



# The Printer Working Group

IPP Workgroup Session

November 15, 2022



# Before We Begin...

- **PWG Antitrust Policy:**
  - [https://www.pwg.org/chair/membership\\_docs/pwg-antitrust-policy.pdf](https://www.pwg.org/chair/membership_docs/pwg-antitrust-policy.pdf)
  - The IEEE-ISTO Printer Working Group ("PWG") will not become involved in the business decisions of its Members. The PWG strictly complies with applicable antitrust laws. Every PWG meeting attendee shall comply with this policy. The PWG Officers and PWG Workgroup Officers are responsible to ensure that this policy is adhered to in all PWG activities.
- **PWG Intellectual Property Policy:**
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  - TL;DR: Anything you say in a PWG meeting or email to a PWG address can be used in a PWG Document
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# Agenda (1/3)



## November 15, 2022 (US Eastern Standard Time)

| When          | What  |
|---------------|---|
| 10:00 - 10:45 | PWG Plenary                                     |
| 10:45 - 11:00 | IPP WG: Status                                  |
| 11:00 - 12:00 | IPP WG: Prototype-Ready Specifications          |
| 12:00 - 12:45 | Lunch Break                                     |
| 12:45 - 14:00 | IPP WG: Evolution of IPP/2.x and IPP Everywhere |

# Agenda (2/3)



## November 16, 2022 (US Eastern Standard Time)

| When          | What  |
|---------------|---|
| 10:00 - 11:00 | IPP WG: IPP Production Printing Extensions v2.0 |
| 11:00 - 12:00 | IPP WG: IPP Driver Replacement Extensions v2.0  |
| 12:00 - 12:45 | Lunch Break                                     |
| 12:45 - 14:30 | IPP WG: Evolution of IPP and OAuth              |

# Agenda (3/3)



## November 17, 2022 (US Eastern Standard Time)

| When          | What                          |
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| 10:00 - 12:00 | IDS WG: Status and Discussion |
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| 12:45 - 13:45 | IPP WG: 3D Printing Liaisons  |
| 13:45 - 14:00 | IPP WG: Next Steps            |



- Current charter:
  - <https://ftp.pwg.org/pub/pwg/ipp/charter/ch-ipp-charter-20210409.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, the PWG Semantic Model schema, and handle synchronization with changes in IPP



- Pending:

- PWG 5100.5-2019 (Document Object v1.1): 4 issues
- PWG 5100.6-2003 (Page Overrides v1.0): 2 issues
- PWG 5100.8-2003 ("-actuals" v1.0): 1 issue
- PWG 5100.9-2009 (Printer State Extensions v1.0): 2 issues
- PWG 5100.15-2014 (FaxOut v1.0): 2 issues
- PWG 5100.18-2015 (Infrastructure Extensions v1.0): 8 issues
- PWG 5100.19-2015 (Implementor's Guide v2.0): 8 issues
- PWG 5100.22-2019 (System Service v1.0): 3 issues
- PWG 5107.3-2019 (MFD Alerts v1.1): 1 issue

- In-Progress:

- PWG 5100.3-2001 (Production Printing): 2 issues
- PWG 5100.7-2019 (Job Extensions v2.0): 8 issues
- PWG 5100.11-2010 (JPS2 - Enterprise Printing): 7 issues
- PWG 5100.12-2015 (IPP 2.0, 2.1, and 2.2): 2 issues
- PWG 5100.13-2012 (JPS3 - Driver Replacement): 15 issues
- PWG 5100.14-2020 (IPP Everywhere v1.1): 4 issues
- PWG 5100.20-2020 (IPP Everywhere v1.1 Self-Cert): 1 issue



# Prototype-Ready Specifications

- IPP Encrypted Jobs and Documents v1.0 (TRUSTNOONE)
  - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ipptrustnoone10-20210519.pdf>
- IPP Enterprise Printing Extensions v2.0 (EPX)
  - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippepx20-20211101.pdf>
- IPP Job Extensions v2.1 (JOBEXT)
  - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippjobext21-20221105.pdf>





# IPP Job Extensions v2.1

- Prototype draft:
  - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippjobext21-20221105-rev.pdf>
- Updates PWG 5100.7-2019: IPP Job Extensions v2.0
- Primary focus is clarifications for "media-col", "media-col-database", "media-col-ready", "media-size", and "media-size-supported"
- Also adds:
  - Missing attributes: "job-hold-until-time-supported", "job-processing-time"
  - New values for "media-source" and "print-content-optimize"
- Q: Add "max-page-ranges-supported" from IANA registry?
- Proposed schedule:
  - Stable draft and IPP WG last call Q4 2022



# The Printer Working Group

Lunch Break

*Resuming at 12:45pm ET*

# IPP/2.x Fourth Edition



- Current interim draft:
  - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippbase23-20220809-rev.pdf>
- Errata update of PWG 5100.12-2015:
  - Clarification about Get-Printer-Attributes operation
  - Definition of classes or categories of printers
  - Updated document references, including an informative reference to IPP Everywhere
  - Simplified reference tables and conformance requirements
  - New history of the development of the Internet Printing Protocol content to explain how we ended up with different protocol versions with the same encoding
- Proposed schedule:
  - Prototype draft after EPX 2.0 and JOBEXT 2.1

# IPP Everywhere v2.0



- Current prototype draft:
  - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippeve20-20221107-rev.pdf>
- Major update of PWG 5100.14-2020: IPP Everywhere v1.1
  - Most RECOMMENDED items become REQUIRED
  - New CONDITIONALLY REQUIRED items
  - REQUIRE "printer-firmware-xxx" Printer Status attributes
  - REQUIRE Get-Printers from PWG 5100.22 for print servers
  - RECOMMEND IPP-USB support
- Proposed schedule:
  - Stable draft Q1/Q2 2023

# IPP Everywhere Printer Self-Certification Manual v2.0



- Initial draft:
  - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippeveselfcert20-20220510.pdf>
- Major update to PWG 5100.20-2020
  - Synchronize with changes in IPP Everywhere v2.0
  - Add IPP-USB support (particularly for USB-only printers)
  - Add feature tests for duplex, finishings, roll, tray
  - Add Get-Printers test for servers
- Proposed schedule:
  - Prototype draft and beta tools Q1 2023



# Self-Certification Tools

- **Platforms:**
  - Linux: Drop Red Hat, Ubuntu 22.04 LTS for Intel/ARM?
  - macOS: macOS 12+ for Intel and Apple Silicon
  - Windows: Windows 10+ and higher for Intel
- **Add command-line and GUI front-end**
  - GUI options: native (different for each platform), Electron (Javascript), FLTK (C++), Flutter (Dart)
- **Look at publishing on corresponding App stores as free apps**
  - Potential issues with using ISTO as "vendor"



# (New) Proposed Tool

- "ippevetool"
  - GUI and command-line
  - Run self-certification tests
  - Inspect TXT records, Printer attributes, resources (icon/profile/string), and X.509 certificates
  - Do ad-hoc print tests using canned and/or user-supplied files
  - Do ad-hoc ipptool tests using canned and/or user-supplied files
- Implement using Flutter (GUI) and Dart (language)
  - One code base for all platforms
  - Compiles to native code
  - Potential for supporting Android and iOS/iPadOS
  - Existing mDNS/DNS-SD library can be used
  - Need to implement proper IPP library for Dart

# (New) Proposed Tool







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| 11:00 - 12:00 | IPP WG: IPP Driver Replacement Extensions v2.0  |
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| 12:45 - 14:30 | IPP WG: Evolution of IPP and OAuth              |

# IPP Production Printing Extensions v2.0 (PPX)



- Stable draft
  - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippppx20-20220708.pdf>
- Updates PWG 5100.3-2001: IPP Production Printing Attributes
- Prototyping completed in the ippsample project
- PWG Last Call completed, needs PWG Formal Approval
- 9 responses without objections, 35 comments:
  - <https://ftp.pwg.org/pub/pwg/ipp/wd/lcrc-ippppx20.txt>

# IPP Driver Replacement Extensions v2.0 (NODRIVER)



- Stable Draft:
  - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippnodriver20-20221027.pdf>
- Updates PWG 5100.13-2013: IPP Job and Printer Extensions - Set 3 (JPS3)
  - Old title "Driverless Printing Extensions"
- Prototyping completed in the PAPPL project
- PWG Last Call ends November 28, 2022



# The Printer Working Group

Lunch Break

*Resuming at 12:45pm ET*



# Evolution of IPP and OAuth

- IPP + OAuth first documented in PWG 5199.10-2019: IPP Authentication Methods v1.0
  - <https://ftp.pwg.org/pub/pwg/informational/bp-ippauth10-20190816-5199.10.pdf>
- The IETF OAuth WG has/will publish(ed) new documents:
  - Current documents:  
<https://datatracker.ietf.org/wg/oauth/documents/>
  - (WG Consensus) OAuth 2.0 Security Best Current Practice  
<https://datatracker.ietf.org/doc/draft-ietf-oauth-security-topics/>
  - RFC 8628: OAuth 2.0 Device Authorization Grant  
<https://datatracker.ietf.org/doc/rfc8628/>
  - RFC 8693: OAuth 2.0 Token Exchange  
<https://datatracker.ietf.org/doc/rfc8693/>
- Similarly, the OpenID Foundation has published updated specifications:
  - <https://openid.net/developers/specs/>



# IPP and OAuth Work Items

- Update documents:
  - IPP Authentication Methods (AUTH)
  - IPP Shared Infrastructure Extensions (INFRA)
  - IPP System Service (SYSTEM)
- Implement OAuth support in CUPS (Client and Printer/System)
  - CUPS includes an OAuth callback for bringing up any necessary UI or retrieving cached tokens, but we haven't implemented a default callback for Linux or macOS desktops
  - CUPS 2.5 cupsd and CUPS 3.0 sharing server are supposed to include OAuth-based authenticated queues
- Implement OAuth support in PAPPL (Client) for IPP Proxy support
- Implement OAuth support in IPP Sample for ippproxy (Client) and ippserver (Printer/System)





# Evolution of IPP and OAuth (con't)

- Microsoft Universal Print Service uses OAuth + special RESTful provisioning endpoint to issue an X.509 Client certificate that the IPP Proxy uses when negotiating a TLS connection with the IPP Infrastructure Printer
  - We have been talking about updates to PWG 5100.18 (INFRA) and 5100.22 (SYSTEM) to incorporate System-issued client certificates
- Mopria also has a cloud printing profile in development



# Goals for PWG 5199.10

- Update for current standards and use cases/requirements
- Promote interoperability with multiple implementations
- Define/reference best practices
- Extend IPP authentication model as needed



# Errata for PWG 5199.10

- Add information about getting server metadata (RFC 8414/OpenID) which provides capabilities and endpoints
  - Two different "well-known" resource paths
  - "oauth-authorization-server-uri (uri)" points to root ("https://oauth.example.com/")
  - GET `"/.well-known/oauth-authorization-server"` (RFC 8414) and `"/.well-known/openid-configuration"` (OpenID) to get JSON-formatted server metadata
- Clarify resource identifiers for OAuth
  - Normally the "printer-uri (uri)" value
  - Define new "oauth-resource-uri (uri)" Printer Description/System Description attributes to make this explicit
- Fix terminology to match OAuth RFCs as needed



# Errata for PWG 5199.10 (con't)

- Recommend RFC 7519 JSON Web Token
- Recommend RFC 7636 Proof Key for Code Exchange by OAuth Public Clients
- Add RFC 8693 OAuth Token Exchange
  - "grant\_types\_supported" server metadata lists 'urn:ietf:params:oauth:grant-type:token-exchange' when token exchange is supported
  - IANA OAuth registries: [https://www.iana.org/protocols#index\\_O](https://www.iana.org/protocols#index_O)
  - "resource" parameter is usually the Printer URI but we'll have the "oauth-resource-uri (uri)" attribute to provide the correct URI
    - Will this cause problems for multi-homed servers?
- Add RFC 8628 Device Authorization Grant for authorizing Printer/System
- Talk more about OAuth scopes
  - Typically used to provide role/element-based access control



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# 3D Printing and Scanning Discussions

- 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 (2023-2024):
  - IPP 3D Scan Service v1.0 specification to address 3D scanning
  - IPP 3D Production Printing Extensions v1.0 specification to address VDMA - OPC UA "Joint Working Group (JWG) for Additive Manufacturing" efforts
  - Updated PWG 3D Print Job Ticket and Associated Capabilities v2.0 (PJT3D) best practice to incorporate production extensions and IPP 3D v1.1
  - Example 3MF print files with embedded job tickets



- ASTM has published an Additive Manufacturing Common Data Dictionary standard
  - ASTM F3490-21 Standard Practice For Additive Manufacturing - General Principles - Overview Of Data Pedigree
  - <https://webstore.ansi.org/Standards/ASTM/ASTMF349021>
- Biden Administration announces "AM Forward" program for small to medium size manufacturers:
  - <https://www.whitehouse.gov/briefing-room/statements-releases/2022/05/06/fact-sheet-biden-administration-celebrates-launch-of-am-forward-and-calls-on-congress-to-pass-bipartisan-innovation-act/>
- ISO has approved 3D PDF with STEP
  - ISO/TS 24064 Document management - Portable Document Format - 3D data streams conforming to the ISO 10303:242
  - <https://www.pdfa.org/pdf-2-0-adds-step-3d-model-support/>
  - <https://www.iso.org/standard/77686.html>



# 3D Meetings (1/2)

- ASTM International Conference on Additive Manufacturing (ASTM ICAM 2022):
  - October 31 – November 4, 2022 sponsored by the ASTM International Additive Manufactured Center of Excellence (AM CoE), was held in Orlando, FL at the JW Marriott Orlando Bonnet Creek Resort and Spa
  - Alan Sukert (IDS Workgroup Chair) and Paul Tykodi (IPP Co-chair) attended in-person on Friday Nov 4th, 2022 on behalf of the PWG to make a presentation in the conference's Cyber Security track on the possible value of extending Common Criteria to cover 3D printing equipment as a mechanism for adding Cyber Security controls to the Additive Manufacturing digital thread



# 3D Meetings (2/2)

- formnext – **This Week** – Frankfurt Germany:
  - Possibility to attend in person in the event the VDMA – OPC UA Joint Working Group makes a presentation at formnext. If they don't, attend virtually
- Transportation Research Board - 2nd International Conference on 3D Printing and Transportation: Late November 2022 – Keck Center – Washington, DC:
  - Attend in person – on site
  - Possibility to make a presentation on safe G-code



# The Printer Working Group

## Next Steps



# Next Steps

- IPP/2.x Fourth Edition (Mike)
  - Prototype draft in Q1/Q2 2023
- IPP Driver Replacement Extensions v2.0 (Smith)
  - PWG Last Call ends November 28, 2022
  - PWG Formal Approval Q1 2023
- IPP Encrypted Jobs and Documents v1.0 (Mike/Smith)
  - Stable draft in Q2 2023
- IPP Enterprise Printing Extensions v2.0 (Smith)
  - Stable draft in Q1 2023
- IPP Everywhere v2.0 (Mike)
  - Stable draft in Q1/Q2 2023
- IPP Everywhere Printer Self-Certification Manual v2.0 (Mike)
  - Prototype draft in Q1 2023
- IPP Job Extensions v2.1 (Mike)
  - Stable draft and IPP WG last call in Q4 2022
- IPP Production Printing Extensions v2.0 (Mike)
  - PWG Formal Approval Q4 2022/Q1 2023



# 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, November 24 and December 8, 2022 at 3pm ET