Possibilities

#CiscoLive

Advanced Coding and Deployment for Cisco Video Devices

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DGTL-BRKPRG-3244

Agenda

- CE Programmability
- Cloud Programmability

/Cisco/CX/DevNet/StèveSfartz

- API Architect at Cisco - Customer eXperience
- Working to deliver the greatest API and developer eXperience for our customers & partners
- Technical lead for Cisco API Experience group and API Style Guide
- Subject Matter Expert for Webex APIs
- Contributor to DevNet CodeExchange and AutomationExchange

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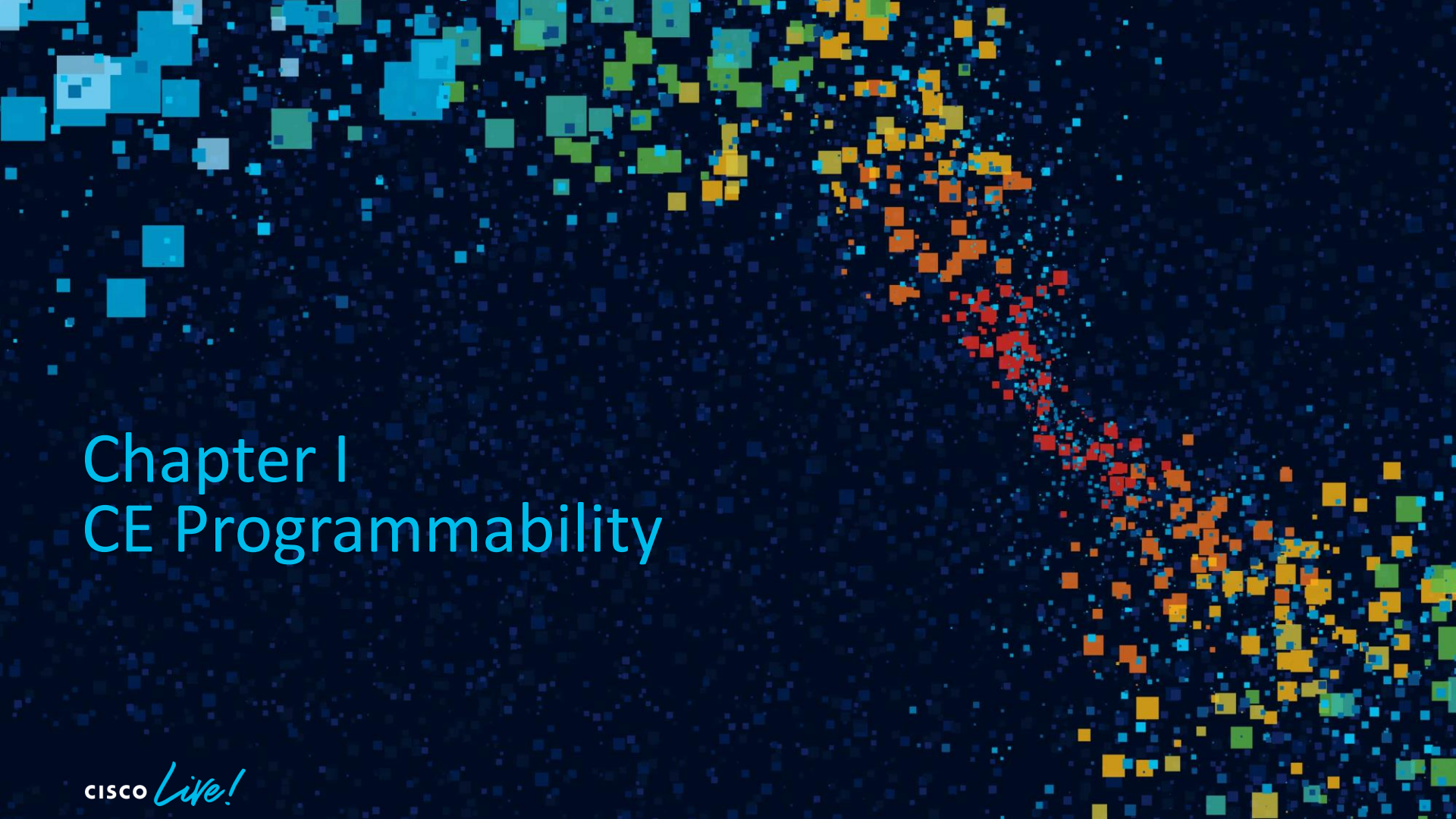
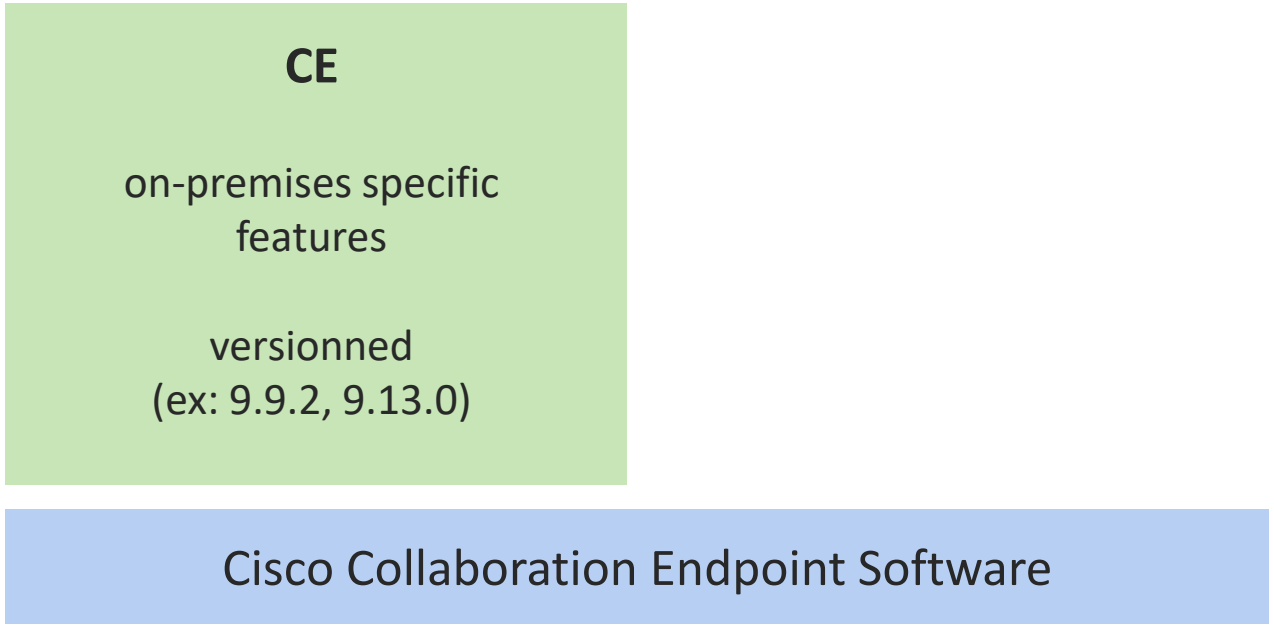
github: ObjectIsAdvantag
twitter: @SteveSfartz

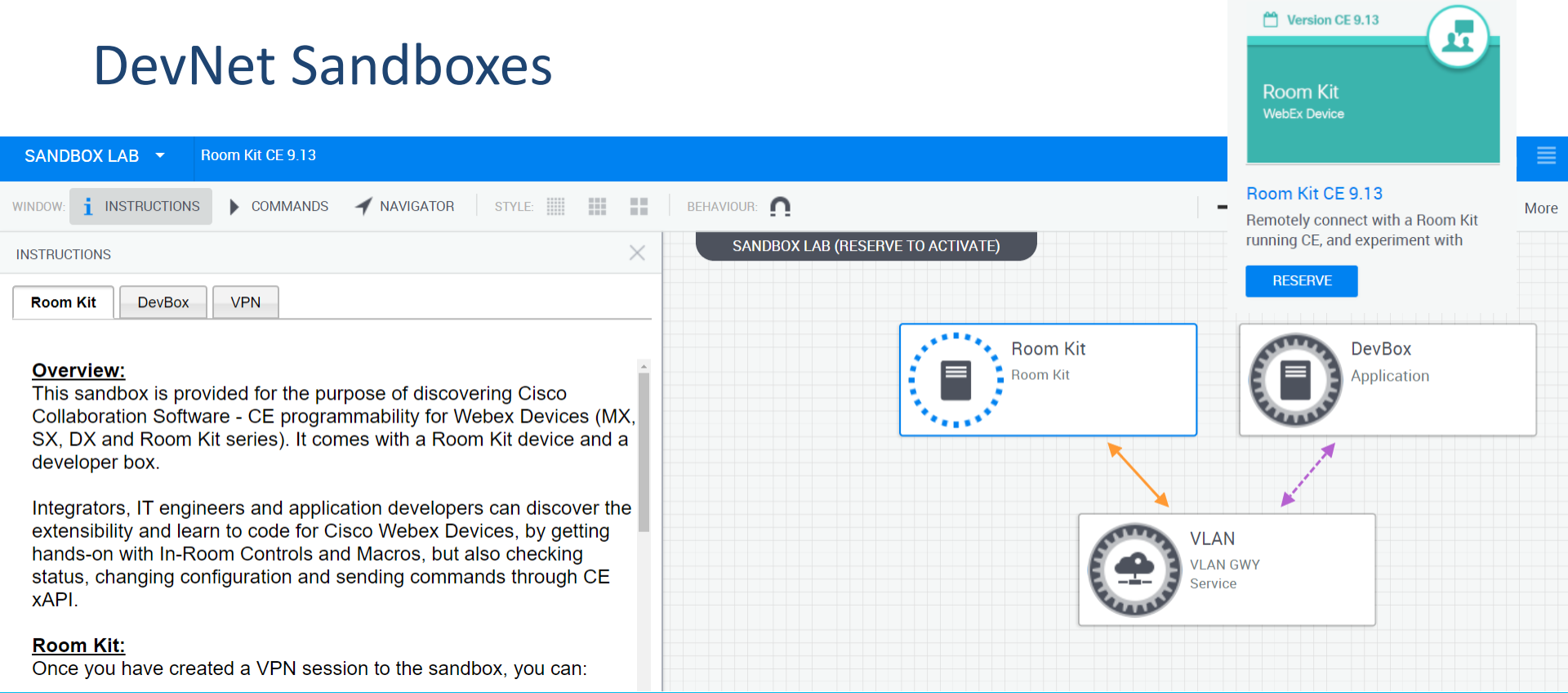
"vision without execution is hallucination"


Chapter I
CE Programmability

CE and RoomOS



DevNet Sandboxes



https://developer.cisco.com/sandbox/

Cisco Collaboration Devices Programmability

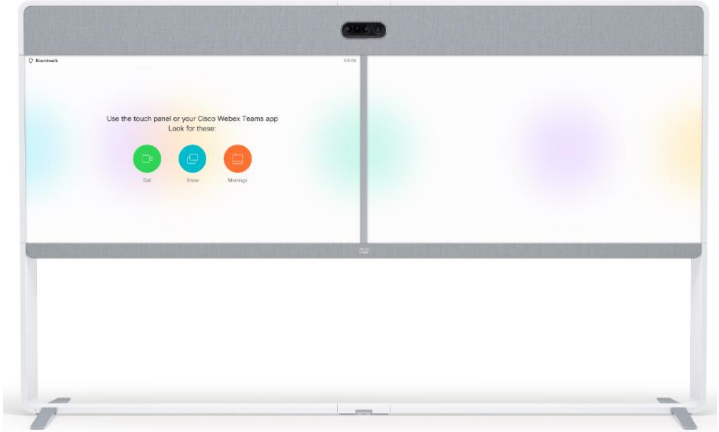
Available on all devices running CE & RoomOS

RoomKit standard, pro, mini

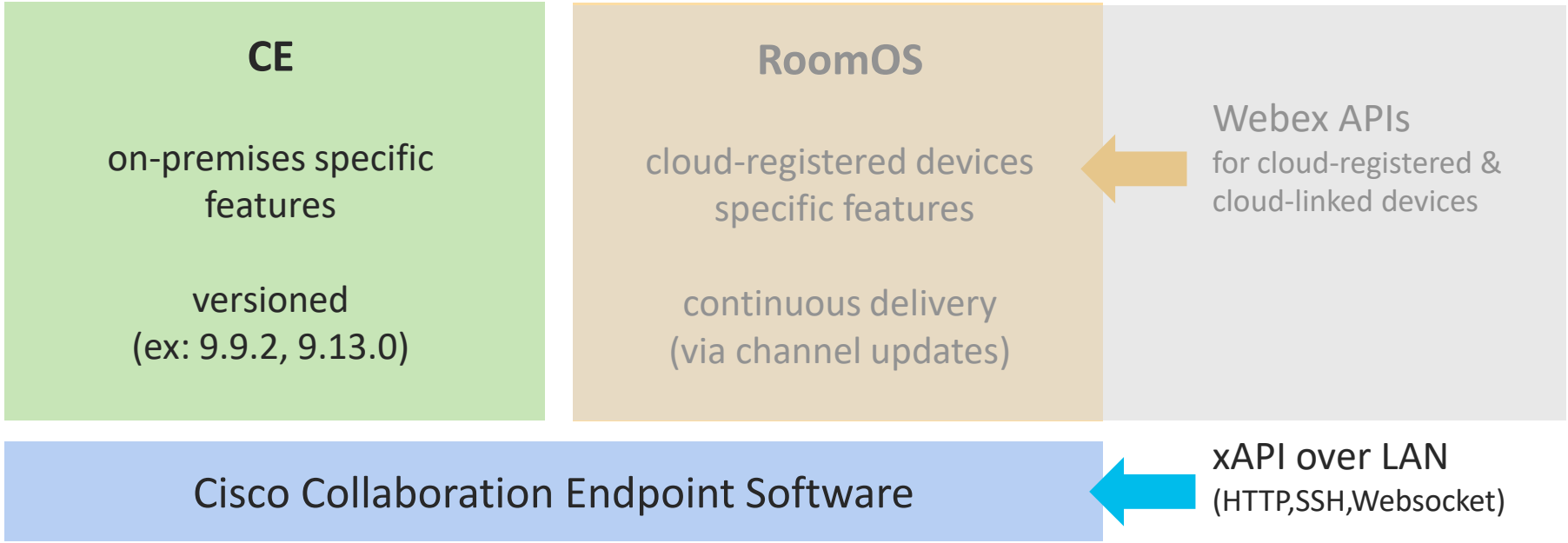
*no Macros on SX10

Webex Board

DX, DeskPro



CE and RoomOS



xAPI module at DevNet

https://developer.cisco.com/learning/modules/xapi-intro

Introduction to Webex Devices Programmability

Discover how to customize and extend Webex Devices through xAPI – the API exposed by Cisco Collaboration Endpoint CE software. Learn to configure your device, start video calls from code, add Branding but also how to create custom In-Room Controls and deploy Macros on your devices. Go hands-on with a CE-capable device or a provided RoomKit sandbox. This module assumes you have some basic programming experience.

1 Hour 50 Minutes

Introduction to xAPI for Cisco Collaboration Devices

Explore the programmability of Cisco Collaboration Devices and understand xAPI – the API exposed by Cisco TelePresence CE software.

Creating custom in-room controls for Cisco collaboration devices

Learn how to create custom in-room controls for Cisco collaboration devices, using the on-board control simulator tool and the in-room control editor. Then make those controls interactive via a PC-based Node.js script.

Customizing collaboration devices from code

Learn to customize display logos, signage and custom messages for Cisco Collaboration Devices via SSH, HTTP and Node.js/JavaScript.

CE Programmability (xAPI)

Detailed in BRKPRG-3244 CL20B

Standalone
(JavaScript, Python…)

Macros
(JavaScript)

Touch Interfaces

deploy

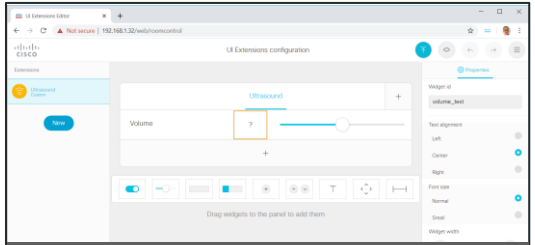
status

configure

command

*over ssh, Websocket, serial, or HTTP**

events



UI Extensions Editor

Is the device configured for HttpClient?

Is the panel deployed?

How can I pass these values?

What if the request fails?

Is this the correct event?

Detailed in BRKPRG-3244 CL20B

```
// The device must be configured to support HttpClient
//  - xConfiguration HttpClient Mode: On
//  - xConfiguration HttpClient AllowInsecureHTTPS: True

const xapi = require('xapi');

xapi.event.on('UserInterface Extensions Widget Action', (event) => {
  if ((event.WidgetId == 'BRKDEV_slider') && (event.Type == 'released')) {
    // Change color for Philips Hue light
    const HUE_BRIDGE = '192.168.1.33';
    const HUE_USERNAME = 'EM2Vg2GtNUqAASukv47wm1pWY0FayFe48D03f6Cb';
    const HUE_LIGHT = 1; // number of the light in your deployment

    xapi.command('HttpClient Put', {
        Header: ["Content-Type: application/json"],
        Url: `http://${HUE_BRIDGE}/api/${HUE_USERNAME}/lights/${HUE_LIGHT}/state`,
        AllowInsecureHTTPS: "True",
        ResultBody: 'plaintext'
      },
      JSON.stringify({ "hue": Math.round(event.Value / 255 * 65535), "sat": 255 }));
  }
```

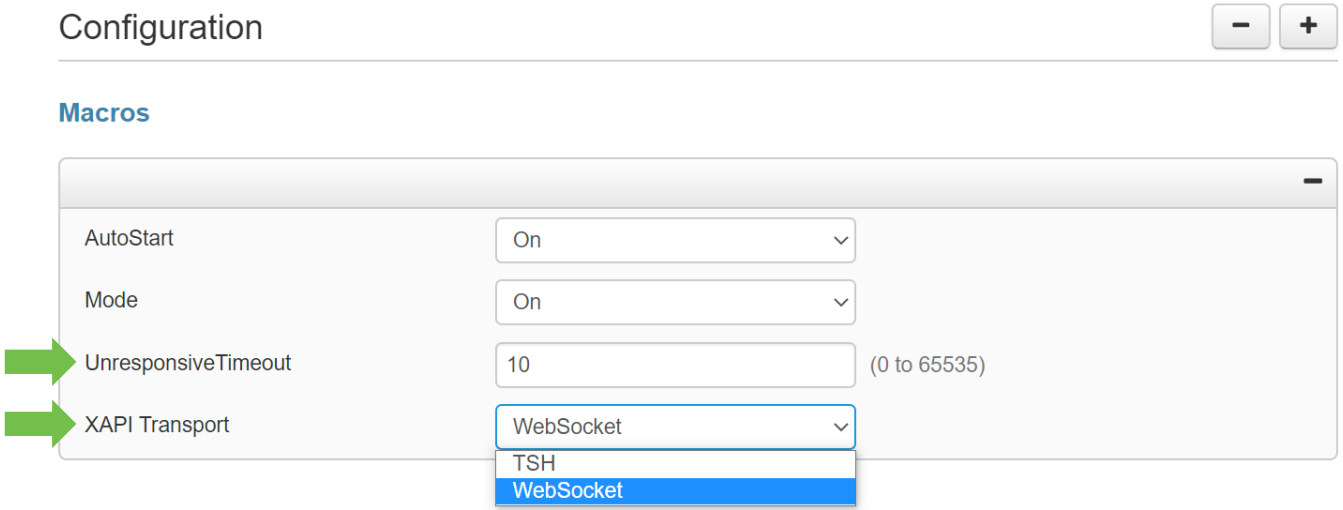
Macro Runtime

- Available for CE & RoomOS Webex devices (except SX10)
- Duktape JavaScript runtime with Babel
  - babel-preset-latest' is specified to support latest ES6+ features
  - async/await is supported
- Macros are executed as 'Admin' role
- Increased number of Macros (30 and more, depends on device capacity)
- Maximum of 10 active macros
- Macro tutorial accessible from the codec
  - http://<ip-address>/static/docs/macro-tutorial.pdf

new

Tuning the Macro Runtime

xAPI transport now defaults to WebSocket



Node.js ‘jsxapi’ module

https://github.com/cisco-ce/jsxapi

- Connect via ‘ssh’ or ‘websockets’ (since jsxapi v4.4 & CE 9.8)

```
const jsxapi = require('jsxapi');

jsxapi
  .connect('ssh://host.example.com', {
    username: 'admin',
    password: 'password',
  })
  .on('error', console.error)
  .on('ready', async (xapi) => {
    const volume = await xapi.status.get('Audio Volume');
    console.log(`volume is: ${volume}`);
    xapi.close();
  });
```

```
jsxapi
  .connect('wss://host.example.com', {
    username: 'admin',
    password: 'password',
  })
```

Benefits

- Better performances
- Manage CE directly from Web Applications

Manage Devices from Web Applications

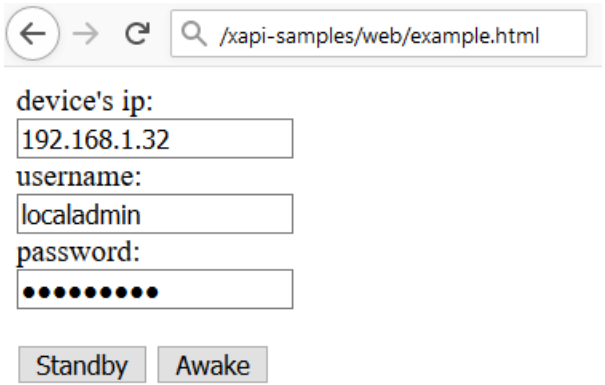
https://github.com/CiscoDevNet/xapi-samples/blob/master/web/example.html

```
<script src="./jsxapi-501.min.js"></script>
<script>
   let xapi = jsxapi.connect(`wss://${document.device.ip.value}`,
      { username: document.device.user.value, password: document.device.passwd.value });
   xapi.on('ready', () => {
      console.log("connected to device, ready to send xAPI requests");
   });

   function standby() {
      xapi.command("Standby Activate")
         .then(() => console.log("device in Standby mode"))
         .catch((err) => console.log(`error: ${err.message}`));
   }

   function awake() {
      xapi.command("Standby Deactivate")
         .then(() => console.log("device is now Active"))
         .catch((err) => console.log(`error: ${err.message}`));
   }

</script>
```



Enhanced coding style

Available for both Macro runtime and ‘jsxapi’ module

Invoking a command:

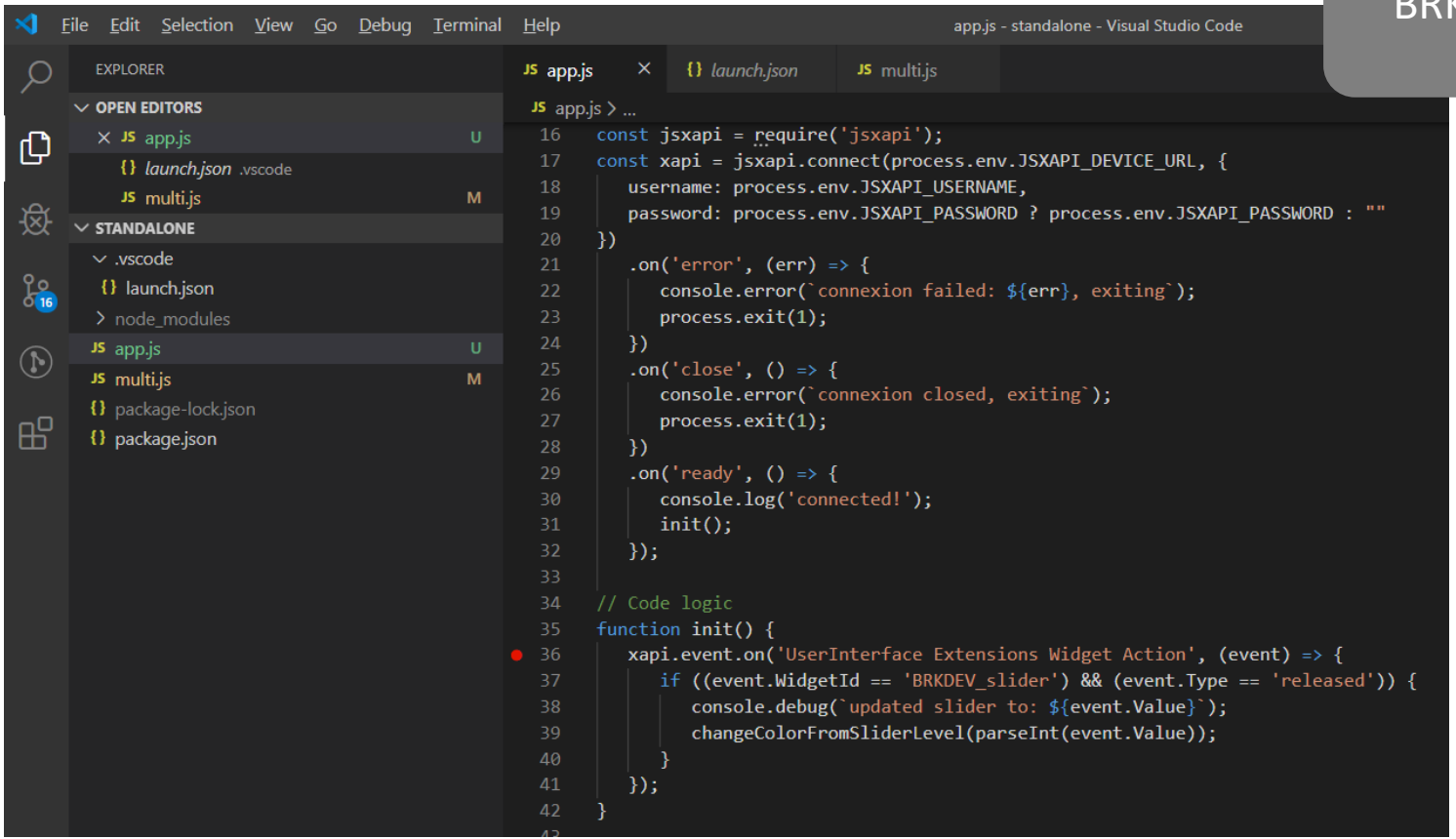
```
xapi.Command.Dial({ Number: 'user@example.com' });
```

Getting a status:

```
xapi.Status.Audio.Volume.get().then((volume) => {
  console.log(volume);
});
```

IDE: a better coding experience!

Detailed in BRKPRG-3244 CL20B



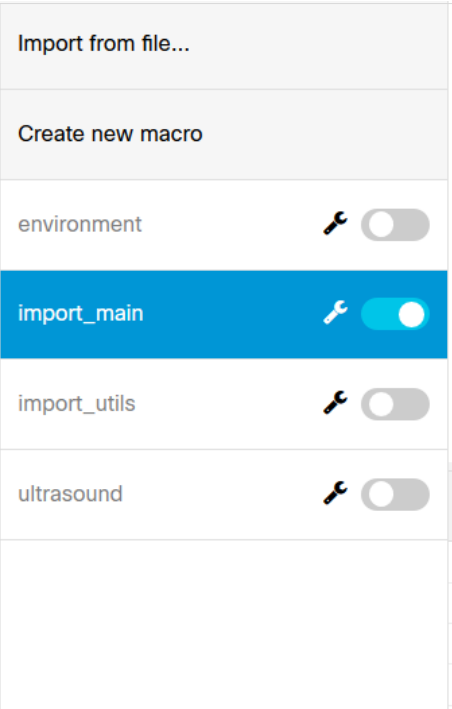
Enhanced Macro Editor

new

- The Macro Editor now leverages ‘Monaco’
- ‘Monaco’ is the code editor that powers Visual Studio Code
- Better code completion and warnings

Reuse code across Macros

new




```
1   // main macro
2   import { getVolume, sleepFor } from './import_utils';
3
4   async function main() {
5     const timeout = 2000;
6     console.log(`fetching volume + sleeping for ${timeout}ms`);
7
8     const [volume] = await Promise.all([
9       getVolume(),
10      sleepFor(timeout),
11    ]);
12    console.log(`DONE: volume is ${volume}`);
13  }
14
15  main();
16
```

Severity ▾ | import | ☐ Show history

```
07:31:38  import_main  >  Loading...
07:31:38  import_main  >  'fetching volume + sleeping for 2000ms'
07:31:38  import_main  >  Ready!
07:31:40  import_main  >  'DONE: volume is 40'
```

```
// utils macro
import xapi from 'xapi';

export async function getVolume() {
  return await xapi.Status.Audio.Volume.get();
}

export function sleepFor(timeout) {
  return new Promise((resolve) => {
    setTimeout(resolve, timeout);
  });
}
```

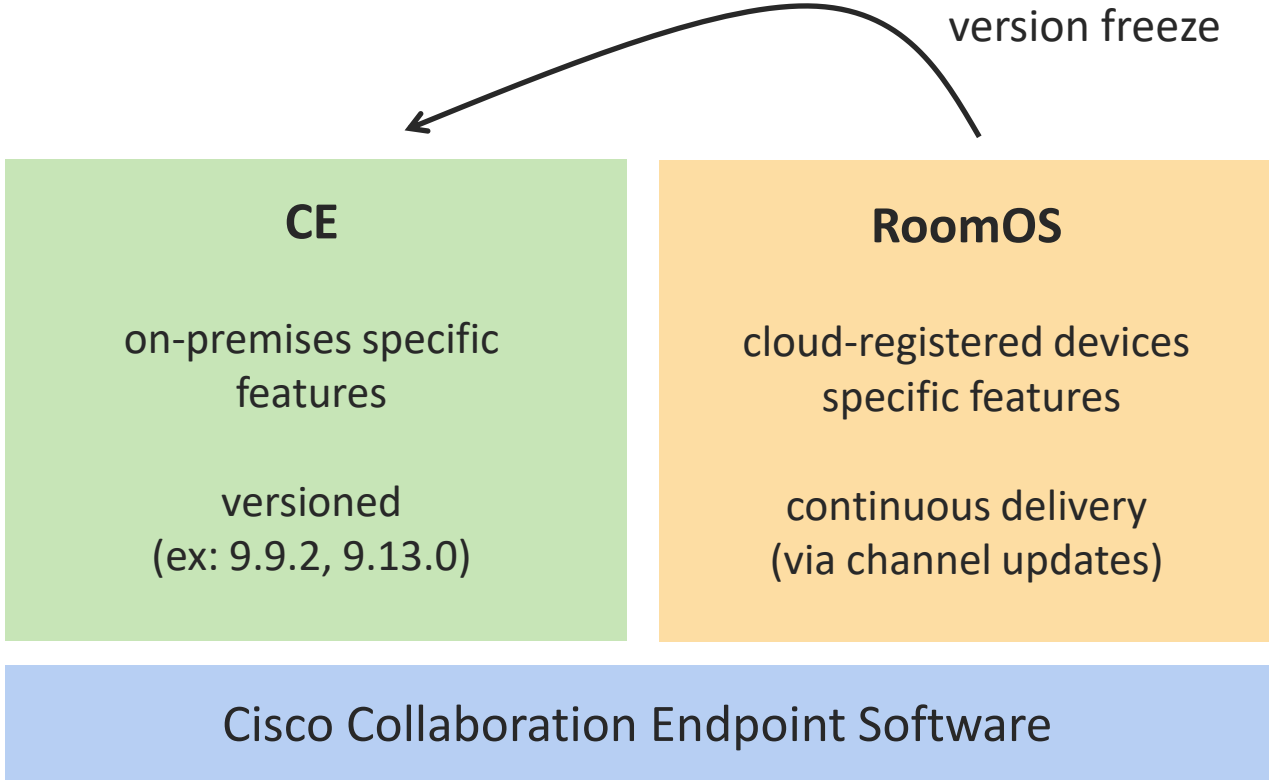
import_utils

What’s new for CE Programmability

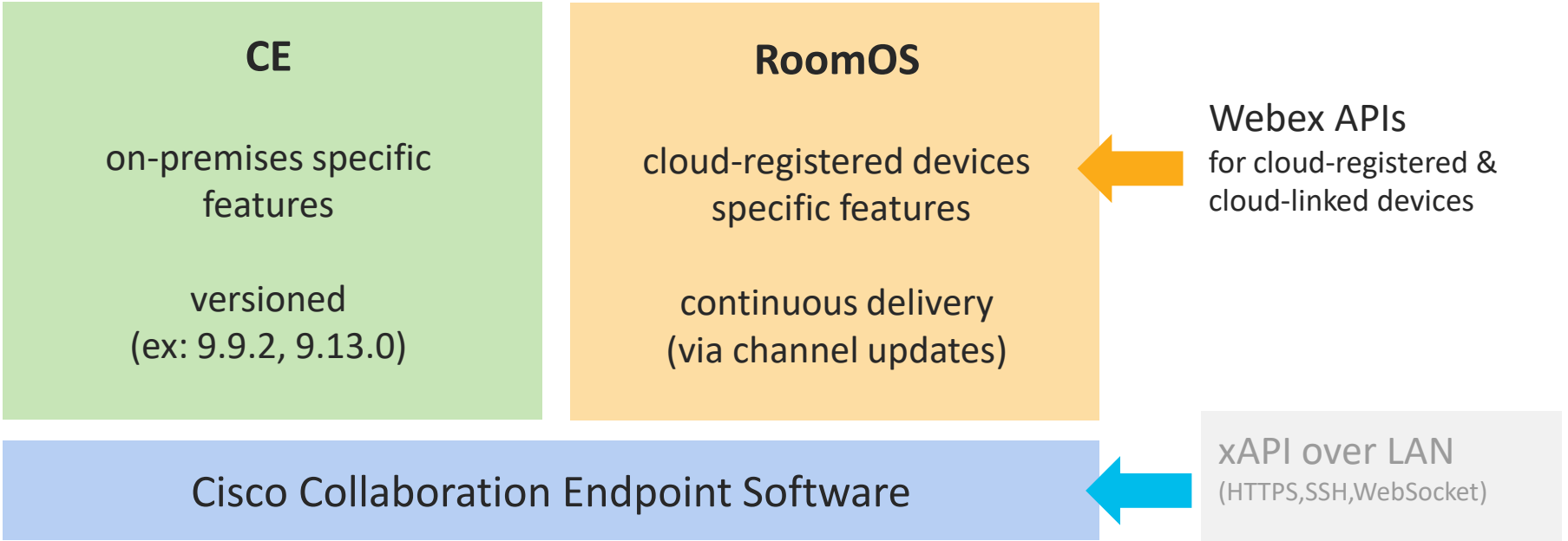
- Enhanced Macro Editor
- Macro Runtime
  - Transport defaults to Websocket
  - Increased number of Macros
  - Reuse code across Macros

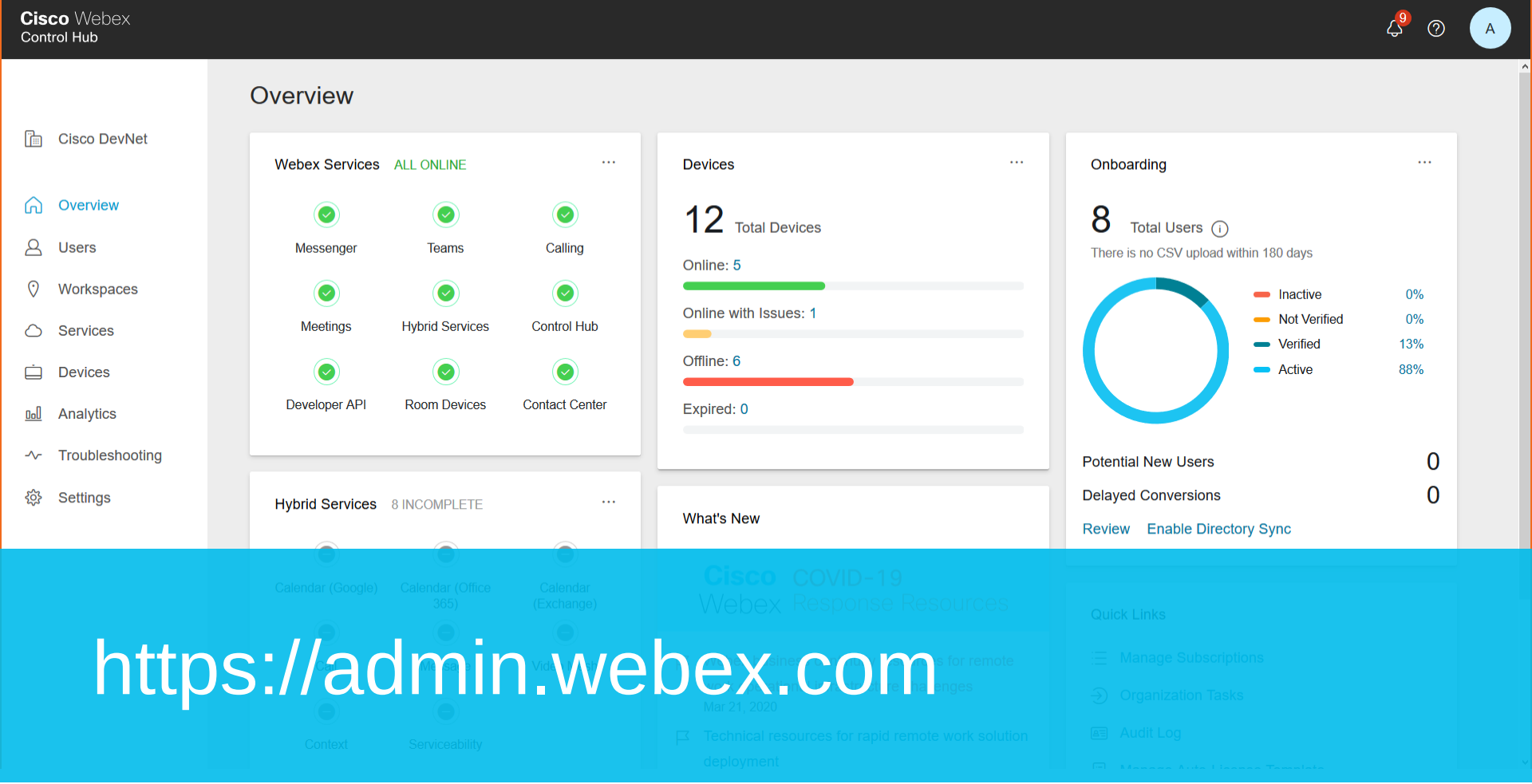

Chapter II
Cloud Programmability for
Webex Devices
cisco Live!

CE and RoomOS



CE and RoomOS





https://admin.webex.com

Webex APIs for Devices

coming

/devices	/places	/xapi	/device Configurations	/workspaces
GET List Devices	GET List Places	GET Query Status	GET List Configurations	GET List Workspaces
POST Activation code	POST Create Place	POST Execute Command		POST Create Workspace
GET Get details	GET Get details			GET Get details
	PUT Update Place		PATCH Update Configurations	PUT Update Workspace
DELETE Delete Device	DELETE Delete Place			DELETE Delete Workspace

Managing Devices & Places

https://developer.webex.com/docs/api/v1/devices

Detailed in DGTL-DEVNET-2610

/devices	/places
GET List Devices	GET List Places
POST Activation code	POST Create a Place
GET Get details	GET Get details
	PUT Update a Place
DELETE Delete a Device	DELETE Delete a Place

OAuth scopes

for Webex administrators:

- spark-admin:devices_read
- spark-admin:devices_write
- spark-admin:places_read
- spark-admin:places_write
- identity:placeonetimepassword_create

for Webex users:

- spark:devices_read
- spark:devices_write
- spark:places_read
- spark:places_write

Managing Devices and Places [demo]

Postman collections for Webex

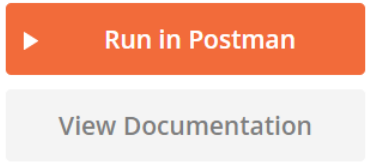
Webex Admin API

Perform administration actions such as provisioning a user and managing devices, rather than using Cisco Webex Control Hub.

The Cisco Webex API includes administration APIs that allow administrators to perform actions such as provisioning users and managing devices.

By automating administration, user management and provisioning can be centralized in an existing tool, rather than using the Webex Control Hub. For example, a partner selling multiple Collaboration tools to customers can use these APIs to enable Webex provisioning through a centralized portal.

https://developer.webex.com/admin-api.html



CHECK all collections for Cisco APIs:
https://explore.postman.com/team/ciscodevnet

▸ List Devices

GET {{WEBEXAPI}}/devices

Body Cookies Headers (12) Test Results (2/2)

Pretty Raw Preview Visualize JSON


```
{
    "items": [
        {
            "id": "Y2lzY29zcGFyazovL3VybjpURUFNOnVzLWVhc3QtMl9hL0RFVklDRS9mNzhlYjYwMC05MDliLTRmZDctOGQ4Yy0xYTBlNzJlYzdlODM=",
            "displayName": "charles",
            "placeId": "Y2lzY29zcGFyazovL3VybjpURUFNOnVzLWVhc3QtMl9hL1BMQUNFLzZjOTY1OWRlLTczNWMtNGViMi04ZTExLWM5ZjQ5ZGQ2MTdmYw==",
            "orgId": "Y2lzY29zcGFyazovL3VybjpURUFNOnVzLWVhc3QtMl9hL09SR0FOSVpBVElPTi8xZWU4MmRlMy1hMmQ0LTRiNWMtOWNhNC1hYzAzOTgzZGYwNzk=",
            "capabilities": [],
            "permissions": [],
            "product": "Cisco Webex DX80",
            "tags": [],
            "ip": "192.168.0.14",
            "mac": "1C:6A:7A:E1:39:EE",
            "serial": "FOC2015NJ04",
            "activeInterface": "LAN",
            "software": "RoomOS 2020-08-06 118dbf07142",
            "upgradeChannel": "Stable",
```

List Devices

Examples 0 | BUILD

GET | {{WEBEXAPI}}/devices | Send | Save

Params | Authorization | Headers (8) | Body | Pre-request Script | Tests | Settings | Cookies | Code

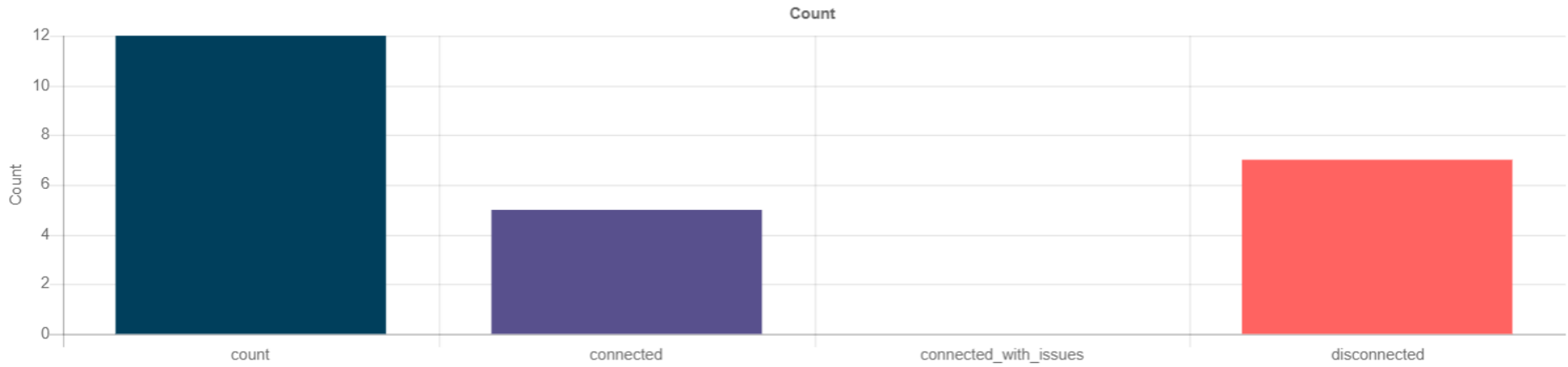
Headers 7 hidden

KEY	VALUE	DESCRIPTION	••• Bulk Edit	Presets
Authorization	Bearer {{access_token}}			
Key	Value	Description		

Body | Cookies | Headers (12) | Test Results (2/2)

Status: 200 OK | Time: 779 ms | Size: 10.15 KB | Save Response

Pretty | Raw | Preview | Visualize



List Devices

GET {{WEBEXAPI}}/devices

Params Authorization Headers (8) Body Pre-request Script Tests Settings

```
78              myChart.update();
79          });
80
81      </script>`;
82
83      // Set the visualizer template
84      pm.visualizer.set(template, {
85          labels: [
86              "count",
87              "connected",
88              "connected_with_issues",
89              "disconnected"],
90          data: [
91              devices.length,
92              devices.filter((device) => { return (device.connectionStatus === "connected") }).length,
93              devices.filter((device) => { return (device.connectionStatus === "connected_with_issues") }).length,
94              devices.filter((device) => { return (device.connectionStatus === "disconnected") }).length]
95      });
96  }
```

Cloud APIs for Webex Devices

Device Configurations API

released

/deviceConfigurations

GET

List Configurations for a device

PATCH

Update, Delete Configurations for a device

OAuth scopes

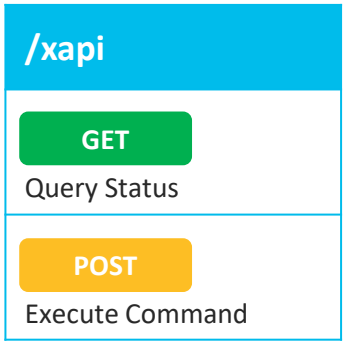
for Webex administrators:

- spark-admin:devices_read
- spark-admin:devices_write

```
curl -X PATCH
'/v1/deviceConfigurations?deviceId=Y2lzY…’
-H 'Authorization: Bearer YzViYz…’
-H 'Content-Type:  application/json-patch+json'
--data-raw '[{
 "op"    : "replace",
 "path"  : "Audio.Ultrasound.MaxVolume/sources
           /configured/value",
 "value" : 70 }]'
```

Cloud /xAPI for Webex Devices

https://developer.webex.com/docs/api/guides/xapi



OAuth scopes

- spark:xapi_statuses
- spark:xapi_commands

Webex administrators can invoke GET & POST /xapi for ALL devices listed via GET /devices

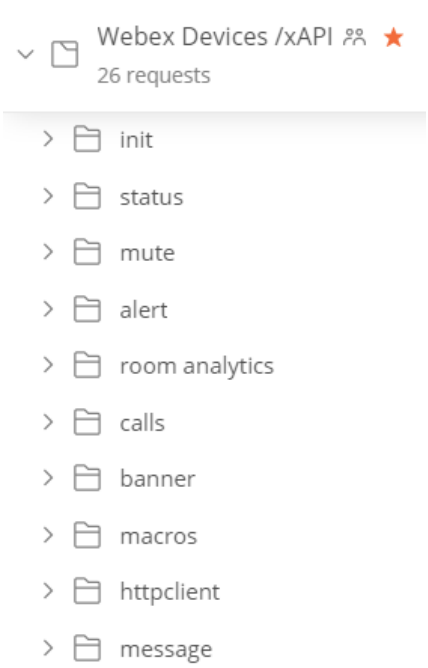
- no need for the ‘xapi’ to show up for the permission attribute

```
"permissions": [
    "xapi"
],
```

Webex users & bots can invoke GET or POST /xapi

- for devices listed with GET /devices
- with ‘xapi’ displayed for the permission attribute (manually configured in Webex Control Hub)

Postman collections for Webex /xAPI



Webex Devices /xAPI

Invoke commands and query the status of devices that run Webex RoomOS software:

The xAPI allows developers to programmatically invoke commands and query the status of devices that run Webex RoomOS software:

Executing commands requires an auth token with the spark:xapi_commands scope.
Querying devices requires an auth token with the spark:xapi_statuses scope.

To manage Devices, see the Devices API. xAPI commands and statuses are described in the Cisco Collaboration Endpoint Software API Reference Guide. For more information about xAPI, see the xAPI Guide.

https://developer.webex.com/docs/api/v1/xapi

Run in Postman

View Documentation

PUBLISHER

Cisco DevNet

Cisco's developer program - developer.cisco.com developers and IT professionals write applicatior develop integrations.

CATEGORIES

BUSINESS SOLUTIONS CLOUD COMMUNICATIONS

CHECK all collections for Cisco APIs
https://explore.postman.com/team/ciscodevnet

Query Status
Execute Commands
[demo]

Webex APIs Access Tokens

Detailed in DGTL-DEVNET-2610

Testing	Thanks to your developer token, invoke Webex APIs **under your own Webex identity.**
Integration	Invoke Webex APIs **on behalf of Webex Users' identity.** Supports fine-grained permissions **using OAuth scopes.**
Bot Account	Invoke the Webex APIs under a **machine identity. Inherits only the 'user-level' OAuth scopes** of its creator (admin privileges are NOT transferred).
Guest Account	Allows for **non-Webex users** to use the Messaging, Calling and Meeting services (note that at least one Webex user must be taking part in the activity).

webex-integration-admin

Utility to create 'scoped' OAuth tokens for Webex Admins and Compliance Officers

Detailed in DGTL-DEVNET-2610

https://developer.cisco.com/codeexchange

Scoped Tokens for Admins

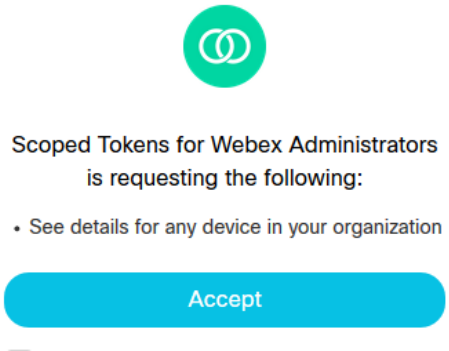
This utility tool helps generate OAuth scoped tokens for Webex Organisations administrators, using an OAuth pre-configured integration.

Select scopes and click Start

Start OAuth flow

'spark-admin' scopes

- ☑ spark-admin:devices_read
  See details for any device in your organization
- ☐ spark-admin:devices_write
  Delete any device in your organization
- ☐ spark-admin:licenses_read
  Access to read licenses available in your user's organizations
- ☐ spark-admin:organizations_read
  Access to read your user's organizations



https://webex-token.herokuapp.com

Webex APIs Access Tokens

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Device APIs Access

Current access for devices belonging to 'steve'

The following bots and users are authorised to access the device APIs. Full access provides control over all devices belonging to this workspace. Make sure that you trust the source.

Full admins and device admins are automatically authorized on all shared devices in the org and don't need to set up access.

Authorized To	Access Level	Access Given By	
Cloud xAPI xapicloud@webex.bot	Full Access	Admin July 3, 2019 6:53 AM	
User 1 user1@chatbot.land	Read Only	Admin August 26, 2020 2:38 AM	

Support for multi-line commands

new

POST /v1/xapi/command/SystemUnit.WelcomeBanner.Set

```
{
    "deviceId": " Y2lzY29zcGF…yazoQzNWU=",
    "arguments": {},
    "body": "****************\nWebex Device\nAuthorized Access Only\n****************"
}
```

200 OK

```
{
    "deviceId": "Y2lzY29zcGF…yazoQzNWU=",
    "result": {}
}
```

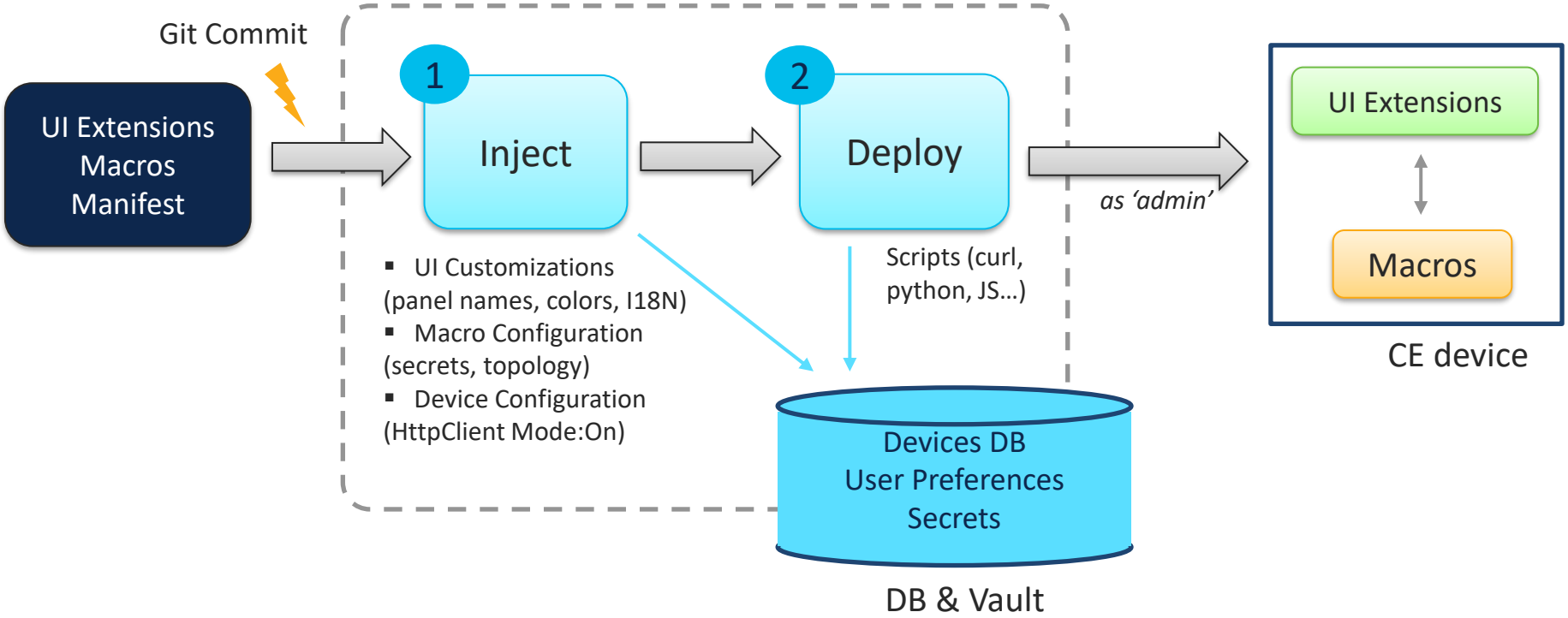
```
$  ssh 192.168.1.32 -l localadmin
Password:
***************
Webex Device
Authorized Access Only
***************

Welcome to
Cisco Codec Release RoomOS 2020-08-06 118dbf07142
SW Release Date: 2020-08-06
*r Login successful
OK
```

[Use case]
Deploying UI Extensions & Macros over the cloud

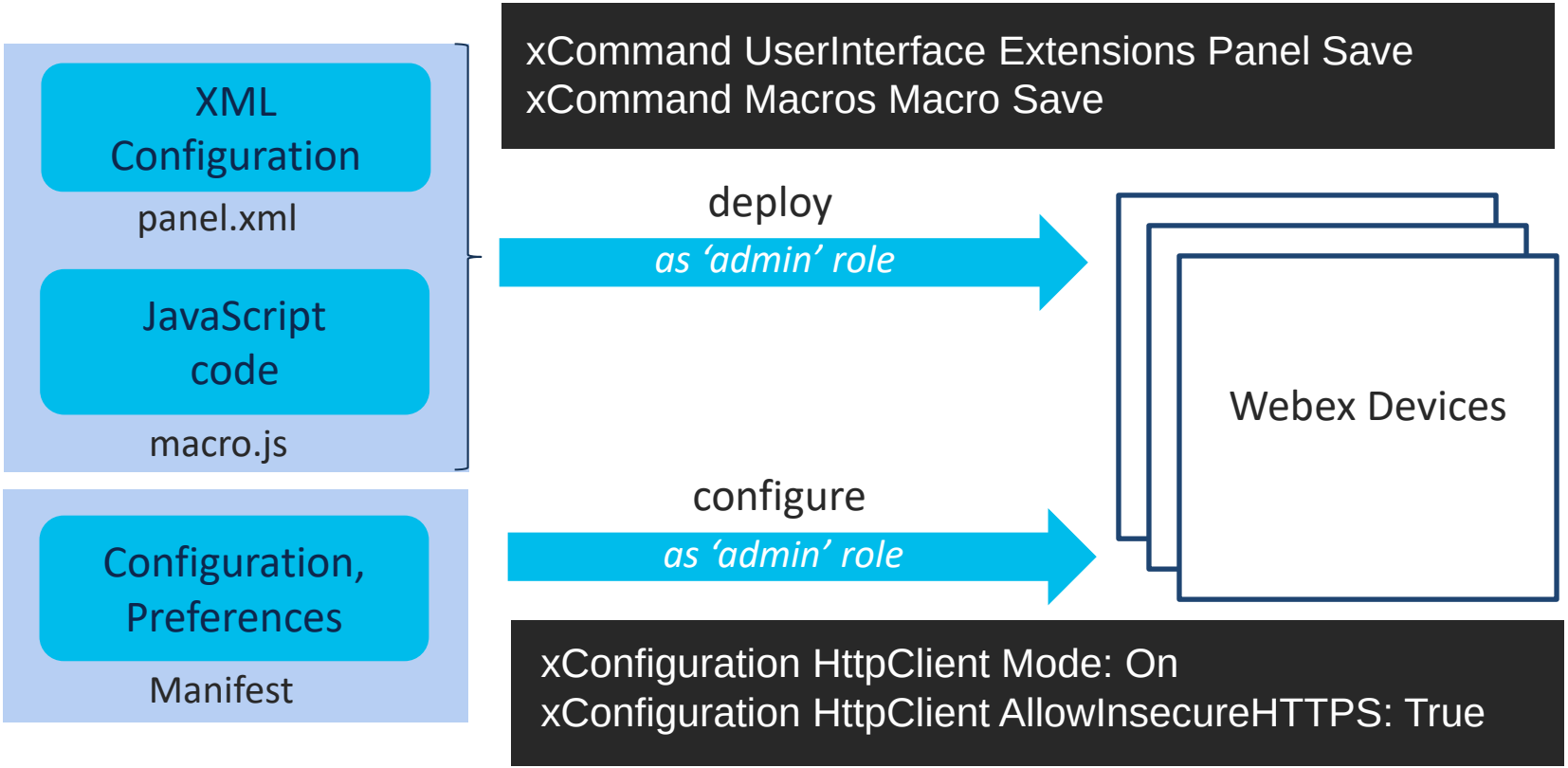
Deployment strategies

Inject topology and secrets along the CI/CD pipeline

See BRKPRG-3244
CL20B



Deploying to Webex Devices



Automated deployment of Macros

xCommand Macros Macro Save

Applies to: *DX70/DX80 SX20 SX80 MX200G2/MX300G2 MX700/MX800/MX800D RoomKit RoomKitMini CodecPlus CodecPro Room55 Room70/Room55D Room70G2 Boards*

Requires user role: ADMIN

Saves the details of a macro. This is a multiline command.

USAGE:

```
xCommand Macros Macro Save Name: "Name" [Overwrite: Overwrite] [Transpile:
Transpile]
```

where

Name:

String (0..255)

The name of the macro that is saved.

Overwrite:

False/True

XML over HTTP: /putxml

LAN Access

unidirectional

POST https://192.168.1.26/putxml

Params | Authorization | Headers (2) | Body | Pre-request Script | Tests

none | form-data | x-www-form-urlencoded | raw | binary | XML (text/xml)

```
<Command>
    <Macros>
        <Macro>
            <Save>
                <Name>HelloWorld</Name>
                <OverWrite>True</OverWrite>
                <body>console.log("hello world")</body>
            </Save>
        </Macro>
    </Macros>
</Command>
```

Post Macros as ‘text’,
as ‘Base64’ encoding for images
Escape XML tags for UI Extensions.

serial port
ssh
HTTP
WebSocket

text
XML
JSON

Support for multi-line commands

Webex Devices /xAPI

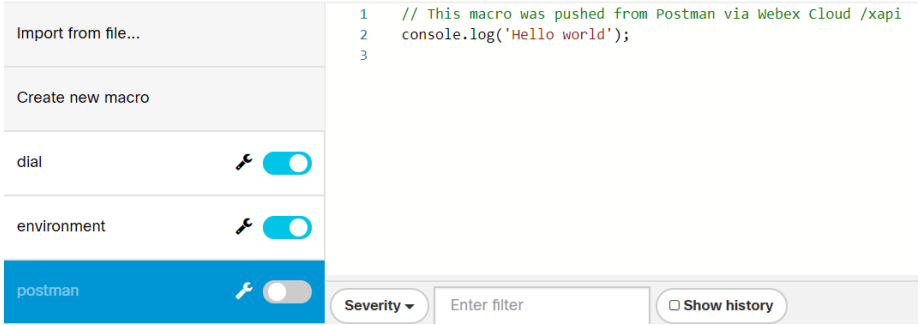
new

POST /v1/xapi/command/Macros.Macro.Save

```
{
    "deviceId": "Y2lzY29zcGF…yazoQzNWU=",
    "arguments": {
        "Name": "postman",
        "OverWrite": "False"
    },
    "body": "// This macro was pushed from P
ostman via Webex Cloud /xapi\nconsole.log('H
ello world');\n"
}
```

200 OK

```
{
    "deviceId": "Y2lzY29zcGF…yazoQzNWU=",
    "result": {}
}
```



Awesome xAPI

github.com/CiscoDevNet/awesome-xapi

A curated list of developer resources for **Webex Devices API** inspired by awesome-go and awesome-python.

> Looking for developer resources for **Webex Messaging and Meetings**? check awesome-webex.

Contents

DISCLAIMER: Cisco does not make any commitments about the resources listed in this document, nor the accuracy of the third party resources and any content accessible via the links below.

Join the 'xAPI Devs' Teams Space

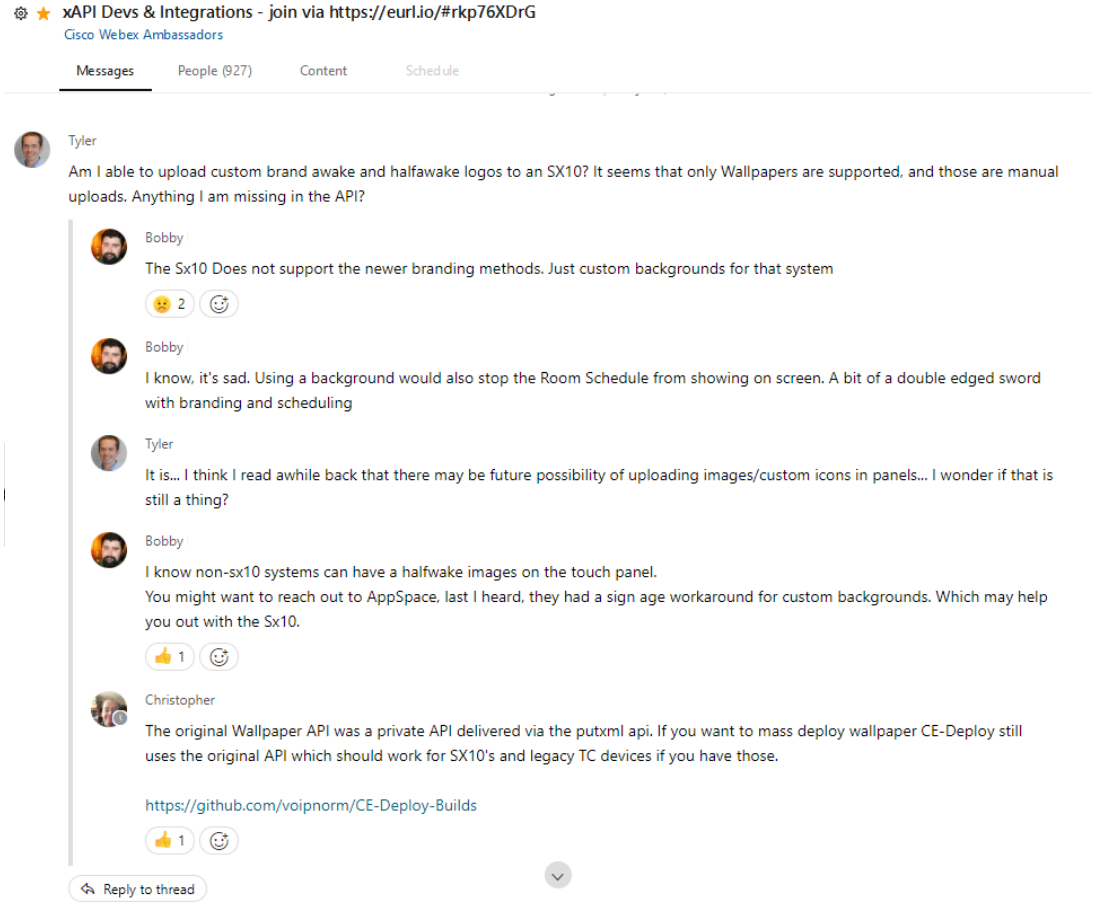
http://bit.ly/join-xapi-devs

‘xAPI Devs’

- Join the community

  https://eurl.io/#rkp76XDrG
  http://bit.ly/join-xapi-devs

- 900+ members



Awesome Webex

github.com/CiscoDevNet/awesome-webex

A curated list of Webex Developer Resources, inspired by awesome-go and awesome-python.

> Note that this list covers Webex Messaging, Meetings and Devices APIs and SDKs, as well as Webex Admin APIs. Check awesome-xapi if you are interested in developer resources for on-premises Cisco Collaboration Devices.

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Join the #webex4devs Teams Space

developer.webex.com/support

Thank you

Possibilities

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