

# The New Tools and Toys of Informix

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***Advanced DataTools***

# Tom Beebe



Tom is a Senior Database Consultant and has been with Advanced DataTools for over 10 years. He has been working with Informix since college with a long time fondness for open source languages. Tom is the lead consultant for Networking, Unix System Administration and Web Development needs. Currently, he is the Project Manager and lead developer on a variety of Web Development projects.

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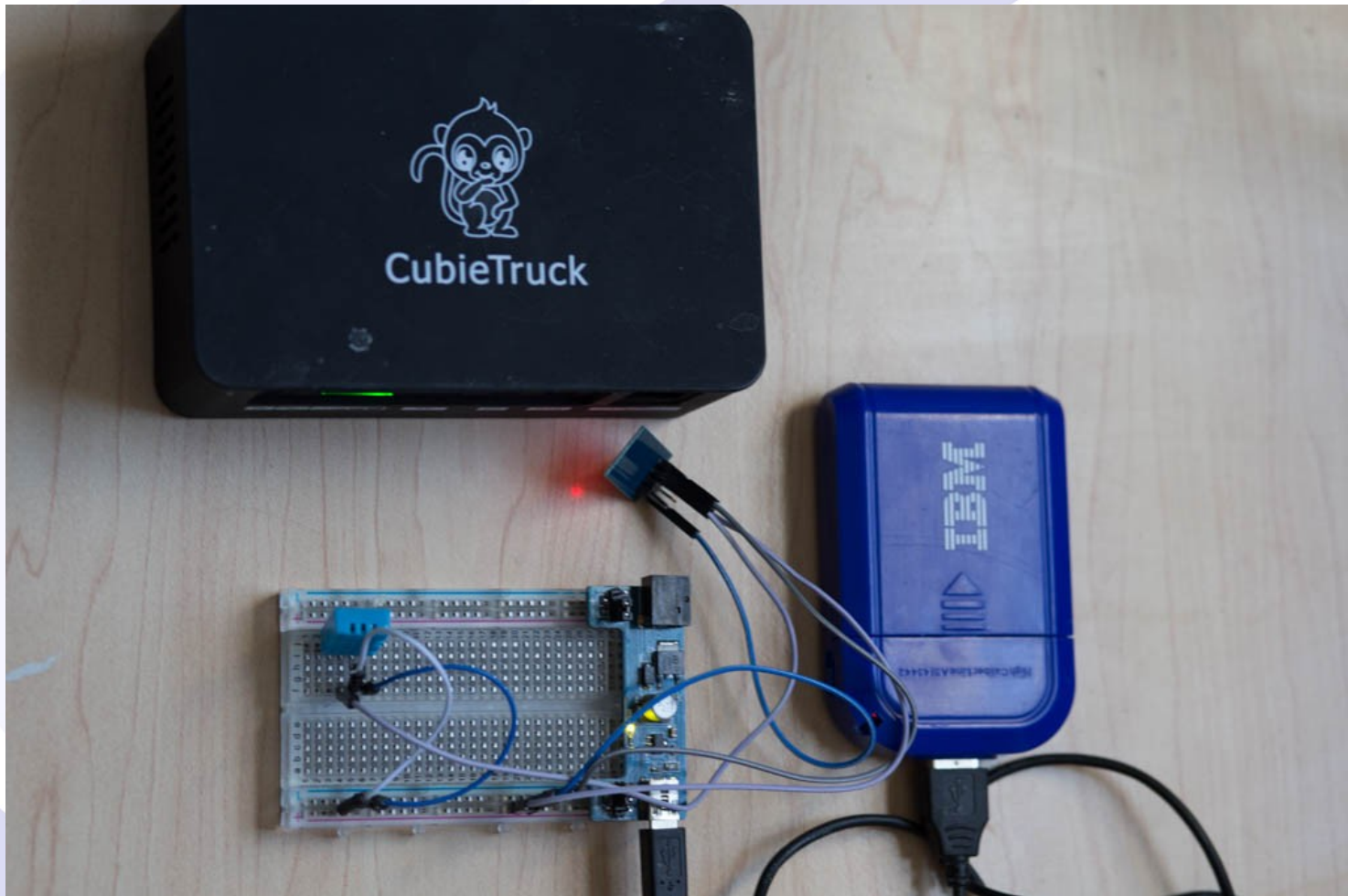
# New Technology For Informix

- New Key Features of 12
- NoSQL
- Mongo Support
- REST Listener
- Node-Red
- Spark
- IoT Data Visualization

# New Features of V12.10

- New PSM storage manager
- Multitenancy
- Improved Timeseries Features
- SPL includes 'case' statement
- Grid Queries
- Bluemix Integration
- ARM Support

# Demo System



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# NoSQL

- Unstructured data
- Often stored in JSON/BSON formats
  - Previously XML was the preferred method
- Key:Value pairs of data
- Supports many different types of data including arrays, even nested ones
- It is a generic term so there are several types

# NoSQL Types

- Key:Value pair databases
  - Simple
  - Just stores lists of key/values for each element
- Graph Stores
  - Store related data for graphing networks
- Wide-Columnar Databases
  - Stores nested 'super' elements
  - Each can have multiple rows per super element
- Document Databases
  - Stores full documents, can be key/value pairs, arrays, nested arrays, documents, other data



Document Database	Graph Databases
  Couchbase  MarkLogic  mongoDB	 Neo4j  InfiniteGraph The Distributed Graph Database
Wide Column Stores	Key-Value Databases
 redis  amazon DynamoDB  AEROSPIKE  riak	 accumulo HYPERTABLE <sup>INC</sup>  Cassandra  APACHE HBASE Amazon SimpleDB

@cloudtxt <http://www.aryannava.com>



# JSON – JavaScript Object Notation

```
{  
  "id": "0001",  
  "type": "donut",  
  "name": "Cake",  
  "ppu": 0.55,  
  "batters":  
    {  
      "batter":  
        [  
          { "id": "1001", "type": "Regular" },  
          { "id": "1002", "type": "Chocolate" },  
          { "id": "1003", "type": "Blueberry" },  
          { "id": "1004", "type": "Devil's Food" }  
        ]  
      },  
    },  
  "topping":  
    [  
      { "id": "5001", "type": "None" },  
      { "id": "5002", "type": "Glazed" },  
      { "id": "5005", "type": "Sugar" },  
      { "id": "5007", "type": "Powdered Sugar" },  
      { "id": "5006", "type": "Chocolate with Sprinkles" },  
      { "id": "5003", "type": "Chocolate" },  
      { "id": "5004", "type": "Maple" }  
    ]  
}
```

# NoSQL Advantages

- Fast application development
  - No waiting on schema changes
- Easy to scale horizontally
- Easy to handle multiple versions
- Handle very different data elements in one place
- Fast inserts
- Can handle delayed inserts if using a middle layer
- Direct inserts without having to go through a database layer

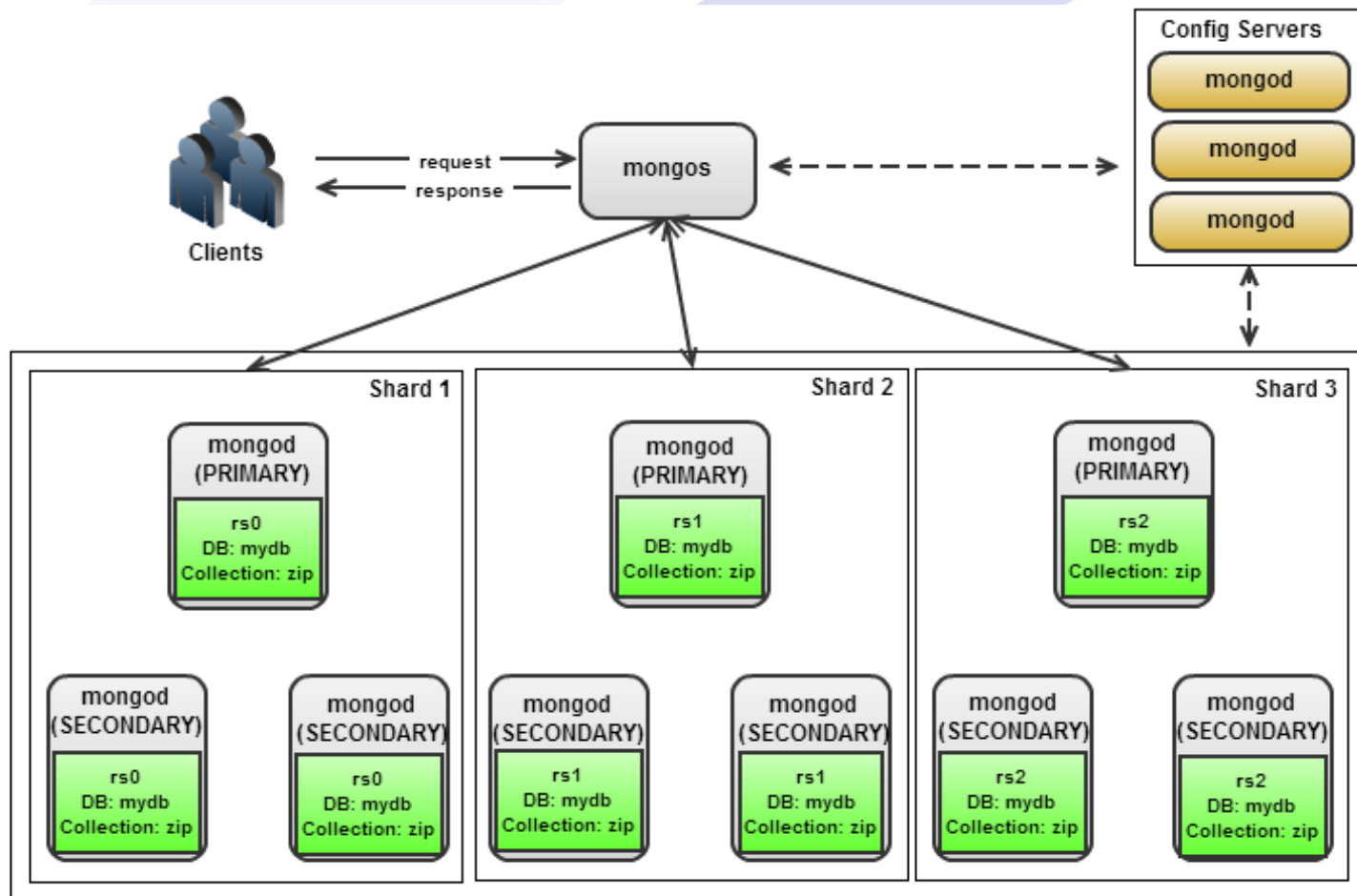
# NoSQL Disadvantages

- Can be slower to update
- Lack of constraints
- Easier to get bad data in a database
- Hard to connect to linking data
- Elements such as default values need to be added by the application
- Need to trust your developers to get it right

# Sharding

- Horizontal scaling
- Splitting data on to different nodes
- Sharded queries read the associated nodes in parallel
- Allows for very high performance and distributed queries without large boxes

# Sharding



Neil Lunn - <http://dba.stackexchange.com/questions/82551/data-distribution-in-mongos-with-shards-or-replica-sets>

# MongoDB

- Document Store style NoSQL database
- Open source
- Indexes (limited)
- Horizontal Replication
- Load Balancing
- Extensive querying syntax options



# MongoDB Downsides

- No traditional constraints
- No transactions until version 3
- Limited types of indexes
- Did not scale vertically well
- Stability issues
- Reliability issues

# Informix + Mongo

- In 12.10xC2 support for the Mongo API was introduced
- New additions to Informix:
  - **full support for the mongo command set**
  - **Added in the json and bson data types**
  - **Added the mongo wire listener**
  - **Data sharding**

# Selecting Data

- Select id, data, modcount, flags from sensor\_json

```
DISPLAY:  Next Restart Exit
Exit DISPLAY Menu.

----- sensors@moogletcp ----- Press CTRL-W for Help -----

id      5648a32a80cd2aed024b9f5a
data    ?
        " : "1a:fe:34:98:b0:d1" }
        88
modcount 0
flags    0

id      5648a33480cd2aed024b9f5b
data    ?
        " : "1a:fe:34:98:b0:d1" }
        24
modcount 0
flags    0

id      5648a33e80cd2aed024b9f5c
data    ?
        " : "1a:fe:34:98:b0:d1" }
        c6
modcount 0
flags    0
```

# Selecting Data – Casting To JSON

- select id, **data::json**, modcount, flags from sensor\_json

```
DISPLAY: [Next] Restart Exit
Display next page of results.

----- sensors@moogletcp ----- Press CTRL-W for Help -----

id          5648a32a80cd2aed024b9f5a
(expression) {"topic":"sensors/temp","payload":{"data": "32" , "sensor_id"
: "1a:fe:34:98:b0:d1" }","qos":0,"retain":false,"_msgid":"8952797
8.76ad88","_id":ObjectId("5648a32a80cd2aed024b9f5a")}}
modcount    0
flags       0

id          5648a33480cd2aed024b9f5b
(expression) {"topic":"sensors/temp","payload":{"data": "20" , "sensor_id"
: "1a:fe:34:98:b0:d1" }","qos":0,"retain":false,"_msgid":"5aacdb3
8.a55324","_id":ObjectId("5648a33480cd2aed024b9f5b")}}
modcount    0
flags       0

id          5648a33e80cd2aed024b9f5c
(expression) {"topic":"sensors/temp","payload":{"data": "25" , "sensor_id"
: "1a:fe:34:98:b0:d1" }","qos":0,"retain":false,"_msgid":"34243a0
1.cbdbc6","_id":ObjectId("5648a33e80cd2aed024b9f5c")}}
modcount    0
flags       0
```

# Setting Up

- Set up the Mongo listener
  - **Configure `jsonlistener.properties`**
  - **Start the listener**
    - Command Line
    - SQL
- Start storing NoSQL data

# jsonlistener.properties

- Sample in \$INFORMIXDIR/etc/ jsonlistener-example.properties

- Content:

```
listener.type=mongo           #Mongo or REST
listener.hostName=localhost    #Use hostname if you want remote connections
listener.port=26351           #Port for mongo listener to run on
security.sql.passthrough=false # allow embedded SQL in the mongo commands
url=jdbc:informix-sqli://mooglenosql:10098/sysmaster:INFORMIXSERVER=mooglenosql;USER=nosql;PASSWORD=n0sql!
```

- sqlhosts:

– **mooglenosql**  
**10098**

**onsoctcp**

**cubietruck**



# Starting Mongo Listener

```
CLASSPATH=${INFORMIXDIR}/lib/ifxjdbc.jar  
/usr/bin/java \  
-jar ${INFORMIXDIR}/bin/jsonListener.jar \  
-config ${INFORMIXDIR}/etc/jsonListener.properties \  
-logfile ${INFORMIXDIR}/tmp/jsonListener.log \  
-start &
```

Or:

```
EXECUTE FUNCTION task("start json listener",  
"/opt/informix/etc/jsonListener.properties");
```

# Connecting To Informix

- Install Mongo Client package
- `mongo <server>:<port>/<database>`
- `mongo localhost:26351/sensors`
  - Will open the mongo shell
  - If it returns an error check the log from the startup script

# Using Mongo

- `db.<table>.find()`
  - Equivalent to `select * from <table>`
- `db.sensor_json.find({_msgid:"d72c79f8.28d388"})`
  - `{ "topic" : "sensors/temp", "_msgid" : "d72c79f8.28d388", "_id" : ObjectId("5648a37a80cd2aed024b9f62") }`
- Inserts automatically create the table as needed

# Selecting Using Mongo

```
informix@cubie:~/nosql$ mongo localhost:26351/sensors
MongoDB shell version: 2.4.10
connecting to: localhost:26351/sensors
> db.sensor_json.find()
{ "topic" : "sensors/temp", "payload" : "{ \"data\" : \"32\", \"sensor_id\" : \"1a:fe:34:98:b0:d1\" }", "qo
{ "topic" : "sensors/temp", "payload" : "{ \"data\" : \"20\", \"sensor_id\" : \"1a:fe:34:98:b0:d1\" }", "qo
{ "topic" : "sensors/temp", "payload" : "{ \"data\" : \"25\", \"sensor_id\" : \"1a:fe:34:98:b0:d1\" }", "qo
{ "topic" : "sensors/temp", "payload" : "{ \"data\" : \"32\", \"sensor_id\" : \"1a:fe:34:98:b0:d1\" }", "qo
{ "topic" : "sensors/temp", "payload" : "{ \"data\" : \"21\", \"sensor_id\" : \"1a:fe:34:98:b0:d1\" }", "qo
{ "topic" : "sensors/temp", "payload" : "{ \"data\" : \"35\", \"sensor_id\" : \"1a:fe:34:98:b0:d1\" }", "qo
{ "topic" : "sensors/temp", "payload" : "{ \"data\" : \"33\", \"sensor_id\" : \"1a:fe:34:98:b0:d1\" }", "qo
{ "topic" : "sensors/temp", "payload" : "{ \"data\" : \"21\", \"sensor_id\" : \"1a:fe:34:98:b0:d1\" }", "qo
{ "topic" : "sensors/temp", "payload" : "{ \"data\" : \"38\", \"sensor_id\" : \"1a:fe:34:98:b0:d1\" }", "qo
{ "topic" : "sensors/temp", "payload" : "{ \"data\" : \"34\", \"sensor_id\" : \"1a:fe:34:98:b0:d1\" }", "qo
{ "topic" : "sensors/temp", "payload" : "{ \"data\" : \"21\", \"sensor_id\" : \"1a:fe:34:98:b0:d1\" }", "qo
{ "topic" : "sensors/temp", "payload" : "{ \"data\" : \"35\", \"sensor_id\" : \"1a:fe:34:98:b0:d1\" }", "qo
{ "topic" : "sensors/temp", "payload" : "{ \"data\" : \"25\", \"sensor_id\" : \"1a:fe:34:98:b0:d1\" }", "qo
{ "topic" : "sensors/temp", "payload" : "{ \"data\" : \"25\", \"sensor_id\" : \"1a:fe:34:98:b0:d1\" }", "qo
{ "topic" : "sensors/temp", "payload" : "{ \"data\" : \"28\", \"sensor_id\" : \"1a:fe:34:98:b0:d1\" }", "qo
{ "topic" : "sensors/temp", "payload" : "{ \"data\" : \"33\", \"sensor_id\" : \"1a:fe:34:98:b0:d1\" }", "qo
{ "topic" : "sensors/temp", "payload" : "{ \"data\" : \"25\", \"sensor_id\" : \"1a:fe:34:98:b0:d1\" }", "qo
{ "topic" : "sensors/temp", "payload" : "{ \"data\" : \"22\", \"sensor_id\" : \"1a:fe:34:98:b0:d1\" }", "qo
{ "topic" : "sensors/temp", "payload" : "{ \"data\" : \"21\", \"sensor_id\" : \"1a:fe:34:98:b0:d1\" }", "qo
{ "topic" : "sensors/temp", "payload" : "{ \"data\" : \"21\", \"sensor_id\" : \"1a:fe:34:98:b0:d1\" }", "qo
Type "it" for more
> █
```

# Mongo Commands

Mongo Command	Informix Statement
db.customer.insert( { name: "John", age: 65 } )	INSERT INTO customer (name, age) VALUES ("John",65)
db.customer.find()	SELECT * FROM customer
db.customer.find( {age: { \$gt:65 } } )	SELECT * FROM customer WHERE age > 65
db.customer.drop()	DROP TABLE customer
db.customer.ensureIndex( { name : 1, age : -1 } )	CREATE INDEX idx_1 on customer(name , age DESC)
db.customer.remove( {age: { \$gt:65 } } )	DELETE FROM customer where age > 65
db.customer.update( { age: { \$gt: 64 } }, { \$set: { status: "Retire" } }, { multi: true } )	UPDATE customer SET status = "Retire" WHERE age > 64

# REST Listener

- Set up and started the same way as the Mongo listener
- Change listener.type to rest
- Sets up a listener that handles REST POST/GET commands such as from a web server or even from javascript
- Uses JSON to pass/receive data
- REST Syntax is used for Bluemix data transfer
- No drivers needed
- Use 12.1xC5 or later



# REST Methods

- Get – Query
- Post – Insert
- Delete – Delete
- Put - Update

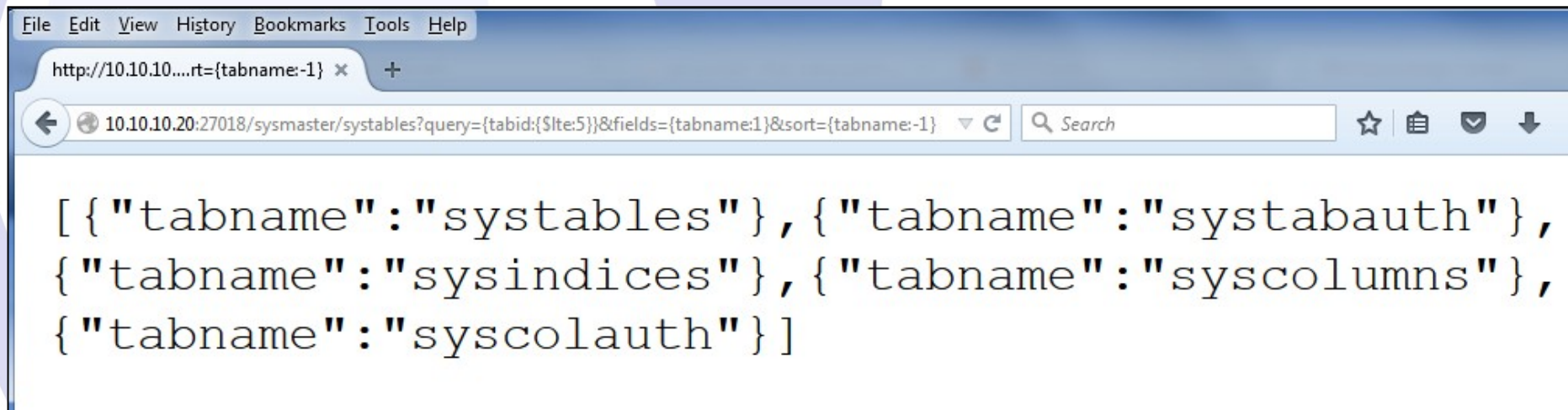
# REST Examples

- GET /mydb/people?  
sort={age:1}&fields={\_id:0,lastName:0}
- [{"firstName":"Sherry","age":31},  
{"firstName":"John","age":31},  
{"firstName":"Bob","age":47},  
{"firstName":"Larry","age":49}]

# REST

Example: Connect from a browser to an Informix database

<http://10.19.40.97:26352/sysmaster/systables?query={tabid:{lte:5}}&fields={tablename:1}&sort={tablename:-1}>

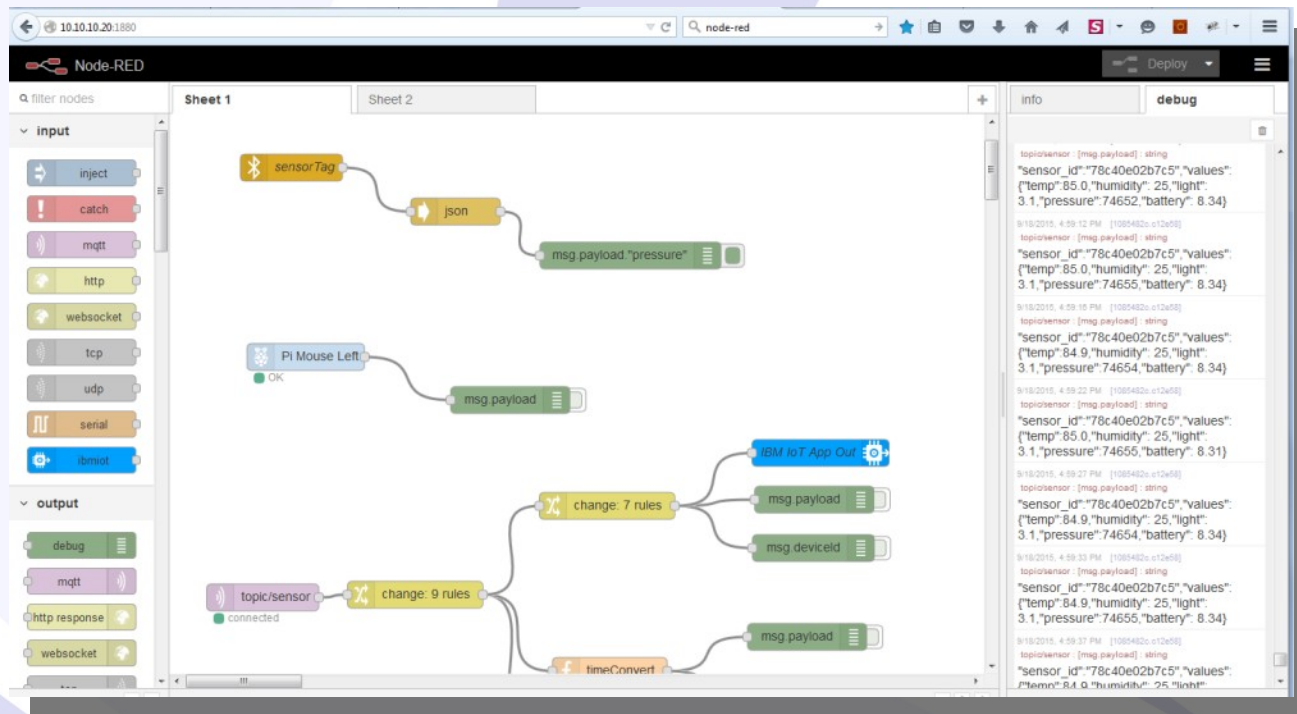


# Node-RED

- Free opensource tool based on node.js
- Visual tool, little to no programming needed
- Drag and drop elements to set up data flows
- Can handle many types of data through freely available modules
- Interfaces extensively with IBM services
  - **Streams**
  - **Watson**
  - **Bluemix**

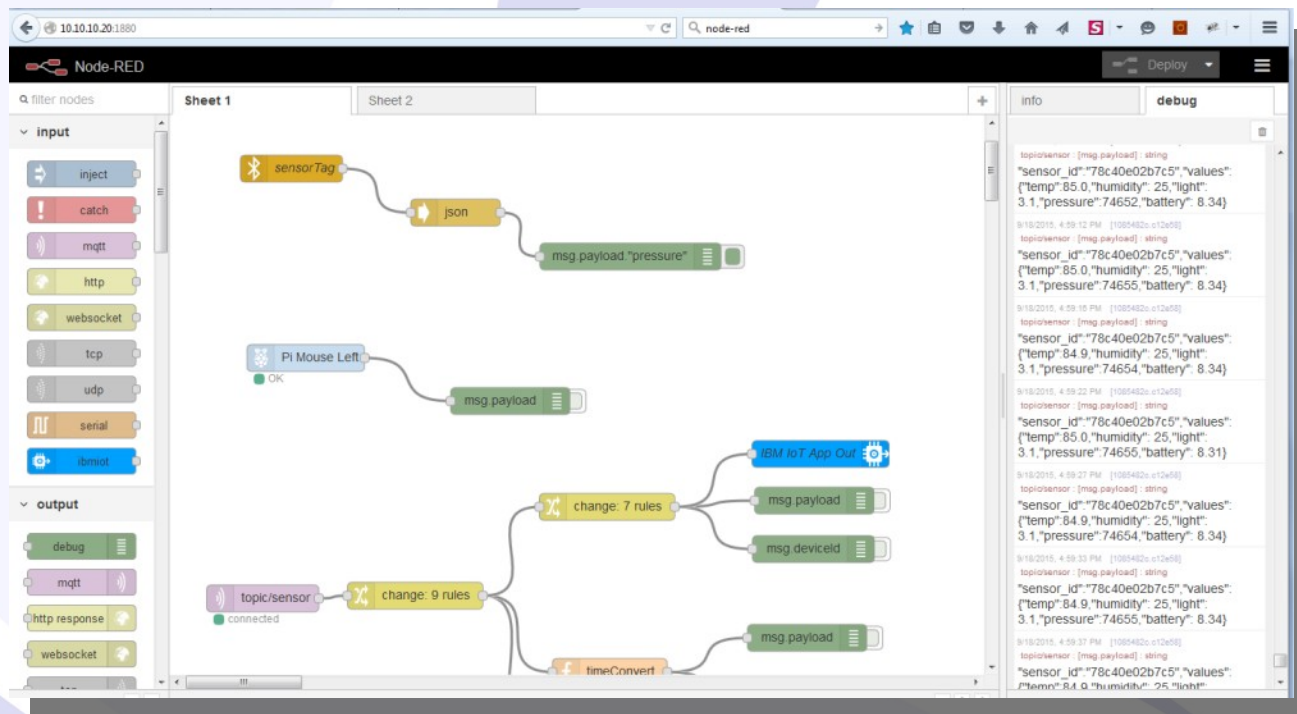
# Node-RED

- Graphical tool – run in a browser
- Use to put together data flows and apply operations
- Additional “nodes” can be added to increase the functionality
- Custom “nodes” can be written



# Node-RED

- Graphical tool – run in a browser
- Use to put together data flows and apply operations
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# Node-RED Install

- `sudo npm install -g node-red`
- `node-red`
- No step 3

# Node-RED Modules

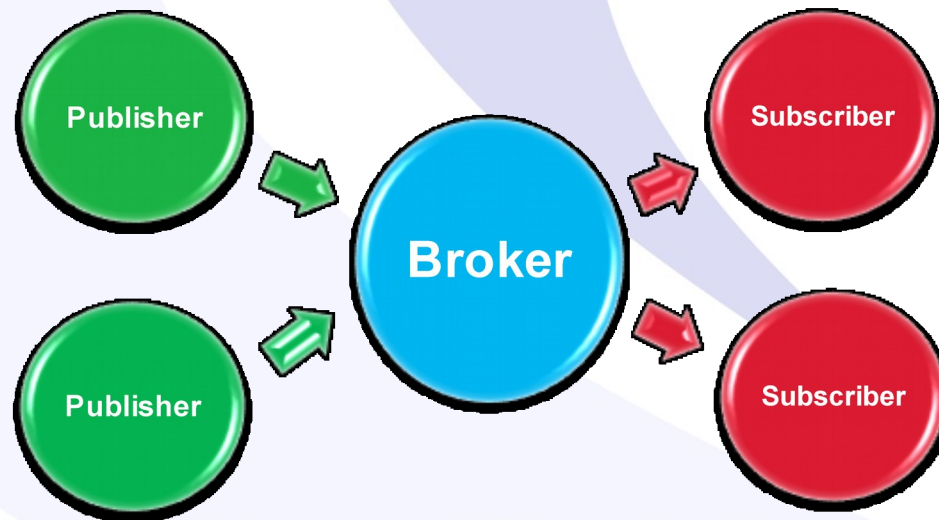
```
cd ~/.node-red
```

```
npm install node-red-node-{filename}
```

- That is it.
- Another node.js utility called pm2 can be useful to control the service

# MQTT

- MQ Telemetry Transport
- Publisher nodes connect and send data
- Subscribers see the data and make use of it
- Many available servers
  - Including Websphere



# Real-Time Operational Database Streaming Analytics with Spark

- Streaming data is becoming more important in the business world
- As we all collect more data from customers, from sensors, from other sources we need to be able to analyze it in real time
- Being able to run analytics on our data in real time gives a huge competitive advantage

# Apache Spark

- Open source, in-memory, clustered solution for processing data sets
- IBM is working with the Apache foundation to improve Spark
- They are working on integrating it with many of their data solutions
- Informix is no exception
- More information coming soon



# IoT Data Visualization

- Beta
- Only available on Docker
- Works with traditional and timeseries data
- Tool to graph out your Informix data

# IoT Data Visualization

LINE CHART

BAR CHART

AREA CHART

Add a new Graph

1. SELECT

2. CONFIGURE

☒ **Select an existing data source**  
Create a new data source

Data Source:

Display Name:

Url:

User:

Informix TimeSeries - 'Weather Demo' - All

Informix TimeSeries - 'Weather Demo' - All

Informix TimeSeries - 'Weather Demo' - Few weeks

Informix TimeSeries - 'Stores Demo'

IoT Foundation - 'Weather Demo'

informix

Next

Show Graph

Cancel

# IoT Data Visualization

LINE CHART

BAR CHART

AREA CHART

Add a new Graph

1. SELECT

2. CONFIGURE

Name:

ATTRIBUTES	SCALE	OPERATE	GROUP BY	FILTER
<div><div>json_data_tempi</div><div></div><div></div></div>	<div></div>	<div><div>✓ Average</div><div>Bottom 5%</div><div>Top 5%</div><div>Min</div><div>Max</div><div>Count</div><div>Standard Dev.</div><div>Variance</div></div>	<div></div>	<div></div>

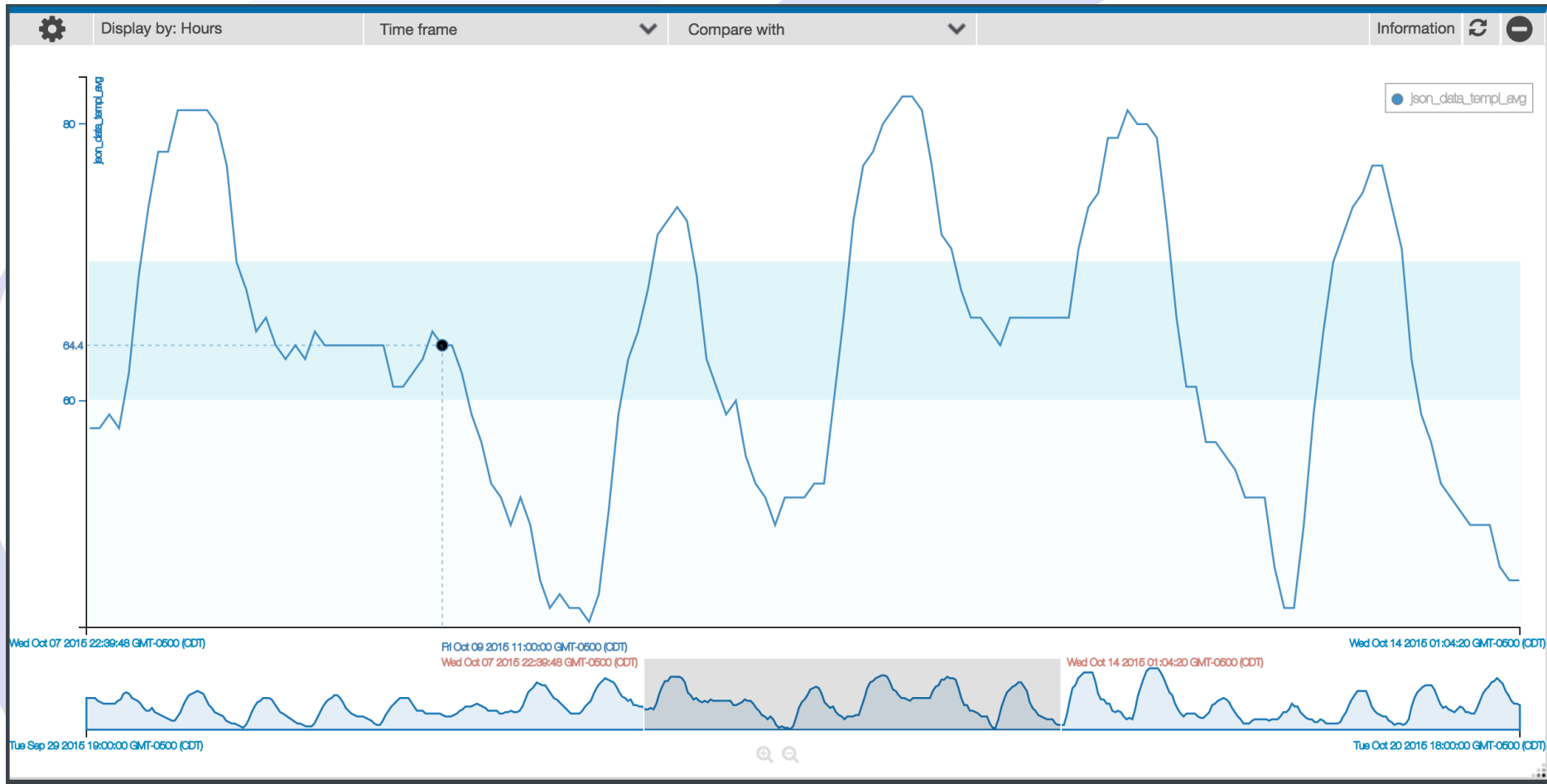
Next

Show Graph

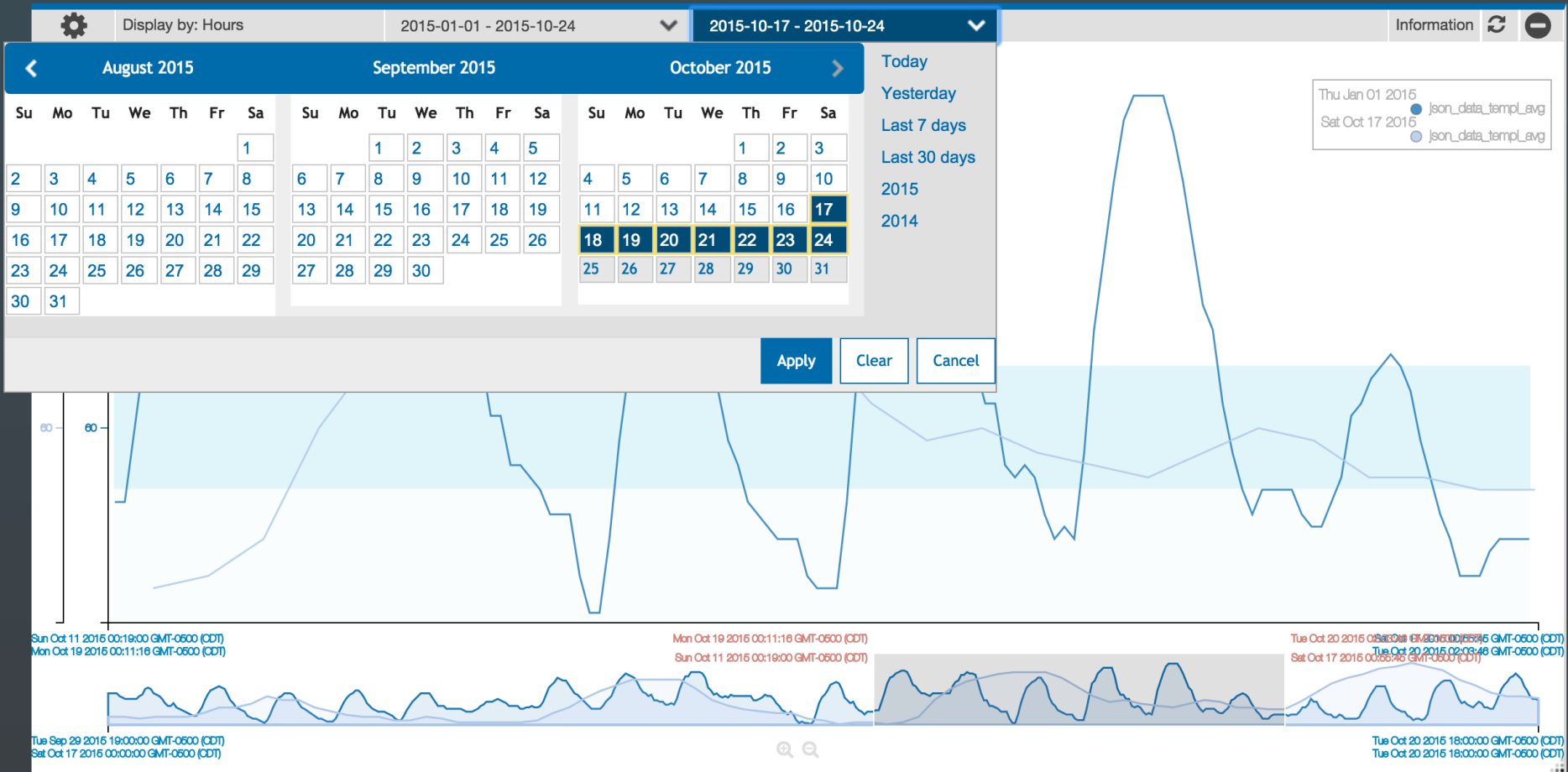
Cancel



# IoT Data Visualization



# IoT Data Visualization



# Links

- <https://www.mongodb.com/nosql-explained>
- [https://adobe.github.io/Spry/samples/data\\_region/JSONDataSetSample.html](https://adobe.github.io/Spry/samples/data_region/JSONDataSetSample.html)
- <https://hub.docker.com/r/ibmcom/iotvisualization>
- <http://ibm.co/1N0XcKU>
  - setting up the wire listener
- <http://www-01.ibm.com/support/docview.wss?uid=swg27041825>
  - Mongo and Informix command comparison
- <http://ibm.co/1MSiSWz>
  - REST Api Information
- <http://nodered.org/docs/getting-started/running.html>
- <http://flows.nodered.org/>

# More Links

- IBM's Spark Site
  - <http://www.ibm.com/analytics/us/en/technology/spark/>
- IOT Data Visualization
  - <https://hub.docker.com/r/ibmcom/iotvisualization/>

# More Resources

- Webcasts covering Informix, ARM, Internet of Things:  
<http://advanceddatatools.com/Informix/Webcasts.html>
- Compare Informix versions:  
<http://www.ibm.com/developerworks/data/library/techarticle/dm-0801doe>
- Docker Site:  
<https://hub.docker.com/r/ibmcom/informix-innovator-c/>
- Advanced DataToolsTraining:  
<http://advanceddatatools.com/Training/InformixTraining.html>

# Questions?



Send follow-up questions to  
[tom@advanceddatatools.com](mailto:tom@advanceddatatools.com)

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Thank You

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