



Planning and Designing Successful Cloud Calling Deployments with Webex Calling

Johannes Krohn – Principal Technical Marketing Engineer
BRKCOL-2787

Webex App

Questions?

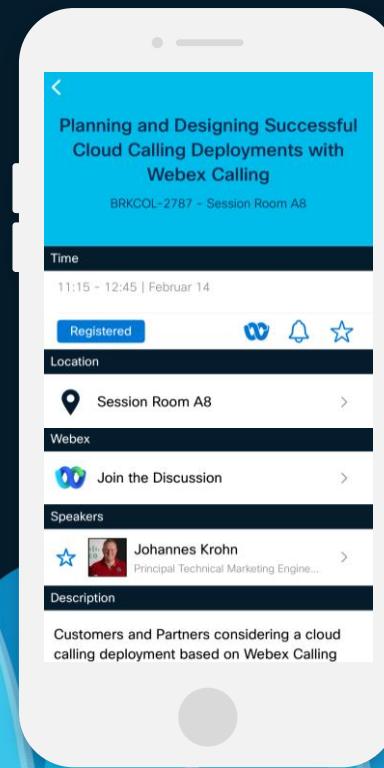
Use the Webex app to chat with the speaker after the session

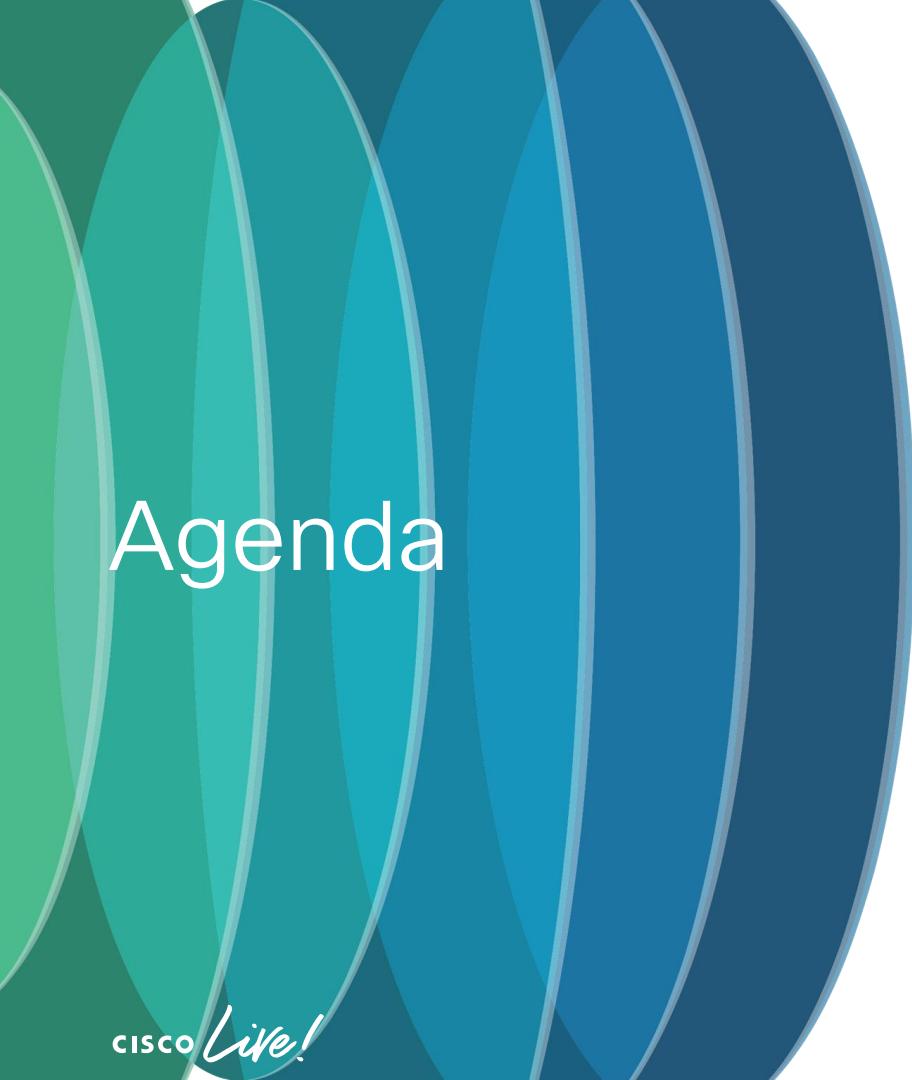
How

- 1 Find this session in the Cisco Events mobile app
- 2 Click “Join the Discussion”
- 3 Install the Webex app or go directly to the Webex space
- 4 Enter messages/questions in the Webex space

Webex spaces will be moderated by the speaker until February 28, 2025.

CISCO *Live!*



The background of the slide features a repeating pattern of overlapping circles in various shades of green, teal, and blue, creating a dynamic, modern look.

Agenda

- Introduction
- Solution Overview
- PSTN Options
- Calling Regions
- Location Considerations
- Dial Plan
- Operating Modes
- Closing

Please download and install the
Slido app on all computers you
use



Where are you on your Webex Calling journey?

- ① Start presenting to display the poll results on this slide.

Solution Overview

Webex Calling



Enterprise-grade calling features



Easy-to-use and **secure**



Centralized management and administration



Hybrid deployment & Flexible migration



Mobile **First** & AI led **innovation**

Webex Calling - Architecture



Webex Calling

Services

Control Hub

Analytics | Telemetry

Directory and Contacts

Recording

APIs

Network Connectivity

Webex Edge Connect

Partner Peering

PNC

OTT

PSTN

Cisco PSTN

CCPP

Premises PSTN/SBC



Devices

- Global cloud calling platform
- Centralized administrative experience from the cloud
- Public Cloud Multi-tenant platforms
- Flexibility to provision users to best address cloud calling business needs
- Flexible PSTN options
- OTT and Private network connectivity options to fit enterprise of various sizes
- Webex App for a unified end-user experience

A complete enterprise feature set

Highlights of supported calling features

Inbound call management

- Auto attendant
- Call queue analytics
- Call routing and queuing
- Call waiting – Up to 4 calls
- Hunt group
- Inbound caller ID
- Music on hold
- Receptionist client
- Request call back
- Skills based routing
- Sequential ring

Make and receive calls

- Call forwarding, hold, transfer
- Call redial
- Directory search (Enterprise and Personal)
- Distinctive ring
- Do not disturb
- Outbound caller ID blocking
- Privacy
- Selective call rejection
- Speed Dial 100
- Three flexible PSTN options
- Availability in 120+ countries

Call history and voicemail

- Call history
- Call logs w/click to dial
- Convenience call recording
- Visual voicemail
- Voicemail transcription

Video, analog, fax, other devices

- ATA support
- Cloud-based fax
- DECT devices
- Video (point to point)

Multi call / line experience

- Alternate numbers
- Busy lamp monitoring
- Conferencing (site based)
- Exec / assistant roles
- Multi call window
- Multi line selection in App
- Multiple lines on Cisco Phones
- N-Way voice and video calling (6)
- Shared lines
- Three-way calling (variable length)
- Virtual extensions

Agent / supervisor

- Call queue analytics
- Call transfer – attended/blind
- Directed call pickup
- Monitor, coach, barge, takeover
- Skills based routing

Mobility

- Business texting
- Hot desking & hoteling
- Remote office
- Simultaneous ring
- Webex Go

Administration

- Analytics and troubleshooting
- Business continuity (CFNR)
- Call history reporting and API
- E911
- Single point of admin for Webex Suite

Integrations and partners

- MS Teams integration
- Google Chrome integration
- Recording, attendant, fax partners
- Security and safety partners
- 20+ Certified Calling Providers

PSTN Options

PSTN Options for Webex Calling

Premises PSTN

Available in 110+ countries

Continue using your existing provider

Support remote branch offices

Manage phone numbers Control Hub

Cisco Calling Plans (Cisco PSTN)

Available in the U.S., Canada, Europe, Australia and New Zealand

Single offer through Cisco and our partners

Fully integrated and managed from Control Hub

Cloud Connect for Webex Calling

Available in over 65 countries

Select from multiple world-class Cisco-certified providers

Choose providers on a site-by-site basis

Manage numbers in Control Hub



CISCO Live!



<https://blog.webex.com/cloud-calling/webex-calling-pstn-options/>

Premises PSTN and PBX interconnect

Trunks

Represents a single SIP trunk to an on-premises device. Device can be registering (CUBE) or certificate based (CUBE + 3rd party) trunk

Must be assigned to a location. If used for PSTN the country dial plan is based on location address.

Can be included in one or more route groups or can be directly associated to a dial plan.

PSTN (SIP, ISDN, ...) decoupled



Trunk

Route groups

Logical grouping of trunks (max. 10) for scale and redundancy of connections to the premises

Does not “live” in a location

Dial Plans

Dial plans allow you to route calls to on-premises destinations by use of trunks or route groups.

Specifies the routing choice (trunk or route group) for calls that match any of its dial patterns.

Dial pattern represents on-premises extensions; ESN/on-net numbers, +E.164 patterns, SIP URI domains.



Registering vs. Cert Based Trunk

Concurrent Calls	# of users serviced	Preferred Trunk Type	Connectivity
~2000 - 6500	65000	Certificate based	Interconnect
250 - 2000	20000	Certificate based	OTT
<= 250	2500	Registering trunk	OTT

Connectivity specs

- OTT: max latency 100 ms, max jitter 10 ms, max packet loss 0.2 %
- Interconnect: max latency 30 ms, max jitter 5 ms, 0 packet loss

Certificate based trunk requirements

- Public IPv4, domain, SRV
- Trusted certificate
- Inbound connections through firewall

<https://help.webex.com/en-us/article/n0xb944>

Webex Calling PSTN: Cloud Connect for Webex Calling



- PSTN access through peering with a selection of Cloud Connected partners integrated into the Webex® Calling cloud
- Partner helps enterprise procure and provision PSTN
- Fully integrated option (number ordering from within Control Hub) available in the US
- Available to service providers who serve customers with locations outside of their PSTN footprint

<https://community.cisco.com/t5/collaboration-knowledge-base/cloud-connect-for-webex-calling-global-availability/ta-p/3916211>

PSTN Options – Comparison

Cloud PSTN (Cisco Calling Plan / Cloud Connect for Webex Calling)	Premises PSTN (Trunk, Local Gateway)
No invest in on-premises GW	re-use of existing PSTN
no maintenance for on-premises GW	interconnect with PBX
No PSTN media hair-pinning*	PSTN interconnect in markets not supported by Cloud PSTN options

*calls from Webex Calling endpoint to PSTN via Local Gateway anchored on Webex Calling access; ICE media path optimization possible if ICE negotiation w/ Local Gateway host candidate succeeds

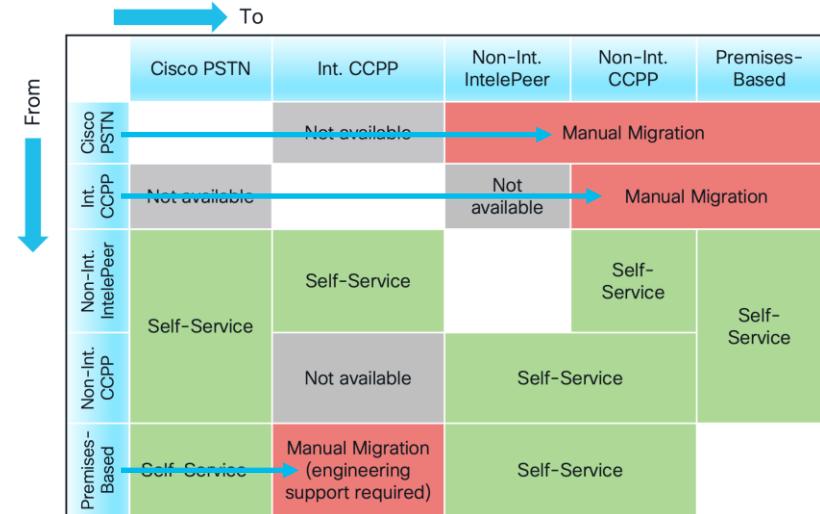
PSTN Migrations

The diagram illustrates the migration matrix for PSTN migrations. The 'From' column represents the current PSTN type, and the 'To' column represents the target PSTN type. The matrix cells indicate the migration method: 'Self-Service' (green), 'Not available' (gray), or 'Manual Migration' (red). Engineering support is required for the red 'Manual Migration' cells.

	To				
	Cisco PSTN	Int. CCPP	Non-Int. IntelPeers	Non-Int. CCPP	Premises-Based
Cisco PSTN		Not available	Manual Migration		
Int. CCPP	Not available		Not available	Manual Migration	
Non-Int. IntelPeers		Self-Service		Self-Service	Self-Service
Non-Int. CCPP	Self-Service	Not available		Self-Service	Self-Service
Premises-Based	Self-Service	Manual Migration (engineering support required)		Self-Service	

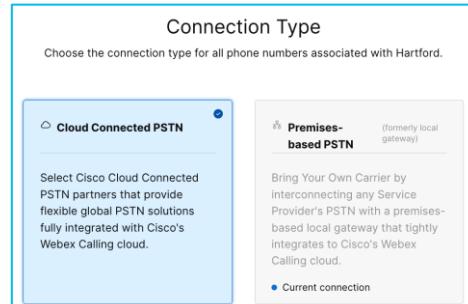
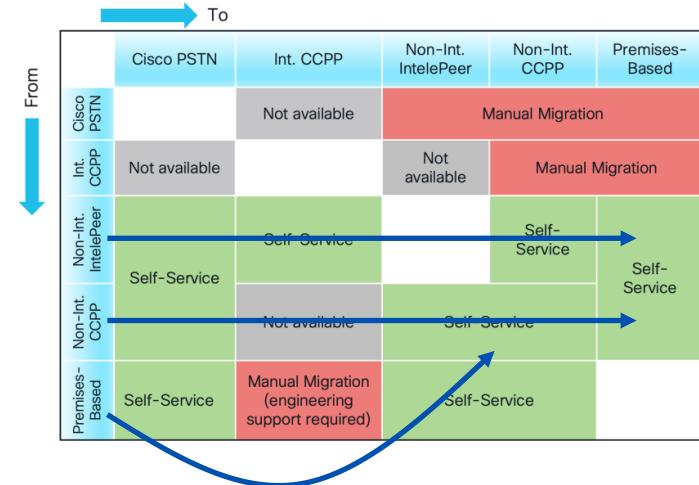
Manual Migrations

- Required for migrations
 - From Cisco Calling Plans
 - From Premises PSTN to Integrated CCPP
- Create new location
- Move TNs and users to new location
- Reconfigure services, site settings
- Can be (partially) automated by
 - Bulk operations
 - APIs



Self Service (CCPP↔Premises PSTN)

- Self-Service: change PSTN choice in Control Hub
- When changing between CCPP and premises PSTN the change is immediate
 - Need to make sure to align the change with port order dates



* I confirm that I understand that this change will immediately change the routing of PSTN calls and that Hartford has been set up correctly to accept this change. This could include porting of numbers, configuration of premises equipment and/or coordinating with PSTN providers. Porting of numbers includes: Users, Auto Attendants, Call Queues, Hunt Groups and Voicemail Portals.

Migrate to Cisco PSTN

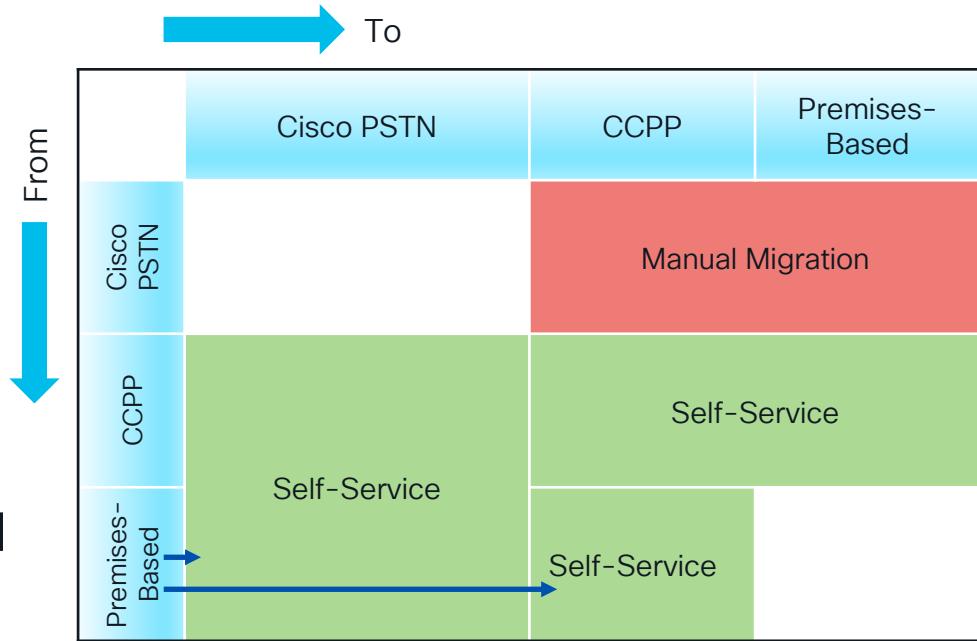
- Numbers are ported
 - Remain functional during transition period
- After initiating the change for a location you can't add/remove/move numbers until the change is complete
- Cisco initiates port order(s)
- PSTN connection change applies when all linked port orders are complete

		To				
		Cisco PSTN	Int. CCPP	Non-Int. IntelePeer	Non-Int. CCPP	Premises-Based
		Cisco PSTN	Not available	Manual Migration		
		Int. CCPP	Not available	Not available		Manual Migration
		Non-Int. IntelePeer	Self-Service	Self-Service		Self-Service
		Non-Int. CCPP	Not available	Self-Service		Self-Service
		Premises-Based	Self-Service	Manual Migration (engineering support required)	Self-Service	

PSTN Migrations

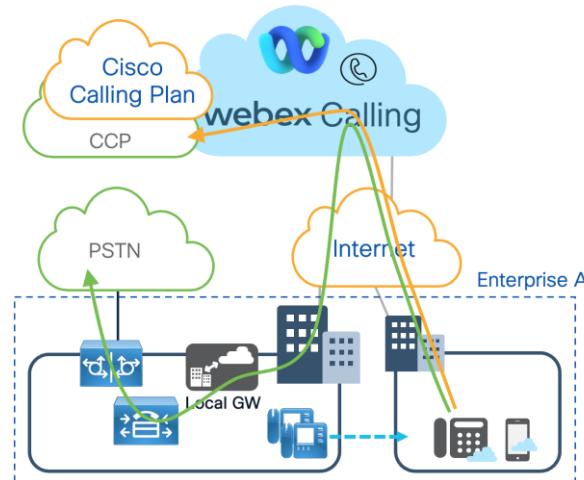
Simplified View (non-US)

- Integrated CCPP (IntelePeer) only exists in the US
- Only caveat: migrations away from Cisco PSTN require manual intervention
- Most commonly used migrations from prem to cloud PSTN are self-service



When to Move PSTN During Migrations

- Move to cloud at the end
 - Move all users to Webex Calling and only then move to cloud PSTN
 - During transition all users (prem and Webex Calling) continue to use premises PSTN
 - Webex Calling users consume premises PSTN via premises trunks
 - PSTN choice of locations switched from prem PSTN to cloud PSTN at the end
- Hybrid
 - Use cloud PSTN for Webex Calling locations right away
 - Port numbers from premises PSTN in sync w/ moving users

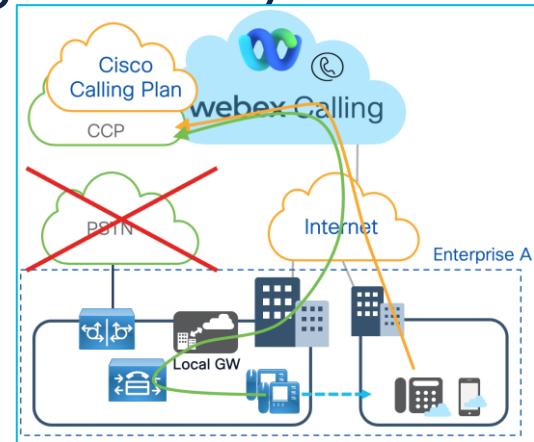


Pros/Cons

Move to cloud PSTN at the end	Hybrid: move to cloud PSTN as you go
Webex Calling locations use premises PSTN first	Webex Calling locations use cloud PSTN from day one
Switch PSTN from premises to cloud for all locations at the end	Port orders as users move
Single port order at the end	Porting parts of number ranges might be problematic (move users per location?)
Switch from premises PSTN to Cisco PSTN or CCPP as self-service	No PSTN switch for Webex Calling locations
During transition premises trunk carries on-net calls and Webex Calling PSTN traffic (scale, redundancy)	Local Gateway only carries on-net calls between Webex Calling and premises users

Why Not Move to Cloud PSTN Right Away?

- Full move to cloud PSTN at the start of the migration
- During transition period premises users consume cloud PSTN via Local GW and Webex Calling
- Not supported: Webex Calling does not allow calls between premises trunks and PSTN*
 - Cannot be used as a PSTN transit



To From	User (TN)	User (ESN/Ext)	Trunk (RL)	Trunk (DP or unknown ext)	PSTN / VON
User	✓	✓	✓	✓	✓
Premises	✓	✓	✓	✓	✗
External	✓	✗	✓	✗	✗

*see appendix for more details

Please download and install the
Slido app on all computers you
use



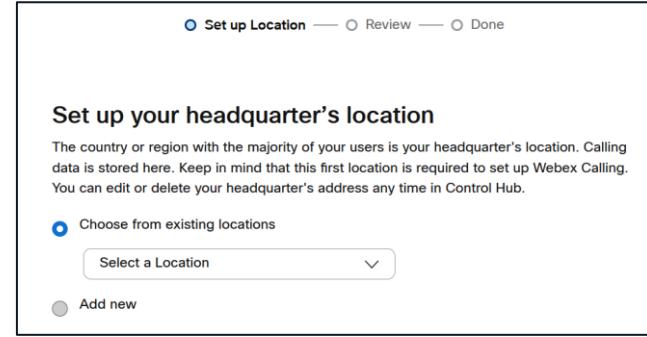
Which PSTN options do you use (or plan to use) in production?

- ① Start presenting to display the poll results on this slide.

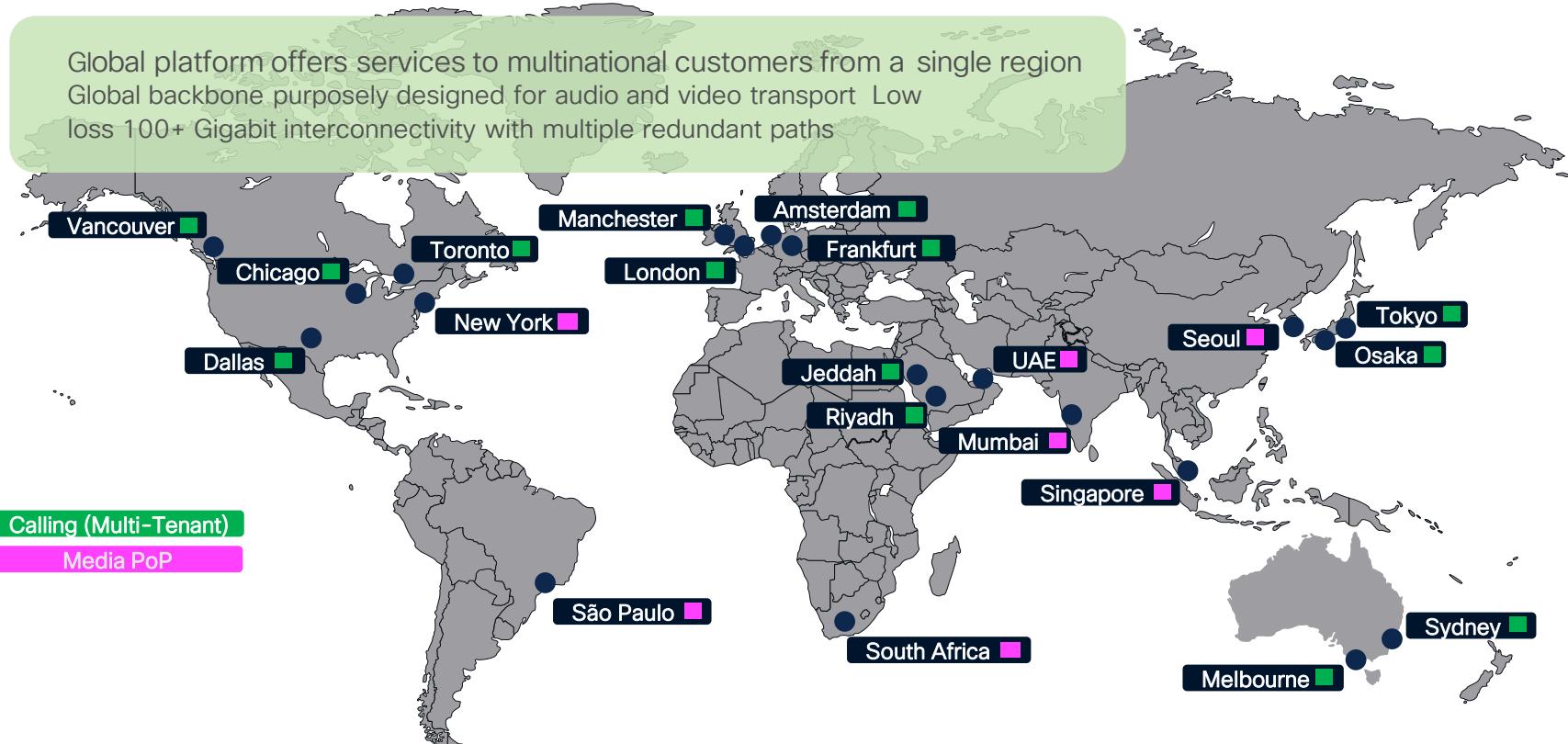
Calling Regions

Webex Calling Region Selection

- Country of first calling location (HQ) **defines the regional platform** of the “Home” calling region
 - All signaling traffic is routed to the “Home” region
 - All calling data is stored in the “Home” region
 - Calling user data, feature configuration data, media files, voicemails, ...
 - Selected during Partner provisioning of a new org or when adding the first calling location to an existing org (first time setup wizard)
- Country/Region **selection criteria**:
 - Where majority of the users reside (lowest delay in signaling traffic)
 - To comply with any data residency requirements
- Regional platform **cannot** be changed after the initial creation*



Webex Calling Global Presence

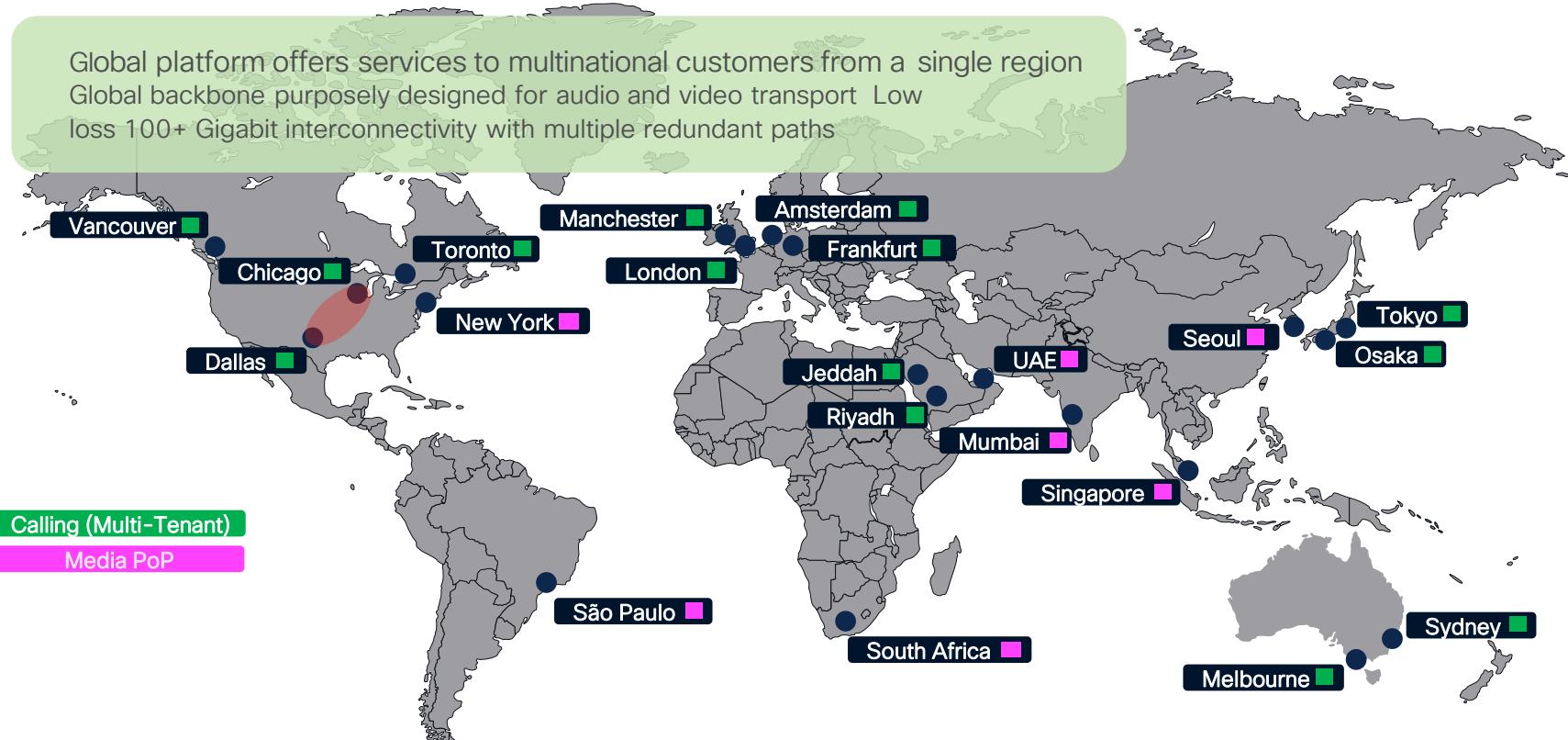


Learn more: [Global availability overview](#)

CISCO Live!

For more detail: BRKCOL-2990 - What's in a Platform? (A guided tour of the Webex cloud infrastructure)

Webex Calling Global Presence

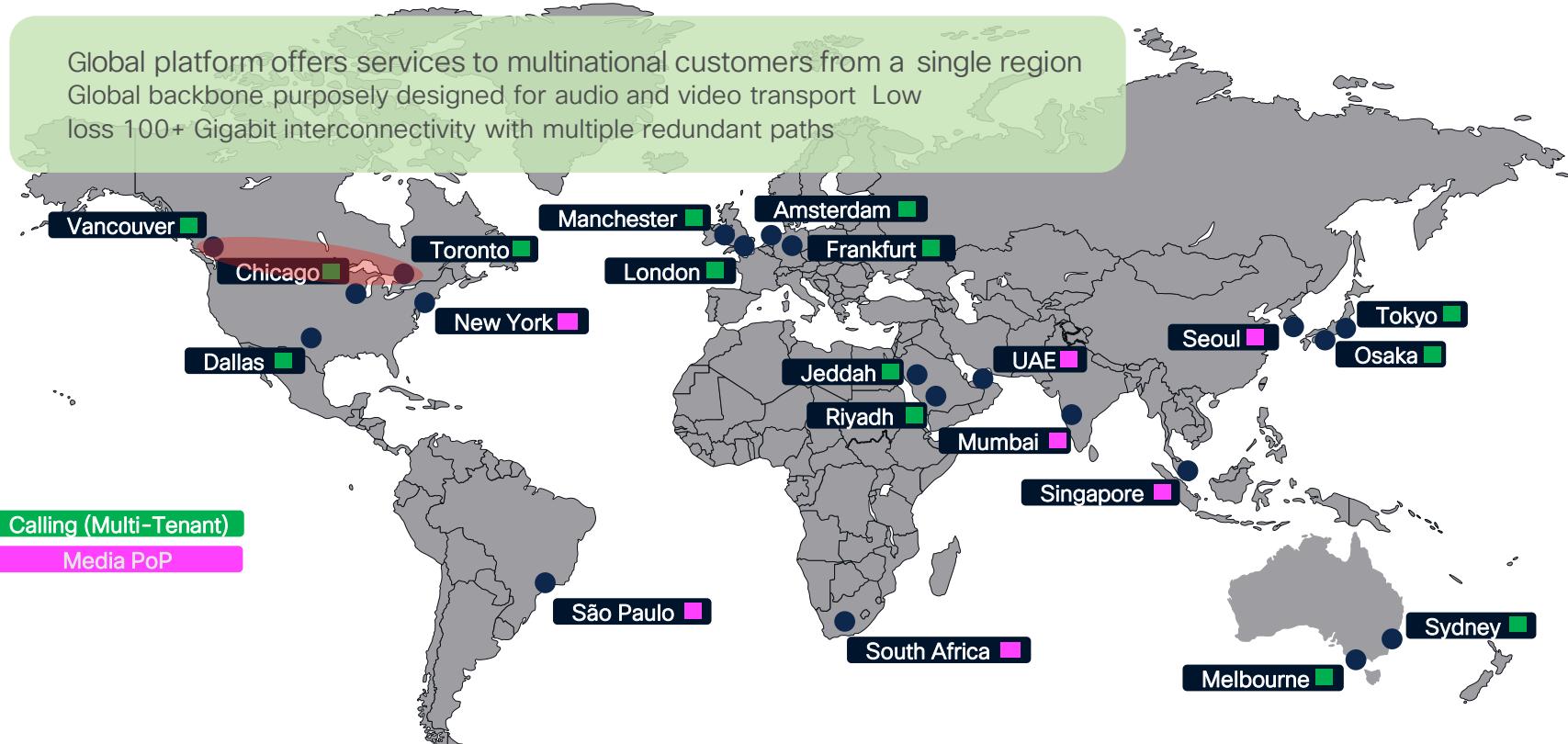


Learn more: [Global availability overview](#)

CISCO Live!

For more detail: BRKCOL-2990 - What's in a Platform? (A guided tour of the Webex cloud infrastructure)

Webex Calling Global Presence

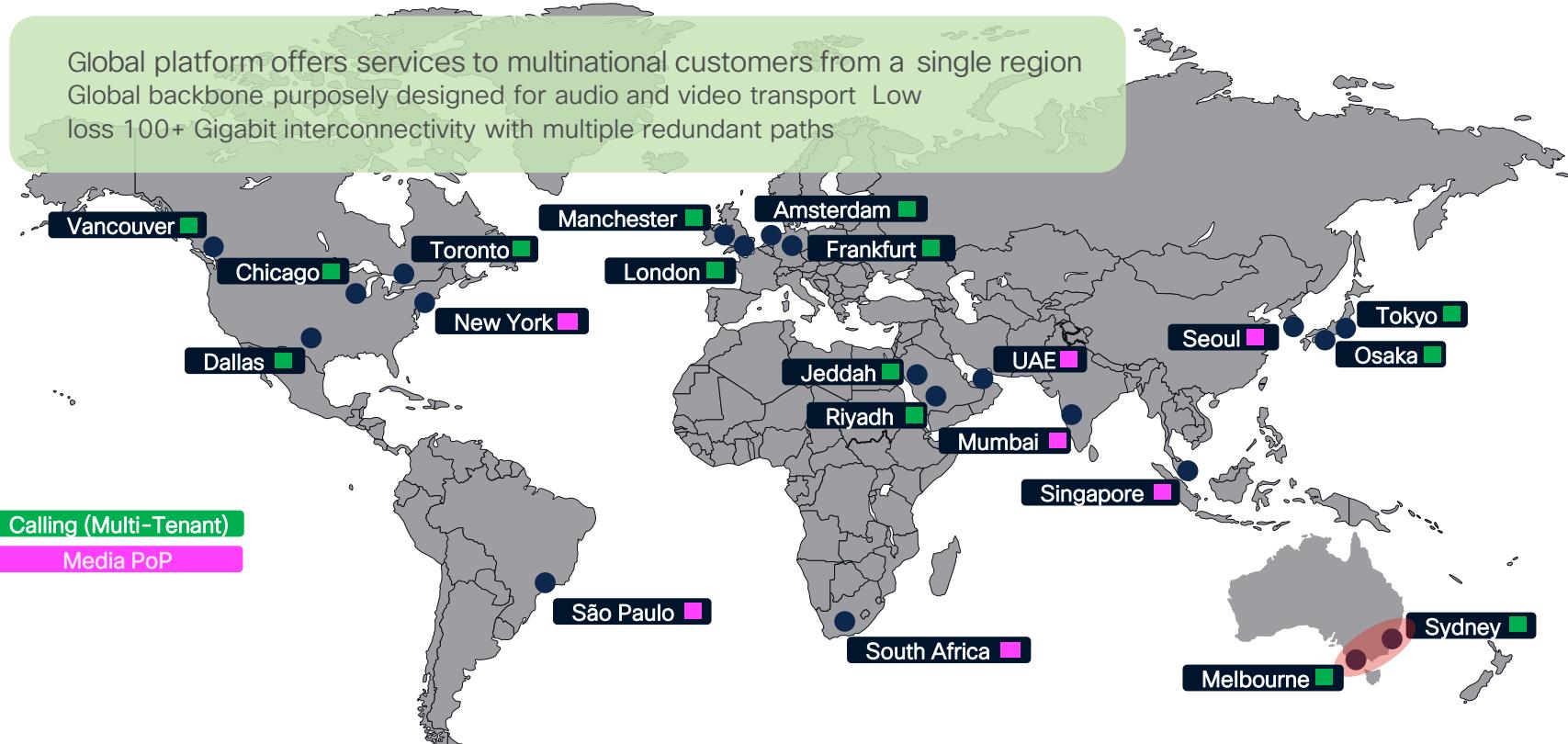


Learn more: [Global availability overview](#)

CISCO Live!

For more detail: BRKCOL-2990 - What's in a Platform? (A guided tour of the Webex cloud infrastructure)

Webex Calling Global Presence

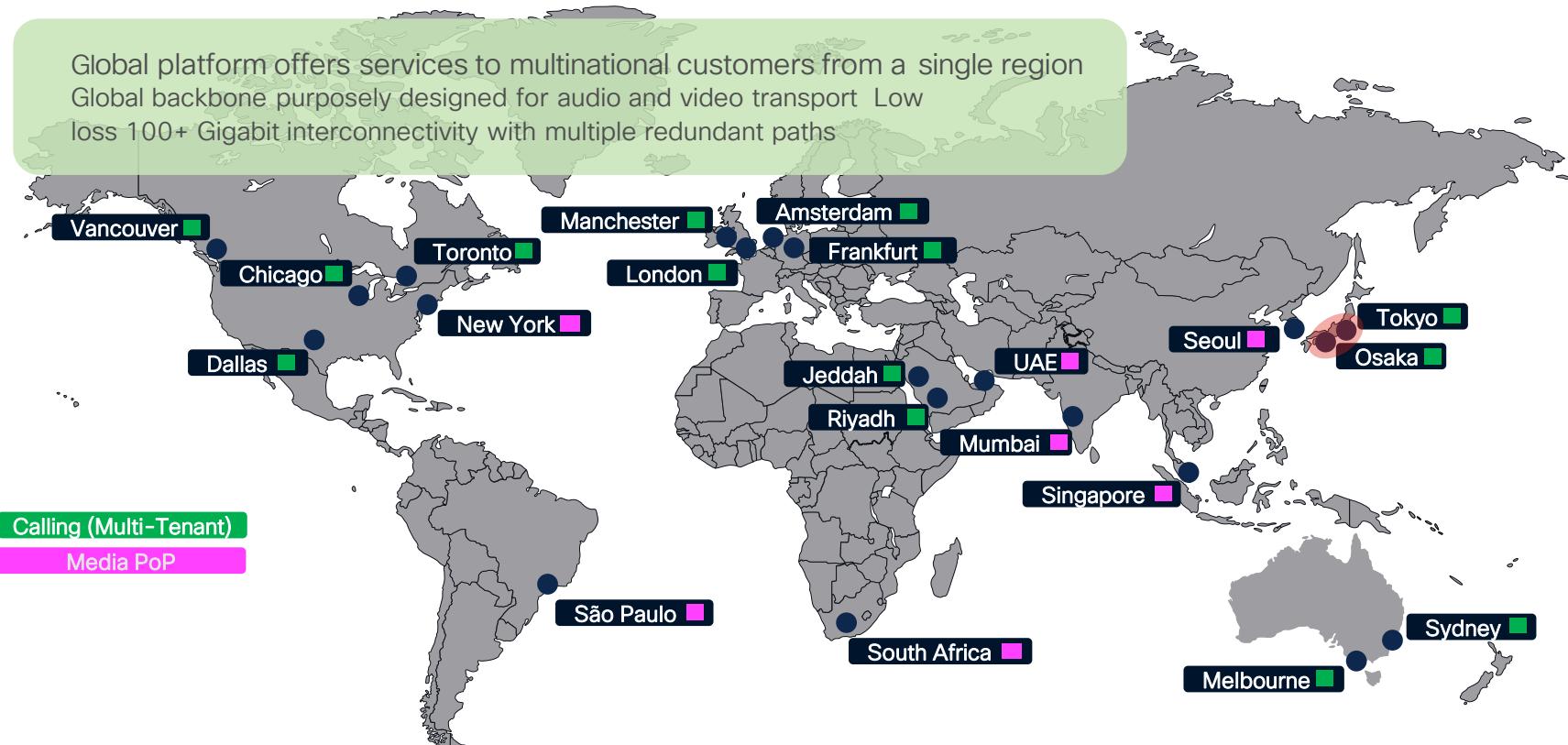


Learn more: [Global availability overview](#)

CISCO Live!

For more detail: BRKCOL-2990 - What's in a Platform? (A guided tour of the Webex cloud infrastructure)

Webex Calling Global Presence

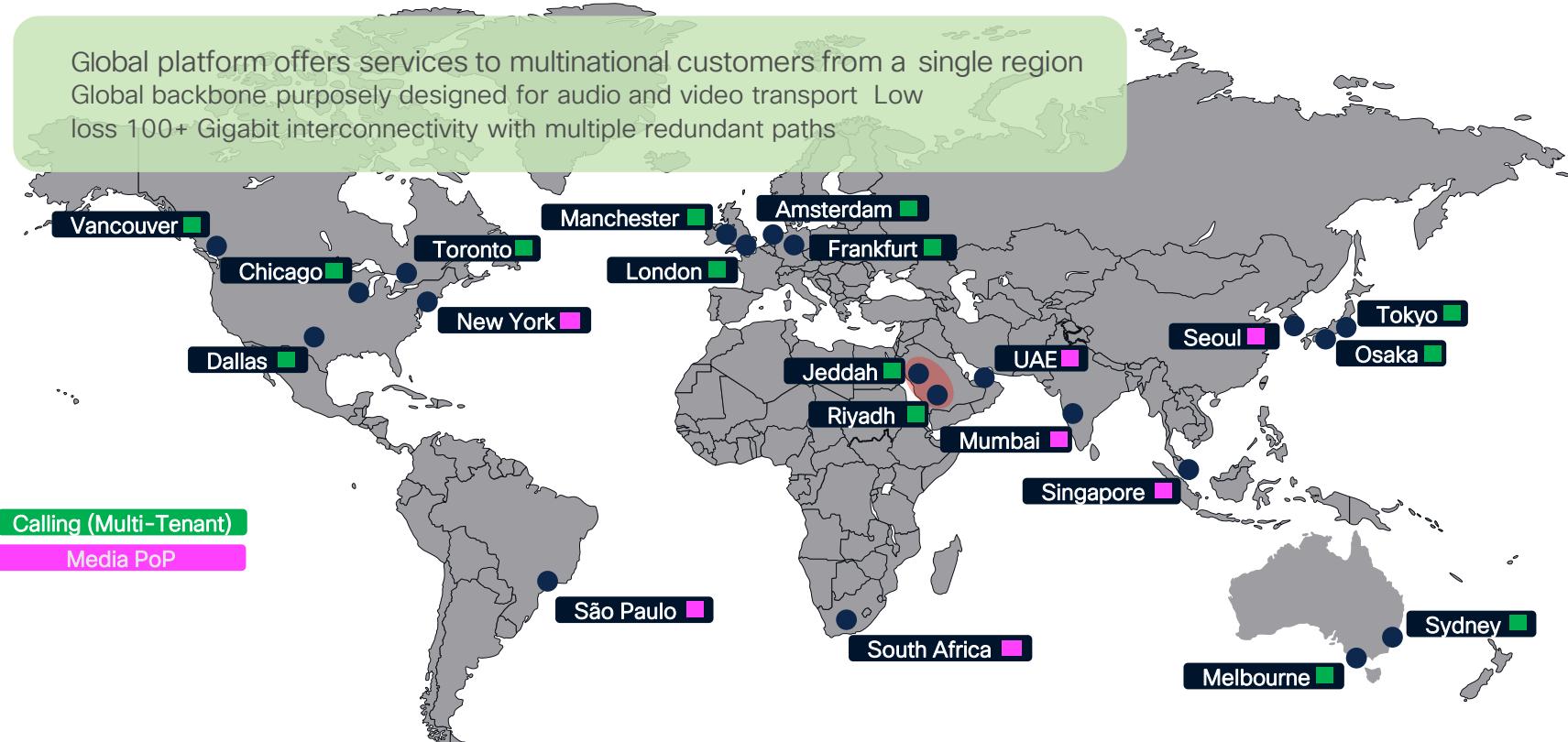


Learn more: [Global availability overview](#)

CISCO Live!

For more detail: BRKCOL-2990 - What's in a Platform? (A guided tour of the Webex cloud infrastructure)

Webex Calling Global Presence



Learn more: [Global availability overview](#)

CISCO Live!

For more detail: BRKCOL-2990 - What's in a Platform? (A guided tour of the Webex cloud infrastructure)

Webex Calling Global Presence



EU: no new customers

Manchester

Amsterdam

London

Frankfurt

EUN: new EU customers

Manchester

Amsterdam

London

Frankfurt



UK: new UK customers

Manchester

Amsterdam

London

Frankfurt

Learn more

CISCO Live!

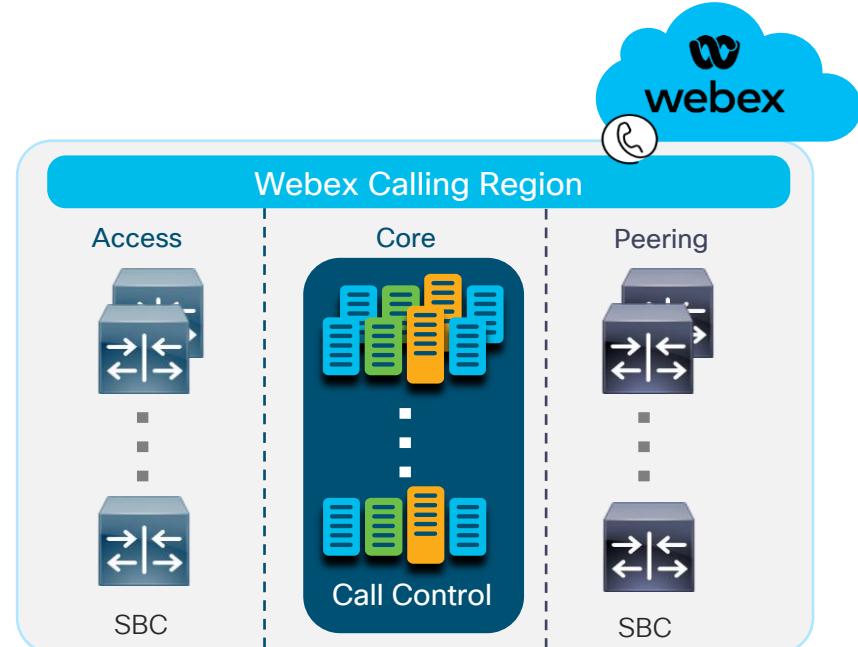
Webex Calling regional scaling

Core call control scales horizontally

- Leveraging micro services to quickly deploy/expand

SBC Resources are separated from Access and Peering

- Access for Endpoints and Local Gateways
- Peering for CCPP integration to PSTN
- Access and Peer SBCs scale horizontally



Why Media PoPs?

- Improve user experience
- Minimize RTT for cloud anchored media flows
- Especially useful for locations in regions without “close” Webex Calling instances



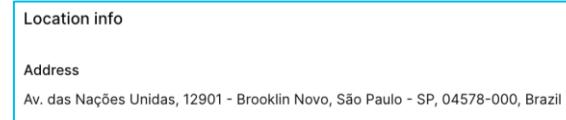
Example Media POP: Singapore

- Two full Webex Calling deployments in APJC
 - JP: Osaka, Tokyo
 - AU: Sydney Melbourne
- Challenge: APAC region too large to keep RTT within acceptable bounds
- Media POP in Singapore
 - Access: endpoint and Local Gateway registration, failover to JP (Osaka, Tokyo)
 - Peering: trunks to Cloud Connected PSTN providers
 - Media services (VM, conferencing)
 - Call Recording: local media server, call recording leg to JP (Osaka, Tokyo)



Identify Calling Region and PoP

- Closest (based on great circle distance) (media) PoP is used for registrations from each location
- Trunk details reveal Webex Calling home region and selected PoP for a location
- (Media) PoP for a location is determined when the location is created (static)
- Migration of locations created prior to PoP availability on a per-request basis
 - True-up would risk issues with customers w/ overly restrictive firewall policies
 - New OBP might be blocked by firewall policy



São Paulo ↗

Trunk > Details

Status

- Offline

Trunk Type

Registration based

Device

Cisco CUBE Local Gateway

90236926.us10.bcl.d.webex.com

Region: US

Registrar Domain

90236926.us10.bcl.d.webex.com

Trunk Group OTG/DTG

so.paulo1078470146_lgu

PoP: São Paulo

Line/Port

So.Paulo0504698976_LGU@90236926.us10.bcl.d.webex.com

gru01.sipconnect.bcl.d.webex.com

Outbound Proxy Address

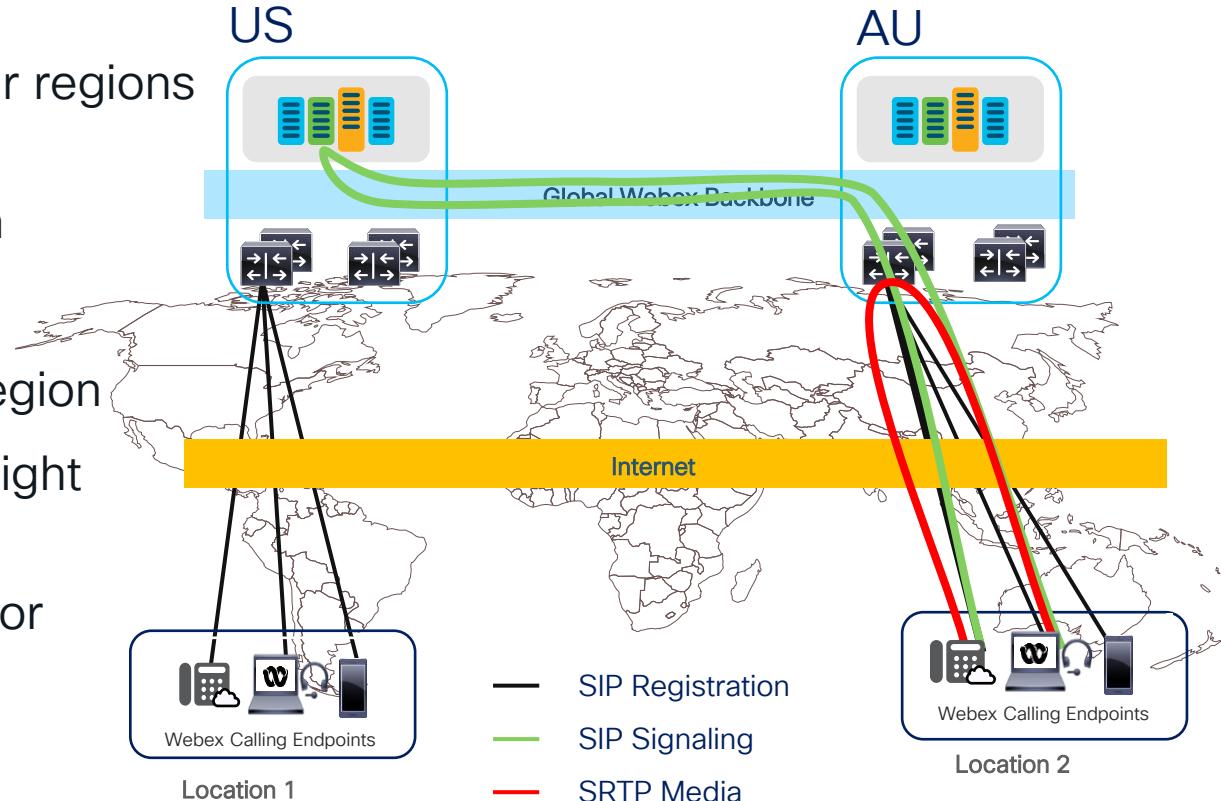
gru01.sipconnect.bcl.d.webex.com

Region: US

PoP: São Paulo

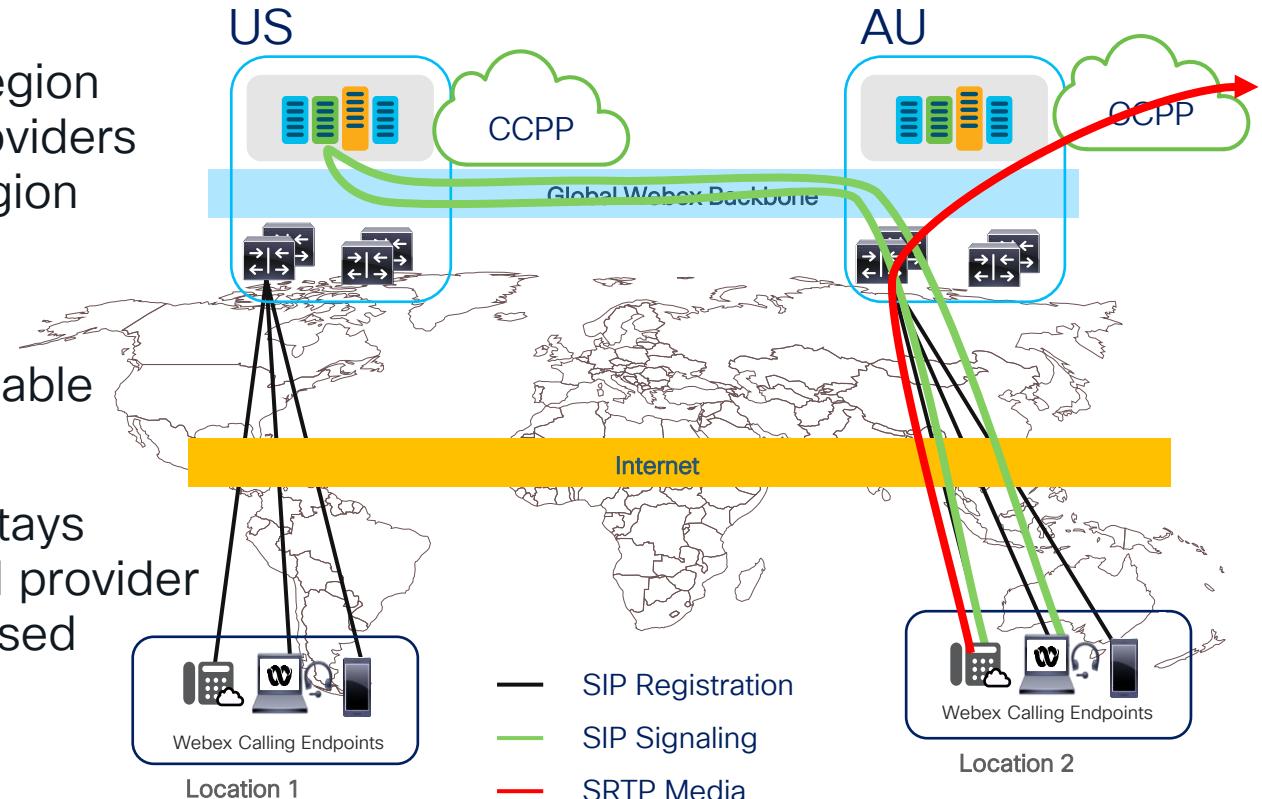
Multi-region customer: Regional media

- Access SBCs in other regions can be used
- In-region registration
- In-region media
- Signaling still inter-region
- Cut-through delay might still occur
- Media RTT not a factor



Multi-region customer: Regional media for CCPP

- Locations in home region can use all PSTN providers available in home region
- Locations in remote region can use PSTN providers available in remote region
- PSTN media traffic stays within region if PSTN provider in remote region is used



Please download and install the
Slido app on all computers you
use



Do you have presences in multiple Webex Calling regions?

- ⓘ Start presenting to display the poll results on this slide.

Location Considerations

Location

- Core concept in Webex Calling
- Grouping for
 - Users
 - Workspaces
 - Features
- Location settings include
 - Street address (emergency address)
 - PSTN choice
 - Main number
 - OAC
 - Site code
 - Language settings (email, announcements)
 - Time zone
 - Various calling settings: permissions, MoH, voice portal, schedules, call handling, calling features, ...

Hartford
Location ID: 724ae5bb-7f3e-47b0-b5c2-4a7c5922df2d ⓘ
1 user + 0 workspaces

Overview Floors Calling

Location info

Address
9396 Central St

Time zone
America/New_York

Email language ⓘ
en_us

Hartford Overview Floors Calling

Enhanced emergency calling ⓘ ⓘ Off

Dialing

Internal dialing ⓘ 8157

External dialing ⓘ

Call handling

Outgoing call permissions

Music on hold or park ⓘ

Call intercept ⓘ Disabled

Call recording ⓘ Organization's default Webex

Calling features settings

Voicemail transcription ⓘ ⓘ Transcribe voice messages in-app and email a copy to the user

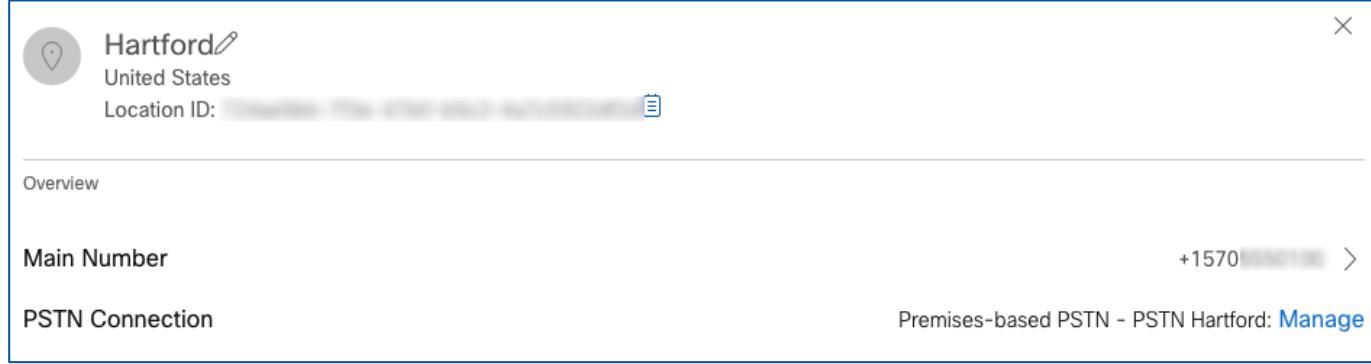
Voice portal ⓘ

Schedules ⓘ

Call park settings ⓘ

Announcement language ⓘ English

PSTN Integration



The screenshot shows a user interface for managing PSTN integration at a location level. The location is Hartford, United States, with a blurred Location ID. The interface includes sections for Overview, Main Number (+1570, with a link), and PSTN Connection (with a Manage link). A note at the bottom right indicates a premises-based PSTN connection.

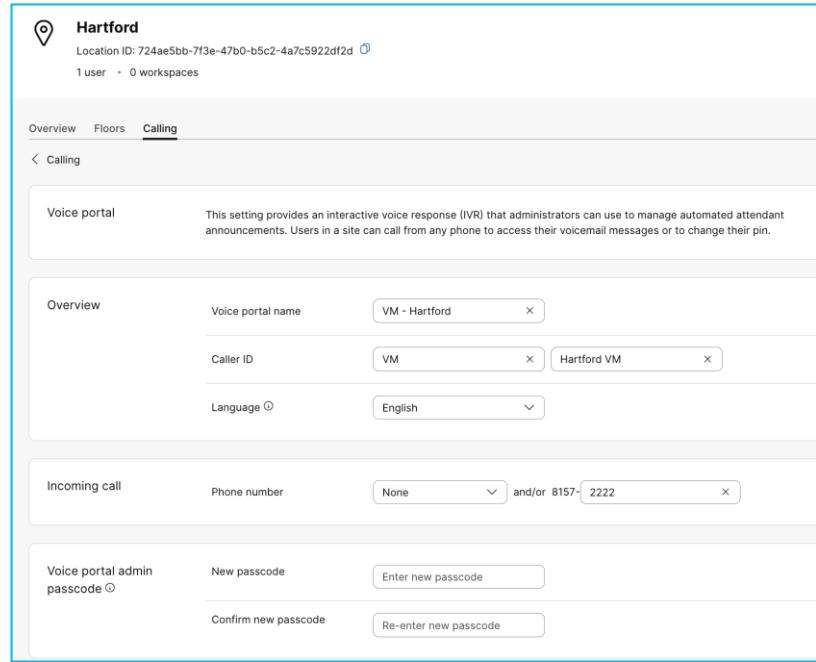
Section	Value
Location	Hartford, United States
Main Number	+1570
PSTN Connection	Premises-based PSTN - PSTN Hartford: Manage

- PSTN defined at the location level
- One PSTN choice per location (Cisco PSTN, CCPP, Premises PSTN)
- All PSTN calls originating from location use same PSTN
 - No destination specific PSTN selection (TEHO) possible*
- **Location main number is required for calls to/from location.**

*more details later in this session

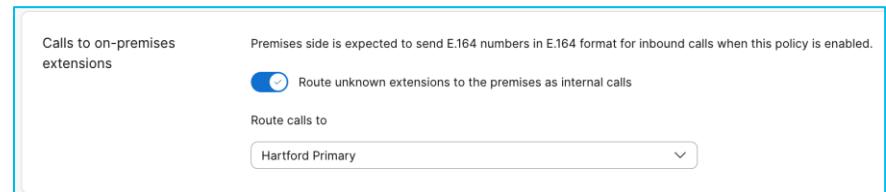
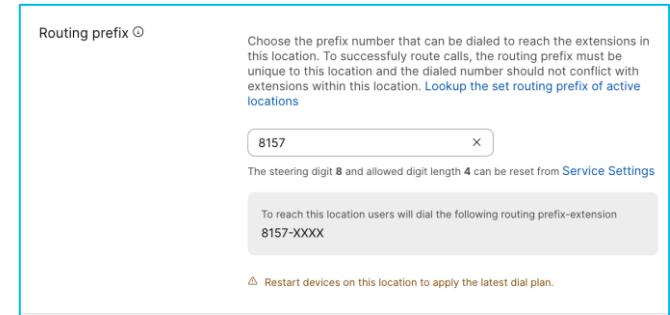
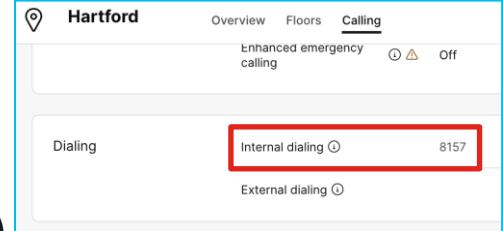
Voice Portal

- Voice portal number configured per location
- Voice portal number required for:
 - IVR access to manage announcements
 - Pilot number for VM access for users
- Voice portal can have a TN for external access
- Without portal number neither CFwd to VM nor phone message button works



Internal Dialing

- Site prefix: prefix for extensions to create global, abbreviated, on-net, inter-location dialing habit (ESN)
 - Same format for all locations (global service setting)
- Unknown extension routing policy*
 - Route unknown extensions to prem
 - Also affects incoming call type classification for premises calls with extension as caller id



*see appendix for more details

Emergency Calling

Two options to handle emergency calls:

- Enhanced emergency (E911) service
 - Dynamic; support roaming device → Nomadic E911 service
 - Only available in US/CAN
 - Uses RedSky: <https://www.redsky911.com/e911-for-cisco-webex>
 - https://help.webex.com/en-us/article/av6003/Enhanced-Emergency-Calling-for-Webex_Calling
- Emergency Callback Number (ECBN) based
 - Static configuration of ECBN per location (per user override)
 - <https://help.webex.com/en-us/article/nzqvtqg/Emergency-Callback-Number-in-Control-Hub>

Emergency Callback Number

- Set at location level
 - Can be main number
 - ... or any other assigned (and active) primary user/workspace number in that location*
- User level override
- Recommendations:
 - for users with phone number use that as ECBN
 - For users w/o phone numbers multiple ECBNs can exist within (large) locations

Emergency Callback Number (ECBN)

Choose which phone number will be the default ECBN for a user without a phone number.

Use location main number: +1570555 0000 (Hartford)

Use assigned number from this location

+1575555 0000 (Anita Hunt)

Lester Ray

• Active • jlester.ray@verizon@gmail.com • Location: Hartford

Profile General Meetings **Calling** Messaging Hybrid Services

< Calling

Emergency callback number

User's phone number: +1570 0000111

Location default ECBN: +1570 0000100

Assigned number from user's location

+1570555 0000 (Timothy St... ▾)

*support for HG numbers as ECBN planned for 2025/Q2

Feature / Location Dependencies

Calling features are configured at the location level ... and many features still work across locations

- **Numbers/extensions** – All numbers are accessible between locations. If an extension overlap exists, site codes can be used to allow extension dialing between locations.
- **Auto Attendants** – Assigned to a location, search scopes can be defined per Location or globally
- **Hunt Groups / Call Queues** – Assigned to a location, agents can be assigned from any location
- **Single Number Reach** – Assigned to a location, user access can be defined per Location or globally.
- **Paging Group** – Assigned to a location, paging targets and originators can be assigned from any location.
- **Receptionist Client** – Assign via user, searched filter available based on location.
- **Virtual Extension** – Can be defined per Location or globally.
- **Voicemail Group** – Assigned to a location and uses location voicemail settings. Any number within the customer can forward to the voicemail if required.

Features with Cross Location Limitations

Call Park

- **Call Park Extensions** – Call Park is used for a network hold and allows a user to park a call against an available user's extension or to a Call Park Extension
 - Call Park Extensions are configured within a specific location
 - Any user from any location can unpark the parked call (provided the extension is accessible)
 - Location level parameters for recall (parking user, hunt group, user/hunt), timers and ring pattern
- **Call Park Group** – The Call Park Group service allows a defined group of users to automatically park calls against other available members of a call park group
 - The members of this group can only be from the same Location and can be in a single group
 - Any user within the ORG can answer the parked call
 - Location level parameters for timers and ring pattern for parked calls
 - Call Park Group defines the recall options (parking user, hunt group, user/hunt)

Features with Cross Location Limitations

Call Pickup

- **Call Pickup** – Users that are added to a call pickup can answer calls when another member of the call pickup is busy.
 - A user can only be assigned to one call pickup. A location may have multiple call pickups
 - A call pickup can only have users from the same location
 - Call Pickup requires FAC for use in Webex Calling; default Pickup softkey uses Directed Call Pickup
 - Directed call Pickup works across all locations

Per Location Scale

- Users & workspaces – 30k combined
- Numbers – No hard limits, recommended: less or equal 3 times the number of users
- Trunks – 100
- Auto Attendants – 1000
- Virtual Extensions – 1000
- Hunt Groups – 1000
- Call Queues – 1000
- Authorization Codes – 1000
- Call Park Extensions – 100
- Call Pickup Groups – 1000
- Translation Patterns – 500
- OCP Auth Codes – 1000
- OCP Patterns – 500
- Operating Modes – 100

Dial Plan

Webex Calling Dial Plan Principles

- Goal: keep it simple
- Predefined set of dialing habits .. Instead of blank sheet
- Predefined national numbering plans .. Instead of having to build everything from scratch
- User based
 - Telephone numbers and/or extensions bound to users
 - ... Or features*
- Location concept
 - Geographic grouping
 - Grouping of users, workspaces, services, ...
 - PSTN per location
 - Dial plan elements per location: prefix, OAC, ...

Internal Dialing

Location Routing Prefix Length
Choose the number of digits to be used to connect with users at other locations.

4

Set Steering Digit in Routing Prefix
Choose the number which will be set as the first digit of every routing prefix.

8

Internal Extension Length
Choose the number of digits for an internal call.

4

Allow extension dialling between locations

This option allows calling between locations within the organization by dialing an extension number. If the option is disabled, caller must dial ESN (Enterprise Significant Number) to reach users in other locations. This should be disabled when there are duplicate extensions in the organization.

Set up Location

Set up your headquarter's location

The country or region with the majority of your users is your headquarter's location. Calling data is stored here. Keep in mind that this first location is required to set up Webex Calling. You can edit or delete your headquarter's address any time in Control Hub.

Location name: Ex: Headquarters

Address

Country or region: United States of America

Address line 2

Language

City / Town

Time zone

State / Province / Region

ZIP / Postal Code

City / Town

State / Province / Region

ZIP / Postal Code

* ... which most likely are treated as users internally ☺

Webex Calling Dialing Habits

- Extension dialing: 2-10 digits (default 4)
 - Intra- and inter-site; inter-site requires unique extensions and can be disabled
- ESN (Location routing prefix + user extension) using an optional location code
 - up to 7 digits
- +E.164
 - Telephone numbers defined in the Webex Calling system.
Always resolvable by +E164 dialing
- PSTN
 - PSTN destinations defined by pre-loaded Country Dial Plans
 - Optional per location outside steering digit (outside access code, OAC) to avoid overlaps between PSTN and enterprise dialing habits

Dial plans by country

Outbound calling regulates behavior for calls placed to various destination types. Select your continent and then country to find your outbound and emergency dial plans. In the Dial Plan table for some countries, the period denotes flexibility in number lengths within certain dial plans. For example, in the case of the dial plan entry '086xxxxx.', the period signifies that the number sequence can vary in length, accommodating more than just a fixed set of digits.

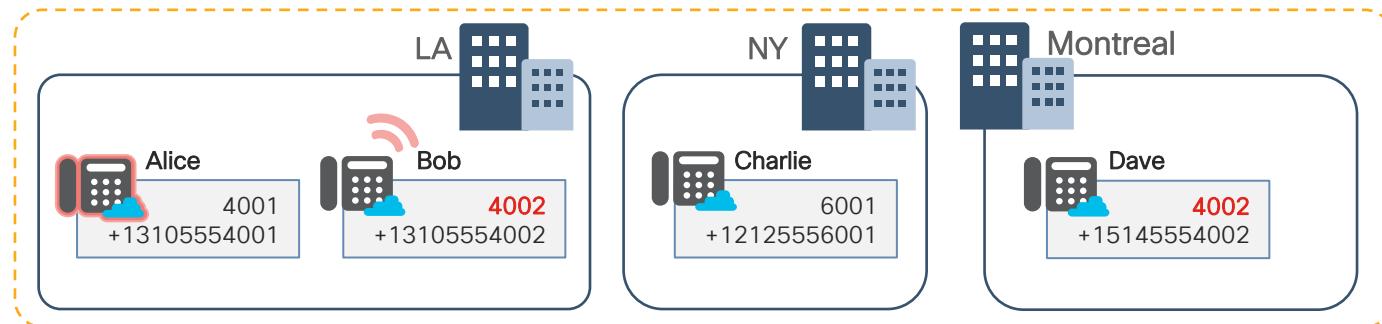
Africa	Asia	Australia	North America	Europe	Central America
South America					
<hr/>					
Albania					
Austria					
Belgium					
Bosnia and Herzegovina					
Bulgaria					
Croatia					
Cyprus					
Czech Republic					
Denmark					
Estonia					

<https://help.webex.com/en-us/article/757iyo/Dial-plans-by-country>

Understanding location codes

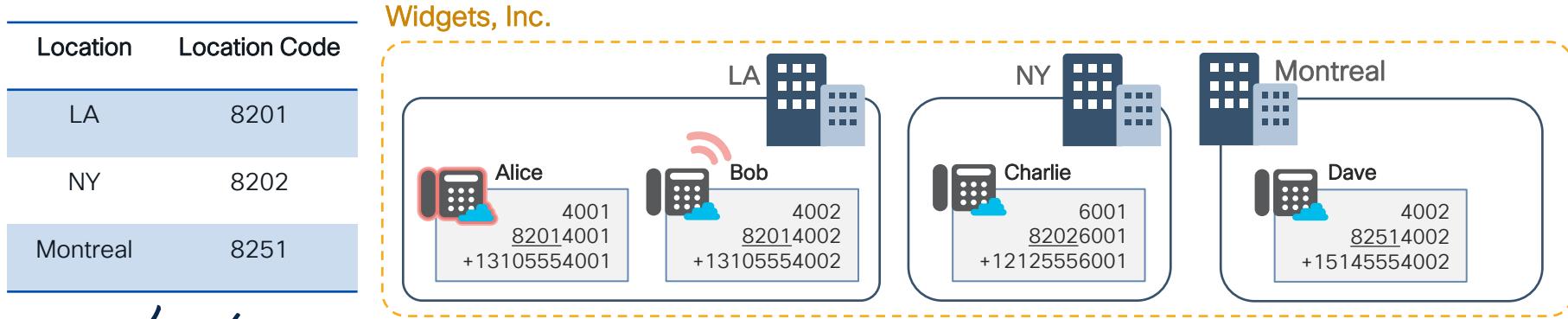
- What if extension ranges of sites overlap?
 - No extension dialing between sites possible
 - Alice can call Bob and Charlie using extension dialing
 - Alice cannot call Dave using extension dialing
 - What if Charlie dials 4002?

Widgets, Inc.



Understanding location codes

- Solution: add location codes
 - Need to be unique!
 - Inter-site dialing using location code + extension
 - Location code + extension is unique
- Alice can call Dave (and the other users) using inter-site dialing



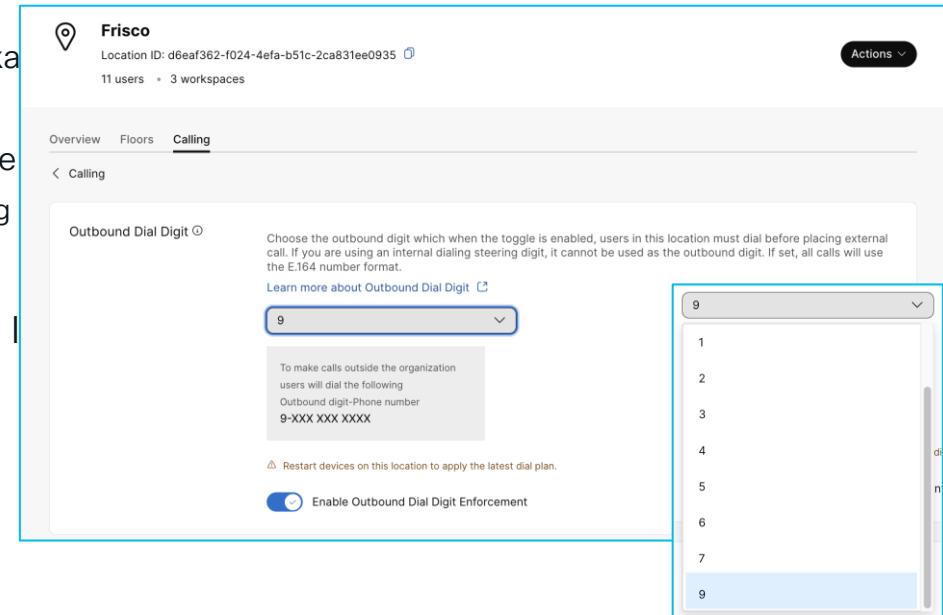
Enterprise Best Practices

- Goal: optimize dial plan handling in phones to minimize timeouts
 1. Outbound dialing digit (for example 9)
 - Per location
 2. Internal steering digit for inter-site (for example 8)
 - Different from PSTN
 3. Uniform location code length (for example 4)
 - Location code includes leading internal steering digit!
 4. Uniform extension length (for example 4)
- Uniform inter-site dialing: steering digit – location id – extension
 - Example: 8-496-9764

Enterprise Best Practices

- Goal: optimize dial plan handling in phones to minimize timeouts
 - 1. Outbound dialing digit (for example 9)
 - Per location
 - 2. Internal steering digit for inter-site (for example)
 - Different from PSTN
 - 3. Uniform location code length (for example)
 - Location code includes leading internal steering
 - 4. Uniform extension length (for example 4)
- Uniform inter-site dialing: steering digit – I
 - Example: 8-496-9764

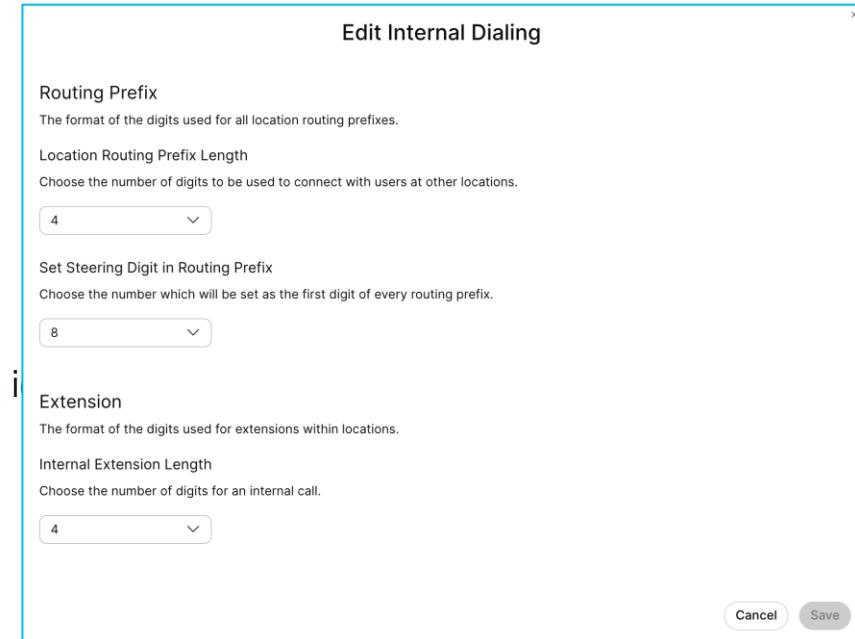
8-496-9764



Enterprise Best Practices

- Goal: optimize dial plan handling in phones to minimize timeouts
 - 1. Outbound dialing digit (for example 9)
 - Per location
 - 2. Internal steering digit for inter-site (for example 8)
 - Different from PSTN
 - 3. Uniform location code length (for example 4)
 - Location code includes leading internal steering digit!
 - 4. Uniform extension length (for example 4)
- Uniform inter-site dialing: steering digit – location i
 - Example: 8-496-9764

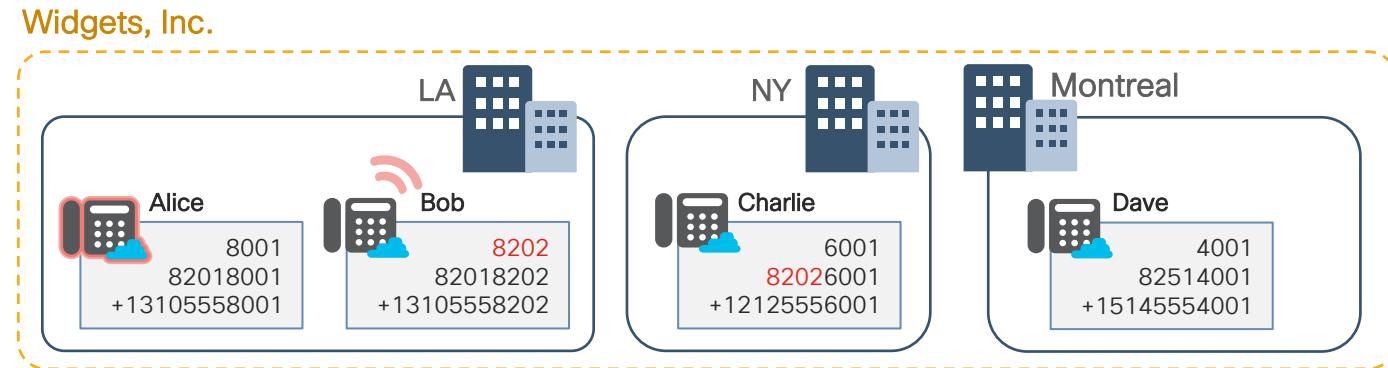
8-496-9764



Conflicts

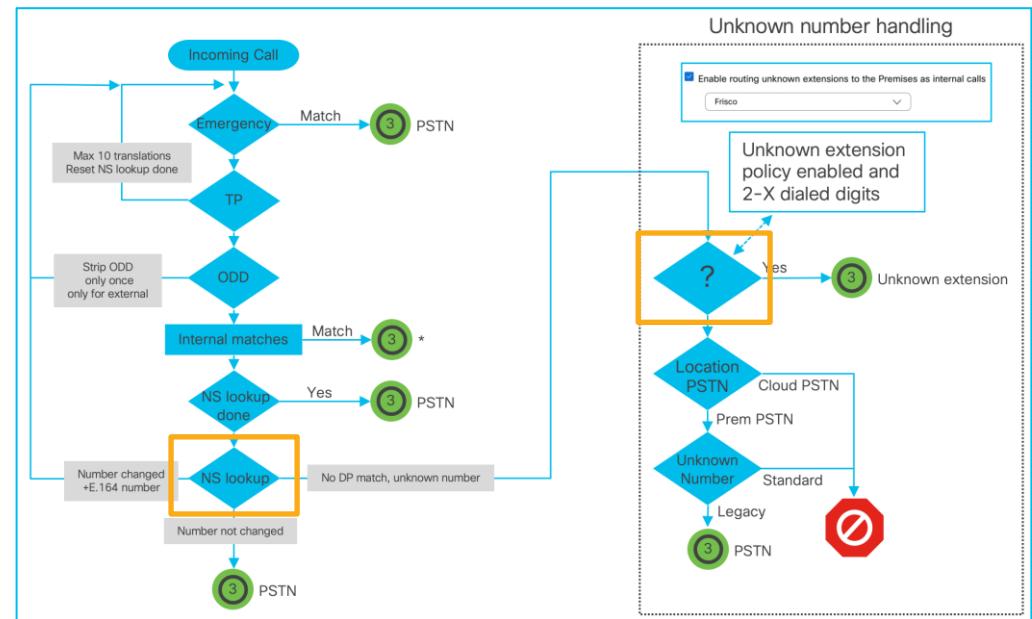
- To avoid timeouts conflicts need to be avoided between:
 - First digit of extensions
 - Internal steering digit
 - Outbound dial digit
- Example: steering digit 8, 4D extensions, 4D location code
- Webex Calling doesn't do digit-by-digit dial plan analysis, but overlaps still considered "bad"

Location	Location Code
LA	8201
NY	8202
Montreal	8251



Unknown Extension vs National Dial Plan Overlap

- Unknown extension policy only checked AFTER national number plan lookup
- National numbering plan trumps in case of overlap with unknown extensions



Unknown Extension vs National Numbering Plan

- Example: Germany has X{5-12} in the national dial plan for local destinations*
- Unknown 5/6D extensions get routed to the PSTN instead of getting blocked or routed according to unknown extension policy
 - .. Even if an outside dial digit is configured for the location
- Reason: permissive national numbering plan lookup makes dialing of outside dial digit optional .. by default

49	xxxxxx	Local	Local
49	xxxxxxx	Local	Local
49	xxxxxxxx	Local	Local
49	xxxxxxxxx	Local	Local
49	xxxxxxxxxx	Local	Local
49	xxxxxxxxxxx	Local	Local
49	xxxxxxxxxxxx	Local	Local
49	xxxxxxxxxxxxx	Local	Local
49	xxxxxxxxxxxxxx	Local	Local
49	xxxxxxxxxxxxxx	Local	Local

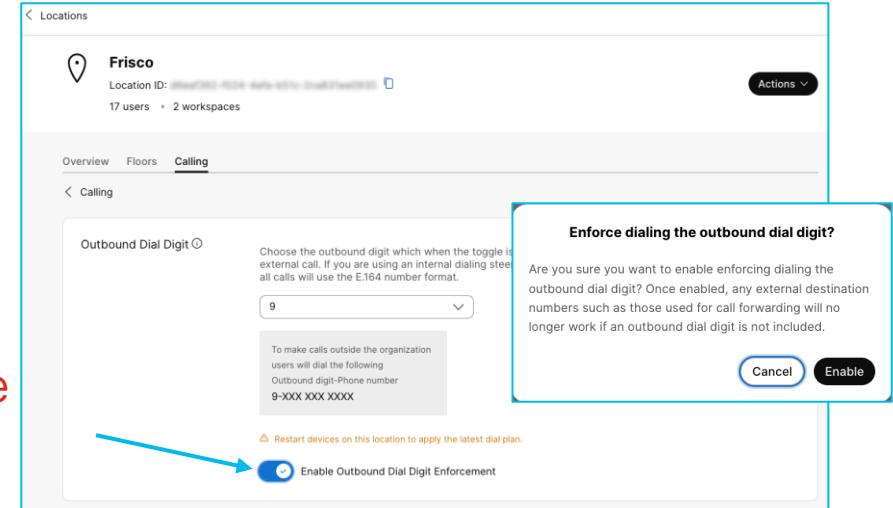
Dial plans by country

<https://help.webex.com/en-us/article/757iyo/Dial-plans-by-country>

*other affected countries include: South Korea, UK, Ireland, Netherlands

Enforce Outside Dial Digit

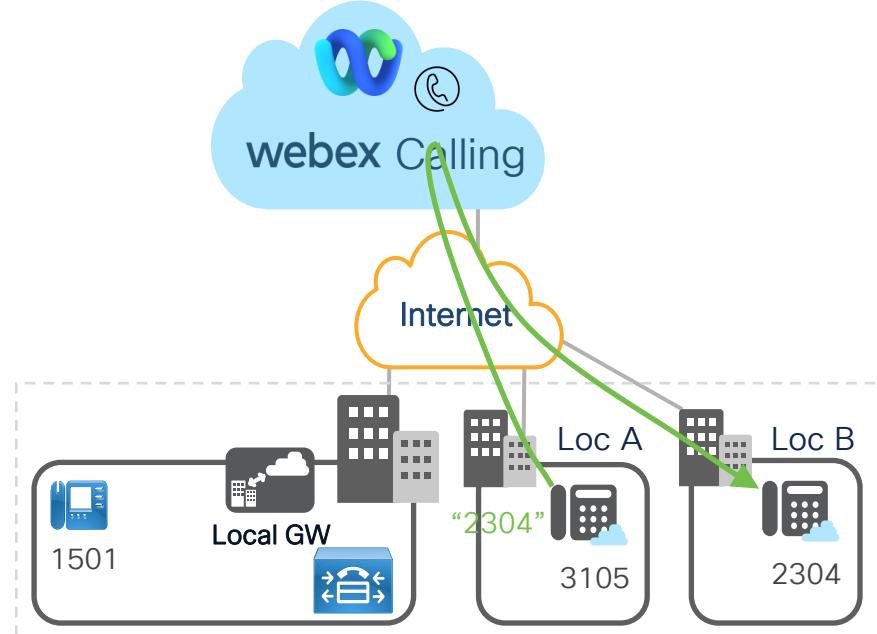
- Enforcing the outside dial digit removes the overlap between on-net dialing habits (including extensions) and PSTN destinations
- Configured per location
 - ... like the outside dial digit
- Caution: not only affects direct dialing but any PSTN destinations
 - ... for example CFwds to PSTN
- Best practice: **always** enforce outside dial digit



<https://help.webex.com/en-us/article/pxtu15/Configure-your-Webex-Calling-dial-plan>

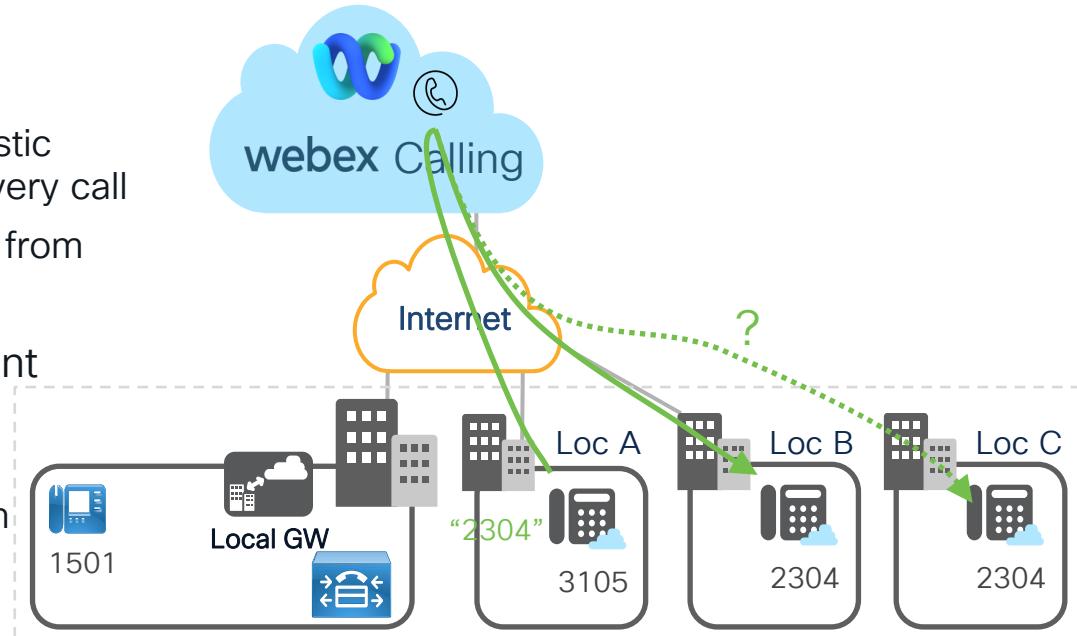
Extension Dialing Between Locations

- User A in location A can call inter-location to user B in location B by dialing “2304”



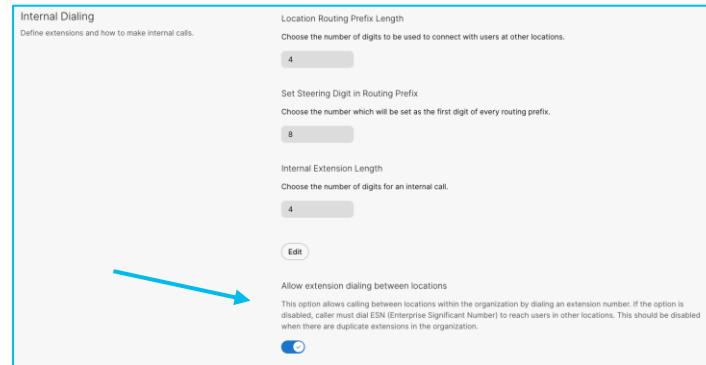
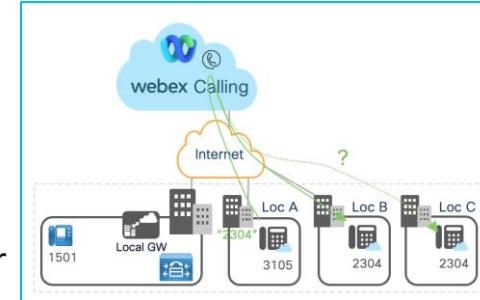
Challenge: Overlap on Webex Calling

- User A in location A dials “2304”, an extension that exists in multiple locations
- The call is routed to one of the extensions, Location B or C
 - Deterministic: in contrast to stochastic the same destination will ring for every call
 - Hard to predict: preference hidden from admin/customer
- This behavior leads to inconsistent user experience
 - Users dialing the same extension from different locations might reach different destinations



Inter-Location Extension Dialing Policy

- Inter-location extension dialing can lead to unexpected results
 - Overlapping extension ranges in multiple locations
 - Unknown extension dialing overlap with extensions in other locations
- Extension dialing policy between locations is configurable (service setting)
- Default: enabled
- Best practice: disable (if overlapping extension ranges exist)



<https://help.webex.com/en-us/article/pxtu15/Configure-your-Webex-Calling-dial-plan>

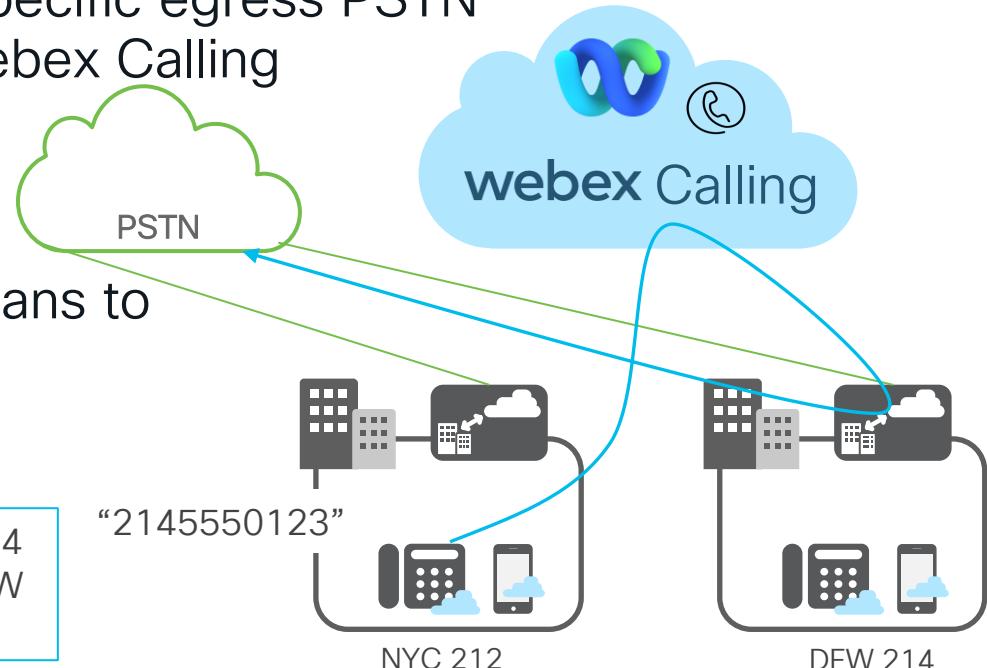
Why not to (ab)use
Dial Plans for TEHO
... or other PSTN
“hacks”

TEHO with Multiple Local Gateways ...

- Tail end hop off (destination specific egress PSTN selection) does not exist in Webex Calling
- PSTN choice is determined by the calling user's location
- Can't we use enterprise dial plans to route PSTN calls (to specific premises trunks?)

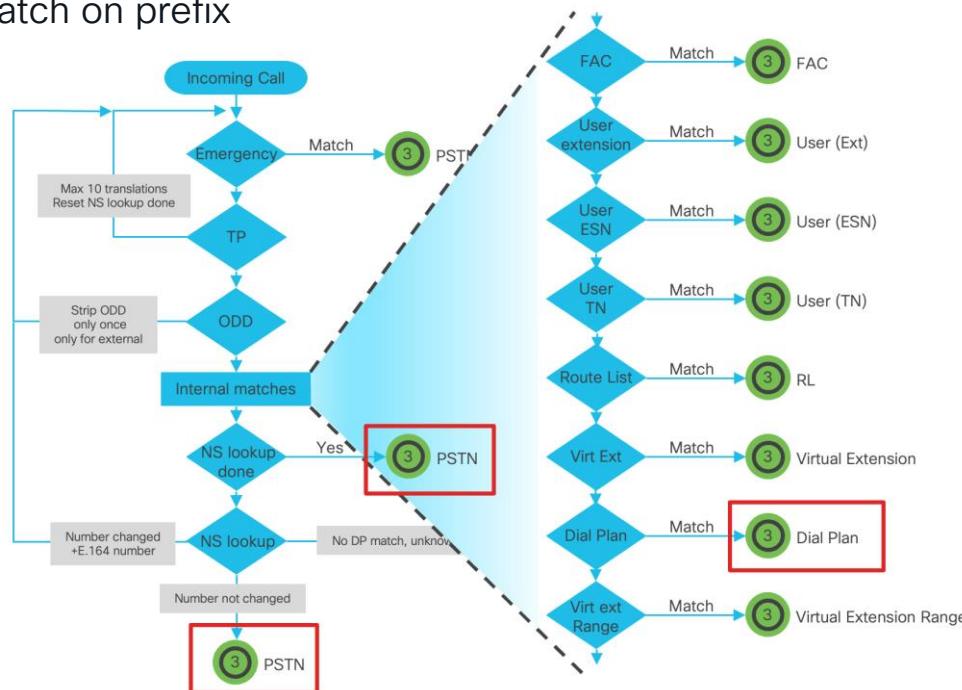
Dial plan: NYC 212
Route choice: NYC
Pattern +1212!

Dial plan: DFW 214
Route choice: DFW
Pattern +1214!



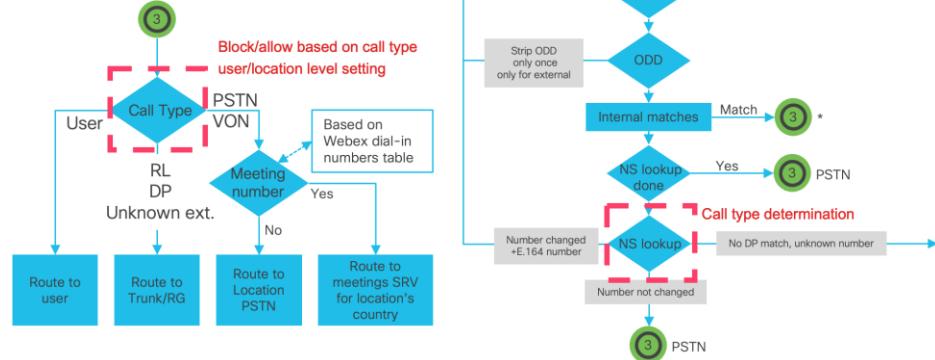
.. And why that is not a good idea

- PSTN calls classified as premises calls instead of PSTN
 - PSTN calls sent to trunk via DP match on prefix
 - NS match never happens



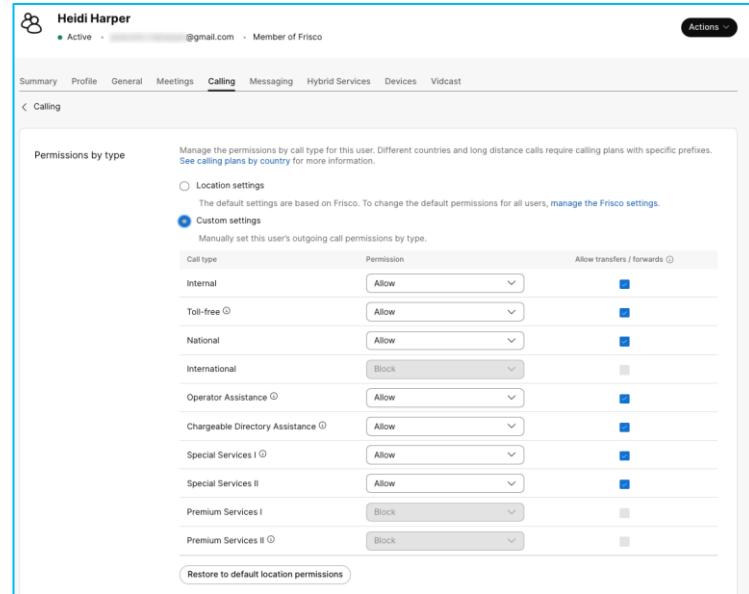
.. And why that is not a good idea

- PSTN calls classified as premises calls instead of PSTN
- Outbound calling permissions won't work
 - Call type (international, national, ...) determined as part of NS routing decision
 - ... which never happens since PSTN calls are intercepted by dial plan patterns



.. And why that is not a good idea

- PSTN calls classified as premises calls instead of PSTN
- Outbound calling permissions won't work
 - Call type (international, national, ...) determined as part of NS routing decision
 - ... which never happens since PSTN calls are intercepted by dial plan patterns
 - Consequence: rejecting calls of specific call type does not work



The screenshot shows the 'Calling' tab of a user profile for Heidi Harper. The 'Permissions by type' section is displayed, with the 'Custom settings' option selected. The table below lists call types and their permissions:

Call type	Permission	Allow transfers / forwards
Internal	Allow	Enabled
Toll-free	Allow	Enabled
National	Allow	Enabled
International	Block	Disabled
Operator Assistance	Allow	Enabled
Chargeable Directory Assistance	Allow	Enabled
Special Services I	Allow	Enabled
Special Services II	Allow	Enabled
Premium Services I	Block	Disabled
Premium Services II	Block	Disabled

<https://help.webex.com/en-us/article/q94e8c/Configure-call-permissions-in-Control-Hub>

.. And why that is not a good idea

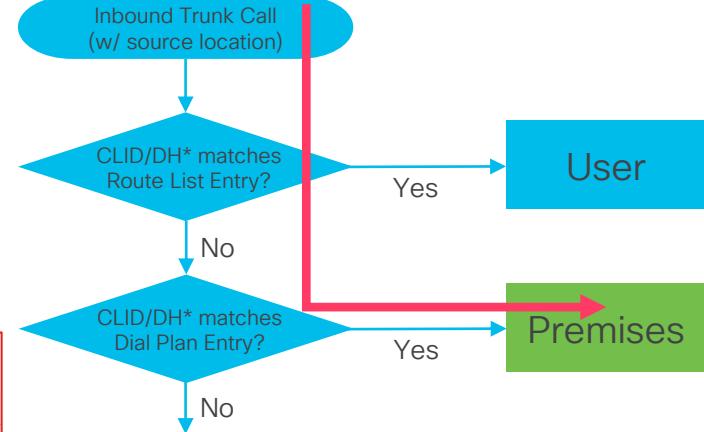
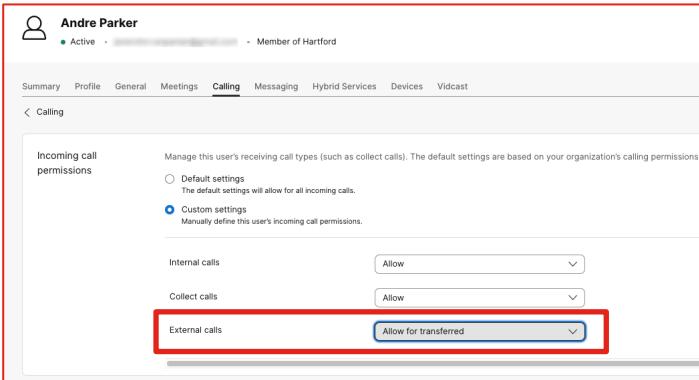
- PSTN calls classified as premises calls instead of PSTN
- Outbound calling permissions won't work
- Wrong call classification in CDRs

Call type	<p>Type of call.</p> <p>Examples:</p> <ul style="list-style-type: none">• SIP_MEETING—Integrated Audio for Webex Calling. A call in or callback to a Webex Meeting using a Webex Calling app or device.• SIP_NATIONAL—An outgoing domestic call within the user's region.• SIP_INTERNATIONAL—An outgoing call made to another region from the user's home region.• SIP_SHORTCODE—Shortcode feature/service call. Short numbers are premium or free, depending on region and service.• SIP_INBOUND—Inbound or Incoming call. This type covers all inbound calls from PSTN or another external trunk.• SIP_EMERGENCY—Emergency calls. For example, dialing 911 in the US.• SIP_PREMIUM—Calls that use enhanced or extended Toll Premium Services, premium rate, or special rate number. Sometimes barred.• SIP_ENTERPRISE—Inter or intra location dialing within the same organization.• SIP_TOLLFREE—Toll-free based arriving (incoming) calls. Freephone numbers.• SIP_MOBILE—A mobile/cell call is when the user originated the call with their mobile number, or received the call when called on their mobile number.• UNKNOWN—Unable to determine the call type. <p> Whenever the PSTN calls are routed using a dial plan pattern, this causes a mis-categorization of the call type. In such cases, it's not considered as a PSTN call.</p> <p>Example: Using TEHO to route the call to the right country and then using the PSTN connection for the local cluster in that country.</p>
-----------	---

.. And why that is not a good idea

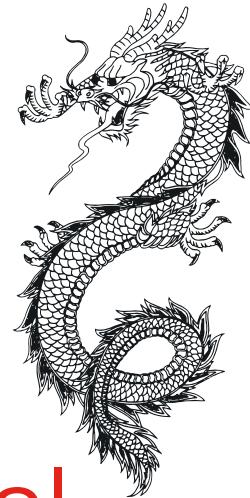
- PSTN calls classified as premises calls instead of PSTN
- Outbound calling permissions won't work
- Wrong call classification in CDRs
- Wrong classification of incoming calls with caller id match on dial plan pattern .. Which breaks features relying on call classification

CISCO Live!



.. And why that is not a good idea

- PSTN calls classified as premises calls instead of PSTN
- Outbound calling permissions won't work
- Wrong call classification in CDRs
- Wrong classification of incoming calls with caller id match on dial plan pattern .. Which breaks features relying on call classification



Don't abuse enterprise dial plans for PSTN routing!

... unless you are aware of the consequences

https://en.wikipedia.org/wiki/Here_be_dragons

Operating Modes

Standard Call Queue Policies

Queue Policies	
Holiday Service	Manage >
Night Service	Manage >
Forced Forwarding	Disabled >
Stranded Calls	Manage >

schedule controlled

Only applied if holiday and night service don't apply

- Call Queues have two schedule controlled policies:
 - Holiday service: days w/o service
 - Night service: hours w/o service for each weekday
 - Holiday service trumps night service
- Forced forwarding only gets applied if neither holiday service nor night service kick in
- “Transfer to phone number” doesn’t have “send to voicemail” option

Holiday Service
Configure the call queue to route calls differently during the holidays.

Enable holiday service

Perform busy treatment

Holiday Schedule

Holiday name	Repeat	Start time	End time
Christmas Day 2025	None	Dec 25, 2025	Dec 25, 2025
Columbus Day 2025	None	Oct 13, 2025	Oct 13, 2025
Independence Day 2025	None	Jul 04, 2025	Jul 04, 2025
Juneteenth 2025	None	Jun 19, 2025	Jun 19, 2025
Labor Day 2025	None	Sep 01, 2025	Sep 01, 2025
Memorial Day 2025	None	May 26, 2025	May 26, 2025
Presidents' Day 2025	None	Feb 17, 2025	Feb 17, 2025
Thanksgiving Day 2025	None	Nov 27, 2025	Nov 27, 2025
Veterans Day 2025	None	Nov 11, 2025	Nov 11, 2025

Holiday Service
Configure the call queue to route calls differently during the holidays.

Enable holiday service

Transfer to phone number

1234

Night Service
Configure the call queue to route calls differently during the hours when the queue is not in service. This is determined by a schedule that defines the business hours of the queue.

Enable night service

Perform busy treat...

Business Hours

Schedule

Schedule Name *

Schedule Type

Hours

Sunday

Monday 09:00 AM to 05:00 PM

Tuesday 09:00 AM to 05:00 PM

Wednesday 09:00 AM to 05:00 PM

Thursday 09:00 AM to 05:00 PM

Friday 09:00 AM to 05:00 PM

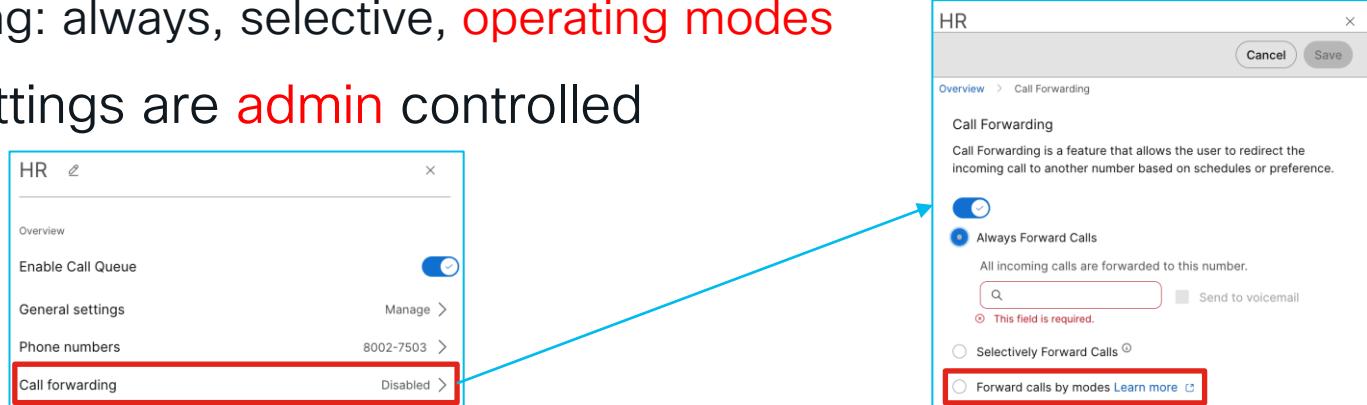
Saturday

Lunch Break (applies to every Business Day)

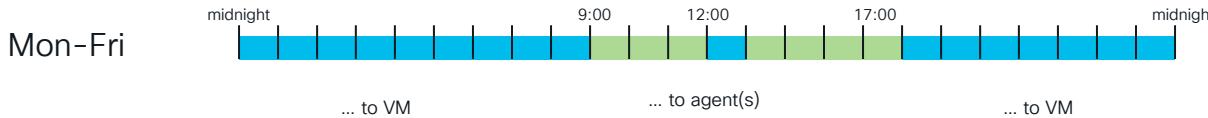
Lunch Break 12:00 PM to 01:00 PM

Call Queue Forwarding

- Calls into CQ can be forwarded to users, other services, VM... for differentiated call handling
- Calls into CQ can be forwarded by:
 - Policies: holiday/night service, forced, stranded calls
 - CFwd setting: always, selective, **operating modes**
- All these settings are **admin** controlled



Schedule Driven Call Forwarding



Selective call forwarding on CQ, HG, and AA can be used to achieve this

CQ Example

Overview > Call Forwarding

Call Forwarding

Call Forwarding is a feature that allows the user to redirect the incoming call to another number based on schedules or preference.

Selectively Forward Calls ①

An incoming call is forwarded or not forwarded to this number, based on the defined criteria.

2000 Send to voicemail

Enable Rule	Rule Name	Rule Type	Incoming Calls From	Incoming Calls To	Actions
<input checked="" type="checkbox"/>	1 Open	Not Forward	All calls	Any Number	<input type="button" value="Edit"/> <input type="button" value="Delete"/>
<input checked="" type="checkbox"/>	2 Closed	Forward	All calls	Any Number	<input type="button" value="Edit"/> <input type="button" value="Delete"/>

Edit When Not to Forward

Call Forwarding Selective Details

Rule Name: 1 Open

When Not to Forward

Calls will not be forwarded according to the schedule set here. Both Business Hours Schedule and Holiday Schedule must be met for the Selective Forward Calls: Do Not Forward rules to apply.

Business Hours Schedule **Holiday Schedule**

Schedule

Day	Weekday	Time
Friday 1:	Weekly	Friday, 9:00 AM to 12:00 PM
Friday 2:	Weekly	Friday, 1:00 PM to 5:00 PM
Monday 1:	Weekly	Monday, 9:00 AM to 12:00 PM
Monday 2:	Weekly	Monday, 1:00 PM to 5:00 PM
Thursday 1:	Weekly	Thursday, 9:00 AM to 12:00 PM
Thursday 2:	Weekly	Thursday, 1:00 PM to 5:00 PM
Tuesday 1:	Weekly	Tuesday, 9:00 AM to 12:00 PM
Tuesday 2:	Weekly	Tuesday, 1:00 PM to 5:00 PM
Wednesday 1:	Weekly	Wednesday, 9:00 AM to 12:00 PM
Wednesday 2:	Weekly	Wednesday, 1:00 PM to 5:00 PM

Calls From
Calls from the number(s) defined here will not be forwarded.

Any Number

Selected Phone Numbers

Calls To
Calls to the number(s) defined here will not be forwarded.

Edit When to Forward

Call Forwarding Selective Details

Rule Name: 2 Closed

When To Forward

Calls will be forwarded according to the schedule set here. Both Business Hours Schedule and Holiday Schedule must be met for the Selective Forward Calls: Forward & Do Not Forward rules to apply.

Business Hours Schedule **Holiday Schedule**

Forward To
Enter the number that your calls will be forwarded to.

Default Phone Number

Different Phone Number

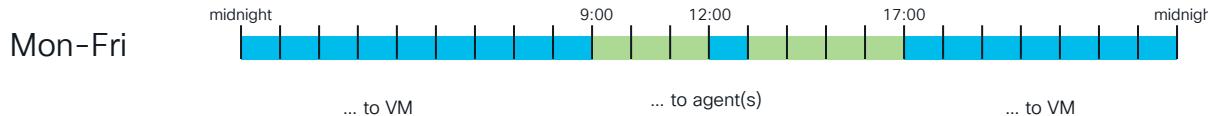
Calls From
Calls from the number(s) defined here will be forwarded.

Any Number

Selected Phone Numbers

Calls To
Calls to the number(s) defined here will be forwarded.

Schedule Driven Call Forwarding



Selective
can be

... but what if office hours need to be extended ad-hoc?
... or start early?

CQ Examples > **Call Forwarding**

Call Forwarding is a feature that allows the user to redirect the incoming call to another number based on schedules or preference.

Always Forward Calls

Selectively Forward Calls ①

An incoming call is forwarded or not forwarded to this number, based on the defined criteria.

Send to voicemail

Enable Rule Rule Name Rule Type Incoming Calls From Incoming Calls To Actions

<input checked="" type="checkbox"/>	1 Open	Not Forward	All calls	Any Number	<input type="button" value="Edit"/> <input type="button" value="Delete"/>
<input checked="" type="checkbox"/>	2 Closed	Forward	All calls	Any Number	<input type="button" value="Edit"/> <input type="button" value="Delete"/>

Friday 2: Weekly Friday, 1:00 PM to 5:00 PM
Monday 1: Weekly Monday, 9:00 AM to 12:00 PM
Thursday 1: Weekly Thursday, 9:00 AM to 12:00 PM
Thursday 2: Weekly Thursday, 1:00 PM to 5:00 PM
Tuesday 1: Weekly Tuesday, 9:00 AM to 12:00 PM
Tuesday 2: Weekly Tuesday, 1:00 PM to 5:00 PM
Wednesday 1: Weekly Wednesday, 9:00 AM to 12:00 PM
Wednesday 2: Weekly Wednesday, 1:00 PM to 5:00 PM

Calls From
Calls from the number(s) defined here will not be forwarded.

Any Number

Selected Phone Numbers

Calls To
Calls to the number(s) defined here will not be forwarded.

Calls will be forwarded according to the schedule set here.
Both Business Hours Schedule and Holiday Schedule must be met for the Selective Forward Calls: Forward & Do Not Forward rules to apply.

Business Hours Schedule **Holiday Schedule**

Forward To
Enter the number that your calls will be forwarded to.

Default Phone Number

Different Phone Number

Calls From
Calls from the number(s) defined here will be forwarded.

Any Number

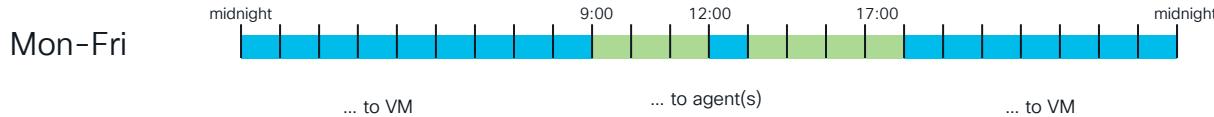
Selected Phone Numbers

Calls To
Calls to the number(s) defined here will be forwarded.

Call Forwarding Operating Modes

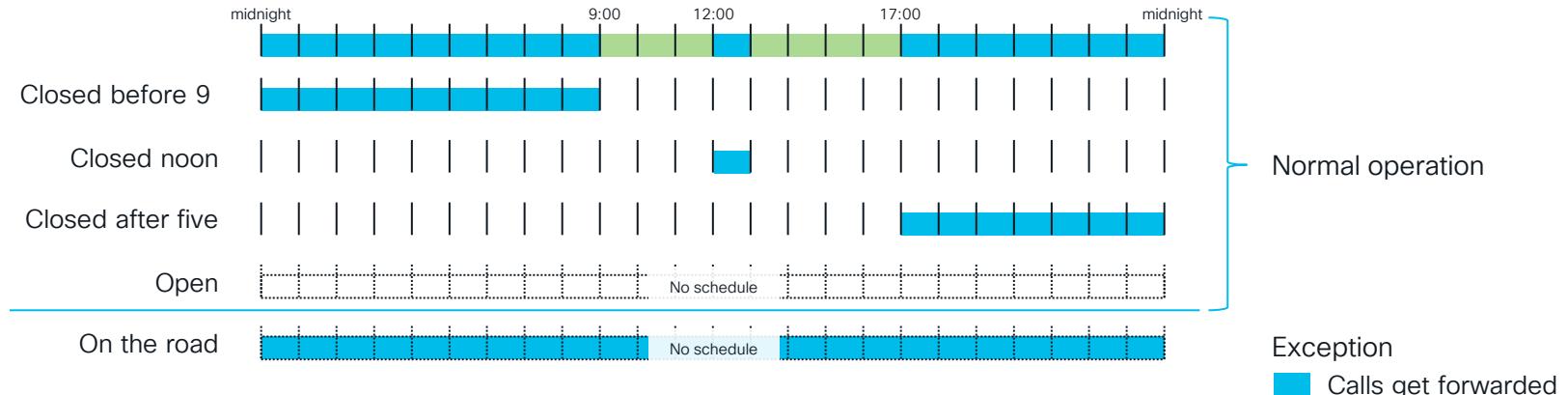
- Business requirement:
 - effectively route incoming calls to different destinations based on ToD and DoW
 - “Operating mode” defines call forwarding behavior for HG, CQ, or AA
 - Authorized users can switch between modes easily
- Solution: Call forwarding for HGs, CQs, and AAs based on operating modes

Example: Modes



Mode	Description	Scheduled	Normal operation
Open	Handle calls according to CQ policy settings	No	Yes
Closed	Forward calls to VM	Yes, time of day	Yes
On the road	Redirect to owner cell phone	No	No

Example: Modes



- Based on time of day one of the “Closed” modes is active and calls get forwarded
- If no “Closed” mode is active based on time of day, then “Open” is active
- Time of day switch between modes for normal operation
- Authorized users can switch modes at any time
 - “Open” mode is required so that user can switch to that mode
 - Users can also switch to an exception mode (“On the road”) at any time

Mode Creation (Closed)

- Scheduled modes for each “closed” time:
 - Before 9
 - Noon
 - After 5
- Benefit: each mode can be selected individually
- Start time of schedule is inclusive, end time is exclusive
 - 8:00 – 9:00 is active at 8:00 but not at 9:00

The image displays three separate screenshots of a mode creation interface, each showing a different configuration for a 'Closed' mode in Hartford. Each screenshot includes a 'Level' section (set to 'Location' for Hartford), a 'Mode Name' field, a 'Schedule' section, and a 'Forward Destination' section.

- Screenshot 1 (Top):** Mode Name is 'Closed before 9'. The schedule is set to 'Monday - Friday' from 12:00 AM to 09:00 AM, with the 'All day' toggle off. The forward destination is 'Forward to 6544' with the 'Send to voicemail' checkbox checked.
- Screenshot 2 (Middle):** Mode Name is 'Closed noon'. The schedule is set to 'Monday - Friday' from 12:00 PM to 01:00 PM, with the 'All day' toggle off. The forward destination is 'Forward to 6544' with the 'Send to voicemail' checkbox checked.
- Screenshot 3 (Bottom):** Mode Name is 'Closed after 5'. The schedule is set to 'Monday - Friday' from 05:00 PM to 12:00 AM, with the 'All day' toggle off. The forward destination is 'Forward to 6544' with the 'Send to voicemail' checkbox checked.

Mode Creation (Open, On The Road)

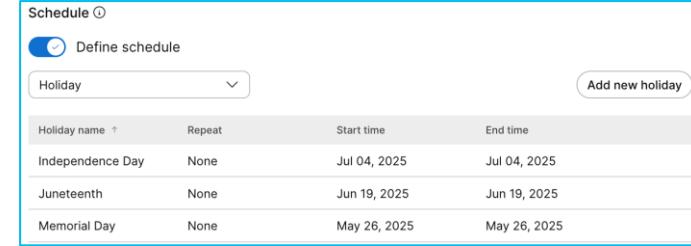
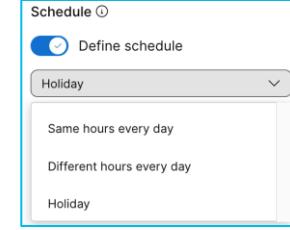
- “Open” is an unscheduled mode
 - Active all day .. if no “closed” mode is active
 - No forwarding
 - Also, can be selected at any time
- “on the road” also is unscheduled
 - Forwards to external phone number
 - Can be selected if needed at any time

The image displays two screenshots of a mode creation interface, likely from a Cisco UC application. Both screenshots show the following fields:

- Level:** Choose at which level to create mode. Options: Organization (radio button), Location (radio button, selected), Hartford (button).
- Schedule:** Define schedule (button).
- Mode Name:** Open (top screenshot) or On the road (bottom screenshot).
- Forward Destination:**
 - Forward to: +19195550178 (top screenshot) or +19195550178 (bottom screenshot).
 - Send to voicemail (checkbox): Unchecked in both screenshots.
 - Do not forward (radio button): Selected in both screenshots.

Operating Mode Schedules

- OMs can be defined w/ and w/o a schedule
 - None: always enabled
 - Same hours every day: from/to for Mon-Fri and/or Sat/Sun
 - Different hours every day: from/to for each day
 - Holiday: multiple holidays (max 150), each
 - can span multiple days
 - can have recurrence
 - can have start/end time
- Start time of schedules is inclusive, end time is exclusive
 - “8:00 – 9:00” is active at 8:00 but not active at 9:00



Holiday name	Repeat	Start time	End time
Independence Day	None	Jul 04, 2025	Jul 04, 2025
Juneteenth	None	Jun 19, 2025	Jun 19, 2025
Memorial Day	None	May 26, 2025	May 26, 2025

Operating Mode Forwarding

- Forwarding Enabled
 - Destination: Webex Calling TN, extension, ESN
 - Can go to voicemail directly if Webex Calling destination has voicemail
 - Destination defined in OM can be overridden when OM is assigned to feature
- Forwarding Disabled
 - Call is handled by the feature the OM is assigned to



Call Queue with Mode Based Forwarding

- Modes added to “Forward calls by modes” on call queue
- “Open” added after scheduled modes
 - Only active if none of the “closed” modes is active
- Automatic mode switch only between modes enabled for “Normal operation”

CQ Example

Overview > Call Forwarding

Call Forwarding

Call Forwarding is a feature that allows the user to redirect the incoming call to another number based on schedules or preference.

Always Forward Calls

Selectively Forward Calls

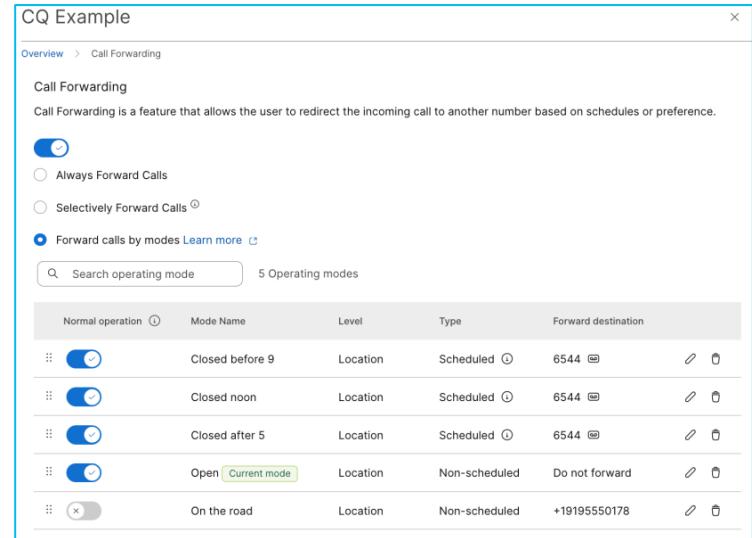
Forward calls by modes [Learn more](#)

Search operating mode 5 Operating modes

Normal operation	Mode Name	Level	Type	Forward destination	Actions
<input checked="" type="checkbox"/>	Closed before 9	Location	Scheduled	6544	
<input checked="" type="checkbox"/>	Closed noon	Location	Scheduled	6544	
<input checked="" type="checkbox"/>	Closed after 5	Location	Scheduled	6544	
<input checked="" type="checkbox"/>	Open Current mode	Location	Non-scheduled	Do not forward	
<input type="checkbox"/>	On the road	Location	Non-scheduled	+19195550178	

Assigning OM to Features

- Multiple OM can be assigned to feature
- Default forwarding setting of the OM can be overridden at the feature level
- Feature's time zone is used when evaluating OM schedules
- Modes can be reordered at the feature level
- “normal” operation mode
 - One or more modes controlling call forwarding
 - Typically, at least one scheduled mode
- “exception” mode
 - Normal operation manually overridden: e.g., “Open” mode extended

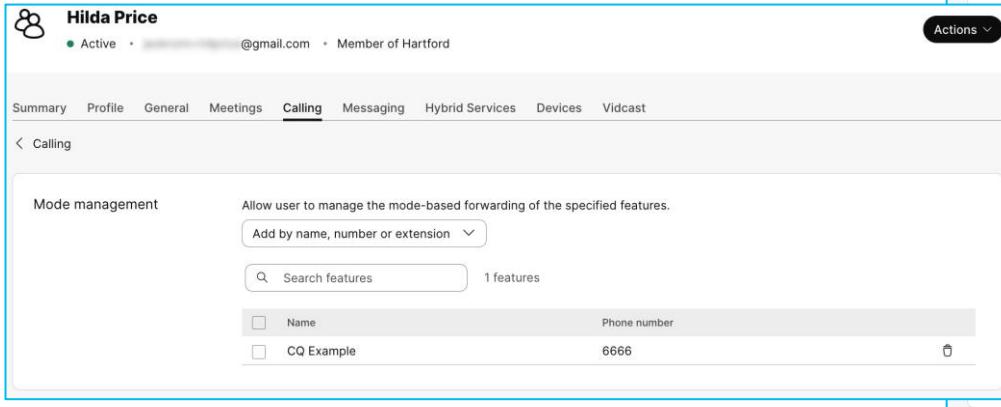


The screenshot shows the 'Call Forwarding' configuration page under 'CQ Example'. It displays a list of operating modes for call forwarding:

Normal operation	Mode Name	Level	Type	Forward destination	Actions
<input checked="" type="checkbox"/>	Closed before 9	Location	Scheduled	6544	<input type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/>	Closed noon	Location	Scheduled	6544	<input type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/>	Closed after 5	Location	Scheduled	6544	<input type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/>	Open Current mode	Location	Non-scheduled	Do not forward	<input type="checkbox"/> <input type="checkbox"/>
<input type="checkbox"/>	On the road	Location	Non-scheduled	+19195550178	<input type="checkbox"/> <input type="checkbox"/>

Enabling Mode Management for User

- Administrator can allow users to switch modes for certain features
- HG/CQ selection not limited to entities the user is agent of



Hilda Price

Active + [redacted] @gmail.com + Member of Hartford

Actions

Summary Profile General Meetings **Calling** Messaging Hybrid Services Devices Vidcast

< Calling

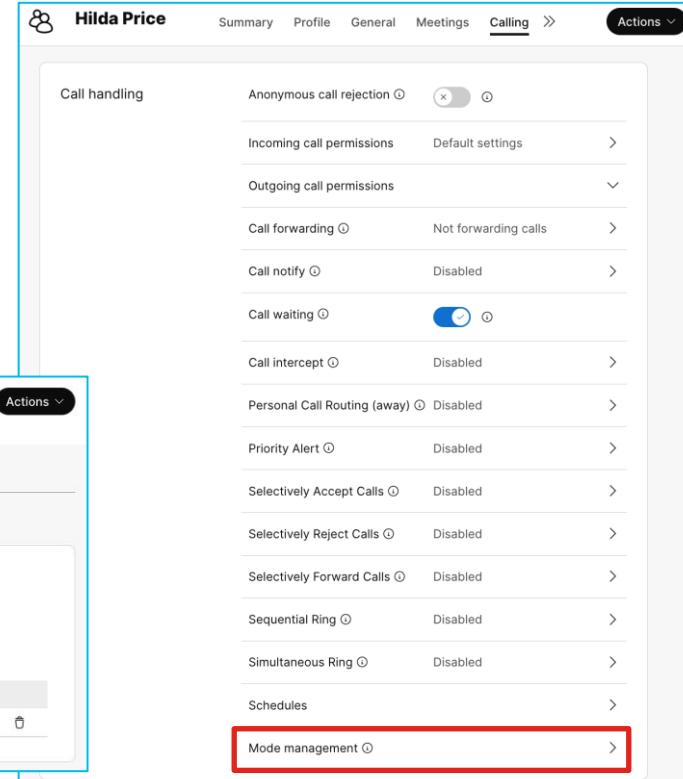
Mode management

Allow user to manage the mode-based forwarding of the specified features.

Add by name, number or extension

Search features 1 features

Name	Phone number
CQ Example	6666



Hilda Price

Summary Profile General Meetings **Calling** >

Actions

Call handling

Anonymous call rejection

Incoming call permissions Default settings >

Outgoing call permissions >

Call forwarding Not forwarding calls >

Call notify Disabled >

Call waiting

Call intercept Disabled >

Personal Call Routing (away) Disabled >

Priority Alert Disabled >

Selectively Accept Calls Disabled >

Selectively Reject Calls Disabled >

Selectively Forward Calls Disabled >

Sequential Ring Disabled >

Simultaneous Ring Disabled >

Schedules >

Mode management >

Mode Management in Device Layout

- “Mode management” as option for line key assignment
- “Mode management” line keys filled by mode management options assigned to user

The image shows the Cisco Device Layout configuration interface. It consists of three main sections: a top configuration window, a middle configuration window, and a bottom preview window.

Top Configuration Window: This window is titled "Line Key Configuration". It displays a table of line key assignments. The table has columns for "Order", "Line Key Assignment", and "Order". The data is as follows:

Order	Line Key Assignment	Order
1	Primary line	6
2	Mode management	7
3	Open	8
4		
5		

Middle Configuration Window: This window is also titled "Line Key Configuration". It displays a table of line key assignments. The table has columns for "Order", "Line Key Assignment", and "Order". The data is as follows:

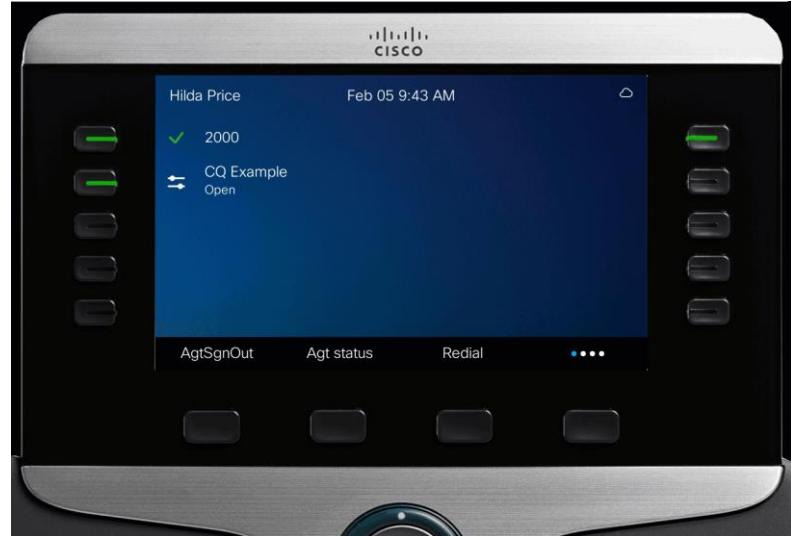
Order	Line Key Assignment	Order
1	Hilda Price (2000) Primary line	6
2	CQ Example (6666) Mode Management (Assigned from Mode Management)	7
3		

Bottom Preview Window: This window shows a "preview" of a physical phone. The phone has three line keys. The first key is labeled "Hilda Price" with a checkmark and the number "2000". The second key is labeled "CQ Example" with a double arrow icon and the text "Closed before 9".

Labels: The middle configuration window is labeled "preview" and the bottom preview window is labeled "phone".

Mode Management on Phone

- Mode switch can be initiated on the phone
- When selecting a scheduled mode one can select automatic (based on time) or manual switch back
- Switchback mode is indicated by color of the line key (orange/red)



Current Mode Reflected on Phone and in Control Hub

Normal operation	Mode Name
<input checked="" type="checkbox"/>	Clos... Current mode
<input checked="" type="checkbox"/>	Closed noon
<input checked="" type="checkbox"/>	Closed after 5
<input checked="" type="checkbox"/>	Open
<input type="checkbox"/>	On the road

Normal operation

Normal operation	Mode Name
<input checked="" type="checkbox"/>	Closed before 9
<input checked="" type="checkbox"/>	Clos... Current mode
<input checked="" type="checkbox"/>	Closed after 5
<input checked="" type="checkbox"/>	Open
<input type="checkbox"/>	On the road

Mode selected
(manual switch-back)

Normal operation	Mode Name
<input checked="" type="checkbox"/>	Closed before 9
<input checked="" type="checkbox"/>	Closed noon
<input checked="" type="checkbox"/>	Closed after 5
<input checked="" type="checkbox"/>	Open
<input type="checkbox"/>	On t... Current mode

Mode selected
(manual switch-back)

Normal operation	Mode Name
<input checked="" type="checkbox"/>	Closed before 9
<input checked="" type="checkbox"/>	Clos... Current mode
<input checked="" type="checkbox"/>	Closed after 5
<input checked="" type="checkbox"/>	Open
<input type="checkbox"/>	On the road

Mode selected
(automatic switch-back)



Summary

- Call routing based on operating modes allows businesses to efficiently direct calls to various destinations, users, and departments within an organization while also giving authorized users the ability to manage the routing process
- Supported for: hunt groups, call queues, auto attendants
- Limitations
 - Max 100 org level operating modes
 - Max 100 operating mode per location
 - Scheduled "holiday" operating mode can have max 150 holidays, each defined as start/end date with optional start/end time

Please download and install the
Slido app on all computers you
use



What do you think of operating modes?

ⓘ Start presenting to display the poll results on this slide.

Closing

Recap / Q & A

- Webex Calling PSTN options
 - PSTN migration aspects
- Calling Regions, design considerations
- Location considerations
- Dial Plan
 - Principles, dialing habits, location codes, best practices, overlaps
- Operating Modes for hunt groups, call queues and auto attendants

Calling Sessions

10 Feb, 14:15	BRKCOL-2481: Successful Migrations from Unified CM to Webex Calling
10 Feb, 16:15	BRKCOL-2067: Calling Interoperability with Microsoft Teams
11 Feb, 8:00	BRKCOL-2065: Webex Calling - How Do I Begin?
11 Feb, 8:30	LTRCOL-2492: Implementing Cisco Calling Interoperability with Microsoft Teams
11 Feb, 12:00	BRKCOL-2068: Cisco IP Phones, Headsets, and Webcams: The Product Updates that we all Need to Know
11 Feb, 13:30	IBOCOL-2420: Calling Migrations: an Interactive Session to Share Experiences, Ideas, Solutions, and Best Practices
11 Feb, 14:00	LTRCOL-2574: A Hands-on Approach to Automation with Cisco Collaboration APIs
11 Feb, 16:30	BRKCOL-2698: Webex Calling Multi-Tenant Architecture
12 Feb, 13:00	IBOCOL-1120: Webex Calling: What Do You Want to Know?
12 Feb, 16:00	BRKCOL-2314: CUBE v14 Updates
13 Feb, 08:45	BRKCOL-2312: Co-locating Local Gateway and Site Survivability for Webex Calling
13 Feb, 13:15	BRKCOL-2094: Webex Edge Connect Design and Deployment for Webex Meetings, Calling and Dedicated Instance
13 Feb, 13:15	BRKCOL-2198: Deploying the Webex App to your Organization
13 Feb, 14:00	LTRCOL-3001: Migration to Webex Calling Lab
13 Feb, 17:00	BRKCOL-2143: Troubleshooting the Session Initiation Protocol (SIP)
14 Feb, 11:15	BRKCOL-2787: Planning and Designing Successful Cloud Calling Deployments with Webex Calling

Webex App

Questions?

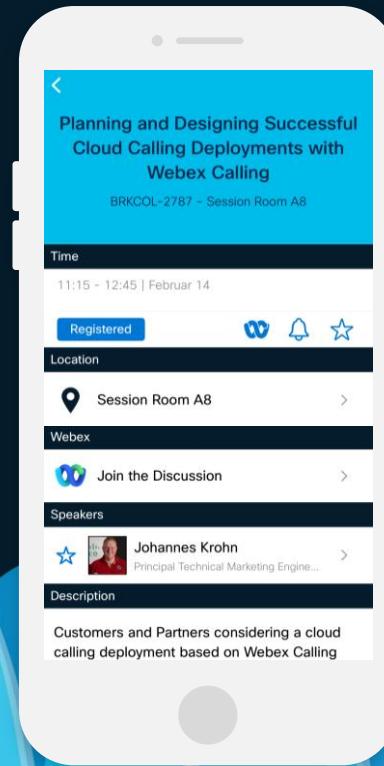
Use the Webex app to chat with the speaker after the session

How

- 1 Find this session in the Cisco Events mobile app
- 2 Click “Join the Discussion”
- 3 Install the Webex app or go directly to the Webex space
- 4 Enter messages/questions in the Webex space

Webex spaces will be moderated by the speaker until February 28, 2025.

CISCO *Live!*



Fill Out Your Session Surveys



Participants who fill out a minimum of 4 session surveys and the overall event survey will get a unique Cisco Live t-shirt.

(from 11:30 on Thursday, while supplies last)



All surveys can be taken in the Cisco Events mobile app or by logging in to the Session Catalog and clicking the 'Participant Dashboard'



Content Catalog



Continue your education

CISCO *Live!*

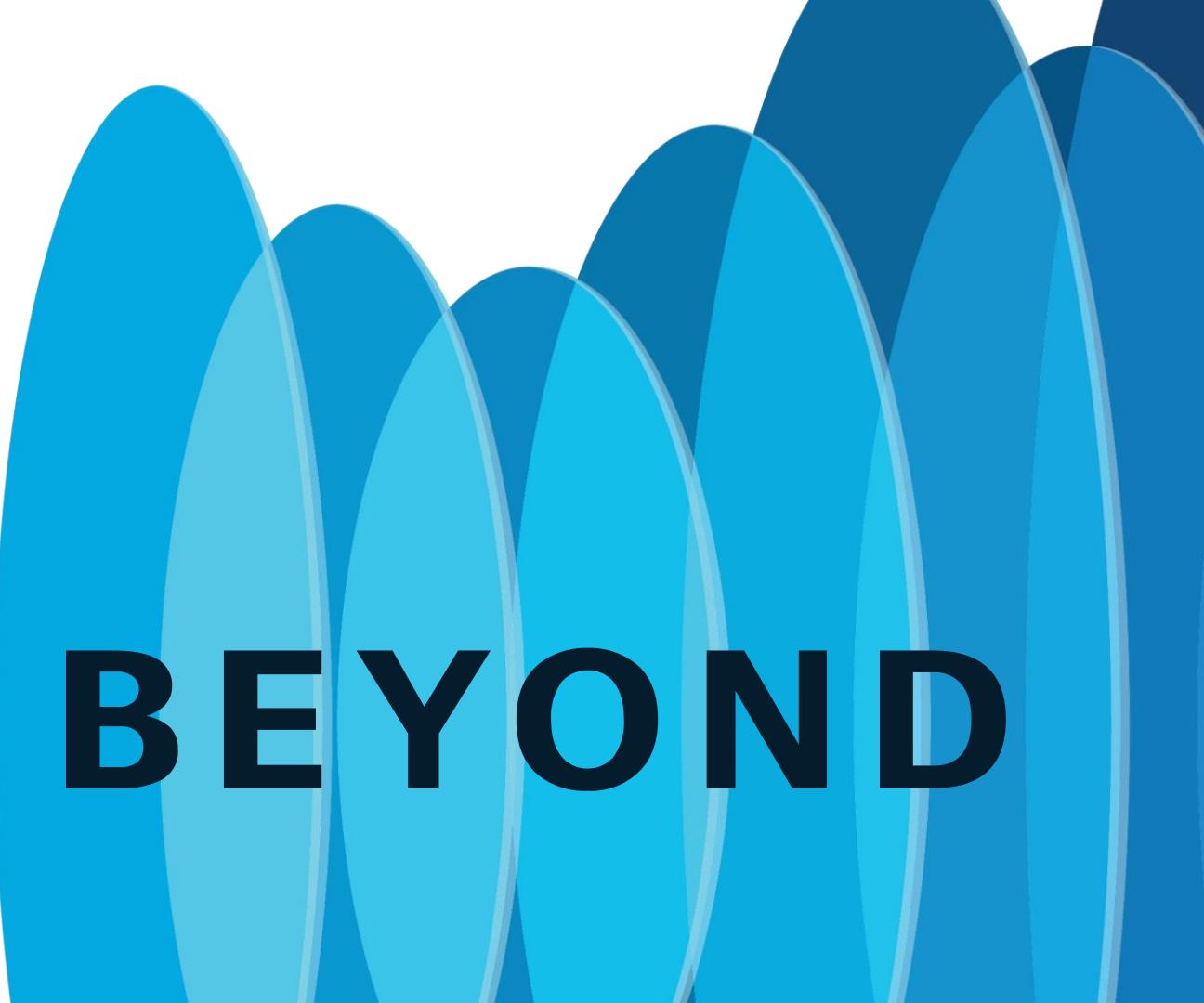
- Visit the Cisco Showcase for related demos
- Book your one-on-one Meet the Engineer meeting
- Attend the interactive education with DevNet, Capture the Flag, and Walk-in Labs
- Visit the On-Demand Library for more sessions at cisco.com/on-demand. Sessions from this event will be available from March 3.

Contact me at: jkrohn@cisco.com



Thank you

cisco *Live!*



GO BEYOND

Appendix

Call Routing

Webex Calling Call Routing

- Three phases
 - Source classification
 - Type of call: user, premises, external
 - Destination selection
 - Where to send the call to: user, premises, PSTN, ...
 - Screening and routing
 - Is this call allowed?

Source Classification

Call from	Classified as
Room devices, MPP, Webex app	User
Cloud PSTN (Cisco Calling Plan or Cloud Connect for Webex Calling)	External (PSTN)
Trunk (Local GW)	Premises or External*
Webex Calling Dedicated instance	User or External*

*based on calling party number (or diversion header if present) and configuration settings

Source Classification

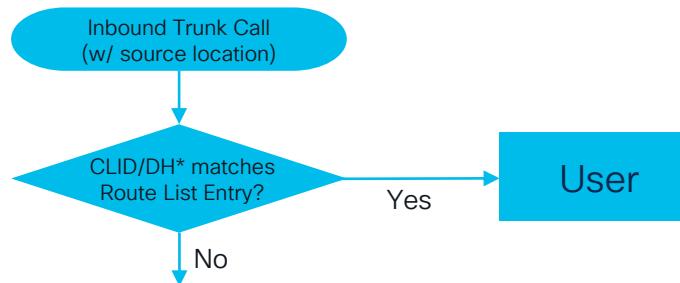
Calls from Local Gateway or Webex Calling DI

Inbound Trunk Call
(w/ source location)



Source Classification

Calls from Local Gateway or Webex Calling DI



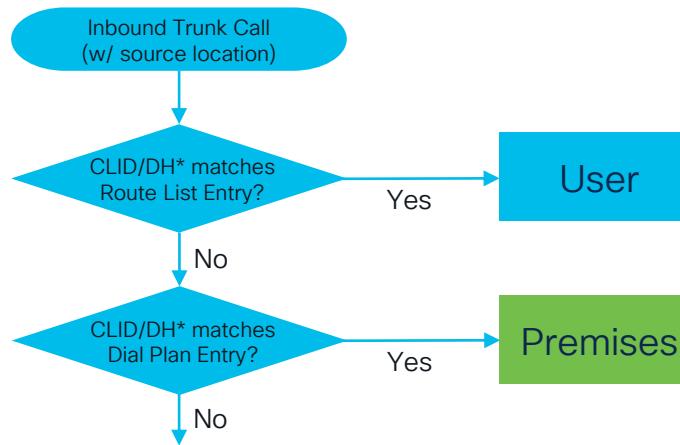
Number in Diversion header used if present, if not number in From header is used

```
INVITE sip:89943702@peering3.us.sipconnect.bcl.d.webex.com:5062 SIP/2.0
Via: SIP/2.0/TLS 64.102.250.137:5061;branch=z9hG4bK8BF831C1E
From: <sip:+19194766200@64.102.250.137>;tag=FD340CF9-200D
To: <sip:89943702@peering3.us.sipconnect.bcl.d.webex.com>
Call-ID: 2EB7BD48-EF7111ED-B8429147-F554AD62@64.102.250.137
Supported: timer,resource-priority,replaces
Min-SE: 1800
User-Agent: Cisco-SIPGateway/IOS-17.10.1a
Allow: INVITE, OPTIONS, BYE, CANCEL, ACK, PRACK, UPDATE, REFER, SUBSCRIBE, NOTIFY, INFO, REGISTER
CSeq: 101 INVITE
Contact: <sip:+19194766200@svs-rtp-dmz-cube9a.cube.ecatslab.com:5061;transport=tls>
Diversion: <sip:89915678@svs-rtp-dmz-cube9a.cube.ecatslab.com>
Expires: 180
Max-Forwards: 68
... snip ...
```

* CLID = Calling Party ID
DH = SIP Diversion Header

Source Classification

Calls from Local Gateway or Webex Calling DI



* CLID = Calling Party ID
DH = SIP Diversion Header

Source Classification

Calls from Local Gateway or Webex Calling DI

Org-wide unknown number handling

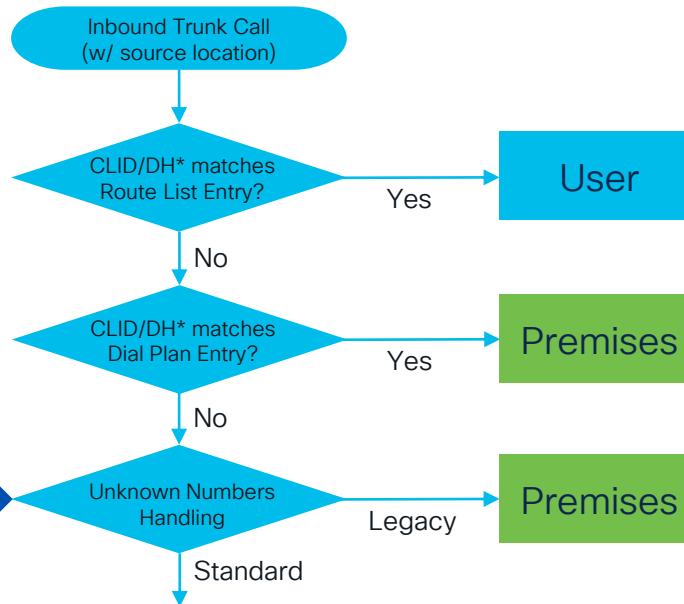
Standard behavior

This is the default and recommended option to achieve the best level of interoperability with an on-premises PBX.

Show Details ▾

Legacy behavior (not recommended)

This option provides backwards compatibility for the legacy Local Gateway behavior and is not recommended when Dial Plans are configured for the organization.



* CLID = Calling Party ID
DH = SIP Diversion Header

Source Classification

Calls from Local Gateway or Webex Calling DI

Org-wide unknown number handling

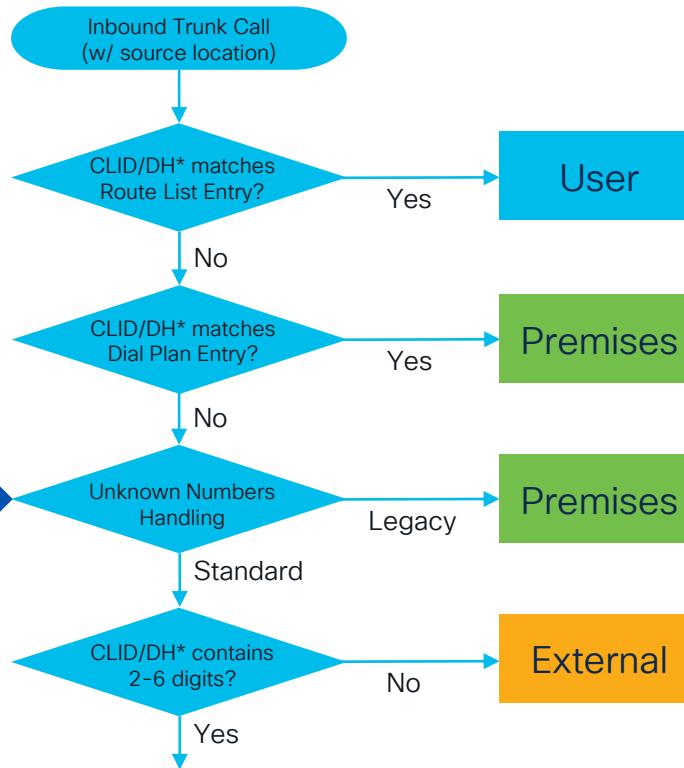
Standard behavior

This is the default and recommended option to achieve the best level of interoperability with an on-premises PBX.

Show Details ▾

Legacy behavior (not recommended)

This option provides backwards compatibility for the legacy Local Gateway behavior and is not recommended when Dial Plans are configured for the organization.



* CLID = Calling Party ID
DH = SIP Diversion Header

Source Classification

Calls from Local Gateway or Webex Calling DI

Org-wide unknown number handling

Standard behavior

This is the default and recommended option to achieve the best level of interoperability with an on-premises PBX.

Show Details ▾

Legacy behavior (not recommended)

This option provides backwards compatibility for the legacy Local Gateway behavior and is not recommended when Dial Plans are configured for the organization.

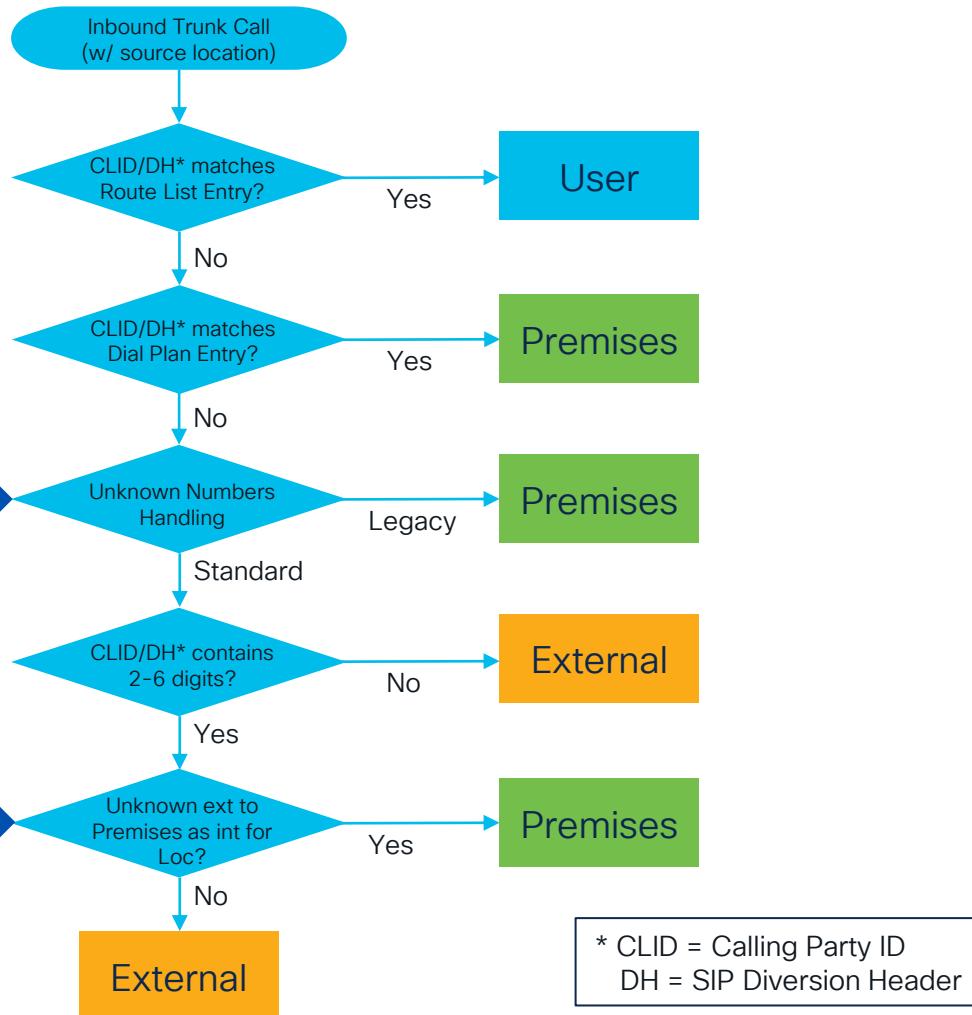
Trunk Location Configuration

Calls to On-Premises Extensions

If some users in this location are registered to a PBX, enable this setting to route unknown extensions (digits that match with the extension length) to the PBX.

Enable routing unknown extensions to the Premises as internal calls

VNT Alpha RG



* CLID = Calling Party ID
DH = SIP Diversion Header

Source Classification

Calls from Local Gateway or Webex Calling DI

With “legacy behavior” incoming calls will never get classified as “External”! Breaks features that rely on call types.

Org-wide unknown number handling

Standard behavior

This is the default and recommended option to achieve the best level of interoperability with an on-premises PBX.

Show Details ▾

Legacy behavior (not recommended)

This option provides backwards compatibility for the legacy Local Gateway behavior and is not recommended when Dial Plans are configured for the organization.

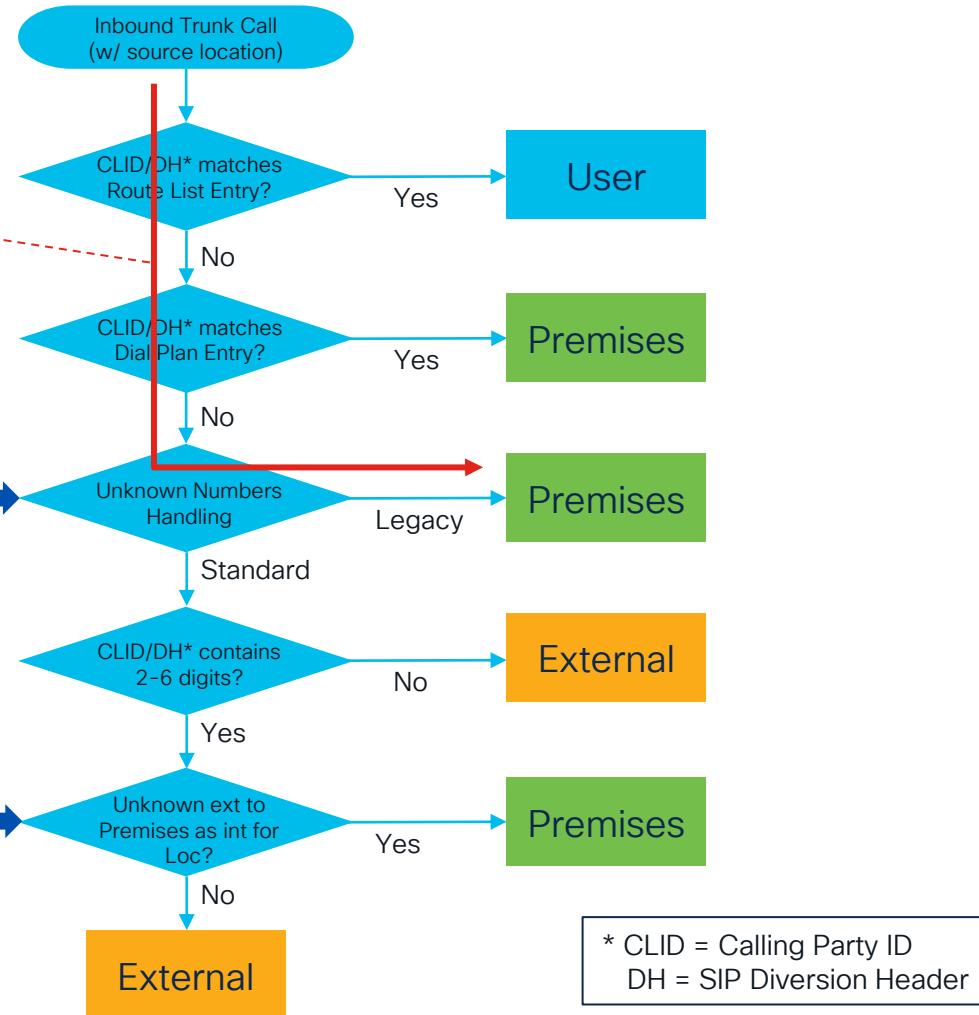
Trunk Location Configuration

Calls to On-Premises Extensions

If some users in this location are registered to a PBX, enable this setting to route unknown extensions (digits that match with the extension length) to the PBX.

Enable routing unknown extensions to the Premises as internal calls

VNT Alpha RG



Source Classification

Calls from Local Gateway or Webex Calling DI

With “legacy behavior” incoming calls will never get classified as “External”! Breaks features that rely on call types.

Org-wide unknown number handling

Standard behavior

This is the default and recommended option to achieve the interoperability with an on-premises PBX.

Show Details ▾

Legacy behavior (not recommended)

This option provides backwards compatibility for the legacy Gateway behavior and is not recommended when Dial Plans are configured for the organization.

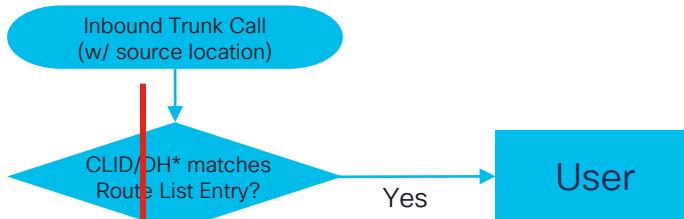
Trunk Location Configuration

Calls to On-Premises Extensions

If some users in this location are registered to a PBX, enable this setting to route unknown extensions (digits that match with the extension length) to the Premises as internal calls.

Enable routing unknown extensions to the Premises as internal calls

VNT Alpha RG



The screenshot shows the "Calling" tab of a user profile for "Andre Parker". The "Incoming call permissions" section is highlighted with a red box. Under "External calls", the dropdown menu is set to "Allow for transferred", which is also highlighted with a red box. The "Premises as int for Loc?" section at the bottom is also highlighted with a red box.

Premises as int for Loc?

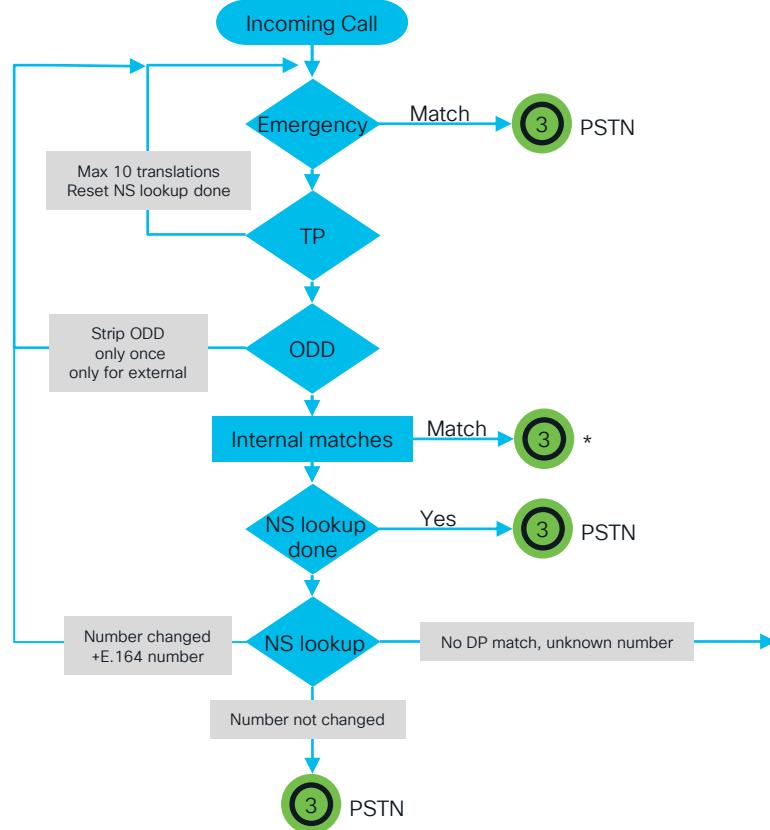
Yes

Premises

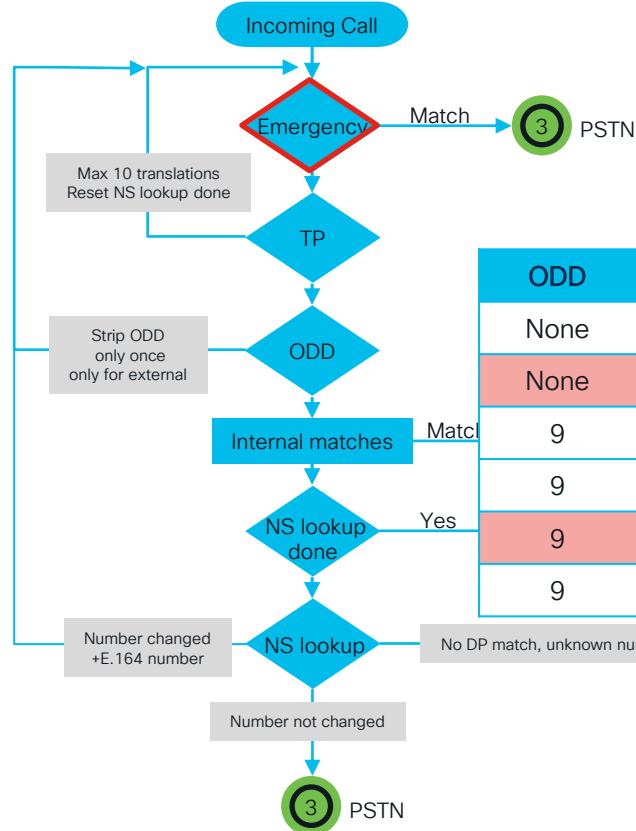
External

* CLID = Calling Party ID
DH = SIP Diversion Header

Destination Selection



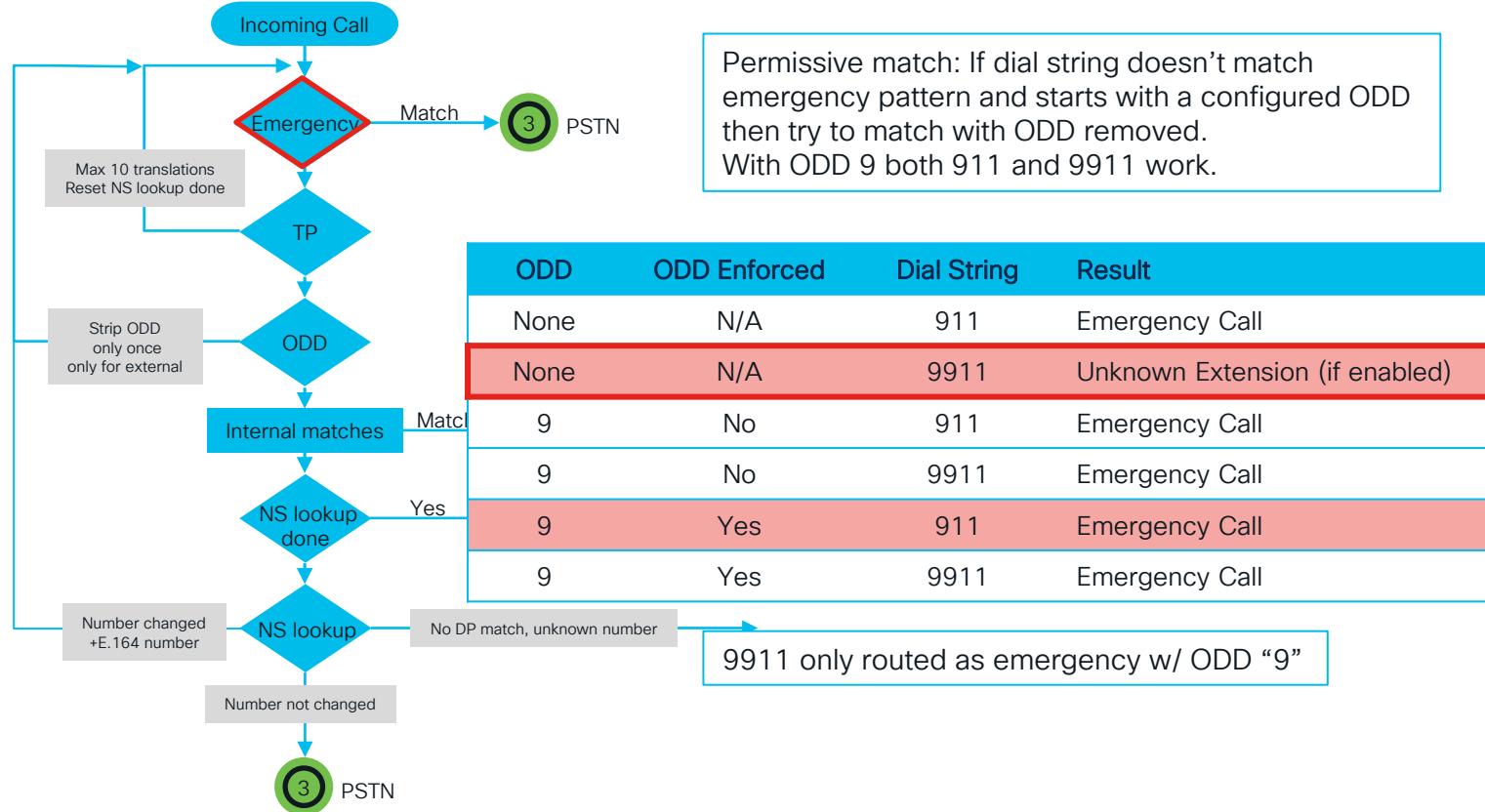
Destination Selection



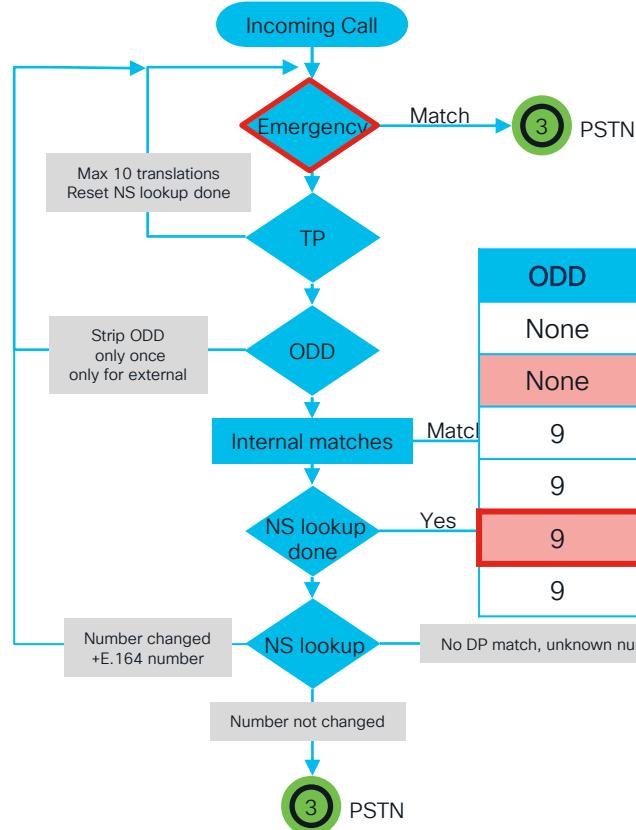
Permissive match: If dial string doesn't match emergency pattern and starts with a configured ODD then try to match with ODD removed. With ODD 9 both 911 and 9911 work.

ODD	ODD Enforced	Dial String	Result
None	N/A	911	Emergency Call
None	N/A	9911	Unknown Extension (if enabled)
9	No	911	Emergency Call
9	No	9911	Emergency Call
9	Yes	911	Emergency Call
9	Yes	9911	Emergency Call

Destination Selection



Destination Selection



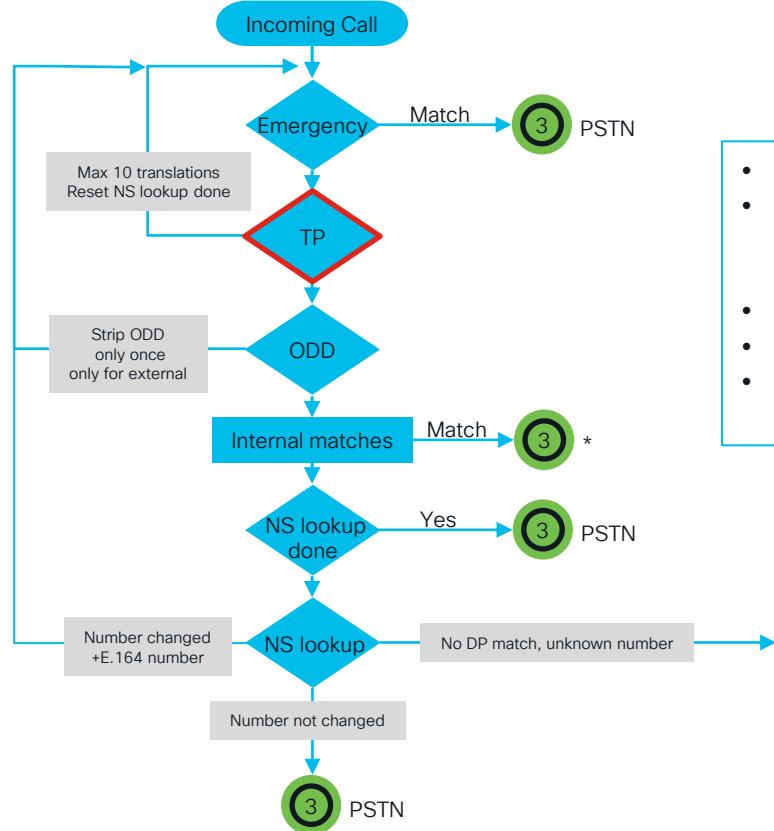
Permissive match: If dial string doesn't match emergency pattern and starts with a configured ODD then try to match with ODD removed.
With ODD 9 both 911 and 9911 work.

ODD	ODD Enforced	Dial String	Result
None	N/A	911	Emergency Call
None	N/A	9911	Unknown Extension (if enabled)
9	No	911	Emergency Call
9	No	9911	Emergency Call
9	Yes	911	Emergency Call
9	Yes	9911	Emergency Call

9911 only routed as emergency w/ ODD "9"

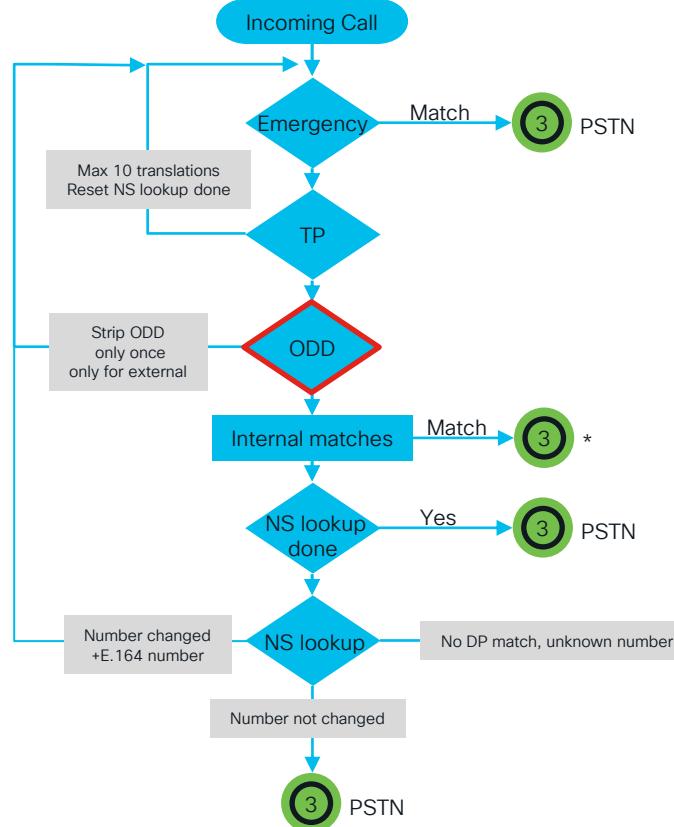
911 routed as emergency even w/ mandatory ODD "9"

Destination Selection



- Try to match translation patterns
- Loop back if the dial string actually changes
For example: 6432 hitting TP (6XXX → 6432) is not changing the dial string
- Max 10 translations in total per call leg
- Don't check TPs if ODD was removed earlier
 - .. Unless NS lookup transformed number to +E.164 and we came back here

Destination Selection



Outbound Dial Digit ⓘ

Choose the outbound digit which when the toggle is enabled, users in this location must dial before placing external call. If you are using an internal dialing steering digit, it cannot be used as the outbound digit. If set, all calls will use the E.164 number format.

Learn more about Outbound Dial Digit ⓘ

9

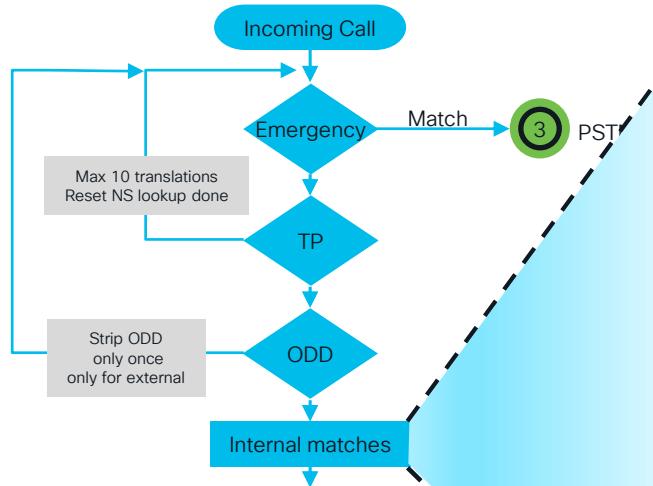
To make calls outside the organization users will dial the following
Outbound digit-Phone number
9-XXX XXX XXXX

⚠ Restart devices on this location to apply the latest dial plan.

Enable Outbound Dial Digit Enforcement

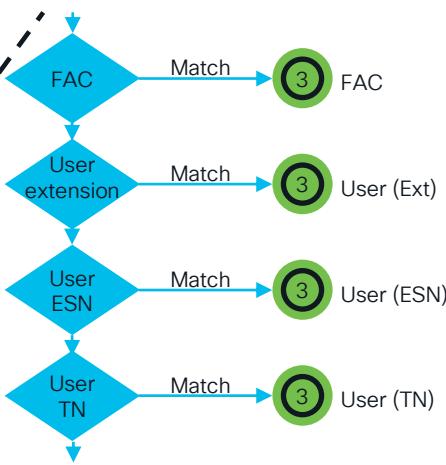
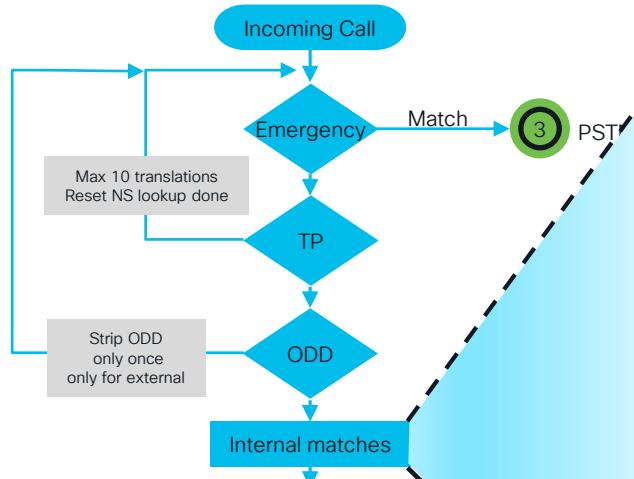
- If dial string starts with outside dial digit (e.g. "9") then start lookups again w/ ODD removed
- For internal matched (like extensions) the stripped dial string will not be used
- ODD enforcement policy setting is irrelevant here
- ODD is only stripped once: be careful with TPs translating to dial strings starting with ODD
- Dial string w/ ODD removed is not used for internal matches (next step)

Destination Selection



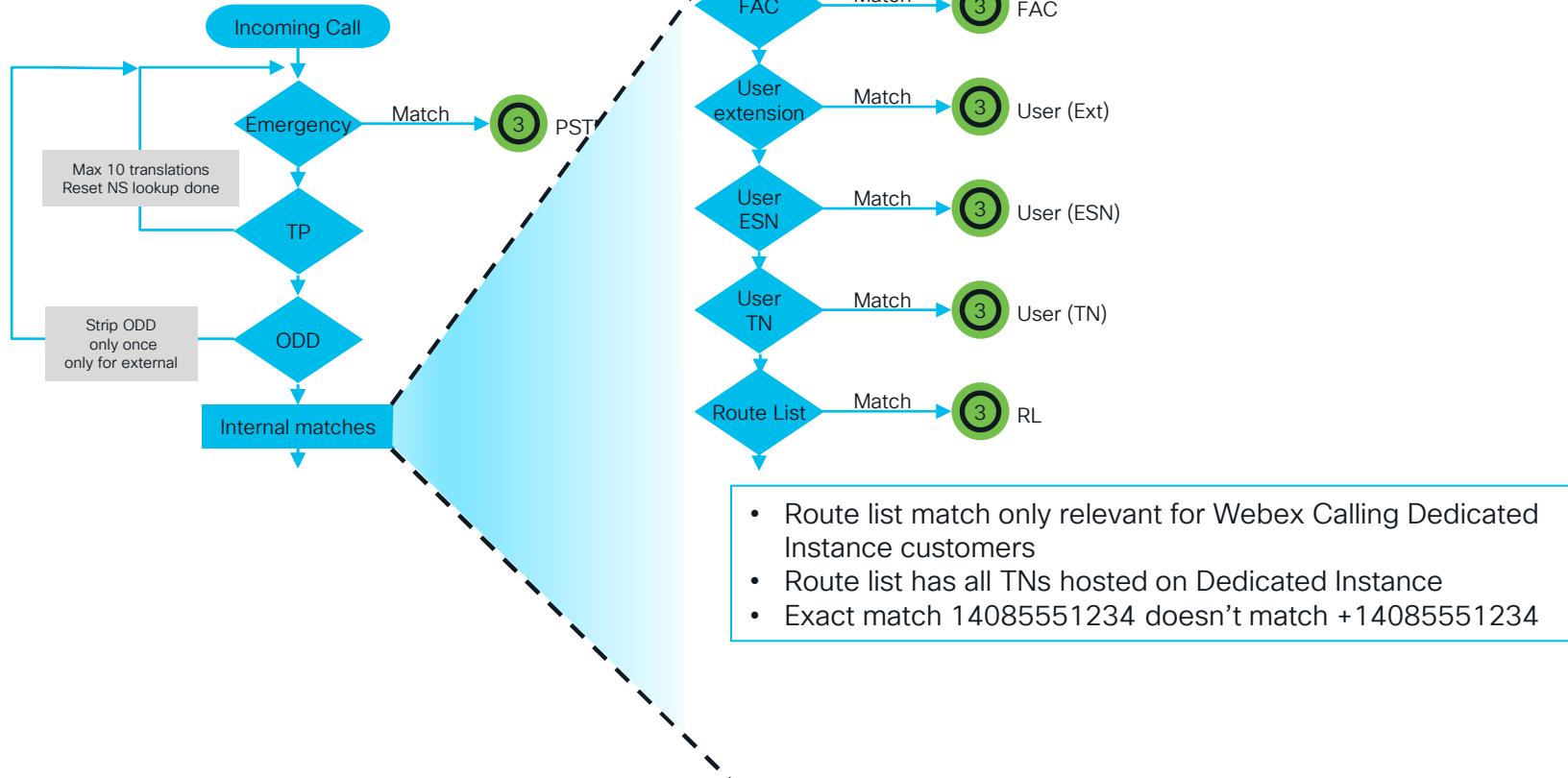
- Feature access codes handled after TPs
- TPs can translate to FACs to create custom feature access code mappings
- ODD removed prior to FAC match
→ for FACs dialed with a phone number the ODD can be dialed before the FAC

Destination Selection

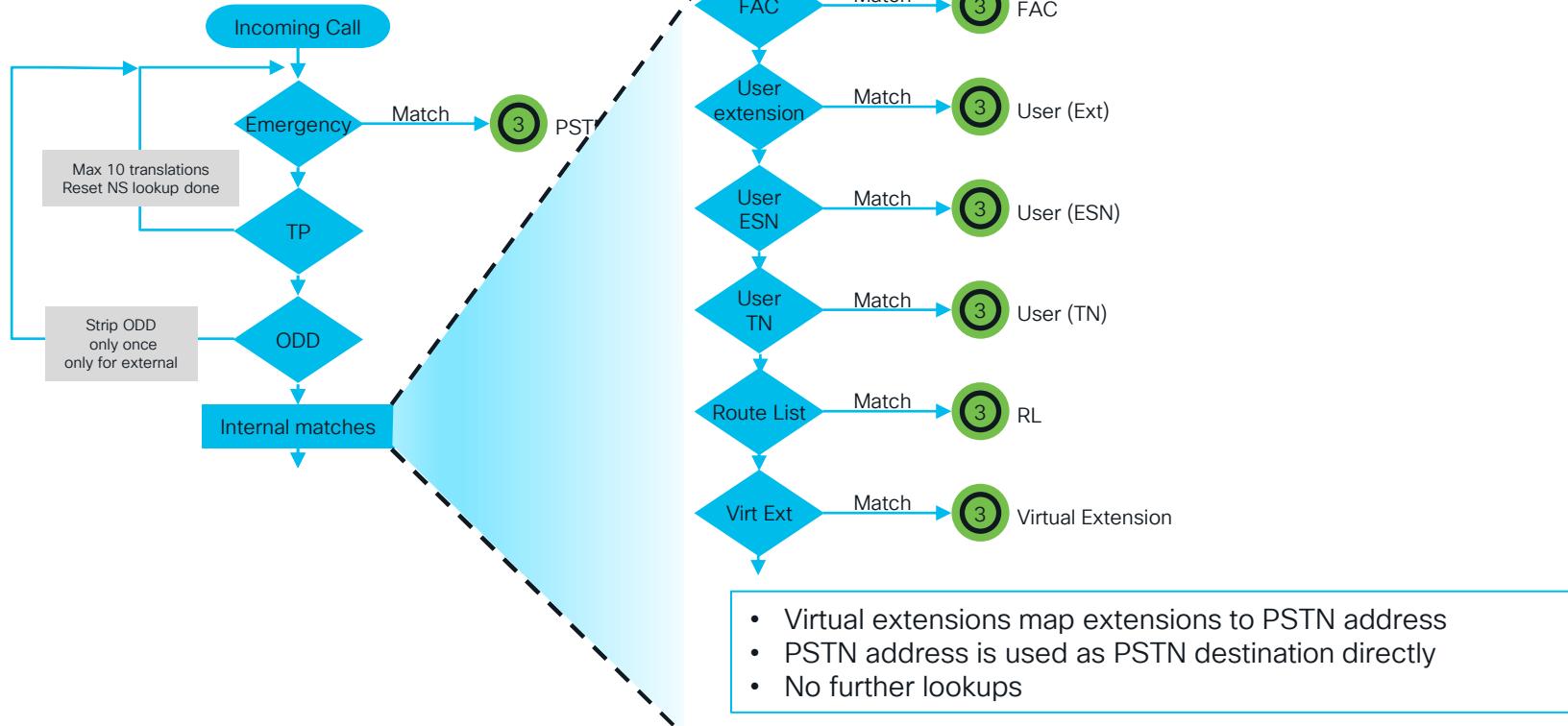


- Extension takes precedence over ESN or TN. Usually overlaps between extensions and other number types should be avoided
- Naïve globalization for TN match: If dial string is not +E.164 then remove national prefix if present and prefix with +CC
 - US, 4085551234, no national prefix, prefix +1 → +14085551234
 - US, 14085551234, remove national prefix "1", prefix +1 → +14085551234
 - DE, 061007739764, remove national prefix "0", prefix +49 → +4961007739764

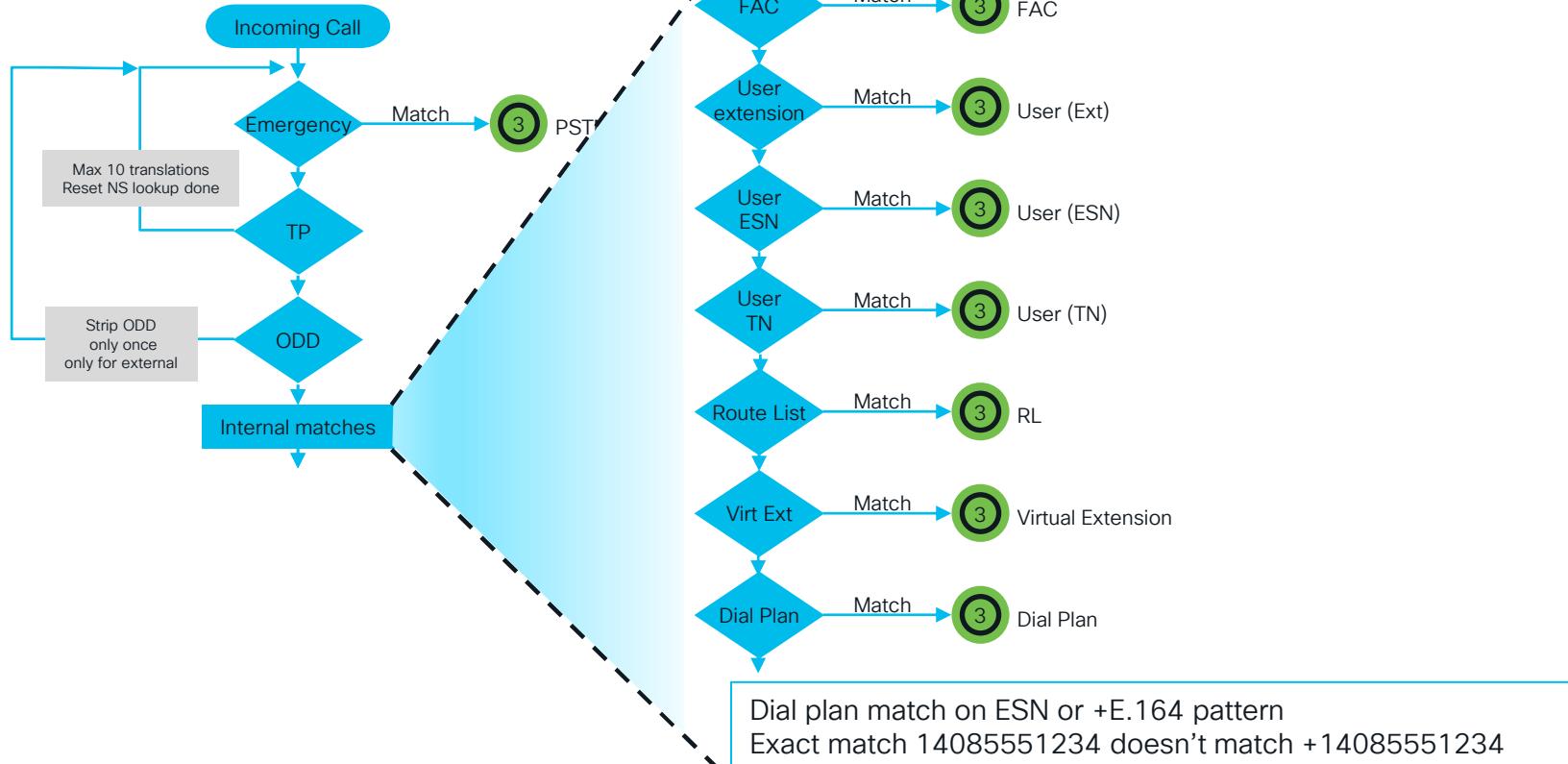
Destination Selection



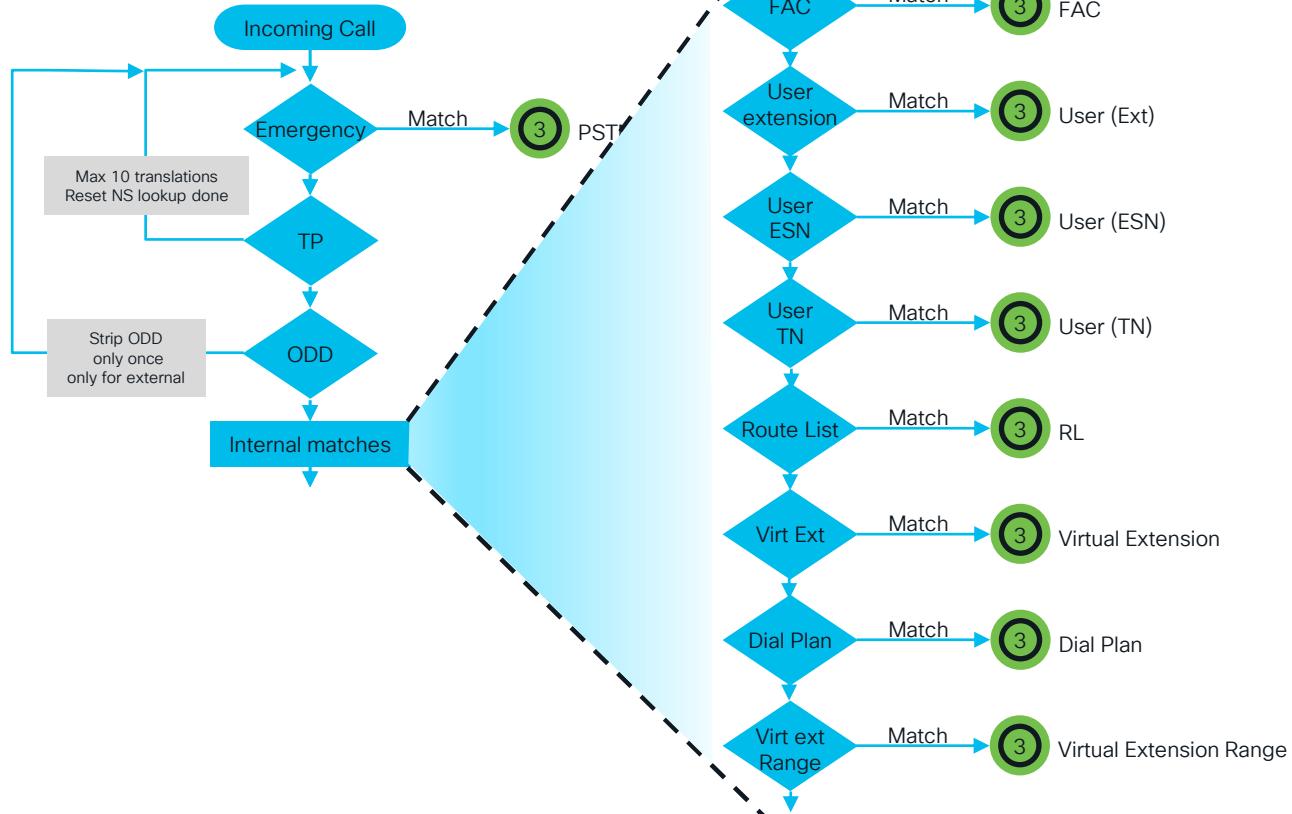
Destination Selection



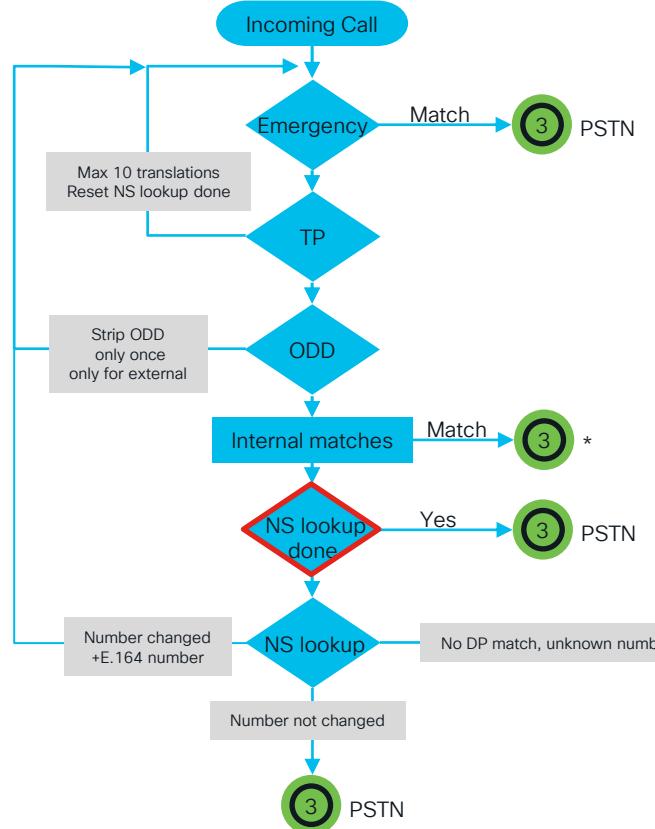
Destination Selection



Destination Selection

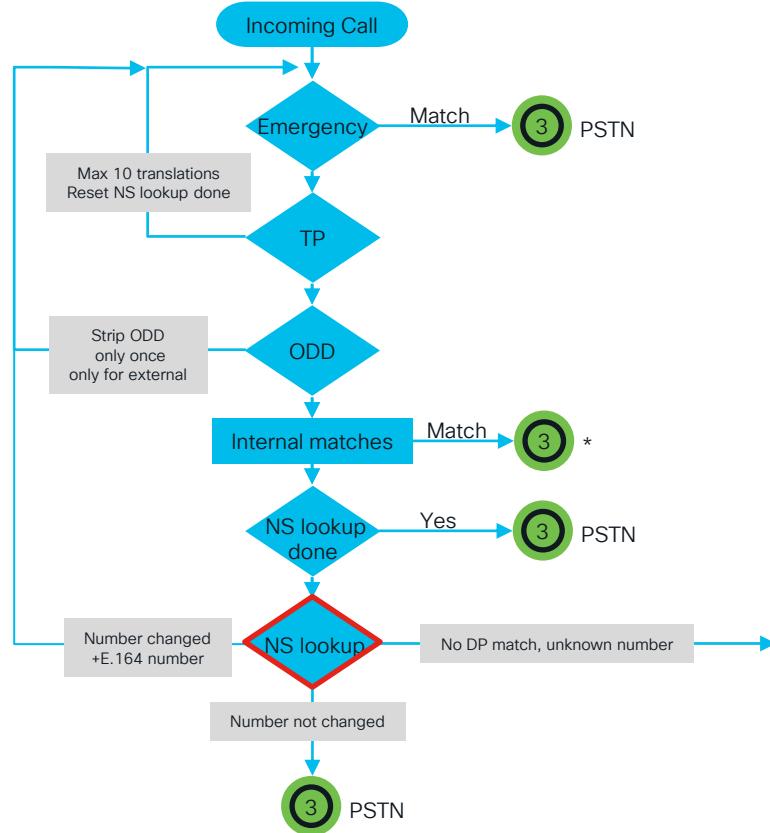


Destination Selection



If NS lookup was already done
... and no TP was applied after that then no new lookup is
required b/c the lookup result would be the same

Destination Selection

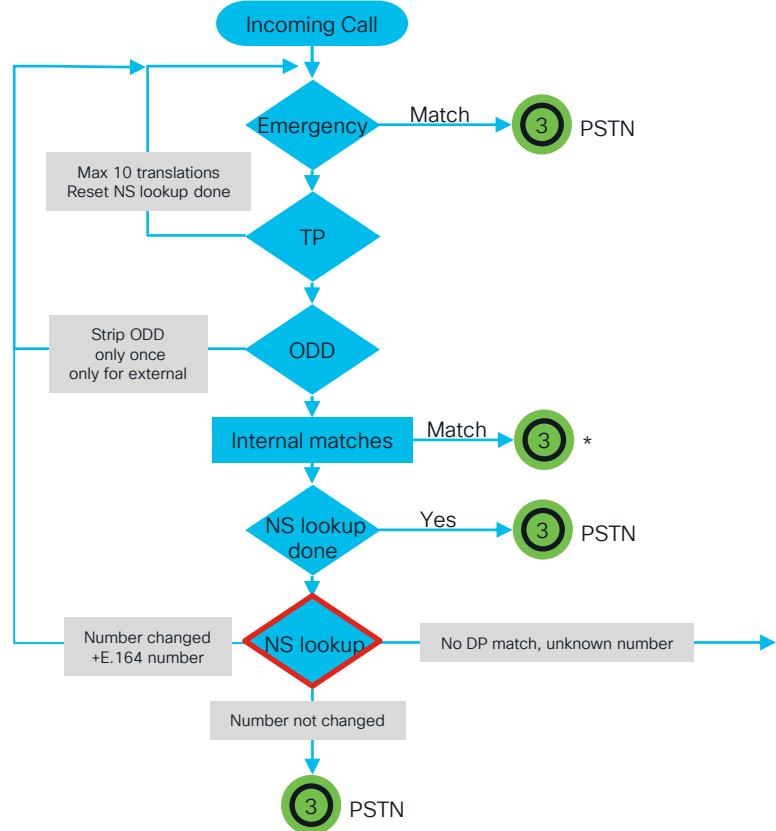


<https://help.webex.com/en-us/article/757iyo/Dial-plans-by-country>

Netherlands			
Outbound calling plan			
Table 185. Netherlands outbound calling plan			
Country code	Digit map	Call type	Description
31	18xx	Chargeable Directory Assistance	Directory Assistance
31	116xxxx	Chargeable Directory Assistance	European Harmonized Services
31	0xxxxxx.	International	International Destinations
31	xxxxxx	Local	Local Calls
31	xxxxxxx	Local	Local Calls
31	084xxxxxxxx	Premium Services I	Personal Assistant Services

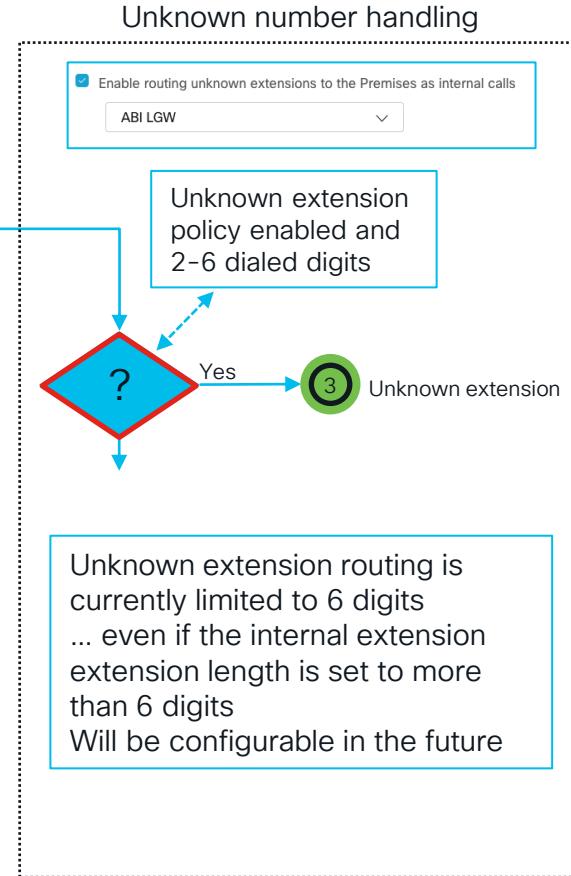
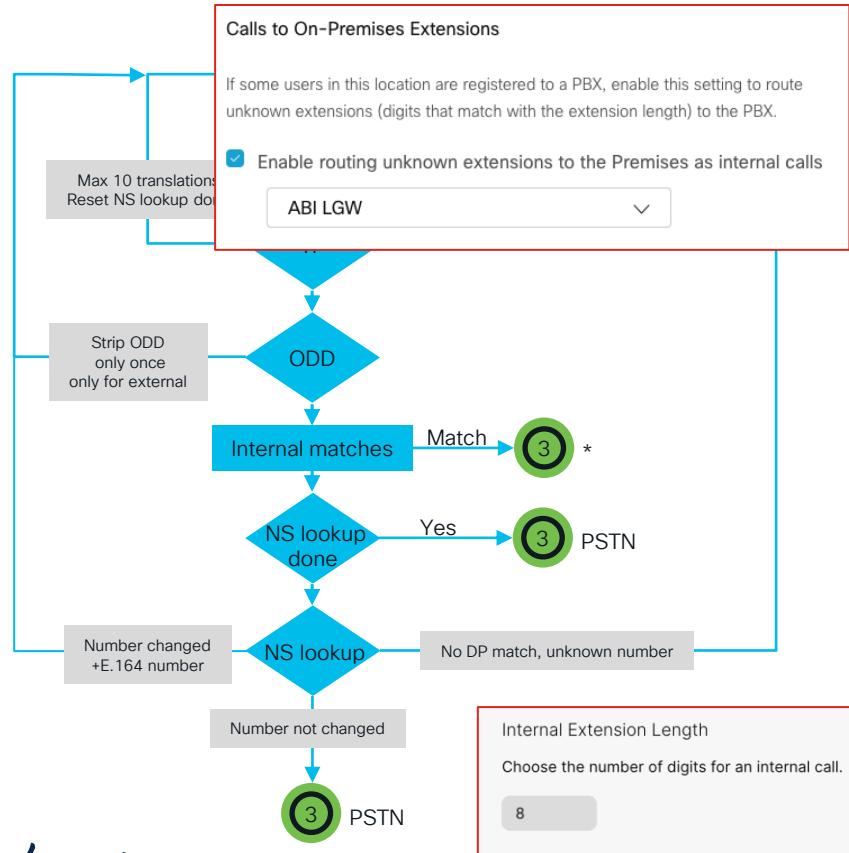
- NS lookup considers dialed ODD and ODD enforcement
- NS lookup uses national calling plan for the country of the Location
- Call Type tagging used for call restrictions (covered later)

Destination Selection

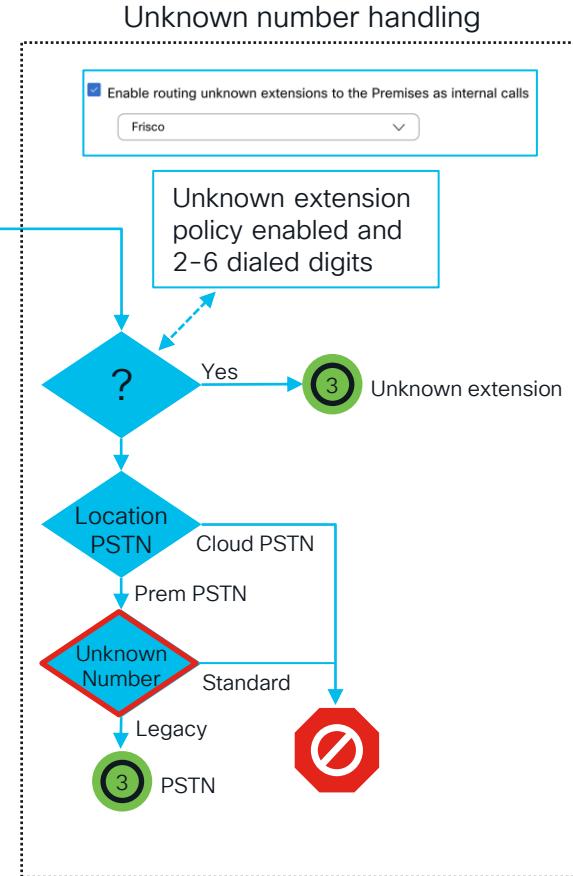
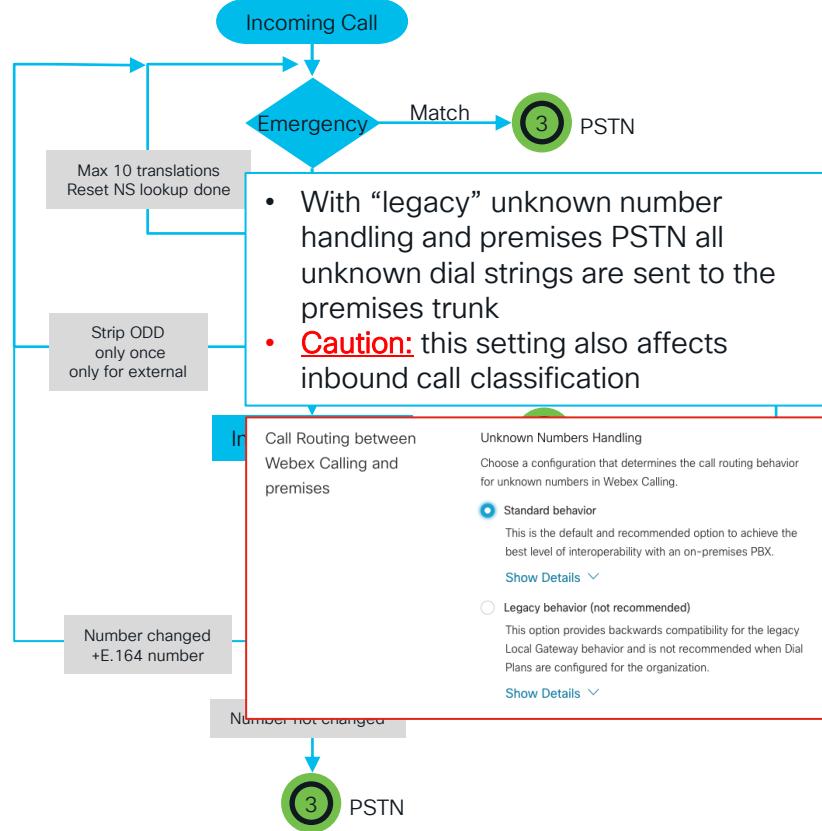


- Three possible outcomes of NS lookup:
 - Found a match, no change
 - Unknown number (no dial plan match)
 - Number changed (typically to +E.164) → loop
Example: 9011496100123 → +496100123
- Loop enables:
 - +E.164 TN matches
 - +E.164 TP matches
 - +E.164 Route list and dial plan matches

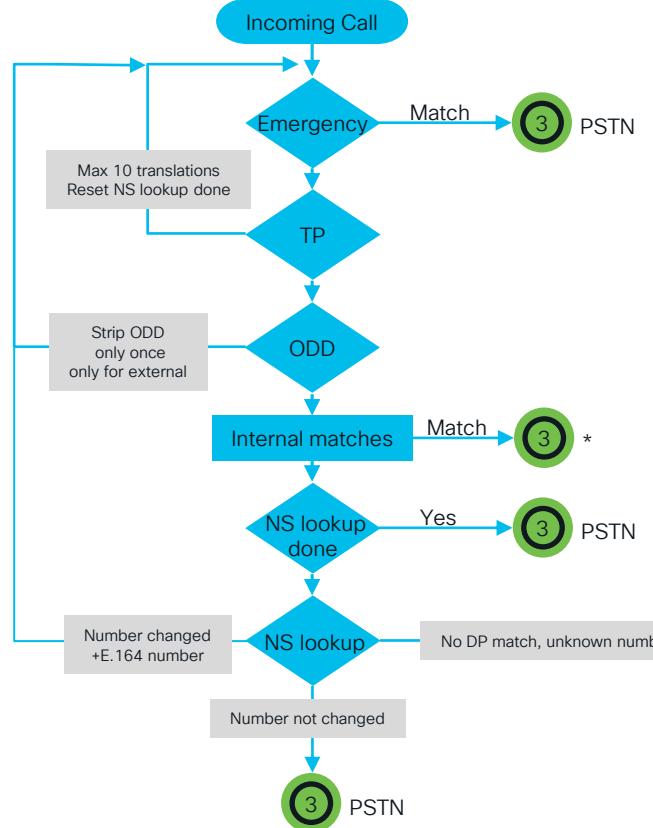
Destination Selection



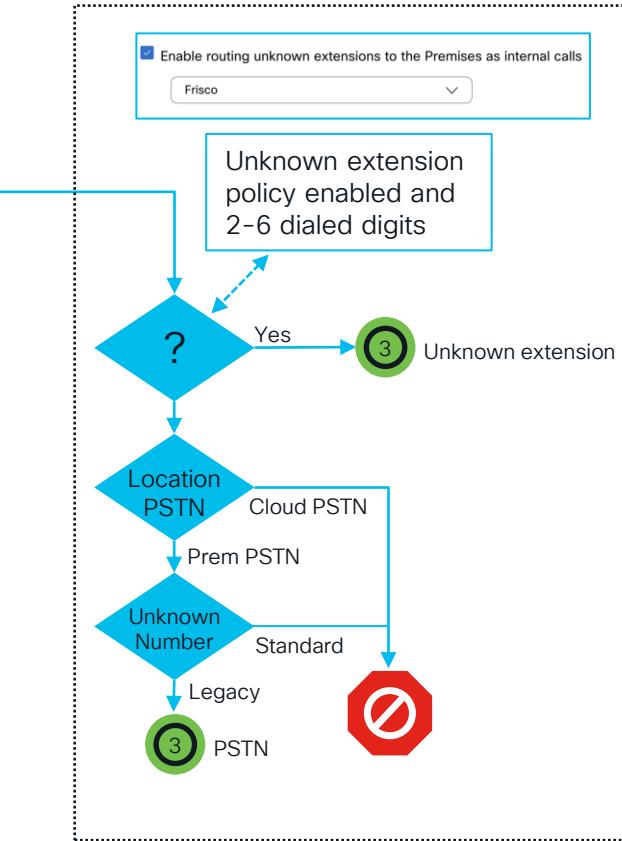
Destination Selection



Destination Selection

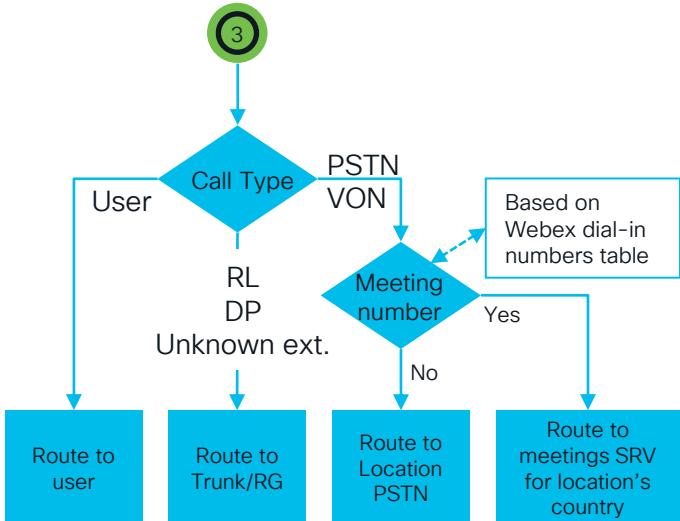


Unknown number handling



Screening and Routing

Block or allow based on calling permissions and route



- Webex dial-in is checked for all PSTN destinations
- Webex Calling dial plan elements like TPs and VONs can point to Webex dial-in numbers and the calls will be optimized

Call Routing for Webex Meetings Dial-in calls (Integrated Audio)

Optimized On-net

This is the default and recommended option to achieve PSTN cost savings and optimized call routing.

PSTN (not recommended)

This option disables the on-net routing optimization for Webex Meetings dial-in calls.

Screening and Routing

To From	User (TN)	User (ESN/Ext)	Trunk (RL)	Trunk (DP or unknown ext)	PSTN / VON
User	✓	✓	✓	✓	✓
Premises	✓	✓	✓	✓	✗
External	✓	✗	✓	✗	✗

Screening and Routing



To From	User (TN)	User (ESN/Ext)	Trunk (RL)	Trunk (DP or unknown ext)	PSTN / VON
User	✓	✓	✓	✓	✓
Premises	✓	✓	✓	✓	✗
External	✓	✗	✓	✗	✗

- Calls from Webex Calling users (including DI users) can be routed anywhere

Screening and Routing



To From	User (TN)	User (ESN/Ext)	Trunk (RL)	Trunk (DP or unknown ext)	PSTN / VON
User	✓	✓	✓	✓	✓
Premises	✓	✓	✓	✓	✗
External	✓	✗	✓	✗	✗

- Calls from On-Premises Users can be routed anywhere except for the PSTN

Screening and Routing



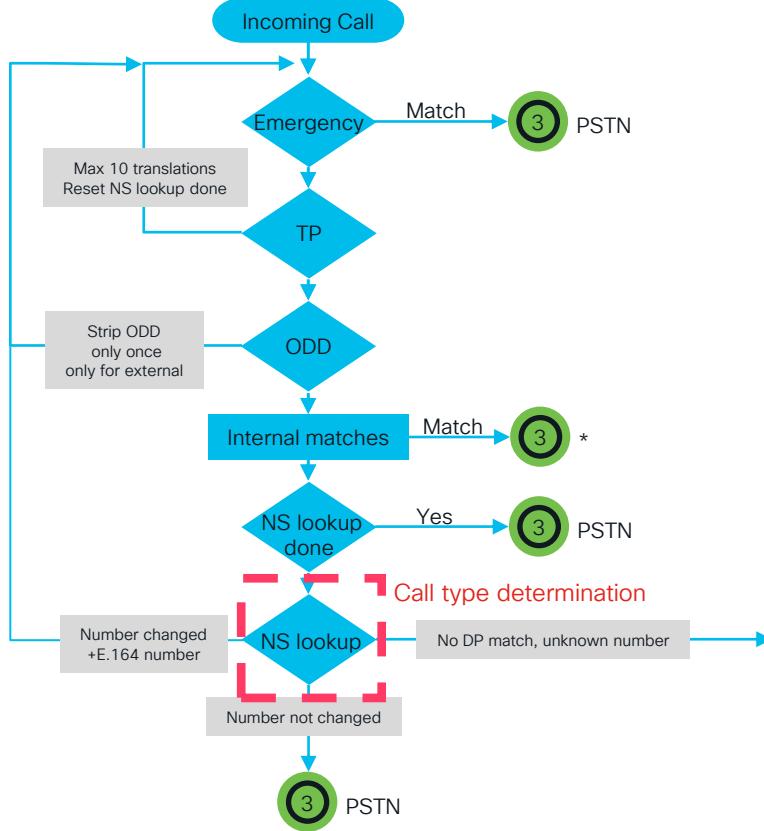
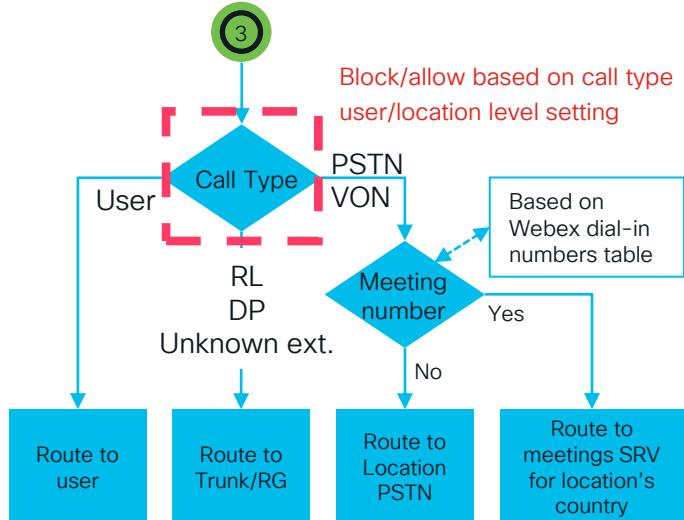
To From	User (TN)	User (ESN/Ext)	Trunk (RL)	Trunk (DP or unknown ext)	PSTN / VON
User	✓	✓	✓	✓	✓
Premises	✓	✓	✓	✓	✗
External	✓	✗	✓	✗	✗

- Calls from PSTN can only route to User TN's (including DI users). Calls from PSTN cannot call ESN / Extension.

Outgoing Call Permissions

Screening and Routing

Block or allow based on calling permissions and route



Country Calling Plans

- NS Lookup uses calling plan for the country of the location of the calling user
- Call Type tagging used for call restrictions

Netherlands

Outbound calling plan

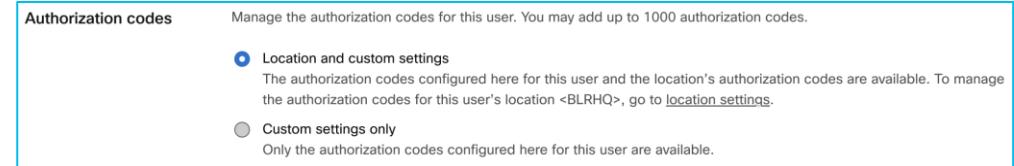
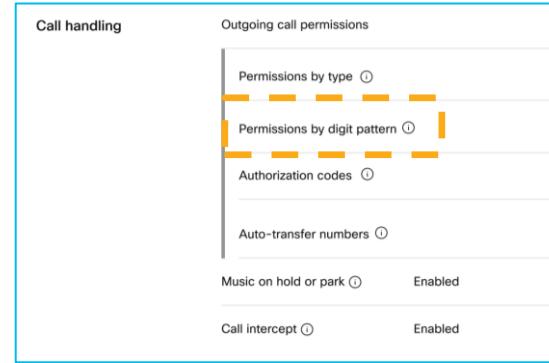
Table 185. Netherlands outbound calling plan

Country code	Digit map	Call type	Description
31	18xx	Chargeable	Directory Assistance
31	116xxx	Chargeable	Directory Assistance
31	00xxxxx.	International	International Destinations
31	xxxxxx	Local	Local Calls
31	xxxxxxx	Local	Local Calls
31	084xxxxxxxx	Premium Services I	Personal Assistant Services

<https://help.webex.com/en-us/article/757iyo/Dial-plans-by-country>

Outgoing Call Permissions – Enhanced

- Separate configuration menus for
 - Permissions by type
 - **Permissions by digit pattern (New)**
 - Authorization codes
 - Auto-transfer numbers
- ... for locations, users, workspaces, virtual lines
- Authorization codes, auto-transfer numbers, patterns at user/workspace/virtual line level can be combined w/ location level authorization codes
 - “Location and custom settings” vs “Custom settings only”
- Up to 1000 authorization codes at each level (location/user/workspace/virtual line)



Outgoing Call Permissions – Enhanced

- Provisioning APIs
 - permissions by type (user, workspaces, virtual lines) – location API already exists
 - authorization codes (user, workspaces, virtual lines) – location API already exists
 - auto-transfer numbers (user, workspaces, virtual lines) – location API already exists
 - CRUD for patterns and permissions
 - APIs for virtual lines tracked as separate initiative
- Bulk management (CSV)
 - Location authorization codes
 - User Calling Data: columns for category controls, up to 20 authorization codes
- Proper handling of call type “internal”
- “Verify Call Routing” tool
 - Full support for new outgoing call permissions
 - Output of call intercept result: level, permission (block, transfer to, transfer to number)
 - Now shows final routing destination

Outgoing Call Permissions – By Pattern

- Policy (allow, block, auth. code, auto-transfer number) per pattern
- Up to 500 patterns per location/user/workspace/virtual line
- Provisioning APIs for locations, users, workspaces, and virtual lines
- Bulk management for locations, users (workspaces and virtual lines don't have bulk management; separate initiative)
- Permissions by pattern take precedence over permissions by type
- Note: call types other than “internal” always block for user in Cisco Calling Plan location w/o OCP regardless of any pattern
- For external destinations pattern match is tried twice: before/after translation according to national numbering plan
 - +E.164 patterns can be used to apply policy regardless of how the destination was dialled
 - Non +E.164 patterns can be used to apply different handling depending on how the number was dialed
- As outgoing call permissions are applied for all routing tree outcomes, policy can be applied to all call types (... other than emergency) .. even internal

Permissions by digit pattern

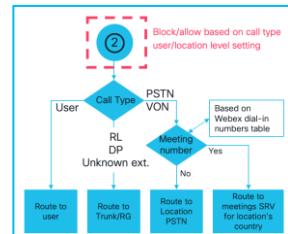
Manage the permissions by digit pattern for this user.

Location and custom settings
The digit patterns configured here for this user are applied first. If no matches found then the location's digit patterns are applied. To manage the digit patterns for this user's location <BLRHQ>, go to [location settings](#).

Custom settings only
Only the digit patterns configured here for this user are applied.

Search

Name	Pattern	Permission	Allow transfers / forwards
Digit Pattern 1	469XXXXXX	Allow	<input checked="" type="checkbox"/> <input type="checkbox"/>
Digit Pattern 2	+7!	Block	<input checked="" type="checkbox"/> <input type="checkbox"/>
Digit Pattern 3	510[3-6]XX	Block	<input checked="" type="checkbox"/> <input type="checkbox"/>



Outgoing Call Permissions – By Pattern

- Granular control over outgoing call permissions
- Examples:
 - Only allow international calls to certain countries/destinations
 - Block calls to certain countries/destinations
 - .. Per location/user/workspace/virtual line
- Caveat
 - No grouping other than at the location level
 - Sharing permissions for a larger number of users requires bulk provisioning or API use

Best Pattern Match Logic

- If multiple matches exist, the “best” match is selected
- Rules
 - Count the number of numbers matching the pattern and prefer lesser number
 - Precendence: exact match, X wildcard, ! Wildcard
 - Final tie breaker: string compare and prefer lexicographically lesser pattern

Best Pattern Match Logic

- Expansion logic:
 - Exact digit → 1
 - Digit range → number of digits in range
 - X wildcard → 10
 - ! Wildcard → 10 for each matched digit

• Example

- Pattern 4[3-6]2X!
- Digit string 452966
- Expansions 4000

Pattern	Match	expansions
4	4	
[3-6]	5	
2	2	
X	9	
!	66	

Best Pattern Match Logic

- Expansion logic:
 - Exact digit → 1
 - Digit range → number of digits in range
 - X wildcard → 10
 - ! Wildcard → 10 for each matched digit

- Example

- Pattern 4[3-6]2X!
- Digit string 452966
- Expansions 4000

Pattern	Match	expansions
4	4	1
[3-6]	5	4
2	2	1
X	9	10
!	66	10 * 10
		4000 (4 * 10 * 100)

Best Pattern Match Logic – Examples

Patterns	Matched number	Possible expansions	Pattern Used
P1: XXXX P2: 123!	1234	P1: $10*10*10*10 = 10^4$ P2: $1*1*1*10 = 10$	
P1: 123X P2: 12[0-5][0-5]	1234	P1: $1*1*1*10 = 10$ P2: $1*1*6*6 = 36$	
P1: 12[0-5][0-5] P2: [0-5][0-5]12	1212	P1: $1*1*6*6 = 36$ P2: $6*6*1*1 = 36$	
P1: 12X! P2: 12XXX!	12345678	P1: $1*1*10*10^5 = 10^6$ P2: $1*1*10^3*10^3 = 10^6$	
P1: 1[0-5]3X P2: 1[1-6]3X	1234	P1: $1*6*1*10 = 60$ P2: $1*6*1*10 = 60$	

Best Pattern Match Logic – Examples

Patterns	Matched number	Possible expansions	Pattern Used
P1: XXXX P2: 123!	1234	P1: $10*10*10*10 = 10^4$ P2: $1*1*1*10 = 10$	P2 - num of possible expansions are less than P1
P1: 123X P2: 12[0-5][0-5]	1234	P1: $1*1*1*10 = 10$ P2: $1*1*6*6 = 36$	P1 - num of possible expansions are less than P2
P1: 12[0-5][0-5] P2: [0-5][0-5]12	1212	P1: $1*1*6*6 = 36$ P2: $6*6*1*1 = 36$	P1 - num of possible expansions are same, but P1 has exact digit match at digit position 1 while P2 has digit range
P1: 12X! P2: 12XXX!	12345678	P1: $1*1*10*10^5 = 10^6$ P2: $1*1*10^3*10^3 = 10^6$	P2 - num of possible expansions are same, but P2 has wildcard X at digit position 4 while P1 has !
P1: 1[0-5]3X P2: 1[1-6]3X	1234	P1: $1*6*1*10 = 60$ P2: $1*6*1*10 = 60$	P1 - num of possible expansions and wild card precedence is same, but P1 is lexicographically less than P2

Translation Patterns

Motivation

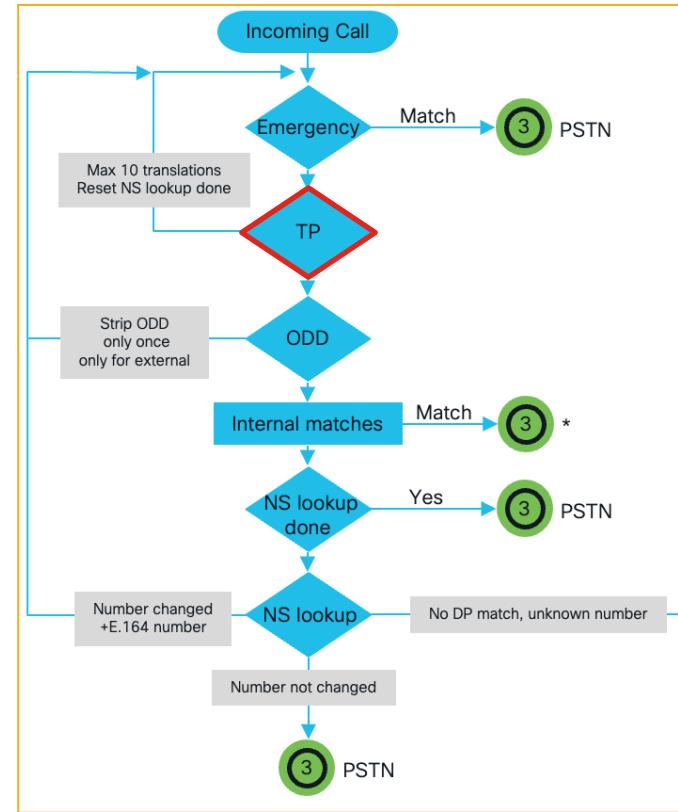
- Manipulate dial string before routing the call
- Use cases:
 - Map short codes to internal destinations
 - Like “on-net virtual extensions”
 - Add overlay dialing habits
 - “dial 88XXXX to reach users in the HQ” ... where 88XXXX is incompatible with established ESN scheme
 - Intercept and re-route certain dialing habits (more flexible than outbound calling permissions and auto-transfer numbers)
 - “dial *88* to reach the IT helpdesk”
 - ...

Overview

- Translation patterns applied to “user” calls only
 - Calls from users
 - Inbound calls from trunks when classified as user or prem call
 - ... and all other calls originating from users and features: e.g. redirections
- Translation patterns can be defined at organization and location level
 - Location takes precedence over organization (organization level TPs only considered if there's no location level TP match)
- Support up to 500 translation patterns for each location and 1000 at organization level
- Verify call routing tool shows applied translation patterns
- Translation patterns can be used for various use cases such as:
 - Short number dialing
 - Operator dialing
 - General digit translation with wild cards
- Bulk CSV and API support for translation pattern provisioning

Translation Pattern Matching Sequence

- Translation Pattern match:
 - After emergency calling
 - Before all other matches (internal & external)
- Up to 10 translation loops
- Translation patterns evaluated (again) after NS lookup and +E.164 transform



Example

Create Translation Pattern

Create a translation pattern that can manipulate digits before routing an outgoing call.

Level
Choose at which level to create this translation pattern. Location level patterns have precedence over organization level patterns.

Organization

Location

Name *
starone

Matching Pattern *1

Replacement Pattern +4961007739764

Test the above pattern with sample digits
Input digits
Test pattern

Calling

Numbers Virtual Lines **Call Routing** Managed Gateways

Trunk Route Group Dial Plans **Verify Call Routing** Zone Trusted

Verify your call routing by choosing a cloud user, workspace, virtual line or your on-premises configuration is correct.

Select Call Source
 Select a user/workspace/virtual line Select a trunk
Heidi Harper (8002-7109)

Select Call Destination
*1

See Routing Result Clear All

Routing Results
The call to +4961007739764 will be rejected.

From
Heidi Harper (8002-7109)
Frisco

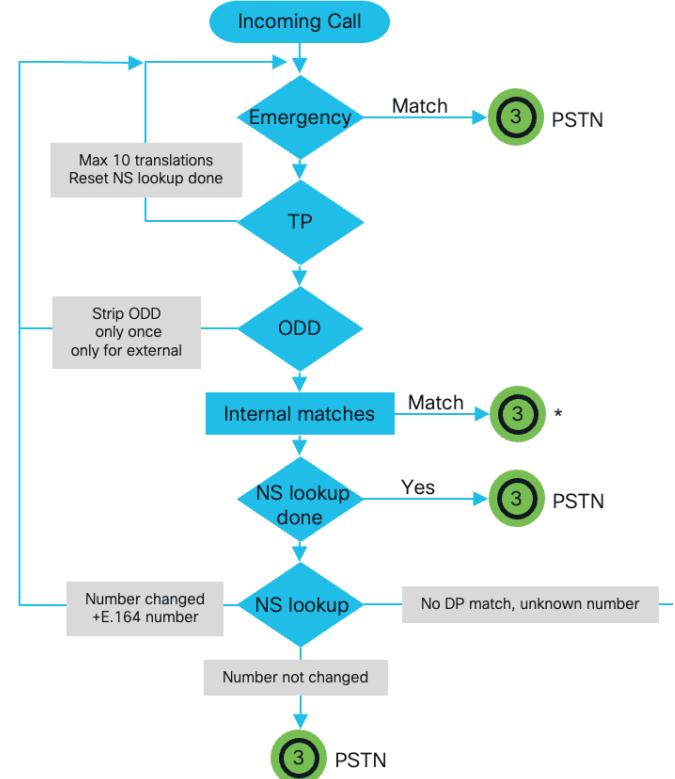
Translation pattern
Level: Organization
Name: starone
Matching Pattern: *1
Replacement Pattern: +4961007739764
Matched number: *1
Translated number: +4961007739764

Outgoing call permissions
Level: Location
Call type: International
Permission: Block
Number: +4961007739764

To (Initial routing destination)
Rejected

Best Match vs. Match in Sequence

- Webex Calling tries different matches in sequence
- Not single "best match" lookup ... like Unified CM
- Consequence: translation patterns in Webex Calling cannot be used as "catch-all"
 - 4XXX TP catches all 4XXX patterns ... and not only unassigned 4XXX extensions



Translation Patterns Fields

Field	Constraints
Name	<ul style="list-style-type: none">• Up to 50 Unicode characters• Must be unique within its entity (location/organization)
Matching Pattern	<ul style="list-style-type: none">• Up to 50 characters• Allowed characters are 0-9, *, #, +• + character if present, must be the first character except the group opening character '('• Allowed wildcard characters are X, x, !, [], -• Allowed grouping characters are (,)• Must be unique within its entity (location/organization)
Replacement Pattern	<ul style="list-style-type: none">• Up to 50 characters• Allowed characters are 0-9, *, #, +• + character if present, must be the first character• Allowed group wildcard character \$

Translation Patterns Wildcards

Wildcard	Definition
X/x	<ul style="list-style-type: none">• Matches a single digit (0-9)• Lowercase x is accepted but converted to uppercase X
!	<ul style="list-style-type: none">• Matches one or more digits (0-9)• Must be the last character except the group closing character ')
[]	<ul style="list-style-type: none">• Matches the specified range of digits (0-9)• Open and close brackets are required• For example, [089] matches 0, 8, or 9
-	<ul style="list-style-type: none">• Identifies a consecutive set of digits within a [] range of digits• Must have a leading and trailing digit where trailing digit > leading digit• For example, [02-589] matches 0, 2, 3, 4, 5, 8 or 9

Translation Patterns – Groups

Characters	Definition
()	<ul style="list-style-type: none">Identifies matching pattern groupsOpen and close parenthesis are required for each group
\$	<ul style="list-style-type: none">Identifies replacement pattern group indexgroup index starts at 1, groups are ordered by their start position\$0 used for the implicit group representing the entire provided number

Grouping and replacement pattern group index are more flexible than using masks ... like on Unified CM

Use case examples

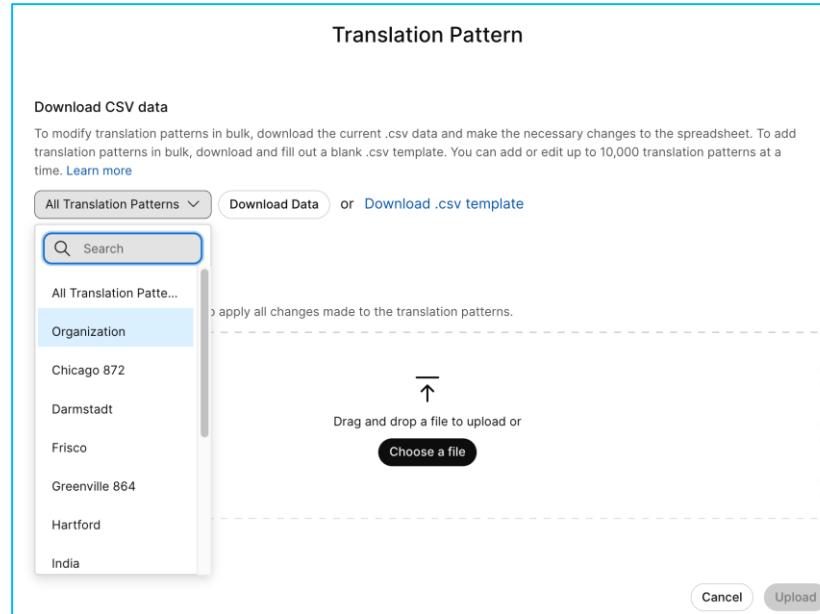
Name	Matching Pattern	Replacement Pattern	Example
DigitExtension	(XXXX)	+91805555\$1	0123 is translated to +918055550123 (Translates 4-digit extensions)
OperatorBlr	0	+918024681357	0 is translated to +918024681357 (Translates 0 to Blr operator)
SitePrefixBlr	6222(XXXX)	+91804444\$1	62220246 is translated to +918044440246 (Translates numbers with on-net prefix (6) and Blr site code (222))
DigitRange	([3-7]XXXX)	+9180333\$1	54567 is translated to +918033354567 (Translates 5-digit extensions starting with the digit range between 3-7 inclusive)
PrefixAdd	([2-9]X[29]XXXXXXXX)	91\$1	8055554567 is translated to 918055554567 (Adds a country prefix in front of a 10-digit number with restrictions on the first and third digits)
NoTranslation	XXXXXX	\$0	34567 is translated to 34567 (Match 5 digits but no translation)

Use case examples cont...

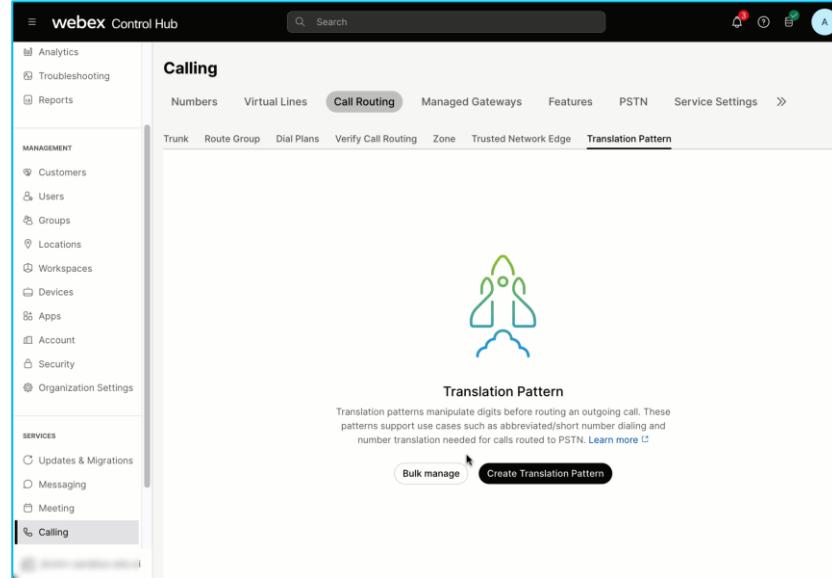
Name	Matching Pattern	Replacement Pattern	Example
ImplicitGrp	80[2-9]XXXXXXX	91\$0	8036640740 is translated to 918036640740 (Translate 10 digits starting with 80 and 3rd digit between 2 to 9)
ITHelpDeskBlr	*88*	+918054688888	*88* is translated to +918052688888 (Translation pattern for IT help desk)
VariableLen	8042!	800	80423 is translated into 800 (Match 8042 followed by 1 or more digits)
VarLenGrp	80(XXXX!)	+9180\$1	8035792468 is translated into +918035792468
MultiGrp	80(XX)333(XXX)	+9180\$1333\$2	8012333456 is translated into +918012333456

Bulk Provisioning - Download

- Download
 - Template
 - All TPs
 - Organization level TPs
 - TPs of one location



Bulk Provisioning - Import



The screenshot shows the Cisco Webex Control Hub interface. The left sidebar has 'Calling' selected. The main content area is titled 'Calling' and shows the 'Translation Pattern' section. It features a green rocket icon, a description of what translation patterns do, and two buttons: 'Bulk manage' and 'Create Translation Pattern'.

A	B	C	D	E
Name	Level	Location Name	Matching Pattern	Replacement Pattern
HDOrg	Organization		*88*	80027104
HDDarmstadt	Location	Darmstadt	*88*	80028000
HDFrisco	Location	Frisco	*88*	80027110
AltODD	Location	Frisco	01(!)	9\$1

Import can contain org and location level TPs

← Org level shortcode for helpdesk

← Location level overrides

← Alternate ODD for location

Verify Call Routing Tool

- Verify Call Routing Tool supports translation patterns
- Final output has information about matched translation patterns

The screenshot shows the 'Verify Call Routing' tab selected in a navigation bar. The interface includes fields for 'Select Call Source' (set to 'Select a user/workspace/virtual line' with 'Johannes Krohn ...' selected) and 'Select Call Destination' (set to '*88*'). A 'See Routing Result' button is highlighted in blue. The 'Routing Results' section displays the following information:

The call to 80028000 routes to a call queue.

```
graph TD; A[From  
Johannes Krohn ( [REDACTED] )  
Darmstadt] --> B[Translation pattern  
Level: Location  
Name: HDarmstadt  
Matching Pattern: *88*  
Replacement Pattern: 80028000  
Matched number: *88*  
Translated number: 80028000]; B --> C[To (Initial routing destination)  
DC escalations (9725550102)  
Frisco]
```

Dashed blue lines connect the 'From' box to the 'Translation pattern' box, and the 'Translation pattern' box to the 'To' box, illustrating the routing flow.

API Support

- API support for CRUD and list()
- list() has comprehensive filtering options

Method	Description
POST https://webexapis.com/v1/telephony/config/callRouting/translationPatterns	Create a Translation Pattern
GET https://webexapis.com/v1/telephony/config/callRouting/translationPatterns	Retrieve a list of Translation Patterns
GET https://webexapis.com/v1/telephony/config/callRouting/translationPatterns/{translationId}	Retrieve the details of a Translation Pattern
PUT https://webexapis.com/v1/telephony/config/callRouting/translationPatterns/{translationId}	Modify a Translation Pattern
DELETE https://webexapis.com/v1/telephony/config/callRouting/translationPatterns/{translationId}	Delete a Translation Pattern

limitToLocationId
string
When a location ID is passed, then return only the corresponding location level translation patterns.

limitToOrgLevelEnabled
string
When set to be true, then return only the organization-level translation patterns.

max
number
Limit the number of objects returned to this maximum count.

start
number
Start at the zero-based offset in the list of matching objects.

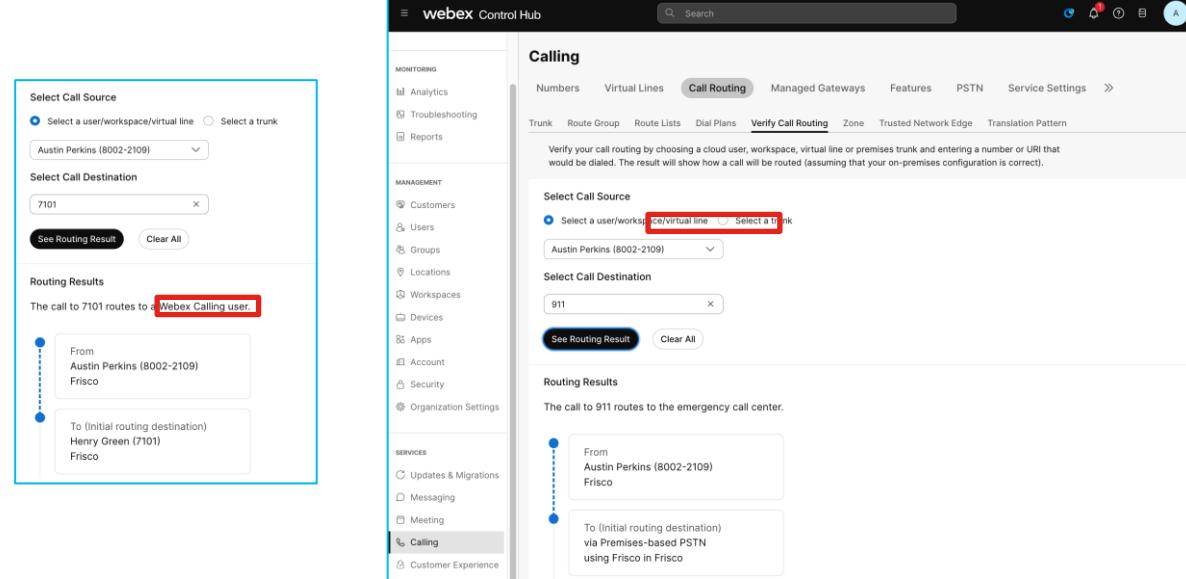
name
string
Only return translation patterns with the matching name.

matchingPattern
string
Only return translation patterns with the matching matchingPattern.

Verify Call Routing Tool

Verify Call Routing Tool (VCR)

- VCR allows to troubleshoot call routing decisions for user calls
 - Calls from Webex Calling users
 - Trunk calls classified as “premises” or “user”



The image shows two side-by-side screenshots of the Webex Control Hub 'Verify Call Routing' tool. Both screenshots have a blue border around the main content area.

Left Screenshot (Call to 7101):

- Select Call Source:** Radio button selected for "Select a user/workspace/virtual line". A dropdown menu shows "Austin Perkins (8002-2109)".
- Select Call Destination:** Input field shows "7101".
- Routing Results:** Text: "The call to 7101 routes to a **Webex Calling user**." Below this, a diagram shows a dashed blue line from "From: Austin Perkins (8002-2109) Frisco" to "To (initial routing destination) Henry Green (7101) Frisco".

Right Screenshot (Call to 911):

- Select Call Source:** Radio button selected for "Select a user/workspace/virtual line". A dropdown menu shows "Austin Perkins (8002-2109)".
- Select Call Destination:** Input field shows "911".
- Routing Results:** Text: "The call to 911 routes to the emergency call center." Below this, a diagram shows a dashed blue line from "From: Austin Perkins (8002-2109) Frisco" to "To (initial routing destination) via Premises-based PSTN using Frisco in Frisco".

Trunk Calls and Dial Plan Match

Select Call Source

Select a user/workspace/virtual line Select a trunk

DFW trunk A

+12145550120

Select Call Destination

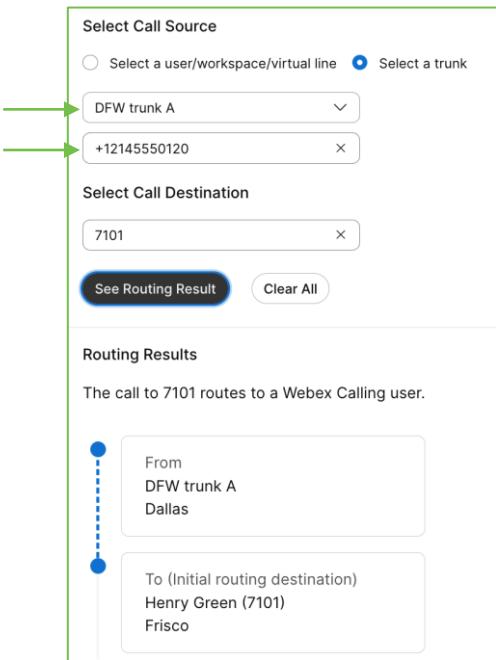
7101

Routing Results

The call to 7101 routes to a Webex Calling user.

From
DFW trunk A
Dallas

To (Initial routing destination)
Henry Green (7101)
Frisco



Select Call Source

Select a user/workspace/virtual line Select a trunk

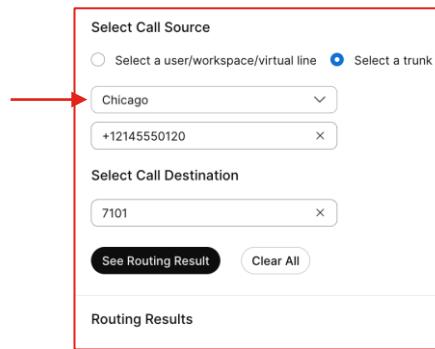
Chicago

+12145550120

Select Call Destination

7101

Routing Results



Caller ID does not match an EDP pattern .. of a dial plan pointing to the right trunk

DFW prem

Dial Plan

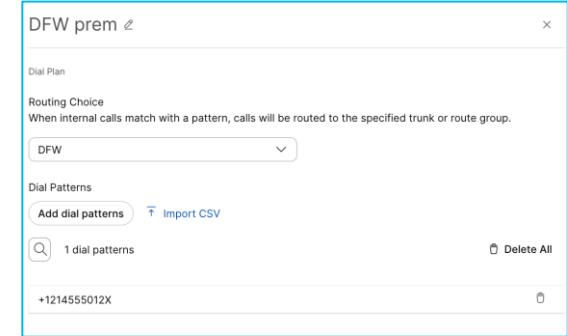
Routing Choice
When internal calls match with a pattern, calls will be routed to the specified trunk or route group.

DFW

Dial Patterns

1 dial patterns

+1214555012X



Select Call Source

Select a user/workspace/virtual line Select a trunk

DFW trunk A

+14085551234

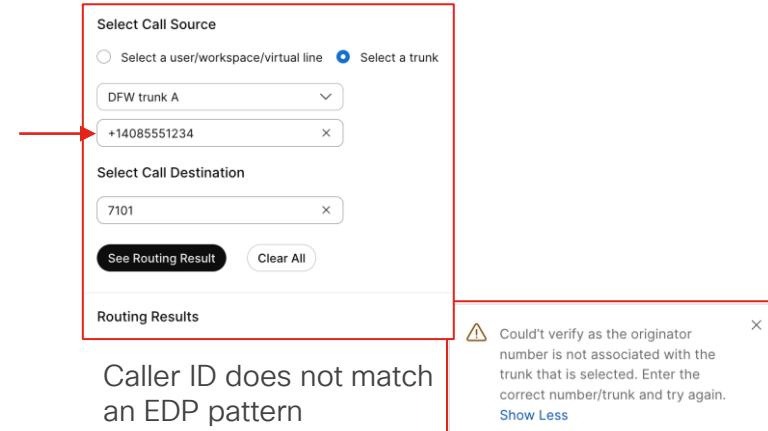
Select Call Destination

7101

Routing Results

Caller ID does not match an EDP pattern

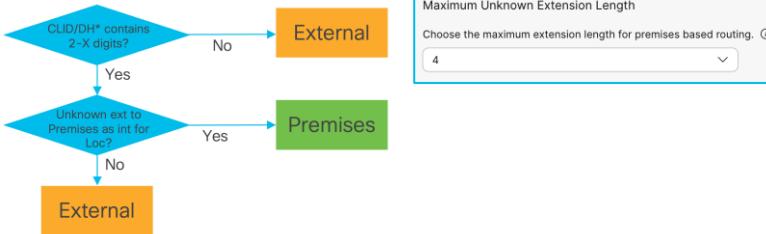
Could't verify as the originator number is not associated with the trunk that is selected. Enter the correct number/trunk and try again.



Note: Cisco recommends to use +E.164 caller ID on trunks except for calls from extension only users

Trunk Calls and Extensions as Caller Id

Calls with extension caller id are classified as user calls only if unknown extension dialing is enabled and the caller id length matches



Dallas
Location ID: fa27c060-5e3a-4e38-a8cc-d3b684ae1d95 ⓘ
0 users • 0 workspaces

Calls to on-premises extensions
Premises side is expected to send E.164 numbers in E.164 format for inbound calls when this policy is enabled.
 Route unknown extensions to the premises as internal calls
Route calls to
DFW

Select Call Source
 Select a user/workspace/virtual line Select a trunk
DFW trunk A
1234

Select Call Destination
7101
See Routing Result Clear All

Routing Results
The call to 7101 routes to a Webex Calling user.

From
DFW trunk A
Dallas

To (Initial routing destination)
Henry Green (7101)
Frisco

Select Call Source
 Select a user/workspace/virtual line Select a trunk
DFW trunk A
12345

Select Call Destination
7101
See Routing Result Clear All

Routing Results

⚠ Could not verify as the originator number is not associated with the trunk that is selected. Enter the correct number/trunk and try again.
Show Less

Translation Patterns

Select Call Source
 Select a user/workspace/virtual line Select a trunk
Elsie Sullivan VL (8157-2205)

Select Call Destination
88

Routing Results
The call to 80027504 routes to a call queue.

From Elsie Sullivan VL (8157-2205)
Hartford

Translation pattern
Level: Organization
Name: HDOrg
Matching Pattern: *88*
Replacement Pattern: 80027504
Matched number: *88*
Translated number: 80027504

To (Initial routing destination)
IT (7504)
Frisco

Select Call Source
 Select a user/workspace/virtual line Select a trunk
Johannes Krohn ...

Select Call Destination
88

Routing Results
The call to 80028000 routes to a call queue.

From Johannes Krohn (+496150 ...)
Darmstadt

Translation pattern
Level: Location
Name: HDDarmstadt
Matching Pattern: *88*
Replacement Pattern: 80028000
Matched number: *88*
Translated number: 80028000

To (Initial routing destination)
DC escalations (9725550102)
Frisco

Translation Pattern

Translation patterns manipulate digits before routing an outgoing call. These patterns support use cases such as abbreviated/short number dialing and number translation needed for calls routed to PSTN. [Learn more](#)

Q. *88* X 3 Translation Patterns All Translation Patterns Bulk manage Create Translation Pattern

Name	Matching Pattern	Replacement Pattern	Level	Location	Actions
HDDarmstadt	*88*	80028000	Location	Darmstadt	...
HDFrisco	*88*	80027110	Location	Frisco	...
HDOrg	*88*	80027504	Organization		...

Outgoing Call Permissions

- VCR shows outgoing call permissions

Select Call Source

Select a user/workspace/virtual line Select a trunk

Austin Perkins (8002-2109)

Select Call Destination

94085550123

See Routing Result Clear All

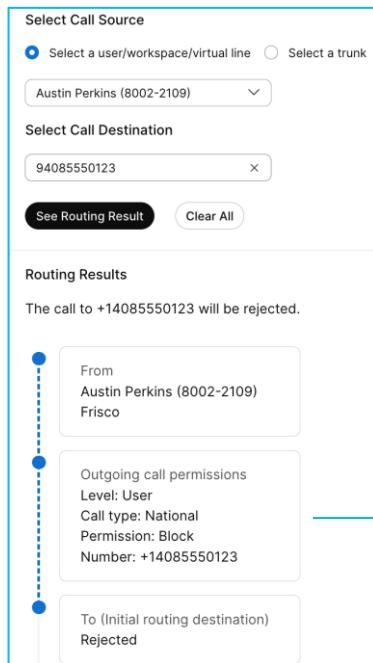
Routing Results

The call to +14085550123 will be rejected.

From Austin Perkins (8002-2109) Frisco

Outgoing call permissions Level: User Call type: National Permission: Block Number: +14085550123

To (Initial routing destination) Rejected



Austin Perkins

Active @gmail.com Member of Frisco

Actions

Summary Profile General Meetings Calling Messaging Hybrid Services Devices Vidcast

Calling

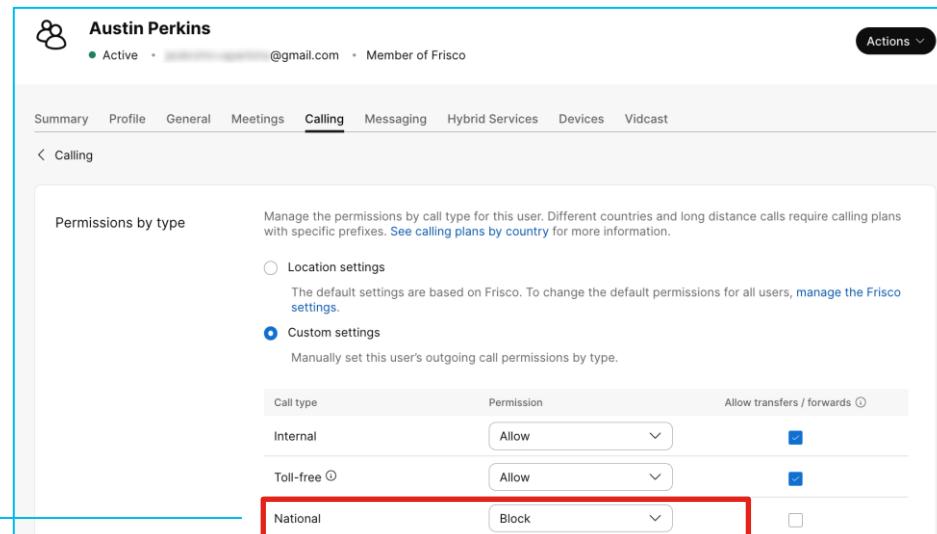
Permissions by type

Manage the permissions by call type for this user. Different countries and long distance calls require calling plans with specific prefixes. See [calling plans by country](#) for more information.

Location settings The default settings are based on Frisco. To change the default permissions for all users, [manage the Frisco settings](#).

Custom settings Manually set this user's outgoing call permissions by type.

Call type	Permission	Allow transfers / forwards
Internal	Allow	<input checked="" type="checkbox"/>
Toll-free	Allow	<input checked="" type="checkbox"/>
National	Block	<input type="checkbox"/>



Virtual Extensions

- VCR does show virtual extension mapping
- ... and outgoing call permissions get applied and displayed

The image consists of three screenshots illustrating the configuration and application of virtual extensions and call permissions:

- Left Screenshot: Select Call Source**
 - Shows the 'Select Call Source' interface with the 'Select a user/workspace/virtual line' radio button selected.
 - The dropdown shows 'Austin Perkins (8002-2109)'.
 - The 'Select Call Destination' field contains '7777'.
 - The 'See Routing Result' button is highlighted.
 - Routing Results:**
 - The text 'The call to +14085551234 routes to a location level virtual extension,' is highlighted with a red box.
 - Details:
 - From: Austin Perkins (8002-2109)
 - To: Frisco
 - Outgoing call permissions:
 - Level: User
 - Call type: National
 - Permission: Block
 - Number: +14085551234
 - To (initial routing destination): Rejected
- Middle Screenshot: 7777 Virtual Extension**
 - Shows the 'Virtual Extension' configuration for '7777'.
 - Location: Frisco
 - First name: Frisco 7777
 - Last name: Enter last name
 - Display Name: Frisco 7777
 - Phone Number: + 14565551234
- Right Screenshot: Austin Perkins User Profile - Calling Tab**
 - Shows the user profile for 'Austin Perkins' with the 'Calling' tab selected.
 - Permissions by type:
 - Location settings:** The default settings are based on Frisco.
 - Custom settings:** Manually set this user's outgoing call permissions by type.
 - Call type permissions table:

Call type	Permission	Allow transfers / forwards
Internal	Allow	<input checked="" type="checkbox"/>
Toll-free	Allow	<input checked="" type="checkbox"/>
National	Block	<input type="checkbox"/>

Another Translation Pattern Example

Name ↑	Matching Pattern	Replacement Pattern	Level
Intercept 21255510XX	+121255510XX	80027502	Organization

Calls to given range get redirected to some on-net destination (CQ)

Translation patterns get applied to user calls ..

.. and that includes trunk calls classified as “premises” or “user”

This example also shows that 10D gets normalized to +E.164 inbound on trunks

The screenshots illustrate the call flow through three stages:

- Select Call Source:** Shows the initial call source (Austin Perkins or DFW trunk A) and the matching pattern (+12145550126).
- Select Call Destination:** Shows the destination number (80027502 or 2125551045) and the routing result (a call queue).
- Routing Results:** Shows the final call details, including the source (From Austin Perkins or DFW trunk A Dallas), the translation pattern (Intercept 21255510XX), and the normalized destination (To (Initial routing destination) office support (7502) Frisco).

Red boxes highlight the destination numbers in the Select Call Source and Select Call Destination steps, indicating the points of pattern application.