



Meru Bonjour Support

An Architecture Overview

Wireless Networks Designed for Today **and** Tomorrow

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Table of Contents

Executive summary	1
A Bonjour overview	1
Bonjour in the enterprise	2
Meru Bonjour topology	2
Enterprise Bonjour requirements	2
Base Bonjour services	3
Meru extended Bonjour features	3
Meru policy features	3
Meru Bonjour management portal	4
Summary	4

Executive summary

Meru Networks supports the Apple® Bonjour®¹ zero-configuration service to deliver users of Apple devices a seamless experience when accessing key services such as AirPlay® and AirPrint™ in an enterprise network. The Meru Bonjour capability is integrated into Meru’s Mobile**FLEX** architecture and is one of a number of service “discovery” functions that are important in today’s business wireless LANs. Bonjour service support also can be extended to Microsoft® Windows® client platforms via several third-party applications.²



To provide organizations with maximum control, Meru’s Bonjour service supports the concept of “policies” to govern who may advertise and who may discover and use these services across the entire network. Additionally, Meru provides dashboard management, so administrators can easily monitor what services are being accessed, the location on the network, and the partitioning between wired and wireless clients.

Meru’s extremely rich Bonjour gateway service is integrated into Meru System Director v6.0. This whitepaper describes how Meru Networks implements the Bonjour service within our wireless solution portfolio and how we expand the access management capabilities beyond the base Bonjour functionality to give users the mobile experience they expect while maximizing control for IT managers.

A Bonjour overview

Bonjour is Apple’s marketing name for a zero-configuration networking mechanism that allows a user to discover application services that are available on a local network. Bonjour, however, was designed for home networks. When Bonjour is deployed in an enterprise network, it potentially can flood the network with advertising and discovery traffic.

As currently implemented, Apple Bonjour doesn’t support operations across networks with multiple subnets, and enterprise and university campus networks typically have multiple subnets. Without a gateway solution, users who want to access Bonjour services are restricted to a single subnet.

The demand for Bonjour capabilities is growing rapidly. Apple products represent about half of all devices on today’s university campuses, and Apple® iPads and iPhones are making significant inroads in corporations. The Educause Higher Ed Wireless Networking Admin Group³ petitioned Apple to provide enterprise support for Bonjour, and the petition garnered 750+ signatures in a matter of weeks.⁴ The group cited the growing use of Apple TV®, which uses AirPlay for presentations, as well as network printing services, which use AirPrint. In addition to these two popular services, Bonjour supports a host of other service classes that can be supported in a similar manner.

The market focus on Bonjour highlights an important pain point when Apple devices are used in networks outside the home. However, the pain is not limited to Apple devices. Windows, Android, Linux, and other devices beg for a common solution in terms of how they discover printers, displays, and other network-based services.

Because of the importance of Bonjour’s capabilities, Meru has enhanced the Service Control component of the Mobile**FLEX** architecture within our wireless network products to provide a seamless Bonjour experience for both wired and wireless devices connected to large business and education networks.

¹ AirPrint, AirPlay and Bonjour Logo are trademarks or registered trademarks of Apple® Inc., in the U.S. and other countries.

² Windows AirPrint is supported by <http://support.apple.com/kb/DL999> or <http://www.colobos.com/index.php> and AirPlay supported by <http://airparrot.com/>

³ <http://www.change.org/petitions/from-educause-higher-ed-wireless-networking-admin-group>

⁴ <http://www.networkworld.com/news/2012/110812-apple-university-264091.html?hpg1=bn> and <http://www.change.org/petitions/from-educause-higher-ed-wireless-networking-admin-group>

Bonjour in the enterprise

Meru Bonjour topology

Within the scope of the Bonjour architecture, there are two major network components: **(1)** service provider nodes (advertisers) and **(2)** service subscriber nodes (users). The design is zero-config. Bonjour uses an advertise-discovery metaphor protocol, and no static configuration operation is necessary for either component. Network nodes that provide a “service” (i.e., printing or display management) broadcast (actually multicast) advertising packets, and nodes that wish to use the “service” will listen for these frames and register to use the service. Because nodes come and go asynchronously on a network, a “subscriber” node periodically broadcasts a discovery packet and the service-matching nodes respond accordingly. Bonjour has worked well for Apple home users since its introduction in 2002.

The problem arises when translating the Bonjour capabilities from a home network to a larger enterprise network: the Bonjour design does not provide for support across subnet boundaries. To deliver Apple users the identical Bonjour experience they have at home as when they are at the office or in school, additional network-level gateway functions must be implemented (see Figure 1).

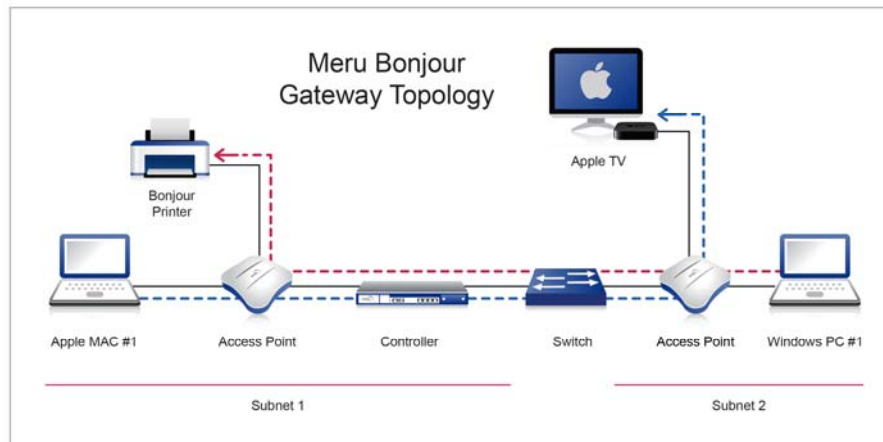


Figure 1 - Meru Bonjour Gateway Topology

Enterprise Bonjour requirements

Enterprise networks are typically large enough to be split into multiple subnets, each of which has a different IP mask, although they are still required to support a consistent network-wide Bonjour service. Additionally, corporate networks may have different classes of “services” installed, and IT may wish to limit access by service (print, display, file sharing, etc.), location (geography), class of user (guest, associate, contractor, etc.), or time of day. The Bonjour architecture does not offer these extended features, although they are very important to enterprises.

To better address enterprise requirements, Meru’s Bonjour implementation addresses the basics of Bonjour, plus the enterprise extensions that are required for successful use in business, including a management portal for monitoring Bonjour activity usage and state across the network.

Meru provides management capabilities to define:

1. What services are advertised across the network
2. Who can advertise services across the network
3. Who can subscribe to what services, when (time), and where (location)

To implement this filtering capability, Meru’s solution involves the ability to define and enforce policies, which are applied to provide access gateway capabilities.

Base Bonjour services

Meru’s implementation of Bonjour involves the participation of Access Points and Controllers in concert to dynamically manage the network-wide knowledge and mapping of service advertisers. No changes need to be made to Bonjour client devices. The implementation has been optimized to eliminate or mitigate the risk of network flooding from using the Bonjour native Multicast DNS (mDNS) frames. Meru’s wireless controller-centric design supports Bonjour services for both wireless and wired devices—anywhere across the network.

Meru extended Bonjour features

Meru policy features

In a large network, who has access to what service can be critical. The concepts of “user groups,” “advertisers,” and “locations” are combined to create access policies to allow a network manager to segregate classes of user types and services to locations within an enterprise campus. For example, students might have access only to Apple printers in Room2 and Room5. Teachers, on the other hand, might have unrestricted access to Apple TV, regardless of location. The Meru Bonjour manager can create policies that enforce such conditions across the network.

The granularity in defining policies is derived from combining user groups, advertiser groups, service types, and locations (both user and provider). A policy can consist of:

Table 1 - Meru Bonjour Policy Structure

Policy Name	User Group(s)	User Group Location(s) (optional)	Service Type(s)	Service Advertiser(s) Group	Advertiser Location(s) (optional)
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1. **Policy Name** – Defined by the Bonjour manager and applied to specific set of subscribers and advertisers
2. **User Group(s)** – One or more user groups identified by SSID or VLAN tag
3. **User Location(s)** – One or more network locations identified by associated access points
4. **Service Types(s)** – One or more service type (e.g., AirPlay, AirPrint) enabled and associated with a service provider⁵
5. **Advertiser Group(s)** – One or more service advertisers identified by SSID or VLAN tag
6. **Advertiser Location(s)** – One or more advertiser locations identified by associated access points.

With Meru, policies can be as simple as “discover only AirPrint and AirPlay services and allow all users access to these services at any location.” Or, they can be complex in specifying inclusion or exclusion of users, locations, or advertisers.

Meru’s Service Control module provides an easy-to-use interface that allows a network administrator to define sophisticated Service Control-policies. The administrator defines these policies by service type, location, and user group, rather than by cumbersome ESS profiles, access points and VLANs. The flexibility provided by building combinations of policies is virtually without limits.

⁵ Meru Service Connect is designed to accommodate support for other network services, which are listed at: <http://www.iana.org/assignments/service-names-port-numbers/service-names-port-numbers.xml>

Meru Bonjour management portal

Unique to the Meru Bonjour implementation is a dashboard for monitoring summary information about current usage and status of Bonjour users on the network.

Figure 2 shows the main dashboard, which is accessible by browser from the Meru controller. In a quick glance, the administrator can view the current use of Bonjour services (Applications), the location of the activity (Location), the activity across SSIDs, and users partitioned between wired and wireless network segments. Selecting a summary icon displays details associated with that metric.

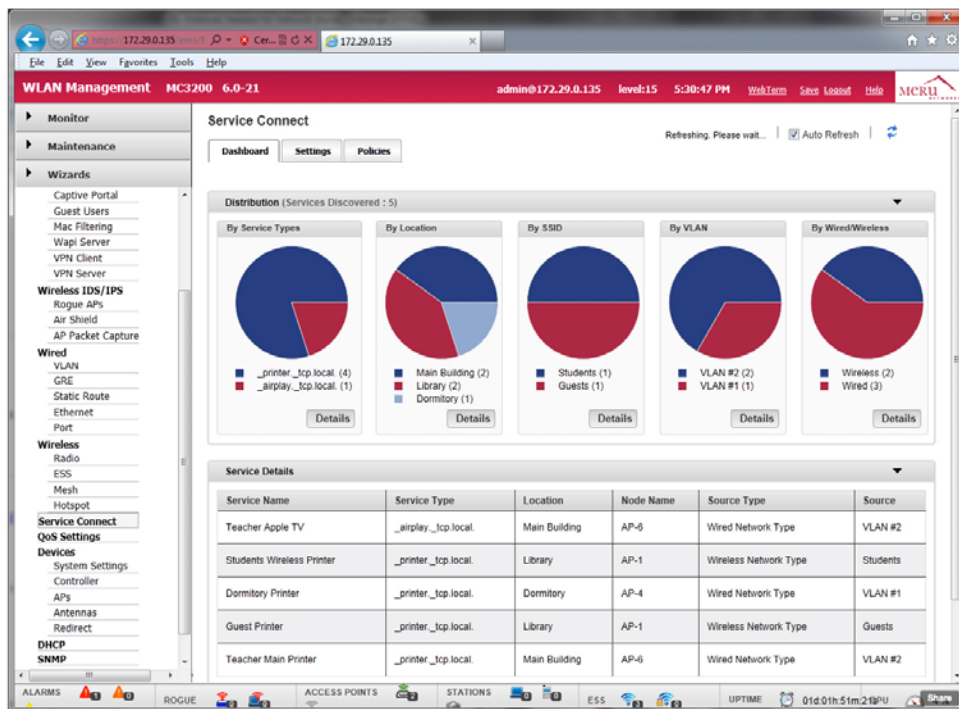


Figure 2 - Meru Bonjour Management Dashboard

Summary

Meru's MobileFLEX architecture is designed to be agile to support the diverse services that are required on today's wireless networks. Meru makes it possible for Apple users to dynamically access Bonjour services in a business network by building Bonjour support into Meru's Service Control element of MobileFLEX and providing that as a base feature in Meru System Director v6.0. Beyond the core function of clients being able to discover Bonjour services, Meru has significantly simplified policy creation and enforcement, monitoring, and management of Bonjour services. Meru makes a difference and brings choice plus control to network administrators.



Powering the Wireless Enterprise

For more information about Meru and Bonjour support, visit www.merunetworks.com.

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