Programmatic AirPrint in the Enterprise

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About Me



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GAHHH PRINTERS!



Who is this presentation for?

- MacAdmins looking for a simple, scalable way to programmatically install printers without installing any drivers
- Anyone who has an interest in printers (are you out there?)
- Anyone who has wanted to scratch beneath the surface of how some of this printing magic works

Disclaimer

The method involved in achieving programmatic AirPrint installations still involves PPDs (PostScript Printer Description). <u>PPDs are deprecated</u> and are eventually going away...

However this does still work on macOS Monterey! (and hopefully that continues in the future)

The opinions expressed in this presentation are my own and do not necessarily reflect those of my employer.

Overview

- **1.** A short origin story
- 2. A little background on AirPrint
- **3.** Quick review of available supported printer install methods and their shortcomings
- **4.** How to install printers programmatically
- **5.** Demo (\downarrow to the demo gods)
- **6.** Q&A

Goals

- **1.** Simple, streamlined method of installing printers
- 2. Fast
- 3. Scalable
- 4. Customizable
- 5. Pretty icon
- 6. Installed by users

Quick Origin Story

- Bug with printing larger image files with HP printers on Mojave configured with lpd://
- Only direct AirPrint connection worked...
- Sec restricted enabling AirPrint...
- So, how do we install these printers programmatically?

printers-n-cups Y Abandon all hope, ye who enter here.





October 22nd, 2019 🗸

Is there a way to programatically install a printer for AirPrint that correctly identifies the printer and not show it as just a generic image? When I do the config manually the printer image shows up but not when I do it via the CLI ... (edited)

2 files 🔻



What I'm running: lpadmin -p M454TEST -D M454TEST -L "MOR 106" -E -v ipps://<printer_IP>/ipp/print -P

/System/Library/Frameworks/ApplicationServices.framework/Versions/A/Fram eworks/PrintCore.framework/Versions/A/Resources/AirPrint.ppd -o printeris-shared=false -o printer-error-policy=abort-job -o printer-make-andmodel='HP Color LaserJet Pro M453-4-AirPrint'

Notably, when I run <u>lpoptions</u> -p on the printer the <u>printer-make-and-model</u> is just <u>AirPrint</u> and not what's listed when installed manually.



Much sleuthing later...

MAC ADMIN

Configuring Printers Programmatically for AirPrint

October 30, 2019 by apizz

MAC ADMIN

Configuring Printers Programmatically for AirPrint Part 2: Now with Icons!

• May 26 by apizz

AirPrint

What is AirPrint?

"AirPrint is an Apple technology that helps you create full-quality printed output without the need to download or install drivers."

https://support.apple.com/en-us/HT201311



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	Use:	HP OfficeJet Pro 6970		
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How does AirPrint work under the hood?



Under the hood...

•••
lpoptions
<pre>copies=1 \ device- uriidnssd://HP%200fficeJet%20Pro%206970%20%5B8ACFAA%5Dippstcp.local./uuid=70951c 21-/azz->4wu-eswo-4wzc4Tbbc>82 \ finishings=3 \ job-cancel-after=10800 \ job-hold-until=no-hold \ job-priority=50 \ job-sheets=none,none \ marker-change-time=0 \ number-up=1 \ printer-commands=none \</pre>
<pre>printer-infod 'HP OfficeJet Pro 6970' \ printer-is-accepting-jobs=true \ printer-is-shared=false \ printer-is-temporary=false \ printer-location 'Home \ printer-make-and-model= 'HP OfficeJet Pro 6970-AirPrint' \ printer-state=3 \ printer-state-change-time=1644986001 \ printer-state-reasons=none \ printer-type=69243100 \ printer-uri-supported=ipp://localhost/printers/HP_OfficeJet_Pro_6970</pre>

Assumptions about how AirPrint works...

- **1.** Bonjour used to find nearby printers
- 2. DNS service discovery is used for connection to avoid needing IP or hostname to find & connect
- **3.** ipp is used to query printer capabilities
- 4. ipp2ppd converts this to .ppd file, also gets icon
- 5. Ipadmin installs printer

When AirPrint is Disabled...

•		Add Printer
	Q Search	
	Name	∧ Kind
	HP OfficeJet	Pro 6970 [8ACFAA] Bonjour Multifunct
	Name:	HP OfficeJet Pro 6970
	Location:	
	Use:	Generic PCL Printer
		The selected printer software isn't from the manufacturer and may not let you use all the features of your printer.
	?	Add

Printing-related Protocols & Standards

• CUPS

- <u>https://openprinting.github.io/cups/</u>
- <u>https://github.com/apple/cups</u>
- Domain Name System Service Discovery (DNS-SD <u>RFC6763</u>)
- Line Printer Daemon (LPD)
- Internet Printing Protocol (IPP <u>RFC2567</u>)
 - 631/tcp
- IPP Everywhere™
 - <u>https://www.pwg.org/ipp/everywhere.html</u>

Internet Printing Protocol

"The Internet Printing Protocol ("IPP") is a secure application level protocol used for network printing. IPP defines high-level Printer, Job, and Document objects, allowing Clients to ask a Printer about capabilities and defaults (supported media sizes, two-sided printing, etc.), the state of the Printer (paper out/jam, low ink/toner, etc.) and any Print Jobs and their Documents. The Client can also submit document files for printing and subsequently cancel them. IPP is supported by all modern network Printers and supercedes all legacy network protocols including port 9100 printing and LPD/lpr."

The important ones (for us)

- Domain Name System Service Discovery (DNS-SD <u>RFC6763</u>)
- Internet Printing Protocol (IPP <u>RFC2567</u>)
 - 631/tcp
- IPP Everywhere™
 - <u>https://www.pwg.org/ipp/everywhere.html</u>

•••

device-

uri=dnssd://HP%200fficeJet%20Pro%206970%20%5B8ACFAA%5D._ipps._tcp.local./? uuid=70951c21-7a22-540d-e306-402c4fbbc582

Original Method

- Manually install printer and drivers with desired settings.
- 2. Test printing.
- 3. Use Jamf Admin to upload the printer to our instance.
- 4. Create policy to deploy.

Pros:

- Not crazy complicated
- Forces you to test before deployment
- Ignorance is bliss (?)

Cons

- Very manual
- Inefficient
- Not scalable for large printer fleets

Jamf Pro Managing Printers

Newer Method

- Manually install printer and drivers with desired settings.
- 2. Test printing.
- 3. Use Jamf Admin to upload the printer to our instance.
- 4. Create configuration profile to deploy.

Pros:

• Same as previous

Cons:

- Same as previous
- Not customizable as a policy

Jamf Pro Managing Printers

man lpadmin

•••

DEPRECATED OPTIONS

The following lpadmin options are deprecated:

-i filename

This option historically has been used to provide either a System V interface script or (as an implementation side-effect) a PPD file. Note: Interface scripts are not supported by CUPS. PPD files and printer drivers are deprecated and will not be supported in a future version of CUPS.

-P ppd-file

Specifies a PostScript Printer Description (PPD) file to use with the printer. Note: PPD files and printer drivers are deprecated and will not be supported in a future version of CUPS.

EXAMPLE

Create an IPP Everywhere print queue:

lpadmin -p myprinter -E -v ipp://myprinter.local/ipp/print -m everywhere

lpadmin -p MyTestPrinter -E -v ipp://<hostname|ip_address>/ipp/print -m everywhere

```
lpoptions -p MyTestPrinter
```

```
copies=1 \
device-uri=ipp://<hostname|ip_address>/ipp/print \
finishings=3 \
job-cancel-after=10800 \
job-hold-until=no-hold\
job-priority=50 ∖
job-sheets=none,none \
marker-change-time=0 \
number-up=1 \
printer-commands=none \
printer-info='HP OfficeJet Pro 6970 [8ACFAA]' \
printer-is-accepting-jobs=true \
printer-is-shared=false \
printer-is-temporary=false printer-location \
printer-make-and-model='OfficeJet Pro 6970 - IPP Everywhere' \
printer-state=3 printer-state-change-time=1644987237 \
printer-state-reasons=none \
printer-type=2134108 \
printer-uri-supported=ipp://localhost/printers/MyTestPrinter
```



Printing-related Binaries

• Ipadmin

• /usr/sbin/lpadmin

• Ipoptions

/usr/bin/lpoptions

• Ipstat

• /usr/bin/lpstat

• ippeveprinter

• /usr/bin/ippeveprinter

• ipptool

/usr/bin/ipptool

• ipp2ppd

- /System/Library/Printers/Libraries/ipp2ppd
 - Usage: ipp2ppd <printer_uri> <input_ppd_path>

AirPrint.ppd & ipp2ppd

- /System/Library/Frameworks/ApplicationServic es.framework/Versions/A/Frameworks/PrintCor e.framework/Versions/A/Resources/AirPrint.ppd
- /System/Library/Printers/Libraries/ipp2ppd

•••

cat

/System/Library/Frameworks/ApplicationServices.framework/Versions/A/Frameworks/PrintCore.framework/V ersions/A/Resources/AirPrint.ppd *PPD-Adobe: "4.3" *%%% PPD file for AirPrint Printer with CUPS. *%%% Created by the CUPS PPD Compiler CUPS v1.5svn. *% Copyright 2009 Apple Inc. *% These coded instructions, statements, and computer programs are the *% property of Apple Inc. and are protected by Federal copyright *% law. Distribution and use rights are outlined in the file "LICENSE.txt", *% which should have been included with this file. If this file is *% file is missing or damaged, see the license at "http://www.cups.org/". *FormatVersion: "4.3" *FileVersion: "1.4" *LanguageVersion: English *LanguageEncoding: ISOLatin1 *PCFileName: "urf.ppd" *Product: "(AirPrint Printer)" *Manufacturer: "AirPrint" *ModelName: "AirPrint Printer" *ShortNickName: "AirPrint" *NickName: "AirPrint" *PSVersion: "(3010.000) 0" *LanguageLevel: "3" *ColorDevice: True *DefaultColorSpace: RGB *FileSystem: False *Throughput: "1" *LandscapeOrientation: Plus90 *TTRasterizer: Type42 *% This tool will replace this ppd with one generated based on ipp queries. *APAutoSetupTool: "/System/Library/Printers/Libraries/ipp2ppd"

Installing a printer programmatically

- **Protocol** (ex. lpd://, ipp://)
- IP Address / Hostname
 - \circ \quad How we're connecting to the printer
- Printer name (no spaces ex. MyAwesomePrinter)
 - What will show up via the CLI
- Printer "friendly" name (ex. "My Awesome Printer")
 - What will show up to users in System Preferences
- Location (helpful, but not required)
- PPD
 - The printer description defining its features & capabilities
- -o <option> (for additional printer options)

Install_AirPrint.sh

- Provide some variables for the desired printer
 - If you have Jamf, can use \$4, \$5, etc. parameter variables so you can use 1 script but customize for each policy
- Use ipp2ppd to query the printer (631/tcp) and generate a .ppd file
- Query the printer for an icon, append to the .ppd file
- Use lpadmin to install the printer given the variables and .ppd file

Gist: https://gist.github.com/apizz/5ed7a944d8b17f28ddc53a017e99cd35

AirPrint Install Comparison

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lpoptions	lpoptions -p "MyAwesomePrinter"
<pre>copies=1 \ devire- urtidnssd://HP%200fficeJet%20Pro%206970%20%5B8ACFAA%5Dippstcp.local./uuid=70951c 21-7azz-54wa-eswo-4wzc41bbc5b2 \ finishings=3 \ job-cancel-after=10800 \ job-hold-until=no-hold \ job-priority=50 \ job-sheets=none,none \ marker-change-time=0 \ number-up=1 \ printer-is-shared=false \ printer-is-shared=false \ printer-is-temporary=false \ printer-is-temporary=false \ printer-location HOme \ printer-state=3 \ printer-state-change-time=1644986001 \ printer-state-reasons=none \ </pre>	<pre>copies=1 \ device-ur'=ipp://<hostname ip_address> finishings=3 job-cancet-atter=10800 \ job-hold-until=no-hold \ job-priority=50 \ job-sheets=none,none \ marker-change-time=0 \ number-up=1 \ printer-commands=none \ printer-commands=none \ printer-is-accepting-jobs=true \ printer-is-shared=false \ printer-is-shared=false \ printer-is-temporarv=false \ printer-location=Home \ printer-state=3 \ printer-state-change-time=1644992062 \ printer-state-reasons=none \ printer-type=69243100 \</hostname ip_address></pre>
<pre>printer-type=69243100 \ printer-uri-supported=ipp://localhost/printers/HP_OfficeJet_Pro_6970</pre>	<pre>printer-uri-supported=ipp://localhost/printers/MyAwesomePrinter</pre>

Manual Install

Programmatic Install

AirPrint Install Comparison



Manual Install

Programmatic Install

AirPrint Install Comparison



~ 17 seconds

~ 6 seconds

AirPrint Install Comparison Breakdown

- Manual install gets you fax functionality (if supported & that's something you care about)
- Manual requires everyone to this once for each printer they want to install.
- Programmatic install simpler, copy & pasta deployment format
- 1-click user interaction
- Programmatic install works even with AirPrint disabled
- PPD deprecation warnings

•••	
man cu	os
NOTES	CUPS printer drivers, backends, and PPD files are deprecated and will no longer be supported in a future feature release of CUPS. Printers that do not support IPP can be supported using applications such as ippeveprinter(1).

man lpadmin

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EXAMPLE

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lpadmin -p myprinter -E -v ipp://myprinter.local/ipp/print -m everywhere

Other programmatic options?

- What app(s) handle ipp:// URLs on Mac?
 - o Safari
 - /System/Library/CoreServices/AddPrinter.app

•••

open -a "/System/Library/CoreServices/AddPrinter.app" \
ipp://<hostname|ip_address>

daboyter from https://machinecompatible.wordpress.com





