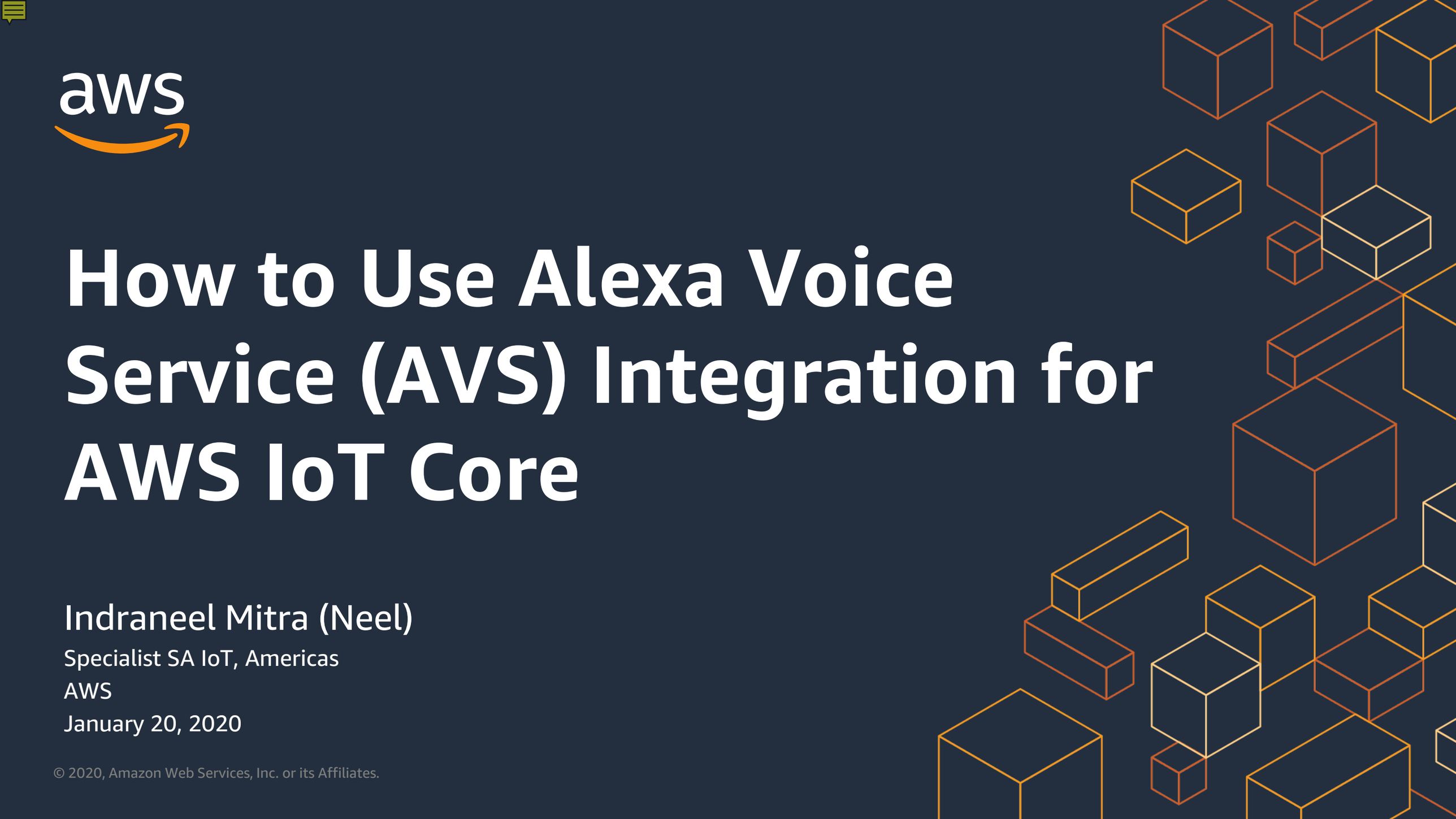

How to Use Alexa Voice Service (AVS) Integration for AWS IoT Core

Indraneel Mitra (Neel)
Specialist SA IoT, Americas
AWS
January 20, 2020

Agenda

- Alexa Voice Service (AVS) Overview
- AWS IoT Overview
- Design Patterns
- Reference Architecture
- Pricing
- How to Get Started
- Demo

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Alexa Voice Service (AVS)

aws

Alexa Voice Service

ASR

TTS

Skills

PHILIPS hue

Device Maker Cloud

Alexa, turn on the light!

Okay!

alexa built-in

WORKS WITH alexa

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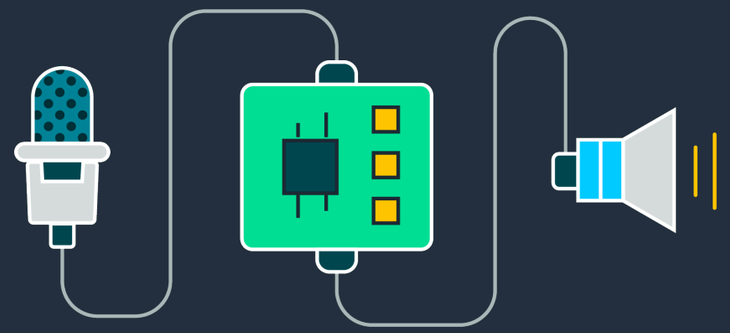
“Alexa, turn on the light”



Wake Word Engine

Speech Capture via Microphone

User’s Utterance

Play back through Speaker

Alexa Voice Response

Alexa Voice Service

Speech Platform

“Recognize” Event

Recognition Result

ASR

Recognition Result

Intent

NLU

Intent

“Play” Directive

Skills

Music Service

Text/SSML

Streaming URL

TTS

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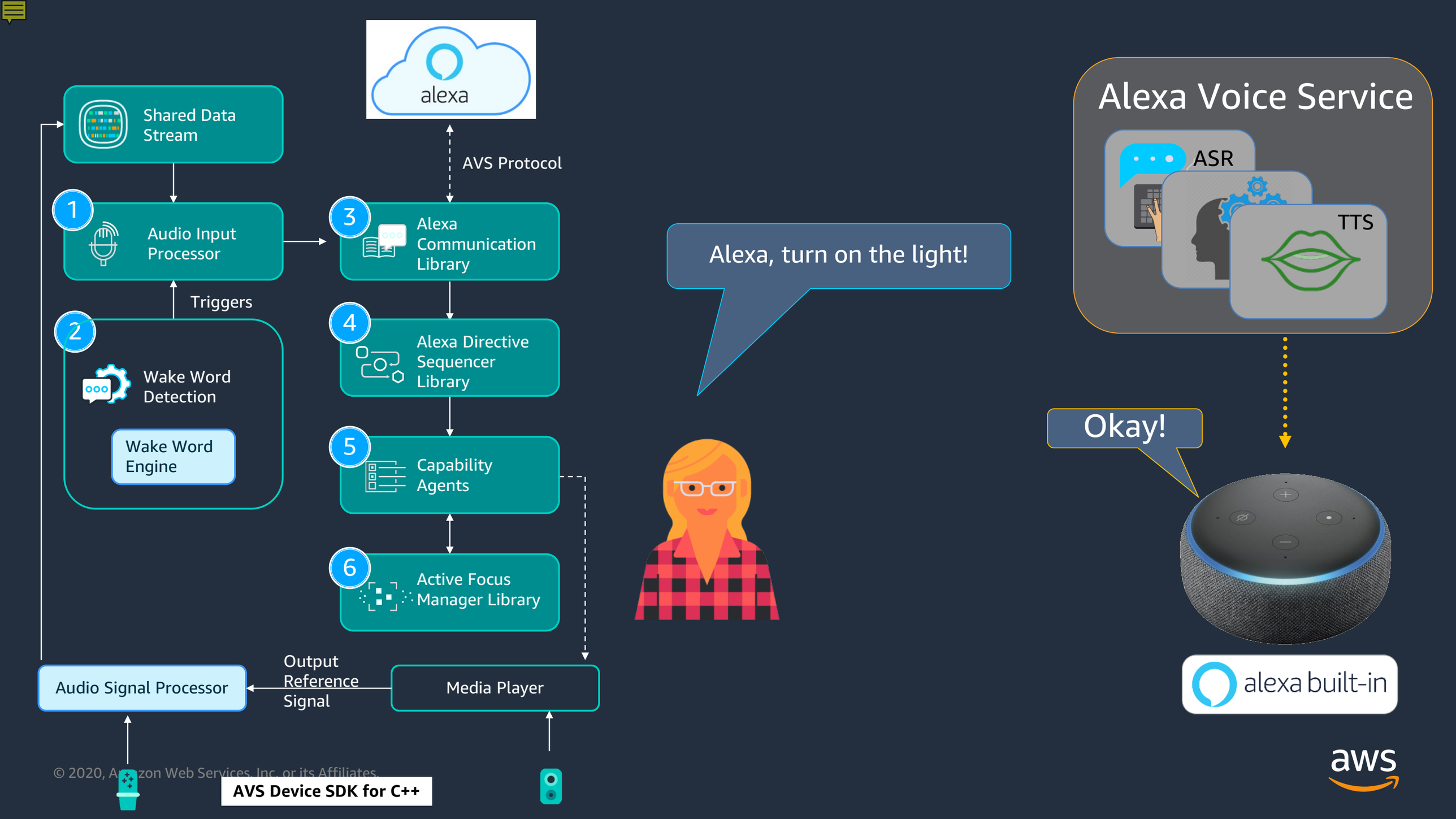

Why isn’t every smart-home device an Alexa Built-in device?

- On-device Resource Limitations
- High Production Cost
- High Complexity

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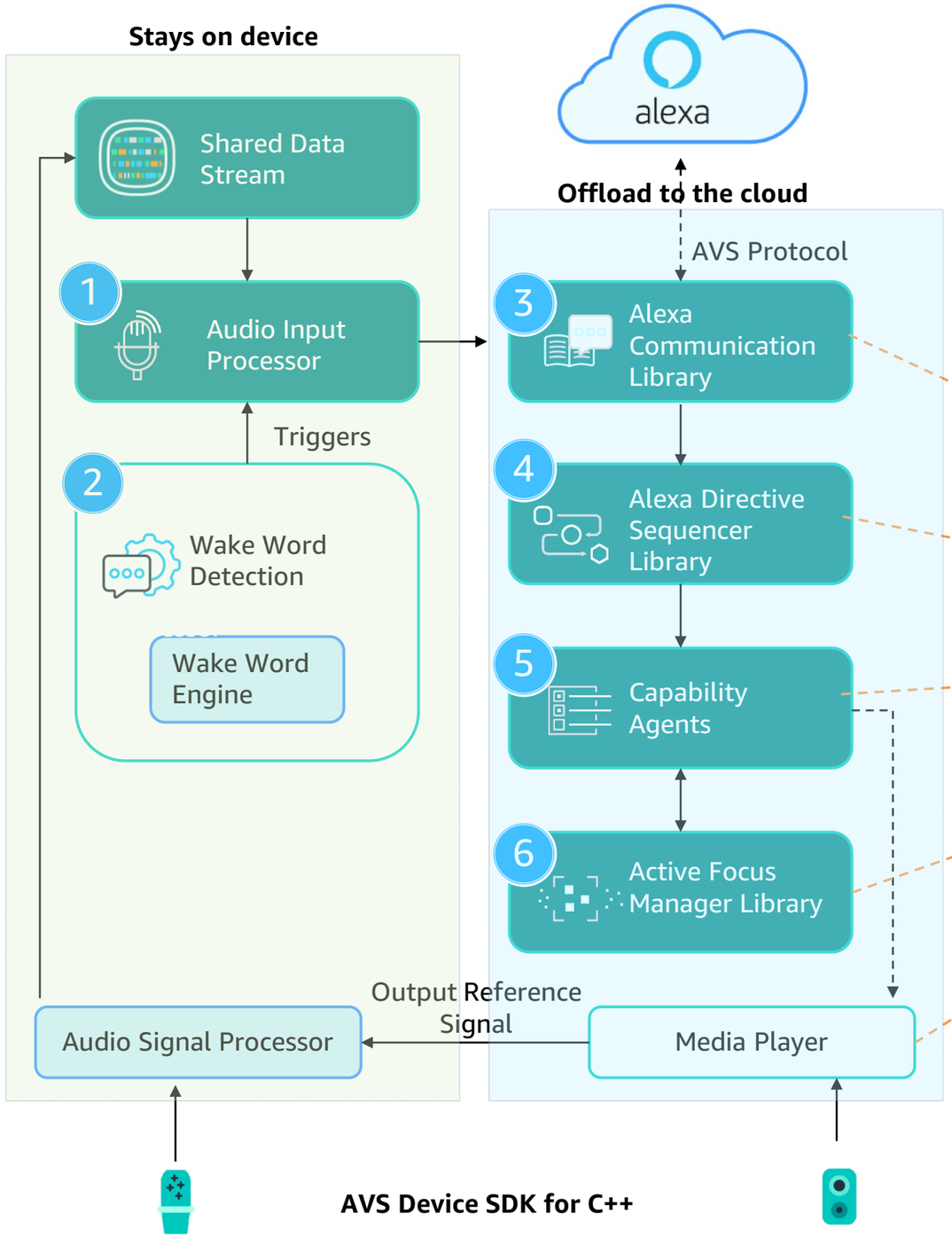
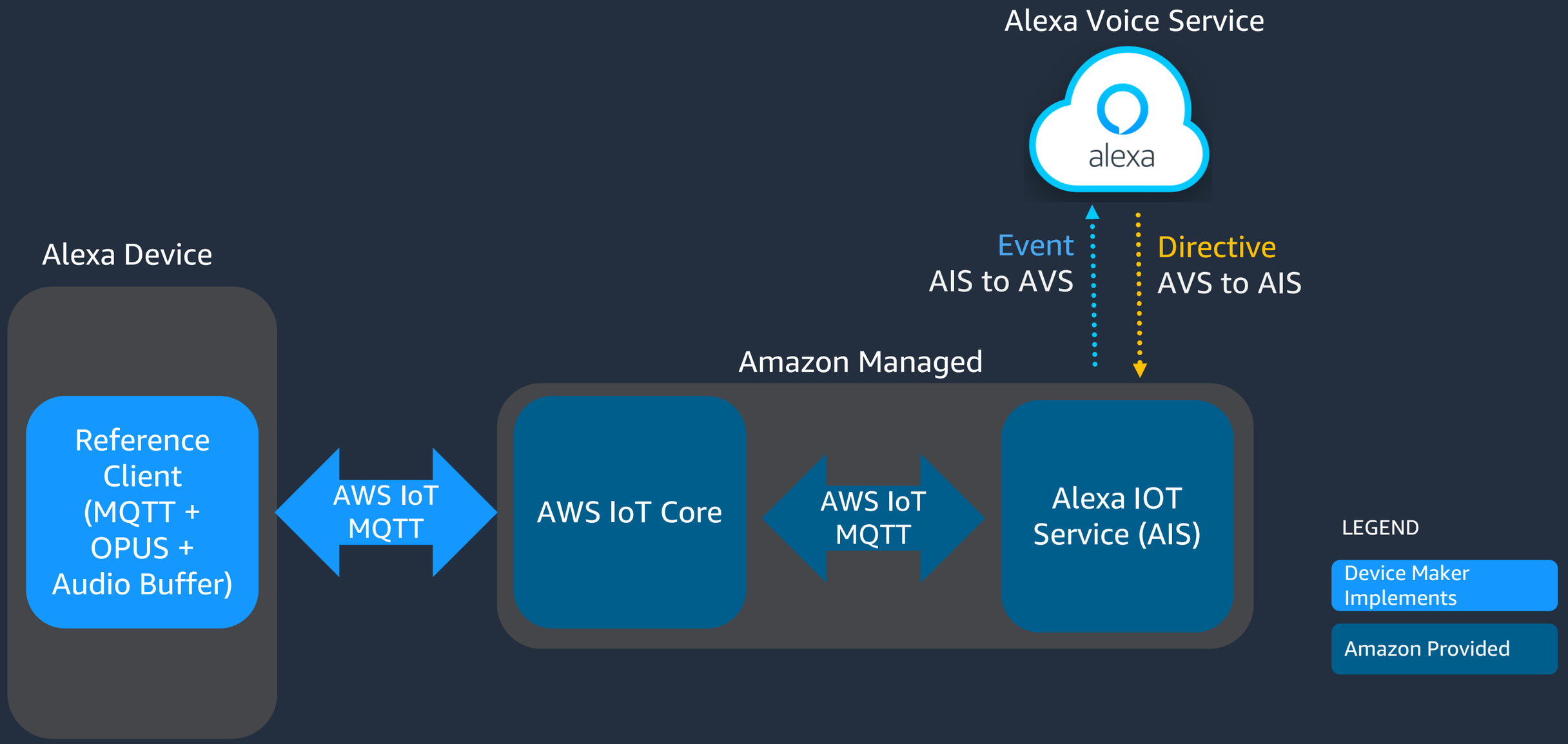
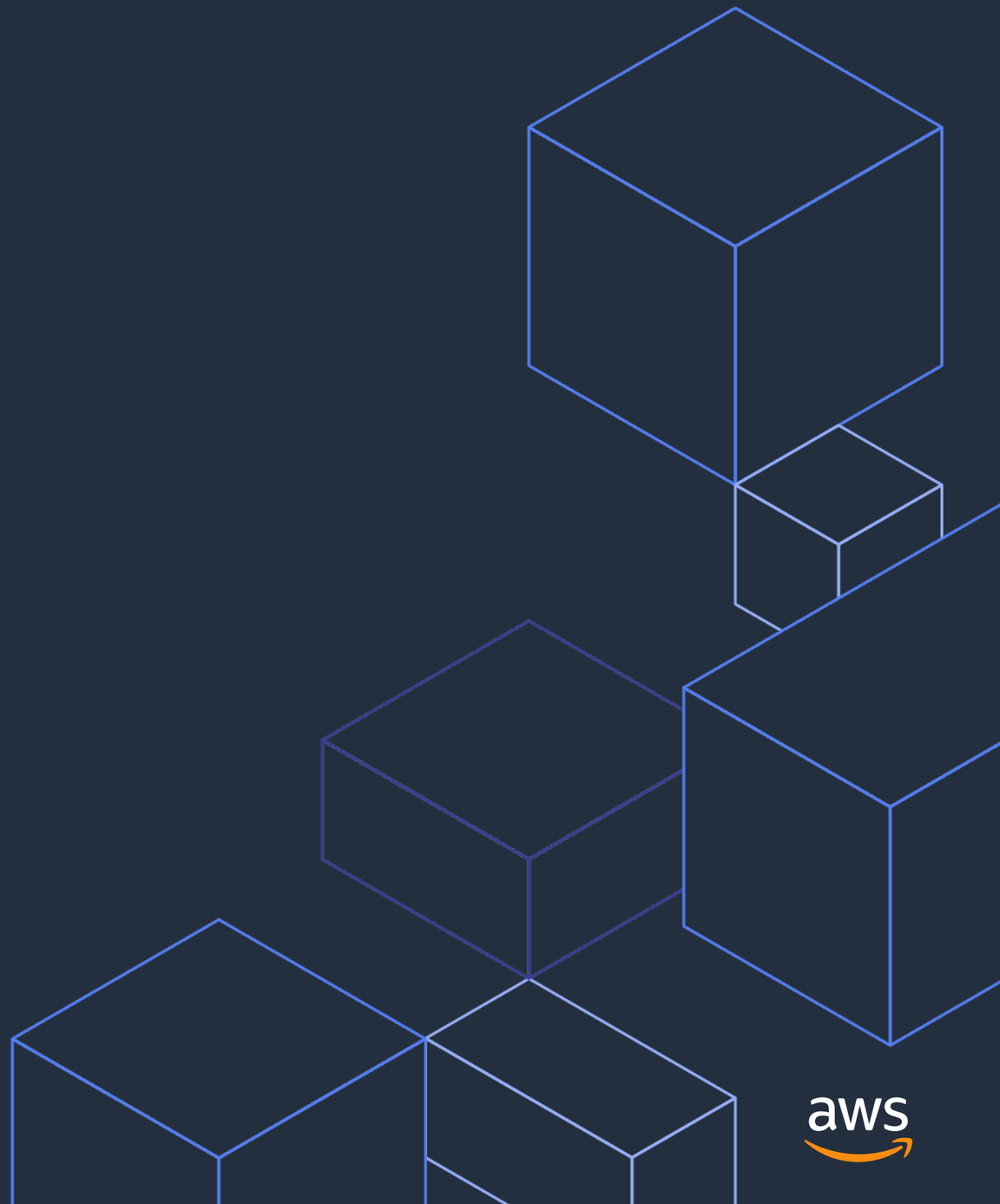
AVS Integration for AWS IoT (AIA)

Offload Complexity to the AWS Cloud





Benefits



Reduce cost , simplify integration

Tap to talk

Client software

- AWS IoT SDK (MQTT)
- Lightweight media player for OPUS playback
- Audio buffering
- Login/authentication

Far-field voice pickup

Algorithms

- Wake word
- Audio frontend – 2+ mics
  - Beam forming
  - Noise suppression
  - Acoustic echo cancellation

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Reduce hardware footprint

	AVS for AWS IoT	AVS Device SDK
Interaction Model	Touch or Voice initiated	Touch or Voice initiated
Processor	ARM M7 or equivalent ARM M4 + AFE DSP	ARM Cortex 'A' Class
RAM	1MB for ARM M7 500KB for M4 + AFE DSP	50MB
Target OS	**FreeRTOS**	**Linux**
Connectivity	MQTT over Wi-Fi	HTTP/2 over Wi-Fi
# of Microphones	2+	2+
Speaker	Optimized for speech playback	Optimized for speech and music playback

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And many others

1 persistent network connection

1 codec on device

1 single speaker "stream"

Authentication through AWS IoT Core

Significantly less compute & memory required

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iDevices®

Problem

iDevices was looking to expand their smart home portfolio to include a product with onboard voice services. In-house engineers and designers developed Instinct™, a smart light switch with Alexa built-in. With the backend infrastructure and industrial design complete, the team needed to choose a cloud-based platform to execute and analyze IoT features.

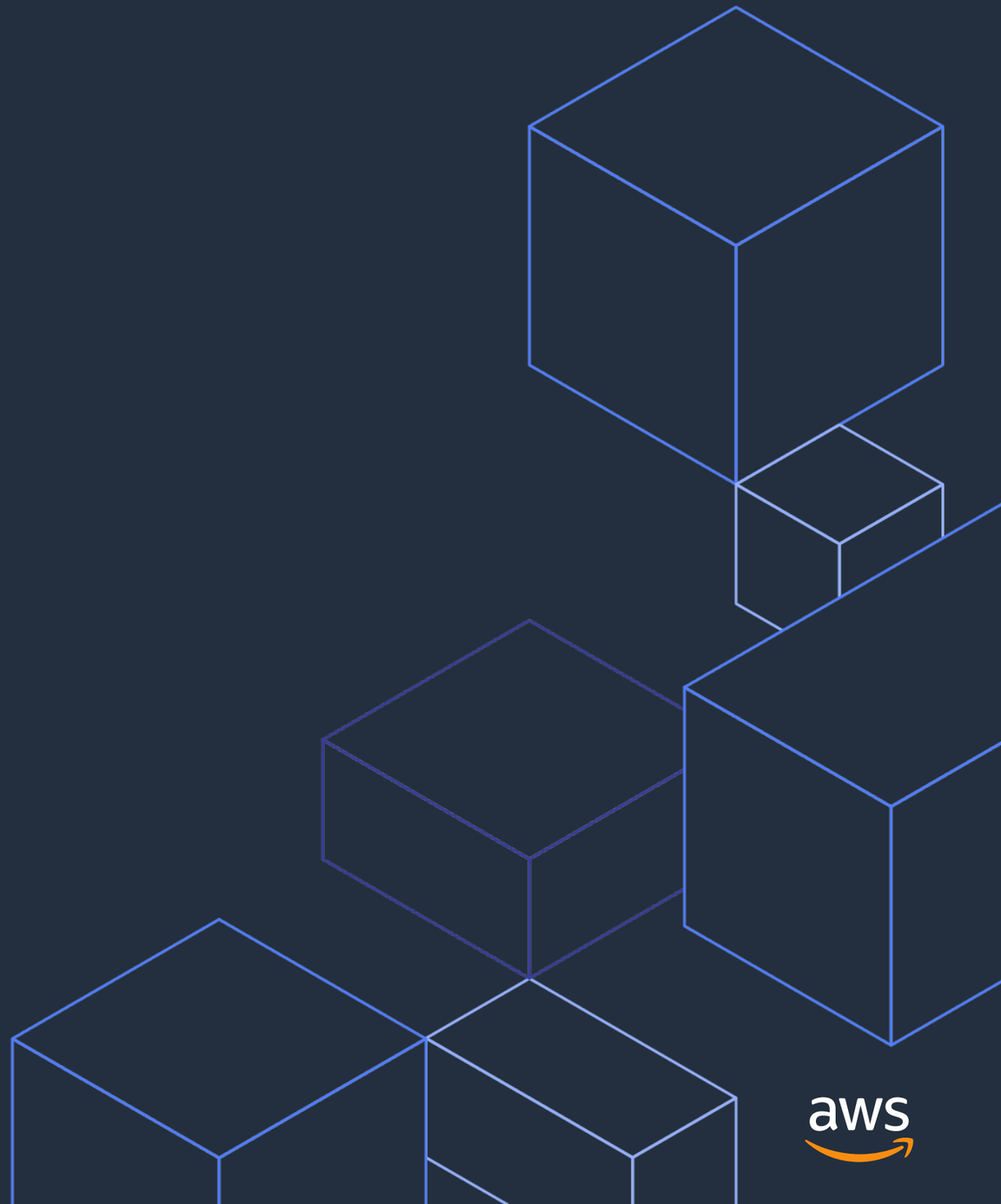
Solution

iDevices chose AWS IoT, which serves as the cloud-based messaging protocol to enable Alexa voice services, lighting control, and motion sensing functionality. Instinct allows users to invisibly integrate the power of Amazon Alexa throughout their homes and reap the benefits of whole-home voice control without sacrificing valuable counter space.

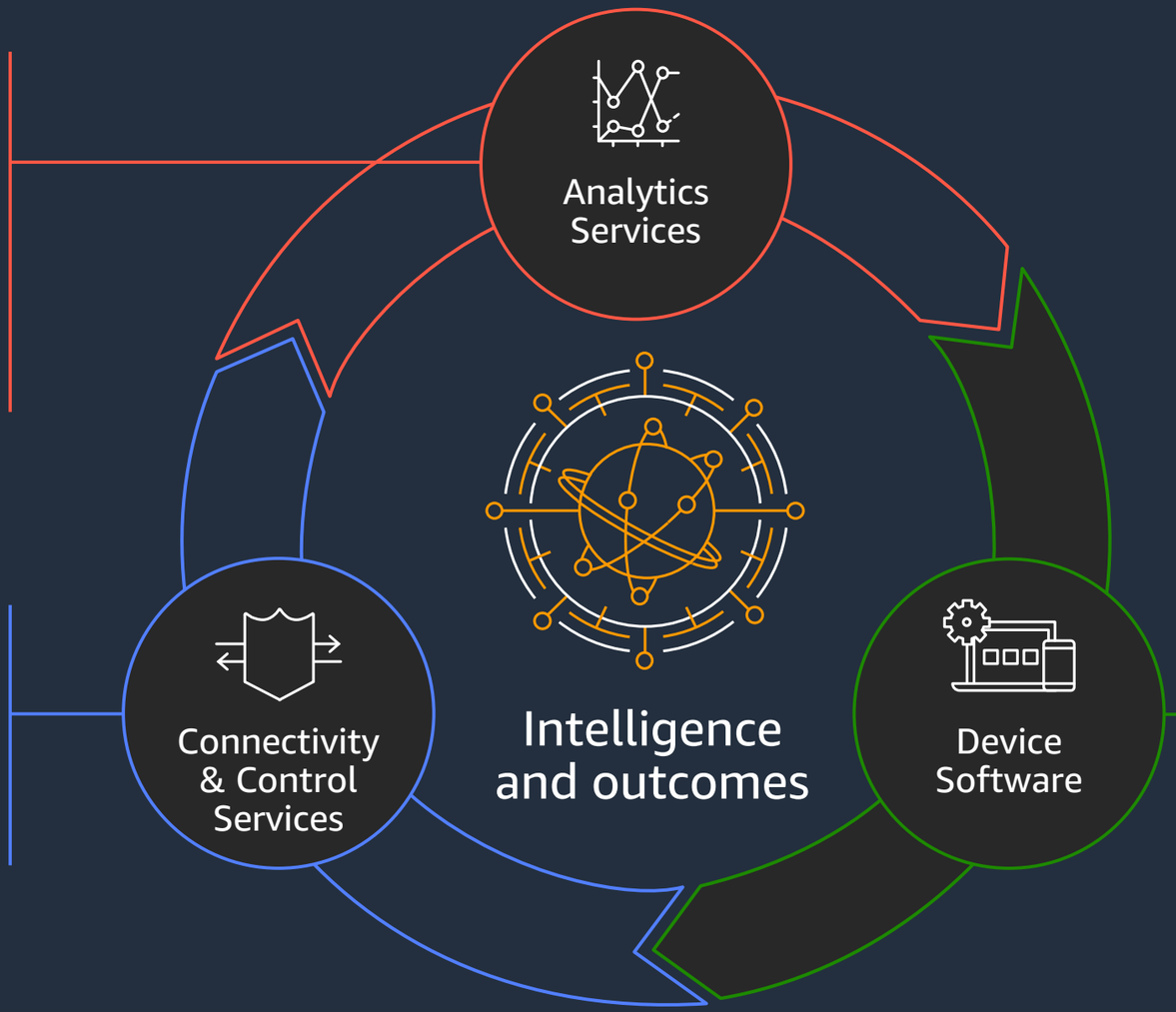
Impact

Instinct is the first of many innovations driven by the combination of iDevices' vast IoT expertise, and Hubbell's 130-plus years of electrical manufacturing and distribution experience. By employing AWS IoT, iDevices was able to accelerate time-to-market and optimize infrastructure costs.

AWS IoT Services



IoT virtuous cycle



AWS IoT SiteWise

AWS IoT Analytics

AWS IoT Events

AWS IoT Things Graph

AWS IoT Core

AWS IoT Device Management

AWS IoT Device Defender

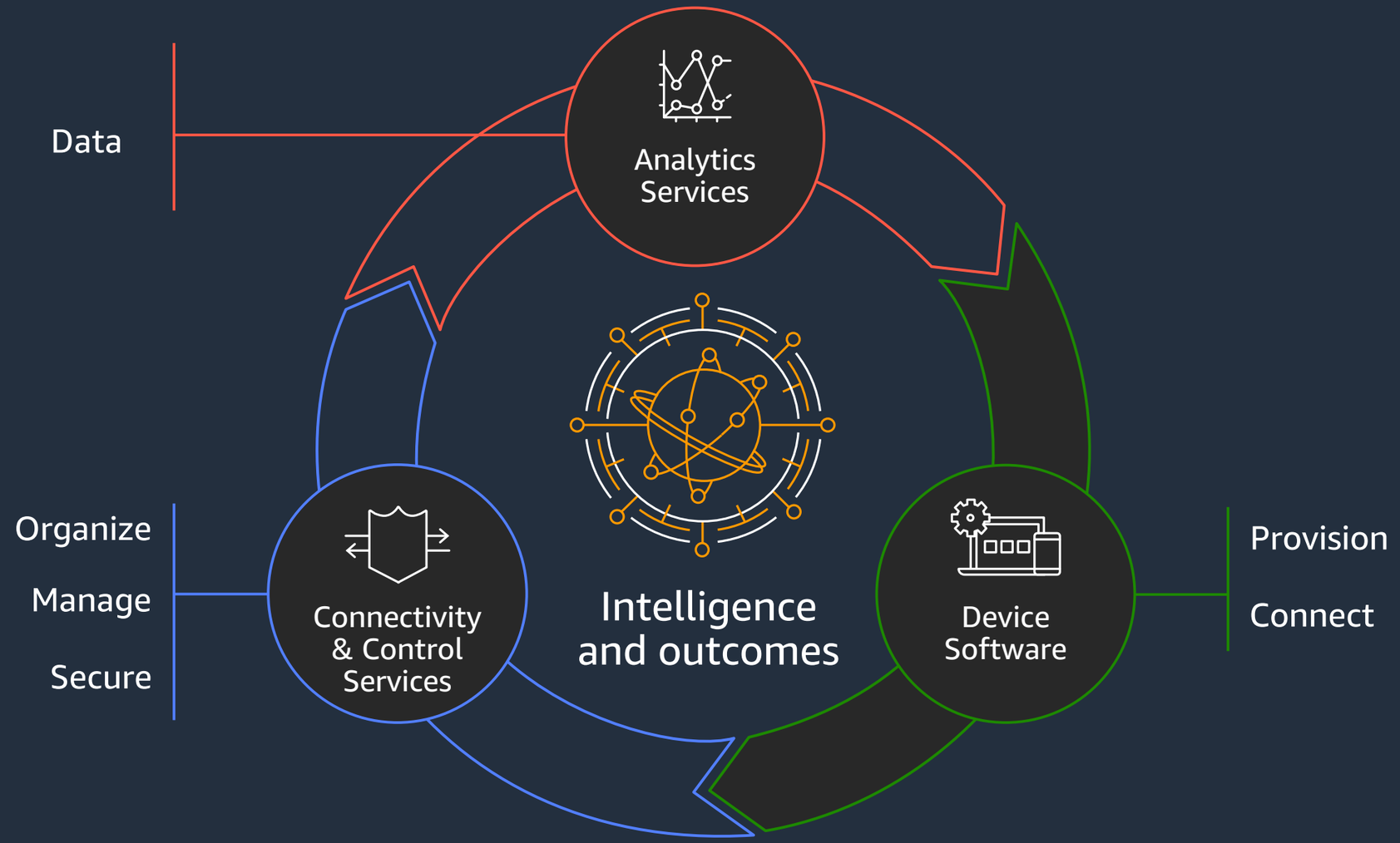
Amazon FreeRTOS

AWS IoT Device SDK

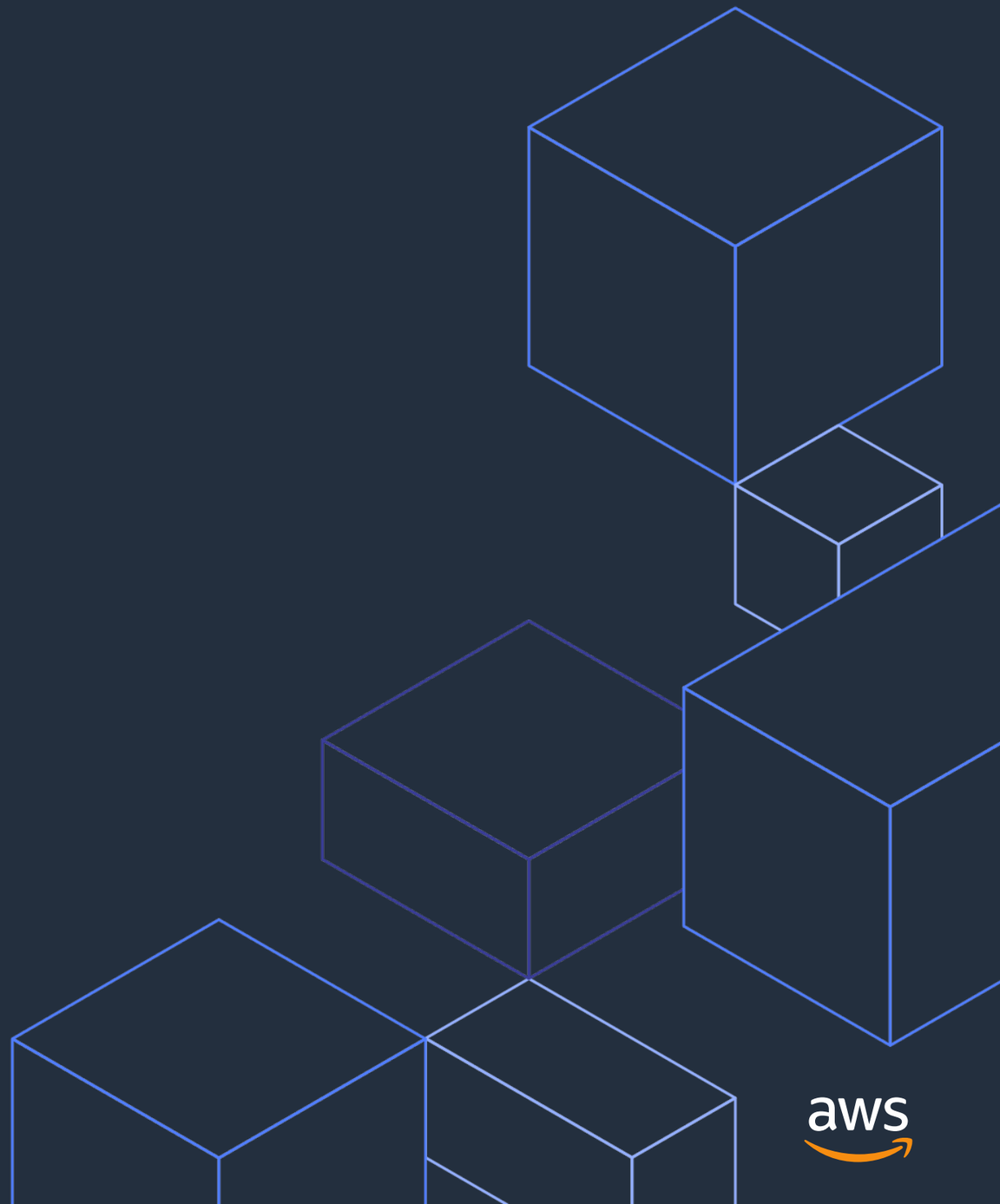
AWS IoT Greengrass

AWS IoT Device Tester

Life of a Voice Controlled Thing



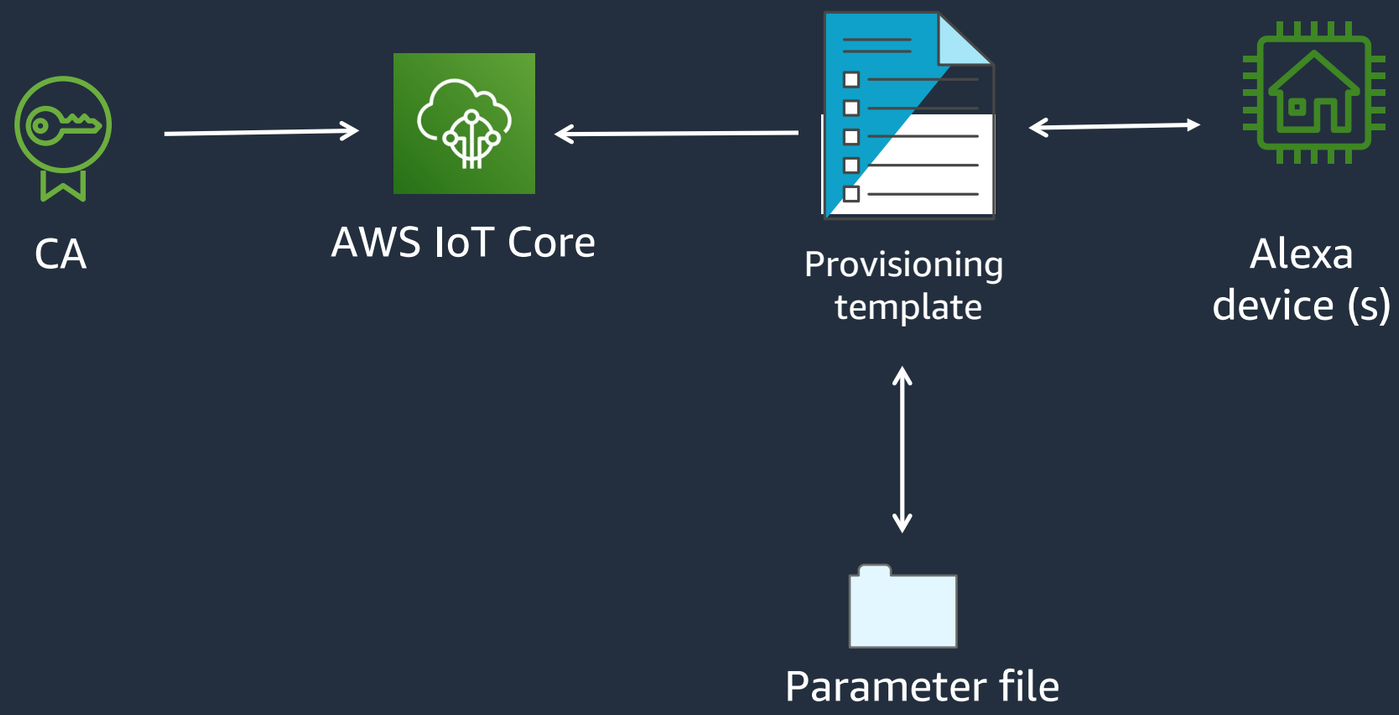
Design Patterns



Provision

Connect

Bulk provision your fleet



1. Choose CA (AWS / BYO)
2. Create thing (s) / thing group
3. Create certificates, keys, policies
4. Attach policy to certificate / thing group
5. Embed keys / certificates on the device

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Provisioning Template

```
"Parameters" : {

    "ThingName" : { "Type" : "String" },

    "SerialNumber" : { "Type" : "String" },

    "Location" : { "Type" : "String",
                   "Default" : "WA" },

     "CSR" : { "Type" : "String" }
}
"Resources" : {
    "thing" : {
        "Type" : "AWS::IoT::Thing",
        "Properties" : {
            "ThingName" : {"Ref" : "ThingName"},
            "AttributePayload" : {
                "version" : "v1",
                "serialNumber" :  {"Ref" : "SerialNumber"}
            },
            "ThingTypeName" :  "lightBulb-versionA",
            "ThingGroups" : ["v1-lightbulbs", {"Ref" : "Location"}]
        }
     },

    "certificate" : {      "Type" : "AWS::IoT::Certificate",      "Properties" : {
"CertificateSigningRequest": {"Ref" : "CSR"},        "Status" : "ACTIVE"            }    }
```

Parameter File

{"ThingName": "device1", "SerialNumber": "123", "CSR": "csr1"}
{"ThingName": "device2", "SerialNumber": "456", "CSR": "csr2"}

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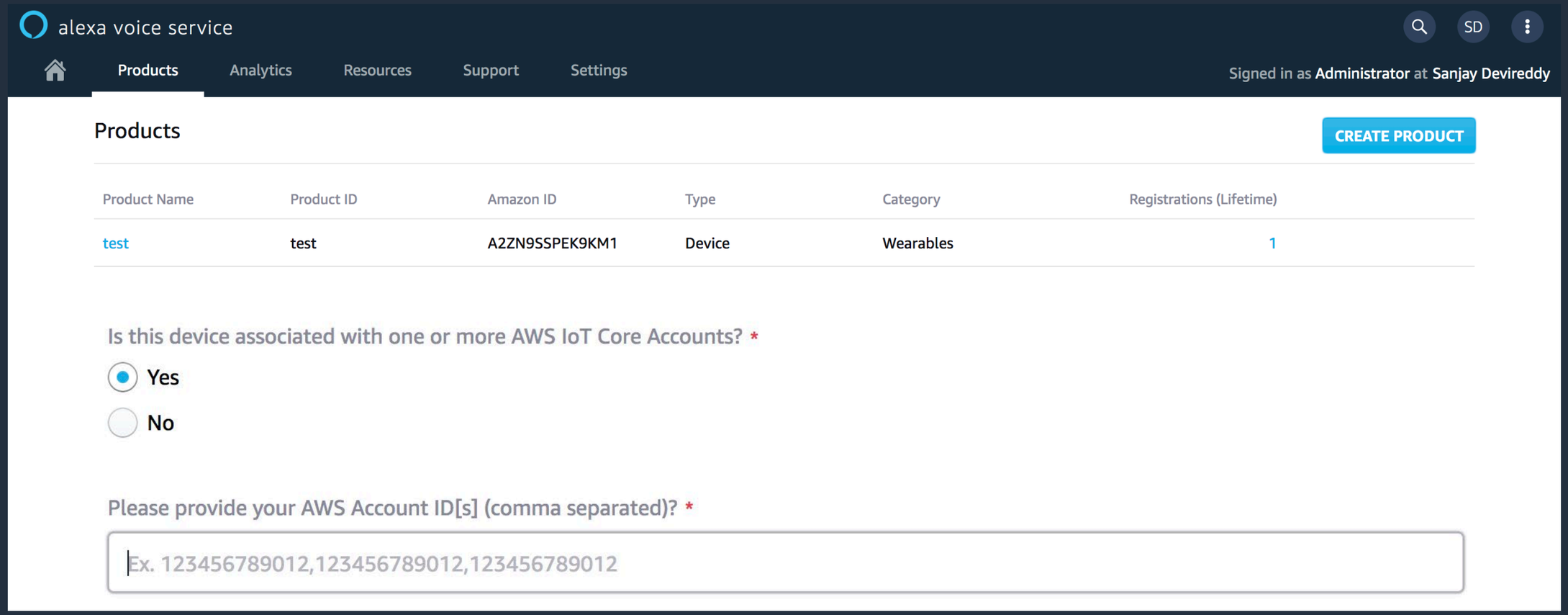
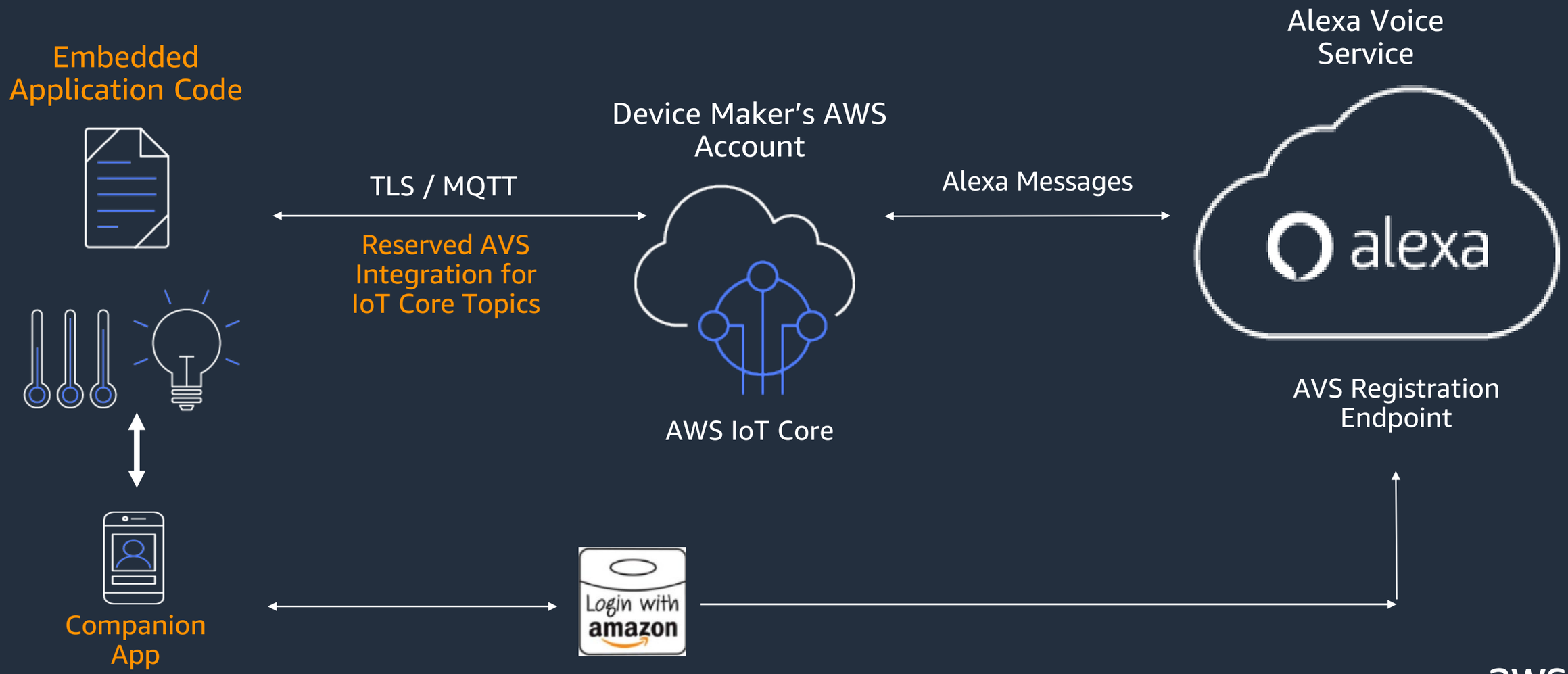
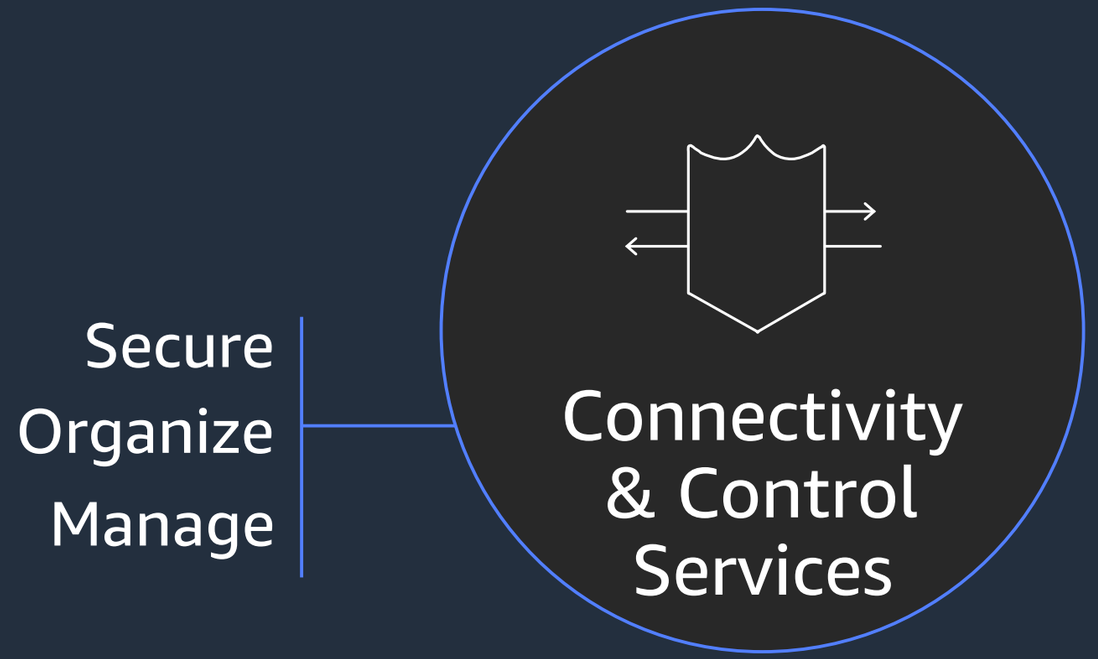
Register voice product



Connect fleet to voice





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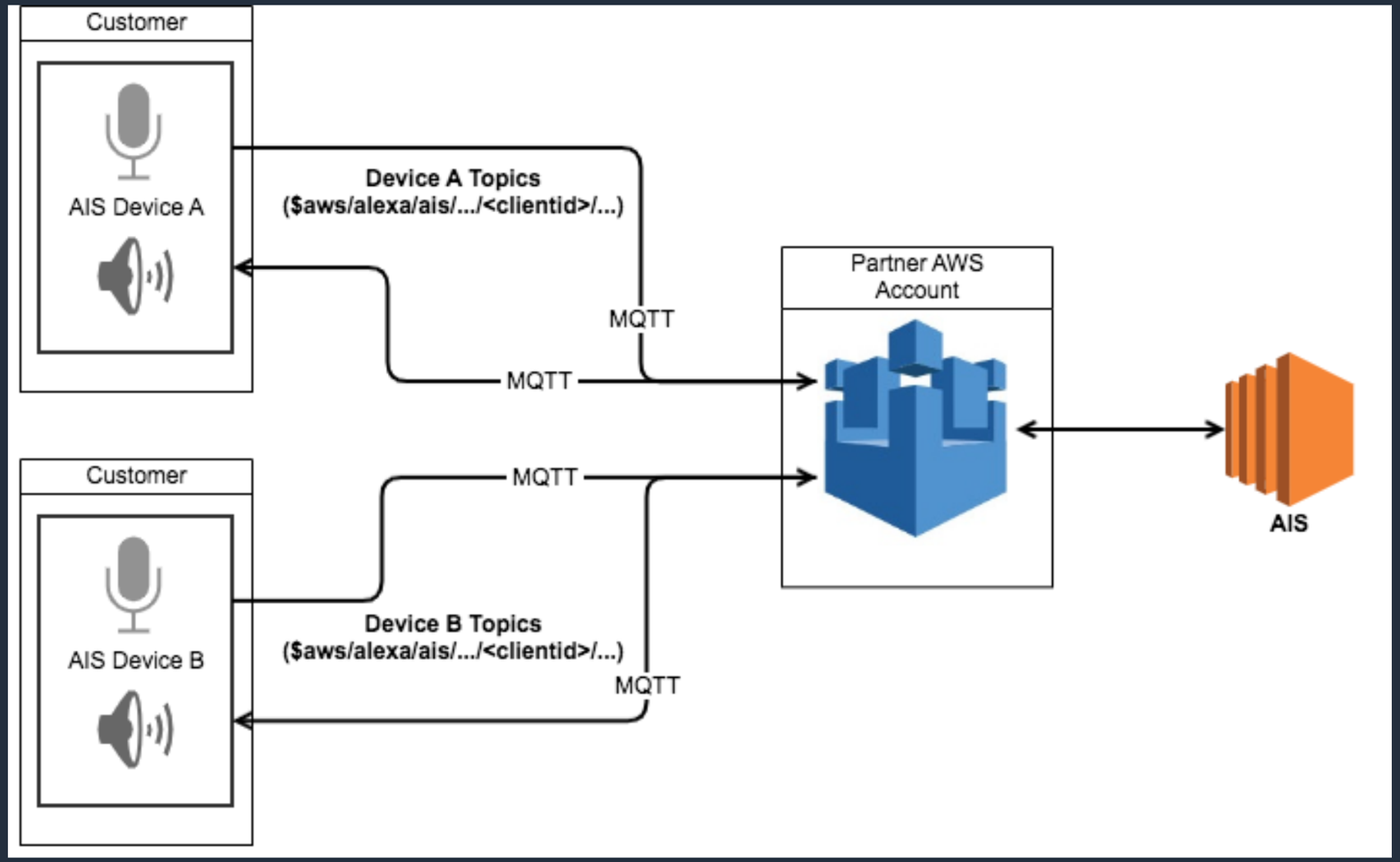
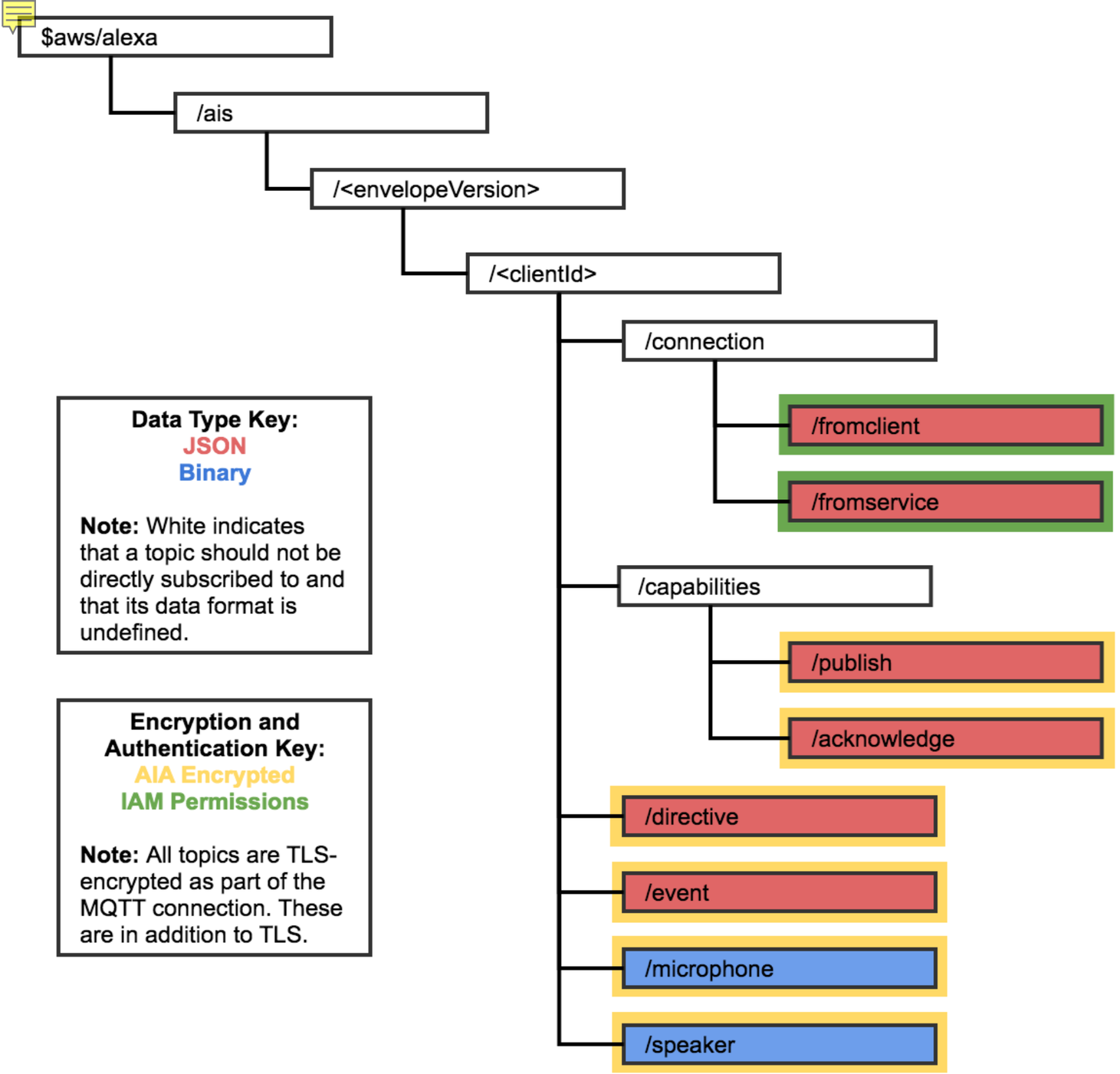


End to End Encryption

- AES-GCM
- Shared key
  - Key is only kept by the device and AVS for AWS IoT Core

aws



Topic Namespace

Control Topics

/connection
/capabilities
/directive
/event

Data topics

/speaker
/microphone

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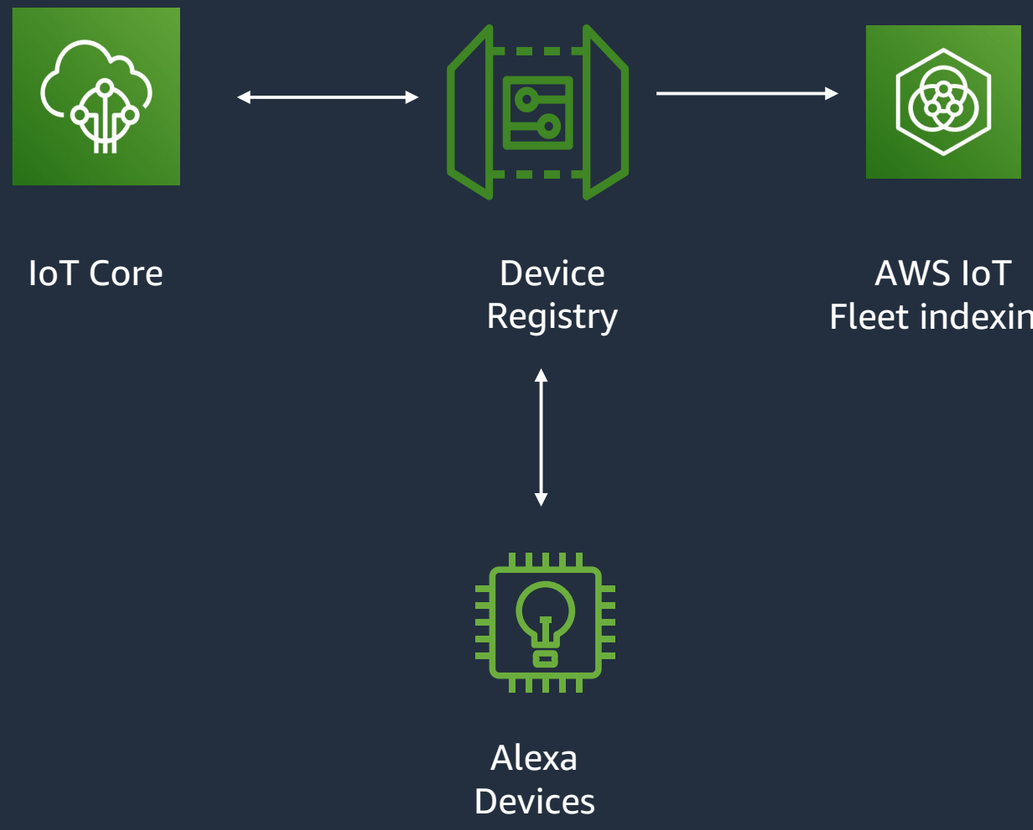
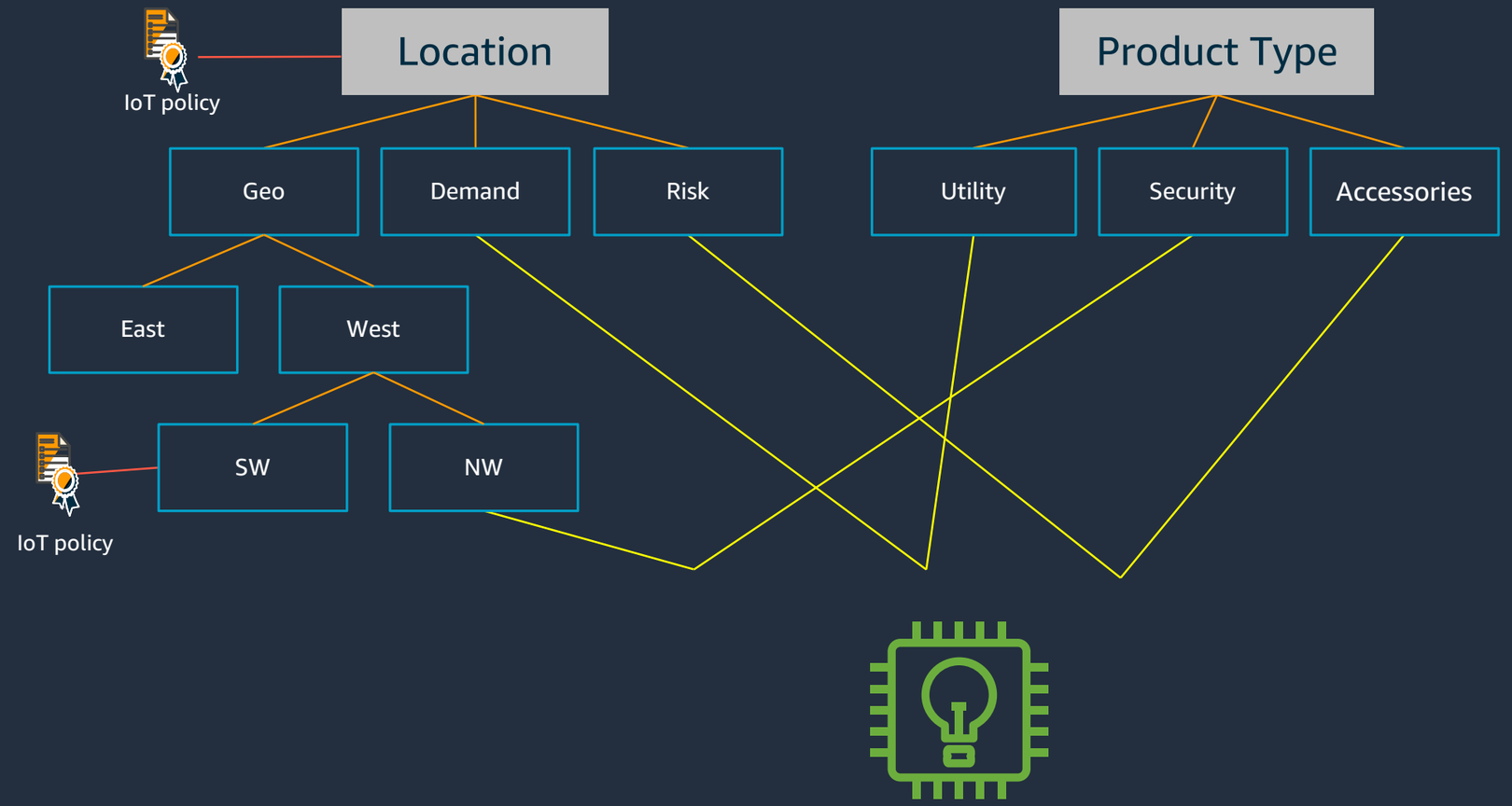
find my lights with firmware v1



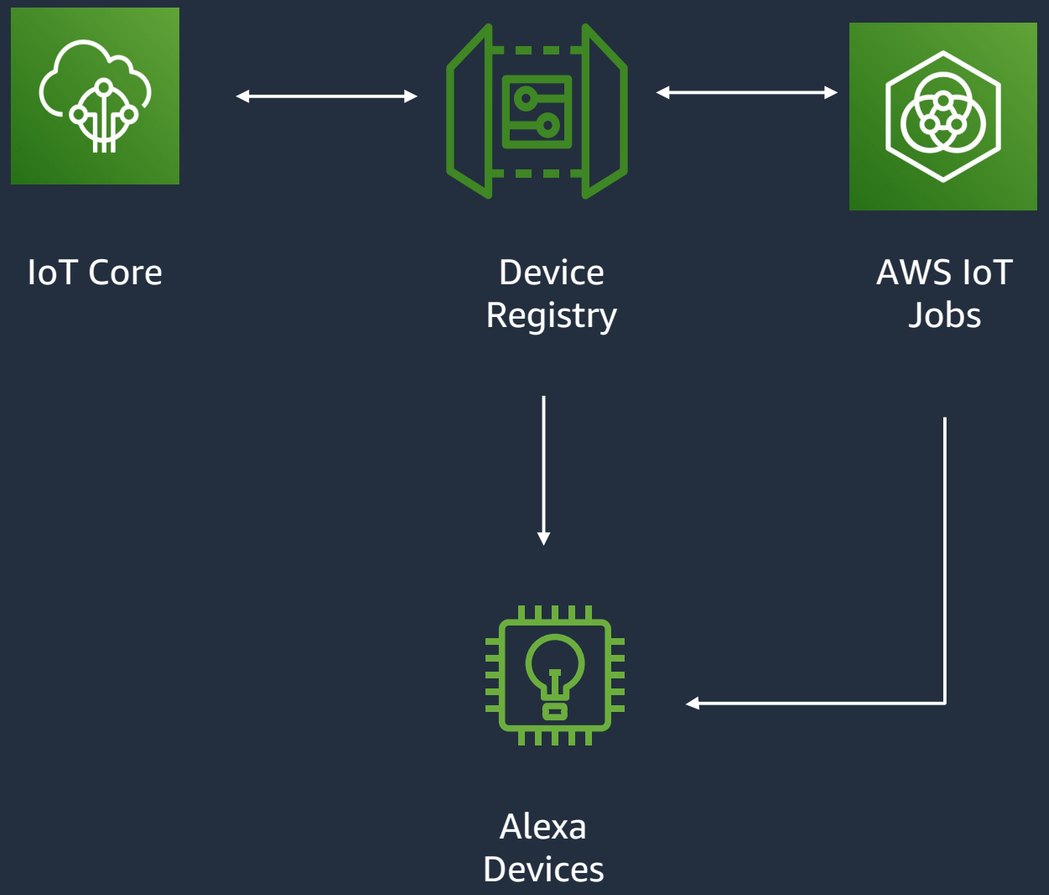

```
thingName:light* AND
thingConnectivity.connected:true AND
thingConnectivity.firmware = “v1”
```

Organize your fleet – Use Device Registry



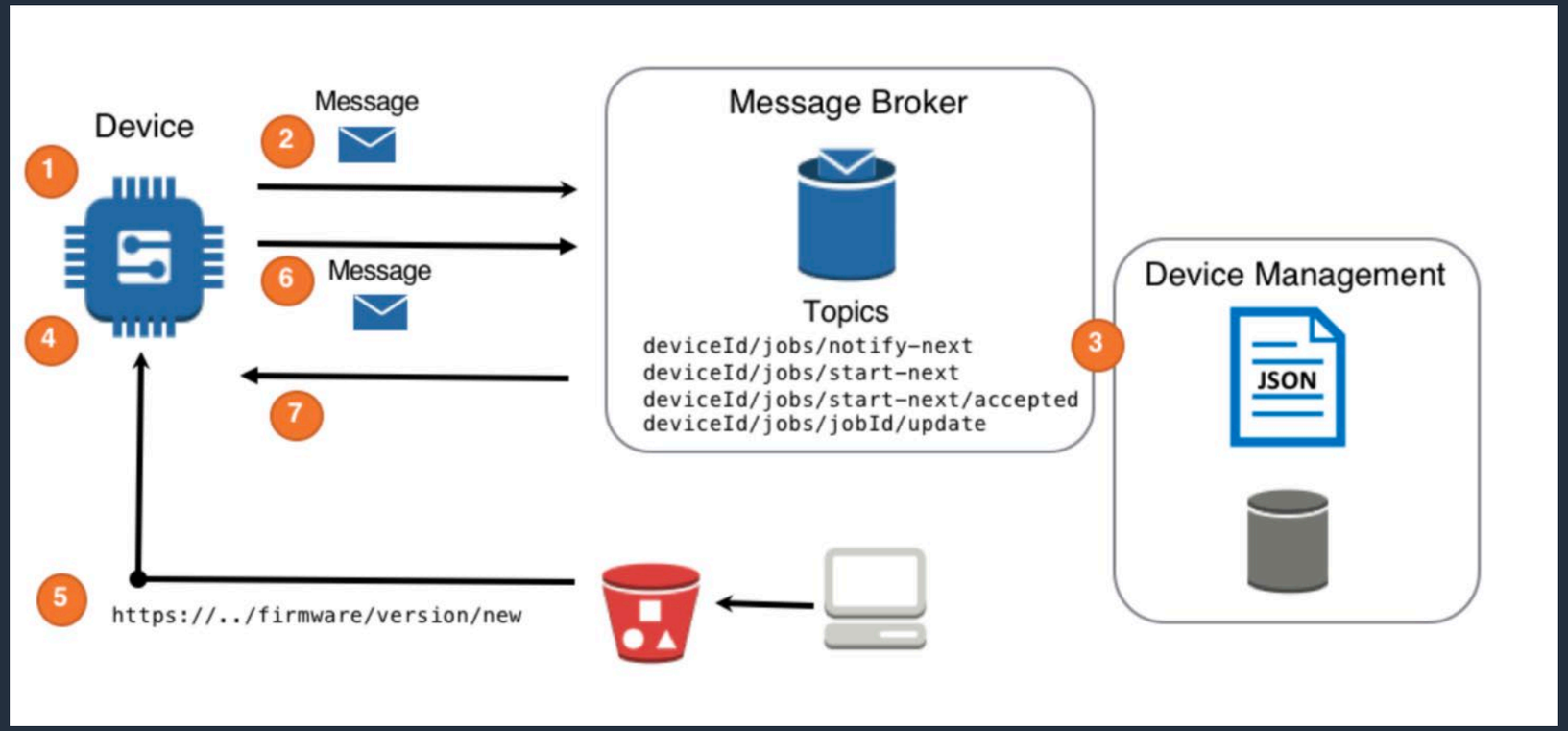
- Group
- Search

patch my lights with firmware v2



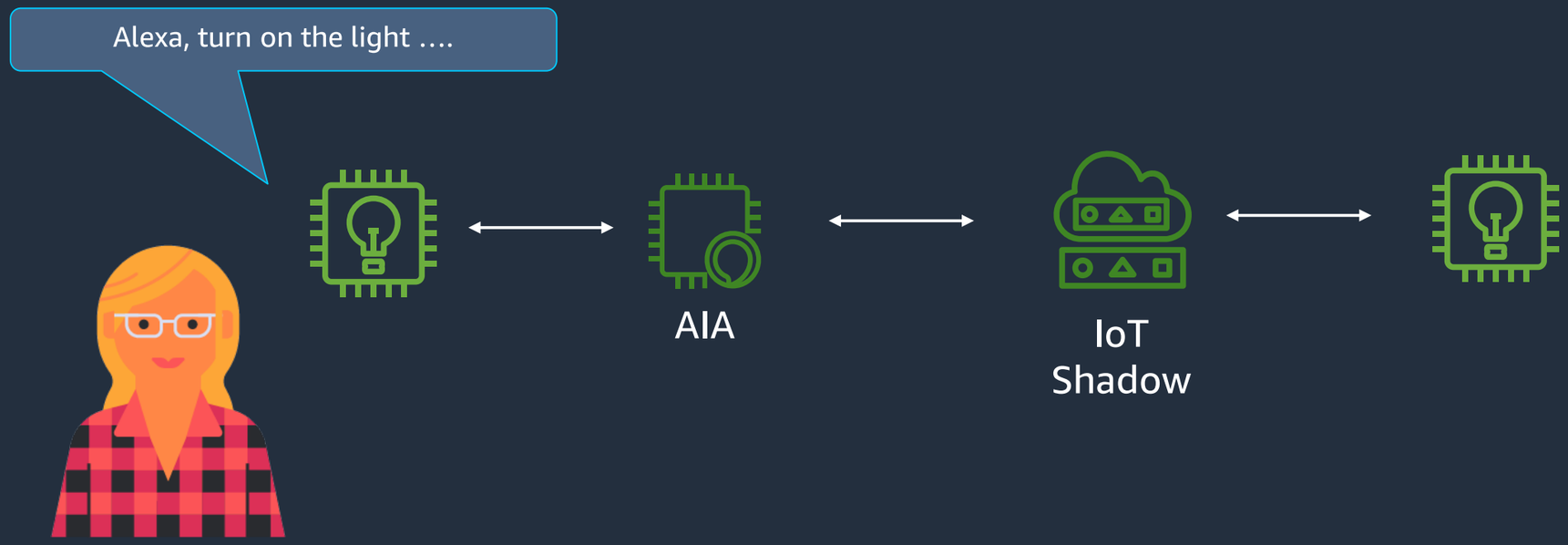

```
{"operation": "install",
"files":[{
  "fileName": “update.bin",
  "fileSource":
{"url":”https://somebucket.s3.amazonaws.com/update.bin”
},},
  {
  "fileName": "config.json",
  "fileSource": { "url": "https://some-
bucket.s3.amazonaws.com/config.json"}
  }
]}
```

Manage your fleet – Use IoT Jobs

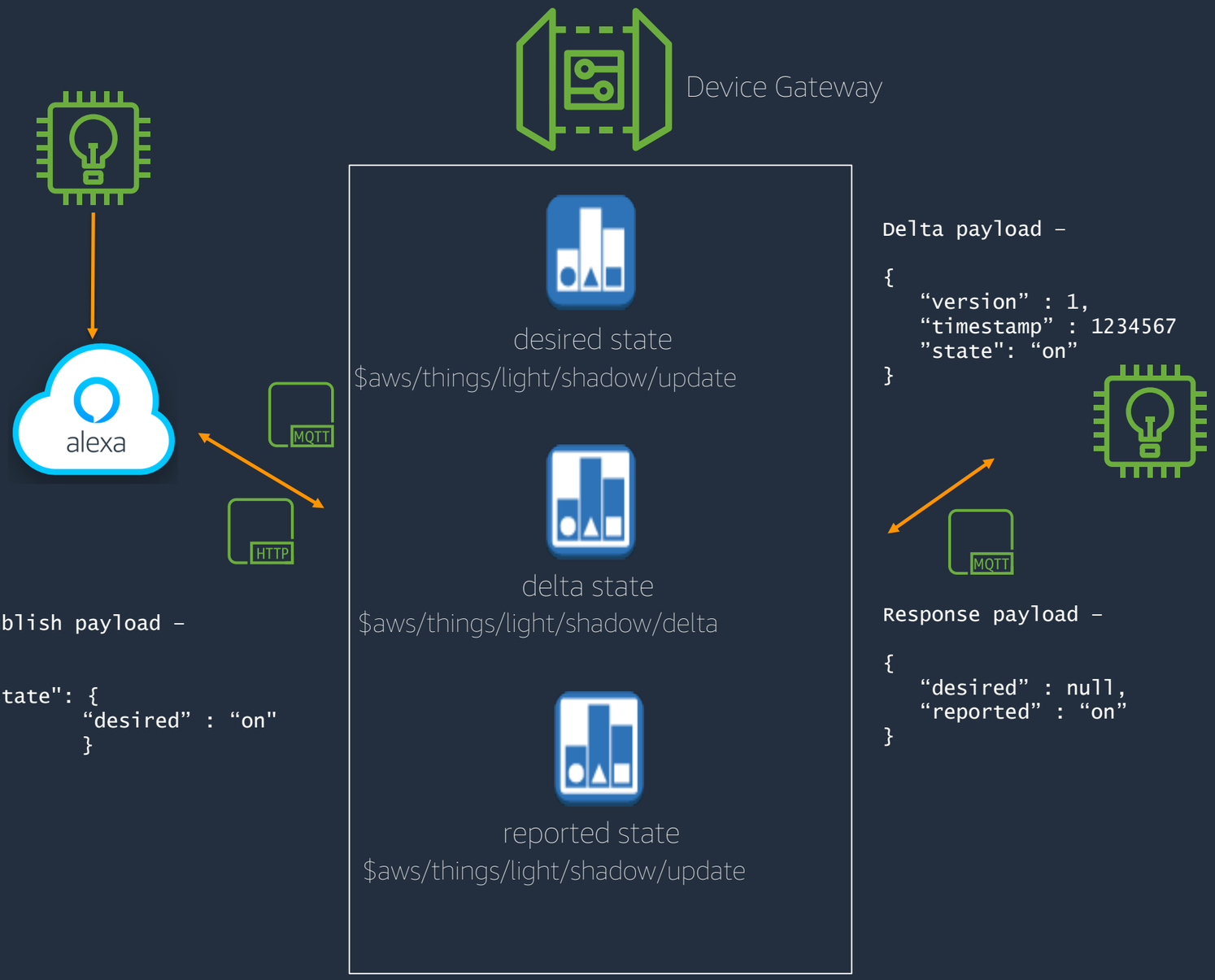


- Code Signing
- OTA

Alexa, turn on the light

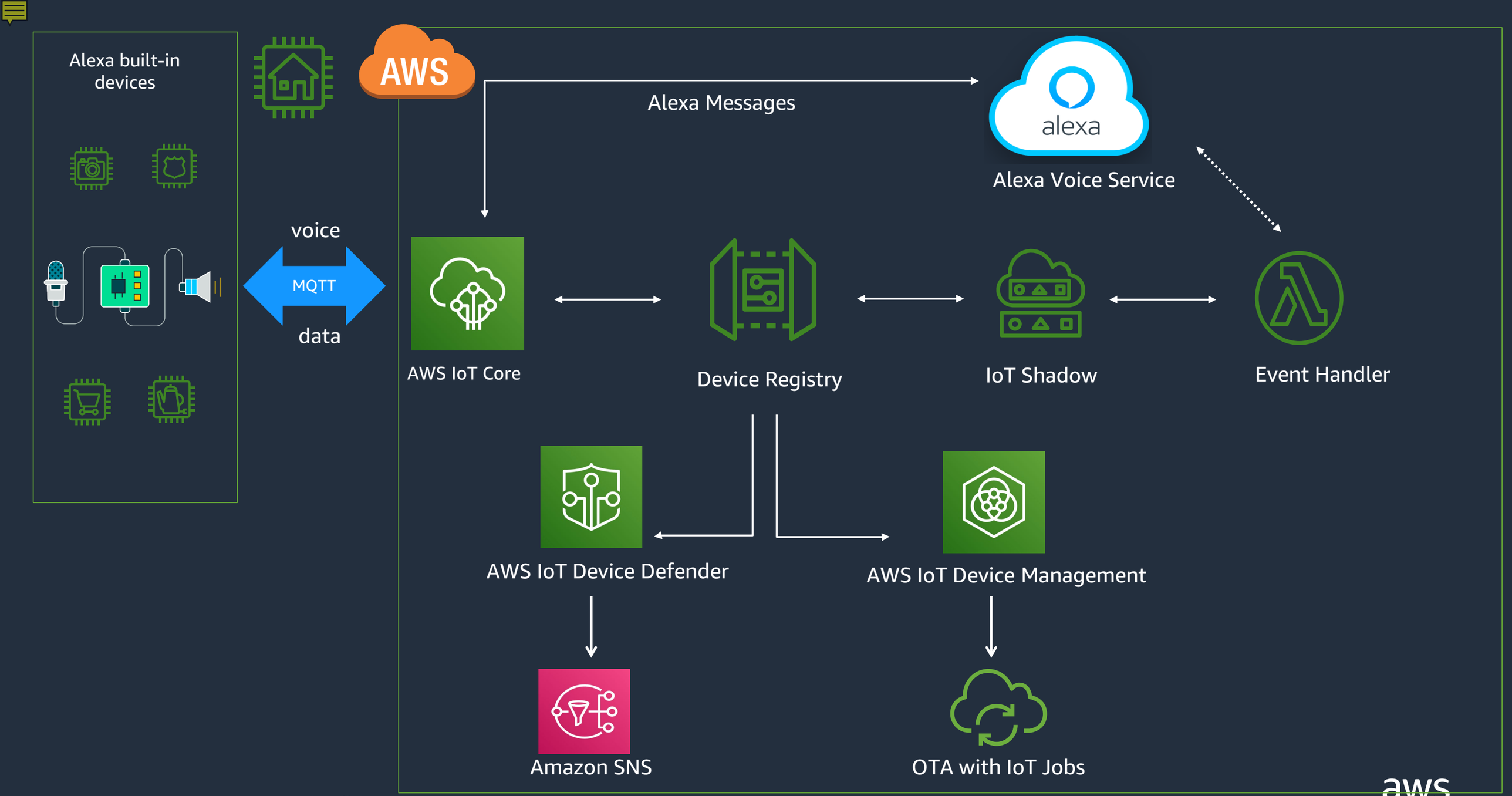


Command & Control – Use Device Shadow



- Optimistic Locking
- Low to Medium TPS
  - ✓ Status Metrics
  - ✓ Metadata

Reference Architecture



Pricing

- Available as Reserved Topic in AWS IoT Core
- All messages to and from this reserved topic are not metered
- AWS accounts are not billed for the messages used by this feature

Extra AWS IoT Core charges may apply. See pricing at https://aws.amazon.com/iot-core/pricing

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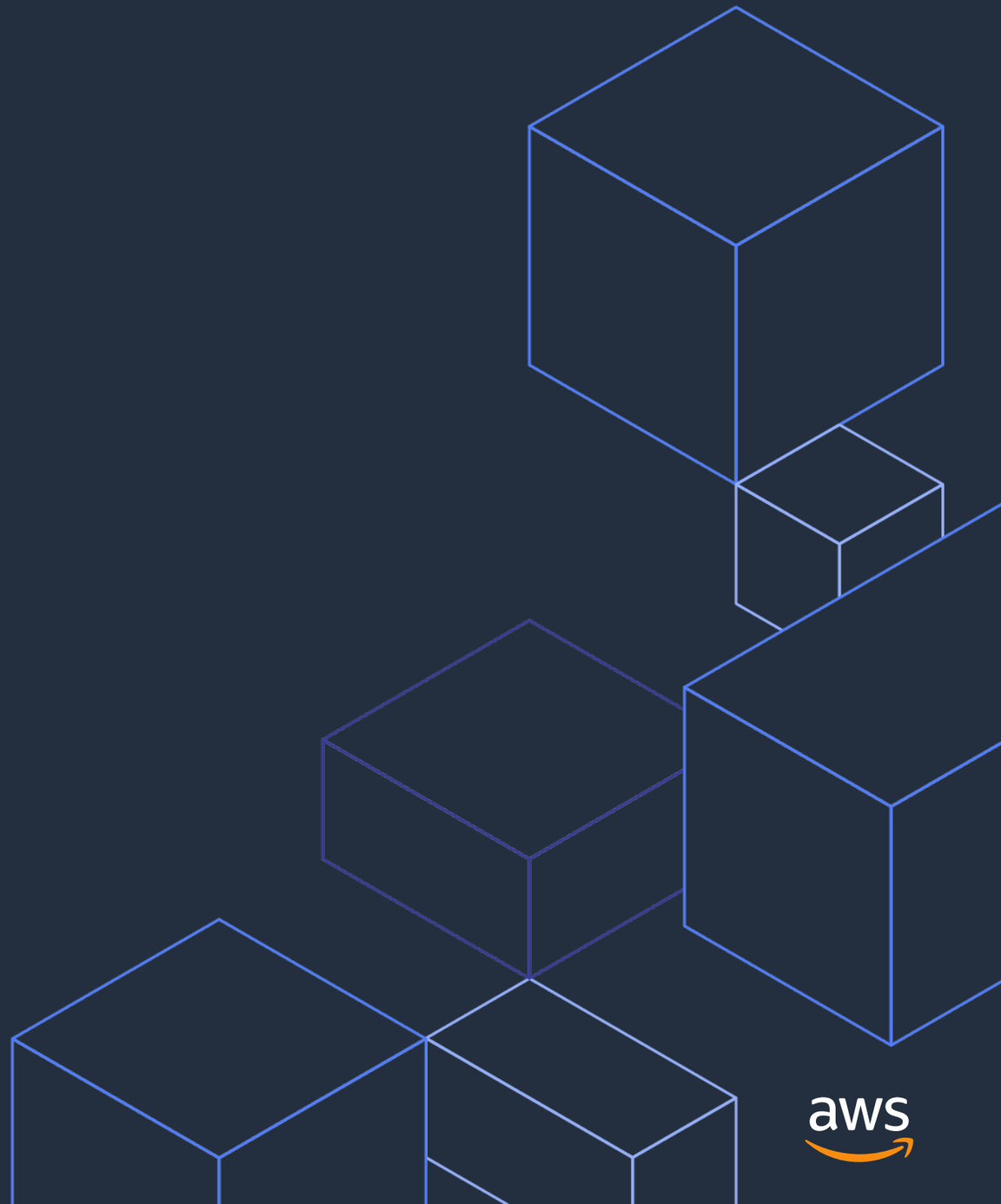
Getting Started



Qualified Partner Hardware

NXP i.MX RT MCU Alexa Voice Service solution

Far-Field

- MCU-based solution qualified by Amazon
- NXP i.MX RT106A ARM Cortex-M7
- Three-mic far-field audio algorithm
- “Alexa” wake word
- Amazon FreeRTOS
- End-to-end system reference design for creating products with Alexa built-in

http://bit.ly/35J55mA

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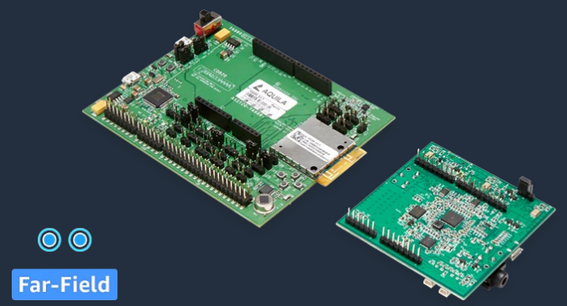
Qualified Partner Hardware

Qualcomm QCA4020 Home Hub 100 Dev Kit for Amazon AVS



- MCU + DSP based solution qualified by Amazon
- Qualcomm QCA4020 SoC
- Conexant CX20921 voice processor with two-mic far-field noise suppression
- ”Alexa” wake word
- End-to-end system reference design for creating products with Alexa built-in

http://bit.ly/2XXRPrH

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Resources

- Alexa Voice Service Blog - https://amzn.to/2Du9jCI
- Getting Started with AVS for AWS IoT Core - https://amzn.to/34xCmkF
- AVS for AWS IoT Core Spec https://amzn.to/35Km3kp

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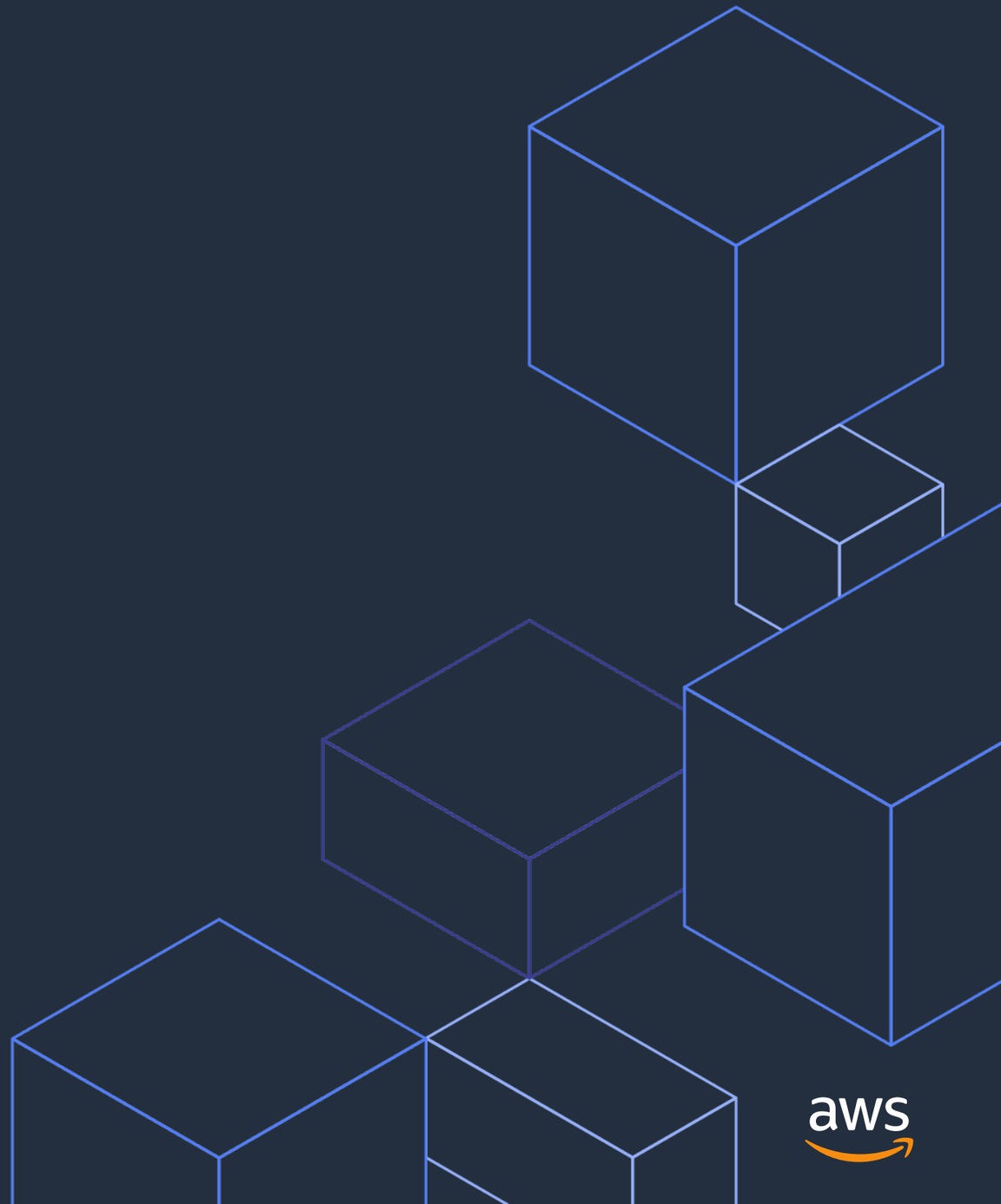
Demo



Thank you!

Any questions?