Going Beyond the Device Heart Beat

Balwinder Kaur, Principal Software Engineer
Agenda

• Introduction
• The Basics
• An IoT World
  o Device Visibility
  o Application Visibility
• Best Practices for End to End Performance Monitoring
• Unique Challenges of IoT
• Q&A
• Summary

Disclaimer: "Opinions expressed are solely my own and do not express the views or opinions of my employer."
Introduction
Connected Things Disrupt Business Models

Oslo Smart Lighting
“IoT devices directly, or indirectly, impact the bottom line of a business.”
The Nest Learning Thermostat is dead to me, literally. Last week, my once-beloved “smart” thermostat suffered from a mysterious software bug that drained its battery and sent our home into a chilli in the middle of the night.

Although I had set the thermostat to 70 degrees overnight, my wife and I were woken by a crying baby at 4 a.m. The thermometer in his room read 64 degrees, and the Nest was off.

This didn’t happen to just me. The
How do I prevent an NYT moment?
The Basics
The Device
What is an IoT Device?

Traditional Embedded Device

+ Connectivity

+ Cloud Services
Are all IoT “Things” equal?

• No
• A very fragmented space
• Classify to manage

Gateway

Endpoints w/ Routing

Endpoints w/o Routing

Digital

Sensor Rich | Touches the Physical World
The Cloud
IT Teams Monitor Cloud Services

Infrastructure Monitoring
- Server Monitoring
- Network Monitoring

Log Files

Application Performance Monitoring (APM) Systems
- Web applications & containers
- Database Performance
- Byte Code Injection is popular

Crash Reports
Application Performance Monitoring System

“One of the most important steps in any application performance monitoring initiative is combining data from disparate monitoring "silos" into a correlation engine and dashboard. The dashboard makes data logs easier to read and saves IT staff from memory-dependent and error-prone manual correlation and analysis.”

• Source: http://searchenterprisedesktop.techtarget.com/definition/Application-monitoring-app-monitoring
An IoT World
Changing Business Models

- Performance monitoring must be extended to cover the IoT Devices
Device Visibility
IoT Device Visibility

Device Management Systems

Device Management

Not operational data

Device Health

On device; closely related

Application Health (on device)

Application Health (transactions)

Main Focus Area
# Device Health

## System Performance
- ✓ CPU Usage
- ✓ Memory Usage
- ✓ Power Level
- ✓ Uptime
- ✓ Disk I/O
- ✓ Network Health
- ✓ Location Information

## Device Configuration
- ✓ OS
- ✓ Model
- ✓ Manufacturer
- ✓ Hardware, Firmware, S/W Version

### Fast Moving Data

### Slow Moving Data
Application Visibility
Application Transaction Health

Measurement Metrics

1) Calls per minute
2) Errors per minute
3) Latency (in milliseconds)
4) Crash Reporting
Two Classes of Problems

Device Management System

✓ Transaction Health is good
✓ Device Health is deteriorating

Application Performance Management Systems

✓ Device Health is good.
✓ Transaction Health is poor
  ✓ Network Problems
  ✓ S/W Version mismatch
  ✓ S/W- H/W version mismatch
Key Performance Indicator - MTTR

- Trapped Metrics
- Manual Correlation
- Manual Remediation
- Gap between Operations and Engineering

Major Reasons Contributing to a Poor MTTR (Mean-Time-to-Resolution)
Unified Dashboard

Device Management Systems

APM Systems

Device Health

Application Health

Infrastructure Health

IoT Device

Cloud Services
Top Five Features

Availability
Performance
Correlation
Remediation
Analytics
Device Side Instrumentation

Capture and report Device Metrics

Capture and report Device Events
Unified Monitoring System

- Aggregates Metrics and Events
- Correlates Events
- Alerts
- Remediates
Unique Challenges that IoT brings
(aka devil is in the details)
Choosing Instrumentation Agents for IoT Devices

<table>
<thead>
<tr>
<th></th>
<th>Web Agent</th>
<th>Embedded Agent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message Payload Format</td>
<td>JSON</td>
<td>ProtoBuf, CBOR, BSON</td>
</tr>
<tr>
<td>Application Layer</td>
<td>HTTP/HTTPS</td>
<td>MQTT/MQTT-SN, CoAP</td>
</tr>
<tr>
<td>Security</td>
<td>TLS</td>
<td>DTLS</td>
</tr>
<tr>
<td>Transport Layer</td>
<td>TCP/UDP</td>
<td>UDP</td>
</tr>
<tr>
<td>Network Layer</td>
<td>IPv4/IPv6</td>
<td>IPv6/ 6LowPAN</td>
</tr>
<tr>
<td>Link Layer</td>
<td>Ethernet, 802.11</td>
<td>802.15.4</td>
</tr>
</tbody>
</table>
Choosing Instrumentation Agents for IoT Devices (contd)

- Small static and runtime memory footprint
- Small disk usage.
- Meets or exceeds security requirements of the IoT Device
- Support for your favorite programming language.
OPEN DISCUSSION
Best Practices

✓ Monitor Device Health
✓ Understand what device data is important
✓ Understand what device applications are important
✓ Monitor End Devices and Gateways
✓ Monitor Application Transactions Health
✓ Monitor Cloud Services
✓ Embedded Agents should meet power, security and privacy requirements
✓ Unified View of the world reduces MTTR
A Heart Beat is Important.
But do not be on Life Support.
Stay IoT Healthy!

balwinder.kaur@appdynamics.com
Thank You