An Introduction to Developing for Cisco Kinetic

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Technical Marketing Engineer IoT Software
Questions?
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What is IoT?
Cisco Kinetic IoT Platform
Developing for Cisco Kinetic Data Control Module
Walk Through
Summary
To get value from data

Extract & move data from things to apps

Derive business value

$ $ $ $
And these things and apps are distributed
Customers are challenged!

- Complexity of connecting, securing and managing diverse devices
- Data remains locked inside its sources
- No programmatic way to move right data to right apps at right time
- No software control to enforce data ownership, privacy & security
Cisco Intent-Based Network is needed
But customer challenges remain…

- Complexity of connecting, securing and managing a set of diverse devices
- A lot of data remains locked inside its sources
- No programmatic way to move the *right* data to the *right* apps at the *right* time
- No programmatic way to enforce ownership, privacy, and security policies

**Cisco Intent-Based Network**

**IoT Data Fabric is needed**
An IoT data fabric is needed
An IoT data fabric is needed

Cisco Kinetic

System of distributed software that extracts data, computes data, and moves data.
Cisco Kinetic unlocks your data

Extract Data

Extract data from its sources and makes it usable.

Compute Data

Compute data to transform it, apply rules, and perform distributed micro-processing from edge to endpoint.

Move Data

Move data programmatically to the right applications at the right time.
Cisco IoT

Extract Data

Compute Data

Move Data

Cisco Kinetic
IoT Data Fabric

The Network. Intuitive.
Intent-Based Network
Cisco Kinetic Platform

Cisco Kinetic IoT Data Fabric

- Extract Data
- Compute Data
- Move Data

Gateway Management Module
Edge & Fog Processing Module
Data Control Module
The Cisco IoT Product Portfolio Organization

<table>
<thead>
<tr>
<th>Implementation Methodology</th>
<th>Cloud Data Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical Market Applications</td>
<td>Fog Data Services</td>
</tr>
<tr>
<td></td>
<td>Manage</td>
</tr>
<tr>
<td></td>
<td>Collect</td>
</tr>
<tr>
<td></td>
<td>Connect</td>
</tr>
</tbody>
</table>

- Device Communication Application
- Cisco Kinetic
How Kinetic works?

1. Gateway Power On
How Kinetic works?

1. Gateway Power On
2. Field Tech App
How Kinetic works?

1. Gateway Power On
2. Field Tech App
3. Scanning / Claiming
How Kinetic works?

1. Gateway Power On
2. Field Tech App
3. Scanning / Claiming
4. Call Home / Register
How Kinetic works?

1. Gateway Power On
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5. Gateway Provisioning
How Kinetic works?

1. Gateway Power On
2. Field Tech App
3. Scanning / Claiming
4. Call Home / Register
5. Gateway Provisioning
6. Edge / Fog App Download

Diagram:
- Gateway
- Cisco Kinetic
- Field Tech App
- Scanning / Claiming
- Call Home / Register
- Gateway Provisioning
- Edge / Fog App Download
How Kinetic works?

1. Gateway Power On
2. Field Tech App
3. Scanning / Claiming
4. Call Home / Register
5. Gateway Provisioning
6. Edge / Fog App Download
7. Connect to Devices / Sensors
How Kinetic works?

1. Gateway Power On
2. Field Tech App
3. Scanning / Claiming
4. Call Home / Register
5. Gateway Provisioning
6. Edge / Fog App Download
7. Connect to Devices / Sensors
8. Data Gathering, Processing, API to Applications
9. Cisco or 3rd Party Applications
Empowering the Edge
Compute Inside the Network

Data Center / Cloud

- IoT Applications
- Management
- Business Applications
- Analytic Systems
- Billing

Microservices

Edge / Fog Processing
- Optimized hardware footprint
- No need for separate compute machinery
- Integrated security

Edge / Fog Processing
- Empowered edge processing
- Reduced latency & bandwidth cost
Cisco (IoT Cloud Services)
Services for the Cisco IoT Network

IoT Services
Fog Computing Fabric
IP Network

Distributed Computing Built into the Network, Served by the Cloud
Cisco (IoT Cloud Services)
Services for the Cisco IoT Network

• Gateway Management (covered in earlier slides)

IoT Services
Fog Computing Fabric
IP Network

Distributed Computing Built into the Network, Served by the Cloud
Cisco (IoT Cloud Services)
Services for the Cisco IoT Network

- Gateway Management (covered in earlier slides)
- Remote Access

Distributed Computing Built into the Network, Served by the Cloud
Cisco (IoT Cloud Services)
Services for the Cisco IoT Network

- Gateway Management (covered in earlier slides)
- Remote Access
- Application Management

IoT Services

Fog Computing Fabric

IP Network

Distributed Computing Built into the Network, Served by the Cloud
Cisco (IoT Cloud Services)  
Services for the Cisco IoT Network

- Gateway Management (covered in earlier slide)
- Remote Access
- Application Management
- Data Routing

“Brokering” Data Distribution
- By Source
- By Content
- By Rules
- By Policy

IoT Services
Fog Computing Fabric
IP Network

Distributed Computing Built into the Network, Served by the Cloud
An Open System

Cisco Networking
  + Gateway & Connection Management
  + Microservices
    (Develop or Buy)
  + IoT Cloud Services
  + IoT Vertical Applications

Device or Controller
  Generating Data

Edge Node
  Capturing Data

Fog Node
  Aggregating Data

Data Center
  Leveraging Data

Cloud
  Analyzing Data
Leveraging Data End to End with Cisco

**EFM Module**
- High Performance Data Storage
- Data Transformation
- Anomaly Detection
- Third Party Applications

**DCM Module**
- E2E Management
- E2E Security

**Cloud APIs**
- Policy Based Data Transformation, Event Processing and Routing

**Visualization**
- Analytics
- Alerting

**Modbus** | **OPC** | **MTC 1.4** | **MTC 1.3** | **Other**
Walk through
Where do I begin?

- Create a DevNet account
- Read this Cisco Kinetic Getting Started page – http://cs.co/9001D3BvV
- Visit - www.ciscokinetic.com
Gateway Management

• Swagger Style APIs
• Integrate with existing Management Tools
• Build Custom Interfaces
• API Docs
  • https://eu.ciscodataconnect.io/api/v1
  • https://eu.ciscodataconnect.io/api/v2
Edge & Fog App Development

- Intelligence at Edge
  - Take action based on data
  - Real time response

- Protocol Support
  - Interface with various sensors / machines

- Analytics
  - Run efficient ML algorithms

- Visualization
  - Provide Vertical Specific Dashboards

### IOX App – package_config.ini

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>mqtt.broker</code></td>
<td>(Mandatory) MQTT broker IP and port, example &quot;127.0.0.1:1883&quot;</td>
</tr>
<tr>
<td><code>gw.id</code></td>
<td>(Mandatory) The gateway id</td>
</tr>
<tr>
<td><code>gw.password</code></td>
<td>(Mandatory) The gateway password where the app is installed</td>
</tr>
<tr>
<td><code>device1.id</code></td>
<td>(Mandatory) device 1 id</td>
</tr>
<tr>
<td><code>device1.tag</code></td>
<td>(Optional) device 1 tag</td>
</tr>
<tr>
<td><code>device1.topic.observation</code></td>
<td>(Mandatory) MQTT observation topics, for example,</td>
</tr>
<tr>
<td></td>
<td>/v1/&lt;gw.id&gt;:/&lt;device1.id&gt;/json/dev2app</td>
</tr>
<tr>
<td><code>device1.topic.command</code></td>
<td>(Optional) MQTT command topics, for example,</td>
</tr>
<tr>
<td></td>
<td>/v1/&lt;gw.id&gt;:/&lt;device1.id&gt;/json/app2dev</td>
</tr>
<tr>
<td><code>device1.ip</code></td>
<td>(Optional) Raspberry Pi web server IP address. If left blank, the system scans the Gwaas subnet to find the Raspberry Pi.</td>
</tr>
<tr>
<td></td>
<td>&lt;The subnet is specified in the Gwaas network Configuration. By default, the system scans the next subnet of the IOx app.&gt;</td>
</tr>
<tr>
<td><code>device1.port</code></td>
<td>(Optional) Raspberry Pi web server port</td>
</tr>
<tr>
<td><code>polling.interval</code></td>
<td>(Optional) MQTT publishing intervals in seconds</td>
</tr>
<tr>
<td><code>connection.timeout</code></td>
<td>(Optional) Device connection timeout in seconds</td>
</tr>
<tr>
<td><code>connection.attempts</code></td>
<td>(Optional) Device reconnection retrying times</td>
</tr>
</tbody>
</table>
Cisco Kinetic Developer Support for Edge

- https://github.com/CiscoDevNet/iotsp-device-sdk-java

- Intelligence at Edge
  - DSL – State Processing at Edge
    - Data Inspection & Decision Making
    - Thresholds / Slice / Throttle / Time Series Data Operations
    - Supports Data Reduction
    - Data Delivery Policies in the Cloud
  - Rules Engine at Edge – Java JAR File
  - Sample App - http://cs.co/9001D3Bxv
    - Works with RaspberryPi + SenseHat
    - Easily adaptable
Cisco Kinetic MQTT Client APIs

/*Client object instantiation*/
ICloudConnectClient dcClient = new MQTTClientEdge();

/* Initialize the client with Properties and MqttCallbackExtended.
props - Properties object which reads the package_config.ini to populate mqtt credentials.
callback - MqttCallbackExtended object to decide necessary action required on messageArrival, connectComplete, onDelivery etc.*/
dcClient.init(props, callback);

/*The connect API establishes the mqtt connection from the sample app to IoT Data Connect Cloud. */
dcClient.connect();

/*The publish API publishes 'msg' on 'topic' for mqtt broker in IoT DataConnect Cloud */
dcClient.publish(topic(), msg);

/*The subscribe API subscribes to 'topicToSubscribe' for mqtt broker in IoT DataConnect Cloud */
dcClient.subscribe(topicToSubscribe);
Cisco Kinetic Rules Engine

- Example Rules at Edge using Cisco Kinetic Rule Engine

- Threshold
  
  ```
  when<Rule1> brakes.temp in-msg THEN {
    when<Rule1a> msg(brakes.temp) > 5 then {
      LOG "Brake temp greater than 5" ;
    }
  }
  ```

- Slice Data – Do this in the Portal to drive Data Policies
  
  ```
  SEND TO "BluemixApp" TOPIC "onlytemp" JSON brakes.temperature;
  ```

- Throttling
  
  ```
  when abs(msg(engine.temp) - prev(engine.temp)) > 10 THEN THROTTLE(1 m) {
    SEND TO "starlord" TOPIC "EMAIL/TEMP_CHANGED_10" JSON engine;
  }
  ```

- Time Series
  
  ```
  TS_UPDATE tempTimeSeries WITH msg(engine.temp) WINDOW (3 sec);
  temp_avg = ts_avg(tempTimeSeries);
  temp_count = ts_count(tempTimeSeries);
  ```
Cisco Kinetic Rules Engine APIs

/*Instantiate the rule engine object*/
RuleEngine ruleProcessor = new RuleEngine(configFile);  

/*Pass each message through ProcessData method in rule engine to get a list of actions generated after applying the rule on the message
deviceName - Name of the device as defined in the IoT DataConnect portal.
message - json string for the message received from Raspberry Pi or read from the file.*/
List<REMessage> messages = ruleProcessor.ProcessData(deviceName, message);
Cloud Applications

- Vertical Specific Applications
  - Predictive Maintenance – Analytics / Machine Learning
  - Remote Expert – Build on Remote Access Feature

- Visualization
  - Uses Aggregated Data from the sensors
  - Custom Dashboards – Fleet Mgmt / Robot Maintenance Support

- Admin & Management Apps
  - Integrate with Workflow
  - Uses Portal APIs
  - Gateway / Device Deployment App
  - Alert / Notification Apps
Cisco Kinetic – DCM Module

• Data Consumer / Command Publisher
  • Visit - http://cs.co/9007D3B4d
  • Sample AMQP client to consume data
    • Extend to pull data into your Applications
  • Sample AMQP client to send commands to Devices
    • Extend to send commands from your Applications
Summary

- Integrate with GMM APIs – Custom Dashboard
- Build Edge Intelligence – EFM
- Move Data to Applications - DCM
- Stability, Reliability, Manageability – Cisco Kinetic
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  • DEVNET-2093 An Introduction to Cisco IoT Operations Platform
  • DEVNET-2404 DevNet Workshop- Deep Dive into Cisco IoT Operations Platform
  • DEVNET-1777- An Introduction to the IoT Ecosystem-Casey Bleeker is the speaker
Thank you