IBM Watson IoT Portfolio

A quick look at our Toolbox for IoT

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IBM’s contribution to the World
IBM contributions to Open Source: 18 years & counting

<table>
<thead>
<tr>
<th>Year Range</th>
<th>IBM Contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999 - 2001</td>
<td>- IBM forms Linux Technology Center&lt;br&gt;- Leads Apache projects Xerces, Xalan, SOAP&lt;br&gt;- Starts ICU project&lt;br&gt;- Creates OSI-approved IBM Public License&lt;br&gt;- Strategic participation in Mozilla&lt;br&gt;- IBM becomes founding member of OSDL&lt;br&gt;- Founder of Eclipse.org &amp; Eclipse Consortium&lt;br&gt;- Creates internal bazaar using OSS methodology</td>
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<tr>
<td>2002 - 2005</td>
<td>- Linux contributions to scalability (8-way+), reliability (stress testing, defect mgmt, doc)&lt;br&gt;- Leads Apache projects in Web Services&lt;br&gt;- Leads Eclipse projects GEF (editing), EMF (modeling), XSD/ UML2 (XML Schema), Hyades (testing), Visual Editor, AspectJ, Equinox (OSGi bundles)&lt;br&gt;- Eclipse Foundation, Inc. becomes independent&lt;br&gt;- Pledged 500 patents to open source&lt;br&gt;- Starts Apache Derby database, supports Geronimo app server</td>
</tr>
<tr>
<td>2006 - 2009</td>
<td>- Contributions for Linux on Power, usability, security certifications&lt;br&gt;- Leads Apache projects Tuscany (SCA standard), OpenJPA, UIMA&lt;br&gt;- Contributes to Eclipse Higgins&lt;br&gt;- Partners with Zend PHP&lt;br&gt;- Accessibility code to Firefox&lt;br&gt;- IBM starts OpenAjax Alliance and joins Dojo Foundation&lt;br&gt;- IBM joins OpenOffice.org &amp; creates ODF Toolkit Union&lt;br&gt;- IBM joins Open Health Tools, merging code from Eclipse OHF&lt;br&gt;- Contributes to Mozilla Bespin (web editor) &amp; WebKit (browser engine)&lt;br&gt;- Lead Apache Aries (OSGi Enterprise)</td>
</tr>
<tr>
<td>2010 - current</td>
<td>- Linux contributions to kvm, oVirt, &amp; support Open Virtualization Alliance&lt;br&gt;- Contributes to Apache Shindig&lt;br&gt;- Supports Apache Hadoop (Big Data) – part of IBM BigInsights&lt;br&gt;- Eclipse: Orion (web-based tooling), Lyo (OSLC), Paho (M2M protocols)&lt;br&gt;- Announces OpenJDK involvement&lt;br&gt;- Contributes to Apache Cordova (fka PhoneGap) (mobile app framework)&lt;br&gt;- Starts Dojo Maqetta (RIA tooling)&lt;br&gt;- Leads Apache OpenOffice&lt;br&gt;- OpenStack: platinum sponsor of independent Foundation; over 140 contributors&lt;br&gt;- Increase OSS projects &amp; visibility at JazzHub and GitHub&lt;br&gt;- Contributes to Cloud Foundry</td>
</tr>
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More than 1000 IBM developers involved in OSS projects

IBM leads 80+ OSS projects

IBM contributes to 150+ OSS projects
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
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
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
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
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
IBM Watson IoT Platform - Analytics

Real-time Analytics
- Rule-based analytics and actions built into 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?

<table>
<thead>
<tr>
<th>Industry Leading Analytics</th>
<th>Unmatched Scale and Scope</th>
<th>Most Trusted IoT Platform</th>
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<tbody>
<tr>
<td>• Watson-inside – machine learning and cognitive</td>
<td>• Global data centers – 40+ data centers across the globe</td>
<td>• Device neutral – IBM does not compete with its sensor, gateway, network, and processor partners</td>
</tr>
<tr>
<td>• Industry models – deep, industry-specific analytics models</td>
<td>• Low latency and high throughput at enterprise scale</td>
<td>• Built on open standards</td>
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<tr>
<td>• Third party data sources – leading the industry at partnering</td>
<td>• Hybrid delivery form factors... public cloud, dedicated cloud, on</td>
<td>• Data neutral – IBM’s business model does not depend on owning its customer’s data</td>
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<tr>
<td>with outside data providers (e.g. Weather Company)</td>
<td>premise</td>
<td>• Privacy protection and access control</td>
</tr>
<tr>
<td>• Industry Integrations – easily push and pull data from leading</td>
<td>• Bluemix and Softlayer – built to work on IBM’s core cloud offerings</td>
<td>• Platform of Platforms – IBM is committed to integrating with other leading platforms so customers are not forced to chose proprietary tech stacks</td>
</tr>
<tr>
<td>industry solutions, both IBM’s and its partners’</td>
<td>but also deliver the transactional scale required by the new world</td>
<td>• IoT specific security – security micro-services</td>
</tr>
<tr>
<td></td>
<td>of IoT</td>
<td>built specifically for IoT-based solutions</td>
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**Enterprise-ready components to connect, secure, provide data insight, assemble and manage IoT Applications**

- The Weather Company APIs and data
- IoT Platform integrated with Blockchain
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

Internet of Things Platform Starter

Get started with IBM Watson IoT platform using the Node-RED Node.js sample application. With the Starter, you can quickly simulate an Internet of Things device, create cards, generate data, and begin analyzing and displaying data in the Watson IoT Platform dashboard.

App name: IoTStarterApp

Host name: IoTStarterApp

Domain: mybluemix.net

Select region to deploy in: US South

Choose an organization: @2demo

Choose a space: demospace

Selected Plan:

SDK for Node.js™

Default

Cloudant NoSQL DB

Lite

Internet of Things Platform

Lite

Need Help?
Contact Bluemix Sales
Estimate Monthly Cost
Cost Calculator
NodeRed

Flow 1

- **Device Simulator**
- **Send Data**: 1. Configure target
  2. Click to send data
- **Device payload**: Send to IBM IoT Platform
- **Debug output payload**

**Node**

- **Name**: IBM IoT App In
- **Type**: ibmiotin
- **ID**: "3e7f7854319882a"

**Information**

Input node that can be used with Watson IoT Platform to receive events sent from devices, or receive status updates concerning device 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 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 (SSO)**: Extension allows additional authentication options to be utilized.
  - Status: Not Configured
  - Setup

- **Email**: The email extension configures options for the SendGrid and SMTP server integration method.
  - 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 to complete the operation.
  - Status: Not Configured

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Creating a Warehouse for Cloudant Data

Specify connection details to create a warehouse in a DB2 instance, or

DB2 Warehouse on Cloud

To create a warehouse in Bluemix, you must first log in to Bluemix with

IBM ID

IBM password

Forgot your IBM password?

Authenticate in Bluemix
Example 2 – Quick Walkthrough 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

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
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

<table>
<thead>
<tr>
<th>Environmental awareness &amp; Contextual information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly accurate and scalable map matching</td>
</tr>
<tr>
<td>High performance road attributes such as: traffic sign, speed limit, link-node network, give way</td>
</tr>
<tr>
<td>High performance and trajectory data analysis</td>
</tr>
</tbody>
</table>

| 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                              |

| 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.
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.

- Tens of millions of devices, on a cloud infrastructure across >44 data centers
- Cost efficient and secure information management
- Store and analyze information for actionable insights and pattern awareness
- Real-time for rapid awareness and resolution
- Onboarding to updating – secure and efficient
- Aftermarket service management, from work orders to work scheduling
- Improve product & client engagement thru connectivity and analysis of usage
- Reduce service costs with timely, accurate information
Demo IoT for Electronics Instance: 
<yourinstancename>. mybluemix.net
Carriers are transforming their historic risk assessment models by proactively mitigating risk through real-time alerts and analytics. The IBM Watson IoT for Insurance platform leverages connected environments to protect assets and equipment, ensuring safety and security in various settings such as homes, buildings, fleets, and commercial offices. It integrates contextual insights, real-time monitoring, and alerts to provide comprehensive risk management. Key features include weather and construction insights, predictive maintenance, and authorized access, ensuring that insurance carriers can make informed decisions and offer tailored risk solutions to their clients.
IoT for Insurance tailored for Proactive Protection

**Transformation**
Collect and Normalize Data

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

**Industry specific Analytics**

**Home Devices**
- Water

**Auto Data**
- Driver Behavior
- GPS

**Wearables**
- Body Temp
- Blood Sugar
- Vitals

**Environment Sensing**
- Weather
- Light
- Noise
- Gas

**Equipment**
- Diagnostics

**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

**Alerts**
- Text
- Email
- Emergency

**Devices / Data Providers**

**Raw Data**

Shields (1..N)

**Industry 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

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

**Transformation**
Collect and Normalize Data

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

**Industry specific 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)
- Fall | alertness | dehydration | fatigue …

Safelet Runtime
- Store
  - Node JS, BlueMix rules
- 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

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.

The customer supplies this part - Vodafone does the rest.

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: 18 months before battery change. ROI: 1.2 years
- **Analytics**: battery life-cycle, route cycle times, weather impact

**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.

**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

**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**: Zeltron 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

**BUILD SMARTER MERCHANDISING AND SUPPLY NETWORKS**

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

**DELIVER A SMARTER SHOPPING EXPERIENCE**

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

**DRIVE SMARTER OPERATIONS**

- Smart Trolleys
- Payment systems
- Queue management
- Anti-theft systems
- Security & surveillance
- Vending and reverse vending machines
Open ecosystem & partnership strategy extend IBM Watson IoT platform

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

Examples:

Wide variety of supported devices
✓ Self Service
✓ Open ecosystem
✓ Simple tutorials
✓ Connect in moments

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
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.
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
Architecture

IBM Watson IoT Platform

RTI

Temperature Readings
MQTT

Temperature readings

Apache Spark Service

Watson Machine Learning service

Predictive model deployed in IBM Blumix, predicts the temperature trend

Temperature readings
Temperature trends

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