

Man-on-the-Loop Architecture Research and Prototyping

Reason for Man-on-the-Loop Decision Making

As highlighted in the 2016 Defense Science Board summer study on autonomy, the scale and speed of cyber-attacks will overwhelm human-in-the-loop defenses. The DoD recognizes the need to move from human-in-the-loop analysis of Intelligence, Surveillance, and Reconnaissance (ISR) data to dynamic, autonomous human-on-the-loop analytics and decision making.

Why OASD R&E Worked with the SEI: Software Architecture Expertise and Rapid Prototyping Capability

Knowing that the SEI is the DoD's FFRDC with knowledge and expertise regarding critical software system capabilities and formal testing principles, the Office of the Assistant Secretary of Defense for Research and Engineering (OASD R&E) asked the SEI to

- apply its existing technologies to evaluate the software architectures of related system components
- prototype a human-on-the-loop architecture to autonomously compute mission-related analytics

SEI's Role: Design and Build a Prototype Distributed Computing Infrastructure

In this work, the Carnegie Mellon University Software Engineering Institute (SEI)

- analyzed the architecture and design requirements for a distributed computing infrastructure that would enable human-on-the-loop ISR data analytics
- conducted a Mission Thread Workshop to identify classified and unclassified mission vignettes and sources of test and evaluation data
- applied the SEI's Architectural Tradeoff Analysis Method (ATAM) for the Resiliency Analytic Framework Topology Toolkit (RAFTT) being developed by John Hopkins University/Applied Physics Laboratory (JHU/APL) and the Datahub system being developed by Massachusetts Institute of Technology/Lincoln Laboratory (MIT/LL)
- prototyped the means to monitor and verify in real-time that the software-based concepts and actions of a human-on-the-loop approach are operating correctly and effectively
- developed and implemented proof-of-concept to autonomously compute mission-related analytics that learn over time and provide a user relevant course of action for a variety of tasks based on a given level of mission risk

OASD R&E Use

The goal for OASD R&E is to build sufficient confidence in the autonomous system's performance and correctness so that the human personnel do not feel impelled to jump back into the loop.

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