



Navy Product Data Initiative Overview

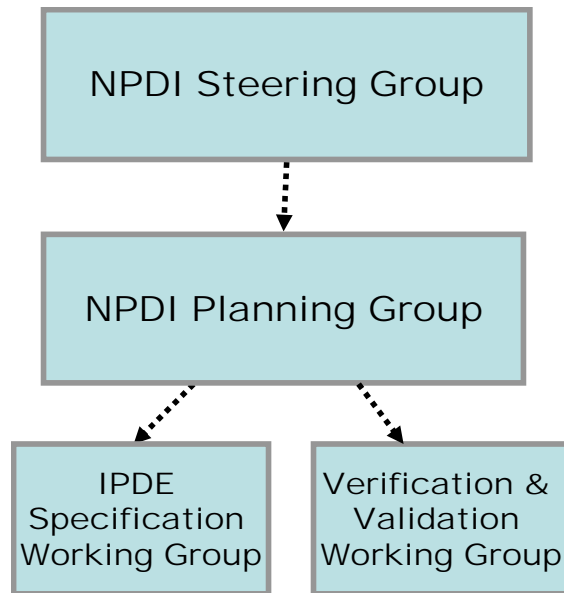
May 2007



Objective

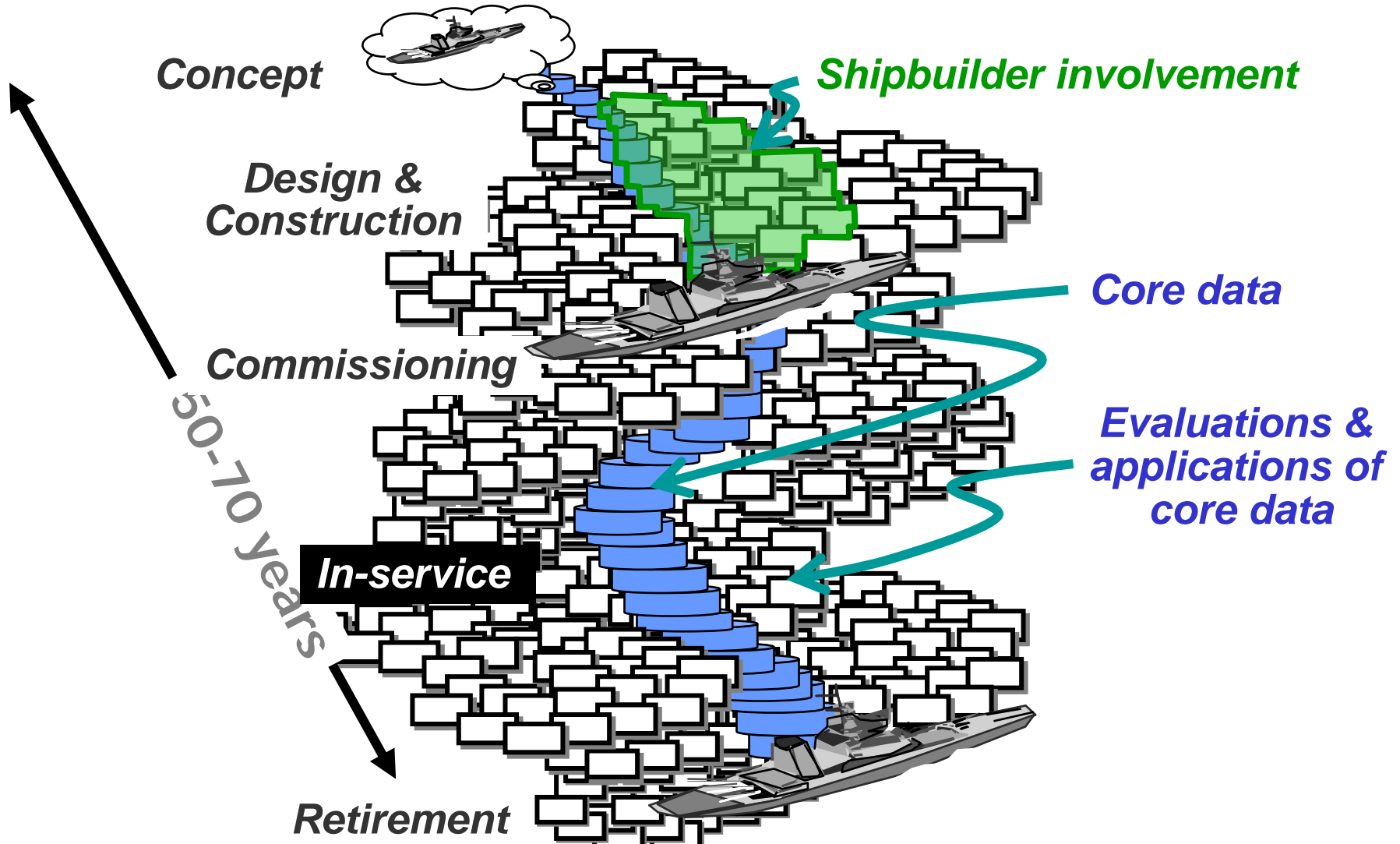
To specify the requirements for and drive the implementation of product data systems based on an open architecture having suitable functionality and enterprise-wide interoperability to support affordable Navy ships design, construction and service life support.

Navy Product Data Initiative Organization



- NPDI Steering Group: Deputy PEOs (Subs, Ships, Carriers), NSRP ECB
- NPDI Planning Group: Representatives from NAVSEA, PEOs, Shipbuilders
- NPDI IPDE Specification Working Group: membership includes NGSS, NGNN, GDEB, NASSCO, NGIT, NSWC Carderock, CSC
- NPDI Verification and Validation Working Group: combination of PG and WG augmented as needed

Ships Information Life Cycle



Navy's need for ship information is long lasting

What's Out There Today?

Program	Location	3D CAD
CV(RCOH)*	NGNN	AutoCAD
CV(RCOH)*	NNSY	AutoCAD
CVN 21	NGNN	Catia 4 AEC
CVN 21	EB	Catia 4 AEC
DD(X)	BIW	Catia 5
DD(X)	NGSS Pascagoula	Catia 5
DDG 51	BIW	CADDS 5
DDG 51	NGSS Pascagoula	Dim 3
DDG 51	LM	AutoCAD
DDX	NGSS Pascagoula	Catia 5
DDX	BIW	Catia 5
Deepwater	NGSS Avondale	Ship Constructor
LCAC	Textron	AutoCAD
LCS LM*	LM	Ship Constructor
LCS LM*	Marinette	Ship Constructor
LCS LM*	Bollinger	Ship Constructor
LCS GD*	BIW	AutoCAD
LCS GD*	Austal	AutoCAD
LHA 6*	NGSS Pascagoula	Velum/AutoCAD
LHD 8*	NGSS Pascagoula	Velum/AutoCAD
LPD 17	NGSS Avondale	ISDP
LPD 17	BIW	ISDP
LPD 17	NGSS Pascagoula	ISDP
SSN 21	EB	CADDS 3
SSN 21	NGNN	VIVID
SSN 23	EB	Catia 4 Mech
SSGN*	EB	Catia 4 Mech
T-AKE	NASSCO	Tribon
Virginia	EB	Catia 4 Mech
Virginia	NGNN	Catia 4 Mech
* ship partially modeled in 3D		



Navy Product Data Initiative

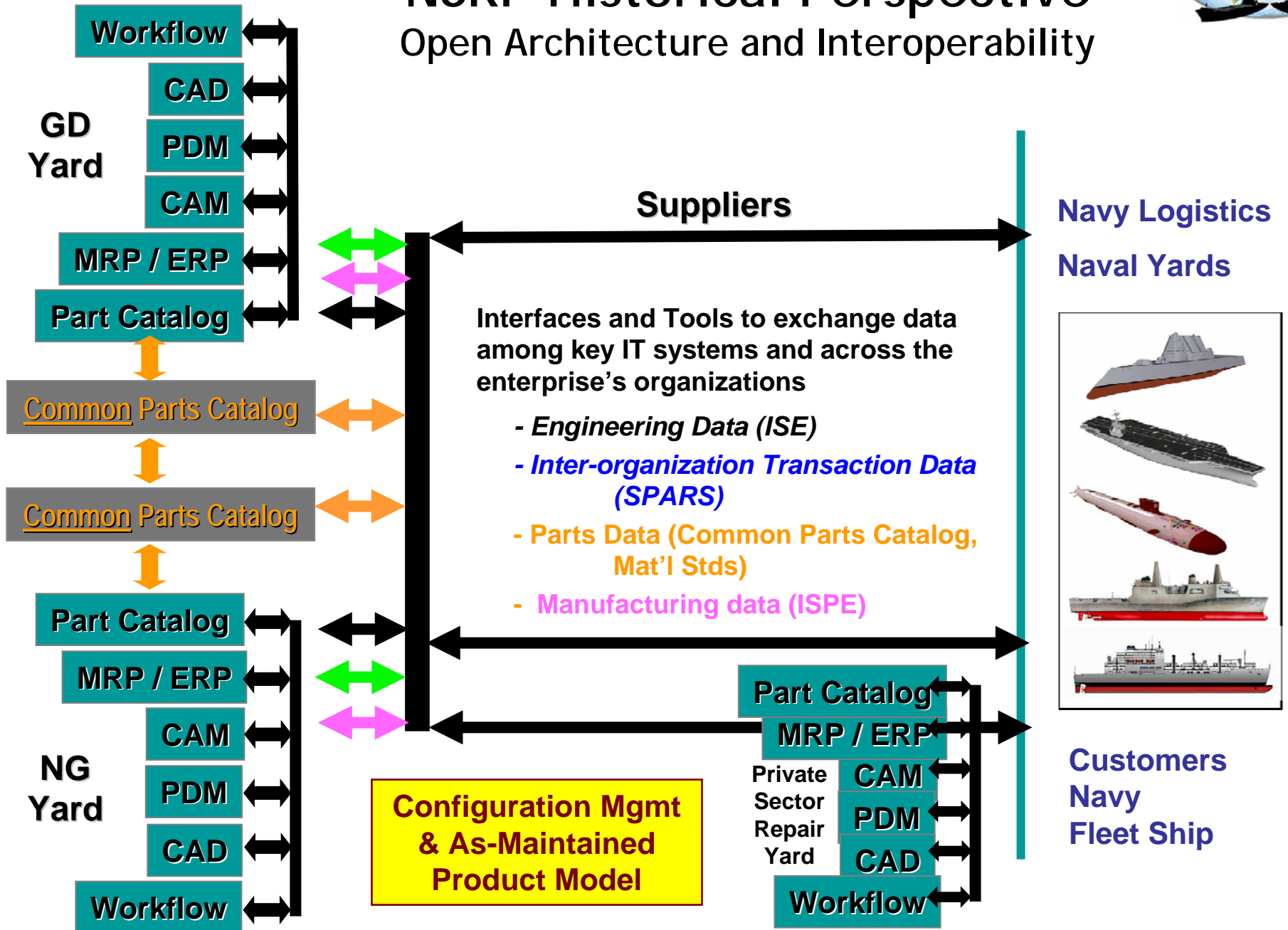
- **WHY**
 - High cost of Naval shipbuilding and the cost of making changes
 - Cost of Development, Implementation, and Maintenance of Integrated Product Data Environments (IPDEs) -- Each new Program specifies different IPDE requirements
 - Application and Data Architectures Limit Access, Interoperability, & Re-use
- **NSRP assembled an industry planning team in response to a Navy request to develop an Industry-wide approach to more effective Integrated Product Data Environments (IPDEs).**
- **NPDI is a four-phased Navy/industry shipbuilding enterprise effort**
 - Phase 0 defined the initiative.
 - Phase 1 was a five month planning effort to develop the IPDE specification outline and Concept of Operations.
 - Phase 2 is approximately a one-year effort to
 - develop the initial Navy IPDE specification to be invoked in future shipbuilding and ship repair contracts;
 - develop a verification mechanism to measure specification compliance; and,
 - stakeholders planning for implementation.
 - Phase 3 is the implementation phase
- **Phase 0 and Phase 1 are complete. Phase 2 is starting up.**

Definitions

- **Open Architecture**
 - An architecture whose specifications are public. This includes officially approved standards as well as privately designed architectures whose specifications are made public by the designers.
 - The opposite of open is closed or proprietary.
 - The great advantage of open architectures is that anyone can design add-on products for it.
- **Integrate Product Data Environment (IPDE)**
 - An information rich electronic environment that integrates technical and tactical information.
 - It provides those who design, acquire, use, and support a product with the technical and management information needed to field, operate, and sustain affordable, effective products and to achieve major reductions in process cycle times.

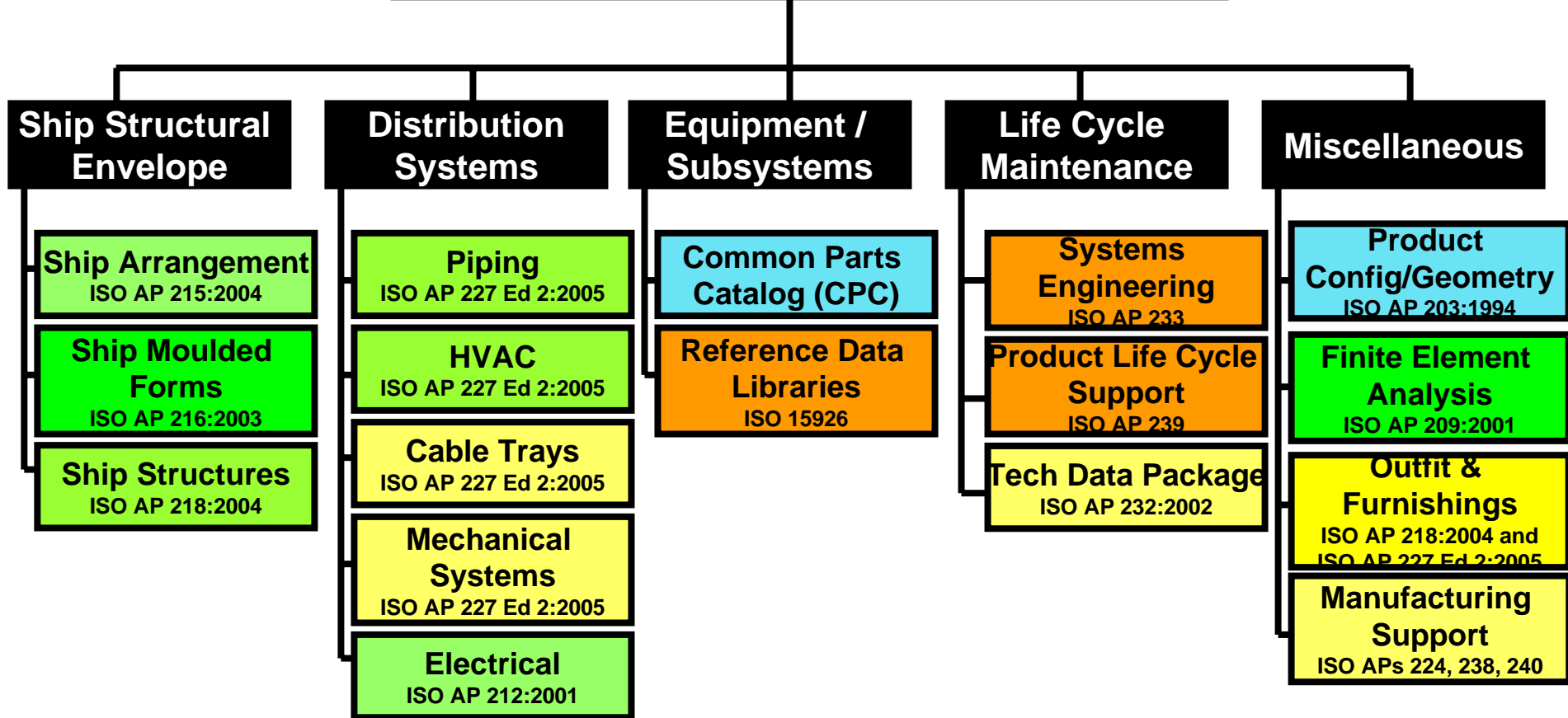
NSRP Historical Perspective

Open Architecture and Interoperability



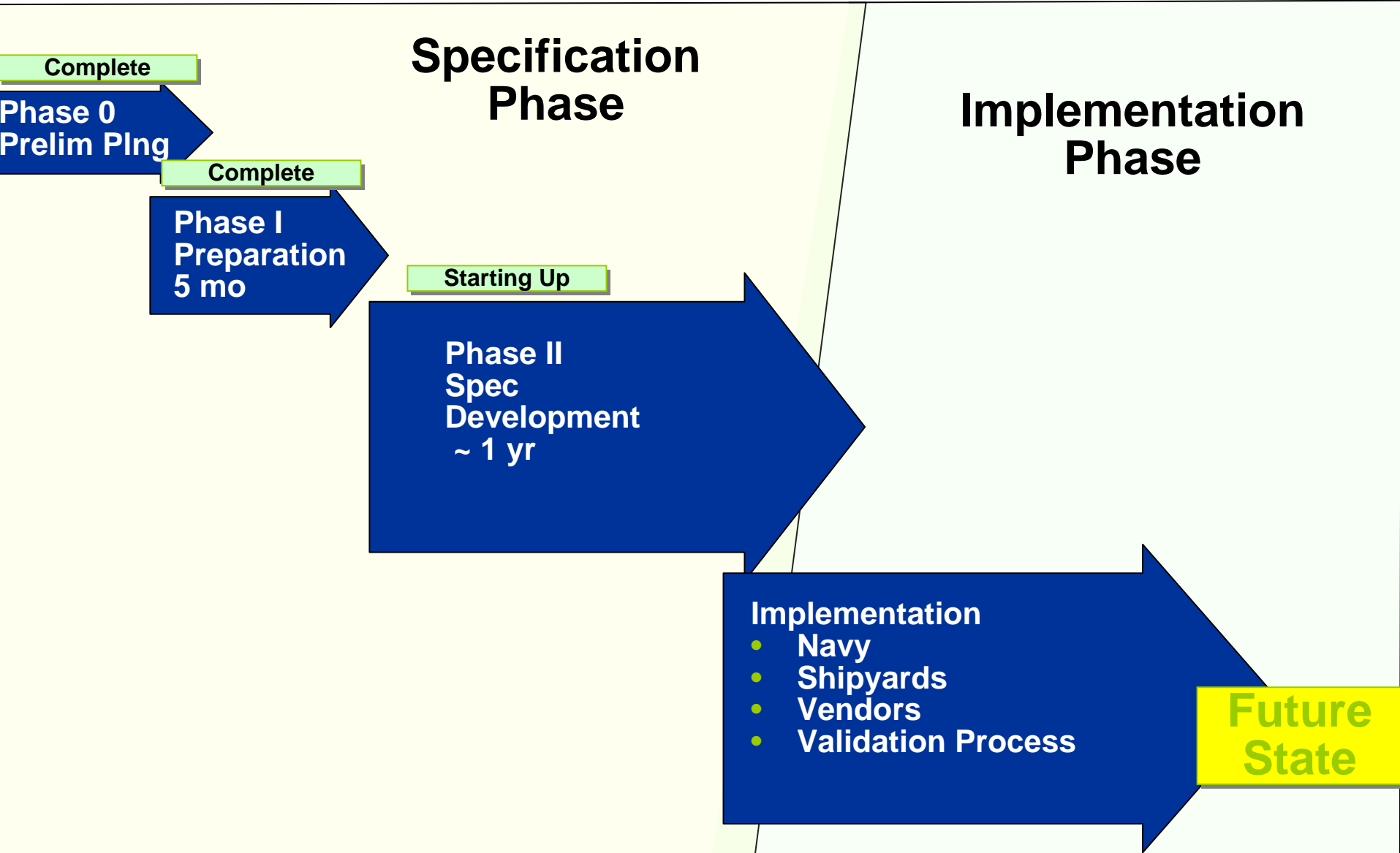
ISO/STEP Standard Readiness

Ship Product Model Data



Standard Development	Standard Published	Information Model	Prototype Translators	Testing Framework	Deployment, integration, testing
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Way Ahead



Initial IPDE Specification In Scope

Configuration management

- Configuration Units (class, flight, hull, system, assembly, Piece Part,.....)
- Access Control

Change Management

- Status Dependency Management

Collaboration

- Design in context (all disciplines working in same model)
- Planning
- ILS
- Construction
- Design reviews and oversight (internal and external)
- Interface requirements

In service support requirements

- As maintained product model/configuration

Interoperability

- Minimum data elements for various objects
- Data Exchange via Standards and Open Architecture



Initial IPDE Specification Out of Scope

Ability to handle various DOD security levels

Single sign-on

Implementation of Workflow Management

Defining what portion of the spec is to be met in CAD, PDM, or CAE system, etc...

Complete CAD/CAE/ERP/Catalog tool functionality requirements

Standard parts catalog

These requirements are not waived – just not included in the initial spec

Future State Vision

More capable ships will be delivered at a lower cost, with improved design-build cycle time, and with a significant reduction in the cost of changes. These gains will be achieved because:

- **Lower cost**

- Each Navy shipbuilder will be able to maintain a **single** IPDE
 - BUT Yards choose - Navy will NOT dictate which IPDE
 - No need to switch from program-specific IPDE to program-specific IPDE
- Individual IPDE components can be upgraded / replaced without major disruption
- Software cost and development risk for incremental IPDE improvements can be spread across multiple programs / yards for shared benefit

- **Improved design-build cycle time**

- Information will be readily communicated to other yards, suppliers, Navy, and classification society reviewers.
- Enhanced Sharing of Best Practices (e.g., Design Practices) across the Enterprise
- Best-of-breed software, including third party software, can be selected / shared

- **Reduction in the cost of changes**

- Non-value added labor will be reduced searching for, transforming, and validating ship info



Back Up Slides

Cost Drivers / Challenges with Current Integrated Product Data Environment Systems

Cost of Change

- Lack of Hull Effectivity Management
- Document-Based Data Management

Cost of Development, Implementation, and Maintenance

- Duplicated across software vendors and new Programs
- Eight to ten partially integrated systems among the shipyards
- Multiple systems at many shipyards
- Program integration costs \$10M - \$30M per year
- Ship lifecycles outlive information systems

Application and Data Architectures Limit Access, Interoperability, & Re-use

- Cannot easily access the data environments externally
- Inconsistent and varied sources of product information
- Closed or proprietary architectures impede migration to new technology & reuse across programs

Customer IPDE Requirements and Responsibilities

- Each new Program specifies different IPDE requirements
- Content and integrity of the “As-Maintained” IPDE product models in the fleet are not consistently maintained

NSRP tasked to outline an industry-wide approach to more effective implementation of IPDEs supporting Navy shipbuilding and service life support programs



Open Architecture with Standards-Based Interoperability

- Modular Design and Design Disclosure
- Reusable Application Software
- Interoperability [Joint Warfighting](#) Applications and Secure Information Exchange using Common Services
- Life Cycle Affordability
- Encouraging Competition and Collaboration through Development of Alternative Solutions and Sources
- *Enterprise ability to understand and Independently access Data Structure to the lowest levels*
- *Compliant with DoN Policy*

NPDI

The CNO’s vision for open architecture isn’t limited to “systems built to a set of open standards, but rather is focused on open business models for the acquisition and spiral development of the new systems that enable multiple developers to collectively and competitively participate in cost-effective and innovative capability delivery to the Naval enterprise.”

Open Architecture Systems Will Provide Navy Benefits, But Challenges Ahead ASN RDA Oct 2006

- Service officials acknowledge a number of challenges remain. One challenge is *defining the concepts of open architecture and open business models*
- "What we are working on now is trying to find the right business model to use for it," she said. "It's a complicated thing. For one thing, *getting everybody to agree on what we are talking about; everybody has different definitions.*"
- There are a lot of things that fall under the general definition of open architectures
 - Some have the source code available, some don't have the source code available, but they have ***ways to connect to the source code***, she added.
 - ***"Ideally you might like to have open source codes for everything, but that may not be possible"***. Some companies have proprietary things that are part of what gives them their business advantage.
 - ***"I don't think you have to have open source to have open architecture"***. Certainly open source codes contributes to open architecture"
 - "If you can do those things, then what you get are real important capabilities that allow you to address affordability. That's where we've got to go"
- Open business model will provide opportunities to have a bigger pool of companies competing for contracts
 - "Right now, there is no opportunity for these other folks to come in."
 - The key is in designing an architecture to: take advantage of commercial standards, the ability to pull pieces out and reuse them in other systems / platforms, and that allows 3rd party access.
 - "This is where we ***bring in a much larger pool of people to help us develop things***, [it] lets us access some of the people who haven't been involved because they didn't have the resources or capabilities to do the whole thing"
 - "This opens up [the process] for a lot more of the small businesses." The idea, however, is that all of these efforts are done with minimal dependency on the integrators. ***"Sometimes people like to say 'with no dependency,' but that is too hard to do."***
 - Navy wants a path that ***enables companies to compete for individual pieces***. A ***framework still has to exist***, and that's where the integrator comes in. "If you have a new capability you want to add, more than likely the integrator has to be involved, but they have minimal involvement"

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- "There's no time to continue debating and discussing; we have to move out."
- "Let's begin putting in place the business model. So ***our contracts need to be written where we have the ability to have the integrator that is designing the architecture in an open way so we can do competition for various pieces. So [that it is] easier to update with new functionality later on.***
- Etter believes it is important to pick some goals outlined at a high level, and then start hitting specific things to make headway.
- We have to interface that so we are not impacting the schedule, so we are not slowing things down.
- The Navy is also looking at how it can break up codes into small pieces, or functionalities. Although this idea is still a bit down the road, the Navy is hoping to come up with some tools to do it. ***"If you had tools that would take this and break this up into functionalities so that while it is pretty bound code it allows you to have interfaces into a piece of functionality"***.
- "It would allow us to go back to legacy codes and break [them] up into components that individually have an openness to them.

Interoperability Status

