
AWS
re:Invent

ARC311

Building resilient cities with AWS IoT and data services

Craig Lawton

Principal IoT and Cloud Architect

AWS

AWS re:Invent

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Agenda

Resilient cities and AWS

Connectivity

Data lakes

Analytics and visualization



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Resilient cities and AWS



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What are smart cities?

Strong foundations

Primacy of data

Cities are complex and collaborative

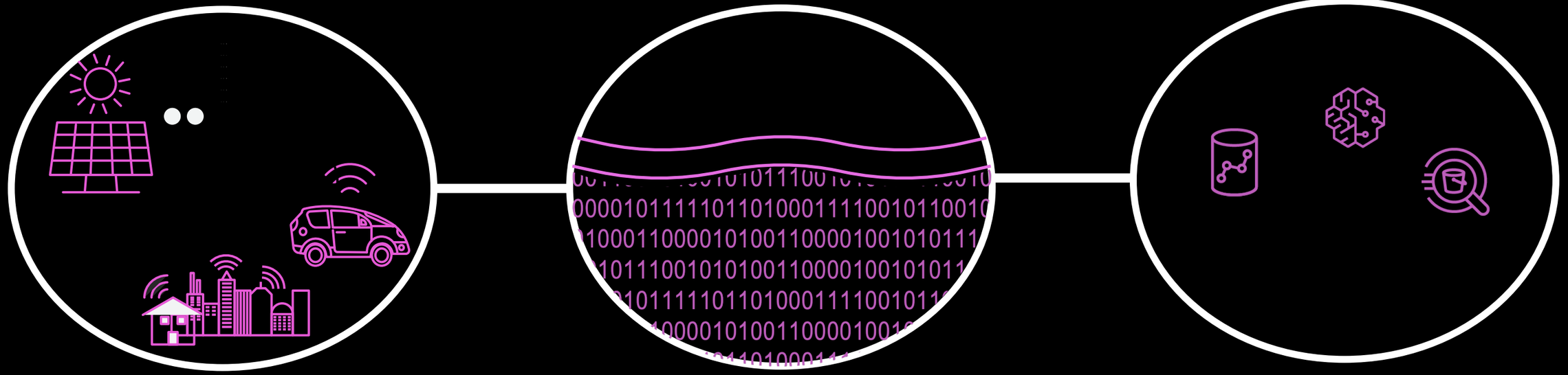
Small, medium, and large

Data is the new oil . . .
Internet of Things (IoT) is the pipeline

Ingest data

Build or grow your data lake

Transform using ML and analytics



Data is the new oil . . .
Internet of Things (IoT) is the pipeline

Ingest data



AWS IoT Analytics



AWS IoT Core



Amazon Timestream

Build or grow your data lake



AWS Lake Formation



AWS Glue



Amazon Athena



Amazon Simple Storage Service (Amazon S3)

Transform using ML and analytics



Amazon QuickSight

IoT Device Simulator

View implementation guide

ON-DEMAND WEBINAR

Simplifying Application Building With AWS Solutions Constructs and the AWS CDK

Build faster using multi-service, well-architected patterns from the new AWS Solutions Constructs library.

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AWS Solutions Implementation overview

Connectivity



AWS re:Invent

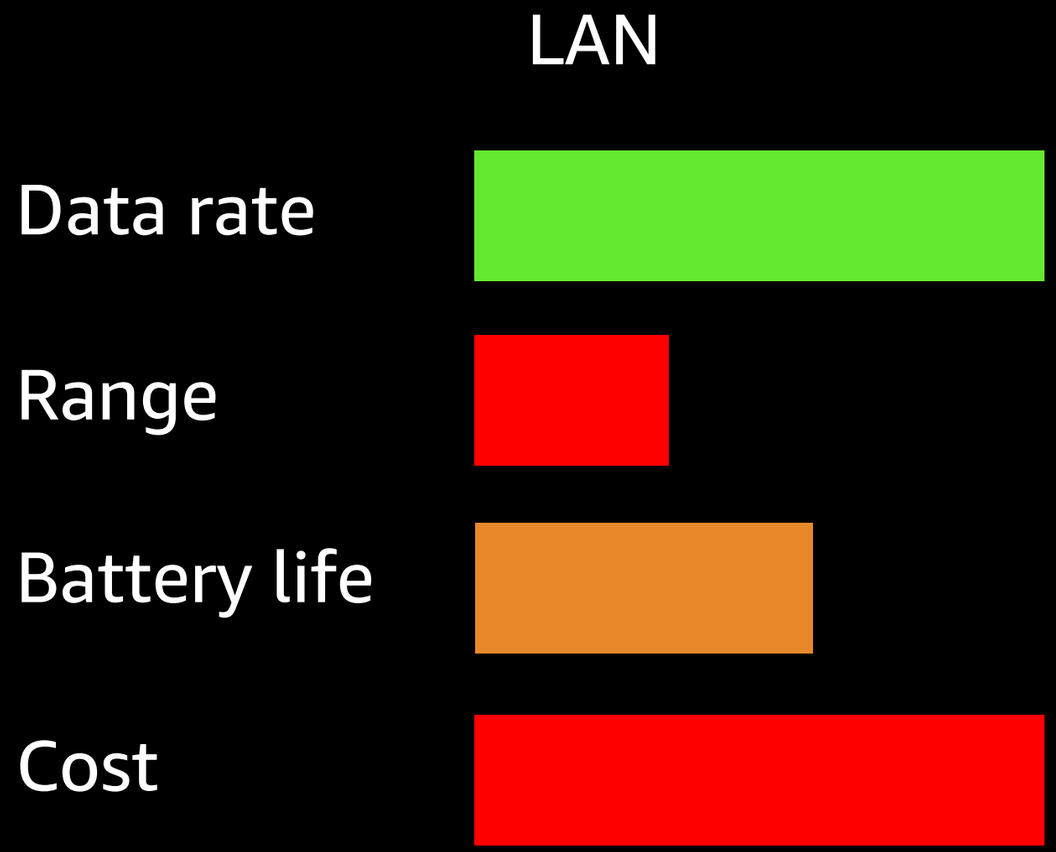
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Low-power wide-area networks (LPWAN)

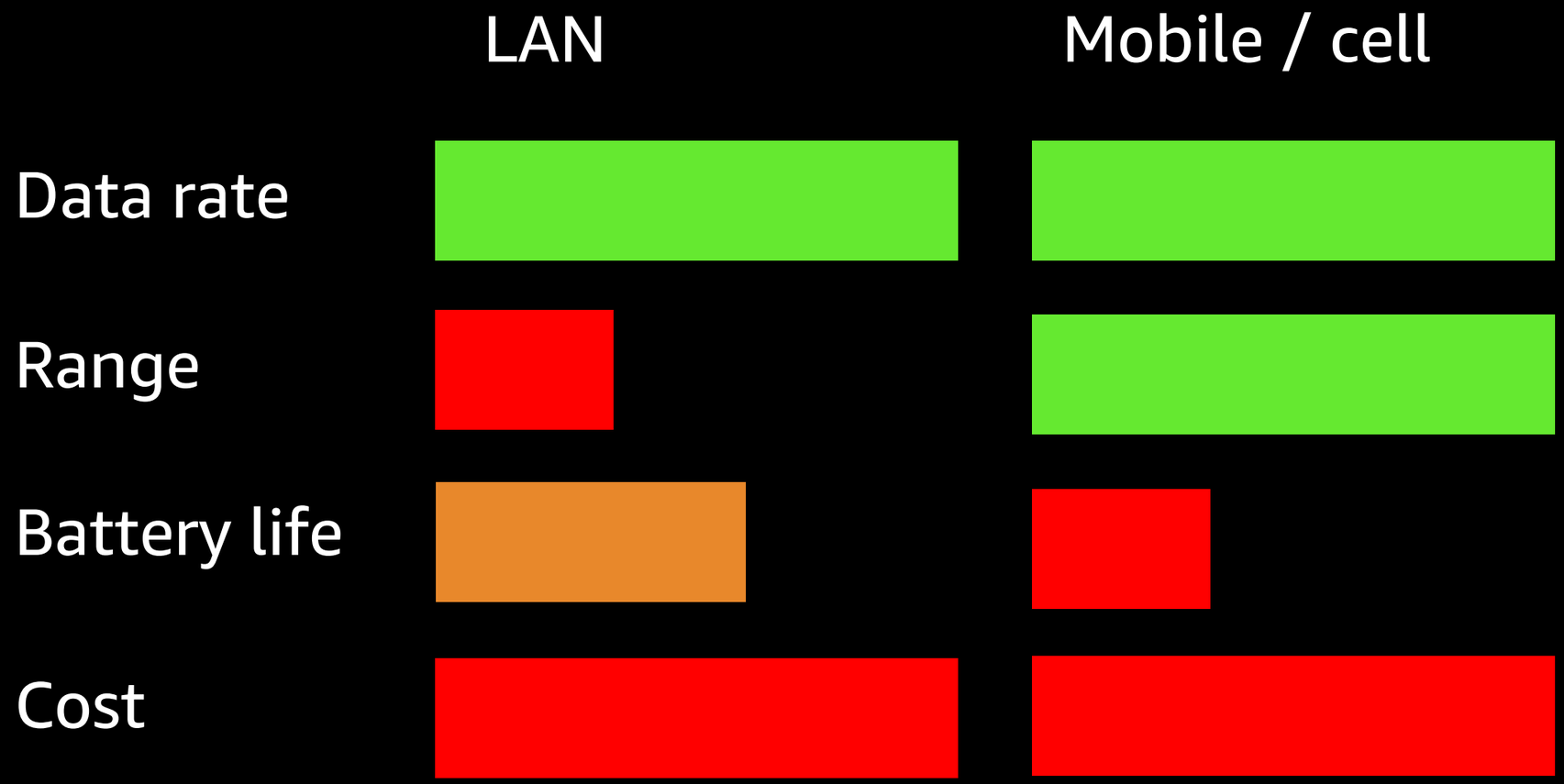
“Things” have constraints

- Energy
- Network
- Price

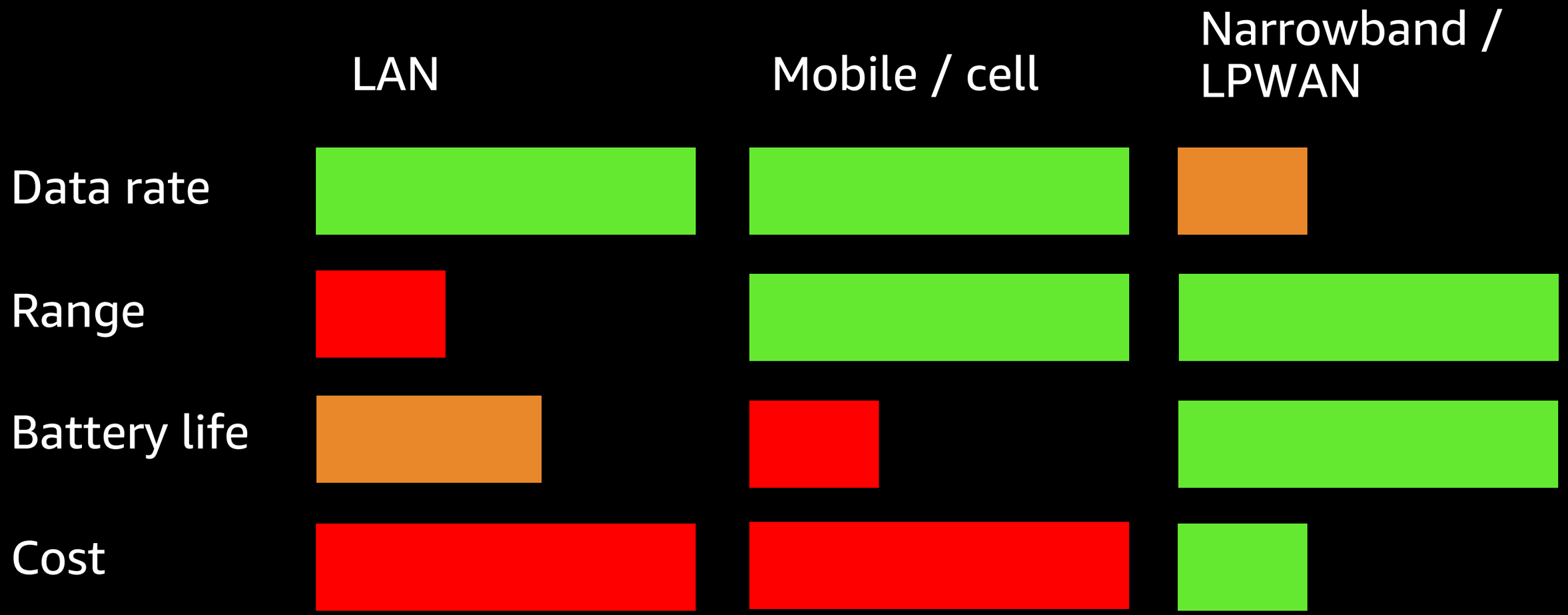
Comparing networks



Comparing networks



Comparing networks



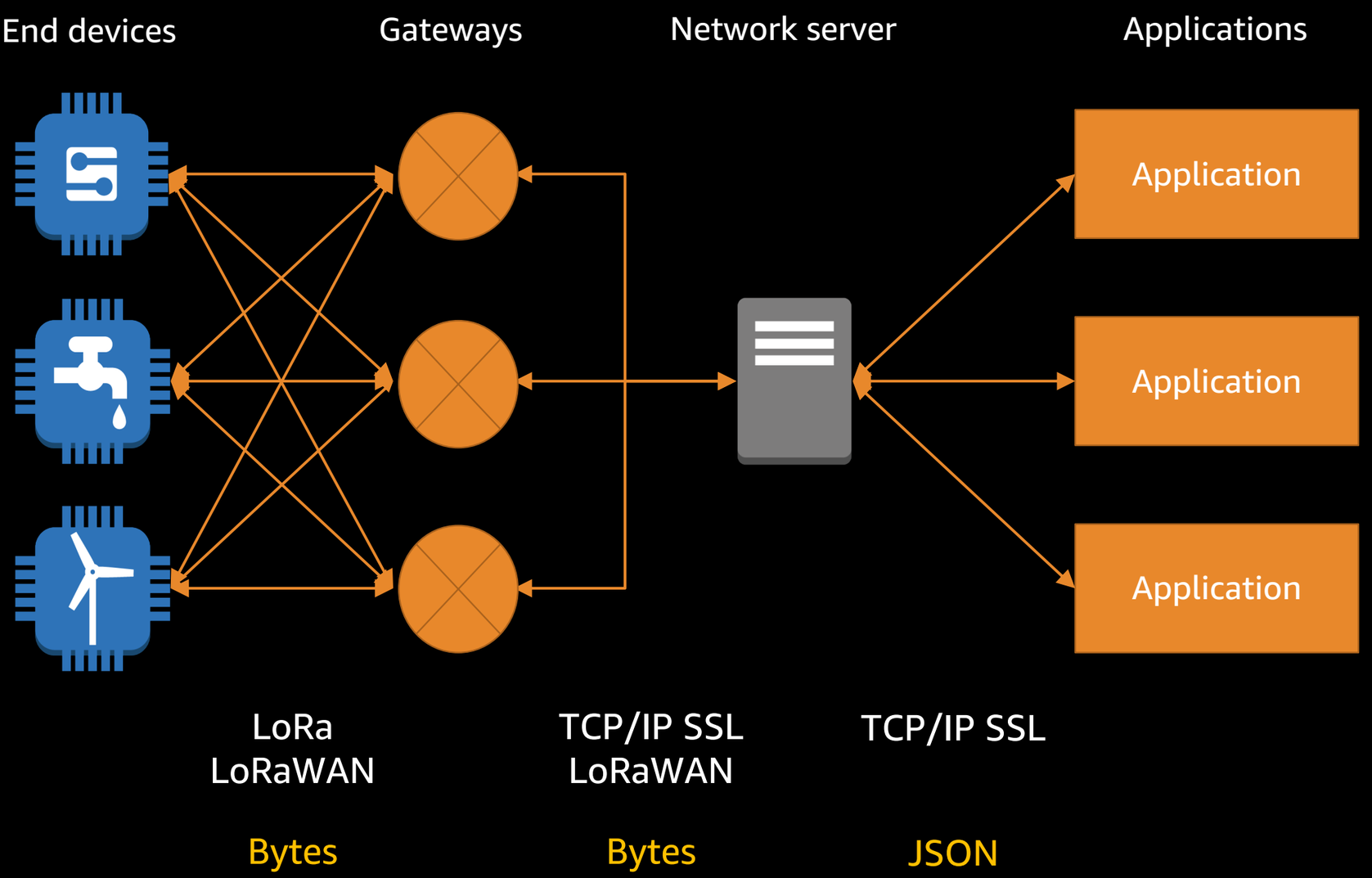
Comparing Narrowband / LPWAN Networks

	Sigfox	LoRaWAN	NB-IoT
Modulation	**BPSK**	**CSS**	**QPSK**
Frequency	Unlicensed ISM bands (868 MHz in Europe, 915 MHz in North America, and 433 MHz in Asia)	Unlicensed ISM bands (868 MHz in Europe, 915 MHz in North America, and 433 MHz in Asia)	Licensed LTE frequency bands
Maximum data rate	100 bps	50 kbps	200 kbps
Bidirectional	Limited / half-duplex	Yes / half-duplex	Yes / half-duplex
Maximum payload length	12 bytes (UL), 8 bytes (DL)	243 bytes	1600 bytes
Range	10 km (urban), 40 km (rural)	5 km (urban), 20 km (rural)	1 km (urban), 10 km (rural)
Standardization	Sigfox company is collaborating with ETSI on the standardization	LoRa-Alliance	3GPP

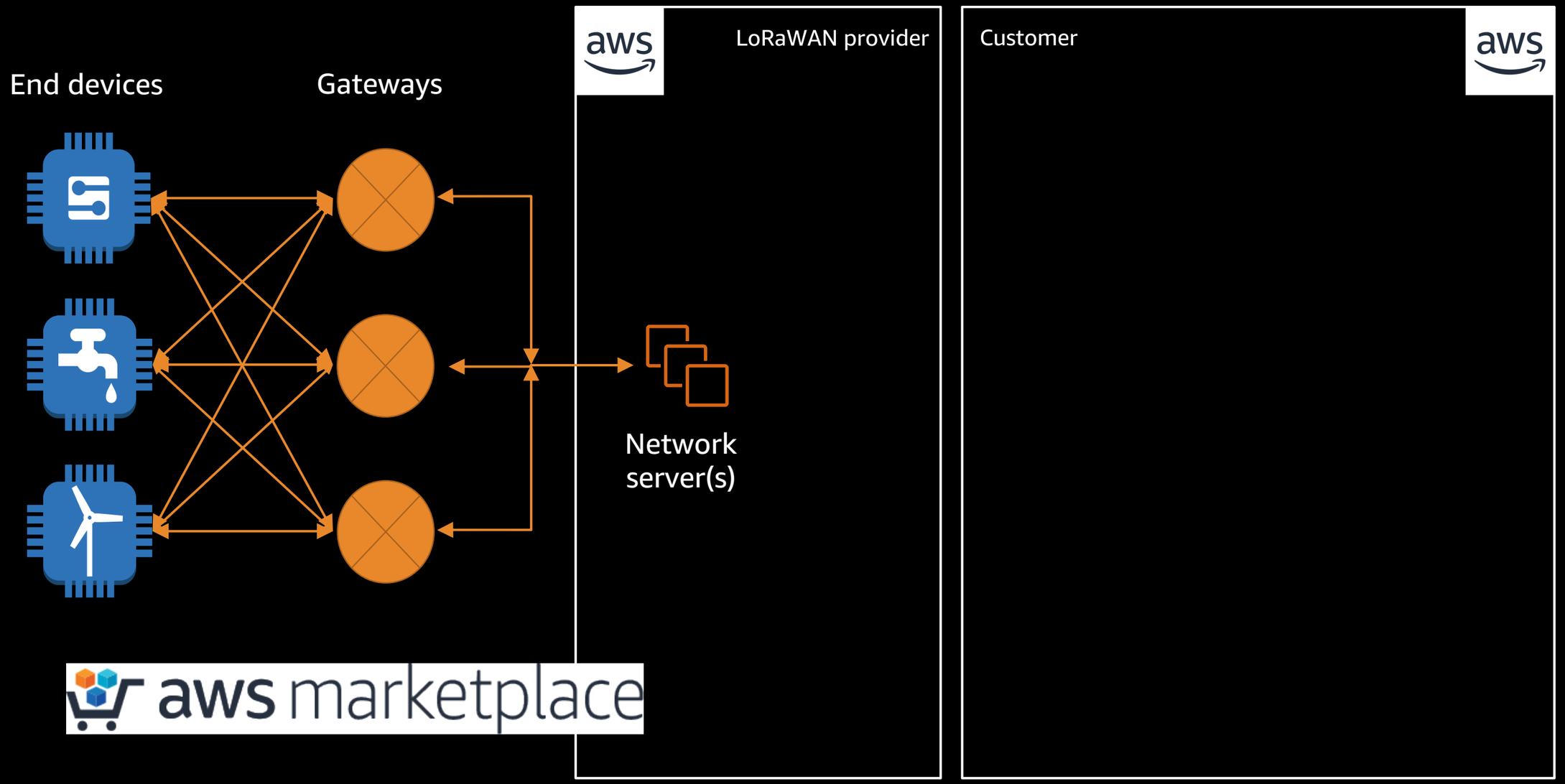
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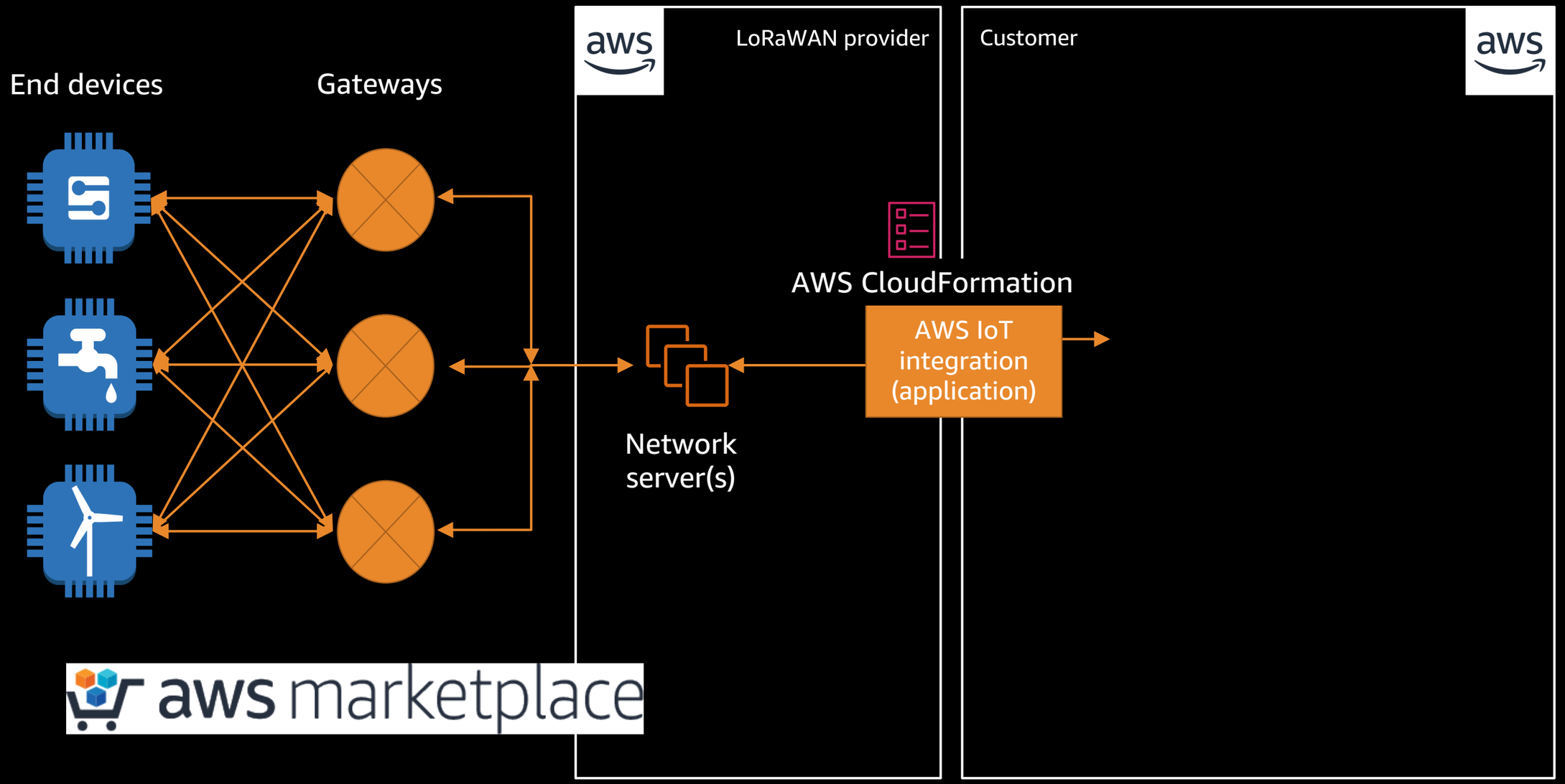
LoRa and LoRaWAN



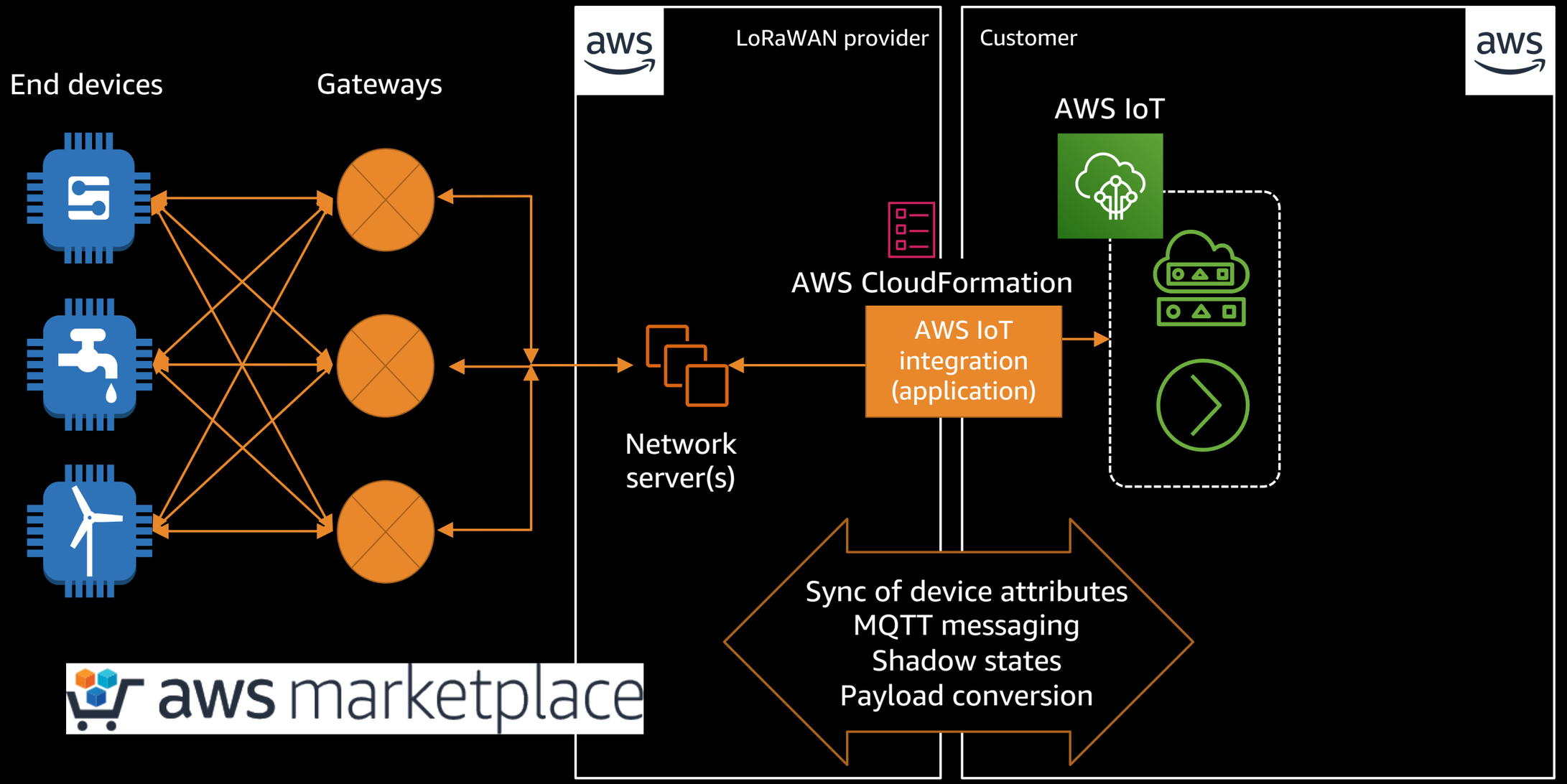
LoRaWAN: Integration with AWS IoT services



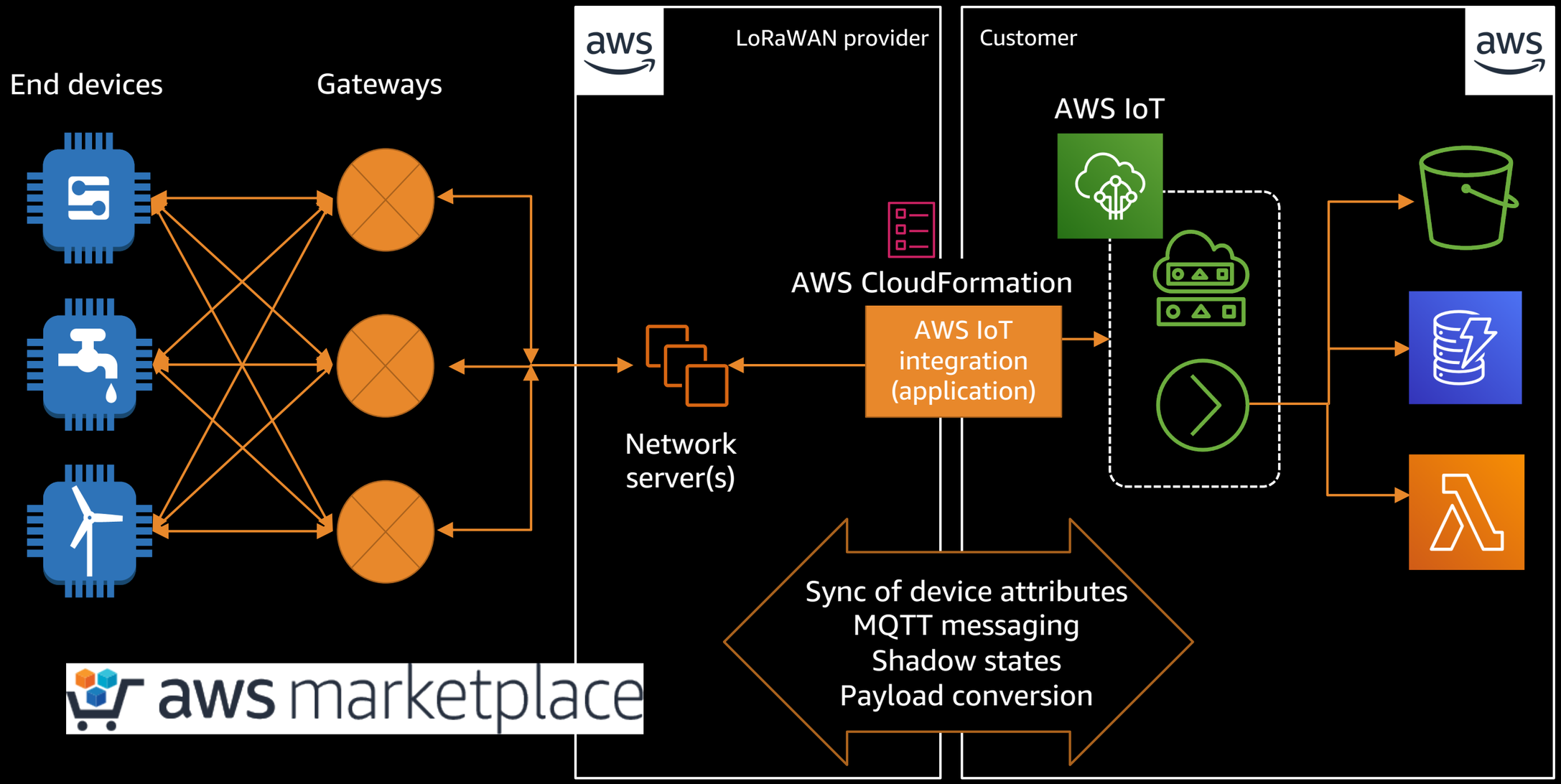
LoRaWAN: Integration with AWS IoT services



LoRaWAN: Integration with AWS IoT services



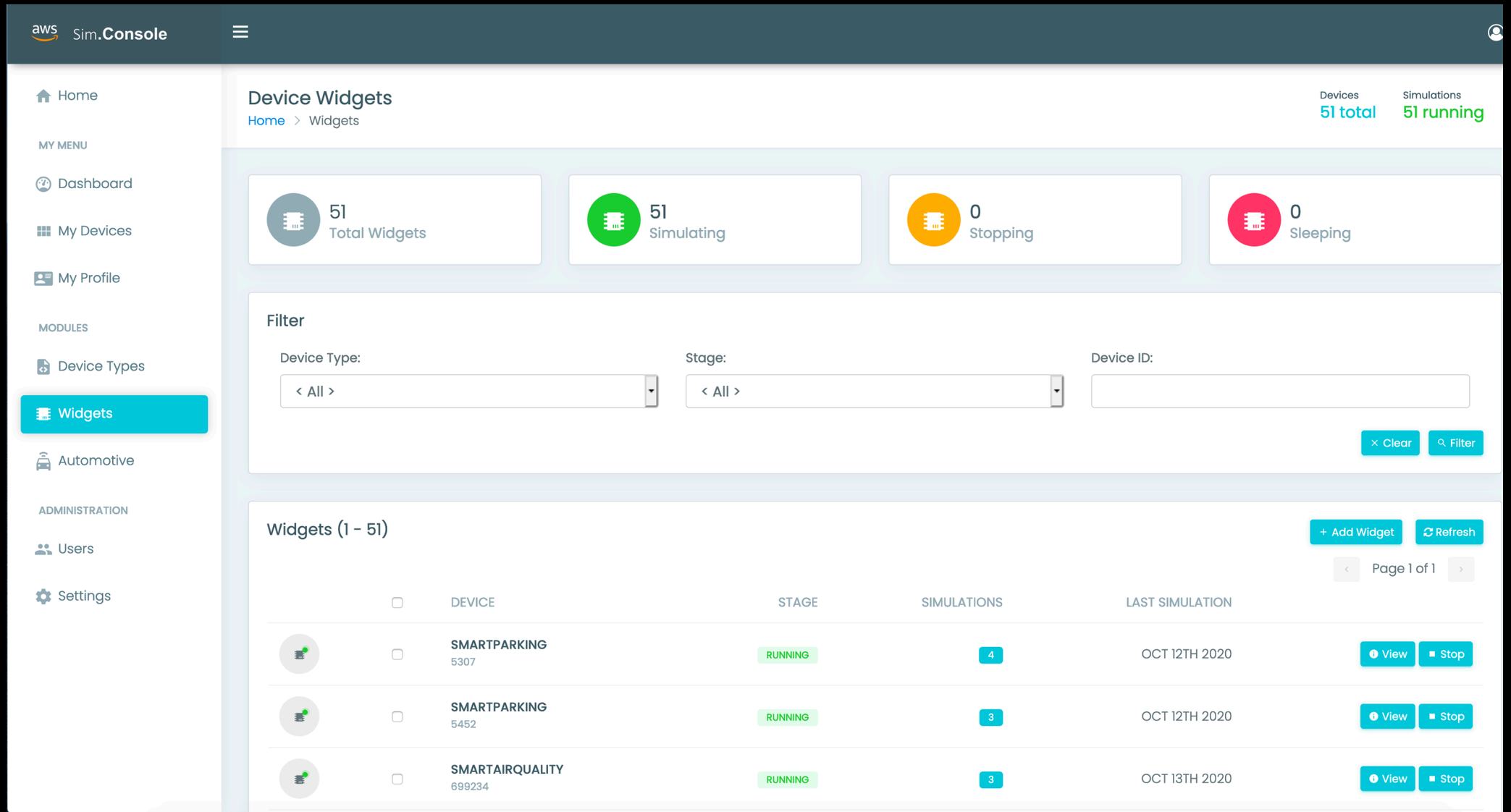
LoRaWAN: Integration with AWS IoT services



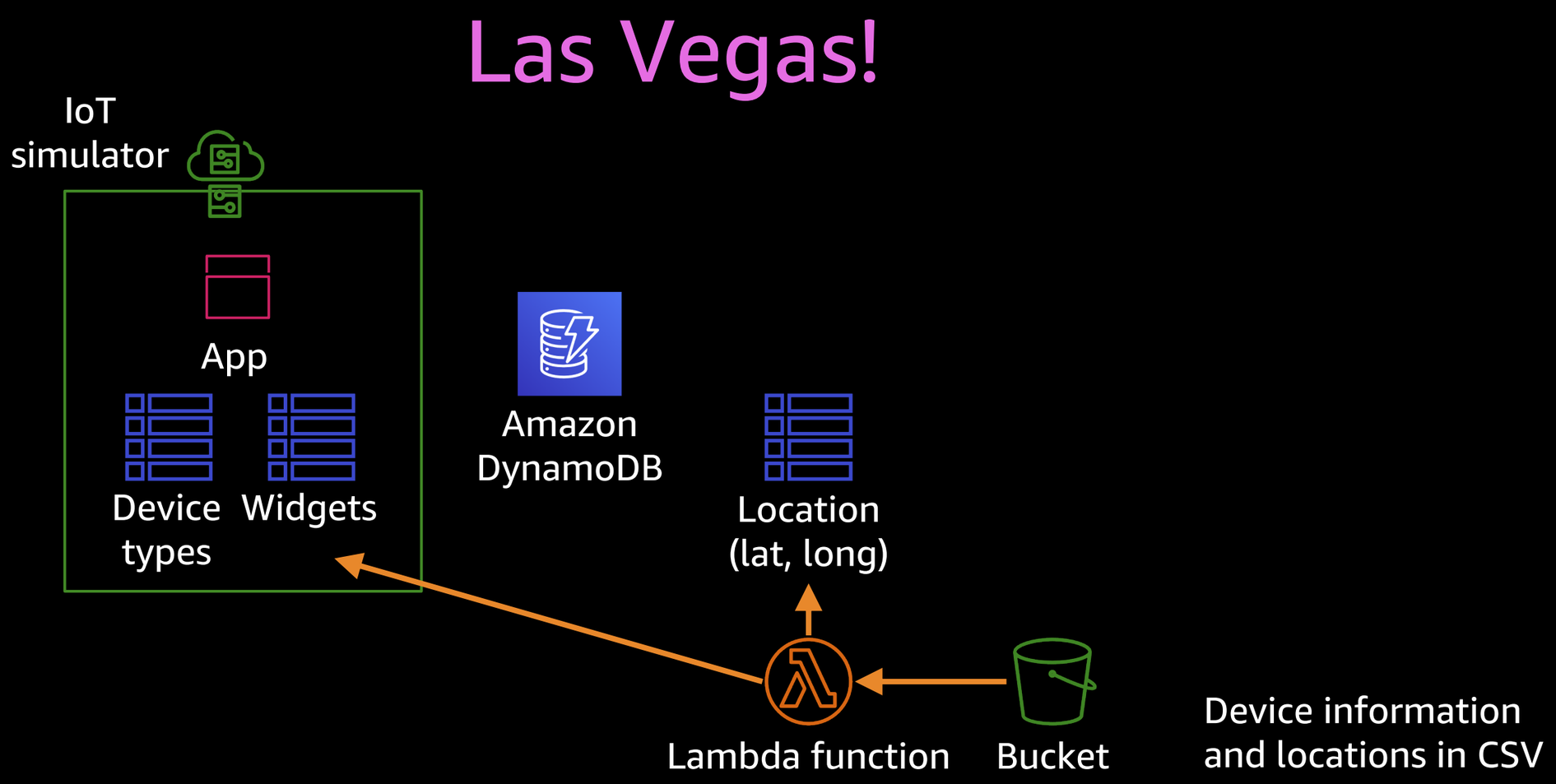
IoT Device Simulator

https://aws.amazon.com/solutions/implementations/iot-device-simulator/

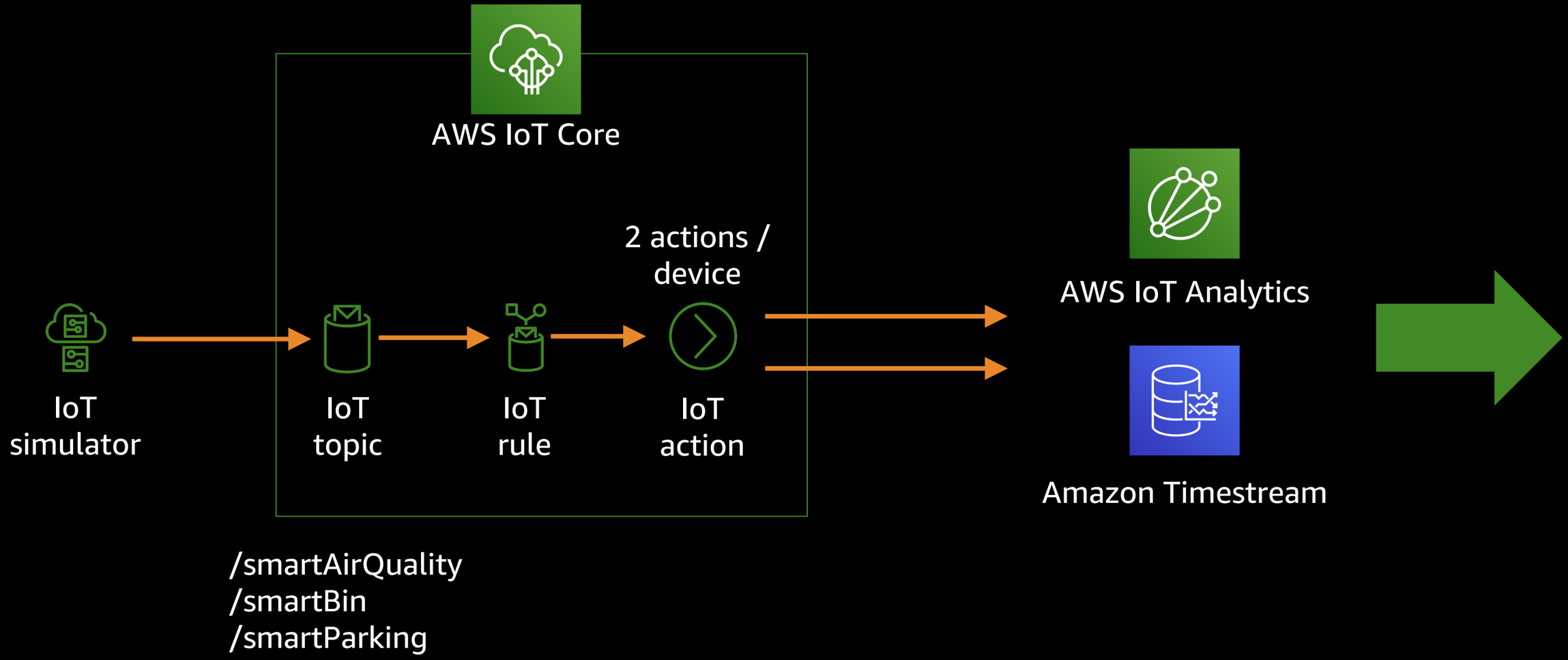




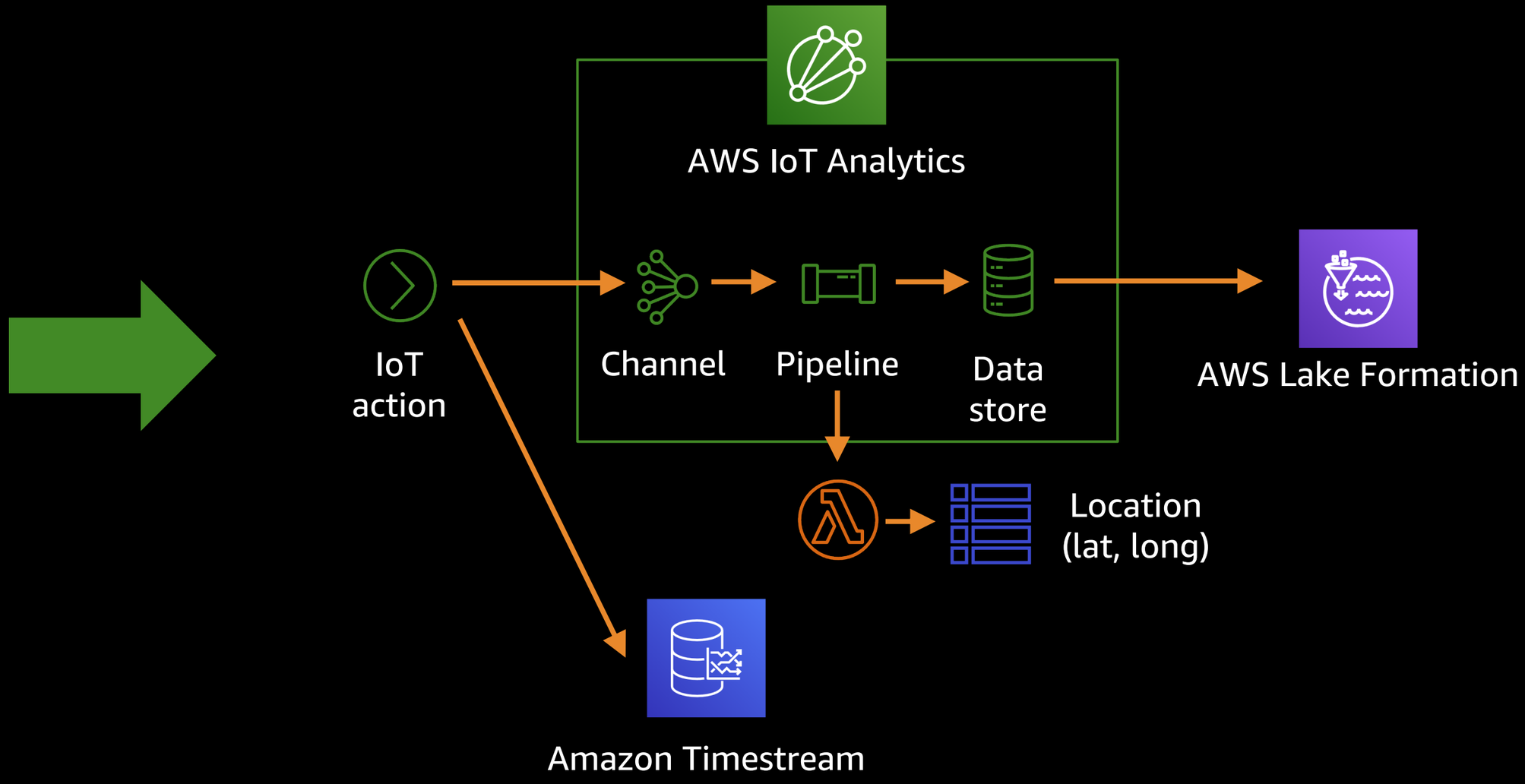
Our simulated environment: IoT



Our simulated environment: IoT



Our simulated environment: IoT



location-lookup Lambda



```
import sys
import boto3
from boto3.dynamodb.conditions import Key

client = boto3.client('dynamodb')

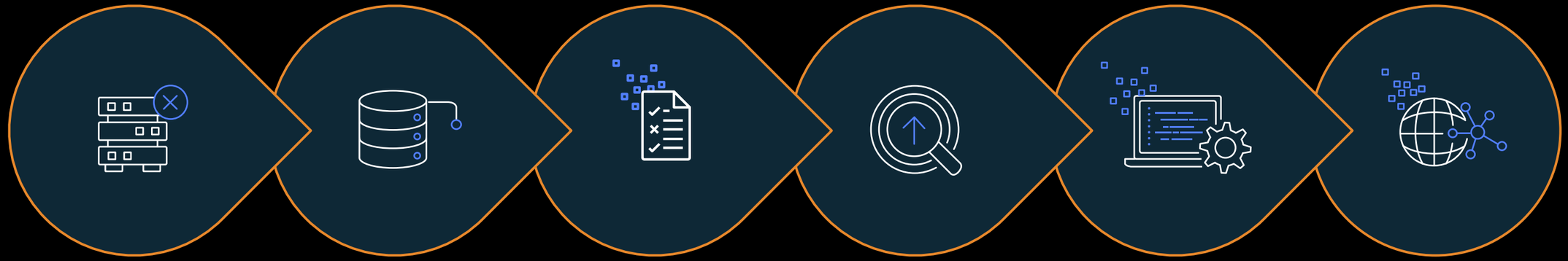
def lambda_handler(event, context):
    for e in event:
        response = client.get_item(
            TableName='iot-sim-location-lookup',
            Key={
                'device_id': {'S': e['deviceId']}
            }
        )

        e['lat'] = float(response['Item']['lat']['S'])
        e['lon'] = float(response['Item']['lon']['S'])

    return event
```

Amazon Timestream

Amazon Timestream is a serverless time-series database that collects, stores, and processes data sequenced by time



- Serverless auto-scaling for ingesting, storing, and querying
- Data lifecycle management
- No predefined schema
- Access data across storage tiers with adaptive query engine
- Built-in time-series analytics in SQL
- Integrates with ML, analytics, and data collectors

IoT Device Simulator

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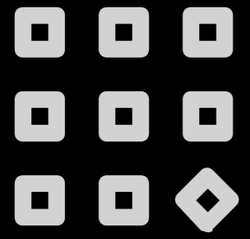
AWS Solutions Implementation overview

Data lakes



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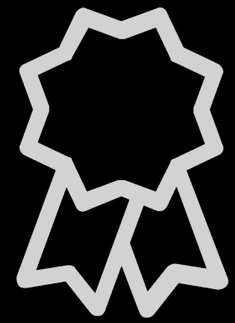
Organizational data challenges



Silos



Security

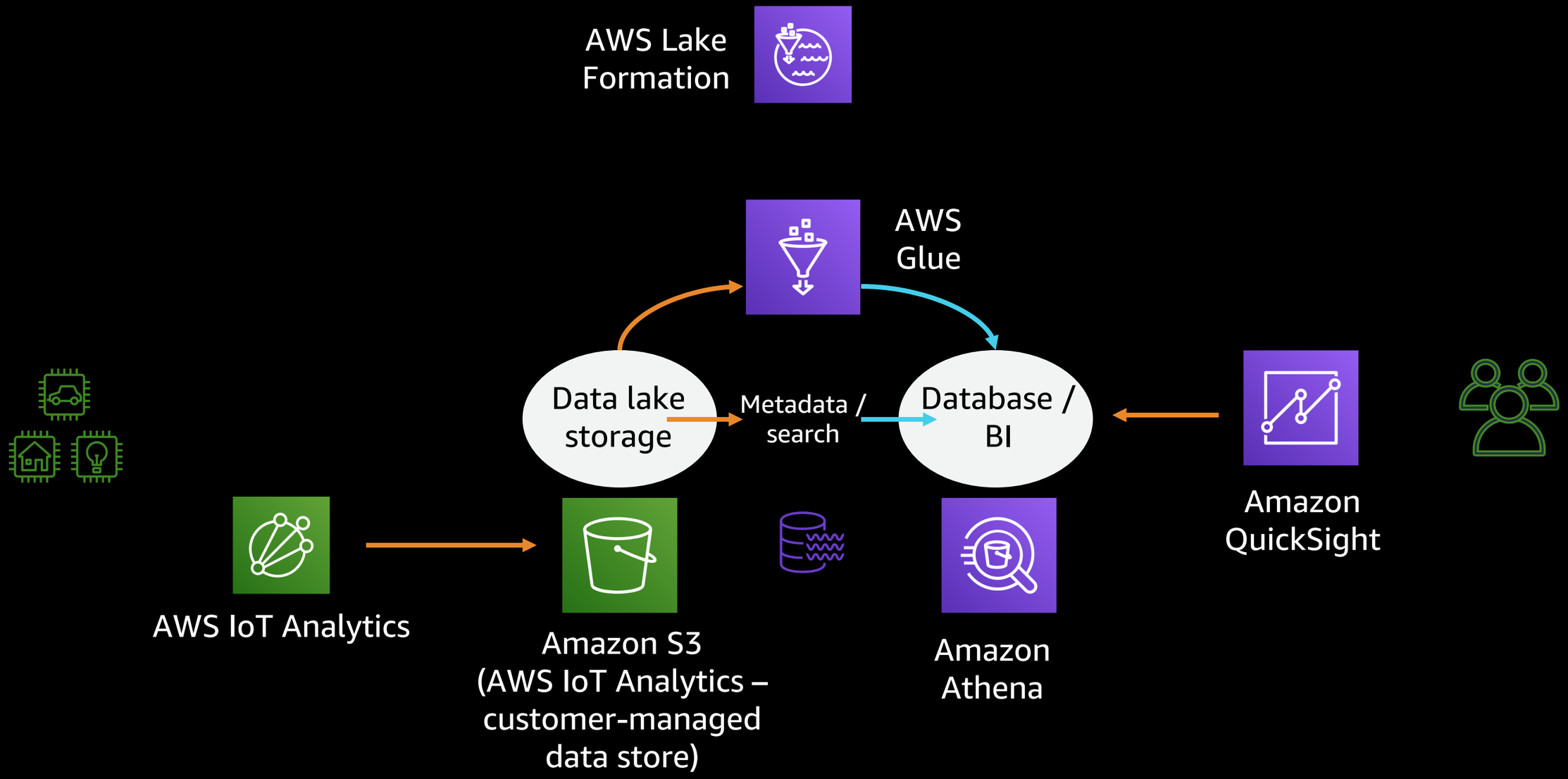


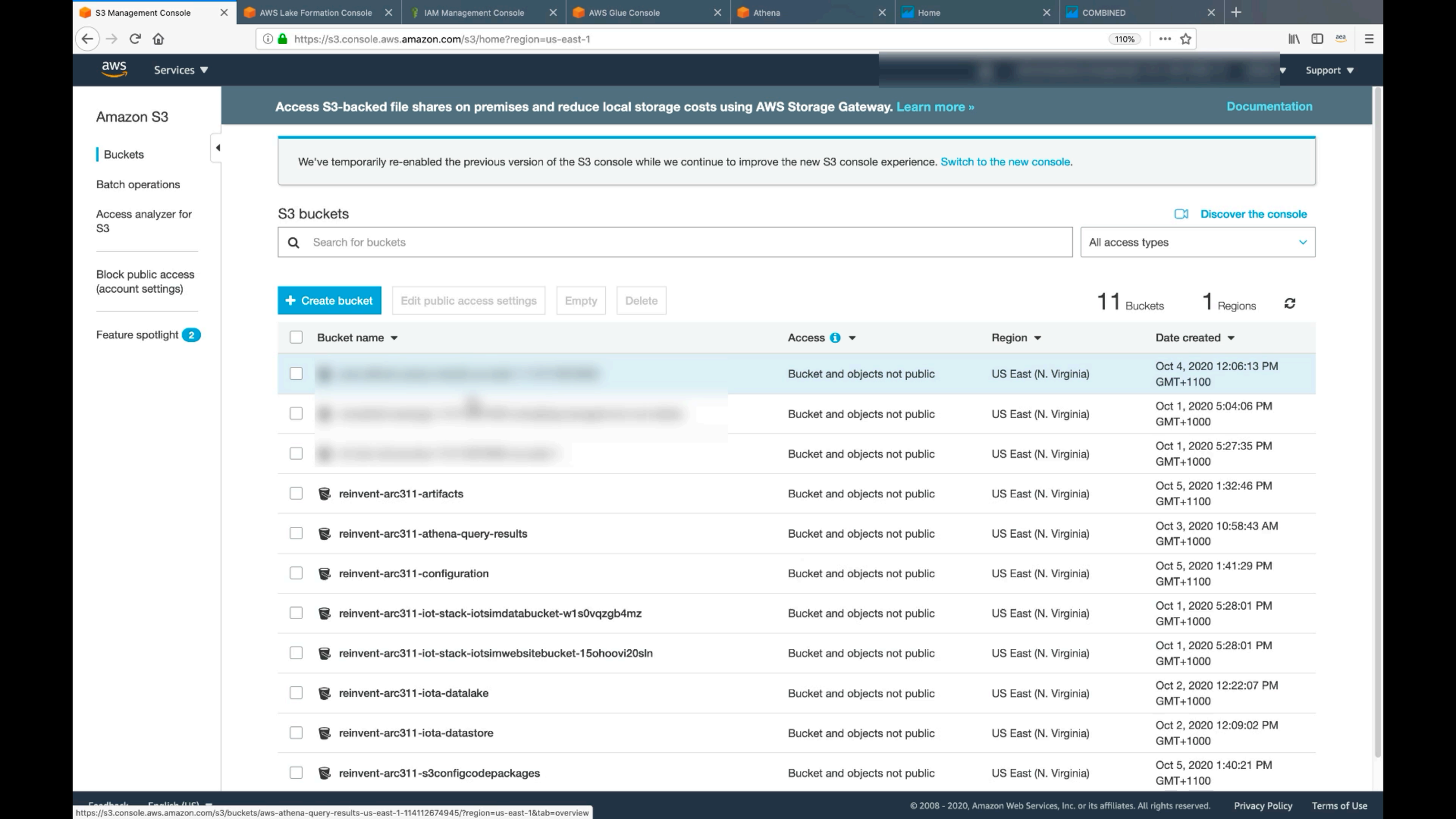
Governance



Scalability

Data organization in data lake



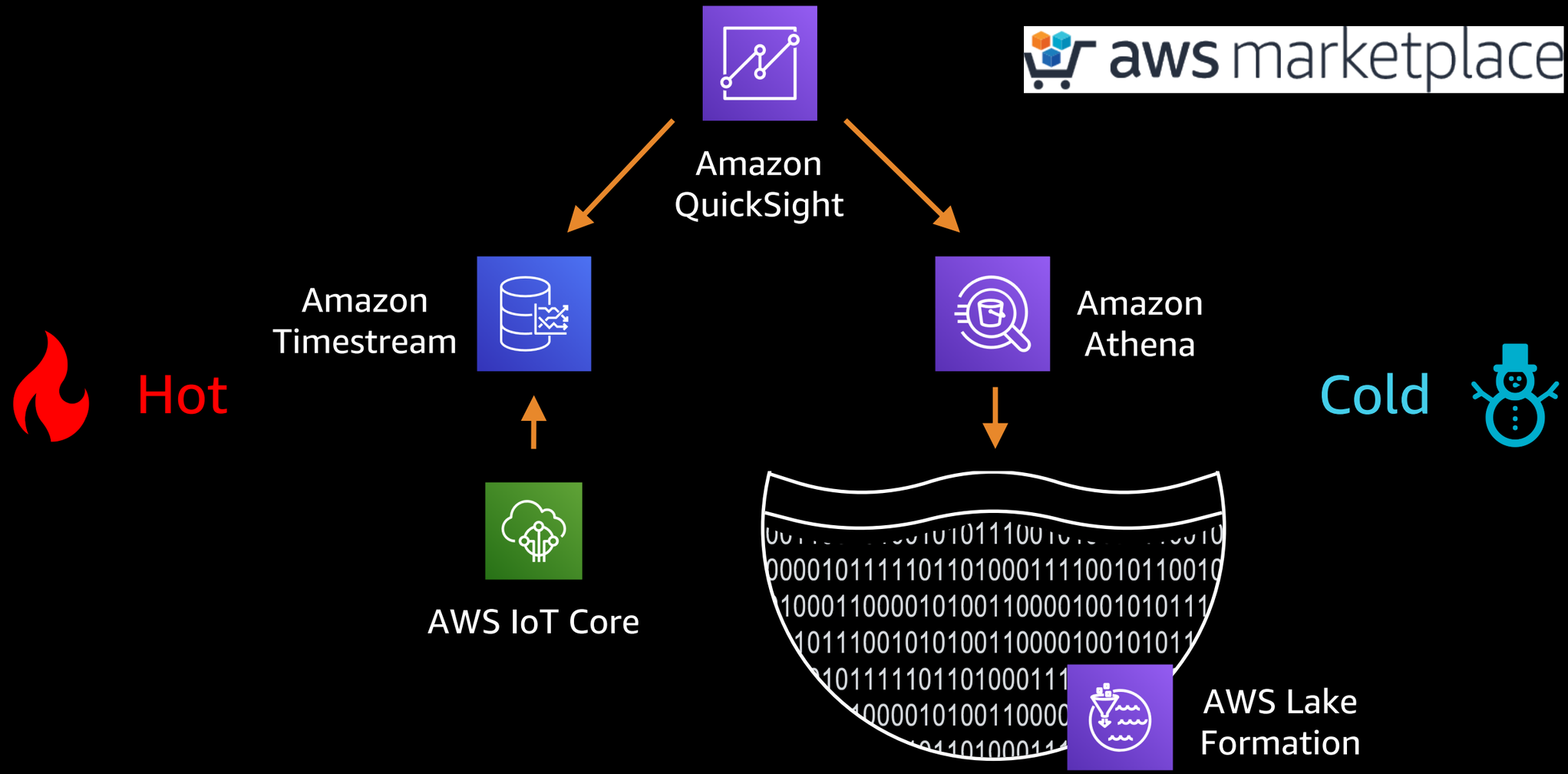

S3 Management Console
AWS Lake Formation Console
IAM Management Console
AWS Glue Console
Athena
Home
COMBINED
https://s3.console.aws.amazon.com/s3/home?region=us-east-1
110%
aws
Services
Support
Amazon S3
Buckets
Batch operations
Access analyzer for S3
Block public access (account settings)
Feature spotlight 2
Access S3-backed file shares on premises and reduce local storage costs using AWS Storage Gateway. Learn more »
Documentation
We've temporarily re-enabled the previous version of the S3 console while we continue to improve the new S3 console experience. Switch to the new console.
S3 buckets
Discover the console
Search for buckets
All access types
+ Create bucket
Edit public access settings
Empty
Delete
11 Buckets
1 Regions
Bucket name
Access
Region
Date created
Bucket and objects not public
US East (N. Virginia)
Oct 4, 2020 12:06:13 PM GMT+1100
Oct 1, 2020 5:04:06 PM GMT+1000
Oct 1, 2020 5:27:35 PM GMT+1000
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Oct 3, 2020 10:58:43 AM GMT+1000
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Oct 2, 2020 12:09:02 PM GMT+1000
reinvent-arc311-s3configcodepackages
Oct 5, 2020 1:40:21 PM GMT+1100
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https://s3.console.aws.amazon.com/s3/buckets/aws-athena-query-results-us-east-1-114112674945/?region=us-east-1&tab=overview

Analytics & visualization



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Hot and cold visualizations



S3 Management Console | AWS Lake Formation Console | IAM Management Console | Amazon Timestream | Athena | Home | COMBINED

https://us-east-1.quicksight.aws.amazon.com/sn/start/data-sets

QuickSight

Search for analyses, data sets, and dashboards

admin...

- Favorites
- Recent
- My folders
- Shared folders
- Dashboards
- Analyses
- Datasets

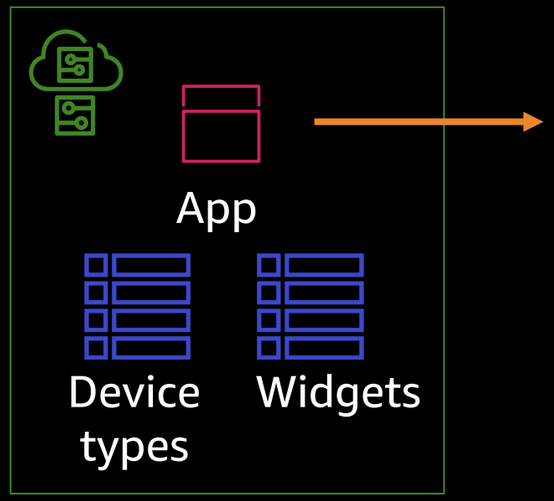
Datasets

New dataset

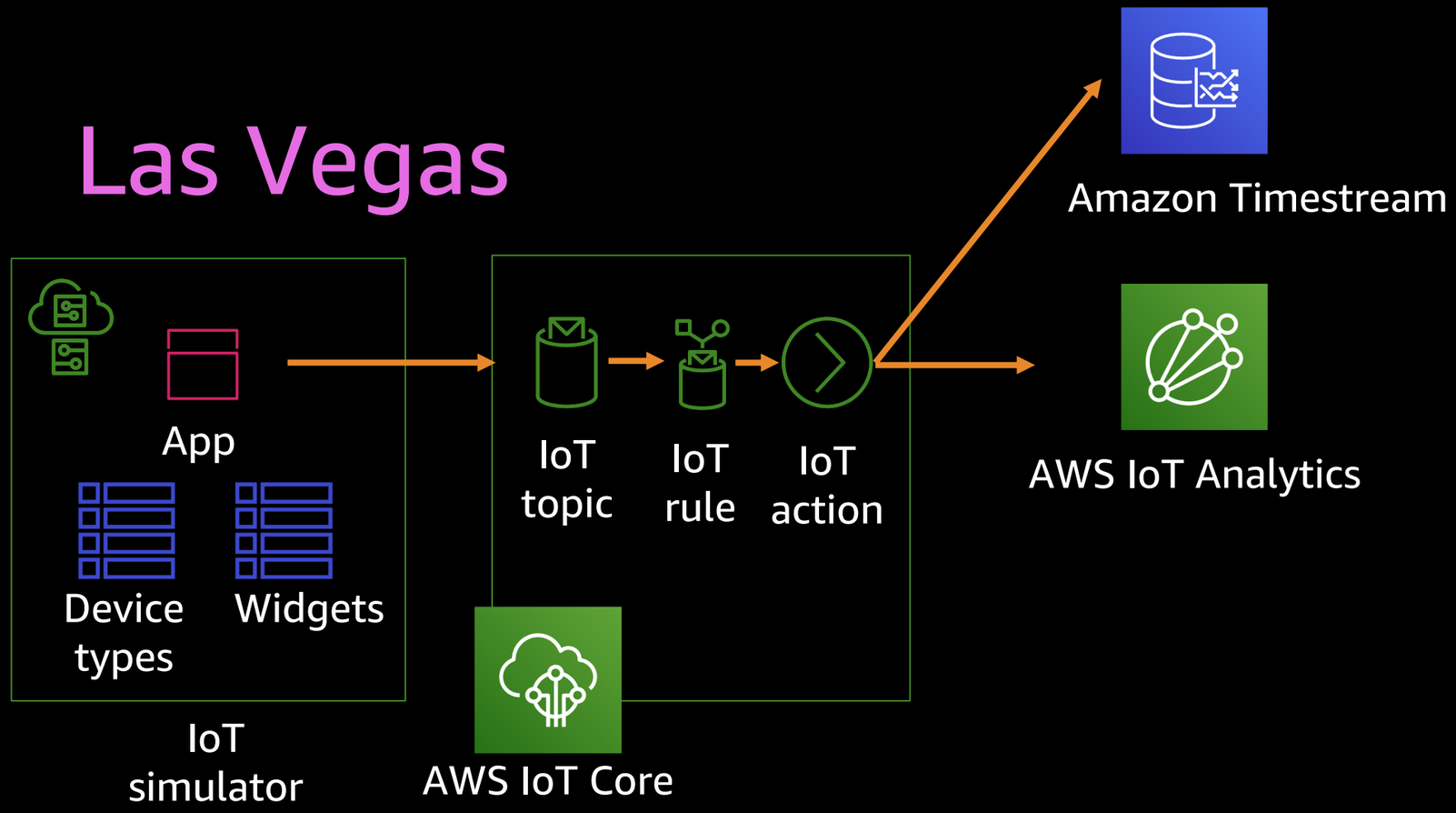
Name		Owner	Last Modified
smartparking	SPICE	Me	15 minutes ago
smartbin	SPICE	Me	15 minutes ago
smartBin	SPICE	Me	43 minutes ago
smartParking	SPICE	Me	44 minutes ago
smartairquality	SPICE	Me	44 minutes ago
smartAirQuality	SPICE	Me	an hour ago

Recap

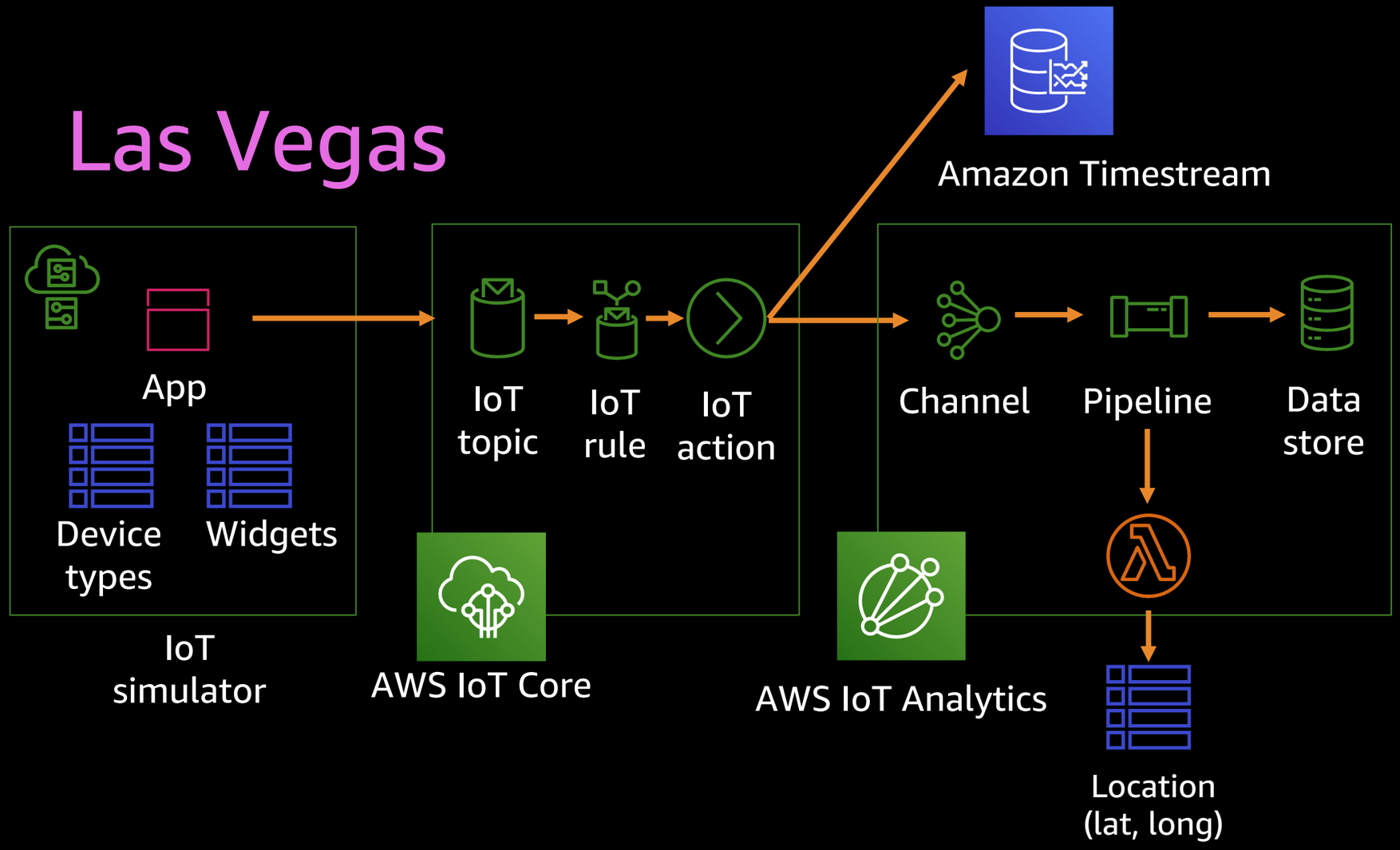
Las Vegas



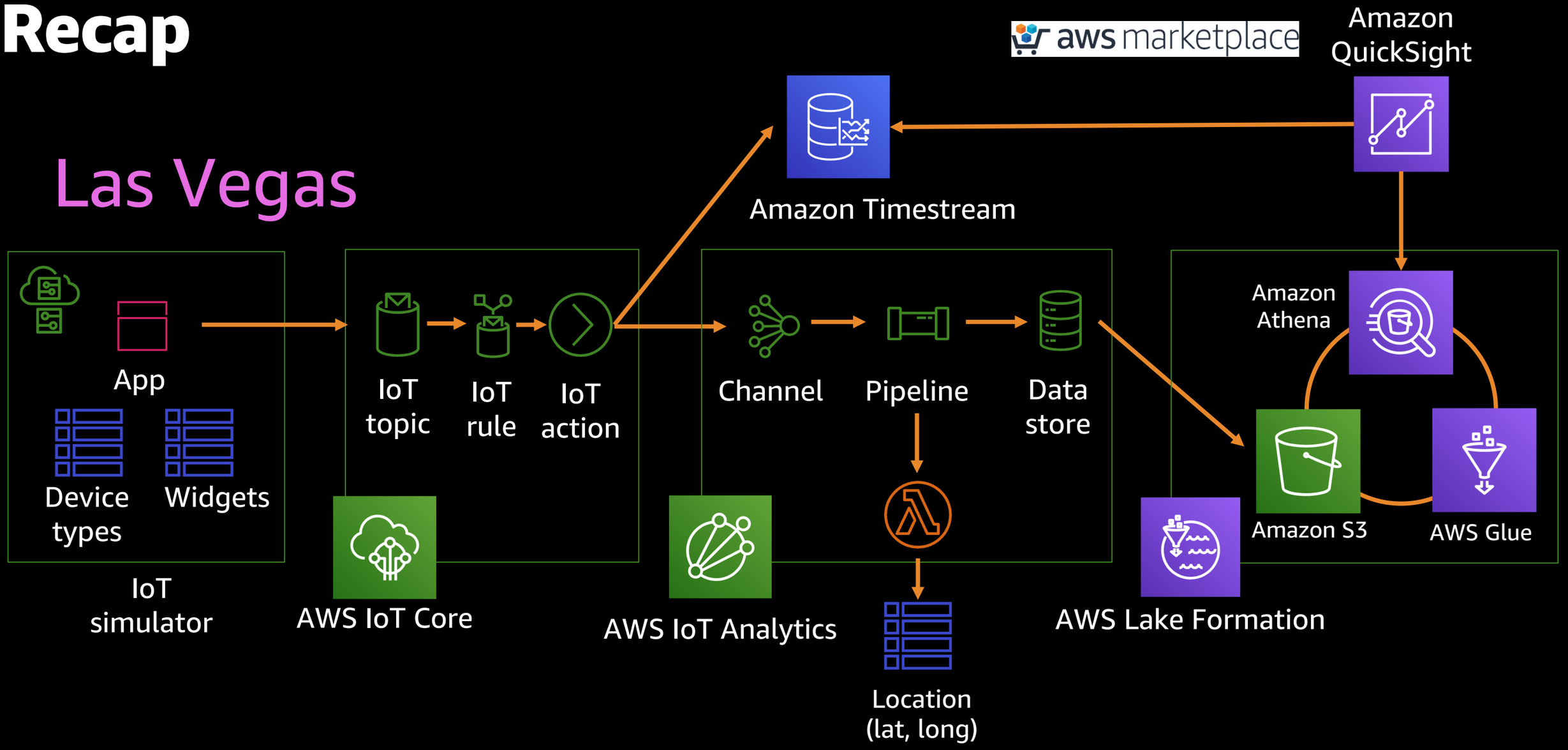
Recap


Las Vegas
App
Device types
Widgets
IoT simulator
IoT topic
IoT rule
IoT action
AWS IoT Core
Amazon Timestream
AWS IoT Analytics

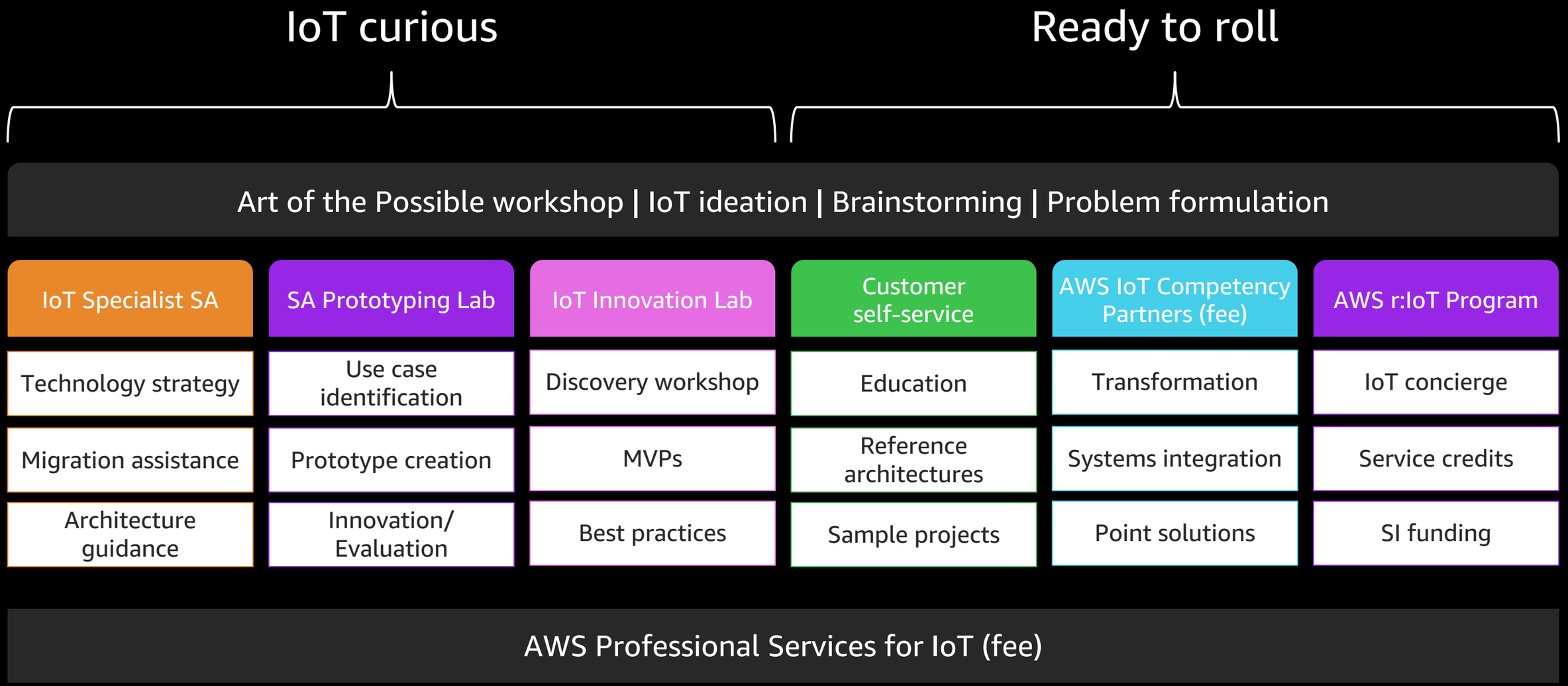
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aws marketplace
Amazon QuickSight
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Location (lat, long)
Amazon Athena
Amazon S3
AWS Glue
AWS Lake Formation

Customer support options



What happens in Vegas . . .

Build your own smart city simulator using AWS IoT Core, Amazon Timestream, and Amazon QuickSight

Video: Ingesting Data into Amazon Timestream with AWS IoT Core
https://www.youtube.com/watch?v=00Wersoz2Q4

Get started with IoT Device Simulator, Amazon Timestream, Amazon QuickSight, AWS IoT Analytics, and AWS Lake Formation

https://aws.amazon.com/solutions/implementations/iot-device-simulator/

https://docs.aws.amazon.com/timestream/latest/developerguide/getting-started.html

https://aws.amazon.com/quicksight/getting-started/

https://docs.aws.amazon.com/iotanalytics/latest/userguide/getting-started.html

https://docs.aws.amazon.com/lake-formation/latest/dg/getting-started.html

What happens in Vegas . . .

Read these eBooks and learn about AWS city customers

1. ***Innovation for Life: Cities Powered by the Cloud***

https://pages.awscloud.com/city_transformation_ebook.html

https://pages.awscloud.com/APAC-acq-DL-intc-inv_innovationforlife_ANZ-2020-reg.html
(Australia/NZ edition)

2. Cities of the Future, Powered by the Cloud: eBooks on digital government, transportation, and healthcare

https://aws.amazon.com/government-education/city-transformation/



Join the competition

City on a Cloud 2020 is open to all government entities, healthcare organizations, and nonprofit organizations, as well as AWS partners, start-ups, and ISVs supporting these institutions or developing solutions that have a potential to impact the wider community

Architecture resources

AWS Well-Architected Framework

The official best practices for architecting in the AWS Cloud

https://aws.amazon.com/architecture/well-architected

AWS Well-Architected Labs

Hands-on labs to help you learn, measure, and build using architectural best practices

https://wellarchitectedlabs.com

AWS Architecture Center

Official AWS repository for all architecture resources

https://aws.amazon.com/architecture

AWS Solutions Library

Vetted reference implementations and well-architected patterns

https://aws.amazon.com/solutions

Reach out to your regional smart cities lead

APAC – Linh Le:	linhamzn@amazon.com
Americas – Ali Hasan:	aahasan@amazon.com
EMEA – Wayne Soutter:	wayneds@amazon.co.uk
Aus / NZ – Craig Lawton	cclawton@amazon.com

Thank you!

Craig Lawton

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