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The bridge to possible

Deploying and Troubleshooting Wide Area Bonjour

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BRKTRS-3011

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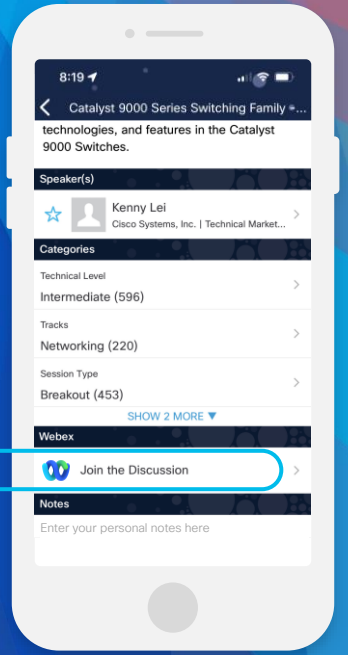

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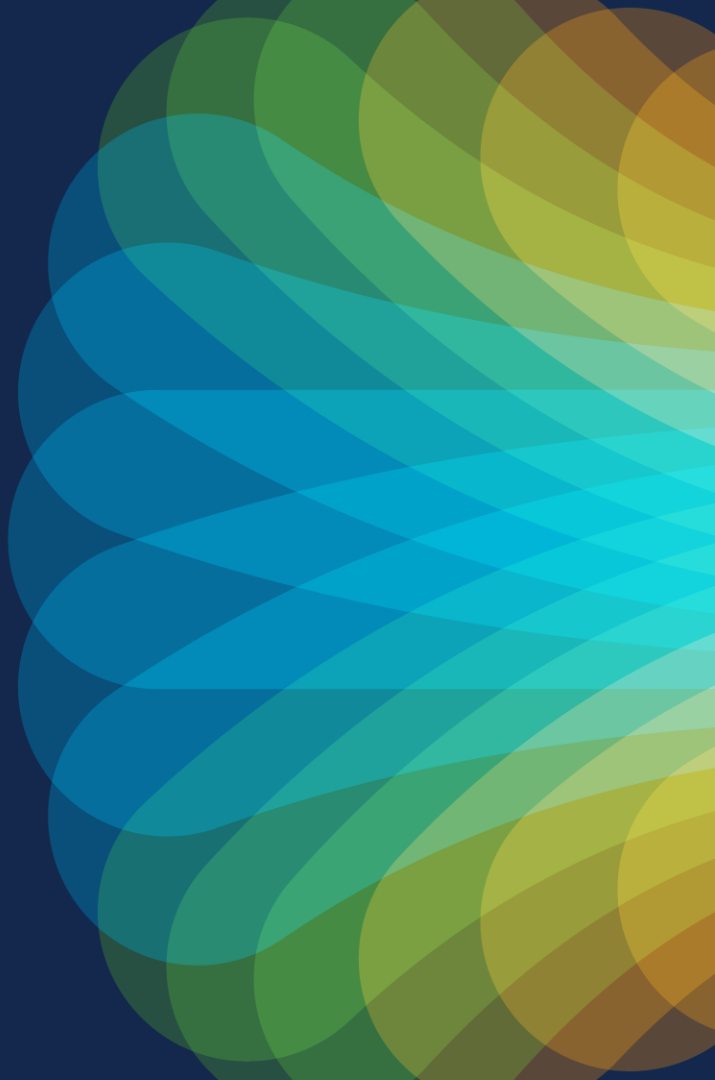
Agenda

- Bonjour Challenges in Enterprise Networks
- Local and Wide Area Bonjour
- Device Configuration
- Cisco DNA Center Configuration
- Wired Bonjour Troubleshooting
- Wireless Bonjour Troubleshooting
- Wide Area Bonjour Troubleshooting
- Appendix

Bonjour Challenges in Enterprise Networks – Performance and Security



Bonjour in Enterprise Networks

Invented by Apple in 2002

ZeroConf Service Solution

Uses multicast Domain Name System (mDNS) service records

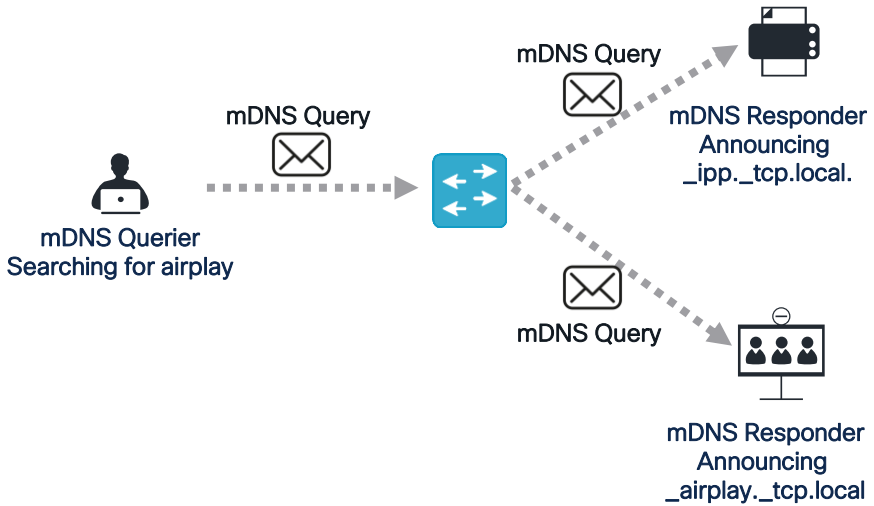
mDNS packets cannot be routed

Global Enterprise Customers

Join us in BRKENS-2097 for more details about Bonjour Architecture and Best Practices!

Multicast DNS Operation

Giant Home Network – Query Flooding

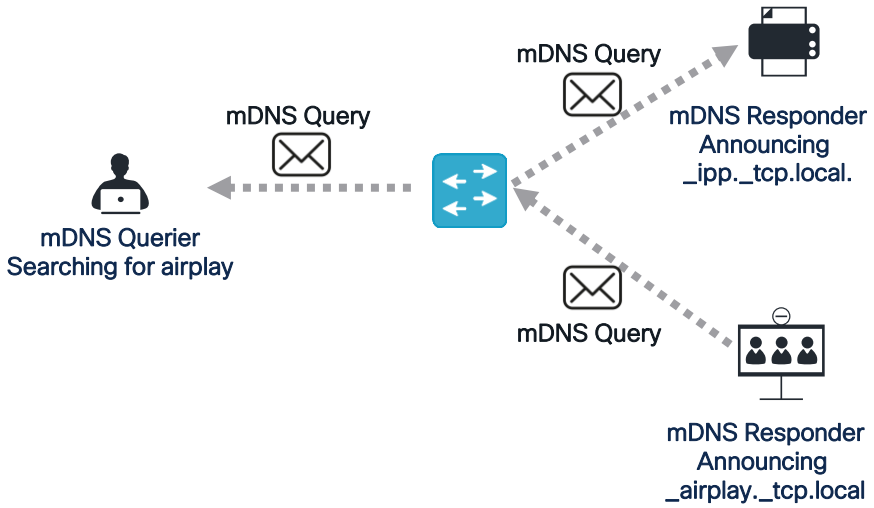



```
10… 2023-04… 172.19.10.15        224.0.0.251     103 MDNS    Standard quer
<
› Frame 1003: 103 bytes on wire (824 bits), 103 bytes captured (824 bits)
› Ethernet II, Src: VMware_b3:0e:e7 (00:50:56:b3:0e:e7), Dst: IPv4mcast_
› Internet Protocol Version 4, Src: 172.19.10.15, Dst: 224.0.0.251
› User Datagram Protocol, Src Port: 5353, Dst Port: 5353
⌄ Multicast Domain Name System (query)
    Transaction ID: 0x0000
  › Flags: 0x0000 Standard query
    Questions: 2
    Answer RRs: 0
    Authority RRs: 0
    Additional RRs: 0
  ⌄ Queries
    › _sleep-proxy._udp.local: type PTR, class IN, "QM" question
    ⌄ _airplay._tcp.local: type PTR, class IN, "QM" question
        Name: _airplay._tcp.local
        [Name Length: 19]
        [Label Count: 3]
        Type: PTR (domain name PoinTeR) (12)
        .000 0000 0000 0001 = Class: IN (0x0001)
        0... .... .... .... = "QU" question: False
```

Multicast Group : 224.0.0.251

Multicast DNS Operation

Giant Home Network – Response Flooding

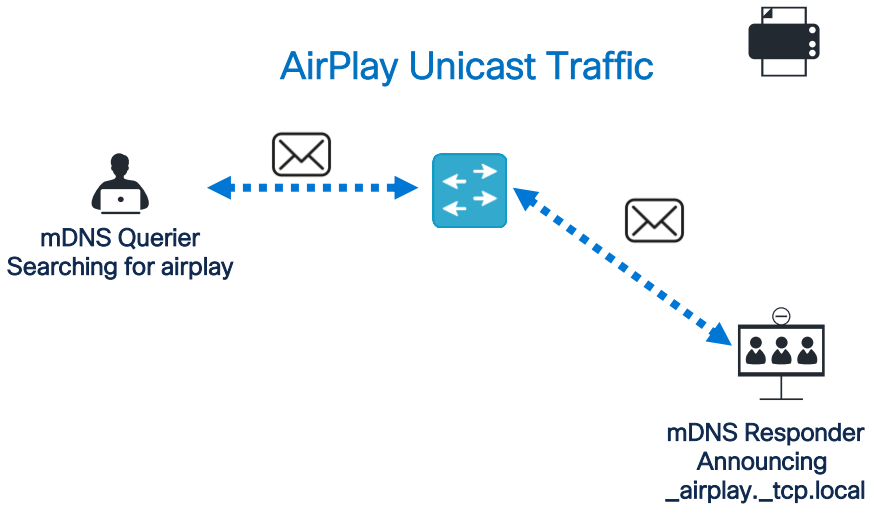



```
10… 2023-04… 172.19.10.1        224.0.0.251    173 MDNS   Standard
Frame 1082: 173 bytes on wire (1384 bits), 173 bytes captured (1
Ethernet II, Src: Cisco_44:f6:f5 (6c:71:0d:44:f6:f5), Dst: VMware
Internet Protocol Version 4, Src: 172.19.10.1, Dst: 224.0.0.251
User Datagram Protocol, Src Port: 5353, Dst Port: 5353
Multicast Domain Name System (response)
  Transaction ID: 0x0000
  Flags: 0x8000 Standard query response, No error
  Questions: 0
  Answer RRs: 1
  Authority RRs: 0
  Additional RRs: 3
  Answers
    _airplay._tcp.local: type PTR, class IN, My_Bonjour_Service._
  Additional records
    My_Bonjour_Service._airplay._tcp.local: type SRV, class IN, p
    DESKTOP-TN2FL74-2.local: type A, class IN, addr 172.19.10.31
    My_Bonjour_Service._airplay._tcp.local: type TXT, class IN
```

Multicast Group : 224.0.0.251

Multicast DNS Operation

Successful Discovery



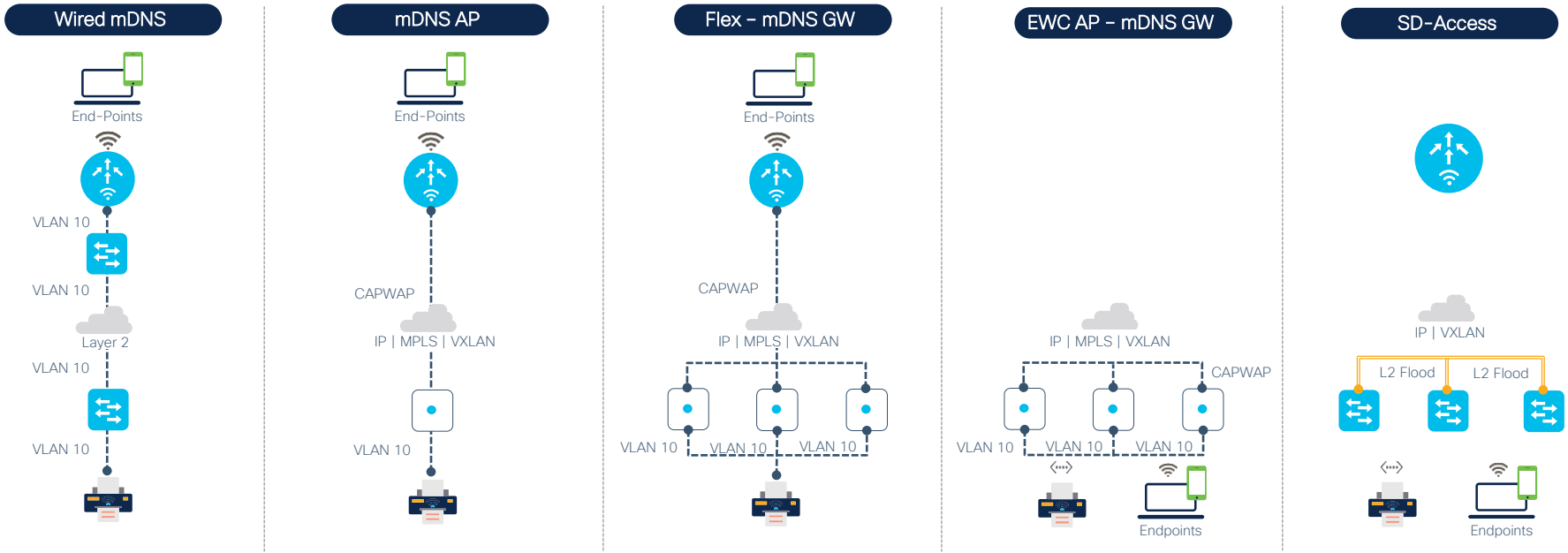
- mDNS traffic is only used to learn the IP address of the mDNS responder offering the requested service
- After mDNS resolves, the mDNS querier can initiate a connection to the IP address of the responder
- Only mDNS traffic is flooded, traffic between endpoints is unicast which is switched or routed

Multicast DNS Operation

- mDNS packets have IP TTL=1 and use a link-local multicast address that cannot be routed
- Announcements (mDNS responses) have a time-to-live value in the mDNS payload, this will maintain service-to-IP mapping information cached on a device for that amount of time
- Once the mDNS time-to-live reaches 0, mappings will be purged from the endpoint cache
- Responders can deliberately send mDNS responses with a time-to-live value of 0 to withdraw themselves before the time-to-live expires
- mDNS packet exchange can occur in any NIC on the endpoint, including Bluetooth adapters

Challenges in Enterprise

Service on a Stick



Challenges in Enterprise

Service on a Stick

Single Network visibility

Single Local Gateway

No End-to-End Solution

Not Scalable

Challenges in Enterprise

Service on a Stick

Single Network visibility

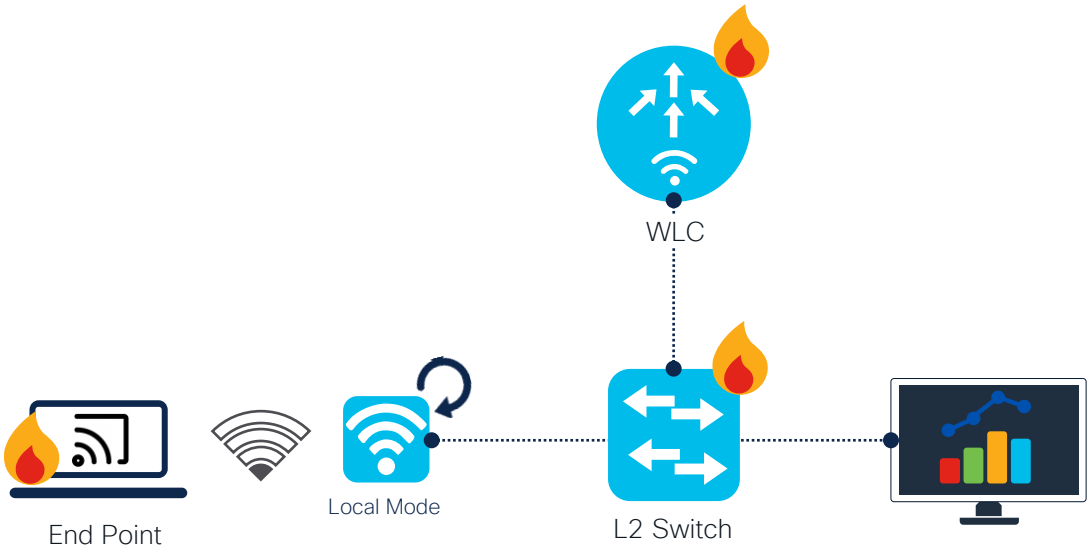
Limited Wired Service

L2 Flooded Networks

Not Scalable

Challenges in Enterprise

Service on a Stick



- High CPU/Memory Usage
- High TCAM Utilization
- Unexpected AP reloads
- Poor Wi-Fi
- Problem with Endpoints

End to End Performance Impact

High CPU in Switches

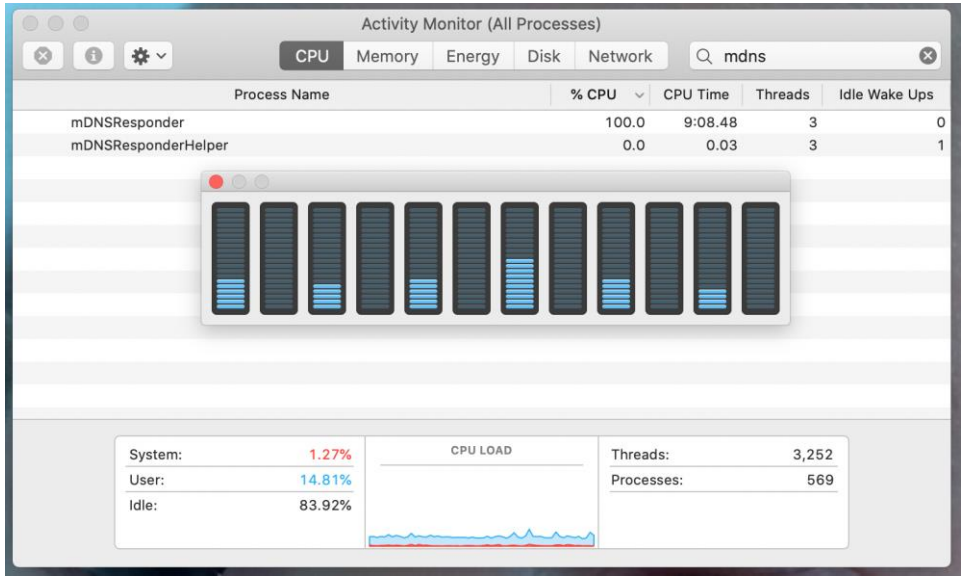
```
SDG#
SDG#show processes cpu history


     11111111111111111111111111111         111111111111111111
     00000000000000000000000000000099999999990000000000000000000
     00000000000000000000000000000099999999990000000000000000000
 100 ***********************************************************
  90 ***********************************************************
  80 ***********************************************************
  70 ***********************************************************
  60 ***********************************************************
  50 ***********************************************************
  40 ***********************************************************
  30 ***********************************************************
  20 ***********************************************************
  10 ***********************************************************
    0....5....1....1....2....2....3....3....4....4....5....5....6
              0    5    0    5    0    5    0    5    0    5    0
              CPU% per second (last 60 seconds)



     1111111111111111111111111111111111
     0000000000000000000000000000000034442114121122221211111111

SDG#show processes cpu sorted
CPU utilization for five seconds: 100%/1%; one minute: 99%; five minutes: 99%
 PID Runtime(ms)     Invoked      uSecs   5Sec   1Min   5Min TTY Process
 256     2779111     2270772       1223 97.19% 97.06% 97.00%   0 mDNS
 135      145243     2090383         69  0.96%  0.98%  0.96%   0 IOSXE-RP Punt Se
 253       23013      120185        191  0.96%  0.88%  0.86%   0 IP Input
 608       61373       28450       2157  0.24%  0.16%  0.17%   0 mDNS ctlr
 252      357139    59573990          5  0.08%  0.00%  0.00%   0 IP ARP Retry Age
```

```
five minutes: 99%
 TTY Process
   0 mDNS
```

- **Every** mDNS packet is punted to the CPU for processing
- All mDNS packets are flooded to other switches, mDNS flooding can impact several network devices at once
- CPU hogs can cause memory leaks and other malfunctions that can lead to network outages.

End to End Performance Impact

Impact on endpoints



- mDNS packets are also processed by endpoints; unnecessary flooding can lead to high CPU in endpoints
- High CPU conditions can lead to device overheating, noise caused by spinning fan, poor battery life and potential permanent damage in the long term.
- mDNS packets can be sent twice by endpoints, in IPv4 and IPv6!
- Apples to Apples: An Analysis of the Effects of mDNS Traffic | Bryan Ward | WLPC Phoenix 2023

mDNS Security

Flood and Learn Based Attacks

US Department of Homeland Security
https://www.cisa.gov/news-events/alerts/2014/01/17/udp-based-amplification-attacks

European Union Agency of Cybersecurity
https://www.enisa.europa.eu/publications/enisa-threat-landscape-2020-distributed-denial-of-service/at_download/fullReport

National Cybersecurity Center of Ireland
https://www.ncsc.gov.ie/emailsfrom/Shadowserver/DoS/mDNS/

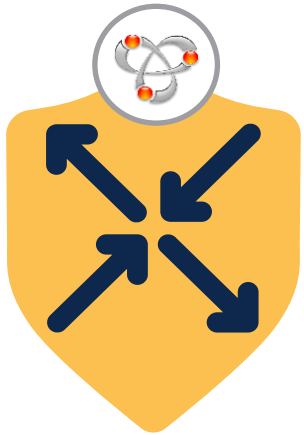
Industry-wide Recognized CyberSecurity Services
https://docs.fluidattacks.com/criteria/vulnerabilities/084/

mDNS Attack Github Tools

- dns-amplification-attack
- dns-attacks
- dns-poisoning-tool
- ddos-attacks
- dns-spoof
- LLMNR/NBNS/mDNS Spoofing Detection Toolkit
- Framework for Man-In-The-Middle attacks

mDNS Security

Built-In Security



Reflection

- Built-in IANA PTR support
- Enumerated Query Blocked
- Strict Policy Enforcement

Amplification

- Rate-limited Query Flood
- Unicast Query Blocked
- Advanced Query Mgmt

MiTM Spoofing

- Flood-free L2 networks
- Limited to PTR Query only
- Authentic source discovery

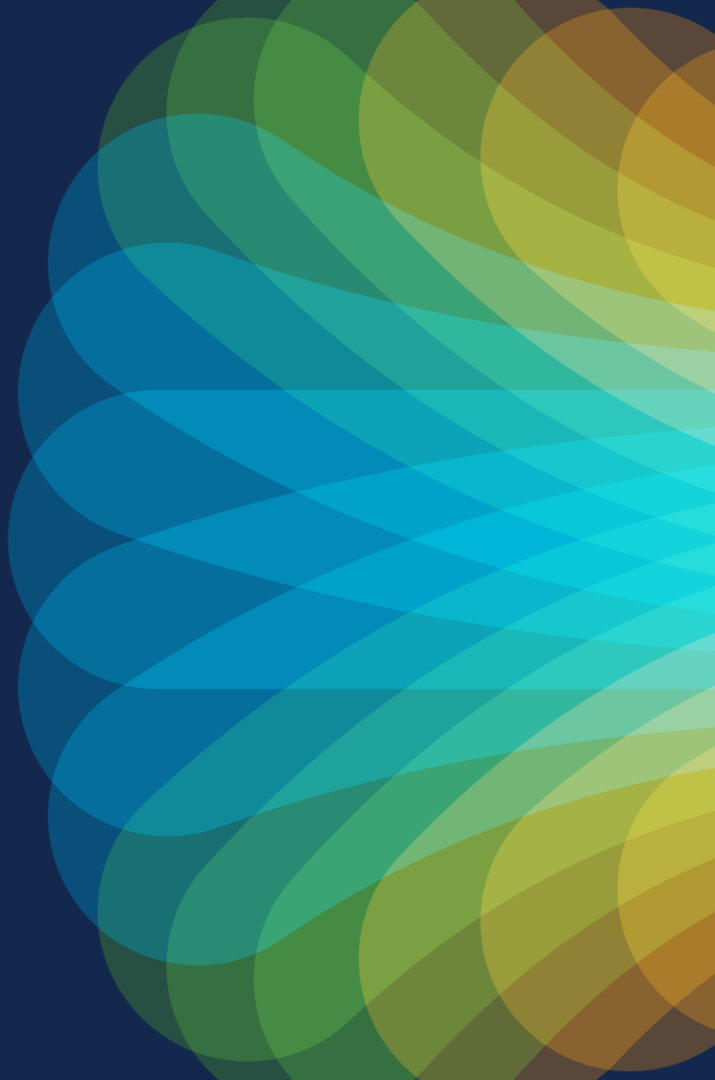
Poisoning

- Role-based mDNS Policy
- Secure service distribution
- Dynamic Policy Enforcement

Resource

- Protected Resource Utilization
- HW-based rate-limiters
- Secure endpoint devices

Cisco DNA Service for Bonjour Solution Overview



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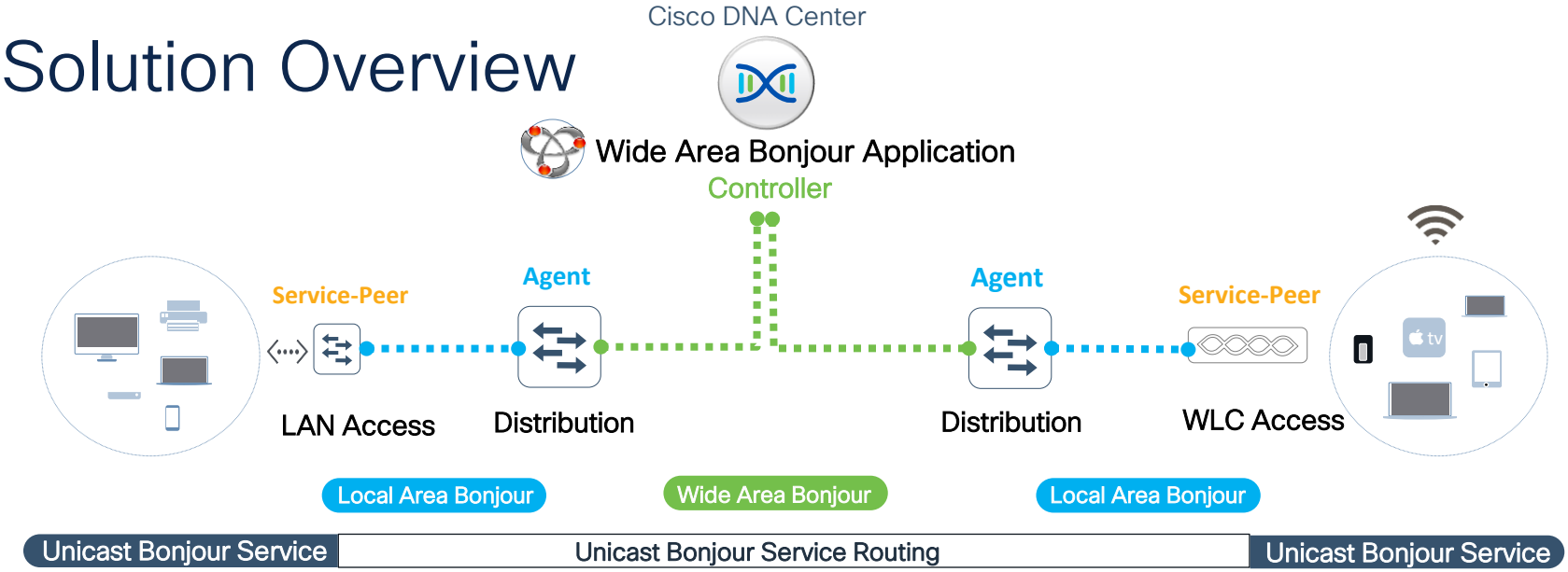
Solution Overview



Hierarchical

- 2-Tier Service Routing
- Structured Role and Function
- mDNS Flood-Free Networks

Secure

- Policy-Based Service Management
- IT controlled deterministic services
- Protected network flood boundaries

Location

- Deep granular location-based service
- Location-aware Wide Area Bonjour
- Flexible design any Enterprise Network

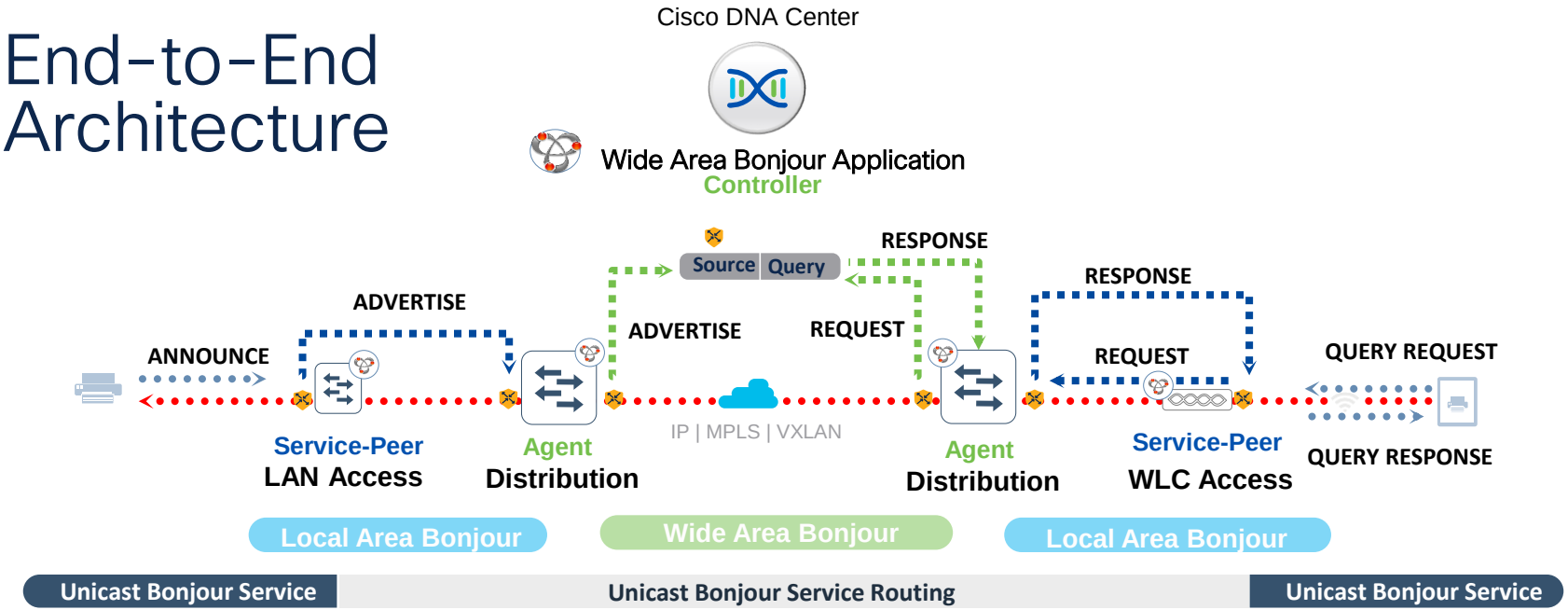
Performance

- Improved system performance
- Increase network bandwidth
- Flexible design any Enterprise Network

Battery Life

- May assist improve battery-life
- On-demand Query response mode
- Increase Wireless network bandwidth

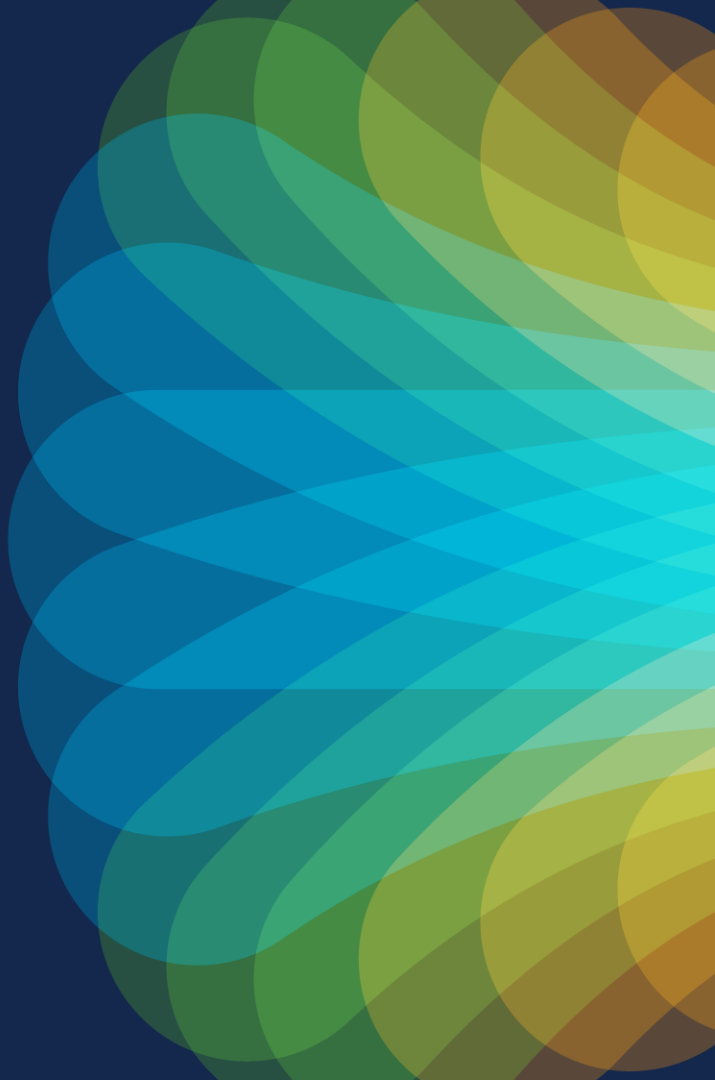
End-to-End Architecture



Wide Area Bonjour

- Policy-based Processing
- Centralized Service Lookup
- Distributed Data-Plane
- Follows Network Security

Local and Wide Area Bonjour

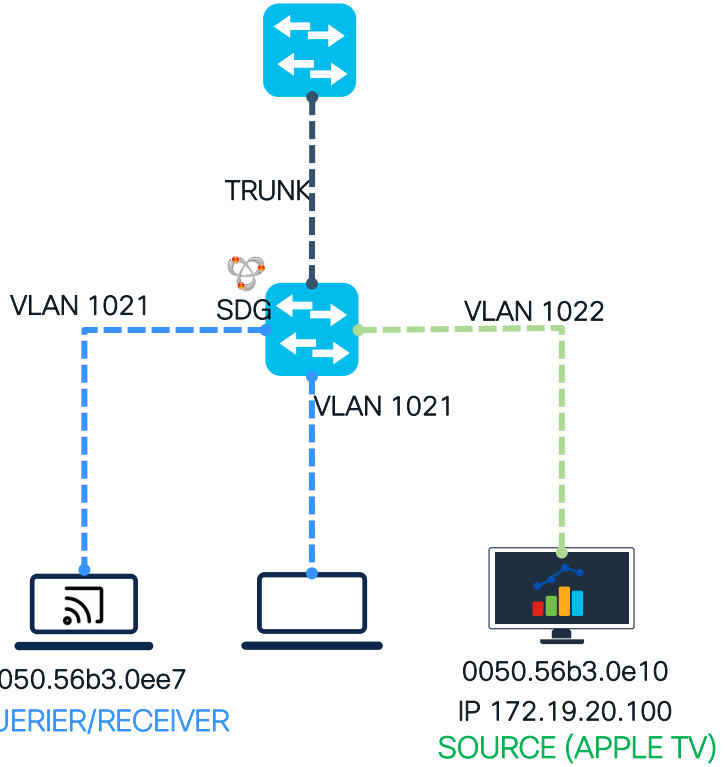


Local Area Bonjour – Service Discovery Gateway

Single Service Discovery Gateway – Sample Topology

Diagram Highlights

- Layer 3 switch acting as Service Discovery Gateway for VLAN 1021 and VLAN 1022
- An upstream switch connected with a trunk allowing both VLANs
- An mDNS querier in VLAN 1021: 0050.56b3.0ee7
- A normal endpoint **not sending any mDNS packet** in VLAN 1021
- An mDNS responder in VLAN 1022, with an IP of 172.19.20.100



Local Area Bonjour – Service Discovery Gateway

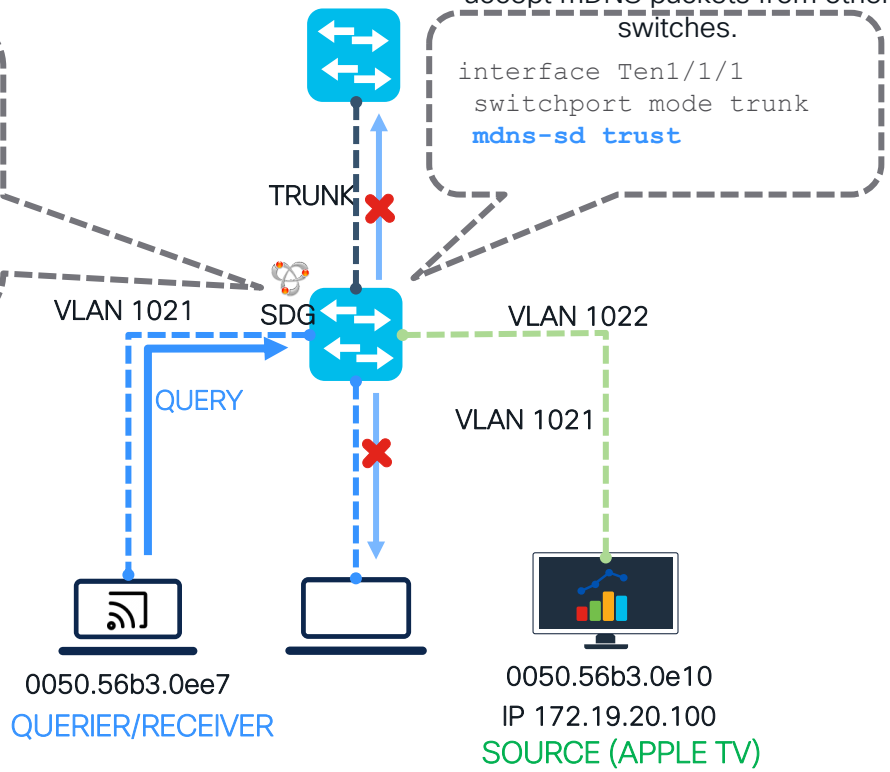
Inter-VLAN Service Routing – **Query** Snooping

```
Switch#show mdns query-db
-----------------------------------------------------
--------------
Client MAC        Vlan ID     Location ID     User Role
-----------------------------------------------------
--------------
PTR Name: _airplay._tcp.local
0050.56b3.0ee7     1021          Default      none
```

- The mDNS query-DB table is created from query packets snooped from clients by the mDNS snooping feature.
- mDNS packets are filtered in egress direction to all ports in the VLAN.
- This flood prevention mechanism is one of the main features of mDNS snooping, enabled with Bonjour.

mDNS trust ports are configured to **not** accept mDNS packets from other switches.

```
interface Ten1/1/1
 switchport mode trunk
 mdns-sd trust
```



Local Area Bonjour – Service Discovery Gateway

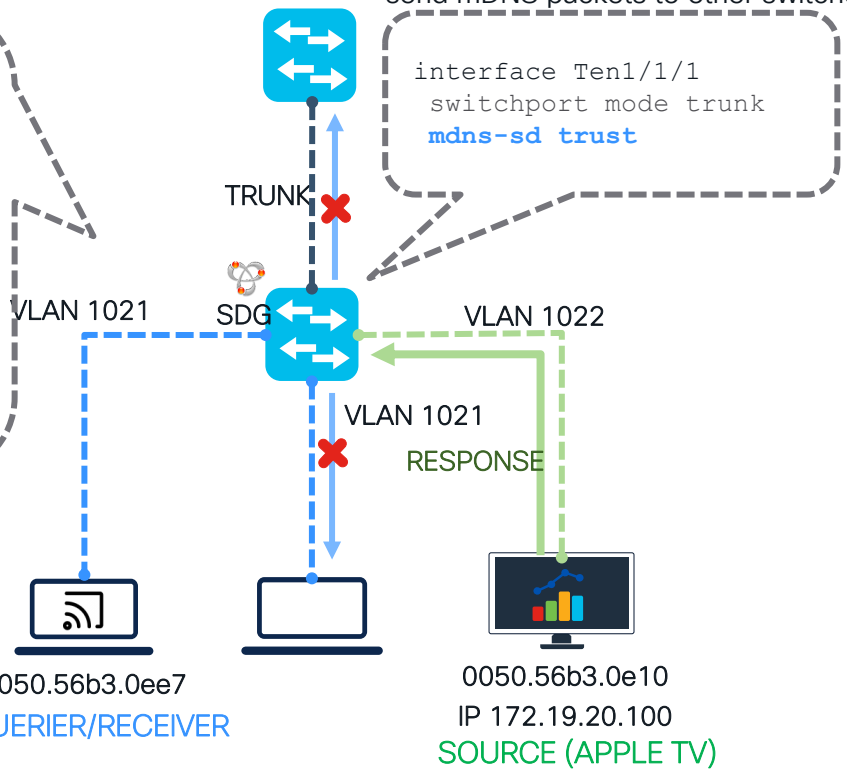
Inter-VLAN Service Routing – **Response** Snooping

```
Switch#show mdns cache
                                        mDNS CACHE
============================================================
====================================
[<NAME>]                  [<TYPE>][<TTL>/Remaining][Vlan-Id/If-
name] [Mac Address] [<RR Record Data>]

_airplay._tcp.local        PTR      4500/4465        1022       00
50.56b3.0e10  Test._airplay._tcp.local
Test._airplay._tcp.local   SRV      4500/4465        1022       00
50.56b3.0e10  0        0        515
Test._airplay._tcp.local   TXT      4500/4465        1022       00
50.56b3.0e10  (1)''
My_Host.local              A        4500/4465        1022       00
50.56b3.0e10  172.19.20.100
```

Like the mDNS query-DB table, the mDNS cache table stores information about endpoints by snooping the mDNS response packets.

mDNS trust ports are configured to **not** send mDNS packets to other switches.

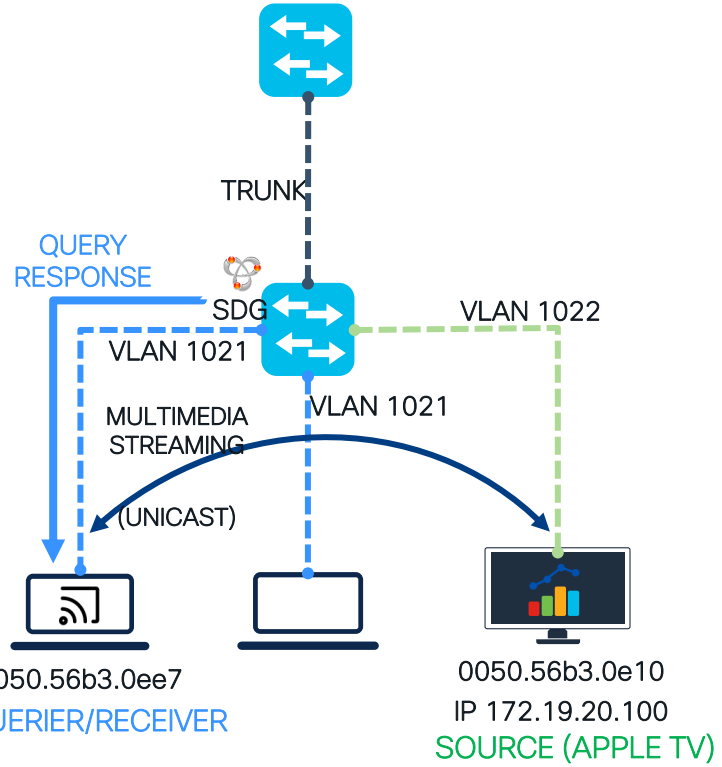
```
interface Ten1/1/1
 switchport mode trunk
 mdns-sd trust
```



Local Area Bonjour – Service Discovery Gateway

Inter-VLAN Service Routing – **Proxy Response** and successful discovery

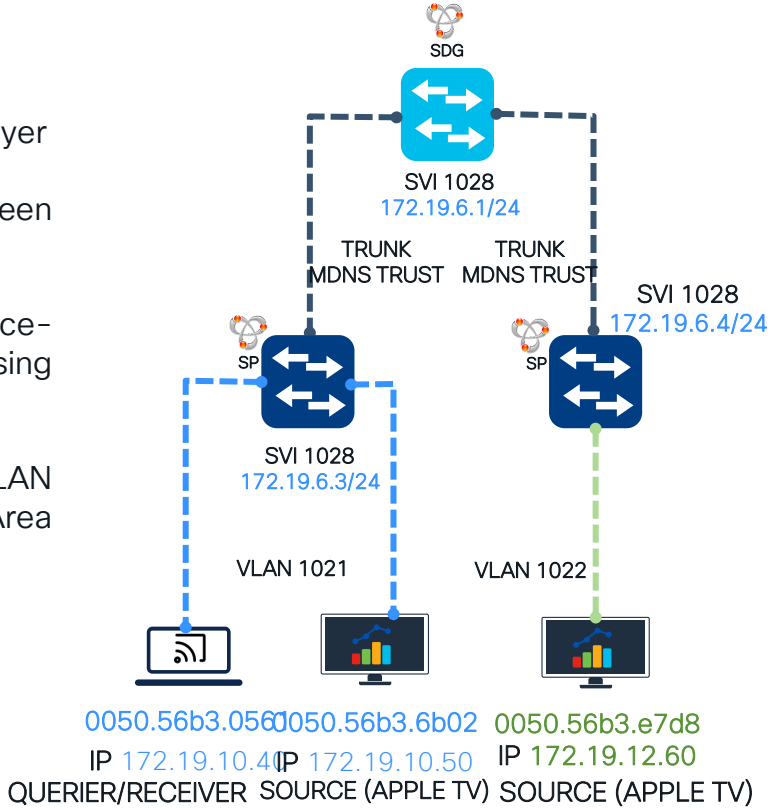
- After the mDNS source is stored in the mDNS cache, the SDG can send a “proxy” response **only** to endpoints in the mDNS query-DB table registered for that service (airplay).
- The mDNS response is sent as **unicast** to the queriers, endpoints that did not request an mDNS service will not receive any mDNS packet.
- This two-way packet exchange allows 0050.56b3.0ee7 to discover remote mDNS sources. Actual service traffic (screen share, streaming, printing, etc.) is **unicast** traffic.



Local Area Bonjour – Service Peer

Service Peers

- Service-Peers are ***Layer 2*** devices closer to the access layer
- Service-Peers can perform **service routing** between endpoints on the same VLAN
- They require an SDG to be defined to perform service-routing between other Service-Peers or remote SDGs, using unicast
- Layer 2 Catalyst Switches and Catalyst Wireless LAN controllers are considered Service-Peers in the Wide Area Bonjour solution



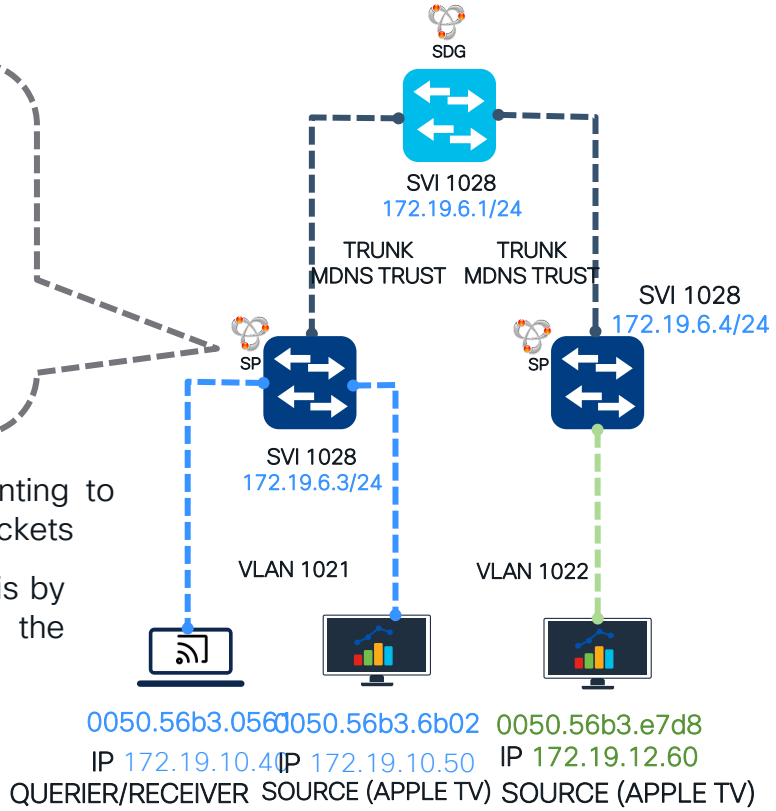
Local Area Bonjour – Service Peer

Service Peers – Service Peer Role

```
Ex_Node2#show mdns-sd summary
Global mDNS Gateway
====================================
mDNS Gateway          : Enabled
Rate Limit            : 60 PPS (default)
AirPrint Helper       : Disabled
Mode                  : Service-Peer
SDG Agent IP          : 172.19.6.1
Source Interface      : Vl1028
  . . .
```

Layer 2 switches are configured as “service-peers”, pointing to the SDG IP address in order to exchange mDNS unicast packets

The source-interface used for this unicast communication is by default elected as the outgoing interface used to reach the SDG IP, and is also configurable



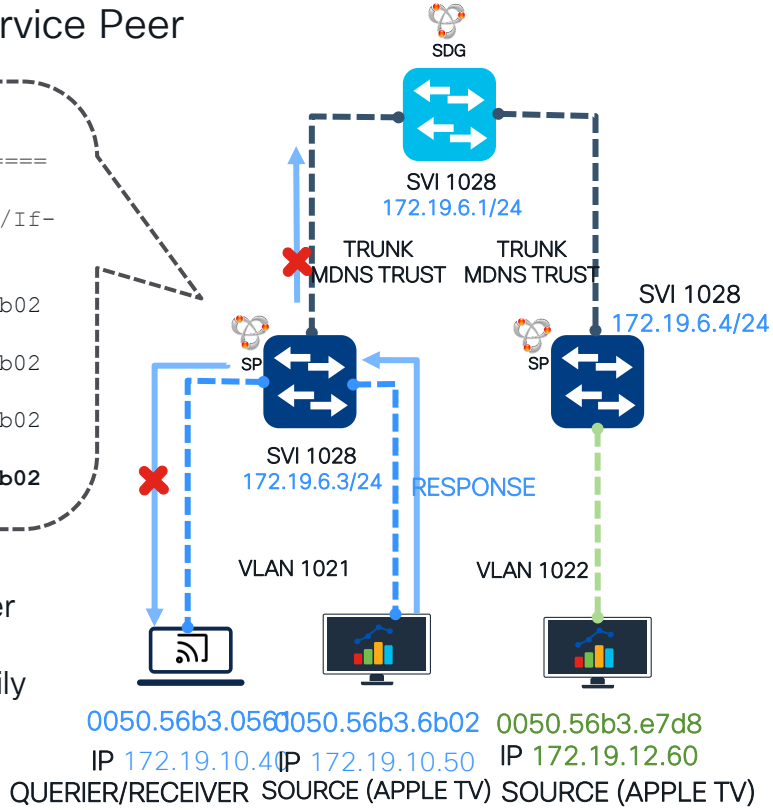
Local Area Bonjour – Service Peer

Service Peers - Registering a Service from a Service Peer

```
Ex_Node2#show mdns cache
                                                mDNS CACHE
================================================================
==================================
[<NAME>]                        [<TYPE>][<TTL>/Remaining][Vlan-Id/If-
name] [Mac Address] [<RR Record Data>]

_airplay._tcp.local          PTR    4500/3261   1021   0050.56b3.6b02
PC1._airplay._tcp.local
PC1._airplay._tcp.local      SRV    4500/3261   1021   0050.56b3.6b02
0    0    515      PC1.local
PC1._airplay._tcp.local      TXT    4500/3261   1021   0050.56b3.6b02
(1)''
PC1.local                    A      4500/3261   1021   0050.56b3.6b02
172.19.10.50
```

Services announced by mDNS responders will create a mDNS cache entry in the directly connected Service-Peer

mDNS snooping prevents packets from being unnecessarily flooded on all ports in the VLAN



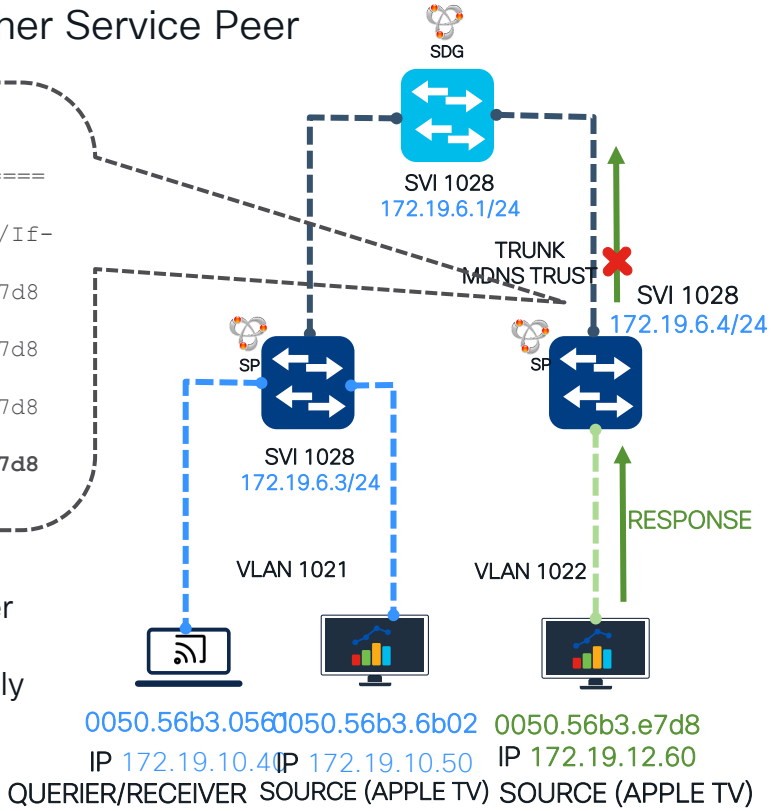
Local Area Bonjour – Service Peer

Service Peers - Registering a Service from another Service Peer

```
Ex_Node3#show mdns cache
                                        mDNS CACHE
================================================================
==================================
[<NAME>]                    [<TYPE>][<TTL>/Remaining][Vlan-Id/If-
name] [Mac Address] [<RR Record Data>]
_airplay._tcp.local         PTR    4500/3261   1022   0050.56b3.e7d8
PC2._airplay._tcp.local
PC2._airplay._tcp.local     SRV    4500/3261   1022   0050.56b3.e7d8
0    0    515      PC2.local
PC2._airplay._tcp.local     TXT    4500/3261   1022   0050.56b3.e7d8
(1)''
PC2.local                   A      4500/3261   1022   0050.56b3.e7d8
172.19.12.60
```

Services announced by mDNS responders will create a mDNS cache entry in the directly connected Service-Peer

mDNS snooping prevents packets from being unnecessarily flooded on all ports in the VLAN

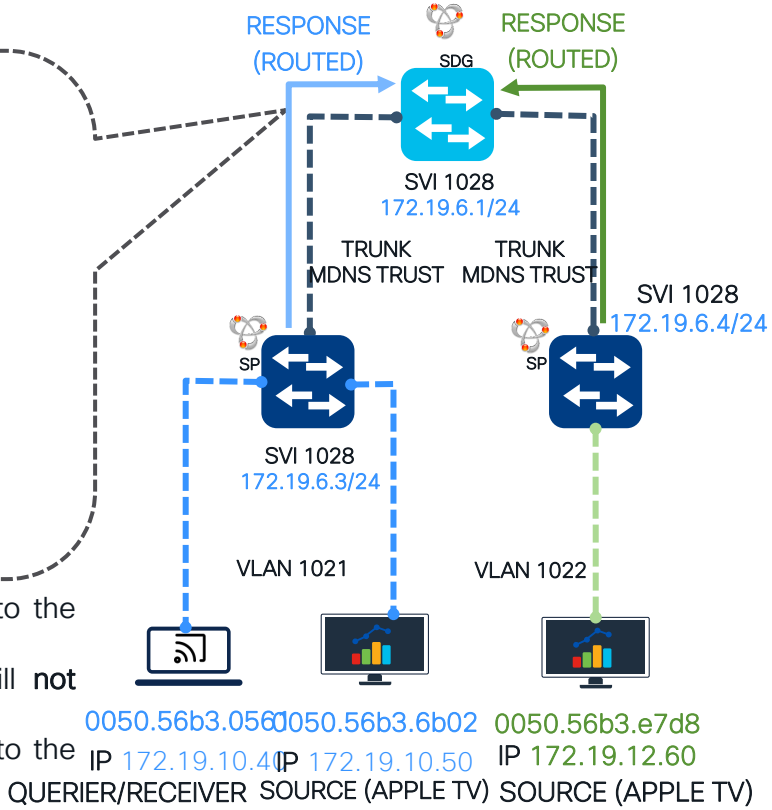


Local Area Bonjour – Service Peer

Service Peers - Exporting a Service to an SDG

```
Edge#show mdns cache type PTR detail | i
Name|MAC|Peer|Record|Vlan
Name                          : _airplay._tcp.local
 MAC Address                  : 0050.56b3.6b02
 Record Data                  : PC1._airplay._tcp.local
 Exported Records             : V4
 Service-Peer-id              : 172.19.6.3
 Vlan/Location-group          : 1021/0
 VRF Name / VRF id            : Campus / 3
Name                          : _airplay._tcp.local
 MAC Address                  : 0050.56b3.e7d8
 Record Data                  : PC2._airplay._tcp.local
 Exported Records             : V4
 Service-Peer-id              : 172.19.6.4
 Vlan/Location-group          : 1022/0
 VRF Name / VRF id            : Campus / 3
```

- mDNS cache information will be routed from the **service peer** to the **SDG** as **unicast.**
- mDNS cache entries in SDGs created from Service-Peers will **not** decrease their TTL (4500 seconds).
- Expired mDNS records in a service peer will trigger an update to the SDG to purge the mDNS cache in a remote way.

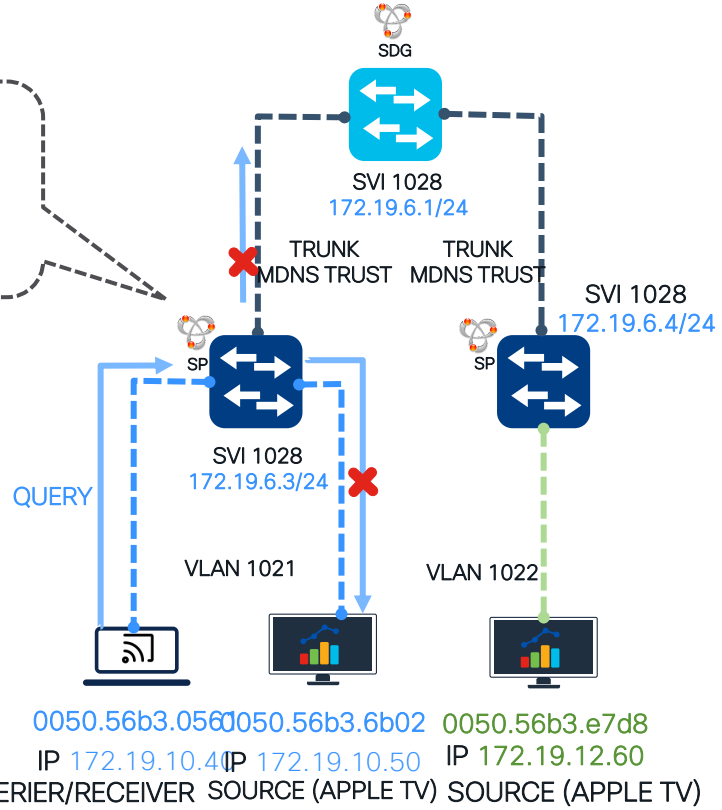


Local Area Bonjour – Service Peer

Service Peers - Accepting a Query in an SDG

```
Ex_Node2#show mdns query-db
---------------------------------------------------------------
Client MAC      TTL    Vlan ID  Location ID  User Role
---------------------------------------------------------------
PTR Name: _airplay._tcp.local
0050.56b3.0561  118    1021     Default      none
```

mDNS queries create query-DB entries on the SP



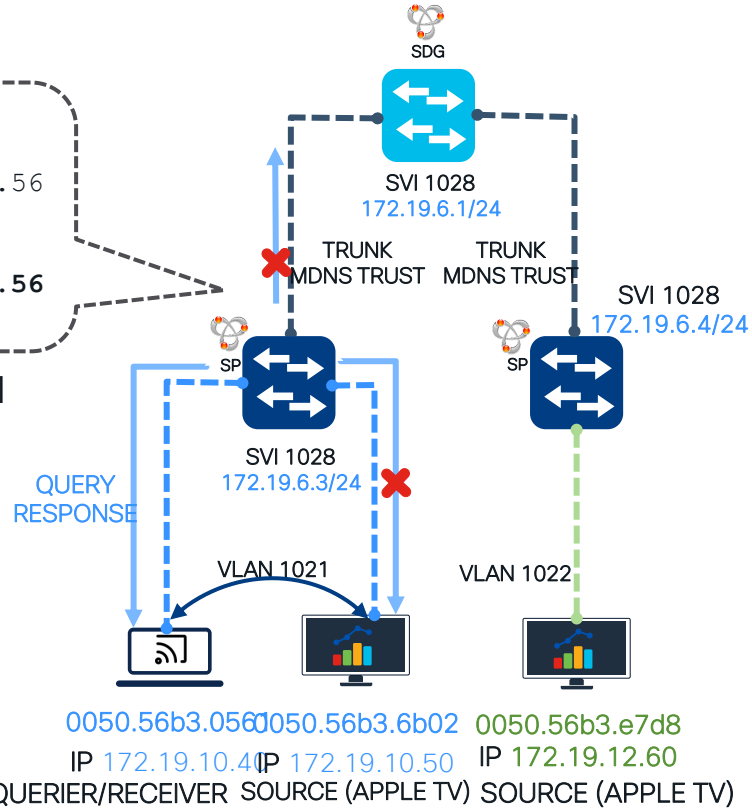
Local Area Bonjour – Service Peer

Service Peers – Resolving a local Query

```
Ex_Node2#show mdns cache | i 6b02

_airplay._tcp.local          PTR    4500/3261   1021   0050.56
b3.6b02   PC1._airplay._tcp.local
. . .
PC1.local                    A      4500/3261   1021   0050.56
b3.6b02   172.19.10.50
```

The SP can immediately reply with one of its local cache entries, no need for an SDG response.

This concludes service discovery for endpoints directly connected in the same service peer



Local Area Bonjour – Service Peer

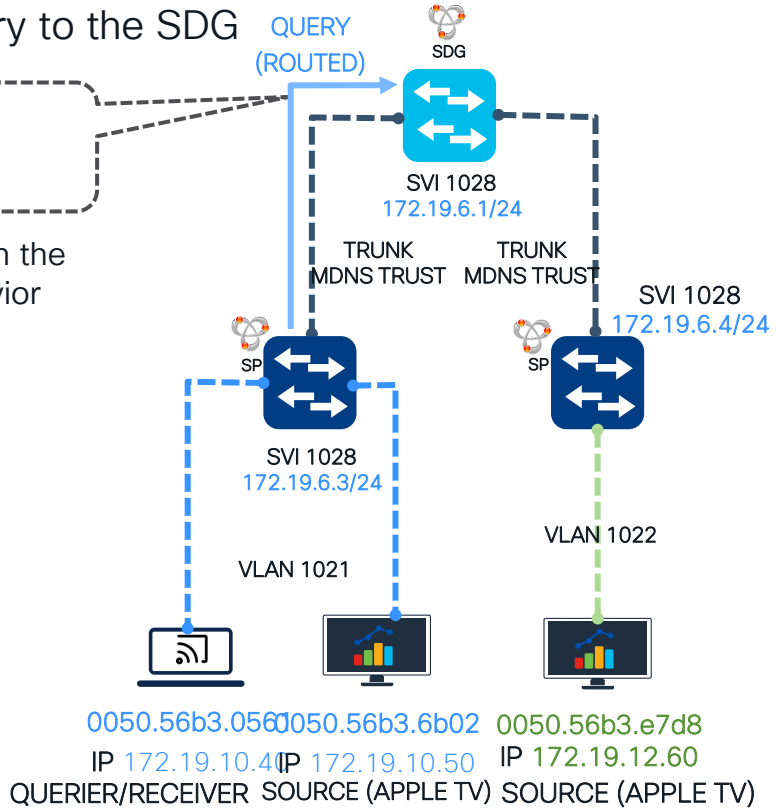
Service Peer Service Routing - Exporting a Query to the SDG

```
Edge#show mdns query-db
Query DataBase Empty
```

Queries coming from service peers will **not** create an entry in the mdns query database of the SDG, this is an expected behavior

- To allow mDNS queries from a Service-Peer to be replied with the information of an announcer behind another Service-Peer, an SDG is required.

- Queries sent to the SDG as unicast can be replied with the cache information from a remote Service-Peer.
- Service Routing between SPs require Service-Peer group configuration in the SDG.

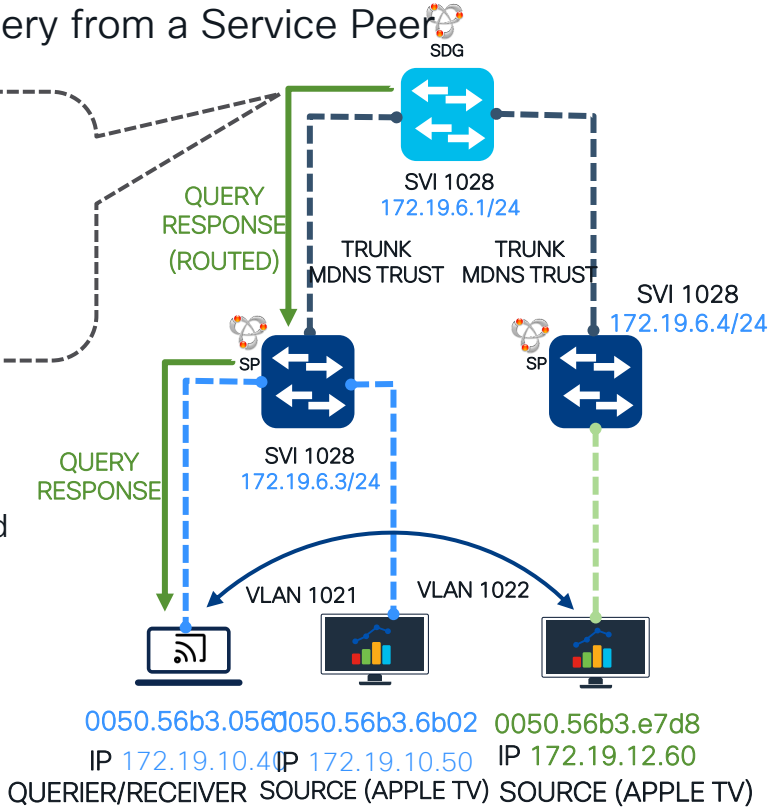


Local Area Bonjour – Service Peer

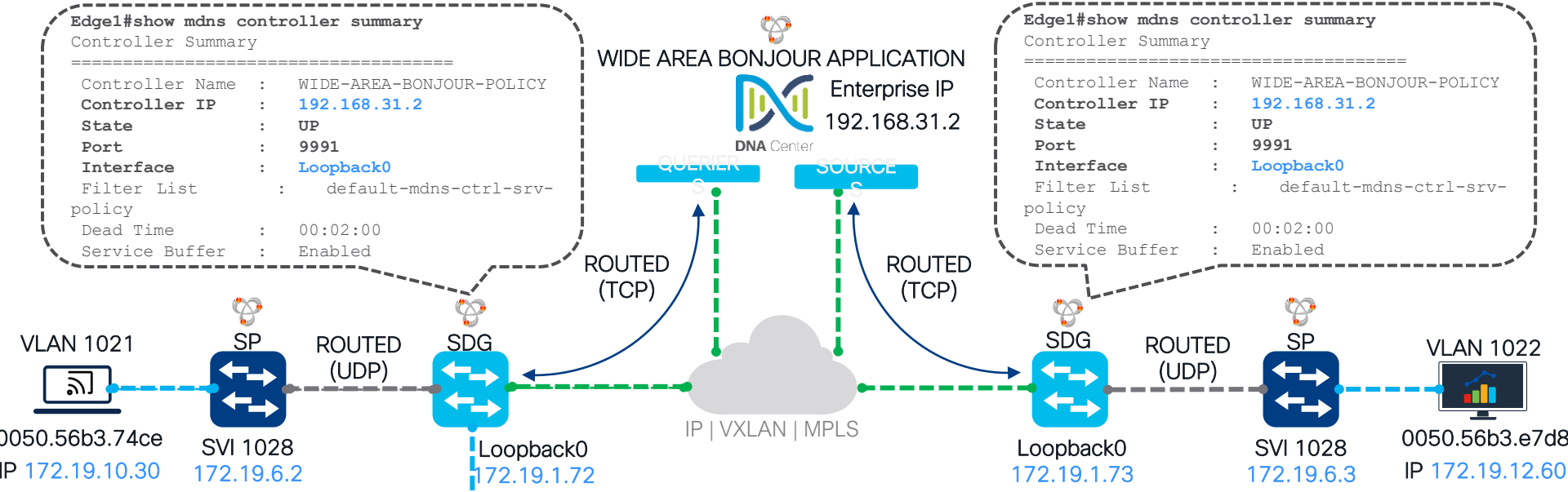
Service Peer Service Routing – Replying to a Query from a Service Peer

```
Edge#show mdns cache type PTR detail | i
Name|MAC|Peer|Record|Vlan
 MAC Address                : 0050.56b3.e7d8
 Record Data                : PC2._airplay._tcp.local
 Exported Records           : V4
 Service-Peer-id            : 172.19.6.4
 Vlan/Location-group        : 1022/0
 VRF Name / VRF id          : Campus / 3
```

- The SDG replies to the Service-Peer with the contents of its local mDNS cache, routing this packet to the Service-Peer.
- The Service-Peer receives the packet with the mDNS record information and injects an mDNS response to the endpoints listed in the query-DB table.
- After the query response is sent to the endpoint, discovery between endpoints in different service peers is successful.



Wide Area Bonjour

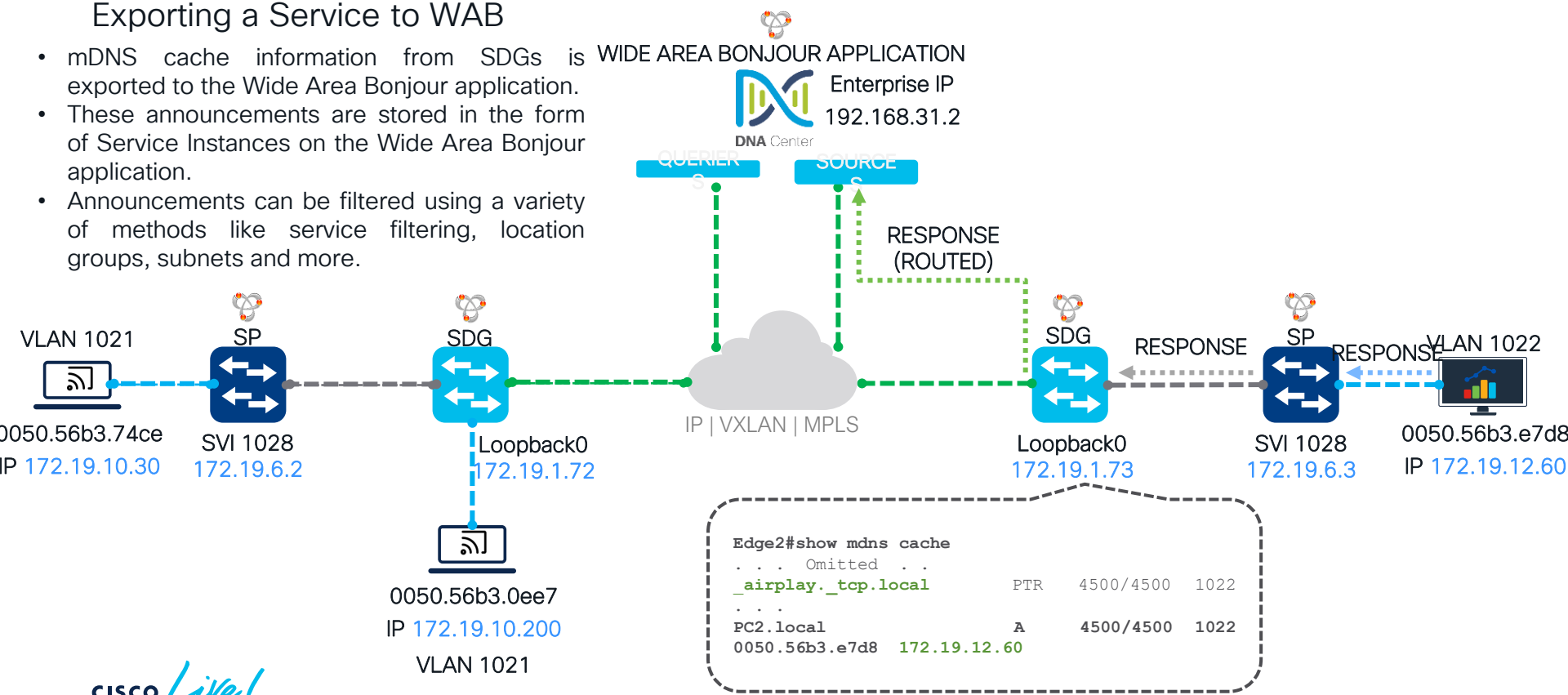


- Cisco DNA Center acts as a centralized application that can accept source registration from remote SDGs, while allowing other SDGs to query for such sources.
- Communication between SDGs and the Wide Area Bonjour application contained inside of Cisco DNA Center is established using a TCP socket, creating a control plane session.

Wide Area Bonjour

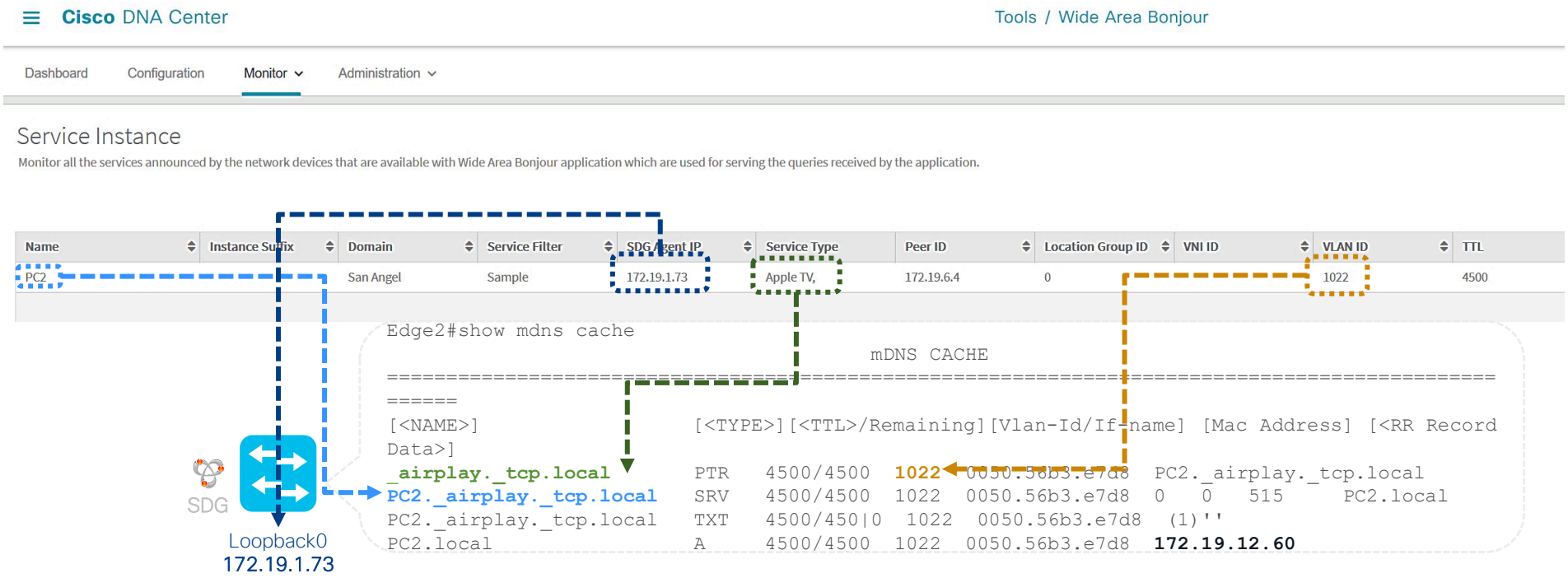
Exporting a Service to WAB

- mDNS cache information from SDGs is exported to the Wide Area Bonjour application.
- These announcements are stored in the form of Service Instances on the Wide Area Bonjour application.
- Announcements can be filtered using a variety of methods like service filtering, location groups, subnets and more.



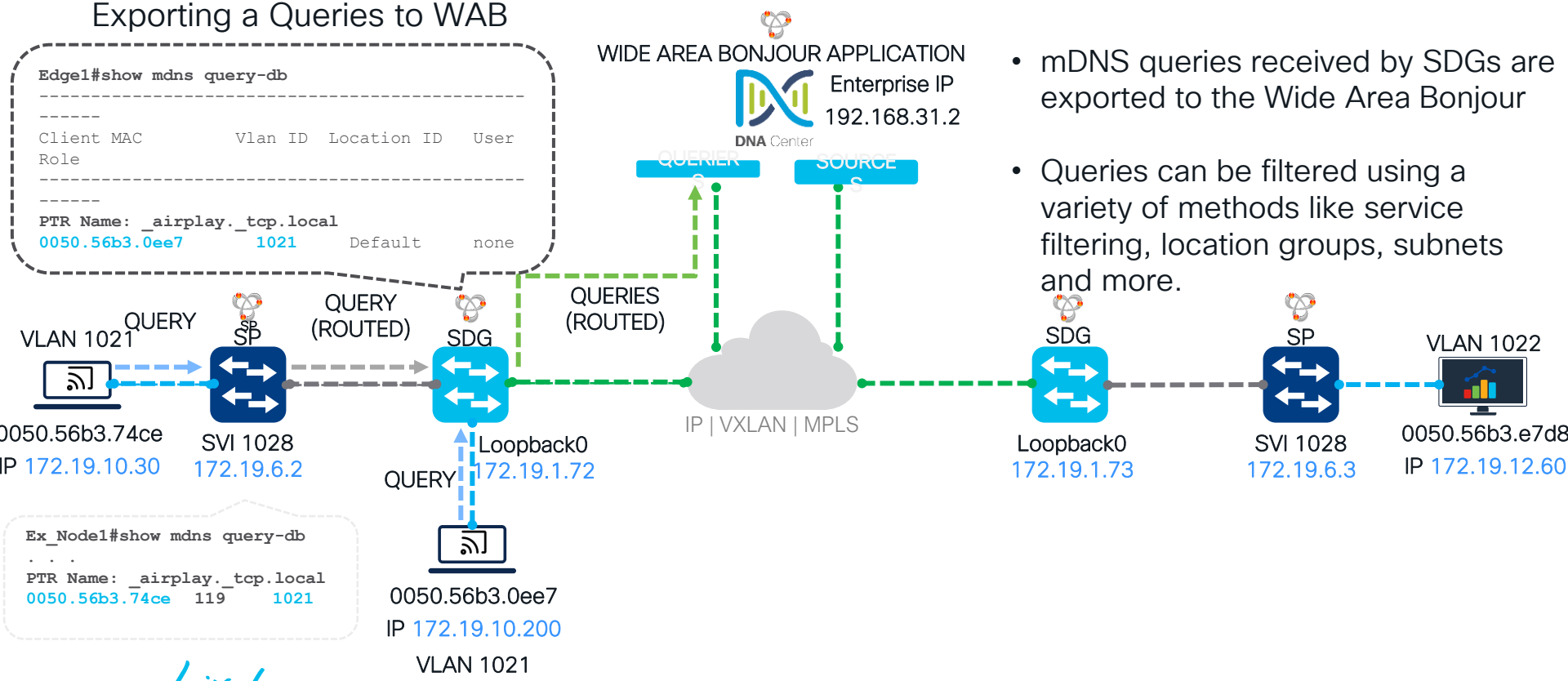
Wide Area Bonjour

Exporting a Service to WAB



Wide Area Bonjour

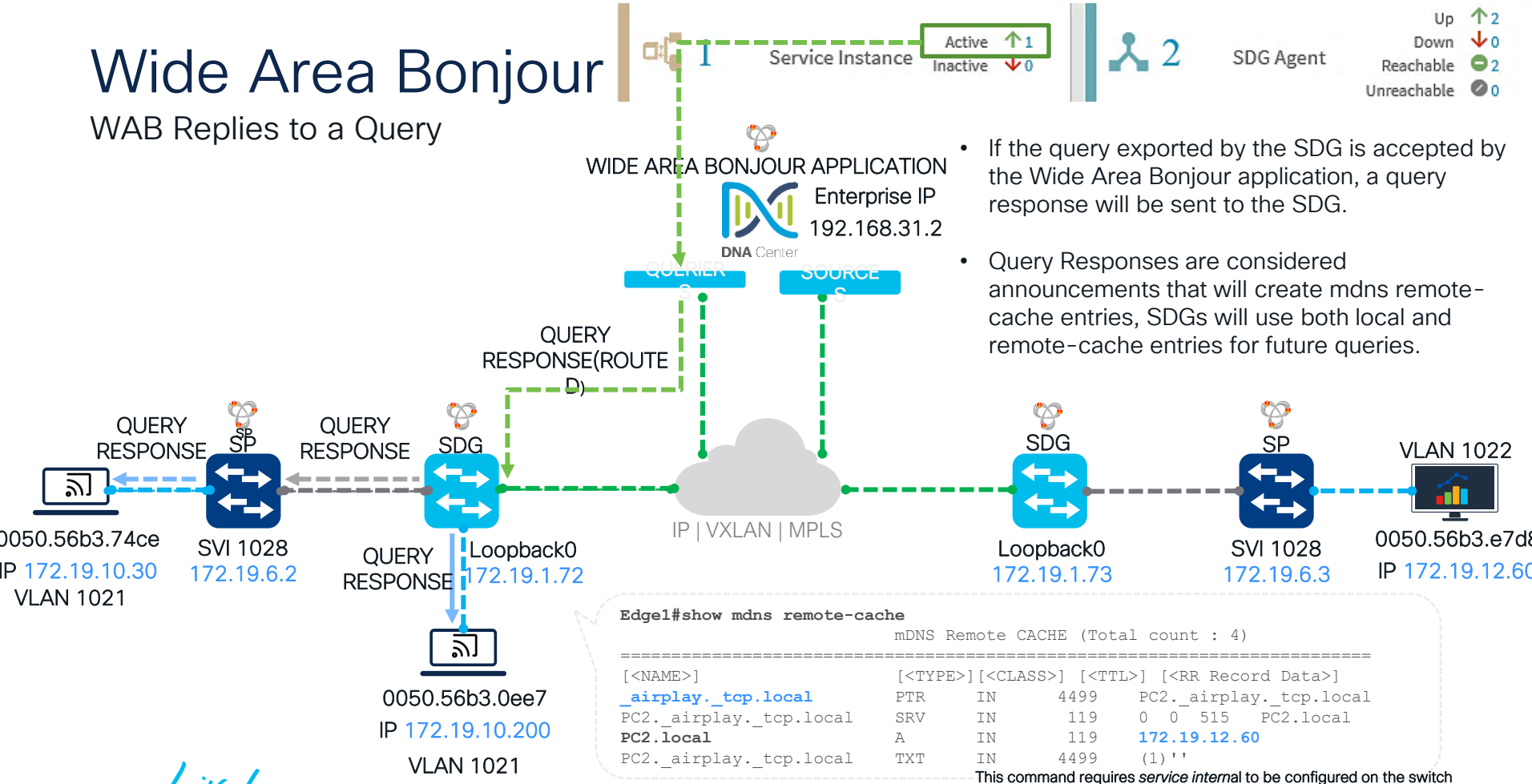
Exporting a Queries to WAB



- mDNS queries received by SDGs are exported to the Wide Area Bonjour
- Queries can be filtered using a variety of methods like service filtering, location groups, subnets and more.

Wide Area Bonjour

WAB Replies to a Query

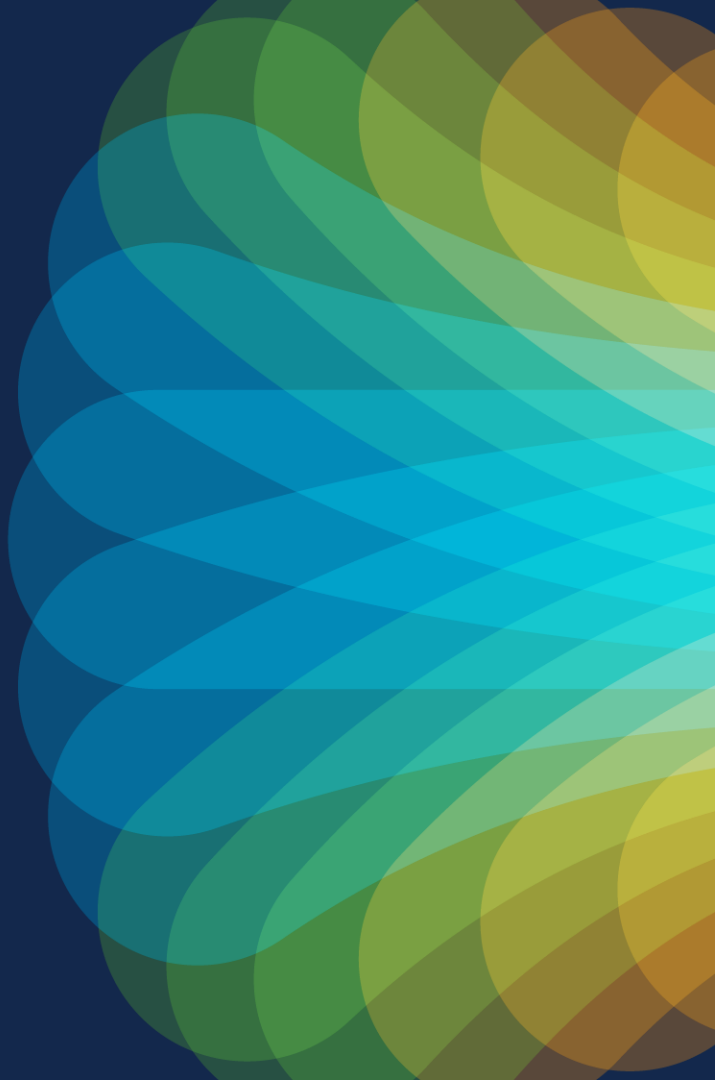


- If the query exported by the SDG is accepted by the Wide Area Bonjour application, a query response will be sent to the SDG.
- Query Responses are considered announcements that will create mdns remote-cache entries, SDGs will use both local and remote-cache entries for future queries.

```
Edge1#show mdns remote-cache
                                mDNS Remote CACHE (Total count : 4)
=============================================================================
[<NAME>]                        [<TYPE>][<CLASS>] [<TTL>] [<RR Record Data>]
_airplay._tcp.local             PTR     IN        4499    PC2._airplay._tcp.local
PC2._airplay._tcp.local         SRV     IN         119    0  0  515   PC2.local
PC2.local                       A       IN         119    172.19.12.60
PC2._airplay._tcp.local         TXT     IN        4499    (1)''
```

This command requires *service internal* to be configured on the switch

Device Configuration



“Flood” Bonjour & “Unicast” Bonjour

```
interface vlan1021
 mdns-sd gateway
  service-policy LOCAL-AREA-POLICY


interface vlan1022
 mdns-sd gateway
  service-policy LOCAL-AREA-POLICY
```

- Queries and Announcements are flooded in the VLAN
- No mDNS query-db
- Deprecated CLI
- Does not enable mDNS snooping
- Not compatible with micro-location features

```
Edge-1#show mdns-sd query-db
Query DataBase Empty
```

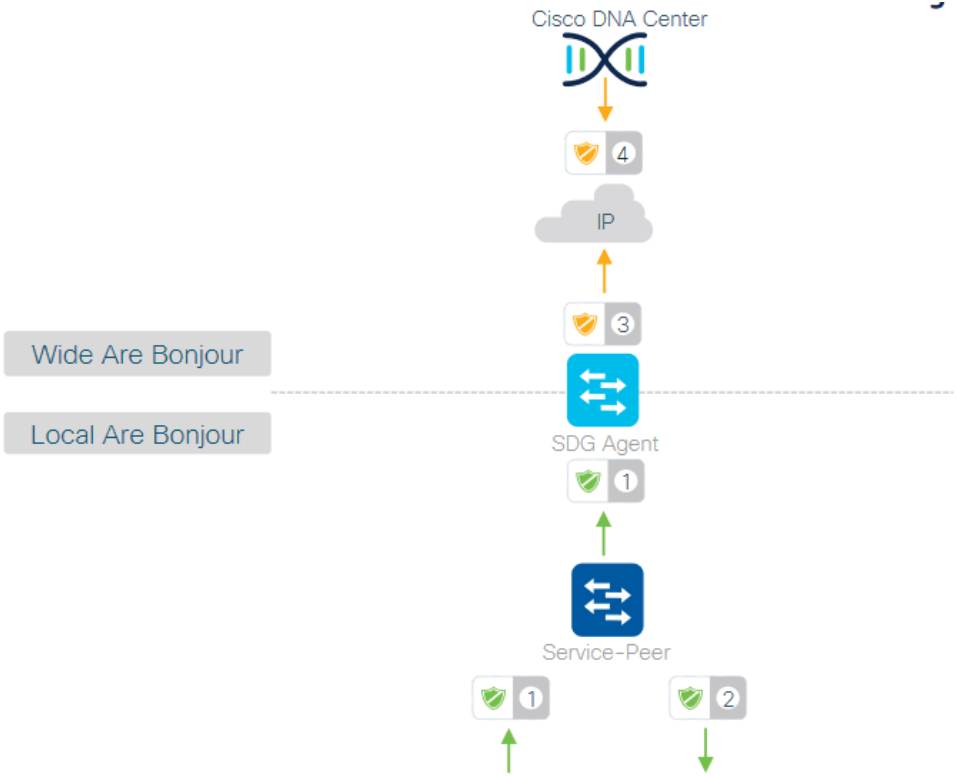
IOS-XE 17.3.1

```
vlan configuration 1021,1022
mdns-sd gateway
 service-policy LOCAL-AREA-POLICY
```

- Queries are snooped by the switch, and only sent to upstream SDGs or WAB application as unicast
- Announcements are sent only to queriers in the mDNS query-db table
- Enables mDNS snooping
- Compatible with micro-location features

```
Edge-1#show platform software fed switch active ip mdns snooping
vlan
Vlan      Address Family (1:IPv4 2:IPv6 0:Both)
-----------------------------------------
1021      1
1022      1
```

Bonjour Policies



Wide Area Bonjour – **Global Policy**

4 Permits bi-directional distribution mDNS services between SDA-Agents.
Implicit Deny for remaining

Wide Area Bonjour – **Egress Policy**

3 Permits selective mDNS service distribution to Controller

Local Area Bonjour – **Egress Policy**

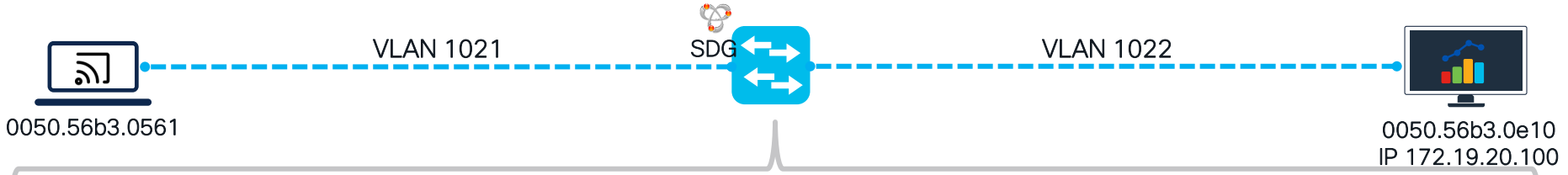
2 Permits selective mDNS Service response between Endpoints/Service-Peer.

Local Area Bonjour – **Ingress Policy**

1 Permits selective mDNS Service from Endpoints/Service-Peer.
Implicit Deny for remaining

Bonjour Configuration – Policies

Before Cisco IOS XE 17.6 : Manual Policies




```
mdns-sd gateway

mdns-sd service-list INGRESS-SERVICE-LIST IN
  match apple-tv
  match printer-ipp
  match google-chromecast
mdns-sd service-list EGRESS-SERVICE-LIST OUT
  match apple-tv
  match printer-ipp
  match google-chromecast
```

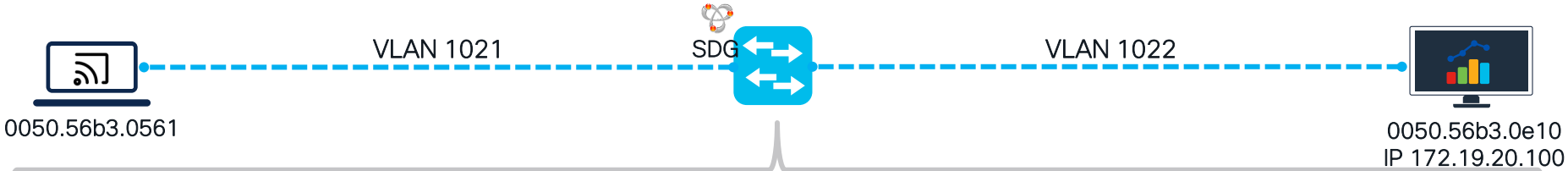
```
mdns-sd service-policy LOCAL_AREA_POLICY
   service-list INGRESS-SERVICE-LIST IN
   service-list EGRESS-SERVICE-LIST OUT
mdns-sd service-policy WIDE-AREA-POLICY
   service-list EGRESS-SERVICE-LIST OUT
```

```
vlan configuration 1021,1022
   mdns-sd gateway
    service-policy LOCAL-AREA-POLICY
```

```
service-export mdns-sd controller DNA-POLICY
  controller-address [DNAC_IP/VIP]
  controller-service-policy WIDE-AREA-POLICY OUT
  controller-source-interface Loopback0
```

Bonjour Configuration – Policies

Now in Cisco IOS XE 17.6 : Default Policy



Default Policy

- Activates well-known Services
- Built-in Policy
- Auto Policy Activation
- Auto Service-Proxy
- Auto Service Tagging

```
apple-airprint
apple-remote-login
apple-screen-share
apple-tv
apple-windows-fs
google-chromecast
google-expeditions
homesharing
multifunction-printer
printer-ipps
```

Bonjour Configuration – Policies

Now in Cisco IOS XE 17.6 : Verifying the default policy

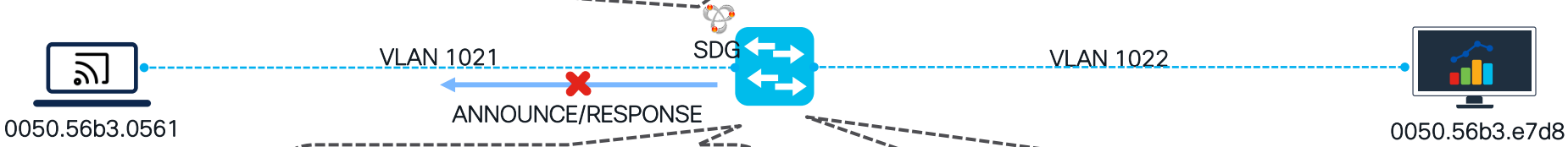
```
Edge1#show mdns-sd service-policy
Service Policy Name          Type          Service List IN Name         Service List Out Name    Controller Service List
=============================================================================================================================
default-mdns-service-policy  EDGE  default-mdns-in-service-list default-mdns-out-service-list                          -
default-mdns-ctrl-srv-policy CTRL                          -                                - default-mdns-ctrl-srv-list
```

```
Edge1#show mdns-sd service-list name default-mdns-in-service-list
Name                          Type          Service  Msg-Type   Source                Location-filter
=============================================================================================
default-mdns-in-service-list  IN   apple-airprint       any       -                           -
. . .
Edge1#show mdns-sd service-list name default-mdns-out-service-list
Name                          Type          Service  Msg-Type   Source                Location-filter
=============================================================================================
default-mdns-out-service-list OUT  apple-airprint       any      ALL   default-mdns-location-filter
. . .

Edge1#show mdns-sd service-list name default-mdns-ctrl-srv-list
Name                          Type          Service  Msg-Type   Source                Location-filter
=============================================================================================
default-mdns-ctrl-srv-list    CTRL  apple-airprint       any      ALL                         -
. . .
```

Bonjour Configuration – Policies

Local Area Bonjour – Inter VLAN Service Routing with Custom Policies

```
Edge-2#show mdns cache
                                        mDNS CACHE
=============================================================================================================
[<NAME>]                  [<TYPE>][<TTL>/Remaining][Vlan-Id/If-name] [Mac Address] [<RR Record Data>]
_airplay._tcp.local        PTR    4500/4500   1022   0050.56b3.e7d8   PC2._airplay._tcp.local
PC2._airplay._tcp.local    SRV    4500/4500   1022   0050.56b3.e7d8   0    0    515      PC2.local
PC2._airplay._tcp.local    TXT    4500/4500   1022   0050.56b3.e7d8   (1)''
PC2.local                  A      4500/4500   1022   0050.56b3.e7d8   172.19.12.60
```



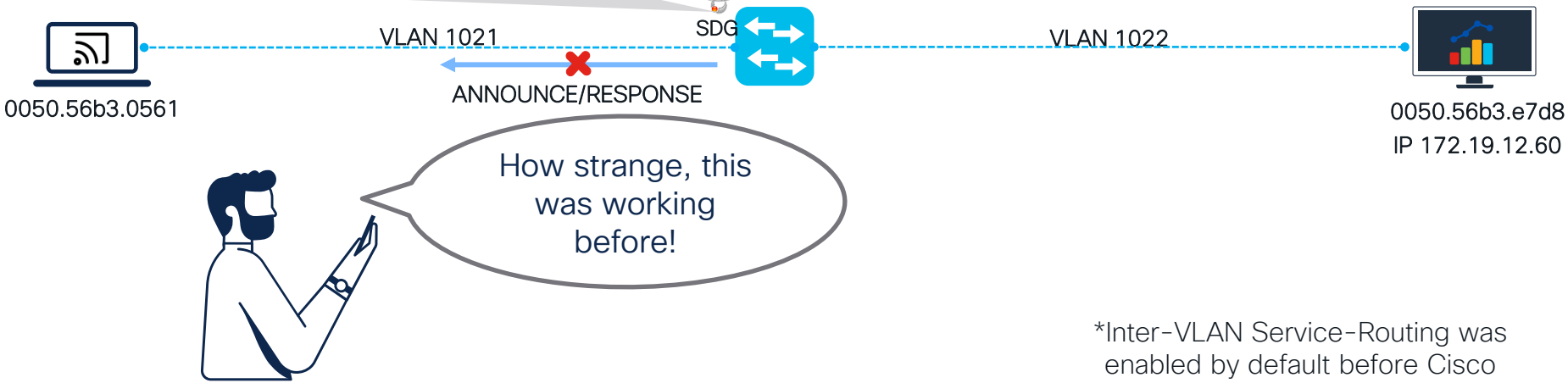

```
mdns-sd gateway
mdns-sd service-list INGRESS IN
 match airplay
mdns-sd service-list EGRESS OUT
 match airplay
mdns-sd service-policy LOCAL
 service-list INGRESS IN
 service-list EGRESS OUT

vlan configuration 1021,1022
 mdns-sd gateway
  service-policy LOCAL
```

```
Edge-2#show mdns query-db
Client MAC        Vlan ID    Location ID
User Role
-----------------------------------------------
PTR Name: _airplay._tcp.local
0050.56b3.0561     1021         Default    none
```

Bonjour Configuration – Policies

Local Area Bonjour – Inter VLAN Service Routing with Custom Policies

```
Edge-2#debug mdns-sd event
mDNS event debugs debugging is on

028275: *Apr 20 00:32:48.115: mDNS: Query on IPv4 is recieved at interface UNKNOWN from 172.19.10.40
028276: *Apr 20 00:32:48.115: mDNS: mdns_sd_match_rr_name_in_service_definition: Service _airplay._tcp.local matched
in service definition airplay
...
028280: *Apr 20 00:32:48.116: mDNS: mdns_sd_match_single_vlan_lg_filter: Out filter drop, No mDNS cache record
matching with query vlan: 1021, lg-id: 0, user_role: none
```

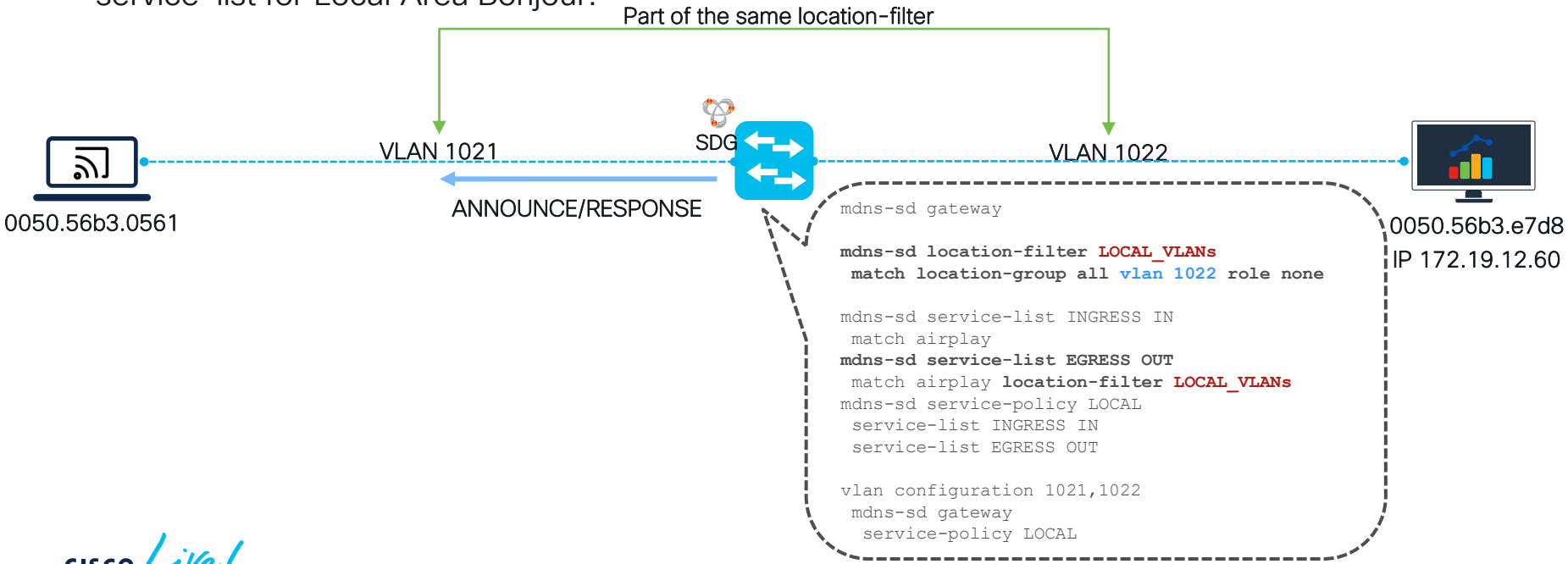


*Inter-VLAN Service-Routing was enabled by default before Cisco IOS-XE 17.3 for Catalyst 9000 Switches

Bonjour Configuration - Policies

Local Area Bonjour – Inter VLAN Service Routing with Custom Policies

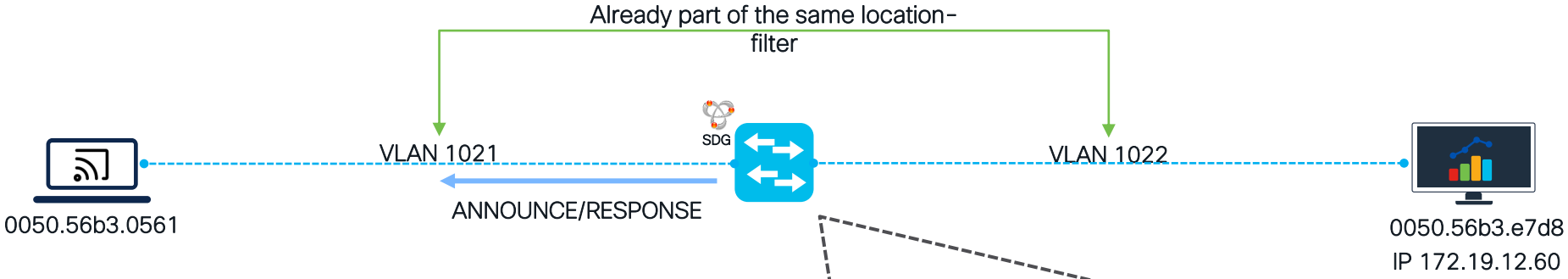
For Inter-VLAN support in Custom Policies, configure a location-filter including all the required VLANs and apply it to the service-definitions (airplay,google-chromecast, etc) in the **egress** service-list for Local Area Bonjour.



Bonjour Configuration - Policies

Local Area Bonjour – Inter VLAN Service Routing with Custom Policies

Egress-default policies have a built-in mDNS location filter, allowing by default Inter-VLAN Service Routing in all mDNS enabled VLANs.

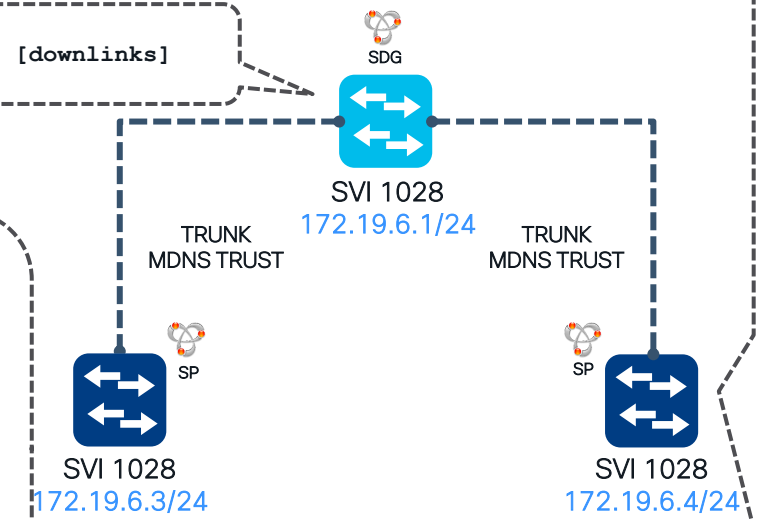



```
Edge-2#show mdns-sd service-list name default-mdns-out-service-list
Name                          Type         Service  Msg-Type   Source              Location-filter
=============================================================================================
default-mdns-out-service-list OUT  apple-airprint       any      ALL   default-mdns-location-filter
. . .
```

Bonjour Configuration

Wired Service-Peer Configuration – Default Policy

```
interface range [downlinks]
  mdns trust
```



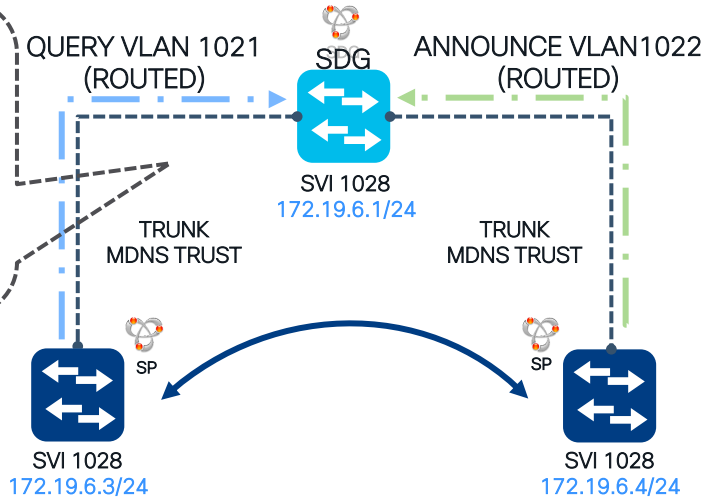

```
[Both Service-Peers]

mdns-sd gateway
  mode service-peer
  sdg-agent 172.19.6.1

vlan configuration 1021,1022
  mdns-sd gateway

interface [uplink]
  mdns trust
```

```
Ex_Node2#show mdns summary
Global mDNS Gateway
==================================
===========
mDNS Gateway    : Enabled
Rate Limit      : 60 PPS (default)
AirPrint Helper: Disabled
Mode            : Service-Peer
SDG Agent IP    : 172.19.6.1
Source Interface : Vl1028
. . .

VLAN  :  1021
========================
mDNS Gateway              : Enabled
mDNS Service Policy       :
default-mdns-service-policy
. . .
VLAN  :  1022
========================
mDNS Gateway              : Enabled
mDNS Service Policy       :
default-mdns-service-policy
. . .
```

Bonjour Configuration

Wired Service-Peer Configuration – Inter-VLAN service-routing between Service-Peers

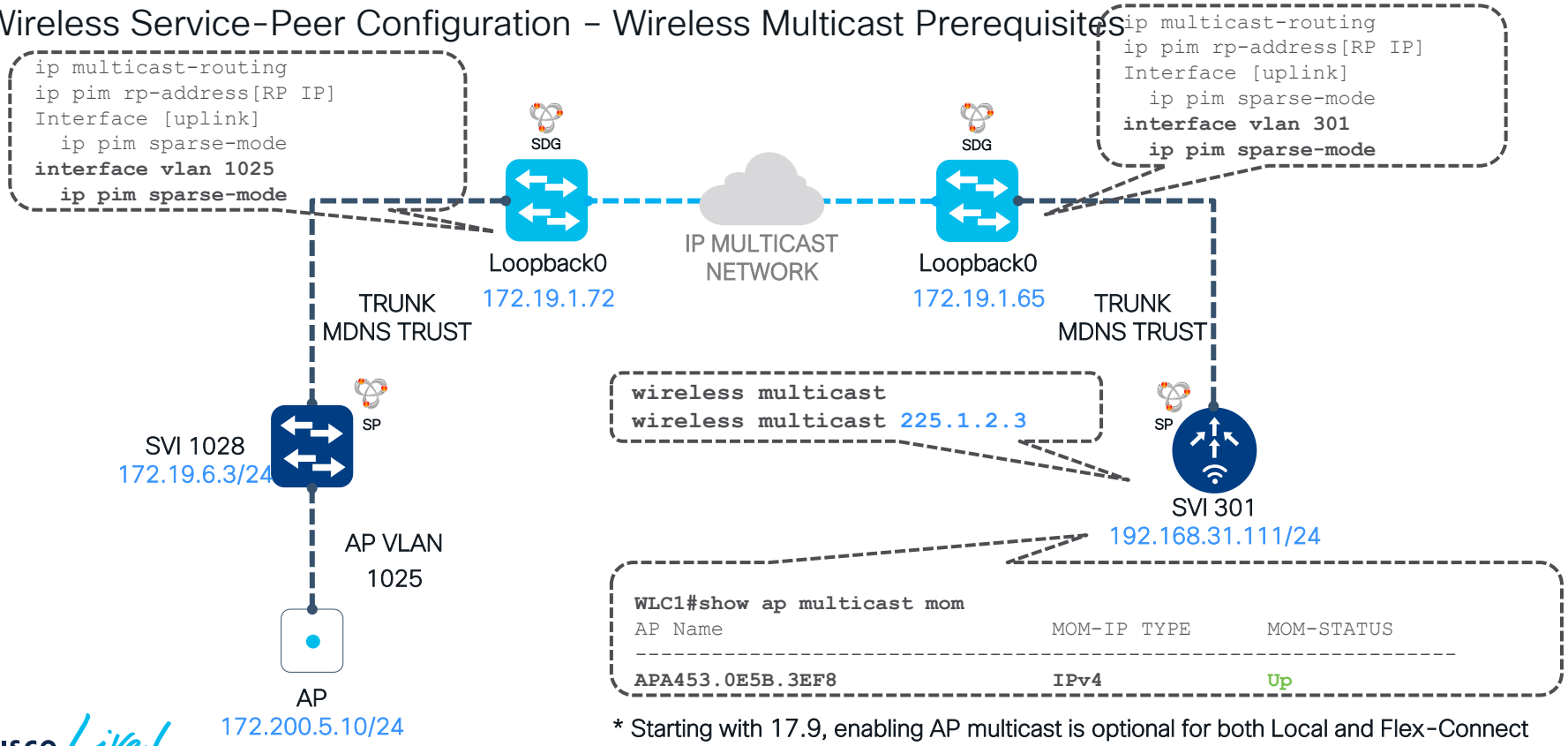
```
SDG:
mdns-sd service-peer group
 peer-group 10
  service-peer 172.19.6.3 location-
group all role none
  service-peer 172.19.6.4 location-
group all role none
```



- Service-Peer groups are only configured on the Service Discovery Gateway.
- Inter-VLAN service-routing between Service-Peers is not enabled by default, it requires a service-peer group to work.
- If Inter-VLAN service-routing is not needed for a particular Service-Peer, you may not include it in the peer-group configuration.
- Layer 2/Intra-VLAN service-routing for endpoints **in the same service peer does not** require a service-peer group.

Bonjour Configuration

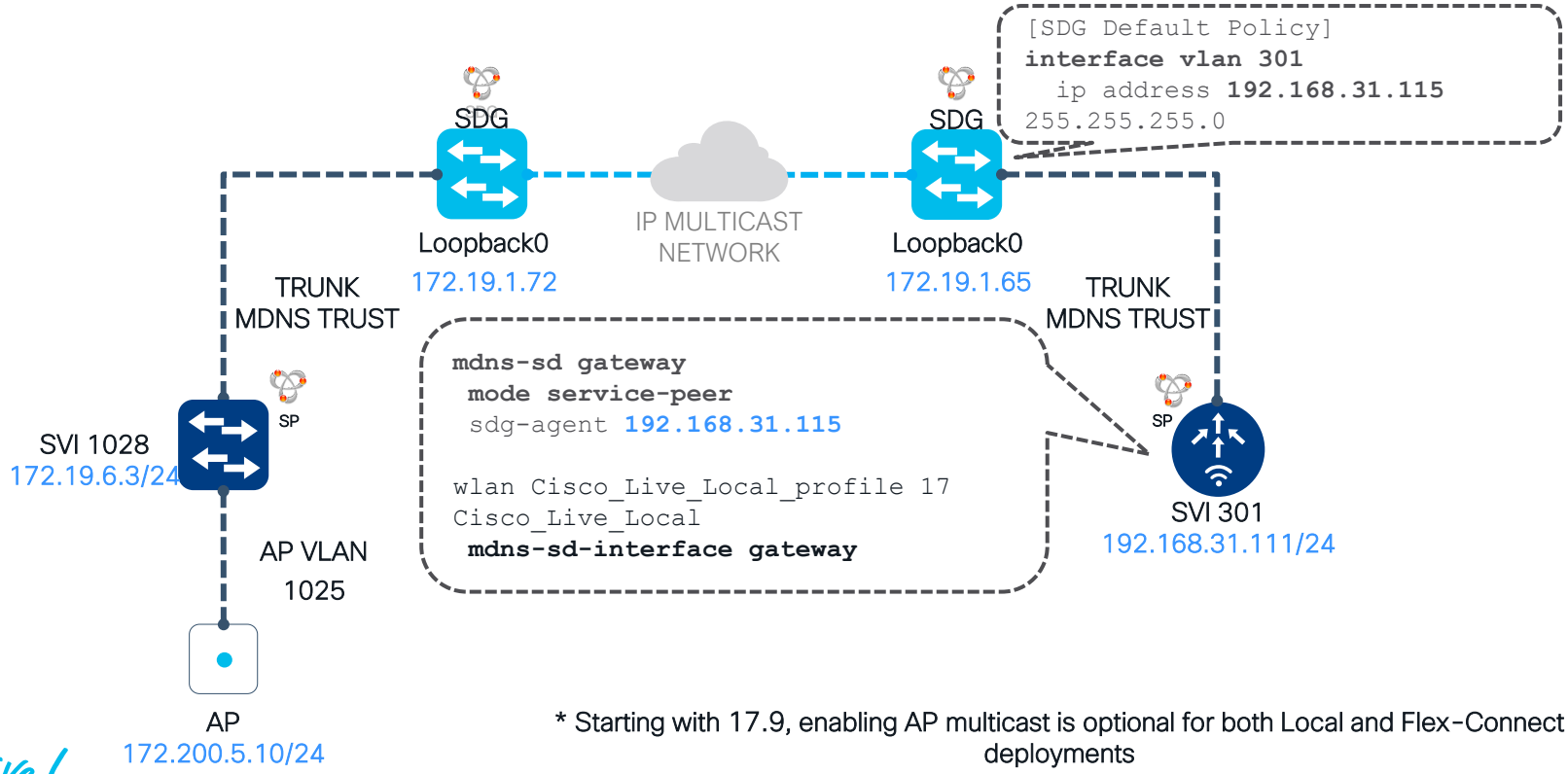
Wireless Service-Peer Configuration – Wireless Multicast Prerequisites



* Starting with 17.9, enabling AP multicast is optional for both Local and Flex-Connect deployments.

Bonjour Configuration

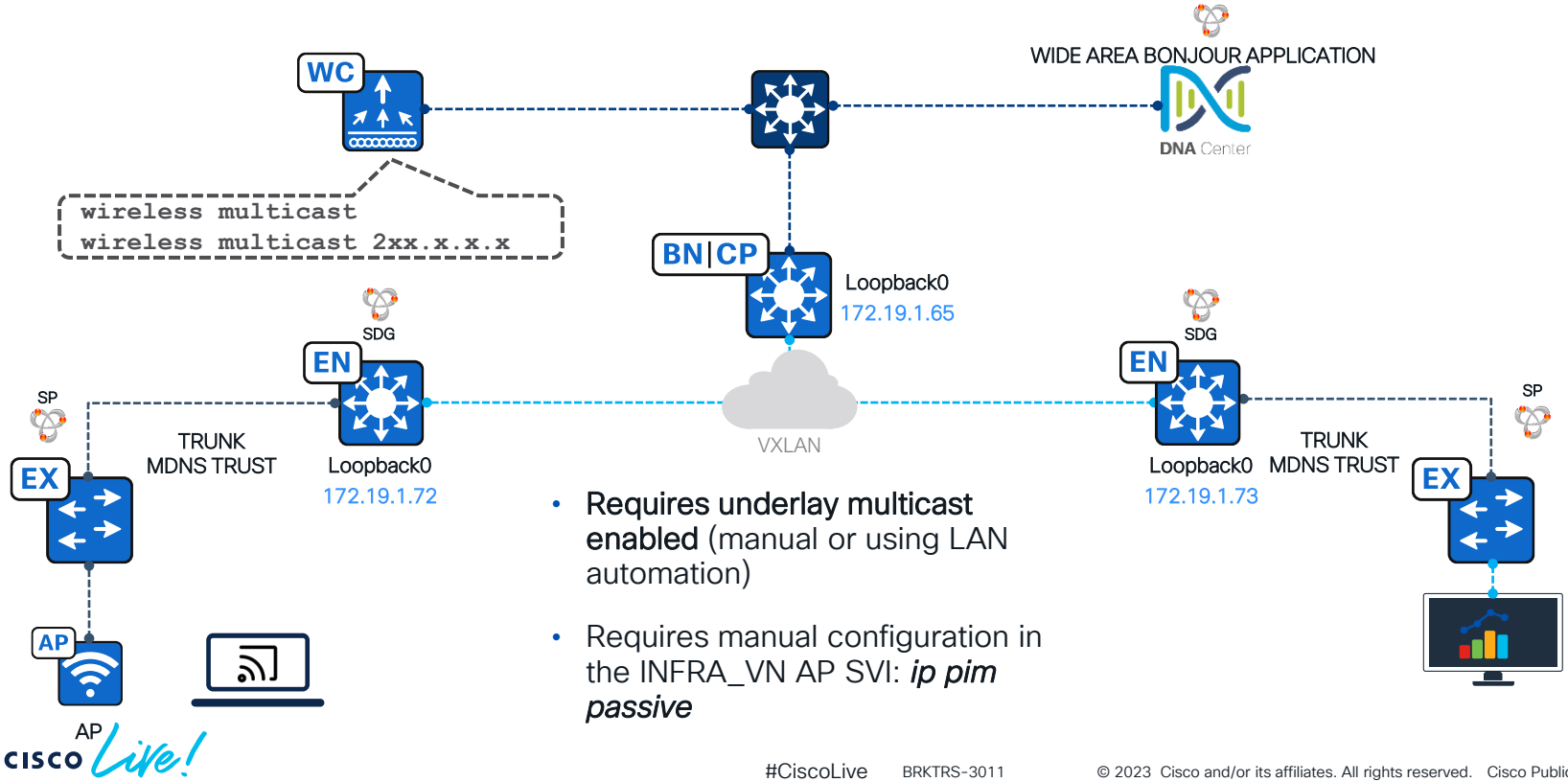
Wireless Service-Peer Configuration – Wireless LAN Controller as Service Peer



* Starting with 17.9, enabling AP multicast is optional for both Local and Flex-Connect deployments

Bonjour Configuration

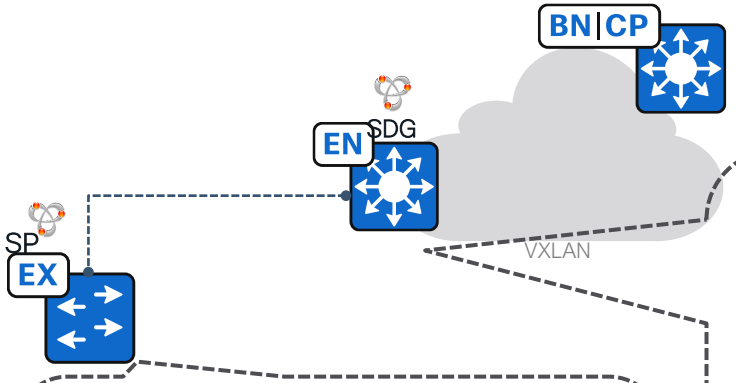
Wired and Wireless (Fabric Enabled Wireless) in SD-Access



- **Requires underlay multicast enabled** (manual or using LAN automation)
- Requires manual configuration in the INFRA_VN AP SVI: ***ip pim passive***

Bonjour Configuration

Wired and Wireless (Fabric Enabled Wireless) in SD-Access - Wired Configuration




```
[All Extended Nodes]
mdns-sd gateway
 mode service-peer
 sdg-agent [EX_AnycastGateway]

vlan configuration x,x
 mdns-sd gateway

interface range [FE_Uplink/Portchannel]
  mdns trust
```

```
[All Fabric Edges/FIABs/L2 Handoff Borders]

mdns-sd gateway

vlan configuration x,x
 mdns-sd gateway

service-export mdns-sd controller DNA-POLICY
  controller-address [DNAC_IP/VIP]
  controller-source-interface Loopback0

interface range [EX_Downlink/Portchannel]
  mdns trust
```

Bonjour Configuration

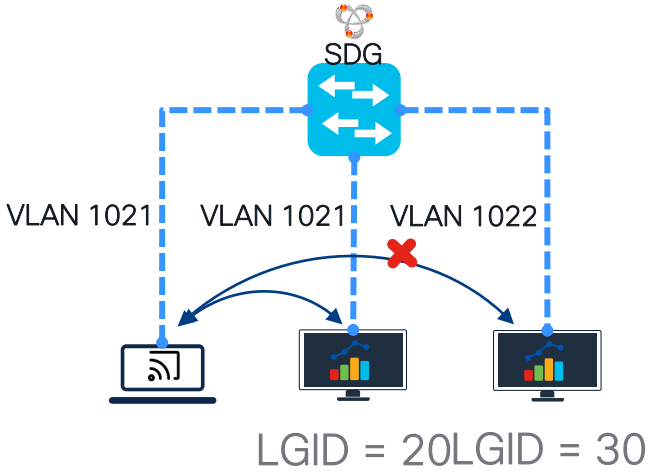
Layer 2 Flooding or Wide Area Bonjour?

- Enabling Layer 2 Flooding forwards Broadcast, Unknown Unicast and Multicast (Link-Local, TTL=1, Layer 2) traffic across fabric Edge Nodes.
- With L2 Flooding, mDNS packets are natively forwarded to all endpoints in the VLAN, along with no control or micro-location enforcement.
- Endpoints can discover far remote Bonjour devices as everything is contained in a big, extended subnet.
- If all devices must be discovered all at once (ex. Dante, AV systems, etc.), L2 flooding is a better option.
- Advertisement loops can be created if L2 flooding is enabled along with “Flood” Bonjour (deprecated).

Bonjour Configuration – Wired Micro-Location

Local Area Bonjour Micro-Location requires Custom Policies

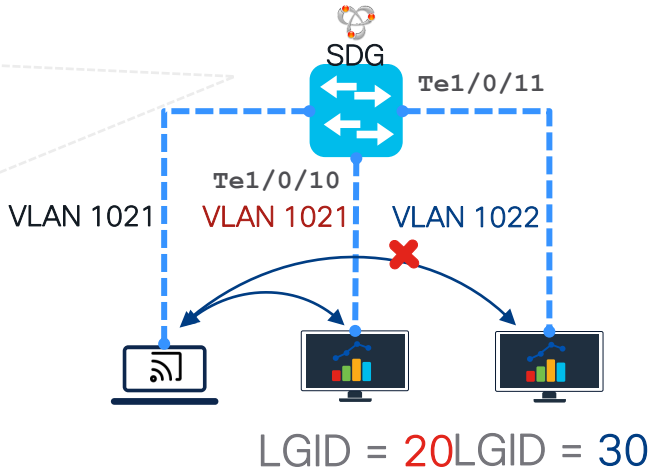
- mDNS Location-Group tags can be assigned to individual or a group of Ethernet ports on LAN Access switches, and can be combined with Wireless Access-Points providing WiFi services in the same location as the Ethernet connections
- Define the Location-Groups wired bindings with the “mdns-sd location-group” command for wired endpoints
- For Local Area (Inter or Intra-VLAN), create a Location-Filter rule, matching the required Location Group IDs
- Apply the Location-Filter to the egress-service list for the required service (ex. Airplay)



Bonjour Configuration – Wired Micro-Location

Local Area Bonjour Micro-Location requires Custom Policies

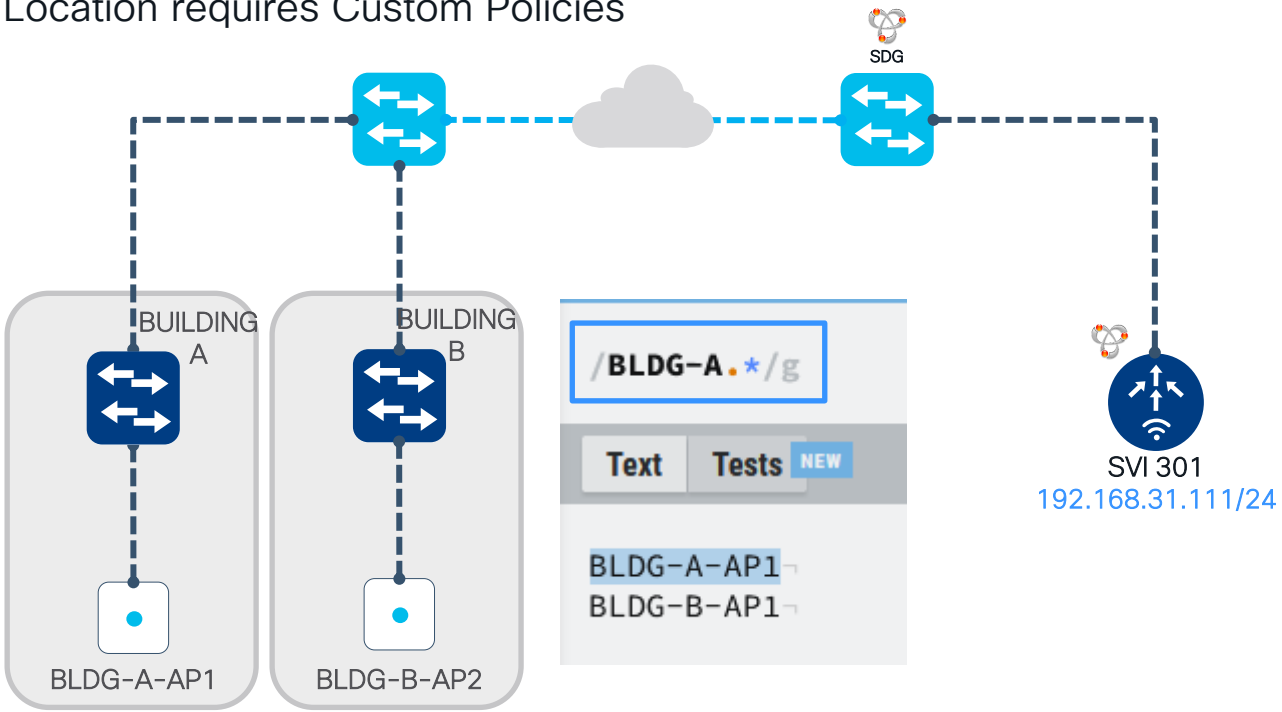
```
mdns-sd gateway

mdns-sd location-filter lgfilter
match location-group 20 vlan 1021 role none

mdns-sd location-group 20 vlan 1021
  interface Te1/0/10  --- Announcer 1
mdns-sd location-group 30 vlan 1022
  interface Te1/0/11 --- Announcer 2

mdns-sd service-list custom_out OUT
 match airplay location-filter lgfilter

mdns-sd service-list custom_in IN
 match airplay

mdns-sd service-policy custom
 service-list custom_in IN
 service-list custom_out OUT

vlan configuration 1021,1022
   mdns-sd gateway
     service-policy custom
```



Bonjour Configuration – Wireless Micro-Location

Local Area Bonjour Micro-Location requires Custom Policies

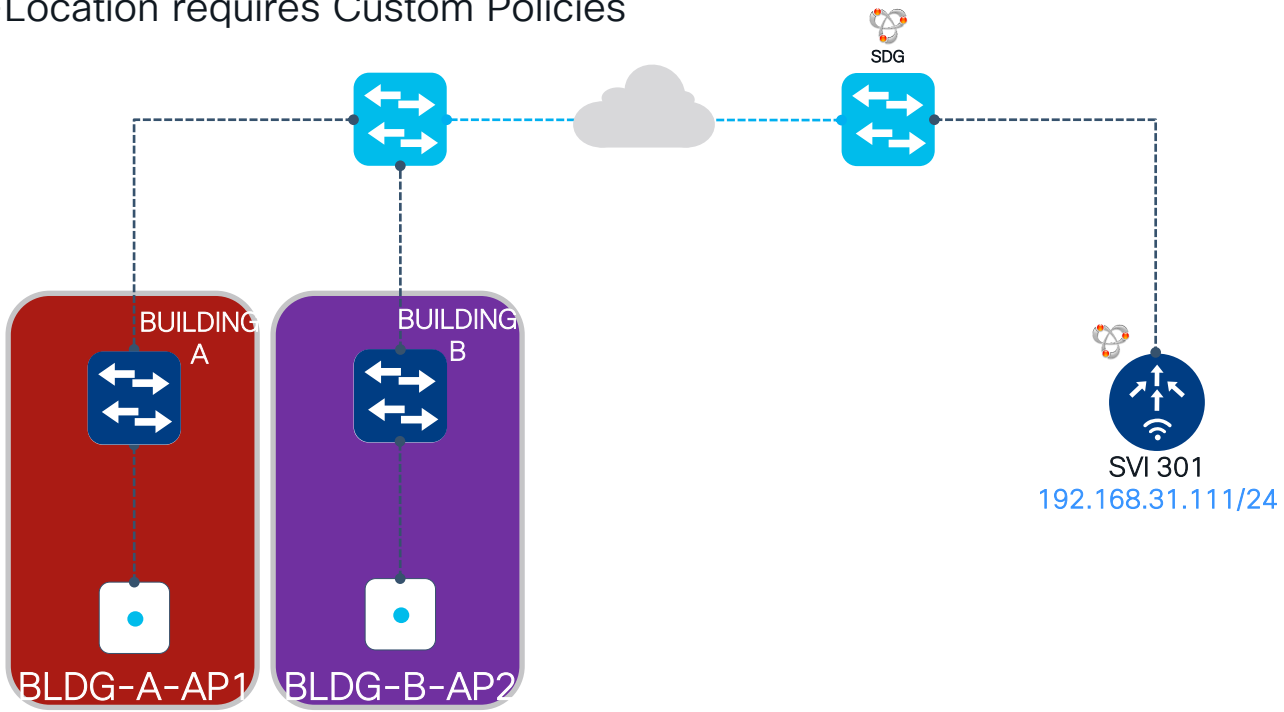
- mDNS Location-Groups can be defined at different levels based on the Access-Point name or location
- Using a regex rule, you can match a common part of the name or location of an AP to assign an LGID to queries and announcements coming from these
- Like wired micro-location, this level of granularity requires a custom policy



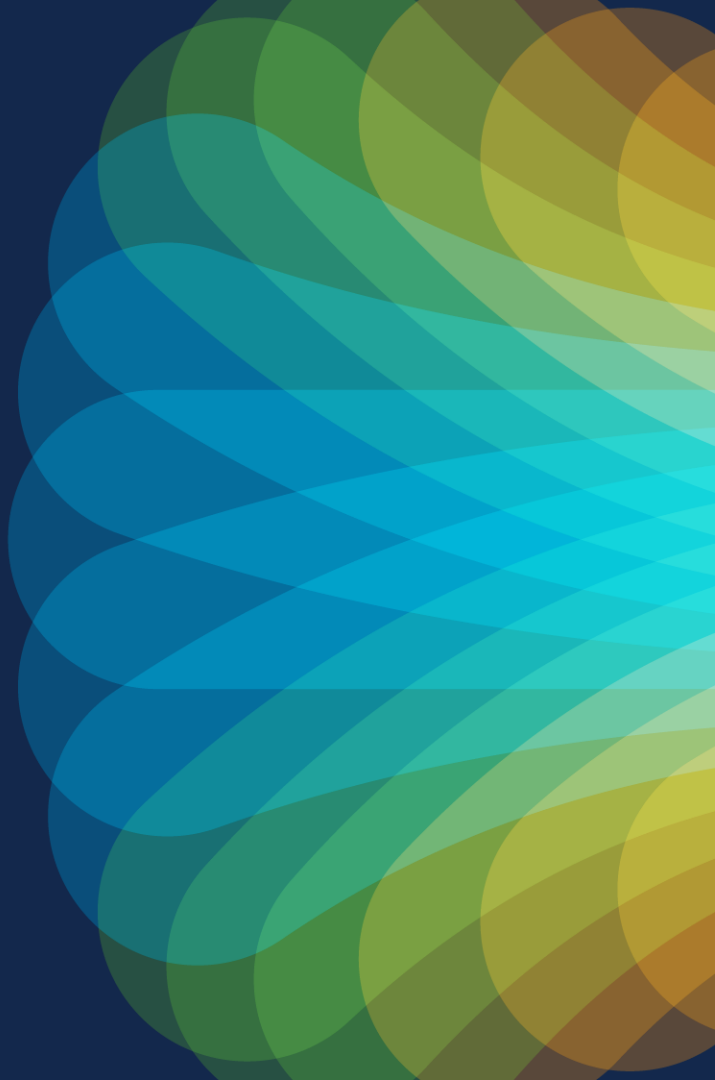
Bonjour Configuration – Wireless Micro-Location

Local Area Bonjour Micro-Location requires Custom Policies

```
[9800 WLC Configuration]
mdns-sd gateway
 mode service-peer
 sdg-agent 192.168.31.115

mdns-sd service-policy custom
    location location-group

wireless rule application mdns
 rule-priority 1 rule-name BuildingA
  regex BLDG-A-.
  action-type grouping
   group-id 100
 rule-priority 1 rule-name BuildingB
  regex BLDG-B-.
  action-type grouping
   group-id 200

wlan Cisco_Live_Local_profile 17
Cisco_Live
 mdns-sd-interface gateway
```

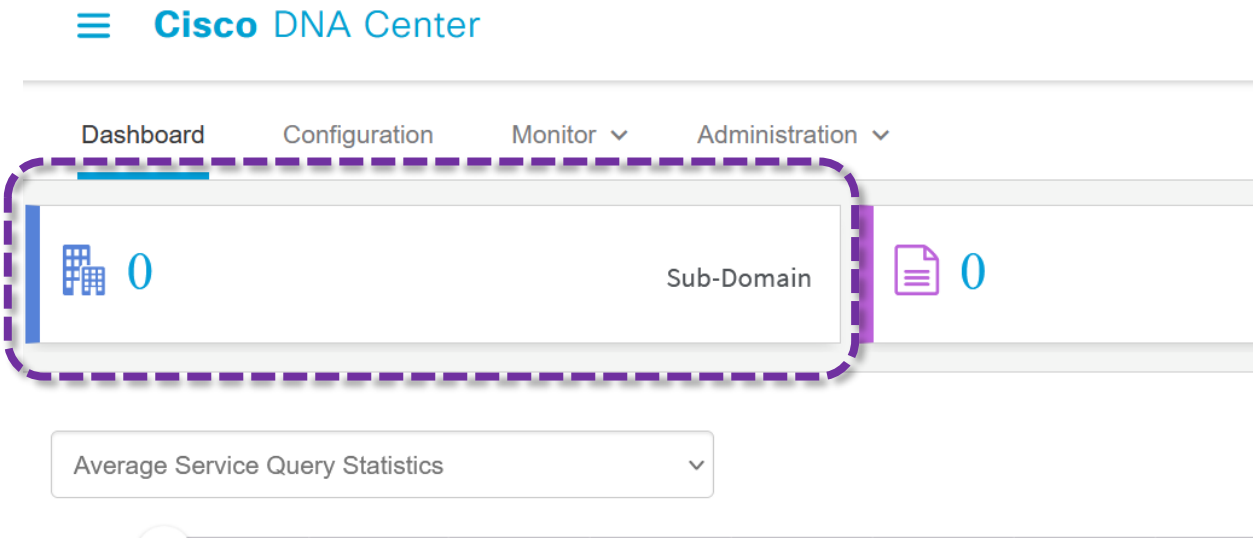


Cisco DNA Center Configuration



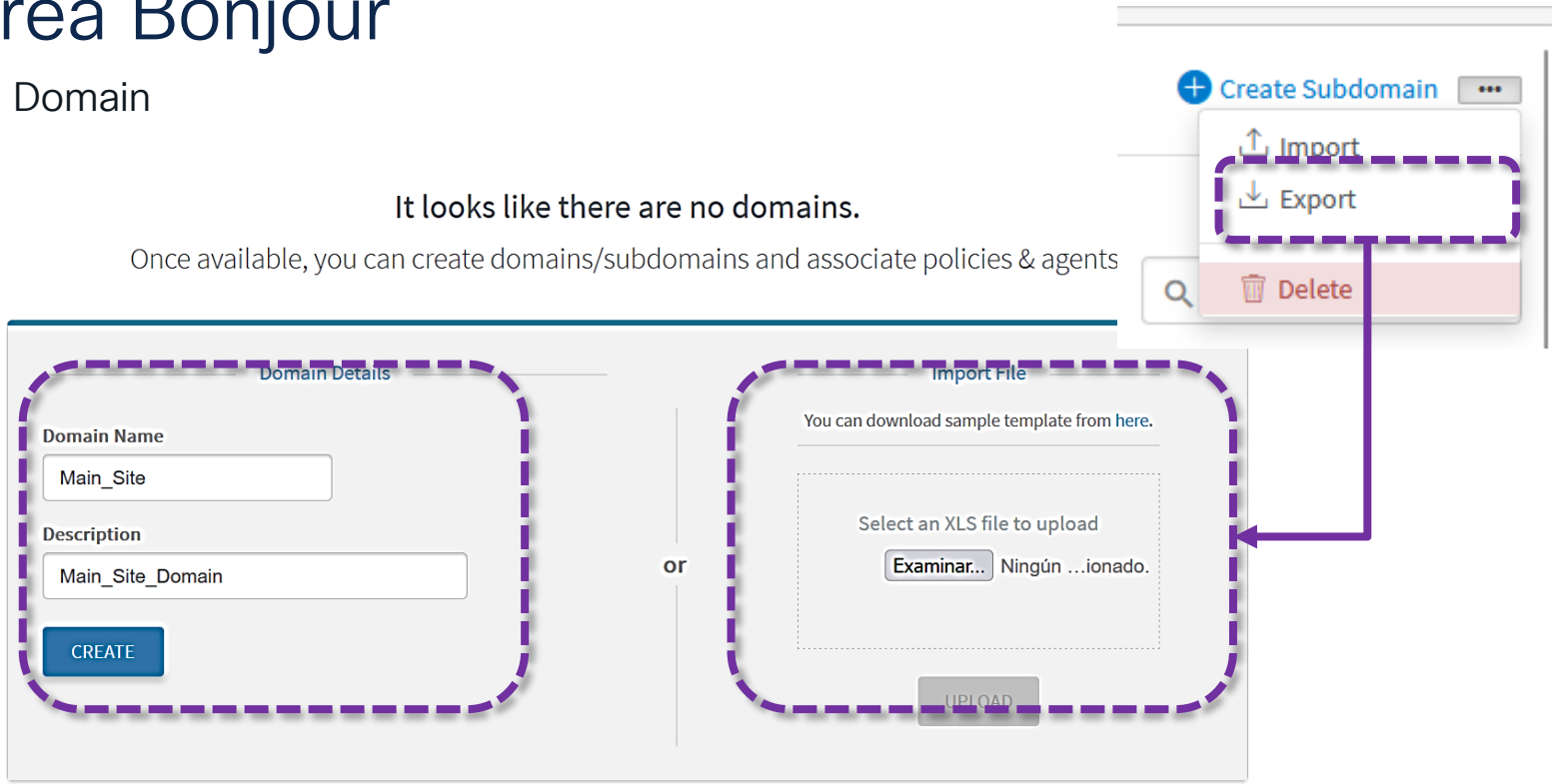
Wide Area Bonjour

WAB Application Dashboard in Cisco DNA Center (Tools / Wide Area Bonjour)



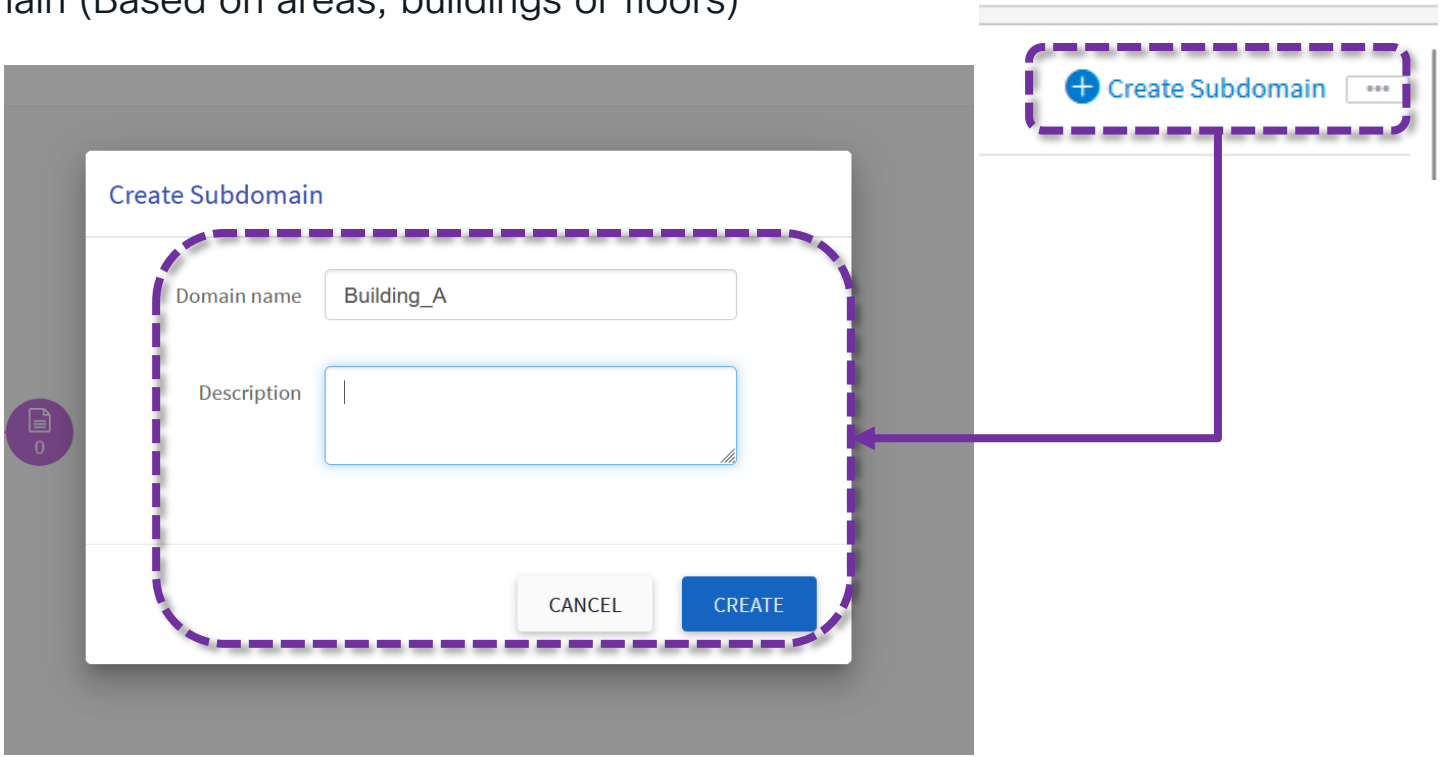
Wide Area Bonjour

Create a New Domain



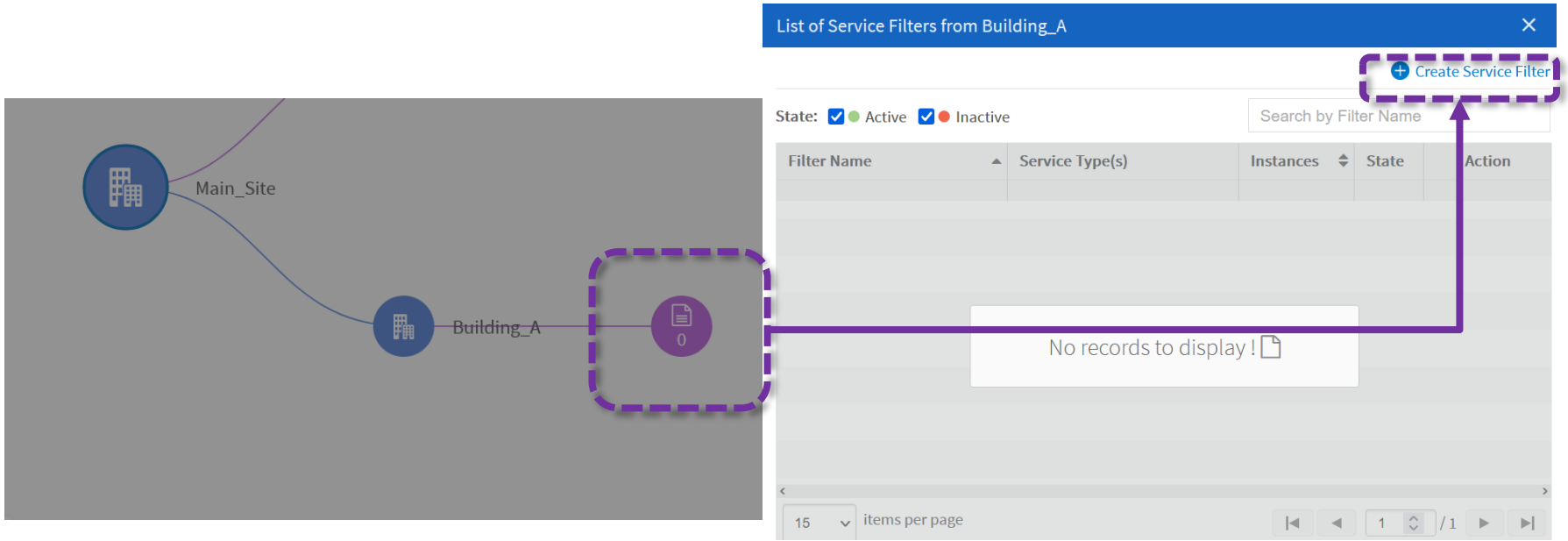
Wide Area Bonjour

Create a Subdomain (Based on areas, buildings or floors)



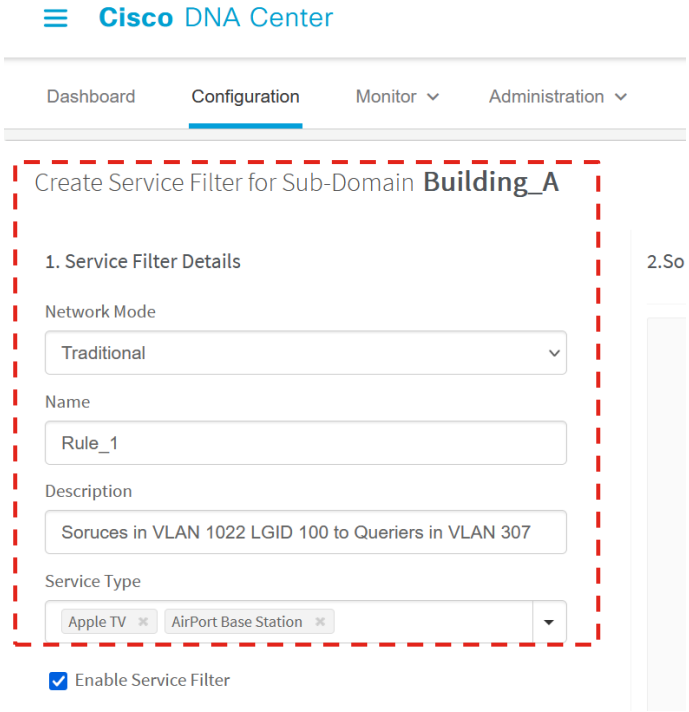
Wide Area Bonjour

Create a Service Filter to define Sources and Queriers



Wide Area Bonjour

Enable the Service Filter and select which services you want to allow in the rule



Network Model: Traditonal or Overlay, Overlay model is for EPVN VXLAN networks

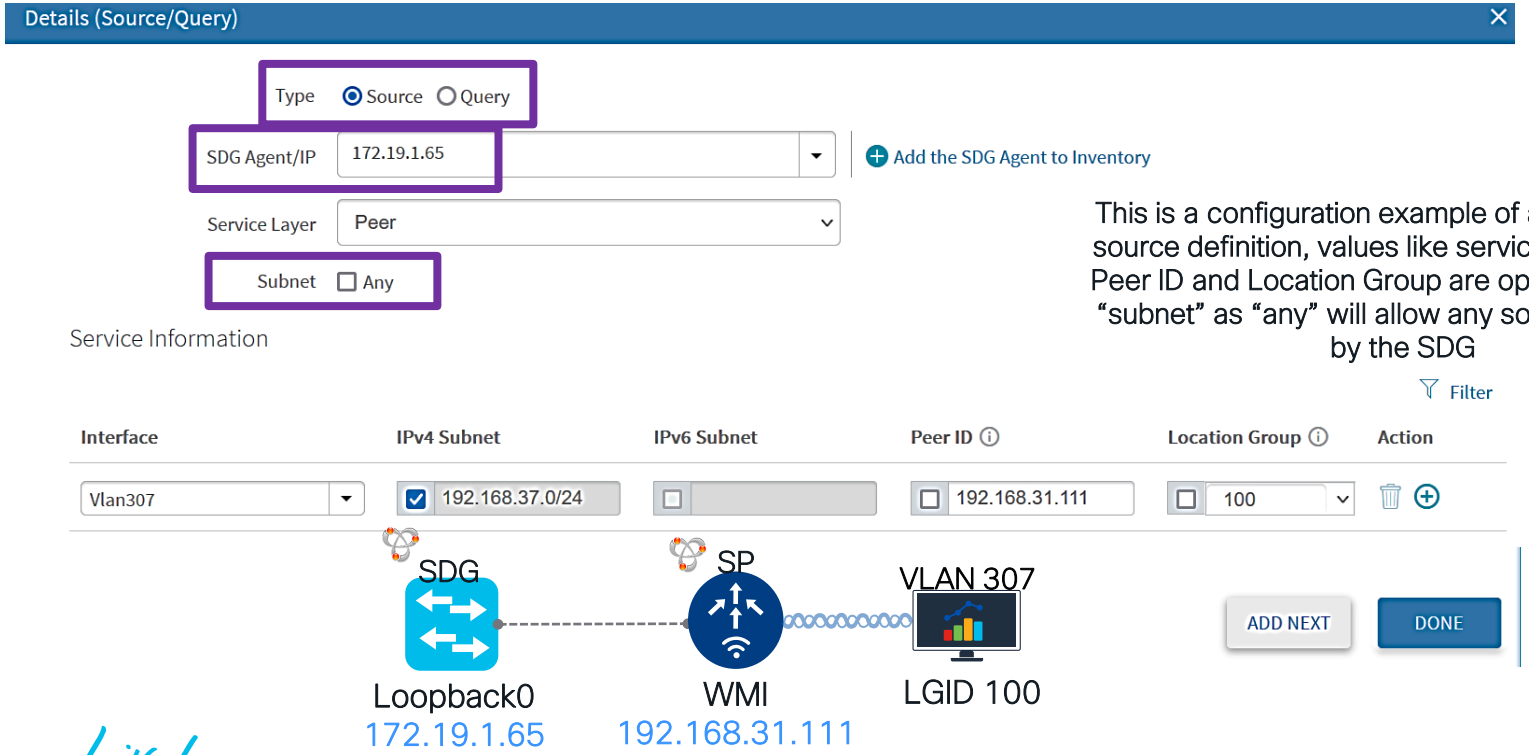
Name and Description

Service Type: Which services will be allowed to be queried and registered by this service-filter

Enable Service Filter: Always enabled

Wide Area Bonjour – Point to Point

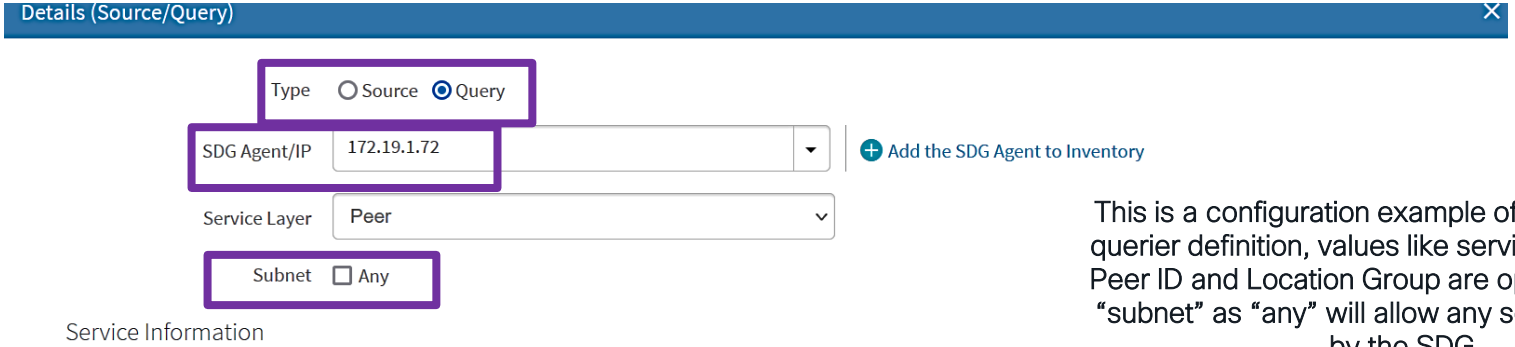
Define SDGs and/or Service-Peers as **sources**



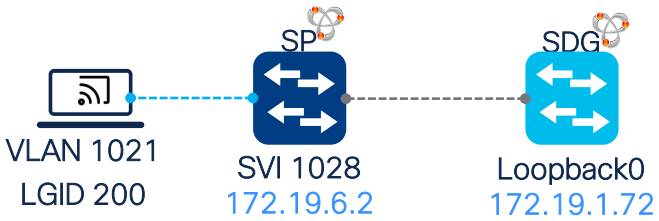
This is a configuration example of a very specific source definition, values like service layer, VLAN, Peer ID and Location Group are optional, marking "subnet" as "any" will allow any source exported by the SDG

Wide Area Bonjour – Point to Point

Define SDGs and/or Service-Peers as **query**

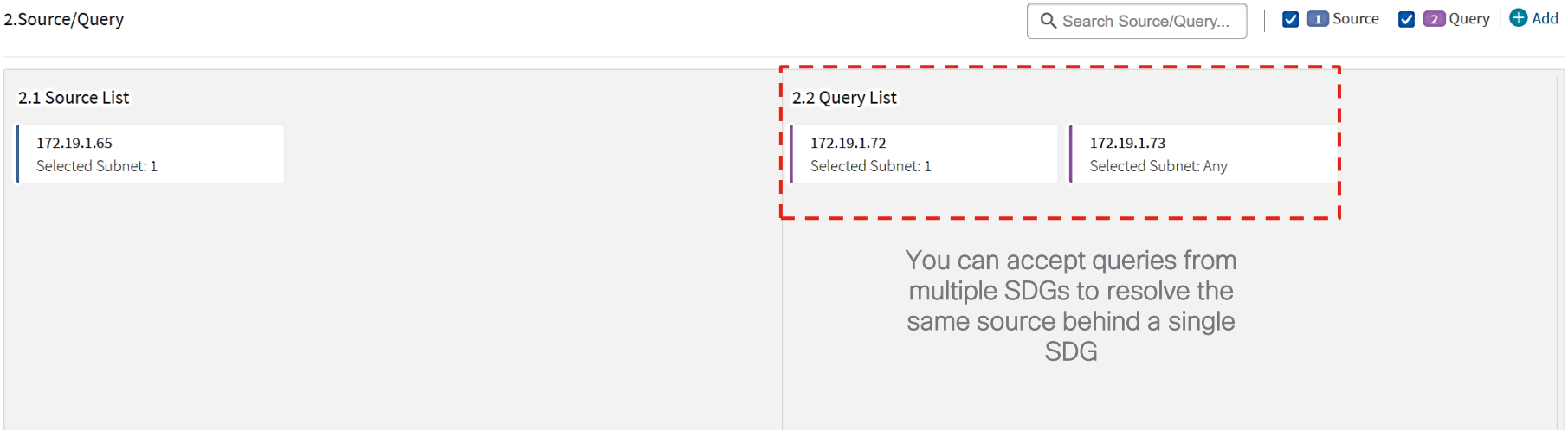


This is a configuration example of a very specific querier definition, values like service layer, VLAN, Peer ID and Location Group are optional, marking "subnet" as "any" will allow any source exported by the SDG



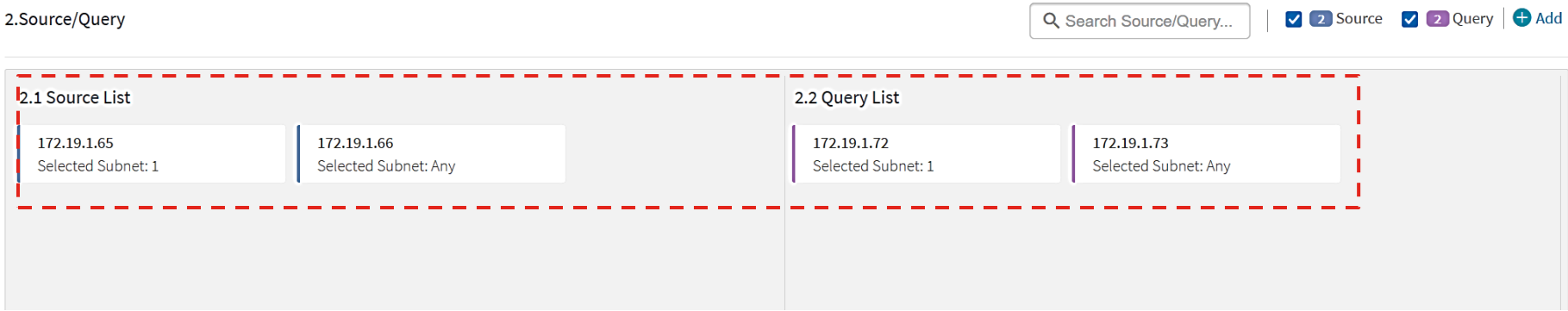
Wide Area Bonjour – Point to Multipoint

Multiple queriers for a single source



Wide Area Bonjour – Multipoint to Multipoint

Multiple queriers for multiple sources



The same way, multiple sources can serve multiple queriers

Wide Area Bonjour – Bi-Directional Rules

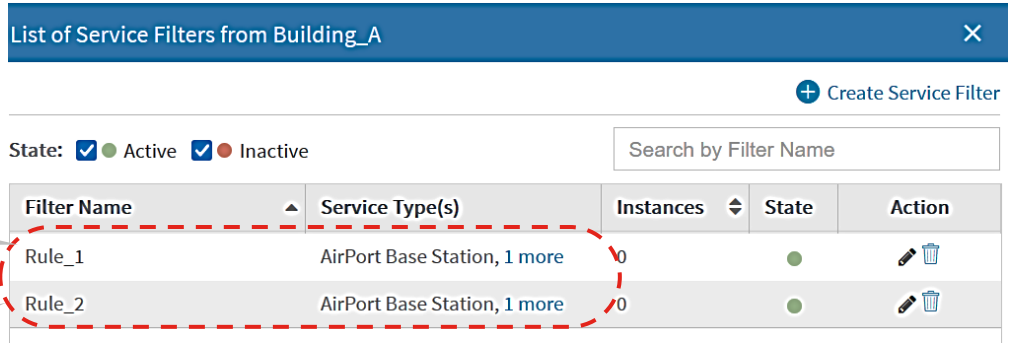
Sources acting as queriers and vice-versa

SDGs as Source:
- 172.19.1.65
- 172.19.1.66

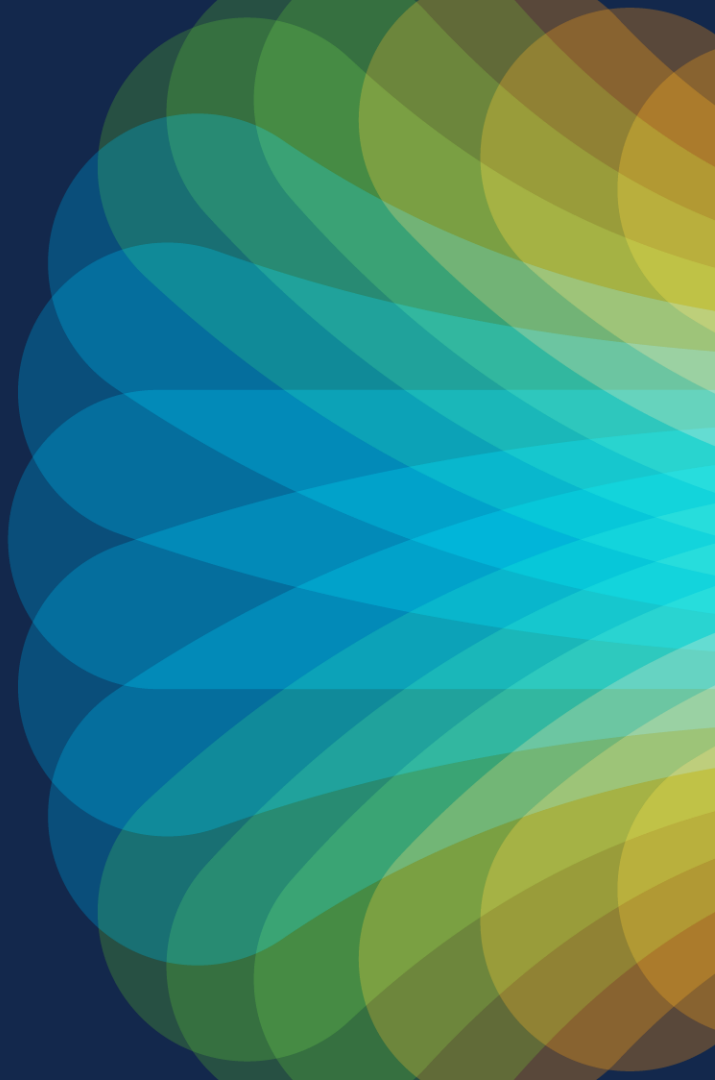
SDGs as Querier:
- 172.19.1.72
- 172.19.1.73

SDGs as Source:
- 172.19.1.72
- 172.19.1.73

SDGs as Querier:
- 172.19.1.65
- 172.19.1.66



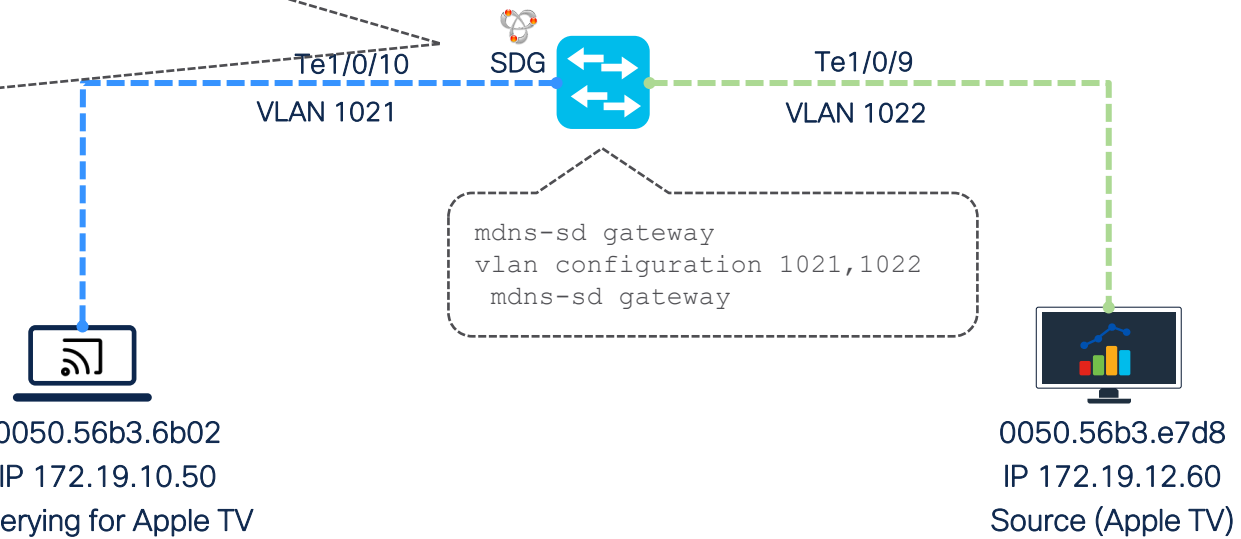
Wired Bonjour Troubleshooting



Troubleshooting – Inter-VLAN Local Area

Basic Checks – mDNS Summary

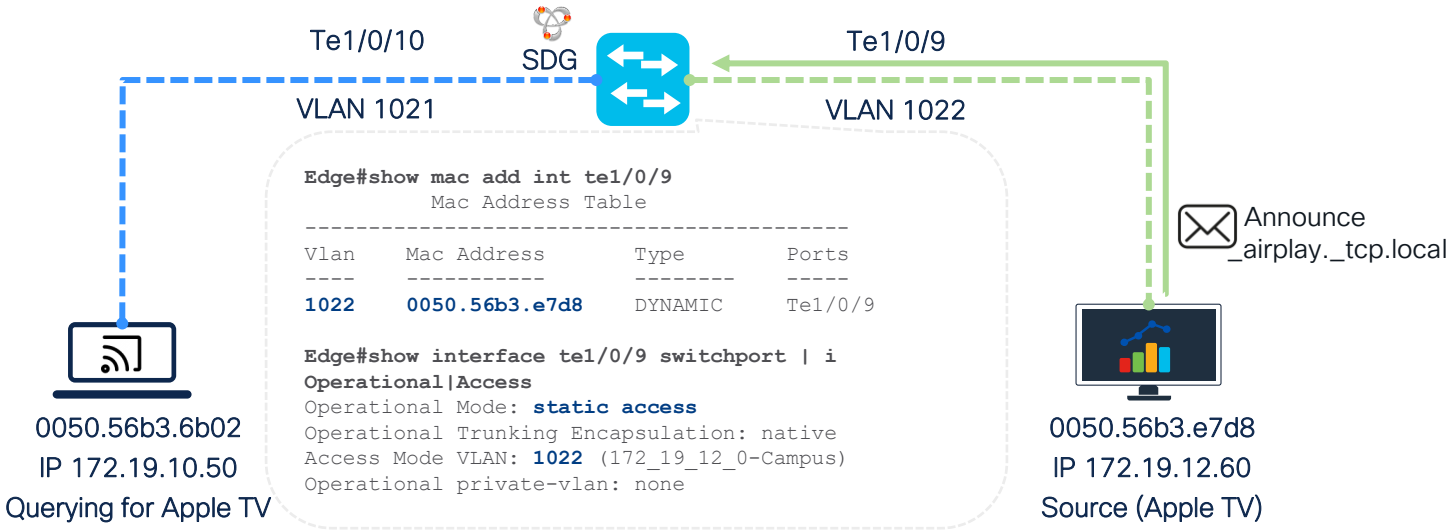
```
Edge#show mdns summary
Global mDNS Gateway
=====================================
mDNS Gateway          : Enabled
Rate Limit            : 60 PPS (default)
AirPrint Helper       : Disabled
Mode                  : SDG-Agent
Source Interface      : Vl1021

VLAN  :  1021
=====================================
mDNS Gateway          : Enabled
mDNS Service Policy   : default-mdns-
service-policy

VLAN  :  1022
=====================================
mDNS Gateway          : Enabled
mDNS Service Policy   : default-mdns-
service-policy
```



Troubleshooting – Inter-VLAN Local Area

Storing an announcement/response in the mDNS cache

Is the port connected to the announcer an access port?
mDNS trusted ports (trunks) will drop mDNS packets at ingress and egress

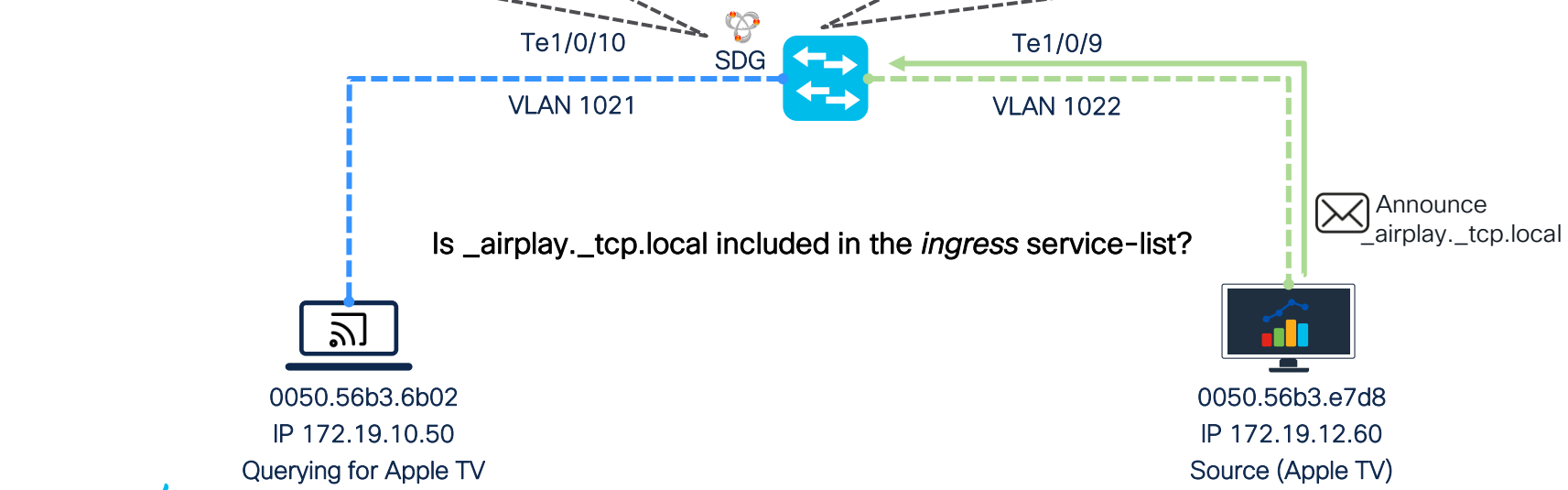


Troubleshooting – Inter-VLAN Local Area

Storing an announcement/response in the mDNS cache

```
Edge#show mdns-sd service-definition
Service        Type                      PTR
=========================================
apple-tv    built-in        _raop._tcp.local
                          _airplay._tcp.local
```

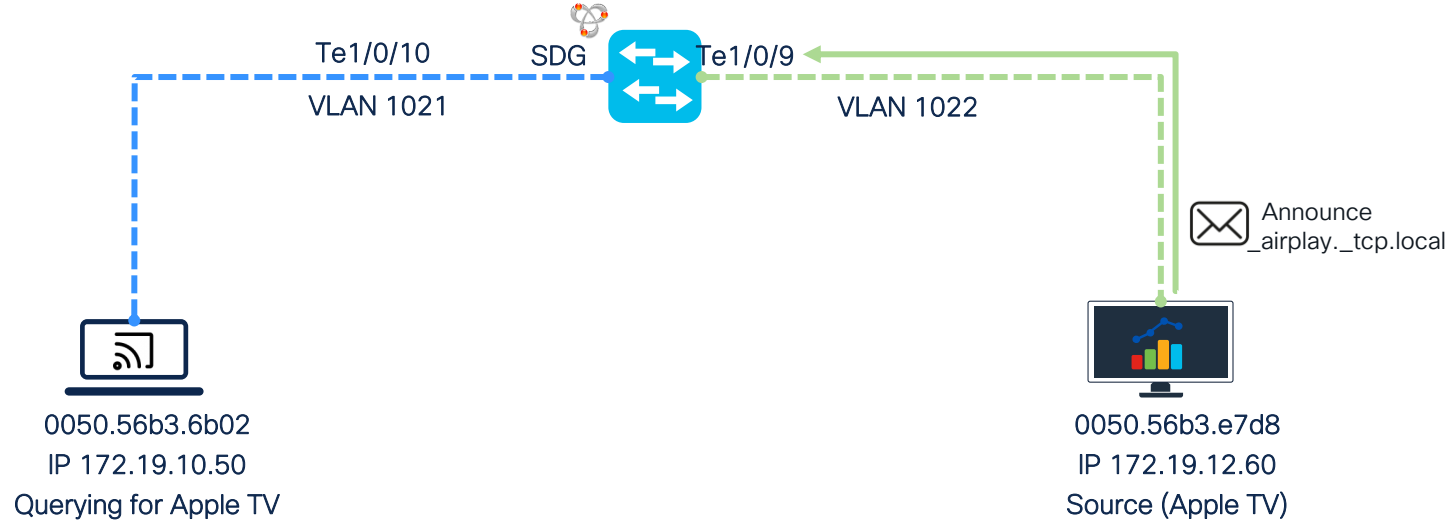
```
Edge#show mdns-sd service-list direction in | i Name|=|apple-tv
Name                              Type    Service Msg-Type Service...
=================================================================
default-mdns-in-service-list  IN  apple-tv      any
```



Troubleshooting – Inter-VLAN Local Area

Storing an announcement in the mDNS cache

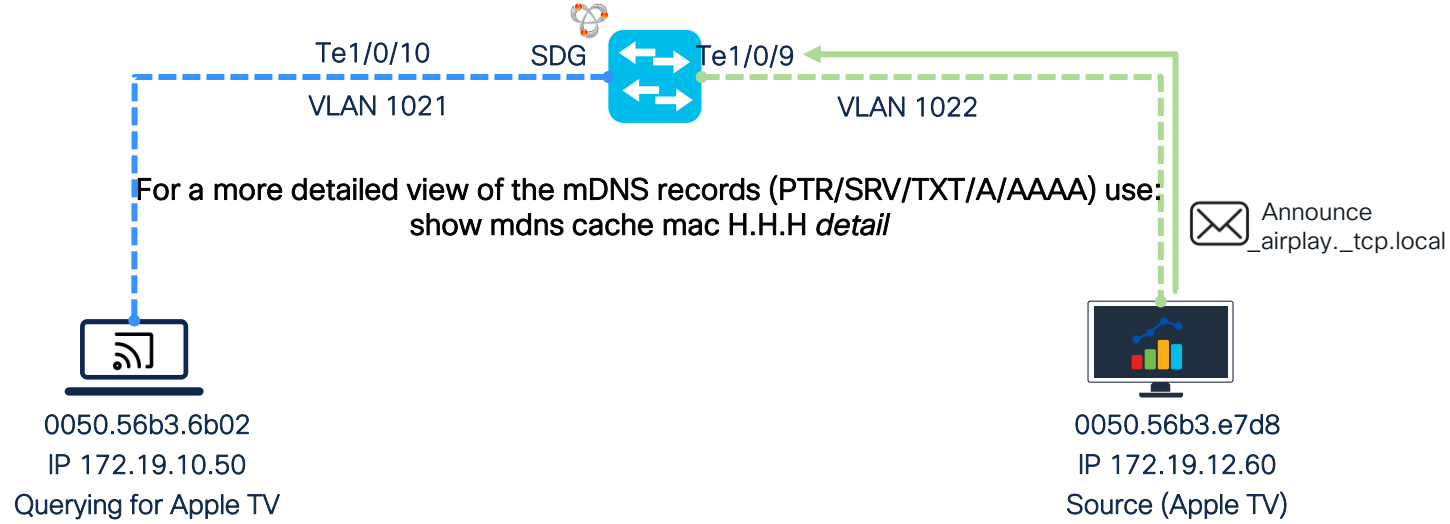
```
Edge#debug mdns events
mDNS: L2 mDNS packet received from As: UNKNOWN vlan: 1022 SG : 0 RtdAccess: 1 Mac: 0050.56b3.e7d8
mDNS: Advertisement on IPv4 is recieved at interface UNKNOWN from 172.19.12.60
mDNS: Prcoessing answer section in advertisements
mDNS: mdns_sd_match_rr_name_in_service_definition: Service _airplay._tcp.local matched in service definition apple-tv
```



Troubleshooting – Inter-VLAN Local Area

Storing an announcement in the mDNS cache

```
Edge#show mdns cache
                                        mDNS CACHE
=============================================================================================================
[<NAME>]                  [<TYPE>][<TTL>/Remaining][Vlan-Id/If-name] [Mac Address] [<RR Record Data>]
_airplay._tcp.local        PTR    4500/4500   1022   0050.56b3.e7d8   PC2._airplay._tcp.local
PC2._airplay._tcp.local    SRV    4500/4500   1022   0050.56b3.e7d8   0    0    515      PC2.local
PC2._airplay._tcp.local    TXT    4500/4500   1022   0050.56b3.e7d8   (1)''
PC2.local                  A      4500/4500   1022   0050.56b3.e7d8   172.19.12.60
```

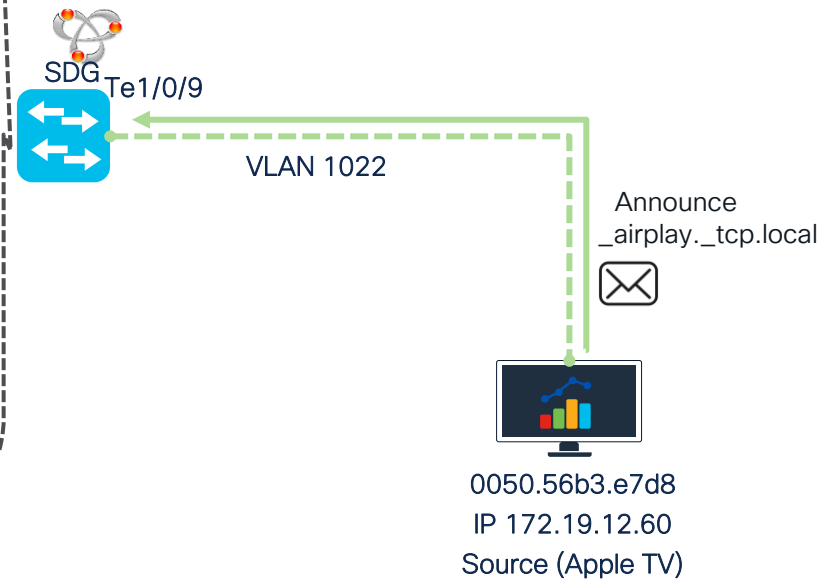


Troubleshooting – Inter-VLAN Local Area

Storing an announcement in the mDNS cache

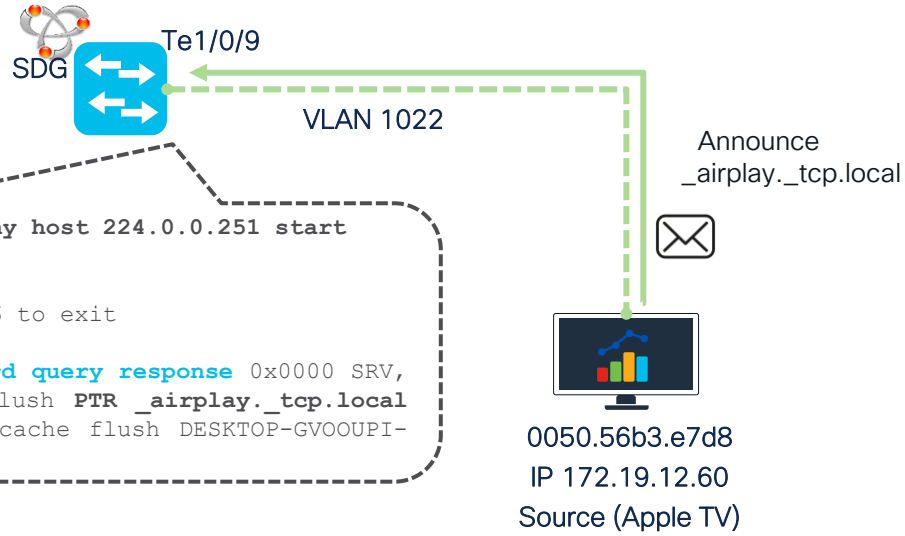
```
Edge#show mdns-sd statistics vlan 1022
 mDNS Statistics
 Vl1022:
  . . .
  mDNS packets received      : 192
   advertisements received   : 102 are advertisements increasing?
   queries received                  : 90
     IPv4 received                   : 192
       IPv4 advertisements received : 102
       IPv4 queries received        : 90
     IPv6 received                   : 0
       IPv6 advertisements received : 0
       IPv6 queries received        : 0
  mDNS packets dropped               : 4    are these dropped?
. . .
  ================================================================
  PTR Name                      Advertisement     Query
      ======================================================
  _sleep-proxy._udp.local                0         1
  _airplay._tcp.local                   27         0
  _smb._tcp.local                        1         0
```

Not getting anything? Check mDNS statistics counters



Troubleshooting – Inter-VLAN Local Area

Storing an announcement in the mDNS cache



Still not getting anything? Try an Embedded Packet Capture

```
Edge#monitor capture cap interface te1/0/9 in match ipv4 any host 224.0.0.251 start
Edge#monitor capture cap stop
Edge#show monitor capture cap buffer brief
Starting the packet display ........ Press Ctrl + Shift + 6 to exit

1    0.766547 172.19.12.60 -> 224.0.0.251  MDNS 264 Standard query response 0x0000 SRV,
cache flush 0 0 515 DESKTOP-GVOOUPI-2.local TXT, cache flush PTR _airplay._tcp.local
PTR PC2._airplay._tcp.local A, cache flush 172.19.12.60, cache flush DESKTOP-GVOOUPI-
2.local NSEC, cache flush PC2._airplay._tcp.local
```

Troubleshooting – Inter-VLAN Local Area

Registering a query into the mDNS query database

Is the port connected to the querier an access port?
mDNS trusted ports (trunks) will drop mDNS packets at ingress and egress

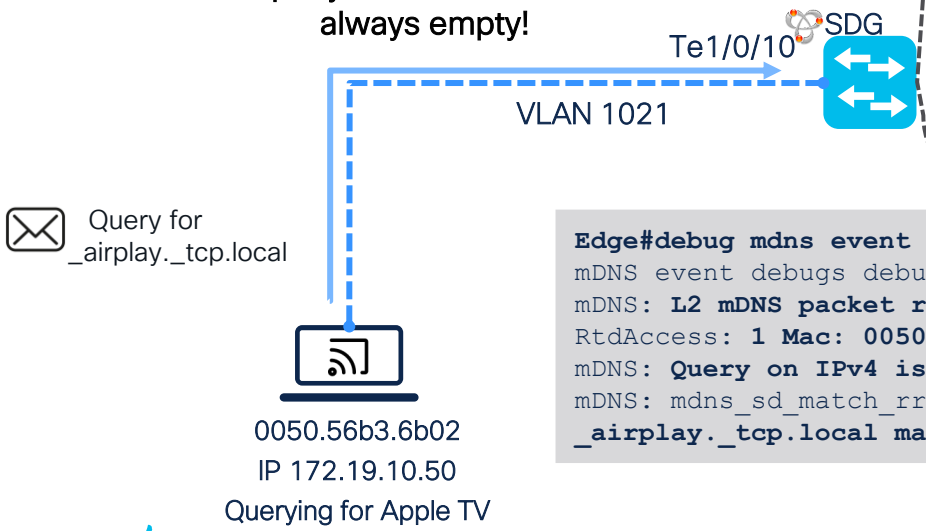
Incoming queries and the announces/responses are controlled by the same ingress list, the same verification steps (service definition and list) apply


```
Edge#show mac address-table interface te1/0/10
          Mac Address Table
-------------------------------------------

Vlan    Mac Address       Type        Ports
----    -----------       --------    -----
1021    0050.56b3.6b02    DYNAMIC     Te1/0/10
Total Mac Addresses for this criterion: 1

Edge#show interface te1/0/10 switchport | i
Operational|Access
Operational Mode: static access
Operational Trunking Encapsulation: native
Access Mode VLAN: 1021 (172_19_10_0-Campus)
Operational private-vlan: none
```

Troubleshooting – Inter-VLAN Local Area

Registering a query into the mDNS query database

If mDNS snooping is not enabled (unicast bonjour), query database will be always empty!

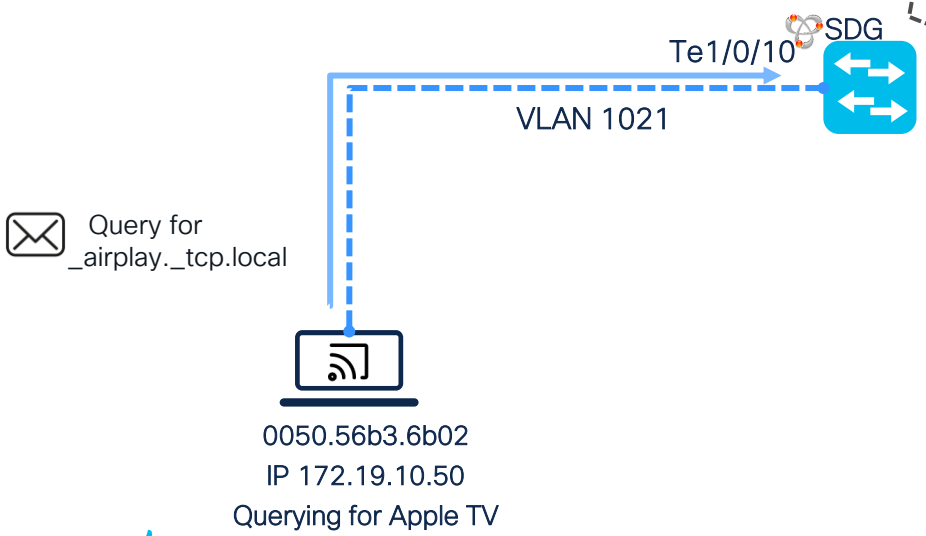



```
Edge#show mdns-sd query-db
-----------------------------------------------
Client MAC      Vlan ID    Location ID    User Role
-----------------------------------------------
PTR Name: _airplay._tcp.local
0050.56b3.6b02    1021         Default      none

Edge#show platform software fed switch active ip mdns
snooping vlan
Vlan       Address Family (1:IPv4 2:IPv6 0:Both)
-----------------------------------------------
1021       1
1022       1
```

```
Edge#debug mdns event
mDNS event debugs debugging is on
mDNS: L2 mDNS packet received from As: UNKNOWN vlan: 1021 SG : 0
RtdAccess: 1 Mac: 0050.56b3.6b02
mDNS: Query on IPv4 is recieved at interface UNKNOWN from 172.19.10.50
mDNS: mdns_sd_match_rr_name_in_service_definition: Service
_airplay._tcp.local matched in service definition apple-tv
```

Troubleshooting – Inter-VLAN Local Area

Registering a query into the mDNS query database



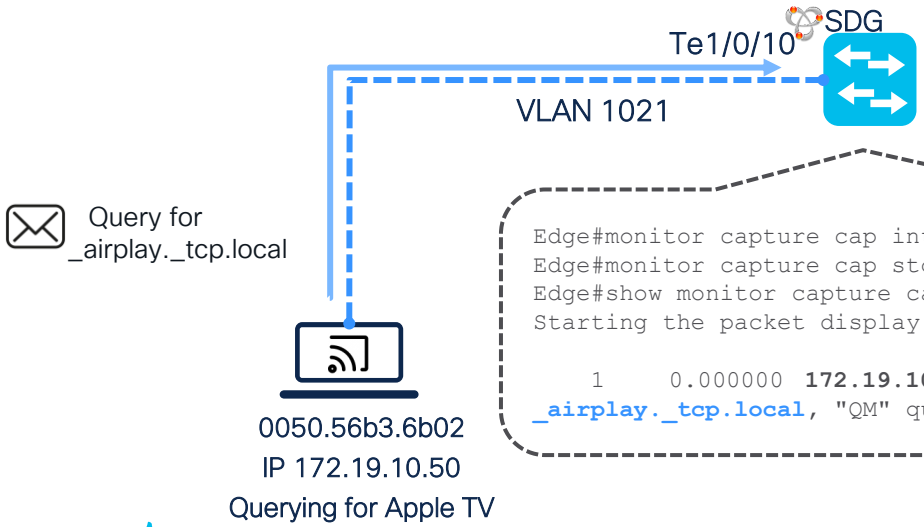

```
Edge#show mdns-sd statistics vlan 1021
mDNS Statistics
Vl1021:
. . .
queries received                    : 386
IPv4 received                     : 451
IPv4 advertisements received : 65
IPv4 queries received  : 386 are queries increasing?
. . .
  mDNS packets dropped                : 0
  ========================================
  Query Type                          : Count
  ========================================
  PTR                                 : 2318
  SRV                                 : 0
  A                                   : 0
  AAAA                                : 0
  TXT                                 : 0
  ANY                                 : 44
  ========================================
PTR Name
                      Advertisement  Query
  ========================================
_raop._tcp.local                    0          1
_airplay._tcp.local                 0          1
```

Not getting anything? Check mDNS statistics counters

Troubleshooting – Inter-VLAN Local Area

Registering a query into the mDNS query database

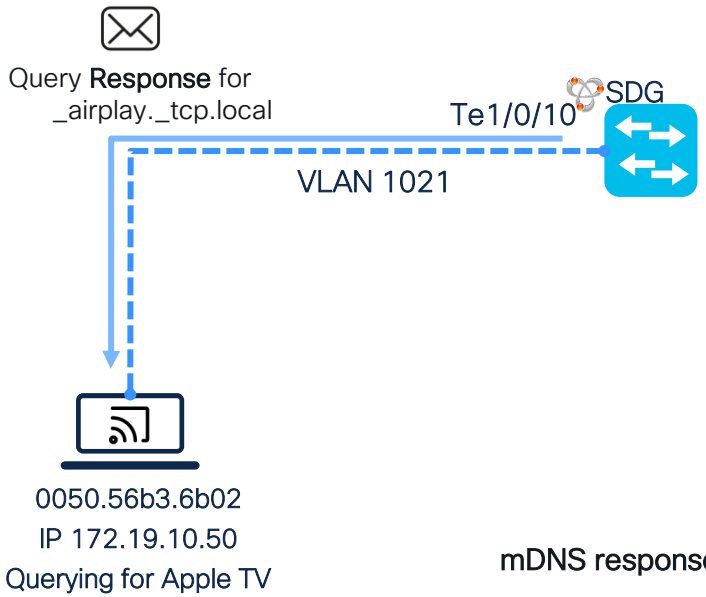
Still nothing? Do a packet capture facing the endhost




```
Edge#monitor capture cap interface te1/0/10 in match ipv4 any host 224.0.0.251 start
Edge#monitor capture cap stop
Edge#show monitor capture cap buffer brief
Starting the packet display ........ Press Ctrl + Shift + 6 to exit

    1    0.000000 172.19.10.50 -> 224.0.0.251   MDNS 79 Standard query 0x0000 PTR
_airplay._tcp.local, "QM" question
```

Troubleshooting – Inter-VLAN Local Area

Replying a query with the local cache information



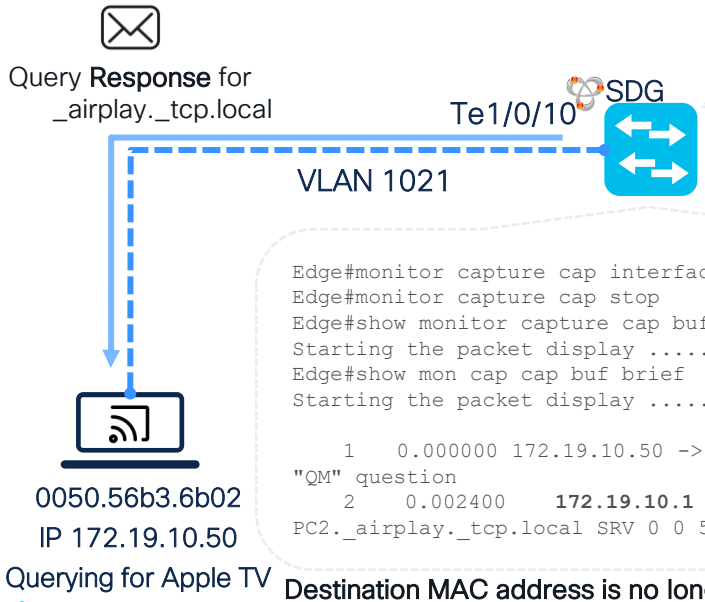

```
Edge#debug mdns all
mDNS: send PD on vlan: 1021 ip_ver: 7
mDNS: packet to PD: source mac : 6c71.0d40.6bf5
destination mac: 0050.56b3.6b02
mDNS: packet source ip : 172.19.10.1
mDNS-DOM: id=0, response, opcode=0, aa=0, tc=0, rd=0,
ra=0
     rcode=0, qdcount=0, ancount=1, nscount=0,
arcount=3
Answer section:
   Name='_airplay._tcp.local'
   RR type=12, class=1, ttl=4500, data length=6
     PTR='PC2._airplay._tcp.local'
Authority section:
Additional record section:
   Name='PC2._airplay._tcp.local'
   RR type=33, class=1, ttl=120, data length=26
   Name='PC2.local'
   RR type=1, class=1, ttl=120, data length=4
     IP=172.19.12.60
   Name='PC2._airplay._tcp.local'
   RR type=16, class=1, ttl=4500, data length=1
     TXT=''
mDNS: mDNS pkt sent to PD 1, status: success
```

mDNS response will be injected and sent out on the port where the querier is connected

Troubleshooting – Inter-VLAN Local Area

Replying a query with the local cache information

Do a packet capture in the CPU in both directions
What is the destination IP destination for the query response?
What is the destination MAC of the query response?




```
Edge#show monitor capture cap buffer display-filter
"ip.src==172.19.10.1" detail | i Src|Dst|Internet

Ethernet II, Src: 6c:71:0d:40:6b:f5
(6c:71:0d:40:6b:f5), Dst: 00:50:56:b3:6b:02
(00:50:56:b3:6b:02)
Internet Protocol Version 4, Src: 172.19.10.1, Dst:
224.0.0.251
User Datagram Protocol, Src Port: 5353, Dst Port: 5353
```

```
Edge#monitor capture cap interface control-plane both match ipv4 any host 224.0.0.251 start
Edge#monitor capture cap stop
Edge#show monitor capture cap buffer brief
Starting the packet display ........ Press Ctrl + Shift + 6 to exit
Edge#show mon cap cap buf brief
Starting the packet display ........ Press Ctrl + Shift + 6 to exit

    1   0.000000 172.19.10.50 -> 224.0.0.251  MDNS 79 Standard query 0x0000 PTR _airplay._tcp.local,
"QM" question
    2   0.002400   172.19.10.1  ->  224.0.0.251   MDNS  158  Standard  query  response  0x0000  PTR
PC2._airplay._tcp.local SRV 0 0 515 DESKTOP-GVOOUPI-2.local A 172.19.12.60 TXT
```

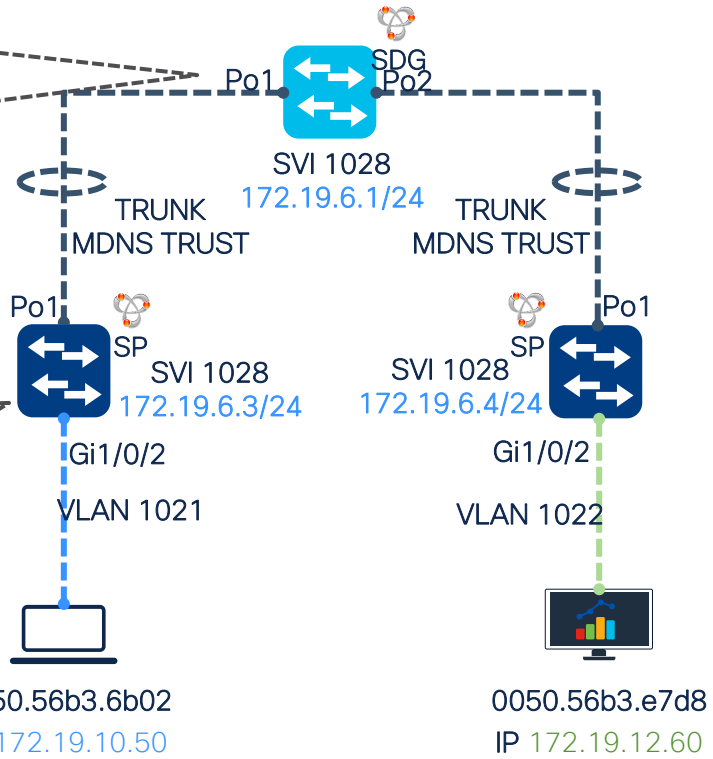
Destination MAC address is no longer mDNS multicast MAC, but the unicast MAC address of the endpoint

Troubleshooting – Service-Peer Service Routing

Initial Setup – Default Policy and Service Peer Groups

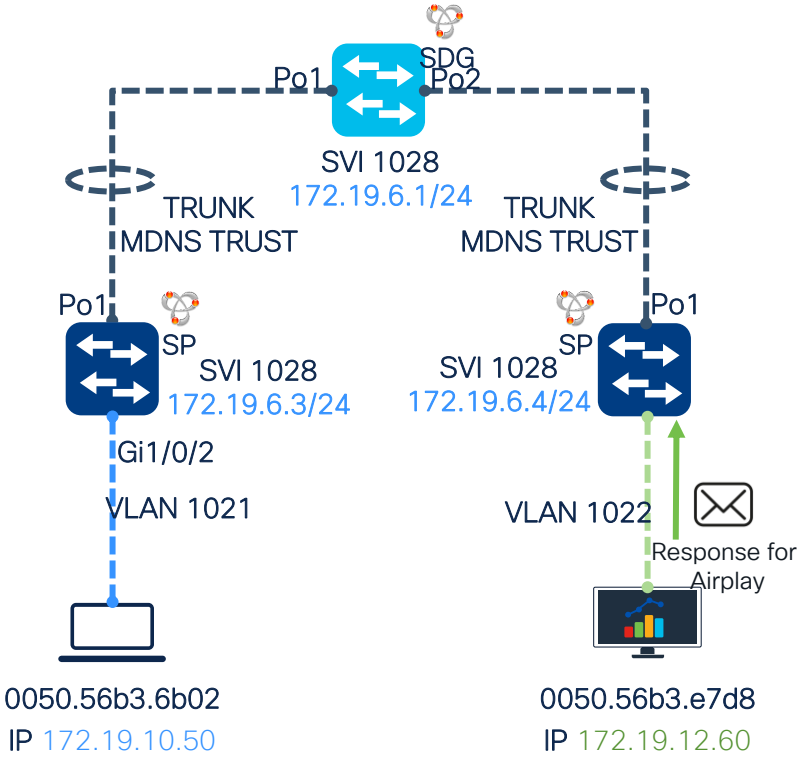
```
mdns-sd gateway

mdns-sd service-peer group
 peer-group 10
  service-peer 172.19.6.3 location-group all role none
  service-peer 172.19.6.4 location-group all role none

vlan configuration 1021,1022
 mdns-sd gateway

interface range Port-channel1-2
 mdns trust
 switchport mode trunk
```

```
[Both Service Peers]
mdns-sd gateway
 mode service-peer
 sdg-agent 172.19.6.1

vlan configuration 1021,1022
 mdns-sd gateway

interface Port-channel1
 mdns trust
 switchport mode trunk

Interface GigabitEthernet1/0/2
 switchport mode access
 switchport access vlan 1021
```



Troubleshooting – Service-Peer Service Routing

Registering a service from a Service Peer on the SDG



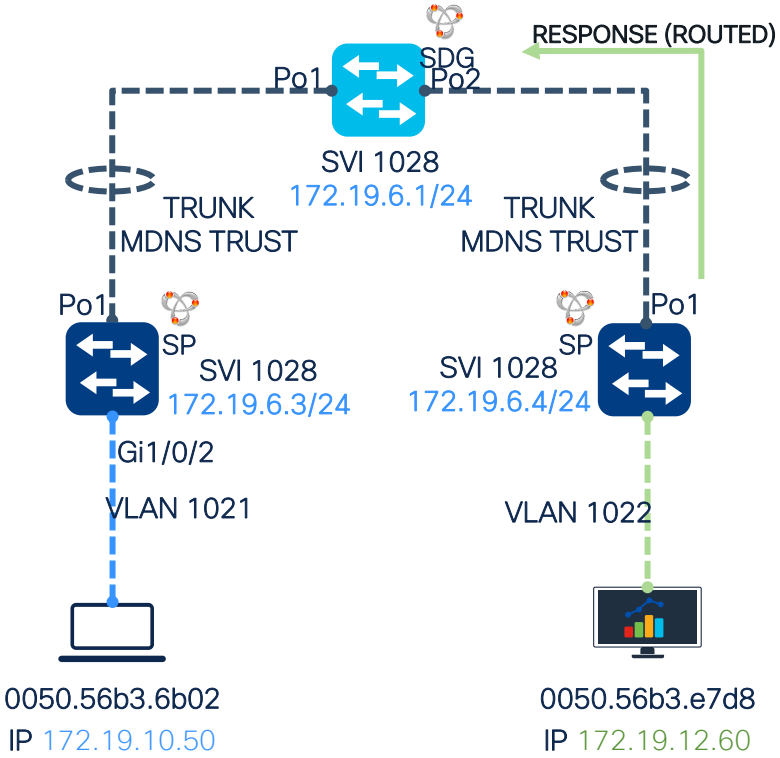

```
Ex_Node3#show mdns-sd summary  | i Advertisemen
Next Advertisement to SDG        : 00:00:03
Ex_Node3#show mdns-sd summary  | i Advertisemen
Next Advertisement to SDG        : 00:00:02
Ex_Node3#show mdns-sd summary  | i Advertisemen
Next Advertisement to SDG        : 00:00:01
```

Max 30 seconds
(Announce Timer Periodicity)

```
Ex_Node3#debug mdns all
Ex_Node3#
mDNS: mDNS packet from snooping process VNid: 0, sp_if_id: 9
mDNS: L2 mDNS packet received from As: 172.19.6.4 vlan: 1022 SG : 0
RtdAccess: 0 Mac: 0050.56b3.e7d8
mDNS: Advertisement on IPv4 is recieved at interface UNKNOWN from
172.19.12.60
mDNS: Prcoessing answer section in advertisements
mDNS: mdns_sd_match_rr_name_in_service_definition: Service
_airplay._tcp.local matched in service definition apple-tv

------ ** mDNS cache is created on Extended Node3 *** ---
```

Troubleshooting – Service-Peer Service Routing

Registering a service from a Service Peer on the SDG



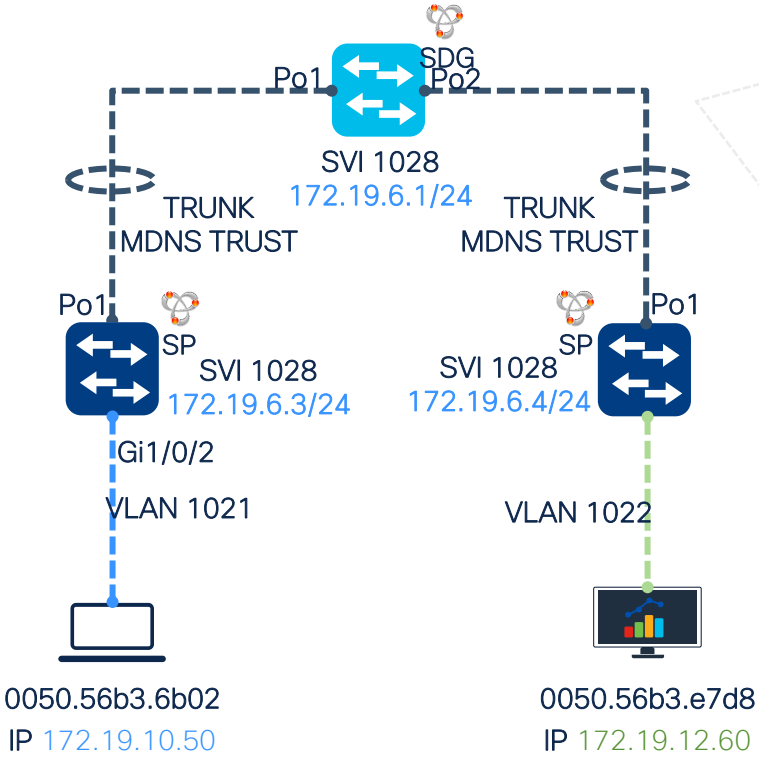

```
Ex_Node3#debug mdns all
mDNS event debugs debugging is on
Ex_Node3#
028931: *Apr 23 01:37:26.527: mDNS: Service-Peer sending
MDNS_MSG_ADVERTISEMENT BCP packet from src_ip : 172.19.6.4 src
port: 10991 to dest_ip: 172.19.6.1 and dest port: 10991
028932: *Apr 23 01:37:26.527: mDNS: TLV pkt sent, TLV len: 172
028933: *Apr 23 01:37:26.527: mDNS: mdns_sd_fill_data_and_send
sending bcp msg to SDG success
```

```
Ex_Node3#show mdns-sd summary  | i Advertisemen
Next Advertisement to SDG        : 00:00:03
Ex_Node3#show mdns-sd summary  | i Advertisemen
Next Advertisement to SDG        : 00:00:02
Ex_Node3#show mdns-sd summary  | i Advertisemen
Next Advertisement to SDG        : 00:00:01
```

Max 30 seconds
(Announce Timer Periodicity)

Troubleshooting – Service-Peer Service Routing

Registering a service from a Service Peer on the SDG




```
SDG#show mdns-sd sdg  service-peer summary
============================================================
Service-Peer/Port   Cache-Sync     Uptime            Record
Count
                    Sent    Time
============================================================
172.19.6.3/10991     0      NA     0 Hrs 0  Mins      0
172.19.6.4/10991     0      NA     0 Hrs 0  Mins      1  ** 1
advertisement received on this peer

SDG#show mdns-sd sp-sdg statistics | se received
 Messages received:
  Query                          : 2179
  ANY query                      : 0
  Advertisements                 : 79
  Advertisement Withdraw         : 29
  Interface down                 : 4
  Vlan down                      : 0
  Service-peer cache clear       : 0
  Resync response                : 189
  Srvc Discovery response        : 0
  Keep-Alive                     : 56478

** An mDNS cache is created on the SDG from this Service-
Peer advertisement
```

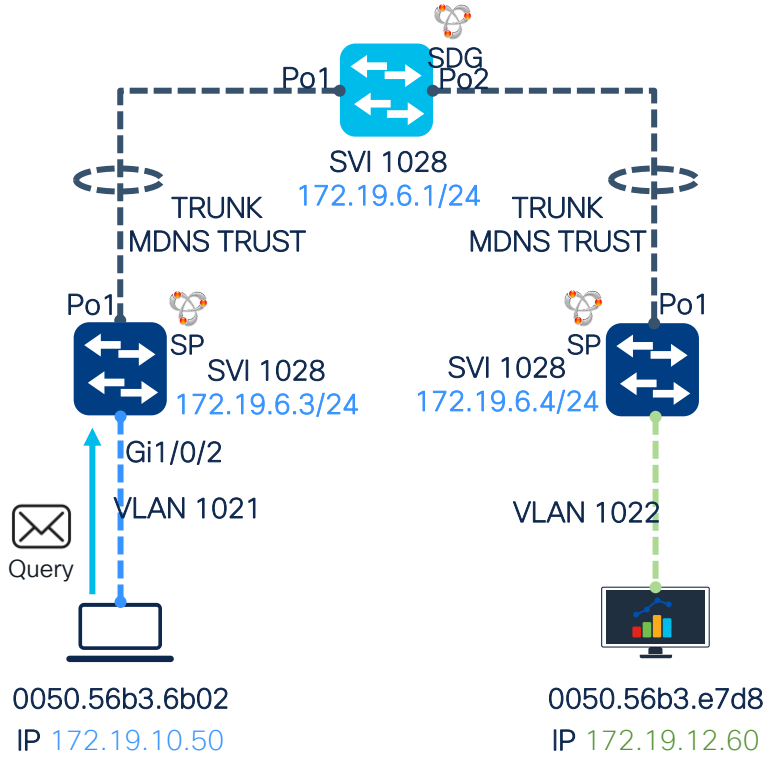
Troubleshooting – Service-Peer Service Routing

Querying a service from a Service Peer

```
Ex_Node2#show mdns-sd summary | i Next Query
Next Query to SDG                : 00:00:01
Ex_Node2#show mdns-sd summary | i Next Query
Next Query to SDG                : 00:00:00
Ex_Node2#show mdns-sd summary | i Next Query
Next Query to SDG                : 00:00:14
```

Max 15 seconds
(Query Timer Periodicity)

```
Ex_Node2#debug mdns all
mDNS: mDNS packet from snooping process VNid: 0, sp_if_id: 10
mDNS: L2 mDNS packet received from As: 172.19.6.3 vlan: 1021 SG : 0
RtdAccess: 0 Mac: 0050.56b3.6b02
mDNS: stats: if_index 0 vlan 1021 param 2
mDNS: Query on IPv4 is recieved at interface UNKNOWN vlan 1021 from
172.19.10.50

*** mDNS query-DB entry is created on the Extended Node 2 ***
```



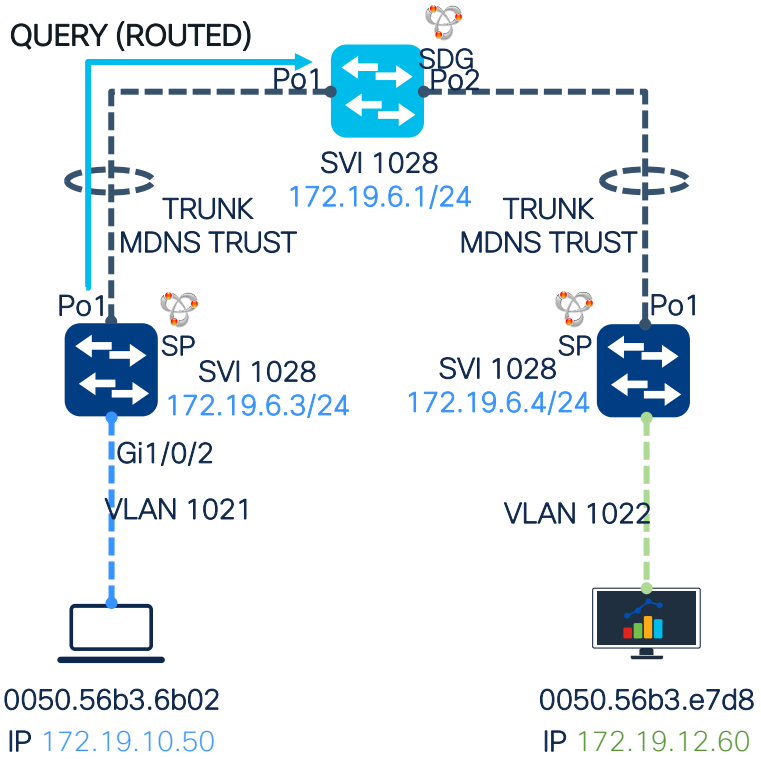
Troubleshooting – Service-Peer Service Routing

Exporting a query to the SDG

```
Ex_Node2#debug mdns all
mDNS event debugs debugging is on
Ex_Node2#
mDNS: Service-Peer sending MDNS_MSG_SELF_GENERATED_PTR_QUERY BCP
packet from src_ip : 172.19.6.3 src port: 10991 to dest_ip:
172.19.6.1 and dest port: 10991
```

```
Ex_Node2#show mdns-sd summary | i Next Query
Next Query to SDG                : 00:00:01
Ex_Node2#show mdns-sd summary | i Next Query
Next Query to SDG                : 00:00:00
Ex_Node2#show mdns-sd summary | i Next Query
Next Query to SDG                : 00:00:14
```

Max 15 seconds
(Query Timer Periodicity)

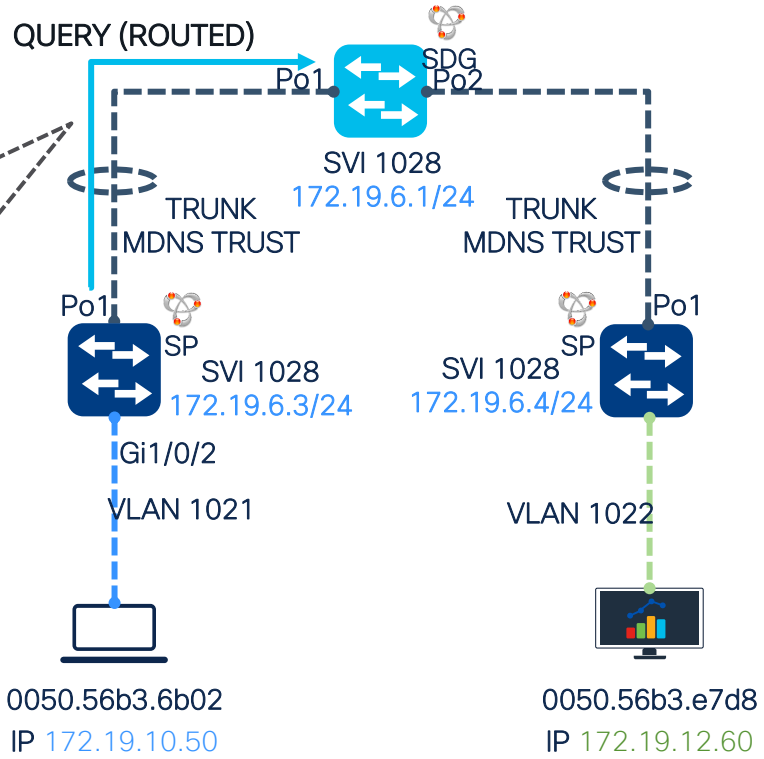


Troubleshooting – Service-Peer Service Routing

Exporting a query from a Service Peer

Queries from Service-Peers routed to the SDG will not create an mDNS query-DB entry, these must be dropped by the mDNS trust boundary

```
SDG#show mdns-sd  query-db
Query DataBase Empty

Edge#show   mdns-sd   sp-sdg   statistics   |   se
Messages received:
 Messages received:
  Query                          : 2205
  ANY query                      : 0
  Advertisements                 : 79
  Advertisement Withdraw         : 30
  Interface down                 : 4
  Vlan down                      : 0
  Service-peer cache clear       : 0
  Resync response                : 191
  Srvc Discovery response        : 0
  Keep-Alive                     : 56633
```

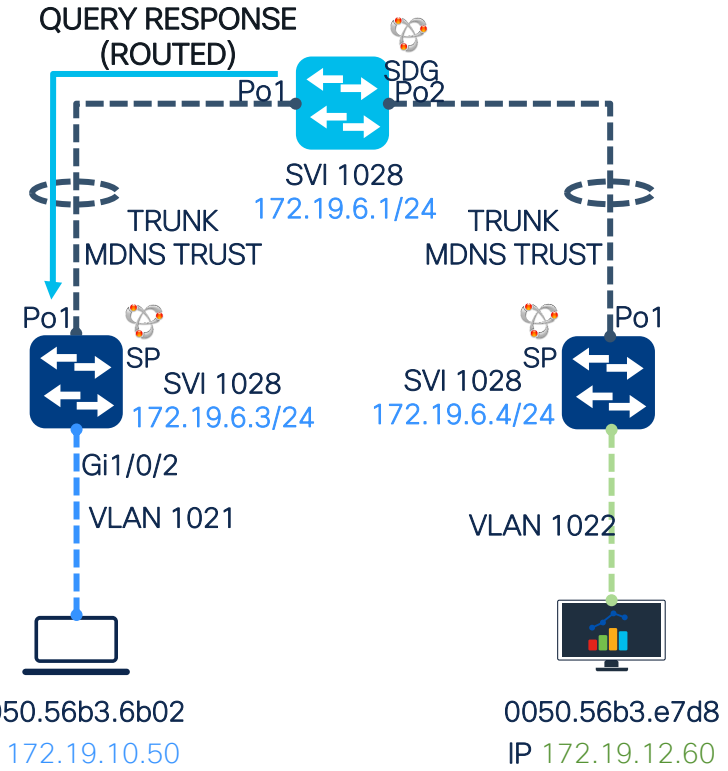


Troubleshooting – Service-Peer Service Routing

SDG replies a query from a Service Peer

```
SDG#debug mdns all
mDNS event debugs debugging is on
 mDNS: L2 mDNS packet received from As: 172.19.6.3 vlan: 1021 SG : 0 RtdAccess: 0 Mac:
0000.0000.0000
 mDNS packet dump

 mDNS-DOM: id=0, query, opcode=0, aa=0, tc=0, rd=1, ra=0
      rcode=0, qdcount=1, ancount=0, nscount=0, arcount=0
      query name is _airplay._tcp.local, qtype=12, class=1
 mDNS: Filtering done. Handle query
```

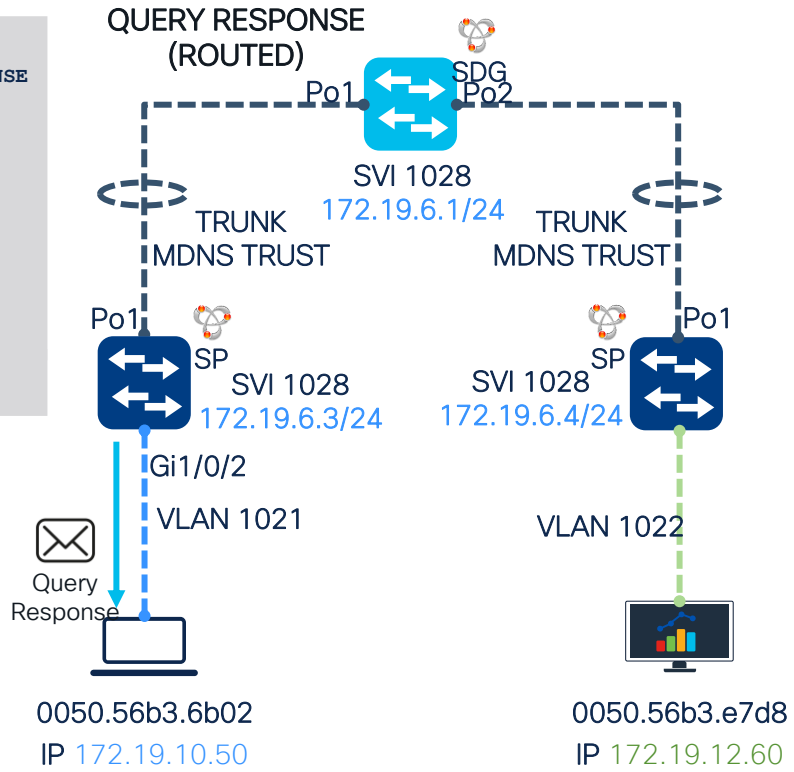
```
mDNS: send response to PTR query: _airplay._tcp.local
mDNS: add TLV: MDNS_TLV_TYPE_VLAN_ID
mDNS: add TLV: MDNS_TLV_TYPE_LOCATION_GROUP_ID
mDNS: add TLV: MDNS_TLV_TYPE_QUERY_NAME
mDNS: add TLV: MDNS_TLV_TYPE_SERVICE_PEER_ID
mDNS: add TLV: MDNS_TLV_TYPE_MDNS_PAYLOAD
mDNS: add TLV: MDNS_TLV_TYPE_USER_ROLE
mDNS: SDG sending MDNS_MSG_PTR_QUERY_RESPONSE BCP packet from src_ip : 172.19.6.1 src
port: 10991 to dest_ip: 172.19.6.3 and dest port: 10991
```



Troubleshooting – Service-Peer Service Routing

Service Peer sends a query response to the end host

```
Ex_Node2#debug mdns all
035030: *Apr 23 01:57:41.953: mDNS: Received BCP msg type: MDNS_MSG_PTR_QUERY_RESPONSE
035031: *Apr 23 01:57:41.953: mDNS: Length of the complete packet is 158
035032: *Apr 23 01:57:41.953: mDNS: send PD on vlan: 1021 ip_ver: 7
035033: *Apr 23 01:57:41.953: mDNS: packet to PD: source mac : 5c5a.c769.5fee
destination mac: 0050.56b3.6b02
. . .
035037: *Apr 23 01:57:41.953: Answer section:
035038: *Apr 23 01:57:41.953:    Name='_airplay._tcp.local'
035039: *Apr 23 01:57:41.953:    RR type=12, class=1, ttl=4500, data length=6
035040: *Apr 23 01:57:41.953:      PTR='PC2._airplay._tcp.local'

035051: *Apr 23 01:57:41.953:      TXT=''
035052: *Apr 23 01:57:41.953: mDNS: mDNS pkt sent to PD 1, status: success
```

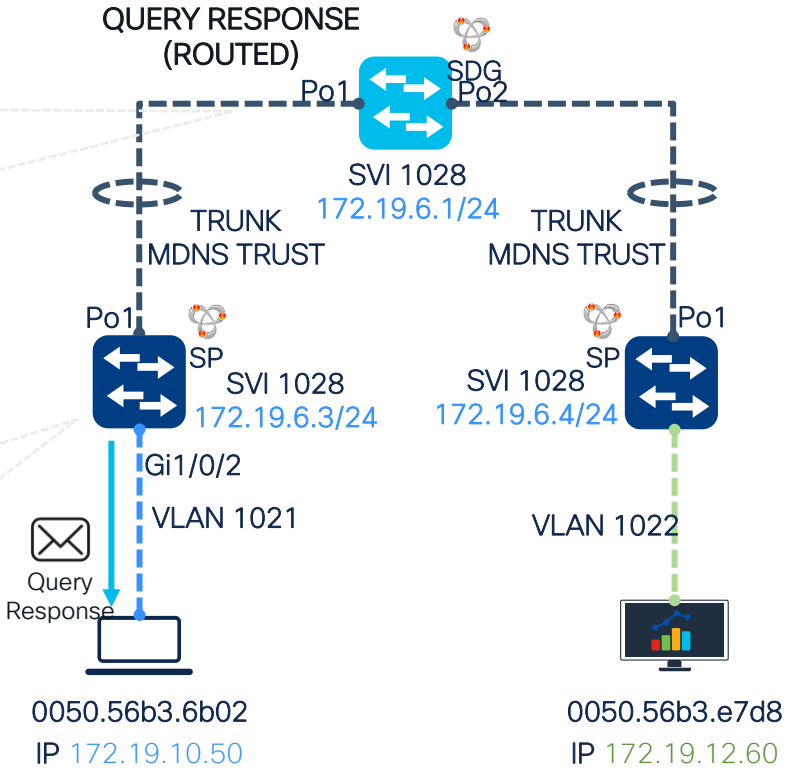


Troubleshooting – Service-Peer Service Routing

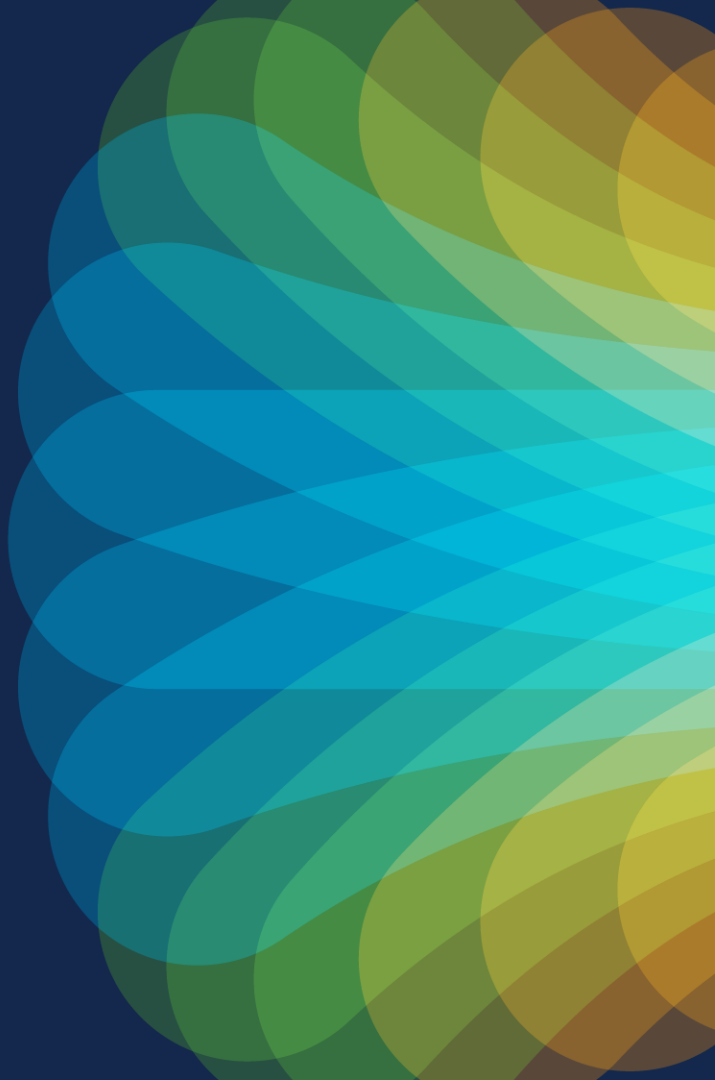
Verifying query response counters in SDG and Service Peer

```
Edge#show mdns-sd  query-db
Query DataBase Empty

Edge#show mdns-sd sp-sdg statistics | se Messages sent
 Messages sent:
  Query response              : 398
  ANY Query response          : 0
  Cache-sync                  : 313
  Get service-instance        : 3
  Srvc Discovery request      : 0
  Keep-Alive Response         : 56760
```

```
Ex_Node2#show mdns-sd sp-sdg statistics | se Messages
received
 Messages received:
  Query response              : 403
  ANY Query response          : 0
  Cache-sync                  : 156
  Get service-instance        : 1
  Srvc Discovery request      : 0
  Keep-Alive Response         : 28419
```



Wireless Bonjour Troubleshooting



Troubleshooting – Wireless Bonjour

Wireless mDNS configuration

```
mdns-sd gateway
 mode service-peer
 sdg-agent 192.168.31.115

mdns-sd service-policy LOCAL-AREA-POLICY
 location location-group
```

```
wireless rule application mdns
 rule-priority 1 rule-name BLDG
  regex B1-AP.
  action-type grouping
   group-id 100

wlan    Cisco_Live_Local_profile    17
Cisco_Live_Local
 mdns-sd-interface gateway
```

```
WLC1#show wireless client summary
Number of Clients: 1

MAC Address       AP Name      Type  ID
State      Protocol Method      Role
-------------------------------------
34e1.2d88.2b15  B1-AP-1       WLAN  17
Run        11ac     None        Local
```


```
mdns-sd gateway

vlan configuration 307
  mdns-sd gateway

interface
TwentyFiveGigE1/0/3
  mdns trust
```

```
wireless multicast
wireless multicast 225.1.2.3
```

Troubleshooting – Wireless Bonjour

How to debug

```
WLC1#set platform software trace wncd chassis active r0 mdns verbose

Display:
WLC1#show logging process wncd internal | i mdns

Save to a file:
WLC1#show logging process wncd internal to-file bootflash:logs.log

Disable wncd-mDNS traces:
WLC1#set platform software trace wncd chassis active r0 all-modules notice
```

mDNS debugs in Catalyst 9800 Wireless LAN Controllers must be enabled as binary traces

```
Edge#debug mdns-sd
```

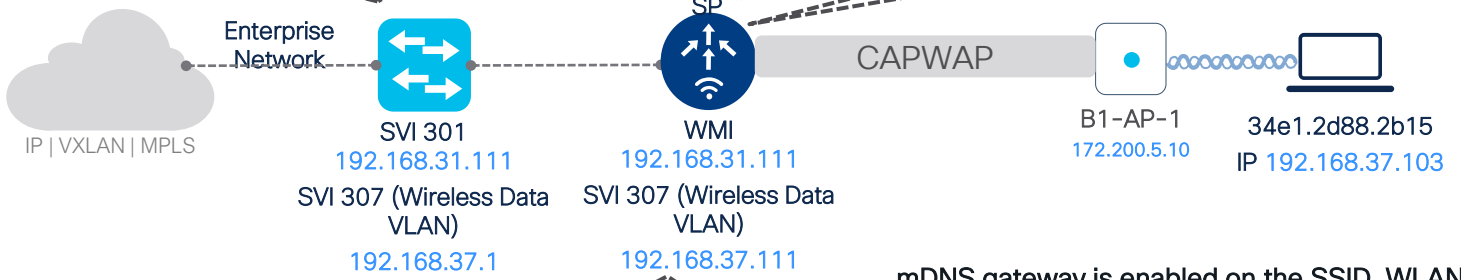
Troubleshooting – Wireless Bonjour

Basic Checks

```
Edge#show mdns-sd sdg service-peer summary
=============================================
Service-Peer/Port     Cache-Sync          Uptime
Record Count
                   Sent    Time
=============================================
192.168.31.111/10991    0    NA  0 Hrs 0  Mins
```

```
WLC1#show mdns-sd summary
mDNS Gateway: Enabled
Mode: Service Peer
. . .
SDG Agent IP: 192.168.31.115
. . .
mDNS AP service policy: default-
mdns-service-policy
```

```
WLC1#show ap multicast mom
AP Name        MOM-IP TYPE       MOM-STATUS
-----------------------------------------------
B1-AP-1        IPv4              Up
```



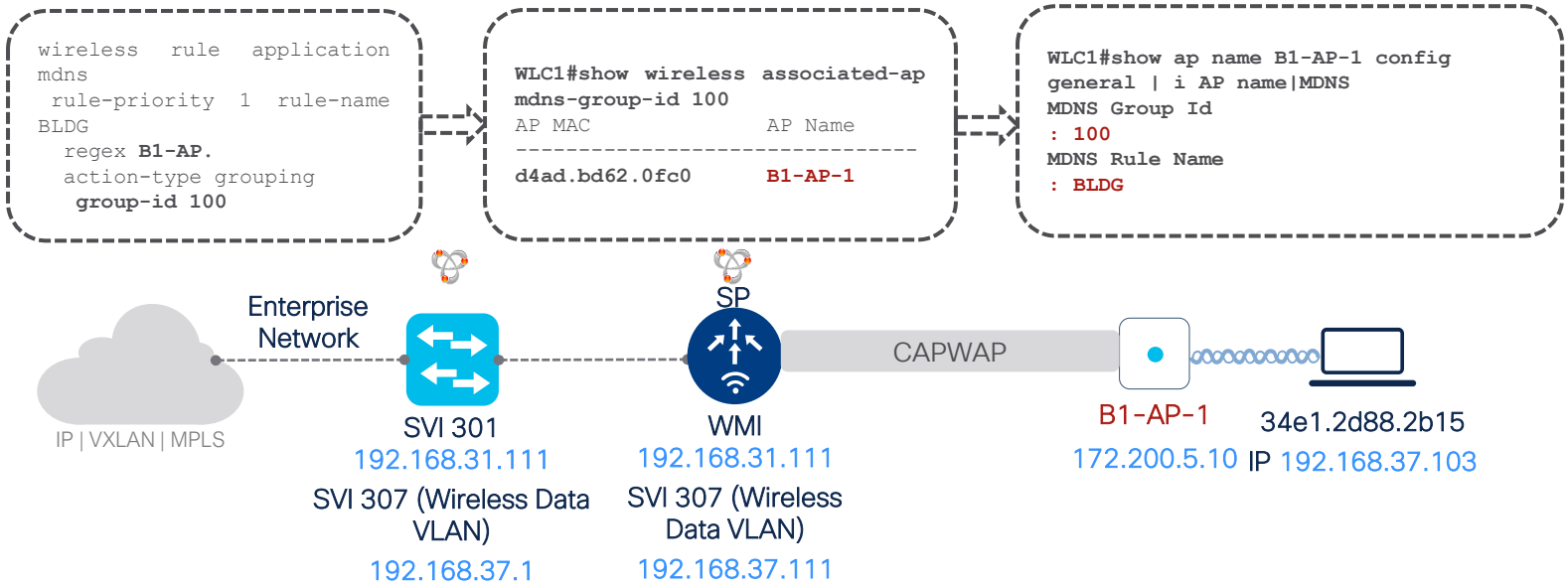
The WLC should be listed as a service-peer on the SDG, using the same keepalive mechanism as wired Service-Peers

```
WLC1#show wlan id 17 | i mDNS
mDNS Gateway Status    : Gateway
```

mDNS gateway is enabled on the SSID, WLAN 17 is Cisco_Live_Local in this example

Troubleshooting – Wireless Bonjour

Location Group ID Assignment



Troubleshooting – Wireless Bonjour

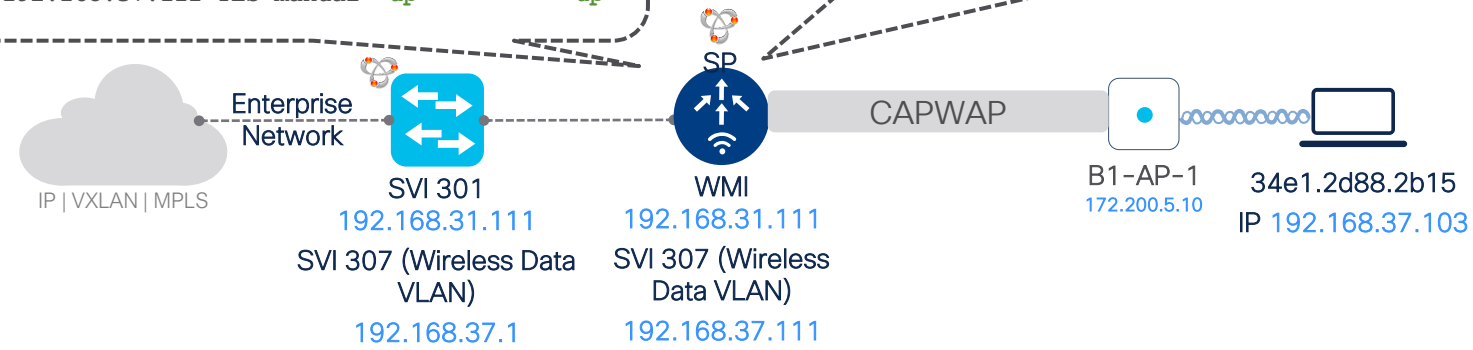
Do **not** forget the SVI for the Data VLAN for wireless clients

Confirm that the SVI for the wireless clients is in *up* state

```
WLC1#show ip interface brief | ex unassigned
Interface IP-Address     OK? Method Status    Protocol
Vlan301 192.168.31.111   YES NVRAM  up            up
Vlan307  192.168.37.111 YES manual  up            up
```

Otherwise, mDNS packets coming from clients will be dropped

```
WLC1#set platform software trace wncd chassis active r0 mdns verbose

WLC1#show logging process wncd internal | i mdns

{wncd_x_R0-0}{2}: [mdns] [17177]: (info): IPv4 mDNS Query packet
received from 192.168.37.103 [VLAN:307, WLAN:17, MAC:34e1.2d88.2b15]
. . .
{wncd_x_R0-0}{2}: [mdns] [17177]: (verbose): Dropping mDNS packet, SVI
interface (VLAN : 307) not present/UP
```



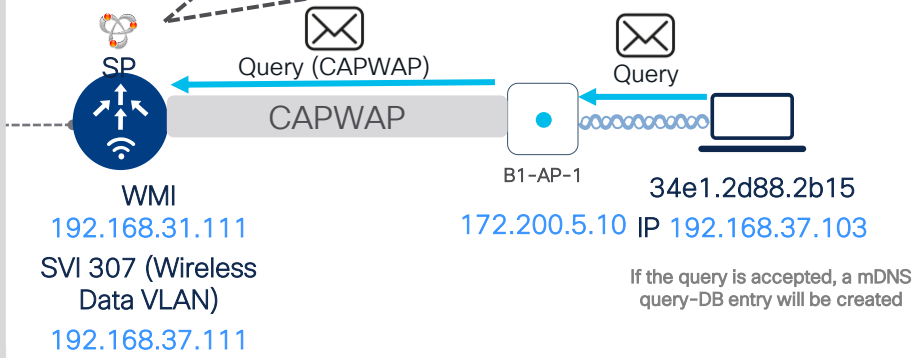
Troubleshooting – Wireless Bonjour

Querying a service from a wireless client

You can track the mDNS query-DB insertion event by enabling the WNCD mDNS binary traces, the service must match the ones listed in the service-list

```
(With wncd mdns traces enabled in verbose level)
WLC#show logging process wncd internal | i mdns
. . .
{wncd_x_R0-0}{2}: [mdns] [17177]: (info): IPv4 mDNS
Query packet received from 192.168.37.103 [VLAN:307,
WLAN:17, MAC:34e1.2d88.2b15]
{wncd_x_R0-0}{2}: [mdns] [17177]: (verbose): DOM: id=0,
query, opcode=0, aa=0, tc=0, rd=0, ra=0
{wncd_x_R0-0}{2}: [mdns] [17177]: (verbose):
rcode=0, qdcount=1, ancount=0, nscount=0, arcount=0
{wncd_x_R0-0}{2}: [mdns] [17177]: (verbose):      query
name is _airplay._tcp.local, qtype=12, class=1
. . .
{wncd_x_R0-0}{2}: [mdns] [17177]: (verbose): Matched
alias name: apple-tv for srv_type: _airplay._tcp.local
service-list: default-mdns-service-list
{wncd_x_R0-0}{2}: [mdns] [17177]: (verbose): Matched
alias name: apple-tv for srv_type: _airplay._tcp.local
service-list: default-mdns-service-list
{wncd_x_R0-0}{2}: [mdns] [17177]: (debug):
MDNS_QUERY_FILTER :[MAC:34e1.2d88.2b15]Query allowed
for: airplay._tcp.local
. . .
2021/04/23 01:33:14.349178 {wncd_x_R0-0}{2}: [mdns]
[17177]: (info): MDNS_DB inserted mdns query_db record
successfully
```

```
WLC1#show mdns-sd query-db
mDNS Query-DB
Client MAC          Vlan ID   Wlan ID   Location ID     User Role
34e1.2d88.2b15      307       17        100             none
PTR Name(s):
_googlecast._tcp.local, _airplay._tcp.local
```

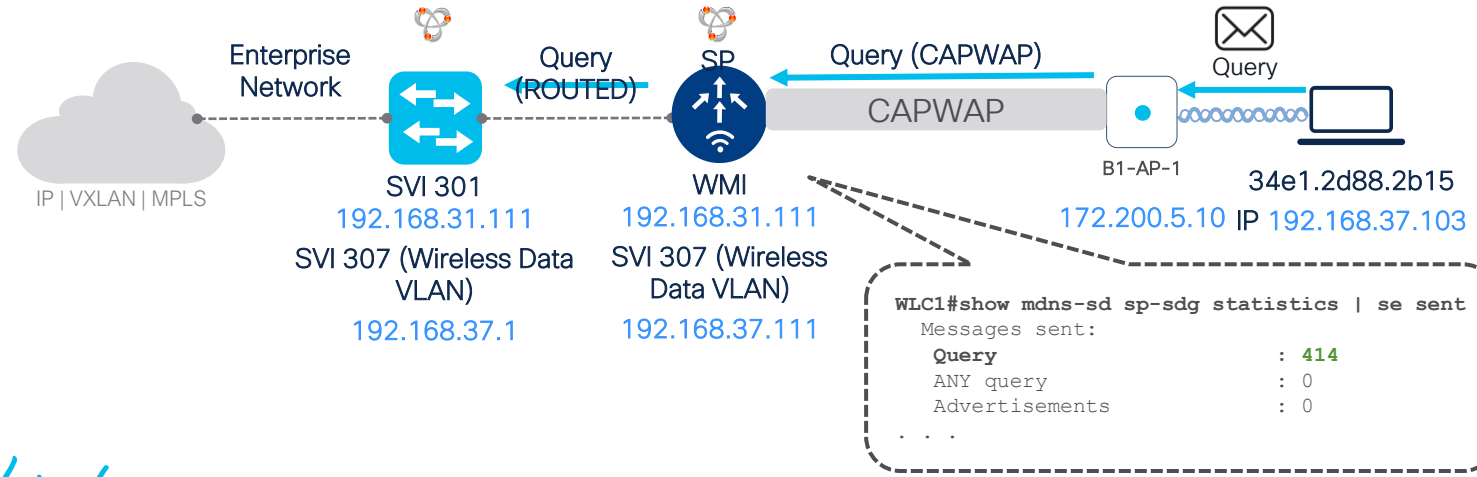


Troubleshooting – Wireless Bonjour

Sending a query to the SDG

Similar to wired Service-Peers, WLCs will route the Query to the SDG

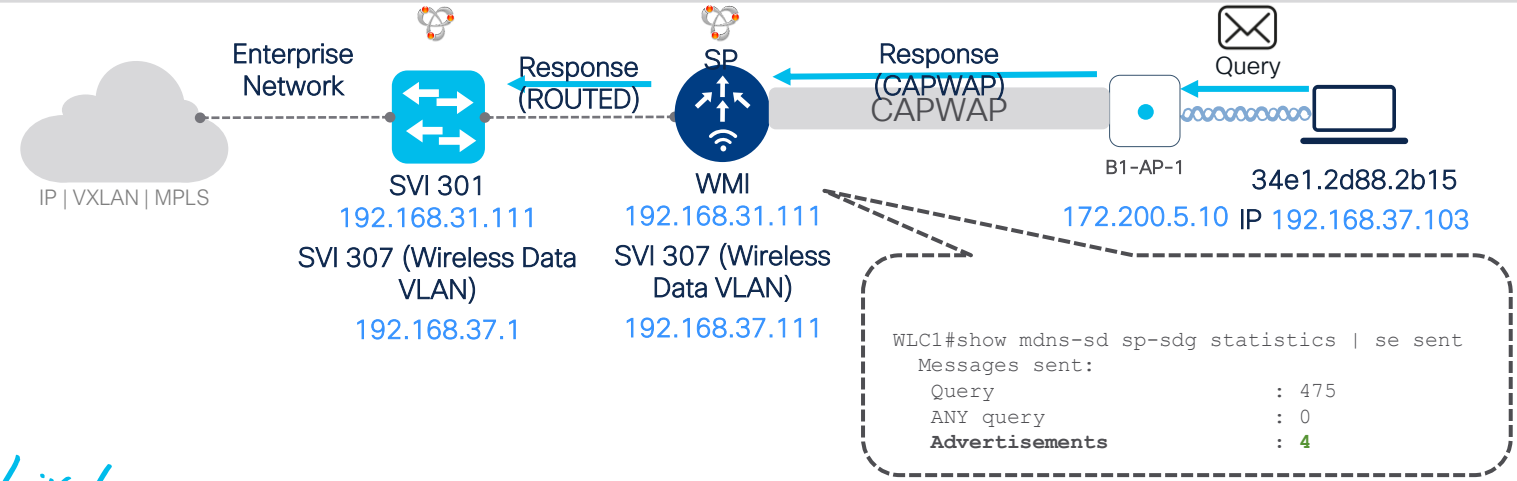
```
(With wncd mdns traces enabled in verbose level)
WLC#show logging process wncd internal | i mdns
. . .
WLC1#show logging process wncd internal | i BCP
{wncd_x_R0-0}{2}: [mdns] [17177]: (info): SelfGenQry: sent BCP msg for PTR-<_airplay._tcp.local>, LG-ID-<100>, VLAN-ID-<307> USER-ROLE-
none>
{wncd_x_R0-0}{2}: [mdns] [17177]: (verbose): SERVICE_PEER: src_port for UDP BCP: 10991
```



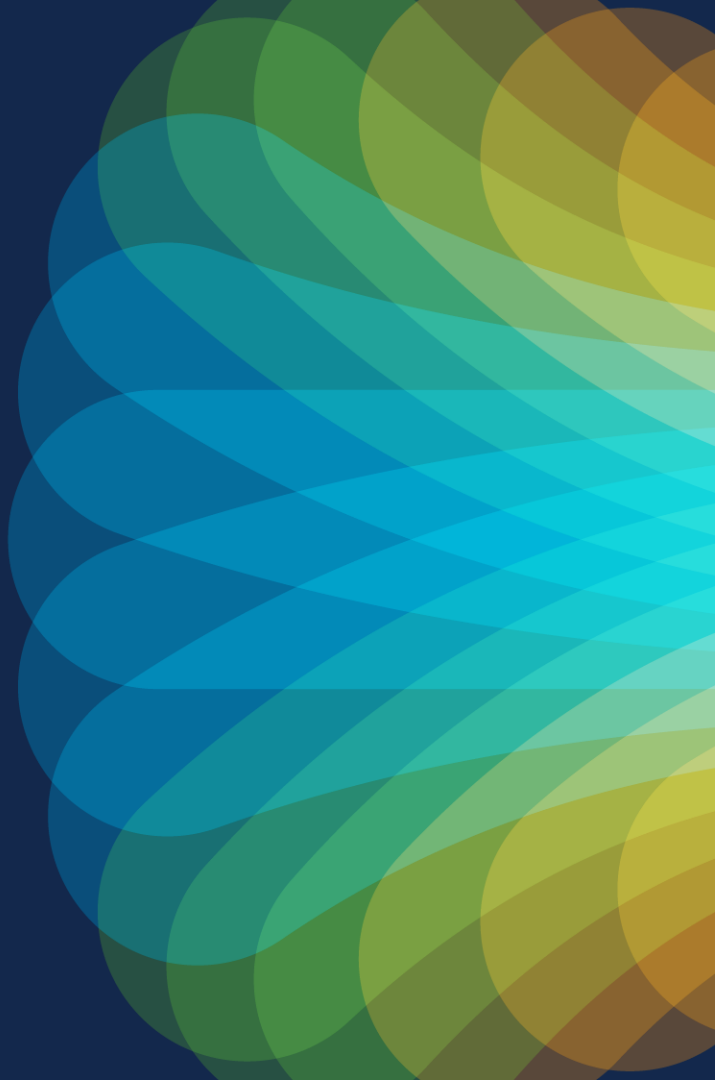
Troubleshooting – Wireless Bonjour

Sending a response/announcement to the SDG

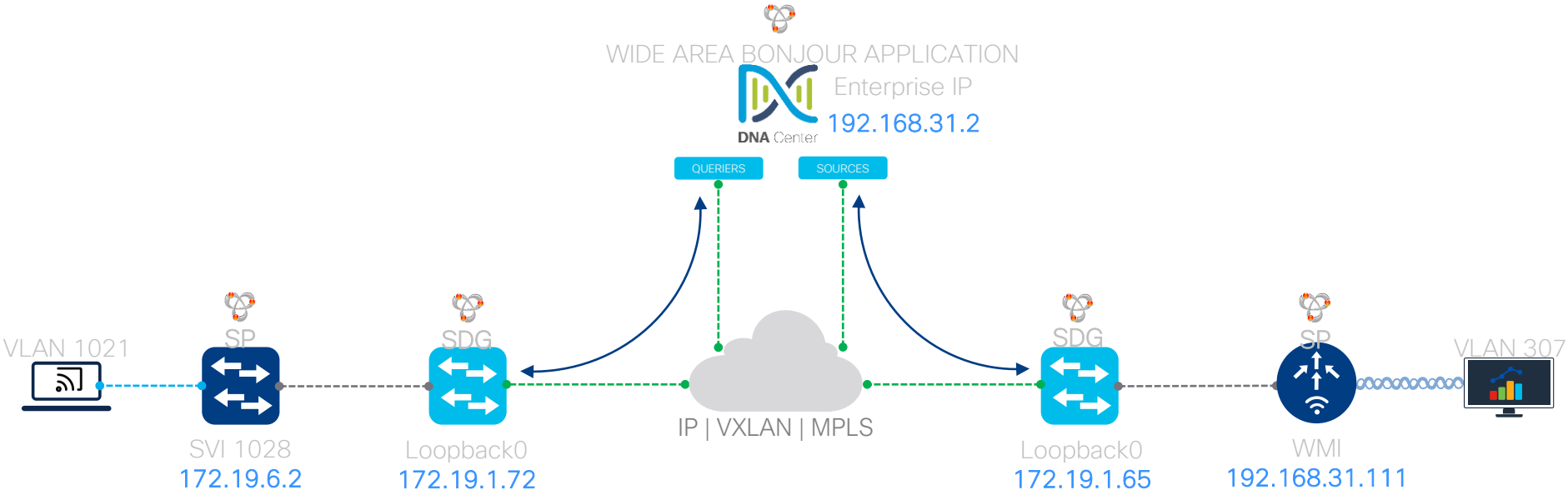
```
WLC#show logging process wncd internal | i mdns
{wncd_x_R0-0}{2}: [mdns] [17177]: (info): IPv4 mDNS Advertisement packet received from 192.168.37.103 [VLAN:307, WLAN:17, MAC:34e1.2d88.2b15]
. . .
{wncd_x_R0-0}{2}: [mdns] [17177]: (verbose):      PTR='_airplay._tcp.local'
. . .
{wncd_x_R0-0}{2}: [mdns] [17177]: (verbose): mDNS client wireless policy profile is Cisco_Live_Local_profile
{wncd_x_R0-0}{2}: [mdns] [17177]: (verbose): mDNS client WLAN SSID is Cisco_Live_Local
{wncd_x_R0-0}{2}: [mdns] [17177]: (verbose): mDNS client AP ether MAC is a453.0e5b.3ef8
{wncd_x_R0-0}{2}: [mdns] [17177]: (verbose): mDNS client BSSID is d4ad.bd62.0fce
. . .
{wncd_x_R0-0}{2}: [mdns] [17177]: (verbose): MDNS_CACHE: Record inserted successfully ** a map cache is created on this device **
```



Wide Area Bonjour Troubleshooting



Sample Diagram



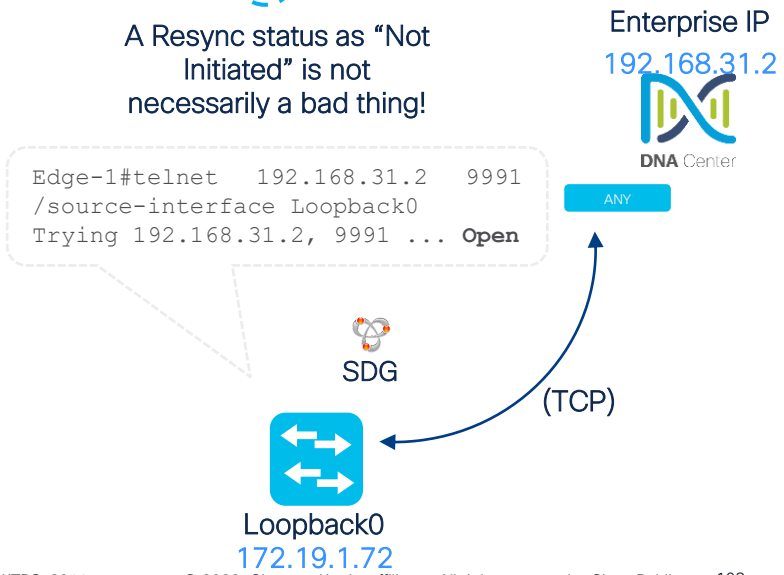
Wide Area Bonjour – SDG Agents

Verify the TCP session between SDGs and Cisco DNA Center

SDG Agent	Management IP	Source Interface	Domain	Reachability	State	Last Sync	Resync Status
172.19.1.65	172.19.1.65		Building_A	Reachable		2023-04-21 11:00:15	Successful
172.19.1.72	172.19.1.72	Loopback0	Building_A	Reachable			Not Initiated

A Resync status as "Not Initiated" is not necessarily a bad thing!

- Reachability depends on a TCP session from the SDG to the Cisco DNA Center IP or VIP using port 9991
- SDGs are the ones that start the TCP 3-way handshake, make sure that no firewall rule blocks this traffic
- If the WAB application receives a TCP packet from a source IP not defined as Source or Querier, it will drop the packet



Wide Area Bonjour – SDG Agents

Verify the TCP session between SDGs and Cisco DNA Center

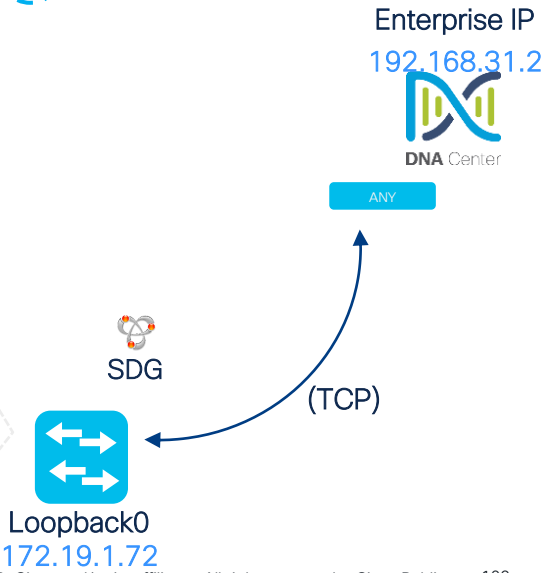
SDG Agent	Management IP	Source Interface	Domain	Reachability	State	Last Sync	Resync Status
172.19.1.65	172.19.1.65		Building_A	Reachable		2023-04-21 11:00:15	Successful
172.19.1.72	172.19.1.72	Loopback0	Building_A	Reachable			Not Initiated

Useful debugs for the device side:

- Catalyst 9000 Switches: debug mdns-sd all
- Catalust 9800 Controllers: set platform trace wncd chassis active R0 mdns verbose

```
Edge-1#show mdns controller summary
Controller Summary
=====================================
Controller Name : DNAC
Controller IP : 192.168.31.2
State : NEGOTIATING
Port : 9991
Interface : Loopback1 -- Wrong source IP!!
```

```
Edge-1#show mdns controller summary
Controller Summary
=====================================
 Controller Name     :      WIDE-AREA-BONJOUR-POLICY
 Controller IP       :   192.168.31.2
 State               :   UP
 Port                :   9991
 Interface           :   Loopback0
 Filter List         :    default-mdns-ctrl-srv-policy
 Dead Time           :   00:02:00
 Service Buffer      :   Enabled
```



Wide Area Bonjour – Collecting Logs

https://[Cisco_DNA_Center_IP]/dna/housed-content/?content=kibana

Query: (kubernetes.labels.serviceName:sdg-service AND 172.19.1.73)

_source

Example of an SDG node failing to establish a connection to the WAB application

log: 2023-04-22 22:28:23,360 | DEBUG | er-SendReceiveCategory-41 | | c.c.s.p.h.GeneralPacketWorkerThread | ---------- RECIEVED SALUT PACKET FROM 172.19.1.73 ---------- | kubernetes.labels.serviceName: sdg-service stream: stdout docker.container_id: 054de21ce6cc4a12e627b9c4013de9129879bea1a6a69ba751cd3d3177a8e93e kubernetes.container_name: sdg-service kubernetes.namespace_name: fusion kubernetes.pod_name: sdg-service-5f78967bc-4q6dt kubernetes.container_image: maglev-registry.maglev-system.svc.cluster.local:5000/fusion/sdg-service:7.32.560.75194 kubernetes.container_image_id: docker-pullable://maglev-registry.maglev-system.svc.cluster.local:5000/fusion/sdg-service@sha256:79050c9a764ba98825878b3a3b7bb7554cbd156b2bb9ddf4c98a2d0b9434895d kubernetes.pod_id: 01ed3f19-1151-4b84-942b-af76ec2dded3 kubernetes.host: 10.88.244.151 kubernetes.labels.passivate: true kubernetes.labels.pod-template-hash: 5f78967bc kubernetes.labels.version: 7.32.560.75194 kubernetes.master_url: https://10.60.8.1:443/api kubernetes.namespace_id: 8b69289e-e791-11ea-b25f-b08bcf6a9e1c @timestamp: Apr 22, 2023 @ 16:28:23.360

log: 2023-04-22 22:28:23,360 | INFO | er-SendReceiveCategory-41 | | c.c.s.p.h.GeneralPacketWorkerThread | Received a SALUT from 172.19.1.73 which is a INVALID SDGNode or not inventory collected. DROPPING THE SALUT | kubernetes.labels.serviceName: sdg-service stream: stdout docker.container_id: 054de21ce6cc4a12e627b9c4013de9129879bea1a6a69ba751cd3d3177a8e93e kubernetes.container_name: sdg-service kubernetes.namespace_name: fusion kubernetes.pod_name: sdg-service-5f78967bc-4q6dt kubernetes.container_image: maglev-registry.maglev-system.svc.cluster.local:5000/fusion/sdg-service:7.32.560.75194 kubernetes.container_image_id: docker-pullable://maglev-registry.maglev-system.svc.cluster.local:5000/fusion/sdg-service@sha256:79050c9a764ba98825878b3a3b7bb7554cbd156b2bb9ddf4c98a2d0b9434895d kubernetes.pod_id: 01ed3f19-1151-4b84-942b-af76ec2dded3 kubernetes.host: 10.88.244.151 kubernetes.labels.passivate: true kubernetes.labels.pod-template-hash: 5f78967bc kubernetes.labels.version: 7.32.560.75194 kubernetes.master_url: https://10.60.8.1:443/api kubernetes.namespace_id: 8b69289e-e791-11ea-b25f-b08bcf6a9e1c @timestamp: Apr 22, 2023 @ 16:28:23.360

The root cause: 172.19.1.73 is not defined as either Source or Querier in the WAB application

Wide Area Bonjour – Registering a Source

Exporting a source to Wide Area Bonjour

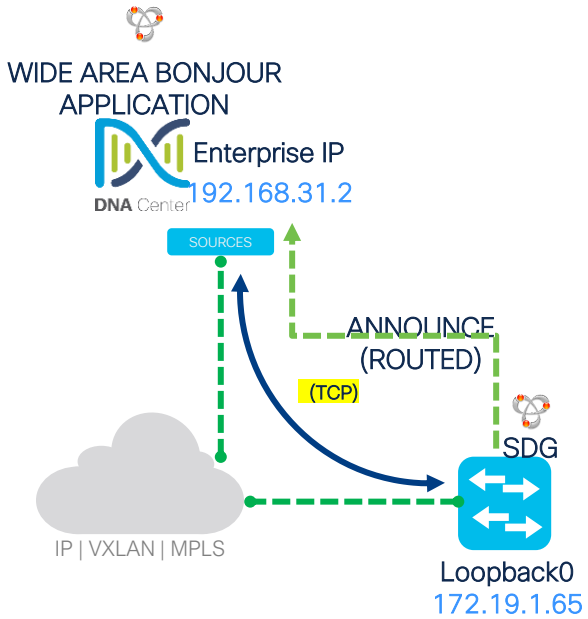
Wait for the “next export” timer to reach zero

```
Edge#show mdns-sd  controller detail | i Next Export
 Total Export Count 21, Next Export in 00:00:09
```

SDG sends the announcement to the WAB Application, service must match the egress service list (default-mdns-ctr-srv-list if the default policy is used)

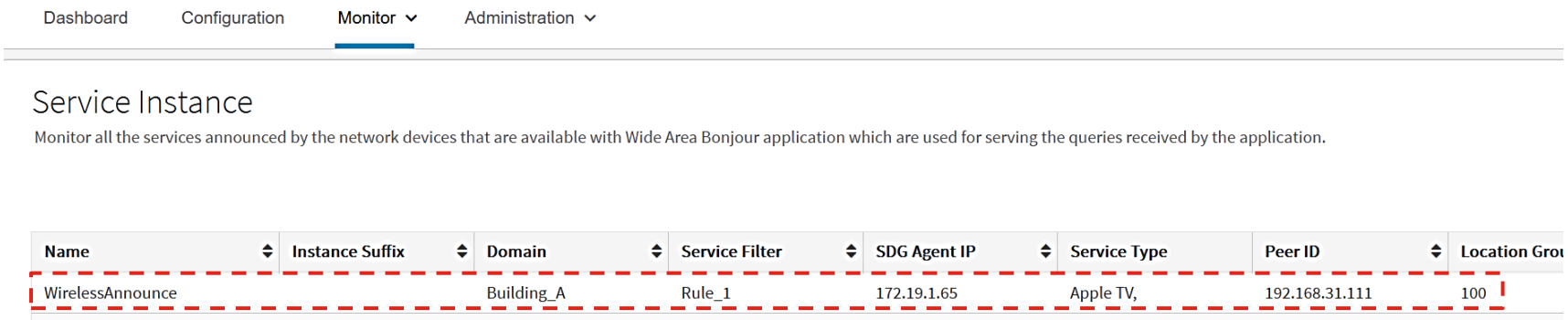
```
Edge#show mdns-sd controller statistics | section Service Adv
  Service Advertisements:
   Advertisements sent      : 27
   Withdraws sent           : 10 – Will increase if the service is
denied by the egress service list
   Advertisements Filtered    : 0
   Total service resynced     : 9
```

- An mDNS cache entry exists on the SDG configured as **source** with IP 172.19.1.65
- The configured mDNS controller is in “UP” state



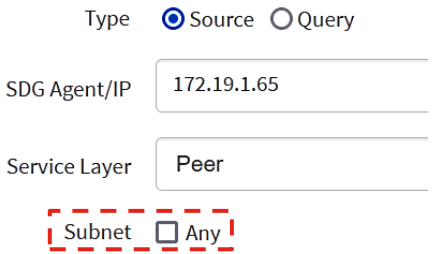
Wide Area Bonjour – Registering a Source

WAB Application verification



If the SDG exports an announcement to the WAB application (after the Next Export timer reaches zero) and it is still not visible as a service in the Monitor / Service Instance tab, verify the following:

- Is the SDG exporting this announcement configured as **source** in the Service Filter?
- Is this service allowed in the **service type** list in the Service Filter where the SDG was defined as **source**?
- Is the announce coming with a valid VLAN, LGID and Service-Peer attribute configured in the source definition?
- If you change the **source** subnet to **any**, does it register?



Wide Area Bonjour – Accepting a Query

Device side verifications

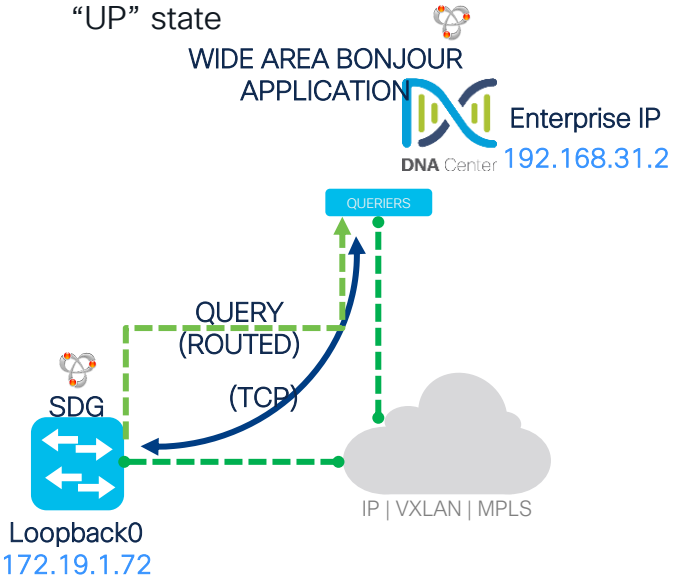
Wait for the “next export” timer to reach zero

```
Edge-1#show mdns-sd controller detail | i Next Query
  Total Query Count 475, Next Query in 00:00:01
Edge-1#show mdns-sd controller detail | i Next Query
  Total Query Count 475, Next Query in 00:00:00
```

The SDG sends the query to the WAB Application, service must match the egress service list (default-mdns-ctr-srv-list if the default policy is used)

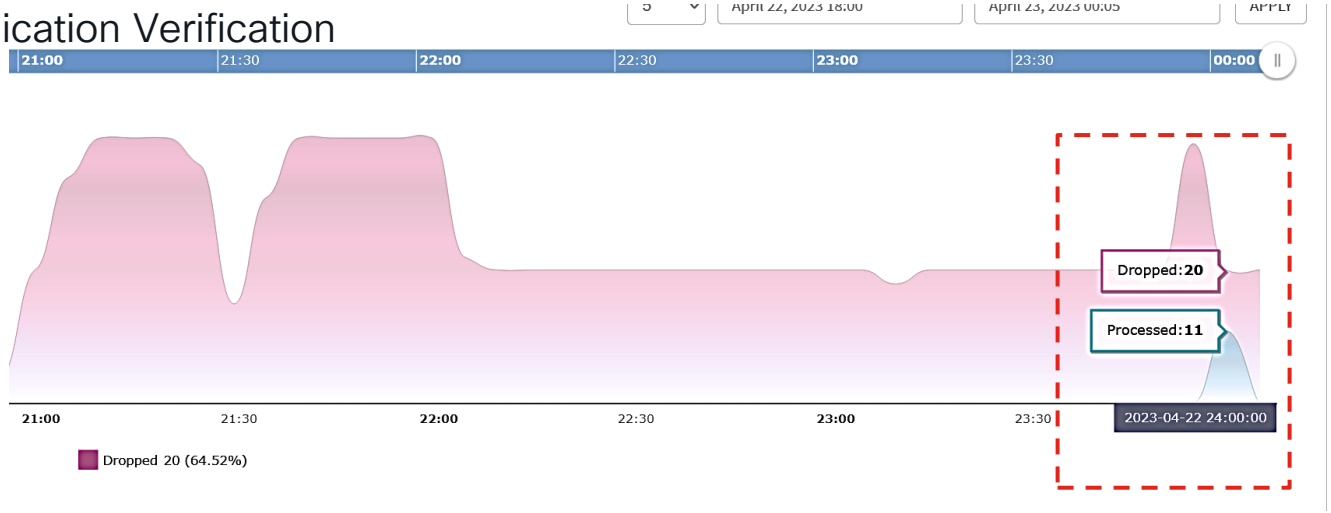
```
Edge-1#show mdns-sd controller statistics | section Service Queries
  Service Queries:
    Queries sent                    : 479
    Queries Filtered                : 0 – Will increase if the service
is denied at the egress service list
    Query responses received        : 104
```

- An mDNS query-db entry exists on the SDG configured as **query** with IP 172.19.1.72
- Service Filters are configured on the WAB application to accept this query
- The configured mDNS controller is in “UP” state



Wide Area Bonjour – Accepting a Query

WAB Application Verification



If the SDG exports a query to the WAB application (after the Next Query timer reaches zero) and no response is seen, verify the following:

- Is the SDG exporting this query configured as **query** in the Service Filter?
- Are there **any** active services in the **service instance** tab (registered sources)?
- Is this service allowed in the **service type** list in the Service Filter where the remote SDG was defined as **source**?
- Is the query coming with a valid VLAN, LGID and Service-Peer attribute configured in the **query** definition?

Wide Area Bonjour – Responding to a Query

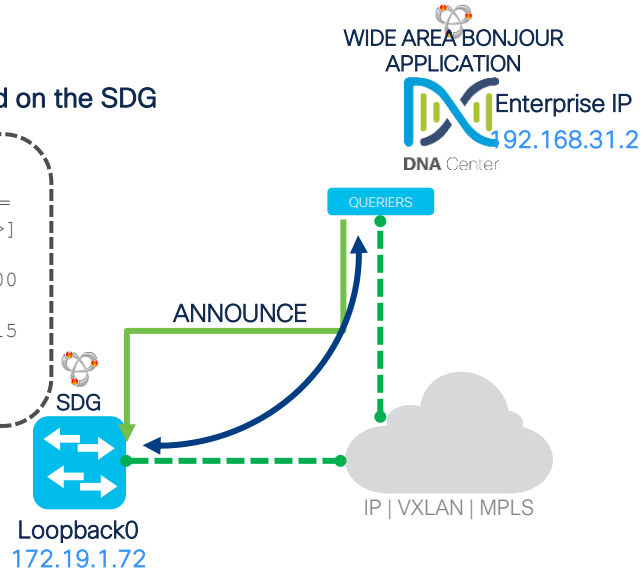
Device side verifications

- A query was sent by the SDG to the WAB application and accepted by the service filter
- Available services are registered in the WAB application by other SDGs
- The configured mDNS controller is in “UP” state

(Requires *service internal* to be configured) : An mDNS remote-cache entry is created on the SDG

```
Edge-1#show mdns remote-cache
                mDNS Remote CACHE (Total count : 4)
================================================================================
====================== [<NAME>]                                  [<TYPE>][<CLASS>]
[<TTL>] [<RR Record Data>]
_airplay._tcp.local                                  PTR          IN           4500
WirelessAnnounce._airplay._tcp.local
WirelessAnnounce._airplay._tcp.local    SRV      IN        120     0        0        515
DESKTOP-2.local
DESKTOP-TN2FL74-2.local                 A        IN        120     192.168.37.103
WirelessAnnounce._airplay._tcp.local    TXT      IN       4500     (1)''
```

The mDNS response is sent to directly connected queriers and queriers behind a Service-Peer



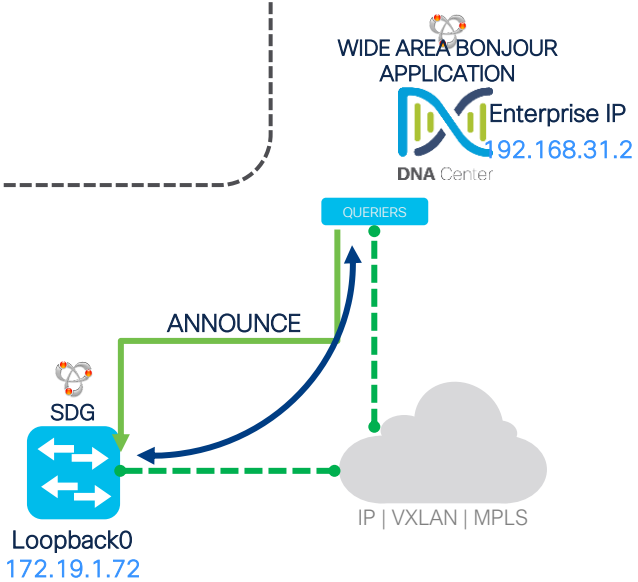
Wide Area Bonjour – Responding to a Query

Device side verifications

WAB application sends an announcement back to the SDG

```
Edge-1#debug mdns-sd all
mDNS: Received mDNS remote entries event 11
. . .
mDNS-DOM: id=52053, response, opcode=0, aa=0, tc=0, rd=0, ra=0
rcode=0, qdcount=0, ancount=1, nscount=0, arcount=3
Answer section:
       Name='_airplay._tcp.local'
       RR type=12, class=1, ttl=4500, data length=19
       PTR='WirelessAnnounce._airplay._tcp.local'
. . .
```

```
Edge-1#show mdns-sd controller statistics | se Service Queries
  Service Queries:
   Queries sent                    : 491
   Queries Filtered                : 0
   Query responses received          : 116   - This counter increases when a
query response from the WAB application is received
```



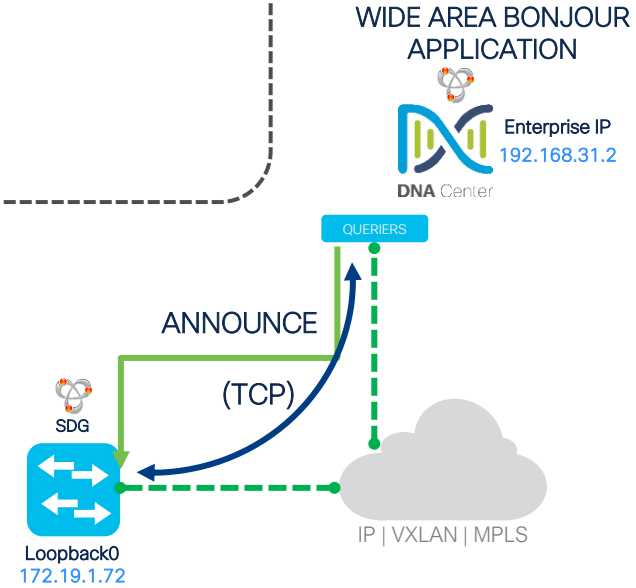
Wide Area Bonjour – Responding to a Query

Device side verifications

WAB application sends an announcement back to the SDG

```
Edge-1#debug mdns-sd all
mDNS: Received mDNS remote entries event 11
. . .
mDNS-DOM: id=52053, response, opcode=0, aa=0, tc=0, rd=0, ra=0
rcode=0, qdcount=0, ancount=1, nscount=0, arcount=3
Answer section:
       Name='_airplay._tcp.local'
       RR type=12, class=1, ttl=4500, data length=19
       PTR='WirelessAnnounce._airplay._tcp.local'
. . .
```

```
Edge-1#show mdns-sd controller statistics | se Service Queries
  Service Queries:
   Queries sent                    : 491
   Queries Filtered                : 0
   Query responses received        : 116  - This counter increases when
a query response from the WAB                          application      is
received
```



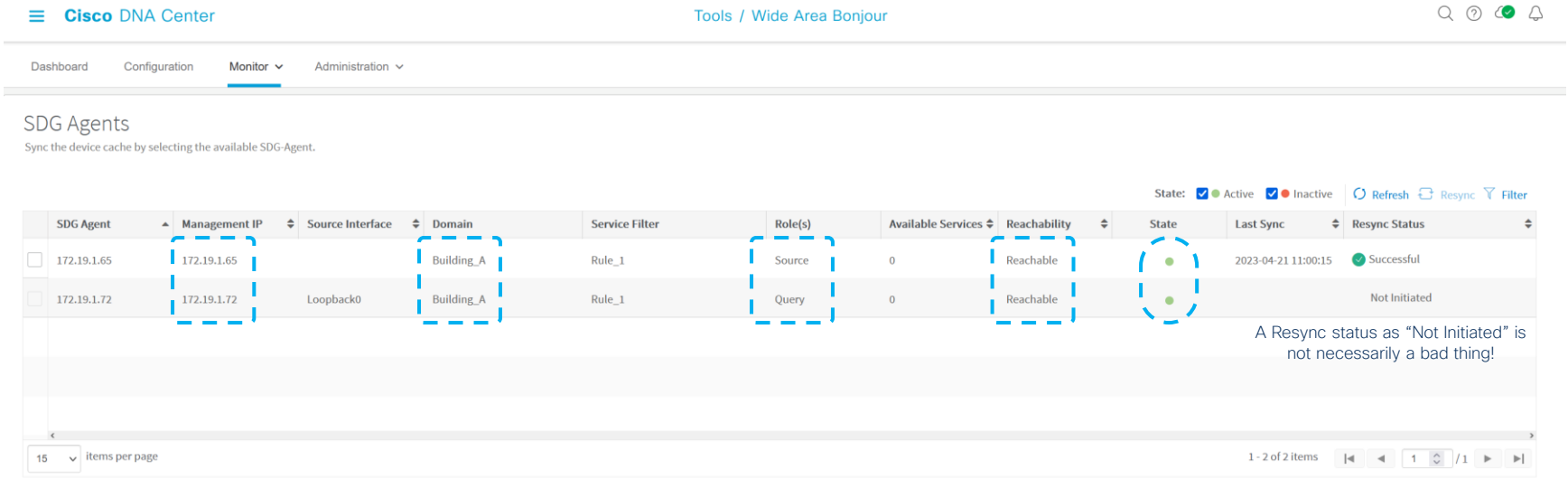
Appendix

Cisco DNA Service for Bonjour Support Matrix

	Cisco DNA-Center Appliance	Wide Area Bonjour App	Catalyst 9600	Catalyst 9500	Catalyst 9400	Catalyst 9300	Catalyst 9200	Catalyst 9800 WLC	Nexus 9000
Platform Series	DN2-HW-APL DN2-HW-APL-L[SDG] DN2-HW-APL-XL		Any	Any	Any	Any	Any (Including CX)	Any	Nexus 9300
Minimum Software	2.2.2.0	2.2.2.0	17.6.2 X-Series : 17.10.1	17.6.2 X-Series : 17.10.1	17.6.2 Sup-2 : 17.10.1	17.6.2 X-Series : 17.10.1	17.11.1	17.6.2	10.2.(3)F
Supported Role	Platform	Controller	SDG-Agent[SDG] Service-Peer	SDG-Agent[SDG] Service-Peer	SDG-Agent[SDG] Service-Peer	SDG-Agent[SDG] Service-Peer	SDG Service-Peer	Service Peer	SDG Agent
Wide-Area Support	–	●	●	●	●	●	Roadmap	–	●
Local-Area Support	–	●	●	●	●	●	●	●	●
Service Scale	–	150000	15000	12000	10000	7500	1000	14000	4500
Software License									
Local and Wide-Area License	–	–	DNA-Advantage	DNA-Advantage	DNA-Advantage	DNA-Advantage	DNA-Advantage	DNA-Advantage	Advantage
System Mode									
Cluster	HA Cluster	Multi-Instance	StackWise Virtual	StackWise Virtual	StackWise Virtual	StackWise-480	StackWise-160	HA Cluster	vPC Domain
Default	Single Host	Single Instance	Standalone	Standalone	Standalone	Standalone	Standalone	Standalone	Standalone
Wired/Wireless Network Support									
Wired – Multilayer	Required	●	●	●	●	●	●	–	●
Wired – Routed Access	Required	●	●	●	●	●	●	–	●
Wireless – Local Mode	Required – Distributed Design Optional – Collapsed Design	●	●	●	●	●	●	●	●
Wireless – FlexConnect Mode	Optional	●	●	●	●	●	●	Switch mDNS Gateway	-
Wireless – Catalyst 9100 EWC, Meraki, Multi-Vendor	Optional	●	●	●	●	●	●	Switch mDNS Gateway	-
Overlay Network Support									
Cisco SD-Access	Required	●	●	●	●	●	–	–	-
Cisco SD-Access Wireless	Required	●	●	●	●	●	–	Switch mDNS Gateway	-
BGP EVPN VXLAN	Required	●	●	●	●	●	●	–	●
MPLS VPN	Required	●	●	●	●	●	●	–	-
Multi-VRF	Required	●	●	●	●	●	●	–	●
Operation									
Assurance	–	●	–	–	–	–	–	–	●
SNMP MIB Support	–	–	●	●	●	●	●	–	-

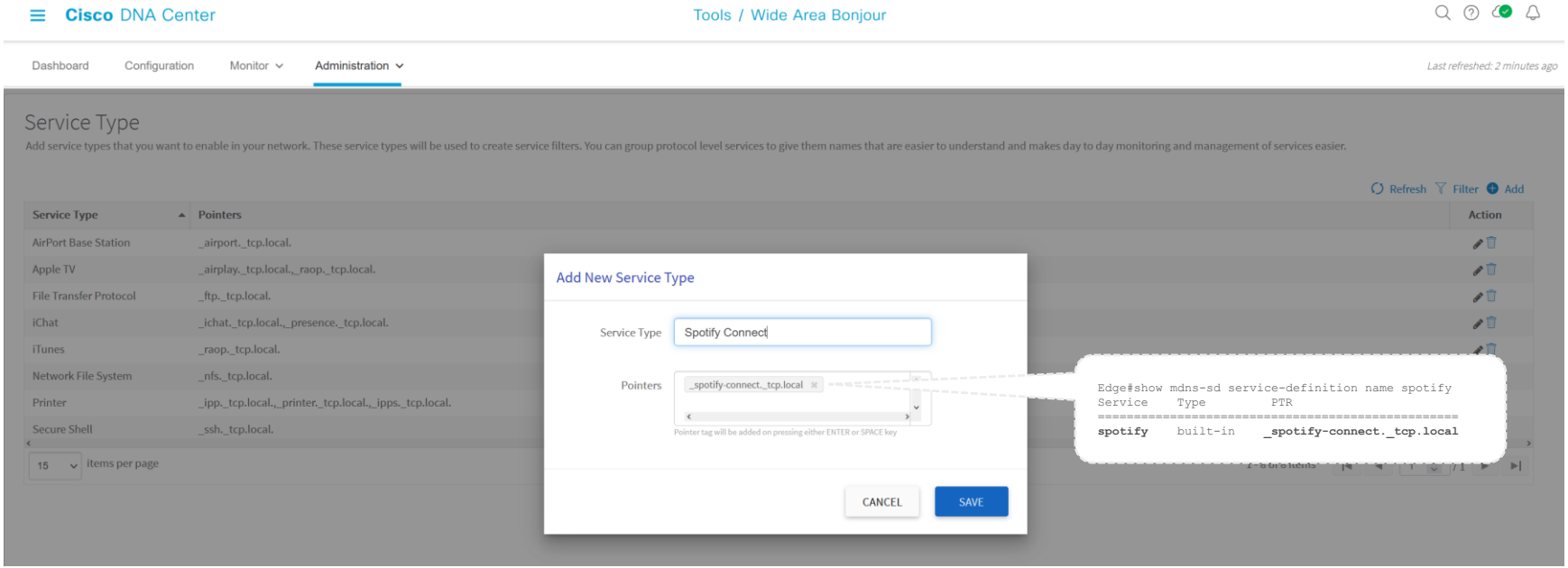
Wide Area Bonjour – SDG Agents

Verify SDG reachability to the WAB application



Wide Area Bonjour – SDG Agents

(Optional) Create custom service types if needed



Bonjour Reference and Resources

- Multicast Domain Name System (mDNS) – Still Flooding?
- Cisco DNA Service for Bonjour
- Cisco DNA Service for Bonjour Deployment Guide – Traditional LAN and Wireless Local Mode
- Cisco DNA Service for Bonjour Deployment Guide – Cisco Software-Defined Access Mode
- Cisco DNA Service for Bonjour Quick Configuration Guide
- Cisco DNA Center – Wide Area Bonjour User Guide

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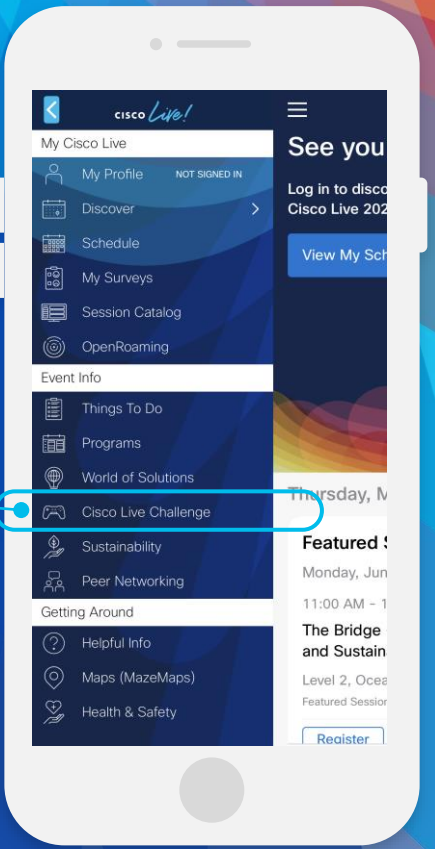


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