

# **Space Cyber Metrics**

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The logo for Applied Physics Laboratory (APL) at Johns Hopkins University, consisting of the letters 'APL' in a large, bold, red, sans-serif font.

The Johns Hopkins University  
APPLIED PHYSICS LABORATORY

# Agenda

- Executive Summary
- Goals
- Benefits
- Approach
- Milestones
- Progress

# Executive Summary

- This presentation describes
  - Space Cyber Metrics research and development efforts at the Johns Hopkins University Applied Physics Laboratory
- This work defines a common set of system- and mission-level Space Cyber metrics
- Common metrics allow architectures to be evaluated and traded off
- Metrics facilitate higher reliability against cyber-attacks and increasing survivability
  - Thereby enabling mission success.

# Goals

- Define a framework for architecture definition in the cyber domain
  - Refine use cases
  - Define system-level metrics
  - Define mission-level metrics
  - Create models to link the above
- Assess system compromise impact to mission performance through federated modeling
  - Leverage cyber & space modeling
  - Reduce reliance on qualitative analysis by imposing systems engineering process on the space cyber problem

# Benefits

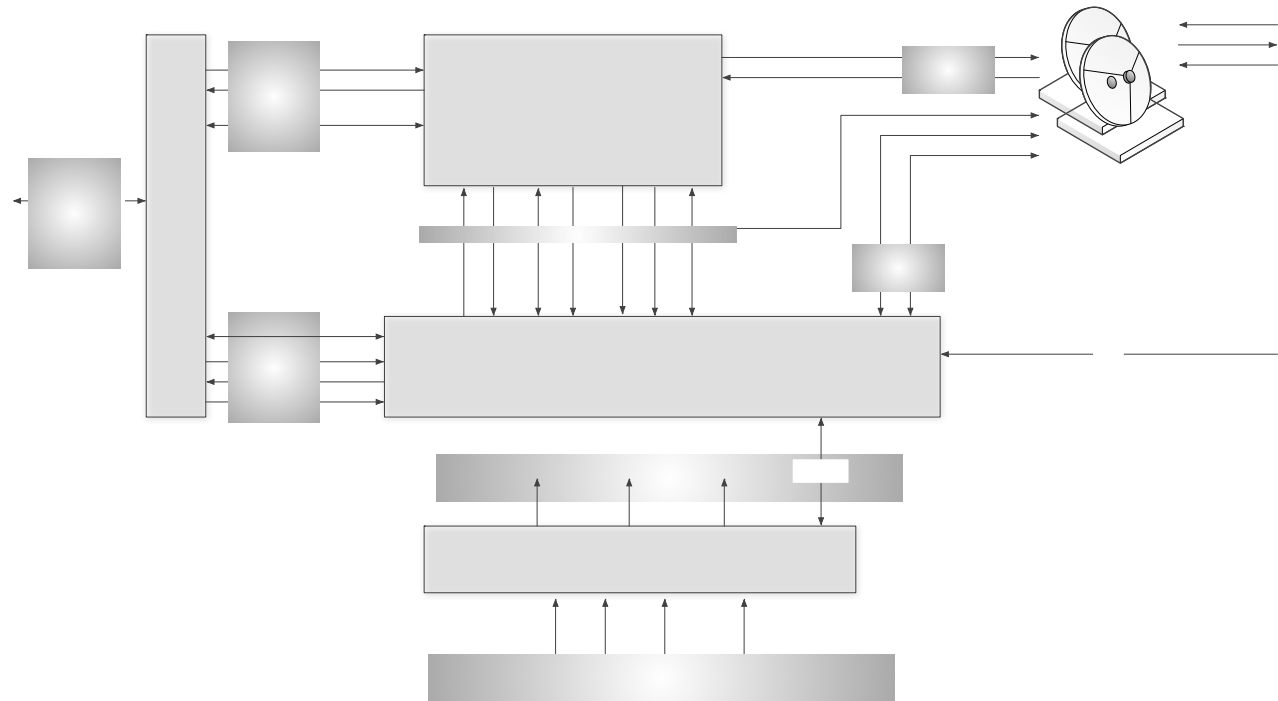
- A common set of metrics provide a foundation and up front systems engineering rigor
- Enables modeling of space cyber that is currently unavailable to acquisition, operational and strategic decision makers
- Allows architecture trades to define robust capabilities and increase survivability enabling mission success



# System Architecture

Generalized architecture for basic modeling efforts

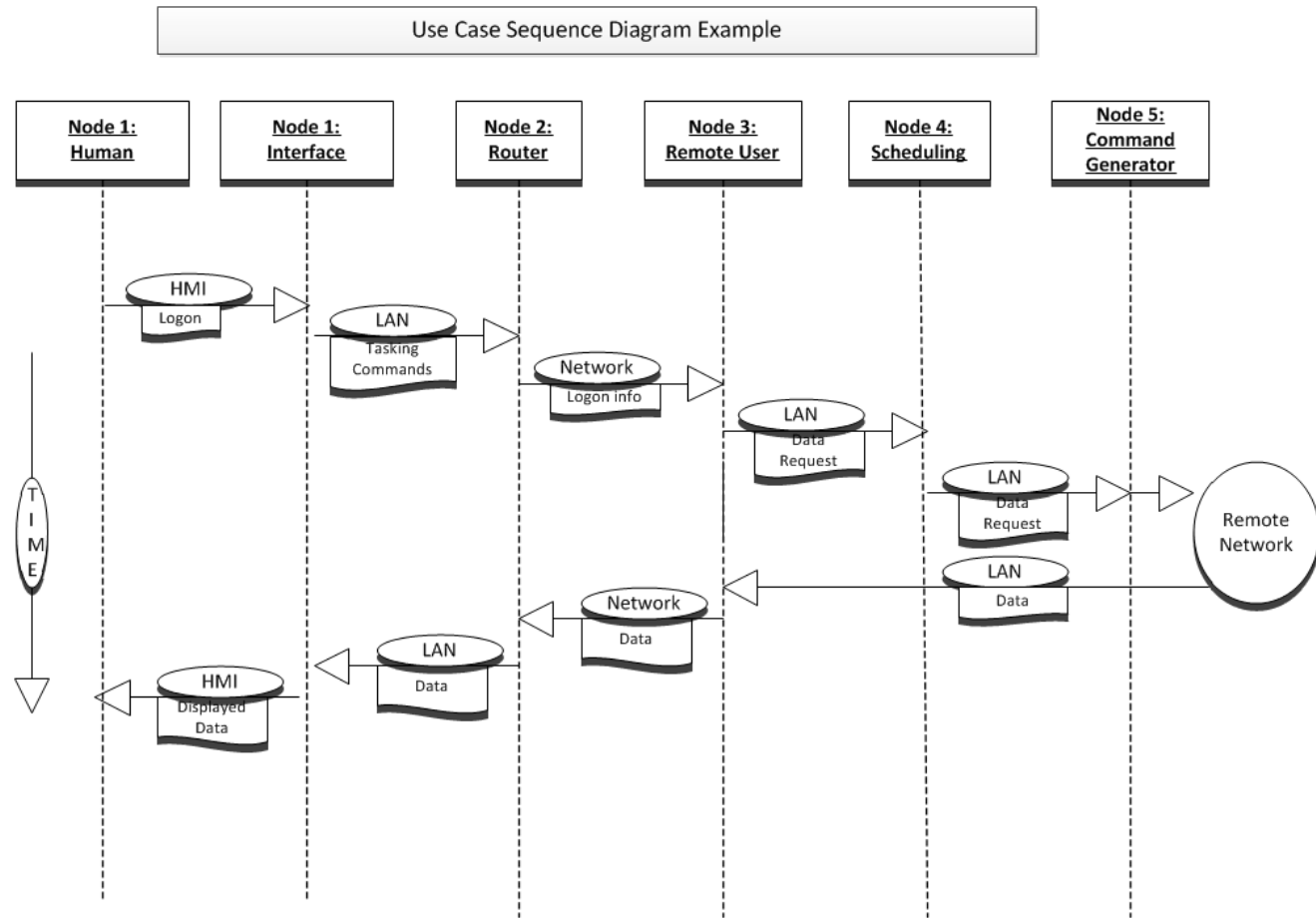
Easily refined for more specific situations



# Use Cases

Use cases determine what needs are affected by a system change

Failure of a use case is traced to a related performance metric



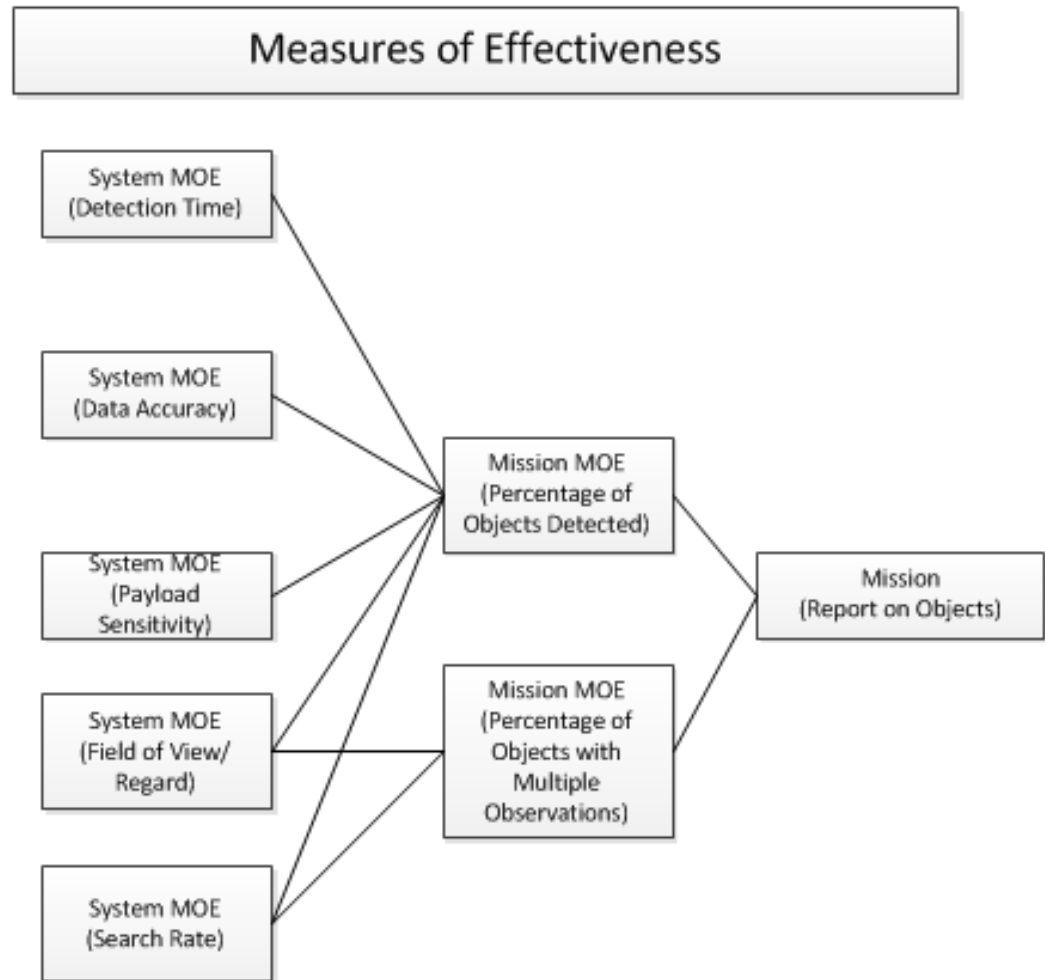


# System and Mission Measures of Effectiveness

Systems are defined by mission performance

Performance is broken into standard system engineering measures of effectiveness

System effects are traced to the overall effect on the mission



# Milestones

- Identify system and mission metrics
- Refine use cases
- Define algorithms for mission impact analysis
- Assess metric and model performance

# Progress

- Identified 2 mission sets
  - Communications
  - Sensing
- Defined top-level architecture for mission sets and built out space components using a visualization tool
- Identified preliminary set of system and mission MOEs for the mission sets
- Identified hardware in the loop simulator for practical applications