



Cisco Wide Area Bonjour Application on Cisco DNA Center User Guide, Release 2.1.1

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CHAPTER 1

Introduction to the Cisco Wide Area Bonjour Application on Cisco DNA Center

- [Overview of the Cisco Wide Area Bonjour Application on Cisco DNA Center, on page 1](#)
- [Cisco Wide Area Bonjour Supported Network Design, on page 5](#)

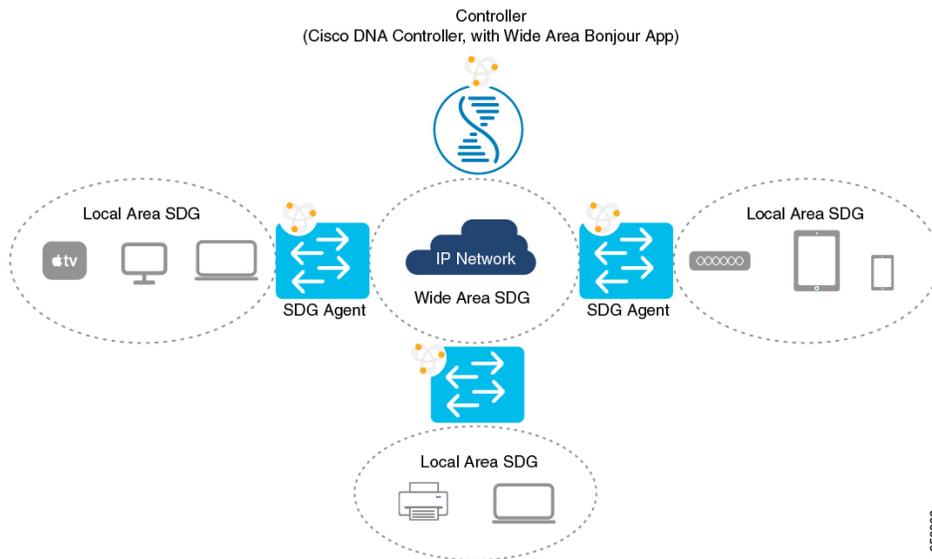
Overview of the Cisco Wide Area Bonjour Application on Cisco DNA Center

The Apple Bonjour protocol is a zero-configuration solution, which simplifies network configuration and enables communication between connected devices, services, and applications. Using Bonjour, you can discover and use shared services with minimal intervention and configuration. Bonjour is designed for single Layer-2 domains that are ideal for small, flat, single-domain setups, such as home networks. The Cisco Wide Area Bonjour solution eliminates the single Layer-2 domain constraint and expands the scope to larger Layer-3 wired and wireless networks, as well as Cisco Software-Defined Access (SD-Access) networks.

The Wide Area Bonjour application is a software-defined controller-based solution that enables devices to advertise and discover Bonjour services across Layer-2 domains, making these services applicable to a wide variety of wired and wireless enterprise networks. The Wide Area Bonjour application also addresses problems relating to security, policy enforcement, and services administration on a large scale. The distributed architecture is designed to build isolated flood boundaries and policy enforcement points, and to enable the management of Bonjour services. With the Wide Area Bonjour application, you can introduce new services into your existing environment, without modifying the existing network design or configuration.

The intuitive GUI provides you with centralized access control and monitoring capabilities, combined with the scalability and performance required for large-scale Bonjour services deployments.

The Wide Area Bonjour application operates across two integrated domain networks.



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- **Local-Area SDG Domain:** The Cisco Catalyst switches at the Layer 3 boundary function as a Service Discovery Gateway (SDG) for local cache discovery and distribution functions between local VLANs. In this Bonjour solution without a Cisco DNA Center controller (controller), the SDG gateway switch provides a single gateway solution in the LAN and Wireless Distribution block. The SDG switch communicates with local Bonjour endpoints to build and manage the services information. The Bonjour gateway function is ineffective between the Bonjour endpoints in the same Layer 2 network, because these endpoints follow the standards-based flood-and-learn rule.
- **Wide-Area SDG Domain:** The Wide Area Bonjour domain is a controller-based solution. The Bonjour gateway role and responsibilities of Cisco Catalyst switches is extended from the SDG to an SDG agent. The network-wide distributed SDG agent devices establish a lightweight, stateful, and reliable communication channel with centralized Cisco DNA Center controller running the Wide Area Bonjour application. Service routing between the SDG agents and the controller operates over regular IP networks using TCP port 9991. The SDG agents route locally discovered services based on the export policy.

Solution Components

The Cisco DNA Service for Bonjour solution is an end-to-end solution that includes the following key components:

- **Cisco SDG Agent:** A Cisco Cat switch or a Cisco 4000 Series Integrated Services Router functions as a SDG agent and communicates with the Bonjour Service endpoints within the Layer 2 domain and central Cisco DNA controller.
- **Cisco DNA Controller:** The Cisco DNA controller provides a secure channel with trusted SDG agents, for centralized services management and controlled service routing.
- **Cisco Wireless LAN Controller:** The Cisco Wireless LAN controller (WLC) transparently switches mDNS messages between wireless clients and an upstream Bonjour gateway switch in the distribution layer network.
- **Endpoints:** A Bonjour endpoint is any device that advertises or queries Bonjour services conforming to RFC 6762. The Bonjour endpoints can be in either LANs or WLANs. The Wide Area Bonjour application

is designed to integrate with RFC 6762-compliant Bonjour services, including AirPlay, Google Chromecast, and AirPrint.

Cisco Wide Area Bonjour Service Workflow

The Cisco Wide Area Bonjour solution follows a client-server model. The SDG agent functions as a client and the Wide Area Bonjour application functions as a server.

The following sections describe the workflow of service announcement and discovery in the IP network.

Announcing Services to the Network

1. The endpoint devices (Source) in the Local Area SDG domain send service announcements to the SDG agent and specify what services they offer, for example, `_airplay._tcp.local`, `_raop._tcp.local`, `_ipp._tcp.local`, and so on.
2. The SDG agent listens to these announcements and matches them against the configured Local Area SDG agent policies. If the announcement matches the configured policies, the SDG agent accepts the service announcement and routes the service to the controller.

Discovering Services Available in the Network

1. The endpoint device (Receiver) that is connected to the Local Area SDG agent sends a Bonjour query to discover the services available, using the mDNS protocol.
2. If the query conforms to the configured policies, the SDG agent responds with the services obtained from appropriate service routing channel through the Wide Area Bonjour Controller.

Wide Area Bonjour Multitier Policies

The various policies that can be used to control the Bonjour announcements and queries are classified as:

- **Local Area SDG Agent Filters:** Enforced on the SDG agent in Layer 2 network domain. These bidirectional policies control the Bonjour announcements or queries between the SDG agents and the Bonjour endpoints.
- **Wide Area SDG Agent Filters:** Enforced on the SDG agent for export control to the Controller. This egress unidirectional policy controls service routing from the SDG agent to the controller.
- **Cisco Wide Area Bonjour Policy:** Enforced on the controller for global service discovery and distribution. Policy enforcement, between the controller and the IP network is bidirectional.

Supported Platforms

The following table lists the supported controllers, along with the supporting hardware and software versions.

Table 1: Supported Controllers with Supported Hardware and Software Versions

Supported Controller	Hardware	Software Version
Cisco DNA Center Appliance	DN2-HW-APL DN2-HW-APL-L DN2-HW-APL-XL	1.3.1.0
Cisco Wide Area Bonjour Application	–	2.4.0.10062

The following table lists the supported SDG agents along with their licenses and software requirements.

Table 2: Supported SDG Agents with Supported Licenses and Software Requirements

Supported SDG Agent	Local Area SDG	Wide Area SDG	Minimum Software
Cisco Catalyst 9200	DNA Essentials	Unsupported	17.1.1
Cisco Catalyst 9200L	Unsupported	Unsupported	–
Cisco Catalyst 9300	DNA Essentials	DNA Advantage	16.11.1
Cisco Catalyst 9400	DNA Essentials	DNA Advantage	16.11.1
Cisco Catalyst 9500	DNA Essentials	DNA Advantage	16.11.1
Cisco Catalyst 9500-H	DNA Essentials	DNA Advantage	16.11.1
Cisco Catalyst 9600	DNA Essentials	DNA Advantage	16.11.1
Cisco Catalyst 9800 WLC	DNA Essentials	DNA Advantage	16.11.1
Cisco Catalyst 5520/8540 WLC	Unsupported	Unsupported	Pass-Thru
Cisco Catalyst 6800	IP Base	IP Services + DNA-Add on	15.5(1)SY4
Cisco Catalyst 4500E	IP Base	IP Services + DNA-Add on	3.11.0
Cisco Catalyst 4500X	IP Base	IP Services + DNA-Add on	3.11.0
Cisco Catalyst 3850	DNA Essentials	DNA Advantage	16.11.1
Cisco Catalyst 3650	DNA Essentials	DNA Advantage	16.11.1
Cisco Catalyst 2960 X	LAN Base	Unsupported	15.2.6E2
Cisco Catalyst 2960 XR	IPLite	Unsupported	15.2.6E2
Cisco ISR 4000 Series	IP Base	AppX	16.11.1

Cisco Wide Area Bonjour Supported Network Design

The Cisco DNA Service for Bonjour can be used with either traditional wired and wireless networks or with Cisco SD Access wired and wireless networks. The design for the Cisco DNA Service for Bonjour varies based on the type of network you're using.

Traditional Wired and Wireless Networks

Cisco DNA Service for Bonjour supports various LAN network designs that are commonly deployed in an enterprise. The SDG agent providing Bonjour gateway functions is typically an IP gateway for wired endpoints that could be residing in the distribution layer in multilayer network designs, or in the access layer in routed access network designs.

- **Multilayer LAN:** In this deployment mode, the Layer 2 access switch provides the transparent bridging function of Bonjour services to distribution layer systems that act as the IP gateway or SDG agent. There is no additional configuration or new requirement to modify the existing Layer 2 trunk settings between the access and distribution layers of the Cisco Catalyst switches.
- **Routed Access:** In this deployment mode, the first-hop switch is an IP gateway boundary, and therefore, it must also perform the SDG agent role.

The Cisco DNA Service for Bonjour also supports various wireless LAN network designs that are commonly deployed in an enterprise. The SDG agent provides consistent Bonjour gateway functions for wireless endpoints, as for wired networks. In general, the IP gateway of wireless clients is also a Bonjour gateway. However, the placement of the SDG agent may vary depending on the wireless LAN deployment mode.



Note Disable the mDNS snooping functionality on the wireless LAN Controller and on the primary access point.

- **Local Mode:** In this central switching wireless deployment mode, the Bonjour traffic is encapsulated within the CAPWAP tunnel from the Cisco access points to the centrally deployed Cisco wireless LAN controller. The Cisco access points are configured to be in local mode (central switching also allows the access point to be configured in FlexConnect mode, which is also supported). With central switching, the Cisco wireless LAN controller provides a transparent bridging function of Bonjour services to the Cisco Catalyst switch in the distribution layer, which acts as the IP gateway as well as the SDG agent. There is no additional configuration or requirement to modify the existing Layer 2 trunk settings between the Cisco wireless LAN controller and the distribution layer of the Cisco Catalyst switch. In this mode, access point multicast is required to enable processing. Unless the access point joins the wireless LAN controller multicast group, communication to and from Bonjour will not be enabled for the wireless user group.
- **FlexConnect:** In FlexConnect local-switching mode, both wired and wireless users share the same IP gateway in the distribution layer. The Cisco Catalyst switches in the distribution layer function as SDG agents for the LAN and wireless LAN user groups. The FlexConnect access point multicast must match the multicast group configured on the central wireless LAN Controller, to enable processing. Unless an access point joins the wireless LAN Controller Multicast Group, the communication to and from Bonjour will not be enabled for the wireless user group.
- **Mobility Express:** The Cisco Mobility Express solution enables the lightweight integrated wireless LAN controller function within the Cisco access points configured in the primary role. The Mobility Express

wireless users share the same IP gateway in the distribution layer as the wired endpoints. The Cisco Catalyst switches in the distribution layer function as SDG agents to the LAN and wireless LAN user groups. AP multicast is required for Mobility Express mode AP, and mDNS must be set in bridging mode.

Cisco SD-Access Wired and Wireless Networks

In an SD-Access network, a Fabric Edge switch is configured as the SDG agent. Wide Area Bonjour policies need to be aligned with the SD-Access network policies with respect to virtual networks and SGT policies, if any.

Wide Area Bonjour uses two logical components in a network:

- **SDG Agent:** The Fabric Edge switch is configured as the SDG agent, and the configuration is added only after SD-Access is configured.
- **Wide Area Bonjour Controller:** The Wide Area Bonjour application in Cisco DNA Center acts as the controller.

The Wide Area Bonjour communication between the SDG agent and the controller takes place through the network underlay. The SDG agent forwards the end-point announcements or queries to the controller through the fabric underlay. After discovering a service, a Bonjour-enabled application establishes direct unicast communication with the discovered device through the fabric overlay. This communication is subject to configured routing and SDG policies, if any.



CHAPTER 2

Install the Cisco Wide Area Bonjour Application

- [Overview of the Wide Area Bonjour Application Installation, on page 7](#)
- [Create User Roles, on page 8](#)
- [Update the Wide Area Bonjour Application, on page 8](#)

Overview of the Wide Area Bonjour Application Installation

Depending on the installation status of your Cisco DNA Center and Wide Area Bonjour application, use one of the following procedures to install the Wide Area Bonjour application on your Cisco DNA Center.

Install the Wide Area Bonjour Application on a Fresh Installation of Cisco DNA Center

For a fresh ISO installation of Cisco DNA Center, follow the instructions outlined in the *Cisco Digital Network Architecture Center M4 Appliance Installation Guide* or the *Cisco Digital Network Architecture Center M5 Appliance Installation Guide*, depending on your Cisco DNA Center Appliance.

After you have installed the Cisco DNA Center Appliance, if you have a firewall, allow Cisco DNA Center to access the following location for all system and package downloads: <https://www.ciscoconnectdna.com:443>. To ensure that you have cloud connectivity to AWS, log in to the cluster and run the following CLI command:

```
maglev catalog settings validate
```

For more information, see the *Cisco Digital Network Architecture Center Installation Guide*.

After you have completed the configuration, connect to AWS and identify and download the Wide Area Bonjour application.

To install the Wide Area Bonjour application in Cisco DNA Center, complete the following steps:

-
- Step 1** Navigate to **System Settings** in Cisco DNA Center.
 - Step 2** Click the **Software Updates** tab.
 - Step 3** Identify **Wide Area Bonjour** on the list and click **install** under the **Action** column.
-

Install the Wide Area Bonjour in a Cisco DNA High Availability Cluster

First, set up the Cisco DNA High Availability cluster. See the *Cisco Digital Network Architecture Center High Availability Guide*.

After your Cisco DNA Center has been set up, complete the following steps to install the Wide Area Bonjour application.

-
- Step 1** Navigate to **System Settings** in Cisco DNA Center.
 - Step 2** Click the **Software Updates** tab.
 - Step 3** Select **Updates** from the left navigation pane.
 - Step 4** Identify **Wide Area Bonjour** in the **Application Updates** list and click **install** under the **Action** column.
-

Create User Roles

Cisco DNA Center enables you to create user roles with controlled access. For information about user roles and how to create one, see the *Cisco Digital Network Architecture Center Administrator Guide*.

The minimum required permissions according to user role for the Wide Area Bonjour application on Cisco DNA Center are as follows:

Table 3: Required Permissions According to User Role

User Role	Access	Permission
Observer (OBSERVER-ROLE)	Network Services > Bonjour	Read
<ul style="list-style-type: none"> • Administrator (SUPER-ADMIN-ROLE) • Network Administrator (NETWORK-ADMIN-ROLE) 	Network Services > Bonjour	Write



Note If you're a user with an observer role, the options to create or edit data will not be enabled in the GUI.

Update the Wide Area Bonjour Application

Cisco periodically releases updates to the Wide Area Bonjour application. To ensure that you have the latest version of the Wide Area Bonjour application installed in your Cisco DNA Center, complete the following steps:

-
- Step 1** Navigate to **System Settings** in Cisco DNA Center.

- Step 2** Click the **Software Updates** tab.
- Step 3** Select **Updates** from the left navigation pane.
- Step 4** Identify **Wide Area Bonjour** in the **Application Updates** list and click **install** under the **Action** column.
-



CHAPTER 3

Configuration Prerequisites

For the Wide Area Bonjour application to function optimally, it is imperative that the following requirements are met in Cisco DNA Center:

- The SDG Agent switches are added to and are being managed by the Cisco DNA Center Inventory.
- The SDG Agent switches have been provisioned according to network requirements.
- The underlay network (including the client VLANs) in an SD-Access network are in place.
- [Set Up Building Sites, on page 11](#)
- [Add Devices to the Inventory, on page 12](#)
- [Provision Switches Using Templates, on page 12](#)

Set Up Building Sites

Before you can begin configuring and using the Wide Area Bonjour application, you must first set up a network site hierarchy. For more information, see the *Cisco Digital Network Architecture Center User Guide*.

Step 1 From the Cisco DNA Center home page, choose **Design > Network Hierarchy**.

A world map is displayed.

Step 2 On the **Network Hierarchy** window, click **+Add Site**, or click the gear icon next to the parent site in the left pane, and then select the appropriate option.

You can also upload an existing heirarchy. For more information, see the *Cisco Digital Network Architecture Center User Guide*.

Step 3 Enter a name for the site, and select a parent Node. By default, **Global** is the parent node.

Step 4 Click **Add**.

The site is created and listed under the parent node in the left menu.

Add Devices to the Inventory

All switches that are going to be configured as SDG Agents must be added to the Cisco DNA Center Inventory. Typically, the SDG Agent switches are already added in the Cisco DNA Center Inventory. However, if you are adding a new switch to be configured as an SDG Agent, you must add it to the Cisco DNA Center Inventory. For more detailed information about the Inventory, see the *Cisco Digital Network Architecture Center User Guide*.



Note Before adding your devices to the Inventory, ensure that the hardware and software versions are supported. See [Supported Platforms, on page 3](#).

- Step 1** From the Cisco DNA Center home page, click **Inventory**.
- Step 2** Click **Add**.
The Add Device dialog box is displayed.
- Step 3** From the **Type** drop-down list, choose **Network Device**.
- Step 4** In the **Device IP / Name** field, enter the IP address or name of the device.
- Step 5** Expand the **SNMP** area, if it is not already visible.
- Step 6** From the **Version** drop-down list, choose **V2C** (SNMP Version 2c) or **V3** (SNMP, Version 3), and configure the required fields.
- Step 7** Expand the **SNMP RETRIES AND TIMEOUT** area, if it is not already expanded, and configure the **Retries** and **Timeout (in seconds)** fields.
- Step 8** Expand the **CLI** area, if it is not already expanded, and configure the required fields.
- Step 9** Expand the **NETCONF** area, if it is not already expanded, and configure the **Port** field.
NETCONF requires that you configure SSH as the CLI protocol and define the SSH credentials.
- Note** NETCONF is necessary only for the Wireless LAN Controller.
- Step 10** Click **Add**.
-

Provision Switches Using Templates

Before configuring a switch as an SDG Agent, the switch must be provisioned per deployment network requirements, with applicable templates, if any.

- Step 1** Navigate to the **PROVISION** page of Cisco DNA Center.
- Step 2** In the left pane, click **Unassigned Devices**.
- Step 3** Use the **Filter** icon to select the site of the filter SDG Agent switch list.
- Step 4** for the **DEVICE TYPE**, select **All**.

Selecting the **All** option lists all the unassigned devices, including routers, switches, APIs and WLCs.

Step 5 From the **Actions** menu, navigate to the **Inventory** sub-menu.

Step 6 Click **Resync Device** to provision Template configurations.



CHAPTER 4

Introduction to the Wide Area Bonjour Application GUI

You can access the Wide Area Bonjour application on Cisco DNA Center in the following ways:

- From the Cisco DNA Center dashboard, click the **Wide Area Bonjour** application.
- In the Cisco DNA Center, from the **Tools** drop-down list, click **Wide Area Bonjour**.

From the Wide Area Bonjour application GUI, you can perform the following tasks:

- [Review the Wide Area Bonjour Dashboard, on page 15](#)
- [Review the Cisco Wide Area Bonjour Configuration, on page 17](#)
- [Monitor SDG Agents, on page 18](#)
- [Monitor Service Instances with the Wide Area Bonjour Application, on page 19](#)
- [Review the Wide Area Bonjour Global Application Preferences, on page 20](#)

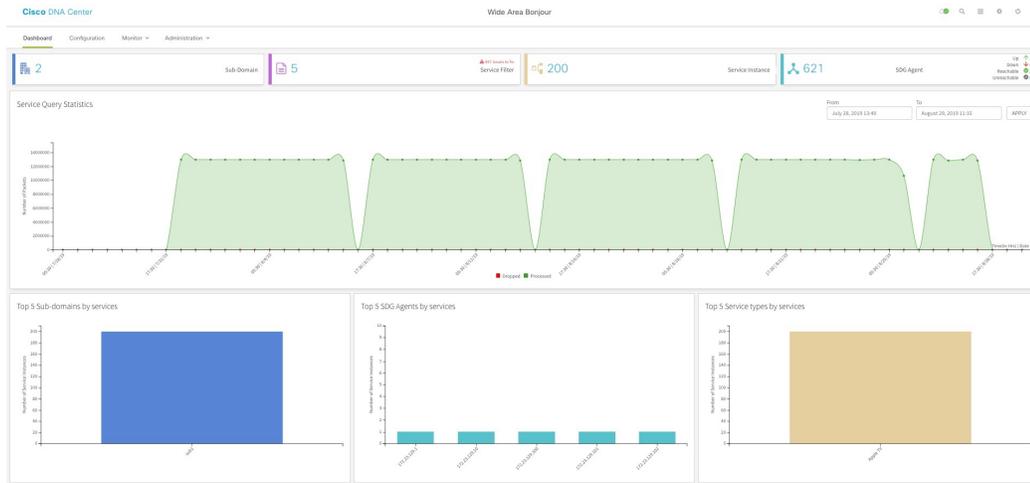
Review the Wide Area Bonjour Dashboard

The Wide Area Bonjour application is a software-defined, policy-based Apple Bonjour protocol controller that facilitates multicast-DNS based service discovery.

You can access the Wide Area Bonjour application through one of the following ways:

- From the Cisco DNA Center home, click **Wide Area Bonjour**.
- From the **Tools** drop-down menu, select **Wide Area Bonjour**.

The Wide Area Bonjour application displays the following dashboard.



The dashboard provides a snapshot of the following:

- **Sub-domain.** Number of subdomains. When you click the number of subdomains in this tile, you're directed to the **Configuration** page of the Wide Area Bonjour application.
- **Service Filter.** Number of policies established between network devices for the application. When you click the number on this tile, you're directed to the **Configuration** page of the Wide Area Bonjour application.
- **Service Instance.** Number of service instances. When you click the number in the tile, you're directed to the **Service Instance** page.
- **SDG Agent.** Number of network devices (SDG Agents) connected to the application and the status of the SDG Agents. When you click this tile, you're directed to the **SDG Agent** page. It displays the count of SDG Agents that are **UP**, **DOWN**, **Reachable**, and **Unreachable**.

On the **SDG Agent** page, you can filter the SDG Agents according to Active and Inactive state, or by any of the following parameters:

- SDG Agent IP Address
- Domain Name
- Service Filter name
- Role (whether the SDG Agent is a source agent advertising service, or a query agent requesting service, or both)
- Available services (the current count of available service instances announced by the SDG Agent)
- Reachability (whether the SDG Agent is reachable)
- State (whether the SDG Agent is **UP** or **DOWN**).



Note The SDG Agent may be reachable, but still be down if the SDG Agent is not included in any policy.

- Last sync (the time of the last synchronization with the SDG Agent)

- Resync Status (status of the last resync operation - successful, failed, or in-progress)
- **Service Query Statistics.** Graphical display of query packet traffic statistics for the application (number of processed and dropped service query packets at a given interval of time). This graphical display can be used to monitor the network health and to become aware of any issue due to an increase in the number of packets being dropped.

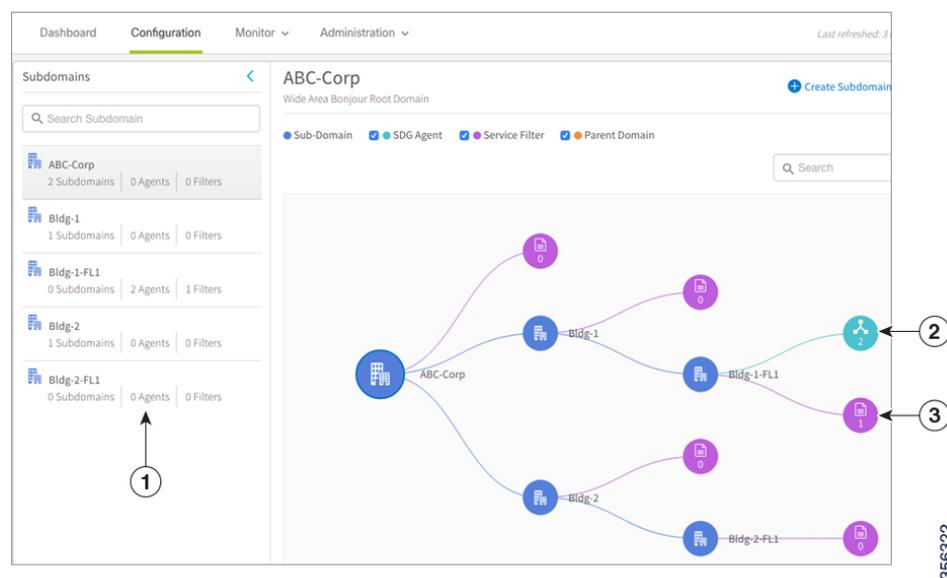
Additionally, you can view the following information from the dashboard:

- Top 5 Sub-domains by services
- top 5 SDG Agents by services
- Top 5 Service types by services

Click the bar graphs in the tiles to view more information.

Review the Cisco Wide Area Bonjour Configuration

The **Configuration** screen in the Wide Area Bonjour application enables you to review or change your current configuration.



The following table lists the elements of the GUI called out in the above image.

1	Subdomain panel. Click any subdomain to display its domain tree.
2	The green bubbles in the domain tree are the SDG Agents. There are 2 SDG Agents attached to the subdomain Bldg-1-FL1, in this configuration.
3	The purple bubbles are the service filters. There is 1 service filter configured for the subdomain Bldg-1-FL1.

The **Configuration** tab displays the following information:

- **Subdomains.** This is a panel that lists the current subdomains, filters, and agents in your configuration. Select or type a subdomain name in the **Search** field to display that subdomain in the Domain Tree panel.
- **Domain tree.** This visualization displays the graphical representation of the selected subdomain with the following elements:
 - Sub-Domain
 - SDG Agent
 - Service Filter
 - Parent Domain



Note Select the element checkbox at the top of the page to view that element in the domain tree (**Sub-Domain, SDG Agent, Service Filter, and Parent Domain**).

Type a subdomain or filter name in the **Search** field in the Domain tree panel to view that subdomain or filter.

Monitor SDG Agents

To view the list of SDG Agents registered with the Wide Area Bonjour application, along with details for each agent, click **SDG Agent** from the **Monitor** drop-down menu on the application home page.

From this page, you can:

- Filter the SDG Agents by their State using the **Active** and **Inactive** checkboxes. Selecting both checkboxes displays all SDG Agents.



Note You must select at least one checkbox for information to be displayed.

- Manually trigger a sync between the SDG Agent and the device cache using the **Resync** button.
- Filter the list of SDG Agents to view information only for specific SDG Agents, using the **Filter** button.

In the filter, you can input values for the following fields:

- **Resync Status:** From the drop-down list, use the check boxes to filter the SDG Agents based on whether their resync status is **Failed, In Progress, Not Initiated, or Successful**. Checking the **Select All** check box displays all SDG Agents.
- **SDG Agent:** Enter the IP address of the specific SDG Agent for which you want to view information.
- **Domain(s):** Specify the domain for which you want to view the SDG Agents.
- **Service Filter(s):** Specify the Service Filter for which you want to view the SDG Agents.
- **Role(s):** From the drop-down list, select the corresponding checkbox to view SDG Agents which perform **Source** or **Query** roles. You can also choose to view SDG Agents with both roles (**Select All**) or **None** of the roles.

- View the following information for each SDG Agent:

Parameter	Description
SDG Agent	IP address for the SDG Agent
Management IP	Management IP address of the device.
Source Interface	Source interface associated with the SDG agent
Domain(s)	Domain under which the SDG Agent is configured
Service Filter(s)	Service filters which use the SDG Agent
Role(s)	Whether the SDG Agent is a Source or Query agent
Available Services	Number of services advertised by the SDG Agent
Reachability	Whether the SDG Agent is Reachable or Unreachable
State	Whether the SDG Agent is in Active or Inactive state
Last Sync	Time stamp of the last sync between the SDG Agent and the controller's device cache
Resync Status	Status of the resync action

Monitor Service Instances with the Wide Area Bonjour Application

To monitor your service instances from the Wide Area Bonjour application, click **Service Instances** from the **Monitor** drop-down menu in the Wide Area Bonjour application. From this page, you can monitor all the services announced by the network devices that are available with the Wide Area Bonjour application, which are used for serving the queries received by the application.

Dashboard Configuration **Monitor** Administration

Service Instance

Monitor all the services announced by the network devices that are available with Wide Area Bonjour application which are used for serving the queries received by the application.

State: ● Active ● Inactive Refresh Filter

Name	Instance Suffix	Domain(s)	Service Filter(s)	SDG Agent IP	Service Type(s)	TTL	Instance IPv4	Instance IPv6	MAC Address	State
RTP-ATV-8		Bldg-1-FL1	Bldg-1-FL-1-	10.151.255.1	Apple TV,	4500	10.151.1.17	--	08:66:98:ee:f8:40	●
Bldg-1-FL1-ATV		Bldg-1-FL1	Bldg-1-FL-1-	10.151.255.1	Apple TV,	4500	10.151.1.3	--	c8:69:cd:7e:28:f1	●
Bldg-1-FL1-PRN		Bldg-1-FL1	Bldg-1-FL-1-	10.151.255.1	Printer,	4500	10.151.1.2	2001:10:151:1:ae18:...	ac:18:26:51:03:fe	●

With the **Filter** icon, you can filter the list of SDG Agents by the following parameters:

- Name

- Instance Suffix
- Domain(s)
- Service Filter(s)
- SDG Agent IP
- Service Type(s)
- Instance IPv4
- Instance IPv6
- MAC Address

Using the check boxes above the Service Instances table, you can also filter the service instances by their state (Active or Inactive).

Review the Wide Area Bonjour Global Application Preferences

The application preferences are various parameters that are used by the application to work effectively and provide services to the users. To navigate to the **Global Wide Area Bonjour Application Settings**, click **Global** from the **Administration** drop-down menu. From here, you can set the following parameters:

- **MD5 Security:** Use this application preference to maintain and confirm the integrity of the packets sent to the Wide Area Bonjour application. Enable the MD5 security and then enter an alphanumeric password that is between 6 and 32 characters long. At present, special characters and spaces are not allowed. When the MD5 key is set or updated, it is propagated to the SDG Agents, and the services are relearned.
- **Keepalive Timer:** Use this application preference to gauge the availability of SDG Agents on the network. The default value is 30 seconds, but you can choose a value from 15 seconds to 120 seconds, in 15 second increments. If the Wide Area Bonjour application misses four consecutive keepalive messages, then the SDG Agent is considered to be unreachable, and the connection to the agent is automatically reset. All previous service entries from the SDG Agent are marked as stale in the application. The SDG Agent resends all services to the Wide Area Bonjour application when connectivity with the Controller is restored.
- **Inactive Service:** Use this application preference to set the recurring time period for periodically removing all stale or inactive service instances from the Wide Area Bonjour application cache. Updating this value takes effect only after the currently active time period expires. The default value is 24 hours, but you can choose an interval between 1 and 24 hours.



CHAPTER 5

Configure SDG Agents Through the Cisco DNA Center Template Editor Tool

The Cisco Wide Area Bonjour application on Cisco DNA Center does not push configurations to the SDG Agent switches automatically. The SDG Agents need to be configured either manually or through templates created by the template editor in the Cisco DNA Center.

This section explains how to create templates for deploying SDG Agents. The exact IP Addresses, VLANs, and service types used in the template will vary based on the deployment. You can add or remove service types as necessary.

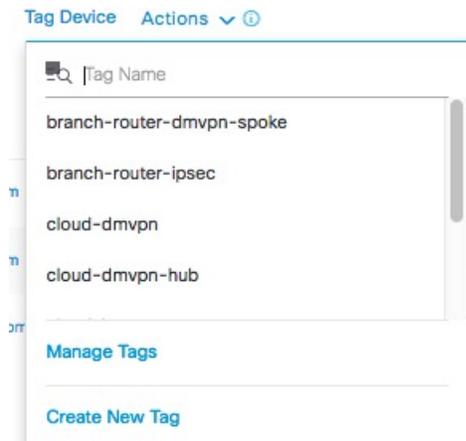
- [Tag Cisco Catalyst SDG Agent Switches, on page 21](#)
- [Build the Wide Area Bonjour Controller Policy CLI Template, on page 23](#)
- [Build the Local Area Bonjour Policy CLI Template, on page 25](#)
- [Create the Cisco Catalyst Switch Network Profile, on page 26](#)
- [Provision Cisco Service Discovery Gateway Bonjour Policies, on page 28](#)

Tag Cisco Catalyst SDG Agent Switches

You can create a tag and apply it to your SDG Agents to make it easy to identify the switches when selecting templates to apply to them.

-
- Step 1** From the Cisco DNA Center home page, navigate to **Provision > Inventory**.
- Step 2** Use the associated check box to select the SDG Agents which you want to tag.
- Step 3** Click **Tag Device**.

The following image shows you the **Tag Device** drop-down list.

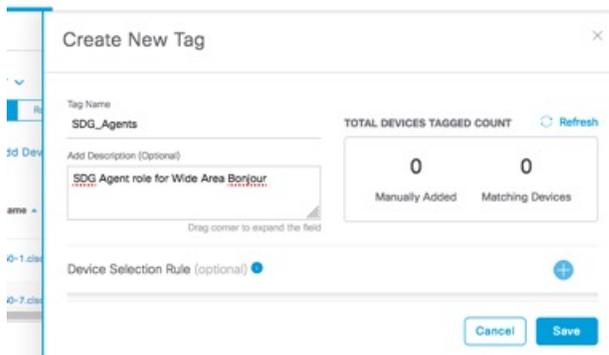


Step 4 From the drop-down list, select the tag with which you want to tag the selected SDG Agent.

If you need to create a tag, complete the following steps:

- a. Click **Create New Tag**.
- b. Enter the name (mandatory) of the tag to be created and a description (optional).

The following image shows you the filled-in **Create New Tag** screen.



c. (Optional) To set device selection rules, expand the **Device Selection Rules** section.

d. Click **Save**.

The tag is created.

Step 5 Click **Apply**.

The tag is applied to the selected SDG Agents.

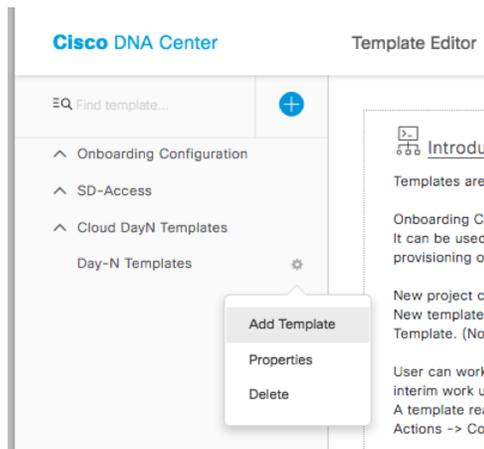
Build the Wide Area Bonjour Controller Policy CLI Template

This template pushes run-time global configurations to turn on mDNS on the SDG Agent and configure the parameters for the Wide Area Bonjour controller (such as the IP address, TCP port, and the source interface from which the SDG Agent will initiate the TCP session to the controller).

Step 1 In the Cisco DNA Center Template Editor, click the settings icon to the right of a project.

The Templates for SDG Agent are normally Day-N templates.

The following image shows the drop-down menu.



Step 2 From the drop-down menu, click **Add Template**.

Step 3 In the **Add New Template** screen, under **Template Type**, select **Regular Template**.

Step 4 Enter a **Name** and **Description** for the template.

Step 5 Enter the tag for the switches to which the template needs to be added. You can add more than one tag.

Step 6 Select the **Device Type** to which the template will be applicable.

Step 7 Enter the **Software Type**.

The following screenshots shows the filled-in **Add New Template** screen.

Step 8 Click **Add**.

Step 9 Under the **Provision** page, select the project under which the newly created template exists.

Step 10 Click the template name.

Step 11 In the **Template** screen, enter the CLI commands that the template needs to push to the SDG Agent switches.

The following is a sample set of CLI commands that can be used to configure the Wide Area Bonjour policy.

```
mdns-sd service-list DNAC-CONTROLLER-SERVICES OUT
match airplay
match airtunes
match apple-airprint
match amazon-fire-tv
match apple-rdp
match apple-file-share
match google-chromecast
match apple-windows-fileshare
match multifunction-printer
mdns-sd service-policy DNAC-CONTROLLER-POLICY
service-list DNAC-CONTROLLER-SERVICES OUT
service-export mdns-sd controller WIDE-AREA-BONJOUR-POLICY
controller-address 10.251.1.1
controller-port 9991
controller-service-policy DNAC-CONTROLLER-POLICY OUT
controller-source-interface Loopback0
mdns-sd gateway
ingress-client query-suppression enable
```

Step 12 In the **Actions** drop-down menu, click **SAVE**.

Step 13 In the **Actions** drop-down menu, click **COMMIT**.

The Template Editor provides the additional flexibility of customizing templates in multiple ways. You can use template variables and provision-time (text or form-based) data input. For more information about working with the Template Editor tool, see the *Cisco Digital Network Architecture Center User Guide*.

You may change the match statements to include the service types that are going to be deployed. Replace the controller IP Address with the actual one. Replace the Controller source interface with the actual interface from which the SDG Agent will connect to the Controller. The names of the policies given in the above example are user defined, and can be changed, if required.

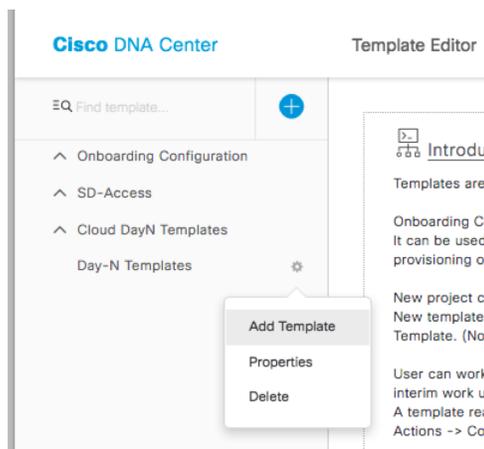
Note Do not change the controller port value from 9991.

Build the Local Area Bonjour Policy CLI Template

The Local Area Bonjour Policy CLI Template pushes configurations for the SDG Agent to configure the Local Area Bonjour policies, and apply them to client VLANs.

Step 1 In the Template Editor in Cisco DNA Center, click the settings icon to the right of a Day-N project.

The following image shows the drop-down menu.



Step 2 From the drop-down list, click **Add Template**.

Step 3 In the **Add New Template** screen, under **Template Type**, select **Regular Template**.

Step 4 Enter a **Name** and **Description** for the template.

Step 5 Enter the tag for the switches to which the template needs to be added.

Step 6 Select the **Device Type** to which the template will be applicable.

Step 7 Enter the **Software Type**.

Step 8 Click **Add**.

Step 9 Under the **Provision** page, select the project under which the newly created template exists.

Step 10 Click the template name.

Step 11 In the **Template** screen, enter the CLI commands that the template needs to push to the SDG Agent switches.

The following is a sample set of CLI commands for a Local Area Bonjour policy template.

```
mdns-sd gateway
mdns-sd service-list LOCAL-AREA-SERVICES-IN IN
  match airplay
  match airtunes
  match amazon-fire-tv
  match apple-rdp
  match apple-file-share
  match google-chromecast
  match apple-windows-fileshare
  match multifunction-printer
mdns-sd service-list LOCAL-AREA-SERVICES-OUT OUT
  match airplay
  match airtunes
  match amazon-fire-tv
  match apple-rdp
  match apple-file-share
  match google-chromecast
  match apple-windows-fileshare
  match multifunction-printer
mdns-sd service-policy LOCAL-AREA-POLICY
  service-list LOCAL-AREA-SERVICES-IN IN
  service-list LOCAL-AREA-SERVICES-OUT OUT
interface Vlan101
  mdns-sd gateway
    service-policy LOCAL-AREA-POLICY
    active-query timer 90
    transport ipv4
    service-mdns-query ptr
```

You can add or delete `match <service-type>` statements in the service-lists according to your deployment requirements.

Note Replace the VLAN with one or more VLANs that are specific to your deployment.

Step 12 In the **Actions** drop-down menu, click **SAVE**.

Step 13 In the **Actions** drop-down menu, click **COMMIT**.

The Template Editor provides the additional flexibility of customizing templates in multiple ways. You can use template variables and provision-time (text or form-based) data input. For more information about working with the Template Editor tool, see the *Cisco Digital Network Architecture Center User Guide*.

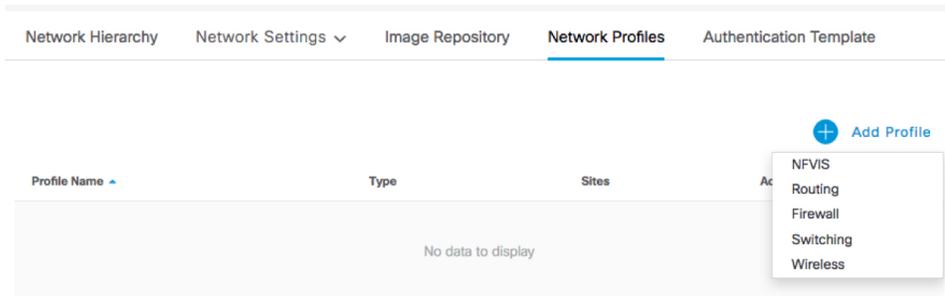
Create the Cisco Catalyst Switch Network Profile

With the Cisco DNA Center, you can create a network profile for SDG Agents, and assign templates to them. This step creates a network profile for the SDG Agents, and assigns both the templates created in the previous steps to the template. The Network Profile will be used to provision the SDG Agents later.

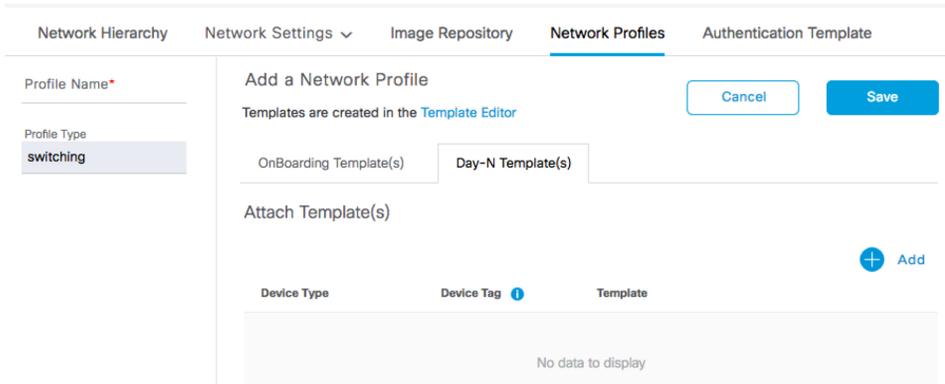
Step 1 From the Cisco DNA Center home page, navigate to the **Design** tab.

Step 2 Click **Network Profiles**.

Step 3 Click **Add Profile** and select **Switching**.



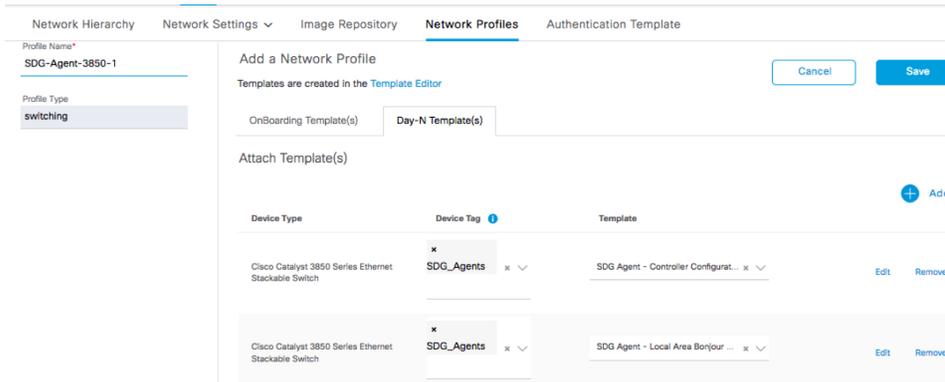
The following window is displayed.



Step 4 Select the **Day-N Template(s)** tab.

Step 5 Click **Add**.

Step 6 From the drop-down lists, select the **Device Type**, **Device Tag**, and **Template** for the network profile you want to create.



Step 7 Click **Add** to add another template.

Step 8 Click **Save**.

Provision Cisco Service Discovery Gateway Bonjour Policies

Provisioning the Cisco SDG Bonjour policies pushes the CLI configurations of the two templates assigned to the network profile, enabling the switch to process Bonjour announcements and queries, and to forward them to the Wide Area Bonjour Controller.

- Step 1** Navigate to the Cisco DNA Center **Inventory**.
- Step 2** From the **Actions** drop down list, expand the **Provision** sub-menu and click **Provision Device**.
- Step 3** Enter the details of the site and click **Next**.
- Step 4** Select the devices to fill out the provisioning parameters and click **Next**.
- Step 5** Review the details and ensure that both the required templates are listed under **Template Name** before clicking **Deploy**.
- Step 6** Select **Now** to provision the template immediately, or select **Later** to schedule the provisioning for a later date.
- Step 7** Click **Apply**.

You can monitor the provisioning status from the **Inventory** page with the **Focus** set to **Provision**.



CHAPTER 6

Manage the Cisco Wide Area Bonjour Service Database

- [Create, Edit, and Delete Custom Service Types, on page 29](#)

Create, Edit, and Delete Custom Service Types

Service types are used by the Wide Area Bonjour application to create service filters. You can group protocol level services and give them names that are easier to understand with service types. The Wide Area Bonjour application comes with several commonly used service types, but more can be created as needed.

To manually configure service types, complete the following steps:

-
- Step 1** Navigate to the **Administration** tab of the Wide Area Bonjour application and select **Service Type** from the drop-down list.
- This displays the Service Type screen with pre-defined service types and their pointers, with options to edit or delete. You can also add a new service type.
- Step 2** Click the **Add** icon in the upper-right portion of the screen.
- The following screen is displayed.

Add New Service Type

Service Type:

Pointers:

- _airport_tcp.local.
- _ichat_tcp.local.
- _presence_tcp.local.
- _ftp_tcp.local.
- _ssh_tcp.local.
- _ipp_tcp.local.
- _printer_tcp.local.
- _ipps_tcp.local.

SAVE

Step 3 Enter a unique name in the **Service Type** field.

Step 4 Create the pointers by either selecting them from the drop-down list or manually entering the pointers.

Note The format for manually entering pointers is "_airplay_tcp.local.". Observe the "." at the end.

Step 5 Click **SAVE**.

Note A maximum of 10 pointers can be combined under one service type.



CHAPTER 7

Configure the Wide Area Bonjour Application

- [Service Policy Configurations, on page 31](#)
- [Service Routing Topologies, on page 32](#)
- [Create Selective Service Instance Service Filter, on page 33](#)
- [Create the Wide Area Bonjour Domain Hierarchy, on page 34](#)
- [Build Wide Area Bonjour Service Filter Configurations, on page 34](#)
- [Configure Service Filters Using the GUI, on page 38](#)

Service Policy Configurations

Controller service policy is implemented by configuring service filters. A service filter specifies the policies that allow the controller to accept and process service announcements and queries of specified service types and from specified SDG Agent subnets. A subdomain can be associated with one or more service-filters. A service filter has the following components:

- **Service Filter Name.** A unique name of the service filter.
- **Description** (Optional).
- **Service Type.** Service announcements and queries of the specified service type will be permitted by the service filter.
- **A set of Source SDG Agents.** For each Source SDG Agent, the following are specified:
 - **SDG Agent IPv4 Address.** Service announcements will be accepted only from the specified SDG Agent
 - **Specific (IPv4 or IPv6) subnets of the SDG Agent.** Announcements will be accepted only when they originate from the specified subnet of the SDG Agent. These subnets pertain to the client VLANs, to which the Bonjour endpoints are connected.

If a service announcement is permitted by a service filter, the services being announced are accepted, and become eligible to be included in service response for any query that may match the same service filter.

Service announcements that do not match any service-filter are dropped.

- **A set of Query SDG Agents,** each specifying:

- SDG Agent IPv4 Address: Service queries will be accepted only from the specified SDG Agent or Agents.
- Specific (IPv4 or IPv6) subnets of the SDG Agent: Service queries will be accepted only when they originate from the specified subnet or subnets of the querying SDG Agent. These subnets pertain to the client VLANs, to which the Bonjour endpoints are connected.

If a query is accepted by the service filter, then a response is sent to the service querier with the details of those services instances that were previously accepted through the same service filter (in other words, originating from the source SDG Agents and subnets, as specified in the service filter).

Service queries that do not match any service filter are dropped.

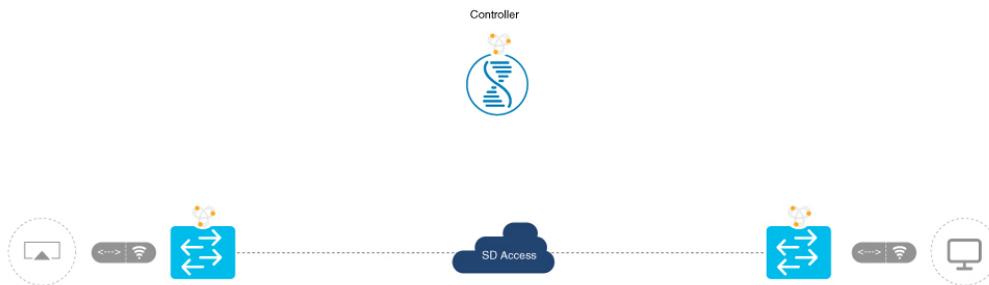
In the domain hierarchy, multiple domains may be configured with service filters. When the controller receives a service query, the query may match with more than one service filter, in which case each matching service filter is processed, and the aggregated response is sent back.

Service Routing Topologies

Service routing policies can have multiple service filters to support the following types of service routing topologies:

Point-to-Point Service Routing Topology

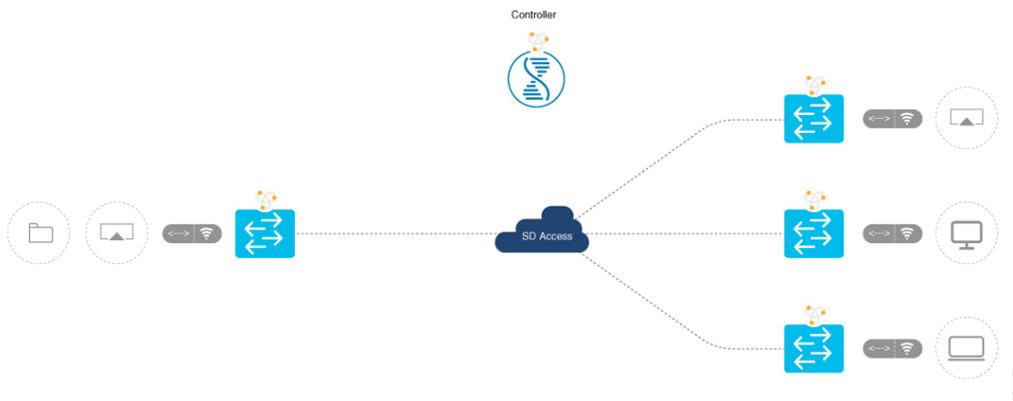
The Wide Area Bonjour application supports a point-to-point service routing topology, where there is a single source SDG Agent, which connects to a single other location for a specific service type on a specific network range.



SDG2016

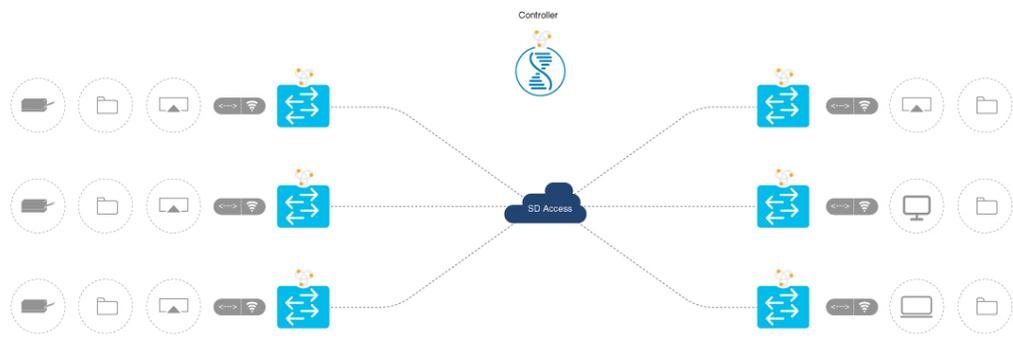
Point-to-Multipoint Service Routing Topology

The Wide Area Bonjour application supports a point-to-multipoint service routing topology, where a single service source SDG Agent connects to multiple remote receiving SDG Agents (or vice versa), for granular service-types and network ranges.



Multipoint-to-Multipoint Service Routing Topology

The Wide Area Bonjour application supports a multipoint-to-multipoint service routing topology, which is a full-mesh service-rich network with multiple sources and receivers on IT-controlled service types and specific or all network ranges.



Create Selective Service Instance Service Filter

The service policy, consisting of multiple filters, can support any of the topologies described above. Selective service is an additional way to restrict the services that can be announced. By configuring selective service on a service filter, you can specify a list of MAC addresses of endpoints that are allowed to announce services of the service type configured in the service filter.

This is optional. The configuration of selective services for the Wide Area Bonjour application can be done only through the XLS file. See [Build the XLS File](#), on page 35. After the selective services are configured, the application GUI shows the MAC addresses configured for a service filter.



Note Selective services cannot be configured through the GUI, although displaying the service filter displays the configured selective service MAC addresses.

Create the Wide Area Bonjour Domain Hierarchy

The Wide Area Bonjour application uses a domain hierarchy to attach policies to individual nodes.



Note The Wide Area Bonjour application domain hierarchy is different from the Cisco DNA Center domain hierarchy. Creating the domain hierarchy is a prerequisite for adding service filters to domains.

Initially, when no domain is configured, navigating to the **Configuration** tab displays the following screen.

The screenshot shows the 'Configuration' tab in the Wide Area Bonjour application. At the top, there is a navigation bar with 'Dashboard', 'Configuration' (highlighted), 'Monitor', and 'Administration'. Below the navigation bar, a message states: 'It looks like there are no domains. Once available, you can create domains/subdomains and associate policies & agents.' Below this message, there are two main sections: 'Domain Details' and 'Import File'. The 'Domain Details' section has a 'Domain Name' input field, a 'Description (optional)' input field, and a 'CREATE' button. The 'Import File' section has a 'Browse...' button and an 'UPLOAD' button. A dashed box around the 'Browse...' button contains the text 'Select an XLS file to upload' and 'No file...lected.'

You may create the root domain by entering the Domain Name, an optional Description, and clicking **CREATE**.

Alternatively, you can create the root domain, subdomains, with the complete configuration by importing the configurations from a file. See [Import Configurations from a .XLS File, on page 38](#).

Once the initial domain is created, subsequent sub-domains can be added from the GUI by the following procedure.

- Step 1** Navigate to the **Configuration** tab in the Wide Area Bonjour application.
- Step 2** From the **Subdomains** pane, click the domain under which you want to create a subdomain.
- Step 3** Click **Create Subdomain** in the upper right corner of the page.
- Step 4** Enter a name and description for the subdomain in the **Create Subdomain** dialog box.
- Step 5** Click **Create**.

After the domain and subdomains are created, the domain hierarchy is displayed.

Build Wide Area Bonjour Service Filter Configurations

You can create service filter configurations through the following ways:

- **Build the XLS File** : Use this method for adding or updating bulk policy configurations for your initial setup. This method of creating service filter configurations allows for complete network policy automation.
- **Configure Service Filters Using the GUI**: From the Wide Area Bonjour application GUI, you can add or update policies during run-time. You can also export and import service filter configurations at any subdomain level.

Build the XLS File

Wide Area Bonjour application configurations can be imported from (and saved to) an Excel XLS file. The file has the following four sheets in a predefined format.

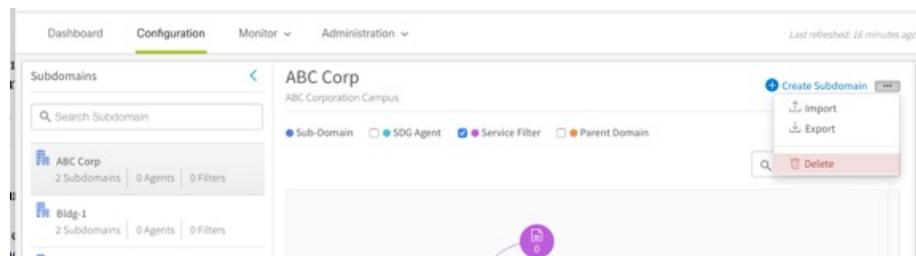
- Service Type
- Domain
- Policy
- Selective Services (Advanced)

To minimize errors, Cisco recommends that you download an empty configuration file from the controller to your laptop, and populate it, instead of creating the XLS file manually.

To download the template from the Wide Area Bonjour application, complete the following steps:

1. Click the icon with the three dots in the upper-right corner of the **Configuration** tab.

The following menu is displayed.



2. From the drop-down menu, click **Export**. This exports the existing configuration file. If you do not have a configuration in place, the file is an empty configuration file, which can serve as a template to enter the configurations.

Further details of each of the four sheets are given below.

Build the Service Type Sheet

The Service Type sheet populates the built-in Bonjour database.

After downloading a blank XLS template from the controller as described above, perform the following tasks:

- Open the Service Type sheet.
- Enter the user-friendly names of the service types in the **Service Type Name** column.
- Enter the lists of the actual Bonjour pointers in the **Bonjour Types** column. You can have up to 10 pointers for a single service type.

The following is an extract of a populated Service Type sheet.

	A	B
1	Service Type Name	Bonjour Types
2	Apple TV	_airplay._tcp.local, _raop._tcp.local.
3	AirPrint	_ipp._tcp.local.
4	NFS	_nfs._tcp.local.
5	FTP	_ftp._tcp.local.
6	iTunes Music	_daap._tcp.local.
7	Printer	_ipp._tcp.local, _lpps._tcp.local, _printer._tcp.local.
8		
9		



Note Each Bonjour pointer type must end with a ".".

Build the Domain Sheet

The Domain sheet shows the hierarchical domain structure of your network. This sheet shows the logical division of subdomains.

Enter a name, description, and parent domain for each domain in this sheet.

The following is an extract from a populated domain sheet.

	A	B	C
1	Domain Name	Description	Parent Domain
2	ABC Corp	ABC Corporation Campus	
3	Bldg-1		ABC Corp
4	Bldg-1-FL1		Bldg-1
5	Bldg-1-FL2		Bldg-1
6	Bldg-2		ABC Corp
7	Bldg-2-FL1		Bldg-2
8			



Note The Wide Area Bonjour application supports a structure with only a single root domain. The value for the parent of the root domain is left empty.

Build the Policy Sheet

Use the policy sheet to create service filters that control service routing from and to the various SDG Agents. The domain names and service type information from the previous sheets are used by the Policy sheet. The Wide Area Bonjour application allows for flexible Bonjour mappings, including point-to-point service routing, point-to-multipoint service routing, and multipoint-to-multipoint service routing.



Note The Wide Area Bonjour application supports IPv4 and IPv6.

The following is an extract from a completed policy sheet.

	A	B	C	D	E	F	G	H	I	J	K
	Domain	Service Type	Policy Name	Description	Enabled	Source IP	Source Network	Source Mask	Query IP	Query Network	Query Mask
1											
2	bidg 9 fir 9	Apple TV	bidg 9 fir 9 ATV	bidg 9 fir 9 ATV Desc	TRUE	10.101.255.9	10.101.9.0	28	10.125.255.114	10.100.223.0	24
3						10.101.255.9	2001:10:101:130:0:0:0:0	64	10.125.255.114	2001:10:100:223:0:0:0:0	64
4						10.101.255.9	10.101.176.0	28			
5						10.101.255.9	2001:10:101:141:0:0:0:0	64			
6	bidg 9 fir 9	Printer	bidg 9 fir 9 Printer	bidg 9 fir 9 PRT Desc	TRUE	10.101.255.9	10.101.9.0	28	10.125.255.114	10.100.223.0	24
7						10.101.255.9	2001:10:101:130:0:0:0:0	64	10.125.255.114	2001:10:100:223:0:0:0:0	64
8						10.101.255.9	10.101.176.0	28			
9						10.101.255.9	2001:10:101:141:0:0:0:0	64			
10	bidg 9 fir 5	Apple TV	bidg 9 fir 5 ATV	bidg 9 fir 5 ATV Desc	TRUE	10.101.255.5	10.101.5.0	28	10.125.255.114	10.100.221.0	24
11						10.101.255.5	2001:10:101:77:0:0:0:0	64	10.125.255.114	2001:10:100:221:0:0:0:0	64
12	bidg 9 fir 5	Printer	bidg 9 fir 5 PRT	bidg 9 fir 5 PRT Desc	TRUE	10.101.255.5	10.101.5.0	28	10.125.255.114	10.100.221.0	24
13						10.101.255.5	2001:10:101:77:0:0:0:0	64	10.125.255.114	2001:10:100:221:0:0:0:0	64

The **Policy Name** is a unique name for the current Domain and for a particular Service Type. The policy name is not case sensitive.

The Source IP and Query IP are the SDG agent's IP address. These are the IP addresses of the Controller source interface configured under the controller configuration on the SDG agent. The IP address of the same SDG Agent cannot be used for both Source IP and Query IP fields. You must also create a new policy with values interchanged for bidirectional exchange of services.

The Source Network, Source Mask, Query Network, and Query Mask specify the Source and Query SDG Agents subnets (VLANs) on which the endpoints are connected. These help filter services based on VLAN.



Note Shorthand notations of IPv6 addresses are not valid. For example: 2001:10:100:221:: is not a valid entry, and will have to be entered as 2001:10:100:221:0:0:0:0.

You can also choose to enter "any" as the value for the Source Network or Query Network.



Note If the Source or Query IP is provided and the network and mask are left empty, then the Wide Area Bonjour application will consider the entry to be "any".

Build Selective Services (Advanced) Sheet

This optional sheet can be left empty. When populated, it specifies a list of service policies and one or more endpoint MAC addresses for each. Service announcements matching the service policy are accepted by the SDG Agent only from the endpoints with these specific MAC addresses.

Selective service enables global service distribution of user-specified source end-points to the receivers.

To configure selective service, open the Selective Services (Advanced) sheet, and enter a policy name, and one or more MAC addresses of the Bonjour endpoints that this policy should allow.

Multiple MAC addresses for a policy are added in different rows.

You may also add data for multiple policies in separate rows.

The following is an extract from a completed selective services sheet.

Policy Name	Source MAC Address
BLDG9-ATV-PRT-AFP	01:02:03:04:05:06
	11:12:13:14:15:16

The **Source MAC Address** is the MAC address of the announcing device, which helps to filter services.

Import Configurations from a .XLS File

After creating the configuration on a .XLS file, as described in the previous sections, you need to import the file to create the policies. The file can be imported as a Day-0 operation to create policies on a new controller, or subsequently as a Day-N modification to the existing configuration.

To import service filter configurations using a .XLS file, complete the following steps:

-
- Step 1** Navigate to the **Configuration** tab of the Wide Area Bonjour application.
 - Step 2** From the left pane, select the domain or subdomain under which you want to import the service filter configurations.
 - Step 3** Click the icon with the three dots, located to the right of the **Create Subdomains** menu.
The **Upload Data to the domain** screen is displayed.
 - Step 4** Click **Browse**.
 - Step 5** Click **Choose file**.
 - Step 6** Select the file from your local folder and click the **UPLOAD** button.
When the upload is complete, the page is refreshed and displays a domain tree structure, representing the logical network.
-

Back Up Configuration Data from the Wide Area Bonjour Application

You can export the configuration data from the Wide Area Bonjour application in the form of a .XLS file. To export the configuration, complete the following steps:

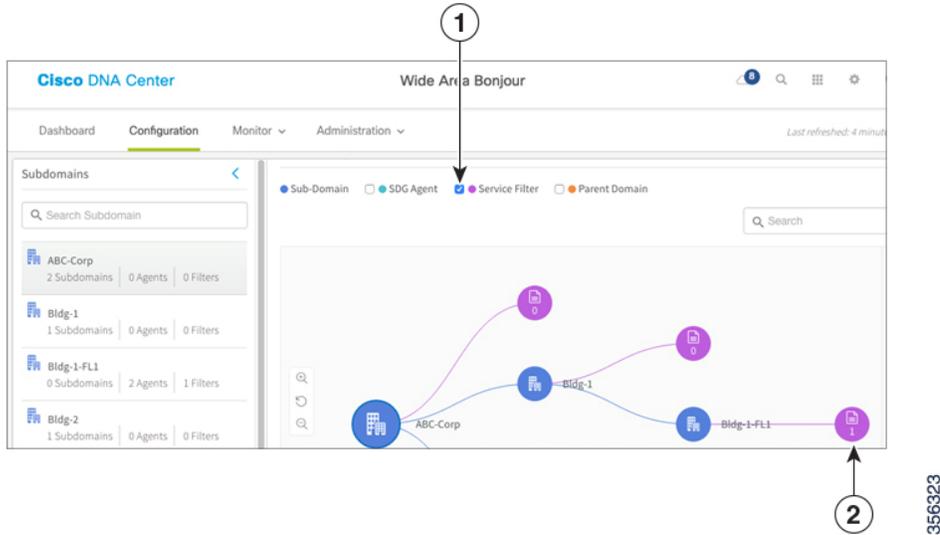
-
- Step 1** Navigate to the **Configuration** tab in the Wide Area Bonjour application.
 - Step 2** Click the domain or subdomain for which you want to export the configuration file.
 - Step 3** Click the menu button in the upper-right corner of the Wide Area Bonjour application GUI, and select **Export**.
The configuration is exported as a .XLS file, which can be saved, used later to import the configuration (possibly, after editing, to reflect policy changes, if any).
-

Configure Service Filters Using the GUI

Instead of importing the configuration from XLS files, it is possible to create the configuration using the GUI. The Wide Area Bonjour application must be set up with service filters for every service type that is deployed in the network. Normally, a service filter should have a Source SDG Agent and a Query SDG Agent. However, the Query SDG Agent is optional.

To create a service filter, complete the following steps:

- Step 1** Navigate to the **Configuration** tab in the Wide Area Bonjour application.
- Step 2** From the sidebar, select the subdomain for which you want to create the filter.
- Step 3** Select the **Service Filter** checkbox just above the topology.
- Step 4** Click the purple icon from the topology to view a list of the service filters for the selected domain. You can also manually edit existing service filters from this list.



The following table lists the elements of the GUI called out in the above image.

1	The Service Filter checkbox. Ensure that the Service Filter checkbox is selected, to display all the service filters configured for the selected subdomain.
2	The service filter. To create a service filter for a subdomain, click the associated (purple) service filter bubble in the domain tree. The number inside the bubble indicates the count of already configured service filters for the selected subdomain.

- Step 5** Click **Create Service Filter**.
 - Step 6** Enter a name (mandatory) and description (optional) for the service filter you're creating.
- The following image shows the filled-in values for creating a service filter.

Step 7 From the drop-down list, select the service type. You can choose multiple service types, if necessary.

Step 8 Check the **Enable** service filter checkbox to enable the service filter immediately after creating it.

Step 9 Click **Add** to add a source and a query agent.

From the **Details (Source/Query)** screen, you can specify the Source and Query SDG Agents for the service filter.

Note Empty Query SDG Agents are supported.

Step 10 Select the **Source** or **Query** radio button, depending on whether the agent to be added is a source or query agent.

Step 11 Select the SDG Agent or IP Address from the drop-down list.

Note If you cannot find the SDG Agent in the drop-down list, you need to manually add it to the Cisco DNA Center Inventory.

Step 12 Select the associated subnets from the list. Use the **Select All** option to select all the current subnets. Select the **Any** option to choose all current subnets and any subnet that will be added in the future.

Step 13 To add another source or query agent, click **ADD NEXT**.

Step 14 After you have added all the necessary SDG Agents and IP subnets to the policy, click **DONE**.

Note You must have at least one source agent in a service filter.

Step 15 Click **CREATE** to save the service filter.

This completes the creation of a Service Filter using the GUI.



CHAPTER 8

Monitor the Cisco Wide Area Bonjour Application

- [Monitor SDG Agent State, on page 41](#)
- [Monitor the Service Instance Status, on page 41](#)
- [Manually Synchronize SDG Agents and the Device Cache, on page 42](#)
- [Collect Troubleshooting Logs from the Cisco Wide Area Bonjour Application, on page 43](#)

Monitor SDG Agent State

- Step 1** Navigate to the **SDG Agents** page from the **Monitor** tab in the Wide Area Bonjour application. From here, you can view detailed information about the configured SDG Agents.
- Step 2** Use the checkboxes above the Service Instances table to filter SDG Agents according to their state.
- Step 3** Select the **Active** or **Inactive** state checkboxes to display active or inactive SDG Agents. To view the active and inactive SDG Agents, select both checkboxes. Use the arrows in the various column headers to order the SDG Agents, as needed.
- Step 4** If necessary, trigger a resync between the SDG Agents and the Device Cache. See [Manually Synchronize SDG Agents and the Device Cache, on page 42](#).
-

Monitor the Service Instance Status

You can monitor the status of your service instances in the **Monitor** tab of the Wide Area Bonjour application.

- Step 1** From the Wide Area Bonjour application home page, navigate to the **Service Instance** page from the **Monitor** drop-down list.
- Step 2** Select the **Active** or **Inactive** state check boxes to display active or inactive service instances. To view the active and inactive service instances, select both check boxes. Use the arrows in the various column headers to order the service instances, as needed.
- The list of service instances is filtered based on the status or statuses you have selected. You can also filter the service instances by the following:

- Name
- Instance Suffix
- Domain(s)
- Service Filter(s)
- SDG Agent IP
- Service Type(s)
- Instance IPv4
- Instance IPv6
- MAC Address

Note You must select at least one of the checkboxes for service instances to be displayed.

Manually Synchronize SDG Agents and the Device Cache

Every time an agent's policies are modified (for example, a subnet is added, an existing subnet is modified, or a service type is added under the service heirarchy group), a sync between your SDG Agent and the controller's device cache is automatically triggered. From the Wide Area Bonjour application, you can manually trigger a sync between the SDG agent and the device cache.



Note Syncs triggered directly from the device inventory are not recorded in the Wide Area Bonjour application.

To manually re-sync your SDG agent with the device cache, complete the following steps:

Step 1 From the **Monitor** drop-down menu in the Wide Area Bonjour application, click **SDG Agents**.

On this page, you can view a list of the available SDG Agents. If necessary, you can filter the SDG Agents based on their state (Active or Inactive or both) by selecting the corresponding checkboxes.

Step 2 Select the SDG Agent or Agents you want to resync with the device cache.

Step 3 Click the **Resync** button.

The sync may take several minutes to complete, and the corresponding entry will state that a resync is in progress. After the sync is complete, the date and time at which the sync was last completed is updated in the **Last Sync** column against the agent.

Collect Troubleshooting Logs from the Cisco Wide Area Bonjour Application

You can download logs from the Wide Area Bonjour application for troubleshooting and debugging. Complete the following steps:

-
- Step 1** From the Wide Area Bonjour application home page, under the **Monitor** drop-down list, select **Troubleshoot**.
 - Step 2** Enter the starting date and time (**From**) and the ending date and time (**To**) for which you want to download the logs.
 - Step 3** From the **View Advanced filters** menu, select the checkboxes corresponding to the information for which you want to view the logs.
 - Step 4** Click **DOWNLOAD**.
Only dropped announcements and query packets are downloaded. For other packet types such as Hello, Resync, all packets (processed and dropped) are downloaded.
-



CHAPTER 9

Troubleshoot the Cisco Wide Area Bonjour Application

- [Cisco SDG Agent Connection State Issues, on page 45](#)
- [Missing Wide Area Bonjour Service Records, on page 45](#)
- [Device Does Not Receive a Response From the Controller, on page 48](#)

Cisco SDG Agent Connection State Issues

The Cisco SDG Agent can ping Cisco DNA Center, but the Wide Area Bonjour application shows the status of the SDG Agent as Inactive.

Complete the following steps to troubleshoot the issue.

Step 1 From the Wide Area Bonjour application home page, under the **Monitor** drop-down list, select **SDG Agent**.

Step 2 Navigate to the Cisco DNA Center Inventory and check whether the SDG Agent is reachable.

If the SDG Agent is **Unreachable**, make sure that the SDG Agent is reachable in the Cisco DNA Center Inventory. If the SDG Agent is reachable in the Cisco DNA Center Inventory, but the state is **Inactive** in the Wide Area Bonjour application, the issue could most likely be that the IP Address of the SDG Agent is not included as either a Source Agent or a Query Agent in any of the service filters defined in the controller.

For information about creating service filters, see [Build Wide Area Bonjour Service Filter Configurations, on page 34](#).

Missing Wide Area Bonjour Service Records

If a specific service instance is listed in the SDG Agent's records, but is not listed in the **Service Instances** page under the **Monitor** tab, complete the following steps to troubleshoot the issue.

Step 1 Ensure that the SDG Agent is reachable and is in the **Active** state in the Wide Area Bonjour application. See [Cisco SDG Agent Connection State Issues, on page 45](#).

Step 2 If the SDG Agent state is **Active**, check whether the service list of the Source Agent is configured to forward announcements of the required type to the controller.

Note If you do not find the service instances of a specific service type on the **Service Instances** page under the **Monitor** tab of the Wide Area Bonjour application, make sure that the service type is included in one of the match statements on the SDG Agent's out policy for the Controller.

The following is a sample Wide Area Bonjour configuration on the SDG Agent.

```

service-export mdns-sd controller WIDE-AREA-BONJOUR-POLICY
  controller-address 10.251.1.1
  controller-port 9991
  controller-service-policy DNAC-CONTROLLER-POLICY OUT
  controller-source-interface Loopback0

mdns-sd service-list DNAC-CONTROLLER-SERVICES OUT
  match airplay
  match apple-rdp
  match apple-file-share
  match google-chromecast

mdns-sd service-policy DNAC-CONTROLLER-POLICY
  service-list DNAC-CONTROLLER-SERVICES OUT
    
```

In the above example:

- The SDG Agent will send an announcement from the mDNS cache to the Controller only if the service type is allowed by DNAC-CONTROLLER-POLICY.
- DNAC-CONTROLLER-POLICY allows the services that match those defined in the service list DNAC-CONTROLLER-SERVICES
- DNAC-CONTROLLER-SERVICES matches a service type if it is included in one of the match statements. The service list in the example will only send airplay (Apple TV), Apple-RDP, Apple File Share, and Google Chromecast services to the Controller. Other services which have not been specified here (such as printer service) will be dropped.

Step 3 If the SDG Agent is correctly configured, on Cisco DNA Center, ensure that the service policy has been correctly configured to accept the announcement. To identify the reason behind dropped announcements, download the list of dropped announcements from the **Troubleshoot** tab of the Wide Area Bonjour application. See [Collect Troubleshooting Logs from the Cisco Wide Area Bonjour Application, on page 43](#).

The XLS file lists the dropped announcements along with their causes. The following table lists some of the common causes for dropped announcements and how to fix them.

Possible Causes for Dropped Announcements	Suggested Fixes
The IP addresses of the announcing SDG Agent and source SDG Agent of the service filter do not match.	Correct the service filter. See Build Wide Area Bonjour Service Filter Configurations, on page 34 .
The subnet and mask in the announcement packet do not match those in the service filter.	Correct the service filter. Build Wide Area Bonjour Service Filter Configurations, on page 34 .
The service filter is not enabled.	If the service filter is not enabled, then all the matching announcements and queries are dropped. Enable the service filter from the Wide Area Bonjour application.

Possible Causes for Dropped Announcements	Suggested Fixes
The end point MAC address is not included in the list of configured MAC addresses for the service filter. This is applicable only in the case of selective services.	Add the MAC address to the list of configured MAC addresses for the service filter. See Create Selective Service Instance Service Filter, on page 33 .

Step 4

Inspect the sdg-service log on Cisco DNA Center for possible causes of the dropped announcement.

In some cases, it may be useful to view the Cisco DNA Center troubleshooting logs for the sdg-service, since it provides more detailed information, with options for real-time log viewing. To view the Cisco DNA Center debug logs, complete the following steps:

- a. Set the Cisco DNA Center logging level to **DEBUG**. For information about configuring debugging logs in Cisco DNA Center, see the *Cisco Digital Network Architecture Center Administrator Guide*.
- b. SSH to Cisco DNA Center and view the logs for the sdg-service.
- c. Turn on **DEBUG** level logging in Cisco DNA Center, and access the log when the announcements are going on.
- d. In the log, look for the Policy Matcher input string that matches the SDG Agent, Service Type, and Subnet and mask, corresponding to the announcement being sent. Here is a sample Policy Matcher Input string.

```
Policy Matcher Input [ip=10.151.255.1, network=10.151.1.0, mask=28, macAddress=08:66:98:bb:e6:a9,
serviceType=_airplay._tcp.local.]
```

The above sample string tells that the announcement (or query) for service type `_airplay._tcp.local` was sent from the subnet `10.151.1.0/28` of the SDG Agent `0.251.255`. The controller matches this input with its configured service filters. If no matching policies is found then the announcement or query is dropped.

The following is an extract from a log with the error showing that no matching policies have been found for the announcement.

```
2019-07-31 00:23:12,400 | DEBUG | adManager-Announcements-6 | | c.c.s.r.matchers.RulesEngineManager
| Policy Matcher Input [ip=10.151.255.1, network=10.151.1.0, mask=28, macAddress=08:66:98:bb:e6:a9,
serviceType=_airplay._tcp.local.] |

2019-07-31 00:23:12,400 | <snip> <snip> <snip>

2019-07-31 00:23:12,400 | INFO | adManager-Announcements-6 | |
c.c.s.p.p.AnnouncementProcessorImpl | No matching policies for valid announcements found. DROPPING
THE ANNOUNCEMENT. |
```

The following are the possible reasons for why the query may be dropped:

- The service type (such as `_airplay._tcp.local`) is not included in the policy.
- The SDG Agent IP address does not match the Announcing SDG Agent.
- The VLAN (subnet) is not enabled in the policy.
- The VLAN is not in the SDG Agent,
- The subnet or mask does not match the policy configuration.

Device Does Not Receive a Response From the Controller

Your device (a laptop for example) does not receive a response to its query from the Cisco DNA Center Controller, for the following possible reasons:

- Device or VLAN Misconfiguration
 - The device is not connected at all, or is not connected to the correct VLAN. In this case, check the configuration and ping the network.
 - The connected VLAN is not configured with mDNS. In this case, check the VLAN configuration.
 - The query is dropped by the SDG Agent due to incorrect ingress (IN) service list configuration for the VLAN. See the *Cisco IOS-XE Service Discovery Gateway for Bonjour User Guide*.

No Matching Service Instance Found

Step 1 Send a query from the device and access the corresponding log file.

Step 2 In the Cisco DNA Center `sdg-service` debug log, search for the `Policy Matcher Input` string, which matches with the SDG Agent, Service Type, and Subnet or Mask, corresponding to the query that was sent.

The following is an extract of a log which has a service instance.

```
Policy Matcher Input [ip=10.151.255.1, network=10.151.2.0, mask=28, serviceType=_airplay._tcp.local.]
```

```
... ..
<snip> ... Found 1 services to respond. Sending.. |
```

The following is an extract of a log which does not have a service instance.

```
Found 0 services to respond. Sending...
```

Step 3 In this case, either there are actually no service instances present, in which case the result is as expected. However, the service policy itself might have a mistake and may need correction.

The Controller OUT Policy in the SDG Agent Drops the Query

To identify whether the query was dropped by the Controller OUT policy on the SDG Agent, examine whether the policy configured in the Wide Area Bonjour configuration allows the service type being queried. The following is an extract from a log where the policy configured in the Wide Area Bonjour configuration allows the service-type being queried.

```
service-export mdns-sd controller WIDE-AREA-BONJOUR-POLICY
  controller-address 10.251.1.1
  controller-port 9991
  controller-service-policy DNAC-CONTROLLER-POLICY OUT
  controller-source-interface Loopback0
```

For the configuration above, ensure that the service policy `DNAC-CONTROLLER-POLICY` includes the service-type being queried. If not, then the SDG Agent will not route the query to the controller.

Cisco DNA Center Drops the Query Because it Does Not Match Its Policy

Step 1 Access the Cisco DNA Center sdg-service debug logs.

Step 2 Look for the **Policy Matcher Input** string that matches the SDG Agent, Service Type, and Subnet or Mask, corresponding to the query being sent.

The following is an extract from a log with the error showing that no matching policies have been found.

```
2019-08-02 16:17:48,462 | DEBUG | ueryProcessingCategory-14 | | c.c.s.r.matchers.RulesEngineManager
| Policy Matcher Input [ip=10.151.255.1, network=10.151.2.0, mask=28, serviceType=_airplay._tcp.local.]
|
2019-08-02 16:17:48,462 | DEBUG | ueryProcessingCategory-14 | | c.c.a.r.engine.impl.RulesEngineImpl
| Matched rules are: |
2019-08-02 16:17:48,462 | DEBUG | ueryProcessingCategory-14 | | c.c.a.r.engine.impl.RulesEngineImpl
| |
2019-08-02 16:17:48,462 | DEBUG | ueryProcessingCategory-14 | | c.c.s.p.p.QueryProcessorImpl | No
Matching Policies found , returning |
```

The following are the possible reasons for why the query was dropped:

- The service type `_airplay._tcp.local` is not included in policy.
 - The SDG Agent does not match the Query SDG Agent.
 - The VLAN (subnet) is not enabled in the policy.
 - The VLAN is not in the SDG Agent.
 - The subnet or mask does not match the policy configuration. Correct the service filter appropriately.
-

