Feature information for Analysts
Apple AirPrint

AirPrint is Apples driverless printing technology introduced with iOS version 4.2 in November of 2010. It enables Apple's iOS devices including iPhones, iPads, iPod Touches, and even Mac OS X to print with no need to install drivers or download software. AirPrint uses well-established familiar technologies already in use today like Bonjour, IPP, PDF and JPEG. Xerox is now implementing AirPrint in the latest WorkCentre line of devices, so it's worth taking a few minutes to examine how AirPrint works and ensure customers can use this powerful new print option from their iOS based mobile and desktop Mac systems. AirPrint is a relatively new technology, and will likely continue to be evolving over the next few years to add new features and functionality, but the basic operation of AirPrint will remain constant, and requires a few steps to ensure AirPrint works as easily and universally as it was designed to do. To make sure a customer's infrastructure is ready for AirPrint, we first need to take a look at the basic operation of AirPrint.

Supported environments

- ConnectKey multifunction devices

AirPrint Process

Step 1: Device Discovery - Bonjour

AirPrint uses Apple's already well-established Bonjour group of technologies. Back in 2002, as Apple was transitioning from it's older Mac OS 9 to the BSD Unix based OS X, they realized that AppleTalk was getting dated and did not scale or play well with the now dominant TCP/IP based networking standard. The problem was no existing technology offered the same level of ease of use and device discovery that AppleTalk provided. The solution was to work with the IETF to help develop and then release ZeroConf networking, which creates usable IP networks without manual configuration or special servers. Apples implementation was initially named "Rendezvous", but was later changed to Bonjour due to licensing issues. Bonjour attempts and succeeds in bringing AppleTalk's easy device and service discovery, address assignment, and user friendly host name resolution over the TCP/IP based suite of protocols, using already existing standards like Automatic IP address acquisition (AutoIP), and multicast Domain Name Services (mDNS), and DNS-SD (DNS service discovery).

AirPrint utilizes some extensions to the existing Bonjour specification, to allow for iOS and OS X (starting in 10.7 and 10.8) devices to search specifically for AirPrint capable printers and multifunction devices. The important thing to note here is that Bonjour is multicast DNS based, and as such is sometimes blocked (along with broadcast traffic) from being passed across subnets. What this means is you will not be able to discover the printer on your iPad or iPhone unless both devices are connected to the same subnet.

Note: that there is no requirement for wireless capability in the printer, the only requirement is that mDNS traffic be visible and passed to the networks and network segments that both the iOS and printer devices reside on. For more information on this, see the reference information at the end of this document for a detailed explanation of Bonjour and mDNS.

Step 2: Device Information and Status

The next step is for the iOS or OS X device to get all the relevant information about the printer. To do this, as well as to move the eventual job data (in step 3), AirPrint uses the IPP protocol, specifically IPP 2.0 to manage print jobs and queues. IPP uses the HTTP protocol, and can take advantage of all of HTTPs security functions (SSL/TLS, etc.) All AirPrint devices must conform to the IPP 2.0 specification. Features such as duplex capability, the various PDLS a device can support, media handling capabilities, plus many others are all passed using IPP and HTTP. Note that the IPP 2.0 specification is extensive, yet the available options within AirPrint are currently fairly limited. Only a few functions are supported, like duplex, number of copies, and media types are shown in the AirPrint dialog currently. As Apple continues to evolve AirPrint the expectation is that more and more capability will be supported in time.

Step 3: Job Data

AirPrint supports three primary types of PDL, which are PDF, JPEG, and Universal Raster (URF). URF is similar to CUPS (Common Unix Printing System) raster format. Of the three, only URF is required by all AirPrint devices to support. It is the fallback job language that AirPrint can always be assured is present. If a device supports the PDF language natively however, it will be used primarily as the PDL of choice for job data from AirPrint. There are a few exceptions, but primarily PDF is the preferred type if available for quality and efficiency reasons. JPEG is also an optional format, and will be used in some circumstances from some applications if available. The Xerox Workcentre devices that support AirPrint support all three types of data for AirPrint.

Enabling AirPrint

AirPrint requires certification from Apple, which has not completed yet. As such the AirPrint feature is currently hidden in the ConnectKey devices. To enable the feature, perform the following steps:

1. Open a web browser and go to the following "hidden" URL: http://<IP>/diagnostics/airPrintUnhide.php
2. Check the box named "Unlocked / Visible".
3. Click "Apply".

Note: If you are prompted to login, provide "admin" as the User ID and "1111" as the Password, or the appropriate username/password if something other than the default has been set.

4. Next, enable AirPrint Go to the device properties URL: http://<IP>/properties/index.php
5. Under Properties on the left frame, select Connectivity - > Setup. This will bring up the Connectivity page in the right frame.
6. In Connectivity -> Protocol, click on the "Edit" button on the AirPrint row.
7. On the AirPrint page, under protocol settings, check the box named "Enabled"
8. Click "Save".

AirPrint should now be enabled and functional on the device.

AirPrint FAQs

What is AirPrint?

AirPrint is Apples driverless printing technology introduced with iOS version 4.2 in November of 2010. It enables Apple's iOS devices including iPhones, iPads, iPod Touches, and even Mac OS X to print with no need to install drivers or download software. AirPrint uses well-established familiar technologies already in use today like Bonjour, IPP, PDF and JPEG.

I can't find my printer, why not?

AirPrint requires that devices are discoverable via the Bonjour protocols. Bonjour is mDNS based, and in some networks mDNS traffic is not allowed to be passed across subnets. In these cases, a device will only be discoverable if the iOS device and the AirPrint capable Printer or Multifunction device are on the same subnet. Currently Apple does not allow for any manual entry of IP addresses in the iOS device side to work around this issue. If your device is not being discovered, check with your IT administrator to ensure that mDNS traffic is not being filtered.

Does AirPrint require both devices to be wireless capable?

No, wireless is not required on both devices. All iOS devices will be using wireless, however, there is no requirement for a printer or MFD to be wirelessly enabled. What does need to happen however is the wired and wireless segments of the network need to be bridged, and as noted before, mDNS traffic needs to be routed between them.

I only see a few printer features in the AirPrint dialog, why?

The IPP 2.0 specification provides a large list of supported attributes and functions, but currently Apple is only providing a limited subset of features from within iOS. As the AirPrint feature grows and evolves, you can expect to see additional device settings and capability within the print dialogs, but for the time being only a small number are available.

I'm looking for AirPrint jobs in my accounting records, but I don't see any, why not?

All AirPrint jobs are passed across the IPP protocol, and do not contain any specific information identifying them as "AirPrint" jobs. The job accounting and tracking tools will all see IPP job information. Enhancing the capability to track AirPrint jobs and traffic is on the "to do" list, but is not available in the initial implementation of

Reference information

What are AutoIP and mDNS, and why should I care? All devices on a TCP/IP network must have a unique address, much like a house on a city street needs a unique address so that mail and individuals can find it. AutoIP provides a mechanism to allow multiple devices on the same network to acquire addresses within a specified reachable range (network or subnet) and ensure that no two devices have the same address on that network (conflict resolution.) In many networks there exists infrastructure and services to provide this function (namely DHCP), but for smaller networks and homes, DHCP servers usually are not present. No need to worry however if you don't have a DHCP server, since Bonjour and AutoIP takes care if this for you. This brings up the concept of networks and subnets specifically. A subnet is a "group" of devices that all belong to the same range of addresses, and in networking terms are thought of as "local". Using our address and postal service analogy, you can think of subnets as different towns or cities. Devices that exist in the same network range are considered local to each other and usually are easily found and able to communicate with each other.

mDNS is the second piece we need to care about, and provides a vital and core role to AirPrint and its operation. Going back to our house on a street reference, typical TCP/IP traffic uses something called unicasting, which can be likened to the postal service. A letter is addressed to a specific house, and the letter is delivered JUST to that address. In contrast, broadcast traffic would be like the local free advertising newspaper that gets delivered to EVERYONE on the street (whether you want it or not), no address required. Multicast DNS fits somewhere in between, and the easiest way to compare it would be to think of it as a radio station. A mDNS packet on a network is sent to all addresses just like broadcast (like radio waves are everywhere), but in this case devices CHOOSE which groups they want to belong to (like a radio receiver is tuned to a specific frequency and ignores all others.) Bringing it back to AirPrint, AirPrint capable devices are preprogrammed to listen to the specific mDNS group that all Bonjour devices must receive, and ignore all the other multicast traffic (unless of course they are programmed to listen for other groups as well.) So when an iPhone sends out a request to the network looking for AirPrint capable printers, it sends the request to that group. Only AirPrint devices are listening for that, and respond.

So that's the "m" or multicast part of mDNS, but what does the DNS part do? Well, as most of us are aware, IP addresses are not very user friendly. Something like 135.202.176.251 just doesn't have a memorable ring to it. DNS or "Domain Name System" tried to take care of this, by invisibly mapping those unfriendly addresses into more memorable and user friendly names. Compare the example address 135.202.176.251 to the name "Johns Printer". If I was looking to find a device on my network to print to, I'm pretty sure I know which option I'd prefer. AirPrint is the same, when an iOS or OS X device looks for an AirPrint printer, the printers return a "friendly name" which is part of the AirPrint configuration. On larger networks, this naming function is handled by a centralized "root" server or servers, which own the name to address mappings for everything on those networks. Requests are unicast to the server, which responds with the address of the device. However, on smaller networks, such centralized root DNS servers don't usually exist, so how do you find names to show rather than IP addresses? To use another analogy, say you walked into the lobby of a small office, and wanted to find a particular individual. You would likely have two options, one, walk to the reception desk and ask the receptionist if the person you were looking for is present. The second option would be to simply walk into the office and shout that person's name out. The first method requires that there be a receptionist, and that the receptionist knows the name and location of the person you are looking for. This is like the unicast DNS model. The second option requires none of this, no receptionist (or DNS server) needs be present. The drawback here is that depending on the size of the office (network), this could get very disruptive. mDNS is more like this second option. In general however this isn't a problem, since Bonjour and mDNS based services are mostly aimed at smaller networks. Why bring this up? Here is why...

To tie this all together, for AirPrint to work, the iOS device must be able to find all the AirPrint capable printers or MFDs available on the network. In smaller networks, this works out great. However, on larger networks, it would get very disruptive to have a whole bunch of devices "shouting" all the time looking for services. To prevent this, many larger corporate IT admins will block multicast traffic from passing across subnets. Going back to the office analogy, this would be like closing the doors to all the offices so that only the room you are standing in hears you shout. On a network, this means only the local subnet you belong to will see the AirPrint discovery request, so if your printer is on a different subnet it will NOT appear in your iPad or iPhone. Given many Xerox devices get placed into larger accounts with complicated networks, this is a very real potential scenario to be aware of. Currently Apple does not provide any workaround for this, if the device is not discovered via the Bonjour discovery process, there is no manual name or address entry available (yet). So the important step here is to ensure the iOS device, and the printer exist on the same subnet, -OR- that the network administrator is allowing mDNS traffic to pass across subnets. This is configuration issue that would need to be handled by the IT admin at the local router(s), and is not something a local end user would be likely able to do.

One additional complication is that iOS devices will be connected to wireless networks, and the printers will likely be connected to a wired segment of the network. This isn't inherently a problem since many networks in SMB and enterprises now have wireless available, and AirPrint does NOT require wireless on both devices in any way. Traditionally these wired/wireless networks are bridged, which means at an access point that hosts the wireless net, or a router

somewhere on the wired side, the traffic gets converted to the appropriate type depending on it's destination. Wireless radio traffic is converted to wired signals, and vice versa. That's all good, but the potential problem arises again in that many wired and wireless sections of a network are deliberately configured to have different network IP configurations, which as we just discussed, often will not be passing broadcast and multicast traffic across subnets. In these cases AirPrint devices will not be discoverable. Again, the solution here is to talk to the network administrator to allw mDNS traffic to pass across the network segments and subnets