

# IoT is driving Digital Disruption of the Physical World

Accelerating advances  
in technology

-  Advanced analytics
-  Cloud computing
-  Pervasive connectivity
-  Product Lifecycle Management
-  Embedded sensors

And transforming every part of business

Improving operations  
and lowering costs



Creating new products  
and business models



Driving engagement and  
customer experience



[www.ibm.com/iot](http://www.ibm.com/iot)

## At the Intersection of the Internet of Things with the internet of people

Cognitive IoT enables us to learn from, and infuse intelligence into, the physical world to transform business and enhance the human experience.

Cognitive systems aren't programmed. They learn from virtually every interaction and the surrounding context to unleash the potential of the IoT.

## Outthink the limits of what's possible ...

### IoT

Connects devices, gateways and endpoints  
Secures and integrates device data and contextual data  
Scales via cloud-based services  
Analyzes performance and utilization data



### IBM Watson

Applies cognitive technologies to help change how we approach and understand the world's information  
Leverages data driven industries and economies to bring cognition to everything and everyone  
Reason and learns from data

### IBM Watson IoT Platform

- **Platform of Platforms** – IBM is committed to integrating with other leading platforms so customers are not forced to choose proprietary tech stacks
- **IoT specific security** – security micro-services built specifically for IoT-based solutions
- **Rich integration of contextual data sources** – leading the industry at partnering with outside data providers (e.g. Weather Company)
- **Deep, industry-specific analytics models**

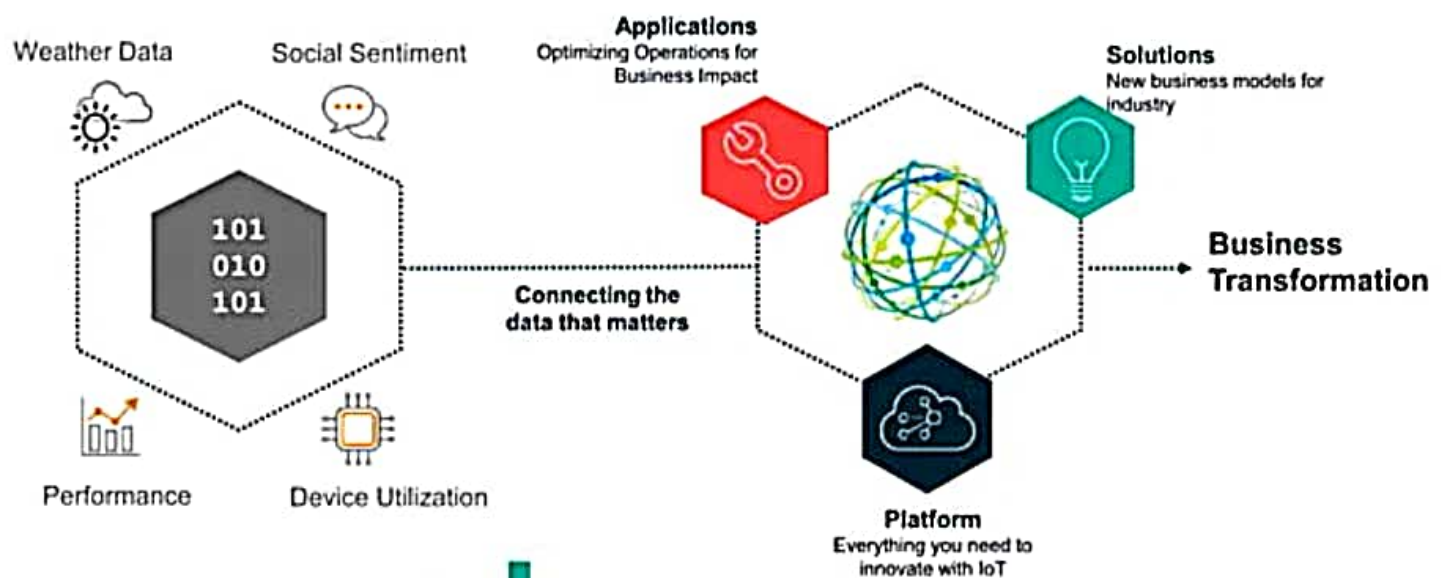
IBM

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IBM Watson IoT 5

# Ready your business for cognitive IoT

*Start by deploying a highly secure, scalable, and open platform that lets you start small, and grow quickly*



# The IBM Watson IoT Platform Offerings

*Everything you need to transform with IoT*

## IBM Watson IoT Platform - Connect

Connect and manage devices, networks, and gateways

## IBM Watson IoT Platform - Information Management

Integrating information, structured and unstructured, from devices, people, and the world around us

## IBM Watson IoT Platform - Analytics

Gaining insights from information using Realtime, Predictive and Cognitive analytics

## IBM Watson IoT Platform - Risk Management

Ensuring you leverage the right information from the right sources, and the right software runs where you need it



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Uniquely IBM



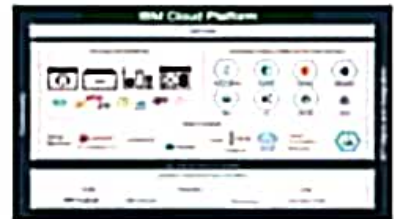
**Integrate enterprise, device, and 3<sup>rd</sup> party data**

*Combining weather data with traditional business data and rich data from an unprecedented number of Internet of Things (IoT) enabled systems and devices will fundamentally transform enterprise decision-making.*



**Out think the competition with Watson**

*Gain competitive advantage with Cognitive and Advanced Analytics services, such as natural language processing, machine learning, textual analytics, and video/image analytics.*



**IBM Bluemix environment for IoT development**

*Composable services development, runtime and operations for your IoT apps, running on IBM SoftLayer global cloud*

[www.ibm.com/iot](http://www.ibm.com/iot)



# 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 Platform - Connect

Connect what matters....

## The Hub for IoT Data

Connect and manage your IoT devices, Gateways and Networks from a broad and growing ecosystem

Open standards based communications (MQTT, HTTPS)

Secure communication and management  
Globally scalable, starting with a single device



[www.ibm.com/iot](http://www.ibm.com/iot)



# IBM Watson IoT Platform - Risk Management

*Address privacy and manage risk through security and Blockchain capabilities*



## Leading Security Capabilities

Enforce the appropriate level of security and privacy to your IoT solution from the device through the network to the cloud and beyond

End to end core security features for devices, data and connections

Gain system wide confidence via Security Analytics

Provide support for secure decentralized systems such as Blockchain

[www.ibm.com/iot](http://www.ibm.com/iot)

IBM **Emerging Technology**

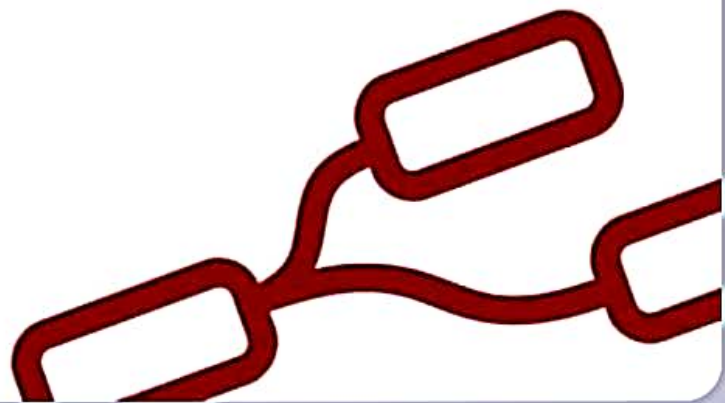
# Node-RED

A visual tool for wiring the Internet of Things

Kleber Carvalho  
Application Architect – IBM  
Professor – Developer School

29-March-2017

**IBM**



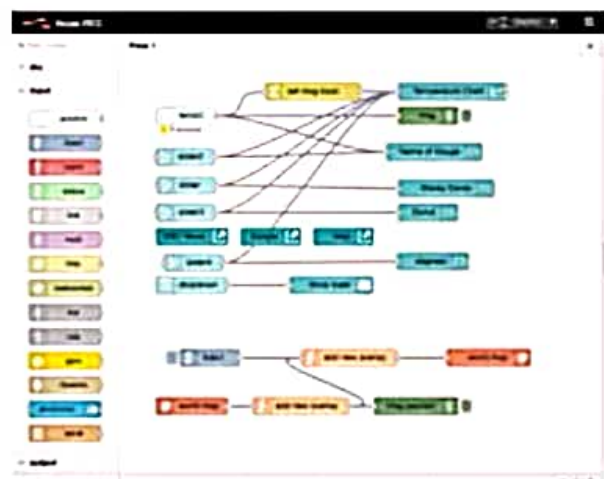
## Introducing Node-RED

Node-RED makes it easy to wire together the Internet of Things.

It provides a browser-based drag-drop UI for creating flows of events and deploying them to the runtime.

The light-weight runtime, built in **node.js**, is ideal for edge-of-network environments or running in the cloud.

It can be easily expanded to take add new nodes to the palette - taking full advantage of the node package manager (npm) ecosystem



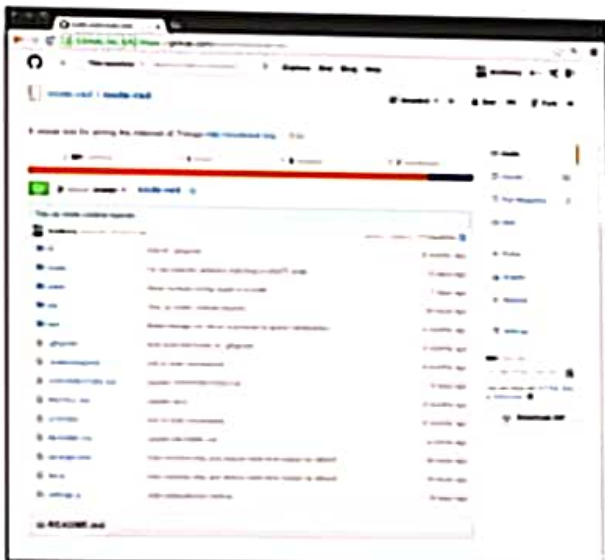
## Flow-based Programming

Invented by J. Paul Morrison at IBM in the early 1970's

- 
- A network of asynchronous processes communicating by means of streams of structured data chunks
- 
- Each process is a black box – it doesn't know what has come before it, or what comes after it; it just acts on the data it receives and passes the result on

[https://en.wikipedia.org/wiki/Flow-based\\_programming](https://en.wikipedia.org/wiki/Flow-based_programming)

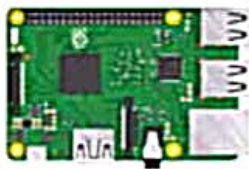
## Open Source Development



- Released on GitHub September 2013
- Apache 2 License
- 3rd party pull-requests accepted under **Contributor License Agreement**
  - Most contributions direct via NPM
- Active Google Group and Slack channel
- <http://nodered.org>
- <http://flows.nodered.org>
  - Online flow library for examples
- Encourages sharing and reuse of flows within the community



## From the edge to the cloud



### **Raspberry Pi**

Pre-installed on the default Raspberry Pi image, Node-RED can be used out of the box to begin creating IoT applications.



### IBM **Bluemix**

Available in the Bluemix catalog as a Quick Start application, it takes moments to create cloud applications that combine services from across the platform.

## Boilerplate Application on IBM Bluemix



The screenshot shows the IBM Bluemix console interface. On the left, the 'Create a Cloud Foundry Application' wizard is visible, with fields for 'App name', 'Plan', and 'Stack'. Below this, the 'Node-RED Starter' application is listed. On the right, a detailed view of the Node-RED workflow is shown, featuring various nodes like 'inject', 'split', 'join', and 'http request' connected in a complex flow.

[bluemix.net](http://bluemix.net)

## 3<sup>rd</sup> Party Hosted Node-RED services



Install it locally and get wiring

```
$ sudo npm install -g --unsafe-perm node-red  
$ node-red  
$ You can then access the Node-RED editor at  
http://localhost:1880.
```

Recommend: node.js 4.x & npm 2.x

<https://www.coursera.org/learn/developer-iot>

## Coursera – A developer's guide to the Internet of Things

Learn about IoT and Node-RED over a 4 week online course

The screenshot shows the Coursera course page for "A developer's guide to the Internet of Things (IoT)". The page layout includes a top navigation bar with the Coursera logo, a search bar, and links for "Catalog", "Institutions", "Log In", and "Sign Up". Below the navigation bar is a breadcrumb trail: "Home > Computer Science > Software Development". The main header area features the course title "A developer's guide to the Internet of Things (IoT)" in large white text on a dark red background. To the left of the main content is a sidebar menu with links for "Overview", "Syllabus", "FAQs", "Pricing", and "Ratings and Reviews". The "Overview" section is currently selected. Below the menu, there is a blue button that says "Enroll Now" with the text "Starts May 30" underneath it. To the right of the sidebar, the "About this course" section begins with a warning: ">>> By enrolling in this course you agree to the End User License Agreement as set out in the FAQ and at the end of this course description <<<". This is followed by a paragraph: "The Internet of Things (IoT) is an area of rapid growth and opportunity. Technical innovations in networks, ...". Below this is a "More" link with a downward arrow. The "Who is this class for:" section states: "This course is an entry level course for the Internet of Things. Some basic programming knowledge is assumed and the course requires learners to complete simple programming tasks in both Python and JavaScript." At the bottom, it says "Created by: IBM" and displays the IBM logo. A small note at the bottom left mentions: "Financial Aid is available for learners who cannot afford the fee. Learn more and apply."

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Home > Computer Science > Software Development

### A developer's guide to the Internet of Things (IoT)

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▼ More

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**Created by:** IBM

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## IBM developerWorks Recipes

Lots of contributed recipes for connecting things to Watson IoT platform - many using Node-RED

The screenshot shows the IBM developerWorks Recipes interface. At the top, there's a navigation bar with 'Recipes' and a 'Sign in' button. Below this, a 'RECIPE' header is visible. The main content area features a large title 'Connecting Raspberry Pi as a Device to Watson IoT using Node-RED' and a description: 'This recipe will help you to connect your Raspberry Pi to the Watson IoT Platform using the easy wiring approach of Node-RED.' To the left of the main content, there's a sidebar with a search bar and a list of categories including 'analyst', 'sentiment', and 'advanced'. At the bottom, there's a 'Requirements' section with a 'Hardware' subsection listing '1 Raspberry Pi Model B+ Model B+ 2'. On the right side of the bottom section, there's a 'Skill level' section indicating 'Beginner'.

**Connecting Raspberry Pi as a Device to Watson IoT using Node-RED**

This recipe will help you to connect your Raspberry Pi to the Watson IoT Platform using the easy wiring approach of Node-RED.

**Requirements**

**Hardware**

- 1 Raspberry Pi Model B+ Model B+ 2

**Skill level**

Beginner

Welcome to Pro... x IBM x IBM Cloud Acco... x Obtain an IBM C... x Service Details... x Cloudant Dashb... x Sign in or Regist... x +

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## Databases

Database name  Create Database {} JSON

Your Databases

Name	Size	# of Docs	Partitioned	Actions
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cloud.ibm.com/apidocs/cloudant#related-apis

Update

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MethodsServerDatabasesDocumentsDesign DocumentsViewsQueriesSearches

IBM Cloud API Docs / Cloudant

Introduction

Last updated: 2022-10-24

IBM® Cloudant® for IBM Cloud® is a document-oriented database as a service (DBaaS). It stores data as documents in JSON format. It is built with scalability, high availability, and durability in mind. It comes with a wide variety of indexing options that include MapReduce, IBM Cloudant Query, full-text indexing, and geospatial indexing. The replication capabilities make it easy to keep data in sync between database clusters, desktop PCs, and mobile devices.

Detailed documentation is also available such as a [Getting started tutorial](#), [API overview documentation, tutorials, and guides](#).

This documentation describes the SDKs and examples. To see usage information and examples in your preferred SDK, select the language tab in the right pane.

Endpoint URLs

The IBM Cloudant API uses an instance-specific endpoint URL for all regions. You can find your external endpoint by following these steps:

1. Go to the IBM Cloud dashboard and open an instance.
2. Click the Service credentials tab.
3. Click the st

CurlJavaNodePythonGo

Feedback

Type here to search

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Welcome to IBMIBM Cloud APIObtain an IBM Service DetailsCloudant DocsCloudant | IBM Sign in or Register

cloud.ibm.com/apidocs/cloudant?code=python#related-apis

Update

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AuthenticationAuditingEvent trackingError handlingAdditional headersRate limitsRelated APIsLogging

MethodsServerDatabasesDocumentsDesign DocumentsViewsQueries

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CurlJavaNodePythonGo

The code examples on this tab use the IBM Cloudant SDK for Python.

Installation

```
pip3 install ibmcloudant
```

GitHub

<https://github.com/ibm/cloudant-python-sdk>

Feedback

Type here to search

Taskbar icons: File Explorer, Edge, Mail, Settings, etc.

System tray: Network, Volume, Date/Time (14:19 05-11-2022), Language (ENG)