cisco Live!

Let's go

The bridge to possible

Internet of Things on the Next Generation Cisco Catalyst Wireless Wi-Fi 6E Access Points

Jose Correa, Technical Marketing Engineer
Ali Samioglu, Leader, Systems Engineering

BRKEWN-1538

Cisco Webex App

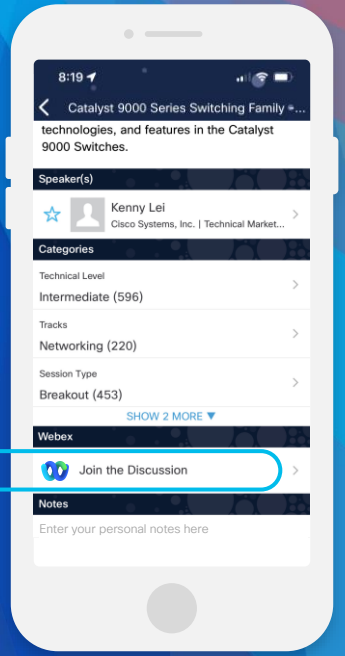
Questions?

Use Cisco Webex App to chat
with the speaker after the session

How

1. Find this session in the Cisco Live Mobile App
2. Click “Join the Discussion”
3. Install the Webex App or go directly to the Webex space
4. Enter messages/questions in the Webex space

Webex spaces will be moderated by the speaker until June 9, 2023.



https://ciscolive.ciscoevents.com/ciscolivebot/#BRKEWN-1538

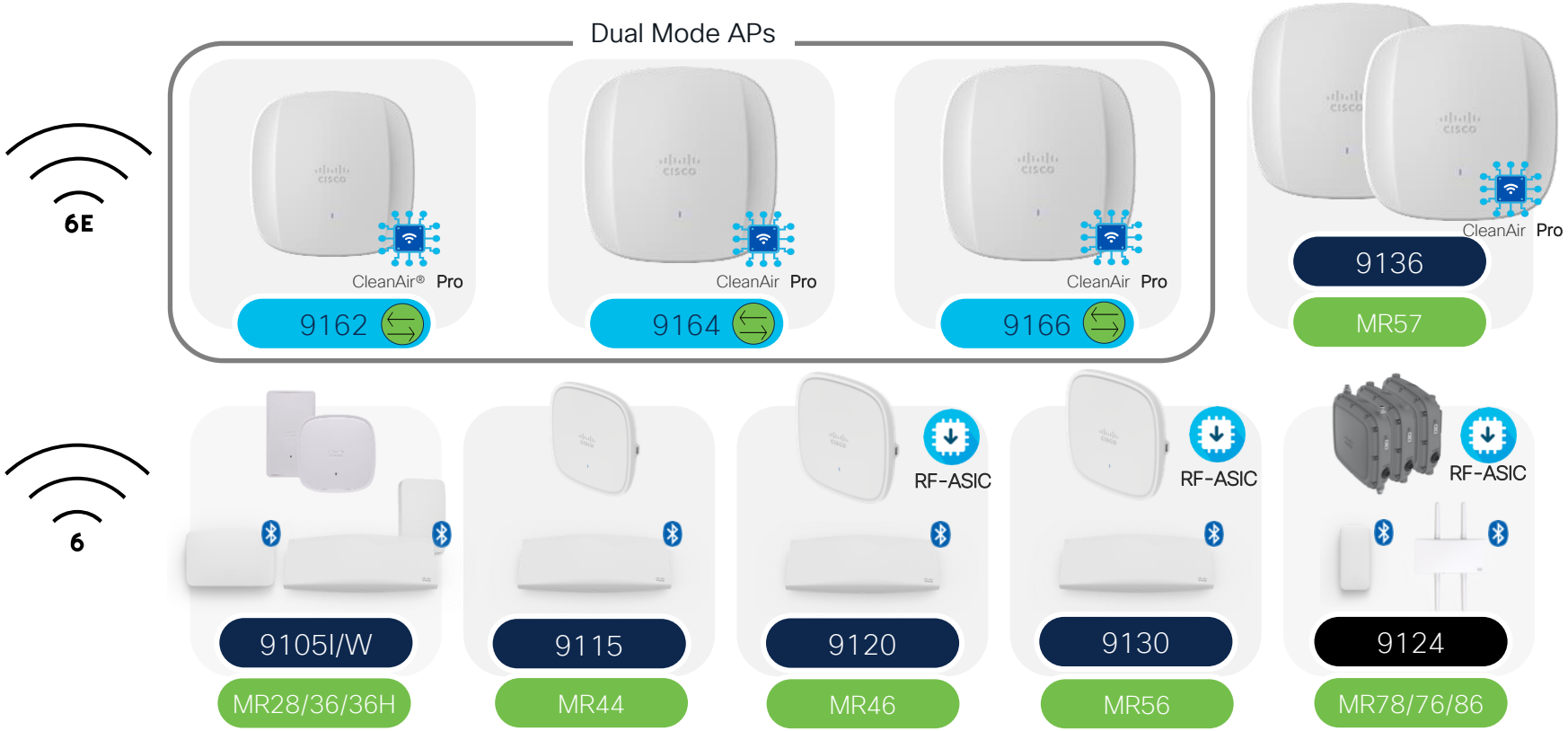
Agenda

- Internet of Things Overview
- Integrated IoT Radio
- Built-in Environmental Sensors
- Meraki IoT Integrations
- Application Hosting on Catalyst Wi-Fi 6E Access Points
- Wipelot Eagle Eye

Jose Correa
Technical Marketing Engineer

- 3 Years at Cisco
- Working on Access Points, Wireless Sensors, and IoT technology for Cisco Catalyst Wireless
- Loves eating new food and watching Netflix

Industry's best & broadest Wi-Fi 6/6E portfolio



Management mode can be changed

Catalyst 6E Access Points
Enabling New Experiences

Cisco CleanAir® Pro

Dedicated tri-band radio for intelligent packet capture and spectrum analysis for rapid troubleshooting

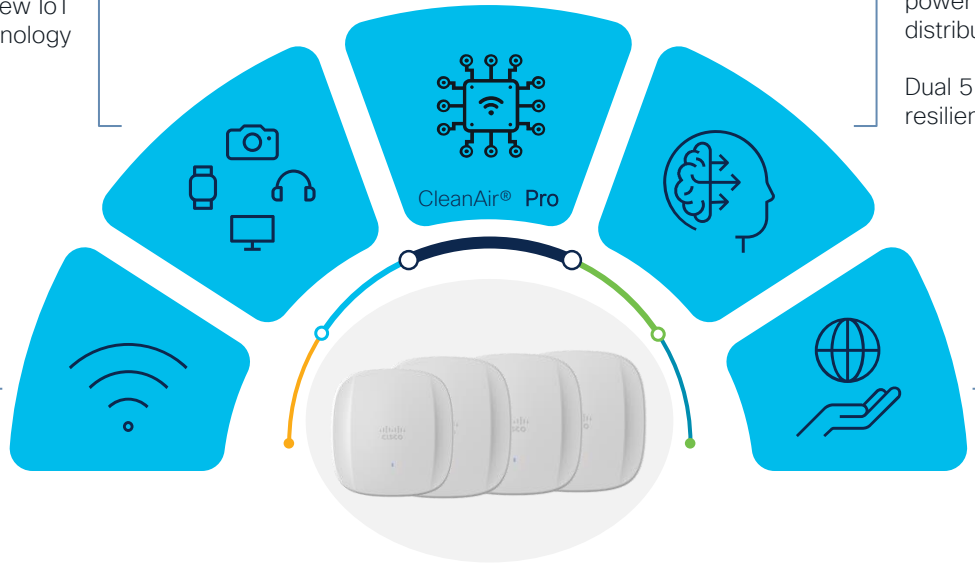
Multilingual IoT radios

Third-generation IoT 802.15.4 radio USB with up to 9W for new IoT technology

Smart, resilient infrastructure

AP power optimizations for power savings and distribution

Dual 5-Gbps uplink ports for resiliency (9136)



Unmatched Wi-Fi experience

Up to 16-stream tri-band concurrent

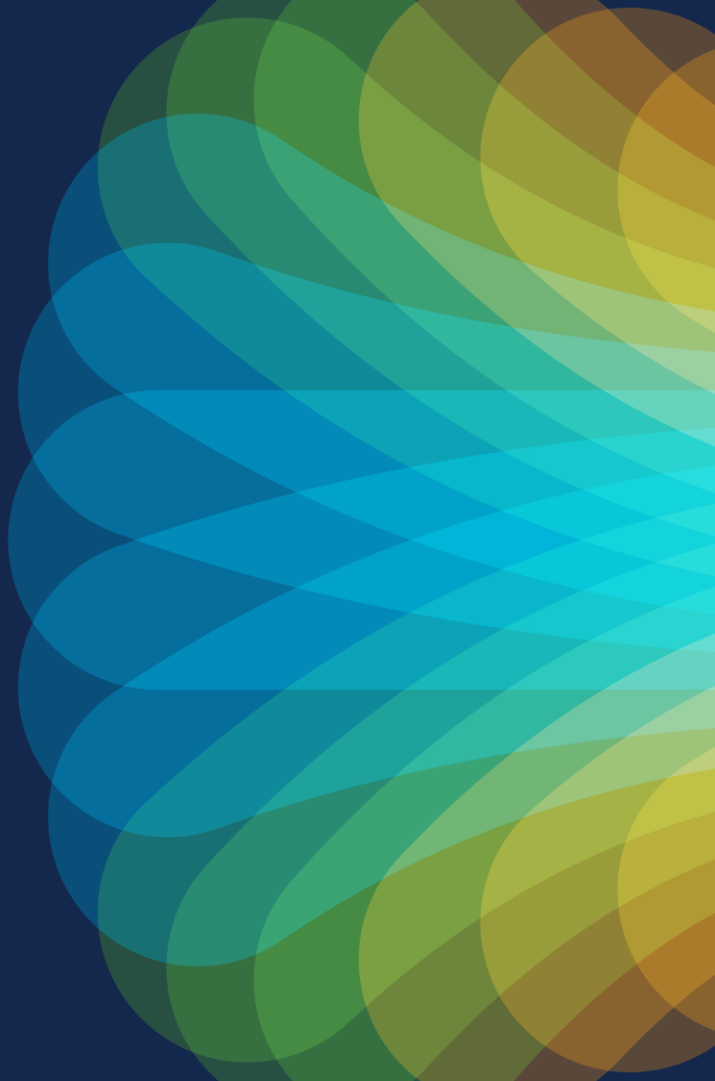
XOR and Flexible Radio Assignment (FRA) for changing needs

WPA3 security

Environmental sensors

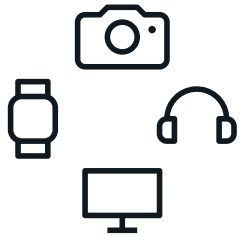
Air quality sensor for HVAC integration
Temperature, humidity sensors

Internet of Things Overview



What is IoT?

"The **Internet of things** (**IoT**) describes physical objects (or groups of such objects) with sensors, processing ability, software and other technologies that connect and exchange data with other devices and systems over the Internet or other communications networks."
-Wikipedia



Ecosystem

Relationships between different objects to exchange data

Growing Number of IoT Devices

The Beginning

The path to IoT began with basic forms of long distance communication. In 1832, Baron Shillings in Russia invented the first electromagnetic telegraph.

Concept of IoT is born

While working at Procter & Gamble, Kevin Ashton coined the term “Internet of Things” during a presentation on RFID.

IoT grows from Tech

As more Tech Giants realize the benefits of IoT, we have seen a large increase in IoT devices each year. In 2017, we recorded 8.4 billion IoT devices.

Present

In 2023, the market for the Internet of Things is expected to grow 18 percent to **14.4 billio**n active connections.

First IoT Device

John Romkey creates the first smart toaster that could be controlled from the internet. He showcased his invention at the INTEROP conference.

Using Sensors

Thermostats and home lighting start using sensors to accurately sense the surrounding environment. This allowed people to control home lighting, garage doors, and thermostats all from their phone.

IoT grows in Enterprise

The market grew to **12.3 billion** connected IoT devices and roughly **$160 billion** in IoT enterprise spending.

Benefits of IoT Solutions

Better utilization and monitoring of resources

Reduce manual effort and increase automation

Power and cost efficiency has increased

Example Use Cases

Location Analytics

Space Utilization

Environmental Monitoring

Staff Operations

Asset Management

Process Automation

Example Verticals

Manufacturing

Healthcare

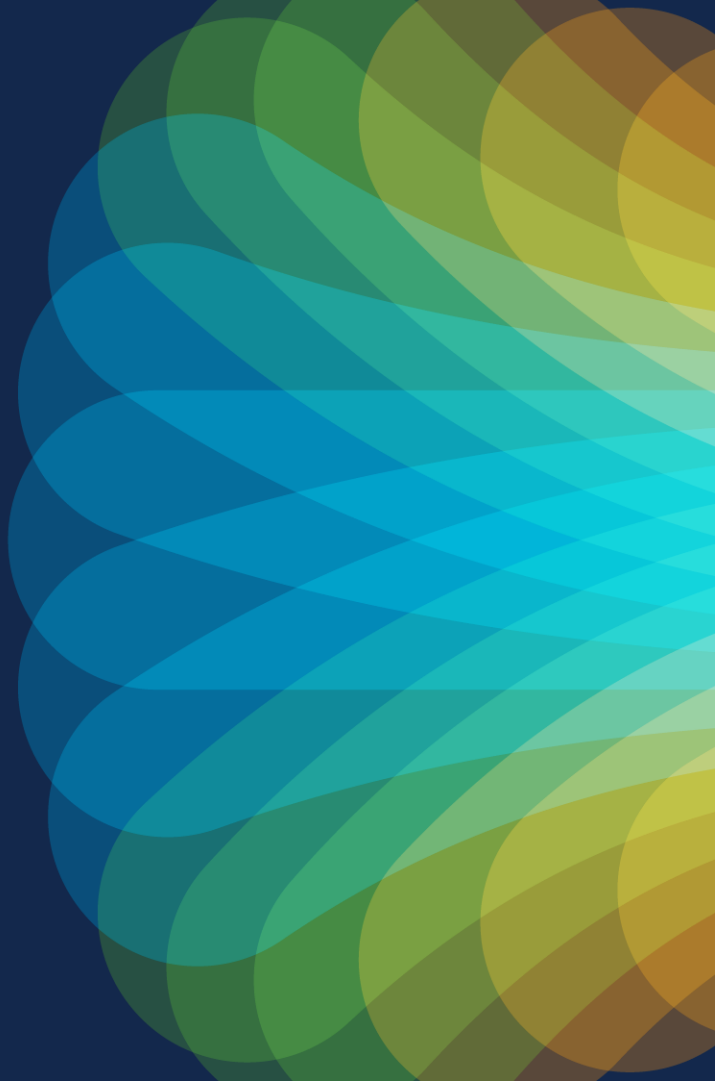
Retail

Education

Workplaces

Hospitality

Wi-Fi 6E Access Points Integrated IoT Radio



cisco Live!

Integrated IoT Radio Placement

Catalyst 9136I

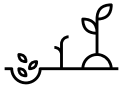
Catalyst 9164I/9166I

Catalyst 9162I

Integrated IoT radio use cases

Asset Tracking

- Track assets in real time
- Leverage one singular platform



Environmental Monitoring

- Measure and display a variety of environmental statistics
- Alerting and reporting based on the data

Workspace Optimization

- Insight on workspaces to enhance visitor and employee experience
- Increase internal efficiency and utilization within your workspaces

Integrated IoT Radio in DNA Management Mode Access Points

Leverage outcomes via
Spaces Native & Partner Apps

Cisco Spaces Platform & Solutions

Data Sources

- Catalyst Access Points
- Meraki Access Points
- Switches
- Meraki cameras
- Webex
- Meraki Thinkgs
- Third Party IoT Sensors

Platform

1.Connect
Aggregate signals from all your buildings

- Spaces Connector
- Cloud Sync
- Plug-in Framework
- Dynamic Gateway

2.Context
Add context to the signal

- Location Metadata (Business Context)
- Map Metadata (Spatial Context)
- X-Y location of People & Things (Location Compute)

3.Services
Make sense of this data (Identity ,Presence & Telemetry)

- Location Services
- IoT Services
- Map Services

4.Extensibility
Extend this data to your enterprise

- Native Apps
- Meta API
- ISV App Center
- Spaces SDK
- Data Export

Solutions

Smart Workspaces
Make your workspace ready for Hybrid Work & drive Sustainability

Smart Operations
Drive operational efficiency & people safety

Smart Venues
Create moments that matter for your visitors

Catalyst 9100 Series Access Points have a built-in IoT radio which integrates with Cisco Spaces

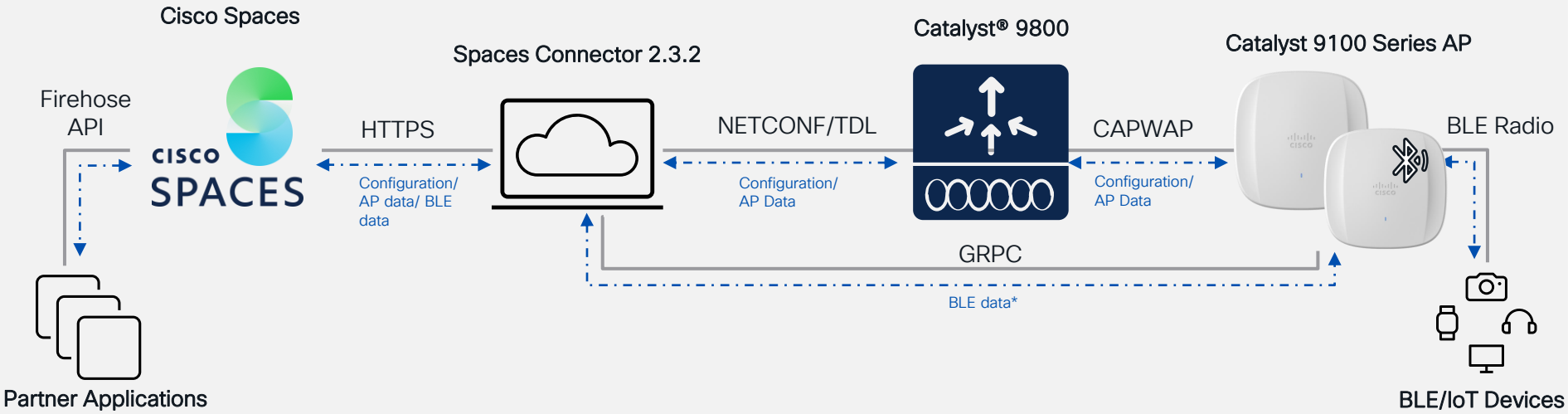
AP Product	IOS-XE Release
Catalyst 9136I	17.8.1
Catalyst 9164I/9166I	17.9.1
Catalyst 9162I	17.9.2/17.10.1

Configure as a BLE Gateway → Enable Catalyst 9100 Access Points as a Base or Advanced AP Gateway

Enable Scan and/or Transmit Mode → Scan for information from nearby BLE devices and stream that data to Cisco Spaces and/or transmit BLE signals from Catalyst 9100 Access Points

BLE Device Configuration → Configure the BLE devices from Cisco Spaces and remove the need for multiple Gateways

Architecture of the Catalyst 9100 Series AP IoT radio with Cisco Spaces



(*) BLE Floor Beacon data is sent to the Cisco Spaces Connector, then sends to the data to DNAS Cloud via the HTTPs tunnel where is shown in the Dashboard

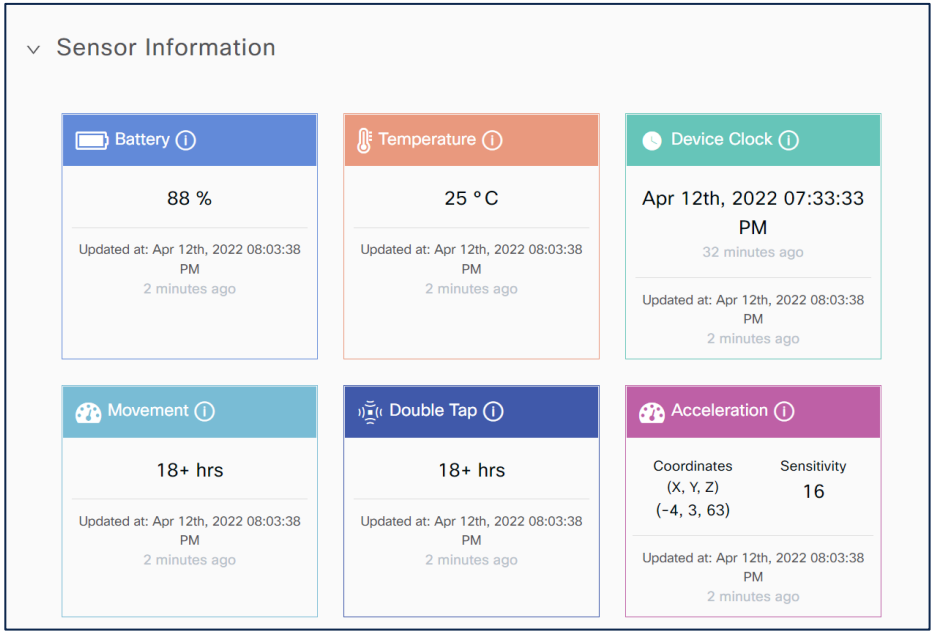
Supports all AP modes: Local, FlexConnect, Fabric, monitor, sniffer

IoT Device Telemetry using IoT Services Integration with Cisco Spaces

Monitor various telemetry data in Cisco Spaces Dashboard

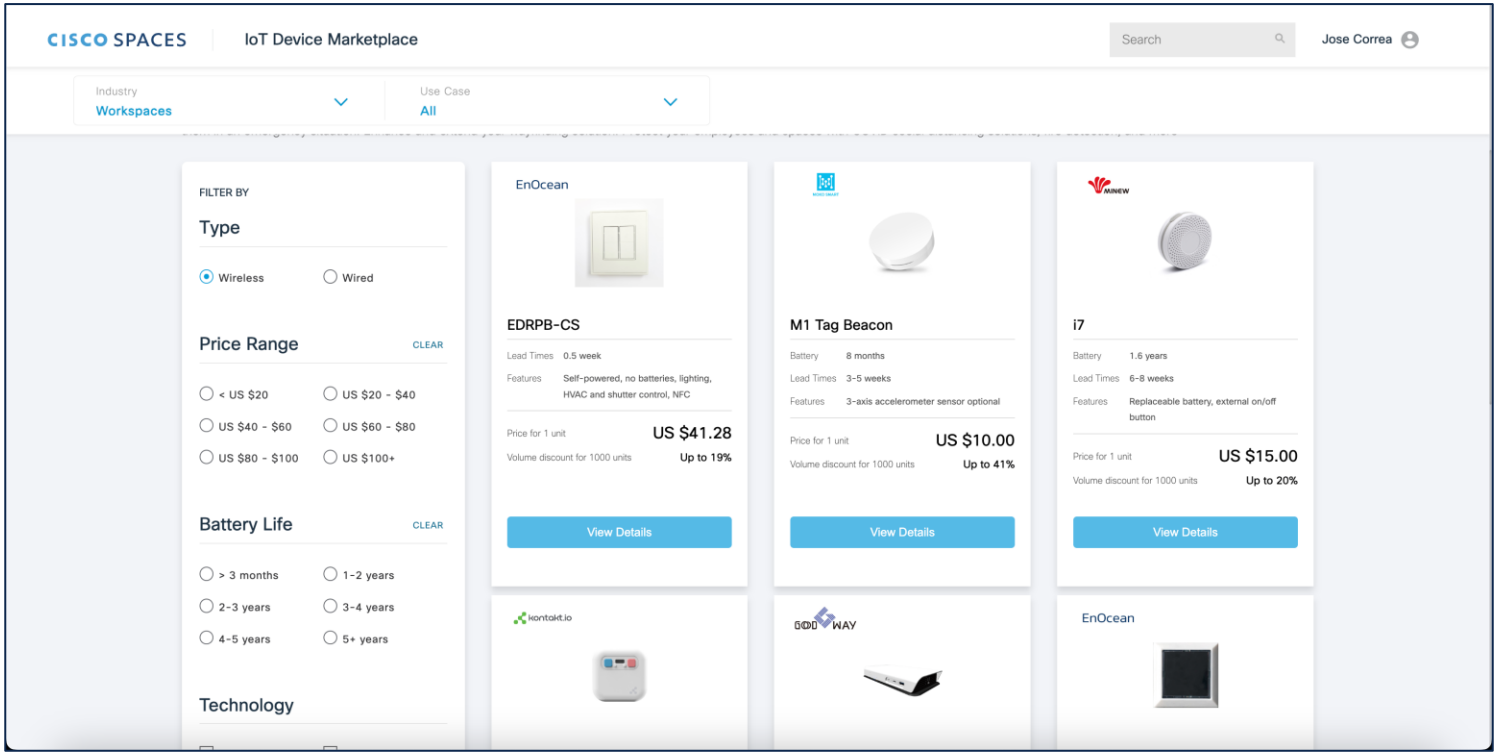
BLE Devices

IoT BLE Device Sensor Telemetry



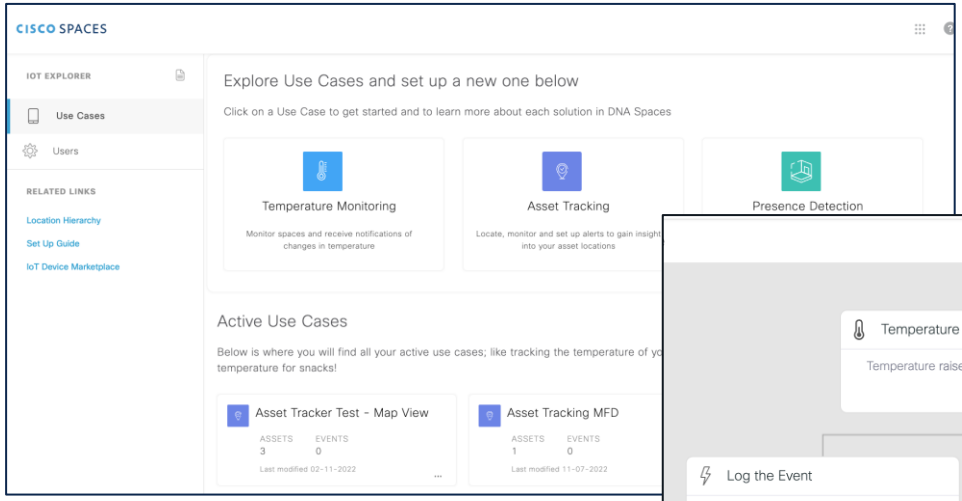
IoT Device Marketplace

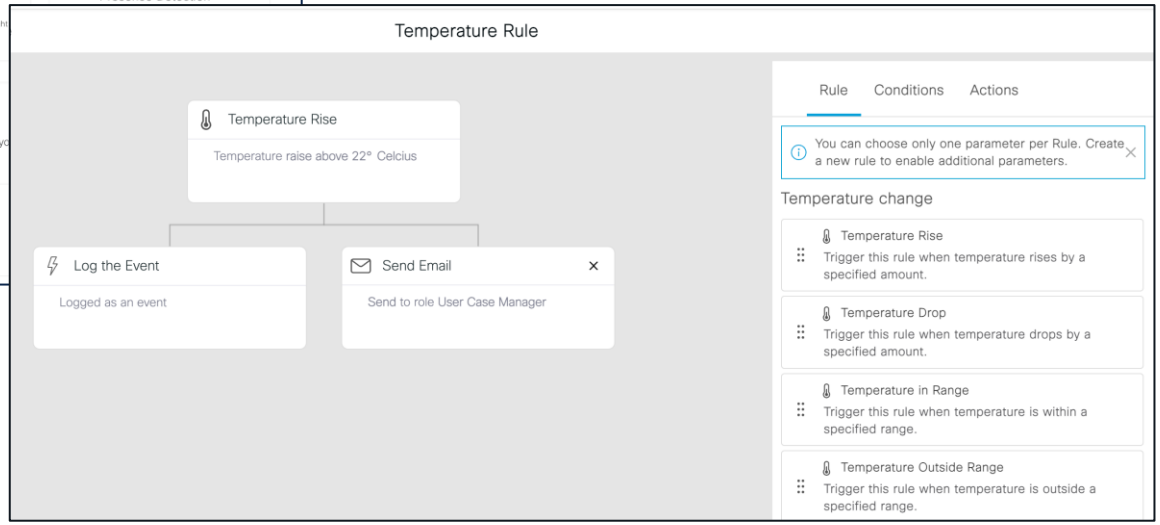
Ecosystem of third-party IoT devices – wired and wireless



IoT Explorer

Monitor, manage, and optimize assets, Internet of Things (IoT) sensors, alerting system, and operational workflows





Demo

CISCO SPACES

IoT Services Help

Home | Devices | Groups | Policies | Settings

Floor Beacons | AP Beacons | Wired Sensors | Cameras | Smart PDUs

All Campuses

Claimed Beacons	All Profiles	IBeacon	Eddystone UID	Eddystone URL	Other Profiles
0	42	2639	11	11	63

Profile Type *equals* Kontakt | Save as New

Filters | Actions | Advance Configuration

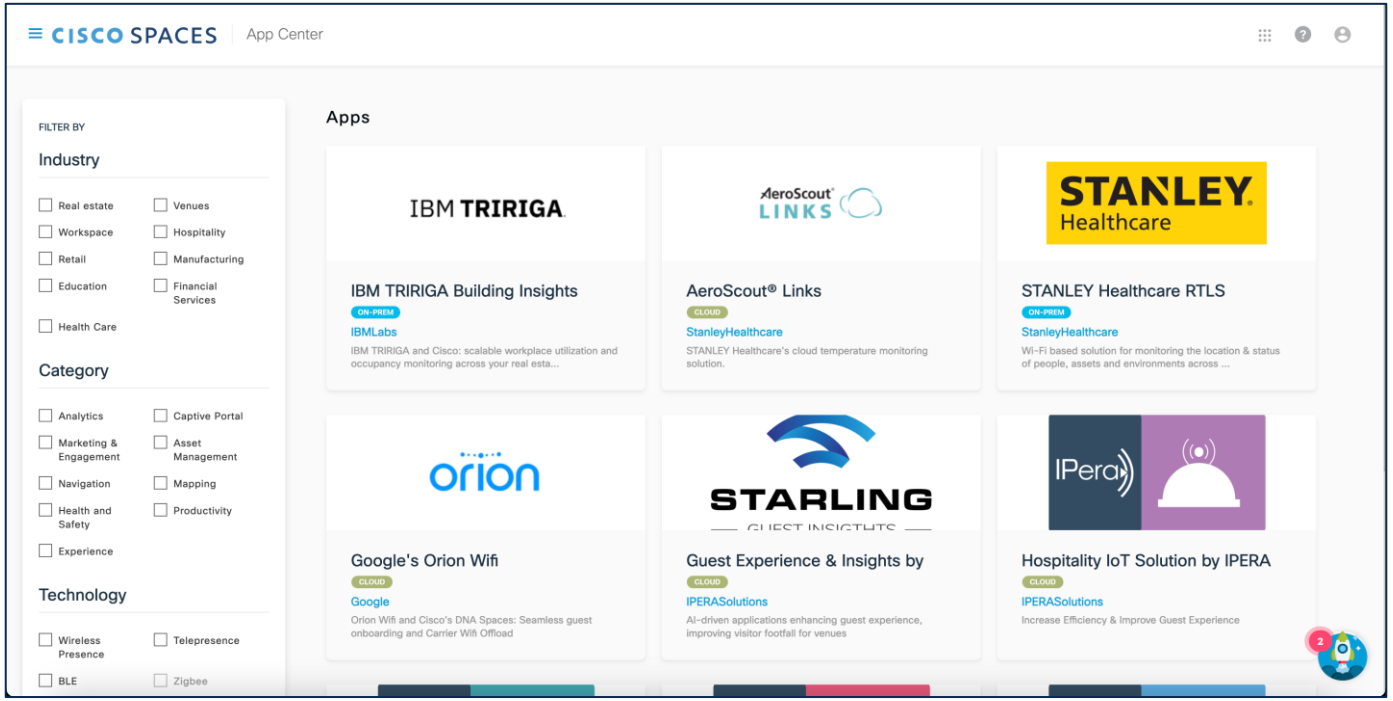
As of: Jan 20, 2023 2:27 PM | Refresh | Export

Mac Address	Mac Address Type	Label	Location	Last Heard	Group Name	Profile Type	Battery	Unique Id	Firmware	Adv. TxPower (dBm)
fc:3d:d2:43:47:0f	-	-	San Jose->Building 14->Floor 1	Jan 20th, 2023 02:27:30 PM a few seconds ago	-	Kontakt	100%	VuCmly	2.0	-
f0:97:41:75:94:3f	-	-	San Jose->Building 14->Floor 1	Jan 20th, 2023 02:27:30 PM a few seconds ago	-	Kontakt	77%	uuVf3U	2.0	-
e3:73:94:43:93:66	-	-	San Jose->Building 14->Floor 1	Jan 20th, 2023 02:27:27 PM a few seconds ago	-	Kontakt	100%	VuaPMi	2.0	-
e2:a3:8d:c2:84:a8	-	-	San Jose->Building 14->Floor 1	Jan 20th, 2023 02:27:27 PM	-	Kontakt	100%	10UK2LT	1.1	-

2

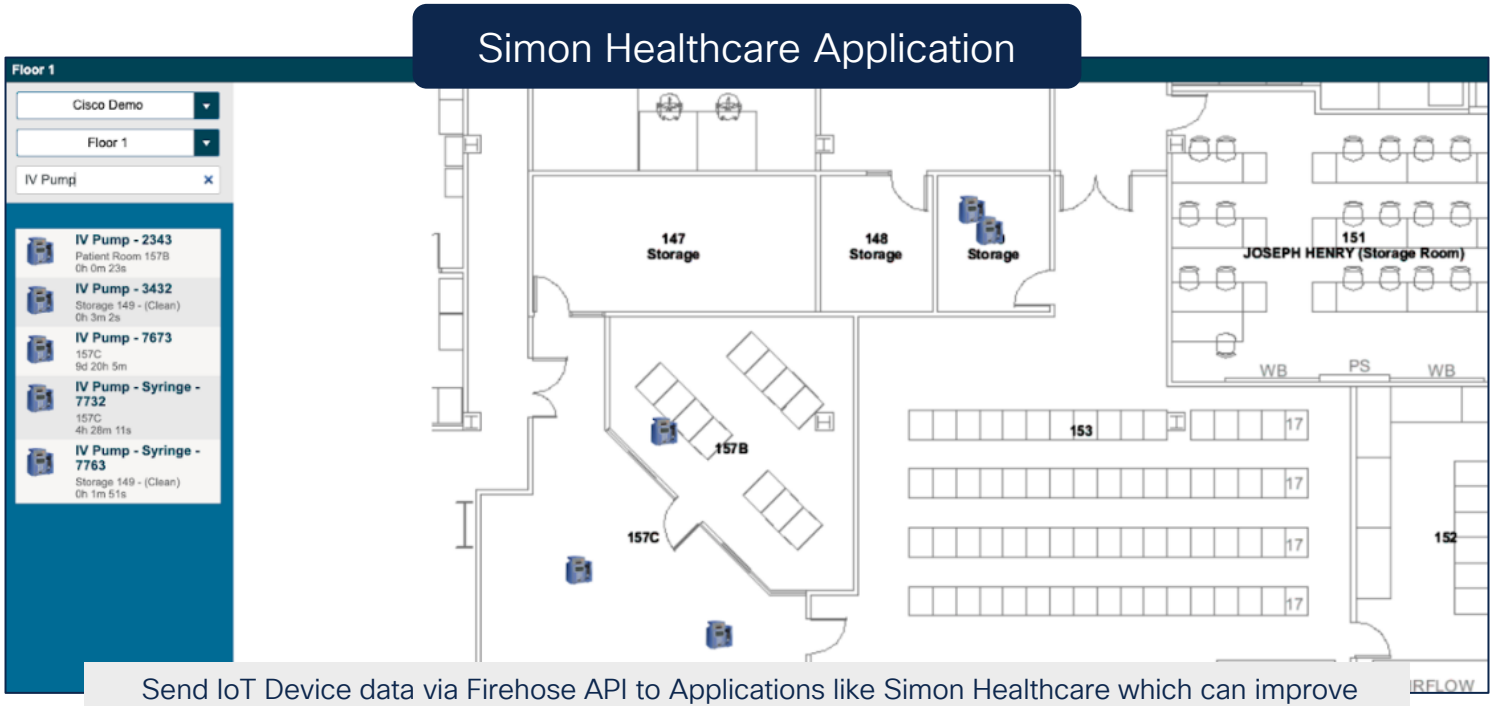
Partner App Center

Integrated marketplace of application partners focused on business outcomes



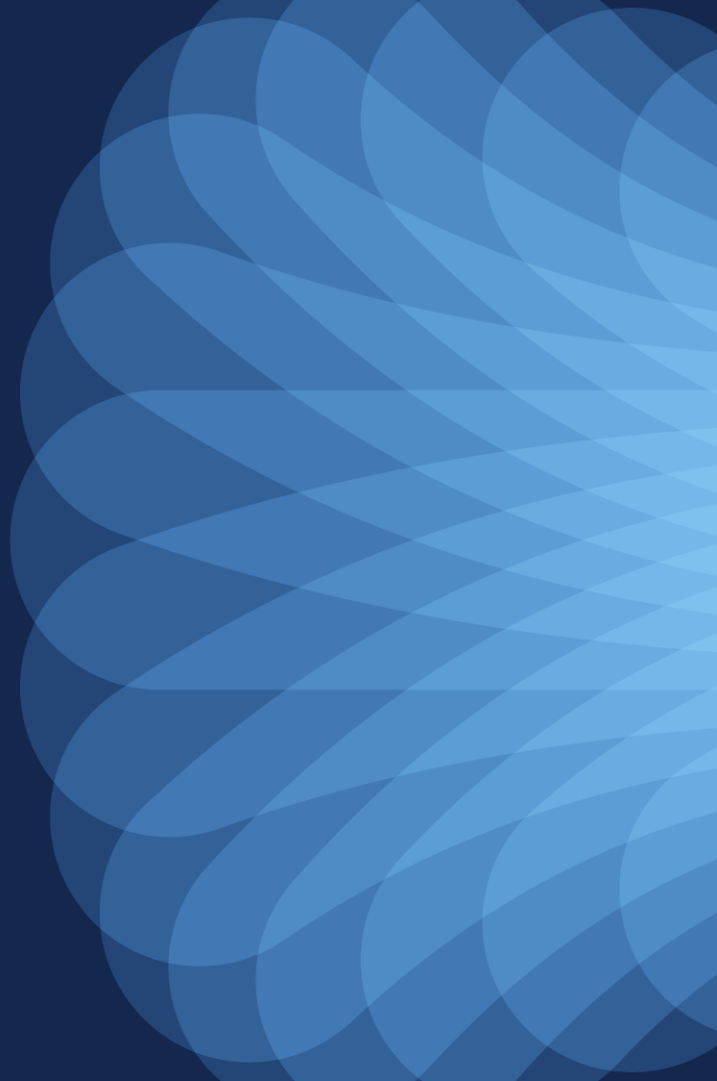
Example Partner Application

Simon Healthcare – optimizing healthcare operational efficiency



Send IoT Device data via Firehose API to Applications like Simon Healthcare which can improve operational efficiency, patient care, and experience with real-time IV pump PAR level management

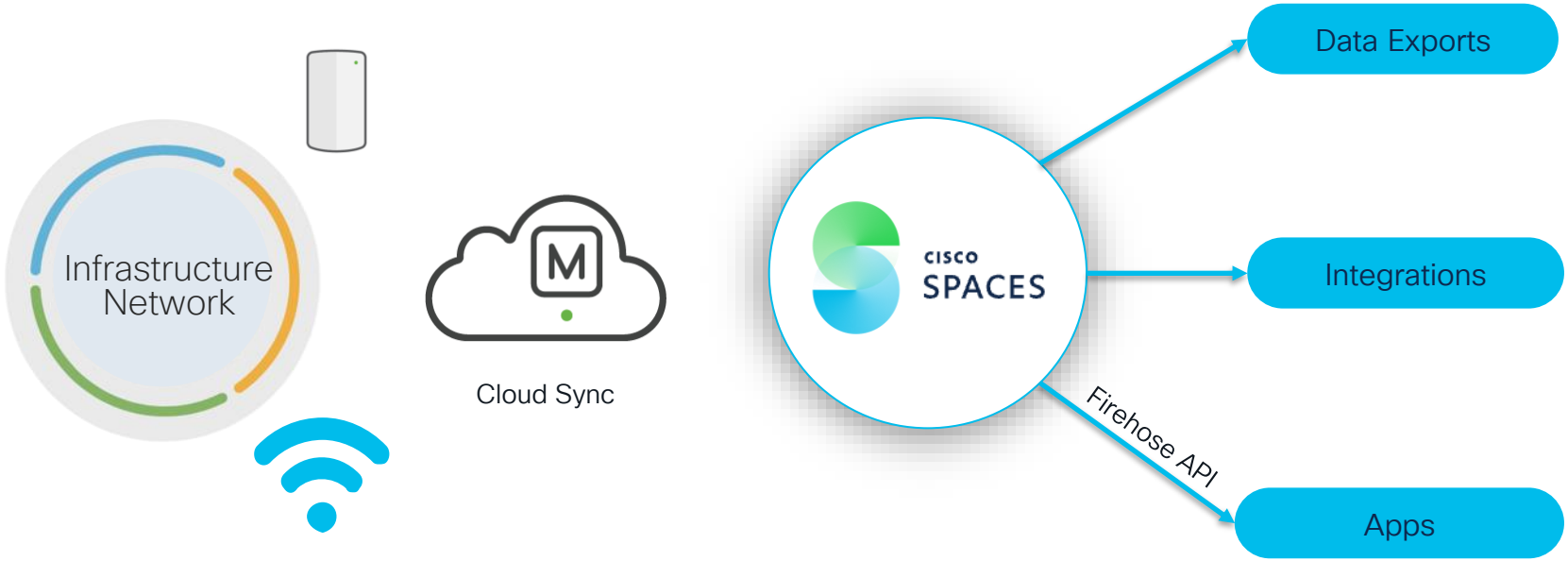
Integrated IoT Radio in Meraki Management Mode Access Points



cisco Live!

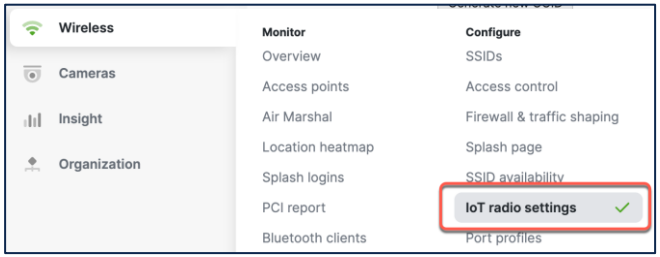
Cisco Spaces Architecture with Meraki

Cloud-to-Cloud integration with Cisco Spaces

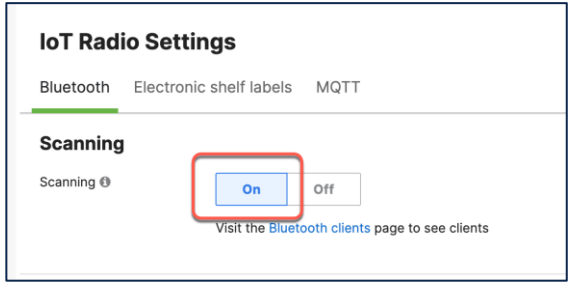


IoT Radio on Meraki Dashboard

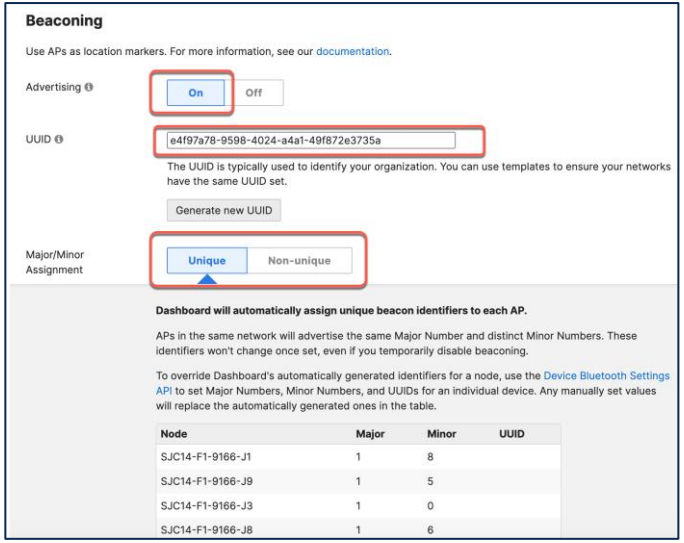
Quickly enable IoT Radio settings



AP Scanning BLE Devices



AP Broadcasting iBeacon

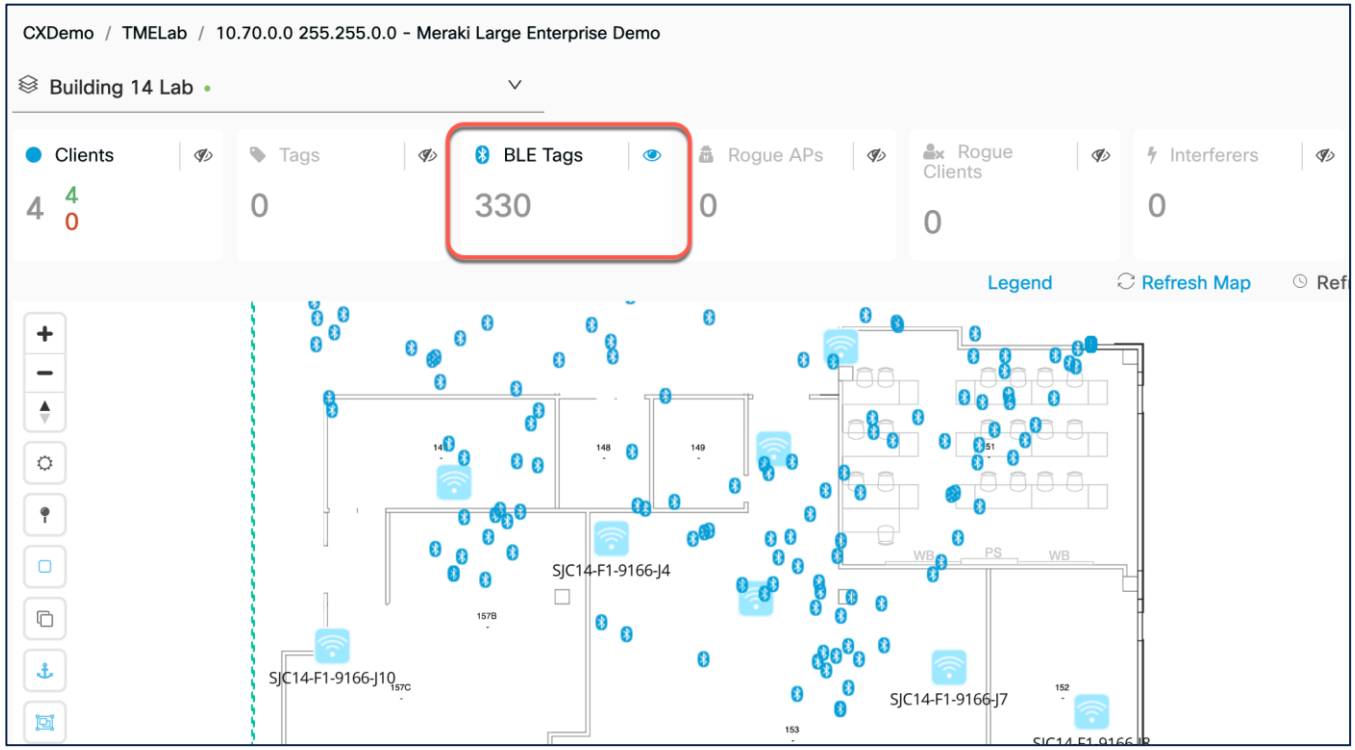


Meraki Dashboard Location Heatmap

Locate BLE clients in Meraki Dashboard

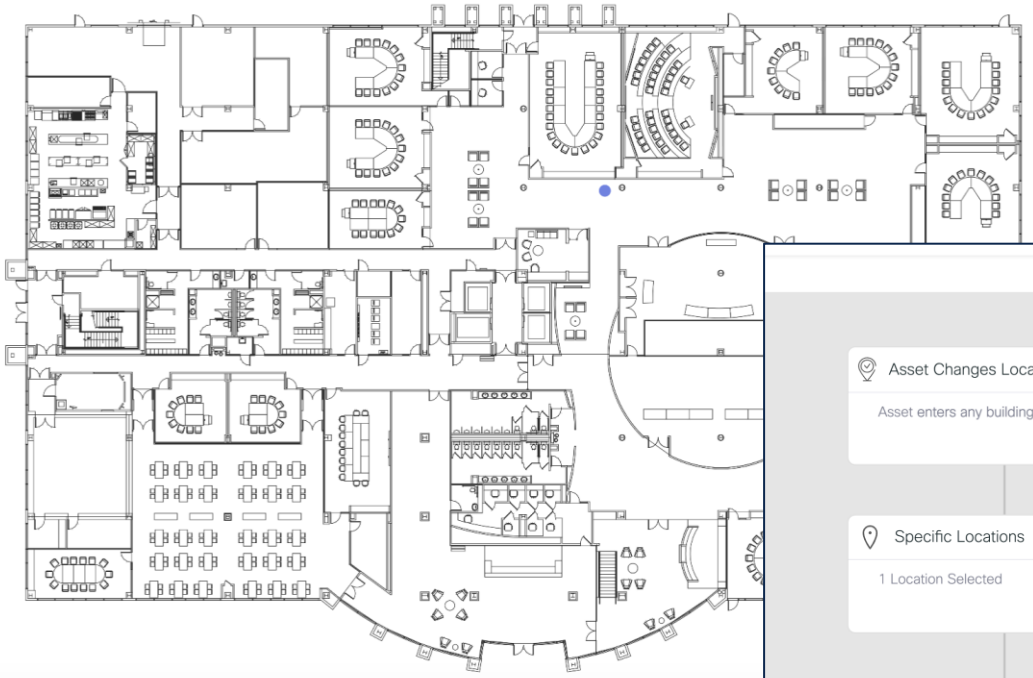
Meraki IoT Integration with Cisco Spaces

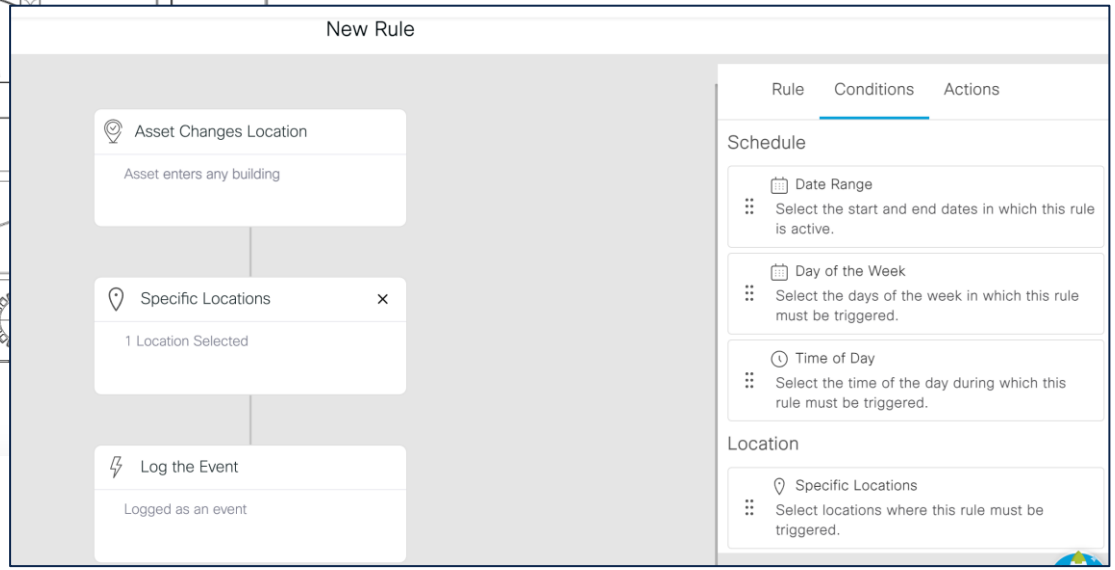
Locate BLE clients in Detect and Locate



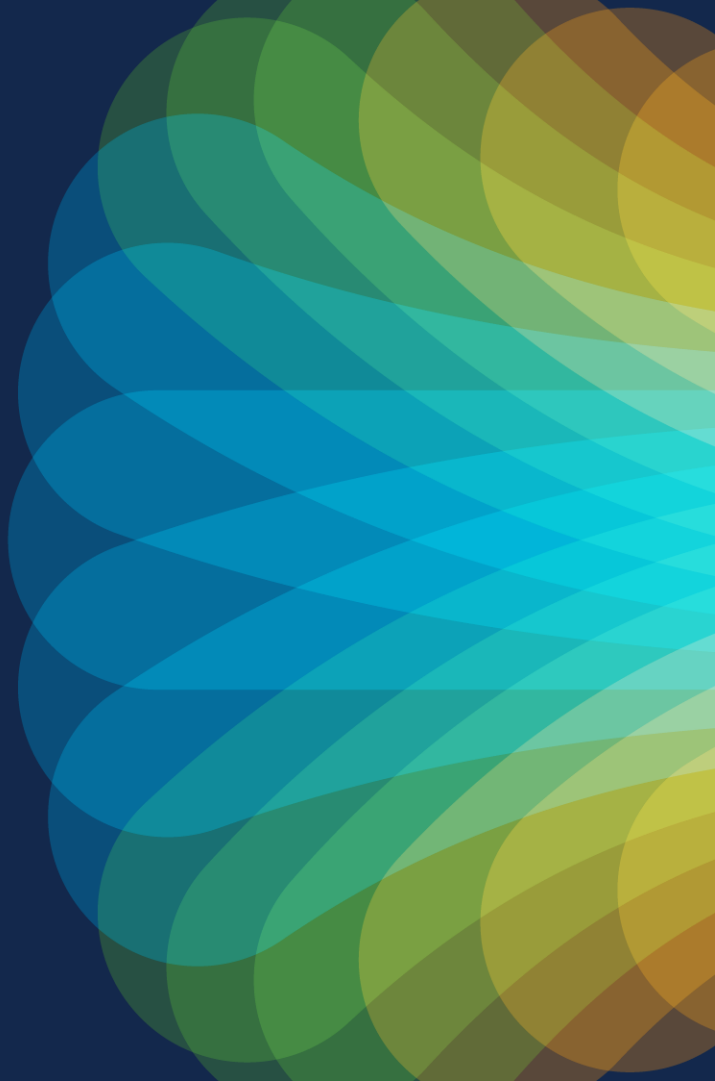
IoT Explorer – Asset Tracker

Monitor, manage, and optimize assets in Cisco Spaces





Built-in Environmental Sensors in DNA Management Mode Access Points



Built-in Environmental Sensor Placement

Catalyst 9136I

Catalyst 9166I

Environmental Sensors with Cisco Spaces

cisco Live!

Catalyst 9136I and 9166I have three built-in environmental sensors with full Cisco Spaces integration

AP Product	IOS-XE Release
Catalyst 9136I	17.8.1
Catalyst 9166I	17.9.1

Air quality

The built-in Gas Sensor Module will enable the reading of Total Volatile Organic Compound (TVOC) concentration and Indoor Air Quality (IAQ) rating.

Humidity

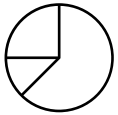
The built-in module is a fully calibrated sensor with the ability to measure the relative humidity in the air.

Temperature

The built-in module can also capture the temperature to provide a reading of the environment remotely.

Note: The temperature generated by the AP will be considered during temperature and IAQ readings.

Environmental sensor use cases



Environmental Visibility

- Insight into environmental metrics
- Assess conditions and trends

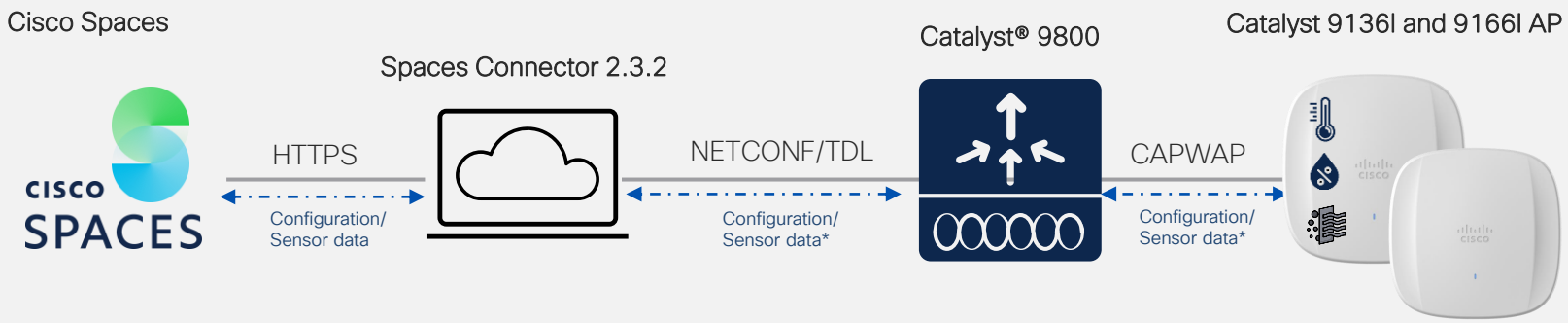
Sustainability

- No additional cables
- No overlay of dedicated equipment

Application Integration

- Integrate with different applications and systems

Topology of the Catalyst 9136I and 9166I environmental sensors with Cisco Spaces



(*) Sensor data is sent to C9800 via CAPWAP, Spaces Connector subscribes to the Yang models and get the data via telemetry, then sends to the data to DNAS Cloud via the HTTPs tunnel where is shown in the Dashboard

Supports all AP modes: Local, FlexConnect, Fabric, monitor, sniffer

Catalyst 9136I and 9166I has three built-in environmental sensors with full Cisco Spaces integration

AP Environmental Sensor Telemetry

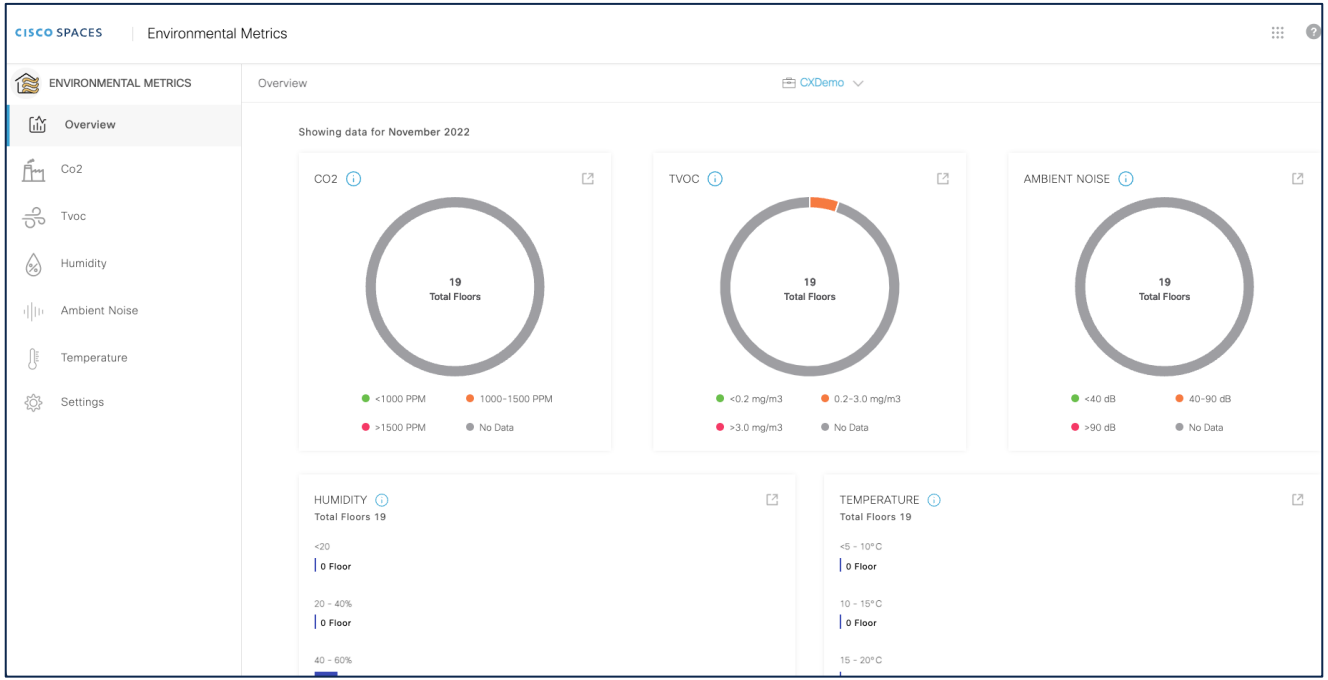
Approximate measurement of TVOC in PPB

Total Volatile Organic Compounds	Calculated Indoor Air Quality
657 PPB	3.26
Updated at: Apr 12th, 2022 08:50:53 PM a few seconds ago	Updated at: Apr 12th, 2022 08:50:53 PM a few seconds ago

Humidity	Temperature
28.6 %	22.8 °C
Updated at: Apr 12th, 2022 08:50:52 PM a few seconds ago	Updated at: Apr 12th, 2022 08:50:52 PM a few seconds ago

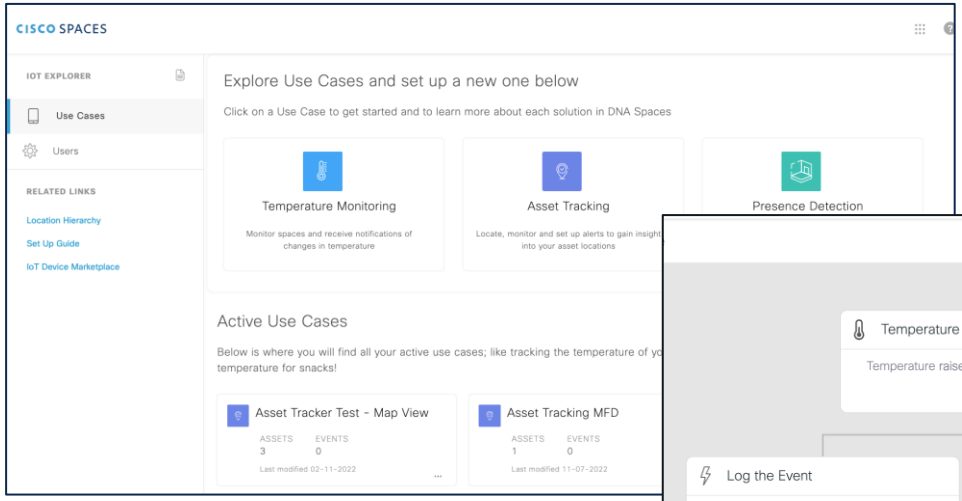
Environmental Metrics

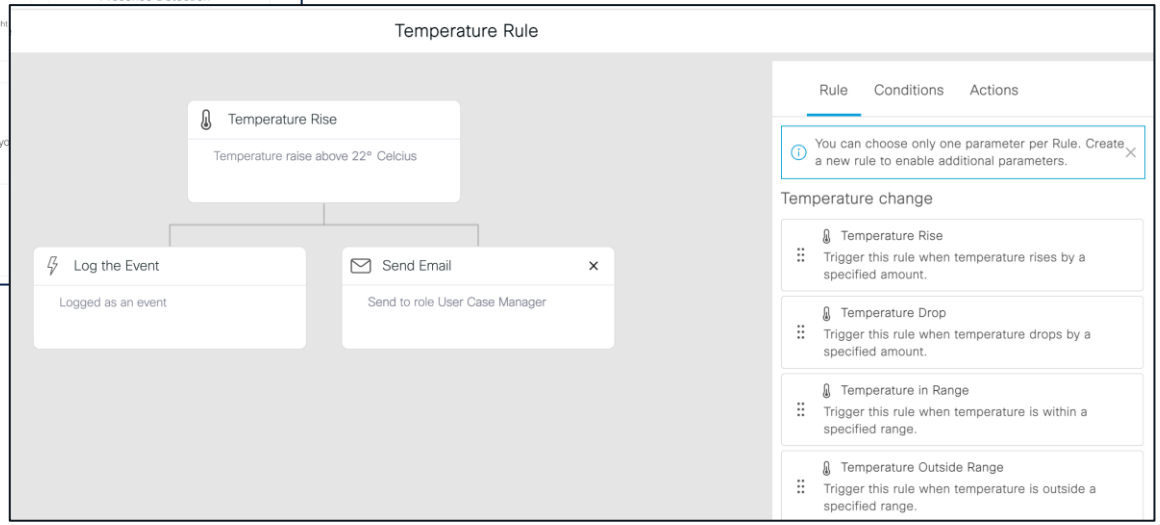
Trends and Insights from Environmental Data from your Network Devices in your buildings



IoT Explorer

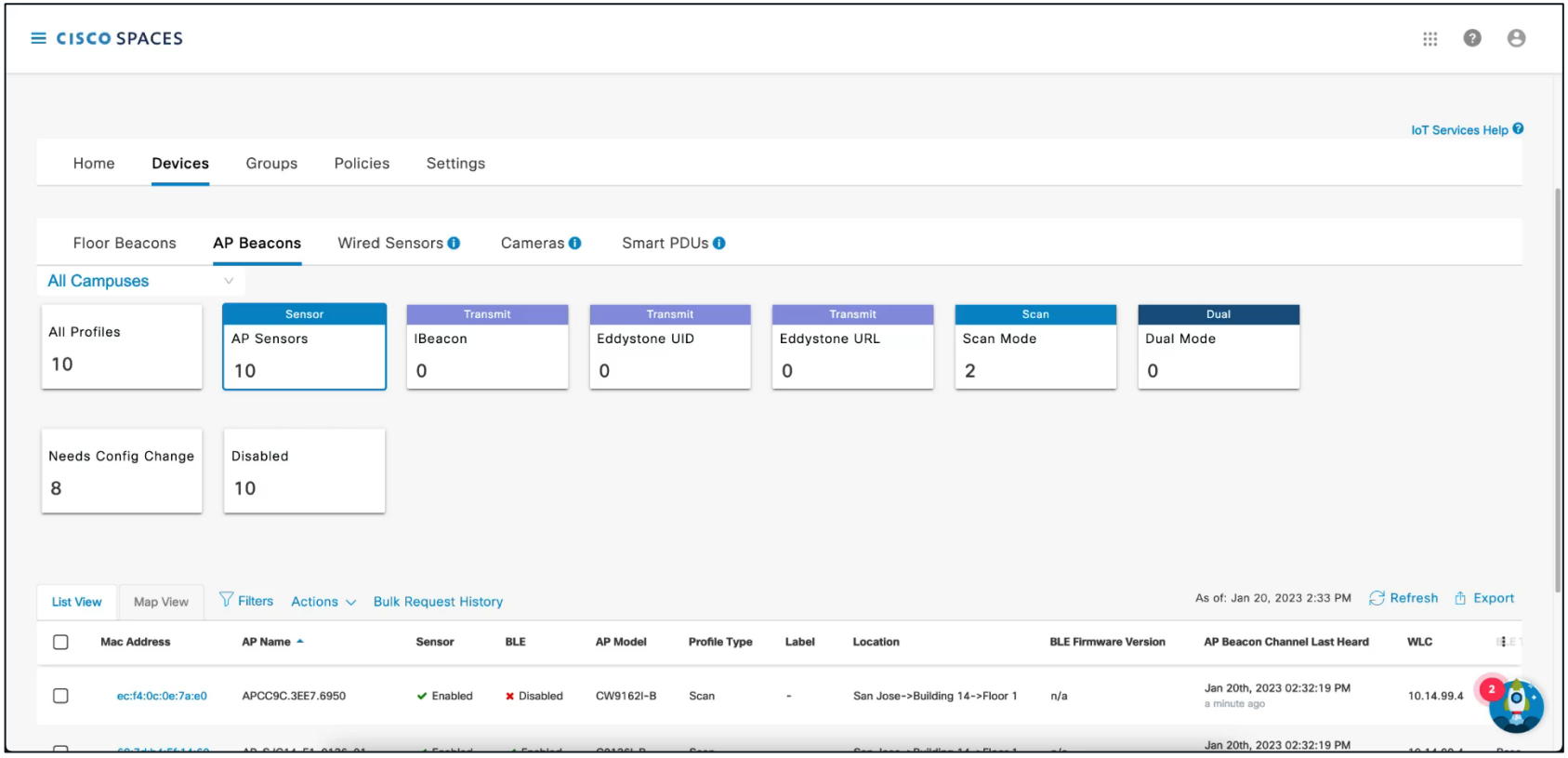
Monitor, manage, and optimize assets, Internet of Things (IoT) sensors, alerting system, and operational workflows





Demo

Demo



IoT enhanced hybrid work experience

Catalyst 9100 Series Access Points integrate with Cisco Spaces for back-to-office use cases

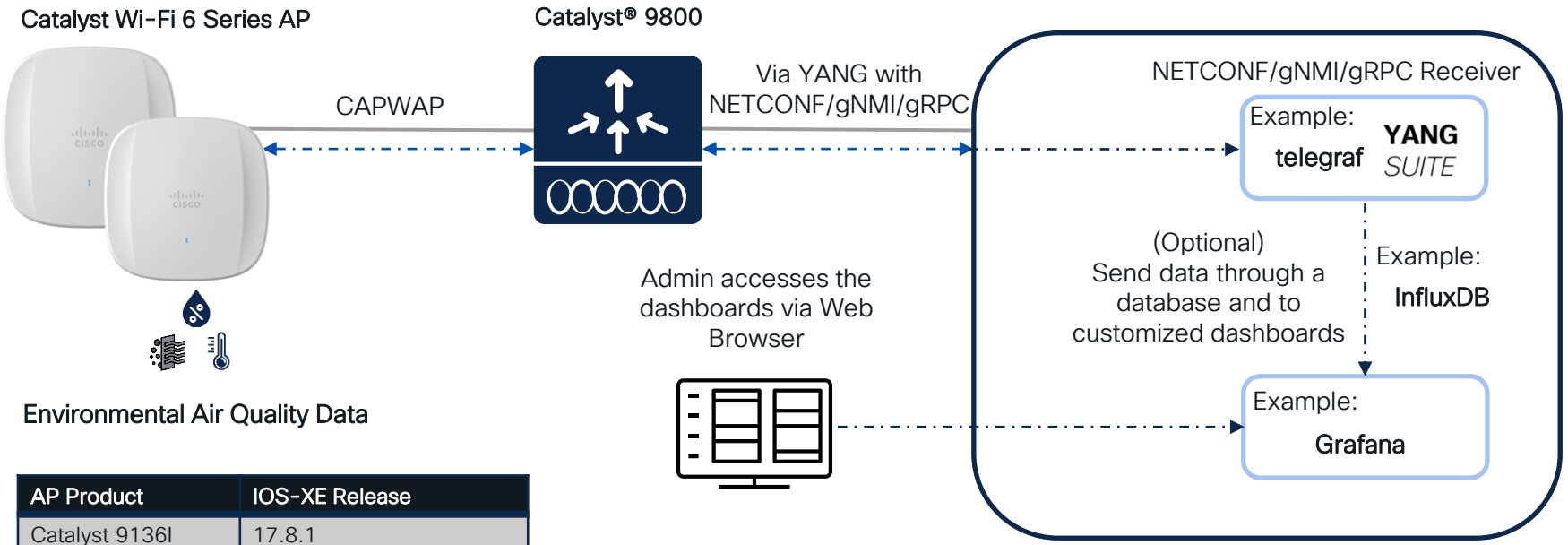
Cisco Spaces will support rich maps for an immersive experience

Network experience and BLE IoT integration to drive business outcomes

Catalyst® 9136I and 9166I have built-in environmental sensors that feed Cisco Spaces data

Environmental Sensors without Cisco Spaces

Topology of the Environmental Sensors on Catalyst Wi-Fi 6E Series Access Points using Model Driven Telemetry



AP Product	IOS-XE Release
Catalyst 9136I	17.8.1
Catalyst 9166I	17.9.1

Example Environmental Sensor Temperature Telemetry Output

```
{
    "ap-mac": "XX:XX:XX:XX:XX:XX",
    "event-type": "access-point-oper-data/ap-temp",
    "humidity": "28.743200",
    "temp": "39.496500"
}
```

Temperature

- Humidity (%)
- Temperature (ºC)

Example Environmental Sensor Air Quality Telemetry Output

```
{
    "ap-mac": "XX:XX:XX:XX:XX:XX",
    "event-type": "access-point-oper-data/ap-air-quality",
    "rmox_0": "1018991936.000000",
    …
    "rmox_12": "90387552.000000",
    "iaq": "3.051500",
    "etoh": "0.633100",
    "tvoc": "1.190300"
}
```

Air Quality

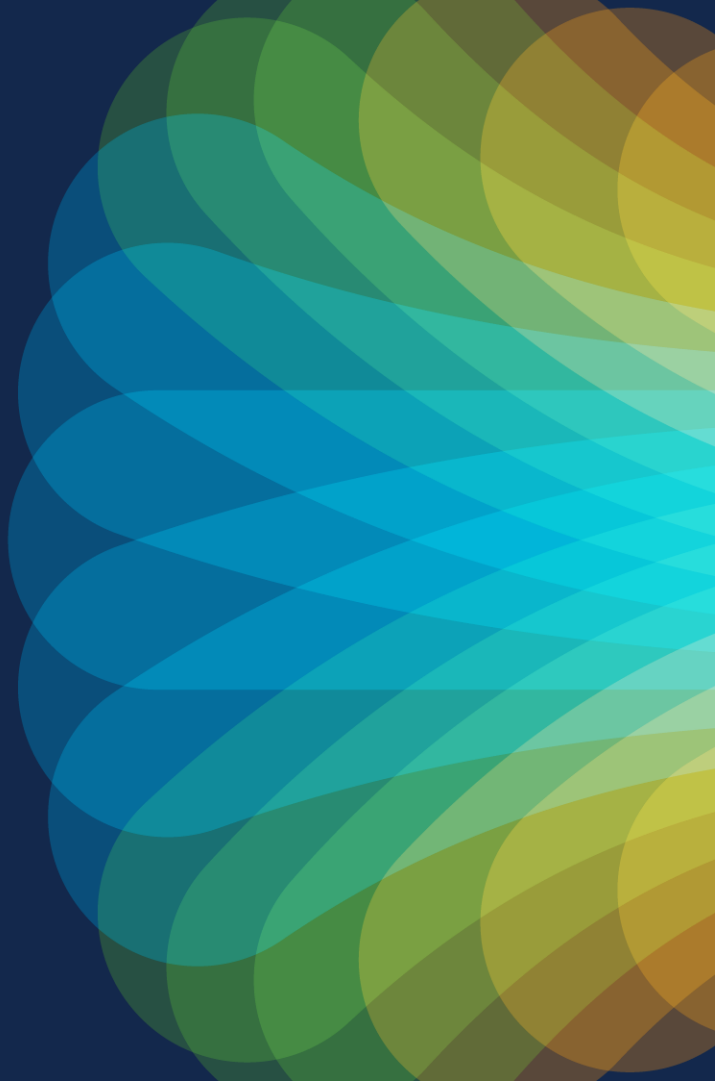
- Calculated Air Quality (IAQ) score between 1-7
- Total Volatile Organic Compounds (TVOC) in mg/m3
- Estimated Ethanol (ETOH) in ppm
- Mox Resistance (RMOx) values as raw data

Environmental Sensor Data from the Catalyst 9136I and 9166I visualized in Grafana

Demo

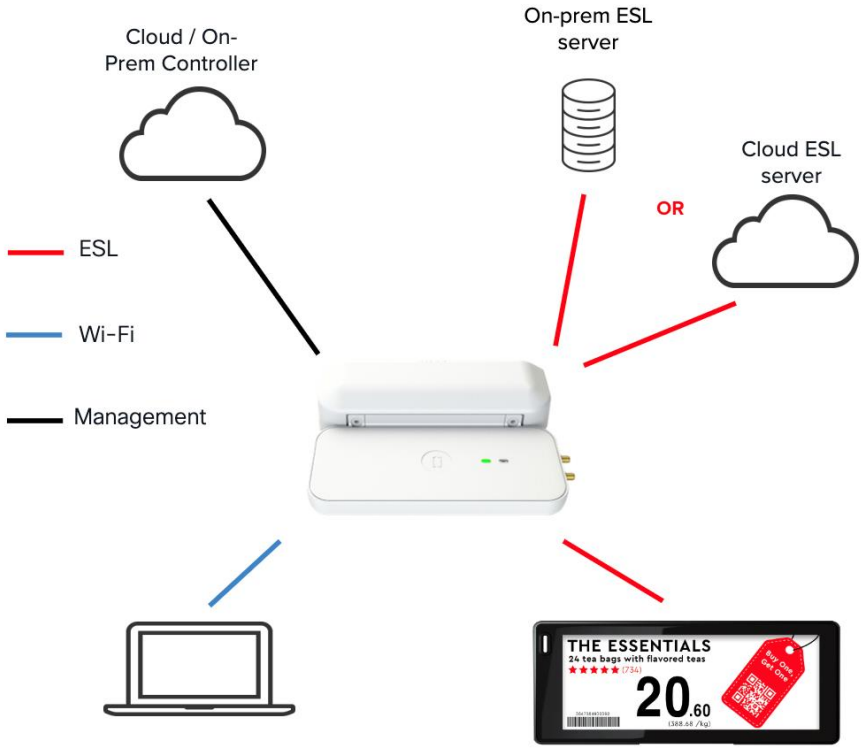
Demo of Environmental Sensors with Grafana

Meraki IoT Integrations



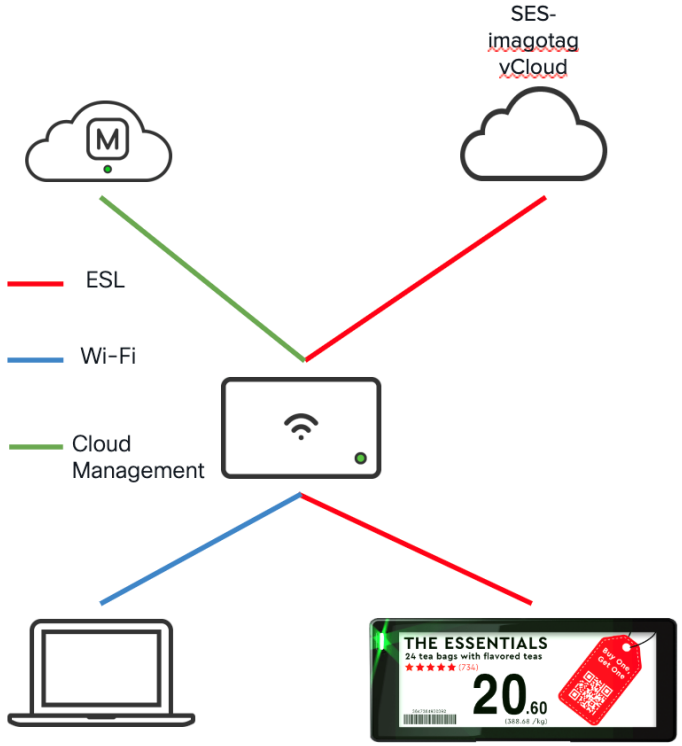
IoT Connector (Add-On) ESL Infrastructure

- **IoT Connector** infrastructure (APs for Wi-Fi and ESL using a separate PCIe card or USB ESL gateway)
  - Does not require additional switch ports
  - Might require extra PoE Budget



Integrated (Native) ESL

- **Integrated (native)** infrastructure (no additional HW)
  - Decreases CAPEX
  - No additional switch ports
  - No extra PoE requirements
  - No separate devices to troubleshoot, update, and maintain



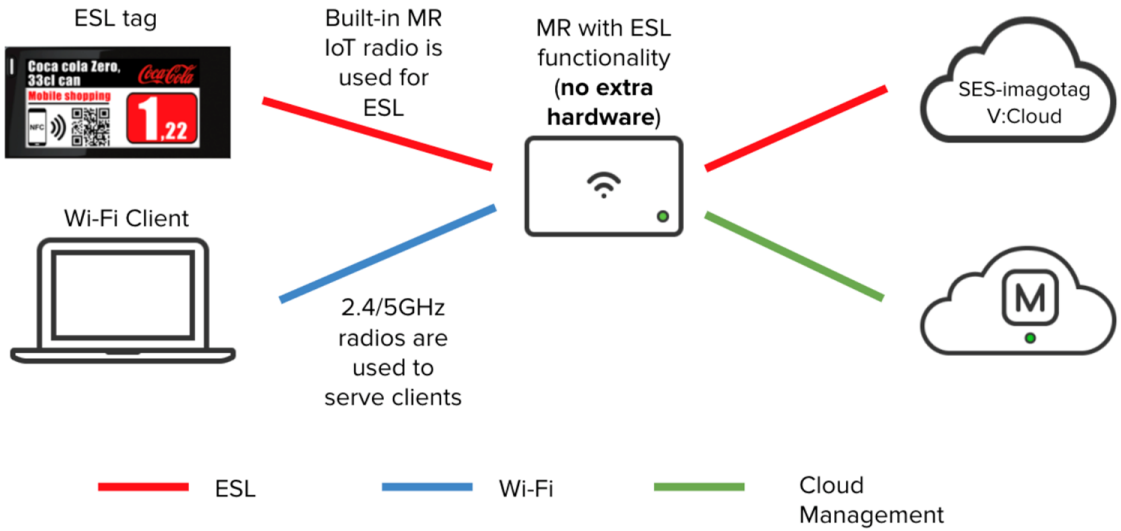
Meraki ESL Ecosystem Overview

Vendor	ESL Integration Type	Supported Models
SES-imagotag	Native (MR IoT radio)	Most MRs, See Deployment Guide for all Supported Models
SoluM	USB ESL gateway	MR57, CW9166/64/62I-MR
Hanshow	USB ESL gateway	MR57, CW9166/64/62I-MR

SES Native ESL Integration

ses imagotag

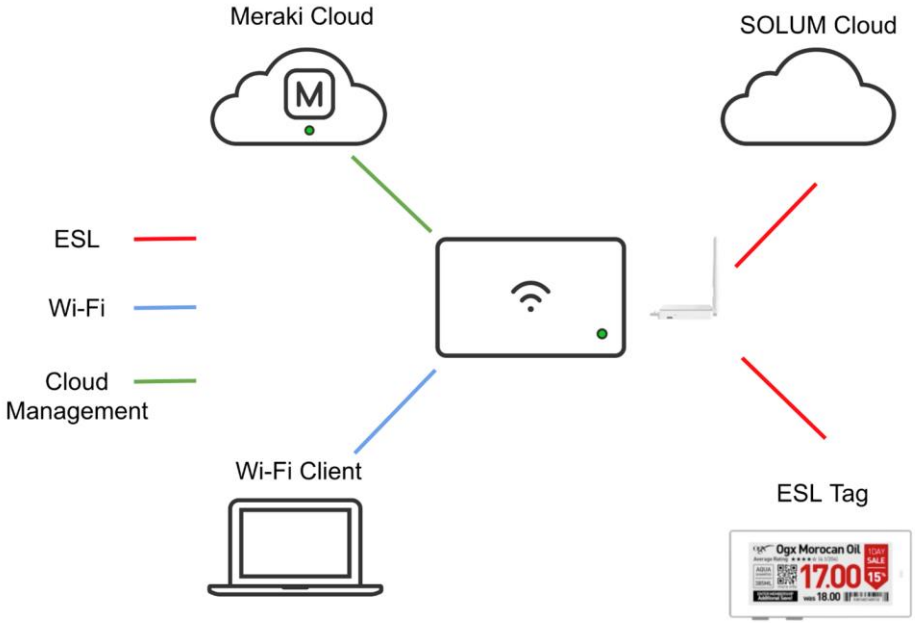
Native (Built-In IoT radio)



SoluM USB ESL Integration

SOLUM
Solution provider.

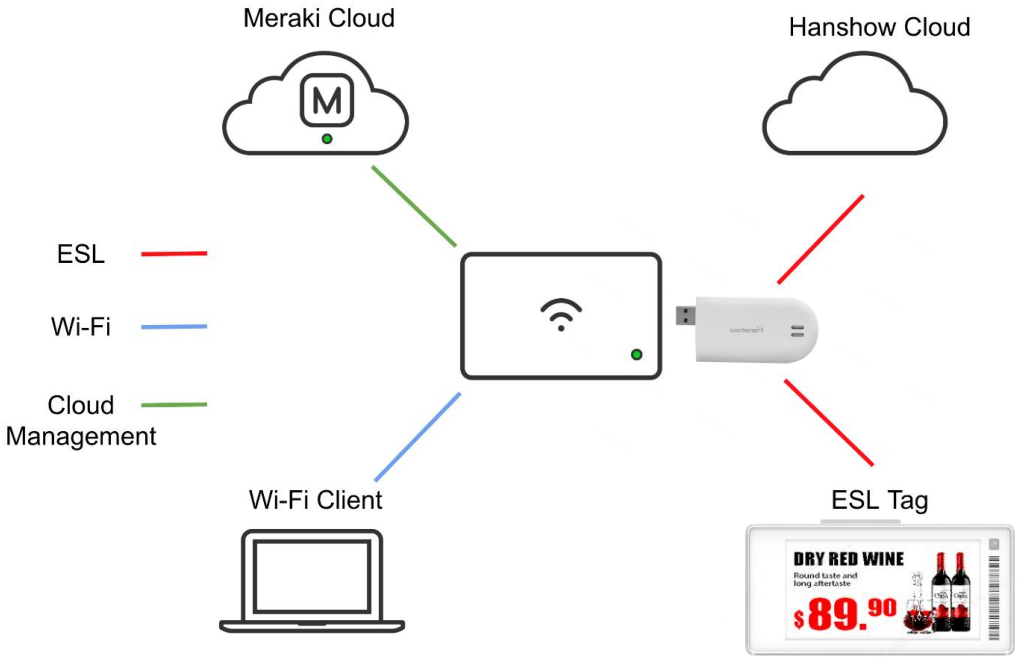
IoT Connector (USB)



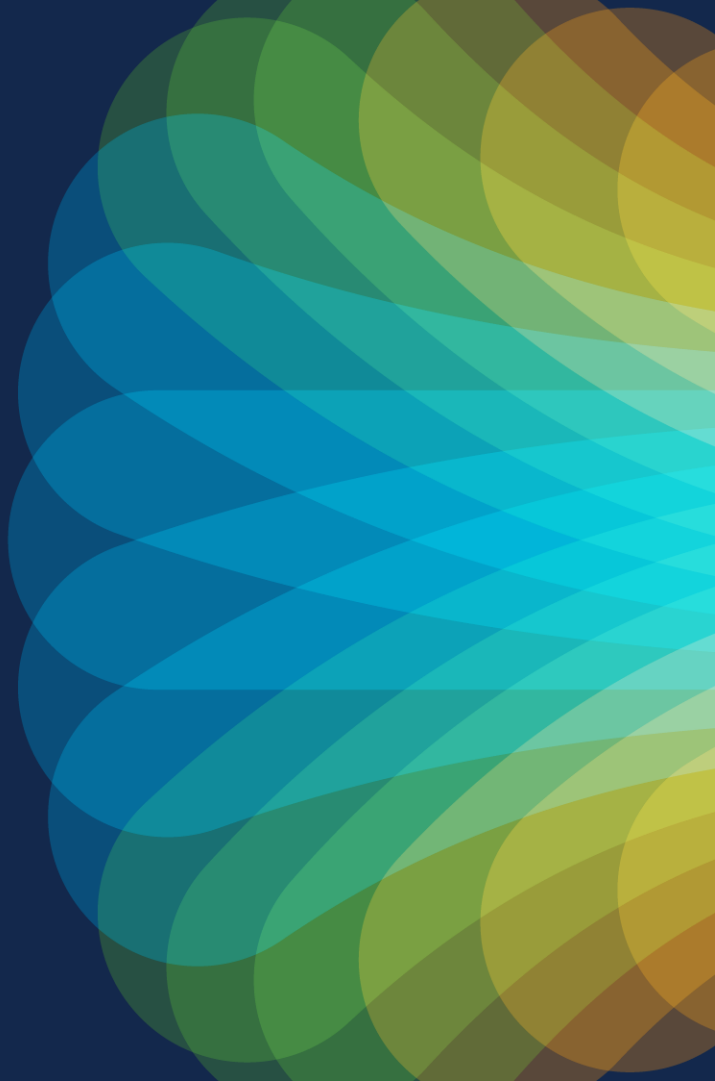
Hanshow USB ESL Integration

Hanshow

IoT Connector (USB)



Application Hosting on Catalyst Wi-Fi 6E Access Points in DNA Management Mode



cisco Live!

Application Hosting on Cisco Catalyst Access Points in DNA Management Mode

Enterprise Wireless Internet-of-Things

AP as an IoT development platform

Simplified application management

Wi-Fi and IoT convergence

Ecosystem of IoT applications

Available on all Cisco® Catalyst® 9100 Access Points

Partner Solution Use Cases

Electronic Shelf Label
Retail Management

- LED price tags that can be updated remotely.

Asset Tracking
Building Management

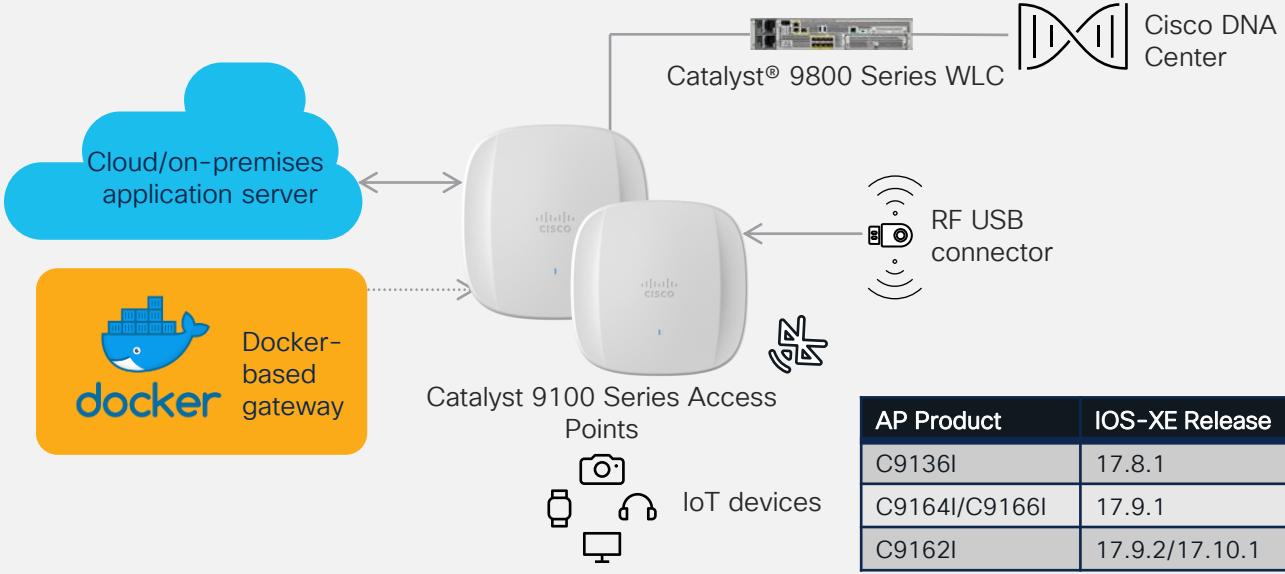
- Sensors that track, movement, temperature, humidity, location, and many more.

Patient Tracking
Medical Management

- Sensor that track location, human vitals and many more for efficient medical operations.

Catalyst 9100 Series Access Points support application hosting

for an enterprise wireless IoT experience



AP Product	IOS-XE Release	DNAC Release
C9136I	17.8.1	2.3.3
C9164I/C9166I	17.9.1	2.3.4
C9162I	17.9.2/17.10.1	2.3.5

Cisco DNA Center
for application management

Application Hosting Partners and Solutions

SES-imagotag

SOLUM

Wipelot

Infsoft

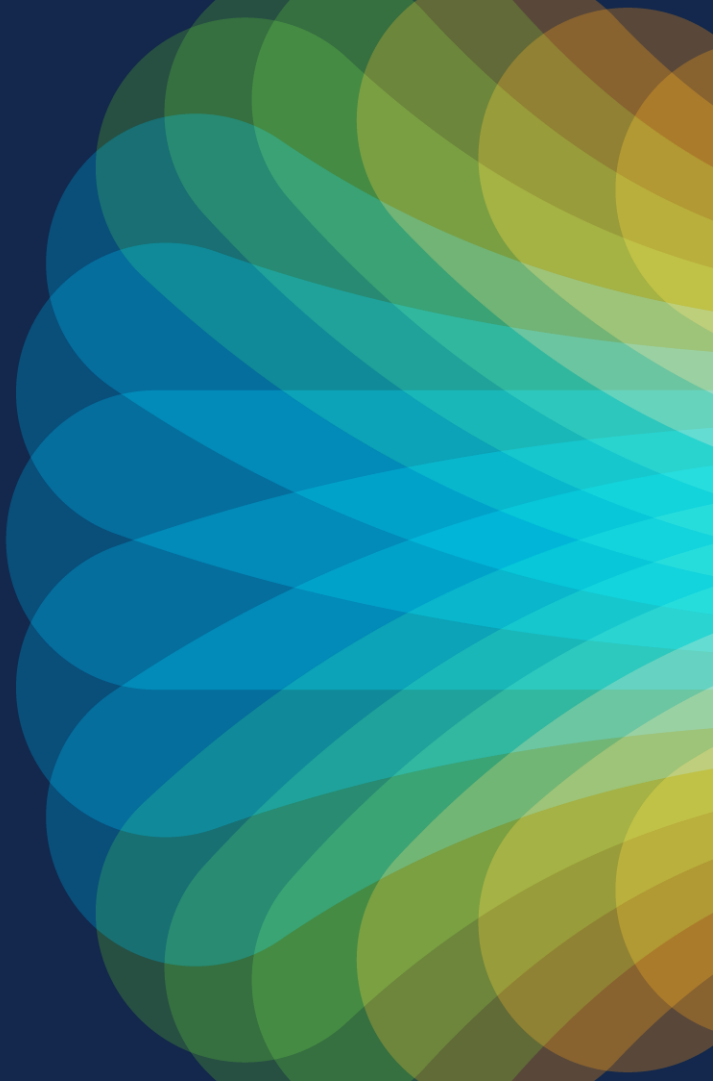
EnOcean

Leitwert

Meshtech

Rainus

Wipelot Eagle Eye



Ali Samioglu
Leader of Systems Engineering, GVSE MEA

- 14 years at Cisco in multiple roles; including post-sales and pre-sales
- CCIE RS&DC #29893, Cisco Hall of Fame
- Leading the Eagle Eye project from the incubation to final product

and introducing...

Wipelot EagleEye

- Ultra Wideband location tracking
- Accuracy up to 20cm
- Enhanced personnel safety and asset accountability
- Workplace Safety
- Social Distancing
- Workplace planning

Wifi6 / Wifi6E

cisco Live!

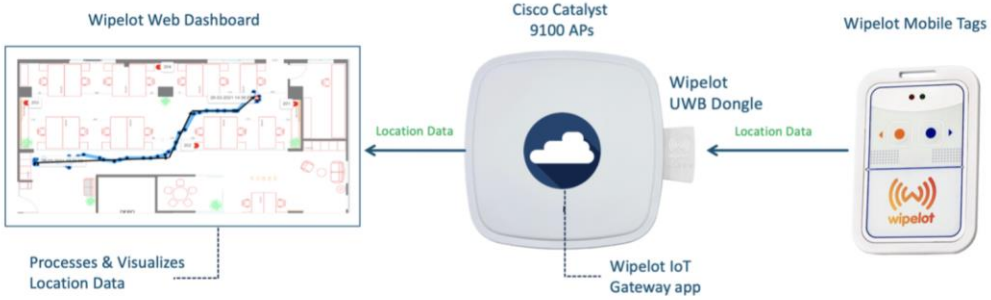
Leveraging UWB Technology

To leverage this UWB technology, this solution requires the following:

1. **Cisco DNA Center** – Used to manage the deployment and serviceability of Wipelot's RTLS IOx Application.
2. **Wiplot's RTLS IOx Application** – Deployed to the Catalyst 9100 Series AP through Cisco DNA Center to allow the AP to control the UWB dongle and communicate to the Wipelot Mobile Tag and send data to the Wipelot web dashboard.
3. **Wipelot's UWB Dongle** – Inserted into the Cisco Catalyst 9100 Series AP and emits UWB RF.
4. **Wipelot's Mobile Tag** – Attached to equipment or people and sends UWB location data to the Wipelot UWB dongle.
5. **Wipelot's Web Dashboard** – Web UI used to visualize the location of Wipelot's mobile tags.

Cisco Catalyst 9100 Series AP with a Wipelot UWB dongle

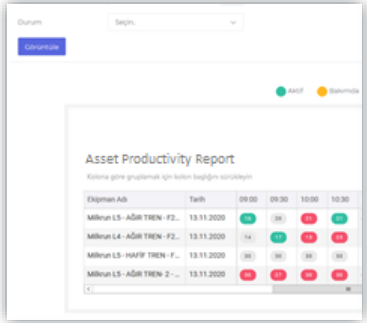
When Wiplot's RTLS IOx application has been deployed to the AP, the following topology can be referenced for how location data is sent from the mobile tags to the UWB dongle, then through the IOx application to the Wipelot web dashboard. Data structure is private and it is binary data with timing information of tags and anchors.

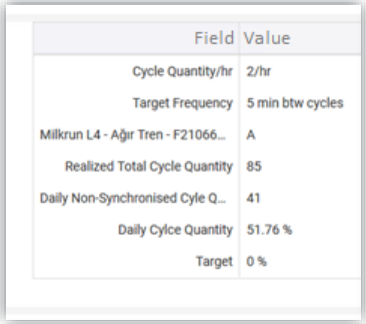


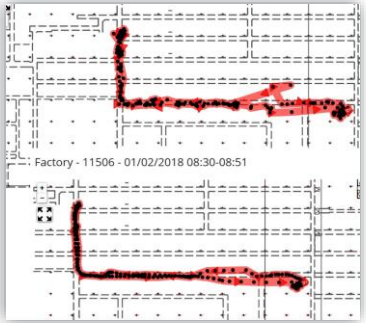
Metrics & use cases

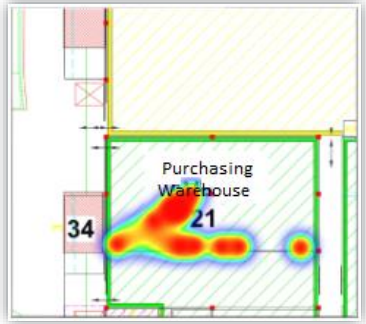
- Accurate location information provides detailed route analysis
- Detailed heatmap
- Distance measurement
- Region based idle work hour calculations

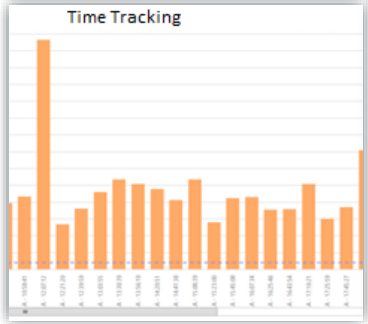
- Collision avoidance
- Lone worker safety
- Social distancing
- Environmental monitoring

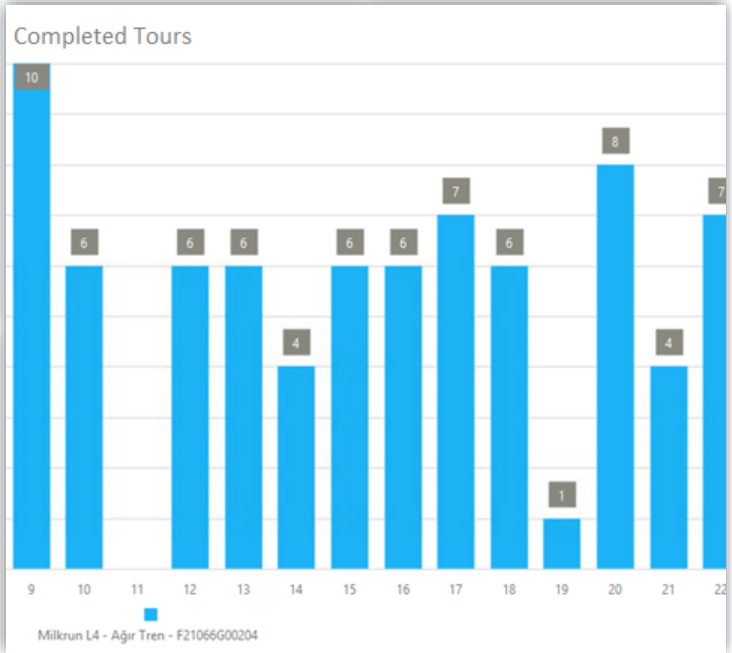




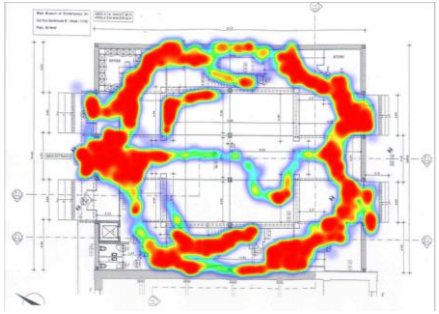








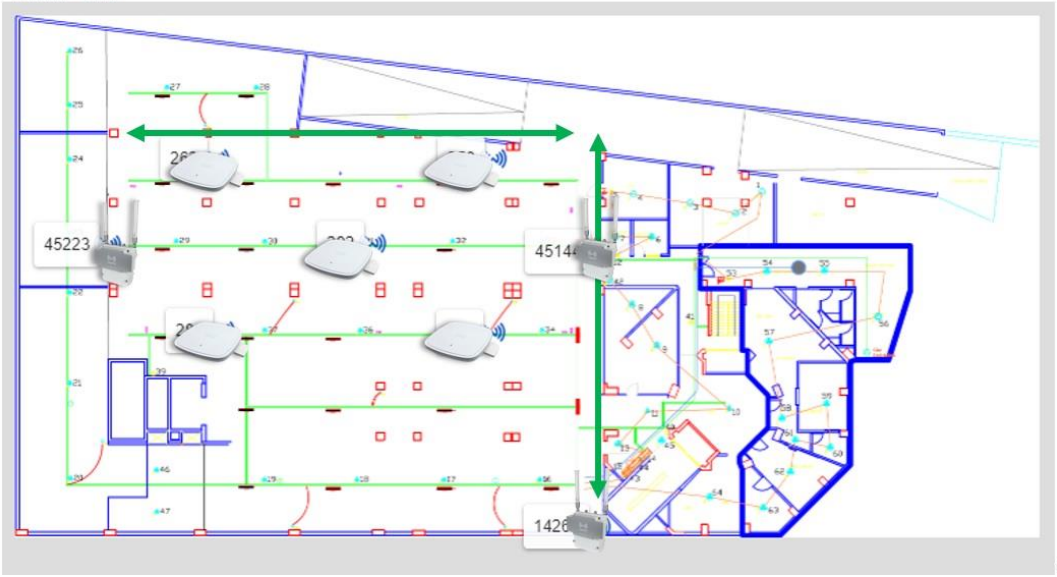
Greece CDA Pilot in Momus Contemporary Arts Museum



- Cisco Catalyst c9100 Wifi6 AP + Eagle Eye Dongles
- Real time location tracking with sub-meter accuracy
- Tags are provided to visitors
- Visitor's Dwell Time for each art
- Visitor footprint / heatmaps
- Museum Art Planning

Eagle Eye POV

Demonstration Site: Parking Lot
Size: 1100 Square meters
Green Arrows: Demonstration Area
Anchors: EagleEye Sense & EagleEye Motion
Environment: Metal
Number of Anchors: 8
Number of Tags: 270



- Parking Lot – 1100 m2
- Metal Constructions
- Hybrid Eagle Eye Deployment Cisco Catalyst C9100/ IOT IW6300
- CM Level Accuracy with 270 tags

Demo

What's next

Blogs / Cisco Live sessions/ Partner Events

EagleEye website: https://www.wipeloteagleeye.com

Reach out to Ali Samioglu or Jose Correa for any opp.

Email Us!
Ali Samioglu - asamiogl@cisco.com
Jose Correa – joseacor@cisco.com

Q&A

Continue your education

- Visit the Cisco Showcase for related demos
- Book your one-on-one Meet the Engineer meeting
- Attend the interactive education with DevNet, Capture the Flag, and Walk-in Labs
- Visit the On-Demand Library for more sessions at www.CiscoLive.com/on-demand

Fill out your session surveys!

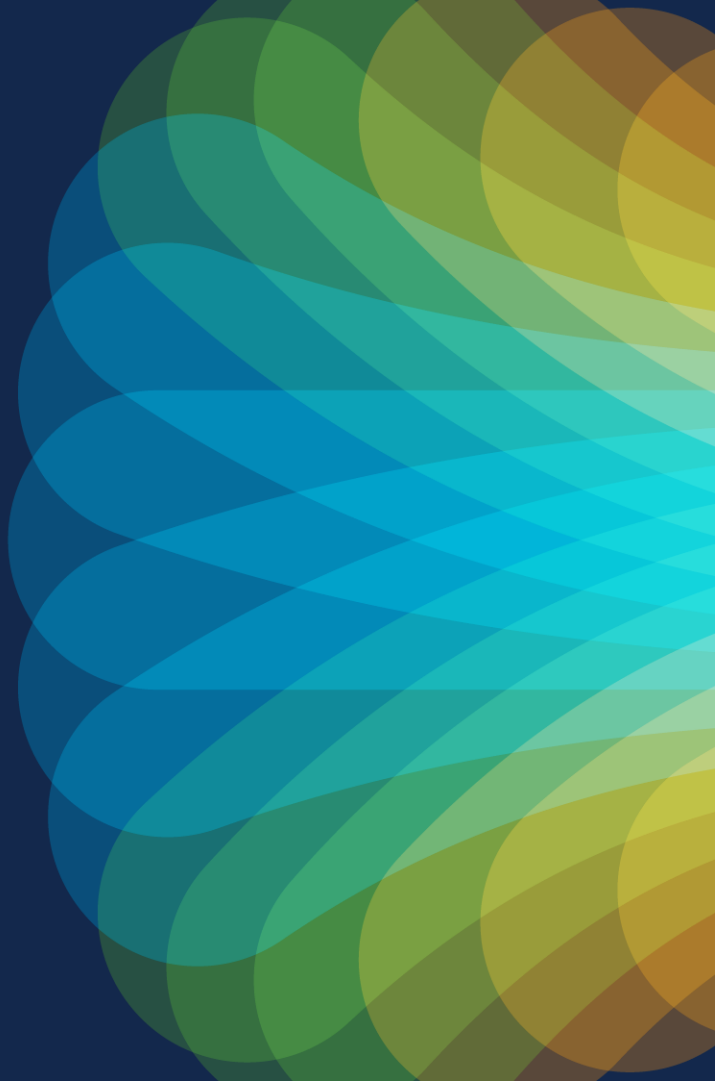
Attendees who fill out a minimum of four session surveys and the overall event survey will get **Cisco Live-branded socks** (while supplies last)!

Attendees will also earn 100 points in the **Cisco Live Challenge** for every survey completed.

These points help you get on the leaderboard and increase your chances of winning daily and grand prizes

The bridge to possible

Thank you



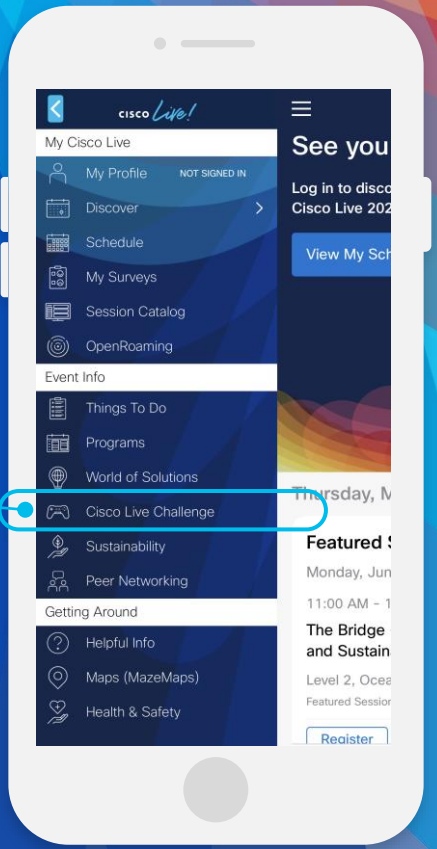
Cisco Live
Challenge

Gamify your Cisco Live experience!

Get points for attending this session!

How:

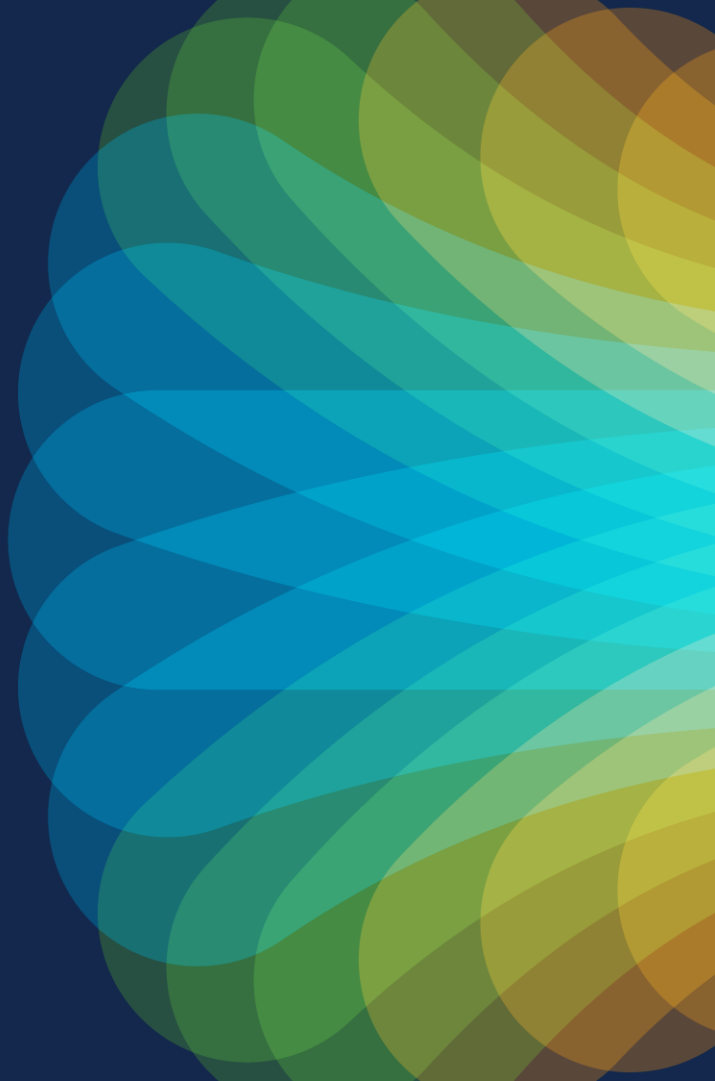
1. Open the Cisco Events App.
2. Click on 'Cisco Live Challenge' in the side menu.
3. Click on View Your Badges at the top.
4. Click the + at the bottom of the screen and scan the QR code:



cisco Live!

Let's go

Deploying IoT Services on Cisco Spaces



cisco Live!

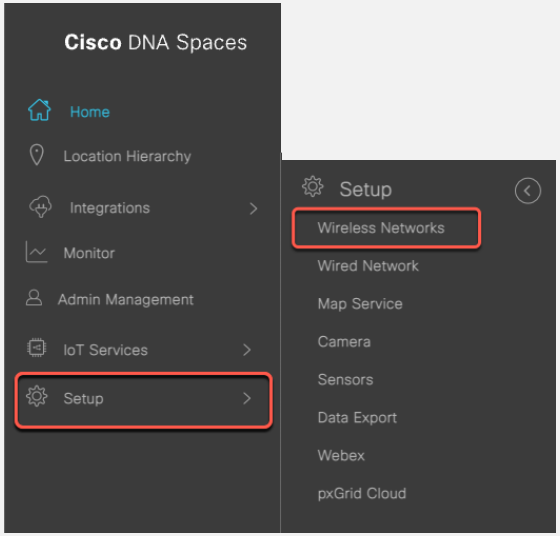
Day 1: Enabling IoT Services on Spaces Dashboard

Part 1 – Enable Streaming on Spaces Connector and Wireless Controller

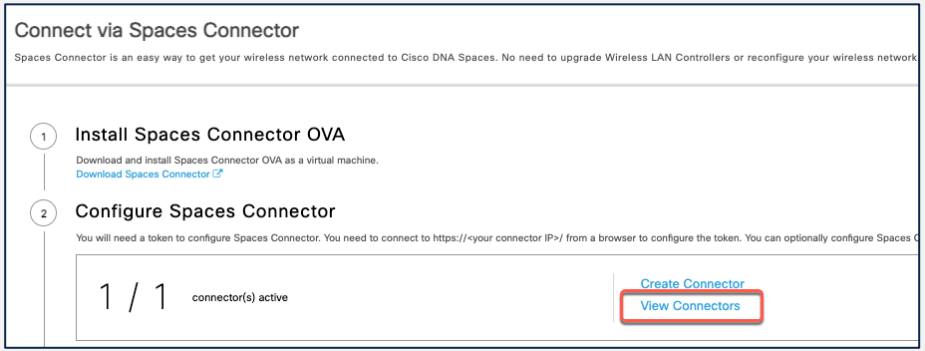
Section goals: Enable IoT Services through the Cisco Spaces Dashboard which sets up both the Spaces Connector, Wireless Controller, and Access Point for IoT capability.

Step 1: Enable Streaming on Spaces Connector

1. Log in DNA Spaces Dashboard -> Navigate to Setup -> Wireless Networks



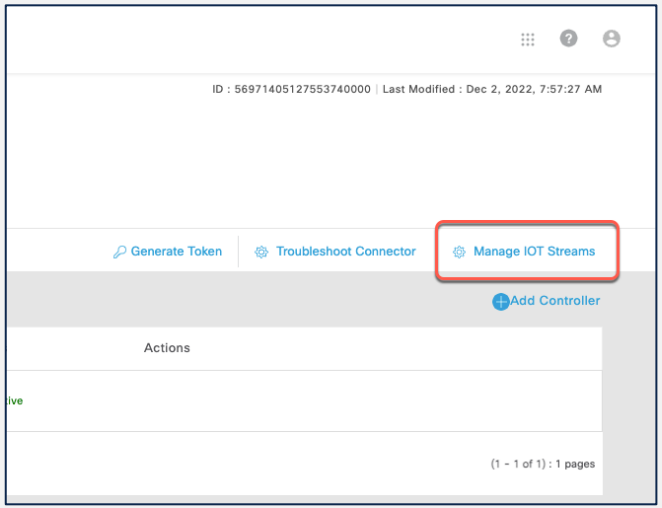
2. Under the connector that was created, click on View Connectors



Step 1: Enable Streaming on Spaces Connector (Continued)

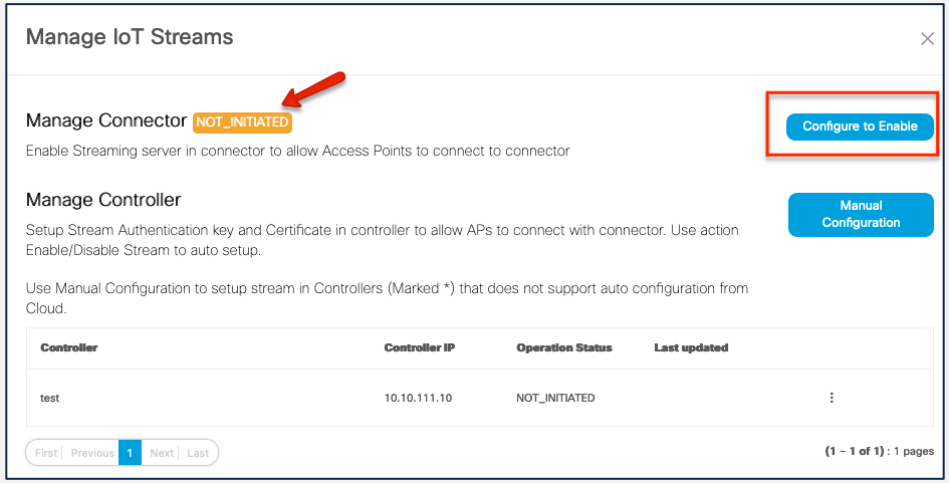
3 Select the Connector

4 Select Manage IOT Streams



Step 1: Enable Streaming on Spaces Connector (Continued)

5 If the connector's streaming server is not initiated yet, click the Configure to Enable button

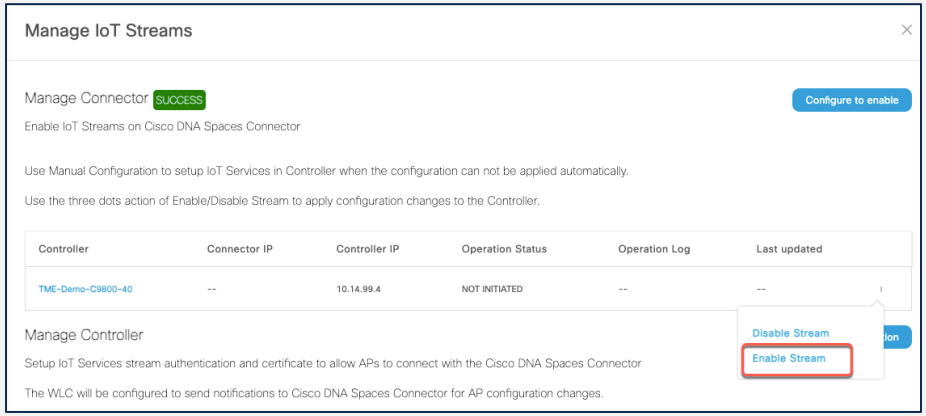


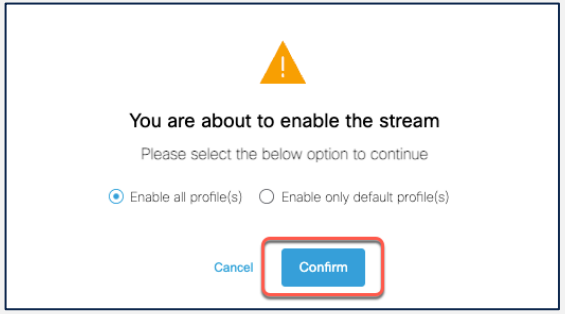
6 There will be a configuration successful message and see the Manage Connector as a Success.

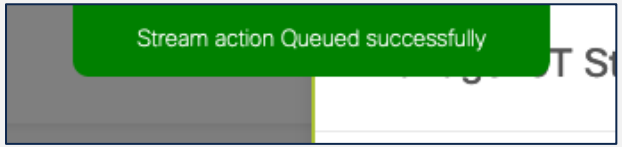
Step 2: Enable Streaming on the Wireless Controller

1. Select the three dots options button under the Controller section and select Enable Stream

2. Select either default AP group or all AP groups. There is a success message after confirming your selection.

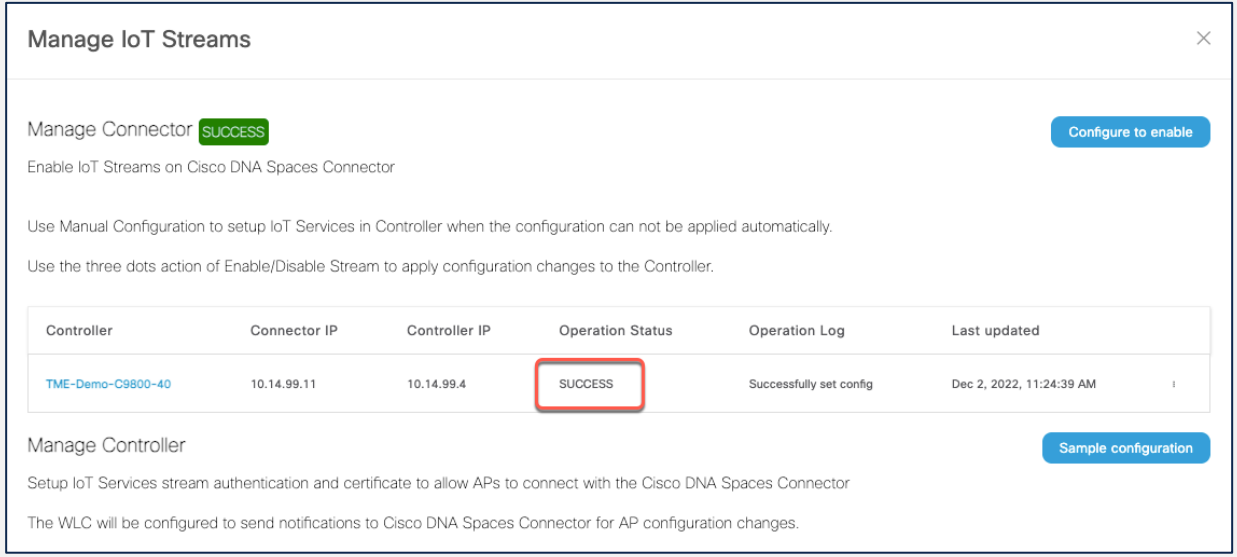






Step 2: Enable Streaming on the Wireless Controller (Continued)

3 The Manage Controller Part is showing Operation Status as Success which means that the Stream Authentication key and Certificate in controller to allow APs to connect with connector is properly configured.



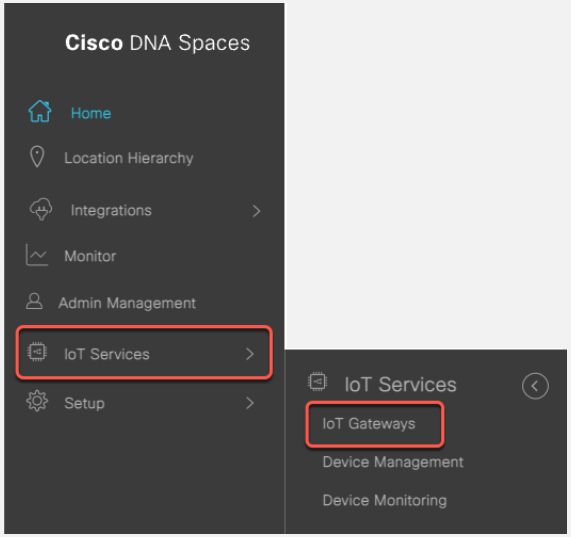
Day 1: Enabling IoT Services on Spaces Dashboard

Part 2 – Deploy BLE Gateway and IOx Application on Access Points

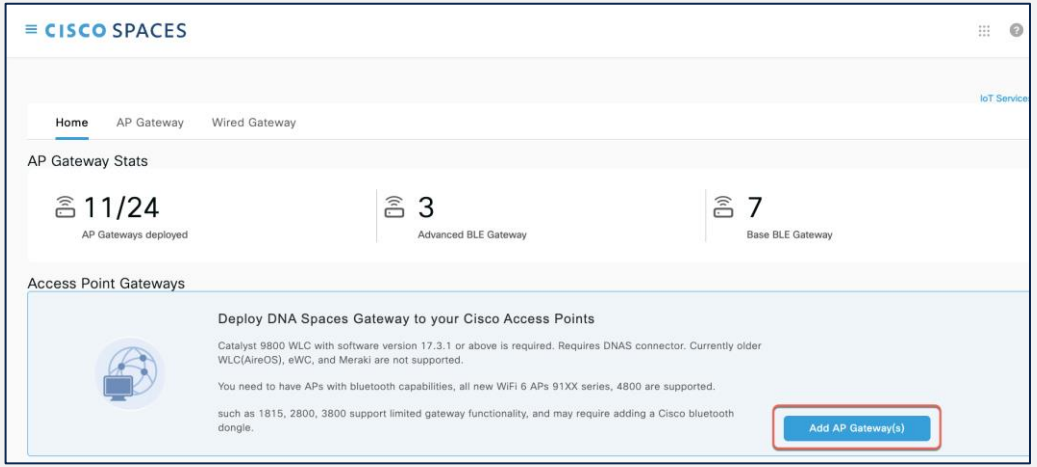
Section goals: Deploy the BLE Gateway on Access Points to scan/transmit BLE device data and deploying the IOx application on Access Points to configure BLE devices.

Step 1: Deploying BLE Gateway on Access Point

1 Select Hamburger Menu -> IoT Services -> IoT gateways

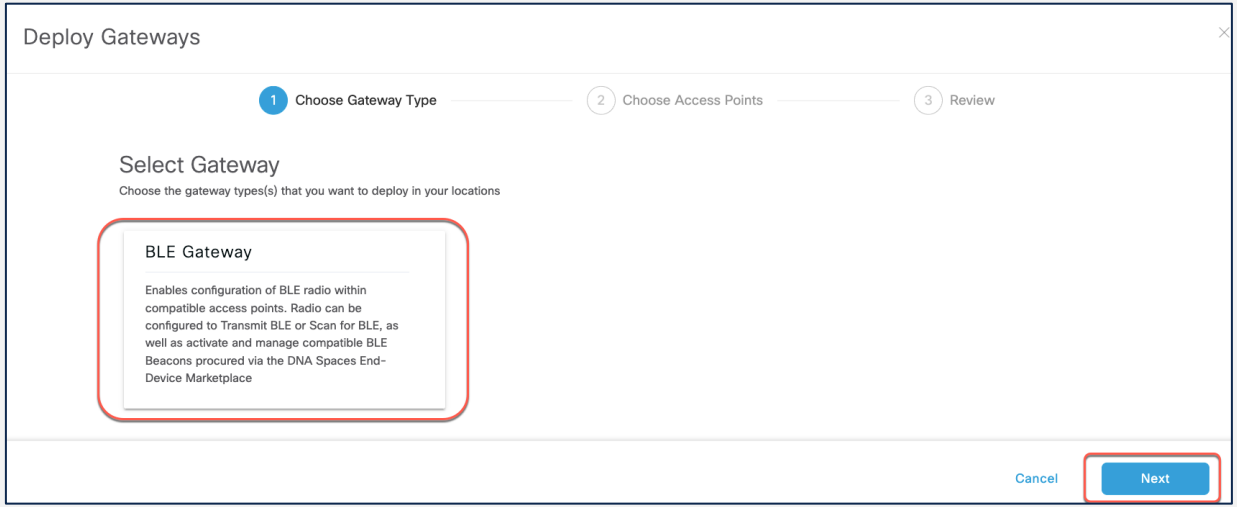


2 Select Add AP Gateway(s)



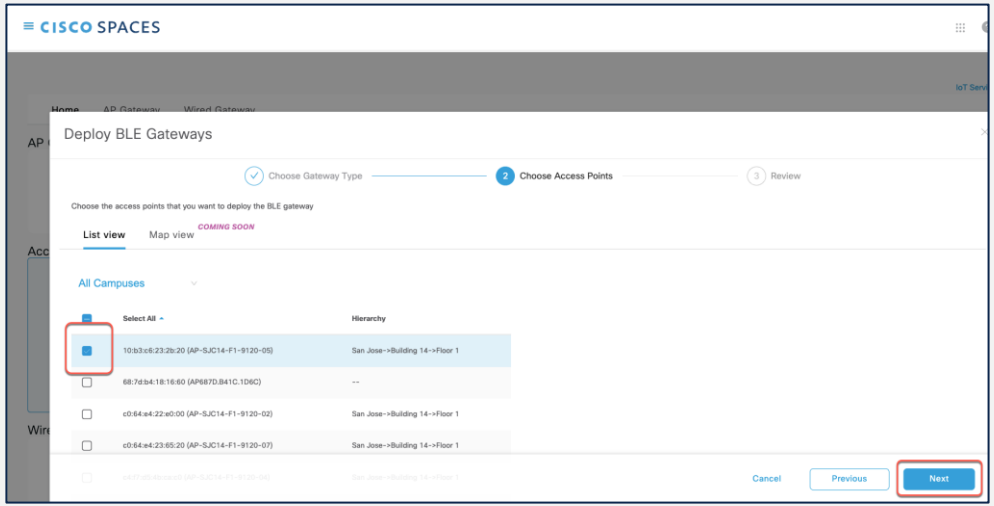
Step 1: Deploying BLE Gateway on Access Point (Continued)

3 Select BLE Gateway and hit Next



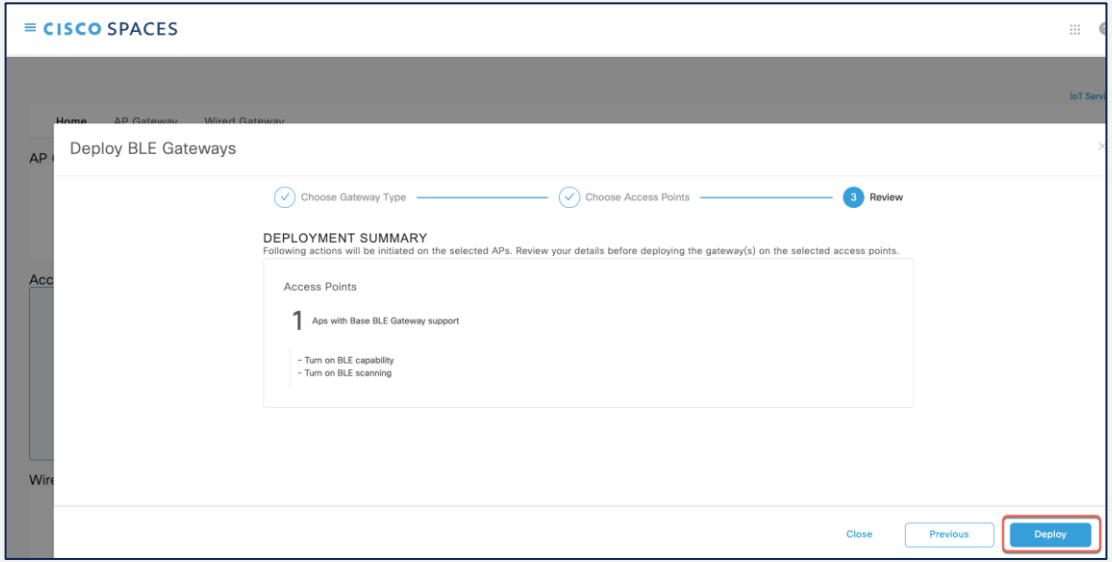
Step 1: Deploying BLE Gateway on Access Point (Continued)

4 Select the Access Points you want to deploy as a BLE Gateway



Step 1: Deploying BLE Gateway on Access Point (Continued)

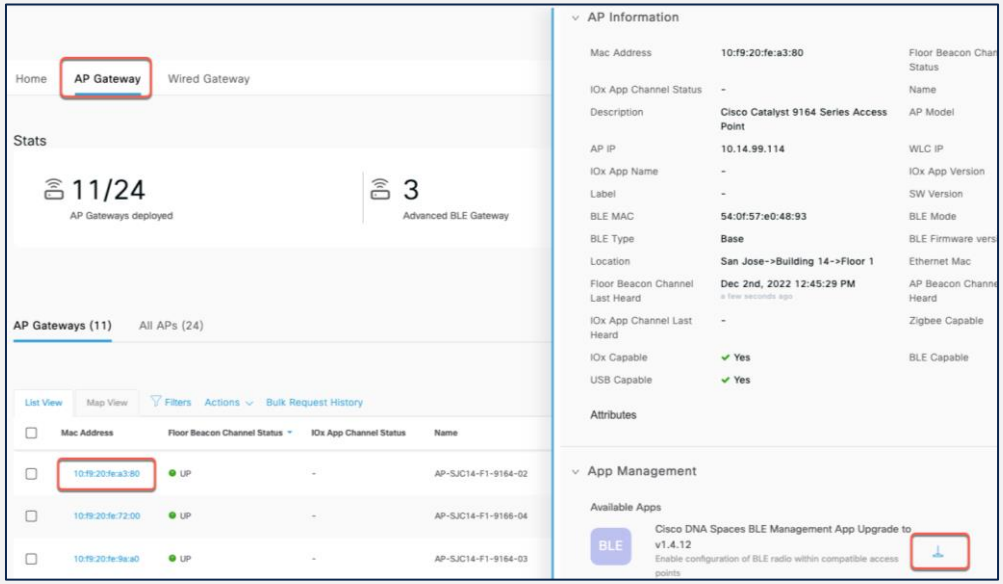
5 Review the deployment summary and select Deploy



Step 2: Advanced BLE Gateway on Access Point

1 Select AP Gateway and select the Access Point

2 Click the download button to install the IOx application



Deploying Application Hosting on DNA Center

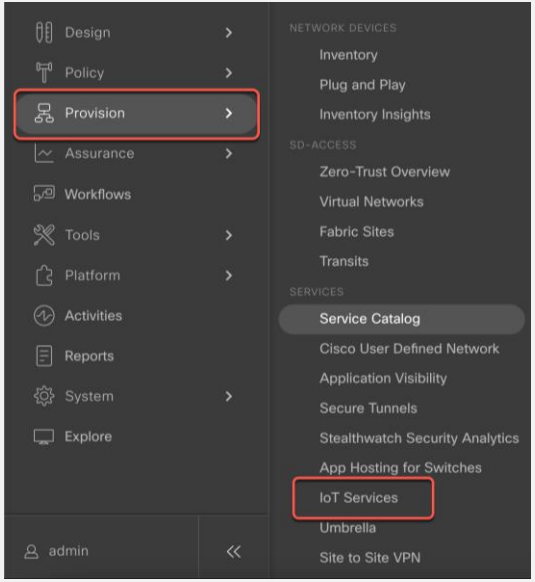
Day 1: Upload and Deploy IOx Application

Part 1 – Upload IOx Application

Section goals: Upload an IOx application into Cisco DNA Center's repository so it can be ready for deployment to the desired access point.

Step 1: Navigate to IoT Services

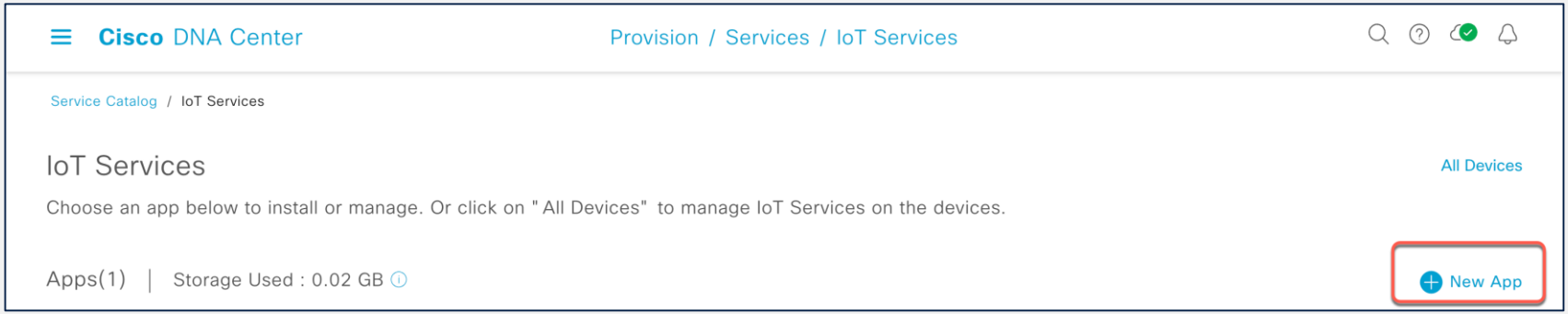
1 On DNA Center, open the menu, click on **Provision**, then **IoT Services to enter the App Hosting page.**



Cisco DNA Center's IoT Services page provides an intuitive graphical user interface for users to upload and manage a third-party application they would like to deploy onto their access points.

Step 2: Upload the IOx application to Cisco DNA Center

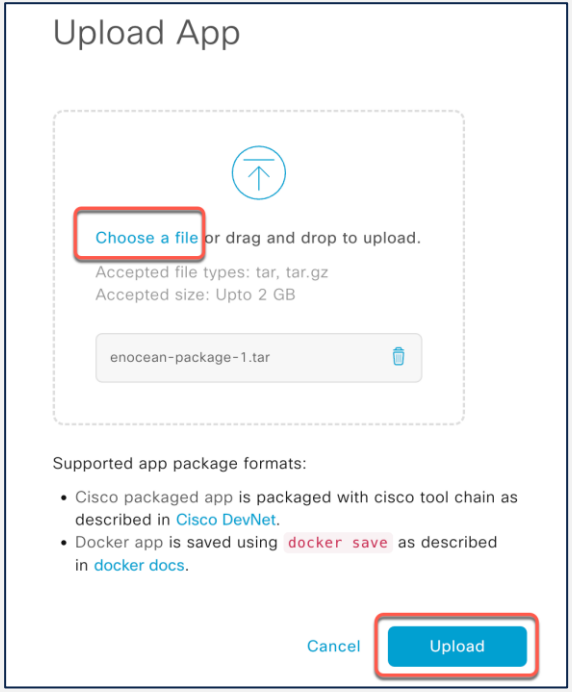
1 Click on **New App** on the right side of the screen.



Step 2: Upload the IOx application to Cisco DNA Center (Continued)

2 Upload the Application by choosing a file with either of the following application types:

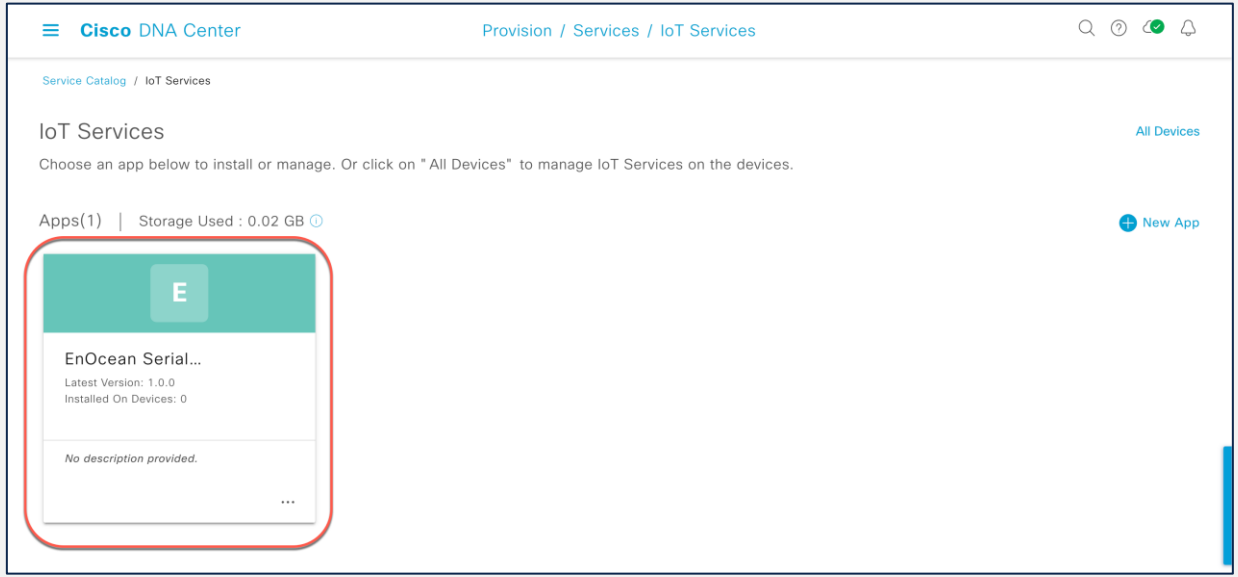
- Option 1 – Docker
  - Choose this option if the app you are uploading is a Docker app saved as a tar file using the Docker save command.
- Option 2 – Cisco Package
  - Choose this option if the app you are uploading has been packaged using the Cisco app packaging toolchain.
- For more information regarding both package types, visit: https://developer.cisco.com/docs/iox/



Step 2: Upload the IOx application to Cisco DNA Center (Continued)

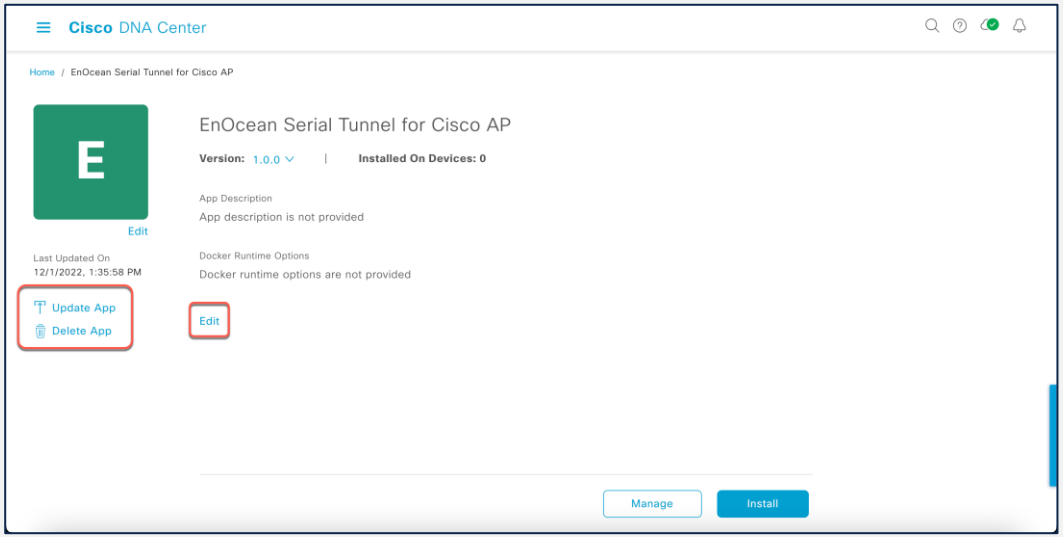
3 Ensure the application you've uploaded now appears within the App Hosting page.

4 Optional: If you would like to manage the application, click on the application to enter the application's management page.



Step 2: Upload the IOx Application to Cisco DNA Center (Continued)

5 (1) To update the application, click on the **Update App** button; (2) To delete the application, click on the **Delete App** button; (3) To edit the application's description, click on the **Edit** button.



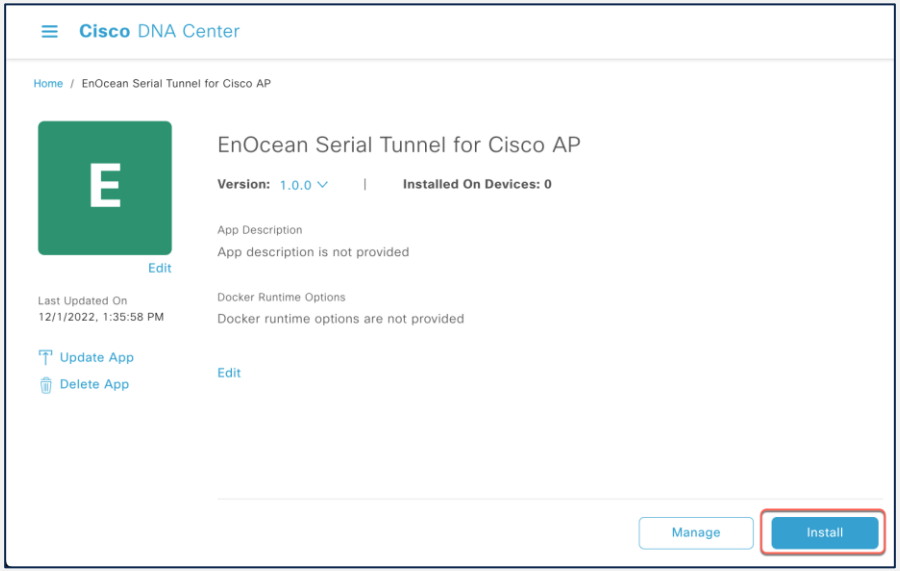
Day 1: Upload and Deploy IOx Application

Part 2 – Deploy IOx Application

Section goals: Deploy an IOx application to all devices within a network hierarchy created in the prior section.

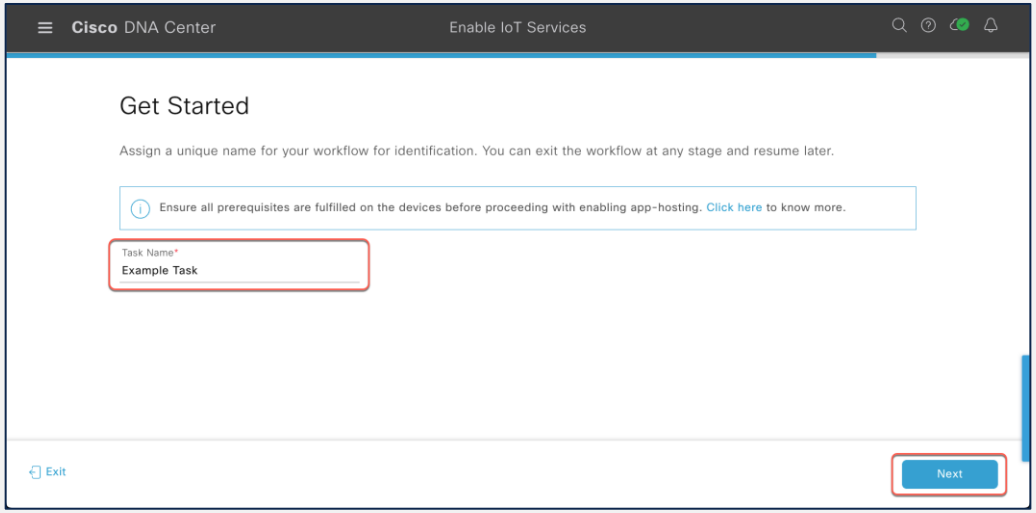
Step 1: Start the Workflow of installing an application on Access Points

1 Within the application select the Install button



Step 1: Start the Workflow of installing an application on Access Points (Continued)

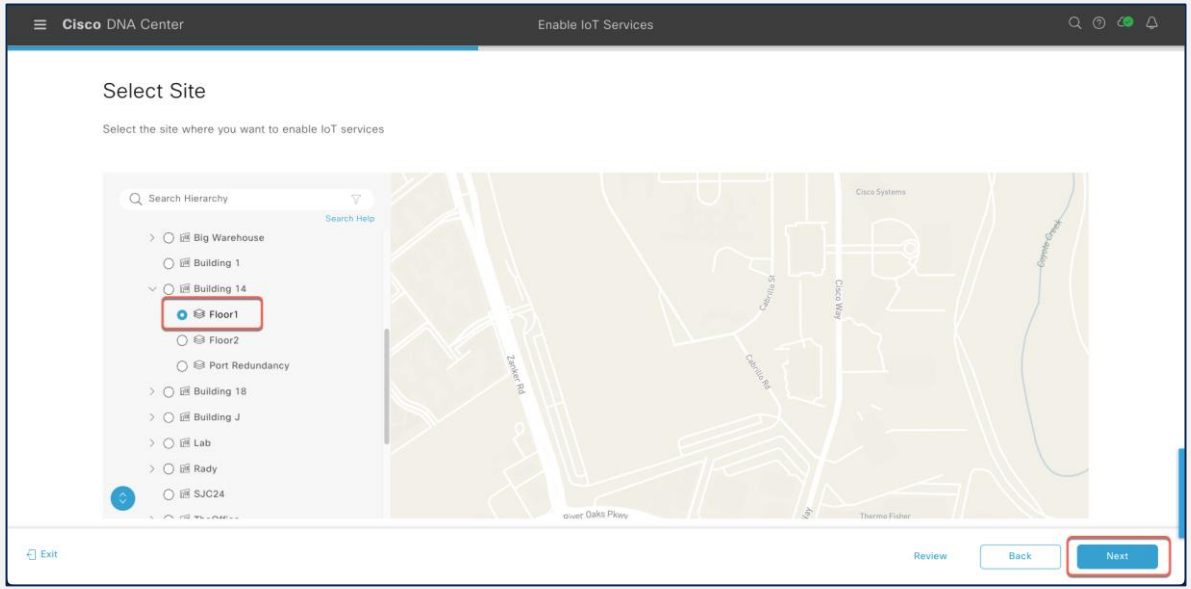
2 Give a Task Name for the workflow then hit **Next**



Cisco DNA Center's "Enable IoT Services Workflow" function allows you to easily deploy your application to either a location or specific access point.

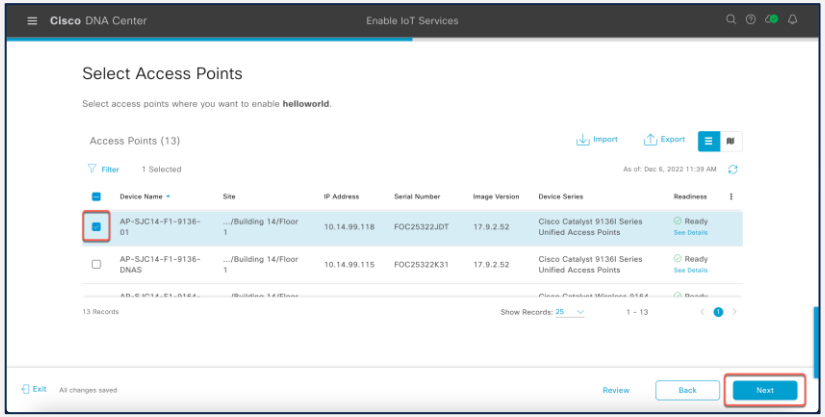
Step 2: Deploy application to access points on a floor

3 Select a floor within the network hierarchy to deploy the application, then hit **Next**

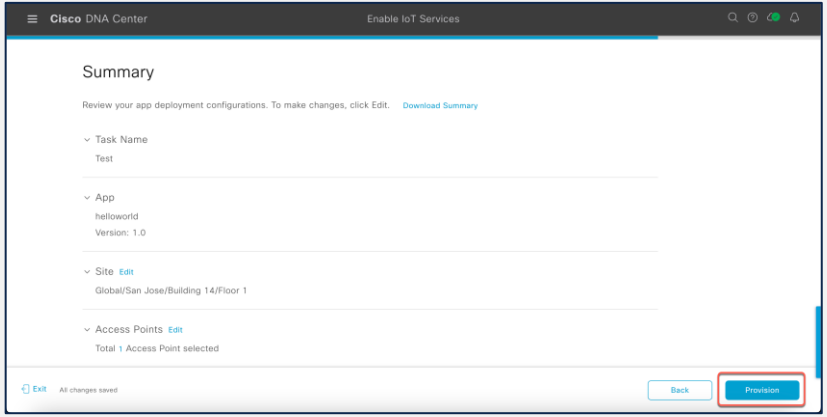


Step 2: Deploy application to access points on a floor (Continued)

3 Select the AP(s) on this floor where you would like to deploy the application, then click **Next**.



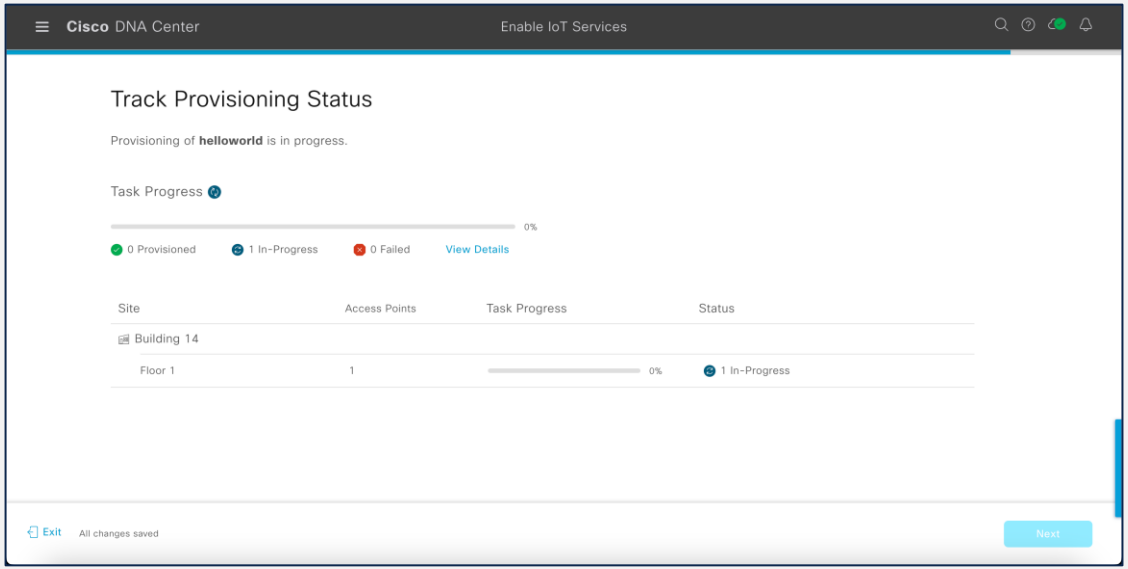
4 Review that the application is being deployed to the intended site and access point(s), then click **Provision**.



- Ensure the Readiness column says **Ready**
- By default, this page shows an AP list view; however, it can be toggled to a maps view via the map icon at the top right-side corner of the table.

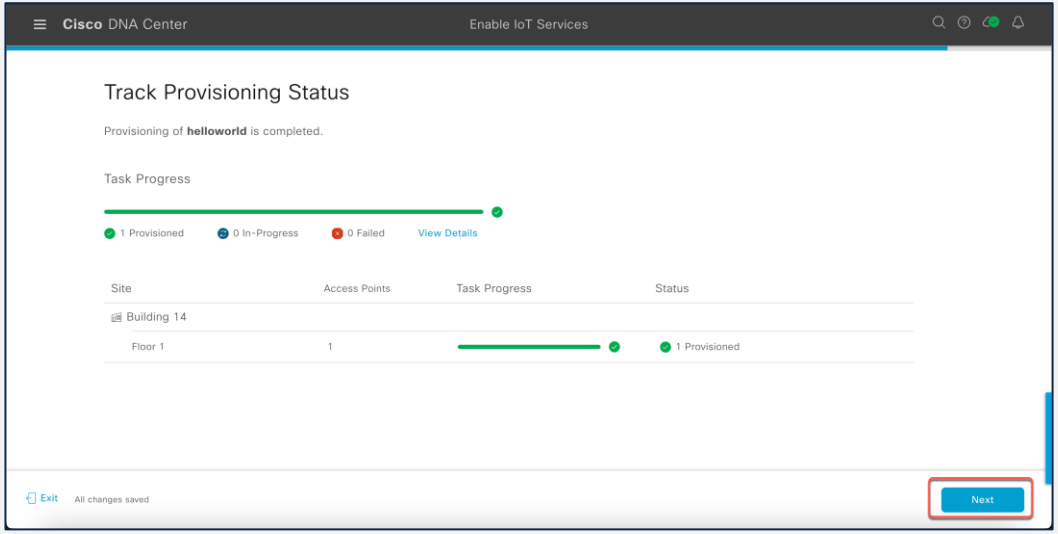
Step 2: Deploy application to access points on a floor (Continued)

5 Observe that the application deployment process will begin



Step 2: Deploy application to access points on a floor (Continued)

6 After completing the provisioning of your application deployment, hit **Next**.

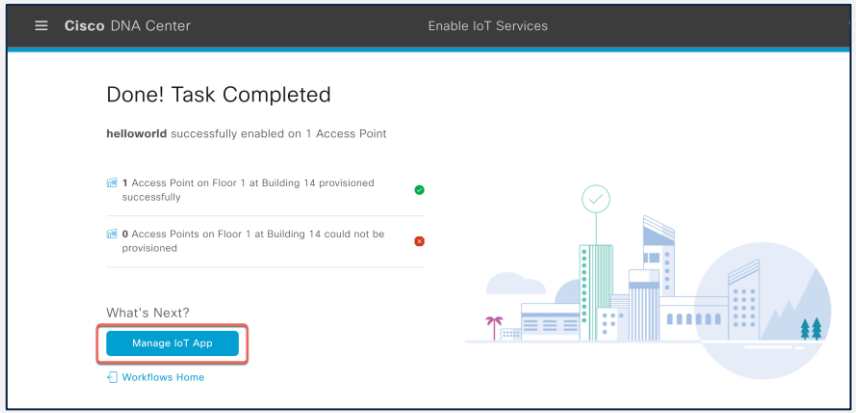


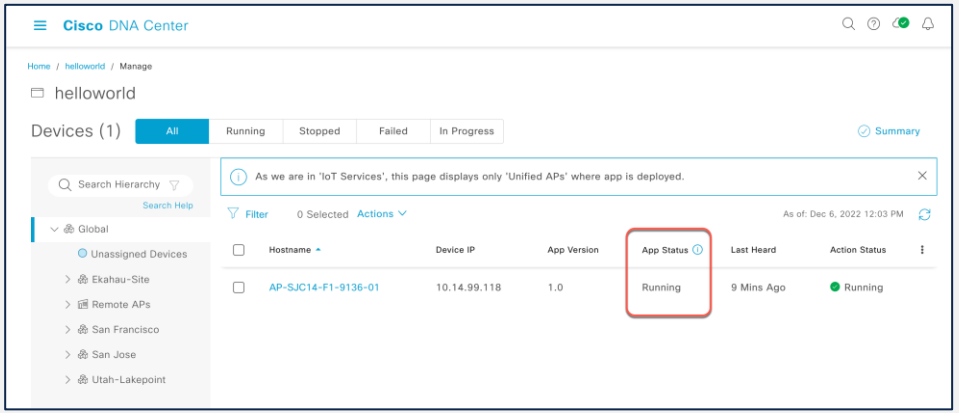
Warning: If you attempt to deploy an application with a dependency on a USB attachment, and the attachment is not detected, you will receive a Failed message.

Step 2: Deploy application to access points on a floor (Continued)

7 Click on the **Manage IoT Application** button to continue to the application's management page.

8 On this Application Management page, you're able to manage the status of the deployed applications.





Observe beneath the **App Status** column that you can monitor the status of your application.

Step 2: Deploy application to access points on a floor (Continued)

9 In order to manage the application deployed to the access point, click on the **Actions** drop-down menu

1. **Start App** – If you stopped your app via the **Stop App** button, you could start it again via this button
2. **Stop App** – You can stop the loaded application from running. (Stopping an application does not delete or uninstall it.)
3. **Upgrade App** – If you've uploaded a newer version of your use through the initial IoT Services Workflow, you can click on the **Upgrade App** button to upgrade the application running on the AP to the new version
4. **Uninstall App** – Click this button to remove the application from your access point entirely