t23plan7.pdf

ISO TC 184/SC 4/WG 3/T 23 (Ship Team)
APPLICATION PROTOCOL PROJECT PLAN

1. Application protocol project plan title:

Ship Product Model Data Exchange

2. Date of project plan:

original, 1992/06/11 (Identifies ship industry needs and intentions)

revision 2, 1998/02/04 (Identifies the assigned AP numbers for the ship functional exchange areas)

revision 3, 2000/07/31 (Cancels AP 217, Ship piping, and replaces it with AP 227, Plant spatial configuration, and adds AP 212, Electrotechnical design and installation)

revision 4, 2001/04/25 (Organizes APs by Structural Envelope (APs 215, 216,218), Distributed Systems (AP 212, 227), and Mission Subsystems/Equipment

revision 5, 2002/06/11 (Adds Annex of T 23 needs)

revision 6, 2003/06/27 (Cancels APs 226/234 and adds ship through life system level APs 233/239)

revision 7, 2003/09/20 (Adds manufacturing APs 238/240)

3. Nominator:

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4. Proposal advocates:

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5. Scope of the AP planning project:

The ship design, construction, operation and life cycle support process is one of the most complex found in the engineering world.

5.1. Product descriptions
The Ship Team (T 23) Application Protocol (AP) Project Plan identifies the key ship product information that we need to be able to exchange between dissimilar product model definition systems.

Ship Through life Management
AP 233 - Systems engineering data representation
AP 239 - Product life-cycle support

Ship Manufacturing
AP 238 – Application interpreted model for computer numeric controllers (STEP-NC)
AP 240 – Process plans for machine parts

Structural Envelope Systems
AP 215 - Ship arrangement
AP 216 - Ship moulded forms
AP 218 - Ship structures

Distributed Systems
AP 227 - Plant spatial configuration (piping, HVAC, cableways, mechanical systems)
AP 212 - Electrotechnical design and installation

Equipment/Subsystems
ISO 13584 - Parts library
ISO 15926 - Oil and gas

Ship structural envelope system APs is the only area that needs unique ship APs. System level data, distributed systems, and subsystems/equipment are covered with APs and library standards that are generic and interoperable with aeronautical, automotive, and facilities/process plants.

5.2. Process Descriptions
The project plan concerns itself with four major application areas that correspond to four major stages of a ship's life cycle. The specific lifecycle and applications to be supported by ship application protocols include, but are not limited to:

Contract/Functional Design Phase
Equipment arrangement and connectivity check
Design analysis
Graphic representation
Classification type approval
Logistic Analysis

Detail Design Phase
Interference analysis
Connectivity check
Bill of material
Design engineering analysis
Graphic representation
Version control/Configuration Management
Classification design approval
Logistic Analysis

Production Engineering Phase
Fabrication and assembly
Installation and assembly
Version control/Configuration management
Manufacturing survey
Testing

Operation Phase
Support engineering
Operational survey (Class, flag states, port authorities)
Condition monitoring
Performance analysis
Management and control systems
Maintenance
Logistic support
Version control/Configuration management

Information exchange is an iterative process that requires exchange of data amongst Computer-Aided Design (CAD), Computer-Aided Engineering (CAE), Computer-Aided Manufacturing (CAM), Product Data Management systems and logistics systems. The standards also provide for long-term data retention.

6. Evidence of industry need for APs in this domain.

The activities associated with design, construction and service life support must be accomplished by numerous different organizations, including prime contractors, design agents, shipbuilders, equipment vendors, classification societies, logistics agents and operators. The APs developed will enable the exchange of marine industry information between successive agents in this process. Within an e-business environment all information should be exchanged/shared electronically, this includes the design and associated product information. Continued participation by the Marine e-business Standards Association (EMSA) headquartered in Europe, Japanese Marine Standards Association (JMSA), Korea STEP Center, and the Navy/Industry Digital Data Exchange Standards Committee (NIDDESC) in the US and other suchlike national organizations show this effort is important to national initiatives. A Memorandum of Understanding was signed by EMSA, NIDDESC, JMSA, and Korea STEP Center in February of 2001 to document their intention to continue past cooperation.

General T 23 needs are ranked based on an informal survey of the step-ship email list members:

1. Implementation of ship structural envelope and distributed system APs
2. Implementation of Product Life Cycle Support Suite APs
3. Implementation of Engineering Analysis Suite APs
4. Development of ship mission subsystem/equipment APs
5. Implementation of parts library and catalog standards
6. Implementation, and validation of Manufacturing Suite APs
7. Supply Chain Support
8. PDM Schema
9. Enhance distributed systems APs
10. Enhance ship structural envelope APs
11. AP modernization, interoperability, and simplification

Descriptions of these T 23 opportunities are in an Annex to the plan.

7. Ship Specific APs

The list of APs shown below are designed specifically for naval architecture needs providing the totality of hull design and ship arrangements.

Title	Part	Publication
Ship arrangement	AP 215	2004/02
Ship moulded forms	AP 216	2003/08
Ship structures	AP 218	2003/04

8. Relationship to other APs:

Almost every AP can be used by almost every industry. There are APs that are considered key to ship industry processes. Many of these are not under WG 3/T 23 (ship team). There are other working groups in SC 4 that are addressing some of the functional areas that are relevant to ship product model data exchange.

Ship Through Life Management

Title	Part	Publication
Systems engineering data representation	AP 233	2005/01
Product life-cycle support	AP 239	2003/12

Distributed Systems

Title	Part	Publication
Plant spatial configuration (piping, HVAC, cable trays, mechanical)	AP 227	2004/05
Electrotechnical design and installation (electrical)	AP 212	2001/03

Ship Manufacturing

Title	Part	Publication

AIM for computer numeric controllers	AP 238	in work
Process Plans for Machine Parts	AP 240	in work

Mission Subsystems and Equipment

Title	Part	Publication
Parts Library	ISO 13584	Available
Oil and Gas	ISO 15926	Available

WG 3 projects are emerging for Composite and Metal Structural Analysis and Related Design (AP 209) and Furniture product and project data (AP 236) and that are important for ship product model data exchange.

Also under SC 4, WG 2 is addressing Parts Library (PLIB) that is critical for the efficiency of product model data exchanges for large assemblies such as ships.

9. Current participants and committed resources for the AP planning project:

There have been long-term resources committed by organizations to improve ship data exchange.

Organizations:
Europe - Marine e-business Standards Association (EMSA)
Asia - Japan Marine Standards Association (JMSA) and the Korea STEP Center
US - Navy/Industry Digital Data Exchange Standards Committee (NIDDESC)

These organizations have undertaken numerous projects to develop and test the T 23 and ship related APs and they have freely shared the results.

Projects:
Agder (In-process)
Calypso (Complete)
EDIMAR (Complete)
EMSA Tasks (Complete)
ESTEP (In-process)
Harvest (In-process)
KS-STEP (In process)
MariSTEP (Complete)
MARVIN (Complete)
MOSYS (Complete)
SEASPRITE (Complete)

ANNEX - Description of Team Needs

1. Structural Envelope and Distributed Systems APs
Implementation and validation of commercial translators for Shipbuilding Suite of APs (AP 215, 216, 218, 212, 227). Getting a return on the investment that the participants have made is of vital importance to the T 23 membership.

2. Product Life Cycle Support Suite APs
Development, implementation, and validation of Product Life Cycle Support Suite APs and commercial translators to support shipbuilding requirements (APs 201, 202, 203, 232, 239, etc) is an opportunity to make use of the efforts other industries. Participation in these APs enables T 23 to include ship requirements in their development and provides additional reasons for software vendors to provide commercial translators.

3. Engineering Analysis Suite APs
Development, implementation, and validation of Engineering Analysis Suite APs to support shipbuilding requirements (APs 209, 212, 227, 233, 237, etc) is an opportunity to improve design processes and ship quality. This effort is leveraged by the active participation of other industries. CAD to CAE interchange is an important aspect of in internal and external exchange functions.

4. Mission subsystem/equipment APs
Development, implementation, and validation of mission subsystem/equipment APs (AP 226, outfit and furnishings (possibly AP 236), electronics, weapons, etc) is an important part of T 23's four major application areas: Contract/Functional Design Phase, Detail Design Phase, Production Engineering Phase, and Operation Phase. The description of these systems enables the exchange of fishing systems, cargo handling equipment, deck machinery, weapons, and other the other equipment that give a ship its reason for existence.

5. Part libraries and catalogs
ISO 13584 Parts Library (PLIB)
PLIB supports part catalog exchanges by providing a mechanism to map vendor catalogs to customer buying systems or CAD parts libraries. Harmonization of ship APs with PLIB can simplify them APs and ship product model data exchanges.
ISO 15926 Oil and Gas (STEP Library)
Supports reference data libraries of all kinds, but it was started for the oil and gas industries.

6. Manufacturing Suite APs
Development, implementation, and validation of Manufacturing Suite APs to support shipbuilding requirements (APs 212, 213, 215, 218, 219, 224, 227, 238, etc) can help improve ship quality and cost. CAD to CAM interchange is an important aspect of in internal and external exchange functions. This effort is leveraged by the active participation of other industries.

7. Supply Chain Support
The electronic commerce infrastructure that is developing is providing opportunities for using digital data exchange tools to improve cost, speed, and quality with hardware vendors and subcontractors. Major industries need to assist small and medium sized enterprises with education, policy guidance, catalog exchange implementation, product model exchange implementation, and other aspects of the movement from paper exchange processes.

8. PDM Schema
All STEP APs define an information model for the exchange of product data for their particular domain. But even though the AP domains may be dissimilar, there is a common set of data structures used by APs for data exchange. At the core of these structures is product identification. A product in STEP represents the concept of a general managed item, and may be interpreted as either a Part or a Document. Also at the core is product

classification. Classification of products is important for information classification and retrieval.

The Product Data Management (PDM) Schema is the reference information model containing these concepts, it represents the intersection of requirements and data structures from a range of STEP Application Protocols. Edition 2 of AP 215, AP 216, and AP 218 could use the PDM schema, thus harmonizing the Ship APs with STEP architecture and other APs.

9. Distributed Systems APs

Additional development/enhancement of the distributed systems APs (APs 212, 227, resolve cableway overlap) is an opportunity to add increased functionality.

10. Ship Structural Envelope APs

Additional development/enhancement of the ship structural envelope APs (APs 215, 216, 218) is an opportunity to add increased functionality.

11. AP Modernization

New Application Interpreted Constructs (AICs) for ship common model building blocks:

There are several units of functionality (UoFs) that are common between the Ship APs. For example: location_concepts, definitions, items, or ship_general_characteristics. Currently all of the application objects defined in these UoFs are defined in all of the Ship APs. This causes redundancy, and a large possibility of error and inconsistency. The better approach is to remove these UoFs and their objects from all of the Ship APs and define them in a separate ISO standard document called an Application Interpreted Construct. The Ship APs would normatively reference these AICs. Any additional new Ship AP ever developed would also reference these AICs as needed.

Modular technology for ship common model building blocks:

Modules are similar to AICs but more granular. Using the AIC approach Ship_general_characteristics would be a single AIC. All objects like Class_notaion, Class_parameters, Lightship_definition, etc. would all be contained in this single AIC. Modules are more granular so objects like Class_notaion, Class_parameters, or Lightship_definition would be defined in separate modules. Using the AIC approach, when the Ship AP references an AIC it gets all of the objects, even objects that may not be needed. With the module approach the Ship AP would reference only the objects required.

Use of subtypes:

There are several ways to constrain STEP data structures used by an AP. The current Ship APs do not subtype STEP data structures, but write all constraints as global rules. AP 218 has over 350 global rules, AP 216 has over 100 global rules, and AP 215 has over 250 global rules. This is difficult for implementors. These global rules are in an alphabetical order in the document, it is not intuitively obvious to the implementor which rules are needed for implementing an AP requirement. An alternative approach is to subtype STEP data structures and add local constraint rules on the subtypes. If this method was used the global rules for these APs would be reduced to 5 or 10. Subtypes would be created and the global rules would be distributed down to the appropriate subtype. Each subtype would have 5 to 10 rules. Using this method a subtype and the associated local rules represents the implementation of a specific AP requirement.