Push Notifications Deployment Guide

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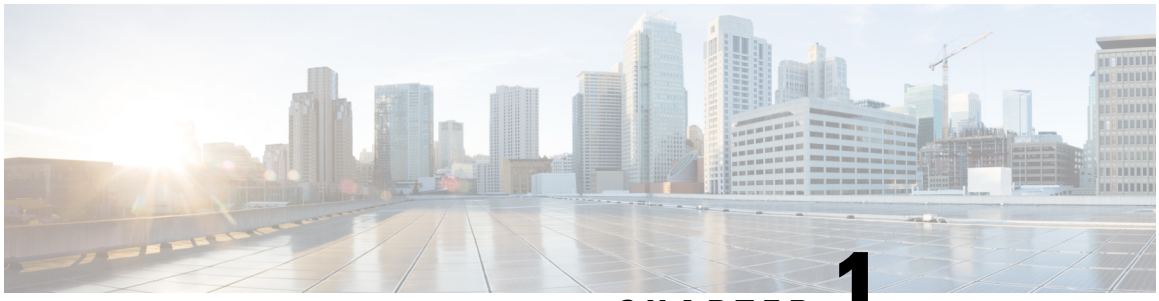


CHAPTER 1

Preface

Purpose of this Document

This document describes how to configure Push Notifications on Cisco Unified Communications Manager and the IM and Presence Service for compatible Cisco Jabber and Cisco Webex clients that run on iOS or Android devices. With Push Notifications, your deployment uses Google or Apple's cloud-based Push Notification service to push voice call, video call, and instant message notifications to Cisco Jabber and Cisco Webex for iOS and Android clients that are running in the background. You must enable Push Notifications to maintain persistent communication with clients that are running in the backgound.

This document describes how to enable Push Notifications for the following deployment types:

- Push Notifications (On-Premises Deployments)—For on-premises deployments of Cisco Unified Communications Manager and the IM and Presence Service, refer to Chapter 2 for instructions on how to enable the cluster for Push Notifications. This includes deployments where the clients register via Expressway's Mobile and Remote Access (MRA) feature.
- Push Notifications (Cloud Deployment)—For cloud deployments with Webex Messenger, refer to Chapter 3 for deployment requirements.

Note The Webex Messenger cloud retires end of 2020. For more information, see https://blogs.cisco.com/collaboration/making-the-move-to-modern-messaging.

Apple Push Notification Service Upgrade Requirements

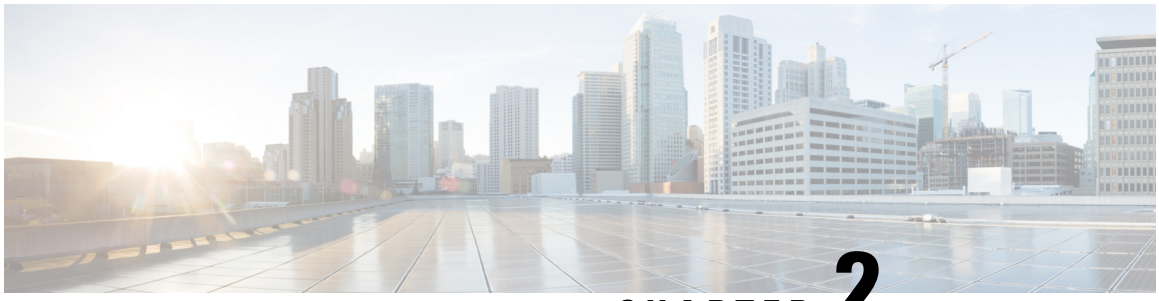
In alignment with Apple's changes to the iOS notification architecture, Cisco Jabber and Cisco Webex clients on iOS are implementing Apple Push Notification support for notifications. We highly recommend that customers upgrade Cisco Unified Communications Manager, IM and Presence Service, Cisco Expressway, Cisco Jabber, and Cisco Webex as soon as possible. Failure to upgrade on time will result in loss of voice notification for Cisco Webex users using Unified Communications Manager and IM notifications for Cisco Jabber and Cisco Webex iOS users.

Important If Apple Push Notification Service (APNS) is enabled on the CUCM/IM and Presence clusters and if the Expressway is upgraded to a version that supports Push:3 protocol, first upgrade all CUCM/IM and Presence clusters to the version that supports push:3 protocol.

This means that if your existing CUCM/IM and Presence version is 11.5(1)SU8 or 12.5(1)SU3 or below (that supports Push:2), however you have upgraded the Expressway to 12.7 (that supports Push:3), the APNS will not work in such deployment scenario. In such case, you must upgrade your CUCM/IM and Presence cluster to a version that supports Push:3, such as 11.5(1)SU9.

Apple Push Notification Service needs HTTPS and will not work with unrestricted software.

For up to date support information that is related to Push Notifications with iOS13 and above versions, including upgrade requirements, refer to Apple Push Notification Service Updates.



CHAPTER 2

New and Changed Information

New and Changed Information

The following table provides an overview of the significant changes to the features in this guide up to this current release. The table does not provide an exhaustive list of all changes that are made to the guide or of the new features up to this release.

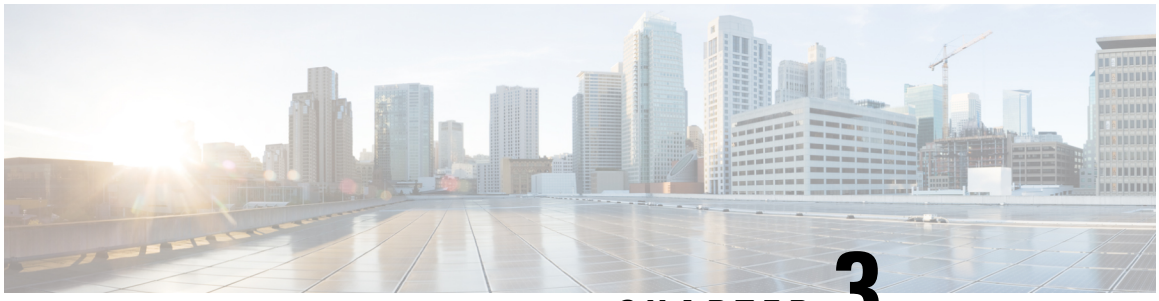
Table 1: New Features and Changed Behavior in Unified Communications Manager and IM and Presence Service

Feature or Change	Description	See	Date
Release 15	Updated the Android Push Notification considerations for Cisco Jabber and Webex client.	Android Push Notification, on page 15	August 20, 2024
Release 15	Removed the note indicating deprecation of VoIP socket support on Android devices in the 'Android Push Notification' section.	Android Push Notification, on page 15	July 10, 2024
Release 15	Included 'fos-a.wbx2.com' to SSL Decryption Exclusion list in Firewall	Push Notifications Prerequisites, on page 24	February 08, 2024
Release 15	No new technical features were introduced for this release.	—	December 18, 2023
Release 14SU3	No new technical features were introduced for this release.	—	May 18, 2023
Updated the LPNS Interactions and Restrictions section	Certificate Required feature is updated to include information on LPNS to meet Apple's certificate requirements.	LPNS Interactions and Restrictions, on page 45	July 26, 2023
Version update for Cisco Jabber for Android	Included a note to mention that Jabber for Android must be updated to Android target API 34 (Android 14) in the 'Android Push Notification' section.	Android Push Notification, on page 15	July 21, 2023

Feature or Change	Description	See	Date
Updated the Minimum Releases and Feature Support for Push Notifications table	Included information on iOS12 (APNS) deprecation.	Minimum Releases and Feature Support for Push Notifications, on page 21	July 21, 2023
Support Matrix for APNS and LPNS	Included information on the support matrix for APNS and LPNS.	• Push Notifications Overview, on page 7 • Minimum Releases and Feature Support for Push Notifications, on page 21	May 25, 2023

Feature or Change	Description	See	Date
iOS Local Push Connectivity for Calls	Webex App is not notified of incoming VoIP call notifications when an iOS device operates in a Wi-Fi constrained network with no internet connection such as, hospitals, cruise ships, airplane, and so on. Due to lack of internet connectivity, the device does not have access to the Apple Push Notification Service (APNS). Users expect to receive calls without any delay. However, with APNS a call can be delayed for a few seconds when there is a network latency. With this release, Local Push Notification Service (LPNS) for calls has been introduced on Apple devices. It helps to minimize any delay as the push message is sent to the client through a persistent connection.	• Local Push Notification Service, on page 40 • LPNS Prerequisites, on page 41 • How Local Push Connectivity Works, on page 42 • Configure Wi-Fi SSID, on page 43 • Associate Jabber Service Profile to the End User, on page 44 • LPNS Behavior If There Is Unified Communications Manager Failover, on page 44 • High Availability of LPNS for Remote LPNS Push Call Handling, on page 45 • Open Ports for LPNS, on page 41 • LPNS Interactions and Restrictions, on page 45 • LPNS Alarms, on page 60 • Performance Counters for LPNS, on page 61	May 18, 2023
Release 14SU2	No technical features were introduced for this release.	—	June 16, 2022
Release 14SU1	No technical features were introduced for this release.	—	October 27, 2021
Release 14	Initial publication of the System guide.	—	March 31, 2021
Release 12.5.x	Included information for Cisco Jabber support.	Push Notifications Overview, on page 7	August, 2020

Feature or Change	Description	See	Date
Release 11.5(1)SU3	Included information for Push Notifications Enhancements for Cisco Jabber on iPhone and iPad.	Push Notifications Overview, on page 7	August, 2017
Release 11.5(1)SU2	Push Notification support provided for IM and Presence (without High Availability).	Push Notifications High Availability for IM and Presence, on page 20	January, 2017



CHAPTER 3

Push Notifications (On-Premises Deployments)

Push Notifications Overview

When your cluster is enabled for Push Notifications, Cisco Unified Communications Manager and the IM and Presence Service use either the Apple, or Google cloud's Push Notification service to send push notifications to compatible Cisco Jabber or Webex clients that run on iOS or Android devices. Push Notifications let your system communicate with the client, even after it has entered into background mode (also known as suspended mode). Without Push Notifications, the system may not be able to send calls or messages to clients that have entered into background mode.

The encrypted payload in the Push Notification includes the following PII information:

- Display Name
- Display Number
- Hunt Pilot DN

Following table details the support matrix for Apple Push Notification Service (APNS) and Local Push Notification Service (LPNS).

Table 2: Support Matrix for APNS and LPNS

	Unified CM	IM and Presence Service	Cisco Expressway (is MRA is deployed)	Cisco Jabber	Webex App	Mobile Operating System	Comments
Apple—APNS Messaging	11.5(1)SU2	11.5(1)SU2	X8.9.1	11.8.1	N/A	12	Requires connectivity with Apple and Cisco cloud.
Apple—APNS Calling	11.5(1)SU3	11.5(1)SU3	X8.10.1	11.9.0	40.6	12	—
Apple—APNS CallKit	11.5(1)SU8 and 12.5(1)SU3 and 14	NA	X12.6	12.9	40.6	13	—
Apple—APNS China region	12.5(1)SU3 and 14	12.5(1)SU3	X12.6	12.9 MR	41.4	13	—
Android— FCM	12.5(1)SU3 and 14	12.5(1)SU3	X12.6.2	12.9.1	40.8	8.0	Requires connectivity with Google and Cisco cloud.
Apple—LPNS	14SU3	NA	Not Supported	14.2	43.6	16.5	Supported in WiFi deployment

For Unified Communications Manager and IM and Presence Service deployments, Push Notifications are used by the following clients:

Table 3: Compatible Clients That Use Push Notifications (On-Premises Deployments)

Communication Type	Clients that Use Push Notifications	Operating System	Partner Cloud Service	Local Push Connectivity
Calls	Cisco Jabber on iPhone or iPad Cisco Webex on iPhone or iPad	iOS	Apple Push Notification service (in Apple cloud)	Supported from Unified CM version 14SU3 and Webex App 43.6 or later or Cisco Jabber 14.2 or later.
Calls	Cisco Jabber on Android Cisco Webex on Android	Android	Android Push Notification service (in Google cloud)	Not Supported

Communication Type	Clients that Use Push Notifications	Operating System	Partner Cloud Service	Local Push Connectivity
Messages *	Cisco Jabber on iPhone or iPad	iOS	Apple Push Notification service (in Apple cloud)	Not Supported
Messages *	Cisco Jabber on Android	Android	Android Push Notification service (in Google cloud)	Not Supported

* For messaging, Webex App clients register to the Webex App cloud rather than the IM and Presence Service.

Note For minimum release information for specific Push Notifications features on both iOS and Android, see Minimum Releases and Feature Support for Push Notifications, on page 21.

How Push Notifications Work

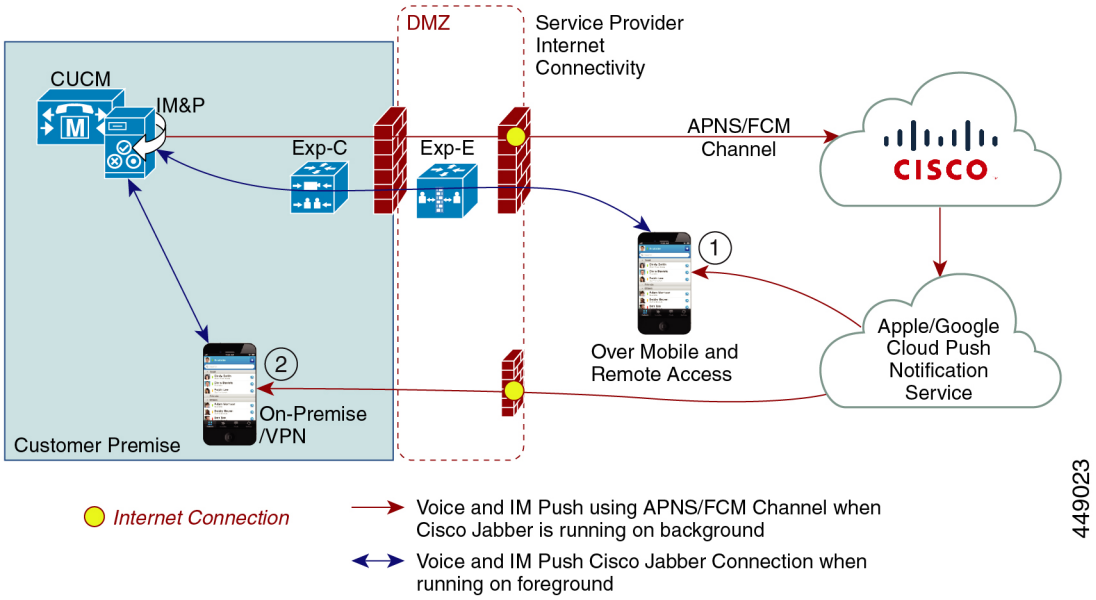
At startup, Cisco Jabber clients that are installed on Android and iOS platform devices register to Unified Communications Manager and the IM and Presence Service while Webex App clients that run on Android or iOS register to Unified Communications Manager for calling and the Webex App cloud for messaging. In addition, the Jabber and Webex clients also register to the Google or Apple cloud, depending on which platform they are running. So long as the client remains in foreground mode, calls or messages can be sent to the client directly.

However, once the client moves to background mode (for example, this may happen to maintain battery life), the standard communication channels are unavailable, preventing direct communication with the client. Push Notifications provides an alternative channel to reach the clients through the partner clouds (Apple or Google).

Note Cisco Jabber and Webex App clients are considered to be running in suspended mode if any of the following conditions are true:

- The Cisco Jabber or Webex App is running off-screen (in the background).
- The Android or iOS device is locked.
- The Android or iOS device screen is turned off.

Figure 1: Push Notifications Architecture



The above diagram displays what happens when Cisco Jabber for Android and iOS clients run in the background or are stopped. Because the standard channel is unavailable, the push notification is sent to the Push REST service in the Cisco cloud, which forwards the notification to the appropriate partner cloud (Apple or Google), which then forwards the push notification to the client. The client then reregisters to the on-premises deployment in order to accept the call or message.

The figure illustrates: (1) an MRA deployment where a Jabber client connects with an on-premises Unified Communications Manager and IM and Presence Service deployment through Expressway, and (2) a Cisco Jabber for Android or iOS client that connects directly to the on-premises deployment from within the enterprise network.

Note For Jabber users who have simultaneously logged in to Windows and iOS devices:

- If two users are in an active call, and another user sends a message, a push notification is sent to the iOS device.
- If a user is not in an active call, and another user sends a message, no push notification is sent to the iOS device.

Push Notifications Behavior

The following table shows Push Notifications client behavior with on-premises deployments of Unified Communications Manager and the IM and Presence Service.

Note Webex App clients use the Webex App cloud for messaging rather than an on-premises IM and Presence Service.

Note Webex App and Cisco Jabber on IOS will always display as a Video Call due to limitations in the Apple IOS CallKit.

Table 4: Push Notifications Behavior for Cisco Jabber or Webex Clients on iOS or Android

Cisco Jabber or Webex client is in...	Running iOS12	Running iOS13 and above versions or Android
Foreground Mode	**Voice and Video Calls** Unified CM sends calls to Cisco Jabber or Webex clients directly using the SIP channel. In addition, Unified CM sends a Push Notification to clients that are in foreground mode. However, the Push Notification doesn't get used to establish the call—the standard SIP channel is used instead. **Messages (Jabber only)** The IM and Presence Service sends messages to Cisco Jabber directly using standard communication channels. The IM and Presence Service doesn't send Push Notifications to clients that are in foreground mode.	**Voice and Video Calls** Unified CM sends calls to Cisco Jabber or Webex clients directly using the SIP channel. In addition, Unified CM sends a Push Notification to clients that are in foreground mode. However, the Push Notification doesn't get used to establish the call—the standard SIP channel is used instead. **Messages (Jabber only)** The IM and Presence Service sends messages to Cisco Jabber directly using the standard communication channel. The IM and Presence Service doesn't send Push Notifications to clients that are in foreground mode.

Cisco Jabber or Webex client is in...	Running iOS12	Running iOS13 and above versions or Android
Background Mode	**Voice and Video Calls** SIP channel is unavailable. Unified CM uses the Push Notifications channel. Upon receiving the push notification, the client reregisters to Unified CM and receives the SIP INVITE via the SIP channel. **Messages (Jabber only)** Standard channel is unavailable. The IM and Presence Service uses Push Notifications channel to send the IM notification to Jabber. When the user clicks the notification, the client moves to foreground mode, resumes the session with the IM and Presence Service, and downloads the message. **Note** While the client is in background mode, the Presence status is **Away**.	**Voice and Video Calls** SIP channel is unavailable for calls. Unified CM uses the Push Notifications 'VoIP' channel. Upon receiving the push notification, the client launches CallKit with Caller ID, reregisters to Unified CM, and receives the SIP INVITE via the SIP channel. The user can then answer the call. **Messages (Jabber only)** Standard channel is unavailable. The IM and Presence Service uses Push Notifications 'message' channel to send the IM notification to Jabber. When the user clicks the notification, the client moves to foreground mode, resumes the session with the IM and Presence Service, and downloads the message. **Note** While the client is in background mode, the Presence status is **Away**.

Apple Push Notification

Cisco Jabber and Cisco Webex clients that run on iOS (for example, Cisco Jabber on iPhone and iPad) receive Push Notifications from the Apple Push Notification service, which runs in the Apple cloud.

From Cisco Jabber 12.9 release, all new iOS applications and updates will be built using iOS 13 and above versions. Under iOS 13, Apple processes Push Notifications for suspended applications differently than it did with iOS 12:

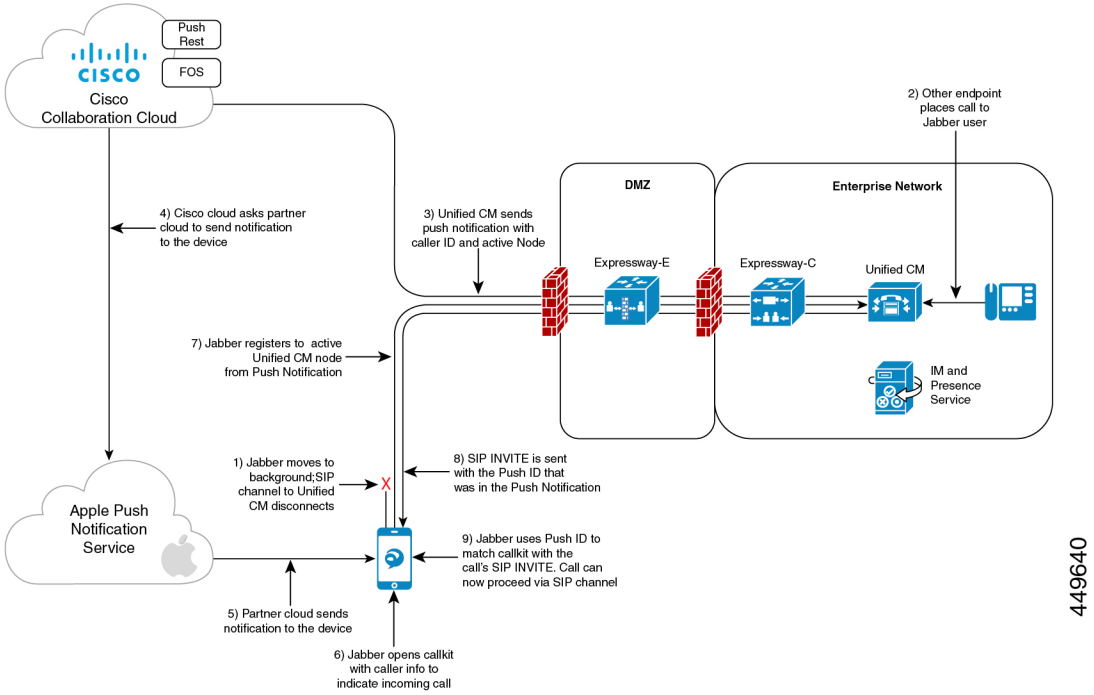
- Push Notifications under iOS 13 are delivered using a "VoIP" channel for calls and a separate "Message" channel for messaging. This is in contrast to iOS 12 where all Push Notifications traffic are delivered using the same channel.
- Push Notifications is mandatory for Apple iOS clients as of August 2020.
- The iOS client, upon receiving the notification, launches CallKit immediately to indicate an incoming call.
- Push Notifications "VoIP" traffic includes caller identity information (Display Name, Number), which the client uses to populate the CallerID field in CallKit. If the External Presentation Name and Number is configured, Push Notification displays the customized identification Name and Number on the supported devices. If not, the original name and number of the calling party are displayed on the called party device.
- **Missed Call Notification**: A second Push Notification is sent to the push-enabled device when the caller disconnects the outgoing call that is in progress. The Push Notification is also sent if the push-enabled device does not register an incoming call within 13 seconds.

- **Shared Line**: When the Push Notification enabled device that has a shared line with another device receives the call, and the shared device answers the call, the Push Notification enabled device receives the second push notification stating the call has been answered from the other device.
- Push Notifications of type "VoIP" are considered high priority and are delivered without delay.

Note See Minimum Releases and Feature Support for Push Notifications, on page 21 for detailed information as to which Push Notifications features are supported with which Unified CM release.

The following image provides a breakdown of what happens when a VoIP Push Notification is sent under iOS13 and above versions.

Figure 2: VoIP Push Notification Behavior When Sent Under iOS13 and Above Versions



Comparison of Push Notification Calling Experience for Cisco Jabber or Webex App Clients with iOS13 or Above Versions and APNS Changes

The following table describes the user experience behavior when the Client is upgraded and Server that is not upgraded or the Client is not upgraded and the Server is upgraded.

	Locked Screen	Unlocked Screen
Cisco Jabber 12.9	• Client gets the push notification. • CallKit view along with CallerID of the caller is displayed on the screen. • Users can answer or reject call from the CallKit without unlocking the device.	• Client gets the push notification. • CallKit view along with CallerID of the caller is displayed in the incoming call notification. • Cisco Jabber app launches when a user answers the call with caller details (Caller Name and Caller ID).
Cisco Jabber 12.8 and earlier	• Client gets the push notification. • The notification causes Cisco Jabber app to register and users see call information in it. • Users can answer the call from locked device,	• Client gets the push notification. • The notification causes Cisco Jabber app to register and users see call information in it. • Users can answer the call directly from the app.

Note There is no change in user experience behavior for message push notifications.

Cloud Security for Push Notifications

Security is central to our push for Cisco Jabber and Cisco Webex architecture. All Push Notifications content is encrypted using a 256-bit Advanced Encryption Standard (AES) key that is defined by Cisco Jabber and Cisco Webex when the user signs in; the key could also be updated by the client periodically. All content sent as part of Push Notification is encrypted.

Cisco's cloud push service requires encrypted payloads and will reject anything that is not encrypted before transmission to the Apple or Google cloud. All communications with Cisco's cloud push service is secured using Transport Layer Security (TLS). This ensures that any content pushed through APNS is encrypted.

The PushRest service doesn't cache any payload that it gets from On-premise servers. The PushRest service is a proxy and passes the information to the Apple or Google cloud.

All Personal Identifying Information (PII) is encrypted. The only information outside of service details that isn't within the encrypted payload, but which is sent over a secure TLS connection is:

- Push Target that is, the client (APNS or FCM as the case maybe)-generated token for a particular push session device, rotated occasionally or changed in subsequent sign-ins.
- Tracking ID (client-generated ID for each messaged use in debugging if any issues occur)

iOS13 Push Notification (China Region)

Unified Communications Manager supports VoIP call Push Notifications for Cisco Jabber or Webex clients that are running on iOS13 or above version devices. In addition, the IM and Presence Service supports message Push Notifications for Cisco Jabber clients that run on iOS13 or above version devices. When we get any incoming call to a Push Notification-enabled device that is in the Mainland China region, the clients running

on iOS devices cant show CallKit view due to regulatory requirements. Instead, a message notification with Caller-ID details such as name or number is displayed.

Cisco Jabber and Cisco Webex clients on iOS13 and above version in Mainland China region:

- Can’t show CallKit view when it gets VoIP call Push Notification message.
- The VoIP call Push Notification message causes the application to show a message toast with information about the incoming call and Caller-ID.

This allows the end-user to be assured of the caller's identity before answering the call. Tap on the message notification for the application to start and register with Unified Communications Manager. After successful registration, the Unified Communications Manager routes the incoming call to the application.

Note We recommend that the user quickly tap on the message notification on the Cisco Jabber and Cisco Webex client for Unified Communications Manager to route calls to the user. If the user doesn’t tap on the message notification within the set time (13 seconds), the incoming call doesn’t alert the receiver over a CallKit and a missed call message notification is sent to the user.

China region Push Notification is for iOS devices only and the minimum release is 12.5(1)SU3. It’s not supported on Android devices.

Cisco Jabber 12.9 MR is required. The IM and Presence Service Push Notification is not impacted by this regulation.

Android Push Notification

As of 12.5(1)SU3, Unified Communications Manager supports VoIP Push Notifications for Cisco Jabber or Webex clients that run on Android devices. In addition, the IM and Presence Service supports messaging Push Notifications for Cisco Jabber on Android clients.

When there's an incoming call, the Unified Communications Manager Push Notification Service (CPNS) sends a push notification over the Google cloud to the Android clients that is running in suspended or background mode. After receiving the notification, the Cisco Jabber or Webex client registers back to Unified Communications Manager to receive the call.

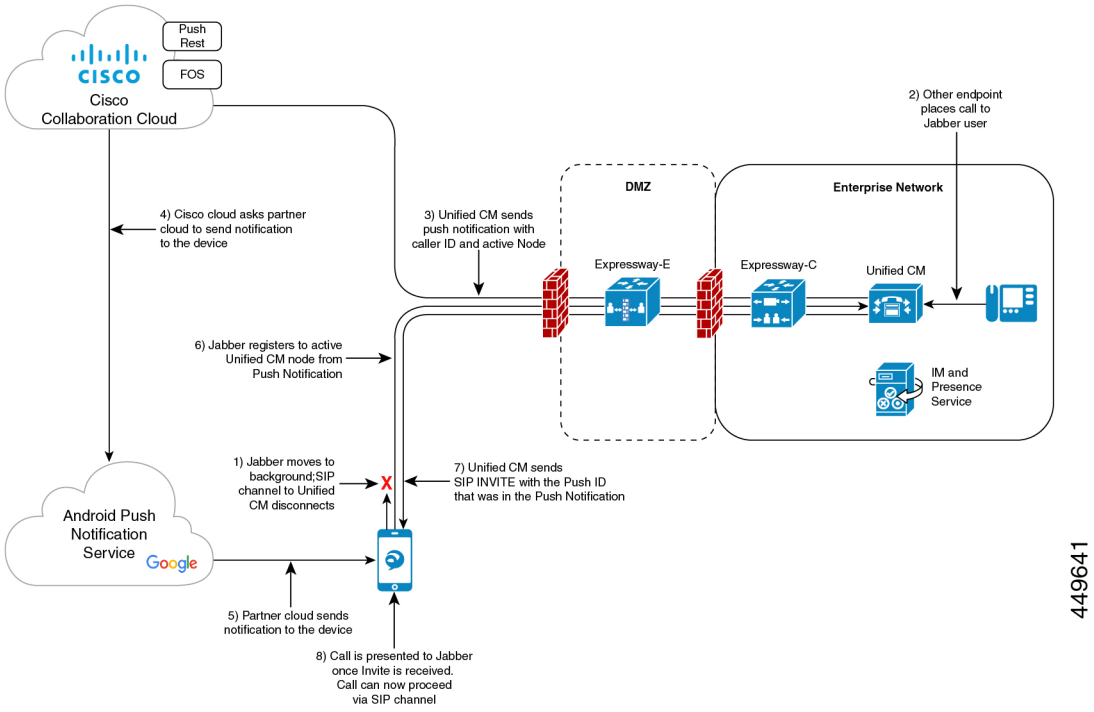
Note

- Android Push Notification for Cisco Webex is only for voice call notifications. For messaging, Cisco Webex doesn't use an on-premises IM and Presence Service server.

  If IM and Presence Service 12.5 SU3 is deployed with Expressway X12.6 and Cisco Jabber 12.9 versions, then the bug ID CSCvv12541 doesn't apply and Cisco Jabber users on Android wouldn't face any problems.

- On Android, there's no guarantee that the foreground service always works on the Cisco Jabber or Webex client, when the applications are running in the background. Cisco Jabber or Webex client may still be terminated by the Android OS sometimes. For example, during a memory constraint or system components update. Hence, we recommend that you enable Cisco Cloud Onboarding to use FCM (Firebase Cloud Messaging) which ensures that you receive chat messages (Cisco Jabber Only) and calls while the Cisco Jabber or Webex client is in the background.

Figure 3: Android Push Notification Call Processing for Background Mode



Note As part of Cisco Jabber and Cisco Webex client user sign-in with Android push notifications service from the Google cloud, the subscriber services FCM (Firebase Cloud Messaging) and FCM: dev are supported.

Push Notification in case of Unified Communications Manager Failover

Unified Communications Manager Group is a prioritized list of up to three redundant servers to which devices can register. Each group contains a primary node and up to two backup nodes. The order in which you list the nodes determine their priority with the first node being the primary node, the second being the backup node, and the third being the tertiary node.

In the Unified Communication Manager, device pools provide a common set of configurations for a group of devices and allow you to configure devices according to their specific location information. You can assign a device to a Cisco Unified Communications Manager Group through the Device Pool Configuration.

When Cisco Jabber or Cisco Webex clients move to the background or suspended state and the primary node on which clients are registered, goes out of network or crashes, then any calls made to the Cisco Jabber or Cisco Webex will trigger a Push Notification from the Unified CM.

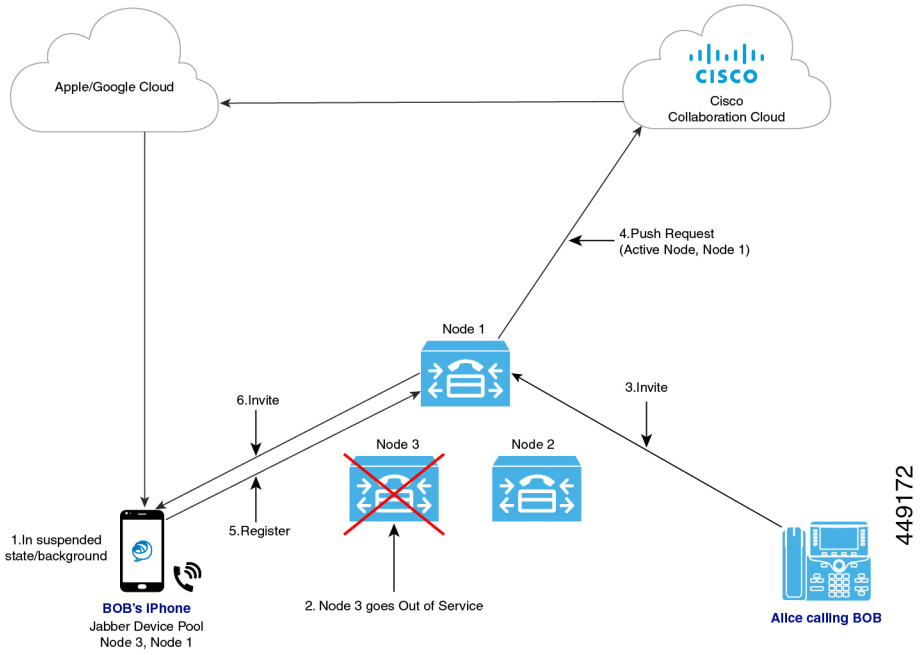
Previously, Cisco Jabber or Cisco Webex tried to register to the node it had previously registered to, but the registration failed. Now, it subsequently tries to connect to the active nodes in its device pool to register back successfully. This process of discovering the current active node to which Cisco Jabber or Cisco Webex clients must register results in a loss of time.

The Unified Communications Manager Push Notification Service (CPNS) aims to avoid the loss or delay by helping Cisco Jabber or Cisco Webex register to the correct active node, whenever a Push Notification is sent. This Push Notification request contains the current active node information and enables the clients to quickly register back to the same node or to the current active node.

Note The active node is only included in the Push Notification from 12.5(1)SU3 release onwards.

Figure 4: Push Notification for Incoming Call

The following image illustrates a Unified Communications Manager failover example where the primary node goes out of service while the client is in background mode or suspended state. Upon receiving an incoming call for the client, the Unified Communications Manager sends the push notification with the backup node highlighted as the active node, as the primary registration node is down. Upon receiving the push notification, the client registers to the backup node.

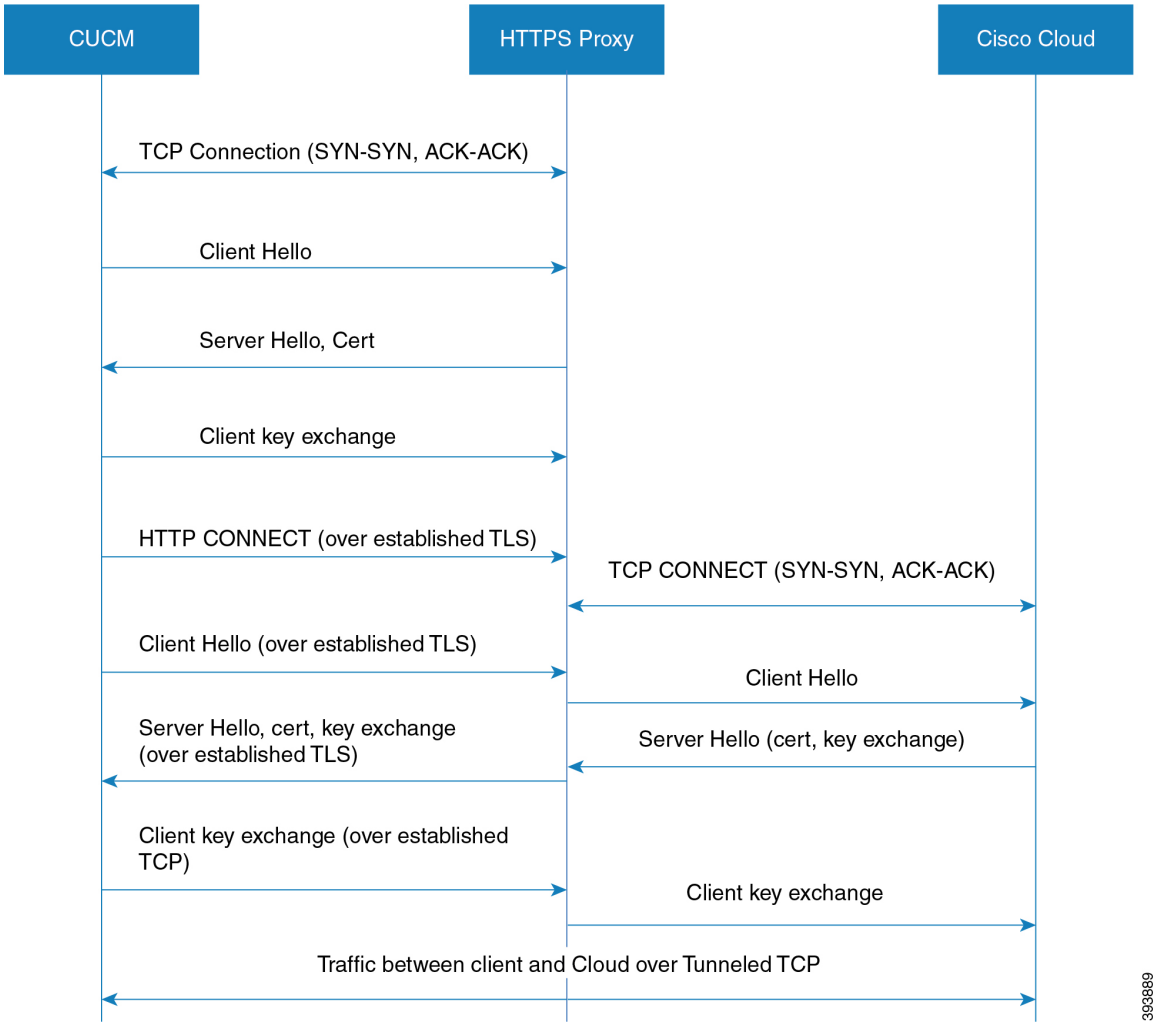


Proxy Support for Cloud Connection

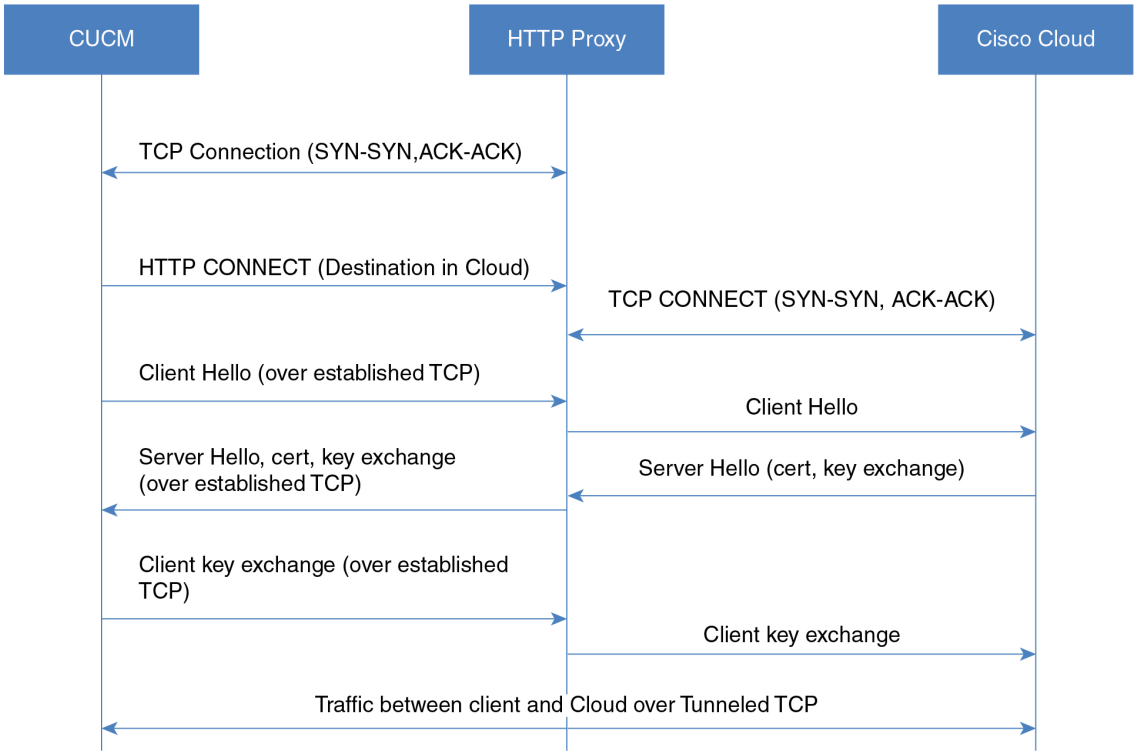
For some deployments, you may need to use a proxy server to connect to the Cisco cloud. This is particularly true if your on-premise deployment is behind a company firewall that does not allow direct access to the cloud.

Unified Communications Manager supports the Cisco Web Security Appliance as an HTTPS proxy server. However, you can use any HTTP or HTTPS proxy server that supports one of the below call flows. Note that if you decide to use an HTTP proxy with authentication enabled, we recommend that you configure digest authentication for the proxy server for credential security.

Supported Call Flow for HTTPS Proxy



Supported Call Flow for HTTP Proxy



Capacity Requirements for Proxy Servers

Use the Proxy Server Capacity Calculator for Push Notifications to estimate capacities that your Proxy Server must be able to handle. Enter the information that applies to your deployment and the calculator outputs the number of transactions that your HTTP(S) Proxy server must be able to handle for Push Notifications deployments.

DNS Requirements for Proxy Servers

- For the Unified Communications Manager to proxy server connection, if you use a FQDN address for the proxy server, DNS is used to connect to the proxy server. If the proxy server FQDN resolves to multiple IP addresses, Unified Communications Manager tries the first IP address and waits two seconds before moving on to the second address.
- After sending a push notification, Unified Communications Manager waits five seconds for a confirmation before trying the second address.
- For the proxy server to Cisco cloud connection, we recommend that you configure the proxy server with a low failover rate in order to speed up the failover process for connection failures.
- If you are deploying the Cisco Web Security Appliance, the FQDN must map to the WSA's virtual IP address.

Note The default Time To Live (TTL) for proxy IP addresses is one hour. As a result, if an IP address is changed, it may take up to one hour for that change to be available for DNS requests.

Push Notifications High Availability for IM and Presence

Push Notifications High Availability provides failover and redundancy for Push Notifications-enabled IM and Presence sessions for Cisco Jabber Android and iOS clients. With this feature, the IM and Presence Service saves the IM session in the local in-memory database (IMDB), which gets replicated automatically to the in-memory database on the subcluster backup node. This ensures that the backup node has the session information and can take over the session without user action from the user.

IM History

When Push Notifications High Availability is configured, the Cisco Jabber user does not lose the chat history when failover occurs.

Unread Message Queue when Jabber is in Suspended Mode

For Push Notifications-enabled IM sessions, when a Cisco Jabber for Android and iOS clients moves into suspended mode, the IM and Presence Service sends Push Notifications to the clients, but stops sending unread instant messages, Presence updates, and other XMPP stanzas (for example, chat room invites). Instead, these messages are queued on the local server until the client clicks on a Push Notification, or reenters foreground mode.

There is a limitation involving the unread message queue for Push Notifications-enabled IM sessions where Cisco Jabber is in suspended mode. In some failover use cases, the unread message queue is lost. See "Redundancy and Failover Use Cases" for a description of when this occurs.

Redundancy and Failover Use Cases

The following use cases are covered by this feature:

- Node failure (automatic failover)—If a node fails suddenly, the backup node takes over the IM session and Push Notifications continue to be sent to the Cisco Jabber user, this time from the backup node. Users can continue working without any user action or loss of IM history. However, the unread messages that were queued on the failed server while client was in suspended mode, and which had not yet been sent to the clients, are lost.
- Node shutdown (manual failover)—If a node is shut down gracefully, the backup node takes over the IM session and Push Notifications continue to be sent, this time from the backup node. Users can continue working without any user action or loss of IM history. The unread messages that were queued on the original node, and which were waiting to be sent to the Jabber client, are lost temporarily when the backup node takes over. However, after the original node comes back up, and the user falls back to the original node, that message queue is retrieved, and is sent to the user.
- Cisco XCP Router crash—If the Cisco XCP Router crashes suddenly, once the router comes back up, the node resumes the session and continues to send Push Notifications. The IM history is maintained, and Cisco Jabber users can continue working without any user action. However, the unread messages that were queued on the server prior to the router crash, and which had not yet been sent to the client, are lost

- Cisco XCP Router restarts—If an administrator restarts the Cisco XCP Router, such as may happen after a configuration update, both the IM history and the unread message queue are maintained. Once the router restarts, the IM and Presence Service resumes sending Push Notifications. The unread message queue is sent once the Jabber client logs in again.

Note For voice and video calls, redundancy and failover is handled by Cisco Unified Communications Manager Groups.

Supported Re-login Rate during HA Event for Push v3 Enabled Devices

This sections provides you the information about how to calculate the client relogin rate during HA event for PUSH v3 enabled devices depending on your deployment need.

This procedure assumes that you have 15,000 OVA and it is distributed in the following order:

- 2,000 users registered to the IM and Presence Publisher node are Push v3 enabled,
- 5,500 users registered to IM and Presence Publisher node directly are not Push enabled, and
- 7,500 users registered to IM and Presence Subscriber node directly and are not Push enabled.

In case of High Availability event, the supported failover rate should be 4 users/sec, or lower. You can achieve this rate using the following measurement:

If the client re-login lower limit is set to 200, then the client re-login upper limit should be set to 2075, so that the re-login rate is calculated in the following manner:

7500/(2075-200)= 4 users/sec

Note
- The above result is measured for UCS-C220-M4S Intel Xeon CPU E5-2660 v4@2.00GHz platform.
- This calculation is applicable to IM and Presence Release 11.5 deployments only.

Minimum Releases and Feature Support for Push Notifications

Minimum Releases

The following table highlights minimum releases for basic Push Notifications support.

Note For minimum releases that are required for specific Push Notifications features, refer to the table Feature Support for Push Notifications.

Operating System	Minimum Releases for Push Notifications
iOS16.5 and above (LPNS)	• Unified Communications Manager 14SU3 • Cisco Jabber 14.2 • Cisco Webex App 43.6 • Not supported for IM and Presence Service messaging • Not supported on Android
iOS12 (APNS) **Note** Not Supported. Refer to https://www.cisco.com/c/en/us/support/docs/field-notices/705/fn70555.html for more details.	• Unified Communications Manager 11.5(1)SU4 or higher (Recommended: 11.5(1)SU7 or 12.5(1)SU2) • IM and Presence Service 11.5(1)SU4 or higher (Recommended: 11.5(1)SU7 or 12.5(1)SU2) • Cisco Jabber 11.9 (Recommended: 12.8) • Cisco Expressway X8.10.1—if MRA is deployed (Recommended: X12.6)
iOS13 and above (APNS)	• Unified Communications Manager 11.5(1)SU8 for 11.x releases, 12.5(1)SU3 for 12.x releases • IM and Presence Service 11.5(1)SU8 for 11.x releases, 12.5(1)SU3 for 12.x releases • Cisco Jabber 12.9 • Cisco Expressway X12.6 (if MRA is deployed) **Note** If upgrading to minimum releases and push notifications feature is already enabled, you must upgrade all IM and Presence service clusters first before upgrading Expressway. If upgrading Expressway to the version X12.7 or higher, and the IM and Presence service to the version higher than 11.5(1)SU8 or 12.5(1)SU3, and push notifications feature is already enabled, at least one IM and Presence service cluster needs to be upgraded before Expressway upgrade is started.

Operating System	Minimum Releases for Push Notifications
Android	• Unified Communications Manager 12.5(1)SU3 or higher releases • IM and Presence Service 12.5(1)SU3 or higher releases • Cisco Jabber 12.9.1 • Cisco Expressway X12.6.2 (if MRA is deployed) For more information, see the latest X12.6.2 Expressway release notes. **Note** If upgrading to minimum releases and push notifications feature is already enabled, you must upgrade all IM and Presence service clusters first before upgrading Expressway. If upgrading Expressway to the version X12.7 or higher, and the IM and Presence service to the version higher than 11.5(1)SU8 or 12.5(1)SU3, and push notifications feature is already enabled, at least one IM and Presence service cluster needs to be upgraded before Expressway upgrade is started.

Feature Support

The following table outlines Push Notifications features that are supported with specific Unified Communications Manager releases.

Unified CM Release	iOS12	iOS13 and above versions	Android	iOS16.5
11.5(1)SU4 - SU7	Basic Push Notification support Single Push Notification channel	Basic Push Notification support Single Push Notification channel	No support	Basic Cloud Push Notification support
11.5(1)SU8	Basic Push Notification support Single Push Notification channel	Basic Push Notification support Caller ID in Push Notification Separate channels for calls and messages	No support	Basic Cloud Push Notification support
12.5(x) up to SU2	Basic Push Notification support Single Push Notification channel	Basic Push Notification support Single Push Notification channel	No support	Basic Cloud Push Notification support

Unified CM Release	iOS12	iOS13 and above versions	Android	iOS16.5
12.5(1)SU3	Basic Push Notification support Single Push Notification channel	Basic Push Notification support Caller ID in Push Notification CallerID supports External Presentation Name and Number Registration node in Push Notification Separate channels for calls and messages	Basic Push Notification support Registration node in Push Notification Separate channels for calls and messages	Basic Cloud Push Notification support
14SU3	No support	No support	Basic Push Notification support Registration node in Push Notification Separate channels for calls and messages Local Push not supported	Local Push Notification support for calls. Messaging is not supported Basic Push Notification support Caller ID in Push Notification Caller ID supports External Presentation Name and Number Registration node in Push Notification

Push Notifications Prerequisites

The following are the prerequisites to onboard Push Notifications for on-premises deployments:

- Domain Name System must be configured in both Unified Communications Manager and IM and Presence Service and must be able to resolve externally routable addresses.
- The Unified Communications Manager Push Notification Service (CPNS) must run on all nodes and the CallManager must connect only to local CPNS. To ensure a functional push notification, it is mandatory to enable CPNS at the local node.
- Connectivity must be enabled from Unified Communications Manager and IM and Presence Service over port 443 for the following connections to the Cisco cloud:

- Fusion Onboarding Service at `fos-a.wbx2.com`—Unified Communications Manager connects to this service for Push Notification subscription requests. Unified CM communicates with the Fusion Onboarding Service (FOS) to provision a Common Identity (CI) machine account.
- Push REST service at `push.webexconnect.com`—Unified Communications Manager and IM and Presence Service connect to this service to send Push Notifications.
- Common Identity service at `idbroker.webex.com`—Unified Communications Manager and IM and Presence Service authenticates to this service before sending a Push Notification.

Note Add `fos-a.wbx2.com`, `push.webexconnect.com` and `idbroker.webex.com` to the SSL Decryption Exclusion list in the firewall.

- For messaging Push Notifications to Cisco Jabber, the Instant Messaging must be enabled, and the Multiple Device Messaging and Stream Management features must be configured on the IM and Presence Service. For details, see the Configuration and Administration of the IM and Presence Service.
- Push Notifications depends on the following network services, which were introduced with Release 11.5(1)SU3. You can confirm that these services are running in the **Control Center - Network Services** window of Cisco Unified Serviceability. Both services are enabled by default.
  - **Cisco Push Notification Service**—handles the Push Notification for voice and video calls.
  - **Cisco Management Agent Service**—handles the sending of troubleshooting information that is related to Push Notifications.
- The iOS or Android device must be configured to allow notifications from the Cisco Jabber application.
- If you require a proxy server for the cloud connection, see Proxy Support for Cloud Connection, on page 17 for HTTP(S) proxy support.
- If you are deploying Cisco Jabber on iPhone or iPad clients, the **EnableVoipSocket** parameter setting must be **false** for Voice Push Notifications to work. You can configure the parameter in the **UC Service Configuration** window of Cisco Unified CM Administration (choose **Jabber Client Configuration** as the service type and look under the **Options** section to set the parameter).

  You can also edit the parameter in an XML editor. See the Parameters Reference Guide for Cisco Jabber for detailed information on the parameter.

Licensing Prerequisites

- For 11.5(x) releases, Unified Communications Manager uses Cisco Prime License Manager for licensing. As part of the Push Notifications onboarding process, you must synchronize licenses in Prime License Manager.
- For 12.x and later releases, Unified Communications Manager uses Smart Licensing for licensing. Smart Licensing must be configured before you onboard the cluster for Push Notifications. For details on how to set up Unified Communications Manager for Smart Licensing, see the "Smart Software Licensing" chapter of the System Configuration Guide for Cisco Unified Communications Manager.

- From Release 12.5(x) and onward, Push Notifications is not supported when Smart Licensing is configured with Specific License Reservation. The Specific License Reservation feature must be disabled for Push Notifications to work.

Certificate Prerequisites

- If MRA is configured, you must exchange certificates between Unified Communications Manager, the IM and Presence Service, and Cisco Expressway-C. We recommend that you use CA-signed certificates with the same CA for each system. In this case:
  - Install the CA root certificate chain on each system (for Unified Communications Manager and the IM and Presence Service install the certificate chain to the tomcat-trust store).
  - For Unified Communications Manager, issue a CSR to request CA-signed Cisco Tomcat and Cisco CallManager certificates.
  - For the IM and Presence Service, issue a CSR to request CA-signed Cisco Tomcat certificates.

Note If you use different CAs, you must install each CA's root certificate chain on Unified Communications Manager, IM and Presence Service, and Expressway-C.

Note You can also use self-signed certificates for both Unified Communications Manager and the IM and Presence Service. In this case, you must upload onto Expressway-C the Cisco Tomcat and Cisco CallManager certificates for Unified Communications Manager and a Cisco Tomcat certificate for the IM and Presence Service.

Push Notifications Configuration Task Flow

Complete the following tasks to configure Cisco Unified Communications Manager and IM and Presence Service clusters for Push Notifications.

Before you begin

Push Notifications Prerequisites, on page 24

Procedure

	Command or Action	Purpose
Step 1	Synchronize Licenses, on page 27	Release 11.5(1)SUx only. Synchronize your system licensing in Cisco Prime License Manager. This is a mandatory task regardless of whether you have added new licenses.

	Command or Action	Purpose
		Note You can skip this task for Cisco Unified Communications Manager Release 12.0(1) and later as Prime License Manager is replaced by Smart Licensing.
Step 2	Open Ports for Push Notifications, on page 28	Open the ports that are required for Push Notifications.
Step 3	Enable Push Notifications, on page 29	Onboard the Cisco Unified Communications Manager and IM and Presence Service clusters for Push Notifications.
Step 4	Enable Push Notifications High Availability, on page 30	For IM and Presence deployments, enable Push Notifications High Availability.
Step 5	Configure OAuth Refresh Logins, on page 31	Complete this set of tasks to deploy OAuth Refresh Logins for faster Cisco Jabber logins.
Step 6	Refresh Settings from Expressway-C, on page 34	On the Expressway-C, refresh your Unified Communications Manager servers to allow for a resync of the Authz certificate. After you are done, restart the Expressway-C.
Step 7	Restart Expressway-E, on page 34	If you are deploying the IM and Presence Service, you must restart Expressway-E.
Step 8	Configure Troubleshooting Options, on page 35	Configure troubleshooting parameters that determine how often Cisco Unified Communications Manager sends Push Notifications alarms to the Cisco Cloud, and for which alarm severities.

Note For Mobile and Remote Access (MRA) deployments with Cisco Expressway, see the Mobile and Remote Access via Cisco Expressway Deployment Guide for information about Push Notifications with Expressway.

Synchronize Licenses

For 11.5(1)SU systems, use this procedure in Cisco Prime License Manager to synchronize your system licensing. This is a mandatory task to enable Push Notifications for on-premises deployments, regardless of whether you have updated your licensing.

Note This task is required for Cisco Unified Communications Manager 11.5(1)SU releases only. You can skip this task for Release 12.0(1) and higher as Smart Licensing replaces Prime License Manager.

Before you begin

For details on licensing, including procedures for adding licenses or product instances, refer to the Cisco Prime License Manager User Guide.

Procedure

Step 1 In Cisco Prime License Manager, select the **Product Instance** tab.

Step 2 Click **Synchronize Licenses**.

Open Ports for Push Notifications

Ensure that the following ports are open for Push Notifications support from Cisco Unified Communications Manager and the IM and Presence Service.

Table 5: Port Requirements for Push Notifications

From	To	Port and Protocol	Description
Unified CM and IM and Presence Service	Cisco cloud	443/TLS	HTTPS-based communications for Push Notifications: • Subscription requests from Unified CM publisher node to Fusion Onboarding Service at `fos-a.wbx2.com` • Authentication requests to Common Identity Service at `idbroker.webex.com` • Push notifications to the Push REST service at `push.webexconnect.com` This port should be open for all cluster nodes.

Note

- For Apple devices, refer to Use Apple products on enterprise networks - Apple Support.

  For Android devices, refer to Android Enterprise Network Requirements - Android Enterprise Help (google.com).

Note In addition, port 9966 is used internally by the Cisco Push Notification Service to communicate with the Cisco CallManager Service on all Unified Communications Manager cluster nodes. This port must be open in the firewall if communication between nodes in your cluster pass through a firewall (for example, the nodes are located in a different subnet if as an example they are clustered over the WAN). In this case, this port must be open in the firewall so that these services can communicate.

Enable Push Notifications

Use this procedure to enable Push Notifications within the Cisco Unified Communications Manager and the IM and Presence Service cluster.

Before you begin

Make sure of the following:

- Port 443 must be open from the Unified Communications Manager publisher node for outbound HTTPS requests.
- Both the **Cisco Push Notification Service** and the **Cisco Management Agent Service** network services must be running in Cisco Unified Serviceability. Both services are enabled by default.

Procedure

Step 1 Log in to the Cisco Unified Communications Manager publisher node.

Step 2 From Cisco Unified CM Administration, choose **Advanced Features** > **Cisco Cloud Onboarding**.
The page may take a minute to load while Unified Communications Manager checks whether the Cisco cloud is reachable, and whether certificates are present.

Step 3 Click the **Generate Voucher** button to synchronize system licensing.

Step 4 Check the **Enable Push Notifications** check box.

Step 5 Check the **I want Cisco to manage the Cisco Cloud Service CA Certificates required for this trust** check box to have the system update certificates automatically.

Note If you check this check box, Cisco installs your cloud certificate requirements automatically. However, if a new certificate requirement is added that was not included in the file that you used to install your system, you may need to obtain cloud certificates manually. For information on uploading certificates manually, see Certificates for Cloud Connection, on page 49.

Step 6 If you require an HTTP(S) Proxy to reach the Cisco cloud, check the **Enable HTTP(S) Proxy** check box and enter the server details.

Note Cisco supports Basic and Digest authentication for the proxy server. The recommended authentication method is digest authentication.

Step 7 Click **Save**.

Step 8 Restart the Cisco Tomcat service on all nodes in the cluster to install Cisco-managed certificates.

a) Log in to the Command Line Interface.
b) Run the `utils service restart Cisco Tomcat` command.
After the Cisco Tomcat service restarts, the Status in the **Cisco Cloud Onboarding Configuration** window displays the message "Cisco Cloud Onboarding Pending".

Step 9 In the **Cisco Cloud Onboarding Configuration** window, make sure that the **Enable Push Notifications** and the **I want Cisco to manage the Cisco Cloud Service CA Certificates required for this trust** check boxes are still checked. You may need to recheck them.

Step 10 (Optional) Configure troubleshooting settings to ensure that system issues can be resolved quickly. See the online help for field descriptions.

a) Check the **Send Troubleshooting Information to the Cisco Cloud** check box.
b) Check the **Send encrypted PII to the Cisco Cloud for troubleshooting** check box.

Step 11 Click **Save**.
The cluster initiates a Push Notifications subscription request. When the request completes, and Push Notifications is enabled, the **Status** displays the message "Cloud Onboarding Completed".

Note Restart the Unified Communications Manager Push Notification Service (CPNS).

Step 12 If your deployment includes the IM and Presence Service, restart the **Cisco XCP Config Manager** and **Cisco XCP Router** service for all IM and Presence Service cluster nodes:

a) Click the **Control Center - Network Services** link that appears in the **Status** area of the **Cisco Cloud Onboarding** window. If no link appears, log in to the Cisco Unified Serviceability interface and select **Tools** > **Control Center - Network Services**.
b) From the **Server** drop-down list, choose the IM and Presence database publisher node, and click **Go**.
c) Select the **Cisco XCP Config Manager** service and click **Restart**.
d) Select the **Cisco XCP Router** service and click **Restart**.
e) Repeat this step for all IM and Presence cluster nodes.

Note If you get a message that says "*No phones are enabled in the Device Defaults page to use Activation Code Onboarding*", it doesn't mean that the onboarding has failed, but it indicates that no devices in the **Device Defaults** window have been configured to use the activation code for the On-premise Onboarding method.

Note The Unified Communications Manager Push Notification Service (CPNS) needs to be restarted whenever there are updates in the Unified CM onboarding page.

Note Restarting the **Cisco XCP Router** does not update the **Status** message in the **Cisco Cloud Onboarding Configuration** window. If you complete the above procedure for all nodes and then return to the **Cisco Cloud Onboarding Configuration** window, the **Status** message will still say that you need to restart the Cisco XCP router. However, you need restart it only once on each IM and Presence cluster node.

Note To disable Push Notifications, uncheck the **Enable Push Notifications** check box and click **Save**. After saving, restart the **Cisco XCP Router** on all IM and Presence Service cluster nodes.

Enable Push Notifications High Availability

Use this procedure to confirm that Push Notifications High Availability is enabled on the IM and Presence Service. This feature is required to provide redundancy and failover for Cisco Jabber on Android or iOS clients that are in suspended mode.

Note Cisco Webex clients use the Cisco Webex cloud for messaging rather than the IM and Presence Service.

Procedure

Step 1 From Cisco Unified CM IM and Presence Administration, choose **System** > **Service Parameters**.

Step 2 From the **Server** drop-down, choose an IM and Presence node.

Step 3 From the **Service** drop-down, choose **Cisco XCP Router (Active)**.

Step 4 Under **Push Notifications (Clusterwide)**, set the **Push Notifications High Availability** service parameter to **Enabled**.

Step 5 Click **Save**.

Step 6 If you edited the setting of this service parameter, restart the **Cisco XCP Router** on all IM and Presence nodes. Otherwise, you can go to the next task:

a) From Cisco Unified Serviceability, choose **Tools** > **Control Center - Network Services**.
b) From the **Server** drop-down, choose an IM and Presence cluster node and click **Go**.
c) Select **Cisco XCP Router** and click **Restart**.
d) Repeat this procedure on all IM and Presence cluster nodes.

Configure OAuth Refresh Logins

Complete these tasks to set up OAuth Refresh Logins, an optional feature that provides a faster login for Cisco Jabber and Cisco Webex clients.

Note OAuth Refresh Logins are enabled by default in Cisco Expressway, but are disabled by default in Unified Communications Manager. If you use the default settings for both systems, a configuration mismatch occurs.

Procedure

	Command or Action	Purpose
Step 1	Configure OAuth Refresh Logins in Unified Communications Manager, on page 32	Configure Refresh Logins with OAuth access tokens and refresh tokens in Unified Communications Manager. **Note** OAuth Refresh Logins are an optional deployment in Unified Communications Manager.
Step 2	Confirm OAuth Configuration in Expressway, on page 33	If you have Cisco Expressway deployed, make sure that the OAuth Refresh Login configuration on Expressway matches your Unified Communications Manager configuration.

	Command or Action	Purpose
Step 3	Enable OAuth on Unity Connection, on page 33	In Cisco Unity Connection, enable OAuth Refresh Logins and assign the Unified Communications Manager publisher node as an Authz server.

Configure OAuth Refresh Logins in Unified Communications Manager

Use this procedure in Unified Communications Manager to configure Refresh Logins with OAuth access tokens and refresh tokens for Cisco Jabber and Cisco Webex clients. OAuth Refresh Logins provide a streamlined login flow that doesn't require users to re-login after network changes.

Note To ensure compatibility, make sure that the various Unified Communications components of your deployment all support refresh logins. Once OAuth Refresh Logins are enabled, disabling the feature requires you to reset all Jabber and Webex clients.

Caution We recommend that you enable OAuth Refresh Logins, which are disabled by default in Unified Communications Manager, but are enabled by default in Cisco Expressway. If you are have both systems deployed, and you are using the default settings, you must either enable Refresh Logins in Unified Communications Manager or disable them in Cisco Expressway. Otherwise, a configuration mismatch results.

Procedure

Step 1 From Cisco Unified CM Administration, choose **System** > **Enterprise Parameters**.

Step 2 Under **SSO Configuration**, do either of the following:

- Choose the **OAuth with Refresh Login Flow** enterprise parameter to **Enabled** to enable OAuth Refresh Logins.
- Choose the **OAuth with Refresh Login Flow** enterprise parameter to **Disabled** to disable OAuth Refresh Logins. This is the default setting.

Step 3 If you enabled OAuth Refresh Logins, configure expiry timers for access tokens and refresh tokens by configuring the following enterprise parameters:

- **OAuth Access Token Expiry Timer (minutes)**—This parameter specifies the expiry timer, in minutes, for individual OAuth access tokens. The OAuth access token is invalid after the timer expires, but the Jabber client can request and obtain new access tokens without the user having to re-authenticate so long as the refresh token is valid. The valid range is from 1 - 1440 minutes with a default of 60 minutes.
- **OAuth Refresh Token Expiry Timer (days)**—This parameter specifies the expiry timer, in days, for OAuth refresh tokens. After the timer expires, the refresh token becomes invalid and the Jabber client must re-authenticate to get a new refresh token. The valid range is from 1 - 365 days with a default of 60 days.

Step 4 Click **Save**.

Note Once you've saved the configuration, reset all Cisco Jabber and Webex clients.

What to do next

Make sure that the OAuth Refresh Login configuration in Cisco Expressway matches your Unified Communications Manager setting. For details, Confirm OAuth Configuration in Expressway, on page 33.

Confirm OAuth Configuration in Expressway

If you have Cisco Expressway deployed, make sure that the OAuth Refresh Login configuration on Expressway matches your Unified Communications Manager configuration.

Note OAuth Refresh Logins are enabled by default in Cisco Expressway, but are disabled by default in Unified Communications Manager. If you use the default settings for both systems, a configuration mismatch occurs. In Unified Communications Manager, OAuth Refresh Logins are configured via the **OAuth with Refresh Login Flow** enterprise parameter.

Procedure

Step 1 Sign in to Cisco Expressway-C.

Step 2 Choose **Configuration** > **Unified Communications** > **MRA Access Control**.

- If OAuth Refresh Logins are enabled in Unified Communications Manager, set the **Authorize by OAuth token with refresh** setting to **On**. This is the default setting.
- If OAuth Refresh Logins are disabled in Cisco Unified Communications Manager, set the **Authorize by OAuth token with refresh** setting to **Off**.

Step 3 Click **Save**.

Enable OAuth on Unity Connection

If you are deploying OAuth Refresh Logins for Jabber, use this procedure to enable the feature in Unity Connection. As part of your configuration, you must also assign the Unified Communications Manager publisher node as an Authz server.

Procedure

Step 1 Enable OAuth Refresh Logins on Cisco Unity Connection:

a) From Cisco Unity Connection Administration, choose **System Settings** > **Enterprise Parameters**.
b) Configure the settings under **SSO and OAuth Configuration**.
c) Set the **OAuth with Refresh Login** enterprise parameter to **Enabled**.
d) Click **Save**.

Step 2 Add the Unified Communications Manager publisher node as the Authz server for Cisco Unity Connection:

a) From Cisco Unity Connection Administration, choose **System Setting** > **Authz Server**.
b) Do one of the following:
   - Select the server to edit an existing Authz server configuration.
   - Click **Add New** to add a new Authz server.
c) Configure the fields on the page.
d) Click **Save**.

Refresh Settings from Expressway-C

Use this procedure to refresh settings on Cisco Expressway for Push Notifications. This will allow Expressway to sync configurations and certificates with Unified Communications Manager.

Note For detailed information on Cisco Expressway configurations, see the *Cisco Expressway Administrator Guide* for your release at the Expressway Maintain and Operate Guides page.

Procedure

Step 1 Log in to Expressway-C.

Step 2 Refresh the Cisco Unified Communications Manager Administration servers:
a) On the Expressway-C, go to **Configuration** > **Unified Communications** > **Unified CM servers** .
b) Click **Refresh Servers**.
Expressway synchronizes the Authz certificate with Unified Communications Manager.

Step 3 After the servers refresh, restart the Expressway-C. Until the restart, Expressway-C doesn't recognize the push capability on the IM and Presence Service, and does not send PUSH messages to Cisco Jabber clients:
a) Select **Maintenance** > **Restart options**.
b) Click **Restart**.

Restart Expressway-E

An Expressway-E restart is required for Push Notifications with instant messages. After you enable Push Notifications on the IM and Presence Service you must restart Expressway-E. Until the restart, Expressway-E cannot recognize the push capability on IM and Presence Service, and does not send PUSH messages to the Jabber clients.

Note If your deployment does not include the IM and Presence Service, you can skip this task.

Procedure

Step 1 Log in to Expressway-E.

Step 2 Select **Maintenance** > **Restart options**

Step 3 Click **Restart**.

Configure Troubleshooting Options

Use this procedure on the Unified Communications Manager publisher node to configure parameters that determine how often you send Push Notifications alarms to the Cisco cloud, and for which alarm severities.

Before you begin

The **Cisco Management Agent Service** network service must be running for Unified Communications Manager to send Push Notifications alarms to the Cisco Cloud. You can confirm that the service is running in the **Control Center - Network Services** window of Cisco Unified Serviceability. The service is enabled by default.

Procedure

Step 1 Log in to the Command Line Interface.

Step 2 To configure how often Push Notifications alarms are sent to the cloud, run the `utils managementAgent alarms pushfrequency <minutes >` command where `<minutes>` represents an integer between 5 and 90 minutes. The default value is 30 minutes.

Step 3 To configure the minimum alarm severity for sending Push Notifications alarms to the Cisco Cloud, run the `utils managementAgent alarms minpushlevel <alarm_level>` command where `<alarm_level>` represents the minimum severity. Push Notifications alarms below this severity will not be sent to the Cisco Cloud.

For Push Notifications, the `<alarm_level>` options from most-to-least severe are as follows:

- `Critical`
- `Error` (Default value)
- `Warning`
- `Notice`
- `Information`

Step 4 If you want to send Push Notifications alarms to the Cisco Cloud immediately, and can't wait for the scheduled upload, run the `utils managementAgent alarms pushnow` command.

APNS Voucher Generation from Release 12.0 Onwards

In Release 11.5, Prime License Manager(PLM) generates, the voucher needed for APNS. With PLM going away in 12.0, this functionality is provided by Cisco Smart Software Manager (CSSM) and CSSM Satellite.

Fresh Install or Upgrade from a Version Before 11.5(1)SU2 Which Does Not Have Push Notification Feature

In Release 12.0, smart licensing is used instead of PLM. Register the Unified CM to Smart License Manager (SLM) and synchronize the voucher to Unified CM by clicking Generate Voucher on Cisco Cloud Onboarding UI. Then proceed with the onboarding process which is slightly different compared to the process for 11.5(1)SU2.

Upgrade from 11.5(1)SU2 to 12.0 and Later Releases

In this scenario, Unified CM goes to evaluation mode. Before the evaluation mode expires, register the Unified CM to SLM.

- Voucher code that is synchronized from PLM is removed from the database during the upgrade.
- If the Unified CM was onboarded before the upgrade, push notifications continue to work until the provisioning is allowed. Push notifications do not work once provisioning is disabled by smart licensing. But if push notifications are disabled during the evaluation mode, re-onboarding would be possible only after the new vouchers are synchronized from SLM and onboarding is done through the new onboarding process.
- If the Unified CM was not onboarded before the upgrade, the Unified CM must be registered to CSSM or CSSM Satellite. The voucher must be synchronized to Unified CM by clicking Generate Voucher on the Cisco Cloud Onboarding UI and onboarding must be done using the new onboarding process.
- We recommend that the you disable push notifications before upgrade and re-onboard using the new onboarding flow after the upgrade.

Push Notifications Troubleshooting

Push Notifications impacts many different components, some of which are hosted locally and some of which are in the cloud. It's important to configure Push Notifications troubleshooting so that Cisco TAC has the required information to troubleshoot system issues proactively.

Send Troubleshooting information to Cisco Cloud

By default, Unified Communications Manager sends Push Notifications troubleshooting information to the Cisco Cloud at regular intervals. Cisco may use this information for proactive debugging of Push Notifications and system components. This speeds up system troubleshooting by ensuring that Push Notifications alarms can be accessed quickly by Cisco TAC.

This option is enabled by default after Push Notifications is enabled, but administrators can disable it in the **Cisco Cloud Onboarding Configuration** window. When this option is enabled, Cisco Unified Communications Manager also generates a **Customer Cluster ID** and saves the ID in the customer's home Unified Communications Manager cluster. Customers who call Cisco TAC for Push Notifications issues must provide the ID so that TAC personnel can locate the customer's Push Notifications alarms.

Personally-Identifiable Information (PII) Encryption

You can also configure Unified Communications Manager to encrypt personally-identifiable information (PII) that is saved with the Push Notifications alarms. PII data includes any data that allows you to identify a specific person, such as a username, hostname, or device name. Select the **Send encrypted PII to the Cisco Cloud for Troubleshooting** option to enable this feature.

To provide greater security, the **Cisco Support Token** that decrypts the PII data is provided only in the **Cisco Cloud Onboarding Configuration** window of the customer's Unified Communications Manager server. Cisco cannot decrypt this data unless you provide the token. Customers who call Cisco TAC for Push Notifications issues must provide the token (assuming that PII encryption is configured) so that TAC can read the encrypted information with the Push Notifications alarms.

If you don't select this option, no personally identifiable information is sent to the Cisco Cloud.

CLI Commands for Troubleshooting Push Notifications

Push Notifications provides the following CLI commands, which can be run on the Unified Communications Manager publisher node for troubleshooting:

- **utils managementAgent alarms pushfrequency**—Run this command to configure the interval following which Cisco Unified Communications Manager sends Push Notifications alarms to the Cisco Cloud. The default value is 30 minutes.
- **utils managementAgent alarms pushlevel**—Run this command to configure the minimum severity level for which Cisco Unified Communications Manager sends Push Notifications alarms to the Cisco Cloud. The default severity is `Error`.
- **utils managementAgent alarms pushnow**—Run this command to upload Push Notifications alarms to the Cisco Cloud immediately, without waiting for the interval to expire.

Traces

You can also run traces on the Cisco Management Agent Service and the Cisco Push Notification Service. By default, traces are set to the Info level and get saved to the following location:

- Cisco Management Agent Service—`/var/log/active/cm/trace/cmas/log4j/`
- Cisco Push Notification Service—`/var/log/active/cm/trace/ccmpns/log4j/`

For details on how to configure trace, refer to the "Traces" chapter of the Cisco Unified Serviceability Administration Guide.

Cloud Services Reachability

Verify that you're able to establish connectivity with `push.webexconnect.com` and `idbroker.webex.com` from all the nodes in the Unified CM cluster. Also, check if any of your IP addresses are listed under the blocked IP address list. To verify that your IP address isn't on the blocked IP address list, see: https://help.webex.com/en-us/article/WBX1831/Unable-to-Reach-or-Access-Webex-Site.

Upgrades from 11.5(1)SU2 with Push Notifications Enabled

If you are upgrading from the 11.5(1)SU2 release and you had Push Notifications enabled in the old release, you must disable Push Notifications in the current release and then follow the onboarding process to enable Push Notifications once again. This is required due to API changes in this release that were not a part of the

11.5(1)SU2 release. Your upgraded system will not be able to send troubleshooting logs to the Cisco Cloud unless you disable Push Notifications and then follow the onboarding process for this release.

After you upgrade your system to the new release, do the following:

Procedure

	Command or Action	Purpose
Step 1	Disable Push Notifications	Follow these steps: **a.** From Cisco Unified CM Administration, choose **Advanced Features** > **Cisco Cloud Onboarding** **b.** Uncheck the following check boxes: • **Enable Push Notifications** • **Send Troubleshooting information to the Cisco Cloud** • **Send encrypted PII to the Cisco Cloud for troubleshooting** **c.** Click **Save**.
Step 2	Enable Push Notifications for this release.	For the full onboarding process, see Push Notifications Configuration Task Flow, on page 26.

Update Refresh Token Manually

If you receive a `400 Bad Request` message then your machine access token to the Push Notifications service has expired and you need to update the access token manually. Follow this process to update your access token manually.

	Step	Details
Step 1	Install a new Cisco Unified Communications Manager server using the same version as the affected machine	For installation instructions, see the Installation Guide for Cisco Unified Communications Manager and the IM and Presence Service.
Step 2	License your new node	See the "Smart Software Manager" chapter of the System Configuration Guide for Cisco Unified Communications Manager
Step 3	Upload the necessary certificate chains to tomcat-trust and onboard your new node for Push Notifications	Follow the onboarding instructions in this document.

	Step	Details
Step 4	Verify that onboarding was successful	Restart the Cisco Push Notification Service by running the `utils service restart Cisco Push Notification service` command. View logs and ensure that a token was retrieved successfully.
Step 5	Get the refresh token from your new machine	On the original node with the expired token obtain machine details by running the `run sql select * from machine account details` CLI command.
Step 6	Get the machine details from your original node	Run the `run sql * from machineaccountdetails` CLI command.
Step 7	Update the customer's refresh token	Run the `run sql update machineaccountdetails set refreshtoken=<actual_token_text>` CLI command
Step 8	Update the refresh token across your cluster	Run the following CLI command on all nodes across the Unified Communications Manager and IM and Presence Service clusters: `run sql select refreshtoken from machineaccountdetails`

Push Notifications Interactions and Restrictions

The following feature interactions and restrictions have been observed with Push Notifications.

Table 6: Feature Interactions and Restrictions for Push Notifications

Feature	Interactions and Restrictions
NAT and Firewall Connections	We recommend that you configure NAT and Firewall devices to keep idle TCP connections to the Push REST service open for at least 30 minutes. Push notifications do not get retried on new TCP connections when an error occurs on an existing connection. Keeping existing connections open ensures that errors are not introduced due to premature termination by NAT and Firewall devices.
Voice calls	For voice and video calls, where the client is in suspended mode, there may be a delay in connecting a call while the Push Notifications channel is established. After 5 seconds, if Unified CM hasn't received a ring back from the iOS device, Unified CM provides a ring on the calling device. If there is a delay in the Push Notifications process that prevents Unified CM from offering the call to the IOS device, Unified CM drops the call after 13 seconds.

Feature	Interactions and Restrictions
Push Notifications High Availability	High Availability is supported on the IM and Presence Service for Push Notifications deployments as of 11.5(1)SU3. If Push Notifications is enabled, and a node fails over, the following occurs for Cisco Jabber for Android and iOS clients: • For Cisco Jabber clients in foreground mode, the client logs in automatically to the backup node, which takes over until the main node recovers. There is no interruption in services, either when the backup node takes over, or when the main node recovers. • For Cisco Jabber clients in background mode, the backup node takes over, but there is delay before any Push Notifications are sent. Because the Jabber client is in background mode, it does not have an active connection to the network so it doesn't sign in automatically to the backup node. The backup node must recreate JSM sessions for all failed over users who were in background mode before any Push Notifications can be sent. The length of the delay depends on the system load. Testing has shown that for a 15,000 user OVA with users evenly distributed in an high-availability pair, it takes 10–20 minutes for Push Notifications to be sent following a failover. This delay is observed when the backup node takes over, and again after the main node recovers. **Note** In the event of a node failure or unexpected crash of the Cisco XCP Router, the user's IM session, including the IM history, is maintained without the need for any user action. However, if the Cisco Jabber for Android and iOS clients was in suspended mode, it will be unable to retrieve unread messages that were queued on the server when it crashed.
Stopping Push Notifications	If you want to stop Push Notifications from being delivered to your device, log out of the Cisco Jabber or Webex application.
Multiple Device Messaging (MDM)	If a user use Cisco Jabber client for desktop alongside Cisco Jabber client for mobile, push notifications follow the **last active session** rule. This means that push notifications would be sent to the Cisco Jabber client for mobile only if one of the following conditions is met: • Cisco Jabber client for mobile was the last client that the user interacted with before both the clients became inactive. • Cisco Jabber client for desktop was inactive for over 300 seconds. • Cisco Jabber client for desktop is signed out.

Local Push Notification Service

Important This section is applicable from Release 14SU3 onwards.

Note

- iOS devices running on iOS16.5 or later with Webex App 43.6 or later or Cisco Jabber 14.2 or later support this feature. Ensure that your iOS device is connected in on-premises mode.
- In this release, Local Push Notification Service (LPNS) supports notification for voice calls only.
- LPNS is not supported on Android devices and MRA users.

Note MRA users continue to receive push notifications through APNs channels. Setting up LPNS does not preclude this condition.

Currently, Webex App does not receive incoming VoIP call notifications when an iOS device operates in a Wi-Fi constrained network with no internet connection. For example, hospitals, cruise ships, airplanes, and so on. Due to lack of internet connectivity, the device does not have access to the APNS. Users expect to receive calls without any delay. However, with APNS a call is received after a few seconds delay caused by network latency. LPNS helps to resolve this issue.

When Webex App registers to the Unified Communications Manager and joins a provisioned Wi-Fi network that provides LPNS, the Webex App starts receiving notifications about incoming and missed calls. The notification displays the name and number of the calling party.

When the client is in any of the configured Wi-Fi networks, it establishes a persistent local connection to the Unified Communications Manager server. When the iOS device receives a push notification, it first tries to send it on the local server. when that fails, it sends it over the Apple Push server.

LPNS Prerequisites

To enable Local Push Notifications for on-premises deployments, onboard the Unified CM clusters for APNS. For more information, see Enable Push Notifications, on page 29.

Note You do not have to perform Step 12 in the referenced section.

You can check if LPNS is running in the **CM Services** area of the **Control Center - Network Services** window of Cisco Unified Serviceability. If available, it is listed as **Cisco Local Push Notification Service**. By default, this service is enabled.

Open Ports for LPNS

Ensure that the following ports are open for LPNS support from the Unified Communications Manager.

Table 7: Port Requirements for LPNS

From	To	Port and Protocol	Description
Webex App	Unified Communications Manager	9560/Secure WebSocket	**Note** The LPNS in a cluster uses the 9560 port to enable the mesh for High Availability.

How Local Push Connectivity Works

At startup, Webex App clients that are installed on the iOS platform register to the Unified CM for calling. Until the client remains in foreground mode, Unified CM directly sends the calls to the client. When the client is in any of the configured Wi-Fi networks, it establishes a local connection to the Unified CM server. When the Webex App receives a push notification, it tries to send it on the local server first. If that fails, it sends the push notification over the Apple Push Server.

The Webex App keeps a secure persistent connection with the Unified CM when the device is connected to the Wi-Fi network. The Unified CM delivers the incoming call notifications over this connection to the Webex App. The WebSocket connection is maintained as long as the device is connected to that specified network. If the Webex App is killed or the phone reboots, the LPNS WebSocket connection is reestablished to the Unified CM server as long as it remains connected to the specified Wi-Fi network.

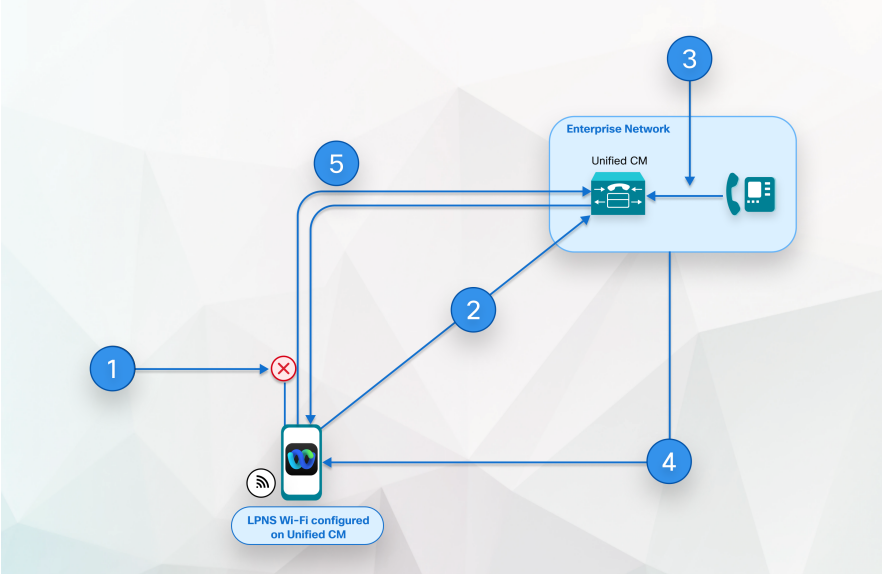
To enable efficient usage of resources, the LPNS server must know whenever the OAuth token expires or the Webex App client moves out of the specified Wi-Fi network. This is done using keepalive messages. The client sends a keepalive message to the LPNS server every 120 seconds. The LPNS server acknowledges this message and maintains the WebSocket connection. If the LPNS server doesn't receive a keepalive message (either due to token expiry or the Webex App client disconnecting from the Wi-Fi network) within 120 seconds, it closes the connection to the client and sends a 401 error message.

Note In addition to the above, LPNS session for a particular iOS device would be closed:

- when a user logs off.
- when a signed-in user is deleted.
- when a device is deleted.
- when a user moves from a provisioned Wi-Fi to a non provisioned Wi-Fi

The following image provides a breakdown of the process that takes place when a VoIP Local Push Notification is sent in a private network to an iOS device.

Figure 5: VoIP Local Push Notification Behavior in a Private Network When Sent to an iOS Device



1. Webex App in background; SIP channel to Unified CM disconnects.
2. Webex App remains connected through WebSocket until device is connected to Wi-Fi and user is logged in.
3. Webex App receives an incoming call.
4. Unified CM buffers invite and sends local push notification to Webex App through WebSocket.
5. Webex App is woken up, registers to Unified CM, and a SIP channel is established.

Configure Wi-Fi SSID

To enable LPNS notifications, you must first configure the Wi-Fi SSID.

Before you begin

Ensure that you have enabled the **OAuth with Refresh Login Flow** enterprise parameter. For more information about this parameter, see the Common Enterprise Parameters section in the System Configuration Guide for Cisco Unified Communications Manager.

Procedure

Step 1 From Cisco Unified CM Administration, choose **User Management** > **User Settings** > **UC Service**.

Step 2 Click **Add New**.

Step 3 From the **UC Service Type** drop-down, select **Jabber Client Configuration (jabber-config.xml)** and click **Next**.

Step 4 Enter the **Name** and **Description** for the Wi-Fi SSID.

Step 5 In the **Jabber Configuration Parameters** area:

a) From the **Section** drop-down, select **Phone**.
b) From the **Parameter** drop-down, select **LocalPushSSIDList**.
c) For **Value**, enter the Wi-Fi address ID. Alphanumeric characters are valid.

You can enter up to ten IDs each separated by a semicolon.

Step 6 Click **Save**.

Associate Jabber Service Profile to the End User

After you configure the Wi-Fi SSID, you must create a service profile and associate it with an end user.

Procedure

Step 1 From Cisco Unified CM Administration, choose **User Management** > **User Settings** > **Service Profile**.
Step 2 Click **Add New**.
Step 3 Enter the **Name** and **Description** for the Jabber Service Profile.
Step 4 Click **Save**.
Step 5 In the **Jabber Client Configuration (jabber-config.xml)** area, from the **Mobile** drop-down, select the UC service profile that you had created in the previous step.
Step 6 Click **Save**.
Step 7 From Cisco Unified CM Administration, choose **User Management** > **End User** and click **Find**.

The end user list appears.

Step 8 Click the **User ID** of the chosen end user.
Step 9 In the **Service Settings** area, from the **UC Service Profile** drop-down, select the **Jabber Service Profile** that you had created in steps 3–4 and click **Save**.

The devices that are associated with the selected end user get configured with the selected Jabber Service Profile. The `jabber-config.xml` file with the selected configuration settings gets downloaded to the Webex App.

LPNS Behavior If There Is Unified Communications Manager Failover

Unified Communications Manager Group is a prioritized list of up to three redundant servers to which devices can register. Each group contains a primary node and up to two backup nodes. The order in which you list the nodes determine their priority with the first node being the primary node, the second being the backup node, and the third being the tertiary node.

In the Unified CM, device pools provide a common set of configurations for a group of devices and allow you to configure devices according to their specific location information. You can assign a device to a Cisco Unified Communications Manager Group through the Device Pool Configuration.

When the LPNS service on the primary node goes down, Webex App client detects it and connects to the next priority node in the device pool.

When the LPNS service on the primary node is up, the Webex App client continues to remain connected to the node to which it had previously established a WebSocket session. The client does not attempt to fallback to higher priority node unless the current active session is closed or broken.

Client checks if a higher priority node is available before doing failover. This hunting of highest priority node before establishing a session results in a delay until a session comes through. LPNS is not able to deliver push notifications until the client connects back to one of the available LPNS servers.

High Availability of LPNS for Remote LPNS Push Call Handling

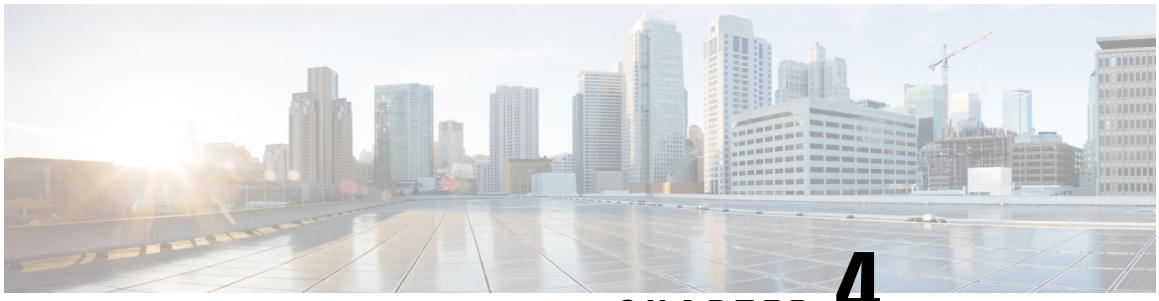
High Availability of LPNS provides failover and redundancy for the LPNS sessions of iOS Webex App clients. It ensures that active session information of every client is known to every node on which LPNS is running. This ensures seamless delivery of push notification to client irrespective of where the device's current active call processing node is.

LPNS Interactions and Restrictions

The following feature interactions and restrictions have been observed with LPNS.

Table 8: Feature Interactions and Restrictions for LPNS

Feature	Interactions and Restrictions
Network Address Translation (NAT) and Firewall Connections	We recommend that you configure NAT and firewall devices to maintain the client-WebSocket connection to the LPNS.
LPNS High Availability	High availability is guaranteed on the Unified Communications Manager provided the Webex App attempts to fail over to the next available Unified Communications Manager that is configured in its Call Manager Group. If the client WebSocket failover happens, the iOS device registers to the Unified Communications Manager whenever the Webex App moves to the foreground. Then, Unified Communications Manager delivers voice call notifications through the established WebSocket.
Certificate Requirement	• We do not recommend Self-signed certificates for the LPNS feature due to ioS certificate requirements. For more info, see https://support.apple.com/en-us/HT211025. • We recommend public CA-signed certificate confirming to iOS certificate requirements (certificate expiry duration less than 397 days) while using LPNS. • If you're using a private CA-Signed certificate confirming to iOS certificate, ensure that you import the certificates into the iOS trust store. • LPNS deployment must meet Apple's certificate requirements.



CHAPTER 4

Push Notifications (Cloud Deployment)

Cloud Deployments with Webex Messenger

At startup, Cisco Jabber or Cisco Webex for Android and iOS clients register both to Cisco WebEx Messenger and to the Apple cloud. If a Cisco Jabber or Cisco Webex for Android and iOS clients moves into the background, the standard communication channel from Webex Messenger to Cisco Jabber or Cisco Webex becomes unavailable. Push Notifications provides an alternative channel to reach the Jabber client.

For instant messages, an IM notification gets sent to the Cisco Jabber or Cisco Webex clients client via the Apple cloud. When the user clicks the IM notification, the Cisco Jabber or Cisco Webex clients moves back into the foreground, resumes the session with Webex Messenger, and downloads the instant message.

For voice and video calls, the call gets sent to the Cisco Jabber or Cisco Webex clients through the Apple cloud. When the Cisco Cisco Jabber or Cisco Webex clients receives the push notification, the client moves back to the foreground and the client rings.

Push Notifications Configuration

For IM-only cloud deployments, no configuration is required to enable Push Notifications–Webex Messenger supports Push Notifications for Cisco Jabber or Cisco Webex for Android and iOS clients by default.

To add voice and video call support, you must onboard an on-premise Unified Communications Manager for Push Notifications. For details, refer to the prerequisites and configuration tasks in the chapter Push Notifications (On-Premises Deployments), on page 7.

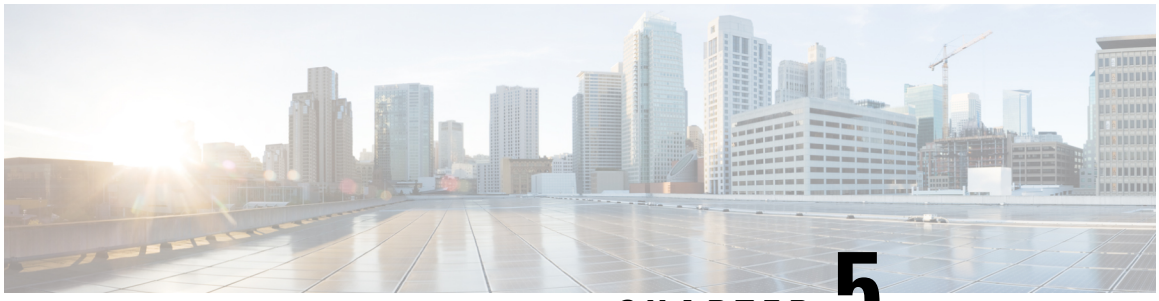
For general Cisco Webex Messenger setup, see the Cisco Webex Messenger Administration Guide.

Terminated Push Notifications for Cloud Deployments

If Webex Messenger shuts down gracefully, a terminated push notification gets sent to the Cisco Jabber or Cisco Webex for Android and iOS clients. The terminated push notification notifies the user of the server shutdown and notifies the user that all queud instant messages, Presence updates, and other XMPP stanzas (for example, chat room invites) are lost. The user must move Cisco Jabber or Cisco Webex back to the foreground to start a new session with Push Notifications enabled for the new session.

If the Webex Messenger server fails, no terminated push notification is sent. All queued instant messages, Presence updates, and XMPP stanzas that are queued on the server and waiting to be delivered to the client,

are lost. The user must move Cisco Jabber or Cisco Webex back to the foreground to begin a new session with Push Notifications enabled in the new session.



CHAPTER 5

Certificates and Performance Monitoring

Certificates for Cloud Connection

For on-premises deployments, you must obtain and upload certificates manually if you choose not to have Cisco manage cloud certificates automatically, or if a new certificate requirement is added that was not included in your system installation file. In these instances, you will have to download certificates manually from the CA site and upload them to Unified Communications Manager and IM and Presence Service. To choose this option, uncheck the **I want Cisco to manage the Cisco Cloud Service CA Certificates required for this trust** check box in the **Cloud Onboarding Configuration** window in Unified Communications Manager.

Root Certificates for Cloud Connection

Refer to the below table for the root certificates that you must obtain if you are uploading certificates manually. For details on how to upload certificates to Unified Communications Manager and IM and Presence Service, refer to the "Certificates" sections in the Security Guide for Cisco Unified Communications Manager. Make sure to select **tomcat-trust** as the **Certificate Purpose**.

Table 9: Root Certificates for Cloud Connection

Cloud hosts signed by this CA	Must be trusted by	For this purpose	Issuing CA	Fingerprint (Thumbprint) in SHA256
Common Identity (CI) service	Unified Communications Manager and IM and Presence Service	1. Cisco Unified Communications Manager requests a CI machine token to authenticate with Cisco Push REST service. 2. Secure https communication between Unified Communications Manager, IM and Presence Service, and the Cisco Push REST service.	O = IdenTrust CN = IdenTrust Commercial Root CA 1	5D 56 49 9B E4 D2 E0 8B CF CA D0 8A 3E 38 72 3D 50 50 3B DE 70 69 48 E4 2F 55 60 30 19 E5 28 AE
Cisco Webex	Cisco Unified Communications Manager andIM and Presence Service	Unified Communications Manager communicates with Fusion Onboarding Service (FOS) to provision CI machine account.	O = The Go Daddy Group, Inc. OU = Go Daddy Class 2 Certification Authority	C3 84 6B F2 4B 9E 93 CA 64 27 4C 0E C6 7C 1E CC 5E 02 4F FC AC D2 D7 40 19 35 0E 81 FE 54 6A E4

Scenarios Where Cloud Certificates can be Uploaded Automatically

The following table shows whether onboarding will be successful with the **I want Cisco to manage the Cisco Cloud Service CA certificates required for this trust** check box selected in the **Cisco Cloud Onboarding Configuration** window, or whether certificates need to be uploaded manually for onboarding to be successful.

Table 10: Scenarios Where Cloud Certificates can be Uploaded Automatically

Scenario	Installation iso file included the required certificates?	You have chosen to have Cisco manage certificate requirements	Onboarding is Successful?
Onboarding for first time	Yes	Yes	Yes
Onboarding for first time	No. The certificate requirements changed sometime after the installation iso was created	Yes	No. You must obtain and upload the new certificates manually. See the preceding table "Root Certificates for Cloud Connection".

Scenario	Installation iso file included the required certificates?	You have chosen to have Cisco manage certificate requirements	Onboarding is Successful?
You are already onboarded, but now a new certificate requirement has arisen	Your installation will not include the required certificates	Yes	Yes. The system can fetch and install new certificates automatically.

Push Notifications Alarms

The following table highlights alarms that were added to support Push Notifications call support in Unified Communications Manager and IM and Presence Service Release 11.5(1)SU3.

Table 11: Alarms for Push Notifications

Alarm	Description
Cisco CallManager Alarms	
PushNotificationServiceUnavailable	**Description**: Unable to connect with Cisco Push Notification Service. The CallManager service requires a connection in order to send Push Notifications to the Cisco Cloud. **Severity**: ALERT_ALARM **Action**: In Cisco Unified Serviceability, check that the Cisco Push Notification Service status is running. If the service is stopped, start it. If the service is running, restart it.
PushNotificationInvalidDeviceTokenResponse	**Description**: Cloud returned Error code 410 for Push Notification sent from CallManager Service due to invalid device token. Push Notification for this iOS Cisco Jabber or Cisco Webex device will be stopped until valid device token is set by iOS Cisco Jabber and Webex device. **Severity**: ERROR_ALARM **Action**: User should log out and log back in to Cisco Jabber or Webex clients on that iOS device .

Alarm	Description
PushNotificationServiceAccessTokenUnavailable	**Description:**Cisco Push Notification Service (CPNS) does not have a valid Access Token. Unified Communications Manager requires valid Access Token to send Push Notifications to Cloud. This Access Token is not available from Cloud due to authentication or network error. **Severity:** ALERT_ALARM **Action:** Check the **Cisco Cloud Onboarding Configuration** window to confirm that the onboarding process has completed successfully. If the issue persists contact Cisco TAC for further assistance..
Cisco Push Notification Service Alarms	
StartFailed	**Description:** This alarm indicates that an internal failure prevented the Cisco Push Notification Service from starting **Severity:** CRITICAL_ALARM **Action:** Try restarting the Cisco Push Notification Service. If the issue persists check the Cisco Push Notification Service application logs and contact Cisco TAC for further assistance.
AccessTokenInvalid	**Description:** This alarm indicates that current access token is expired and become invalid and new access token is unavailable. **Severity:** ALERT_ALARM **Action:** Check the **Cisco Cloud Onboarding Configuration** window to confirm that the onboarding process has completed successfully. If the issue persists, contact Cisco TAC for further assistance.
HttpClientPoolCreationError	**Description:** Indicates an error in creating the Http Client connection pool **Severity:** ALERT_ALARM **Action:** Check the **Cisco Cloud Onboarding Configuration** window and verify that the HTTP proxy settings are correct. In addition, verify that the on-boarding process has completed.
Cisco XCP Config Manager	

Alarm	Description
PushNotificationFailed	**Description:** Cisco XCP Config Manager was not able to send Push Notification. **Severity:** CRITICAL_ALARM **Action:** Check the Error Code and follow the Error action that is directed.
PushNotificationFailedInvalidDeviceToken	**Description:** An attempt to send a Push Notification to the Cisco Cloud failed due to an invalid device token. **Severity:** CRITICAL_ALARM **Action:** User should re-login to Jabber.
PushNotificationFailedInvalidAccessToken	**Description:** An attempt to send a Push Notification to the Cisco Cloud failed due to an invalid access token. **Severity:** CRITICAL_ALARM **Action:** Look at the IM and Presence Service Cisco XCP Config Manager service logs to verify whether the AccessToken was fetched and refreshed on a timely basis. If the AccessToken was fetched and refreshed it on timely basis then do check the Cisco Cloud for further debugging.
AccessTokenFetchFailed	**Description:** Cisco XCP Config Manager was unable to fetch the Access Token. **Severity:** CRITICAL_ALARM **Action:** Check the Error Code and follow the Error action that is directed
XCPConfigMgrAccessTokenIsNull	**Description:** Cisco XCP Config Manager was unable to fetch the access token. **Severity:** **Action:** IM and Presence Service nodes must connect to the Cisco cloud to obtain the Access Token. Verify the following: • Verify that the access token URL and refresh token are valid. • Verify that the proxy details are correct on the **Cisco Cloud Onboarding** window. • Check connectivity to the Cisco cloud.
Cisco Jabber Alarms	

Alarm	Description
APNSAlarm	**Description:** An iOS Jabber client was unable to process an Push Notification. **Severity:** ALERT_ALARM **Action:** Contact Cisco TAC for further assistance.
Unread Messages alert **Note** This alert appears only in releases prior to 12.5(1). The issue is fixed as of 12.5(1).	**Description**: An iOS Jabber client gets the following message: Unread messages might be deleted from server due to timeout. Please sign in Jabber to check unread messages. **Severity:** ALERT_ALARM **Conditions:** Cisco Jabber for iPhone running in the background. The user did not sign out of Cisco Jabber prior to closing the application.

Performance Counters for Push Notifications

Performance Counters for Apple Push Notifications

The following table shows counters added to the Cisco Unified Real Time Monitoring Tool to support Push Notifications for on-premises deployments of Unified Communications Manager and IM and Presence Service. Note that the counters increment only for specific APNS subscriber services (for example, APNS, APNS:beta, APNS:dev, APNS:test, APNS:load). For example, if the subscriber service is 'APNS:beta' only the APNS:beta counters increment, and none of the APNS:dev counters increment. The Cisco Jabber and Cisco Webex service type determines which subscriber service is used.

RTMT Counter	Counter Description	Counter increments if the Subscriber service is set to...
Cisco CallManager Counters		
NumberOfPushReqSent	The total number of Push Notification Requests sent by the Cisco CallManager Service.	Any APNS Subscriber Services.
NumberOfPushResReceived	The total number of Push Notification Responses received by the Cisco CallManager Service.	Any APNS Subscriber Services.
NumberOfPushErrorResReceived	The total number of Push Notification Responses received by Cisco CallManager Service with response code other than 200 OK. In case of TLS handshake failure between Cisco Push Notification Service (CPNS) and Cloud PushRest, this counter will be incremented for push requests which could not be sent due to TLS handshake failure.	Any APNS Subscriber Services.

RTMT Counter	Counter Description	Counter increments if the Subscriber service is set to...
CustomRegionNumofMsgPushReqSent	The total number of Message Push Notification requests sent from CallManager Service, when call is made to Custom Region devices, where CallKit is disabled.	Any APNS Subscriber Services.
CustomRegionNumofMissedCallMsgPushReqSent	The total number of missed call Message Push Notification requests sent from CallManager Service to Custom Region devices, where CallKit is disabled.	Any APNS Subscriber Services.
CustomRegionNumofSharedCancelMsgPushReqSent	The total number cancel call Message Push Notification requests sent from CallManager Service in Shared Line scenario to Custom Region devices, where CallKit is disabled.	Any APNS Subscriber Services.
Cisco Mobility Manager Counters		
MobilityPushNotificationCallsExtendedToMIDueToTimeout	This represents the total number of calls sent to the Mobility Identity destination where Cisco Jabber or Cisco Webex did not register after receiving push notification before the "Cisco Jabber Dual Mode (iPhone) Incoming Call Push Notification Wait Timer" expired.	Any APNS Subscriber Services.
MobilityPushNotificationCallsExtended ToJabber	This represents the total number of calls sent to Cisco Jabber where Cisco Jabber registers successfully after receiving push notification before the "Jabber Dual Mode (iPhone) Incoming Call Push Notification Wait Timer" expired.	Any APNS Subscriber Services.
Cisco XCP Config Manager Counters		
NumberOfPushSuccess	Number of successful Push Notifications sent.	Any APNS Subscriber Services.
NumberOfPushFailure	Number of failed attempts to send Push Notifications.	Any APNS Subscriber Services.
TargetInvalid	Total number of Push Notification failures due to an invalid target.	Any APNS Subscriber Services.
TargetExpired	Total number of Push Notification failures due to an expired target.	Any APNS Subscriber Services.
Cisco XCP Push Counters		
PushEnabledSessionsApns	Number of push enabled sessions for APNS clients with APNS as the subscriber service. The counter is incremented when push notifications is enabled and decrements when push notifications is disabled or a session terminates.	APNS

RTMT Counter	Counter Description	Counter increments if the Subscriber service is set to...
PushEnableReqRcvdApns	Number of push enable requests received for clients with APNS as the subscriber service, during the 60 seconds interval. This counter resets to 0 every 60 seconds.	APNS
PushErrorsApns	Number of push errors received during the 60 secondsinterval. This counter resets to 0 every 60 seconds.	APNS
PushSentSilentApns	Number of messages sent to sessions in silent mode during the 60 secondsinterval. This counter resets to 0 every 60 seconds.	APNS
PushSentDisconnApns	Number of messages sent to sessions in suspended state during the 60 secondsinterval. This counter resets to 0 every 60 seconds.	APNS
PushEnabledSessionsApnsBeta	Number of push enabled sessions for clients with APNS:beta as the subscriber service. The counter is incremented when push notifications is enabled and decrements when push notifications is disabled or a session terminates.	APNS:beta
PushEnableReqRcvdApnsBeta	Number of push enable requests received for clients with APNS:beta as the subscriber service, during the 60 secondsinterval. This counter resets to 0 every 60 seconds.	APNS:beta
PushErrorsApnsBeta	Number of push errors received during the 60 secondsinterval where the subscriber service is APNS:beta. This counter resets to 0 every 60 seconds.	APNS:beta
PushSentSilentApnsBeta	Number of messages sent to sessions in silent mode during the 60 secondsinterval where the subscriber service is APNS:beta. This counter resets to 0 every 60 seconds.	APNS:beta
PushSentDisconnApnsBeta	Number of messages sent to sessions in suspended state during the 60 secondsinterval where the subscriber service is APNS:beta. This counter resets to 0 every 60 seconds.	APNS:beta
PushEnabledSessionsApnsDev	Number of push enabled sessions for clients with APNS:dev as the subscriber service. The counter is incremented when push notifications is enabled and decrements when push notifications is disabled or a session terminates.	APNS:dev

RTMT Counter	Counter Description	Counter increments if the Subscriber service is set to...
PushEnableReqRcvdApnsDev	Number of push enable requests received for clients with APNS:dev as the subscriber service, during the 60 secondsinterval. This counter resets to 0 every 60 seconds.	APNS:dev
PushErrorsApnsDev	Number of push errors received during the 60 secondsinterval where the subscriber service is APNS:dev. This counter resets to 0 every 60 seconds.	APNS:dev
PushSentSilentApnsDev	Number of messages sent to sessions in silent mode during the 60 secondsinterval where the subscriber service is APNS:dev. This counter resets to 0 every 60 seconds.	APNS:dev
PushSentDisconnApnsDev	Number of messages sent to sessions in suspended state during the 60 secondsinterval where the subscriber service is APNS:dev. This counter resets to 0 every 60 seconds.	APNS:dev
PushEnabledSessionsApnsLoad	Number of push enabled sessions for clients with APNS:load as the subscriber service. The counter is incremented when push notifications is enabled and decrements when push notifications is disabled or a session terminates;	APNS:load
PushEnableReqRcvdApnsLoad	Number of push enable requests received for clients with APNS:load as the subscriber service, during the 60 secondsinterval. This counter resets to 0 every 60 seconds.	APNS:load
PushErrorsApnsLoad	Number of push errors received during the 60 secondsinterval where the subscriber service is APNS:load. This counter resets to 0 every 60 seconds.	APNS:load
PushSentSilentApnsLoad	Number of messages sent to sessions in silent mode during the 60 secondsinterval where the subscriber service is APNS:load. This counter resets to 0 every 60 seconds.	APNS:load
PushSentDisconnApnsLoad	Number of messages sent to sessions in suspended state during the 60 secondsinterval where the subscriber service is APNS:load. This counter resets to 0 every 60 seconds.	APNS:load

RTMT Counter	Counter Description	Counter increments if the Subscriber service is set to...
PushEnabledSessionsApnsTest	Number of push enabled sessions for clients with APNS:test as the subscriber service. The counter is incremented when push notifications is enabled and decrements when push notifications is disabled or a session terminates.	APNS:test
PushEnableReqRcvdApnsTest	Number of push enable requests received for clients with APNS:test as the subscriber service, during the 60 secondsinterval. This counter resets to 0 every 60 seconds.	APNS:test
PushErrorsApnsTest	Number of push errors received during the 60 secondsinterval where the subscriber service is APNS:test. This counter resets to 0 every 60 seconds.	APNS:test
PushSentSilentApnsTest	Number of messages sent to sessions in silent mode during the 60 secondsinterval where the subscriber service is APNS:test. This counter resets to 0 every 60 seconds.	APNS:test
PushSentDisconnApnsTest	Number of messages sent to sessions in suspended state during the 60 secondsinterval where the subscriber service is APNS:test. This counter resets to 0 every 60 seconds.	APNS:test

Performance Counters for Android Push Notifications

The following table shows counters added to the Cisco Unified Real Time Monitoring Tool to support Android Push Notifications for Unified Communications Manager and IM and Presence Service from Release 12.5(1)SU3 onwards.

Note Messaging counters apply to Cisco Jabber only. Cisco Webex clients use the Cisco Webex cloud for messaging rather than the IM and Presence Service.

Note FCM (Firebase Cloud Messaging) and FCM:dev counters increment when a push enabled Cisco Jabber or Cisco Webex clients user logs in from Android device using FCM or FCM:dev as the subscriber service.

RTMT Counter	Counter Description	Counter increments if the Subscriber service is set to...
Cisco XCP Push Counters		

RTMT Counter	Counter Description	Counter increments if the Subscriber service is set to...
PushEnabledSessionsFcm	Number of push enabled sessions for clients with FCM as the subscriber service. The counter is incremented when a push enabled Cisco Jabber or Cisco Webex user logs in on Android device using FCM as subscriber service and decrements when push notifications are disabled or a client session terminates.	FCM
PushEnableReqRcvdFcm	Number of push enable requests received by the IM and Presence server for clients with FCM as the subscriber service, during the 60 seconds interval. This counter resets to 0 every 60 seconds.	FCM
PushErrorsFcm	Number of push errors received during the 60 seconds interval where the subscriber service is FCM. This counter resets to 0 every 60 seconds.	FCM
PushSentSilentFcm	Number of messages sent to sessions in silent mode during the 60 seconds interval where the subscriber service is FCM. This counter resets to 0 every 60 seconds. A push-enabled client session moves to silent mode when the Cisco Jabber or Cisco Webex application on the Android device goes to background.	FCM
PushSentDisconnFcm	Number of messages sent to sessions in suspended state during the 60 seconds interval where the subscriber service is FCM. This counter resets to 0 every 60 seconds. A push enabled client session moves to suspended state when the Cisco Jabber or Cisco Webex application on the Android device goes to background and the network connection is terminated.	FCM
PushEnabledSessionsFcmDev	Number of push enabled sessions for clients with FCM:dev as the subscriber service. The counter is incremented when a push enabled Cisco Jabber or Cisco Webex user logs in on Android device using FCM:dev as subscriber service and decrements when push notifications are disabled or a client session terminates.	FCM:dev

RTMT Counter	Counter Description	Counter increments if the Subscriber service is set to...
PushEnableReqRcvdFcmDev	Number of push enable requests received by the IM and Presence server for clients with FCM:dev as the subscriber service, during the 60 seconds interval. This counter resets to 0 every 60 seconds.	FCM:dev
PushErrorFcmDev	Number of push errors received during the 60 seconds interval where the subscriber service is FCM:dev. This counter resets to 0 every 60 seconds.	FCM:dev
PushSentSilentFcmDev	Number of messages sent to sessions in silent mode during the 60 seconds interval where the subscriber service is FCM:dev. This counter resets to 0 every 60 seconds. A push-enabled client session moves to silent mode when the Cisco Jabber or Cisco Webex application on the Android device goes to background.	FCM:dev
PushSentDisconnFcmDev	Number of messages sent to sessions in suspended state during the 60 seconds interval where the subscriber service is FCM:dev. This counter resets to 0 every 60 seconds. A push enabled client session moves to suspended state when the Jabber application on the Android device goes to background and the network connection is terminated.	FCM:dev

LPNS Alarms

Important This section is applicable from Release 14SU3 onwards.

The following table gives details of the alarms that were added to support LPNS in Unified Communications Manager.

Table 12: Alarms for LPNS

Cisco LPNS Alarms	Description
LocalPushNotificationInvalidOAuthToken	**Description:** Webex client responded with invalid / expired oAuth Token. CallManager will remove the connection and stop further sending of Local Push Notification to this client. **Severity:** ALERT_ALARM **Action:** Verify Webex App on Mobile connection with Cisco Unified CM for updating refresh / access token.
LocalPushNotificationServiceUnavailable	**Description:** Unable to connect with Cisco Local Push Notification Service. The CallManager service requires a connection in order to send Local Push Notifications to the Webex App on Mobile. **Severity:** CRITICAL_ALARM **Action:** Try restarting Cisco Push Notification service and Cisco Local Push Notification service. If the issue persists, check the application logs for the Cisco Local Push Notification service and contact Cisco TAC for further assistance.
LocalPushStartFailed	**Description:** This alarm indicates that an internal failure prevented the Cisco Local Push Notification Service from starting. **Severity:** ALERT_ALARM **Action:** Try restarting Cisco Local Push Notification service. If the issue persists, check the application logs for the Local Push Notification service and contact Cisco TAC for further assistance.

Performance Counters for LPNS

Important This section is applicable from Release 14SU3 onwards.

The following table gives details of the counters added to the Cisco Unified Real Time Monitoring Tool to support LPNS for on-premises deployments of Unified Communications Manager.

Table 13: Performance Counters for LPNS

RTMT Counter	Counter Description	Counter increments if the Subscriber service is set to...
Cisco CallManager Counters		
NumberOfLocalPushReqSent	The total number of Local Push Notification requests sent by the Cisco CallManager service. This counter will be updated from the node where the Local Push request is sent.	Any LPNS Subscriber Services.
NumberOfLocalPushResReceived	The total number of Local Push Notification responses received by the Cisco CallManager service. This counter will be updated from the node where the Local Push response is received.	Any LPNS Subscriber Services.
NumberOfLocalPushTimout	The total number of Local Push Notification requests which were timed out.	Any LPNS Subscriber Services.
NumberOfLocalPushErrorResReceived	The total number of Local Push Notification responses received by Cisco CallManager Service with error response code.	Any LPNS Subscriber Services.
NumberofMissedCallLocalPushReqSent	The total number of missed call Local Push Notification requests sent from CallManager Service to devices.	Any LPNS Subscriber Services.
NumberofSharedCancelLocalPushReqSent	The total number of cancel call Local Push Notification requests sent from CallManager Service in Shared Line scenario to devices.	Any LPNS Subscriber Services.