

IoT Building Blocks: From Edge Devices to Analytics in the Cloud

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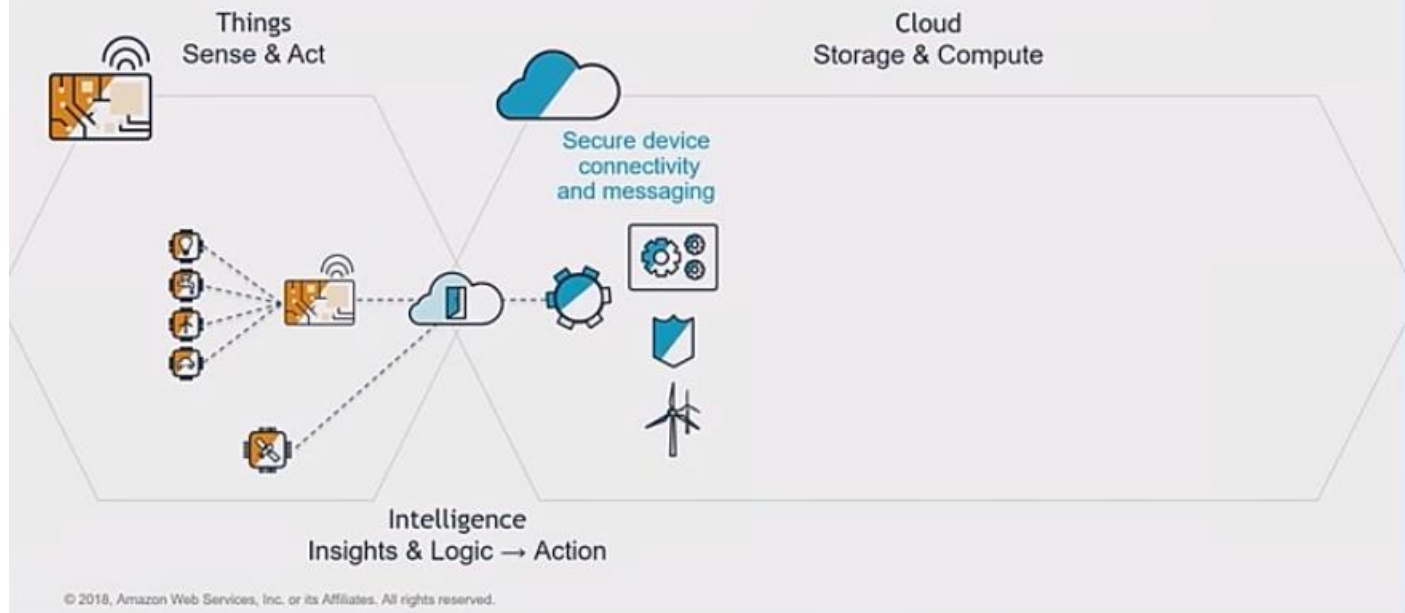
CEO and Founder, Modjoul

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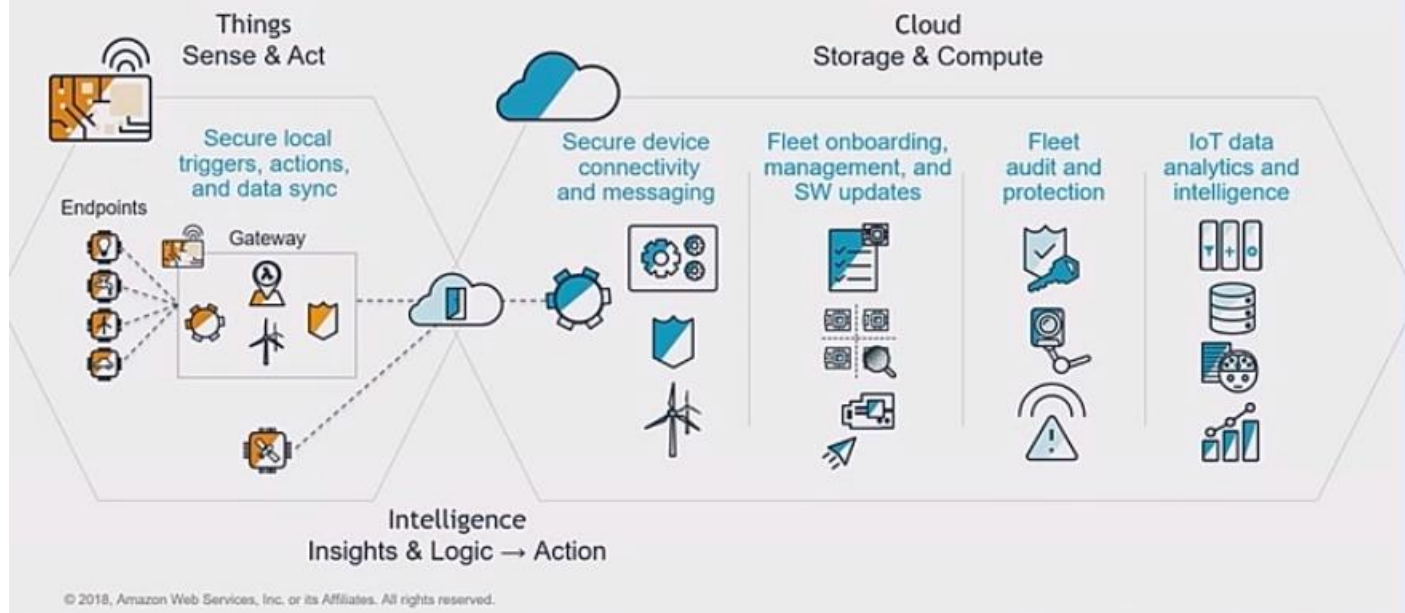
Our Concept of IoT



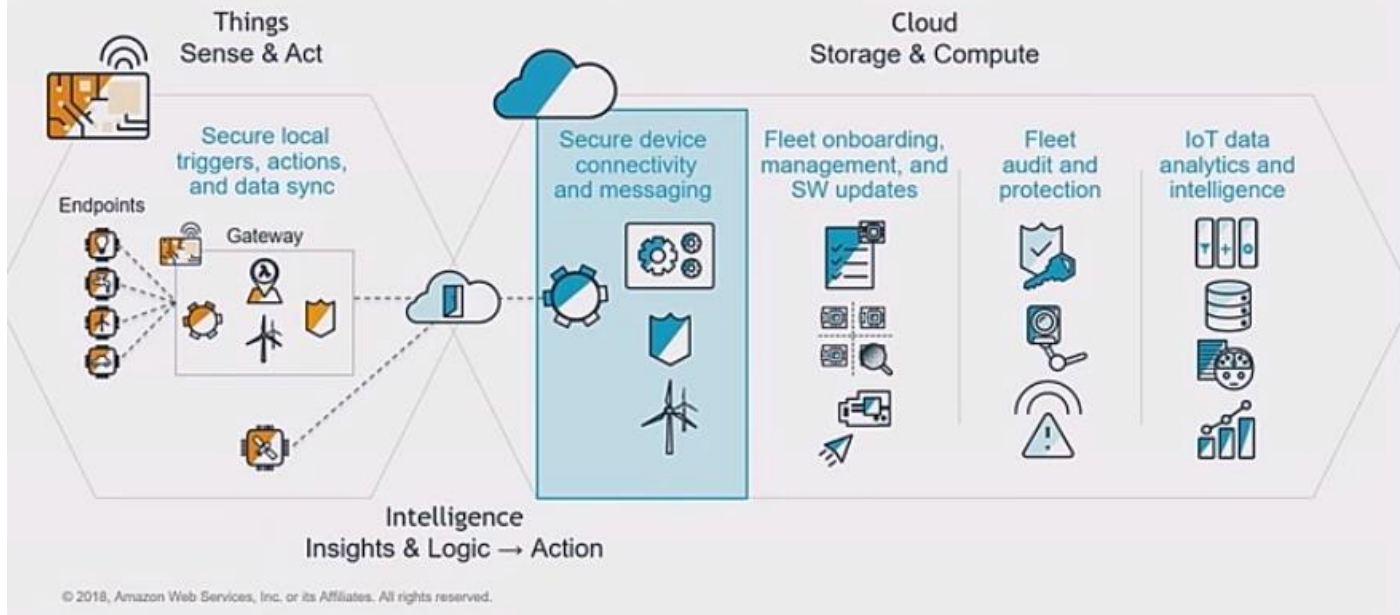
AWS IoT Architecture



AWS IoT Architecture

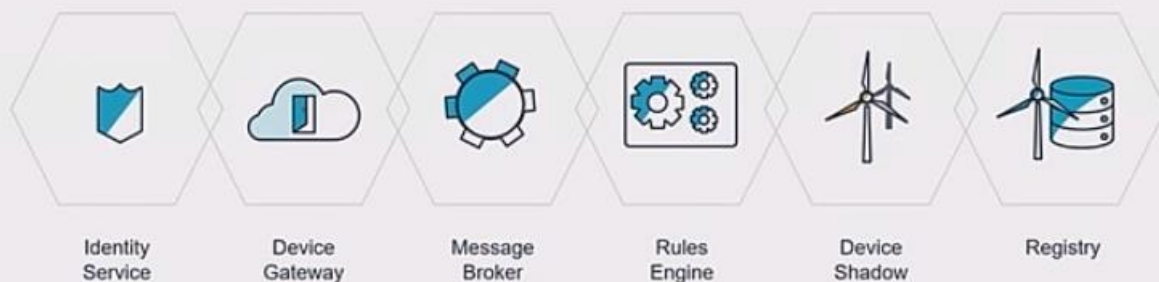


AWS IoT Architecture



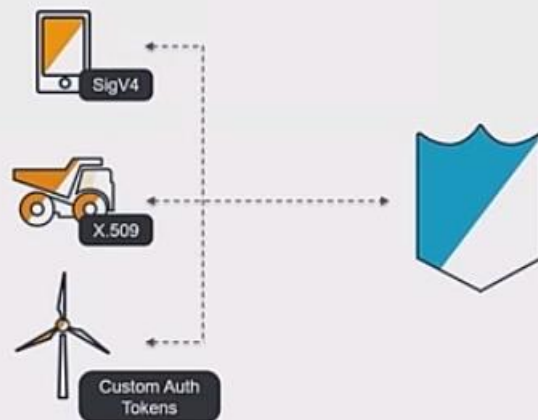
AWS IoT Core

Secure Device Connectivity and Messaging



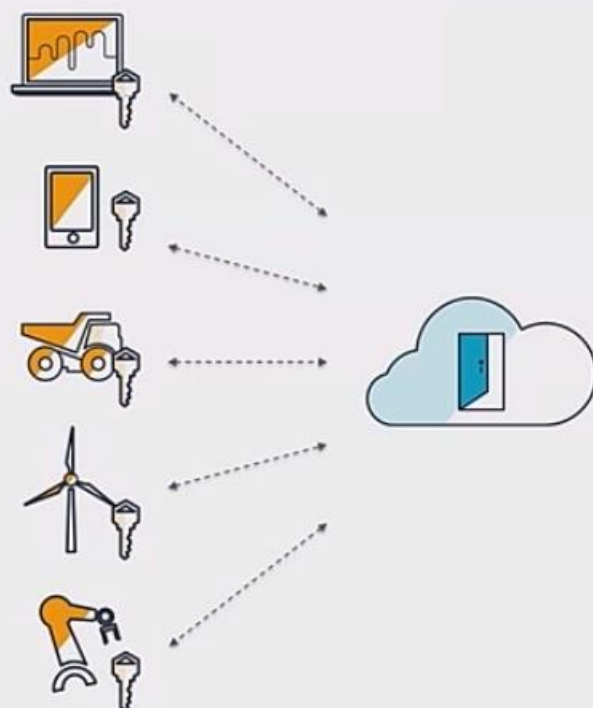
Identity Service

- Certificates
 - AWS or BYOC
- Manual or JITR
- IAM and AWS IoT policies
- Amazon Cognito
- Federated users



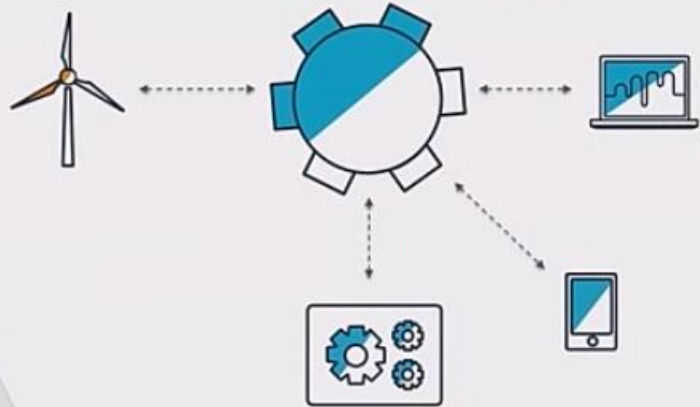
Device Gateway

- Long-lived connections
- MQTT, WebSockets, HTTP
- SigV4, X.509, and token-based authentication
- TLS 1.2



Message Broker

- MQTT-based routing
- Publish/Subscribe
- QoS 0/1
- Topics
 - Reserved (\$aws/#)
 - Wildcards



Rules Engine

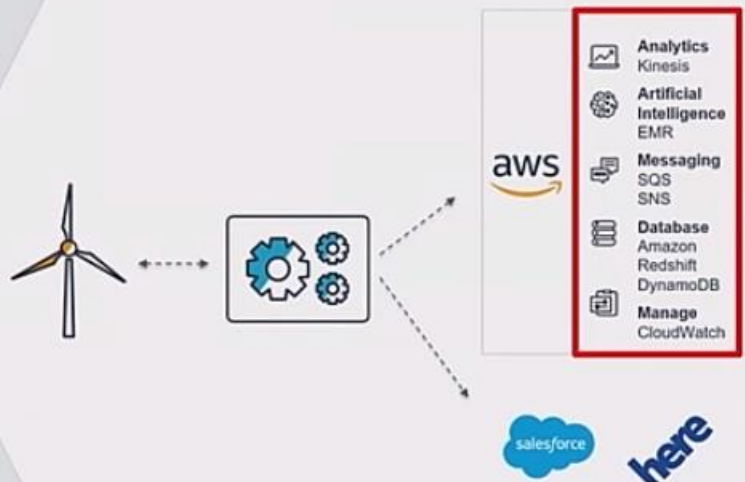
Data transformation and actions



- Query language
`SELECT * from 'topic/structure'`
`WHERE temperature > 35`
- Topics



- Republish
- ML



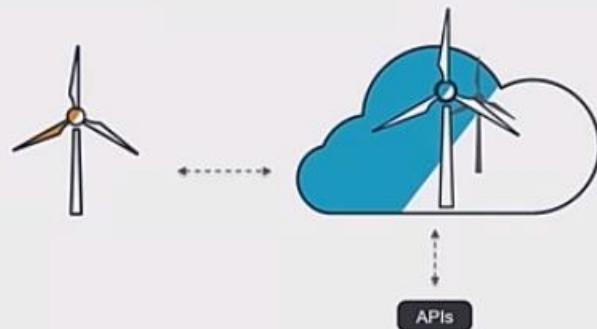
Device Shadow

- Representation of state

- Reported
- Desired

```
{
  "desired": {
    "welcome": "aws-iot"
  },
  "reported": {
    "welcome": "aws-iot",
    "latitude": "38.10",
    "longitude": "98.17",
    "counter": "3",
    "button": "1"
  }
}
```

- Application interaction

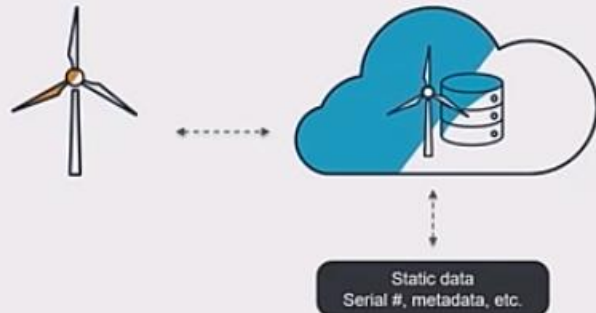


Device Shadows

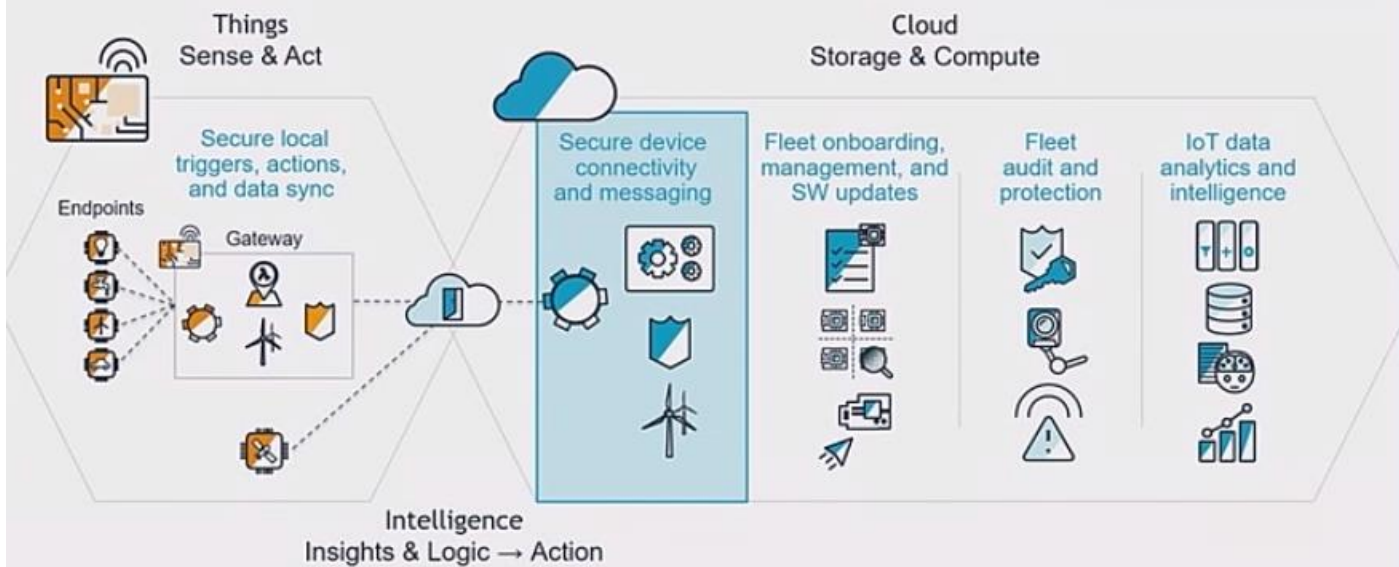


Registry

- Static device metadata
- ThingTypes
- Groups
- Jobs



AWS IoT Architecture

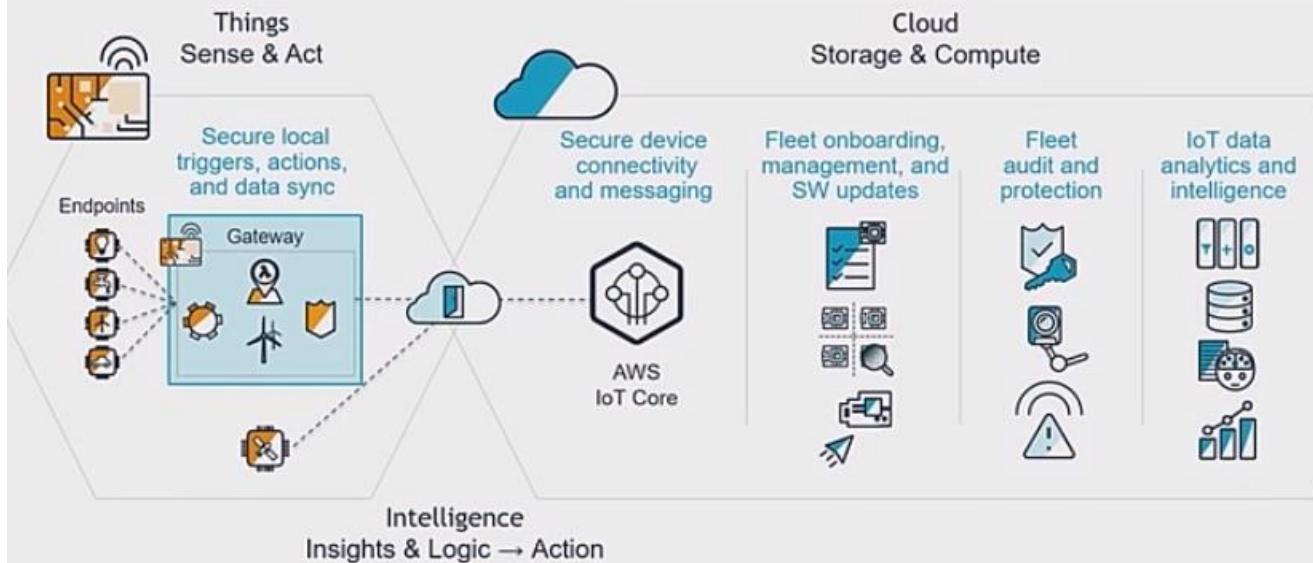


AWS Greengrass

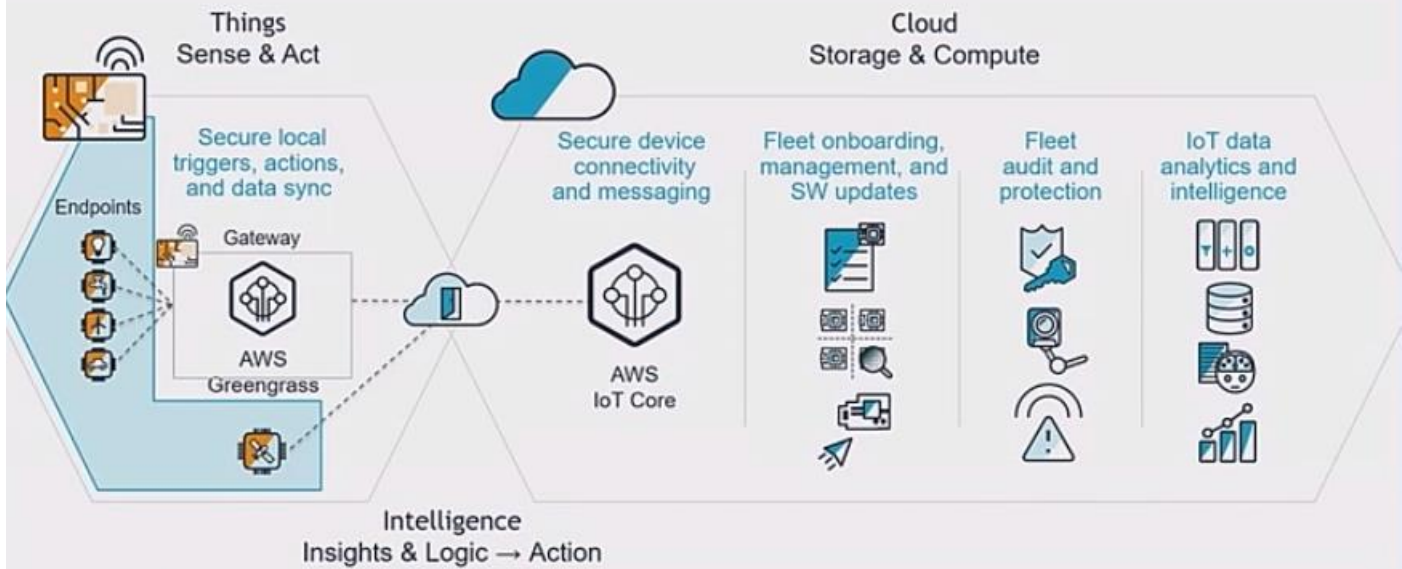
Extend AWS IoT to the Edge



AWS IoT Architecture



AWS IoT Architecture



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Amazon FreeRTOS

IoT Microcontroller OS



Based on FreeRTOS kernel

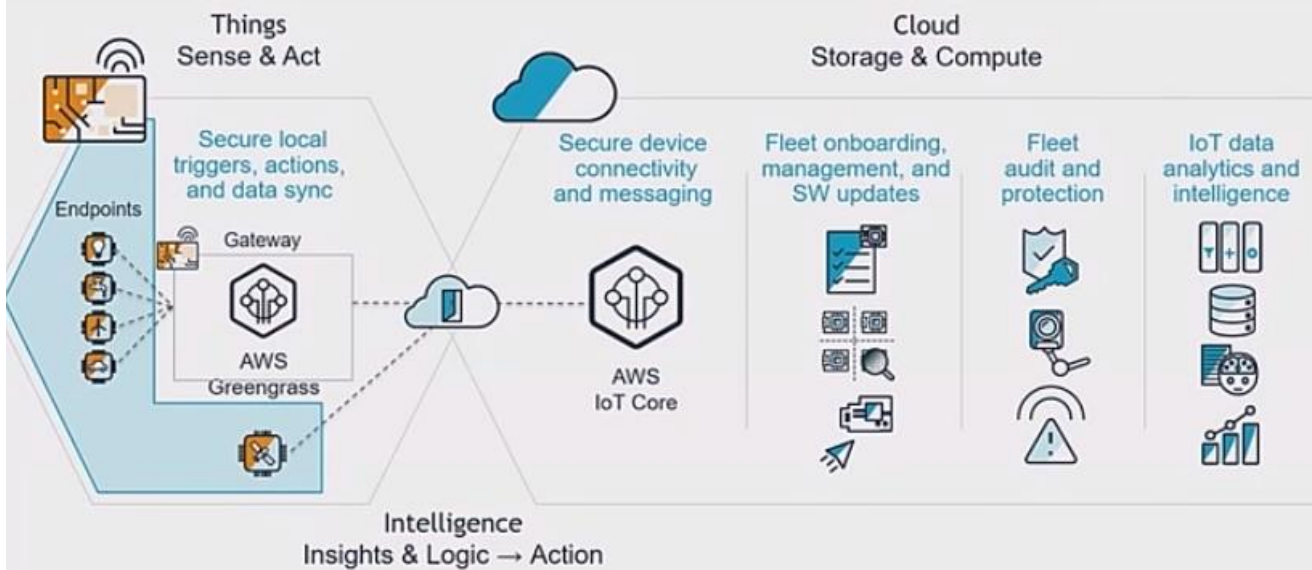
Amazon FreeRTOS

IoT Microcontroller OS



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AWS IoT Architecture



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AWS IoT Device Management

Maintain Fleet Health



Batch Fleet
Provisioning



Real-time
Fleet Index & Search

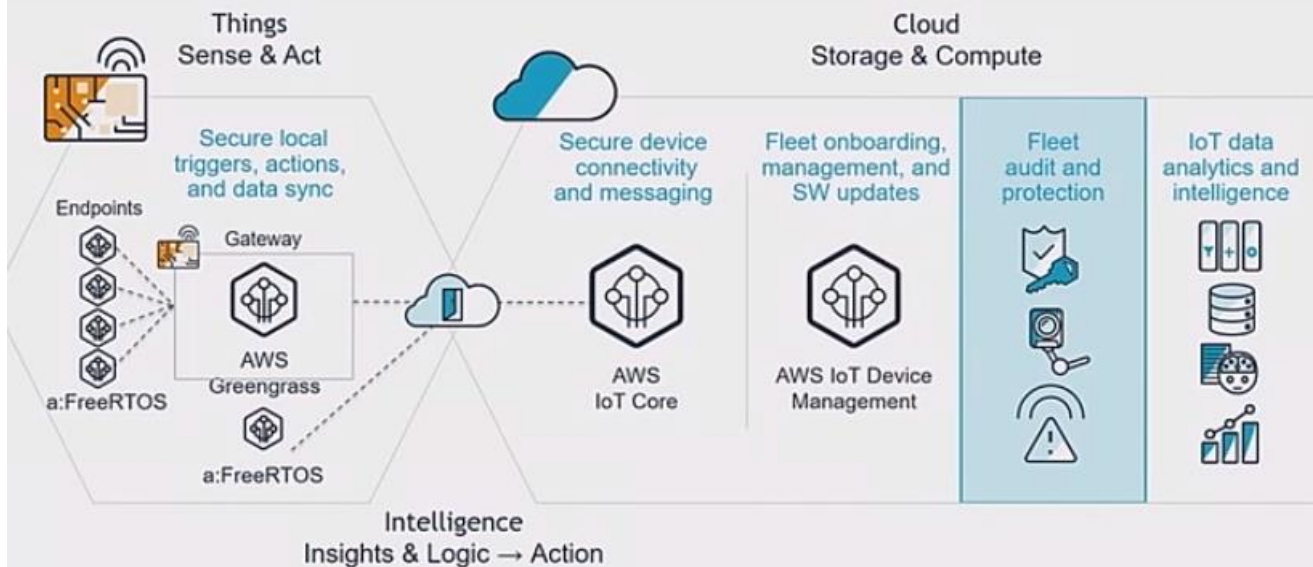


Fine Grained
Device Logging
& Monitoring



Over the
Air Updates

AWS IoT Architecture





AWS IoT Device Defender

COMING
IN 2018

Keep your fleet secure



Audit Device
Configurations



Monitor Device
Behavior



Identify
Anomalies

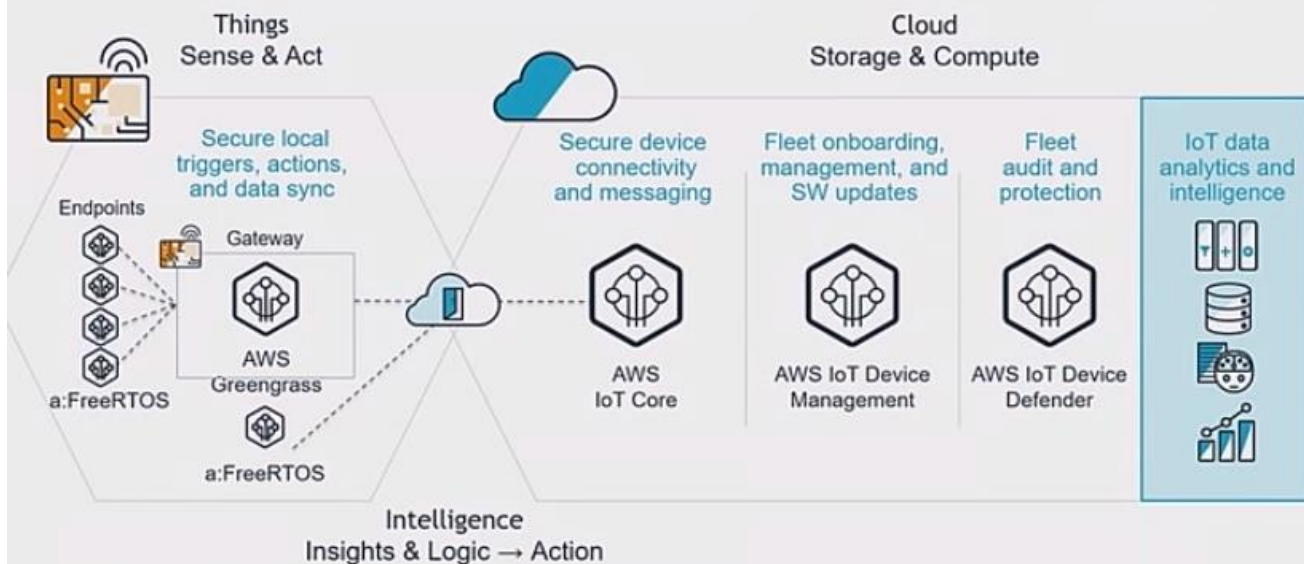


Generate
Alerts



Patch Security
Vulnerabilities

AWS IoT Architecture



AWS IoT Analytics

Easily analyze IoT data

AWS IoT Analytics is a service that processes, enriches, stores, analyzes, and visualizes IoT data for manufacturers and enterprises.



Channels



Pipelines



Data Stores

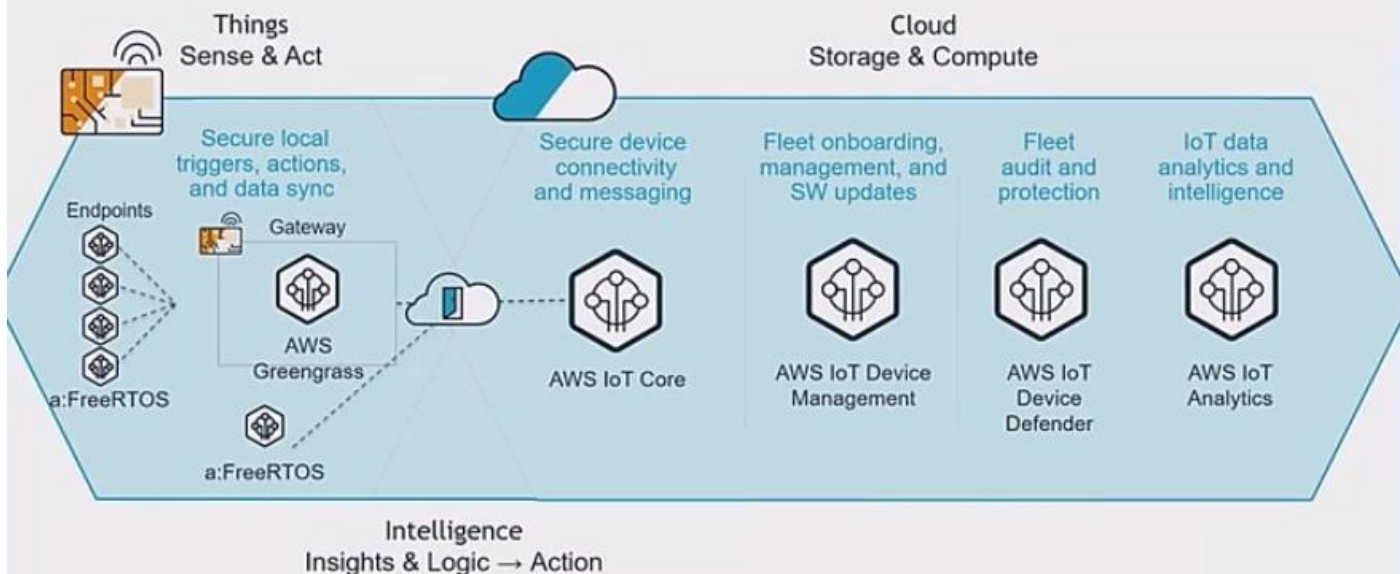


Datasets



Jupyter Notebooks
& Templates

AWS IoT Architecture



AWS IoT 1-Click

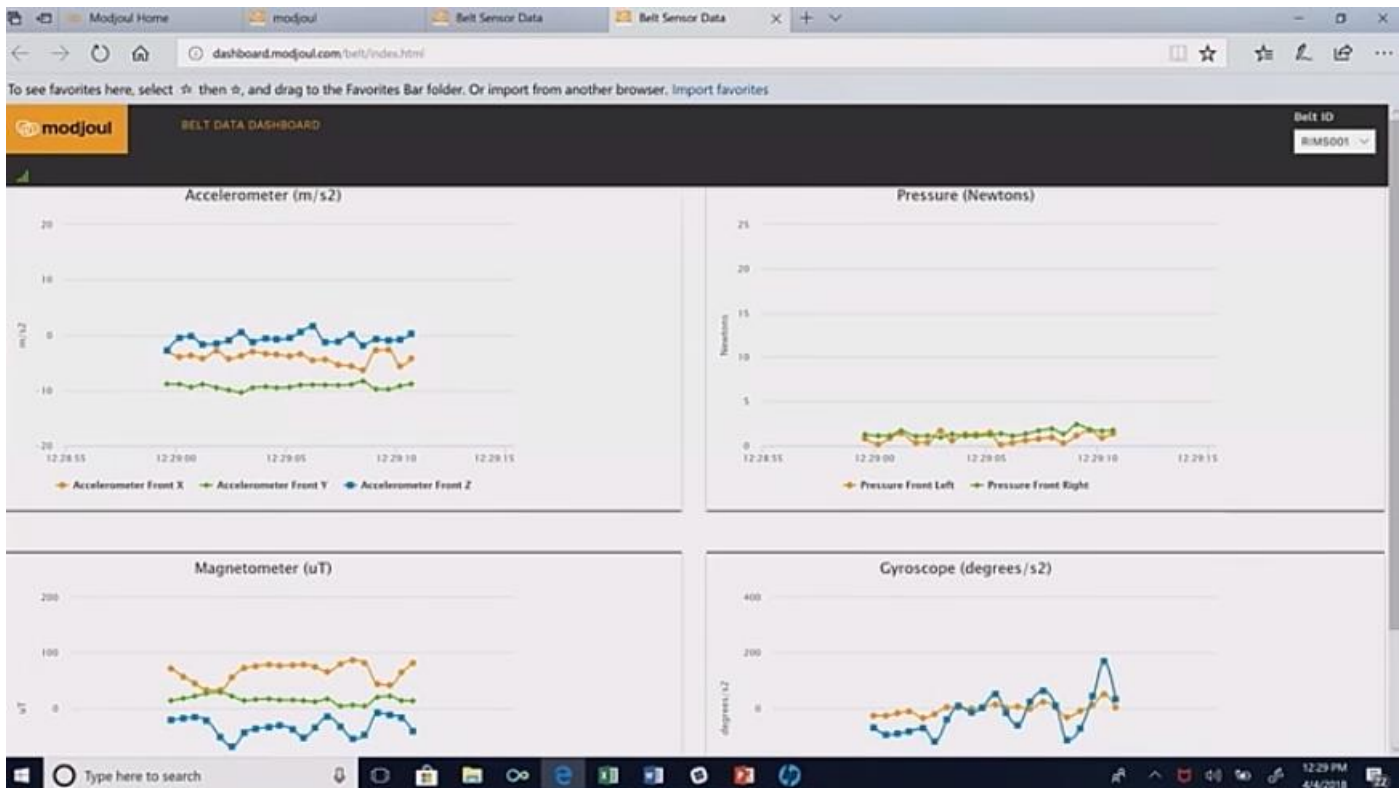
Easily Trigger Actions in the Cloud

AWS IoT 1-Click makes it easy for simple devices to trigger actions such as Lambda functions with one click



Modjoul – Activity Tracker

www.modjoul.com



The belt is equipped with 8 sensors plus GPS for location, motion and the environment, the data are streamed every second into the AWS IoT cloud and the employee or supervisor can view the data through a device as actionable insight to keep the worker safe. The raw data from each belt results in about 15MB a day. We hold the data until we get a strong enough WIFI or RF signal strength before sending the data out from the belt to the central data hub, we can alternatively keep the data in Greengrass until the signal is strong enough to send the data out

What is Modjoul

We create **new data and insights** for blue collar employees and empower them through analytics to achieve their highest performance.

SmartBelt slides into the trouser belt loops and buckle is the processing center

Proprietary modeling analytics that interpret the digital signatures of movements

Different report views for employee, supervisor, and leaders, which are displayed on mobile or web browser

www.modjoul.com
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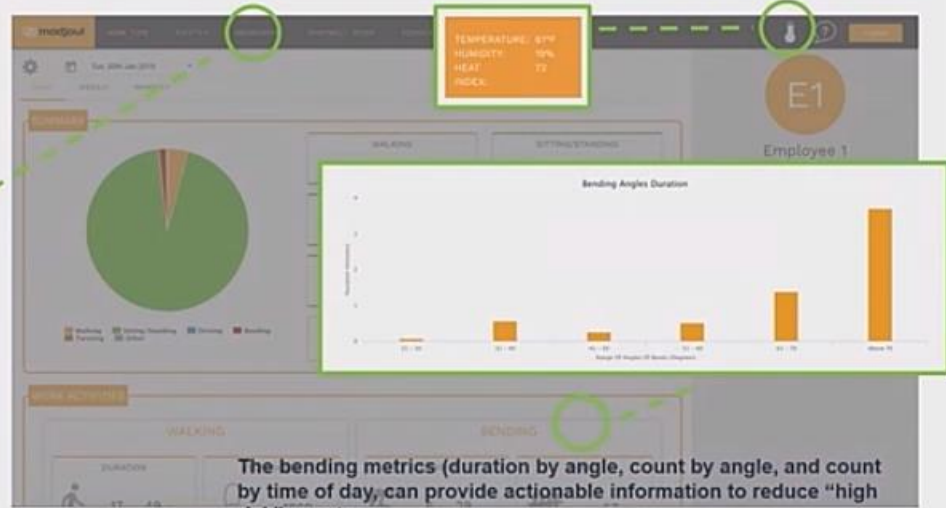
A Day in the Life of an Employee

Job Role: Material Inspector

The breadcrumb report can provide valuable data on an employee's location throughout the day.



Temperature and humidity readings can provide insights around the worker's ambient environment.



The bending metrics (duration by angle, count by angle, and count by time of day) can provide actionable information to reduce "high risk" events

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We convert the temperature and humidity values into a heat index. We convert this into about 37 metrics for each employee.



Current Activities and Metrics

Activities (11)	Metrics (37)
Walking	Duration Steps Speed Distance
Bending	Total Count Total Duration Bend with: Twist, Acceleration, Twist and Acceleration Bend Count and Duration by Angle: 21° - 30°, 31° - 40°, 41° - 50°, 51° - 60°, 61° - 70°, >70°
Twisting	Count Duration
Lying	Duration
Sitting/Standing	Duration
Falls	Count
Trips	Count
Outdoor Driving	Distance Duration Hard Acceleration Hard Braking Hard Maneuver
Indoor Driving	Duration Hard Braking Hard Maneuver
Vibration	Whole Body Vibration
MET	Metabolic Equivalent

Environment (1)	Metrics (3)
Temperature/Humidity	Ambient Temperature Ambient Humidity Heat Index

- Collects 50+ MB of data per day
- Location, Motion, and Environmental sensors
- New indoor driving and twist metrics rolling out

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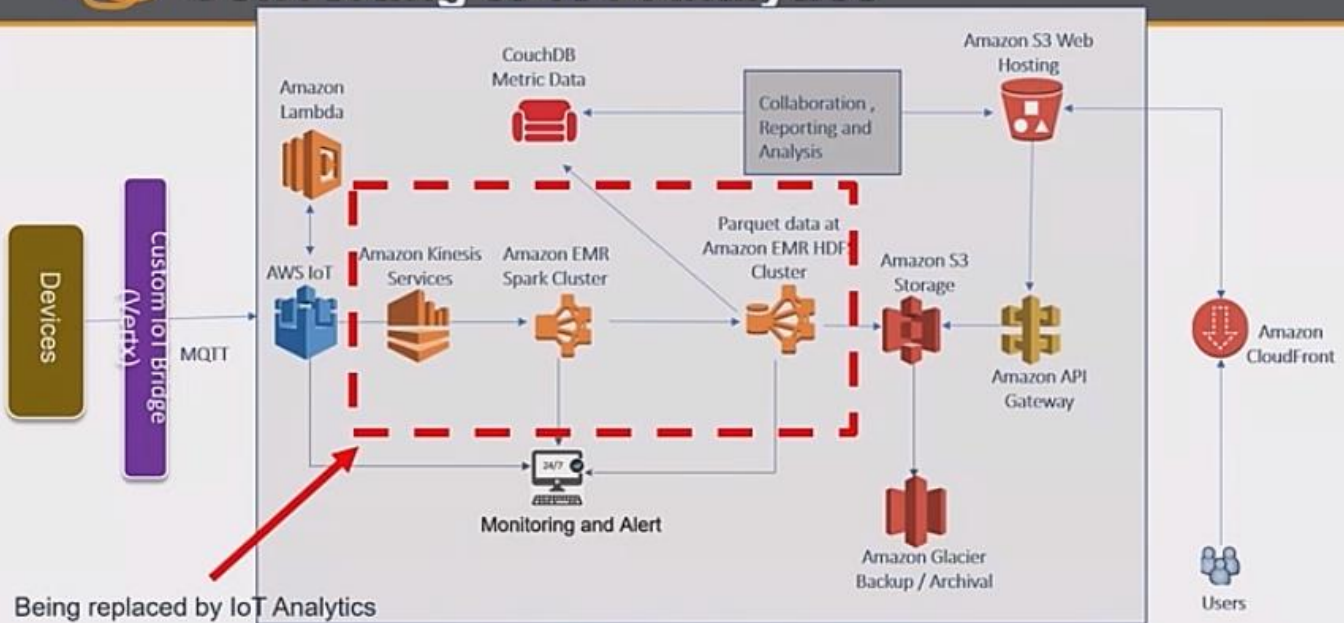
Modjoul Features



The SmartBelt Difference

- **Weak radio signals** – ability to store two weeks of data on SmartBelt
- **Employees leave** – ability to interchange SmartBelt between employees
- **Employees forget to charge** – battery holds charge for two days and is part of everyday uniform
- **Employees are rough** – electronics are protected with a plastic stiffener and water and dust resistivity rating of IP43
- Blue collar employees are not allowed cell phones and data is significant to serve as a medium
- Accurately time stamps all activities
- Models are dependent on multiple variables and consistent orientation
- Data storage, computational power pay as you go model and commoditized
- Wear and go model with no edge routers required

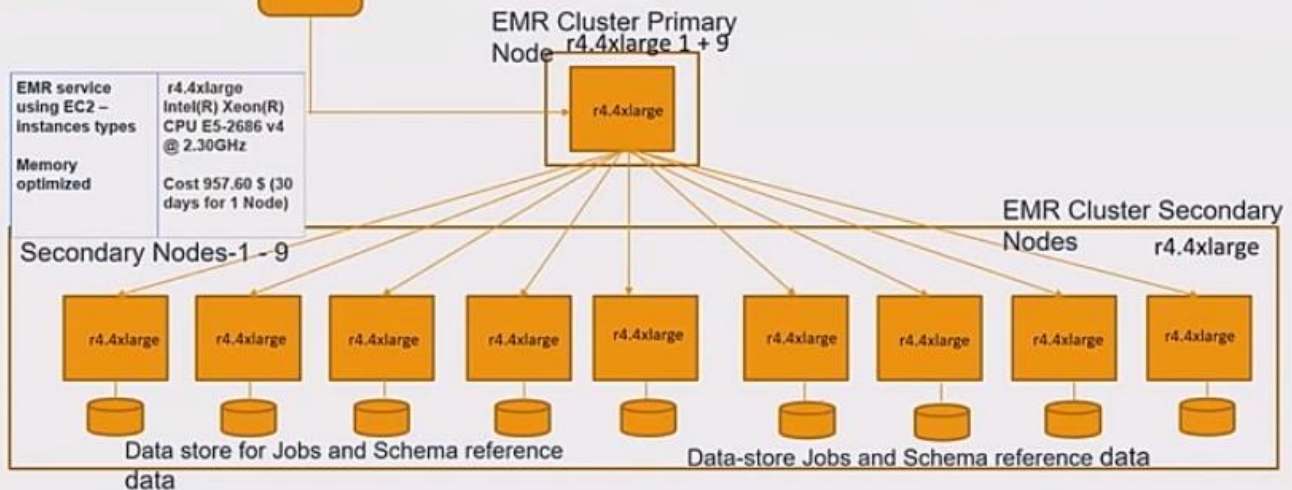
Converting to IoT Analytics





Kinesis streaming / Users

Current Computational Architecture



- The **primary node** divides input data into blocks, and distributes the processing of the blocks to the secondary nodes.
- Each secondary node then runs the **map function** on the data it has been allocated, generating intermediate data
- The **primary node** manages the **cluster** and typically runs primary components of distributed applications.
- For example, the **primary node** runs the YARN ResourceManager service to manage resources for applications, as well as the HDFS NameNode service.

www.madjsai.com

Conversion to IoT Analytics

- Customer management of the Primary/Secondary EMR to a managed service
- Computational round-trip time is better
- Cost-effective scaling
- Reporting/Visualisation

Demonstration

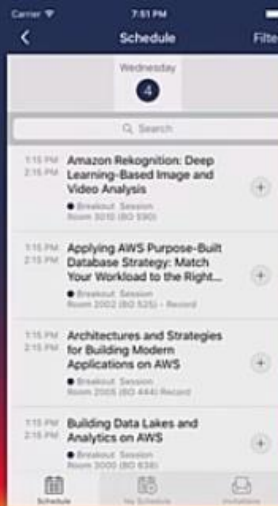
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