



Cisco Meeting Server with Cisco Expressway

Deployment Guide

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Expressway X8.11.4

Cisco Meeting Server 2.4

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Preface

Change History

Table 1 Deployment Guide Change History

Date	Change	Reason
October 2019	Clarify Meeting Server load balancing requires a neighbor zone per peer on Expressway.	Document correction
July 2019	Add preloaded SIP routes (Expressway zone configuration option) to list of unsupported deployments .	Document correction
March 2019	Update document to reference Cisco Expressway X8.11.4, as version X8.11.1 was withdrawn. No substantive changes.	X8.11.4
October 2018	Renamed document from <i>Cisco Expressway Session Classification Deployment Guide</i> to <i>Cisco Meeting Server with Cisco Expressway Deployment Guide</i> . Moved the scenario "Video Calls Between Two Standards-based Organizations (B2B)" into the <i>Cisco Expressway-E and Expressway-C Basic Configuration Deployment Guide</i> . Moved the scenario "IM&P Federation With Microsoft-based Organizations" into the <i>Cisco Unified Communications XMPP Federation Deployment Guide</i> .	X8.11.1
December 2017	Renamed document from <i>Cisco Expressway Options with Cisco Meeting Server and/or Microsoft Infrastructure Deployment Guide</i> to <i>Cisco Expressway Session Classification Deployment Guide</i> . Removed the Web Proxy option, which is now documented in the <i>Cisco Expressway Web Proxy for Cisco Meeting Server Deployment Guide</i> on Cisco Expressway Series configuration guides page . Removed outbound NOTIFY configuration for IM&P federation (issue fixed in X8.10).	X8.10
October 2017	Added four Microsoft federation options related to mixed on-premises infrastructure with B2B.	New validation of MS interop
July 2017	Added DNS limitations for federation with Microsoft.	New information
June 2017	Note about clustered Meeting Server not supported in the scenarios presented.	Document correction
May 2017	Document name changed. Clarified where search rules should Stop (they default to Continue). Added Office 365 to list of supported Microsoft federation options. Removed caution about not using Web Proxy for Meeting Server.	X8.9.2
March 2017	Removed section "On-Premises Microsoft Options" which are not currently supported. Added pointers to Meeting Server documents that enable similar scenarios.	Untested scenarios

Table 1 Deployment Guide Change History (continued)

Date	Change	Reason
February 2017	Document name changed. Updated information about NOTIFY messages in Microsoft with IM&P federation. IM&P federation now fully supported using IM&P 11.5(1)SU2.	Known issues
January 2017	Updated. CMS version changed.	X8.9.1
December 2016	First release.	X8.9

Related Documents

- For installing Expressway:
Cisco Expressway Virtual Machine Installation Guide on the [Expressway installation guides page](#).
Cisco Expressway CE1100 Appliance Installation Guide on the [Expressway installation guides page](#).
- [Cisco Meeting Server installation guides page](#)
- [Cisco Meeting Server configuration guides page](#)
- [Expressway Administrator Guide](#)
- For certificates on Expressway:
See *Cisco Expressway Certificate Creation and Use Deployment Guide* on the [Expressway configuration guides page](#).
- For clustering Expressway:
See the *Cisco Expressway Cluster Creation and Maintenance Deployment Guide*, for your version, on the [Cisco Expressway Series configuration guides page](#).
- For firewall configuration:
See the *Cisco Expressway IP Port Usage Configuration Guide*, for your version, on the [Cisco Expressway Series configuration guides page](#).
- For configuring Web Proxy for Meeting Server:
See the *Cisco Expressway Web Proxy for Cisco Meeting Server Deployment Guide* on the [Cisco Expressway Series configuration guides page](#).

Introduction

This Expressway guide also now applies to VCS. Any VCS-specific information is noted where necessary in the guide. (Older VCS guides on Cisco.com are still valid for the VCS versions they apply to—as specified on the title page of each guide.)

Scope and Purpose

This document describes how to use Cisco Expressway Series and Cisco Meeting Server to enable multiple collaboration scenarios between the following systems:

- Your on-premises SIP collaboration environment, which the document distinguishes into two categories:
 - Cisco Unified Communications Manager-centric call control
 - Third-party or Expressway-centric call control
- Cisco Meeting Server spaces
- Cisco collaboration clients in other organizations
- Cisco Meeting App (on premises)

Note: Expressway cannot currently traverse calls from/to Cisco Meeting App when it is outside the network. This functionality can be provided by using the Meeting Server Load Balancer and TURN server components.

See *Deploying the Trunk and the Load Balancer* and *Configuring TURN Servers* in the Meeting Server deployment guides, on the [Cisco Meeting Server configuration guides page](#).

- Jabber clients, registered to Cisco Unified Communications Manager IM and Presence Service
- Microsoft clients on Lync or Skype for Business infrastructure in other organizations, or Skype for Business clients on Office 365

Note: We do not interoperate with "consumer" versions of Skype.

- On-premises Microsoft infrastructure and Meeting Server. In this scenario, the Cisco Meeting Server must use the Microsoft Edge server to traverse Microsoft calls into and out of the organization. See [Microsoft On-premises Federation Options](#), page 51.

The scenarios in this document use the following Expressway tools in combination:

- **Session classification:** A search rule filter for different implementations of the SIP protocol.
- A DNS zone that searches for different SRV records, depending on the SIP variant.

Note: To federate with external Microsoft-based organizations, via Expressway-E, you must use DNS zones. We do not support federation via neighbor zones, because neighbor zones are not designed for interoperating with Microsoft infrastructure that is behind a network address translator.

Because these tools are simple and build on established Expressway behavior, this document is deliberately light on configuration detail. Instead, we give a configuration summary and related reading where you may need it. Each configuration summary lists the steps needed to complete a particular task, and each step includes the menu option you need. After following the UI menu, you can generally access online help for detailed information. If not, you can refer to the appropriate configuration guide.

Out of Scope

This document does not cover the following scenarios:

- Cisco Meeting WebRTC Apps connecting to Meeting Server via reverse proxy on Expressway-E. This deployment is covered in *Expressway Web Proxy for Meeting Server*.
- Clustered Meeting Servers.
- Cisco Meeting App off-premises.

Document Structure

The introduction to this document contains two 'deployment maps'. The first shows Unified CM as the primary standards-based call control agent on-premises, and the second shows an organization that uses both Microsoft and Cisco infrastructure for voice, video, and chat scenarios. Note that if you do not have/need Unified CM, you can use the Expressway as a registrar and call control agent.

The deployment maps show many of the anticipated scenarios overlaid on one picture; you may not need to configure everything on the map! Also, the maps illustrate only the signaling connections. Media will not usually flow through all of the systems in the signaling path; in some cases we provide supplementary diagrams to show media flow paths.

We've tried to structure the document to show you how to implement new options onto your existing environment without being too prescriptive. For that reason, we summarize the minimum 'core configuration' you'll need before you can implement new functionality.

The rest of the document body is split into three main parts, which build on each other in complexity:

- Scenarios that use only Cisco collaboration infrastructure in our organization
- Scenarios that use only Cisco collaboration infrastructure in our organization, and integrate with other organizations that use Microsoft infrastructure
- Scenarios that use both Cisco and Microsoft infrastructure in our organization

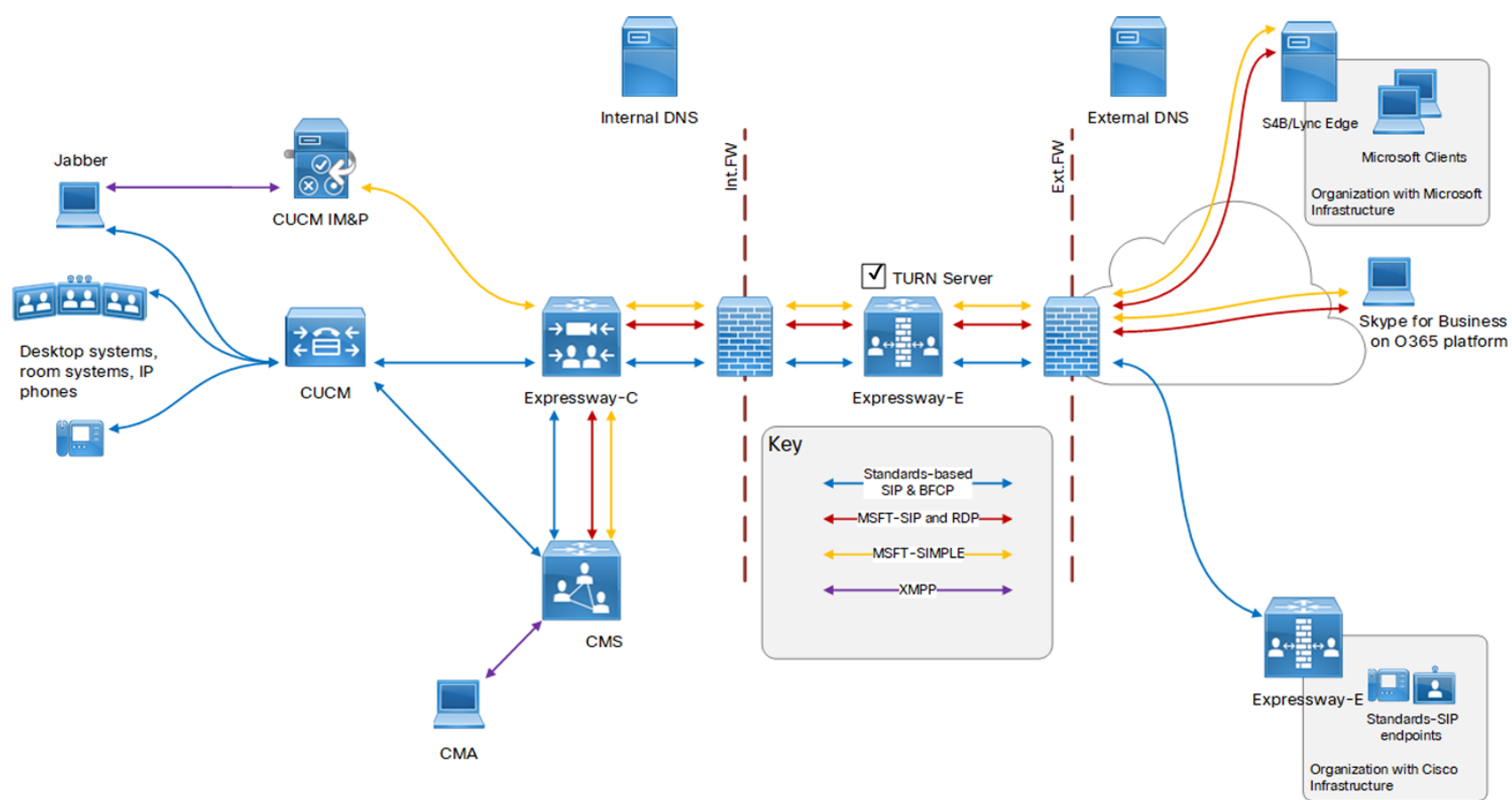
The scenarios use call setup diagrams and sample dial plans to describe different user outcomes.

Note: Your scenario may not be represented. We've tried to give you a flavor of the possibilities without making the document too long.

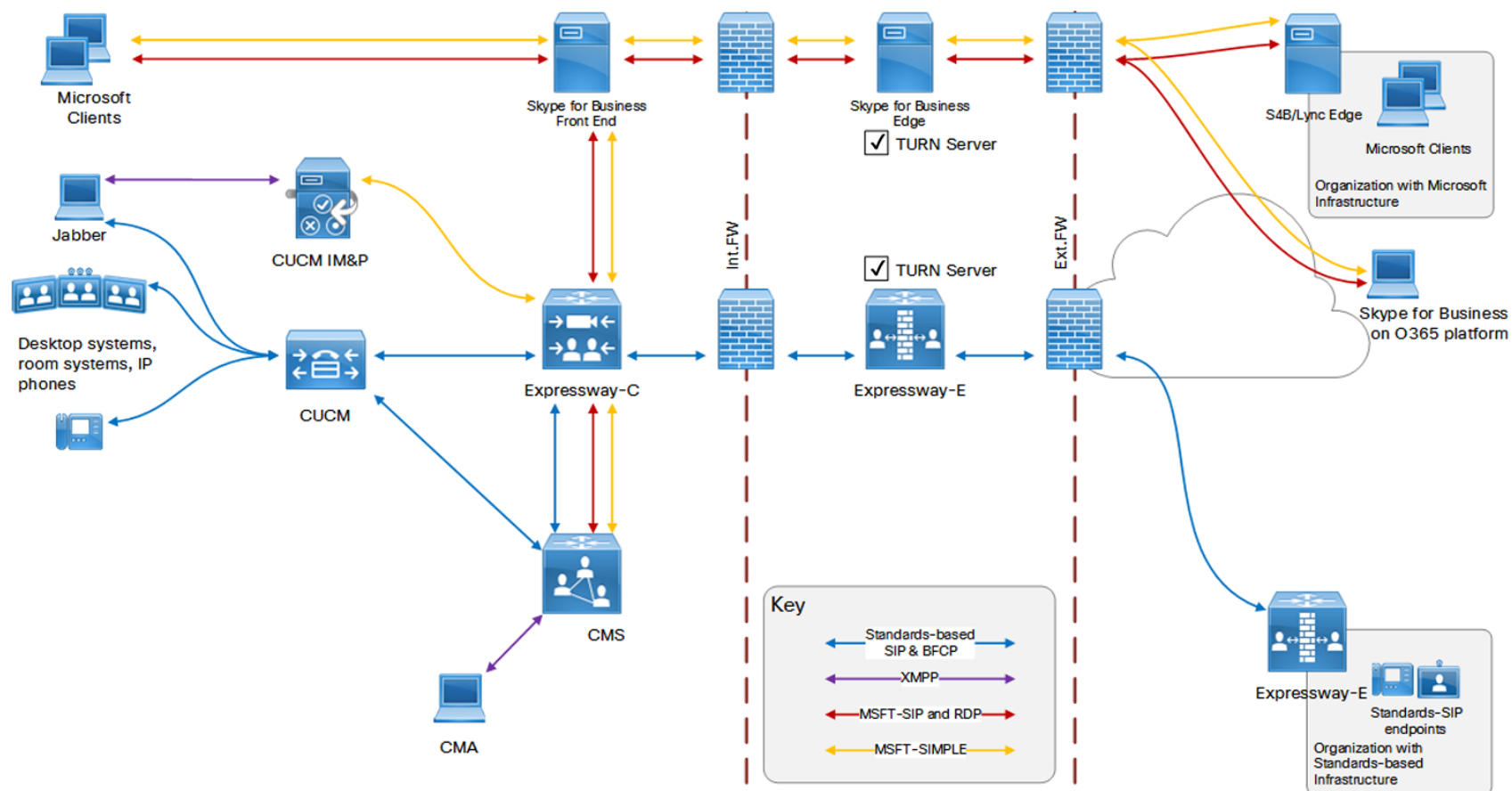
Related Reading

- Microsoft documentation on Skype for Business PowerShell cmdlets: <https://docs.microsoft.com/en-us/powershell/module/skype/?view=skype-ps>
- Cisco Meeting Server documentation at [Cisco Meeting Server configuration guides page](#)
- Cisco Meeting Server MMP Command Line Reference, for your version, at [Cisco Meeting Server Programming Guides page](#).

Unified CM-centric Deployment Map



Cisco and Microsoft Infrastructure On-Premises Deployment Map



Terminology and Example Values

Note: Do not use the domain names and other example values from this document in your test or production deployments. You must change the example values to represent your own environment.

- **Federation:** Federation in this context means connecting users in two or more organizations using collaboration technologies.
- **Our organization:** An organization using on-premises collaboration infrastructure to federate with other organizations. It is shown on the left hand side of diagrams in this document. If there is one domain we use *example.com* or *ciscoexample.com*, and if there are two SIP domains, we use *ciscoexample.com* and *msexample.com*.
- **Traversal server / client zones:** Special zones on the Expressway-E and Expressway-C that enable the pair to traverse calls across firewalls. You can use Unified Communications zones instead – and you must use this type for the Web Proxy for Meeting Server – but in this document we call the zones traversal server and traversal client, to simplify understanding.
- **Named Federation:** means connecting users from our organization with users from other, specific organizations. We know the target SIP domains in advance. In this document we'll use the value *msdomain1.com* for a named Microsoft-based organization and *stdsdomain1.com* for a named standards-based organization.
- **Open Federation:** means connecting users from 'our' organization with users in organizations whose SIP domains we don't know in advance.
- **Interdomain Federation:** On-premises federation between different SIP domains. This is necessary when different SIP domains are used by Microsoft infrastructure and Cisco infrastructure (on premises). In this document, we use *msexample.com* for the SIP domain used by on-premises Microsoft infrastructure.
- **Intradomain Federation:** On-premises federation between different infrastructure (Microsoft and Cisco) that use the same SIP domain. In this document, we use *example.com* for the SIP domain used by both types of SIP infrastructure.

Note: The terms *inter~* and *intra~ domain* federation are notoriously difficult to work with and often misinterpreted. In this document we have tried to use other ways of describing these topologies, but you may see the terms in related documents and the interfaces of other systems in these deployments.

- **Example user contact URIs:** User A *userA@ciscoexample.com* in our organization calls User C *userC@msdomain1.com* in the federated organization.
- **Meeting Server space contact URIs:** User B invites folks to join the space *userb@space.ciscoexample.com*. We recommend using a subdomain for your conferences because some call agents cannot make routing decisions based on the username part of the requested URI. For example, we suggest that you use the form *user1@space.example.com* in your dial plan instead of *user1.space@example.com*. Another option is to use a numeric range in the dial plan, eg. *81100100@example.com* to *81100199@example.com*.
- **Outbound and Inbound:** Generally, calls initiated from inside our organization's network to another organization or remote user are Outbound. Calls initiated from outside our organization's network, to users or spaces in our network, are Inbound.

We also use these terms in the specific context of particular systems. In these cases, you can infer the call direction from the text and supporting diagrams.

- **Gateway Meeting Server:** A normal Meeting Server that is only used for adapting between different SIP variants.
- **Conferencing Meeting Server:** A normal Meeting Server that is dedicated to hosting spaces.

Building Block Examples

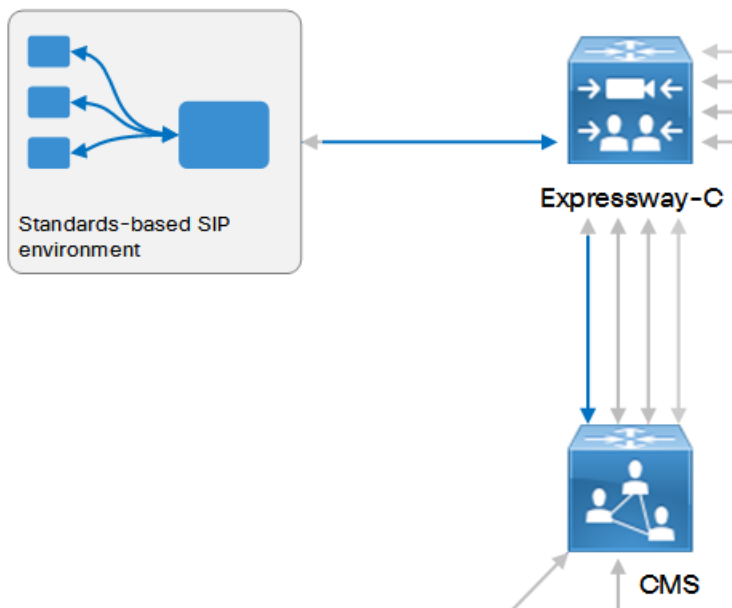
The examples in this section illustrate and summarize some configuration tasks. They are not useful on their own, but they are included here for two reasons:

- They introduce the format of the modular deployment scenarios: diagram, sample dial plan, and configuration summary.
- They illustrate how a typical deployment scenario is built up from smaller configuration tasks.

The examples here can be adapted to implement outbound calling from standards-based SIP endpoints to Microsoft clients in federated organizations.

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Example: Route Standard SIP Calls to Meeting Server



To enable standards-based endpoints to call into spaces, you would use a *Standards-based* SIP search rule that looks for an *Alias pattern match* of the Meeting Server space dial pattern (for example, the regular expression could be `.*@space.ciscoexample.com`).

If you want Meeting Server to adapt the call signaling from a standards-based SIP endpoint to a Microsoft SIP client, you would still use a *Standards-based* search rule, but match on a different domain; for example, the regular expression could be `.*@msdomain1.com`.

Example Call Flow 1

1. Collaboration endpoint user A (`userA@ciscoexample.com`) dials Microsoft client user C (`userC@msdomain1.com`).

2. The standards-based SIP registrar recognizes this pattern is for Expressway-C, and routes the call on that trunk/neighbor zone.
3. Your search rule on Expressway-C is looking for calls that come in on the neighbor zone from the standards-based registrar. It is filtering out those calls that use the *Standards-based* SIP variant, and are destined for any aliases in the domain *@msdomain1.com*.
4. When Expressway-C identifies a call that matches these parameters, it routes the call to the Meeting Server neighbor zone.

Example Call Flow 2

1. Collaboration endpoint user A (*userA@ciscoexample.com*) dials *userB@space.ciscoexample.com*.
2. The standards-based SIP registrar recognizes this pattern is for its trunk to Expressway-C, and routes the call on that trunk.
3. Your search rule on Expressway-C is looking for calls to *space.ciscoexample.com* that come in on the neighbor zone from the standards-based registrar.
4. When Expressway-C identifies a call that matches these parameters, it routes the call to the Meeting Server neighbor zone.

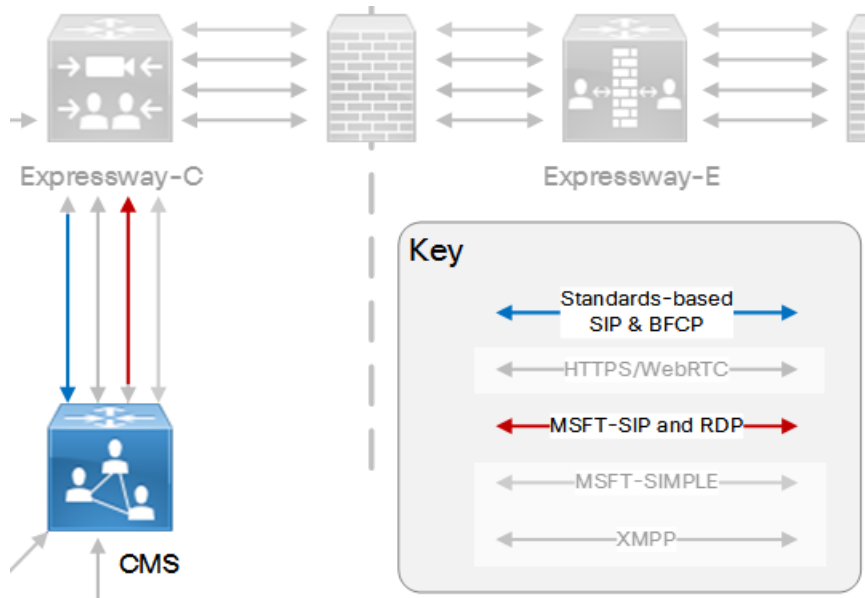
Configuration Summary

- SIP trunk on the registrar to route to Expressway-C.
- Neighbor zone to the registrar from Expressway-C.
- Neighbor zone to Meeting Server on Expressway-C.
- Dial plan that mandates routing the patterns *@msdomain1.com* and *@space.ciscoexample.com* via Expressway-C towards Meeting Server.

Dial Plan Description

- Routing rule on the standards-based registrar to send calls for *msdomain1.com* to the Expressway-C.
- Routing rule on the standards-based registrar to send calls for *space.ciscoexample.com* to the Expressway-C.
- Search rule on the Expressway-C to send *.*@msdomain1\.com* to Meeting Server.
- Search rule on the Expressway-C to send *.*@space\.ciscoexample\.com* to Meeting Server.

Example: Configure Meeting Server to Transcode Standards-based to Microsoft Variant SIP



Example Call Flow 1 (diagram)

1. Meeting Server receives a Standard SIP call for *userC@msdomain1.com*.
2. An inbound dial plan rule on Meeting Server is matching calls with destination pattern **@msdomain1.com*.
3. An outbound rule on Meeting Server routes calls with that pattern on the Lync type trunk to Expressway-C. Because the outbound rule specifies the Lync type trunk, the Meeting Server transcodes the signaling messages into the Microsoft AV & Share variant.

Example Call Flow 2

1. Meeting Server receives a call for *userB@space.ciscoexample.com*
2. An inbound rule matches the pattern **@space.ciscoexample.com* and connects the call to a space.

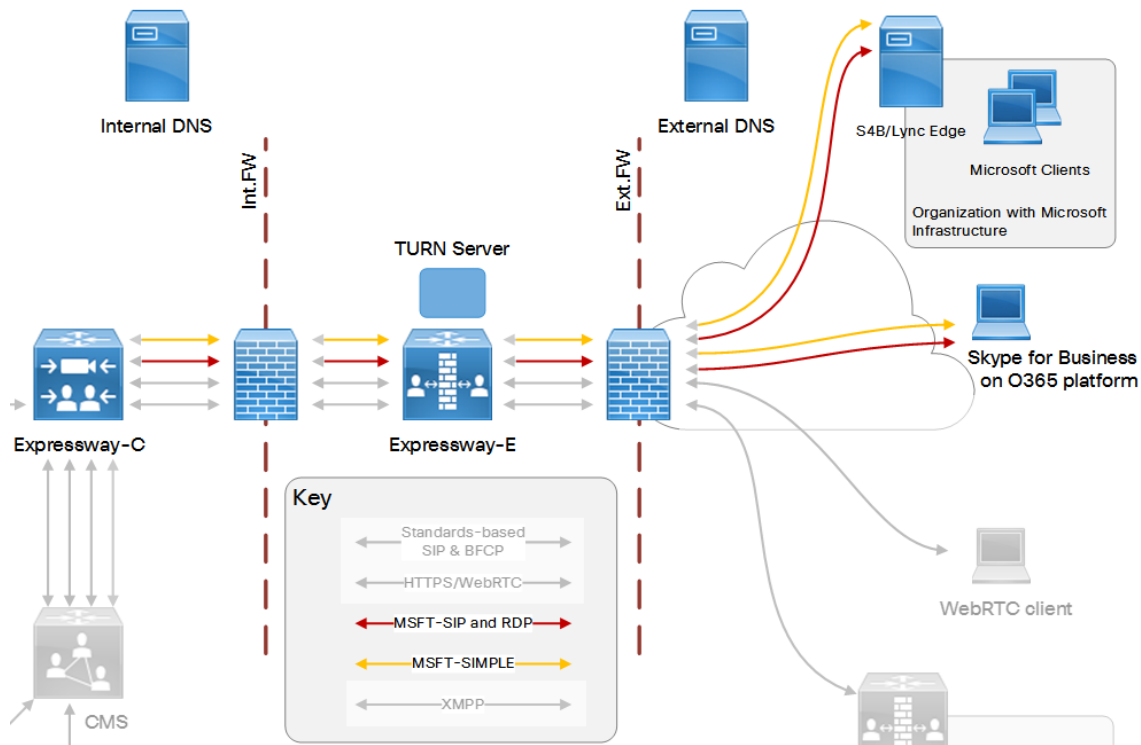
Configuration Summary

- Neighbor zone from Expressway-C to Meeting Server.
- Create dial plan on Expressway-C and Meeting Server.

Dial Plan Description

- Incoming call forwarding rule on Meeting Server that forwards calls with the pattern **@msdomain1.com*.
- Outbound call rule on Meeting Server that sends calls for **@msdomain1.com* back to Expressway-C (SIP Proxy) using the Lync type trunk.
- Incoming call matching rule on Meeting Server for the pattern **@space.ciscoexample.com* that targets spaces.

Example: Route Microsoft SIP from Expressway-C to Microsoft Organization



Example Call Flow

1. An outbound call for Microsoft user C (*userC@msdomain1.com*) has been routed to the Unified Communications traversal zone on the Expressway-C.
2. Your search rule on Expressway-E is looking for calls that come in on the Unified Communications traversal zone for *.*@msdomain1.com* that use *Any Microsoft SIP* variant.
3. When Expressway-E identifies a call matching these parameters, it routes the call to the DNS zone.
4. The DNS zone recognizes the Microsoft SIP variant, and does a DNS SRV lookup for *_sipfederation1s._tcp.msdomain1.com*. This resolves the Lync / Skype for Business Edge servers for the federated organization.
5. The Expressway-E routes the call to the remote Edge server.
6. The Meeting Server and Microsoft user C's client use TURN to negotiate a media path to the federated Microsoft organization.
7. The call is established.

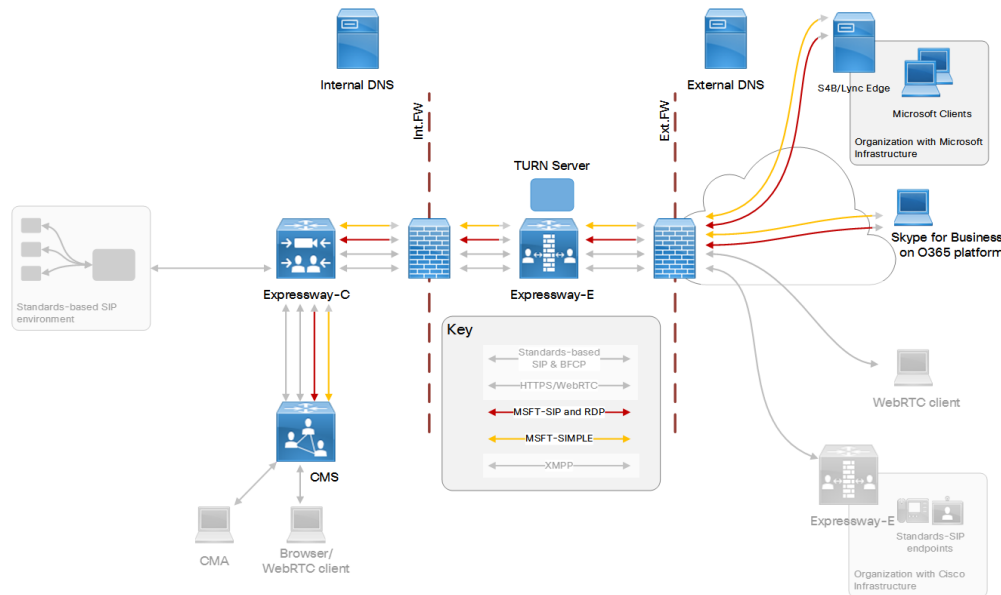
Configuration Summary

- Unified Communications traversal (server) zone on Expressway-E.
- Unified Communications traversal (client) zone on Expressway-C.
You can use normal traversal zones instead, but not if you also have MRA on the Expressway pair.
- DNS zone on Expressway-E.
- Enable TURN server on Expressway-E.
- Point Meeting Server at TURN server on Expressway-E.
- Create dial plan.

Dial Plan Description

- Search rule on Expressway-C to route Microsoft variant SIP, destined for `.*@msdomain1\.com`, to the traversal zone.
- Search rule on the Expressway-E to route all calls from the traversal zone to the DNS zone.

Example: Route Inbound Microsoft SIP from Expressway-E to Meeting Server



Example Call Flow

1. Federated Microsoft user C (`userC@msdomain1.com`) calls user B's space (`userB@space.ciscoexample.com`).
2. The Microsoft on-premises or cloud infrastructure does a DNS lookup for `_sipfederationtls._tcp.cms.ciscoexample.com`. (federation SRV record) and routes the call to the Expressway-E public address.
3. Your search rule on Expressway-E is looking for calls that come in on the Default zone. It's filtering calls destined for anything `.*@space\.ciscoexample\.com*`.
4. When Expressway-E identifies a call matching these parameters, it routes the call to the traversal zone.
5. The call traverses the firewall to the traversal (client) zone on the Expressway-C.
6. Your search rule on Expressway-C is looking for calls that come in on the traversal zone. It's filtering out calls destined for anything `.*@space\.ciscoexample\.com*`.
7. When Expressway-C identifies a call matching these parameters, it routes the call to the Meeting Server neighbor zone.
8. The Meeting Server and Microsoft user C's client use TURN services to negotiate a media path.
9. The call is established.

Configuration Summary

- Traversal (server) zone on Expressway-E.
- Traversal (client) zone on Expressway-C.
- Neighbor zone to Meeting Server on Expressway-C.
- Enable TURN server on Expressway-E.

- Point Meeting Server at TURN server on Expressway-E.
- Create dial plan.

Dial Plan Description

- Search rule on Expressway-E to route `.*@space\.ciscoexample\.com` from the default zone to the traversal zone.
- Search rule on Expressway-C to route `.*@space\.ciscoexample\.com` from the traversal zone to the Meeting Server zone.

Core Configuration

This section gives you an overview of the minimum configuration you need to get the Expressway pair working with Cisco Meeting Server. The sections that follow will describe the options for making this core configuration work for your users.

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Prerequisites

Supporting Systems Configuration

- DNS. An internal DNS configured with forward and reverse lookups for Expressway-E, Expressway-C, and Cisco Meeting Server.
- External DNS. An external DNS configured with forward lookup for the Expressway-E cluster FQDN.
- NTP. All servers must be internally synchronized to the same time source.

Software Versions

- Expressway X8.9 or later
- Cisco Meeting Server 2.4 or later
- Cisco Unified Communications Manager 10.x or later, for the audio / video call deployments shown
- Cisco Unified Communications Manager IM and Presence Service 11.5(1) SU3 or later. This software is only required for chat federation with Microsoft clients
- Lync 2013 Server, or Skype for Business Server
- Microsoft clients on Lync 2013 Server, Skype for Business Server, or Office 365 for voice / video
- Microsoft clients on Lync 2013 Server or Skype for Business Server for chat
- Cisco Collaboration endpoints and Microsoft client software

Using Clustered Meeting Servers for Load Balancing

If you plan to use Meeting Server load balancing capabilities, you need to define multiple neighbor zones on Expressway - one for each peer in the Meeting Server Call Bridge cluster. See [Neighbor the Expressway-C to Cisco Meeting Server](#), page 21 for details.

Core Systems Basic Configuration

- Install and basic configuration of Cisco Meeting Server
- Install and basic configuration of Expressway (traversal pair)
- Certificate creation and install on Expressway
- [Optional] Clustering of Expressway
- [Optional] Configure MRA if you have off-premises endpoints registering to Unified CM.

For more information about these items, see the relevant guides listed in [Related Documents](#), page 6.

Create Traversal Server and Client Zones

1. On each system in the Expressway pair, go to **Configuration > Zones > Zones**.
2. Click **New**.

3. Configure the following fields (leave all other fields with their default values):

Field Name	Expressway-C	Expressway-E
Name	TraversalClient for example	TraversalServer for example
Type	<i>Traversal client or Unified Communications traversal</i> Note: If you are using MRA or Meeting Server web proxy with this Expressway pair, then you must use Unified Communications traversal zones. Otherwise traversal zones are sufficient.	<i>Traversal server or Unified Communications traversal</i>
Connection credentials section		
Username	exampleauth for example	Match the credential entered on Expressway-C. Such as exampleauth
Password	ex4mp13.c0m for example	a. Click Add/Edit local authentication database b. In the dialog box, click New and enter the Name and Password values. Using our examples, these would be exampleauth and ex4mp13.c0m . c. Click Create credential .
H.323 section		
Mode	<i>Off</i>	<i>Off</i>
SIP section		
Port	7001	7001
TLS verify subject name	Not applicable	Enter the name to look for in the traversal client's certificate. This must be in either the Subject Common Name or the Subject Alternative Name attributes. If you have a cluster of traversal clients, specify the cluster name here and ensure that it's included in each client certificate.
Authentication section		
Authentication policy	<i>Do not check credentials</i>	<i>Do not check credentials</i>
Location section		
Peer 1 address	Enter the FQDN of the Expressway-E.	Not applicable

Field Name	Expressway-C	Expressway-E
Peer 2...6 address	(Clustered Expressway-Es only.) Enter the FQDNs of each additional peer.	Not applicable

4. Click **Create zone**.

Neighbor the Expressway-C to Cisco Meeting Server

1. On the Expressway-C, go to **Configuration > Zones > Zones** and click **New**.
2. Select type *Neighbor*.
3. Configure the following zone parameters (leave all other parameters with their default values) then save the zone:

Table 2 Meeting Server Neighbor Zone Settings

Field Name	Select or Enter This Value
Name	CiscoMeetingServer
H.323 Mode	Off
SIP Mode	On
Transport	TLS
Peer 1 address	FQDN or IP address of the Cisco Meeting Server.
Peer 2-6 address	Do not configure this setting to use Load Balancing with multiple Meeting Servers, as Expressway currently requires each Meeting Server peer to be defined as a separate zone (see next setting and also Prerequisites, page 19).
Meeting Server load balancing	To use Meeting Server load balancing capabilities through Expressway, create a separate neighbor zone for each peer in the Meeting Server cluster. For each zone, configure the following settings: <ol style="list-style-type: none"> Zone profile to <i>Custom</i>. Meeting Server load balancing to <i>On</i>.

4. Click **Create zone**.

About TURN Services

With the infrastructure scenarios in this document, it is possible that up to three different TURN servers could be used:

- Expressway-E TURN server
- Skype for Business / Lync Edge TURN server

Recommendations

Your choice of TURN server depends on your requirements:

- **If you are doing SIP federation only**, between your standards-based organization and another standards-based, or Microsoft-based, organization, then we recommend using the Expressway-E TURN server.
- **If you are doing dual homed conferencing** between on-premises Meeting Server and on-premises Microsoft Skype for Business infrastructure, then the Meeting Server automatically uses the Skype for Business Edge for TURN services.

Note: This document describes the use of Expressway-E whenever a TURN server is required. See [Cisco Meeting Server configuration guides page](#) for details of how to configure Meeting Server edge deployments and dual homed conferencing.

Expressway-E TURN services

- The Expressway-E has an embedded TURN server which listens on TCP and UDP port 3478 by default.
- If it's a large Expressway-E, it listens on the range 3478–3483 inclusive. These ports are configurable within the 1024–65535 range.
- On a large Expressway-E you can enable port multiplexing for that range so that you only need to open one port on the external firewall.
- The TURN server can be configured to listen on TCP 443, for TURN requests from clients that fall back to TCP when UDP TURN is not available because the network is restricted.

Meeting Server TURN services

Meeting Server can use the Expressway-E-TURN server, or the Microsoft Lync/Skype for Business Edge server.

- By default, the CMS Meeting Server tries to connect to UDP port 3478 and TCP port 3478 when connecting to the Expressway-E TURN server.
- By default, the CMS Meeting Server tries to connect to UDP port 3478 and TCP port 443 when connecting to the Microsoft Lync/Skype for Business Edge server.
- By default, the WebRTC client and the Cisco Meeting App try to connect to UDP port 3478.
- By default, the WebRTC client will try to connect to TCP port 443.
- You can change the TCP default for the Cisco Meeting Server and WebRTC client to any port number.

Configure Meeting Server to Use Expressway-E for TCP TURN Services

You can use the Meeting Server UI to point it at a TURN server as described here, or you can use the API to modify the `/turnServers` node.

See *Cisco Meeting Server API Reference Guide* on the [Cisco Meeting Server programming guides page](#).

1. Go to **Configuration > General**.
2. Enter the following values:

Fieldname	Example value / description
TURN Server address (CMS)	This is the address that the Meeting Server uses for TURN requests. If using the Expressway-E TURN server, then it should be the private address of the Expressway-E. You can use an IP address or FQDN in this field.
TURN Server address (CMA)	This is the address that the Cisco Meeting App and the Cisco Meeting WebRTC App use for TURN requests. If using the Expressway-E TURN server, then it should be the public address of the Expressway-E. You can use an IP address or FQDN in this field. Note: The Meeting Server resolves the FQDN before passing the IP address to the clients. This means external clients may be unable to connect (depending on your DNS configuration) because they might be trying an internal IP address.
Username	An account to represent the Meeting Server on the TURN server. You must create the corresponding account on the TURN server.
Password	A secret used to authenticate this account. You must share the secret with the corresponding TURN server account.
Confirm password	Re-enter the value from the previous field.

3. Submit the configuration.

The port defaults to 3478 (UDP & TCP) if Meeting Server detects the Expressway-E TURN server.

You cannot override the TCP TURN port with the UI. If you need to change this port, you must modify the `/turnServers` node with the API.

Cisco On-Premises Deployment Options

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Audio/Video Meetings in Meeting Server Spaces

This option combines Expressway as the target for calls with the Meeting Server Skype for business interoperability. So enterprises with traditional VoIP environments can adopt video, and collaborate with organizations which use Skype for Business.

The diagram does not show Unified CM, but you can use Unified CM in place of the generic SIP registrar shown in the diagram.

You can register video endpoints to the Expressway-C if your SIP agent does not support these types of systems.

We recommend using a subdomain for your conferences because some call agents cannot make routing decisions based on the username part of the requested URI. For example, we suggest that you use the form `user1@space.example.com` in your dial plan instead of `user1.space@example.com`. Another option is to use a numeric range in the dial plan, eg. `81100100@example.com` to `81100199@example.com`.

Figure 1 Call Routing

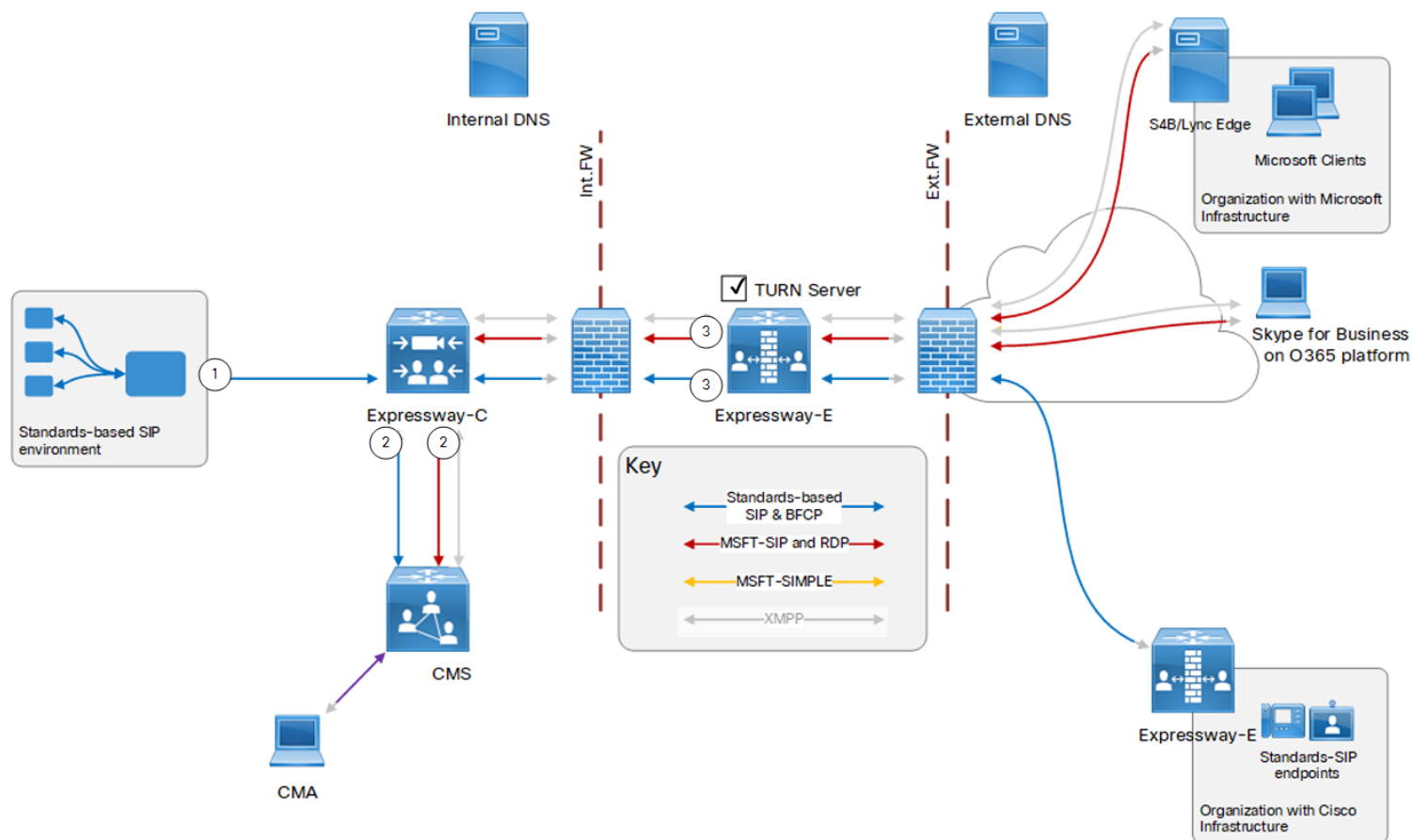


Table 3 Sample Dial Plan Rules

Arrow #	Rule Hosted On	Rule Order/Priority	From	Pattern and Logic	To
1	SIP registrar		Locally registered endpoints	For <i>@space.ciscoexample.com</i> If the registrar is an Expressway or VCS, then On successful match Stop .	Expressway-C trunk
2	Expressway-C		Any	All SIP variants, for <i>.*@space\.ciscoexample\.com</i> On successful match Stop	Meeting Server zone
3	Expressway-E		Default zone	All SIP variants, for <i>.*@space\.ciscoexample\.com</i> [†] On successful match Stop	Traversal server zone

[†] Using a subdomain for Meeting Server spaces requires that you publish a SIP federation SRV record for the subdomain in the DNS. If you cannot do this, then you can use the Expressway to transform a pattern like *(.*)\.space@ciscoexample\.com* to *\1@space.ciscoexample.com*.

Configuration Summary

1. [Core Configuration, page 18](#) for zones, trunks, and TURN.
2. Meeting Server: Create spaces on Meeting Server, following the pattern *username@space.ciscoexample.com*. (**Configuration > Spaces**)
3. Publish standards-based and Microsoft-variant SIP federation SRV records for your domains *ciscoexample.com* and *space.ciscoexample.com* that resolve to the A record(s) of your Expressway-E(s)

Dial Plan Description

- SIP registrar: Create a dial plan rule to route calls matching *space.ciscoexample.com* on the trunk to Expressway-C.
- Expressway-C: Create a search rule on Expressway-C. To route "All SIP" variants for calls matching *.*@space\.ciscoexample\.com*, to the Meeting Server neighbor zone. (**Configuration > Dial plan > Search rules**).
- Expressway-E: Create a search rule on Expressway-E. To route "All SIP" variants for calls matching *.*@space\.ciscoexample\.com*, from the default zone to the traversal server zone. (**Configuration > Dial plan > Search rules**).
- Meeting Server: Create an incoming call matching rule for the pattern **@space.ciscoexample.com*, that targets spaces. (**Configuration > Incoming calls**).

Meeting Server Calling Out

This option enables Meeting Server to call out to users in other organizations that have published their audio/video federation addresses. So that our users can invite external participants to join Meeting Server spaces.

Figure 2 Outbound Callflows From Meeting Server Spaces

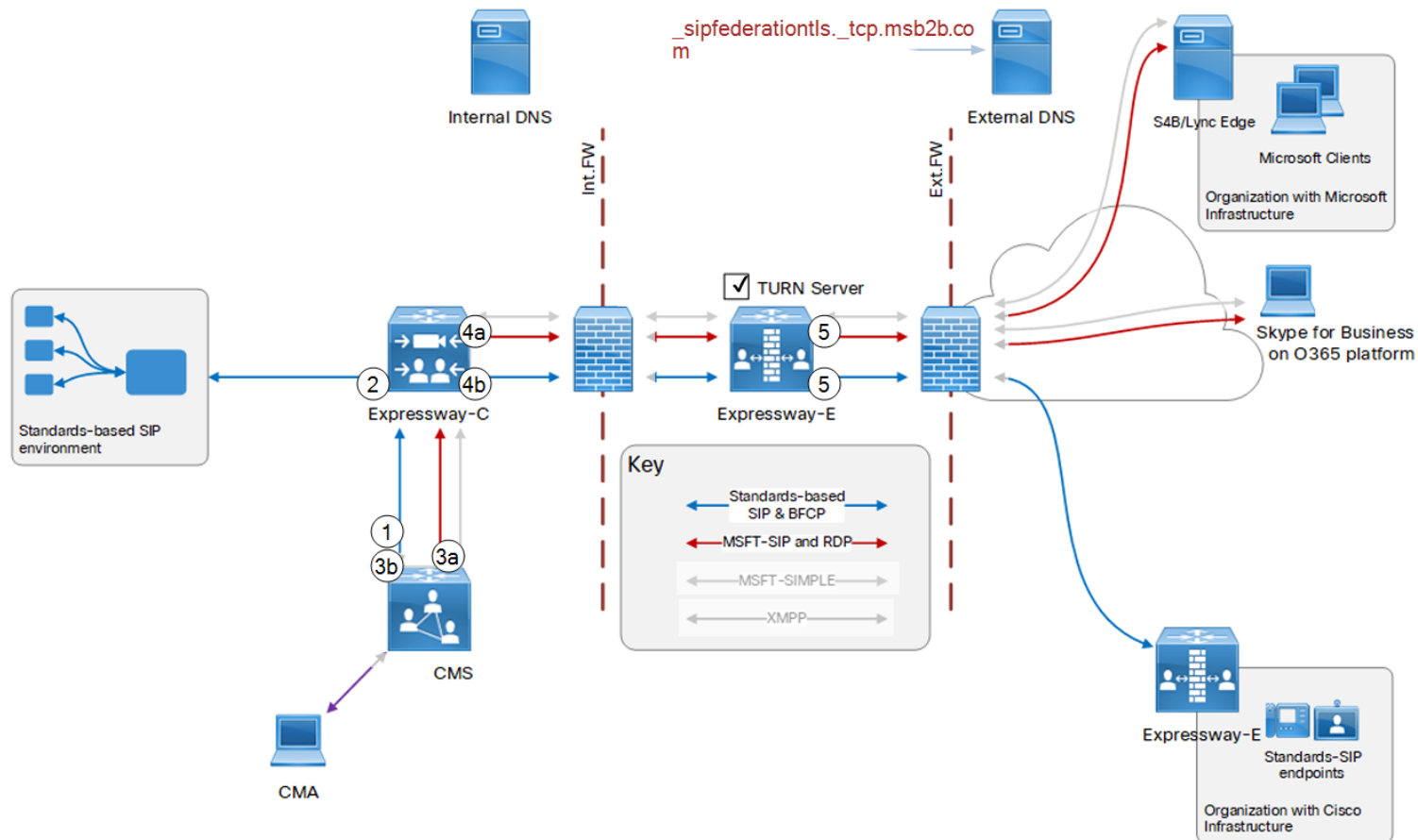


Table 4 Sample Dial Plan Rules for Outbound Calls

Arrow #	Rule Hosted On	Rule Order/Priority	From	Pattern and Logic	To
1	Meeting Server	Higher priority than all rules to unknown domains.	Meeting Server space	Outbound configuration for <i>*@ciscoexample.com</i> to Standards type trunk. Set the rule to <i>Stop</i> if matched.	Expressway-C
2	Expressway-C	Higher priority than all rules for unknown domains.	Meeting Server neighbor zone	Standards-based SIP, for <i>.*@ciscoexample.com</i> . On successful match Stop	Neighbor zone to SIP registrar
3a	Meeting Server	Higher priority (lower priority number) than rule related to call flow arrow 3b.	Meeting Server space	Outbound configuration for any pattern to Lync type trunk. Set the rule to <i>Continue</i> if matched.	Expressway-C
3b	Meeting Server	Lower priority (higher priority number) than rule related to call flow arrow 3a.	Meeting Server space	Outbound configuration for any pattern to Standards type trunk. Set the rule to <i>Stop</i> if matched.	Expressway-C

Table 4 Sample Dial Plan Rules for Outbound Calls (continued)

Arrow #	Rule Hosted On	Rule Order/Priority	From	Pattern and Logic	To
4a	Expressway-C	Higher priority (lower priority number on UI) than rule relating to call flow arrow 4b. Set the rule to continue, in case the first DNS lookup fails because the external domain does not have a Microsoft federation record.	Meeting Server neighbor zone	Microsoft AV & Share type, for any destination that does not match <code>.*@ciscoexample\.com</code> (or other well-known registrar domains). On successful match <i>Continue</i>	Traversal client zone
4b	Expressway-C		Meeting Server neighbor zone	Standards-based SIP, for any destination that does not match <code>.*@ciscoexample\.com</code> (or other well-known registrar domains). On successful match <i>Stop</i>	Traversal client zone
5	Expressway-E		Traversal server zone	All SIP variants, for any destination. On successful match <i>Stop</i>	DNS zone

Technical Overview

This option enables Meeting Server to call out to users in other organizations that have published their audio/video federation addresses. So that users can invite external participants to join Meeting Server spaces.

Dial Plan Concepts

The dial plan here assumes that the outbound trunk from Meeting Server should be *Lync* type for the first attempt at an outbound call for an unknown domain. (Call flow 3a, 4a, 5 on the diagram.)

However, the call will probably fail if the dialed URI is not in a Microsoft-based organization. The DNS lookup will fail because the external domain will not have published the Service Record used by Microsoft for SIP federation (`_sipfederationtls._tcp.example.com`). The organization may have published a standard SIP federation record in the DNS instead (`_sip._tcp.example.com`. Or `_sips._tcp.example.com`).

So when you create a rule on Meeting Server, to route outbound calls as *Lync* type, we recommend that the rule *continues* searching if the call is not placed. Then Meeting Server will try the lower priority rule that routes the call out as a Standards-based SIP call. (Call flow 3b, 4b, 5 on the diagram.)

If you know that some specific domains are of standards-based organizations, then you could add specific rules for those domains. You could set the rules with higher priority than 3a and 3b and send the calls out as Standard type.

Configuration Summary

1. [Core Configuration, page 18](#) for zones, trunks, and TURN.
2. Expressway-E: Create a DNS zone on Expressway-E (**Configuration > Zones > Zones** with type = *DNS*).

Dial Plan Description

- Meeting Server: Create search rules in this priority order:
 - a. Create outbound configuration on Meeting Server to route calls for `*@ciscoexample.com` on Standard trunk to Expressway-C. Stop if matched.
 - b. Create outbound configuration on Meeting Server to route calls for unknown destinations (*) to Expressway-C on *Lync* type trunk. Continue if matched.
 - c. Create outbound configuration on Meeting Server to route calls for unknown destinations (*) to Expressway-C on *Standard* type trunk. Stop if matched.
- Expressway-C: Create search rules in this priority order:
 - a. Route Standards-based SIP for `.*@ciscoexample.com` from the Meeting Server zone to the registrar zone. Stop if matched.
 - b. Route Microsoft AV & Share SIP variant for any alias from the Meeting Server zone to the traversal client zone. Stop if matched.
 - c. Route Standards-based SIP for any alias from the Meeting Server zone to the traversal client zone. Stop if matched.
- Expressway-E: Create a search rule to route All SIP Variants from the traversal server zone to the DNS zone.

High Scale Calls and Meetings with Unified CM and Meeting Server

This option uses a dedicated Meeting Server to transcode between different SIP variants, and a separate Meeting Server to host spaces.

The outbound configuration and call flows are discussed in other sections of the document. Here we are going to focus on making sure that inbound calls, and calls within the organization, are routed to the destination endpoint or space.

Figure 3 Traffic Routing

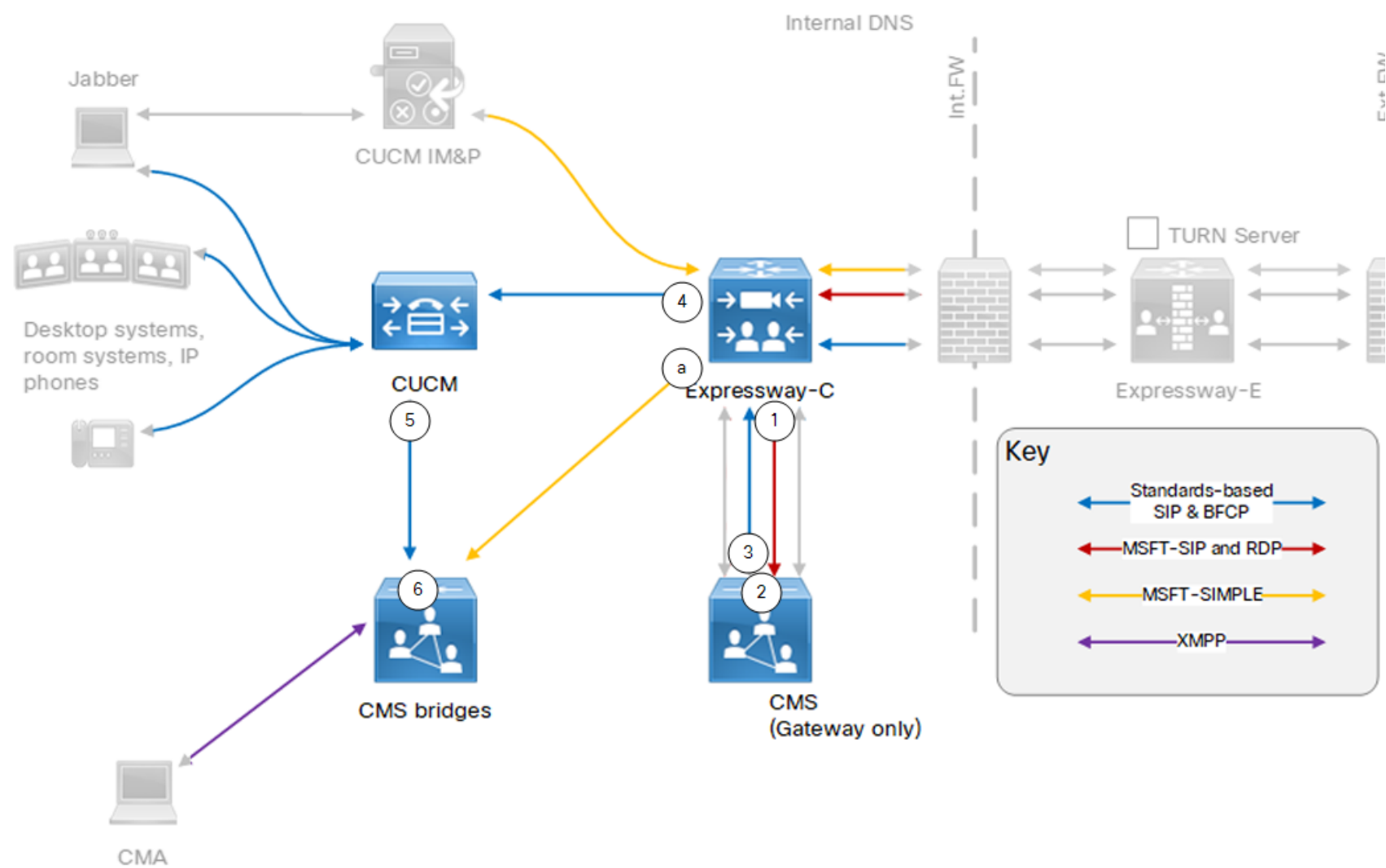


Table 5 Sample Dial Plan Rules

Arrow #	Rule Hosted On	Rule Order/Priority	From	Pattern and Logic	To
1	Expressway-C		Traversal client zone	Microsoft SIP, for <i>.*@space\.ciscoexample\.com</i> On successful match Stop	Gateway Meeting Server zone
1	Expressway-C		Traversal client zone	Microsoft SIP, for <i>.*@ciscoexample\.com</i> On successful match Stop	Gateway Meeting Server zone
2	Gateway Meeting Server		Expressway-C	Incoming calls for <i>*@space.ciscoexample.com</i>	Forward (not terminate)
2	Gateway Meeting Server		Expressway-C	Incoming calls for <i>*@ciscoexample.com</i>	Forward (not terminate)
3	Gateway Meeting Server		Meeting Server	Outbound calls for <i>*@space.ciscoexample.com</i> on Standard SIP type trunk	Expressway-C
3	Gateway Meeting Server		Meeting Server	Outbound calls for <i>*@ciscoexample.com</i> on Standard SIP type trunk	Expressway-C
4	Expressway-C		Any	Standards-based SIP, for <i>.*@ciscoexample\.com</i> On successful match Stop You could combine the two rules for this arrow using a regex. Having two rules is arguably safer and easier to demonstrate / troubleshoot.	Unified CM zone
4	Expressway-C		Any	Standards-based SIP, for <i>.*@space\.ciscoexample\.com</i> On successful match Stop	Unified CM zone
5	Unified CM		Expressway-C trunk or locally registered endpoints	For <i>*@space.ciscoexample.com</i>	Conferencing Meeting Server trunk

Table 5 Sample Dial Plan Rules (continued)

Arrow #	Rule Hosted On	Rule Order/Priority	From	Pattern and Logic	To
6	Conferencing Meeting Server		Unified CM	Match <i>*@space.ciscoexample.com</i>	Targets spaces
a	Expressway-C		Any	Microsoft SIP IM&P for <i>.*@space\.ciscoexample\.com.*</i> On successful match <i>Stop</i>	Conferencing Meeting Server neighbor zone

Technical Overview of High Scale

Two Cisco Meeting Servers:

- A "gateway" Meeting Server. This one is dedicated to adapting between standards-based SIP and Microsoft SIP.
- A "conferencing" Meeting Server. This one hosts spaces and web bridges with aliases `*@space.ciscoexample.com`

Gateway operations (transcoding) between different SIP variants is handled by a dedicated Meeting Server, which saves resources for conferencing on the other Meeting Server.

Arrow 1: Calls that come from external Microsoft clients and are addressed for spaces on the conferencing Meeting Server are first diverted to the gateway Meeting Server to be transcoded to standards-based SIP.

Arrow 2: Two rules on the gateway Meeting Server to forward inbound calls that are for `*@space.ciscoexample.com` and `*@ciscoexample.com`.

Arrow 3: Two rules on the gateway Meeting Server to route outbound calls for `*@space.ciscoexample.com` and `*@ciscoexample.com` on a standard SIP trunk to Expressway-C.

Arrow 4: Rules on Expressway-C to route calls for both domains `.*@space.ciscoexample.com` and `.*@ciscoexample.com` to Unified CM.

You need to route standards-based SIP calls from both the traversal client zone and the gateway Meeting Server zone to the Unified CM neighbor zone. You could do that with one rule, but you might find it easier to implement and maintain if you use two or four.

Arrow 5: A route pattern on Unified CM to send calls for `*@space.ciscoexample.com` to the conferencing Meeting Server.

Calls that come from internal standards-based clients and are addressed for external Microsoft clients are first diverted to the gateway Meeting Server to be transcoded to Microsoft-variant SIP.

Arrow 6: A rule on the conferencing Meeting Server to match calls for `*@space.ciscoexample.com` and terminate them in spaces.

Arrow a: Routes Microsoft SIP IM&P towards spaces on the conferencing Meeting Server, enabling chat between Jabber and Microsoft clients. You need at least one search rule to route Microsoft SIP IM&P for `space.ciscoexample.com`. You may find it easier to use two rules, if you have traffic from IM and Presence Service as well as from external Microsoft infrastructure.

High Scale Configuration Summary

1. [Core Configuration, page 18](#) for zones, trunks, and TURN (Neighbor the Expressway-C to the gateway Meeting Server).
2. Trunk Unified CM to the conferencing Meeting Server.
See *Cisco Meeting Server Deployments with Call Control* on the [Cisco Meeting Server configuration guides page](#).
3. Create spaces on the conferencing Meeting Server, following the pattern `name@space.ciscoexample.com`. (**Configuration > Spaces**)
4. Create the dial plan.

Dial Plan Description

- Unified CM:
 - Create a SIP route pattern on Unified CM to route destinations ending `space.ciscoexample.com` on the trunk, to the conferencing Meeting Server. (**Call Routing > SIP Route Pattern**)

- Create route patterns on Unified CM to route calls for federated domains (*stdsdomain1.com* and *msdomain1.com*) on the trunk to the Expressway-C. (**Call Routing > SIP Route Pattern**)
- Conferencing Meeting Server: Create an inbound rule to terminate calls for *space.ciscoexample.com* in spaces. (**Configuration > Incoming calls**)
- Expressway-C:
 - Create a search rule to route Microsoft AV & Share calls from the traversal client zone. For destinations matching *.*@ciscoexample.com*. To the gateway Meeting Server neighbor zone. (**Configuration > Dial plan > Search rules**)
 - Create a search rule to route Microsoft AV & Share calls from the traversal client zone. For destinations matching *.*@space.ciscoexample.com*. To the gateway Meeting Server neighbor zone. (**Configuration > Dial plan > Search rules**)
 - Create a search rule on Expressway-C, to route Standards-based SIP from the Traversal Client zone. For destinations ending *.*@ciscoexample.com*. To the Unified CM neighbor zone. (**Configuration > Dial plan > Search rules**)
 - Create a search rule on Expressway-C, to route Standards-based SIP from the Traversal client zone. For destinations ending *.*@space.ciscoexample.com*. To the Unified CM neighbor zone. (**Configuration > Dial plan > Search rules**)
- Gateway Meeting Server inbound rules (**Configuration > Incoming calls**):
 - Define an incoming call matching rule to forward calls for **@space.ciscoexample.com*, instead of terminating them on this Meeting Server.
 - Define an incoming call matching rule to forward calls for **@ciscoexample.com* instead of terminating them on the Meeting Server.
 - Define inbound rules to forward calls for federated Microsoft-based domains (**@msdomain1.com*), instead of terminating them on the Meeting Server.
- Gateway Meeting Server outbound rules (**Configuration > Outbound calls**):
 - Define an outbound rule to route calls for **@ciscoexample.com*, on the standards-based trunk to the Expressway-C.
 - Define an outbound rule to route calls for **@space.ciscoexample.com*, on the standards-based trunk to the Expressway-C.
 - Define an outbound rule to route calls for federated Microsoft-based domains (**@msdomain1.com*), on the Lync-type trunk to the Expressway-C.
- Expressway-E search rules (**Configuration > Dial plan > Search rules**):
 - Create a search rule to route calls for *.*@space.ciscoexample.com* from the default zone to the traversal server zone.
 - Create a search rule to route calls for *.*@ciscoexample.com* from the default zone to the traversal server zone.
 - Create a search rule to route calls for federated Microsoft-based domains (*.*@msdomain1.com*) from the traversal server zone to the DNS zone.

"Named Federation" Video Calls Between Cisco-based and Microsoft-based Organizations

Named Federation: means to connect users from 'our' organization with users in a different, known organization. We know the target domain. In this document, we use the value *msdomain1.com* to indicate a Microsoft-based organization, and *stdsdomain1.com* for a standards-based organization.

This option enables voice, video, and content calls between on-premises Cisco collaboration users and Microsoft client users in a different, known domain.

Figure 4 Outbound Call Signaling

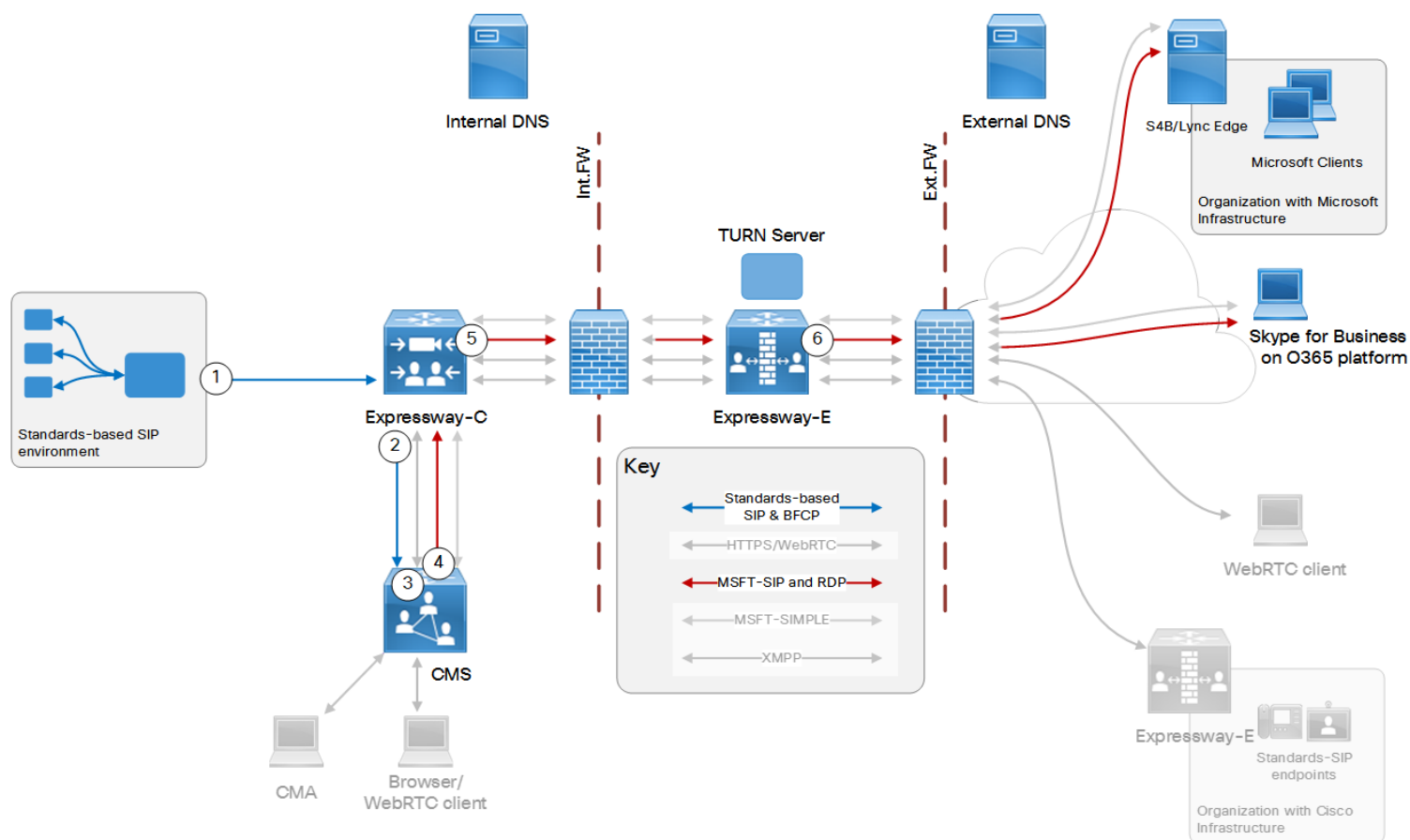


Table 6 Sample Dial Plan Rules for Outbound Callflow

Arrow #	Rule Hosted On	Rule Order/Priority	From	Pattern and Logic	To
1	Registrar		Locally-registered endpoints	Route pattern <code>*@msdomain1.com</code>	Trunk to Expressway-C
2	Expressway-C		Registrar zone	Standards-based SIP variant, for <code>.*@msdomain1.com</code> On successful match <i>Stop</i>	Meeting Server zone
3	Meeting Server		Expressway-C	Incoming call forwarding match on <code>*@msdomain1.com</code>	Forward (not terminate)
4	Meeting Server		Meeting Server	Outbound calls for <code>*@msdomain1.com</code> on Lync type trunk	Expressway-C
5	Expressway-C		Meeting Server zone	Microsoft AV & Share SIP variant, for <code>.*@msdomain1.com</code> On successful match <i>Stop</i>	Traversal client / UC zone
6	Expressway-E		Traversal server / UC traversal zone	Microsoft AV & Share SIP variant, for <code>.*@msdomain1.com</code> On successful match <i>Stop</i>	DNS zone

Figure 5 Inbound Call Signaling

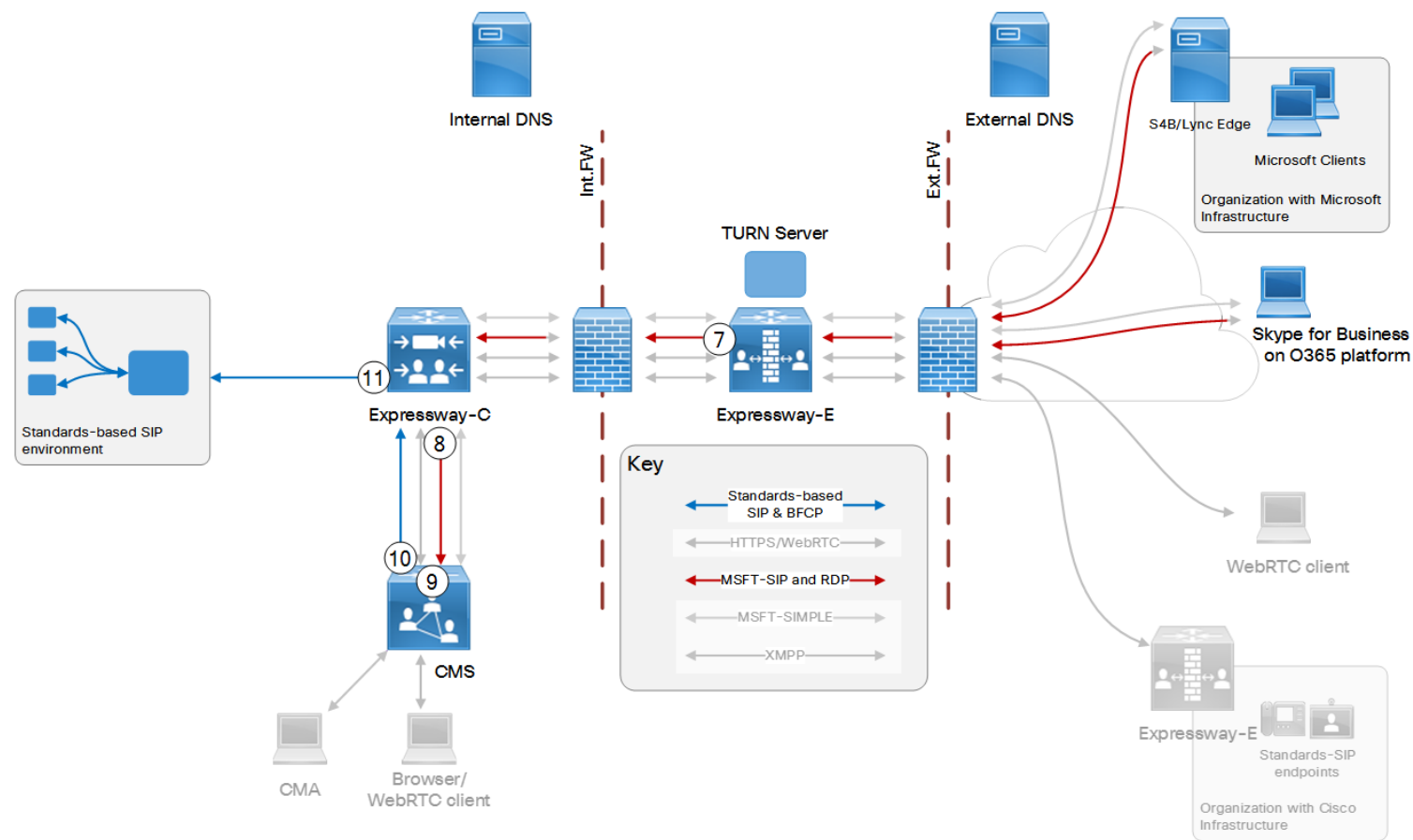


Table 7 Sample Dial Plan Rules for Inbound Callflow

Arrow #	Rule Hosted On	Rule Order/Priority	From	Pattern and Logic	To
7	Expressway-E		Default zone	Microsoft AV & Share SIP variant, for .*@ciscoexample\.com(;.*)	Traversal server / UC zone

Table 7 Sample Dial Plan Rules for Inbound Callflow (continued)

Arrow #	Rule Hosted On	Rule Order/Priority	From	Pattern and Logic	To
8	Expressway-C		Traversal client / UC traversal zone	Microsoft AV & Share SIP variant, for .*@ciscoexample\.com(;.*)	Meeting Server zone
9	Meeting Server		Expressway-C	Incoming calls for *@ciscoexample.com	Forward (not terminate)
10	Meeting Server		Meeting Server	Outbound calls for *@ciscoexample.com on Standard SIP type trunk	Expressway-C
11	Expressway-C		Meeting Server zone	Standards-based SIP variant, for .*@ciscoexample\.com	Registrar zone

Technical Overview of Named Federation

We are using the Cisco Meeting Server to adapt the traffic from standards-based SIP to Microsoft SIP, and from Microsoft SIP to standards-based SIP.

Coexistence

If you neighbor to Unified CM and also have Mobile and Remote Access (MRA) to that Unified CM, you must create new neighbor zone(s) and trunk(s). You can't reuse the autogenerated MRA neighbor zones.

If you use MRA with federation, you need a separate trunk from Unified CM to the Expressway-C. The trunk must listen on a different SIP port than the port that Unified CM listens on for MRA (line-side).

Named Federation Configuration Summary

- [Core Configuration, page 18](#)
- Expressway-C: Create a neighbor zone from Expressway-C to the on-premises SIP registrar. (**Configuration > Zones > Zones** with type = *Neighbor*)
- Registrar: Trunk the registrar to Expressway-C. (If Unified CM is the registrar, see *Cisco Expressway SIP Trunk to Unified CM Deployment Guide* on the [Expressway configuration guides page](#).)
- Expressway-E: Create a DNS zone on Expressway-E (**Configuration > Zones > Zones** with type = *DNS*).
- Expressway-E: Enable the TURN server on Expressway-E. (**Configuration > Traversal > TURN**)
- External DNS server: Verify a DNS SRV record exists on the external DNS to resolve `_sipfederationtls._tcp.msdomain1.com.` to the Lync/Skype for Business Edge Server of the named organization.
This is outside of your control, but is required for federation.
- External DNS server: Define a DNS SRV record on the external DNS to resolve `_sipfederationtls._tcp.ciscoexample.com.` to your Expressway-E public FQDN.
- Configure the dial plan across the infrastructure components.

Dial Plan Description

- Registrar: Create a routing rule on the registrar. To route calls addressed to `*@msdomain1.com` on the trunk to Expressway-C. For example, create a route pattern **Call Routing > SIP Route Pattern** if Unified CM is the registrar.
- Expressway-C (**Configuration > Dial plan > Search rules**):
 - a. Create a search rule on Expressway-C. To listen on the Meeting Server neighbor zone for *Microsoft AV & Share* SIP calls destined for `.*@msdomain1\.com`, and route them to the traversal client zone.
 - b. Create a search rule on Expressway-C. To route *Standards-based* SIP calls for `.*@msdomain1\.com` from the registrar neighbor zone to the Meeting Server neighbor zone.
 - c. Create a search rule on Expressway-C. To listen on the traversal client zone for Microsoft SIP calls destined for `.*@ciscoexample\.com(;.*|)`, and route them to the Meeting Server neighbor zone.
 - d. Create a search rule on Expressway-C. To listen on the Meeting Server neighbor zone for standard SIP calls destined for `.*@ciscoexample\.com`, and route them to the registrar neighbor zone.

- Meeting Server:
 - a. Create a dial plan rule on Meeting Server for incoming calls. To forward `*@msdomain1.com` calls instead of terminating them on Meeting Server. (**Configuration > Incoming calls**)
 - b. Create a dial plan rule on Meeting Server for outbound calls. With Expressway-C as the SIP proxy, trunk type Lync, and domain `msdomain1.com`. (**Configuration > Outbound calls**)
Now the Meeting Server will act as a gateway, and adapt inbound standards-based SIP to outbound Microsoft SIP.
 - c. Create a dial plan rule on Meeting Server for incoming calls. To forward `*@ciscoexample.com` calls instead of terminating them on Meeting Server. (**Configuration > Incoming calls**)
 - d. Create a dial plan rule on Meeting Server for outbound calls. With Expressway-C as the SIP proxy, trunk type Standard, and domain `ciscoexample.com`. (**Configuration > Outbound calls**)
Now the Meeting Server will adapt inbound Microsoft-variant SIP to outbound standard SIP.
- Expressway-E:
 - a. Create a search rule on Expressway-E. To listen on the traversal server zone for Microsoft SIP calls destined for `.*@msdomain1.com`, and route them to the DNS zone.
 - b. Create a search rule on Expressway-E. To listen on the default zone for Microsoft SIP calls destined for `.*@ciscoexample.com`, and route them to the traversal server zone.

"Open Federation" Video Calls With Microsoft Clients in External Domains

Open Federation: means connecting users from 'our' organization with users from other organizations whose SIP domains we do not know in advance.

This option enables users in our organization to call users in any external domain that has registered the appropriate SRV records in the external DNS. This option uses the Expressway-E ability to do different SRV lookups, depending on the SIP variant.

Figure 6 Outbound Call Signaling

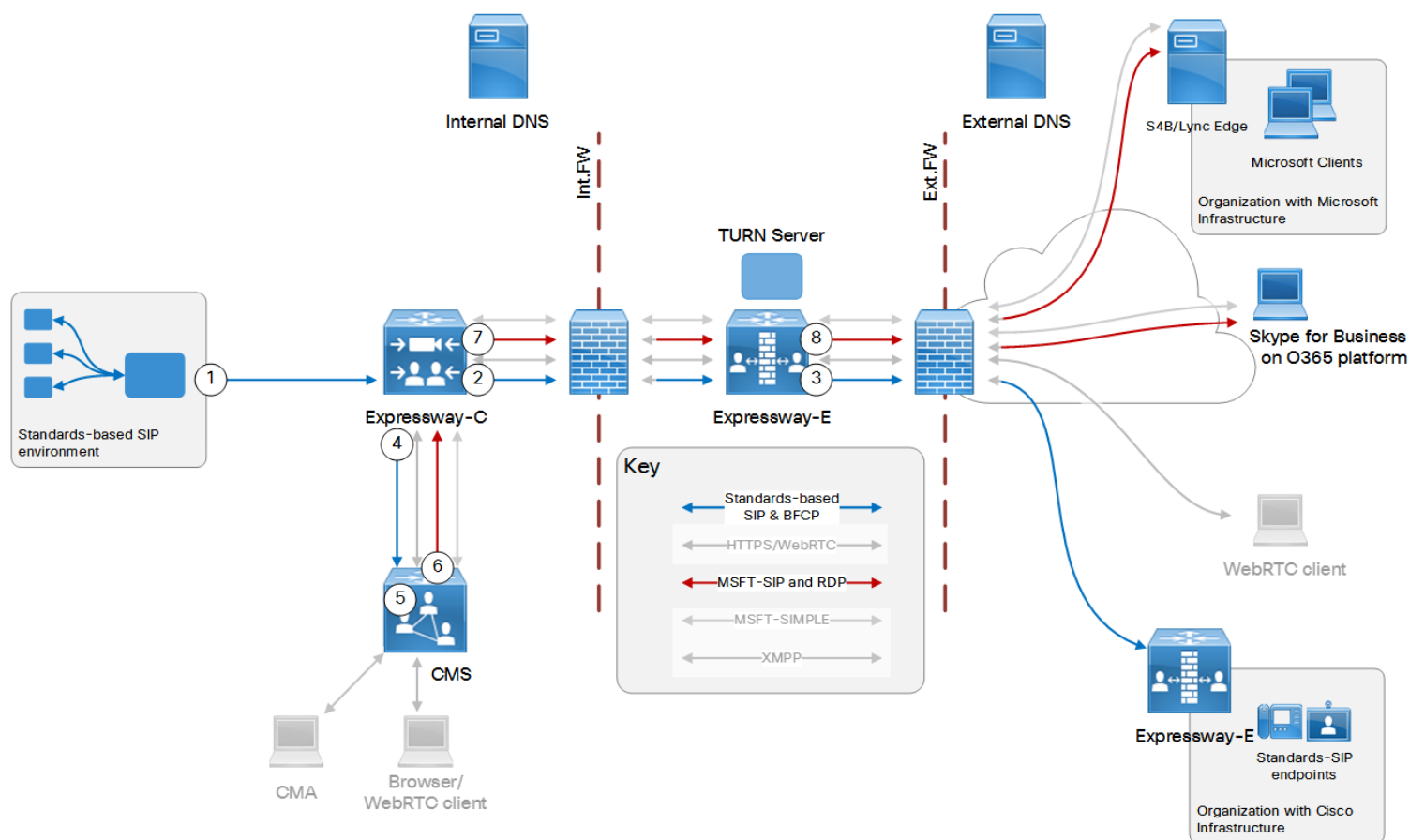


Table 8 Sample Dial Plan Rules for Outbound Callflow

Arrow #	Rule Hosted On	Rule Order/Priority	From	Pattern and Logic	To
1	Unified CM	Lower priority than anything recognized as a local domain	Endpoints registered to Unified CM	Route anything for non-internal domains outwards	Trunk to Expressway-C
2	Expressway-C	Lower priority than any rules for more specific purposes	Unified CM zone	Standards-based SIP variant, any alias. On successful match <i>Continue</i>	Traversal client zone
3	Expressway-E		Traversal server zone	All SIP variants, any alias. If a matching service record is not found by Expressway-E, then Expressway-C uses its next search rule. On successful match <i>Stop</i>	DNS zone
4	Expressway-C	Lower priority than rule related to arrow number 2	Unified CM zone	Standards-based SIP variant, for any alias. On successful match <i>Stop</i>	Meeting Server zone
5	Meeting Server	Lower priority than any incoming rules for known domains	Expressway-C	Incoming calls for unknown domains (*)	Forward (not terminate)
6	Meeting Server	Lower priority than more specific outbound routes	Meeting Server	Outbound calls for unknown domains on Lync type trunk	Expressway-C

Table 8 Sample Dial Plan Rules for Outbound Callflow (continued)

Arrow #	Rule Hosted On	Rule Order/Priority	From	Pattern and Logic	To
7	Expressway-C	Lower priority than more specific rules	Meeting Server zone	Microsoft AV & Share SIP variant, any alias On successful match <i>Stop</i>	Traversal client zone
8	Expressway-E		Traversal server zone	Microsoft AV & Share SIP variant, any alias. On successful match <i>Stop</i>	DNS zone

Figure 7 Inbound Call Signaling

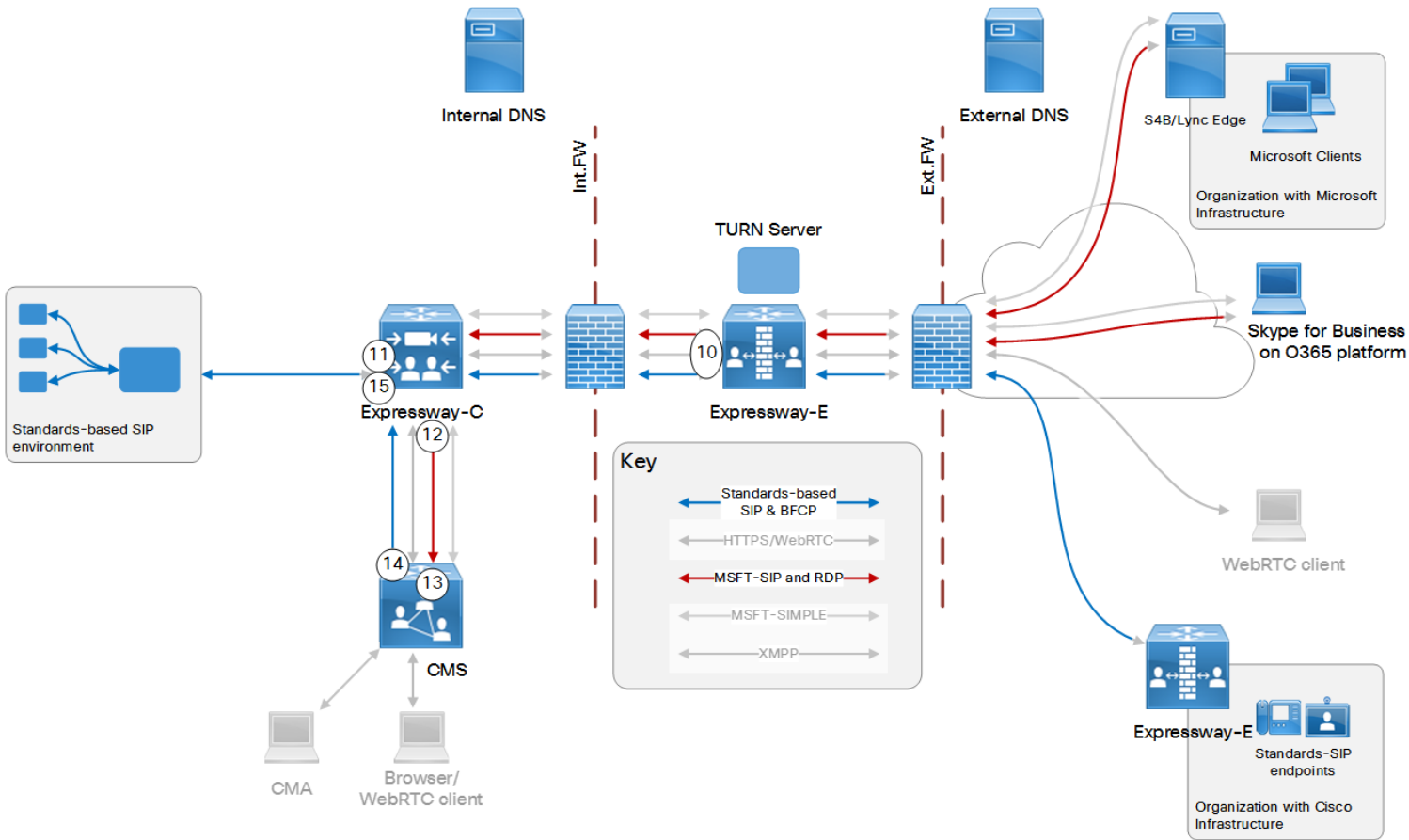


Table 9 Sample Dial Plan Rules for Inbound Callflow

Arrow #	Rule Hosted On	Rule Order/Priority	From	Pattern and Logic	To
10	Expressway-E		Default zone	All SIP variants, and alias pattern <code>.*@ciscoexample\.com</code> On successful match Stop	Traversal server zone
11	Expressway-C		Traversal client zone	Standards-based SIP variant, and alias pattern <code>.*@ciscoexample\.com</code> On successful match Stop	Unified CM zone
12	Expressway-C		Traversal client zone	Microsoft AV and Share SIP variant, and alias pattern <code>.*@ciscoexample\.com(;.*)</code> On successful match Stop	Meeting Server zone
13	Meeting Server		Expressway-C	Incoming calls matching <code>*@ciscoexample.com</code>	Forward (not terminate)
14	Meeting Server		Meeting Server	Outbound calls for <code>*@ciscoexample.com</code> on Standard SIP type trunk	Expressway-C
15	Expressway-C		Meeting Server zone	Standards-based SIP variant, for <code>.*@ciscoexample\.com</code> On successful match Stop	Unified CM zone

Open Federation Technical Overview

The dial plan here assumes that most outbound calls, to domains that are not specifically targeted by the dial plan, are intended for other standards-based organizations. (Call flow following arrows 1, 2, 3 on the diagram.)

However, the call will probably fail if the dialed URI is not in a standards-based SIP domain. The DNS lookup fails if the external domain does not have published a standard SIP federation record (`_sip._tcp.unknown.com.` or `_sips._tcp.unknown.com.`). The organization may have published a Microsoft proprietary SIP federation service record in the DNS instead (`_sipfederationtls._tcp.unknown.com.`).

If the initial attempt fails, we want to try again but using the Microsoft variant SIP. When you create the rule (2) we recommend that you allow it to *Continue* searching, so that Expressway-C can try a lower priority rule. This rule (arrow 4) sends the call to Meeting Server to route the call out as a *Lync* type. (Call flow following arrows 1, 4, 5, 6, 7, 8 on the diagram.)

Open Federation Configuration Summary

- [Core Configuration, page 18](#)
- Expressway-C: Create a neighbor zone from Expressway-C to the on-premises SIP registrar. (**Configuration > Zones > Zones** with type = *Neighbor*)
If you neighbor to Unified CM and also have Mobile and Remote Access (MRA) to that Unified CM, you must create new neighbor zone(s) and trunk(s). You can't reuse the autogenerated MRA neighbor zones.
- Registrar: Trunk the registrar to Expressway-C. (If Unified CM is the registrar, see *Cisco Expressway SIP Trunk to Unified CM Deployment Guide* on the [Expressway configuration guides page](#).)
If you use MRA with federation, you need a separate trunk from Unified CM to the Expressway-C. The trunk must listen on a different SIP port than the port that Unified CM listens on for MRA (line-side).
- Expressway-E: Create a DNS zone on Expressway-E (**Configuration > Zones > Zones** with type = *DNS*).
- Expressway-E: Enable the TURN server on Expressway-E. (**Configuration > Traversal > TURN**)
- External DNS server: On the external DNS, verify DNS SRV federation records which resolve to called destination domains (this is outside of your control, but needs to be there for the call to work).
- External DNS server: Define a DNS SRV record on the external DNS to resolve `_sipfederationtls._tcp.ciscoexample.com` to your Expressway-E public FQDN.
Note: The federation DNS SRV record and target are subject to some limitations, particularly with respect to load balancing and DNS namespace. See [External DNS Records, page 115](#).
- Create dial plan.

Dial Plan Description

- Registrar: Create a route pattern on the registrar. To route all non-local calls on the trunk to Expressway-C. (**Call Routing > SIP Route Pattern** if Unified CM is the registrar)

- Expressway-C:

- a. Create a search rule on Expressway-C. To route all calls for non-local domains to the traversal client zone. (**Configuration > Dial plan > Search rules**)

The search rule must be set to continue searching, as the call may fail if the DNS lookup is performed against the wrong SRV record of the federated organization. That is, a Microsoft-based organization would answer to `_sipfederationtls._tcp` lookup; a standards-based organization would answer to a `_sip._tcp` or `_sips._tcp` lookup.

- b. Create a secondary search rule, lower priority than rule a., on Expressway-C. To route all calls for non-local domains to the Meeting Server neighbor zone. (**Configuration > Dial plan > Search rules**)

The call could fail after being routed as in rule a., so this rule tries routing it through the Meeting Server where it is adapted into Microsoft variant SIP.

- c. Create a search rule on Expressway-C. To listen on the Meeting Server neighbor zone for Microsoft SIP calls and route them to the traversal client zone.
 - d. Create a search rule on Expressway-C. To listen on the traversal client zone for Microsoft SIP calls destined for `.*@ciscoexample.com(;.*|)`, and route them to the Meeting Server neighbor zone.
 - e. Create a search rule on Expressway-C. To listen on Any zone for Standards-based SIP calls destined for `.*@ciscoexample.com`, and route them to the registrar neighbor zone.

- Meeting Server:

- a. Create a dial plan rule on Meeting Server for incoming calls. To forward `ciscoexample.com` calls instead of terminating them on Meeting Server. (**Configuration > Incoming calls**)

- b. Create a dial plan rule on Meeting Server for incoming calls. To forward calls for non-local domains instead of terminating them on Meeting Server. (**Configuration > Incoming calls**)

- c. Create a dial plan rule on Meeting Server for outbound calls. With Expressway-C as the SIP proxy, trunk type Standard, and domain `ciscoexample.com`. (**Configuration > Outbound calls**)

Now the Meeting Server will adapt the inbound Microsoft-variant SIP, to outbound standard SIP.

- d. Create a dial plan rule on Meeting Server for outbound calls. With Expressway-C as the SIP proxy, and trunk type as Lync. (**Configuration > Outbound calls**)

Now the Meeting Server will act as a gateway, and adapt inbound standards-based SIP to outbound Microsoft SIP.

- Expressway-E:

- a. Create a search rule to listen on the default zone for calls destined for `.*@ciscoexample.com(;.*|)`, and route them to the traversal server zone.

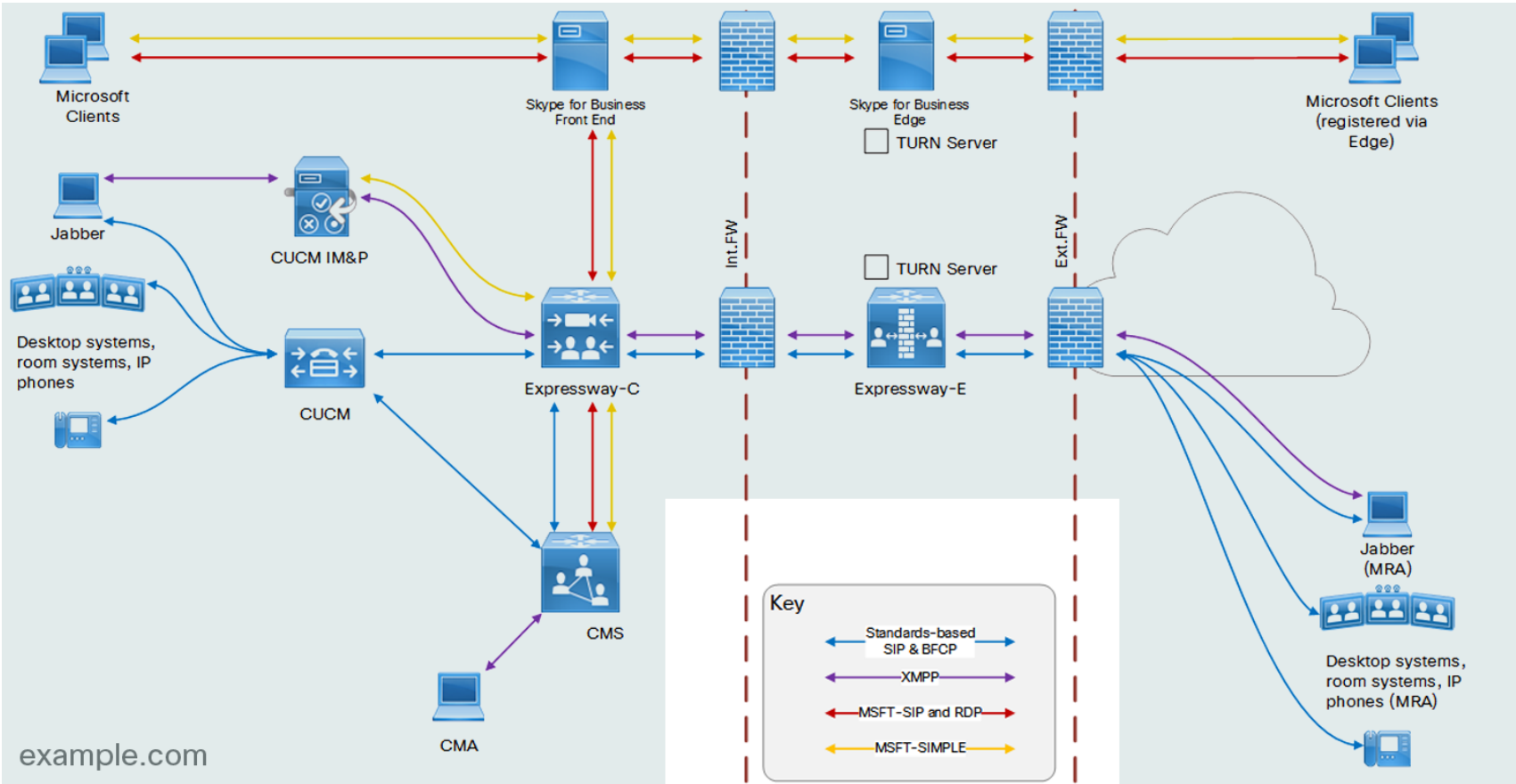
- b. Create a rule to listen on the traversal server zone for SIP calls to Any alias, and route them to the DNS zone.

Microsoft On-premises Federation Options

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On-premises Federation Within One SIP Domain

Figure 8 Federating Microsoft and Cisco Infrastructure Within Your SIP Domain (no B2B)



User Outcomes

- Users of Microsoft clients and users of Cisco clients can call each other:
 - They can see and hear each other
 - They can share their screens with each other
 - If the clients are capable, they can message each other and see each others' presence status
 - They can do these things whether they are inside or outside the network
- Users of Microsoft clients and Cisco endpoints can meet in Meeting Server spaces

Deployment Summary

- This deployment includes on-premises Cisco Unified Communications infrastructure for handling standards-based calls, desktop sharing, chat, and presence between Cisco endpoints and clients. Cisco endpoints and clients are registered to Unified CM. In the case of Cisco Jabber, the clients are also registered to IM and Presence Service.
- The Expressway pair is used for traversing calls, share, presence and chat to Mobile and Remote users.
- You can register endpoints to Expressway-C, though the endpoints are not shown on the diagrams. The deployment assumes that the majority of endpoints are Unified CM-registered.
- The deployment includes on-premises Microsoft Skype for Business infrastructure for handling Microsoft-variant calls, desktop sharing, chat and presence between Microsoft clients.
- The Expressway-C uses session classification to distribute the calls between these two sets of infrastructure.
- The deployment uses Meeting Server for transcoding video and for hosting conferences.
- This deployment is not federated with third party organizations.

Limitations

- Presence does not work in Meeting Server spaces shared by Microsoft-registered clients and Unified CM-registered endpoints.
- Cisco Meeting App and Skype for Business users can chat in Meeting Server spaces, but Jabber messaging is not supported in spaces.

Note: This workaround is not currently supported:

- a. Configure your space addresses using a subdomain.
You must use a subdomain, for example, @space.example.com. IM will not work if you use a number range to identify spaces.
- b. Create a search rule in Expressway-C to route Microsoft SIP IM&P traffic, from IM and Presence Service zone for space.example.com, to Meeting Server.
- c. Create a search rule in Expressway-C to route Microsoft SIP IM&P traffic, from Meeting Server for example.com, to IM and Presence Service zone.
This rule must be lower priority than the rule that routes Microsoft SIP IM&P from Meeting Server for example.com to the Front End zone. You must reconfigure that rule to continue on successful match.

Technical Overview

Registration

- All Microsoft clients register directly to the Skype for Business Front End, or through Skype for Business Edge, in the SIP domain *example.com*
- All standards-based endpoints register directly to Unified CM, or through Expressway (MRA), in the SIP domain *example.com*.

Federation

- The "point of federation" is the trunk / zone between the Expressway-C and the Microsoft Skype for Business Front End Server.
- Federation is achieved mainly by using search rules on the Expressway-C; These should be as specific as possible and, in general, should stop when a match is found.

Conferences

- All calls for spaces are routed through Unified CM, which has a SIP trunk to Meeting Server.
This option enables you to use bandwidth management and call admission control tools on Unified CM.
This is because we expect the majority of endpoints to register to the Unified CM. If your registrations are mainly on Expressway, you may prefer to route spaces via Expressway instead.
- Your dial plan is configured so that FE, UCM and Expressway can distinguish the address of a space from the address of a user; either with a specific numeric pattern or with a subdomain.
You need to make this choice if you want to route calls for spaces through Unified CM.
It is a workaround for a limitation in Unified CM dial plan that can route on numeric ranges, or subdomains, but not on regular expressions in the user portion of a SIP URI.
Eg. For 100 spaces, you might use 81000000-81000099@example.com or RoomName00-99@space.example.com.
- Meeting Server is set up to terminate calls with this destination pattern in pre-configured spaces.

Dual homed conferencing

- Meeting Server registers as a Microsoft client to the Skype for Business Front End
- Enhances conferencing for Microsoft client users and AVMCU conferences
Read more about *Dual Homed Conferencing* in the *Single Combined Server Deployment Guide* at [Cisco Meeting Server configuration guides page](#).

Messaging & Presence

- Indirect, intra-domain federation, between IM and Presence Service and Microsoft Front End, via Expressway-C.

Configuration Summary

- [Core Configuration, page 18](#). In summary:
 - Expressway-C and Expressway-E traversal pair (this deployment assumes MRA is configured).
 - Unified Communications traversal zones.
 - Neighbor zone to Meeting Server.
 - Additional search rules are described for each deployment.

- Expressway-E:
 - MRA configuration
- External DNS server:
 - DNS records for Dual homed conferencing (See *Cisco Meeting Server Single Combined Server Deployment Guide* at the [Meeting Server Configuration Guides page](#))

- Microsoft FE Server:

- Static route to Expressway-C for *example.com* URIs. Example PowerShell commands:

```
$Route667=New-CsStaticRoute -TLSSRoute -Destination "expcpool.example.com" -MatchUri "example.com" -Port 5061 -UseDefaultCertificate $true
```

```
Set-CsStaticRoutingConfiguration -Identity global -Route @{Add=$Route667}
```

```
enable-cstopology
```

- Static route to Expressway-C for *space.example.com* URIs (if you are using this subdomain). Example PowerShell commands:

```
$Route668=New-CsStaticRoute -TLSSRoute -Destination "expcpool.example.com" -MatchUri "space.example.com" -Port 5061 -UseDefaultCertificate $true
```

```
Set-CsStaticRoutingConfiguration -Identity global -Route @{Add=$Route668}
```

```
enable-cstopology
```

- Static route to Expressway-C for *CMSFQDN*. Example PowerShell commands:

```
$Route669=New-CsStaticRoute -TLSSRoute -Destination "expcpool.example.com" -MatchUri "CMSFQDN" -Port 5061 -UseDefaultCertificate $true
```

```
Set-CsStaticRoutingConfiguration -Identity global -Route @{Add=$Route669}
```

```
enable-cstopology
```

- Trusted application pool and application with Expressway-C cluster in the pool. Example:

```
New-CsTrustedApplicationPool -Identity expcpool.example.com -Registrar sfbfe.example.com -site 1 -RequiresReplication $false -ThrottleAsServer $true -TreatAsAuthenticated $true
```

```
New-CsTrustedApplication -ApplicationId expc.example.com -TrustedApplicationPoolFqdn expcpool.example.com -Port 5061
```

- For dual homed conferencing: Trusted application and application pool with Meeting Server cluster in the pool. Example:

```
New-CsTrustedApplicationPool -Identity cmspool.example.com -Registrar sfbfe.example.com -site 1 -RequiresReplication $false -ThrottleAsServer $true -TreatAsAuthenticated $true
```

```
New-CsTrustedApplication -ApplicationId space.example.com -TrustedApplicationPoolFqdn cmspool.example.com -Port 5061
```

- FE server CA trust list must include Expressway-C signing CA and meeting server signing CA. Refer to <https://docs.microsoft.com/en-us/skype-sdk/sdn/articles/installing-the-trusted-root-certificate> link for

reference. Any changes that are done should be verified with a Microsoft admin.

- User dedicated to dual homed conferencing for registration.
- Expressway-C:
 - MRA configuration with auto-created zones to Unified CM and IM and Presence Service
 - Neighbor zone to Skype for Business Front End
 - Additional neighbor zone to Unified CM, using different SIP port than that used for MRA line-side SIP.
 - Additional neighbor zone to IM and Presence Service
 - Trust list to include Skype for Business FE servers' signing CA
 - Search rules
- Unified CM:
 - SIP trunk to Expressway-C, listening on a different port than for MRA line-side SIP.
 - SIP trunk to Meeting Server
 - Dial plan
- Cisco Unified Communications Manager IM and Presence Service
 - Configure indirect, "intra-domain" federation for *example.com*. Use Expressway-C as next hop, instead of using the Front End. That's why we use the term 'indirect'.
(Use the wizard to create an intra-domain federation with Microsoft, but use Expressway-C address as next hop)
- Meeting Server:
 - Spaces configured according to pre-defined pattern
We recommend using a subdomain for your conferences because some call agents cannot make routing decisions based on the username part of the requested URI. For example, we suggest that you use the form `user1@space.example.com` in your dial plan instead of `user1.space@example.com`. Another option is to use a numeric range in the dial plan, eg. `81100100@example.com` to `81100199@example.com`.
 - Skype for Business Edge integration (See *Cisco Meeting Server Single Combined Server Deployment Guide* at the [Meeting Server Configuration Guides page](#)) for "dual homed conferencing"
Note: Where there is overlapping/conflicting configuration between that guide and this, use the configuration for the deployment model you are implementing. This guide places Expressway-C between the Meeting Server and the Front End; the Meeting Server document describes a deployment that makes a direct link to the Front End.
 - A local service resource record (SRV) to resolve the internal Microsoft-variant SIP service to the Expressway-C cluster FQDN instead of to the Front End cluster. For example, you could use the following command on MMP interface to create the local SRV record: `dns add rr "_sipinternaltls._tcp.example.com. 86400 IN SRV 10 10 5061 ExpC-Cluster.example.com"`
This record overrides the result Meeting Server takes from the DNS, to ensure that all the signaling goes via Expressway-C. The internal DNS is expected to have this record pointing to the Microsoft Front End servers because the clients use it.
 - Dial plan
- Configure the dial plan across the infrastructure components.

Dial Plan Summary: On-Premises Federation Within One SIP domain

Microsoft infrastructure (not detailed in this document):

- Routing for all Microsoft clients, both on- and off-premises
- Unrecognized calls for `*@example.com` route on trunk to expressway-c

- Unrecognized presence and messaging for `*@example.com` route on static route to Expressway-C

Unified CM

- Routing for all locally registered endpoints `*@example.com` (not detailed in this document)
- Unrecognized destinations for recipients `*@example.com` on trunk to Expressway-C
- Pattern for spaces route to Meeting Server eg. `*@space.example.com`

Expressway-C

The following table shows the additional rules required to enable on-premises federation within the domain `example.com`. The numbers show the recommended priority order, but you don't need to use exactly those numbers in the **Priority** field of the rules

Table 10 Expressway-C Dial Plan Rules

#	Source	Proto/variant	Mode/Pattern	Target zone	On match
1	Any	Any	Any alias	Local Zone	Continue
Note:	Rule 1 exists by default with priority 50. It's a catch all rule for targeting locally-registered endpoints.				
2	Local Zone	Standards-based	<code>.*@example\.com</code>	Unified CM zone	Continue
3	Local Zone	Standards-based	<code>.*@example\.com</code>	Meeting Server zone	Stop
4	Unified CM zone	Standards-based	<code>.*@example\.com</code>	Local Zone	Continue
5	Unified CM zone	Standards-based	<code>.*@example\.com</code>	Meeting Server zone	Stop
6	Meeting Server zone	Standards-based	<code>.*@example\.com</code>	Local Zone	Continue
7	Meeting Server zone	Standards-based	<code>.*@example\.com</code>	Unified CM zone	Stop
8	Local Zone	Standards-based	<code>.*@space\.example\.com</code>	Unified CM zone	Stop
Note:	You could optionally route rule 9 directly to Meeting Server. However, this deployment assumes that you want to manage all traffic for spaces through Unified CM.				
9	Meeting Server zone	Microsoft AV & Share	<code>.*@example\.com.*</code>	Front End zone	Stop
10	Front End zone	Microsoft AV & Share	<code>.*@example\.com(;.*)</code>	Meeting Server zone	Stop
11	Front End zone	Microsoft AV & Share	<code>.*@space\.example\.com(;.*)</code>	Meeting Server zone	Stop
Note:	The final portion of the regular expression in the two rules above is important. It means that the rules can match the additional parameters that the Front End places on the SIP URI for some messages, for example <code>user@example.com;transport=tls</code> . Put the portion in parentheses at the end of your rule's regex.				
12	Front End zone	Microsoft AV & Share	<code>.*@<CMSFQDN>.*</code>	Meeting Server zone	Stop

Table 10 Expressway-C Dial Plan Rules (continued)

#	Source	Proto/variant	Mode/Pattern	Target zone	On match
13	IM and Presence zone	Microsoft SIP IM&P	example\com	Front End zone	Stop
14	Front End zone	Microsoft SIP IM&P	example\com	IM and Presence zone	Stop
15	Any	Microsoft SIP IM&P	.*<Federation Routing IM/P FQDN>.*	IM and Presence zone	Stop
Note:	This rule is required to correctly route NOTIFY messages to the IM and Presence Service cluster. You need a rule like this for each cluster, that corresponds to the cluster's Federation Routing IM/P FQDN parameter.				
16	Front End zone	Microsoft SIP IM&P	space\example\com	Meeting Server zone	Stop
17	Meeting Server zone	Microsoft SIP IM&P	.*@example\com.*	Front End zone	Stop
Note:	The following three rules enable messaging between Jabber and Meeting Server spaces, but that interoperability is not supported.				
18	Meeting Server zone	Microsoft SIP IM&P	.*@example\com.*	Front End zone	Continue
	The rule 18 here replaces rule 18 above, if you are enabling Jabber chat and presence in Meeting Server spaces. This change to the existing rule means that Expressway-C tries rule 19 after failing to connect the Meeting Server signaling to a Microsoft client.				
19	Meeting Server zone	Microsoft SIP IM&P	.*@example\com.*	IM and Presence zone	Stop
20	IM and Presence zone	Microsoft SIP IM&P	space\example\com	Meeting Server zone	Stop

Expressway-E

- No additional search rules required for this deployment.

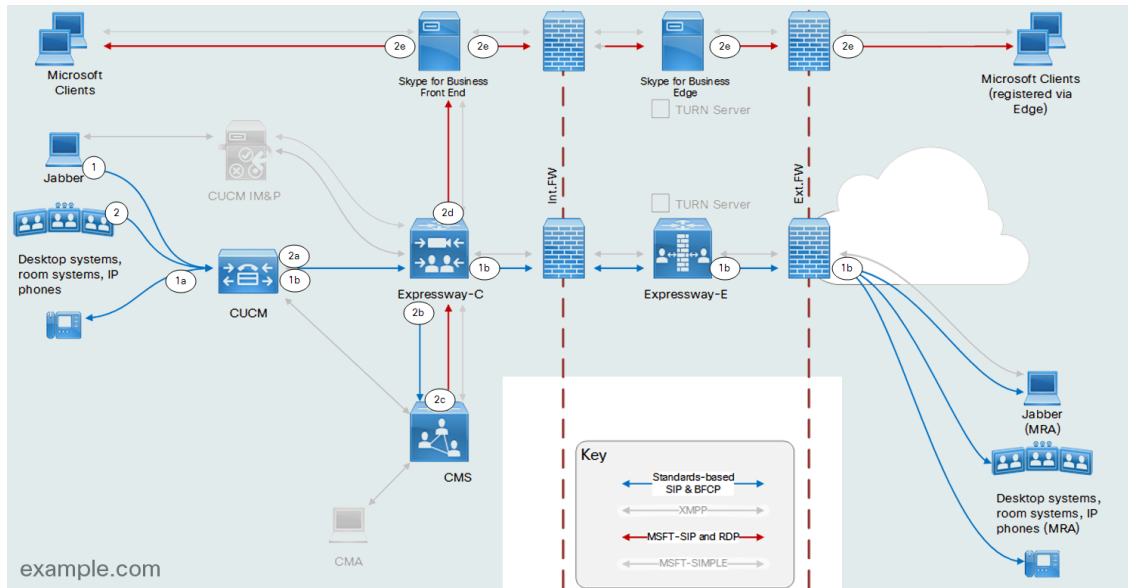
Meeting Server

- Terminate destinations matching the space pattern eg. **@space.example.com*
- Inbound rule matching **@example.com*, from Expressway-C, Forward
- Three outbound rules matching **@example.com*:
 - Highest priority: Route on Microsoft type trunk to Expressway-C
(transcoded calls from Unified CM-registered endpoints destined for Microsoft clients)
 - Middle priority: Route on standards-based trunk to Unified CM
(transcoded calls from Microsoft clients destined for Unified CM-registered endpoints)
 - Lowest priority: Route on standards-based trunk to Expressway-C
(transcoded calls from Microsoft clients destined for Expressway-registered endpoints)

These outbound rule priorities are based on the assumption that majority of standards-based endpoints are registered to Unified CM.

Call Paths

Calls originating from UCM-registered endpoints



1. Unified CM-registered endpoint calls another Unified CM-registered endpoint (either on-prem or MRA):

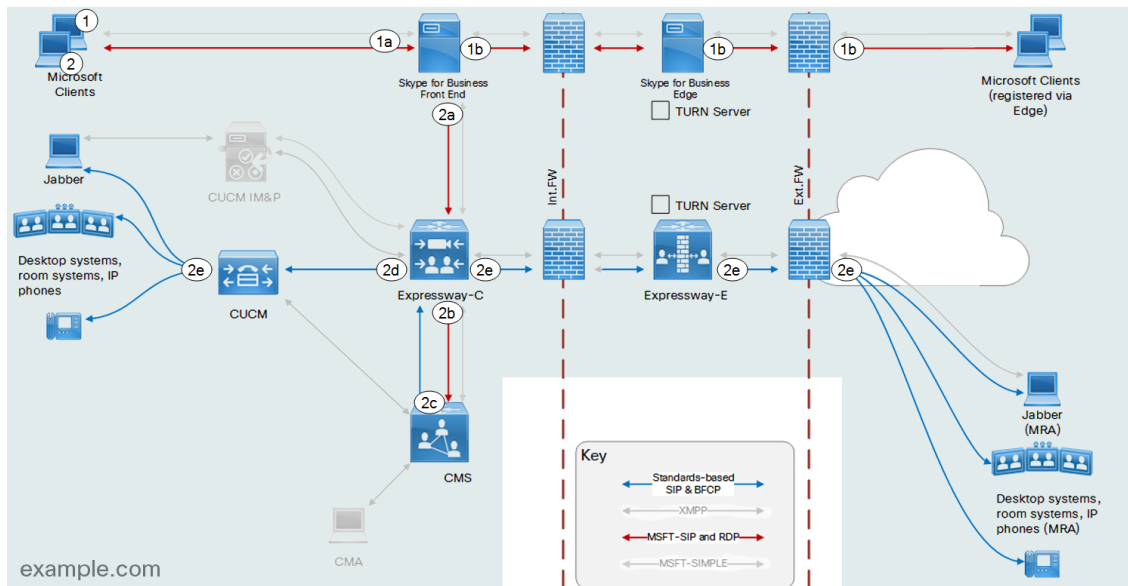
- a. Unified CM routes to a locally-registered endpoint.
- b. or Unified CM routes to an MRA endpoint.

If the Unified CM does not know the recipient, then it sends the call on the trunk to Expressway-C. This might be because the recipient is Microsoft-registered in our organization, or is in another organization.

2. Unified CM-registered endpoint calls a Microsoft-registered client:

- a. Unified CM does not match the recipient, so it sends the call on the trunk to Expressway-C.
[Option, not shown] If Expressway-C has registrations, it tries to match the standards-based call to a locally registered endpoint.
- b. Expressway-C sees standards-based SIP from the Unified CM trunk for *example.com*. After failing to match with Expressway-C-registered endpoints, we assume this is for a Microsoft-registered client. Expressway sends the call to Meeting Server.
- c. Meeting Server transcodes inbound standards-based SIP and sends the call out on the Microsoft-variant trunk to Expressway-C.
- d. Expressway-C sees a Microsoft variant call for *example.com* and routes it to Microsoft Front End.
- e. Front End delivers the call to a Microsoft client (via Edge if necessary).

Calls originating from Microsoft-registered clients



1. Front End-registered client calls another Front End-registered client:

- a. Front End routes to a locally registered endpoint.
- b. or routes to a Front End-registered endpoint via Edge if necessary.

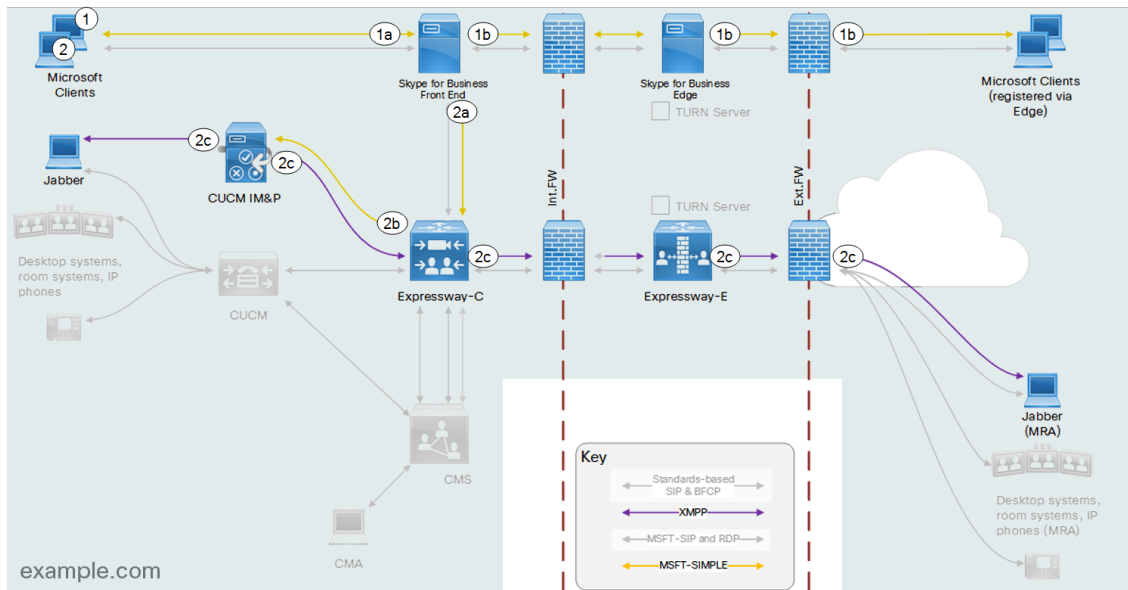
If the Front End does not know the recipient, then it sends the call to Expressway-C.

2. Front End-registered client calls a Unified CM-registered endpoint:

- a. Front End does not match the recipient, so it sends the call to Expressway-C.
- b. Expressway-C sees Microsoft-variant signaling from FE and routes this to Meeting Server.
- c. Meeting Server receives inbound Microsoft-variant, transcodes to standards-based signaling, routes the call on standards-based trunk to Expressway-C.
- d. Expressway-C matches standards-based SIP for *example.com* and routes the call to the UCM neighbor zone.
- e. UCM delivers the call to a UCM-registered endpoint (via MRA if necessary).

Instant messaging and presence

From Microsoft clients to Cisco Jabber



1. ChatterSFB@example.com messages ChatteeSFB@example.com

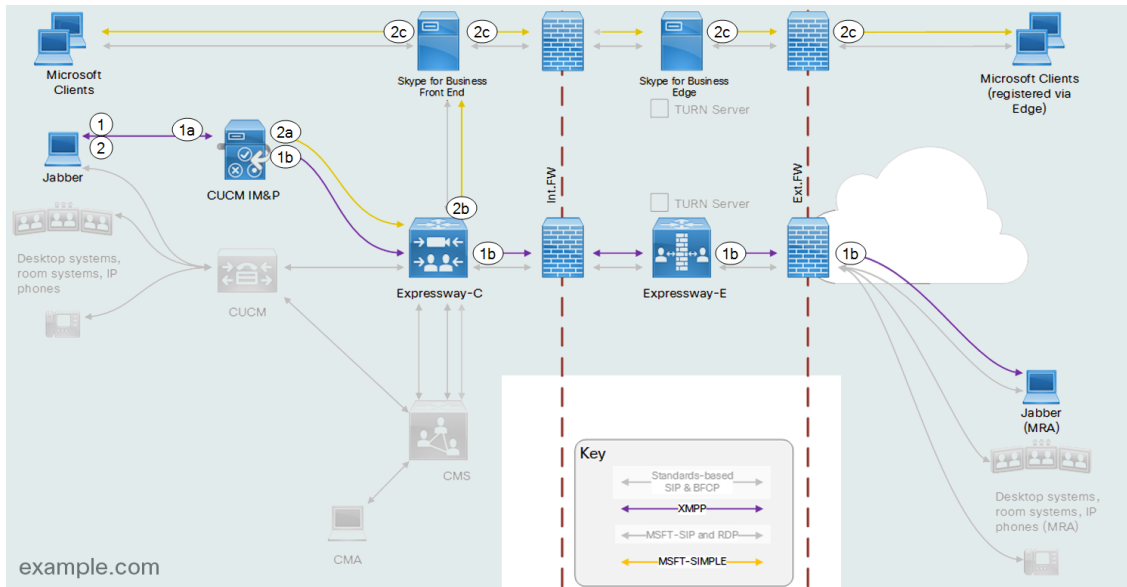
- a. Front End matches a locally-registered client
- b. or routes the messaging to a client that is registered via Edge

If Front End does not match the recipient, it uses the static route to the Expressway-C.

2. ChatterSFB@example.com messages ChatteeJabber@example.com

- a. Front End does not match the recipient, so it routes messaging and presence on the static route to the Expressway-C.
- b. Expressway-C sees Microsoft SIP SIMPLE variant from Front End zone and sends it to the IM&P zone.
- c. IM and Presence Service converts to XMPP and routes the messaging and presence to Jabber (using MRA to reach off-premises Jabber clients as necessary).

From Cisco Jabber to Microsoft clients



1. ChatterJabber@example.com messages ChatteeJabber@example.com:

- a. IM&P routes the XMPP chat to another Jabber user.
- b. IM&P routes XMPP using MRA if necessary.

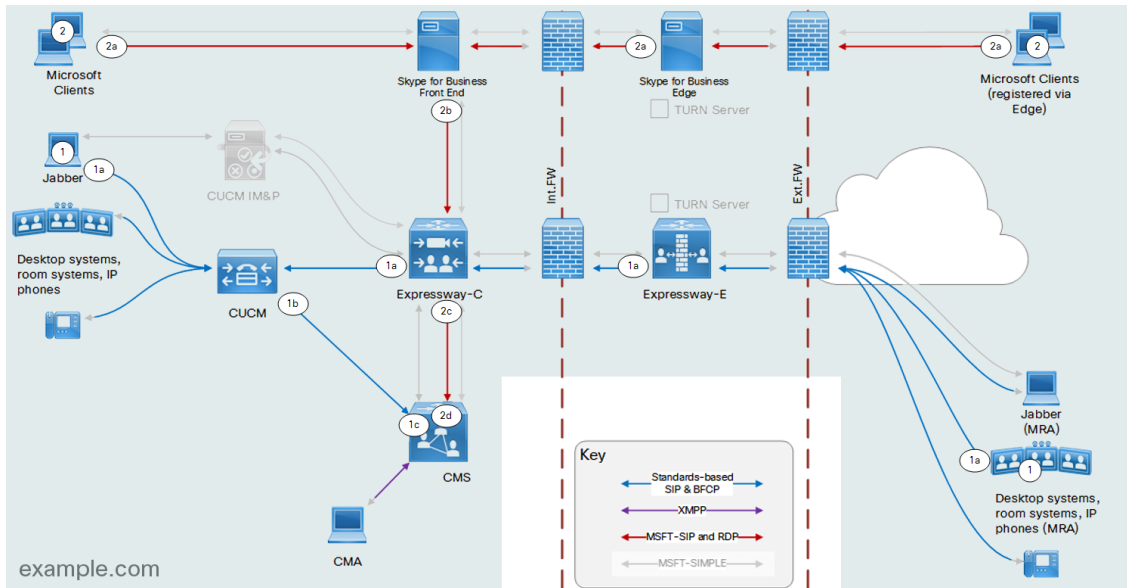
If IM&P cannot match the recipient, it uses the (indirect) "intra-domain" federation via Expressway-C.

2. ChatterJabber@example.com messages ChatteeSFB@example.com:

- a. IM&P does not match the recipient, so routes the chat as Microsoft SIP SIMPLE on the (indirect) federation with Front End via Expressway-C.
- b. Expressway-C sees Microsoft SIP SIMPLE and routes that to the Front End.
- c. Front End routes the messaging to a Microsoft client (via Edge if necessary).

Conferencing in Meeting Server spaces

Participants join from their clients / endpoints



1. Unified CM-registered endpoints:

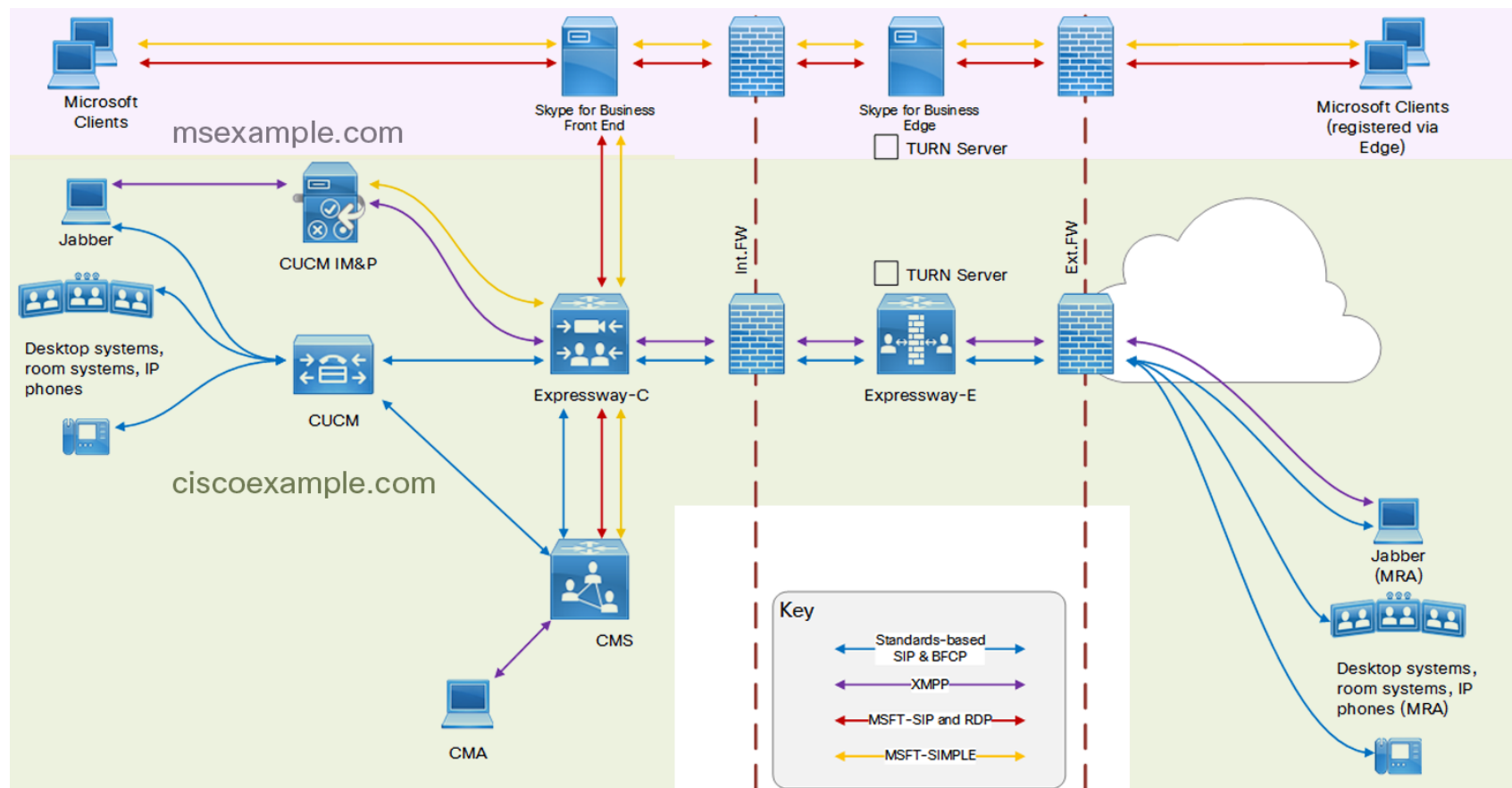
- a. Unified CM-registered endpoints call a space address (via MRA if necessary).
- b. Unified CM routes space addresses on trunk to Meeting Server.
- c. Meeting Server terminates the call in the destination space.

2. Front End-registered clients:

- a. Microsoft clients call a space address (via Edge if necessary).
- b. Front End recognizes this pattern, so routes on the trunk to Expressway-C.
- c. Expressway-C sees Microsoft-variant SIP from Front End zone and routes call to Meeting Server.
- d. Meeting Server terminates the call in the destination space.

On-premises Federation Between Two SIP Domains

Figure 9 Federating Microsoft and Cisco SIP Domains Within Your Organization (no B2B)



User Outcomes

- Users of Microsoft clients and users of Cisco clients (in the same organization network, but different SIP domains) can call each other:
 - They can see and hear each other
 - They can share their screens with each other
 - If the clients are capable, they can message each other and see each others' presence status
 - They can do these things whether they are inside or outside the organization network
- Users of Microsoft clients and Cisco endpoints can meet in Meeting Server spaces

Deployment Summary

- This deployment includes on-premises Cisco Unified Communications infrastructure for handling standards-based calls, desktop sharing, chat, and presence between Cisco endpoints and clients. Cisco endpoints and clients are registered to Unified CM. In the case of Cisco Jabber, the clients are also registered to IM and Presence Service.
- The Expressway pair is used for traversing calls, share, presence and chat to Mobile and Remote users.
- You can register endpoints to Expressway-C, though the endpoints are not shown on the diagrams. The deployment assumes that the majority of endpoints are Unified CM-registered.
- The deployment includes on-premises Microsoft Skype for Business infrastructure for handling Microsoft-variant calls, desktop sharing, chat and presence between Microsoft clients.
- The Expressway-C uses session classification to route signaling between Cisco infrastructure and Microsoft infrastructure.
- The deployment uses Meeting Server for transcoding video and for hosting conferences.
- This deployment is not federated with third party organizations.

Limitations

- Cisco Meeting App and Skype for Business users can chat in Meeting Server spaces, but Jabber messaging is not supported in spaces.

Despite this limitation, it is possible to configure IM services between Jabber and Cisco Meeting ServerSpaces.

Note: This workaround is not currently supported:

- a. Configure your space addresses using a subdomain.
You must use a subdomain, for example, `@space.ciscoexample.com`. IM will not work if you use a number range to identify spaces.
- b. Create a search rule in Expressway-C to route Microsoft SIP IM&P traffic, from IM&P Server for `space.ciscoexample.com`, to CMS.
- c. Create a search rule in Expressway-C to route Microsoft SIP IM&P traffic, from CMS for `ciscoexample.com`, to IM&P Server.

Technical Overview

Registration

- All Microsoft clients register directly to the Skype for Business Front End, or through Skype for Business Edge, in the SIP domain *msexample.com*
- All standards-based endpoints register directly to Unified CM, or through Expressway (MRA), in the SIP domain *ciscoexample.com*.

The deployment assumes MRA. If you do not need mobile and remote users to register to Unified CM, then you can ignore all the Expressway-E related configuration in this deployment.

Federation

- The "point of federation" is the trunk / zone between the Expressway-C and the Microsoft Skype for Business Front End Server.
- Federation is achieved mainly by using search rules on the Expressway-C; These should be as specific as possible (define both Source and SIP variant) and, in general, should stop when a match is found.

Conferences

- All standards-based calls for spaces are routed through Unified CM, which has a SIP trunk to Meeting Server. This option enables you to use bandwidth management and call admission control tools on Unified CM. This is because we expect the majority of endpoints to register to the Unified CM. If your registrations are mainly on Expressway, you may prefer to route calls for spaces via Expressway instead.
- Your dial plan is configured so that FE, UCM and Expressway can distinguish the address of a space from the address of a user; either with a specific numeric pattern or with a subdomain. You need to make this choice if you want to route calls for spaces through Unified CM. It is a workaround for a limitation in Unified CM dial plan that can route on numeric ranges, or subdomains, but not on regular expressions in the user portion of a SIP URI. Eg. For 100 spaces, you might use 81000000-81000099@ciscoexample.com or RoomName00-99@space.ciscoexample.com.
- Meeting Server is set up to terminate calls with this destination pattern in pre-configured spaces.

Dual homed conferencing

- Meeting Server registers as a Microsoft client to the Skype for Business Front End
- Enhances conferencing for Microsoft client users and AVMCU conferences

Messaging & Presence

- Indirect inter-domain federation, between IM&P and Microsoft Front End, uses Expressway-C as next hop from the IM&P cluster.

- Cisco Meeting App and Skype for Business users can chat in Meeting Server spaces, but Jabber messaging is not supported in spaces.

Despite this limitation, it is possible to configure IM services between Jabber and CMS Spaces.

Note: This workaround is not currently supported:

- a. Configure your space addresses using a subdomain.
You must use a subdomain, for example, `@space.ciscoexample.com`. IM will not work if you use a number range to identify spaces.
- b. Create a search rule in Expressway-C to route Microsoft SIP IM&P traffic, from IM&P Server for `space.ciscoexample.com`, to CMS.
- c. Create a search rule in Expressway-C to route Microsoft SIP IM&P traffic, from CMS for `ciscoexample.com`, to IM&P Server.

Configuration Summary

- [Core Configuration, page 18](#). In summary:
 - Expressway-C and Expressway-E traversal pair (this deployment assumes MRA is configured).
 - Unified Communications traversal zones.
 - Neighbor zone to Meeting Server.
 - Additional search rules are described for each deployment.
- Expressway-E:
 - MRA configuration
- External DNS server:
 - DNS records for Dual homed conferencing (See *Cisco Meeting Server Single Combined Server Deployment Guide* at the [Meeting Server Configuration Guides page](#))

- Microsoft FE Server:

- Trusted application pool and application with Expressway-C cluster in the application pool. Example:

```
New-CsTrustedApplicationPool -Identity expcpool.ciscoexample.com -Registrar sfbfe.msexample.com -
site 1 -RequiresReplication $false -ThrottleAsServer $true -TreatAsAuthenticated $true
```

```
New-CsTrustedApplication -ApplicationId expc.ciscoexample.com -TrustedApplicationPoolFqdn
expcpool.ciscoexample.com -Port 5061
```

- Static route to Expressway-C for *ciscoexample.com*. Example:

```
$Route667=New-CsStaticRoute -TLSSRoute -Destination "expcpool.ciscoexample.com" -MatchUri
"ciscoexample.com" -Port 5061 -UseDefaultCertificate $true
```

```
Set-CsStaticRoutingConfiguration -Identity global -Route @{Add=$Route667}
```

```
enable-cstopology
```

- Static route to Expressway-C for *space.ciscoexample.com*. Example:

```
$Route668=New-CsStaticRoute -TLSSRoute -Destination "expcpool.ciscoexample.com" -MatchUri
"space.ciscoexample.com" -Port 5061 -UseDefaultCertificate $true
```

```
Set-CsStaticRoutingConfiguration -Identity global -Route @{Add=$Route668}
```

```
enable-cstopology
```

- For dual homed conferencing: Trusted application and application pool with Meeting Server cluster in the application pool. Example:

```
New-CsTrustedApplicationPool -Identity cmspool.ciscoexample.com -Registrar sfbfe.msexample.com -
site 1 -RequiresReplication $false -ThrottleAsServer $true -TreatAsAuthenticated $true
```

```
New-CsTrustedApplication -ApplicationId cms.ciscoexample.com -TrustedApplicationPoolFqdn
cmspool.ciscoexample.com -Port 5061
```

- CA trust list to include Expressway-C's signing CA and Meeting Server's signing CA
- User dedicated to dual homed conferencing

- Expressway-C:

- Neighbor zone to Skype for Business Front End
- Neighbor zone to Unified CM
- Trust list to include Skype for Business FE servers' signing CA
- Search rules
- Unified Communications traversal zone to Expressway-E
- MRA enabled and the CUCM and IMP servers discovered (See MRA deployment guide in [Related Documents, page 6](#))

- Unified CM:
 - SIP trunk to Expressway-C
 - SIP trunk to Meeting Server
 - Dial plan for routing spaces towards Meeting Server
 - MRA devices / users
- Cisco Unified Communications Manager IM and Presence Service
 - Configure indirect inter-domain federation with *msexample.com*, via Expressway-C. See [Configure IM and Presence Service for Interdomain Federation, page 72](#).
- Meeting Server:
 - Spaces configured according to pre-defined pattern
 - Skype for Business Edge integration (See *Cisco Meeting Server Single Combined Server Deployment Guide* at the [Meeting Server Configuration Guides page](#)) for "dual homed conferencing"
- Configure the dial plan across the infrastructure components (see [Dial Plan Summary: On-Premises Federation Between SIP Domains, page 72](#)).

Configure IM and Presence Service for Interdomain Federation

Change SIP Proxy TLS Server and Peer Listener Ports

1. Go to **System > Application Listeners**
2. Change the Default Cisco SIP Proxy TLS Listener - Server Auth to 5062
3. Change the Default Cisco SIP Proxy TLS Listener - Peer Auth to 5061

Create SIP Federated Domains and Static Routes

For each domain that IM&P will federate via Expressway-C (eg. *msexample.com*):

1. Go to **Presence > Inter Domain Federation > SIP Federation**.
2. Create a new (Microsoft) SIP federation with the target domain, eg. *msexample.com*
3. Clear the **Direct Federation** option.
This is *indirect* federation, because the Expressway-C is proxying the messaging and presence between IM&P and the federated domain.
4. Go to **Presence > Routing > Static Routes**
5. Create a TLS static route towards (Next Hop) Expressway-C for each SIP federated domain (eg. *msexample.com* will have a Destination Pattern of *.com.msexample.**).

Update the Incoming ACL and TLS Peer Context

On each publisher node:

1. Go to **System > Security > Incoming ACL**
2. Add all Expressway-C peers' IP addresses and FQDNs to the Incoming ACL.
3. Save the Incoming ACL.
4. Go to **System > Security > TLS Peer Subjects**
5. Create a new TLS Peer Subject, using the Expressway-C cluster FQDN as the **Peer Subject Name**
6. Go to **System > Security > TLS Context Configuration**
7. Find and open the *Default_Cisco_SIP_Proxy_Peer_Auth_TLS_Context*
8. Move the new peer subject (Expressway-C cluster FQDN) from the **Available TLS Peer Subjects** to the **Selected TLS Peer Subjects**
9. Remove the *ECDHE_ECDSA* ciphers from the **Selected TLS Ciphers**.
10. Check **Disable Empty TLS Fragments**.
11. Save the Peer Context and restart the SIP Proxy service.

Dial Plan Summary: On-Premises Federation Between SIP Domains

Microsoft infrastructure (not detailed in this document):

- Routing for all Microsoft clients in *msexample.com*, both on- and off-premises
- Calls for *ciscoexample.com* route to Expressway-C
- Presence and messaging for *ciscoexample.com* route to Expressway-C

Unified CM

- Routing for all locally registered endpoints **@ciscoexample.com* (not detailed in this document)
- Routing for unrecognized recipients **@ciscoexample.com* on trunk to Expressway-C
- Route all calls for **@msexample.com* on trunk to Expressway-C
- Pattern for spaces route to Meeting Server eg. **@space.ciscoexample.com*

Expressway-C

Table 11 Expressway-C Dial Plan Rules

#	Source	Proto/variant	Mode/Pattern	Target zone	On match
1	Any	Any	Any alias	Local Zone	Continue
Note:	Rule 1 exists by default with priority 50. It's a catch all rule for targeting locally-registered endpoints.				
2	Local Zone	Standards-based	<i>*@ciscoexample\.com</i>	Unified CM zone	Stop
3	Local Zone	Standards-based	<i>*@msexample\.com</i>	Meeting Server zone	Stop
4	Unified CM zone	Standards-based	<i>*@ciscoexample\.com</i>	Local Zone	Stop
5	Unified CM zone	Standards-based	<i>*@msexample\.com</i>	Meeting Server zone	Stop
6	Meeting Server zone	Standards-based	<i>*@ciscoexample\.com</i>	Local Zone	Continue
7	Meeting Server zone	Standards-based	<i>*@ciscoexample\.com</i>	Unified CM zone	Stop
8	Meeting Server zone	Standards-based	<i>*@msexample\.com.*</i>	Front End zone	Stop
9	Local Zone	Standards-based	<i>*@space\.ciscoexample\.com</i>	Unified CM zone	Stop
Note:	You could optionally route rule 9 directly to Meeting Server. However, this deployment assumes that you want to manage all traffic for spaces through Unified CM.				
10	Meeting Server zone	Microsoft AV & Share	<i>*@msexample\.com.*</i>	Front End zone	Stop
11	Front End zone	Microsoft AV & Share	<i>*@ciscoexample\.com(;.*)</i>	Meeting Server zone	Stop
12	Front End zone	Microsoft AV & Share	<i>*@space\.ciscoexample\.com(;.*)</i>	Meeting Server zone	Stop
Note:	The final portion of the regular expression in the two rules above is important. It means that the rules can match the additional parameters that the Front End places on the SIP URI for some messages, for example <i>user@ciscoexample.com;transport=tls</i> . Put the portion in parentheses at the end of your rule's regex.				
13	Front End zone	Microsoft AV & Share	<i>*@<MSFQDN>.*</i>	Meeting Server zone	Stop
14	IM and Presence zone	Microsoft SIP IM&P	<i>msexample\.com</i>	Front End zone	Stop

Table 11 Expressway-C Dial Plan Rules (continued)

#	Source	Proto/variant	Mode/Pattern	Target zone	On match
15	Front End zone	Microsoft SIP IM&P	ciscoexample\.com	IM and Presence zone	Stop
16	Any	Microsoft SIP IM&P	.*<Federation Routing IM/P FQDN>.*	IM and Presence zone	Stop
Note:	This rule is required to correctly route NOTIFY messages to the IM and Presence Service cluster. You need a rule like this for each cluster, that corresponds to the cluster's Federation Routing IM/P FQDN parameter.				
17	Front End zone	Microsoft SIP IM&P	space\.ciscoexample\.com	Meeting Server zone	Stop
18	Meeting Server zone	Microsoft SIP IM&P	.*@msexample\.com.*	Front End zone	Stop
Note:	The following two rules enable messaging between Jabber and Meeting Server spaces, but that interoperability is not supported.				
19	Meeting Server zone	Microsoft SIP IM&P	.*@ciscoexample\.com.*	IM and Presence zone	Stop
20	IM and Presence zone	Microsoft SIP IM&P	space\.ciscoexample\.com	Meeting Server zone	Stop

Expressway-E

- No additional search rules required for this deployment.

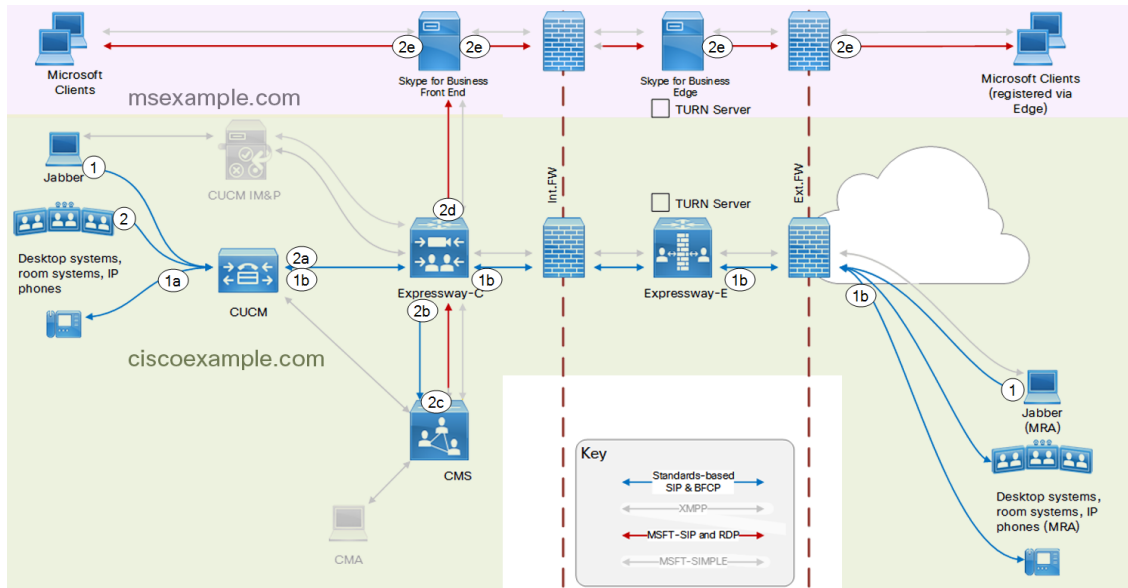
Meeting Server

- Terminate destinations matching the space pattern eg. **@space.ciscoexample.com*
- Inbound rule matching **@msexample.com*, from Expressway-C, Forward
- Outbound rule matching **@msexample.com*, route on Microsoft type trunk to Expressway-C
(Transcoded calls from Unified CM-registered or Expressway-registered endpoints destined for Microsoft clients)
- Inbound rule matching **@ciscoexample.com*, from Expressway-C, Forward
- Two outbound rules matching **@ciscoexample.com*:
 - Higher priority: Route on standards-based trunk to Unified CM
(Transcoded calls from Microsoft clients destined for Unified CM-registered endpoints)
 - Lower priority: Route on standards-based trunk to Expressway-C
(Transcoded calls from Microsoft clients destined for Expressway-registered endpoints)

These outbound rule priorities are based on the assumption that majority of standards-based endpoints are registered to Unified CM.

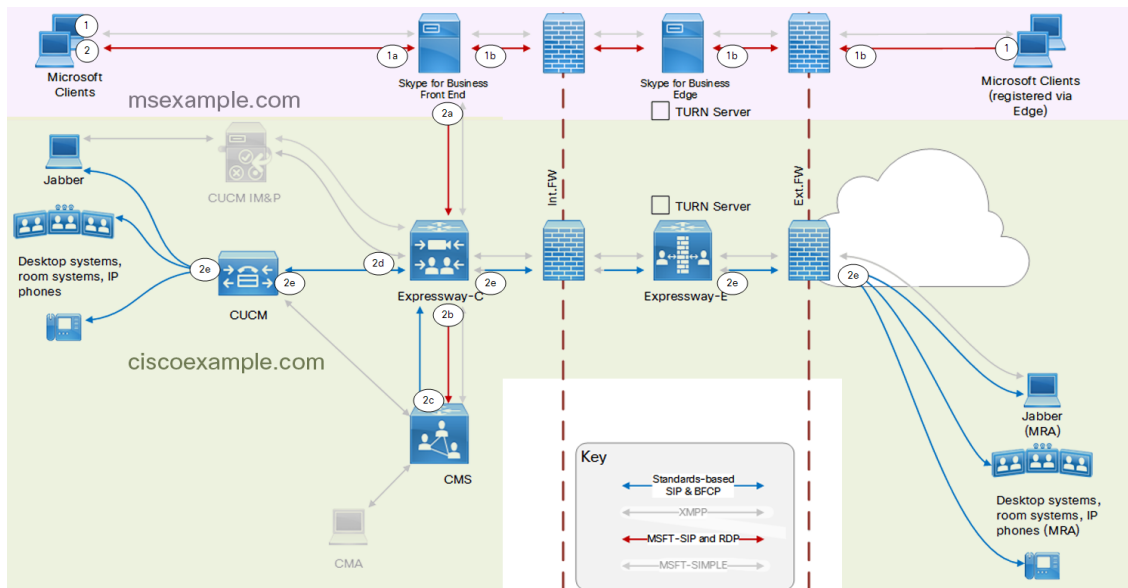
Call Setup Flows

Calls originating from UCM-registered endpoints (@ciscoexample.com)



1. UCM-registered endpoint initiates call to someone@msexample.com:
The call is proxied in to Unified CM if the endpoint is off-premises (MRA).
 - a. Unified CM routes the call to another locally-registered endpoint
 - b. Unified CM routes out via MRA if necessary.
2. UCM-registered endpoint initiates call to someone@msexample.com:
The call is proxied in to Unified CM if the endpoint is off-premises (MRA).
 - a. Unified CM routes the call on the trunk to Expressway-C.
 - b. Expressway-C sees a standards-based call for msexample.com and routes it to Meeting Server
 - c. Meeting Server forwards incoming standards-based SIP on the Microsoft type trunk towards Expressway-C.
 - d. Expressway-C sees Microsoft-variant SIP for msexample.com and routes it to Skype for Business Front End.
 - e. The Microsoft infrastructure places the call if possible.

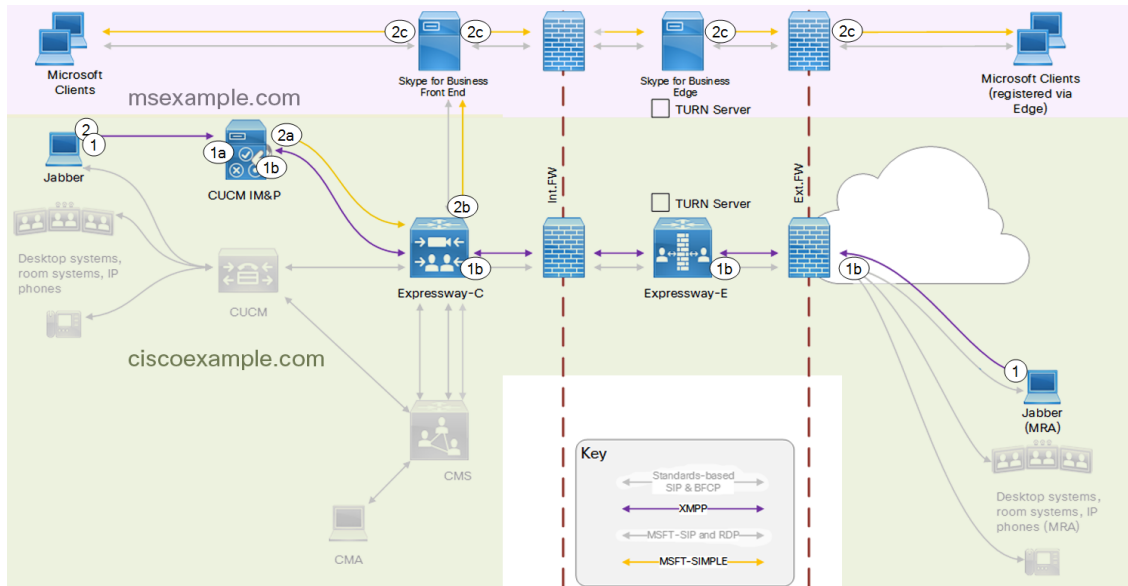
Calls originating from Microsoft-registered clients (@msexample.com)



1. Microsoft-registered client initiates call to someone@msexample.com.
The call is proxied in to the Front End if the client is off-premises.
 - a. Front End tries to route the call to another Microsoft-registered client.
 - b. Front End routes out via Edge if necessary.
2. Microsoft-registered client initiates call to someone@ciscoexample.com
The call is proxied in to the Front End if the client is off-premises.
 - a. Front End routes the call on the trunk to Expressway-C.
 - b. Expressway-C sees a Microsoft-variant call for ciscoexample.com and routes it to Meeting Server.
 - c. Meeting Server forwards incoming Microsoft-variant SIP on the standards-based trunk towards Expressway-C.
 - d. Expressway-C sees a standards-based call for ciscoexample.com and routes it to Unified CM.
 - e. Unified CM places the call (via MRA if necessary).

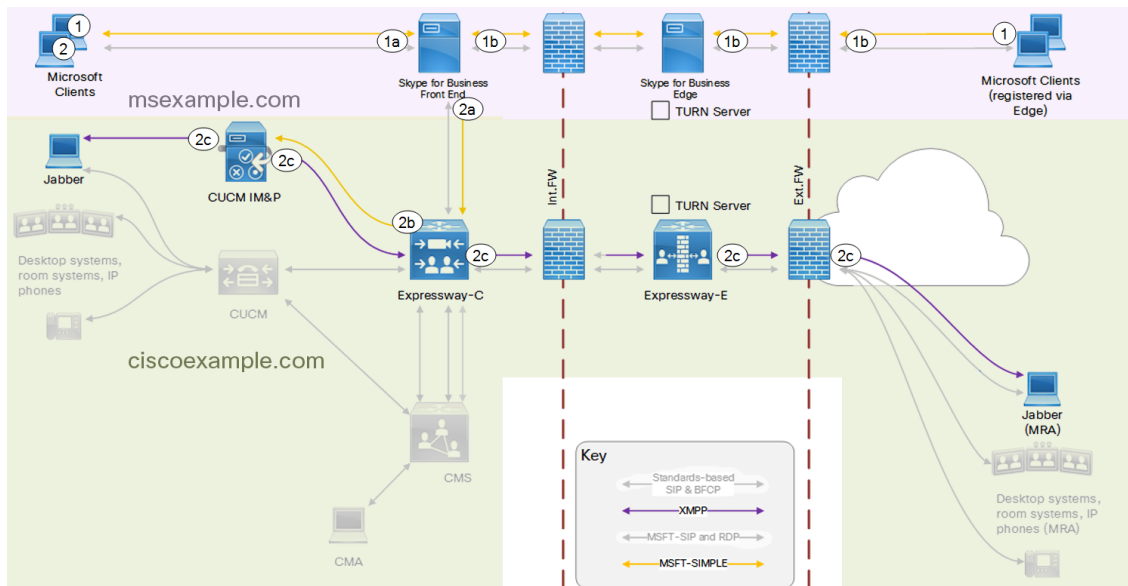
Instant messaging and presence

From Cisco Jabber to Users in Our Organization



1. Jabber user initiates XMPP chat with someone@ciscoexample.com:
The XMPP is proxied in via MRA if necessary.
 - a. IM&P routes it to another Jabber user.
 - b. IM&P routes out via MRA if necessary.
2. Jabber user initiates XMPP chat with someone@msexample.com:
 - a. IM&P routes it as Microsoft SIP IM&P on the static route towards Expressway-C (indirect interdomain federation)
 - b. Expressway-C sees Microsoft SIP IM&P for msexample.com and routes it to Skype for Business Front End
 - c. The Front End routes the chat to a Microsoft-registered client, via Edge if necessary.

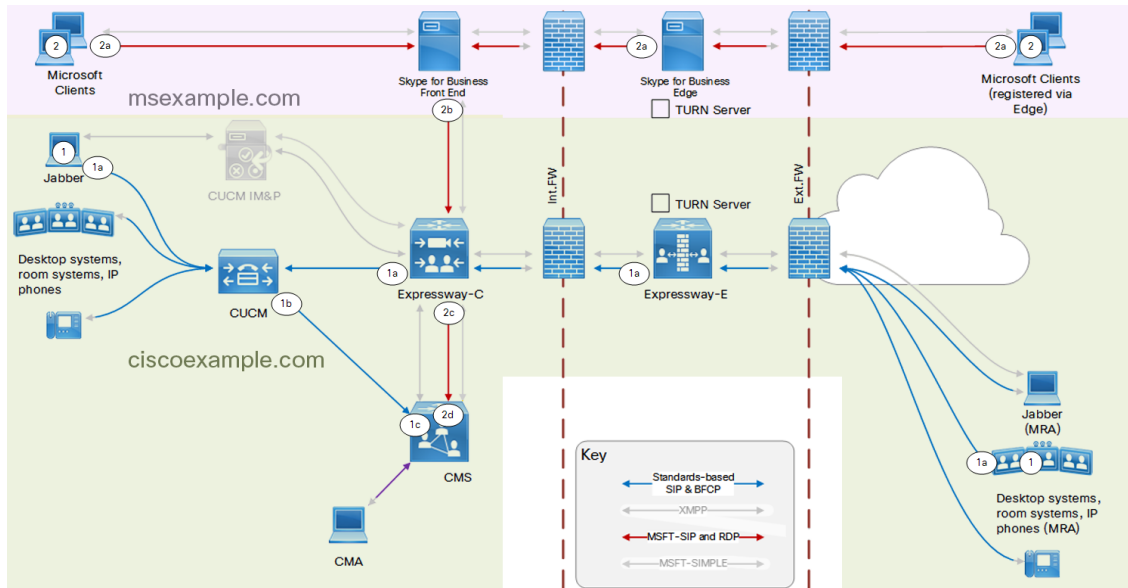
From Microsoft Clients to Users in Our Organization



1. Skype for Business user initiates chat with someone@msexample.com:
The Microsoft messaging is proxied in by Skype for Business Edge if necessary.
 - a. Front End routes it to another Skype for Business user
 - b. Front End routes via Skype for Business Edge if necessary
2. Skype for Business user initiates chat with someone@ciscoexample.com:
The Microsoft messaging is proxied in by Skype for Business Edge if necessary.
 - a. Front End routes it on the static route towards Expressway-C.
 - b. Expressway-C sees Microsoft SIP IM&P for ciscoexample.com and routes it to IM&P.
 - c. IM&P routes the chat as XMPP to a Jabber user, via MRA if necessary.

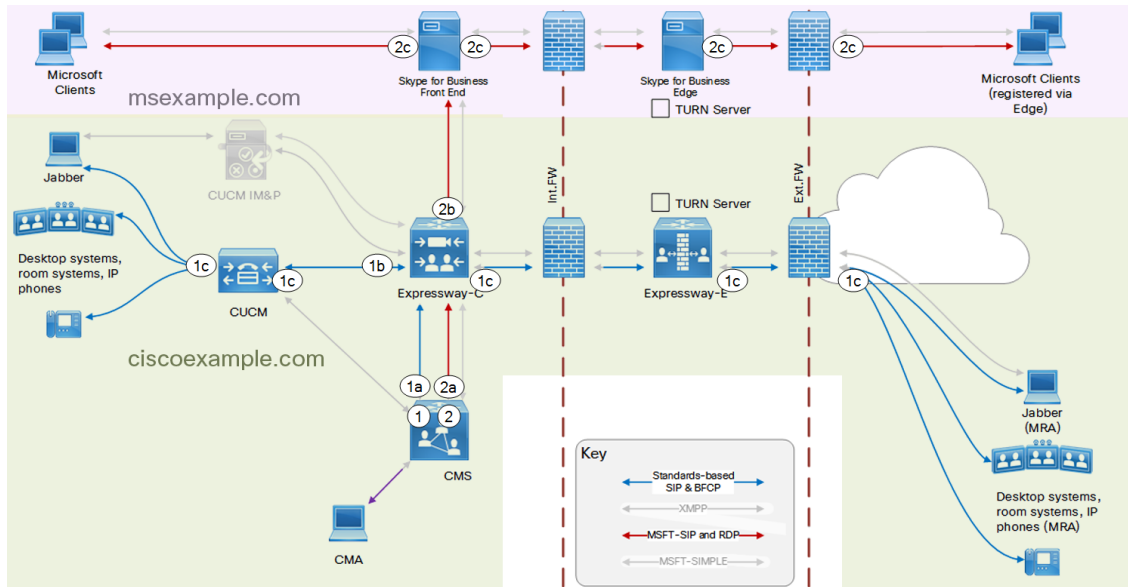
Conferencing in Meeting Server spaces

Participants join from their clients / endpoints



1. Unified CM-registered endpoints call a space address:
 - a. Unified CM-registered endpoints call a space address. The call is proxied in by MRA if necessary.
 - b. Unified CM routes space addresses on trunk to Meeting Server.
 - c. Meeting Server terminates the call in the destination space.
2. Microsoft-registered clients call a space address:
 - a. Microsoft-registered clients call a space address. The call is proxied in by Edge if necessary.
 - b. Front End recognizes the pattern, and routes Microsoft-variant SIP on the trunk to Expressway-C.
 - c. Expressway-C sees Microsoft-variant SIP from Front End and sends it to Meeting Server.
 - d. Meeting Server terminates the call in the destination space.

Meeting Server invites participants



1. Meeting Server invites Unified CM-registered endpoints:

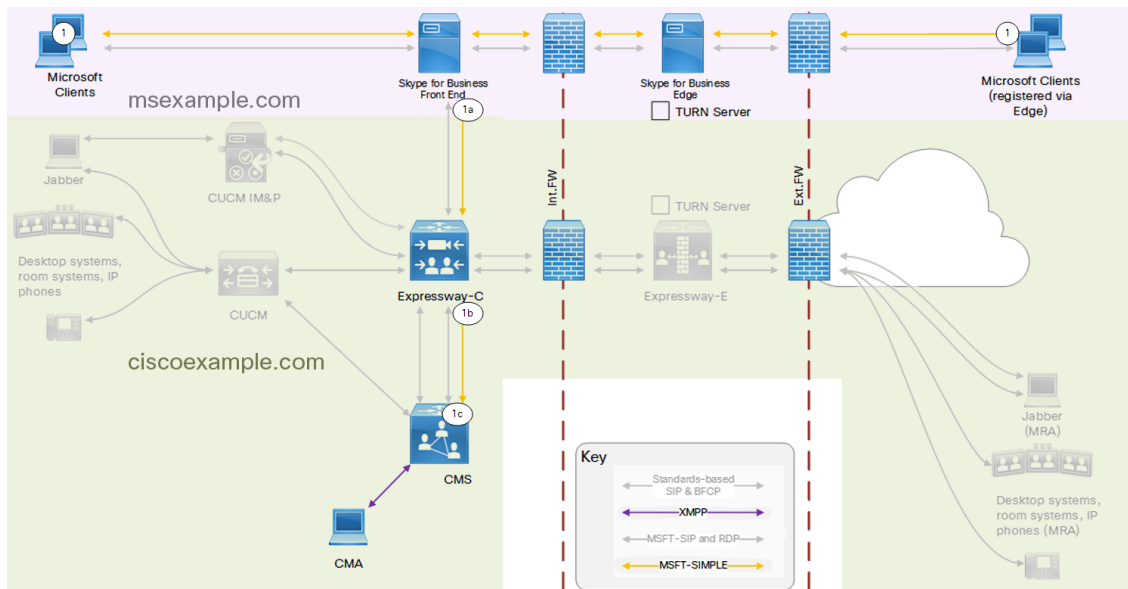
- a. Meeting Server routes standards-based SIP for *ciscoexample.com* on the trunk to Expressway-C.
- b. Expressway-C routes standards-based calls for *ciscoexample.com* to Unified CM.
- c. Unified CM routes the call.

If the endpoint is outside the network, Unified CM routes the call out over MRA.

2. Meeting Server invites Microsoft-registered clients:

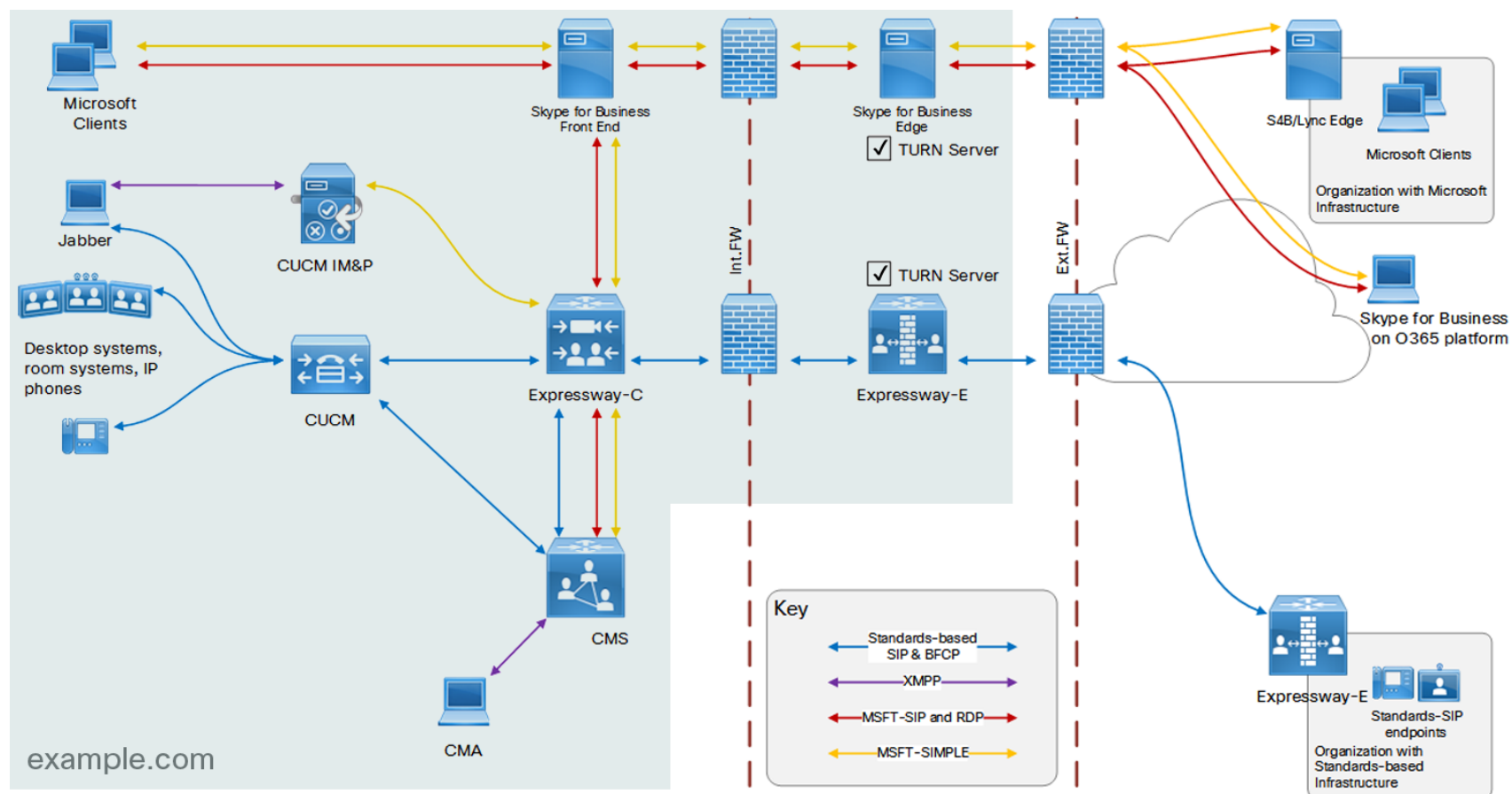
- a. Meeting Server routes Microsoft-variant calls for *msexample.com* to Expressway-C.
- b. Expressway-C routes Microsoft-variant calls to Skype for Business Front End.
- c. Front End connects the call to the participant, via Edge if necessary.

Participants Chat in Meeting Server space



1. Microsoft-registered clients initiate chat with a space address.
 - a. Front End recognizes the pattern and sends the chat on the static route to Expressway-C.
 - b. Expressway-C sees Microsoft SIP IM&P for a space address and routes it to Meeting Server.
 - c. Meeting Server terminates the chat in the space.

Business-to-business Federation With One Local SIP Domain



User Outcomes

- Users of Microsoft clients and users of Cisco clients (in the same organization network) can call each other:
 - They can see and hear each other
 - They can share their screens with each other
 - If the clients are capable, they can message each other and see each others' presence status
 - They can do these things whether they are inside or outside the network
- Users of Microsoft clients and Cisco endpoints can meet in Meeting Server spaces
- Users of Microsoft clients and users of Cisco clients in this organization can call people in other, known organizations
- Users of Microsoft clients and Cisco endpoints in other organizations can call people in this organization
- Users of Microsoft clients and Cisco endpoints in this organization can call people in unknown organizations, if those organizations have published their SIP federation service records in public DNS.

Deployment Summary

- This deployment adds business-to-business federation to the [On-premises Federation Within One SIP Domain, page 52](#).

That deployment deals with all of the on-premises routing between Cisco and Microsoft SIP infrastructure within *example.com*. It is assumed to be working correctly before you configure federation with external SIP domains.
- The Microsoft Skype for Business Edge Server is responsible for all inbound and outbound signaling with federated Microsoft SIP infrastructure.
- The Expressway-E is responsible for all inbound and outbound signaling with federated standards-based SIP infrastructure.

Technical Overview

- When the federated domain is known, outbound routing is easier. When the "federated" domain is not known, ("open federation"), outbound routing can take a little longer. The outbound calls may not match immediately if the DNS service record that is tried first is not in the DNS.
This is because standards-based infrastructure and Microsoft infrastructure use different prefixes to publish federation service in DNS.
- Standards-based records (`_sip._tcp.example.com` or `_sips._tcp.example.com`) point to the public address(es) of the Expressway-E.
- Microsoft-variant records (`_sipfederationtls._tcp.example.com`) point to the public address(es) of the Skype for Business Edge.
- Meeting Server uses Skype for Business Edge turn services for media relay on Microsoft-variant business-to-business calls.
- Meeting Server uses Expressway-E turn services for media relay on standards-based business-to-business calls.

Configuration Summary

- [Core Configuration, page 18](#)
- On-premises federation within one SIP domain: [Configuration Summary, page 54](#)
- External DNS server:
 - External Microsoft-variant SRV record for *example.com* points to the Microsoft Edge
 - External Microsoft-variant SRV record for *space.example.com* points to the Microsoft Edge
 - External standards-based SRV record for *example.com* points to the Expressway-E
 - External standards-based SRV record for *space.example.com* points to the Expressway-E(See [Appendix 1: DNS Entries, page 115](#))
- Configure the dial plan across the infrastructure components.
- Configure Meeting Server for dual homed conferencing.
- IM and Presence Service:
 - Indirect federation for each known Microsoft-based partner organization, with Expressway-C as next hop.

Dial Plan Summary: Business-to-business Federation From One SIP Domain

Microsoft infrastructure (not detailed in this document):

1. Route to Expressway-C any calls unmatched by Front End or Edge
2. Route outbound any calls for unrecognized domains from Expressway-C to Edge
3. Routes for known standards-based domains to Expressway-C.

Unified CM

To prevent inbound calls on the trunk from using the SIP Route Pattern to Expressway-C (and so avoiding loops).

1. Create a new partition and assign it to the SIP Route Pattern in CUCM that points to Expressway-C.
2. Add the new partition to the Calling Search Space assigned to the CUCM-registered (and MRA) endpoints.
Now those endpoints can place calls via Expressway-C.

3. Check the unified CM trunk to Expressway-C. The Calling Search Space for Inbound Calls must not have the new partition.

Expressway-C

Table 12 Expressway-C Dial Plan Rules

#	Source	Proto/variant	Mode/Pattern	Target zone	On match
	Unified CM zone	Standards-based	.*@stdsdomain1\.com	Unified CM traversal zone (client)	Stop
	Meeting Server zone	Standards-based	.*@stdsdomain1\.com	Unified CM traversal zone (client)	Stop
	Front End zone	Microsoft AV & Share	.*@stdsdomain1\.com	Meeting Server zone	Stop
	Unified CM zone	Standards-based	.*@msdomain1\.com	Meeting Server zone	Stop
	Meeting Server zone	Microsoft AV & Share	.*@msdomain1\.com.*	Front End zone	Stop
	Meeting Server zone	Microsoft SIP IM&P	.*@msdomain1\.com.*	Front End zone	Stop
	IM and Presence zone	Microsoft SIP IM&P	.*@msdomain1\.com	Front End zone	Stop
	Front End zone	Microsoft SIP IM&P	.*@example\.com.*	IM and Presence zone	Stop
	Unified Communications traversal zone (client)	Standards-based	.*@example\.com	Unified CM zone	Continue
	Unified Communications traversal zone (client)	Standards-based	.*@example\.com	Meeting Server zone	Stop
	Unified Communications traversal zone (client)	Standards-based	.*@space\.example\.com	Unified CM zone	Stop
	Front End zone	Microsoft AV & Share	.*@space\.example\.com (;.*)	Meeting Server zone	Stop
	Front End zone	Microsoft SIP IM&P	.*@space\.example\.com.*	Meeting Server zone	Stop
	Any zone	Microsoft SIP IM&P	.*<FrontEnd1FQDN>.*	Front End zone	Stop
Note:	This rule ensures correct routing of NOTIFY messages. You need a rule like this for each FQDN in the Front End cluster.				
	Unified CM zone	Standards-based	Any alias	Unified CM traversal zone (client)	Continue

Table 12 Expressway-C Dial Plan Rules (continued)

#	Source	Proto/variant	Mode/Pattern	Target zone	On match
	Unified CM zone	Standards-based	Any alias	Meeting Server zone	Stop
	Meeting Server zone	Microsoft AV & Share	Any alias	Front End zone	Stop
Note:	This rule simplifies the dial plan; it replaces all other rules handling Microsoft AV & Share from the Meeting Server zone.				
	IM and Presence zone	Microsoft SIP IM&P	Any alias	Front End zone	Stop
	Meeting Server zone	Microsoft SIP IM&P	Any alias	Front End zone	Stop

Expressway-E**Table 13 Expressway-E Dial Plan Rules**

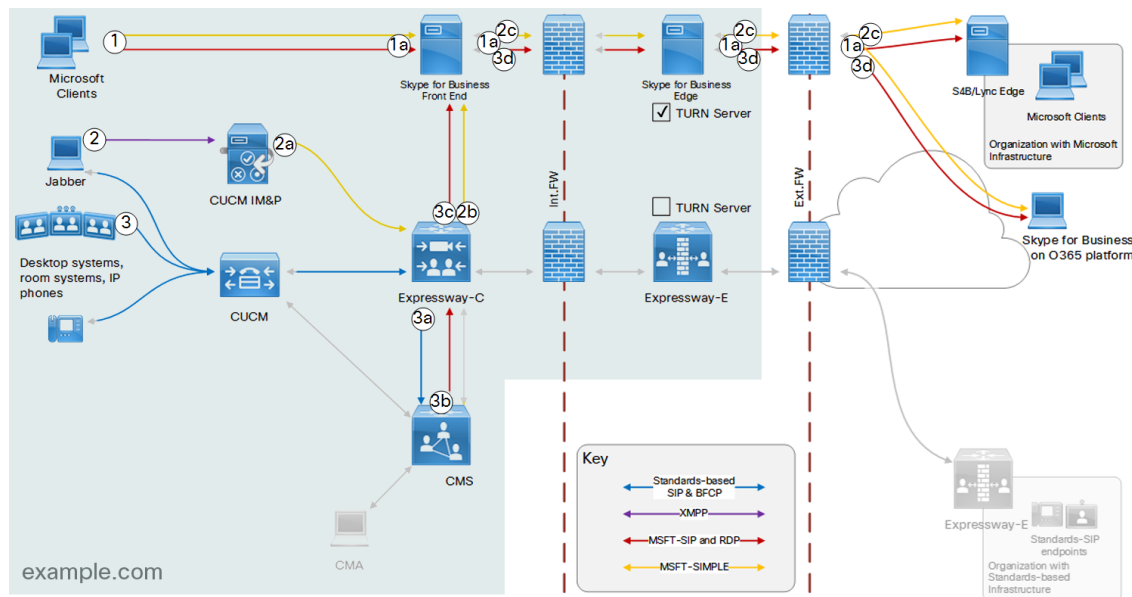
#	Source	Proto/variant	Mode/Pattern	Target zone	On match
	Default zone	Standards-based	.*@space\.example\.com	Unified Communications traversal (server) zone	Stop
	Unified Communications traversal (server) zone	Standards-based	Any alias	DNS zone	Stop
	Default zone	Standards-based	.*@example\.com.*	Unified Communications traversal (server) zone	Stop

Meeting Server**Table 14 Meeting Server Dial Plan Rules**

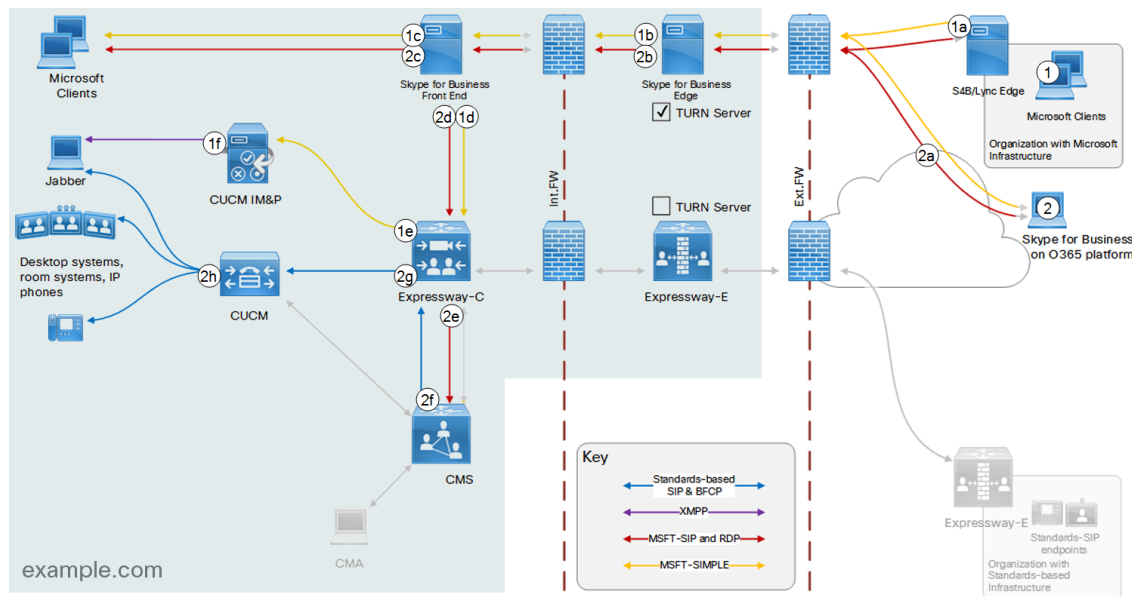
#	Direction	Mode/Pattern	Action	Trunk type
	Inbound	*@msdomain1.com	Forward	-
	Outbound	*@msdomain1.com		Lync type
	Inbound	*@stdsdomain1.com	Forward	-
	Outbound	*@stdsdomain1.com		Standards type
	Inbound	* (any alias)	Forward	-
	Outbound	*		Lync type

Call Setup With Known External Domains

Federated Domain uses Microsoft Infrastructure

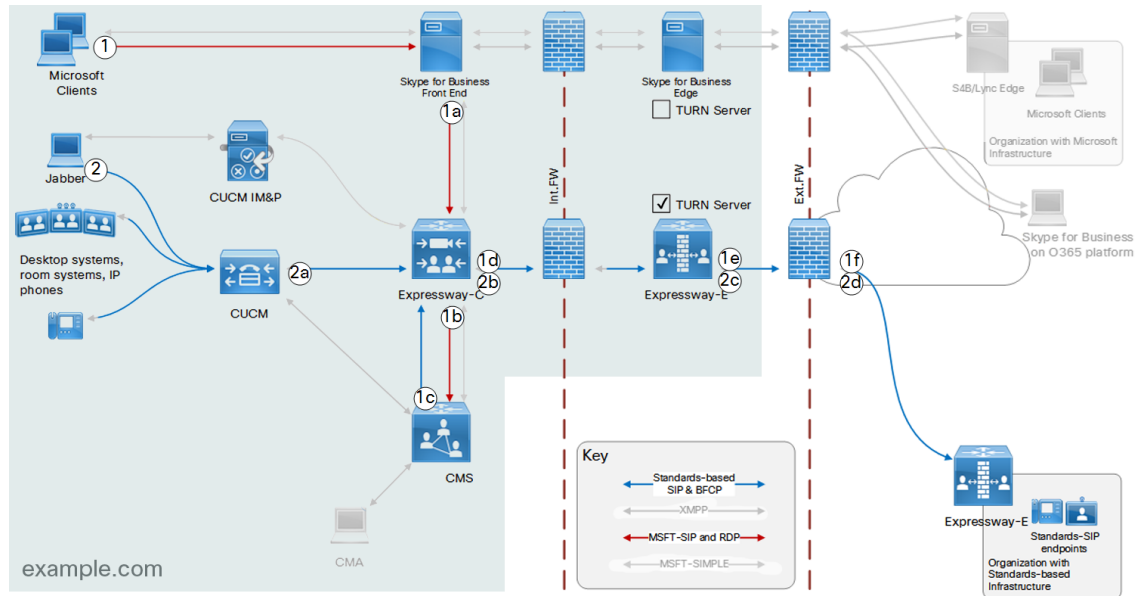
Figure 10 Outbound signaling paths

- Microsoft-registered caller@example.com initiates call or chat to callee@msb2bexample.com.
 - Front End routes Microsoft-variant SIP or SIP IM&P for non-local domains out via Skype for Business Edge.
- JabberUser@example.com initiates chat with SkypeForBusinessUser@msb2bexample.com
 - IM&P routes this on static route to Expressway-C (a new, indirect, inter-domain federation for each partner domain).
 - Expressway-C sees Microsoft SIP IM&P and recognizes the destination domain, so routes to Skype for Business Front End.
 - Front End routes Microsoft-variant SIP IM&P for non-local domains out via Skype for Business Edge.
- Unified CM-registered caller@example.com initiates call to callee@msb2bexample.com.
 - Expressway-C recognizes the destination domain and standards-based SIP, so routes the call to Meeting Server
 - Meeting Server forwards the standards-based SIP from Expressway-C on Microsoft-variant trunk to Expressway-C
 - Expressway-C recognises Microsoft-variant SIP and the federated domain, so routes the call to the Front End.
 - Front End routes Microsoft-variant SIP for non-local domains out via Skype for Business Edge.

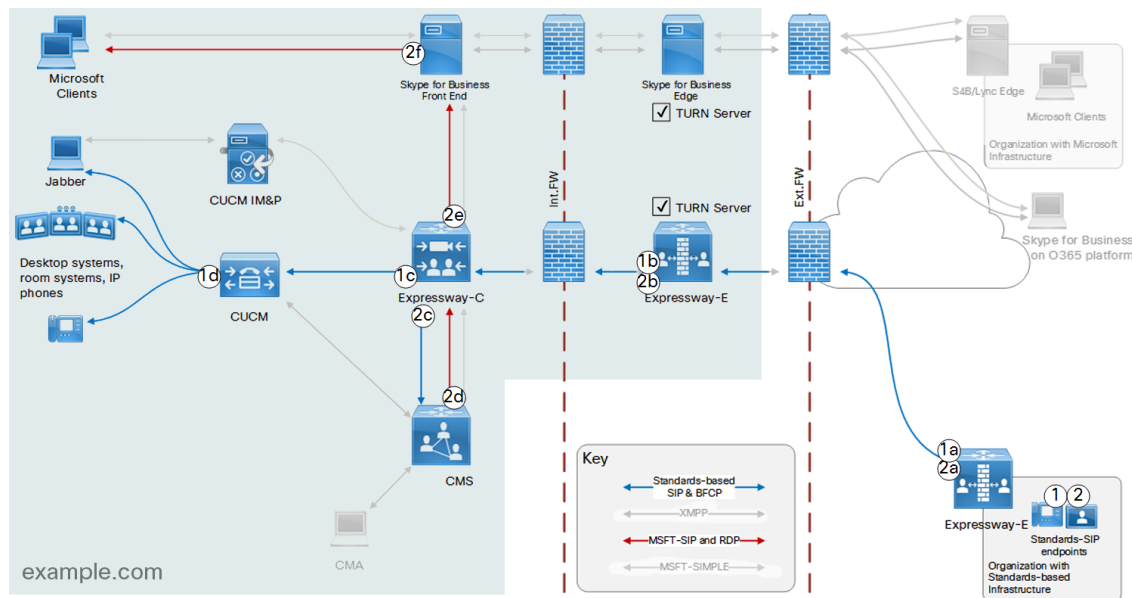
Figure 11 Inbound signaling paths

1. SkypeForBusinessUser@msb2bexample.com initiates chat with User@example.com:
 - a. The partner organization's Edge does a SRV lookup for the Microsoft-variant SIP federation record for example.com. It discovers the Edge server for example.com and routes the chat there. (DNS not shown)
 - b. Example.com Edge proxies the chat to Front End.
 - c. Front End places the chat to a Microsoft-registered client if possible. This could be to an off-premises user registered via the Skype for Business Edge, but these users are not shown on the diagram.
 - d. If Front End does not know this user, it routes the chat on trunk to Expressway-C.
 - e. Expressway-C sees Microsoft SIP IM&P from Front End, so routes to IM&P.
 - f. IM&P connects the chat using XMPP to the Jabber user. It routes out via MRA if necessary (MRA endpoints not shown).
2. Caller@O365example.com initiates call to callee@example.com:
 - a. O365 cloud does a SRV lookup for the Microsoft-variant SIP federation record for example.com. It discovers the Edge server for example.com and routes the call there. (DNS not shown).
 - b. Example.com Edge proxies the call to Front End.
 - c. Front End places the call to a Microsoft-registered client if possible.
This could be to an off-premises user registered via the Skype for Business Edge, but these users are not shown on the diagram.
 - d. If Front End does not know the user, it routes the call to Expressway-C.
 - e. Expressway-C routes Microsoft-variant SIP to Meeting Server.
 - f. Meeting Server forwards the Microsoft-variant SIP from Expressway-C on standards-based trunk to Expressway-C.
 - g. Expressway-C recognizes standards-based SIP for the local domain, so routes the call to Unified CM.
 - h. Unified CM places the call. It routes out via MRA if necessary (MRA endpoints not shown).

Federated Domain uses Standards-based Infrastructure

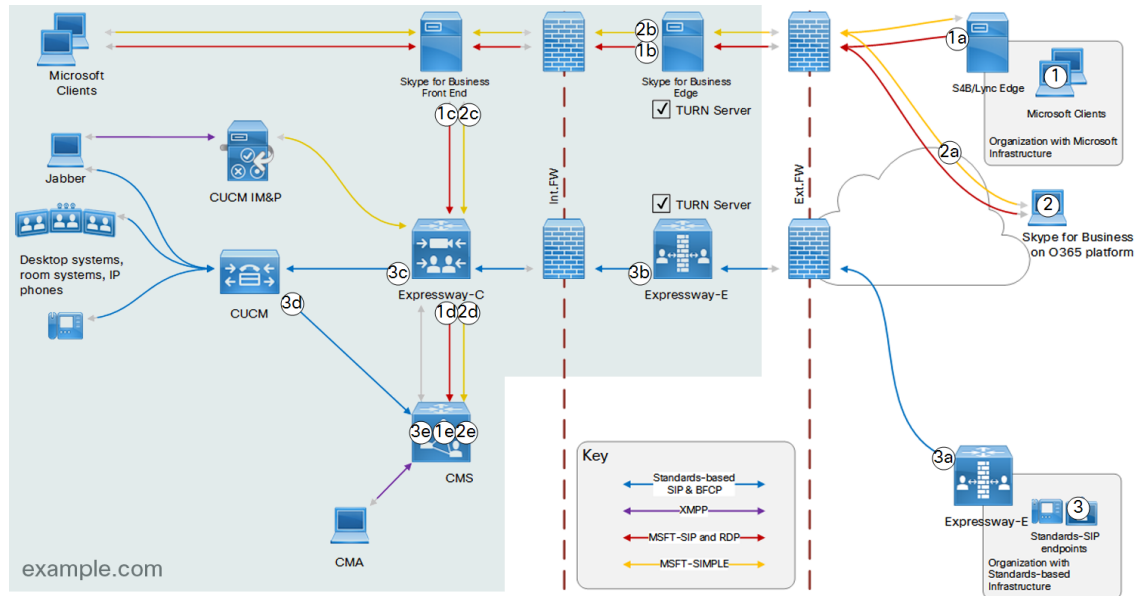
Figure 12 Outbound signaling paths

1. Microsoft-registered Caller@example.com initiates call to callee@ciscob2bexample.com.
 - a. Front End routes Microsoft-variant SIP for known standards-based federated domains to Expressway-C.
 - b. Expressway-C recognizes the destination domain and Microsoft-variant SIP, so routes the call to Meeting Server.
 - c. Meeting Server forwards the Microsoft-variant SIP from Expressway-C on standards-based trunk to Expressway-E.
 - d. Expressway-C recognizes the destination domain and standards-based SIP, so routes the call to Expressway-E.
 - e. Expressway-E routes the call using the DNS zone.
2. JabberUser@example.com initiates call with callee@ciscob2bexample.com
 - a. Unified CM routes non-local domains on trunk to Expressway-C.
 - b. Expressway-C recognizes the destination domain and standards-based SIP, so routes the call to Expressway-E.
 - c. Expressway-E routes the call using the DNS zone.

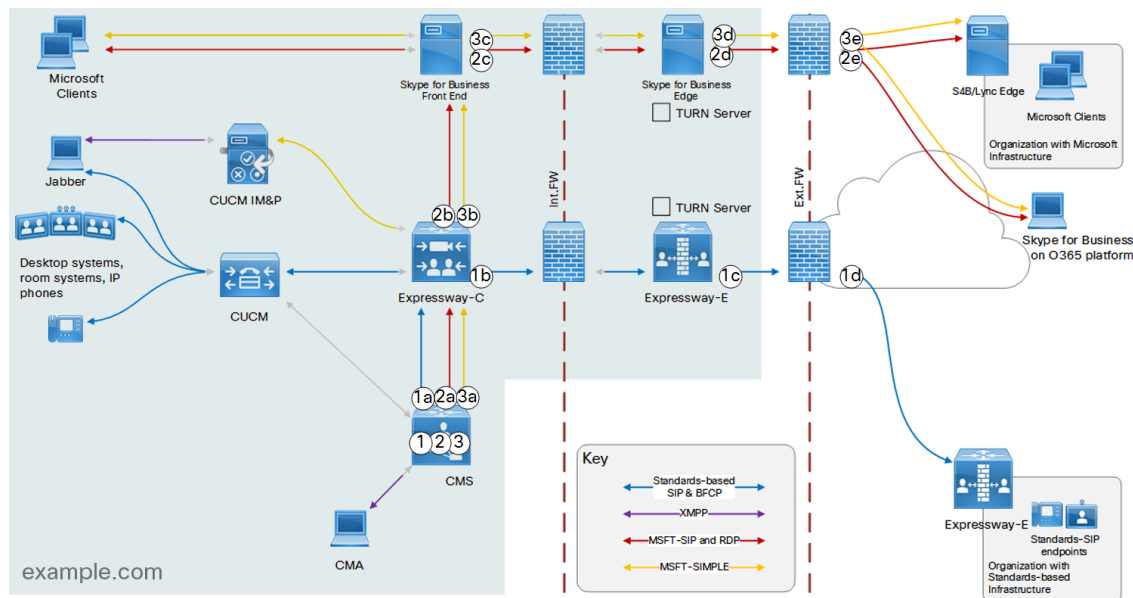
Figure 13 Inbound signaling paths

1. Caller@ciscob2bexample.com initiates call to callee@example.com (UCM-registered).
 - a. Standards-based edge server does a SRV lookup for the standard SIP federation record for example.com. It discovers the Expressway-E for example.com and routes the call there. (DNS not shown)
 - b. Expressway-E routes the call to Expressway-C.
 - c. Expressway-C recognizes the destination domain and standards-based SIP, so routes the call to Unified CM
 - d. Unified CM places the call, via MRA if necessary (MRA endpoints not shown).
If Unified CM does not know the user, it cannot route the call back to Expressway-C, because we configured the Unified CM dial plan to prevent loops. (See the next use case).
2. Caller@ciscob2bexample.com initiates call to callee@example.com (FE-registered).
 - a. Standards-based edge server does a SRV lookup for the standard SIP federation record for example.com. It discovers the Expressway-E for example.com and routes the call there. (DNS not shown)
 - b. Expressway-E routes the call to Expressway-C.
Expressway-C recognizes the destination domain and standards-based SIP, so routes the call to Unified CM. In this case, Unified CM fails to place the call because the callee is registered to Front End.
 - c. The call on the trunk to Unified CM did not succeed, so Expressway-C continues searching. It tries the lower priority rule to route standards-based SIP to Meeting Server.
 - d. Meeting Server forwards the standards-based SIP from Expressway-C on Microsoft-variant trunk to Expressway-C.
 - e. Expressway-C routes Microsoft-variant SIP to Front End.
 - f. Front End places the call.

Participants From Federated Domains In Meeting Server Spaces

Figure 14 Participants join spaces

1. Caller@msb2bexample.com dials cmsspace@space.example.com (or numericpattern@example.com)
 - a. The partner organization's Edge does a SRV lookup for the Microsoft-variant SIP federation record for example.com . It discovers the Edge server for example.com and routes the chat there. (DNS not shown)
 - b. Skype for Business Edge routes the call in to Front End.
 - c. Front End knows this pattern is for spaces, and routes the call to Expressway-C.
 - d. Expressway-C routes Microsoft-variant SIP for the space pattern to Meeting Server.
 - e. Meeting Server terminates the call in the named space.
2. SkypeForBusinessUser@O365example.com initiates chat in cmsspace@space.example.com (or numericpattern@example.com)
 - a. O365 cloud does a SRV lookup for the Microsoft-variant SIP federation record for example.com . It discovers the Edge server for example.com and routes the call there. (DNS not shown).
 - b. Skype for Business Edge routes the chat in to Front End.
 - c. Front End knows this pattern is for spaces, and routes the chat to Expressway-C.
 - d. Expressway-C routes Microsoft SIP IM&P for the space pattern to Meeting Server.
 - e. Meeting Server terminates the chat in the named space.
3. Caller@ciscob2bexample.com dials cmsspace@space.example.com (or numericpattern@example.com)
 - a. Standards-based edge server does a SRV lookup for the standard SIP federation record for example.com . It discovers the Expressway-E for example.com and routes the call there. (DNS not shown)
 - b. Expressway-E routes the call to Expressway-C.
 - c. Expressway-C routes standards-based SIP with the space pattern to Unified CM.
 - d. Unified CM routes the call on trunk to Meeting Server.
 - e. Meeting Server terminates the call in the named space.

Figure 15 Spaces invite participants

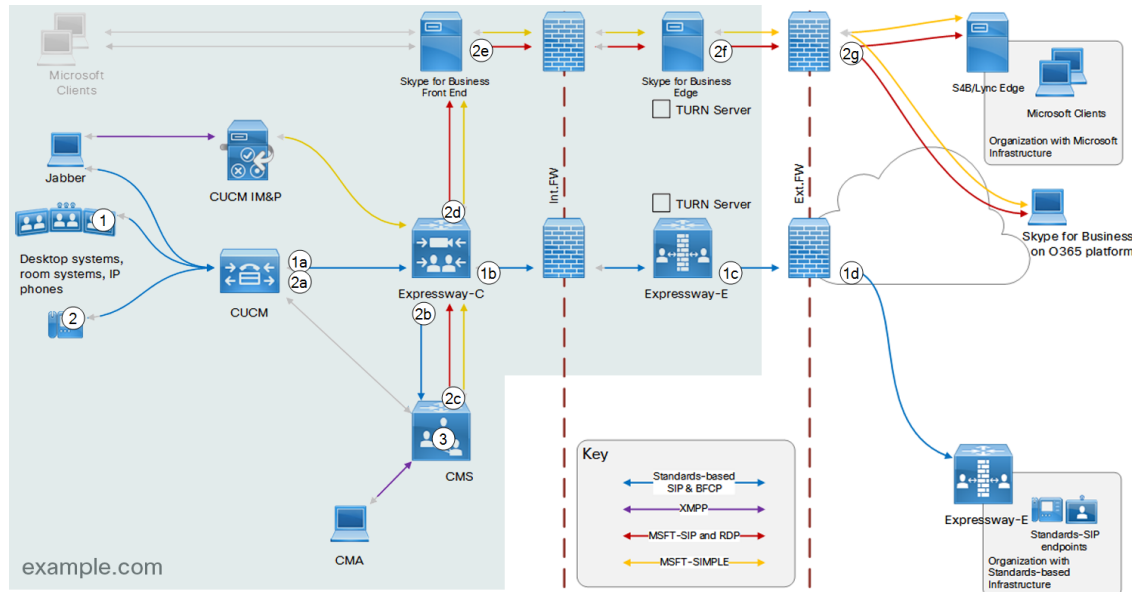
1. `cmsspace@space.example.com` (or `numericpattern@example.com`) invites `Callee@ciscob2bexample.com`:
 - a. Meeting Server routes the call on the standards-based trunk to Expressway-C.
 - b. Expressway-C routes the standards-based SIP variant for this domain to Expressway-E.
 - c. Expressway-E does a SRV lookup for the standard SIP federation record for `ciscob2bexample.com` and discovers the edge for the standards-based partner. (DNS not shown)
 - d. Expressway-E places the call.
2. `cmsspace@space.example.com` (or `numericpattern@example.com`) invites `Callee@msb2bexample.com`
 - a. Meeting Server places the call on the Microsoft-variant trunk to Expressway-C.
 - b. Expressway-C routes Microsoft-variant SIP for this domain to Skype for Business Front End.
 - c. Front End routes the call out via Skype for Business Edge.
 - d. Edge does a SRV lookup for the Microsoft-variant SIP federation record for `msb2bexample.com` and discovers the edge for the Microsoft-based partner. (DNS not shown)
 - e. Edge places the call.
3. `cmsspace@space.example.com` (or `numericpattern@example.com`) initiates chat with `SkypeforBusinessUser@O365example.com`
 - a. Meeting Server routes the chat on the Microsoft-variant trunk to Expressway-C.
 - b. Expressway-C routes Microsoft SIP IM&P for this domain to Front End.
 - c. Front End routes the chat out via Skype for Business Edge.
 - d. Edge does a SRV lookup for the Microsoft-variant SIP federation record for `O365example.com` and discovers the Office 365 cloud. (DNS not shown)
 - e. Edge places the chat.

Call Setup With Unknown External Domains

Outbound calls for unknown domains will exit via the Microsoft Skype for Business Edge, or the Cisco Expressway-E, depending on which type of SIP federation SRV record has been published in the DNS by the unknown domain.

Inbound calls from unknown domains will arrive either at the Microsoft Skype for Business Edge, or at the Cisco Expressway-E, depending on which type of edge server sends the call from the unknown domain.

Figure 16 Outbound signaling from Unified CM-registered endpoints to unknown SIP domains



1. Unified CM-registered endpoint initiates call to unknown domain (the domain has a standards-based Edge):
 - a. Unified CM cannot place the call locally and routes it on trunk to Expressway-C.
 - b. Expressway-C routes the standards-based call to Expressway-E. This rule is set to continue searching if a match is not found.
 - c. Expressway-E does a SRV lookup for the standard SIP federation records for the unknown domain, and gets the edge server's address.
 - d. Expressway-E places the call.

2. Unified CM-registered endpoint initiates a call to an unknown domain (the domain has a Microsoft Edge):
 - a. Unified CM cannot place the call locally and routes it on trunk to Expressway-C.

Expressway-C routes the call to Expressway-E. Expressway-E attempts standards-based federation (as per previous use case) and fails to place the call.

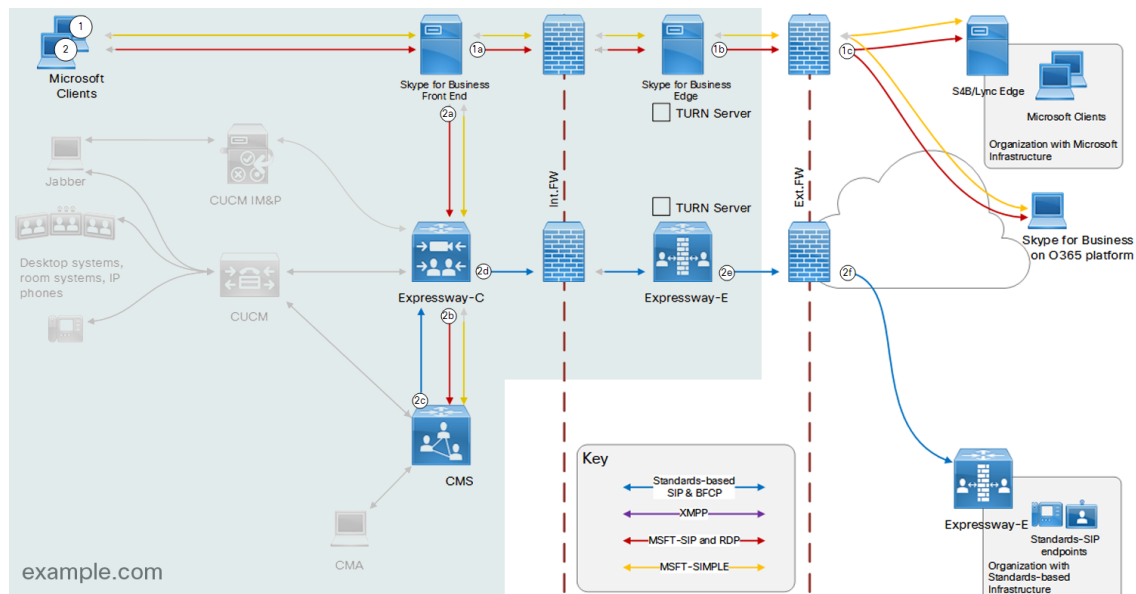
If Expressway-E cannot place the call to a standards-based SIP agent, it's probably because the standard SIP federation record search did not return any addresses.
 - b. Expressway-C continues searching and uses a lower priority rule to route the call to Meeting Server.
 - c. Meeting Server forwards the standards-based call from Expressway-C on the Microsoft-variant trunk to Expressway-C.

Expressway-C sees Microsoft-variant SIP from Meeting Server and routes it to Skype for Business Front End.
 - d. **Note:** This rule must be more permissive than the rule for known/named federations. It must match on *any* domain, and so it can replace any existing rules for routing Microsoft-variant SIP for known domains towards Front End.
 - e. Front End routes the call out via Skype for Business Edge.
 - f. Edge does a SRV lookup for the Microsoft-variant SIP federation records for the unknown domain, and gets the edge server's address.
 - g. Edge places the call.
3. Meeting Server invites a participant from an unknown domain:

Meeting Server places the call on the trunk to Expressway-C.

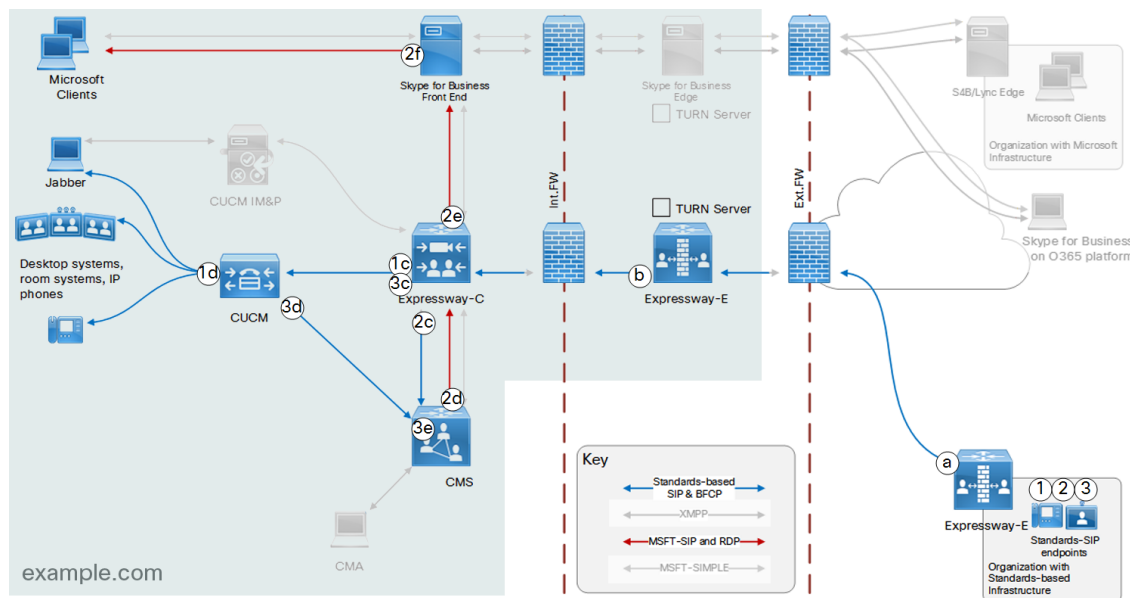
The call follows one of the paths, as described in cases 1 or 2 above, depending on whether the unknown domain is standards-based or Microsoft-based.

Figure 17 Outbound signaling from Front End-registered endpoints to unknown SIP domains



1. FE-registered endpoint initiates a call to an unknown domain (the domain has a Microsoft Edge):
 - a. Front End cannot place the call locally and routes it via Skype for Business Edge.
 - b. Edge does a SRV lookup for the Microsoft-variant SIP federation records for the unknown domain, and gets the edge server's address.
 - c. Edge places the call.
2. FE-registered endpoint initiates call to unknown domain (the domain has a standards-based Edge):
 - a. Front End cannot place the call locally or by DNS, and routes it on trunk to Expressway-C.
 - b. Expressway-C sends the Microsoft-variant SIP to Meeting Server
 - c. Meeting Server transcodes Microsoft-variant SIP from Expressway-C and places the call on the standards-based trunk to Expressway-E.
 - d. Expressway-C routes standards-based SIP for unknown domains to Expressway-E.
 - e. Expressway-E does a SRV lookup for the standard SIP federation records for the unknown domain, and gets the edge server's address.
 - f. Expressway-E places the call.

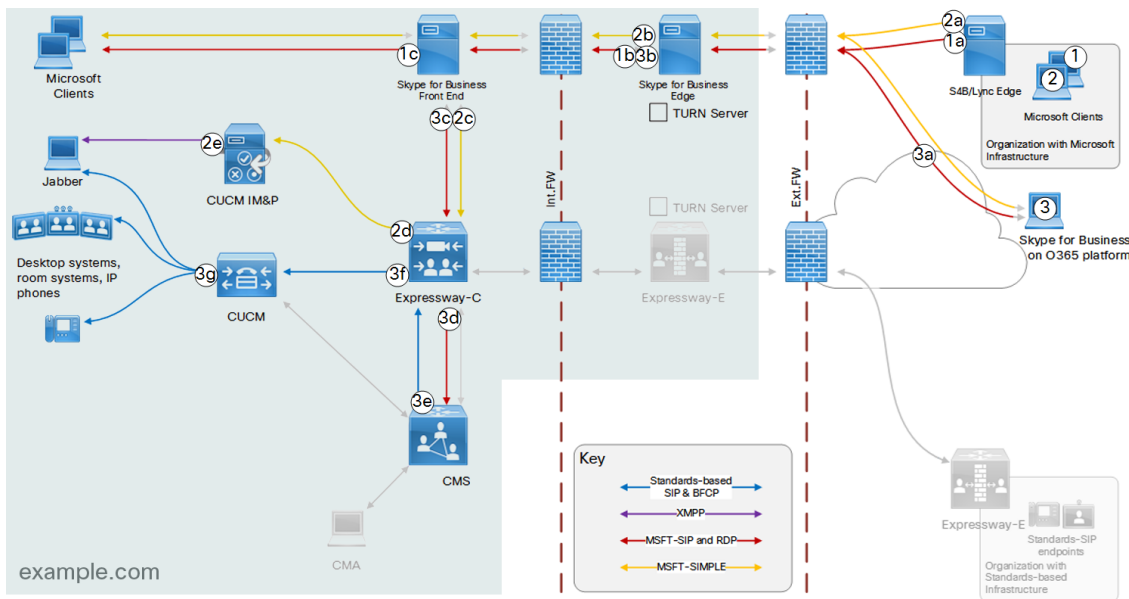
Figure 18 Inbound signaling from unknown SIP domains (domain has a standards-based edge)



1. Caller@unknownexample.com calls UCMendpoint@example.com:
 - a. Standards-based edge does a SRV lookup for standard SIP federation record for example.com, and gets the Expressway-E address.
 - b. Expressway-E routes all standards-based calls for example.com on the traversal zone to Expressway-C.
 - c. Expressway-C routes standards-based calls for example.com to Unified CM. This rule is set to continue if no match is found.
 - d. Unified CM places the call, via MRA if necessary (MRA endpoints not shown). If Unified CM cannot place the call, Expressway-C continues searching (see next use case).

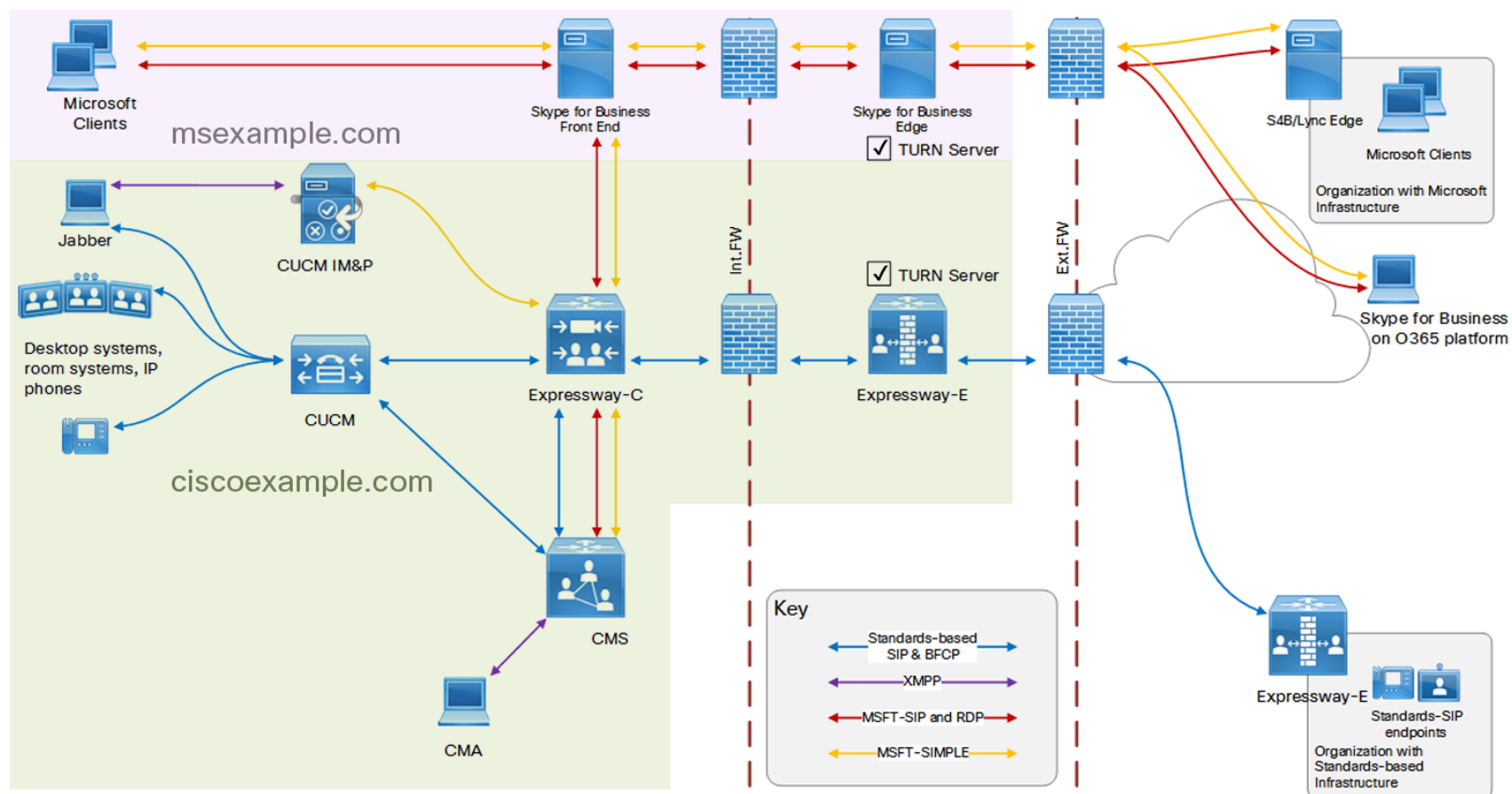
2. Caller@unknownexample.com calls MSClient@example.com:
 - a. Standards-based edge does a SRV lookup for standard SIP federation record for example.com, and gets the Expressway-E address.
 - b. Expressway-E routes all standards-based calls for example.com on the traversal zone to Expressway-C. Expressway-C routes standards-based calls for example.com to Unified CM. In this case Unified CM cannot place the call, because the recipient is registered to Front End.
 - c. Expressway-C continues searching. It finds a lower priority rule and routes the call to Meeting Server.
 - d. Meeting Server accepts inbound standards-based SIP from Expressway-C and forwards on the Microsoft-type trunk to Expressway-C.
 - e. Expressway-C routes Microsoft-variant SIP to Front End.
 - f. Front End places the call, via Edge if necessary (off-premises Microsoft clients not shown).
3. Caller@unknownexample.com calls cmsspace@space.example.com
 - a. Standards-based edge does a SRV lookup for standard SIP federation record for *space.example.com*, and gets the Expressway-E address.
 - b. Expressway-E routes all standards-based calls for *.*@space.example.com* on the traversal zone to Expressway-C.
 - c. Expressway-C routes standards-based calls for space addresses to Unified CM.
 - d. Unified CM routes space addresses on the trunk to Meeting Server.
 - e. Meeting Server terminates the call in the named space.

Figure 19 Inbound signaling from unknown SIP domains (domain has a Microsoft-based edge)



1. Caller@unknownexample.com calls MSClient@example.com:
 - a. Microsoft-based edge does a SRV lookup for Microsoft-variant SIP federation record for example.com, and gets the Skype for Business Edge address.
 - b. Edge proxies the call to Front End.

Business-to-business Federation With Two Local SIP Domains



User Outcomes

- Users of Microsoft clients and users of Cisco clients (in the same organization network) can call each other:
 - They can see and hear each other
 - They can share their screens with each other
 - If the clients are capable, they can message each other and see each others' presence status
 - They can do these things whether they are inside or outside the network
- Users of Microsoft clients and Cisco endpoints can meet in Meeting Server spaces
- Users of Microsoft clients and users of Cisco clients in this organization can call people in other, known organizations
- Users of Microsoft clients and Cisco endpoints in other organizations can call people in this organization
- Users of Microsoft clients and Cisco endpoints in this organization can call people in unknown organizations, if those organizations have published their SIP federation DNS records.

Deployment Summary

- This deployment adds business-to-business federation to the [On-premises Federation Between Two SIP Domains, page 66](#).

That deployment deals with all of the on-premises routing between Cisco infrastructure in *ciscoexample.com* SIP domain and Microsoft infrastructure within *msexample.com* SIP domain. It is assumed to be working correctly before you configure federation with external SIP domains.
- The Microsoft Skype for Business Edge Server is responsible for all inbound and outbound signaling with federated Microsoft infrastructure.
- The Expressway-E is responsible for all inbound and outbound signaling with federated standards-based infrastructure.

Technical Overview

- When the federated domain is known, outbound routing is easier. When the "federated" domain is not known, aka "open federation", outbound routing can take a little longer because the outbound calls may not match immediately if the wrong DNS lookup is tried first. This is because standards-based infrastructure and Microsoft infrastructure use a different pattern in the SIP federation DNS SRV record.
- Meeting Server uses different TURN servers for different purposes: it uses Skype for Business Edge turn services for media relay on Microsoft-variant B2B calls, and the Expressway-E turn services for media relay on standards-based B2B calls.
- Standards-based records for both on-premises domains (`_sip._tcp.ciscoexample.com` and `_sip._tcp.msexample.com` or `_sips._tcp.ciscoexample.com` and `_sips._tcp.msexample.com`) point to the public address(es) of the Expressway-E.
- Microsoft-variant records for both on-premises domains (`_sipfederationtls._tcp.msexample.com` and `_sipfederationtls._tcp.ciscoexample.com`) point to the public address(es) of the Skype for Business Edge.
- Meeting Server uses Skype for Business Edge turn services for media relay on Microsoft-variant business-to-business calls.
- Meeting Server uses Expressway-E turn services for media relay on standards-based business-to-business calls.

Configuration Summary

- [Core Configuration, page 18](#)
- Expressway-E:
 - Unified Communications traversal zone to Expressway-C
 - Search rules
- External DNS server:
 - DNS records for Dual homed conferencing (See *Cisco Meeting Server Single Combined Server Deployment Guide* at the [Meeting Server Configuration Guides page](#))
 - SIP federation SRV records for both internal domains. See [External DNS Records, page 115](#).

- Microsoft FE Server:

- Static route to Expressway-C for *ciscoexample.com*. Example:

```
$Route667=New-CsStaticRoute -TLSSRoute -Destination "expcpool.ciscoexample.com" -MatchUri "ciscoexample.com" -Port 5061 -UseDefaultCertificate $true
Set-CsStaticRoutingConfiguration -Identity global -Route @{Add=$Route667}
enable-cstopology
```
- Static route to Expressway-C for *space.ciscoexample.com*. Example:

```
$Route667=New-CsStaticRoute -TLSSRoute -Destination "expcpool.ciscoexample.com" -MatchUri "ciscoexample.com" -Port 5061 -UseDefaultCertificate $true
Set-CsStaticRoutingConfiguration -Identity global -Route @{Add=$Route667}
enable-cstopology
```
- Trusted application pool and application with Expressway-C cluster in the pool. Example:

```
New-CsTrustedApplicationPool -Identity expcpool.ciscoexample.com -Registrar sfbfe.msexample.com -site 1 -RequiresReplication $false -ThrottleAsServer $true -TreatAsAuthenticated $true
New-CsTrustedApplication -ApplicationId expc.ciscoexample.com -TrustedApplicationPoolFqdn expcpool.ciscoexample.com -Port 5061
```
- For dual homed conferencing: Trusted application and application pool with Meeting Server cluster in the pool. Example:

```
New-CsTrustedApplicationPool -Identity cmspool.ciscoexample.com -Registrar sfbfe.msexample.com -site 1 -RequiresReplication $false -ThrottleAsServer $true -TreatAsAuthenticated $true
New-CsTrustedApplication -ApplicationId space.ciscoexample.com -TrustedApplicationPoolFqdn cmspool.ciscoexample.com -Port 5061
```
- CA trust list to include Expressway-C's signing CA and Meeting Server's signing CA
- User dedicated to dual homed conferencing

- Expressway-C:

- Neighbor zone to Skype for Business Front End
- Neighbor zone to IM and Presence Service
- Neighbor zone to Unified CM
- Neighbor zone to Meeting Server
- Trust list to include Skype for Business FE servers' signing CA
- Search rules
- Unified Communications traversal zone to Expressway-E
- MRA enabled and the CUCM and IMP servers discovered (See MRA deployment guide in [Related Documents, page 6](#))

- Unified CM:

- SIP trunk to Expressway-C, listening on different port to the lineside port used for MRA
- SIP trunk to Meeting Server
- Dial plan for routing spaces towards Meeting Server
- MRA devices / users

- Cisco Unified Communications Manager IM and Presence Service

- Configure indirect, inter-domain federation with *msexample.com*, via Expressway-C. See [Configure IM and Presence Service for Interdomain Federation, page 72](#).

- Meeting Server:
 - Spaces configured according to pre-defined pattern.
We recommend using a subdomain for your conferences because some call agents cannot make routing decisions based on the username part of the requested URI. For example, we suggest that you use the form `user1@space.example.com` in your dial plan instead of `user1.space@example.com`. Another option is to use a numeric range in the dial plan, eg. `81100100@example.com` to `81100199@example.com`.
 - Skype for Business Edge integration (See *Cisco Meeting Server Single Combined Server Deployment Guide* at the [Meeting Server Configuration Guides page](#)) for dual homed conferencing
- Configure the dial plan across the infrastructure components.

Dial Plan Summary: Business-to-business Federation From Two SIP Domains

Microsoft infrastructure (not detailed in this document):

- Routing for all Microsoft clients in `*@msexample.com`, both on- and off-premises
- Calls for `*@ciscoexample.com` and `*@space.ciscoexample.com` route to Expressway-C
- Presence and messaging for `*@ciscoexample.com` and `*@space.example.com` route to Expressway-C
- Unknown destinations route out via Edge and DNS lookup
- (Lower priority than previous rule) Calls to unknown destinations route to Expressway-C

Unified CM

- Routing for registered endpoints `*@ciscoexample.com` (not detailed in this document)
- Destinations for `*@msexample.com` on trunk to Expressway-C
- Unknown destinations on trunk to Expressway-C
- Pattern for spaces on trunk to Meeting Server eg. `*@space.ciscoexample.com`

Expressway-C

Table 15 Expressway-C Dial Plan Rules

#	Source	Proto/variant	Mode/Pattern	Target zone	On match
	Any zone	Standards-based	<code>.*@msexample\.com</code>	Meeting Server zone	Stop
	Any zone	Microsoft AV & Share	<code>.*@msexample\.com</code>	Front End zone	Stop
	Front End zone	Microsoft AV & Share	<code>.*@ciscoexample\.com</code>	Meeting Server zone	Stop
	Front End zone	Microsoft SIP IM&P	<code>.*@ciscoexample\.com.*</code>	IM and Presence zone	Stop
	IM and Presence zone	Microsoft SIP IM&P	Known federated Microsoft-based domains eg <code>.*@msdomain1.com</code>	Front End zone	Stop
	Any zone	Standards-based	<code>.*@ciscoexample\.com</code>	Unified CM zone	Stop
	Any zone	Standards-based	<code>.*@space\.ciscoexample\.com</code>	Unified CM zone	Stop

Table 15 Expressway-C Dial Plan Rules (continued)

#	Source	Proto/variant	Mode/Pattern	Target zone	On match
	Front End zone	Microsoft AV & Share	.*@space\.ciscoexample\.com.*	Meeting Server zone	Stop
	Front End zone	Microsoft SIP IM&P	.*@space\.ciscoexample\.com.*	Meeting Server zone	Stop
	Meeting Server zone	Microsoft SIP IM&P	Known federated Microsoft-based domains eg .*@msdomain1.com	Front End zone	Stop
	Unified CM zone	Standards-based	Known federated Microsoft-based domains eg .*@msdomain1.com	Meeting Server zone	Stop
	Meeting Server zone	Microsoft AV & Share	Known federated Microsoft-based domains eg .*@msdomain1.com	Front End zone	Stop
	Unified CM zone	Standards-based	Known federated standards-based domains eg .*@stdsdomain1.com	Unified Communications traversal (client) zone	Stop
	Meeting Server zone	Standards-based	Known federated standards-based domains eg .*@stdsdomain1.com	Unified Communications traversal (client) zone	Stop
	Any zone	Standards-based	Any alias	Unified Communications traversal (client) zone	Continue
	Unified CM zone	Standards-based	Any alias	Meeting Server zone	Stop
	Meeting Server zone	Microsoft AV & Share	Any alias	Front end zone	Stop
Note:	This rule simplifies the dial plan; it replaces all other rules handling Microsoft AV & Share from the Meeting Server zone.				
	IM and Presence zone	Microsoft SIP IM&P	Any alias	Front End zone	Stop
	Meeting Server zone	Microsoft SIP IM&P	Any alias	Front End zone	Stop
Note:	Previous two rules are lower priority than more specific rules. They are only required for 'open federation' with Microsoft-based domains.				

Expressway-E**Table 16 Expressway-E Dial Plan Rules**

#	Source	Proto/variant	Mode/Pattern	Target zone	On match
	Default Zone	Standards-based	.*@ciscoexample\.com	Unified Communications traversal (server) zone	Stop
	Default Zone	Standards-based	.*@msexample\.com	Unified Communications traversal (server) zone	Stop
	Default Zone	Standards-based	.*@space\.ciscoexample\.com	Unified Communications traversal (server) zone	Stop

Table 16 Expressway-E Dial Plan Rules (continued)

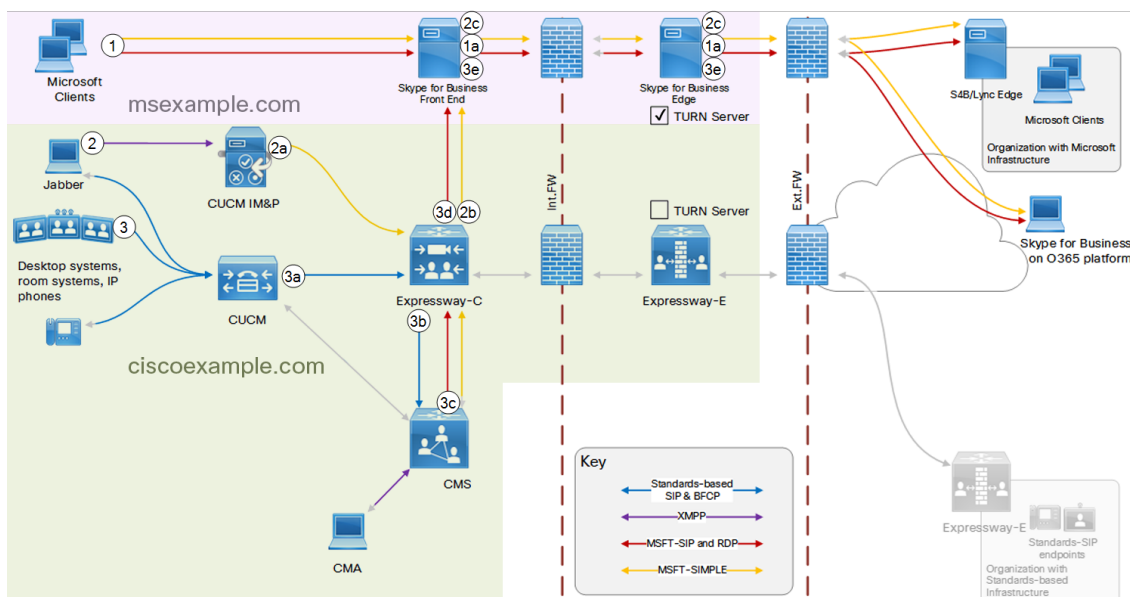
#	Source	Proto/variant	Mode/Pattern	Target zone	On match
	Unified Communications traversal (server) zone	Standards-based	Any alias	DNS zone	Stop

Meeting Server**Table 17 Meeting Server Dial Plan Rules**

#	Direction	(Matching or Routing) Pattern	Action	Trunk type
	Inbound	Match *@space.example.com	Terminate	-
	Inbound	Match *@ciscoexample.com	Forward	-
	Outbound	Route *@ciscoexample.com		Standards type
	Outbound	Route *@stdsdomain1.com		Standards type
	Inbound	Match *@msexample.com	Forward	-
	Outbound	Route *@msexample.com		Lync type
	Outbound	Route *@msdomain1.com		Lync type
	Inbound	Match *	Forward	-
	Outbound	Route *		Lync type

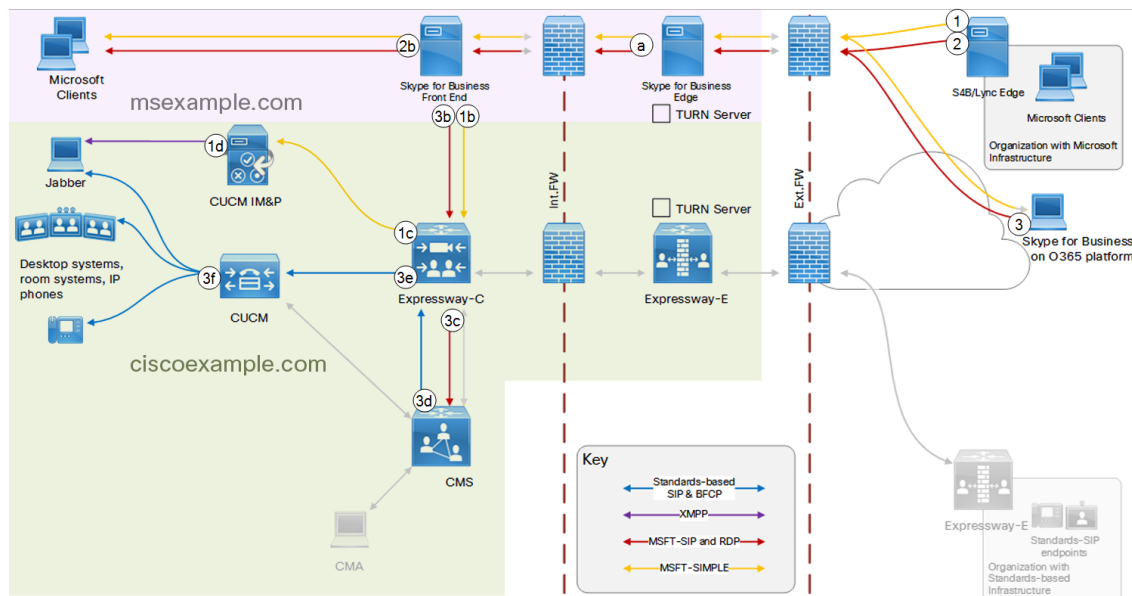
Call Setup With Known External Domains

Federated Domain uses Microsoft Infrastructure

Figure 20 Outbound signaling paths

1. Caller@msexample.com initiates call or chat to callee@msb2bexample.com.
 - a. Front End routes calls for non-local domains out via Skype for Business Edge.
2. JabberUser@ciscoexample.com initiates chat with SkypeForBusinessUser@msb2bexample.com
 - a. IM and Presence Service routes this on static route to Expressway-C
 - b. Expressway-C sees Microsoft SIP IM&P and recognizes the destination domain, so routes to Skype for Business Front End.
 - c. Front End routes Microsoft-variant SIP IM&P for non-local domains out via Skype for Business Edge.
3. Caller@ciscoexample.com initiates call to callee@msb2bexample.com.
 - a. Unified CM does not recognize the recipient and routes on the trunk to Expressway-C.
 - b. Expressway-C recognizes the destination domain and standards-based SIP, so routes the call to Meeting Server.
 - c. Meeting Server forwards the standards-based SIP from Expressway-C on Microsoft-variant trunk to Expressway-E.
 - d. Expressway-E recognises Microsoft-variant SIP and the federated domain, so routes the call to the Front End.
 - e. Front End routes calls for non-local domains out via Skype for Business Edge.

Figure 21 Inbound signaling paths

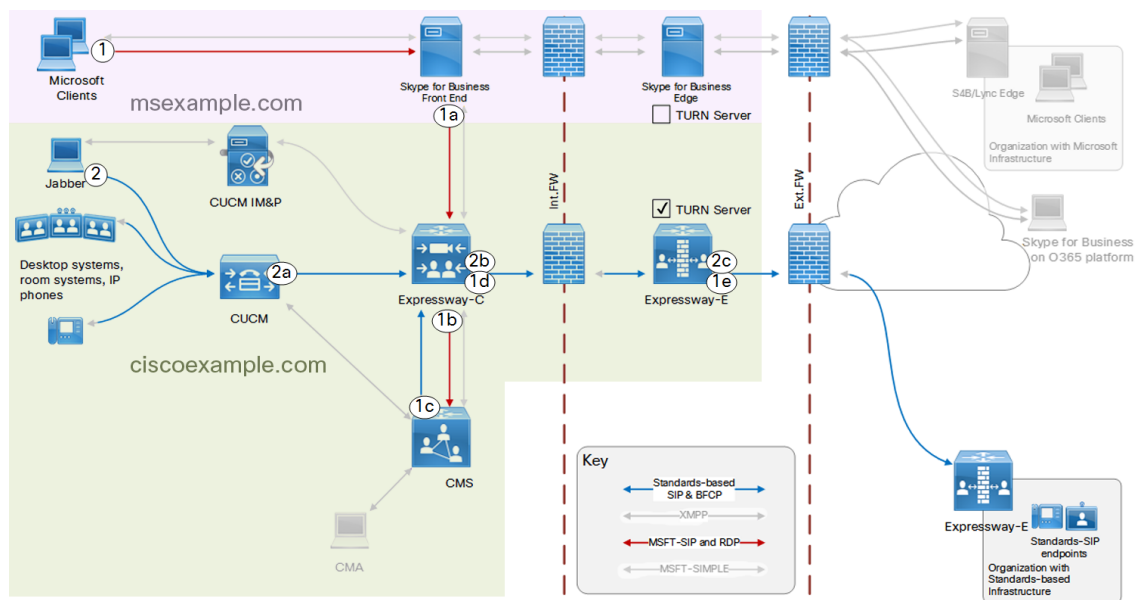


1. SkypeForBusinessUser@msb2bexample.com initiates chat with JabberUser@ciscoexample.com.
 - a. Skype for Business Edge routes the call or chat in to the Front End.
 - b. Front End routes Microsoft-variant SIP IM&P for this domain to Expressway-C.
 - c. Expressway-C sees Microsoft SIP IM&P and recognizes the destination domain, so routes to IM&P.
 - d. IM&P connects the chat if possible.

2. Caller@msb2bexample.com initiates call or chat to callee@msexample.com.
 - a. Skype for Business Edge routes the call or chat in to the Front End.
 - b. Front End places the call if possible.
This could be to an off-premises user registered to the msexample.com domain, but these users are not shown on the diagram.
3. Caller@O365example.com initiates call to callee@ciscoexample.com.
 - a. Skype for Business Edge routes the call or chat in to the Front End.
 - b. Front End routes Microsoft-variant SIP for this domain to Expressway-C.
 - c. Expressway-C recognizes the destination domain and Microsoft-variant SIP, so routes the call to Meeting Server.
 - d. Meeting Server forwards the Microsoft-variant SIP from Expressway-C on standards-based trunk to Expressway-E
 - e. Expressway-E recognizes standards-based SIP and the local domain, so routes the call to Unified CM.
 - f. Unified CM places the call.

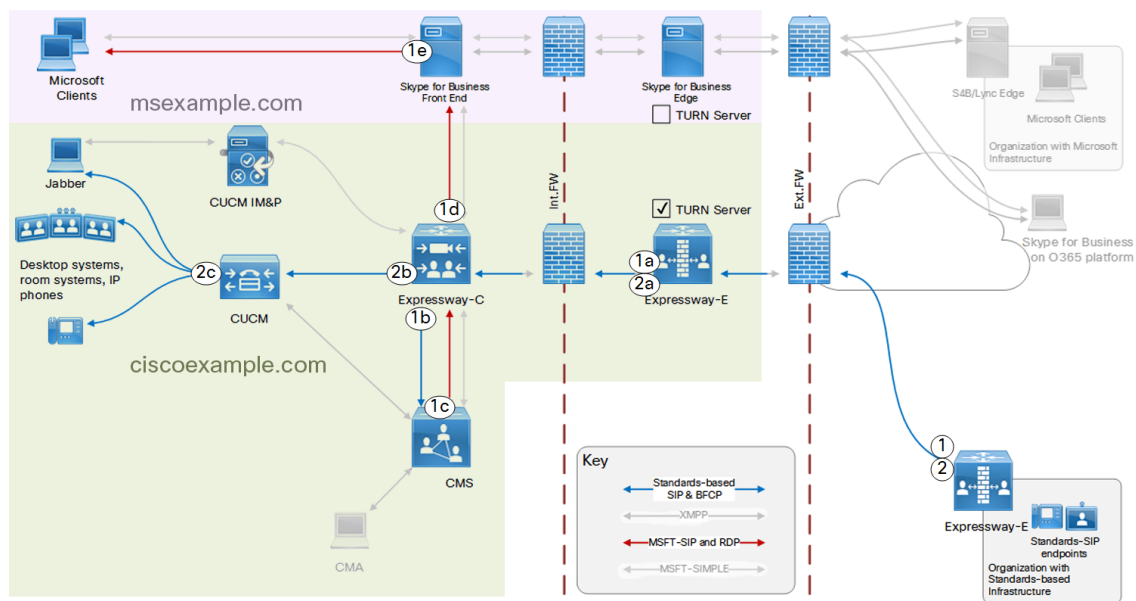
Federated Domain uses Standards-based Infrastructure

Figure 22 Outbound signaling paths



1. Caller@msexample.com initiates call to callee@ciscob2bexample.com.
 - a. Front End routes Microsoft-variant SIP for known standards-based federated domains to Expressway-C.
 - b. Expressway-C recognizes the destination domain and Microsoft-variant SIP, so routes the call to Meeting Server
 - c. Meeting Server forwards the Microsoft-variant SIP from Expressway-C on standards-based trunk to Expressway-E

- d. Expressway-C recognizes the destination domain and standards-based SIP, so routes the call to Expressway-E
 - e. Expressway-E routes the call using the DNS zone.
2. JabberUser@ciscoexample.com initiates call with callee@ciscob2bexample.com
 - a. Unified CM routes non-local domains on trunk to Expressway-C.
 - b. Expressway-C recognizes the destination domain and standards-based SIP, so routes the call to Expressway-E.
 - c. Expressway-E routes the call using the DNS zone.

Figure 23 Inbound signaling paths

1. Caller@ciscob2bexample.com initiates call to callee@msexample.com.
The standards-based edge does a lookup for the standard SIP federation SRV record for msexample.com, which resolves to Expressway-E.
 - a. Expressway-E routes the call to Expressway-C.
 - b. Expressway-C recognizes the destination domain and standards-based SIP, so routes the call to Meeting Server
 - c. Meeting Server forwards the standards-based SIP from Expressway-C on Microsoft-variant trunk to Expressway-C
 - d. Expressway-C recognizes the destination domain and Microsoft-variant SIP, so routes the call to Front End
 - e. Front End places the call.

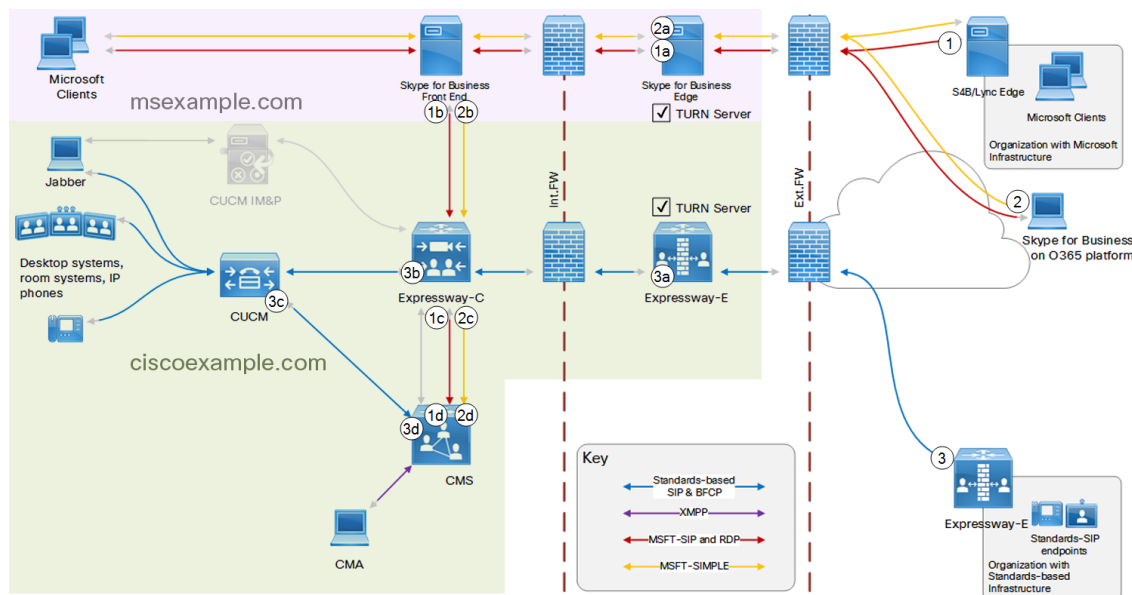
2. Caller@ciscob2bexample.com initiates call to callee@ciscoexample.com.

The standards-based edge does a lookup for the standard SIP federation SRV record for ciscoexample.com, which resolves to Expressway-E.

- a. Expressway-E routes the call to Expressway-C.
- b. Expressway-C recognizes the destination domain and standards-based SIP, so routes the call to Unified CM
- c. Unified CM places the call.

Participants From Federated Domains In Meeting Server Spaces

Figure 24 Participants join spaces



1. Caller@msb2bexample.com dials cmsspace@space.ciscoexample.com (or numericpattern@ciscoexample.com)

The Microsoft-based edge does a lookup for the Microsoft-variant SIP federation SRV record for space.ciscoexample.com, which resolves to our organization's Skype for Business Edge server.

- a. Skype for Business Edge routes the call in to Front End
- b. Front End routes the call to Expressway-C
- c. Expressway-C routes Microsoft SIP for the space pattern to Meeting Server
- d. Meeting Server terminates the call in the named space

2. SkypeForBusinessUser@O365example.com initiates chat in cmsspace@space.ciscoexample.com (or numericpattern@ciscoexample.com)

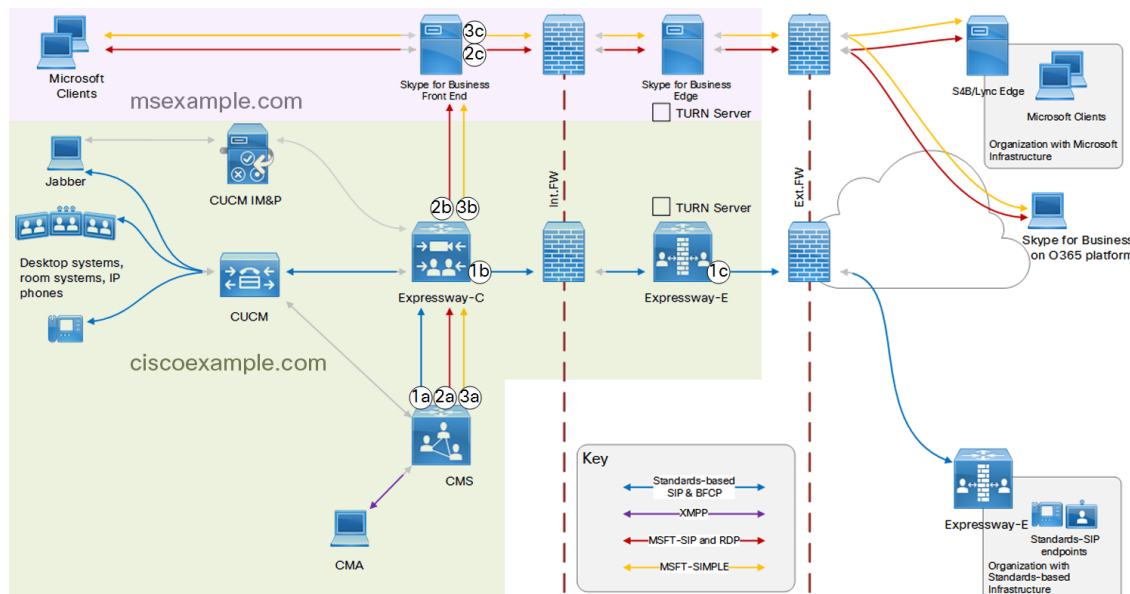
The Microsoft-based edge does a lookup for the Microsoft-variant SIP federation SRV record for space.ciscoexample.com, which resolves to our organization's Skype for Business Edge server.

- a. Skype for Business Edge routes the chat in to Front End
 - b. Front End routes the chat to Expressway-C
 - c. Expressway-C routes Microsoft SIP IM&P for the space pattern to Meeting Server
 - d. Meeting Server terminates the chat in the named space
3. Caller@ciscob2bexample.com dials cmsspace@space.ciscoexample.com (or numericpattern@ciscoexample.com)

The standards-based edge does a lookup for the standard SIP federation SRV record for space.ciscoexample.com, which resolves to Expressway-E.

- a. Expressway-E routes the call to Expressway-C
- b. Expressway-C routes standards-based SIP with the space pattern to Unified CM
- c. Unified CM routes the call on trunk to Meeting Server
- d. Meeting Server terminates the call in the named space

Figure 25 Spaces invite participants

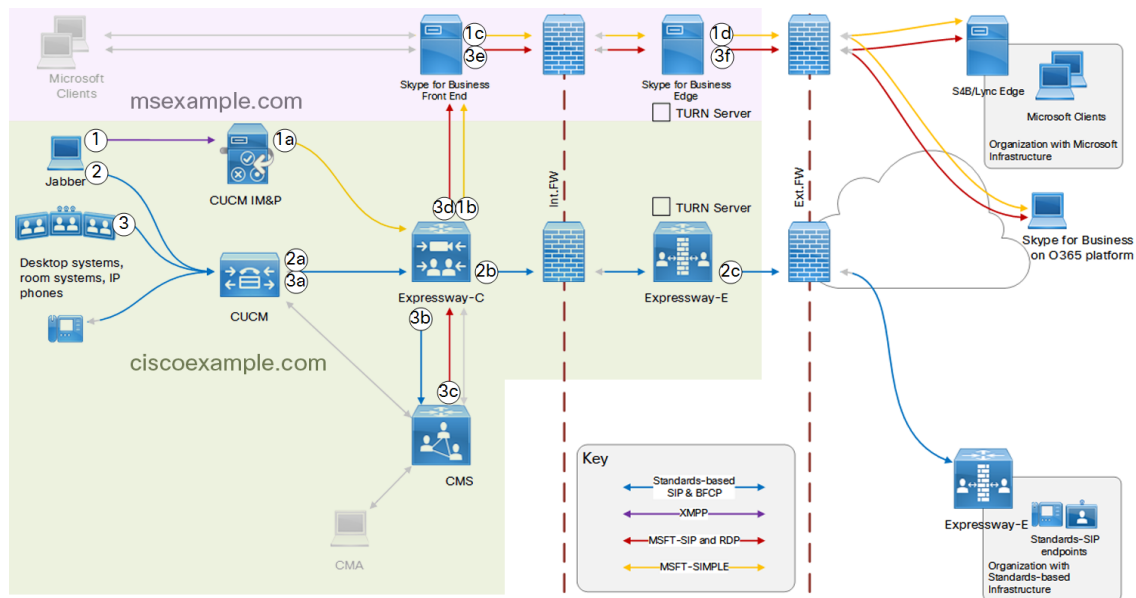


1. cmsspace@space.ciscoexample.com (or numericpattern@ciscoexample.com) invites Callee@ciscob2bexample.com:
 - a. Meeting Server routes the call on the standards-based trunk to Expressway-C
 - b. Expressway-C routes the standards-based SIP variant for this domain to Expressway-E
 - c. Expressway-E places the call via DNS search

2. cmsspace@space.ciscoexample.com (or numericpattern@ciscoexample.com) invites Callee@msb2bexample.com
 - a. Meeting Server places the call on the Microsoft-variant trunk to Expressway-C
 - b. Expressway-C routes Microsoft-variant SIP for this domain to Skype for Business Front End
 - c. Front End routes the call out via Skype for Business Edge
3. Cmsspace@space.ciscoexample.com (or numericpattern@ciscoexample.com) initiates chat with SkypeforBusinessUser@O365example.com
 - a. Meeting Server routes the chat on the Microsoft-variant trunk to Expressway-C
 - b. Expressway-C routes Microsoft SIP IM&P for this domain to Front End
 - c. Front End routes the chat out via Skype for Business Edge

Call Setup With UnKnown External Domains

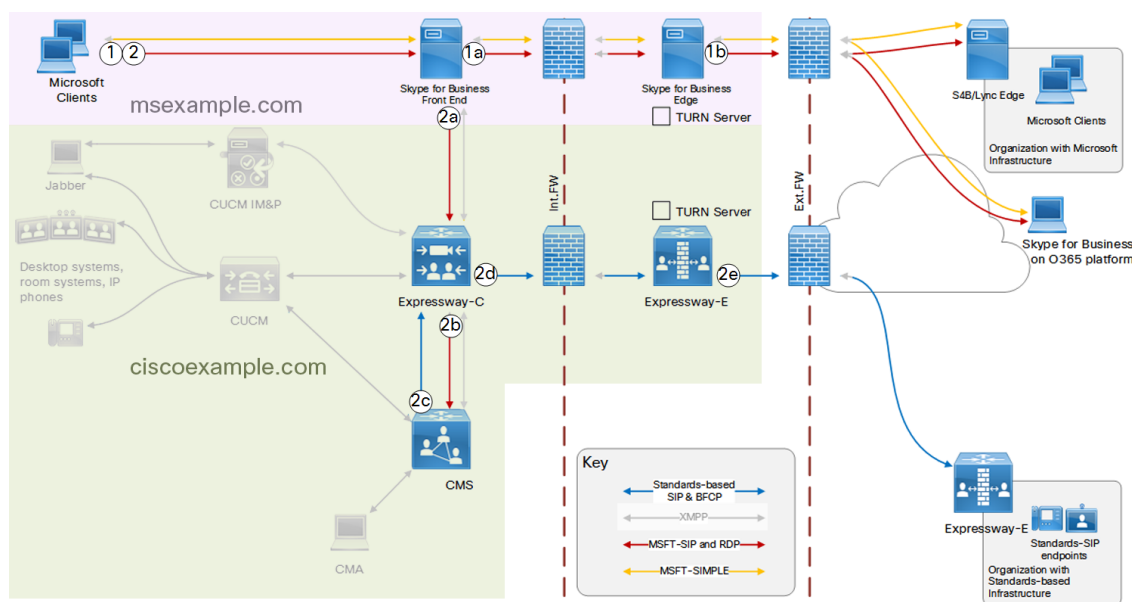
Figure 26 Outbound signaling from Unified CM-registered endpoints to unknown SIP domains



1. Jabber user tries to chat with an unknown external domain
 - a. IM&P cannot route this, sends it to Expressway-C
 - b. Expressway sees Microsoft IM&P and routes it to Front End.
 - c. Front End cannot route the call locally and sends it out via Edge
 - d. Edge does a SRV lookup for the unknown domain, tries to route the chat to the returned addresses.

2. Unified CM-registered endpoint initiates call to unknown domain (the domain has published standards-based federation record):
 - a. Unified CM cannot place the call locally and routes it on trunk to Expressway-C
 - b. Expressway-C routes the call to Expressway-E. This rule is set to continue searching if a match is not found.
 - c. Expressway-E does a SRV lookup for the standards-based federation record.
Expressway-E routes the call to an address returned by the SRV lookup.
If Expressway-E cannot place the call to a standards-based SIP agent, Expressway-C continues searching (see next use case).
 3. Unified CM-registered endpoint initiates call to unknown domain (the domain has published Microsoft-based federation record):
 - a. Unified CM cannot place the call locally and routes it on trunk to Expressway-C
Expressway-C routes the call to Expressway-E. The Expressway-E attempts standards-based federation (see previous use case). The attempt fails, so the Expressway-C continues searching.
 - b. Expressway-C finds a lower priority rule to route unknown standards-based SIP to Meeting Server
 - c. Meeting Server forwards the standards-based call from Expressway-C on the Microsoft-variant trunk to Expressway-C.
 - d. Expressway-C sees Microsoft-variant SIP from Meeting Server and routes it to Skype for Business Front End.
 - e. Front End routes the call out to Skype for Business Edge
 - f. Edge attempts Microsoft-based federation.
- Note:** This rule must be more permissive than the rule for known federations. It must match on any domain, and so it can replace any existing rules for Microsoft-variant SIP towards Front End.

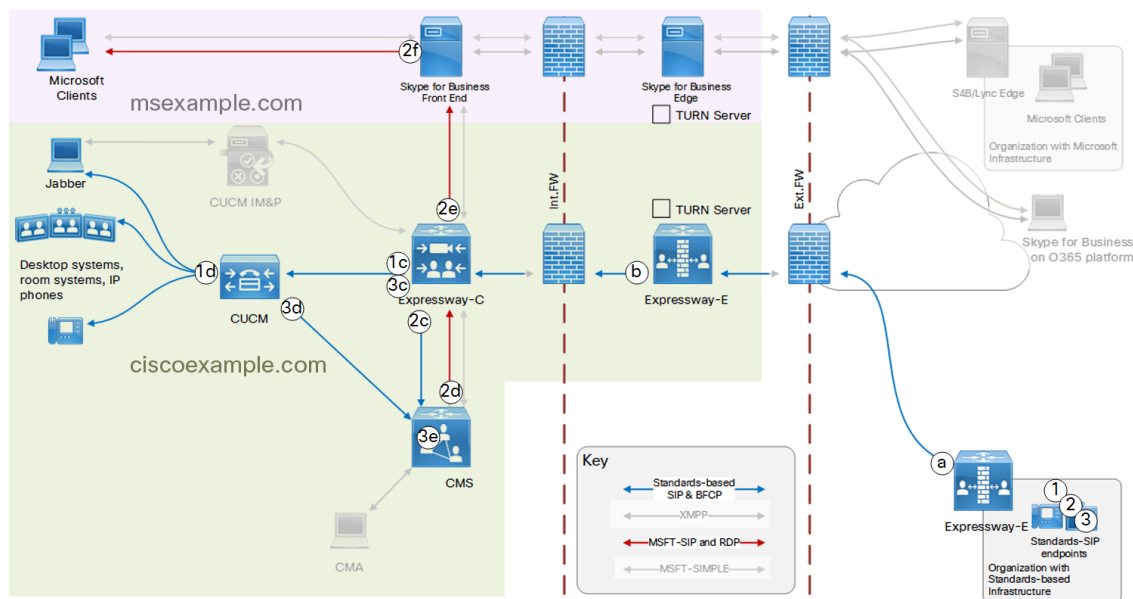
Figure 27 Outbound signaling from Front End-registered endpoints to unknown SIP domains



1. Microsoft-registered client initiates call to unknown domain (domain has published Microsoft-based federation record):

- a. Front End cannot route the call locally and sends it out to Skype for Business Edge.
 - b. Skype for Business Edge attempts Microsoft-variant federation.
If Microsoft-variant federation fails Front End tries the route to Expressway-C.
2. Microsoft-registered client initiates call to unknown domain (domain has published Standards-based federation record):
 - a. Front End places the call on trunk to Expressway-C
 - b. Expressway-C routes Microsoft-variant SIP to Meeting Server
 - c. Meeting Server forwards Microsoft-variant SIP from Expressway-C on standards-based trunk to Expressway-C
 - d. Expressway-C routes the call to Expressway-E. This rule is set to continue searching if a match is not found.
 - e. Expressway-E attempts standards-based federation.

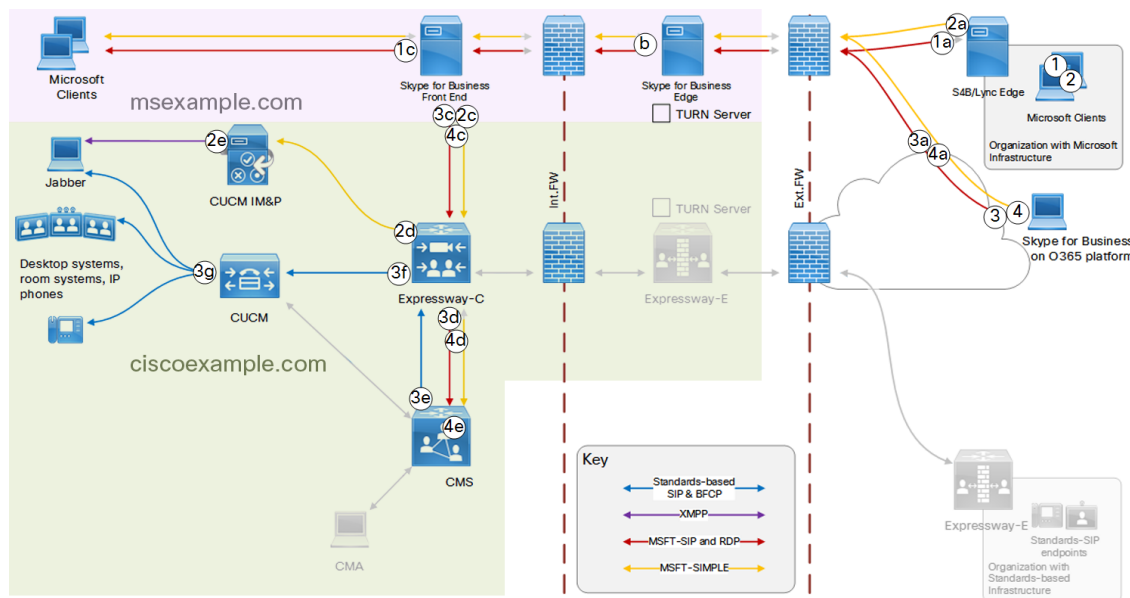
Figure 28 Inbound signaling from unknown SIP domains (domain has a standards-based edge)



1. Caller@unknownexample.com calls UCMendpoint@ciscoexample.com:
 - a. Standards-based edge does a SRV lookup for standard SIP federation record for ciscoexample.com, and gets the Expressway-E address.
 - b. Expressway-E routes all standards-based calls for ciscoexample.com on the traversal zone to Expressway-C.
 - c. Expressway-C routes standards-based calls for ciscoexample.com to Unified CM.
 - d. Unified CM places the call, via MRA if necessary (MRA endpoints not shown).

2. Caller@unknownexample.com calls MScient@msexample.com:
 - a. Standards-based edge does a SRV lookup for standard SIP federation record for msexample.com, and gets the Expressway-E address.
 - b. Expressway-E routes all standards-based calls for msexample.com on the traversal zone to Expressway-C.
 - c. Expressway-C routes standards-based calls for msexample.com to Meeting Server.
 - d. Meeting Server accepts inbound standards-based SIP from Expressway-C and forwards on the Microsoft-type trunk to Expressway-C.
 - e. Expressway-C routes Microsoft-variant SIP to Front End.
 - f. Front End places the call, via Edge if necessary (off-premises Microsoft clients not shown).
3. Caller@unknownexample.com calls cmsspace@space.ciscoexample.com
 - a. Standards-based edge does a SRV lookup for standard SIP federation record for ciscoexample.com, and gets the Expressway-E address.
 - b. Expressway-E routes all standards-based calls for ciscoexample.com on the traversal zone to Expressway-C.
 - c. Expressway-C routes standards-based calls for space addresses to Unified CM.
 - d. Unified CM routes space addresses on the trunk to Meeting Server.
 - e. Meeting Server terminates the call in the named space.

Figure 29 Inbound signaling from unknown SIP domains (domain has a Microsoft-based edge)



1. Caller@unknownexample.com calls MScient@MSexample.com:
 - a. Microsoft-based edge does a SRV lookup for Microsoft-variant SIP federation record for MSexample.com, and gets the Skype for Business Edge address.
 - b. Edge proxies the call to Front End.
 - c. Front End places the call to a locally-registered client, via the Edge if necessary (off-premises msexample.com clients not shown).

2. Chatter@unknownexample.com initiates chat with JabberUser@ciscoexample.com:
 - a. Microsoft-based edge does a SRV lookup for Microsoft-variant SIP federation record for ciscoexample.com, and gets the Skype for Business Edge address.
 - b. Edge proxies the chat to Front End.
 - c. Front End recognizes ciscoexample.com and routes the chat to the Expressway-C.
 - d. Expressway-C routes Microsoft SIP IM&P to Cisco Unified Communications Manager IM and Presence Service.
 - e. IM and Presence places XMPP chat to the Jabber user, via MRA if necessary (MRA clients not shown).
3. Caller@unknownexample.com calls UCMendpoint@ciscoexample.com
 - a. Microsoft-based edge does a SRV lookup for Microsoft-variant SIP federation record for ciscoexample.com, and gets the Skype for Business Edge address.
 - b. Edge proxies the call to Front End.
 - c. Front End recognizes ciscoexample.com and routes the call to Expressway-C.
 - d. Expressway-C routes Microsoft-variant SIP to Meeting Server
 - e. Meeting Server accepts inbound Microsoft-variant SIP from Expressway-C and forwards it on the standards type trunk to Expressway-C
 - f. Expressway-C routes standards-based SIP for ciscoexample.com to Unified CM
 - g. Unified CM places the call to the locally registered endpoint, via MRA if necessary (MRA endpoints not shown).
4. users@unknownexample.com call and chat in spaces:
 - a. Microsoft-based edge does a SRV lookup for Microsoft-variant SIP federation record for space.ciscoexample.com, and gets the Skype for Business Edge address.
 - b. Edge proxies the call to Front End.
 - c. Front End recognizes the space address and routes the calls/chats to Expressway-C.
 - d. Expressway-C recognizes the space address pattern and the Microsoft variant signaling, and routes to Meeting Server.
 - e. Meeting Server terminates the call or chat in the named space.

Appendix 1: DNS Entries

External DNS Records	115
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External DNS Records

Configure the external DNS with the records you need for your deployment. This table lists example records you may need for the purposes described in this document.

Table 18 DNS Configuration Summary

Purpose	Record type	Example entry	Port	Resolves to target
Resolve Expressway-E cluster FQDN to peer IP addresses	A/AAAA	<i>expe.example.com</i>		Public IP address of one Expressway-E cluster peer. Create one record for each peer in the Expressway-E cluster (Up to 6 records).
Discover destination for calls to third party Microsoft infrastructure domain (Outside of your control, but needs to be there for federation to succeed)	SRV	<i>_sipfederationtls._tcp.msb2bexample.com.</i>	5061	Public address of Microsoft Skype for Business Edge server / cluster
Discover destination for calls to third party standards-based infrastructure domain (Outside of your control, but needs to be there for federation to succeed)	SRV	<i>_sip._tcp.ciscob2bexample.com.</i> Or <i>_sips._tcp.ciscob2bexample.com.</i>	5060 or 5061	Public address of standards-based edge server / cluster
Discover user destination for calls from third party Microsoft infrastructure domain	SRV	<i>_sipfederationtls._tcp.example.com.</i>	5061	FQDN of Skype for Business Edge, eg. <i>s4be.example.com</i>
Discover space destination for calls from third party Microsoft infrastructure domain	SRV	<i>_sipfederationtls._tcp.space.example.com.</i>	5061	FQDN of Skype for Business Edge, eg. <i>s4be.example.com</i>

Table 18 DNS Configuration Summary (continued)

Purpose	Record type	Example entry	Port	Resolves to target
Discover user destination for calls from standards-based business to business federation, SIP TCP	SRV	<code>_sip._tcp. example.com.</code>	5060	FQDN of Expressway-E cluster, eg. <code>expe.example.com</code>
Discover user destination for calls from standards-based business to business federation, SIP TLS	SRV	<code>_sips._tcp. example.com.</code>	5061	FQDN of Expressway-E cluster, eg. <code>expe.example.com</code>
Discover space destination for calls from standards-based business to business federation, SIP TCP	SRV	<code>_sip._tcp. space.example.com.</code>	5060	FQDN of Expressway-E cluster, eg. <code>expe.example.com</code>
Discover space destination for calls from standards-based business to business federation, SIP TLS	SRV	<code>_sips._tcp. space.example.com.</code>	5061	FQDN of Expressway-E cluster, eg. <code>expe.example.com</code>
Discover edge for calls from third party Microsoft infrastructure domain towards Unified CM-registered endpoints when using two SIP domains in our organization	SRV	<code>_sipfederationtls._tcp. ciscoexample.com.</code>	5061	FQDN of Skype for Business Edge, eg. <code>s4be.example.com</code>
Discover edge for calls from third party Microsoft infrastructure domain towards Microsoft-registered endpoints when using two SIP domains in our organization	SRV	<code>_sipfederationtls._tcp. msexample.com.</code>	5061	FQDN of Skype for Business Edge, eg. <code>s4be.example.com</code>
Discover edge for calls from third party Microsoft infrastructure to Meeting Server spaces in our organization	SRV	<code>_sipfederationtls._tcp. space.ciscoexample.com.</code>	5061	FQDN of Skype for Business Edge, eg. <code>s4be.example.com</code>
Discover edge for SIP TCP calls from third party standards-based infrastructure towards Unified CM-registered endpoints in our organization	SRV	<code>_sip._tcp. ciscoexample.com.</code>	5060	FQDN of Expressway-E cluster, eg. <code>expe.example.com</code>
Discover edge for SIP TLS calls from third party standards-based infrastructure towards Unified CM-registered endpoints in our organization	SRV	<code>_sips._tcp. ciscoexample.com.</code>	5061	FQDN of Expressway-E cluster, eg. <code>expe.example.com</code>
Discover edge for SIP TCP calls from third party standards-based infrastructure towards Microsoft-registered endpoints in our organization	SRV	<code>_sip._tcp. msexample.com.</code>	5060	FQDN of Expressway-E cluster, eg. <code>expe.example.com</code>

Table 18 DNS Configuration Summary (continued)

Purpose	Record type	Example entry	Port	Resolves to target
Discover edge for SIP TLS calls from third party standards-based infrastructure towards Microsoft-registered endpoints in our organization	SRV	<code>_sips._tcp. msexample.com.</code>	5061	FQDN of Expressway-E cluster, eg. <code>expe.example.com</code>
Discover edge for SIP TCP calls from third party standards-based infrastructure to Meeting Server spaces in our organization	SRV	<code>_sip._tcp. space.ciscoexample.com.</code>	5060	FQDN of Expressway-E cluster, eg. <code>expe.example.com</code>
Discover edge for SIP TLS calls from third party standards-based infrastructure to Meeting Server spaces in our organization	SRV	<code>_sips._tcp. space.ciscoexample.com.</code>	5061	FQDN of Expressway-E cluster, eg. <code>expe.example.com</code>

Deployment Limitations Related to DNS

DNS Load Balancing by Microsoft Skype for Business (also applies to Microsoft Lync Server)

Microsoft Skype for Business does not attempt to use DNS SRV load balancing when routing calls or messages to federated domains; the Microsoft Skype for Business Edge servers always choose the DNS SRV record with the lowest priority and highest weight, ignoring all others. When the priorities and weights are equal, they choose one and ignore all others.

Microsoft's best practices recommend that you configure round-robin A/AAAA record load balancing, using the A record `sip.domain.com`. That is, the DNS SRV record for SIP federation should have only one entry that targets a single round-robin A/AAAA record that includes all of your Expressway-E cluster peers.

For example:

- Create the SRV record `_sipfederationtls._tcp.ciscoexample.com.` with a single entry targeting `sip.ciscoexample.com`
- Create an A/AAAA record for `sip.ciscoexample.com` that targets either the public IP address of the Expressway-E, or multiple A/AAAA records for round-robin service of all the Expressway-E peers in the cluster.

Domain Namespace Compatibility for Microsoft Skype for Business (also applies to Microsoft Lync Server)

Microsoft Skype for Business requires that federated edge servers are in the same DNS namespace (domain/subdomain) as the federated SIP domain. If they are not in the same DNS namespace, then federation will fail without additional configuration on the Skype for Business servers.

We recommend that your DNS SRV records for SIP federation resolve to a target in the same DNS namespace, so that open SIP federation will work from the Microsoft side without requiring any additional configuration.

For example, if you intend to federate Microsoft infrastructure with the domain `cms.ciscoexample.com`, you would create the SRV record `_sipfederationtls._tcp.cms.ciscoexample.com.`. The target of that DNS SRV must be an A/AAAA record in the subdomain `cms.ciscoexample.com` (eg. `sip.cms.ciscoexample.com`). If the DNS SRV target were outside that namespace (eg. `sip.ciscoexample.com`) then the Microsoft side would not allow the connection.

Internal DNS Records

If you can split your DNS to give different results internally, then we recommend that you create different records for the following purposes. These records must be resolvable by Expressway-C.

Table 19 DNS Configuration Summary

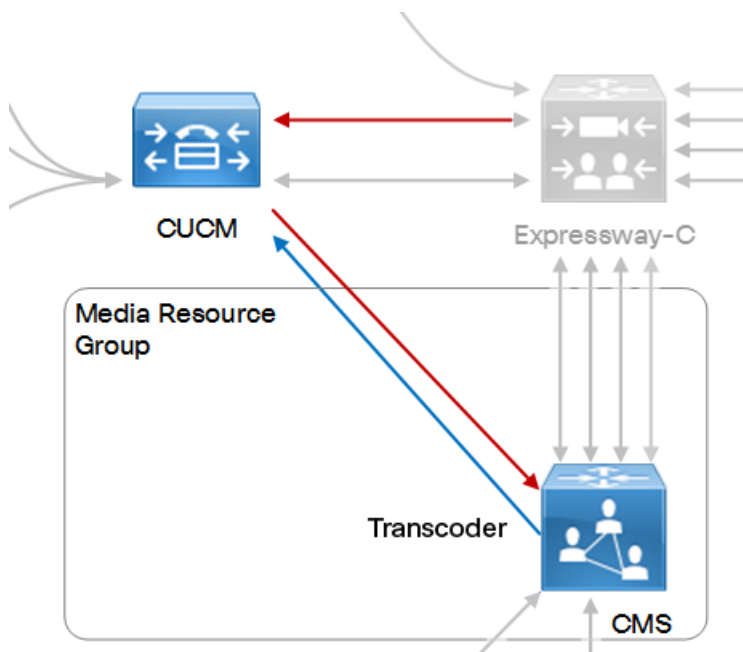
Purpose	Record type	Example entry	Port	Resolves to
For Expressway-C to resolve the Federation Routing IM/P FQDN of the IM and Presence Service cluster	A	<code>IMP1-public.ciscoexample.com</code>		IP address of the IM and Presence Service publisher

Appendix 2: Unsupported Deployments

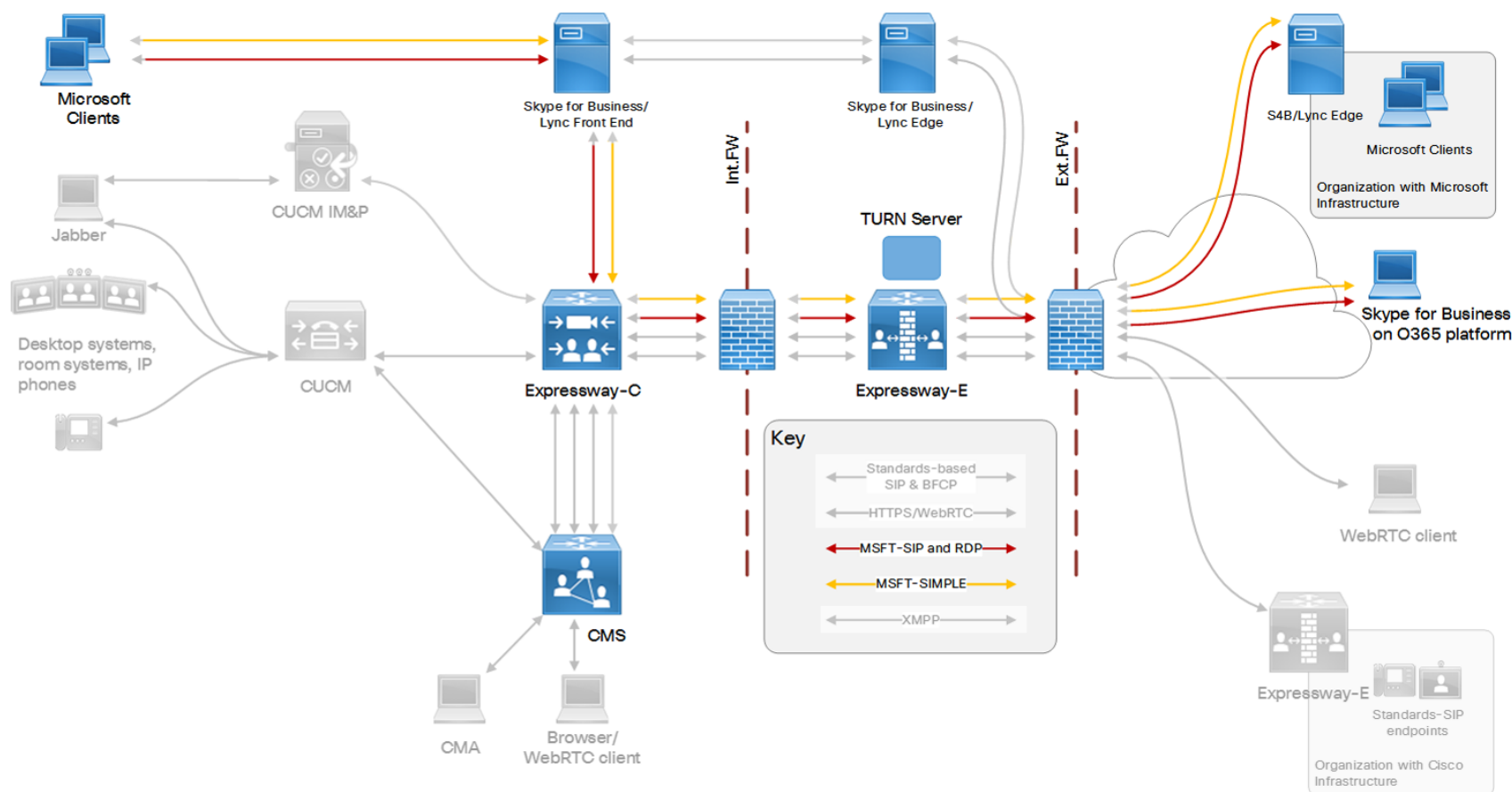
- Off-premises Microsoft clients traversing the Expressway pair to the on-premises Skype for Business Front End Servers (topology shown in [\[Unsupported\] Expressway Pair Traversing on Behalf of Microsoft On-Premises Infrastructure, page 120](#)). Skype for Business Edge Server is required for this scenario.
- Unified CM handling Microsoft-variant SIP and invoking Meeting Server (in a media resource group) to do transcoding. [\[Unsupported\] Unified CM Invoking Meeting Server as a Transcoder \(MRG\), page 119](#). This option is being investigated but is in no way supported in this release.
- Cisco Meeting App traversing the Expressway pair to the Cisco Meeting Server. This is work in progress, but not currently available. External users can join with the Cisco Meeting WebRTC App using [a supported browser](#).
- The **Preloaded SIP routes support** option for Expressway zones configuration is neither required nor supported for Microsoft interoperability using Expressway and Meeting Server.

[Unsupported] Unified CM Invoking Meeting Server as a Transcoder (MRG)

This option is not supported because Unified CM cannot currently invoke Cisco Meeting Server as a transcoder. The Meeting Server can be part of a Media Resource Group for other purposes, for example, for ad hoc conference escalation.



[Unsupported] Expressway Pair Traversing on Behalf of Microsoft On-Premises Infrastructure



This option is not supported when the Expressway pair is configured as an edge for Meeting Server (this document). If you need to use on-premises Microsoft infrastructure to enable on- and off-premises Microsoft clients to join Meeting Server spaces, see the Microsoft integration topics in the Meeting Server deployment guides at [Cisco Meeting Server configuration guides page](#).

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