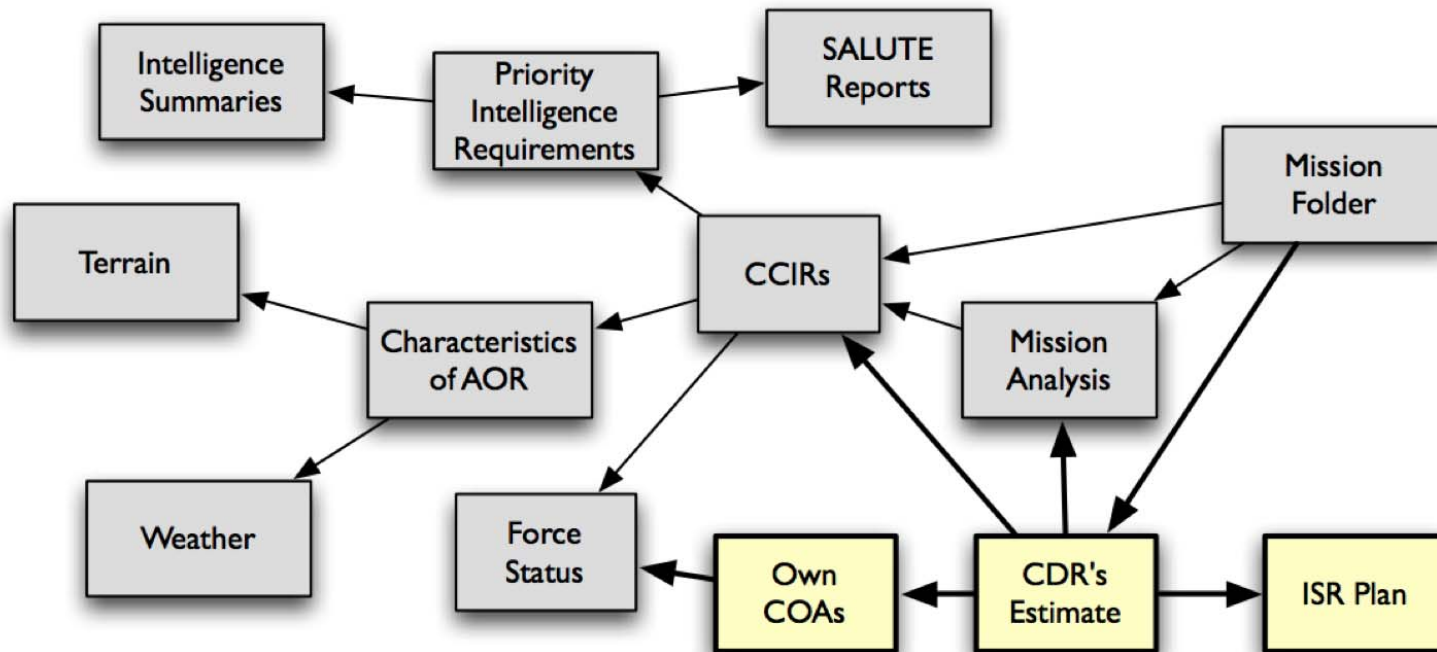
- The initial state of the commander's intent shows the critical information requirements
 - Set of information requirements that the commander has identified as being critical to facilitate timely decision-making
 - CCIRs provide an organizing construct for navigating the global picture

Mission Folder and Mission Analysis



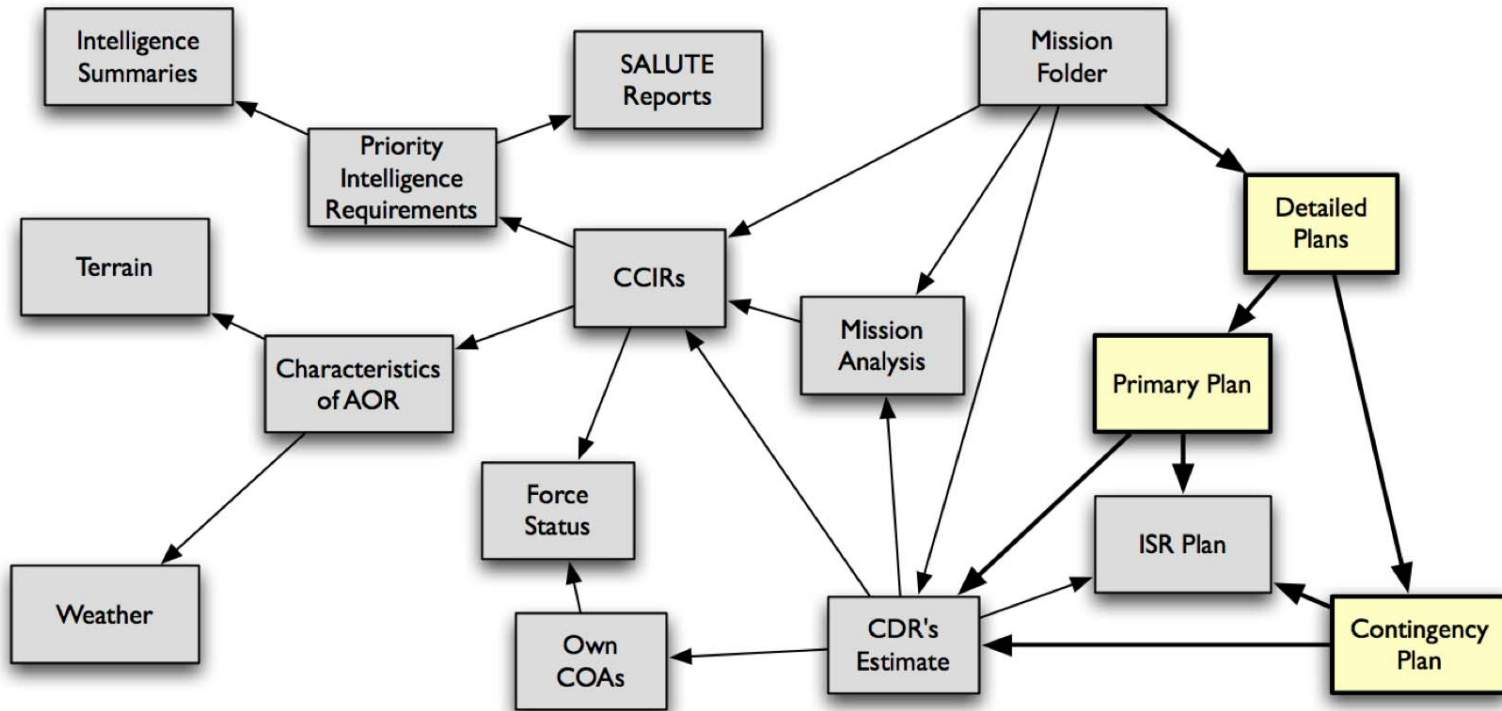
- Upon detection of the crisis event of concern, mission analysis is performed to establish whether a response is warranted
- A mission folder is created to tie together relevant information
 - The mission folder acts as a hub for the particular event

Commander's Estimate and Proposed COA



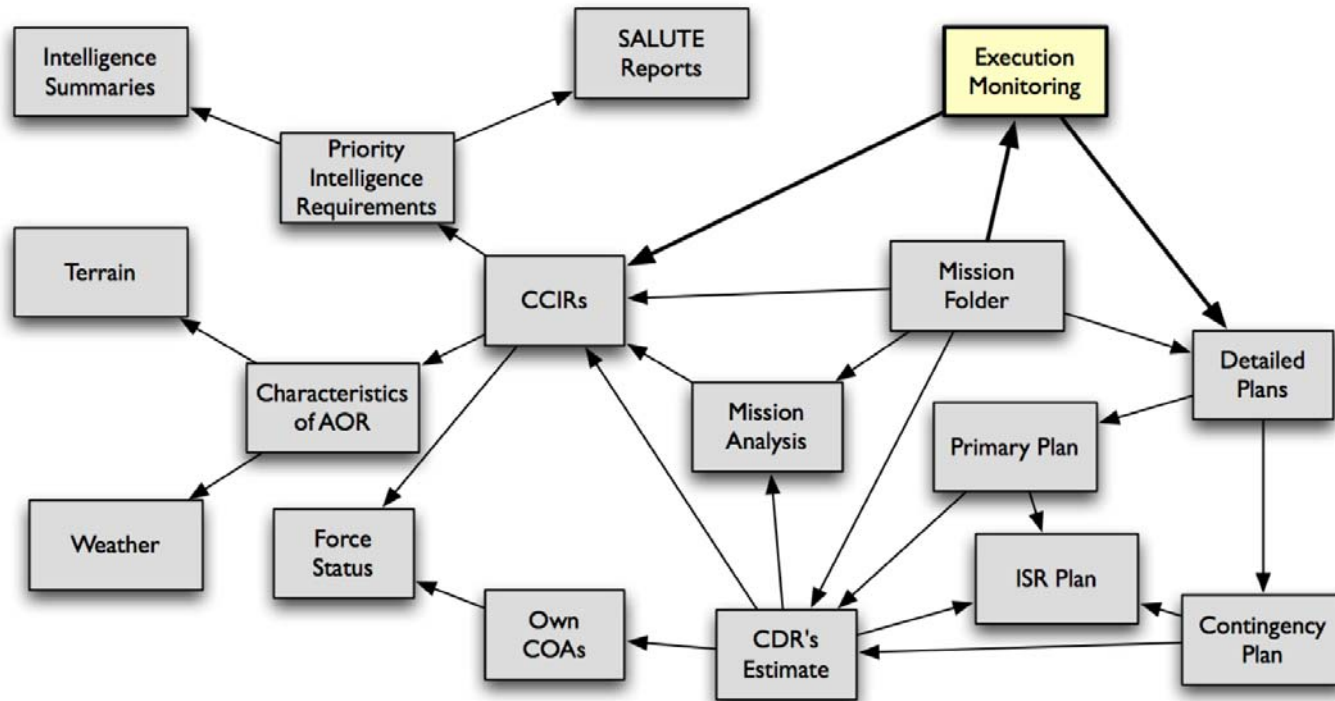
- Next, the commander's estimate, COA, and ISR plans are added to the mission folder hub
- Meanwhile, existing elements may update independently due to new or incoming information

Development of Detailed Plans



- Once a COA is selected for development, planning processes occur

Integration of Execution Assessment



- A node or sub-graph is added to monitor the execution of the mission, and attached to the graph

Summary

- The types and variety of missions that military forces are called on to execute is increasing
 - Ensuring that a C2 system can collect and synthesize the correct information and communicate it to the executing forces is critical
 - The traditional approach of monolithic data objects is insufficient for the fluidity of real situations
- Our scale-free, graph model is an approach to creating agile C2 pictures
- Future work has two major foci
 - How do we effectively search and manipulate the graph of heterogeneous nodes?
 - How do we incorporate these techniques into the net-centric enterprise?