Joint Autonomic Sustainment

Accelerating CBM+ and CPI across the Joint Operations Battlespace to the DOD / OEM Industrial Base

DOD Maintenance Symposium
Great Ideas

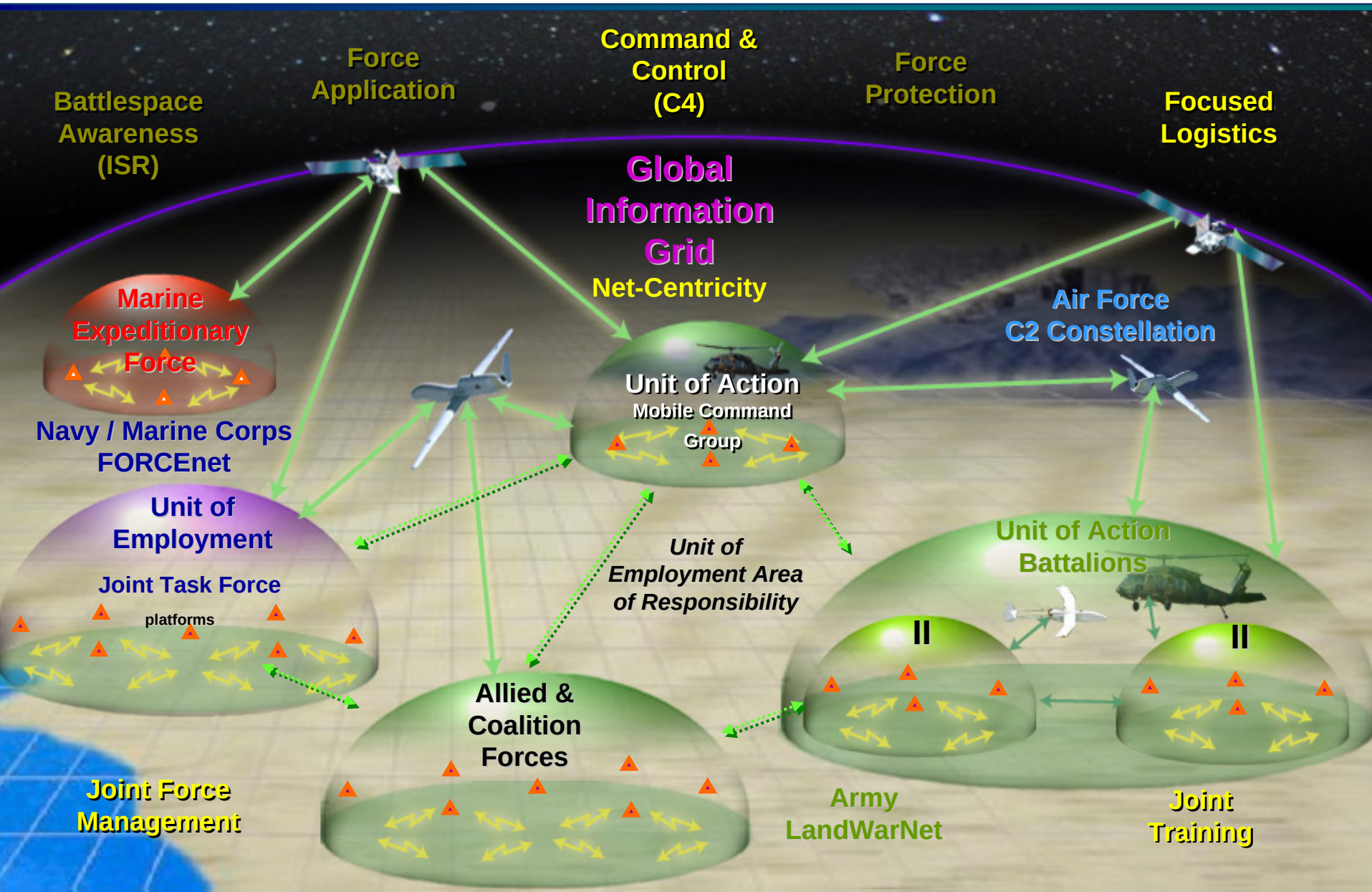
October 23, 2006

BearingPoint PTC Rolls-Royce Blue Water Solutions, Inc

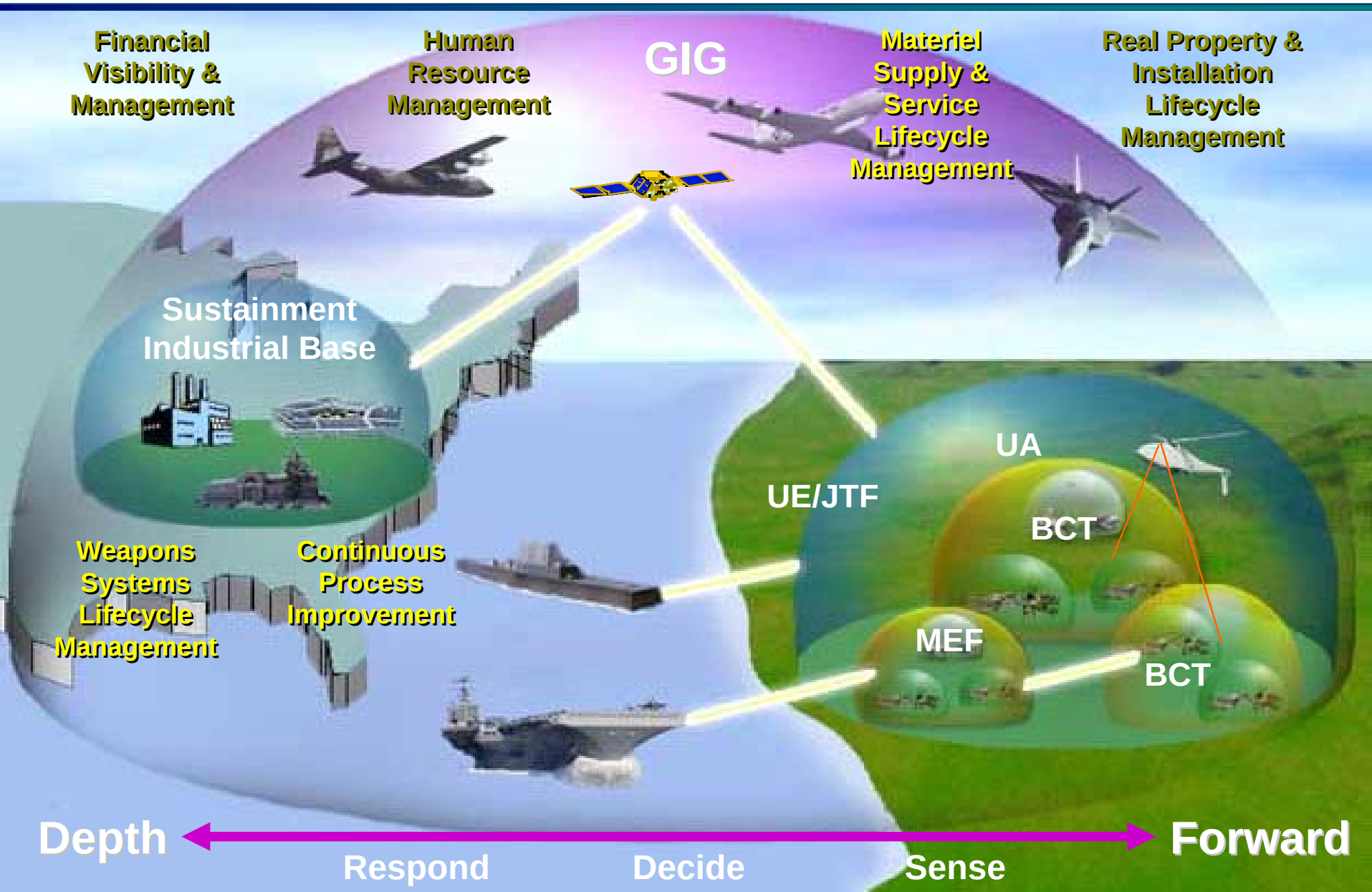
Agenda

- The Vision – Focused Logistics / Sense & Respond Logistics
- The Capability Gap – Condition Based Maintenance
- The Solution – Joint Autonomic Sustainment Capability
- The Value – Warfighter, Business & Taxpayer Value
- The Great Idea – Joint Autonomic Sustainment System (JASS)

The Warfighting Mission Area (WMA) capabilities vision.



The Business Mission Area (BMA) capabilities vision.

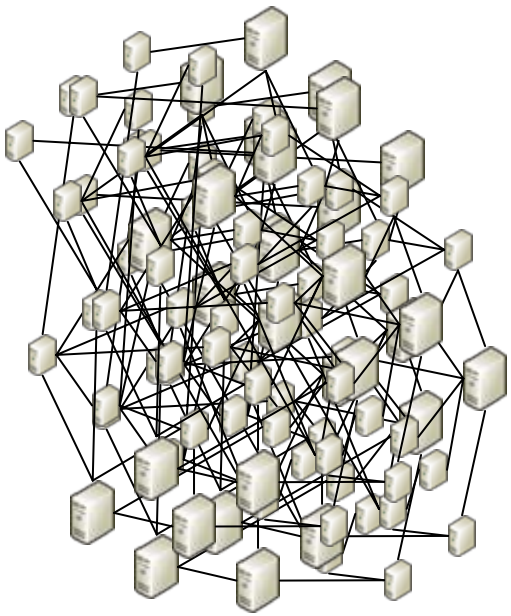


The DOD Information Technology Modernization and Recapitalization vision.

Current Configuration

Islands of Automation

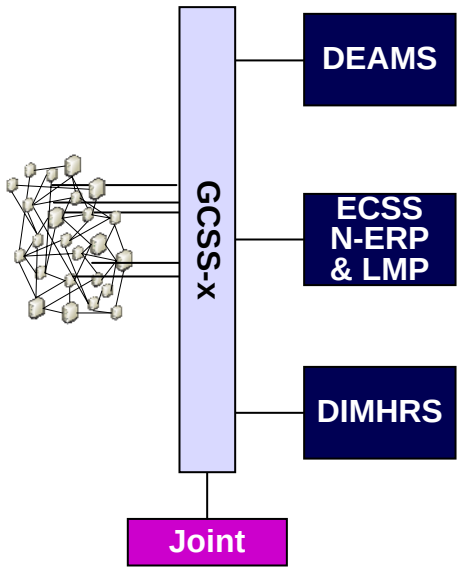
~19,000 apps, ~1,700 systems



2012 Target Configuration

Legacy and Service Group Mix

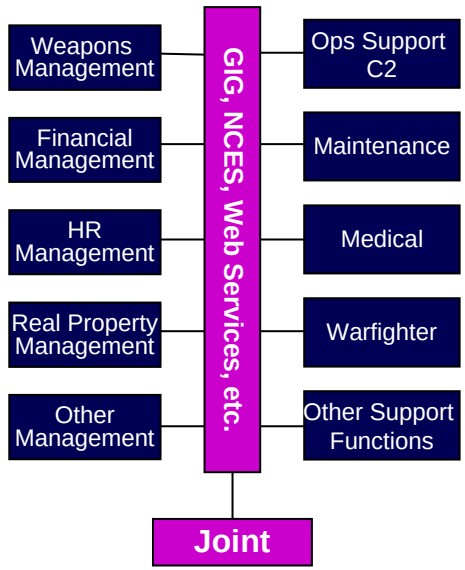
~10,000 apps, ~700 systems



20XX Objective Configuration

Interoperable Service Groups

~10,000 apps, ~700 systems



End Proprietary Approaches

Limited interoperability…*Stove-piped functional solutions*

High custom development costs…*Stand-alone services*

Field Open, Scaleable Solutions

Greater interoperability…*Common data standards*

Reduce costs…*Share & reuse…build once use many*

Exploit COTS solutions first…then modify or build only as needed to save $8B+

Source: *LTG Michael W. Peterson, SAF/XC & USAF CIO – Enterprise Transition Plan – 11 June, 2006*

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What are the differences in capability enablers (process and technological)?

PLM

CAD,
CAM,
CAE,
PDM

PDM systems are "component" centric and use "transaction" based workflows

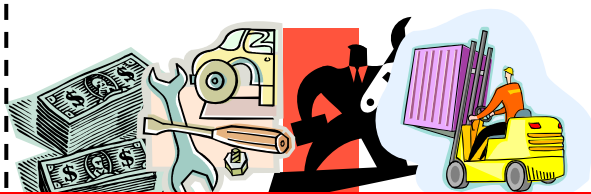
The Authoritative Source of Logical (As-Designed) Configuration (CM_{LS} & CM_{LF}) is a Blueprint.

ERP

HR,
SCM,
MRPII,
FI/CO,
ABC

ERP systems are "order" centric and use "transaction" based workflows

The Authoritative Source of Resources: people, skills, qualifications, materiel, locations, tools, and money.



SLM

Off-Board
RCM,
RBS,
CMMS

Near-Board
CBM,
IETM,
ATE, IUID

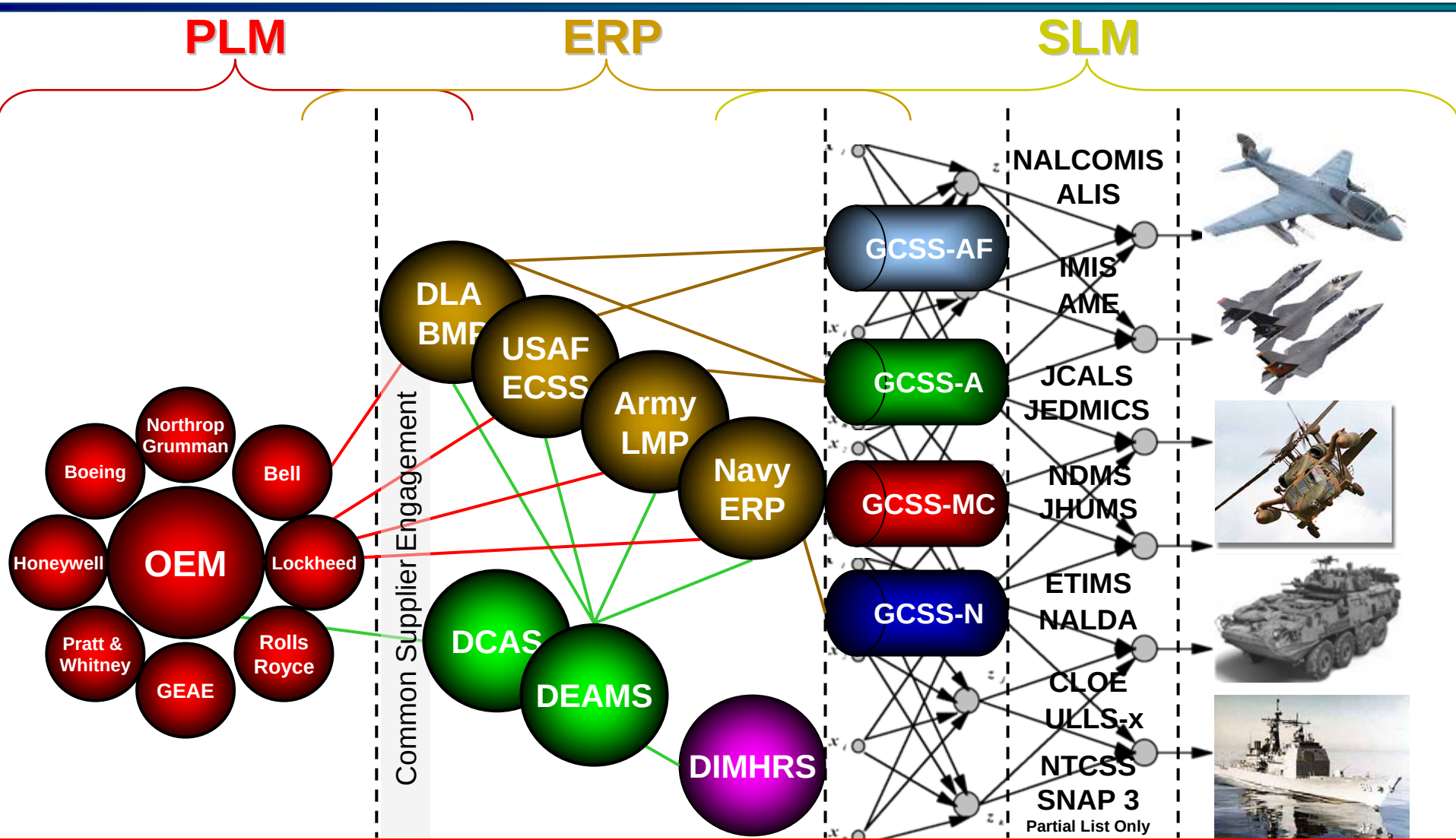
On-Board
EFB,
MFOQA,
PHM

SLM systems are "component" centric and use "role based" workflows

The Authoritative Source of Physical (As-Operated) Configuration (CM_{PS} & CM_{PF}) is the Aircraft.

ERPs do not have the full maturity (range and depth) of PLM or SLM capabilities.

What is the current “As Planned” state according to BTA ETP Appendix J dtd March 2006?



COCOMs in the battlespace are facing four GCSSs and a multitude of CBM tools.

What is the Joint Capability Gap of Focused Logistics & Sense & Respond Logistics?

DOD does not have
a joint
industry standards based
Net-Centric Operating Environment architecture compliant
end-to-end capability in place
to gather, track, transform and disseminate
on, near board and off-board asset service management and condition data
into accurate decision knowledge which supports
the warfighters' real time
sustainment, readiness and process improvement needs
at the point of operations and maintenance
and systems engineering commands'
reliability centered engineering,
product lifecycle management and
continuous process improvement analysis needs
within programs and across asset classes.

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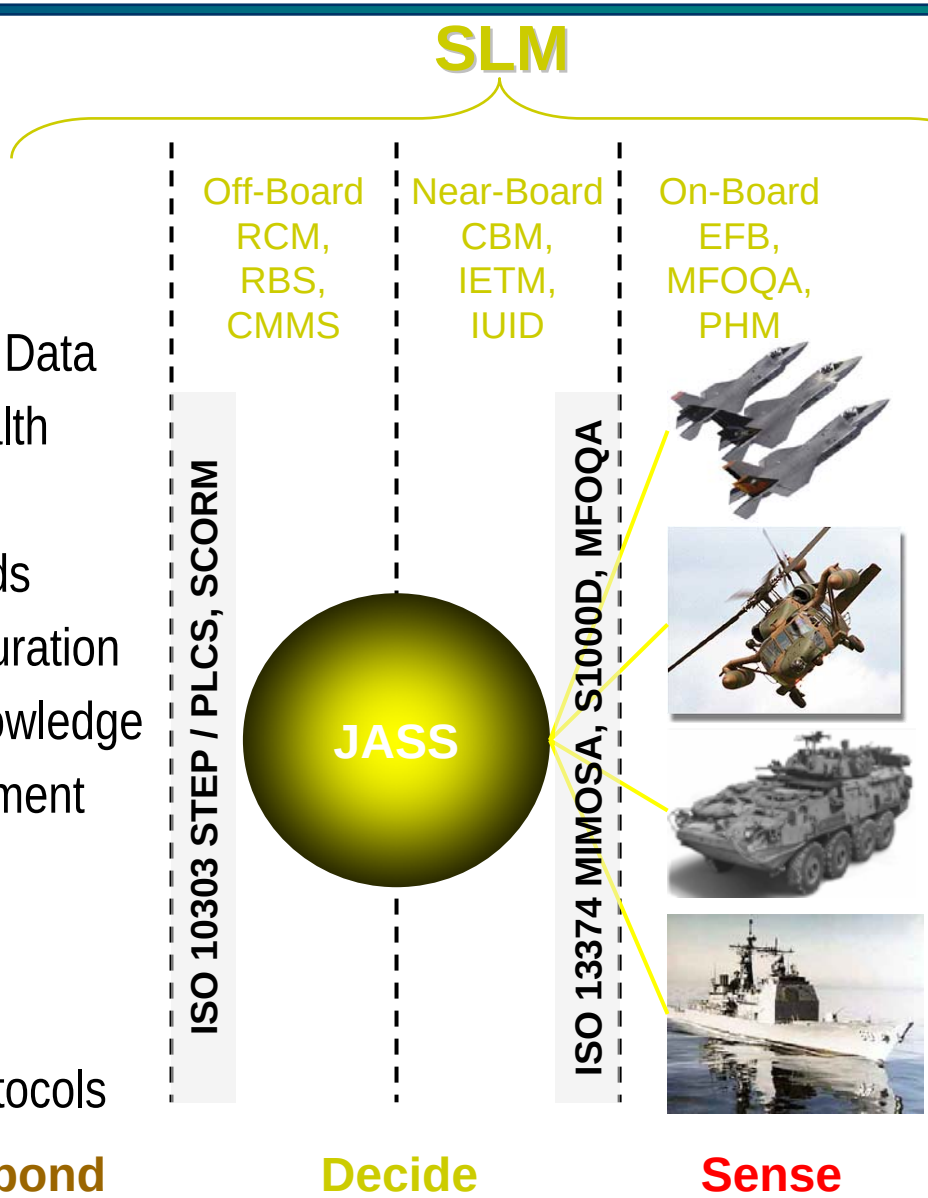
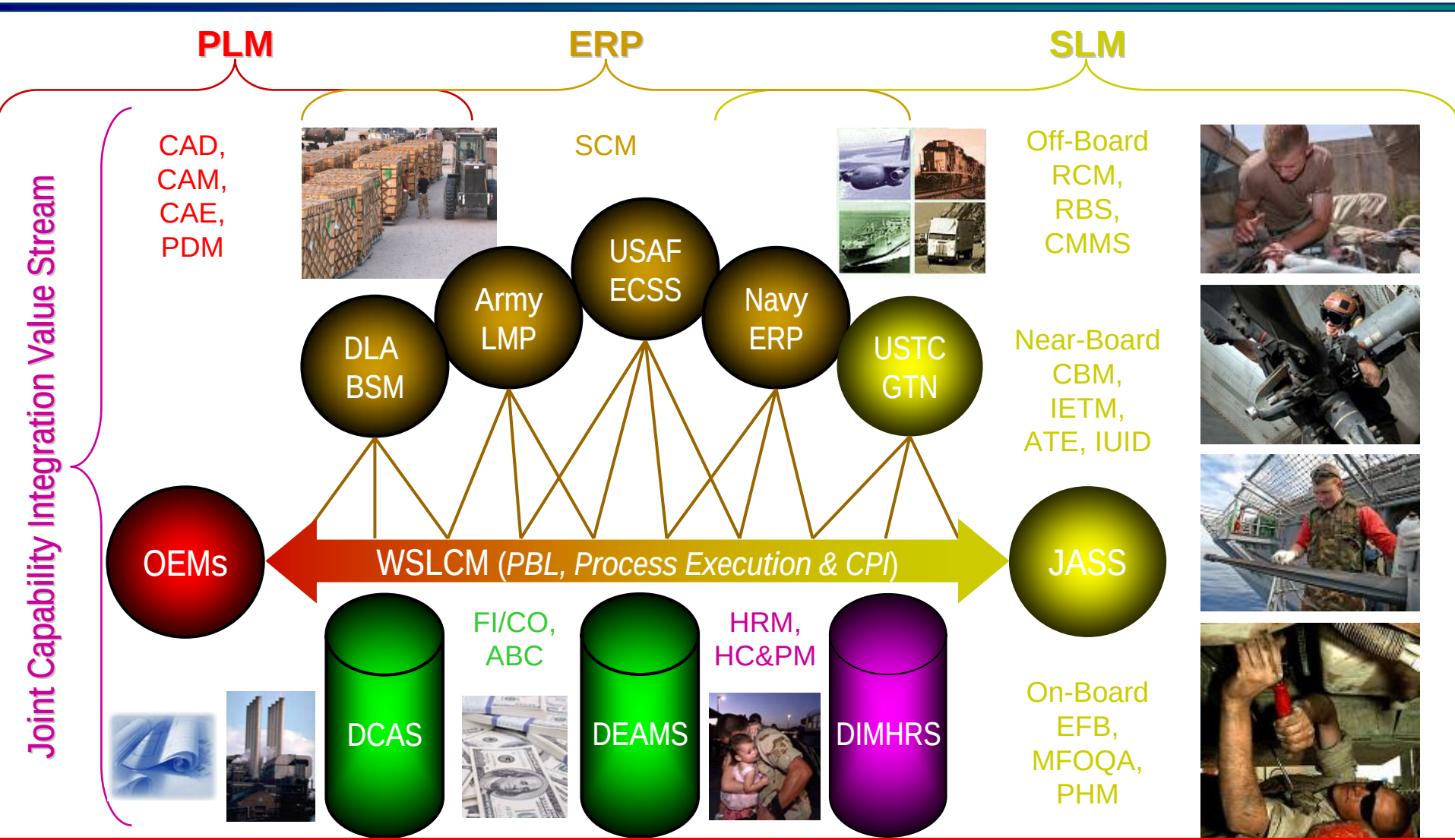
Joint Autonomic Sustainment at the point of maintenance would address the current Service Lifecycle Management capability gaps in CBM, PHM, RBS, CPI and PBL.

Joint Autonomic Sustainment is:

- Collector of Condition Based Maintenance Data
- Forecaster of Prognostic Based Asset Health
- Distributor of System & Asset Health
- Analyzer of Component Degradation Trends
- Manager of Multiple Dimensions of Configuration
- Creator of Mission Support Readiness Knowledge
- Facilitator of Continuous Process Improvement
- Enabler of Readiness Based Sparing
- Enabler of Performance Based Logistics
- User of A&D Industry Data Standards
- User of Technology Industry Standard Protocols



Where would a Joint Autonomic Sustainment System fit in the DOD logistics structure?



JASS accelerates battlespace focused logistics via sense & respond capabilities.

How does Autonomic Sustainment enable Continuous Process Improvement (CPI)?

Manpower
- Training
- Experience
- Qualifications

Method
- Processes
- Procedures
- Documentation

Money
- ECPs
- AD / SBs

Materiel / Material
- Vendor Sourcing
- Vendor Repair
- NFF / CND Rate

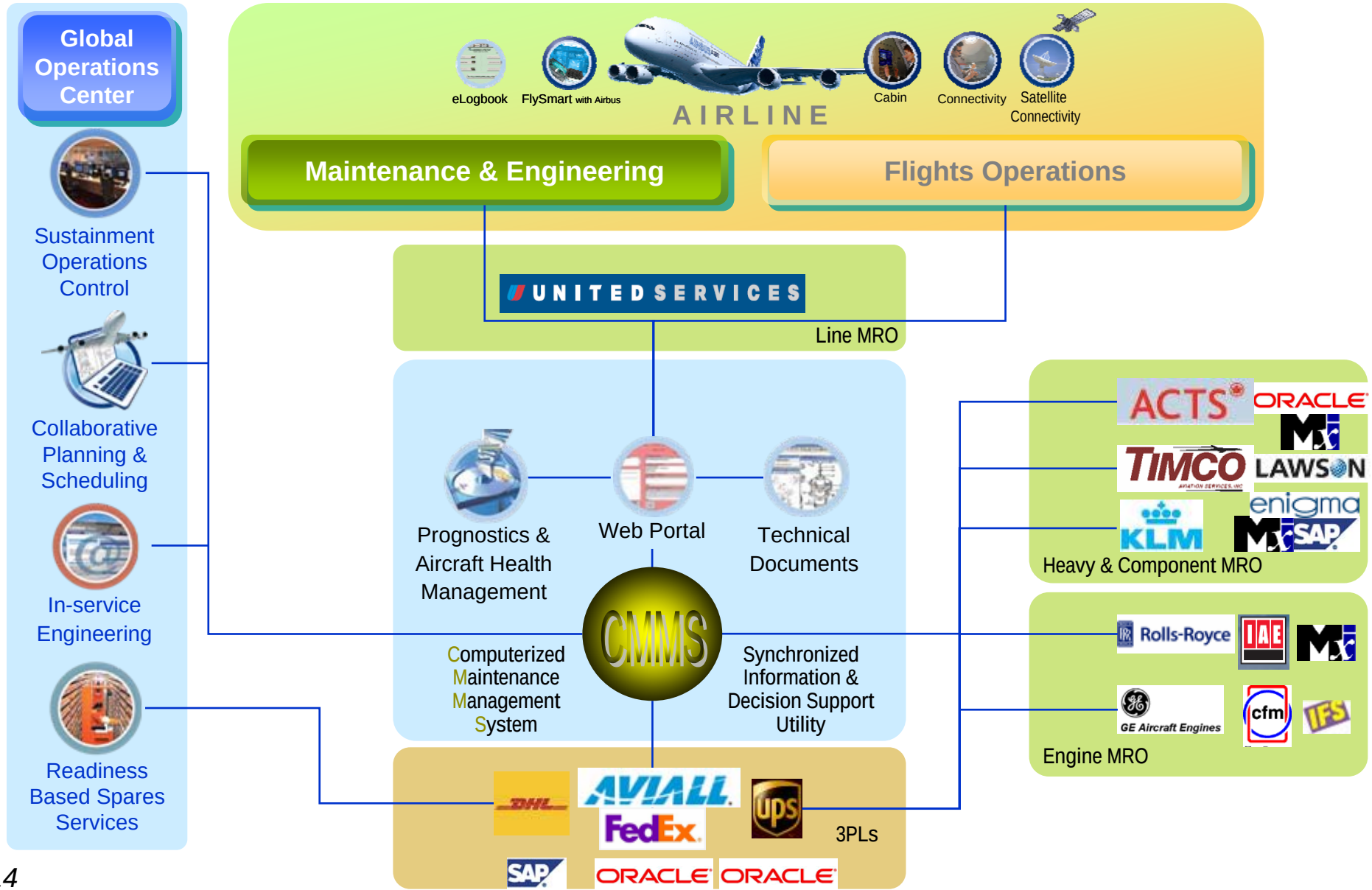
Machine
- GSE
- Tooling
- Infrastructure

Measurement
- Calibration
- Scheduling

Engineering & Reliability

Lifecycle tracking of utilization and maintenance - facilitates determination of causality.

Commercial airlines build in-flight, real time, reliability centered, condition based, nose-to-tail, MRO capabilities through agile collaborative networks integrated to operations centres.



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Delta Air Lines Technical Operations Case

Business Challenge

In 2000, Delta needed a program for increasing maintenance capacity through labor productivity to prevent investing in new infrastructure capacity while reducing maintenance costs per flight hour, managing service parts more effectively and improving the efficiency of maintenance-related regulatory compliance. To make these improvements happen, Delta TechOps and their consultancy designed a new set of interlocking capabilities to optimize maintenance operations globally. The result was a initiative consisting of a master "MRO Maintenance Plan" and a series of "Bay 8" pilots to validate the Master Plan's capabilities and concept of operation.

Innovations Delivered

- Developed the NextGen MRO Business Architecture – an integrated business process and technology architecture for aviation maintenance that encompasses:
  - Line, heavy, component and engine maintenance
  - Reengineered maintenance processes for engineering, configuration management, planning, packaging, scheduling, supply chain management, customer relationship management, document & task card management and lean - six sigma
  - An EAI & BPM rules based, event driven SOA built on the Delta Nervous System technical architecture
- Design and execution of a series of "Bay 8" pilots to:
  - Validate key tenets of the NextGen MRO capabilities
  - Test specific operational metrics and improvements
  - Assess overall labor productivity & cost effectiveness
- Eleven US/EU patents covering the eight dimensions of configuration management & three effectivity dimensions over the service lifecycle management of complex assets.

High Performance Results

- Confirmed opportunity to reduce HMV-check costs by $200 thousand dollars per plane (Delta performs 60-70 HMV-checks per year). Savings are the result of pilot programs that demonstrated:
  - 64 percent decrease in job interruptions
  - 42 percent decrease in materiel utilization
  - 26 percent increase in work order labor productivity
  - 16 percent reduction in maintenance cycle time
  - 100 percent regulatory compliance visibility
- Five year NPV of $182M plus $400M additional revenue

Delta's MRO has the second highest labor rate but second lowest labor cost.

NAVAIR F/A-18 OIF / OEF Mission Readiness Case

Scale:

- Fleet of over 1000 aircraft and 2200 GE engines (F404 and F414)
- Operated from more than 120 separate sites and 12 aircraft carriers

Functions:

- Configuration management
- Engineering change management
- Life usage tracking
- Planning & Scheduling
- Electronic log book
- Electronic integration with airframe and engine OEMs

Results:

- Operation Enduring Freedom Sortie rate for VFA-115 was 97.5%
- Operation Iraqi Freedom VFA-115 Averaged over 55 Flight Hours/day
- Depot Turn-around-Time and awaiting parts backlog reduced from 90- 45 days
- F404 Engine Availability went from 55% to a current 85%

Boeing's support of the F/A-18 is the most successful PBL initiative in the DOD.

Service Lifecycle Management (SLM) is a key capability enabler of the F-35 JSF Autonomic Logistics Information System (ALIS) and Global Sustainment Center.

Global Sustainment Center

... Resulting in Global 24x365 engineering, maintenance, supply & logistics support.

JDIS Architecture Provides the Framework for Data Integration . . .

. . . And Autonomically Converts Data Into Decision Enabling Information . . .

. . . Resulting in Enhanced Mission Execution

ALIS

Maintenance

Supply Chain Management

Training System

Operations Support

Technical Data

JDIS Distributed Database

External System Interfaces

Customer Support Services

JDIS Administration

Theater Level

Commander's Intent

Immediate Air Asset Allocation

Hourly ATO Update and Redirection

Wing Level

Mission Support Requirements
Operational Awareness

Ability to Reallocate Mission Tasking by Aircraft

Squadron Level

Maintenance and Support Requirements
Resource Allocation

Maximizes Efficient Allocation of Support Resources

By 2012, 100% of the Navy's Strike fleet will be sustained by Mxi Technologies.

Swedish Defense Force's Network Based Defense (NBD) initiative is to create a Joint Autonomic Sustainment capability across air, land and sea assets.

Maintenix at Swedish Defence Force Logistics (FMV):

- Mxi recently contracted for all large asset service lifecycle configuration and maintenance management requirements (Air, Land and Sea).
- Multi- year complex competitive analysis & selection process that included the assessment of Maintenix in comparison to IFS, Intentia, SAP as well as an internally built system.
- Maintenix going live Oct 2006 on 400+ Fixed & Rotary Wing Aircraft (including C-130J) followed by all land and sea assets.

SAAB JAS-39 Gripen

NH-90 High-Cabin (Search and Rescue)

FMV

FMV Visby Class Corvette (K31)

Sweden's NBD will sustain all asset classes on a common CBM solution.

Empirical results of Autonomic capabilities in commercial aviation are significant.

Stakeholders:

- Operators (Warfighter) = increased asset availability (readiness)
- Customers = increased on time travel at reduced costs
- Shareholders (Taxpayers) = Total Shareholder Return = Revenue Growth + EVA
- Regulators = safe, compliant and reliable asset operation with full lifecycle documentation
- Employees = stable wages and job security through increased competitive productivity
- Management = increased risk adjusted EVA and ROIC as well as Continuous Process Improvement

Empirical Value Proposition Ranges	
↓ Total MRO costs	10% to 25%
↑ Labor productivity	20% to 40%
↓ Unplanned & non-routine maintenance	40% to 60%
↓ Heavy maintenance cycle times	10% to 25%
↓ Inventory costs	15% to 35%
↓ Rework & scrap	35% to 60%
↓ Unplanned downtime	5% to 15%
↓ Work-in-progress	10% to 30%
↑ Compliance visibility	100%

JASS also increases ROIC by reducing integration & training - risks & costs.

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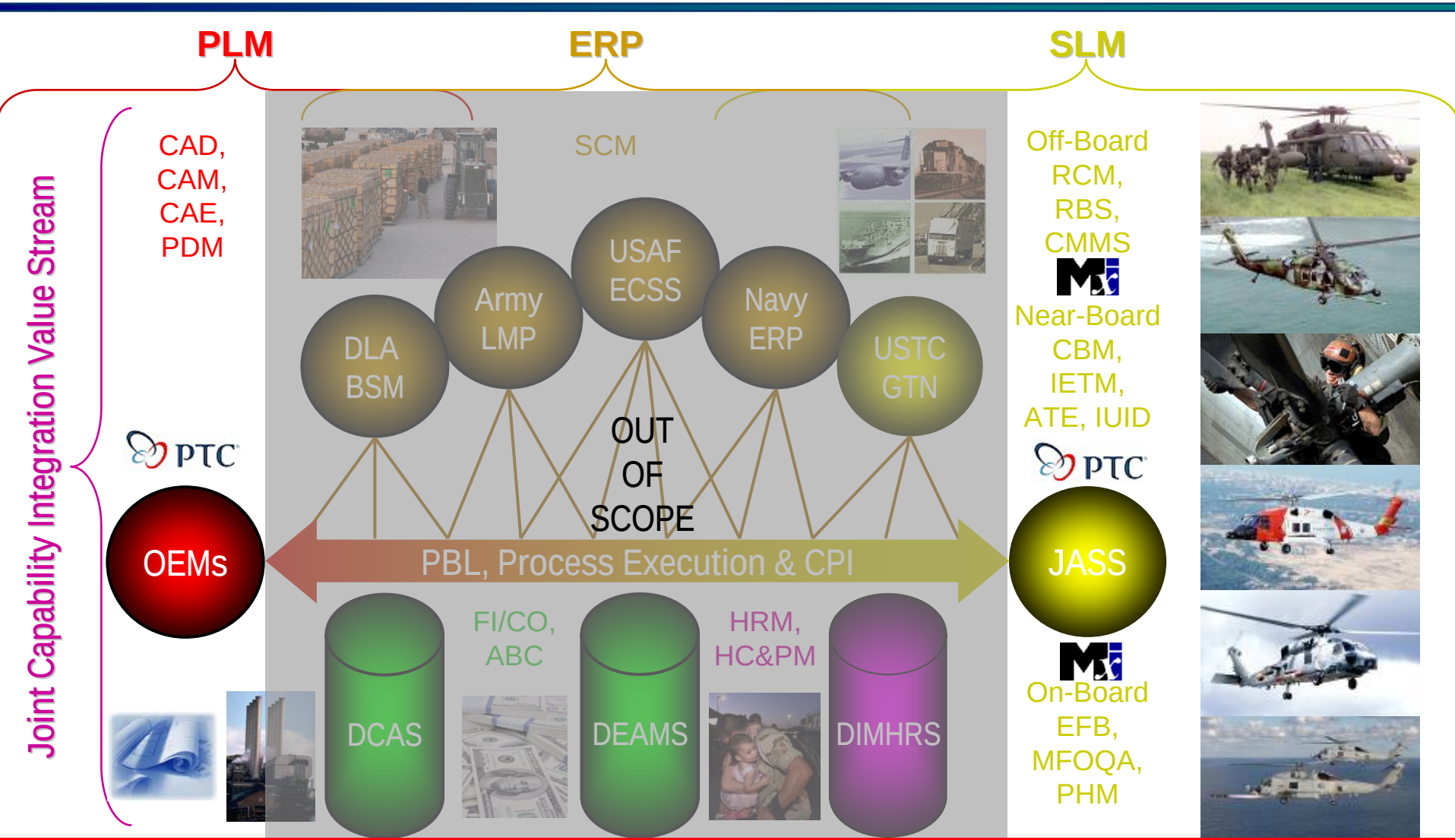
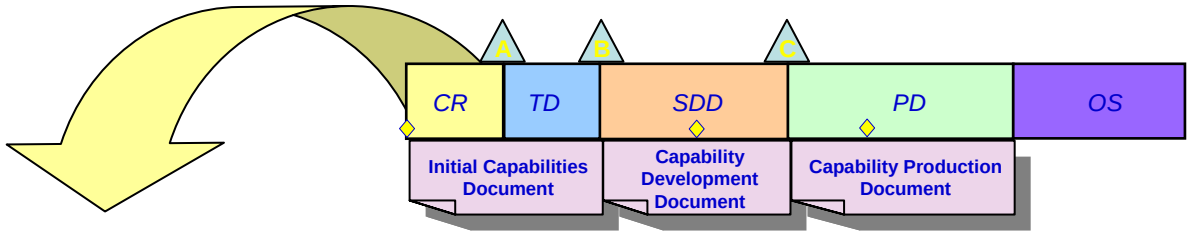
The Great Idea – Build a Joint Autonomic Sustainment initial capability…



The H-60 variants represent the most widely operational "joint" aircraft globally.

… leveraging prior, current and future committed investments and existing technologies …



Purpose:

Leverage commercial capabilities & DOD previous, current and future programmed investments in CBM:

1. Joint H-60x Integrated Vehicle Health Management System (IVHMS)
2. NAVAIR F/A-18 Automated Maintenance Environment (AME)
3. Joint Strike Fighter F-35 Autonomic Logistics Information System (ALIS)
4. Army Future Combat Systems (FCS) - Advanced Collaboration Environment (ACE)
5. TACOM Automated Configuration Management Systems (ACMS)
6. TACOM Stryker Brigade Tactical Logistics Data Digitization (TLDD)
7. Army CBM Data Warehouse and Aviation Digital Exploitation Capability (ADEC) initiatives
8. Joint Aeronautical Logistics Commanders (JALC) H-60 configuration mapping initiative

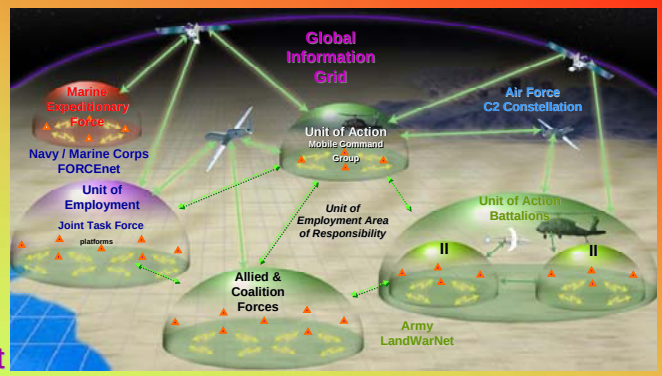
Outcomes:

1. An immediately fieldable Joint Autonomic Sustainment capability which enables CBM and PBL
2. Joint Autonomic Sustainment Initial Capabilities Document (ICD)
3. Joint Autonomic Sustainment Analysis of Alternatives (AoA) (ERP + Best of Breeds COTS)
4. Joint TV-1 Data & Computing Standards (ISO 10303, AP 239, ISO 13374, S1000D, SOAP, J2EE, IPv4, …)
5. Joint Autonomic Sustainment Technology Development Strategy (TDS)
6. Phased funding in parallel to spiral capability maturity development & operational deployment

… which accelerates the current 2012 / 2020 vision and value to TODAY.

Global Sustainment Center

- Sustainment Operations Control
- Collaborative Planning & Scheduling
- In-service Engineering
- Readiness Based Spares Services



Joint Sustainment

Joint Operations

COCOM Battlespace

DOD & OEM Sustainment Industrial Base

Prognostics & Aircraft Health Management

Web Portal

Technical Documents

JASS

Joint Autonomic Sustainment System

NAVAIR Naval Air Systems Command

Asset Lifecycle Management & Depot Level Maintenance Owner

AMC

MSC

MTMC

Distribution Process Owner

Boeing · Lockheed Martin · Sikorsky A United Technologies Company · GE Aircraft Engines · TIMCO Aviation Services, Inc.

OEM / 3rd Party Maintenance

Questions