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

DSCS-III  Milstar  WGS  AEHF

Operational SOC x4

* WGS FDS is a CLIN 4 deliverable.
**CACE Overview**

- **CCS-C Assurance and Capacity Enhancement**

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

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

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
• 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
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)