



# The Printer Working Group

IPP Workgroup Session, Day 1

May 16, 2018

# PWG IP Policy



- "This meeting is being held in accordance with the PWG Intellectual Property Policy"
  - [http://www.pwg.org/chair/membership\\_docs/pwg-ip-policy.pdf](http://www.pwg.org/chair/membership_docs/pwg-ip-policy.pdf)
- TL;DR: Anything you say in a PWG meeting or email to a PWG address can be used in a PWG standard
  - (but please do read the IP policy above if you haven't done so)



## May 16, 2018 (Pacific Standard Time)

When	What
09:00 - 09:30	IPP Workgroup Status
09:30 - 10:30	IPP Sample Code Demo
10:30 - 10:45	Break
10:45 - 11:30	IPP System Service
11:30 - 12:00	IPP Authentication Methods
12:00 - 13:00	Lunch Break
13:00 - 14:30	IPP Encrypted Jobs and Documents
14:30 - 14:45	Break
14:45 - 15:15	IPP Job Reprint Password
15:15 - 17:00	IPP Everywhere v1.1

# Agenda (con't)



## May 17, 2018 (Pacific Standard Time)

When	What
09:00 - 11:00	Imaging Device Security
11:00 - 12:00	How to Use the Internet Printing Protocol
12:00 - 13:00	Lunch Break
13:00 - 15:00	IPP 3D Topics
15:00 - 15:30	Next Steps



- Current charter:
  - <http://ftp.pwg.org/pub/pwg/ipp/charter/ch-ipp-charter-20170615.pdf>
- The Internet Printing Protocol (IPP) workgroup is chartered with the maintenance of IPP, the IETF IPP registry, and support for new clients, network architectures (Cloud, SDN), service bindings for MFDs and Imaging Systems, and emerging technologies such as 3D Printing
- In addition, we maintain the IETF Finisher MIB, Job MIB, and Printer MIB registries, and handle synchronization with changes in IPP



- **IPP WG Co-Chairs:**
  - Paul Tykodi (TCS)
  - Ira McDonald (High North)
- **IPP WG Secretary:**
  - Michael Sweet (Apple)
- **IPP WG Document Editors:**
  - Ira McDonald (High North) – IPP System Service, Printer MIB and IPP MFD Alerts v1.1
  - Michael Sweet (Apple) – How to Use the Internet Printing Protocol, IPP Encrypted Jobs and Documents, IPP Everywhere v1.1, IPP Everywhere Printer Self-Certification Manual v1.1, IPP System Service, Safe G-Code
  - Smith Kennedy (HP Inc.) – How to Use the Internet Printing Protocol, IPP Authentication Methods, IPP Encrypted Jobs and Documents, IPP Job Reprint Password, Printer MIB and IPP MFD Alerts v1.1
  - Peter Zehler (Xerox) - How to Use the Internet Printing Protocol



- PWG Specifications in development:
  - IPP Everywhere v1.1 - Interim Draft
  - IPP Everywhere Printer Self-Certification Manual v1.1 - Interim Draft
  - IPP System Service v1.0 - Prototype Draft
  - Printer MIB and IPP MFD Alerts v1.1 - Initial Draft
- IPP Registration Documents in development:
  - IPP Job Reprint Password - Interim Draft
- IPP White Papers in development:
  - IPP Authentication Methods - Interim Draft
  - IPP Encrypted Jobs and Documents - Interim Draft
- IPP Book in development:
  - How to Use the Internet Printing Protocol - Interim Draft

# Status (2/3)



- Recent IPP WG Approved Documents:
  - "IPP Get-User-Printer-Attributes" Registration
  - "IPP Presets" Registration
  - "Supporting Multi-Purpose Trays" Best Practice
  - "IPP Privacy Attributes" Registration
- Recent PWG Approved Documents:
  - PWG 3D Print Job Ticket and Associated Capabilities v1.0 (PJT3D)
  - PWG 5100.1-2017: IPP Finishings 2.1 (FIN)
  - PWG 5100.21-2017: IPP 3D Printing Extensions v1.0 (3D)
- Recent IETF RFCs:
  - RFC 8010: Internet Printing Protocol/1.1: Encoding and Transport
  - RFC 8011: Internet Printing Protocol/1.1: Model and Semantics





- Up-to-date pending IANA registrations online:
  - <http://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>
  - 206 printers currently listed (more than doubled since August 2017)
  - Second 1.0 self-certification tools update released in October 2017
  - *Third 1.0 self-certification tools update in testing*
- IPP Sample Code:
  - Github repository:
    - <https://github.com/istopwg/ippsample>
  - Fork of CUPS code includes ippfind, ippproxy, ippserver, ipptool, ipptransform, and ipptransform3d



# IETF IPP/1.1 Updates

- RFCs 8010 and 8011 have been published which replace (obsolete) RFCs 2910, 2911, 3381 (deprecated job progress attributes), and 3382 (collection attribute syntax)
- Published RFCs:
  - <http://tools.ietf.org/html/rfc8010>
  - <http://tools.ietf.org/html/rfc8011>
- **Pending:** Advance RFC 8010 and 8011 to IETF Internet Standard through status change
  - IESG process described in RFCs 2026 and 6410
  - Mike and Ira working on this



# IPP Everywhere Self-Certification

- Resources:
  - <http://www.pwg.org/ipp/everywhere.html> (for tools/info)
  - <https://www.pwg.org/ippeveselfcert> (submission form)
  - <http://www.pwg.org/printers> (printer list)
  - <https://github.com/istopwg/ippeveselfcert> (Github repo)
- Released v1.0 Update 2 of self-certification tools on October 13th, 2017
  - v1.0 is tracking CUPS 2.2.x (current stable branch)
  - Update 3 in testing to fix minor issues and Windows packaging
- Planning future 1.1 errata update for manual and tools in 2018
  - v1.1 will track CUPS 2.3.x (current development branch)



# IPP Sample Code

- Github Repository:
  - <https://github.com/istopwg/ippsample>
- Tracking CUPS 2.3
- Apache License Version 2.0
- Implements most IPP specifications and extensions
- Specific focus areas:
  - IPP Everywhere
  - IPP 3D
  - IPP Shared Infrastructure Extensions
  - IPP System Service
  - Authentication, authorization, and access control
  - Providing a gateway for legacy document formats: HP PCL, Safe G-Code
- Snapcraft and Docker builds are available, AppImage possibly in the future



# IPP Sample Code (con't)

- IPP Everywhere support passes self-certification
- IPP 3D support is still a work-in-progress
  - All required bits are implemented
  - 3D transform functionality (for slicing and printer-specific commands) is using CuraEngine
    - CuraEngine integration needs to be updated for current release
  - Currently only single-extruder printers are supported
  - Printer can be directly connected via USB or get G-Code via INFRA extensions
  - Also want to support Safe G-Code
    - Will probably setup CuraEngine to output Safe G-Code and then use a common configuration file for printer-specific G-Code
  - Supports prototyping/development with Raspberry Pi or desktop systems



# IPP Sample Code (con't)

- IPP Shared Infrastructure Extensions (INFRA) support is basically complete
  - Will add Register-Output-Device support as part of the System service prototyping
  - Still some room for improvement - do sparse updates of device attributes, and track the last "printer-config-change-time" value to determine whether an update is even needed
- IPP System Service prototyping almost complete
  - Status at <https://github.com/istopwg/ippsample/projects/1>
  - Prototyping experience will be covered after the break
  - A few major architectural changes:
    - Authentication support is now in place, with explicit administrative and authorized print groups
    - Subscriptions are now globally tracked (part of the System object) rather than tracked as part of a Printer object



# The Printer Working Group

## IPP Sample Code Demo

IPP System Service

IPP Shared Infrastructure Extensions

IPP 3D Printing Extensions



# The Printer Working Group

Break





# IPP System Service (SYSTEM)

- Current prototype draft at:
  - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippsystem10-20180214-rev.pdf>
- Combines and implements a concrete IPP binding of the following abstract Semantic Model 2.0 services and objects:
  - PWG 5108.06: System Object and System Control Service
  - PWG 5108.03: Network Resource Service
  - PWG 5109.1: Cloud Imaging Requirements and Model
- Proposed Schedule:
  - Stable draft in Q2/Q3 2018



# Prototyping Experience

- "system-configured-printers" should allow a 'no-value' value when there are no Printers
- "system-configured-resources" should allow a 'no-value' value when there are no Resources
- "system-device-id" should not be required
  - Do we even need this?
- "system-settable-attributes-supported" should reference definition of "printer-settable-attributes-supported" (RFC 3380) and mention using 'none' value to indicate no attributes are currently settable.



# Prototyping Experience (con't)

- "system-state" definition does not allow for some printers to be stopped and some to be idle and none processing.
  - Recommend that 'stopped' means all stopped, 'processing' means at least one 'processing', and 'idle' means at least one 'idle' and none 'processing'.
- "system-state-message" - is there a good reason to make this required? No way to do roll-up of the message, so the System would need to synthesize something or pick the most important "printer-state-message" value...
- "system-state-reasons" - not clear how to do the roll-up of these values since the severity suffix depends on the "printer-state"...



# Prototyping Experience (con't)

- Notifications:
  - Attributes need to be added to System Description attributes:
    - ipp-get-event-life
    - notify-attributes-supported
    - notify-events-default
    - notify-events-supported
    - notify-lease-duration-default
    - notify-lease-duration-supported
    - notify-max-events-supported
    - notify-pull-method-supported
  - Also need "notify-system-uri" and "notify-system-up-time"  
Subscription Status attributes



# Prototyping Experience (con't)

- Resources

- "date-time-at-installed", "date-time-at-canceled" need to be "dateTime | no-value"
- "time-at-installed" and "time-at-canceled" need to be "integer | no-value"
- Additional "resource-type" keywords:
  - 'static-icc-profile' (instead of 'static-iccprofile')
  - 'static-strings' for localization files
  - 'static-other' for other static files



# Prototyping Experience (con't)

- "xxx-owner-col" issues:
  - Rare to have full VCARD information or a URI for the authenticated user
    - PAM/POSIX/GECOS information generally doesn't include phone numbers or email addresses (OpenID does, however)
    - Providing an empty VCARD or a dummy URI ("user:name") is a waste of resources
  - No basic user name member attribute ("owner-user-name (name(MAX))")
  - No support for 'unknown' out-of-band value
  - Proposal:
    - Change all "xxx-owner-col" to be "collection | unknown"
    - Add REQUIRED "owner-user-name (name(MAX))" member attribute
    - Make "owner-uri" and "owner-vcard" RECOMMENDED



# Prototyping Experience (con't)

- "xxx-owner-col" issues (con't):
  - "job-owner-col" Job Status attribute:
    - Purpose is not clear - already have "job-originating-user-xxx" and "job-recipient-name"
      - Do we even need/want it? Or are we looking for a more complete version of "job-recipient-name"
    - Semantics of how the attribute is created are not clear
      - Synthesized VCARD from "job-originating-user-xxx" will often be incomplete
  - "printer-owner-col" Printer Description attribute:
    - REQUIRED but how do we populate the initial value - most authenticated user (might have insufficient info), "system-owner-col" value, ???
  - "resource-owner-col" Resource Description attribute:
    - REQUIRED but how do we populate the initial value - most authenticated user (might have insufficient info), "system-owner-col" value, ???



# Prototyping Experience (con't)

- "requesting-user-vcard" operation attribute:
  - Purpose is not clear - value is not authenticated and is not automatically copied to "xxx-owner-col" for Set operations - could only be used for Job Creation Requests (all other "xxx-owner-col" attributes are READ-WRITE)
  - Already have "requesting-user-name" and "requesting-user-uri" (email, telephone number, etc.) which have well-defined semantics - most authenticated values get copied to "job-originating-user-xxx"





# IPP Authentication Methods

- Current white paper:
  - <https://ftp.pwg.org/pub/pwg/ipp/whitepaper/tb-ippauth-20180123-rev.pdf>
- Provides an overview of how HTTP authentication methods are used with IPP
  - Currently HTTP Basic, HTTP Digest, HTTP Bearer (OAuth 2.0), HTTP Negotiate (Kerberos)
  - Maybe HTTP MutualAuth and others in the future



# Obsoleting "access-x509-certificate"

- The current "access-x509-certificate (1setOf text(MAX))" member attribute cannot be implemented securely
  - Requires associated private key to use for TLS client certificate authentication
  - Without the private key, it is not possible to authenticate the holder of the certificate
- Recommend we formally mark the "access-x509-certificate" member attribute obsolete
  - No known implementations
  - No way to securely implement - violates TLS/X.509 best practices



# The Printer Working Group

Lunch Break

*Resuming at 1pm PT*



# IPP Encrypted Jobs and Documents

- Interim draft:
  - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ipptrustnoone10-20180328-rev.pdf>
- Discussion:
  - How to get encrypted Job Receipt (i.e. Get-Encrypted-Job-Attributes or something like that)
  - Do we really need support for signed requests?
- Proposed schedule:
  - Prototype draft Q1 2019



# The Printer Working Group

Break



# IPP Job Reprint Password

- Interim draft:
  - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippreprintpwd-20180424-rev.pdf>
- Proposed schedule:
  - Prototype draft Q3 2018

# IPP Everywhere v1.1



- Interim drafts:
  - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippeve11-20180417-rev.pdf>
  - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippeveselfcert11-20180404-rev.pdf>
- Discussion:
  - How long can vendors continue to submit 1.0 results after 1.1 is approved?
    - v1.0 manual says 12 months
  - Should we track the firmware version(s) associated with the certification?
- Proposed schedule:
  - Prototype drafts and beta tools Q3/Q4 2018



# Self-Certification 1.1 Update

- Tool changes:
  - Align with conformance requirements in v1.1 spec
  - More tests for required operations: Cancel-My-Jobs, Close-Job, Identify-Printer
  - New OS requirements
    - Linux: Ubuntu LTS 18.04 or later?
    - macOS: 10.13 or later
    - Windows: 8 or later
- Portal changes:
  - Track implementation type: logical device (server) vs. physical device (printer)
  - Track specific capabilities (type of finishers, etc.)
  - Existing submissions will be updated by hand (only 2 have finishers, all are printers)





# The Printer Working Group

IPP Workgroup Session, Day 2

May 17, 2018

# PWG IP Policy



- "This meeting is being held in accordance with the PWG Intellectual Property Policy"
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15:00 - 15:30	Next Steps

# "How to Use the Internet Printing Protocol"



- Interim draft:
  - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippbook-2018mmdd.html>
- A short introduction to IPP client development
- Target audience is developers new to IPP, typically enterprise web applications
- Development being tracked in a new Github repository in the "ippguide" directory:
  - <https://github.com/istopwg/pwg-books>
- Goal is to provide EPUB, PDF, and online HTML versions that we can point people to as needed
- Not our typical standards document!
- Volunteer editors (so far): Smith Kennedy (HP), Mike Sweet (Apple), Peter Zehler (Xerox)



# The Printer Working Group

Lunch Break

*Resuming at 1pm PT*

# IPP 3D Topics



- A Safe G-Code Subset for 3D Printing
- Time for an IPP 3D Printing Extensions v1.1?
- Other liaisons and news



# A Safe G-Code Subset for 3D Printing

- Interim draft:
  - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-sweet-safe-gcode-20180416-rev.pdf>
- White paper that defines a subset of G-Code for entry-level FDM printers
- Discussion:
  - Other G-Code commands required?
  - Other Printer Description or Job Template attributes required?
- Proposed schedule:
  - Stable draft Q3 2018



# IPP 3D Liaison Discussions

- ASTM Committee F42 on Additive Manufacturing Technologies
  - [www.astm.org/COMMITTEE/F42.htm](http://www.astm.org/COMMITTEE/F42.htm)
- IEEE Consumer 3D Printing Working Group (P3030)
  - [standards.ieee.org/develop/wg/C3DP.html](http://standards.ieee.org/develop/wg/C3DP.html)
- ISO/IEC JTC 1 3D Printing and Scanning Study Group
  - [www.iso.org/committee/45020.html](http://www.iso.org/committee/45020.html)
- 3D PDF Consortium
  - [www.3dpdfconsortium.org](http://www.3dpdfconsortium.org)
- 3MF Consortium
  - [www.3mf.io](http://www.3mf.io)
- Press requests
  - "3D Printing Industry" web site: [www.3dprintingindustry.com](http://www.3dprintingindustry.com)

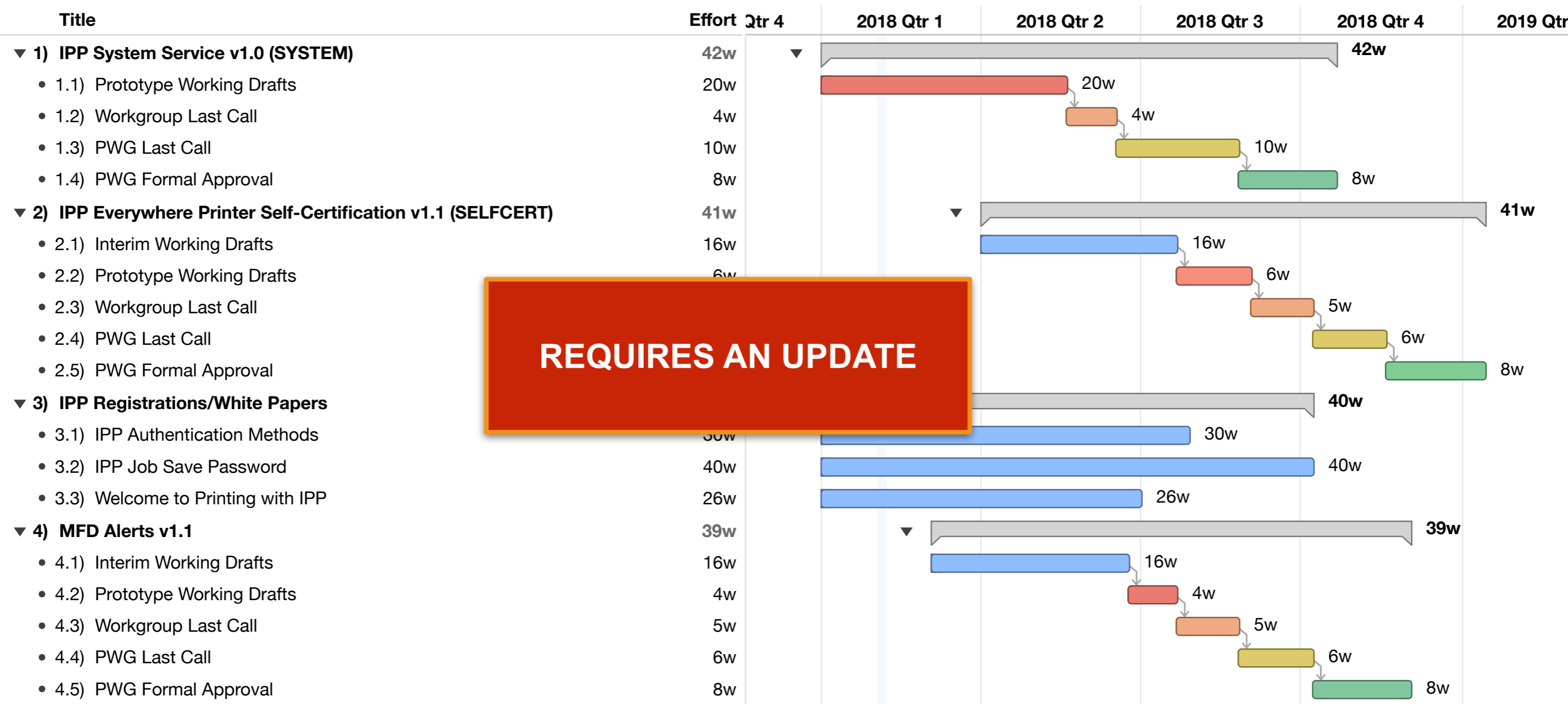




# The Printer Working Group

## Next Steps

# Next Steps





# Next Steps (con't)

- Advance IPP/1.1 to IETF Internet Standard
  - Request change of status ASAP
- IPP Authentication Methods, IPP Job Reprint Password (Smith)
  - Continue developing as white papers/registrations
- "How to Use the Internet Printing Protocol" Book (Mike/Pete/Smith)
  - Finish initial version ASAP, post updates as needed
- IPP System Service (Ira/Mike)
  - Stable working draft in Q2/Q3 2018
- IPP Everywhere and Self-Certification v1.1 (Mike/Smith)
  - Prototype working drafts/beta tools in Q3/Q4 2018
- "A Safe G-Code Subset for 3D Printing" (Mike)
  - Stable draft in Q3 2018



# Next Steps (con't)

- MFD Alerts v1.1 (Ira/Mike/Smith - Errata Update)
  - Initial working draft in Q3/Q4 2018
- IPP Encrypted Jobs and Documents (Mike/Smith)
  - Prototype draft in Q1 2019
- IPP 3D Printing Extensions v1.1 (Mike)
  - As needed



# More Information

- We welcome participation from all interested parties
- IPP Working Group web page
  - <http://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, May 24, 2018 and June 7, 2018 at 3pm ET