terra solutions
Industrial IoT

Cumulocity IoT

software AG
Freedom as a Service

terra solutions

CUMULOCITY IOT

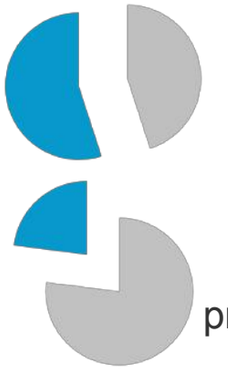
Technology leader for 50 years

in data management and application development platforms

€879+

MILLION

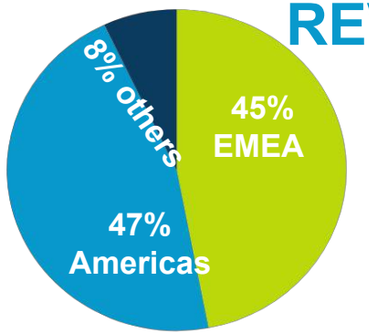
IN REVENUE



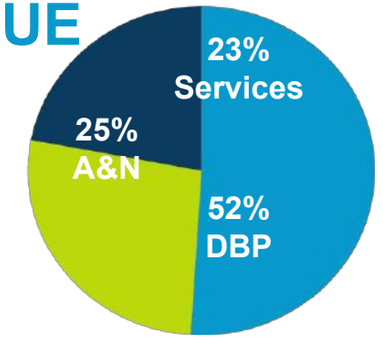
45%+
recurring

77%
product revenue

REVENUE



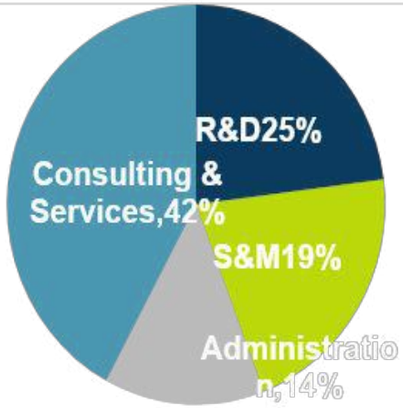
BY REGION*



BY BUSINESS LINES*

4,700+

EMPLOYEES**



€2.5bn

MARKET CAP

~65% Free Float

* Based on Group product revenue – FY 2018

**P&L as of December 31, 2018

Recognized by Analysts

Consistent Leader in Key Smart Cities Disciplines

STREAMING ANALYTICS

Forrester Wave Streaming Analytics, Q3 2018

DEVICE MANAGEMENT

MachNation IoT Device Management Scorecard, 2018

IIoT PLATFORM

Gartner MQ Industrial IoT Platforms **Q2 2019**

IPAAS & HYBRID INTEGATRION

Forrester Wave iPaas & Hybrid Integration Q1 2019

API MANAGEMENT

Forrester Wave Full Lifecycle API Management Q1 2018

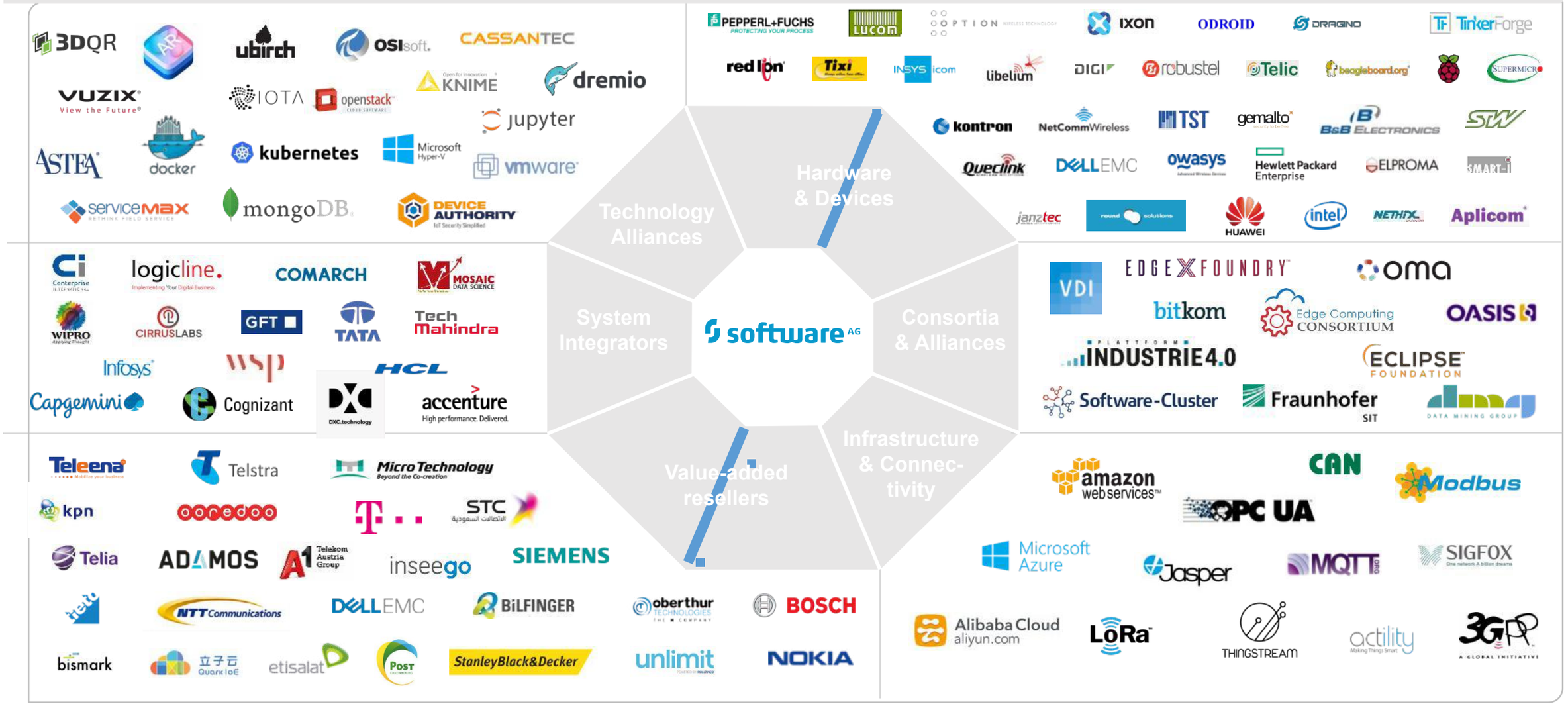
Gartner magic quadrant

for industrial IoT platforms June 2019

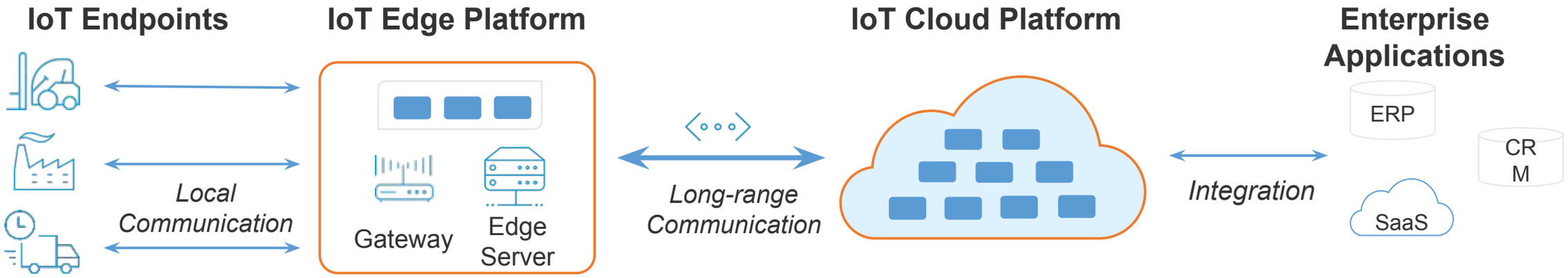
Source: Gartner (June 2019)

Software AG IoT Ecosystem

Diversity of Partners



Components of an end-to-end IoT Solution



Business challenges

- Create IoT solutions for smarter products and higher-value services
- Deliver value of IoT solutions quickly: start small & scale in iterations
- Balance risk & innovation: leverage new technologies, but stay open and flexible
- Benefit from best practice, IoT methodology and proven tools

Cumulocity IoT

Device Connectivity

Plug & Play with existing integrations

- **100+** devices and gateways
- **300+ protocols** (BACnet, KNX, Siemens..)

Cloud Fieldbus

- Central, web based end-to-end integration

CAN, Modbus, OPC, PROFIBUS, PROFINET

LPWAN Agents LoRa, 3GPP, SIGFOX, NB-IoT

Connect over any IP network **without VPN**

Integrate new device types

Protocols supported:

- **MQTT**, **REST**, **LWM2M**, Tracker, **SNMP**
- SmartREST payload **compression**

Device SDK's for:

C++, Lua, Java SE & ME

Use **any environment** with:

MQTT, { REST:API }

Model-less integration

- **Use 1000's** of device types/versions
- **Device originated** data model extension

all devices, all networks, all verticals, all use cases

Cumulocity IoT

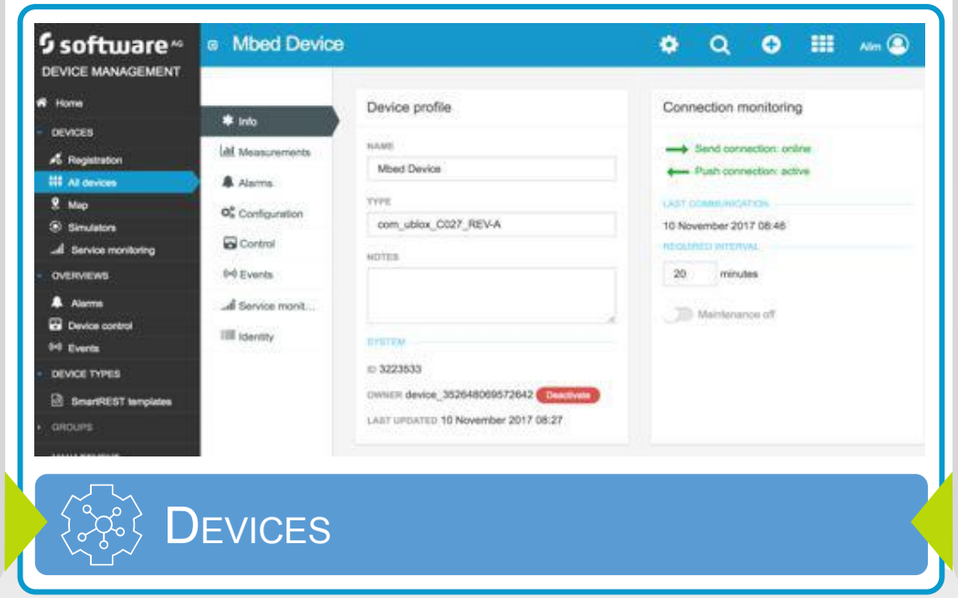
Device Management

Device Lifecycle

- Device Inventory & Runtime Statistics
- Device Identity Management
- Credentials per individual device
- Provisioning for small & large deployment
- Auto-registration
- Asset management (network, location, …)
- Gateway hierarchy and command routing
- Device Twin

Connection Management

- Connection availability monitoring
- Connection metrics (RSSI, Signal strength)
- Switching between IP and SMS



Device Operations

- Firmware & software management
- Fault & alarm management
- Configuration management
- Remote command execution
- Bulk operations with scheduling
- Troubleshooting: Remote shell, logs, ….
- Real-time alarms with integrated workflow

Cloud Remote Access

- Access screen of remote machine / HMI
- Single sign-on, per user access rights
- No shared password, VPN, or client SW
- VNC, SSH, Web

all devices, all networks, all verticals, all use cases

Cumulocity IoT

Analytics & Date

Streaming & Predictive Analytics

Apama's patented, in-memory streaming analytics enables:

- **Filtering, correlation, aggregation and pattern detection with time and location constraints**
- Enrichment of streaming data with context data for deeper, **richer analytics**
- Performs analytics on both **discrete events and event streams**
- Designed for **high throughput & low latency**, with **small HW footprint**
- Predictive analytics with R and Python
- **Operationalization of predictive models**

DATA & ANALYTICS

DEVICES

Visualization & Data Exploration

- Interactive business-focused **mashup dashboards** with responsive design
- Real-time with **historic data blending**
- Exploratory ad-hoc & **time series analysis**
- Supports rich set of **data sources**
- **SCADA** visualization
- IIoT **Cockpit & Digital Twins**

Data Management

- **Elastically scalable** data store MongoDB
- Complemented by **Terracotta DB** as in-memory data platform
- Pre-built integration with **data lakes**
- **Built-in** IoT/IIoT domain **data models**

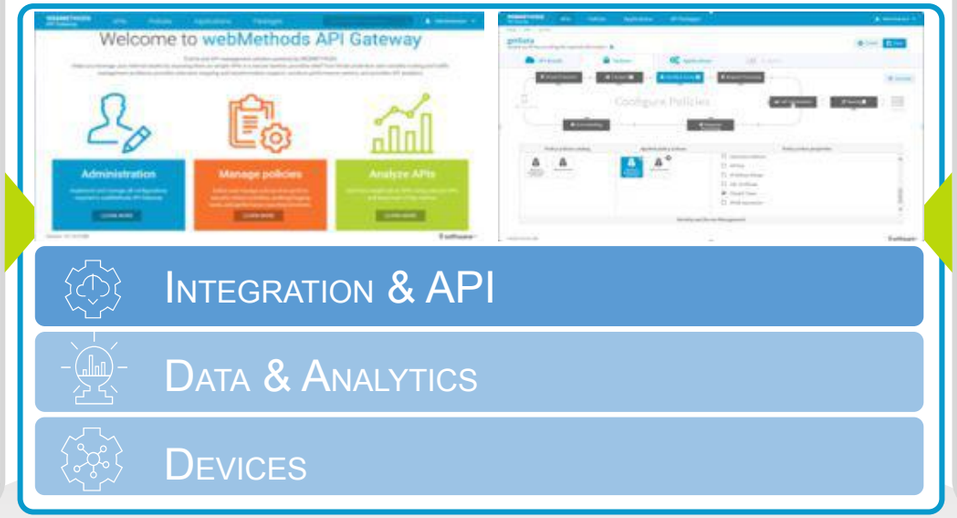
all devices, all networks, all verticals, all use cases

Cumulocity IoT

Integration & API

Hybrid Integration

- Easily integrate *device data* with **Enterprise Apps**, **Cloud Apps**, **Big Data Apps** and **3rd Party Ecosystems**
- **150+ adapters:** SAP, Oracle, Siebel, Salesforce, MS Dynamics, AWS S3, …
- Manipulate data with **graphical mapping** & convert it into other formats
- Provide support for relevant protocol and interfaces in addition to IoT protocols
- End-to-end security support; supporting all relevant security standards like OAuth, SAML, Kerberos plus custom APIs
- Start **automated actions based on IoT events** (e.g. remedy actions, kick off smart contracts, send technician out)



API Management

- **Full lifecycle API Management** for delivering higher-value data via REST, SOAP, etc.
- **API Portal** for API design, development, promotion and 3rd party access
- **API Gateway** for security, authorization, monitoring, governance & monetization

Master Data Management

- Validates, enriches, standardizes and matches device data and metadata – providing a single version of truth
- Applied data governance and data quality tracks/manages hierarchical relationships between IoT data elements

all devices, all networks, all verticals, all use cases

Cumulocity IoT
Solution Accelerators

Pre-packed Features, Plugins and Configurations

Simplifies, speeds and secures time to value:

- **Industrial IoT Accelerator:**
  Cloud Fieldbus secure connection
  Support for over 300 protocols
  Full featured SCADA-like visualizations
- **Telematics Accelerator:**
  Connect industrial vehicles
  Optimize vehicle operations
  Analyze environmental conditions
- **Tracking Accelerator:**
  Connection to locator devices
  Geofencing and localization techniques
  Condition monitoring

SOLUTION ACCELERATORS

INTEGRATION & API

DATA & ANALYTICS

DEVICES

Starter Kit for various Use Cases & Industries

all devices, all networks, all verticals, all use cases

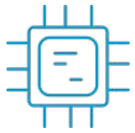
The Challenges

That prevent IoT Adoption in the cloud

CONNECTION	**Too much data to move into the cloud**	**Remote locations, too expensive to connect**
SPEED	**Complex cases need millisecond response**	**Decisioning needed even if disconnected from the cloud**
SECURITY	**Security concerns to store data in the cloud**	**Not allowed to connect from a governance perspective**

Software AG's Distributed Architecture

Different Builds for all Stages



Controller

Device Agent

Cumulocity

Thin Edge

Device Agent

Cumulocity

Thick Edge

Plug-Ins and Applications

Data Visualisation

Storage

Real-Time Analytics

Device Management

Device Connectivity

Cumulocity

Cumulocity IoT Edge

Datacenter

Integration

Plug-Ins and Applications

Data Visualisation

Storage

Real-Time Analytics

Device Management

Device Connectivity

Cumulocity

Cumulocity IoT Cloud

Get an Edge on Competition

Dell EMC and Software AG Joining Forces!

The Challenge

The Way to Success

DÜRR

ADAMOS Member

How can we empower our customers to use real-time streaming analytics on the shop floor?

DÜRR

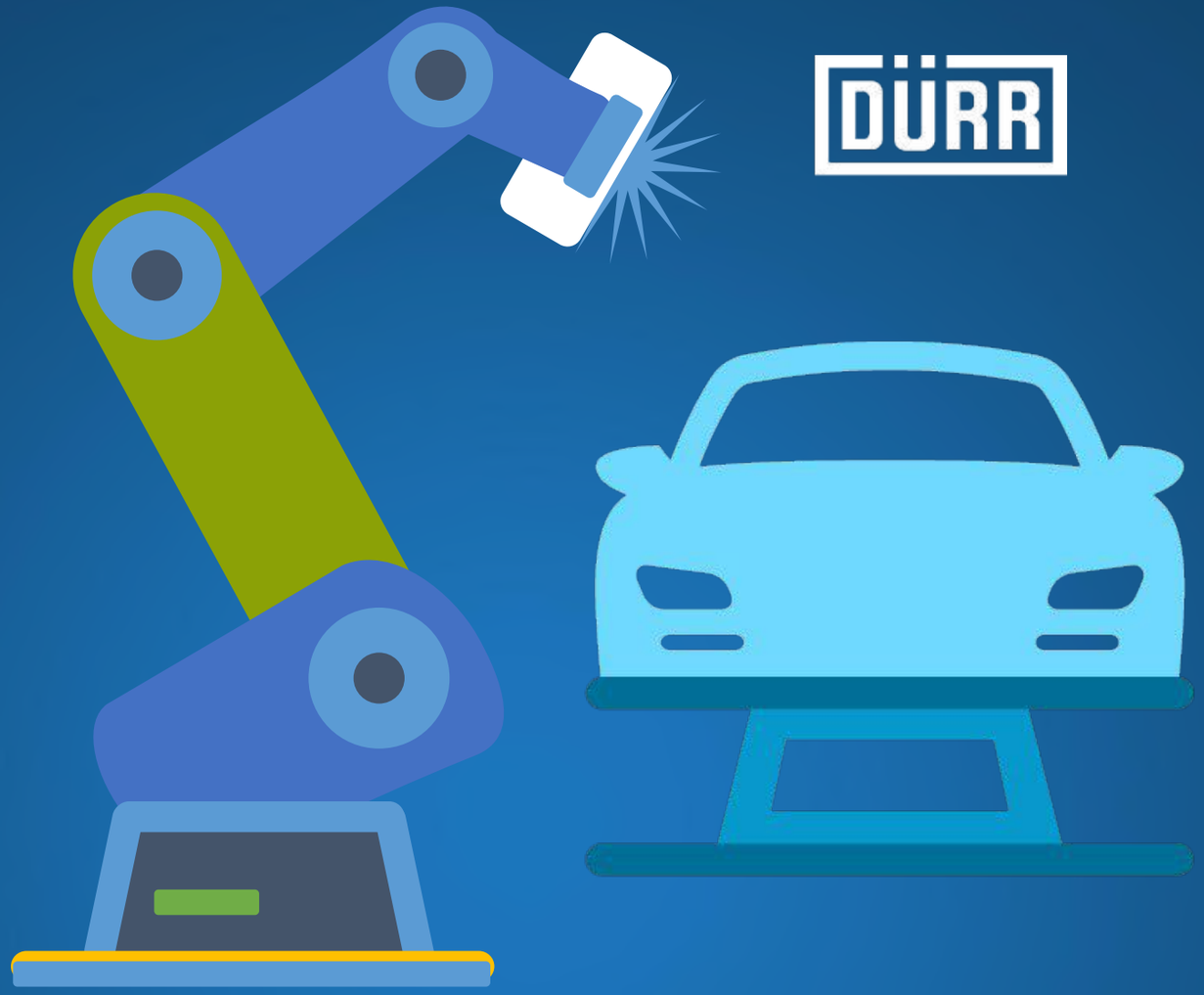
Co-innovation project

software AG

Freedom as a Service

REAL-TIME ANALYTICS OF PROCESS DATA

MONITORING OF PAINTING PLANTS



PLANT MANAGEMENT

CLOUD

Private / public cloud

- *Cloud-based management and analytics*
- *Remote asset management*

PAINT ROBOT

EDGE

PLC & edge hardware

- *Local streaming analytics of high-frequency sensor data from painting robot*
- *Closed loop analytics (with feedback to PLC)*

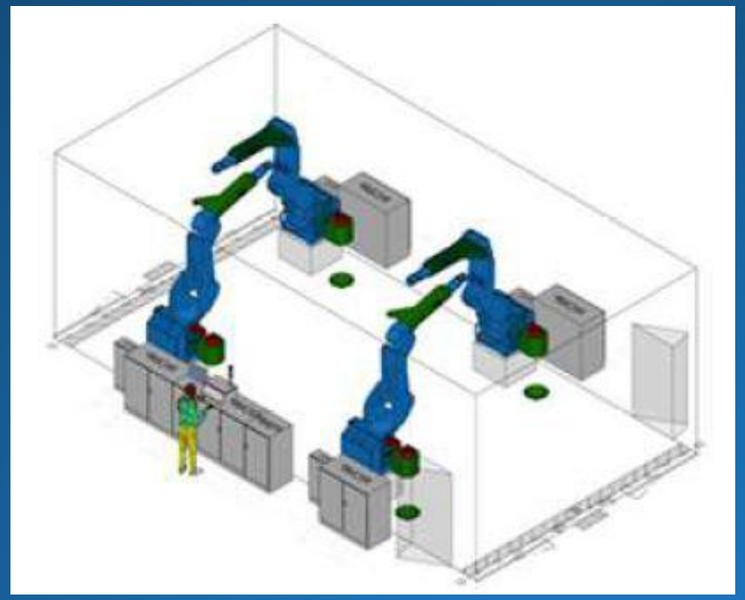
PAINTING FACILITY

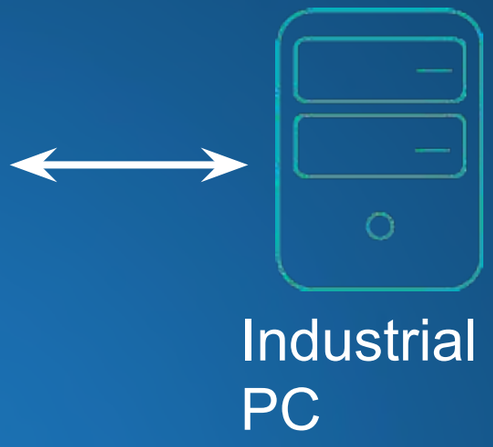
EDGE / ON-PREMISE

Edge / plant-level compute

- *Combination of multiple paint robots to paint shop*
- *(Remote) monitoring of paint process*
- *Long term analysis of paint process*

A TYPICAL PAINT ROBOT STATION SETUP

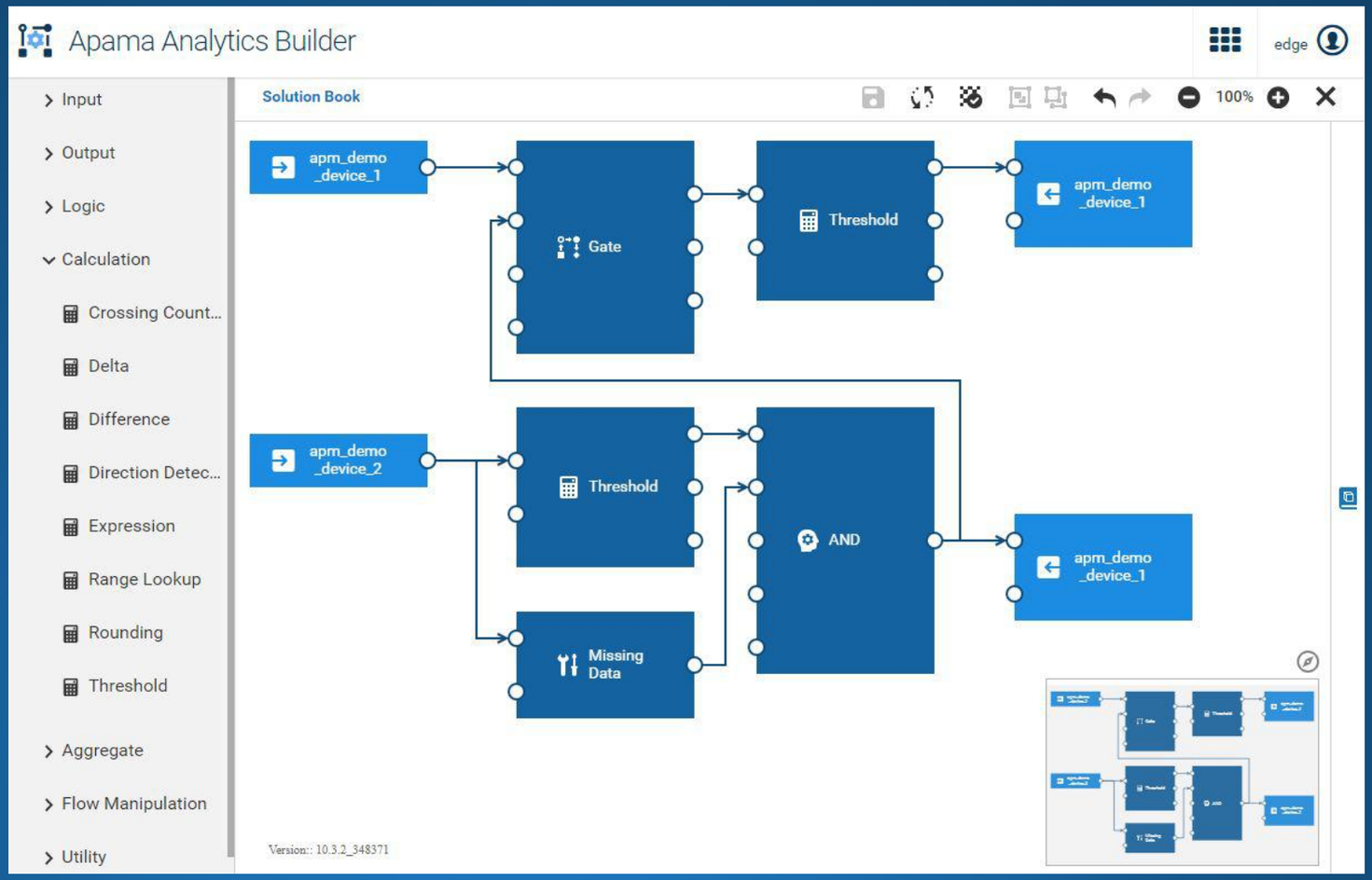




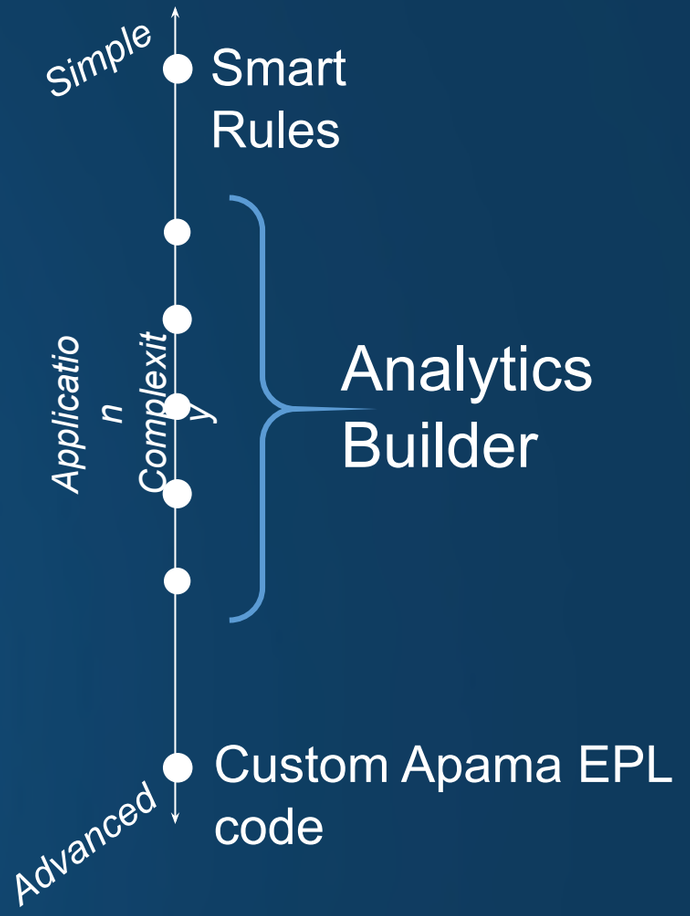
- A robot station consists of 2-8 robots connected to an industrial PC (IPC)
- **For each robot +30 production-relevant KPIs** are captured and send to the industrial PC **in a 8 milliseconds time interval**

THE ANSWER: APAMA ANALYTICS BUILDER

SELF-SERVICE STREAMING ANALYTICS



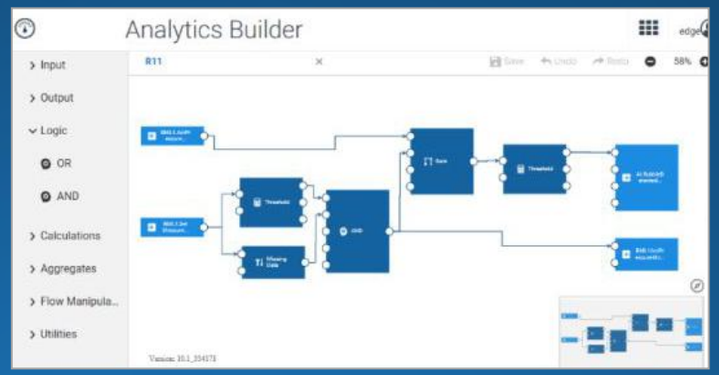
For domain experts
like **shop floor engineers** or
machine operators



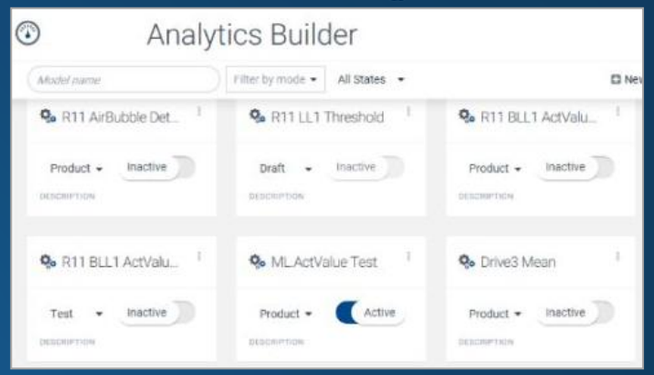
APAMA ANALYTICS BUILDER
MORE DETAILS

Graphical editor for **non-coders** wanting to take advantage of **streaming analytics**, e.g. shop floor engineers

Model Editor

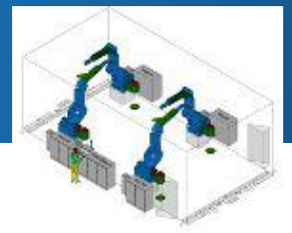


Model Management



Model Runtime

Data



Trigger reaction in production process

Model management for running models with simulated or live data before deployment

Real-time processing of sensor data and events to recognize patterns, relationships and errors

Wind Power Plant

Real-Time Data Analysis for Preventive Maintenance

- Secure remote access and central monitoring system
- Monitoring, collection and processing of real-time data (e.g. icing protection on turbines) for controlling industrial processes
- Visualization of real-time data for better and faster decisions
- Accelerated commissioning process
- Same software architecture from edge to cloud with identical APIs, data models and analytics.
- Up and running in a few weeks

Wind Energy Production

Control and Maintain Wind Farms with Real-Time Insights and Benefit from Predictive Maintenance Models

WIND TURBINE

EDGE

PLC & edge hardware

- *Local IoT analytics*

CONTROL ROOM

CLOUD

Consolidated view of edge installations

- *Central management*
- *Cloud IoT analytics*

WIND FARM

EDGE

Edge hardware at onsite facility

- *Local IoT analytics*

Wind Energy Production

From Edge to the Cloud

Integrated information model

WIND TURBINE

DELL edge hardware

Cumulocity IoT Edge

PLC connectivity

WIND FARM

DELL edge hardware

Cumulocity IoT Edge

PLC connectivity

CONTROL CENTER

Cumulocity IoT Cloud

Cumulocity IoT Reference Examples

Leading Telco's rely on Cumulocity IoT

White labelled

Telia, tele, TELSTRA, unlimit, NTT Communications, T, Post Luxembourg, Teleena, etisalat, kpn, STC الاتصالات السعودية

Leading Industrial IoT providers rely on Cumulocity IoT

BOSCH, ADAMOS, DMG MORI, SIEMENS, HOMAG GROUP, ZEISS, ASM, DÜRR

Leading Smart Equipment Makers/ Operators rely on Cumulocity IoT

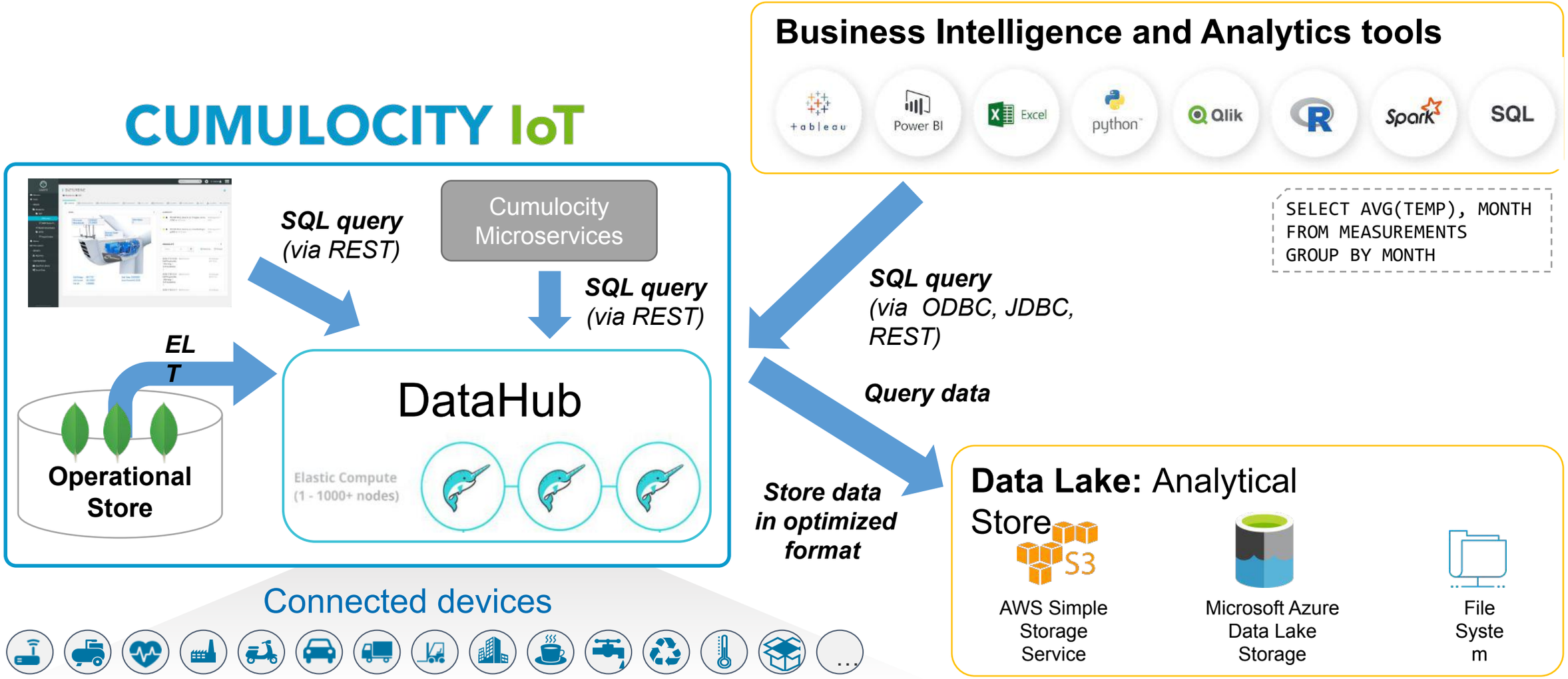
SEM/ SDM

CERTUSS Steam Generators, trackerando, Gardner Denver, ATEA, HUBTEX, eConnect HAIBIKE, OCTO, WINORA, VIESMANN, Lyreco, DAL DEUTSCHE AFRIKA-LINIEN, SW, e·on, Pfannenberg ELECTRO-TECHNOLOGY FOR INDUSTRY, NOKIA, Quarkline

IOT DATA HUB

Cumulocity IoT Datahub

High-level Overview



Key Takeaways for Cumulocity IoT Datahub

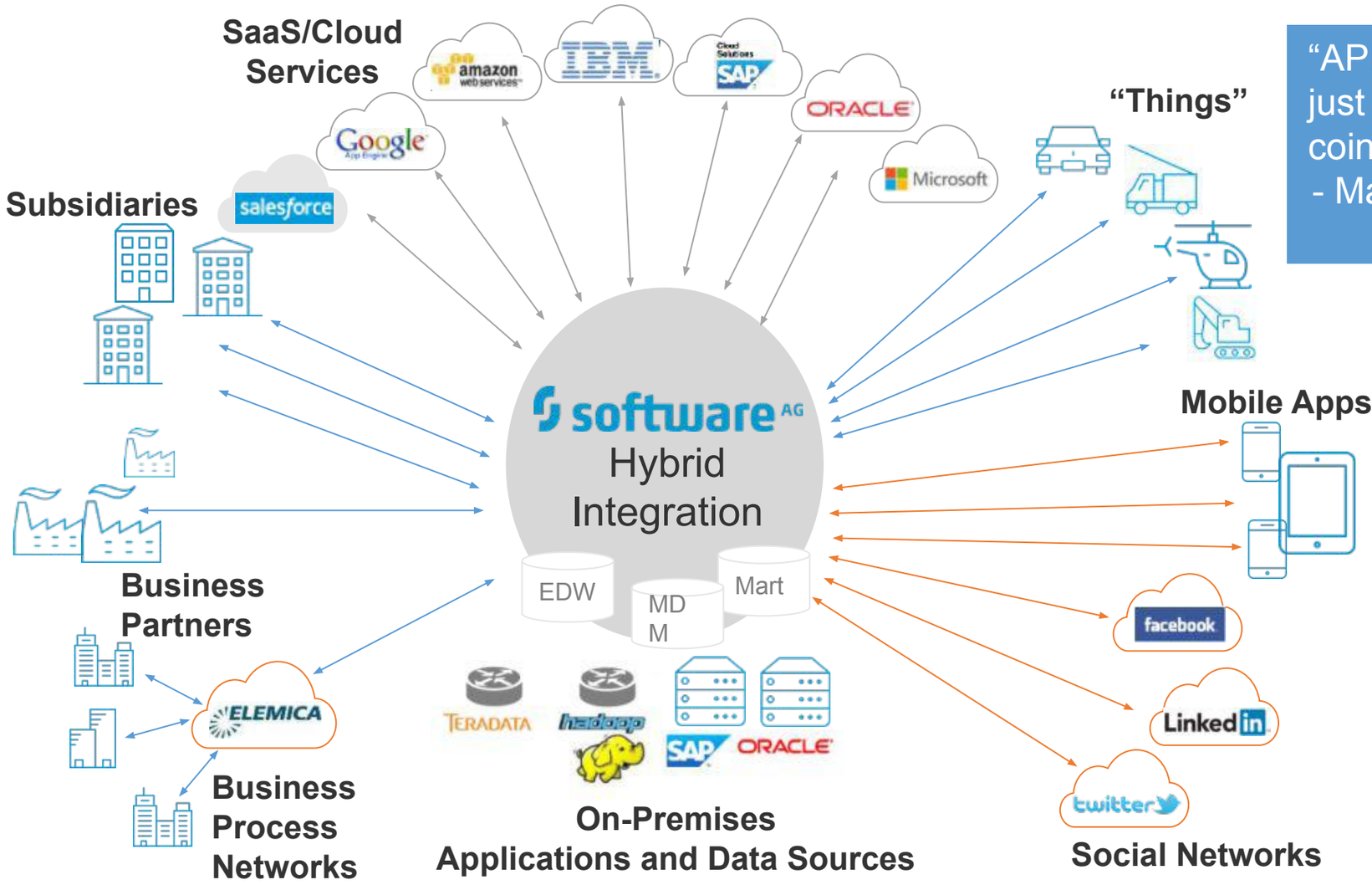
1 SCALABLE SQL QUERYING OVER LONG-TERM IoT DATA

2 LONG-TERM STORAGE OF IoT DATA IN DATA LAKE

3 STANDARD INTERFACES TO BI & DATA SCIENCE TOOLS

Hybrid Integration

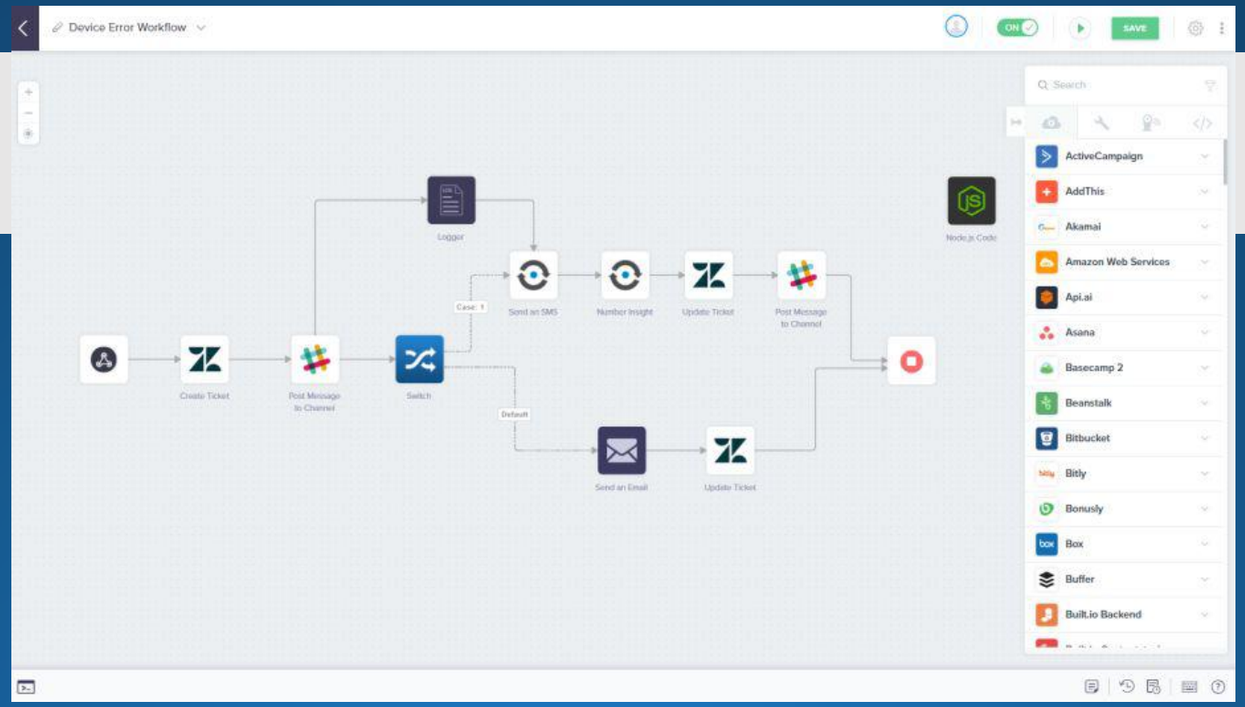
Driving “Pervasive” Connectivity



“APIs and integration are just two sides of the same coin.”
- Massimo Pezzini, Gartner

IOT AND INTEGRATION

WEBMETHODS.IO INTEGRATION
DESIGNING INTEGRATION WORKFLOWS

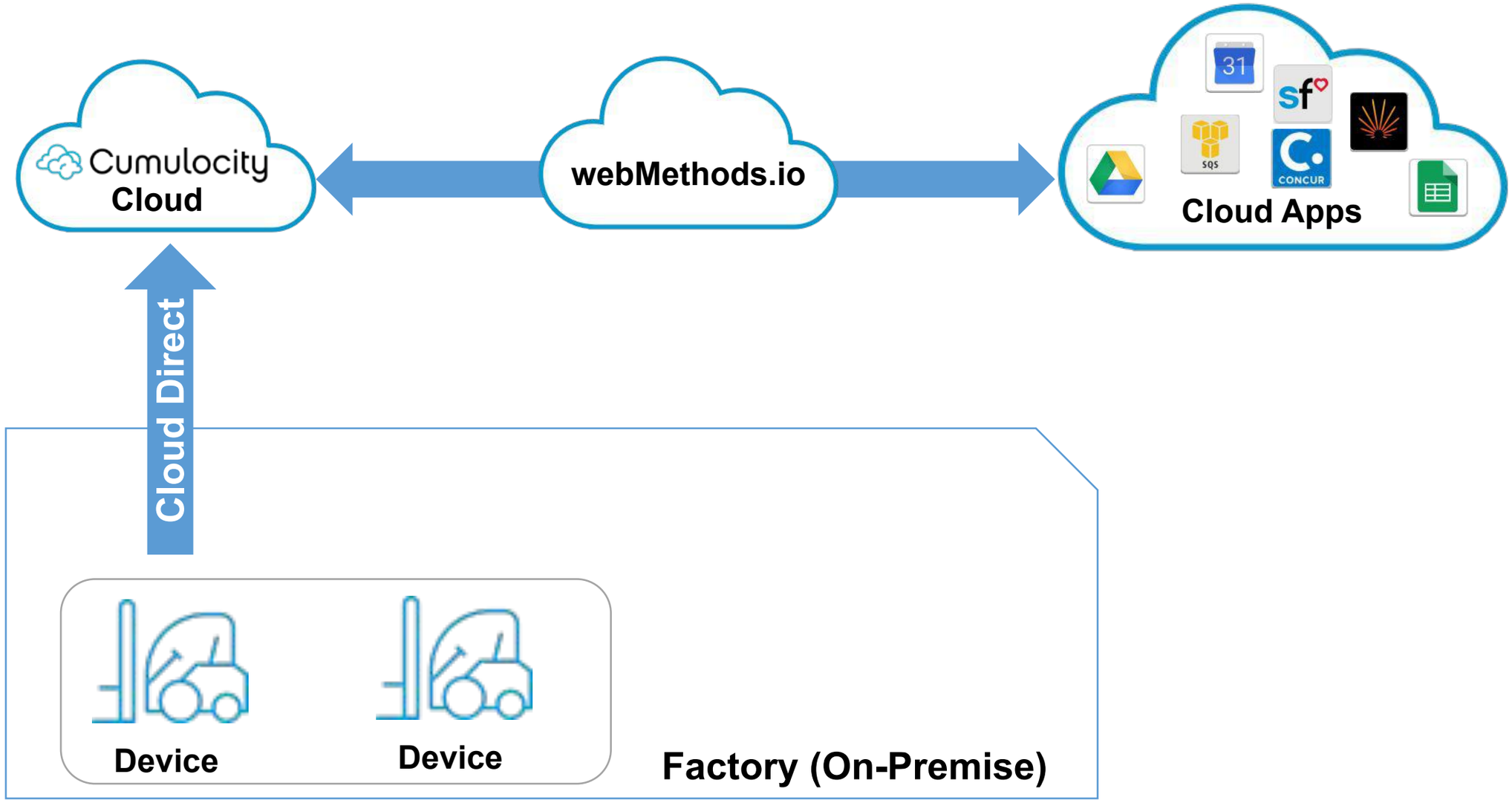


CLOUD INTEGRATION WITH IPAAS

1. **Connect** to cloud applications
2. **Orchestrate** integration workflows
3. **Graphical UI** for non-integration experts
4. **Prebuilt “Recipes”** for template-driven integrations

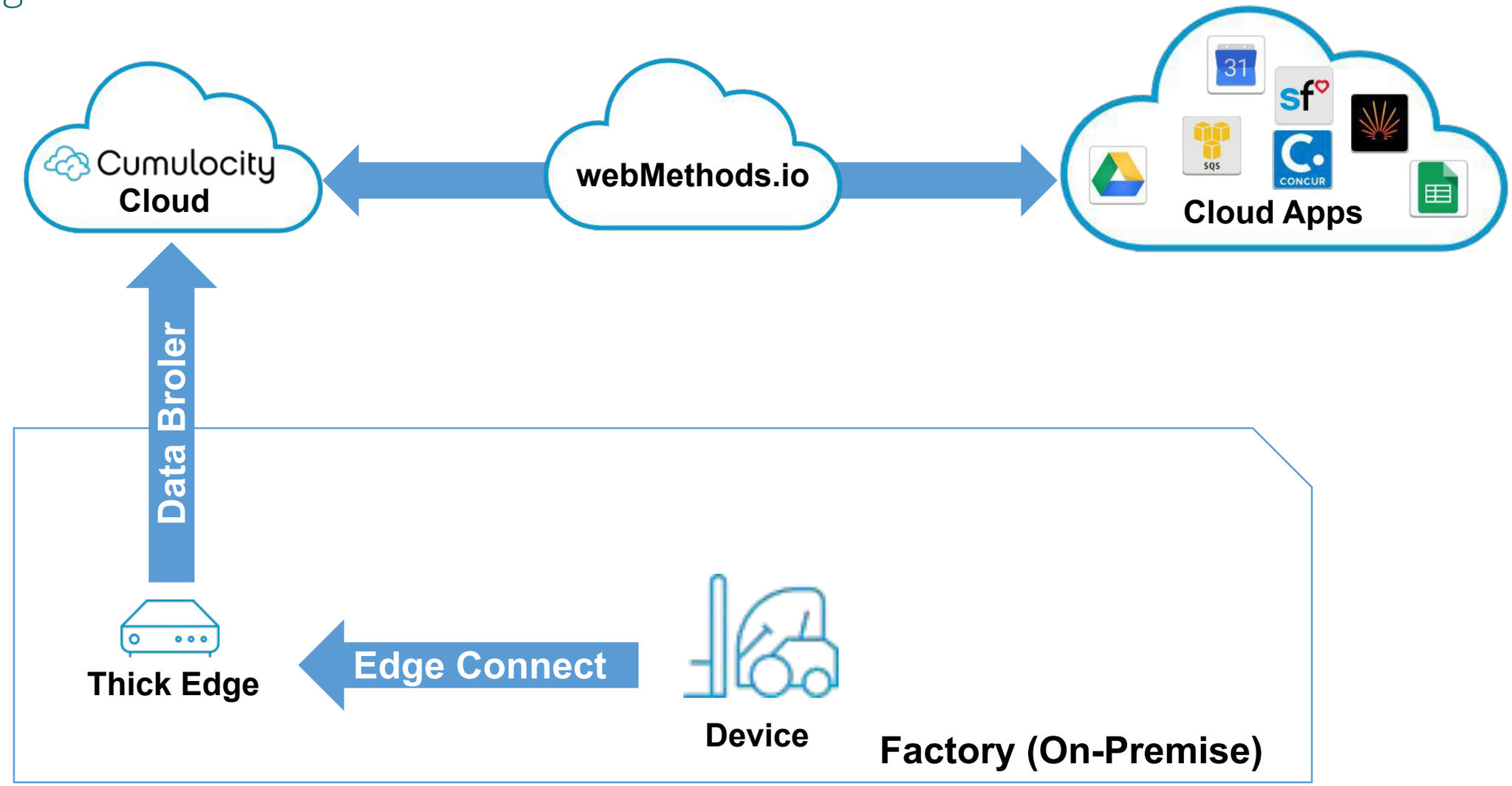
Common IoT Integration Patterns

Cloud to Cloud



Common IoT Integration Patterns

Edge Connected



Common IoT Integration Patterns

Edge Stand-Alone