Microsoft

Voice Scenario and Integration Concepts with Teams

Dave Jennings
Principal Program Manager
Microsoft Teams

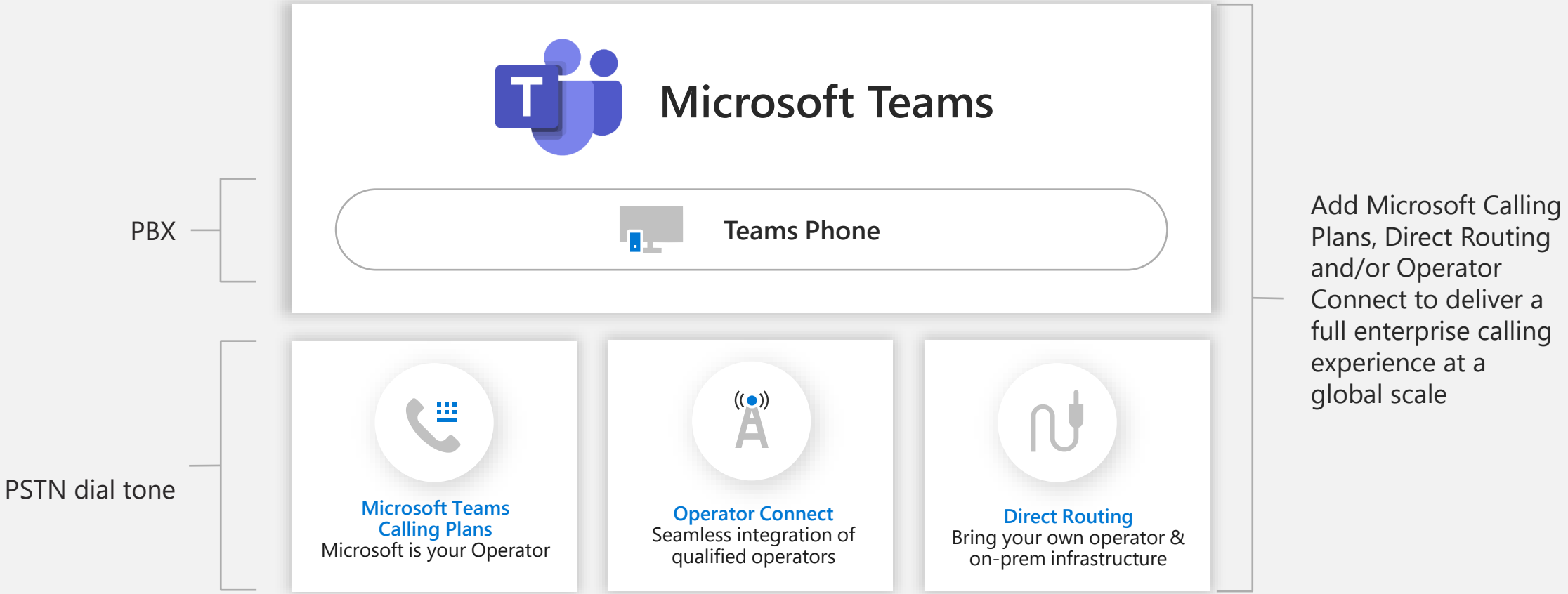
Agenda

Voice Scenarios

Voice Integration Concepts

Microsoft Teams Voice Overview

Simplify Calling Enablement and Migration with Microsoft Teams



Microsoft Teams Voice Capabilities

Microsoft Teams Calling Plans

Microsoft is your operator

Operator Connect

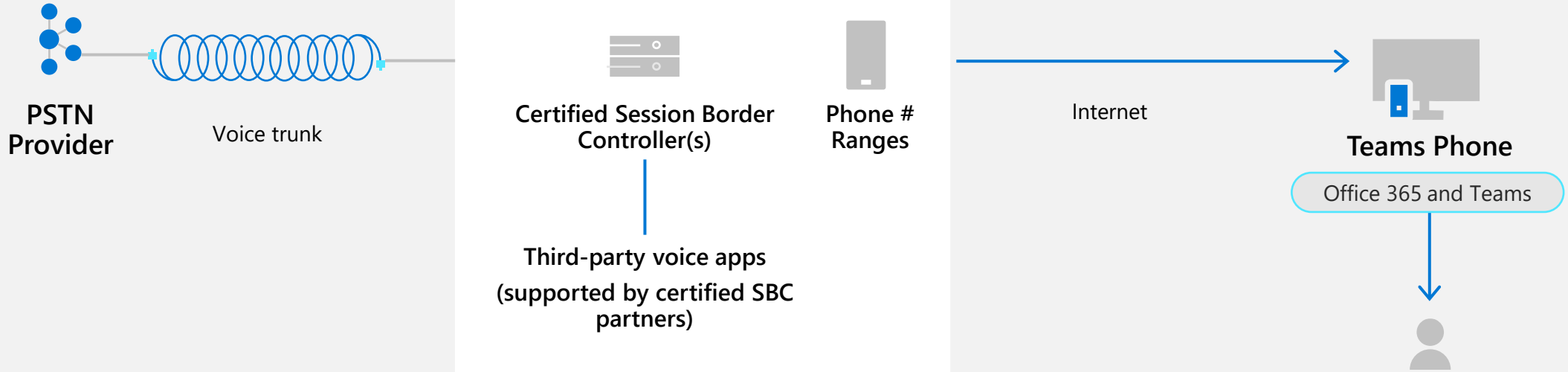
Simply and seamlessly integrate qualified operators

Direct Routing

Use your existing infrastructure, supported in >180 countries

Direct Routing

Direct Routing



Directly route dial tone to Microsoft Teams users

Direct Routing in Microsoft 365 allows customers to connect their SIP trunks directly from their network. Customers can work with their local telecommunications provider to enable Microsoft Teams users to make and receive telephone calls. No porting required – keep your numbers.

Interoperability with third-party systems

Direct Routing allows customers with users in the Microsoft cloud to continue using third-party systems such as PBXs, call center, and analog telephony adaptors (ATA) helping preserve key investments.

Session Border Controllers (SBCs) certified for Direct routing

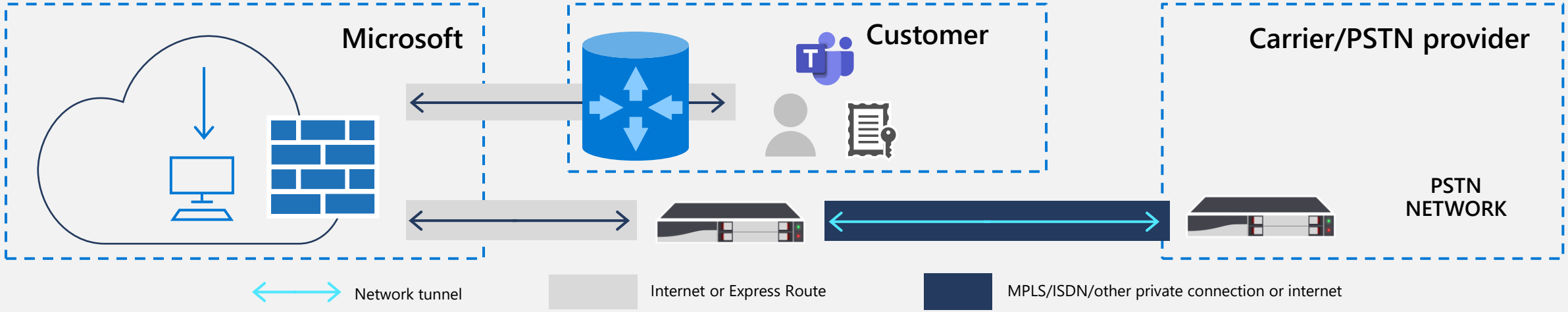
Microsoft partners with selected Session Border Controllers (SBC) vendors to certify that their SBCs work with Direct Routing

Microsoft works with each vendor to:

- Jointly work on the SIP interconnection protocols.
- Perform intense tests using a third-party lab. Only devices that pass the tests are certified.
- Run daily tests with all certified devices in production and pre-production environments. Validating the devices in pre-production environments guarantees that new versions of Direct Routing code in the cloud will work with certified SBCs.
- Establish a joint support process with the SBC vendors.
- SBCs can be physical appliances, or deployed in the cloud.
- List of supported SBCs: https://aka.ms/dr-sbc

Session Border Controllers certified for Direct Routing

Notional Direct Routing Deployment Model



Requirements to each involved party:

Microsoft	Customer	Carrier
Teams Phone Teams client Support (including incident transfers been Microsoft and SBC vendors) Configuration guidance/documentation	"E5" or "E3 + Microsoft Teams Phone licenses" Contract with carrier The supported SBC (including the support contract) Access to the SBC from the Office 365 Public IP FQDN Certificate Configuration of SBC with Office 365 and carrier	Telephony trunk Support

Configuration and support includes interaction between four entities: Microsoft, SBC vendor, customer support and consultants, carrier

Survivable Branch Appliance with Direct Routing

A Survivable Branch Appliance (SBA) provides the ability to survive telephony connectivity for Microsoft Teams clients in case the connection between Microsoft and the customer premises is not available

Components of an SBA

- Tenant data sync service
- Keep alive interface
- Router
- NGC to SIP protocol converter
- Registrar
- Lightweight routing engine
- CDR service

Supported vendors

- Audiocodes
- TE-Systems
- Oracle
- Ribbon

Survivable Functionality when in Offline Mode

Available

- Inbound PSTN call
- Outbound PSTN call
- Mute/Unmute
- Hold/Unhold
- DTMF
- Call history during outage updated once online
- Up to 24-hour limit for offline mode

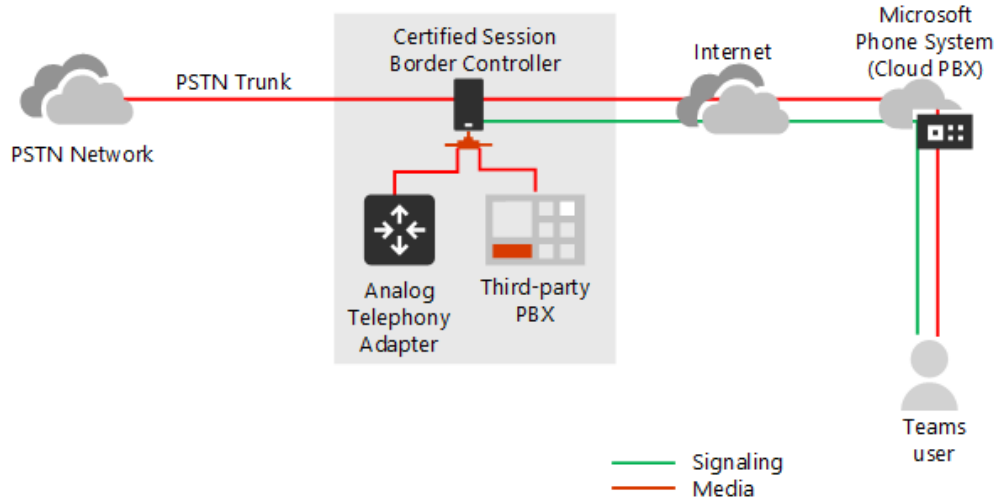
Not Available

- VOIP calls
- UX features: Add/Remove contact, Search, Add/Remove to speed-dial, voice mail
- In Call: call escalation to multiparty
- Complex enterprise features: Call forwarding, call queue, merge, consult transfer, delegation, call queues, and auto attendants
- More than 24-hours outage

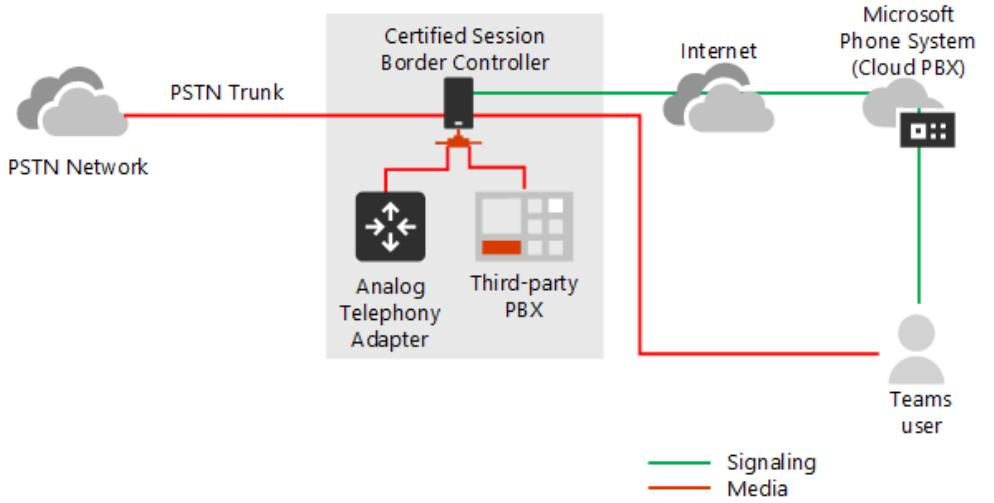
Direct Routing with Media bypass:

- Teams user needs access to the public IP address of the SBC (even from internal) unless utilizing local media optimization
- Recommended when user is in the same physical building/network as the SBC
- Signaling (SIP/TLS) is always through the Microsoft cloud

Call flow without media bypass



Call flow with media bypass



For additional details, please refer to: https://docs.microsoft.com/en-us/microsoftteams/direct-routing-plan-media-bypass

Direct Routing with Local Media Optimization:

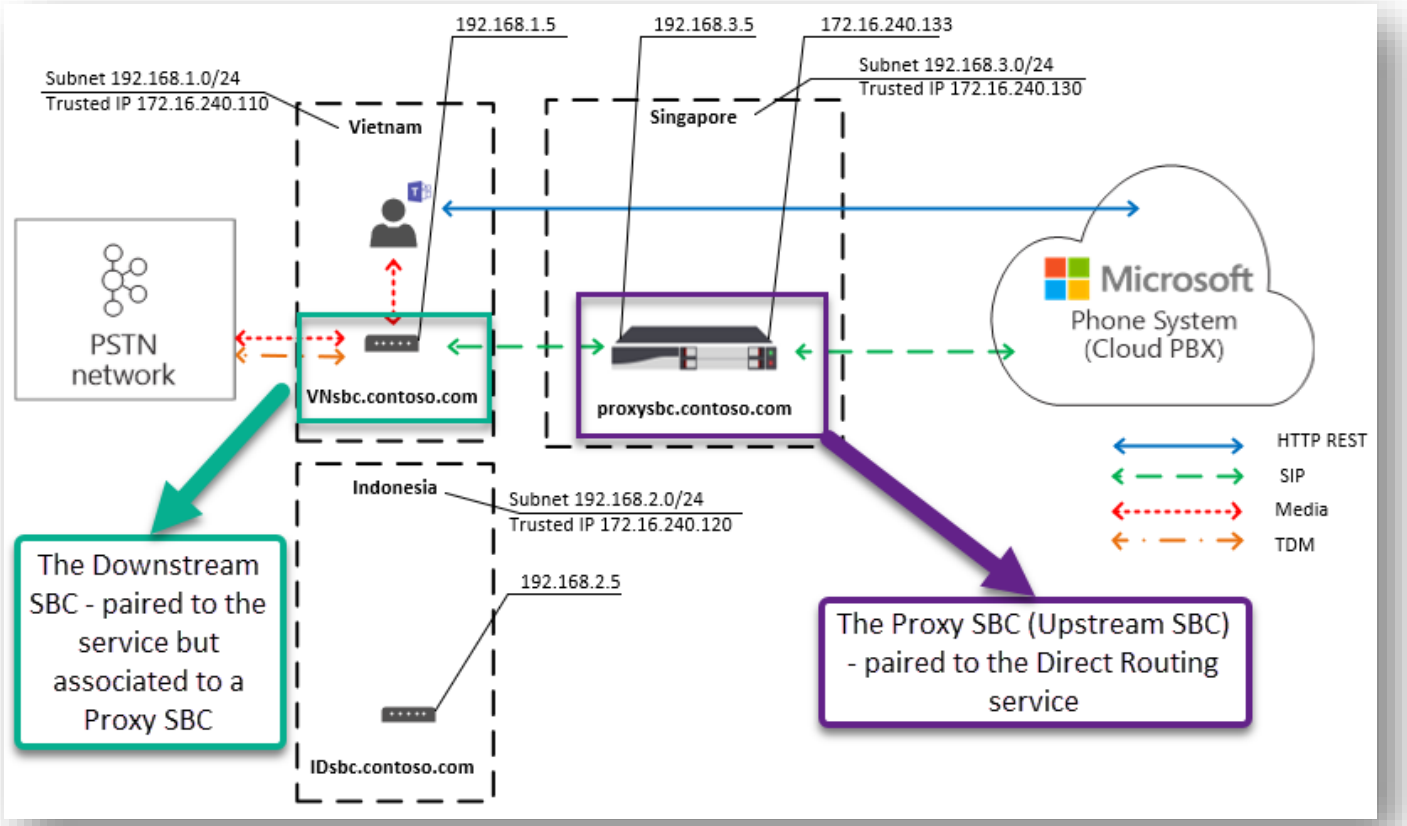
Proxy SBC

- Has a public IP address
- Deployed in the same manner as any SBC for Direct Routing
- Can be targets of Online Voice Routes

Downstream SBC

- Does not have a public IP address assigned
- Paired to the service with association to Proxy SBC
- Can be targets of Online Voice Routes

Call flow with Local Media Optimization

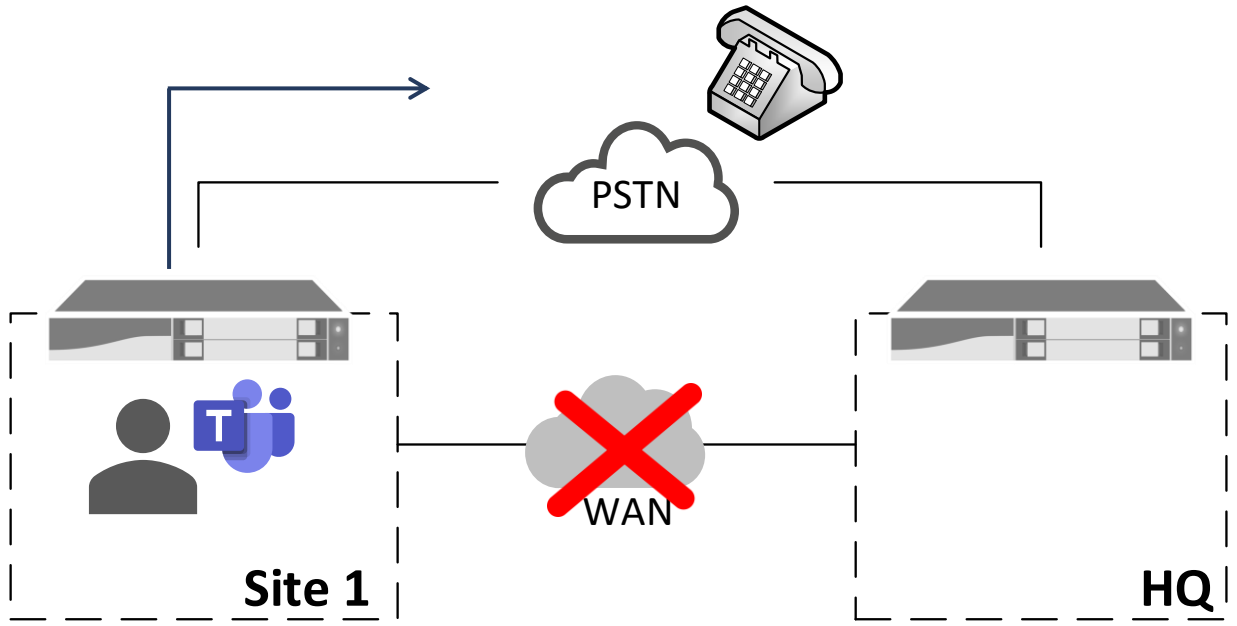


For additional details, please refer to: https://docs.microsoft.com/en-us/microsoftteams/direct-routing-media-optimization

Direct Routing with Location-based Routing:

- In some countries and regions, it's illegal to bypass the Public Switched Telephone Network (PSTN) provider to decrease long-distance calling costs.
- Location-based routing is a feature that lets you restrict toll bypass based on policy and the user's geographic location at the time of an inbound or outbound PSTN call.
- Location-based routing is intended to provide a mechanism to prevent toll bypass.
- It shouldn't be used as a mechanism to dynamically route PSTN calls based on the location of the user or unintended consequences may result.

Call flow with Local Based Routing



For additional details, please refer to:
https://docs.microsoft.com/en-us/microsoftteams/location-based-routing-plan

Dynamic Emergency Calling

Overview: Dynamic Emergency Calling

Route emergency calls based on the known location of the Teams client

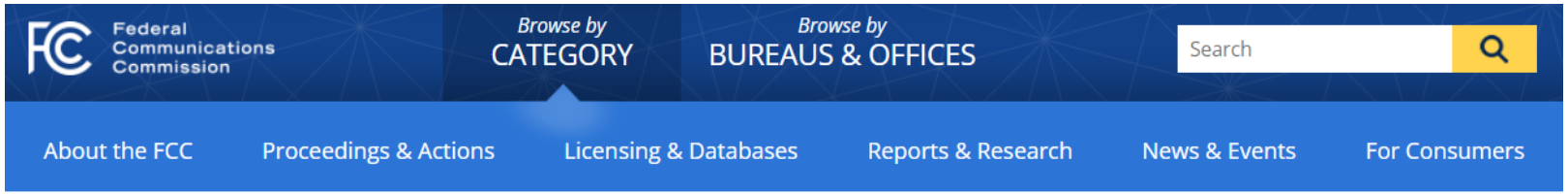
Call Routing Service included for Calling Plan Users

Direct Routing users must obtain additional service [Emergency Routing Service Providers – see https://aka.ms/dr-sbc]

Direct Routing can also leverage Emergency Location Identification Number [ELIN] gateways [upcoming support – see https://aka.ms/dr-sbc]

Configure security desk notifications

Legislation: Dynamic Emergency Calling (source FCC)



Home / Public Safety / Policy and Licensing Division / 911 Services /

Multi-line Telephone Systems – Kari's Law and RAY BAUM'S Act 911 Direct Dialing, Notification, and Dispatchable Location Requirements

911 Services

- Annual 911 Fee Reports
- 911 Strike Force
- 911 Master PSAP Registry
- Dispatchable Location
- PSAP Text-to-911 Readiness and Certification Form
- Task Force on Optimal Public Safety Answering Point Architecture (TFOPA)
- Indoor Location Accuracy Timeline and Live Call Data Reporting

In August 2019, the Commission adopted rules implementing two federal laws that strengthen emergency calling: Kari's Law and Section 506 of RAY BAUM'S Act.

Kari's Law – Direct Dialing and Notification for MLTS

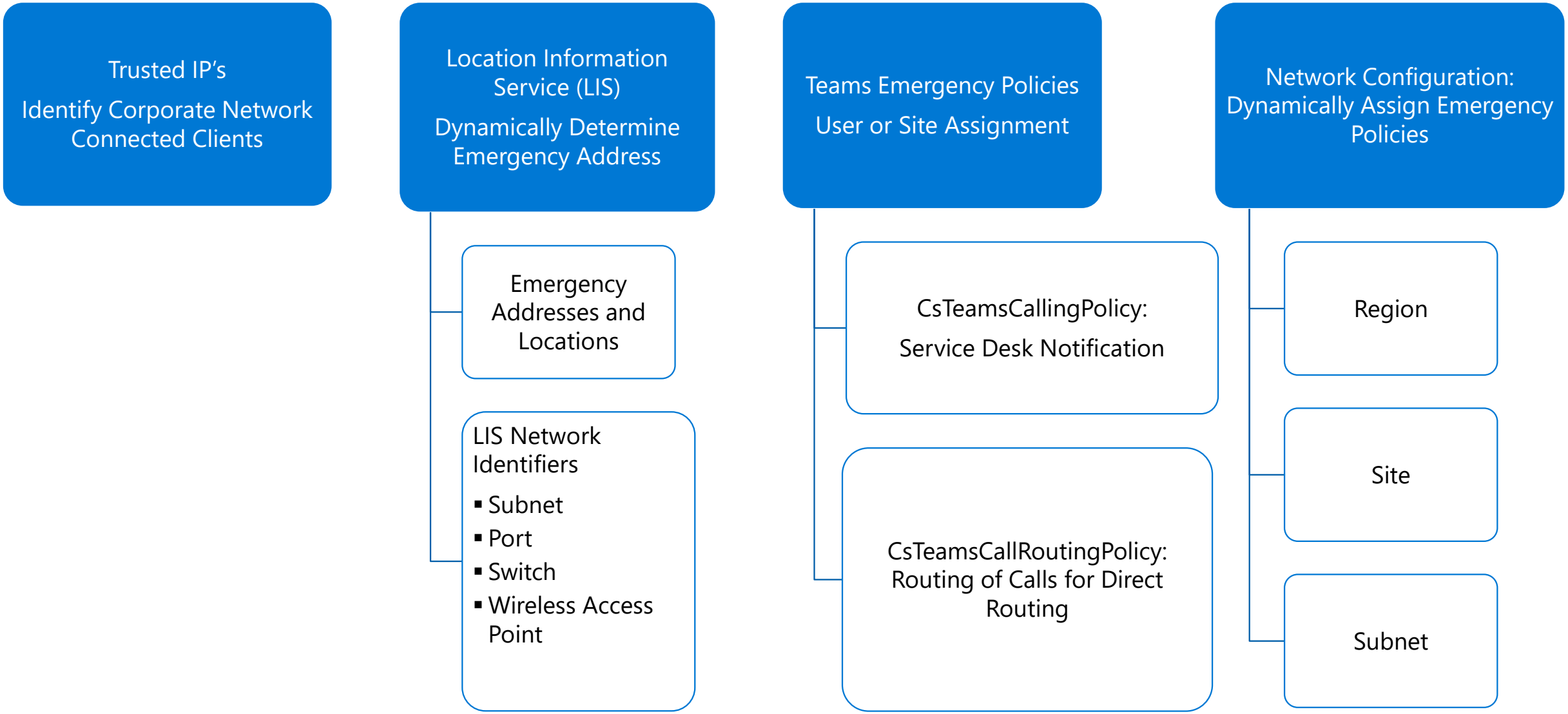
Kari's Law is named in honor of Kari Hunt, who was killed by her estranged husband in a motel room in Marshall, Texas in 2013. Ms. Hunt's 9-year-old daughter tried to call 911 for help four times from the motel room phone, but the call never went through because she did not know that the motel's phone system required dialing "9" for an outbound line before dialing 911.

Congress responded by enacting Kari's Law in 2018. Kari's Law requires direct 911 dialing and notification capabilities in multi-line telephone systems (MLTS), which are typically found in enterprises such as office buildings, campuses, and hotels. The statute provides that these requirements take effect on February 16, 2020, two years after the enactment date of Kari's Law. In addition, Kari's Law and the federal rules are forward-looking and apply only with respect to MLTS that are manufactured, imported, offered for first sale or lease, first sold or leased, or installed after February 16, 2020.

Under the statute and the Commission's rules, MLTS manufacturers and vendors must pre-configure these systems to support direct dialing of 911—that is, to enable the user to dial 911 without having to dial any prefix or access code, such as the number 9. In addition, MLTS installers, managers, and operators must ensure that the systems support

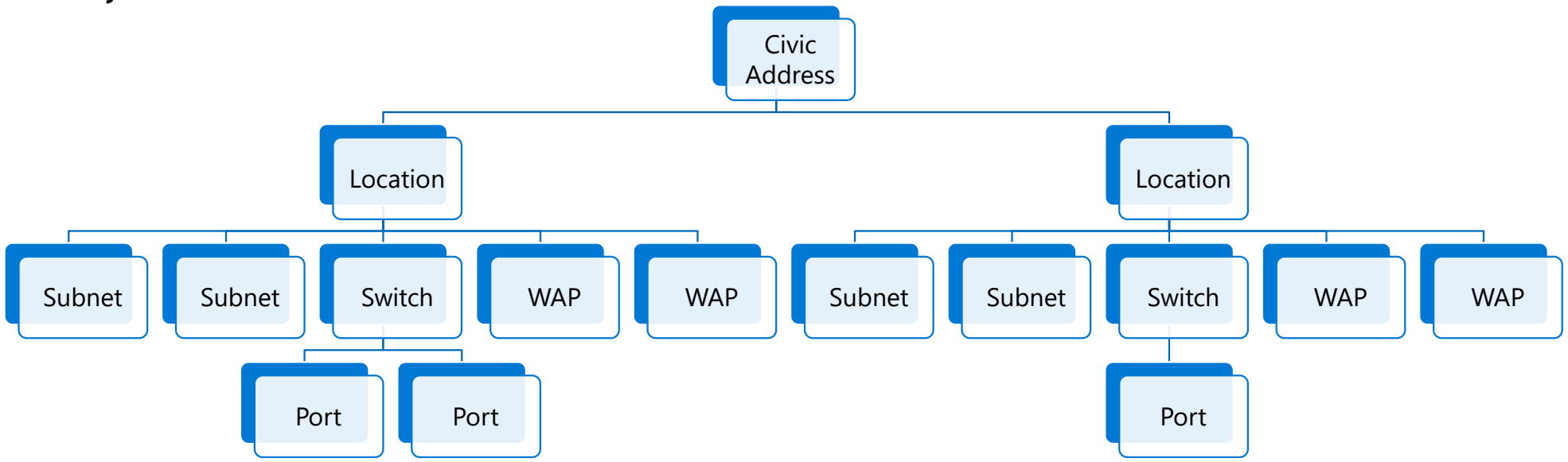
https://www.fcc.gov/mlts-911-requirements

Dynamic Emergency Calling Configuration Components



Defining Dynamic Emergency Calling Locations (LIS)

- Hierarchy and information should be detailed enough to allow emergency responders to easily locate a person.
- Civic Address ➔ specific building
- Location (also called Places) ➔ for example, a floor in the building
- In each location ➔ one (or more) network elements {subnet, Wireless Access Point, Switch/Port}



Dynamic Emergency Calling Considerations: Microsoft Calling Plans

Automatic routing to PSAP (Public Safety Answering Point) is country dependent.

United States**

Client within a tenant-defined dynamic emergency location (including geo codes): call will be automatically routed to PSAP.

Client not located in a tenant-defined dynamic emergency location: call will be screened by a national call center [ECRC] to determine caller's location.

If the caller is unable to update their emergency location with the ECRC, transfer to PSAP serving the caller's registered address.

Outside of the United States [dynamic routing not applicable here]**

Canada, Ireland, UK: Emergency calls are routed to Tier 1 screening center, equivalent behavior in US without registered address.

Germany, France Spain: Emergency calls are routed directly to the PSAP serving the emergency address associated with the number regardless of the location of the caller. When adding emergency locations for users in these locations, address must map to the phone number based on emergency address mapping in region.

Netherlands: Emergency calls are routed directly to the PSAP for the local area code of the number regardless of the location of the caller.

Australia: Emergency addresses are configured and routed by the carrier partner.

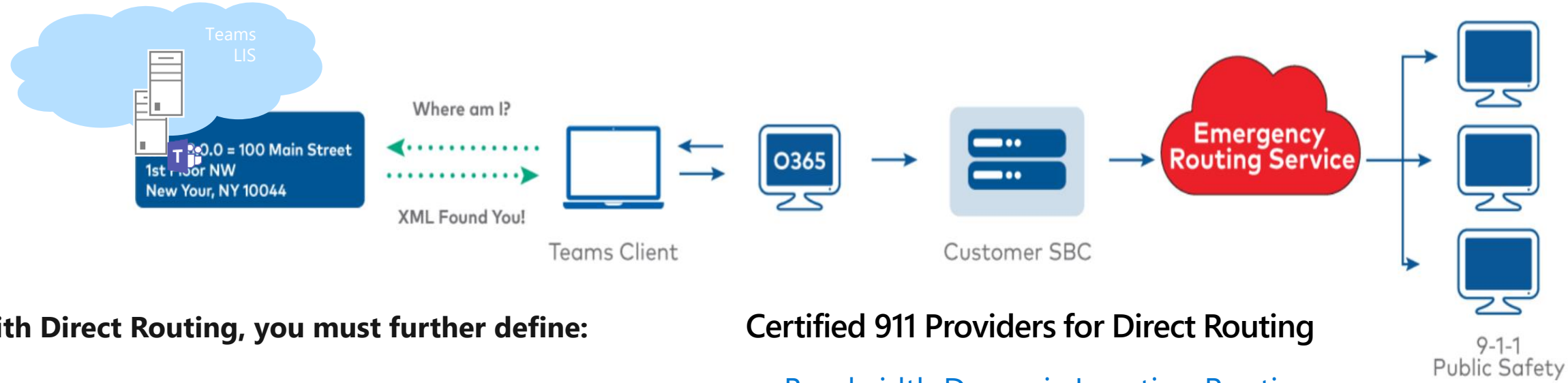
Japan: Emergency calling is not supported.

**Same considerations for Operator Connect, however implementation will vary by carrier

For additional information, please refer to: https://aka.ms/tec

Dynamic Emergency Calling Considerations: Direct Routing

For Direct Routing, an Emergency Routing Service Provider is required for integration so that emergency calls with a dynamically acquired location will be automatically routed to the Public Safety Answering Point (PSAP) serving that location.



With Direct Routing, you must further define:

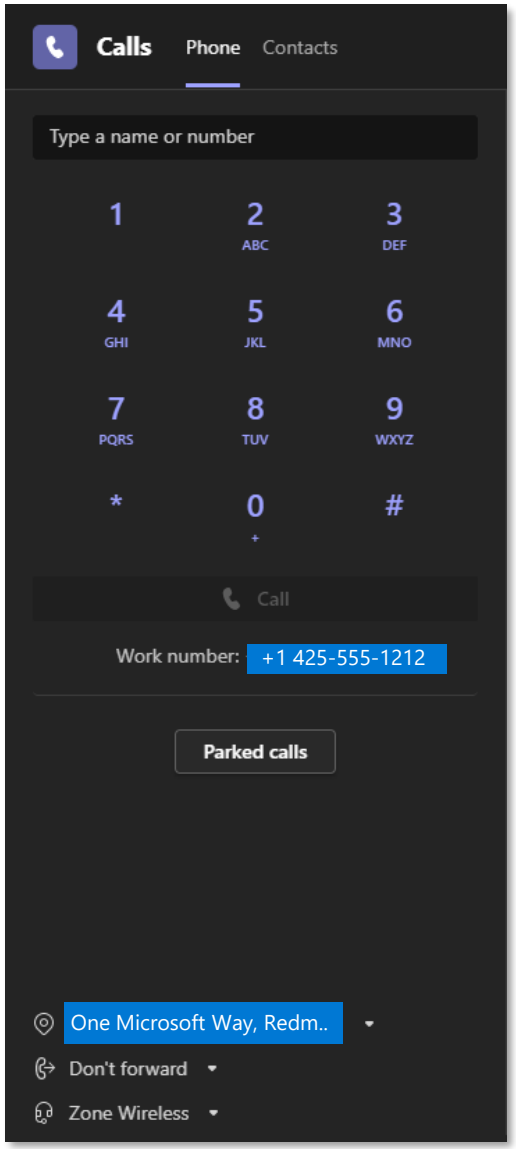
- Emergency calling policy**
- Emergency call routing policy
- Dialplan supporting emergency number routing
- Additional configuration as required for routing emergency calls with certified 911 Provider

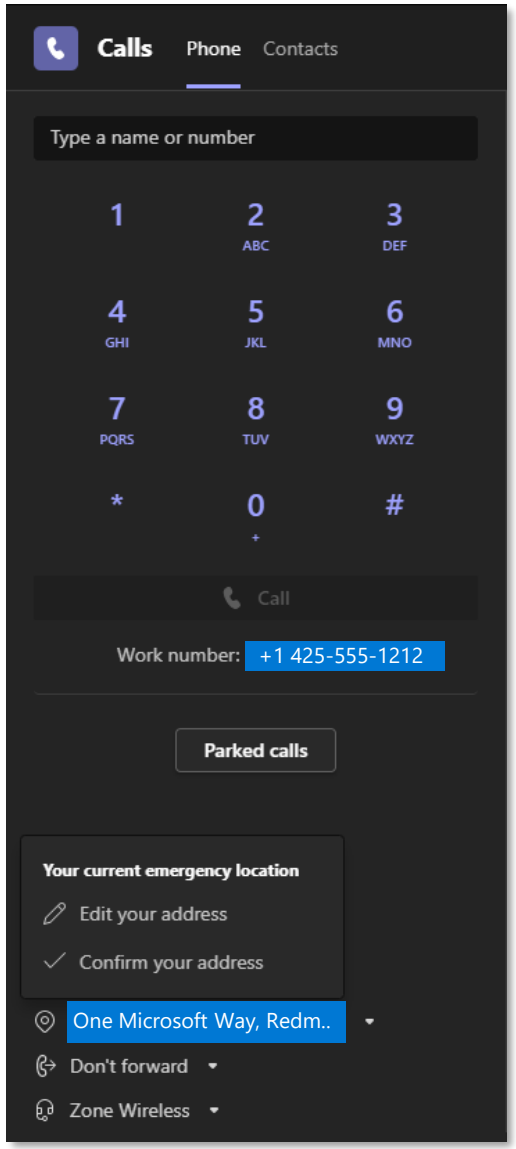
Certified 911 Providers for Direct Routing

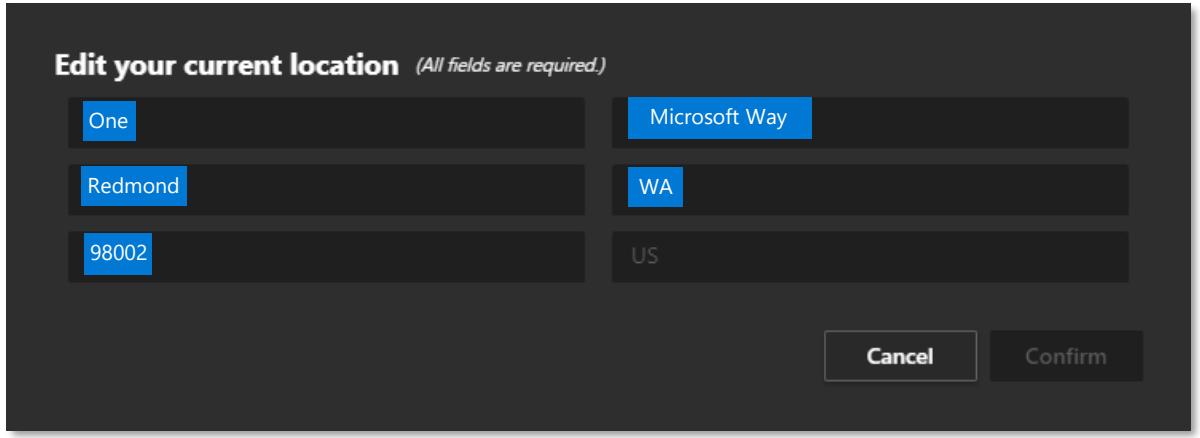
- Bandwidth Dynamic Location Routing
- Intrado Emergency Routing Service (ERS)
- Intrado Emergency Gateway (EGW)
- Inteliquent

For additional information, please refer to: https://aka.ms/tec

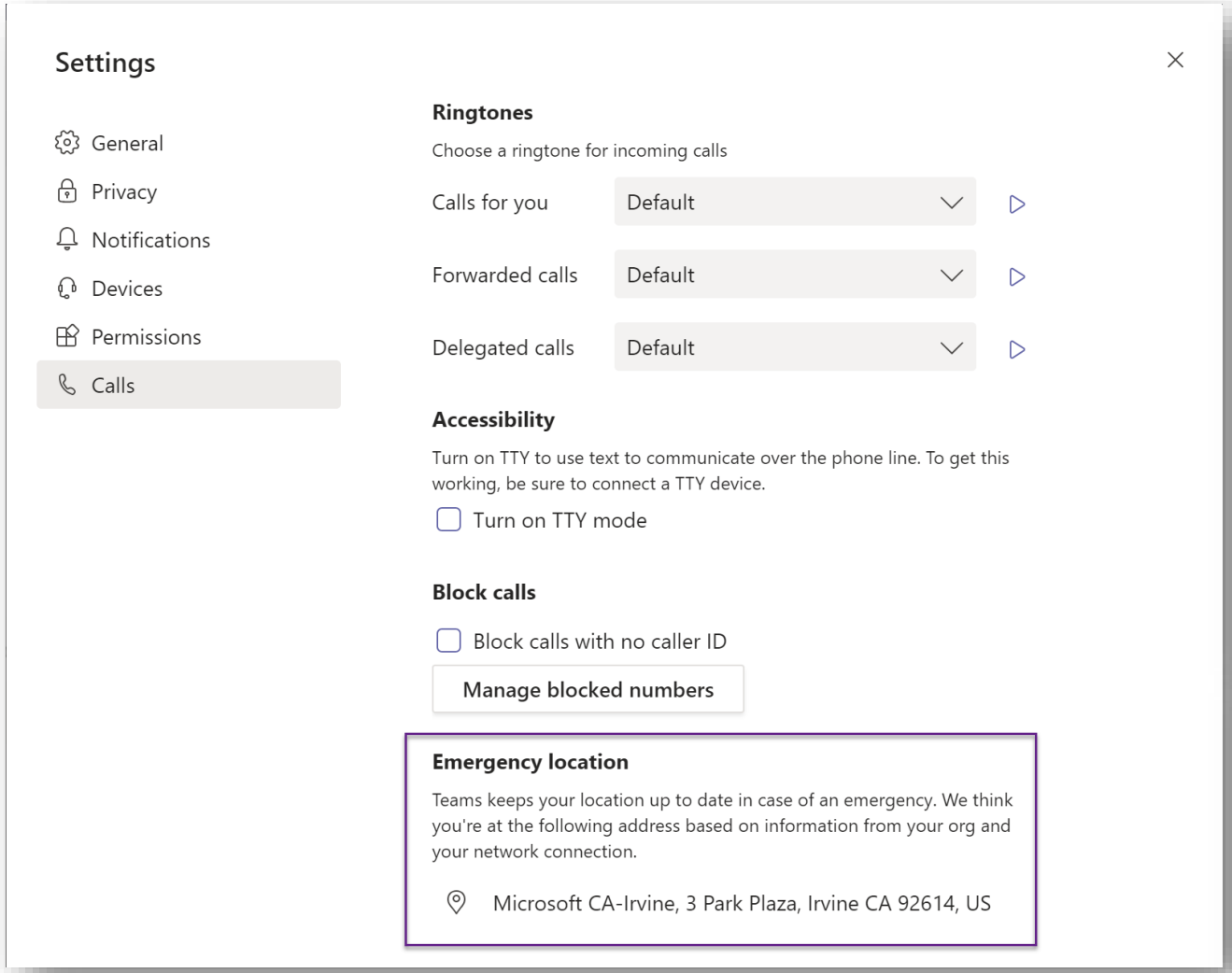
Dynamic Emergency Work From Home Considerations

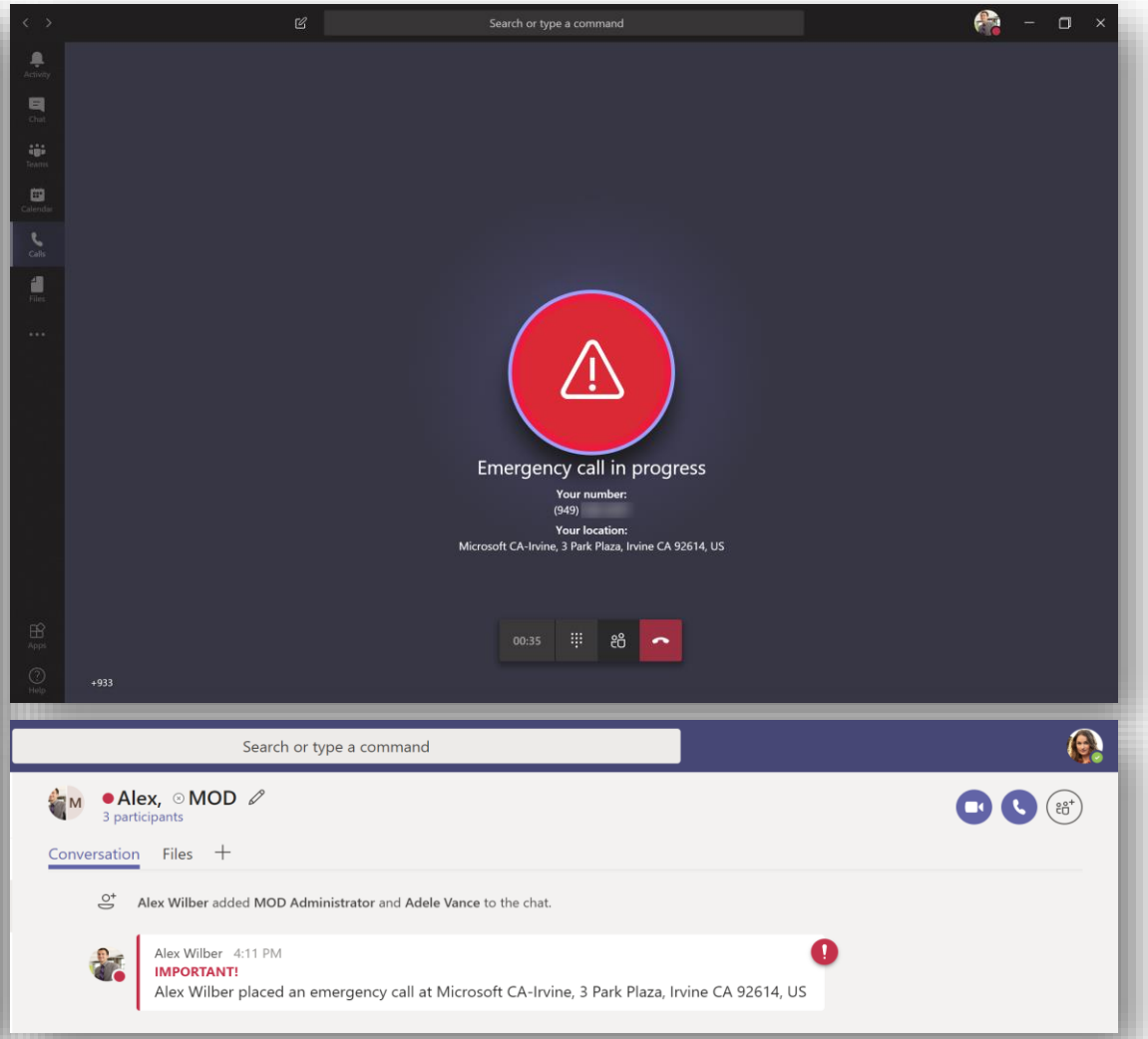




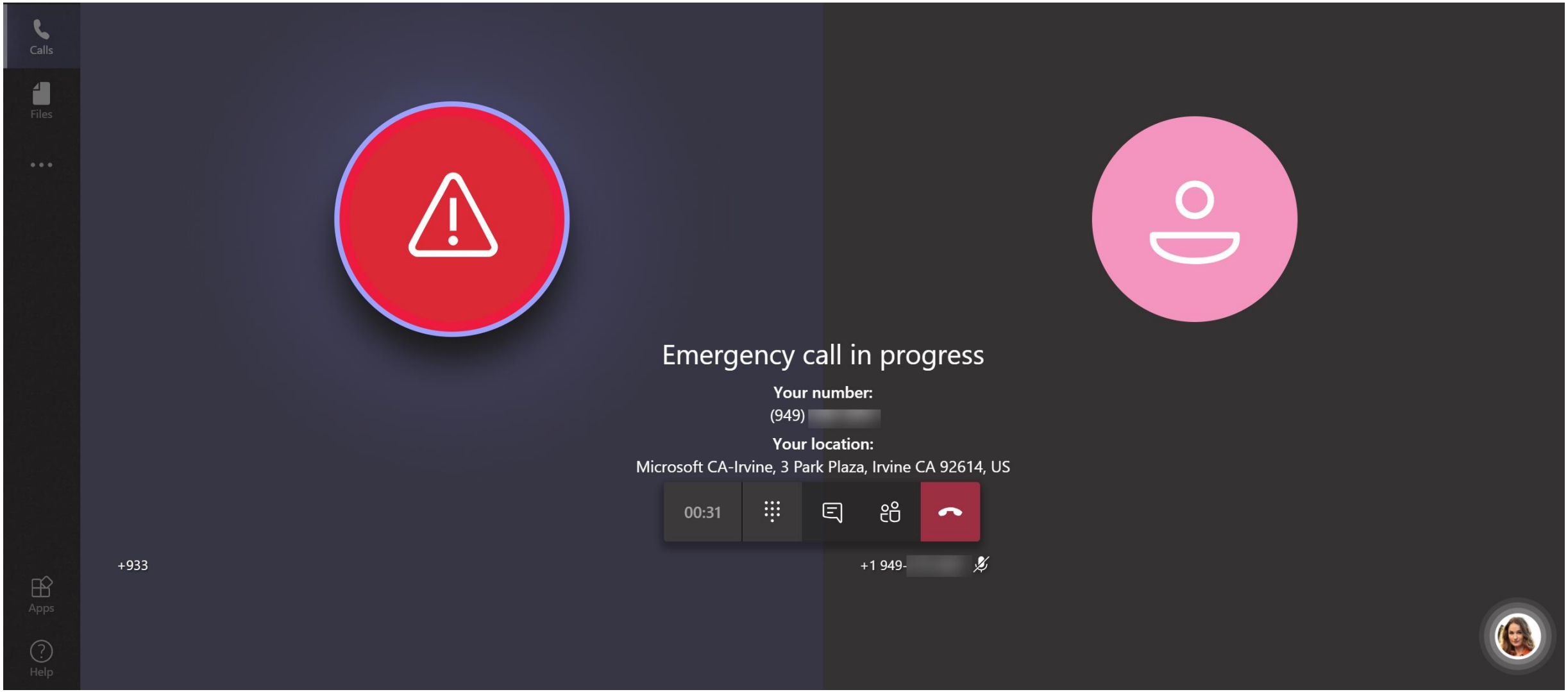


Dynamic Emergency Calling User Experience





Dynamic Emergency Calling Security Desk Notification (e.g. Conferenced in, but muted)



Direct Routing
Device Considerations

Teamwork across spaces and devices

United by Microsoft Teams

Individual workspaces

Individual office or dedicated workspace

On the go or in transit at home

Group workspaces

Small, medium and large meeting rooms

huddle/focus spaces and touchdown spaces

collaboration workspaces

Personal devices

- Audio & video peripherals
- PCs and Mobile
- Phones

Shared devices

- Conference phones
- Teams Rooms
- Surface Hub

3PIP Gateway (Available today)

EoL: July 31st 2023

Features Supported

Authentication
Sign in with user credentials/Web Sign-in
Modern Authentication
Phone lock/unlock
Hot Desking Support

Calling
Incoming/Outgoing P2P calls from/to Teams users
In-call controls via UI (Mute/unmute, hold/resume, blind transfer, end call)
PSTN calls
Visual Voicemail
Static 911 support (e.g. Dynamic 911 not supported)

Device Update and Management
Device Update
In-band provisioning
QoE & Log Upload
Common Area Phone Support

Meetings
One-click Join for Pre-Scheduled Teams Meeting
Meeting Call controls (Mute/unmute, hold/resume, hang up, Add/remove participant)
Meeting Reminders
Add Skype for Business participant to ongoing meeting

Calendar and Presence
Calendar Access and Meeting Details
Presence Integration
Exchange Calendar Integration
Contact Picture Integration
Corporate Directory Access
Visual Voicemail

Features Not-Supported

Native Teams Device Features (e.g. Examples)
Call forwarding*
Setting presence
DND (calls will still land on 3PIP)
Anything not listed as supported is unsupported

For additional information, please refer to : https://techcommunity.microsoft.com/t5/microsoft-teams-blog/skype-for-business-phones-3pip-support-with-microsoft-teams/ba-p/789351

SIP Gateway

Leverage your existing SIP phone investments

User authentication

Core calling features

- Inbound / outbound calls to Teams or PSTN (hold/resume with music, mute/unmute, DTMF)
- Call transfer (single step/blind, consulted transfer)
- Dial in/out from a meeting (audio conferencing)
- Device-only "do not disturb"
- Voicemail and message waiting indicator

Integrated into Teams routing policies/regulations

Device inventory management in Teams admin center

Static emergency calling, static emergency location support with security desk notifications

Compatible SIP phones

Cisco IP Phones with MPP firmware (6821, 6901, 7800 series, 8800 series)

Polycom SIP phones (VVX series 100, 200, 300, 400, 500, 600 etc.)

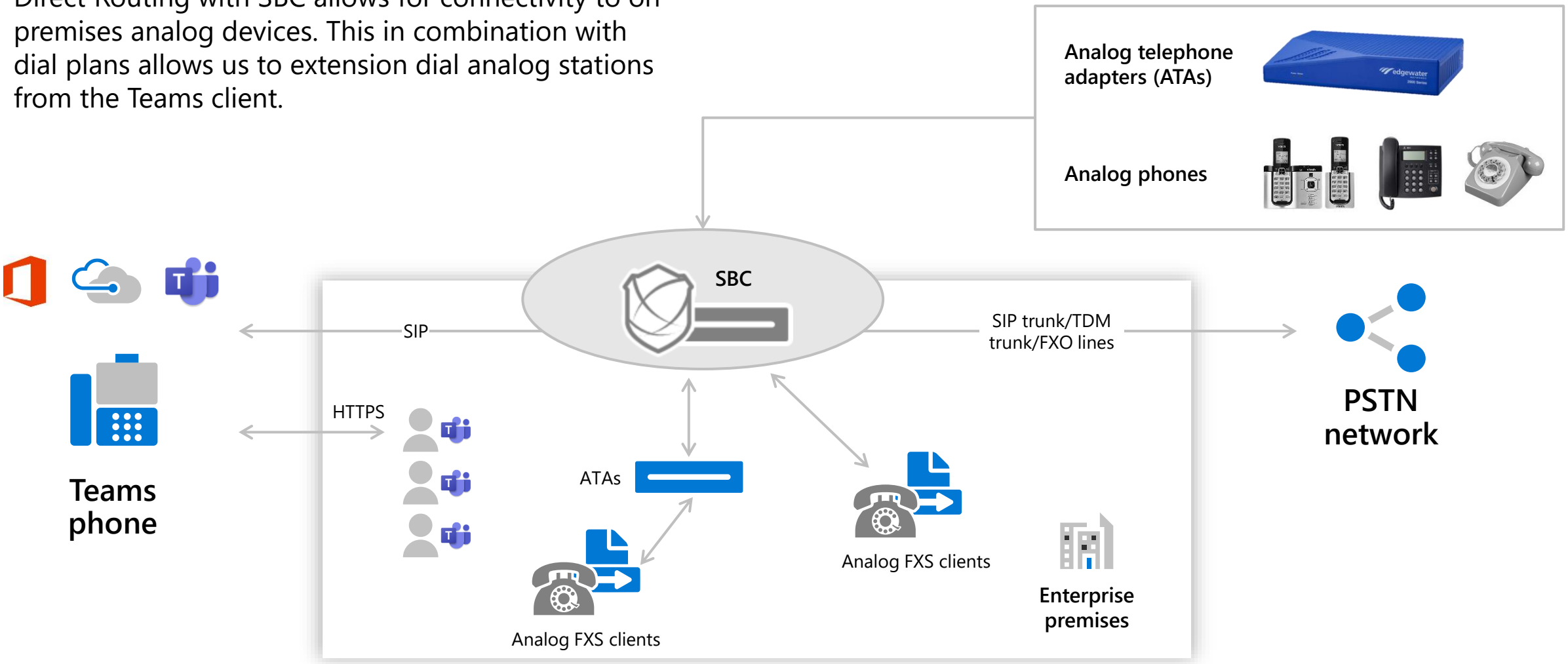
Yealink (T20 series, T30 series, T40 series, T50 series)

AudioCodes 400 HD series

For additional information, please refer to: https://docs.microsoft.com/en-us/microsoftteams/sip-gateway-plan

Analog Device Interoperability

Direct Routing with SBC allows for connectivity to on premises analog devices. This in combination with dial plans allows us to extension dial analog stations from the Teams client.



For additional information, please refer to: https://docs.microsoft.com/en-us/MicrosoftTeams/direct-routing-border-controllers#direct-routing-and-analog-devices-interoperability

Voice Integration Concepts

Deploying Direct Routing

Direct Routing SBC FQDN Requirements

IP: 99.66.240.133
DNS Name: sbc1.contoso.com

Internet

Microsoft
Teams Phone

DNS name registered in Office 365 tenant	Can be used for SBC FQDN	Department
contoso.onmicrosoft.com		Executive leadership
contoso.com		**Valid names:** sbc1.contoso.com; ussbcs15.contoso.com; europe.contoso.com **Non-valid name:** sbc1.europe.contoso.com (requires registering domain name europe.contoso.com in "Domains" first)

Direct Routing SBC Certificate Requirements

Validate identity of trusted SBC

Supported certificate root authorities

https://aka.ms/sbc-cert

	1 **Scenario** Minimize certificate cost	2 **Scenario** Balance the cost and security	3 **Scenario** Maximize security
Description	This scenario is for companies that want to pair many SBCs or change them frequently	This scenario is good for companies that do not change the gateways frequently. In the example below. a company has four SBCs (gw1.contoso.com; gw2.contoso.com; gw3.contoso.com; gw4.contoso.com).	In this scenario the company assigns a certificate to each gateway. There is only one certificate for every gateway.
Subject name	gw1.contoso.com	gw1.contoso.com	gw1.contoso.com
SAN	*.contoso.com	gw1.contoso.com gw2.contoso.com gw3.contoso.com gw4.contoso.com	gw1.contoso.com

Direct Routing Required IP Ports and Ranges

SBC requirements are different from client requirements

Check SBC vendor guidance if NAT can be used

Media ports (UDP/SRTP)

From IP	To IP	Source port	Destination port
Media processor	SBC	49,152 – 53,247	Defined on the SBC
SBC	Media processor	Defined on the SBC	49,152 – 53,247

SIP signaling ports (TLS/SIP)

From IP	To IP	Source port	Destination port
SIP proxy	SBC	1,024 – 65,6536	Defined on the SBC
SBC	SIP Proxy	Defined on the SBC	5061

IP ranges

SIP proxy	**Americas:** Traffic Manager FQDN sip-du-a-us.pstnhub.microsoft.com Datacenter FQDNs and IPs • sip-du-a-uswe2.pstnhub.microsoft.com - 52.114.148.0 • sip-du-a-usea.pstnhub.microsoft.com - 52.114.132.46 **Europe:** Traffic Manager FQDN sip-du-a-eu.pstnhub.microsoft.com Datacenter FQDNs and IPs: • sip-du-a-euwe.pstnhub.microsoft.com - 52.114.75.24 • sip-du-a-euno.pstnhub.microsoft.com - 52.114.76.76 **Asia:** Traffic Manager FQDN sip-du-a-as.pstnhub.microsoft.com Datacenter FQDNs and IPs: • sip-du-a-asea.pstnhub.microsoft.com - 52.114.7.24 • sip-du-a-asse.pstnhub.microsoft.com - 52.114.14.70
Media processors	52.112.0.0/14 (first IP address 52.112.0.1, last IP address 52.115.255.254)

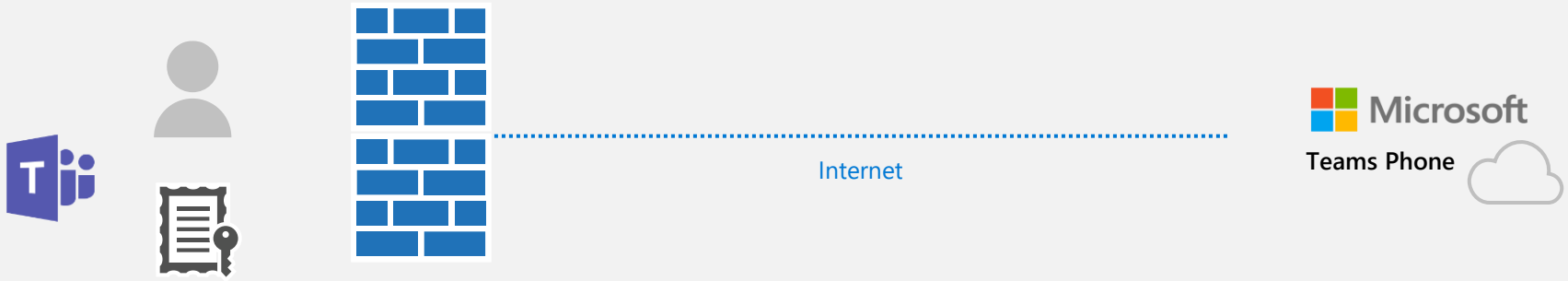
Registering an SBC for Direct Routing Integration

New-CsOnlinePSTNGateway -Fqdn <SBC FQDN> -SipSignallingPort <SBC SIP Port> -MaxConcurentSessions <Max Concurrent Session which SBC capable handling> -Enabled $true

```
PS C:\windows\System32\WindowsPowerShell\v1.0> New-CsOnlinePSTNGateway -Identity sbc1.contoso.com  SipSignallingPort 5068
 -ForwardCallHistory $true -ForwardPai $true -MaxConcurrentSessions 140

Identity              : sbc1.contoso.com
Fqdn                  : sbc1.contoso.com
SipSignallingPort     : 5068
ForwardCallHistory    : True
ForwardPai            : True
SendSipOptions        : True
MaxConcurrentSessions : 140
Enabled               : True
```

User Provisioning for Direct Routing



	Direct Routing only	Mixed Microsoft Calling Plan and Direct Routing
Licenses required	Skype for Business Online (Plan 2) Microsoft Teams Phone Microsoft Teams	Skype for Business Online (Plan 2) Microsoft Teams Phone Microsoft Teams Microsoft Calling Plan
Number provisioned	In on-premises or Azure Active Directory	Acquired from Microsoft or ported to Teams Phone
Routing	Only administrator configured routes evaluated. If no routes exist matching the callee number, the call drops.	Step 1. Routes configured by administrator evaluated. Step 2. If no routes matching the callee number exist on step 1, route the call via Microsoft Calling plan.

Defined Direct Routing Dialplan

Online PSTN Gateway

New-CsOnlinePSTNGateway -Fqdn sbc1.contoso.com -SipSignallingPort 5068 -Enabled $true

New-CsOnlinePSTNGateway -Fqdn sbc2.contoso.com -SipSignallingPort 5068 -Enabled $true

Usages

Set-CsOnlinePstnUsage -Identity Global -Usage @{Add="US and Canada"}

Voice Routes

Route for +1425 and +1206 (Priority 1):

New-CsOnlineVoiceRoute -Identity "Redmond 1" -NumberPattern "^\+1(425|206)(\d{7})$" -OnlinePstnGatewayList sbc1.contoso.com, sbc2.contoso.com -Priority 1 -OnlinePstnUsages "US and Canada"

Route for +1425 and +1206 (Priority 2)

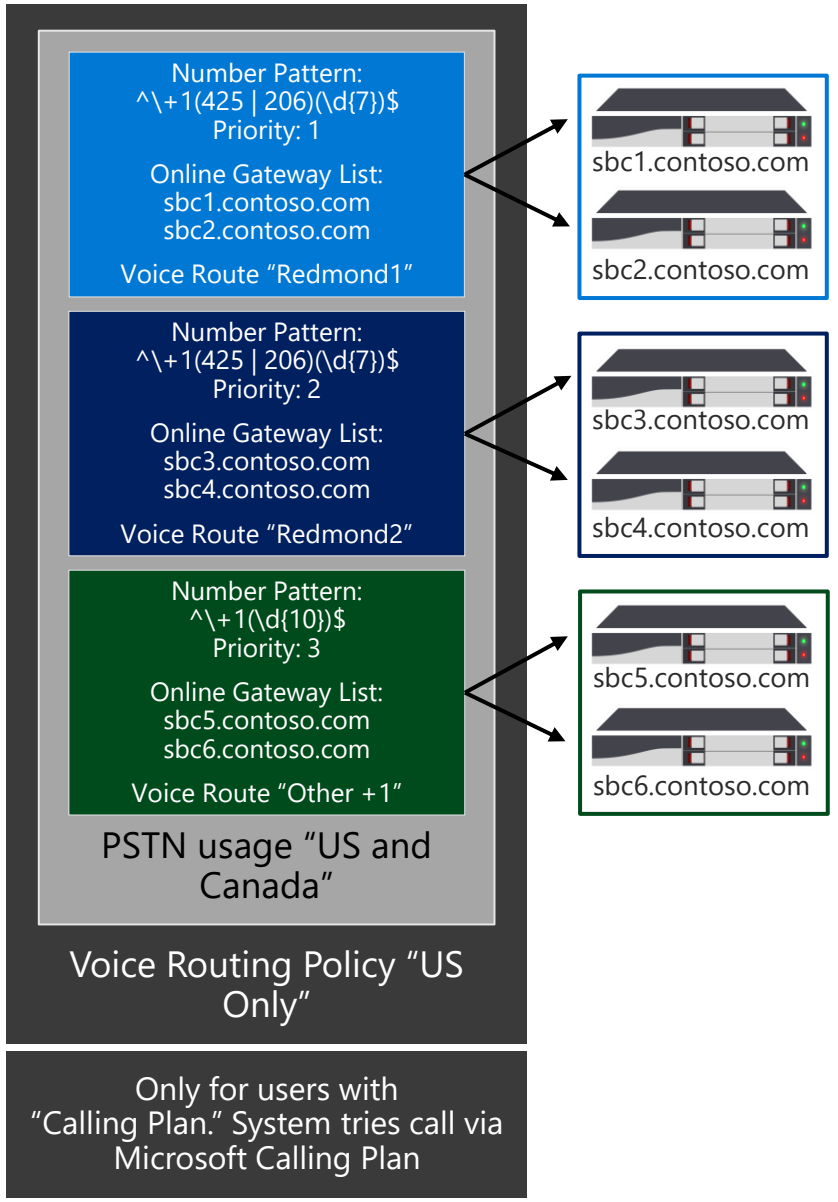
New-CsOnlineVoiceRoute -Identity "Redmond 2" -NumberPattern "^\+1(425|206)(\d{7})$" -OnlinePstnGatewayList sbc3.contoso.com, sbc4.contoso.com -Priority 2 -OnlinePstnUsages "US and Canada"

Route for other calls:

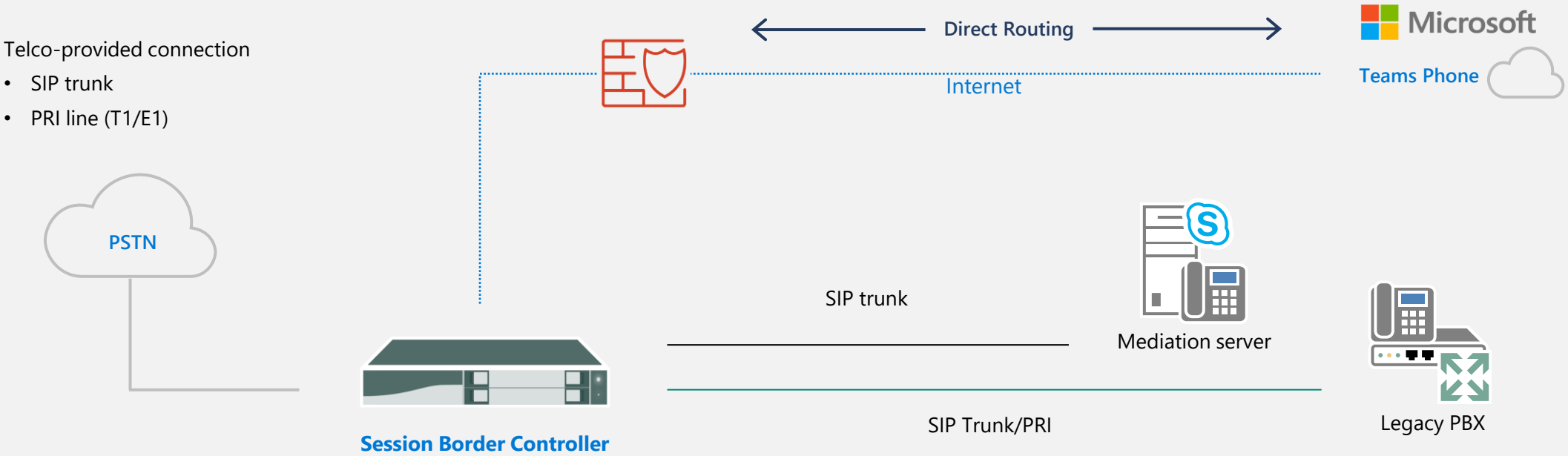
New-CsOnlineVoiceRoute -Identity "Other +1" -NumberPattern "^\+1(\d{10})$" -OnlinePstnGatewayList sbc5.contoso.com, sbc6.contoso.com -OnlinePstnUsages "US and Canada"

Voice Routing Policy

New-CsOnlineVoiceRoutingPolicy "US Only" -OnlinePstnUsages "US and Canada"
Grant-CsOnlineVoiceRoutingPolicy -Identity "Spencer Low" -PolicyName "US Only"



Migrating Existing Voice to Direct Routing



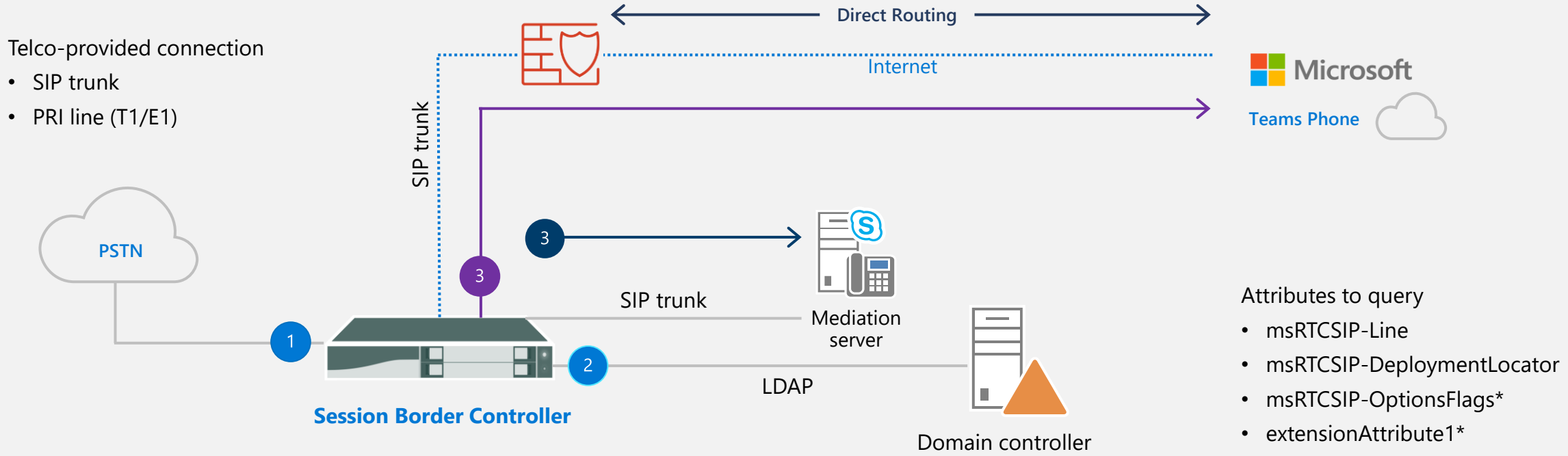
Session Border Controller is key

Recommend to place the SBC at the “front of the line”

Routing logic is anchored on the SBC

Option for directory-based lookups

Direct Routing Dynamic Routing Considerations



Attributes to query

- msRTCSIP-Line
- msRTCSIP-DeploymentLocator
- msRTCSIP-OptionsFlags*
- extensionAttribute1*

msRTCSIP-Line -> This is the anchor attribute, used to match with the incoming call.
msRTCSIP-DeploymentLocator -> This indicates where the user account is located.
"sipfed.online.lync.com" indicates the account is in the service (Route to Microsoft Teams).
"SRV:" indicates the account is on-premises (Route to Skype for Business).
*Optional items
msRTCSIP-OptionsFlags -> You can use this to also ensure the account is enabled for Enterprise Voice (value 385).
extensionAttribute1 (if Exchange is deployed) -> You can use this to help flag when a user has been migrated, or to differentiate between Skype for Business Online and Microsoft Teams.

1. Inbound call to SBC
2. Lookup to AD (query)
3. Route to Microsoft Teams
3. Route to Skype for Business

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In Closing…

Summary: “Top 10” Reasons for Deploying Direct Routing

1. **Cost Efficiency**. It’s a lot cheaper to use Direct Routing then Calling Plans.
2. **Simple Deployment.** Direct Routing eliminates the need for any call carrying equipment (CCE). But if physical equipment that is on-prem SBC is required then Direct Routing makes it possible.
3. **Leverage Existing contracts** which includes current infrastructure, DIDs and telephony contracts with service providers.
4. **Pain Free Migration**. Direct Routing helps to migrate from On-Prem Infrastructure to Cloud platform.
5. **Troubleshooting.** If there is an issue with calls/voice quality, it is easier to troubleshoot since we terminate the PSTN connection. Example: Leveraging OVOC (AudioCodes Management platform) we can see a call from PSTN to Teams and even Teams to Teams calls on a single management system.
6. **Integration**. We can connect to legacy PBX’s and Calling Center platforms (among other things)
7. **Remote User Troubleshooting**. Monitoring the users calling platform to see what they are using (headset attached to laptop, IP Phones, 3rd party device, etc.). From there we can resolve.
8. **Coverage.** Enable PSTN connectivity in countries where Microsoft Calling Plans doesn’t exist.
9. **Survivability.** Direct Routing along with Teams Survivable Branch Appliance helps you achieve survivability during network outage which means connection to TEAMS cloud being down.
10. **Analog Connectivity.**

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Thank you.

Questions and answers