



The Printer Working Group

IPP Workgroup Session

August 16, 2022



Before We Begin...

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



August 16, 2022 (US Eastern Daylight 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)



August 17, 2022 (US Eastern Daylight Time)

When	What
10:00 - 11:00	IPP WG: 3D Printing Liaisons/Discussion
11:00 - 12:00	IPP WG: Evolution of IPP and OAuth, part 1
12:00 - 12:45	Lunch Break
12:45 - 13:45	IPP WG: Evolution of IPP and OAuth, part 2
13:45 - 14:00	IPP WG: Next Steps

Agenda (3/3)



August 18, 2022 (US Eastern Daylight Time)

When	What
10:00 - 12:00	IDS WG: Status and Discussion
12:00 - 12:45	Lunch Break
12:45 - 14:00	IPP WG: Extra 3D Printing Topics



- 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



- **IPP WG Co-Chairs:**
 - Paul Tykodi (TCS)
 - Ira McDonald (High North)
- **IPP WG Secretary:**
 - Michael Sweet (Lakeside Robotics)
- **IPP WG Document Editors:**
 - Michael Sweet (Lakeside Robotics) – Internet Printing Protocol/2.x Fourth Edition, IPP Encrypted Jobs and Documents v1.0, IPP Everywhere v2.0, IPP Everywhere Printer Self-Certification Manual v2.0, IPP Job Extensions v2.1, 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



- PWG Specifications in development:
 - Internet Printing Protocol/2.x Fourth Edition - Interim
 - IPP Driverless Printing Extensions v2.0 - Prototype
 - IPP Encrypted Jobs and Documents v1.0 - Prototype
 - IPP Enterprise Printing Extensions v2.0 - Prototype
 - IPP Everywhere™ v2.0 - Interim
 - IPP Everywhere™ Printer Self-Certification Manual v2.0 - Initial
 - IPP Job Extensions v2.1 - Initial
 - IPP Production Printing Extensions v2.0 - Stable
- Recently published:
 - PWG 5100.1-2022: IPP Finishings v3.0 (FIN)
 - Deprecating IPP Print by Reference v1.0
 - PWG 5199.11-2021: Job Accounting with IPP v1.0

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>
 - 854 **878** printers currently listed from DCC, HP, Lexmark, and OKI
 - 1.1 self-certification tools update 3 approved June 2021
 - *Update 4 in beta testing*
- IPP Sample Code:
 - Github repository:
 - <https://github.com/istopwg/ippsample>
 - Now based on CUPS library v3 and PDFio
 - Adds ipp3dprinter, ippproxy, ippserver, 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 5100.8-2003 ("-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 Errata:**

- 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 - Driverless Printing): 15 issues
- PWG 5100.14-2020 (IPP Everywhere v1.1): 4 issues
- PWG 5100.20-2020 (IPP Everywhere v1.1 Self-Cert): 1 issue



Initial/Interim Specifications

- Internet Printing Protocol/2.x Fourth Edition (BASE)
 - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippbase23-20220809-rev.pdf>
- IPP Everywhere™ v2.0 (EVE)
 - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippeve20-20220510-rev.pdf>
- IPP Everywhere™ Printer Self-Certification Manual v2.0 (SELFCERT)
 - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippeveselfcert20-20220510-rev.pdf>
- IPP Job Extensions v2.1 (JOBEXT)
 - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippjobext21-20220809.pdf>



Prototype-Ready Specifications

- IPP Driverless Printing Extensions v2.0 (NODRIVER)
 - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippnodriver20-20220503.pdf>
- 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>

Stable Specifications



- IPP Production Printing Extensions v2.0 (PPX)
 - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippppx20-20220708.pdf>
 - Prototyping completed in the ippsample project
 - Needs IPP WG last call



IPP Job Extensions v2.1

- Initial draft:
 - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippjobext21-20220809.pdf>
- Errata update of PWG 5100.7-2019
- Primary focus is clarifications for "media-col", "media-col-database", "media-col-ready", "media-size", and "media-size-supported"
- Proposed schedule:
 - Stable draft Q4 2022



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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, FIN 3.0, and PPX 2.0

IPP Everywhere v2.0



- Current interim draft:
 - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippeve20-20220510-rev.pdf>
- Major update of PWG 5100.14-2020: IPP Everywhere v1.1
 - Most RECOMMENDED items become REQUIRED
 - New CONDITIONALLY REQUIRED items
 - Get-Printers from PWG 5100.22 for print servers
 - Pending addition: RECOMMEND IPP-USB support
- Proposed schedule:
 - Prototype draft Q3/Q4 2022

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 Q3/Q4 2022



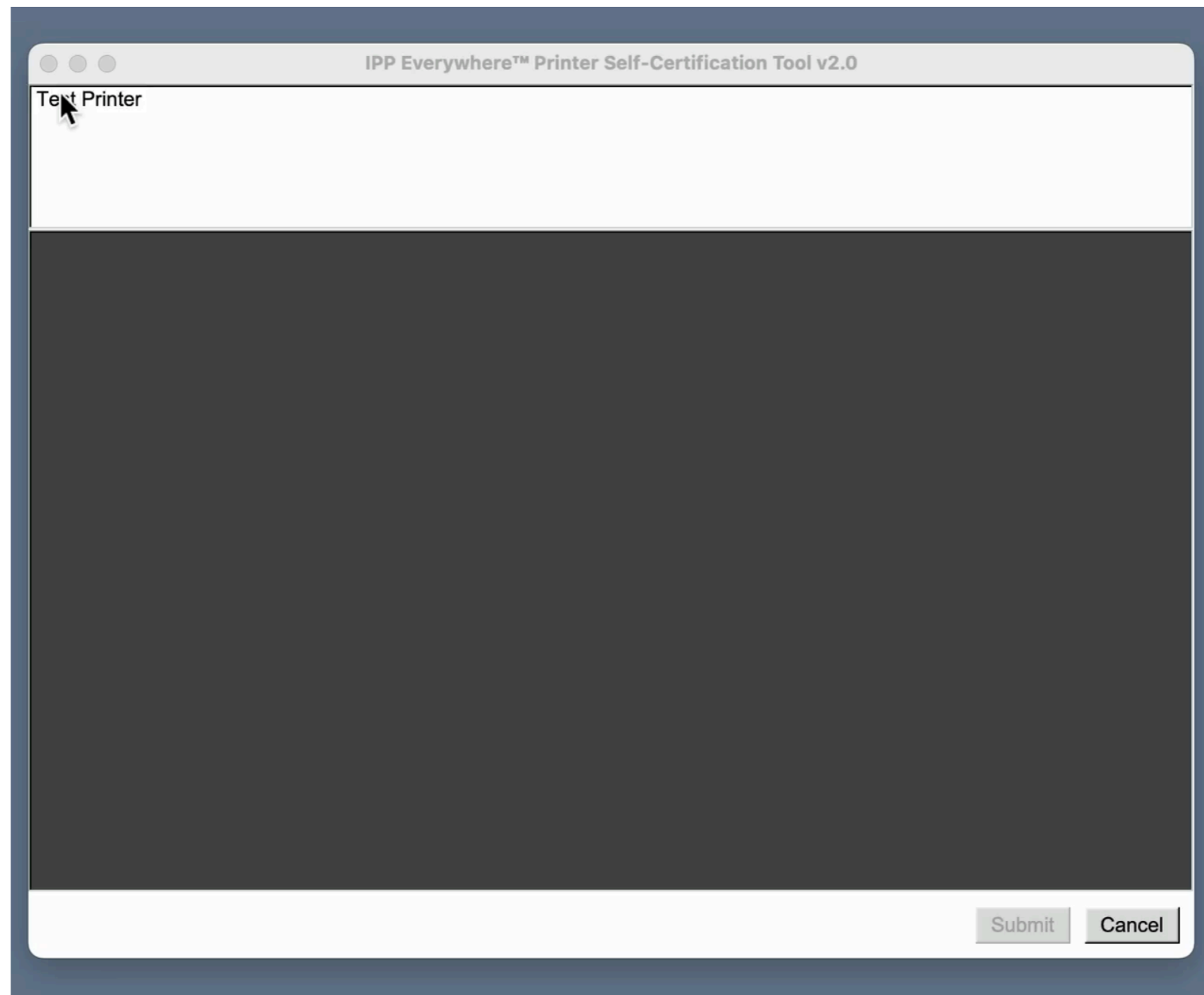
Self-Certification Tools

- Platforms:
 - Linux: Drop Red Hat, Ubuntu 22.04 LTS for Intel
 - macOS: macOS 12+ for Intel and Apple Silicon
 - Windows: Windows 10+ and higher for Intel
- Replace/augment scripts with GUI front-end?
- Look at publishing on corresponding App stores as free apps?



Proposed Self-Certification GUI

<https://ftp.pwg.org/pub/pwg/ipp/slides/ippeveselfcert-20220815.mov>





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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 (2022-2023):
 - 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



- 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), will be 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) will be attending 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)

- Standards Forum at formnext – Nov 14, 2022 – Frankfurt Germany:
 - If attending formnext in person, due to participation in the activities of the VDMA – OPC UA Joint Working Group, attend the Standards Forum as well. Sponsored by US Commercial Service, ASTM, and ISO.
- formnext – Nov 15 – 18, 2022 – 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



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/>



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
 - "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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Lunch Break

Resuming at 12:45pm ET



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)



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Next Steps



Next Steps

- IPP/2.x Fourth Edition (Mike)
 - Prototype draft in Q3 2022
- IPP Driverless Printing Extensions v2.0 (Smith)
 - Stable draft in Q2/Q3 2022
- IPP Encrypted Jobs and Documents v1.0 (Mike/Smith)
 - Stable draft in Q4 2022
- IPP Enterprise Printing Extensions v2.0 (Smith)
 - Stable draft in Q3 2022
- IPP Everywhere v2.0 (Mike)
 - Prototype draft in Q3/Q4 2022
- IPP Everywhere Printer Self-Certification Manual v2.0 (Mike)
 - Prototype draft in Q3/Q4 2022
- IPP Production Printing Extensions v2.0 (Mike)
 - PWG Last Call in Q3 2022



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, September 1 and 15, 2022 at 3pm ET



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Extra 3D Printing Topics

