

mDNS Enhancements

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Overview

Understanding Multicast DNS (mDNS)

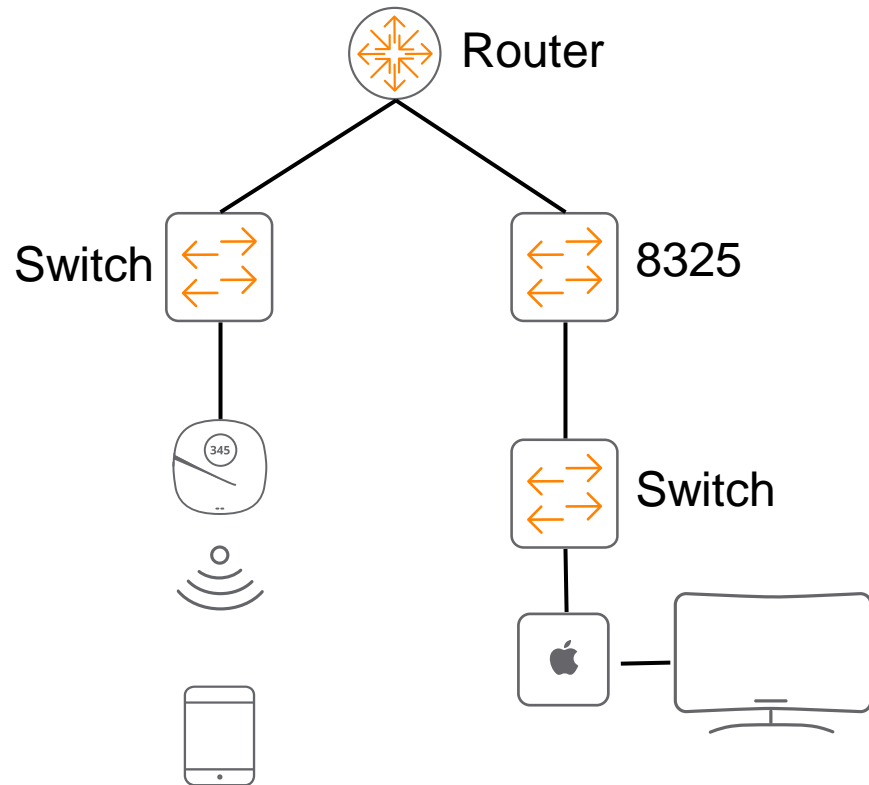
- Multicast Domain Name Service (mDNS) provides the ability for devices to discover various “servers” such as Apple printers, Apple TV, and Google’s Chromecast across VLANs using Multicast DNS service discovery (mDNS-SD)
- mDNS provides the ability to perform DNS-like operations on the local link without a typical Unicast DNS server¹
- mDNS uses a reflection mechanism which allows clients to discover various “services” across VLANs that are filtered based on the mDNS-SD profile
- AOS-CX 10.09 enhances support for the Aruba CX 8325, 8360, and 10000 switch platforms



Examples

Use cases

Screen Mirroring with Apple AirPlay



Use cases

Other notable use cases:

- Apple device streaming via AirPlay
- Apple Print
- Google Chromecast
- Windows network printer discovery
- Miracast (screen mirroring)

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Details

Feature Details

mDNS Reflection Mechanism

- mDNS-SD packets received in one VLAN will be reflected, via multicast, to all other mDNS-SD enabled VLANs based on the configured filters (mdns-sd profile) – DNS records are used as part of the mDNS process
- Only packets containing PTR, SRV, TXT, and A records will be supported for reflection
 - Pointer (PTR) Record: This record contains the service-name to service-instance name mapping.
 - Service (SRV) Record: This record contains service-instance name to UDP/TCP port number and hostname mapping.
 - Text (TXT) Record: This record contains the more information about the service-instance such as vendor information etc.
 - Address (A) Record: This record contains the Hostname to Host IP address mapping.

When a client in a VLAN sends a service request PTR record, the same will be reflected to all mdns-sd enabled VLANs

PTR Query

```
386 44.167180 10.201.200.90 224.0.0.251 MDNS
Authority RRs: 0
Additional RRs: 1
Queries
  _airplay._tcp.local: type PTR, class IN, "QU" question
    Name: _airplay._tcp.local
    [Name Length: 19]
    [Label Count: 3]
    Type: PTR (domain name PointeR) (12)
    .000 0000 0000 0001 = Class: IN (0x0001)
    1... .... = "QU" question: True
```

PTR Response

```
389 44.220708 10.201.200.95 224.0.0.251 MDNS 975 Stand
> Frame 389: 975 bytes on wire (7800 bits), 975 bytes captured (7800 bits) on interface
> Ethernet II, Src: Apple_ba:c2:d9 (90:dd:5d:ba:c2:d9), Dst: IPv4mcast_fb (01:00:5e:00:
> Internet Protocol Version 4, Src: 10.201.200.95, Dst: 224.0.0.251
> User Datagram Protocol, Src Port: 5353, Dst Port: 5353
  Multicast Domain Name System (response)
    Transaction ID: 0x0000
    > Flags: 0x8400 Standard query response, No error
    Questions: 0
    Answer RRs: 3
    Authority RRs: 0
    Additional RRs: 9
  Answers
    > Master bedroom_device-info._tcp.local: type TXT, class IN
    > _airplay._tcp.local: type PTR, class IN, Master bedroom._airplay._tcp.local
      Name: _airplay._tcp.local
      Type: PTR (domain name PointeR) (12)
      .000 0000 0000 0001 = Class: IN (0x0001)
      0... .... = Cache flush: False
      Time to live: 4500 (1 hour, 15 minutes)
      Data length: 17
      Domain Name: Master bedroom._airplay._tcp.local
```

Note: Multicast group IP 224.0.0.251 is used for mDNS

Scale and Caveats

Scale

- Max 256 VLANs – 6300/6400/8325/8360/10000
- Max 128 VLANs - 6200

Caveats

- Not supported on the Aruba CX 6000, 6100, 8320 and 8400 platforms
- No IPv6 mDNS service discovery
- Filtering is applied only on egress mDNS packets
- Filtering is performed only based on parameters extracted in the first mDNS record
- SSDP based discovery not supported
- mDNS packets are rate limited at 150 packets per second
- Only enable debugging for troubleshooting, debugging at high scale may lead to high CPU utilization and slow the system down

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Configuration

Feature/Solution configuration

- First, configure the mDNS service profile and services

```
mdns-sd service mdns-demo-service
  id _airplay._tcp
  id _appletv-v2._tcp
  id _roap._tcp
```

- Next, configure the profile with the desired action for the services

```
mdns-sd profile mdns-demo
  1 permit service-name mdns-demo-service
```

- Finally, enable mdns-sd globally and at the interface

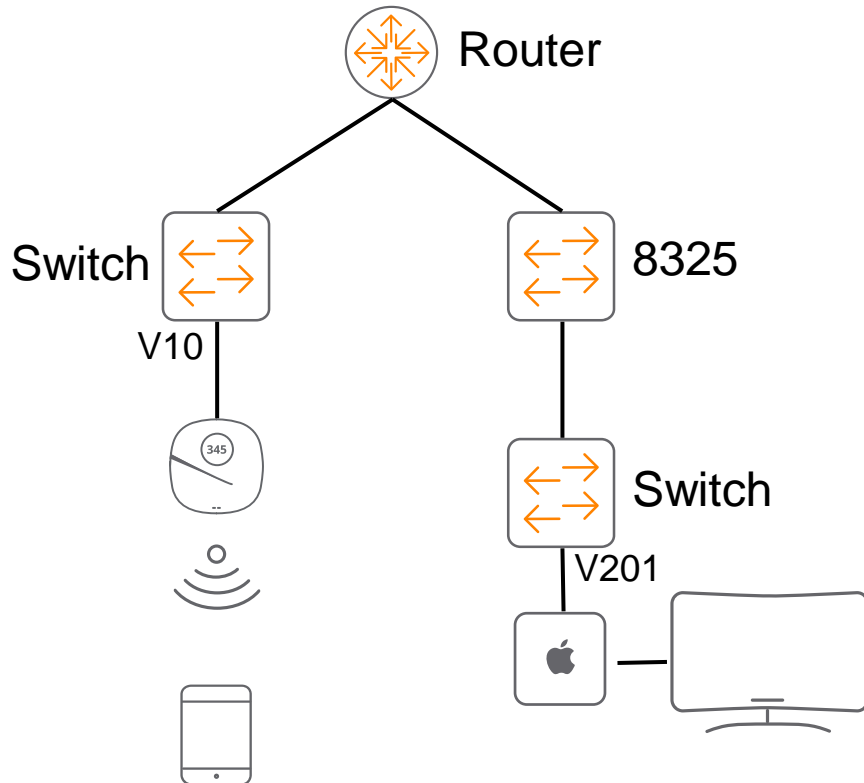
```
mdns-sd enable
interface vlan201
  mdns-sd
  mdns-sd apply-profile mdns-demo tx
  ip address 10.201.200.90/24
  ip ospf 1 area 0.0.0.0
exit
```


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Troubleshooting

Troubleshooting

- Have a topology diagram ready
- Ensure IPs, interface details are included
- Check physical cabling and generate “show tech” when opening a TAC case
- Check network: show LLDP neighbor, ensure underlay network works using ping and traceroute between loopbacks and interfaces, fix any issues found



- Recommended troubleshooting flow

1. Check mDNS services are configured correctly

2. Verify mDNS configs are correctly applied

3. Verify VLAN connectivity

4. Check hitcounts of mDNS service instance

5. Check debug output

1. Checking mDNS services

```
Switch(config)# show mdns-sd service-entries
mDNS-sd service-entries learnt from mDNS-SD enabled VLANs
```

```
MAC-Address : 90:dd:5d:ba:c2:d9
VLAN Id      : 200
Record Name  : _services._dns-sd._udp.local
Record Type  : PTR
TTL          : 4500
```

```
MAC-Address : 0e:04:fe:7d:31:20
VLAN Id      : 100
Record Name  : _dacp._tcp.local
Record Type  : PTR
TTL          : 4500
```

```
MAC-Address : 90:dd:5d:ba:c2:d9
VLAN Id      : 200
Record Name  : _airplay._tcp.local
Record Type  : PTR
TTL          : 4500
```

```
MAC-Address : 0e:04:fe:7d:31:20
VLAN Id      : 100
Record Name  : iTunes_Ctrl_7FDAC3699739D984._dacp._tcp.local
Record Type  : TXT
TTL          : 4500
```

1. Checking mDNS services - Continued

Check that the correct services are applied and permitted

```
Switch(config)# show run mdns-sd service
mdns-sd service appletv
    id _airplay._tcp
    id _appletv-v2._tcp
    id _roap._tcp
    id _xgrid._tcp
```

```
Switch(config)# show run mdns-sd profile
mdns-sd profile mdnsdemo
    10 permit service-name appletv
```

If denied, service ID queries and responses will be dropped (no response to _airplay.tcp)

▼ Multicast Domain Name System (response)

- > Transaction ID: 0x0000
- > Flags: 0x8400 Standard query response, No error
 - Questions: 0
 - Answer RRs: 1
 - Authority RRs: 0
 - Additional RRs: 1
- ▼ Answers
 - > Master bedroom._companion-link._tcp.local: type TXT, class IN, cache flush
- ▼ Additional records
 - > Master bedroom._companion-link._tcp.local: type NSEC, class IN, cache flush, next domain name Master bedroom._companion-link._tcp.local

[\[Retransmitted response. Original response in: 4971\]](#)
[Retransmission: True]

2. Verify mDNS configs are correctly applied

Check that the correct services are applied and permitted

Ensure that mDNS is enabled globally using the “show mdns-sd summary” command

```
Switch# show mdns-sd summary
global mdns-sd status: enabled
```

```
-----
VLAN STATUS      TX-Profile
-----
10    enabled     mdns-demo
201   enabled     mdns-demo
```

Ensure that mDNS is enabled at the interface level as well as the correct profile is applied

```
interface vlan10
  mdns-sd
  mdns-sd apply-profile mdns-demo tx
  ip address 10.5.8.42/24
  ip ospf 1 area 0.0.0.0
  exit
```


3. Verify VLAN connectivity

```
Switch# show run int vlan10
interface vlan10
  mdns-sd
  mdns-sd apply-profile mdns-demo tx
  ip address 10.5.8.42/24
  ip ospf 1 area 0.0.0.0
  exit
Switch# show run int vlan201
interface vlan201
  mdns-sd
  mdns-sd apply-profile mdns-demo tx
  ip address 10.201.200.90/24
  ip ospf 1 area 0.0.0.0
  exit
```

```
Switch# ping 10.5.8.42 source 10.201.200.90
PING 10.5.8.42 (10.5.8.42) from 10.201.200.90 : 100(128) bytes of data.
108 bytes from 10.5.8.42: icmp_seq=1 ttl=64 time=0.038 ms
108 bytes from 10.5.8.42: icmp_seq=2 ttl=64 time=0.037 ms
--- 10.5.8.42 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4087ms
rtt min/avg/max/mdev = 0.034/0.038/0.046/0.004 ms

Switch# ping 10.201.200.90 source 10.5.8.42
PING 10.201.200.90 (10.201.200.90) from 10.5.8.42 : 100(128) bytes of data.
108 bytes from 10.201.200.90: icmp_seq=1 ttl=64 time=0.036 ms
108 bytes from 10.201.200.90: icmp_seq=2 ttl=64 time=0.036 ms
--- 10.201.200.90 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4108ms
rtt min/avg/max/mdev = 0.036/0.036/0.037/0.000 ms
```

Check connectivity to upstream and downstream devices as well

4. Check hitcounts of mDNS service

```
Switch(config)# show mdns-sd statistics vlan
vlan1
Packets Received : 0
Packets Sent      : 0
Packets Dropped   : 0
Vlan10
Packets Received : 164
Packets Sent      : 3
Packets Dropped   : 205
vlan201
Packets Received : 44
Packets Sent      : 3
Packets Dropped   : 205
```

```
6300-UI(config)# show mdns-sd statistics profile mdnsdemo
-----
Sequence-Number Hit-Count
-----
10                6

Total number of packets permitted by the profile : 6
Total number of packets denied by the profile    : 424
```

5. Check debug output

Denied service entries are in bold – check service if permitted or denied

```
Switch(config)# debug mdns all
Switch(config)# debug destination buffer
Switch(config)# show debug buffer reverse

-----
show debug buffer
-----

2021-11-09:15:02:06.068388|svcdisc-gwd|LOG_DEBUG|CDTR|1|MDNS|MDNS_TIMER|mdns_remove_expired_entries:Removing expired service entries
2021-11-09:15:02:04.067913|svcdisc-gwd|LOG_DEBUG|CDTR|1|MDNS|MDNS_PACKET|parsing the MDNS Records
2021-11-09:15:02:04.012245|svcdisc-gwd|LOG_DEBUG|CDTR|1|MDNS|MDNS_PACKET|Freeing up <0x336b6b0>, <0x3369350>, <0x3376540>
2021-11-09:15:02:04.012224|svcdisc-gwd|LOG_DEBUG|CDTR|1|MDNS|MDNS_PACKET|Received mDNS packet
2021-11-09:15:02:04.012196|svcdisc-gwd|LOG_DEBUG|CDTR|1|MDNS|MDNS_PACKET|RX mdns Packet: cnt 65241, <0x336b6b0>, <0x3369350>, <0x3376540>
2021-11-09:15:02:04.012171|svcdisc-gwd|LOG_DEBUG|CDTR|1|MDNS|MDNS_PACKET|match_service_name FAIL: in <lb._dns-sd._udp.local>, filt <appletv>
2021-11-09:15:02:04.012149|svcdisc-gwd|LOG_DEBUG|CDTR|1|MDNS|MDNS_PACKET|Looking Out-Profile:<mdnsdemo> match for Vlan 100
2021-11-09:15:02:04.012129|svcdisc-gwd|LOG_DEBUG|CDTR|1|MDNS|MDNS_PACKET|match_service_name FAIL: in <lb._dns-sd._udp.local>, filt <appletv>
2021-11-09:15:02:04.012104|svcdisc-gwd|LOG_DEBUG|CDTR|1|MDNS|MDNS_PACKET|Looking Out-Profile:<mdnsdemo> match for Vlan 200
2021-11-09:15:02:04.012073|svcdisc-gwd|LOG_DEBUG|CDTR|1|MDNS|MDNS_PACKET|MDNS CTX: QUERY, record_type <12>, service_name <lb._dns-sd._udp.local>, service_inst_name <>
2021-11-09:15:02:04.012047|svcdisc-gwd|LOG_DEBUG|CDTR|1|MDNS|MDNS_PACKET|parsing the first Record of QUERY:
2021-11-09:15:02:04.012020|svcdisc-gwd|LOG_DEBUG|CDTR|1|MDNS|MDNS_PACKET|Dropped 32 log messages in last 2 seconds (most recently, 2 seconds ago) due to excessive rate
```

If permitted – entries will be parsed

```
2021-11-09:15:08:09.254479|svcdisc-gwd|LOG_DEBUG|CDTR|1|MDNS|MDNS_PACKET|parsing the Record 4 name
90DD5DBAC2D9\064Master\032bedroom._raop._tcp.local
2021-11-09:15:08:09.254460|svcdisc-gwd|LOG_DEBUG|CDTR|1|MDNS|MDNS_PACKET|parsing the Record 3 name Master\032bedroom._airplay._tcp.local
2021-11-09:15:08:09.254438|svcdisc-gwd|LOG_DEBUG|CDTR|1|MDNS|MDNS_PACKET|parsing the Record 2 name
90DD5DBAC2D9\064Master\032bedroom._raop._tcp.local
2021-11-09:15:08:09.254414|svcdisc-gwd|LOG_DEBUG|CDTR|1|MDNS|MDNS_PACKET|parsing the Record 1 name Master\032bedroom._airplay._tcp.local
```


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Demo



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Thank you

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