

Adaptive Sensor Tasking and Control

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Air Force MOIE

The logo for the MITRE Technology Program, featuring a stylized graphic of stacked blocks in yellow, orange, and blue to the left of the text.

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Problem

- **A coordinated control mechanism will be essential if network-centric sensor systems with highly diverse platforms and sensing modalities are to achieve the goal of information superiority on the battlefield.**
- **The network of platforms and sensors cannot be controlled by a single optimization process because of the multitude of scales (temporal and spatial) and the diversity of sensors.**
- **The constellation must be segmented into layers, each layer with a tailored resource management mechanism, and the layers must be loosely integrated to allow collaborative interaction but not dependency.**

Background

■ Key Problem

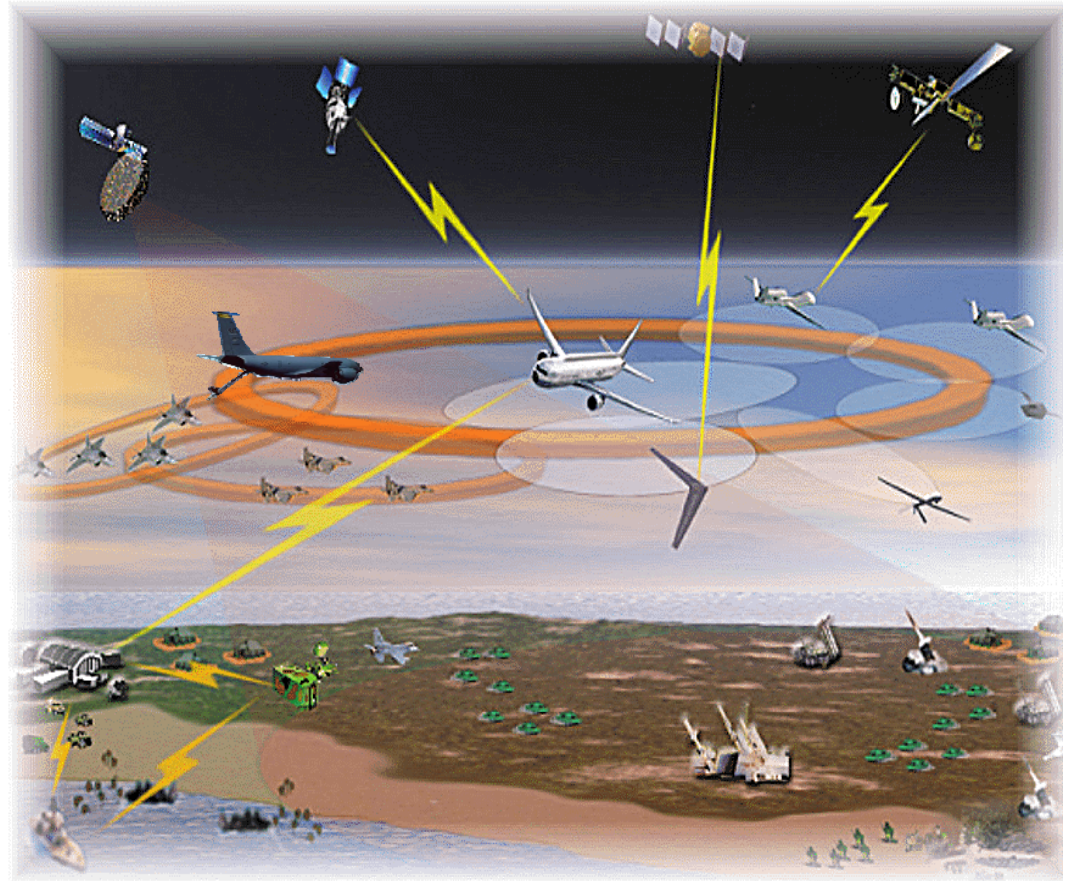
- How will the actions of the various sensors in the network be controlled to work efficiently and collaboratively?
- How will users and operators interface to the system?

■ Technical Challenge

- Control of the entire network sensor system cannot be managed by a single optimization process

■ Technical Approach

- Define layers in the sensor network system
- Each layer is managed optimally
- Integrate



*System-of-Systems Approach for Air/Space/Ground --
and Manned/Unmanned*

Objective

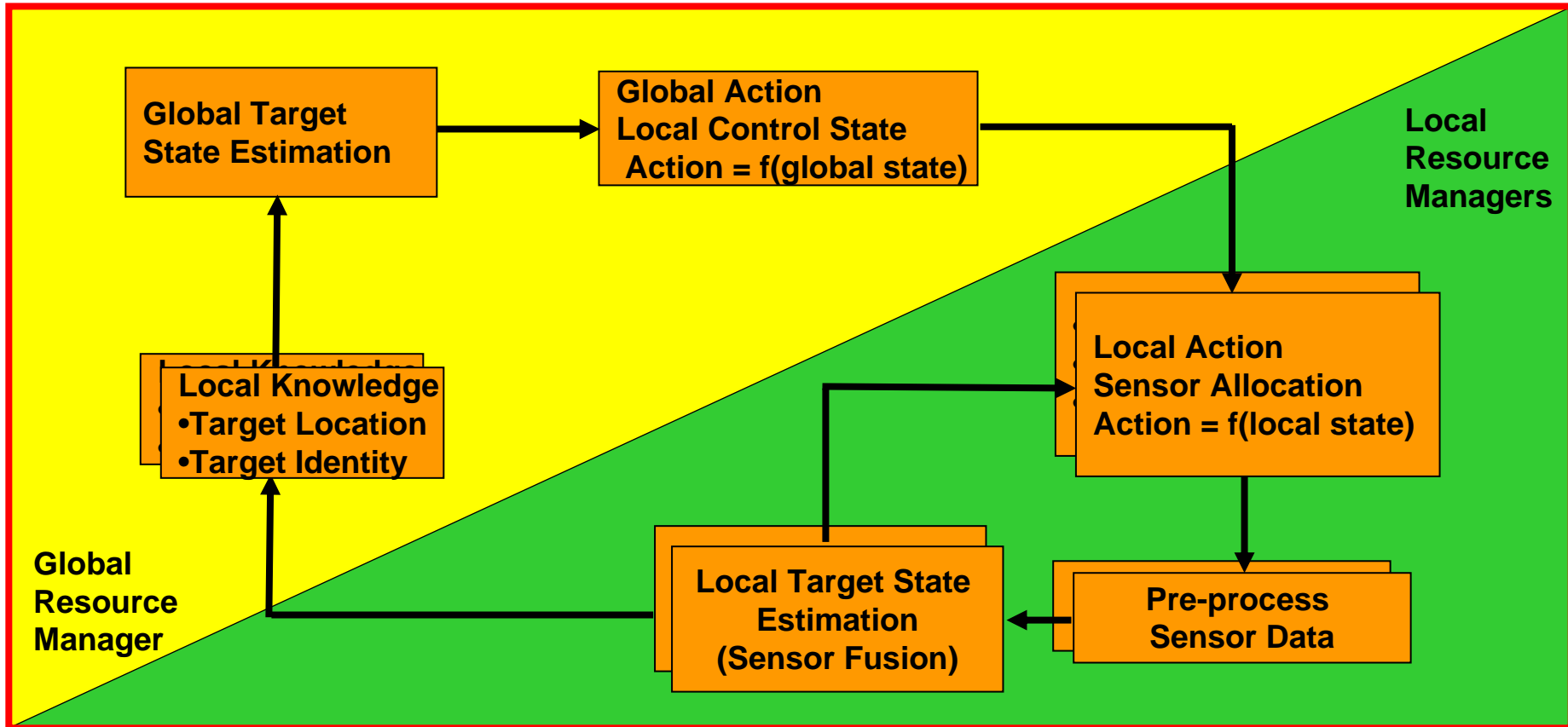
- The objective of this MOIE is to expand and integrate existing resource management tools developed by MITRE to quantify the performance that can be achieved by network centric ISR systems
- We will demonstrate the effectiveness of system level resource management using a “layered” approach for networks comprised of standoff ISR sensors operating collaboratively with multiple in situ sensors (i.e. an UGS network)

Activities

- **Adaptive control of multiple heterogeneous sensors**
 - Sensors arranged in clusters
 - MITRE Bedford scenario
 - Traffic leaving campus at the end of the day
- **Tracking application**
 - Discover targets
 - Initiate and maintain tracks using target features
- **Resource management**
 - Global resource manager (system level)
 - Local resource manager (cluster level)
 - Generalized resource management

System Architecture

Coupled Restless Bandits



Demonstration

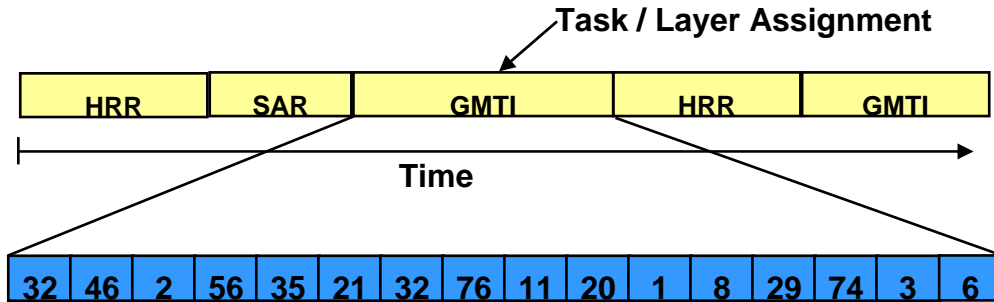
■ Bedford Campus Simulation



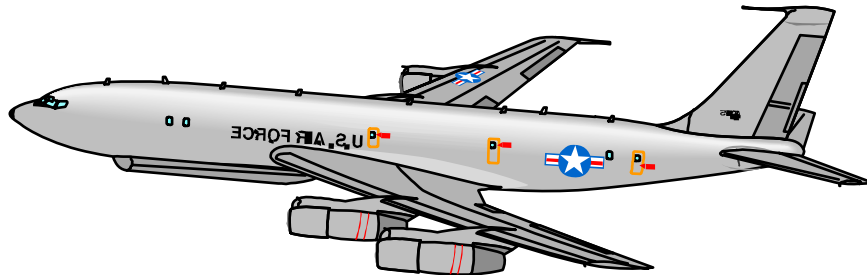
Impacts

- Comprehensive resource management (RM) is a fundamental technology to enable integrated ISR systems
- This technology will contribute to achieving the vision of an Interoperable Multi-INT ISR enterprise
- MITRE's research in this important field will aid ESC in the design and evaluation of Command and Control (C2) architectures, RM algorithms and tasking procedures the C2 Constellation (C2C), it's components and programs
 - DCGS AF
 - Space Based Radar (SBR)
 - JSTARS
 - Global Hawk
 - MC2A
 - NCCT

Future Plans



- Outer / Inner Loop Scheduling
- Deterministic / Adaptive



- Adaptive Control of Multi-mode Radar
- Feature Aided Tracking and ID