Developing the ERS Collaboration Framework

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ERS Development Challenges

Resilient System

A system with sufficient adaptive capacity to respond to unanticipated challenges.

- Finding resilient system designs requires:
  - Large scale exploration of cyber-physical design space.
  - Frequent communication among stakeholders.
  - Increased re-use of design assets.
  - Automation of analysis and design tasks.
ERS Development Challenges

Resilient System

A system with sufficient adaptive capacity to respond to unanticipated challenges.

- The current design process...
  - ...is slower than the threat evolution.
  - ...is hindered by communication barriers.
  - ...does not leverage expertise across organizations.
  - ...depends on manual management and tweaking.
ERS Cloud Computing Architecture (ECCA)

Impact

• BAE Systems is developing a proof-of-concept platform to facilitate ERS development.

DoD

Large-scale, cross agency trade-space analysis.

Support future asset testing and evaluation.

Industry/Academia

Shape requirements with new, disruptive technologies.

Scalable, reliable computing resources.

Encourage greater communication and collaboration.
ERS Cloud Computing Architecture (ECCA)

Impact

• BAE Systems is developing a proof-of-concept platform to facilitate ERS development.

An agile design, development, and evaluation process that enables rapid response to emerging threats.
ECCA Operational Goals

• Tool and data access across the ERS Community.
ECCA Operational Goals

- Dynamically **protect** stakeholder IP.
ECCA Operational Goals

- Enable **scalable** analysis of alternatives.
ECCA Design
High Level

- Facilitate bi-directional access:
  - ERDC ↔ ERS partner agents.
  - ERS partners ↔ ERDC tools.
  - Use non-proprietary, extensible data formats (e.g. JSON, XML)
- Service oriented architecture:
  - ERDC Coordinator.
  - Asset Manager.
  - Security Broker.
  - Platform Manager.
  - Partner ECCA Agents.
ECCA Design
Core Services

• ERDC Coordinator:
  • Handshaking between ERS Segment and the ECCA.

• Asset Manager:

• Platform Manager:
  • IaaS provisioning control.

• Security Broker:
ECCA Agents

- Manage user assets (e.g. simulations, analytics) deployed in the ECCA or on corporate infrastructure.

**ECCA Deployed Assets**
- Loaded into AWS via specialized VM containers.
- Configurable runtime access and scalability rules.

**Corporate Assets**
- Communicate via secure web services.
- Configurable runtime access rules.

Diagram: ECCA Agent Interface

- ECCA Agent API
  - User Asset
  - Virtual Machine
- ECCA Core Services
  - Asset Manager
  - Security Broker
  - Platform Manager

Diagram: ECCA Deployed Assets

- ECCA Agent API
  - Web Service
  - Corporate Asset
Securing Proprietary Assets

- **Security Best Practices:**
  - Data at rest:
    - Encrypt databases and VMs
  - Data in motion:
    - Encrypt communication channels

- **Collaboration:**
  - Legal.
  - Algorithmic:
    - Call budgets
    - Differential privacy
    - Model feature control

ECCA Phase 1 Effort
10/2016 – 07/2017

- Develop ECCA components that support ERDC ⇔ BAE Systems collaboration.
- Develop and deploy surrogate models as “guinea pigs.”
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10/2016 – 07/2017

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ECCA Infrastructure Exploration
AWS GovCloud

- GovCloud region dedicated to State and Federal Entities.
  - Managed by US citizens, on US soil.
  - ITAR, FedRAMP compliant.
  - Core AWS services available, e.g. EC2, S3.

- Initial ECCA Mapping to AWS.
  - Partners connect to AWS via Virtual Private Clouds (VPC).
  - ECCA Agent services front segments of VPCs.
  - Partner communication via VPC peering.
  - Security broker clears/rejects communication based on policies.
Future Challenges

• Trust.
  • Reliability, model accuracy, security, usability.
• Automatic workflow provisioning and interconnect.
  • Granularity and composition of simulation components.
• Maintaining analysis and design workflows.
  • Evolvable interconnect among tools, simulations, and components.
• Component and Design management.
  • Design repositories.
Thank you!

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