
**Abstract**

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**Status:**

New [X]  Renewal  Status Report

**Description:**

Mission critical apps (financial IT, SCADA, air/missile defense) require a reliance on the assurance guarantees at mission levels and underlying networked information operations. We propose to use directed acyclic graph (DAG) model for mission assurance assessment, and analyze the impact (scope/source) of attacks & failures to missions.

**Related Work Elsewhere:**


**How Our Work is Different:**

We propose a new DAG-based approach (with probabilistic info) to characterize assurance characteristics and the dependency of mission components and their underlying IO systems. We will use graph spectral sparsification and partition for criticality and impact analysis at multi-levels.

**Milestones:**


**Deliverables:**

- Case-guided Study on Mission Definition and Modeling
  - Air fleet defense mission
- DAG-based Mission Assurance Modeling and Inference
  - Graph Spectral Sparsification
  - Graph Partitioning – Cut sets of graph
  - Topological Patterns/Criticality
- Metrics for QoIA
- Adaptation methodologies for problems including two or more missions sharing limited resources.

**Related Work in S’ERC:**

**Affiliate Support:**

**Potential Benefits:**

We aim at developing a semi-automated framework for mission assurance modeling and performance impact analysis. With it, we will be able to provide real-time situation-aware guarantees for mission assurance, even in the presence of malicious attacks, system/network failures, and/or other performance degradations. This work will also provide a foundation for balancing between quality of service (QoS) and quality of information assurance (QoIA), and allow us to allocate resources properly in a mission critical system. For example, without adaptation many mission important activities receive fewer resources than needed while less important activities waste resources by receiving more resources than necessary.