Local Area Service Discovery Gateway

The Service Discovery Gateway feature enables multicast Domain Name System (mDNS) to operate across Layer 3 (L3) boundaries. An mDNS gateway will be able to provide transport for service discovery across L3 boundaries by filtering, caching and extending services from one subnet to another. Prior to implementation of this feature, mDNS was limited in scope to within a subnet due to the use of link-local scoped multicast addresses. This feature enhances Bring Your Own Device (BYOD).

Caution
Extension of services should be done with proper care. Generally, only specific services should be extended. Service names should be unique in the network to avoid duplicate name conflicts.

See Feature Information for Service Discovery Gateway section to check feature availability for your platform release version.

- Information About Service Discovery Gateway, on page 1
- How to Configure Service Discovery Gateway, on page 7
- Verifying and troubleshooting Service Discovery Gateway, on page 14
- Configuration Examples for Service Discovery Gateway, on page 16
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- Feature Information for Service Discovery Gateway, on page 19

Information About Service Discovery Gateway

Service Announcement Redistribution and Service Extension

Redistribution of announcements is the actual forwarding of announcements and query responses while service extension is the capability of proxying services between subnets. The actual replication of the service announcement can help to speed up the visibility of newly announced services and also a service's withdrawal if a service or device is turned off.

Note
Extension of services such as printers or Apple TV works fine without actual replication of service announcements. The Service Discovery Gateway will cache announcements, queries and their responses in the cache. If another device queries for a service, the Service Discovery Gateway will be able to provide an answer from its cache.
Enable the `redistribution mdns-sd` command only on a per-interface basis, and only if it is actually required. You must ensure that there are no loops in the network topology corresponding to the interface for which service announcement redistribution is being enabled. A loop can lead to a broadcast storm.

Redistribution of service announcement information cannot be done globally. You can enable redistribution of service information only at the interface level.

**Extending Services Across Subnets—An Overview**

You need to enable a multicast Domain Name System (mDNS) gateway to extend services across subnet boundaries. You can enable an mDNS gateway for a device or for an interface. You must enable routing of services for the device before enabling it at the interface level. After the mDNS gateway is enabled on a device or interface, you can extend services across subnet boundaries.

To extend services across subnets, you must do the following:

1. **Set Filter Options to Extend Services Across Subnets**—You can allow services such as printer services to be accessed across subnets. If printer x is available on interface 1, users on interface 2 can use printer x without configuring the printer on their local systems.

2. **Extend Services Across Subnets**—The filter created in Step 1 should be applied on the interfaces 1 and 2. Only then can users on other interfaces access the printer service.

For the sample scenario where a printer service is accessible by clients on other interfaces, you must apply these filters:

- On the interface where the printer service is available (IN filter) — You want to allow the printer service into the mDNS cache, so that it can be accessed by users on other subnets.

- On the interface where the printer service is available (OUT filter) — Since clients on other interfaces will access the service (printer x, for example), you should allow queries coming from the device (OUT filter, from the device's point of view).

- On each interface where clients reside (IN filter) — For clients on other interfaces (subnets) wanting to access the printer service, you must allow queries from users into the mDNS cache (IN filter).

**Remember**

Applying the IN filter means that you are allowing the printer service into the device mDNS cache, and other interfaces can access it. Applying the OUT filter means that you are allowing the queries out of the cache so that queries from clients on other interfaces can reach the printer interface. On other client-facing interfaces, the IN filter is applied to allow queries in.

**Note**

- Filters can be applied at the global level and at the interface level. Filters applied at the interface level take precedence over the filters applied at the global level.

- The term 'service discovery information' refers to services (printer services, etc), queries (queries for printer services, etc, from one interface to the other), announcements (printer service is removed, etc), and service-instances (a specific service—printer x, Apple TV 3, etc) that you want to extend across subnets.
Set Filter Options to Extend Services Across Subnets

You can set filter options to allow services such as printer services into or out of a device or interface. You can also permit or prohibit queries, announcements, services learnt from an interface, specific service–instances, and locations. Use the `service-list mdns-sd` command to create a service-list and set filter options.

You need to create a service-list and use filter options within it. While creating a service-list, use one of the following options:

- The `permit` option permits specific services, announcements and service-instances across subnets.
- The `deny` option restricts services, announcements and service-instances from being transported across subnets.
- The `query` option is provided to browse services. For example, if you want to browse printer services periodically, then you can create a service-list with the `query` option, and add the printer service to the query. When you set a period for the query, the service entries are refreshed in the cache memory.

You must mention a sequence number when using the `permit` or `deny` option. The filtering is done sequentially, in the ascending order. The same service-list can be associated with multiple sequence numbers. Within a sequence, match statements (commands) must be used to specify what needs to be filtered. Generally, match statements are used to filter queries (for example, queries from clients to find printer and fax services), announcements (new service is added, and so on), specific service–instances, types of service such as printer services (so that the service is allowed into the cache for use), services available for a specific interface (printers and Apple TVs associated with a VLAN), and locations.

A service-list by itself does not contain any services. You must specify a service type in the match statement when setting filter options to allow or prohibit services. (For example, `_ipp._tcp` is the service type for an IPP printing service running over TCP).

**Sample scenario** - Consider a device is in a client segment. The goal is to allow the following on the device:

- All queries from clients to the device.
- Printer services to clients on other subnets.

The following example explains how to achieve the goal:

```
! service-list mdns-sd mixed permit 10
    match message-type query
!
! service-list mdns-sd mixed permit 20
    match message-type announcement
    match service-type _ipps._tcp.local
!
```

In the above example, a service-list called 'mixed' is created and the `permit` option is used twice—to filter queries and to filter printer services and announcements. The filtering is done in the sequence given below:

- Sequence 10 - A match statement is used to filter queries.
- Sequence 20 - Match statements are used to filter announcements and printer services.
The match statement in Sequence 10 sets a filter for queries on the device, but does not specify that queries be allowed into the device. To allow queries from clients, the filter needs to be applied on the interface in the IN direction. The example is displayed in the Extend Services Across Subnets section.

Similarly, the match statements in Sequence 20 sets a filter for announcements and printer services on the device, but does not specify that they be allowed into the device. To allow announcements and printer services into the device, the filter needs to be applied on the required interfaces in the IN direction. The example is displayed in the Extend Services Across Subnets section.

If neither the permit option nor the deny option is used, the default action is to disallow services from being transported to other subnets.

Browsing services periodically—Service-lists of the type query can be used to browse services. Such queries are called active queries. Active queries periodically send out requests for the services specified within the query on all interfaces. As services have a specific Time to Live (TTL) duration, active queries can help to keep services fresh in the cache memory.

In the following example, a service-list named 'active-query' is created and the service-list is of the type query. Services such as printer services are specified within the query, and these are the services that we want to extend. Typically, these services would match the services that have been configured as 'permitted' services in the IN filter.

```
service-list mdns-sd active-query query
  service-type _universal._sub._ipp._tcp
  service-type _ipp._tcp.local
  service-type _ipps._tcp.local
  service-type _raop._tcp.local
```

The purpose of an active query and a query associated with a match statement is different. When you enable an active query, services are browsed periodically. A query is used in a match statement to permit or prohibit queries (not active queries) on the interface.

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**Note**

- Service-list creation can only be used globally and cannot be used at the interface level.
- You can create a new service-instance of a specific service-type using the service-instance mdns-sd command.
- A service end-point (such as a printer, fax, and so on) sends unsolicited announcements when a service starts up. After that, it sends unsolicited announcements whenever a network change event occurs (such as, an interface coming up or going down, and so on). The device always responds to queries.

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**Remember**

Filtering only sets filter options and specifies that certain services need to be filtered. You must *apply* the filters on an interface for the services, queries, or announcements to actually be permitted or prohibited on the interface. To know about applying filters and the other available service discovery configuration options, refer the Extend Services Across Subnets section.
Extend Services Across Subnets

You must have set filter options for the device before extending services across subnets. If you have set filter options for specific services and other service discovery information to be allowed, prohibited or queried periodically, you can apply the filters for an interface.

Before applying filters, note the following:

- You must enable multicast Domain Name System (mDNS) on a device to apply filter options. You can enable mDNS using the command `service-routing mdns-sd`.
- Since you might want to allow services into the device or prohibit services from being learnt on an interface, you must apply the filter in the needed direction. The options **IN** and **OUT** perform the desired actions on the interface.
- Typically, a service-policy is applied on an interface. Global service-policies are optional and affect all L3 interfaces.

Sample scenario - A device is in a client segment and the goal is to allow the following between the device interfaces:

- All queries from clients to the device.
- Printer services.

A note about filter options - Filter options have been set for the above scenario by creating a service-list called 'mixed' and adding filter options to it. (see Set Filter Options to Extend Services Across Subnets for more details). The following example explains how to apply the filters:

```plaintext
! interface Ethernet0/0
  description *** (wireless) Clients here plus some printers
  ip address 172.16.33.7 255.255.255.0
  service-routing mdns-sd
  service-policy mixed IN

! interface Ethernet0/3
  description *** (wireless) Clients here plus some printers
  ip address 172.16.57.1 255.255.255.0
  service-routing mdns-sd
  service-policy mixed IN

In the above example, service-routing is enabled on the interface and the filter options in the service-policy 'mixed' are applied in the **IN** direction. In other words, all queries and printer services will be allowed into the device, from the interfaces Ethernet 0/0 and Ethernet 0/3.

Sample scenario for browsing specific services - A service-list of the type query (called active query) has been created. It contains services that we want to browse periodically, such as printer services (see Set Filter Options to Extend Services Across Subnets for more details about creating an active query). To enable browsing of the services in the query, you must apply the active query for the device.

```plaintext
! service-routing mdns-sd
  service-policy-query active-query 90
!```
In the above example, the period is set to 90 seconds. The services within the active query are queried on all interfaces of the device after an interval of 90 seconds.

**Note**
- You can enable browsing of services for specific interfaces. If browsing of services is enabled globally, you can disable browsing of services on specific interfaces.
- Services are browsed specific to a device or interface by the mDNS process. So, the IN or OUT option is not relevant for browsing of services.

You can use the following options after enabling mDNS on a device or interface.

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Use this Command</th>
<th>Global and Interface Configuration Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>For a service-list, apply a filter to allow or prohibit services.</td>
<td>service-policy</td>
<td>Global and interface levels.</td>
</tr>
<tr>
<td>Set some part of the system memory for cache.</td>
<td>cache-memory-max</td>
<td>Global level.</td>
</tr>
<tr>
<td>Configure an active query and the query period so that specified services are queried periodically.</td>
<td>service-policy-query</td>
<td></td>
</tr>
<tr>
<td>Designate a specific device or interface in a domain for routing mDNS announcement and query information.</td>
<td>designated-gateway</td>
<td>Global and interface levels.</td>
</tr>
<tr>
<td>Access services in the proximity of the device.</td>
<td>service-policy-proximity</td>
<td>Global and interface levels.</td>
</tr>
<tr>
<td><strong>Note</strong> Service policy proximity filtering functionality is only available on wireless devices and their interfaces.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Configure service-type enumeration period for the device.</td>
<td>service-type-enumeration period</td>
<td>Global level.</td>
</tr>
<tr>
<td>Specify an alternate source interface for outgoing mDNS packets on a device.</td>
<td>source-interface</td>
<td>Global level.</td>
</tr>
<tr>
<td>Configure the maximum rate limit of incoming mDNS packets for a device.</td>
<td>rate-limit</td>
<td>Global level.</td>
</tr>
</tbody>
</table>
### How to Configure Service Discovery Gateway

#### Setting Filter Options for Service Discovery

**Before you begin**

Ensure that you permit a query or announcement when you set filter options. If you do not use a `permit` option and only use `deny` options, you will not be able to apply the filter.

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#### SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `service-list mdns-sd service-list-name {deny sequence-number | permit sequence-number | query}`
4. `match message-type {announcement | any | query}`
5. `match service-instance {instance-name | any | query}`
6. `match service-type mDNS-service-type-string`
7. `match location civic civic-location-name`
8. `exit`

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#### DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td><code>enable</code></td>
<td>- Enter your password if prompted.</td>
</tr>
<tr>
<td><strong>Example:</strong> Device&gt; enable</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><code>configure terminal</code></td>
<td><strong>Example:</strong></td>
</tr>
<tr>
<td>Device# configure terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>Enters mdns service discovery service-list mode.</td>
</tr>
<tr>
<td>`service-list mdns-sd service-list-name {deny sequence-number</td>
<td>permit sequence-number</td>
</tr>
<tr>
<td><strong>Example:</strong> Device(config)# service-list mdns-sd all permit 3</td>
<td>Or</td>
</tr>
<tr>
<td>Command or Action</td>
<td>Purpose</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------</td>
</tr>
</tbody>
</table>
| Or
Device(config)# service-list mdns-sd sl4 query | • Creates a service-list and associates a query for the service-list name if the query option is used. |

**Remember** When you set filter options, ensure that you permit a query or announcement for a service-list. If you do not use a permit option and only use deny options, you will not be able to apply the filter.

**Step 4**

**match message-type {announcement | any | query}**

**Example:**

Device(config-mdns-sd-sl)# match message-type announcement

**Note** You cannot use the match command if you have used the query option. The match command can be used only for the permit or deny option.

**Step 5**

**match service-instance {instance-name | any | query}**

**Example:**

Device(config-mdns-sd-sl)# match service-instance printer-3

**Step 6**

**match service-type mDNS-service-type-string**

**Example:**

Device(config-mdns-sd-sl)# match service-type _ipp._tcp.local

**Step 7**

**match location civic civic-location-name**

**Example:**

Device(config-mdns-sd-sl)# match location civic location3

**Step 8**

**exit**

**Example:**

Device(config-mdns-sd-sl)# exit

**What to do next**

Apply filters on an interface for the services, queries, or announcements to actually be permitted or prohibited on the interface.
Applying Service Discovery Filters and Configuring Service Discovery Parameters

After enabling multicast Domain Name System (mDNS) gateway for a device, you can apply filters (IN-bound filtering or OUT-bound filtering) and active queries by using `service-policy` and `service-policy-query` commands, respectively.

Steps 5 to 11 are mDNS Service Discovery configuration options. The steps are optional and not meant to be used in any specific order.

**Before you begin**
You must set filter options for the device before applying filters.

### SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `service-routing mdns-sd`
4. `service-policy service-policy-name {IN | OUT}`
5. `cache-memory-max cache-config-percentage`
6. `service-policy-query service-list-name query-period`
7. `designated-gateway enable [ttl duration]`
8. `service-policy-proximity service-list-name [limit number-of-services]`
9. `service-type-enumeration period period-value`
10. `source-interface type number`
11. `rate-limit in maximum-rate-limit`
12. `exit`

### DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> <code>enable</code></td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> <code>Device&gt; enable</code></td>
<td>- Enter your password if prompted.</td>
</tr>
<tr>
<td><strong>Step 2</strong> <code>configure terminal</code></td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> <code>Device# configure terminal</code></td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong> <code>service-routing mdns-sd</code></td>
<td>Enables mDNS gateway functionality for a device and enters multicast DNS configuration (config-mdns) mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
</tbody>
</table>
### Applying Service Discovery Filters and Configuring Service Discovery Parameters

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>Device(config)# service-routing mdns-sd</code></td>
<td>For a service-list, applies a filter on incoming service discovery information (IN-bound filtering) or outgoing service discovery information (OUT-bound filtering).</td>
</tr>
</tbody>
</table>

**Step 4**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>`service-policy service-policy-name {IN</td>
<td>OUT}`</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>By default, 10% of the system memory is set aside for cache. You can override the default value by using this command.</td>
</tr>
<tr>
<td><code>Device(config-mdns)# service-policy sl1 IN</code></td>
<td>Creates an active query and configures the service-list-query period.</td>
</tr>
</tbody>
</table>

**Step 5**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>cache-memory-max cache-config-percentage</code></td>
<td>Configures service policy proximity filtering on the device.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>• Service policy proximity filtering is only available for wireless clients and is based on Radio Resource Management (RRM). Wired clients and services are not affected by the limit.</td>
</tr>
<tr>
<td><code>Device(config-mdns)# cache-memory-max 20</code></td>
<td>• The default value for the maximum number of services that can be returned is 50.</td>
</tr>
</tbody>
</table>

**Step 6**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>service-policy-query service-list-name query-period</code></td>
<td>Configures service-type enumeration period for the device.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Specifies an alternate source interface for outgoing mDNS packets on a device.</td>
</tr>
<tr>
<td><code>Device(config-mdns)# service-policy-query sl4 100</code></td>
<td>Configures the maximum rate limit of incoming mDNS packets for a device.</td>
</tr>
</tbody>
</table>

**Step 7**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>designated-gateway enable [ttl duration]</code></td>
<td></td>
</tr>
</tbody>
</table>
### Applying Service Discovery Filters for an Interface

**SUMMARY STEPS**

1. `enable`
2. `configure terminal`
3. `interface type number`
4. `service-routing mdns-sd`
5. `service-policy service-policy-name {IN | OUT}`
6. `exit`

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td><code>enable</code></td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td>Example:</td>
<td>Device&gt; enable</td>
<td>• Enter your password if prompted.</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td><code>configure terminal</code></td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td>Example:</td>
<td>Device# configure terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td><code>interface type number</code></td>
<td>Enters Interface multicast DNS configuration mode, and enables interface configuration.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td><code>service-routing mdns-sd</code></td>
<td>Enables mDNS gateway functionality for an interface and enters multicast DNS configuration (config-mdns) mode.</td>
</tr>
<tr>
<td>Example:</td>
<td>Device(config-if)# service-routing mdns-sd</td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td>`service-policy service-policy-name {IN</td>
<td>OUT}`</td>
</tr>
<tr>
<td>Example:</td>
<td>Device(config-if-mdns-sd)# service-policy all IN</td>
<td></td>
</tr>
</tbody>
</table>
When you set filter options, ensure that you permit a query or announcement for a service-list. If you have not permitted a service, query, or announcement while setting filter options, then you will see this warning when you apply the filter:

**Warning:** Please enable explicit service-list rule with the permit action to allow queries and responses.

### Creating a Service Instance

#### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **service-instance mdns-sd service instance-name regtype service-type domain name**
4. \((\text{ipv4addr} | \text{ipv6addr}) \text{ IP-address}\)
5. **port number**
6. **target-hostname host-name**
7. **txt text-record-name**
8. **priority value**
9. **weight value**
10. **exit**

#### DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td><strong>enable</strong>&lt;br&gt;<strong>Example:</strong>&lt;br&gt;Device&gt; enable</td>
</tr>
</tbody>
</table>
| **Step 2**        | **configure terminal**<br>**Example:**<br>Device# configure terminal | Enables privileged EXEC mode.<br>• Enter your password if prompted. Enters global configuration mode.
<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 3</strong></td>
<td><strong>service-instance mdns-sd service instance-name regtype service-type domain name</strong>&lt;br&gt;<strong>Example:</strong>&lt;br&gt;Device(config)# service-instance mdns-sd service printer-3 regtype _ipp._tcp.local domain tcp4</td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>**(ipv4addr</td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td><strong>port number</strong>&lt;br&gt;<strong>Example:</strong>&lt;br&gt;Device(config-mdns-sd-si)# port 9100</td>
</tr>
<tr>
<td><strong>Step 6</strong></td>
<td><strong>target-hostname host-name</strong>&lt;br&gt;<strong>Example:</strong>&lt;br&gt;Device(config-mdns-sd-si)# target-hostname fqdn-of-printer.example.com</td>
</tr>
<tr>
<td><strong>Step 7</strong></td>
<td><strong>txt text-record-name</strong>&lt;br&gt;<strong>Example:</strong>&lt;br&gt;Device(config-mdns-sd-si)# txt _ipp._tcp.local-printer3</td>
</tr>
<tr>
<td><strong>Step 8</strong></td>
<td><strong>priority value</strong>&lt;br&gt;<strong>Example:</strong>&lt;br&gt;Device(config-mdns-sd-si)# priority 3</td>
</tr>
<tr>
<td><strong>Step 9</strong></td>
<td><strong>weight value</strong>&lt;br&gt;<strong>Example:</strong>&lt;br&gt;Device(config-mdns-sd-si)# weight 20</td>
</tr>
</tbody>
</table>
Verifying and troubleshooting Service Discovery Gateway

**Purpose**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 10 exit</td>
<td>Exits multicast Domain Name System (mDNS) service discovery service-instance (config-mdns-sd-si) mode and enters global configuration mode.</td>
</tr>
</tbody>
</table>

**SUMMARY STEPS**

1. `show mdns requests [detail] [type record-type] [name record-name]`
2. `show mdns cache [interface type number [detail] | [name record-name] [type record-type] [detail]]`
3. `show mdns statistics {all | interface type number} [service-list list-name | [cache | service-policy] {all | interface type number} [services orderby providers]}
4. `show mdns service-types {all | interface type number}`
5. `debug mdns {all | error | event | packet | verbose]`

**DETAILED STEPS**

**Step 1**

`show mdns requests [detail] [type record-type] [name record-name]`

Example:

```
Device# show mdns requests detail
```

MDNS Outstanding Requests

```
Request name : _ipp._tcp.local
Request type : PTR
Request class : IN
```

This command displays information for outstanding multicast Domain Name System (mDNS) requests, including record name and record type information.

**Step 2**

`show mdns cache [interface type number [detail] | [name record-name] [type record-type] [detail]]`

Example:

```
Device# show mdns cache
```

mDNS CACHE

```
[<NAME>] [TYPE] [CLASS] [TTL] [Remaining] [Accessed]
```

**Note**

The show and debug commands mentioned below are not in any specific order.

Verifying and troubleshooting Service Discovery Gateway
This command displays mDNS cache information.

**Step 3**  
*show mdns statistics {all | interface type number | service-list list-name} [cache | service-policy] {all | interface type number} | services orderby providers}

**Example:**

```
Device# show mdns statistics all

mDNS Statistics
mDNS packets sent : 0
mDNS packets received : 31
mDNS packets dropped : 8
mDNS cache memory in use: 64264(bytes)
```

This command displays mDNS statistics.

**Step 4**  
*show mdns service-types [all | interface type number]*

**Example:**

```
Device# show mdns service-types

mDNS SERVICES
-----------------------------------------------
[<NAME>] [<TTL>/Remaining] [If-name]
  _ipp._tcp.local 4500/4496
```

This command displays mDNS statistics.

**Step 5**  
*debug mdns {all | error | event | packet | verbose}*

**Example:**

```
Device# debug mdns all
This command enables all mDNS debugging flows.
```
Configuration Examples for Service Discovery Gateway

Example: Setting Filter Options for Service Discovery

The following example shows creation of a service-list sl1. The permit option is being applied on sequence number 3 and all services with message-type announcement are filtered and available for transport across various subnets associated with the device.

```
Device> enable
Device# configure terminal
Device(config)# service-list mdns-sd sl1 permit 3
Device(config-mdns-sd-sl)# match message-type announcement
Device(config-mdns-sd-sl)# exit
```

Example: Applying Service Discovery Filters and Configuring Service Discovery Parameters

```
Device> enable
Device# configure terminal
Device(config)# service-routing mdns-sd
Device(config-mdns)# service-policy serv-pol1 IN
Device(config-mdns)# cache-memory-max 20
Device(config-mdns)# service-policy-query sl-query1 100
Device(config-mdns)# designated-gateway enable
Device(config-mdns)# rate-limit in 80
Device(config-mdns)# exit
```

Example: Applying Service Discovery Filters for an Interface

Example: Setting Multiple Service Discovery Filter Options

The following example shows creation of filters using service-lists mixed, permit-most, permit-all, and deny-all. Then, the filters are applied at various interfaces, as required.

```
! service-list mdns-sd mixed permit 10
  match message-type query
! service-list mdns-sd mixed permit 20
  match message-type announcement
  match service-type _ipp._tcp.local
! service-list mdns-sd mixed permit 30
  match message-type announcement
  match service-type _ipp._tcp.local
```
match service-type _universal._sub._ipp._tcp
!
service-list mdns-sd mixed permit 40
  match message-type announcement
!
match service-type _sleep-proxy._udp.local
!
match service-type _ipp._tcp.local
match service-type _ipps._tcp.local
match service-type _raop._tcp.local
!
service-routing mdns-sd

interface Ethernet0/0
description *** (wireless) Clients here plus some printers or aTVs
ip address 172.16.33.7 255.255.255.0
service-routing mdns-sd
  service-policy mixed IN
  service-policy permit-all OUT
!
interface Ethernet0/1
description *** AppleTVs, Print Servers here
ip address 172.16.57.1 255.255.255.0
service-routing mdns-sd
  service-policy permit-most IN
  service-policy permit-all OUT
!
interface Ethernet0/2
description *** Clients only, we don't want to learn anything here
ip address 172.16.58.1 255.255.255.0
service-routing mdns-sd
  service-policy deny-all IN
  service-policy permit-all OUT
!
interface Ethernet0/3
no ip address
shutdown
!

In the above example, the service-lists are:

- permit-all - As the name suggests, this service-list permits all resource records, and should be used with care. This is typically applied in the OUT direction; allows the cache to respond to all requests regardless of query content or query type.
- permit-most - This allows anything in, except for sleep-proxy services. This is because extending sleep-proxy services causes an issue with devices that register with a sleep proxy across the
Service Discovery Gateway. Due to split horizon, the real (sleeping) device won't be able to re-register its services when waking up again when its pointer (PTR) record is pointing to the sleep-proxy.

- **deny-all**: This prevents the cache from learning anything. Again incoming on a segment where only clients live. As a result, clients will be able to query for services from the cache (hence the permit 10 match query), but there is no need to learn anything from the clients.
- **mixed**: This is created to be used in client segments. In addition to clients (such as iPads, PCs, and so on), the occasional printer or a TV will also connect. The purpose here is to learn about those specific services but not about services the clients provide. The filter applied is IN. As a result, the following actions are applicable:
  - Allow every query IN.
  - Allow specific services in (such as printer services [IPP]).
  - Deny everything else.

In addition, to keep the service PTRs fresh in the cache an active query is configured. The active query queries for those services that we want to extend. Typically, this would match the services that have been configured as 'permitted' services in the IN filter. The value is set to 900 seconds. The duration is enough to refresh the PTRs as they typically have a TTL of 4500 seconds.

**Example: Creating a Service Instance**

```
Device> enable
Device# configure terminal
Device(config)# service-instance mdns-sd service printer-3 regtype _ipp._tcp.local domain tcp4
Device(config-mdns-sd-si)# ipv4addr 209.165.200.230 255.255.255.0
Device(config-mdns-sd-si)# port 9100
Device(config-mdns-sd-si)# txt _ipp._tcp.local=printer3
Device(config-mdns-sd-si)# priority 3
Device(config-mdns-sd-si)# weight 20
Device(config-mdns-sd-si)# exit
```

**Note**

When you create a service-instance, a text record is created even if you do not configure service-instance parameters.

**Additional References for Service Discovery Gateway**

**Related Documents**

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<thead>
<tr>
<th>Related Topic</th>
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<tr>
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<tr>
<td>IP Addressing Services Command Reference</td>
<td>Cisco IOS IP Addressing Services Command Reference</td>
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### Standards and RFCs

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<td>RFC 6763</td>
<td>DNS-Based Service Discovery</td>
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<td>Multicast DNS Internet-Draft</td>
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### MIBs

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<th>MIB</th>
<th>MIBs Link</th>
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<tbody>
<tr>
<td>No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.</td>
<td>To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a></td>
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### Technical Assistance

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<tr>
<td>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</td>
<td><a href="http://www.cisco.com/support">http://www.cisco.com/support</a></td>
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</table>

## Feature Information for Service Discovery Gateway

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to [www.cisco.com/go/cfn](http://www.cisco.com/go/cfn). An account on Cisco.com is not required.
Table 1: Feature Information for Service Discovery Gateway

<table>
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<tr>
<th>Feature Name</th>
<th>Releases</th>
<th>Feature Information</th>
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<tr>
<td>Service Discovery Gateway</td>
<td></td>
<td>The Service Discovery Gateway feature enables multicast Domain Name System (mDNS) to operate across L3 boundaries (different subnets). The following commands were introduced or modified: cache-memory-max, clear mdns cache, clear mdns statistics, debug mdns, match message-type, match service-instance, match service-type, redistribute mdns-sd, service-list mdns-sd, service-policy, service-policy-query, service-routing mdns-sd, show mdns cache, show mdns requests, show mdns statistics</td>
</tr>
<tr>
<td>Service Discovery Gateway—Phase 2</td>
<td></td>
<td>The Service Discovery Gateway feature was enhanced with additional filter and configuration options. The following commands were introduced or modified: clear mdns cache, clear mdns service-types, clear mdns statistics, designated-gateway, match location, rate-limit, service-instance mdns-sd, service-policy-proximity, service-routing mdns-sd, service-type-enumeration, show mdns cache, show mdns statistics, source-interface</td>
</tr>
</tbody>
</table>
| Service Discovery Gateway—Phase 3  |          | The Service Discovery Gateway feature was enhanced with the following features:  
  - **De-congestion of incoming mDNS traffic using the rate limiting mechanism**—The rate-limit value range was reset to 1-100 p/s.  
  - **Redistribution of service-withdrawal announcements across subnets when services are withdrawn, to improve mDNS cache efficiency and to avoid message loops**—The withdraw-only option was added to the redistribute mdns-sd command.  
  - **A filter criterion for services available and learnt on a specific interface**—The match learnt-interface command was added to filter services.  
  - **Enabling and disabling of periodic browsing of services on specific interfaces**—The service-policy-query (interface) command was added. For existing, globally configured active queries, the disable option was added to disable browsing of services on an interface, retaining the configurations on other interfaces.  
  
  The following commands were introduced or modified: match learnt-interface, rate-limit, redistribute mdns-sd, service-policy-query (interface)