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APPENDIX A UNIQUE DEPLOYED (TACTICAL)

A.1 PURPOSE

Appendix A defines the unique tactical requirements that are not contained in other Unified Capabilities (UC) Requirements (UCR) 2013 sections as well as those strategic requirements that need to be modified in order to support tactical users. This appendix consolidates interoperability certification requirements to the maximum extent possible and incorporates them as part of requirements for the overarching Global Information Grid (GIG) in support of network-centric warfare. This appendix provides guidance for satisfying the certification requirements for Net-centric Enterprise Services (NCES) employed as part of an Operational Area Network (OAN), which is the deployed extension of the GIG. This appendix also defines other UCR elements applicable to the tactical community, and serves as a ready-reference to be used by the Joint Interoperability Test Command (JITC) when writing the tactical annex to the Generic Switch Test Plan (GSTP).

A.2 APPLICATION

The information provided in this document applies to Combatant Commands (COCOMs), sub-unified Commands, Joint Task Forces (JTFs), subordinate components of these Commands, the Services, and Industry Vendors.

This document's intent is to provide a framework to identify usable, common communications system operating standards (and associated information) to augment the efficient development, deployment, and establishment of communication networks for joint warfighting.

System interoperability is critical to effective joint warfighting operations. Therefore, communications system developers, planners, and operators are encouraged to leverage the information contained within this document to the fullest extent possible. A unified joint effort to use this information will contribute to greater network situational awareness and fewer configuration management challenges.

A.3 SCOPE

This document and the identified communications system operating standards are based on the OAN. This document encompasses aspects of tactical networked communications including multimedia networking, routing, switching, trunking, transmission, security, and interoperability of respective systems.

A.4 DEFINITIONS

Appendix C, Definitions, Abbreviations and Acronyms, and References, contains the definitions.

A.5 RESPONSIBILITIES

See Appendix C, Definitions, Abbreviations and Acronyms, and References.

A.6 RELEASABILITY

This document is approved for public release; distribution is unlimited. Department of Defense (DOD) Components, other Federal agencies, and the public may obtain copies of this document through the Headquarters, U.S. Army Communications-Electronics Command, at 6002 Combat Drive, Aberdeen Proving Ground, Maryland 21005-1845, Attention: Joint On-Demand Interoperability Network.

A.7 BACKGROUND

The establishment of the DOD UC Framework 2013 is the result of continued telecommunications interoperability challenges in the tactical warfighting environment. Lessons learned from past and current conflicts have demonstrated the need for a common approach to establishing and maintaining communication networks in the joint operational arena. Additionally, this document provides a framework to assist in identifying common communications system operating standards for establishing and employing joint tactical networks within a geographic identified theater and the GIG.

A.8 UNIFIED CAPABILITIES REFERENCE ARCHITECTURE

A.8.1 The UC Reference Architecture

The UC Reference Architecture, as defined in [Figure A.8-1](#), UC Reference Architectural All View (AV-1), enables strategic, tactical, classified, and allied missions with a broad range of interoperable and secure capabilities for converged voice, video, and data services from the end device, through Local Area Networks (LANs), and across the backbone networks. All DOD Components shall comply with the UC Reference Architecture beginning in fiscal year (FY) 2012, consistent with available resources, and fully leveraging cost avoidance/reductions inherent in the UC Reference Architecture.

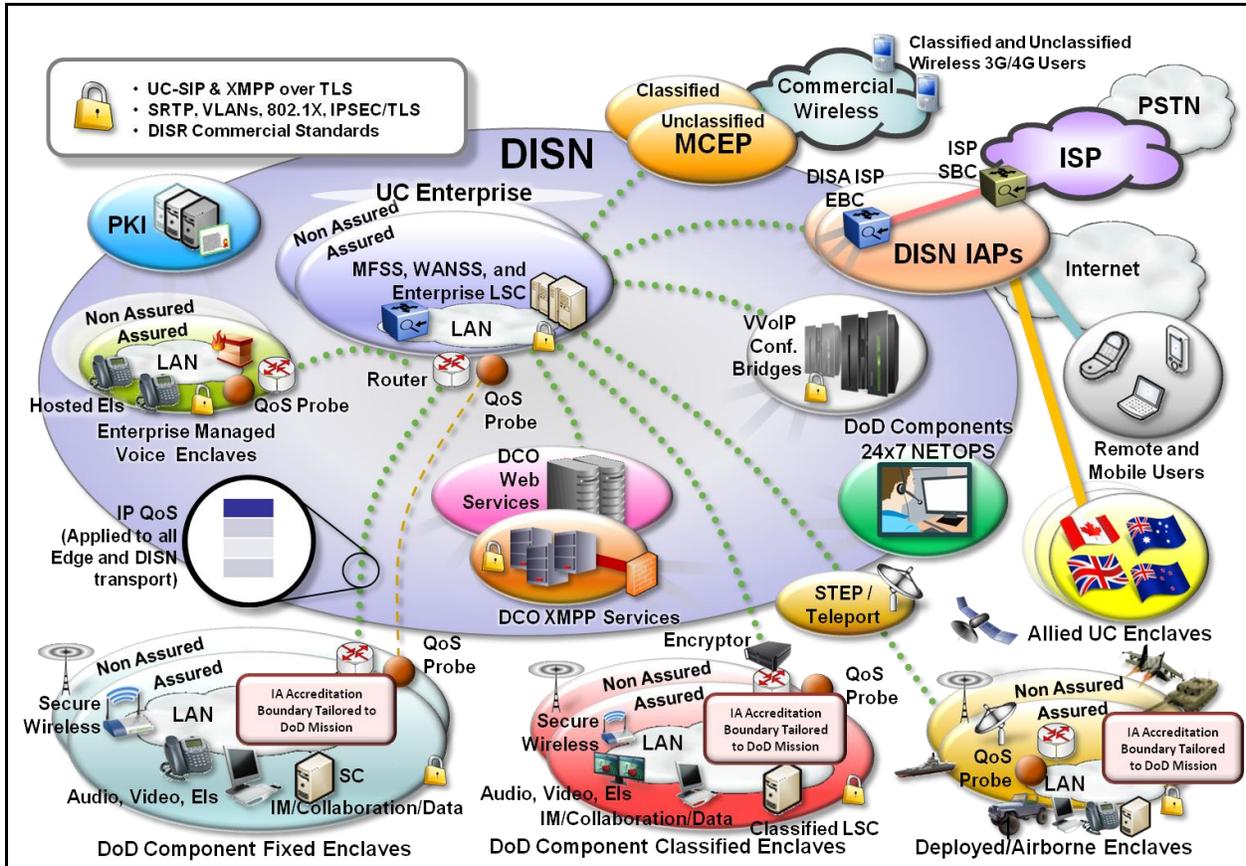


Figure A.8-1. UC Reference Architectural All View (AV-1)

1. The UC Reference Architecture fully leverages the extensive work already accomplished by the Defense Information Systems Agency (DISA) through laboratory and pilot testing using interoperable and secure products from the DOD UC Approved Products List (APL), and deploying those products in the Defense Information Systems Network (DISN) backbone infrastructure. As a result of the progress made to date, the DOD has already begun deployment of approved Internet protocol (IP)-based products. This deployment has followed traditional Title 10 lines of demarcation between DISA (as the backbone networks supplier) and the DOD Components [as the Base/Post/Camp/Station (B/P/C/S) Edge Network Providers]. Voice and Video over IP (VVoIP) technologies provide a unique opportunity to collaboratively implement voice, video, and data services, resulting in the opportunity to achieve cost avoidance and reductions.
2. The UC Reference Architecture is consistent with the DOD Information Technology (IT) Enterprise Strategy and Roadmap. Enterprise voice and video initiatives—by implementing enterprise voice, video, collaboration, and data services, investment in, and operating costs for, those services—can be substantially reduced using a service model employed by commercial carriers and major business enterprises. Implementation of enterprise voice and video services can provide a full range of related capabilities to all DOD users from central locations that leverage the DISN, and IP technologies.

3. Operational Rules (OV-6A). [Figure A.8-2](#), Operational View-6A, Operational Rules of the UC Reference Architecture, defines the operational rules of the UC Reference Architecture showing the following three categories of operations:
- U.S. Cyber Communications (USCYBERCOM) receives situational awareness from the Military Departments (MILDEPs) and DISN Network Operations and Security Centers (NOSCs), and provides operational directives to meet mission needs.
 - DISA NOSCs oversee the DISN backbone infrastructure and centralized enterprise services. The MILDEP NOSCs oversee respective infrastructures supporting UC delivered to the Edge infrastructures and end devices.
 - DISA and MILDEPs will be responsible for end-to-end UC network management, through the NOSCs, to include quality of service, faults, configuration, administration, performance, and security.

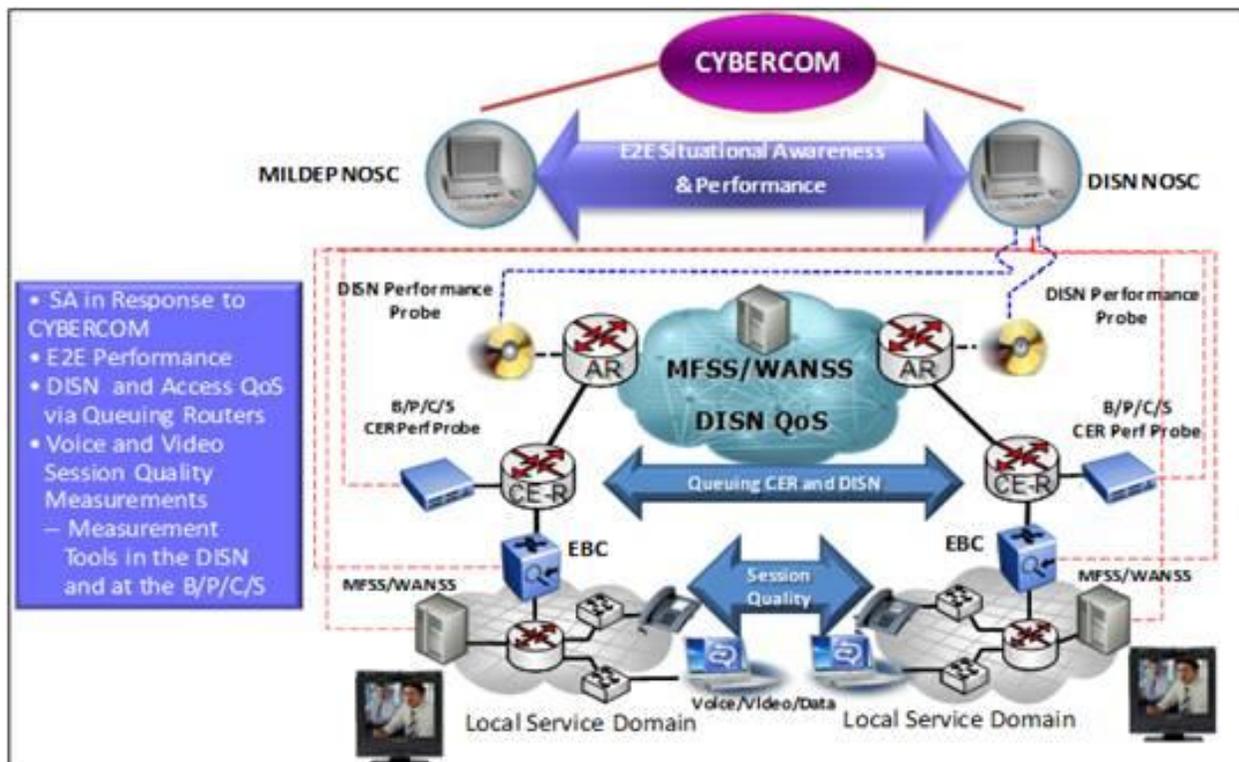


Figure A.8-2. Operational View-6A, Operational Rules of the UC Reference Architecture

A.8.2 Global Information Grid (GIG)

The GIG is the globally interconnected, end-to-end set of information capabilities, associated processes, and personnel for acquiring, processing, storing, transporting, controlling, and presenting information on demand to joint forces and support personnel. The GIG includes all owned and leased communications and computing systems and services, software (including applications), data, security services, and other associated services necessary to achieve information superiority. The GIG supports all DOD, national security, and related Intelligence

Community (IC) missions and functions (strategic, operational, tactical, and business), in war and in peace. The GIG provides capabilities from all operating locations and provides interfaces to multinational and non-DOD users and systems. The GIG is an ever evolving entity that interacts with and provides connections to the national information infrastructure and the global information infrastructure.

A.8.2.1 Defense Information Systems Network (DISN)

The DISN is an integrated network, centrally managed and configured, to provide telecommunications services for all DOD activities. This information transfer service is designed to provide dedicated point-to-point and switched voice, data, imagery, and video teleconferencing (VTC) services in support of national defense command, control, communications, computers, and intelligence (C4I) decision support requirements.

A.8.2.2 Tactical Edge Network

Tactical Operations Centers (TOCs) and other deployed enclaves operate under austere conditions; rely on a Deployed power supply or grid; and are restrictive in their size, weight, and packing allocations. The Deployed LAN and the backbone and transmission components operate from the same Deployed power source. It is extremely difficult to approach the availability and power backup requirements mandated on the fixed infrastructure with its commercial-grade power supply and fixed operating environment.

The Assured Services LAN (ASLAN) requirements defined in Section 7, Network Edge Infrastructure, represent the optimal LAN design. Deployed users are encouraged to implement these requirements whenever possible. However, operational realities often preclude the deployment of highly redundant components and multiple backup power sources.

A.8.2.3 Hybrid UC TDM Networks

This section is still under development; please contact the author with comments.

POC: Anthony Stampul

443-395-5037 DSN: 312-648-5037

Anthony.stampul.civ@mail.mil

A.8.3 Operational Area Network (OAN)

The OAN is a template JTF network architecture that serves as a reference model for forces when deploying joint tactical networks. The OAN serves as a baseline for identifying the common communications system operating standards necessary for facilitating system interoperability and configuration management in the joint operating environment. The OAN is

composed of tiers zero (0) through eight (8). [Figure A.8-3](#) illustrates the OAN, and the tiers are described in the following text:

- Tier 0: includes DISN Video Services (DVS), Defense Switched Network (DSN), Defense Red Switch Network (DRSN), Non-Classified Internet Protocol Router Network (NIPRNet), Secure Internet Protocol Router Network (SIPRNet), Joint Worldwide Intelligence Communications System (JWICS), Defense Messaging, and DISN Transport*.
- Tier 1: includes the DISN Long-Haul systems*.
- Tier 2: includes DOD Gateways*.
- Tier 3: includes theater resources of the geographic combatant commands such as the theater headquarters and the Theater NetOps Control Center (TNCC).
- Tier 4: includes the force-level elements such JTFs, Joint Special Operation Task Forces (JSOTFs), and service component headquarters.
- Tier 5: includes unit levels such as Army Corps, Marine Expeditionary Forces (MEFs), numbered Air Forces, and Navy Carrier Battle Groups (CVBGs).
- Tier 6: includes unit levels such as divisions, wings, and task forces.
- Tier 7: includes units levels such as brigades, regiments, groups, and task units.
- Tier 8: includes unit levels such as battalions, squadrons, and ships.

*Tiers 0–2 constitutes the DISN core.

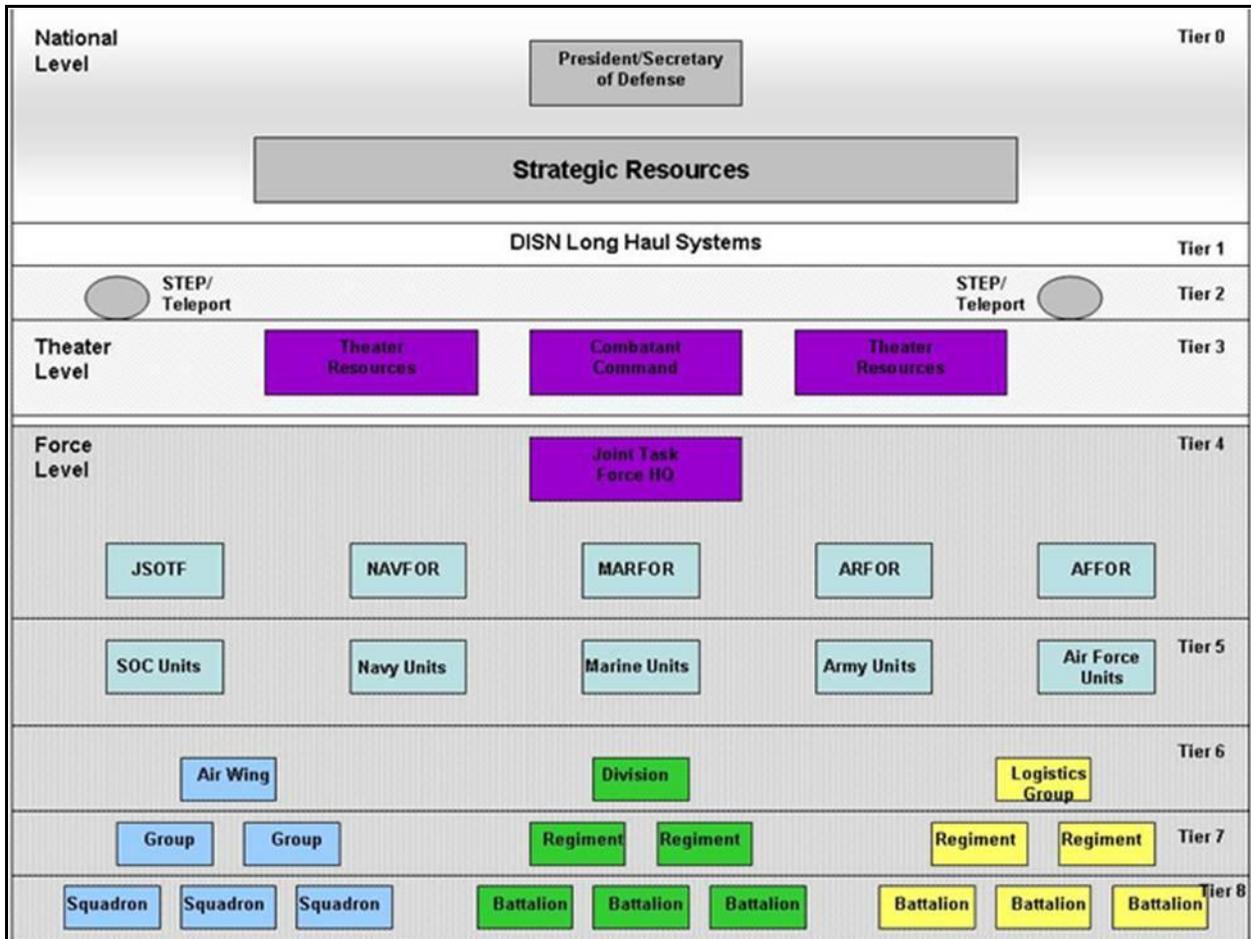


Figure A.8-3. OAN Tier Structure

A.9 DEPLOYED UNIFIED CAPABILITIES STANDARDS REFERENCES

The following section refers to common functional areas required for effective implementation of joint tactical networks. Each of the following topics highlights technical Tactical UC areas. Each topic is generally defined, along with amplifying or supporting information. When required, information is elaborated to ensure that all organizations referencing the UC Framework understand the information being presented.

A.9.1 Network Operations

Network Operations (NetOps) is the DOD-wide construct used to operate and defend the GIG. NetOps consists of three essential tasks—Enterprise Management, Network Defense, and Content Management; situational awareness; and command and control (C2)—and provides for integrated network visibility and end-to-end management of networks, global applications, and services across the GIG.

A.9.2 Information Assurance

Information Assurance refers to measures that protect and defend information and information systems by ensuring their availability, integrity, authentication, confidentiality, and non-repudiation. These measures include providing for restoration of information systems by incorporating protection, detection, and reaction capabilities.

A.9.3 Communications Security

Communications Security (COMSEC) is defined as measures and controls taken to deny unauthorized persons information derived from telecommunications and to ensure the authenticity of such telecommunications. COMSEC includes crypto-security, transmission security, emission security, traffic-flow, and physical security of COMSEC material.

A.9.4 Spectrum Planning and Management

Spectrum Planning and Management is the effective control of the Electromagnetic Spectrum through proper planning of available resources by a central control. This includes frequency planning, requesting, allocation, and de-confliction to ensure maximum operational support while minimizing negative impacts to other spectrum users.

A.9.5 Collaboration (Chat, Presence, Desktop Sharing)

This section is still under development; please contact the author with comments.

POC: Anthony Stampul

443-395-5037 DSN: 312-648-5037

Anthony.stampul.civ@mail.mil

A.9.6 Quality of Service

This section is still under development; please contact the author with comments.

POC: Anthony Stampul

443-395-5037 DSN: 312-648-5037

Anthony.stampul.civ@mail.mil

A.9.7 Cyber Operations

This section is still under development; please contact the author with comments.

POC: Anthony Stampul

443-395-5037 DSN: 312-648-5037

Anthony.stampul.civ@mail.mil

A.9.8 Public Key Infrastructure

This section is still under development; please contact the author with comments.

POC: Anthony Stampul

443-395-5037 DSN: 312-648-5037

Anthony.stampul.civ@mail.mil

A.9.9 Global Block Numbering Plan

This section is still under development; please contact the author with comments.

POC: Anthony Stampul

443-395-5037 DSN: 312-648-5037

Anthony.stampul.civ@mail.mil

A.9.10 Dynamic Unified Capabilities Admission Control (DASAC)

This section is still under development; please contact the author with comments.

POC: Anthony Stampul

443-395-5037 DSN: 312-648-5037

Anthony.stampul.civ@mail.mil

A.9.11 Multiple Path Call Management

This section is still under development; please contact the author with comments.

POC: Anthony Stampul

443-395-5037 DSN: 312-648-5037

Anthony.stampul.civ@mail.mil

A.9.12 Deployed Voice Quality

The desired objective for Deployed voice quality is a mean opinion score (MOS) of 4.0 or greater, but it is realized that the network may operate under less than ideal conditions. The requirements provided in the following paragraphs are the minimally acceptable values under the

conditions specified. The MOS calculation will assume the use of G.729 with 20 ms samples for the purpose of Service-Level Agreements (SLAs).

Using the International Telecommunications Union – Telecommunication (ITU-T) Recommendation P.862 testing standard, the baseline test environment shall be operated in an open air, clear of obstruction, line-of-sight environment, with the specific requirements. Based on the results, the estimated MOS performance range will be extrapolated and provided in the vendor Letter of Compliance (LOC) based on the Access Network operating at or near full power mode and, at a minimum, operating at a height of 80 feet. The values provided in the vendor LOC will be included in the APL report.

A.9.13 Deployed Cellular Network Systems

Data Communications Network (DCN) systems provide wireless mobile communication services with military-unique features (MUFs) and draw their Strategic services by approved DOD authorized gateway switching systems only. DCN systems can be connected to a Deployed Voice Exchange – Commercial (DVX-C), connected directly to the DSN, and/or to the UC Services Network utilizing UC Session Initiation Protocol (SIP) (UC SIP) for Time Division Multiplexing (TDM) and IP switching systems, respectively. The DCN system also may be interconnected with other cellular telephone systems, excluding commercial systems, unless the commercial system is procured or leased for DOD usage and is operating in an isolated mode from other commercial provider cellular systems.

When placed in a Deployed environment, the DCN will have the capability to connect to DSN/UC Services and between other Deployed Cellular Voice Exchanges (DCVXs) and DVX-Cs using UCR-defined protocols such as Integrated Services Digital Network (ISDN) Primary Rate Interface (PRI), Multilevel Precedence and Preemption (MLPP) PRI (T1.619a), and/or UC SIP. A DCVX system may also be configured to interconnect at the network transmission level with other DCN systems to provide roaming capability outside the local home base cellular network for supported terminal devices. In support of this roaming capability, the DCN systems may interconnect based on the interconnection protocol requirements of the appropriate 2G, 3G, and/or 4G standards.

The DCN terminal devices often referred to as mobile subscriber cellular handsets, Personal Digital Assistants (PDAs), Smartphones, BlackBerrys®, and any other end user cellular devices, commercial or Government developed, may connect to commercial cellular systems when operating outside the transmission range of the DCN. Additionally, the cellular terminal devices may have the capability to interface with other wireless networks [e.g., Institute of Electrical and Electronics Engineers (IEEE) 802.11 and IEEE 802.16]. Actual employment of this additional cellular terminal device capability will be by command approval only in the Tactical OAN.

DCNs are composed of the following three major functional areas: Terminal devices(s), Access Network, and Core Network. Terminal devices can be mobile subscribers' cellular handsets, PDAs, Smartphones, BlackBerry, or any other end user cellular devices, commercial- or

Government-developed. With the evolution of cellular technology from 2G to 4G, the primary functional components that compose the DCN Access and Core Networks are evolving as well. For comparison of the primary functional Access and Core Network components that compose an operational DCVX across the evolutionary changes,

Figures A.9-1 through A.9-3 provide the primary cellular Access and Core Network components for 2G, 3G, and 4G systems, respectively.

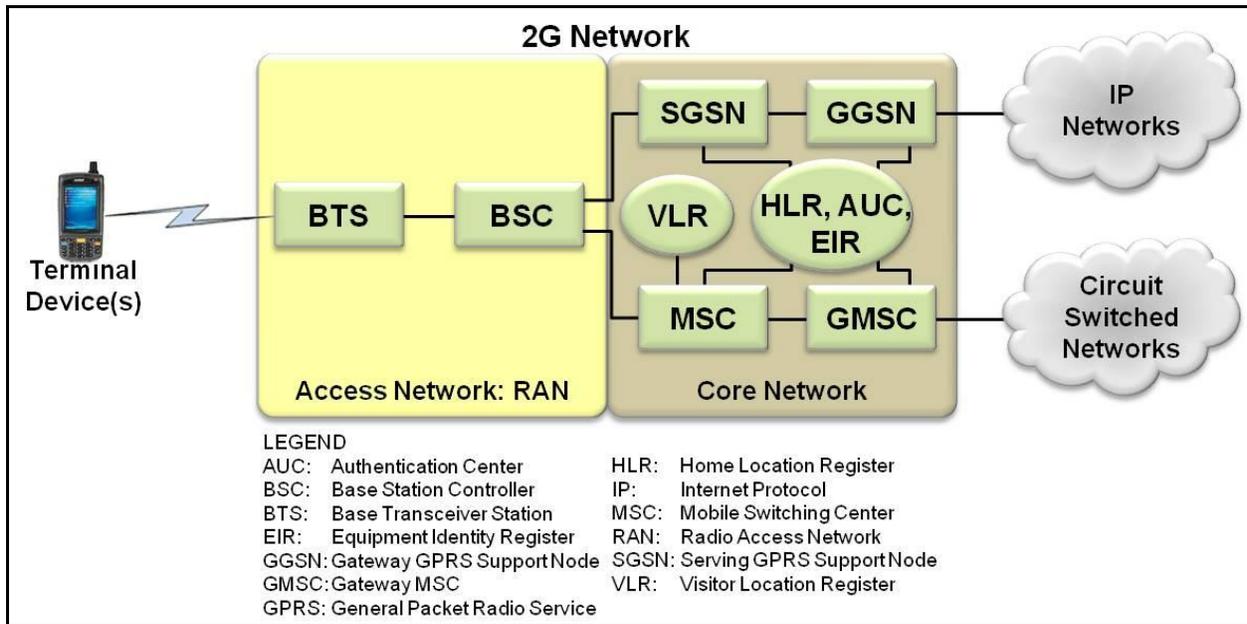


Figure A.9-1. 2G Cellular Primary Components

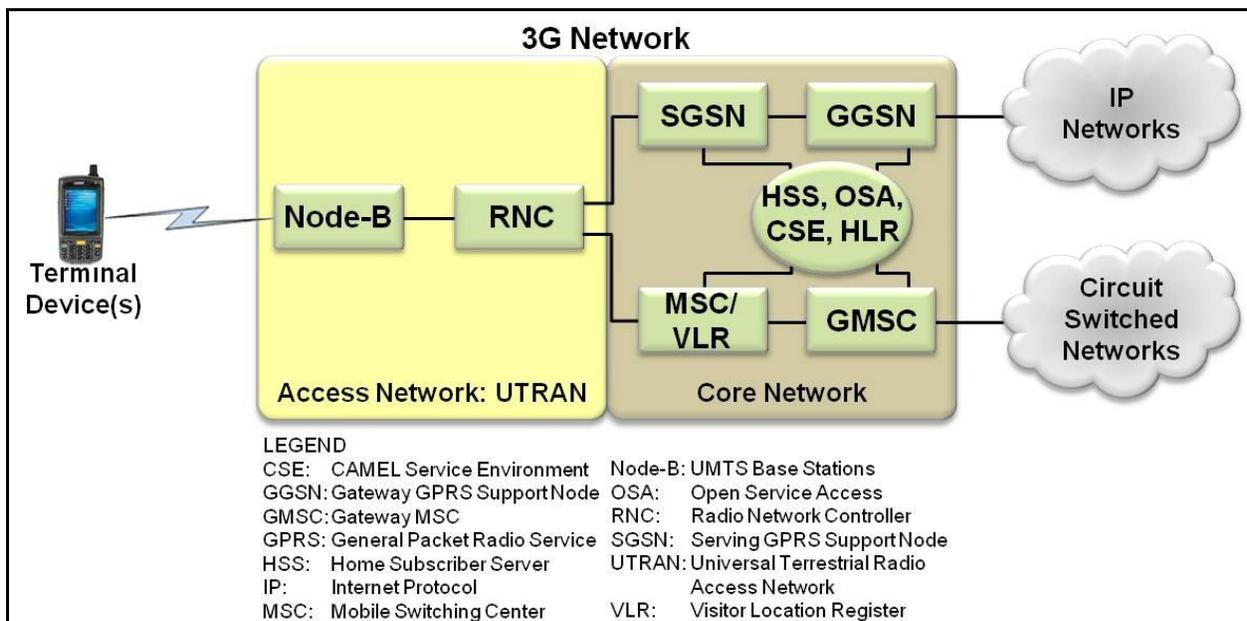


Figure A.9-2. 3G Cellular Primary Components

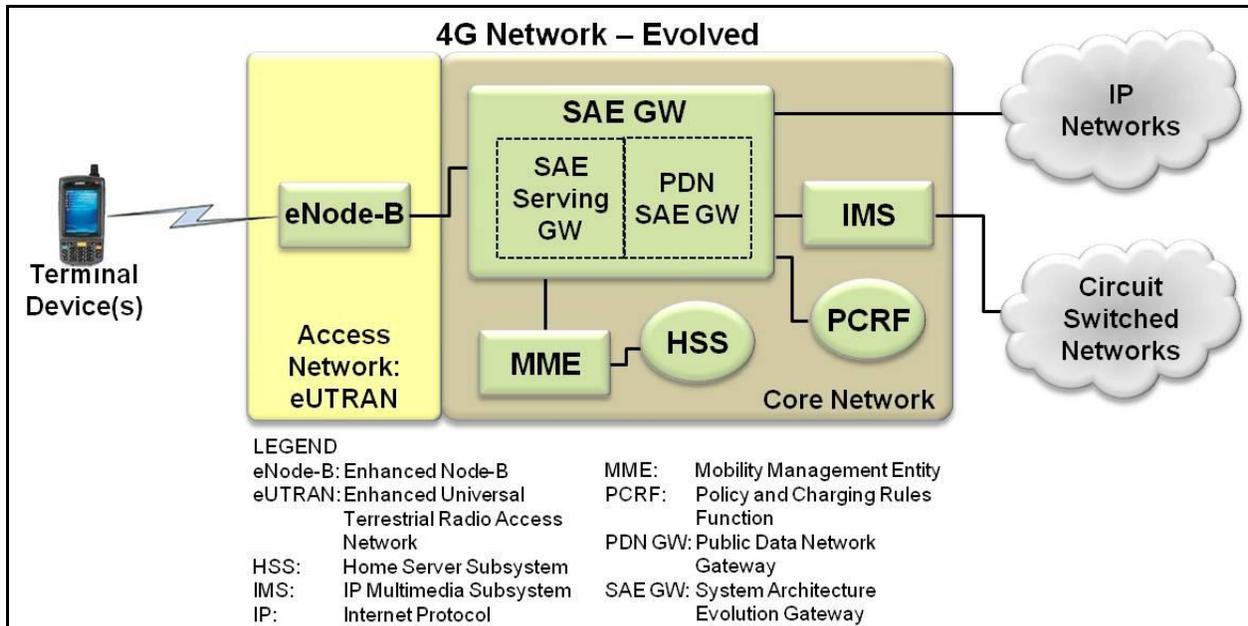


Figure A.9-3. 4G Cellular Primary Components

A.9.14 Tactical WAN Optimization

This section is still under development; please contact the author with comments.

POC: Anthony Stampul

443-395-5037 DSN: 312-648-5037

Anthony.stampul.civ@mail.mil

A.9.15 Deployed User Addressing

This section is still under development; please contact the author with comments.

POC: Anthony Stampul

443-395-5037 DSN: 312-648-5037

Anthony.stampul.civ@mail.mil

A.9.16 Voice Call Signaling (Transcoding, Mid Call Negotiation, Mix Mode)

This section is still under development; please contact the author with comments.

POC: Anthony Stampul

443-395-5037 DSN: 312-648-5037

Anthony.stampul.civ@mail.mil

A.9.17 Precedence and Preemption

Precedence and preemption can only be implemented in a DOD network. This service has two parts: precedence and preemption. Precedence involves assigning a priority level to a call (wireless or wired). Preemption involves the seizing of a communications channel that is in use by a lower precedence level caller, in the absence of an idle channel. In the DCVX, the Precedence and Preemption capability is Conditional. Precedence and preemption may be provided by enacting enhanced multilevel precedence and preemption (eMLPP) or a vendor proprietary version that performs precedence and preemption in the DCVX between the terminal device and the cellular switch. The eMLPP is a cellular version of MLPP and Assured Service in TDM and IP networks respectively. In either version, precedence will be invoked by keying defined digits before dialing the destination number on cellular instruments that have been classmarked for this service. Precedence will function jointly in combination with Wireless Priority Service (WPS) and will perform E2E as an adjunct to regular MLPP service on the wired DSN and Assured Service on the UC Network. However, in either of the provided versions, if available in the DCVX, eMLPP or vendor proprietary, the connection to the DSN will be MLPP PRI (T1.619a) or use the UC SIP protocol for the UC Network.

Mobile systems, as currently designed, provide a maximum of seven priority levels. The two highest levels (A and B) are reserved for network internal use (e.g., for emergency calls or the network-related service configurations for specific voice broadcast or voice group call services). The second highest level (B) can be used for network internal use or optionally, depending on regional requirements, for subscription. These two levels (A and B) can only be used locally, that is, in the domain of one DCVX. The other five priority levels are offered for subscription and can be applied globally if supported by all related switch elements, and for interworking with ISDN networks providing the MLPP service or Assured Service on UC Network. The seven eMLPP priority levels and their respective mapping to MLPP are defined as follows:

A	Highest, for network internal use	
B	For network internal use or, optionally, for subscription	
0	For subscription:	FLASH-OVERRIDE
1	For subscription:	FLASH
2	For subscription:	IMMEDIATE
3	For subscription:	PRIORITY
4	Lowest, for subscription:	ROUTINE

Levels A and B shall be mapped to level “0” for priority treatment outside of the DCVX area in which they are applied. The vendor-proprietary version will support the five precedence levels as specified for DSN MLPP or UC Assured Service.

A.9.18 Real-Time QoS With ASAC/DASAC

This section is still under development; please contact the author with comments.

POC: Anthony Stampul

443-395-5037 DSN: 312-648-5037

Anthony.stampul.civ@mail.mil

A.9.19 Tactical Network Elements

This section is still under development; please contact the author with comments.

POC: Anthony Stampul

443-395-5037 DSN: 312-648-5037

Anthony.stampul.civ@mail.mil

A.9.20 Tactical Radio Network Gateway(TRN) VoIP Integration

This section is still under development; please contact the author with comments.

POC: Anthony Stampul

443-395-5037 DSN: 312-648-5037

Anthony.stampul.civ@mail.mil

A.10 DEPLOYED UNIFIED CAPABILITIES STANDARDS REQUIREMENTS

A.10.1 Expanded Beam Fiber Optic Cable

This section is still under development; please contact the author with comments.

POC: Anthony Stampul

443-395-5037 DSN: 312-648-5037

Anthony.stampul.civ@mail.mil

A.10.2 IP Modems

This section is still under development; please contact the author with comments.

POC: Anthony Stampul

443-395-5037 DSN: 312-648-5037

Anthony.stampul.civ@mail.mil

A.10.3 Deployed Cellular Voice Exchange (DCVX)

The DCVX functions and provides mobile cellular services similar to standard commercial cellular systems with the addition of MUFs. It is based on a two-way cellular radio system that interconnects cell phones with other cell phones and landline stations. When used, the DCVX will provide full mobile cellular coverage in designated deployed environments; this includes training, exercise, and operational missions within COCOM areas of responsibility (AORs) or specific geographic areas. User voice, data, and related communications via terminal devices will be similar to landline wired DSN or commercial services. Except for the inherent characteristics of radio transmission, basic service features between the two systems will be similar and transparent to the users. After full mature architectural implementation, the DCVX will function as a wireless adjunct and extension of the joint OAN tier of the GIG.

A.10.4 Radio Gateway

This section is still under development; please contact the author with comments.

POC: Anthony Stampul

443-395-5037 DSN: 312-648-5037

Anthony.stampul.civ@mail.mil

A.10.5 WAN Optimization Controller (WOC)

This section is still under development; please contact the author with comments.

POC: Anthony Stampul

443-395-5037 DSN: 312-648-5037

Anthony.stampul.civ@mail.mil

A.11 OTHER REAL-TIME SERVICES

A.11.1 Sensor Telemetry

This section is still under development; please contact the author with comments.

POC: Anthony Stampul

443-395-5037 DSN: 312-648-5037

Anthony.stampul.civ@mail.mil

A.11.2 Machine-to-Machine Communications

This section is still under development; please contact the author with comments.

POC: Anthony Stampul

443-395-5037 DSN: 312-648-5037

Anthony.stampul.civ@mail.mil

A.11.3 Global Positioning

This section is still under development; please contact the author with comments.

POC: Anthony Stampul

443-395-5037 DSN: 312-648-5037

Anthony.stampul.civ@mail.mil

A.11.4 Unmanned Vehicles

This section is still under development; please contact the author with comments.

POC: Anthony Stampul

443-395-5037 DSN: 312-648-5037

Anthony.stampul.civ@mail.mil