SAND2018-5484PE

Science of Cyber Software and Systems Analysis

PRESENTED BY

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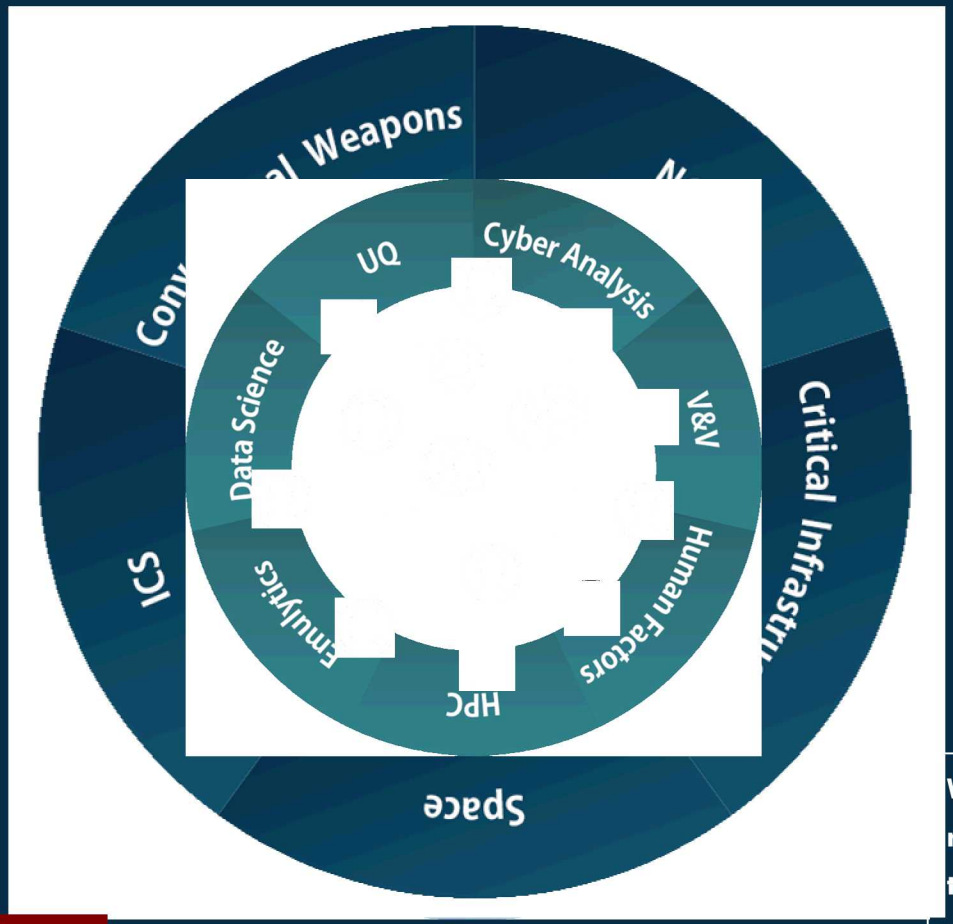
Science of Cyber Systems Analysis

Cyber systems are pervasive across all aspects of civilization, and becoming more so. However, we are falling behind in our ability to understand, engineer, and control them.



Heroics do not scale

Current State

Requires time and expertise

We need automated, scientific reasoning about cyber systems (in the same way we reason about physical systems) that scales to meet national security needs.

Why Cyber Science?
Reasoning about software and systems

Today

Analysts spend significant time creating, predicting, reproducing, and verifying experiments.

Generalize: construct or refine a theory to account for observed behavior

Tomorrow

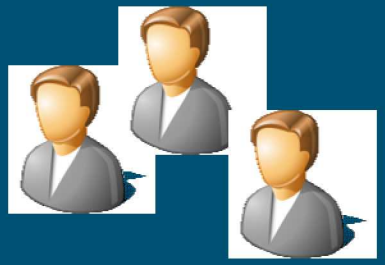
Experiment enablers allow analysts to spend significant time on inductive reasoning.

Hypothesize: formulate a falsifiable prediction based on the theory

Theoretical

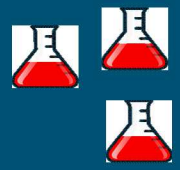
Empirical

Observe: analyze how the system under analysis behaves



Experiment: test the prediction in the system

Automation



Rigor

What's needed?

Automated tools

- Software analysis
- Graph analytics
- Formal methods
- Human factors
- Computing

Rigorous experimental methodologies for cyber

- High fidelity testbed environments
- Uncertainty quantification
- Design of experiments
- Verification and validation

We need help from our academic partners

Formal and informal collaborations with faculty and research groups

Center for Cyber Defenders (CCD)

Year-round internships

Sandia's university programs (graduate studies)

Workshops

Sandia National Laboratories | Berkeley University of California | Georgia Tech | Illinois | New Mexico | Purdue University | The University of Texas at Austin