



# Configuration Example for FlexConnect Mode - Wireless and Wired

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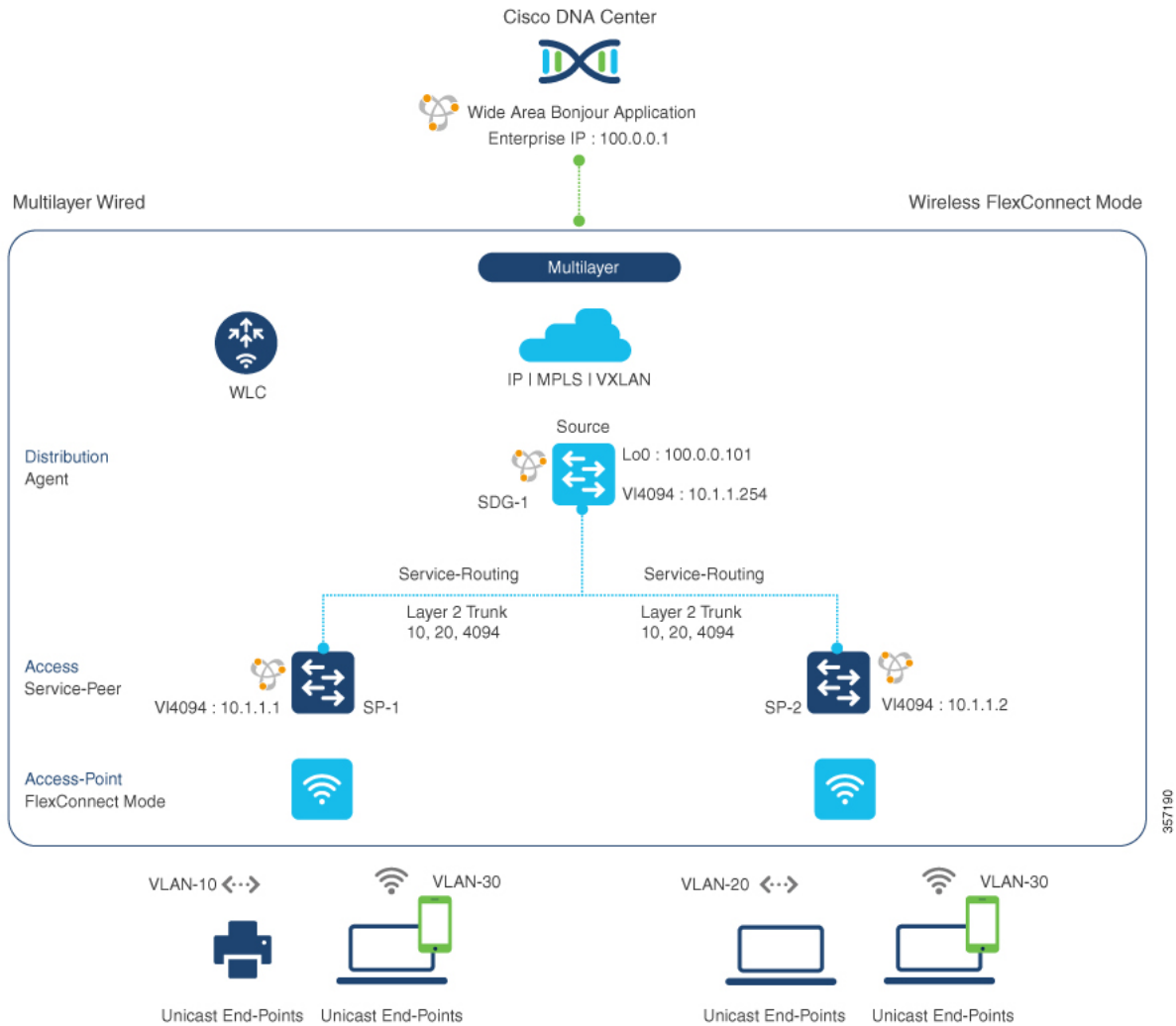
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## Overview

This chapter provides configuration guidelines to implement Local Area Bonjour enabling end-to-end policy-based mDNS service discovery and distribution across multilayer wired and wireless FlexConnect local-switching mode. The first hop mDNS gateway at Layer 2 access switch must be implemented in service peer mode and paired with common distribution-layer switch in SDG agent role IP gateway function to wired and wireless clients. The network-wide distributed SDG agent can be paired alternatively with the Cisco Catalyst Center to enable mDNS service-routing across IP core network providing mDNS service assurance, monitoring and troubleshooting.

The following figure illustrates unicast mode bonjour network environment with AirPrint capable printer and wireless user computer (macOS, Microsoft Windows, and so on.) connected to the same Ethernet switch. The network administrator implements the policy permitting additional endpoints associated to nearby location Ethernet switch to discover and use remote AirPrint capable Printer without flooding mDNS over wired and wireless networks.

Figure 1: Local Area Bonjour Service-Routing Multilayer Wired and Wireless FlexConnect Local-Switching Mode



## Configuration Example for Customized Service List and Policy in FlexConnect Mode - Wireless and Wired

This section provides guidance on configuring Service-Peer, SDG Agent, and Cisco Catalyst Center, allowing the wired and wireless endpoints to dynamically discover printer using Layer 2 unicast and policy.

### Example: Wired and Wireless Access Layer Service Peer Configuration

The following table provides a sample configuration of wired and wireless controller access layer service peer.

Table 1: Configuring Wired and Wireless Access Layer Service Peer

Configuration Step	Sample Configuration: SP-1 Service-Peer Configuration	Sample Configuration: SP-2 Service-Peer Configuration
<b>Step-1:</b> Enable mDNS gateway and set the gateway mode.	! <pre>mdns-sd gateway mode service-peer !</pre>	! <pre>mdns-sd gateway mode service-peer !</pre>
<b>Step-2:</b> Create unique mDNS inbound policy to permit ingress AirPrint service announcement and query on the Catalyst Switch in service peer mode.	! <pre>mdns-sd service-list LOCAL-AREA-SERVICES-IN in match printer-ipp !</pre>	! <pre>mdns-sd service-list LOCAL-AREA-SERVICES-IN in match printer-ipp !</pre>
<b>Step-3:</b> Create unique mDNS outbound policy to permit egress AirPrint service response on the Catalyst Switch in service peer mode	! <pre>mdns-sd service-list LOCAL-AREA-SERVICES-OUT out match printer-ipp !</pre>	! <pre>mdns-sd service-list LOCAL-AREA-SERVICES-OUT out match printer-ipp !</pre>
<b>Step-4:</b> Associate inbound and outbound service list to a unique service policy.	! <pre>mdns-sd service-policy LOCAL-AREA-POLICY service-list LOCAL-AREA-SERVICES-IN service-list LOCAL-AREA-SERVICES-OUT !</pre>	! <pre>mdns-sd service-policy LOCAL-AREA-POLICY service-list LOCAL-AREA-SERVICES-IN service-list LOCAL-AREA-SERVICES-OUT !</pre>
<b>Step-5:</b> Activate unicast mDNS gateway and attach service policy on wired VLAN and wireless FlexConnect user VLAN of SP-1 and SP-2 Layer 2 access switch.	! <pre>vlan configuration 10, 30 mdns-sd gateway service-policy LOCAL-AREA-POLICY active-query timer 3600 !</pre>	! <pre>vlan configuration 20, 30 mdns-sd gateway service-policy LOCAL-AREA-POLICY active-query timer 3600 !</pre>
<b>Step-6:</b> Enable service routing on wired service peer mDNS between mDNS source and receiver local VLANs.  <b>Note</b> This step is optional for SP-2 switch as it does not have local mDNS service provider endpoints or VLANs.	! <pre>mdns-sd location-filter LOCAL-PROXY match location-group default vlan 10 match location-group default vlan 30 ! mdns-sd service-list LOCAL-AREA-SERVICES-OUT OUT match printer-ipps location-filter LOCAL-PROXY !</pre>	
<b>Step-7:</b> Enable unicast service routing between wired and wireless service peer and SDG agent using wired management source VLAN ID and IP address.	! <pre>vlan configuration 10, 30 mdns-sd gateway source-interface vlan 4094 sdg-agent 10.1.1.254 !</pre>	! <pre>vlan configuration 20, 30 mdns-sd gateway source-interface vlan 4094 sdg-agent 10.1.1.254 !</pre>

## Example: Wired and Wireless Distribution Layer SDG Agent Configuration

The following table provides a sample configuration of distribution layer SDG agent.

**Table 2: Configuring Wired and Wireless Distribution Layer SDG Agent**

Configuration Step	Sample Configuration: SDG-1 – SDG Agent
<b>Step-1:</b> Enable mDNS gateway and set the gateway mode. The default mode is sdg-agent.	! mdns-sd gateway !
<b>Step-2:</b> Create a unique mDNS inbound policy to permit ingress AirPrint service announcement and query the Catalyst Switch in Service-Peer mode.	! mdns-sd service-list LOCAL-AREA-SERVICES-IN in match printer-ipp !
<b>Step-3:</b> Create a unique mDNS outbound policy to permit egress AirPrint service response on Catalyst Switch in Service-Peer mode.	! mdns-sd service-list LOCAL-AREA-SERVICES-OUT out match printer-ipp !
<b>Step-4:</b> Associate the inbound and outbound service-list to a unique service-policy.	! mdns-sd service-policy LOCAL-AREA-POLICY service-list LOCAL-AREA-SERVICES-IN service-list LOCAL-AREA-SERVICES-OUT !
<b>Step-5:</b> Activate unicast mDNS gateway on wired VLAN and wireless user VLAN on SDG agents.	! vlan configuration 10, 20, 30 mdns-sd gateway !
<b>Step-6:</b> Configure the service peer-group and attach service-policy on the SDG agent distribution switch and enable service-routing between the assigned Service Peer switch group.	! mdns-sd service-peer group peer-group 1 service-policy LOCAL-AREA-POLICY service-peer 10.1.1.1 location-group default  service-peer 10.1.1.2 location-group default !
<b>Step-7:</b> Create a unique controller bound mDNS policy to permit egress AirPrint service discovery and distribution from Catalyst Switch in SDG agent mode. Inbound policy towards controller is not required.	! mdns-sd service-list WIDE-AREA-SERVICES-OUT out match printer-ipp !
<b>Step-8:</b> Associate outbound service-list to a unique service-policy.	! mdns-sd service-policy WIDE-AREA-POLICY service-list WIDE-AREA-SERVICES-OUT !

Configuration Step	Sample Configuration: SDG-1 – SDG Agent
<b>Step-9:</b> Enable Wide Area Bonjour service-routing with service export configuration association controller IP Address, source interface for stateful connection, and mandatory egress policy for Wide Area service-routing.	<pre>! service-export mdns-sd controller DNAC-CONTROLLER-POLICY controller-address 100.0.0.1 controller-source-interface LOOPBACK 0 controller-service-policy WIDE-AREA-POLICY !</pre>

## Cisco Catalyst Center Traditional Multilayer Wired and Wireless Configuration

### Configuring Service Filters for Traditional Multilayer Wired and Wireless FlexConnect Local-Switching Mode (GUI)

This procedure implements global service filters, which permit the Cisco Wide Area Bonjour application to dynamically discover and distribute service information between trusted Cisco Catalyst SDG agent switches across the IP network.

#### Procedure

- 
- Step 1** Navigate to the **Configuration** tab in the Wide Area Bonjour application.
  - Step 2** From the sidebar, select the sub-domain for which you want to create the service filter.
  - Step 3** Check the **Service Filter** box.
  - Step 4** Click **Service Filter** 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.
  - Step 5** Click **Create Service Filter**.
  - Step 6** From the **Network Mode** drop-down list, choose **Traditional** (the default mode).
  - Step 7** Enter a unique name for the service filter.
  - Step 8** (Optional) Enter a description for the service filter.
  - Step 9** Select one or more service types to permit announcements and queries.
  - Step 10** Enable or disable service filters after creating them. By default, service filters are enabled.
- 

### Configuring Source SDG Agents in Traditional Multilayer Wired and Wireless FlexConnect Local-Switching Mode (GUI)

This procedure configures discovery of wired printer sources from the LAN distribution switches paired with Layer 2 Catalyst Switches in a service peer role. The wireless distribution switches paired with a controller in a service peer role receive query responses for wired printers and distribute the responses to querying devices over the wireless FlexConnect local switching mode network.

#### Procedure

- 
- Step 1** Click **Add** on the upper-right of Cisco Catalyst Center.

- Step 2** Click the **Source** radio button to select a source SDG agent. By default, this radio button is selected.
- Step 3** From the **SDG Agent/IP** drop-down list, select an SDG agent (100.0.0.101) which announces the services, for example, Printer.
- Step 4** Select **Peer** from the **Service Layer** drop-down list.
- Step 5** Uncheck the box **Any**. By default, this is unchecked.
- Step 6** Select the query **VLAN** (Vlan-10) to distribute services (Printer) from a specific network.
- Step 7** Enable or disable services from the selected query IPv4 subnet. By default, this is enabled.
- Step 8** Enable or disable services from the selected query IPv6 subnet. By default, this is enabled.
- Step 9** Enter the **service peer IPv4 address** (10.1.1.1).
- Note** Select **Any** to accept services from any peer on a selected VLAN.
- Step 10** (Optional) Click **Add Next** to add more source SDG agents. (Repeat the preceding steps.)
- Step 11** Click **DONE**.
- Step 12** Click **CREATE**.

## Configuring Query SDG Agents in Traditional Multilayer Wired and Wireless FlexConnect Local-Switching Mode (GUI)

This procedure configures distributed services to query SDG agents connected to a controller in service peer mode, based on a policy.

If the network environment is different, see the [Cisco Wide Area Bonjour on Cisco Catalyst Center User Guide, Release 2.1.2](#).

### Procedure

- Step 1** Click **Add** on the upper-right of Cisco Catalyst Center.
- Step 2** Select the **Query SDG agent** radio button. By default, the **Source** radio button is selected.
- Step 3** From the **SDG Agent/IP** drop-down list, select an SDG agent (100.0.0.102) that receives queries for the services (Printer).
- Step 4** Select **Peer** from the **Service Layer** drop-down list.
- Step 5** Uncheck the box **Any**. By default, this is enabled.
- Step 6** Select the query **VLAN** (Vlan-30) to distribute services (Printer) to a specific network.
- Step 7** Enable or disable services from the selected query IPv4 subnet. By default, this is enabled.
- Step 8** Enable or disable services from the selected query IPv6 subnet. By default, this is enabled.
- Step 9** Enter the **service peer IPv4 address** (10.2.1.254).
- Step 10** Click the + icon to add more service-peers, if any. Select **Any** to accept services from any peer on a selected VLAN.
- Step 11** (Optional) Click **Add Next** to add more query agents. (Repeat the preceding steps.)
- Step 12** Click **DONE**.
- Step 13** Click **CREATE**.

# Verifying Configuration Example for FlexConnect Mode - Wireless and Wired

This section provides step-by-step mDNS configuration and service discovery and distribution status based on applied policy on Wired Layer 2 access switch in service peer and SDG agent mode.

## Verifying Wired Service-Peer Configuration

Use the following commands on the Cisco Catalyst switch in service peer (SP-1 and SP-2) mode to determine the operational status after applying configuration and discovering the AirPrint service from the local network.

```
Device# show mdns-sd summary vlan 10
```

```
VLAN: 10
=====
mDNS Gateway: Enabled
mDNS Service Policy: LOCAL-AREA-POLICY
Active Query: Enabled
                : Periodicity 3600 Seconds
Transport Type: IPv4
Service Instance Suffix: Not Configured
mDNS Query Type: ALL
SDG Agent IP: 10.1.1.254
Source Interface: Vlan4094
```

```
Device# show mdns-sd service-policy name LOCAL-AREA-POLICY
```

```
Service Policy Name      Service List IN Name      Service List Out Name
=====
LOCAL-AREA-POLICY       LOCAL-AREA-SERVICES-IN    LOCAL-AREA-SERVICES-OUT
```

```
Device# show mdns-sd cache vlan 10
```

Name	Type	TTL/ Remaining	Vlan-Id/ Interface-name	MAC Address	RR Record Data
_universal._sub._ipp._tcp.local	PTR	4500/4486	V110	ac18.2651.03fe	Bldg-1-FL1-PRN._ip
_ipp._tcp.local	PTR	4500/4486	V110	ac18.2651.03fe	Bldg-1-FL1-PRN._ip
Bldg-1-FL1-PRN._ipp._tcp.local	SRV	4500/4486	V110	ac18.2651.03fe	0 0 631 Bldg-1-FL1-F
Bldg-1-FL1-PRN.local	A	4500/4486	V110	ac18.2651.03fe	10.153.1.1
Bldg-1-FL1-PRN.local	AAAA	4500/4486	V110	ac18.2651.03fe	2001:10:153:1:79:A4

Name	Type	TTL/ Remaining	Vlan-Id/ Interface-name	MAC Address	RR Record Data
Bldg-1-FL1-PRN._ipp._tcp.local	TXT	4500/4486	Vl10	ac18.2651.03fe	(451)'txtvers=1"priority= ty=EPSON WF-3620 Ser usb_MFG=EPSON" usb_MDL=W~'

Device# **show mdns-sd statistics vlan 10**

mDNS Statistics

Vl10:

```
mDNS packets sent           : 612
  IPv4 sent                  : 612
    IPv4 advertisements sent : 0
    IPv4 queries sent        : 612
  IPv6 sent                  : 0
    IPv6 advertisements sent : 0
    IPv6 queries sent        : 0
Unicast sent                 : 0
mDNS packets rate limited    : 0
mDNS packets received        : 42
  advertisements received    : 28
  queries received           : 14
    IPv4 received            : 42
      IPv4 advertisements received: 28
      IPv4 queries received      : 14
    IPv6 received            : 0
      IPv6 advertisements received: 0
      IPv6 queries received      : 0
mDNS packets dropped         : 0
```

```
=====
Query Type                   : Count
=====
PTR                           : 12
SRV                           : 0
A                             : 0
AAAA                          : 0
TXT                           : 0
ANY                           : 3
=====
```

```
=====
PTR Name      Advertisement  Query
=====
_ipp._tcp.local      9          4
=====
```

## Verifying Wired SDG Agent Configuration and Service-Routing Status

This section provides information on mDNS configuration and service-routing on Wired and Wireless SDG Agent (SDG-1) with locally attached Layer 2 access switches in Service-Peer (SP-1 and SP-2) mode and with centrally paired Cisco Catalyst Center for Wide Area Bonjour service-routing.

Device# **show mdns-sd summary vlan 10**

VLAN: 10

```
=====
mDNS Gateway                 : Enabled
```



```
mDNS Service Policy      : LOCAL-AREA-POLICY
Active Query            : Disabled
Transport Type         : IPv4
Service Instance Suffix : Not Configured
mDNS Query Type        : ALL
SDG Agent IP           : Not-Configured
Source Interface       : Not-Configured
```

Device# **show mdns-sd cache vlan 10**

Name	Type	TTL/ Remaining	Vlan-Id /Interface-name	MAC Address	RR Record Data
_universal._sub._ipp._tcp.local	PTR	4500/4500	V110	ac18.2651.03fe	Bldg-1-FL1-PRN._ipp._tcp.local
_ipp._tcp.local	PTR	4500/4500	V110	ac18.2651.03fe	Bldg-1-FL1-PRN._ipp._tcp.local
Bldg-1-FL1-PRN._ipp._tcp.local	SRV	4500/4500	V110	ac18.2651.03fe	0 0 631 Bldg-1-FL1-PRN.local
Bldg-1-FL1-PRN.local	A	4500/4500	V110	ac18.2651.03fe	10.153.1.1
Bldg-1-FL1-PRN.local	AAAA	4500/4500	V110	ac18.2651.03fe	2001:10:153:1:79A40C:6BEE:AEEC
Bldg-1-FL1-PRN._ipp._tcp.local	TXT	4500/4500	V110	ac18.2651.03fe	(45) <del>key=priority=30</del> ty=EPSON WF-3620 Series" <del>EPSON</del>

Device# **show mdns-sd sp-sdg statistics**

```

                                One min, 5 mins, 1 hour
Average Input rate (pps)      : 0,      0,      0
Average Output rate (pps)    : 0,      0,      0
Messages received:
  Query                       : 15796
  ANY query                   : 0
  Advertisements              : 28
  Advertisement Withdraw      : 0
  Interface down              : 0
  Vlan down                   : 0
  Service-peer ID change      : 0
  Service-peer cache clear    : 12
  Resync response             : 6
Messages sent:
  Query response              : 5975
  ANY Query response          : 0
```

```
Cache-sync           : 61
Get service-instance : 0
```

```
Device# show mdns-sd controller detail
```

```
Controller: DNAC-Policy
IP: 100.0.0.1, Dest Port : 9991, Src Port : 42446, State : UP
Source Interface: Loopback0, MD5 Disabled
Hello Timer 30 sec, Dead Timer 120 sec, Next Hello 00:00:24
Uptime 2d05h (17:02:37 UTC Jan 15 2021)
Service Buffer: Enabled

Service Announcement:
Filter: DNAC-CONTROLLER-POLICY
Count 50, Delay Timer 30 sec, Pending Announcement 0, Pending Withdraw 0
Total Export Count 56, Next Export in 00:00:24

Service Query:
Query Suppression Enabled
Query Count 50, Query Delay Timer 15 sec, Pending 0
Total Query Count 15791, Next Query in 00:00:09
```

## Verifying Cisco Catalyst Center Configuration and Service Routing Status

The Cisco Wide Area Bonjour application supports comprehensive assurance capabilities to manage service routing with network-wide distributed Cisco Catalyst switches in SDG Agent role and mDNS services discovered over Wide Area Bonjour domain. The assurance capabilities in Cisco Wide Area Bonjour provides the ability to determine service routing state, mDNS service state, and many more information at various levels for day-2 operations, analysis and troubleshooting. Each category serves unique function to manage and troubleshoot Wide Area Bonjour service routing for day-2 operation.

This sub-section provides brief overview for each category of monitor function:

- **Dashboard:** The landing page of Cisco Wide Area Bonjour application provides key statistics in various formats to quickly determine service routing health across the network. The network administrator can monitor operational status of service routing with SDG Agent devices, historical chart of service discovery request, processing and drops from network-wide distributed devices and top five talkers across the network.
- **Sub-Domain 360°:** The network administrator can briefly collect statistics and status counts in 360° view. The left-panel monitoring, and configuration bar is automatically open upon clicking selected sub-domain to verify configured policies, discovered service-instances on per sub-domain basis of the configuration section.
- **Monitor:** A comprehensive 3-tier monitoring and troubleshooting function of Cisco Wide Area Bonjour application for various day-2 operations. The detail view of SDG Agent, Service-Instance, and advanced Troubleshooting capabilities allows network administrator to manage and troubleshoot Wide Area Bonjour domain with a single pane of glass on Cisco Catalyst Center.

For more information, see [Cisco Wide Area Bonjour on Cisco Catalyst Center User Guide, Release 2.1.2](#) guide. The assurance capabilities and operation details are explained in **Monitor the Cisco Wide Area Bonjour Application** chapter to manage Cisco Wide Area Bonjour application with various supporting service routing assurance function.

# Reference

*Table 3:*

<b>Related Topic</b>	<b>Document Title</b>
DNA Service for Bonjour Deployment on Cisco Catalyst 9600 Switch	<a href="#">Cisco Catalyst 9600 Series Switch Software Configuration Guide, Release 17.4.X</a>
DNA Service for Bonjour Deployment on Cisco Catalyst 9500 Switch	<a href="#">Cisco Catalyst 9500 Series Switch Software Configuration Guide, Release 17.4.X</a>
DNA Service for Bonjour Deployment on Cisco Catalyst 9400 Switch	<a href="#">Cisco Catalyst 9400 Series Switch Software Configuration Guide, Release 17.4.X</a>
DNA Service for Bonjour Deployment on Cisco Catalyst 9300 Switch	<a href="#">Cisco Catalyst 9300 Series Switch Software Configuration Guide, Release 17.4.X</a>
Cisco Wide Area Bonjour Application on Cisco Catalyst Center User Guide	<a href="#">Cisco Wide Area Bonjour Application on Cisco Catalyst Center User Guide, Release 2.2.2</a>

