Configuring Local Area Bonjour in Multicast DNS Mode for LAN and Wireless Networks

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How to configure Multicast DNS Mode for LAN and Wired Networks

This section provides information about how to configure Local Area Bonjour in multicast DNS mode.

Enabling mDNS Gateway on the Device

To configure mDNS on the device, follow these steps:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**mdns-sd gateway** **Example:** `Device(config)# mdns-sd gateway`	Enables mDNS on the device and enters mDNS gateway configuration mode. Enter the following commands in mDNS gateway configuration mode to enable the respective functionalities:

	Command or Action	Purpose
		• **air-print-helper**: Enables IOS devices like iPADs to discover and use older printers that support Bonjour • **cache-memory-max**: Configures the percentage memory for cache • **ingress-client**: Configures Ingress Client Packet Tuners • **rate-limit**: Enables rate limiting of incoming mDNS packets • **service-announcement-count**: Configures maximum service advertisement count • **service-announcement-timer**: Configures advertisements announce timer periodicity • **service-query-count**: Configures maximum query count • **service-query-timer**: Configures query forward timer periodicity **Note** For **cache-memory-max**, **ingress-client**, **rate-limit**, **service-announcement-count**, **service-announcement-timer**, **service-query-count**, and **service-query-timer** commands, you can retain the default value of the respective parameter for general deployments. Configure a different value, if required, for a specific deployment.
Step 4	**exit** **Example:** `Device(config-mdns-sd)# exit`	Exits mDNS gateway configuration mode.

Creating Custom Service Definition

Service definition is a construct that provides an admin friendly name to one or more mDNS service types or PTR Resource Record Name. By default, a few built-in service definitions are already predefined and available for admin to use. In addition to built-in service definitions, admin can also define custom service definitions.

Procedure

	Command or Action	Purpose
Step 1	**enable**	Enables privileged EXEC mode.

	Command or Action	Purpose
	Example: `Device> enable`	Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**mdns-sd service-definition** *service-definition-name* **Example:** `Device(config)# mdns-sd service-definition CUSTOM1`	Configures mDNS service definition. **Note** All the created custom service definitions are added to the primary service list. Primary service list comprises of a list of custom and built-in service definitions.
Step 4	**service-type** *string* **Example:** `Device(config-mdns-ser-def)# service-type _custom1._tcp.local`	Configures mDNS service type.
Step 5	Repeat step 4 to configure more than one service type in the custom service definition.	
Step 6	**exit** **Example:** `Device(config-mdns-ser-def)# exit`	Exit mDNS service definition configuration mode.

Creating Service List

mDNS service list is a collection of service definitions. To create a service list, follow these steps:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**mdns-sd service-list** *service-list-name* {**in** | **out**} **Example:**	Configures mDNS service list.

	Command or Action	Purpose
	`Device(config)# mdns-sd service-list VLAN100-list in`	
Step 4	**match** *service-definition-name* [**message-type** {**any** | **announcement** | **query**}] **Example:** `Device(config-mdns-sl-in)# match PRINTER-IPPS message-type announcement`	Matches the service to the message type. Here, *service-definition-name* refers to the names of services, such as, airplay, airserver, airtunes, and so on. **Note** To add a service, the service name must be part of the primary service list. If the mDNS service list is set to IN, the applicable command syntax is: **match** *service-definition-name* [**message-type** {**any** | **announcement** | **query**}]. If the mDNS service list is set to OUT, the applicable command syntax is: **match** *service-definition-name* [**message-type** {**any** | **announcement** | **query**}] [**location-filter** *location-filter-name*] [**source-interface** {*mDNS-VLAN-number* | *mDNS-VLAN-range*}].
Step 5	**exit** **Example:** `Device(config-mdns-sl-in)# exit`	Exits mDNS service list configuration mode.

Creating Service Policy

A Service Policy that is applied to an interface specifies the allowed Bonjour service announcements or the queries of specific service types that should be processed, in ingress direction or egress direction or both. For this, the service policy specifies two service-lists, one each for ingress and egress directions. In the Local Area Bonjour domain, the same service policy can be attached to one or more Bonjour client VLANs; however, different VLANs may have different service policies.

To configure service policy with service lists, follow these steps:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.

	Command or Action	Purpose
Step 3	**mdns-sd service-policy** *service-policy-name* **Example:** `Device(config)# mdns-sd service-policy mdns-policy1`	Configures mDNS service policy.

Step 4	**service-list** *service-list-name* {**in** | **out**}
	Example:
	`Device(config-mdns-ser-pol)# service-list VLAN100-list in`
	`Device(config-mdns-ser-pol)# service-list VLAN300-list out`
		Configures service lists for IN and OUT directions.

Step 5	**exit** **Example:** `Device(config-mdns-ser-pol)# exit`	Exits mDNS service policy configuration mode.

Associating Service Policy to an Interface

To configure mDNS on the device, follow these steps:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface** *interface-name* **Example:** `Device(config)# interface Vlan 601`	Enters interface mDNS configuration mode and enables interface configuration.
Step 4	**mdns-sd gateway** **Example:** `Device(config-if)# mdns-sd gateway`	Configures mDNS gateway on the interface. Enter the following commands in the interface mDNS gateway configuration mode to enable the respective functionalities: • **active-query**: Sets the time interval for SDG agent to refresh the active status of connected Bonjour client services. The

	Command or Action	Purpose
		timer value ranges from 60 to 3600 seconds. **Note** This configuration is mandatory only on VLANs whose Bonjour policy is configured to accept Bonjour service announcements from connected Bonjour clients. If the VLAN is configured to only accept Bonjour queries but not Bonjour service announcements, this configuration is optional. • **service-instance-suffix**(Optional) : Appends the service instance suffix to any announced service name that is forwarded to the controller. • **service-mdns-query** [**ptr** | **all**]: Configures mDNS query request message processing for the specified query types. If the **service-mdns-query** command is used without any keyword, then all Bonjour query types (PTR, SRV, and TXT) are processed by default. It is recommended to use the **service-mdns-query ptr** command. • **service-policy** *policy-name*: Attaches the specified service policy to the VLAN. Bonjour announcements, and queries received by and sent from the VLAN are governed by the policies configured in the service policy. This configuration is mandatory for all VLANs. **Note** Service policies can only be attached at interface level. • **transport** [**all** | **ipv4** | **ipv6**] (Optional): Configures BCP parameter. It is recommended to use **transport ipv4** command, except in those networks where the Bonjour clients send only IPv6 announcements and queries.
Step 5	**exit** **Example:**	Exits mDNS gateway configuration mode.

	Command or Action	Purpose
	`Device(config-if-mdns-sd)# exit`	

How to Configure Local Area Bonjour in Multicast DNS Mode for Wireless Networks

The configuration of local area Bonjour on a switch that acts as the SDG Agent in a wireless network involves the same set of procedures that are used to configure local area Bonjour on a switch that acts as the SDG Agent in a wired network.

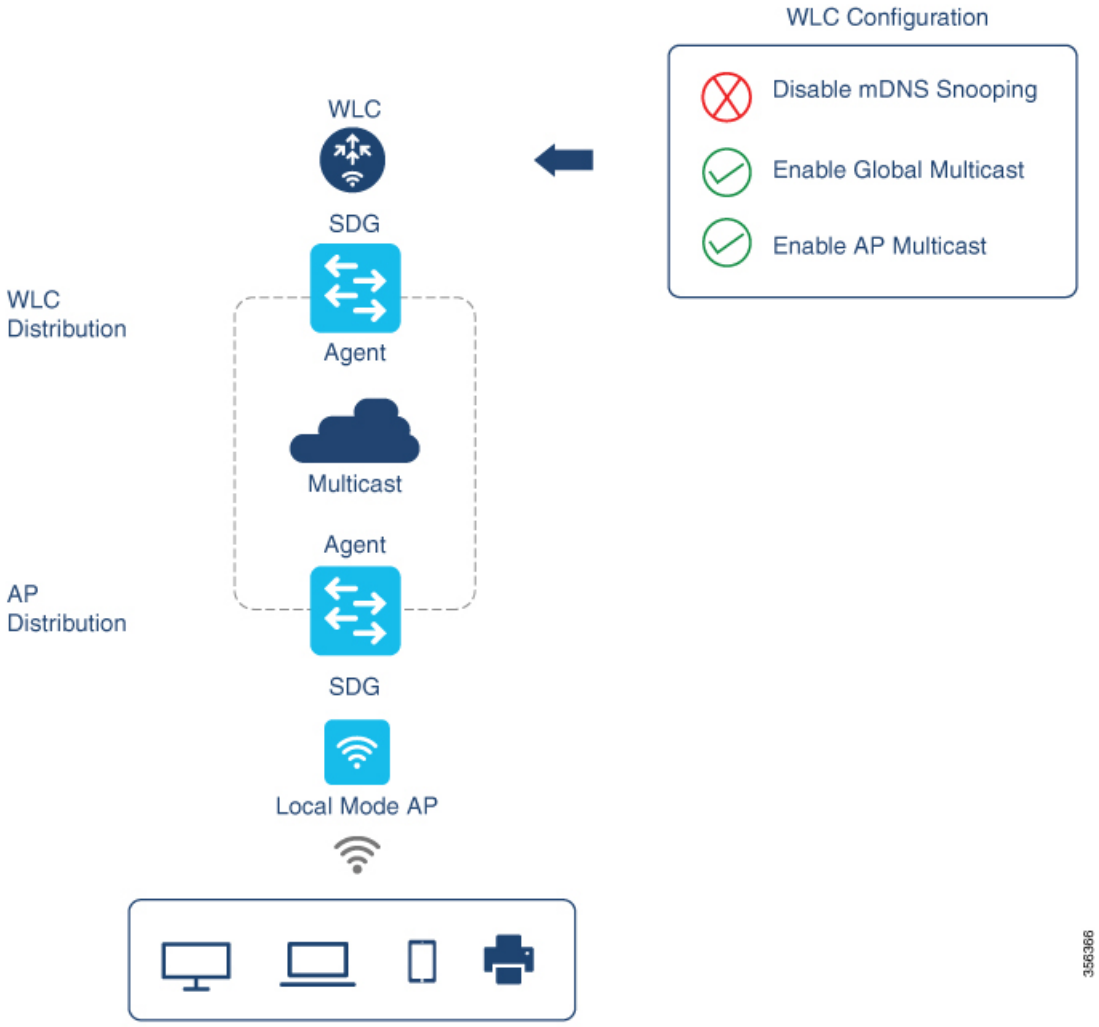
The Bonjour protocol operates on service announcements and queries. Each query or advertisement is sent to the mDNS IPv4 address 224.0.0.251 and IPv6 address FF02::FB. The mDNS messages are carried over well-known industry standard UDP port 5353, over both Layer 3 transport types.

The Layer 2 address used by the Bonjour protocol is link-local multicast address and therefore it's only forwarded to the same Layer 2 network. As multicast DNS (mDNS) is limited to a Layer 2 domain, for a client to discover a service, it has to be a part of the same Layer 2 domain. This isn't always possible in a large-scale deployment or enterprise.

To enable mDNS communication between Wireless endpoints and Cisco Catalyst switch that acts as an SDG Agent, the intermediate WLC must transparently allow the network to transmit and receive mDNS messages.

Hence, for a Multicast DNS Mode Wireless network deployment, disable the mDNS Snooping on Cisco AireOS based WLC and enable mDNS Gateway feature on Cisco Catalyst 9800 series WLC and set the AP Multicast Mode to Multicast.

Figure below illustrates a prerequisite configuration for Wireless network to enable seamless communication between SDG-Agent switches and Wireless endpoints.



The Cisco WLC and Access Points by default prevent the forwarding of Layer 2 or Layer 3 Multicast frames between Wireless and Wired network infrastructure. The forwarding is supported with stateful capabilities enabled using AP Multicast. The network administrator must globally enable Multicast and configure a unique Multicast Group to advertise in the network. This multicast group is only required for Cisco Access Points to enable Multicast over Multicast (MCMC) capabilities across the LAN network. The Bonjour solution doesn't require any Multicast requirements on Wireless Client VLAN; thus, it's optional and applicable only for other Layer 3 Multicast applications.

The core network must be configured with appropriate Multicast routing to allow the Access Points to join WLC Multicast Group. The Multicast configuration must be enabled on Cisco WLC management VLAN and on the Cisco Access Points of their respective distribution layer switch.

Enabling mDNS Gateway on the Device

To configure mDNS on the device, follow these steps:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**mdns-sd gateway** **Example:** `Device(config)# mdns-sd gateway`	Enables mDNS on the device and enters mDNS gateway configuration mode. Enter the following commands in mDNS gateway configuration mode to enable the respective functionalities: • **air-print-helper**: Enables IOS devices like iPADs to discover and use older printers that support Bonjour • **cache-memory-max**: Configures the percentage memory for cache • **ingress-client**: Configures Ingress Client Packet Tuners • **rate-limit**: Enables rate limiting of incoming mDNS packets • **service-announcement-count**: Configures maximum service advertisement count • **service-announcement-timer**: Configures advertisements announce timer periodicity • **service-query-count**: Configures maximum query count • **service-query-timer**: Configures query forward timer periodicity **Note** For **cache-memory-max**, **ingress-client**, **rate-limit**, **service-announcement-count**, **service-announcement-timer**, **service-query-count**, and **service-query-timer** commands, you can retain the default value of the respective parameter for general deployments. Configure a different value, if required, for a specific deployment.

	Command or Action	Purpose
Step 4	**exit** **Example:** `Device(config-mdns-sd)# exit`	Exits mDNS gateway configuration mode.

Creating Custom Service Definition

Service definition is a construct that provides an admin friendly name to one or more mDNS service types or PTR Resource Record Name. By default, a few built-in service definitions are already predefined and available for admin to use. In addition to built-in service definitions, admin can also define custom service definitions.

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**mdns-sd service-definition** *service-definition-name* **Example:** `Device(config)# mdns-sd service-definition CUSTOM1`	Configures mDNS service definition. **Note** All the created custom service definitions are added to the primary service list. Primary service list comprises of a list of custom and built-in service definitions.
Step 4	**service-type** *string* **Example:** `Device(config-mdns-ser-def)# service-type _custom1._tcp.local`	Configures mDNS service type.
Step 5	Repeat step 4 to configure more than one service type in the custom service definition.	
Step 6	**exit** **Example:** `Device(config-mdns-ser-def)# exit`	Exit mDNS service definition configuration mode.

Creating Service List

mDNS service list is a collection of service definitions. To create a service list, follow these steps:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**mdns-sd service-list** *service-list-name* {**in** | **out**} **Example:** `Device(config)# mdns-sd service-list VLAN100-list in`	Configures mDNS service list.
Step 4	**match** *service-definition-name* [**message-type** {**any** | **announcement** | **query**}] **Example:** `Device(config-mdns-sl-in)# match PRINTER-IPPS message-type announcement`	Matches the service to the message type. Here, *service-definition-name* refers to the names of services, such as, airplay, airserver, airtunes, and so on. **Note** To add a service, the service name must be part of the primary service list. If the mDNS service list is set to IN, the applicable command syntax is: **match** *service-definition-name* [**message-type** {**any** | **announcement** | **query**}]. If the mDNS service list is set to OUT, the applicable command syntax is: **match** *service-definition-name* [**message-type** {**any** | **announcement** | **query**}] [**location-filter** *location-filter-name*] [**source-interface** {*mDNS-VLAN-number* | *mDNS-VLAN-range*}].
Step 5	**exit** **Example:** `Device(config-mdns-sl-in)# exit`	Exits mDNS service list configuration mode.

Creating Service Policy

A Service Policy that is applied to an interface specifies the allowed Bonjour service announcements or the queries of specific service types that should be processed, in ingress direction or egress direction or both. For this, the service policy specifies two service-lists, one each for ingress and egress directions. In the Local Area

Bonjour domain, the same service policy can be attached to one or more Bonjour client VLANs; however, different VLANs may have different service policies.

To configure service policy with service lists, follow these steps:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**mdns-sd service-policy** *service-policy-name* **Example:** `Device(config)# mdns-sd service-policy mdns-policy1`	Configures mDNS service policy.

Step 4	**service-list** *service-list-name* {**in** | **out**}
	Example:
	`Device(config-mdns-ser-pol)# service-list VLAN100-list in`
	`Device(config-mdns-ser-pol)# service-list VLAN300-list out`
		Configures service lists for IN and OUT directions.

Step 5	**exit** **Example:** `Device(config-mdns-ser-pol)# exit`	Exits mDNS service policy configuration mode.

Verifying Local Area Bonjour in Multicast DNS Mode for LAN and Wireless Networks

This section shows how to verify Local Area Bonjour in Multicast DNS mode for LAN and Wireless networks.

Verifying SDG-Agent Status

The following is a sample output of the **show mdns-sd service-list** *service-list-name* {**in** | **out**} command.

```
Name            Direction  Service    Message-Type     Source
============================================================
VLAN100-list    In         Printer    Announcement      -
```

```
                In          Airplay    Query             -
                In          CUSTOM1    Any               -
VLAN300-list    Out         Printer    Announcement      Vl200
```

The following is a sample output of the **show mdns-sd service-definition***service-definition-name* **service-type** {*custom* | *built-in*} command.

```
Service                 PTR                            Type
=============================================================================
apple-tv                _airplay._tcp.local             Built-In
                         _raop._tcp.local
apple-file-share       _afpovertcp._tcp.local          Built-In
CUSTOM1                _custom1._tcp.local             Custom
CUSTOM2                _customA._tcp.local             Custom
                       _customA._tcp.local
```

The following is a sample output of the **show mdns-sd** *service-policy-name* **interface** *interface-name* command.

```
Name    Service-List-In   Service-List-Out
================================================
mdns-policy-1  VLAN100-list   VLAN300-list
mdns-policy-2  VLAN400-list   VLAN400-list
```

The following is a sample output of the **show mdns-sd summary** command.

```
mDNS Gateway: Enabled
Mode: Service Peer
Service Announcement Periodicity(in seconds): 30
Service Announcement Count: 50
Service Query Periodicity(in seconds): 15
Service Query Count: 50
Active Response Timer (in seconds): Disabled
ANY Query Forward: Disabled
SDG Agent IP: 9.8.57.10
Active Query Periodicity (in minutes): 30
mDNS Query Type: PTR only
Transport Type: IPv4
mDNS AP service policy: default-mdns-service-policy
```

The following is a sample output of the **show mdns-sd sp-sdg statistics** command.

```
mDNS SP Statistics
last reset time: 07/27/21 15:36:33
Messages sent:
Query : 122
ANY query : 35
Advertisements : 12
Advertisement Withdraw : 1
Service-peer cache clear : 0
Resync response : 3
Srvc Discovery response : 0
```

```
Keep-Alive : 2043
Messages received:
Query response : 0
ANY Query response : 0
Cache-sync : 9
Get service-instance : 0
Srvc Discovery request : 0
Keep-Alive Response : 2042
```

Verifying Wide Area Bonjour Controller Status

The following is a sample output of the **show mdns controller summary** command.

```
Device# show mdns controller summary

Controller Summary
====================================
 Controller Name  :   Cisco Catalyst Center-BONJOUR-CONTROLLER
 Controller IP    :   10.104.52.241
 State            :   UP
 Port             :   9991
 Interface        :   Loopback0
 Filter List      :   policy1
 Dead Time        :   00:01:00
```

The following is a sample output of the **show mdns controller export-summary** command.

```
Device# show mdns controller export-summary

Controller Export Summary
=========================
 Controller IP    :   10.104.52.241
 State            :   UP
 Filter List      :   policy1
 Count            :   100
 Delay Timer      :   30 seconds
 Export           :   300
 Drop             :   0
 Next Export      :   00:00:01
```

The following is a sample output of the **show mdns controller statistics** command.

```
Device# show mdns controller statistics

Total BCP message sent           : 47589
  Total BCP message received       : 3
  Interface WITHDRAW messages sent : 0
  Clear cache messages sent        : 0
  Total RESYNC state count         : 0
  Last successful RESYNC           : Not-Applicable

  Service Advertisements:
   IPv6 advertised                 : 0
   IPv4 advertised                 : 300
```

```
   Withdraws sent                  : 0
   Advertisements Filtered         : 0
   Total service resynced          : 0

  Service Queries:
   IPv6 queries sent               : 0
   IPv6 query responses received   : 0
   IPv4 queries sent               : 0
   IPv4 query responses received   : 0
```

The following is a sample output of the **show mdns controller detail** command.

```
Device# show mdns controller detail

Controller : Cisco Catalyst Center-BONJOUR-CONTROLLER
 IP : 10.104.52.241, Dest Port : 9991, Src Port : 0, State : UP
 Source Interface : Loopback0, MD5 Disabled
 Hello Timer 0 sec, Dead Timer 0 sec, Next Hello 00:00:00
 Uptime 00:00:00
Service Announcement :
 Filter : policy1
 Count 100, Delay Timer 30 sec, Pending Announcement 0, Pending Withdraw
 0
 Total Export Count 300, Next Export in 00:00:16
Service Query :
 Query Suppression Disabled
 Query Count 50, Query Delay Timer 15 sec, Pending 0
 Total Query Count 0, Next Query in 00:00:01
```

Verifying Local Area Bonjour Configuration for LAN and Wireless Networks

The following is a sample output of the **show run** command.

```
mdns-sd gateway

mdns-sd service-definition custom1
 service-type _airplay._tcp.local
 service-type _raop._tcp.local


mdns-sd service-list list1 IN
 match custom1
mdns-sd service-list list2 OUT
 match custom1


mdns-sd service-policy policy1
service-list list1 IN
service-list list2 OUT
```

```
service-export mdns-sd controller Cisco Catalyst Center-CONTROLLER-POLICY
controller-address 99.99.99.10
controller-service-policy policy1 OUT
controller-source-interface Loopback0
```