AWS re:Invent

IOT230-P

Modernizing Amazon.com warehouse device connections with AWS IoT

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AWS re:Invent

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aws

Agenda

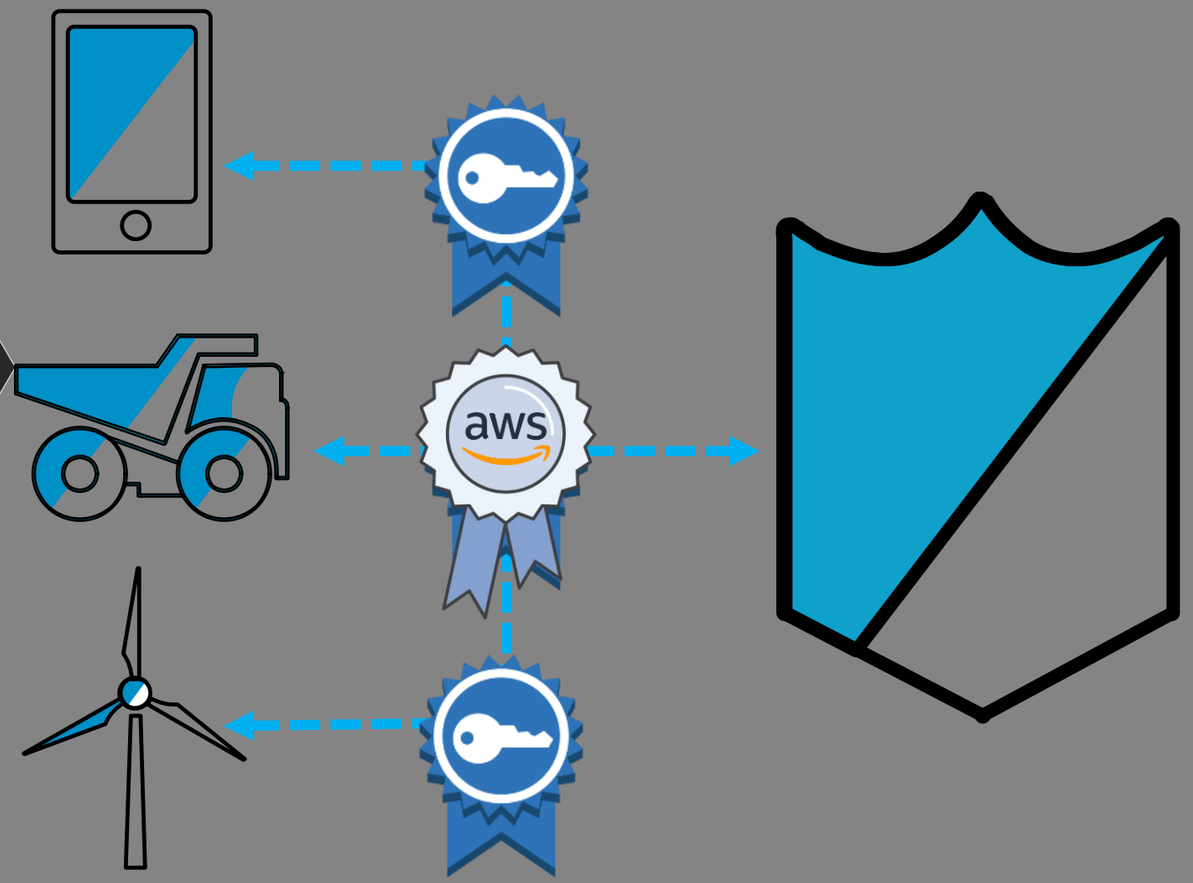
- AWS IoT Core
- AWS IoT Greengrass
- Amazon FreeRTOS
- Customer spotlight: AFT
- Resources

AWS IoT Core

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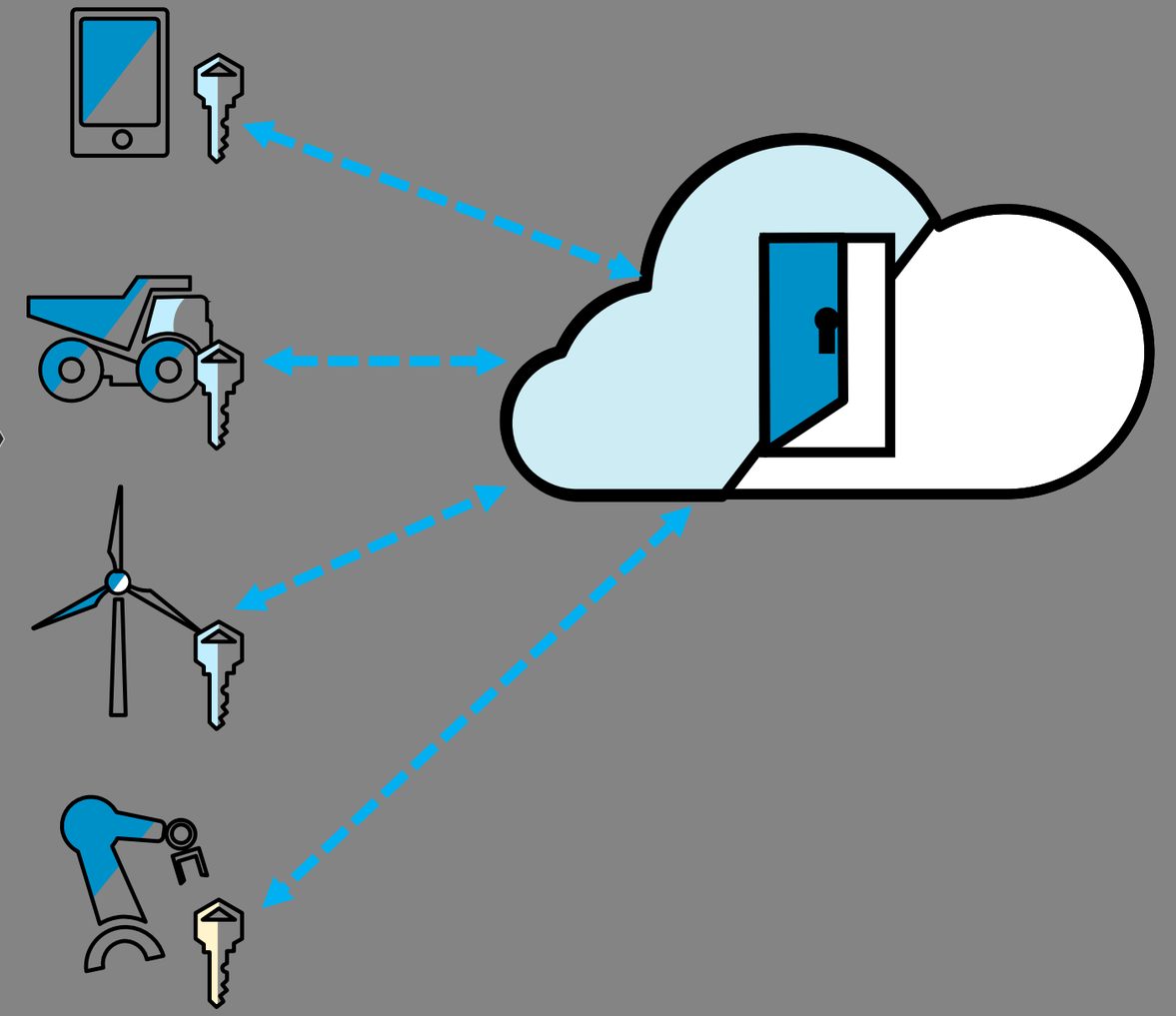
Identity service

- **Certificates**
  - AWS or BYOC
  - Manual or JITR
  - SigV4 & token
- **IoT policies**
- **Amazon Cognito**



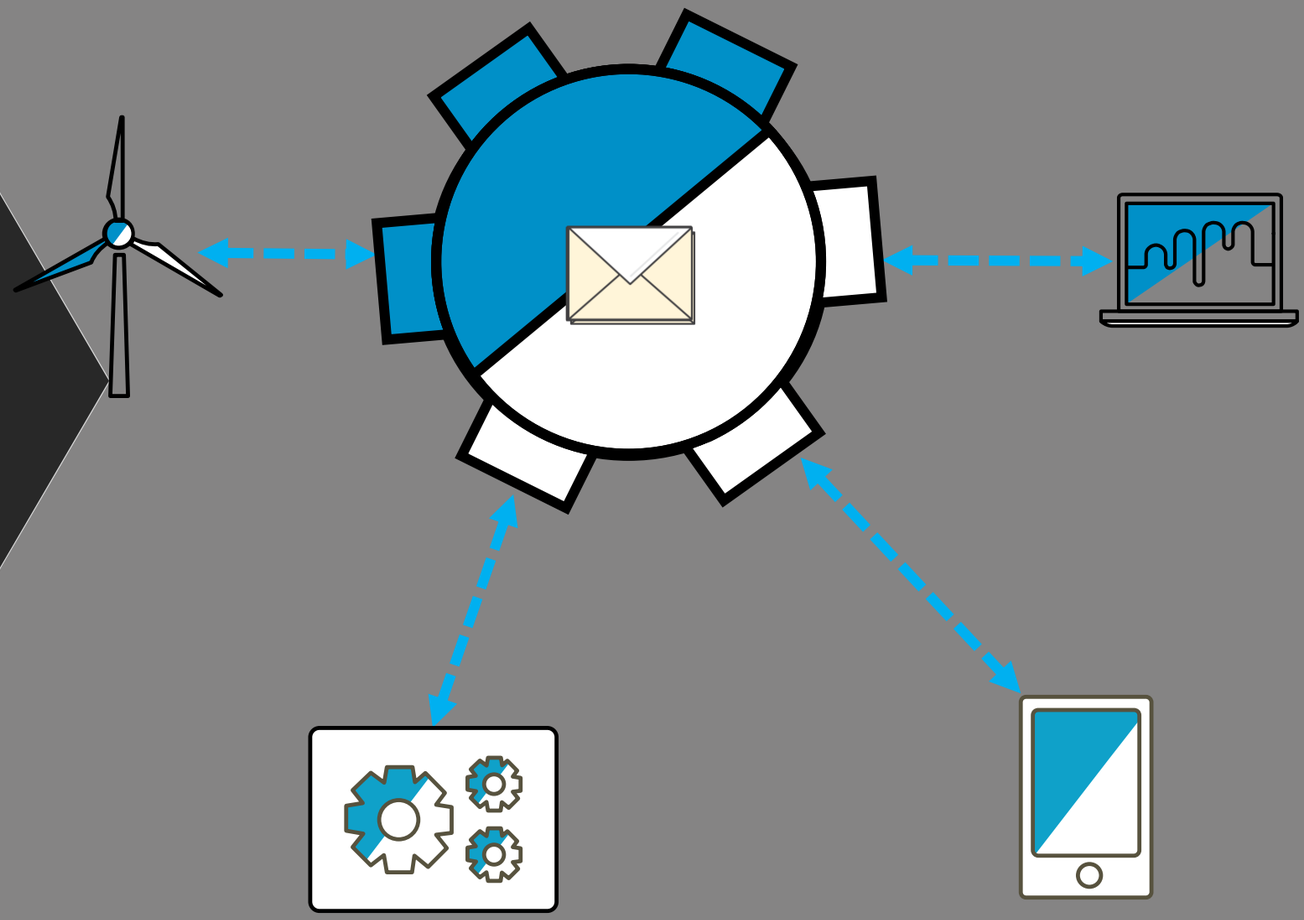
Device gateway

- **Long-lived connections**
  - MQTT, WebSockets, HTTP
- **TLS 1.2**
- **Constrained devices**



Message broker

- **Publish/Subscribe**
- **Topics**
  - Reserved ($aws)
  - Custom + Wildcards
- **Offline queuing**
- **QoS 0/1**



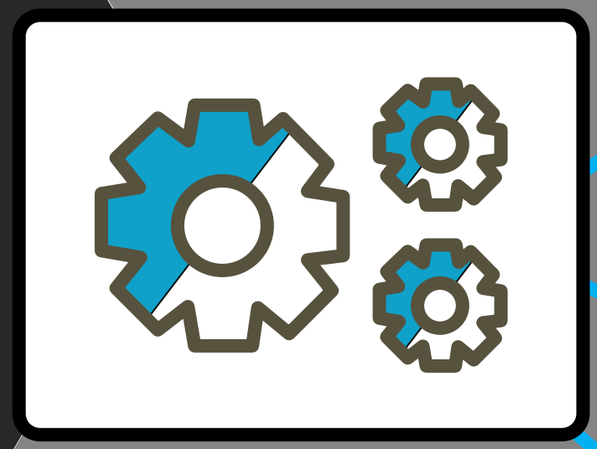
Rules engine

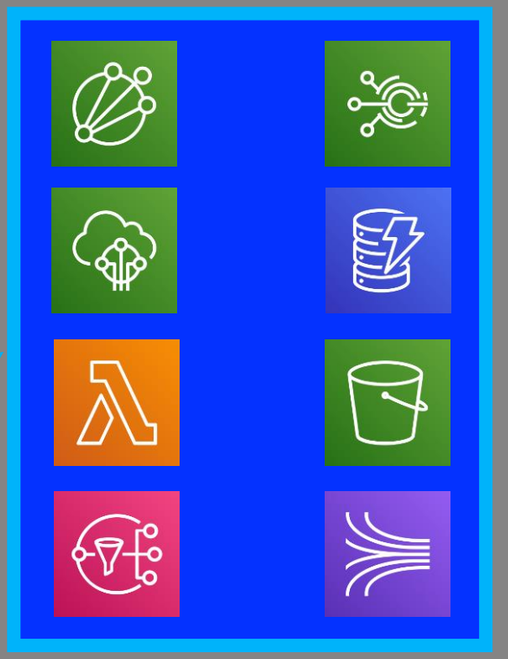
Data transformation

- **Services**
  - **AWS**
  - **3rd party**

+

- **SQL-like**
  - **SELECT * from ‘topic/xyz’**
  - **WHERE temperature > 35**
  - **Action**
  - **…** th, string, date, etc.)
  - **…**



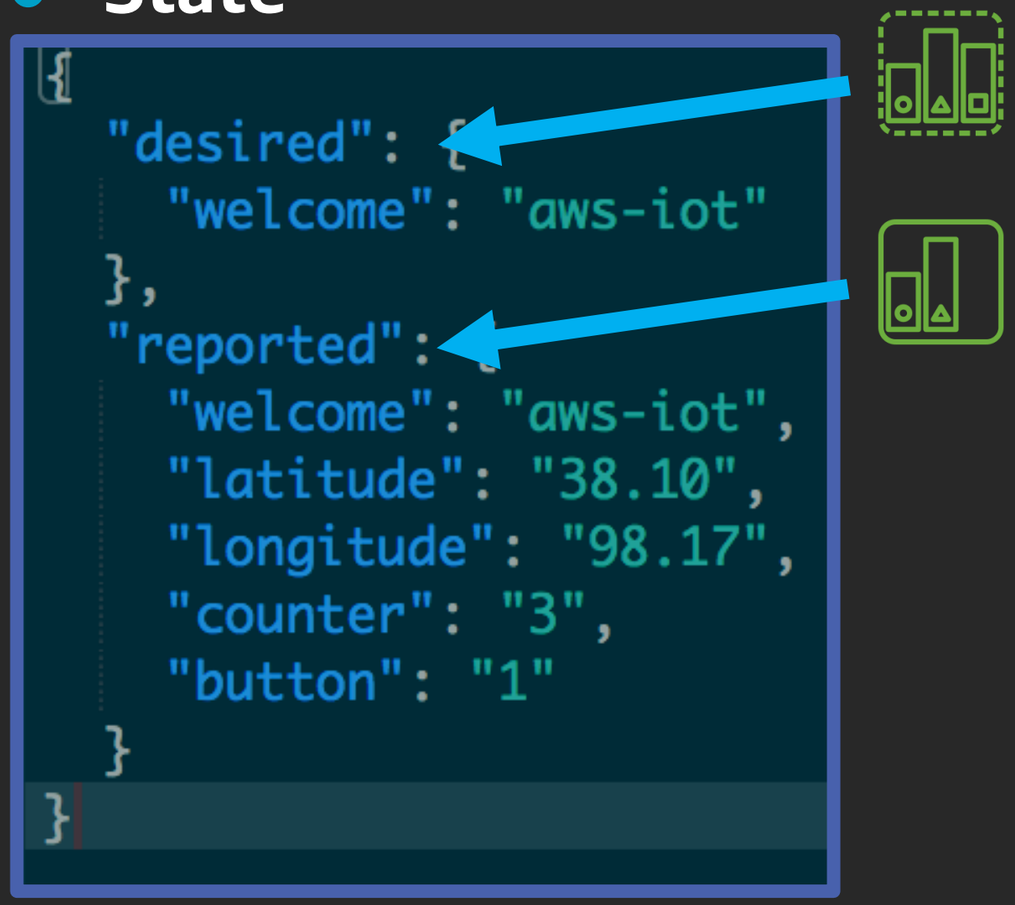


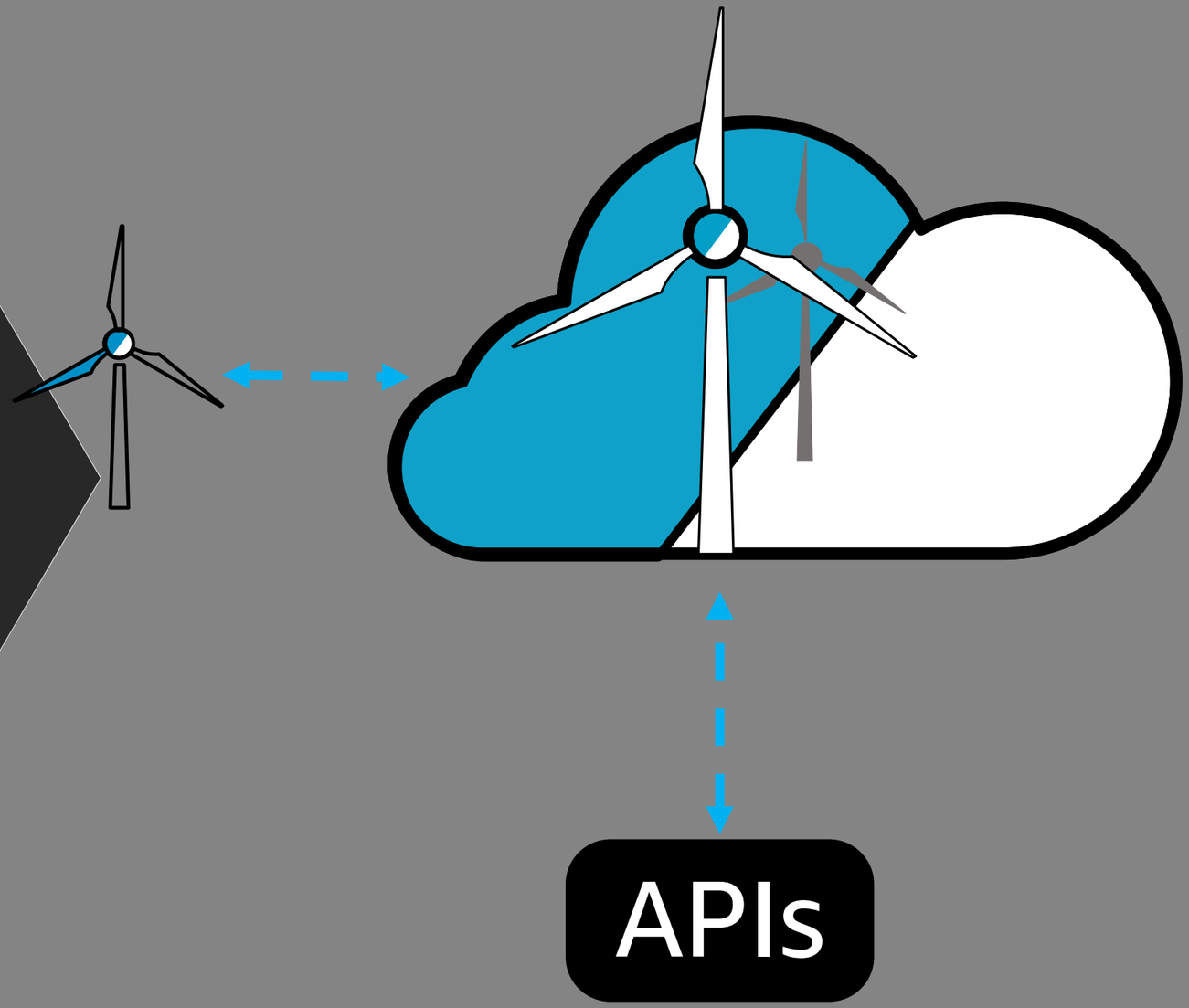




Device Shadow

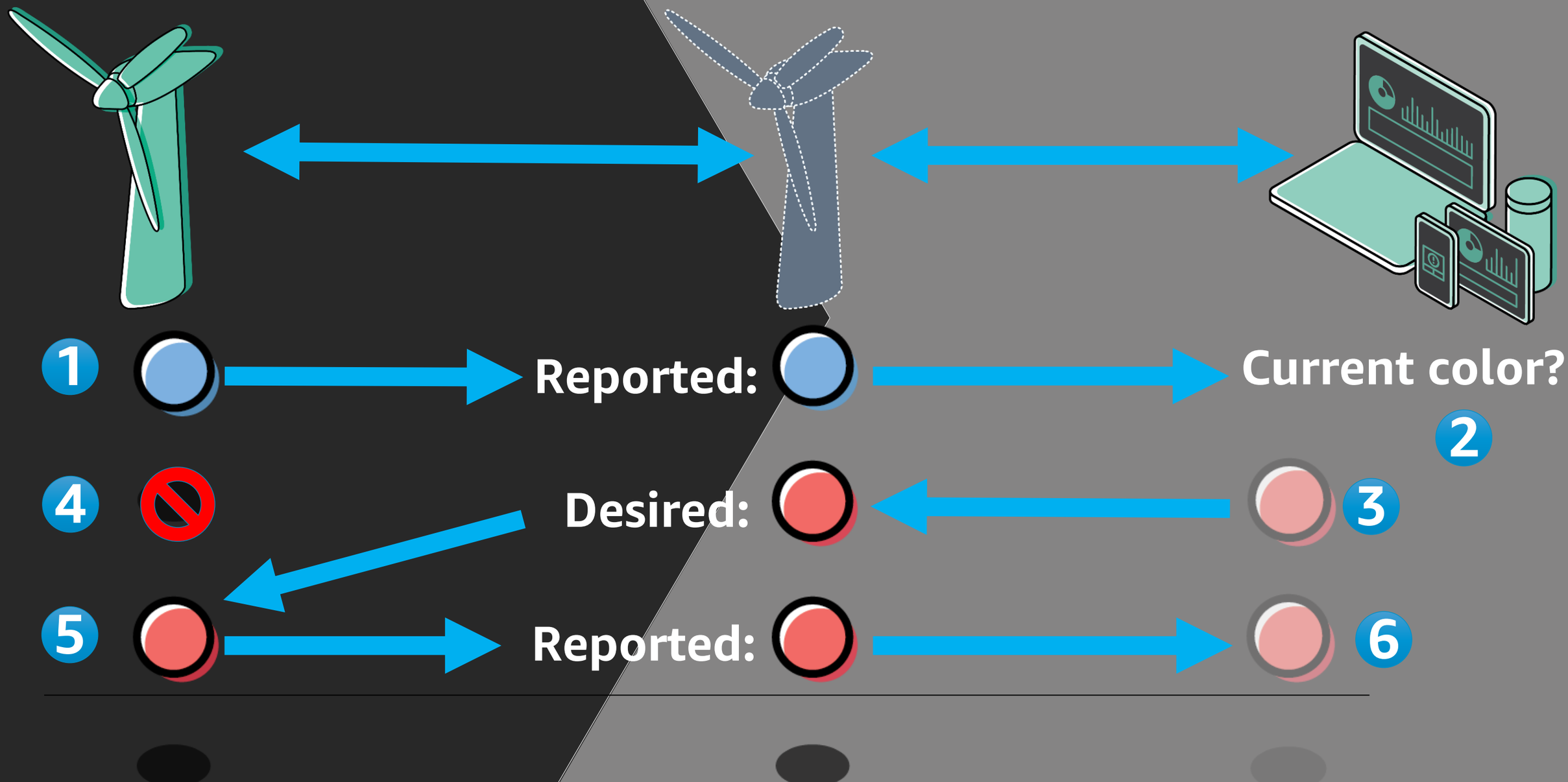
- **State**





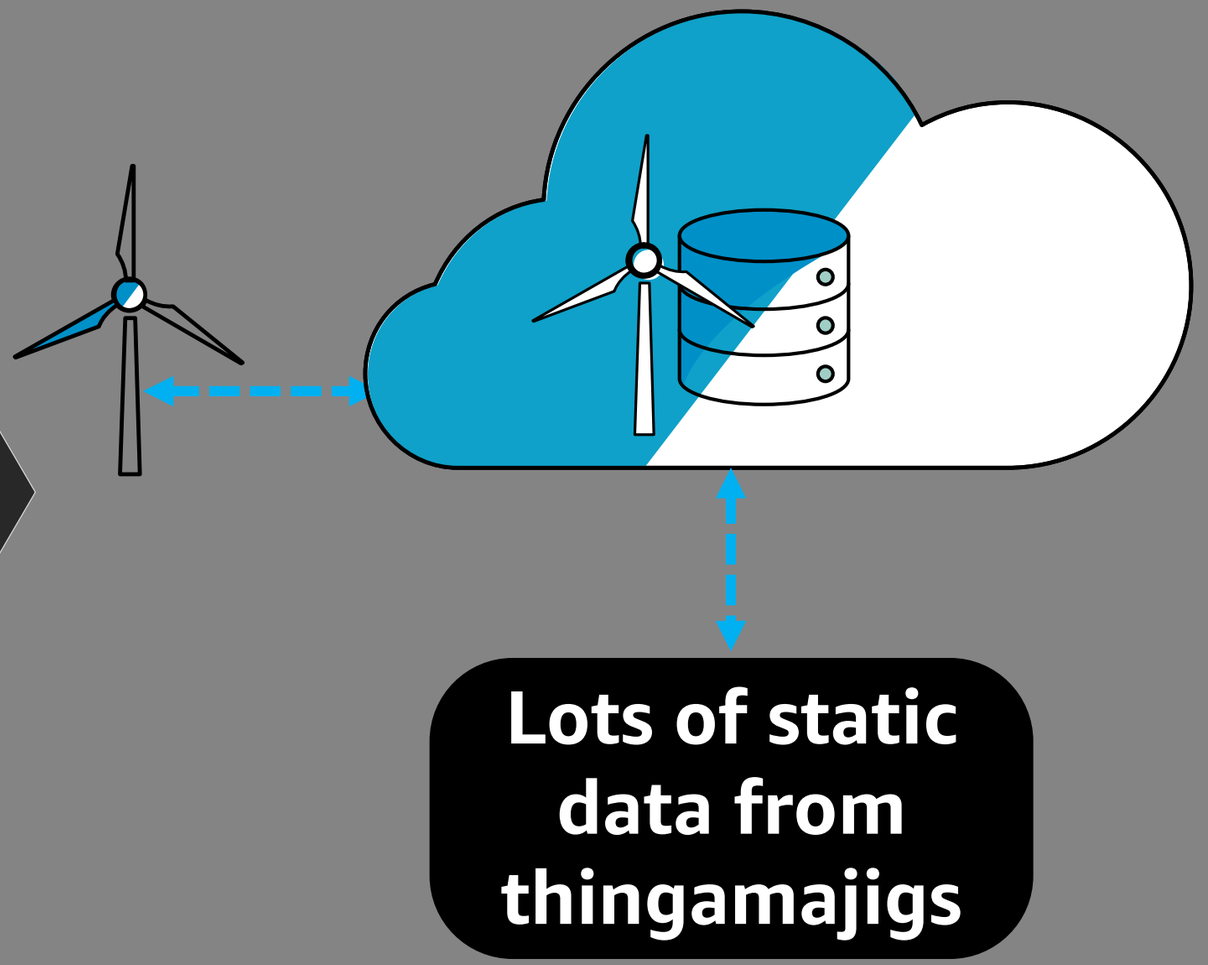
- **SDK, API (offline)**

Device Shadow example



Registry

- **Metadata**
- **ThingTypes**
- **Groups**
- **Jobs**



AWS IoT Greengrass

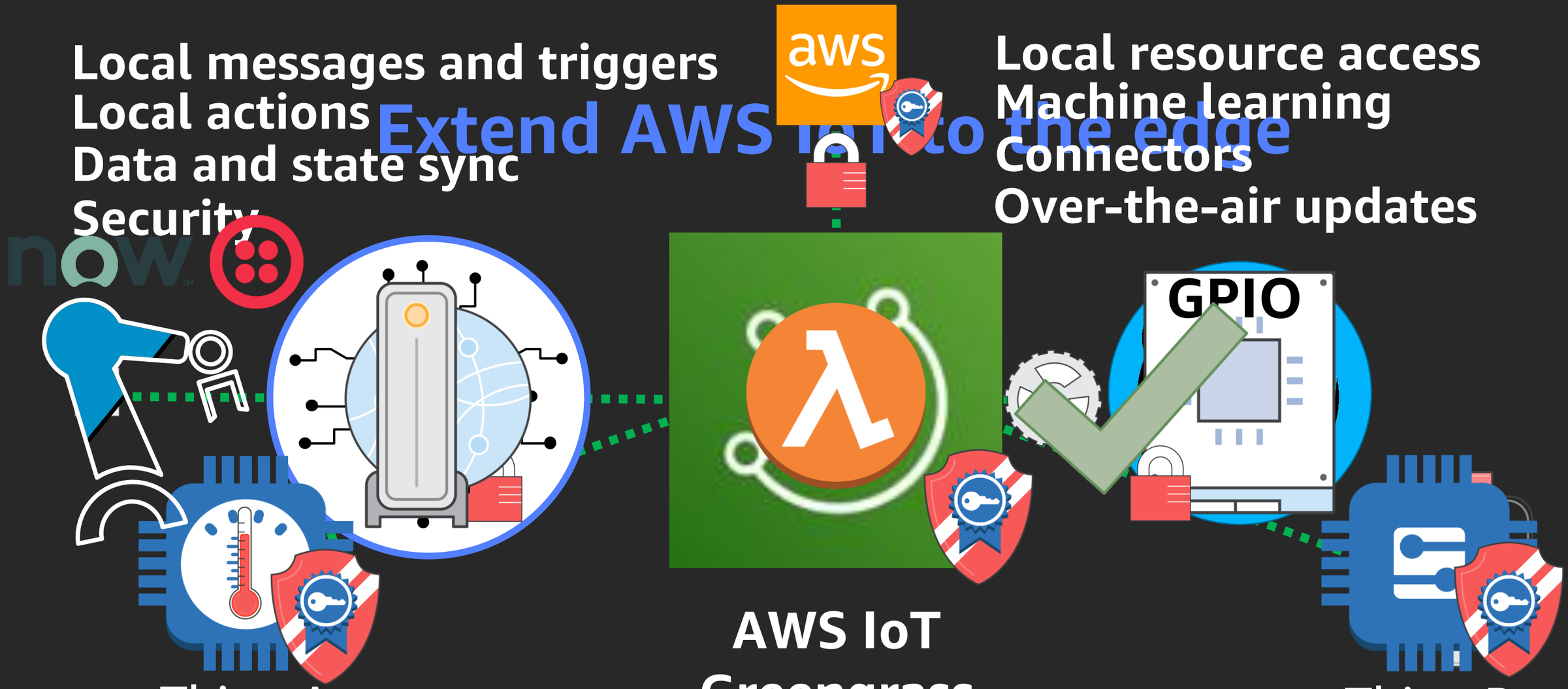
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AWS IoT Greengrass

Local messages and triggers
Local actions
Data and state sync
Security

Extend AWS IoT into the edge

Local resource access
Machine learning
Connectors
Over-the-air updates



Thing A

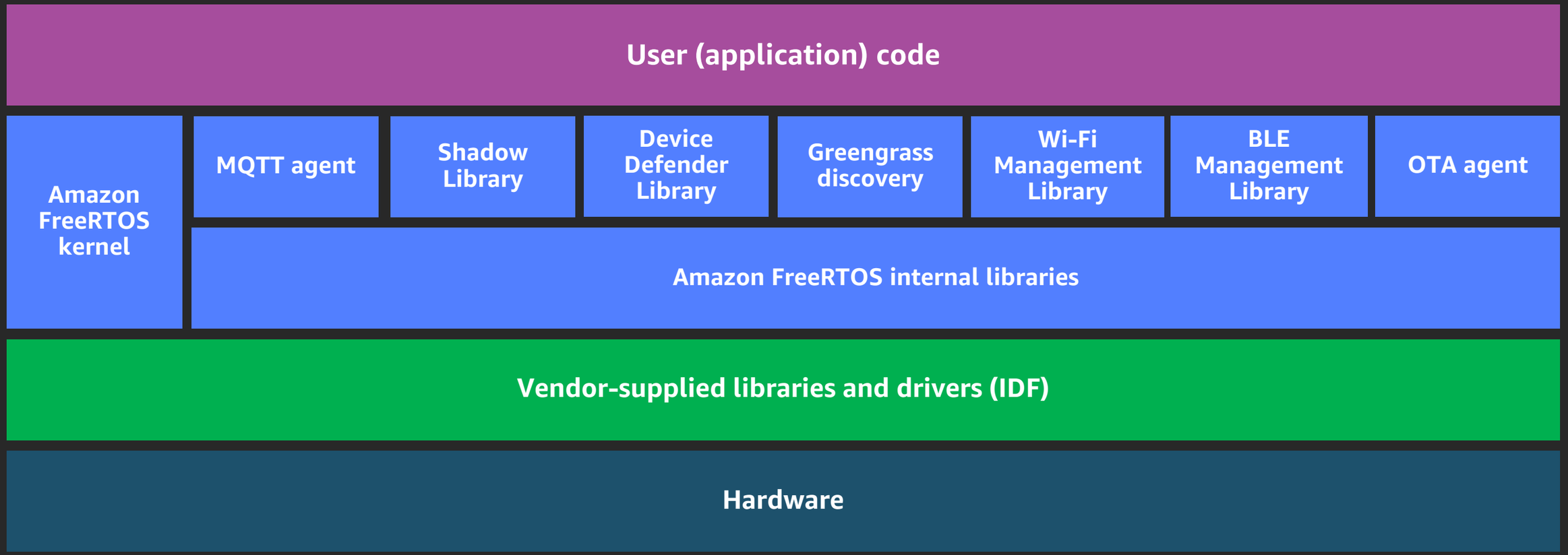
AWS IoT Greengrass Core

Thing B

Amazon FreeRTOS

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Amazon FreeRTOS: Modular architecture



Local connectivity libraries



Edge, Wi-Fi,
AWS IoT Greengrass



BLE



iOS & Android
SDKs

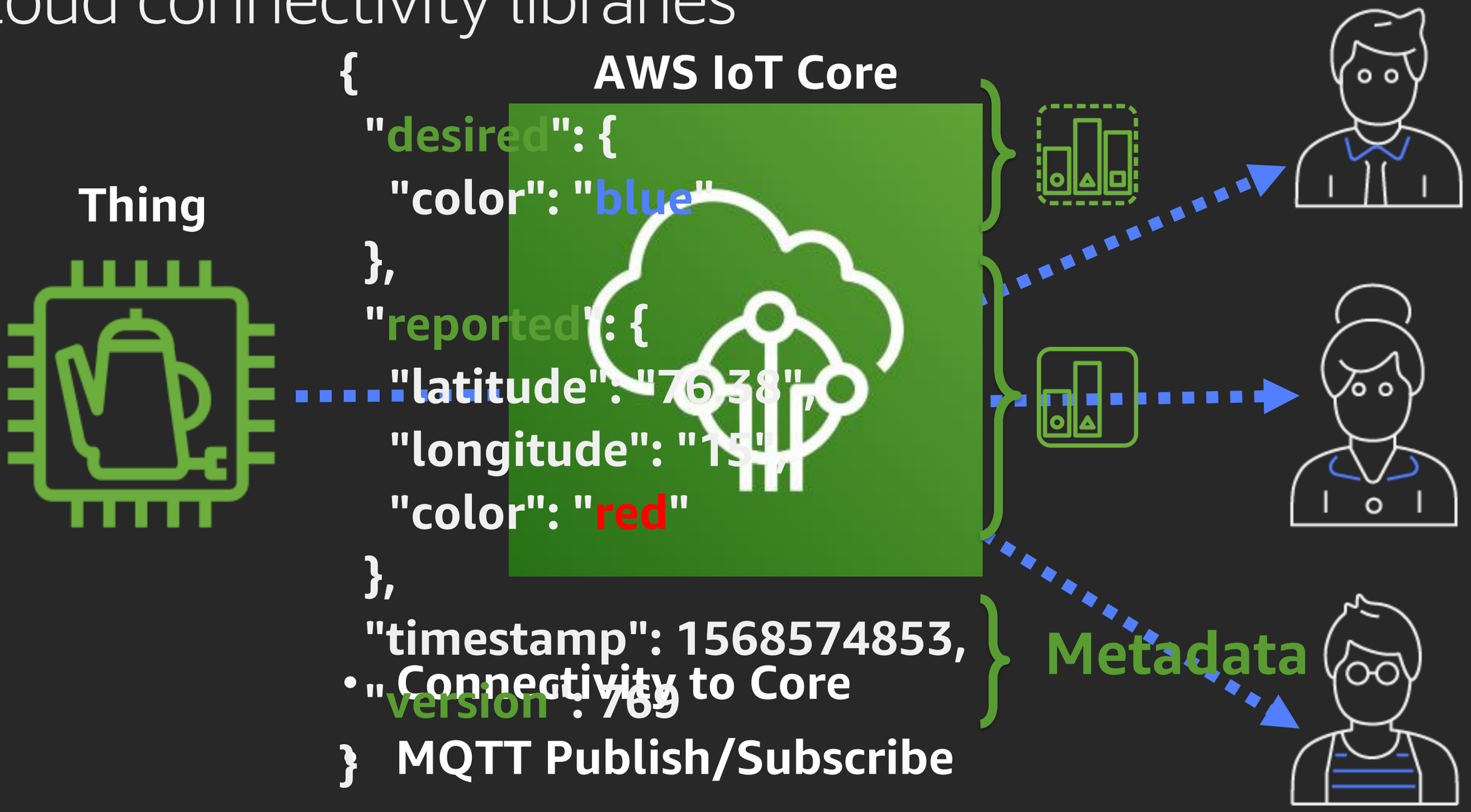


Wi-Fi management



No cloud

Cloud connectivity libraries



- Connectivity to Core
- MQTT Publish/Subscribe
- Device Shadow

Security connectivity libraries

Cert-based AuthN

!Open ports & TLS

Trusted code









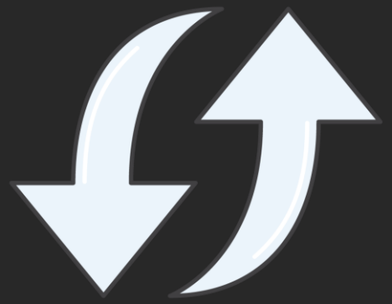
```
-----BEGIN CERTIFICATE-----
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-----END CERTIFICATE-----
```

CLI: **aws iot create-keys-and-certificate --certificate-pem-outfile "Certainly.cert.pem" \ --public-key-outfile "Certainly.public.key" \ --private-key-outfile "Certainly.private.key"**

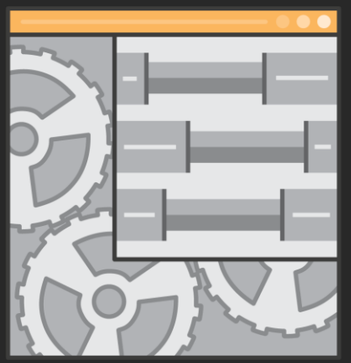
Over-the-air updates



Updates to Groups



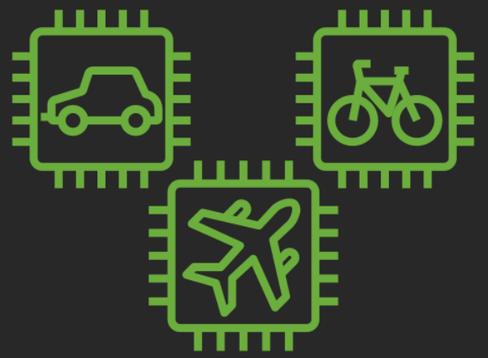
APIs for install/reboot



Sign firmware images



Stream over MQTT

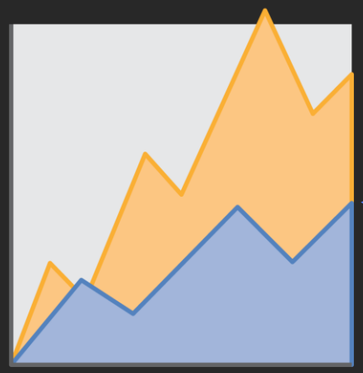


Groups

AWS IoT Device Defender Library

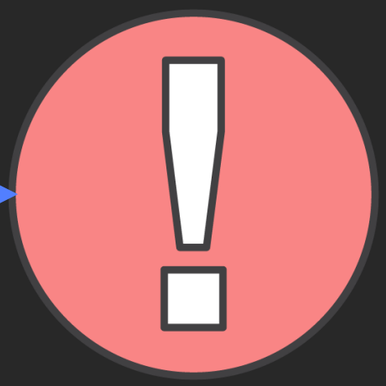


Audit & monitor

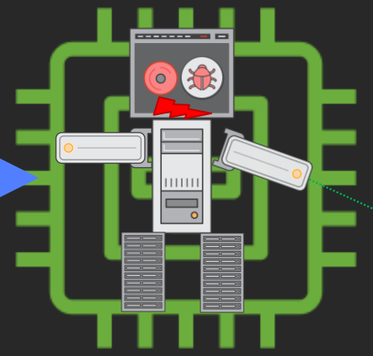


Device-side metrics





Alerts



Anomaly detection

Externalized printing using AWS IoT

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Who we are: Amazon fulfillment technology



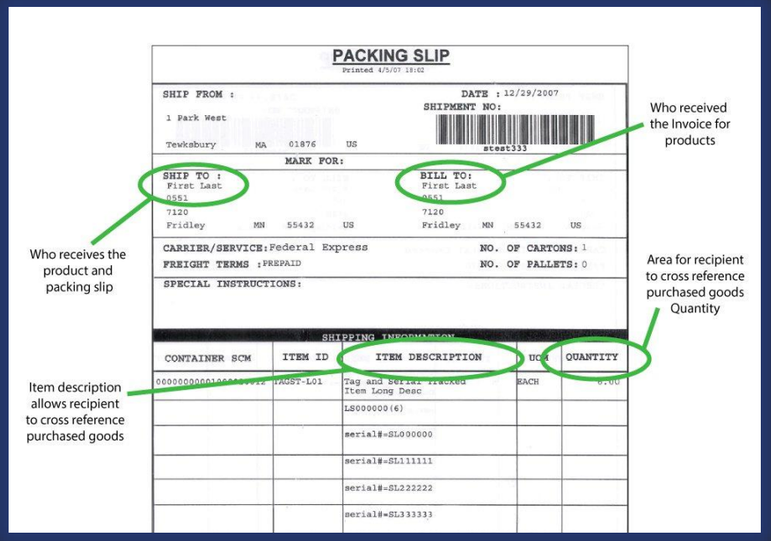
Sub-agenda

- Printing in AFT
- What is external FC?
- Problem statement
- Solution using AWS IoT
- Prototype to production using AWS IoT Greengrass

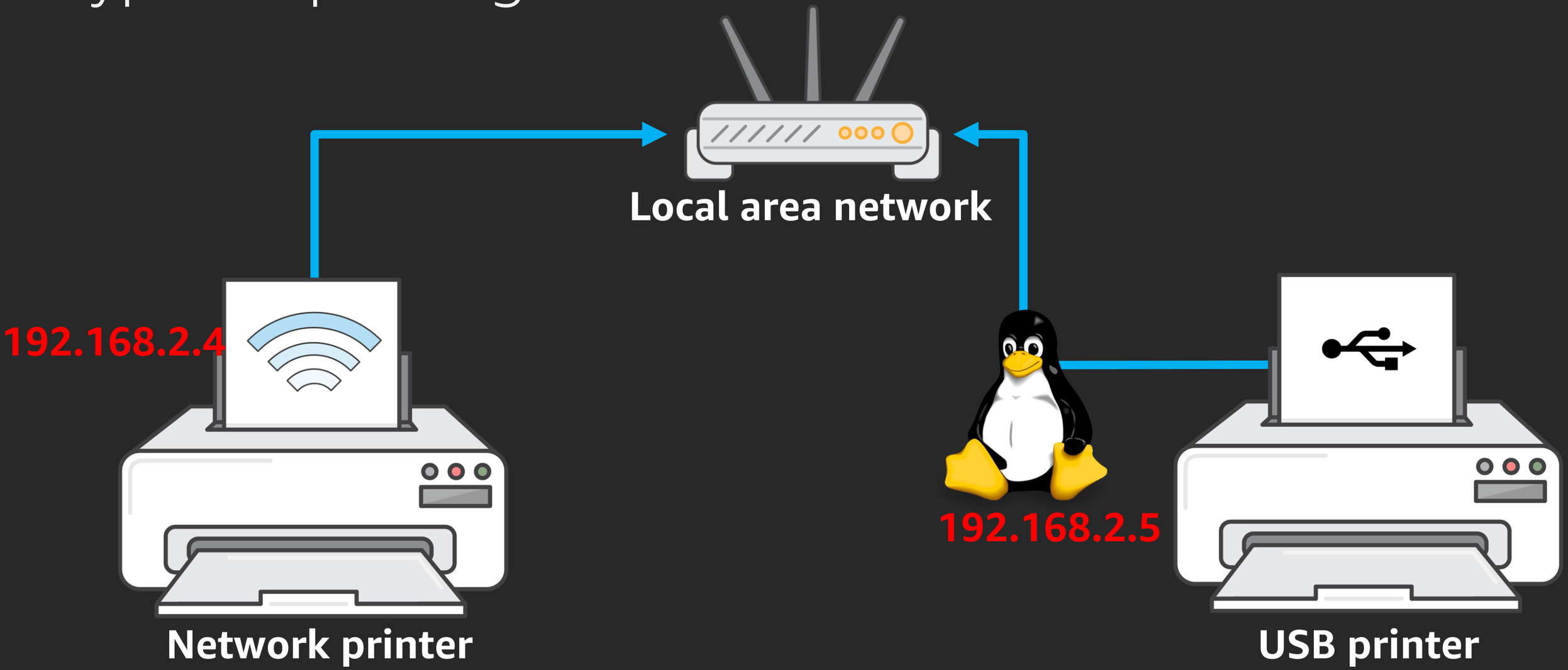
Printing in AFT



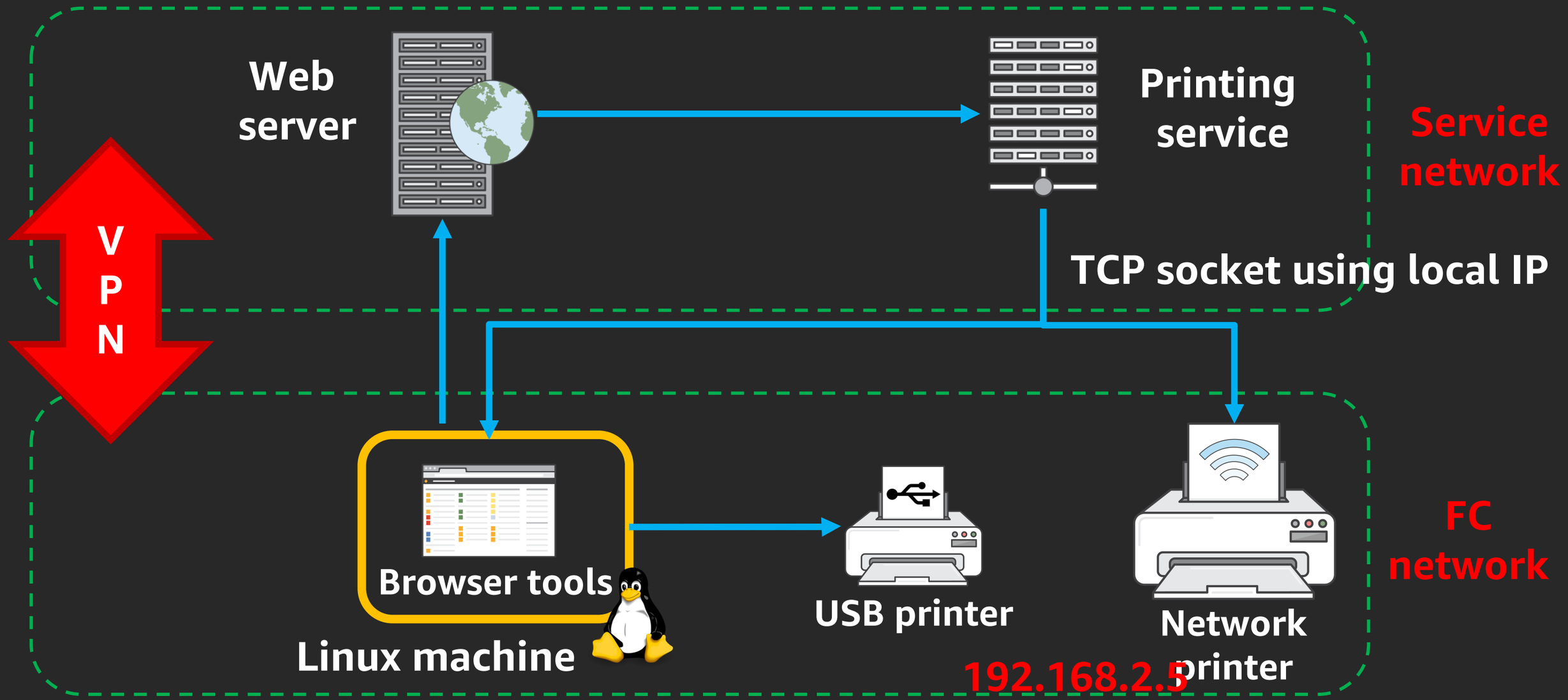




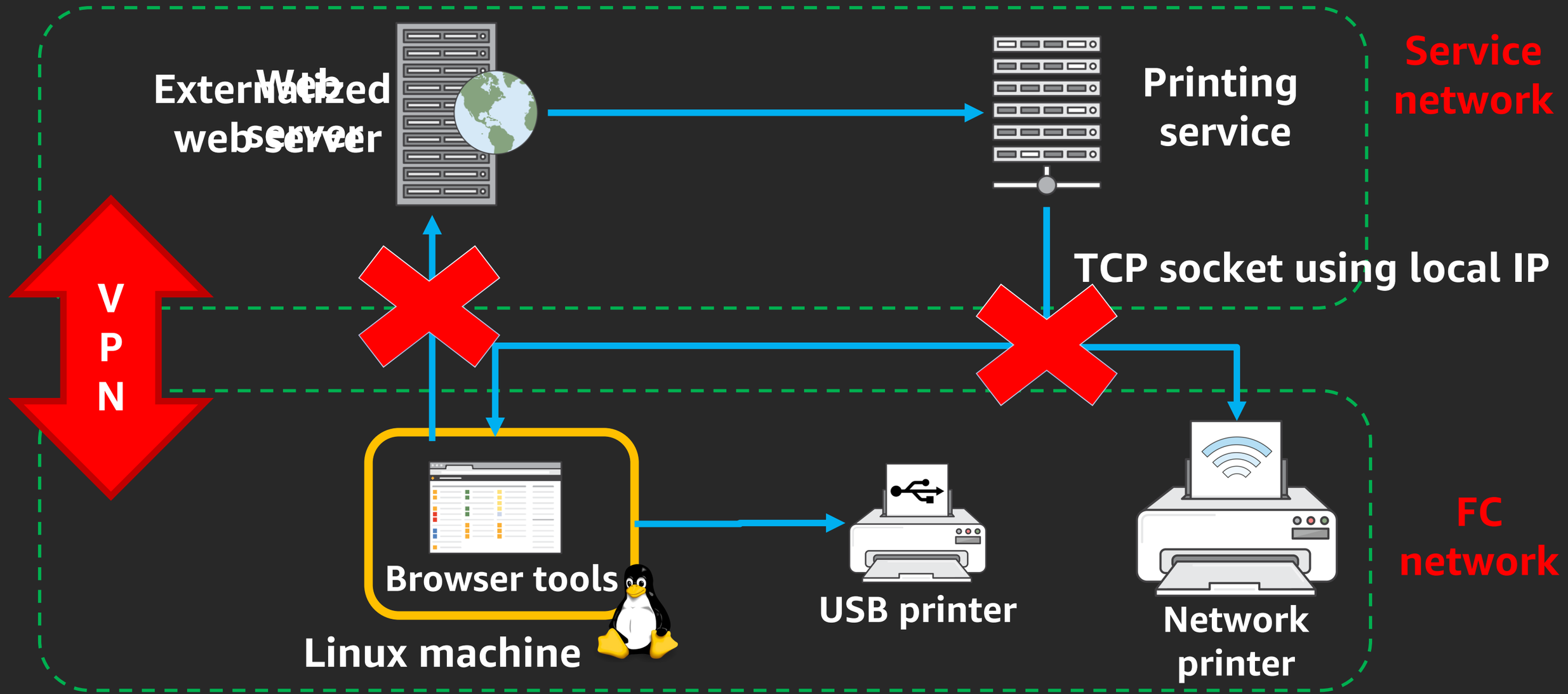
Types of printing devices in AFT



Printing in AFT today

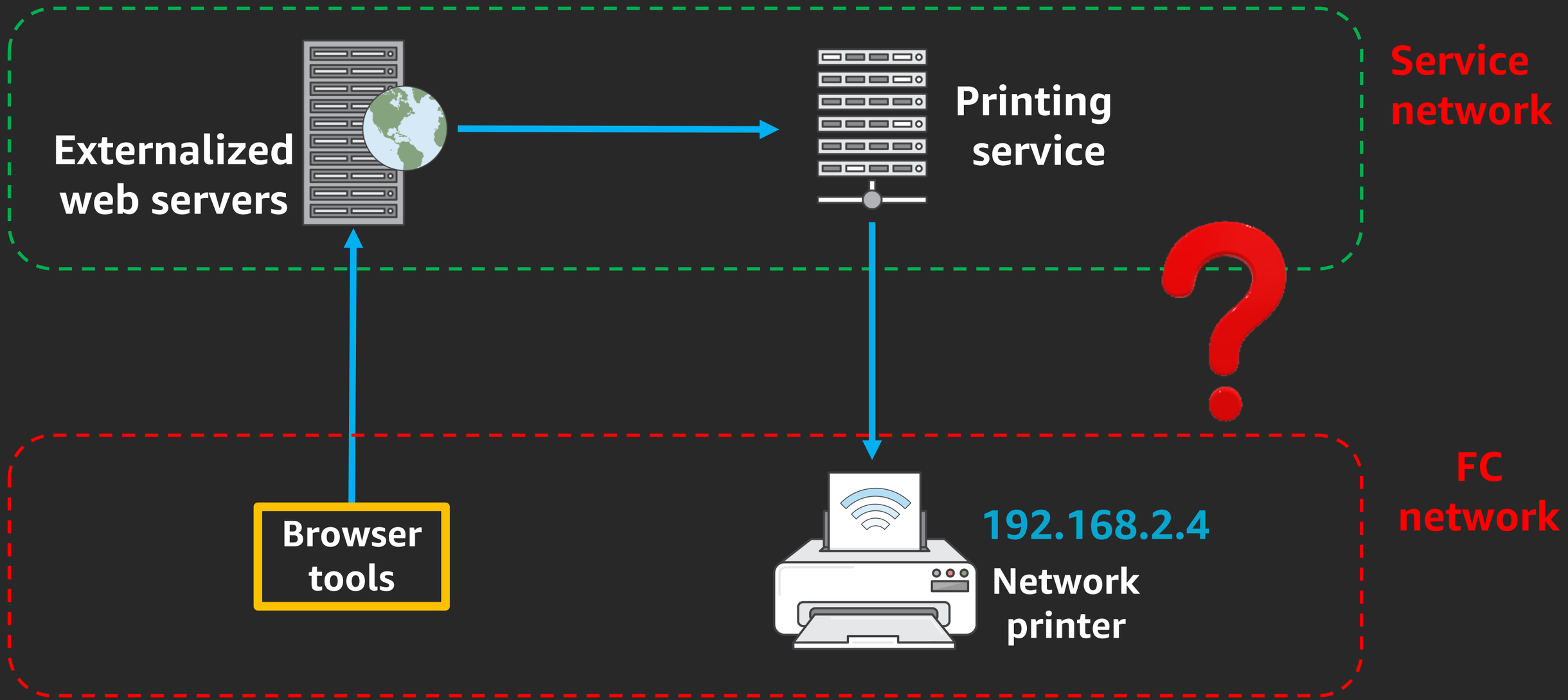


External FC


Service network
Web server
Printing service
TCP socket using local IP
VPN
Browser tools
Linux machine
USB printer
Network printer
FC network

Backward compatibility constraint

Send print command using private IP address of local network printer



USB-connected printers

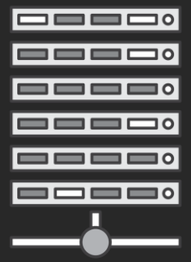
AFT-X + IND1

+

192.168.2.3 -> thingName

Externalized web server





Printing service

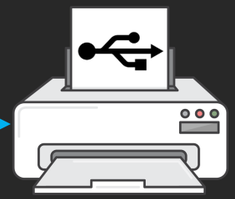


Browser tools

IoT SDK

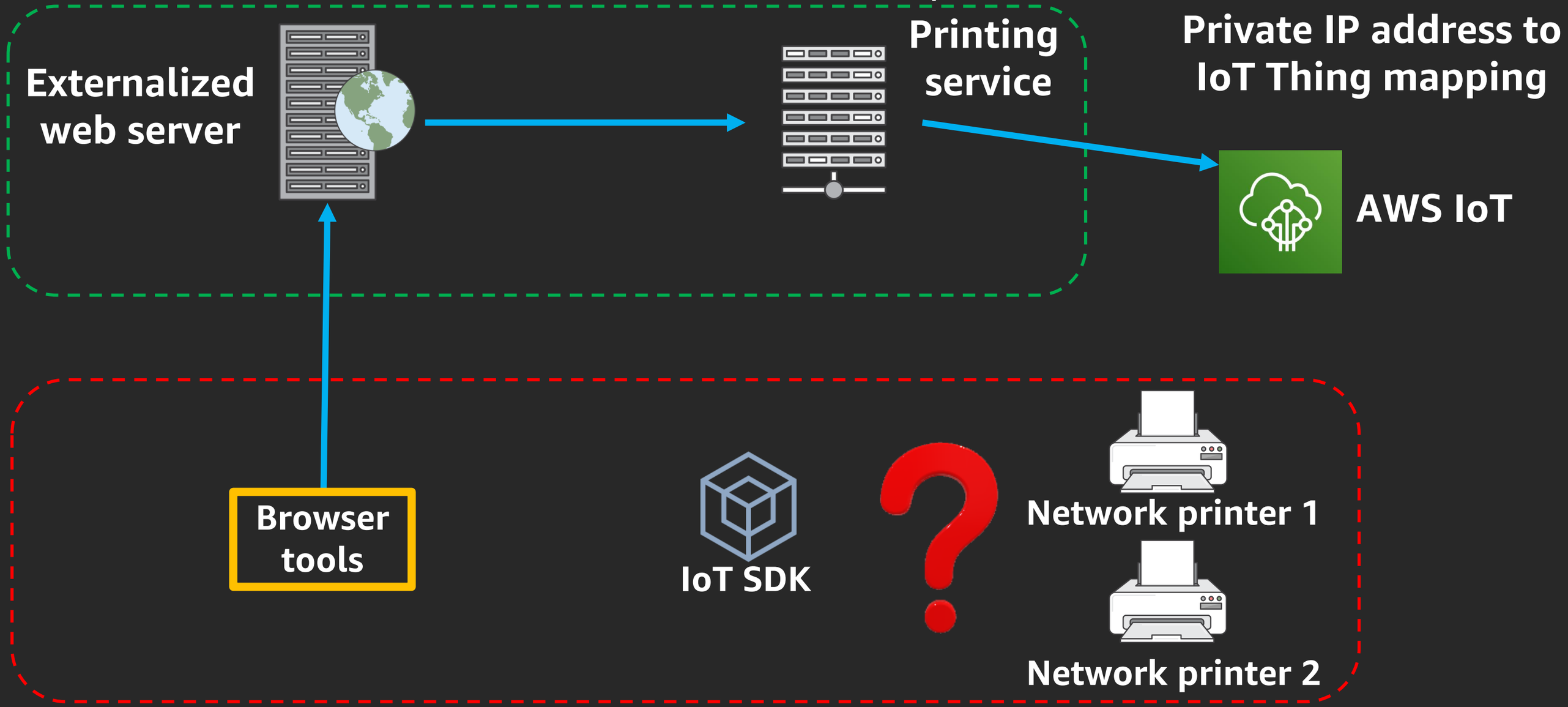


192.168.2.3

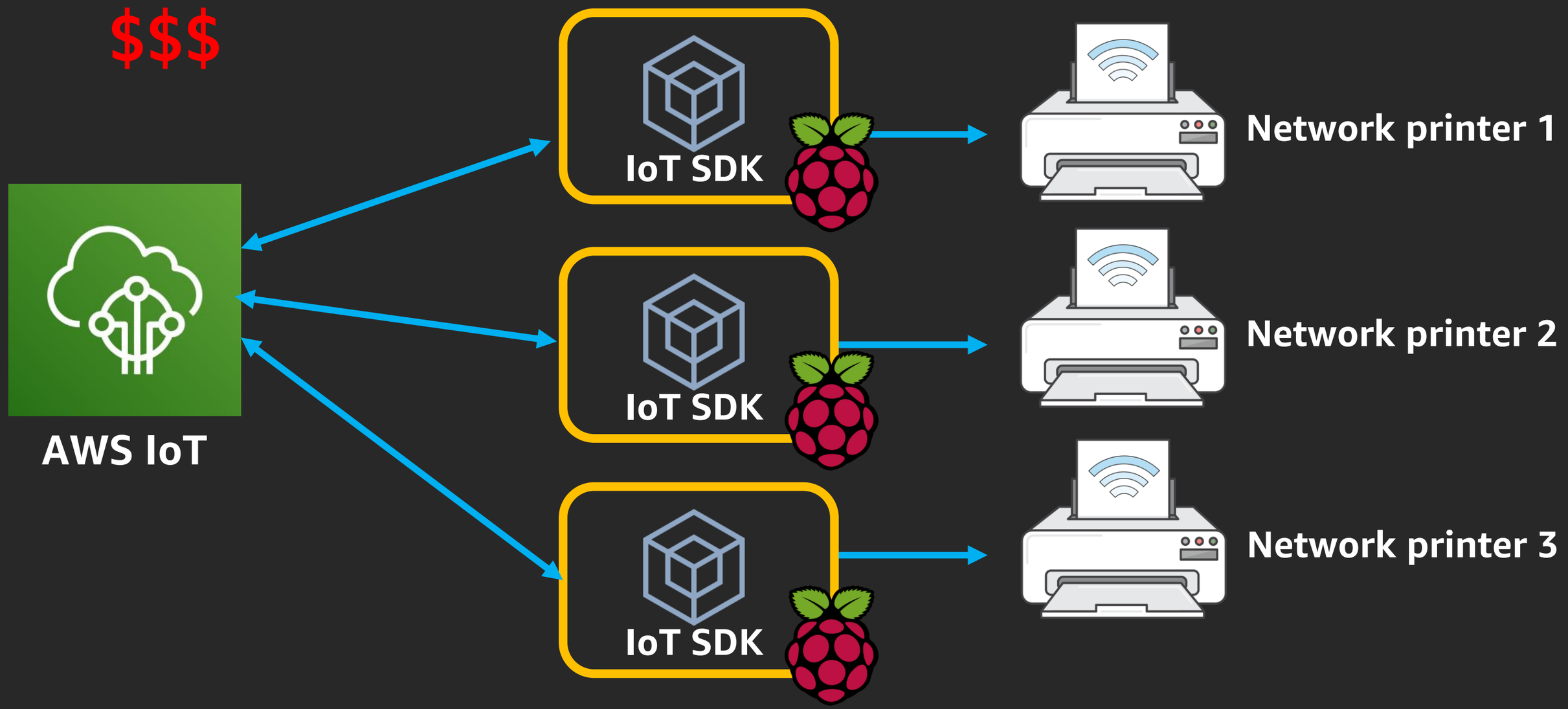


USB printers

What about network-connected printers ?



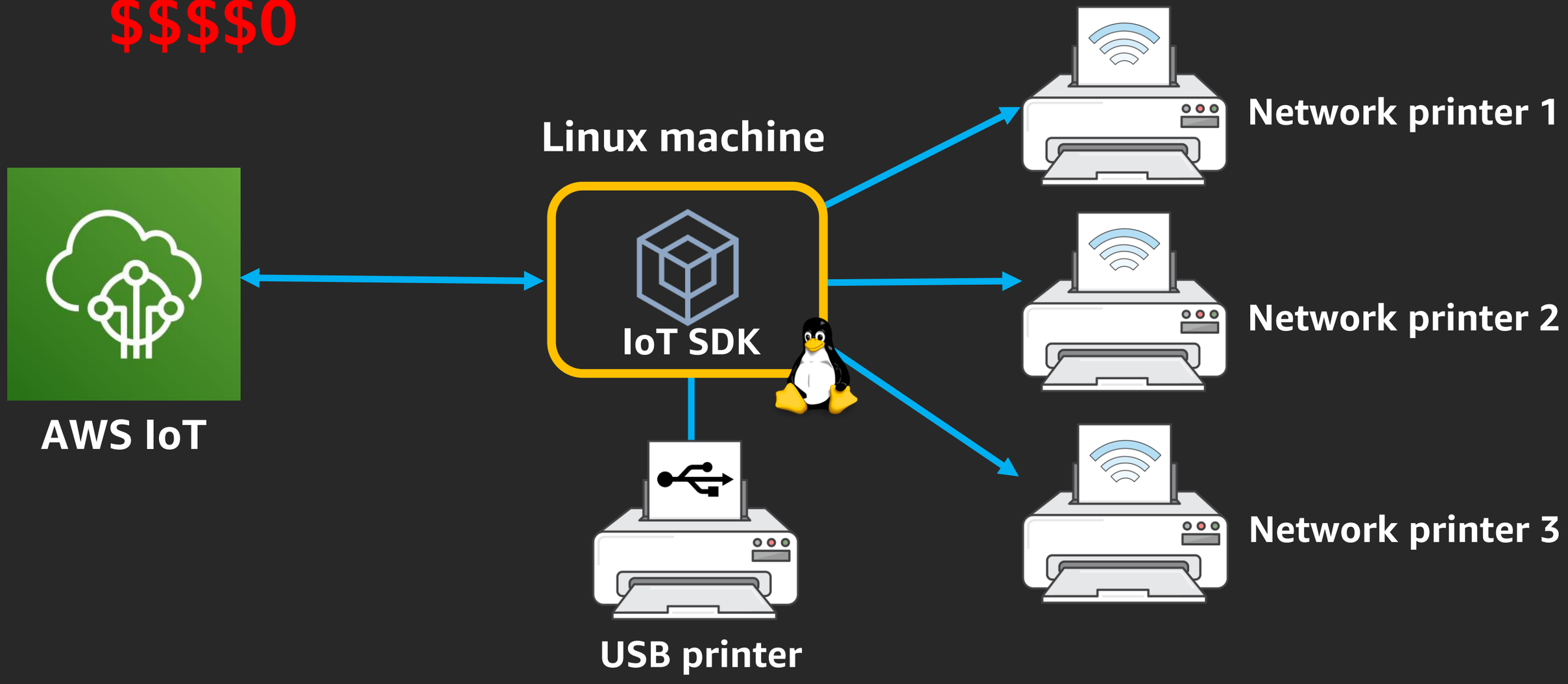
Smart printers



Smarter idea

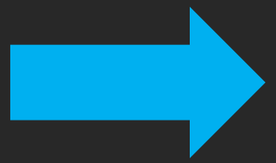
Frugal solution of reusing existing compute of USB printers

$$$$0



Prototype to production journey



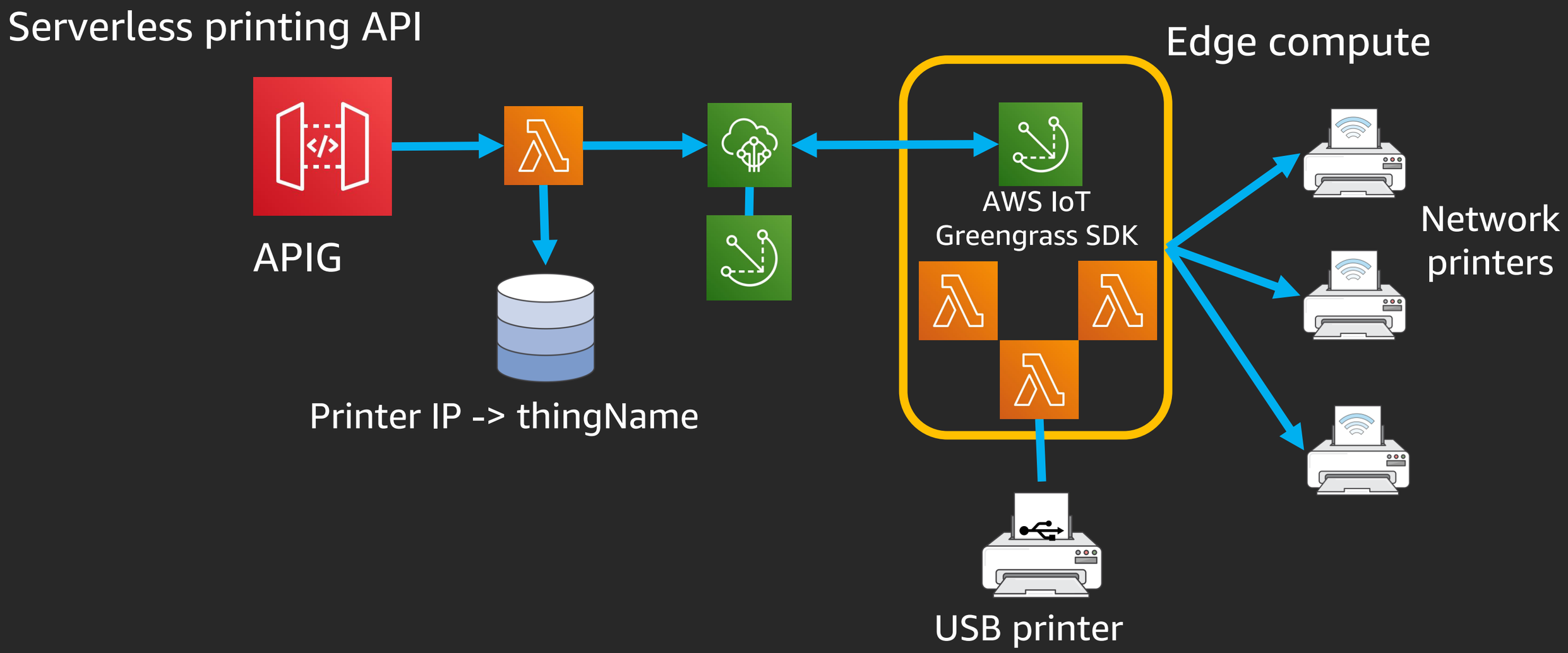




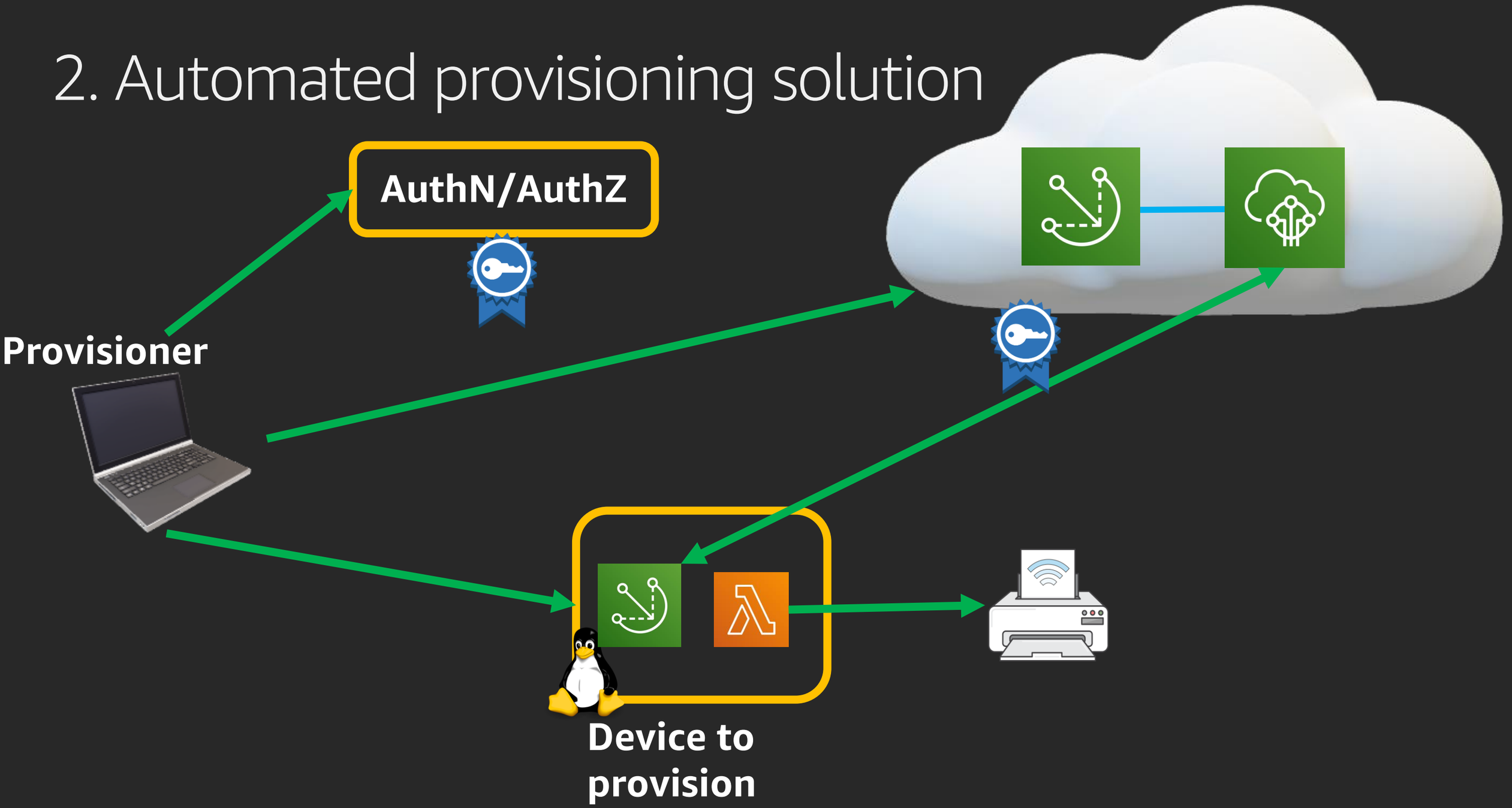
Prototype vs. production solution at Amazon scale

- Multiple platform support, code packaging, phased deployments
- Automated provisioning solution
- Synchronous APIs in AFT
- Sequencing of commands
- Redundancy of devices
- Print idempotency
- Large print docs
- Monitoring, alarms

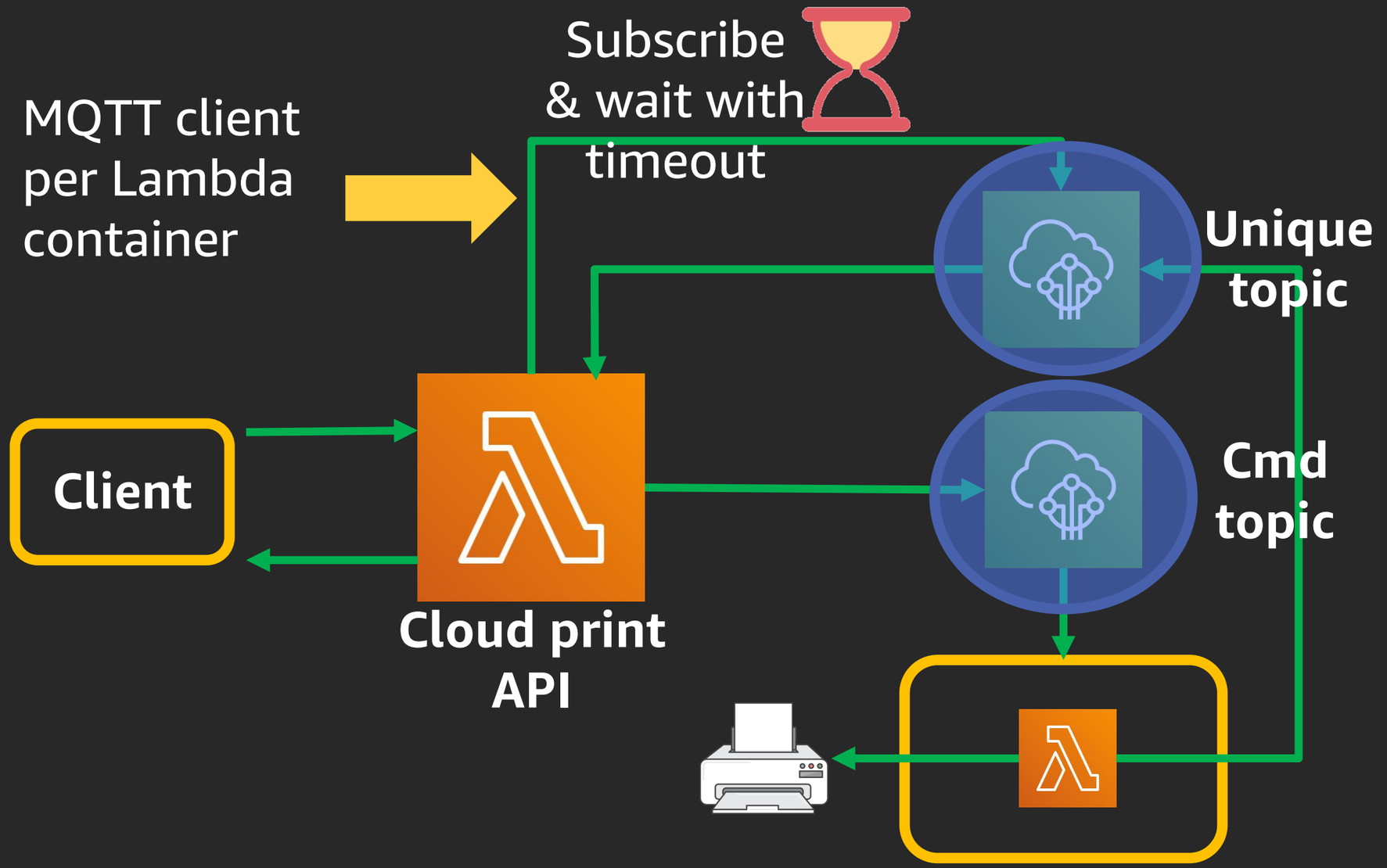
1. Multi-platform, code packaging, phased deployments



2. Automated provisioning solution



3. Synchronous/Blocking APIs



Payload

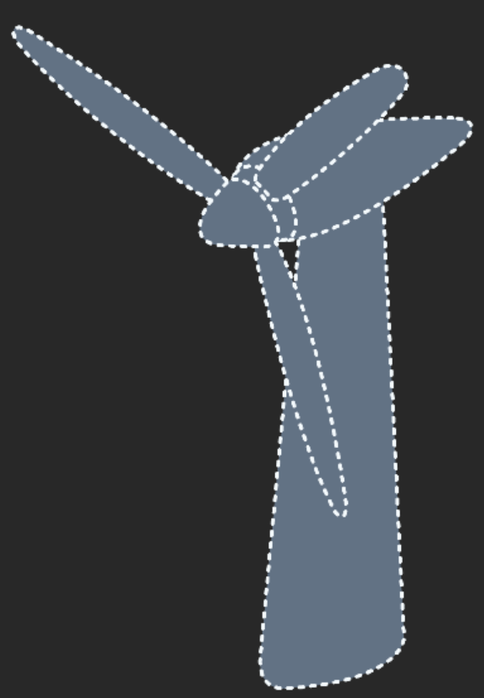
uniqueReplyTopic

CmdTimeToLive

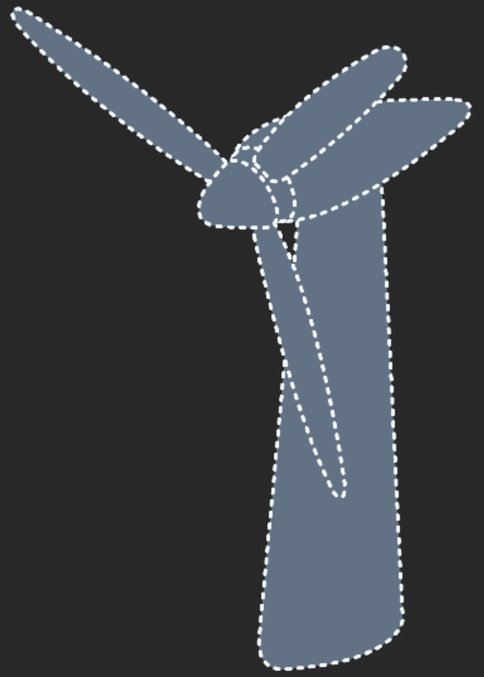
CmdTriggerTime

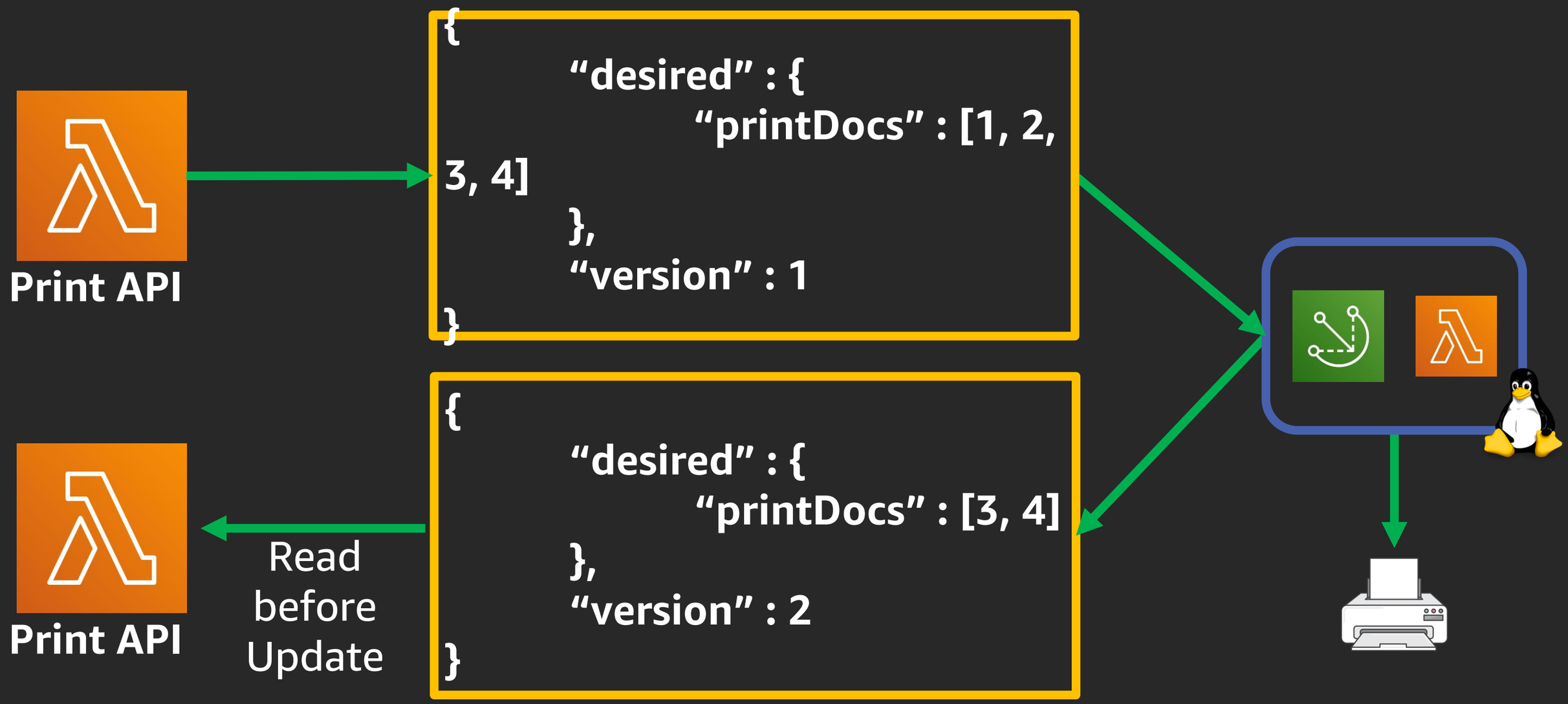
4. Sequencing of commands

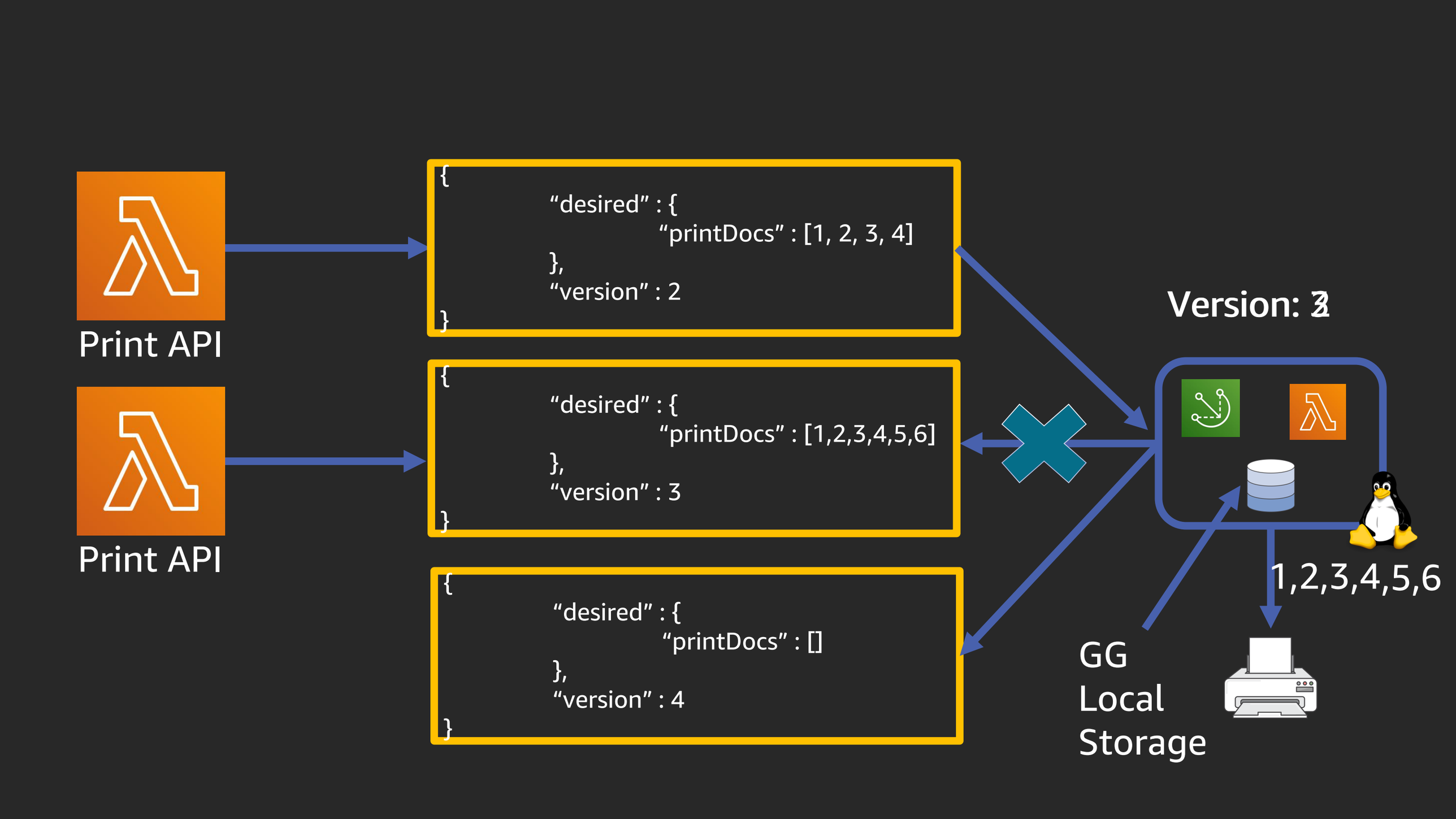
Using AWS IoT shadow








Print API
{
"desired" : {
"printDocs" : [1, 2,
3, 4]
},
"version" : 1
}
Print API
Read
before
Update
{
"desired" : {
"printDocs" : [3, 4]
},
"version" : 2
}


Print API
Print API
{
"desired" : {
"printDocs" : [1, 2, 3, 4]
},
"version" : 2
}
{
"desired" : {
"printDocs" : [1,2,3,4,5,6]
},
"version" : 3
}
{
"desired" : {
"printDocs" : []
},
"version" : 4
}
Version: 3
1,2,3,4,5,6
GG
Local
Storage

Things to keep in mind

- IoT QoS concepts
- No ordering of connect and disconnect events
- AWS IoT Greengrass deployment success: Does that mean your Lambda functions are running fine?
- On-the-fly new Lambda functions at the edge
- Container vs. no-container AWS IoT Greengrass approach
- On-demand Lambda

Resources

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Resources: Would you like to know more?

AWS IoT Workshop

https://tinyurl.com/iot-rudy



AWS IoT Core



AWS Lambda



Amazon SNS

Resources: AWS Training and Certification

Solution overview: Internet of Tracking

http://aws.training/learningobject/video?id=16652



