

Singapore/U.S. Vehicle Electronics &
Architecture Workshop Meeting

PM HBCT VHMS Program

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16 August 2011



Report Documentation Page				Form Approved OMB No. 0704-0188	
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1. REPORT DATE 12 AUG 2011		2. REPORT TYPE Briefing Charts		3. DATES COVERED 12-08-2011 to 12-08-2011	
4. TITLE AND SUBTITLE Vehicle Health Management System Definition				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Larry Marino				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Army TACOM ,PM HBCT,6501 E.11 Mile Rd,Warren,MI,48397-5000				8. PERFORMING ORGANIZATION REPORT NUMBER TACOM	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army TACOM, PM HBCT, 6501 E.11 Mile Rd, Warren, MI, 48397-5000				10. SPONSOR/MONITOR'S ACRONYM(S) TACOM	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S) #22217	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES briefed to SINGAPORE/US VEHICLE ELECTRONICS AND ARCHITECTURE WORKSHOP AT TACOM, 16 AUGUST 11					
14. ABSTRACT n/a					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 20	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			



Agenda



Objective: Provide an overview of PM HBCT 's VHMS Program (Informational Brief):

- ☐ Vehicle Health Management System Definition
- ☐ User Requirements and System Engineering Artifacts
- ☐ VHMS System Software and Hardware Components
 - ☐ VHMS Key Products
- ☐ Condition Based Maintenance & Command Guidance
- ☐ Off-Platform Reporting to the GCSS-Army Enterprise
 - ☐ Tactical Logistics Systems
- ☐ Question/Answer Session



VHMS Definition

□ On-platform:

- Improved embedded diagnostics (self reporting platform)
- Data collection and storage (faults, supply, configuration management, etc.)
- User interface for:
 - Interactive PMCS & troubleshooting (IETMs)
 - System state, configuration & supply status management
 - Off-platform reporting & requisitioning

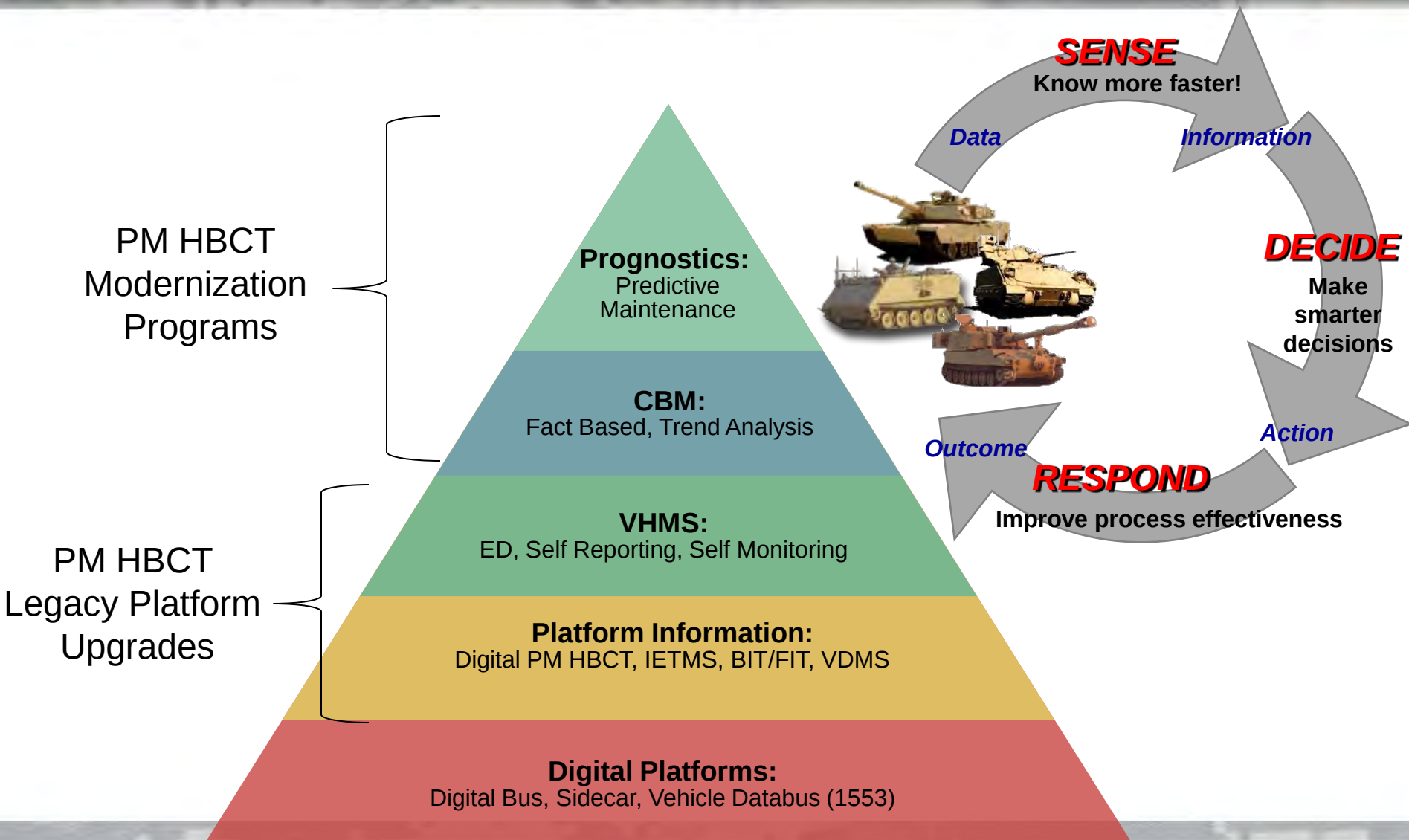
□ VHMS links to Army Logistics Enterprise networks for (Future Capability):

- Logistics reporting
- Supply requisitioning
- Fleet data storage & analysis
- CBM:
 - Predictive (use-based) maintenance
 - Development & refinement of prognostic (condition-based) maintenance algorithms





VHMS: Building the Future Incremental Capability Development



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VHMS Operational Requirement Traceability



Start with User Requirements from the Warfighter

Operational requirements with trace to approved ORDs

Current diagnostic performance

Record diagnostic events and data in non-volatile memory

Report equipment health to operator

Track on-hand fuel/ammunition and report to C2

Report deadlining faults to C2

Manage software and hardware configuration

Incorporate class III ETMs

Provide automated troubleshooting with ETMs

Provide wired interface for SoS sharing

28 VHMS operational requirements

Operational requirements that need approval of draft ORD/CDD requirements

Enhanced diagnostic performance

Provide prognostic capability

Track equipment capability and report to C2

Incorporate class V IETMs

Provide PMA

Provide automated PMCS

Track equipment usage

Display vehicle history

Provide wireless interface for SoS sharing

Provide fault resolution and maintenance action tracking

33 VHMS operational requirements

Hard or Desired Requirement

Increment 1 Capabilities

Increment 2 Capabilities

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Common System Engineering Document Tree



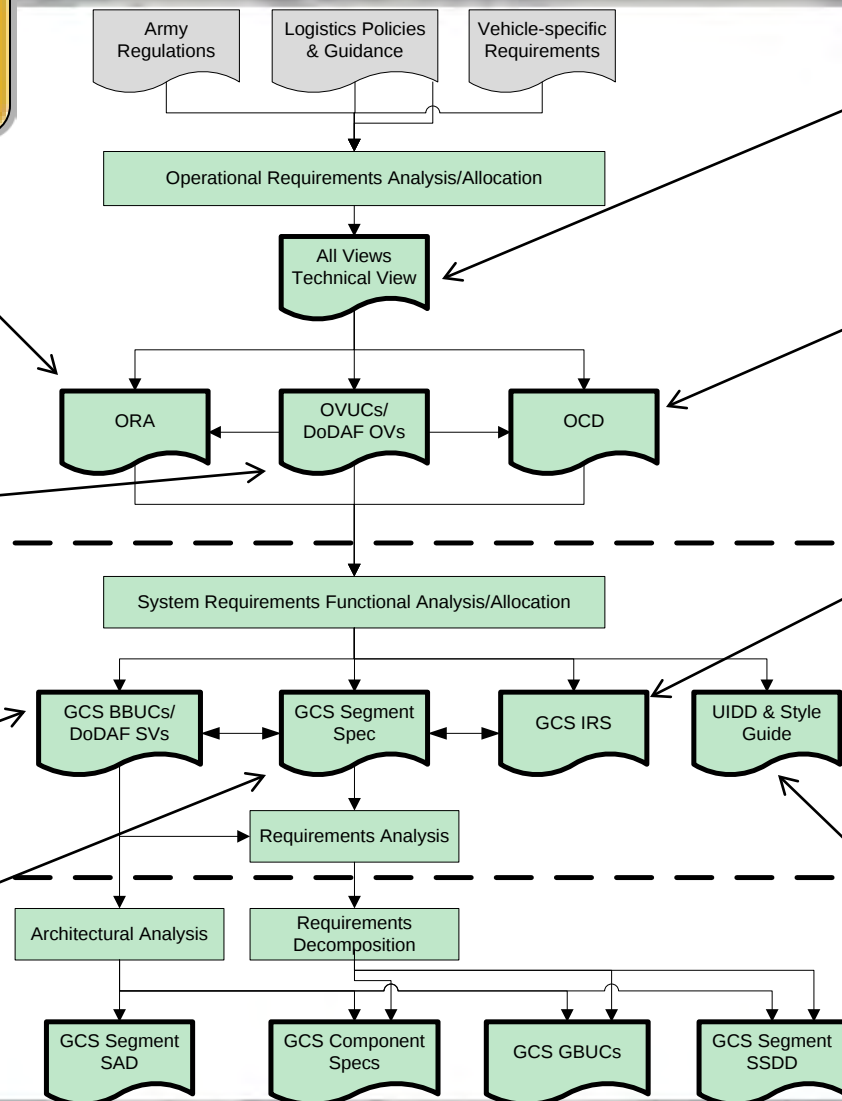
Derive Requirements to Performance Specifications

Operational Requirements Analysis provides top-level VHMS requirements & traceability to sources.

Operational Views & OV Use Cases describe VHMS capabilities through user scenarios.

System Views & Black Box Use Cases decompose VHMS capabilities into system functions and define interfaces.

GCS Requirements needed to implement VHMS.



VHMS scope, purpose, definitions and technical standards.

Operational concept describing the “as is” and “to be” VHMS concept.

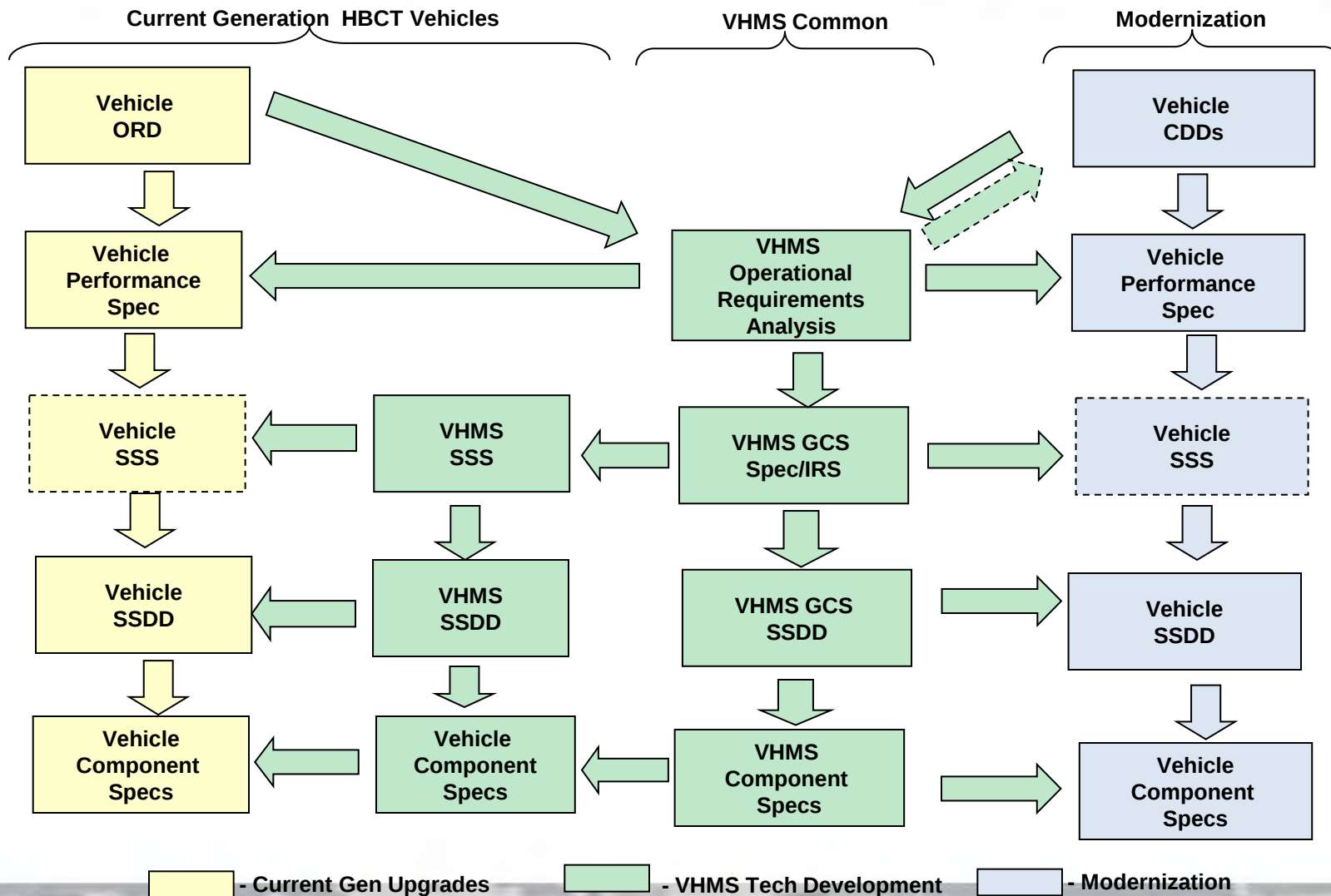
Interface requirements between on components on platform and requirements to communicate off-platform. (i.e.. GCSS-Army)

Common user interface design for each VHMS screen. Style guide to facilitate tailoring an individual screen.



VHMS Requirements Flow-Down

Requirements Across Platforms and Future Capability Increments



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Vehicle Health Management System (VHMS)

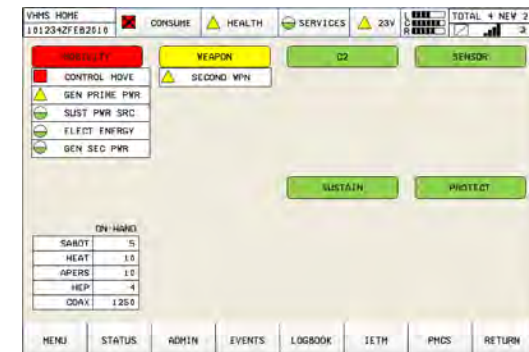


- Development of overarching system requirements and architecture for a PM HBCT VHMS implementation
- Enhance and Integrate Diagnostics on platform
- Coordinate off-platform interfaces with Enterprise-level logistics systems (GCSS-A, CBM Data Warehouse)

BAE SYSTEMS



GENERAL DYNAMICS
Land Systems



- Centralized Health Management Application
- Common GUI that reduces training footprint for HBCT maintainers

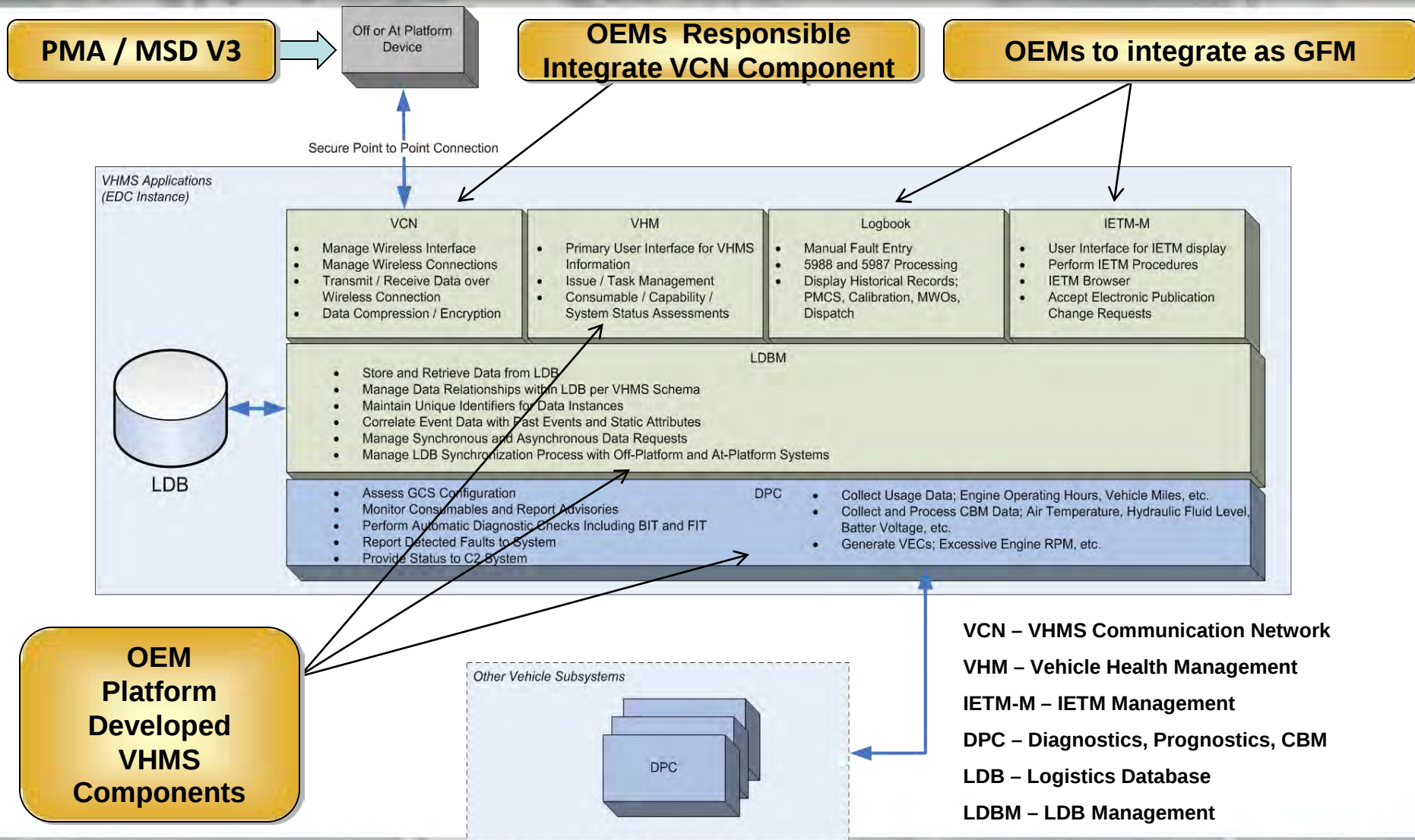
- Enhance Embedded Diagnostics
- Enable platform data storage and transfer
- Develop & integrate IETMs
- Integrate Ground Digital Log Book (GDLB)
- Plan for future upgrades (LRMs, SRU-level Fault Isolation)

Commonality where feasible with Industry Partners

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GCS Software Architecture



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Hardware Approaches

	PMA	EDC	Ethernet Switch	Wireless NIC
Abrams	 Portable Multi-Functional Display*	 Recording & Simulation Unit (RSU)	 E-Switch	 Common WNIC
Bradley & PIM		 SMART Display*	 E-Switch	 Common WNIC
Maintainer	 MSD V3	MSD V3 to be used for At-Platform Functions & Off-Platform Data Transfer		

* Current display HW are surrogates until common display IPT does official RFI/RFP

VHMS Key Products



Matériel Solutions

- ❑ Ground Digital Logbook
- ❑ IETMs
- ❑ VHMS Comms Network (VCN)
- ❑ E-switch
- ❑ Wireless Network Card



EMS-NG(IETM)



Ground Digital LB



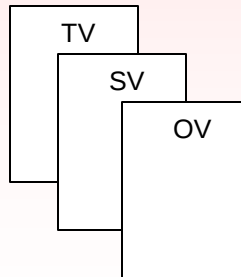
Wireless NIC



E-switch



Specifications



DoDAF Architecture Artifacts

Systems Engineering Work Products

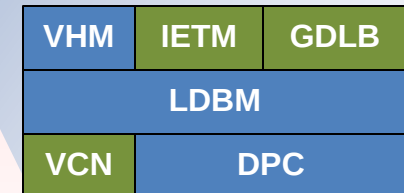
- ❑ GCS Specification
- ❑ Interface Requirements
- ❑ User Interface Descriptions
- ❑ DoDAF Architecture Artifacts



Common Screens

Platform Software

- ❑ Vehicle Health Management
- ❑ Enhanced Diagnostics
- ❑ Logistics Database Management
- ❑ Integrating GFM



GFM

OEM



Baseline Benefits of Vehicle Health Management



□ PM HBCT capabilities based initiative

- Mission Readiness Assessment
- Improved diagnostics and provides data storage & transfer capability
- Provides a systems engineering approach to obsolescence

□ Reduce Logistics Footprint and increase reliability

- STE / BRADS / ATE Reduction/Elimination (cost avoidance)
- Reduces Troubleshooting burdens (IETMS, GDLB)
- Self diagnosing, self reporting and verification on board (real time)
- Automates maintenance processes (PMCS)
- Common User Interface (Screens)
- Leverages existing platform diagnostics and vehicle networks

***Improved diagnostics, reduced maintenance time, increased reliability,
reduced NEOF's = improved OR rates and improved
combat power for soldiers and reduced costs***



Summary of Benefits Achievable with VHMS & CBM+

- Reduce or eliminate reliance on DSESTS in Field (cost avoidance)
- Reduce NEOF rates in Field & Sustainment (cost avoidance, inventory reduction)
- Platforms become self-diagnosing & self-reporting (workload reduction, accuracy increase)
- Automate maintenance (workload reduction & increase accuracy)
- Common maintenance display (reduced training assets, cross-functional field diagnosis)
- Increase Ao
- Reduce MDT (shorter diagnostic time, reduced maintenance workload, reduced part order errors)
- Automate PMCS (workload reduction & increase accuracy)
- Reduce time to process repair parts requisitions
- Increase asset visibility, situational understanding of combat power, consumables & crew situation
- Contribution to net-centric warfare & logistics capabilities
- Increase early warning of possible failures through CBM condition advisories (increase MTBSA, reduce potential collateral damage)

P3I

VHMS Program is being implemented with incremental capabilities on Current Legacy and future Modernization Programs (P3I)

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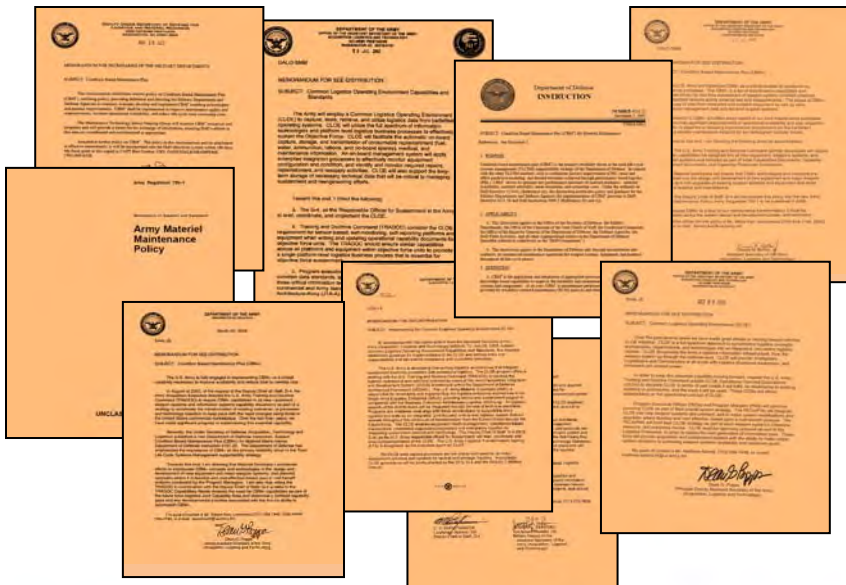


Command Guidance for CBM

- ❑ DUSD(L&MR) memorandum, 25 Nov 2002
- ❑ ASA(ALT) memorandum, 25 Jul 2003
- ❑ MILDEP & G-4 memorandum, 05 May 2005
- ❑ ASA(ALT) memorandum, 17 August 2005
- ❑ AR 750-1, 20 Sep 2007
- ❑ DOD Instruction 4151.22, 2 Dec 2007
- ❑ ASA(ALT) memorandum, March 20 2008
- ❑ CLOE/CBM+ Policy Memorandum, 09 Feb 2009

❑ Bottom line:

- PMs must implement CBM+ and integrate CLOE standards into both new and existing systems when deemed feasible and cost effective.
- Requires cost-benefit analysis for existing systems.



**Next Capability
Increment for
Modernization
Programs**



Condition Based Maintenance (CBM)



- A set of proactive maintenance processes and capabilities that improve **operational availability** and reduce the soldier's **maintenance burden** by performing maintenance based upon evidence of need in lieu of scheduled based or run-to-failure maintenance processes .
- Accomplished through:
 - Digitized platform (embedded sensors and vehicle network)
 - Enhanced diagnostics
 - Evolving systems to predict remaining useful life of components
 - Then to automate supply transactions
- Derived from near real-time assessment and analysis of data from:
 - Embedded Sensors
 - Platform Maintenance Environments
 - Platform Supply & Maintenance Data (historical)

Proactive. Evidence of Need. Condition Based Overhauls & Inspections

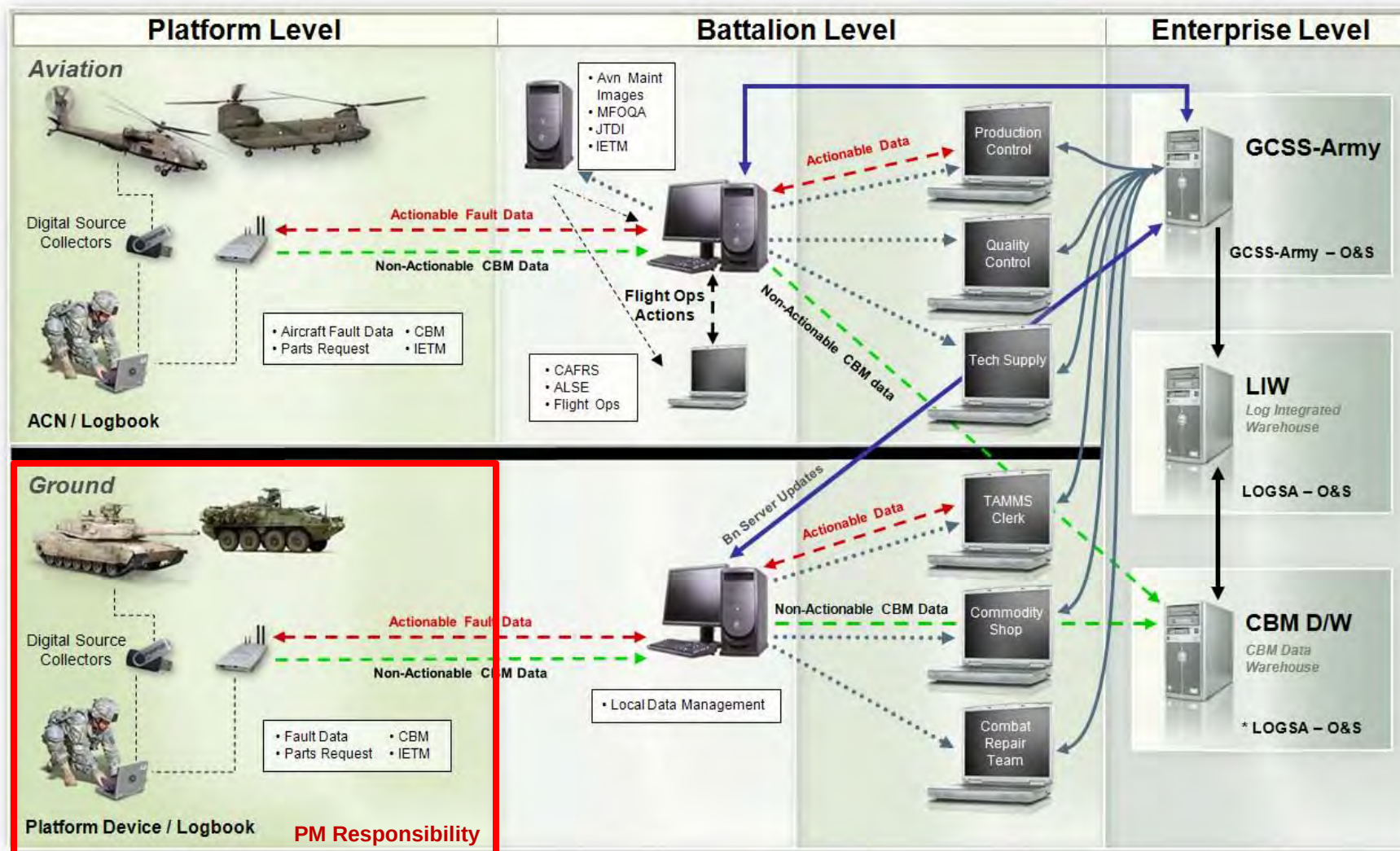


Ground Platform VHMS





Visualizing the Enterprise





Benefits of GCSS-Army/CLOE

Provides **ACCURATE VISIBILITY OF PARTS** in the Supply Chain

Today's Tactical Logistics Systems:

SARSS-1

SARSS-GW

SARSS-2AC/B

PBUSE

SAAS-MOD

ULLS-A(E)

SAMS-E

GCSS-Army
IOC in FY12
FOC in FY15

Provides Accurate **EQUIPMENT READINESS** Data

ASSET VISIBILITY



Captures Total Weapons System **COSTS**

TOTAL WEAPONS SYSTEM COSTS



Performs Tactical Logistics **FINANCIAL FUNCTIONS**

The Tactical Army's Logistics ERP

SUPPLY

FINANCE



AMMO

AMMO VISIBILITY AND ACCOUNTABILITY



OPERATIONAL AND EQUIPMENT READINESS



Equipment Master

Enables Accurate **PROPERTY ACCOUNTABILITY**

PROPERTY BOOK



Provides a **CENTRALIZED AMMUNITION MANAGEMENT System**

Providing Soldiers a Single System to accomplish a wide range of Logistics Missions
HBCT is Leveraging "Big Army" Initiatives



PM HBCT VHMS Program Summary



- ❑ The VHMS program has developed and delivered system engineering documentation and a set of common materiel solutions.
- ❑ VHMS team is now developing platform specific materiel solutions to implement a VHMS system to connect to End to End Logistics Systems and Data Warehouses (logistics, engineering and CBM data).
- ❑ VHMS will connect to the Global Combat Support System Army (GCSS-A) – which is the Army's future Enterprise Resource Planning (ERP) system.



PM HBCT VHMS Program



Question/Answer Session