

Leveraging Virtualization Technology for Command and Control Systems Training

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C2 System Training Challenges for NORAD and USNORTHCOM Missions

- Unique C2 systems and simulation models
 - Expensive scenario development
- Isolated internal system simulations
 - Single mission stimulus
 - Limited participants
- Crews memorized the limited set of scenarios
 - Resulted in “negative training”

NORAD Bi-National mission: To conduct aerospace warning, aerospace control, and maritime warning in the defense of North America.

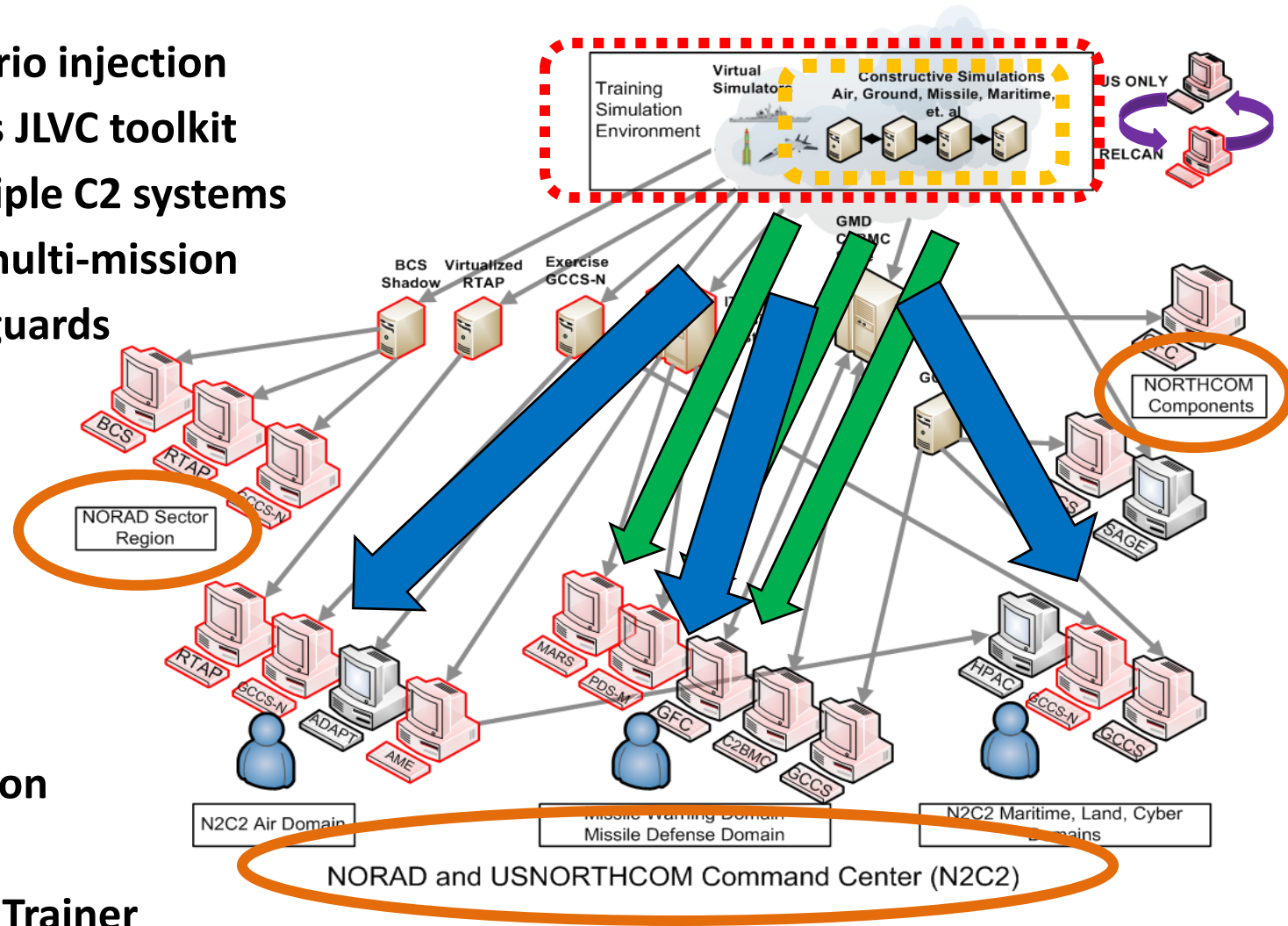
USNORTHCOM mission: Partner to conduct homeland defense, civil support, and security cooperation to defend and secure the United States and its interests.



NORAD and USNORTHCOM Training C2 System Objectives

Dynamic scenario injection
Utilize Service's JLVC toolkit
Stimulate multiple C2 systems
Synchronized multi-mission
Cross-domain guards

Local training
or multi-echelon
Affordable for
Alternate and Trainer

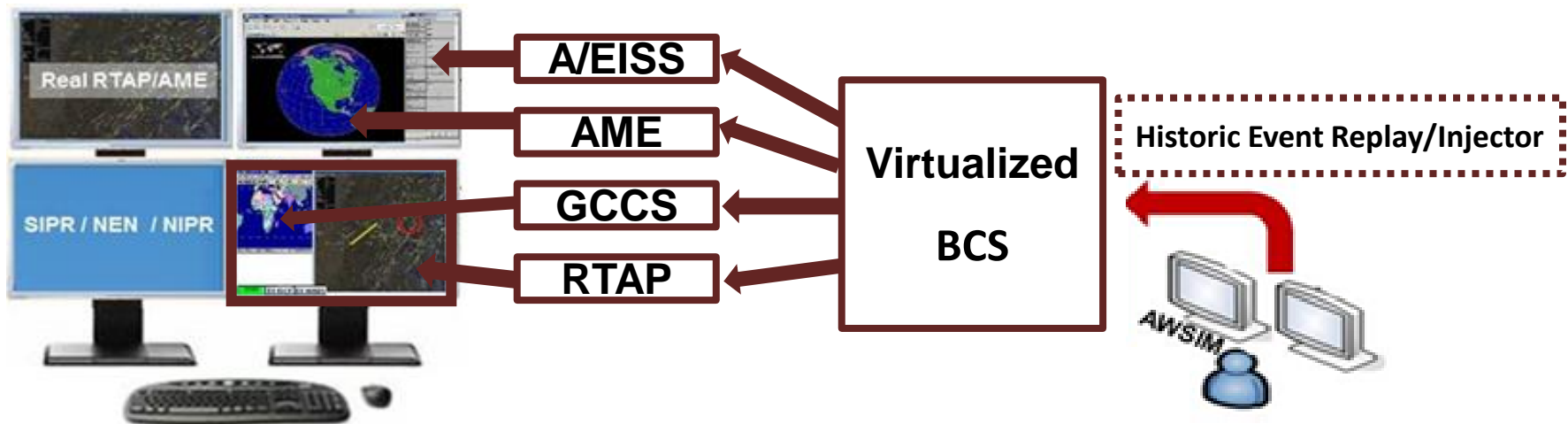


Initial Focus: Air Warning Training

- **Original work plan was revectorred**
 - Leadership changed prioritization of primary C2 system to a new Remote Tactical Air Picture (RTAP) – No documentation; not feasible to emulate
 - Command introduced a new Air Event Information Sharing Service (A/EISS)
 - Stopped adaptation work on existing Air Warfare Simulation (AWSIM) to directly stimulate the old primary system, Air Mission Evolution (AME)
- **Way-ahead – Virtualized training system**
 - Rather than emulating individual feeds into four local C2 systems, stepped back one level to common source, Battle Control System (BCS)
 - Virtualization of BCS and our C2 systems provided cost-effective replication with authentic processing, messages, and displays
 - End result is an end-to-end air string representing inputs from military, FAA, and NAVCAN sensors through the NORAD sectors' BCS processing with outputs merged into Headquarter's systems

Air Warning C2 System Training

- AWSIM modified to model North America AOR (primarily FAA civilian aviation)
- AWSIM Model Operator dynamically stimulating virtualized BCS
- Authentic BCS processing with outputs to virtualized NORAD C2 systems
- Warfighter trains at operational workstation – added thin client hardware
- Adding a historic event capture and replay capability



Virtualization Benefits

- View of training systems have same “Look/Touch/Feel” as operational systems
- Authentic processing and message content
- Inherits many Cyber Security and Information Assurance characteristics – simplified approval for Authority to Operate
- Virtual machines are “files”
 - Small footprint – AWSIM, four NORAD Sectors’ BCS components and HQ C2 systems hosted on two virtualization servers
 - Easily restored back to initial state
 - Select files for software upgrades, mixing versions or “reverting” back
- Cost-effective
 - Replicated for Qualification Trainer, Alternate Operations Center and Cyber Range



Virtual Air Warning Training Systems

vCenter Map View

NDTE-vCenter.NDTE.local - vSphere Client

File Edit View Inventory Administration Plug-ins Help

Home Inventory Hosts and Clusters

Search Inventory

10.34.1.1

- ANR_DMO
 - ANR_DMO_Procon
 - ANR_DMO_SV01
 - ANR_DMO_SV11
 - ANR_DMO_WS01
- CADS_DMO
 - CADS_DMO_Procon
 - CADS_DMO_SV01
 - CADS_DMO_SV11
 - CADS_DMO_WS01
- CMAS
 - CMAS-SV21
 - CMAS-WS01
- CMOC-GTE
 - CMOC-SV21
 - CMOC-WS01
- EADS_DMO
 - EADS_DMO_Procon
 - EADS_DMO_SV01
 - EADS_DMO_SV11
 - EADS_DMO_WS01
- NDTE Mgmt
 - AEISS OCT2014
 - NDTE-BDC
 - NDTE-DC-12Dec13
 - NDTE-DC-DoDbaseline-v13
 - NDTE-vCenter-2008R2-DoD-v12
- WADS_DMO
 - MCCBS-w-wireshark
 - WADS_DMO_Procon
 - WADS_DMO_SV01
 - WADS_DMO_SV11
 - WADS_DMO_WS01
- ACAS-NDTE-SC
 - ACAS-SC-Lab
 - ACAS-SC-Prod
- AWSIM-53-Maritime
 - AWSIM55 NO STIG
 - AWSIM57_NO_ORACLE_NO_GIAC
- MCCBS-1
- Win7-CATSIT-10Feb14
- 10.34.1.221
- CMOC RTAP
 - CMOC_SV21
 - CMOC_WS01
 - CMOC_WS02
 - CMOC_WS03
 - CMOC_WS04
 - CMOC_WS05
- GCCS
 - GCCS-STIG-18Dec13
 - GCCS-STIG-18Dec13-for-GTE

NDTE

Summary Virtual Machines Hosts IP Pools Performance Tasks & Events Alarms Permissions Maps Storage Views

Custom Map

Air Defense Sector Components (one of four - WADS)

AWSIM

Headquarters C2 Systems
GCCS/Agile Client
A/EISS and RTAP

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Overview

Map Relationships:

Custom Map

- Host Options
 - ☐ Host to VM
 - ☐ Host to Network
 - ☐ Host to Datastore
- VM Options
 - ☐ Fault Tolerance relationships
 - ☒ VM to Network
 - ☐ VM to Datastore
 - ☒ Show only powered on VMs

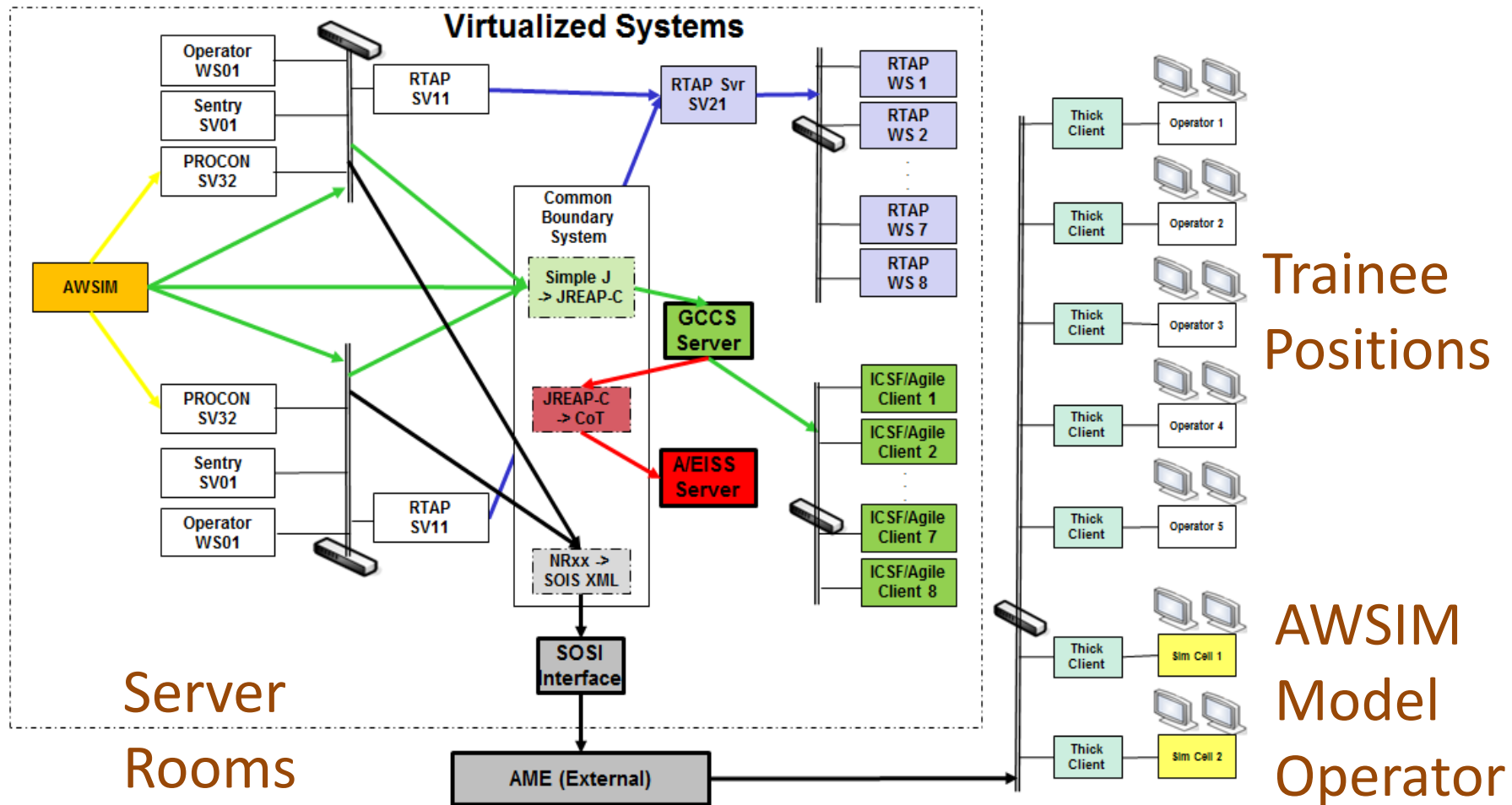
Apply Relationships

Tasks Alarms

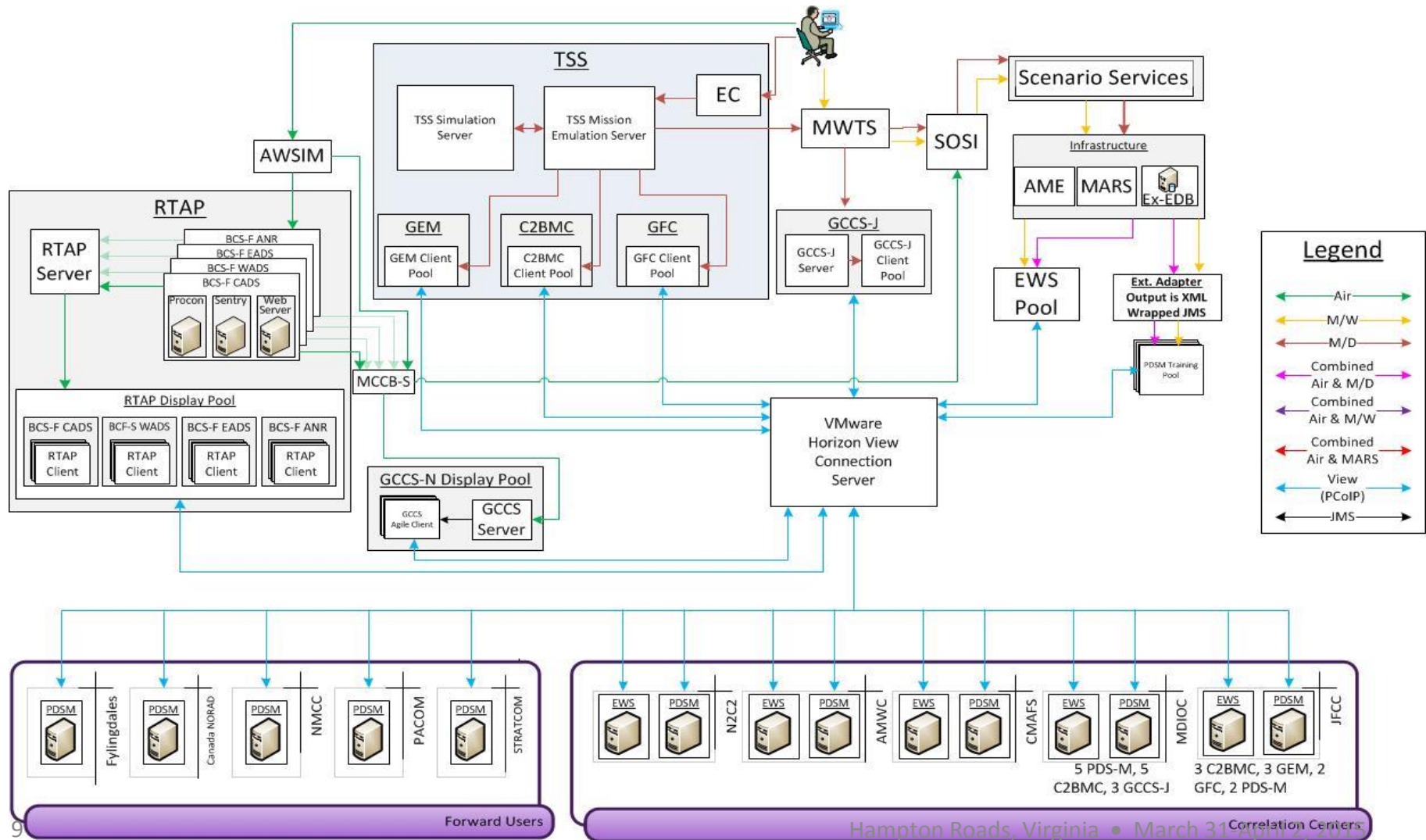
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Air Warning C2 Training System Deployment



Next: Virtualized/Distributed/Integrated Air and Missile Event C2 System Training



Summary

Leveraged virtualization technology to enhance NORAD and USNORTHCOM C2 system training objectives

- Dynamic scenario injection
- Utilizes Service's JLVC toolkit - AWSIM
- Stimulates multiple C2 systems with authentic processing, messages, and displays
- Initially deployed for local training, but scalable for distributed multi-echelon events
- Affordably replicated in Alternate Command Center and Qualification Trainer
- Expanding capabilities for synchronized air and missile event multi-mission training

