
Control Point Corporation

CBM+ and Future Logistics Design Activities

Presented to
TARDEC CBM 2007 Workshop

29 November 2007

- ❑ CPC Introduction
- ❑ Systems Engineering Development Approach
- ❑ Projects
 - Common Logistics Operating Environment (CLOE)
 - Ground Combat Systems
 - Aviation
 - PM HBCT Vehicle Health Management System (VHMS)

Combat System Development Experience

CPC is a small business providing Systems Engineering expertise to Combat Systems developers since 1995



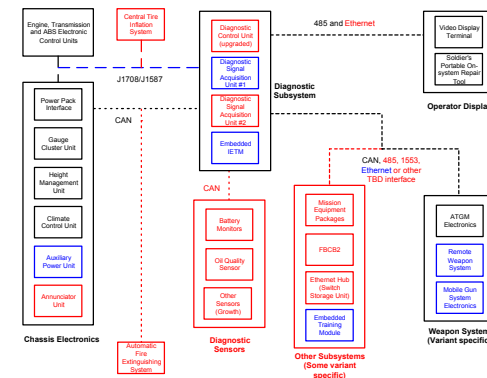
Sustainment Projects

- ❑ Stryker 3rd Brigade Embedded Diagnostics
 - Designed, specified, implemented, and tested the embedded diagnostic system
- ❑ Stryker Logistics Proof of Enablers (POE)
 - Created and demonstrated network-centric logistics system on Stryker vehicle
 - Prototype system for CLOE
- ❑ Common Logistics Operating Environment (CLOE)
 - Ground Combat Systems
 - Aviation Systems
- ❑ A3 Diagnostic Trainer
- ❑ FCS Fault Management and PS-MRS
- ❑ Employees have developed Contact Test Sets, Physics of Failure models, fault trees, FMECAs, and pattern matching algorithms.

| Code | Cat | Subsystem | Title | Potential Sources | ACK | Status |
|-------|-----|-------------|-------------------------|------------------------|-----|----------|
| 02203 | W | Mobility | Engine Crank Fault | PP1 - Starter soleno. | ACK | Inactive |
| 05280 | SA | Environment | Toxic Fumes Venting LI | CCU - W418 - Driver v. | ACK | Inactive |
| 07790 | SA | Weapon | Gunner Handle Fault | Gunner handles | ACK | Inactive |
| 02295 | SA | Mobility | Ignition On Fault | PP1 - W422 - DFP - AU | ACK | Active |
| 03150 | C | Mobility | Fuel Level Fault | Fuel sender - GOU-WV | ACK | Active |
| 05801 | C | Environment | Heater Controller Fault | Heater | ACK | Active |
| 04220 | C | Height | Controller (HMJ), Fault | HMJ | ACK | Active |
| 01480 | C | Diagnostics | Weapon System Comm | DCU - W457 - ATGM | ACK | Active |

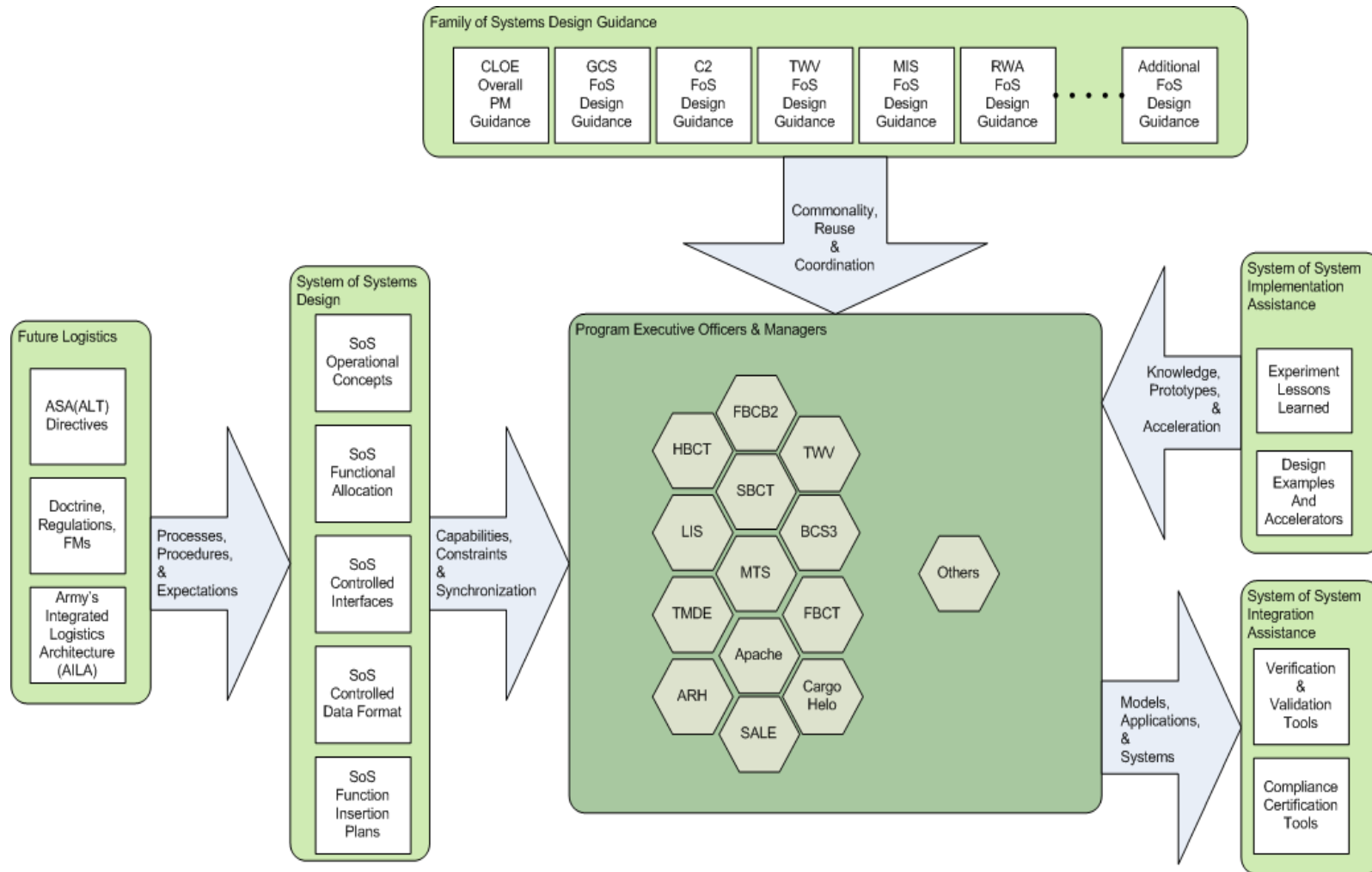
Effect: Engine Starter Failure
Engine crank functionality lost. This condition can occur as a result of damage to W431 or W441 cables or concurrent starter solenoid output failures.

COA: Perform CMT checks. If all OK, contact Maintenance for directions.



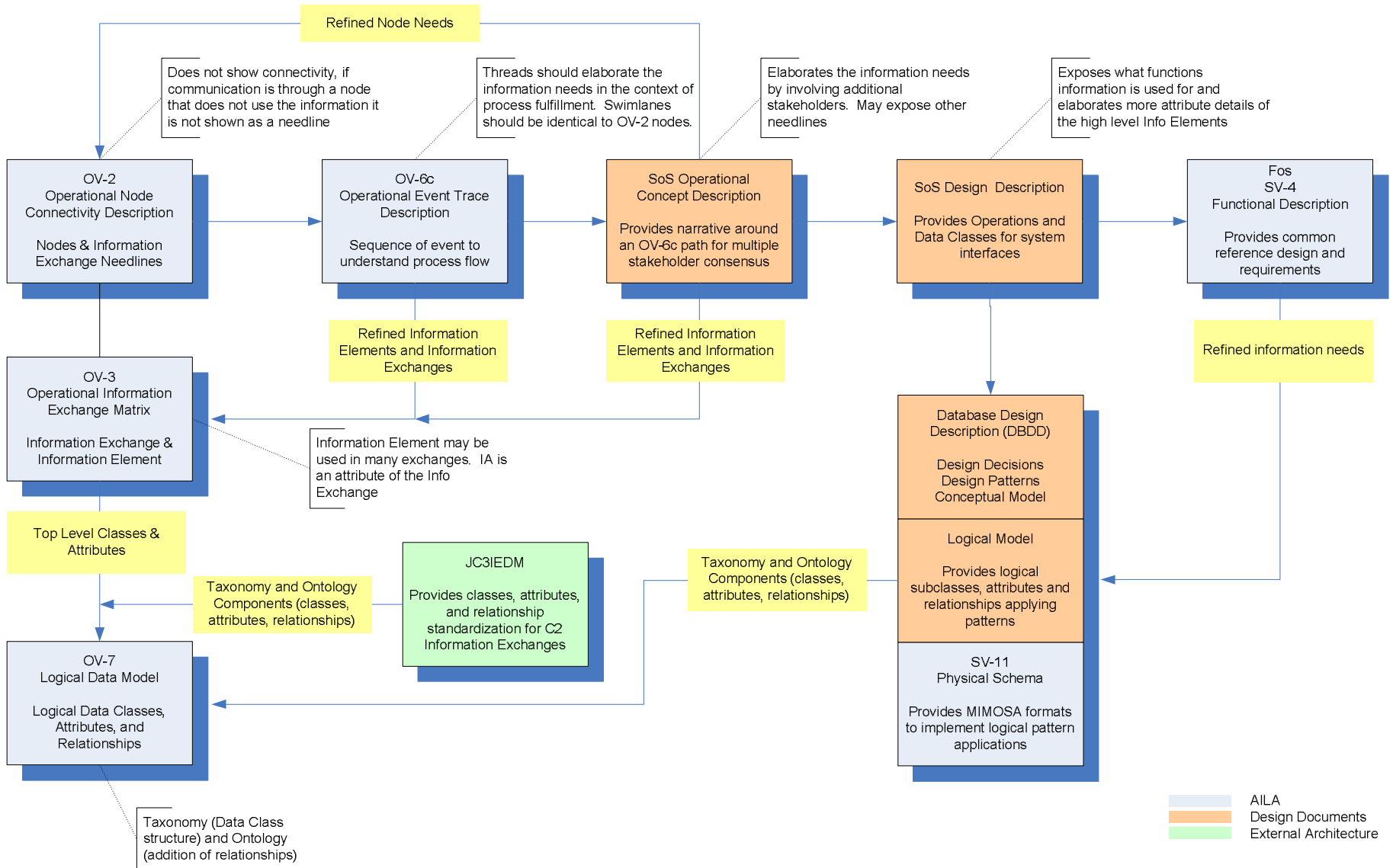
- ❑ Develop common understanding of the operating concepts across all system developers.
 - Common objectives for all stakeholders
 - New stakeholders quickly assimilated
 - Mechanism for operational validation
- ❑ Communicate near-term, mid-term, and long-term SoS design decisions that result from trade studies
 - Provide rigor to decisions
 - Eliminate constantly re-assessing the same trade-off analysis
- ❑ Define requirements that the system PMs can impose on their developers.
 - Provide complimentary requirements across System of Systems (SoS)
 - Provide consistent requirements within Family of Systems (FOS)
- ❑ Define reference design to guide the system developers.
 - Provide consistency within Family of Systems (FOS) and promote reuse.
- ❑ Establish information to be shared between producer and consumer(s)
 - What information is needed, not how it got there
 - What function needs to be performed with the information
 - Consistency of information at all SoS consumers.

CLOE Design Support



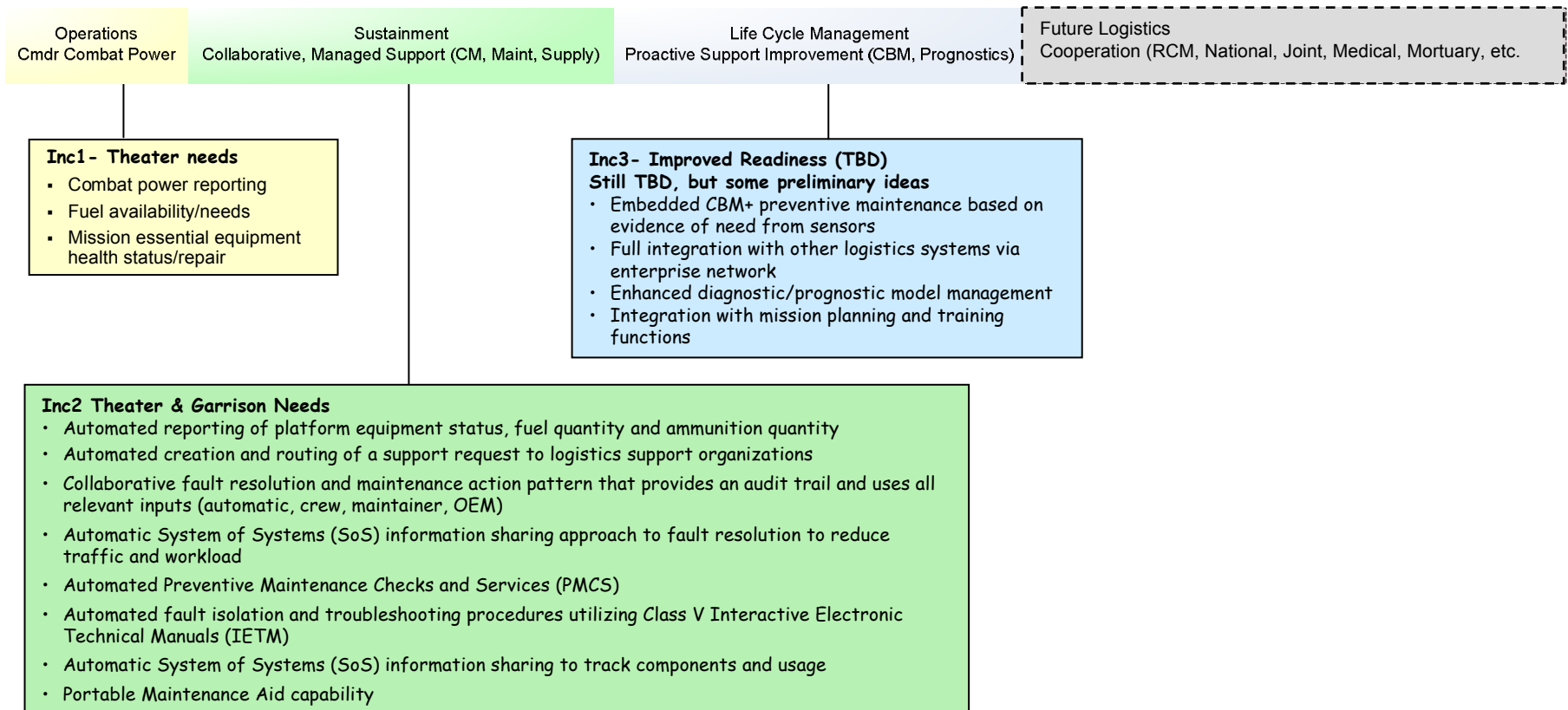
Implementation of CLOE is a disciplined, collaborative systems engineering process from doctrine through contractor-unique best-value designs

CLOE Design Support (cont)



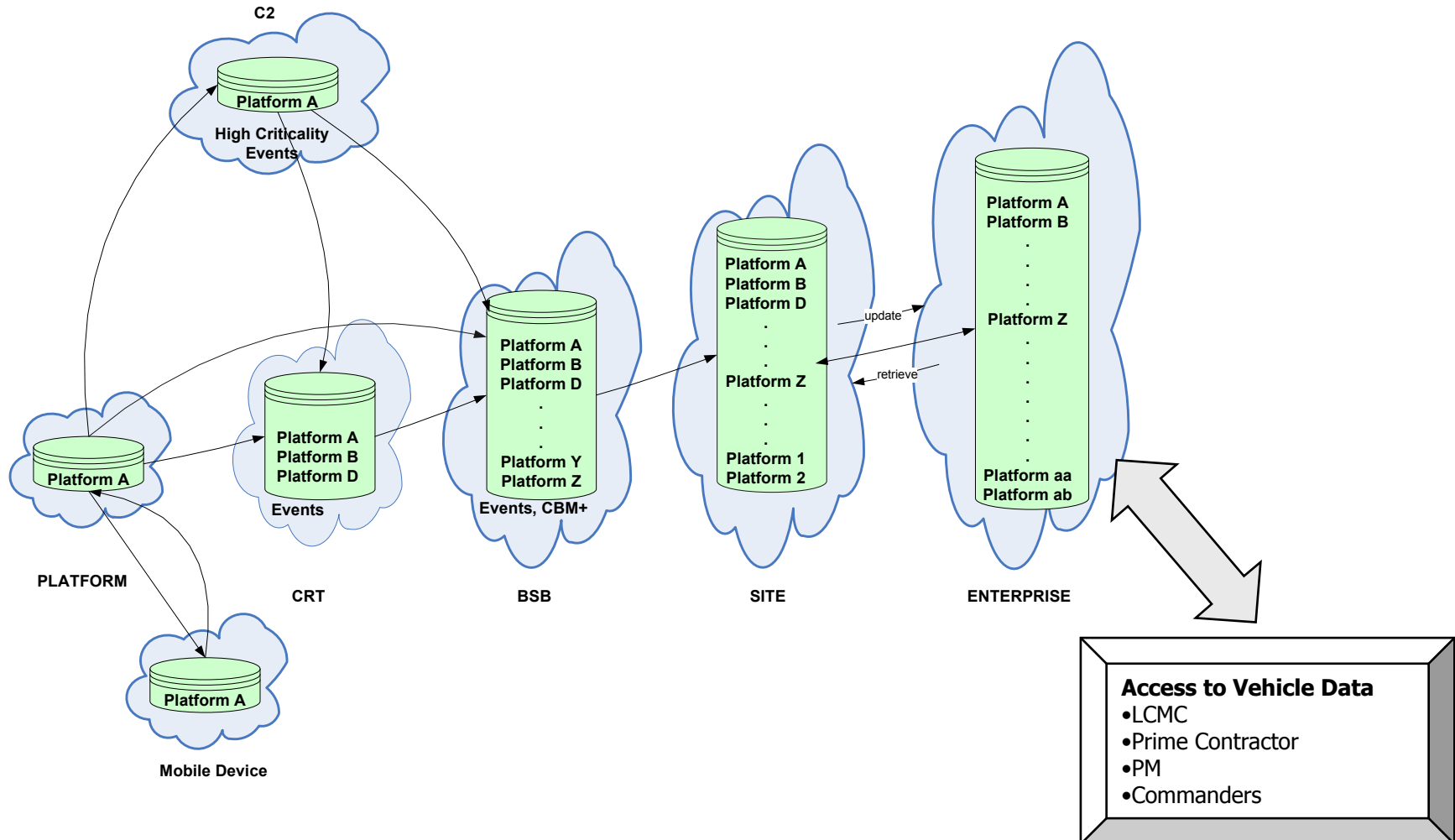
CLOE Incremental Implementation

- ❑ Provide capability insertions with measurable benefit.
- ❑ Provide for phasing in of the capabilities by expected system impact.
- ❑ Allow time for experimentation, demonstration, and Proof of Enablers for least mature capabilities.
- ❑ Provide PEOs/PMs with a roadmap for planning



Information Architecture

Built on the mobile device database paradigm for a net-centric logistics enterprise



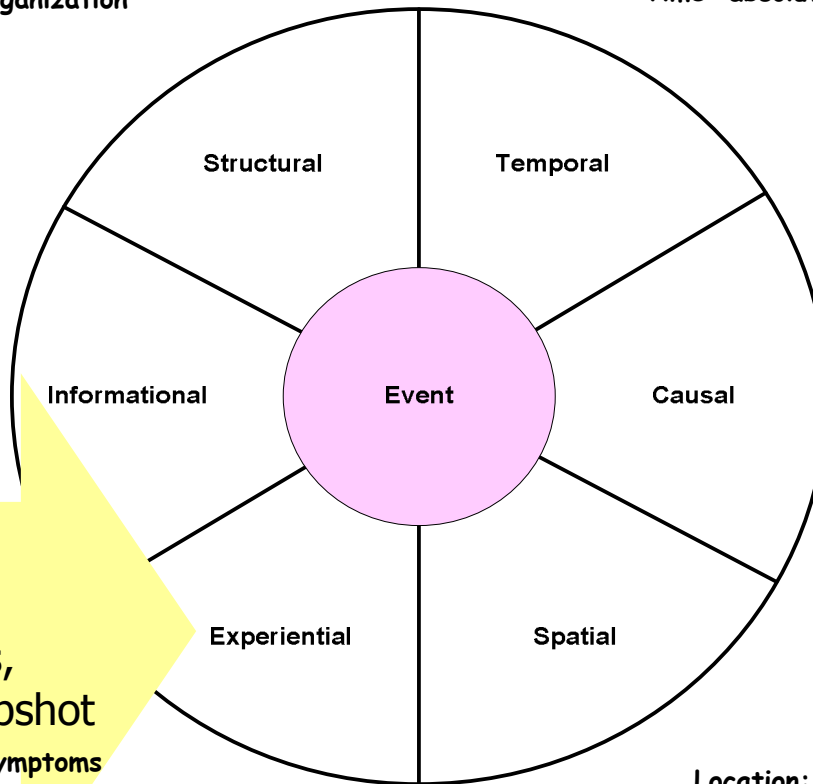
Event Conceptual Model

- CBM requires collaborative management of complex relationships

Impacts: *Capability, Component, Organization*

Time: *absolute, relative, logical*

Effect, *Severity, COA, etc.*



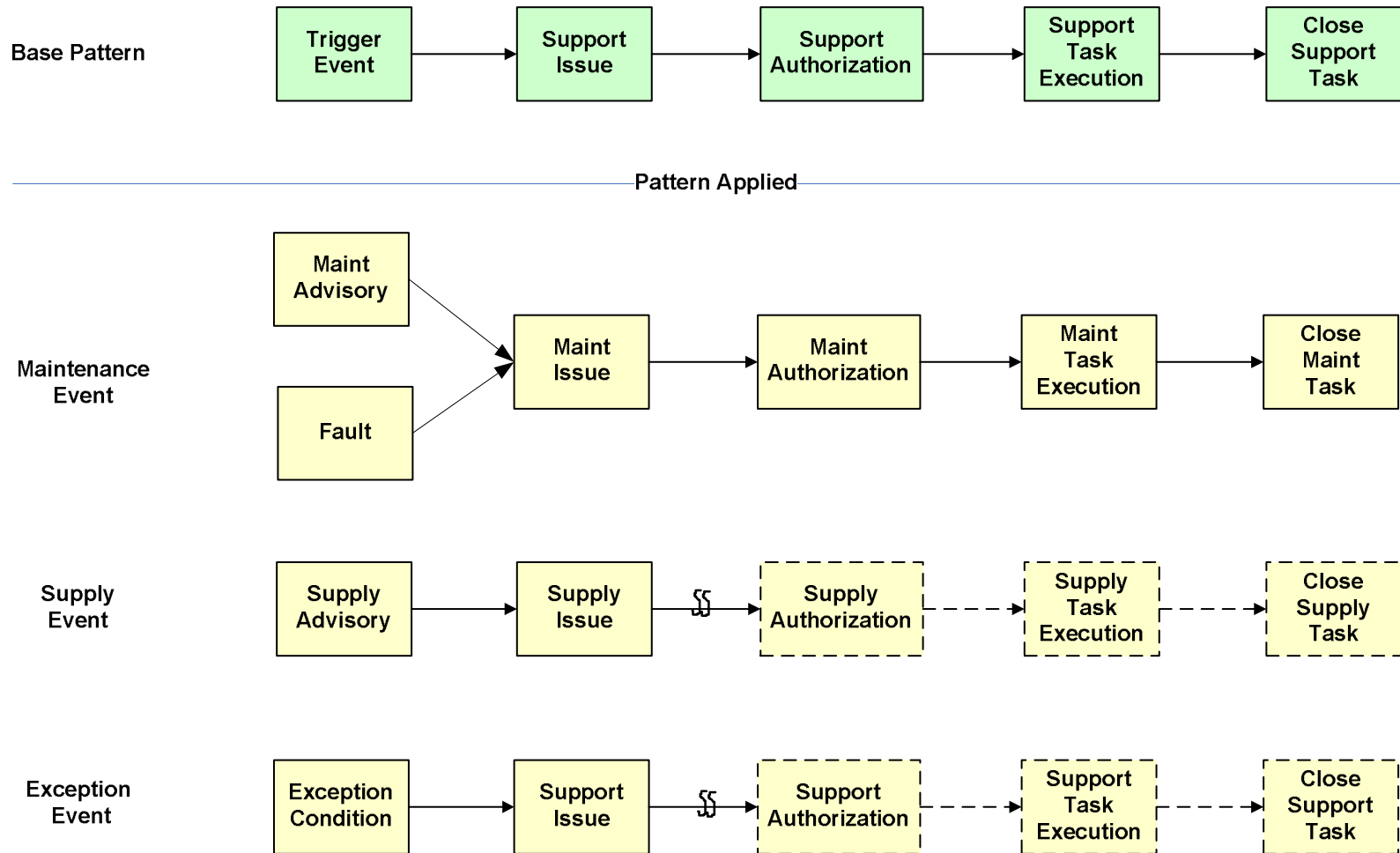
Cause

CBM:
Influential Parameters,
Usage Stress, Calibrations,
PMCS, VECs, Regime Snapshot
Surrounding conditions/symptoms

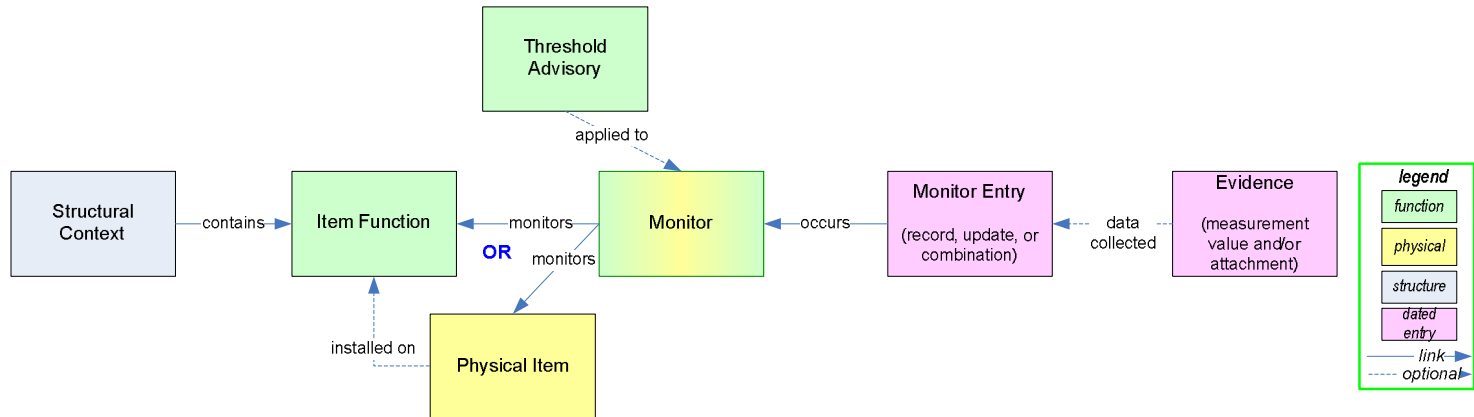
Location: *absolute, relative, logical*

The common event conceptual model introduced by Westermann and Jain of the University of California at Irvine.

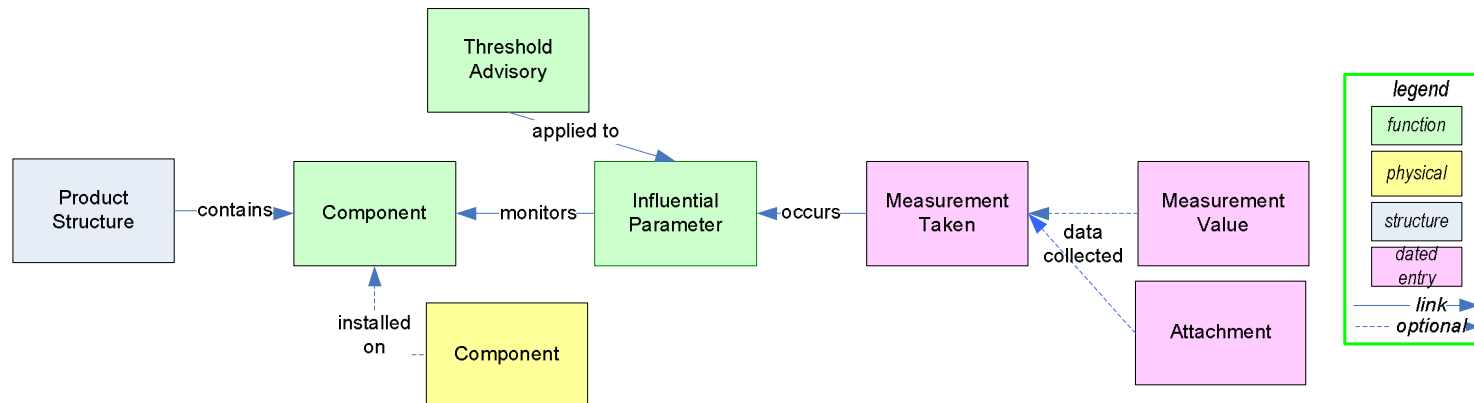
Patterns: Event Resolution



Patterns: Monitor

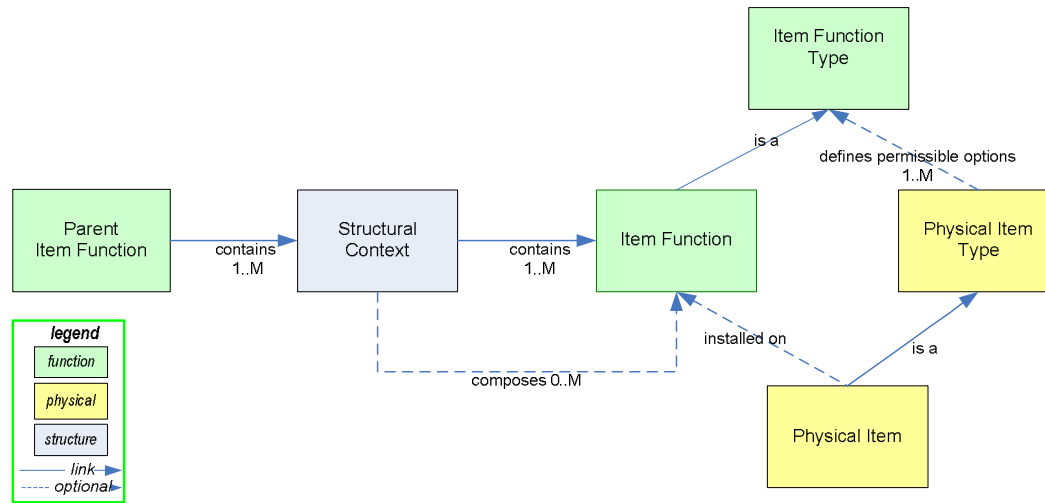


Pattern Applied

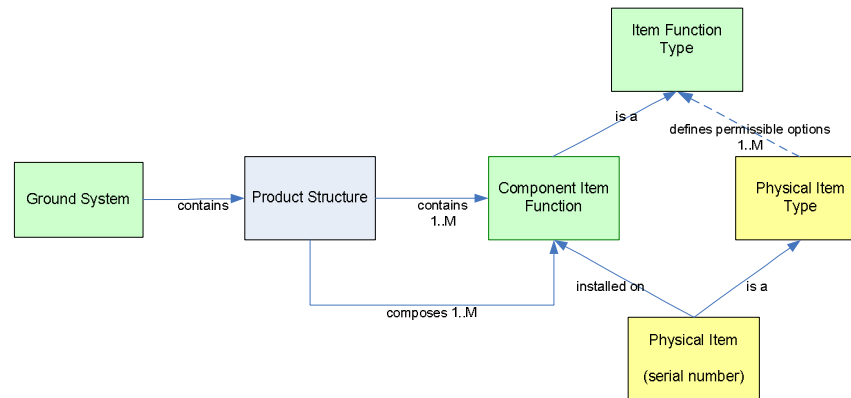


Applications: Consumable Quantity, CBM Influential Parameters, Usage Stress, Calibration Information, Preventative Maintenance Checks, Personnel Activity, Event Symptoms

Patterns: Structure



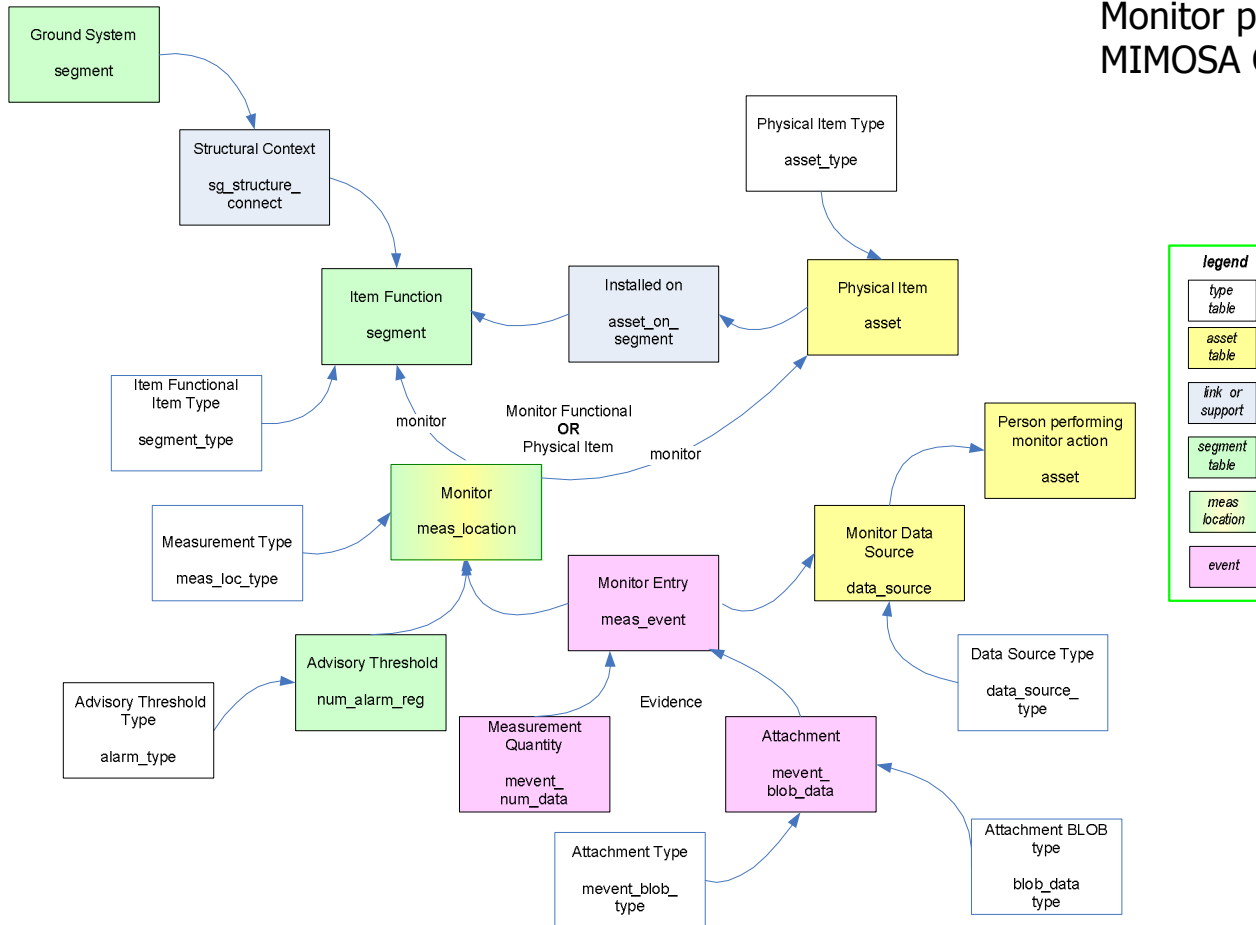
Pattern Applied



Applications: MTOE, Unit Organization, Property Unit Authorized Item List, Consumable List, Cargo List, Furnished Equipment Installation, Product Structure, Capability Function Tree, Causal Ambiguity Group, Report Contents List.

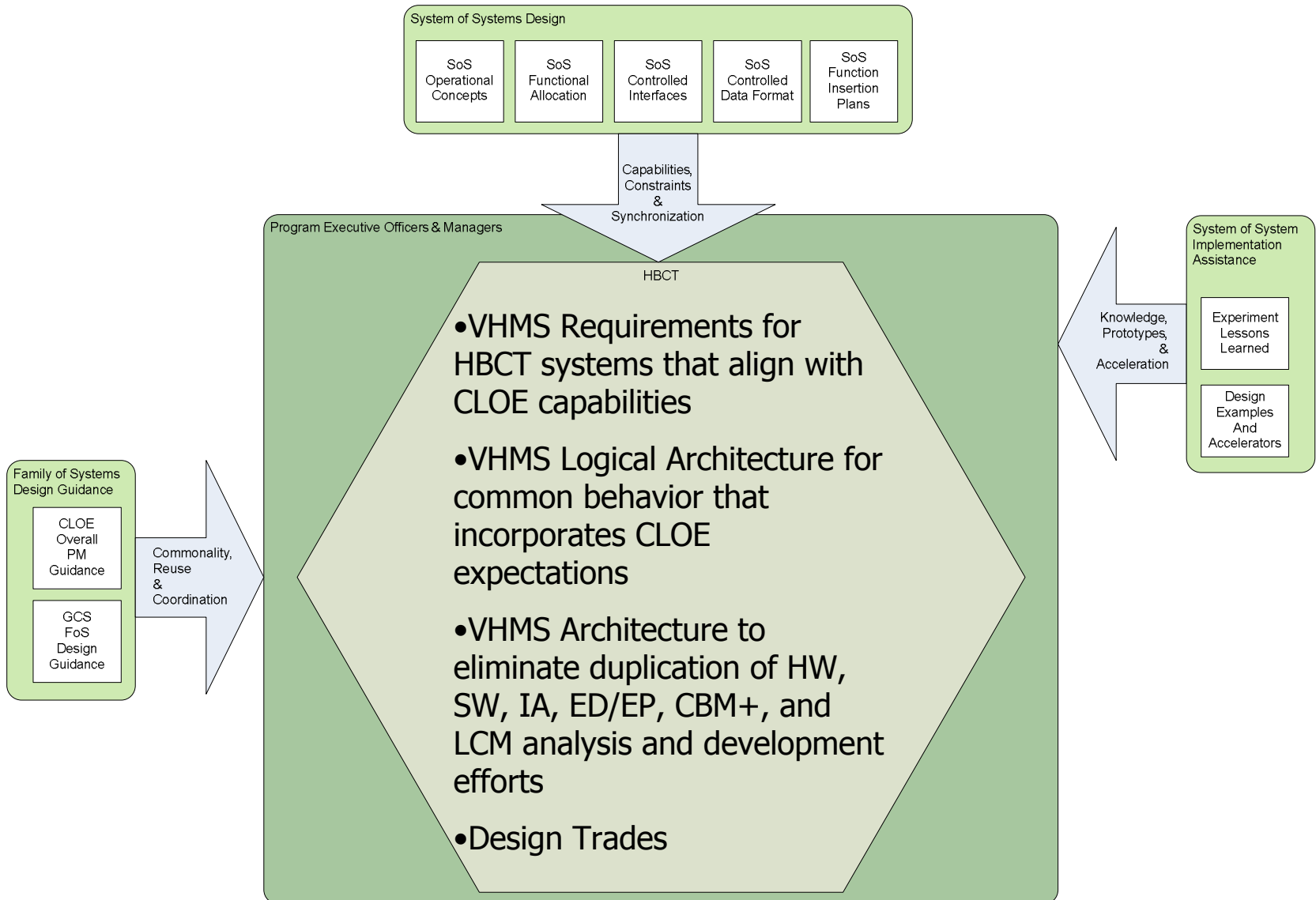
Enabling Interoperability

Monitor pattern implemented in MIMOSA OSA-EAI schema

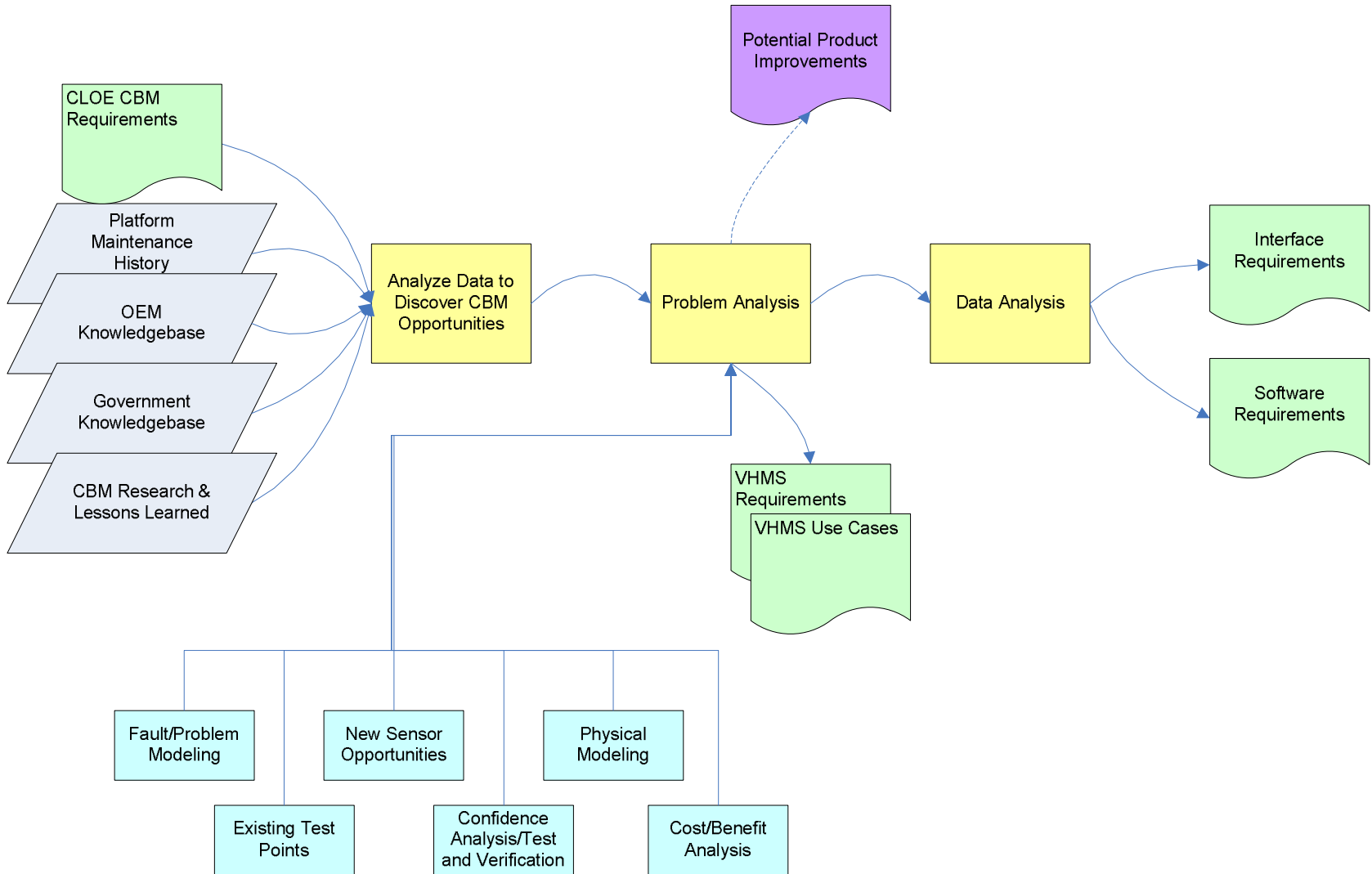


Patterns provide a prototypical data structure that can be applied for consistency. Consistency enables interoperability, enhances analysis capabilities, and multiplies lifecycle efficiency improvements.

PM HBCT VHMS Support



Specific CBM Data of Value



- ❑ **CPC is helping the Army's Common Logistics Operating Environment to flow down CBM expectations and synchronize development of a networked architecture through:**
 - **Clarifying Operating Concepts**
 - **Eliminating System Design Duplication**
 - **Controlling Interfaces for Interoperability**
 - **Enabling Information Systems Design**
 - **Accelerating Concepts into Implementation**
 - **Assuring Open Architecture- No Product Bias**
- ❑ **CPC is helping the VHMS program to:**
 - **Assure CLOE enablers are implemented**
 - **Identify specific influential parameters and usage stress monitors applicable to each platform for CBM advantage.**
- ❑ **CPC networked approach integrates users, sensors, and business systems to collaborate for a holistic CBM.**