Appendix VI - Department of the Navy Information Technology Infrastructure Architecture - Archived 06/2003

Department of the Navy Chief Information Officer (DON CIO)

Information Technology Infrastructure Integrated Product Team (ITI IPT)

Version 99-1.0

16 March 1999

Executive Summary

1. Background and Purpose

In May 1998, representatives from major echelon 2 Department of the Navy (DON) organizations met in the forum of the DON CIO Board of Representatives to discuss the need for an enterprise information technology infrastructure. As a result of that meeting, the DON Information Technology Infrastructure (ITI) Integrated Product Team (IPT) was chartered by the Board of Representatives. The ITI IPT was tasked with developing the DON information technology infrastructure architecture framework, guidance, and templates for all DON ITI network connectivity and basic network services, including end-to-end network management and security. In December 1998, the ITI IPT released the draft of the ITI Architecture to the Board of Representatives for review. The final version incorporates the resulting comments and recommendations.

This Executive Summary provides an overview of the ITI IPT report. For more information, see the two published volumes of the report contained in this document and accessible through the DON CIO Web site at http://www.doncio.navy.mil

The DON ITI Architecture is targeted at providing a DON network of networks that meets the ITI security, interoperability, and performance requirements of the Navy and Marine Corps, including both tactical and non-tactical missions. The ITI Architecture fully supports and provides implementation guidance for approved DON strategies, including IT-21 and Network Centric Warfare, and is aligned with the Department of Defense (DoD) C^4ISR Framework 2.0 and Joint Technical Architecture (2.0). The ITI Architecture, along with its companion document, the Information Technology Standards Guidance (ITSG) Version 98-1.1 (released in June 1998), enables network planners and service providers to design, develop, and implement integrated network solutions that are seamless and cost-effective. The ITI Architecture is designed to support the DON's ITI management philosophy of centralized IT policy and decentralized implementation. All DON personnel involved in network planning, design, and procurement should use the ITI Architecture and the ITSG documents to formulate integrated plans and to undertake IT modernization initiatives.

2. ITI Architecture Strategic Drivers

An ITI Architecture provides the foundation for robust DON enterprise-wide ITI. Four major strategic forces are driving the need for this robust infrastructure.

- Dependency on ITI to achieve Naval information superiority and the potential of ITI to support a revolution in military affairs (RMA) and revolution in business affairs (RBA).

- Alignment of ITI investment initiatives to produce a more focused, efficient, and holistic approach to building and operating the DON enterprise infrastructure.

- The need to correct the current imbalance in resources applied to combat programs versus combat support programs.

- The requirement to implement the Clinger-Cohen Act of 1996 and Office of Management and Budget Memorandum 97-16.

3. ITI Architecture Document Overview

The ITI IPT produced a DON ITI Architecture document that is organized into multiple volumes.

- Volume I − Network Infrastructure and Services Architecture, describes the network connectivity and network services architecture by components. It also provides architecture guidance in the form of

a Wide Area Network Connectivity Plan, the Metropolitan Area Network Design Template, the Campus Area Network Design Template, and an Information Technology Services Center (ITSC) template.

- Volume II – Enterprise Architecture Framework, introduces a comprehensive structure for integrating all major planning activities involved in the transformation of the DON. It positions the critical role of IT infrastructure in supporting the evolving operational requirements of the DON within the context of identified strategic mission requirements. A framework for the ITI Architecture is also provided.

There are a number of additional components of the ITI Infrastructure Architecture that remain to be developed.

These will be added to this document structure as they are completed and approved. In addition, the ITI IPT presented a number of issues and recommendations relating to ITI governance in the DON. These presentations include strong recommendations for changes in policy, organization, and business processes with respect to ITI architecture, requirements planning, design, procurement, management, and operations. As decisions are made regarding changes in ITI governance, it is our intention to publish them as extensions or additional volumes to this architecture document.

Volume I - Network Infrastructure and Services Architecture

Volume I – Network Infrastructure and Services Architecture provides architecture guidance to address the enterprise network requirements of the DON. It identifies the special DON geographical, organizational,

and operating environments that must be accommodated to satisfy the diversity of ITI users. The conceptual network architecture for the DON is represented in Figure 1.
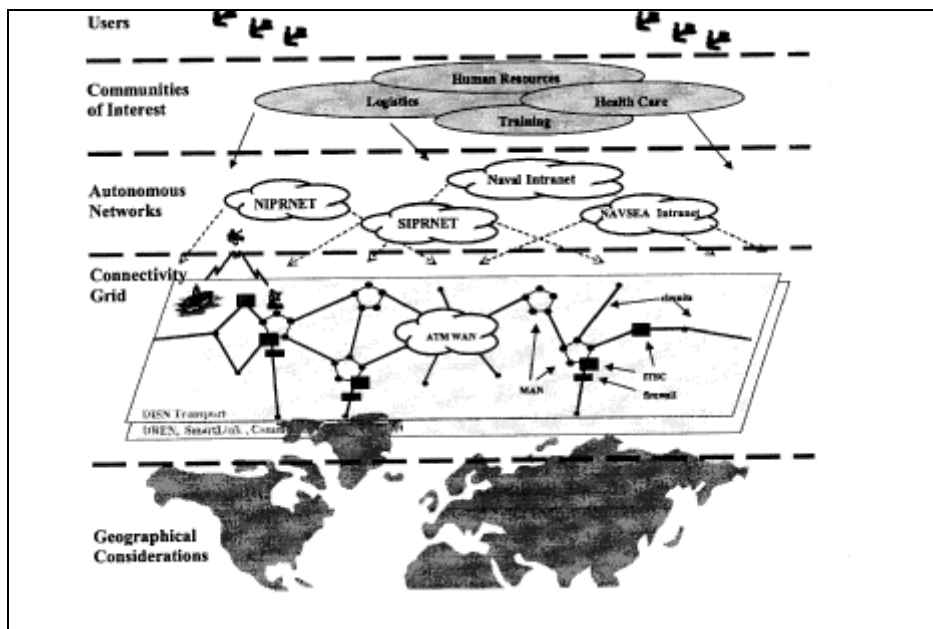

Figure 1. Conceptual Network Architecture

The network infrastructure should align geographically with Naval user population densities providing global end-to-end connectivity. The underlying connectivity grid provides the transport capability for all network services. Autonomous networks include the specific service networks (e.g., SIPRNET) that provide capabilities targeted at specific requirements. Communities of interest represent the numerous functional areas (e.g., medical health system) and their associated information management and systems applications that must be network accessible by the users working in

these functional areas. These users are at geographically and organizationally dispersed sites, and many of the users are members of multiple communities of interest. Collectively, these enterprise networks must meet the diverse requirements of all Navy and Marine Corps users – for seamlessness, mobility, and jointness.

Translating the conceptual architecture to a network solution is facilitated by the technical model depicted in Figure 2. The model was adopted as a basis for considering, organizing, developing, and presenting the

components of this ITI architecture. The network-centric solution begins at the bottom layer with the transmission service. Above this layer are the additional layers (e.g., SONET rings, ATM networks, and IP networks) of networking capability that successfully interact according to the rules of this architecture to deliver the required network services.

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+---------------------------------------------------------------+
|                                                               |
|   +-------------------------------------------------------+   |
|   |           Voice and Video Applications                |   |
|   +-------------------------------------------------------+   |
|                                                               |
|   +---------------+  +---------------+  +----------------+    |
|   | Voice Trunking|  |  ATM Services |  |  IP Networks   |    |
|   +---------------+  +---------------+  +----------------+    |
|                                                               |
|        +------------------------------------------------+     |
|        |              ATM Virtual Circuits              |     |
|        +------------------------------------------------+     |
|                                                               |
|        +------------------------------------------------+     |
|        |                 ATM Networks                   |     |
|        +------------------------------------------------+     |
|                                                               |
|   +-------------------+       +---------------------------+   |
|   |   SONET Rings     |       |   Point to point circuits |   |
|   +-------------------+       +---------------------------+   |
|                                                               |
|   +-------------------------------------------------------+   |
|   |             Transmission Service                      |   |
|   |    (fiber in the ground, cabling, switching)          |   |
|   +-------------------------------------------------------+   |
|                                                               |
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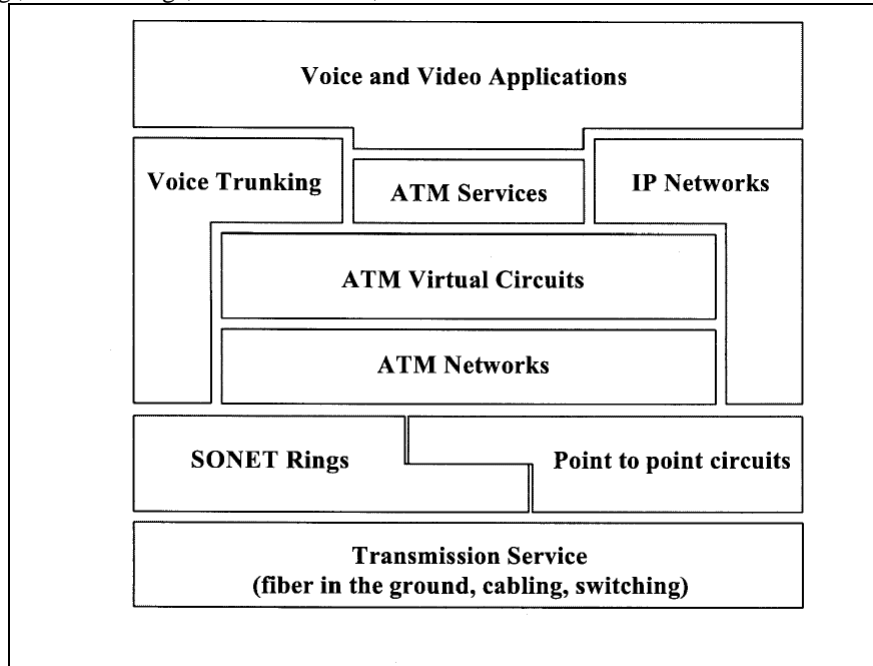
Figure 2. Layered Approach to Network Solution

Highlighting Volume I, it contains detailed guidance for deployment of an ATM infrastructure across the DON's Wide Area Networks (WANs) and Metropolitan Area Networks (MANs), and to the campuses. It fully supports the DON's ubiquitous IP networks and, in fact, provides improved performance through IP over ATM. The architecture also provides details of essential network services required for interconnectivity and operation of the DON enterprise network. It includes the following:

- A robust and responsive ATM solution in the WAN and MAN environments that recognizes multiple ATM service implementations, supports a wide range of DON service level requirements, and provides a solid capability to support virtual private networks.

- A full description of the enterprise solution for deploying internal and external routing protocols to provide efficient interconnectivity and improved network performance.

- Specific security solutions for the ATM and IP network environments by taking the established DoD principles of Defense in Depth to the next level of detail.

- Detailed description of the 14 essential enterprise network services that allow the design of DON enterprise solutions to permit efficient network component interconnectivity and interoperability. Examples of enterprise services are Directory Services, Domain Name System (DNS), and Network Time Service.

- Support requirements as defined by IT-21, including point-to-point ATM connectivity to the desktop for those users that require it.

- A Wide-Area Connectivity Plan for a single enterprise ATM backbone service to meet global enterprise-wide needs and to provide the end-to-end connectivity required for DON functional missions.

- The connectivity guidance appropriate for a typical Naval concentration area through a detailed MAN template, and similarly, the extensive connectivity guidance for bases presented in a very detailed CAN template. The campus template can be extended to address shipboard LAN requirements.

- A Network Security Strategy that includes implementation guidelines for a system of complementary and redundant Defense in Depth network security mechanisms.

Volume II - Enterprise Architecture Framework

Volume II – Enterprise Architecture Framework introduces a comprehensive structure for supporting the integration of all major planning activities involved in the transformation of the DON. The Enterprise Architecture Framework (EAF) was developed to position the critical role of IT Infrastructure in supporting the evolving operational requirements of DON within the context of identified strategic mission requirements.

The EAF is, therefore, more than an integrated IT architecture framework. It pulls together, in one unified structure, all of the components of the enterprise that must be considered in establishing readiness to perform the DON's missions. However, the EAF strongly and properly positions the role of information (knowledge), information management systems, and the underlying IT infrastructure by linking these elements to mission essential tasks and the unique operational environments of the Navy and Marine Corps. Consequently, it is ideally suited for supporting the complex planning of RMA/RBA and giving substance to the key strategic notions of network-centric warfare and information superiority.

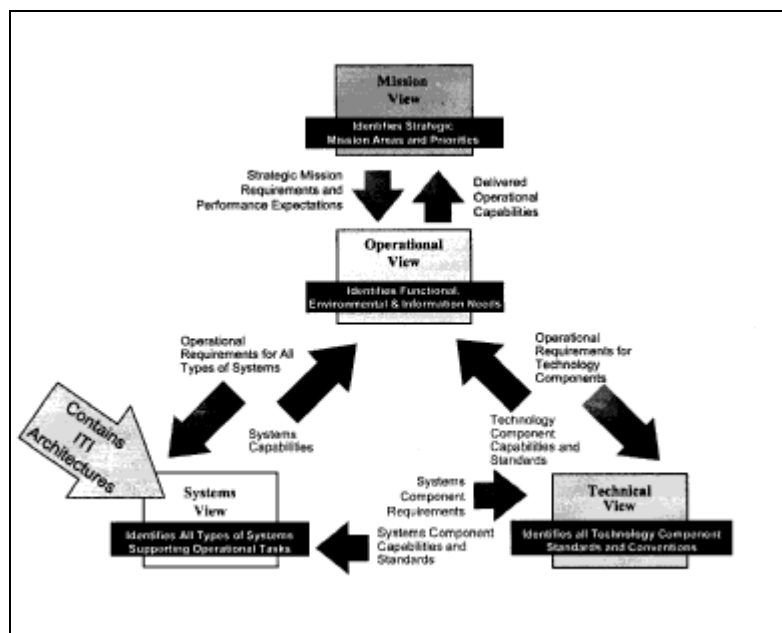The high level view of the EAF is show in Figure 3.

Figure 3. Enterprise Architecture Framework

The DON EAF is upwardly compatible with the existing C[4]ISR V2 Architecture Framework from DoD.

It builds upon this established base in the following areas:

- Extends the functional task model beyond C[4]ISR to include all support functions as well as enterprise planning and policy setting activities so that it is a complete enterprise functional model.

- Adds a "Mission View" to the framework to provide structure and linkage to the analysis of threats, determination of strategic mission requirements, and positioning of key roles of other services, agencies, and contractors.

- Expands the "Systems View" to include all types of systems (sensor, weapon, platforms, information systems, etc.) that collectively support the warfighter and all other personnel performing mission-essential tasks. The IT infrastructure is positioned within this view as a capability upon which these other systems depend.

- Provides the construct for organizing the planning of the ITI architecture by defining the sub-architecture components of Workgroup Computing, Network, and Enterprise Server combined with the required end-to-end services of Security Manage-ment, Infrastructure Management, and Information Distribution.
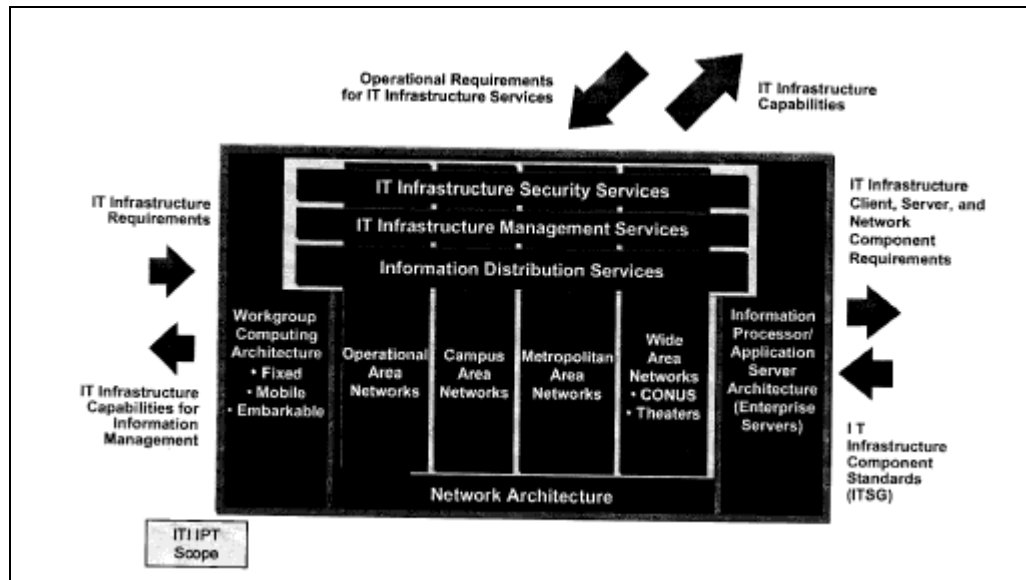
The ITI architecture framework is shown below in Figure 4.

Figure 4. ITI Architecture Framework

The development of the enterprise network architecture templates and plans as presented in Volume I represents the initial application of the EAF. It will continue to be applied for further expansion of the ITI and for work on enterprise systems and enterprise processes.   The broader the use of the EAF in providing structure and context for integrating enterprise planning initiatives, the greater its value to the DON and, through extension, to DoD and other agencies.

4. Governance Issues

The publication of the network architecture plans and templates addresses the technical challenge of inte-grating the disparate networking solutions that exist today into an effective consolidated enterprise infrastructure. The shift to an infrastructure orientation implies that many existing enterprise policies, organizational responsibilities, and business processes will be impacted by this approach.

The most critical success factor for building the DON ITI infrastructure is implementing an effective approach for ITI governance. The ITI IPT identified a number of governance issues. Five are presented here because of their importance.

- How should we organize within the DON to effectively perform the management functions of ITI? There are currently multiple organizations performing duplicate, uncoordinated functions, including planning, designing, building, pro-visioning, and managing networks. How should

we reorganize to more effectively allocate resources, assign responsibilities, instill discipline, and maintain operational support for an enterprise network infrastructure?

- How should we pay for ITI services? Some common set of ITI services such as telephone, email, directory, time, domain naming, web access, and others must be standardized and offered as basic network services across the DON. A single DON enterprise ATM backbone and regional MANs are also network services that should be centrally funded.   Any solution must incorporate mechanisms that curb network user appetites and discipline its use.   How should we fund these services?

- How do we collaborate to ensure that all user requirements are reflected in enterprise solutions? How do we ensure that the regional and enterprise providers of IT infrastructure services are

responsive, efficient, and accountable to their customers? How can we ensure that the relative priority placed on competing services accurately reflects the relative priority of the Navy and Marine Corps missions being supported by the ITI? How do we ensure that service providers incorporate best practices and remain cost competitive?

- The reorganization of the management functions of ITI cannot succeed without a reengineering of supporting ITI enterprise processes such as determining requirements, negotiating service agreements, reporting performance, managing operations, providing user support, and billing customers. How do we undertake an effective reengineering of our ITI processes?

- How do we address the acquisition and development of the necessary skills and competencies to effectively plan, implement, and operate this ITI? What is the best use of contractors and external service providers in meeting these capabilities?

5. Implementation Recommendations

The following initial actions are recommended to address implementation of the ITI network solution.

- Adopt the use of the EAF and the ITI architecture templates for all related enterprise planning activities.

- Determine organizational accountabilities for planning, procuring, and operating the ITI.

- Determine a Navy and Marine Corps solution for a Wide Area Connectivity Plan that results in a single DON enterprise backbone.

- Define the regions (MANs) and an operational management structure that is acceptable to the fleets, Marine Corps, and the Systems Commands and specifies responsibilities and accountability (including Information Technology Support Centers).

- Direct the full architecture development of ITI network services (directory, DNS, time, etc.) and implement them across the DON.

- Determine a funding structure for common user services and enterprise networks, and develop a billing structure for other uses.

- Develop the required ITI management processes.

- Fully provision the DON enterprise backbone and begin to connect organizations and regions.

- Conduct a pilot MAN and ITSC implementation using the ITI architecture guidance.

Implementing the IT infrastructure is one of the most strategic initiatives for the DON. It will require effective collaboration and leadership to develop and maintain this increased capability. The publication of the network architecture plans and templates is an important first step. Implementation efforts to apply this guidance are already under way. It will take the collective energy of all involved in IT to quickly and efficiently migrate to this infrastructure approach.

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