IBM Watson IoT

IBM Watson IoT Portfolio

A quick look at our Toolbox for IoT

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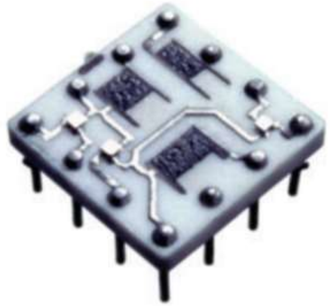
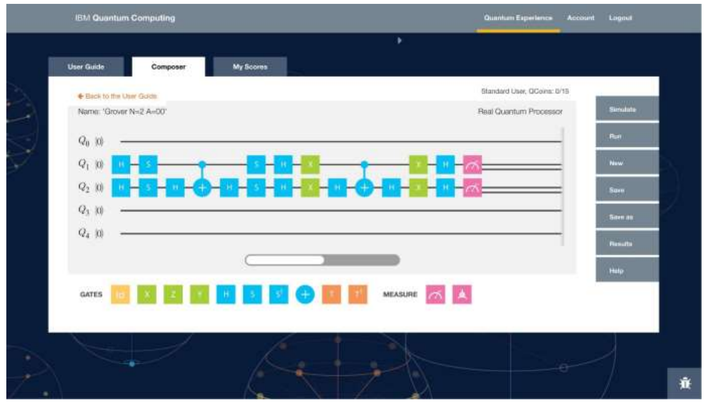
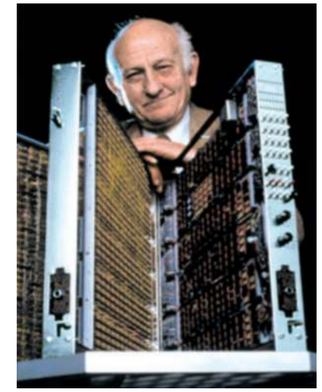
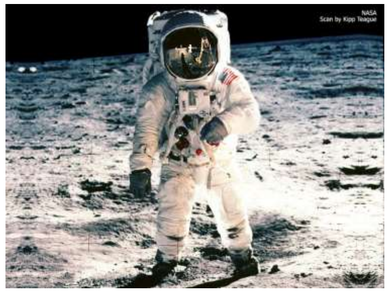
IBM

IBM’s contribution to the World

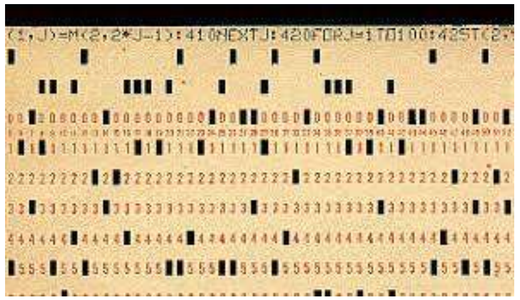


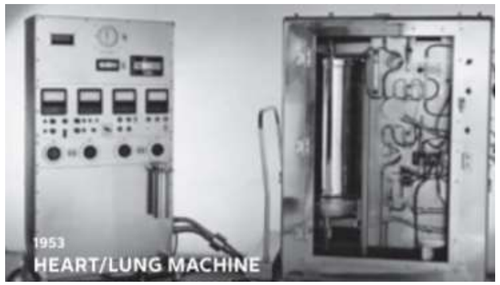


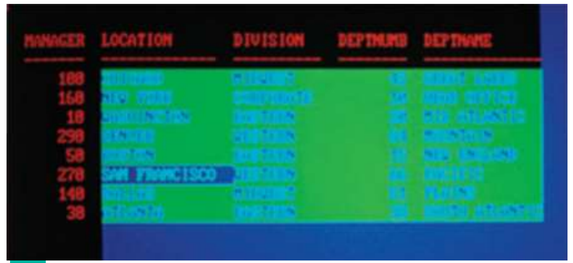




eBusiness







IBM contributions to Open Source: 18 years & counting

1999 - 2001

- IBM forms Linux Technology Center
- Leads Apache projects Xerces, Xalan, SOAP
- Starts ICU project
- Creates OSI-approved IBM Public License
- Strategic participation in Mozilla
- IBM becomes founding member of OSDL
- Founder of Eclipse.org *& Eclipse Consortium*
- Creates internal bazaar using OSS methodology

2002 - 2005

- Linux contributions to scalability (8-way+), reliability (stress testing, defect mgmt, doc)
- Leads Apache projects in Web Services
- Leads Eclipse projects GEF (editing), EMF (modeling), XSD/UML2 (XML Schema), Hyades (testing), Visual Editor, AspectJ, Equinox (OSGi bundles)
- *Eclipse Foundation, Inc.* becomes independent
- Pledged 500 patents to open source
- Starts Apache Derby database, supports Geronimo app server

2006 - 2009

- Contributions for Linux on Power, usability, security certifications
- Leads Apache projects Tuscany (SCA standard), OpenJPA, UIMA
- Contributes to Eclipse Higgins
- Partners with Zend PHP
- Accessibility code to Firefox
- IBM starts OpenAjax Alliance and joins Dojo Foundation
- IBM joins OpenOffice.org & creates ODF Toolkit Union
- IBM joins Open Health Tools, merging code from Eclipse OHF
- Contributes to Mozilla Bespin (web editor) & WebKit (browser engine)
- Lead Apache Aries (OSGi Enterprise)

2010 - current

- Linux contributions to kvm, oVirt, & support Open Virtualization Alliance
- Contributes to Apache Shindig
- Supports Apache Hadoop (Big Data) – part of IBM BigInsights
- Eclipse: Orion (web-based tooling), Lyo (OSLC), Paho (M2M protocols)
- Announces OpenJDK involvement
- Contributes to Apache Cordova (fka PhoneGap) (mobile app framework)
- Starts Dojo Maqetta (RIA tooling)
- Leads Apache OpenOffice
- OpenStack: platinum sponsor of independent Foundation; over 140 contributors
- Increase OSS projects & visibility at JazzHub and GitHub
- Contributes to Cloud Foundry

More than 1000 IBM developers involved in OSS projects

IBM leads 80+ OSS projects

IBM contributes to 150+ OSS projects

https://developer.ibm.com/code/openprojects/

IBM Watson IoT Platform

Make sense of data to optimize operations, manage assets, rethink products and services, and transform customer experience.

Connect

Connect and manage devices, networks and gateways.

Analytics

Gain insights from information using real-time streaming as well as machine learning and cognitive analytics in the cloud and at the edge.

Risk Management

Visualize the IoT landscape, manage risk, and build trusted sources of IoT data with innovative technology such as blockchain.

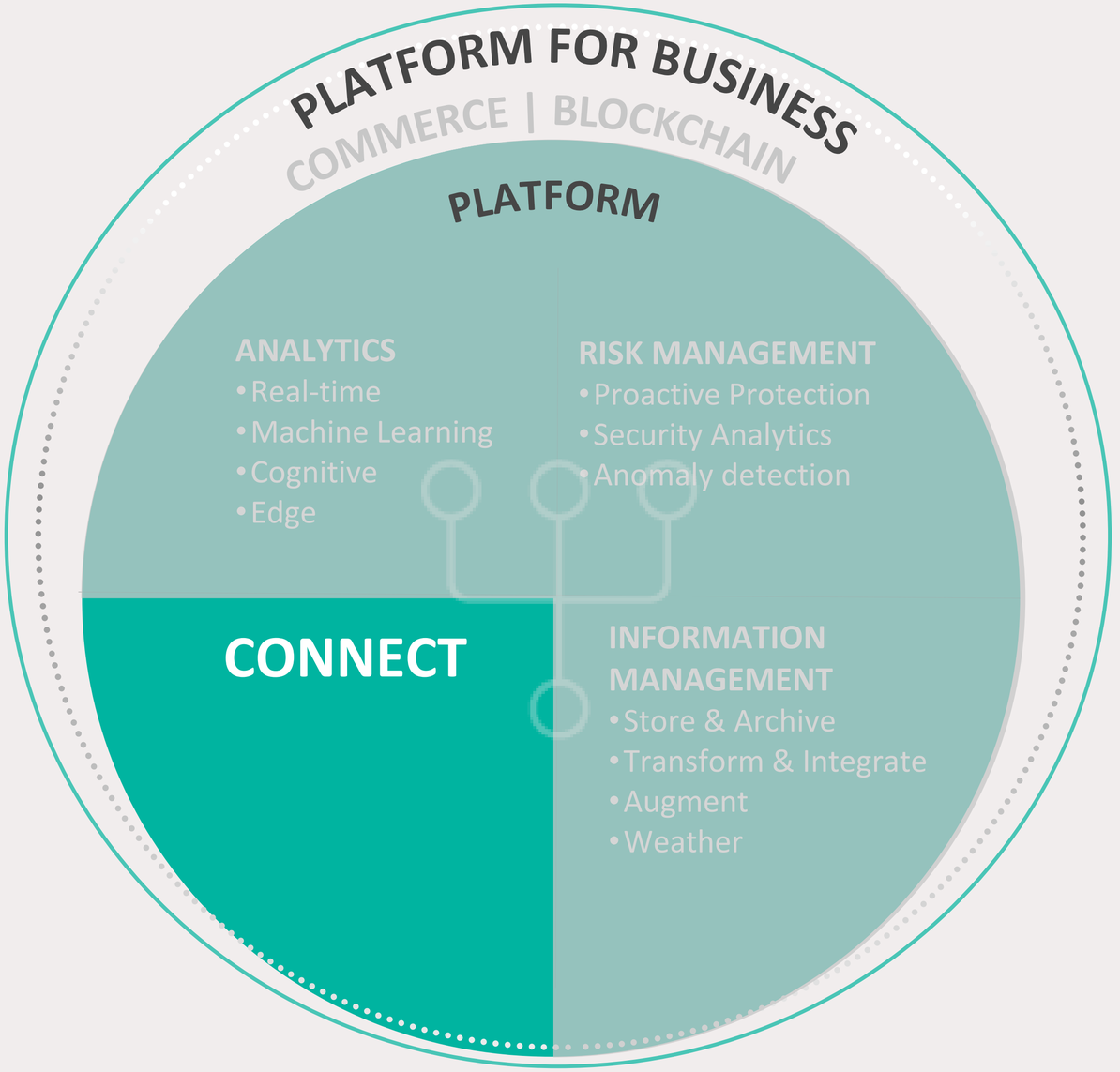
Information Management

Integrate information, structured and unstructured, from devices, people, the weather and the world around us.

IBM Watson IoT Platform Connect

Connect your devices, equipment, and workforce to gain a new level of insight into your business

- Secure Connectivity
- Device Management
- Visualization



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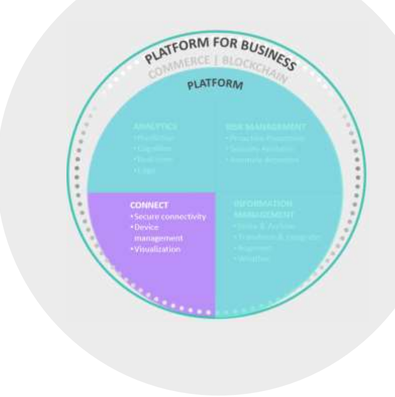
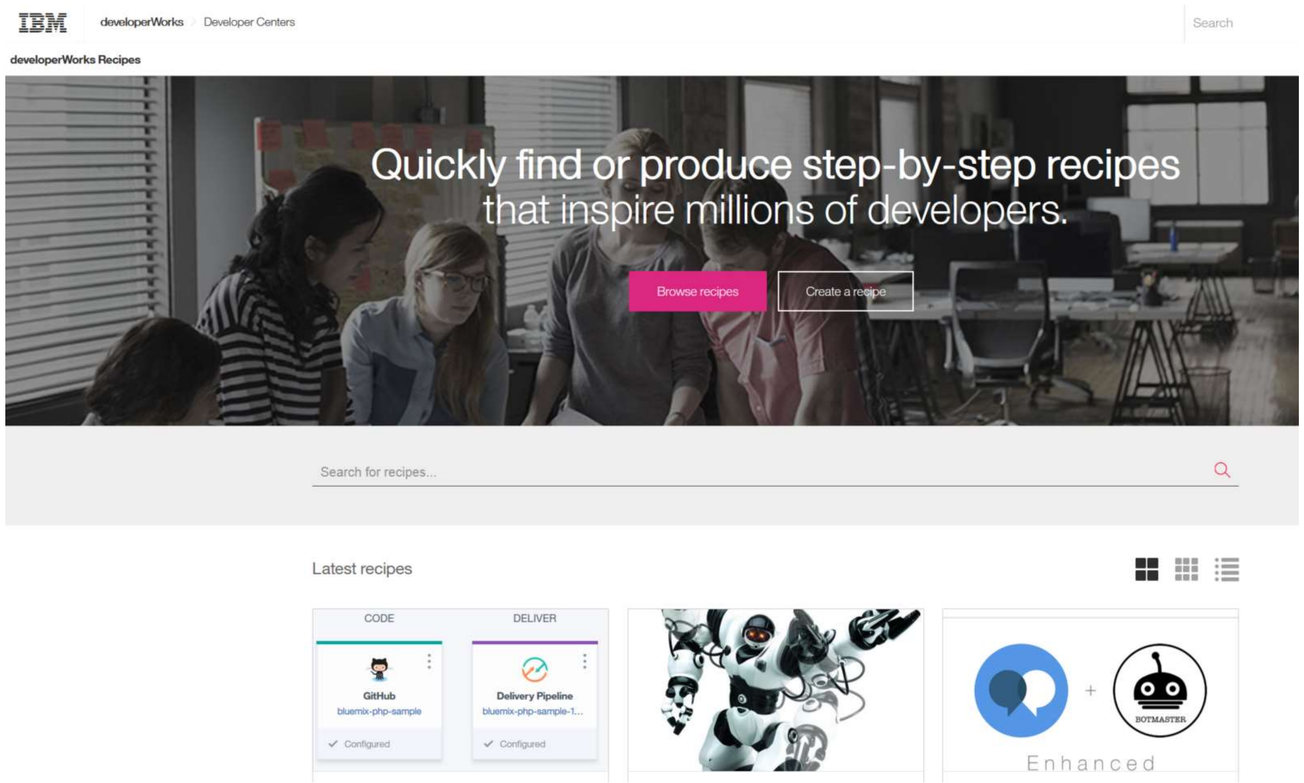
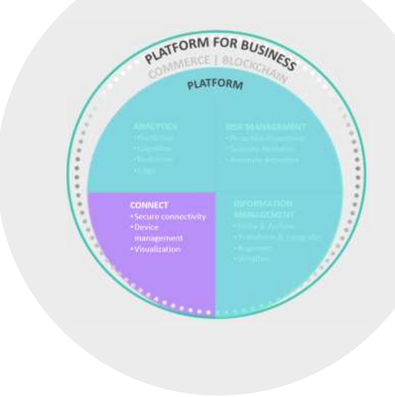
IBM Watson IoT Platform -
Connect and manage your IoT devices & gateways



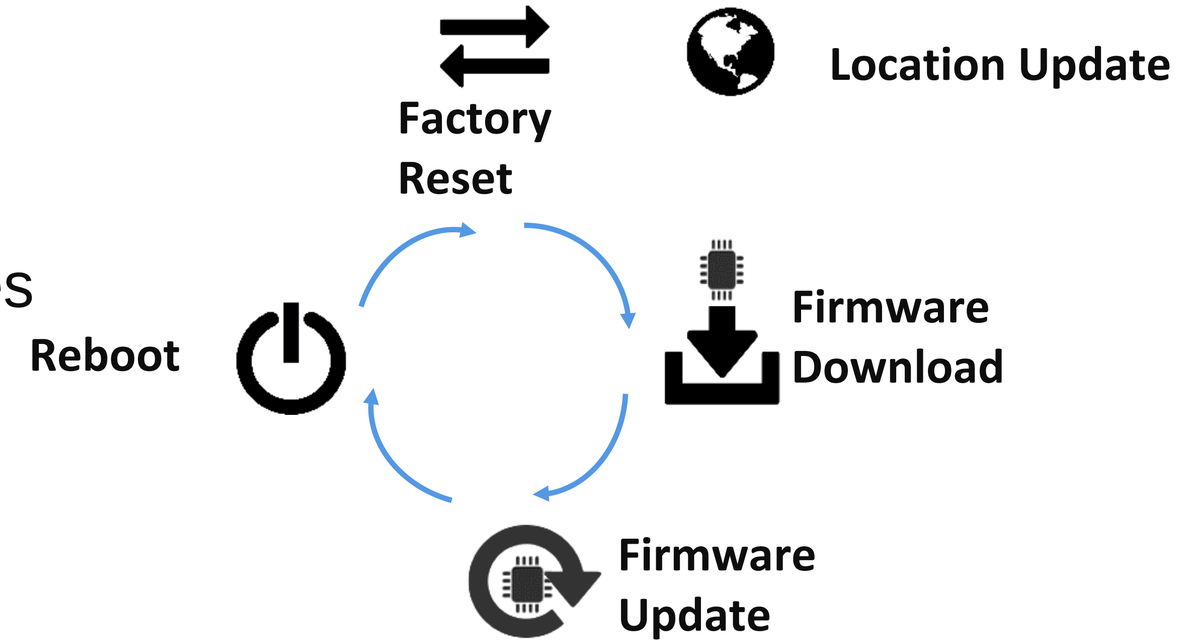


- Open standards based communications (MQTT, HTTPS)
- Secure communication (TLS)
- Globally scalable starting with a single device
- Fully integrated Gateway support
- Broad and growing device ecosystem

IBM Watson IoT Platform – Integrated device management



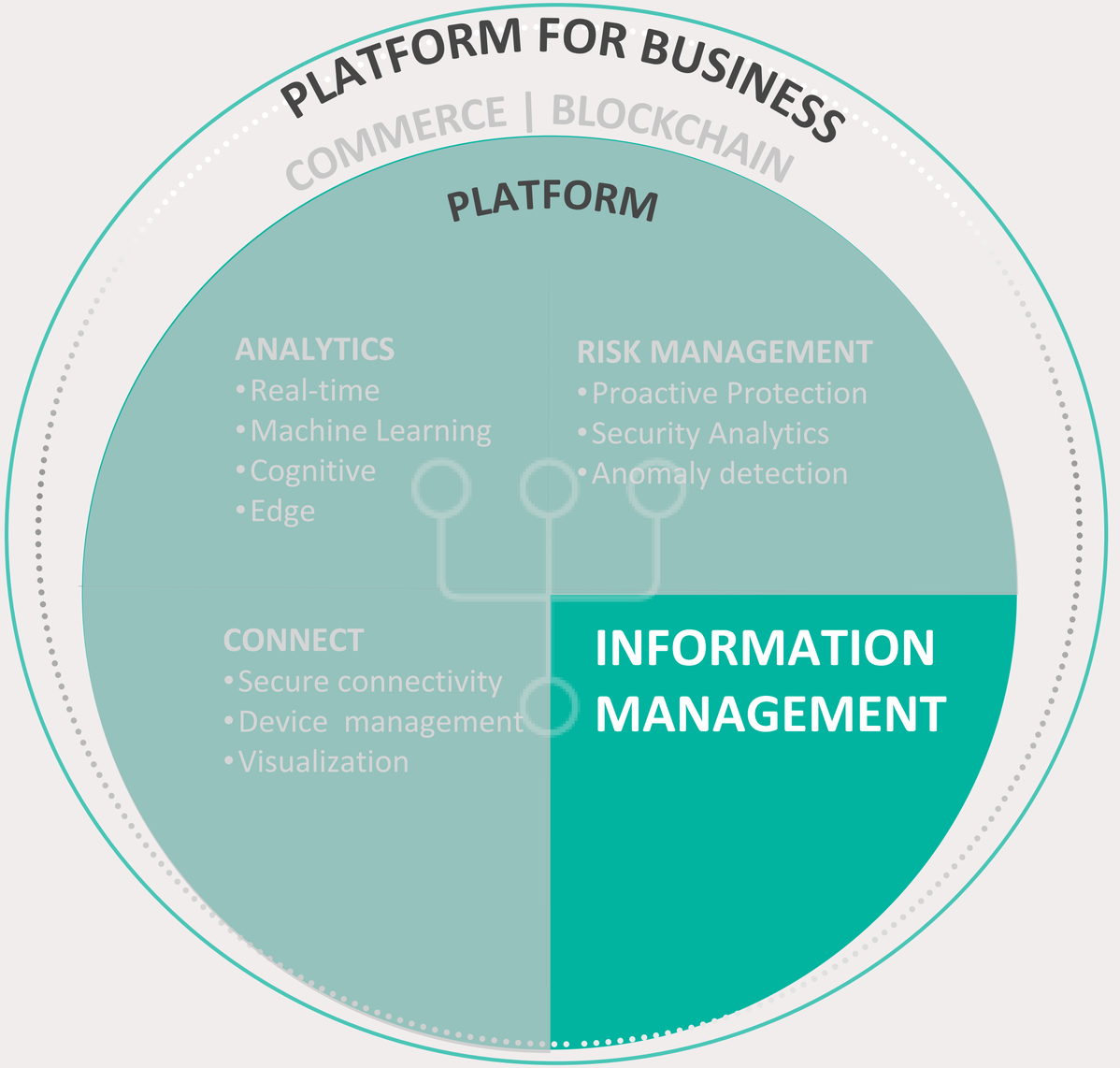
- Manage via dashboard or programmatic APIs
- Action device management functions on thousands of devices at a time
- Create your own custom device management commands



IBM Watson IoT Platform Information Management

Identify, aggregate, and transform data from your IoT sources into asset-based data structures.

- Store and Archive
- Transform and Integrate
- Augment with Weather & Unstructured data



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Information Management

- **Built in last event cache**
  Always have access to the last reading whether device is on or offline

- **Fully managed NoSQL JSON document store** built for high integrity and high performance

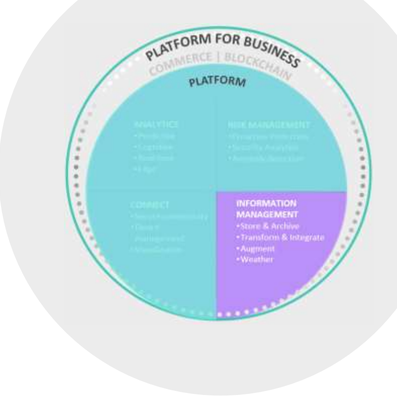
- **Internet scale buffering** between the IoT Platform and your chosen storage service, with bridge to other Bluemix services, such as IBM Object Store

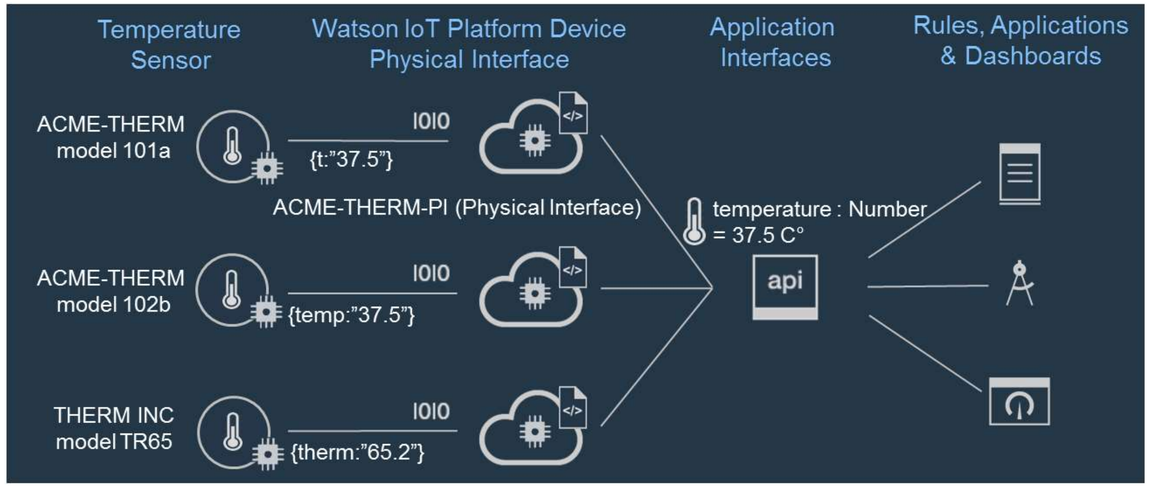
IBM **Cloudant®**

IBM **Message Hub®**

Built on **Apache** kafka

Information Management – New Services Capabilities





Device Abstraction

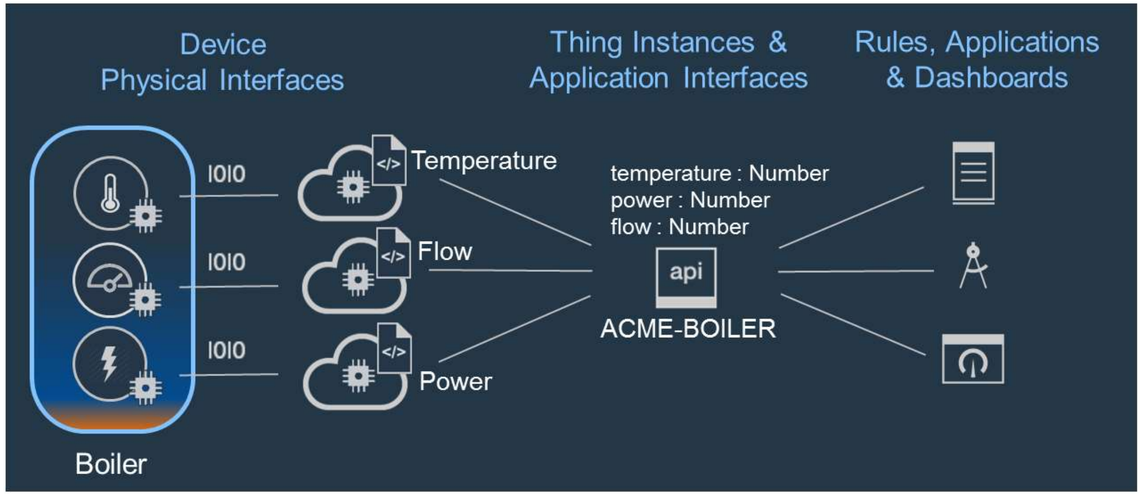
Define your own APIs to insulate applications from variability across device types, sensor models, variants and versions

Example: Different models and brands of temperature sensor represented by a single common API

Aggregation into Things

Aggregate multiple devices into logical objects so they can be managed as a single Thing

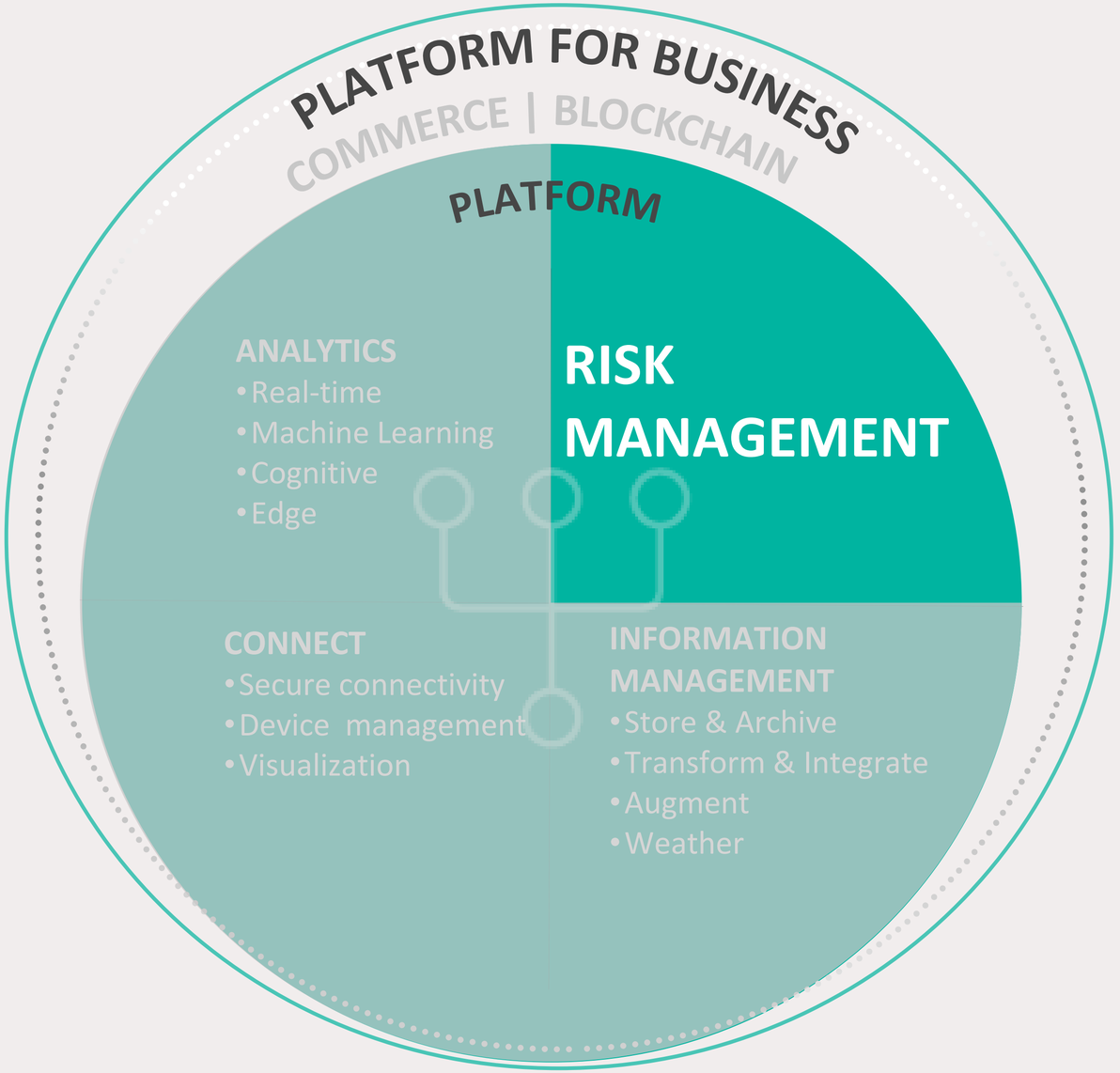
Example: Several different sensors represented as a single boiler object



IBM Watson IoT Platform
Risk Management

Manage risk and gather insights across your entire IoT landscape.

- Proactive Protection
- Security Analytics
- Anomaly Detection



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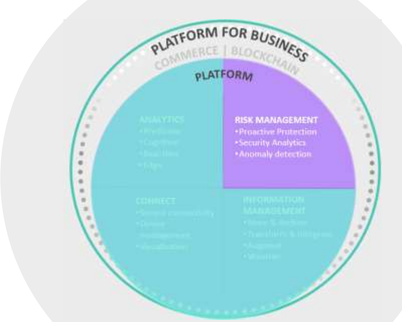
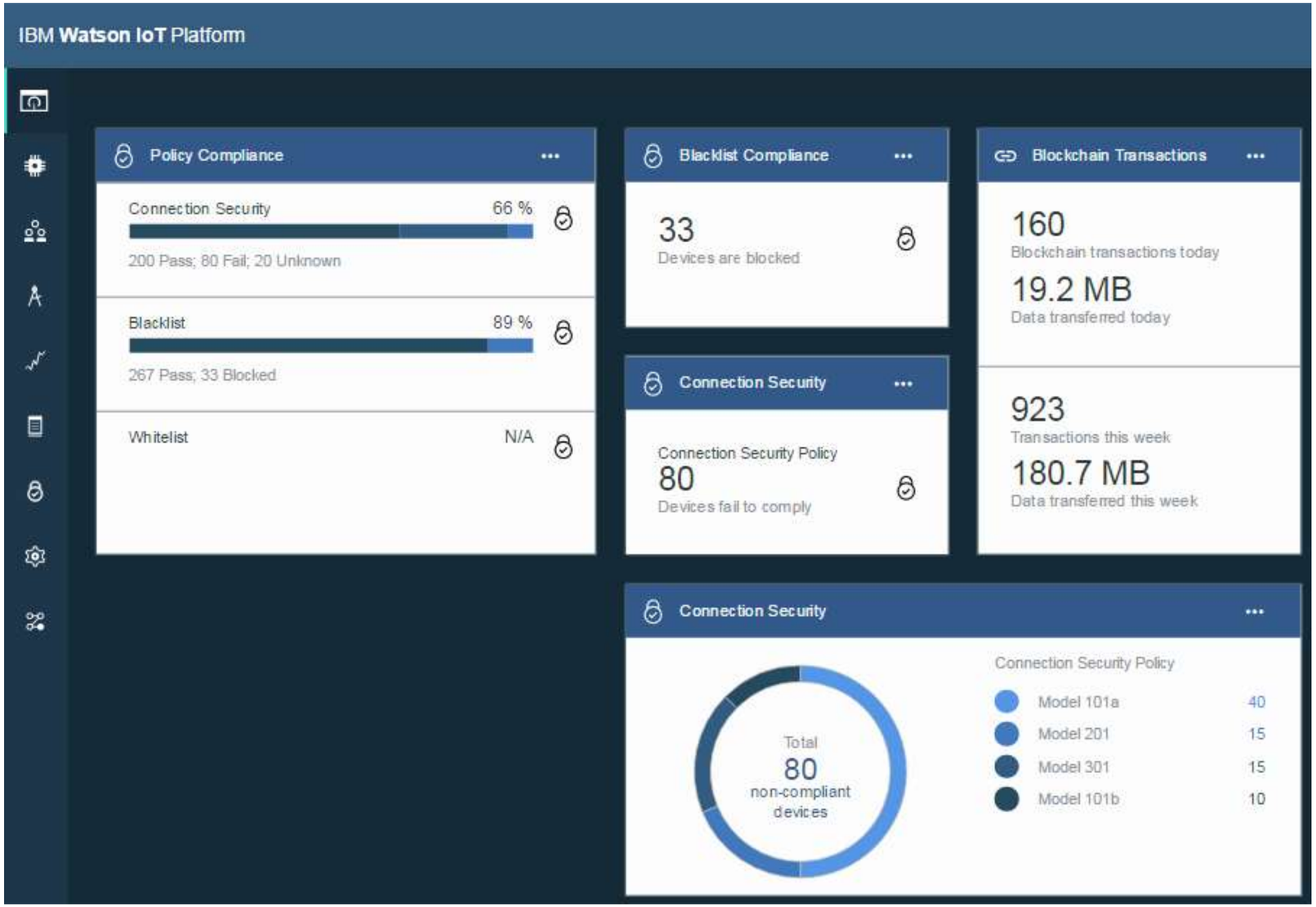
Risk Management & Policy Dashboard

Your single perspective on IoT risk exposure



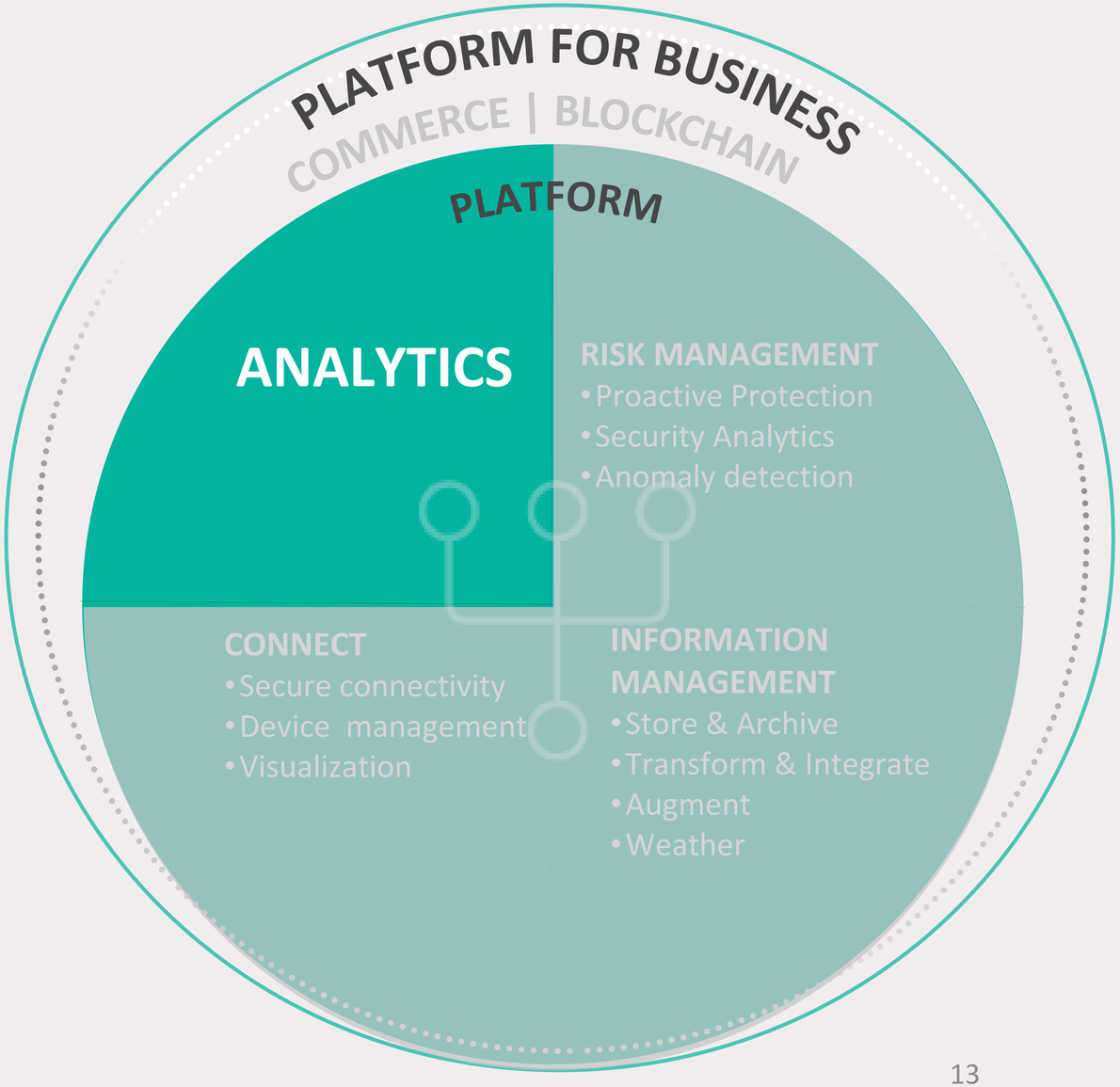


- Implement and accumulate reusable checks to identify device compromise and malicious events
- Protect against threats to the IoT environment with blacklists, whitelists and device behaviour thresholds
- Maintain platform resilience by acting on alerts automatically

IBM Watson IoT Platform Analytics

Leverage a host of cutting edge cognitive tools to gain a deeper understanding of your structured and unstructured data.

- Real-time
- Machine Learning
- Cognitive – Natural Language, Text, Video and Image Analytics, Machine Learning
- Edge



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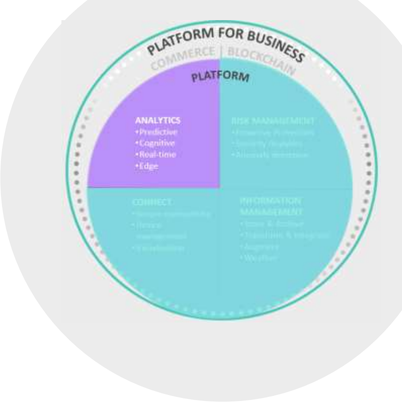
IBM Watson IoT Platform - Analytics



Real-time Analytics

- Rule-based analytics and actions built in to the platform
- Easy to use interfaces that drive automation of prescribed actions

Machine Learning

- Integrated IBM Predictive Maintenance and Quality and Watson Machine Learning services
- Visibility of usage and operating conditions based on environment
- Analysis of device data using IBM Data Science Experience to build custom analytics for your assets

Cognitive

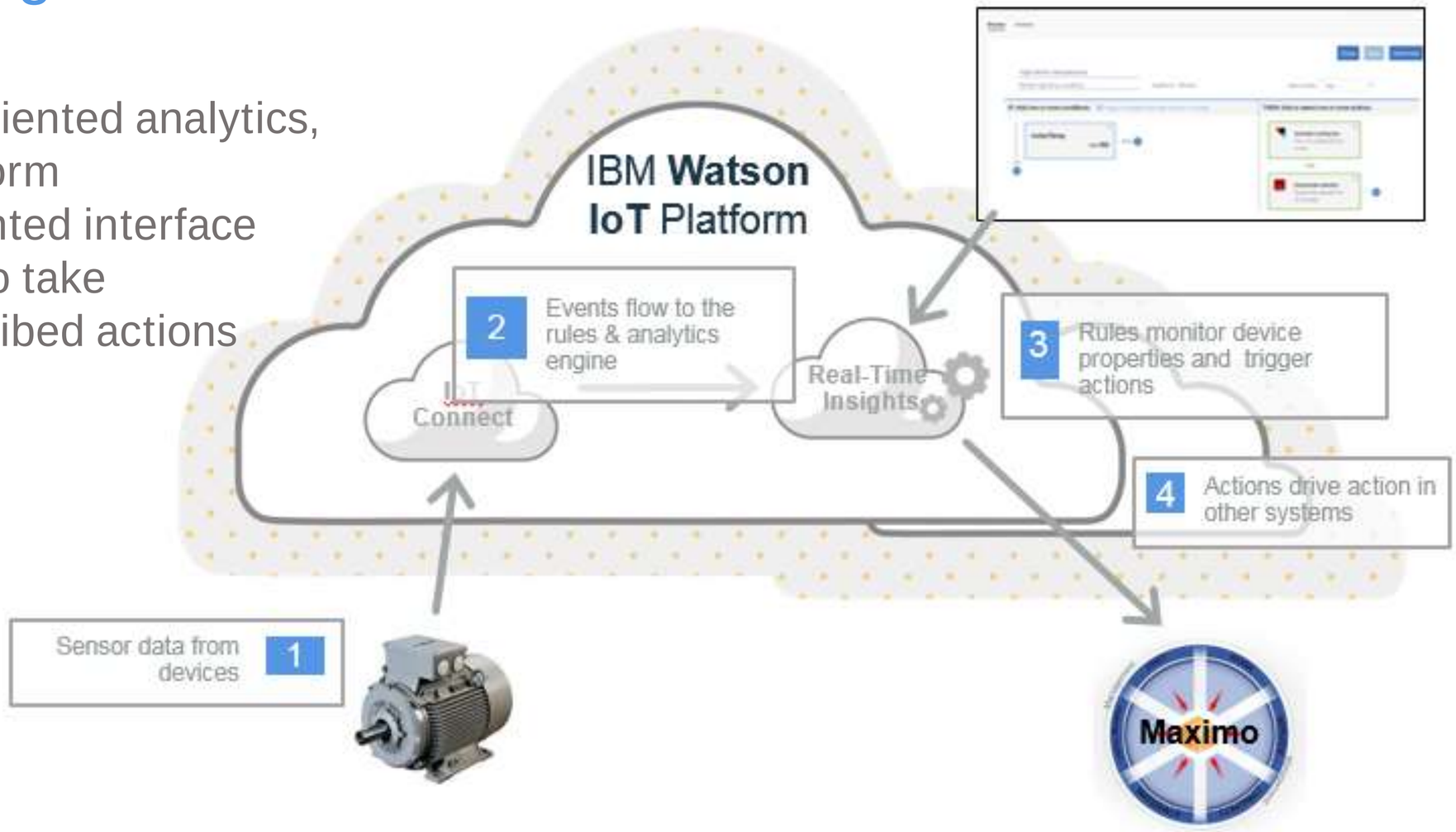
- Watson API families allow easy integration of cognitive analytics into IoT apps
- Natural human interaction, learning from historical data, analysis of image and contextual data sources, analytics, and insights

Edge Analytics

- Single click deploy of RTI rules from Cloud to Edge
- Open SDK extending gateway choice

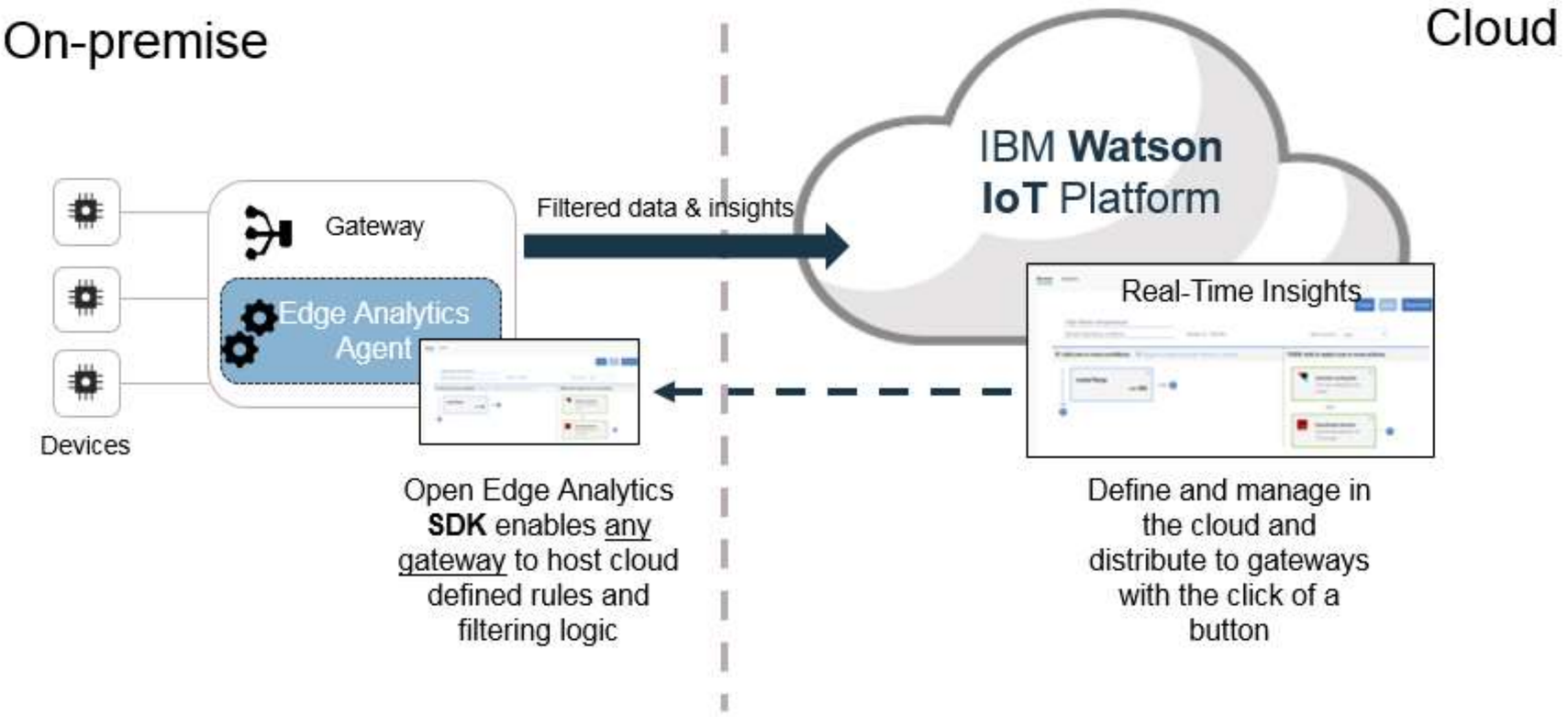
Watson IoT Platform Analytics: Real-Time Insights

- Rules and action oriented analytics, built in to the platform
- Business user oriented interface
- Drive automation to take appropriate, prescribed actions



Watson IoT Platform: Edge Analytics
Reduce data feeds, make local decisions, work disconnected

- Single click deploy of RTI rules from cloud to Edge
- New open SDK extending gateway choice



How is IBM Watson IoT Platform different?

Enterprise-ready components to connect, secure, provide data insight, assemble and manage IoT Applications

Industry Leading Analytics

- Watson-inside – machine learning and cognitive
- Industry models – deep, industry-specific analytics models
- Third party data sources – leading the industry at partnering with outside data providers (e.g. Weather Company)
- Industry Integrations – easily push and pull data from leading industry solutions, both IBM's and its partners'

The Weather Company APIs and data

IoT Platform integrated with Blockchain

Unmatched Scale and Scope

- Global data centers – 40+ data centers across the globe
- Low latency and high throughput at enterprise scale
- Hybrid delivery form factors… public cloud, dedicated cloud, on premise
- Bluemix and Softlayer – built to work on IBM's core cloud offerings but also deliver the transactional scale required by the new world of IoT

Most Trusted IoT Platform

- Device neutral – IBM does not compete with its sensor, gateway, network, and processor partners
- Built on open standards
- Data neutral – IBM's business model does not depend on owning its customer's data
- Privacy protection and access control
- Platform of Platforms – IBM is committed to integrating with other leading platforms so customers are not forced to chose proprietary tech stacks
- IoT specific security – security micro-services built specifically for IoT-based solutions

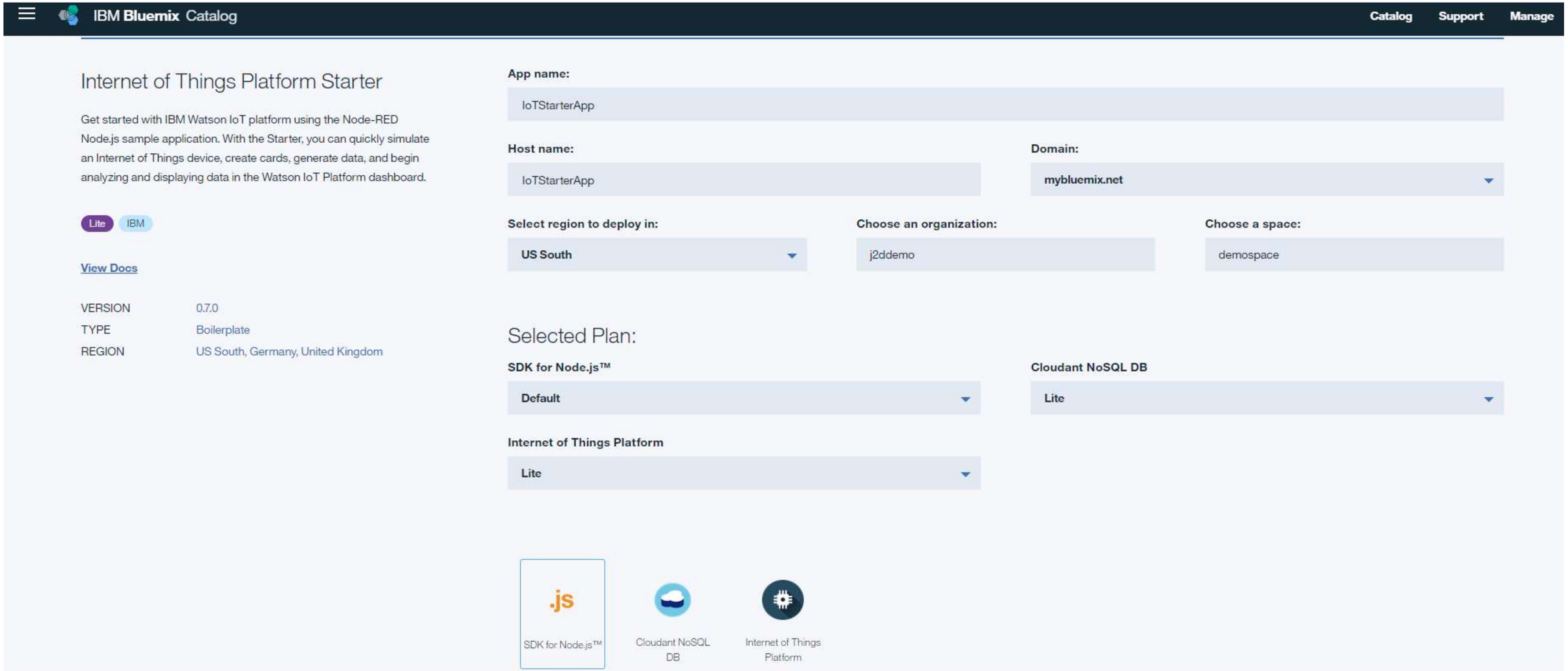
A brief Platform Showcase

Example 1 – Turn your Mobile into an IoT device

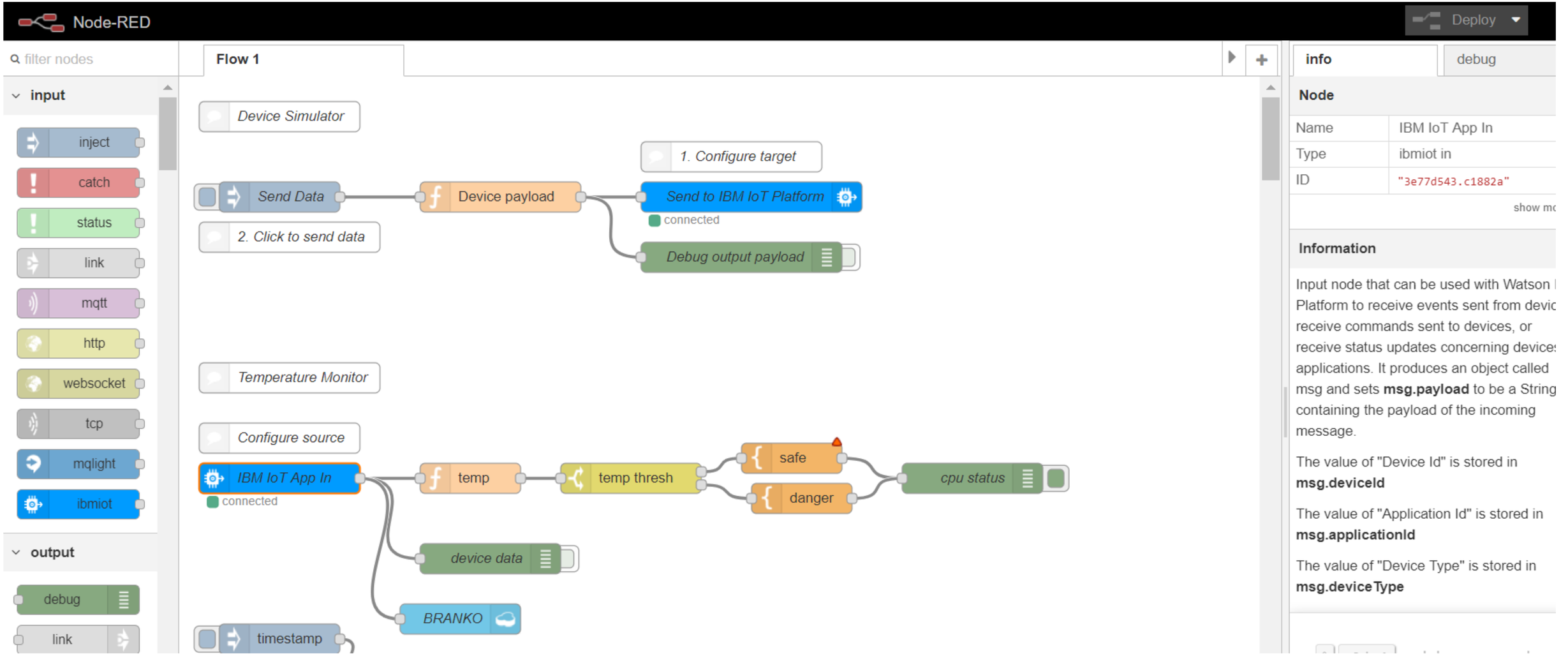
http://discover-iot.eu-gb.mybluemix.net/#/play

IoT Platform Starter on Bluemix

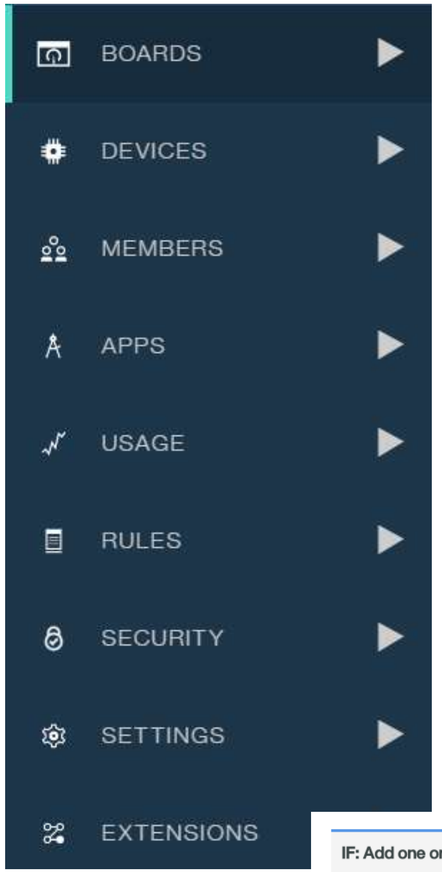
IoT Platform Starter Boilerplate

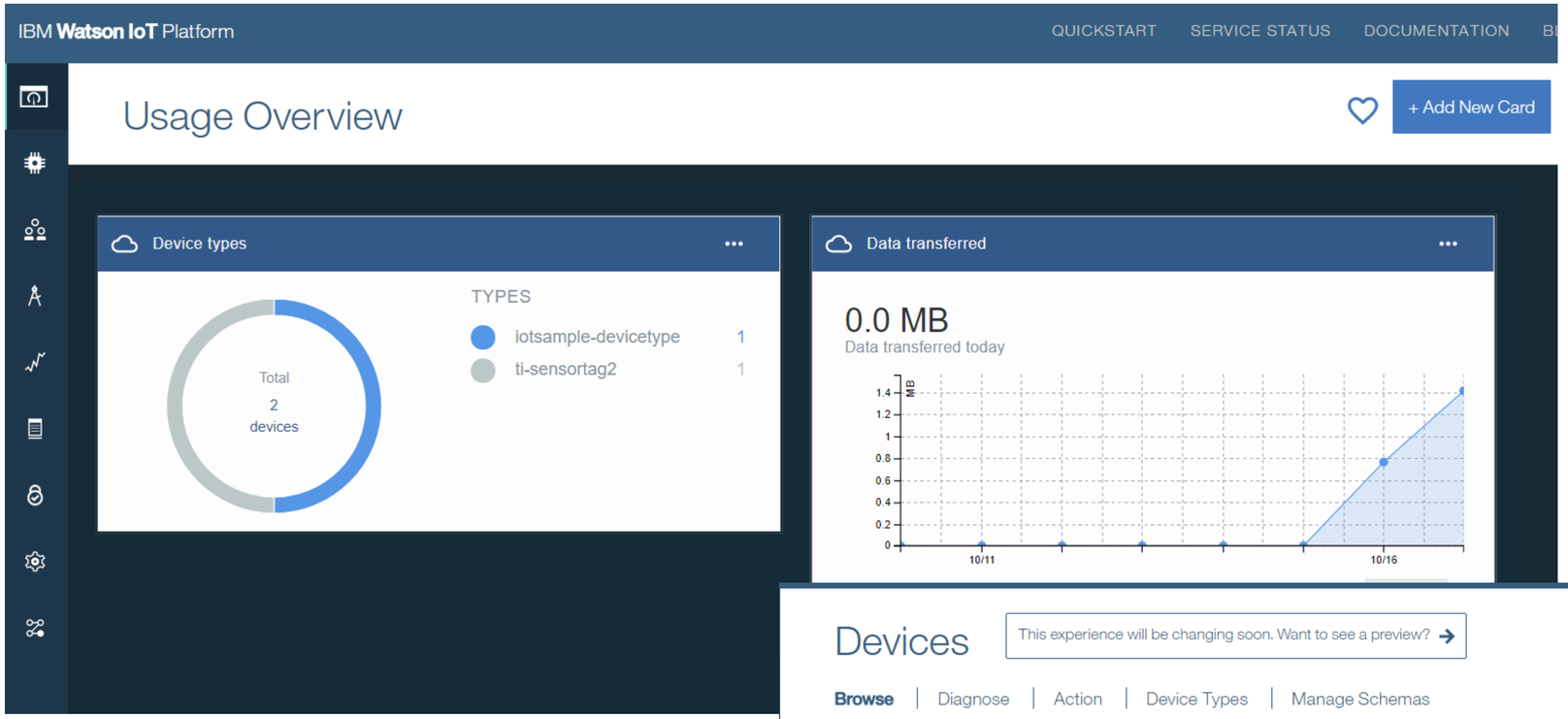


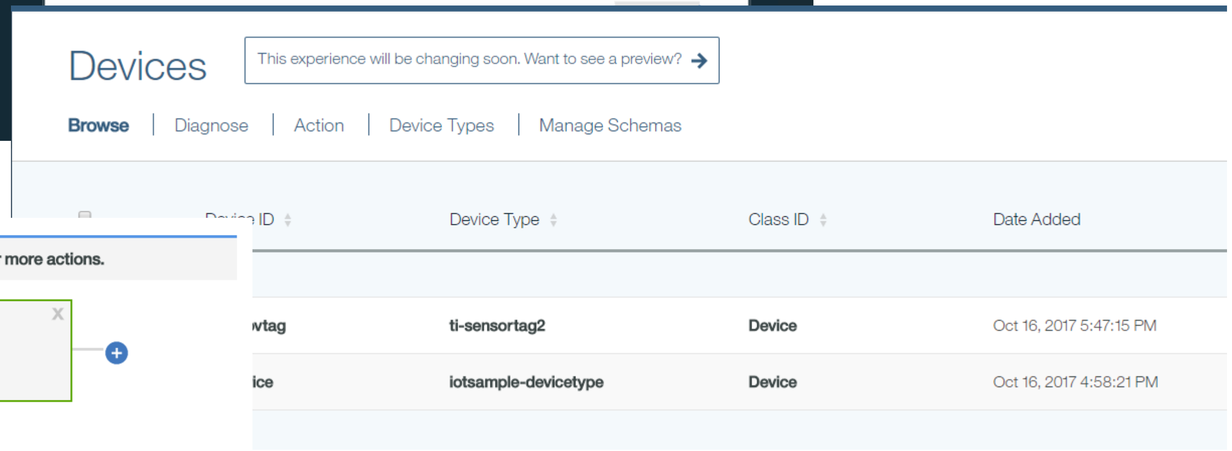
NodeRed

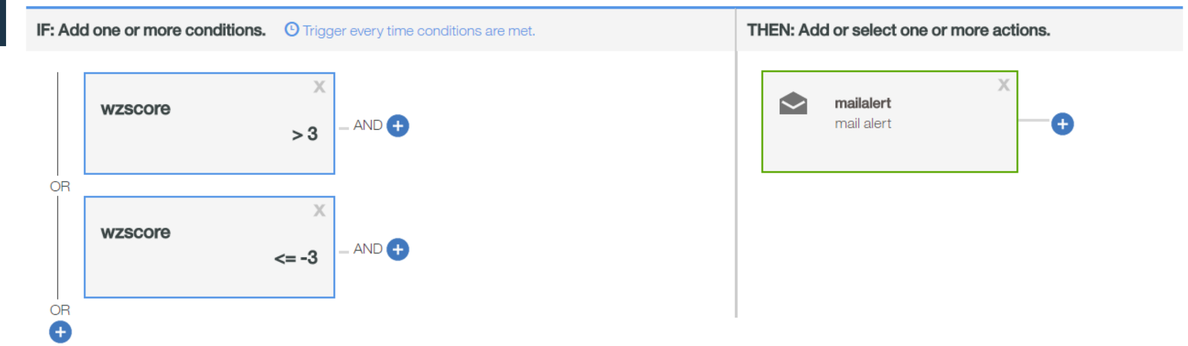

Node-RED
Deploy
filter nodes
Flow 1
input
inject
catch
status
link
mqtt
http
websocket
tcp
mqlight
ibmiot
output
debug
link
Device Simulator
1. Configure target
Send Data
Device payload
Send to IBM IoT Platform
connected
2. Click to send data
Debug output payload
Temperature Monitor
Configure source
IBM IoT App In
connected
temp
temp thresh
safe
danger
cpu status
device data
BRANKO
timestamp
info
debug
Node
Name
IBM IoT App In
Type
ibmiot in
ID
"3e77d543.c1882a"
show mo
Information
Input node that can be used with Watson I
Platform to receive events sent from devic
receive commands sent to devices, or
receive status updates concerning devices
applications. It produces an object called
msg and sets msg.payload to be a String
containing the payload of the incoming
message.
The value of "Device Id" is stored in
msg.deviceId
The value of "Application Id" is stored in
msg.applicationId
The value of "Device Type" is stored in
msg.deviceType

Management Portal

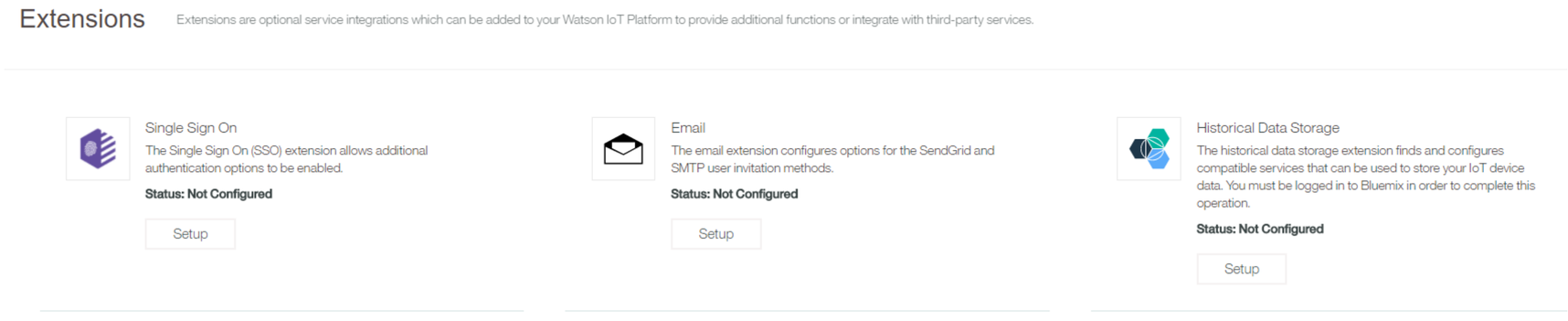


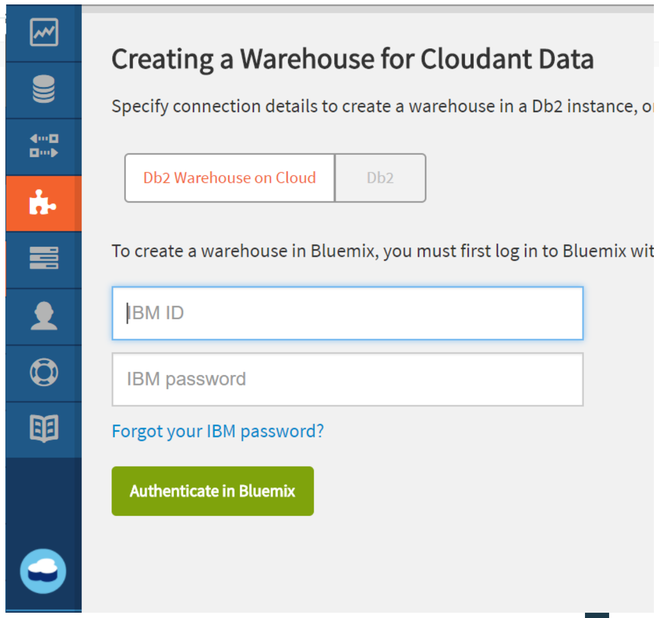


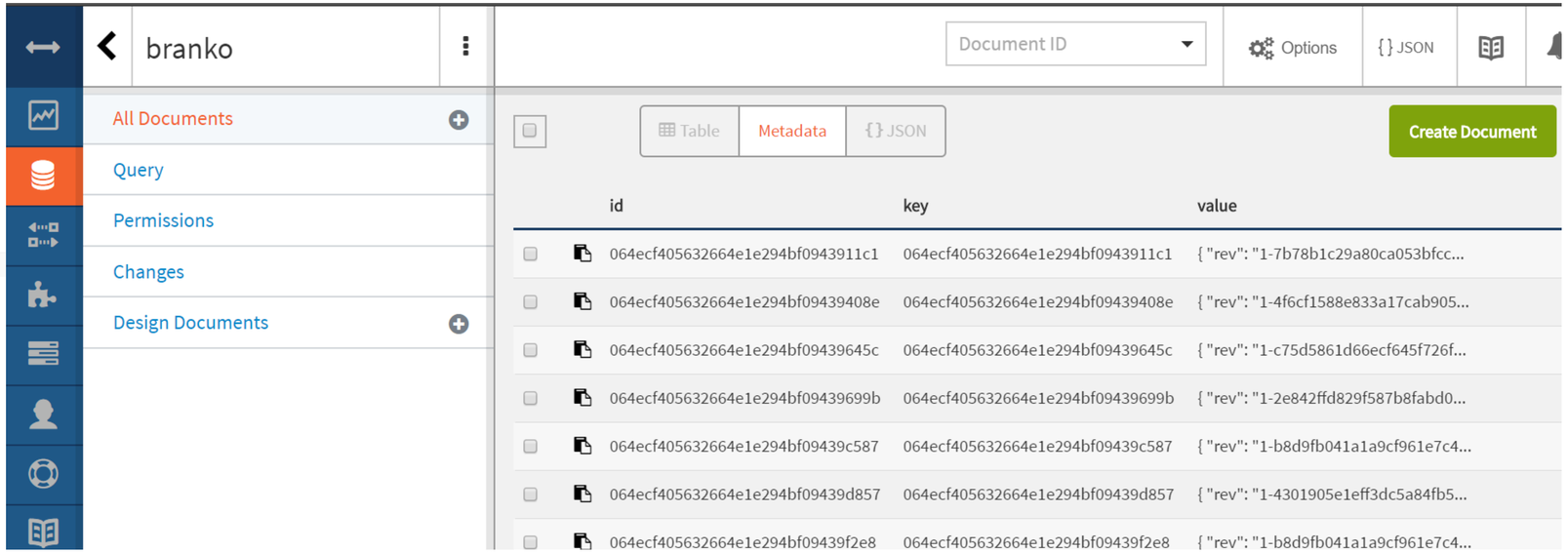




Extensions


Extensions
Extensions are optional service integrations which can be added to your Watson IoT Platform to provide additional functions or integrate with third-party services.
Single Sign On
The Single Sign On (SSO) extension allows additional authentication options to be enabled.
Status: Not Configured
Setup
Email
The email extension configures options for the SendGrid and SMTP user invitation methods.
Status: Not Configured
Setup
Historical Data Storage
The historical data storage extension finds and configures compatible services that can be used to store your IoT device data. You must be logged in to Bluemix in order to complete this operation.
Status: Not Configured
Setup
BL
Blockchain
The blockchain extension provides an interface to add and manage IBM Blockchain and Hyperledger fabric connections.
Status: Disconnected
Setup


Creating a Warehouse for Cloudant Data
Specify connection details to create a warehouse in a Db2 instance, o
Db2 Warehouse on Cloud
Db2
To create a warehouse in Bluemix, you must first log in to Bluemix wit
IBM ID
IBM password
Forgot your IBM password?
Authenticate in Bluemix


branko
Document ID
Options
{ } JSON
All Documents
Query
Permissions
Changes
Design Documents
Table
Metadata
{ } JSON
Create Document
id
key
value
064ecf405632664e1e294bf0943911c1
064ecf405632664e1e294bf09439408e
064ecf405632664e1e294bf09439645c
064ecf405632664e1e294bf09439699b
064ecf405632664e1e294bf09439c587
064ecf405632664e1e294bf09439d857
064ecf405632664e1e294bf09439f2e8

Example 2 – Quick Walkthough of IoT Starter

www.bluemix.net

IBM Watson IoT Industry Solutions

IBM Watson IoT and Industry Innovation

Enabling new business models with integrated solutions

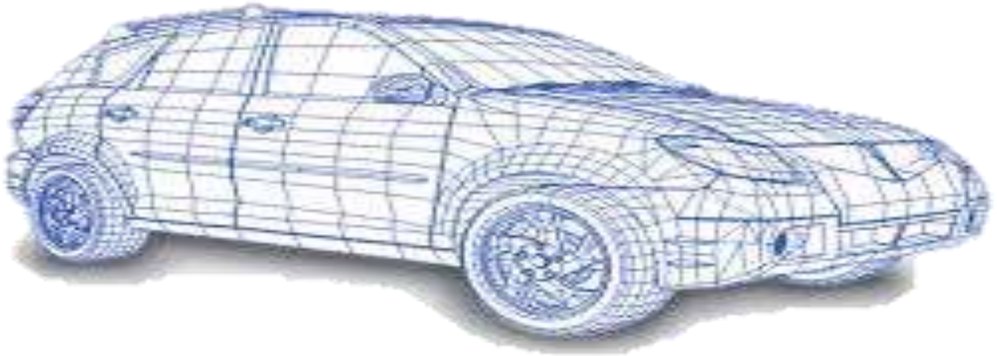
Transform traditional business with the capabilities of IoT

- Drive customer relationships & experiences
- Improve operational efficiency & reduce costs
- Deliver new product and business models
- Drive better customer engagement
- Leverage Watson for cognitive solutions

IBM Watson IoT for Automotive

Enabling the next generation of connected vehicles

A Next Gen Vehicle will produce more than 50 GB of data per hour



80% of new apps will be distributed or deployed on cloud

Real-Time

- Nanosecond level high speed computing
- Real-time awareness of vehicle and surrounding

Deep Analytics

- Store and analyze historical information for actionable insights
- Traffic sign identification and map generation

Dynamic Map Management

- Efficient in memory map store and IDE for application development
- Multiple map vendor and version support

Road Network Dynamics

- High accuracy and high scalability map matching
- High performance trajectory data management & analytics

Value-added services further differentiate our IoT for Automotive offering

Map Insights

- Real time Contextual information
- Awareness of vehicle and surrounding

Driver Insights

- Personalized mobility services
- Store and analyze historical driving behavior and vehicle usage information

Vehicle Insights

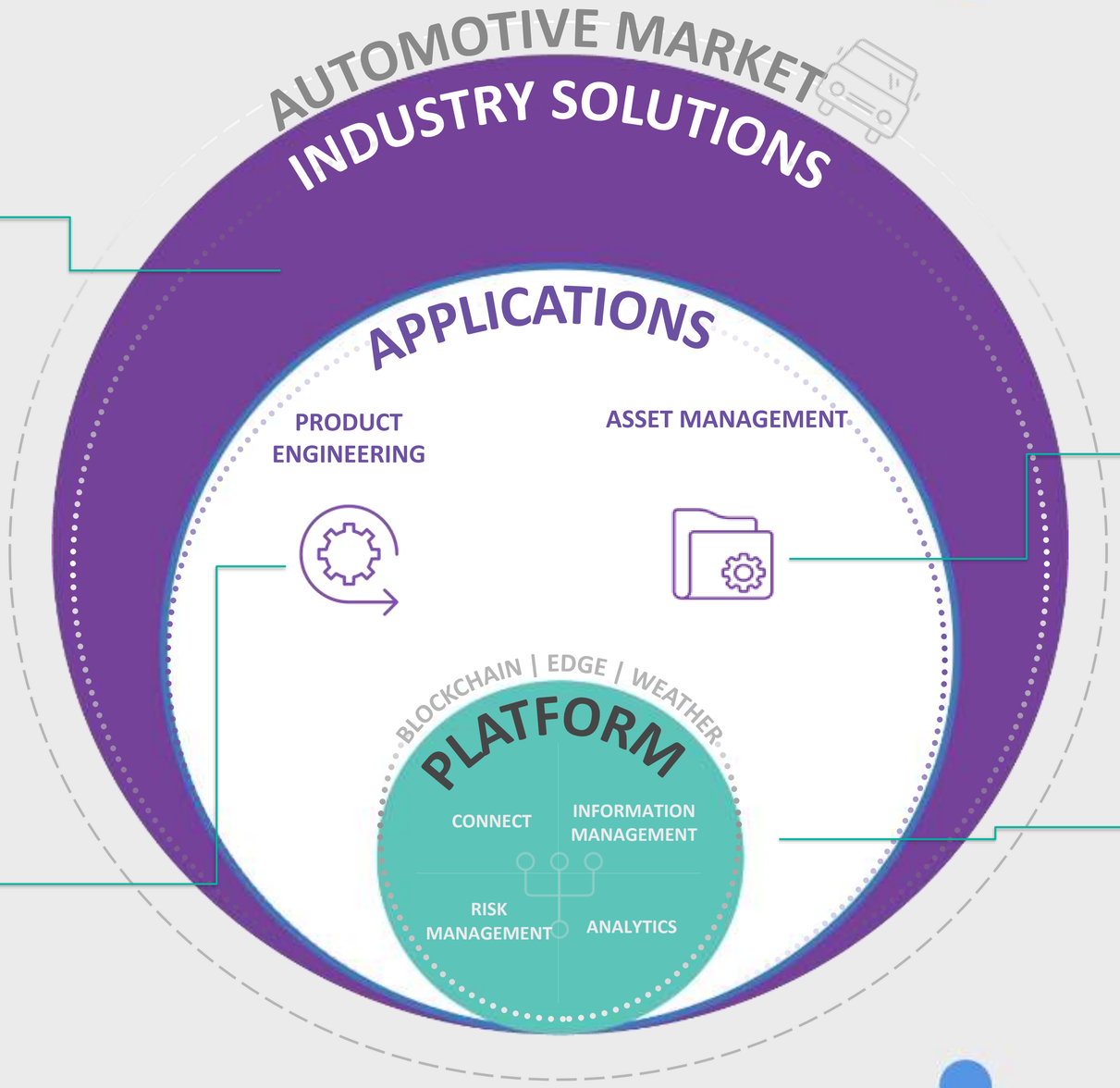
- Store and analyze historical information for actionable insights
- Optimize assets and supply chain

Capability
Environmental awareness & Contextual information
Highly accurate and scalable map matching
High performance road attributes such as: traffic sign, speed limit, link-node network, give way
High performance and trajectory data analysis

Capability
Per vehicle & driver real-time awareness
Store and analyze historical driver and vehicle usage information
High speed, low latency messaging & distributed cloud environment
Unique Agent system

Capability
Store and analyze historical vehicle condition information
Vehicle asset information
Data integration with multiple systems of record
Enhance OBD capabilities with IoT Cloud

Our automotive clients are among the leading industries on the edge of IoT-based transformation



Panasonic

Ford

HONDA

DAIMLER

FCA

SCHAEFFLER

GM

HONDA

Cummins

BOSCH

Watson IoT

Example 3 – IoT for Automotive Experience

https://iot-for-automotive-starter-experience.mybluemix.net/

IBM Watson IoT for Electronics

Enabling the next generation service delivery of connected products

80% of new apps will be distributed or deployed on cloud

<1% of data is currently used. More must be used for optimization and prediction.

Scale

- Tens of millions of devices, on a cloud infrastructure across >44 data centers
- Cost efficient and secure information management

Analytics

- Store and analyze information fo actionable insights and pattern awareness
- Real-time for rapid awareness and resolution

Life cycle Management

- Onboarding to updating – secure and efficient
- Aftermarket service management, from work orders to work scheduling

Client Experience

- Improve product & client engagement thru connectivity a analysis of usage
- Reduce service costs with timel accurate information

Example 4 – IoT for Electronics Experience

Demo IoT for Electronics Instance:
<yourinstancename>. mybluemix.net

IBM Watson IoT for Insurance

Protected
Wellness / Workers

Safety
Health

Protected
Home & Buildings

Homes
Ships
Factories
Warehouses
Construction Sites
Commercial Office

Protected
Lifestyle & Business

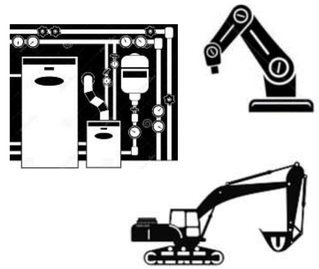
Risks
Assets
Finances

Connected Environment

Weather
Construction
Crime

Protected
Cars / Fleet

Driver Profiles
Telematics
Mapping



Protected
Assets & Equipment

Predictive Maintenance
Authorized Access
Location

Carriers are transforming their historic risk assessment models by proactively mitigating risk through real time alerts

IoT for Insurance tailored for Proactive Protection

IBM Watson IoT

Transformation
Collect and Normalize Data

Home Devices
- Water

Auto Data
- Driver Behavior
- GPS

Wearables
- Body Temp
- Blood Sugar
- Vitals

Environment Sensing
- Weather
- Light
- Noise
- Gas

Equipment
- Diagnostics

- Device and External data
- Standardized formatting
- Annotation/augmentation
- Data published

Aggregation – correlates data, applies against intelligent rules for potential Hazards

Simple
- Water Intrusion
- Gas exposure
- Overexertion
- Man Down
- Ice Slip/fall
- Heat or Cold stress

Predictive
- Avoidance of issues
- Potential Black Mold
- Noise exposure over time
- High risk areas
- Fall Prevention

Cognitive
- Fall prevention
- Alertness
- Dehydration
- Fatigue
- Use of safety equip

- Connect data sets
- Real Time
- Hazards / Insurance Risk

Industry specific Analytics

Insurance Industry
- Home/Auto/Workers compensation
- Policy holder alerts
- Device utilizations
- Claims analysis
- Fraud analysis
- Risk dashboards

Other Industry
- Safer Workplace
- Employee alerts
- Supervisor dashboards
- Injury prevention
- Elderly Care

Alerts
- Text
- Email
- Emergency

Devices / Data Providers

Raw Data

Shields (1..N)

Industry Analytics

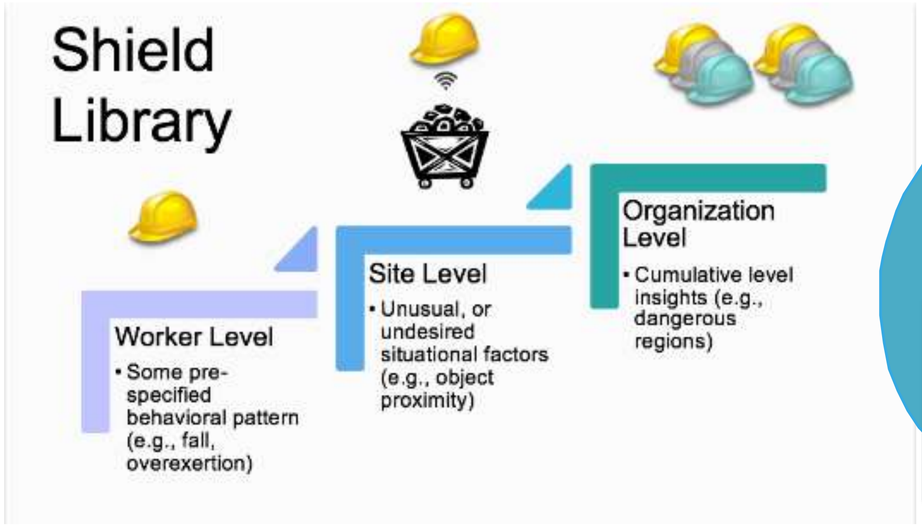
IBM Watson IoT for Insurance Safer Workplace

The “Guardian Angel” App

- Mobile as-a Gateway
- Linkage to guards libraries
- Shields subscription mgmt
- Sensor-stack admin
- Messaging/Notifications

Body-worn and environmental sensor stack:

- Movement
- Heart rate
- Body Temperature
- EEG
- Location
- Air quality
- Noise



Shield Library

Stream analytics components reflecting a concrete hazard(e.g., Node-Red flows)

Node-RED

Fall | alertness | dehydration | fatigue …

node

Safelet Runtime

Node JS, BlueMix rules

Data Store

Cloudant

IoT for Insurance Safer Workplace

Example 5 – IoT for Insurance

Employee Wellness and Safety Demo

https://www.youtube.com/watch?v=8-j26pA9Wrg

IBM Watson IoT 4 Telco

Services Innovation

- How do I reassert relevance in B2B Markets?
- How do I find new things to sell?
- How do I partner to deliver value?
- How do I participate in the API economy?
- How do I make my offerings 'cognitive'?

Enterprise

- How do I manage *my* fleet, network, masts?
- How do I manage *my* employees?
- How do I manage *my* stores? My sites?
- How do I secure *my* enterprise?

Network

- How do I manage signalling?
- How do I compete against low power competitors?
- How do I secure IoT?
- How do I differentiate?

- The Watson IoT Platform helps to drive "Services Innovation" in particular, and the focus of most discussions with telecom service providers is in this domain. The others are important considerations, however, for our clients.

Introducing *Mobile Asset Optimization* from Vodafone and IBM

Data Capture

Capture the location data from all your assets

Connect

Transfer the data to Vodafone's and IBM's cloud

Analytics

Leverage intelligent analytics to provide insights

Tracking

Track your assets to ensure seamless operations

Notifications

Receive notifications through SMS for extreme cases

Decisions

Make informed decisions to minimize impact on overall business

Result **Make data-driven logistics decisions**

How Mobile Asset Optimization works

Customer's asset is fitted with a tracking device

Device will report to a central server via Vodafone Network

M2M platform manages device data, and integrates with IBM Watson IoT Platform via. a Cloud to Cloud Connector

Data integrates with advanced analytics to provide predictive insights

Customer Asset

The customer supplies this part - Vodafone does the rest

Vodafone

Tracking Device

M2M Platform

Business logic

Data storage

Device integration and management

Alarm management

Reporting and maps

KPI's and notifications

API

IBM Cloud to Cloud Connector

Watson IoT Platform

- Weather impacts
- Availability Prediction
- Risk/Loss Zone detection
- Lifecycle optimization

MAO Dashboard

Customer

Solution offered as a managed cloud service

Containers and trailers

- **Customer**: Large UK based SME
- **Problem**: Locating container fleet . Regulatory fines when trailer maintenance goes over-schedule
- **Solution**: CalAmp ATU620 fitted to trailers and containers, reporting once a day, Device lifecycle: 18months before battery change. ROI: 1.2 years
- **Analytics**: battery life-cycle, route cycle times, weather impact

Electric bicycles

- **Customer**: Netherlands manufacturer of electric bicycles.
- **Problem**: Low security but high-value electric bike, low market differentiation
- **Solution**: CalAmp TTU1220 engineered into the bicycle cowling and wired to the bicycle battery, movement sensed reporting . ROI: 2 years
- **Analytics**: usage patterns, maintenance schedules, loss zones

Specialised stillages for closed-loop circulation

- **Customer**: Multi-national manufacturing vehicle windscreens
- **Problem**: Poor flow of transit cages causing backlogs at factory. 4000 cages per year lost.
- **Solution**: CalAmp ATU620 fitted to each ‘stillage’, movement sensing, Device lifecycle: 10 months before battery change. ROI: 3 years
- **Analytics**: battery life-cycle, loss zones, availability.

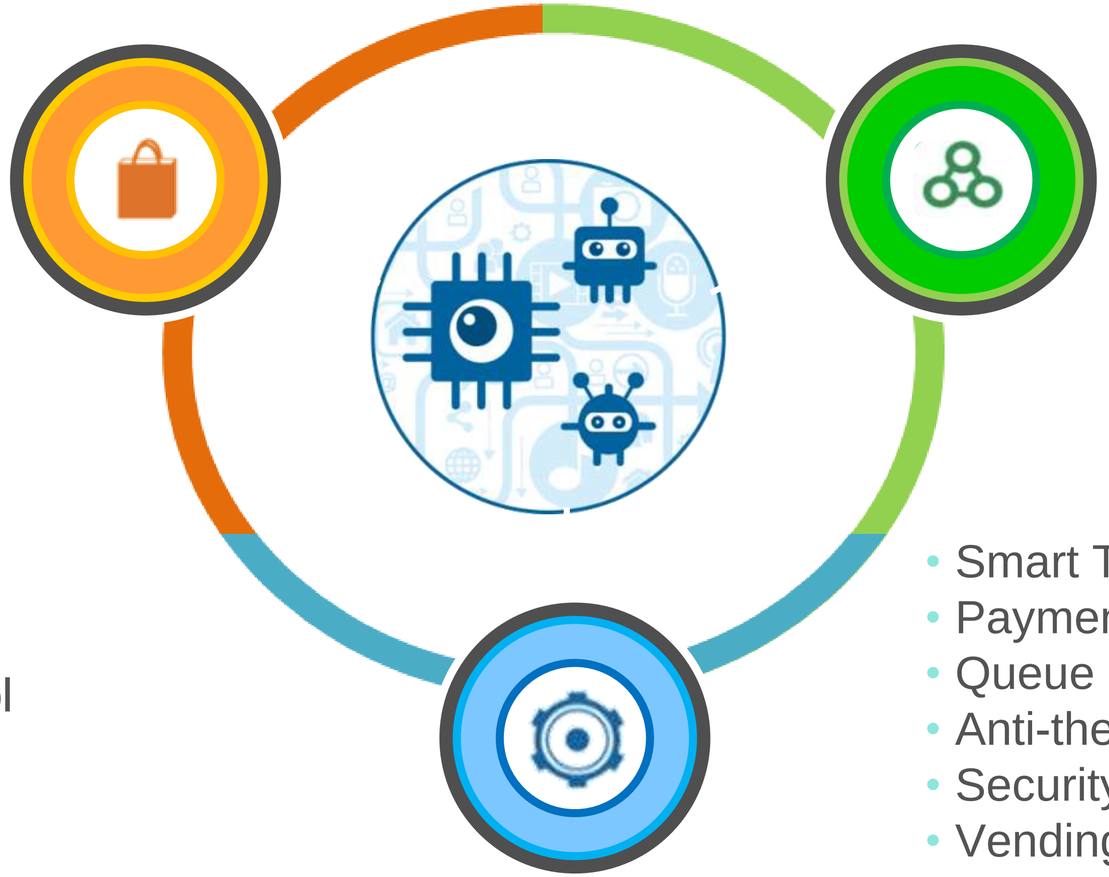
Coffee machines

- **Customer**: Service/maintenance provider in New Zealand
- **Problem**: Machines are moved and cannot be maintained by visiting technicians or mistakenly disposed of at end of lease.
- **Solution**: Zelitron ZLT-AT-11 inserted inside the machine, reporting once a day on Cell-ID and monitoring for tamper. ROI: 1 year
- **Analytics**: maintenance schedules, loss zones

IBM Watson IoT for Retail

DELIVER A **SMARTER SHOPPING EXPERIENCE**

- Smart Shelf
- Smart POS
- RFID Solutions
- Monitoring & Tracking
- People counter
- Scanning and weight control



BUILD **SMARTER MERCHANDISING AND SUPPLY NETWORKS**

- Smart Trolleys
- Payment systems
- Queue management
- Anti-theft systems
- Security & surveillance
- Vending and reverse vending machines

DRIVE **SMARTER OPERATIONS**

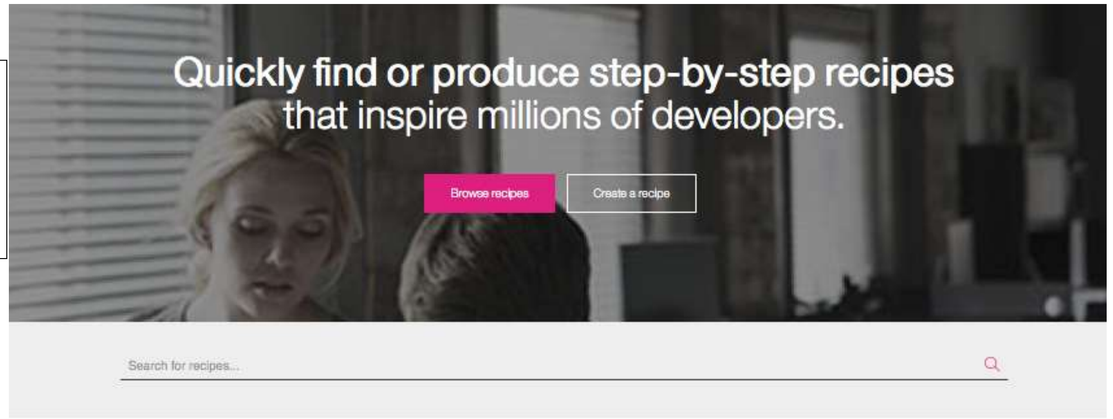
Open ecosystem & partnership strategy extend IBM Watson IoT platform

Derive IoT value on the Cloud through strong industry partnerships and open ecosystem

Examples:

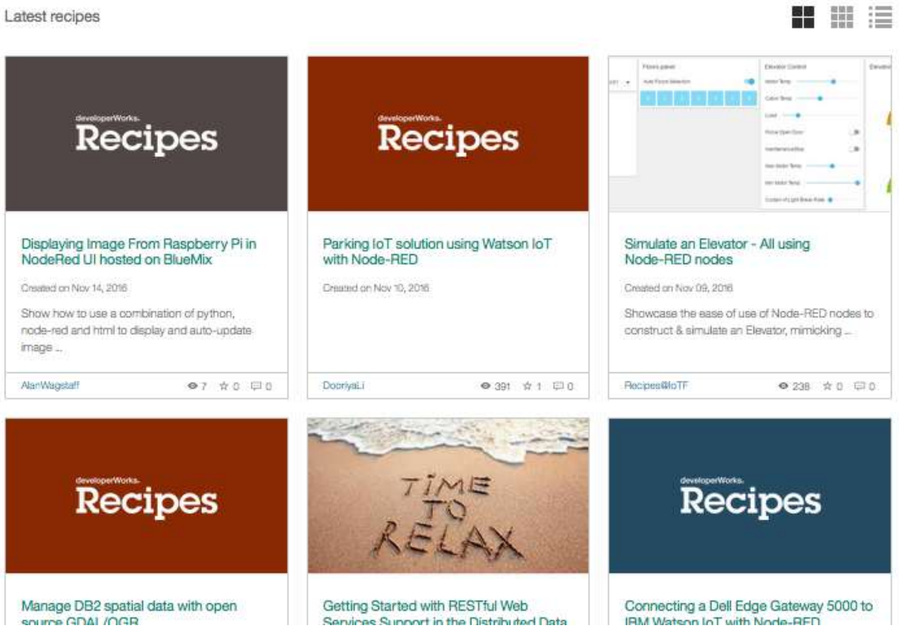
ARM intel Texas Instruments at&t Sprint

developerWorks. Recipes



Wide variety of supported devices

- ✓ Self Service
- ✓ Open ecosystem
- ✓ Simple tutorials
- ✓ Connect in moments



https://developer.ibm.com/recipes/tutorials/

IBM Watson IoT

Watson IoT Platform meets Machine Learning

Hands on Lab

Engage Machine Learning for detecting anomalous behaviors of Things

Branko Tadić, Enterprise Solution Consultant, IBM Cloud CEE
branko.tadic@rs.ibm.com

IBM

Key Links and Prerequisites

Detailed instructions (Recipe) for the Lab:

ibm.co/2bwi5zj

Bluemix PaaS home:

bluemix.NET (register for a free 30 day trial accnt)

IBM Data Science Experience (DSX):

datascience.ibm.com (register for a free 30 day trial accnt)

Git and Maven installed

JDK installed ☺

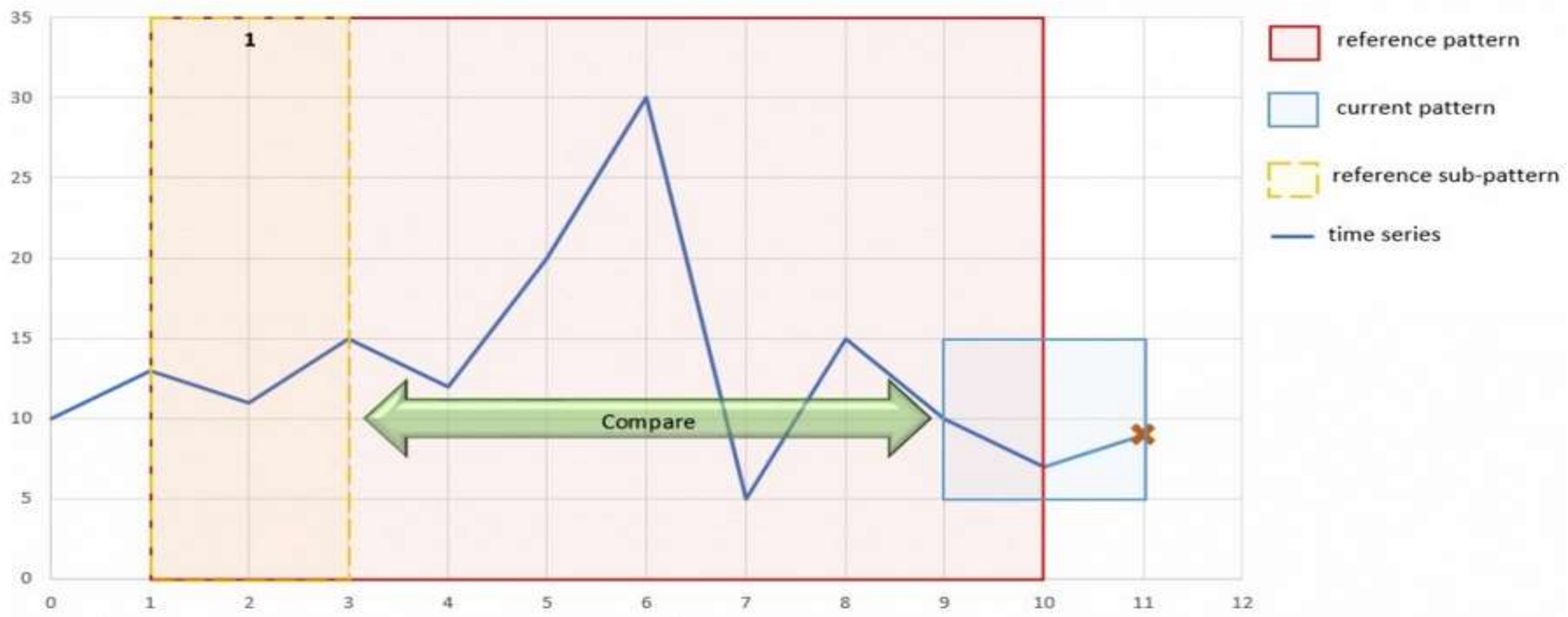
Basic Terms

- **What is Machine Learning?**
  - Machine learning is a method of data analysis that automates analytical model building. Using algorithms that iteratively learn from data, machine learning allows computers to find hidden insights without being explicitly programmed where to look

- **What is Predictive Analytics?**
  - Predictive analytics encompasses a variety of statistical techniques from predictive modeling, machine learning, and data mining that analyze current and historical facts to make predictions about future

- **Types of ML Algorithms**
  - Supervised learning
  - Unsupervised learning
  - Reinforcement learning

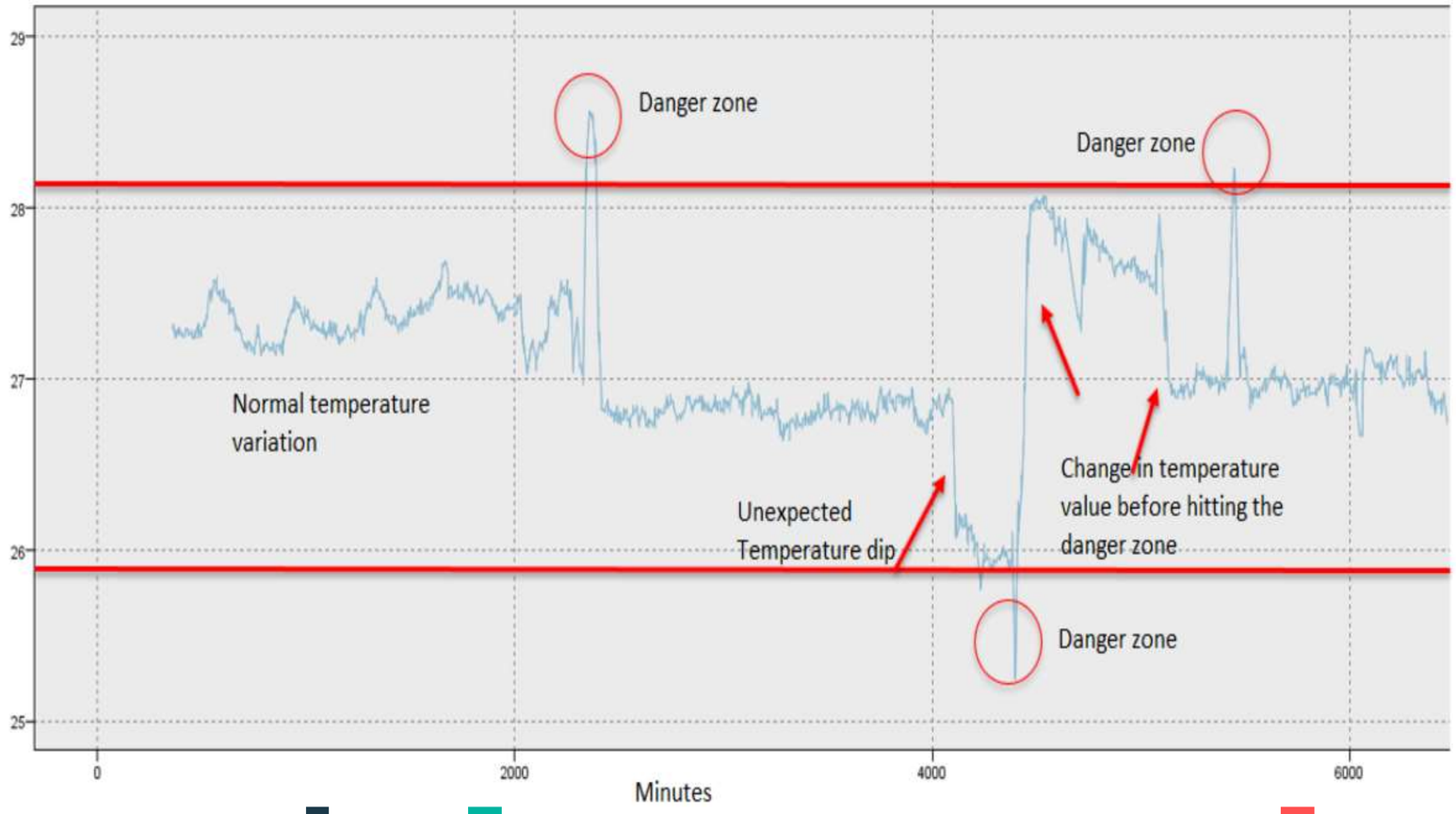
Engage Streams to detect Anomalies



- Anomaly Detector operator reports anomalies with the pattern of the incoming IoT data
- The operator maintains a recent history of the input time series, which is referred to as the reference pattern
- The operator compares the current pattern with the reference pattern and generates a score

Scenario

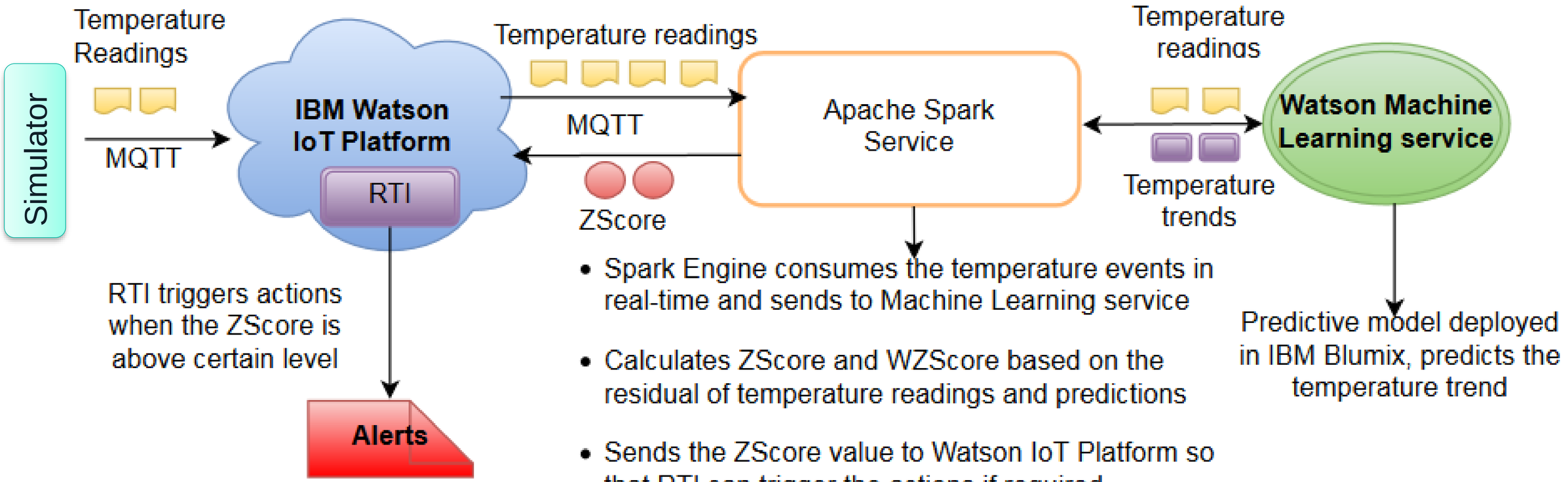
This recipe explains how one can integrate IBM Watson Machine Learning service with IBM Watson IoT Platform to predict a temperature change before it hits the danger zone.



Ingredients

- Temperature sensor simulator (Java source available on GitHub, https://github.com/ibm-messaging/iot-predictive-analytics-samples.git)
- Watson IoT Platform instance, on Bluemix
- Apache Spark instance, on Bluemix
- Watson Machine Learning instance, on Bluemix
- Object Storage Service, on Bluemix
- Machine Learning Streaming Predictive Analytics Model, available on GitHub, https://github.com/ibm-watson-iot/predictive-analytics-samples/raw/master/SPSSModel/nocycle20rebuid50.str

Architecture



ZScore - How abnormal the reading is comparing to all the values in history?

WZScore - How abnormal the reading is comparing to the neighboring values in time?

So, let’s start!

Thank You