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SECTION 15

ENTERPRISE AND NETWORK MANAGEMENT SYSTEMS

The migration to Unified Capabilities (UC) services in which voice, video, and data services are being converged onto an Internet protocol (IP) infrastructure requires enhancement to the existing methods and procedures used to perform network management of the hybrid Time Division Multiplexing (TDM)/IP based voice, video, and data service environment. The enhancement to current methods and procedures is also required to support the new Network Operations (NetOps) environment defined by Department of Defense (DoD) Instruction (DoDI) 8410.02.

The end-to-end (E2E) management functions and metrics that must be collected and the measurements taken for voice and video services are different from those required to manage data services. Voice and video quality is sensitive to E2E delay, while data services are not delay sensitive, but sensitive to packet loss. E2E performance management of voice and video services must therefore extend to End Instruments (EIs) to obtain true voice performance assessment. Another important consideration is that the converged network infrastructure being used E2E for voice and video sessions consists of Military Department (MILDEP)-managed local infrastructures and intranets and the Defense Information Systems Agency (DISA)-managed backbone infrastructure. This is reflected in the definition of “E2E” for voice, video, and data services shown in [Figure 15-1](#).

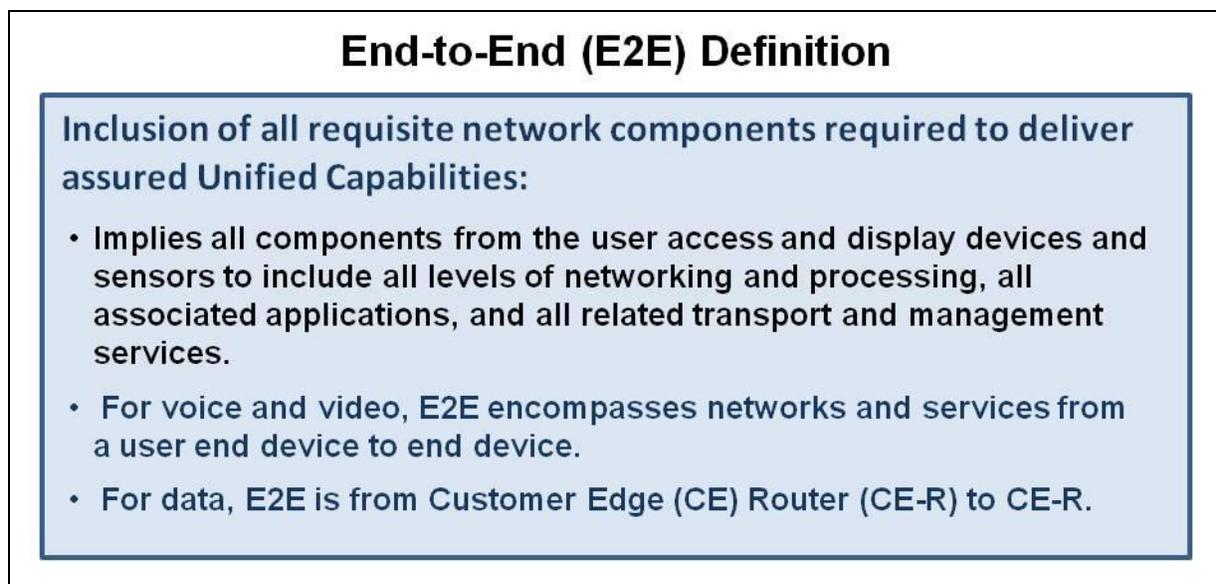


Figure 15-1. Definitions of End-to-End for Voice, Video, and Data Services

To satisfy the E2E management responsibilities for the Global Information Grid (GIG), it is critical that NetOps systems are implemented that support the information sharing concept (as directed by policy). The concept is the enabler that provides E2E visibility and situational awareness to U.S. Cyber Command (USCYBERCOM). The following sections describe the

NetOps support systems and their application in providing E2E system performance monitoring and situational awareness to USCYBERCOM.

15.1 DISN OPERATIONAL SUPPORT SYSTEM COMPLEX

The Defense Information Systems Network (DISN) Operational Support System (OSS) complex used by DISA consists of “all the systems” that automate Operations, Administration, Maintenance, and Performance (OAM&P) management functions. [Figure 15.1-1](#), DISN OSS Functions, illustrates the OSS hierarchy. At the bottom of the hierarchy is the Network Element (NE) layer. The NEs are monitored and controlled by a series of Element Management Systems (EMSs). The EMSs communicate with the Network Management (NM) layer using a common communications vehicle. At the NM layer, alerts from the monitored NEs are consolidated into situational awareness data. This data is made available to MILDEP Network Operations and Security Centers (NOSCs) or USCYBERCOM for a top-level E2E view of the DISN backbone. The situational awareness data is provided through the DISN Information Sharing Service (ISS) on Secure IP Router Network (SIPRNet).

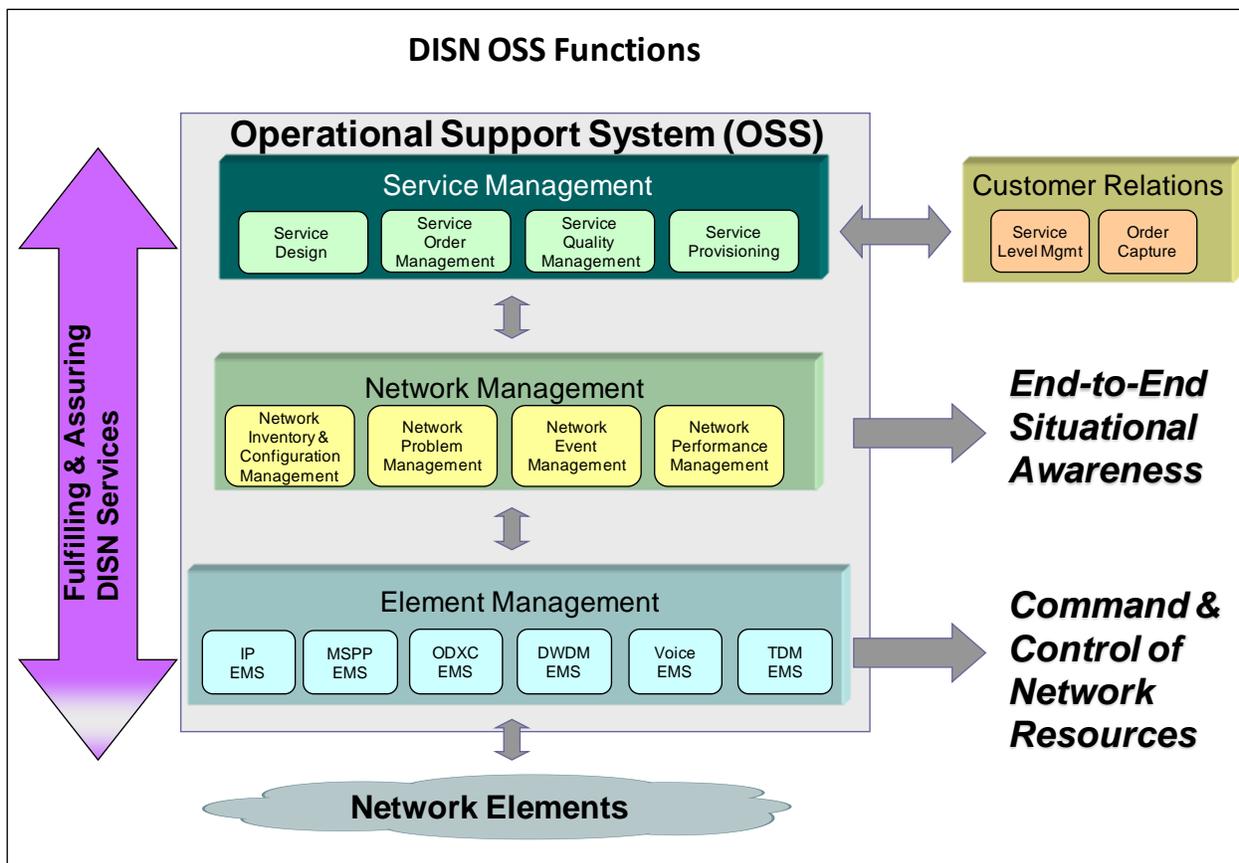


Figure 15.1-1. DISN OSS Functions

15.2 UC VOICE AND VIDEO SERVICES BACKBONE MANAGEMENT SYSTEM

Performance monitoring and management of the UC voice and video services backbone is presently managed by DISA using EMS (as the Voice EMS depicted in [Figure 15.1-1](#)). This includes point-to-point (P2P) video systems services with Assured Services Session Initiation Protocol (AS-SIP) signaling. The EMS collects performance data from all voice/video backbone switches including TDM-based Multifunction Switches (MFSs) and IP-based softswitches (SSs). The EMS connects to the switch monitoring ports with a closed telemetry network using secure protocols including Secure Shell Version 2 (SSHv2) and Transport Layer Security (TLS). Data is transferred using either command line syntax or Simple Network Management Protocol Version 2 (SNMPv2) [with IP Security (IPSec)] or SNMPv3, depending on the particular switch vendor management port interface capabilities. The EMS also sends NM controls to the switching systems using each vendor's unique command syntax. The EMS forwards data to the DISN OSS NM layer with a one-way data feed.

DISA's voice and video performance monitoring capabilities are being augmented by the installation of Telchemy probes connected to the Customer Edge (CE) Routers (CE-Rs) at each SS location. Combined, the EMS and Telchemy probes will provide performance monitoring and measuring capability for the voice and video services within the converged DISN IP backbone.

[Figure 15.2-1](#), Spiral E2E EMS Monitoring of Voice/Video/Data Services, provides a high-level illustration of how the EMS solution monitors performance of the TDM and IP-based voice/video network elements E2E.

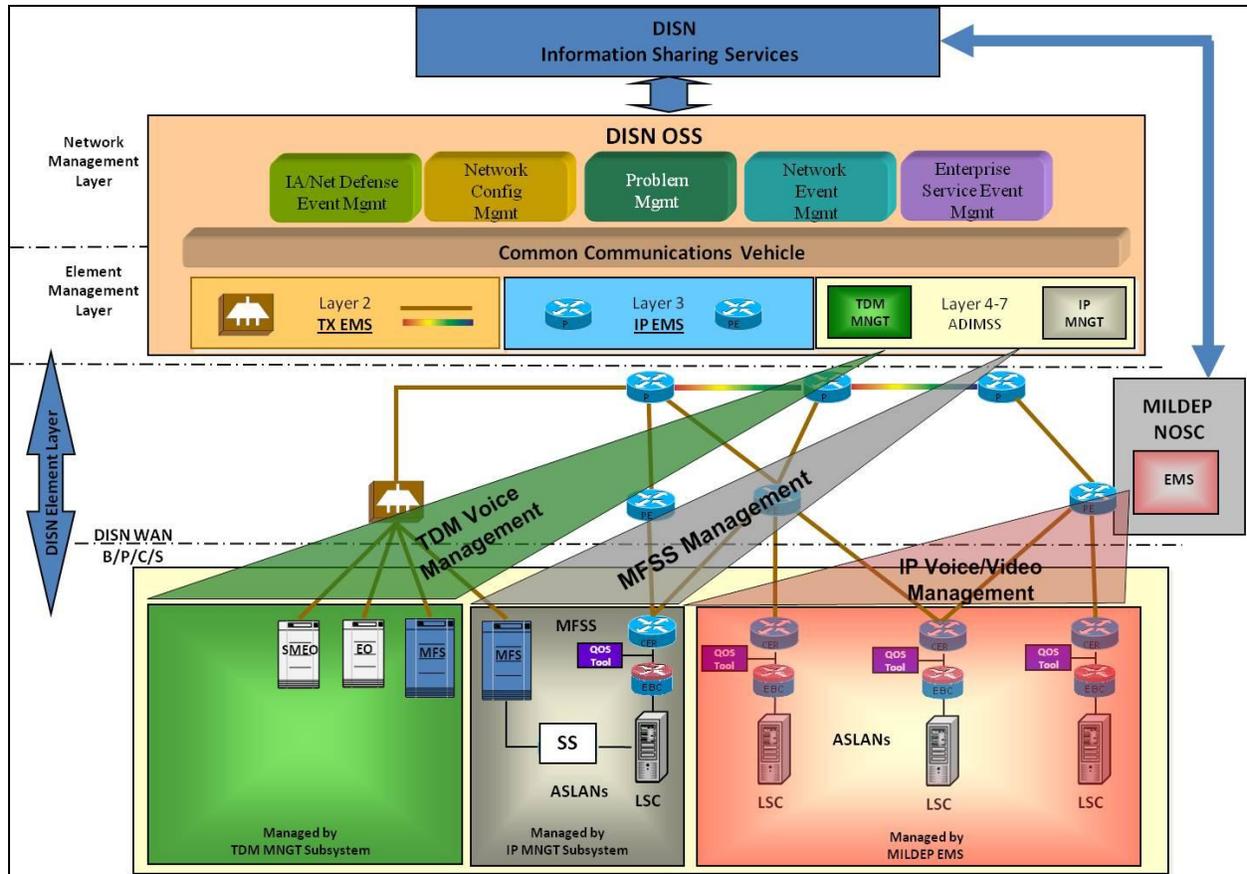


Figure 15.2-1. Spiral E2E EMS Monitoring of Voice/Video/Data Services

15.3 INFORMATION SHARING

Information sharing between DISA backbone monitoring systems and MILDEP Edge monitoring systems is a critical component of the NetOps requirements for GIG Enterprise Management (GEM) and GIG Network Assurance (GNA). The envisioned DoD ISS provides both Machine-to-Machine (M2M) and Human-to-Machine (H2M) methods of sharing DISN OSS data and MILDEP Edge data. The ISS is an enabler of the following:

- The Joint Concept of Operations (JCONOPS) for NetOps.
- DoD Chief Information Officer (CIO) NetOps Strategic Vision.
- GEM (DoDI 8410.02).

Information Sharing is the solution being adopted for the UC Spirals. DISA/NS8, Operational Support System (OSS) Division, has developed an information sharing solution based on net-centric, service-oriented principles and technologies for sharing NetOps information across boundaries. [Figure 15.3-1](#), GIG E2E DISN UC Services Management Approach, depicts the high-level approach to information sharing.

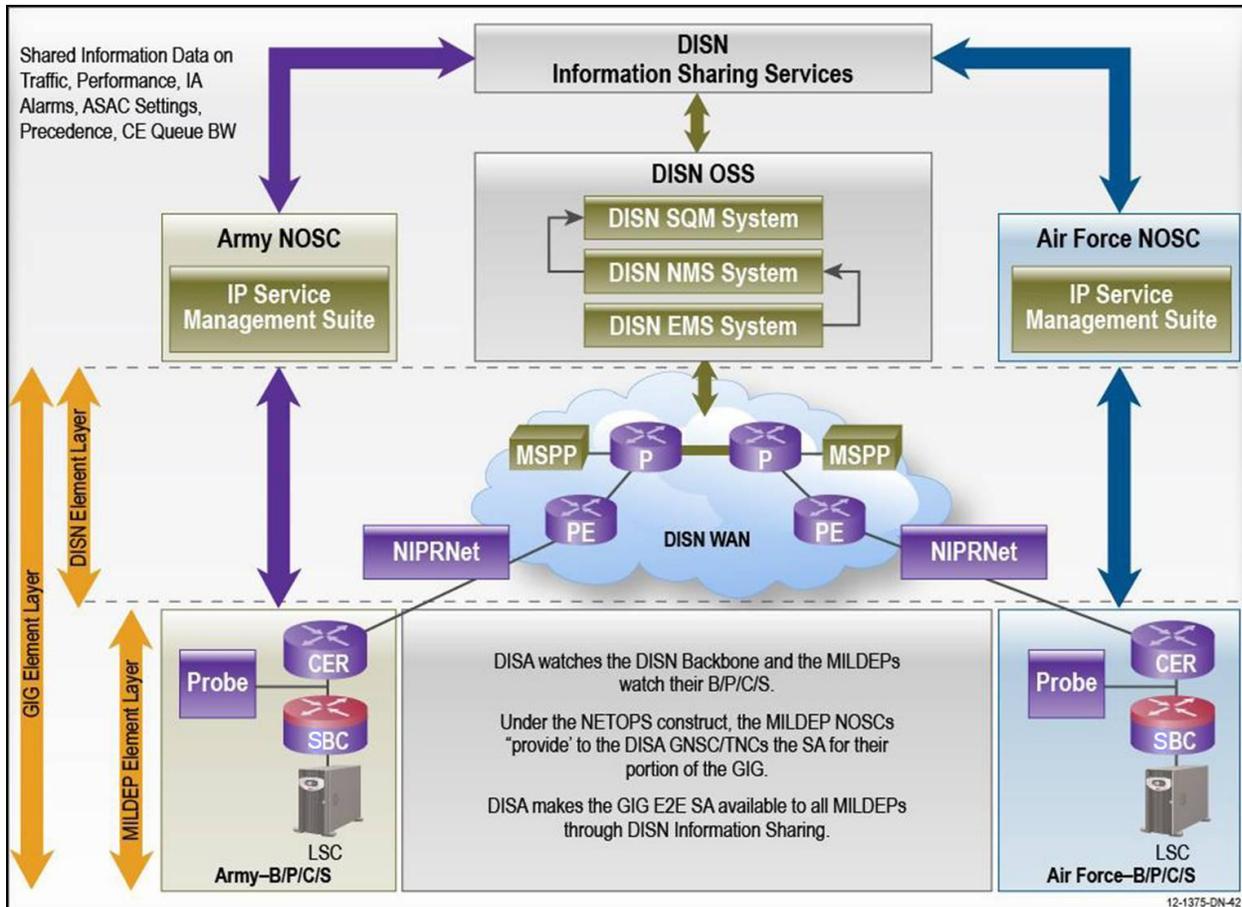


Figure 15.3-1. GIG E2E DISN UC Services Management Approach

[Figure 15.3-1](#) depicts the information sharing solution that requires DISA and the MILDEPs to be both producers and subscribers of information services over the SIPRNet to establish E2E situational awareness about the GIG UC environment. For DISA, the DISN OSS will provide alarm, performance, trouble tickets, and inventory data using web services technologies for authorized users to analyze.

[Figure 15.3-1](#) also depicts that the MILDEPs will provide alarm, traffic, performance, trouble tickets, Assured Services Admission Control (ASAC) settings, and inventory data about their enclaves also using web services technology for authorized users to analyze. Both DISA and the MILDEPs will use the data they consume to aggregate, correlate, and present an E2E operational view of the infrastructure.

[Figure 15.3-2](#) depicts information sharing from a slightly different perspective. It shows the DISA Network Operations Centers (NOCs) displaying information pulled from the SSs by the EMS and DISN OSS Data Communications Network (DCN), and Information Sharing data published by the MILDEP edge sites via a MILDEP network (either out-of-band or in-band). Further, the figure shows MILDEP NOSC's displaying information provided from their MILDEP

edge sites via their MILDEP networks and combining it with DISA network and network component information pulled from DISA's Information Sharing solution.

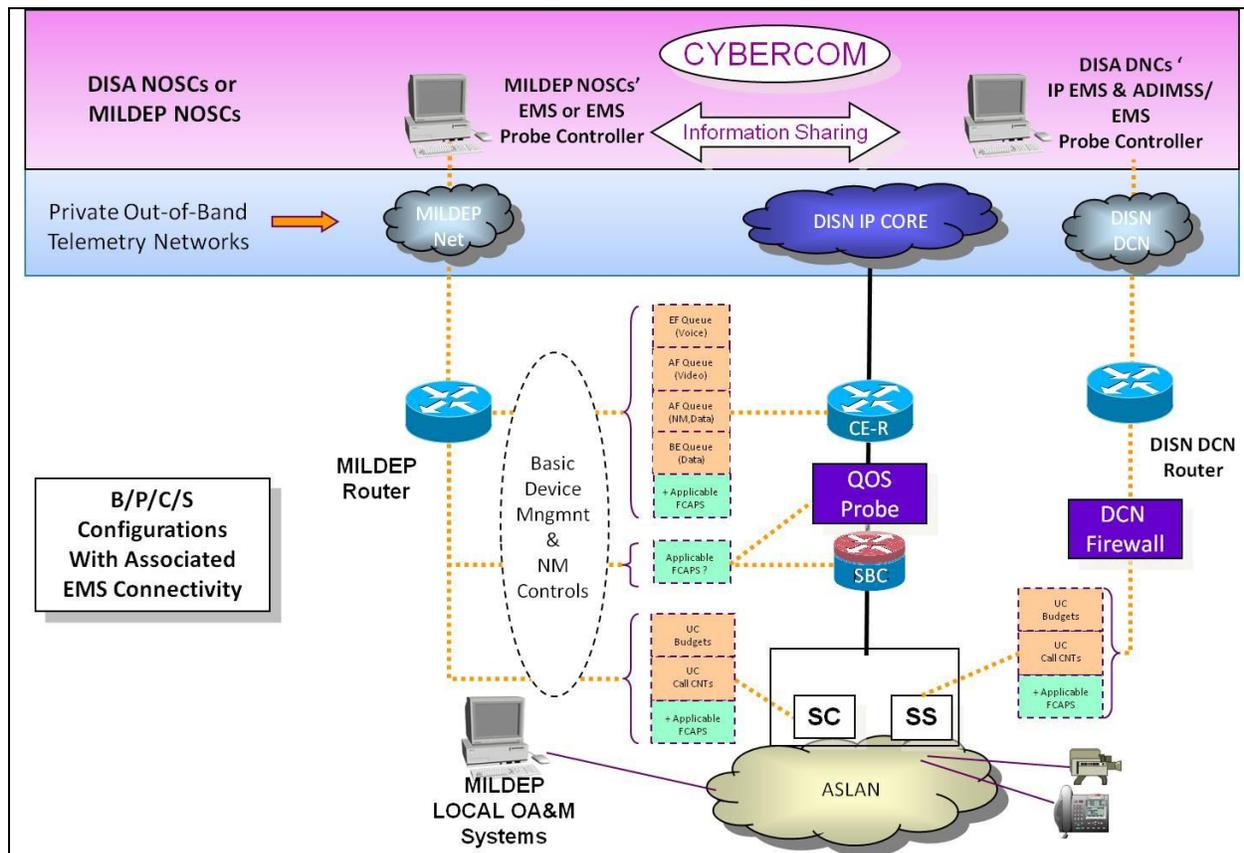


Figure 15.3-2. DISN UC E2E Solution for UC Spirals

Using the composite information shared by the DISA solution, both DISA NOCs and the MILDEP NOSCs can obtain an E2E view of the network including its various network segments and components to determine where degraded service is being experienced.

As outlined in the Joint Concept of Operations (JCONOPS) for NetOps, the NetOps Center for each network must cooperate with the other centers to consolidate and integrate information regarding the operational health and status of their networks and systems. The fusion of the information from the NetOps Centers in the theater of operations and up to USCYBERCOM will provide E2E situational awareness of the GIG to improve decision-making for the Commander, U.S. Strategic Command (CDRUSSTRATCOM) and, ultimately, for all Warfighters.