Embracing Rapid Change Through Flexible Architecture: A CACE Case Study

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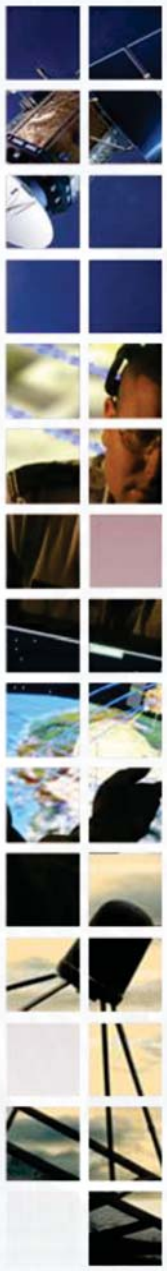
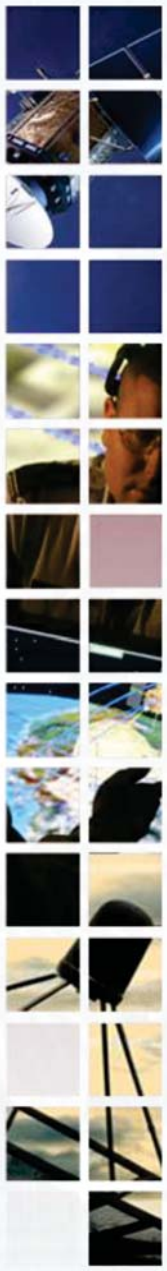
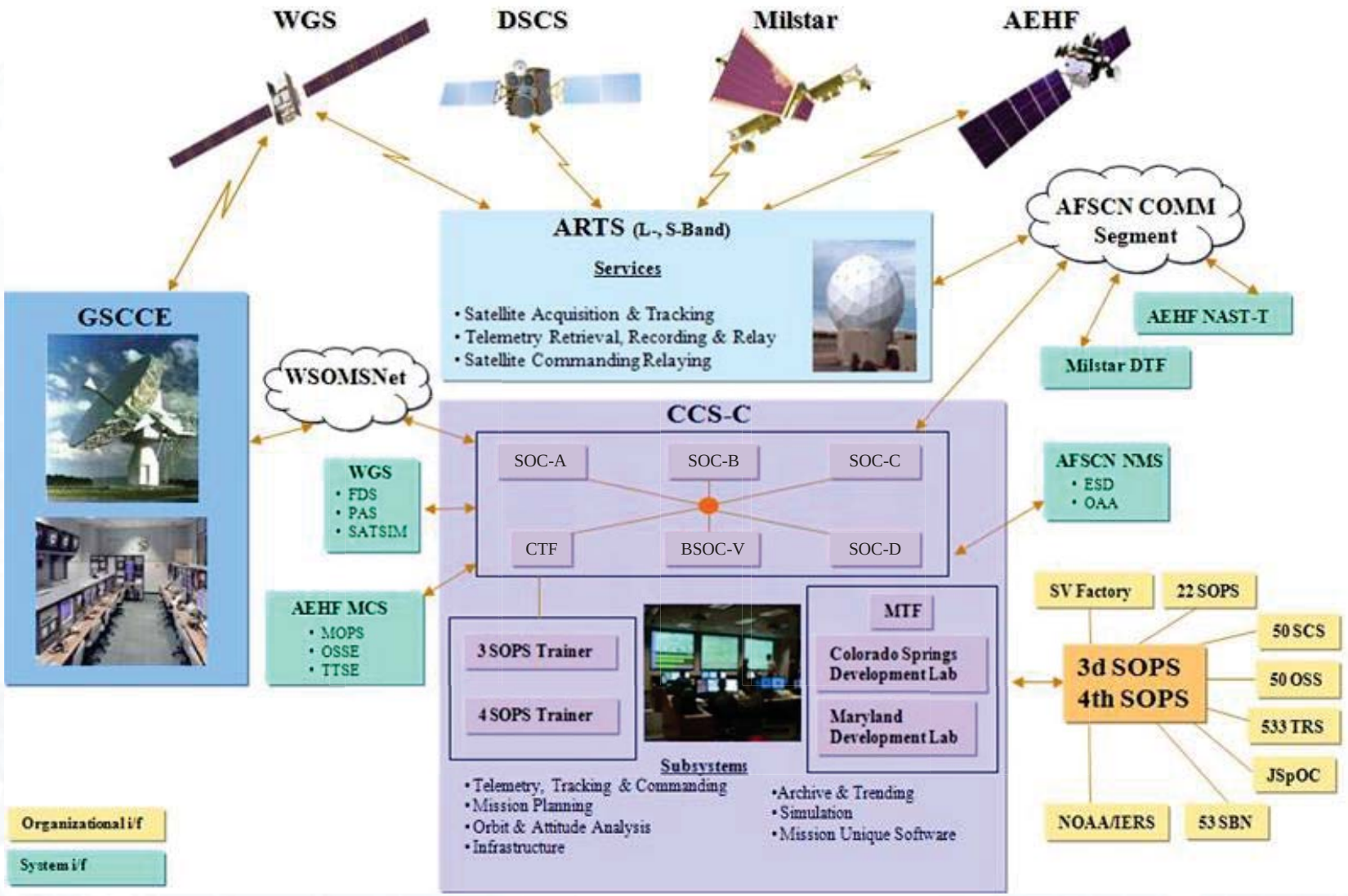
Outline



- CCS-C History & Overview
- CACE Overview
  - Architecture
  - Features
  - DevOps
- Lessons Learned
- Supporting Future Evolution
- Summary

CCS-C History & Overview





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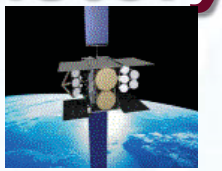
CCS-C History & Overview

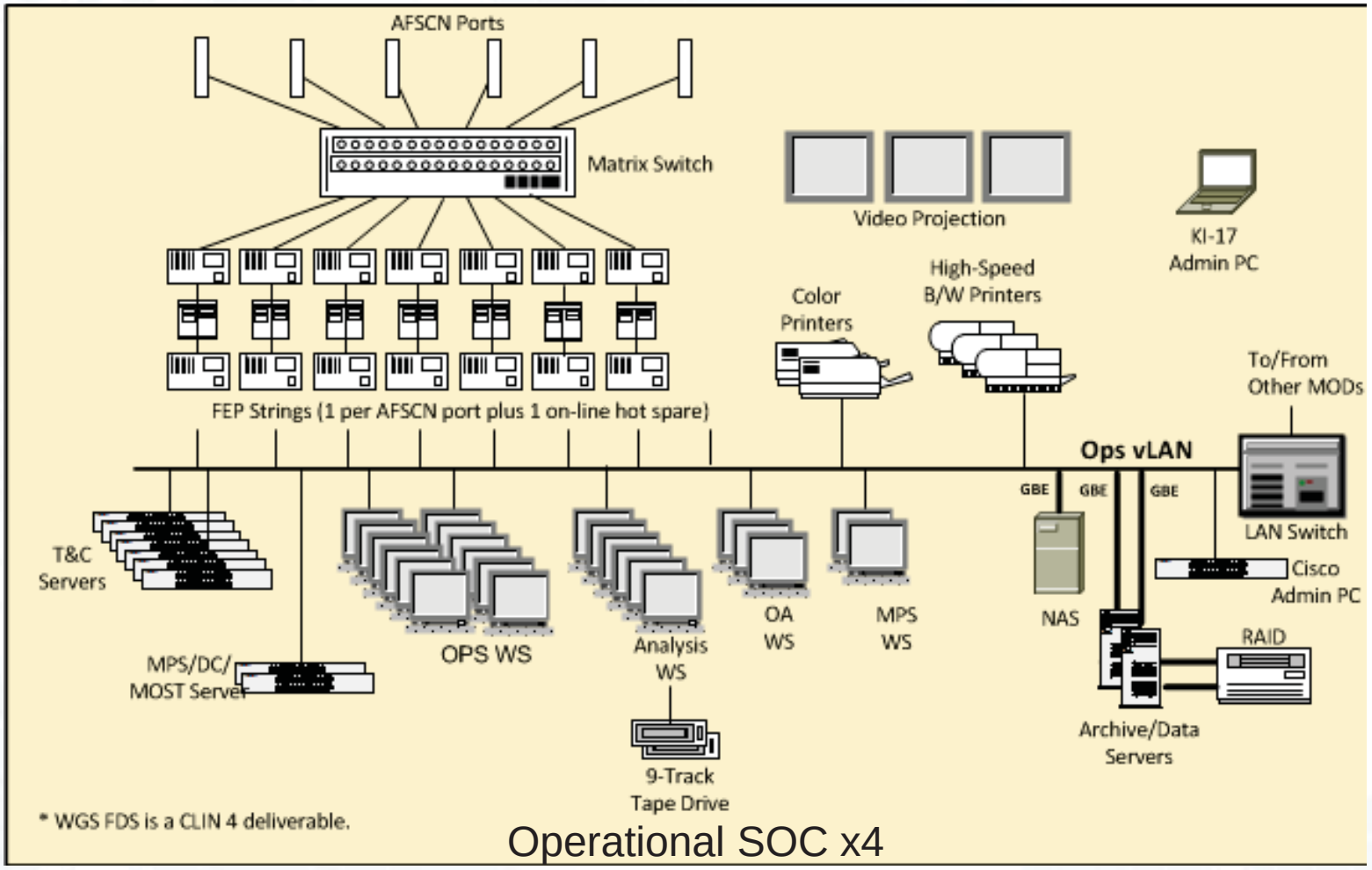

DSCS-III


Milstar

WGS




AEHF



Operational SOC x4

CACE Overview

- **C**CS-C **A**ssurance and **C**apacity **E**nhancement

- Comprehensive architecture upgrade to CCS-C
  - *Upgrade*, not a new acquisition
    - constrains scope
  - High-level Requirements
    - Improve cybersecurity
    - Ensure long-term capacity for WGS, DSCS, Milstar, AEHF
    - Reduce physical system footprint
    - Streamline system sustainment

Deliver Change Without Disruption

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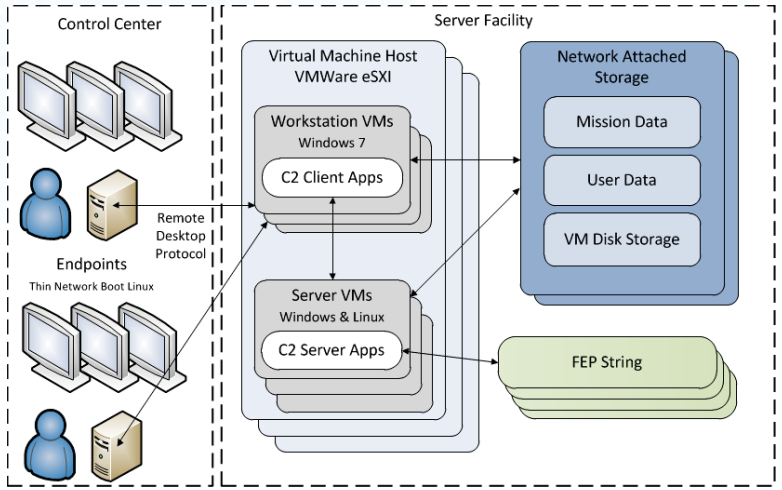
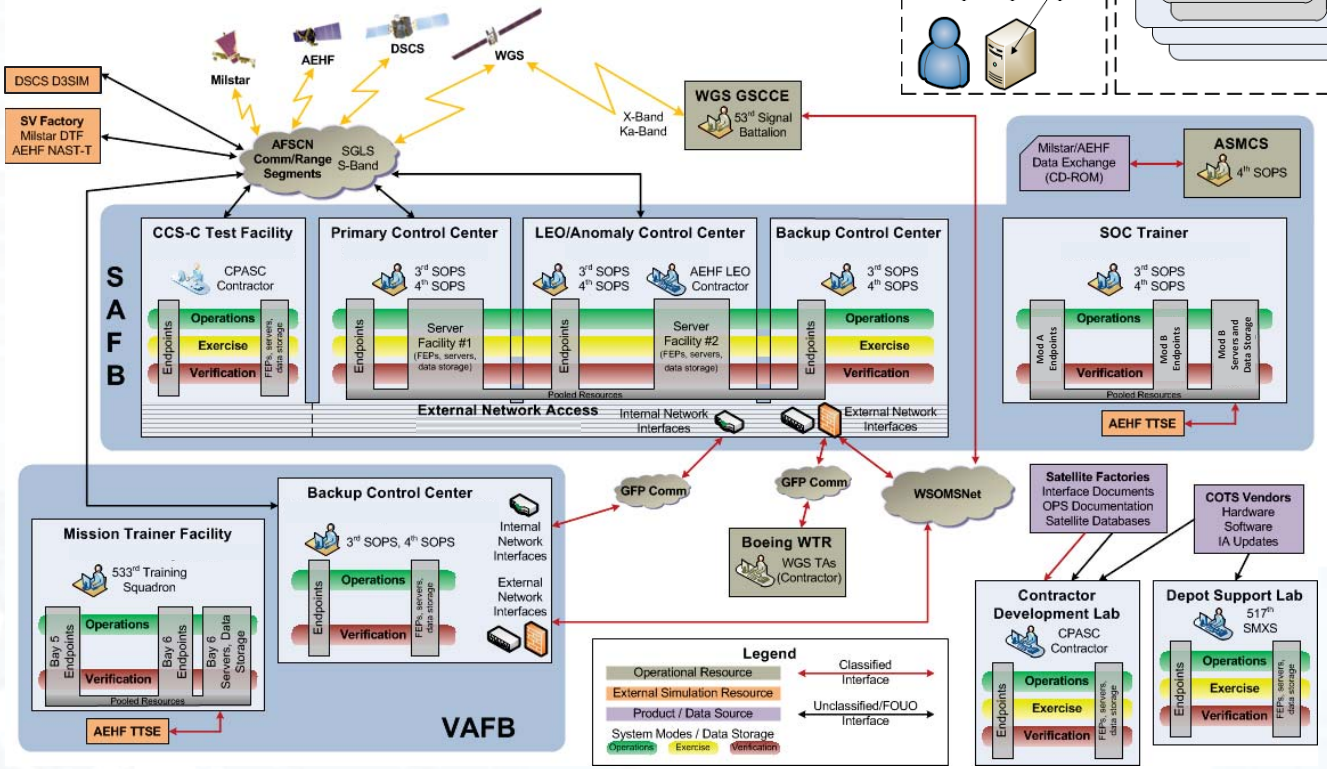
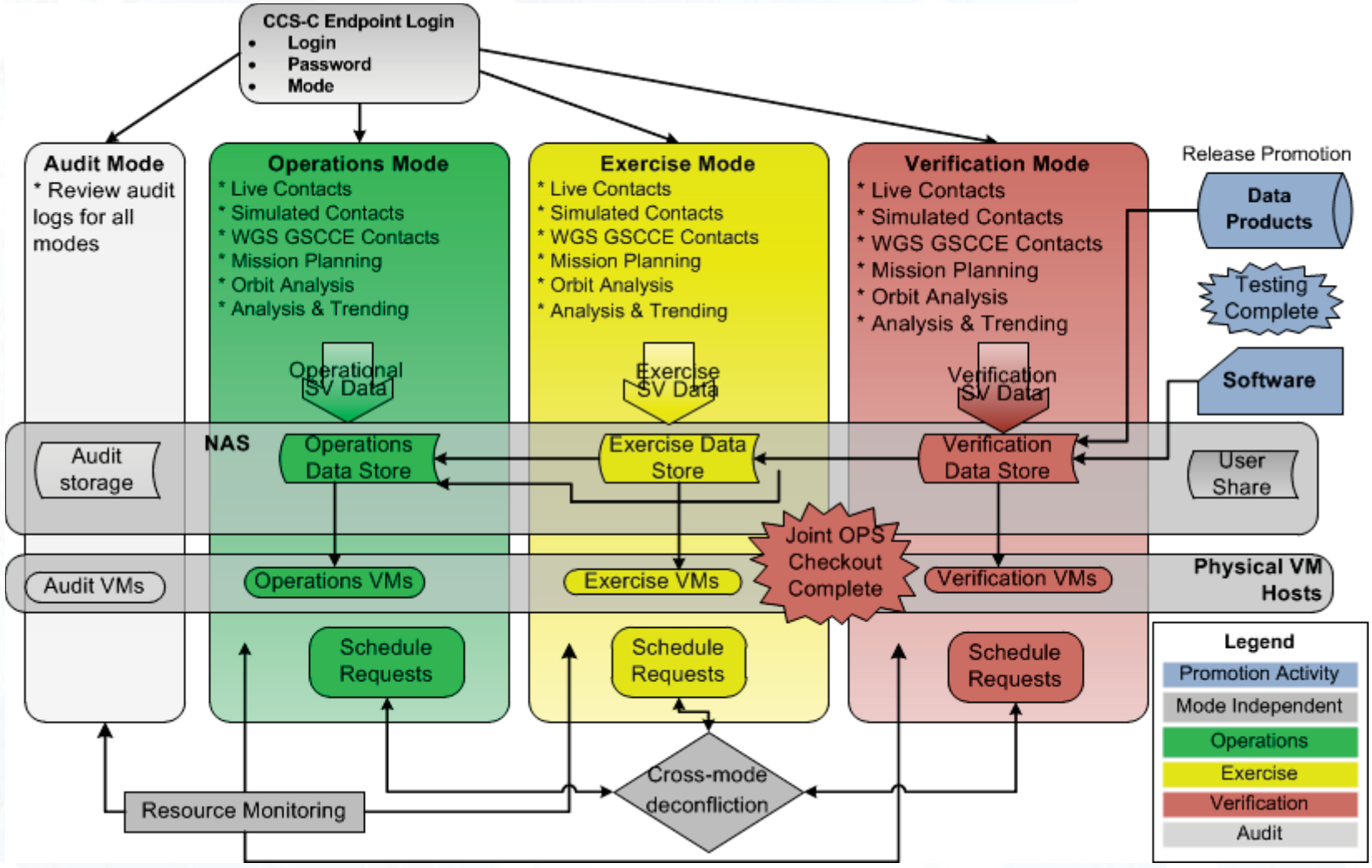
CACE Architecture

- Server & Client apps moved to VMs
- Thin network-boot endpoints
- Common services across system modes
- Preserves unique system interfaces
- Smaller sustained footprint



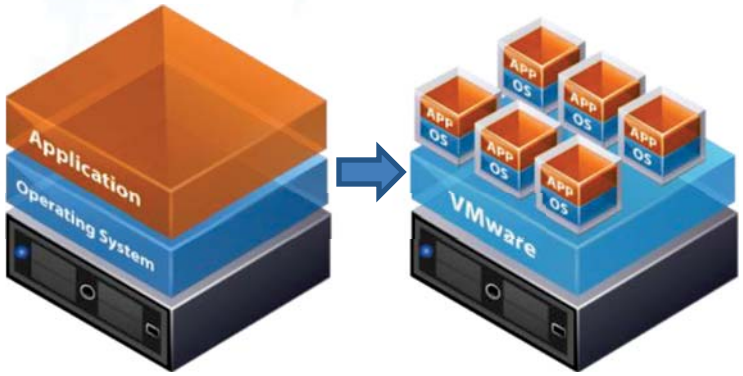


CACE Modes


CCS-C Endpoint Login
Login
Password
Mode
Audit Mode
* Review audit logs for all modes
Operations Mode
* Live Contacts
* Simulated Contacts
* WGS GSCCE Contacts
* Mission Planning
* Orbit Analysis
* Analysis & Trending
Exercise Mode
* Live Contacts
* Simulated Contacts
* WGS GSCCE Contacts
* Mission Planning
* Orbit Analysis
* Analysis & Trending
Verification Mode
* Live Contacts
* Simulated Contacts
* WGS GSCCE Contacts
* Mission Planning
* Orbit Analysis
* Analysis & Trending
Release Promotion
Data Products
Testing Complete
Software
Operational SV Data
Exercise SV Data
Verification SV Data
NAS
Audit storage
Operations Data Store
Exercise Data Store
Verification Data Store
User Share
Joint OPS Checkout Complete
Audit VMs
Operations VMs
Exercise VMs
Verification VMs
Physical VM Hosts
Schedule Requests
Schedule Requests
Schedule Requests
Cross-mode deconfliction
Resource Monitoring
Legend
Promotion Activity
Mode Independent
Operations
Exercise
Verification
Audit

CACE Features

- Enhanced scalability
  - Physical hardware no longer constrains operational capability
  - System easily expandable to support additional AEHF or WGS vehicles or other new families (IOE concept)
- Reduced operational downtime
  - Installs/upgrades take less than 30 min
  - Virtualization improves CM by easing System Administration



- Improved operator experience
  - WGS fleet-level status display eliminates operator confusion and allows for reductions in operations staffing
  - Consolidated workstation image eliminates differences in UI at user endpoints
  - Single operational domain eliminates multiple login and manual data transfers between workstations
  - More powerful components and technology improve system responsiveness and data availability
  - Fully supports ongoing squadron automation efforts

CACE Features (cont'd)

- Future capable
  - KS-252 will support future cryptographic algorithms
  - System positioned for additional future interfaces – SIPRNET, NIPRNET, AFSCN over TCP/IP
  - Enables and simplifies transition to future enterprise architecture
  - Aligns capability with trends in commercial satellite operations
- Improved system cybersecurity posture
  - HBSS, DMZ, OOB network management, and CDS addresses several longstanding security deficiencies with current architecture
  - Positions system to interface into future multi-security level enterprise ground service

DevOps

- CACE development utilizes tailored DevOps software development method
  - a portmanteau of “development” and “operations”
  - stresses communication, collaboration, integration, automation and measurement of cooperation between software developers and other information-technology (IT) professionals
- Recognizes the intersection of software development and IT operations to enable rapid fielding
- Continuous development and automated test
- Enables repeatable and controlled installation across multiple sites and modes

CACE Lessons Learned

- Major architecture evolution on operational system isn't easy
  - SE 101 – need stable requirements before design!
  - *When* that fails, need graceful in-process change management
  - Focused, independent upgrades in parallel can introduce change more quickly
- Power of DevOps model hindered by traditional sequential development process in Gov't programs
  - "Punctuated equilibrium" achieved within sequential DoD acquisition process
  - Wider benefits will require paradigm changes in gov't SW PM
- Always keep future system evolution in mind
  - Virtualization of system components enables evolution toward service bus architecture
  - Enables wider set of SATOPS paradigms for MILSATCOM
    - Secure remote operations
    - Full TT&C-as-a-Service (TaaS)

Affordable, achievable, relevant architecture enhancement

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Summary

- Original CCS-C system architecture was developed with the future in mind
  - Enterprise approach – no stovepipes
  - Common tools and services following successful commercial model
- CACE upgrade implements latest technology to bring MILSATCOM Enterprise C2 into 21st century
  - Virtualized server and client applications
  - Enhanced cybersecurity controls
  - Streamlined maintenance and sustainment
- CACE positions CCS-C for future architectural and operational paradigms
  - Enterprise Ground Services
  - Commercial TT&C-as-a-Service (TaaS)