IPv6 Introduction

Documentation Changes

Table 1: Documentation Changes

Date	Change	Link to Topic
November 2023		-

Date	Change	Link to Topic
	The entire guide is updated. The following are the updates to the guide. A few to mention - • Table 8 is updated. • Deleted "for DOD Network only" • Replaced "Recommended" to "Supported" • Removed "CSR 12" and "CSR 14" references • Removed release numbers across the guide to keep it generic • Removed occurrences of "Solution Tested" • Deleted all Deployment Gaps and created a new list • Jabber on IPv6, Expressway-E external on IPv6, Expressway-E internal interface on IPv4, UCM, IM&P, CUC on IPv4 are supported deployments • **Dual-stack:** Used for application servers, such as Cisco Unified Communications Manager, Cisco Unity Connection, Cisco Emergency Responder, and Cisco Unified Survivable Remote Site Telephony (Unified SRST) • Table 8 and Table 10: Titles "Supported" instead of "Recommended", remove "Solution Tested" column • Note: IPv6 NAT-based solution is not supported • DHCP v6 modify the text accordingly • MRA: Jabber on IPv6, Expressway-E external on IPv6, Expressway-E internal interface on IPv4, UCM, IM&P, CUC on IPv4 are supported deployments • The SIP Trunk configuration settings discussed in this section are applied through the Common Device Configuration profile that is created and assigned to the SIP trunk (IP Addressing	

Date	Change	Link to Topic

	Mode and IP Addressing Mode Preference for Signaling), and through the SIP Profile configuration assigned to the SIP trunk (Enable ANAT should be disabled). Change "Enable ANAT should be disabled". This is confusing. Instead, mentioned "ANAT is not enabled."
	
	• Removed the following from ANAT section:
	
	    • Media Selection for Outbound Early Offer Calls with ANAT
	
	    • Media Selection for Inbound Early Offer Calls with ANAT
	
	    • Media Selection for Delayed Offer Calls Over Unified CM SIP Trunks with ANAT
	
	    • Media Selection for Outbound Delayed Offer Calls with ANAT
	
	    • Inbound Delayed Offer Calls with ANAT
	
	    • Inbound Delayed Offer Calls with ANAT and Supported: sdp anat
	
	    • Inbound Delayed Offer Calls with ANAT and Require: sdp-anat
	
	• Included this: The SIP trunk uses either the Unified CM IPv4 address or the Unified CM IPv6 address for signaling, and an MTP. We recommend IPv6 Only for production environments.
	
	Removed the media part. Instead mentioned, MTP or other trunk address for media.
	
	Modified to: Outbound SIP best effort early offer (without MTP/TRP) in SIP trunk as we don't support in IPv6 mode.
	
	• Removed this Note: In CSR 12.0, SIP Early Offer does not support IPv6. CUBE or Unified SRST gateways will not support ANAT.	

Date	Change	Link to Topic
	• The following changes are made to the section "IPv6-Only Phones":	
	• Existing content is removed. Replaced with the following:	
	IPv6 only Supported Features: Mobility – MVA/IVR, CAPFv3, TVS and TFTP, Extension Mobility, EMCC, SRST, SIP GW, SIP Route Pattern, Barge, Intercom, Phone NTP Reference, Device Mobility, Self Care Portal, Self Provisioning using with and without IVR, Phone services - Corporate Directory, Missed Calls, Placed Calls, Intercom Calls, Personal Directory, Voicemail, Received Calls, Web Dialer, Quality Report Tool (QRT), SNMPv6 MIB, Phone Config. download, CTI, IPVMS (Unicast MoH, software MTP, ANN, Conference Bridge, IVR), CDR	
	IPv6-Only Not Supported Features	
	• Best Effort Early Offer over SIP Trunk	
	• External MoH, Multicast MoH, Video On Hold, Voicemail, Recording (BIB Recording, GW Recording), Enhanced E911	
	• SSH, Cluster Manager, LDAP, Syslog Server/Alarm Library, Serviceability Applications - IPMA, RTMT	
	• DRS, IPSec	
	• Media Resources (IOS Xcoder/ hardware MTP/TRP)/Conference Bridge), Video conference resource (MCU/Conductor), FAX/ATA	
	• MRA (Jabber in IPv6 and Expressway-E external interface in v6 and enterprise	

Date	Change	Link to Topic
	network in v4 is supported)	
	• Silent Monitoring, Whisper Coaching, Agent Greeting, VG as analog line interface using SCCP (pending test)	
	• Removed ISR 4000 references	
	• IPv6 endpoints should be configured as IPv6 with preference	
	• Dual Stack with preference IPv6	
	• Removed "with no telephony services provided over an IP WAN."	
	• Remove CSR 12.0	
	• Addressed CDET "CSCwh69667"	
	• Removed SRST 12.0	
	• Table 8: Added row for "Cisco Room Series, Board Series, and Desk Series". All "Yes"	
	• Change 7832 - "Yes"	
	• Removed row Wi-Fi enabled devices: Cisco IP Phone 8861, 8865	
	• The first row "Dual- Stacks: IPv4 and IPv6" is "Yes" for all 78xx and 88xx. Added the following phones to this row: 7811, 7821, 7841, 7861	
	• For 7832 and 8832: YES to Dual-Stack	
	• For 7832 - "Yes" in 8861 all columns	
	• Removed the entire row that says "Cisco Unified IP Phone 6901, 7945G, 7965G, 7975G …" It is End of Support	
	• Removed "Cisco DX70 and DX80"	
	• Removed row "Cisco TelePresence MX Series, SX Series"	
	• Removed row "Cisco TelePresence System EX Series"	
	• Removed row "Cisco Webex Share"	
	• Remove row "Cisco IP Communicator"	

Date	Change	Link to Topic
	• Remove row Wi-Fi enabled devices: Cisco IP Phone 8861, 8865 • Document direction • Removed "We recommend Stateful DHCP host configuration for both IPv4 or IPv6 IP phones." • Remove dual-stack IP Phones that require ANAT, which is not supported in Unified SRST call agents • Removed the "Security and IPv6 Traffic" section • Removed ISR 4000 G3 • Include row for "Cisco Room Series, Board Series, and Desk Series". All "Yes" • Removed "Cisco ATA 190 Series Analog Telephone Adapters"	
June 08, 2022	Updated the table "Table 9: Supported Addressing Modes Communication Gateways".	Table 9: Supported Addressing Modes for,Communication Gateways
April 01, 2021	Removed redundant topics from *Call Processing and Call Admission Control* chapter.	-
April 10, 2019	Changed book title to include Cisco Collaboration System Release.	-

Date	Change	Link to Topic
April 30, 2018	Updated overview based on Cisco Collaboration Systems Release.	IPv6 Deployment Overview
	Updated deployment gaps.	Deployment Recommendations for Enterprise Networks
	Added a note about IPv6 multicast application.	IPv6 Multicast Addresses
	• Updated the supported IPv6 addressing modes for endpoints. • Added Cisco Meeting Server and Cisco TelePresence Management Suite.	Supported IPv6 Addressing Modes for Products
	Updated the note.	IPv6 Bandwidth Provisioning
	• Added Cisco Meeting Server and Cisco TelePresence Management Suite in Video Conferencing section. • Added Multistream video section. • Updated Unified CM IM and Presence Service section to include dual-stack.	Applications Overview
	Added: • Cisco TelePresence EX Series • Cisco Meeting Server • Cisco TelePresence Management Suite	Product Configuration Resources for IPv6

IPv6 Deployment Overview

This document describes our recommendations on how to transition your Cisco Collaboration network design to use IPv6 in a dual-stack (IPv4 and IPv6) environment.

This document does not describe how to implement IPv6 in the campus and WAN, but does refer you to other documents for those details. It is assumed that data IPv6 desktop services are deployed first, for example internet access when Collaboration IPv6 upgrade is initiated in a dual-stack mode.

Application Server Addressing Mode

All Collaborations applications servers are deployed in IPv4 and IPv6 stacks to support IPv4 or IPv6 devices and components.

Branch Office Addressing Mode

In Cisco Collaboration Systems Release, a branch office can be in one of the following IP addressing modes. A cluster can support the following types of IP addressing modes and all can co-exist.

- Traditional IPv4-only configuration where the LAN is IPv4-only or dual-stack.

- IPv6-only configuration where the LAN is dual-stack.

- Dual-stack sites that support IPv4 stack or IPv6 stack devices, where the LAN is dual-stack.

Provides IPv6-only site or branch offices that can have the following components:

- Cisco Integrated Services Routers (ISR) Edge Routers

  - PSTN GW

  - SRST

  - Audio Conference

  - MTP

- Endpoints

  - Video TP CE (Cisco DX Series, Cisco TelePresence MX, SX, and EX and Series)

  - Cisco IP Phone 7800 and 8800 Series

  - Conference IP Phone (8832)

  - On-premise Cisco Jabber (Jabber)

  - ATA FAX

We strongly recommend that you use this document with following guides that provide in-depth guidance on Collaboration deployments using IPv4:

- *Cisco Collaboration System Solution Reference Network Design (SRND)*, available at: Link .

- *Cisco Preferred Architecture for Enterprise Collaboration 11.6 Design Overview*, available at: Link
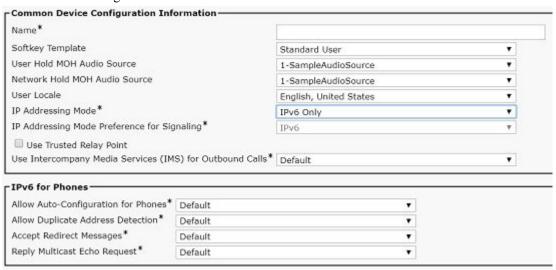
Cisco Collaboration IPv6 transition follows the Cisco Preferred Architecture (PA) recommended deployment of IPv4 products:

- Cisco Unified Communications Manager (Unified CM) is the call control server.

- Cisco IP Phones, Jabber clients, and Cisco TelePresence video endpoints use SIP to register directly to Unified CM.

- Unified CM cluster's failover mechanism provides endpoint registration redundancy. If a WAN failure occurs, and endpoints at remote locations cannot register to Unified CM, they use SRST functionality for local and PSTN calls. However, some services such as Jabber presence might not be available.

Note   As of Cisco Collaboration Systems Release, some default settings have not been adjusted for IPv6-only as a default, so follow the directions in this guide to ensure that you use the recommended settings for IPv6 deployment. Also some labels in the Admin Configuration UI have not been updated, but changes are noted in this document. For example, the Allow Auto-Configuration for Phones label has not been updated to Allow Stateless Auto-Configuration for Phones.

Common Device Configuration Information

Name*	
Softkey Template	Standard User
User Hold MOH Audio Source	1-SampleAudioSource
Network Hold MOH Audio Source	1-SampleAudioSource
User Locale	English, United States
IP Addressing Mode*	IPv6 Only
IP Addressing Mode Preference for Signaling*	IPv6
☐ Use Trusted Relay Point	
Use Intercompany Media Services (IMS) for Outbound Calls*	Default

IPv6 for Phones

Allow Auto-Configuration for Phones*	Default
Allow Duplicate Address Detection*	Default
Accept Redirect Messages*	Default
Reply Multicast Echo Request*	Default

Move Toward IPv6-Only Network

In Cisco Collaboration Systems Release, the deployment of IPv6-only stack devices reduces dependency on IPv4 addresses. For all applications servers, emphasis is given to the deployment of dual-stack (IPv4 and IPv6) applications servers. Dual-stack applications servers offer a greater degree of functionality and interoperability with existing traditional IPv4-only devices that may not support IPv6-only stack because they are not developed.

The ultimate goal is for all collaboration endpoints, servers, and gateways to be configured as IPv6-only stack, meaning that they can provide collaboration functions without using any IPv4 addresses and they do not require IPv4 to IPv6 media interworking functions.

Table 2: Reduction in IPv4 Addresses

Scale of Deployment (Endpoints)	Servers and Gateways (Dual-stack or IPv4)	IPv4 Addresses Before Deploying IPv6-only Endpoints	IPv4 Addresses After Deploying IPv6-only Endpoints	Percent Reduction in IPv4 Addresses
500	6	506	6	98.8%
5,000	13	5,013	13	99.7%
10,000	25	10,025	25	99.8%

Note The scope of this document is limited to the solutions approved by Cisco. Supported IPv4-only stack applications are limited to those stated in this document. It is assumed that IP phones and gateways are configured with either an IPv4-only stack or IPv6-only stack using SIP signaling. Supported application servers support IPv4-only and IPv6-only stacks (dual-stack). Any applications that we did not develop or test are not supported by Cisco TAC. In IPv6 supported network configurations, Skinny Client Control Protocol (SCCP) for IP phones, voice gateways (Cisco VG Series Gateways), and Cisco Unity Connection are not configured except for the use of media termination points (MTP) by Cisco Unified Communications Manager.

Deployment Recommendations for Enterprise Networks

IPv4-only stack or IPv6-only stack devices support:

- Single-site call processing deployments.

- Multi-site distributed call processing deployments.

- Multi-site deployments with centralized call processing.

To move toward an IPv6 deployment and reduce dependency on IPv4 addresses, we recommend that you deploy:

- IPv6-only stack SIP phones, SIP gateways, and SIP trunks.

- Dual-stack Cisco Unified Communications Manager (Unified CM) clusters and other application servers.

Deployment Gaps

When you transition from a traditional IPv4 network to an IPv6 dual-stack network deployment, the following functionality is not supported.

- IPv6-only stack site or branch office (LAN)

- IPv6-only data center

- All IP phones with SCCP signaling

- Secure IP phones, CE endpoints, and gateways

- Applications based on ISR and ISR G2 Routers

- IP phone VPN

- IP phones with NTP

- Video conference deployment based on Cisco TelePresence Conductor, Cisco TelePresence MCU, and Cisco TelePresence Server

- Mobile Remote Access

- Off-premise Cisco Jabber

- Cisco Meeting Server

- Cisco TelePresence Management Suite

- SCCP signaling configuration IP phones

- RSVP call admission control

- Cisco Spark Hybrid Services

- Third-party API products

- Media Gateway Control Protocol (MGCP) gateways

- Unified CM supported H.323 gateways

- Products that are End-of-Support

- Cisco Jabber on IPv6

- Expressway-E external on IPv6

- Expressway-E internal interface on IPv4

- Unified CM , IM & Presence, CUC on IPv4

Comparison of IPv4 and IPv6

This section provides a brief description of the motivation behind deploying IPv6, and a summary comparison of IPv4 and IPv6.

Why Deploy IPv6?

The deployment of IPv6 is primarily driven by IPv4 address exhaustion. As the worldwide usage of IP networks increases, the number of applications, devices, and services requiring IP addresses is rapidly increasing. According to the Internet Assigned Numbers Authority (IANA) and Regional Internet Registries, their pool of unallocated IPv4 addresses is exhausted. For example, all area wireless networks in the American Registry for Internet Numbers (ARIN) are IPv6-only stack.

Because the current IPv4 address space is unable to satisfy the potential huge increase in the number of users and the geographical needs of the Internet expansion, many companies are either migrating to or planning their migration to IPv6, which offers a virtually unlimited supply of IP addresses.

Transforming the Internet from IPv4 to IPv6 is likely to take several years. During this period, IPv4 will co-exist with and then gradually be replaced by IPv6.

Advantages of IPv6 Over IPv4

As a new version of the Internet Protocol, IPv6 provides the following advantages over IPv4:

- Larger address space (Supported in Cisco Collaboration Systems Release)

  The main feature of IPv6 that is driving adoption today is the larger address space. Addresses in IPv6 are 128 bits long compared to 32 bits in IPv4. The larger address space avoids the potential exhaustion of the IPv4 address space without the need for network address translation (NAT) or other devices that break the end-to-end nature of Internet traffic. By avoiding the need for complex sub-netting schemes,

IPv6 addressing schemes are easier to understand, making administration of medium and large networks simpler.

- Address scopes (Supported)

IPv6 introduces the concept of address scopes. An address scope defines the region, or span, where an address can be defined as a unique identifier of an interface. These spans are the link, the site network, and the global network, corresponding to link-local, site-local (or unique local unicast), and global addresses.

- Stateless Address Auto-Configuration (SLAAC) (Supported)

IPv6 hosts can be configured automatically when connected to a routed IPv6 network using ICMPv6 router discovery messages. Address reconfiguration is also simplified. If IPv6 auto-configuration is not suitable, a host can be configured manually.

- Multicast (**Not** supported)

Multicast is part of the base specifications in IPv6, unlike IPv4, where it was introduced later. Like IPv6 unicast addresses, the IPv6 multicast address range is much larger than that of IPv4. IPv6 does not have a link-local broadcast facility; the same effect can be achieved by multicasting to the all-hosts group address (FF02::1).

- Streamlined header format and flow identification (**Not** supported)

The IPv6 header format reduces router processing overhead by using a fixed header length, performing fragmentation on hosts instead of routers, and using an improved header extension method and a new flow label to identify traffic flows requiring special treatment.

- Mobile IPv6 (**Not** supported)

Mobile IPv6 allows a mobile node to change its locations and addresses, while maintaining a connection to a specific address that is always assigned to the mobile node and through which the mobile node is always reachable. Mobile IPv6 provides transport layer connection survivability when a node moves from one link to another by performing address maintenance for mobile nodes at the Internet layer.

Note Mobile IPv6 is not supported by Cisco IP Phones or other collaboration components.

- Network-layer security (**Not** supported)

IPsec, the protocol for IP network-layer encryption and authentication, is part of the base protocol suite in IPv6. This is unlike IPv4, where IPsec is optional. Because of its reduced payload and performance overhead, products use TLS and SRTP for authentication and encryption.

The following table summarizes the differences between IPv4 and IPv6 services.

Table 3: IPv4 and IPv6 Services

IP Service	IPv4 Feature	IPv6 Feature
Address range	32-bit, NAT	128-bit, multiple scopes
Auto-configuration	DHCP	Stateless, Easy Reconfiguration, DHCP

IP Service	IPv4 Feature	IPv6 Feature
Routing	RIP, OSPFv2, IS-IS, EIGRP, MP-BGP	RIPng, OSPFv3, IS-IS, EIGRP, MP-BGP
IP Security	IPsec	IPsec
Mobility	Mobile IP	Mobile IP with direct routing
Quality of Service (QoS)	Differentiated Service, Integrated Service	Differentiated Service, Integrated Service
IP multicast	IGMP, PIM, and Multicast BGP	MLD, PIM, and Multicast BGP; Scope Identifier