

Developing Interoperable Components for an Open IoT Foundation

Red Hat and Eurotech collaboration simplifies Internet of
Things integration and accelerates implementations

Marco Carrer – CTO, Eurotech

James Kirkland – Chief Architect for IoT, Red Hat

IoT



Open.



Integrated.



Managed.

A black and white photograph of a weathered wooden door. A metal handle is mounted on the door, and a chain is attached to it. A dark, rectangular sign hangs from the chain. The sign has the text "Come In" in a large, white, cursive font, "WE'RE" in a smaller, white, sans-serif font, and "OPEN" in a large, white, bold, sans-serif font. The door is made of horizontal wooden planks with visible grain and some wear.

Come In
WE'RE
OPEN

Open IoT

Open Source

Open Standards

Open Hardware

No Vendor Lock-in

Large Eco-system

Interoperability

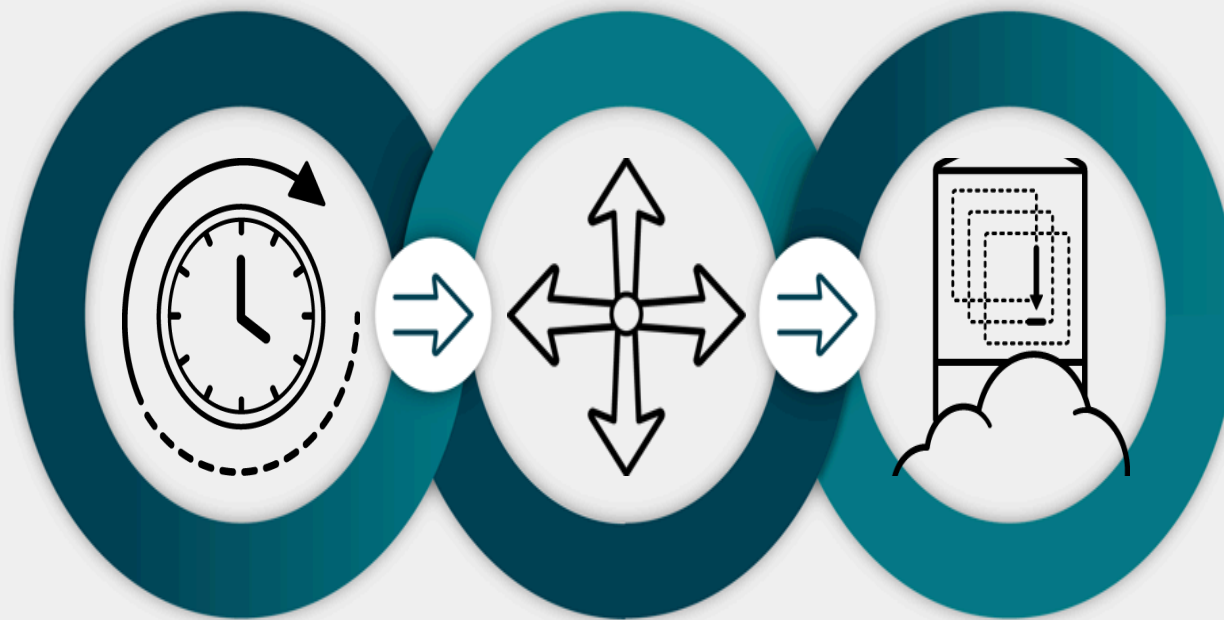
Simple & Quick Prototyping

Higher Quality

Customers as Partners

Why open source?

Accelerate your business



Bring products to market faster

Expand to new and adjacent markets

Build end-to-end solutions

Why Open Source for IoT?

- Pressure to add value in shrinking timeframes
 - Decomposition of vertically-integrated value add
- Velocity of technology change outstrips staffing
 - Impractical / costly to sustain in-house platforms
- Interoperability trumps exclusive differentiation
 - More devices/protocols “outside” vs. “inside”
- Quest for quality w/o lock-in
 - Main reason for OSS deployment no longer cost
 - OSS defects:LoC provably lower than proprietary
 - Legacy platform differentiation shrinking / vanishing

Why Red Hat for IoT?



Open source, open
standards for IoT
market

Tight integration
of IoT apps & data
with enterprise
platforms & services

Iterate
quickly
with low risk,
greater
flexibility,

OPEN – FLEXIBLE – ROBUST

Why Eurotech for IoT?

- One of the world top players in the global Embedded Computers market
- Behind the products & services of more than 20 Global 500 companies
- 20+ Years of experience in “M2M” and IoT systems
 - 20+ Years experience in OT / embedded / gateway hardware & software
 - 16 Years ago co-developed MQTT with IBM
 - 10+ Years experience with Java in embedded
 - 6+ Years history in M2M/IoT cloud platforms
- Strong vertical market competencies:
 - Industrial & Logistics
 - Transportation
 - Defense & Security
 - Healthcare & Medical





Founded in 2012 by



2.3M

lines of code



26

projects



250+

developers



1.3M

annual
visitors



Middleware for IoT Gateways



Modular IoT Integration Platform

Code base donated by EUROTECH

Started Dec 2013, first release Sept 2014

Started Oct 2016, first release May 2017



Commercially Supported Versions by EUROTECH:



Everyware Software Framework

MIDDLEWARE FOR IoT GATEWAYS

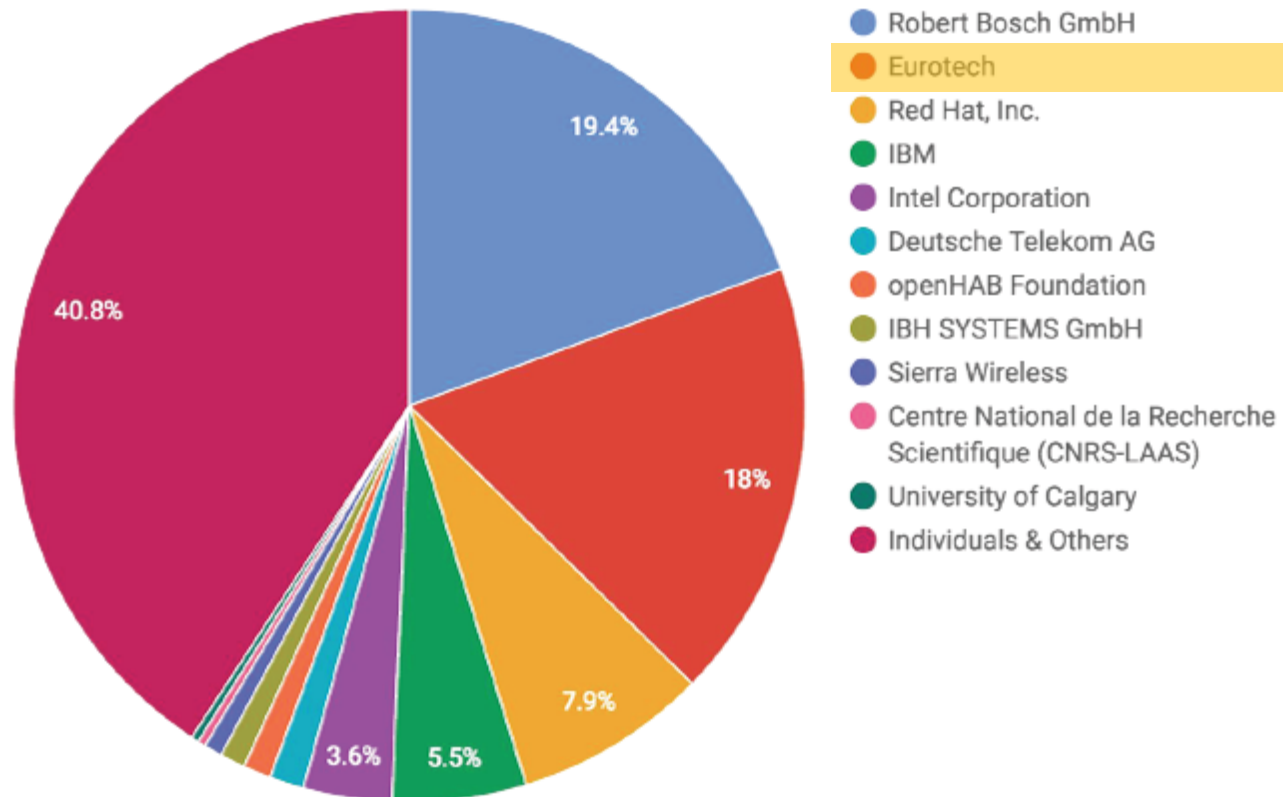


Everyware Cloud™

IoT INTEGRATION PLATFORM



Contributions by Company in 2016



Open Standards

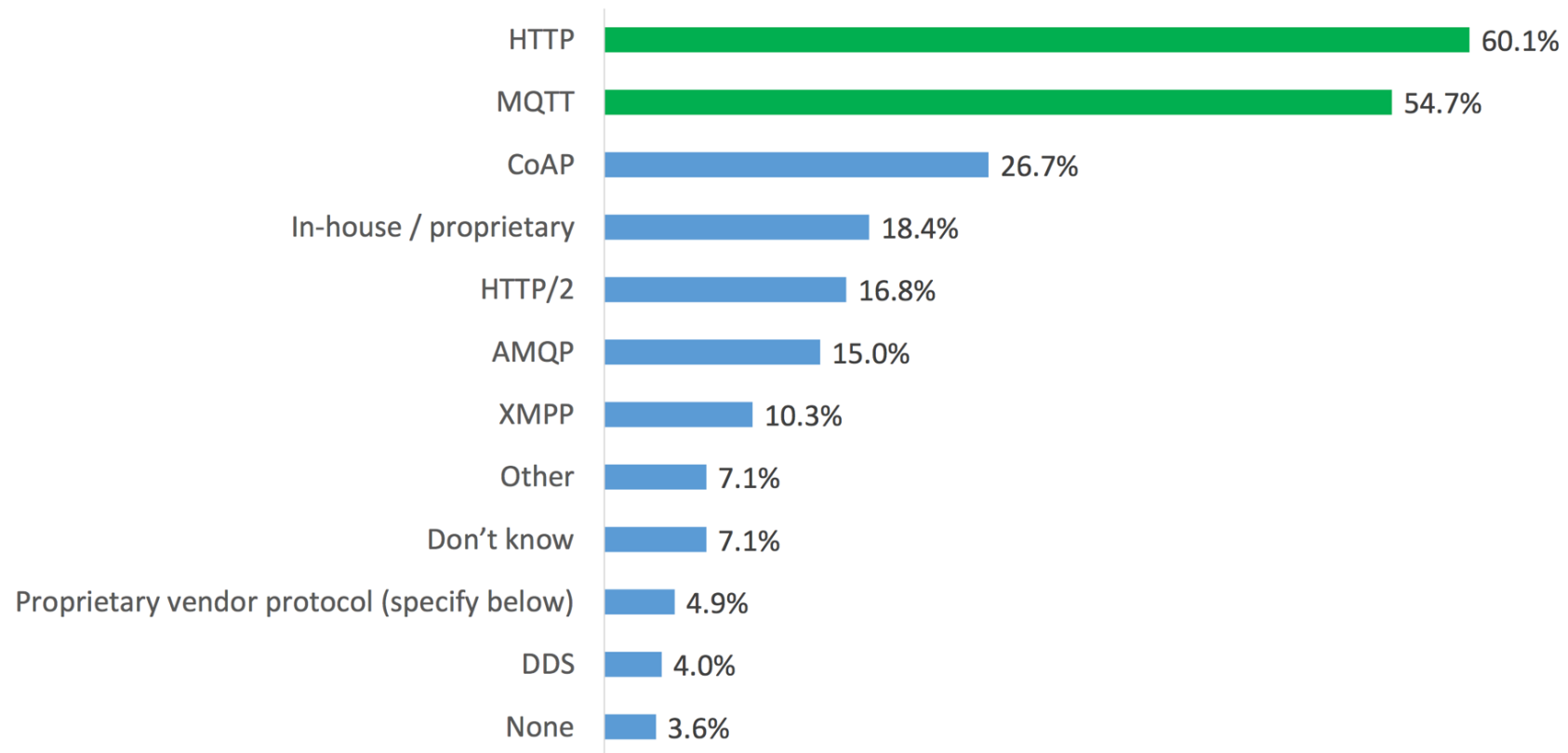
Message Queue Telemetry Transport (MQTT)

- M2M Messaging Protocol
- Low Bandwidth / Low Power
- 2-way Communication
- Publish and Subscribe
- Hierarchical Topic Namespaces
- Data Payload Agnostic
- Device Initiated Connection
- Firewall-friendly
- SSL and Authenticated
- Large ecosystem



MESSAGING STANDARDS

What messaging protocol(s) do you use for your IoT solution?



IoT Developer Survey 2017 - Copyright Eclipse Foundation



Integrated IoT



Integration @ Edge

Integration @ Data Center

End-to-end Modular IoT Solutions

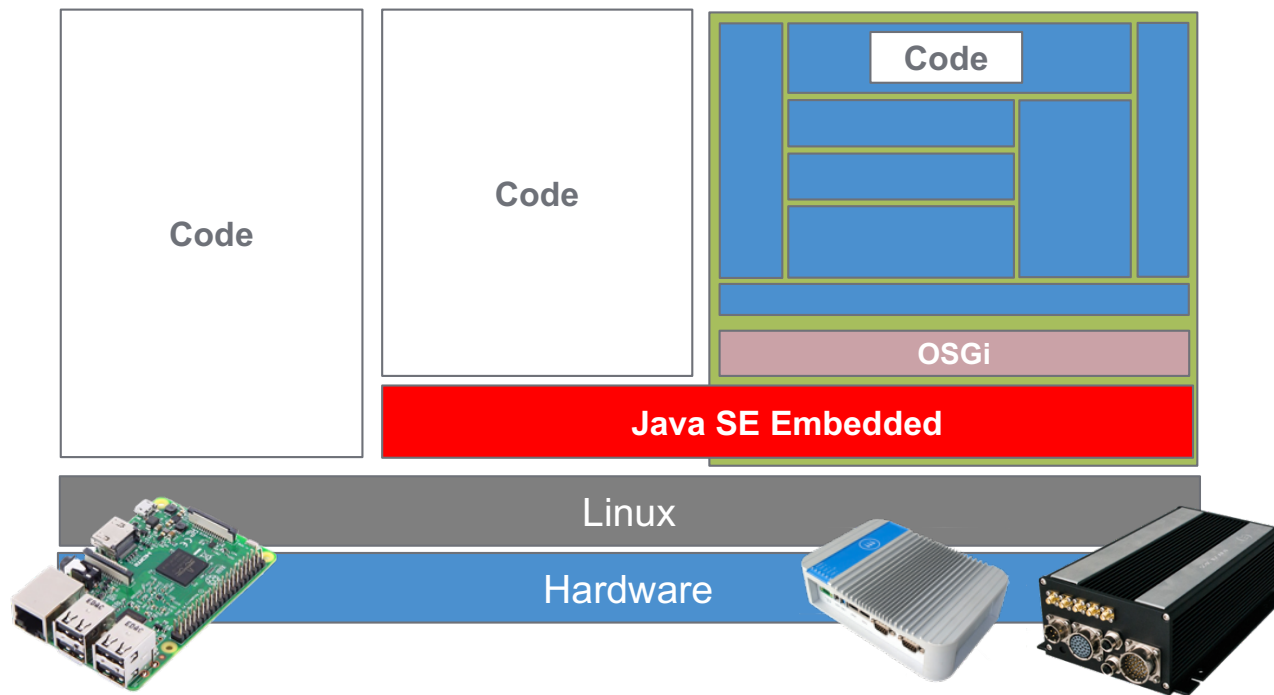
Faster Innovation

Faster Time-to-Market

Integration @ Edge

Eclipse Kura / Everyware Software Framework (ESF)

Developer's Productivity, Increasing Value, Minimizing TCO



Integration @ Edge

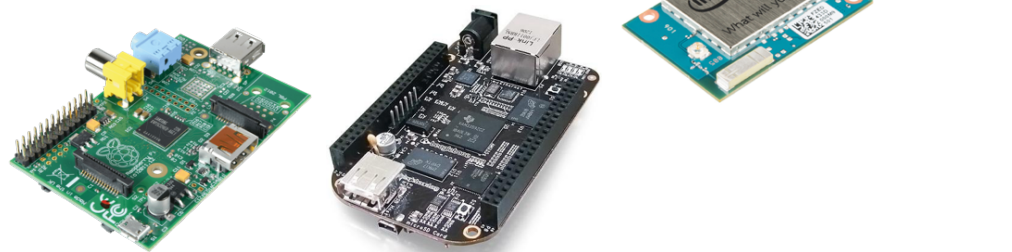
From Prototype to Production

Software portability
across HW Platforms

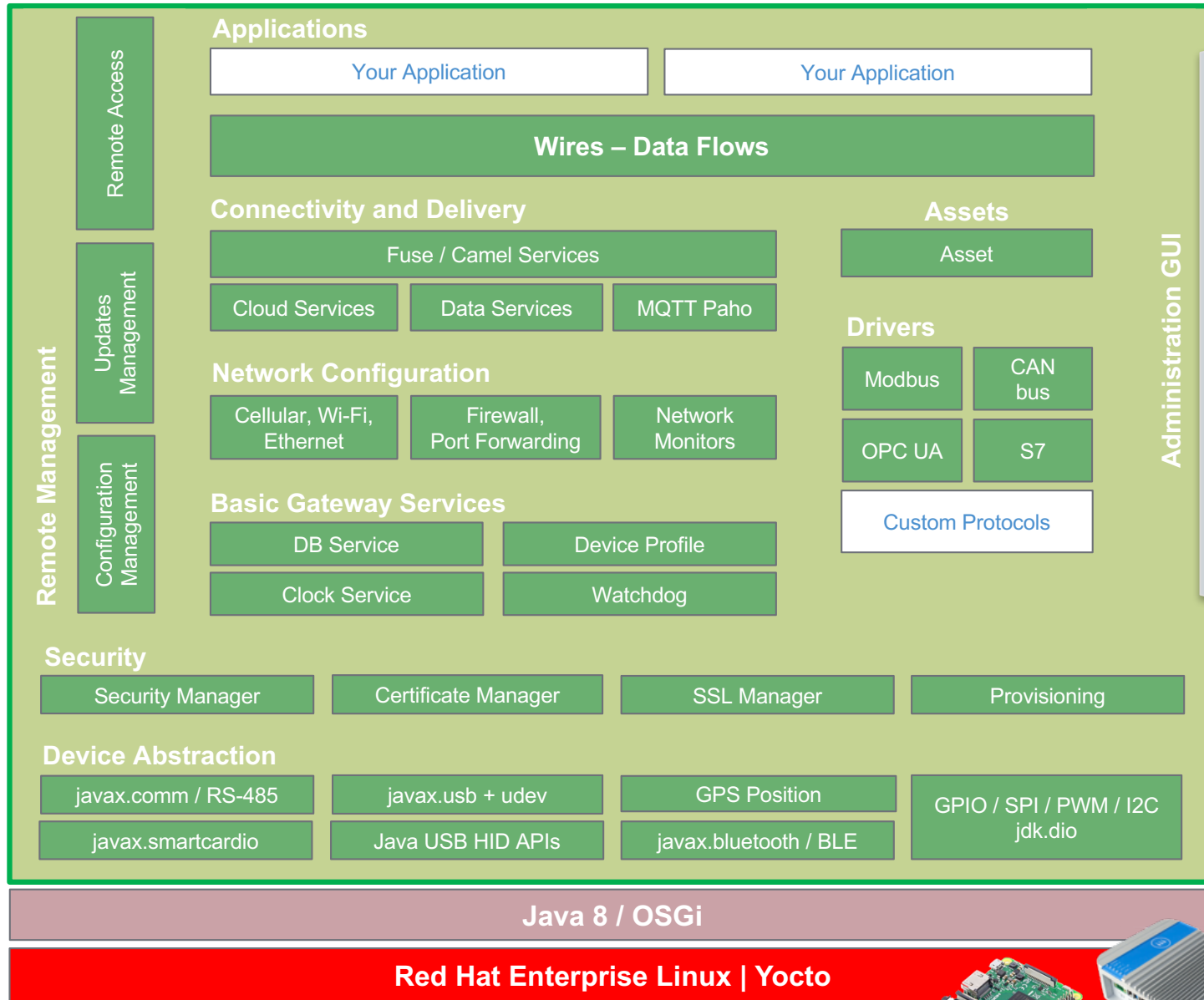
Industrial
IoT Gateways



Open Hardware



Integration @ Edge - Kura / ESF



Everyware

System

- Status
- Device
- Network
- Firewall
- Packages
- Settings

Services

- BluetoothService
- ClockService
- CloudService
- CommandService
- WebConsole
- DataService
- Heater
- MqttDataTransport
- PositionService
- ProvisioningService
- SslManagerService
- VpnClient
- WatchdogService
- RS485 Service



Integration @ Edge

Eclipse Kura 3 / Everyware Software Framework (ESF) 5

Connect to IoT Cloud Services

Multiple Connections
Message Routing
Digital Twins



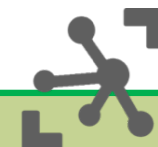
Everyware
Cloud



Eclipse
Kapua



AWS IoT



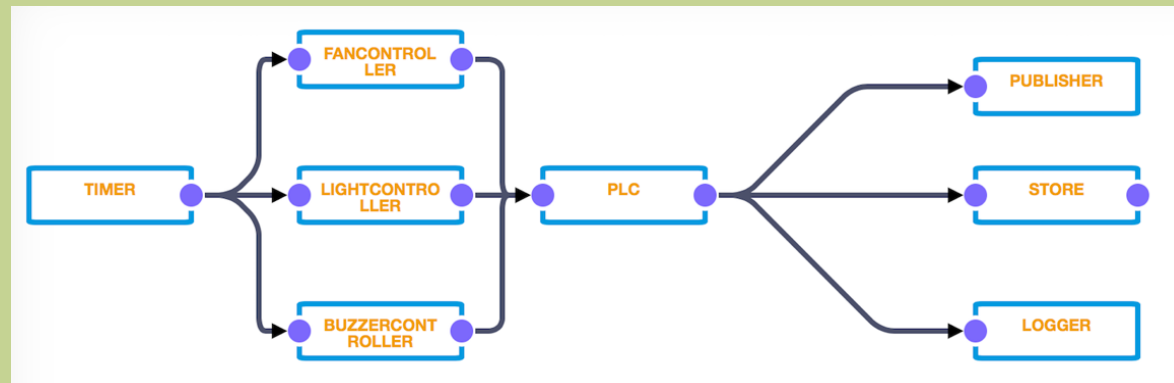
Azure IoT



Apache
Camel

Develop IoT Edge Computing Apps

Wires Data Flow
SQL Database
Full Java APIs



Connect to Field Devices

Industrial Protocols
Modular Drivers

RS 232/485
Bluetooth Low Energy
USB
CAN bus
GPS/GNSS
GPIO/I2C/PWM



Integration @ Edge

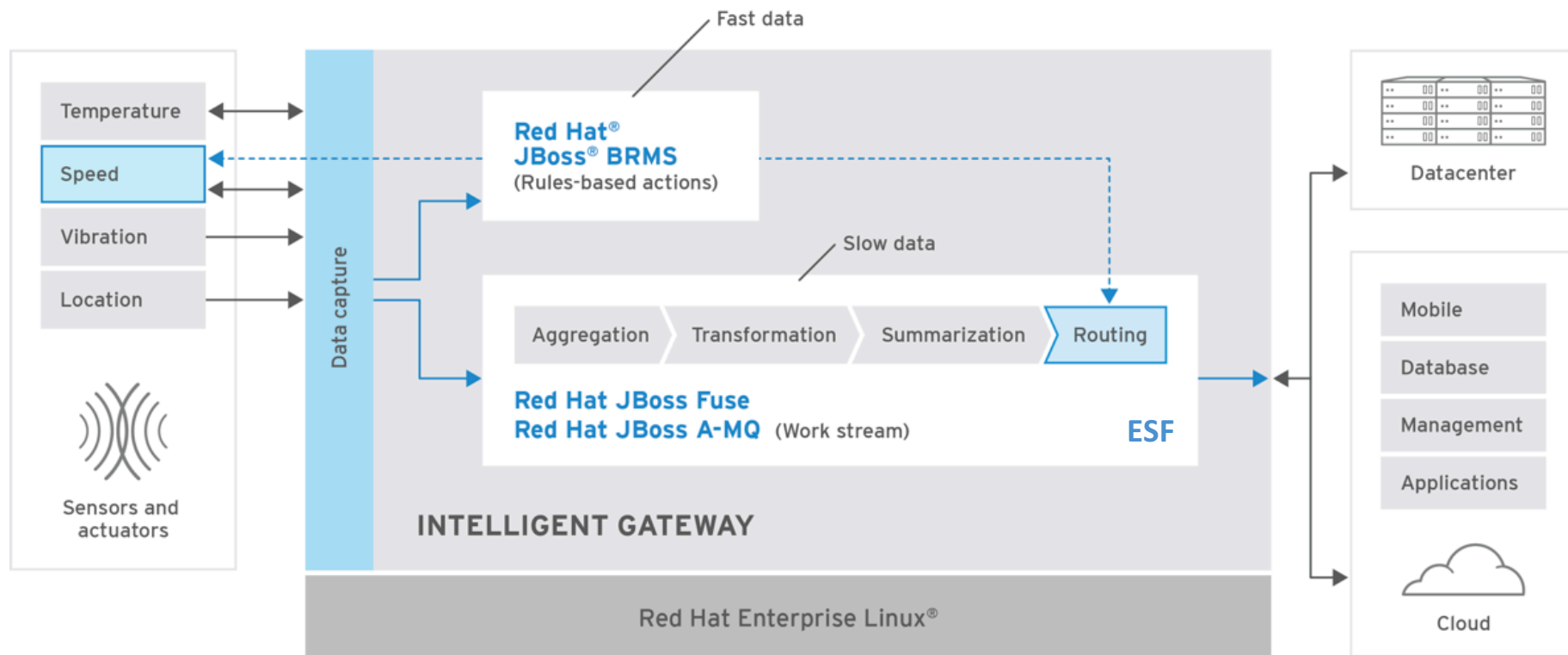
Wires

The screenshot displays the Kura Wires interface. On the left is a navigation sidebar with sections for System (Status, Device, Network, Firewall, Cloud Services, Packages, Settings, Wires) and Services (ClockService, CommandService, WebConsole, Modbus Driver, PositionService, WatchdogService, Camel XML router). The main area is titled 'Wire Graph' and contains a diagram with three components: 'TIMER', 'MODBUS', 'MODBUSPUBLISHER', and 'LOGGER'. Arrows indicate data flow from 'TIMER' to 'MODBUS', and from 'MODBUS' to both 'MODBUSPUBLISHER' and 'LOGGER'. Below the graph is the 'Asset - Modbus' section, which includes a 'Channels Table (Modbus Driver)' with the following data:

ID	name	type	value type	unit.id	primary.table	memory.address
1	temp	READ	INTEGER	1	HOLDING_REGISTERS	1000
2	hum	READ	INTEGER	1	HOLDING_REGISTERS	1001
3	pres	READ	INTEGER	1	HOLDING_REGISTERS	1002




Integration @ Edge

Transforming device data into actionable information



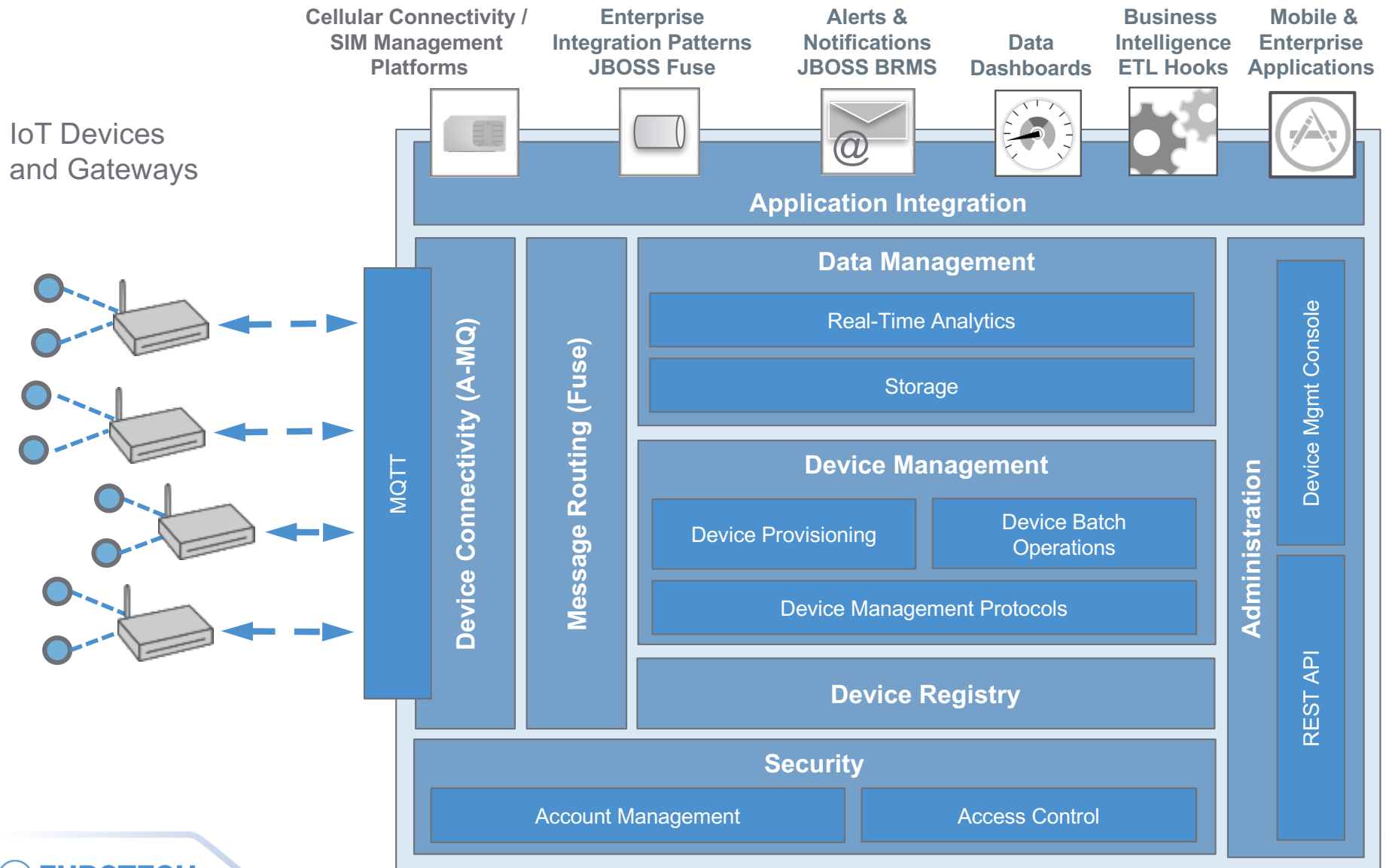
Integration @ Edge

Developer's Experience

<h3>Emulate on PC</h3> 	<h3>Deploy on Target</h3> 	<h3>Cloud Managed</h3> 
<p>Start developing your IoT /M2M application in the comfort of your PC.</p> <ul style="list-style-type: none">• Full Eclipse Integration• Target Platform Definition• Emulated Services• Run/Debug from Eclipse• Support Mac/Linux Hosts	<p>When you are ready, deploy your application on the gateway.</p> <ul style="list-style-type: none">• One-click Deployment• Eclipse Plugin• Remote Debugging	<p>Provision and manage your applications in field devices from the Cloud.</p> <ul style="list-style-type: none">• Remote OSGi Management via MQTT• Web-based Console

Integration @ Data Center

Eclipse Kapua / Everyware Cloud



Integration @ Data Center

Eclipse Kapua Core IoT Services

BATCH JOBS

Job Service

Job Report Service

DATA REGISTRY SERVICES

Data Registry Service

Data Storage Service

Rules Service

Data Usage Service

DEVICE MANAGEMENT SERVICES

Configuration Management Service

Deploy Management Service

Bundle Management Bundle Service

Certificate Management Service

Provisioning Service

Remote Command Service

Remote Access Service

Asset Management Service

DEVICE REGISTRY SERVICES

Device Registry Service

Device Lifecycle Service

Device Connection Service

FOUNDATION SERVICES

User Service

Account Service

Authentication Service

Authorization Service

Everyware Cloud

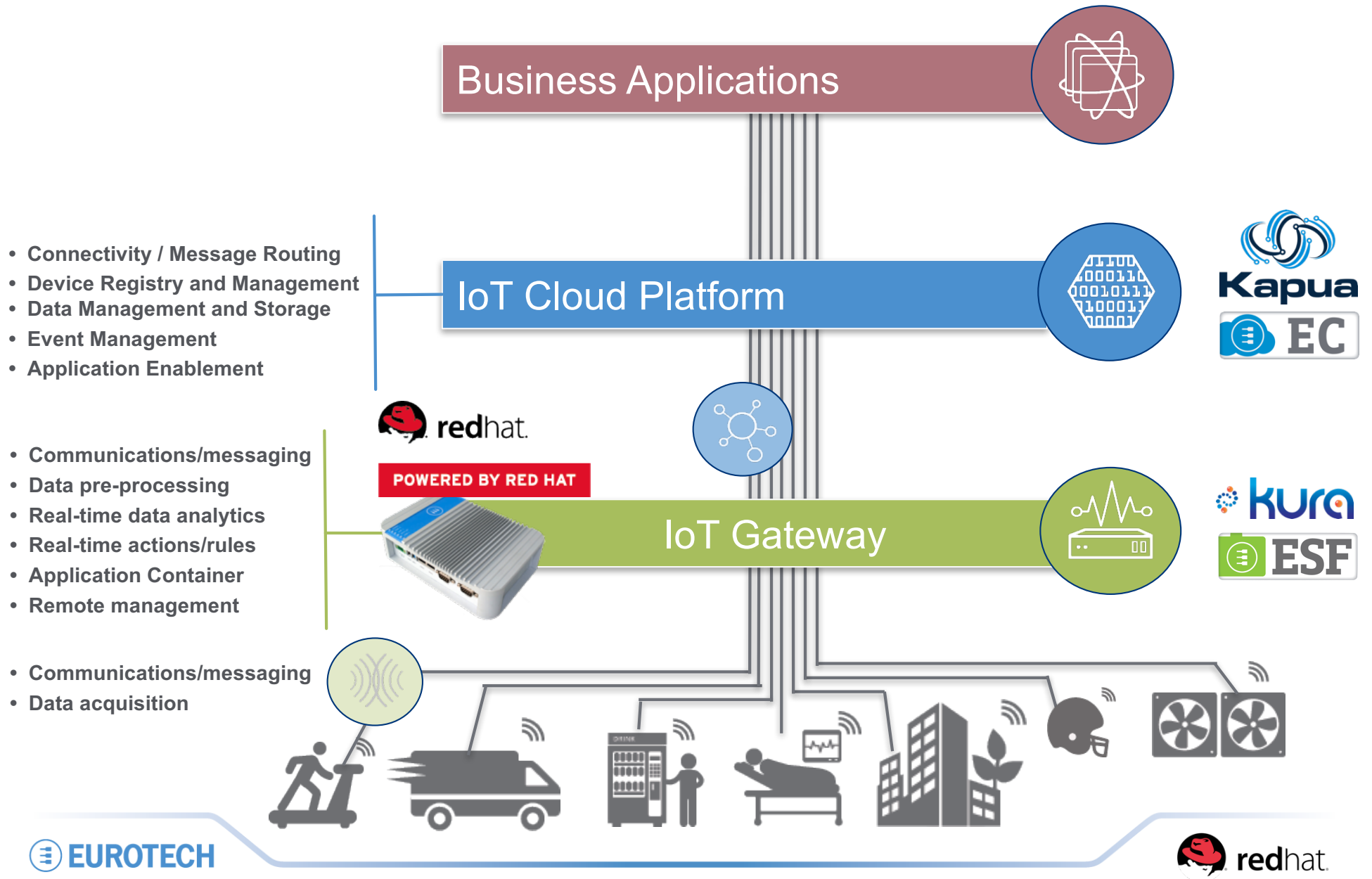
Administrator / Web Console

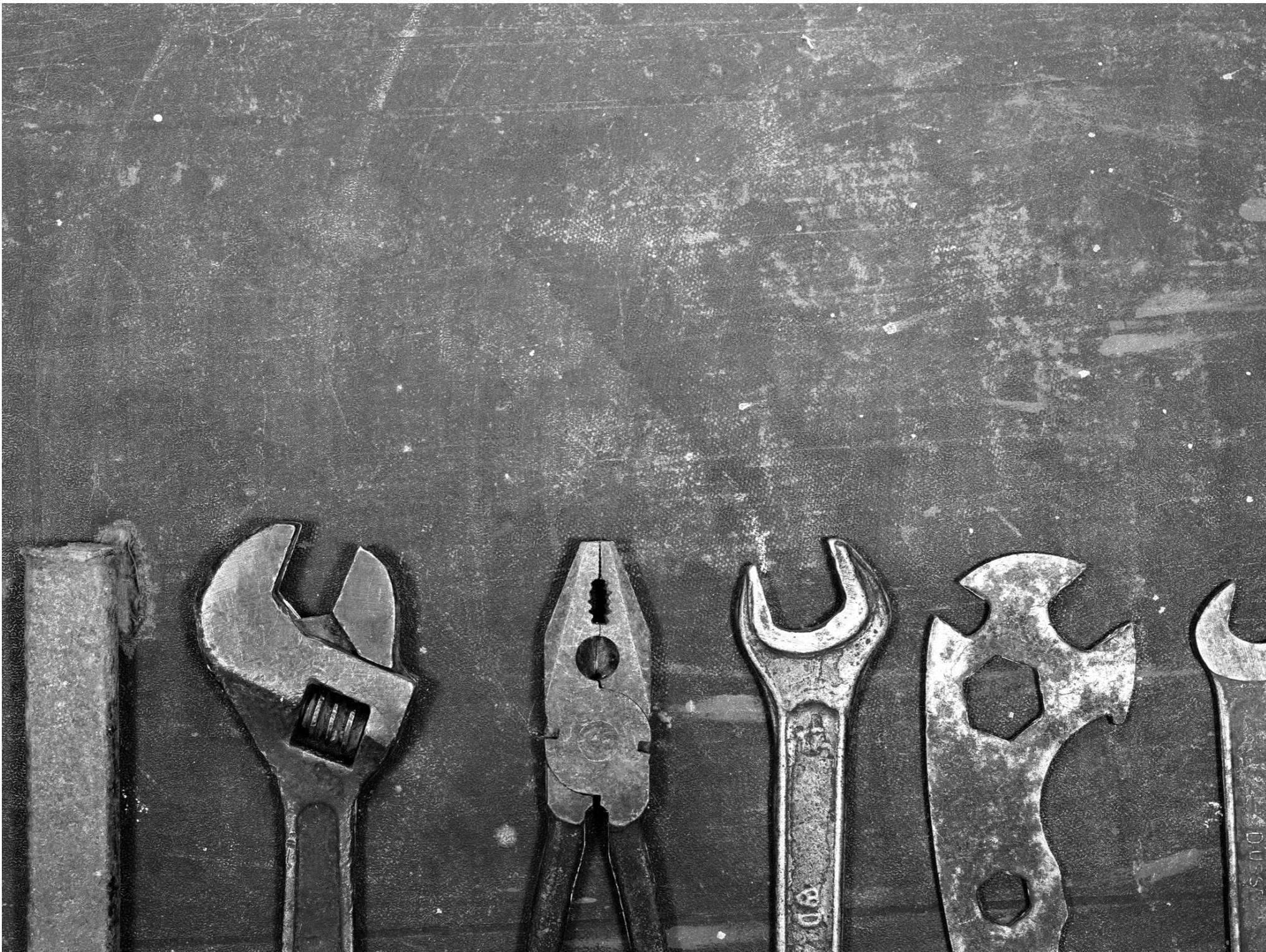
The screenshot displays the Everyware Cloud Administrator Web Console interface. The main dashboard includes a navigation sidebar on the left with categories like Dashboard, Devices, Device Jobs, Device Provisioning, Data, Rules, VPN, Usages, Users, Settings, and Health Check. The central area is divided into several sections:

- Alerts:** A table listing recent alerts with columns for Severity, Creation Date, Device, Category, Code, and Message. Alerts include connectivity issues (signal level below threshold) and performance warnings (CPU usage for esf exceeds threshold).
- Most Recent Data:** A table showing data points for 'heateridata' from various RaspPi Demo devices, including timestamps and device identifiers.
- Recent Data By Topic:** A line graph showing 'temperatureInternal' for 'heater/#' over time, with values fluctuating between approximately 19.25 and 20.5.
- Current Usage:** A horizontal bar chart showing 'Total Usage Consumption [%]' for different categories: Devices, Rules, Accounts, Provision Requests, Device Jobs, and Vpn Connections. The 'Devices' category shows the highest usage.
- Device connectivity Status:** A pie chart showing the distribution of device states: Connected Devices (green), Disconnected Devices (orange), and Missing Devices (red).

Additional panels include 'Settings' (General, Usage, Users) and 'Devices' (Table, Map) views. The interface is branded with 'Everyware Cloud' and 'EUROTECH' logos.

Open End-to-end Modular IoT Solution





Managed IoT

IT Management

OT Management

IT-OT Security



IT Management



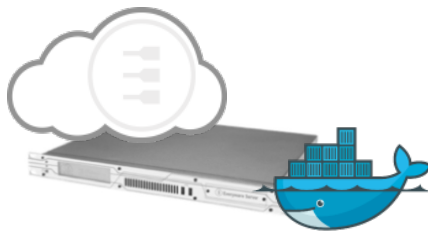
Everyware CloudTM
IoT INTEGRATION PLATFORM



Appliance

Private and On Premise

Public



On-premise
Appliance

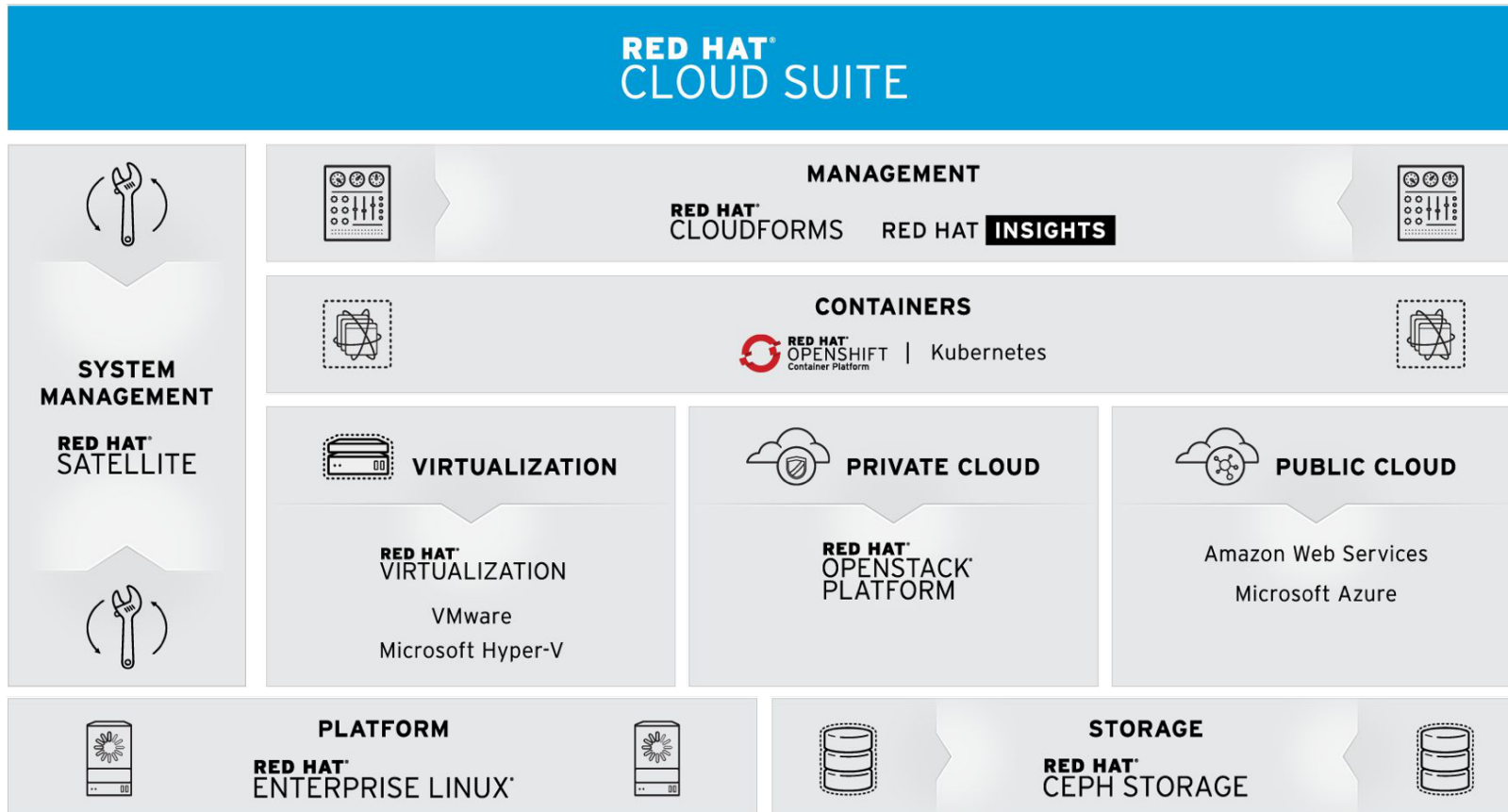
Software Appliance

SaaS Edition



IT Management

OpenShift as a platform for IoT microservices

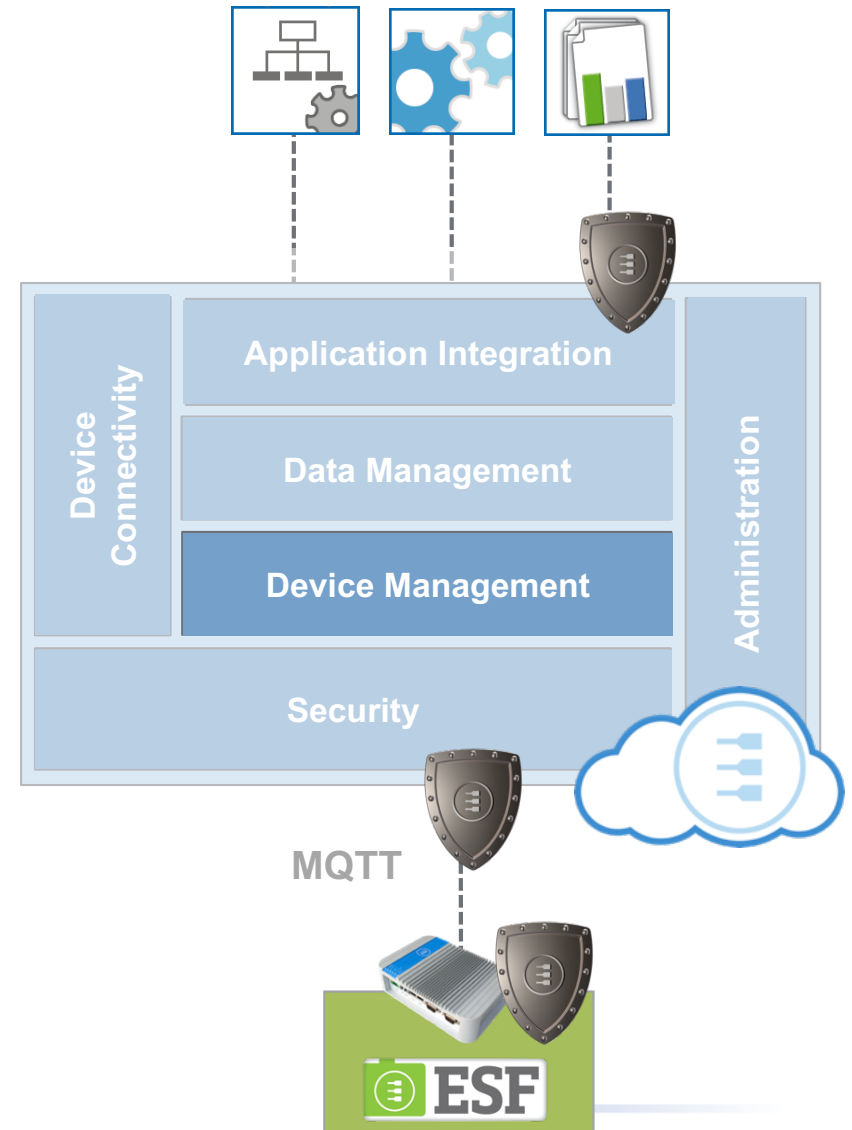


CL0074-01

OT Management

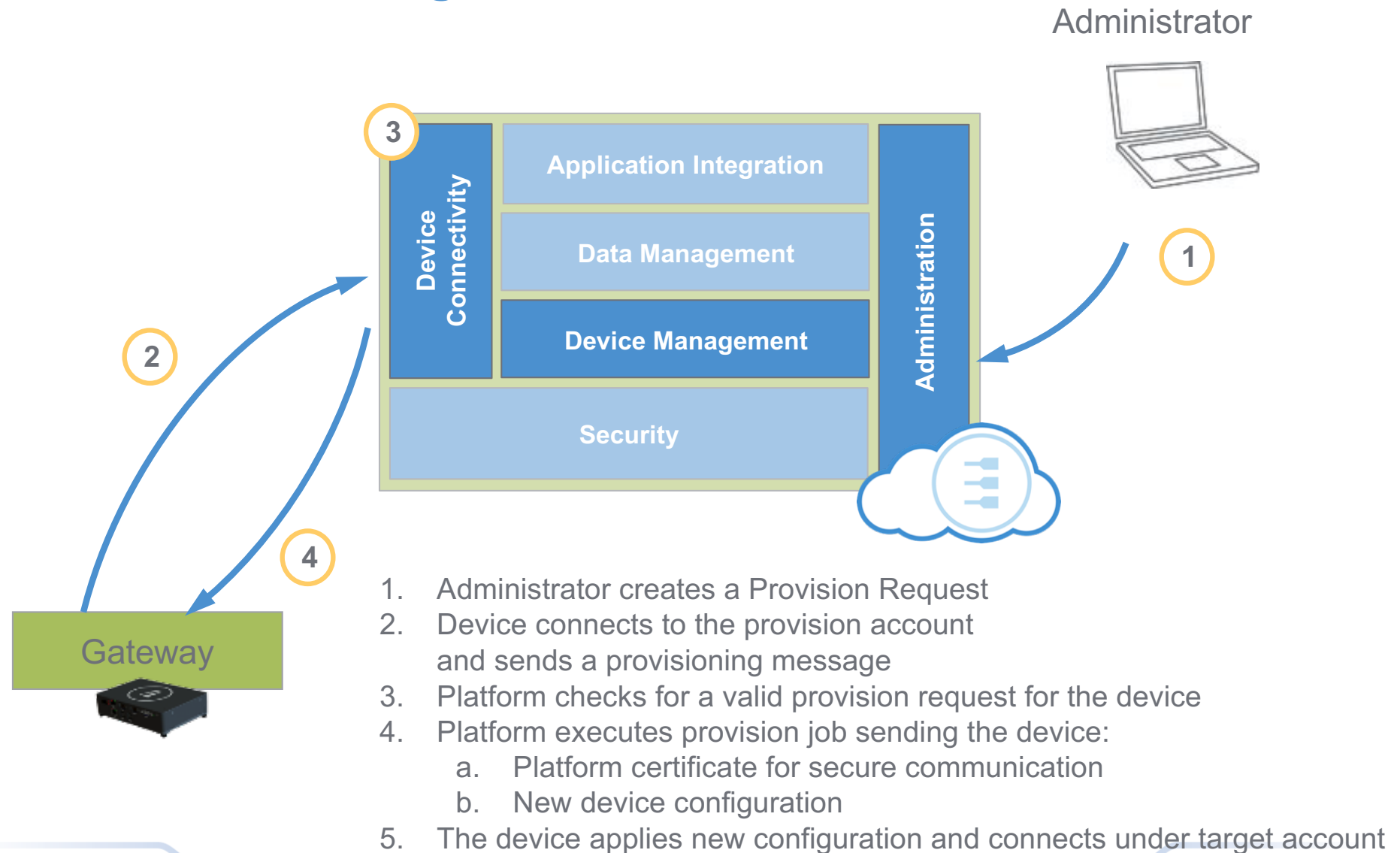
Device Management

- Device Provisioning
- Application Life-cycle Management
- Service Configuration Management
- Certificate Management
- Device Batch Operations
- Remote Access and Maintenance

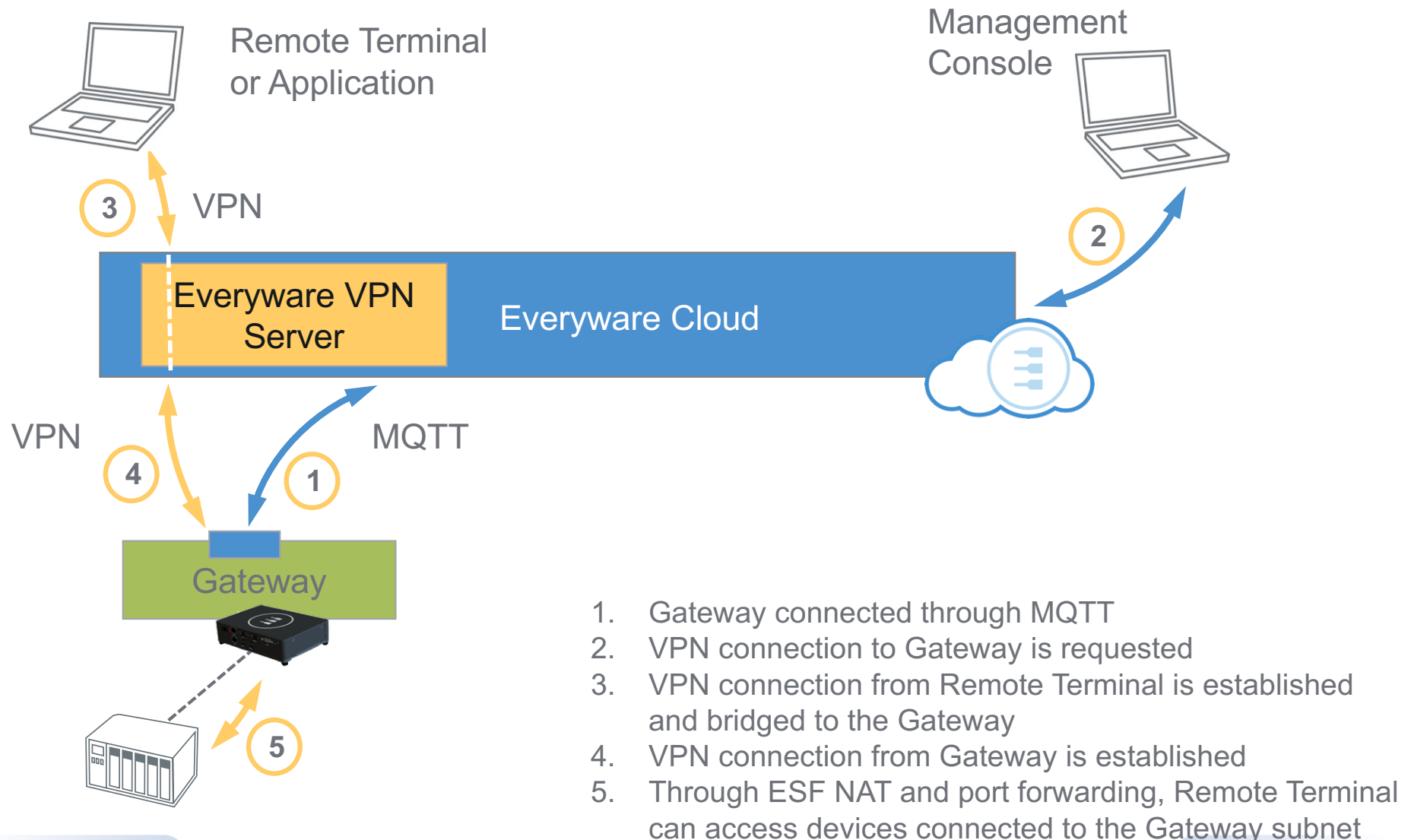


OT Management

Device Provisioning



OT Management Remote Access



IT-OT Security



Vulnerability Assessments and Penetration Tests



Cloud-level Security

- ✓ Integrated Certificate Management
- ✓ Validated Server Identity
- ✓ Tenant Isolation
- ✓ Role-based Access Control
- ✓ 2-factor Authentication



Device-level Security

- ✓ Unique Device Identity and Credentials
- ✓ Signed ESF/Application Code
- ✓ Encrypted Configuration and Storage

Secure Communication

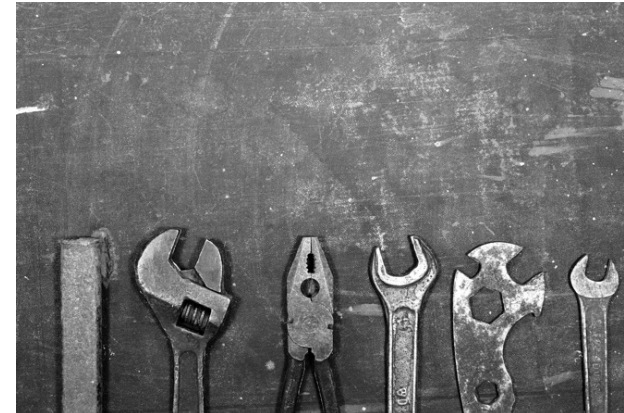
- ✓ SSL/TLS Encryption w/ Hostname Verification*
- ✓ Mutual Authentication
- ✓ Digitally Signed Messages



Open Source
Open Standards
Open Hardware



Integration @ Edge
Integration @ Data Center
End-to-end IoT Solutions



IT Management
OT Management
IT-OT Security

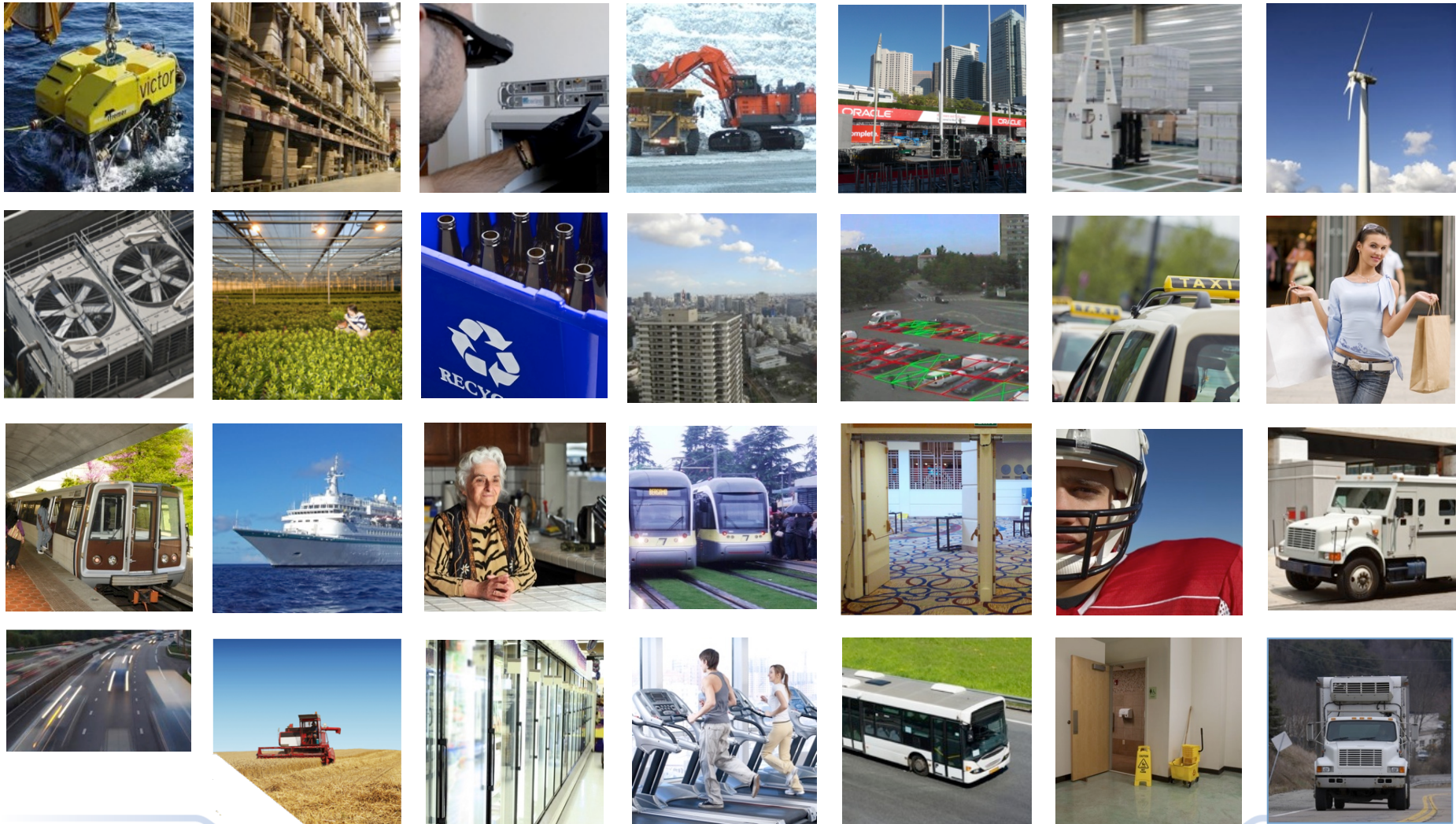
Open. Integrated. Managed. IoT.

as simple as

Ev^③ryware IoT™

Everyware IoT Use Cases

Many Customers & Applications



Connected Product

 ARISTON
THERMO GROUP

 elco heating solutions

BOILER WITH SENSYS



GATEWAY



IOT APPLICATION IOT PLATFORM



CONSUMER



SERVICE CENTER

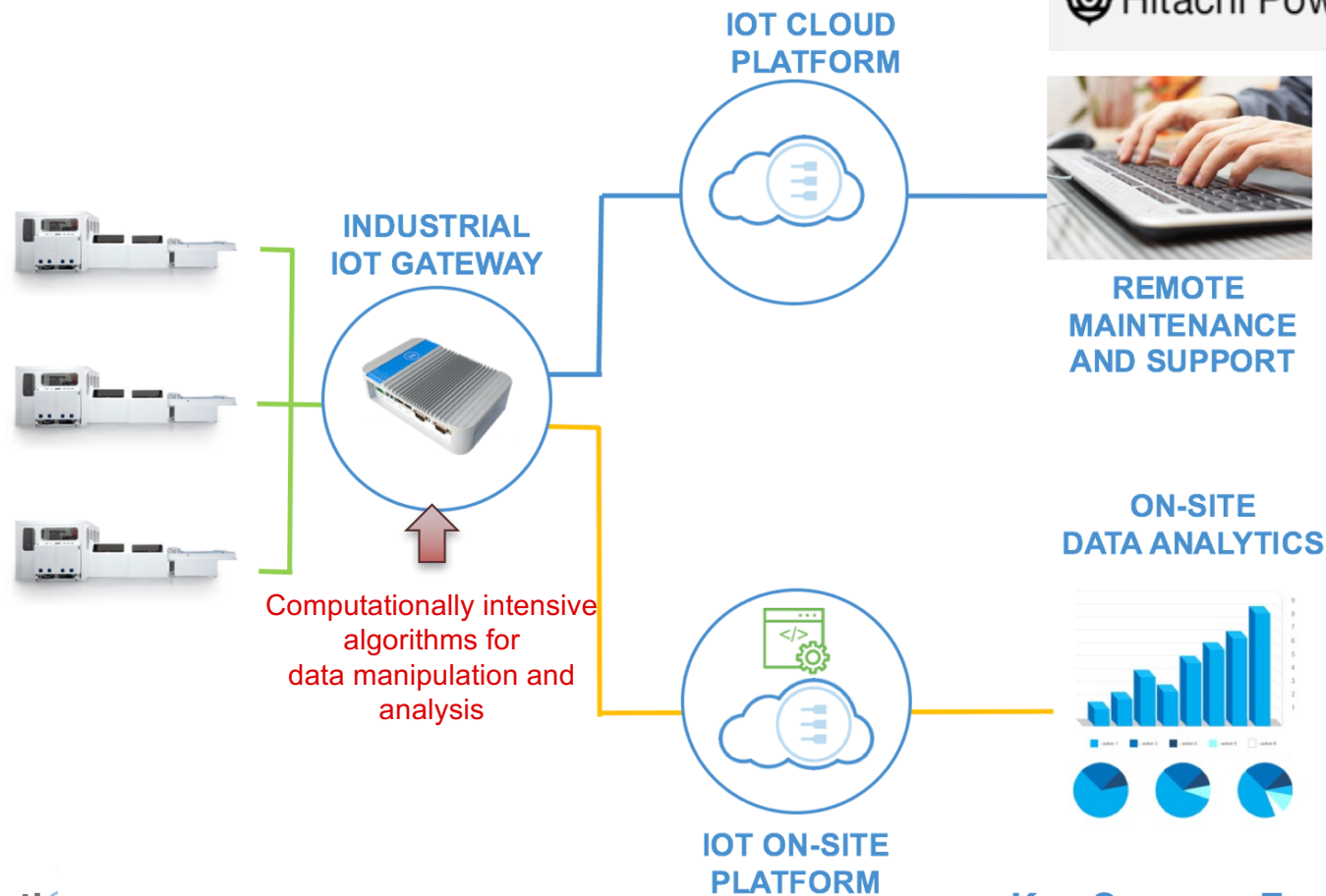
Application:


- end users to remote control their own thermo-devices
- for technical assistance operators to perform remote diagnostics
- valuable data for R&D, Service, Marketing departments to develop & sell new products and services

Key Success Factors:

- Service-oriented business model
- Open and industry standards based
- ESF hardware abstraction, Java/OSGi
- Remote device & embedded app. mgmt.
- Real time data
- M2M / IoT know how in Eurotech
- Eurotech worldwide footprint

Predictive Maintenance

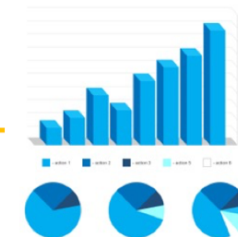


 Hitachi Power Solutions Co.,Ltd.



**REMOTE
MAINTENANCE
AND SUPPORT**

**ON-SITE
DATA ANALYTICS**



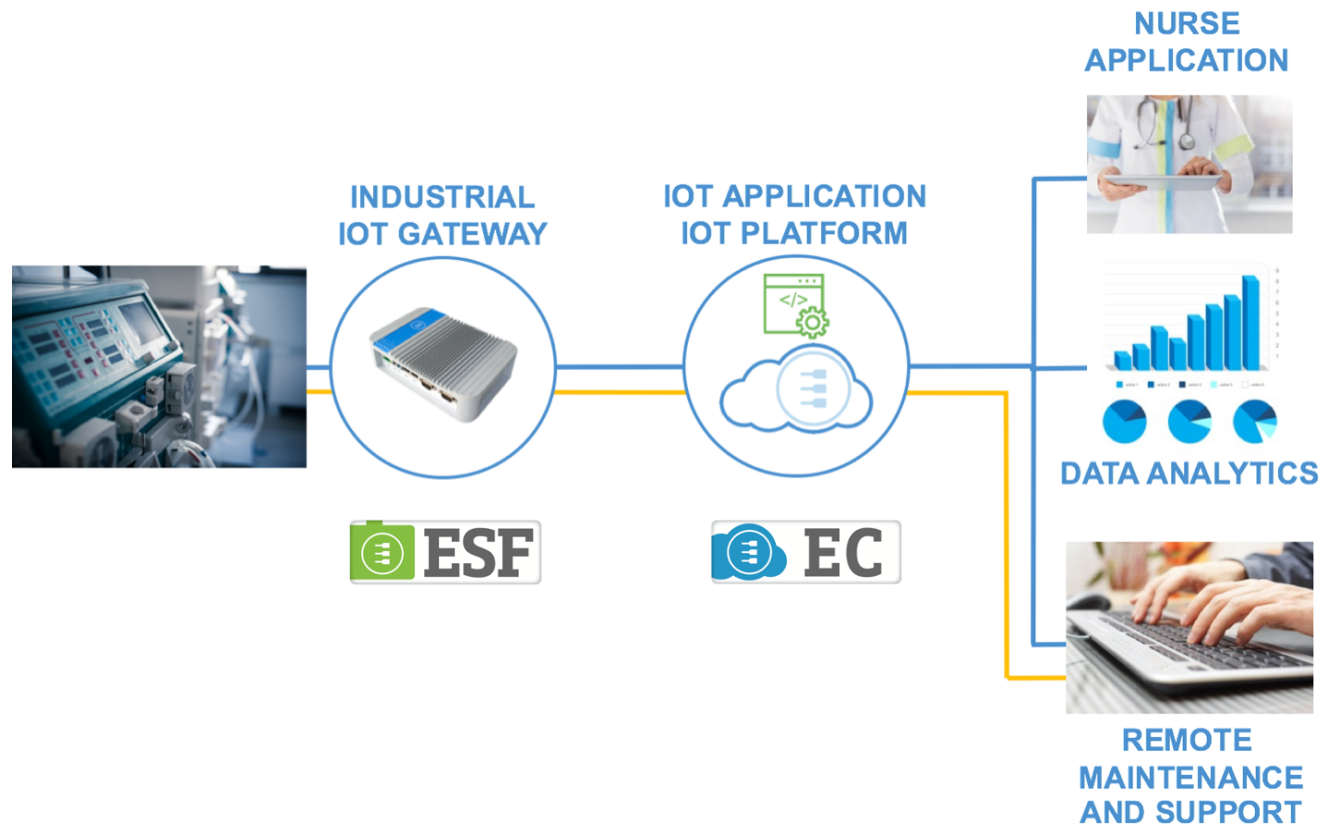
Application:

- Failure Monitoring and Predictive Maintenance
- Smart sensor and analytics capabilities at the edge
- Powerful analytics and visualization solutions at the enterprise IT level

Key Success Factors:

- Flexibility of the platform
- Advanced Analytics and Pattern Matching at the gateway (Fog/Edge Computing)
- Multiple Cloud connections

Remote Maintenance and Services



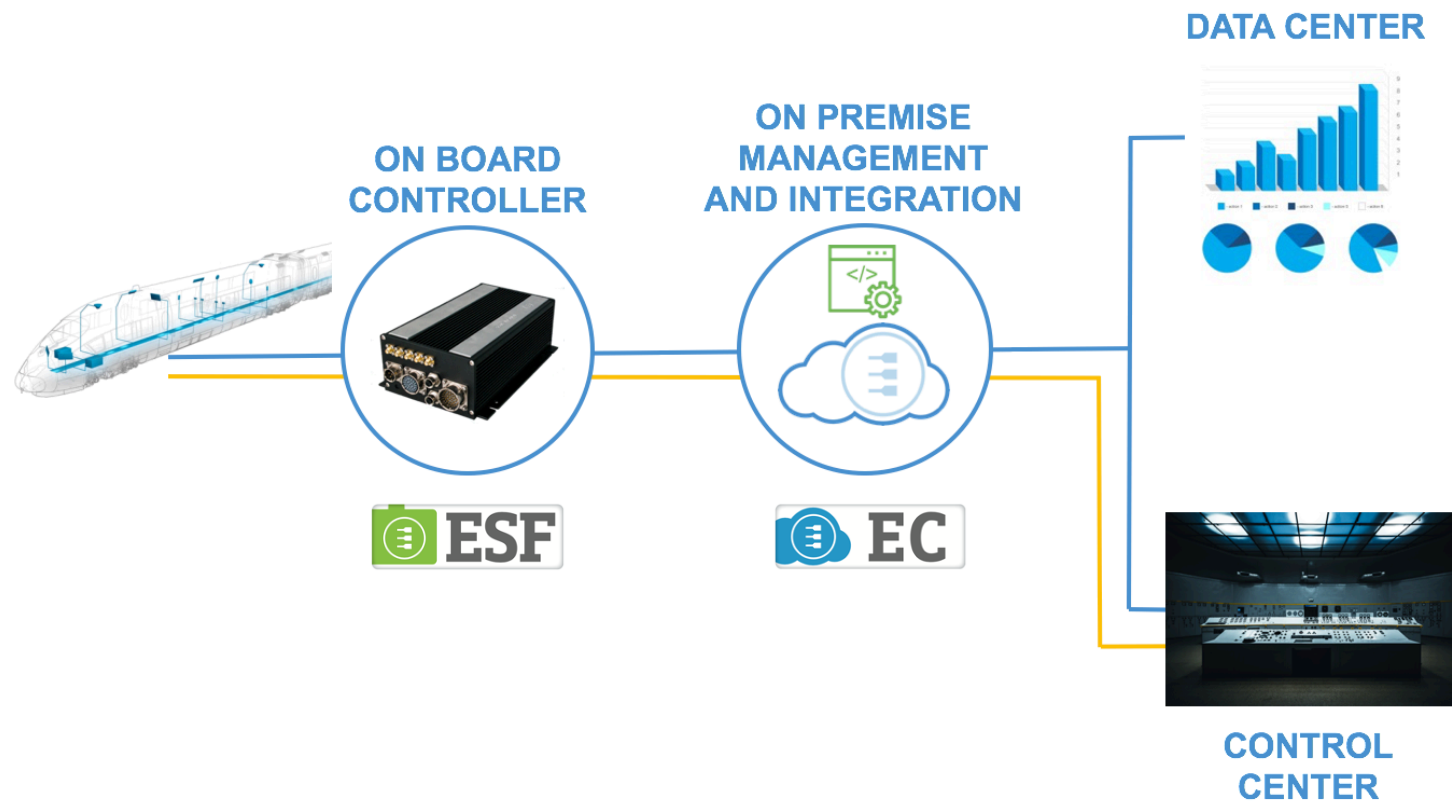
Application:

- Connect machines to the internet in a nonintrusive way
- Provide nurses with access to machine status
- Provide manufacturers access to machine logs
- Enable remote maintenance with less field visits

Key Success Factors:

- Open Standard Connectivity
- Device Provisioning
- Remote Access VPN
- Onboarding and Data Acquisition App
- Port/IP Forwarding
- Cellular Connectivity

Intelligent Data Logger



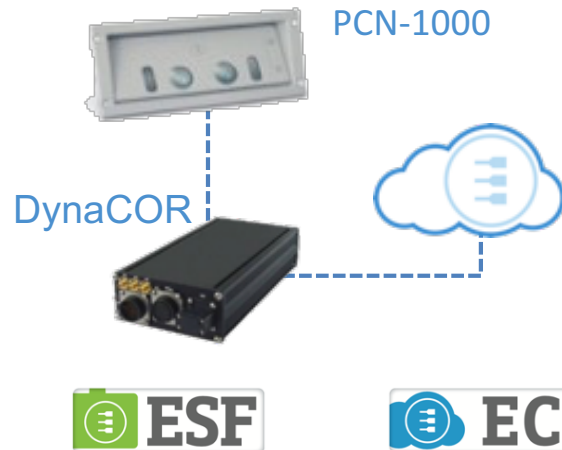
Application:

- On board diagnostics
- Data collection for optimization and predictive maintenance
- Remote access and maintenance
- Railway certified hardware with MVB interface
- On premise device management and data integration

Key Success Factors:

- Open Standard Connectivity
- Modular Field Access Drivers
- Data Flow Programming
- Portable IoT Edge Middleware
- On-premise IoT Cloud Platform

Tram Fleet Management Optimization



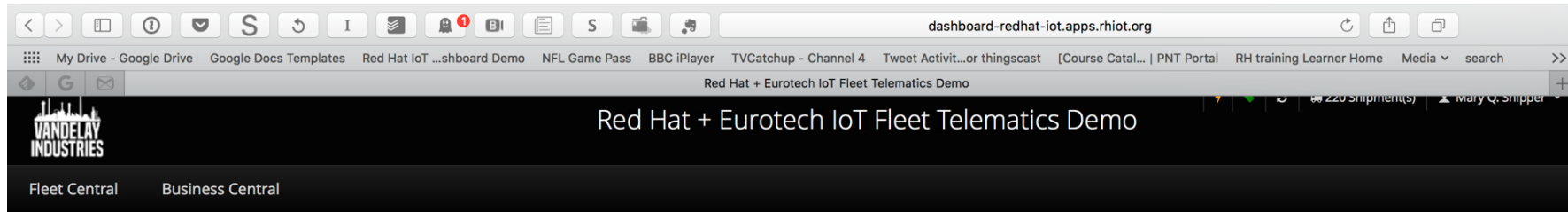
Application:

- Cloud based automatic passenger counting (APC) system
- Equip trams with Eurotech's passenger counters and a gateway
- Real time planning of route, optimizing use of the fleet
- Application for Data Statistics, combining passenger counts, GPS positioning, door open/close events and other route information

Key Success Factors:

- Complete end-to-end solution
- Advanced PCN technology
- High accuracy
- Short development time
- Easily integration with web app
- Cost effective
- Scalable for future requirements

Eclipse IoT Testbed



Vehicles

Find...

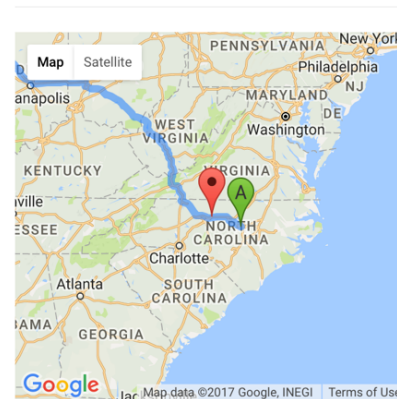
Vehicle ID	Route	ETA	Status
truck-8	Raleigh, NC Chicago, IL	May 5, 2017 2:56:08 PM	✓
truck-9	New York, NY Chatanooga, TN	May 5, 2017 8:25:41 PM	✓
truck-6	Raleigh, NC Omaha, NE	May 6, 2017 6:00:14 AM	✓
truck-7	Showshoe, WV Louisville, KY	May 5, 2017 3:41:33 PM	✓
truck-10	Atlanta, GA New Orleans, LA	May 5, 2017 1:12:23 PM	✓
truck-1	Raleigh, NC New Orleans, LA	May 5, 2017 1:12:56 PM	✓

Client Shipments

Find...

Client Package	Route	ETA	Status
Soylent (Antique Baseballs)	Atlanta, GA Louisville, KY	Saturday at 6:36 AM	✓
Gekko & Co (Spare F-22 Parts)	Virginia Beach, VA Louisville, KY	Sunday at 7:34 PM	✓

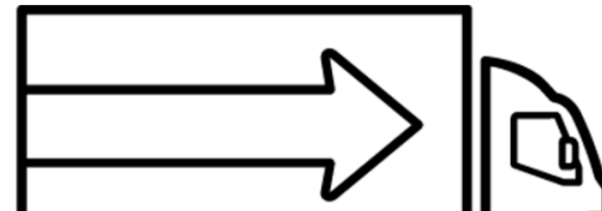
Vehicle Tracking



Package Telemetry

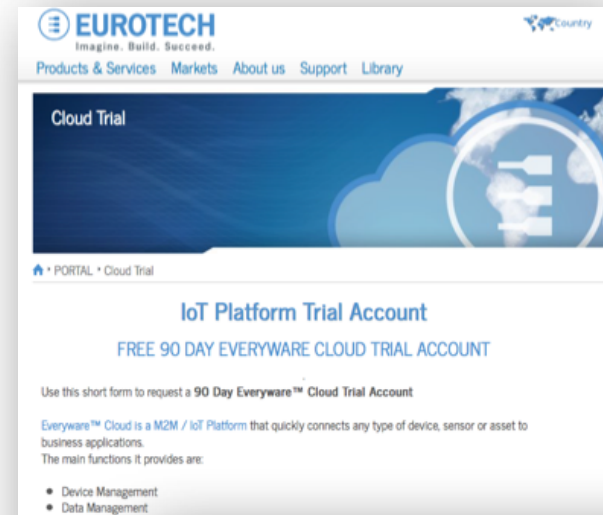
Choose a shipment to view its telemetry

Vehicle Telemetry



For more information

- Go to <http://redhat.com/iot> or <http://developers.redhat.com/iot>
- Go to <http://eurotech.com> or <http://esf.eurotech.com>
- Go to <http://eclipse.org/kura>
- Go to <http://eclipse.org/kapua>
- Go to <https://iot.eclipse.org/testbeds/>
- Come by IoT Pavillion





Thank You



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