Integrated Use Cases –
IoT Data & Business Application Integration

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Agenda

- Overview AWS IoT and related Services
- Include Device Data into your Information Platform
- Integrate your Device Network with your Business Applications
- Learn from your data, predict behavior, and act on it
- Summary
Overview AWS IoT and related Services
AWS customers are connecting physical things to the cloud in every industry imaginable.

- Healthcare and Life Sciences
- Municipal Infrastructure
- Smart Home
- Retail
- Manufacturing, Logistics & Supply Chain
- Agriculture
- Education
- Automotive
IoT Initiatives Powered by AWS

- Industrial Internet
- Fleet Tracking And Monitoring
- Oil Deposit Discovery
- Street Lighting
- DNA Sequencing Instruments
- Equipment Management
- Connected Car Device
- Video Monitoring
- Asset and vehicle Tracking
- Consumer Smart Device Electronics
Dash connects your smartphone to your car with a simple, low-cost device which provides real-time road safety information to drivers.

As a startup, using AWS has allowed us to scale nicely and use resources without spending a lot of capital.

Brian Langel
CTO, Dash

Dash streams more than 1 TB of real-time data per day over Amazon Kinesis.

- Real-time information for drivers
- Streams more than 1 TB of real-time data per day over Amazon Kinesis
- Processes billions records using Amazon DynamoDB
- Thousands of updates per second during spikes
- Reduced operating costs by $200,000 per year
Two Areas For IoT – How to bring them together?

Connecting Devices To The Cloud

• Easily and securely connect devices and cloud applications to one another
• Easily manage relationships and data between devices
• Let devices act even without connectivity and use the cloud opportunistically

Big Data and Applications

• Ingest, combine, process and analyze massive amounts of data rapidly and economically.
• Utilize machine learning to let devices get smarter over time
• Extend the onboard capabilities of physical products with cloud resources
Use Cases…

- Assistance for elderly or disabled people living independent.
- Control of conditions inside freezers storing vaccines, medicines and organic elements.
- Monitoring of conditions of patients inside hospitals and in old people's home.
- Integration of desperate lab equipment to achieve the Connected Lab

- Monitoring of parking spaces availability in the city
- Monitoring of vibrations and material conditions in buildings, bridges and historical monuments.
- Monitoring of vehicles and pedestrian levels to optimize driving and walking routes
- Detection of waste levels in containers to optimize the trash collection routes.

- Energy and water supply consumption monitoring to obtain advice on how to save cost and resources.
- Switching on and off remotely appliances to avoid accidents and save energy.
- Remote Monitoring of security systems
• Monitoring of storage conditions along the supply chain and product tracking for traceability purposes.
• Enhancing Customer Experience with Omni-Channel integration
• Analytic processing to track location or activity duration (dwell) for public transport, retail locations, etc.
• Control of rotation of products in shelves and warehouses to automate restocking processes.
• Machine auto-diagnosis and assets control.
• Control of temperature inside industrial and medical fridges with sensitive merchandise.
• Asset location.
• Control of temperature inside industrial and medical fridges with sensitive merchandise.
• Information collection to generate real time alarms to
IoT Challenges for Companies and Developers

- Many SDKs & Tools
- Connecting To The Cloud
- Scalability
- Security & Management
- Cloud Powered Apps
- Big Data & Analytics
- Prediction
AWS Global Infrastructure

11 Regions
30 Availability Zones
53 Edge Locations
AWS IoT

- **DEVICE SDK**: Set of client libraries to connect, authenticate and exchange messages.
- **DEVICE GATEWAY**: Communicate with devices via MQTT and HTTP.
- **AUTHENTICATION AUTHORIZATION**: Secure with mutual authentication and encryption.
- **RULES ENGINE**: Transform messages based on rules and route to AWS Services.
- **DEVICE SHADOW**: Persistent thing state during intermittent connections.
- **DEVICE REGISTRY**: Identity and Management of your things.
- **AWS IoT API**: AWS services that enable device connectivity and management.
- **APPLICATIONS**: Applications that interact with AWS IoT services.
- **3P SERVICES**: Third-party services integrated with AWS IoT.

This diagram illustrates the architecture of AWS IoT, showing how devices communicate with AWS services through a set of SDKs, gateways, and other components.
Integration with cloud based applications

RULES ENGINE
Transform messages based on rules and route to AWS Services

DEVICE SHADOW
Persistent thing state during intermittent connections
Include Device Data into your Information Platform
Many thousands of companies use AWS for big data
AWS big data portfolio

Collect
- AWS Direct Connect
- AWS Import/Export
- Amazon Kinesis Firehose
- Amazon Kinesis

Store
- Amazon S3
- Amazon Glacier
- Amazon DynamoDB
- Amazon RDS, Aurora
- Amazon CloudSearch
- Amazon ElasticSearch

Analyze
- Amazon EMR
- Amazon Redshift
- Amazon Machine Learning
- Amazon QuickSight

New
- AWS Database Migration
- AWS Data Pipeline
- Amazon Kinesis Analytics
- Amazon Kinesis
- AWS Data Pipeline
- Amazon QuickSight
- New
- New
AWS IoT Rules Engine

1. AWS Services (Direct Integration)
   - S3
   - DDB
   - Lambda
   - SQS

2. Rest of AWS (via Kinesis, Lambda, S3, and more)
   - RDS
   - Glacier
   - Redshift
   - EC2

3. External Endpoints (via Lambda and SNS)
Use Case: Device Message to Status Dashboard

- **Thing/Device**
  - SDK
  - Private Key & Certificate

- **AWS IoT**
  - Policy
  - Rule
  - Action

- **AWS Services**
  - IAM Role
  - Policy
  - DynamoDB
  - S3 Website

- **DynamoDB Table**

- **Dashboard**
**AWS IoT Rules Engine & Stream Data**

**N:1 Inbound Streams of Sensor Data (Signal to Noise Reduction)**
Rules Engine filters, transforms sensor data then sends aggregate to Amazon Kinesis

**Amazon Kinesis Streams to Enterprise Applications**
Simultaneously stream processed data to databases, applications, other AWS Services
Example: Include Device and Business Data

- Device Data
  - consolidated
  - transformed
  - compressed
  - ...

- Device Data
  - e.g. ERP
    - Master data
    - Service Records
    - Customer data
    - ...

- Stream

- Amazon Kinesis

- EC2 Instance

- Business App

- Amazon Redshift

- Amazon QuickSight
Increase the Value of a Product Over Time with Data

- Telemetry and Usage Data
- Data Filtering and Routing Rules
- Ordered Stream to Amazon Kinesis Firehose
- Storage and Offline Analysis
- Online Monitoring
- Customization, New Capabilities
Integrate your Device Network with your Business Applications
Running Business Applications on AWS

... and many more
Running Microsoft Applications on AWS

http://aws.amazon.com/windows/
Use Case: integrate with mobile notification

- **SDK**
- **Private Key & Certificate**
- **Thing/Device**
- **Policy**
- **Rule**
- **Action**
- **AWS IoT**
- **Lambda Function**
- **External Endpoint**
- **Permission**
- **Execution Role**
- **Policy**
- **Notification**
- **Notification Service Provider**
Example: Smart Business Apps

- **Amazon S3**
- **EC2 Instance**
- **Amazon Kinesis**
- **Amazon API Gateway**
- **Amazon Redshift**
- **Amazon EMR**
- **Business App**
- **EC2 Instance**
- **Amazon API Gateway**
Learn from your Data, predict Behavior, and act on it
AWS IoT Rules Engine for Machine Learning

Anomaly Detection
Amazon Machine Learning can feed predictive evaluation criteria to the Rules Engine

Continuous Improvement Around Prediction
Continuously look for outliers and re-calibrate the Amazon Machine Learning models

Amazon Machine Learning
Re-Train
Send to S3
S3
Example: Smart Business Apps

- Amazon Kinesis
- EC2 Instance
- Amazon API Gateway
- S3
- Amazon Machine Learning
- Business App

Flow:
- Send to S3
Summary
Summary

AWS supports your IoT initiative

- Reach your customers globally - supported by standardized and certified AWS global infrastructure
- Build and run end-to-end solutions – AWS services integrate all the way from device to business process
- Run critical business apps on AWS, integrate and analyze all your data
- Transform data into insight and act based on the knowledge hidden in your data
- Scale (and pay) only for what you need
- Innovate and experiment at (almost) no risk
Thank You