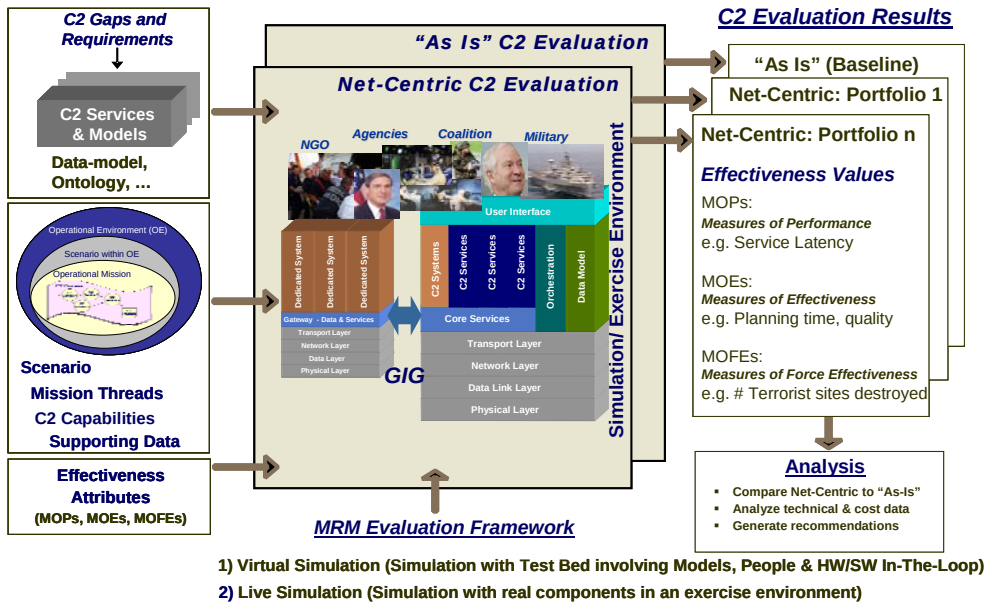
Use of an Executable Workflow Model to Evaluate C2 Processes

Paul North
paul.north@jhuapl.edu

C2 Evaluation - Critical Challenges & Need

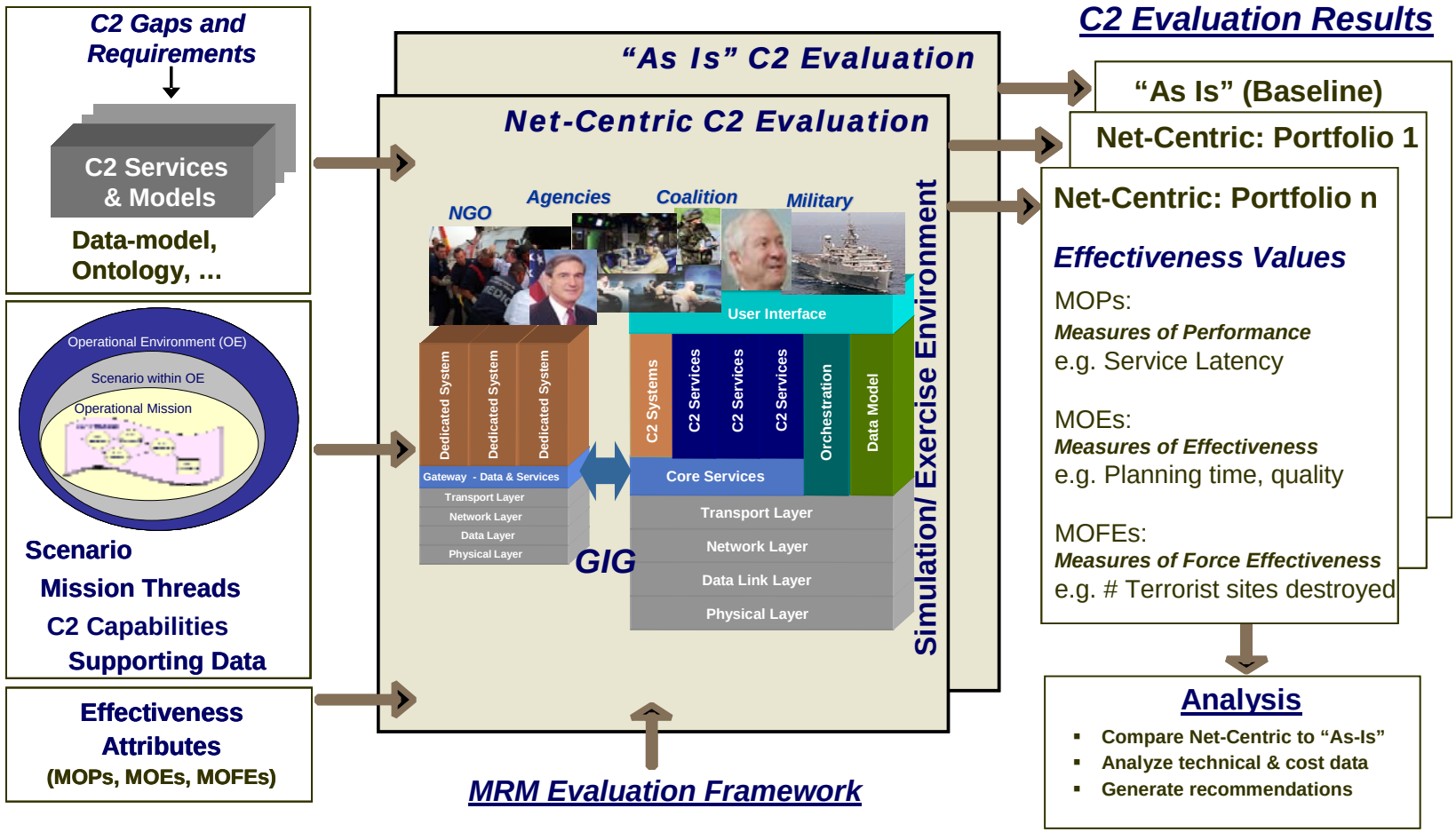
Critical Challenges:

- Evaluating command & control (C2)
- Evaluating the impact of net-centricity on force effectiveness
- Decision makers require quantitative methods and metrics for measuring the extent to which:
  - Net-centricity improve C2 and related applications
  - The GIG infrastructure and Core Services effectively and efficiently support C2 and related applications



1) Virtual Simulation (Simulation with Test Bed involving Models, People & HW/SW In-The-Loop)
2) Live Simulation (Simulation with real components in an exercise environment)

Multi-resolution Modeling Evaluation Framework



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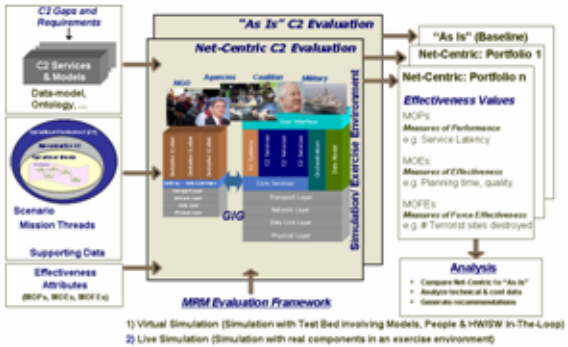
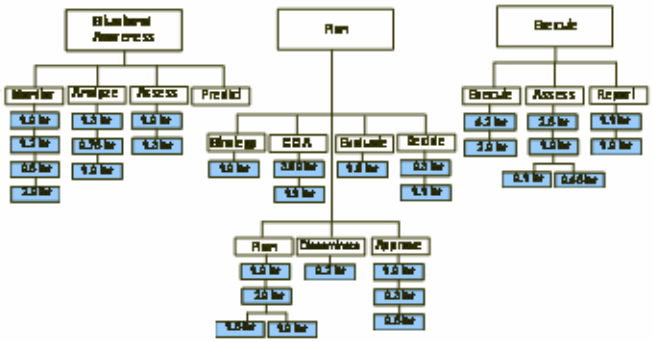
Net-centric C2 Evaluation: Key Elements

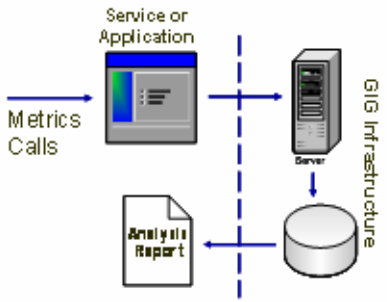
Multi-resolution Modeling Evaluation Framework



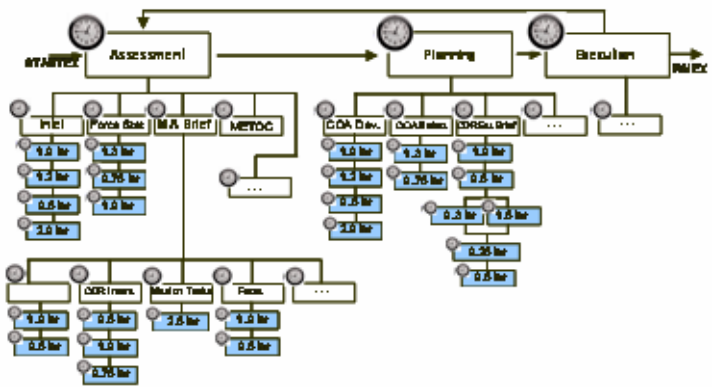
Process Decomposition & Assessment

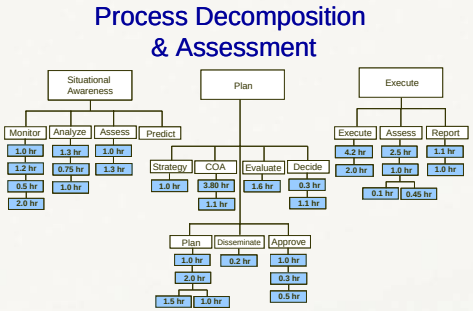


Automated Data Collection, Analysis, & Reporting



Mission-specific Workflow Evaluation





Process Decomposition & Assessment

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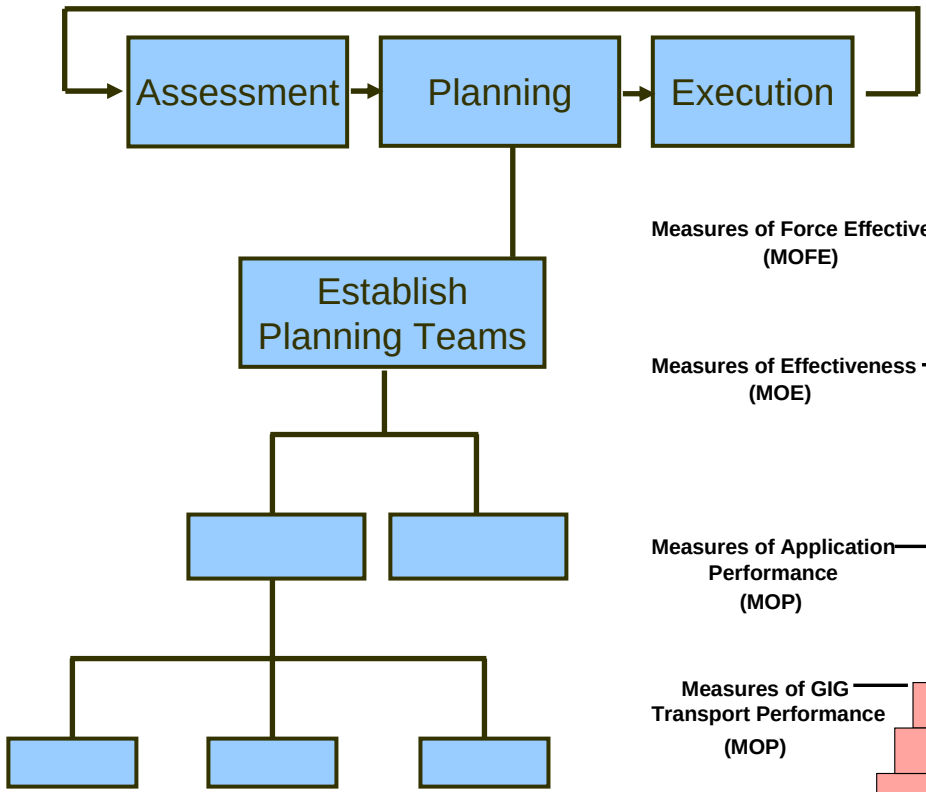
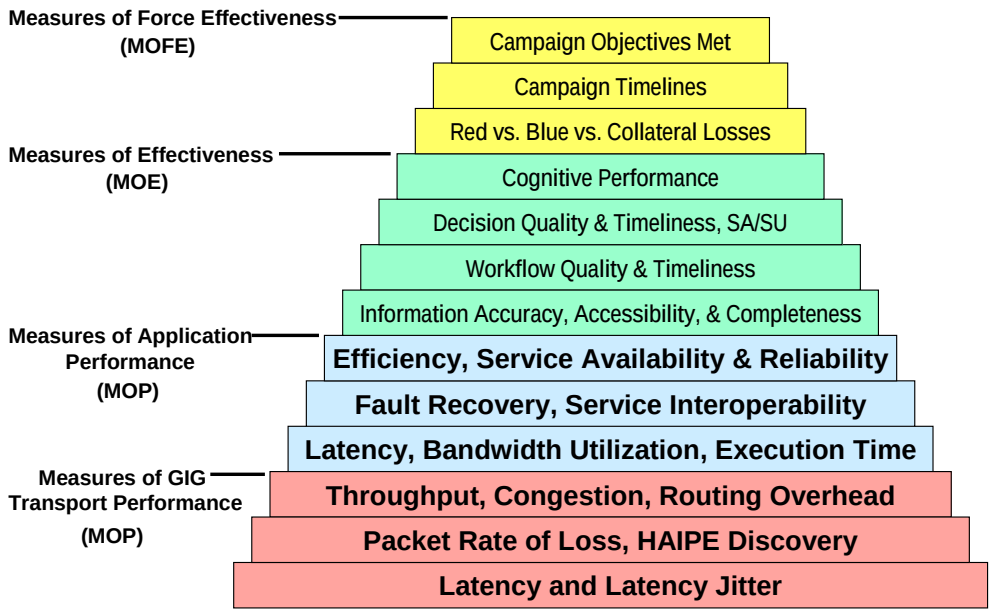
C^2 Process Decomposition

Serves as the basis for measuring end-to-end performance

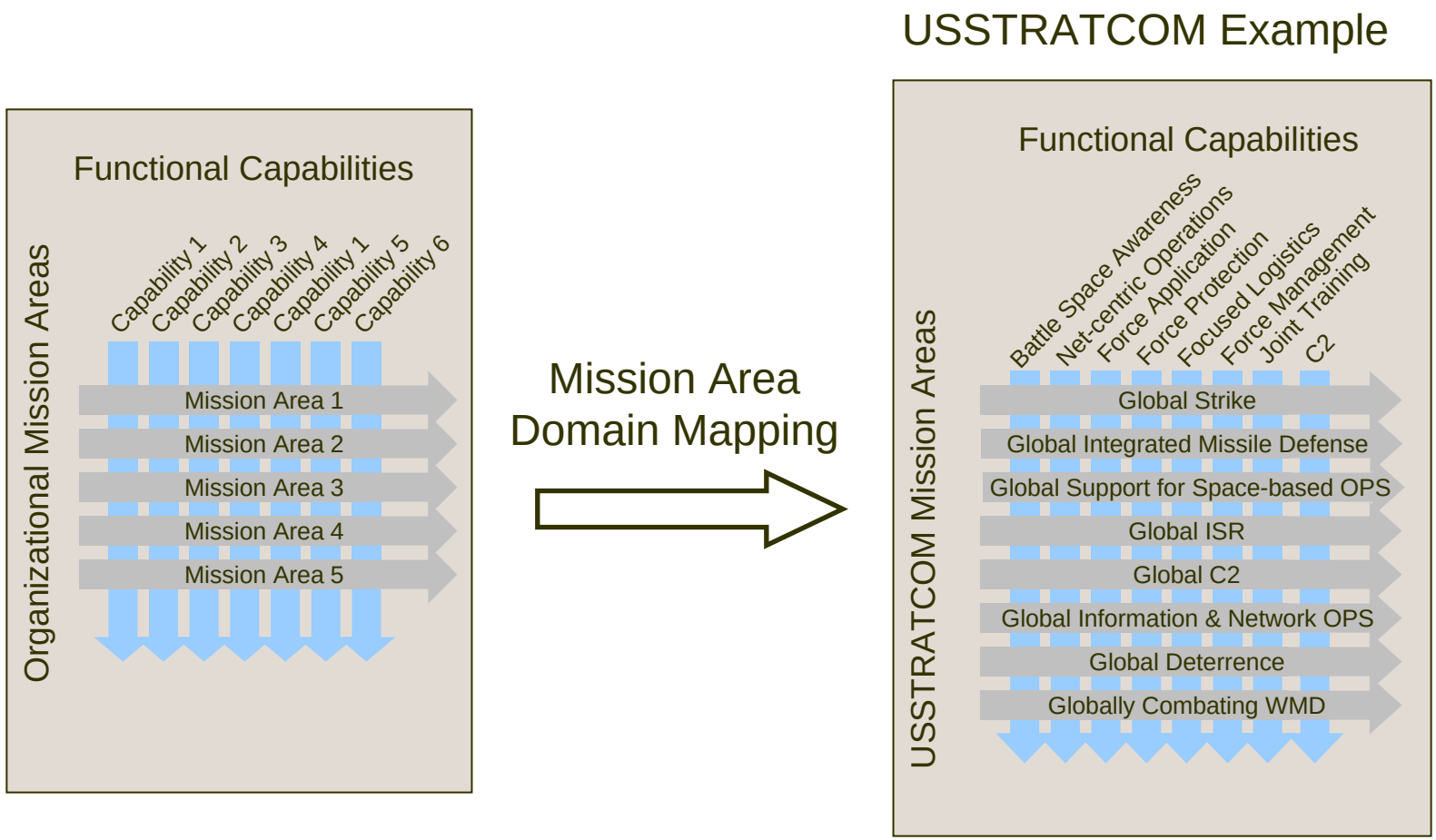
Example: Global Strike Mission End-to-End C^2 Process



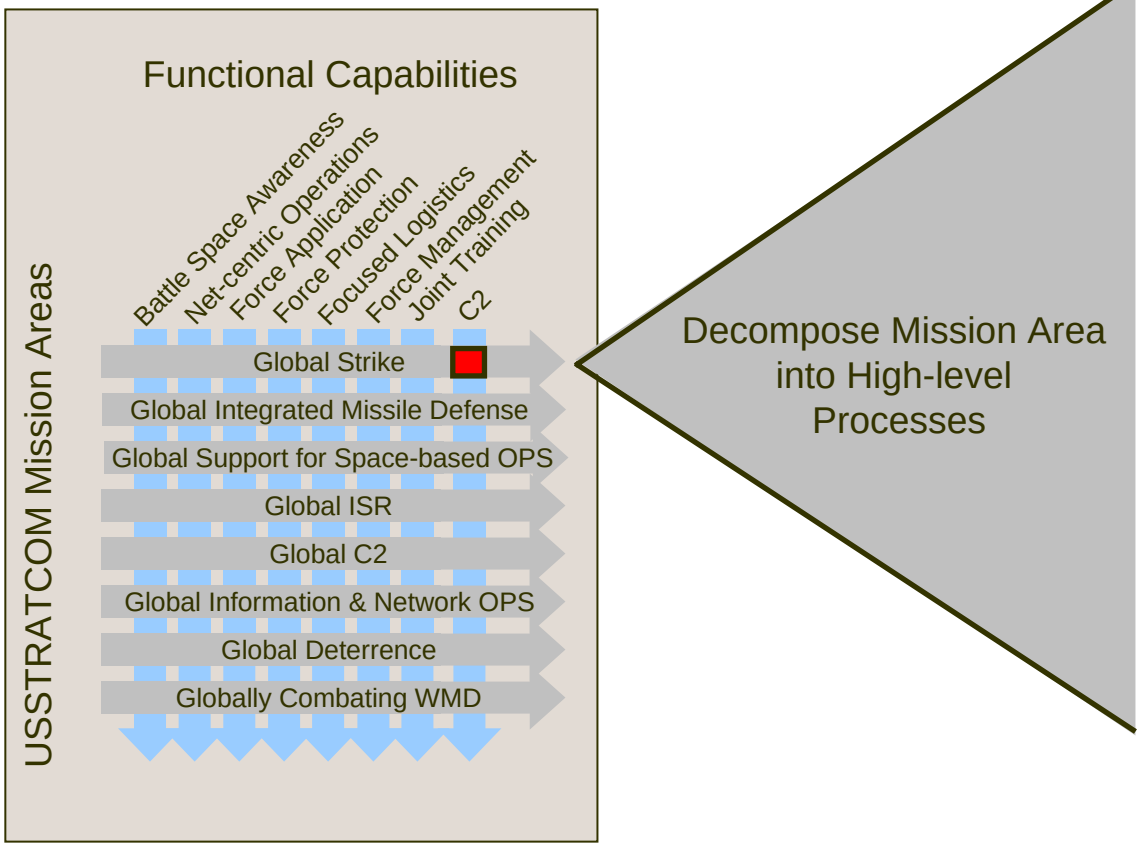


Define detailed measures and metrics to measure and evaluate the quality and execution time of COA Development tasks at the MOE and MOP levels

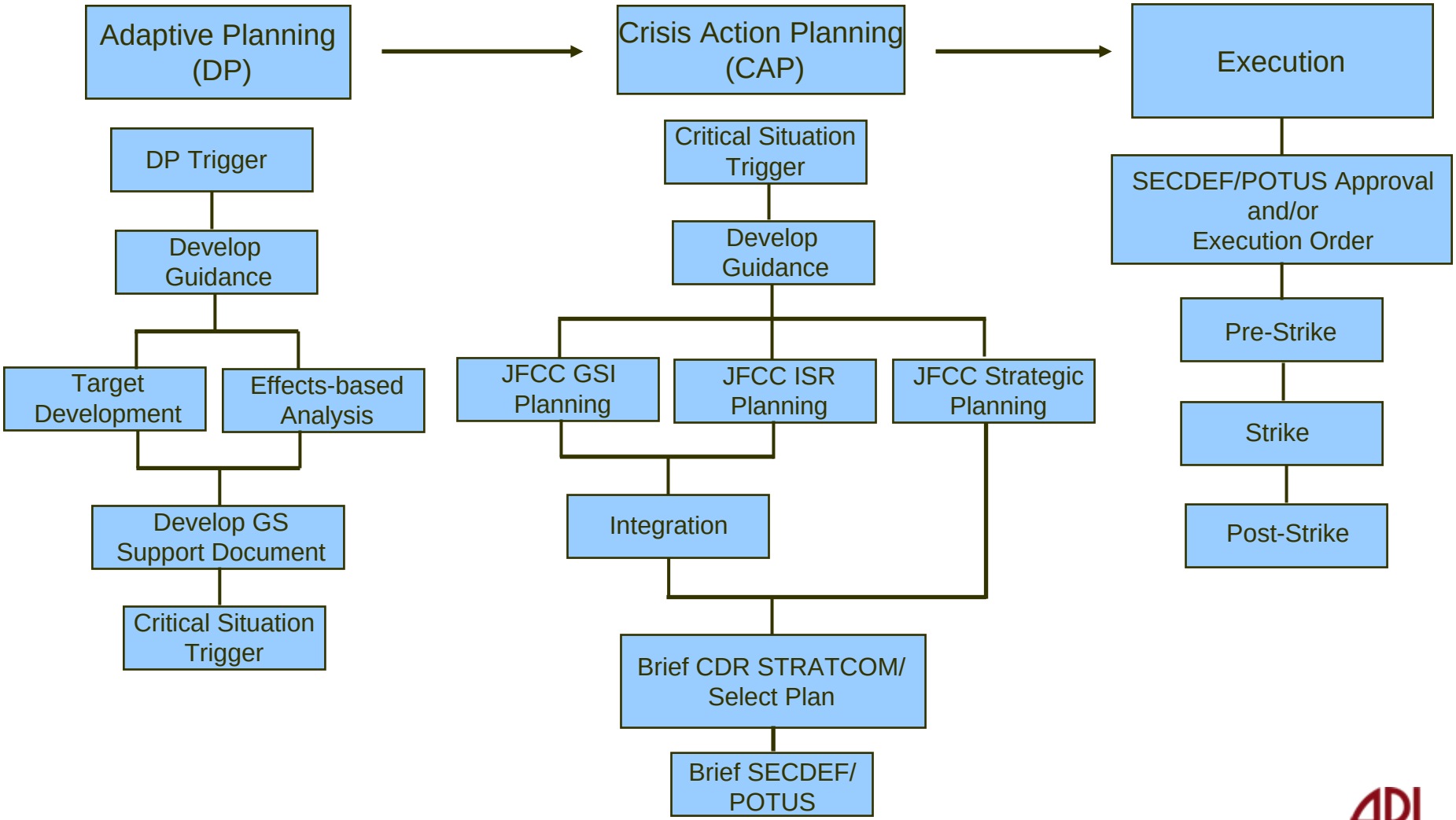
Mission Area/Functional Capabilities Map



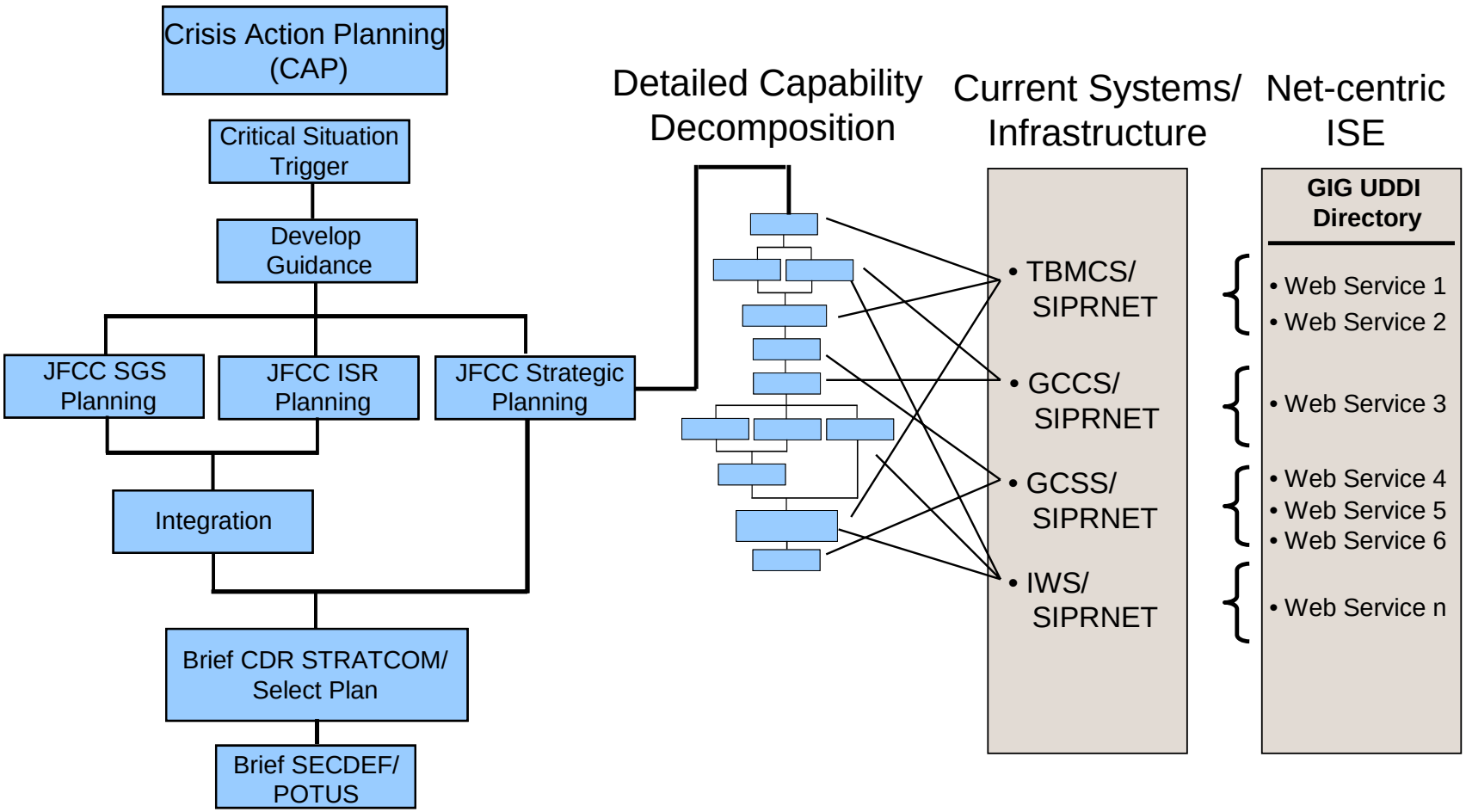
Decompose High-level Mission Area



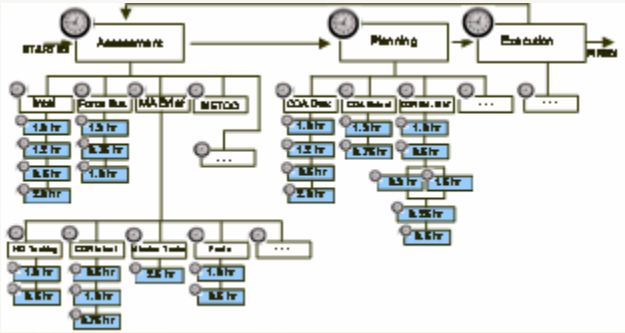
Decompose Global Strike Processes into Functional Capabilities



Map Global Strike Capabilities to Programs of Record & Web Services



Mission-specific
Workflow Evaluation



Mission-specific Workflow Evaluation

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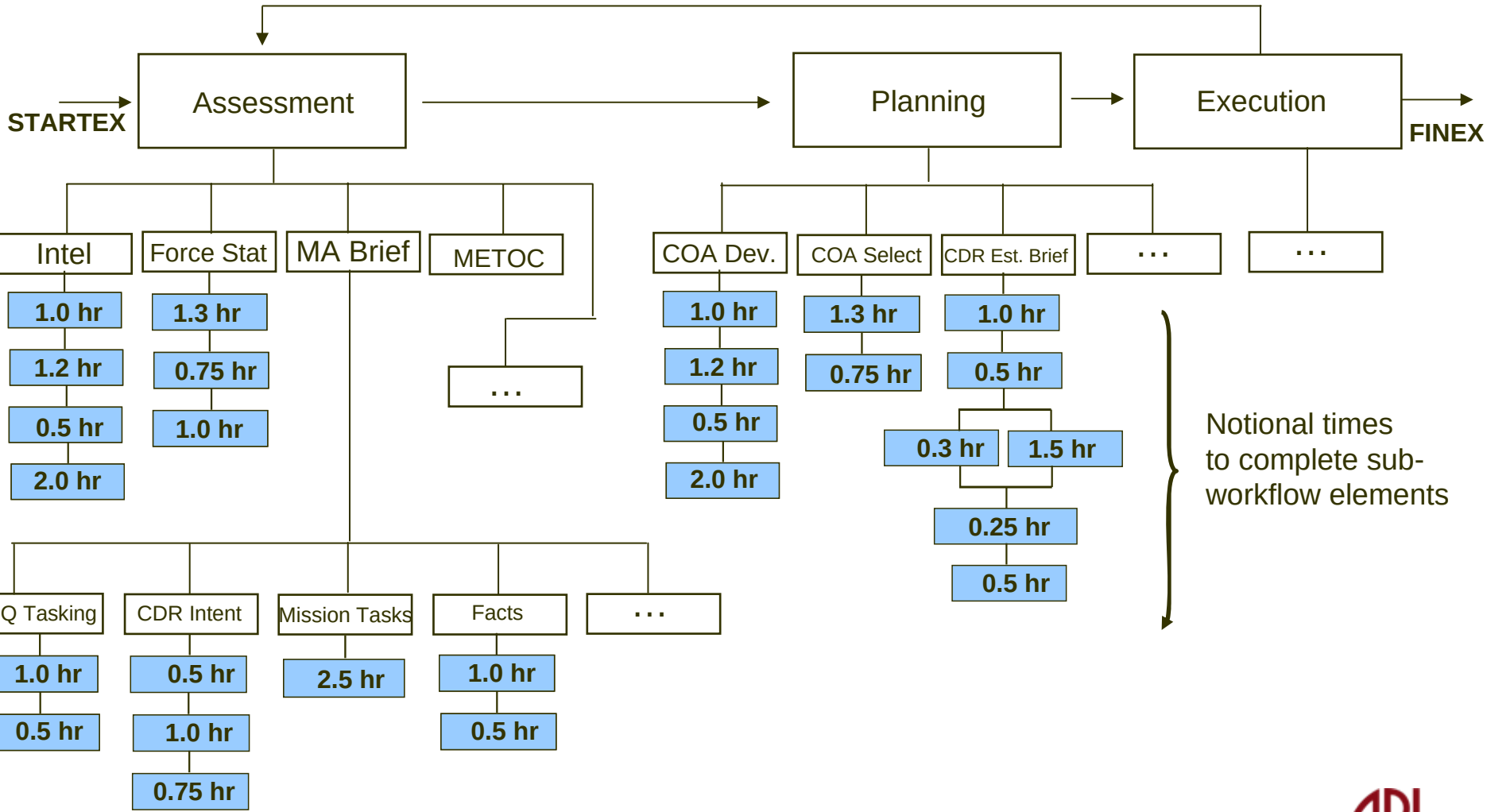
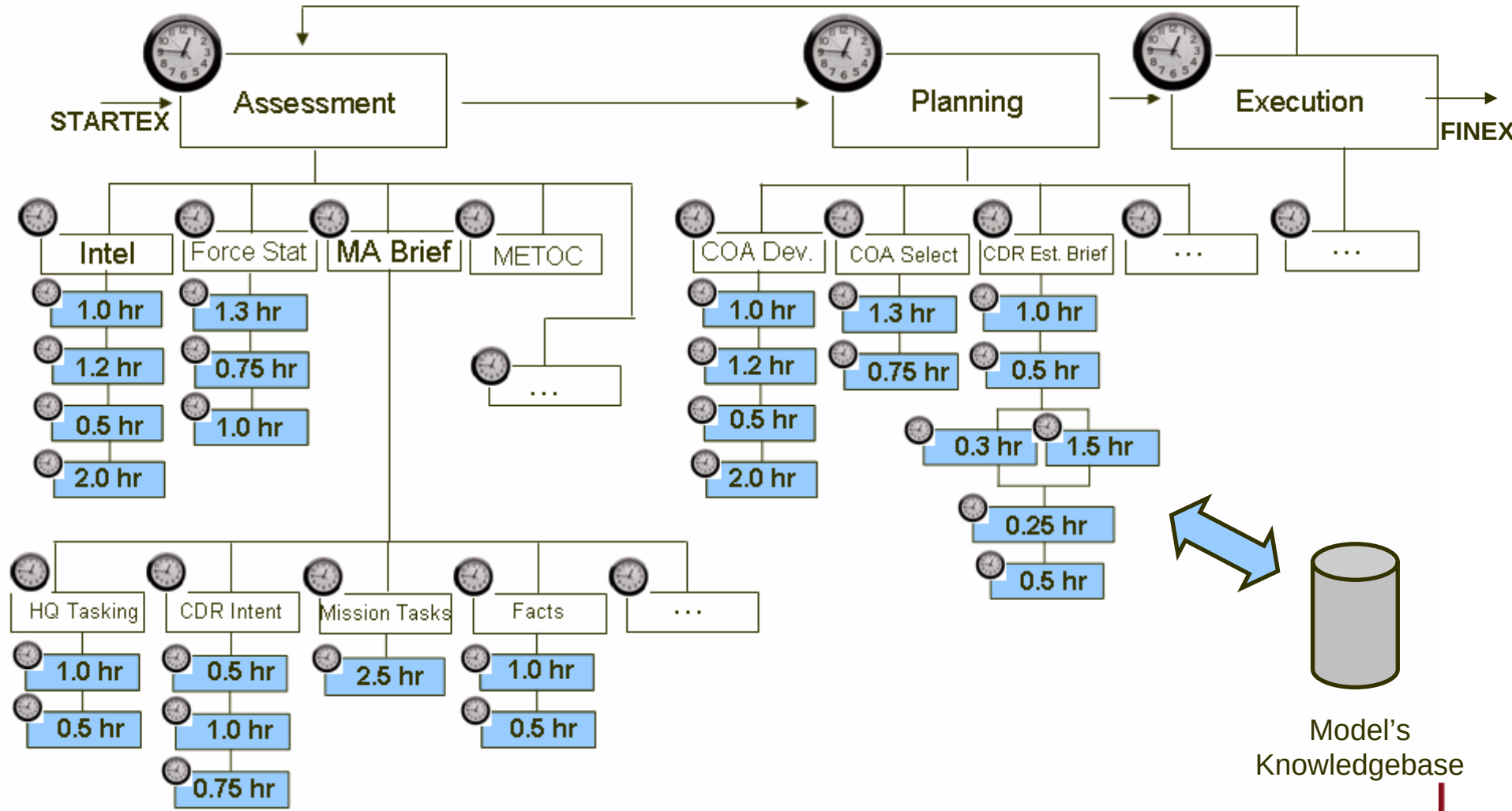
Create & Characterize a Workflow Pattern based on the Global Strike Process Decomposition



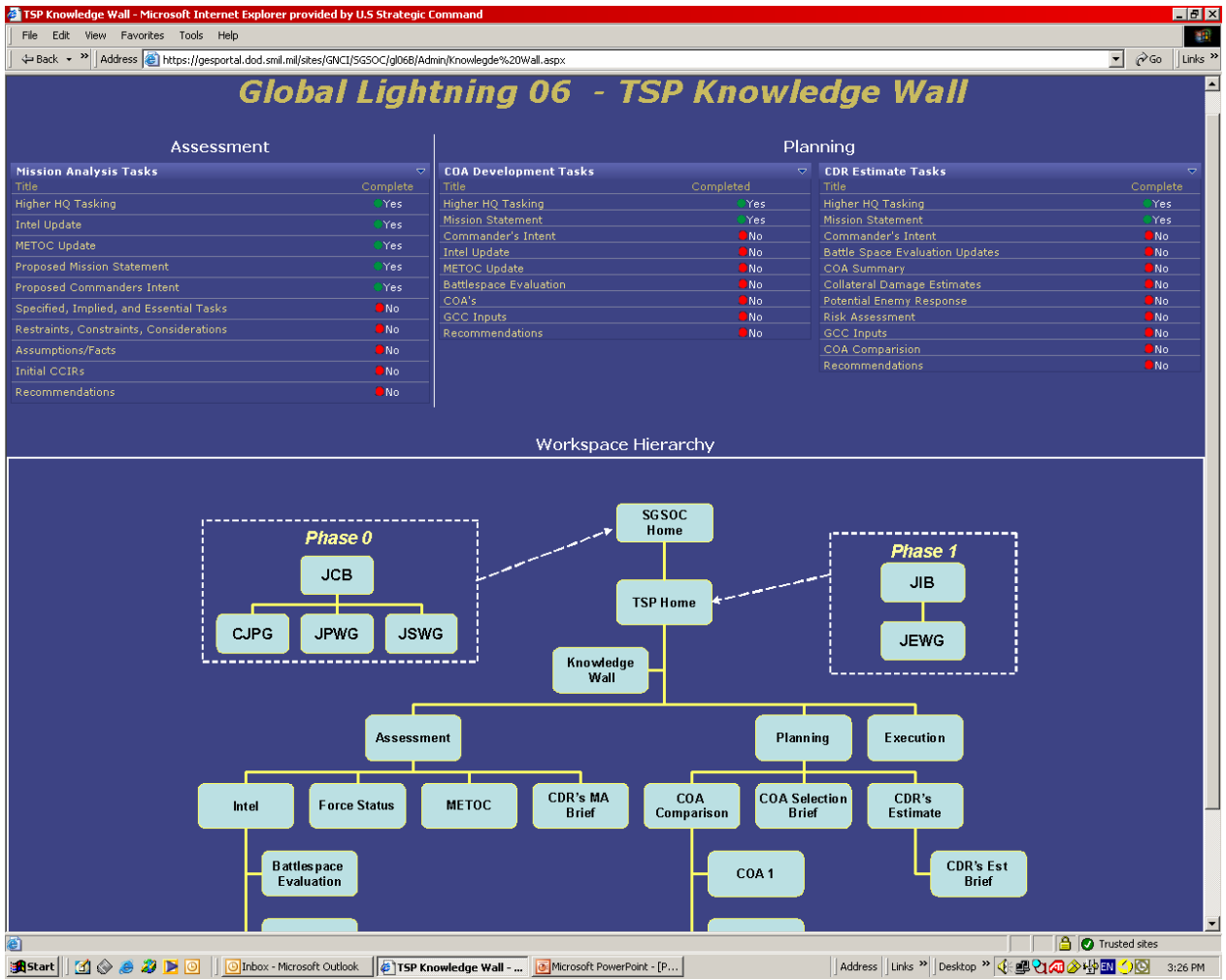
Create an Executable Model of the Workflow Pattern



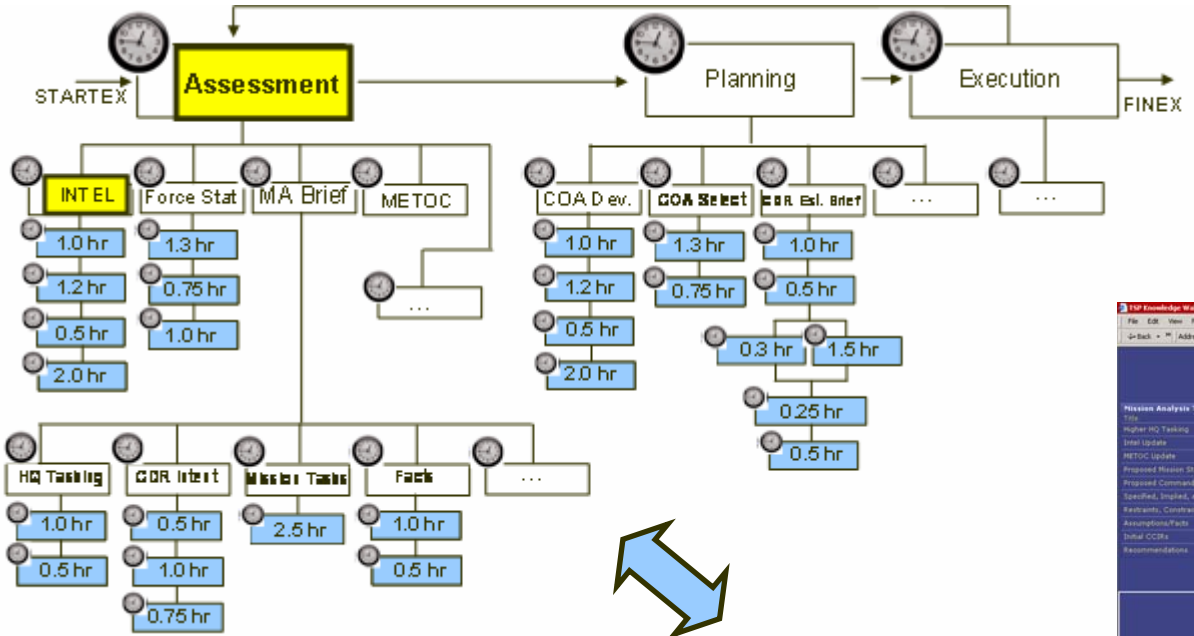
GOC-CE: Portal-based Visualization of the Global Strike TSP Workflow

TSP Knowledge Wall site pulls status information maintained in other TSP workspaces

The Knowledge Wall provides the CDR a quick view of GS TSP process status

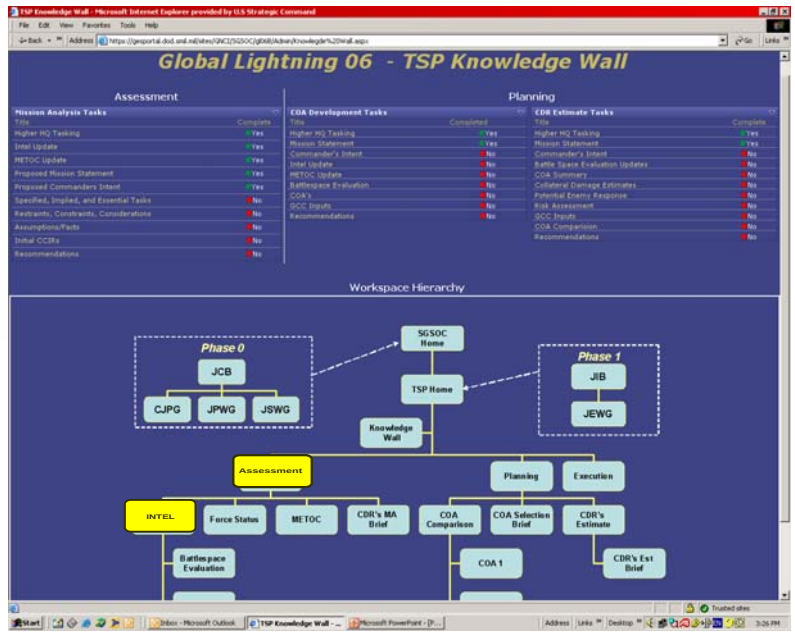


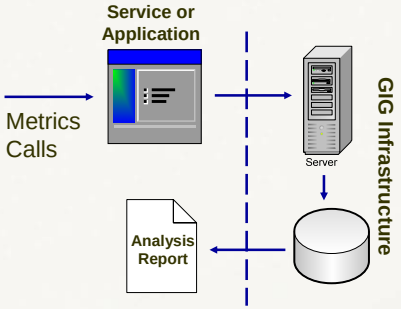
Evaluate Execution of Mission-specific Workflow Pattern



Model's Knowledgebase

Visualize Model's Execution Status Via the GOG-CE





Automated Data Collection, Analysis, & Reporting

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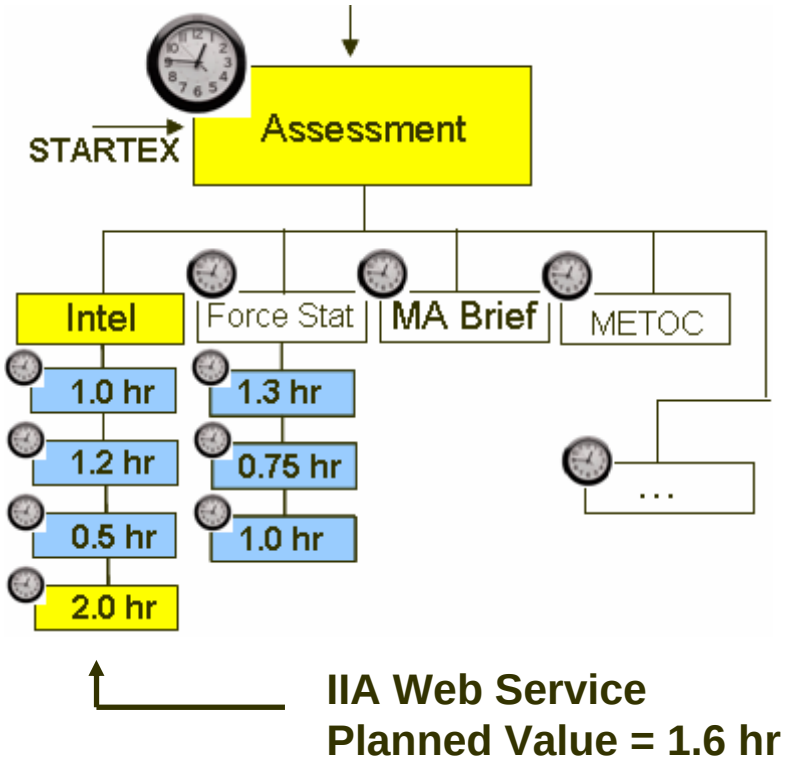
Automated Data Collection, Analysis & Reporting

- Developed a set of “analysis services (AS)” that facilitate automated data collection and detailed analysis of “core” and “vendor-developed” services and applications
- The AS are bound to those services/applications at run time via dynamic run-time binding
- Execution of the AS is controlled via runtime configuration settings
- Gathered metrics and analytic results are intended to be managed within the GIG infrastructure for each service/application to be analyzed
- The AS are used to identify and analyze service/application performance, e.g. time spent per class/method, CPU, IO, and memory utilization, etc.
- The AS are discovered via a Universal Description, Discovery and Integration (UDDI) registry

Example Value-Add Use Case

- During the TSP mission assessment phase, the workflow model identifies a temporal overflow exception associated with INTEL image acquisition (IIA)
- The web service software responsible for that task exceeded its planned execution time budget by 25%



- The question to be answered: is there a problem with the software or did some external factor contribute to/cause that problem?

Example Value-Add Use Case (cont.)

- A probe from an envisioned NCES diagnostic software service was used to analyze the IAA web service
- That analysis showed
  - The web service software was not at fault
  - The performance issue was due to a failure of the software to establish a secure socket connection to the network, i.e. a network problem
  - The software error messages should be augmented for better diagnostic clarity

Value of Model-driven Workflow Evaluation Approach

- Employs a disciplined, system engineering process
- Quantifies workflow shortfalls
- Identifies areas for capability improvements
- Provides focus for future capabilities development and helps shape acquisition decisions