Bonjour Deployment

A Guide For Squirrels Products

This document is intented to help you ensure that your network environment is compatible with AirPlay technologies.

In addition to allowing the software to communicate through any security barriers in place, such as firewalls, the network must also be capable of using the correct communication protocols required for automatic discovery of your mirroring device. Included in this document is an overview of all networking requirements needed for proper use of Bonjour services such as AirPlay.

Local traffic only

AirPlay applications use a direct connection method through the local network. Reflector takes a direct connection from iOS devices, Chromebooks, Android devices, AirPlay-enabled Mac computers and AirParrot-equipped computers.

Your device must be on the same VLAN or subnet within the network to connect. Apple's AirPlay cannot cross subnets/VLANs natively. This is an AirPlay limitation. If you require the connecting devices to be on different subnets, then you may wish to have the IT department look into a Bonjour Gateway for the network. Some network hardware has this functionality built in, while others may require a third-party solution.

The Bonjour Gateway allows AirPlay to cross subnets/VLANs so your devices can communicate. This, however, will broadcast all AirPlay devices on the network, so the users may wish to change the device broadcast name and add an AirPlay password as well.

Aerohive is one such developer for a Bonjour Gateway. We have many large users who have added this to their network and are able to mirror across subnets/VLANs.

Multicast availability

The local network must be allowed to run Bonjour and mDNS, and multicast must be enabled. The Bonjour protocol consists of service announcements and service queries that allow devices to ask for and advertise specific applications, such as file or printer sharing and AirPlay. For our purposes, we are primarily concerned with AirPlay availability.

Each query or advertisement is sent to the Bonjour multicast address for delivery to all clients on the subnet. Apple's Bonjour protocol relies on multicast DNS (mDNS) operating at UDP port 5353 and sends to these reserved group addresses:

       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 thus are only forwarded locally. **Routers cannot use multicast routing to redirect traffic because the time to live (TTL) is set to one, and link-local multicast is meant to stay local by design.**

Required ports

AirPlay ports must be available on the subnet or VLAN being used to connect your devices as well. Here is the port list that AirPlay and Google Cast use with our applications:

224.0.0.251 > tcp > port 5353	MDNS - Apple
224.0.0.251 > udp> port - 5353	These ports are used for AirPlay detection on the network
udp > port 1990	Google Cast detection
tcp > port - 5000	Seen with music
tcp > port - 7001	Seen with video
tcp > port - 7000	Seen with picture/file
tcp > port - 7100	Seen with display-mirroring
udp > port - 7010	Seen with display-mirroring
udp > port - 7011	Seen with display-mirroring
tcp > port - 47000	Audio connection negotiation
tcp > port - 49152-65535	Dynamic ports, audio connection
udp > port - 49152-65535	Dynamic ports, audio connection
tcp > port 8008	Google Cast
tcp > port 8009	Google Cast

Squirrels' Reflector software will also access TCP 80 for any directly connected videos (such as YouTube). Everything else will be local traffic with no need to access the internet.

Multicast groups

Some networks may use a multicast group to manage multicast traffic. When multicast is enabled, all multicast traffic will flow to all connected clients in a subnet. By using a multicast group to limit the amount of clients receiving the multicast data, you can reduce the overall workload being placed on the network.

Using groups is typically not required, but it can be helpful in the event that there are many AirPlay devices on the network. When creating multicast groups, there are three important factors to consider:

1.   Multicast groups must include the subnets or VLANs where AirPlay devices (and clients that may mirror to those devices) are connected.
2.   All AirPlay devices and clients must be members of the multicast group.
3.   If using multicast groups, then IGMP Snooping must be enabled on your network in order to allow your devices to listen to the multicast group. This allows your devices to see the multicast group traffic without affecting the rest of your network.

Using all of the information contained in this guide, you should be able to ensure that any network is compatible with AirPlay and Bonjour services. For answers to specific questions or more advanced configuration details, visit help.airsquirrels.com or contact your network hardware manufacturer.