



The Printer Working Group

IPP Workgroup Session

May 7, 2024



Before We Begin...

- PWG Antitrust Policy:
 - 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.
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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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- **This meeting is being recorded to assist in preparation of minutes but will not be published**



Agenda (1/2)

May 7, 2024 (US Eastern Standard Time)

When	What
10:00 - 12:00	OpenPrinting
12:00 - 12:45	Lunch Break
12:45 - 13:45	PWG Plenary
13:45 - 14:15	IPP WG: Status / Prototype-Ready Specifications
14:15 - 14:45	Break
14:45 - 15:30	IPP WG: 3D Printing
15:30 - 16:15	IPP WG: IPP System Service v1.1
16:15 - 17:00	IPP WG: IPP Shared Infrastructure Extensions v1.1



Agenda (2/2)

May 8, 2024 (US Eastern Standard Time)

When	What
10:00 - 12:00	IDS WG
12:00 - 12:45	Lunch Break
12:45 - 13:15	IPP WG: Strong Device Identity BoF
13:15 - 14:45	IPP WG: IPP Everywhere v2.0
14:45 - 15:00	IPP WG: Next Steps



- Current charter:
 - <https://ftp.pwg.org/pub/pwg/ipp/charter/ch-ipp-charter-20210409.pdf>
- Stable draft charter for 2024-2025:
 - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ipp-charter-20240309.pdf>
 - PWG Call for Objections ends May 10, 2024 (this Friday)
- 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 5100.6-2003 (IPP Page Overrides v1.0): 2 issues
- PWG 5100.8-2003 (IPP "-actuals" v1.0): 1 issue
- PWG 5100.9-2009 (IPP Printer State Extensions v1.0): 2 issues
- PWG 5100.15-2014 (IPP FaxOut v1.0): 2 issues
- PWG 5100.19-2015 (IPP Implementor's Guide v2.0): 8 issues
- PWG 5107.3-2019 (MFD Alerts v1.1): 1 issue

- **In-Progress:**

- PWG 5100.5-2019 (IPP Document Object v1.1): 4 issues
- PWG 5100.11-2010 (IPP JPS2/Enterprise Printing Extensions v1.0): 7 issues
- PWG 5100.12-2015 (IPP 2.0, 2.1, and 2.2): 2 issues
- PWG 5100.14-2020 (IPP Everywhere v1.1): 4 issues
- PWG 5100.18-2015 (IPP Shared Infrastructure Extensions v1.0): 8 issues
- PWG 5100.20-2020 (IPP Everywhere v1.1 Self-Cert): 1 issue
- PWG 5100.22-2019 (IPP System Service v1.0): 3 issues

IPP OAuth Extensions v1.0 (OAUTH)

- **Prototype draft:**
 - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippoauth10-20230814-rev.pdf>
- **Goals:**
 - Define/reference best practices for using OAuth/OpenID with IPP
 - Prototype/deploy OAuth/OpenID support for printing
- **Prototyping Status:**
 - OAuth (JWT) and X.509 support code is available in libcups v3 and CUPS 2.5
 - <https://github.com/OpenPrinting/cups/tree/master>
 - <https://github.com/OpenPrinting/libcups/tree/master>
 - <https://github.com/OpenPrinting/cups-local/tree/master>
 - <https://github.com/OpenPrinting/cups-sharing/tree/master>
- **Proposed Schedule:**
 - Stable draft Q3 2024



IPP Encrypted Jobs and Documents v1.0 (TRUSTNOONE)

- **Prototype draft:**
 - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ipptrustnoone10-20210519.pdf>
- **Goals:**
 - Provide end-to-end privacy and integrity of IPP Job/Document attributes and Document data, even through intermediaries
- **Prototyping status:**
 - Initial support code started in libcups project (not complete, needs refactoring)
 - <https://github.com/OpenPrinting/libcups/tree/smime>
- **Proposed schedule:**
 - Stable draft Q4 2024

Other Working Drafts

- IPP Document Object v1.2 (DOCOBJECT):
 - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippdocobject12-20240301.pdf>
 - Stable draft, ready for PWG Call for Objections
- IPP Wi-Fi Configuration Extensions v1.0 (WIFI):
 - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippwifi10-20240102.pdf>
- Internet Printing Protocol/2.x Fourth Edition (BASE):
 - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippbase23-20220809.pdf>
- ACME-Based Provisioning of IoT Devices:
 - <https://datatracker.ietf.org/doc/draft-sweet-iot-acme/>
 - Currently awaiting decision from IETF Area Directors



The Printer Working Group

Break

May 7, 2024

IPP workgroup resuming at 14:45pm ET

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)
 - PWG 5199.7-2019: PWG Safe G-Code Subset for 3D Printing v1.0
- How to explain these specifications to 3D vendors?
 - Update 3D Printing page to reference the How to Use the Internet Printing Protocol book?
 - Add use cases?
 - Other thoughts?

3D Meetings (1/2)

- Drupa - May/June 2024
 - https://www.drupa.com/en/Media_News/Press/Press_Material/Press_releases/drupa_next_age_Platform_for_networking_and_new_business
 - We have been invited to prepare a presentation looking at how standardization may shape future directions in Additive Manufacturing for the Drupa Next Age stage
 - The Drupa representative is interested in hearing whether Microsoft might be willing to participate in a PWG sponsored panel discussion focusing on the potential benefits Microsoft sees in possibly converting its 3D Printer support in Windows OS to an IPP class driver concept.
 - In the last SC meeting, Smith Kennedy suggested he felt this type of presentation would need to be supported by some PWG use cases that would need to be developed.
 - Q: Is this something PWG membership wants to do?

3D Meetings (2/2)

- TCT 3Sixty Conference - June 2024
 - <https://tct3sixty.com/>
 - We have been invited to submit an abstract on any of the following Additive Manufacturing topics:
 - Construction & Architecture - Safe G-Code for sharing test files
 - Standards & Repeatability - Use aspects of IPP suite of standards to develop cloud to device secure remote job submission option for production class additive manufacturing devices
 - IP & Security - Common Criteria for Additive Manufacturing
 - Q: Is this something we want to do?
 - If so, it is due by December 8th, 2023



IPP Shared Infrastructure Extensions v1.1 (INFRA)

- Initial draft:
 - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippinfra11-20240102-rev.pdf>
- Errata update of PWG 5100.18-2015:
 - Fixed typos
 - Updated references
 - Reference OAUTH and SYSTEM specifications
 - Sync up with EPX - Release Printing and Proof Printing
- Proposed schedule:
 - Prototype draft Q1 2024



IPP System Service v1.1 (SYSTEM)

- Initial draft:
 - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippsystem11-20240214-rev.pdf>
- Errata update of PWG 5100.22-2019:
 - Fixed typos
 - Updated references
 - Merged System Service Discovery registration content
 - Added Register-Output-Device extensions for X.509 authentication
- Proposed schedule:
 - Prototype draft Q1 2024



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13:15 - 14:45	IPP WG: IPP Everywhere v2.0
14:45 - 15:00	IPP WG: Next Steps

Strong Device Identity BoF

- Who needs it?
- Trust on First Use (TOFU)
- Strong Device Identity vs. Device Attestation
- Home Networks and Trust
- Use Cases
- Examples:
 - Matter
 - IEEE 802.1AR / TPM

Strong Device Identity – Who needs it?

- Increasing need for robust trust establishment now includes the home and small business environments
 - Zero Trust Networks
 - Hybrid work environments driving this into the home, but still using enterprise (awkward) workflows
 - Growth of IoT is creating a second more trustworthy "realm" within a home network
- Legacy trust establishment (self-signed certificates / TOFU / certificate pinning) nearing threshold of unacceptability
 - Trust on First Use has no system for initial validation
- Printers are either basically untrusted or have trust established using "enterprise" credential provisioning, which is awkward and unwieldy for home / SMB market segment

Trust on First Use

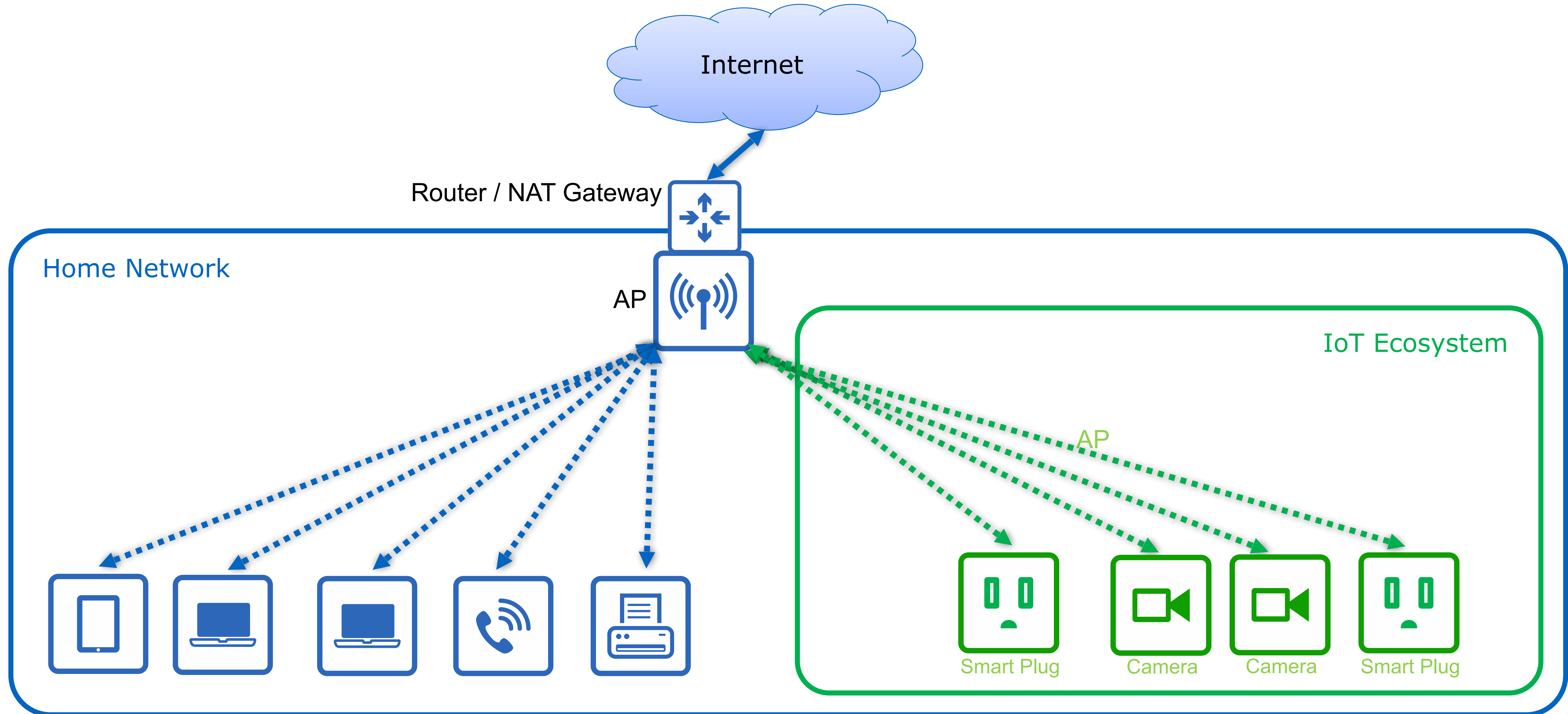
- Device joins network
- Client connects to Device via TLS
 - If the device is unrecognized (no entry in cache for whatever identifying keys are used), cache TLS server cert for that device and trust it***
 - If the device is recognized and the cert hasn't changed, continue to trust it
 - If the device is recognized but the certificate has changed, suspend trust and request user intervention

***** Validation in a web browser is awkward; most print systems trust with no validation**

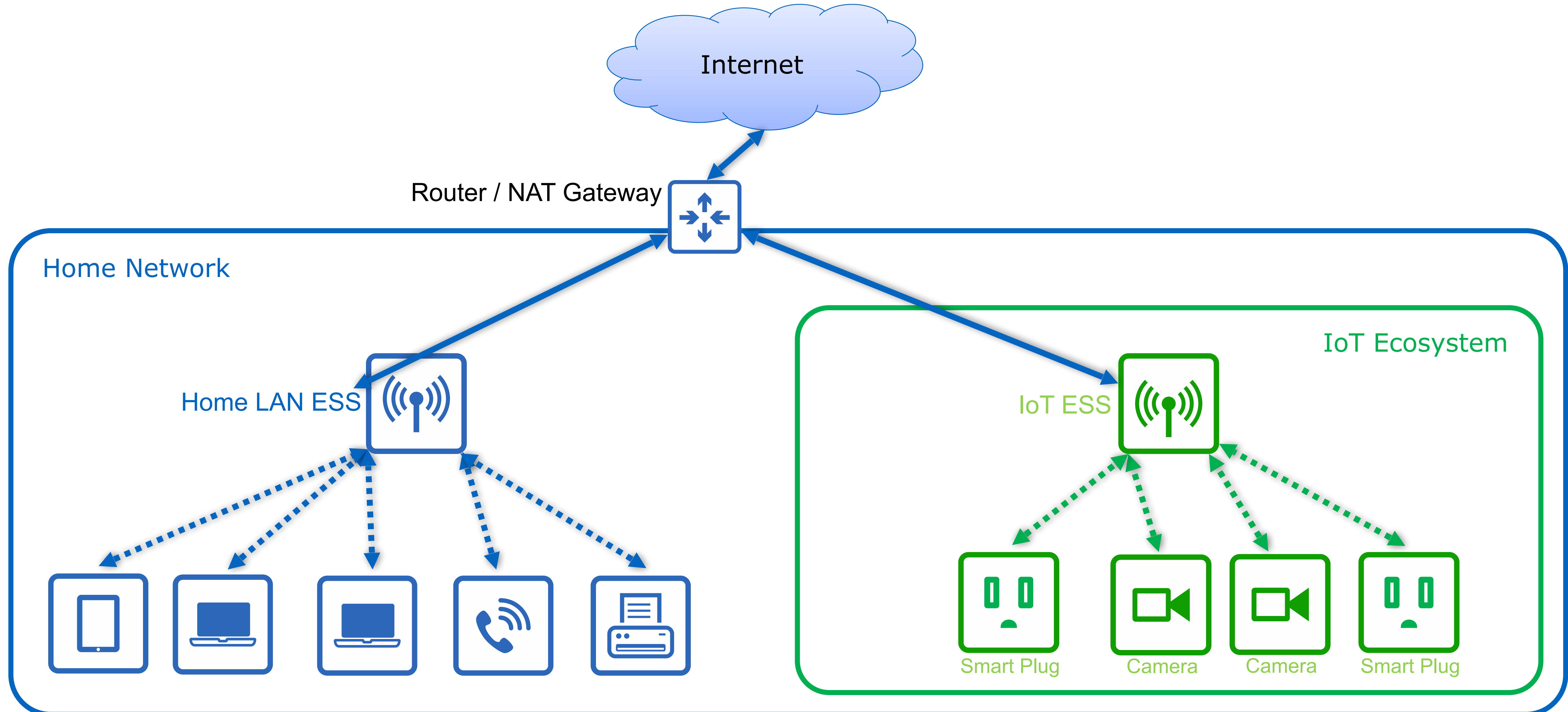
Strong Device Identity vs. Device Attestation

- What is the difference?
- Device Identity: Verifiable individual identity and manufacturer identity
- Device Attestation: Device Identity + verifiable device health assertions (software / firmware is unaltered)

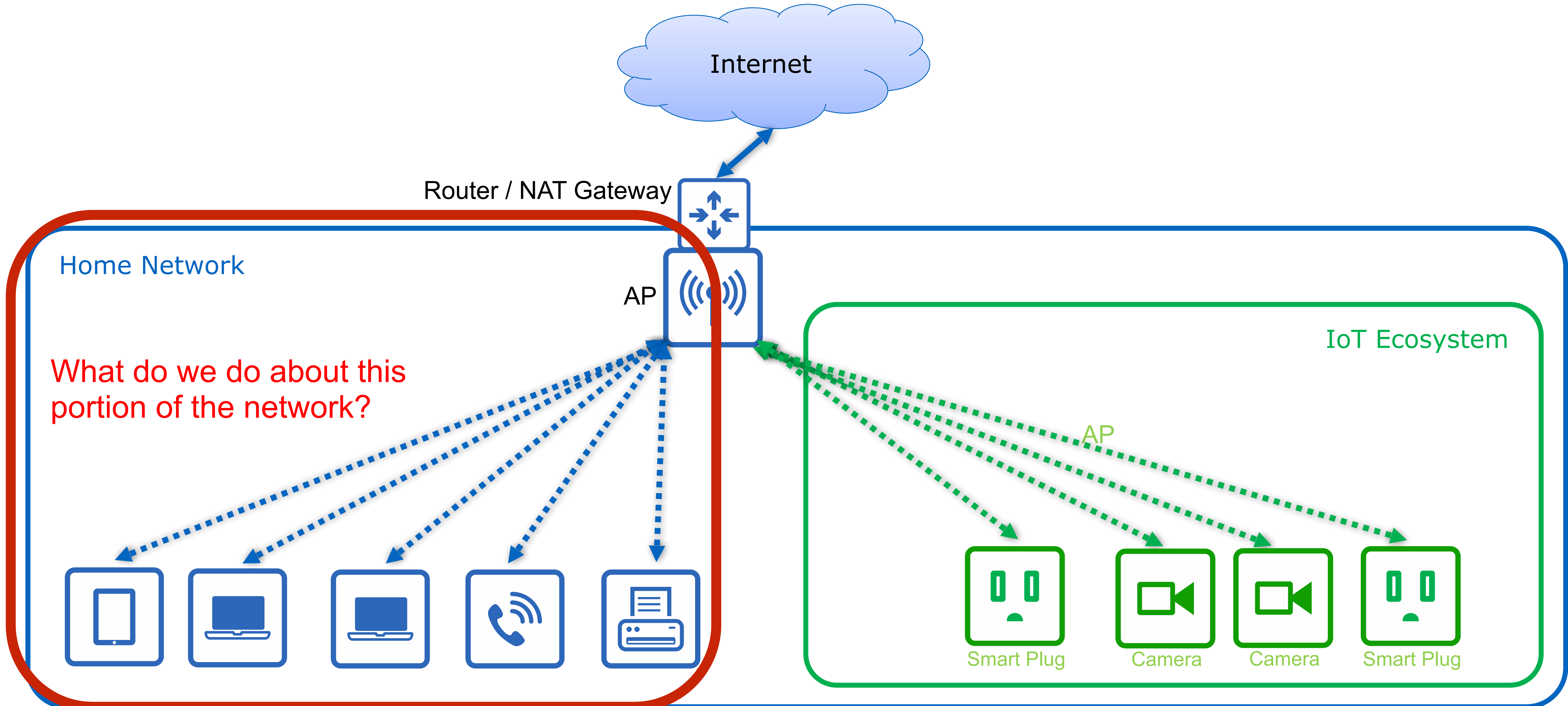
Home Network



Home Network



Home Network





- User is a home owner who buys a printer and attaches it to their network via an Ethernet cable. A Network Manager daemon running on the User's home router notifies the agent app on the User's phone that a new device has been added to the network, indicating that it will be isolated until the Printer's identity and assertions of health have been validated, and requests approval to perform the validation. The User approves the offer. The Network Manager performs the validation, which succeeds. The User points their laptop's browser at the Printer to configure some settings, and the browser trusts the Printer because it is now holding a TLS certificate issued by a CA associated with that network.

Matter IoT Device Attestation

- Taken from the new Matter Handbook:
 - <https://handbook.buildwithmatter.com/howitworks/attestation/>
- During the commissioning process, a device cryptographically proves (attests) to the commissioner that:
 - it is a genuine product
 - it is a product that passed Matter compliance tests and has been thus certified by CSA.
- In order to accomplish those goals, the device carries:
 - A Device Attestation Certificate (DAC) that conveys device's manufacturer ID (VID) and product ID (PID). The DAC chains up to a set of trusted roots, approved by CSA members.
 - A securely-stored, private key associated with the public key stored in the DAC that proves the device owns this unique certificate.
- Certificate declaration is a statement cryptographically signed by CSA that states that a tuple (VID,PID) has passed Matter compliance tests.

- **IEEE 802.1AR-2018**
 - C.2 DevID uses in consumer devices
 - End users are not expected to directly use the IEEE 802.1AR device identity. Instead the DevID is expected to be used by a home networking access point or router. These devices provide network connectivity to all devices on the home network and also provide security mechanisms such as passwords or Web-based authentication.
 - Often routers and access points also include a mechanism for limiting which devices can join the network through configuration of a list of allowed MAC addresses or other device identifying information. The IEEE 802.1AR device identity can be used as a secure form of identity for these purposes. Vendors that include human readable identity information within the DevID subject field, or use a machine readable serialNumber attribute, or the subjectAltName hardwareModuleName, can provide integrated solutions with interfaces that are both more user-friendly and more secure than current MAC address-based solutions.

IPP Everywhere v2.0

- **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
- **Prototyping Status:**
 - Mostly in shipping printers; dependent specifications are prototyped separately
- **Proposed Schedule:**
 - Stable draft Q4 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
- Prototyping Status:
 - Mike is working on updates to the ippeveselfcert repository
 - <https://github.com/istopwg/ippeveselfcert/tree/flutter>
 - Nothing to test yet
- Proposed Schedule:
 - Prototype draft and beta tools Q4 2023



The Printer Working Group

Next Steps

Next Steps (1/2)

- Internet Printing Protocol/2.x Fourth Edition (Mike)
 - Stable draft in Q2 2024
- IPP Document Object v1.2 (Mike)
 - PWG Call for Objections ASAP
- IPP Encrypted Jobs and Documents v1.0 (Mike/Smith)
 - Stable draft in Q4 2024
- IPP Everywhere v2.0 (Mike)
 - Stable draft in Q2 2024
- IPP Everywhere Printer Self-Certification Manual v2.0 (Mike)
 - Prototype draft in Q2 2024
- IPP OAuth Extensions v1.0 (Mike/Piotr)
 - Stable draft in Q2 2024

Next Steps (2/2)

- **IPP Shared Infrastructure Extensions v1.1 (Mike)**
 - Prototype draft in Q2 2024
- **IPP System Service v1.1 (Mike)**
 - Prototype draft in Q2 2024
- **IPP Wi-Fi Configuration Extensions v1.0 (Mike)**
 - Stable draft in Q2 2024



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, May 23 and June 6, 2024 at 3pm ET