

# Managing & Accelerating Innovation with Open Source at the Edge

Bill Hunt, CTO - Dianomic

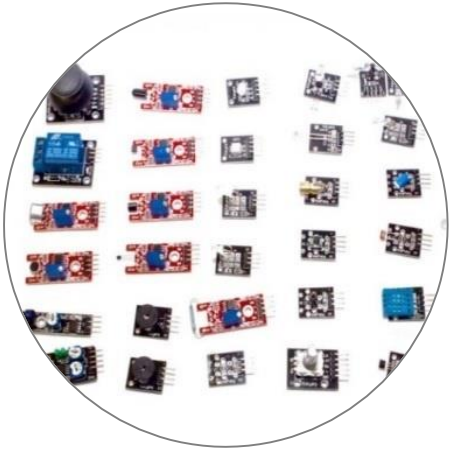




# Welcome!

- The IIoT Opportunity
- Resolve Complexity & Fragmentation with FogLAMP
- Use case: Defense Contractor Aircraft Manufacturing
- Scalable Provisioning and Management with Arm Mbed
- Conclusion

# IIoT: The Opportunity



Cheap, and tiny  
sensors



Decreasing compute  
and storage costs



New abilities to  
process and analyze  
data



Ubiquitous  
connectivity

Sensors on the Entire Supply Chain will Automate and  
Transform Business

# Open Source and Standards

- IIoT is Massively Complex and Fragmented
- Reducing Complexity/Fragmentation Requires
  - Open Standards
  - Open Source Platform
  - Open Community
- Dianomic
- FogLAMP
  - IEEE/OpenFog
  - Available on GitHub today. Licensed Apache 2

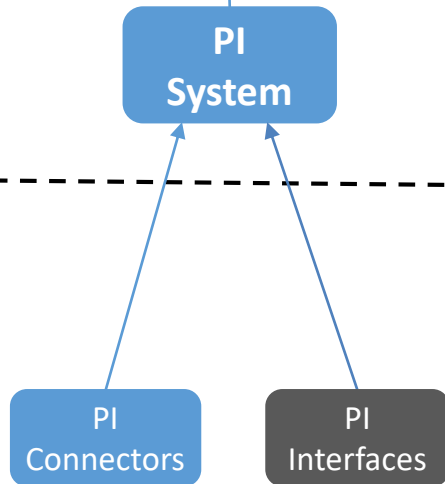
# IIoT is Massively Complex & Fragmented



The Enterprise

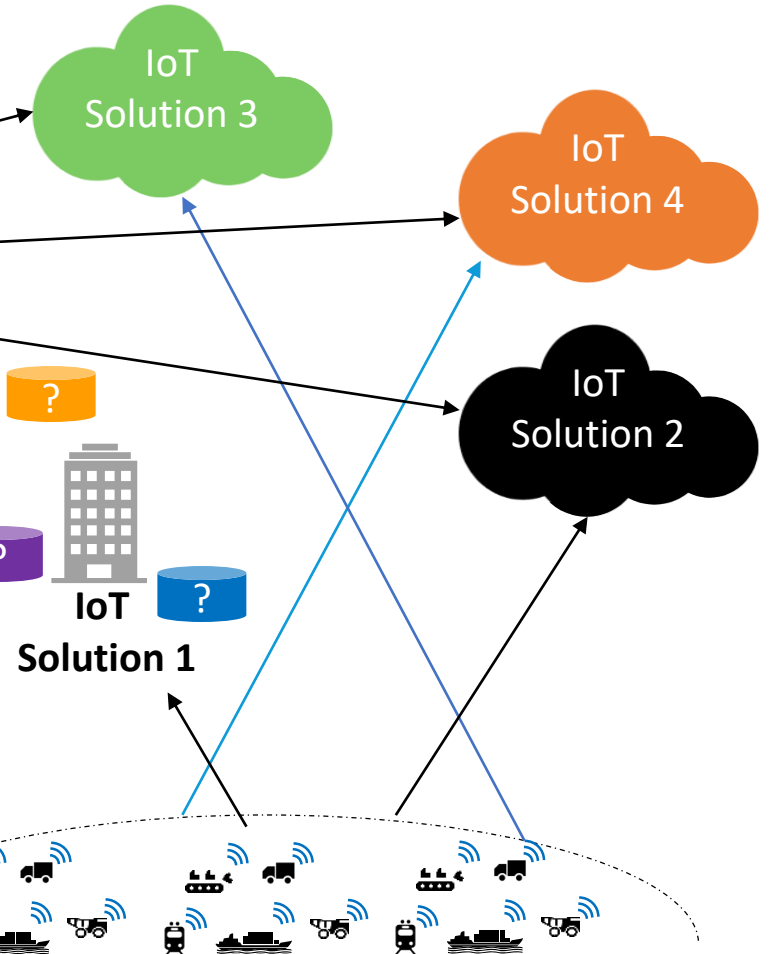
Plant Operators

Edge



?

Data Silos  
Data Ownership  
No Data Context



Current Devices through PLC or SCADA

New IIoT Smart Sensors and Devices



PIWorld SAN FRANCISCO 2018

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# Embrace & Extend w/ Open Source & Standards



The Enterprise



No Silos

Clear Ownership  
Data in Context

Plant Operators

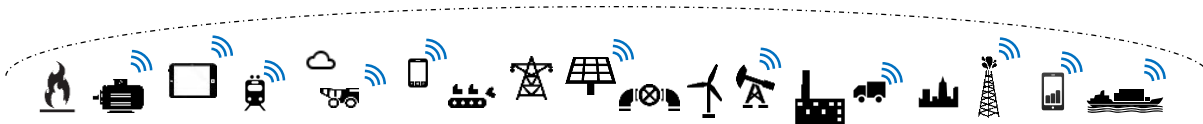
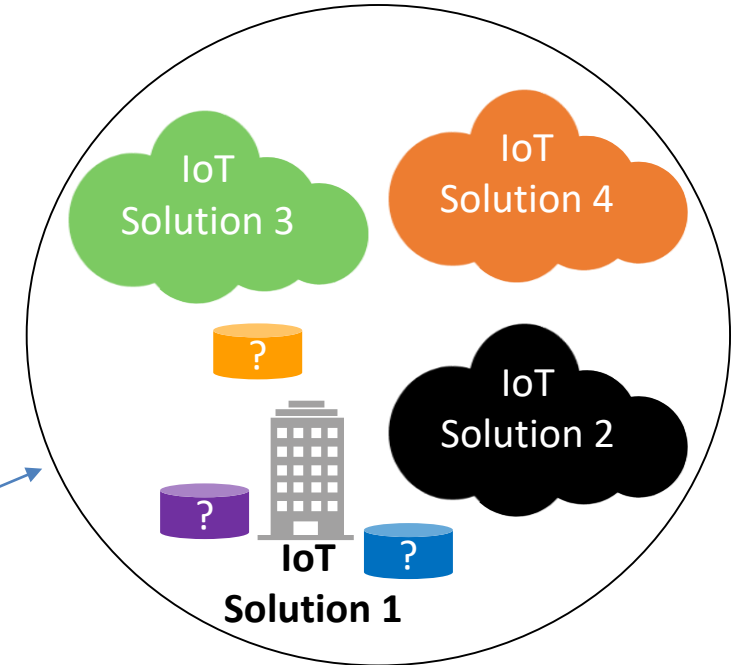
PI  
System

Edge

PI  
Connectors

PI  
Interfaces

**FOGLAMP**



Current Devices through PLC or SCADA



New IIoT Smart Sensors and Devices



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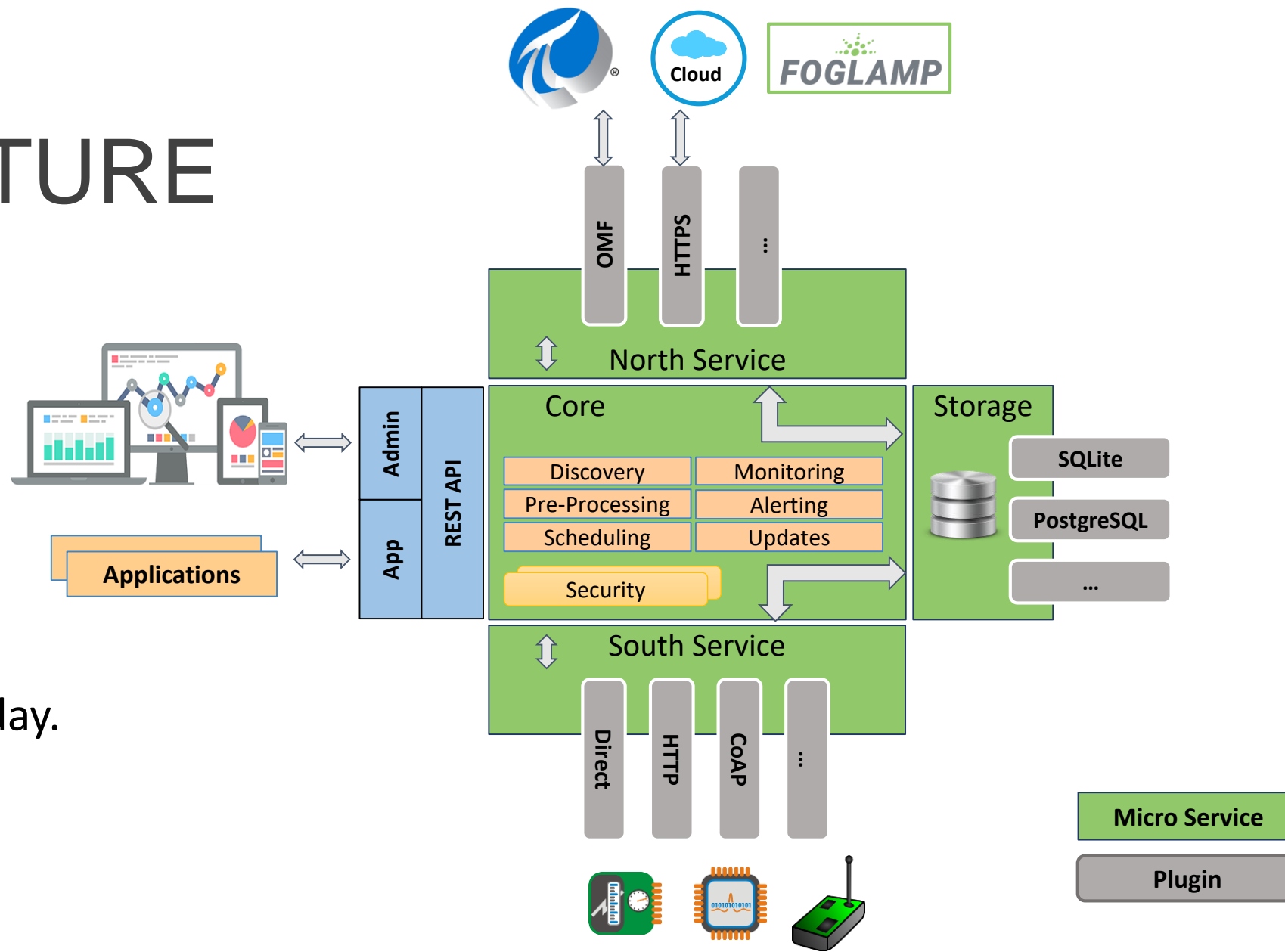


# FOGLAMP

- Data collection, aggregation, pre-processing, buffering & analysis
- Runs on various hardware and operating systems
- Low effort provisioning and maintenance
- Resilient and highly available
- Modular / Pluggable / External Applications
- Certified connectivity to OSIsoft PI and OCS
- Standards Based (IEEE/OpenFog)
- Open Source - Available on GitHub today

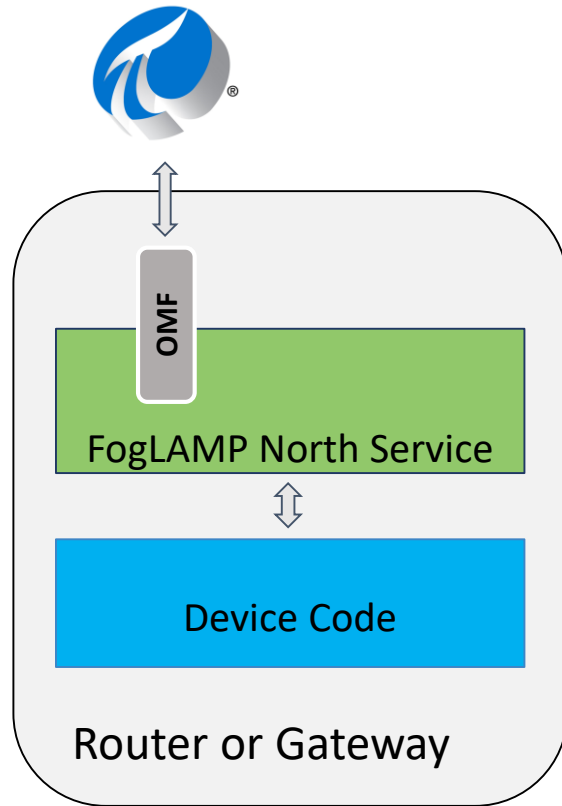


# FOGLAMP ARCHITECTURE

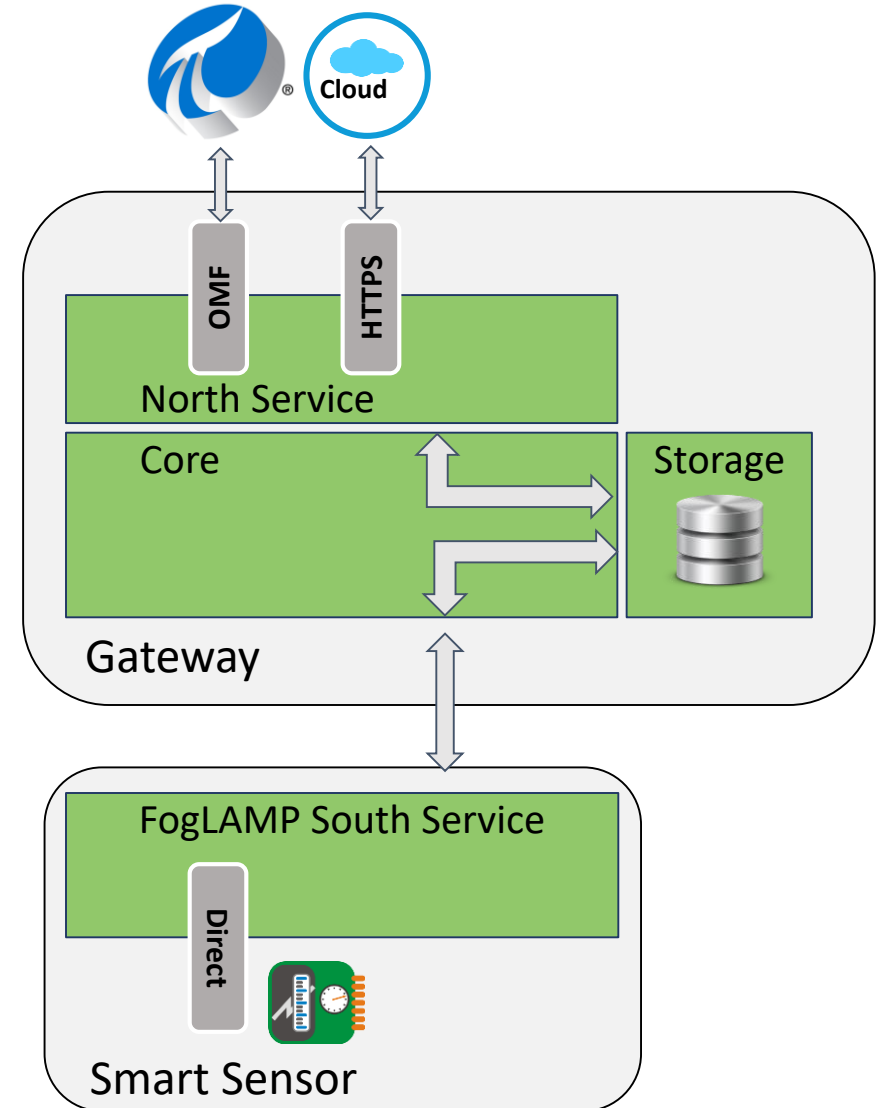


Available on GitHub today.  
Licensed Apache 2

# Scaling Down Micro-Services in Isolation

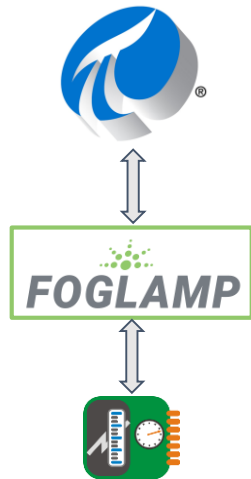


North Service can be integrated into  
Router or Gateway

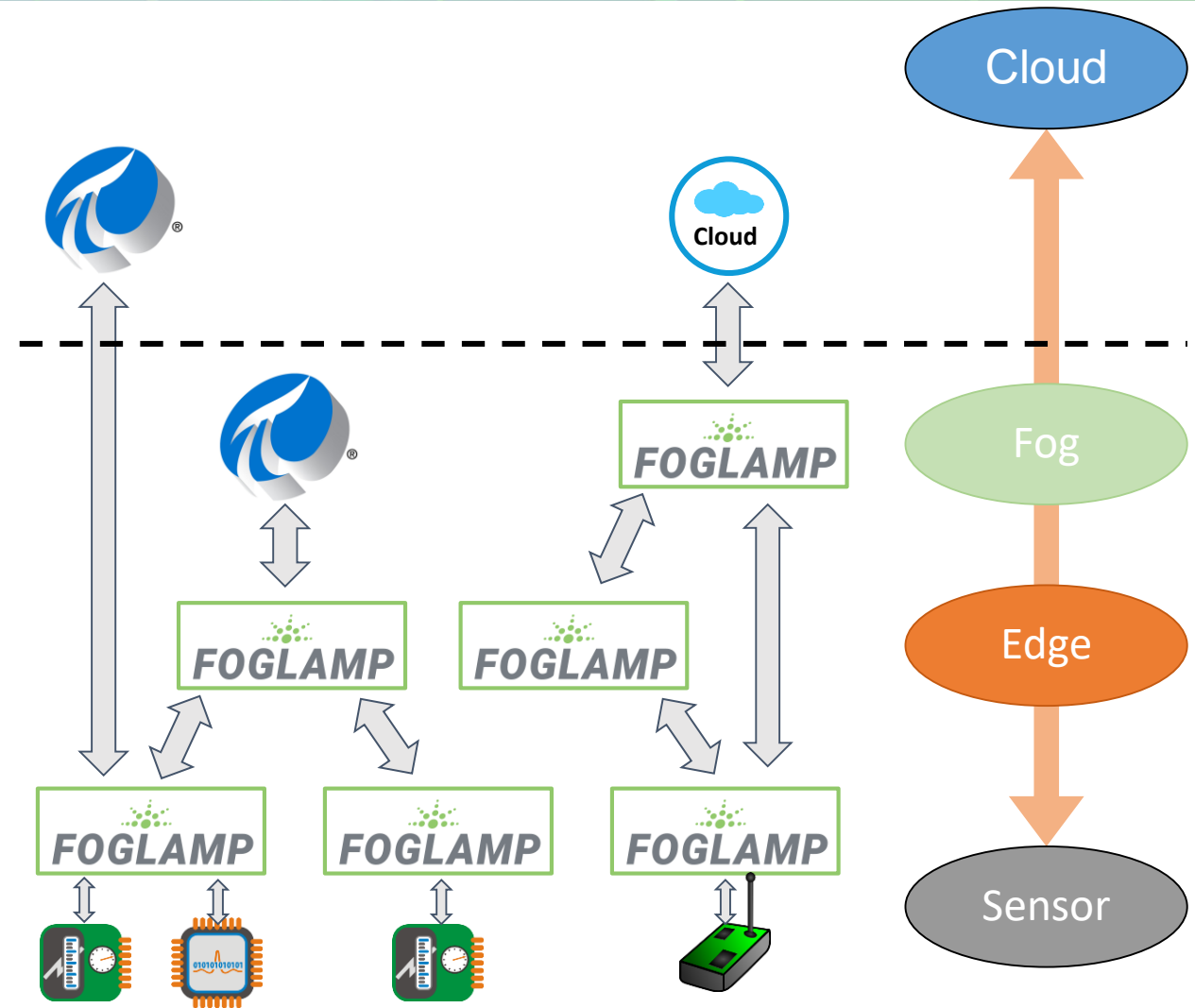


South Service can be built into  
Sensor with Pico Footprint (50k)

# Scaling Up



FogLAMP is a single device solution or...



Deploy as hierarchy or mesh,  
Pre-process & buffer data all layers

# **FOGLAMP** Community – Join Us!



**OSI**soft®

  
**DIANOMIC**

**Sprint**



**TOSHIBA**

**ARROW**  
ARROW ELECTRONICS, INC.

**arm**



Beyond The Edge  
Networks

**PANDUIT®**

# And You!

# Use Case

- Customer
  - Military Aircraft Manufacturer
  - Massive factory with many opportunities for optimization via new sensor deployments
- Goals
  - Gain efficiencies
  - Elevate production quality
  - Increase asset health and uptime
  - Manage safety compliance
- Key Requirements
  - Security
  - Manageability
  - Scalability





# Proof of Concept – Paint-booth Temperature



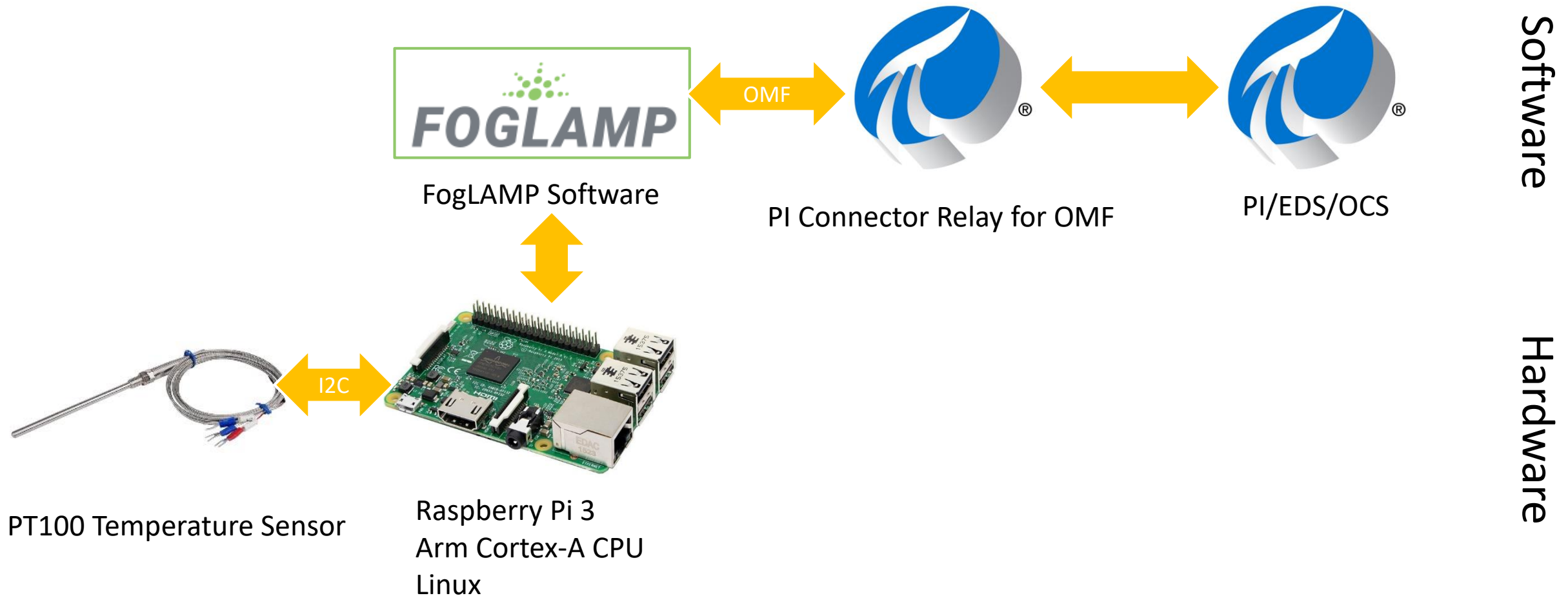
## Problem

- Temperature can't be monitored in real-time
- Can lead to expensive flaws in manufacturing, delaying delivery dates

## Solution

- Quick win with focused scope
- Install with limited/zero impact on security and operations

# Solution Architecture



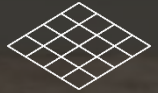
# A Thousand of Anything is Hard



**Complex to Provision**



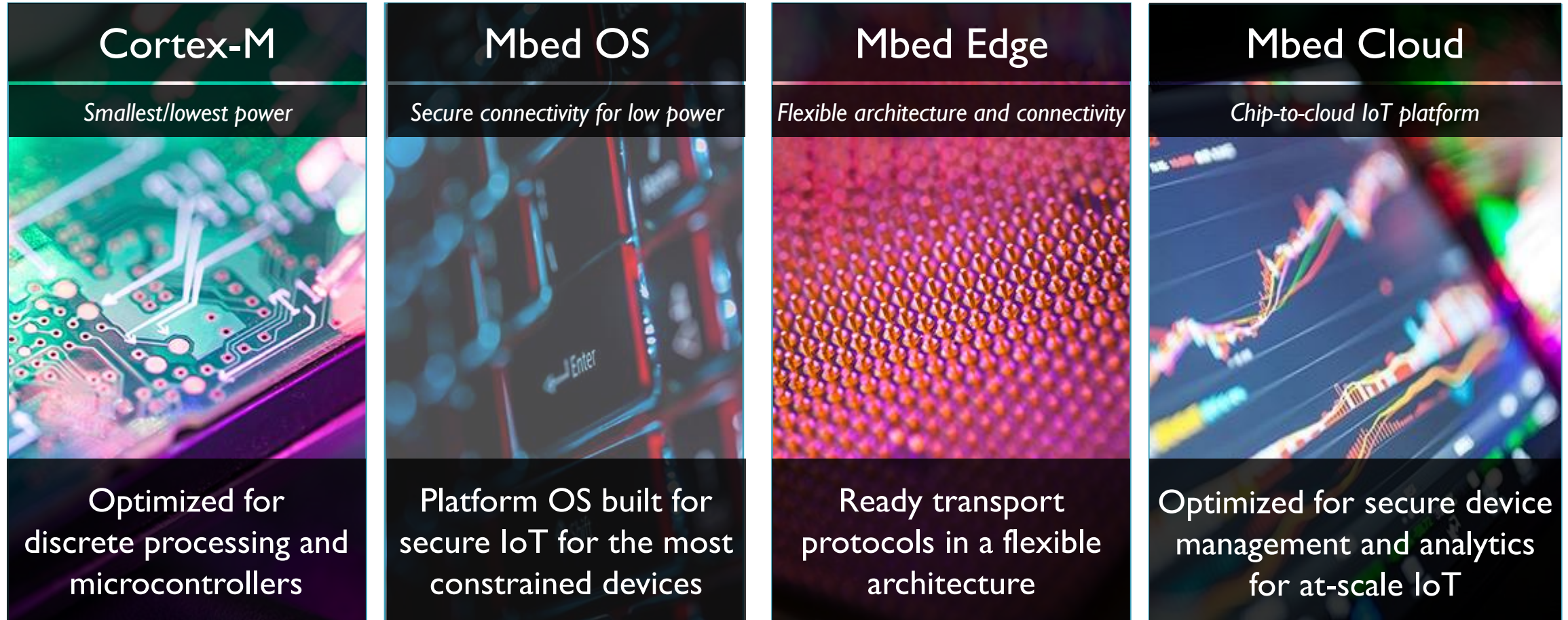
**Difficult to Update & Patch**



**Large Security Surface Area**



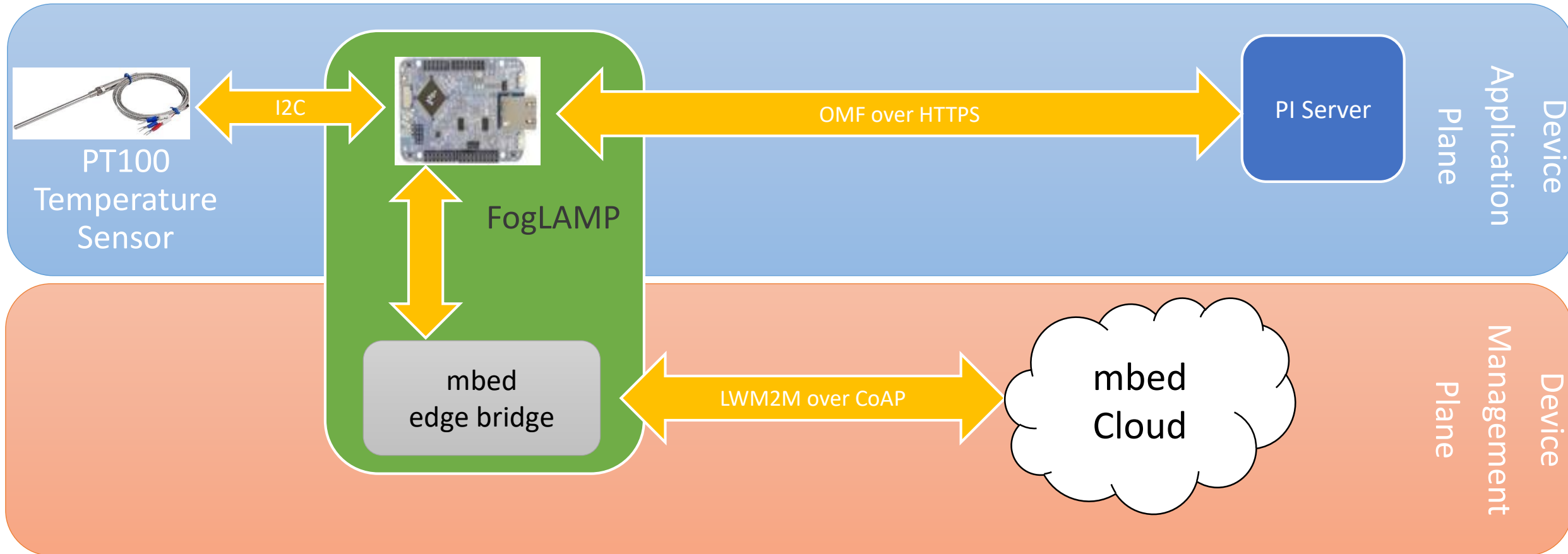
# Arm Mbed IoT Platform - Chip to Cloud IoT



Designed for IoT from the silicon,

To lifecycle management

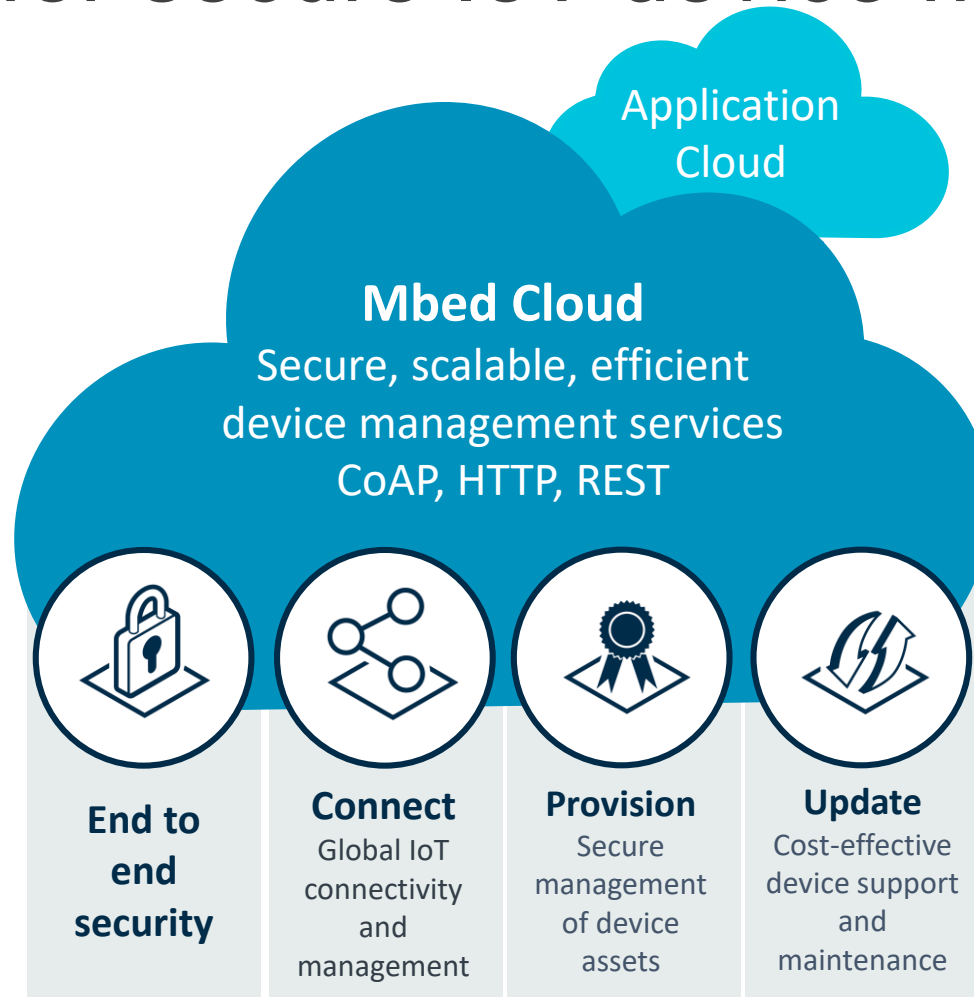
# Next Phase: Cloud Management and Security



- Application Data: temperature/humidity data is sent directly to the local PI Server
- Device Management: Temperature/humidity sensors and FogLAMP seen in mbed Cloud as managed devices
  - Arm-contributed north-bound plugin into FogLAMP utilizing mbed-edge creates device management plane.

# Arm Mbed

## Platform for secure IoT device management



# Mbed OS Platform Security

PSA-compliant security components to enable deployment of trusted devices

## Communication Security

Authentication,  
confidentiality and  
integrity



**Mbed TLS**

## Device Security

PSA-Compliant  
trusted boot, storage  
and opaque  
cryptography



**Mbed secure  
firmware**

## Lifecycle Security

Trusted firmware  
update,  
provisioning and  
device-based  
authorisation

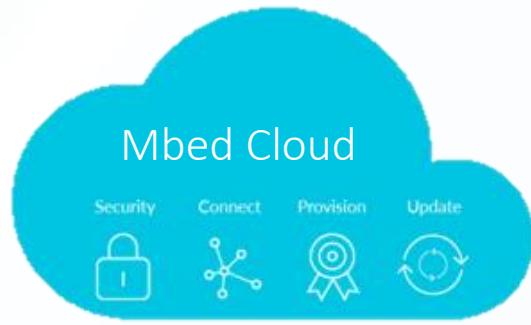


**Mbed Cloud**

# arm

## Device Management Plane

- Device Provisioning
- Lifecycle Management
- Security & Key Management



Device Management ↔  
Operational Data ↔



# OSIsoft®

## Operational Data Plane

- Real Time Visibility
- Elimination of Data Silos
- Clear Data Ownership



FOGLAMP



# IIoT is Here. And it's Big.

- Open Source and Standards are critical - FogLAMP
- Scalable Provisioning and Management – Arm Mbed
- Industrial Data Management - OSIsoft



*Possible only through partnership*

# Learn More about FogLAMP

- PI World Talks

Time	Talk
Thurs 10:30	Introduction to FogLAMP
Thurs 1:30	Lab: IoT and Fog Computing: Develop Data Ingress Applications from Edge to Cloud
Thurs 2:30	Fog Computing on the Plant Floor

- Visit the FogLAMP Community Booth

- [dianomic.com](http://dianomic.com)

- [github.com/foglamp](https://github.com/foglamp)

Merci

谢谢

Спасибо

Danke

Gracias

Thank You

감사합니다

ありがとう

Grazie

Obrigado