



IoT Service (Wireless)

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Overview of Cisco Spaces: IoT Service (Wireless)

Cisco Spaces: IoT Service (Wireless) is a platform service within Cisco Spaces that enables you to claim, manage, and monitor IoT devices using Cisco's wireless infrastructure. IoT Service is designed to enable management of IoT devices across vendors, form factors, and technology protocols. Bluetooth Low Energy (BLE) is the first technology available for management using IoT services.

IoT service (wireless) encompasses hardware, software, and partner components to enable the management of devices that support critical business outcomes. IoT service (wireless) uses Cisco Catalyst 9800 Series Wireless Controllers, Cisco Spaces: Connector, Cisco Wi-Fi6 access points, and Cisco Spaces. IoT service (wireless) adopts a next-generation approach to manage complexity in an enterprise environment.

Using the IoT service (wireless), you can perform the following IoT management activities:

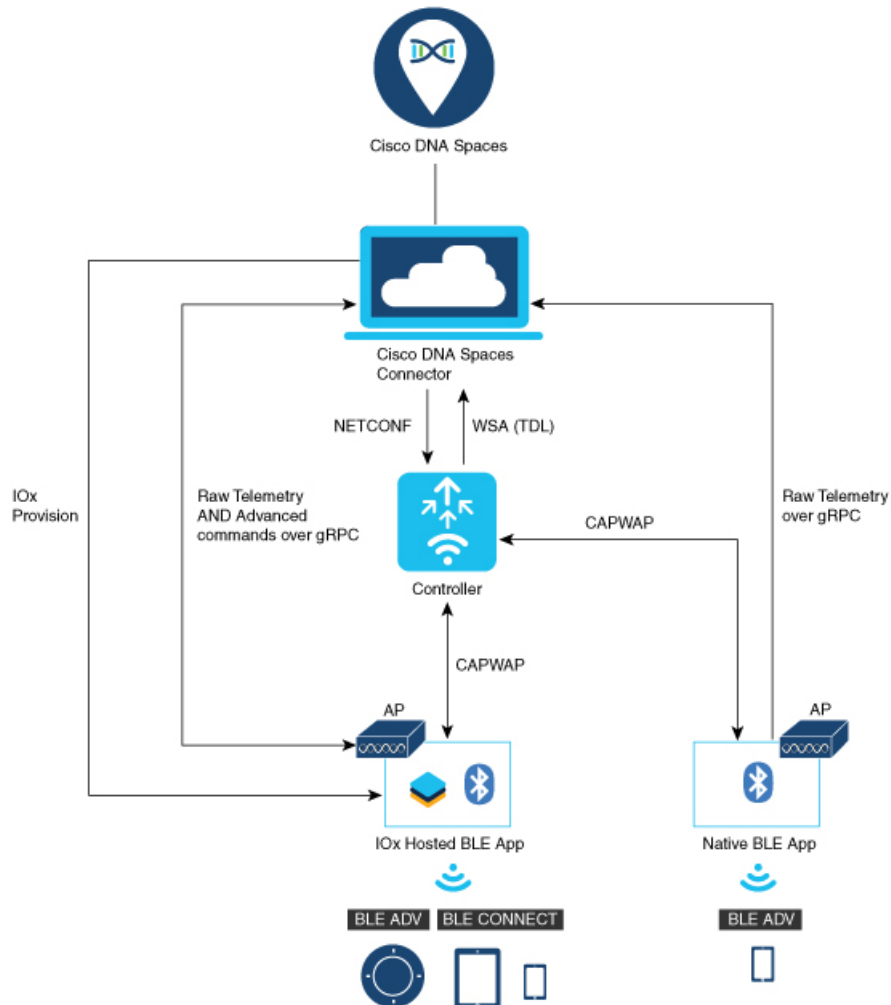
- Deploy BLE gateways on supported APs in your network.
- Claim the BLE beacons that you acquired from Cisco Spaces: IoT Device Marketplace.
- Configure APs and manage floor beacons.
- Monitor device attributes such as location, telemetry, battery status, and movement status.

Components of Cisco Spaces: IoT Service

The section describes the various components that work to complete the Cisco Spaces: IoT Service solution.

The Cisco Catalyst 9100 Series Family of Access Points acts as a gateway of communication between Cisco Spaces and the IoT devices. Cisco Spaces: IoT Service can then use a range of common APIs to communicate with edge devices and apps. The Cisco Spaces: IoT Service collects data from devices and apps, and passes it to Cisco-partnered websites that manage these devices far more extensively (referred to in this document as Device Manager websites). These Device Manager websites can use edge-device signals to enable outcomes specialized and targeted for each industry.

Figure 1: Components of IoT Service



Access Points

You can configure access points as gateways in Cisco Spaces. You can find the list of supported APs in the **Compatibility Matrix** section.

Depending on the type of Cisco APs, you can configure an AP as one of the following types of BLE gateways:

- **Base BLE Gateway:** This is a type of AP that you can configure in either the **Transmit** mode or the **Scan** mode.

In the **Transmit** mode, the AP can broadcast iBeacon, Eddystone URL, and Eddystone UID profiles.

In the **Scan** mode, the AP can scan the vicinity for other BLE devices. Using gRPC, an AP sends the scanned data to Cisco Spaces: Connector. The AP can also receive telemetry data from floor beacons. The Cisco Spaces: Connector dashboard decodes and displays this information.

- **Advanced BLE Gateway:** This gateway is an AP that is installed with the Cisco IOx App. Using the installed Cisco IOx App, you can configure floor beacons on the Cisco Spaces dashboard. You can also upgrade the floor beacon firmware from the Cisco Spaces dashboard.

You can configure this AP in the **Scan** mode and the **Transmit** mode.

In the **Transmit** mode, the AP can broadcast iBeacon, Eddystone URL, and Eddystone UID profiles.

In the **Scan** mode, the AP can scan the vicinity for other BLE devices. Using gRPC, an AP sends the scanned data to Cisco Spaces: Connector. The AP can also receive telemetry data from floor beacons. The Cisco Spaces: Connector dashboard decodes and displays this information.

Cisco Catalyst 9800 Series Wireless Controllers

The Cisco Catalyst 9800 Series Wireless Controller (Catalyst 9800 controller) combines RF excellence with Cisco IOS-XE benefits, and comes in physical or virtual form factor. This wireless controller is reliable and highly secure. You can manage this Catalyst 9800 controller using CLI, GUI, NETCONF, Yang, or the Catalyst Center.

The Catalyst 9800 controller is the single point for configuring and managing a wireless network and access points. The Catalyst 9800 controller configures and manages APs using the CAPWAP protocol.

The Catalyst 9800 controller receives BLE configuration from Cisco Spaces over NETCONF and passes the configuration to AP over CAPWAP. The feedback path from the AP to the wireless controller is through CAPWAP, and from the Catalyst 9800 controller to Cisco Spaces through Telemetry data logger (TDL) telemetry streaming. The gRPC configuration from Cisco Spaces also goes through the Catalyst 9800 controller, and from there to the corresponding AP. The configuration sets up the gRPC channel between the AP and Cisco Spaces. The AP sends the gRPC channel statistics to the Catalyst 9800 controller, and you can view these statistics on the Catalyst 9800 controller.



Note

- You can have only one gRPC session between an AP and connector.
- Cisco Catalyst 9800 Series Wireless Controller running Cisco IOS XE Amsterdam 17.3.x supports only one of the following:
 - IoT service (wireless) with Cisco Spaces.
 - Network Assurance solution on Catalyst Center using Intelligent Capture (iCAP)

IoT service (wireless) and Intelligent Capture (iCAP) can co-exist from Cisco IOS XE Cupertino 17.7.x or higher.

Cisco Spaces: IoT Device Marketplace

Cisco Spaces: IoT Device Marketplace is a platform where you can discover, research, and purchase IoT devices. IoT Device Marketplace is a part of the Cisco Spaces full-stack partner ecosystem. Each device is preconfigured to give the customer an out-of-the-box experience with sensors, tags, wearables, and more. All the devices are compatible with the applications in the App Center. Current devices in the IoT Device Marketplace leverage BLE to transmit telemetry, with plans to add other technology in the future, such as Ultra Wide Band (UWB) and Zigbee.

Cisco Spaces: Connector

Cisco Spaces: Connector allows Cisco Spaces to communicate with more than one Cisco AireOS Wireless Controller.

APs connect to connector using the gRPC framework.

The APs establish a connection to connector using the gRPC protocol. The gRPC protocol configures floor beacons and receives telemetry data from the floor beacons. gRPC is a bidirectional streaming service, and requires a certificate to validate the host connection and a token for authentication. Each AP creates a gRPC connection. Connector can thus support many simultaneous connections.

Compatibility Matrix for IoT Service (Wireless)

| Application Name | Support for Cisco Spaces: IoT Service |
|--|---|
| Supported wireless controllers | <ul style="list-style-type: none"> Supported on Cisco Catalyst 9800 Series Wireless Controllers, Release 17.3.1 and later Not supported on Cisco AireOS Wireless Controller Not supported on Cisco Embedded Wireless Controller on Cisco Catalyst Access Points (Cisco EWC-AP) |
| Cisco Spaces: Connector Docker | 2.0.455 and later |
| Cisco Spaces: Connector OVA | 2.3 and later |
| Cisco Prime Infrastructure | Cisco Prime Infrastructure Release 3.8 MR1 and later |
| Catalyst Center (for map import) | Catalyst Center Release 2.1.1 and later |
| Access Points for advanced BLE gateway (Wi-Fi 6) | <ul style="list-style-type: none"> Cisco Catalyst 9105 Series Access Points Cisco Catalyst 9115 Series Access Points Cisco Catalyst 9117 Series Access Points Cisco Catalyst 9120 Series Access Points Cisco Catalyst 9130 Series Access Points Cisco Catalyst 9136 Series Access Points Cisco Catalyst 9162 Series Access Points Cisco Catalyst 9164 Series Access Points Cisco Catalyst 9166 Series Access Points Cisco Aironet 4800 Series Access Points |

| Application Name | Support for Cisco Spaces: IoT Service |
|-------------------------------------|---|
| Access points for basic BLE gateway | <ul style="list-style-type: none"> • Cisco Aironet 1815 Series Access Points • Cisco Aironet 2800 Series Access Points (USB dongle needed. No in-built USB radio) • Cisco Aironet 3800 Series Access Points (USB dongle needed. No in-built USB radio) |
| Cisco IOx App Version | 1.0.46 and later Note For Cisco Catalyst 9800 Series Wireless Controllers Cisco IOS XE Cupertino 17.7.x, ensure that the IoX Application version is upgraded to Version 1.3.x |

IoT Service is not supported on the following:

- Directly connected and CMX Tethering connectors.

The following table lists the compatibility of the Advanced BLE Gateway for BLE and the Base BLE Gateway App with various AP modes. This table is not applicable to Cisco Embedded Wireless Controller on Cisco Catalyst Access Points (Cisco EWC-AP).

Table 1: AP Modes and App Support

| AP Mode | Advanced BLE Gateway App | Base BLE Gateway App |
|------------|--|--|
| PI: Local | <ul style="list-style-type: none"> • 11-AX: Supported • Wave2: Not supported | <ul style="list-style-type: none"> • 11-AX: Supported • Wave2: Supported |
| P1: Flex | <ul style="list-style-type: none"> • 11-AX: Supported • Wave2: Not supported | <ul style="list-style-type: none"> • 11-AX: Supported • Wave2: Supported |
| P2: Fabric | <ul style="list-style-type: none"> • 11-AX: Supported • Wave2: Not supported | <ul style="list-style-type: none"> • 11-AX: Supported • Wave2: Supported |
| P3: Mesh | <ul style="list-style-type: none"> • 11-AX: Supported • Wave2: Not supported | <ul style="list-style-type: none"> • 11-AX: Supported • Wave2: Supported |

Prerequisites of IoT Service (Wireless)

The following prerequisites can get you started with Cisco Spaces: IoT Service.

- Install Cisco Spaces: Connector in your network.
- Install a Cisco Catalyst 9800 Series Wireless Controller with a Cisco IOS XE Amsterdam 17.3.x image.

- Deploy supported APs in your network (see the [Compatibility Matrix for IoT Service \(Wireless\)](#), on page 4).
- Ensure that Cisco Spaces is configured with maps either from Cisco Prime Infrastructure or Catalyst Center.
- If the Cisco Spaces: Connector is an Amazon Elastic Compute Cloud (EC2) Instance from Amazon Machine Images (AMI), ensure that the wireless controller and connector are in the same virtual private cloud (VPC). Ensure that the wireless controller has a private IP address so that the security group of connector does not block the traffic, allowing enabled IOT streams to function.
- Permit all the TCP traffic at the Virtual private clouds (VPC) level so that the Telemetry Data Logger (TDL) is established without any issues.
- Before adding a Cisco Catalyst 9800 Series Wireless Controller to a connector, run the following commands on the Catalyst 9800 controller in a sequence:
 - **aaa new-model**
 - **aaa authentication login default local**
 - **aaa authorization exec default local**

These commands disable the connection services to Cisco Spaces.

- Cisco Spaces: IoT Service and Intelligent Capture (iCAP) feature can now co-exist on Cisco Catalyst 9800 Series Wireless Controller Cisco IOS XE Cupertino 17.7.x release and later. For releases earlier than Cisco IOS XE Cupertino 17.7.x, disable iCAP, if already enabled on the controller.
- Perform NTP synchronization over wireless controllers, a connector, and APs in the network.
- If a USB BLE module is inserted in an AP, reboot the AP.
- NETCONF must be enabled in Cisco Catalyst 9800 Series Wireless Controller in port 830, along with permission to use NETCONF.



Caution The application (app) installed and running over the AP uses the default 17.17.0.0/16 subnet. So, using this subnet for other purposes might create network issues.

- IPv6 is not supported on Cisco Spaces: Connector.
- If you require two connectors installed with 3.x to work with IoT service (wireless) and function as a high-availability pair, you must configure the connectors as Virtual IP (VIP) pair.

Access Points that support IoT Service (Wireless) are as follows:

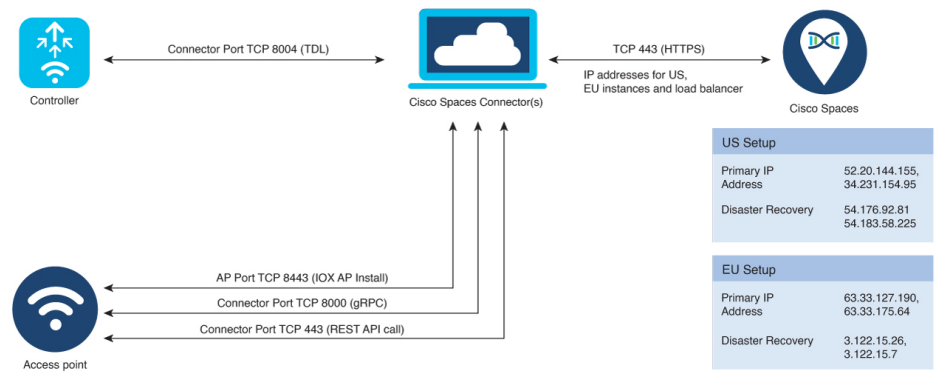
- Cisco Catalyst 9105 Series Access Points
- Cisco Catalyst 9115 Series Access Points
- Cisco Catalyst 9117 Series Access Points
- Cisco Catalyst 9120 Series Access Points
- Cisco Catalyst 9130 Series Access Points

- Cisco Catalyst 9136 Series Access Points
- Cisco Catalyst 9162 Series Access Points
- Cisco Catalyst 9164 Series Access Points
- Cisco Catalyst 9166 Series Access Points
- Cisco Aironet 4800 Series Access Points

Open Ports for IoT Service (Wireless)

This section lists the connector ports that must be open for the proper functioning of IoT service (wireless).

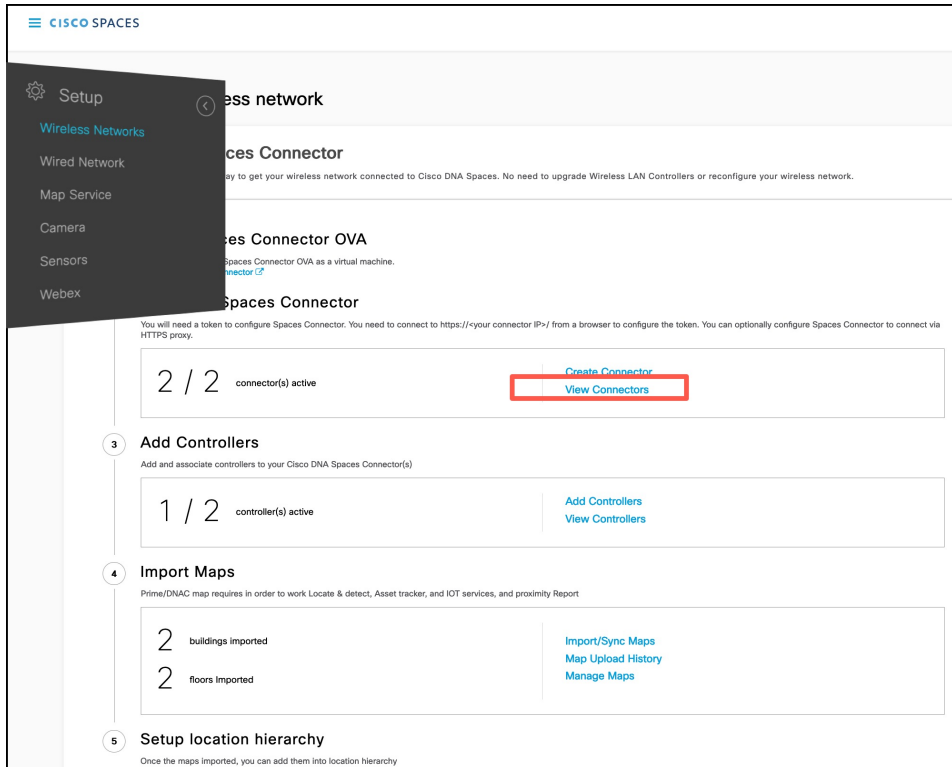
Figure 2: Open Ports for IoT service (wireless)



Configure IoT Service (Wireless)

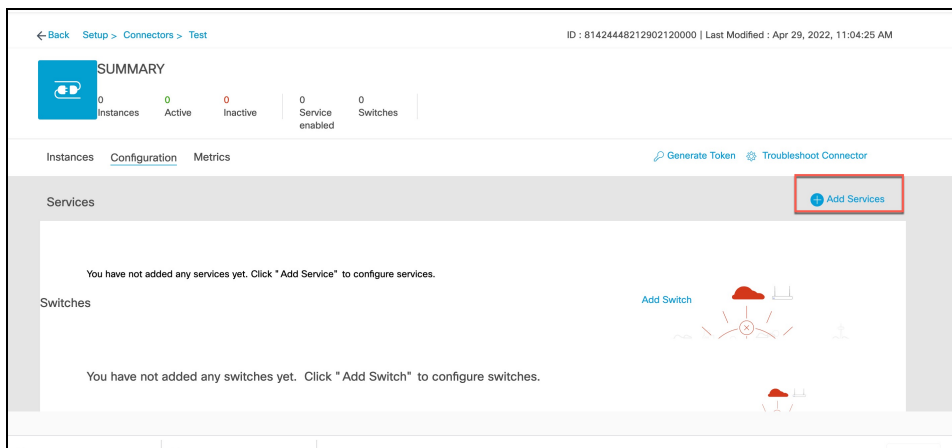
- Step 1** In the Cisco Spaces dashboard left navigation pane, click **Setup** and choose **Wireless Networks**.
- Step 2** In the **Connect your wireless network** window that is displayed, go to the **Step 2** area and click **View Connectors**.

Figure 3: View Connectors



Step 3 In the connector details window that is displayed, click **Add Services**.

Figure 4: Add Services



Step 4 In the **Add Services** window that is displayed, choose **IoT Wireless** and click **Add**.

Note **service-manager** is chosen by default.

Figure 5: Connector Details

← Back Setup > Connectors > Test ID : 81424448212902120000 | Last Modified : Apr 29, 2022, 11:04:25 AM

SUMMARY

0 Instances 0 Active 0 Inactive 2 Services enabled 0 Switches

Instances Configuration Metrics [Generate Token](#) [Troubleshoot Connector](#)

Services [Add Services](#)

| Service Name | Version | Last Updated |
|-----------------|-----------|--------------|
| service-manager | 2.8.0.123 | Never |
| iot-services | 2.8.0.33 | Never |

Switches [Add Switch](#)

In the **Connector Details** window, you can see that the number of services that are enabled has increased.

Verify IoT Streams for Catalyst 9800 Controller

This task is for troubleshooting purposes only. IoT streams are automatically enabled for all the wireless controllers associated with the IoT service (wireless) service of a connector.

This task helps you troubleshoot IoT streams of a Catalyst 9800 controller. If your APs are not visible, you can manually enable or disable the IoT streams of Cisco Spaces.

- Step 1** In the Cisco Spaces dashboard left navigation pane, choose **Setup > Wireless Network**.
- Step 2** In the **Configure via Spaces Connector** area titled **Step 2: Add Controllers**, click **View Connectors**.
- Step 3** Click the connector of your choice.
- Step 4** In the **Services** tab, in the **Actions** column, click the gear icon near IoT service (wireless) to open the **Manage IoT Streams** window.

Figure 6: Troubleshooting IoT Streams

Manage IoT Streams ×

Manage Connector SUCCESS Configure to enable

Enable IoT Streams on Cisco DNA Spaces Connector

Use Manual Configuration to setup IoT Services in Controller when the configuration can not be applied automatically.

Use the three dots action of Enable/Disable Stream to apply configuration changes to the Controller.

| Controller | Connector IP | Controller IP | Operation Status | Operation Log | Last updated | |
|------------|----------------|---------------|------------------|-------------------------|--------------------------|---|
| sid-ewlc-2 | 172.20.239.157 | 172.20.239.18 | SUCCESS | Successfully set config | Jun 14, 2022, 9:22:00 AM | ⋮ |
| sid-ewlc-3 | 172.20.239.157 | 172.20.239.38 | SUCCESS | Successfully set config | Jun 14, 2022, 9:05:20 AM | ⋮ |

Manage Controller Sample configuration

Setup IoT Services stream authentication and certificate to allow APs to connect with the Cisco DNA Spaces Connector

The WLC will be configured to send notifications to Cisco DNA Spaces Connector for AP configuration changes

Cancel

Verify Access Points

This task helps you verify whether your APs have synchronized with IoT service (wireless) and are visible on the IoT service (wireless) GUI.

- Step 1** In the Cisco Spaces dashboard left-navigation pane, choose **IoT Services > IoT Gateways > AP Gateway**.
- Step 2** Click the **All APs** tab to observe whether IoT service (wireless) has synchronized the APs in your network successfully and listed the APs.

Figure 7: Verify APs

The screenshot displays the Cisco DNA Spaces interface. At the top, the header reads "Cisco DNA Spaces". Below this is a "Stats" section with two metrics: "AP Gateways deployed" showing "3/3" and "Advanced BLE Gateway" showing "1". A red callout bubble labeled "All APs" points to the "All APs (3)" link in the "AP Gateways (3)" section. Below the stats is a table with columns for "Mac Address", "Name", and "Description". One entry is visible with Mac Address "c0:64:e4:22:ef:20", Name "ap-9120-19", and Description "Cisco Catalyst 9120AX Series (IEEE 802...". A sidebar menu is open at the bottom left, showing "IoT Services" with a back arrow, "IoT Gateways" (highlighted in blue), "Device Management", and "Device Monitoring".

| Mac Address | Name | Description |
|-----------------------------------|------------|---|
| c0:64:e4:22:ef:20 | ap-9120-19 | Cisco Catalyst 9120AX Series (IEEE 802... |

Step 3 Verify whether IoT service (wireless) has synchronized the APs in your network successfully and listed the APs. Observe the **Floor Beacon Channel Status** and **AP Beacon Channel Last Heard** columns.

Figure 8: Verify APs

| | Floor Beacon Channel Status | IOx App Channel Status | Floor Beacon Channel Last Heard | AP Beacon Channel Last Heard |
|-------------------|-----------------------------|------------------------|--|---|
| aces Demo>Floor 1 | ● UP | ● UP | Sep 3rd, 2020 09:01:20 PM a few seconds ago | Sep 3rd, 2020 08:32:08 PM 29 minutes ago |
| aces Demo>Floor 1 | ● UP | - | Sep 3rd, 2020 09:01:35 PM | Sep 3rd, 2020 08:32:08 PM 29 minutes ago |
| aces Demo>Floor 1 | ● UP | - | | Sep 3rd, 2020 08:32:08 PM 29 minutes ago |

Show Records: 10 1 - 3 < 1 >