Modeling and Simulation as a Service

Cloud Computing, Big Data Technology, and Advanced Analytics

2015 Spring Simulation Multi-Conference
Cloud Computing Technology

• Collect the low-hanging fruit that benefits private sector IT industry
  – Simplify the deployment and use of complex applications and databases
  – Reduce the requirements on edge-node devices and reduce deployment and maintenance resources
  – Support large numbers of users worldwide in a robust and reliable manner
  – Automate Service Level Agreement (SLA) and performance monitoring and management
Big Data Technology

• There are many different types of data that must be managed:
  – Instrumentation data
  – Environmental conditions
  – Virtual reality representations
  – Physical characteristics
  – Non-physical, mental/cognitive descriptions and characteristics of humans
  – Military operations specific data
  – Performance data collected from the subjects/systems
• Given that the performance of the system cannot be slowed by the data collection process, the following must be performed:
  – An understanding of which type of data store is best for each type of data to be managed
  – Architecture for each data store and a method for integration into the larger system architecture
  – A prototype of the data architecture integrated with the system architecture
Advanced Analytics

• This includes certain types of interactive/real-time orchestration and alerting

• Event management and control
  – Many COTS tools exist that could provide capability and value
  – Enable monitoring of event objectives and execution more easily

• After-action review
  – Take advantage of the new big data storage tools combined with analytics
  – Enable deeper understanding of what happened and when
  – Improve correlation
Key Issues

• Enable data sharing with security, scalability, and performance
  – Days, not months

• Simple Publish-Subscribe API
  – Support both structured and unstructured data distribution

• Standards compliant (Web and others)

• Solution Metrics
  – Easy to use and intuitive implementation framework for Developers as Users
    • Reduce the amount of developer-written code
  – Reduce rework – get the job done right the first time
  – Create applications in shorter cycles – involve users in the development process early and often
  – Creation of complex, realistic, and scalable networks of component inter-relationships
Technical Challenges

- Rapidly create complex, realistic, and scalable networks of systems and component inter-relationships
- Distribution of autonomous controls and monitors
- Implementation of complex webs of cause and effect
- Dynamic alteration of the component execution structure
  - Adaptation and evolution of the system
- Ability to handle billions of active processes in real-time
  - Harness power of sequential, distributed and/or parallel processing – optimizing the use of any compute/network/storage configuration
  - Smartphones to supercomputers
Summary

• Representation of complex webs of synchronized causes and effects is central to the implementation of complex systems
• Computation, correlation of simultaneously evolving systems and interrelated phenomena
• Ability to control an activity based on a web of logic, and start another in response to dynamic conditions
• Achievement of scalability without loss of capability