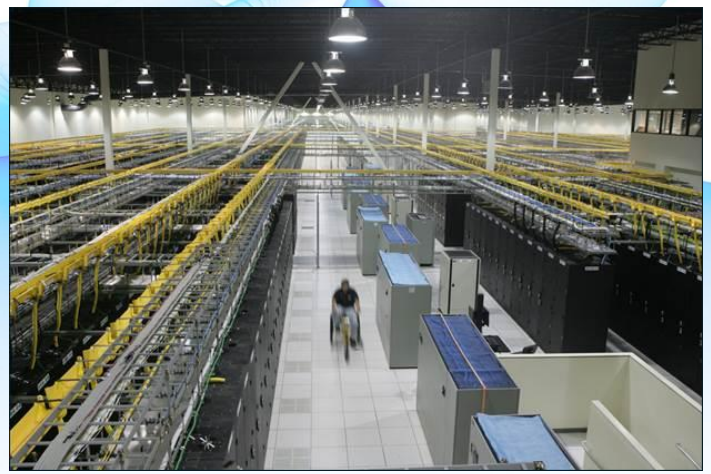
Modeling and Simulation as a Service

Cloud Computing, Big Data Technology, and Advanced Analytics



2015 Spring Simulation Multi-Conference

Infinite Dimensions

Solving Tomorrow's Problems Today

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

Big Data and M&S

- 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