Product Life Cycle Support (PLCS)
Managing Product Support Information from Concept to Disposal

Setting the standard for product support

Howard Mason (BAE SYSTEMS)
Chairman of the Board, PLCS inc
Objectives of the day

- Overview of the PLCS initiative
  - Scope and features
  - Status
- Opportunities for exploitation
- Implementation plans
  - Vendors
  - Suppliers
  - Customers
- The way ahead for PLCS
- Questions?
The PLCS Initiative

- The Business Context
- Overview of PLCS
  - Vision
  - Scope
  - Deliverables
  - Capabilities
- Status
Setting the Business Context

Business Drivers

Reduced Cost of Ownership

- Users of products are seeking improved availability, reliability, maintainability and lower cost of ownership.

Protect investment in product data

- Users of information systems want more open platforms to reduce IT costs and ensure longevity in use of information

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
Setting the Business Context

Digital Product Data has become a valuable business asset

New Business Opportunities

- Leading manufacturers are ‘going downstream’ to generate additional revenue from supply of lifecycle support services

Product Lifecycle Management

- Increased focus on managing information throughout the product lifecycle – Concept to Disposal
- Businesses are focusing on total cost of ownership, as product life cycles increase and products become more expensive to maintain

Extended Enterprise

- Increasingly complex business networks
- Knowledge workers need to share information in real time
- Not practical to adopt common system mandate
- Internet technology changes everything
Setting the Business Context
Requirements of the Extended Enterprise

Extended enterprises are formed to meet project specific requirements

- Partners may differ from project to project
- Different partners are likely use different systems
- Companies want a common way to exchange digital product data
- Configuration Management becomes a key enabler for information exchange
- Suppliers want a unified approach from Prime Contractors and OEMs
- International collaboration demands product data exchange and sharing across many organizations
- Worldwide operation demands a worldwide standard
Setting the Business Context

Configuration Management is a major challenge

- Multiple product views
- Major problems keeping information to operate and maintain a product aligned to actual product configuration through life
- Major problems linking support information to product information
- Software applications use proprietary data standards and are often difficult to integrate
- Inconsistent data definitions
Setting the Business Context

Limitations with current standards (1998)

**Transaction Centric**
- Defence: AECMA 2000M
- Commercial: ATA Spec 2000, Edifact, ANSIx.12

**Content Centric**
- CAD Models/PDM: ISO 10303 (STEP)
- Configuration Management (EIA 649+)
- Logistic Support Analysis: MIL-STD-1388, Def-Stan 00-60

**Presentation Centric**
- AECMA Spec 1000D
- ATA Spec 100

**Current (1998) standards for product support information:**
- Address individual processes, not life cycle management
- Use different technologies
- Have gaps, conflicts and overlaps.
- Predate the internet age
**Setting the Business Context**

**Available capabilities - ISO STEP**

**STEP is an established international standard for the exchange, integration and sharing of product data**

- Geometry
- Product structure
- Manufacturing interfaces
- Drawings

**STEP Release 2 covers new functions:**

- Finite Element Analysis
- Printed Circuit Assemblies
- Wiring looms
- Mechanical Design
- Construction industry

**XML for the Web**
Eurofighter Typhoon
STEP in service

Structural build work share
- 37.5% BAE SYSTEMS
- 30% EADS-Germany
- 19.5% ALENIA
- 13% EADS-CASA

Suppliers

National and export customers

Common supplier base
Concurrent product development
Four assembly lines
Eurofighter PDM Data Exchange
STEP in service

Partners use different PDM systems
- ProductManager (BAE SYSTEMS, Alenia),
- MetaPhase (EADS-Germany)
- Optegra (EADS-CASA)

Exchange required to support
- Configuration management
- Product Structure release
Setting the Business Context

STEP in service

Supplier interface for Lockheed Martin
Configuration Management and Digital Pre-Assembly exchange at Boeing - RR, GE and P&W
Interface between A380 and its engines
IBM's global e-procurement design data exchange
Solid model exchange for Electric Boat
US and UK Navy RAMP programmes
Japanese SCADEC programme for the construction industry
Ford CAD/PDM data integration
NASA Engineering information
Overview

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
Overview
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 Life Cycle Support (PLCS)

Membership

Finnish Defence Forces

FMV

The Royal Norwegian Ministry of Defence

Alvis Hägglunds

Aerosystems International

Baan

Boeing

BAE Systems

Defence

Det Norske Veritas

DNV

Defense

Industry

Industrial & Financial Systems

LSC Group

Pennant

SAAB

SEDA

Rolls-Royce

SAAB Technologies

SAAB Group

Saab

Some other

System

The Swedish Defence Materiel Administration

United States Army

United States Navy

United States Air Force

United States Space Force

United States Marine Corps

United Kingdom Ministry of Defence

United States Space Force
Product Life Cycle Support (PLCS)
The Initiative

A joint industry and government initiative to accelerate development of new standards for product support information

An international project to produce an approved ISO standard within 4 years; commenced November 1999

PLCS will ensure support information is aligned to the evolving product definition over the entire life cycle

PLCS extends ISO 10303 STEP - the STandard for Exchange of Product model data

www.plcsinc.org
Product Life Cycle Support (PLCS)
The Vision

Scope of STEP Today
- Product Structure
- Product Representations
- Product Performance
- Support Performance
- Support Environment
- Failure Analysis
- Maintenance Analysis
- Task Resource Data

Change Directives

Life Cycle Data

Maintain/Dispose

Use
- Derived Disposable Data

Support and Operational Feedback

Standard Commercial Transactions

Feed and Extract

Query

Respond

Derived Disposable Data
Product Life Cycle Support (PLCS)

Typically complex systems environment – point to point integration
Product Life Cycle Support (PLCS)

PLCS will enable cost effective information exchanges

In future, support system integration will be easier to implement
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

Extended Enterprise of OEM’s, Customer, Partners and Suppliers

Enterprise Integration through dedicated networks

Domain specific information systems (e.g. CAD, MRPII, Planning)

Define and implement the support solution, maintain the product configuration

Operational Feedback

Product Life Cycle
Product Life Cycle Support (PLCS)

Extended Enterprise – Importance of PLCS

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

Typically 25 – 50 years Operational Life

PLCS Domain

Design for Supportability

In Service Support and Operational Feedback

Product Life Cycle

Extented Enterprise Integration

Dept

Customers

Enterprise

Tier 2

Partners

Tier 1

Suppliers

Typically 25 – 50 years Operational Life

5 – 10 years

In-Service
Product Life Cycle Support (PLCS)
Example: PLCS for MOD and Defence Contractors

Multiple Contracts with UK Defence Contractors

ISO 10303 STEP, AP 239 (PLCS)

MOD Databases for Product Support
Product Life Cycle Support (PLCS)

Goals

**PLCS Standard:**
- Improve product availability
- Reduce operating, support and maintenance costs
- Improve quality and accessibility of Product Life Cycle Support information

**PLCS, Inc:**
- Accelerate technical development of the ISO standards
- Encourage early implementation commercial software vendors
- Encourage early industry participation in the development and testing of the standard
Product Life Cycle Support (PLCS)

Deliverables

- A new vision for life cycle support
- A terminology dictionary
- An illustrative process model (Application Activity Model)
- A large data model, standardised through ISO (AP239)
- An extensible set of data exchange standards (constrained subsets of AP239, with implementation guidance)
- Improved capability to tailor or extend the data model or exchange sets using “reference data” (with maximum re-use from current standards)
- A standardised interface to one (or more) transaction standards/systems .. (ebXML, Exostar, 2000M?)
Product Life Cycle Support (PLCS)

Capabilities enabled by PLCS – ISO 10303 AP 239

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
Product Life Cycle Support (PLCS)
Unique Value Proposition

- **International Standard** for product support information - based on ISO 10303 STEP (AP 239)
- **Complete product lifecycle** – from concept to disposal
- **Single source** of assured product and support information
- **Data independence** - Processes, Systems, Format
- **Interoperability** across enterprises and systems through:
  - Standardization of semantics for product support
  - Integrated suite of data models for data exchange and information sharing
  - Utilization of ISO STEP standards, methods and tools (incl XML/XSLT)
- **Extensibility and tailoring** through the use of Reference data libraries

Customers, Contractors and Software Vendors
working together to develop and implement
a neutral data exchange standard for product support
Current situation (November 2003)

- Activity Model published (available to all)
- 1750 requirements allocated to ~130 modules
- Module development completed:
  - PDM Modules are now stable as ISO Technical Specifications
  - All PLCS modules unanimously accepted as ISO Technical Specifications
  - AP239 information model available
- Draft International Standard ballot for Application Protocol due to start in November 2003
- Development of first eight Data Exchange Sets under way
- Launch events in September in Scandinavia, US and UK
- Future organisation in place - transition under way
- Implementation activities are gaining momentum in UK, Norway, Sweden, Finland and US
MEMORANDUM FOR THE AIR FORCE ACQUISITION EXECUTIVE
NAVY ACQUISITION EXECUTIVE
ARMY ACQUISITION EXECUTIVE

SUBJECT: Strategy for Product Data throughout the Life Cycle

1. Last year, we evaluated the benefits of standardizing on common product data exchange requirements. In particular, we were interested in standards that would allow engineering data developed under one automated design tool to be read and manipulated by design teams using different automated tools. We determined that the existing ISO 10303 (Standard for Exchange of Product model data – STEP) met our military aeronautical requirements, and that it was widely used by the commercial aerospace community. As a result, we have approved the use of STEP throughout our commands. Since STEP is a standard with many applications beyond aerospace (e.g., it is required in Navy shipbuilding), we encourage you to consider its use in other sectors.

2. Our implementation approach will be to use STEP in new aerospace system designs and major modifications to existing systems unless either the cognizant FEO or Systems Commander approves a waiver. The services have agreed and hence its use should be considered mandatory. Where a business case supports this, we are also encouraging the use of STEP for legacy systems.

3. The use of STEP will give us the greatest flexibility to take advantage of new computer design and support tools, but the real benefit to our services will be seen in reduced cost and cycle time, and in improved supportability. I would be pleased to arrange a briefing on STEP and our intended implementation, if you would like.

4. My point of contact for this subject is Mr. James Arnold, ASC/ENSMS, DSN 785-9833, email: James.Arnold@wpafb.af.mil.

RICHARD V. RINER
Lieutenant General, USAF
JACG Chairman

Attachment:
ISO 10303 Point Paper

MOD Announcement - 2000-11-14 Defence Contracts International

The MOD now specifies the electronic exchange of product model data in many of its contracts. In January 2003, the Department will introduce a new policy that, wherever this is required, IS 10303, Standard for the Exchange of Product Model Data (STEP) will be adopted as the uniform standard of preference.

STEP is a standardised way of structuring information to reflect the needs of supported business process. It provides implicit quality assurance to improve reliability and eliminate transcription errors and is based upon sound computer science principles, which aim to make the standard extensible and not technology limited, hence maximising longevity. STEP provides a mechanism for handling archive, and over time, legacy data.

Early parts of the International Standard were released in 1993 and development has continued through the implementation of its Application Protocols. STEP is already in use in the aerospace industry (including Boeing, BAE SYSTEMS, and Rolls Royce), the automotive industry (including BMW, Mercedes Benz and Volkswagen) and in the US and UK defence departments (including the Rapid Acquisition of Material Parts - RAMP - initiative).

Between now and January 2003, the MOD and appropriate industrial partners will be conducting a number of pilot implementations of the standard to develop the necessary expertise.
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Supplementary slides
Product Life Cycle Support (PLCS)

Inputs to the Initiative

- NATO Pilot Project #1
- ISO 10303 AP239
- Mil Spec CM2549
- ATA Effectivity AP208
- POSC/ Caesar
- FMV CTG2
- Def Stan 00-60
- ALIS
- NCDM
- ISO TC184/SC4 WG3/T8 PWI
- AP233
- AECMA 1000D 2000M
- PDM Schema
- ISO 15288
- OMG
- PLIB
- + Others