



The Printer Working Group

IPP Workgroup Session, Day 1

February 9, 2021



PWG Antitrust Policy

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 - https://www.pwg.org/chair/membership_docs/pwg-antitrust-policy.pdf
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Agenda (1/3)



February 9, 2021 (US Eastern Standard Time)

When	What
10:00 - 11:00	PWG Plenary
11:00 - 11:15	IPP WG: Status
11:15 - 12:00	IPP WG: IPP/2.0 and IPP Everywhere
12:00 - 12:30	Lunch
12:30 - 14:00	IPP WG: IPP INFRA and Cloud Proxy Registration

Agenda (2/3)



February 10, 2021 (US Eastern Standard Time)

When	What
10:00 - 12:00	IDS WG: Status and Discussion
12:00 - 12:30	Lunch
12:30 - 13:15	IPP WG: IPP INFRA and Cloud Proxy Registration
13:15 - 14:00	IPP WG: IPP Finishings v2.2

Agenda (3/3)



February 11, 2021 (US Eastern Standard Time)

When	What
10:00 - 12:00	IPP WG: IPP Enterprise Printing Extensions v2.0
12:00 - 12:30	Lunch
12:30 - 13:45	IPP WG: 3D Liaisons: Status and Guidance
13:45 - 14:00	IPP WG: Next Steps



- Current charter:
 - <https://ftp.pwg.org/pub/pwg/ipp/charter/ch-ipp-charter-20170615.pdf>
- Proposed charter in PWG Call for Objections (ends Feb 26, 2021):
 - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ipp-charter-20210201-rev.pdf>
- The Internet Printing Protocol (IPP) workgroup is chartered with the maintenance of IPP and the IETF IPP registry, and support for new clients, network architectures (Cloud, SDN), MFD/Imaging service bindings, and emerging technologies such as 3D Printing
- In addition, we maintain the IETF Finisher MIB, Job MIB, and Printer MIB registries, the PWG MIBs, and handle synchronization with changes in IPP



- **IPP WG Co-Chairs:**
 - Paul Tykodi (TCS)
 - Ira McDonald (High North)
- **IPP WG Secretary:**
 - Michael Sweet (Lakeside Robotics)
- **IPP WG Document Editors:**
 - Ira McDonald (High North) - IPP WG Charter
 - Michael Sweet (Lakeside Robotics) – IPP Encrypted Jobs and Documents v1.0, IPP Production Printing Extensions v2.0
 - Smith Kennedy (HP Inc.) – IPP Driverless Printing Extensions v2.0, IPP Encrypted Jobs and Documents v1.0, IPP Enterprise Printing Extensions v2.0, IPP Finishings v2.2

Status (1/3)



- PWG Specifications in development:

- IPP Driverless Printing Extensions v2.0 - Interim
- IPP Encrypted Jobs and Documents v1.0 - Prototype
- IPP Enterprise Printing Extensions v2.0 - Interim
- IPP Finishings v2.2 - Interim
- IPP Production Printing Extensions v2.0 - Prototype

- Recently published:

- PWG 5199.11-2021: Job Accounting with IPP v1.0
- IPP Label Printing Extensions v1.0 (registration)
- IPP System Service Discovery v1.0 (registration)
- PWG 5100.14-2020: IPP Everywhere v1.1
- PWG 5100.16-2020: IPP Transaction-Based Printing Extensions v1.1
- PWG 5100.20-2020: IPP Everywhere Printer Self-Certification Manual v1.1



Status (2/3)

- Up-to-date pending IANA registrations online:
 - <https://www.pwg.org/ipp/ipp-registrations.xml>
 - Continue to maintain this in parallel for new specifications
 - Github repository: <https://github.com/istopwg/ippregistry>
- IPP Everywhere Printer Self-Certifications:
 - <https://www.pwg.org/printers>
 - ~~625~~ **629** printers currently listed from HP and Lexmark
 - 1.0 self-certification tools update 5 approved August 2020, can be used until June 30, 2021
 - 1.1 self-certification tools update 2 approved October 2020
- IPP Sample Code:
 - Github repository:
 - <https://github.com/istopwg/ippsample>
 - Fork of CUPS code includes ipp3dprinter, ippeveprinter, ippfind, ippproxy, ippserver, ipptool, ipptransform, and ipptransform3d



- Pending Errata:

- PWG 5100.5-2019 (Document Object v1.1): 4 issues
- PWG 5100.6-2003 (Page Overrides v1.0): 2 issues
- PWG 5100.7-2019 (Job Extensions v2.0): 5 issues
- PWG 5100.8-2003 ("-actuals" v1.0): 1 issue
- PWG 5100.9-2009 (Printer State Extensions v1.0): 2 issues
- PWG 5100.12-2015 (IPP 2.0, 2.1, and 2.2): 2 issues
- PWG 5100.15-2014 (FaxOut v1.0): 2 issues
- PWG 5100.18-2015 (Infrastructure Extensions v1.0): 6 issues
- PWG 5100.19-2015 (Implementor's Guide v2.0): 6 issues
- PWG 5100.22-2019 (System Service v1.0): 2 issues
- PWG 5107.3-2019 (MFD Alerts v1.1): 1 issue

- In-Progress Errata:

- PWG 5100.1-2017 (Finishings v2.1): 3 issues
- PWG 5100.3-2001 (Production Printing): 2 issues
- PWG 5100.11-2010 (JPS2 - Enterprise Printing): 7 issues
- PWG 5100.13-2012 (JPS3 - Driverless Printing): 15 issues



IPP Everywhere Self-Certification

- Resources:
 - <https://www.pwg.org/ipp/everywhere.html> (for info)
 - <https://www.pwg.org/ippeveselfcert> (tools and submission instructions)
 - <https://www.pwg.org/printers> (printer list)
 - <https://github.com/istopwg/ippeveselfcert> (Github repo)
- Released v1.0 Update 5 of self-certification tools on June 17th, 2020 (approved on August 13th, 2020)
 - v1.0 is tracking CUPS 2.2.x (previous stable branch)
 - v1.0 certifications will be accepted until June 30, 2021
- Released v1.1 Update 2 tools on October 7th, 2020 (approved on October 22nd, 2020)
 - v1.1 tracks CUPS 2.3.x (current stable branch)
 - Future update 3 will address document format test issues identified by Lexmark



IPP Driverless Printing Ext v2.0

- Current interim draft:
 - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippnodriver20-20201029-rev.pdf>
- Updates PWG 5100.13-2012: IPP Job and Printer Extensions - Set 3 (JPS3)
- Proposed schedule:
 - Prototype draft in Q3 2021



- **Wiki Page Summarizes Future Plans:**
 - <https://github.com/istopwg/ippsample/wiki/Planned-PWG-Errata-Updates>
- **Internet Printing Protocol/2.0: Fourth Edition**
 - Updates PWG 5100.12-2015: IPP 2.0, 2.1, and 2.2
 - Normalize the document version. Each document has used the name "ipp20" which doesn't match the file naming policy for the PWG. Because this will be the third update to 2.0, working drafts should be named "wd-ipp23-yyyymmdd[-rev].ext".
 - Keep the IPP/2.0 conformance level as-is - IPP/1.1 + collections + MSN2 (basically STD92 with protocol version 2.0)
 - Redefine the IPP/2.1 conformance level as Enterprise Printers that SHOULD conform to EPX 2.0
 - Redefine the IPP/2.2 conformance level as Production Printers that SHOULD conform to PPX 2.0
 - Provide non-normative references to NODRIVER 2.0 (for ipp-features-supported) and text that explains that the old hammer of IPP version is no longer used to identify major features.



IPP Evolution (con't)

- IPP Everywhere v2.0, IPP Everywhere Printer Self-Certification Manual v2.0
 - Mandate support for valuable features that were added as recommendations in IPP Everywhere v1.1:
 - TLS 1.2, privacy, job accounting
 - Add feature definitions for important "vertical solution" use cases:
 - Cloud printing, finishings, authentication with different methods (e.g. Basic, Digest, OAuth2), Job Release, Job Storage
 - Define a complete IPP Everywhere MFD by adding new IPP Everywhere service definitions:
 - Scan? FaxOut? System?
 - Define tests to certify standard common features:
 - Sides
 - Variations in page orientation (e.g. mixed portrait / landscape pages in source document tested with both short and long edge feed media)



The Printer Working Group

Lunch Break

Resuming at 12:30 EST



IPP INFRA/SYSTEM Improvements

- Published candidate standards and best practice:
 - [PWG 5100.18-2015: IPP Shared Infrastructure Extensions v1.0 \(INFRA\)](#)
 - [PWG 5100.22-2019: IPP System Service v1.0 \(SYSTEM\)](#)
 - [PWG 5199.10-2019: IPP Authentication Methods v1.0 \(AUTH\)](#)
- Gathering a list of potential improvements/extensions:
 - Clarify relationship between IPP SYSTEM and IPP INFRA
 - Cloud Proxy registration with X.509 certificates
 - Usage of OAuth 2.0 with Cloud/INFRA
 - Interoperability with Microsoft Universal Print Service
 - Direct Printing (when possible)
 - Release Printing
 - Scan support
 - More SNMP MIB support

Clarify relationship between IPP SYSTEM and IPP INFRA



- IPP INFRA was published before IPP SYSTEM
- IPP INFRA does not define an operation for registering/provisioning an Infrastructure Printer
 - IPP SYSTEM *does* define the Register-Output-Device operation
- This relationship isn't obvious since there is no reference to IPP SYSTEM from IPP INFRA

Cloud Proxy Registration with X.509 Certificates



- Cihan is working on an IPP Registration to address X.509 certificate registration via Register-Output-Device extension to IPP SYSTEM
 - X.509 certificate authentication for Proxy operations in IPP INFRA
- The original model had the Proxy supplying an X.509 certificate to the System
- Microsoft's Universal Print Service has the Proxy supplying an X.509 certificate signing request instead
 - Allows the System (equivalent) in MS UPS to use a common root certificate for authentication certificates
- Still need to define the attributes necessary to tell the Proxy which cipher suites and bit depths are supported for certificate signing requests
 - MS UPS is currently "hard coded" to use 2048-bit RSA CSRs



Usage of OAuth 2.0 with Cloud/INFRA

- AUTH defines how to use OAuth 2.0 with IPP
- INFRA defined the "oauth-authorization-server-uri" attribute, and a subsequent registration defined the "oauth-authorization-scope" attribute
 - SYSTEM does not define these attributes for the System object
 - Need to define/register "oauth-xxx" System Description attributes
- Would be useful to document how all of these pieces work together

Interoperability with MS Universal Print



- Microsoft Universal Print Service has some differences from INFRA/SYSTEM/AUTH
 - Registration uses MS-specific RESTful interface, which generates the X.509 certificate to use for authentication
 - X.509 is used for authentication with the OAuth token endpoint
 - OAuth is used for registration and IPP requests
- Goals for interoperability:
 - Make sure X.509 and OAuth usage is consistent
 - Maybe extend current "oauth-xxx" attributes to include and "oauth-authentication-supported" (or similar) attribute to specify the type of authentication to use when refreshing the OAuth bearer token (addresses use of X.509 authentication)
- Also plan on continuing discussions with Universal Print team about using SYSTEM instead of RESTful interface for provisioning



Direct Printing (MS Request)

- Investigating how to support simultaneous Cloud and Direct printing support
 - Use case is to use Cloud printing when the Client is not connected to the enterprise network (e.g. cellular or guess Wi-Fi) but use direct printing when the Client *is* connected to the enterprise network
- Options being considered so far:
 - "printer-uri-supported" / "printer-xri-supported" from Infrastructure Printer that lists both the Infrastructure Printer URI and the local Printer URI
 - Separate "printer-local-xri-supported" attribute to better delineate the security domains
 - New "printer-xri-supported" member attribute to specify the usage/ scope - has the advantage that both the local and Infrastructure Printer can advertise both sets of URIs for the Client
 - All will likely require Client software changes to take full advantage of the functionality (current Clients will likely stick with the first one that works when accessing the Printer)
 - Need to address security considerations (impersonation attacks)



The Printer Working Group

IPP Workgroup Session, Day 2
February 10, 2021



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11:45 - 12:30	Lunch
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13:15 - 14:00	IPP WG: IPP Finishings v2.2



IPP INFRA/SYSTEM Improvements

- Published candidate standards and best practice:
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Release Printing (MS Request)

- How to support Release Printing ("follow me") with INFRA?
- New Enterprise Printing Extensions update defines Release Printing, but not for INFRA environments
- INFRA can support Release Printing but doesn't define how to configure a Proxy to only fetch jobs and documents when the End User releases a Job at the Printer



Scan Support (MS Request)

- INFRA doesn't define Proxy operations for Scan Jobs
 - Push scanning (where the Printer sends the scanned document data to a URI) might involve some network accessibility issues - may not be a show-stopper though
 - Pull scanning (where the Client requests scanned document data from the Printer) will require an additional Proxy operation for sending the document data to the Infrastructure Printer and a "job-state-reasons" value to let the Proxy know the Client is waiting on data
- One major issue: IPP Scan is not supported by shipping MFPs
 - Could have Proxy be a gateway to the MFP's "native" network scan protocol (typically eSCL)
 - Will make it hard to support direct scanning and IPP (cloud) scanning by a Client



Existing SNMP MIB Support

SNMP Element	IPP Attribute(s)	Defined In
finDevice	printer-finisher/-description	PWG 5100.1
finSupply	printer-finisher-supply/-description	PWG 5100.1
hrStorage	printer-storage/-description	IPP Storage
prtAlert	printer-alert/-description	PWG 5107.3
prtInput	printer-input-tray	
prtMarkerColorant	printer-supply	PWG 5100.13
prtMarkerSupplies	printer-supply/-description	PWG 5100.13
prtOutput	printer-output-tray	PWG 5100.13



More SNMP MIB Support (con't)

- Other Printer MIB v2 elements?
 - prtGeneral - mostly covered by existing attributes from STD 92, RFC 3995, and "printer-serial-number" registration
 - prtGeneralCurrentOperator probably maps to "printer-contact", but what about prtGeneralServicePerson?
 - prtChannel - list of service endpoints/ports
 - prtConsoleDisplayBuffer - access to status line on console display, usually the "printer-state-message" value
 - prtConsoleDisplayLights - access to status lights on console display
 - prtCover - describes the covers and interlocks of the printer (Index, Description, Status)
 - prtInterpreter - describes supported document formats
 - prtLocalization - covered by STD 92 and JPS3/NODRIVER
 - prtMarker - mostly covered by existing attributes from STD 92 and PWG 5100.7
 - prtMediaPath - describes the different paths media can take



More SNMP MIB Support (con't)

- Other Host Resources MIB elements?
 - hrSystem - some coverage in STD 92 attributes already
 - hrDevice - list of processors, network interfaces, printers, disks, partitions, and file systems
 - hrSWRun - list of running software
 - hrSWRunPerf - list of running software statistics (CPU time, memory usage, etc.)
 - hrSWInstalled - list of installed software, some coverage with "printer-firmware-xxx" attributes



IPP Finishings v2.2

- Interim draft:
 - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippfinishings22-20210108-rev.pdf>
- Errata update of IPP Finishings v2.1
 - Clarification of printer-finishers and printer-finisher-supplies
 - Removal of obsolete attributes
 - Other editorial changes
- Proposed schedule:
 - Prototype draft Q2 2021



The Printer Working Group

IPP Workgroup Session, Day 3

February 11, 2021



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13:45 - 14:00	IPP WG: Next Steps



- Current interim draft:
 - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippepx20-20201029-rev.pdf>
- Update of PWG 5100.11-2010: IPP Job and Printer Extensions - Set 2 (JPS2)
 - Obsoleted "job-save-disposition (collection)", replaced by new Job Storage feature
 - Obsoleted "pages-per-subset (1setOf integer(0:MAX))", replaced by "job-pages-per-subset (integer(1:MAX))" in 5100.1
 - Deprecated "proof-print (collection)", replaced by "proof-copies (integer(1:MAX))"
 - Obsoleted "sheet-collate (type2 keyword)" - base attribute from RFC 3381 is obsolete
 - Added "job-release-action (type2 keyword)" to support Job Release
 - Some non-enterprise-specific attributes were moved to PWG 5100.7
- Proposed schedule:
 - Prototype draft in Q2 2021



The Printer Working Group

Lunch Break

Resuming at 12:30 EST



3D Printing Discussions

- Organizations and workgroups:
 - 3MF Consortium: <https://www.3mf.io>
 - AMSC: <https://www.americamakes.us/>
 - AMNOW: <https://www.americamakes.us/ncdmm-and-catalyst-connection-announce-next-phase-of-amnow-program-to-support-additive-manufacturing-technology-insertion-into-the-u-s-army-supply-chain/>
 - ASTM Committee F42: <https://www.astm.org/COMMITTEE/F42.htm>
 - INCITS: <https://www.incits.org>
 - Potential 3D Printing Protection Profile (with IDS workgroup)
 - Looking at AMSC-identified gaps, particularly 3D scanning
 - ISO/IEC JTC 1 WG 12: <https://www.iso.org/committee/45020.html>
 - ISO TR 22100-4: Best Practice document already published
 - PDF Association + ISO/IEC TC171: <https://www.iso.org/committee/53674.html>
 - SAE ITC Additive Manufacturing Data Consortium: <https://www.sae-itc.com/amdc>
 - SME iRAMP: <https://www.sme.org/iramp/>



3D Printing Discussions (con't)

- Current documents:
 - PWG 5100.21-2019: IPP 3D Printing Extensions v1.1
 - PWG 5199.5-2017: PWG 3D Print Job Ticket and Associated Capabilities v1.0 (PJT3D)
- Proposed future work (2021-2022):
 - IPP 3D Production Printing Extensions v1.0 specification to address AMSC AMNOW efforts
 - Updated PWG 3D Print Job Ticket and Associated Capabilities v2.0 (PJT3D) best practice to incorporate production extensions and IPP 3D v1.1



The Printer Working Group

Next Steps



Next Steps

- IPP Workgroup Charter Update (Ira)
 - PWG Call for Objections in Q1 2021
- IPP 2.0, 2.1, and 2.2 Update (Mike/Ira)
 - Initial draft in Q2 2021
- IPP Driverless Printing Extensions v2.0 (Smith)
 - Prototype draft in Q3 2021
- IPP Encrypted Jobs and Documents v1.0 (Mike/Smith)
 - Prototyping/stable draft in Q3 2021
- IPP Enterprise Printing Extensions v2.0 (Smith)
 - Prototype draft in Q2 2021
- IPP Finishings v2.2 (Smith)
 - Prototype draft in Q2 2021
- IPP Production Printing Extensions v2.0 (Mike)
 - Stable draft in Q1 2021
- Cloud Registration with X.509 Certificates (Cihan/Mike)
 - Initial draft in Q2 2021



More Information

- We welcome participation from all interested parties
- IPP Working Group web page
 - <https://www.pwg.org/ipp/index.html>
- Subscribe to the IPP mailing list
 - <https://www.pwg.org/mailman/listinfo/ipp>
- IPP WG holds bi-weekly phone conferences announced on the IPP mailing list
 - Next conference calls scheduled for Thursday, February 25, 2021 and March 11, 2021 at 3pm ET