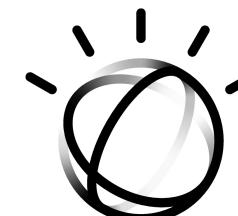


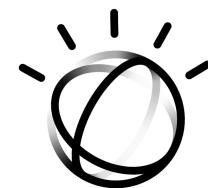
IoT End to End : Turn your IoT Sensor Data into Insights using Watson IoT

John Walicki
Watson IoT Developer Advocate
@johnwalicki
[**<walicki@us.ibm.com>**](mailto:<walicki@us.ibm.com>)

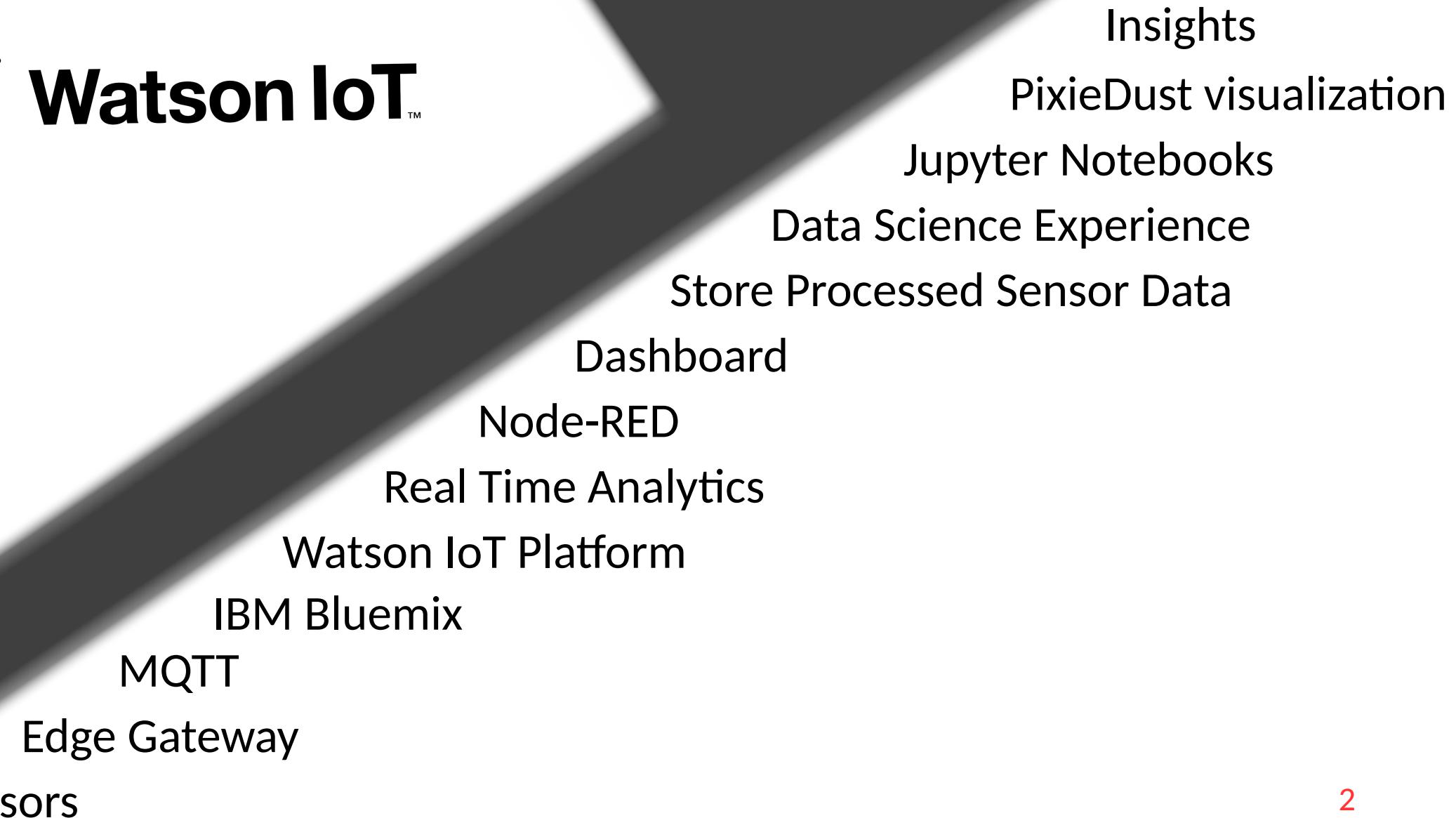
<http://ibm.biz/TryWatsonIoT>



Watson IoT™



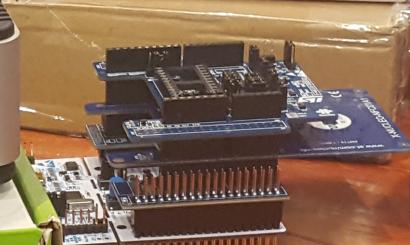
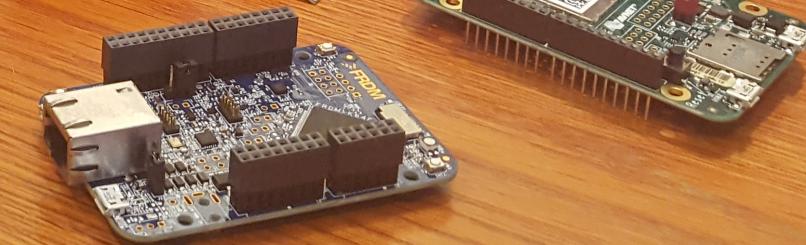
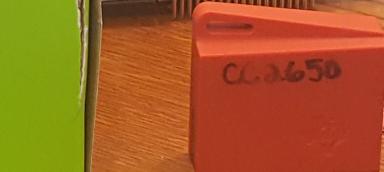
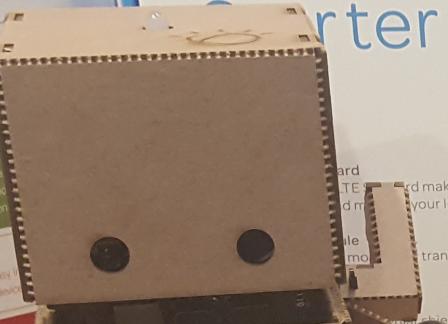
Watson IoT™



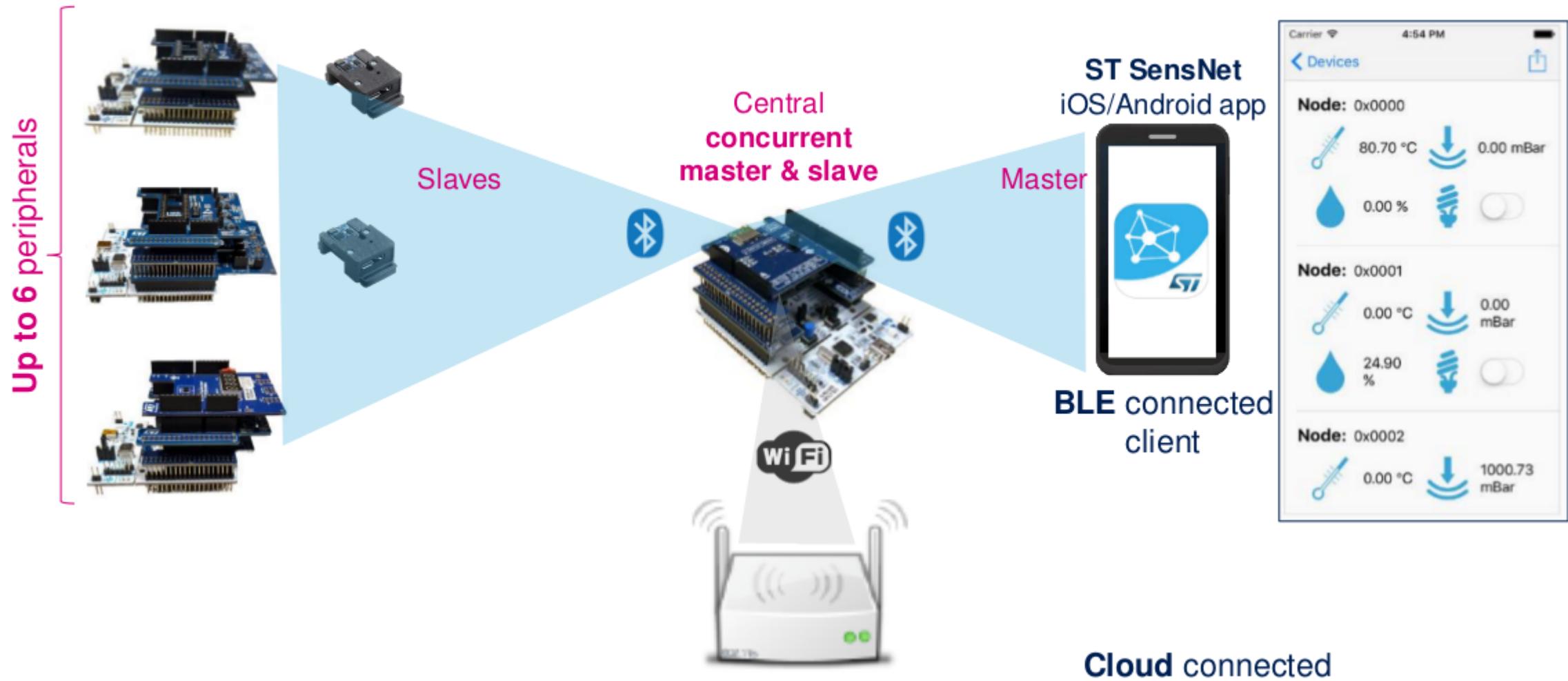
Raspberry Pi 3 IoT Learner Kit



AT&T IoT Starter Kit



Anaren





Quickstart

No sign-up required to see how easy it is to connect your device to Watson IoT Platform and view live sensor data

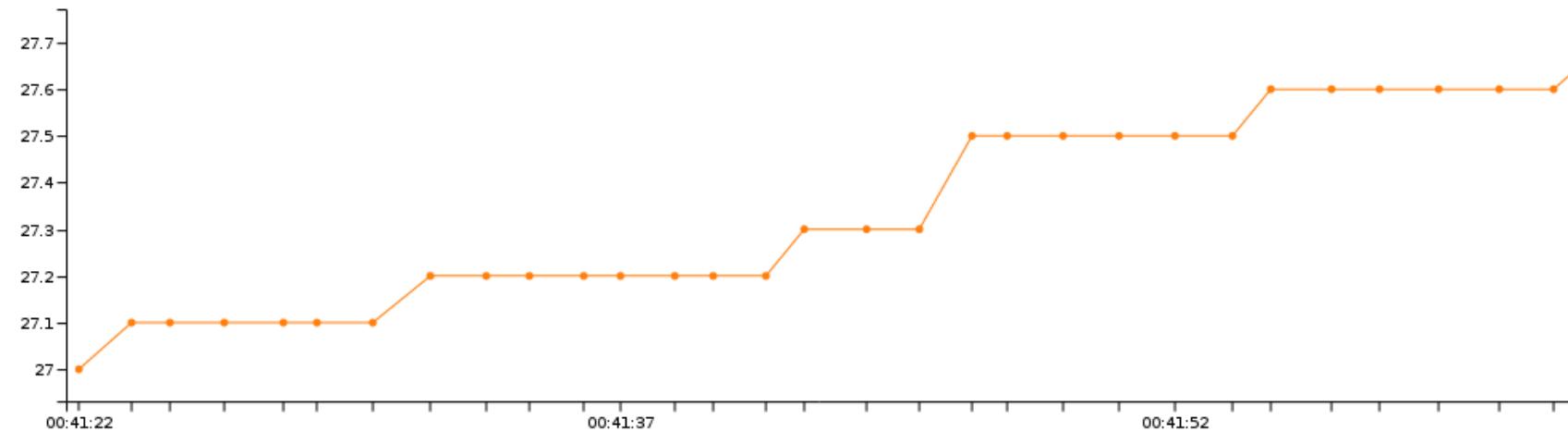
C0_7A_2E_30_5C_4D

Go

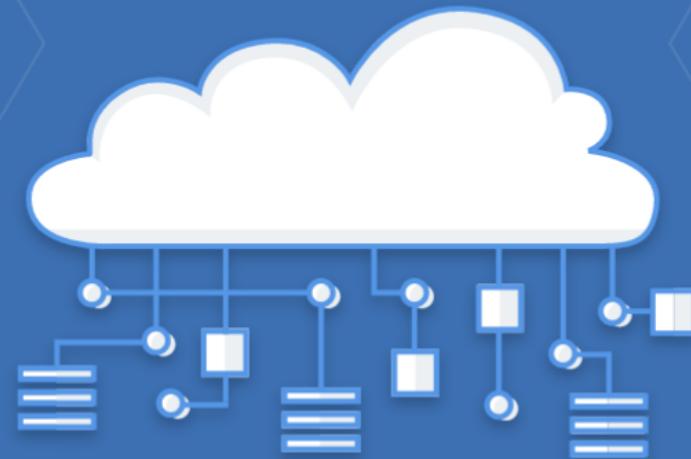
● Last message received at 12:42:03 AM

C0_7A_2E_30_5C_4D

Temperature.Temperature



Event	Datapoint	Value	Time Received
Temperature	timestamp	23291	Sep 6, 2017 12:42:03 AM
Temperature	Temperature	27.700000762939453	Sep 6, 2017 12:42:03 AM



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internet of things|

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Internet of Things Platform Starter

Get started with IBM Watson IoT platform using the Node-RED Node

Lite

IBM



Create a Cloud Foundry App

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.

Lite IBM

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VERSION 0.7.0

TYPE Boilerplate

REGION
US South, Germany, United Kingdom

App name:

sensortile-walicki

Host name:

sensortile-walicki

Domain:

mybluemix.net

Select region to deploy in:

US South

Choose an organization:

walicki@us.ibm.com

Choose a space:

team

Selected Plan:

SDK for Node.js™

Default

Cloudant NoSQL DB

Lite

Internet of Things Platform

Lite



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Cloud Foundry Apps (4) 3.250 GB/16 GB Used

20 ▾ Items per page | 1-4 of 4 items 1 of 1 pages < | >

NAME	ROUTE	MEMORY (MB)	INSTANCES	RUNNING	STATE	ACTIONS
sensortile-walicki	sensortile-walicki.mybluemix.net	256	1	1	Running	
sensortiles	sensortiles.mybluemix.net	1024	1	1	Running	

Getting started

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sensortiles

Running

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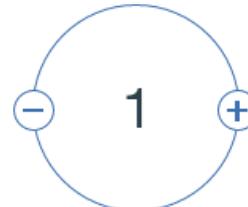
⋮

Runtime

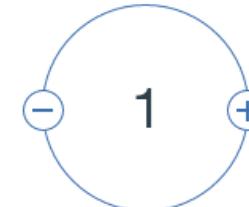


BUILDPACK

SDK for Node.js™



INSTANCES

All instances are running
Health is 100%

GB MEMORY PER INSTANCE



TOTAL GB ALLOCATION

12.75 GB still available

Connections (2)



sensortiles-cloudantNoSQLDB



sensortiles-iotf-service

[Connect new](#)[Connect existing](#)

Runtime cost

\$8.74

Current charges for billing period

\$22.81

Estimated total for billing period
(Sep 1, 2017 - Sep 30, 2017)

Node-RED

Flow-based programming for the Internet of Things

Node-RED is a programming tool for wiring together hardware devices, APIs and online services in new and interesting ways.

The version running here has been customized for the IBM Watson IoT Platform.

More information about Node-RED, including documentation, can be found at nodered.org.

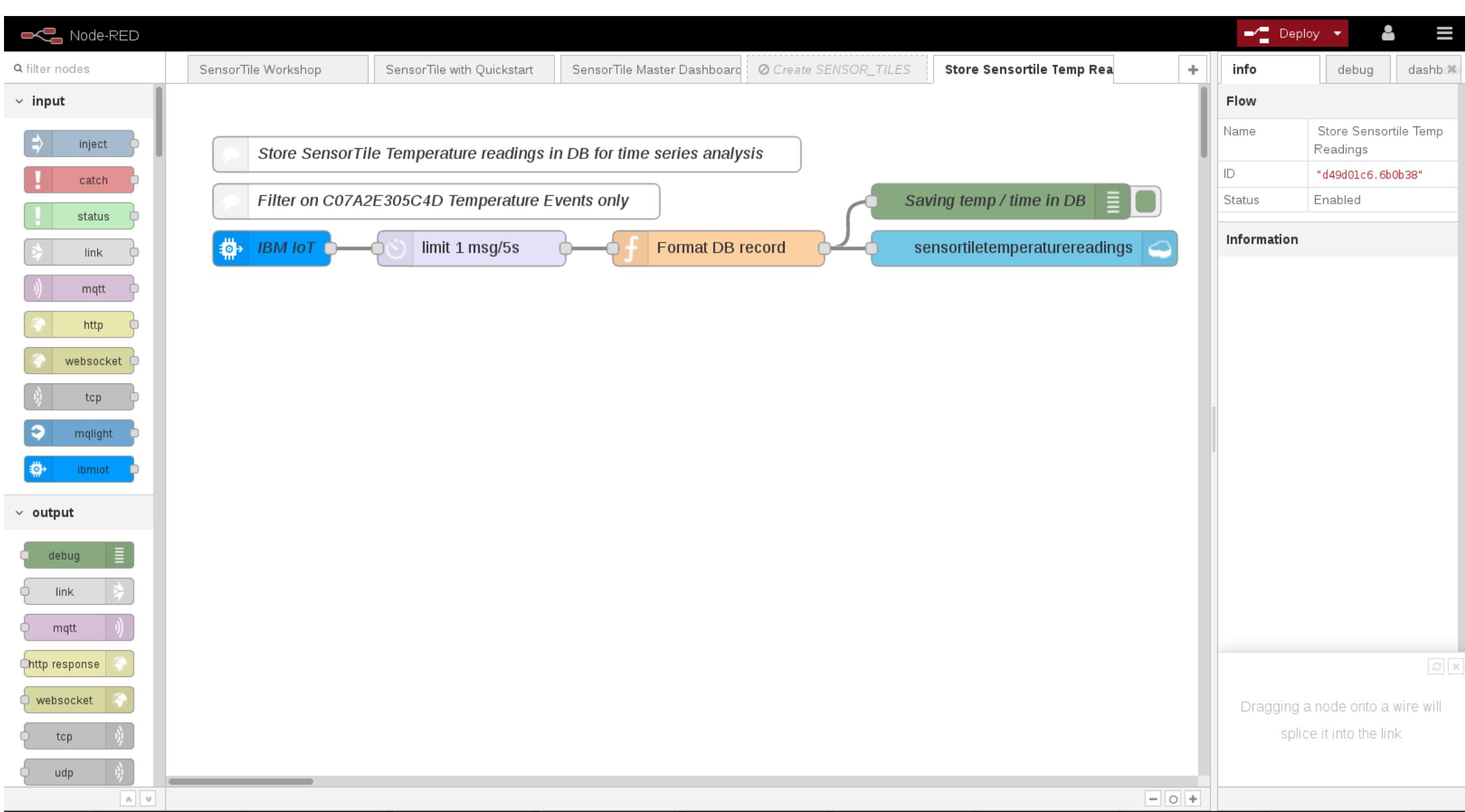
[Go to your Node-RED flow editor](#)

[Learn how to customise Node-RED](#)

Customising your instance of Node-RED

This instance of Node-RED is enough to get you started creating flows.

You may want to customise it for your needs, for example replacing this introduction page with your own, adding http authentication to the flow editor or adding new nodes to the palette.





Getting started

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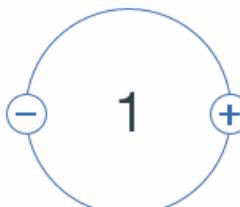
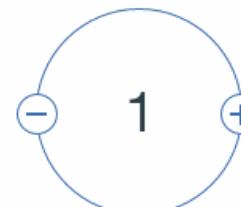


sensortiles

Running

[Visit App URL](#)[Routes](#) ▾**Runtime****BUILDPACK**

SDK for Node.js™

**INSTANCES**All instances are running
Health is 100%

1

GB MEMORY PER INSTANCE

1

TOTAL GB ALLOCATION

12.75 GB still available

Connections (2)

sensortiles-cloudantNoSQLDB



sensortiles-iotf-service

[Connect new](#)[Connect existing](#)**Runtime cost**

\$8.74

Current charges for billing period

\$22.81

Estimated total for billing period
(Sep 1, 2017 - Sep 30, 2017)

Manage

Plan

Connections

Internet of Things / sensortiles-iotf-service



⋮



Let's get started with Watson IoT Platform

Securely connect, control, and manage devices. Quickly build IoT applications that analyze data from the physical world.

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[Learn about Watson IoT Platform ➔](#)

Understand the architecture, concepts, and features of the Watson IoT Platform service and see how it fits in the extended Bluemix universe and your own IoT infrastructure.

[Expand using step-by-step recipes ➔](#)

Browse a multitude of custom recipes to connect your devices to Watson IoT Platform, expand on the basic service, and consume the device IoT data flow in your applications.



Intel® I... | 504 G... | IBM Wats... | Catalo... | Appli... | Dashb... | Node-... | Node-... | Servic... | IBM W... | IBM Wats... | Servic... | Cloud... | IBM D... | Intel - I... | Intel - I... | PixieD... | E | +

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Search

IBM Watson IoT Platform

QUICKSTART SERVICE STATUS DOCUMENTATION BLOG walicki@us.ibm.com ID: (select org)

Collect data from

and make value from it

Things

Learn More

IBM Watson IoT Platform

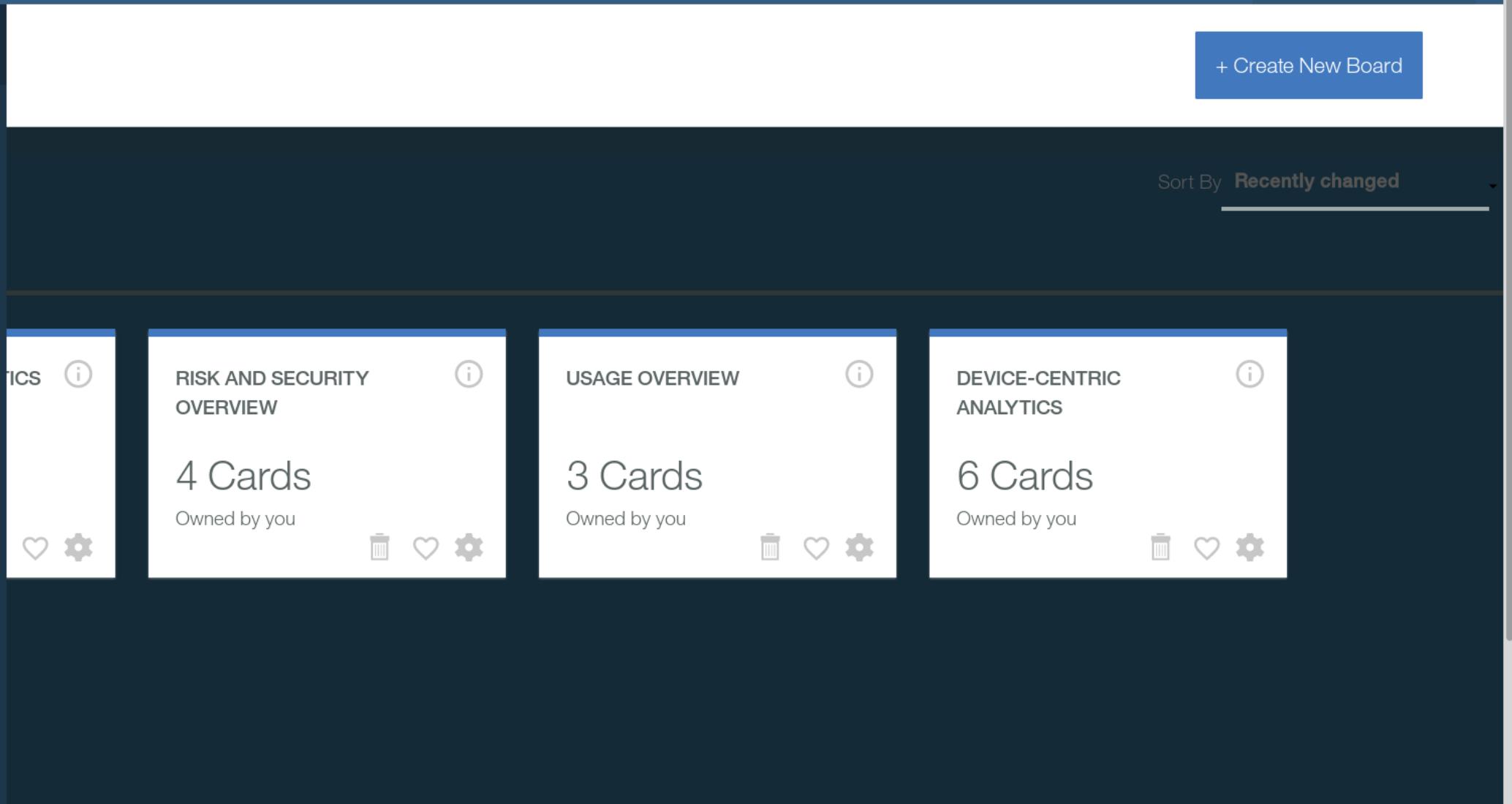
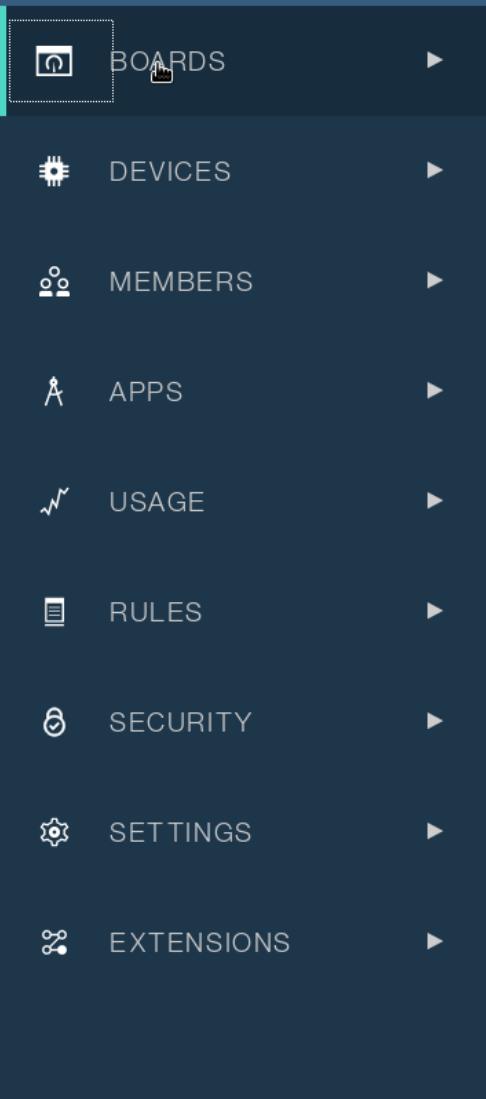
QUICKSTART

SERVICE STATUS

DOCUMENTATION

BLOG

walicki@us.ibm.com ▾
ID: (rv212u)



Devices

This experience will be changing soon. Want to see a preview? →

[Browse](#) | [Diagnose](#) | [Action](#) | [Device Types](#) | [Manage Schemas](#)

[Refresh](#)

[+ Add Device](#)

<input type="checkbox"/>	Device ID	Device Type	Class ID	Date Added	Location	  
<input type="checkbox"/>	 C07A2C345A38	SENSOR_TILE	Device	Aug 30, 2017 11:54:19 PM		
<input type="checkbox"/>	 C07A2D313248	SENSOR_TILE	Device	Aug 30, 2017 11:54:26 PM		
<input type="checkbox"/>	 C07A2D313348	SENSOR_TILE	Device	Aug 30, 2017 11:54:13 PM		
<input type="checkbox"/>	 C07A2E305C4D	SENSOR_TILE	Device	Aug 29, 2017 9:40:16 AM		
<input type="checkbox"/>	 C07A2F313348	SENSOR_TILE	Device	Aug 30, 2017 11:54:04 PM		
<input type="checkbox"/>	 C07A30313348	SENSOR_TILE	Device	Aug 30, 2017 11:54:17 PM		
<input type="checkbox"/>	 C07A30345238	SENSOR_TILE	Device	Aug 30, 2017 11:54:26 PM		

Results 41-50 of 103

<input type="checkbox"/>	 C07A31313248	SENSOR_TILE	Device	Aug 30, 2017 11:54:19 PM
<input type="checkbox"/>	 C07A32315648	SENSOR_TILE	Device	Aug 30, 2017 11:54:05 PM
<input type="checkbox"/>	 C07A32345B38	SENSOR_TILE	Device	Aug 30, 2017 11:53:59 PM

Devices This experience will...

Browse | Connection Information

Recent Events

- C07A2C345A3B Sensor Information
- C07A2D313248
- Metadata C07A2D313348

Device Information

- C07A2F313348 Diagnostic Logs
- C07A30313348

Error Codes C07A30345238

Results 41-50 of 100

Connection Log

- C07A31313248

Actions C07A32315648

- C07A32345B38

Device C07A2E305C4D

Device

[Refresh](#)

Connection Information



Device ID	C07A2E305C4D
Device Type	SENSOR_TILE
Date Added	Tuesday, August 29, 2017
Added By	walicki@us.ibm.com
Connection State	Connected on Wednesday, September 6, 2017 at 1:02:08 AM from 12.229.246.2 with a secure connection Refresh

Recent Events



Event	Format	Time Received
Temperature	json	Sep 6, 2017 1:04:38 AM
Temperature	json	Sep 6, 2017 1:04:39 AM
Temperature	json	Sep 6, 2017 1:04:39 AM
Temperature	json	Sep 6, 2017 1:04:40 AM
Temperature	json	Sep 6, 2017 1:04:40 AM
Temperature	json	Sep 6, 2017 1:04:41 AM
Temperature	json	Sep 6, 2017 1:04:41 AM
Temperature	json	Sep 6, 2017 1:04:42 AM
Temperature	json	Sep 6, 2017 1:04:42 AM

**Browse**

Actions

[Download Edge Agent](#)[+ Create Edge Rule](#)[+ Create Cloud Rule](#)

Browse Rules

Create, edit, and delete rules for your devices. Use rules to create alerts or trigger actions when trigger conditions are met for a device.

<input type="checkbox"/>	Name	Applies To	Rule Type	State			
<input type="checkbox"/>	SensorTile Email Alert	Device Type: SENSOR_T...	Cloud		Activated		



Browse Actions



SensorTile Email Alert

Email Alert on SensorTile Temp Threshold

Applies to: SENSOR_TILE

Alert priority: Low

Cancel

Save

Activate

IF: Add one or more conditions.

Trigger every time conditions are met.

Temperature

> 29

— AND +

OR

+

THEN: Add or select one or more actions.



Email Alert

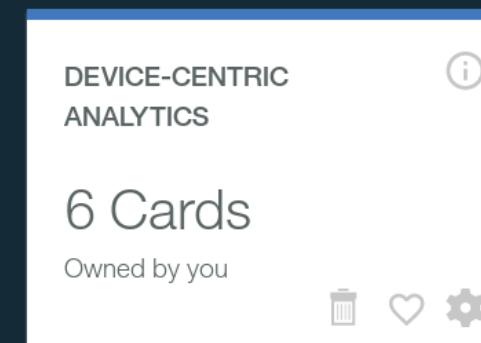
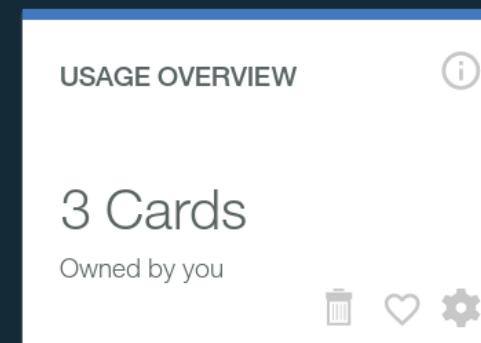
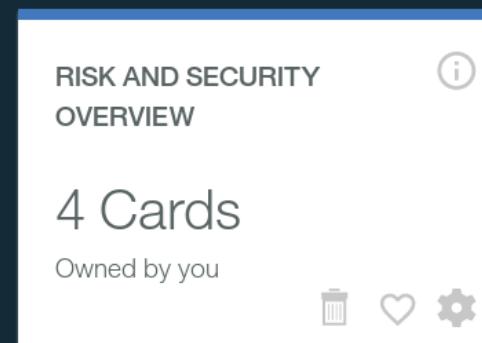
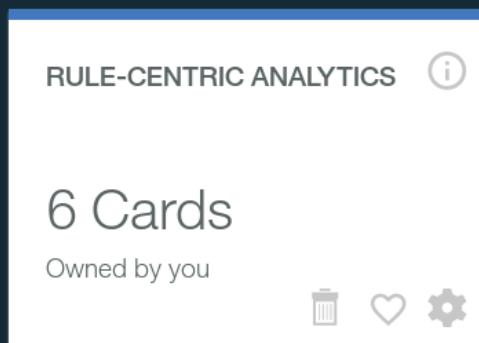
X

+

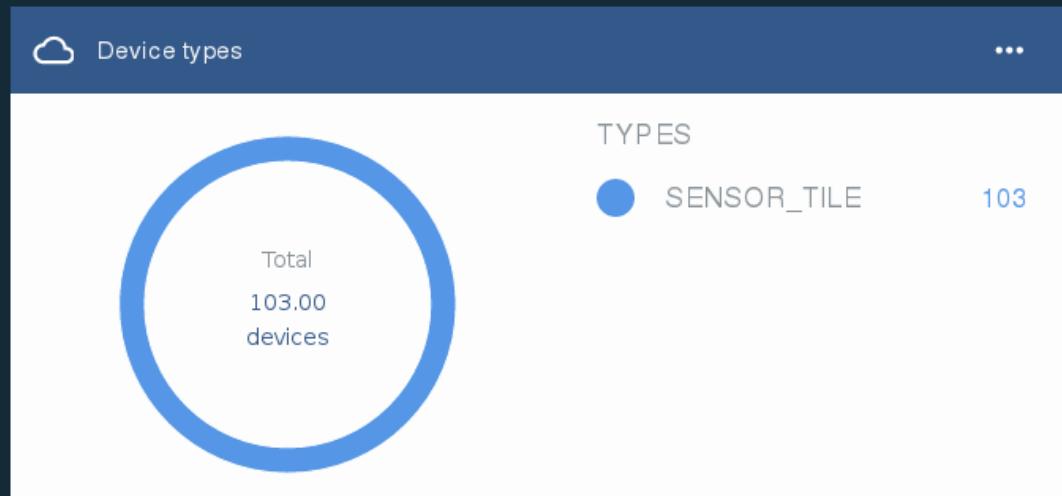
All Boards

+ Create New Board

Your boards



Usage Overview

[+ Add New Card](#)



Device-Centric Analytics



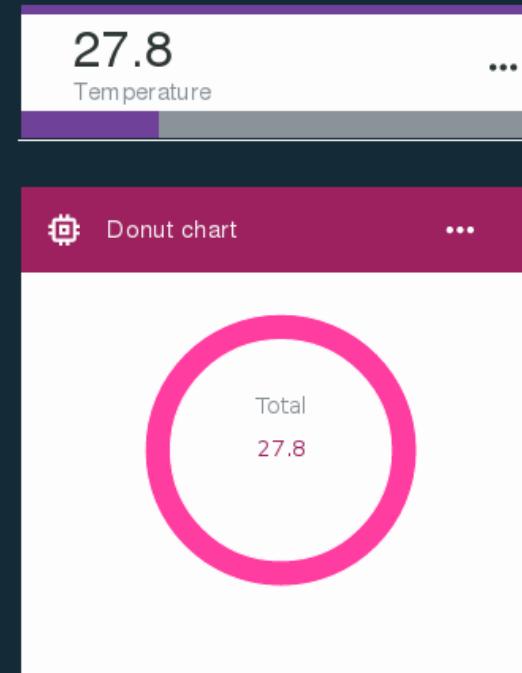
+ Add New Card

Undo

Settings

Devices I Care About			...
Device ID	Device type	Actions	...
C07A17313348	SENSOR_TILE		
C07A1A312B48	SENSOR_TILE		
C07A1A313B48	SENSOR_TILE		
C07A1A313C48	SENSOR_TILE		
C07A1B313B48	SENSOR_TILE		
C07A1B313C48	SENSOR_TILE		
C07A1E313B48	SENSOR_TILE		

Device Info		...
Device name	C07A17313348	
Device type	SENSOR_TILE	
Client ID	d:29bbgl:SENSOR_TILE:C07A17313348	
Creator	a-29bbgl-ynww5ihexx	
Time created	23:54 30/08/2017	
Alerts	No	



Rule Alerts For That Device		...
Last 24 hours		

Rule Alert Info		...
Select an alert		

Device Properties		...
Device name	C07A17313348	



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sensortiles

Running

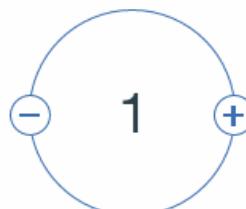
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Runtime

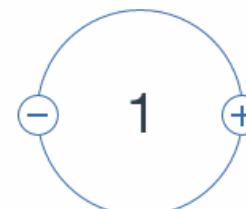


BUILDPACK

SDK for Node.js™



INSTANCES

All instances are running
Health is 100%

GB MEMORY PER INSTANCE



TOTAL GB ALLOCATION

12.75 GB still available ?

Connections (2)



sensortiles-cloudantNoSQLDB



sensortiles-iotf-service

[Connect new](#)[Connect existing](#)

Runtime cost

\$8.74

Current charges for billing period

\$22.81

Estimated total for billing period
(Sep 1, 2017 - Sep 30, 2017)

Current and estimated cost excludes connected services.



Manage

Service credentials

Plan

Connections

Data & Analytics / sensortiles-cloudantNoSQLDB



sensortiles-cloudantNoSQLDB



Cloudant NoSQL DB

LAUNCH

Cloudant NoSQL DB is a fully managed data layer designed for modern web and mobile applications that leverages a flexible JSON schema. Cloudant is built upon and compatible with Apache CouchDB and accessible through a secure HTTPS API, which scales as your application grows. Cloudant is ISO27001 and SOC2 Type 1 certified, and all data is stored in triplicate across separate physical nodes in a cluster for HA/DR within a data center.

Fully managed DBaaS

Work with self-describing JSON documents through a RESTful API that makes every document in your Cloudant database accessible as JSON via a URL. Documents can be retrieved, stored, or deleted individually or in bulk and can also have files attached. IBM takes care of the provisioning, management, and scalability of the data store, freeing up your time to focus on your application.

Powerful query, analytics, replication, and sync

Cloudant indexing is flexible and powerful, and includes real-time MapReduce, Apache Lucene-based full-text search, advanced Geospatial, and declarative Cloudant Query. Cloudant makes it easy to conduct advanced analytics on JSON data with dashDB Warehousing and Apache Spark integrations. Replication enables cross-geo deployments and Cloudant Sync provides data access for mobile devices to run connected or off-line.

Get Started



Databases

Database name ▾

Create Database

{ } JSON



Your Databases



Name	Size	# of Docs	Actions
nodered	185.4 KB	4	
sensortiletemperaturereadings	1.2 MB	4577	

Log Out

Showing 1-2 of 2 databases.

«

1

»



Document ID



{ } JSON



All Documents



Table

Metadata

{ } JSON

Create Document



Query



Permissions



Changes



Design Documents



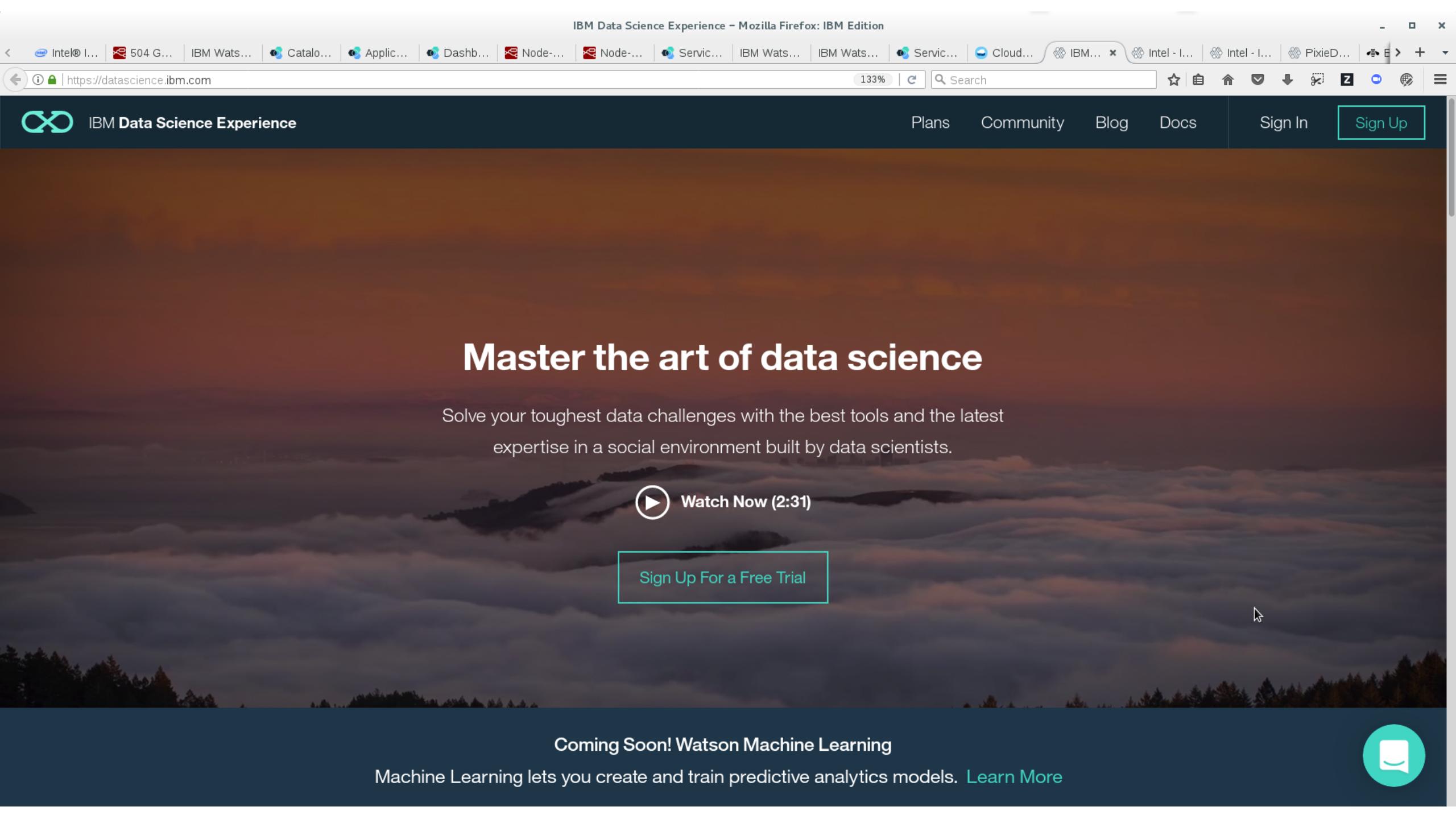
Log Out

_id	deviceId	temp	time
00d781abe49f444...	C07A2E305C4D	35.20000076293945	1504192223935
00d781abe49f444...	C07A2E305C4D	35.20000076293945	1504192295923
00d781abe49f444...	C07A2E305C4D	35.20000076293945	1504192316435
00d781abe49f444...	C07A2E305C4D	35.20000076293945	1504192388920
00d781abe49f444...	C07A2E305C4D	35.4000015258789...	1504192491486
01a93f1525ce8ba...	C07A2E305C4D	31.1000003814697...	1504186037107
01a93f1525ce8ba...	C07A2E305C4D	31.2000007629394...	1504186052563
01a93f1525ce8ba...	C07A2E305C4D	31.6000003814697...	1504186165618
01be92ddf6424a0...	C07A2E305C4D	31	1504189324784

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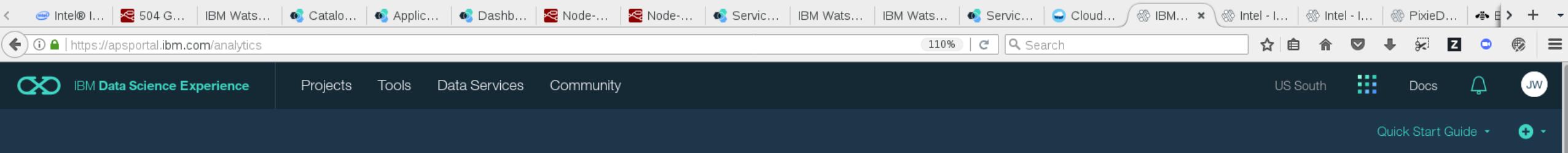
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Machine Learning lets you create and train predictive analytics models. [Learn More](#)





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2

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Data Sets

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The Nurse Assignment Problem data

AUTHOR IBM DATE May 10, 2017

DATA SET
Total population by country

AUTHOR IBM DATE Mar 01, 2017

DATA SET
Employed population by occupation and age

AUTHOR IBM DATE Dec 20, 2016

DATA SET
GoSales Transactions for Logistic Regression...

AUTHOR IBM DATE Dec 20, 2016





Overview

Analytics Assets

Data Assets

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Collaborators

Settings

Notebooks

view all (5)

+ add notebooks

NAME	SHARED	STATUS	LANGUAGE	LAST EDITOR	LAST MODIFIED	ACTIONS
SensorTile		○	Python 2.7	John Walicki	6 Sep 2017	
Intel			Python 2.7	John Walicki	23 Aug 2017	
Romeo			Python 2.7	John Walicki	2 Jun 2017	
PixieDust			Python 2.7	John Walicki	2 Jun 2017	
Assignment 1			Python 2.7	John Walicki	2 Jun 2017	

Data Assets

view all (0)

+ add data assets

NAME	TYPE	SERVICE	LAST MODIFIED	ACTIONS
you currently have no data assets				

Bookmarks

view all (0)

+ explore community

you currently have 0 bookmarks



Files

Connections

Drop file here or [browse](#)
your files to add a new file

Find in Storage

No files found.

Apply



```
In [9]: # To confirm you have the latest version of PixieDust on your system, run this cell
```

```
#!pip install --user --upgrade pixiedust==1.0.6
```

```
!pip install --ignore-installed --upgrade pixiedust
```

```
Collecting pixiedust
```

```
  Collecting mpld3 (from pixiedust)
```

```
    Collecting lxml (from pixiedust)
```

```
      Using cached lxml-3.8.0-cp27-cp27mu-manylinux1_x86_64.whl
```

```
    Collecting geojson (from pixiedust)
```

```
      Using cached geojson-2.1.0-py2.py3-none-any.whl
```

```
Installing collected packages: mpld3, lxml, geojson, pixiedust
```

```
Successfully installed geojson-2.1.0 lxml-3.8.0 mpld3-0.3 pixiedust-1.0.10
```

```
In [10]: import pixiedust
```

```
In [11]: !pip list --format=columns
```

Package	Version
---------	---------

geojson	2.1.0
---------	-------

lxml	3.8.0
------	-------

mpld3	0.3
-------	-----

pixiedust	1.0.10
-----------	--------

```
In [7]: def readDataFrameFromCloudant(host,user,pw,database):
```

```
    sparkSession = SQLContext.getOrCreate(sc).sparkSession
```



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Trusted | Python 2 with Spark 2.0



SPARK JOB PROGRESS

Hide All

JOB	PROGRESS	DURATION	STATUS
0	<div><div style="width: 100%;">1 stage</div></div>	10.41 sec	
Stage 0	<div><div style="width: 100%;">10/10 tasks</div></div>		 Comp...
1	<div><div style="width: 100%;">1 stage</div></div>	1.05 sec	

	_id	_rev	deviceId	temp	time
00d781abe49f44432...	1-64dd5c5c7ab231a...	C07A2E305C4D	35.20000076293945	1504192223935	
00d781abe49f44432...	1-3cbdea0ab672626...	C07A2E305C4D	35.20000076293945	1504192295923	
00d781abe49f44432...	1-43d7fbcb64753d0...	C07A2E305C4D	35.20000076293945	1504192316435	
00d781abe49f44432...	1-1c1a1cc7071fa0b...	C07A2E305C4D	35.20000076293945	1504192388920	
00d781abe49f44432...	1-f4c922159c8e23a...	C07A2E305C4D	35.400001525878906	1504192491486	
01a93f1525ce8badf...	1-323cccd693e560d9...	C07A2E305C4D	31.100000381469727	1504186037107	



In [7]: `display(cloudantdata)`

Options

Renderer: `matplotlib`

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```
In [8]: df = spark.sql("select avg(temp), std(temp), max(temp), min(temp) from sensortiletemperaturereadings")
df.show()
display(df)
```

SPARK JOB PROGRESS

JOB	PROGRESS	DURATION	STATUS
4	2 stages	1.05 sec	▼

```
+-----+-----+-----+
| avg(temp)| stddev_samp(temp)|max(temp) |
+-----+-----+-----+
|31.951628115126628|1.4837960019551515|      35.5|27.799999237060547|
+-----+-----+-----+
```

Average / Min / Max / Standard Deviation



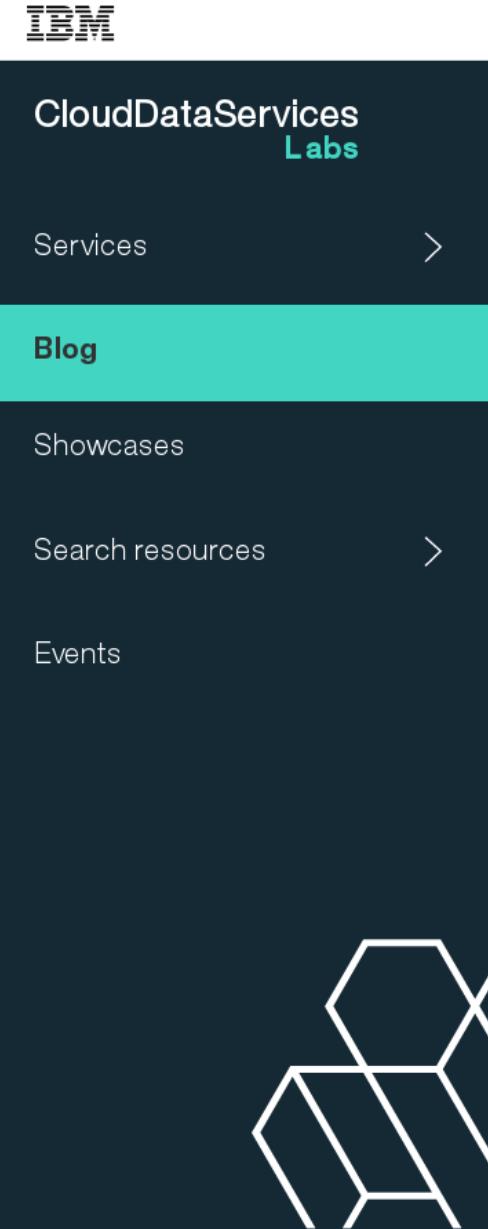
Schema

Table

Search table

Showing 1 of 1

avg(temp)	stddev_samp(temp)	max(temp)	min(temp)
31.9516281151	1.48379600196	35.5	27.7999992371



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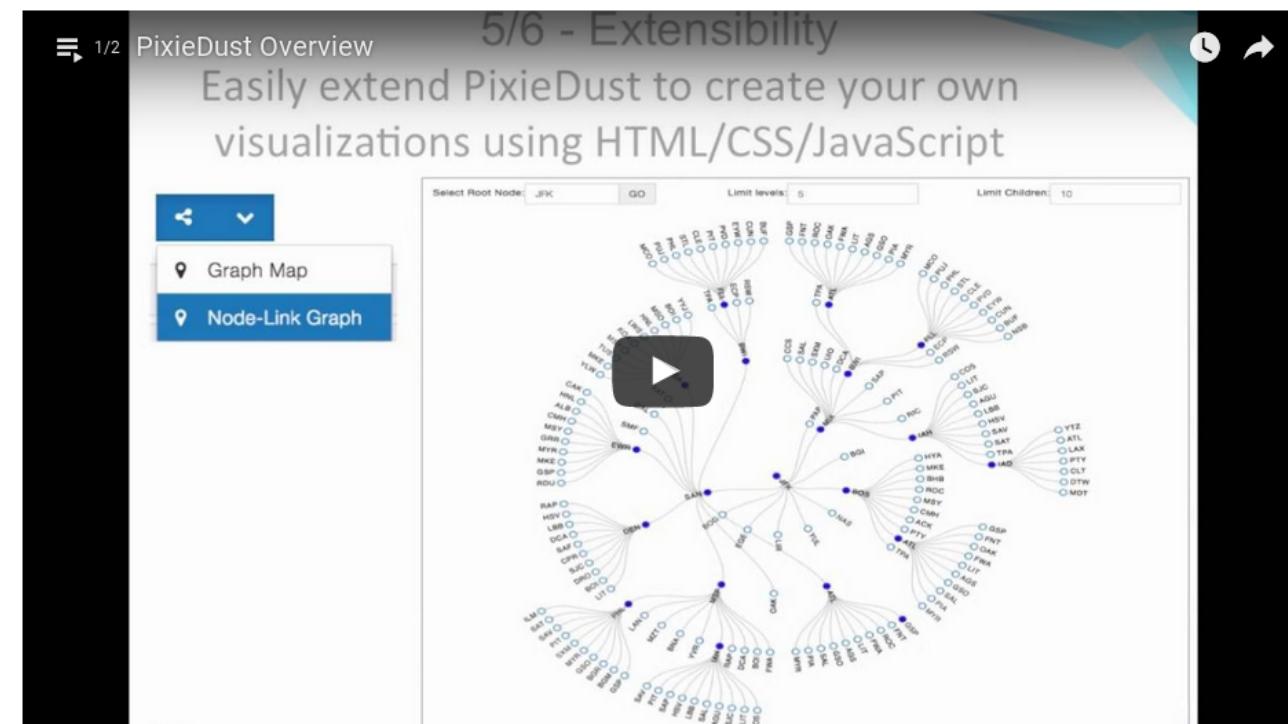
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Friendlier Data Science Notebooks

When I watched data scientists and developers work with Python notebooks, I thought it shouldn't be so difficult. PixieDust fills feature gaps that made notebooks too challenging for certain users and scenarios.



Six quick benefits of PixieDust (no sound).

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Python Helper library for Spark IPython Notebooks <https://ibm-cds-labs.github.io/pixiedust/>

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1,030 commits 25 branches 1 release 13 contributors Apache-2.0

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DTAIEB committed on GitHub Merge pull request #347 from ibm-cds-labs/david-working-branch ... Latest commit d8a5cf5 5 days ago

docs	Updated docs for 1.0.5	17 days ago
docsrc	Updated docs for 1.0.5	17 days ago
install	Removed unnecessary print call	2 months ago
java	Spark Streaming support: multiplexer channel output	9 months ago
notebook	user layers support	7 days ago
pixiedust	Updated tests for #344 PR	5 days ago



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Build a cognitive IoT app in just 7 steps

Transform your cognitive IoT solutions using the Data Science Experience to apply advanced machine learning and detect anomalies in real time on an IoT sensor data stream



Romeo Kienzler

Published on March 22, 2017



0

What makes cognitive IoT so cognitive? How can cognitive IoT be achieved? For some people, it is simply that the interaction between you and things becomes more human. For example, in an elevator you might hear the latest news based on your social media psychological profile. Or, you might hear some relaxing music if it detects that you look stressed.

To me, cognitive IoT is more about what happens behind the scenes. Although human-computer interaction (HCI) is a key part of many cognitive IoT solutions, I'll focus less on HCI because it is already turning into state-of-the-art tech. With IBM Watson cognitive APIs (like text-to-speech (TTS), speech-to-text (STT), machine translation, and visual recognition) working behind the scenes in your cognitive IoT apps, advanced HCI is now only limited by your imagination.

Cognitive IoT and artificial intelligence (AI) are nothing more than advanced machine learning. And advanced machine learning has two drivers:

- Algorithms (or models) that are powerful enough to learn any required behavior from data.

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A developer's guide to Exploring and Visualizing IoT Data

About this course: The value of IoT can be found within the analysis of data gathered from the system under observation, where insights gained can have direct impact on business and operational transformation. Through analysis data correlation, patterns, trends, and other insight are discovered. Insight leads to better communication between stakeholders, or actionable insights, which can be used to [More](#)

Who is this class for: This course is designed for developers who want to improve their data analysis skills or data analysts who want to become expert in finding interesting patterns in IoT Sensor Data.

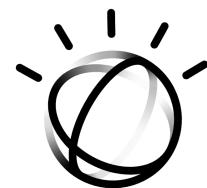
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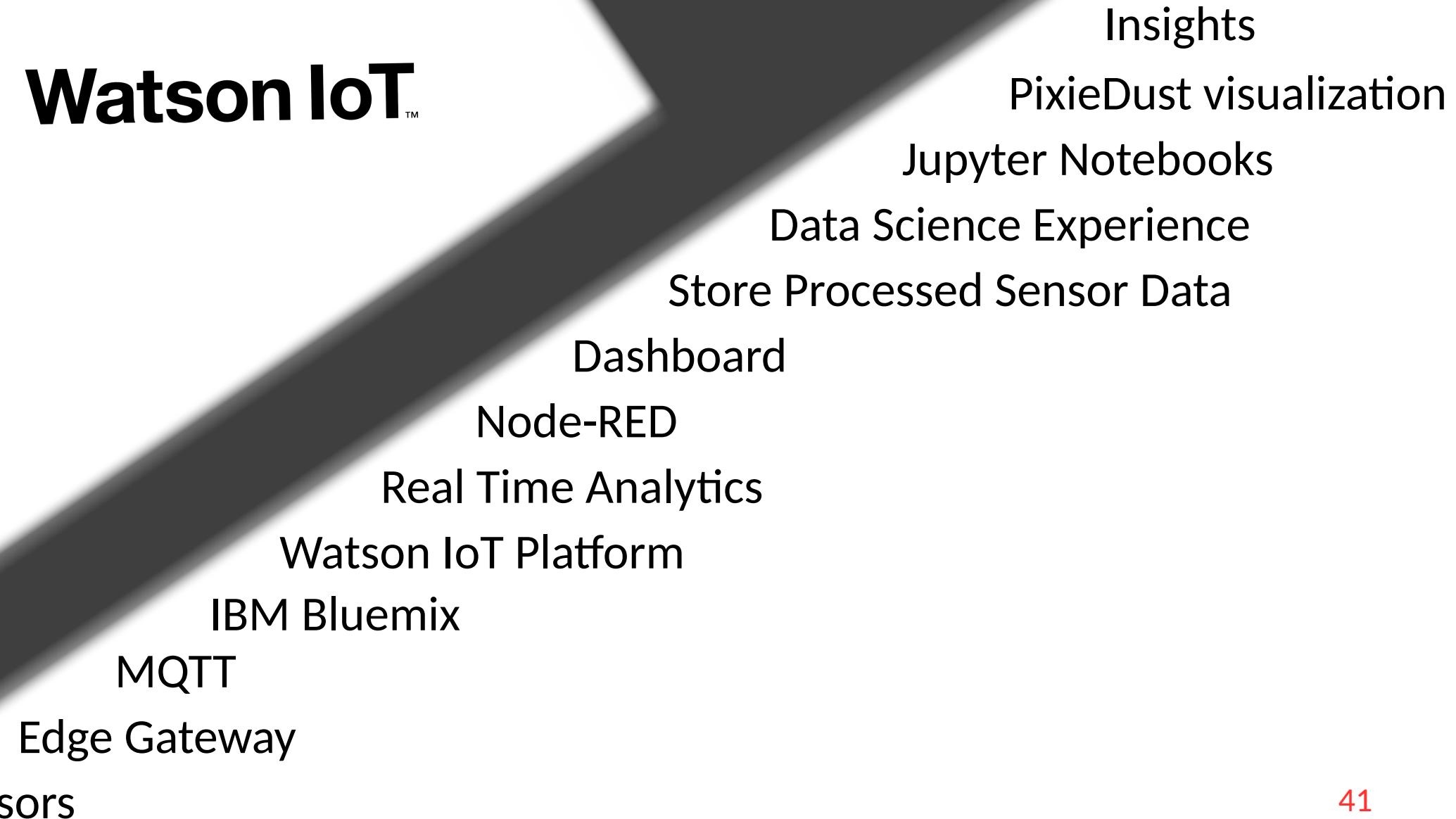
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