

CASE STUDY:

WEB-ENABLED SYSTEMS ENGINEERING MANAGEMENT

CLIENT DESCRIPTION:

The North American Aerospace Defense Command (NORAD)/United States Space Command (USSPACE) Warfighter Support System (N/UWSS) provides real-time warning and assessment of possible attack from missiles, aircraft, and space threats. It provides the United States National Command Authority (NCA), the Unified Commanders-in-Chief (CINCs), and Canadian Authorities with the information necessary to confirm an attack, assess the attack size and targets, determine the aggressor, and support defensive and retaliatory decision-making.

The N/UWSS System exists as a complex grouping of inter-connected systems ("system of systems") which vary widely in age, technology, complexity, operational, maintenance and support postures, and projected life-cycles. There are over 350 component systems comprised of fixed and mobile command and control centers distributed throughout the globe, ground, air and space-based sensors, and fixed and mobile communication systems linking international facilities owned and operated by several countries and the major Air Force, Navy and Army Space commands.

In addition, there is significant diversity in the organizational structures, personnel resources, and budgets of the operating and supporting organizations for these component systems. All of these factors have resulted in the implementation, over time, of a broad range of system management, systems engineering, configuration management, logistics management, and data management postures, as each organization assumed its responsibilities based on the associated system acquisition, maintenance, deployment, and support strategies, and constraints.

The increasing requirements for engineering interoperability between the systems coupled with acquisition reform initiatives, force structural changes, budget reductions, and data digitization requirements, have driven a vital need for cost-effective managing and sharing N/UWSS life-cycle system technical baseline data with the Operational Command and Supporting Command organizations in a digital environment.

INTEGRATED WEAPONS SYSTEM DATABASE (IWSD) SYSTEM DESCRIPTION:

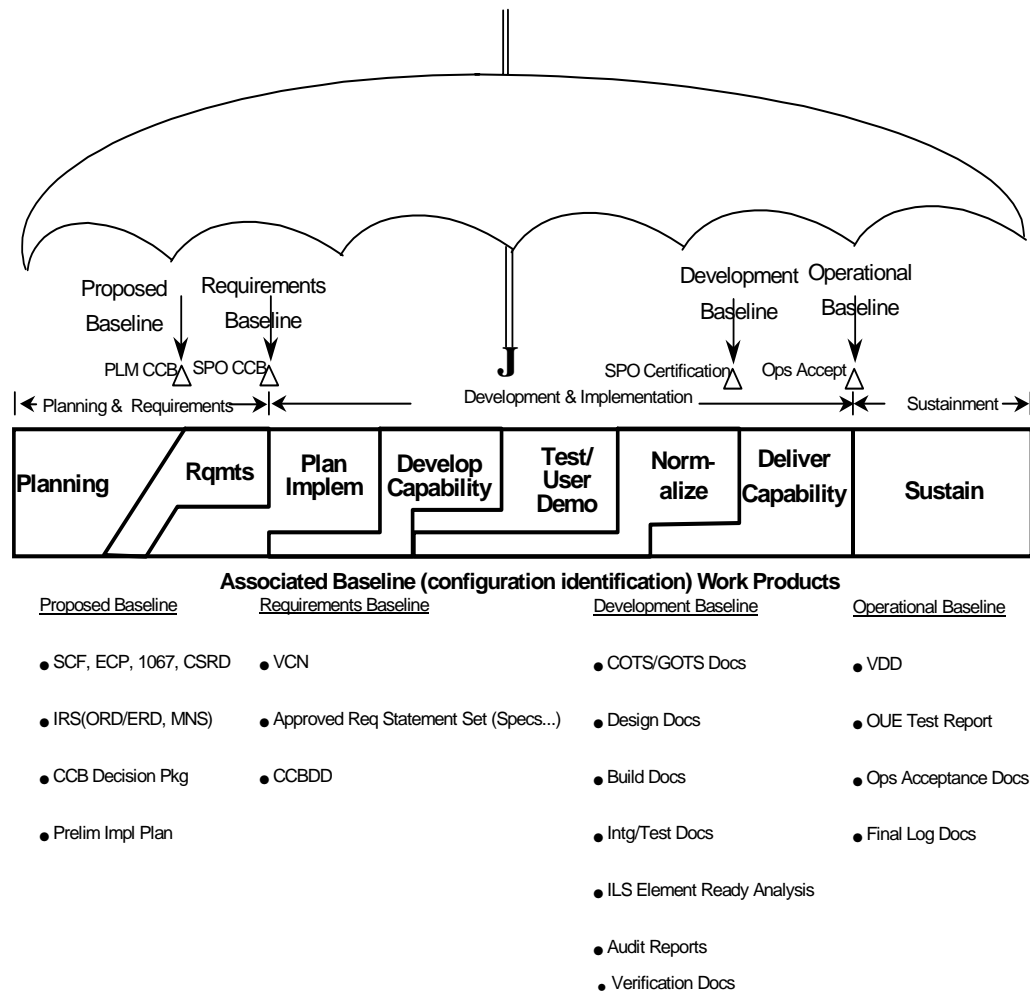
The IWSD System provides users with access to a single source of configuration information for systems comprising N/UWSS and other interfacing systems. The IWSD System provides users with access to a single system view and detailed configuration information, i.e., data that the users need to support their engineering use or maintenance tasks. IWSD information is available for decision-making, and support of Integrated Product Development (IPD) and System Life-Cycle Management responsibilities.

FUNCTIONS The IWSD System supports the System Lifecycle Management Process by maintaining and providing Configuration Management/Data Management (CM/DM) data associated with the following baselines: 1) Proposed Baseline, 2) Requirements Baseline, 3) Development Baseline and 4) Operational Baseline. The Associated Baseline Work Products depicted are a subset of those products in a typical System Lifecycle Management process shown below.

The Proposed Baseline in the IWSD System provides data representing proposed changes to the existing Operational Baseline. It links to change requirement documentation such as Standard Change Forms (SCFs), Engineering Change Proposals (ECPs), AF Form 1067 Modification Proposals, etc. It contains summary and detailed evaluation/approval status of the change requirement documents.

The Requirements Baseline in the IWSD System provides data representing Operating Command and Supporting Command approval to proceed with projects which will implement proposed changes to the existing Operational Baseline. It contains requirements approval documentation such as Operational Approval Board/Panel (OAB/OAP) Decision Packages, Configuration Control Board (CCB) Decision

Packages, Version Content Notifications (VCNs), etc., and associated data, as approved by the IWSD Program Manager.



System Lifecycle Engineering Management Process

The Development Baseline in the IWSD System provides data representing N/UWSS change project design, manufacture, logistics, and integration and testing. It evolves per IWSD PM direction to contain or link to summary and detailed status of:

- Traceability to specific change requirements, e.g. Air Force Space Command requirements documentation.
- The relationship between all change projects being implemented against the existing Operational Baseline (impact analysis).
- Current change project schedules, project task completion status, and points of contact.

The Operational Baseline in the IWSD System provides data representing the current operationally approved product baselines. It also contains summary and detailed status/documentation associated with the Operational Test and Evaluation (OT&E), Trial Period, and Operational Acceptance (OA) of the product baselines by the Operating Commands.

The overall objective of the IWSD System operation is to provide accurate and timely access to support user needs. Specifically, the IWSD objectives are to:

- a. Present current information, whatever the baseline type, to users.
- b. Present consistent information to more than one user.
- c. Maintain an integrated non-redundant set of information elements.
- d. Provide presentation views that support user tasks.
- e. Re-use previously defined IWSD System data records, i.e., modules, throughout the IWSD System life cycle.
- f. Eliminate the need for paper-based documentation.

CTA SECURITY ENGINEERING DESCRIPTION:

IWSD operates at both unclassified and classified levels. As a military system, security requirements for such systems are well defined, with solution sets dictated by military regulations and guidance at the lowest levels of organization within the facility housing the system. Both classified and unclassified systems are housed in secure facilities, on secure networks, behind their own state-of-the-art firewalls, certified and accredited through the efforts of CTA information security professionals. The system provides worldwide web browser and author/editor access through user authentication.

SYSTEM ARCHITECTURE:

IWSD is a commercial-off-the-shelf (COTS)-based system developed to facilitate the management of system-level interfaces, data messages, mission strings, and legacy documents for the Strategic and Nuclear Deterrence Command and Control System Program Office.

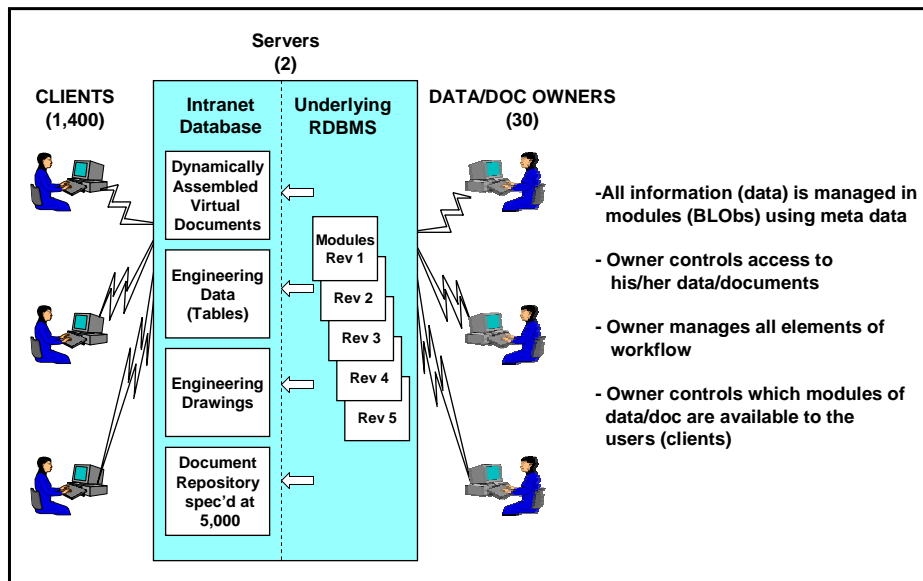
Standards and templates for the data define "owners" of the data and their responsibility for data accuracy and currency. The same standards define processes for data corrections, formats and other administrative activities. Templates drive the format of the tagged data to the agreed information content.

The key features of IWSD include:

- Reusable content information modules.
- Continuous Acquisition & Life-Cycle Support (CALS)-compliant data definition with use of SGML.
- COTS-based open client-server architecture that achieves Defense Information Infrastructure-Common Operating Environment (DII-COE) compliance with UNIX O/S, SQL access, and Netscape browser.
- Full-text search capability.
- Workflow manager and status monitor.
- Configuration Management through property sheets, checkin/checkout, and user privileges.
- Storage of binary large objects (BLOBS) to include text, graphics, and video.
- Document versioning and archiving.
Encryption and password protection.

IWSD is based on Xyvision's Paralance Document Manager (PDM), a client-server compound document management system that stores document elements as information objects in a common database, allowing these elements to be shared and reused in multiple products. It supports objects of varying types and sizes and manages a wide variety of text and other object types including SGML, XML, word processing files, animation, sound, and graphics.

PDM provides built-in workflow management capabilities to control how data moves from one process to the next, enabling work groups to automate the creation, editorial, production, and dissemination processes for complex publishing projects. PDM is well suited for publishing environments with large amounts of text, graphics, and other data that are formatted and published in multiple versions or on multiple media (e.g., web, paper, CD-ROM, etc.).



IWSD Logical Architecture

PDM is extensible and can be customized by users or system integrators to enable it to fit into a wide variety of system solutions. It is designed so that organizations can use the best available UNIX or Windows applications to create, modify, publish, and deliver data from the database.

The PDM architecture consists of three management layers:

- The Content Manager, or object repository, where information is stored, managed, and reused.
- The Workflow Manager, which controls the process and manages the flow of information through the organization.
- The Application Manager, which links third-party applications with the Content Manager.

IWSD uses Xyvision's WebPorter to automate the production of internet and intranet documents from a common database of information that supports other publishing functions across an organization. WebPorter maintains a synchronized version of defined PDM objects for access by users in a separate, secure database. When data changes have been finalized or approved, WebPorter replicates those changes in the synchronized database while also managing text conversions to HTML and graphic conversions to GIF or JPEG.

When gaining access to the database through a web browser, a user can perform searches on object properties such as date last edited or through key words or searches on full text. WebPorter can also manage multiple versions of the same information objects.

A key feature of these Xyvision products is the information granularity of data. Some document management systems replicate traditional file management techniques and store information in logical sections or chapters that mimic traditional paper-based products. To fully use and leverage information, many publishers find that they need to store information in smaller pieces. This is important because it allows greater flexibility in sharing and reusing information. This concept supports the reorganization of data in different sequences based on the output medium or product.

PDM uses Standard Generalized Markup Language (SGML), an industry-standard language used to define the content and structure of document information in a neutral, non-proprietary format. Because SGML is not application or platform specific, it increases the value of an organization's information assets by making them accessible and reusable across platforms, applications, and time. SGML also adds a level of intelligence to the information and facilitates output of the same information in various electronic formats, such as CD-ROM and HTML. PDM can manage SGML fragments as separate objects.

PDM supports a flexible and hierarchical view of the information objects in the Content Manager. Using a parent-child approach, the user can organize, navigate, and reorganize information in a variety of ways. For example, users can define a "publication view," "subject view," "system views," "engineering view," or any other customized user-defined way of looking at the information.

One of the distinguishing features of PDM is its ability to manage and track multiple document versions. PDM tracks and manages the various versions of individual information objects and can also reconstruct historical document versions at any point in time. For each object in the database, PDM tracks the changes in content over time. It also captures and maintains an audit trail of when the changes were made and by whom. For text objects, PDM is unique in that it only stores deltas (changes) instead of the entire modified text document, thereby minimizing storage requirements for document modifications.

PDM provides the ability to "checkpoint" version fragments by remembering which version of which fragment was used for a particular publication at any given release. PDM includes checkpoints in the history listing for a given configuration.

IWSD uses integrated Xyvision workflow management tools for coordinating and managing tasks, people, and projects within networked user work groups. These tools let managers create projects, define associated tasks, identify sequences for performing tasks, assign the tasks to individuals, and then track the progress of each task.

IWSD is an excellent example of the type of system CTA can construct through the acquisition, customization, and integration of such COTS products as Xyvision's PDM and WebPorter. As part of the development and fielding of IWSD, CTA provided services that included:

- Document management workshops and requirements analysis.
- Project management services.
- Database and data configuration services.
- Document analysis and document type definition (DTD) development.
- Workflow analysis and process engineering.
- SGML translation consulting.
- On-site software installation and training.

WORK ACCOMPLISHED:

CTA has successfully employed the internet as a vehicle for managing document access and version control for thousands of multimedia documents describing the system interfaces of the Integrated Tactical Warning and Attack Assessment System, the complex and crucial network that provides an early warning umbrella for any impending airborne attack on the United States or its allies. CTA's Integrated Weapon System Database (IWSD) Management System manages user manipulation, viewing, and revision levels of documents among more than 1,400 authorized users performed from local and remote sites around the world. Security, Version control, User Access, Document Integrity--these are the benefits of this CTA web-enabled document management system.

BENEFITS TO CLIENT:

The IWSD system allows its users to manage the enormous complexity of this "system of systems" system interfaces safely and securely, while realizing significant dollar and time-to-operational cost savings associated with electronic publication and access to current, consistent, integrated system information. The successful management of those interfaces and all the related information is crucial to the maintenance and operability of this early attack warning and assessment system used in defense of our nation and its allies.