AFCEA
PEO C3T Technical Workshop

Common Operating Environment (COE)
Mission Command

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What is Common Operating Environment (COE)?

COE is an approved set of computing technologies and standards that enable secure and interoperable applications to be rapidly developed and executed across a variety of computing environments.

Value Proposition

• Achieve agility on how we deliver capabilities to the Warfighter faster (Vice Chief of Staff, 14 Apr 2011)
• Reduce the life cycle cost of development and sustainment of our IT systems (DoD Efficiency Initiatives, 16 Aug 2010)
• Promote an Open Architecture that is standards based which leverages industry’s best practices and products while reserving government purpose rights (Directive for Better Buying Power, 3 Nov 2010)
• Build on a foundation that is cyber hardened and secure (ARCyber Command)
• Achieve simplicity of the Network – ease of use, reduced number of systems, more agile CPs (NCR Key Tasks)

ASA(ALT) COE Organization:

• Mobile/Handheld CE - PEO Soldier
• Mounted CE - PEO C3T
• Command Post CE - PEO IEW&S & PEO C3T
• Data Center/Cloud/Generating Force CE - PEO EIS
• Sensor CE - PEO IEW&S
• Real Time /Safety Critical/Embedded CE - PEO Aviation

Gain efficiency by establishing common foundations which eliminate duplication and transition PORs to software only; focusing on developing widgets that support Wff
The Command Post (CP) Computing Environment (CP CE) unifies the CP by providing common views, shared data, shared maps, and common services (e.g. network management, collaboration, synchronization, planning analysis) across MC and Intel systems. CP CE will allow users to leverage these services from the web, replacing existing thick bulky systems with thin web clients.

Mounted Computing Environment provides a single computer and software environment to unify operations on ground platforms. The Mounted CE will add the Android-based Mobile/Hand Held CE to the platform to enable more seamless data synchronization and more rapid application development.

Mobile/Hand Held Computing Environment is Android based for both software and hardware, allowing ease of use and rapid application development. Today it hosts applications to provide PLI and limited C2. More applications will be added, including collapsing the older Fires handheld systems on to this single handheld.

Operational Goals:
- Improved interoperability between CE's
- Unified look and feel
- “Big data”-improved decision making through rapid MC/Intel data correlation and analytics
- Improved Training by Reducing Complexity
- Reduce Sustainment Burden

Acquisition Goals:
- Acquisition Agility
- Open Architecture
- Reduced Life Cycle Cost
- Cyber Hardened Foundation
### Capabilities Over Time - Development

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<td><strong>V2</strong> Unified Collaboration</td>
<td><strong>V3</strong> Std Sharable Geospatial</td>
<td><strong>V4</strong> Unified Data</td>
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<td>Initial Standard Geospatial</td>
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<td>- Common Virtual Server implementation</td>
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<td>- Disconnected Infrastructure services</td>
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<td>- Converged Server Hardware</td>
<td>- Initial Disconnected Workstation and Web-client</td>
<td>- Enhanced Performance</td>
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<td>- Rich Web Client</td>
<td>- Joint interoperability</td>
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<td>- Initial Std Sharable Geospatial</td>
<td>- Enhance Common Operating Picture</td>
<td>- Rapid Integration of new Data Formats</td>
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### Operational Benefits

- **COE v1- fielding FY15**
  - Increase the shared situation awareness of the commander and staff
  - Improve the ability of the command and staff to develop situational understanding
  - Allow commander's and staffs to collaborate from geographically dispersed locations
  - Reduces need to travel to CPs
  - Addresses high priority tasks for 5, 6, 7 and 9 which span all five gaps of the NEMC ICD
  - Initial Standard Sharable Geospatial
  - Sets conditions to address high priority task 7 of the NEMC ICD

- **COE v2- fielding 1QFY17**
  - Ensures that all organizations are operating from a common set of map data
  - Common geospatial standards and data products reduce the need for multiple formats of products and data sets
  - Addresses high priority task 7 of the NEMC ICD
  - Initial Unified Data Strategy
  - Sets conditions to Address elements of high priority tasks 18 and 19 of the NEMC ICD

- **COE v3- fielding 1QFY19**
  - Commander's, staff's, and systems utilize common data standards, vocabularies, ontologies and formats
  - Unified data allows the use of analytical capabilities that improve the situational understanding of commander's and staffs
  - Unified data reduces the need for multiple layers of mediation and transformation
  - Addresses components of high priority tasks 18 and 19 of the NEMC ICD

- **COE v4- fielding 3QFY19**
  - Traceability of the data back to the right person or originator to facilitate situational understanding and decision making
  - Assurance that the data presented to the commander and staff is valid and assured
  - Mission Command function on the move. [NIE Gap #1 and NeMC ICD Gap #2]
High Level Schedule

COE v1
- Development, Lab Testing
- Pre-I2E Integration
- AIC
- Baseline; Demo

COE v2
- Planning, Design, Architecture, Demo
- Completion of CE Level ICD, CDD and RDPs
- Pre-I2E Integration
- AIC

COE v3
- Decision Point: Architecture
- Risk Reduction
- Completion of CE Formal Assessment

AWA- Army War Fighters Assessment
NIE- Network Integration Evaluation
I2E- Integration & Interoperability Event
AIC- Army Interoperability Certification

COE & CP CE Schedules Aligned

AWA 16.1
NIE 16.2
AWA 17.1
NIE 17.2
AWA 18.1
NIE 18.2
AWA 19.1
NIE 19.2

Accelerate?

Risk Reduction CP CE Formal Assessment Baseline Baseline
There’s a tactical app for that

Mounted Android Computing Environment

Moving towards mission command anytime, anywhere, with any team and on any device.
MACE Goals

- A software architecture capable of providing the core infrastructure across multiple computing environments
- Supports x86, x86_64, AArch32, AArch64* hardware architectures
- Transition to model driven development using a 3rd party user extensible canonical model
- Abstraction of wire protocols from internal development model
- Write once, run anywhere app development for Android and Web apps
- Support legacy fielded hardware
- Reuse existing assets from other CE’s
- Automated Peer to Peer service detection on local networks
- DIL network capable synchronization service for arbitrary data sets

- More developers, reduced code, fewer barriers, faster acquisition

Challenges the current processes & acquisition paradigm
PM MC – Mission Command Modernization

Apps that run across all tactical environments (CP, Mounted and Mobile Dismount)
- OWF widgets and/or Android apps within CP
- Reuse OWF widgets as Android apps on Mounted/Mobile
- Same user experience

Converged tactical software & services at all echelons
- Provides Shared Data at the tactical level
- Common geospatial, common identity, etc
- Simpler for the maintainer – less services, more easily configured and managed

Hardware for CP/TOC, mounted and dismounted
- Tactical Server Infrastructure
- MFoCS – basic, intermediate and advanced
- Handheld – NW EUD, smartphones and tablets
- Also works on Current/Legacy hardware

Disconnected, Intermittent and Limited Networks
- WIN-T, BFT2, Tactical Radio, Iridium
- Bandwidth aware

**WfF Applications**
- Apps for anything
  - That operate on
  - That reside on
  - That communicates over tactical networks

**Common Core Software/Services**
- That operate on
- That reside on
- That communicates over tactical networks

**Converged Common hardware**
- That communicate over tactical networks

**Movement & Maneuver**
- Fires
- Intel
- Sustainment
- C2
- Protection
  - Platform Weapon & Sensor Systems
  - On Board Vehicle Sensors
  - Tactical Radio & Network Management

Scales across hardware environments, network environments and echelons
Take Aways

Simple

- Simpler for the warfighter – Capabilities using the same software, across different echelons, hardware and network environments – same User experience
- Enabled by:
  - PM Leadership of a system of systems approach
  - Simple tools for the developers of new capabilities

Affordable

- Works on deployed hardware, and leverage MFoCS computers for hardware convergence
- Leverage investment in proven solutions
- Converge on common services within and across CEs
- Large pool of government and industry reduces cost and fosters innovation

Scalable and Open

- Mounted Android Computing Environment (MACE)
- Team with other government and industry
- Use common accepted standards (eg, VICTORY) and open source
- Modular, vendor neutral architecture enables opportunities for the next best thing
Ecosystem enabled by PM Mission Command for Development Environment & Lifecycle Management

- Multi-site, multi-vendor, integrated and collaborative development environment
- Full lifecycle support: including requirements analysis, project planning, software development, configuration management, automated code integration and test, defect tracking, patch management, user support (wiki)
- Secured, supported and free
Mounted Family of Computer Systems

Common Computing solution which consolidates requirements for:
- G-3/5/7 Directed Requirement
- PM Joint Battle Command-Platform (JBC-P)
- PM Warfighter Information Network – Tactical (WIN-T)
- PM Stryker
- PM Armored Brigade Combat Team (ABCT)
- Forward Observer System (FOS)
- United States Marine Corps (USMC)
- Other mounted platform computer requirements

Hardware that improves MACE in the Tactical Environment
- Support WarFighting Functions - Movement and Maneuver, Fires, Intel, Sustainment, C2, Protection
- Platform Weapon and Sensor Systems
- On Board Vehicle Sensors
- Tactical Radio and Network Management

MFoCS can Replace FBCB2, TIGR, FOS, OWF

On Board Video Distribution

Router

Switch

Multiple GPS

CAN Bus

Fuel

Ammo

Vehicle LAN/VICTORY Data Bus

CBRN Sensor

Weapon

UAV

Sensor Network

BFT2

JTRS

VRC 155

EXTREME WORKSHOP
Mounted Android Computing Environment (MACE)

- Leverages proven services of existing BCPL codebase
- Provides Android environment for easy development of new capabilities
- Access to common data for all apps
- 3D map engine
- Supports other apps as VM (but should minimize VMs)
- Supports web services (with appropriate network)

MACE Services – extend to MHHCE and CPCE

- Common services - identity, geospatial, messaging, collaboration, etc
- Common infrastructure - parsers, comms services, IA, etc
- Multi-node MACE data services (incl auto discovery)
- MACE data service sync across WIN-T
- Includes VICTORY support

Android Apps

- Support WarFighting Functions - Movement and Maneuver, Fires, Intel, Sustainment, C2, Protection
- Platform Weapon and Sensor Systems
- On Board Vehicle Sensors
- Tactical Radio and Network Management
- Android, HTML 5 and OWF enable cross hw and network apps

Note that MACE works well on the existing JV-5 (>120,000 deployed)
JBC-P provides common platform MC capabilities and services – PLUS:

- **MCOTM/Enhanced MC**
  - 3D Map – same as CP Map/COP
  - Select MC widgets/web apps
  - Collaboration – Whiteboarding and Chat Apps
  - Fires App – based on MHFA
  - Office/Sharepoint Apps
  - Utility Apps eg, Image Management
  - UAV Data Feed and Task Apps

- **MC Support Apps**
  - ODIN for dynamic NetJoin
  - Map Packaging for other mounted/mobile

- **Platform Support Apps**
  - Radio Control
  - Platform Status

- **Platform/VICTORY services**
  - Shared GPS
  - E-Router & E-Switch

* Widgets converted to Android webapps that use local MACE maps and go to server for data

Planned for Commanders’ Vehicles but not ready for NIE 16.1
PM Mission Command Responsibilities to enable Apps

- **MCE Integration & Sustainment**
  - Lead system integration
  - AIC accreditation
  - Legacy training & sustainment

- **MCE Testing and Verification & Validation**
  - Test and V&V reform (improved C&A strategy)
  - Test tools and harnesses for 3rd party accreditation

- **MCE Developer Support**
  - Developer portal, help desk & Wiki pages
  - Requirements engineering & SE support

- **Process Implementation, Infrastructure Development**
  - JBC-P PDK & standards definition
  - Distributed configuration management & development environment
  - Portfolio Management Dashboard

- **Governance & 3rd Party Processes Defined**
  - Playbook – How 3rd Parties operate within the Mounted CEWG
  - Execution plan – How MCE aligns with COE Implementation Plan