# Enabling Apple® AirPrint® with Your Xerox® AltaLink® Multifunction Printer

White Paper

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# Background

Apple® AirPrint® is a printing technology introduced with iOS version 4.2 in November 2010. It enables Apple Mac OS® devices to print, fax and scan, and Apple iOS devices (iPhone®, iPad®, iPod touch®) to print without installing additional drivers or software. AirPrint uses well-established, familiar technologies already in use today including Apple Bonjour®, IPP, PDF and JPEG.

Xerox is now certified and implementing AirPrint in the latest Xerox® AltaLink® devices. However, when these devices first launched, they were not all AirPrint-enabled. This document will instruct you on the basics of how AirPrint works and how to enable it on your AltaLink device.

AirPrint is designed to offer users the speed and convenience of direct print capability from their iOS-based wireless devices without cloud services or proxy devices in the print path. AirPrint will likely continue to evolve over the next few years as new features and functionality are added. Still, the basic operation of AirPrint will remain constant and will require knowing a few steps to ensure that it works easily across a variety of wireless devices as it was designed to do. AirPrint works best in flat Wi-Fi® networks, which are typically found in homes and small offices.

# AirPrint® Basics

To ensure that your infrastructure is ready for AirPrint, let's first take a look at the basic operation of the system.

### STEP 1: DEVICE DISCOVERY—APPLE® BONJOUR®

Apple is famous for making technology simple, easy to use and easy to configure for all users without the need for a great deal of technical knowledge. AirPrint continues this tradition by implementing Apple's already well-established Bonjour group of technologies.

In 2002, as Apple was transitioning from its older Mac OS® 9 to the BSD Unix®-based OS X®, the company realized that AppleTalk® was becoming dated and did not scale or play well with the now-dominant TCP/IP-based networking standard. The problem was that 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 created usable IP networks without manual configuration or special servers. Apple's implementation was initially named "Rendezvous," but was later changed to Bonjour due to licensing issues. Bonjour attempted—and succeeded—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 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 users will not be able to discover the printer on an 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

Assuming that Step 1 has occurred correctly, the next step is for the iOS or OS X device to get all the relevant information about the printer. To do this and 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 HTTP's security functions (TLS, etc.). All AirPrint devices must conform to the IPP 2.0 specification. Features such as duplex capability, the various Page Description Languages (PDLs) that 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 limited. Only a few functions are supported including duplex, the number of copies and media types are currently shown in the AirPrint dialog box. As AirPrint continues to evolve, the expectation is that more and more capabilities will be supported in time.

### STEP 3: JOB DATA

AirPrint supports three primary types of PDL including PDF, JPEG and Universal Raster (URF). URF is similar to Common Unix Printing System (CUPS) raster format. Of the three, only URF is required to be supported by all AirPrint devices. 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 PDF is primarily 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® devices that support AirPrint support all three types of data for AirPrint.

# Enabling AirPrint on Xerox® AltaLink Devices

Some AltaLink devices were AirPrint 1.6 certified by Apple after they were launched and sold. As such, the AirPrint feature currently requires a Feature Installation Key (FIK) to enable it on some AltaLink devices.

1. AltaLink Software that is at the following SW versions:
   - Xerox® AltaLink B8000 Series: 100.xxx.037.03831
   - Xerox® AltaLink C8000 Series: 100.xxx.037.03830

First needs to be upgraded to the following releases:
   - Xerox® AltaLink B8000 Series: 100.xxx.057.09602
   - Xerox® AltaLink C8000 Series: 100.xxx.057.09600

2. Next install the AirPrint Universal FIK:
   FIKs can be installed by the System Administrator from the local control panel or from the Embedded Web Server.

   Feature Installation Key: 201600871880

   - Installing a Software Feature at the Control Panel
     – At the control panel touchscreen, touch **Device**, then touch **Tools**.
     – Touch **Device Settings > General > Feature Installation**.
     – Touch **Enter Feature Installation Key**, then type the key.
     – Touch **OK**.
   - Installing a Software Feature in in the Embedded Web Server
     – In the Embedded Web Server, click **Properties > General Setup**.
     – Click **Feature Installation**.
     – For Feature Installation Key Entry, click **Enter Installation Key**.
     – Type the key.
     – Click **Apply**.

3. AirPrint should now be available and enabled at the device. However, if it has been disabled, an administrator can re-enable it by following the steps below:

   - You will need the device IP address or DNS name to access the AirPrint configuration **Web** interface from your browser. You can find the IP address at the device UI screen. From the front panel in the device, go to the **Device App** and select the **About** button.

The IP address will be shown on this page or you can select **Informational Pages button** from within the Device App and select and print the configuration report.

- Open the Xerox® device's Web interface by entering the IP address of the Xerox® device into a Web browser's address box (http://<IP>). This will open the Web interface.
- Click on the **Properties** tab (enter credentials if prompted).
- Select **Connectivity > Setup**. This will bring up the Connectivity page in the right frame.
- Under **Mobile Workflows**, look for **AirPrint**.
- From this page, you can modify configuration values that affect AirPrint.

# Frequently Asked Questions

### I CAN'T FIND MY PRINTER. WHAT IS THE PROBLEM?

AirPrint® requires that devices are discoverable via the Bonjour® protocol. 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 printer are on the same subnet. Currently, Apple does not allow for manual entry of IP addresses on 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 but there is no requirement for a printer or MFP to be wireless-enabled. What does need to happen, though, is that 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 only provides a limited subset of features from within iOS. As the AirPrint feature grows and evolves, users can expect to see additional device settings and capability within the print dialogs. For the time being, though, only a small number is available. For more information, see the AirPrint User Guide.

# Reference Information

## ABOUT AUTOIP AND MDNS

All devices on a TCP/IP network must have a unique address, much as 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 to 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. There is no need to worry, however, if you don't have a DHCP server, since Bonjour and AutoIP will take care of 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.

## ABOUT MDNS

mDNS is the second piece we need to care about and provides a vital and core role to AirPrint and its operation. Again, going back to our house on a street reference, typical TCP/IP traffic uses something called unicasting, which can be compared 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 can be compared to the local free advertising newspaper that gets delivered to everyone on the street (whether you want it or not), with 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. An mDNS packet on a network is sent to all addresses just like broadcast (radio waves are everywhere). In this case, however, 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 pre-programmed 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 to look 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. An IP address such as 135.202.176.251 just doesn't have a memorable ring to it. The creation of a Domain Name System or DNS has tried to take care of this by invisibly mapping those unfriendly addresses into more memorable, user-friendly names. Compare the example address 135.202.176.251 to the name "Johns Printer." If a user was looking to find a device on a network to print to, it's fairly obvious which option would be preferred. AirPrint is the same. When an iOS or OS X® device looks for an AirPrint printer, the printers return a "friendly name" that is part of the AirPrint configuration. On larger networks, this naming function is handled by a centralized "root" server or servers that 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 are looking for is present. The second option would be to simply walk into the office and shout out that person's name. 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 no receptionist (or DNS server) to 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.

To tie this all together, in order 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 could get very disruptive to have a whole bunch of devices "shouting" all the time looking for services. To prevent this, many larger corporate IT administrators 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 in which you are standing 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. So the important step here is to ensure that the iOS device and the printer exist on the same subnet OR that the network administrator is allowing mDNS traffic to pass across subnets. For more information on alternate AirPrint device discovery solutions (including Wide Area Bonjour using DNS-SD), see the Xerox® AltaLink® Devices Deliver Apple® AirPrint® to the Enterprise White Paper.

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 Small and Medium Businesses (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 its 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 allow mDNS traffic to pass across the network segments and subnets.

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