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MEMORANDUM FOR: SEE DISTRIBUTION

SUBJECT: Department of Defense Unified Capabilities Reference Architecture Version 1.0

The attached Department of Defense (DoD) Unified Capabilities Reference Architecture (UC RA) Version 1.0 is approved for immediate use. It provides a common language and reference for DoD implementation of UC technology and directs adherence to common standards and specifications. The DoD UC RA serves as a guideline to the DoD Components in the preparation of implementation and acquisition plans for phasing in UC and provides a framework to guide and align DoD Component instantiation of UC solutions.

The DoD UC RA supports the Secretary of Defense initiative to consolidate DoD's information technology infrastructure to achieve greater economies of scale, and is key to the Department's Joint Information Environment goal of establishing effective, secure, and common UC.

The DoD UC RA is part of the DoD Information Enterprise Architecture Version 2.0. It is developed and maintained by the Office of the Department of Defense Chief Information Officer and will be updated as needed to convey changes to Enterprise-level technical direction on UC. It can be accessed through the DoD CIO public site at http://dodcio.defense.gov/Home/Initiatives/DIEA.aspx.

The DoD CIO point of contact for this matter is Mr. Kris Stance at email: kris.strance@osd.mil, (571) 372-4670.

Teresa M. Takai

Attachment:
As stated

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Information Enterprise Architecture

Unified Capabilities Reference Architecture

Version 1.0

January 2013

Prepared by:

Director, Architecture & Interoperability
Office of the DoD Chief Information Officer

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1 Strategic Purpose (AV-1)

1.1 Introduction and Background

Department of Defense (DoD) Instruction (DoDI) 8100.04, "DoD Unified Capabilities (UC)," tasks the Director, DISA to provide to the DoD CIO and the Chairman of the Joint Chiefs of Staff a biennial Unified Capabilities Master Plan (UC MP) "to include DoD-wide UC migration planning and investment guidance, a UC architecture, an assessment of the ability to meet performance requirements and planned schedules, a mitigation plan for security risks, and resource requirements for meeting the UC migration strategy." DoD UC is defined as "the integration of voice, video, and/or data services delivered ubiquitously across a secure and highly available network infrastructure, independent of technology, to provide increased mission effectiveness to the warfighter and business communities." Director, DISA developed the UC MP under the governance of the DoD UC Steering Group, and the DoD CIO signed the UC MP in October 2011.

While the UC MP met the criteria specified in the DoDI 8100.04, there was a desire to present the information contained in the UC MP in the form of a reference architecture (RA).

This report describes the UC RA by utilizing the information specified in the UC MP and the Unified Capabilities Requirements (UCR) document, which "specifies the functional requirements, performance objectives, and technical specifications for DoD networks that support UC." The UC RA provides a framework intended to guide and align DoD Component instantiation of respective UC implementation plans and solutions. It provides a common language and reference for DoD Components' implementation of UC technology, supports implementation of DoD Component solutions, and directs adherence to common standards and specifications to support the Joint Information Environment (JIE) goal of establishing effective, secure, and common UC.

The UC RA is part of the family of architectures that are components of the DoD Information Enterprise Architecture, the capstone architecture for the Enterprise Information Environment Mission Area (EIEMA). It is developed to convey Enterprise level technical direction to meet JIE and EIEMA goals.

1.2 Goals

The DoD UC RA addresses the following goals:

- Enable strategic, tactical, classified, and multinational missions with a broad range of interoperable and secure capabilities for converged non-assured and assured voice, video, and data services from the end device, through Local Area Networks (LANs), and across the backbone networks.
- Define the organizational relationships among the UC key stakeholders consisting of the DoD CIO, Joint Staff, DISA, and the DoD Components.
- Remain consistent with the Secretary of Defense Memorandum, "Department of Defense (DoD) Efficiency Initiatives," August 16, 2010, and corresponding enterprise UC initiatives.

1.3 Purpose

The purpose of the DoD UC RA is to articulate and explain the DoD's strategy for implementing converged, net-centric, Internet Protocol (IP)-based enterprise UC as required by DoDI 8100.04. The UC RA serves as a DoDAF 2.0 compliant guideline to the DoD Components in the preparation of implementation and acquisition plans for phasing in voice and video over IP services, and other UC that shall operate in converged voice, video, and/or data networks.

The architecture answers the following questions:

- What is the Enterprise UC vision?
- What are the organizational relationships and responsibilities for providing UC?
- What are the UC services?
- What are the functional requirements, standards, and technical specifications for UC?
- What is the timeline for having the UC Infrastructure in place?

1.4 Scope

The DoD UC RA provides a framework intended to guide and align DoD Component instantiation of respective implementation plans and solutions. It provides a common language and reference for DoD Components' implementation of UC technology, supports implementation of DoD Component solutions, and directs adherence to common standards and specifications. All DoD Components shall develop and align respective Component implementation plans within this framework, consistent with the constraints of DoD Component resources, mission needs, and business cases. The transition began in Fiscal Year (FY) 2012. DoD Components' implementation plans shall support individual mission requirements, business cases, and most cost effective implementation of enterprise UC. All networks that support UC shall use certified products on the DoD UC Approved Products List (APL) for assured services applications, which may be found at http://disa.mil/Services/Network-Services/UCCO. Beginning in FY 2014, DoD Components shall be responsible for ensuring compliance with this operational framework.

The DoD UC RA applies to all DoD Components.

1.5 Assumptions/Constraints

The following are assumptions and constraints of the DoD UC RA:

- The UC RA is derived from the UC MP; aligned with the Global Information Grid Convergence Master Plan and UC Framework; and is in consonance with JIE architecture. DoD UC RA is based on the current versions of the DoD UC MP and UCR. These documents should be consulted for specific implementation details and guidelines.
- Follows the standards within the:
  - DoD IT Standards Registry (DISR).
  - Current edition of the DoD UCR.
- Leverages UC products from the UC APL that have undergone interoperability and Information Assurance (IA) certification and accreditation for DoD end device-to-end device security, authentication, and non-repudiation, which shall enable new IA strategies that support mission assurance.
- The UC RA shall be used in conjunction with all relevant DoD security requirements and DoD Security Technical Implementation Guides (STIGs), which can be found at http://iase.disa.mil/stigs/.

1.6 Linkage to Other Architectures, Programs, and Initiatives

This architecture effort links to several other related architectures, programs, and initiatives, including the following:

- DoD Instruction 8100.04, "DoD Unified Capabilities (UC)," December 9, 2010
- DoD Directive 5000.01, "The Defense Acquisition System," May 12, 2003
- DoD Instruction 5000.02, "Operation of the Defense Acquisition System," December 8, 2008

- Assistant Secretary of Defense for Networks and Information Integration/DoD Chief Information Officer Publication, "Department of Defense Unified Capabilities Requirements (UCR)," current edition, located at http://disa.mil/ucco
- Secretary of Defense Memorandum, "Department of Defense (DoD) Efficiency Initiatives," August 16, 2010
- DoD Unified Capabilities Master Plan (UC MP), October 2011
- Defense Information Systems Network (DISN) UC CONOPS
- DoD IT Enterprise Strategy and Roadmap, October 5, 2011
- DoD UC Steering Group (JS J8, MILDEP CIOs, USSTRATCOM, DISA, and NSA)
- DISA Campaign Plan
- DISN Technical Evolution Plan
- DISA GIG Convergence Master Plan
- DoD Information Enterprise Architecture 2.0, August 10, 2012
- Defense Information System Network Overarching Technical Strategy, Defense Information Systems Agency, August 2011

1.7 Organization of this Document

The remainder of this document is organized as follows: Section 2 provides the organization relationships among DoD Components as it relates to the implementation of UC. Section 3 describes and depicts the high-level overview of UC. Section 4 provides a detailed description of the capabilities offered by the UC RA, including when these capabilities will be provided and the dependencies between each capability. Section 5 describes the services that make up the UC RA, and how these services map to each of the capabilities. Section 6 provides detailed resource flows for key services within the UC RA, and the high-level rules that govern these flows. An integrated dictionary and the technical standards used to provide UC are each described in separate appendices in this document as part of the AV-2.

2 Organizational Viewpoint (OV-4)

The UC RA document aligns with three primary sources: the DoDI 8100.04, the UC MP, and the UCR. These sources establish the strategic imperative for transformation of the communication and collaboration infrastructure to be interoperable and secure, while being less costly to operate. Figure 1 depicts the organizational relationships among the UC key stakeholders and their relationship to the aforementioned documents. The stakeholders consist of the DoD CIO, Joint Staff, DISA, and DoD Components. The DoD CIO is responsible for UC policy, requirements, and overarching planning documents. The notional governance structure for UC is established in DoDI 8100.04. The Joint Staff is responsible for developing and issuing a Chairman of the Joint Chiefs of Staff Instruction (CJCSI) for UC. DISA is responsible for UC enterprise funding, engineering, acquisitions, operations, maintenance, and sustainment associated with the DISN backbone and edge service provider. DISA is also responsible for maintaining the UCR, which provides implementation guidance, and the APL, which provides a structure to certify and approve products that meet IA and interoperability requirements. Additionally, DISA shall provide a Blanket Purchase Agreement (BPA) for the other DoD Components to use to acquire edge infrastructure UC APL products. The use of the DISA BPA is recommended for use by all DoD Components. DoD Components are responsible for edge infrastructure funding, engineering, acquisitions, and operations, and complying with the aforementioned policies and documents.

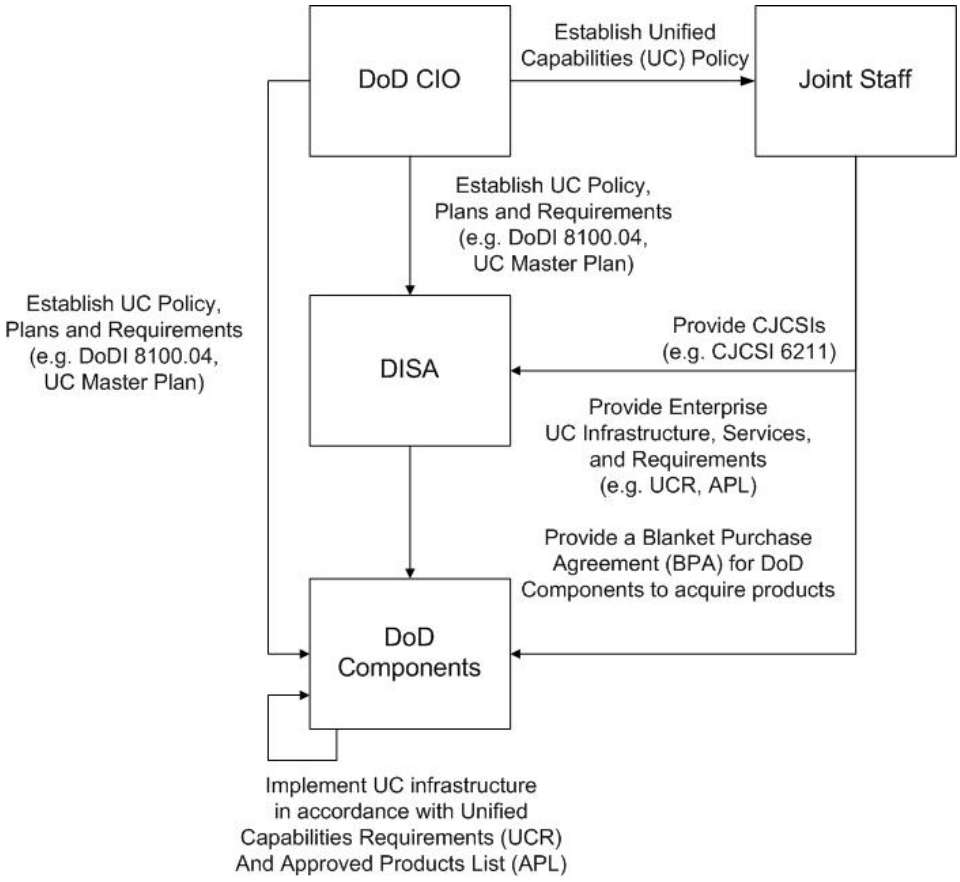

Figure 1: UC Organizational Relationship (OV-4)

3 High-level Operational Concepts (OV-1)

This section provides an explanation of the operational concept behind UC. At the highest level, UC encompasses a broad range of communications, including voice, video, Instant Messaging (IM)/chat, web conferencing, voicemail, and email. These are consumed by various end user devices such as computers, IP phones, and mobile devices. Combined, these capabilities will result in ubiquitous access to services by any user, from any location on any approved (at the enterprise-level) end user device. The UC Operational Concept Model (OV-1) depicted in Figure 2 provides an overarching view of the significant concepts, actors, and attributes of UC. It acts as the foundation for other UC architectural work products and serves to promote UC stakeholder involvement and understanding.

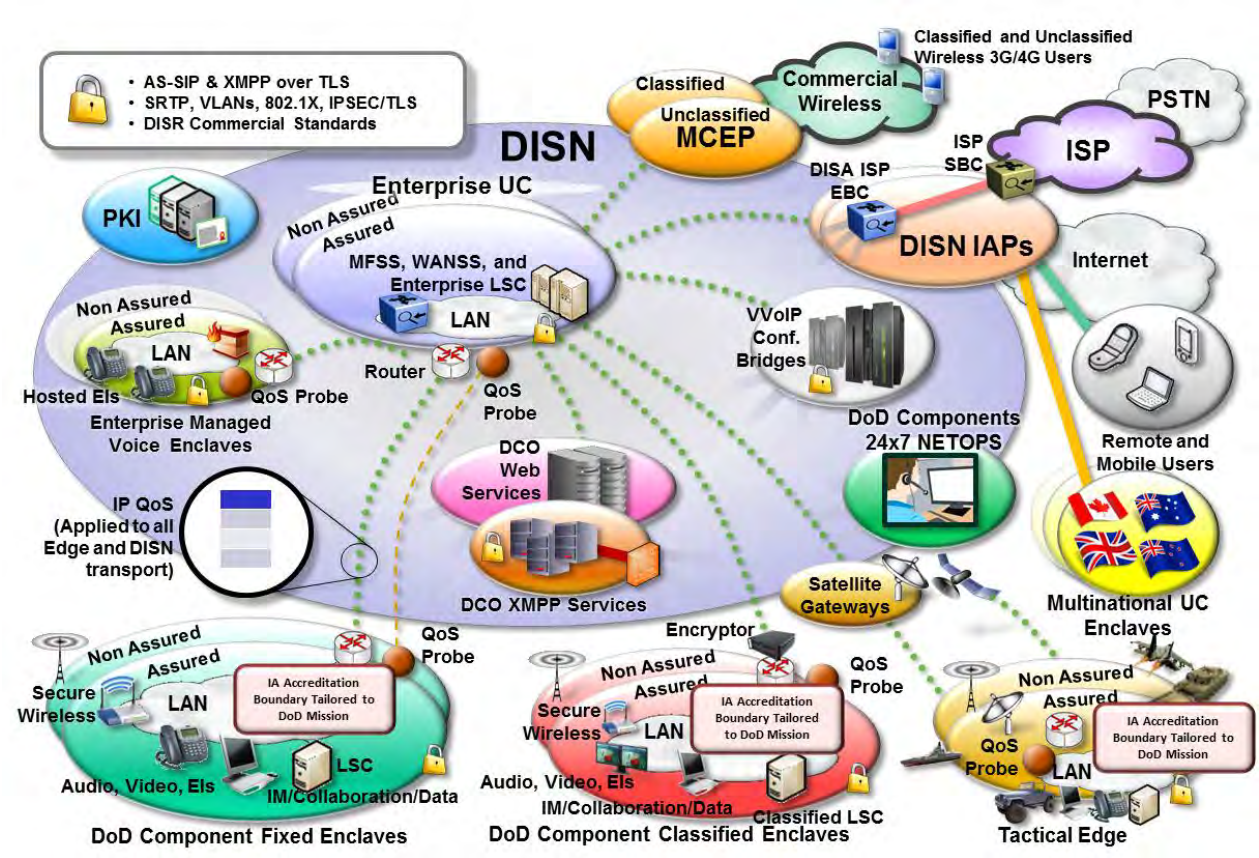

Figure 2: High-level Overview Operational Framework (OV-1)

The operational framework is based on the extensive work already accomplished by DISA through laboratory and pilot testing using interoperable and secure products from the DoD UC APL, and deploying those products in the DISN backbone infrastructure. As a result of the progress made to date, the DoD has already begun deployment of approved IP-based products. This operational framework leverages IP technologies and DoD aggregated buying power to provide enterprise UC solutions by collaboration between DISA, as the backbone and edge services provider, and the other DoD Components, as the edge services and infrastructure providers and users.

The framework is consistent with Secretary of Defense Memorandum, "DoD Efficiency Initiatives," goals and corresponding enterprise UC initiatives. By implementing enterprise multi-vendor UC investment in, and operating costs for, those services may be reduced using common and standard service models. Implementation of enterprise UC can provide a full range of related capabilities to all DoD users from central locations that leverage the DISN and IP technologies. This approach minimizes potential duplication of costs that may occur for UC operations and maintenance, network operations, sustainment, and IA at DoD Component locations worldwide through support of initiatives such as "Shared First" and "Better Buying Power."

The operational framework will continue to evolve as it is tested via multi-vendor test events, demonstrated in DoD test laboratories, and implemented using planned UC pilot test and evaluation activities.

4 Capability Vision (CV-1)

This section describes the strategic context for the capabilities to be offered by a future UC architecture. These capabilities will provide an interoperable enterprise infrastructure based on predefined standards that will allow for the integration of voice, video, and/or data services delivered ubiquitously across a secure and highly available network infrastructure to provide increased mission effectiveness to the warfighter and business communities.

Figure 3 depicts the Enterprise UC Vision for unclassified and classified enterprise UC, which contains nine core capabilities.

In order to achieve this vision, the goals/benefits for implementing these capabilities are identified for the FY 2012 to FY 2016 timeframe.

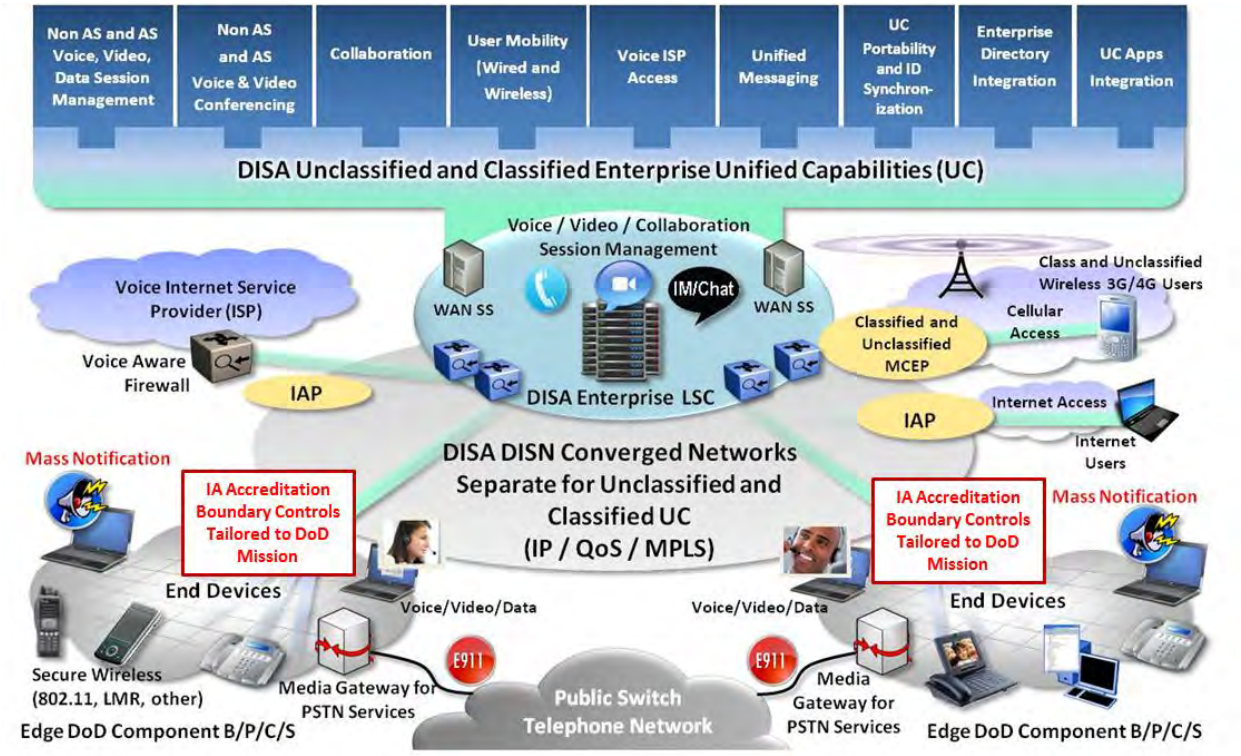

Figure 3: Enterprise Unified Capabilities Vision (CV-1)

4.1 Goals/Benefits

Implementation of UC is required to meet the requirements of the IP-enabled battlefield of the future. UC allows the DoD to achieve the following strategic, tactical, and intelligence community needs:

- Ubiquitous, robust, and scalable DoD networks, enabling integrated operations.
- IP-addressed sensors, biosensors, and logistics tracking applications, which shall enhance situational assessments and information availability.
- End device-to-end device security, authentication, and non-repudiation, which shall enable new IA strategies that support mission assurance.

- Increased operations tempo supported by rapid reorganizational capabilities, shared situational awareness, and improved wireless and mobility support.
- Greater support for mobility and communications on the move.
- Dynamic formation of a Community of Interest (COI) supported by improved collaboration and data sharing.
- Real-time and near real-time collaboration using integrated voice, video, and data capabilities.
- Situational awareness using Network Operations (NetOps) COI information sharing.
- Rapid and agile information technology infrastructures with the capability to "discover" adjacent networks and plug and play to facilitate quicker, more dynamic responses.

5 Capability Taxonomy (CV-2)

The nine capabilities shown in Figure 3 and described in Table 1 are all central in providing the overall UC Vision. While each capability is important, Table 1 lists the capabilities for implementation in the FY 2012 to FY 2016 timeframe.

Table 1: Capability Description (CV-2)

Capabilities	Description
Non-Assured/Assured Voice, Video, and Data Session Management	Provides enterprise point-to-point UC, independent of the technology (circuit switched or IP). Functionalities include, but are not limited to, end device registration, session establishment and termination, and UC session features (e.g., Assured Services Admission Control, Call Hold, Call Transfer, etc.).
Non-Assured/Assured Voice and Video Conferencing	Provides the ability to conference multiple voice or video subscribers with a variety of room controls for displays of the participants. It also includes an optional component that allows subscribers to schedule conferences.
Collaboration	Provides IP-based solutions that allow subscribers to collaborate (e.g., instant messaging, chat, presence, and web based conferencing).
User Mobility (wired and wireless)	Provides the ability to offer wireless and wired access, for UC supported by multifunction mobile devices. In addition, it provides access to enterprise UC globally using UC portability.
Voice Internet Service Provider (ISP) Access	Provides unclassified and classified enterprise UC for access to commercial voice services over IP. This service provides both local and long distance dialing capability using commercial ISPs via secure interconnections.
Unified Messaging	Provides the integration of voicemail and e-mail. The integration of these two capabilities allows subscribers to access voicemail via e-mail or access e-mail via voicemail.
UC Portability and Identity Synchronization	Provides an enterprise UC systematic approach to portability functions (e.g., repository of user profiles and privileges, and subscriber identification and authentication). Uses DISA's existing Identity (ID) Synchronization service as the primary service for DoD ID Synchronization.
Enterprise Directory Integration	Integrates UC with repository of subscriber contact information accessible to all authorized and authenticated subscribers.
UC Applications Integration	Supports mission and business applications integration with the enterprise UC (e.g., integration of UC provided presence with DoD Component-owned business applications).

6 Capability Phasing (CV-3)

Several of the UC capabilities are currently being introduced into the operational environment and can be utilized as independent capabilities today. Many others are currently in the planning phases and are being scheduled for pilot releases. As more of these capabilities are enabled, they may begin to operate together

and start to move towards the goal of providing true UC. Table 2 defines the phasing timeline goals (dependent on DoD Component mission requirements and available resources) for implementation of enterprise UC consistent with the capabilities defined in the CV-1.

Table 2: DISA Capability Phasing (CV-3)

Capabilities	Activities	FY12				FY13				FY14				FY15				FY16			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Non-Assured / Assured Voice, Video, and Data Session Management	Non-Assured/Assured Voice, Video, and Data Session Mgmt. Multivendor Test Events and Unclassified and Classified Pilots																				
	Non-Assured/Assured Voice, Video, and Data Session Mgmt. Phased into Operations in Regions with Approved Products																				
	Interoperable, Secure Global Fixed & Deployable E2E systems with Increasing UC for Unclassified and Classified Users																				
	Integrated Network Management for Performance Monitoring and Situational Awareness with Increasing Capabilities																				
Non-Assured / Assured Voice and Video Conferencing	Non-Assured/Assured Voice and Video Conferencing Multivendor Test Events and Unclassified and Classified Pilots																				
	DISN/LAN QoS Enabled																				
	BB w/MFSS and WAN SS Operational																				
	Non-Assured/Assured Voice and Video Conf. Phased into Operations in Selected Geo. Regions with Approved Products																				
Collaboration	Collaboration Multivendor Test Events and Unclassified and Classified Pilots																				
	Collaboration Phased into Operations in Selected Geographical Regions with Approved Products																				
User Mobility (wired and wireless)	User Mobility (Wired and Wireless) Multivendor Test Event Pilots																				
	User Mobility (Wired and Wireless) Phased into Operations in Selected Geographical Regions with Approved Products																				
Voice Internet Service Provider (ISP) Access	ISP Access for Voice Pilots and Implementation																				
	ISP Access for Voice Phased into Operations in Selected Geographical Regions with Approved Products																				
Unified Messaging	Unified Messaging Multivendor Test Events and Unclassified and Classified Pilots																				
	Unified Messaging Phased into Operations in Selected Geographical Regions with Approved Products																				
UC Portability and Identity Synchronization	UC Portability Multivendor Test Event Pilots																				
	UC Portability Phased into Operations in Selected Geographical Regions with Approved Products																				
Enterprise Directory Integration	Enterprise Directory Integration Plan																				
	Enterprise Directory Integration Phased into Operations in Selected Geographical Regions with Approved Products																				
UC Applications Integration	UC Applications Integration Multivendor Test Event Pilots																				
	UC Applications Integration Phased into Operations in Selected Geographical Regions with Approved Products																				
** Note	=approximate start and end dates																				

7 Capability Dependencies (CV-4)

As shown in Table 2, the various capabilities will be developed, tested, and deployed in different timeframes. While some of the capabilities can be achieved independently, others rely on having another capability in place. Figure 4 illustrates the dependencies between capabilities through the use of single

arrows. The arrows signify which capabilities rely on another capability being operational, prior to that capability's use.

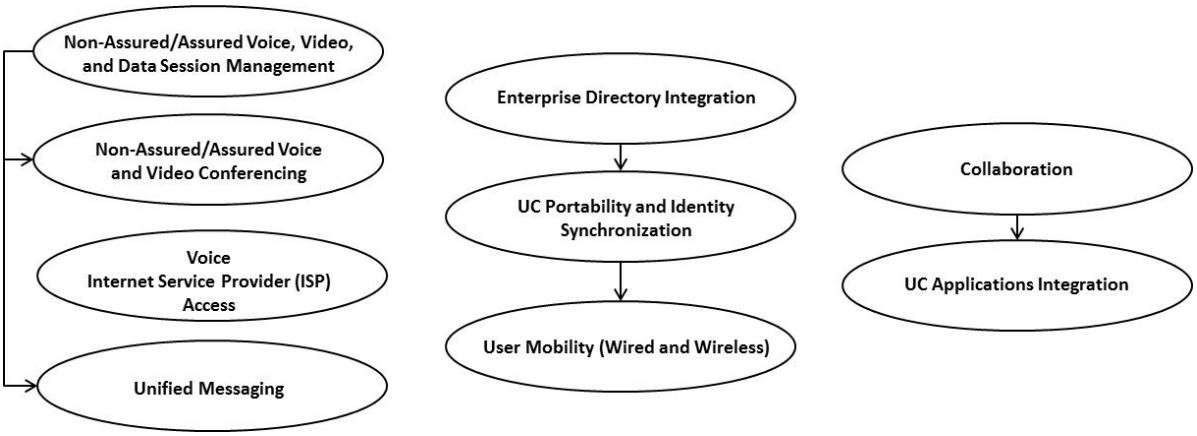

Figure 4: Capability Dependencies (CV-4)

Each of these arrows (i.e., dependencies) is described/defined in Table 3.

Table 3: Capability Dependencies (CV-4)

Capability Dependency	Description
Non-Assured/Assured Voice, Video, and Data Session Management → Voice and Video Conferencing	Voice and Video Conferencing relies on the Voice, Video and Data Session Management Capability to enable voice and video session between end users and audio and video conference bridges.
Non-Assured/Assured Voice, Video, and Data Session Management → Voice ISP Access	Voice ISP Access relies on the Voice, Video and Data Session Management Capability to establish voice sessions between the ISP and DoD end users/devices.
Non-Assured/Assured Voice, Video, and Data Session Management → Unified Messaging	Unified Messaging relies on the Voice, Video, and Data Session Management Capability to enable end users to access Unified Messaging via voice devices.
Enterprise Directory Integration →UC Portability and Identity Synchronization	UC Portability and ID Synchronization relies on the Enterprise Directory Integration Capability to provide it enterprise user profiles.
UC Portability and Identity Synchronization → User Mobility	User Mobility relies on the UC Portability and ID Synchronization Capability to provide access to user profiles and privileges from any location.
Collaboration → UC Applications Integration	UC Application Integration relies on the Collaboration Capability to provide presence information from collaboration applications (e.g., from IM/Chat to SharePoint).

8 Services Context Description (SvcV-1)

UC services are driven by emerging IP and changing communications technologies, which recognize evolving communication capabilities from point-to-point to multipoint, voice-only to rich-media, multiple devices to single device, wired to wireless, non-real time to real time, and scheduled to ad hoc. The capabilities described in the previous section are provided through a collection of services, where a service is defined as 'a mechanism to enable access to a set of one or more capabilities. These services are listed and defined in Table 4.

Table 4: Service Descriptions

Services	Description
Email and Calendaring	Provides for users to send messages to one or many recipients with features such as priority marking, reports on delivery status and delivery receipts, digital signatures, and encryption. Calendaring allows the scheduling of appointments with one or many desired attendees.
Instant Messaging and Chat	The capability for users to exchange one-to-one ad hoc text messages over a network in real time. Instant Messaging is not the same as and must not be confused with signaling or equipment messaging; IM is always user generated and user initiated. Chat provides the capability for two or more users operating on different computers to exchange text messages in real time. Chat is distinguished from IM by being focused on group chat or room-based chat. Typically, room persistence is a key feature of multiuser chat, in contrast with typically ad hoc IM capabilities.
Rich Presence	Allows contact to be achieved with individuals based on their availability as displayed by presence information from multiple sources, including IM, telephone, and mobile devices.
Unified Messaging	Provides access to voicemail via e-mail or access to e-mail via voicemail.
Video Conferencing	Provides multiple video users with the ability to conduct video and voice collaboration with a variety of room controls for displays of the participants often with a variety of scheduling tools.
Voice and Video (Point-to-Point)	Provides two voice and/or video users with the ability to be connected End-to-End with services that can include capabilities such as voicemail, call forwarding, call transfer, call waiting, operator assistance, and local directory services.
Voice Conferencing	Provides multiple voice users with the ability to conduct a collaboration session.
Web Conferencing and Web Collaboration	Provides for multiple users to collaborate with voice, video, and data services simultaneously using web page type displays and features.

The interfaces and interconnections between each of the services described in Table 4 are shown in Figure 5. Single and double arrows are used to indicate interfaces between the various services and the flow of information.

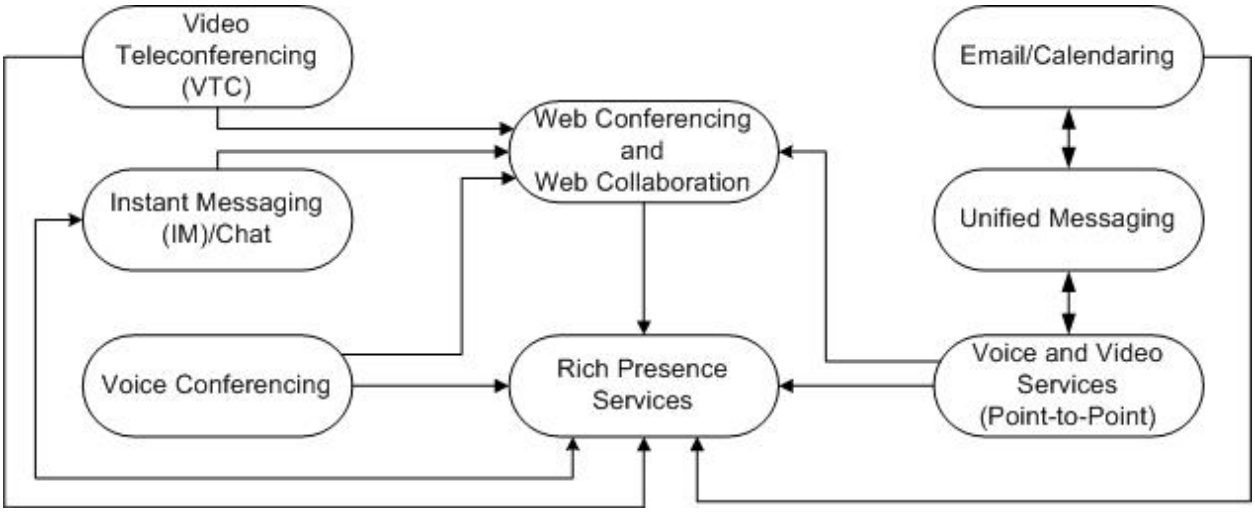

Figure 5: Services Context Description (SvcV-1)

Table 5 describes the information that is exchanged across these interfaces.

Table 5: Service Interface Descriptions

Service Interfaces	Description
Email/Calendaring → Rich Presence Services	Email/Calendaring publishes free/busy presence information to Rich Presence Services.
Unified Messaging ←→ Email/Calendaring	Unified Messaging provides transcription of voicemail to Email/Calendaring, and Email/Calendaring provides email and calendaring information to Unified Messaging.
Unified Messaging ←→ Voice and Video Services (P2P)	Unified Messaging provides text-to-speech to Voice and Video (Point-to-Point), and Voice and Video Services (Point-to-Point) provides voice recording to Unified Messaging.
Voice and Video Services (P2P) → Rich Presence Services	Voice and Video Services(Point-to-Point) publishes voice and video presence information to Rich Presence.
Voice and Video Services (P2P) → Web Conferencing and Web Collaboration	Voice and Video Services (Point-to-Point) provides voice and video services to Unified Conferencing.
Video Conferencing → Web Conferencing and Web Collaboration	Video Teleconferencing provides video services to Unified Conferencing.
Video Teleconferencing → Rich Presence	Video Teleconferencing publishes presence information to Rich Presence Services.
Instant Messaging (IM)/Chat ←→ Rich Presence Services	Instant Messaging (IM)/Chat publishes Instant Messaging (IM)/Chat presence information to Rich Presence Services and Rich Presence information is fed back into the Instant Messaging (IM)/Chat service.
Instant Messaging (IM)/Chat → Web Conferencing and Web Collaboration	IM/Chat provides text messaging services to Unified Conferencing.
Voice Conferencing → Web Conferencing and Web Collaboration	Voice Conferencing provides voice conferencing services to Unified Conferencing.
Voice Conferencing → Rich Presence Services	Voice Conferencing publishes presence information to Rich Presence Services.
Web Conferencing and Web Collaboration → Rich Presence Services	Web Conferencing and Web Collaboration publish attendee presence information to Rich Presence Services.

9 Capability to Services Mapping (CV-7)

While each service listed in Table 4 provides a different means for communicating and/or collaborating, many of the capabilities require the implementation of one or more services. Table 6 provides a mapping between the capabilities and the services. An 'X' indicates that the service contributes to the overall capability.

Table 6: Capability to Services Mapping (CV-7)

Services	Capabilities								
	Non-Assured/Assured Voice, Video, and Data Session Management	Non-Assured/Assured Voice and Video Conferencing	Collaboration	User Mobility (wired and wireless)	Voice ISP Access	Unified Messaging	UC Portability and Identity Synchronization	Enterprise Directory Integration	UC Applications Integration
Voice Services Point-to-Point	X			X	X	X			
Video Services Point-to-Point	X			X	X				
Voice Conferencing		X		X			X	X	

Services	Capabilities								
	Non-Assured/Assured Voice, Video, and Data Session Management	Non-Assured/Assured Voice and Video Conferencing	Collaboration	User Mobility (wired and wireless)	Voice ISP Access	Unified Messaging	UC Portability and Identity Synchronization	Enterprise Directory Integration	UC Applications Integration
VTC		X		X			X	X	
Web Conferencing and Web Collaboration			X	X					
IM and Chat			X	X			X	X	
Rich Presence Services			X	X					X
Email/Calendaring				X		X	X	X	
Unified Messaging				X		X			

10 Operation Rules Model and Event-Trace Diagrams (OV-6a and OV-6c)

Each service described above will be offered through the deployment of multiple devices both within the DISN and in the DoD Component enclaves. There are many detailed operations associated with UC, which describe how users interact with one another using the various services described above. All of these operations can be described in terms of end-to-end communications and/or collaboration processes. These operations are impacted by rules, which are necessary for the various services to behave in their intended manner and interoperate both within and between service components. This section describes some of the operational/business rules for implementing Voice and Video Services Point-to-Point, Voice and Video Conferencing, and IM and Chat. In addition to the business rules, event-trace diagrams are provided to show the processes involved in accessing each of these services. These diagrams are for illustrative purposes and are not meant to apply to every vendor solution or cover every scenario, or call flow.

The following subsections describe five event-trace diagrams, and the high-level rules that influence them:

1. Assured Point to Point Voice Call (10.1)
2. Assured Point to Point Video Call (10.2)
3. Assured Voice and Video Conference Call (10.3)
4. Assured Point to Point Voice Call using an Enterprise Local Session Controller (LSC) (10.4)
5. One to One Instant Message (10.5)

The rules and process flows discussed below were extracted from the UCR document, which contains the detailed rules and requirements used by vendors to develop interoperable UC devices. For more information on performance metrics and measurement techniques, please see the UC Framework in the UCR. The rules governing the five process flows are a small subset of the rules and implementation guidelines identified within the UCR. The UCR should be consulted as the authoritative source for UC product requirements. A complete description of the rules and requirements that govern UC interoperability can be found in the latest UCR document at http://www.disa.mil/Services/Network-Services/UCCO.

10.1 Assured Point to Point Voice Call

In the Point-to-Point Voice Call scenario, a DoD Component user places a call to another user. The receiving user can be within the same LAN as the user placing the call, on a different DoD Component LAN, or attached to the Public Switched Telephone Network (PSTN). Figure 6 shows different call signaling flows, depending on the receiving user's location. For simplicity, the call flow in Figure 6 assumes both end points support and use the Assured Services Session Initiation Protocol (AS-SIP). In addition, all calls between DoD Components use the IP network, and not the legacy Defense Switched Network (DSN).

Prior to the implementation of a voice ISP call, this UC RA allows for two different methods for establishing communication with PSTN users, both of which are shown Figure 6. If the caller's network uses a hybrid voice over IP/Time Division Multiplexing (VoIP/TDM) switch, the call can be signaled directly from the hybrid switch to a PSTN switch, where the call will then be signaled across the PSTN to the intended recipient. If the network does not use a hybrid VoIP/TDM switch, the signaling must go through a media gateway, and a TDM switch, before ultimately being signaled to the PSTN.

If the call is destined to a DoD user, the process depends on the recipient's location within the DoD. If the recipient is connected to the same LSC as the caller, the call signaling will go from the caller to the LSC and then directly to the recipient. If the recipient is on a remote DoD Component network, and is connected to a different LSC, the signaling must first be routed through one or more Wide Area Network (WAN) Soft Switches (SS), before reaching the remote LSC. Edge Border Controllers (EBCs) are used to provide IA protection to the DoD Component enclaves hosting the LSCs and at the DISA location(s) hosting the WAN SS. The UCR describes the detailed requirements for each of the devices shown in Figure 6.

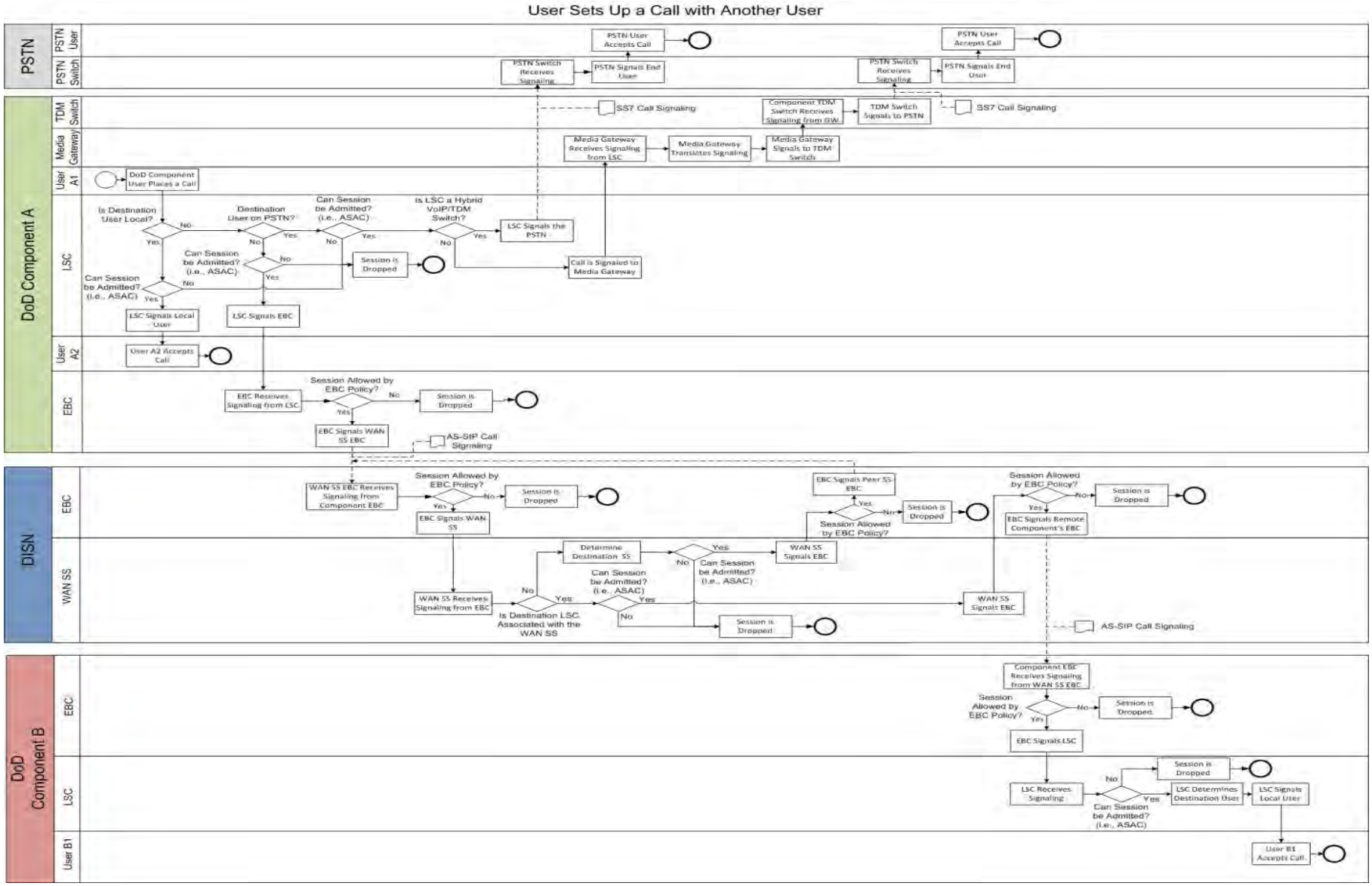

Figure 6: Assured Point to Point Voice Call Diagram (OV-6c)

While the detailed rules and requirements governing the signaling flows shown in Figures 6, 7, and can be found in the most recent version of the UCR, the following describe some of the high-level rules:

- The LSC must use AS-SIP signaling on the trunk side to the wide area network.
- If the LSC interfaces to the PSTN, or to legacy Base/Post/Camp/Station Time Division Multiplexing (TDM) systems, it must also support a Primary Rate Interface (PRI), using its Media Gateway and Media Gateway Controller.
- All LSCs must provide Precedence-Based Assured Services via AS-SIP/Assured Services Admission Control for IP and for TDM trunks (where equipped) via its Media Gateway using the T1.619a protocol.
- Voice signaling must conform to the following rules:
    - There is a two-level signaling hierarchy: LSC and either a Multifunction Soft Switch (MFSS) or a WAN SS
        - LSC A to MFSS A to MFSS B to LSC B when the LSCs have different primary MFSS
        - LSC A to MFSS A to LSC B when they have the same primary MFSS
    - The LSCs are assigned a primary and backup MFSS for signaling robustness
        - Signaling from an IP End Interface to a LSC may be proprietary, or AS-SIP
        - The LSC to LSC signaling is not permitted external to the security enclave except for use in cases involving deployable products operating in a single area of operational responsibility network that is not the DISN
    - The LSC can set up:
        - On-base sessions when a connection to an MFSS is lost
        - Sessions to PSTN trunks independent of an MFSS
    - Signaling
        - A TDM End Office will signal via DSN Common Channel Signaling System No. 7 or PRI to MFSS
        - The MFSS will signal via PRI to the PSTN and to coalition gateways.
- Edge Border Controllers (EBC) are used to provide IA for voice call signaling and bearer traffic.
- DoD Components must use products from the UC APL when implementing their voice architecture.

10.2 Assured Point to Point IP Video Call

In this scenario, a DoD Component user places a video call to another user. The receiving user can be within the same LAN as the user placing the call, or on a different DoD Component LAN. The video call flow shown in Figure 7 assumes the use of AS-SIP compliant end devices. Therefore, the same signaling infrastructure that was used for setting up voice calls across the DoD is used for point to point video.

As shown in Figure 7, if the recipient is connected to the same LSC as the caller, the call signaling will go from the caller to the LSC and then directly to the recipient. If the recipient is on a remote DoD Component network, and is connected to a different LSC, the signaling must first be routed through one or more WAN SS, before reaching the remote LSC. EBCs are used to provide IA protection to the DoD Component enclaves hosting the LSCs and at the DISA location(s) hosting the WAN SS. The UCR describes the detailed requirements for each of the devices shown in Figure 7.

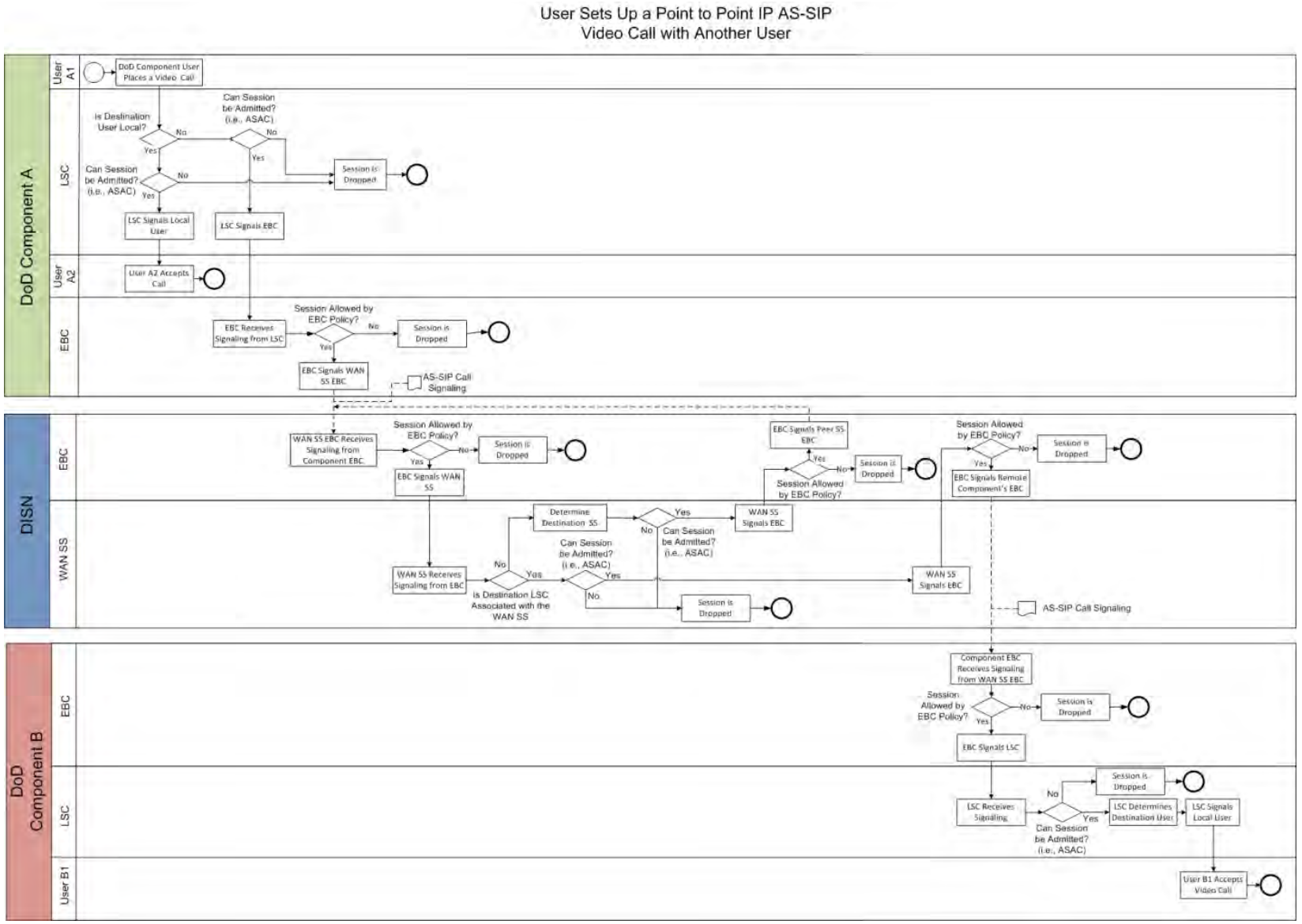

Figure 7: Point to Point IP Video Call Diagram (OV-6c)

10.3 Assured Voice/Video Conference Call

In the Assured Voice/Video Conference Call scenario, a DoD Component user dials into a voice or video conference bridge. The conference bridge in this scenario is hosted within the DISN. As with the other scenarios, this scenario assumes the use of AS-SIP between the endpoints and the LSCs. Figure 8 shows the call signaling flow from an end user into the conference bridge.

10.4 Assured Point to Point Voice Call using an Enterprise Local Session Controller (ELSC)

The previous voice and video call flows assumed the DoD Components provided their own LSCs, and used the DISN WAN SS for establishing sessions between Component enclaves. In the future, DISA plans to provide Enterprise Local Session Controllers (ELSCs) for Component enclaves where it is not cost efficient to deploy their own LSC. However, the Service implementation plans and BCAs will determine the final deployment plan. Since enclaves that use an ELSC are reliant on connectivity to that device for all voice and video services, a Survivable Session Processor (SSP) is deployed within the DoD Component enclave to provide call routing if connectivity to the ELSC is lost. Figure shows the event-trace diagram for a Point to Point Voice service using an ELSC. A similar process flow would be used for the Point to Point Video service and Voice and Video Conferencing service using an ELSC.

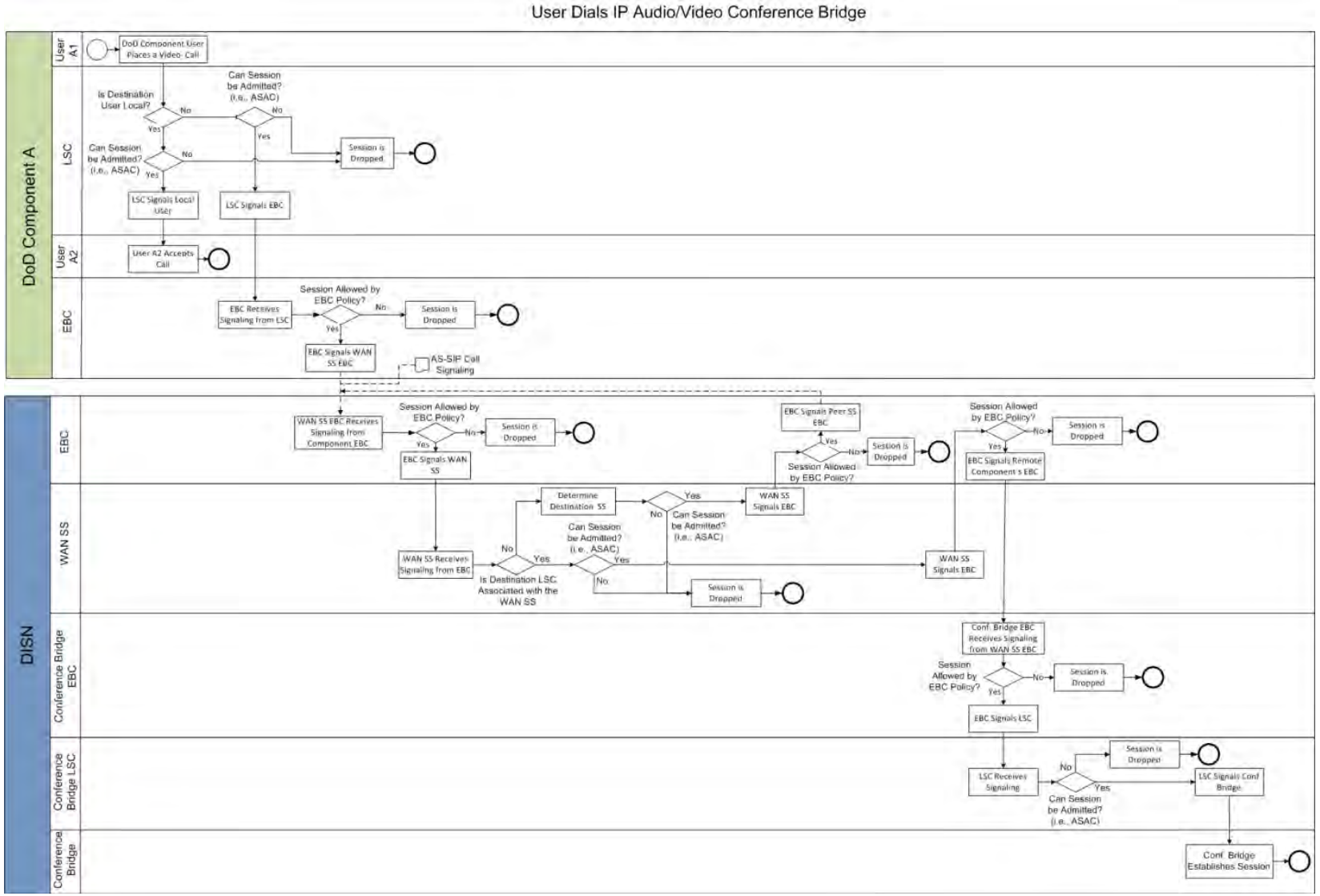

Figure 8: Voice/Video Conference Call Diagram (OV-6c)

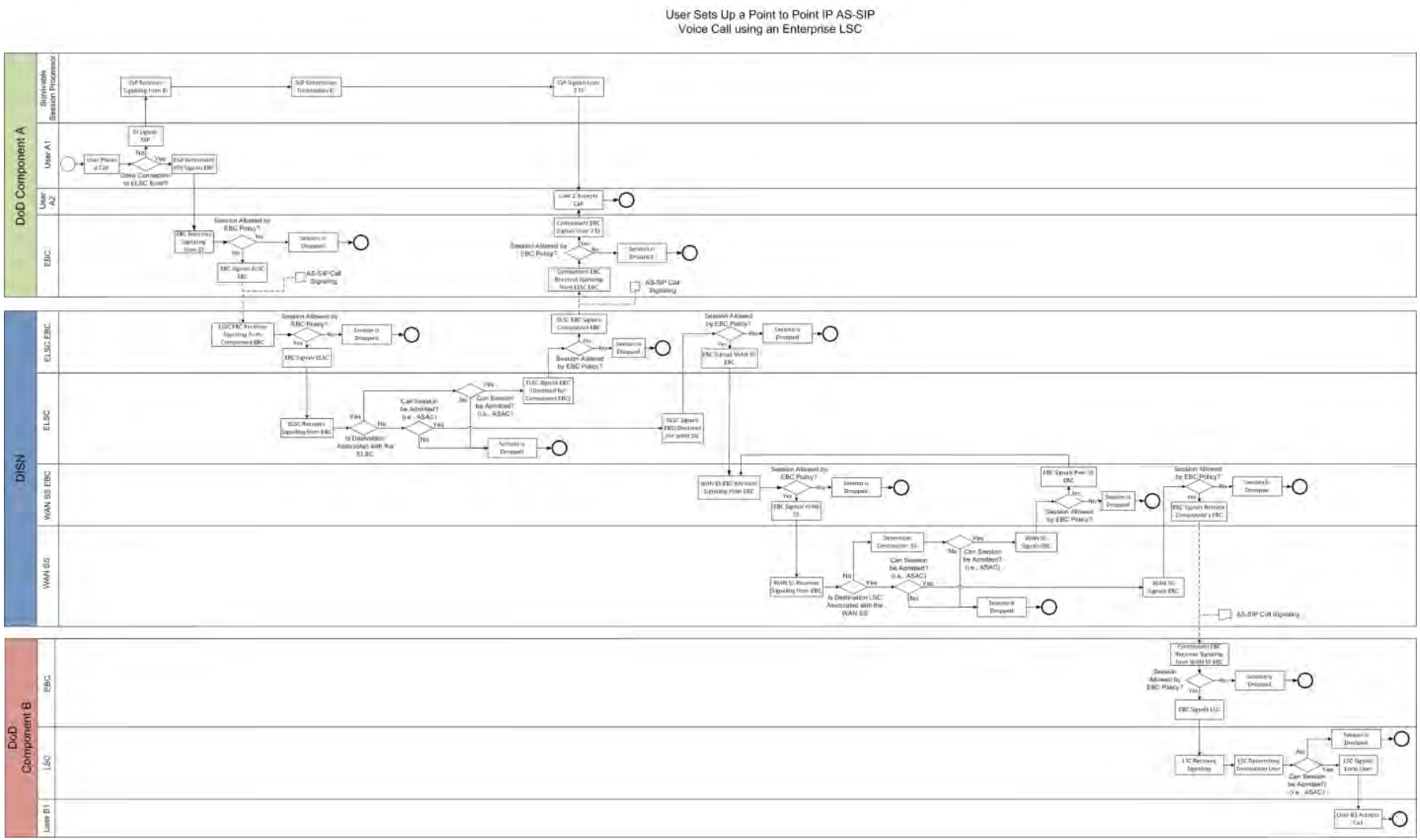

Figure 9: Assured Point to Point Voice Call Using an Enterprise LSC

10.5 One to One Instant Message

In the one to one instant message scenario, a DoD Component user sends an instant message to another user. The high-level rules which govern this operation are:

- IM and Chat servers must use the Extensible Messaging and Presence Protocol (XMPP) as described in the latest version of the UCR document for Client to Server (C2S) and Server to Server (S2S) communication.
- DoD Components must use IM and Chat products from the UC APL if they want to establish S2S communication across the Wide Area Network.
- All XMPP streams, including both C2S and S2S connections, must be secured with the use of Transport Layer Security (TLS).
- An XMPP client must connect to its "home" server in order to be granted access to the network and subsequently to be permitted to exchange IM and presence information with other users/services.
- Proprietary C2S protocols are permitted within the context of a Military Department enclave, but must be able to federate with native XMPP servers by means of an XMPP S2S stream enabled through the use of an XMPP gateway implementation.

As with the voice and video scenarios, the detailed rules and requirements for IM/Chat C2S and S2S operation are described in the most recent version of the UCR.

Figure 10 illustrates the process of an IM being routed to its destination, which consists of three possible paths:

1. Destination user is attached to the same IM/Chat server.
2. Destination user is attached to another IM/Chat server that supports XMPP.
3. Destination user is attached to an IM/Chat server that supports a protocol other than XMPP.

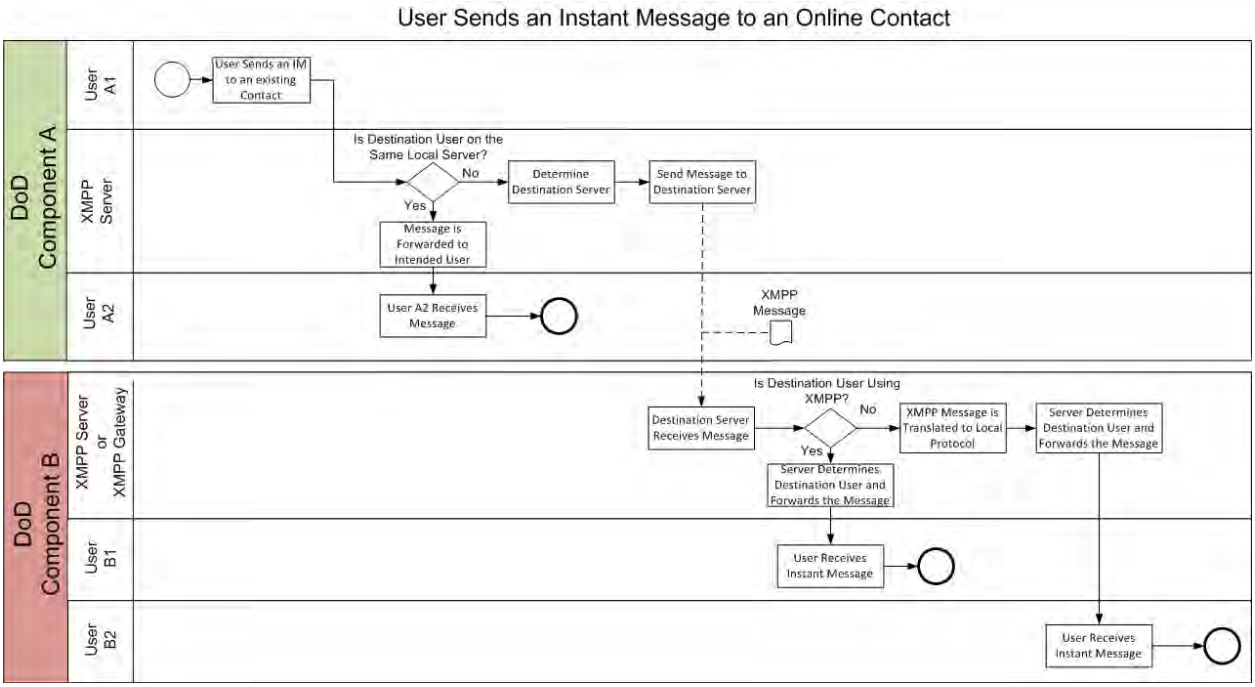

Figure 10: IM/Chat Message Sent (OV-6c)

When an IM is sent to a user associated with the same IM/Chat server, the message flow goes from client to server to client. If the recipient is associated with a different server, the process depends on what type of IM/Chat server is being used by the destination user. Two scenarios are possible:

1. If the destination user uses XMPP, no translation is needed and the message flow goes from client to server to server to client.
2. If the destination user does not use XMPP, the remote network must first translate the XMPP message into the protocol being used by the remote IM/Chat client, using an XMPP gateway. Once the gateway translates the message, the message is sent to the recipient's IM/Chat server (may be the same physical device as the gateway), where it is then forwarded to the recipient.

11 Conclusion

Over the last several years, UC as a concept has taken root across the DoD with a focus on moving towards an all IP architecture to provide increased efficiencies and cost savings. The DoDI 8100.04, UC Master Plan, UC Requirements document, and this UC RA are moving the UC effort from the strategy and definition phase to implementation and impact phase across the enterprise. This includes rigorous analysis and documentation of capabilities and gaps, and a concerted effort to solidify partnerships between key stakeholder communities (e.g., USSTRATCOM, DoD CIO, DISA, MILDEPs, and others) and the vendors. While progress has been made to reach the goal of providing UC to the enterprise, the funding needed at the MILDEP level, as well as for DISN upgrades for related initiatives, plays a critical role in ensuring progress towards the vision.

Appendix A: Operational View (OV-1) – NetOps

Both DISA and the military Services shall provide around-the-clock Network Operations Centers (NOCs) that oversee voice, video, and data services. DISA shall oversee the DISN systems and shall have read-write access to DISN systems, which are shared with the military Services for cost avoidance, such as the multifunction softswitch (MFSS) or WAN SS. All NOCs shall have Element Management Systems (EMSs) that allow for read-write access for the systems for which they have direct responsibility. In addition, the U.S. Cyber Command (CYBERCOM)-sponsored NetOps COI metadata standards and information sharing capabilities shall be used by all NOCs to share alarms, performance data, and trouble tickets. Information sharing and Network Operations and Security Centers (NOSCs) shall enable end-to-end visibility and the configuration of network components, as needed to respond to situational awareness (SA).

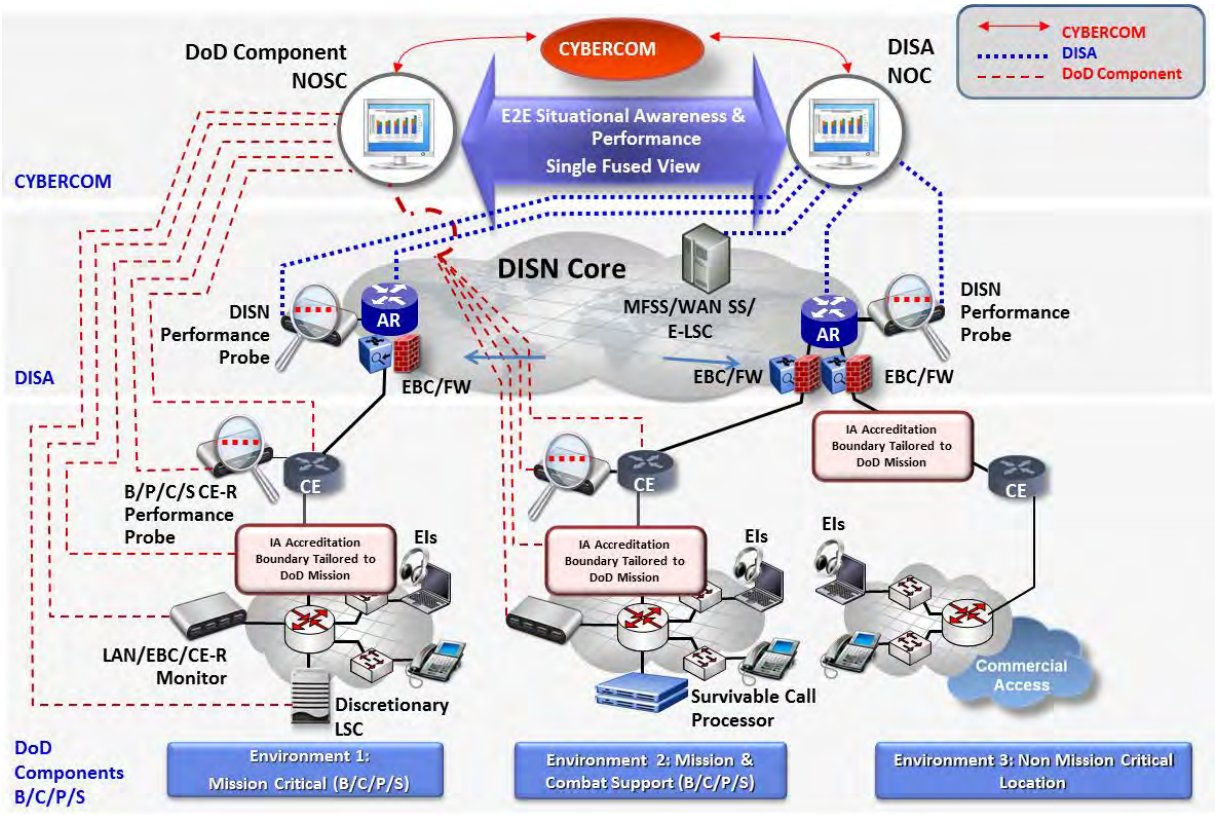

Figure 11: Operational construct for UC NetOps based on the USCYBERCOM/USSTRATCOM-approved DISN UC CONOPS (OV-1)

In order to achieve the desired NetOps Situational Awareness as shown in Figure 11, the following needs to occur:

(1) USCYBERCOM shall receive UC network situational awareness from DoD Component Network Operations and Security Centers (NOSCs) and the DISA Network Operation Center (NOC) infrastructure, and provide Operational Directive Messages to the DoD Components to meet mission needs. DISA and the other DoD Components shall be responsible for end-to-end UC network management, through the DISA NOC infrastructure and DoD Component NOSCs through exchange of information on end-to-end situational awareness and performance, to include quality of service, faults, configuration, administration, performance, and security.

(2) The DISA NOC infrastructure shall oversee the DISN backbone infrastructure and DISA enterprise UC.

(3) The DoD Component NOSCs shall oversee respective regional and Base/Post/Camp/Station (B/P/C/S) infrastructures supporting UC, delivered to the edge infrastructures and end devices. DoD Component B/P/C/S UC infrastructures may be tailored to meet respective mission needs for the three environments shown in Figure .

(4) The DISA NOC and DoD Component NOSCs and associated network engineers shall collaborate on location, capabilities, and network monitoring information requirements to minimize overlaps and duplication of monitoring probe capabilities and information exchange to provide end-to-end situational awareness and performance, to include quality of service, faults, configuration, administration, performance, and security.

Appendix B: Integrated Dictionary (AV-2)

CV-4 Capabilities	
Name	Description
Collaboration	Provides IP-based solutions that allow subscribers to collaborate (e.g., instant messaging, chat, presence, and Web conferencing).
Enterprise Directory Integration	Integrates UC with repository of subscriber contact information accessible to all authorized and authenticated subscribers.
Non-Assured/Assured Voice and Video Conferencing	Provides the ability to conference multiple voice or video subscribers with a variety of room controls for displays of the participants. It also includes an optional component that allows subscribers to schedule conferences.
Non-Assured/Assured Voice, Video, and Data Session Management	Provides enterprise point-to-point UC, independent of the technology (circuit switched or IP). Capabilities include, but are not limited to, end device registration, session establishment and termination, and UC session features (e.g., Assured Services Admission Control, Call Hold, Call Transfer).
UC Applications Integration	Supports mission and business applications integration with the enterprise UC (e.g., integration of UC provided presence with DoD Component-owned business applications).
UC Portability and Identity Synchronization	Provides an enterprise UC systematic approach to portability functions (e.g., repository of user profiles and privileges, and subscriber identification and authentication). Uses DISA's existing Identity (ID) Synchronization service as the primary service for DoD ID Synchronization.
Unified Messaging	Provides the integration of voicemail and e-mail. The integration of these two capabilities allows subscribers to access voicemail via e-mail or access e-mail via voicemail.
User Mobility (Wired and Wireless)	Provides the ability to offer wireless and wired access, for UC supported by multifunction mobile devices. In addition, it provides access to enterprise UC globally using UC portability.
Voice Internet Service Provider (ISP) Access	Provides unclassified and classified enterprise UC for access to commercial voice services over IP. This service provides both local and long distance dialing capability using commercial ISPs via secure interconnections.

CV-4 Capability Dependencies	
Capability Dependencies	Definitions
Collaboration → UC Applications Integration	UC Application Integration relies on the Collaboration Capability to provide presence information from collaboration applications (e.g. from IM/Chat to SharePoint).
Collaboration → User Mobility	User Mobility relies on the Collaboration Capability to provide mobile application and device support for collaboration applications.
Enterprise Directory Integration → Collaboration	Collaboration relies on the Enterprise Directory Integration Capability to provide it enterprise user profiles.
Enterprise Directory → Voice, Video, and Data Session Management	Voice, Video, and Data Session Management relies on the Enterprise Directory Integration Capability to provide it enterprise user profiles.
Enterprise Directory Integration → UC Applications Integration	UC Application Integration relies on the Enterprise Directory Integration Capability to provide it enterprise user profiles.
Enterprise Directory Integration → UC Portability and ID Synchronization	UC Portability and ID Synchronization relies on the Enterprise Directory Integration Capability to provide it enterprise user profiles.
Enterprise Directory Integration → Unified Messaging	Unified Messaging relies on the Enterprise Directory Integration Capability to provide it enterprise user profiles.
Enterprise Directory Integration → Voice and Video Conferencing	Voice and Video Conferencing on the Enterprise Directory Integration Capability to provide it enterprise user profiles.

CV-4 Capability Dependencies	
Capability Dependencies	Definitions
Voice, Video, and Data Session Management → Collaboration	Collaboration relies on the Voice, Video and Data Session Management Capability to enable voice, video, and data sessions used by collaboration applications.
Voice, Video, and Data Session Management → Voice and Video Conferencing	Voice and Video Conferencing relies on the Voice, Video and Data Session Management Capability to enable voice and video session between end users and audio and video conference bridges.
Voice, Video, and Data Session Management → Unified Messaging	Unified Messaging relies on the Voice, Video, and Data Session Management Capability to enable end users to access Unified Messaging via voice devices.
Voice, Video, and Data Session Management → User Mobility	User Mobility relies on the Voice, Video and Data Session Management Capability to establish and support voice, video and data sessions for mobile applications and devices, respectively.
UC Applications Integration → User Mobility	User Mobility relies on the UC Applications Integration Capability to provide and support mobile applications and device, respectively.
UC Portability and ID Synchronization → User Mobility	User Mobility relies on the UC Portability and ID Synchronization Capability to provide access to user profiles and privileges from any location.
Voice and Video Conferencing → User Mobility	User Mobility relies on the Voice and Video Conferencing Capability to provide and support mobile applications and devices.
Unified Messaging → User Mobility	User Mobility relies on the Unified Messaging Capability to provide and support mobile applications and devices.
Unified Messaging → UC Applications Integration	UC Applications Integration relies on the Unified Messaging Capability to provide free/busy calendar information as part of Presence information.
Voice and Video Conferencing → Collaboration	Collaboration relies on the Voice and Video Conferencing Capability to provide voice and video conferencing integration with collaboration applications.
Voice ISP Access → Voice, Video, and Data Session Management	Voice and Video Session Management relies on the Voice ISP Access Capability to allow access to the public telephone network.
Voice ISP Access → Voice and Video Conferencing	Voice and Video Conferencing relies the Voice ISP Access Capability to allow access to the public telephone network.

SvcV-1 Services	
Service	Description
Email and Calendaring	Provides for users to send messages to one or many recipients with features such as priority marking, reports on delivery status and delivery receipts, digital signatures, and encryption. Calendaring allows the scheduling of appointments with one or many desired attendees.
Instant Messaging and Chat	The capability for users to exchange one-to-one ad hoc text messages over a network in real time. Instant Messaging is not the same as and must not be confused with signaling or equipment messaging; IM is always user generated and user initiated.
Rich Presence	Allows contact to be achieved to individuals based on their availability as displayed by presence information from multiple sources, including IM, telephone, and mobile devices.
Unified Conferencing	Provides for multiple users to collaborate with voice, web, or videoconferencing integrated into a single, consolidated solution often as a collaboration application.
Unified Messaging	Provides access to voicemail via e-mail or access to e-mail via voicemail.
Video Conferencing	Provides for multiple video users to conduct video and voice collaboration with a variety of room controls for displays of the participants often with a variety of scheduling tools.
Voice and Video (Point-to-Point)	Provides for two voice and/or video users to be connected EI-to-EI with services that can include capabilities such as voicemail, call forwarding, call transfer, call waiting, operator assistance, and local directory services.
Voice Conferencing	Provides for multiple voice users to conduct a collaboration session.

Web Conferencing and Web Collaboration	Provides for multiple users to collaborate with voice, video, and data services simultaneously using web page type displays and features.

SvcV-1 Service Interfaces	
Service Interface	**Description**
Email/Calendaring → Rich Presence	Email/Calendaring publishes free/busy presence information to Rich Presence.
Unified Messaging ←→ Email/Calendaring	Unified Messaging provides transcription of voicemail to Email / Calendaring, and Email / Calendaring provides email and calendaring information to Unified Messaging.
Unified Messaging ←→ Voice and Video (P2P)	Unified Messaging provides text-to-speech to Voice and Video (Point-to-Point), and Voice and Video (Point-to-Point) provides voice recording to Unified Messaging.
Voice and Video (P2P) → Rich Presence	Voice and Video (Point-to-Point) publishes voice and video presence information to Rich Presence.
Voice and Video (P2P) → Unified Conferencing	Voice and Video (P2P) provides voice and video services to Unified Conferencing.
Web Conferencing and Web Collaboration → Unified Conferencing	Web Conferencing and Collaboration provides conferencing and collaboration services to Unified Conferencing.
Video Conferencing → Unified Conferencing	Video Conferencing provides video services to Unified Conferencing.
Video Conferencing → Rich Presence	Video Conferencing publishes presence information to Rich Presence.
IM/Chat ←→ Rich Presence	IM/Chat publishes IM/Chat presence information to Rich Presence and Rich Presence information is fed back into the IM/Chat service.
IM/Chat → Unified Conferencing	IM/Chat provides text messaging services to Unified Conferencing.
Voice Conferencing → Unified Conferencing	Voice Conferencing provides voice conferencing services to Unified Conferencing.
Voice Conferencing → Rich Presence	Voice Conferencing publishes presence information to Rich Presence.

Other Terms		
Term	**Definition**	**Source**
Approved Products List (APL)	A list of products that have received Joint Interoperability Certification and Information Assurance Accreditation from the Defense Information System Network Designated Approval Authorities in accordance with the Department of Defense Instruction 8100.04. The list is published on the Joint Interoperability Test Command home page (https://aplits.disa.mil).	UCR 2008 Change 3
Assured Service	The ability of a system to optimize session completion rates for all IMMEDIATE/PRIORITY (I/P) users despite degradation because of network disruptions, natural disasters, or surges during crisis or war.	UCR 2008 Change 3
Assured Services Session Initiation Protocol (AS-SIP)	A session signaling protocol consisting of a defined set of Session Initiation Protocol signaling standards and incorporating Department of Defense Assured Service functionality.	UC Master Plan
Availability	Reliable and redundant systems at all levels of the infrastructure [i.e., LAN, wide area network (WAN), Local Session Controller (LSC), and WAN	DOTS

Other Terms		
Term	Definition	Source
	softswitch (SS)] ensure the high availability needed to meet warfighters requirements. Assured Services in combination with QoS ensures that network capacity is available to support mission critical voice, video, and data sessions. Performance tools monitor the performance of the network to ensure the availability requirements are met and alert the appropriate personnel in a proactive manner when issues occur.	
Collaboration Tool Interface	The Integrated Telephony Adaptor interface enables the tight integration between DCO Web Conference capabilities and UC Audio Conference Bridge resources.	DOTS
Combatant Command (CCMD)	Nontransferable command authority established by Title 10 ("Armed Forces"), United States Code, Section 164, exercised only by commanders of unified or specified combatant commands unless otherwise directed by the President or the Secretary of Defense. Combatant command (command authority) cannot be delegated and is the authority of a combatant commander to perform those functions of command over assigned forces involving organizing and employing commands and forces, assigning tasks, designating objectives, and giving authoritative direction over all aspects of military operations, joint training, and logistics necessary to accomplish the missions assigned to the command. Combatant command (command authority) should be exercised through the commanders of subordinate organizations. Normally this authority is exercised through subordinate joint force commanders and Service and/or functional component commanders. Combatant command (command authority) provides full authority to organize and employ commands and forces as the combatant commander considers necessary to accomplish assigned missions. Operational control is inherent in combatant command (command authority).	JP 1-02
Cross-Domain	The capability to access or transfer information across different security domains.	ucdmo.gov
Defense Information Systems Network (DISN)	Integrated network, centrally managed and configured to provide long-haul information transfer services for all Department of Defense activities. It is an information transfer utility designed to provide dedicated point-to-point, switched voice and data, imagery, and video teleconferencing services.	JP 1-02
Defense Switch Network (DSN)	An interbase, nonsecure or secure DoD telecommunications system that provides dedicated telephone service, voiceband data, and dial-up video teleconference for end-to-end command use and DoD authorized IMMEDIATE/PRIORITY (I/P) and non-I/P users in accordance with national security directives. Nonsecure dial-up voice (telephone) service is the system's principal service.	UCR 2008 Change 3
Edge Boundary Controller (EBC)	An appliance that provides voice and video firewall functions. The EBC is located at the boundary between the Edge Segment and the Access Segment. The EBC is a logical entity and its functionality may be implemented in one or more physical platforms. The EBC is used to exert control over the signaling and media streams and is involved in setting up, conducting, and tearing down sessions. Edge Boundary Controllers are put into the signaling and/or media path between the calling and the external called party. The effect of this behavior is that not only the signaling traffic, but also the media traffic (i.e., voice, video) crosses the EBC. Ultimately, EBCs allow their owners to control the kinds of session that can be placed through the networks on which they reside, and	UCR 2008 Change 3

Other Terms		
Term	Definition	Source
	overcome some of the problems that firewalls and Network Address Translation cause for Internet Protocol voice and video sessions. As a minimum, the EBC provides topology hiding, "pinholing," and filtering.	
Extensible Messaging and Presence Protocol (XMPP)	The Extensible Messaging and Presence Protocol (XMPP) is an application profile of the Extensible Markup Language (XML) that enables the near-real-time exchange of structured yet extensible data between any two or more network entities.	RFC 6120
Federation	A server-to-server link that permits the exchange of Presence information and IM between two systems.	UCR 2008 Change 3
Global Directory	Acts as a central authority that can securely authenticate resources and manage identities and relationships between them.	UCR 2008 Change 3
Identity Management	DoD PKI is instrumental in nearly every aspect of UC integration of services, such as voice, messaging, directory, and internal web. Each network segment uses PKI to meet requirements of reduced latency, monitoring, inspection, and flexibility to accommodate different PKI algorithms used on the line and trunk sides of the edge boundary controllers (EBCs).	DOTS
Internet Access Point (IAP)	A network exchange facility where Internet Service Providers (ISPs) connect with the DoD networks in a peering arrangement. The connections within IAPs determine traffic routing to DoD networks and the Internet.	UC Master Plan
Joint Staff	The staff under the Chairman of the Joint Chiefs of Staff as provided for in Title 10, United States Code, Section 155. The Joint Staff assists the Chairman of the Joint Chiefs of Staff and, subject to the authority, direction, and control of the Chairman of the Joint Chiefs of Staff and the other members of the Joint Chiefs of Staff in carrying out their responsibilities.	JP 1-02
Legacy Interoperability	Using gateways, legacy TDM voice and video technologies can interoperate with UC Voice and Video over IP technologies in a seamless manner.	DOTS
Local Session Controller (LSC)	A call stateful Assured Service Session Initiation Protocol (AS-SIP) signaling appliance at a base/post/camp/station that directly serves Internet Protocol (IP) end instruments (EIs). The LSC MAY consist of one or more physical platforms. On the trunk side, the LSC uses AS-SIP signaling. On the line side, the LSC may serve any combination of Session Initiation Protocol EIs, H.323 EIs, and proprietary EIs. The LSC MUST be an intermediary for every inbound and outbound call signaling message received and transmitted by each IP EI served by the given LSC.	UCR 2008 Change 3
Media Gateway	An MG within the DoD environment is defined in accordance with the Internet Engineering Task Force Request for Comments 2805, "Media Gateway Control Protocol Architecture and Requirements," and provides the media mapping and/or transcoding functions between time division multiplexing and Internet Protocol (IP) networks. The MG terminates switched circuit network (SCN) facilities (e.g., trunks, loops), packetizes the media stream, if it is not already packetized, and delivers packetized traffic to an IP network. It would perform these functions in the reverse order for media streams flowing from the IP network to the SCN.	UCR 2008 Change 3

Other Terms		
Term	Definition	Source
Military Department (MILDEP)	One of the departments within the Department of Defense created by the National Security Act of 1947, as amended.	JP 1-02
Net-centricity	The realization of a networked environment (including infrastructure, systems, processes, and people) that enables a completely different approach to warfighting and business operations.	DoD Net-Centric Data Strategy
Network Operations (NetOps)	Activities conducted to operate and defend the Global Information Grid.	JP 1-02
Non-Assured Video	Video sessions that are established independent of any call admission control exercised by either a local session controller or H.323 Gatekeeper	UCR 2008 Change 3
Non-Assured Voice	Audio sessions that are established independent of any call admission control exercised by a local session controller.	UCR 2008 Change 3
Presence	A status indicator that conveys ability and willingness of a potential user to communicate. A user's client provides presence information (presence state) via network connection to a presence service, which is stored in what constitutes the user's personal availability record (called a presentity) and can be made available for distribution to other users (called watchers) to convey the user's availability for communication. Presence information has wide application in many communication services and is one of the innovations driving the popularity of instant messaging (IM) or recent implementations of voice over IP clients.	UCR 2008 Change 3
Prioritization	Currently, VoIP device endpoints apply DSCP markings by default. All application endpoints are required to mark packets appropriately in accordance with the UCR and GTP to receive the correct QoS behavior.	DOTS
Public Key Infrastructure (PKI)	An enterprise-wide service (i.e. data integrity, user identification and authentication, user non-repudiation, data confidentiality, encryption, and digital signature) that supports digital signatures and other public key-based security mechanisms for Department of Defense functional enterprise programs, including generation, production, distribution, control, and accounting of public key certificates. A public key infrastructure provides the means to bind public keys to their owners and helps in the distribution of reliable public keys in large heterogeneous networks. Public keys are bound to their owners by public key certificates. These certificates contain information such as the owner's name and the associated public key and are issued by a reliable certification authority.	JP 1-02
Quality of Service (QoS)	The capability to provide resource assurance and service differentiation in a network. Used with the local area network to provide different priority to traffic flows or sessions, or guarantee a certain level of performance to a traffic flow or session in accordance with requests from the application program. Quality of service is used in conjunction with traffic tagging to guarantee that prioritized traffic flows or sessions are given preferential treatment.	UCR 2008 Change 3
SECRET Internet Protocol Router Network (SIPRNet)	The worldwide SECRET-level packet switch network that uses high-speed internet protocol routers and high-capacity Defense Information Systems Network circuitry.	JP 1-02
Session Creation	Assured Services-Session Initiation Protocol (AS-SIP) establishes assured, secure, and interoperable UC sessions among multiple vendor products and other UC applications as they emerge.	DOTS

Other Terms		
Term	Definition	Source
Session Initiation Protocol (SIP)	The SIP is "…an application-layer control (signaling) protocol for creating, modifying, and terminating sessions with one or more participants. These sessions include Internet telephone calls, multimedia distribution, and multimedia conferences." [RFC 3261]	UCR 2008 Change 3
Signaling System #7 (SS7)	Global standard for telecommunications defined by the International Telecommunications Union (ITU) Telecommunication Standardization Sector (ITU-T). The standard defines the procedures and protocol by which network elements in the public switch telephone network (PSTN) exchange information over a digital signaling network to effect wireless (cellular) and wire line call setup, routing, and control. The ITU definition of SS7 allows for national variants, such as the American National Standards Institute and Telcordia Technologies standards used in North America, and the European Telecommunications Standards Institute standard used in Europe.	UCR 2008 Change 3
Soft Switch (SS)	A programmable network appliance that: • Controls connection services for a media gateway and/or native IP endpoints. • Selects processes and services that can be applied to a call. • Provides routing for call control within the network based on signaling and customer database information. • Transfers control of the call to another network element. • Interfaces to and supports management functions such as provisioning, fault, and billing. • Ability to control the access of sessions within and external to its domain. [International Softswitch Consortium]	UCR 2008 Change 3
Security Technical Implementation Guidance (STIG)	The Security Technical Implementation Guides (STIGs) and the NSA Guides are the configuration standards for DOD IA and IA-enabled devices/systems. Since 1998, DISA Field Security Operations (FSO) has played a critical role enhancing the security posture of DoD's security systems by providing the Security Technical Implementation Guides (STIGs). The STIGs contain technical guidance to "lock down" information systems/software that might otherwise be vulnerable to a malicious computer attack.	iase.disa.mil/stigs/
Unified Capabilities (UC)	The integration of voice, video, and/or data services delivered ubiquitously across a secure and highly available network infrastructure, independent of technology, to provide increased mission effectiveness to the warfighter and business communities.	UCR 2008 Change 3
Unified Capabilities Requirements (UCR)	Specifies the functional requirements, performance objectives, and technical specifications for DoD networks that support UC, and shall be used to support test, certification, acquisition, connection, and operation of these devices.	UCR 2008 Change 3
Video Teleconference (VTC)	Two-way electronic form of communications that permits two or more people in different locations to engage in face-to-face audio and visual communication. Meetings, seminars, and conferences are conducted as if all the participants are in the same room. Video teleconferencing provides the capability to exchange and distribute combinations of voice, video, imagery, messages, files, and streams.	UCR 2008 Change 3
Voice and Video Conferencing	Provides the ability to conference multiple voice or video subscribers with a variety of room controls for displays of the participants. It also includes	UC Master Plan

Other Terms		
Term	Definition	Source
	an optional component that allows subscribers to schedule conferences.	
Voice over Internet Protocol (VoIP)	A set of components required to provide Defense Switched Network (DSN) Internet Protocol (IP) voice services from end instrument to DSN trunk, or IP phone to IP phone. The VoIP system includes, but is not limited to, the IP telephony instrument, the local area network, the local session controller, and the IP gateway.	UCR 2008 Change 3
Voice over Secure Internet Protocol (VoSIP)	The instantiation of Internet Protocol (IP) Telephony on a classified local area network or wide area network infrastructure that provides the routing of voice conversations using the Secure Internet Protocol Router Network (SIPRNet) as the transport medium. The use of the SIPRNet allows users in secure environments to communicate at the Secret level without the need for specialized phones or the use of key material. Bidirectional interoperability with the Defense Red Switch Network is provided through the Defense Information Systems Agency-managed IP-to-Time Division Multiplexing interfaces.	UCR 2008 Change 3
Voice, Video, and Data Session Management	Provides enterprise point-to-point UC, independent of the technology (circuit switched or IP). Per Reference (d), capabilities include, but are not limited to, end device registration, session establishment and termination, and UC session features (e.g., Assured Services Admission Control, Call Hold, Call Transfer, etc.).	UCR 2008 Change 3
Wide Area Network Soft Switch (WAN SS)	An IP DISN backbone component that supports LSC, ELSC, and Tandem Switch capabilities. In addition, the WAN SS can include, as an option, an LSC and Softswitch (SS) functions to support line-side IP end instrument and trunk-side Assured Service Session Initiation Protocol (AS-SIP) and AS-SIP for signaling.	UC Master Plan
XMPP Gateway	A service used to translate instant messages between XMPP and another protocol.	UCR 2008 Change 3

Appendix C: Technical Standards Profile (StdV-1)

There are a number of technical standards that apply to UC, which have been gathered and listed previously by the Unified Capabilities Requirements (UCR) document. Below is a listing of those standards which apply to the UC RA, pulled from the UCR 2008, Change 3.

ANSI		
Standard Identifier	Standard Title	Source
T1.101-1987	Synchronization Interface Standards for Digital Networks, 1987.	UCR 2008 Change 3
T1.102-1993	Digital Hierarchy – Electrical Interfaces, December 1993.	UCR 2008 Change 3
T1.102-1999	Digital Hierarchy – Electrical Interfaces, 1999.	UCR 2008 Change 3
T1.105-2001	Synchronous Optical Network (SONET) – Basic Description including Multiplex Structure, Rates, and Formats, May 2001.	UCR 2008 Change 3
T1.105.1-2000	Synchronous Optical Network (SONET) – Automatic Protection, Revised 2005.	UCR 2008 Change 3
T1.105.03-1994	Synchronous Optical Network (SONET) – Jitter Network Interfaces,Revised 2008.	UCR 2008 Change 3
T1.105.03-2003	Synchronous Optical Network (SONET) – Jitter Network Interfaces, Revised 2008.	UCR 2008 Change 3
T1.105.06-2002	Synchronous Optical Network (SONET) – Physical Layer Specifications, Revised 2007.	UCR 2008 Change 3
T1.107-2002	Digital Hierarchy – Formats Specifications, Revised 2006.	UCR 2008 Change 3
T1.111	Signaling System Number 7 (SS7) – Message Transfer Part (MTP), 2001.	UCR 2008 Change 3
T1.112	Signaling System Number 7 (SS7) – Signaling Connection Control Part (SCCP), 2001.	UCR 2008 Change 3
T1.113	Signaling System No. 7 (SS7) – Integrated Services Digital Network (ISDN) User Part, 1995.	UCR 2008 Change 3
T1.113-2000	Signaling System No. 7 (SS7) – Integrated Services Digital Network (ISDN) User Part (Revision of T1.113-1995; includes two Supplements: T1.113a-2000 and T1.113b-2001).	UCR 2008 Change 3
T1.113.3	Signaling System No. 7 (SS7) – Signaling Link.	UCR 2008 Change 3
T1.114-2000	Signaling System Number 7 (SS7) – Transaction Capabilities and Application Part (TCAP), 2000.	UCR 2008 Change 3
T1.231-1993	Digital Hierarchy - Layer 1 In-Service Digital Transmission Performance Monitoring, 1993.	UCR 2008 Change 3
T1.231.01-2003	Digital Subscriber Line (DSL) – Layer 1 In-Service Digital Transmission Performance Monitoring, Revised 2007.	UCR 2008 Change 3
T1.403-1999	Network to Customer Installation Interfaces – DS1 Electrical Interface, Revised 2007.	UCR 2008 Change 3
T1.404-2002	Network and Customer Installation Interfaces – DS3 Metallic Interface Specification (Revision and Consolidation of T1.404-1994 and T1.404a-1996), Revised 2006.	UCR 2008 Change 3
T1.523-2000	Telecom Glossary 2000.	UCR 2008 Change 3
T1.601-1999	ISDN Basic Access Interface for Use on Metallic Loops for Application at the Network Side of NT, Layer 1 Specification.	UCR 2008 Change 3
T1.602	Data Link Layer Signalling Specification for Application at the User-Network Interface, February 2000.	UCR 2008 Change 3
T1.605-1991	ISDN Basic Access Interface for S and T Reference Points and Layer 1 (1999) Specification.	UCR 2008 Change 3
T1.607-1998	ISDN Layer 3 Signaling Specifications for Circuit Switched Bearer Service for Digital Subscriber Signaling System No. 1 (DSS1).	UCR 2008 Change 3
T1.613-1992	ISDN Call Waiting Supplementary Service.	UCR 2008 Change 3
T1.615-1992	Digital Subscriber Signalling System No. 1 (DSS1)-Layer 3 Overview. (R1999).	UCR 2008 Change 3

T1.616-1992	ISDN Call Hold Supplementary Service.	UCR 2008 Change 3
T1.619-1992	Integrated Services Digital Network (ISDN) – Multi-Level Precedence (R2005) and Preemption (MLPP) Service Capability, February 1992, Reaffirmed 2005.	UCR 2008 Change 3
T1.619a-1994	Integrated Services Digital Network (ISDN) – Multi-Level Precedence and (R1999) Preemption (MLPP) Service Capability (MLPP Service Domain and Cause Changes), July 1994, Reaffirmed 1999.	UCR 2008 Change 3
T1.621-1992	ISDN User-to-User Signaling Supplementary Service.	UCR 2008 Change 3
T1.632-1993	ISDN Normal Call Transfer Supplementary Service.	UCR 2008 Change 3
T1.642-1993	ISDN Call Deflection Supplementary Service.	UCR 2008 Change 3
T1.643-1995	ISDN Explicit Call Transfer Supplementary Service.	UCR 2008 Change 3
T1.646-1995	Broadband ISDN – Physical Layer Specification for User-Network Interfaces including DS1/ATM, Supersedes ANSI T1.624-1993), 1995.	UCR 2008 Change 3
T1.647-1995	ISDN Conference Calling Supplementary Service.	UCR 2008 Change 3
T1.679-2004	Interworking between Session Initiation Protocol (SIP) and Bearer Independent Call Control or ISDN User Part, June 2004.	UCR 2008 Change 3
T1.801.01	Digital Transport of Video Teleconferencing/Video Telephony Signals Video Test Scenes for Subjective and Objective Performance Assessment," November 1995.	UCR 2008 Change 3
T1.801.02	Digital Transport of Video Teleconferencing/ Video Telephony Signals Performance Terms, Definitions and Examples, May 1996.	UCR 2008 Change 3
T1.801.03	Digital Transport of One-Way Signals - Parameters for Objective Performance Assessment, February 1996.	UCR 2008 Change 3
T1.801.04	Multimedia Communications Delay, Synchronization, and Frame Rate Measurement, 1997.	UCR 2008 Change 3
ANSI/TIA-1057	Link Layer Discovery Protocol for Media Endpoint Devices, April 2006.	UCR 2008 Change 3
T1X1.3/94-001R5	Jitter Measurement Methodology.	UCR 2008 Change 3
T11 FC-BB-5	Fibre Channel – Fibre Channel Backbone – 5 (FC-BB-5), Revision 2.00, 4 June 2009.	UCR 2008 Change 3
X3.230	See ANSI INCITS 230-1994.	UCR 2008 Change 3
X3.296	Information Technology – Single-Byte Command Code Sets Connection (SBCON) Architecture, Replaces ANSI X3.296-1997.	UCR 2008 Change 3
X3.297	Fibre Channel Physical and Signaling Interface – 2 (FC-PH-2), 1997.	UCR 2008 Change 3
X3.303	Fibre Channel Physical and Signaling interface - 3 (FC-PH-3), 1997.	UCR 2008 Change 3
INCITS 230-1994	Information Technology - Fibre Channel - Physical and Signaling Interface (FC-PH) - Amendment 2 (supplement to ANSI X3.230-1994) (formerly ANSI X3.230-1994/AM 2-1999).	UCR 2008 Change 3
INCITS 374-2003	Information Technology – Fibre Channel – Single-Byte Command Code Sets Mapping Protocol – 3 (FC-SB-3), 2003.	UCR 2008 Change 3
ANSI/TIA-810-B	Telecommunications – Telephone Terminal Equipment – Transmission Requirements for Narrowband Voice over IP and Voice over PCM Digital Wireline Telephones, SP-3-4352-RV2 (to become ANSI/TIA-810-B).	UCR 2008 Change 3
IEEE		
Standard Identifier	Standard Title	Source
455-1985	IEEE Standard for Standard Test Procedure for Measuring Longitudinal Balance of Telephone Equipment Operating in the Voice Band, 1 January 2001.	UCR 2008 Change 3
802.1p	IEEE Standard for Traffic Class Expediting and Dynamic Multicast Filtering(published in 802.1D-1998).	UCR 2008 Change 3
802.1AB-2009	IEEE Standard for Station and Media Access Control Connectivity Discovery, 11 September 2009.	UCR 2008 Change 3
802.1AX-2008	IEEE Standard for IEEE Standard for Local and Metropolitan Area Networks – Link	UCR 2008 Change 3

	Aggregation, 2008.	
802.1D™-2004	IEEE Standard for Local and Metropolitan Area Networks: Media Access Control (MAC) Bridges, June 2004.	UCR 2008 Change 3
802.1Q™-1998	IEEE Standards for Local and Metropolitan Area Networks: Virtual Bridged Local Area Networks, 1 January 1998.	UCR 2008 Change 3
802.1Q™-2003	IEEE Standards for Local and Metropolitan Area Networks: Virtual Bridged Local Area Networks, 2003.	UCR 2008 Change 3
802.1Qau	IEEE Standard for Local and Metropolitan Area Networks—Virtual Bridged Local Area Networks – Amendment: 10: Congestion Notification, 15 September 2006.	UCR 2008 Change 3
802.1Qaz	IEEE Standard for Local and Metropolitan Area Networks—Virtual Bridged Local Area Networks – Amendment: Enhanced Transmission Selection, 27 March 2008.	UCR 2008 Change 3
802.1Qbb	IEEE Standard for Local and Metropolitan Area Networks—Virtual Bridged Local Area Networks – Amendment: Priority-based Flow Control, 27 March 2008.	UCR 2008 Change 3
802.1s	IEEE Standard for Local and Metropolitan Area Networks: Multiple Spanning Trees, 2003. (Merged into 802.1Q-2003).	UCR 2008 Change 3
802.1w	IEEE Standard for Local and Metropolitan Area Networks: Rapid Reconfiguration of Spanning Tree, 2003. (Merged into 802.1D-2004).	UCR 2008 Change 3
802.1X™-2001	IEEE Standard for Local and Metropolitan Area Networks: Port Based Network Access Control, 2001.	UCR 2008 Change 3
802.1X™-2004	IEEE Standard for Local and Metropolitan Area Networks: Port Based Network Access Control, 2004.	UCR 2008 Change 3
802.3™-1993	IEEE Standard for information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Part 3: Carrier sense multiple access with collision detection(CSMA/CD) access method and physical layer specifications, 1993.	UCR 2008 Change 3
802.3™-2008	IEEE Standard for Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications, 26 December 2008.	UCR 2008 Change 3
802.3i IEEE	Standard for information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications: 10BASE-T 10Mbit/s (1.25 MB/s) over twisted pair, 1990.	UCR 2008 Change 3
802.3u-1995	IEEE Standard for information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications: 100BASE-TX, 100BASE-T4, 100BASE-FX Fast Ethernet at 100 Mbit/s (12.5 MB/s) w/autonegotiation, 1995.	UCR 2008 Change 3
802.3x-1997	IEEE Standard for information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications: Full Duplex and flow control, 1997.	UCR 2008 Change 3
802.3z-1998	IEEE Standard for information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications: 1000BASE-X Gbit/s Ethernet over Fiber-Optic at 1 Gbit/s (125 MB/s), 1998.	UCR 2008 Change 3
802.3ab-1999	IEEE Standard for information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications: 1000BASE-T Gbit/s Ethernet over twisted pair at 1 Gbit/s (125 MB/s), 1999.	UCR 2008 Change 3

802.3ad-2000	IEEE Standard for information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications: Link aggregation for parallel links, 2000.	UCR 2008 Change 3
802.3ae-2003	IEEE Standard for information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications: 10 Gbit/s (1,250 MB/s) Ether over fiber; 10GBASE-SR, 10GBASE-LR, 10GBASE-ER, 10GBASE-SW, 10GBASE-LW, 10GBASE-EW, 2003.	UCR 2008 Change 3
802.3ah-2004	IEEE Standard for information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications: Media Access Control Parameters, Physical layers, and Management Parameters for Subscriber Access Networks, 2004.	UCR 2008 Change 3
802.11™-2007	IEEE Standard for information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements—Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications, June 2007.	UCR 2008 Change 3
802.11a	Supplement to IEEE Standard for Information technology — Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements—Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: High-speed Physical Layer in the 5 GHz Band, June 2003.	UCR 2008 Change 3
802.11b	Supplement to IEEE Standard for Information technology— Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements—Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: Higher-Speed Physical Layer Extension in the 2.4 GHz Band, June 2003.	UCR 2008 Change 3
802.11e	Supplement to IEEE Standard for Information technology— Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements—Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: Wireless LAN for Quality of Service, June 2003.	UCR 2008 Change 3
802.11e-2005	Supplement to IEEE Standard for Information technology— Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements—Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: Amendment 8, Medium Access Control (MAC) Quality of Service Enhancements, 9 February 2006.	UCR 2008 Change 3
802.11h	Supplement to IEEE Standard for Information technology— Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements—Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: Amendment 5, 29 December 2003.	UCR 2008 Change 3
802.11i	Supplement to IEEE Standard for Information technology— Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements—Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: Amendment 6, Medium Access Control (MAC), 14 February 2005.	UCR 2008 Change 3
802.11g	Supplement to IEEE Standard for Information technology— Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements—Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: Amendment 4: Further Higher Data Rate Extension in the 2.4 GHz Band, June 2003.	UCR 2008 Change 3
802.16™-2004	IEEE Standard for Local and metropolitan area networks—Part 16: Air Interface	UCR 2008 Change 3

	for Fixed Broadband Wireless Access Systems, 1 October 2004.	
802.16d™	Standard for Amendment to IEEE Standard for Local and metropolitan area networks—Part 16: Air Interface for Fixed Broadband Wireless Access Systems – Detailed System Profiles for 2-11 GHz, 11 December 2002.	UCR 2008 Change 3
802.16e™	IEEE Standard for Local and metropolitan area networks— Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems, Amendment 2: Physical and Medium Access Control Layers for Combined Fixed and Mobile Operation in Licensed Bands and Corrigendum 1, 28 February 2006.	UCR 2008 Change 3
802.17-2004	IEEE Standard for Information Technology—Telecommunications and Information Exchange Between Systems—Local and Metropolitan Area Networks—Specific Requirements—Part 17: Resilient Packet Ring (RPR) Access Method and Physical Layer Specifications, 24 September 2004.	UCR 2008 Change 3
ITU		
Standard Identifier	Standard Title	Source
E.164	ITU-T Recommendation E.164, "The International Public TelecommunicationNumbering Plan," Geneva, Switzerland, 2005.	UCR 2008 Change 3
G.107	ITU-T Recommendation G.107, "The E-model: a computational model for use intransmission planning," Geneva, Switzerland, April 2009.	UCR 2008 Change 3
G.165	ITU-T Recommendation G.165, "Echo cancellers," Geneva, Switzerland, November1988.	UCR 2008 Change 3
G.168	ITU-T Recommendation G.168, "Digital network echo cancellers," Geneva, Switzerland, January 2007.	UCR 2008 Change 3
G.651	ITU-T Recommendation G.651, "Characteristics of a 50/125 μm multimode graded index optical fibre cable," February 1998.	UCR 2008 Change 3
G.651.1	ITU-T Recommendation G.651.1, "Characteristics of a 50/125 μm multimode graded index optical fibre cable for the optical access network," Geneva, Switzerland, July 2007.	UCR 2008 Change 3
G.652	ITU-T Recommendation G.652, "Characteristics of a single-mode optical fibre and cable," Geneva, Switzerland, June 2005.	UCR 2008 Change 3
G.655	ITU-T Recommendation G.655, "Characteristics of a non-zero dispersion-shifted single-mode optical fibre and cable," Geneva, Switzerland, March 2006.	UCR 2008 Change 3
G.691	ITU-T Recommendation G.691, "Optical interfaces for single channel STM-64 and other SDH systems with optical amplifiers," Geneva, Switzerland, March 2006.	UCR 2008 Change 3
G.693	ITU-T Recommendation G.693, "Optical interfaces for intra-office systems," Geneva, Switzerland, May 2006.	UCR 2008 Change 3
G.694.1	ITU-T Recommendation G.694.1, "Spectral grids for WDM applications: DWDM frequency grid," Geneva, Switzerland, 2002.	UCR 2008 Change 3
G.703	ITU-T Recommendation G.703, "Physical/Electrical Characteristics of Hierarchical Digital Interfaces at 1544, 2048, 8448, and 44736 kbit/s Hierarchical Levels," 2001.	UCR 2008 Change 3
G.704	ITU-T Recommendation G.704, "Series G: Transmission Systems and Media, Digital Systems and Networks—Digital transmission systems – Terminal equipments – General Synchronous frame structures used at 1544, 6312, 2048, 8448 and 44 736 kbit/s hierarchical levels," October 1998.	UCR 2008 Change 3
G.707/Y.1322	ITU-T Recommendation G.707/Y.1322, "Network node interface for the synchronous digital hierarchy (SDH)," Geneva, Switzerland, January 2007.	UCR 2008 Change 3
G.709/Y.1331	ITU-T Recommendation G.709/Y.1331, "Network node interface for the optical transport network (OTN)," Geneva, Switzerland, March 2003.	UCR 2008 Change 3
G.711	ITU-T Recommendation G.711, "General Aspects of Digital Transmission Systems, Terminal Equipments, Pulse code modulation (PCM) of voice frequencies," Geneva, Switzerland, November 1988. Appendix I, "A high quality low complexity algorithm for packet loss concealment with G.711," Geneva, Switzerland, September 1999. Appendix II, "A comfort noise payload definition for ITU-T G.711 use in packetbased multimedia communication systems," Geneva, Switzerland, February 2000.	UCR 2008 Change 3

G.722	ITU-T Recommendation G.722, "7 kHz audio-coding within 64 kbit/s," Geneva, Switzerland, November 1988.	UCR 2008 Change 3
G.723.1	ITU-T Recommendation G.723.1, "Dual rate speech coder for multimedia communications transmitting at 5.3 and 6.3 kbit/s," Geneva, Switzerland, May 2006.	UCR 2008 Change 3
G.726	ITU-T Recommendation G.726, "32 kbps Adaptive Differential Pulse Code Modulation (ADPCM)," Geneva, Switzerland, December 1990.	UCR 2008 Change 3
G.728	ITU-T Recommendation G.728, "Coding of speech at 16 kbit/s using low-delay code excited linear prediction," Geneva, Switzerland, September 1992.	UCR 2008 Change 3
G.729	ITU-T Recommendation G.729, "Coding of speech at 8 kbit/s conjugate-structure algebraic-code-excited linear prediction (CS-ACELP)," Geneva, Switzerland, March 1996, plus Erratum 1, April 2006, and Annexes A through J, and Appendices I, II, and III.	UCR 2008 Change 3
G.729.1	ITU-T Recommendation G.729.1 (2006) Amendment 1, "New Annex A on G.729.1 usage in H.245, plus corrections to the main body and updated test vectors," Geneva, Switzerland, January 2007. This corrigendum was never published, its content having been included in the published ITU-T Recommendation G.729.1 (2006).	UCR 2008 Change 3
G.732	ITU-T Recommendation G.732, "Characteristics of primary PCM multiplex equipment operating at 2048 kbit/s," Geneva, Switzerland, November 1988.	UCR 2008 Change 3
G.783	ITU-T Recommendation G.783, "Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks," Geneva, Switzerland, March 2006.	UCR 2008 Change 3
G.811	ITU-T Recommendation G.811, "Timing characteristics of primary reference clocks," 1997.	UCR 2008 Change 3
G.825	ITU-T Recommendation G.825, "The control of jitter and wander within digital networks which are based on the synchronous digital hierarchy (SDH)," Geneva, Switzerland, March 2003.	UCR 2008 Change 3
G.826	ITU-T Recommendation G.826, "End-to-end error performance parameters and objectives for international, constant bit-rate digital paths and connections," Geneva, Switzerland, December 2002.	UCR 2008 Change 3
G.829	ITU-T Recommendation G.829, "Error performance events for SDH multiplex and regenerator sections," Geneva, Switzerland, December 2002.	UCR 2008 Change 3
G.831	ITU-T Recommendation G.831, "Management capabilities of transport networks based on the synchronous digital hierarchy (SDH)," Geneva, Switzerland, March 2000.	UCR 2008 Change 3
G.841	ITU-T Recommendation G.841, "Types and characteristics of SDH network protection architectures," Geneva, Switzerland, October 1998.	UCR 2008 Change 3
G.842	ITU-T Recommendation G.842, "Interworking of SDH network protection architectures," Geneva, Switzerland, April 1997.	UCR 2008 Change 3
G.872	ITU-T Recommendation G.872, "Architecture of optical transport networks," Geneva, Switzerland, November 2001.	UCR 2008 Change 3
G.957	ITU-T Recommendation G.957, "Optical interfaces for equipments and systems relating to the synchronous digital hierarchy," Geneva, Switzerland, March 2006.	UCR 2008 Change 3
G.958	ITU-T Recommendation G.958, "Digital line systems based on the synchronous digital hierarchy for use on optical fibre cables." [Withdrawn]	UCR 2008 Change 3
G.991.1	ITU-T Recommendation G.991.1, "High bit rate digital subscriber line (HDSL) transceivers," 1998.	UCR 2008 Change 3
G.991.2	ITU-T Recommendation G.991.2, "Single-pair high-speed digital subscriber line (SHDSL) transceivers," 1998.	UCR 2008 Change 3
G.992.1	ITU-T Recommendation G.992.1, "Asymmetric digital subscriber line (ADSL) transceivers," 1999.	UCR 2008 Change 3
G.992.2	ITU-T Recommendation G.992.2, "Splitterless asymmetric digital subscriber line (ADSL) transceivers," 1999.	UCR 2008 Change 3
G.992.3	ITU-T Recommendation G.992.2, "Asymmetric digital subscriber line transceivers 2 (ADSL2)," 2009.	UCR 2008 Change 3
G.992.4	ITU-T Recommendation G.992.4, "Splitterless asymmetric digital subscriber line transceivers 2 (splitterless ADSL2)," 2002.	UCR 2008 Change 3

G.992.5	ITU-T Recommendation G.992.5, “Asymmetric digital subscriber line (ADSL) transceivers – Extended bandwidth ADSL2 (ADSL2plus),” 2009.	UCR 2008 Change 3
G.993.1	ITU-T Recommendation G.993.1, “Very high speed digital subscriber line transceivers (VDSL),” 2004.	UCR 2008 Change 3
G.993.2	ITU-T Recommendation G.993.2, “Very high speed digital subscriber line transceivers 2 (VDSL2),” 2006.	UCR 2008 Change 3
G.998.1	ITU-T Recommendation G.993.2, “ATM-based multi-pair bonding,” 2005.	UCR 2008 Change 3
G.998.2	ITU-T Recommendation G.993.2, “Ethernet-based multi-pair bonding,” 2005.	UCR 2008 Change 3
G.998.3	ITU-T Recommendation G.993.2, “Multi-pair bonding using time-division inverse multiplexing,” 2005.	UCR 2008 Change 3
G.1070	ITU-T Recommendation G.1070, “Opinion model for video-telephony applications,” Geneva, Switzerland, April 2007.	UCR 2008 Change 3
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