

# The Information Backbone for the Logistics Enterprise

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## Product Life Cycle Standards



Jack Harris

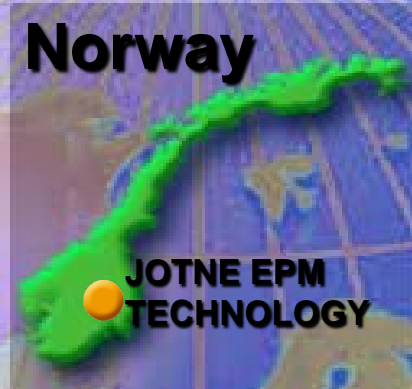
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October 13, 2009

- ❖ *Introduction to PDES, inc*
- ❖ *The Model Based Enterprise*
- ❖ *STEP through the lifecycle*
- ❖ **PLCS**
  - ❖ *The business context*
  - ❖ *Key capabilities*
  - ❖ *Features*
  - ❖ *Implementations*

# PDES, Inc. Members

## Norway



JOTNE EPM TECHNOLOGY

## Sweden



EUROSTEP

## UK



THEOREM SOLUTIONS  
BAE SYSTEMS

## Germany



LKSOFT

## France



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THE BOEING COMPANY

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COSTVISION

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ROCKWELL COLLINS

INTERNATIONAL TECHNEGROUP

GEORGIA TECH

LOCKHEED MARTIN

DSN INNOVATIONS

IBM

PTC  
CCAT

NARA  
NASA  
NIST

SCRA  
HOST CONTRACTOR



*Be the world leader in accelerating the development, implementation and use of STEP and related product data standards to deliver extraordinary business value*

## Initiatives

- Model Based Enterprise
  - Model Based Engineering
  - Model Based Manufacturing
  - Model Based Sustainment
- Integration & Data Exchange Testing
- Information Standards

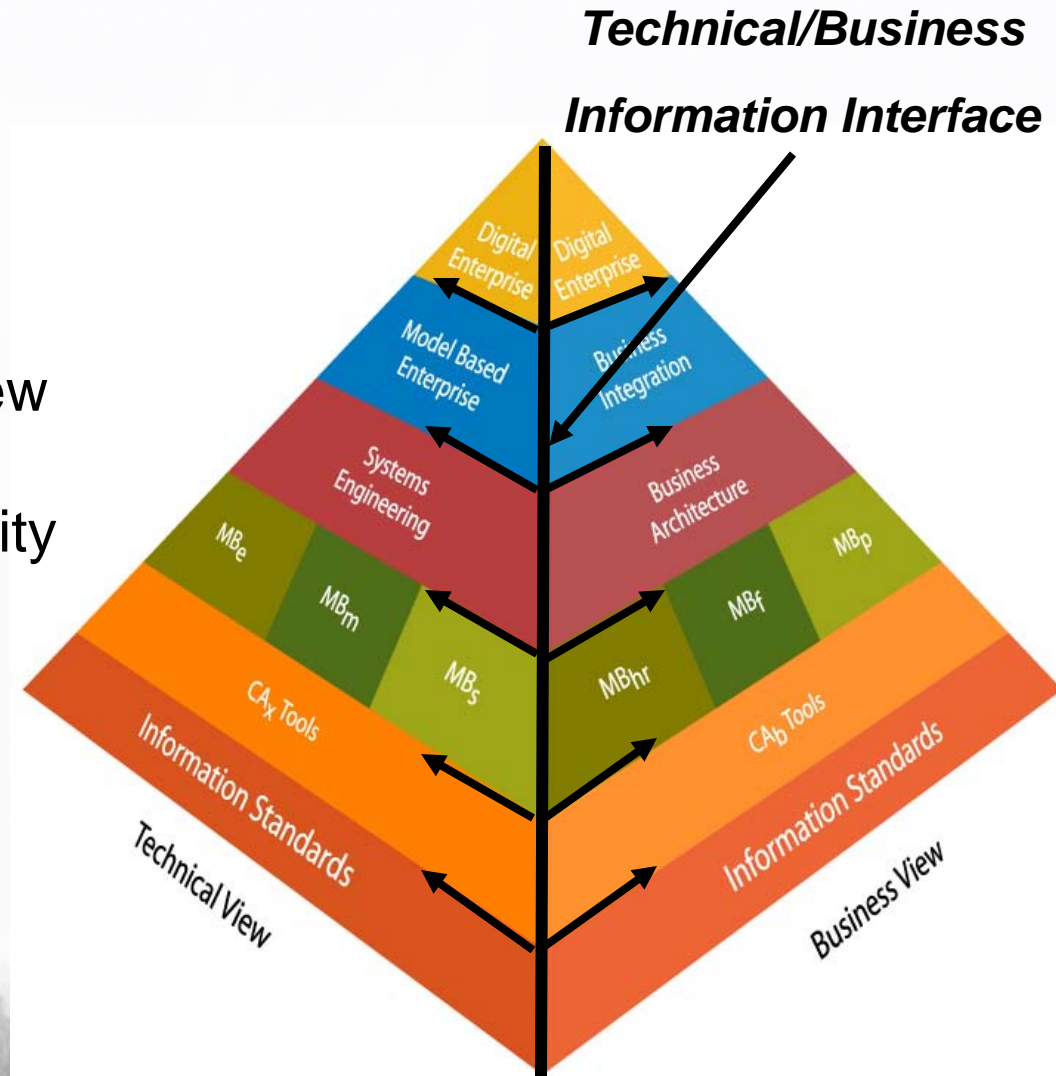
# Digital Enterprise View

## Digital Enterprise (DE)

Product and a Business View

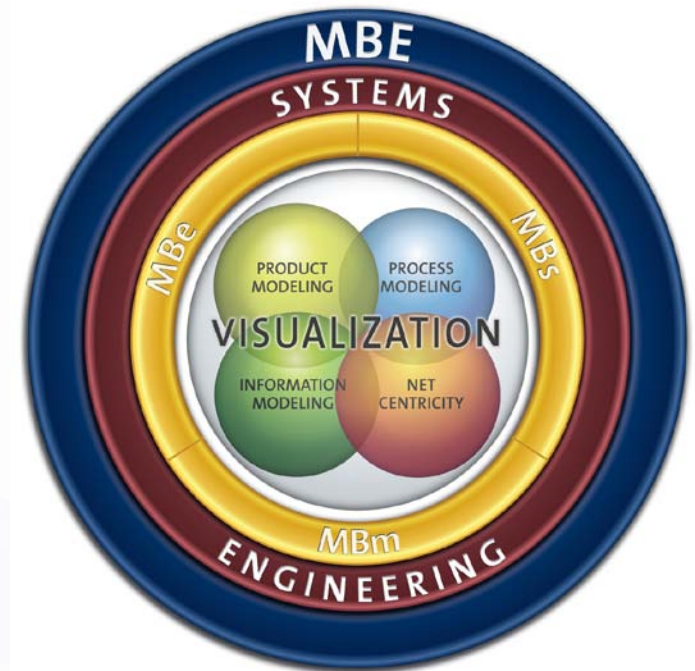
Model Based Enterprise (MBE) is a component of the DE Technical View

Largest problem by far is interoperability using standard information



***Industry has defined MBE from the technical view as...  
An integrated modeling/simulation/information environment that enables multi-disciplinary use of information to address all aspects of the life cycle***

- Models are defined as information abstractions from enterprise data for application in domain specific use
- Tools and processes are integrated through the application of standard information
- Information is accessible through PLM interfaces
- Key Life Cycle Characteristics predicted through math and science based simulations, and augmented through advanced visualization

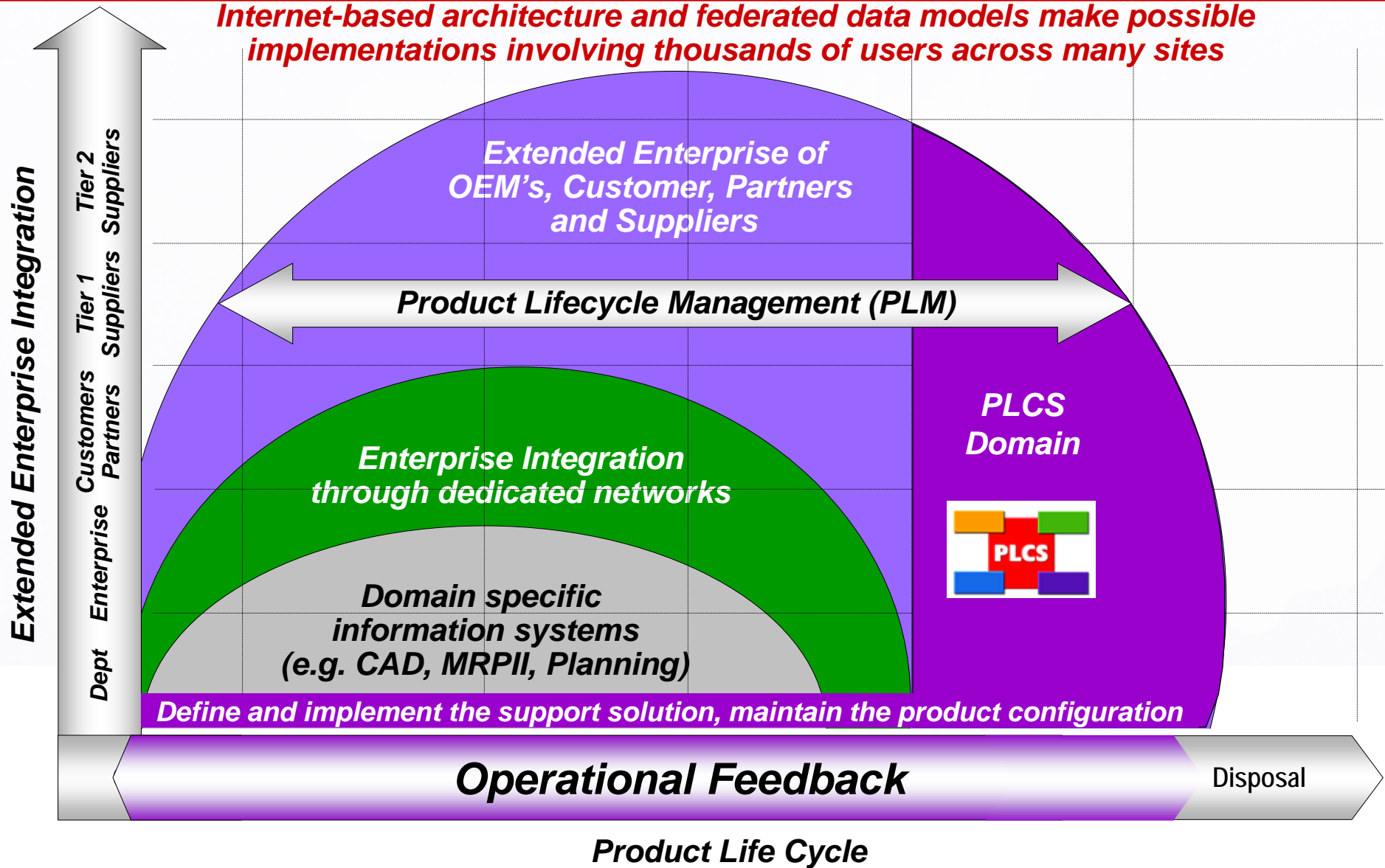


# Product Life Cycle Support (PLCS)

*Extended Enterprise enabled by Internet technology*



*Internet-based architecture and federated data models make possible implementations involving thousands of users across many sites*

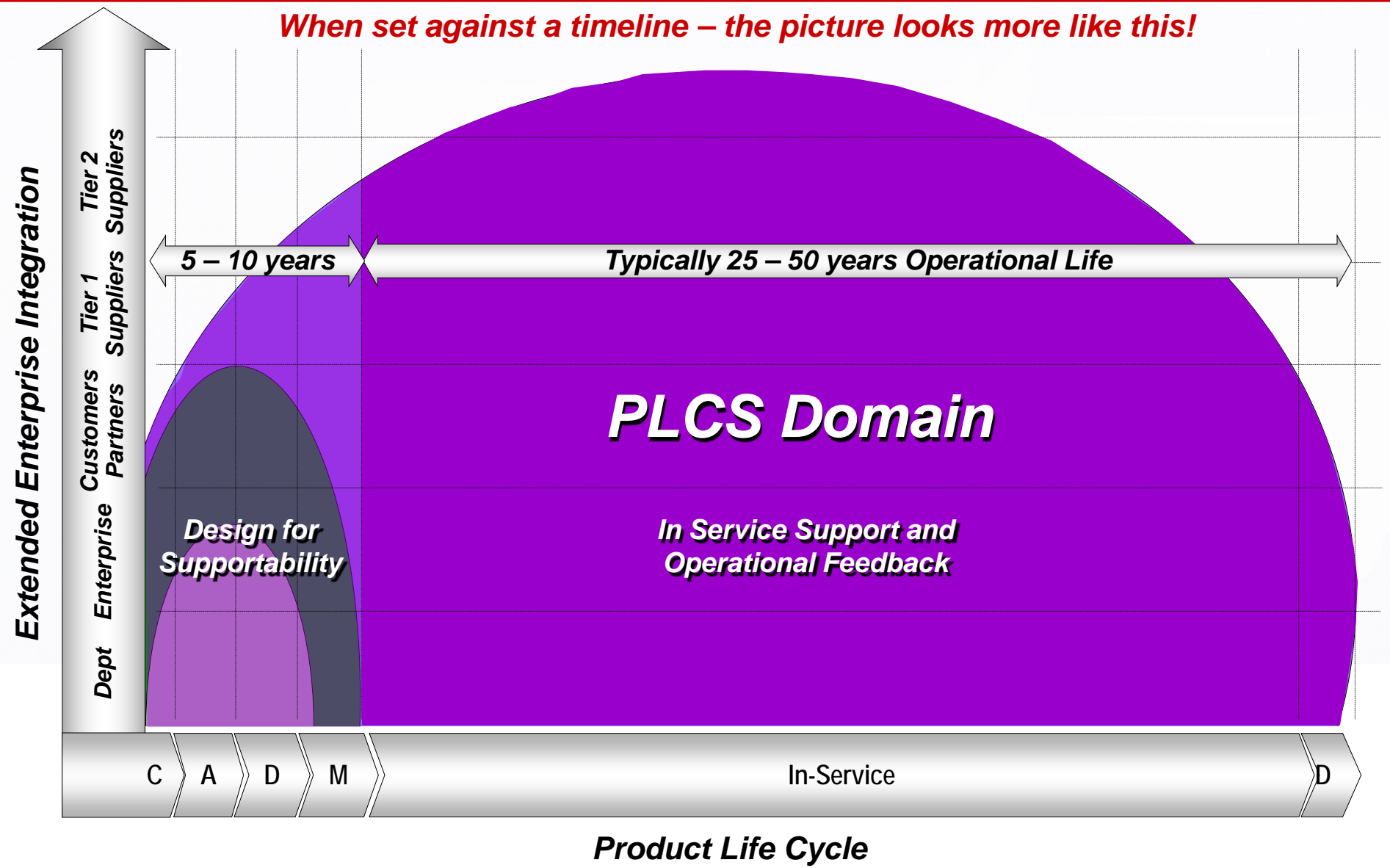


# Product Life Cycle Support (PLCS)

## Extended Enterprise – Importance of PLCS



*When set against a timeline – the picture looks more like this!*





# Setting the Business Context

## *Business Drivers*



- ***Reduced Cost of Ownership***
  - ❖ *Users of products are seeking improved availability, reliability, maintainability and lower cost of ownership*
- ***Sustainable Business Growth***
  - ❖ *Companies are seeking to make money through the life cycle support of their products to improve profits, improve quality and be more competitive*
- ***Protect investment in product data***
  - ❖ *Users of information systems want to ensure long term usability for product information as IT and processes change*

# Setting the Business Context

*Imagine the opportunities if ...*



- ❖ *Configuration management information was always accurate, up to date and immediately accessible*
- ❖ *Maintenance information was precisely tailored to the work to be done*
- ❖ *Spares and inventory costs were minimized through vendor involvement in an integrated supply chain*
- ❖ *In-service feedback was accurate, meaningful and readily available to product designers and support managers*
- ❖ *Change was easy to manage*



# Setting the Business Context

## *The Key Business Problem*



***How to keep the information needed to operate and maintain a product aligned with the changing product over its life cycle?***

***Product Definition  
Information***

***Maintenance  
Schedules***

***Tools***

***Test  
Equipment***



***Transportation***

***Consumables***

***Software***

***Spares***

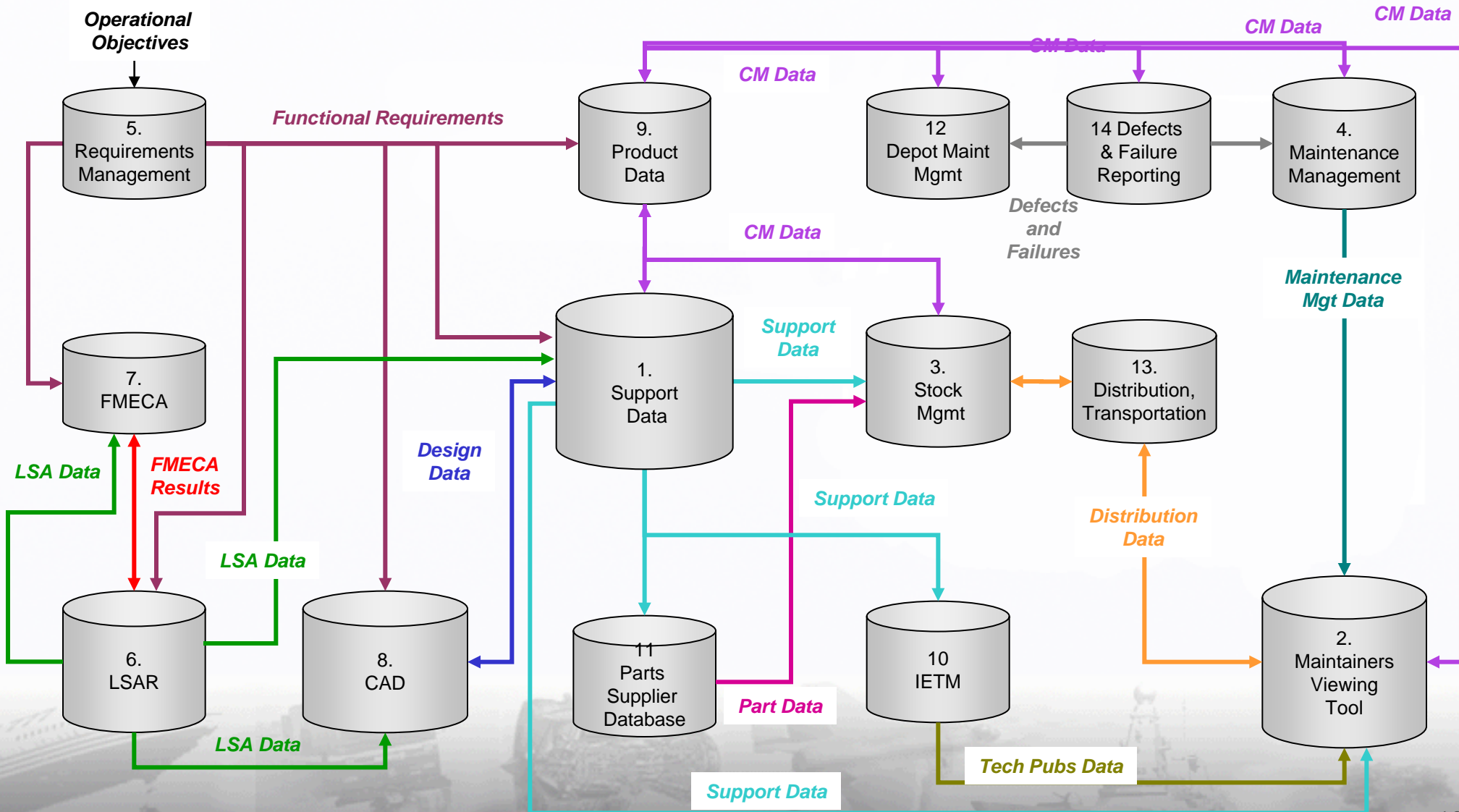
***Training***

***Support  
Facilities***

***Storage  
Requirements***

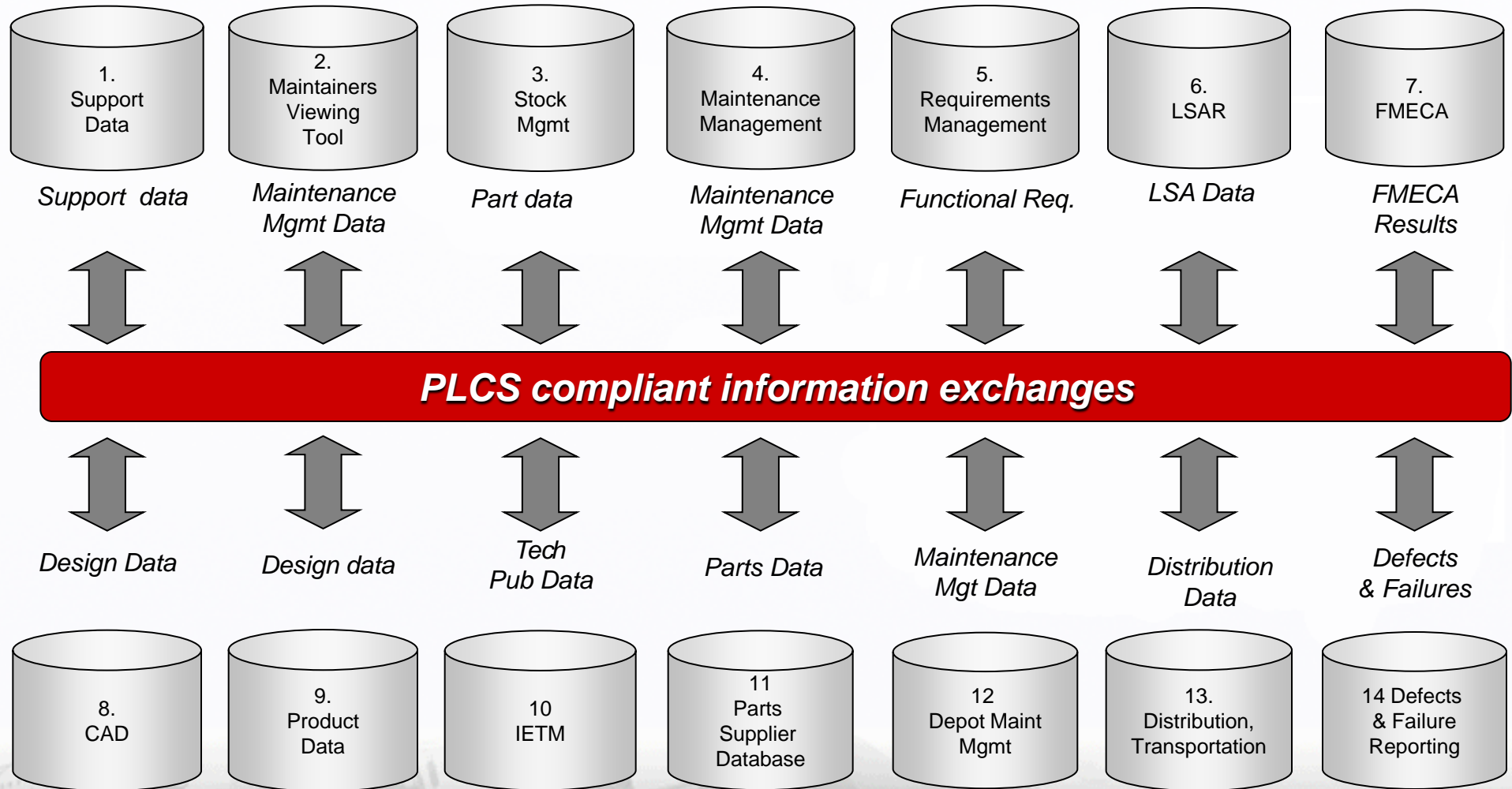
# Setting the Business Context

## Typical systems environment – point to point integration



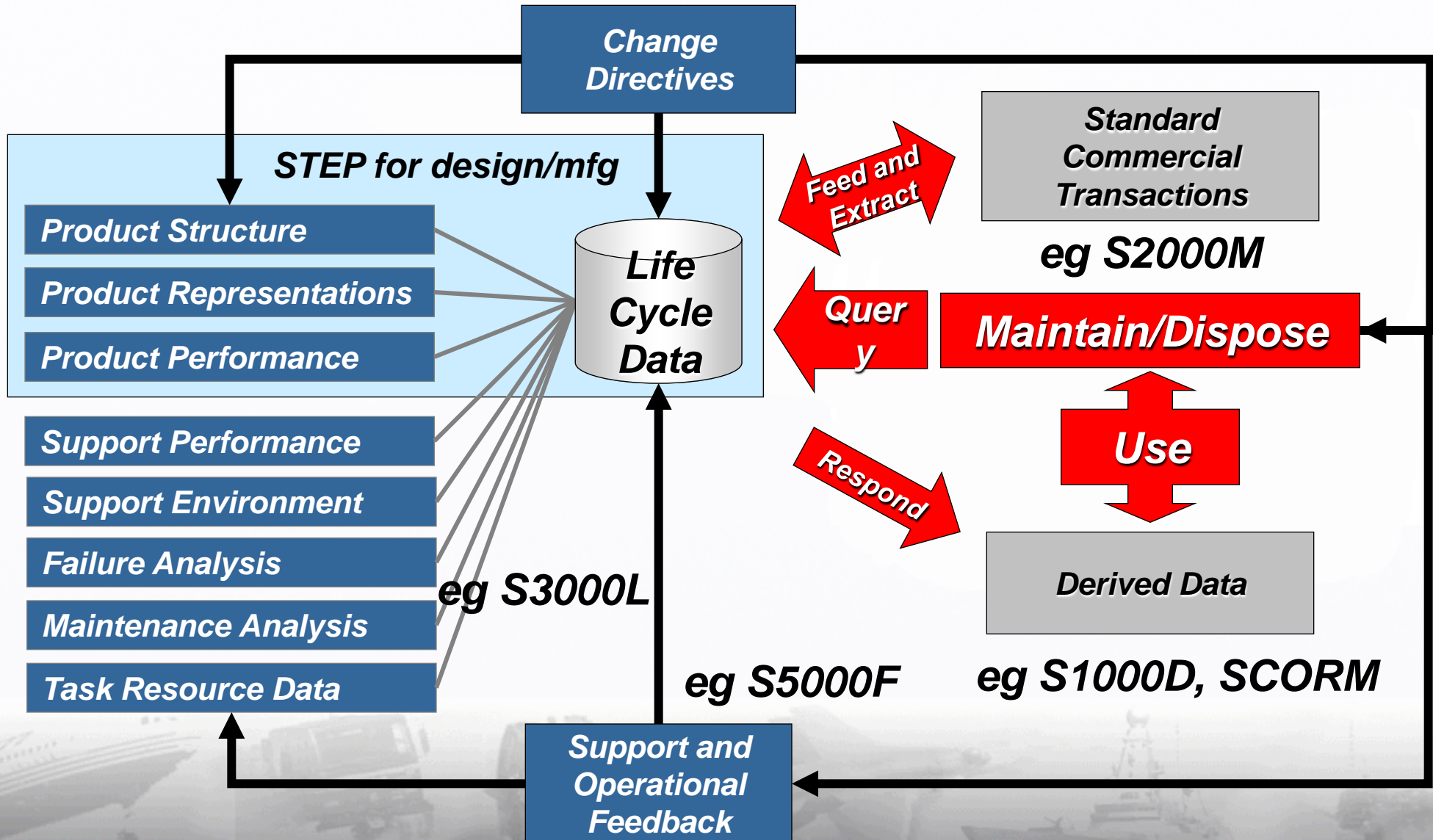
# Product Life Cycle Support (PLCS)

*PLCS enables cost effective information exchanges*



# Product Life Cycle Support (PLCS)

## The Vision



# Product Life Cycle Support (PLCS)

## Capabilities enabled by PLCS



### **Product Description**

*Capability to define product requirements and configuration, including relationships between parts and assemblies in multiple product structures (as-designed, as-built, as-maintained)*

### **Work Management**

*Capability to request, define, justify, approve, schedule and capture feedback on work (activities) and related resources.*

### **Property, State and Behaviour**

*Capability that describes and captures feedback on product properties, operating states, behaviour and usage*

### **Support Solution and Environment**

*Capability to define the necessary support for a given set of products in a specified environment and to define support opportunity, facilities, personnel and organizations*

- *A new vision for life cycle support*
- *A terminology dictionary*
- *An illustrative process model to provide data context*
- *A comprehensive data model, standardised through ISO 10303-239 (STEP AP239)*
  - ❖ *Compatible with other modular life cycle APs*
- *Capability to define data exchange specifications (constrained subsets of AP239)*
- *Capability to tailor or extend the data model or exchange specifications using external reference data (e.g. existing standards)*



- ***The Product in focus (PIF): “what products do you want me to support?”***
- ***A PIF will be supported by one or more support solution definitions: how to support these products***
- ***Each support solution definition is based on***
  - ❖ ***Deployment environment, with a matching***
  - ❖ ***Support solution requirement***
- ***The deployment environment defines:***
  - ❖ ***A product group – a subset of the PIF needing tailored support***
  - ❖ ***A usage pattern***
  - ❖ ***A definition of the expected support organizations, locations, facilities and resources***
- ***A support solution requirement is a structured requirement statement including performance metrics and targets for support performance***
- ***Support metrics are required to enable:***
  - ❖ ***Continuous optimization of support solution definition through life, based on feedback from use***
  - ❖ ***Specification of an assessment strategy (what data to collect and how)***

- ***(Each) Support solution definition includes:***
  - ❖ *Task specifications and task logic (e.g. diagnostic procedures)*
  - ❖ *Relationship of tasks to the product configuration (including “effectivity” /“applicability” to all product versions)*
  - ❖ *Specification of task trigger conditions based on:*
    - *State of individual product (as identified by UID)*
    - *Usage of individual product*
    - *Prior task or other events*
  - ❖ *Identification and quantification of resources needed for each task, including a resource consumption model*
- ***Task specifications may:***
  - ❖ *point to an existing document*
  - ❖ *point to an SGML document (e.g. collection of ASD S1000D modules)*
  - ❖ *be fully “machine readable”*
- ***Task specifications may be linked to resources***
  - ❖ *Required resources*
  - ❖ *Resource items (products, people, facilities etc)*

- ***DEXs are:***
  - ❖ *Subsets of the AP239 Information model*
  - ❖ *Selected to meet a specific data exchange need*
  - ❖ *Built from relevant modules*
  - ❖ *Supported by usage guidance, capabilities, templates and reference data*
  - ❖ *Can be refined from other DEXs*
- ***DEXs may be standardized at any level (work group, company, project, organization, national, international)***
- ***DEXs enable***
  - ❖ *Consistent implementation of AP239*
  - ❖ *Data consolidation through time*

- ***PLCS standard published 2005 by ISO as modular STEP AP***
- ***Modules published by ISO as Technical Specifications:***
  - ❖ ***PDM modules***
  - ❖ ***PLCS modules***
  - ❖ ***AP239 information model***
- ***First two DEX completed first Public Review***
  - ❖ ***Task Definition***
  - ❖ ***Aviation Maintenance***
- ***Publication as OASIS library as new DEX are added***
- ***Open-source DEX development environment in place***

***[www.plcs-resources.org](http://www.plcs-resources.org)***

- ***OASIS DEX***
  - *Product Breakdown for Support*
  - *Product as Individual*
- ***US Army LOGSA – 9 DEX including GEIA-STD-0007***
- ***Swedish FMV – Item of Supply and SLCM***
- ***Norwegian DLO – 7 Business DEX including IUID, Maintenance***
- ***UKMoD – 44 business DEX defined***
- ***ASD Technical Data Package***
- ***ASD S3000L***
- ***ASD S5000F***

# Current implementations

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- ***Norwegian frigate***
  - ❖ *Extending to other NDLO programmes*
  - ❖ *Joint project with USMC*
- ***Being promoted actively for JSF (incl JSF4i)***
- ***NATO/NAMSA - Nasams II***
- ***Visby Corvette***
- ***Gripen pilot project***
- ***BAE Systems Land Systems Hagglunds***
- ***Thales***
- ***US DoD ELITE project for UH-60 helicopter***
  - ❖ *Extending to other services as Aviation Maintenance DEX*
  - ❖ *Linked to UID*
- ***US Army deployment on HMMWV***
  - ❖ *Plans for Bradley*

# Current implementations

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- ***UK MOD pilots for RAF LITS and Navy UMMS***
  - ❖ *LITS mapping for eg Tornado ATTAC*
- ***UK MOD Logistics Coherence Information Architecture***
  - ❖ *Functional model jointly developed between industry and MOD*
  - ❖ *Support to IPTs through central Engagement Team*
  - ❖ *Process support through CBIS project*
- ***NOLITO***



# PLCS works!



- ***PLCS is accepted as an International Standard***
- ***PLCS has been shown to work as designed***
  - ❖ ***Integration architecture***
  - ❖ ***System mapping***
  - ❖ ***Standardised Interface***
- ***DEX development environment available***
  - ❖ ***Documentation***
  - ❖ ***Guidance***
- ***In use already***
- ***Designed to link to other standards***
  - ❖ ***S1000D***
  - ❖ ***SCORM***

