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The bridge to possible

Troubleshooting Webex Cloud Registered and Cloud Aware Endpoints

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BRKCOL-3014

Cisco Webex App

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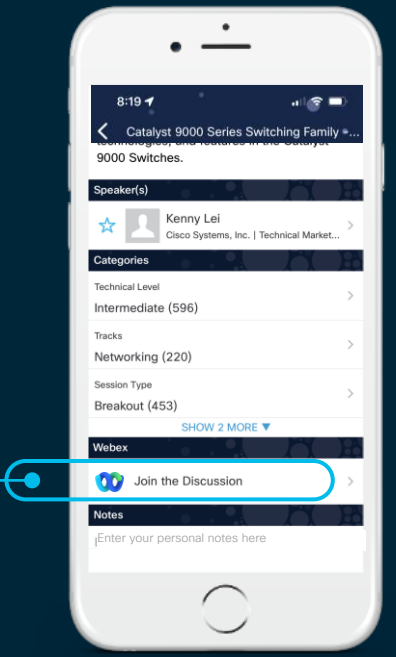

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Webex spaces will be moderated by the speaker until June 17, 2022.

Agenda

- Introduction
- Cloud Architecture
- Activation
- Call Control and Media
- Calendaring
- Questions

Webex Cloud Architecture

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Webex Cloud Architecture

- The Webex cloud can be described as a collection of microservices which work in concert to deliver the Collaboration message, meeting, and calling experiences.

- There are, to date, over 200 microservices that comprise the Webex cloud. Microservice owners are responsible for both the development and maintenance of the microservices, but also for the health and performance of the services (aka devops).

Microservices

A microservice is a distributed, stateless, single purpose process which consumes external requests, performs processing and/or storage (using shared network storage), and optionally returns results.

- Distributed – Microservices are deployed in each datacenter. Requests are load-balanced and processed in isolation.
- Stateless – Microservices do not store any state information. Any state required beyond the span of a request must be stored by the platform.
- Single Purpose – Microservices have complete responsibility for a single role or purpose.

Websockets

Websocket and Events

Websockets are an IETF standard (RFC 6455) providing full-duplex communication channels over a single TCP connection.

Cloud registered endpoints use websockets for the following purposes:

- Event delivery from the Cloud to the Endpoint
- “Data channels” to facilitate low latency communication between clients and endpoints for device control (e.g., volume control)
- Whiteboarding – Send and receive individual strokes in a whiteboarding session.

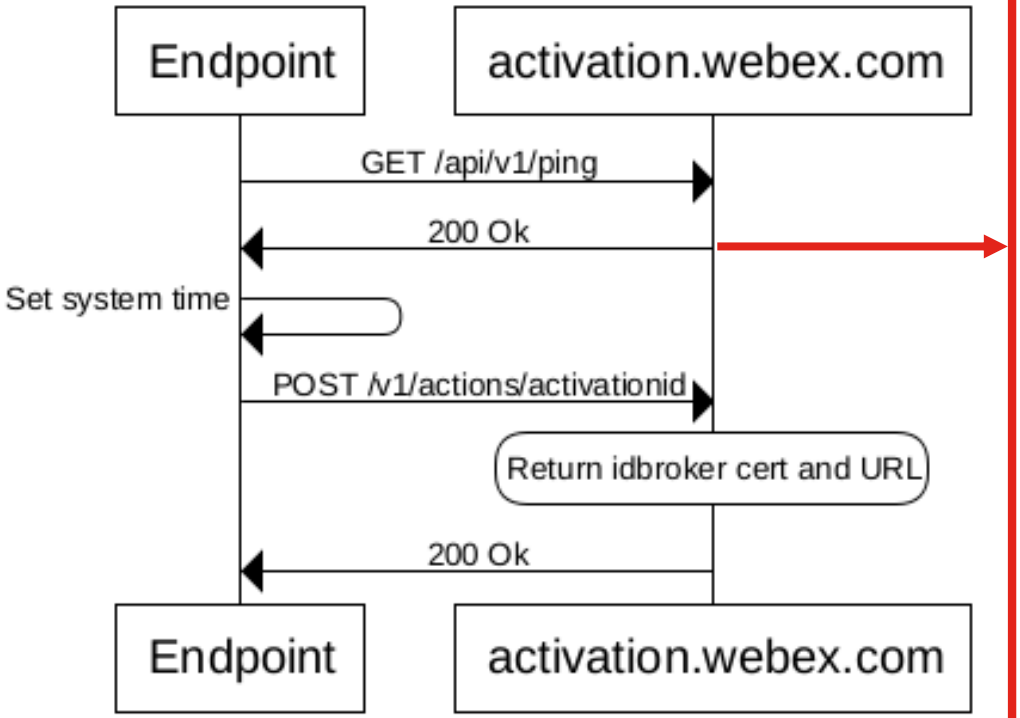
Websocket logging keywords are: Wx2WebSocket, WebSocketNotificationChannel, and NotificationChannel

Activation

Relevant Microservices

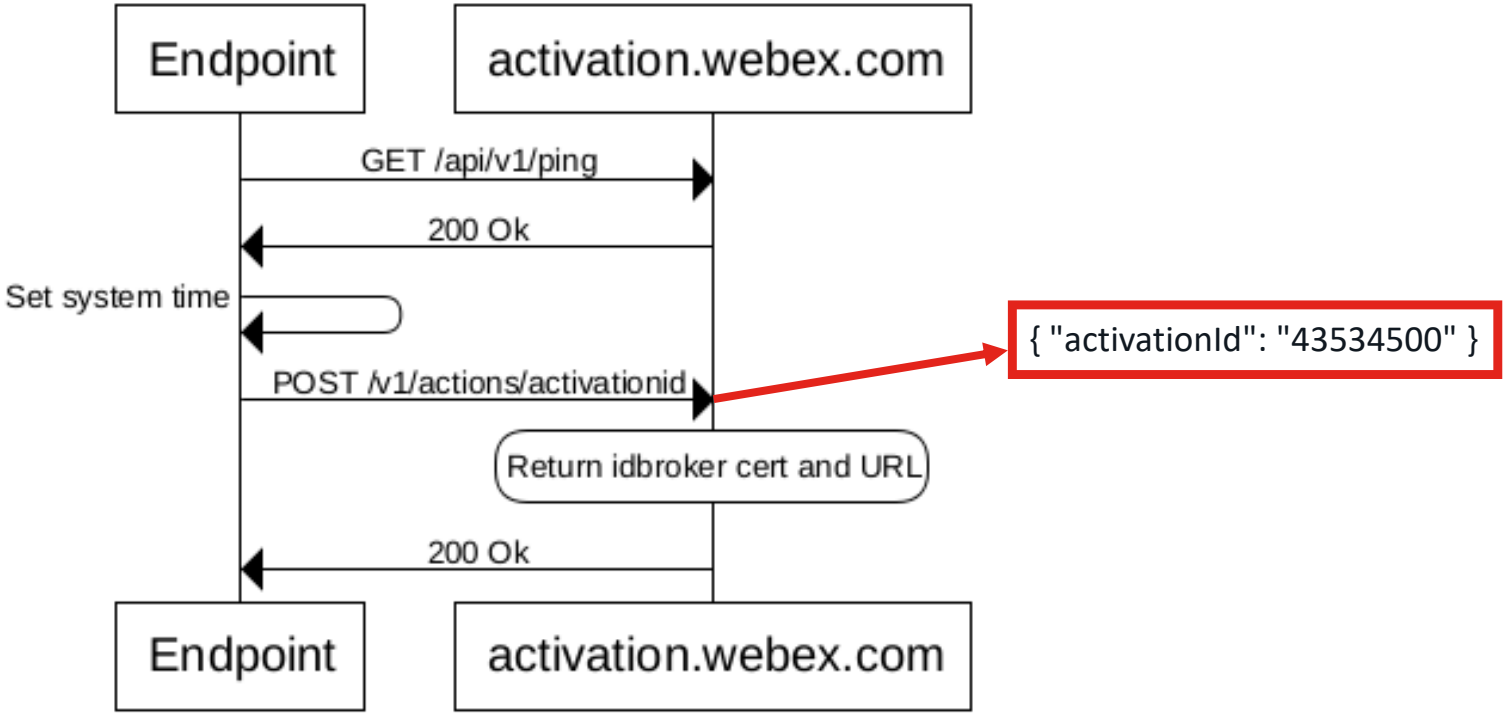
- Identity and Login – Also known as Common Identity or CI.
- Activation – Accepts and validates activation codes.
- Device Management - Used in login flows to create, update, and delete device registrations to the cloud.
- Websocket – Provides websockets to clients and devices for full duplex communication over a single TCP connection.
- User-to-Cluster - Used to determine which cluster the user's services reside. Provides a catalogue of service URLs.
- Workspace Management – Manages workplaces and associated devices, generates activation codes.

Bootstrapping

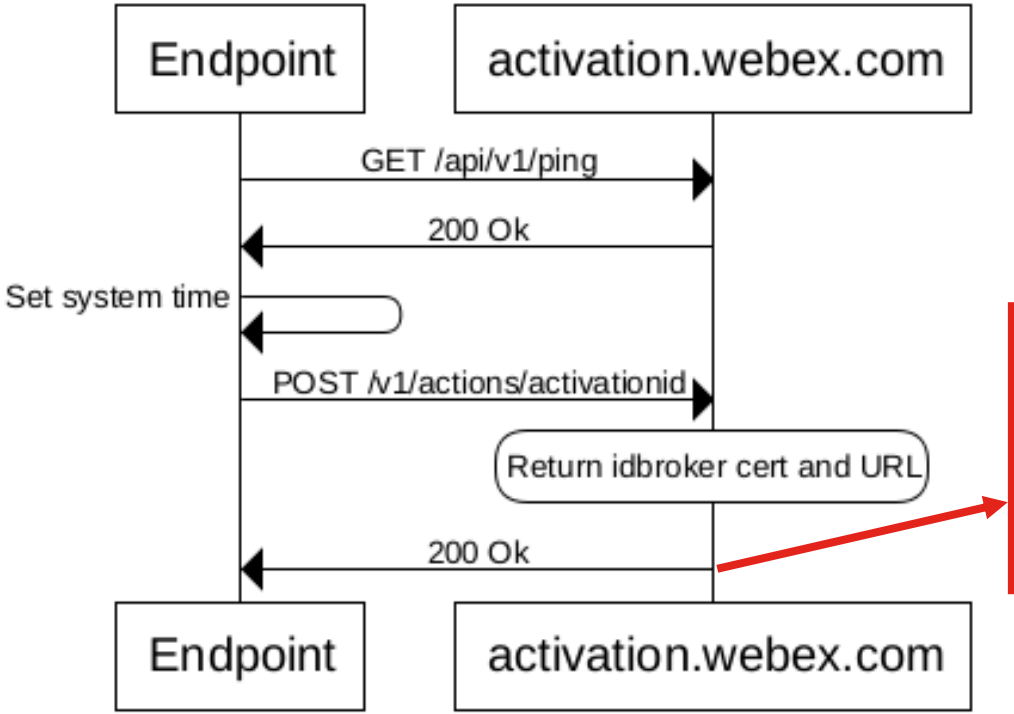



```
{
   "lastUpdated" : "2022-04-22T15:38:10.322Z",
   "message" : "Healthy",
   "serviceName" : "GDS",
   "serviceState" : "online",
   "serviceType" : "REQUIRED",
   "upstreamServices" : [
      {
         "lastUpdated" : "2022-04-22T15:38:09.506Z",
         "message" : "Healthy",
         "serviceName" : "FederationLookupService",
         "serviceState" : "online",
         "serviceType" : "REQUIRED",
         "upstreamServices" : []
      },
      {
         "lastUpdated" : "2022-04-22T15:38:09.407Z",
         "message" : "Healthy",
         "serviceName" : "Cassandra",
         "serviceState" : "online",
         "serviceType" : "REQUIRED",
         "upstreamServices" : []
      },
      {
         "lastUpdated" : "2022-04-22T15:38:09.376Z",
         "message" : "Healthy",
         "serviceName" : "CommonIdentity",
         "serviceState" : "online",
         "serviceType" : "REQUIRED",
         "upstreamServices" : []
      }
   ]
}
```

Bootstrapping

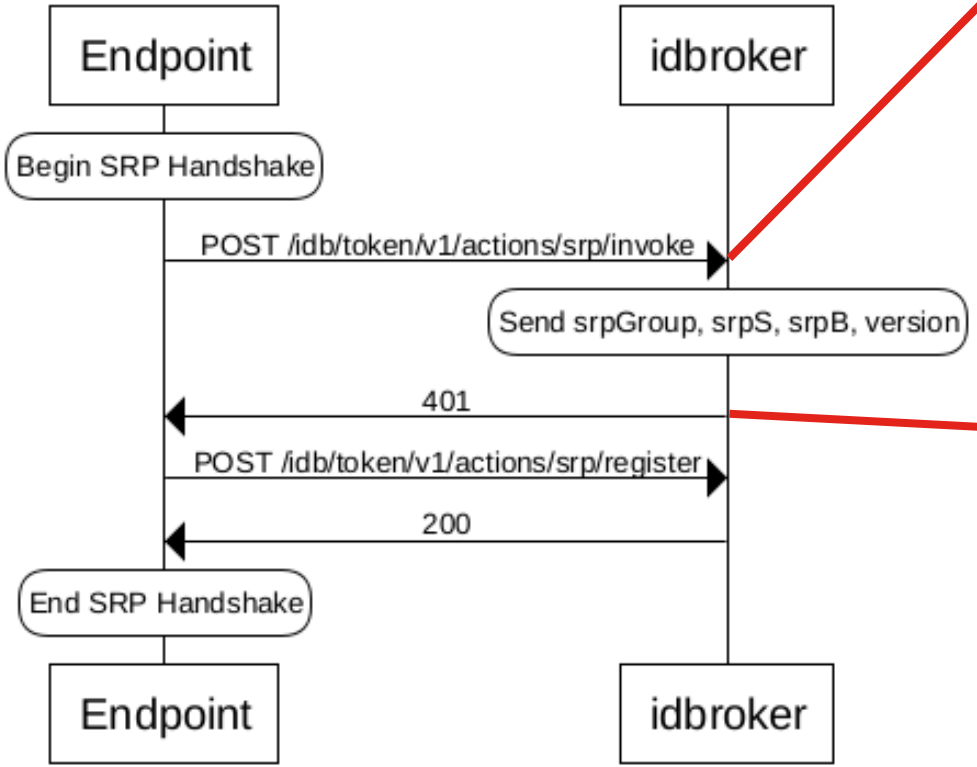


Bootstrapping




```
{
   "serviceDomain" : "idbroker.webex.com",
   "authorities" : [
      {
         "certificate" : "{base64 encoded certificate}"
      }
   ]
}
```

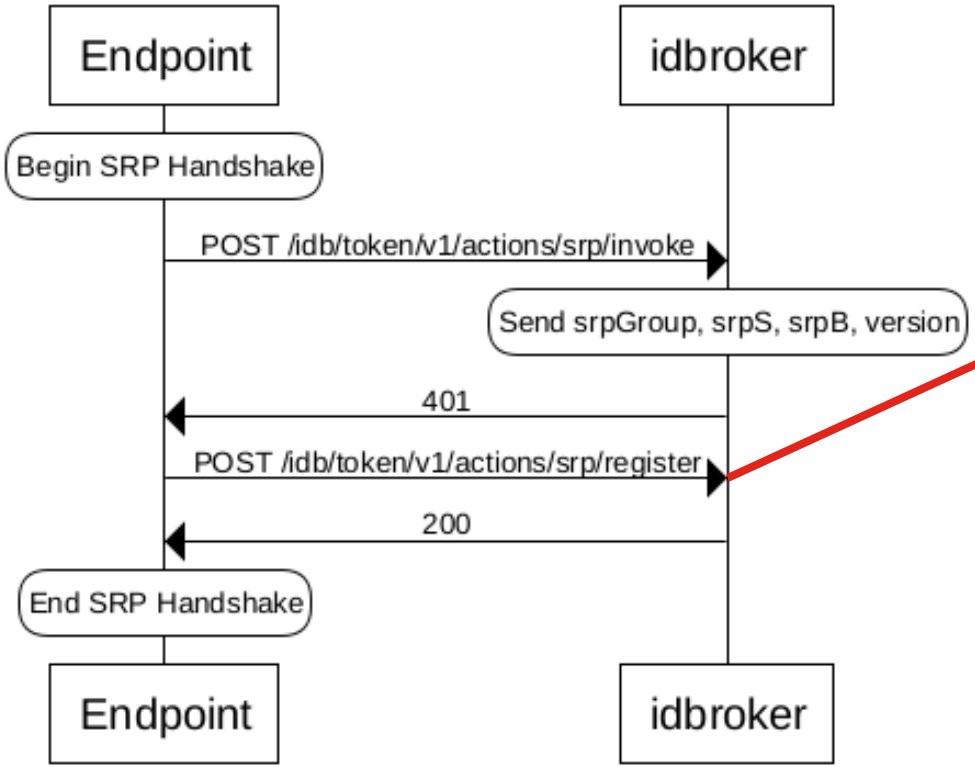
Authentication




```
{ "activationId": "43534500" }
```

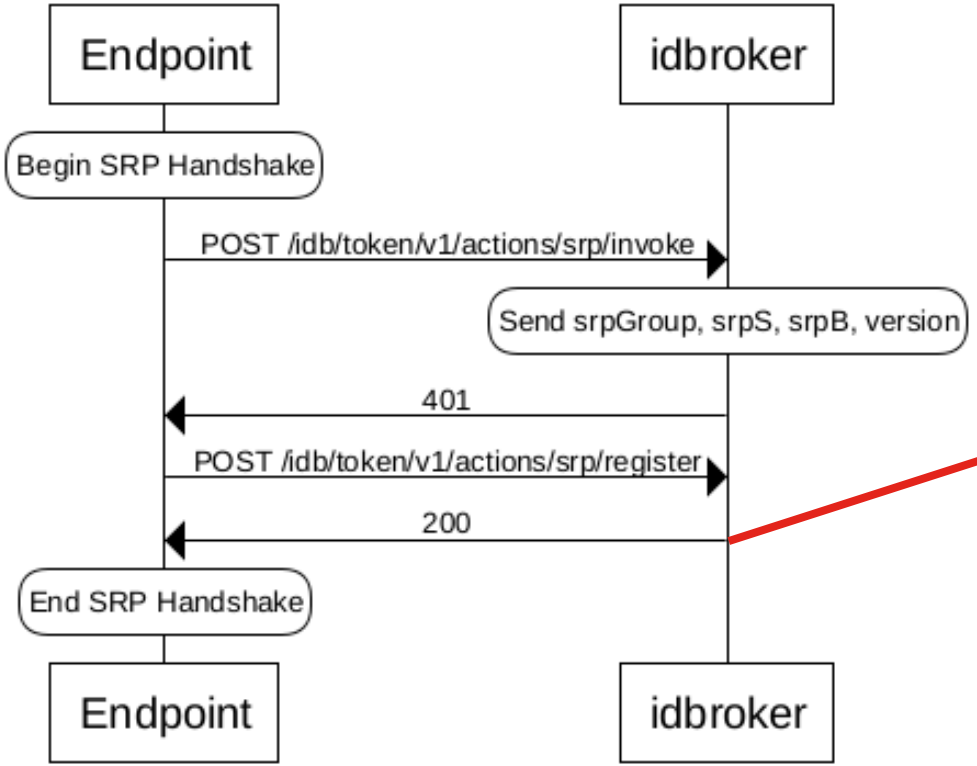
```
{
   "srpB" :
"pDQfZJlkB9PyleD50xU/plvzHLefsJrW4tuE5sfdxrlbFi1wqLiq
G9pvYBckJrFX7yIpRO6nQB775onViH2gwATRQD6BlPdXsQ+9uezEI
DttpExijqTZxtGdiUIzAPnM26ZhPJwI/KmrYcoKJx9USRivuEQoFk
h8t/dn0Cr25SkYyvOzGKBcAe0t8JuPY4Bh0b8QHrxlKH03shrJSrR
XvIiTzulkDnx5PX2LO5LvWsWfPHnO17dODtVHU1bgmDLbmL7rtkrf
qZa2mVsIrv18/iFzr5jACNdfuE3cAmOch0nE45mD+rEVzYW2R0/R2
2UBd35bcdN5/OADYtHh35HIxCPKYTgThvtC6tSZ5u+tj5hHb9gvz6
eMfyf4JFxXbW2EqN/fSzNKqEGDfKULpMv464HwVvYARsUaHQe/Uhe
ktl/RKO8ehbIuZe4EkLweU6VzysW4kgp5GDLoI7GimKb0nhNVGf2e
2V4MiOrpAP3qZs0Vyp02Ae30isGhAMQspElg",
   "url" :
"https://idbroker.webex.com/idb/token/v1/actions/srp/
invoke",
   "version" : "v1.0",
   "srpGroup" : "3072",
   "srpS" :
"fYI0uJpkd+aFsDWE1L1oOE2ZmiitVrVnYcQSvmjaMzb5OYMCnzw6
jSkBOWkeSCciGSyjEE+ASn51WghkdH/qDCKshMQhSQGuAgVfGETG3
x2+KBHwqz8Eu7iMIYmlnwl6bqANZj28U6v8Y9Gt5m0JfXEalfVIlJ
qafUutLA2JRrQN47XBvd7eHKxJ1VD5bCpyZda75ObagYY3oq4B6/U
QZ8R3kCzmgS7HuL6SjHvnvFt7Ck6sqfdRIRpi7YauUemkjlw2pGFT
jhzY/kObcFFr5irvvfaLxyPvJU26YJYpwC4sI5e/RusqEw3OWL5Az
FCsFMAUhNCW0XCGPigN2rLqSg=="
}
```

Authentication




```
{
   "srpA" :
"XxMJTQE5CCxeoRQUdt81N21GquWfYaReJtPFG05CXCO+5szkA8kA
eHM+THU1DXho24LLoxoOhSO/Gplpq0vV3h1Dte+1EcLPf2Gei31UP
XFMCBfZ34boDhacA3oclgmhT0wViDkoJ5Zbzf6DAy81332APsCyMc
LHemD3c1fNRw1QOgRT5hVSBfgZRuDWk+VuZaSgPDFvxrPT5yJL/gJ
n3wSilV+pf7iqoeS4FPBy5yP/qQk1tsdqK7q/BPeE+…",
   "oauthDataHMAC" :
"KhfY1kHHoByK0piU5jyZQ2BuvMuon813Xbm/BiQIELE=",
   "srpB" :
"pDQfZJlkB9PyleD50xU/plvzHLefsJrW4tuE5sfdxrlbFi1wqLiq
G9pvYBckJrFX7yIpRO6nQB775onViH2gwATRQD6BlPdXsQ+9uezEI
DttpExijqTZxtGdiUIzAPnM26ZhPJwI/KmrYcoKJx9USRivuEQoFk
h8t/dn0Cr25SkYyvOzGKBcAe0t8JuPY4Bh0b8QHrxlKH03shrJSrR
XvIiTzulkDnx5PX2LO5LvWsWfPHnO17dODtVHU1bgmDLbmL7rtkrf
qZa2mVsIrv18/iFzr5jACNdfuE3cAmOch0nE45mD+rEVzYW2R0/R2
2UBd35bcdN5/OADYtHh35HIxCPKYTgThvtC6tSZ5u+tj5hHb9gvz6
eMfyf4JFxXbW2EqN/fSzNKqEGDfKULpMv464HwVvYARsUaHQe/Uhe
ktl/RKO8ehbIuZe4EkLweU6VzysW4kgp5GDLoI7GimKb0nhNVGf2e
2V4MiOrpAP3qZs0Vyp02Ae30isGhAMQspElg",
   "oauthData" :
"dI++uCtjfXTfVBmmhYaX8p3/hVG/SAy+CR11CovN059H1CMx2OW4
hSzBLCoKal0ZXZVLhFnHKwwXWfPyKGkaCuGs1HOYp/UQDuMUvxayp
sdvSLqjSKtYjbY0FP0jD0hI9S8GZnsHptp2e/bc/J05G9glaekBWx
gSBCMgcNmu0cyMdsX9rtbE1z8VW4BdBPPxZvymwBFoyDNQ+81reUr
xFQHxl2bk2IwVvm4uln3lAVjalcEimqxEIjwlL3otVF22EKZFfhYj
p8C+KLNd4Zuilus8HwKcssSvscQhxkX0QpojKMKurDFw2BxDaq0Vu
xNykQb2tdBBhx23UhBSlh/ubw=="
}
```

Authentication




```
{
   "serviceData" : {large encrypted blob},
   "serviceDataHMAC" :
"Qas+2GywtBIOIffif95/DGF6ilzYkTUm613edk8jicg=",
   "url" :
"https://idbroker.webex.com/idb/token/v1/actions/srp/
register"
}
```


Encrypted Blob Contains:

- Service URLs
- Service Certificates
- Access and Refresh Tokens

Activation Notes

- TLS Certificates are not verified or validated during activation phase
- TLS-Aware Proxy certs are sent by the cloud in the SRP Register Response
- There is no administrative option for managing TLS-Aware Proxy Certificates in Control Hub. A Cisco TAC case must be opened to add, remove, or update the certificates.
- The endpoint is locked down once the activation code is successfully processed

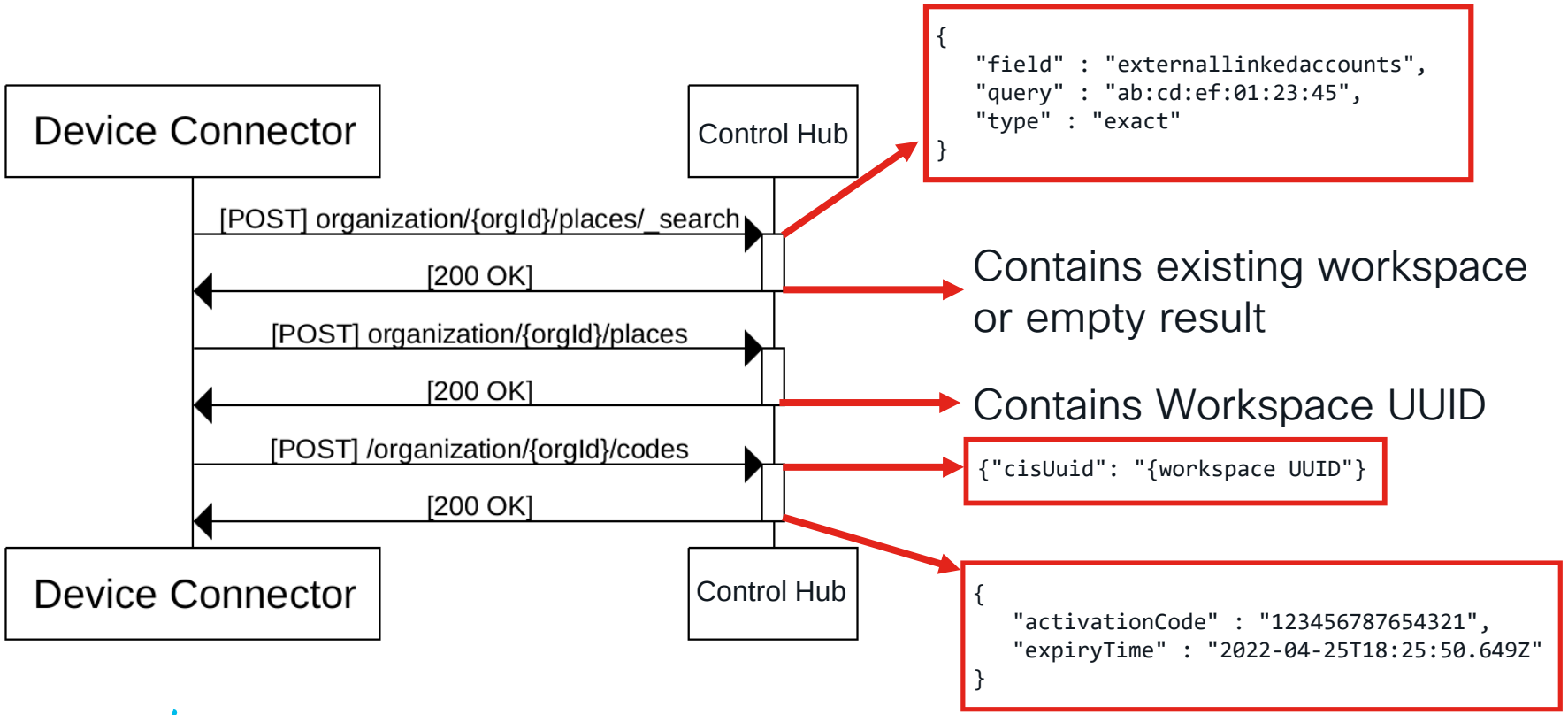
SRP Service Data Processing Logs - TLS Proxy Certs

```
2022-04-20T01:01:48.677-05:00 appl[3611]: Wx2[3]: process_additional_CAs: Parsed 3
additional CA certificate(s)
2022-04-20T01:01:48.692-05:00 appl[3611]: Wx2 I: setup_all_symlinks: using tls proxy certs
directory: "/config/certs/spark_ca_list/tls_proxy" ->
/config/certs/spark_ca_list/tls_proxy-1650434508
2022-04-20T01:01:48.702-05:00 appl[3611]: Wx2 I: process_additional_CAs: Updated CA
certificates from srpconfig
2022-04-20T01:01:48.702-05:00 appl[3611]: Wx2[3]: Restarting CA trust store refresh in
81465 second(s)
```

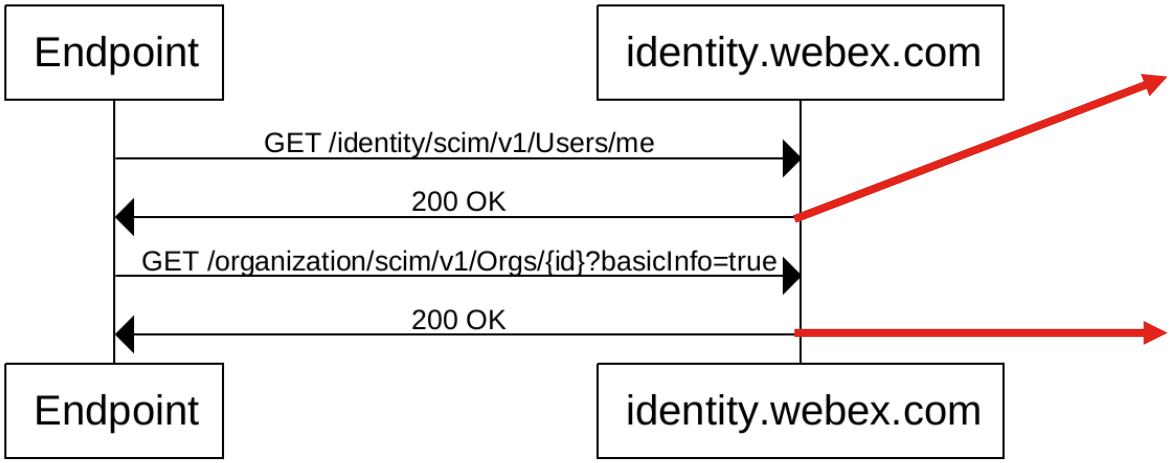
SRP Service Data Processing Logs – No TLS Proxy Certs

```
2022-04-20T01:36:29.813+00:00 appl[3336]: Wx2[1]: safe_extract_array: missing key
trustList
2022-04-20T01:36:29.813+00:00 appl[3336]: Wx2 I: process_additional_CAs: No 'trustList'
sub-document in configData. No CA certificates will be updated
2022-04-20T01:36:29.813+00:00 appl[3336]: Wx2[3]: process_additional_CAs: Parsed 0
additional CA certificate(s)
2022-04-20T01:36:29.966+00:00 appl[3336]: Wx2 I: setup_all_symlinks: using tls proxy certs
directory: "/config/certs/spark_ca_list/tls_proxy" ->
/config/certs/spark_ca_list/tls_proxy-1654115789
2022-04-20T01:36:30.155+00:00 appl[3336]: Wx2 I: process_additional_CAs: Updated CA
certificates from srpconfig
```

Webex Edge Activation



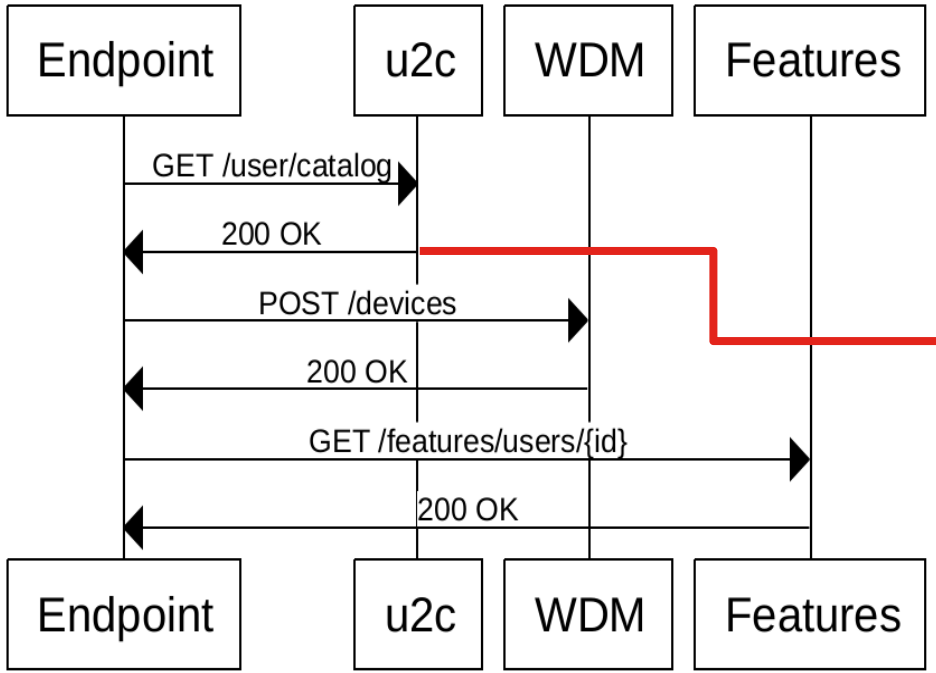
Provisioning



Returns user information, display name, SIP URIs, licenses, avatars, org ID, etc.

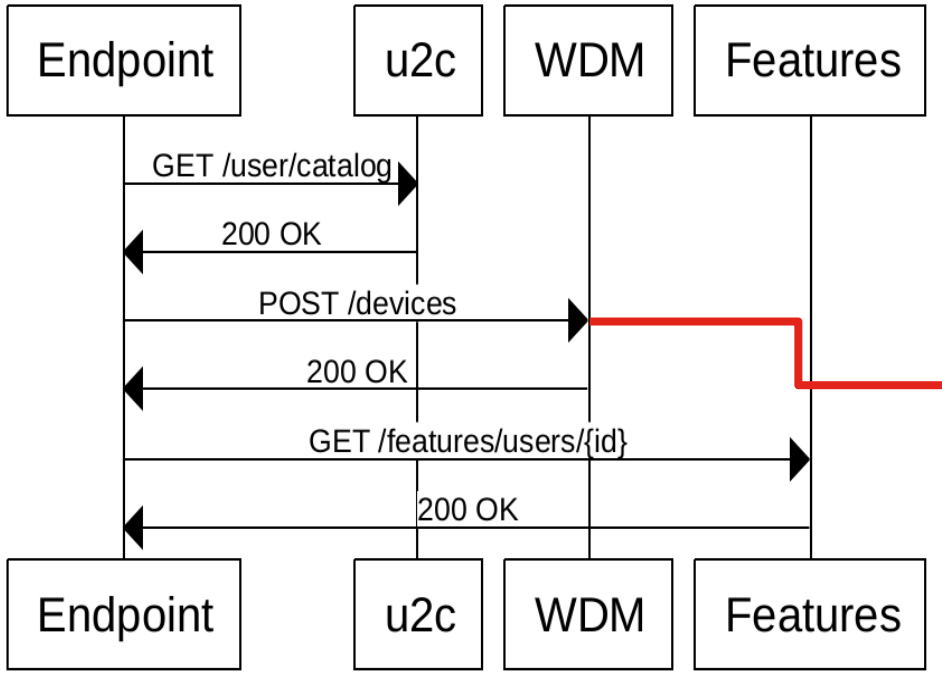
Returns org information: Org Settings, Domains, services, etc.

Registration



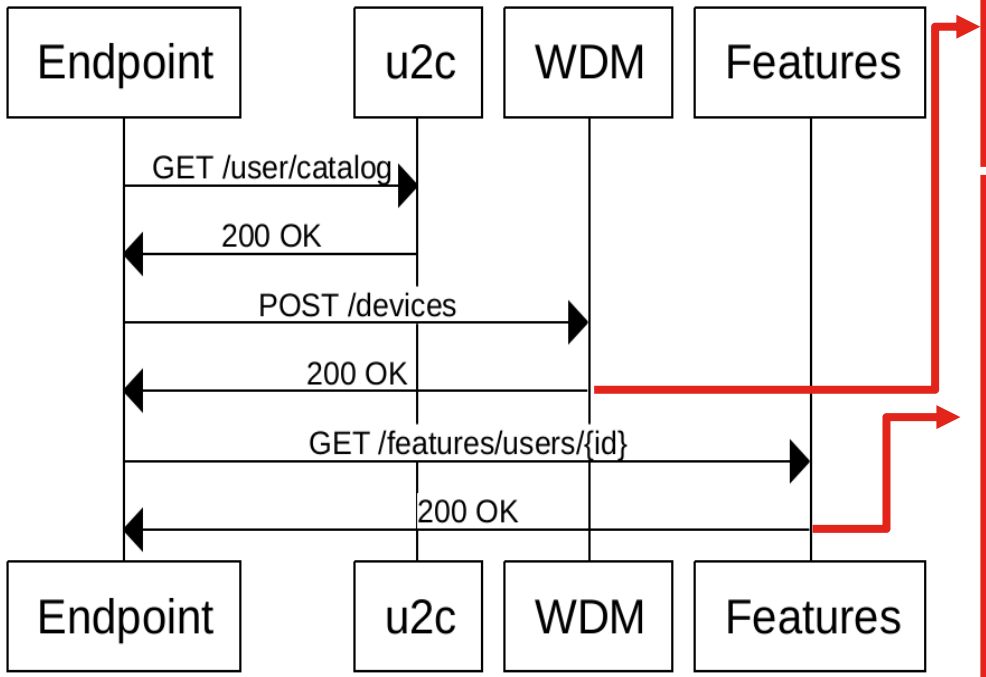

```
{
   "id" : "urn:TEAM:us-east-2_a:wdm",
   "serviceUrls" : [{
         "priority" : 5,
         "baseUrl" :
"https://wdm.a7.ciscospark.com/wdm/api/v1"
      }],
   "ttl" : -1,
   "internalServiceUrls" : [],
   "serviceName" : "wdm",
   "logicalNames" : [
      "https://wdm-a.wbx2.com/wdm/api/v1"
   ]
}
```

Registration




```
{
   "deviceIdentifier" : "00000000-abcd-
0000-abcd-000000000000",
   "systemName" : "s53300",
   "systemVersion" :
"ce10.12.1.6.cd735cb1ea2 2022-04-14",
   "deviceType" : "TP_ENDPOINT",
   "model" : "Desk Pro",
   "name" : "Cisco Webex Desk Pro",
   "localizedModel" : "Cisco Webex Desk
Pro",
   "capabilities" : {
      "groupCallSupported" : true
   },
   "isDeviceManaged" : true
}
```

Registration




```
{webSocketUrl":"wss://mercury-
connection-partition2-
a.wbx2.com/v1/apps/wx2/registrations/
00000000-abcd-0000-abcd-000000000000
/messages”}
```



```
{
  "developer": [{
      "key": "Android-one-on-one-space-obtp",
      "val": "true",
      "mutable": true,
      "group": "ALL",
      "percentage": 100,
      "orgId": "GLOBAL",
      "type": "DEV",
      "deletedTime": 0,
      "lastModified": "2018-06-
07T18:54:23.332Z"
    }, ...
```

Call Control and Media

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Relevant Microservices

- Media services
  - Switching – Sends media between devices without modifying the RTP payload
  - Transcoding – Decodes the sending devices RTP stream and modifies the media and encodes the resulting media to send to the receiving device.
  - Orchestration – Responsible media node management and selection
- Call control microservice
- Websocket microservices

Call Control

Media Cluster Reachability

- As there are many public media nodes geographically dispersed, and private media nodes (video mesh), the cloud needs to select the “best” media node for a given device in a call.
- In order to select the best media node, the cloud must know what media node clusters are reachable by the endpoint, which transport protocols are usable, and the relative round trip time (RTT) between the endpoint and the media node cluster.
- During initialization, and every 2 hours, the endpoint will request a list of media clusters that the endpoint may use, and performs a STUN bind on a node in each media node cluster. The result is cached and used during call setup.

Media Reachability Logs

```
2022-04-24T13:58:15.538-05:00 appl[3899]: Wx2[2]: Starting calliope discovery

2022-04-24T13:58:15.539-05:00 appl[3899]: Wx2Http[1]: HTTP(14) => GET https://calliope-
a.wbx2.com/calliope/api/discovery/v1/clusters

2022-04-24T13:58:15.905-05:00 appl[3899]: Wx2 I: CalliopeDiscovery Cache-Control::max-
age=7200 rand (75 - 100) -> 6962

2022-04-24T14:01:29.156-05:00 appl[3899]: CalliopeDiscovery I: CalliopeDisovery completed
with response from 166 out of 210 servers. 76 udp, 68 tcp, 22 xTls

2022-04-24T14:01:29.156-05:00 appl[3899]: CalliopeDiscovery I: CalliopeDiscovery: BEST
callCenter:wdfw2.wdfw2.*, trnsp:udp, protocol:stun, ip:207.182.171.136:5004 with RTT:25
```

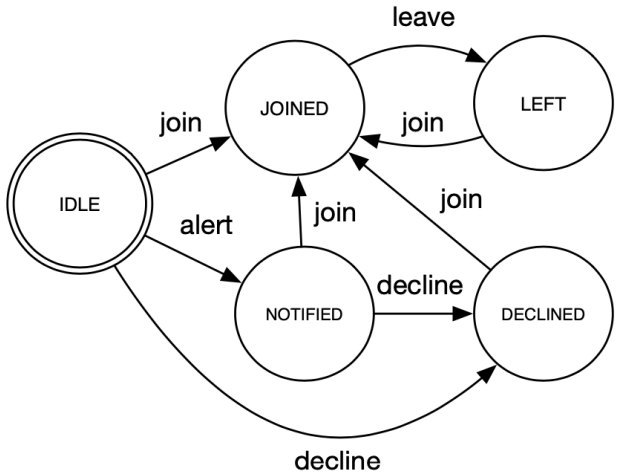
Media Reachability xStatus

```
*s Experimental CalliopeDiscovery Best 1 Cluster: "wdfw2.wdfw2.*"
*s Experimental CalliopeDiscovery Best 1 Ip: "207.182.171.212:5004"
*s Experimental CalliopeDiscovery Best 1 RTT: 32
*s Experimental CalliopeDiscovery Best 1 Transport: "udp"
*s Experimental CalliopeDiscovery Best 2 Cluster: "wdfw2.wdfw2.*"
*s Experimental CalliopeDiscovery Best 2 Ip: "207.182.188.205:5004"
*s Experimental CalliopeDiscovery Best 2 RTT: 29
*s Experimental CalliopeDiscovery Best 2 Transport: "tcp"
*s Experimental CalliopeDiscovery Best 3 Cluster: "wdfw2.wdfw2.*"
*s Experimental CalliopeDiscovery Best 3 Ip: "207.182.171.212:443"
*s Experimental CalliopeDiscovery Best 3 RTT: 32
*s Experimental CalliopeDiscovery Best 3 Transport: "xtls"
*s Experimental CalliopeDiscovery DiscoveryTimeInSec: 195
*s Experimental CalliopeDiscovery Status: "Completed
```

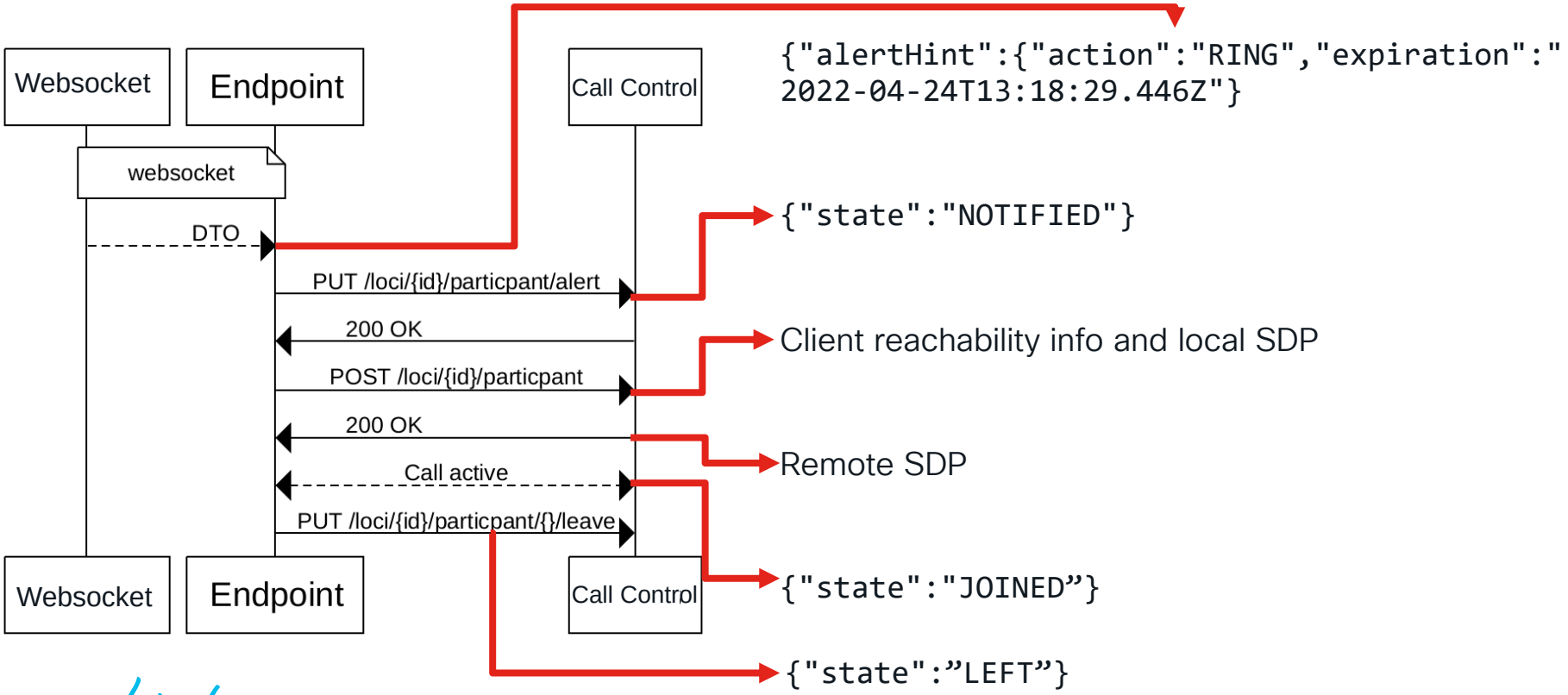
The Call Control DTO

- The Call Control DTO is a JSON structure that is passed between the Call Control Microservice and the clients who are participating in the conference. The DTO contains information about the current state of the conference. Participants parse the DTO to learn state of the conference and take appropriate actions.

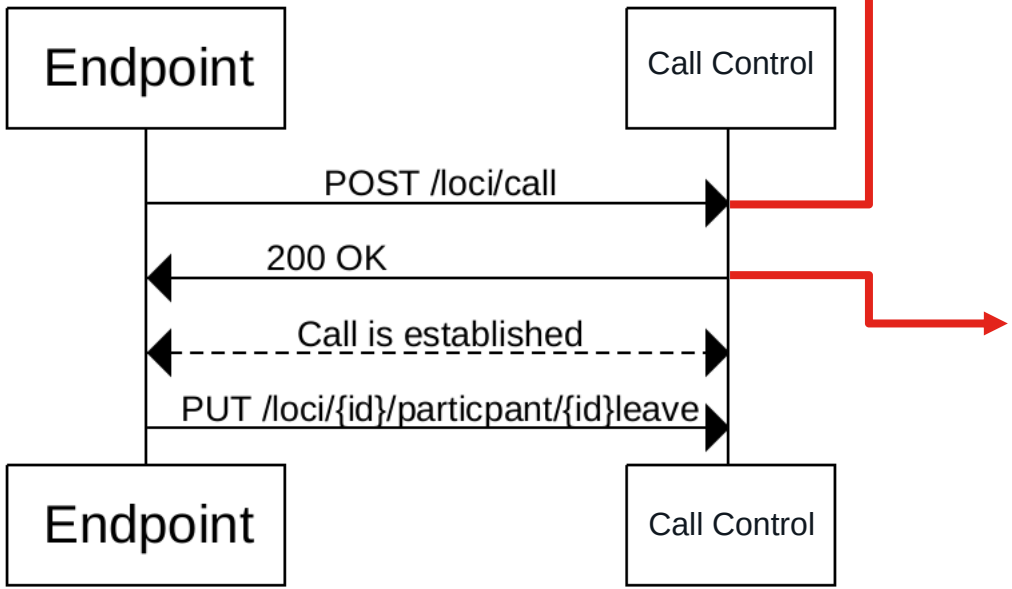
IDLE: Not yet engaged
NOTIFIED: Endpoint is aware of the call
DECLINED: Endpoint declined to join
JOINED: Endpoint Joined
LEFT: Endpoint has left the call



Endpoint Incoming Call Flow



Endpoint Outgoing Call Flow



- Contains reachability info, local SDP, Invitee information, endpoint metadata
- Contains Remote SDP

Edge Webex Optimized Meeting Experience

- Webex Optimized Meeting Experience uses a regular expression to detect whether the dialed URI is a Webex meeting and makes a cloud native call instead of a SIP call.

- Optimized Webex meeting experience requires:
  - Edge Linked device
  - Cloud managed software enabled
  - Configuration Management from Control Hub for Webex Edge for Devices enabled
  - Webex Meetings JoinProtocol setting is set to Webex

Call Analyzer Events

Wx2[6]: Diagnostic event: client.call.initiated
Wx2[6]: Diagnostic event: client.media-engine.local-sdp-generated
Wx2[6]: Diagnostic event: client.media.capabilities
Wx2[6]: Diagnostic event: client.locus.join.request
Wx2[6]: Diagnostic event: client.locus.join.response
Wx2[6]: Diagnostic event: client.media-engine.remote-sdp-received
Wx2[6]: Diagnostic event: client.ice.start
Wx2[6]: Diagnostic event: client.ice.end
Wx2[6]: Diagnostic event: client.media-engine.ready
Wx2[6]: Diagnostic event: client.media.tx.start
Wx2[6]: Diagnostic event: client.media.tx.start
Wx2[6]: Diagnostic event: client.media.rx.start
Wx2[6]: Diagnostic event: client.media.render.start
Wx2[6]: Diagnostic event: client.media.rx.start

Wx2[6]: Diagnostic event: client.media.render.start
Wx2[6]: Diagnostic event: client.mediaquality.event
Wx2[6]: Diagnostic event: client.call.leave
Wx2[6]: Diagnostic event: client.media.tx.stop
Wx2[6]: Diagnostic event: client.media.tx.stop
Wx2[6]: Diagnostic event: client.media.render.stop
Wx2[6]: Diagnostic event: client.media.render.stop
Wx2[6]: Diagnostic event: client.mediaquality.event

Media

Multistream

- Cloud-registered endpoints leverage a form of Multistream to provide simulcasts – simultaneous transmissions of the same picture in multiple resolutions (e.g. high-resolution for main video, and low-resolution thumbnails).
  - Switching relies on Multistream to send video streams to participants without needing transcoding resources.

- Cisco Multistream leverages RTCP messages to advertise and request streams, and RTP Extensions to allow for distinguishing between the multiple RTP streams.

Multistream Glossary

- CSI – Capture Source ID. Represents media sourced from a single physical capture device (e.g. a camera or microphone).
- SCI – Scene Capture ID. Represents a “scene” containing one or more CSI capturing the same physical area (e.g. a camera and microphone capturing audio and video).
- SCA – Sub-channel Advertisement. An RTCP message which informs of a clients Multistream abilities.
- SCR – Sub-channel Request. An RTCP message requesting one or more streams from a remote source.

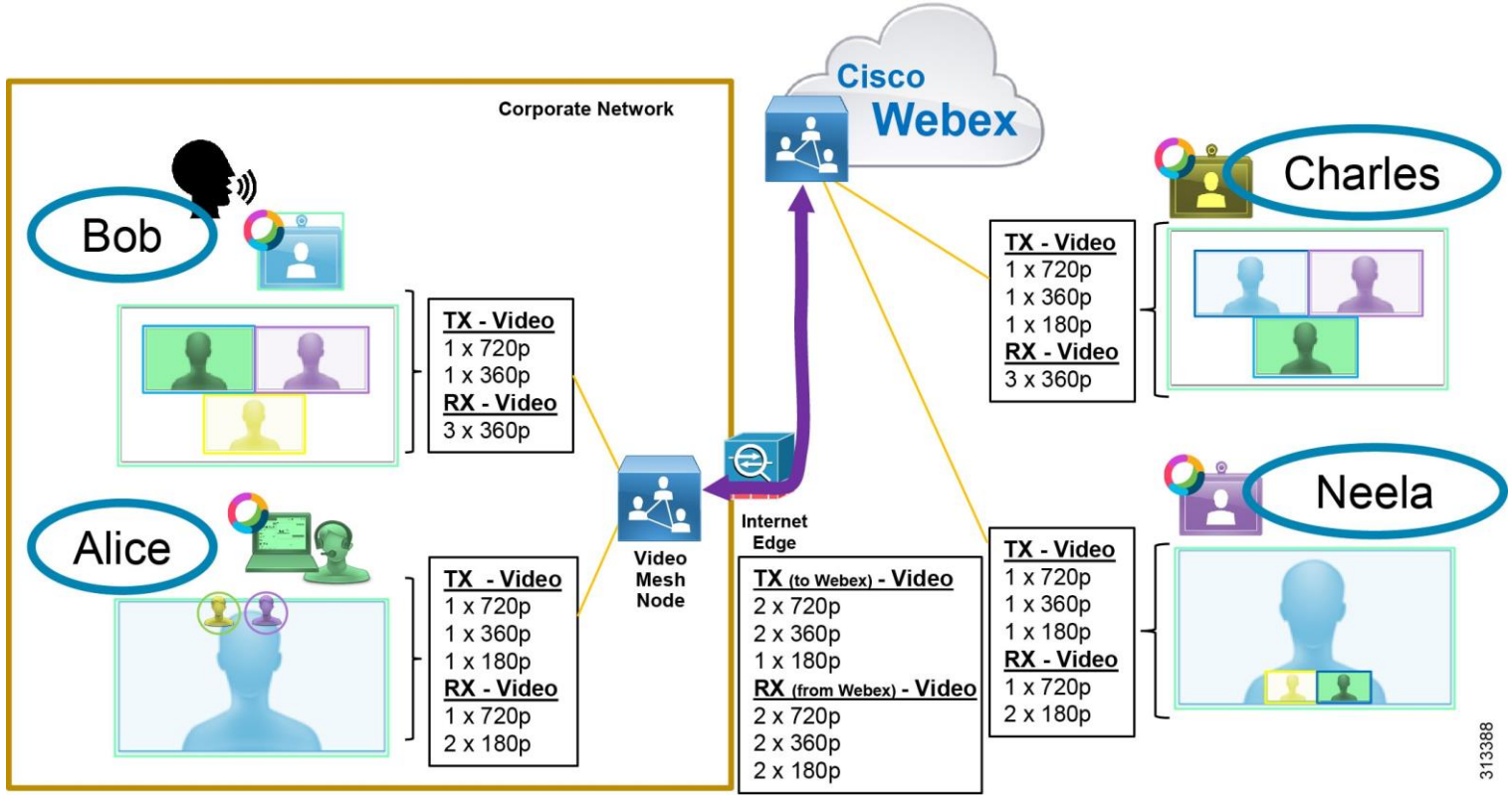
Cisco Multistream – Basic Flow

1. Media senders send an SCA advertising their media capabilities
2. Media receivers send an SCR requesting N number of streams at the same or different qualities.
3. Media senders send an SCA acknowledging the request and can disable some or all of the requested streams in the SCR.
4. Media senders send the requested RTP streams tagged with the CSI identifying the stream in the RTP headers.

This happens in both directions.

- Endpoints request N streams to from the server satisfy their layouts:
  - e.g. 1x 720p stream for main video, and 6x 180p streams for thumbnails.
  - Each stream typically is a **unique** participant or source.
- Servers request N streams from each endpoint to satisfy different Endpoints:
  - e.g. server requests 1x 720p stream, 1x 360p stream, 1x 180p stream.
  - Each stream is typically **the same** participant or source, simulcasted.

Cisco Multistream



Multistream Logs – Overlay Layout

```
2022-04-25T14:21:47.890-05:00 appl[3899]: CuilApp[1]: User root/internal/phoenix-
system about to execute command '/Video/Layout/LayoutFamily/Set CustomLayoutName:
overlay LayoutFamily: custom' from localhost.

2022-04-25T14:21:47.925-05:00 appl[3899]: Multistream[1]: Duo Video Send: SCR
[ver=1 seqno=4 sender_ssrc=0xc003046e media_ssrc=0x00000000] requests=1

2022-04-25T14:21:47.925-05:00 appl[3899]: Multistream[1]: Duo Video   [sci 100]
bitrate=5016000 srcid=0 policy=0 pri=0 adjid=0 dup=false pt=126 (H264)
maxmbps=486000 maxfs=32400 maxcfps=6000 maxwidth=3840 maxheight=3840 acl=000
```

To fulfill the overlay layout, the endpoint sends an SCR for the presentation video in high resolution, followed by six lower resolution video requests for the participant thumbnails.

Multistream Logs – Overlay Layout

```
appl[3899]: Multistream[1]: Video Send: SCR [ver=1 seqno=8 sender_ssrc=0xdbf6f52d
media_ssrc=0x00000000] requests=6

appl[3899]: Multistream[1]: Video   [sci 011] bitrate=100000 srcid=0 policy=1 pri=254 adjid=33
dup=true pt=126 (H264) maxmbps=7200 maxfs=240 maxcfps=3000 maxwidth=3840 maxheight=3840 acl=000

appl[3899]: Multistream[1]: Video   [sci 012] bitrate=100000 srcid=0 policy=1 pri=254 adjid=33
dup=true pt=126 (H264) maxmbps=7200 maxfs=240 maxcfps=3000 maxwidth=3840 maxheight=3840 acl=000

appl[3899]: Multistream[1]: Video   [sci 013] bitrate=100000 srcid=0 policy=1 pri=254 adjid=33
dup=true pt=126 (H264) maxmbps=7200 maxfs=240 maxcfps=3000 maxwidth=3840 maxheight=3840 acl=000

appl[3899]: Multistream[1]: Video   [sci 014] bitrate=100000 srcid=0 policy=1 pri=254 adjid=33
dup=true pt=126 (H264) maxmbps=7200 maxfs=240 maxcfps=3000 maxwidth=3840 maxheight=3840 acl=000

appl[3899]: Multistream[1]: Video   [sci 015] bitrate=100000 srcid=0 policy=1 pri=254 adjid=33
dup=true pt=126 (H264) maxmbps=7200 maxfs=240 maxcfps=3000 maxwidth=3840 maxheight=3840 acl=000

appl[3899]: Multistream[1]: Video   [sci 016] bitrate=100000 srcid=0 policy=1 pri=254 adjid=33
dup=true pt=126 (H264) maxmbps=7200 maxfs=240 maxcfps=3000 maxwidth=3840 maxheight=3840 acl=000
```

Multistream Logs – RTCP Blocked

```
appl[3860]: Multistream[1]: main_video resend: SCR (v1) seqno=13 resend count=1

appl[3860]: Multistream[1]: main_video resend: SCR (v1) seqno=13 resend count=2

appl[3860]: Multistream[1]: main_video resend: SCR (v1) seqno=13 resend count=3

appl[3860]: Multistream[1]: main_video resend: SCR (v1) seqno=13 resend count=4

appl[3860]: Multistream[1]: main_video resend: SCR (v1) seqno=13 resend count=5

appl[3860]: Multistream[1]: main_video resend: SCR (v1) seqno=13 resend count=6

appl[3860]: Multistream[1]: main_video resend: SCR (v1) seqno=13 resend count=7

appl[3860]: Multistream W: main_video resend: SCR not acknowledged (v1) seqno=13 resend count=8, giving
up

Wx2Call[3]: wx2_call::diagnosticEvent(p=2) name=client.media.rx.stop mediaType=video error=media-engine
```

Call Control and Media Notes

- Cloud registered endpoints will ALWAYS send media to a Webex media node.
- There is no SIP stack on cloud registered endpoints, all calls use the cloud native call flows.
- A SIP Gateway microservice exists in the cloud to facilitate SIP calls into and out of the Webex cloud.
  - Media still flows between the endpoint and the cloud media nodes on SIP calls.

Calendaring

Cloud Calendaring

- Cloud-registered devices support OBTP through various integrations to calendaring services (O365, Google, Exchange, Webex) and use OBTP to simplify the meeting join experience.
- The primary mechanism for an endpoint to become aware of scheduled meetings is via events delivered through the Websocket connection.
  - The events contain calendar DTOs which hold all (or some) details about the meeting.
- The secondary mechanism is a HTTP-based REST API which devices can request bulk meeting details.

Calendaring Events

- Full DTOs contain all the necessary details:
  - calendar.meeting.create – A new meeting has been created.
  - calendar.meeting.update – An existing meeting has been modified.
  - calendar.meeting.delete – An existing meeting has been deleted.

- Minimal DTOs require a `GET /calendarEvents/{id}` for the full details:
  - calendar.meeting.create.minimal
  - calendar.meeting.update.minimal

Calendar Logs *calendar.meeting.create*

```
appl[3899]: Wx2 I: NotificationChannel: calendar.meeting.create, trackingid ccc_b2fc8a1c-23c1-46c5-a5ce-d1e4349eb2bc

appl[3899]: Wx2[3]: CalendarClientImpl::on_meeting_updated_event

appl[3899]: Wx2[1]: Inserting new meeting - organizer='d3701784-bbe3-41ff-afc6-b14086d26d4f' start='2022-04-26T13:15:00.000Z' id='6103501f-3650-6ae0-bf76-b661a74ceba3' meetingJoinType='WEBEX' meetingJoinURI=true meetingJoinURL=true webexURI=true spaceURI=false callURI=true

appl[3899]: Wx2[3]: Decrypting title for calendar event with id='6103501f-3650-6ae0-bf76-b661a74ceba3'

appl[3899]: Wx2[3]: Found plaintext title for calendar event with id='6103501f-3650-6ae0-bf76-b661a74ceba3'

appl[3899]: Wx2[5]: MeetingsControl::on_calendar_event_created

appl[3899]: Wx2[5]:   Creating new Meeting (id=1)

appl[3899]: Wx2[5]:   Attaching CalendarEvent (id=6103501f-3650-6ae0-bf76-b661a74ceba3) to Meeting (id=1)
```

calendar.meeting.update Processing

```
appl[3899]: Wx2 I: NotificationChannel: calendar.meeting.update, trackingid
ccc_be477ce2-a797-45bb-a6f3-5b2d8398c5af

appl[3899]: Wx2[1]: updateMeetingFromCalendarEvent resourceUrl='https://calendar-
a.wbx2.com/calendar/api/v1/calendarEvents/OTczNTkzZTctYjhjZS02MjVkLTljZTctOWJjNmJkZWRjM
DNm'

appl[3899]: Wx2[3]: CalendarClientImpl::on_meeting_updated_event

appl[3899]: Wx2[1]: Updating meeting - organizer='07f97aea-6498-4322-b635-df6431bf8ea6'
start='2022-04-25T13:30:00.000Z' id='973593e7-b8ce-625d-9ce7-9bc6bdedc03f'
meetingJoinType='TEAMS' meetingJoinURI=true meetingJoinURL=true webexURI=false
spaceURI=true callURI=true

appl[3899]: Wx2[3]: Decrypting title for calendar event with id='973593e7-b8ce-625d-
9ce7-9bc6bdedc03f'
```

Example: *calendar.meeting.update.minimal*

```
appl[3899]: Wx2 I: NotificationChannel: calendar.meeting.update.minimal, trackingid
ccc_6557608e-e791-43ad-ac2d-6f8b5a4b92d9

appl[3899]: Wx2Http[1]: HTTP(739) => GET https://calendar-
a.wbx2.com/calendar/api/v1/calendarEvents/ZTAyYzZjNjYtNzBiYS02NWI1LThiMWYtYzY4YWZhZDc2O
GI5?compact=true

appl[3899]: Wx2Http[1]: HTTP(739) <= 200

appl[3899]: Wx2[1]: Inserting new meeting - organizer='efe2ed24-f541-4b68-825e-
5b1e7f6cbfc6' start= '2022-04-26T13:00:00.000Z' id='e02c6c66-70ba-65b5-8b1f-
c68afad768b9' meetingJoinType='WEBEX' meetingJoinURI=true meetingJoinURL=true
webexURI=true spaceURI=false callURI=true

appl[3899]: Wx2[3]: Decrypting title for calendar event with id='e02c6c66-70ba-65b5-
8b1f-c68afad768b9'
```

Example: *calendar.meeting.delete*

```
2022-04-25T09:00:40.200-05:00 appl[3899]: Wx2 I: NotificationChannel:
calendar.meeting.delete, trackingid ccc_e09c60ce-c01a-430a-b9e9-2a2f1517c071

2022-04-25T09:00:40.201-05:00 appl[3899]: Wx2[5]:
MeetingsControl::on_calendar_event_deleted

2022-04-25T09:00:40.201-05:00 appl[3899]: Wx2[5]:   Detaching CalendarEvent
(id=5b168744-8d10-68c4-84bb-5430cea7d072) from Meeting (id=11)

2022-04-25T09:00:40.202-05:00 appl[3899]: Wx2[5]:   Removing Meeting (id=11)

2022-04-25T09:00:40.203-05:00 appl[3899]: Wx2 I:
Wx2MeetingsHandlerImpl::meetings_updated: num meetings=1
```

Calendar Catch-Up Flow

```
2022-04-24T13:58:17.285-05:00 appl[3899]: Wx2Http[1]: HTTP(31) => GET
https://calendar-
a.wbx2.com/calendar/api/v1/calendarEvents?max=50&offset=0&fromDate=2022-04-
23T18:58:17.284Z&toDate=2022-04-25T18:58:17.284Z&compact=true

appl[3899]: Wx2[1]: Inserting new meeting - organizer='e8177b4d-a358-4a83-95c8-
150f80a5be8f' start='2022-04-23T19:00:00.000Z' id='73c850f2-be93-6797-aa8c-
3eea4e1838b7' meetingJoinType='WEBEX' meetingJoinURI=true meetingJoinURL=true
webexURI=true spaceURI=false callURI=true

appl[3899]: Wx2[3]: Decrypting title for calendar event with id='73c850f2-be93-
6797-aa8c-3eea4e1838b7'

appl[3899]: Wx2[1]: Inserting new meeting - organizer='b964b828-abfa-4cca-978c-
5e85f4dbeac5' start='2022-04-23T20:00:00.000Z' id='6fcdceec-b2e8-6700-95e7-
4b98757c2449' meetingJoinType='WEBEX' meetingJoinURI=true meetingJoinURL=true
webexURI=true spaceURI=false callURI=true
```

Calendaring Notes

- Meeting Subject is encrypted and requires KMS connection to decrypt
- OBTP Requires one of meetingJoinURI, meetingJoinURL, webexURI, spaceURI, or callURI to show up
  - Ensure that `DeleteComments` is set to false on the resource mailbox
- Meeting IDs shown in logging can be cross referenced in bookings.txt
  - `*r BookingsListResult Booking 1 Id: "webex-1"`
  - `*r BookingsListResult Booking 1 MeetingId: "6103501f-3650-6ae0-bf76-b661a74ceba3"`
  - `*r BookingsListResult Booking 1 Title: "CLUS 2022 Test Meeting"`

Questions

Technical Session Surveys

- Attendees who fill out a minimum of four session surveys and the overall event survey will get Cisco Live branded socks!
- Attendees will also earn 100 points in the Cisco Live Game for every survey completed.
- These points help you get on the leaderboard and increase your chances of winning daily and grand prizes.

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