Department of the Navy Information Technology Infrastructure Architecture (ITIA)

Volume II
Enterprise Architecture Framework

Department of the Navy Chief Information Officer (DON CIO)
Information Technology Infrastructure Integrated Product Team (ITI IPT)

Version 1.0 proposed
16 March 1999

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Introduction to Volume II

This publication is included as part of the Report of the Department of the Navy (DON) Chief Information Officer (CIO) Information Technology Infrastructure (ITI) Integrated Product Team (IPT). Volume II describes the Enterprise Architecture Framework (EAF) for the DON. This framework is being advanced under the leadership of the DON CIO and the CIO Board of Representatives and through the coordination of the Enterprise Architecture and Standards Competency Unit within the Office of the DON CIO.

This EAF is being introduced in conjunction with the results of the ITI IPT to provide the overall context for all enterprise architecture modeling activities. It positions the role of Information Systems and ITI within a broader strategic context related to the Revolution in Military Affairs and the Revolution in Business Affairs (RMA/RBA).

It is intended that this framework will assist the various planning teams across the DON by providing a unified and common set of reference models around which to plan and coordinate the complex changes involved in RMA/RBA.

It is intended that this framework will further evolve through effective application to various architecture initiatives in the Joint community as well as across all DON functional areas.

Volume II - The Enterprise Architecture Framework

The volume is organized into the following chapters:

Chapter 1 - The Enterprise Architecture Framework Overview

This chapter introduces the EAF. It discusses the purpose behind introducing a Department-wide architecture planning framework and presents some underlying principles to guide the development of this framework. The chapter introduces the overall framework and explains the purpose for each of the four primary views of the Enterprise Architecture.

Chapter 2 - The Mission View

This chapter describes the elements that comprise the Mission View. These are the elements that are used to construct strategic plans and derive the enterprise missions from analyzing the changing national security needs and other forces for change that are acting upon the enterprise. The critical role of Stakeholders, Partners, Suppliers, and Recruits is also included in this view.

Chapter 3 - The Operational View

This chapter describes the elements that comprise the Operational View. These are the elements used to construct operational capabilities in support of the Mission Essential Tasks and in relation to the required operational environments. This view includes Personnel, Platforms, Facilities, Equipment, Supplies, and Information.

Chapter 4 - The Systems View

Chapter 4 identifies the many different types of systems that are required to support the operational capabilities of the DON. These are presented in the EAF as sub-views. They include Weapons Systems, Information Systems, Other Special Purpose Systems, and their supporting Platform Architectures, Facility Architectures, Utility Architectures, and the Information Technology Infrastructure Architecture. The IT Infrastructure Architecture is the part of the Enterprise Architecture that was developed by the ITI IPT.

Chapter 5 - The Technical View

Chapter 5 presents the different categories of Technology Component Standards and Specifications relating to each of the systems' sub-views. For the IT Infrastructure, the corresponding standards are the Information Technology Component Standards as contained in the ITSG. The Standards Framework, as developed within the ITSG, is presented here to link this guidance document to the EAF.

Chapter 6 - Framework Implementation Considerations

The final chapter discusses the considerations for fully implementing the EAF. Topics include the need for developing reference models for the elements of each of the four views to create a standardized set of terms and definitions to be used across the enterprise. The need for creating a repository for enterprise architecture models and an associated tool set is also discussed. Chapter 6 also includes a section on how the EAF was applied to produce the work products of the ITI IPT.

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1. The Enterprise Architecture Framework Overview

The DON is involved in a major enterprise transformation as envisioned by the QDR notions of the RMA and the inter-related RBA. This revolution will affect most, if not all, of the operational areas of the Department. The complexity of planning and managing this transformation cannot be overstated.

The purpose for introducing this EAF is to assist all of the planning and implementation teams working on components of the RMA/RBA by providing a common underlying structure around which to model this transformation. This framework is intended to be comprehensive and address all of the inter-related components involved in planning and managing enterprise transformations.

The development of this EAF is a collaborative effort under the sponsorship of the DON CIO and the CIO Board of Representatives. The Enterprise Architecture and Standards Competency Unit of the Office of the DON CIO provides coordination of this initiative. This initial publication of the EAF is occurring in conjunction with the publication of the ITI IPT Report because this is the first of the enterprise-wide architecture initiatives to occur under the mandate of the DON CIO. A sub-team of the ITI IPT has been responsible for developing this initial version of the EAF.

As noted above, the EAF is intended to provide the structure and components for all areas of transformation planning and incorporate many disparate architecture initiatives from across Joint and Departmental planning areas. This EAF has built upon the existing C4ISR Version 2 Architecture Framework to ensure compatibility with this key Joint direction. It has extended this framework to be more broadly applicable to all functional areas and to tightly link investment planning in systems and infrastructure to the key strategic missions and transformation objectives of the Department.

The role of information technologies in supporting or enabling the intended transformation (Information Superiority, Network Centric Warfare, etc.) is strongly represented in this proposed EAF.

1.1 Framework Principles

In developing this Framework, the IPT defined a number of key principles that must be applied in creating an effective architecture planning capability to assist planners. These principles are described below along with their supporting rationale.

1.1.1 Enterprise Perspective

To achieve the stated strategic objectives of RMA/RBA, the DON must take an enterprise perspective in all planning of mission, operational, systems, and technology requirements and solutions.

Rationale:

- To fully explore opportunities for transformation, it is necessary to remove all existing functional, organizational, and geographic barriers.
- The impacts of information technology on how our military and business affairs will be conducted are far-reaching and require an enterprise view of how information can be better leveraged to support our primary mission objectives.
- The opportunities to leverage common solutions to mission and business requirements are significantly increased by combining the interests of all communities across the DON and by extending this analysis across Joint, Allied, other governmental agencies, and the private sector.

1.1.2 One Framework

To support enterprise oriented transformation planning, all of the various communities of interest within the DON must adopt a common framework with common references to architecture elements.

Rationale:

- A unified framework maximizes the opportunity to identify areas of commonality and opportunities for sharing in the development and use of common solutions.
- A unified framework supports the identification of interoperability requirements.
- A unified framework facilitates developing enterprise perspectives and "out-of-the-box" thinking.
- Using a common framework for tactical and non-tactical areas will assist in identifying opportunities to shift resources "from the tail to the tooth."
- A unified framework facilitates the development of common planning and design methods and the ability to share and/or redistribute resources.

1.1.3 Fully Integrated

The framework must support modeling and planning of all required enterprise capabilities crossing traditional tactical and non-tactical functions and covering all operational environments.

Rationale:

- The framework must provide a uniform basis for assessing existing capabilities and prioritizing requirements to upgrade or improve areas of concern.
- Planning for the delivery of basic Infrastructure Services across the DON requires enterprise-wide coordination and synchronization.
- Although regionalization is concentrating control of IT resources, many communities of interest operate cross-regionally and need to integrate with the afloat and deployed commands, thereby requiring enterprise-wide views of current and planned capabilities on which to base their transformation strategies and plans.

1.1.4 Multiple Views

The framework must support the needs of all types of architects and planners and provide views of mission capabilities, operational capabilities, systems capabilities, and technology capabilities as well as the inter-relationships between these views.

Rationale:

- The planning of enterprise transformation occurs at a number of different levels, ranging from the strategic planning of enterprise missions down to the development and application of new technologies.
- Each of the levels involves different types of planners and architects with different experience and capabilities all working on inter-related aspects of the transformation plan.
- The framework must provide the top-down context for all of these initiatives such that strategic relevance and investment or resource allocation priorities can be linked.

1.1.5 Time-line Dependencies

To support current and opportunity assessment, alternative evaluation, target solution design, and migration planning, the framework must support the identification of time periods and interdependencies across implementation projects.

Rationale:

- Operational capabilities are dependent upon a number of factors aligning in time to ensure readiness to perform expected missions.
- These factors include the required number of suitably trained and organized personnel with appropriate platforms and/or facilities containing necessary equipment and supplies providing access to the required information systems.
- These systems require the appropriate IT infrastructure to be in place with adequate capacity, high availability, and supporting the necessary levels of security.
- The framework must support the ability to align these requirements and ensure synchronization across the various design and development, implementation, and training projects involved in creating the operational capability.

1.1.6 Supporting Toolset and Repository

A graphical architecture modeling tool and model repository is required to represent all EAF architecture models and elements with associated attributes and relationships.

Rationale:

- The framework is comprised of a number of architecture planning models and associated elements (objects). Most of these elements will have a large number of occurrences and many relationships. A tool and repository environment is essential to managing this complex information domain.
- Architecture drawings are graphical by nature. A graphically-oriented tool will allow appropriate "blueprints" to be developed and viewed and will standardize associated iconic representations.
- All architecture elements will have associated attributes that will be populated and updated as part of the model development or as the model is used to support assessment or planning.
- Architecture elements and models have many relationships that are developed or explored over the course of developing models, conducting assessments, and building plans. The tool must support the creation and viewing of these complex inter-relationships.

1.2 Architecture Framework Terminology

This section provides definitions of terms that are associated with the EAF. A key aspect of introducing an EAF is to provide a common means of referring to the components of the Enterprise. Here, we are practicing what we preach by normalizing our own use of terminology within the architecture community.

Architecture - the structure of "anything"; an image of the required or planned functionality.

Architecture Framework - the underlying or basic structure upon which other architectures are built.

Enterprise Architecture Framework - the underlying structure for planning the capabilities of an enterprise, encompassing all required functions and views.

Architecture View - a different perspective of the architecture provided for specific purposes and planners with different interests. The EAF identifies four views: Mission, Operational, Systems, and Technology.

Architecture Element - a primary component or enterprise "object" defined by the framework. Each element is a unique class (e.g. ship) with possible sub-classes (e.g., carrier, destroyer, etc.) with associated attributes (e.g., tonnage, maximum speed, date commissioned, etc.) with definable relationships (e.g., member of battlegroup X, SIPRNET-enabled, embarked commands, etc.)

Architecture Model - Any representation using combinations of architectural elements and possibly including their attributes and relationships. These can be diagrams showing groups of elements, connectivity or flow between elements, tables showing relationships, or reports containing diagrams, tables, and textual descriptions (e.g., an information flow model showing how information is created and used by a related operational functions). These models can represent different periods of time from current or baseline assessments through planned implementations.

Reference Model - Identification of the set of occurrences for Architectural Elements and their primary relationships in advance of their use. This provides a common means of identifying and defining elements for use across the enterprise (e.g., the Universal Joint Task List -UJTL for joint operational functions and tasks).

Infrastructure Service - Recognition of a common service or capability that is widely required across the enterprise or by large numbers of users such that it can be planned and operated as a "common enterprise utility" (e.g., communication networks).

Template - A pre-planned architecture model providing solution guidance for a recognized common or repeatable set of requirements (e.g., metropolitan area network template, service center management and organization template).

1.3 Framework Positioning

Based on these definitions, the Architecture Framework can be positioned within the process for planning for transformational change. Figure 1-1 summarizes this positioning for an architecture framework.

An Architecture Framework provides the structure required to translate a vision for a renewed enterprise capability into a well-planned and managed set of implementation projects.

A framework is really a model of models (or a meta-model) because it describes and positions a number of different architectural views that are made up of different architecture elements. These views and elements are then used to construct different architecture models that assist planners and designers in making key decisions regarding opportunities for transforming the enterprise.

In many areas, these models will identify common requirements from which templates can be developed to leverage reusable solutions.

By providing visualization (a blueprint) of the desired change and its inter-relationships with other elements, the models and templates help the planners focus investments in the areas of greatest benefit to the enterprise.

By effectively applying this managed architecture approach, it is possible to prioritize and sequence implementations in accordance with overall enterprise strategic goals.

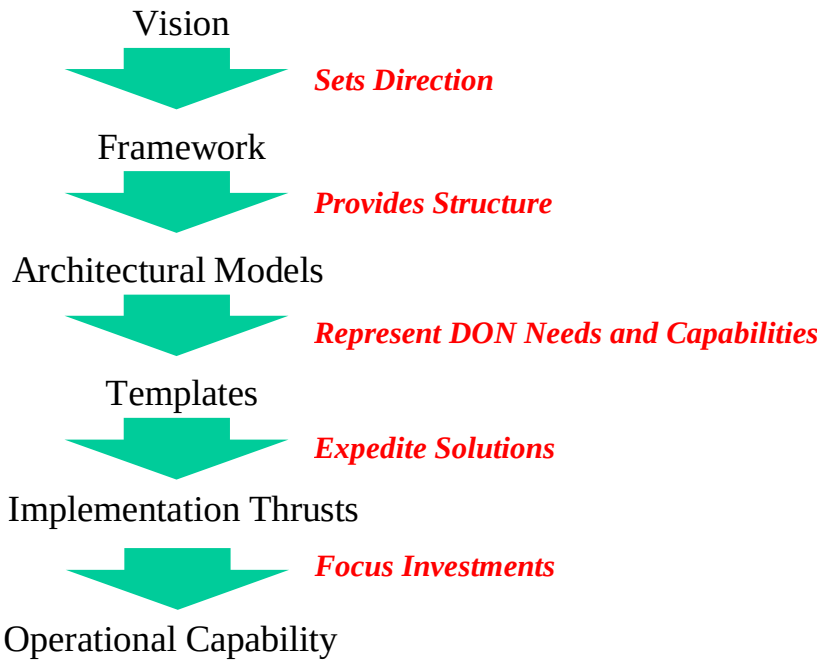


Figure 1-1. Positioning the Role of the Framework

1.4 C4ISR Framework Version 2

Figure 1-2 depicts the current version of the C4ISR Architecture Framework. There are three different Architecture Views - Operational, Systems, and Technical - and a corresponding set of inter-relationships.

This framework is the basis for much architecture planning work underway across the Joint Services in the C4ISR Community. This EAF was built upon this base.

This existing framework is now heavily populated with reference models for many of the elements and relationships. It is rightly focused on the needs of the warfighter and supports the integrated requirements for operational, systems, and technology planning

The EAF has built on this foundation and extended this framework in the following areas:

1. Added the “Mission View” to provide a structured approach to representing strategic operational requirements as driven from RMA/RBA and the corresponding threat analyses

2. Extended the functionality to include all required enterprise functions (operational, support, and planning) and all operational environments

3. Expanded the “Systems View” to include all types of “Systems” (Weapons, Platforms, Information, etc.) and added the notion of IT Infrastructure to the Systems View to address the need for templates based on the established Technical Standards (JTA and ITSG)

4. Positioned each of the four views in the flow of requirements and capabilities to show the inter-dependencies and emphasize the need for alignment

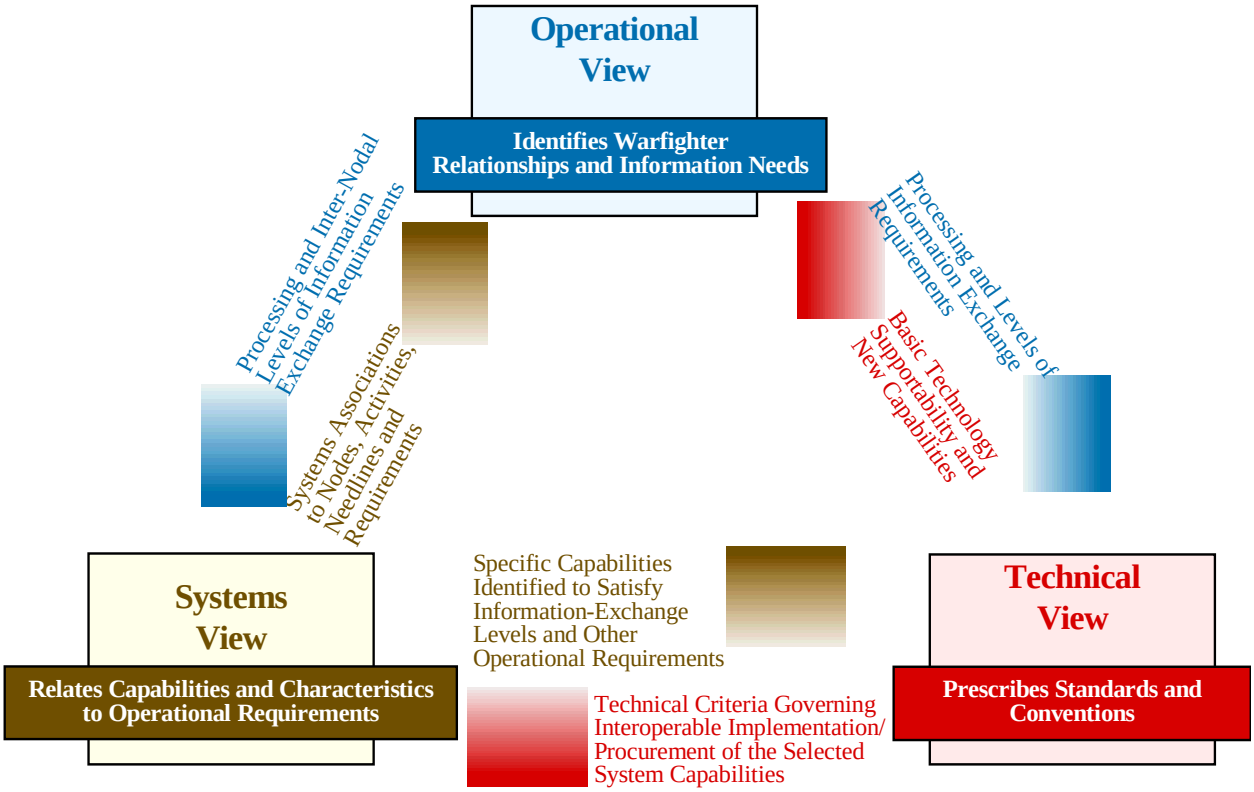


Figure 1-2. The C4ISR V2 Architecture Framework

1.5 Enterprise Architecture Framework – Four Views

Figure 1-3 shows the four top-level views of the proposed DON EAF. The Mission View has been added to provide additional structure pertaining to strategic mission requirements.

The Operational View has been expanded to reflect all functional requirements of the Enterprise (tactical and non-tactical) in a common structure with associated environments.

The Systems View now contains all types of systems and the Technical View provides the corresponding technology standards for the various systems components.

All of these four views have key inter-relationships. Requirements flow from top to bottom and capabilities flow up to address those requirements.

The goals of the framework include:

1. Achieving complete alignment of capabilities with requirements across these different views. The Mission View aligns the determination of mission areas and associated funding with the needs for Naval military services and develops associated operational requirements. The Operational View responds to these requirements by delivering the appropriate operational capabilities while at the same time imposing requirements on the Systems View and the underlying technologies. These views respond with the corresponding capabilities.

2. Establishing the strategic priorities for funding and then tracing these priorities through the views to determine the inter-dependencies on capabilities (e.g., how does improving a key mission area relate to new operational capabilities that depend on what systems and infrastructure that are built upon what technologies).

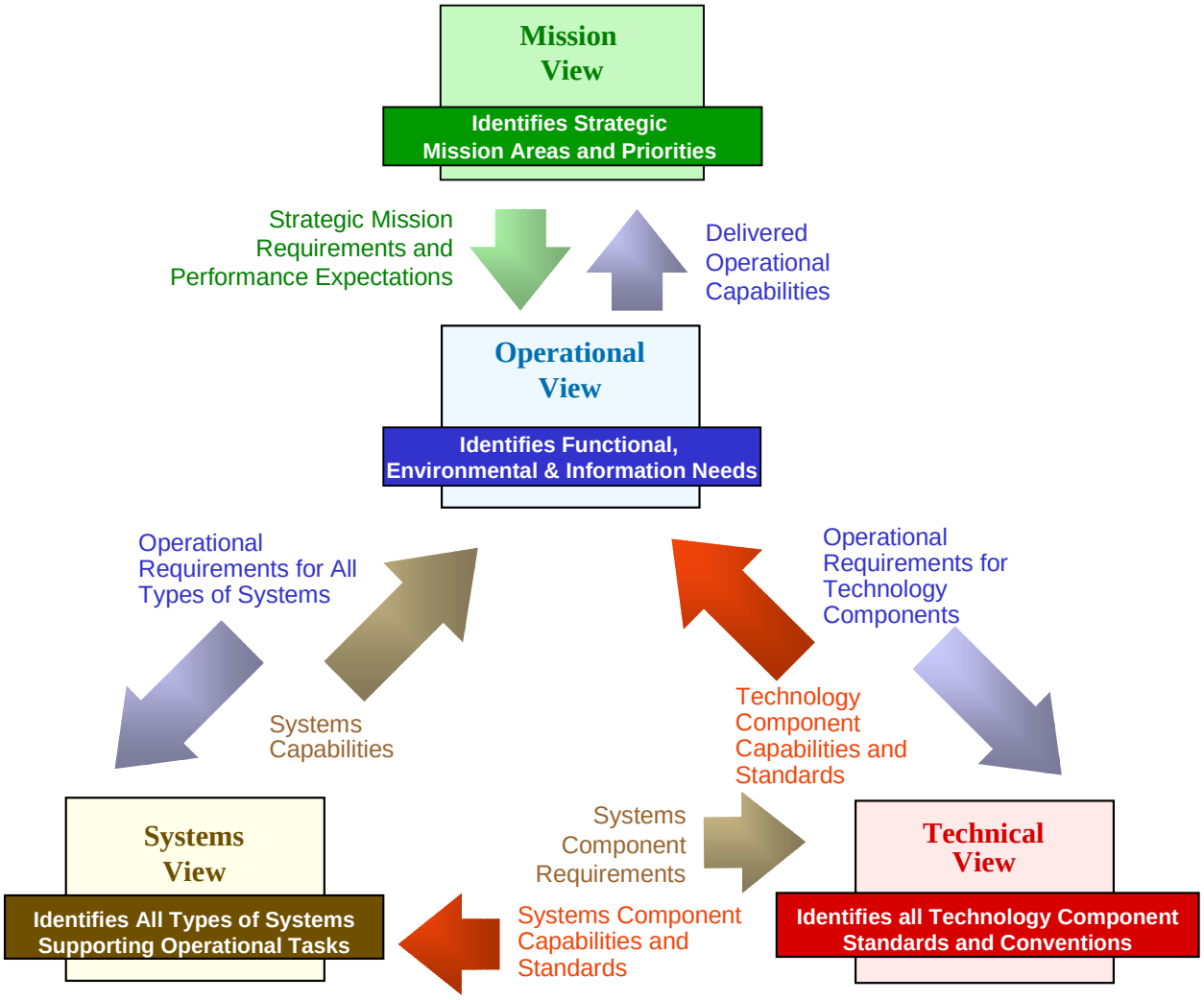
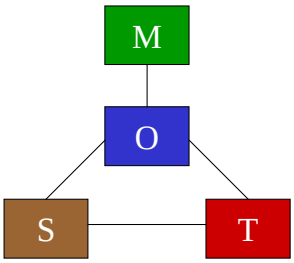


Figure 1-3. The Enterprise Architecture Framework Showing Four Views

3. Developing effective governance and performance management capabilities. What are the fundamental changes in organization/command structures and accountabilities? What performance measures are needed to motivate appropriate behavior?

To achieve these goals, it is necessary to develop a comprehensive framework that includes all of the required planning elements and their inter-relationships. This top-level representation of the EAF is referred to as the “MOST” model using the following icon. The subsequent four chapters describe the underlying components and relationships for each of these four views.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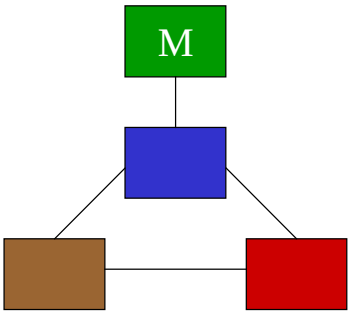
2. The Mission View



The Mission View represents the highest level of the EAF. It is used to model the elements and relationships involved in developing strategic plans for the DON.

This chapter presents the architecture elements and relationships that are involved in the Mission View. It is intended as an introduction to the use of architecture models in supporting strategic and mission planning. It also provides the critical link to the interests of the key stakeholders of the DON as represented by the U.S. Government and the many influences that these stakeholders have on the strategies and missions of the DON.

2.1 Architecture Elements and Relationships

The Mission View is comprised of a number of architecture elements that are used in developing strategic plans and setting the goals and priorities of the DON. Figure 2-1 presents these elements and the key relationships between them.

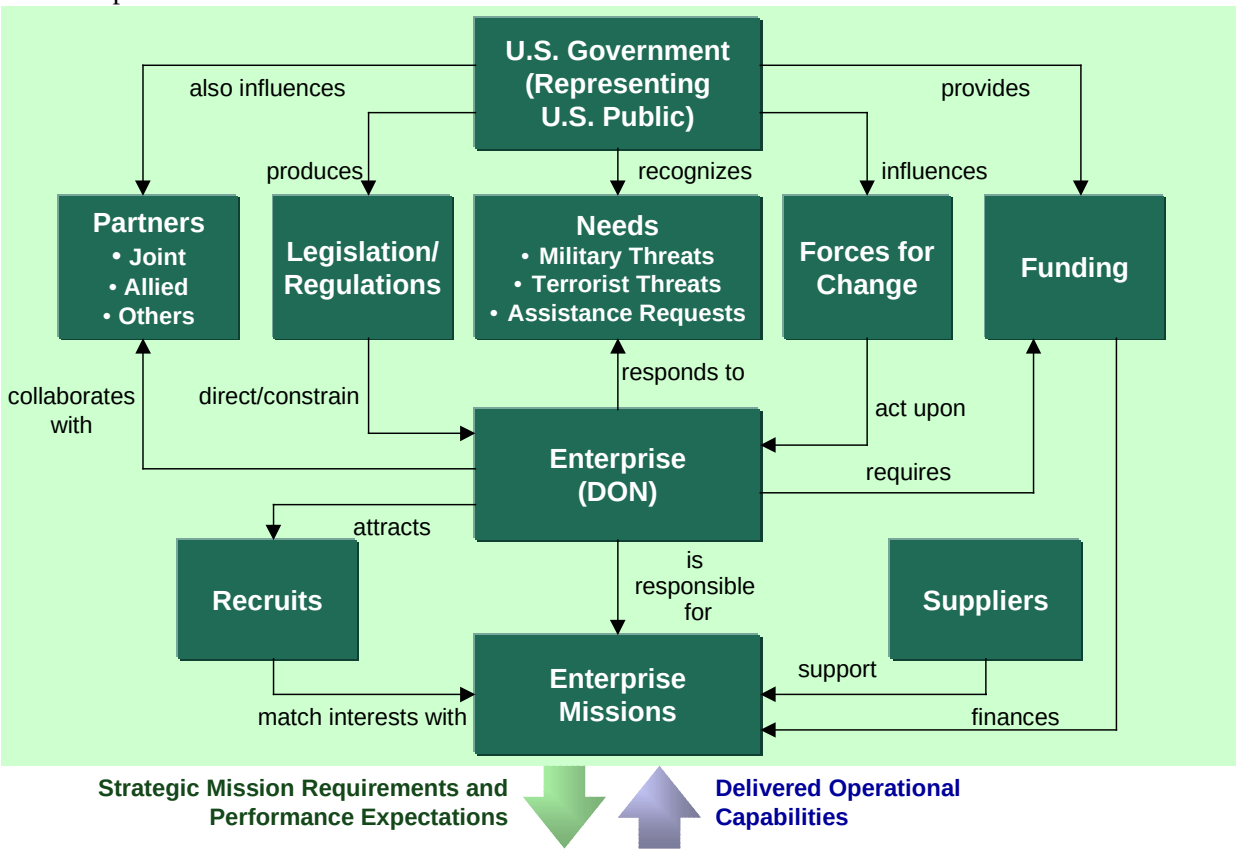


Figure 2-1. The Architecture Elements and Relationships in the Mission View

There are ten (10) architectural elements that comprise the Mission View of the DON EAF. The following paragraphs provide a brief overview of these elements.

The stakeholders for the DON are the people and interests of the USA as represented by **the Government of the U.S.** with the elected bodies of the President, Congress, and the Department of Defense. In their governing role, these bodies and agency also oversee the Army, Air Force, Coast Guard, and other **partners** with whom the DON collaborates in developing integrated national defense strategies and in conducting missions.

Central to the development of defense strategies is the identification and evaluation of **Needs**, including combating threats with force or deterrents and meeting demands for other military assistance (peacekeeping, disaster assistance, etc.). The determination of the role for DON in addressing these needs is central to the development of strategy.

The core element produced by this analysis is the set of **Enterprise Missions** that define the role of the DON in relation to other services and agencies involved in National Defense Programs. These missions form the basis for determining **Funding** requirements and priority allocations. The alignment of funding with the Naval strategic requirements and the resulting operational capabilities is a key relationship of the DON with its stakeholders.

The Government also produces **Legislation & Regulations** which impose constraints and directives on the **Enterprise** (DON). They also influence the **Forces for Change** that are acting upon the DON (e.g., budget constraints, acquisition reform) along with many other sources (e.g., new technologies) which much be addressed in strategy development.

Strategies related to **Recruit**ing requirements and effective use of **Suppliers** are also involved in finalizing mission strategies.

2.2 Enterprise Missions

The framework is used to identify architecture elements and relationships. These elements take on full meaning once they have been “populated” with the complete set of current or planned “instances” to form a reference model for all planners involved with this element. Figure 2-2 provides an example of the reference model for Enterprise Missions.

These missions were extracted from published strategy and vision documents and logically consolidated. Under the overall goal of providing full spectrum dominance, the model shows nine (9) primary missions. Within these primary missions, there are fifty-one (51) secondary missions identified.

This provides the structure to clearly classify and define these missions. The inter-dependencies amongst these missions can be traced back to the needs of combating various types of threats, providing deterrents, and offering military assistance. This analysis, along with other strategic considerations, can be used to help prioritize these mission areas for both funding purposes and to focus readiness and renewal activity.

Each of these strategic missions can be linked to the Operational View. Each imposes operational requirements, some of which are specific to the mission, but many of which are common across some sub-set or all missions.

As we proceed into the Operational View, it is important to think about mission requirements in terms of pulling through Mission Essential Tasks which can be shared across mission areas. In this way, we avoid re-creating organizational “stove-pipes” around missions.

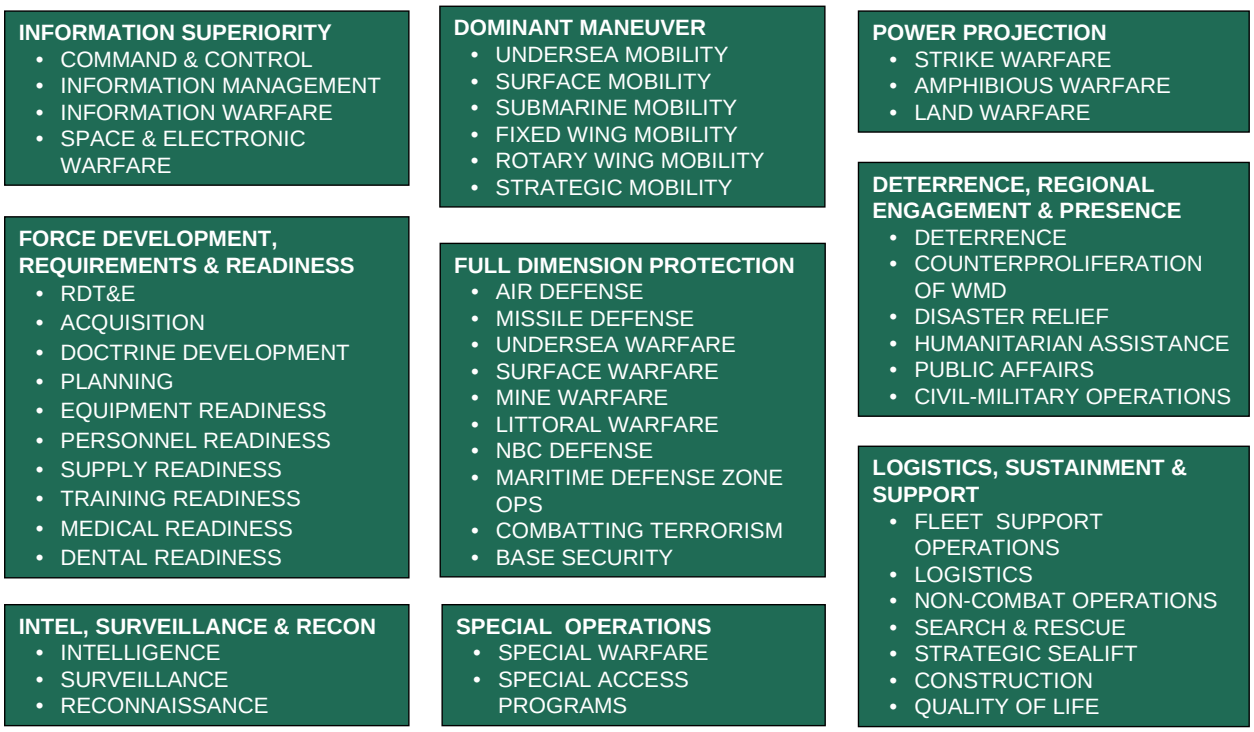


Figure 2-2. Reference Model Showing Primary and Secondary Enterprise Missions

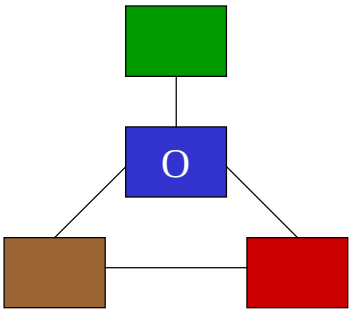
2.3 Uses of the Mission View and Elements

As illustrated above with the "Enterprise Mission" element, the framework provides the structure for populating architecture elements and tracing relationships or inter-dependencies. The elements within the Mission View can be used to construct many different types of models and perform evaluations and analyses. Some of these are listed below.

1. National Security Threat Analyses vs. Mission Capabilities
2. Strategic Impact Assessments of Forces for Change
3. Weighting of Enterprise Goals and Strategic Drivers to Mission Areas
4. Inter-dependencies of Enterprise Missions (or Sub-Missions) to Needs
5. Distribution of Funding by Mission/Sub-Mission
6. Mission Partnering Opportunity Analyses
7. Pending Legislation Impact Analysis
8. Supplier Dependencies - Risk/Opportunity Analysis
9. High-Level Funding Impact Assessments
10. High-Level Enterprise Readiness and Performance Assessments

As part of the implementation plan for the EAF, it is intended to connect with the planning communities involved in these models and analyses to develop meaningful examples of how the Mission View can be fully used to support strategic planning and provide the all-important context for operational planning. See Chapter 6 for information regarding these implementation plans.

3. The Operational View



The Operational View is positioned in the heart of the EAF. As the name implies, this view is very physical in nature and is used to describe the operational requirements and capabilities as dictated by the Strategic Mission requirements defined in the Mission View.

This Operational View sets the context for defining the requirements for all types of systems and technologies as they relate to the needs of the task, the people performing those tasks, and the environment in which they are performed.

This view is used to identify the operational capabilities which define "readiness" to fulfill the strategic mission requirements.

3.1 Architectural Elements and Relationships

The Operational View is comprised of a number of architecture elements that are used in developing mission tasking, describing operational capabilities, and identifying operational environments. Figure 3-1 presents these elements and the key relationships between them.

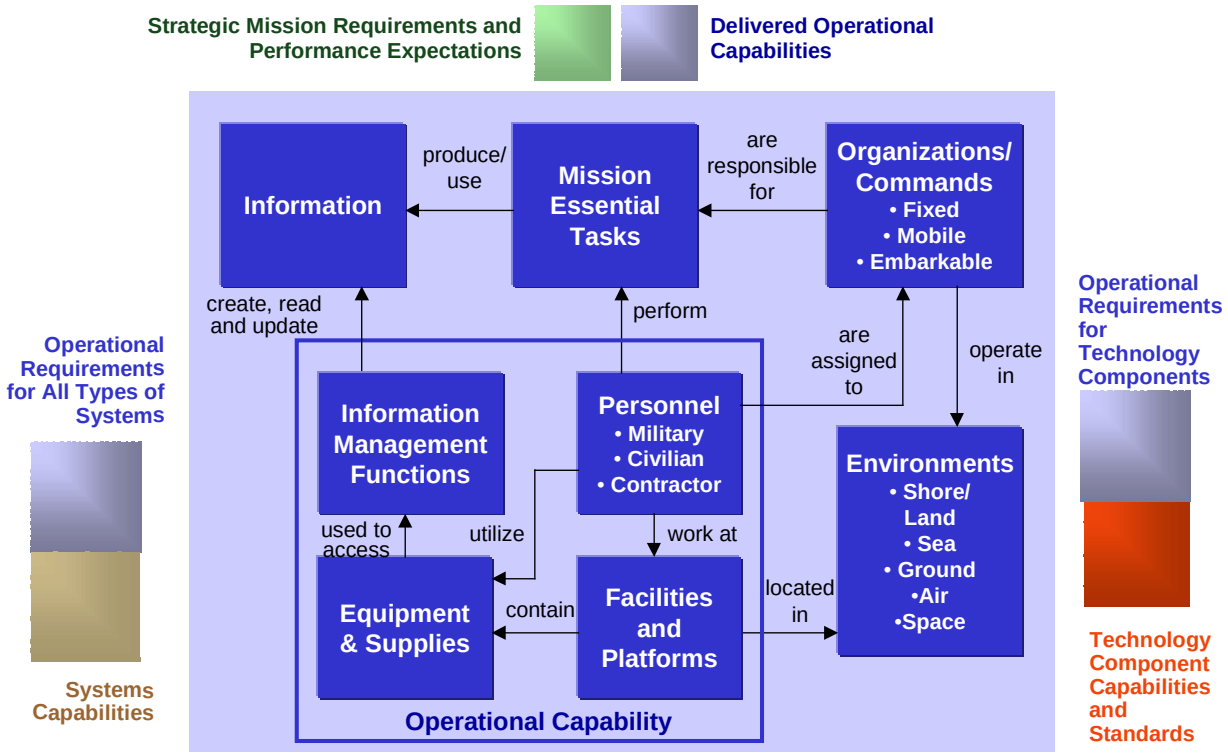


Figure 3-1. The Operational View Showing Architecture Elements and Relationships

The **Operational View** is comprised of a number of architecture elements that collectively are used to describe the overall operational capabilities that are required to respond to the Strategic Mission Requirements.

Mission Essential Tasks (METs) provide the means for modeling the functional requirements of the Enterprise to respond to the stated missions. For the DON, they are the Universal Navy Task List (**UNTL)**, which is based on the UJTL. These tasks are grouped into four layers with multiple levels of decomposition. These tasks can be mapped to the **Organization and Command** Structure that is similarly structured as a hierarchical decomposition structure. Note that the UNTL was intentionally very mission-focused and must be expanded to accommodate many additional enterprise planning and support functions.

Depending on the METs to be performed, a command can be classified as fixed, mobile, or embarkable depending on its relationship to operating **Environments**. A **fixed** unit is assigned to a permanent workplace (in a facility or on a platform). A **mobile** unit moves within its associated environment (e.g., an IPT), and an **embarkable** unit is one that moves within and across operating environments (e.g., Marine Corps and Special Operations units).

The **Information** element identifies and structures the information resources of the enterprise. It provides the basis for defining information flows between METs.

The **Operational Capabilities** required to meet the needs of the METs are defined as combinations of **Personnel** with the appropriate skills supported by their work environments including necessary **Equipment and Supplies** and the related **Facilities and/or Platforms**. Some of that equipment (e.g., PCs, radios, and phones) is used to access the **Information Management Functions** that are used to manage the information requirements of the MET. These operational capabilities set the context for engineering systems solutions as represented by the Systems View. They also impose certain requirements on the underlying technologies that comprise these systems as represented in the Technical View.

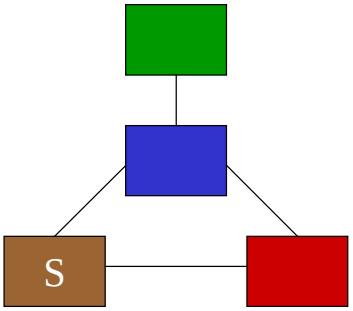
3.2 Uses of the Operational View and Elements

The following models and analyses based on the Operational View can represent **current, proposed, targeted, and migration states where applicable**:

1. Mission Essential Task Lists
2. Work Flow Models
3. Information Flow Models
4. Organizational Accountability Models
5. Resource/Cost Allocation Models
6. Operational Performance Assessment Analyses
7. Operational Improvement Business Case Analyses
8. Systems Requirements Analyses
9. IT Infrastructure Requirements Analyses
10. Funding and Project Impact Analyses

As part of the implementation plan for the EAF, it is intended to connect with the planning communities involved in these models and analyses. This will lead to development of examples of how the Operational View can be fully used to describe the required operational capabilities and provide the context for systems and technology planning. See Chapter 6 for information regarding these implementation plans.

4. The Systems View



The Systems View of the EAF is used to represent the many different types of systems and their components that are required to support the operational capabilities of the DON. This is the "engineering view" in which complex systems are put together from the standardized components as decried in the Technical View and must all work together to meet the complex needs of the user in their operational environment.

The Systems View has combined all of these engineered systems under one view, including the weapons and platforms of the warfighter, the sensor systems that provide the battlespace information, the shore-based facilities and all of the utility and information technology infrastructure that is required to support these other systems.

4.1 Architectural Sub-Views

The Systems View is comprised of a number of different architectural sub-views which each represent a major class of systems. These are shown in Figure 4-1.

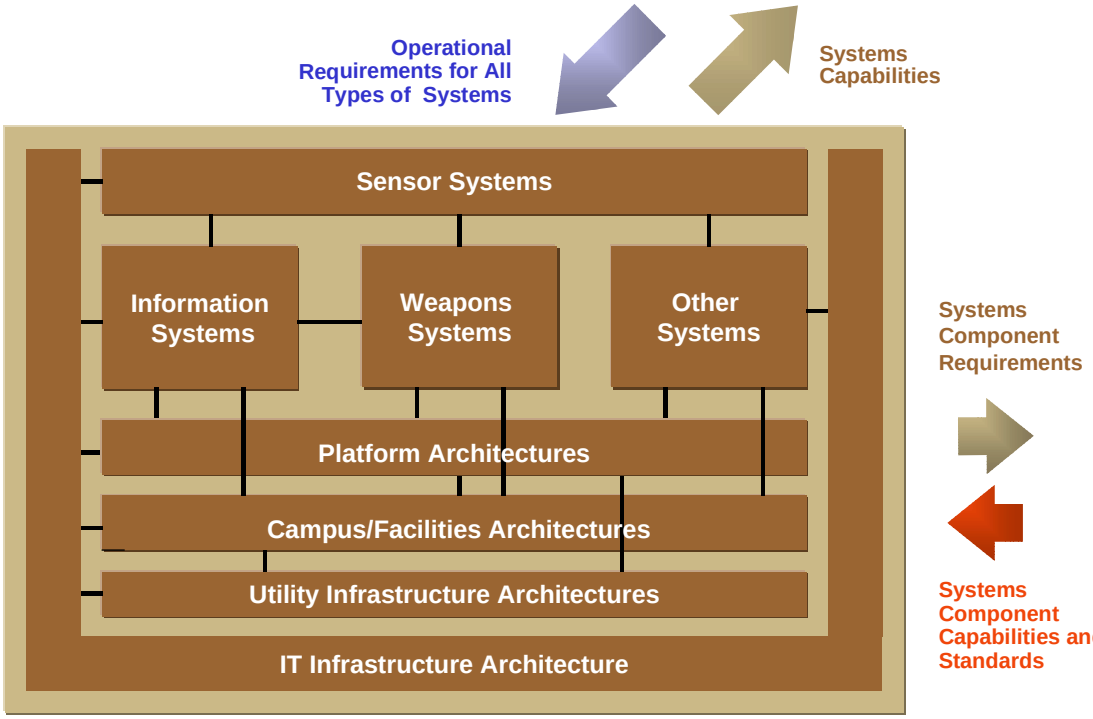


Figure 4-1. System Architecture Sub-Views

Note that these sub-views are still very high-level and may share many common components. They are used here to categorize major types of systems initiatives and how they come together to form a complete operational system for the warfighter or other types of users.

Sensor Systems provide the overall surveillance and data collection capability required to support the planners, commanders, and warfighters. Collectively, various sensor systems combine to produce information "grids" required by various user communities.

Information Systems include all types of information processing and management applications. These are generally specific to Communities of Interest or are common across the Enterprise.

Weapon Systems are a distinct class of systems including the propulsion, guidance, and payload capabilities, all of which may imbed information technologies as part of their respective control systems.

Other Systems include simulators, trainers, robots, materials handling systems, and other sensor-based and/or real-time systems with special user interfaces.

Platforms, including ships, planes, spacecraft, amphibious units, and vehicles, are also recognized as a distinct class of systems with their respective architectures. **Campuses and Facilities** are also viewed as "systems" with their own classes, components, and relationships. The **Utility Systems**, including power, HVAC, water, and sewage, are a sub-view which supports platforms and campuses/facilities.

The **Information Technology Architecture** supports all of the above sub-systems as well as directly interfaces with the various user communities in the operating areas. It is further described in Section 4.5 of this chapter. The ITI IPT used this sub-view to establish a set of enterprise planning templates for the integrated network infrastructure for the DON.

4.2 The Information Systems Sub-View

With the formation of the DON CIO Enterprise Systems IPT occurring at the time of the completion of the ITI IPT, it is important to connect this initiative with the EAF. For this reason, we are including the Information Systems Sub-View at this time. Figure 4-2 shows the layers that comprise this sub-view.

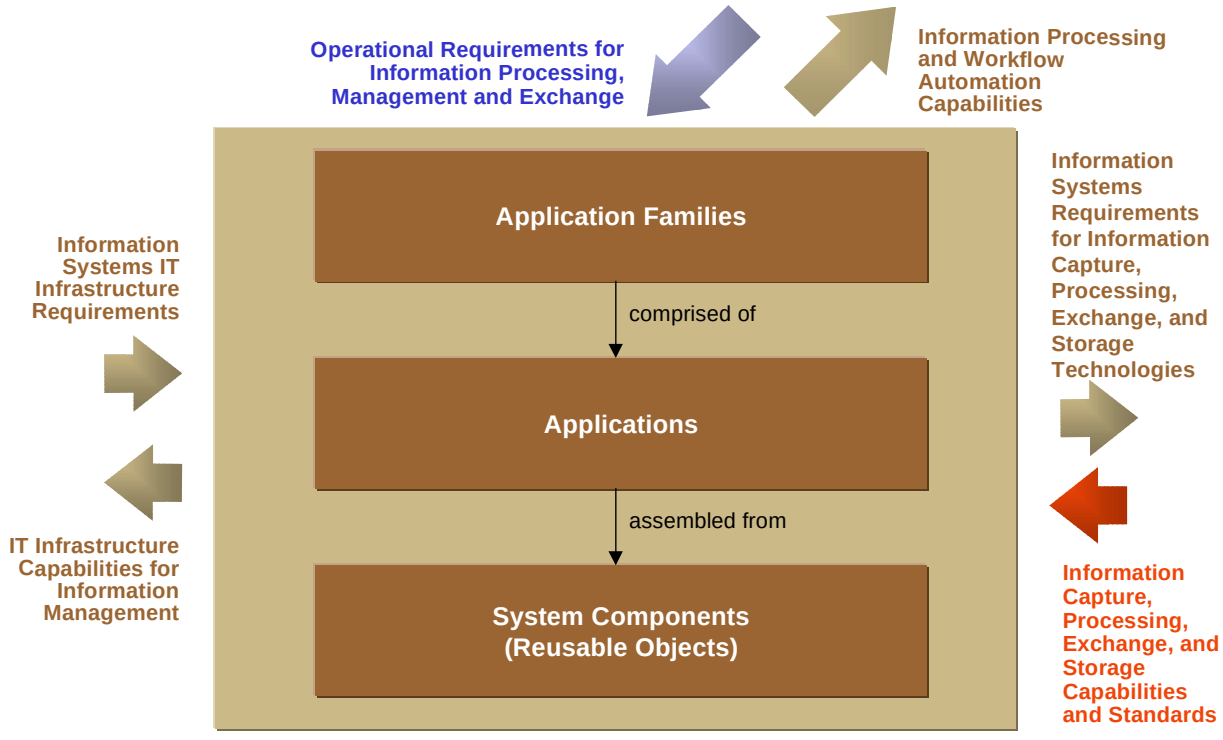


Figure 4-2. Information Systems Sub-View Showing the Three Layers

The **Information Systems Sub-View** includes all of the enterprise IT applications. These applications are related to the information capture, processing, and management requirements derived from the operational capabilities represented by METs and their information needs.

Information systems are first clustered into **Application Families** (e.g., GCCS, financial systems, and H.R. systems). These application families are then further broken down to identify specific **Applications**. Applications will typically have relationships with other applications within a family and may also share or exchange information with applications outside its family.

A key architectural construct in systems development today involves identifying **Application Components** or **"Objects."** These are the building blocks for assembling application capability. In the object world, these capabilities are referred to as "Use Cases," which is a powerful way of linking to the Operations View. A use case can be considered an application requirement invoked when a user requests a function from an application or an event occurs that triggers an application.

Application components are shared across applications and lead to the creation and support of reusable component libraries to aid in the productivity and standardization of application systems development.

This area of the framework is intended to support the DON CIO Enterprise Systems IPT in establishing enterprise guidelines for shared systems. As well, the Information Systems Architecture will assist systems planners and architects in designing future applications solutions that are consistent with operational capabilities and priorities.

4.3 Uses of the Information Systems Sub-View

As with the other views, there are a number of different types of models and analyses that are supported by the Information Systems Sub-View. These include:

1. Relationship of Application Families and Applications to Mission Essential Tasks
2. Relationship of Application Families and Applications to Information
3. Relationship of Applications/Tools to Organizations
4. Inter-system Information Flow Analysis
5. Systems Architecture Models
6. Reusable System Component Libraries and Usage Analyses
7. Y2K Compliance Analyses
8. Preparation Analyses for introduction of Object Management

As part of the implementation plan for the EAF, it is intended to connect with the Enterprise Systems IPT and the systems planning communities involved in these types of models and analyses to develop meaningful examples of how the Information Systems Sub-View can be fully used. See Chapter 6 for information regarding these implementation plans.

4.4 The IT Infrastructure Architecture Sub-View

The primary underlying "system" for the DON in planning for RMA/RBA is the enterprise IT Infrastructure that supports all of the required information systems. The IT Infrastructure Architecture Sub-View provides the framework for developing this infrastructure and recognizing the dependency on implementing this capability to achieve the necessary inter-operability across METs.

Figure 4-3 shows the architecture components within the IT Architecture.

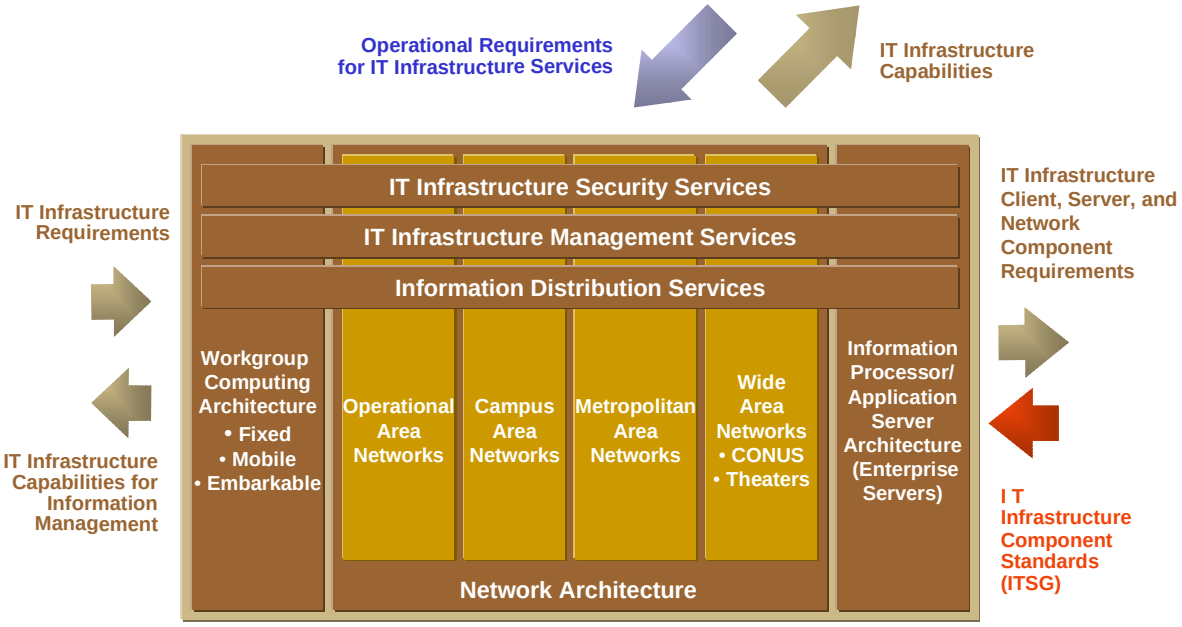


Figure 4-3. The IT Architecture Sub-View Showing Component Architectures

The IT Architecture contains all of the common information access, management, and exchanges services required by information systems and users of information technologies.

The **three underlying component architectures** are:

The **Workgroup Computing Architecture** that addresses the user access devices (PCs, telephones, radios, etc) various display devices, LANs, and workgroup servers. These architectures must support fixed, mobile, and embarkable implementations;

The **Network Architecture** that addresses the connectivity between workgroup devices and servers across the four levels of networks (operational, campus, metropolitan, and wide area) supporting ashore, afloat, and expeditionary communities; and

The **Server Architecture** that addresses the various information and applications processing requirements supported by the ITI.

This network computing capability is then over-laid with three **end-to-end infrastructure services:**

Information Distribution Services that provide for various types of information exchange and communication services across the ITI;

IT Infrastructure Management Services that provide performance and service level management capabilities plus other operational services; and

IT Infrastructure Security Services that provide for the stringent requirements for controlled access, information protection, and infrastructure management protection across the ITI for the various levels of security.

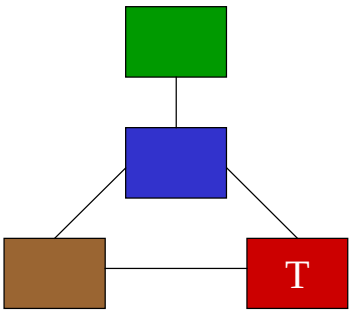
4.5 Uses of the IT Architecture Sub-View

The following list describes some of the uses for this sub-view. Note that the ITI IPT and other current planning initiatives are using these.

1. Development of Architecture Templates for Campus and Metropolitan Networks - Current ITI IPT mandate.
2. Development of Wide Area Network Connectivity Strategies and Plans - Current ITI IPT Mandate.
3. Development of Network Security and Network Service Architecture overlays - Current ITI IPT mandate.
4. Development of Network Management Center Architecture - ITSC Architectures being refined by ITI IPT.
5. Linkage with ITI Mission Essential Tasks to address Governance and Management Requirements - ITI IPT deliverable.
6. Development of Workgroup and Server Architecture Templates – future undertaking.
7. Development and Maintenance of Current and Planned ITI capabilities (BAM etc.)

The components of these various IT architecture templates are further represented in the Technical View. This provides the linkage of the ITI Architecture to the Information Technology Standards Guide (ITSG) as described in the next chapter.

5. The Technical View



The Technical View of the EAF provides the structure for organizing the complexity of standards and specifications associated with the components of the various types of systems represented in the Systems View. This is the "design" view of the framework in which individual building block specifications and their interfaces are determined.

The intention here is to rationalize the need for components and reduce unnecessary diversity. Although the special operational requirements for military applications of technology must be met, it is important to recognize the economic value and timing considerations involved in applying Commercial off the Shelf (COTS) and Government off the Shelf (GOTS) technologies. This framework is also helpful in focusing research and development (R&D) efforts and evaluating emerging technologies.

5.1 Technical Component Sub-Views

The Technical View is comprised of a number of technology component areas around which standards and specifications are developed and maintained. Figure 5-1 shows these components:

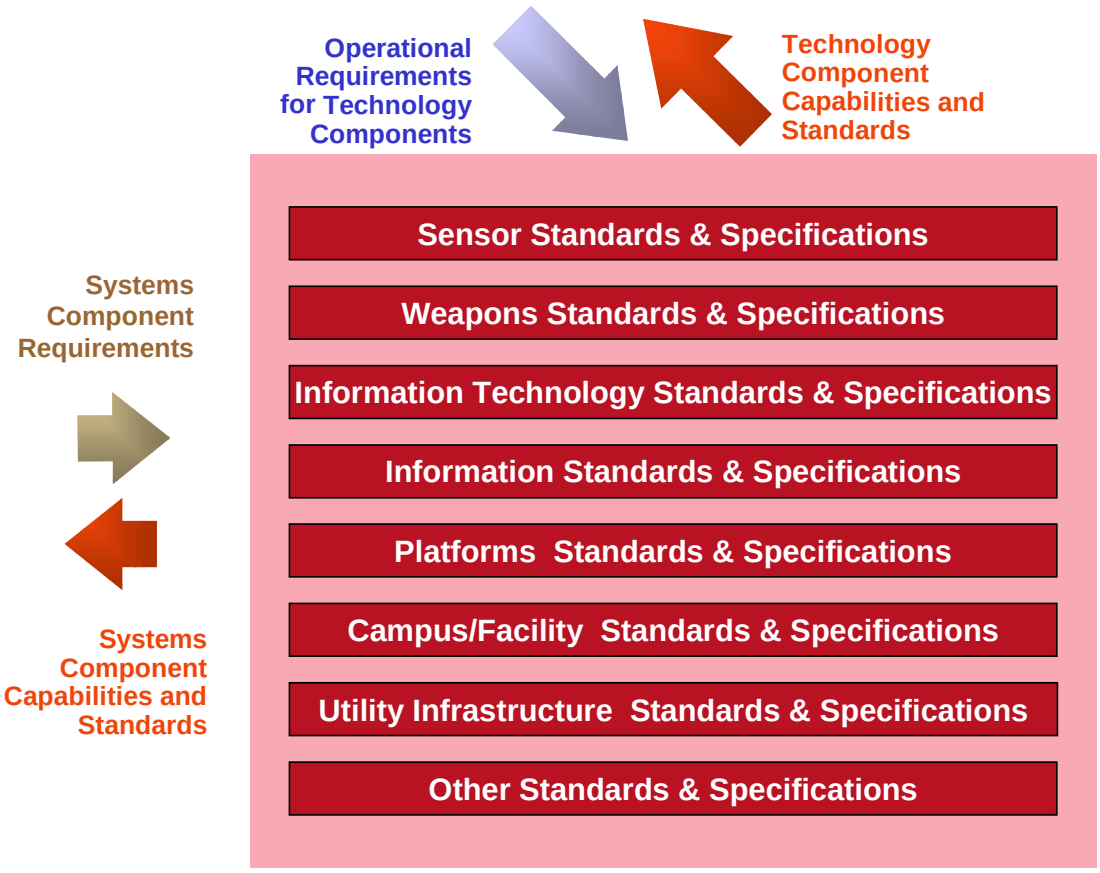


Figure 5-1. The Technical View Showing Components

These various components are extracted from the Systems View. The identification of components and their associated standards needs to be pulled together from the many sources to produce an enterprise-wide perspective on these technologies.

5.2 Information Technology Standards Framework

The initial version of the Enterprise Information Technology Standards was published in early 1998. The framework that was used to categorize these information technology components is shown in Figure 5-2.

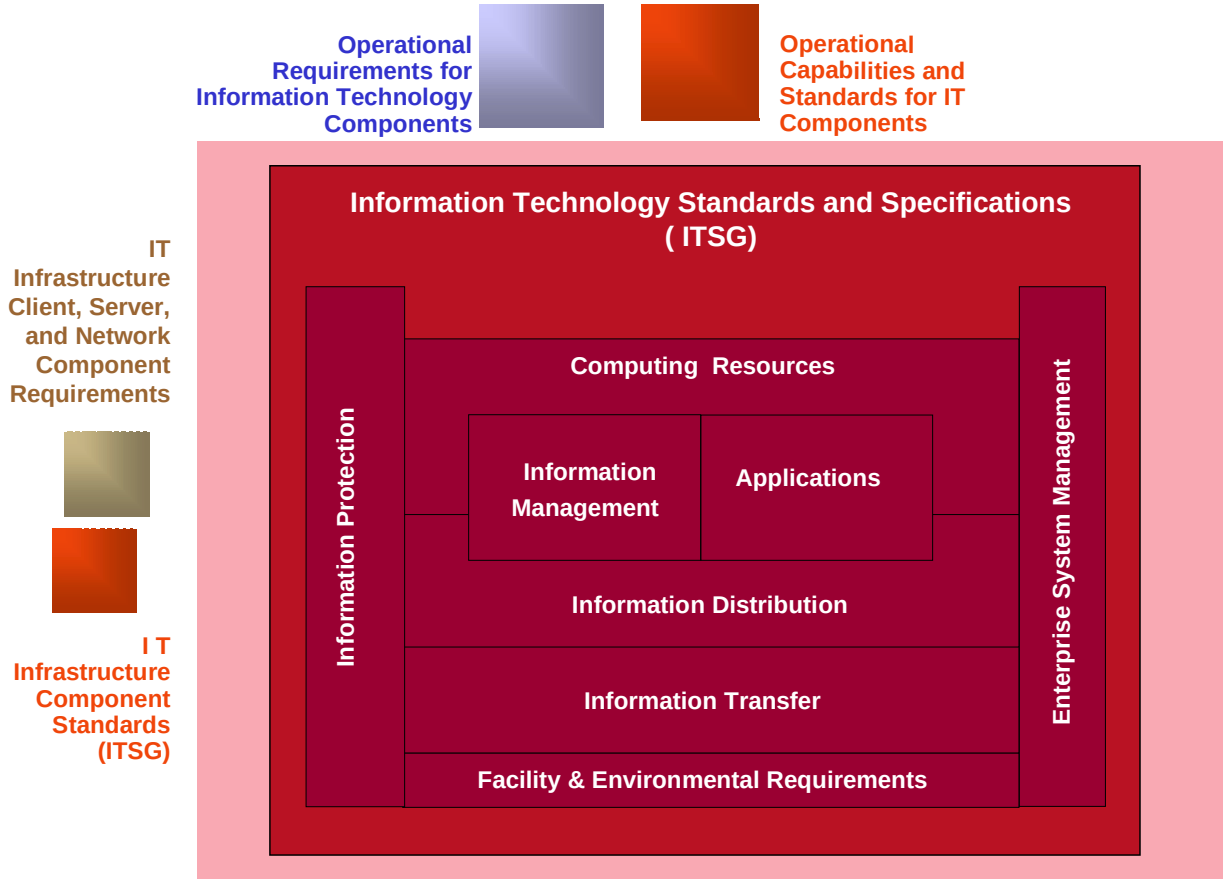


Figure 5-2. The Information Technology Standards Framework

These standards are linked to the ITI templates to add further definition to the ITI architecture for design and acquisition purposes.

These standards and guidelines must be maintained to remain current with information technology advances and market adoption of open systems and de facto standards.

6. Framework Implementation Considerations

The preceding five chapters have introduced the initial version of the DON EAF and described the components for each of the four architectural views - Mission, Operational, Systems, and Technical.

This chapter presents a number of key considerations regarding the implementation of the DON EAF and describes some short-term actions that are underway to capture existing enterprise reference models. In addition, it is important to provide a working prototype of an enterprise architecture modeling tool and repository. It is also important to link with key projects to support framework adoption and measure its effectiveness.

6.1 EAF Implementation Critical Success Factors

The publishing of this initial version of the DON EAF represents an important first step in establishing the means to coordinate and integrate the many planning activities that are underway across the DON. There are a number of follow-on activities that will continue to require collaboration and support from many different commands across the DON. The following Critical Success Factors have been identified for the implementation of the EAF.

6.1.1 Effective Coordination of EAF Evolution

The EAF requires on-going leadership and coordination to oversee its further development and to support its implementation across the DON. As experience is gained, updates will be required to the structures, the reference models, and the enterprise templates and standards. This responsibility is centered in the Office of the DON CIO with the Enterprise Architecture and Standards Competency Unit.

6.1.2 Approval and Adoption by DON CIO Board of Representatives

This publication represents the consensus of the ITI IPT plus invited reviewers. It is now subject to review by additional representatives from across the DON prior to its submission to the DON CIO Board of Representatives for formal approval. It is critical that the Board approves the submitted framework and that each of the command CIOs agrees to apply the framework in their organizations. We must move as quickly as possible to using one common framework. If there are problems with the draft framework, we will fix them.

6.1.3 Acceptance and Adoption by Other Key Enterprise Projects

Although adoption by the IT community is essential, it is not sufficient. To be effective, the EAF must be accepted and adopted by the broader community of planners involved in RMA/RBA-related projects. This is particularly true of all projects that affect systems architectures or designs and all initiatives that are looking to improve acquisition and investment planning processes. IWARs is a case in point. A representative of IWARs participated in the framework workshop, but more must be done to ensure that the EAF is useful to this key transformation initiative.

6.1.4 Population & Maintenance of Enterprise Reference Models

As was stated earlier, the EAF provides the super-structure in which to position all architecture modeling initiatives. The framework really takes on meaning when it is populated with reference models for each of the architecture elements and their relationships. Recall that the UNTL is a reference model for the

Mission Essential Task element of the Operational View. The good news is that the DON has already developed and, in most cases, automated reference models for most of the elements in the EAF. These just need to be consolidated within a common toolset and repository. Space and Naval Systems Warfare Command (SPAWAR) has already created a compact disc version of the Naval Architecture Database V2.1G that has collected many of the existing architecture and standards in one place. It is important to align these many initiatives with the EAF and establish the means to make these truly enterprise-wide and to ensure that the reference models are kept up-to-date.

6.1.5 Provision of an Architecture Modeling Tool and Repository

The sheer volume and complexity of architecture models required to populate the framework and track the many inter-related plans dictate the need for a highly functional modeling tool and repository. Most of the existing models are being maintained in spreadsheets, file managers, drawing tools, and document processors. Architectures are, after all, primarily comprised of graphical and pictorial drawings with associated attributes and information. What is needed is a tool that allows the creation, maintenance, and browsing of architecture drawings across the entire EAF. This tool must be tightly linked to a model and information repository that permit the development and generation of item specifications, matrices, and reports plus provide effective search capabilities. The tool and repository must then be made available with appropriate controls to the various planning communities working on selected models.

The following provides a checklist for the desired features of the DON Architecture Modeling Tool and Repository:

General Capabilities:

- Model-based approach
- Object class orientation
- Ability to support all possible types of models in the EAF
- Ease of customization of models, classes and attributes to suit EAF, planning methodology, and user requirements
- Multi-media user interface
- Scaleable for enterprise-wide use
- Ability to link and import/export items from other tools

Modeling Capabilities:

- Definition and customization of the types of components and connectors, including visual appearance, labeling, object and diagram rules, and display options
- Assignment of diagram items to the object classes and repository entries (new or existing)
- Intelligent diagrams - maintenance and knowledge of connections and interconnections
- Multiple sub-views - ability to create drill-down capability and/or branching to any related model in context of the diagram and its items
- Population of attributes through formatted specification sheets, matrices, or imported fields

Viewing Capabilities:

- Model navigation approach leveraging multiple sub-views for diagrams and objects (in context)

- Attribute display by specification sheet and/or matrix
- Matrix population based on diagrams or repository
- Relationship display through connectors, drill-downs, and relationship matrices
- Linkage from diagrams to other related data bases, documents, and web sites (knowledge management environment)
- Model and class browsing capability
- Generation of "reports" and documents from the repository

Operational Capabilities:

- Central maintenance of EAF and reference models
- Project administration controls (models, classes, users)
- Multi-user project repository with write controls
- Ability to work offline and independent from master repository and project repository
- Project back-up and recovery support
- Tracing of user and change dates

6.1.6 Development of Model-based Planning and Design Methods

The availability of a well-populated framework with reference models, templates, and standards supported by a powerful modeling tool and repository sets the stage for revolutionizing the planning methods of the DON. Before being able to plan for RMA/RBA, we must first revolutionize our way of planning! By developing and using model-based planning methods rooted in the enterprise reference models, we make our planning processes both more effective and efficient. For example, there is current activity within the fleets using the elements in the Operational View to determine requirements for IT Infrastructure. Once the association of workstations (equipment) to personnel is established within operational areas, the requirement for the number of workstations and the related network connectivity can be automatically derived from headcount and location data in conjunction with templates. As these model-based planning methods are developed, they can be made available for use across the enterprise.

6.1.7 Establishment of Re-Use Center and Library for Components

Another way to leverage the investment in architecture management is to establish a re-use center to support the enterprise. This center should be responsible for logging, certifying, and distributing components for re-use. This can apply to component designs, but is extremely applicable to the software community. Component-based development methodologies are now becoming popular, especially as object-oriented designs and code become available. Major breakthroughs in development productivity are achievable through re-use, but it takes a well-organized approach to leverage this opportunity. The framework and reference models are a prerequisite to identifying and classifying reusable components.

6.2 Using the Framework for the ITI IPT

The EAF is being introduced in conjunction with the work of the ITI IPT. This IPT is the first of a number of enterprise IPTs to be stood-up by the DON CIO Board of Representatives to bring an enterprise-wide perspective to planning for the usage of information technologies and information

management systems in supporting the transformation of the DON. The EAF, as described in the previous chapters, can now be used to position the work of the ITI IPT.

In addition to producing this EAF, the IPT was primarily tasked with developing architectures and planning templates to support enterprise-wide networking as well as addressing the related governance and requirements planning issues. Each of these taskings is presented below in the context of the EAF.

6.2.1 Enterprise Network Architecture Framework

The mandate of the ITI IPT was focused on developing architectures and templates related to enterprise networks. This scope is shown in Figure 6-1 as outlined in yellow.

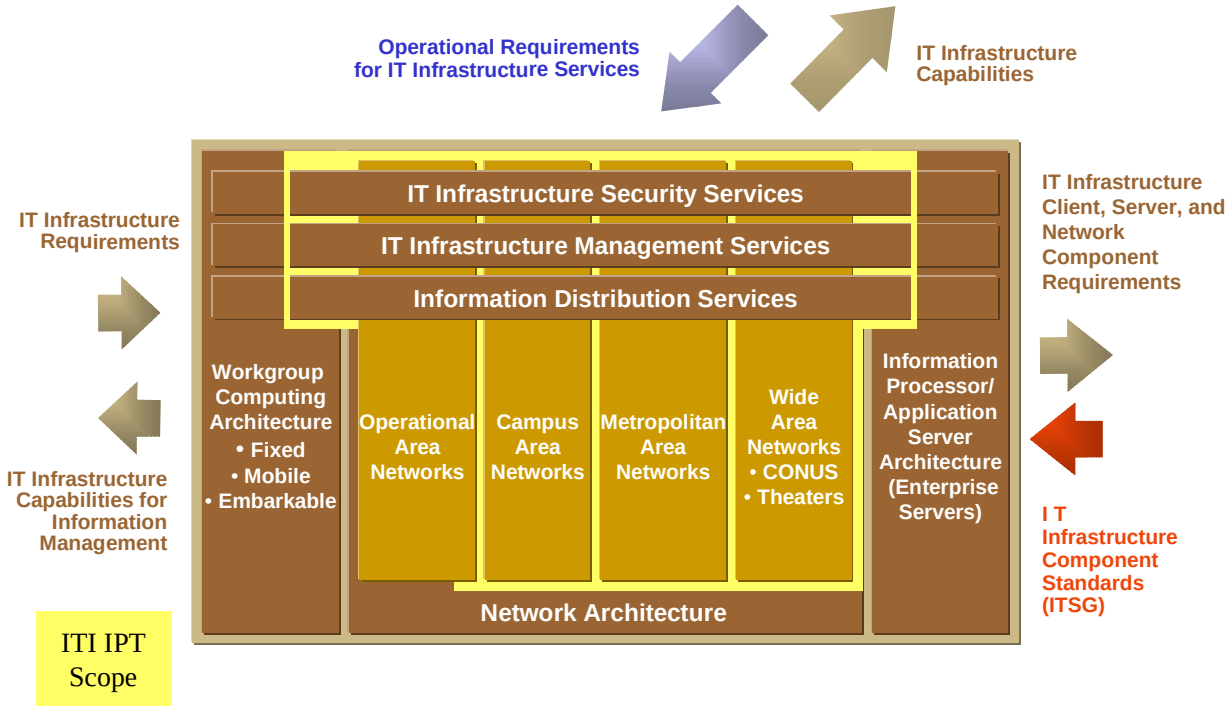


Figure 6-1. Information Technology Architecture Framework Showing Scope of ITI IPT

The Network Architecture View provides the framework for defining the components of the Enterprise Architecture. Note that the mandate included the Wide Area Network Architecture Plan and templates to address the common architecture designs for Metropolitan and Campus (or Base) Area Networks. The Operational Area Networks are also candidates for templates reflecting common architectures for platform-based networks, but were not included in the scope of the IPT. The same is true for Workgroup Computing Architectures and the Information Processor/Application Server Architectures.

A key focus of the IPT was on the common network services that must operate across the technology infrastructure. These address the three primary service areas of security, management, and information distribution. All of the IT architectures and the three service areas can be broken into their respective architecture elements. This model is shown in Figure 6-2.

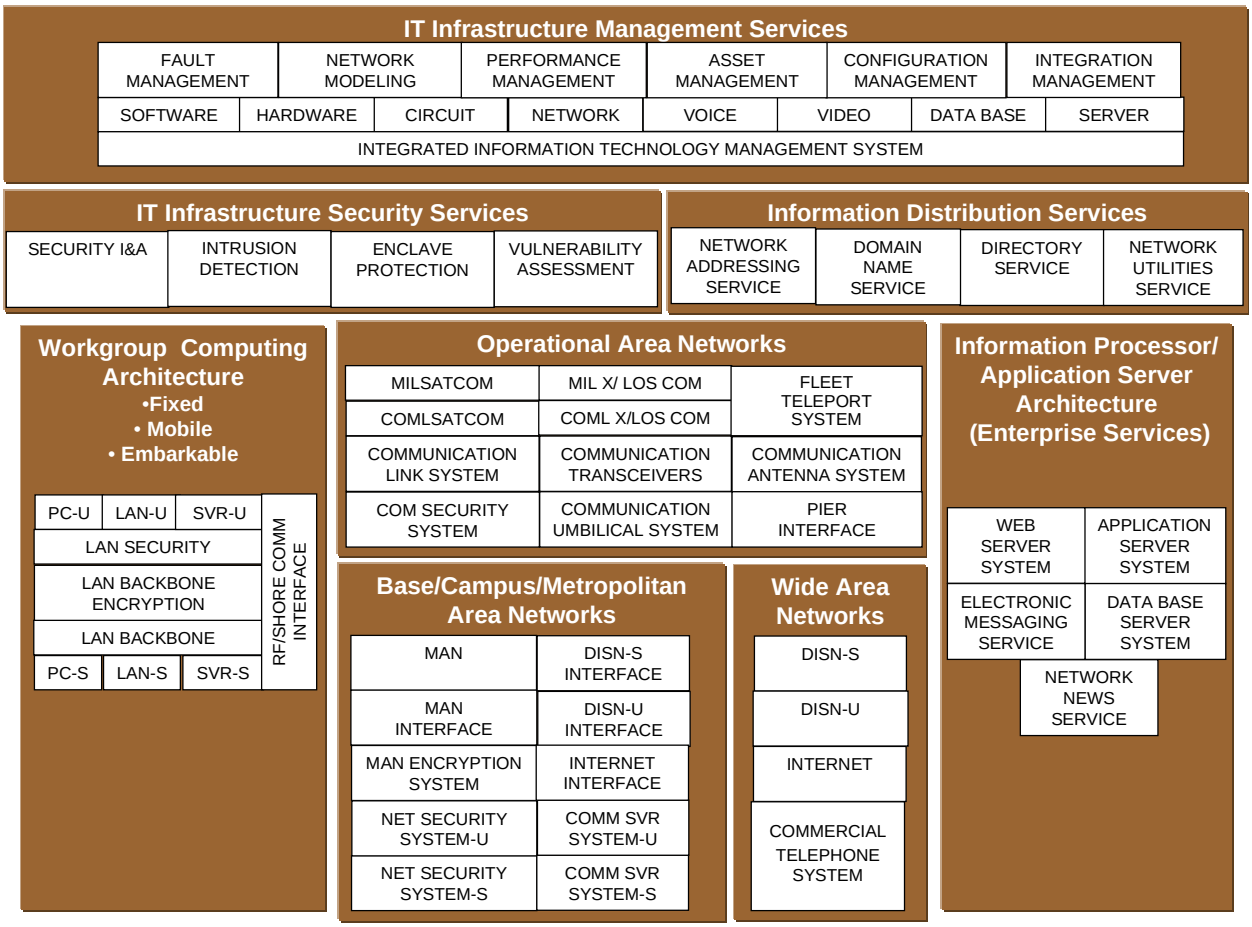


Figure 6-2. The Architecture Components of the DON ITI Architecture

This framework provides the context for identifying the specific connectivity requirements between components of the network architecture and the specific services that must operate across the network.

The major transformations to be achieved in network architecture are summarized in Figure 6-3.

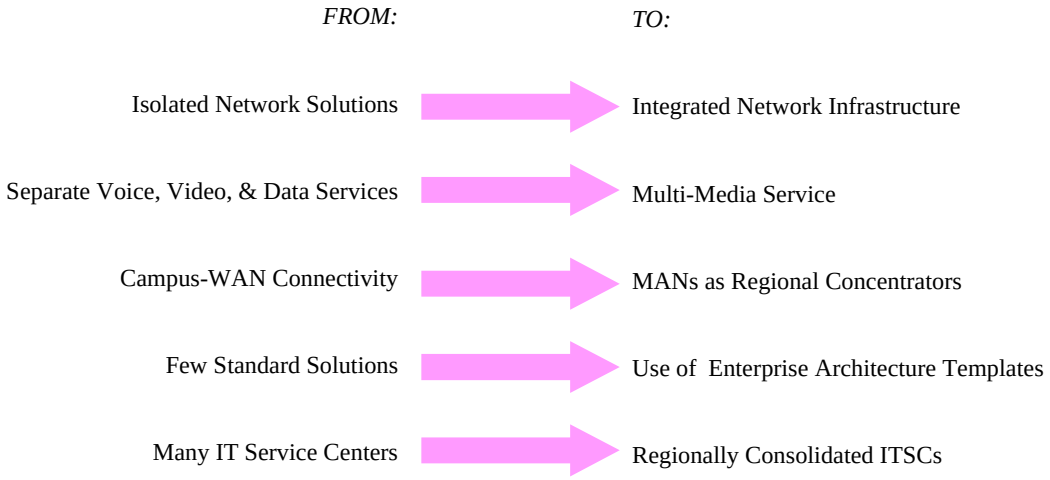


Figure 6-3. Desired Transformations in DON Network Architecture

6.2.2 ITI Governance Framework

The introduction of an Enterprise IT Infrastructure presupposes some major changes in the way IT planning, design, procurement, and operations are conducted throughout the DON. To develop meaningful recommendations for governance, the IPT developed a "business model" to reflect the functional activities and organizational considerations required to fulfill the mission of providing enterprise IT Services to DON Commands. This "business model" is an extension of the MET model in the Operational View of the framework. The UNTL is a well-developed hierarchical model of the military tasks that can now be supplemented with models of the business-related tasks to complete the enterprise MET model.

Figure 6-4 shows a model containing all of the functional components (i.e. METs) required to fulfill the mission of providing IT services for the DON. Note that this mission is an underlying support function for most, if not all, of the METs in the UNTL.

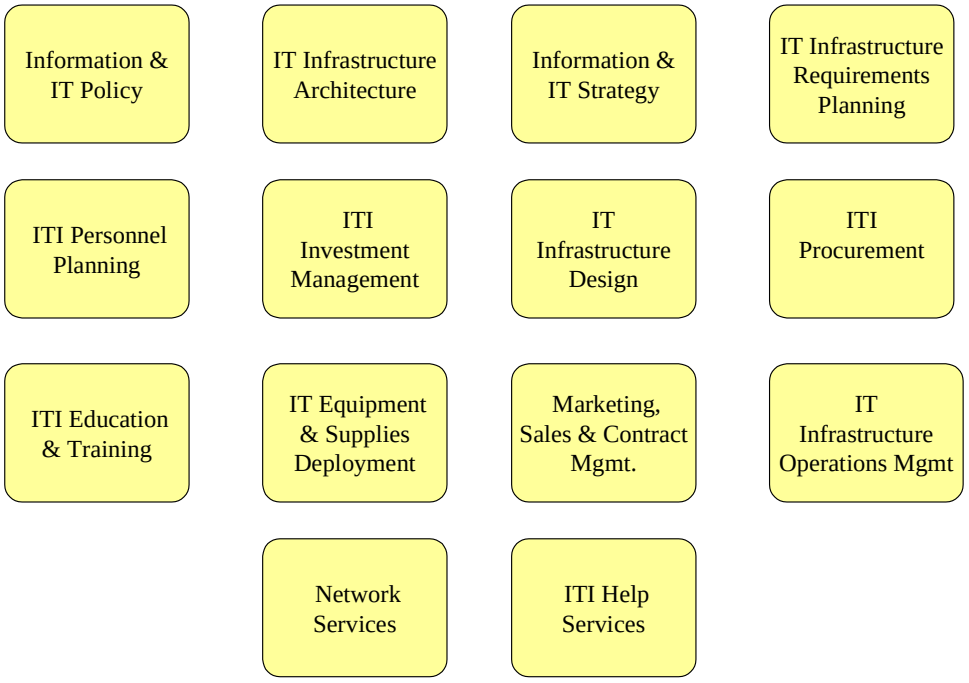


Figure 6-4. The Mission Essential Tasks for IT Infrastructure Services

The IPT makes use of this business model as a framework for assessing governance issues and presenting recommendations regarding realignment of organizational accountabilities and other operational changes required to effectively plan, design, procure, manage, and operate IT Infrastructure Services. See Volumes III and IV for presentation of these findings.

The required transformation in ITI Governance is summarized in Figure 6-5.

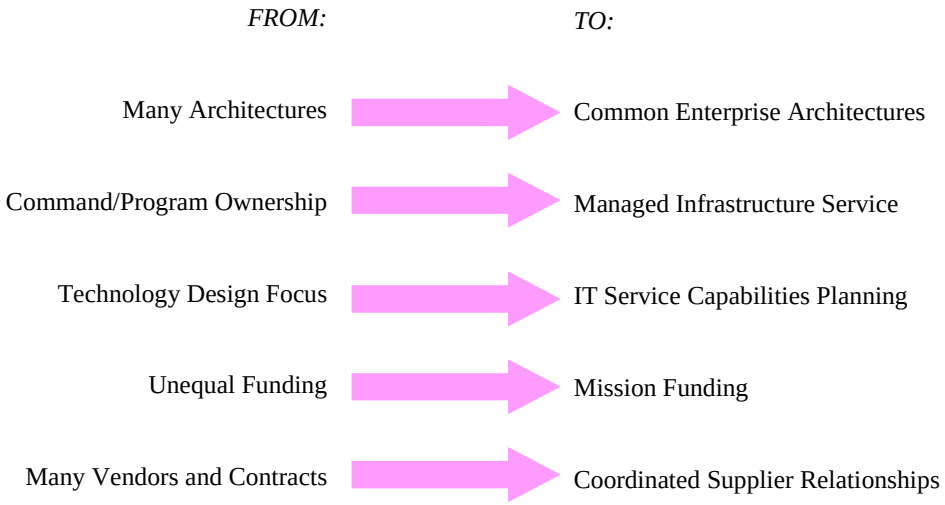


Figure 6-5. Desired Transformations in IT Infrastructure Governance

6.2.3 ITI Services Requirements Planning Framework

One of the METs in the IT Services Business Model (Figure 6-4) is IT Infrastructure Requirements Planning. The EAF is particularly well-suited to assist in transforming the way in which the DON plans for IT services because it was constructed with the primary goal of linking technology planning decisions to the strategic mission requirements of the DON.

There are two primary sources of IT Infrastructure Service requirements as shown in Figure 6-1. The first is the Operational View that provides for each organizational unit, whether fixed, mobile, or embarkable, the number and type of personnel requiring access to ITI Service Capabilities to perform their tasks. This easily leads to a determination of the number of "seats" by organization, by facility, and by platform that must be supported by the IT Infrastructure. By using the framework and linking IT planning to personnel planning and rules for allocation of workstations and services in the different operating environments, it is possible to directly forecast demand for access to the various ITI capabilities. This approach is now being used by the fleets and across N6.

The second source of requirements comes from the Information Systems Architecture. These relate to the demands for information and application processing capabilities. This primarily affects the size, numbers, and placement of application servers to meet the enterprise-wide requirements which, in turn, affects the traffic patterns on the network.

Volume IV contains process models that identify the recommended approach for performing ITI requirements planning. Three different types of processes are identified. The first relates to the functional requirements for the ITI Architecture; the second, to the functional requirements related to designing and developing the specific capabilities; and the third, to the functional requirements related to the operation of the ITI Services.

Figure 6-6 shows the major transformations that are expected in the processes for planning for IT Infrastructure Services.

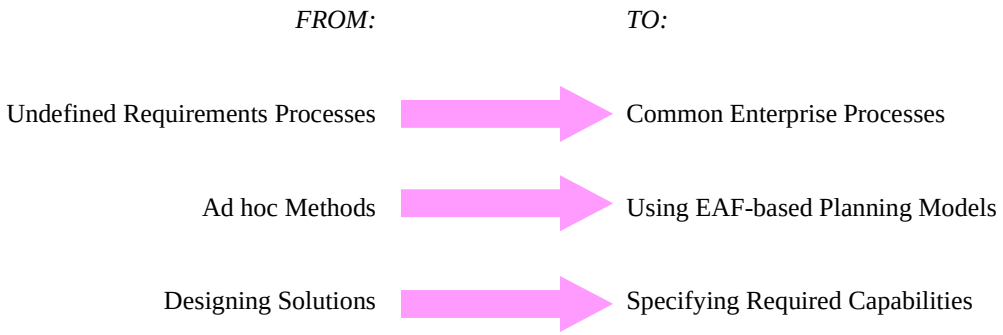


Figure 6-6. Desired Transformations in IT Infrastructure Requirements Planning

6.3 Conclusion

The transformation of the DON will provide many opportunities for leadership. A good leader will prepare for the challenge by adopting the best means available to ensure success. The opportunities for improving the enterprise and discovering innovative means of leveraging information and information technologies are tremendous; but so are the challenges.

Planning methods rooted in sound architecture principles and practices have proven to be the best means of tackling complex human and technical problems. The introduction of the EAF at this critical time of (r)evolution is meant to provide these leaders with an important management tool. The broader the adoption and application of these model-based planning methods, the greater the return to the DON.