

Bonjour Deployment

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Deployment Considerations

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The Bonjour protocol operates on service announcements and service queries, which allow devices to ask and advertise specific applications such as:

- Printing Services
- File Sharing Services
- Remote Desktop Services
- iTunes File Sharing
- iTunes Wireless iDevice Syncing (in Apple iOS v5.0+)
 - Music broadcasting in iOS v4.2+
 - Video broadcasting in iOS v4.3+
 - Full screen mirroring in iOS v5.0+ (iPad2, iPhone4S, or later)

Each query or advertisement is sent to the Bonjour multicast address for delivery to all clients on the subnet. The Apple Bonjour protocol relies on Multicast DNS (mDNS) operating at User Datagram Protocol (UDP) port 5353 and sending to the reserved group addresses listed below:

- IPv4 Group Address 224.0.0.251
- IPv6 Group Address FF02::FB

The addresses used by the Bonjour protocol are link-local multicast addresses and are only forwarded on the local Layer 2 (L2) domain, since link-local multicast is meant to stay local by design. Routers cannot use multicast routing to redirect the traffic because the time to live (TTL) is set to one.



Cisco Bonjour Gateway Solution in Release 7.4

In the 7.4 release, the wireless LAN controller (WLC) supports Bonjour gateway functionality on the WLC itself. You do not need to enable multicast on the controller. The WLC snoops all Bonjour discovery packets but does not forward them on the AIR or Infra network.

Bonjour is the Apple version of zero configuration networking (Zeroconf); it is mDNS with DNS Service Discovery (DNS-SD). Apple devices advertise their services via IPv4 and IPv6 simultaneously (IPv6 link local and Globally Unique). The current 7.4 implementation does not support Bonjour Snooping for IPv6 Addresses. On the iPad, you cannot turn off IPv6 or change any of the Bonjour settings.

If you want to control mDNS/Bonjour, the key is to limit the size of the local segment.

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To address this issue, the Cisco WLC acts as a Bonjour gateway. The WLC listens for Bonjour services and by caching those Bonjour advertisements (AirPlay, AirPrint, and so forth) from the source/host (such as AppleTV) and responding back to Bonjour clients when they ask for or request a service. This process is shown below.



1. The controller listens for the Bonjour services.

2. The WLC caches the Bonjour services.



3. The WLC listens for the client queries for services.



4. The WLC sends a unicast response to the client queries for Bonjour services.



Bonjour Deployment Using mDNS Gateway

Bonjour Configuration on WLAN Through the User Interface

In the 7.4 release, the WLC supports Bonjour gateway functionality on the WLC itself. You do not need to enable multicast on the WLC. The WLC snoops all Bonjour discovery packets but does not forward them on the AIR or Infra network.

1. To configure and demonstrate the Bonjour feature on the WLC, create a dynamic interface for Bonjour services on a separate VLAN from the client VLAN.

The example below shows different interfaces and VLANs for Apple Clients and Apple TV:

cisco				WIRELESS	SECURITY		IMANDS HELP EEEDBAC	ж
Controller General Inventory Interfaces	Interfaces Interface	Apple Name	τv	VLAN Identifier 11	IP Address 10.10.11.2	Interface Type Dynamic	Dynamic AP Management Disabled	t 🖸
Interface Groups	manageme	*		10	10.10.10.2	Static	Not Supported	
Multicast Internal DHCP Server Mobility Management Ports NTP		Ap	ple Clients			5.00	Hot Sapper au	

- **2.** Create a wireless LAN (WLAN) for clients with any security type. By default, mDNS snooping is enabled on the WLAN.
- **3.** To confirm, click **WLAN id**, click the **Advanced** tab, and make sure that the mDNS Snooping option is Enabled. Select **default-mdns-profile** as the mDNS Profile to allow the Bonjour services you require to advertise on the particular WLAN.
- 4. Click Apply.

alialia							
CISCO	MONITOR WLANS CONTRO	ILLER WIRELESS	SECURITY MANAGEM	IENT COMMANDS	HELP	EEEDBACK	
/LANs	FlexConnect						
WLANS	FlexConnect Local Switching 4	Enabled					
Advanced	FlexConnect Local Auth	Enabled					
Auvanceu	Learn Client IP Address &	Enabled					
	Vlan based Central Switching 42	Enabled					
	Central DHCP Processing	Enabled					
	Override DNS	Enabled					
	NAT-PAT	Enabled					
	mDNS						
	mDNS Snooping			Enabled			
	mDNS Profile default-mdr	s-profile 💌					



Only one mDNS profile can be applied to one WLAN.

5. Create another WLAN for services and make sure that the WLAN is mapped to an interface other than management, as shown below.

Note

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Release v5.0 of Apple TV does not support Wi-Fi Protected Access 2 (WPA2)-Enterprise authentication. For 802.1x networks, you can work around this problem by creating a WPA2-Pre- Shared Key (PSK) WLAN using the same wired interface.

ONITOR <u>W</u> LANS <u>C</u> ON	Troller Wireless <u>s</u> ecurity	MANAGEMENT COMMAND	s he <u>l</u> p <u>f</u> eedba	ск	Save Configuration	Ping Logout <u>R</u> ef
/LANs > New	WLAN				< 8	Back Apply
Profile Name	POD1-AppleTV					
SSID	POD1-AppleTV					
ID	2					
CISCO	MONITOR WLANS CO	NTROLLER WIRELESS	SECURITY M	NAGEMENT	COMMANDS	HELP FEEDBAI
ANe	WLANe > Edit 'POD1	-AppleTV'				and a second
-0110	WEARS FEAR TOD	i oppie i v				
WLANS	General Security	QoS Advanced				
WLANS WLANS Advanced	General Security Profile Name	QoS Advanced				
WLANS WLANS Advanced	General Security Profile Name Type	QoS Advanced				
WLANS WLANS Advanced	General Security Profile Name Type SSID	QoS Advanced POD1-AppleTV WLAN POD1-AppleTV	_			
WLANS WLANS Advanced	General Security Profile Name Type SSID Status	QoS Advanced POD1-AppleTV WLAN POD1-AppleTV C Enabled	_			
WLANS WLANS Advanced	General Security Profile Name Type SSID Status	QoS Advanced POD1-AppleTV WLAN POD1-AppleTV Enabled	_			
WLANS WLANS Advanced	General Security Profile Name Type SSID Status Security Policies	QoS Advanced POD1-AppleTV WLAN POD1-AppleTV Enabled None	_			
WLANS WLANS Advanced	General Security Profile Name Type SSID Status Security Policies	QoS Advanced POD1-AppleTV WLAN POD1-AppleTV Enabled None (Modifications done under	r security tab will a	ippear after a	pplying the change	s.)
WLANS WLANS Advanced	General Security Profile Name Type SSID Status Security Policies	QoS Advanced POD1-AppleTV WLAN POD1-AppleTV Enabled None (Modifications done under	r security tab will a	ppear after at	pplying the change	s.)
WLANS WLANS Advanced	General Security Profile Name Type SSID Status Security Policies Radio Policy	QoS Advanced POD1-AppleTV WLAN POD1-AppleTV Enabled Mone (Modifications done under All Mone	r security tab will a	ippear after aj	pplying the change	s.)
WLANS WLANS Advanced	General Security Profile Name Type SSID Status Security Policies Radio Policy Interface/Interface Group(G)	QoS Advanced POD1-AppleTV WLAN POD1-AppleTV Image: Comparison of the second sec	r security tab will a	ippear after aj	pplying the change	s.)
WLANS WLANS Advanced	General Security Profile Name Type SSID Status Security Policies Radio Policy Interface/Interface Group(G) Multicast Vian Feature	QoS Advanced POD1-AppleTV WLAN POD1-AppleTV Enabled None (Modifications done under All Image: Compared to the second	r security tab will a	ppear after ag	oplying the change	s.)
WLANS WLANS Advanced	General Security Profile Name Type SSID Status Security Policies Radio Policy Interface/(Interface Group(C) Multicast VIan Feature Broadcast SSID	QoS Advanced POD1-AppleTV WLAN POD1-AppleTV Enabled V Enabled None (Modifications done under All V Gynamic V Enabled V	r security tab will a	ppear after af	oplying the change	5.)

6. Connect the Apple TV to the service set identifier (SSID) created for device services, and connect the Bonjour client (iPad/iPhone) to the SSID for clients.

7. Navigate to **Monitor > Clients** to see that the Bonjour servicing Apple TV and the Bonjour client (your iPad/IPhone) are associated with two different SSIDs, as shown below:

CISCO	MONITOR WLANS	CONTROLLER	WIRELESS	SECURITY	MANAGEMENT	COMMANDS	HELP	EEEOBACK			
Monitor	Clients									Entr	ies 1 - 2
Summary Access Points	Current Filter	Apple TV	[Change Filts	r) (Clear Filter	1						
Cisco CleanAir	Client MAC Adde	AP Name		WLAN	Profile	WLAN SSID		User Name	Protocol	Status	Auth
Statistics	10:40:f3:e5:d1:b5	AP36021-303f		POD1	AppleTV	POD1-AppleTV	1		802.11bn	Associated	Yes
> CDP	7c:d1:c3:80:2b:c0	AP36021-303f		POD1	Client	P001-Client	l		802.11bn	Associated	Yes
Rogues		~				Representation of the local distance of the	·				
Clients		iDad/(Dhay									7
Multicast		Faunenoi	16								200
Applications											126

As shown above, it is implied that the Apple TV and the client are connected on different VLANs. This mapping will be confirmed in the next steps.

- **8.** Click the client MAC address of the Bonjour device Apple TV, as shown above, to view its details.
- **9.** Verify that the Apple TV associated to the interface is mapped to a different VLAN than the VLAN of the client. In this case, it is VLAN 11.

Monitor	Clients > Detail				< Back Link Test
Summary Access Points	General AVC St	atistics			
Cisco CleanAir	Client Properties		AP Properties		
CDP	MAC Address	10:40:f3:e5:d1:b5	AP Address	64:d9:89:42:22:d0	
Roques	IPv4 Address	10.10.11.132	AP Name	AP36021-303f	
Clients	IPv6 Address	fe80::1240:f3ff:fee5:d1b5,	AP Type	802.11bn	
Multicast			WLAN Profile	POD1-AppleTV	
Applications			Status	Associated	
			Association ID	4	
			802.11 Authentication	Open System	
			Reason Code	1	
			Status Code	0	
			CF Pollable	Not Implemented	
			CF Poll Request	Not Implemented	
	Client Type	Regular	Short Preamble	Implemented	
	User Name		PBCC	Not Implemented	
	Port Number	1	Channel Agility	Not Implemented	
	Interface	dynamic	Timeout	1800	
	VLAN ID	11	WEP State	WEP Disable	

10. Click the MAC address of the client (iPad/iPhone) to view its details. As shown below, ensure that the iPad/iPhone is associated to an interface other than the services interface. In this case, it is VLAN 10.

Monitor	Clients > Detail				< Back Link Test
Summary	General AVC St	atistics			
Access Points Cisco CleanAir Statistics	Client Properties		AP Properties		10.000
CDP	MAC Address	7c:d1:c3:80:2b:c0	AP Address	64:d9:89:42:22:d0	
Roques	IPv4 Address	10.10.10.162	AP Name	AP36021-303f	
Clients	IPv6 Address	fe80::7ed1:c3ff:fe80:2bc0,	AP Type	802.11bn	
Multicast			WLAN Profile	POD1-Client	
Applications			Status	Associated	
			Association ID	2	
			802.11 Authentication	Open System	
			Reason Code	1	
			Status Code	0	
			CF Pollable	Not Implemented	
			CF Poll Request	Not Implemented	
	Client Type	Regular	Short Preamble	Implemented	
	User Name		PBCC	Not Implemented	
	Port Number	1	Channel Agility	Not Implemented	
	Interface	management	Timeout	1800	
	VLAN ID	10	WEP State	WEP Disable	

mDNS Profile Configuration Through the User Interface

- 1. To create and apply the Bonjour services, go to CONTROLLER > mDNS > General.
- **2.** Under Global Configuration, check the mDNS Global Snooping checkbox to enable snooping; it is disabled by default. The Master Services Database shows the default profiles, which are preconfigured.

cisco	MONITOR WLA		WIRELESS	SECURITY	MANAGEMENT	COMMANDS	HEL
Controller	mDNS						
General Inventory	Global Configur	ation			_		
Interfaces Interface Groups	mDNS Global Sn	ooping					
Multicast	Query Interval (10-120)			15 (mins)		
Internal DHCP Server Mobility Management	Master Service:	s Database					
Ports	Select Service	[None		~		
▶ NTP	Query Status						
EDP		hdd					
* mDNS		Sei	rvice				
General	Service Name	Str	ing		Query States	and a	
Profiles Domain Names	AirPrint	_ipi	ptcp.local.			. 🖸	
Advanced	AppleTV	_air	rplaytcp.local.				
HUTUILEU	Printer	_pr	intertcp.local.				

The Master Service Database is a user-configured database for all Bonjour services supported by the WLC. As shown above, a default list of services, like Apple TV and Printer, are added to this list on start-up. The WLC snoops and learns about mDNS service advertisements only if the service is present in the master-service-list database. Similarly, only those queries for services listed in the master-service-list are responded back to clients, as long as the Bonjour profile name associated with the client allows for the service query. A maximum of 64 services can be included in the master-service-list database, so the controller has the potential to snoop and learn about 64 different services.

Select Service	None	1
Ouery Status	None	
	Apple File Sharing Protocol(AFP)	
Ardd	Scanner	
22.02.00	FTP	
	Tunes Music Sharing	
Service Name	stiTunes Wireless Device Syncing	ery
AirPrint	Apple CD/DVD Sharing	
AppleTV	Time Capsule Backup	
Printer	invinter trachurat	

3. To add Bonjour services, select the desired option from the Select Service drop-down list. In this example, select Scanner.

cisco	MONITOR Y	YLANS		WIRELESS	SECURITY	MANAGEMENT	COMMANDS	нецр	EEEDBACK	Sage Configuration	Eng	Logout Befresh
Controller	mDNS											Apply
General Inventory Interfaces Interface Groups Multicast Network Routes	Global Confi mONS Globe Query Interv	guratio al Snoopi rel (10-1	n ing 20)			15 (mina)						
Internal DHCP Server	Master Serv	ices Da	itabase									
Mobility Management Ports NTP CDP IPv6	Select Servi Query Statu Service Nam	ce s		lone Intrunes Iople File Shari Iople File Shari Iople Shari Turnes Music Sh Turnes Home Sh	ng Protocol(A/I aring aring	P) Query Statu						
mDNS	AirPrint			Tunes Wireless Ipple Remote D	Device Syncin lesktop	0 N						
General Profiles Domain Names	AppleTy Printer		i.	time Capsule B ther	ackup	N N						
Advanced												

4. Click the Add button, then click Apply. Each service name has a predefined service string.

cisco	MONITOR WLANS CONT	ROLLER WIRELESS SECU	RITY MANAGEMENT CS	MMANDS HEL	P EEEDBACK	safe combration. End. rodoor. Bereau
Controller	mDNS					Apply
Inventory	Global Configuration					
Interface Groups	mDNS Global Snooping		×.			
Multicast Network Routes	Query Interval (10-120)		15 (mins)			
Internal DHCP Server	Master Services Database	e				
Mobility Management	Select Service	Scanner				
NTP CDP	Query Status					
IPv6	Service Name	Service String	Query Status			
mDNS	AirPrint	_ipptcp.local.				
General	AppleTV	_airplaytcp.local.	1 A			
Domain Names	Printer	_printertcp.local.	X			
Advanced						

- 5. To select the services to be advertised, click **mDNS > Profiles.** The default profile appears.
- 6. Navigate to Controller > mDNS > Profiles, and select the default-mdns-profile.

cisco	MONITOR	<u>W</u> LANs	CONTROLLER	WIRELESS	SECURITY	MANAGEMENT	C <u>O</u> MMANDS
Controller	mDNS P	rofiles					
General Inventory	Number of	Profiles 2					
Interfaces	Profile Na	ame			N	o. Of Services	
Interface Groups	default-bor	niour-profile	1		3		-
Multicast	default-md	ins-profile			3		2
Network Routes							
Internal DHCP Server							
Mobility Management							
Ports							
▶ NTP							
> CDP							
PV6							
mDNS General Profiles							



If the requirement is to use only default services, assign the default?mdns?profile to that particular WLAN.

	MONITOR	WLANS		WIRELESS	SECURITY	MANAGEMENT	C <u>O</u> MMANDS	HELP
Controller	mDNS Pr	ofile > E	dit					
General Inventory Interfaces Interface Groups Multicast Internal DHCP Server Mobility Management Ports	Profile Na Profile Id Service C No. of Int No. of Int No. of WI Services I	ime Count Xerfaces Att Xerface Gro ans Attache List	ached ups Attached ed			def 1 3 0 0 2	ault-mdns-profile	•
CDP IPv6 mDNS General Profiles Domain Names Advanced	Service M Service Name AirPrint AppleTV Printer	lame		AirPrint 🔽			0	

To check which Bonjour services are running, click mDNS > Domain Names.

In the example below, Apple TV is being discovered as the wireless medium.

Controller	mDNS Domain Name	IP > Summary			
General Inventory	Number of Domain Name	e-IP Entries 1			
Interfaces	Domain Name	MAC Address	IP Address	Vian Id	Туре
Interface Groups Multicast	Apple-TV-2.local.	10:40:f3:e5:d1:b5	10.10.11.132	11	Wireless
▶ Internal DHCP Server					
▶ Mobility Management					
Ports					
▶ NTP					
▶ CDP					
▶ IPv6					
 mDNS General Profiles Domain Names 					
Advanced					

7. When the Bonjour service appears under Domain Name, navigate to mDNS > General > AppleTV to check which mDNS profile the service is using. Since this example uses the default profile, the services appear under default-mdns-profile.

cisco		LLER WIRELESS SECU	UTY MANAGEMENT (OMMANDS HELP EEEDBA	Saye Configuration	Bing Logout Befresh
Controller General Inventory Interface Groups Multicast Network Routes Hernal DHCP Server Hobility Management Ports NTP > NTP > DDP POTP6	mDNS Service > Detail Service Name Service String Service Id Service Query Status Profile Court Service Provider Court Profile Information Profile Information Service Provider Informatio	n	AosletV sirplay_top 3 Enabled 1 1	Jocal		chad
IPv6 mDNS General Profiles Domain Names	MAC Address 9c:20:7b:7a:de:85	Service Provider Nam Apple TV1airplaytcp.	e Vlan Id ocal. 11	Type Wireless	TTL (seconds) 4500	Time Left (seconds) 4494

8. Once the profile is attached to the WLAN, check to see if the Bonjour services are routed across the VLANs.

- 9. Make sure your Apple iPhone/iPad Client is connected to the client SSID.
- **10.** Using the TV remote for the monitor, select AirPlay from the Settings menu, and ensure AirPlay is enabled. You can set an optional passcode for security.
- 11. On your Apple iOS device, double-click the home button to reveal the multi-tasking view.



12. Swipe left to right (twice for an iPhone, once for an iPad) to reveal a menu with the AirPlay icon, as shown below.



13. Select the Apple TV from the list, and enable mirroring.

AirPlay	AirPlay 🔤
🖵 iPad	D iPhone
Apple TV 🗸	AirPort
Mirroring ON	C Apple TV
Ith AirPlay Mirroring you can send everything on your iPad's display to an Apple TV, wirelessly.	Mirroring ON
	With AirPlay Mimoring you can send everything on your iPhone's display to an Apple TV, winelessly.

14. The status bar at the top of the Apple device turns blue and displays an icon for AirPlay to signify that you are broadcasting your screen on the Apple TV.



mDNS Services with Wired Bonjour Devices

In most scenarios, some Bonjour devices may be directly connected to the switch or device. Bonjour services can be accessed even when the Bonjour device is connected via an Ethernet cable on a network.



The VLAN of wired Bonjour devices must be trunked to the controller so that their advertisements can be seen and sent out to wireless clients. In this example, the Bonjour device (Apple TV) is on VLAN 11 tied to the dynamic interface on the controller.

1. On the WLC user interface, navigate to **Controller > mDNS > Domain Names**. Apple TV is now discovered as the wired medium in the dynamic VLAN, as shown below.

Controller	mDNS Domain Name	IP > Summary			
General Inventory	Number of Domain Name	e-IP Entries 1			
Interfaces	Domain Name	MAC Address	IP Address	Vlan Id	Туре
Interface Groups Multicast	Apple-TV-2.local.	10:40:f3:e5:d1:b5	10.10.11.132	11	Wired
Internal DHCP Server					
Mobility Management					
Ports					
▶ NTP					
+ CDP					
> IPv6					
 mDNS General Profiles Domain Names 					
Advanced					

2. Use your Apple Client (iPhone/iPad) to check that the Apple services are still being broadcasted.

