Providing Management Tools For The Emerging IoT Infrastructure

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CTO | Internet of Things | VMware
Subtopics

- Background
- Opportunity and Challenges with IoT
- History (Peer-to-peer vs. Three Tier)
- IoT Gateways
- IoT Infrastructure Management
- liota for Simulated Gateways in Testbeds?
- Project Ice Demo
Background

• VMware
  – Leading provider of virtualization and management software for data-centers

• Mine
  – Real-Time Scheduling Theory @ Carolina
  – Created and lead the Real-Time Java effort (JSR-01) @ IBM
  – Lead RTSJ product team @ Sun
    • Four year (concurrent) position at NASA JPL as DVS
  – IoT @ VMware
Internet of Things is Here

$255 BILLION spend globally by 2019

50 BILLION THINGS WILL BE CONNECTED TO THE INTERNET BY 2020

27% Avg Revenue Increase by 2018

—FORBES
The Opportunity With Internet of Things for Our Customers

Differentiation, Innovation, and Growth

Productivity: Connecting People, Data & Things

Automation: Improving Business Processes

Agility: Increasing Speed and Efficiency

Customer Experiences: Enabling Next-Generation Experiences
But IoT is Hard… at Enterprise Scale
Architecting an IoT Solution

An IoT Architecture Looks Simple but is Exponentially Complicated by Diversity, Scale and Bi-directionality

<table>
<thead>
<tr>
<th>Things</th>
<th>Edge</th>
<th>IoT Platform (On-Prem, Private or Public Cloud)</th>
<th>Business Apps</th>
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<td>• Things</td>
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Peer-to-Peer vs. Three-Tier

![Diagram showing the comparison between Peer-to-Peer and Three-Tier IoT Gateway Function]
Architecting an IoT Solution

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| IoT Gateway |
| Agent(s) |
| Edge Apps |
| Data Orchestration |

| IoT Platform |
| (On-Prem, Private or Public Cloud) |
| Data Orchestration |
| Data Platform |
| Device Management |
| Platform Apps |

| Business Apps |

```
Let's Start With Some Basics….

Device

Edge System, aka IoT Gateway

Device+ IoT Gateway

IoT Gateway + Sensors and/or Actuators
Mandatory Requirement

S/W Maintained at best-practices (always)

Intermediate node

IoT Gateway Function

2nd tier

Physical communication

Physical

Data link

2-1 interface

Application

7-6 interface

Presentation

6-5 interface

Session

5-4 interface

Transport

4-3 interface

Network

3-2 interface

2-1 interface

Protocol (7th layer)

Protocol (6th layer)

Protocol (5th layer)

Protocol (4th layer)
IoT Gateways as a De-coupling Point

Expected Lifetime

Security
Little IoT Agent (Liota)

An Python SDK/Framework for building data orchestration applications for IoT gateways

- Abstractions
- Supports SI Units
- Future support for IEEE 1451
- On the Python Package Index
- Come join the fun on GitHub [https://github.com/vmware/liota](https://github.com/vmware/liota)
- Easy to create simulated IoT gateways
liota Abstractions

Devices

Device Comms

Metrics

Edge Systems

Data-Center Components

DCC Comms
Infrastructure vs. Content

**Telemetry:** Derived from Greek roots- “tele” = remote, + “metron” = measure

**Infrastructure →**
Roads, traffic signals, rails, airports, etc.

**Content →**
Cars, trucks, trains, planes, etc.

INFRASTRUCTURE TELEMETRY

CONTENT TELEMETRY
IoT Infrastructure Management

**Assertion**: A complete IoT infrastructure management tool must support the following:

- **Telemetry**
- **Control**
- **Alerts**
- **Configuration update**
- **Application Lifecycle Management**
Sounds a lot like Data Center Infrastructure Management!

Project Ice
Early Tech Preview

*Function from*

- **vRealize Operations Manager**
  - Infrastructure telemetry, alerts, control, notifications

- **AirWatch**
  - Configuration updates, and Application Lifecycle Management

- **NSX**
  - Network Virtualization

- **LogInsight**
Peer-to-Peer vs. Three-Tier

S/W Maintained at best-practices (always)

NSX

Physical communication
Enterprise IoT Challenges Project Ice Can Address

- Diverse – things, gateways, apps, data
- Know and act when things fail
- Data Orchestration from things
- Security across IoT use case
- Deploy IoT use case and to scale
liota for Simulated IoT Gateways

• Liota packages for
  – Simulated devices
    • Simply a sampling function that returns values from a distribution representing some physical device
  – Metrics
  – Edge System(s)
  – DCC(s)

• Assemble with YAML and Templates
• Spin into a docker container
• Create host Linux VM(s) and start containers with Ansible
IoT Pavilion Demo
How Can We Help?- Discussion

- Visit the Dell EMC Booth at IoT SWC
- Engage in an IoT strategy session
- Become an Early Adopter Customer
Thank You