

# IIoT in the Factory and in the Field

Emergent Technologies Track  
Tuesday 10:50 AM – 11:30 AM  
Geronimo Meeting Room

Chris Borneman, VP & CTO  
Software AG Government Solutions

GLOBAL PRODUCT DATA  
INTEROPERABILITY  
**S U M M I T**  
**2019**



# Chris Borneman, VP & CTO

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- **25 years as CTO recommending, designing, implementing and operating technology in industrial industries (manufacturing, aerospace, mining)**
- **Current focused activities around IIoT, Integration, API Management, and Enterprise EA & Portfolio Management**
- **Actively delivering high security cloud solutions to US Federal Government**
- **Former Exostar CTO & COO for 10 years**



# Objectives of this presentation

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- **IoT and Industrial IoT (IIoT) will have a significant material business impact.**
- **Nearly two thirds of IoT projects never get past the pilot.**
- **Most IoT projects focus too much on the vendor-specific IoT technology and not enough on how those technologies will be managed and integrated into an organization's existing solutions.**
- **Nearly 80% of successful IoT projects relates to integration, yet most pilots focus on the remaining 20%.**
- **This session will discuss successful approaches to deploying IIoT by using real-world deployments of IIoT in the factory and beyond. We will discuss actual customer use cases, performance results, and lessons learned.**

# Example of IIoT Use Cases we are tracking in Manufacturing

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- **Tool tracking and utilization**
- **Predictive maintenance during manufacturing**
- **Robotic monitoring (painting, welding)**
- **Tracking of inventory**
- **Supply chain monitoring**
- **Quality metrics**
- **Predictive maintenance / monitoring post deployment**

# What does this mean for manufacturing / Industry 4.0?

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## HYPER AWARENESS

Gain visibility into production through real-time and historical insights

**Increase Productivity**



## INFORMED DECISIONS

Analyze and use information gathered, in real-time, to drive business actions

**Reduce Downtime**



## AUTOMATE PROCESSES

Bi-directional communication with devices and applications

**Boost Efficiency**



## ECOSYSTEM VISIBILITY

Interface with vendor and supplier systems for supply chain insights

**Deliver on Time**

# IoT is making a big business impact

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63%

of CEOs perceive IoT to have a **significant material business impact**



42%

of orgs have deployed **at least one IoT use case**



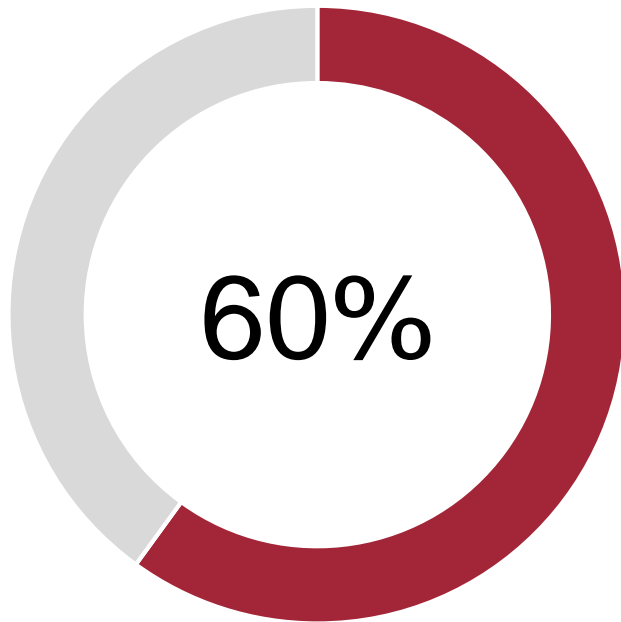
80%

of orgs that have implemented IoT have realized **greater value than expected**

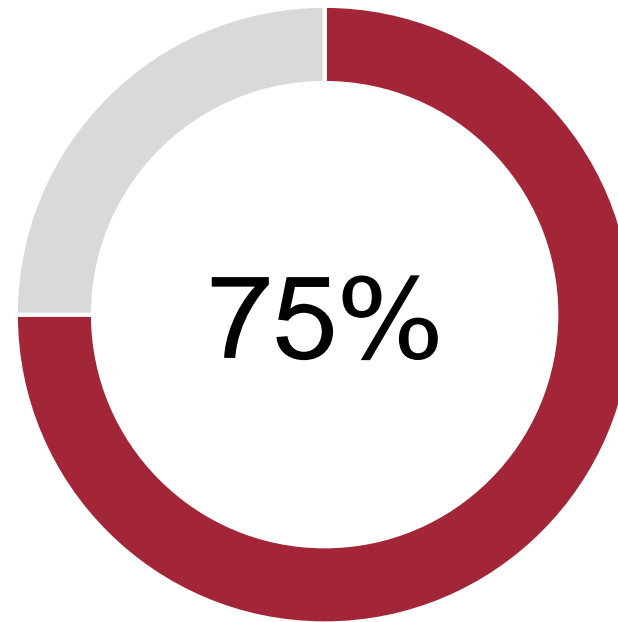
**Gartner**®

# Cisco IoT Industry Study

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60% of companies substantially underestimate the complexity of building an IoT Service

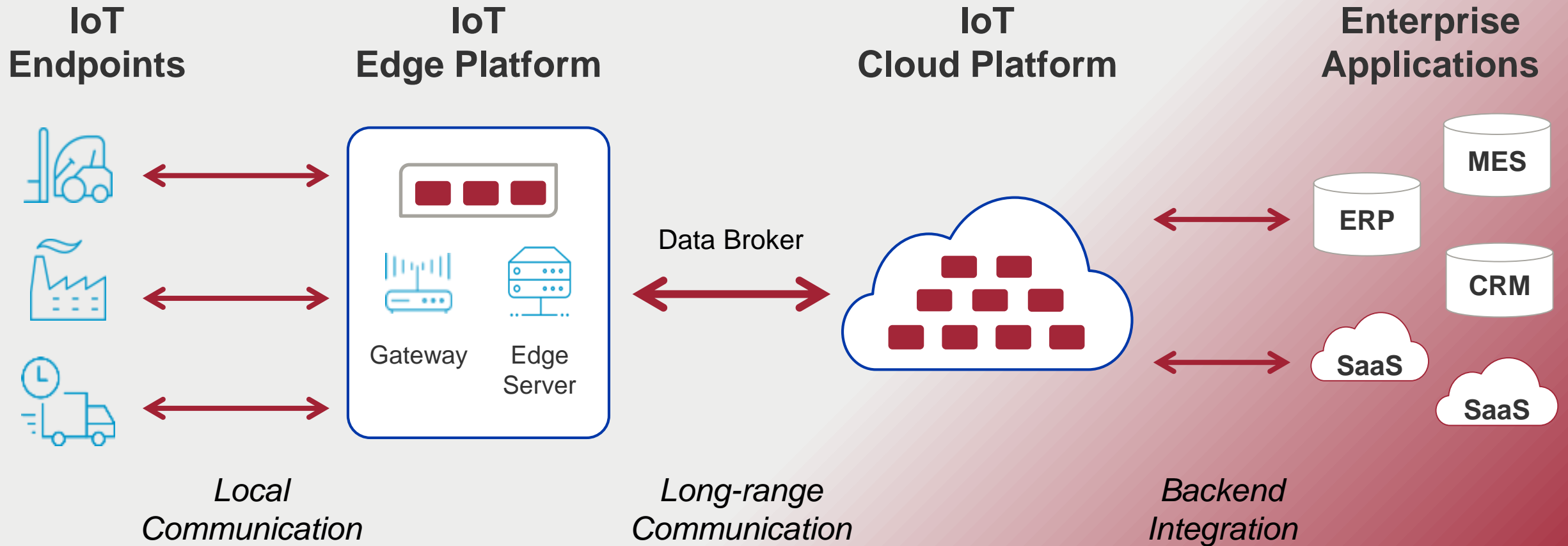


75% of self-initiated IoT projects were considered a failure

# IoT Platforms are distributed and complex

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- 80% of IoT Architecture requires integration



# The Only Leading IoT and Integration Platform

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Gartner®



Magic Quadrant for Industrial IoT Platforms, June 2019

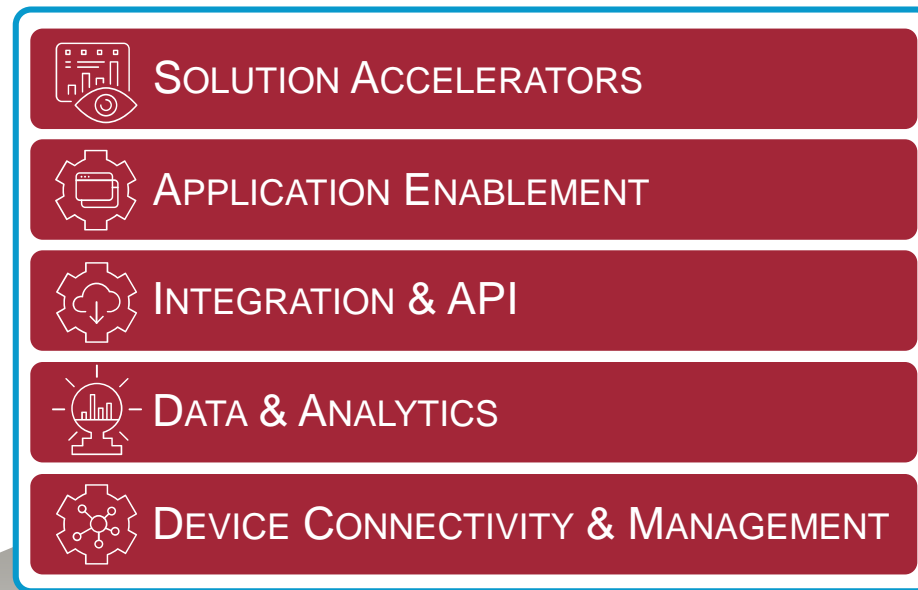
FORRESTER®



Strategic iPaaS And Hybrid Integration Platforms, Q1 2019

# Open Stack of Related Services

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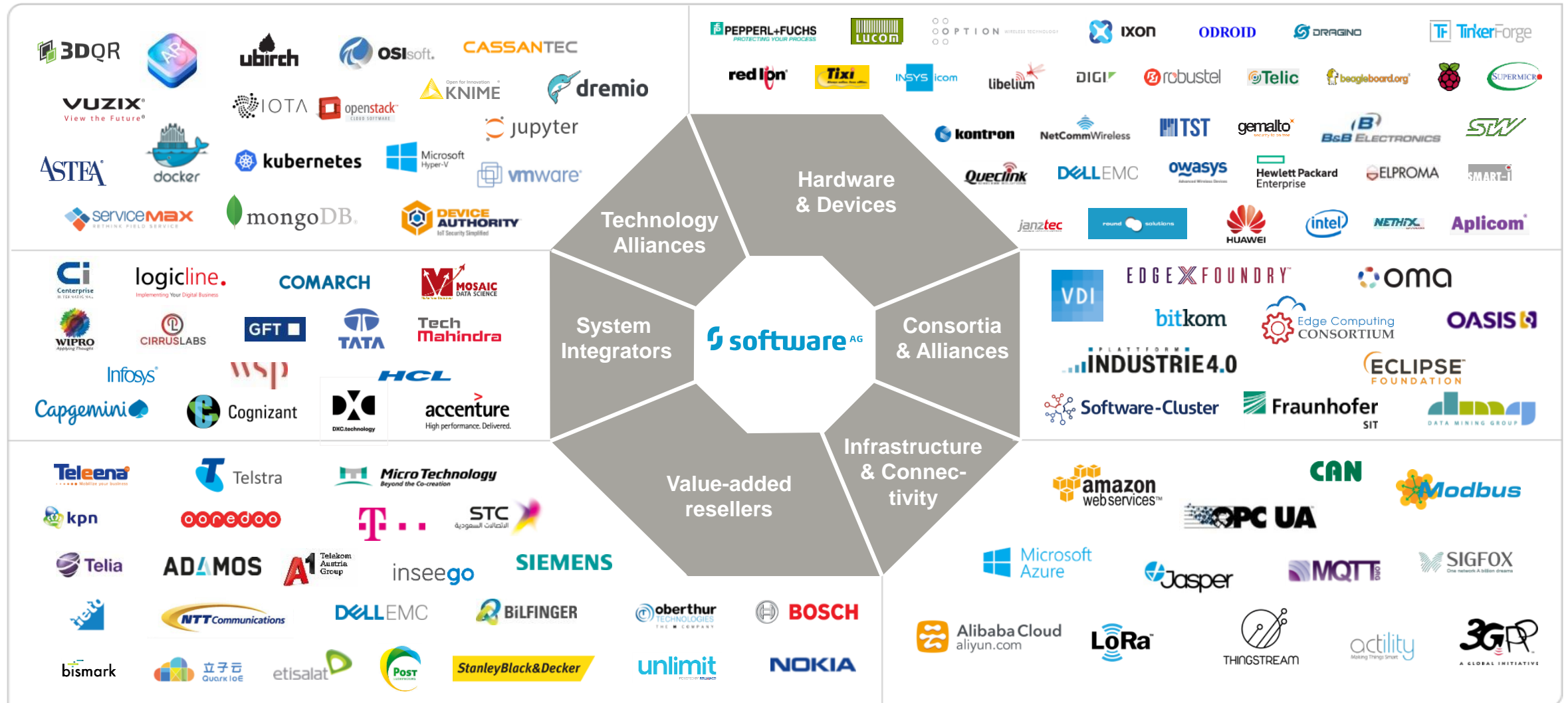


all devices, all networks, all verticals, all use cases



# Software AG IoT Ecosystem

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# Comprehensive Connectivity with 300+ Adapters

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## Mainframe Adapters (10+)



## Big Data Adapters (10+)



## SaaS/PaaS Adapters (Any REST/SOAP) (70+)



## Database Adapters (15+)



## Social Media Adapters



## Content Management Adapters (5+)



## IoT Connectors (150+)



## Application Adapters (10+)



## B2B Adapters (10+)



## Technology Adapters (30+)





EASILY  
**ANALYZE**  
**RAW IoT DATA**

PROVIDE OPTIMUM  
**SUPPORT FOR**  
**MANUFACTURING**  
**CUSTOMERS**



CREATING A  
**GLOBAL**  
**ECOSYSTEM**

ENABLING  
**POWERFUL**  
**INDUSTRY**  
**APPLICATIONS**

# IoT Key Differentiators

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## Open & Independent

- › Flexibility to grow without vendor lock-in
- › Freedom to choose own infrastructure, devices, enterprise apps and 3rd party extensions
- › Supports open standards and any device

## Rapid Self Service

- › Prove value in minutes, not months
- › Get immediate value from your IoT strategy
- › Empower subject matter experts with self-service accessibility (no coding required)

## Distributed Architecture

- › Flexible deployment options:
  - › in the cloud
  - › at the edge
  - › on premises
- › Common APIs throughout uniform underlying technology
- › Write once, deploy anywhere

**SIEMENS**

 **BOSCH**

**Gardner**  
**Denver**

**T ..**

**DÜRR**

**ADAMOS**

**STANLEY**

**DEWALT**

**BOSTITCH**

**BLACK+  
DECKER**

**PORTER  
CABLE**

**CRAFTSMAN**

**IRWIN  
TOOLS**



After evaluating 26+ IoT Platforms in the market, we selected Software AG to be our IoT partner because of their comprehensive offering, modularity and GTM model to partner with customers.”

*- IoT Platform and Digital Architecture team at Stanley Black and Decker*

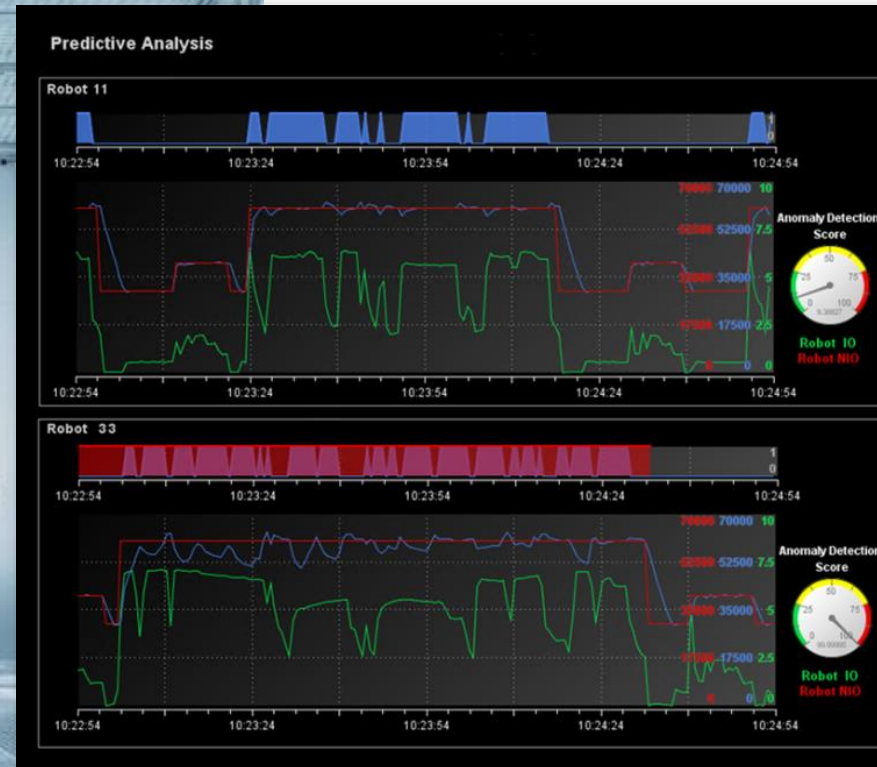
# Monitoring of Paint Systems

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## Applied Intelligence in Real-time

- Real-time signals from paint shop robots
- Anomaly detection score (IO / NIO)
- Detect anomalies in real-time at the edge (Industry PC)
- Closed-loop analytics (real-time execution and re-training of machine learning models)



# Predictive Maintenance (Plant)

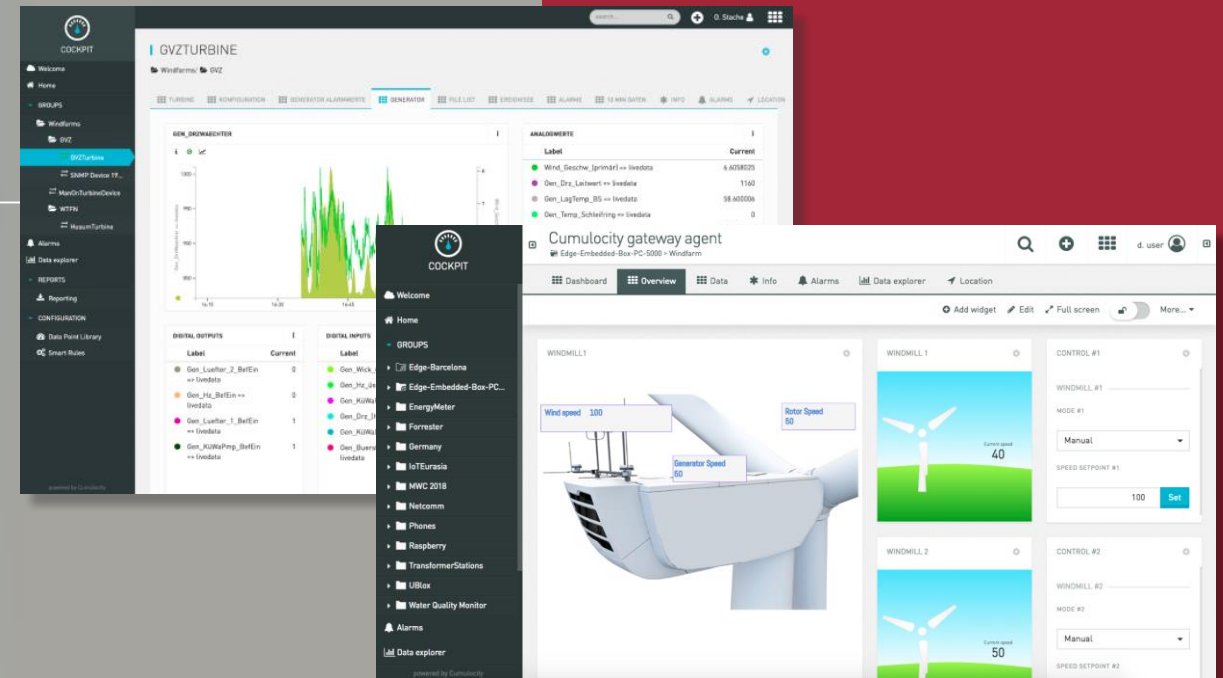
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Major Global  
Chemical Company



# 23GW Power across 5,500 Wind Turbines

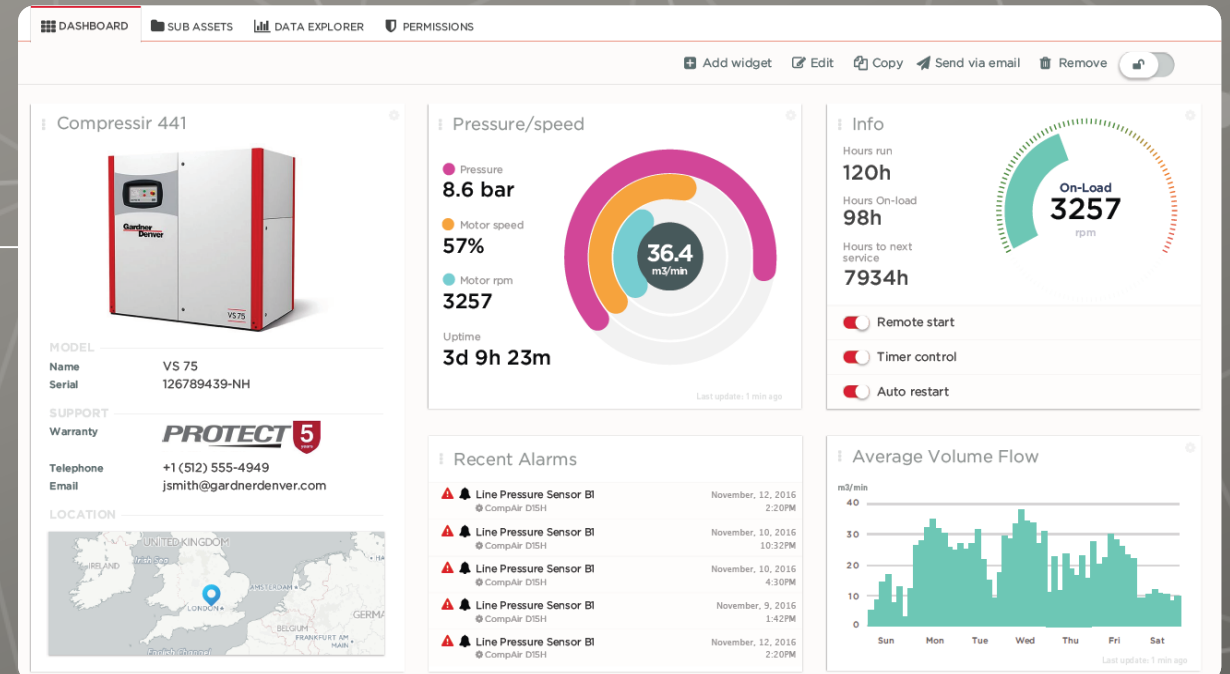
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- Autonomous operation at the edge
- Optimized efficiency of assets & data
- Simplified development, single architecture

# SMART COMPRESSORS

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# Bosch Asset Monitoring for Railway Applications (AMRA)

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# Online Motion & Vibration Analysis


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File Edit View History Bookmarks Tools Help

Demo Usecase Carmotion | Apama... Demo Usecase Elevator | Apama... +

carmotion.html Search

 **BOSCH**  
Invented for life

Car ID	Route from	Route to	Goods Category	Progress	Issue Description
Car0	Stuttgart	Paris	Grocery	<div></div>	-
Car1	Zurich	Genf	Grocery	<div></div>	-
Car2	Munich	Madrid	Grocery	<div></div>	Fatal error: Please check the goods!
Car3	Berlin	London	Trinks	<div></div>	-
Car4	Hamburg	London	Electronics	<div></div>	-
Car5	Berlin	Madrid	Audio	<div></div>	-
Car6	Berlin	Madrid	Electronics	<div></div>	-
Car7	Berlin	Genf	Trinks	<div></div>	-
Car8	Hamburg	Paris	Audio	<div></div>	-
Car9	Stuttgart	London	Electronics	<div></div>	-



[www.softwareag.com/IoT](http://www.softwareag.com/IoT)

# Connect your things and innovate your business

Cumulocity is the leading independent Device and Application Management Internet of Things (IoT) Platform since 2010. Our Internet of Things Platform connects and manages your machines effortlessly, so you can focus on your business's value adding activities.



## Connect

Connect your things over any network in minutes with a 'plug and play' approach



## Manage

Condition monitoring, real-time analytics and fully configurable dashboards



## Extend

Extend your service with easy workflow integration to your business applications

[LEARN ABOUT OUR FEATURES →](#)

Our IoT Platform is open, application centric and free-to-try which allows you to prove your end-to-end business concept quickly with a handful of things and rapidly scale your deployment to over 20 global data centres as you connect millions with telco grade reliability.

**TRY CUMULOCITY FREE**



# Thank You

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**Chris Borneman**  
**VP & CTO**

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[linkedin.com/in/chrisborneman](https://linkedin.com/in/chrisborneman)

## Backup Material for Offline Review

# Device Connectivity

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## Plug & Play with existing integrations

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

### Cloud Fieldbus

- Central, web based end-to-end integration



### LPWAN Agents



SIGFOX  
One network. A billion dreams.

NB-IoT

Connect over any IP network **without VPN**

**DEVICES**

Below is a selection of devices that are used with Connectivity. Many more Embedded Linux, POSIX or Java-compliant devices will work just as well, see below. Watch this space for more information!

Type to search devices...

<b>AirLogic™ PingPong</b> 3 integrated 10/100M hardware platform made for software developers. Fully adaptable for extension boards - Plug & Play.	<b>AirLogic™ Pico-SensorTrack</b> World smallest tracking device that can handle GPS and returns position data and send it to your cloud in real time.	<b>AirLogic™ SenseCancer</b> Industrial Wireless Sensor Gateway. A device that can be used to transport sensitive sensor data wirelessly over 20, 30 or 40 module networks.	<b>BeagleBone Black</b> Low-cost, community-supported development platform. Boot Linux in under 10 seconds.	<b>Del Edge Gateway 3000</b> Del Edge Gateways are intelligent devices designed to aggregate, secure, analyze and relay data from diverse sensors.	<b>Del Edge Gateway 5000</b> An Edge Gateway with powerful dual-core ARM® processors, connects varied wired and wireless devices and systems, aggregates and	<b>Demate Criterion TCASi</b> Wireless GPRS module with ZIGBEE support, OTA capabilities and serial.	<b>SMARTbox Mini</b> General M2M Device that provides a Modbus RTU Master Communication on RS485 for connecting up to 20 Modbus devices to Connectivity.
<b>Digi TransPort® WT1</b> Secure 3G/4G LTE cellular router for retail, back and	<b>Digi TransPort® W521</b> Compact, flexible, low-cost 3G/4G LTE M2M enterprise router.	<b>Digi TransPort® W521</b> Intelligent 4G LTE router designed for critical	<b>Dragino HS14</b> Low-cost device with embedded Linux, USB host port, full Ethernet, IEEE 802.11 b/g/n Wi-Fi plus	<b>Demate Criterion ES55/ES55x</b> Wireless GPRS module with ZIGBEE support, OTA capabilities and serial.	<b>Demate Criterion EH54</b> Wireless five-band 3G module with ZIGBEE support, OTA capabilities	<b>Sigfox</b> Sigfox provides global cellular connectivity for the Internet of Things completely independent of	

**DEVICE CONNECTIVITY & MANAGEMENT**

## Integrate new device types

### Protocols supported:

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

- Device SDK's for:

C++



- Use any environment with:



### Model-less integration

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

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



# Device Management

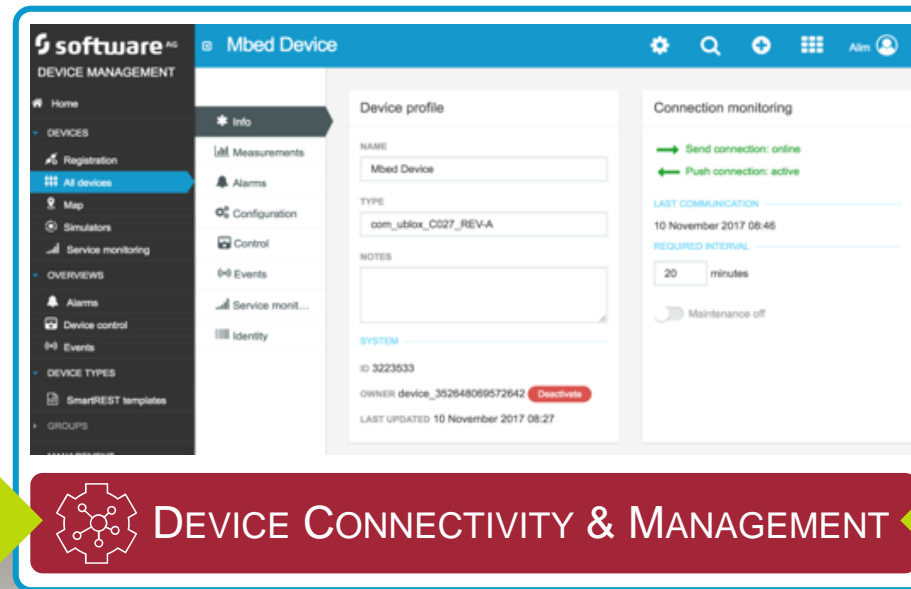
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## Device Lifecycle

- 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 CONNECTIVITY & MANAGEMENT

## 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



# Analytics

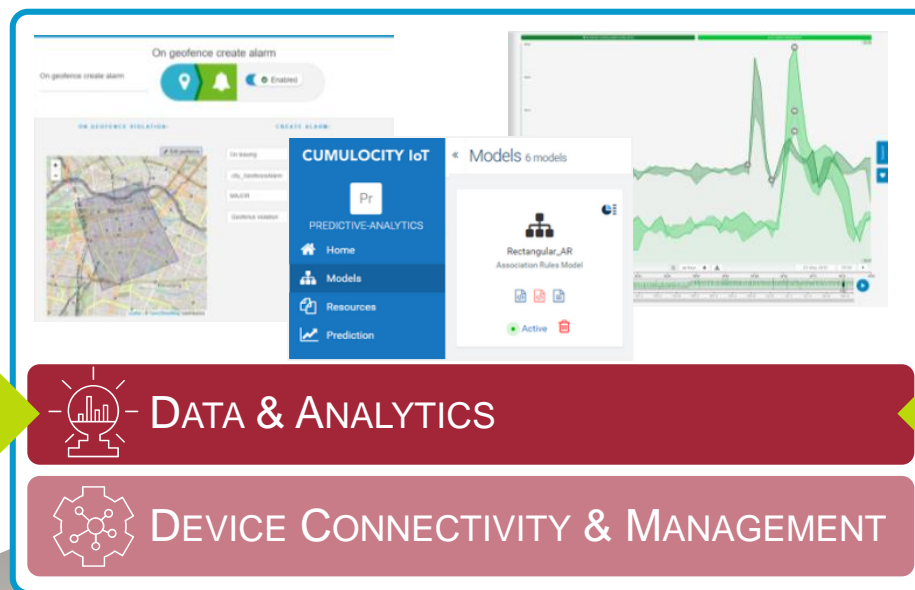
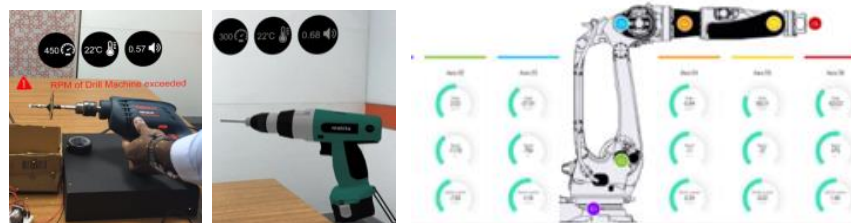
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## Streaming & Predictive Analytics

- In-memory filtering, correlation, aggregation and **pattern detection** with time and location constraints
- Operationalization and model management of **predictive models**  

- For condition monitoring, predictive maintenance, anomaly detection, etc.

## Edge Analytics

- Full support for **distributed architectures**: deploy all types of analytics in the cloud, on-premises and at the edge
- Local analytics to streamline traffic flow and increase autonomous operation



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

## Industrial Self-Service Analytics

- **Non-code**, graphical **streaming analytics environment** for domain experts
- Self-service analytics for **time series data** to analyze, monitor and predict performance of manufacturing processes
- IIoT Cockpit & SCADA visualization
- **Digital Twins & Augmented Reality**
- Interactive business-focused mashup dashboards with responsive design

## Batch Analytics

- Rich data manipulation and discovery through **simple and concise interface**
- Combine and **easily query complicated source data** with nested structures and mixed types
- Connect with any BI tool, Python, R, or SQL (no data replication)



# Data Management

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## Proven IoT Data Model

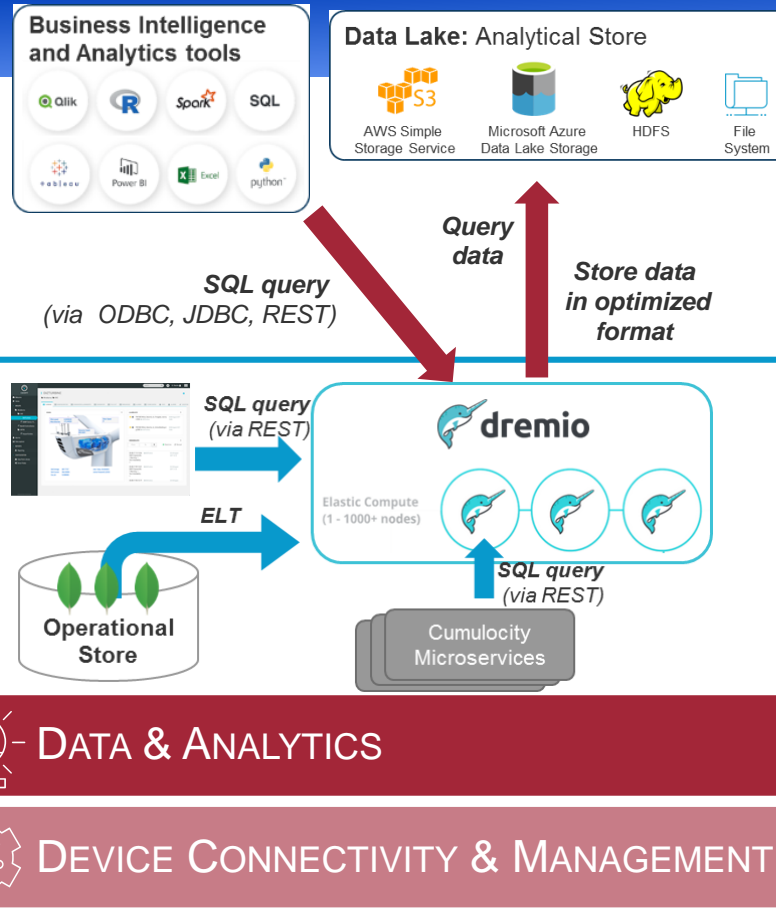
- Built-in extensible IoT data model refined and proven over the last 7 years
- Pre-defined **hierarchical data models** purpose-built for IIoT use cases

## Plug & Play Device Integration

- **Native device model mapping** for multiple protocols
- Support for (brownfield) **fieldbus connectivity** through Cloud Fieldbus
- **Data normalization** support to simplify application and model development

## Operational Data Store

- **Elastically scalable data store** based on MongoDB
- Full **data isolation** on tenant level and configurable **data retention policies**



## Analytical Data Store

- Batch analytics service to efficiently store and compress raw data in Parquet files
- **Long-term archiving** of raw data for the entire platform in data lake of your choice and **enrichment** with other data sources
- Out-of-the-box integration with Business Intelligence tools and machine learning frameworks to visualize/analyze the data
- **In-memory data** platform for caching and storage

## API Gateway

- Secure data access, enforce security policy, and data transformations for **data trust** (available cloud & on-premises)
- Secure device endpoints for **device trust** (identity, integrity) at edge (roadmap)

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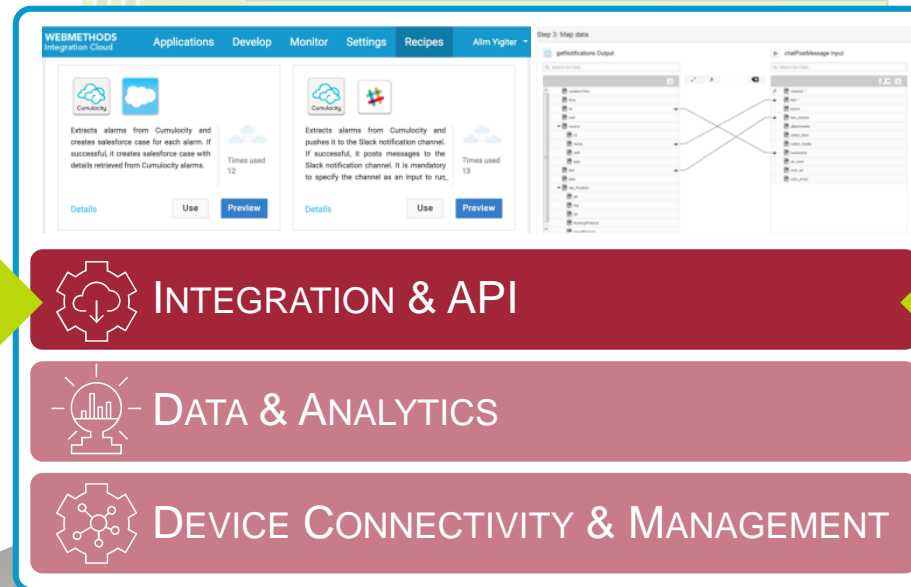
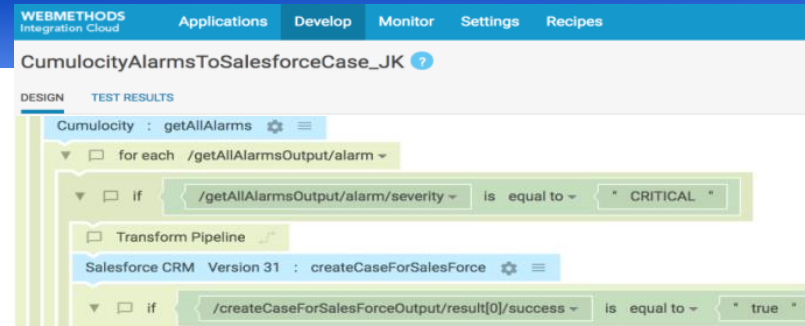


# Integration & API

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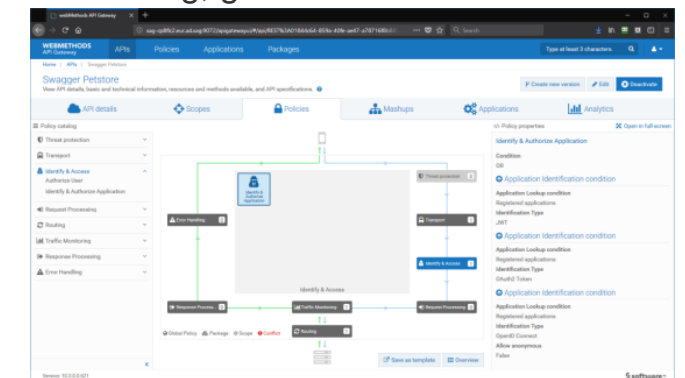
## Hybrid Integration

- Easily integrate *device data* with **Enterprise Apps, Cloud Apps, Big Data Apps, Data Lakes** and **3<sup>rd</sup> Party Ecosystems**
- **170+ adapters:** SAP, Oracle, Siebel, Salesforce, MS Dynamics, AWS S3, ...
- Start **automated actions based on IoT events** (e.g. remedy actions, kick off smart contracts, send technician out)
- Manipulate data with **graphical mapping** & convert it into other formats
- **Pre-built connectors and recipes** to accelerate common integration tasks



## API Management

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



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

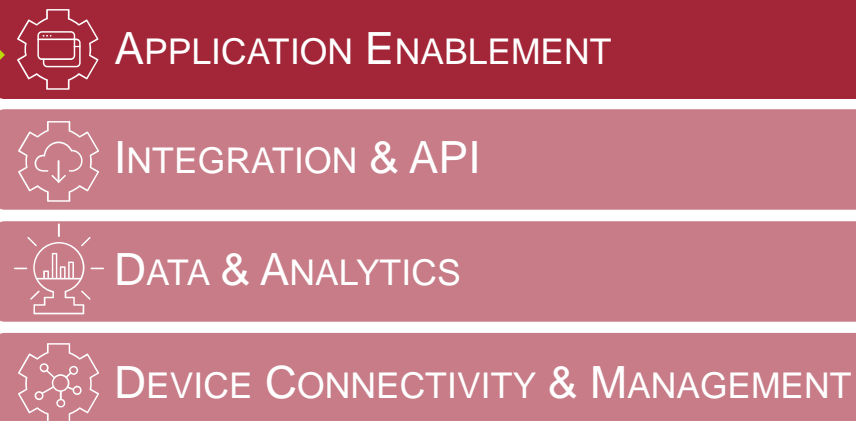
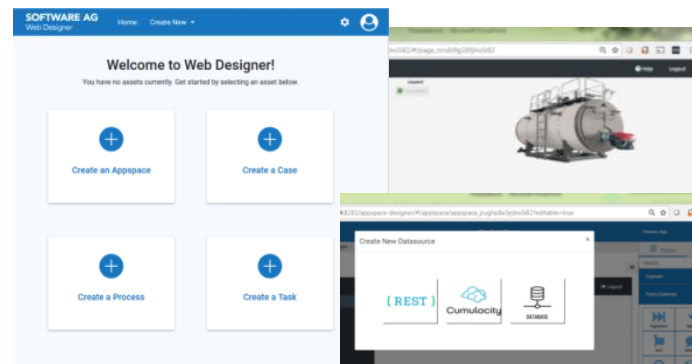


# Process Automation & Application Enablement

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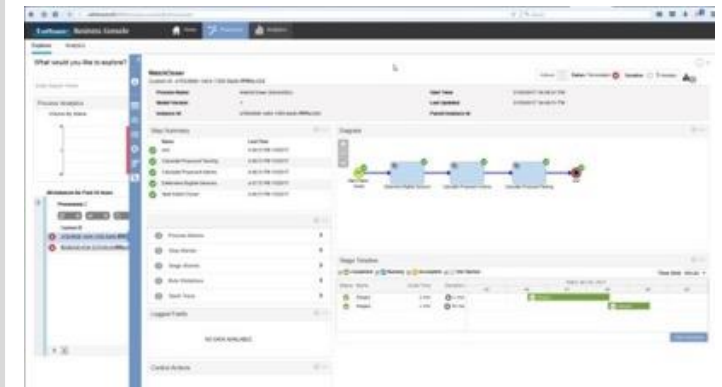
## High-Productivity App Development

- **Low Code Apps:** New drag & drop web designer provides assembly capabilities for applications by leveraging task, process, case and UI logic
- Templates for IoT and workflow apps like incident management use cases
- Pre-built integration with Cumulocity IoT



## High-Control App Development

- **Dynamic Processes:** Insert & change processes “on the fly” including in-flight tasks, steps and sub-processes



- **Microservice SDK & Hosting:** Add and run self-developed functionality easily



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



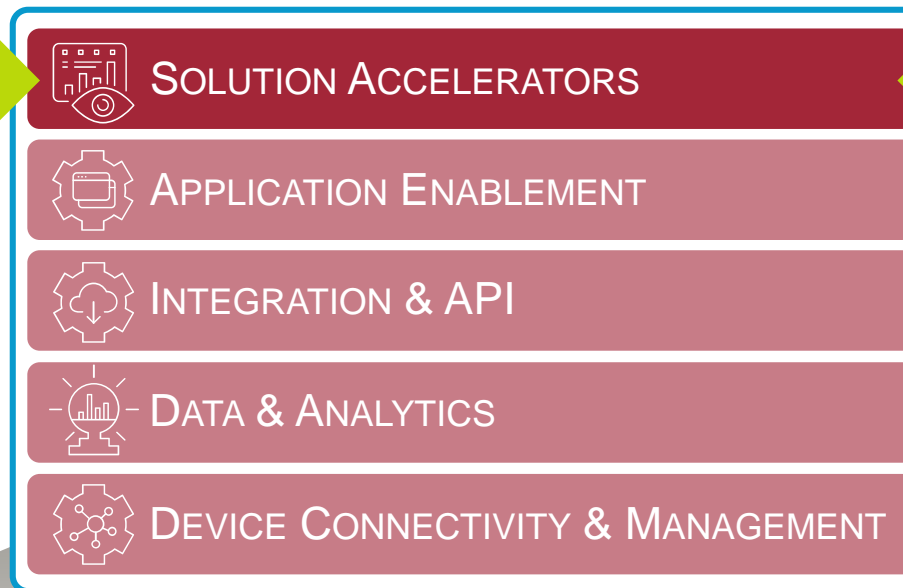
# Solution Accelerators

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## Pre-packed features, plugins and configurations

Simplifies, speeds & 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



## Starter kits for various use cases & industries



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

