NAVY SHORE INFRASTRUCTURE MODERNIZATION JOINT COMPUTER-AIDED ACQUISITION AND LOGISTICS SUPPORT

Steve Weinstein
CALS/CAD IT Manager
Naval Sea Systems Command

Rose DiGeronimo
RMAIS Program Manager
Naval Sea Systems Command

Kevin Predmore
JCALS Program Manager
Naval Sea Systems Command

Andy Kelly
ATIS Program Manager
Naval Sea Systems Command

Abstract

The Department of the Navy (DON) is implementing the Shore Infrastructure Modernization (SIM) Joint Computer-Aided Acquisition and Logistics Support (JCALS) effort to provide personnel at Naval shore activities world-wide access to technical information regardless of its source or location. This effort is being implemented as a Department of Defense (DoD) Defense Information Infrastructure (DII) initiative. JCALS work flow management and communication interface tools are being utilized by authorized Government and Industry sites. These tools enable engineering, maintenance, repair, and planning activities to locate, access, transfer, and manage digitized technical information from remote and dispersed locations. This data is currently stored and maintained on several different repository systems located at various public and private shipyards, In-Service Engineering Activities (ISEAs), Intermediate Maintenance Activities (IMAs), and at other Navy designated shore support activities. JCALS utilizes numerous data repositories such as the Joint Engineering Data Management Information and Control System (JEDMICS) for engineering drawings, the Advanced Technical Information Support (ATIS) System for technical manuals, a WinFrame server for the Planned Maintenance System (PMS) and Engineering Operational Sequencing System (EOSS) data, and other servers for Maintenance, Material, and Management (3-M) history data and ship class configuration management information.

SIM JCALS tools have been installed at over 24 Navy sites. Completed in mid-1995, the initial phase of the SIM JCALS effort demonstrated that a limited number of users at dispersed locations could gain access to DDG 51 Class ship and weapon system engineering drawing data stored in digital format at several different sites. The current phase of the effort involves expanding the JCALS infrastructure to include electronic access to additional digital data repositories and the deployment of a C-2 compliant security environment for users accessing, retrieving, storing, and transferring sensitive but unclassified data across multiple information systems. The security environment includes Wide Area Network (WAN) Data Encryption Units (DEUs) to ensure the secure transfer of data between repositories and users.

Association of Scientists and Engineers
35th Annual Technical Symposium - 17 April 1998

List of Figures

Abbreviations

3-M	Maintenance, Material and Management
ATIS	Advanced Technical Information Support
CDM	Configuration Data Management
CMIS	Configuration Management Information System
COE	Common Operating Environment
COTS	Commercial Off The Shelf
DEU	Data Encryption Unit
DII	Defense Information Infrastructure
EOSS	Engineering Operational Sequencing System
GDMS	Global Data Management System
GDP	Global Data Processor
I & A	Identification and Authentication
IMA	Intermediate Maintenance Activity
ISEA	In-Service Engineering Activity
IT	Information Technology
JCALS	Joint Computer-Aided Acquisition and Logistics Support
JEDMICS	Joint Engineering Data Management Information and Control System
LAN	Local Area Network
MAN	Metropolitan Area Network
MRMS	Maintenance Resource Management System
NEWNET	NAVSEA Enterprise-Wide Network
PC	Personal Computer
PCMCIA	Personal Computer Memory Card International Association
PIN	Personal Identification Number
PMS	Planned Maintenance System
RMAIS	Regional Maintenance Automated Information System
RMC	Regional Maintenance Center
RRC	Regional Repair Center
SBU	Sensitive But Unclassified
SCLSIS	Ship Configuration and Logistics Support Information System
SIM	Shore Infrastructure Modernization
SIMA	Ship Intermediate Maintenance Activity
TCP/IP	Transmission Control Protocol/Internet Protocol
VPN	Virtual Private Network
WAN	Wide Area Network

Introduction

To better prepare for the 21st Century, the Department of Defense (DoD) must embrace open systems and standards-based design in their Information Technology (IT) solutions. This practice will allow for affordable technology upgrade, the increased usage of commercial technology, and the leveraging of DoD investments by re-using software. **[1]** The Department of the Navy (DON) is currently striving to ensure that all digital data can be easily managed, accessed and shared using the infrastructure and tools which are accepted components of the DoD Defense Information Infrastructure (DII) Common Operating Environment (COE). All new or modified automated information systems and software proposed for managing or making use of technical data will need to be operable within the DII COE architecture. The DII COE will include infrastructure services for accessing shared digital data and providing workflow management. A DoD Logistics Infrastructure Technical Architecture has been defined to provide system developers, program managers, and others with a set of rules governing the arrangement, interaction, and interdependence of the elements that together will be used to form the infrastructure for logistics business systems. This common architecture includes core capabilities such as global data management and workflow management tools developed for the Joint Computer-Aided Acquisition and Logistics Support (JCALS) Program. The JCALS Program will provide users world-wide access to digital data repository systems and provide data owners the capability to control the access, retrieval, and use of their

data.

Fleet logistics support is going through an environment of change. Emphasis is being placed on lower cost and reduced cycle times. Regional maintenance and repair centers, along with regional planning activities, are being restructured and consolidated to share assets and resources in the future. The results will be lower overall life cycle costs and clearer lines of technical authority. The NAVSEA Fleet Logistics Support Directorate (SEA 04) and the Naval Sea Logistics Centers are providing innovative IT solutions, automated information systems, and smarter processes to the Fleet and supporting shore activities. Infrastructure modernization efforts such as Shore Infrastructure Modernization (SIM) JCALS are being implemented to support regional maintenance, repair, and planning activities by rapidly bringing required technical and logistics data to their office desktop.

Background

Before the introduction of SIM JCALS, the logistics infrastructure did not enable shore activities to locate, access, transfer, and manage digitized technical information from remote and dispersed locations. This information is currently housed on several different systems at various ship class planning yards, In-Service Engineering Agents (ISEAs), shipyards, Intermediate Maintenance Activities (IMAs), the Navy Inventory Control Point, and at other activities, including commercial sites. No single information locator existed that enabled users to find and access current technical information. In addition to multiple data repositories, multiple data base management systems exist which do not communicate well due to data element inconsistencies.

The Navy SIM JCALS effort (initially called the AEGIS DDG 51 Pilot) was an initiative designed to demonstrate shore activity access to technical and configuration information regardless of its source or location. Completed in mid-1995, the initial phase of the SIM JCALS effort demonstrated that a limited number of users at dispersed locations could gain access to digital DDG 51 Class ship and weapon system engineering drawing data from remote optical storage repositories. Participating sites included the Ship Intermediate Maintenance Activity (SIMA) in Norfolk, VA., Bath Iron Works, Naval Surface Warfare Center (NSWC) Port Hueneme Division, NSWC Crane Division, Louisville, Computer Sciences Corporation (CSC), NAVSEA Headquarters, and Pearl Harbor Naval Shipyard. The Joint Engineering Data Management Information and Control System (JEDMICS) served as the engineering drawing repository. Configuration management information was provided by the Ship Configuration and Logistics Support Information System (SCLSIS) and made readable through the Configuration Management Information System (CMIS). Two important JCALS network management tools, the Global Data Management System (GDMS) and the Workflow Manager, were also utilized and considered instrumental in implementing the SIM distributed, integrated, and shared data environment. The pilot also demonstrated that the standard DoD systems such as the JEDMICS, CMIS, and JCALS could be integrated together into a COE to meet user requirements. The COE would enable users to share data quickly and easily, regardless of format and location of the data. One significant benefit offered by the SIM JCALS effort is world-wide access to digital technical data through a single user interface. **This concept is presented in Figure (1).** The NAVSEA Enterprise-Wide Network (NEWNET) (now called SMART LINK) served as the Wide Area Network (WAN) which provided a state-of-the-art high speed network capable of transferring large data files at near real-time speeds.

SMART LINK is currently being used today to support the SIM JCALS effort. SMART LINK is a computing environment that supports and facilitates any-to-any connectivity and global access to any type of user application and in any format (voice, video, and data). It is easily, efficiently and effectively managed both locally

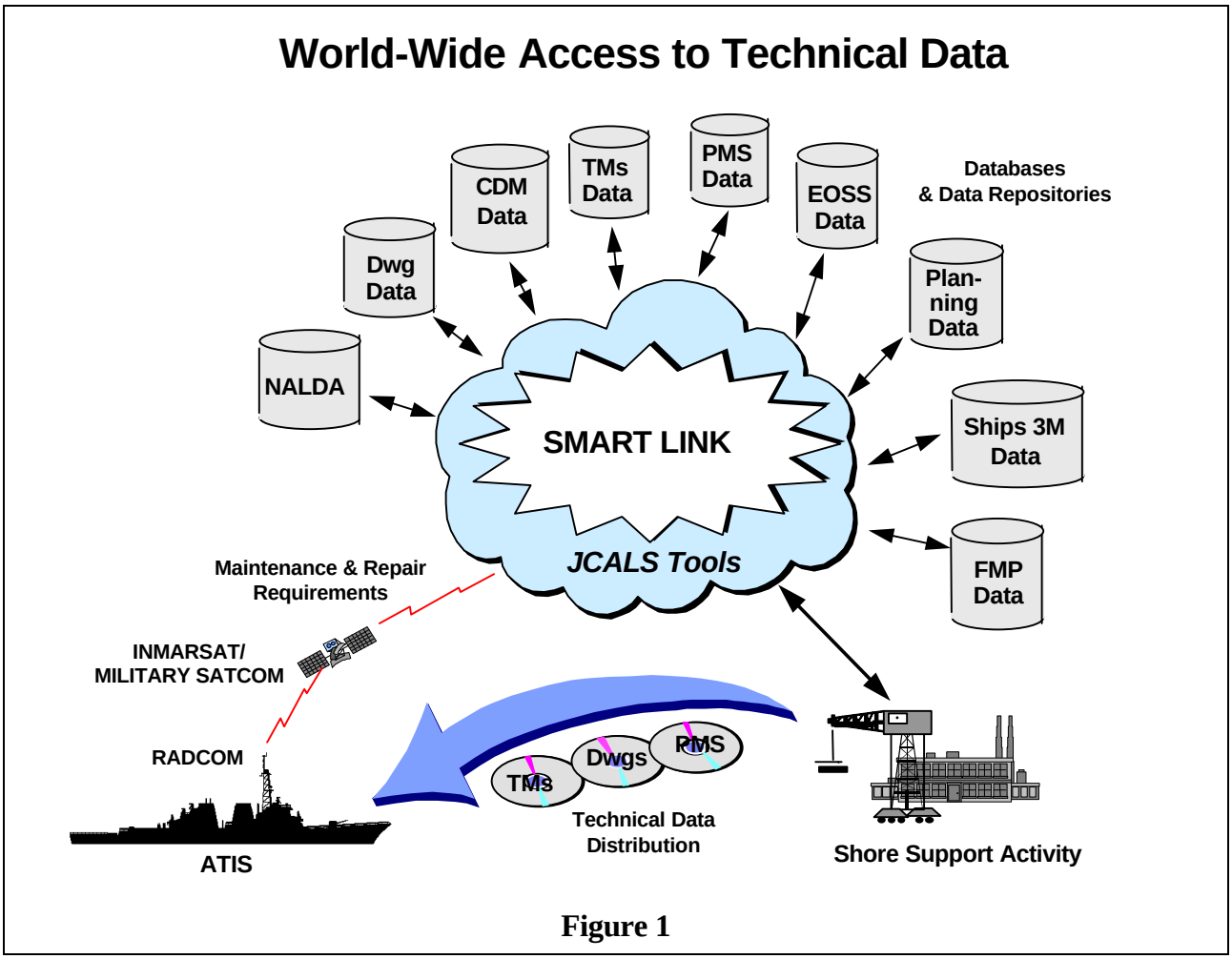
World-Wide Access to Technical Data
CDM Data
TMs Data
PMS Data
EOSS Data
Databases & Data Repositories
Dwg Data
Plan-ning Data
NALDA
SMART LINK
Ships 3M Data
JCALS Tools
FMP Data
Maintenance & Repair Requirements
INMARSAT/ MILITARY SATCOM
RADCOM
RMS
Dwgs
TMs
Technical Data Distribution
ATIS
Shore Support Activity

Figure 1

and globally and is self supporting based upon Commercial Off The Shelf (COTS) products and services, and structured to minimize the cost of shore installation infrastructure. NAVSEA is also implementing a plan involving SMART LINK to network deployed ships at sea. In concert with this plan, an initiative called "Challenge Athena" is currently being implemented on some larger ships to provide a high speed and real time connection for video teleconferencing, voice communications, and digital data transfer between ship-to-ship and ship-to-shore.

The current phase of the SIM JCALS effort is now underway and is building upon its earlier success by expanding the number of users who can access data, the amount and types of data accessible, and additional data repositories. Digital data repositories include JEDMICS, the Advanced Technical Information Support (ATIS) System, a NAVSEA WinFrame server for Planned Maintenance System (PMS) and Engineering Operational Sequencing System (EOSS) data, and other servers for Maintenance, Material, and Management (3-M) history data and ship class configuration management information. The SIM JCALS effort has also resolved the JCALS security issues for accessing, retrieving, storing, and transferring sensitive but unclassified data across multiple information systems. The deployment of SIM JCALS is also providing the opportunity to model and automate specific business processes. These processes include the engineering change control process, and the technical manual and ship maintenance work management processes.

The Challenges

Many challenges exist today relative to locating, accessing, and using digital information, as well as the cost associated with these requirements. Specific business challenges we face include digital data protection or security, numerous legacy stovepipe systems, unclear technical authority, unknown process and product ownership, lack of systems engineering and integration, perpetual and rapid technology advancements and interface issues, and limited network system capability and connectivity.

Data is too often created and maintained in stovepipe systems with little or no visibility and integration. Innovative IT solutions for the 21st Century are required to tear down these stovepipe designs and make information readily available to authorized users. Achieving data synergy through improved access, reduced redundancy and effective security will leverage the COE infrastructure to enable logistics processes to interface seamlessly. **[2]** A mutual goal of the Navy and it's Industry partners is to provide secure access and connectivity between existing technical and logistics information systems. The information in these systems must be maintainable, affordable, and made available to the right person, on time, and in the data format required.

Digital Data Repositories

In the last five years, over 10 million pages or sheets of technical and logistics information have been converted to a two dimensional digital format. This data has included engineering drawings, technical manuals, PMS and EOSS data, 3-M history data, and ship class configuration management information. This data is currently being stored on repository systems located at various sites around the country. Several of these data repositories are located within activities that are isolated behind security firewalls. The SIM JCALS effort addresses the security issue and is providing an acceptable solution to the problem.

SIM JCALS Architecture

The SIM JCALS effort is based on a client-server architecture. The JCALS server consists of a single and dual reduced instruction set computer central processing unit running a UNIX operating system. Clients or user workstations will be IBM compatible personal computers. Clients will connect to servers either across a Local Area Network (LAN), Metropolitan Area Network (MAN), or across a WAN. Clients that connect across a WAN are considered to be remote clients. All communications will

use the Transmission Control Protocol/Internet Protocol (TCP/IP) protocol. Clients will communicate with the servers using TCP/IP sockets and Oracle SQLnet communication software.

NAVSEA SIM JCALS sites are using Hewlett Packard 9000 Models 725/100, J200 and K400 servers. These systems have been chosen based on JCALS engineering studies and compatibility with JCALS, CMIS and JEDMICS software. A WIN NT server configuration is under development. Naval Air Systems Command (NAVAIR) sites are using existing IBM RS6000 servers. The NAVSEA servers are configured with JCALS application and Oracle database management software. The JCALS software includes JCALS infrastructure functions, the technical data search application (for Engineering Drawings and Technical Manuals), a JEDMICS API application, an engineering change proposal application, a technical manual process application, a Regional Maintenance Center (RMC) management application, and the GDMS. The GDMS is an Oracle relational data base management system which serves as the data base engine. All index and configuration data will be stored on the server. One server will communicate with another server using TCP/IP socket protocols.

All clients are Windows 95 or NT compatible and use a 32 bit version of open data base connectivity. Clients are configured with software that includes JCALS PC Client 2.3.10 or higher which is a true MS Windows client, Oracle SQLnet for access to the centralized ship class Configuration Data Management (CDM) data base, a TCP/IP communications package, WinFrame and ATIS client software, and a COTS image viewer of choice.

SIM JCALS Infrastructure

The SIM JCALS infrastructure consists of a core set of JCALS system functions in combination with a set of functional tools. The infrastructure provides:

- A common user interface consisting of a user-friendly, graphical desktop computer environment;
- A user-friendly interface for accessing an enterprise-wide global data management system;
- A managed work environment consisting of work management tools;
- Administration functions to manage user accounts and information access control and security;
- A set of tools for viewing data in various formats;
- Report generation tools for accessing and generating specific data base information;
- Tools for tracking and reporting system problems, comments and suggestions

Current SIM JCALS sites include the following activities:

- CSC
- Bath Iron Works
- Ingalls Shipbuilding
- NAVSEA HQ
- Naval Surface Warfare Center (NSWC) Port Hueneme Division (PHD)
- SIMA Norfolk
- Norfolk Naval Shipyard
- FISC Norfolk
- Puget Sound Naval Shipyard (PSNSY)
- Pearl Harbor Naval Shipyard
- SURFLANT HQ
- Portsmouth Naval Shipyard
- PSNSY Detachment Ingleside
- NSWC Carderock Division, Ship Systems Engineering Station, Philadelphia
- Submarine Maintenance Engineering Planning and Procurement (SUBMEPP) Portsmouth
- Newport News Shipbuilding
- Lockheed-Martin
- NAVICP Mechanicsburg
- NAVICP Philadelphia
- NAVAIR HQ

- T-45 Program Office
- Naval Air Depot North Island
- McDonnell Douglas
- Defense Communications Support Columbus

The SIM JCALS effort utilizes the JCALS System Operation Support Center (SOSC) as a user help desk facility. The SOSC is operated and managed by CSC in Marlton, New Jersey and may be accessed via a toll-free commercial telephone number, 1-800-354-7547.

The JCALS System functionality is accomplished by the prime components of the JCALS tool set. These tools include the GDMS, the Workflow Manager, and the Reference Library. **Figure (2) reflects the JCALS Architecture**.

The Global Data Management System

The GDMS is key to the JCALS distributed, integrated environment. **[3]** A GDMS capability is provided through the use of a JCALS server. Desktop workstations will host the client software necessary to access the server running the global data management software. There is no current industry or international COTS software which provides this functionality. The GDMS provides users the capability to easily locate, retrieve, manage, and integrate data stored in different repositories across multiple sites. GDMS is designed to act in a manner similar to data middleware and allows a user to access multiple heterogeneous database servers from his/her desktop. The user accesses data via calls from an application to the Global Data Processor (GDP) which determines where the data is located (globally or locally). If the data is located globally, it sends a request to that system's GDP which uses a Local Processor Service to translate the data from its source database format into one that can be presented to the user requesting the data.

The Workflow Manager Tool

The Workflow Manager tool allows the user to define, activate, monitor, and control job tasks and business processes, and track the sequence of tasks within or across organizations, servers, and sites. It allows work items, such as engineering change proposals, technical documents, information, or tasks, to be passed between multiple participants for action according to the rules of the business process. The Workflow Manager tool also provides the user with the ability to define all aspects of the work environment for jobs and tasks, from the selection of users who will work a given task, to the selection of objects available for that user to accomplish the task. This includes providing access to the tools that a user requires to accomplish the assigned task. Additionally, the tool provides the reporting and tracking functions required to effectively manage resources. The tracking capability also provides the mechanism necessary for dealing with issues and problems encountered by the users working the job. The Workfolder application of the Workflow Manager serves as the container for holding the pertinent data being worked on or shared.

The Reference Library Function

The Reference Library function provides the capability to navigate through a variety of file types that are stored in the GDMS. Using a public library metaphor, users can search, filter, view card catalogue data and retrieve files and documents. The Reference Library is a front-end tool for accessing information, documents, and graphics stored in the JCALS System database or legacy databases. The services offered by the Reference Library enable the user to organize, locate, and access catalogued information. The Library will also contain any information that is applicable to the system, such as a variety of standard forms, developed plans, drawings, etc. Any new forms of information can be easily added to the library repository.

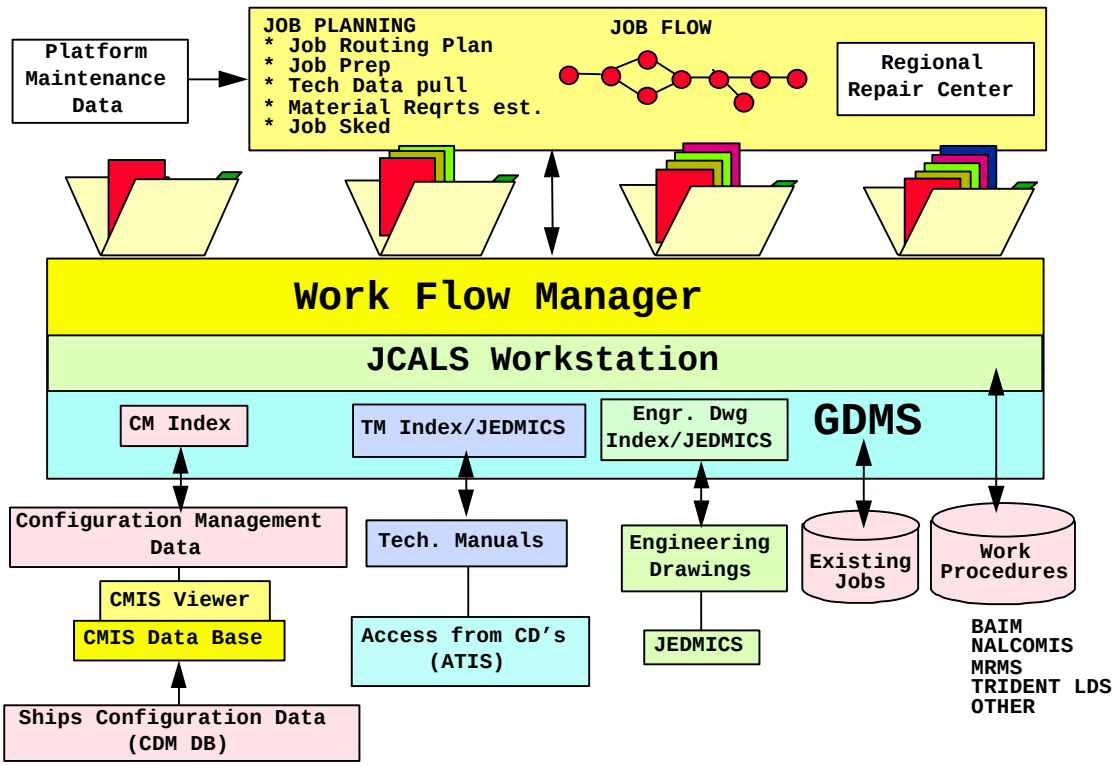
JCALS Architecture
Platform Maintenance Data
JOB PLANNING
* Job Routing Plan
* Job Prep
* Tech Data pull
* Material Reqrts est.
* Job Sked
JOB FLOW
Regional Repair Center
Work Flow Manager
JCALS Workstation
CM Index
TM Index/JEDMICS
Engr. Dwg Index/JEDMICS
GDMS
Configuration Management Data
Tech. Manuals
Engineering Drawings
Existing Jobs
Work Procedures
CMIS Viewer
CMIS Data Base
Access from CD's (ATIS)
JEDMICS
BAIM
NALCOMIS
MRMS
TRIDENT LDS
OTHER
Ships Configuration Data (CDM DB)

Figure 2

Information Security

JCALS is providing information protection by encrypting data sent over a WAN, ensuring strict user Identification and Authentication (I & A), and controlling access to information based on a user's role and organization. The SIM JCALS user community includes all levels of shore planning, maintenance and repair, headquarters, and Fleet supported activities. Users are from the aviation and ship logistics and engineering communities. The nature of the DON business, accompanied by system connectivity and data aggregation issues, led to the final determination that all unclassified systems and data will be considered sensitive. This includes Sensitive But Unclassified (SBU) data as well as other types of export controlled and proprietary information. In view of this level of security requirement, all SIM JCALS server(s) and PC clients must be capable of accessing and retrieving encrypted SBU and/or proprietary data from selected Naval data repositories.

Basic Security Requirements

The SIM JCALS environment has been designed to operate in accordance with NAVSO P-5239-15 (Controlled Access Protection Guidebook) dated January 1995. This document describes the minimum set of automated controls that should be provided to DON Automated Information Systems (AIS's), the DON's interpretation of the Class C-2 (Controlled Access Protection) features, and the functionality requirements of DOD Standard 5200.28-STD (Trusted Computer System Evaluation Criteria) and SECNAVINST 5239.2 (Department of the Navy Automated Information Systems Security Program). C-2 compliant systems enforce a more finely grained discretionary access control than C-1 (Discretionary Security Protection) systems, making users individually accountable for their actions through login procedures, auditing of security-relevant events, and resource isolation. Both C-1 and C-2 classes are defined in DoD Standard 5200.28-STD which is also known as the "The Orange Book". The purpose of this document is to provide technical hardware, firmware, and software security criteria and associated technical evaluation methodologies in support of the overall Automated Data Processing (ADP) system security policy, evaluation and approval and accreditation responsibilities promulgated by DoD Directive 5200.28, Security Requirements for ADP Systems. Access control (the designation and control of users who can use components of the operating system and application programs), system auditing (the ability to determine what users have done and where they have been in the system), and authentication (the use of passwords to protect data and resources) are all requirements of C-2. The JCALS System functions as the trusted host for user entry into the SIM JCALS environment. This allows the user community to use only one login name and password to access multiple JEDMICS, ATIS, and other data repository sites. The JCALS System also provides the capability for segregation of users, from data or functions based or on a need-to-know or need-to-perform requirements basis.

The Security Solution

The first SIM JCALS information security design included strong hardware based I & A and Data Encryption Standard (DES) based encryption for flagged sensitive data. DES, a popular symmetric-key encryption method developed in 1975 and later standardized in 1981, is the National Institute of Standards and Technology (NIST) Data Encryption Standard. This standard was adopted by the U.S. Government as Federal Information Processing Standard (FIPS) Publication 46, which allows only hardware implementations of the U.S. Government's official data encryption algorithm. DES uses a 56-bit key and is illegal to export out of the U.S. or Canada. DES provides a complete description of a mathematical algorithm for encrypting (enciphering) and decrypting (deciphering) binary coded information. Encrypting information converts the data to an unintelligible form called a cipher. A decrypting cipher converts the data back to its original form called plaintext. The algorithm described in DES specifies both enciphering and deciphering operations which are based on a binary number called a key.

Discretionary access controls were also planned for the first SIM JCALS information security design. Firewalls were also to be employed at the discretion of the individual sites and I & A was to be accomplished through the use of C-2 compliant controls. An additional confirmation of JCALS user identity was to be established via a FORTEZZA card. This card is a small, portable, Personal Computer Memory Card International Association (PCMCIA) compliant device that provides value-added security services to protect digital information. The FORTEZZA card Personal Identification Number (PIN) would provide the second confirmation of user identity at the time of system login.

Soon after deciding on the FORTEZZA card solution, the SIM JCALS program office abandoned the hardware solution in favor of a smarter software solution. An improved cost effective security solution was proposed that employed a COTS software product called BSAFE, using RSA Data Security, Inc.'s public key technique for strong user I & A. BSAFE software is currently incorporated as part of the JCALS software package. Users at sites employing foreign nationals will also use BSAFE software to encrypt sensitive data before storing it on their local workstation. Because of the uncertainty of whether information is properly marked as export control, all data is being encrypted by a Data Encryption Unit (DEU). Each JCALS server is routing data traffic through a DEU. These DEU's are encrypting the data before it is sent over the WAN (currently called SMART LINK, previously called NEWNET). The DEU supporting the data requester's JCALS server will decrypt the data before it is received by the requester thus creating a Virtual Private Network (VPN) for data to travel from its source to the user. By employing WAN DEU's, access, transfer, and retrieval of export controlled, proprietary, and other SBU data will not be compromised by unauthorized access. The DEU can also be configured to serve as a rudimentary firewall for sites without sophisticated firewalls already in place.

For dial-up and remote JCALS users, a software package called InfoCrypt Desktop/Solo is being proposed on workstations to meet the requirement for secure networking. The InfoCrypt Desktop/Solo is a client software package designed to be completely transparent to the user. With InfoCrypt Desktop/Solo, users will be able to dial in to any Internet service provider server and create a secured channel back to their enterprise via a VPN. The Desktop/Solo software will allow the remote JCALS user to communicate with a DEU via a VPN when a local JCALS server and associated DEU is not available. Desktop/Solo at the user's workstation will decrypt the encrypted data forwarded by the DEU. **Figure (3) depicts the proposed SIM JCALS security solution.**

Access Control

Access control is the verification that the user accessing specific data has the proper authorization to proceed. In security systems, this authorization is the process of giving individuals access to system data or objects based on their identity. There are three kinds of access. These are no access, view access, and create-change-delete access.

Every object or piece of data is associated with or owned by an organization and will have an object identifier associated with it. JCALS access rights to data specifically associated with an organization is controlled via system administration tools. Each JCALS user belongs to a single organization which does not have to be the same as the data owner's organization. For example, when a user application queries the database using GDMS, the user's organization is compared to those organizations allowed access by the data owning organization. The GDMS filters out those records which are not accessible by that user, and returns only those that are accessible.

In the case of JEDMICS engineering drawing data, each drawing is assigned an object identifier which is associated with the organization owning the data. The

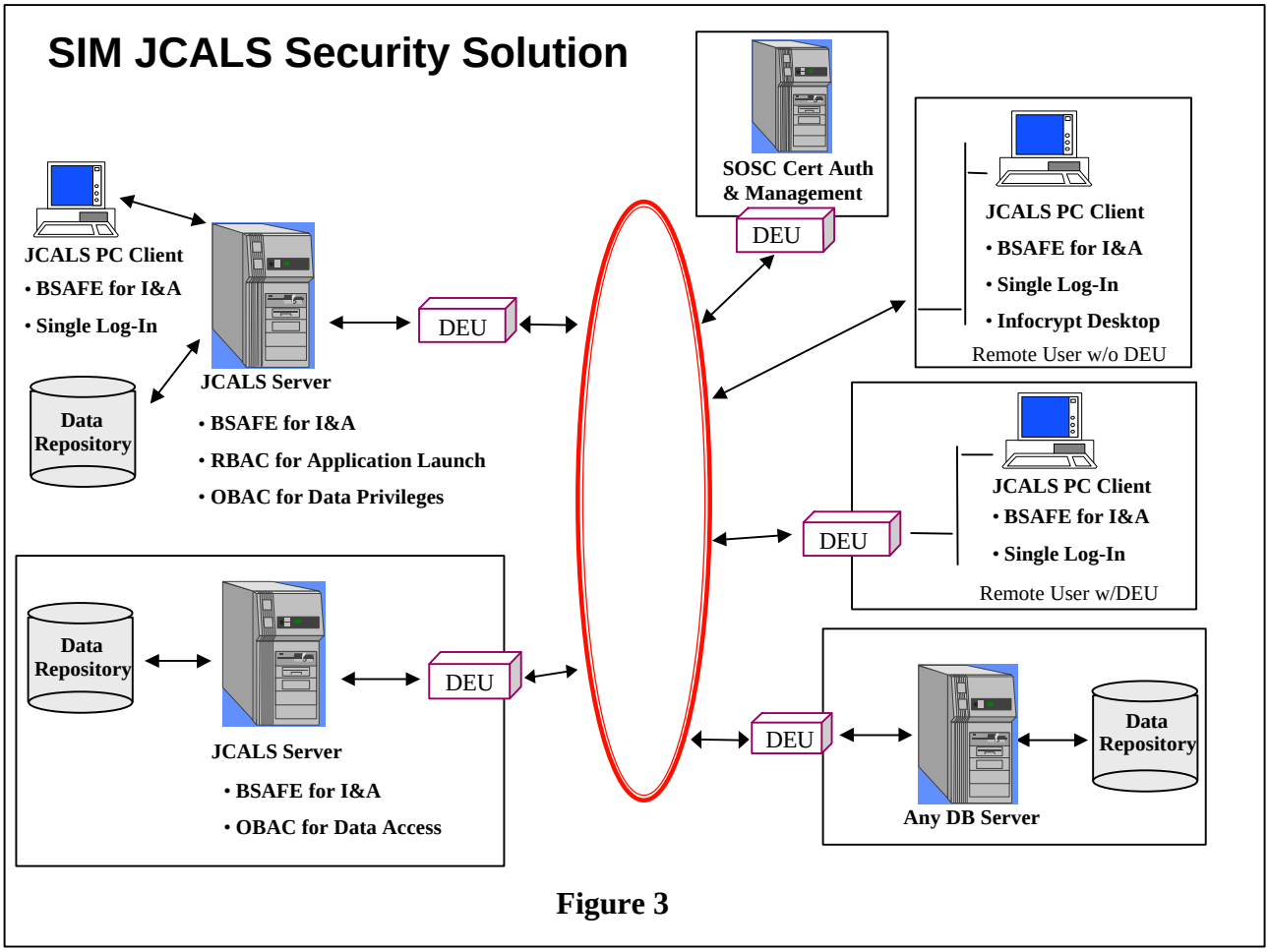
SIM JCALS Security Solution
SOSC Cert Auth & Management
DEU
JCALS PC Client
• BSAFE for I&A
• Single Log-In
• Infocrypt Desktop
Remote User w/o DEU
JCALS PC Client
• BSAFE for I&A
• Single Log-In
JCALS Server
• BSAFE for I&A
• RBAC for Application Launch
• OBAC for Data Privileges
Data Repository
DEU
JCALS PC Client
• BSAFE for I&A
• Single Log-In
Remote User w/DEU
Data Repository
DEU
JCALS Server
• BSAFE for I&A
• OBAC for Data Access
DEU
Data Repository
Any DB Server

Figure 3

SIM JCALS effort uses ship class as the access determinant. For example, at Bath Iron Works, there may be two organizations associated with engineering drawings, a DDG 51 Class data owning organization and a FFG 7 Class data owning organization. When a user requests a hit list of drawings from JCALS via a library search, the request will first go through the GDMS tool where the requesting user's organization identification is examined. The data that satisfies the request is obtained from the database and could contain both DDG 51 & FFG 7 Class data. Prior to returning the full data set to the user, the GDMS looks at the access rights for the data objects returned. The GDMS sees that the user's organization is not one of the organizations allowed to access FFG 7 Class data. Prior to returning the results, the GDMS filters out those FFG 7 Class records. The user's hit list is returned and contains only those records his or her organization has access to.

Identification and Authentication

The software based I & A process generates public/ private key pairs for the JCALS user and server. The JCALS software will provide for a secured (encrypted) I & A process by ensuring that the user's account name and password will not be compromised by "in the clear" transmissions and/or unauthorized access.

Identification schemes are methods by which a user may prove his or her identity to somebody else, without revealing essential knowledge that may be used by either an eavesdropper or the recipient to impersonate the user. The traditional form of identification is by use of a secret key or password. All JCALS users will have a unique login identity consisting of an account name, password, and an access code or PIN. Identification is verified at the time of login via the BSAFE software imbedded in the PC Client.

Authentication is the process of identifying an individual, usually based on a username and password. When a JCALS user logs in, the system will first authenticate his or her password. Authentication merely ensures that the individual is who he or she claims to be, but says nothing about the access rights of that individual. With the software based authentication implementation, each JCALS user will have an access code and a GDMS private and public key pair which will be used to verify the user's identity prior to GDMS access. Once the user enters their access code, the JCALS sign-on process will begin.

SIM JCALS and Regional Maintenance

The methodology of shore based maintenance is currently changing. Maintenance and repair activities have been reorganized and consolidated under eight Fleet maintenance regions with the objective to eliminate redundant maintenance and repair capabilities within and across established regional areas. Within each region, designated RMCs have been established and a common infrastructure is being defined to support centralized planning, coordinating, executing, and reporting on maintenance and repair actions for ships, aircraft, systems and equipment. RMCs will use SIM JCALS tools to access technical data and perform workflow management functions. These tools will also be used to route job packages and communicate work status and accounting information. **Figure (4) shows the SIM JCALS infrastructure supporting the regional maintenance community.**

In July 1996, a Regional Maintenance Memorandum Of Agreement (MOA) between NAVSEA 04 and the Deputy Chief of Naval Operations, Logistics (DCNO (L)) identified the need to develop and deploy an automated information system that advances the Navy's regional maintenance concept, improves the quality of maintenance support, and becomes more responsive to the Fleet. Through this MOA, NAVSEA 04 was designated the project office responsible for designing a Regional Maintenance Automated Information System (RMAIS) technical architecture that will utilize existing maintenance data within the Naval Tactical Command Support System (NTCSS) and ensure a compatible

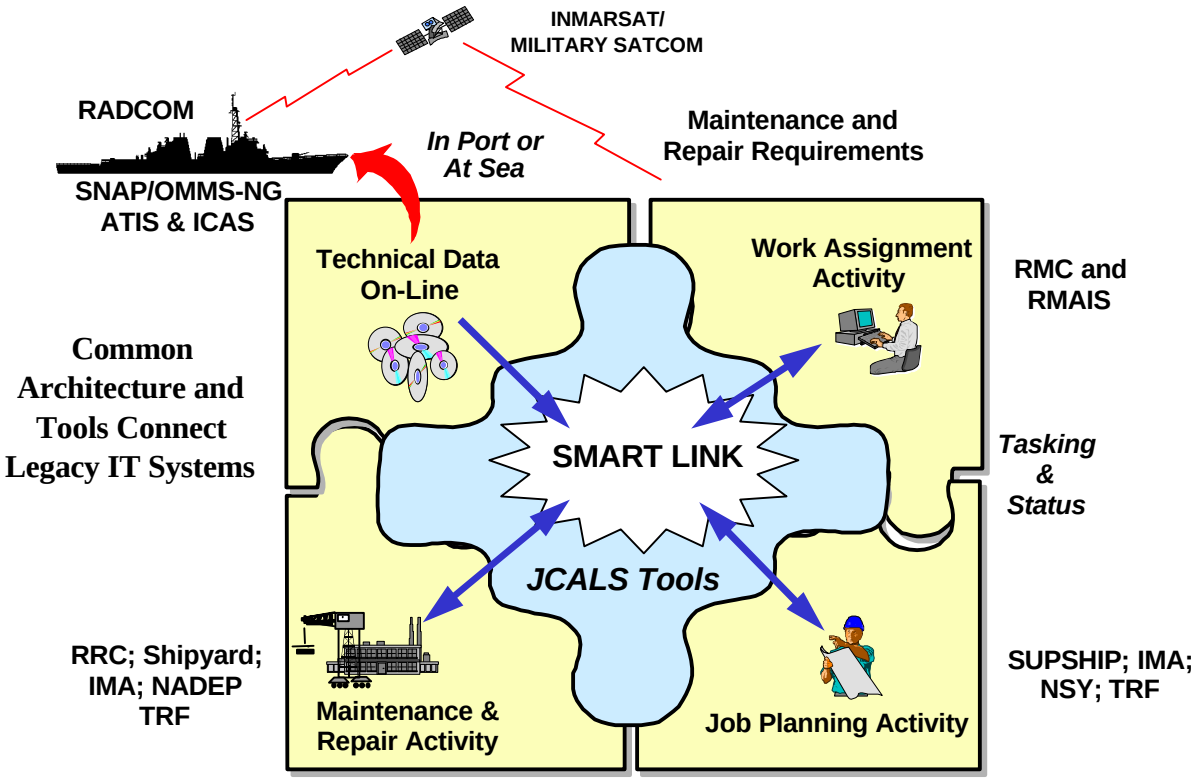
SIM JCALS Supporting Regional Maintenance
INMARSAT/
MILITARY SATCOM
RADCOM
SNAP/OMMS-NG
ATIS & ICAS
In Port or
At Sea
Maintenance and
Repair Requirements
Technical Data
On-Line
Work Assignment
Activity
RMC and
RMAIS
Common
Architecture and
Tools Connect
Legacy IT Systems
SMART LINK
Tasking
&
Status
JCALS Tools
RRC; Shipyard;
IMA; NADEP
TRF
Maintenance &
Repair Activity
Job Planning Activity
SUPSHIP; IMA;
NSY; TRF

Figure 4

interface between afloat and ashore maintenance communities. SIM JCALS tools and an RMAIS data base will be utilized in support of the architecture design. The established RMAIS architecture will allow all regional maintenance and repair Intermediate “I” and Depot “D” level support organizations to access, manage, share, and use vast amounts of maintenance, production, and technical information from their desktop computer. The RMAIS Program has installed an AIS tool set in all west coast regions and is in process of being installed in east coast regions. The Program has deployed JCALS digital data delivery tools in seven maintenance regions and is in the process of delivering data sharing capabilities by providing standard data links or "file bridges" between legacy and emerging execution systems. The file bridges under development today include Maintenance Resource Management System Intermediate Maintenance Activity Component (MRMS IMAC), Naval Aviation Logistics Command Management Information System (NALCOMIS), COMPASS/ Maintenance Requirements Plan (MRP) II, Miscellaneous Industrial Management System (MIMS), Shipyard Management Information System (SYMIS) and the Logistics Data System (LDS). **Figure (5) presents the RMAIS Program top level architecture.**

Regional Maintenance Scenario

In a regional maintenance scenario, the JCALS GDMS and Workflow Manager tools are effectively used to obtain technical data, automate the submission of jobs to Regional Repair Centers (RRCs), automate the production management of the repair work, provide automated status to the RMC and port area maintenance managers, and remove a significant level of manual intervention on the part of the RMC and RRC management.

A future Fleet maintenance scenario may begin with a deployed ship communicating to shore, via a Revised Alternative Dataflow Communication (RADCOM) means, its maintenance and/or repair action requirements. RADCOM is an electronic data transfer allowing ships in port or at sea to electronically report maintenance, repair, and configuration management information and requirements to regional shore support activities. The use of International Marine Satellite (INMARSAT) communications and military Satellite Communications (SATCOM) will provide the ship a capability to send electronic data submissions when at sea. The onboard Shipboard Non-Tactical Automated Data Processing Program (SNAP) program serves as the ships primary data repository and the source of data exchange. A component of SNAP, the Organizational Maintenance Management System (OMMS), is the onboard maintenance manager of all required and completed shipboard maintenance and repair actions (automated OPNAV Form 4790/2-Kilo or work candidates in the OMMS Next Generation (OMMS-NG) System).

All maintenance or work candidates electronically transferred off the ship will be received on shore by the RADCOM Mailbox (RADMB). The RADMB is a central mailbox that does nothing more than hold and route data. The RADMB will forward the required maintenance action (as a direct input or as a Current Ships’ Maintenance Project (CSMP)) to the RMC RMAIS data base for action.

When the Type Commander approves the job, the RMC will access JCALS and the Workflow Manager tool to create a workflow for a specified job. JCALS will assist in building the workflow from a standard template and assigning the proper people and due dates to each of the tasks. The job brokering activity will perform the job induction tasks. The group planner will gather and store into the workfolder all the data necessary for job execution, including engineering drawings, technical manuals and repair, planning, and execution data. The GDMS will be used to locate and retrieve the technical data stored in different repositories across multiple sites. The job scheduler will be used to perform job scheduling and determine which shop(s) will perform the actual repair or maintenance action. The production related work will be performed by the RRCs. At any point in the

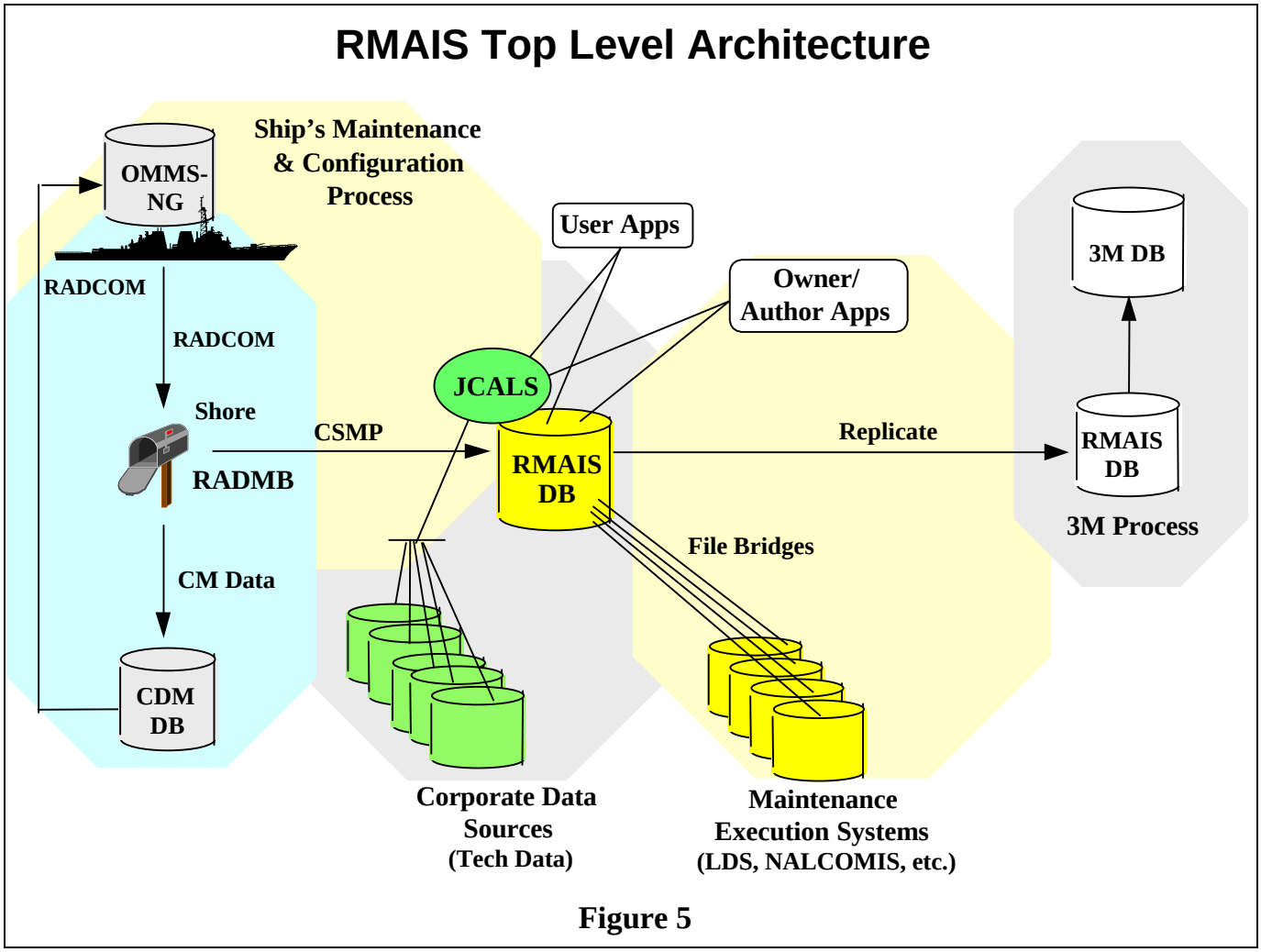
RMAIS Top Level Architecture
Ship's Maintenance & Configuration Process
OMMS-NG
RADCOM
RADCOM
Shore
RADMB
CSMP
CM Data
CDM DB
JCALS
User Apps
Owner/ Author Apps
RMAIS DB
Replicate
3M DB
RMAIS DB
3M Process
File Bridges
Corporate Data Sources (Tech Data)
Maintenance Execution Systems (LDS, NALCOMIS, etc.)

Figure 5

process, the data that is in the workfolder can be accessed by any of the JCALS users that have been assigned tasks within the workflow. All maintenance action status will be electronically forwarded to the Ships' Maintenance and Material Management (3M) history data base.

JCALS Afloat Project

A proposed effort is planned to provide JCALS capabilities onboard the Navy's designated Smart Ship, the USS YORKTOWN (CG 48). The effort will involve the installation of a Deployable SMART LINK System (a FLAPS C-Band antenna) on the USS YORKTOWN and the installation and testing of a TCP/IP connection between the ship and shore utilizing commercial C-band satellites. Planned testing will ensure that existing shipboard and/or shore-based firewalls are configured to allow JCALS TCP/IP socket communications to operate.

This shipboard Deployable SMART LINK System will enable USS YORKTOWN to bring on-line a fully functional JCALS Windows NT Server and allow JCALS GDMS and the Workflow Manager functions to operate in a similar manner as in the shore-base environment. An existing "Challenge Athena" transponder on COMSTAR D-4 will provide the communications. Initially, the bandwidth will be adequate to handle JCALS traffic. However, as traffic increases, additional bandwidth may be leased as needed. Shore-based communication components, such as routers and firewalls, will be configured and tested to allow JCALS TCP/IP communications. The effort will demonstrate the use of GDMS at sea, allowing the ship's crew to access configuration and technical data stored at shore-based repositories. The Workflow Manager tool will provide a shipboard capability to transfer workfolders containing Integrated Condition Assessment System (ICAS) data, 2-Kilo information, and other equipment specific maintenance data to shore supporting activities. When fully deployed, the Deployable SMART LINK System will significantly enhance the afloat and ashore communications and remote tele-maintenance process, reduce on-site technical assistance, and reduce overall total ownership cost.

Conclusion

As technology advances, there will be more interaction between the deployed operating Fleet and shore supporting activities. JCALS near term implementation efforts will continue to support this environment. Evolving information technologies will enable the development and practical application of new, more highly integrated and interoperable digital data environments. The World Wide Web and satellite communication systems will have a significant role in supporting a future DoD infrastructure designed to promote the sharing of data in a common operating environment.

References

[1] Logistics Infrastructure Technical Architecture, prepared by Assistant Deputy Under Secretary of Defense - Logistics Business Systems and Technology Development, June 1997

[2] The Naval Logistics Information Strategic Plan, An Information Infrastructure For Expeditionary Logistics, July 1997.

[3] JCALS Infrastructure - Capabilities Description, Section 1 - The JCALS Infrastructure, Release 3.1, January 1998.

Biographies

Steve Weinstein works in the Fleet Maintenance Management Support Office in NAVSEA's Fleet Logistics Support Directorate. Mr. Weinstein is the Command's technical advisor on Continuous Acquisition and Life-Cycle Support (CALS), 3D CAD product modeling, and Information Technology matters. Prior to joining NAVSEA in 1980, Mr. Weinstein was employed as an engineer at Q.E.D. Systems Inc., and then at Norfolk Naval Shipyard. After completing the NAVSEA EIT Program, he worked in the Submarine Fluid Systems Division, the SSN 21 (SEAWOLF) Program office, and as

the Command's senior advisor on configuration management matters. He holds a Bachelors in Engineering from Old Dominion University.

Rose DiGeronimo is the head of the Engineering Drawing Management and RMAIS Branch in NAVSEA's Fleet Logistics Support Directorate. She is responsible for the policy and deployment of JCALS and JEDMICS at NAVSEA activities and for the Navy's Regional Maintenance AIS (RMAIS) Program. She has held past positions in NAVSEA which include the area of CALS and CAE/CAD/CAM. Prior to NAVSEA, Ms. DiGeronimo was the CAD/CAM Engineer for Supervisor of Shipbuilding, Bath , Maine, in the DDG 51 construction office, after having completed the NAVSEA EIT program. She holds a Bachelors in Engineering from the Catholic University of America, Washington, D.C.

Kevin Predmore works in the Engineering Drawing Management and RMAIS Office in NAVSEA's Fleet Logistics Support Directorate. Mr. Predmore is the NAVSEA JCALS Program Manager where he is responsible for the overall direction and deployment of the SIM JCALS Program. Prior to coming to NAVSEA 0432, Mr. Predmore was the Program Manager for the Laser Heated Thermoluminescent Dosimeter (LHTLD) in SEA 04R. He holds a Master's Degree in Physics.

Andy Kelly works in the Engineering Drawing Management and RMAIS Office in NAVSEA's Fleet Logistics Support Directorate. Mr. Kelly is the NAVSEA Advanced Technical Information Support (ATIS) System Program Manager where he is responsible for the design and configuration, current system deployment, and technological improvements of the System. He also provides technical support to the SIM JCALS Program. He previously held the position of EOSS Program Manager in NAVSEA. Prior to his current position, Mr. Kelly was a Lieutenant in the USN and previously served as Damage Control Assistant (DCA) on the USS VIRGINIA. He holds a Bachelors in Engineering from Vanderbilt University, Nashville TN.