



The bridge to possible

Wide Area Bonjour (mDNS)

Best Practices, Design and Deployment

Igor Dovhan, Customer Success Specialist

Cisco Webex App

Questions?

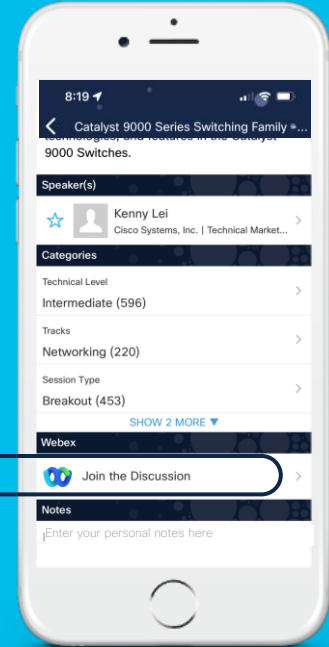
Use Cisco Webex App to chat with the speaker after the session



How

- 1 Find this session in the Cisco Live Mobile App
- 2 Click “Join the Discussion”
- 3 Install the Webex App or go directly to the Webex space
- 4 Enter messages/questions in the Webex space

Webex spaces will be moderated until February 24, 2023.





Agenda

- Bonjour Overview
- Challenges in Enterprise
- Solution Overview
- Configuration Workflow
- Supported Designs
- Demo
- [Appendix]

Bonjour Overview



What it is Bonjour?



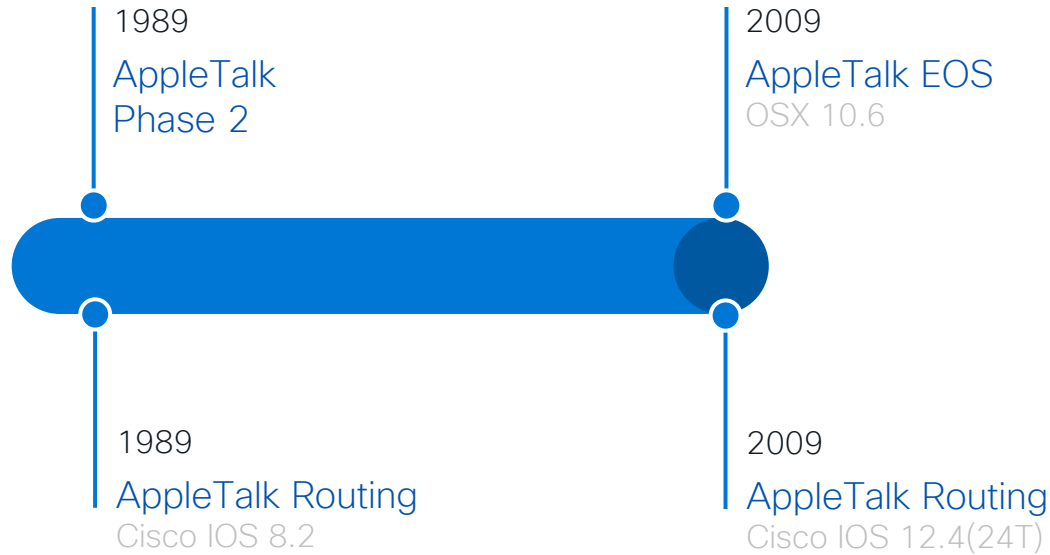
Invented by Apple in 2002

ZeroConf Service Solution

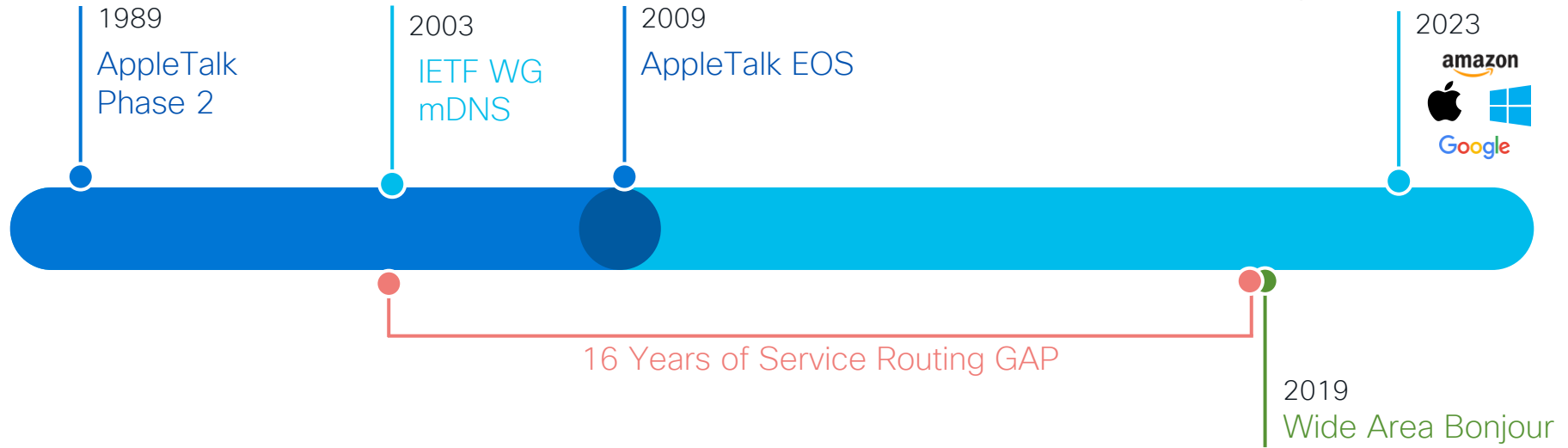
Uses multicast Domain Name System (mDNS) service records

TTL = 1

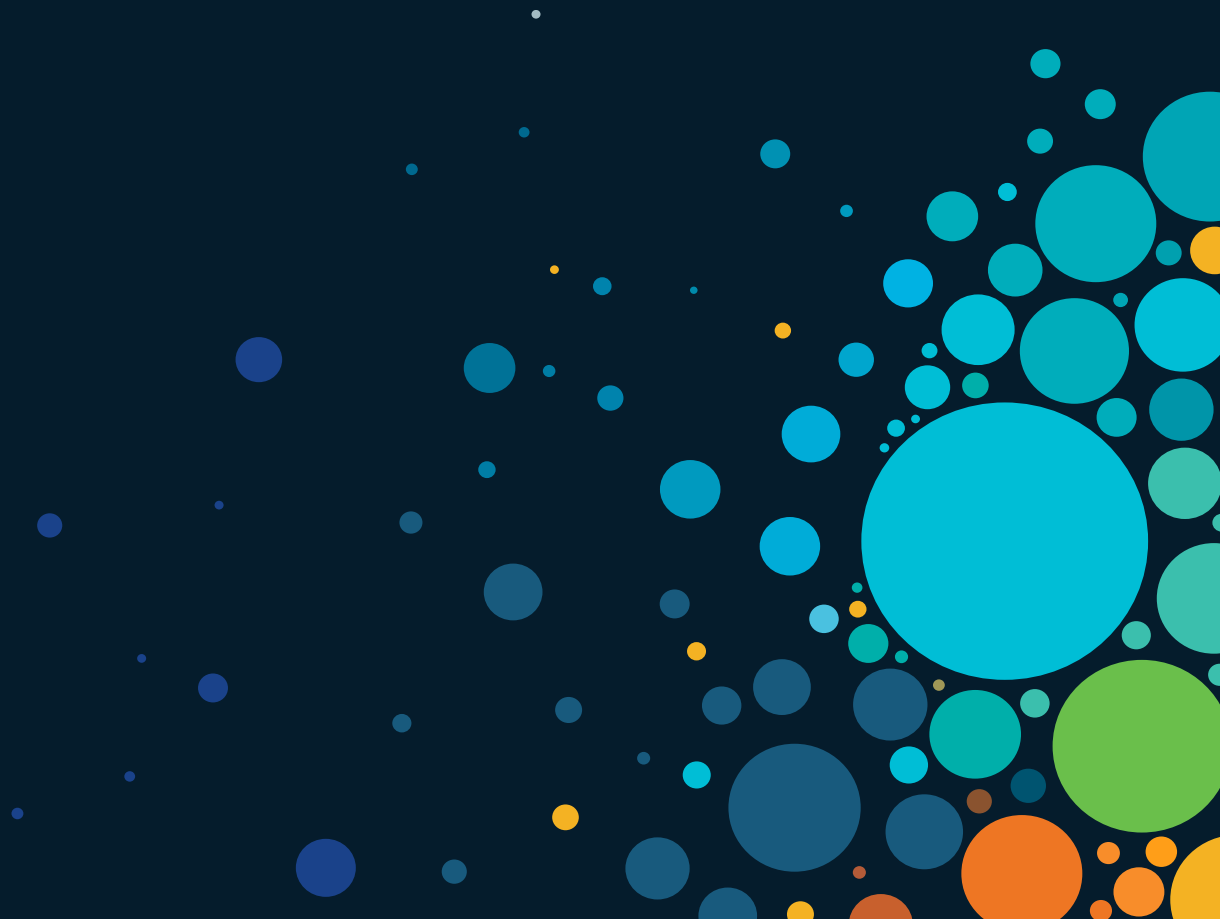
Bonjour History



Bonjour History



Challenges in Enterprise



Challenges in Enterprise



Single Network visibility

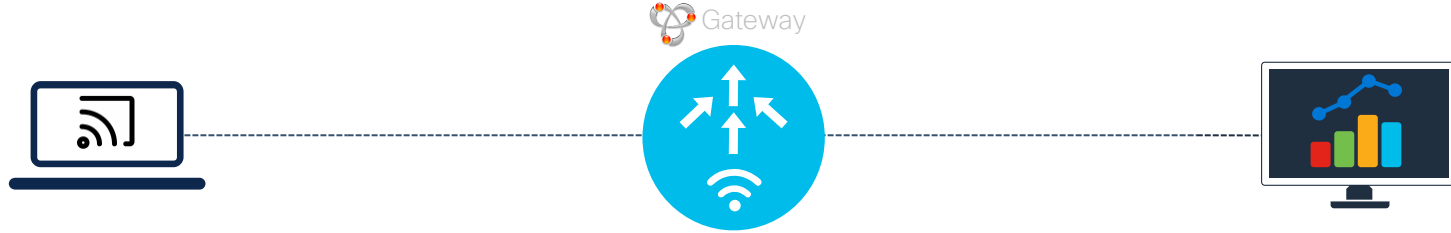
Single Local Gateway

No End-to-End Solution

Not Scalable

Challenges in Enterprise

Service on the Stick



Single Network visibility

Limited Wired Service

Flooded L2 Networks

Not Scalable

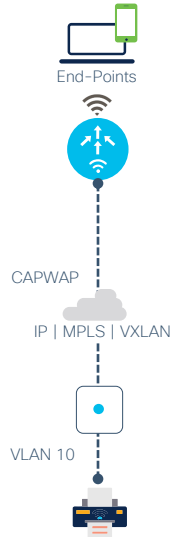
Challenges in Enterprise

Service on the Stick

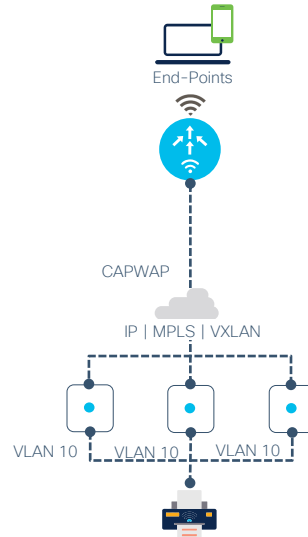
Wired mDNS



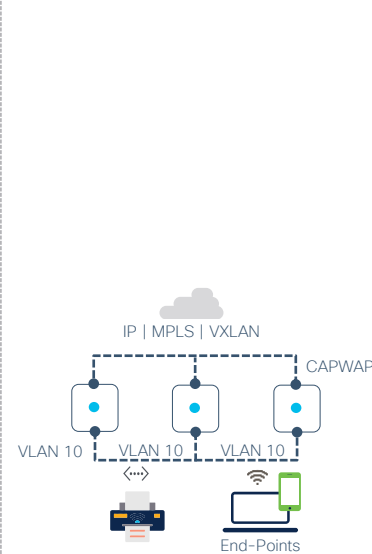
mDNS AP



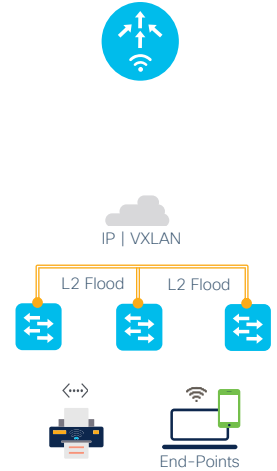
Flex - mDNS GW



EWC AP - mDNS GW

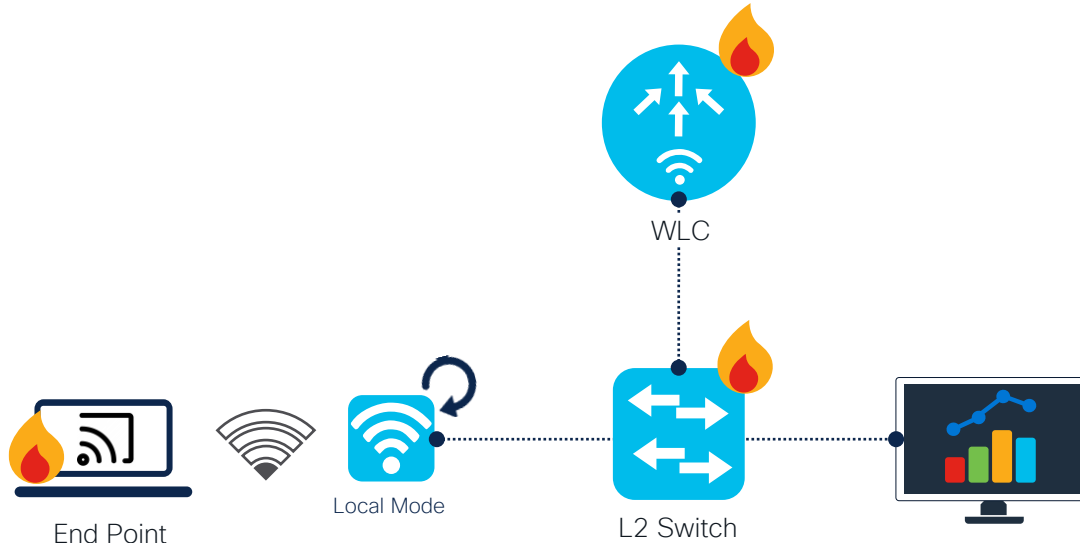


SD-Access



Challenges in Enterprise

Service on the Stick



High CPU/Memory Usage

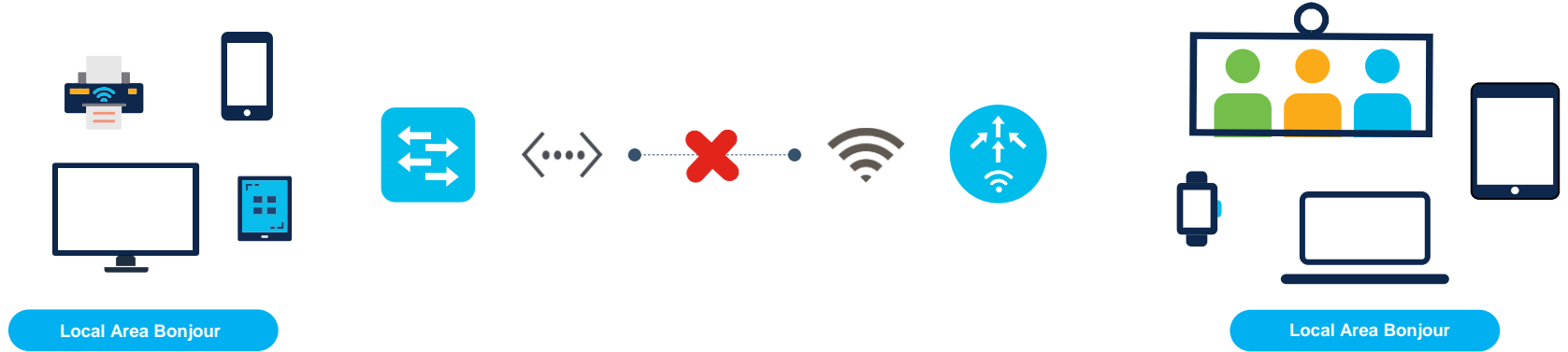
High TCAM Utilization

Unexpected AP reloads

Poor Wi-Fi

Problem with Endpoints

Bonjour Challenges in Enterprise



Network

Wired & Wireless
Service without
boundaries



Scalable

High scale solution
No performance
compromise



Secure

IT controlled service
Policy-Based service
distribution



Role-Based

BYOD Service Management
Role and Network Policy Based

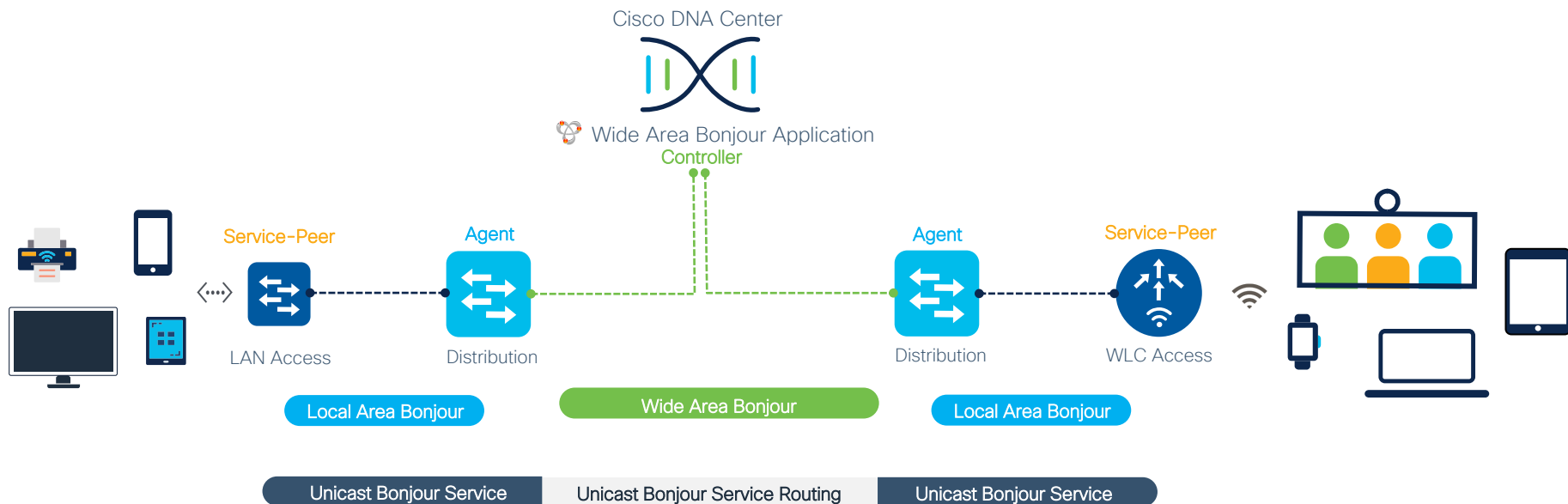



Location


Location Proximity Service
Wired and Wireless
Mobility


Solution Overview


Wide Area Bonjour Overview



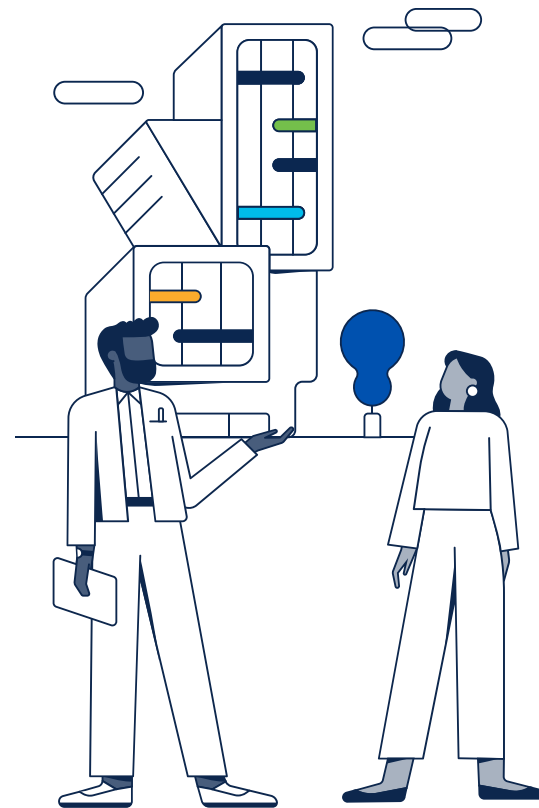
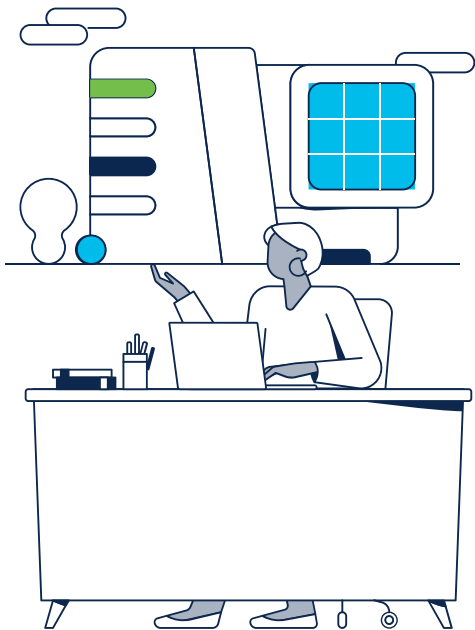
 **Hierarchical**
2-Tier Service Routing
Structured Role and Function
mDNS Flood-Free Networks

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

 **Location**
Deep granular location-based service
Flexible design any Enterprise Network

 **Performance**
Improved system performance
Increase network bandwidth
Enhanced User-Experience

Use Cases



Global Enterprise Customers

7000+ *



Financial



Public Sector



Manufacturing



Hospitality



Broadcast Media



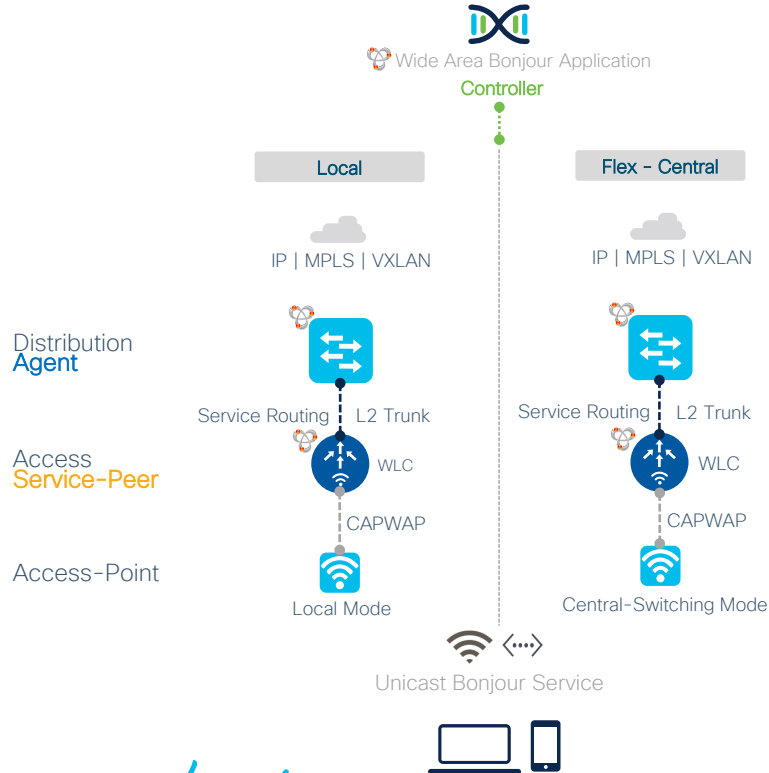
Transportation



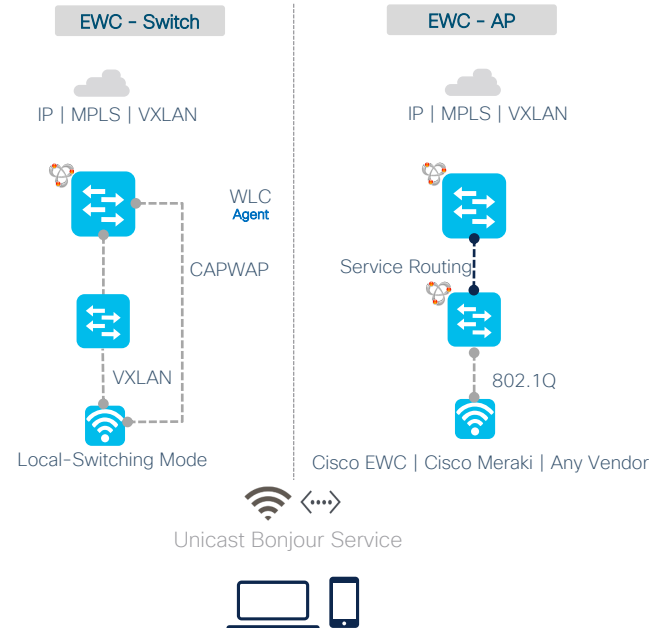
Retail

Wide and Local Area Bonjour

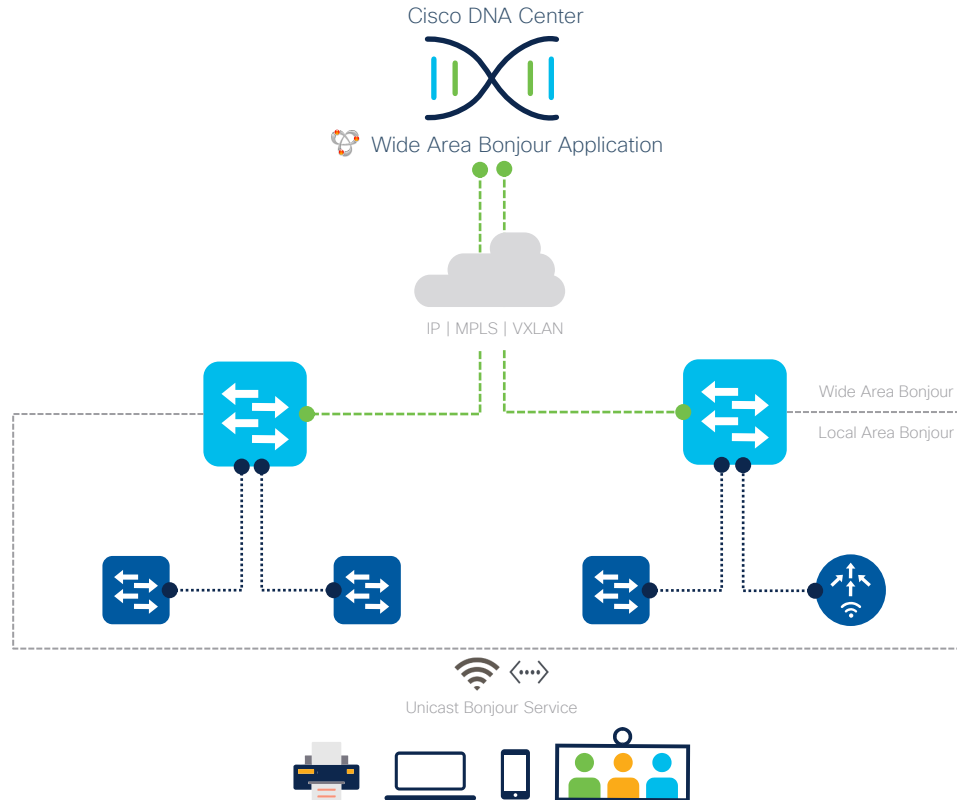
Wide Area Bonjour DNA - Required



Local Area Bonjour DNA - Optional



Bonjour Architecture



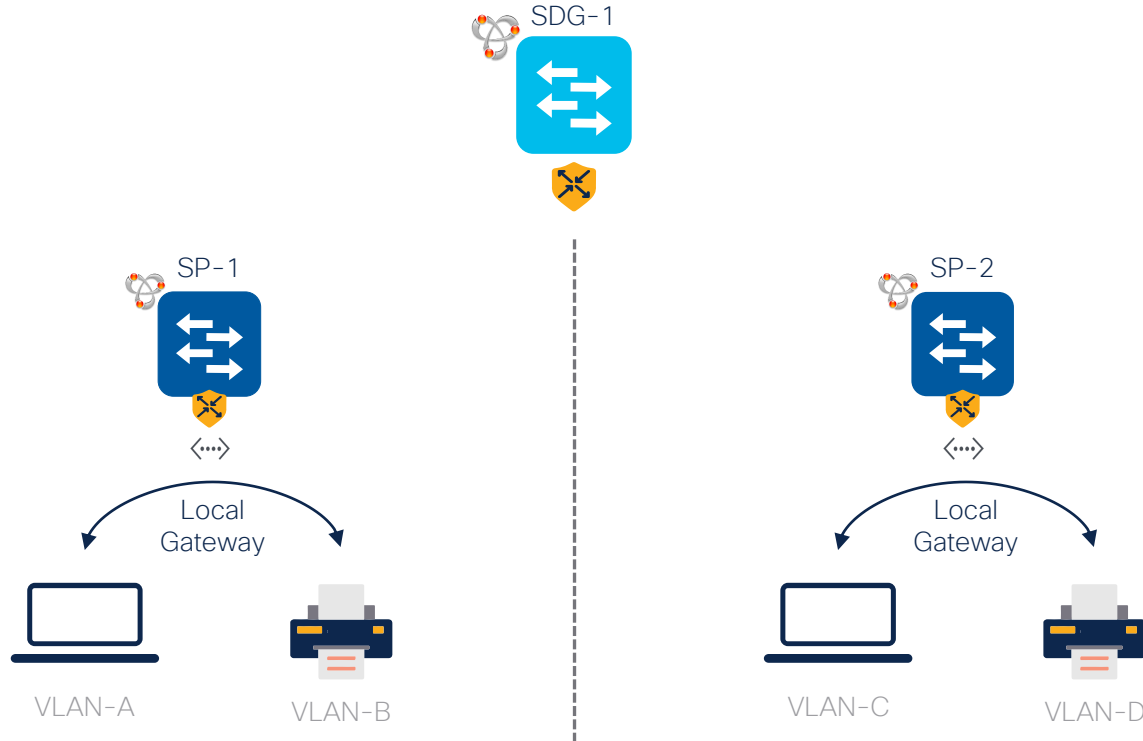
Controller

SDG Agent
Distribution

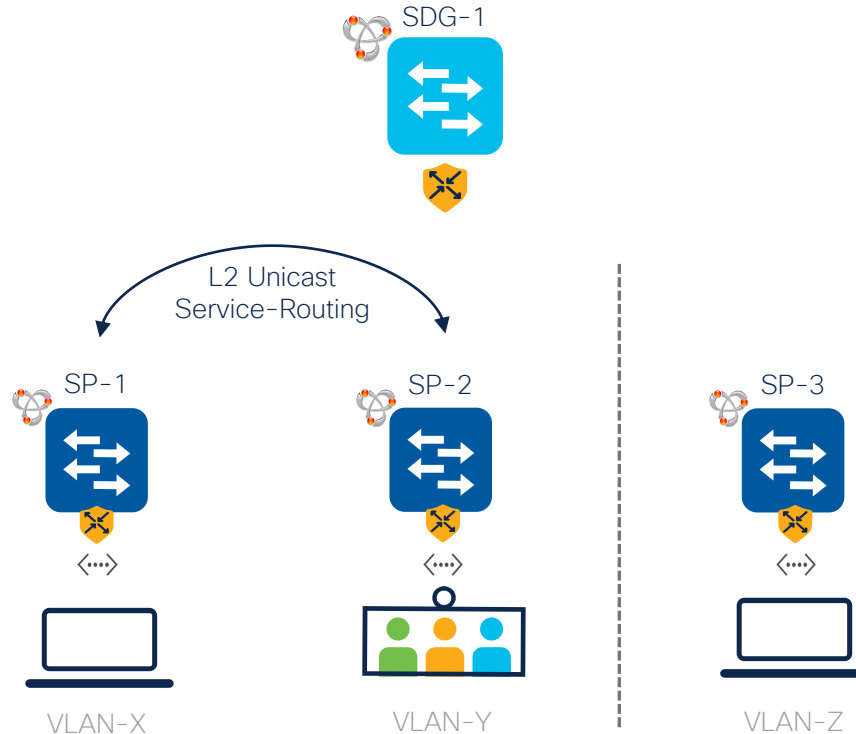
Service-Peer
Access

End-Points

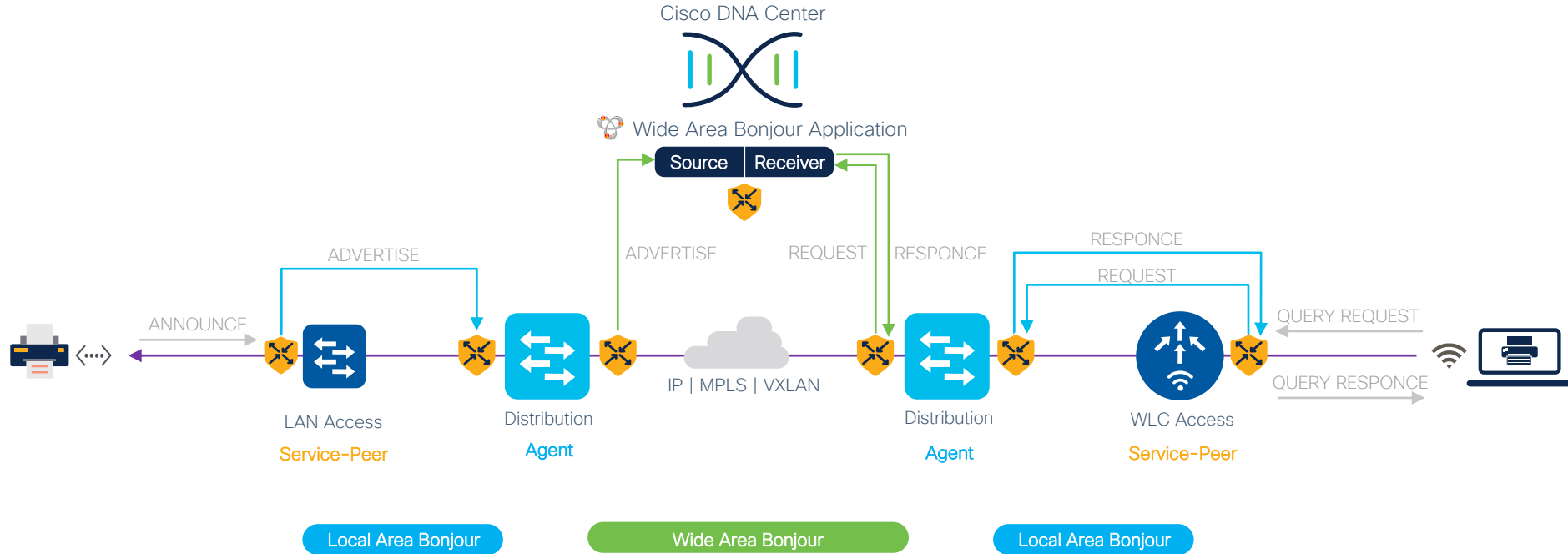
Single Service Peer mDNS Service-Routing



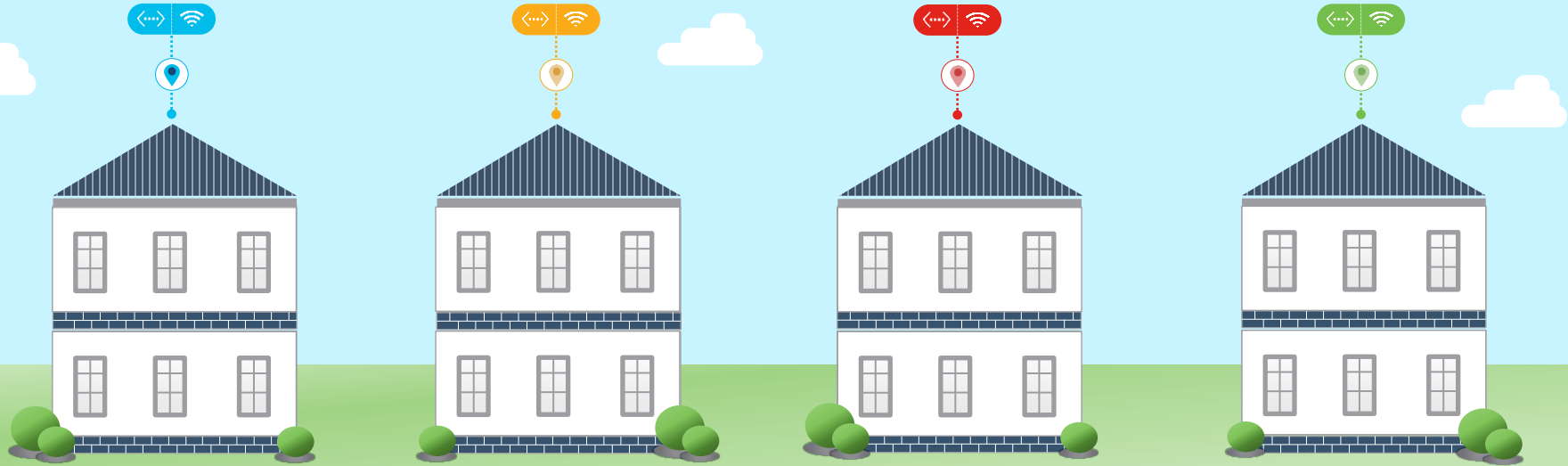
SDG Agent Service-Peers Service-Routing



Routing Example



Micro Location Service Routing



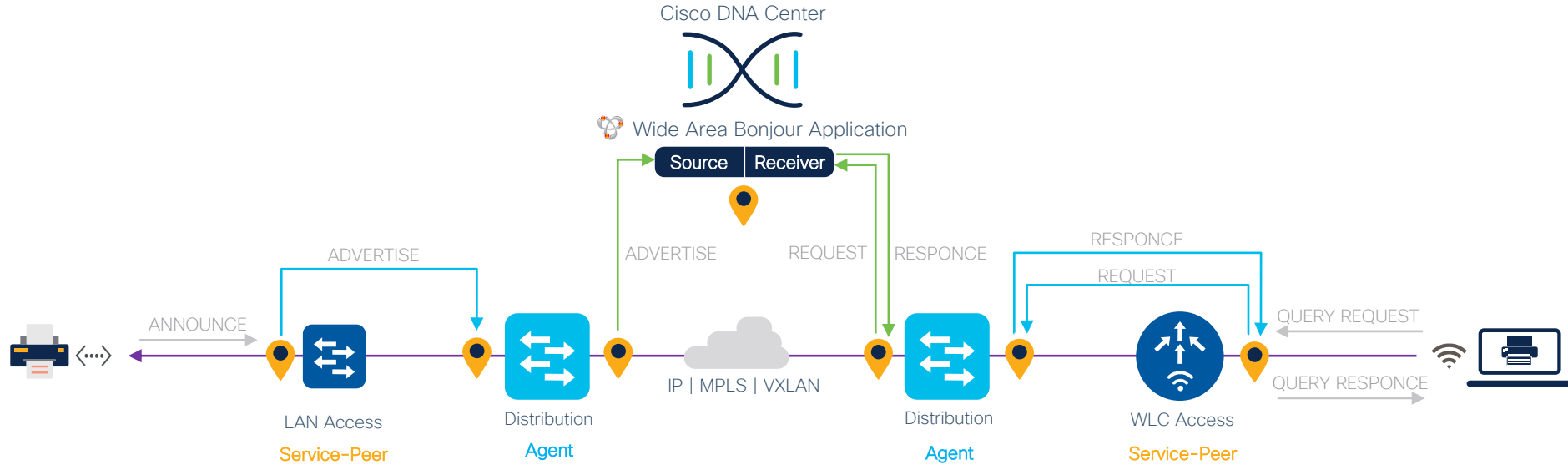
Granular location-based solution

Best-in-Class User-experience

Zero – Wireless and Wired change

End-to-End mDNS location-tag routing

Micro Location Service Routing



Numerical mDNS
location tag assignment

Extend location tag with
services

Location-based mDNS
policy

4049 micro-location
tag support

Solution Integration



DNA Center



Minimum version
2.2.2.0

Catalyst 9000
Series



Minimum version
17.6.2

Catalyst 9800
Series



Minimum version
17.6.2

Nexus 9300 *



Minimum version
10.2(3)F



MacOS

iOS

tvOS

audioOS



RFC 6762

Configuration Workflow



Simplified Policy Management



Default mDNS Service-List



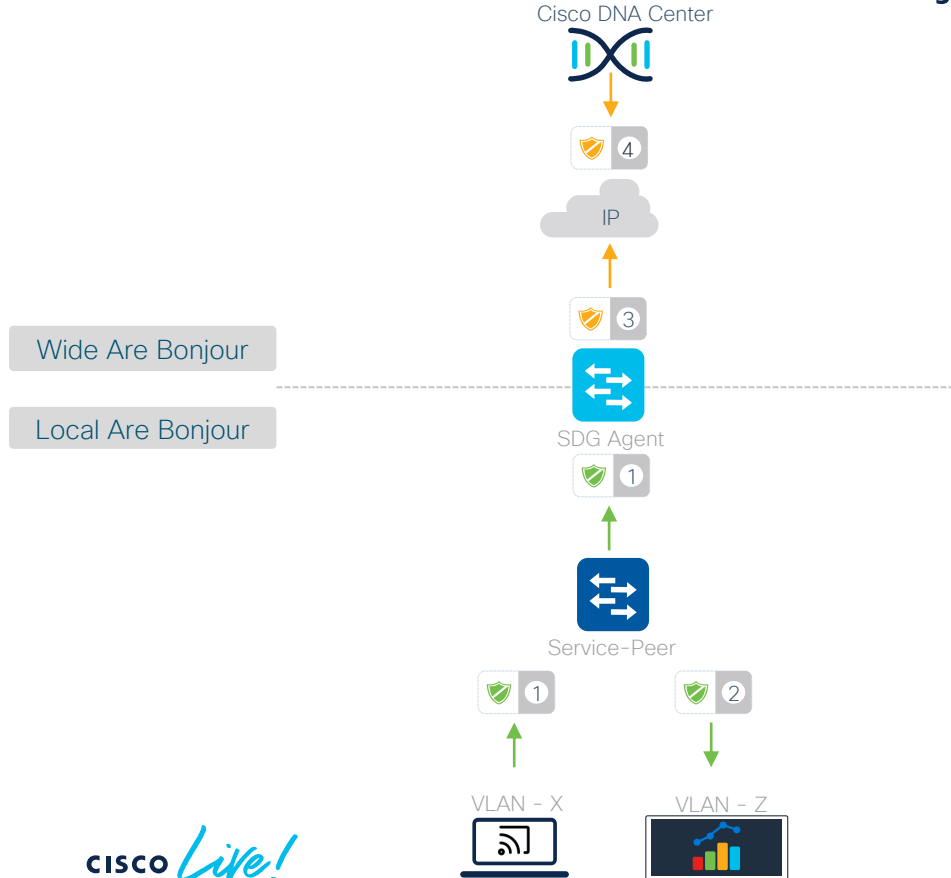
Simplified Policy Management

	Default Mode	Custom Mode
Local Area Bonjour – Service-List Permit	Built-In. Default bi-directional services permitted *	Custom. User-defined uni-directional custom service permission
Local Area Bonjour – Service-Policy	Built-In. Automatically binds default Service-List	Custom. User-defined custom service-list binding
Local Area Bonjour – Service-Policy	Built-In. Automatically associates default policy to mDNS gateway enabled Wired VLAN and Wireless Profile	Custom. User-defined manual policy association to mDNS gateway enabled Wired VLAN and Wireless Profile
Local Area Bonjour – Wired Inter-VLAN Service-Proxy	Built-In. Automatic Inter-VLAN Service-Proxy on L2 Switch	Custom. User-Defined manual Inter-VLAN location-filter on L2 Switch
Wide Area Bonjour – Service-List Permit	Built-In. Default controller services permitted *	Custom. User-defined controller-bound custom service policy
Wide Area Bonjour – Service-Policy	Built-In. Automatically binds default controller Service-List	Custom. User-defined custom controller service-list binding
Location-Tag – Wired Port and Local Mode AP	Built-In. Default Tag (0) to Wired Port and Local Mode AP	Built-In or Custom. Default Tag (0) or custom tag assigned to Wired Port and Local Mode AP

Default mDNS Service-List



Local and Wide Area Bonjour Policies



Wide Area Bonjour – Global Policy



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

Wide Area Bonjour – Egress Policy



Permits selective mDNS service distribution to Controller

Local Area Bonjour – Egress Policy



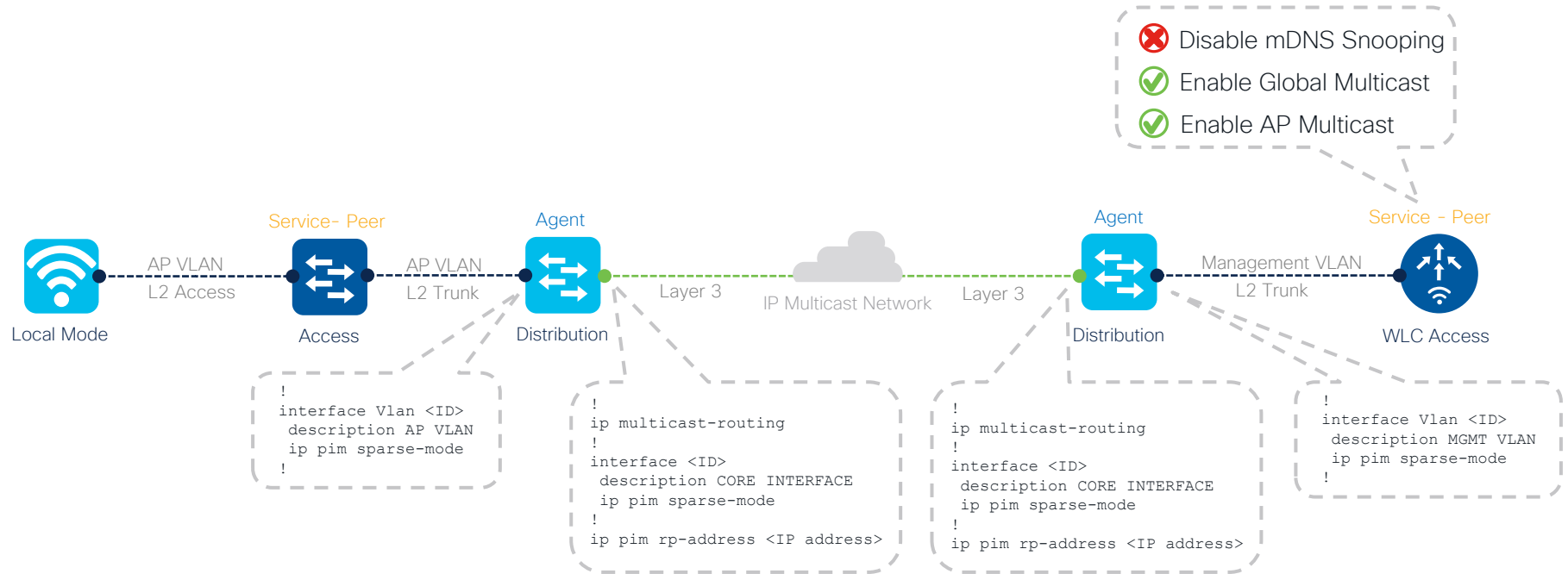
Permits selective mDNS Service response between Endpoints/Service-Peer.

Local Area Bonjour – Ingress Policy



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

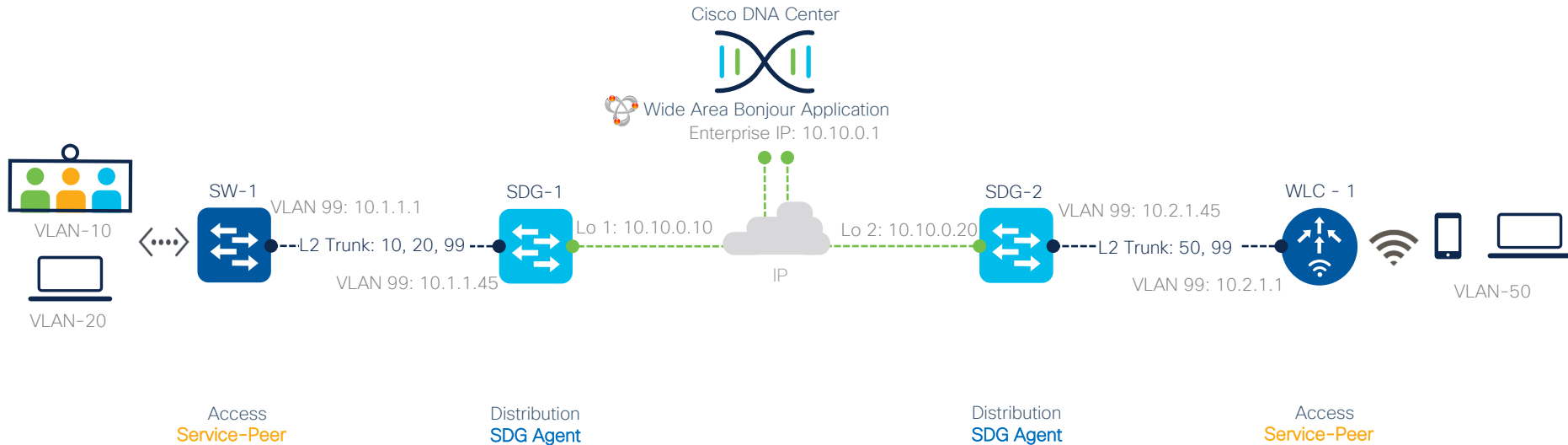
Wireless AP Multicast *



* From 17.9.x enabling AP Multicast is OPTIONAL for Local and Flex-Central deployment

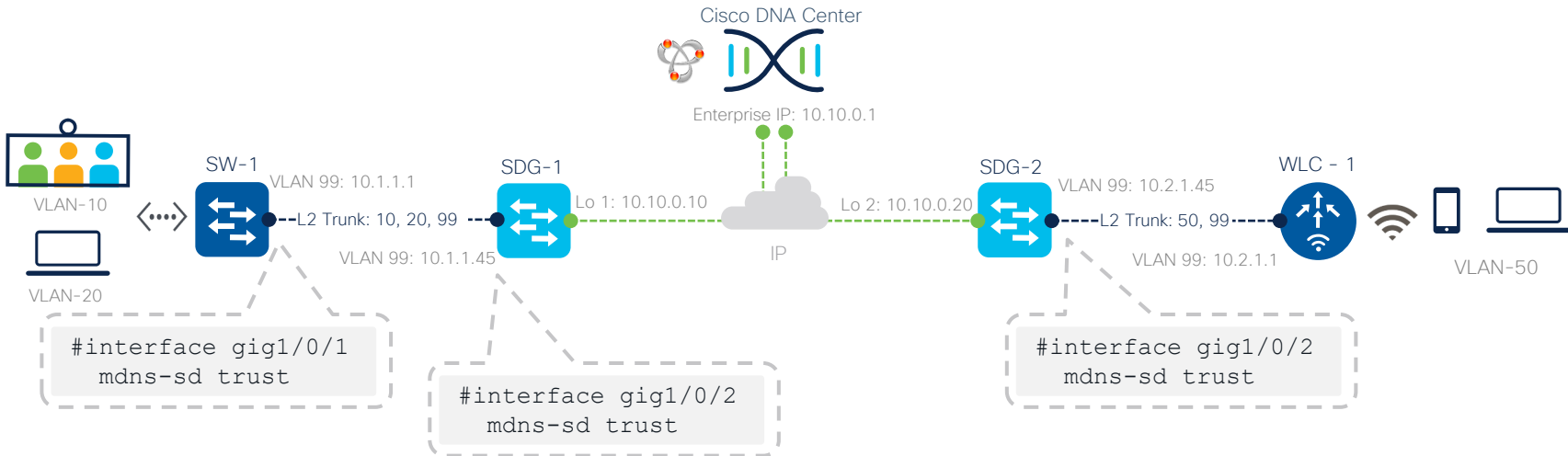
Deploying Local and Wide Area Bonjour

Configuration Example for Local Mode - Wireless and Wired



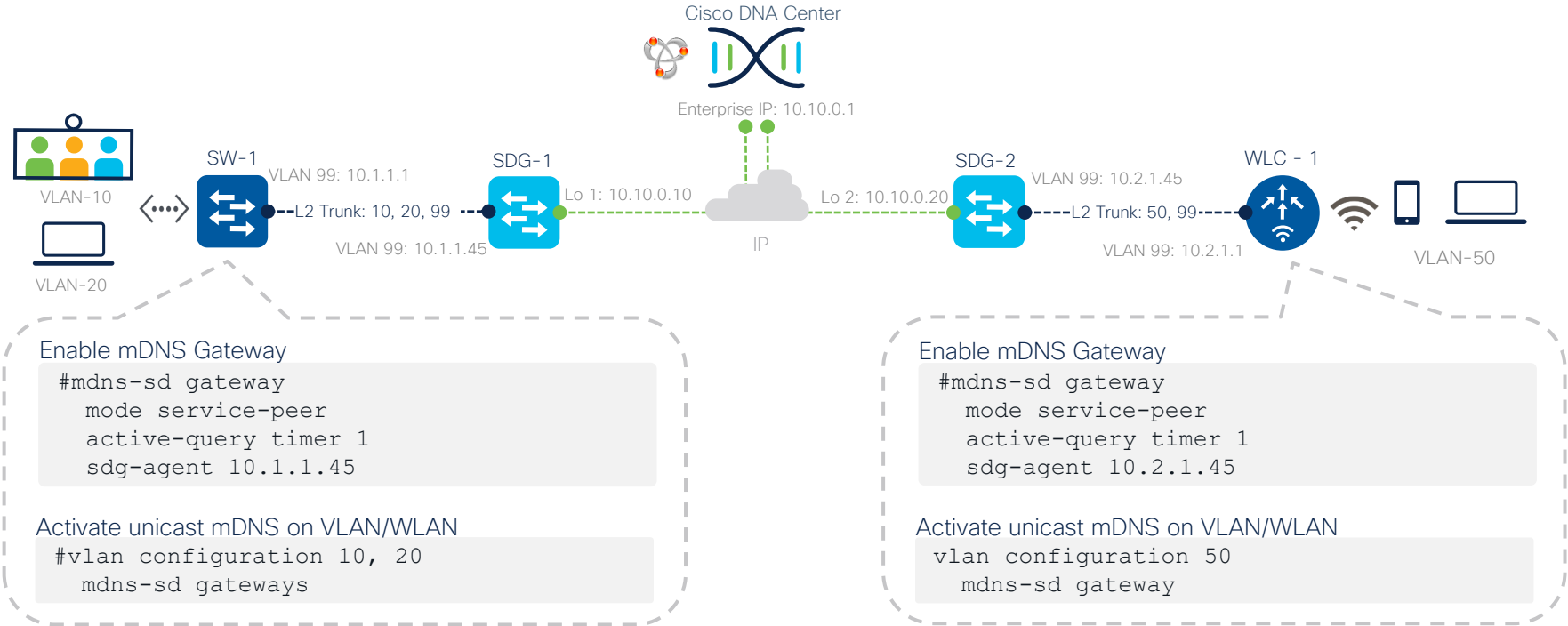
Local Area Bonjour

Configure mDNS trust between Service-peer and SDG Agent



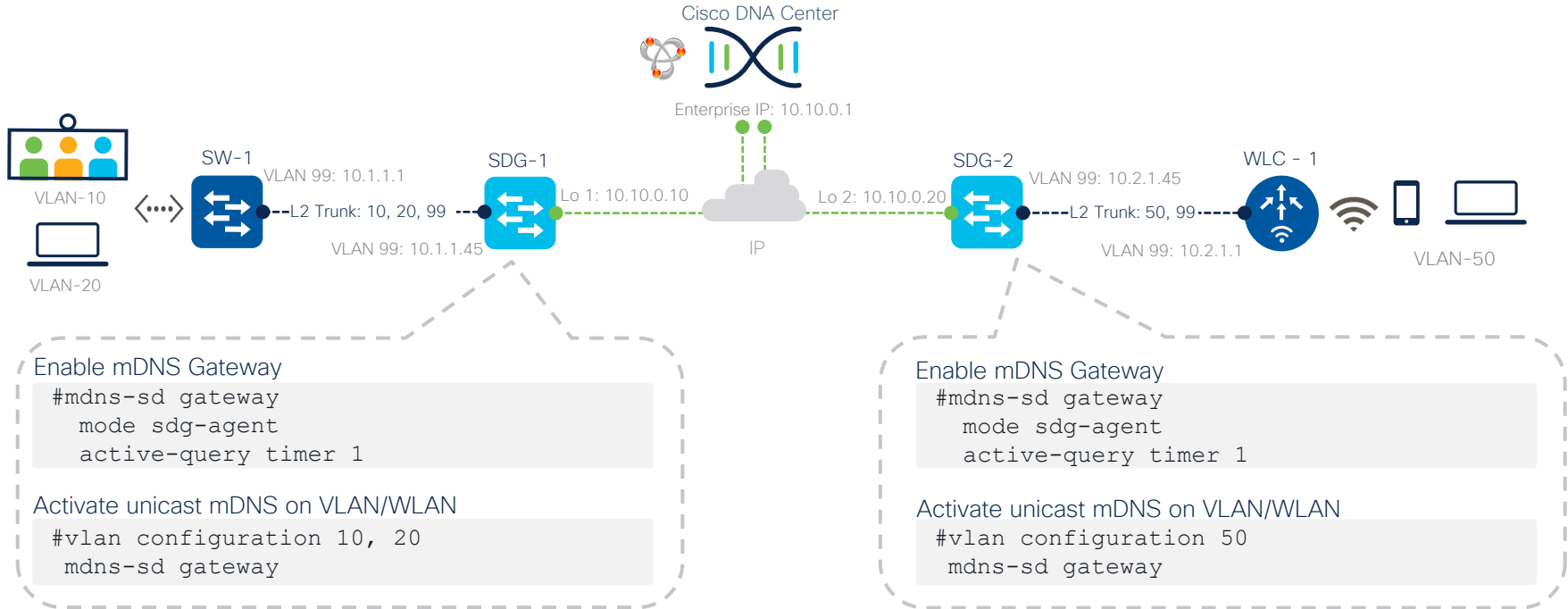
Local Area Bonjour

Configure Service-Peers



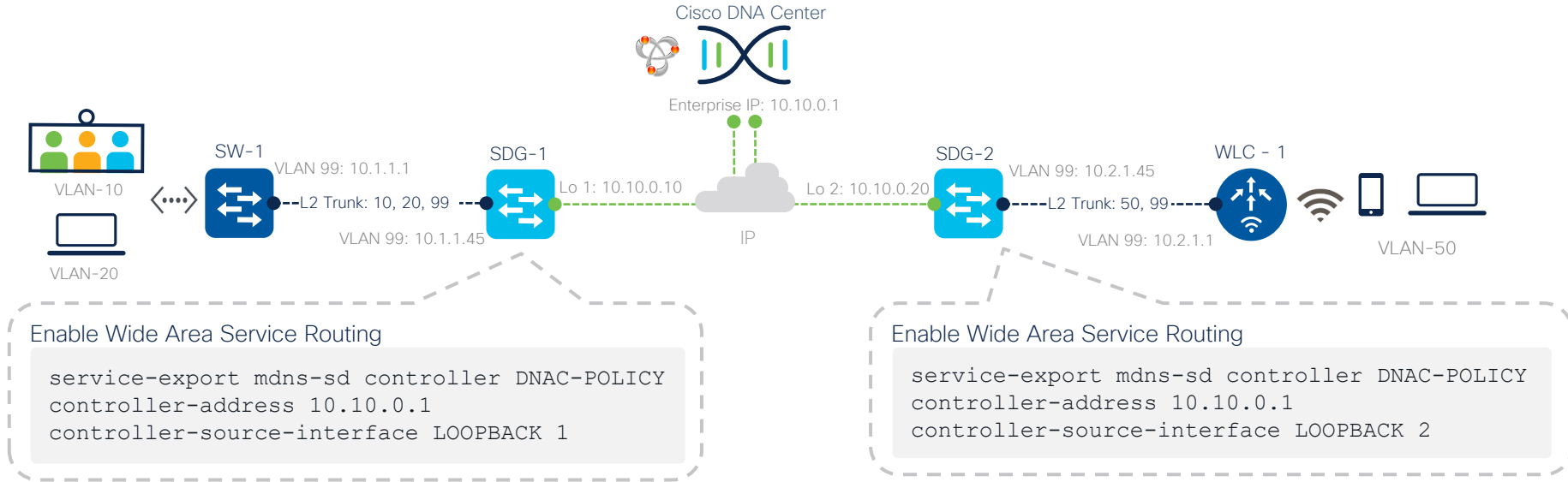
Local Area Bonjour

Configure SDG Agent

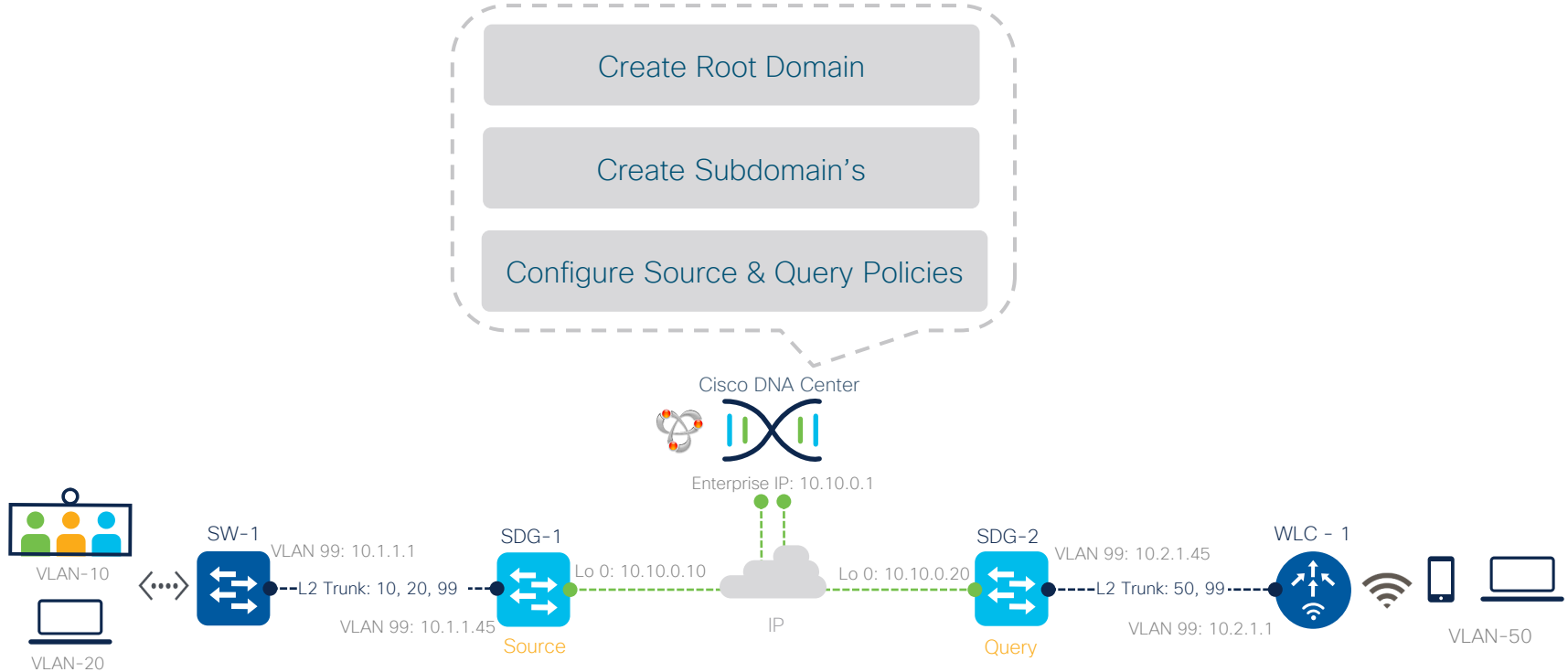


Wide Area Bonjour

Configure SDG Agent



Configure Wide Area Bonjour Application



Agent# [show mdns controller detail](#)

Controller : WIDE-AREA-BONJOUR
IP : 10.0.1.1, Dest Port : 9991, Src Port : 41113, State : UP
Source Interface : Loopback 0, MD5 Disabled
Hello Timer 30 sec, Dead Timer 120 sec, Next Hello 00:00:26
Uptime 06:05:09 (18:25:17 EDT May 23 2019)
Service Buffer : Enabled

Connection State

TCP Session and State Detail
IP Address information
Connection Security
Keepalive Timer Settings and Window
Performance Capability State

Service Announcement :
Filter : DNAC-BONJOUR-POLICY
Count 50, Delay Timer 30 sec, Pending Announcement 0, Pending Withdraw 0
Total Export Count 0, Next Export in 00:00:26

Service Announcement State

Wide Area Bonjour Policy Detail
Service advertisement buckets and timers
Total advertisement and withdraw pending in buffer
Total exported service count and timer window

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

Service Query State

Service Query De-Duplication
Service Query buckets and timers
Total remote Query service count and timer window

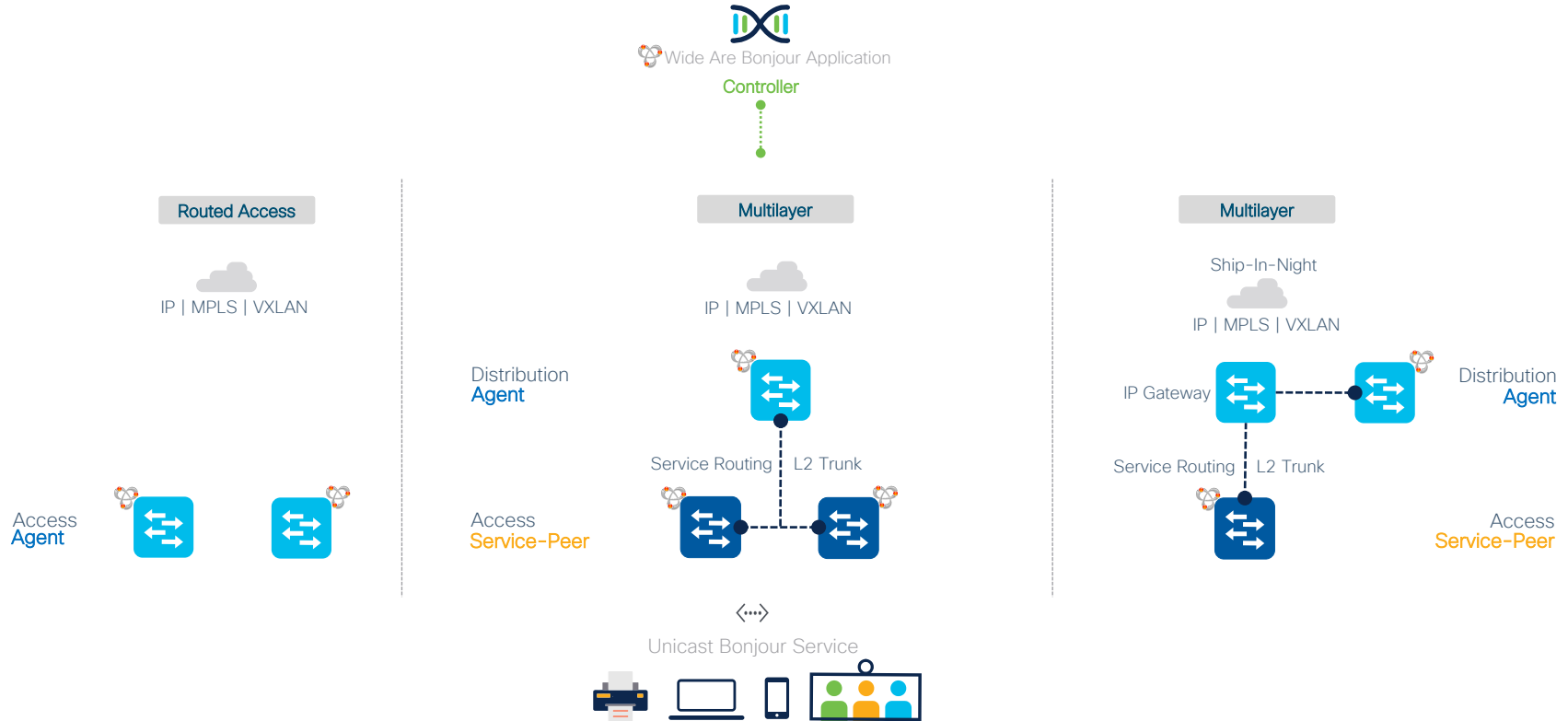


show mdns service-policy
show mdns service-list
show mdns service-definition

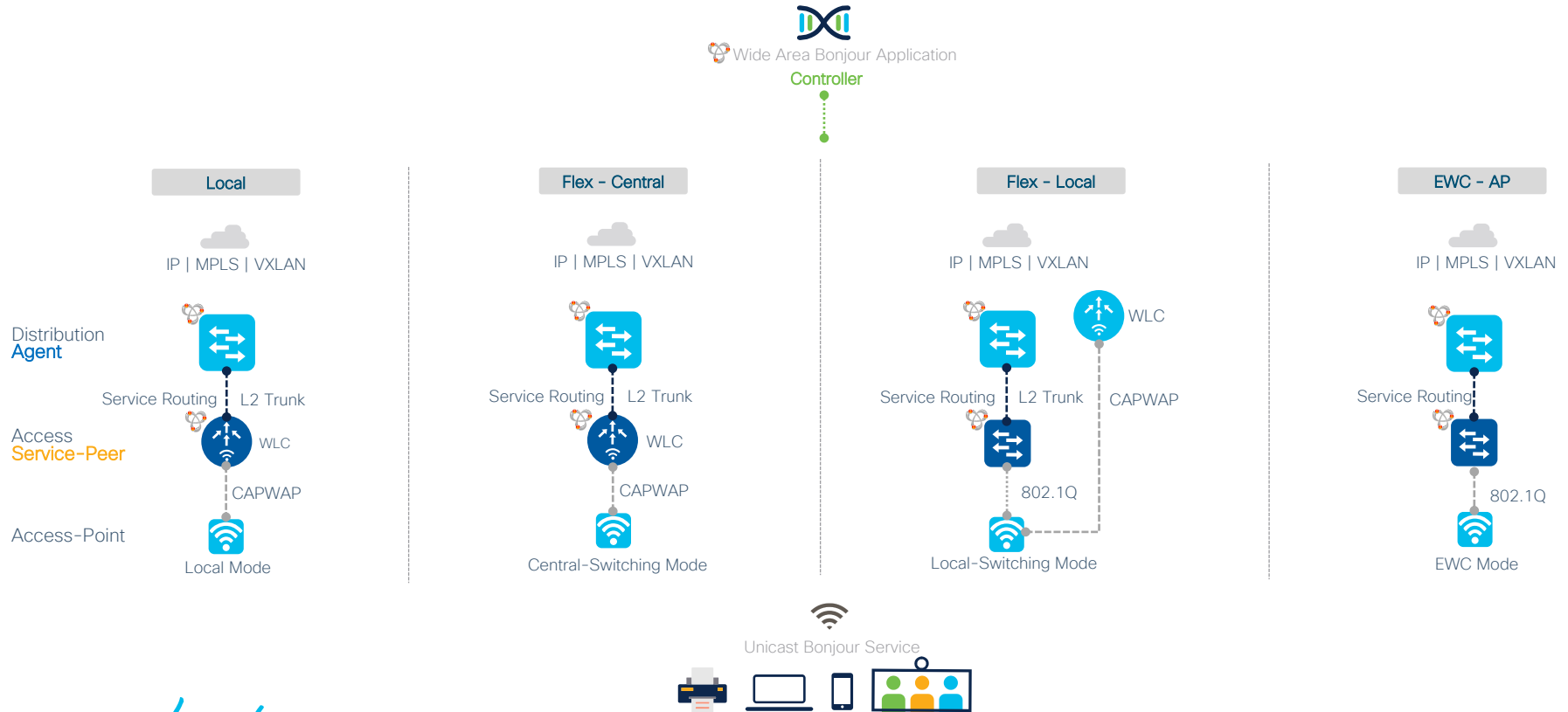
show mdns cache
show mdns statistics
show mdns controller statistics

Supported Designs

Traditional LAN Network Support



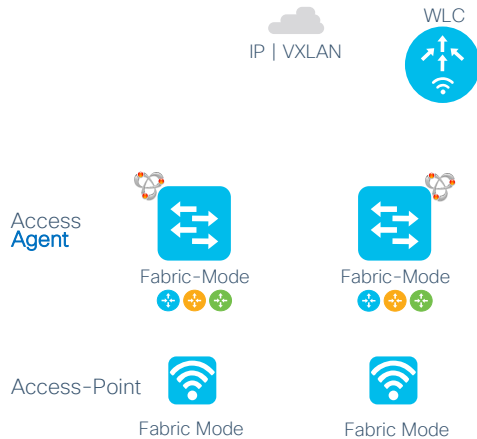
Traditional Wireless LAN Network Support



SD-Access Wired and Wireless Support

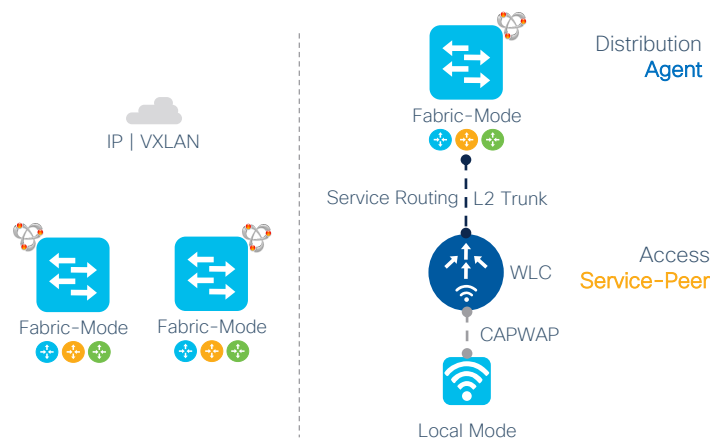


Fabric - Wired and Wireless



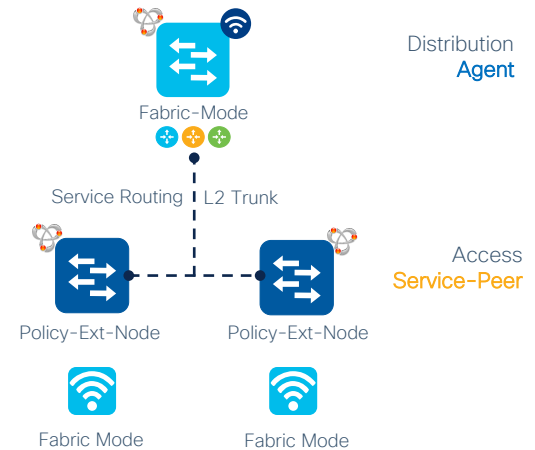
Fabric - Wired

Traditional Local Mode Wireless



Fabric - Embedded Wireless

Traditional Layer 2 Wired



Unicast Bonjour Service



BGP EVPN VXLAN Wired and Wireless Support



Fabric – Layer 2 Overlay



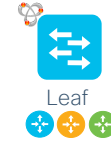
Fabric – Layer 3 Overlay



Fabric – Symmetric IRB



Fabric – Asymmetric IRB



Wireless Fabric Overlay

Centralized Wireless Local Mode



WLC

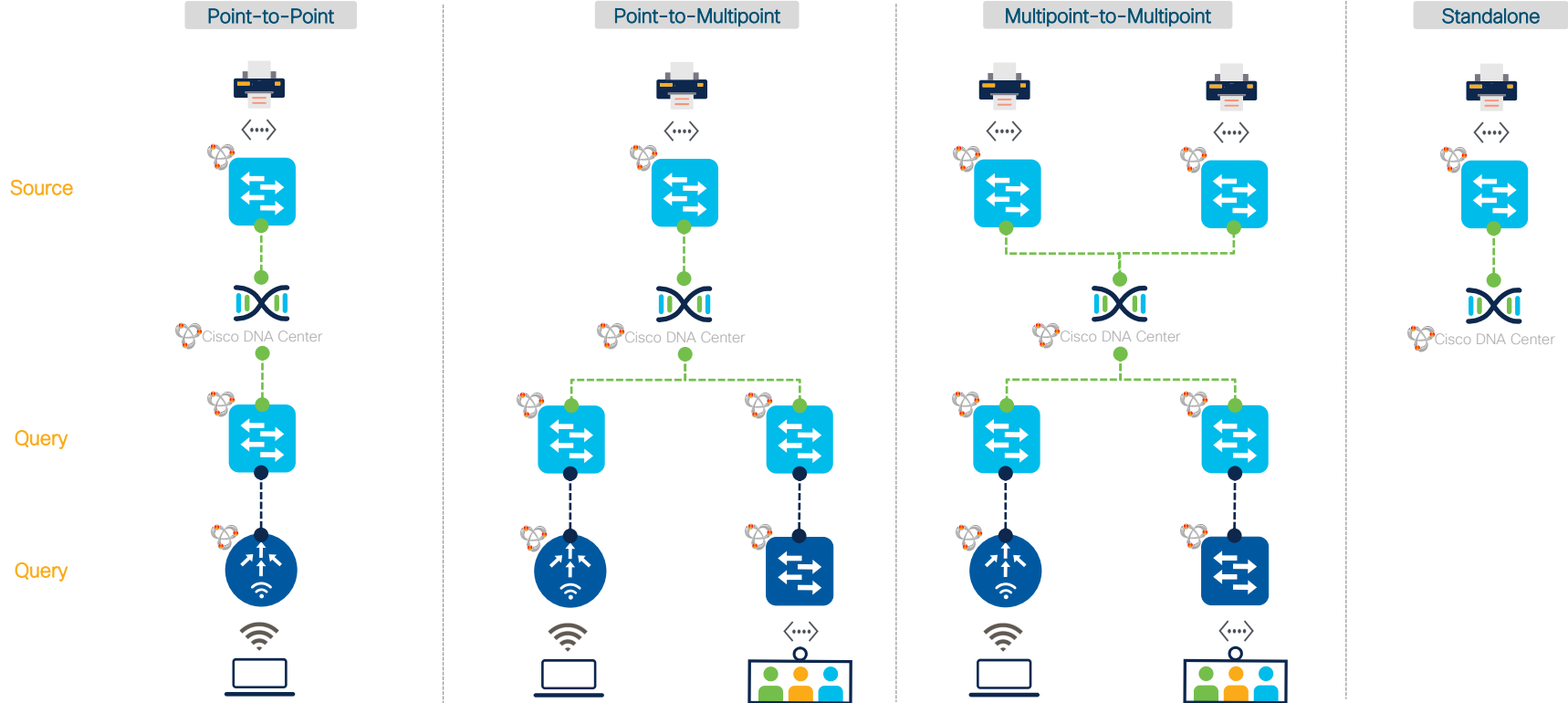
Access Service-Peer

CAPWAP

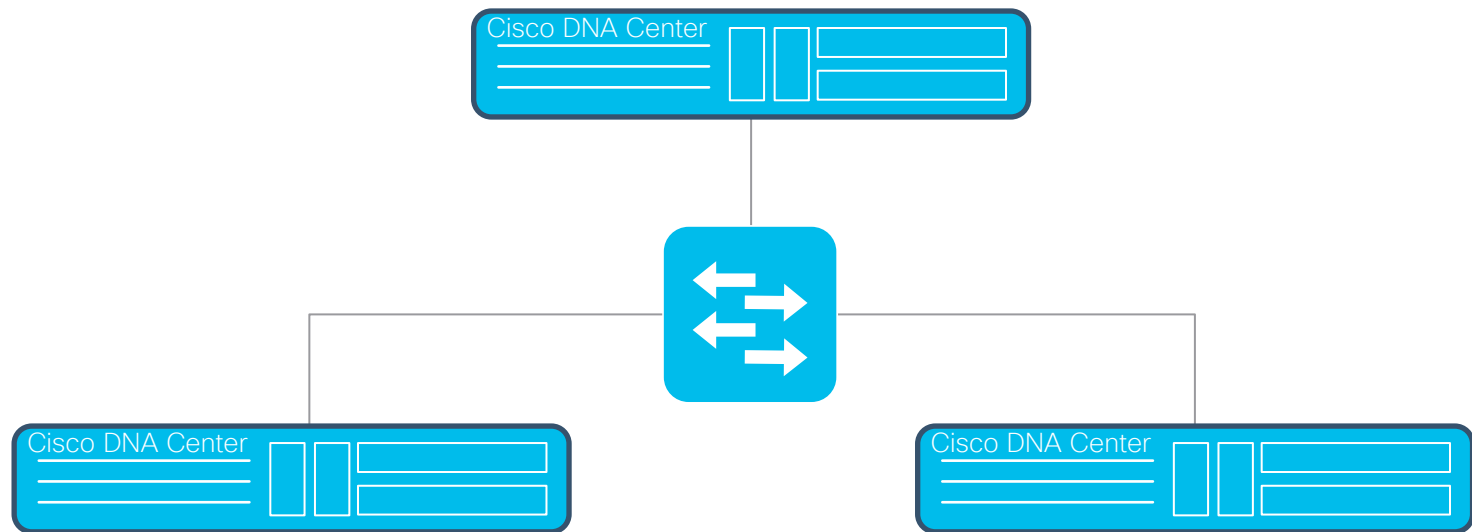
Local Mode



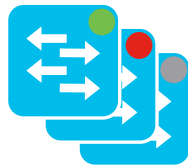
Wide Area Bonjour Service Routing Alternatives



Cisco DNA Center High Availability (HA) Support



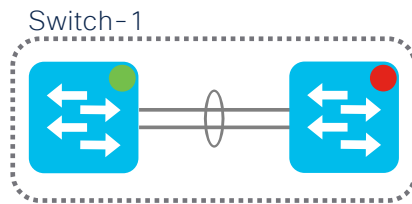
Stateful Switchover (SSO) Support



Cisco StackWise



Modular System



Cisco StackWise-Virtual

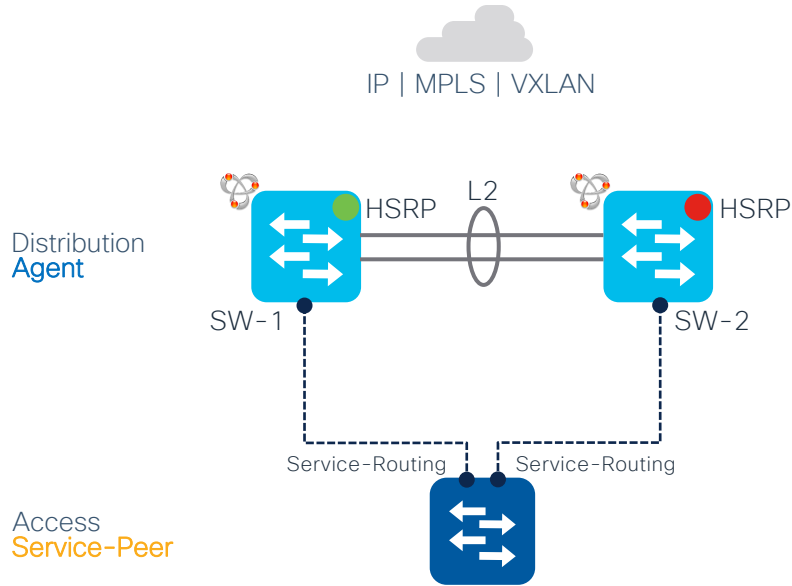


Cisco Wireless HA Mode

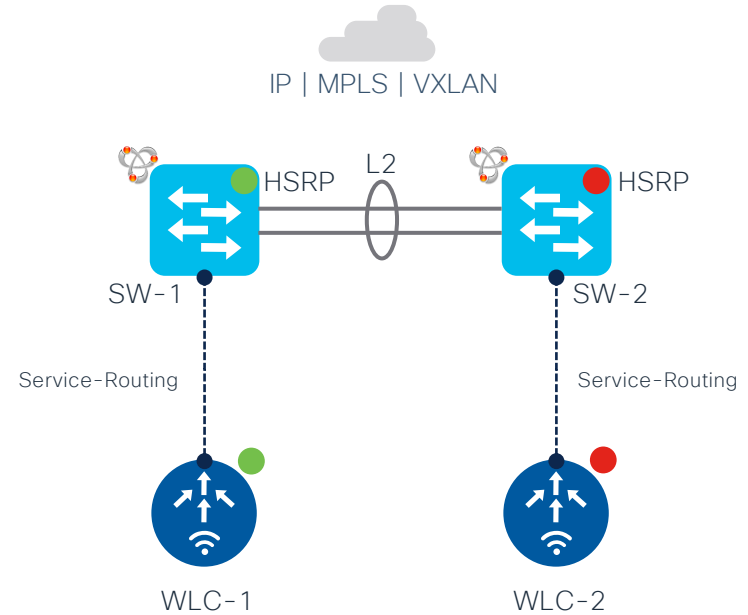


HSRP-aware mDNS Service-Routing

Wired Routing Redundancy



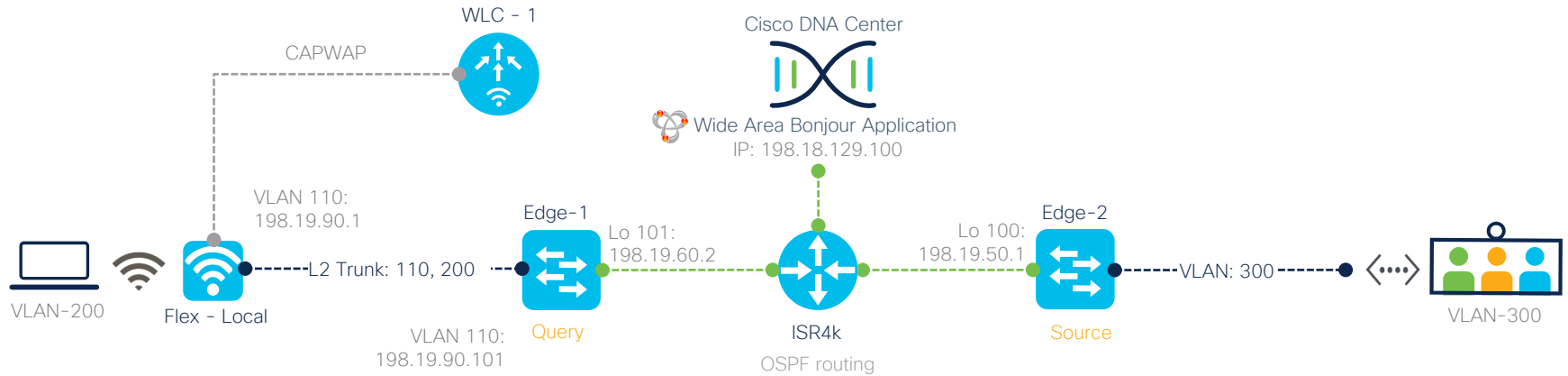
Wireless Routing Redundancy



Demo



Topology





Wrap-up

- Bonjour Overview
- Challenges in Enterprise
- Solution Overview
- Configuration Workflow
- Supported Designs
- Demo

Complete your Session Survey

- Please complete your session survey after each session. Your feedback is very important.
- Complete a minimum of 4 session surveys and the Overall Conference survey (open from Thursday) to receive your Cisco Live t-shirt.
- All surveys can be taken in the Cisco Events Mobile App or by logging in to the Session Catalog and clicking the "Attendee Dashboard" at <https://www.ciscolive.com/emea/learn/sessions/session-catalog.html>



Continue Your Education



Visit the Cisco Showcase for related demos.



Book your one-on-one Meet the Engineer meeting.



Attend any of the related sessions at the DevNet, Capture the Flag, and Walk-in Labs zones.



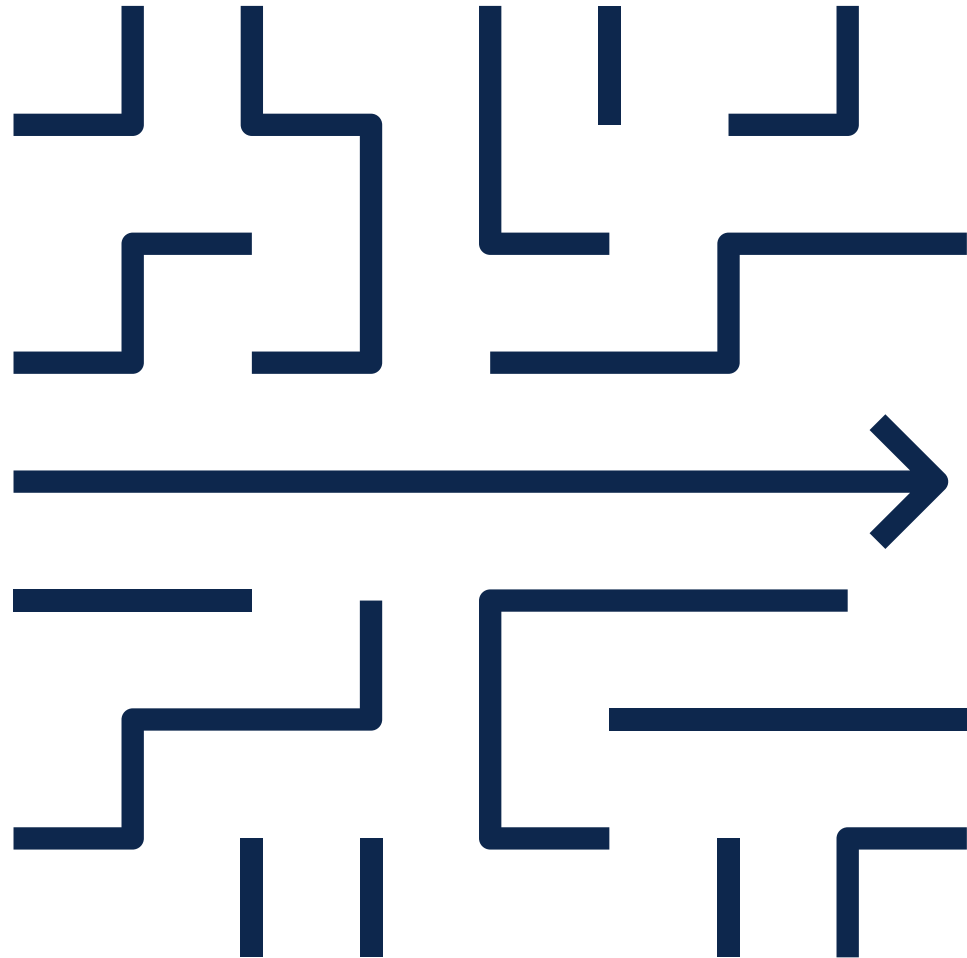
Visit the On-Demand Library for more sessions at ciscolive.com/on-demand.

Wide Area Bonjour Resources

Would you like to know more?

- [Multicast Domain Name System \(mDNS\) – Still Flooding?](#)
- [Cisco DNA Service for Bonjour \(Home Page\)](#)
- [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 Catalyst 9800 Series WLC](#)
- [Cisco Catalyst 9400 Series Switches](#)
- [Cisco Catalyst 9600 Series Switches](#)
- [Cisco DNA-Center – Wide Area Bonjour User Guide](#)
- [Cisco Wide Area Bonjour Application on Cisco DNA Center User Guide, Release 2.3.3](#)

This solution *simplifies* and *secures* your network substantially





The bridge to possible

Thank you

CISCO *Live!*

CISCO *Live!*

ALL IN

[Appendix]

Requirements

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 ⁽¹⁾ 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 ⁽¹⁾ Service-Peer	SDG-Agent ⁽¹⁾ Service-Peer	SDG-Agent ⁽¹⁾ Service-Peer	SDG-Agent ⁽¹⁾ 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	—	—	●	●	●	●	●	—	-



Wireless AP Multicast Requirements

	Local	Fabric	Flex – Central	Flex – Local	EWC - Switch	EWC - AP
AP Multicast	Required *	Required	Required *	Not Required	Required	Required
mDNS Bridging	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required
Wireless Client Multicast	Optional	Optional	Optional	Optional	Optional	Optional
Wired Client Multicast	Optional	Optional	Optional	Optional	Optional	Optional

* From 17.9.x enabling AP Multicast is OPTIONAL

Micro Location Configuration Example

Per-Building Micro-Location Service Routing

LAN Service-Peer | Location-Service

Create Location Policy

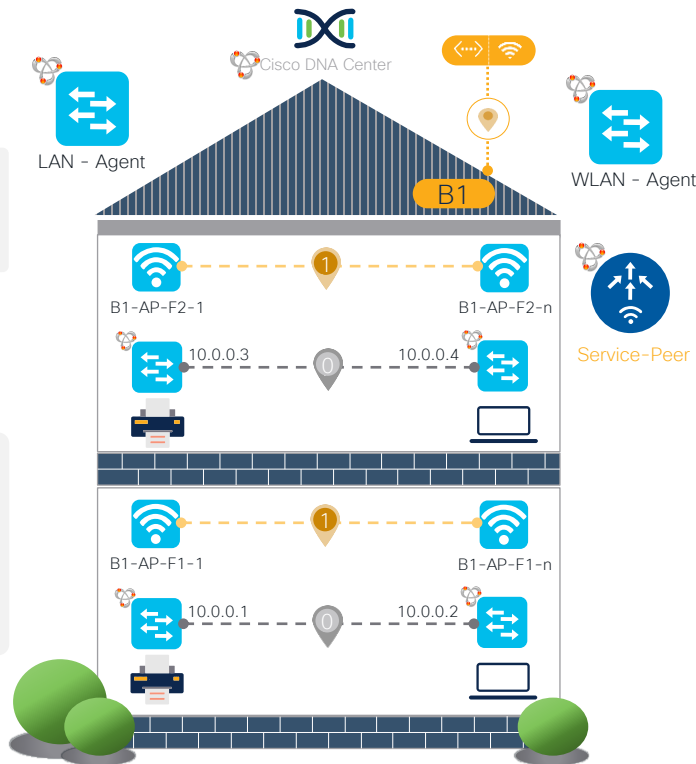
Optional configuration at individual L2 LAN switch

Default Location-Group (0) on all Ports for each mDNS enabled VLAN
mDNS Services and Query routed with Default LGID to Agent Switch

LAN SDG-Agent | Location-Service

Create Peer Policy

```
! Enable Wired-to-Wired Service-Routing between Floors
mdns-sd service-peer group
peer-group 1
service-policy default-mdns-service-policy
service-peer 10.0.0.1 location-group default role none
service-peer 10.0.0.2 location-group default role none
service-peer 10.0.0.3 location-group default role none
service-peer 10.0.0.4 location-group default role none
!
```



Wireless Service-Peer | Location-Service

Create Location Rule

```
mdns-sd service-policy LOCAL-AREA-POLICY
location location-group
!
wireless rule application mdns
rule-priority 1 rule-name BLDG-1-F1F2
regex B1-AP
action-type grouping
group-id 1
!
```

WLAN SDG-Agent | Location-Service

Create Peer Policy

Optional Peer Policy configuration if no Inter-peer routing required.
mDNS Services and Query routed with LGID 1 to Controller

63

Per-Zone Micro-Location Service Routing

LAN Service-Peer | Location-Service

Create Location Policy

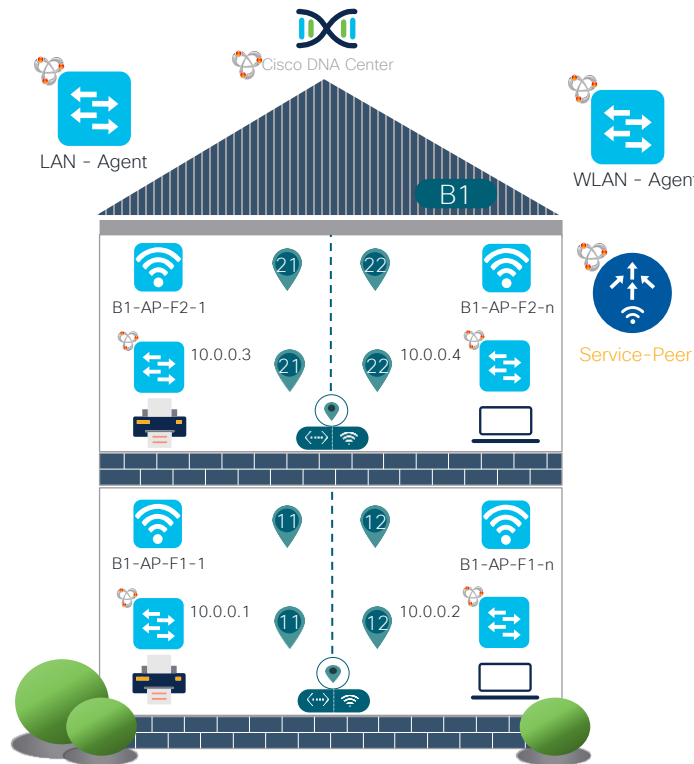
```
!
mdns-sd location-group 11 vlan 11
interface GigabitEthernet 1/0/1
!
```

LAN SDG-Agent | Location-Service

Create Peer Policy

! Enable Wired-to-Wired Service-Routing on same Floors

No Peer Policy needed to support Inter-Peer routing.
Wired-to-Wired service limited per L2 Switch and permitted location ports



Wireless Service-Peer | Location-Service

Create Location Rule

```
mdns-sd service-policy LOCAL-AREA-POLICY
location location-group
!
wireless rule application mdns
rule-priority 1 rule-name BLDG-F1-ZONE-1
regex B1-AP-F1-1
action-type grouping
group-id 11
wireless rule application mdns
rule-priority 1 rule-name BLDG-F1-ZONE-2
regex B1-AP-F1-n
action-type grouping
group-id 12
< snip >
```

WLAN SDG-Agent | Location-Service

Create Peer Policy

Optional Peer Policy configuration if no Inter-peer routing required.

mDNS Services and Query routed with LGID
11-12 and 21-22 to Controller

Custom Example: LAN Access Inter-VLAN Service Local Proxy

LAN Access Inter-VLAN Service Local Proxy

SP-1 | Location-Service

Create Location Policy

```
mdns-sd location-filter LOCATION-POLICY
match location default vlan 10
match location default vlan 11
```

Create Location Service

```
mdns-sd service-list LOCAL-AREA-SERVICES-IN IN
match printer-ipp
mdns-sd service-list LOCAL-AREA-SERVICES-OUT OUT
match printer-ipp location-filter LOCATION-POLICY
```

Build Service Policy

```
mdns-sd service-policy LOCAL-AREA-POLICY
service-list LOCAL-AREA-SERVICES-IN IN
service-list LOCAL-AREA-SERVICES-OUT OUT
```

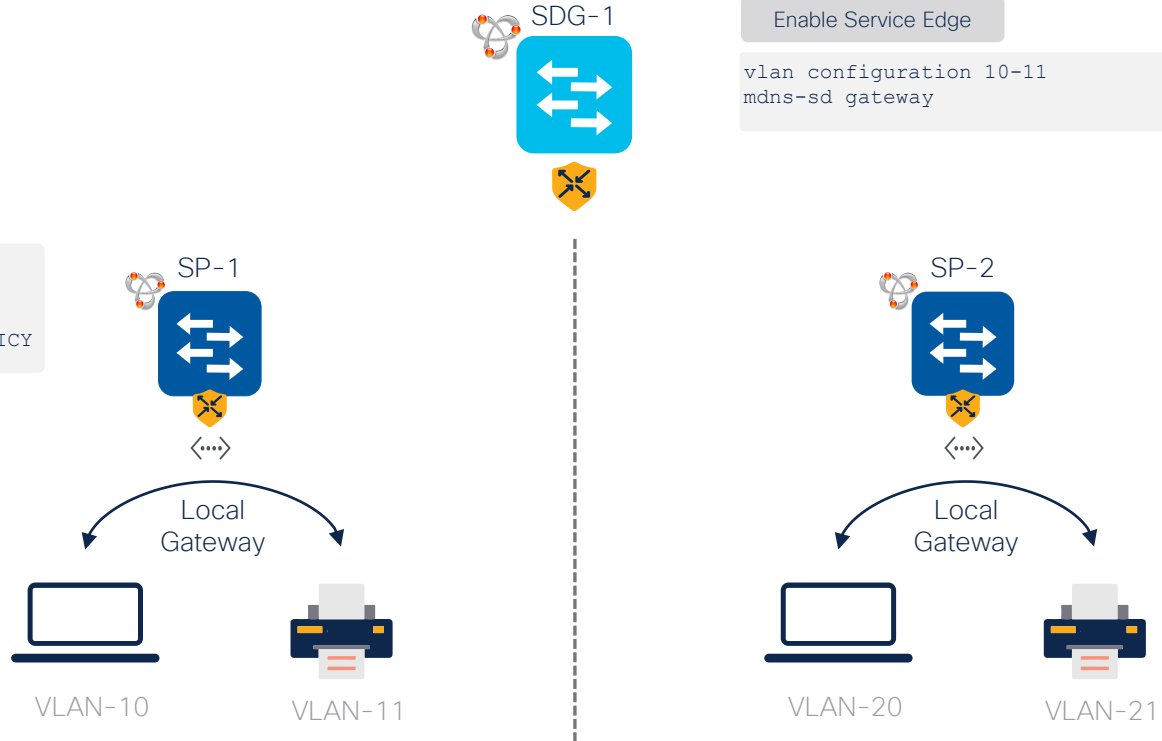
Enable Service Edge

```
vlan configuration 10-11
mdns-sd gateway
service-policy LOCAL-AREA-POLICY
```

SDG-1

Enable Service Edge

```
vlan configuration 10-11
mdns-sd gateway
```



Example: SDG Agent Service-Peers Service-Routing

SDG Agent Service-Peers Service-Routing

SDG-1

Create Service List

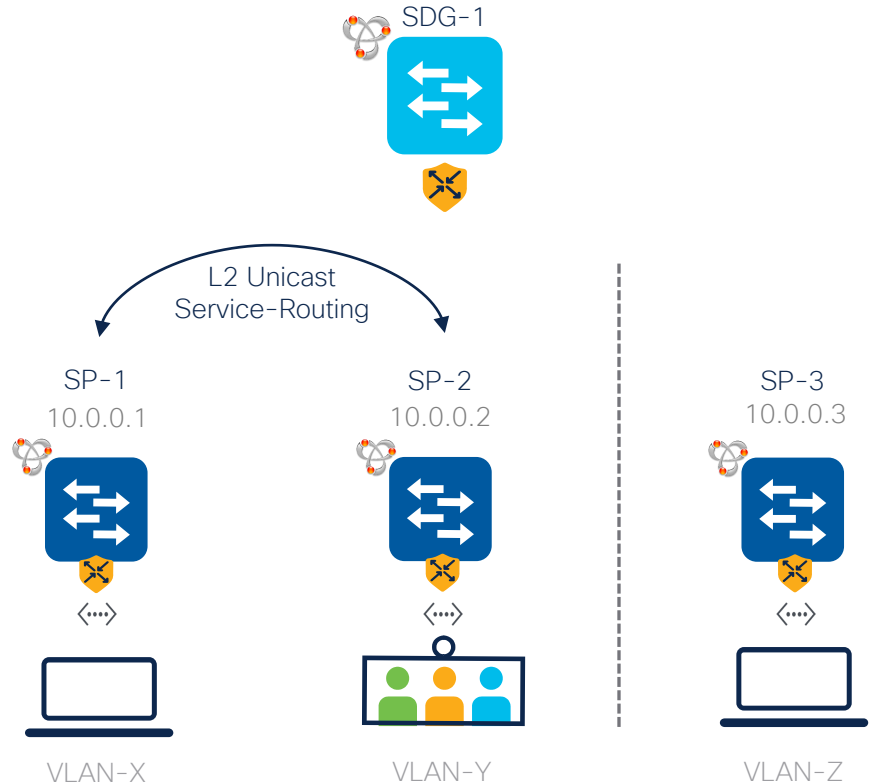
```
mdns-sd service-list LOCAL-AREA-SERVICES-IN IN
  match printer-ipp
mdns-sd service-list LOCAL-AREA-SERVICES-OUT OUT
  match printer-ipp
```

Build Service Policy

```
mdns-sd service-policy LOCAL-AREA-POLICY
  service-list LOCAL-AREA-SERVICES-IN IN
  service-list LOCAL-AREA-SERVICES-OUT OUT
```

Create Service Peer Group

```
mdns-sd service-peer group
peer-group 1
  service-policy LOCAL-AREA-POLICY
  service-peer 10.0.0.1 location-group all
  service-peer 10.0.0.2 location-group all
```



Configuration Example: SDA Deployment

Fabric Enabled Wired and Wireless Mode



Catalyst 9000 - SDG-AGENT
Enable mDNS Service-Routing
<pre>mdns-gateway mode sdg-agent active-query timer 1</pre>
Activate mDNS on VLAN with Default Policy
<pre>vlan configuration <WIRED-CLIENT-VLAN> mdns-sd gateway vlan configuration <WIRELESS-CLIENT-VLAN> mdns-sd gateway</pre>
Enable Wide Area Bonjour Service-Routing
<pre>service-export mdns-sd controller <NAME> controller-address <DNAC-IP-ADDRESS> controller-source-interface <ID></pre>

Catalyst 9000 - SDG-AGENT
Enable mDNS Service-Routing
<pre>mdns-gateway mode sdg-agent active-query timer 1</pre>
Activate mDNS on VLAN with Default Policy
<pre>vlan configuration <WIRELESS-CLIENT-VLAN> mdns-sd gateway vlan configuration <WIRELESS-CLIENT-VLAN> mdns-sd gateway</pre>
Enable Wide Area Bonjour Service-Routing
<pre>service-export mdns-sd controller <NAME> controller-address <DNAC-IP-ADDRESS> controller-source-interface <ID></pre>

Catalyst 9800 - WLC
Configuration
No mDNS Configuration required

Fabric Enabled Wired with Wireless OTT Local Mode



Catalyst 9000 - SDG-AGENT
Enable mDNS Service-Routing
<pre>mdns-gateway mode sdg-agent active-query timer 1</pre>
Activate mDNS on VLAN with Default Policy
<pre>vlan configuration <WIRED-CLIENT-VLAN> mdns-sd gateway vlan configuration <WIRELESS-CLIENT-VLAN> mdns-sd gateway</pre>
Enable Wide Area Bonjour Service-Routing
<pre>service-export mdns-sd controller <NAME> controller-address <DNAC-IP-ADDRESS> controller-source-interface <ID></pre>

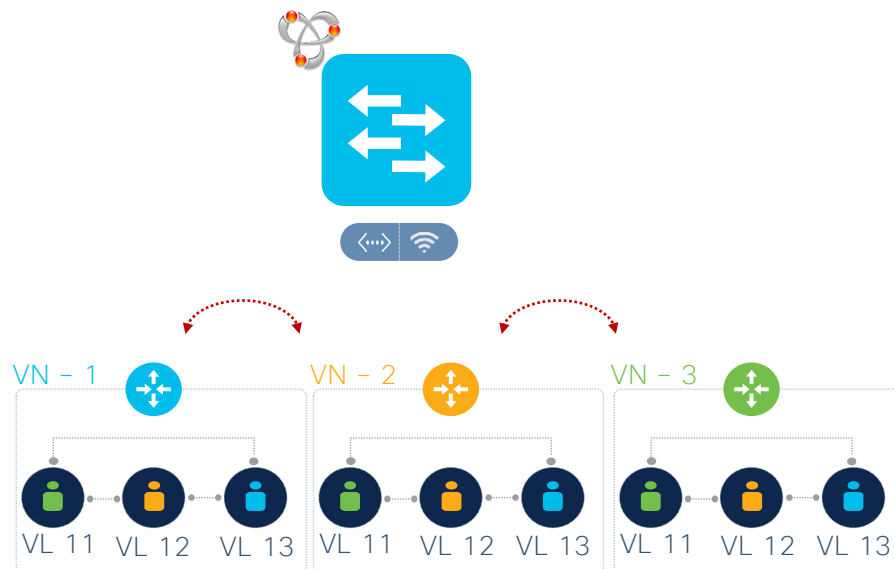
Catalyst 9000 - SDG-AGENT
Enable mDNS Service-Routing
<pre>mdns-gateway mode sdg-agent active-query timer 1</pre>
Activate mDNS on VLAN with Default Policy
<pre>vlan configuration <WIRELESS-CLIENT-VLAN> mdns-sd gateway interface <ID> description CONNECTED TO 9800-WLC-1 mdns-sd trust</pre>
Enable Wide Area Bonjour Service-Routing
<pre>service-export mdns-sd controller <NAME> controller-address <DNAC-IP-ADDRESS> controller-source-interface <ID></pre>

Catalyst 9800 - WLC
Enable mDNS Service-Routing
<pre>mdns-gateway mode service-peer sdg-agent <WIRELESS-MGMT-DIST-SW-IP></pre>
Activate mDNS on SSID with Default Policy
<pre>wlan <PROFILE> id <SSID> mdns-sd-interface gateway</pre>

Custom Example: SD-Access Network – Inter-VN Service- Routing

Inter-VN VRF-Aware Service-Leaking

Agent
Fabric-Edge



Custom

Policy

Agent

Enable mDNS Gateway

```
mdns-sd gateway
mode sdg-agent
active-query timer 1
```

Create Service List

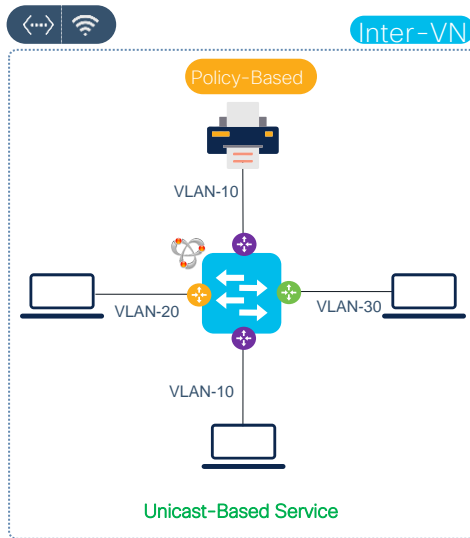
```
mdns-sd service-list LOCAL-AREA-SERVICES-IN IN
match printer-ipp
mdns-sd service-list LOCAL-AREA-SERVICES-OUT OUT
match printer-ipp
```

Build Service Policy

```
mdns-sd service-policy LOCAL-AREA-POLICY
service-list LOCAL-AREA-SERVICES-IN IN
service-list LOCAL-AREA-SERVICES-OUT OUT
```

Enable Service Edge

```
vlan configuration 10
mdns-sd gateway
service-policy LOCAL-AREA-POLICY
```



Inter-VN data-plane thru external overlay routing configuration

Agent

Create Location-Filter

```
mdns-sd location-filter INTER-VN-SERVICE-PROXY
match location-group default vlan 10
```

Create Service List

```
mdns-sd service-list YELLOW-VN-SERVICES-OUT OUT
match printer-ipp location-filter INTER-VN-
SERVICE-PROXY
mdns-sd service-list GREEN-VN-SERVICES-OUT OUT
match printer-ipp location-filter INTER-VN-
SERVICE-PROXY
```

Build Service Policy

```
mdns-sd service-policy YELLOW-VN-POLICY
service-list YELLOW-VN-SERVICES-OUT OUT
mdns-sd service-policy GREEN-VN-POLICY
service-list GREEN-VN-SERVICES-OUT OUT
```

Enable Service Edge

```
vlan configuration 20
mdns-sd gateway
service-policy YELLOW-VN-POLICY
vlan configuration 30
mdns-sd gateway
service-policy GREEN-VN-POLICY
```

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