AFRL Sensing Autonomy Vision for NDIA

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AFRL HERITAGE | 1917–2017

100 YEARS OF U.S. AIR FORCE SCIENCE & TECHNOLOGY

Integrity ★ Service ★ Excellence

RY Autonomy Vision

Autonomy Vision: Timely Generation of knowledge to improve every AF decision

An autonomous sensing system can understand any multi-domain mission environment as a single integrated battlespace through a scalable combination of peer, task, and cognitive flexibilities, executes mission effects, and assesses them in a timely manner.

Flexibility is the key to defense autonomy!

The Need for Change

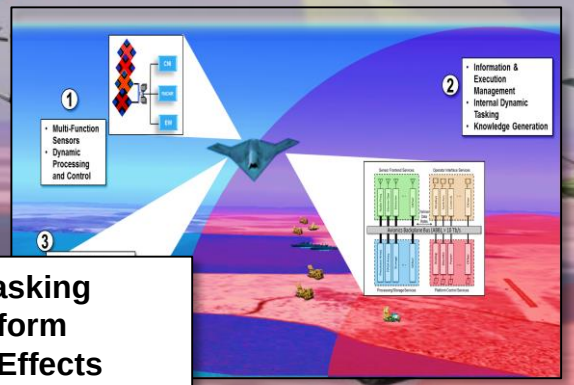
- **Currently USAF is good at generating knowledge using predefined meaning and specific tasks in a linear fashion**
  - **Approach to knowledge generation is manual, slow and not scalable**
  - **Only a small percentage of the data is used to generate knowledge – limited by manpower**
- **Goal of autonomy is to generate knowledge applicable across numerous tasks to break linearity**
  - **Provides ability to utilize multi-domain knowledge for faster decisions and actions/effects**
  - **Applies at all levels of instantiations**
- **Defense autonomy application requires flexibility**
  - **Cognitive, peer, and task flexibilities**

Sensing Autonomy Scenario

- Information requests and Tasking
- Coordinated Sensing and effects
- Decision-aids & Human-Machine Interaction

Knowledge Generation for Human-Based Decisions

- Inputs: Mission Objectives, ROEs, Tasks
- Multi-Domain Fusion
- Decision-aids & Human-Machine Interaction



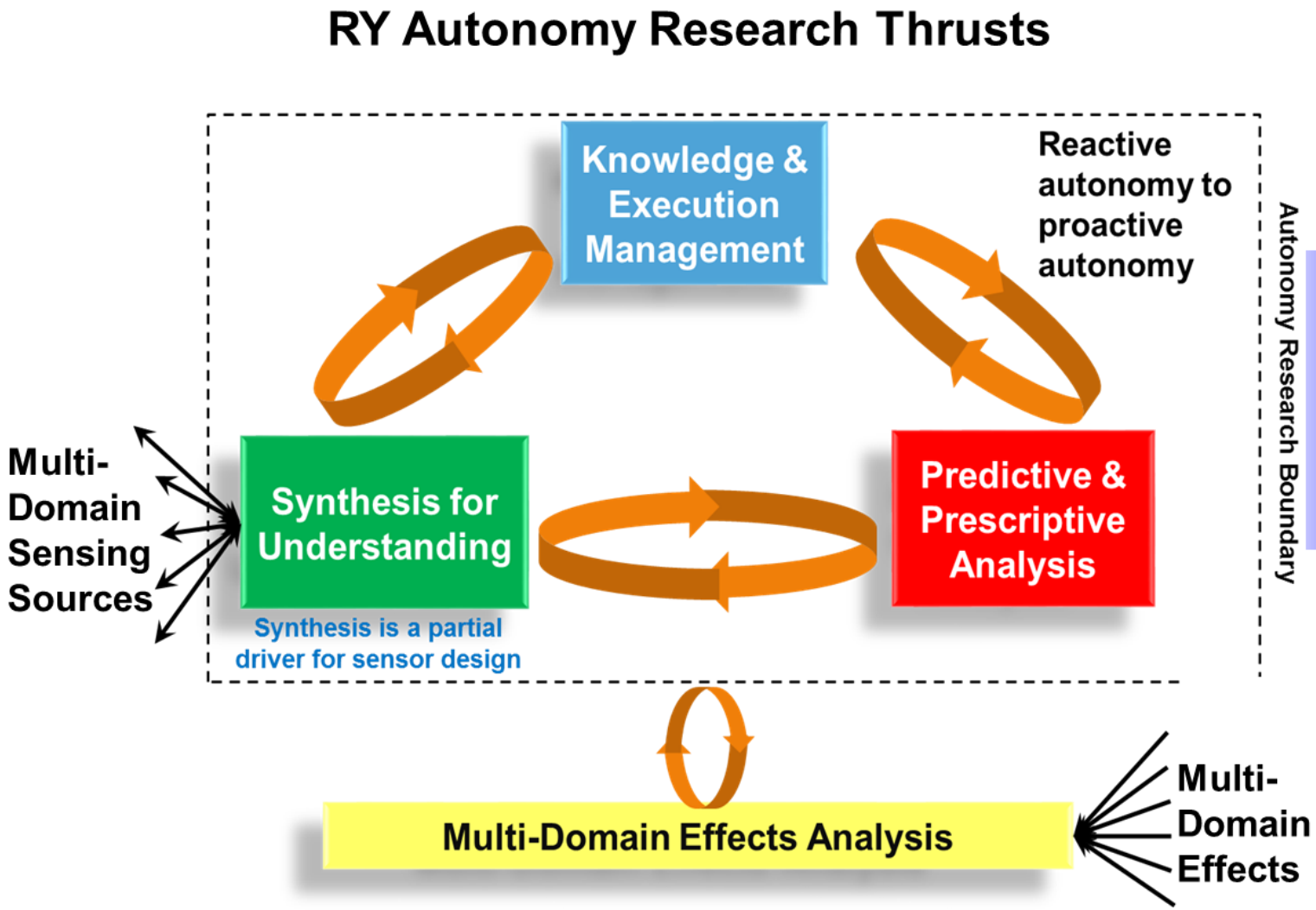
- Dynamic Tasking
- Single-Platform Sensing & Effects
- Multi-Sensor Fusion

- Dynamic Tasking
- Dynamic Networking
- Multi-Platform Sensing & Effects

Knowledge Generation for Multi-Domain Effects

Sensing capabilities to generate knowledge for Multi-Domain SA and Effects

RY Autonomy Science Challenges



Key Technologies

- Multi-phenomenology level machine learning
- Robust knowledge representation strategies
- Flexible resource management and architecture strategies
- Decision & game theory
- Advanced computing
- Dynamic optimization theory
- Joint inference and control
- Multi-domain constructive MS&A tools
- Cognitive EW

Thank You