Defense Information System Network (DISN) - An Overview
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Abstract. This overview of DISN is a summary of what DISN is today, tomorrow and a projection of the future. It begins with a large number of non-integrated legacy networks that are substantial in size and the initial integration of these systems to improve performance and reduce cost. Emerging requirements for image, voice and data are projected to push DISN into the gigabit arena to support the information requirements of DoD that are associated with "new ways of doing business" which is the theme of this session. Enabling technologies are progressing on many fronts and are producing performance at a cost that was only "dreamed about" a decade ago. How DISN might use these technologies in its evolution is discussed. DISN's overall goal for post 2000 is summarized. The potential is high for significant overall cost savings and performance improvement as a result of a DISN that allows consolidation and centralization of a number of functions and also enables distributed interactive processes such as modeling and simulation, joint planning, exercises, computing, conferencing, et al., all of which are discussed in other papers in MILCOM 93.

Introduction
Recent Defense Management Report Decisions, established the Defense Information Infrastructure (DII), the introduction of corporate information management principles, the pursuit of advanced technology research and demonstrations, and the Joint Staff's C4I for the Warrior initiative. The DII is the worldwide aggregation of all mobile and fixed DoD information systems organized to provide collection, production, storage, dissemination and display of information. It provides a foundation that supports National Defense Command and Control (C2), Intelligence (INTEL) decision support requirements, and functional business areas including data processing megacenters. The Defense Information System Network (DISN) is an integral part of the DII providing an information transport platform and network value added services that are responsive to national security and defense needs under all conditions in the most efficient manner, while maintaining transparency to its users. It is the DoD's primary worldwide telecommunications and information transfer network for supporting the warfighter on a global basis in military operations. It has unique capabilities and features such as surge capability, security, robustness using a mix of military and commercial media for global operations, interoperability with tactical and allied systems, end-to-end network management, and precedence to support military operations and for national emergencies. The DISN is expected to evolve to the telecommunications network envisioned in the Global Grid (GG) concept, providing the information transport element of the DII supporting DoD's C4I for the Warrior initiative.

DISN-Near Term (DISN-NT) Description
The DISN-NT is the integration of independent Service and Agency networks which saves money and improves performance. These networks include the Air Force Network (AFNET), the Navy Network (NAVNET), the Defense Logistics Agency Corporate Net (DCN), the Defense Data Network (DDN), the Pacific Consolidated Telecommunications Network (PCTN), and the DCS Spain, Italy Reconfiguration (DSIR). Existing competitively awarded contracts are the primary vehicles for DISN-NT implementation. All initial networks are currently interconnected through gateways, with completion of integration scheduled for October 1993. Over 170 additional networks and systems will be integrated into the network by 1996. This integration is depicted in Figure 1. An appropriate percentage of dedicated transmission services obtained from the GSA FTS2000 contract are included in

Figure 1
DISN-NT so that the network can support both Warner and Non-Warner exempt user requirements. This is referred to as "Blended" DISN. The DISN-NT architecture is shown in Figure 2. It consists of a transmission backbone composed of smart multiplexers interconnected by government owned and leased T-1 circuits. Movement to T-3 transmission circuits is also planned within the DISN-NT time frame. The DISN-NT node, or point-of-presence, at base level (i.e., post, camp, or station) consists of the existing DDN X.25 packet switch, an access or hub router and the smart multiplexer providing access to the transmission backbone. The routers are interconnected via the transmission backbone to form a high-speed hub router packet network which will evolve to replace the lower speed DDN X.25 network. DoD's data network will evolve from the DDN, which was the world's largest X.25 network by most measures, to the world's largest hub router network. DISN-NT is being implemented in accordance with a security architecture that includes such features as protected network elements, appropriate use of encryption on access and backbone transmission, and separate router networks for each level of classified data utilizing the common transmission backbone.

Rapid extension of DISN-NT services to the tactical environment is provided via the Defense Satellite Communications System augmented by commercial satellite systems. Consolidated Network Management is provided through the hierarchical concept depicted in Figure 5. Level I provides worldwide oversight and direction, Level II provides long-haul network management and control, and Level III provides regional and base level network management and control. As currently implemented the Level II centers directly access and control the DISN nodes. Current Level III Network Management is predominantly decentralized and non-standard with little automation. End-to-end network management and control is exercised via the Level II centers in coordination with base level personnel performing Level III network management and technical support functions. DISN network management incorporates the concept of System Management Centers (SMCs) to provide functional ADP/applications management for data processing services supported by the DII and DISN.

Requirements

DISN user requirements have been characterized by dramatic expansion in both the number of services and the
Integrated DISN provides robust connectivity among the many joint military support elements and integrated deployable components to respond quickly to worldwide military contingencies. It is responsive to theater commanders and tactical force elements by servicing inter-theater and intra-theater information transfer needs required to augment organic tactical communications.

**DISN Transition**

DISN is projected to evolve with new capabilities being added based on requirements and availability of technologies. Services and capabilities currently provided by other operational systems such as the Defense Switched Network, AUTODIN and the Defense Red Switch Network will be integrated into the DISN over time, both technically and programmatically, as the new services and technologies become available. This overall evolution concept for technology insertion, new capabilities and services, and program integration is shown in Figure 6.

**DISN Goal Architecture**

The goal architecture design is based on open systems standards and provides integrated voice, data, video, telemetry, imagery and value added network services as well as access to DoD standard functional applications. It is a scalable, up to multigigabit, global grid that extends worldwide communications and information services to the deployed forces. The centerpiece of the goal architecture is the implementation of Broadband Integrated Services Digital Network (BISDN) services, standards and technology, with integrated network management to provide rapid, responsive management and control for all network components. It includes base level and regional, or metropolitan area, networks interconnected by a global long haul network employing a mix of transmission derived from military and commercial satellite systems and government owned and leased terrestrial capabilities. The overall capacity of the network.

Figure 3 illustrates the types of services that are projected. Services in the upper right corner of the figure are the greatest challenge in that they require both high bit rates and are bursty. Bandwidth of a typical backbone link needed to meet selected user community requirements are depicted in Figure 4.

**DISN Goal Architecture**

ARPA's Advanced Technology Demonstration (ATD) Network and other "Global Grid" Advanced Technology Demonstrations (ATDs) are integral to DISN technology insertion for modernization. The results of the ATDs will provide multiple opportunities for the timely insertion of technologies needed to achieve the goal architecture. The sequence of technology demonstration and operational pilots

Figure 6
followed by DISN programmatic and operational integration is fundamental to DISA’s technology insertion approach. Capabilities obtained as a result of technology insertion initiatives will be integrated into DISN predominantly by competitive acquisitions utilizing specifications resulting from the ATD(s). In some instances the ATD(s) may be transitioned to an operational capability, integrated into DISN and expanded via competitive acquisition of open systems technologies and services. The projected possible flow of technology insertion, depicted in Figure 6, begins with the smart multiplexer and T-1 transmission of DISN-NT and is followed by T-3 transmission, SONET transmission, ATM switching with Multicast capability, N-ISDN services, KG-189 high speed encryption, ATM encryption and finally B-ISDN.

DISN network management capabilities will evolve and migrate to an open system as well as to a keyboard to keyboard network control capability. As DISN evolves, management of new services and technologies will be incorporated directly into the DISN network management centers. When new capabilities are acquired as leased services, oversight of the provider’s network management will be accomplished by the DISN Level II control centers, ultimately through automated interfaces with the vendor’s network management system. Additionally, as newer management capabilities are incorporated, existing manual functions, such as the operations aspects of technical control facilities will be automated or phased out. Also, DISN Level III network management will evolve to be automated and centralized at base level and regional Network Management Centers (NMCs). The remainder of this section summarizes related projects and programs, many which will become part of DISN.

The Telecommunications Management Program (TMP) is re-engineering the business processes supporting the management of DoD telecommunications services and is implementing the Telecommunications Management System (TMS) to provide the major automated tools to execute the new processes. Some of the major processes addressed under TMP include service provisioning, customer service, inventory, and requirements planning to optimize the utilization of DISN.

The Defense Message System (DMS) will provide an initial DISN value added service. DMS will ultimately replace AUTODIN network level services and provide official and unofficial DoD messaging. DMS will be integral to DISN with management executed within the DISN network management hierarchy.

As DISN evolves, commercial and military satellite communications systems will be fully integrated to provide robust, agile transmission connectivity. Defense Satellite Communications System (DSCS) capabilities, as well as commercial satellite and terrestrial transmission, will be utilized to provide the appropriate mix of DISN transmission based on threat, location, and other unique military requirements. The Commercial Satellite Communications Initiative (CSCI) is a key effort in determining the appropriate balance.

The Integrated Tactical Strategic Data Network (ITSDN) program is focused on extending DISN capability to tactical systems for end-to-end information transfer. The ITSDN, in conjunction with the ATD’s and the C4I for the Warrior initiative, will continue to improve tactical-to-tactical, and tactical-to-strategic interoperability moving towards a totally seamless integrated environment.
procedures, security technology identification, security transition planning, and provision of a single focal point for security products and issues.

Summary
This overview hopefully has given the reader an appreciation of the scope of DISN, the requirements drivers and the enabling technologies. The large number of non-integrated legacy networks establish a base from which the DISN starts. Much progress has been made in DISN-NT given that the approval to proceed was a little over one year ago. The potential is high for continued significant overall cost savings and performance improvement via the implementation of DISN. Finally the authors are reporting on the efforts of many whose work is summarized here and significant credit is their due.

References
1. DISN Technology Insertion Game Plan, DISA, Nov 92
2. DISN Goal Architecture, Draft, July 93