



# The Printer Working Group

IPP Workgroup Session

May 18, 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:**
  - [https://www.pwg.org/chair/membership\\_docs/pwg-ip-policy.pdf](https://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 Document
  - (but please do read the IP policy above if you haven't done so)

# Agenda (1/2)



## May 18, 2022 (US Eastern Daylight Time)

When	What
10:00 - 11:00	CUPS Plenary
11:00 - 12:00	Printer Applications, Retrofitting
12:00 - 12:45	Lunch
12:45 - 13:45	cups-filters, CUPS Snap, Driverless Scanning
<b>13:45 - 14:15</b>	<b>IPP WG: Status</b>
14:15 - 14:45	Break
14:45 - 15:00	IPP WG: 3D Printing
15:00 - 15:30	IPP WG: Understanding 3D PDF
15:30 - 16:00	IPP WG: Rendering 3D Content Into 2D Contexts

# Agenda (2/2)



## May 19, 2022 (US Eastern Daylight Time)

When	What
10:00 - 11:45	IPP WG: IPP/2.0 and IPP Everywhere 2.0
11:45 - 12:00	IPP WG: Next Steps
12:00 - 12:45	Lunch
12:45 - 14:45	IDS WG: Status and Discussion



# The Printer Working Group

OpenPrinting

CUPS Plenary

Printer Applications

Retrofitting Printer Applications



# The Printer Working Group

Lunch Break

*Resuming at 12:45pm ET*



# The Printer Working Group

OpenPrinting

cups-filters

CUPS Snap

Driverless Scanning



- 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 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 v3.0



- 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 Finishings v3.0 - Formal Vote
  - IPP Production Printing Extensions v2.0 - Prototype
- Recently published:
  - 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>
  - 768 **854** 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 5100.7-2019 (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 5100.15-2014 (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 5100.12-2015 (IPP 2.0, 2.1, and 2.2): 2 issues
- PWG 5100.13-2012 (JPS3 - Driverless Printing): 15 issues



# 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-ipptrustnoone10-20210428.pdf>
- IPP Enterprise Printing Extensions v2.0 (EPX)
  - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippepx20-20211101.pdf>
- IPP Production Printing Extensions v2.0 (PPX)
  - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippppx20-20211020.pdf>
  - Prototyping has begun in the ippsample project

# Stable Specifications



- IPP Finishings v3.0 (FIN)
  - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippfinishings30-20220408.pdf>
  - Prototyped in ippsample project
  - **PWG Formal Vote ends May 27, 2022**

# "ACME-Based Provisioning of IoT Devices"



- Interim (early) draft in IETF IoT Operations WG:
  - <https://datatracker.ietf.org/doc/draft-sweet-iot-acme/>
- Abstract:
  - This document extends the Automatic Certificate Management Environment (ACME) [RFC8555] to provision X.509 certificates for local Internet of Things (IoT) devices that are accepted by existing web browsers and other software running on End User client devices.
- Goal is to eliminate scary browser security warnings when accessing embedded web servers
- Adds a trusted ACME service to local networks that can be discovered via DHCP and/or DNS-SD (traditional DNS, not mDNS)
  - Local x.509 root certificate ("trust anchor") can be self-signed or CA-signed for an organization
  - Self-signed roots need to be added to browser/OS trusted certificates while connected to that network

# ACME on the Web



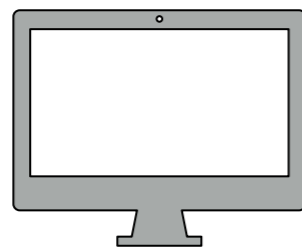
www.example.com

letsencrypt.org

Internet

LAN

Router



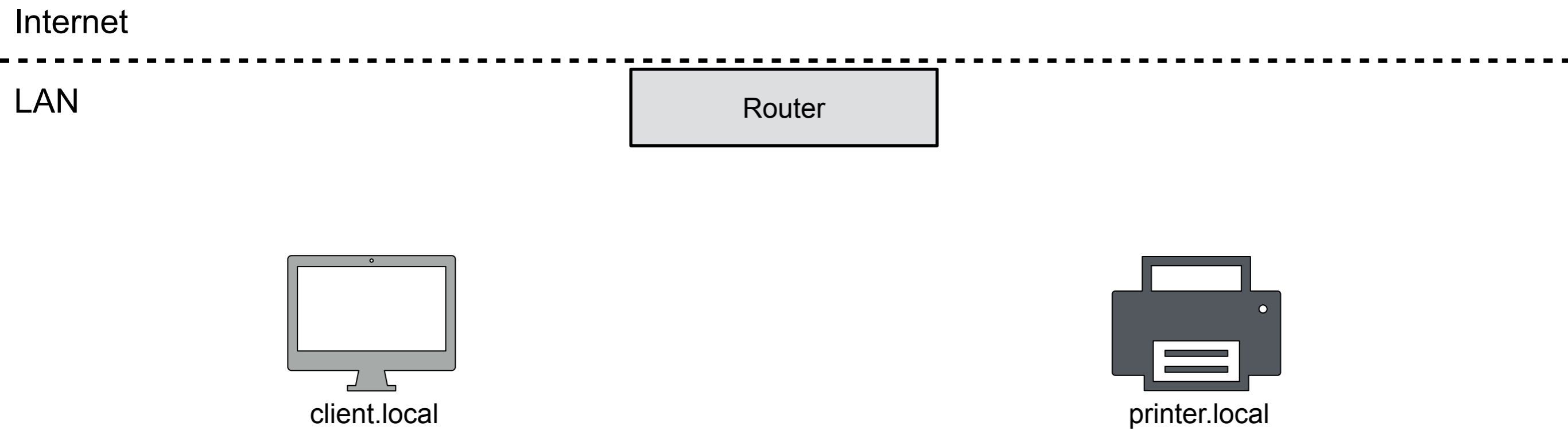
client.local



printer.local



# ACME on the Web

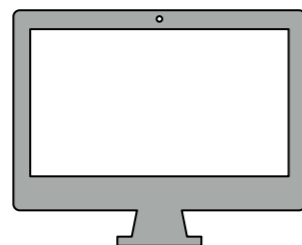
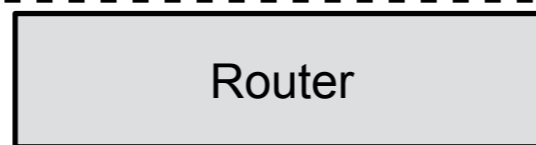


# ACME on the Web



Internet

LAN



client.local



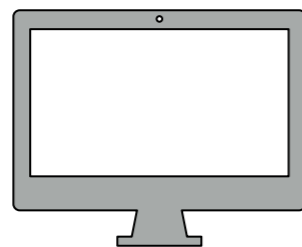
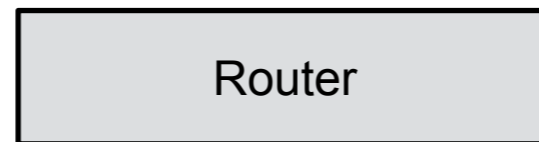
printer.local

# ACME on the Web



Internet

LAN

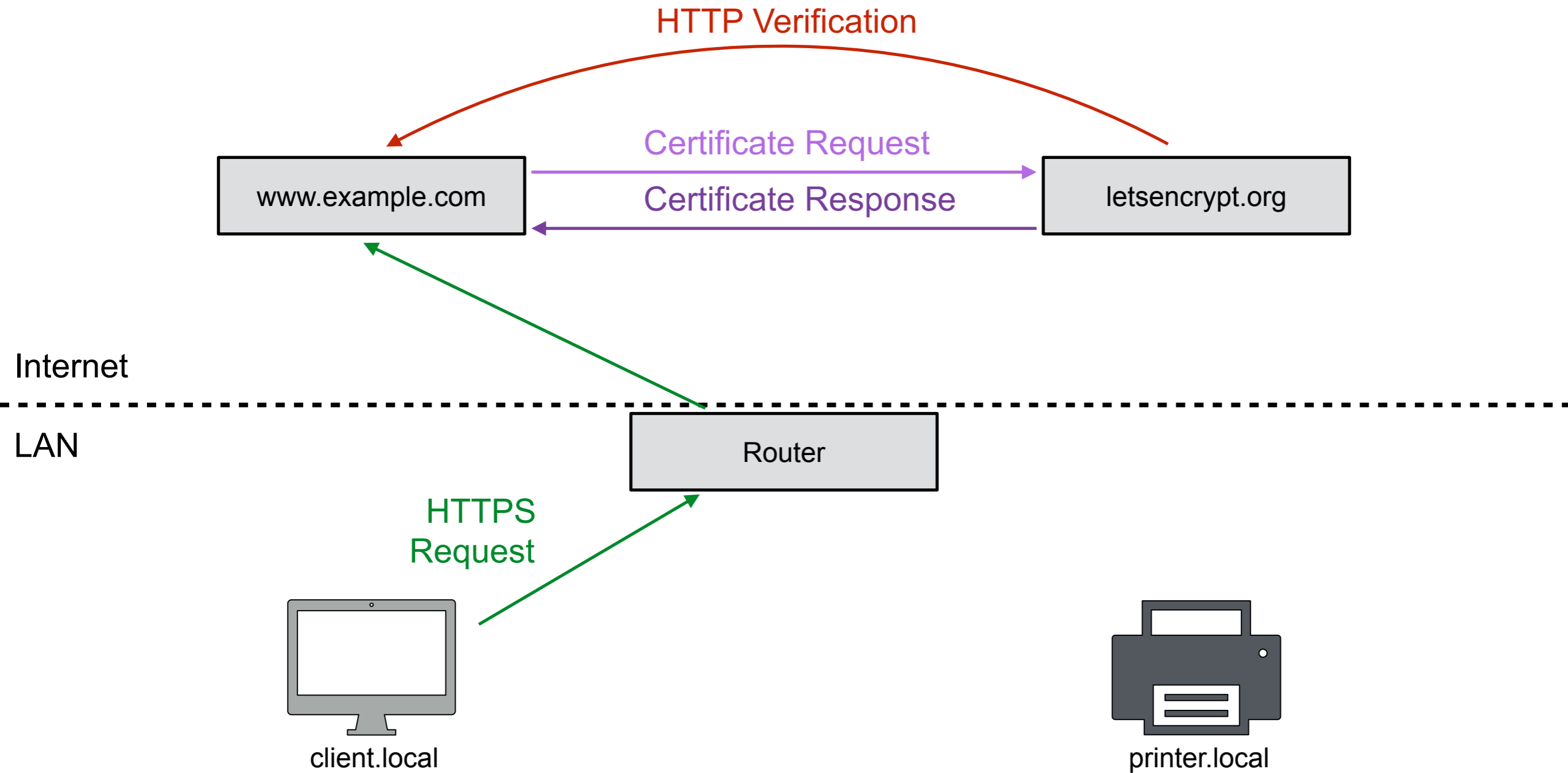


client.local

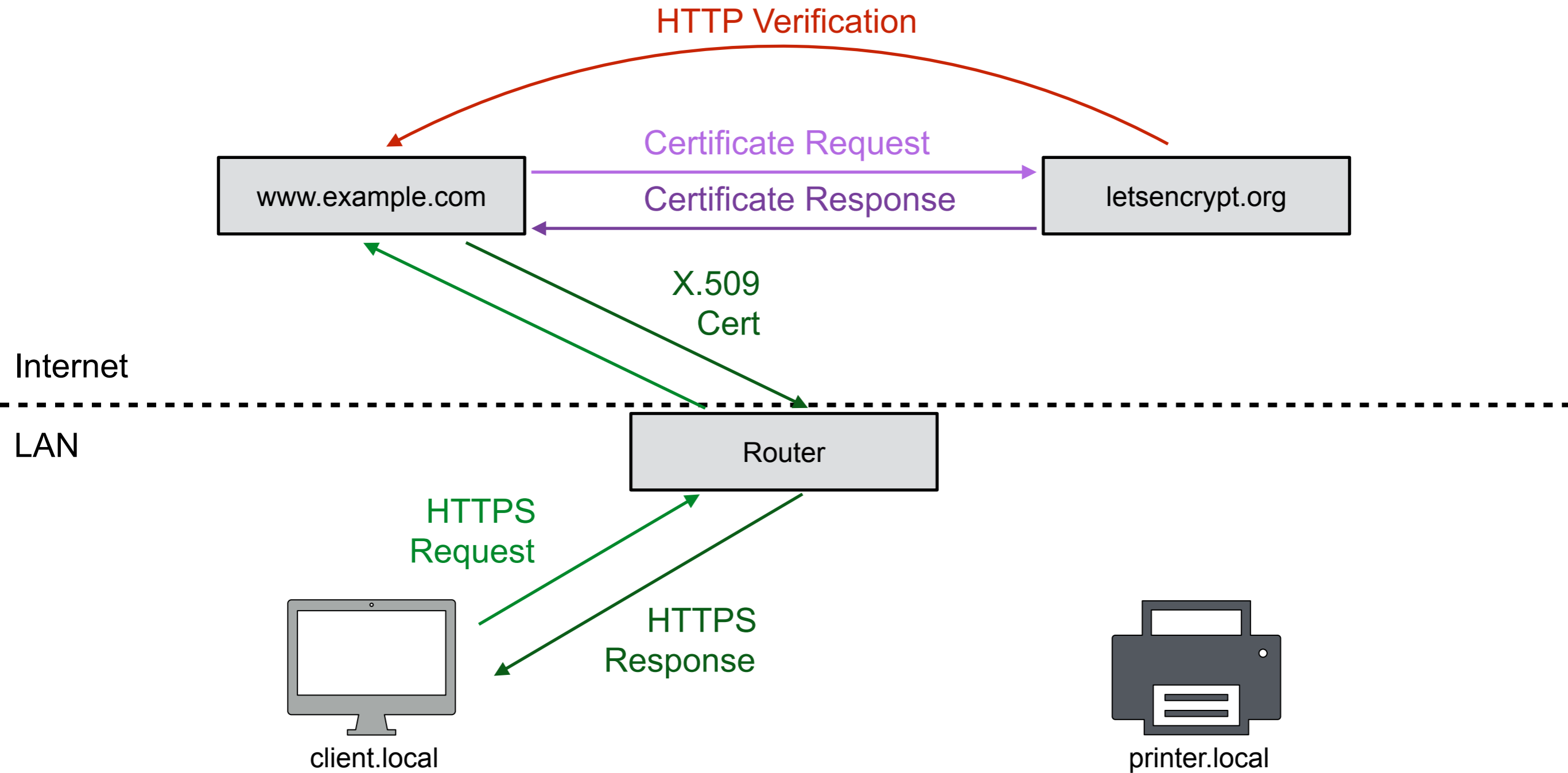


printer.local

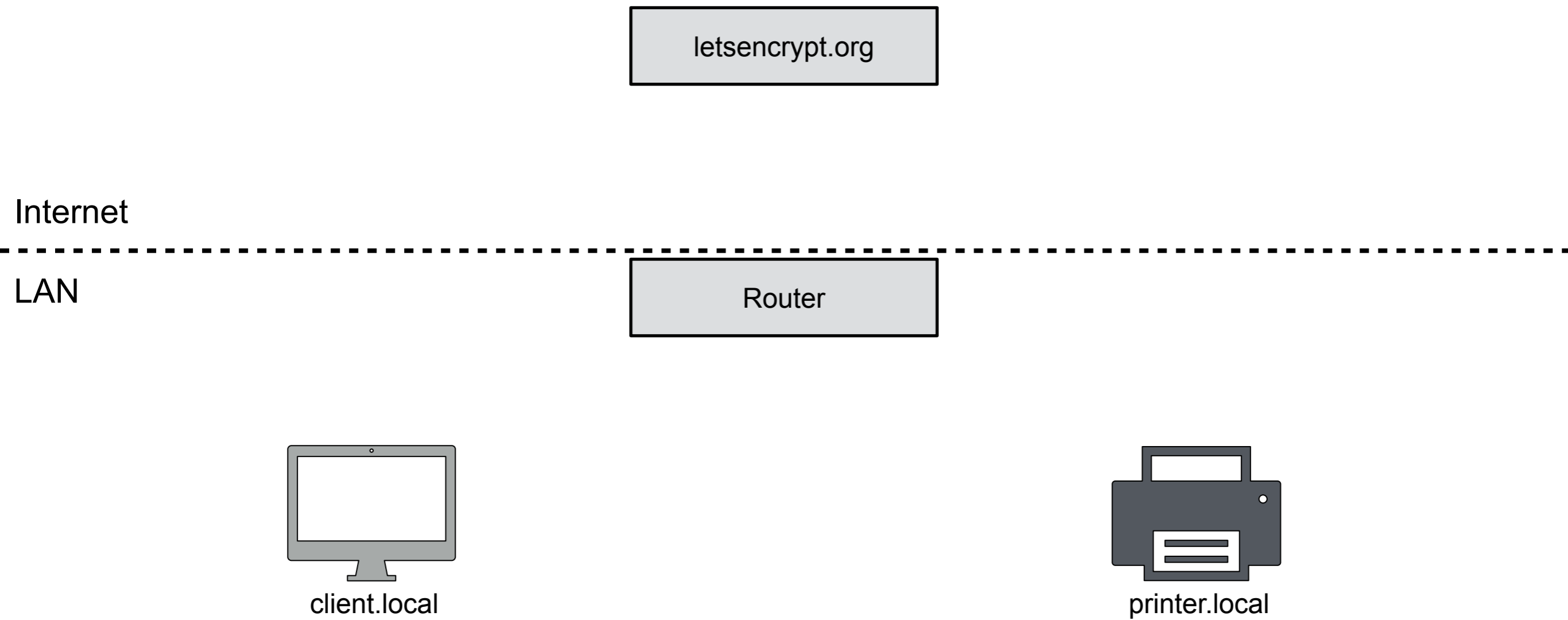
# ACME on the Web



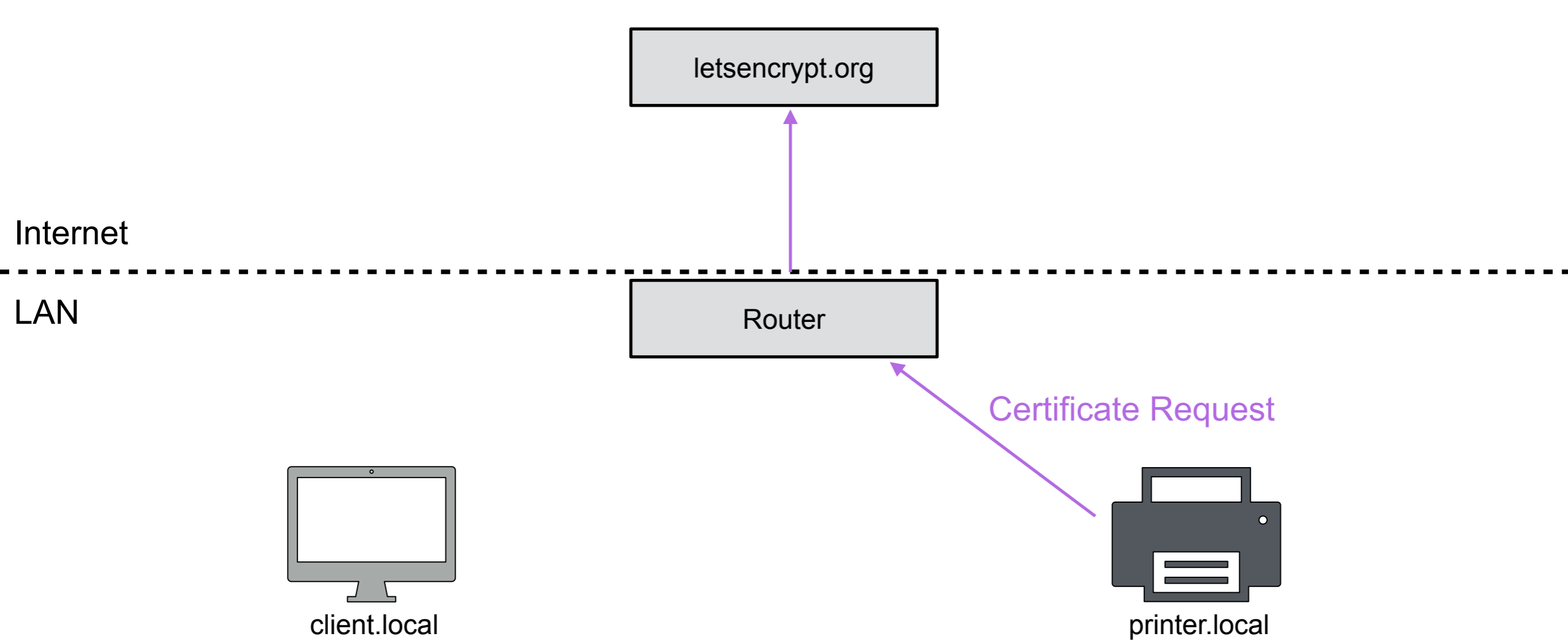
# ACME on the Web



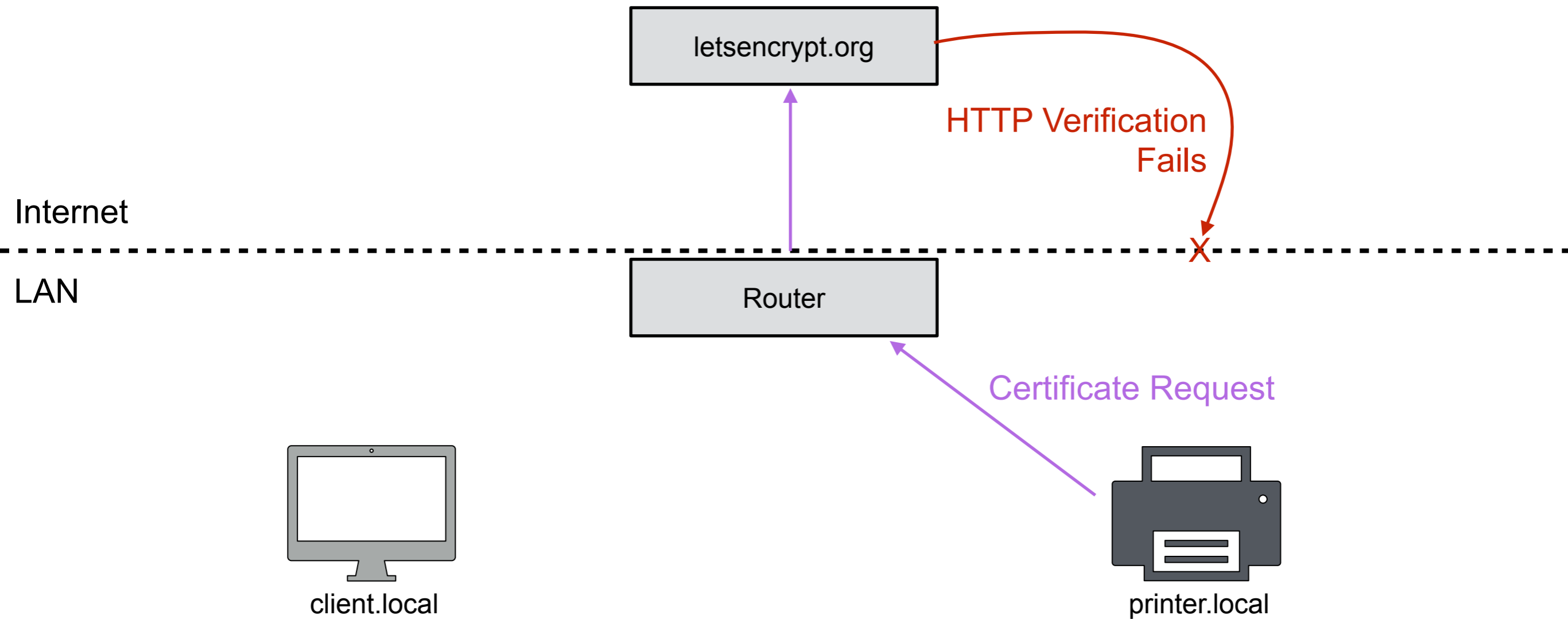
# ACME for IoT



# ACME for IoT

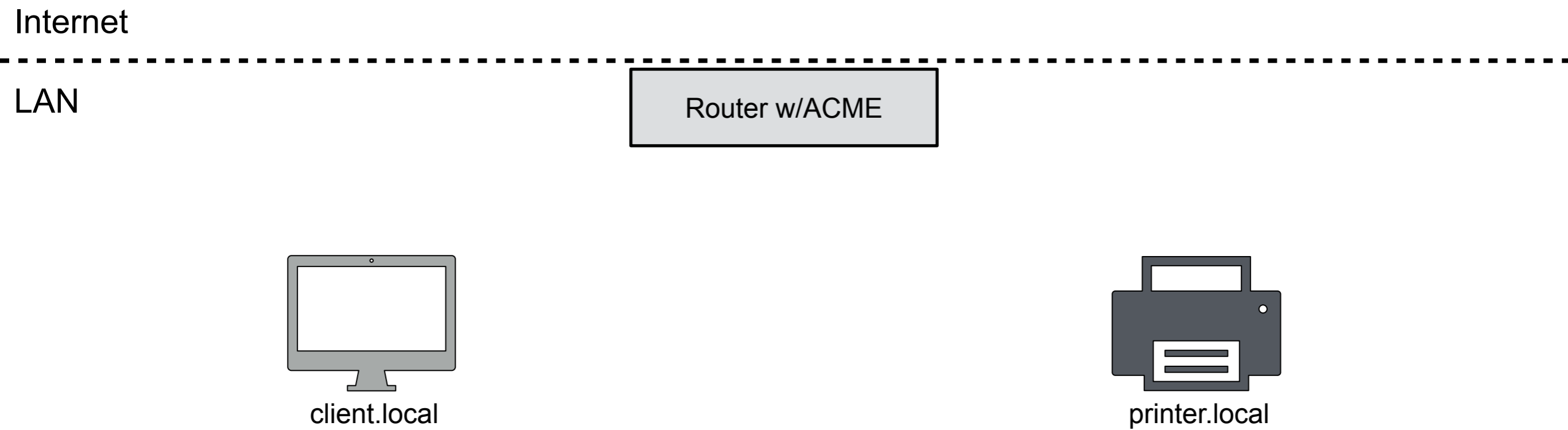


# ACME for IoT

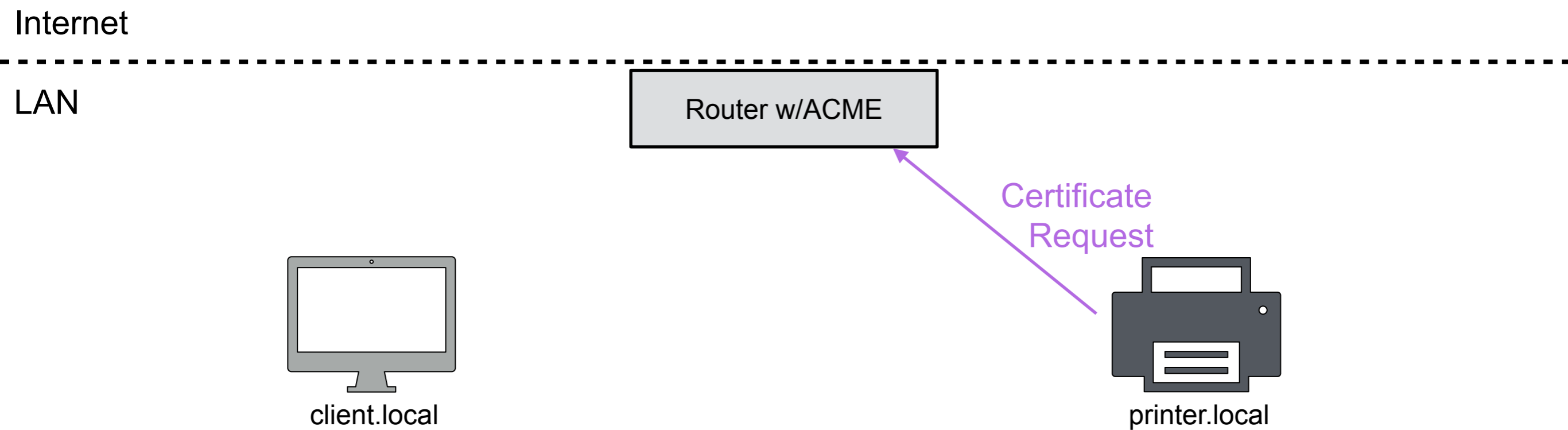




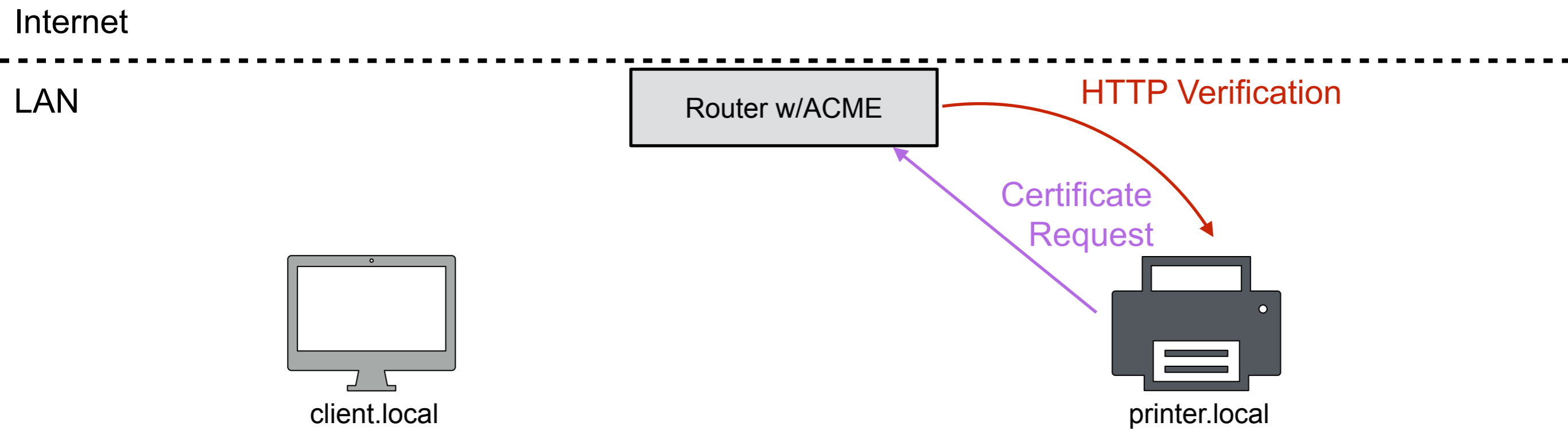
# ACME for IoT



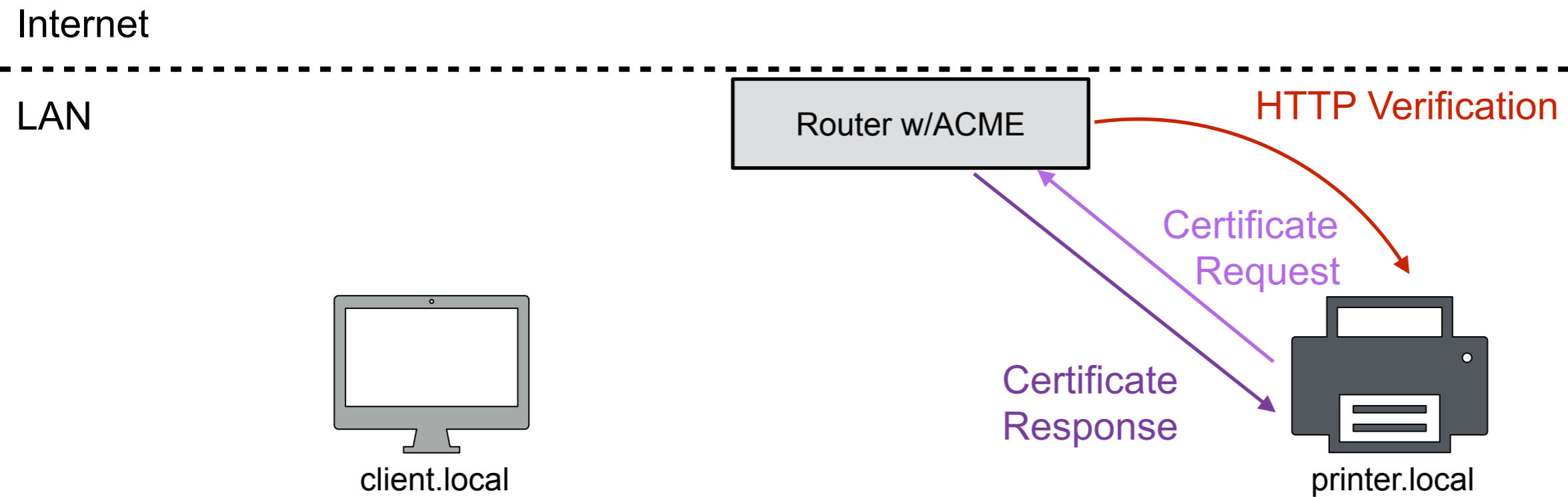
# ACME for IoT



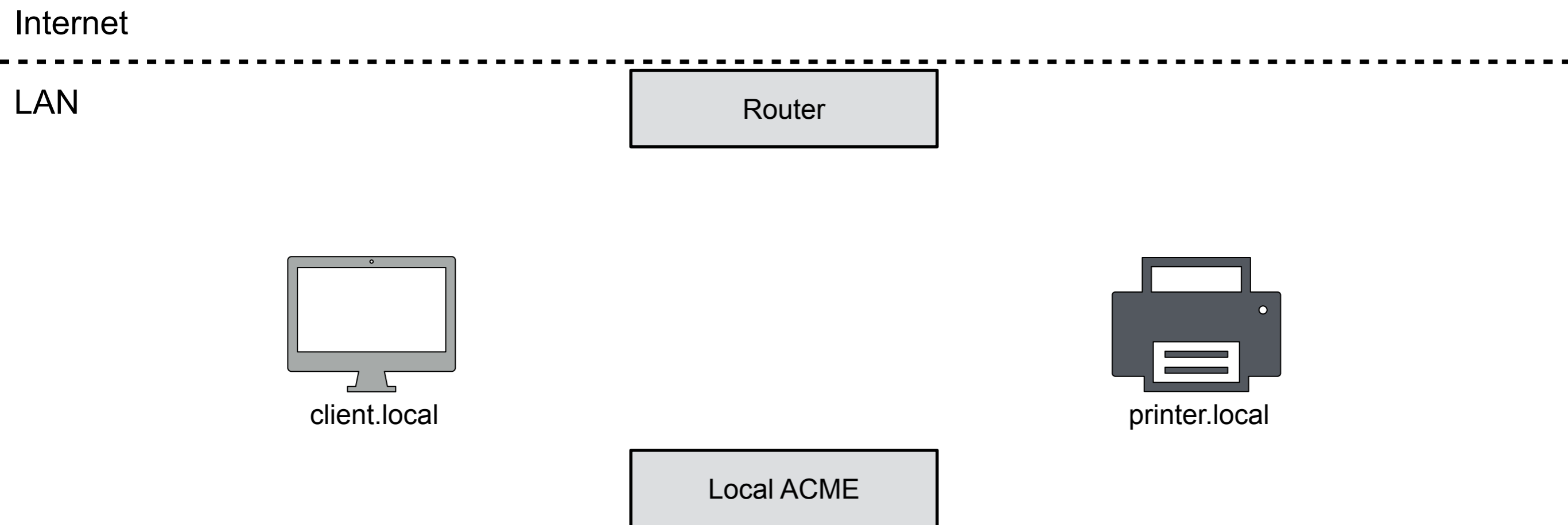
# ACME for IoT



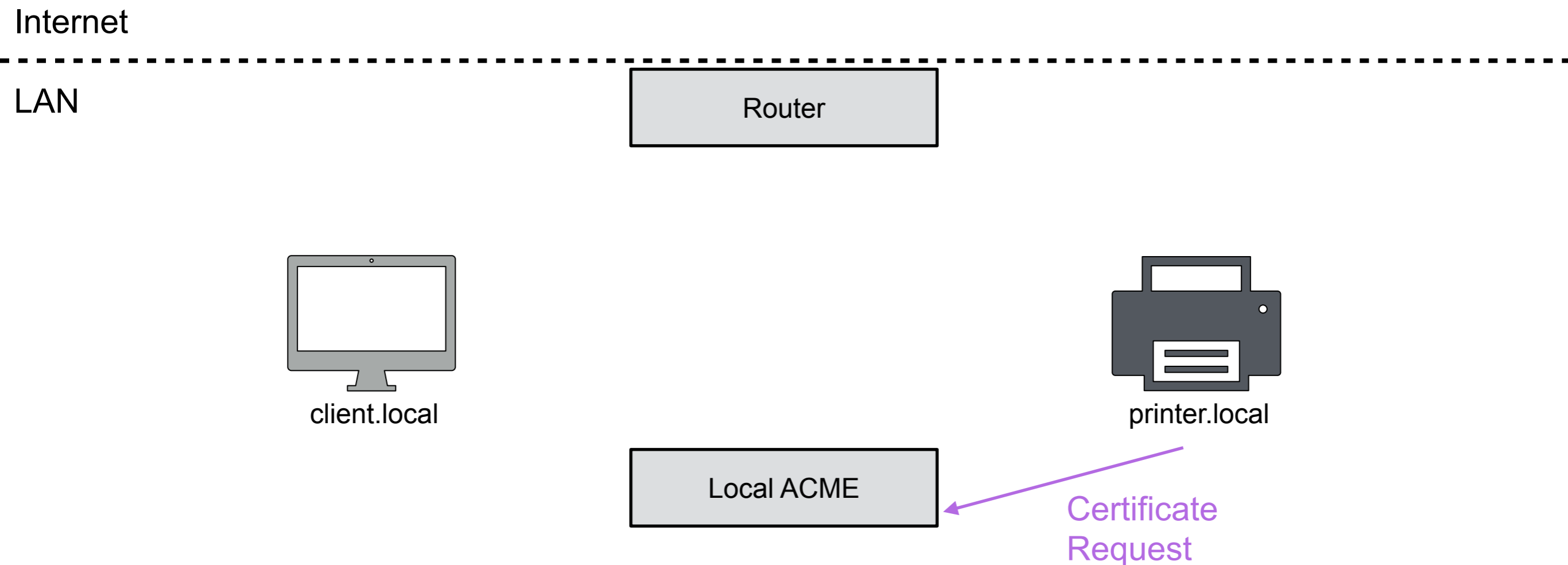
# ACME for IoT



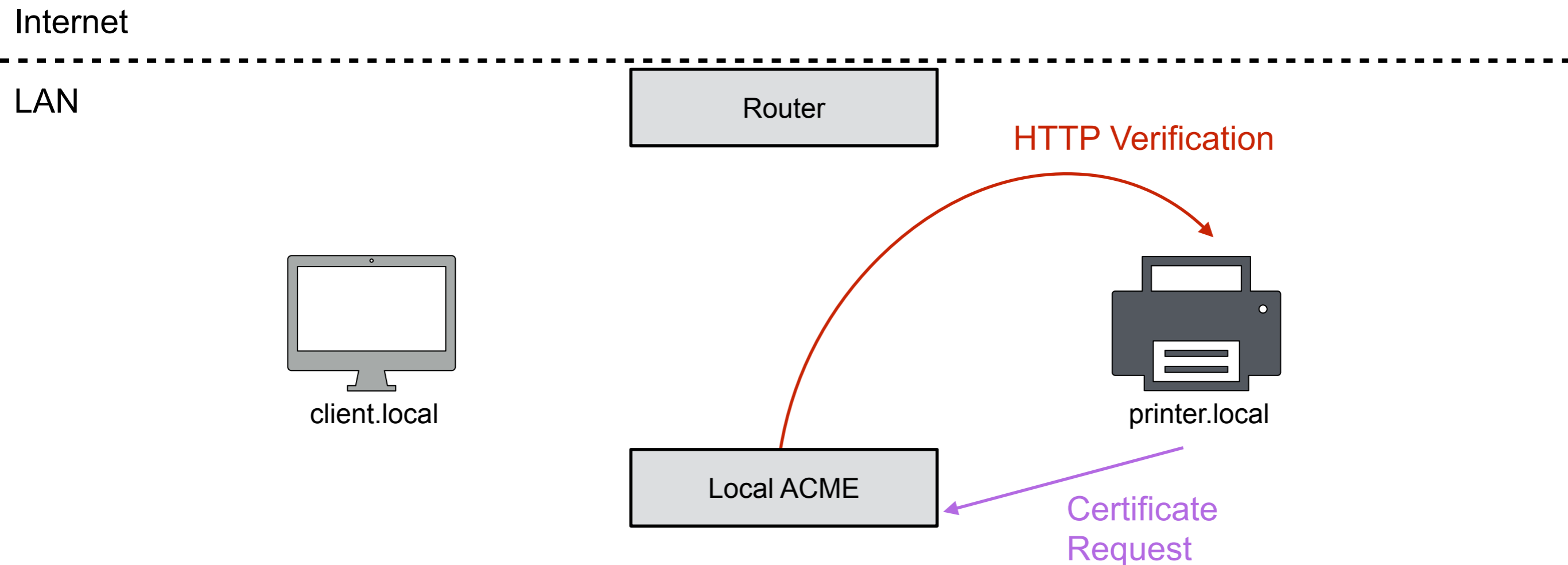
# ACME for IoT



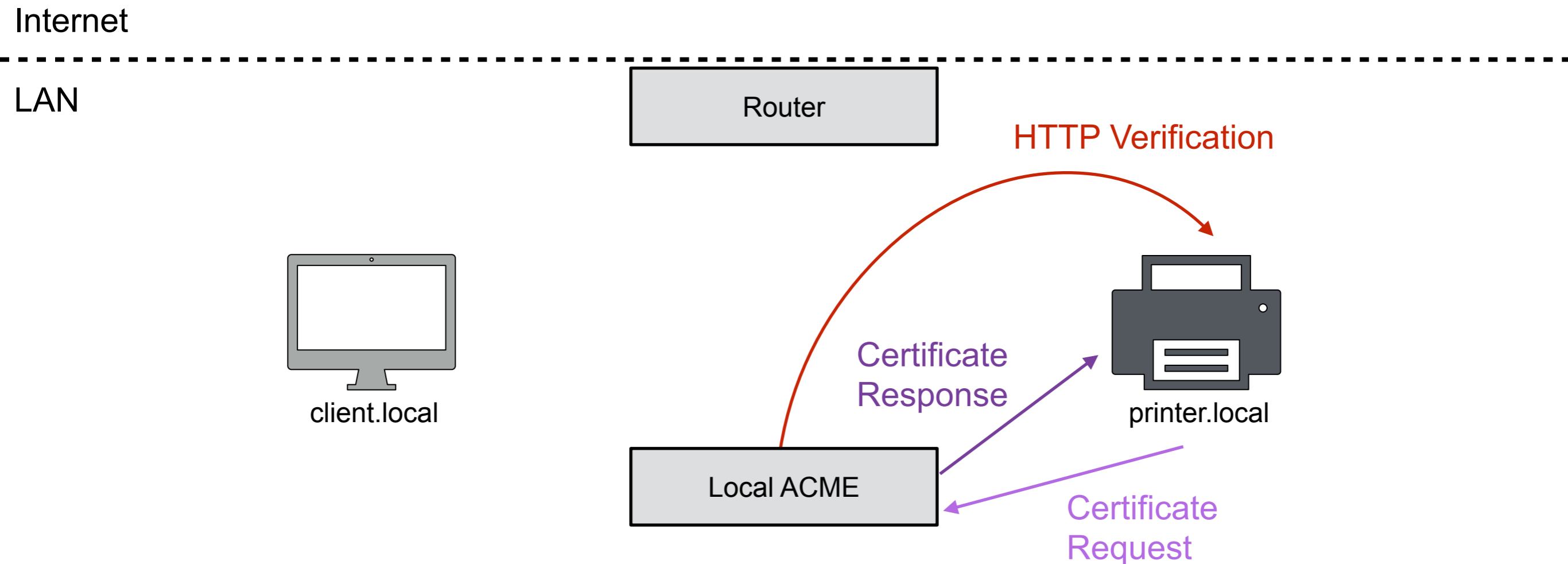
# ACME for IoT



# ACME for IoT



# ACME for IoT



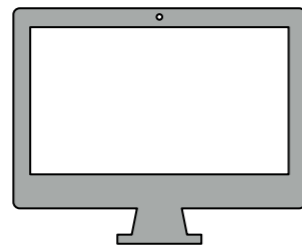


# Local ACME Discovery



Internet

LAN



client.local

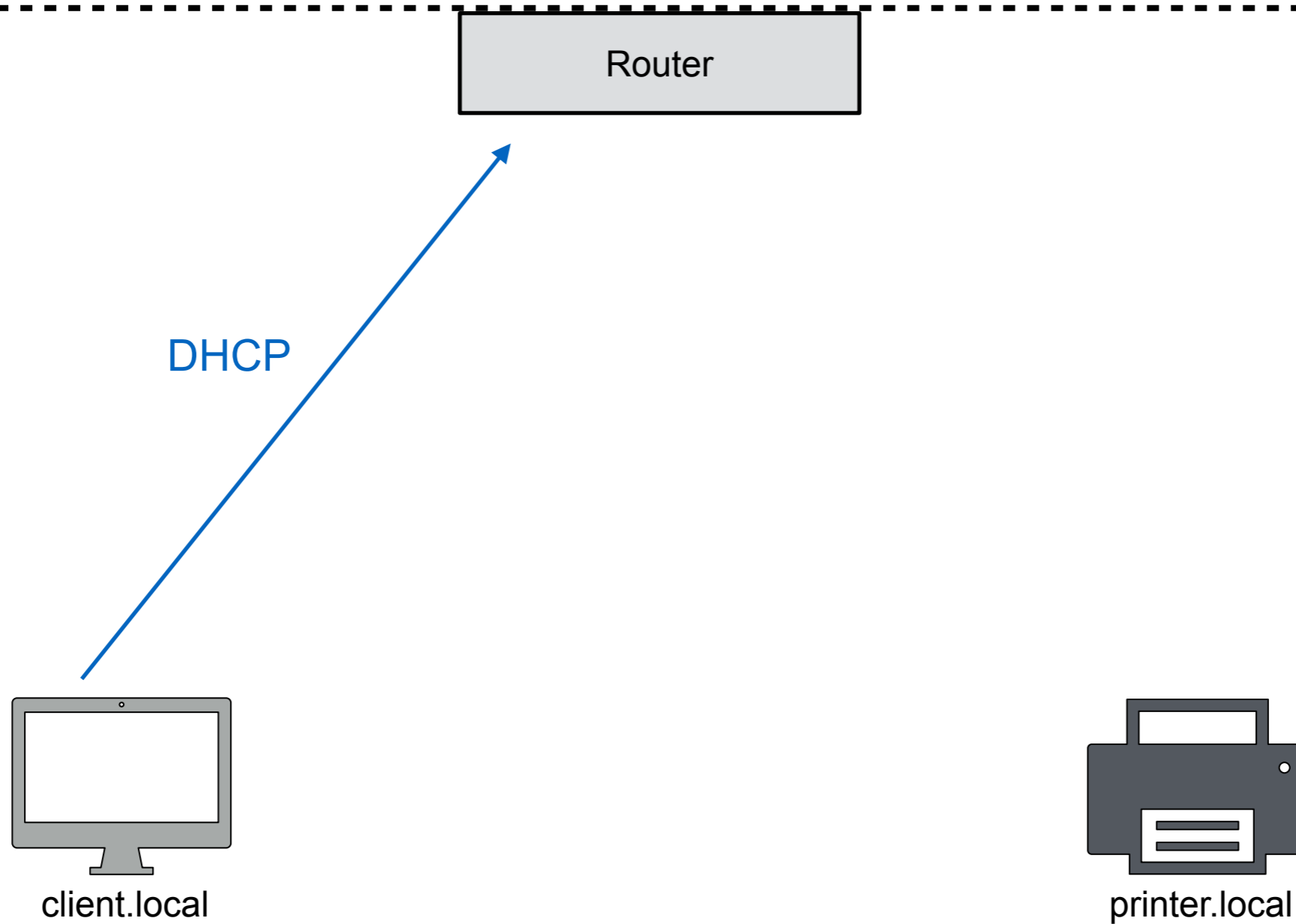


printer.local

# Local ACME Discovery

Internet

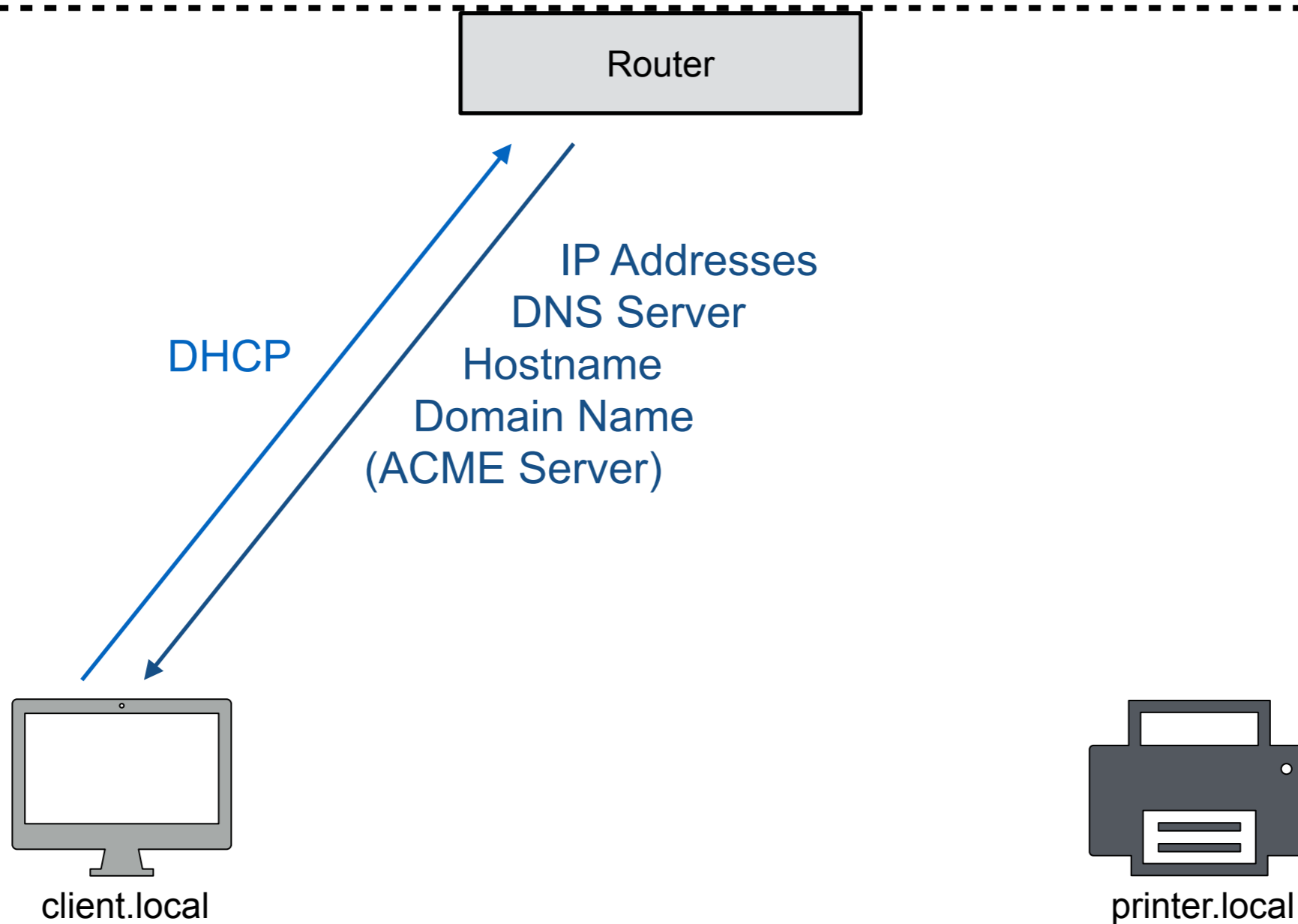
LAN



# Local ACME Discovery

Internet

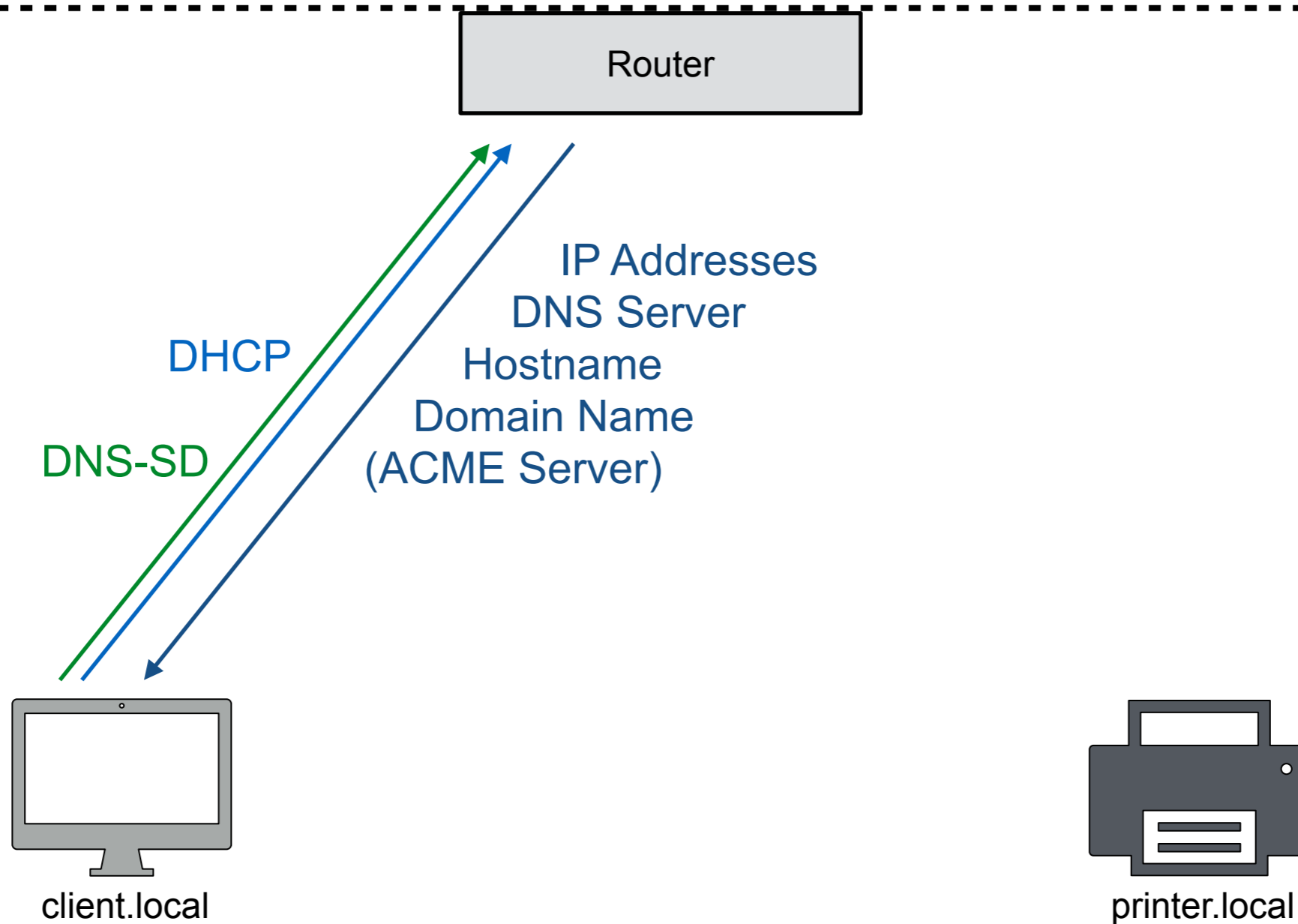
LAN



# Local ACME Discovery

Internet

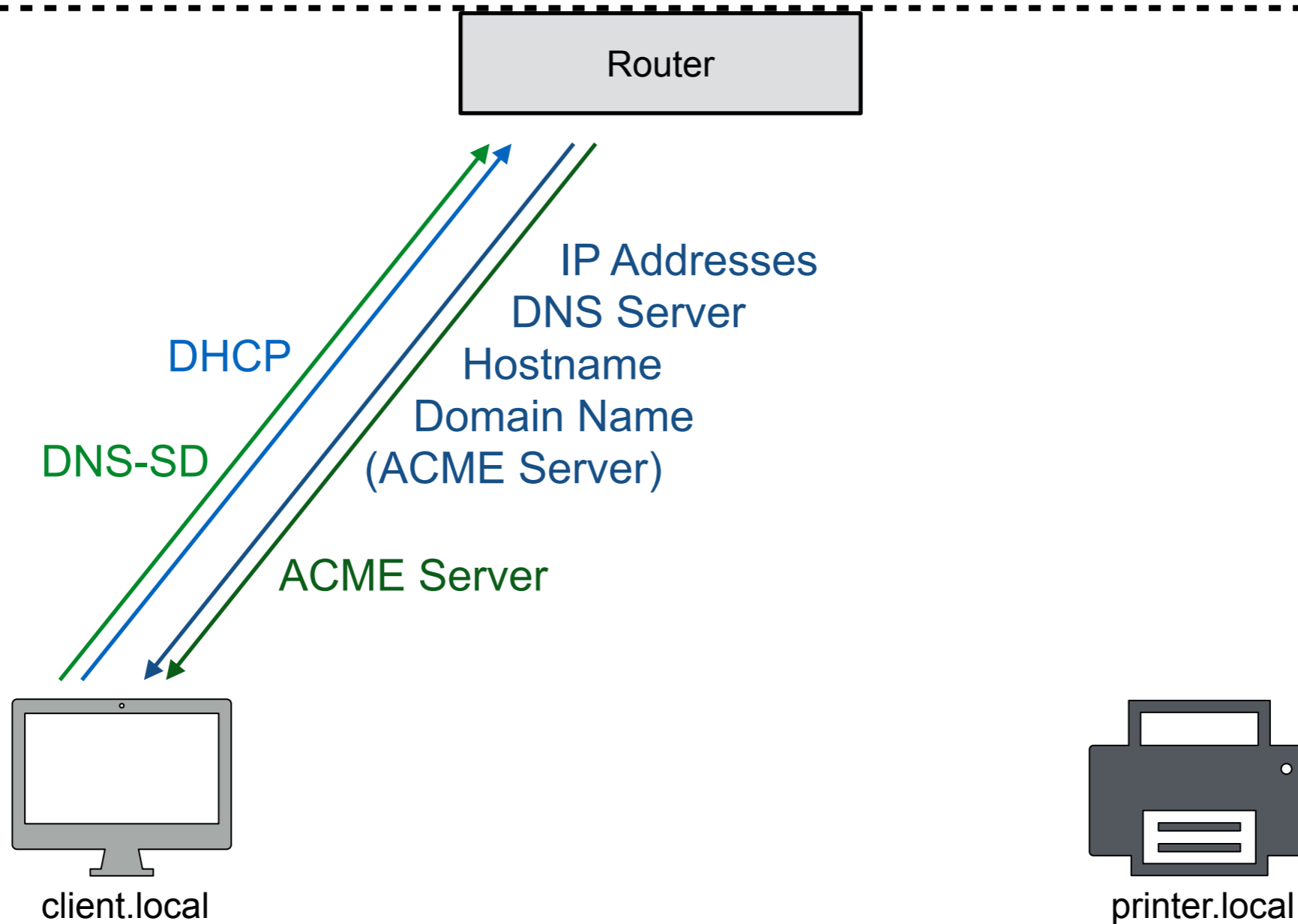
LAN



# Local ACME Discovery

Internet

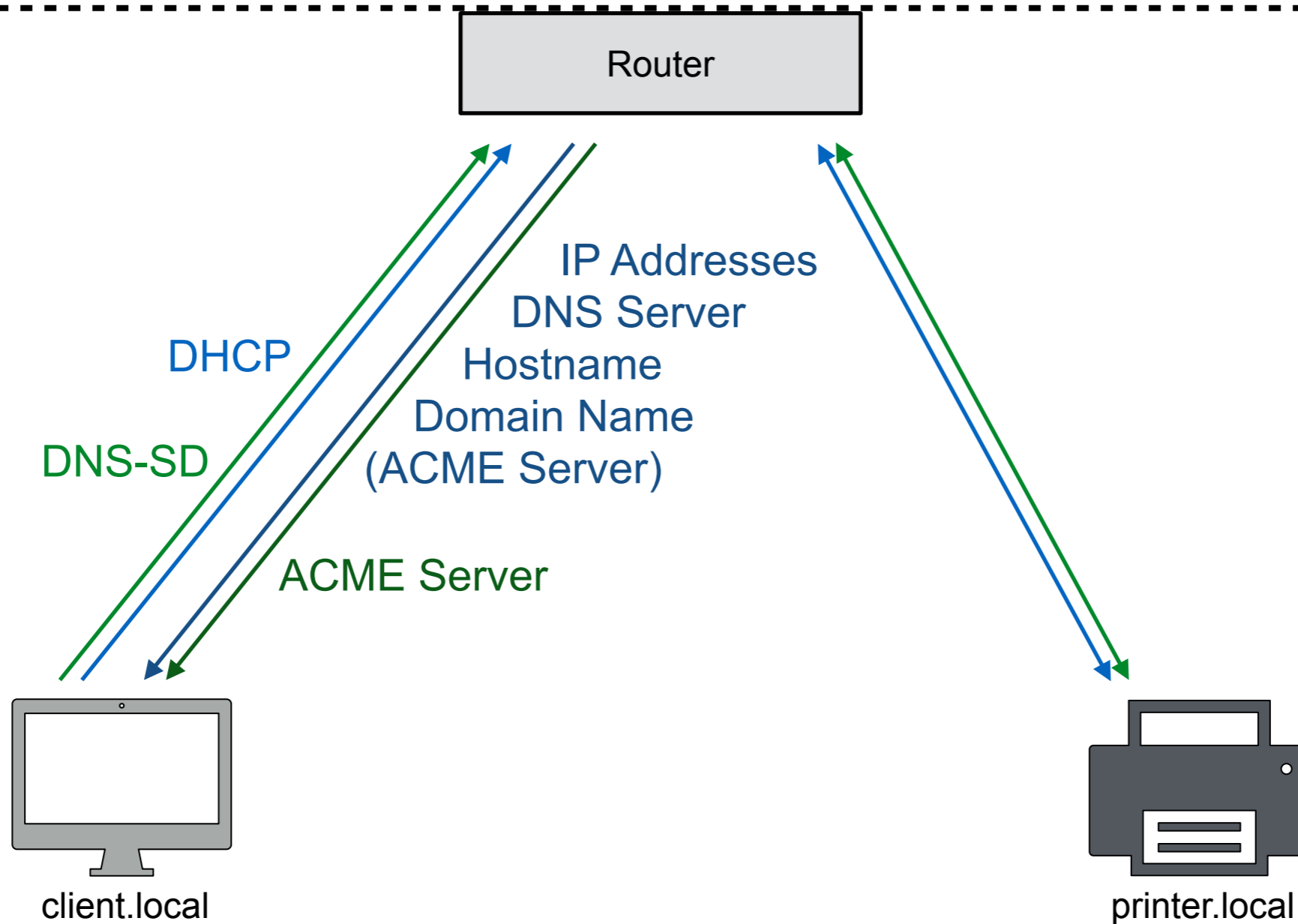
LAN



# Local ACME Discovery

Internet

LAN

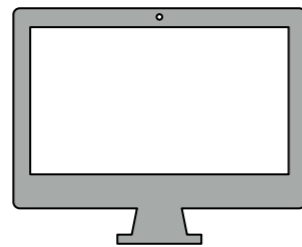
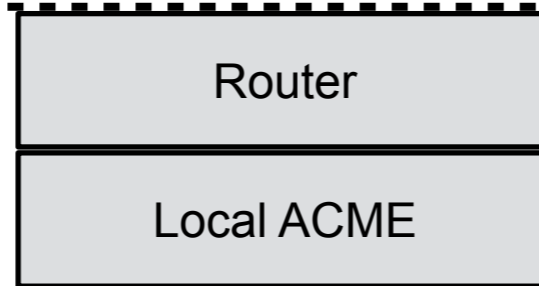


# Local ACME Usage



Internet

LAN



client.local

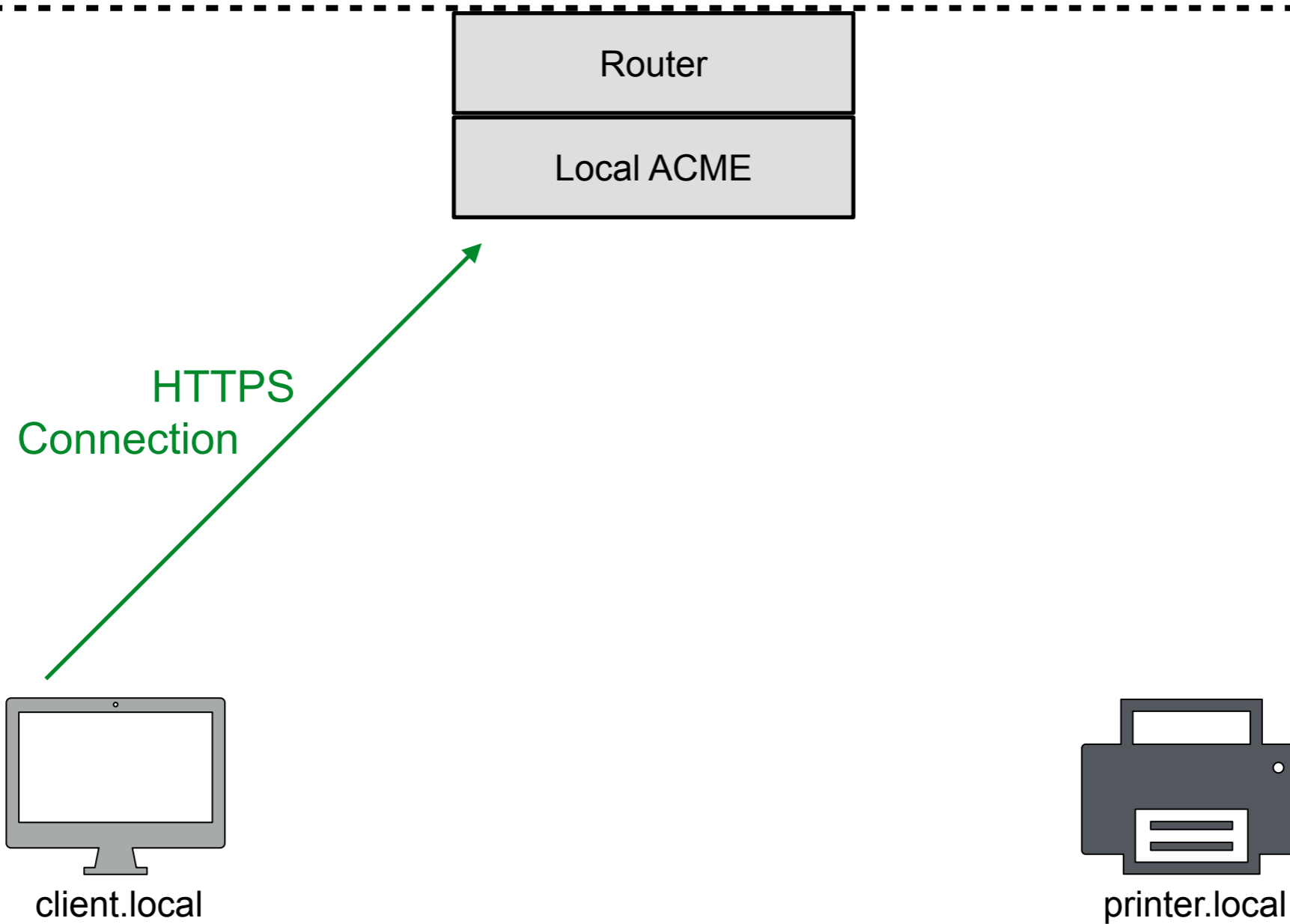


printer.local

# Local ACME Usage

Internet

LAN

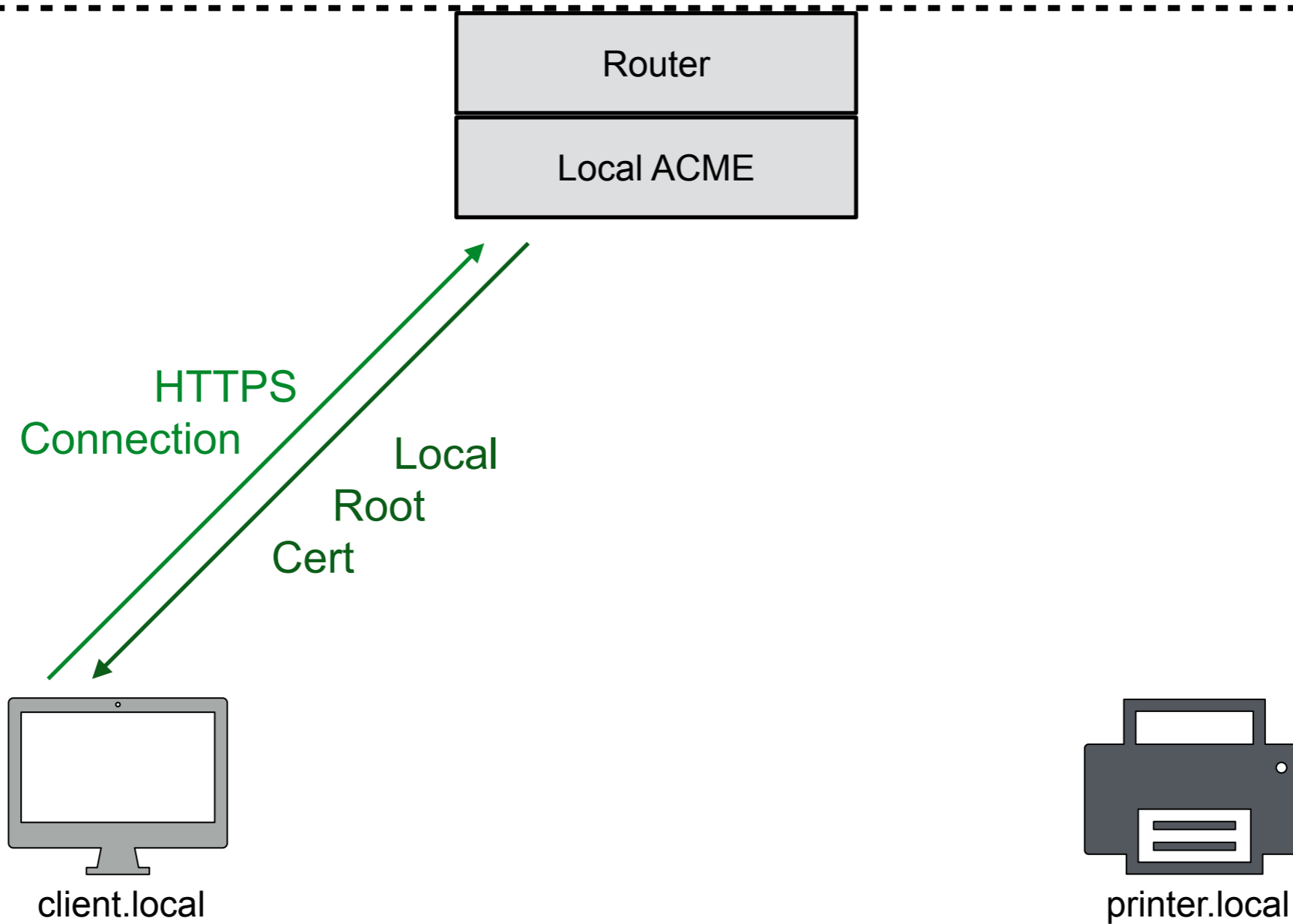




# Local ACME Usage

Internet

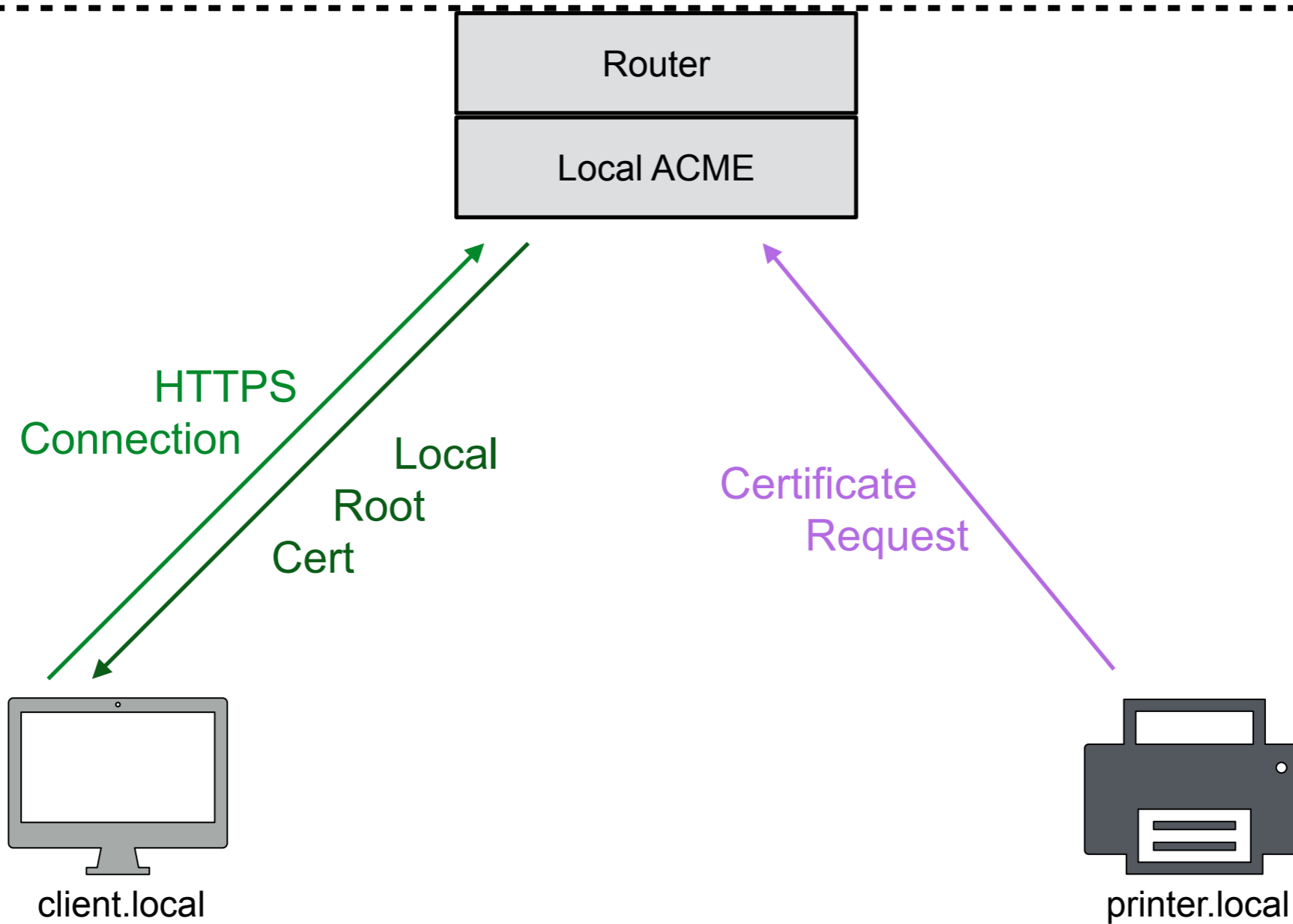
LAN



# Local ACME Usage

Internet

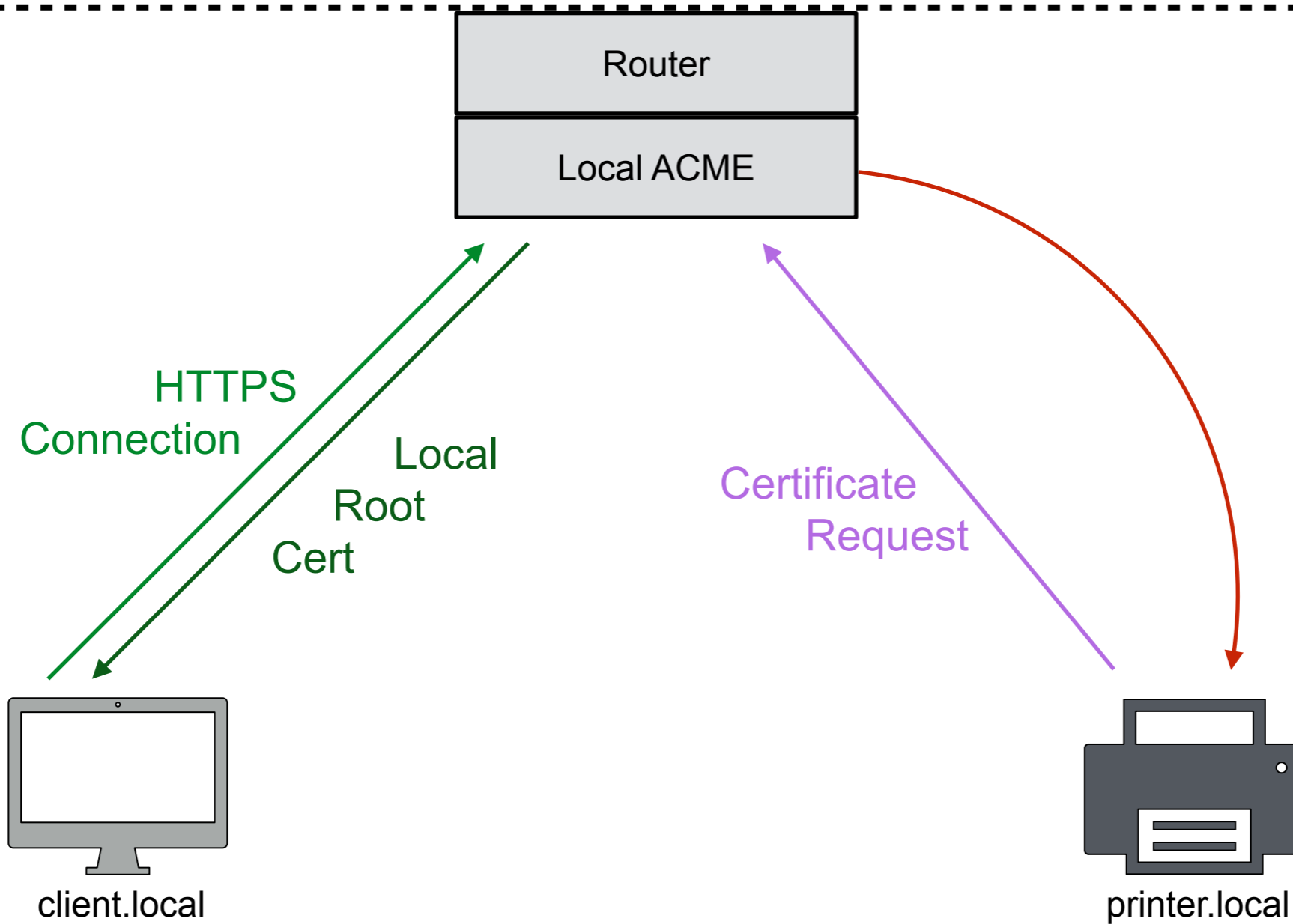
LAN



# Local ACME Usage

Internet

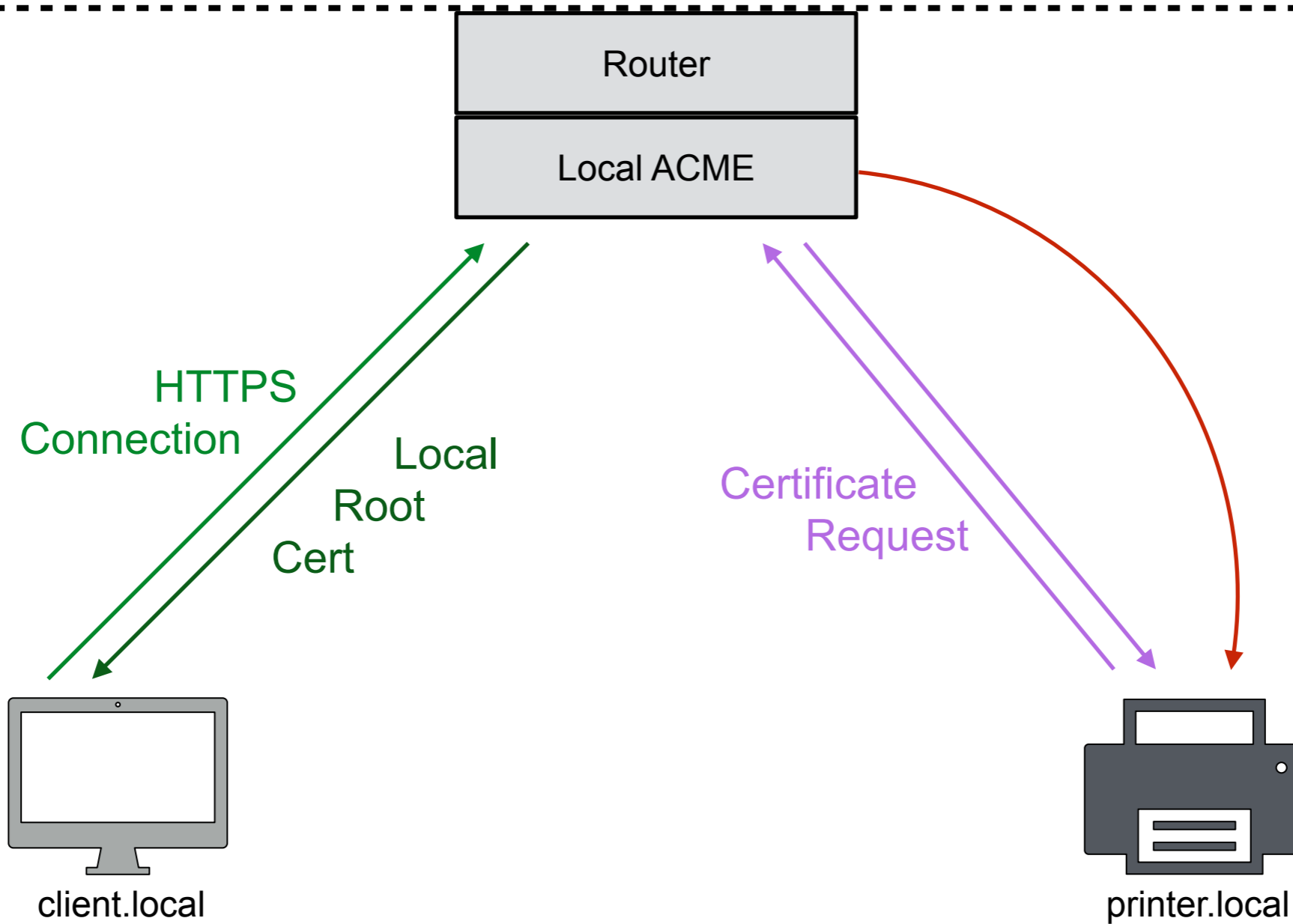
LAN



# Local ACME Usage

Internet

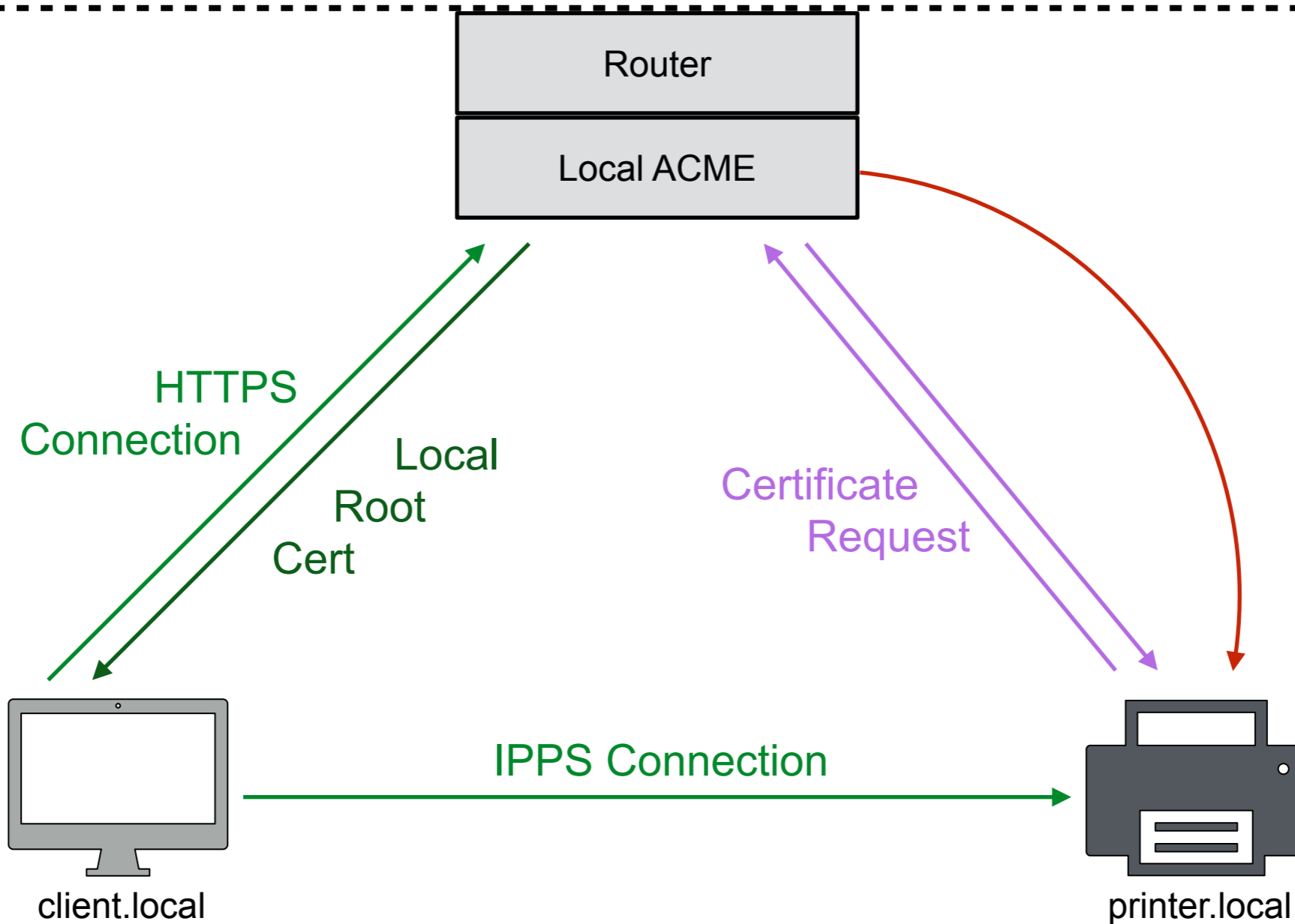
LAN



# Local ACME Usage

Internet

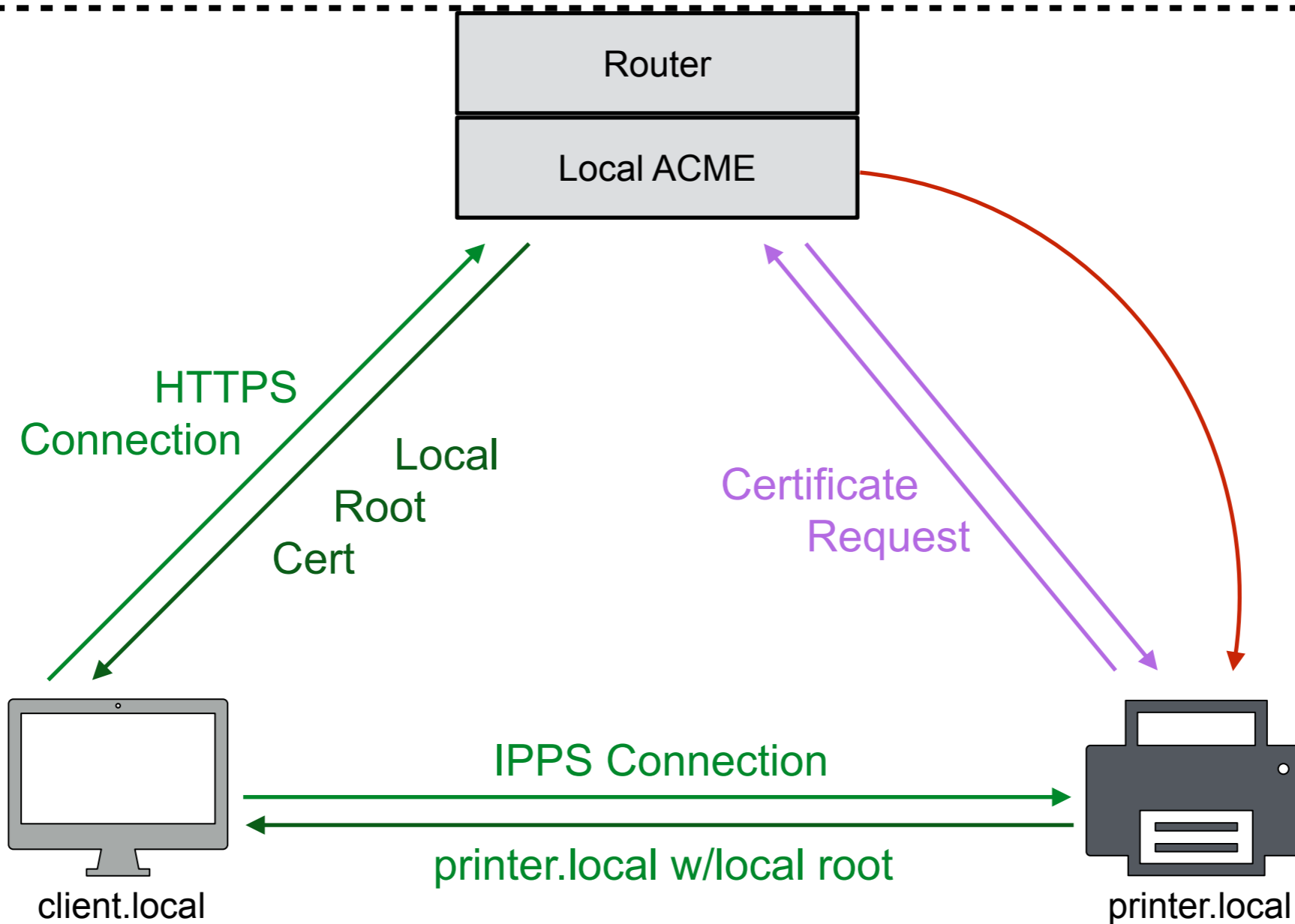
LAN



# Local ACME Usage

Internet

LAN





# The Printer Working Group

Break

*Resuming at 2:45pm 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)
- 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 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





- 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)

- RAPID + TCT – May 17 - 19, 2022 Detroit MI
  - Digital Registration (virtual attendance)
- ASME AM Industry Summit – June 20–22, 2022:
  - Additive Manufacturing Standards Forum - In collaboration with America Makes
  - Monday, June 20, 2022 1:00 PM to 4:30 PM – Requested further information about attending
- ASTM International Conference on Additive Manufacturing (ASTM ICAM 2022):
  - October 31 – November 4, 2022 sponsored by the ASTM International Additive Manufacturing Center of Excellence (AM CoE), will be held in Orlando, FL at the JW Marriott Orlando Bonnet Creek Resort and Spa. If PWG Cyber Security presentation is accepted, at least one PWG member must attend and be onsite to facilitate the presentation. If presentation is not accepted, attend virtually.



# 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

# Rendering 3D Content into 2D Graphics Contexts



- Use Case described by Phil Spreier (Customer Engagement Lead – Elysium) to Paul Tykodi during a meeting they had to discuss historical uses of 3D PDF in subtractive manufacturing
  - Need to print 1:1 Nail Board Drawing to prepare a mockup for a new wire harness design. Some software developed for this manufacturing niche can convert 3D CAD model drawing metrics into the necessary 2D rendering of the 1:1 Nail Board Drawing.
- When the software does not offer this option, there is a need to be able to retrieve the actual design metrics for the 3D content being shown visually within the 3D PDF (wire harness design) and then print it in a 2D rendering at full size to develop the required nail board drawing.
  - Today there is no simple way to accomplish this task.

# Rendering 3D Content into 2D Graphics Contexts

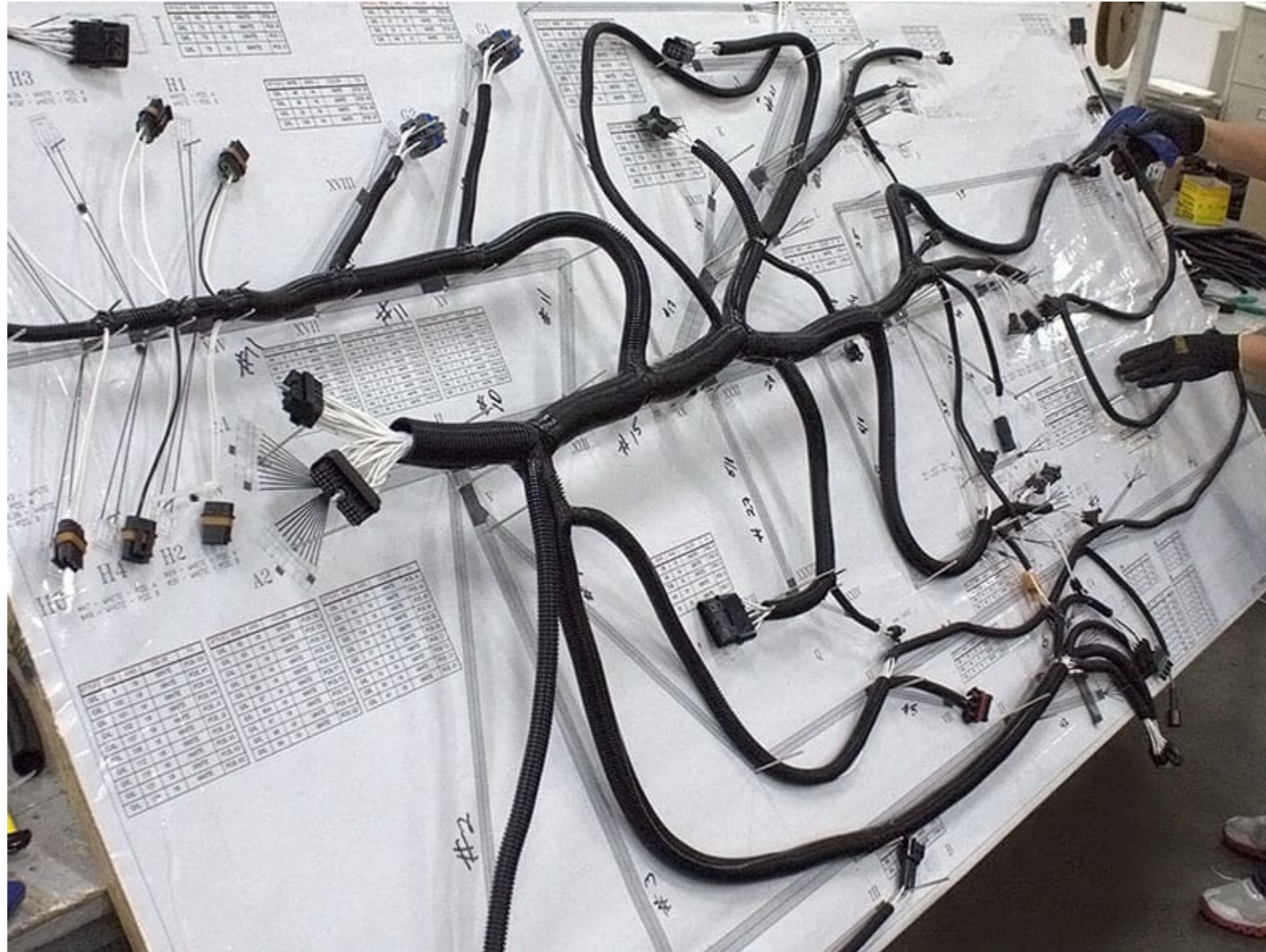


Photo Credit:

<https://www.meridiancableassemblies.com/wp-content/uploads/2015/12/Harness-board.jpg>

# Rendering 3D Content into 2D Graphics Contexts



- United States Library of Congress - Reference Information for the three 3D data formats supported by PDF as of May 2022
  - PRC: <https://www.loc.gov/preservation/digital/formats/fdd/fdd000496.shtml>
  - STEP AP 242: <https://www.loc.gov/preservation/digital/formats/fdd/fdd000448.shtml>
  - U3D: <https://www.loc.gov/preservation/digital/formats/fdd/fdd000491.shtml>



# Understanding 3D PDF

- PDF Association presentation by Peter Wyatt, CTO:
  - <https://ftp.pwg.org/pub/pwg/liaison/pdf-association/IEEE-PWG-3D-PDF.pdf>



# The Printer Working Group

IPP Workgroup Session

May 19, 2022





# Before We Begin...

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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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## May 19, 2022 (US Eastern Daylight Time)

When	What
10:00 - 11:45	IPP WG: IPP/2.0 and IPP Everywhere 2.0
11:45 - 12:00	IPP WG: Next Steps
12:00 - 12:45	Lunch
12:45 - 14:45	IDS WG: Status and Discussion



# IPP/2.x Fourth Edition

- Current interim draft:
  - <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippbase23-20220428-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 v1.1

- Some concerns about timing of submission process and usage of the logo images prior to product release:
  - <https://github.com/istopwg/ippeveselfcert/issues/76>
- Section 12 (Logo Usage Guidelines) of PWG 5100.20-2020 says the following:

*"You can use the IPP Everywhere™ logo [LOGO] in marketing material, product packaging, and documentation for products that have passed the IPP Everywhere™ Printer Self-Certification tests and whose results have been submitted to the IEEE-ISTO Printer Working Group. Please contact the IEEE-ISTO Printer Working Group steering committee to obtain written approval for any other usage of the logo."*

# IPP Everywhere v1.1



- A literal interpretation of these guidelines might lead a member to believe they could not use the logo in the preparation of product and marketing materials *prior* to the submission of the self-certification results to the PWG
- As a result, we've requested and the PWG Steering Committee has approved an update of the IPP Everywhere Logo policy:
  - <https://ftp.pwg.org/pub/pwg/general/process/ippevelogo-policy.pdf>
- The update proactively grants the right for any PWG member to use the logo in the preparation of product and marketing materials for IPP Everywhere™ printers, subject to passing the self-certification tests and eventual submission of the results from those tests within 90 days of public release

# 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
- Proposed schedule:
  - Prototype draft Q3/Q4 2022



# IPP Everywhere v2.0: Updates

- TLS support **REQUIRED**
- **REQUIRED/CONDITIONALLY REQUIRED** specifications:
  - IPP Privacy Attributes v1.0
  - PWG 5100.1-202X: IPP Finishings v3.0 (FIN)
  - PWG 5100.3-202X: IPP Production Printing Extensions v2.0 (PPX)
  - PWG 5100.7-2019: IPP Job Extensions v2.0 (JOBEXT)
  - PWG 5100.11-202X: IPP Enterprise Printing Extensions v2.0 (EPX)
  - PWG 5100.13-20XX: IPP Driverless Printing Extensions v2.0 (NODRIVER)
  - PWG 5100.22-2019: IPP System Service v1.0 (SYSTEM)
  - PWG 5199.10-2019: IPP Authentication Methods v1.0
  - PWG 5199.11-2020: Job Accounting with IPP v1.0

# 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 scripts with GUI front-end?
- Look at publishing on corresponding App stores as free apps?



# The Printer Working Group

## 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 Finishings v3.0 (Smith)
  - **PWG Formal Vote ends May 27, 2022**
- IPP Production Printing Extensions v2.0 (Mike)
  - Stable draft in Q2/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, June 2 and June 16, 2022 at 3pm ET



# The Printer Working Group

Lunch Break

*Resuming at 12:45pm ET*