Integrating with NodeRed, DDS, Etc.

VOLTTRON™ External Tools Integration

MICHAEL ROUP

Pacific Northwest National Laboratory

VOLTTRON™ 2016

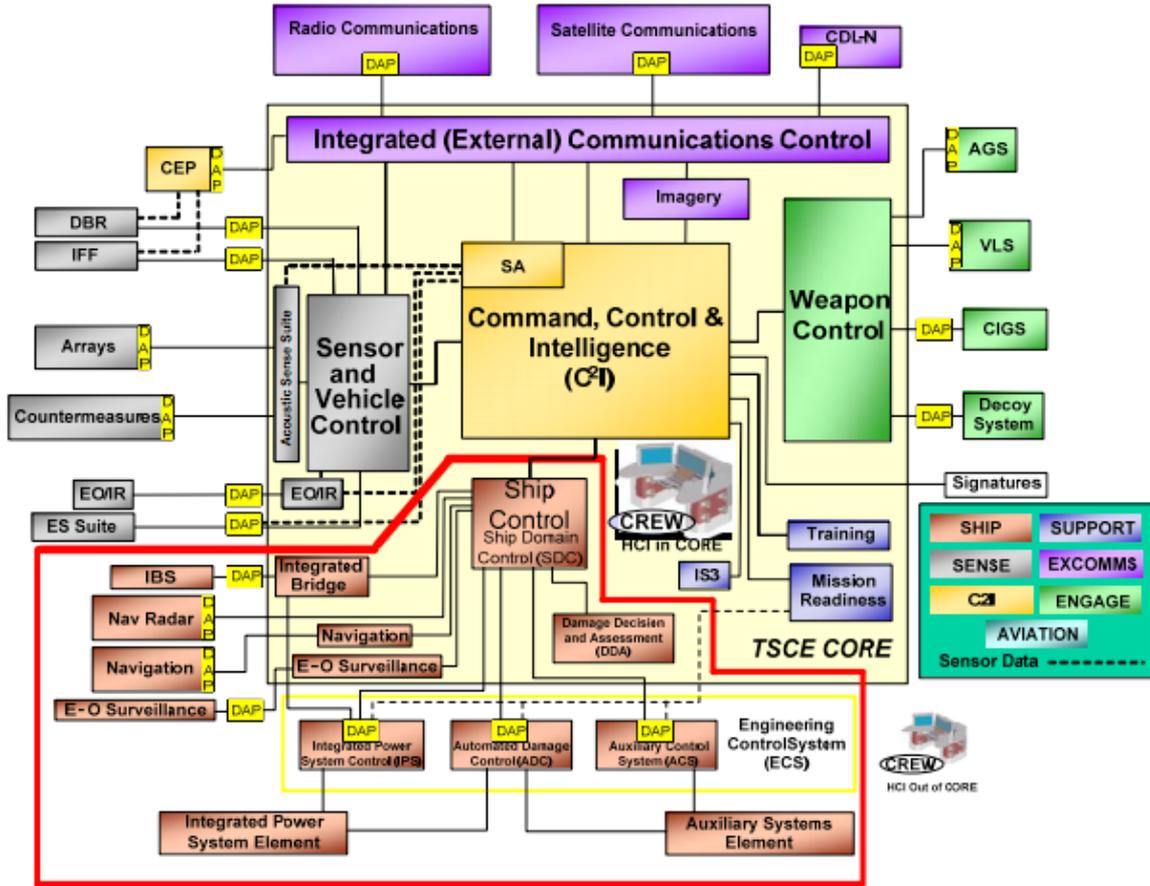# Data Distribution Service (DDS)

► Object Management Group (OMG) standard with multiple implementations

► "Data centric" middleware – data model required

► Publish / Subscribe messaging

► Automatic Discovery

► Fine-grain control at each stage of data transport

   ■ Configurable Quality of Service options

Total Ship Compute Environment

PubSub Topics

DDS

- ► Matched exactly
- ► Associated with a data type i.e. a struct
- ► Explicitly attached to pubsub nodes
- ► Lots of work to add new topics

ZMQ

- ► Matched by prefix
  - ■ Very useful for hierarchical topics
    - ● i.e. campus/building/device
- ► No work to add new topics

DDS Type Configuration

```xml
<types>
  <struct name="ShapeType" extensibility="extensible">
    <member name="color" stringMaxLength="128" id="0" type="string" key="true"/>
    <member name="x" id="1" type="long"/>
    <member name="y" id="2" type="long"/>
    <member name="shapesize" id="3" type="long"/>
  </struct>
  <enum name="ShapeFillKind" extensibility="extensible">
    <enumerator name="SOLID_FILL" value="0"/>
    <enumerator name="TRANSPARENT_FILL" value="1"/>
    <enumerator name="HORIZONTAL_HATCH_FILL" value="2"/>
    <enumerator name="VERTICAL_HATCH_FILL" value="3"/>
  </enum>
  <struct name="ShapeTypeExtended" baseType="ShapeType" extensibility="extensible">
    <member name="fillKind" id="4" type="nonBasic" nonBasicTypeName="ShapeFillKind"/>
    <member name="angle" id="5" type="float"/>
  </struct>
</types>
```
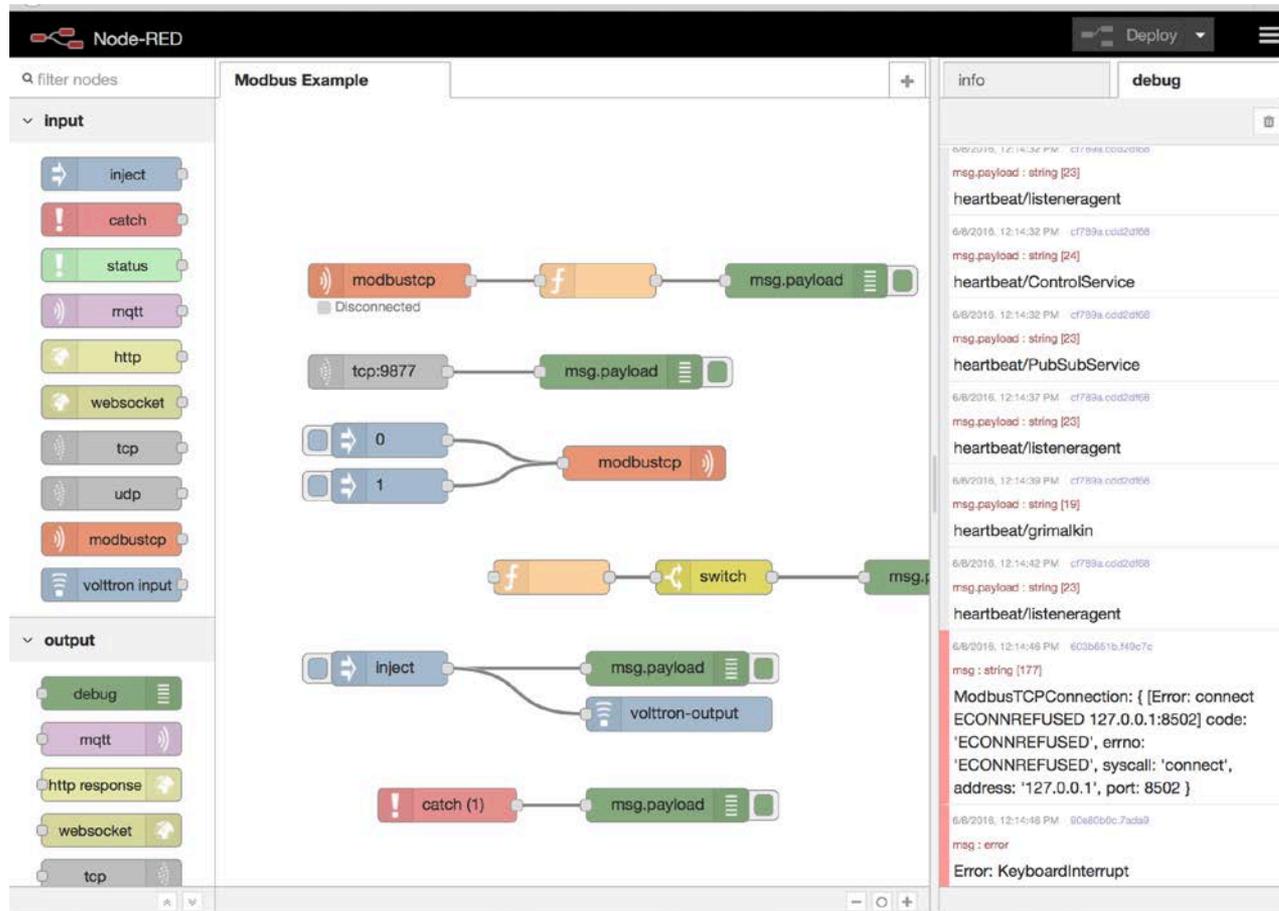
Making DDS Available to VOLTTRON

- ► rticonnextdds-connector adds python support for DDS
  - ■ unofficial 'community' package
- ► Wrap library as an agent
- ► Expose needed functionality as RPC methods
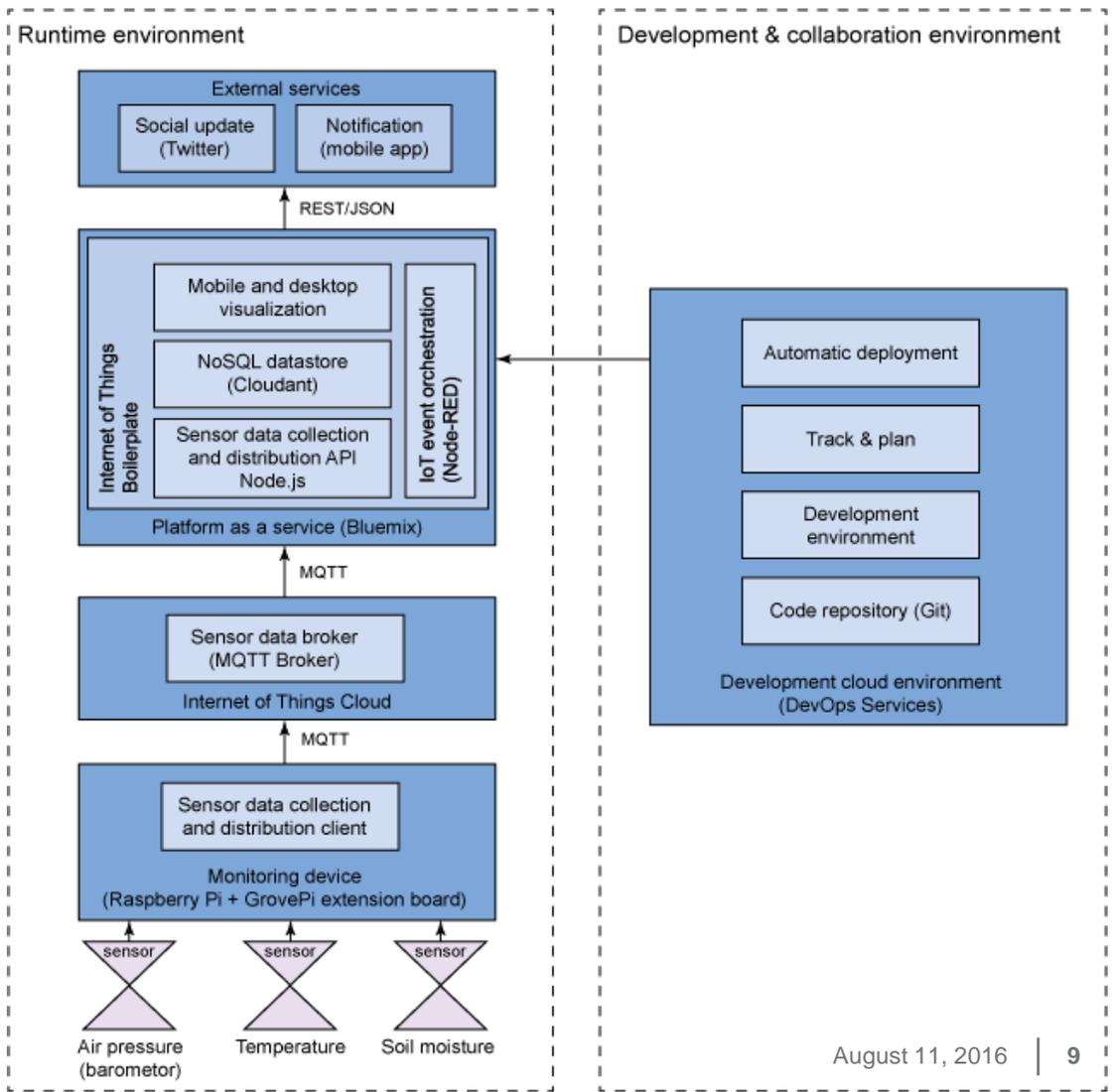- ► Other agents can now retrieve and publish to DDS topics

Demo

Node-RED

- ► Visual wiring tool for the Internet of Things
- ► Built on node.js
- ► Over 800 nodes and flows available for download
- ► Embeddable

Node-RED: Watering Plants with Bluemix

http://www.ibm.com/developerworks/cloud/library/cl-poseidon1-app/

Comparison

Node-RED
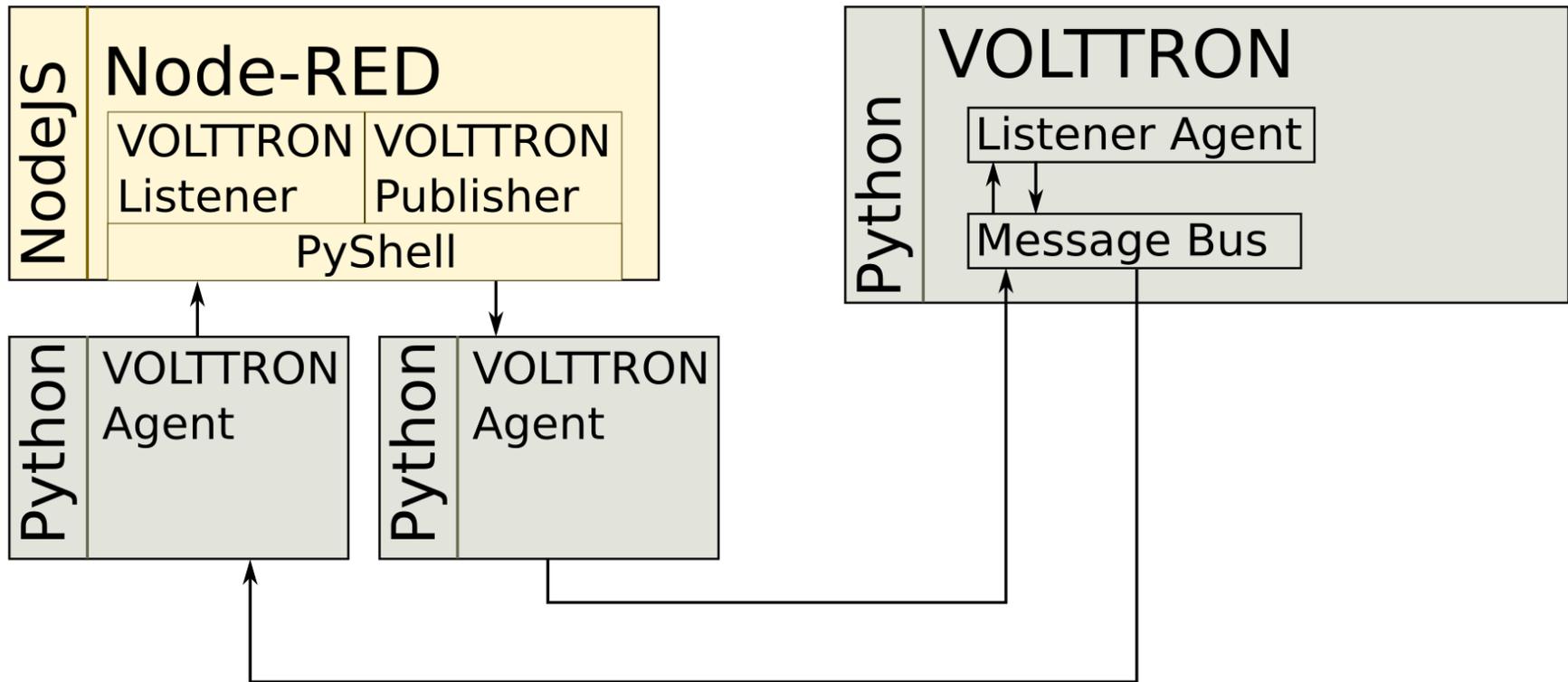
▶ General-purpose event processing

▶ Can talk Modbus

▶ Embed as UI in other tools

VOLTTRON™

▶ Applied to Smart Buildings

▶ Works with Modbus and BACnet

▶ Use UI for monitoring, control, feedback

▶ Includes security infrastructure, historian, etc.

Connecting Node-RED to VOLTTRON™

Demo

Future Extensions

► MQTT – Machine to machine protocol with a focus on maintaining a small footprint

► Alljoyn – Framework for automatic device discovery and communication

► Azure IoT – Microsoft's IoT cloud

► AWS IoT – Amazon's IoT cloud