DELIVERING ARDUINO DATA TO THINGWORX

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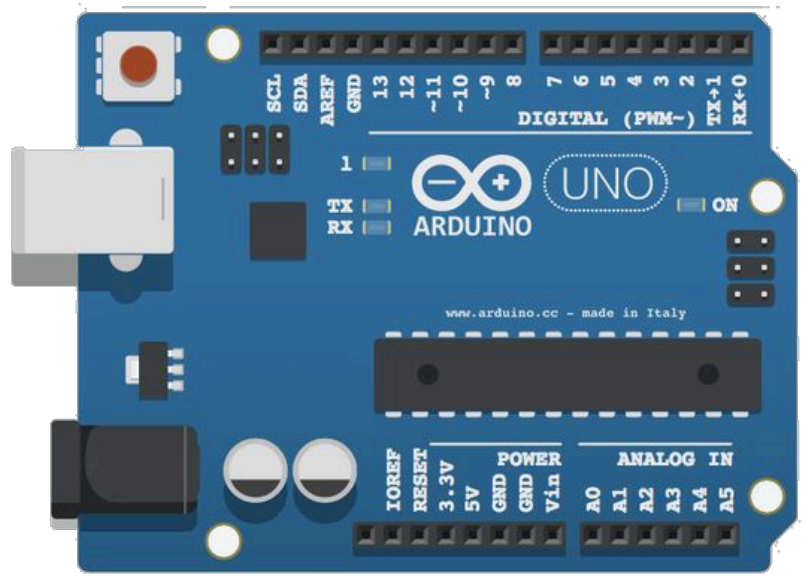
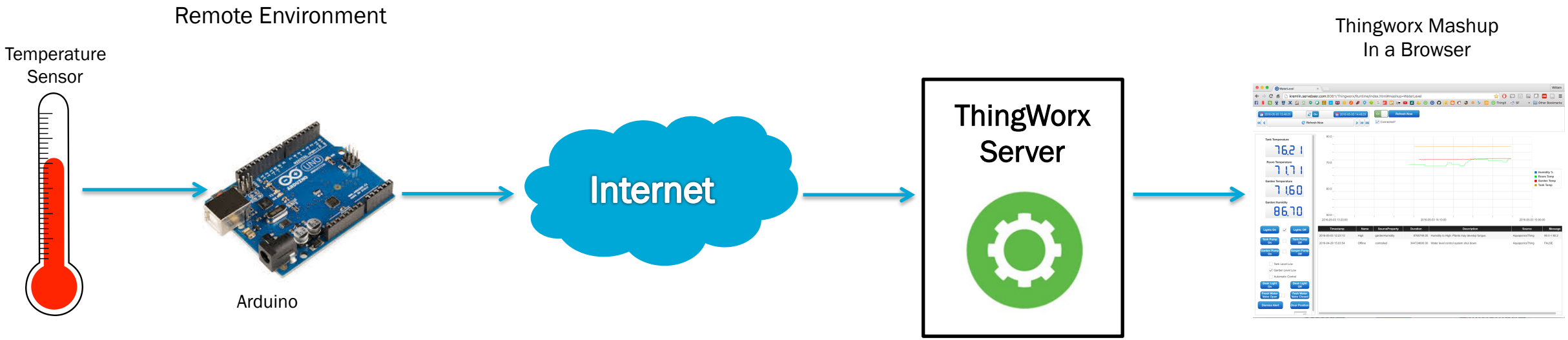
THE ARDUINO PLATFORM

- Easy to use, low cost, microcontroller based platform open source platform
- Great for data acquisition, both analog and digital
- Easy to program
- A low resource platform not suitable for any ThingWorx “Always On” SDK
- Offers no network connectivity out of the box
- Supports Shields to easily add new hardware



EXAMPLE– REMOTE TEMPERATURE MEASUREMENT

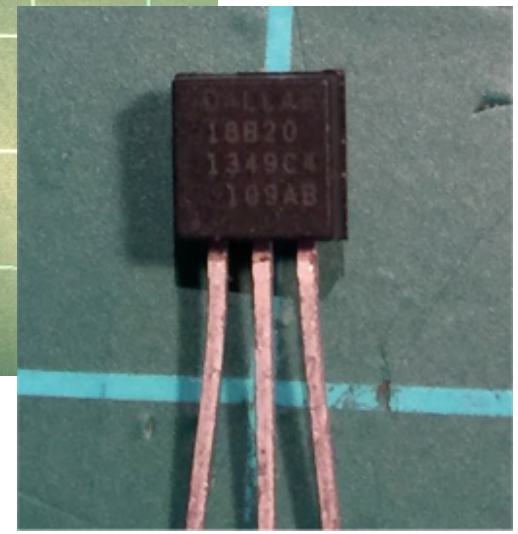
- Report a remote temperature measurement to ThingWorx
- Do minimal protocol development work on the Arduino
- Provide a re-usable example for data delivery



THE HARDWARE

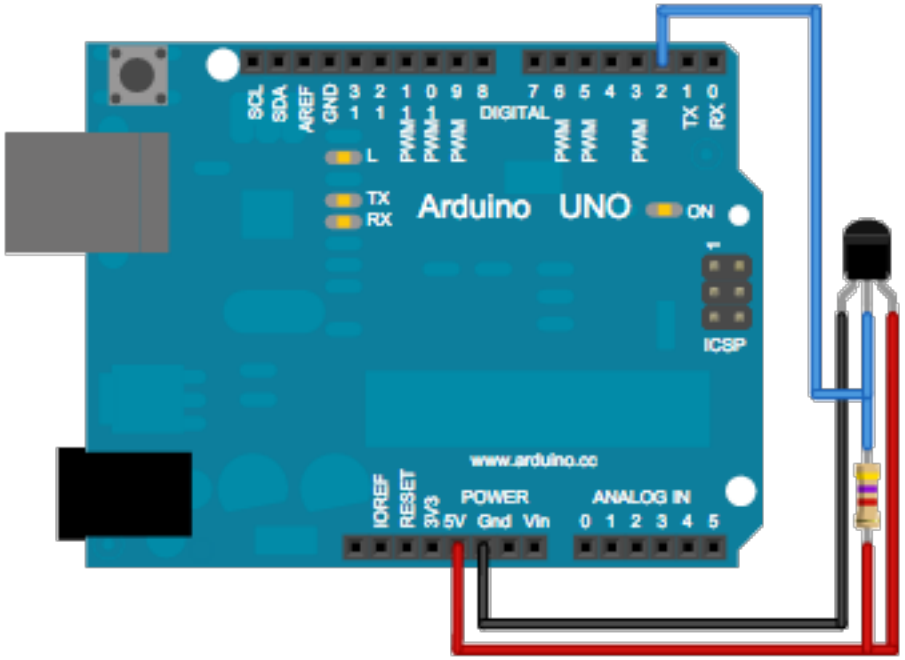
- 1 Arduino Uno
- 1 Arduino Ethernet Shield
- Dallas Systems DS18B20 “One Wire” Temperature sensor
- 4.7 KΩ Resistor is required as a pull up

- The Java Ring used One Wire Protocol



CONNECTING THE TEMPERATURE SENSOR

- Do not reverse +5V and GND on the 18B20!!!
- The sensor will overheat and burn out in seconds, Buy more than one just in case
- Multiple 18B20s can work on the same set of pins



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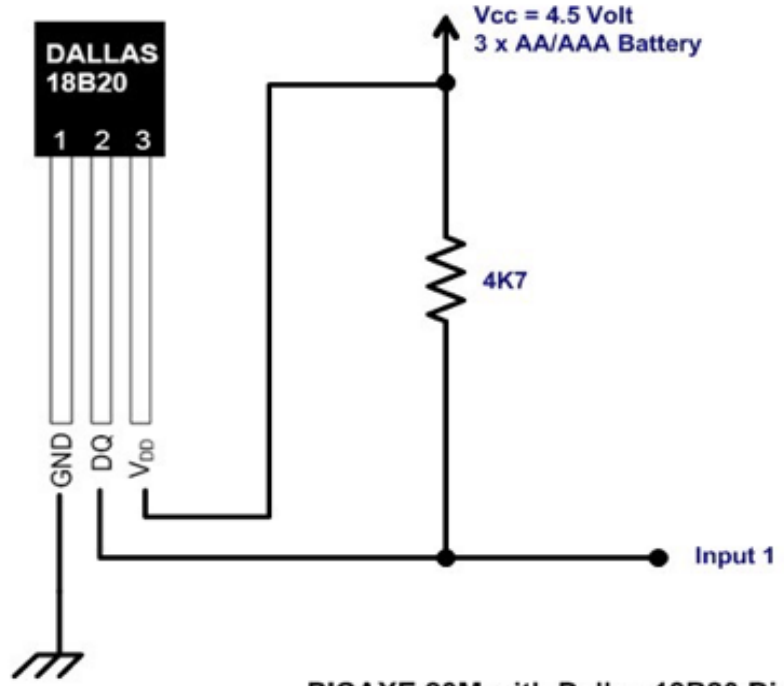
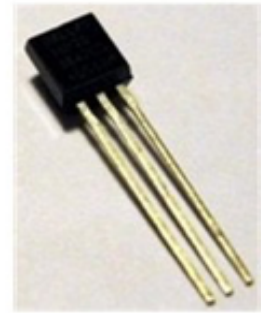




(BOTTOM VIEW)

PICAXE 20M with Dallas 18B20 Digital Thermometer

WHY REST WHEN YOU CAN MQTT?

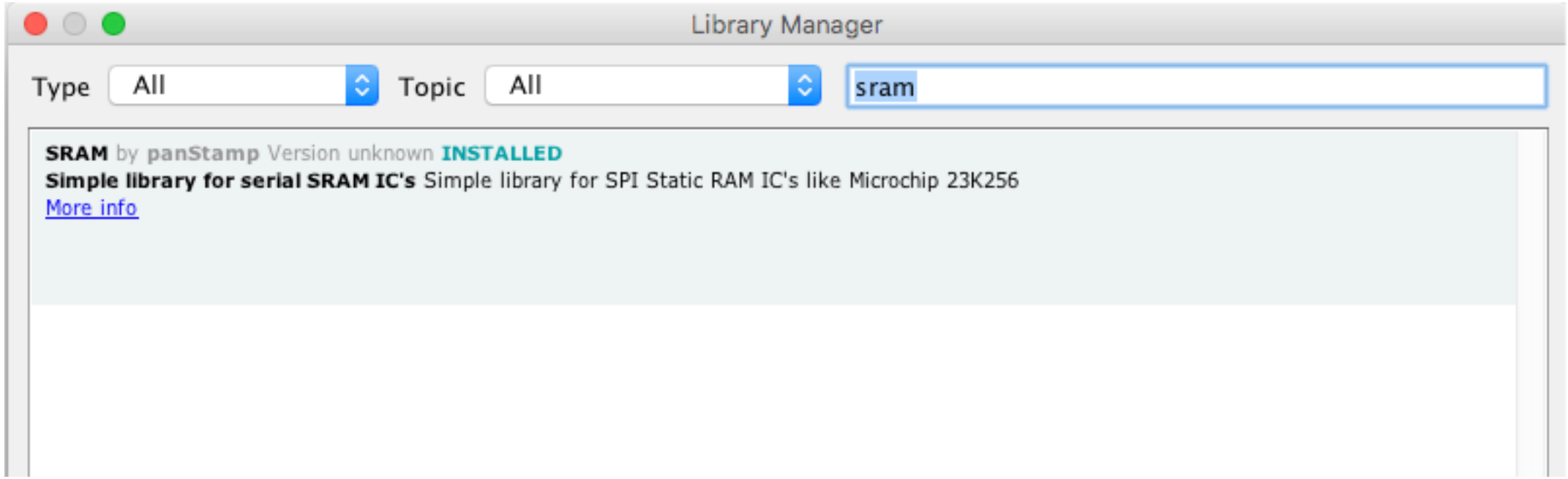
- HTTP REST (REpresentative State Transfer) works
  - You format the request and manage the actions (GET,PUT,POST)
  - Deduce the Thing URL
  - Uses port 80

- MQTT (Message Queue Telemetry Transport)
  - Light weight, efficient protocol – For small footprint systems
  - Publish, Subscribe Model
  - Requires a Server (Broker) in between Arduino and ThingWorx
  - Can be installed on your ThingWorx server host

- Mosquitto MQTT Server (http://mosquitto.org/)
  - Open Source, easy install
  - Requires port 1883 or 8883 open to pass though a firewall
  - Easy to Install
    - Comes with Windows Installer
    - Installs with “Brew” on OSX
    - http://www.xappsoftware.com/wordpress/2014/10/30/install-mosquitto-on-mac-os-x/

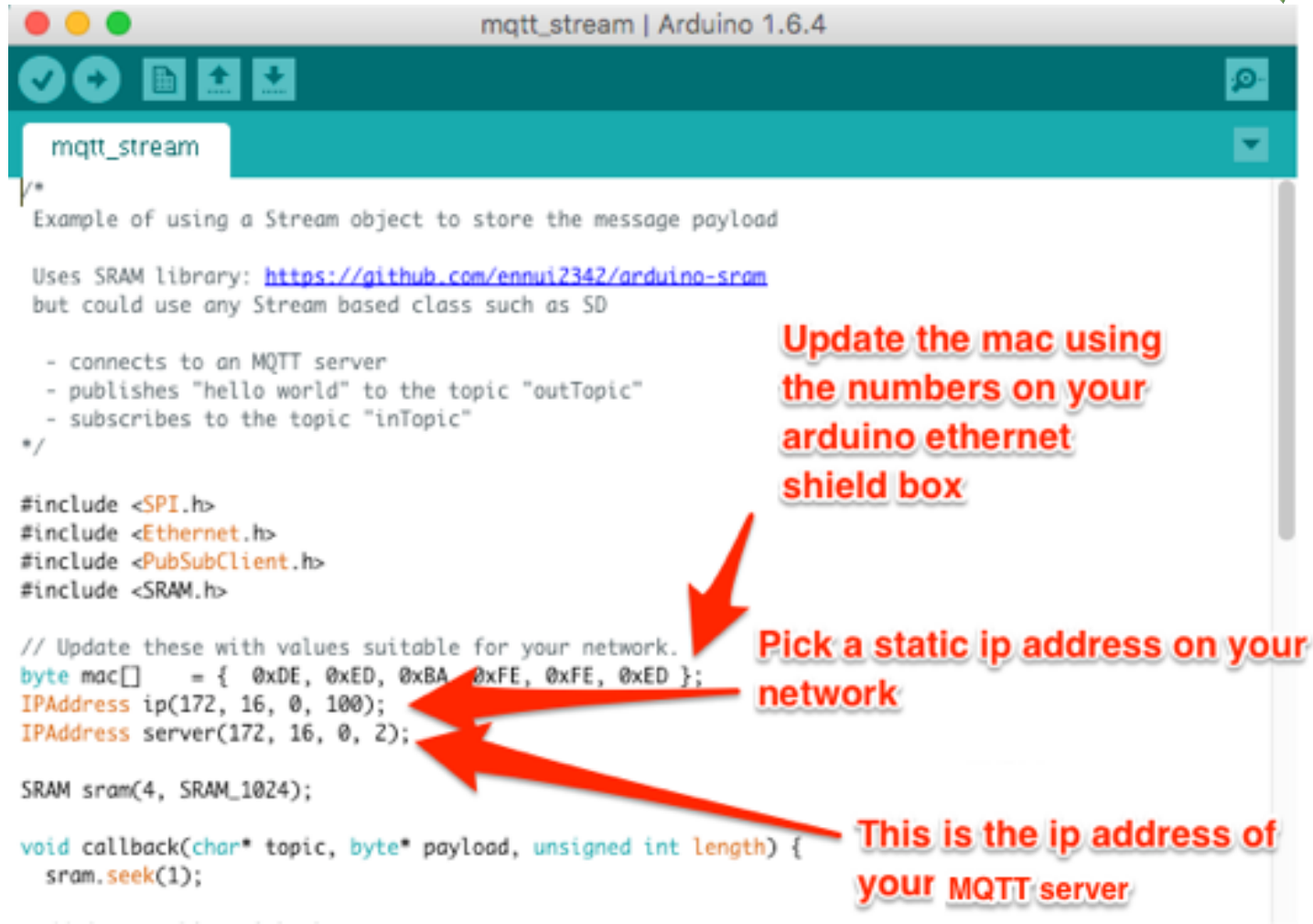
CONFIGURING YOUR ARDUINO IDE

- Download and install the Arduino IDE - https://www.arduino.cc/en/Main/Software
- Install these libraries from Sketch>Include Libraries>Manage Libraries… Menu
  - Pubsub – MQTT Client Library
  - Sram – Simple Serial Library



RUNNING THE TEST SKETCH

- File>Examples>PubSub Client> mqtt_stream.ino
- Enter the MAC Address
- Choose a static IP for your Arduino
- Enter your server IP address
- Install your Ethernet Shield
- Attach your Arduino via USB
- Upload the Modified Sketch
- Connect Arduino to Network



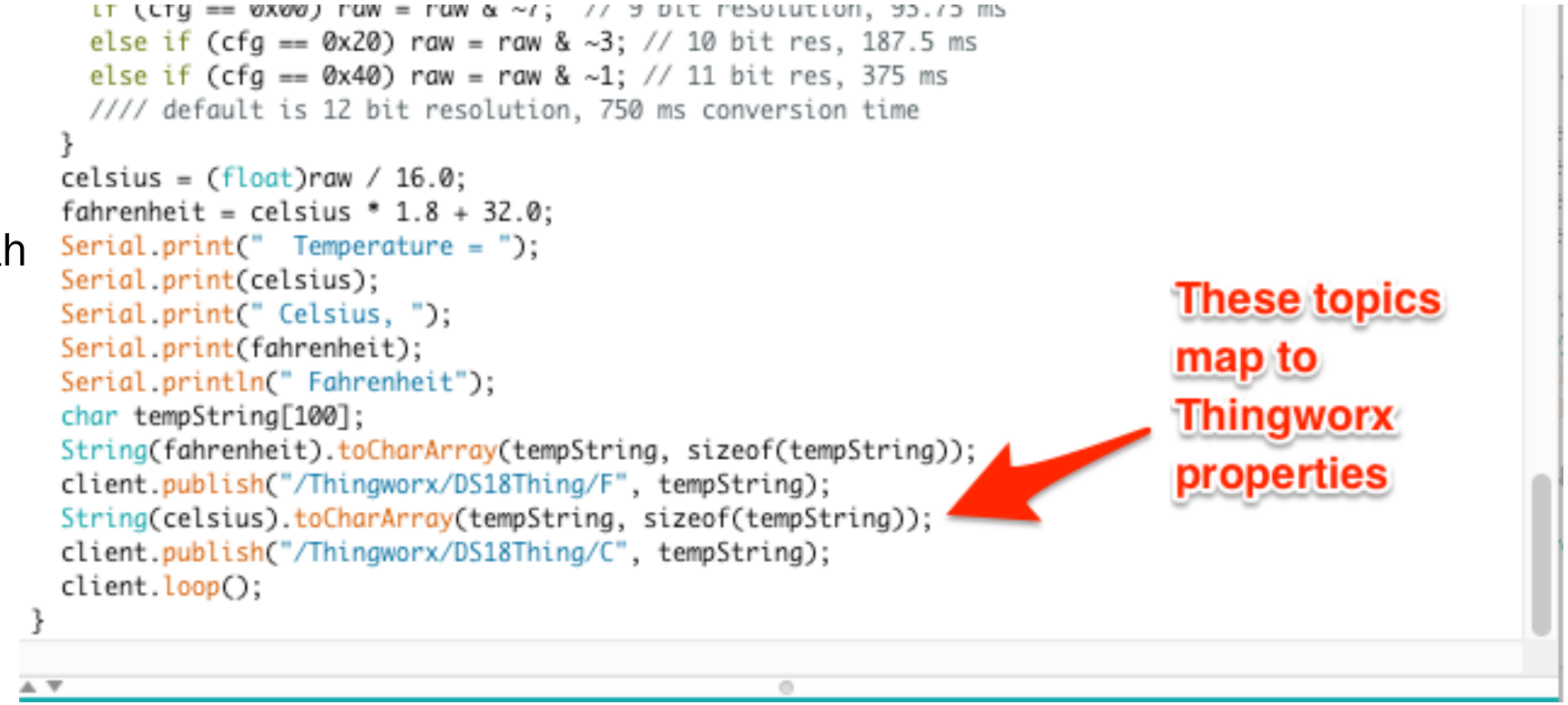
TESTING OUT YOUR CONNECTION – HELLO WORLD

- Test sketch creates an output topic called “outTopic” containing “Hello World”
- Creates an input topic call “inTopic”
- Use the Mosquitto command line client to subscribe to your topic
- Run:
  - mosquitto_sub -h 127.0.0.1 -t outTopic
- -h is the server, 127.0.0.1 assumes you are running this command on the same host
- See “Hello World” in appear in your console when you turn your Arduino on.
- MQTT Topics can be organized by topic level

SENDING TEMPERATURE DATA

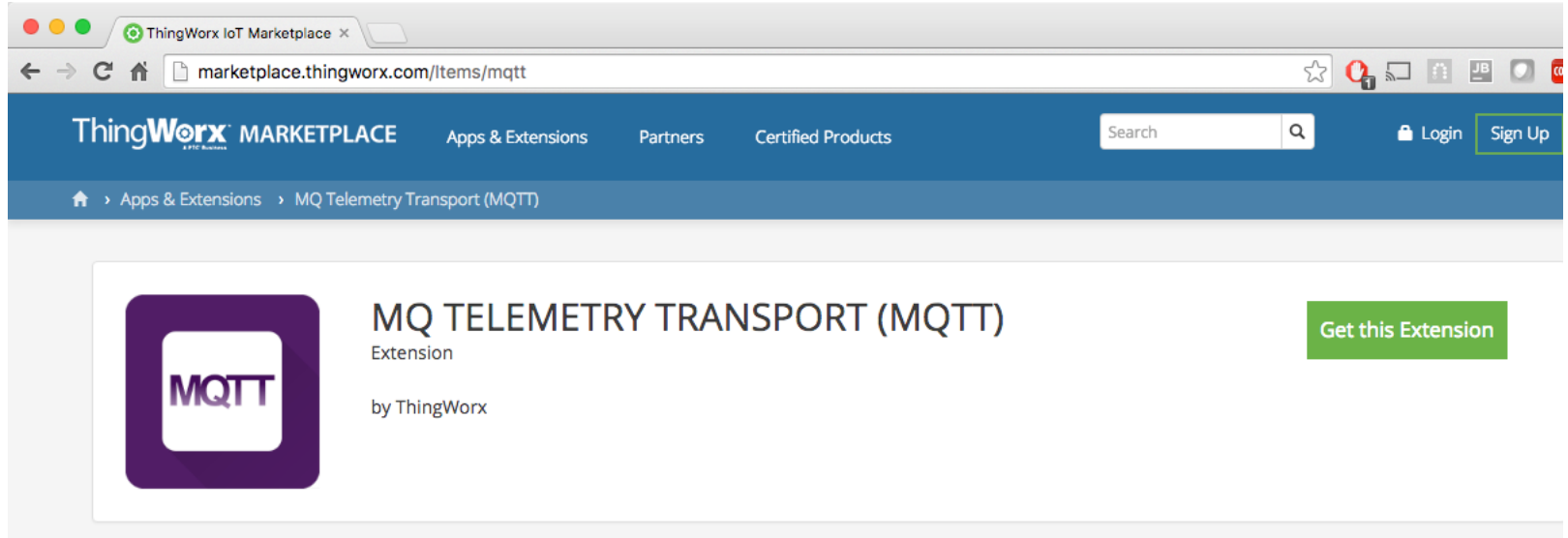
- **The DS18x20_MQTT.ino** sketch is the modified DS18x20 example
  - http://www.pjrc.com/teensy/td_libs_OneWire.html (Docs)
  - https://community.thingworx.com/servlet/JiveServlet/download/38-6087/DS18x20_MQTT.zip (Code)

- Make the same changes MAC Address and IP in this sketch.
- Note the topic changes
- OutTopic has been replaced with /Thingworx/DS18Thing/F and /Thingworx/DS18Thing/C
- To Report Temp readings



INSTALLING THE THINGWORX MQTT EXTENSION

- Download and install the MQTT extension on your server from the ThingWorx Marketplace at:
  - http://marketplace.thingworx.com/Items/mqtt

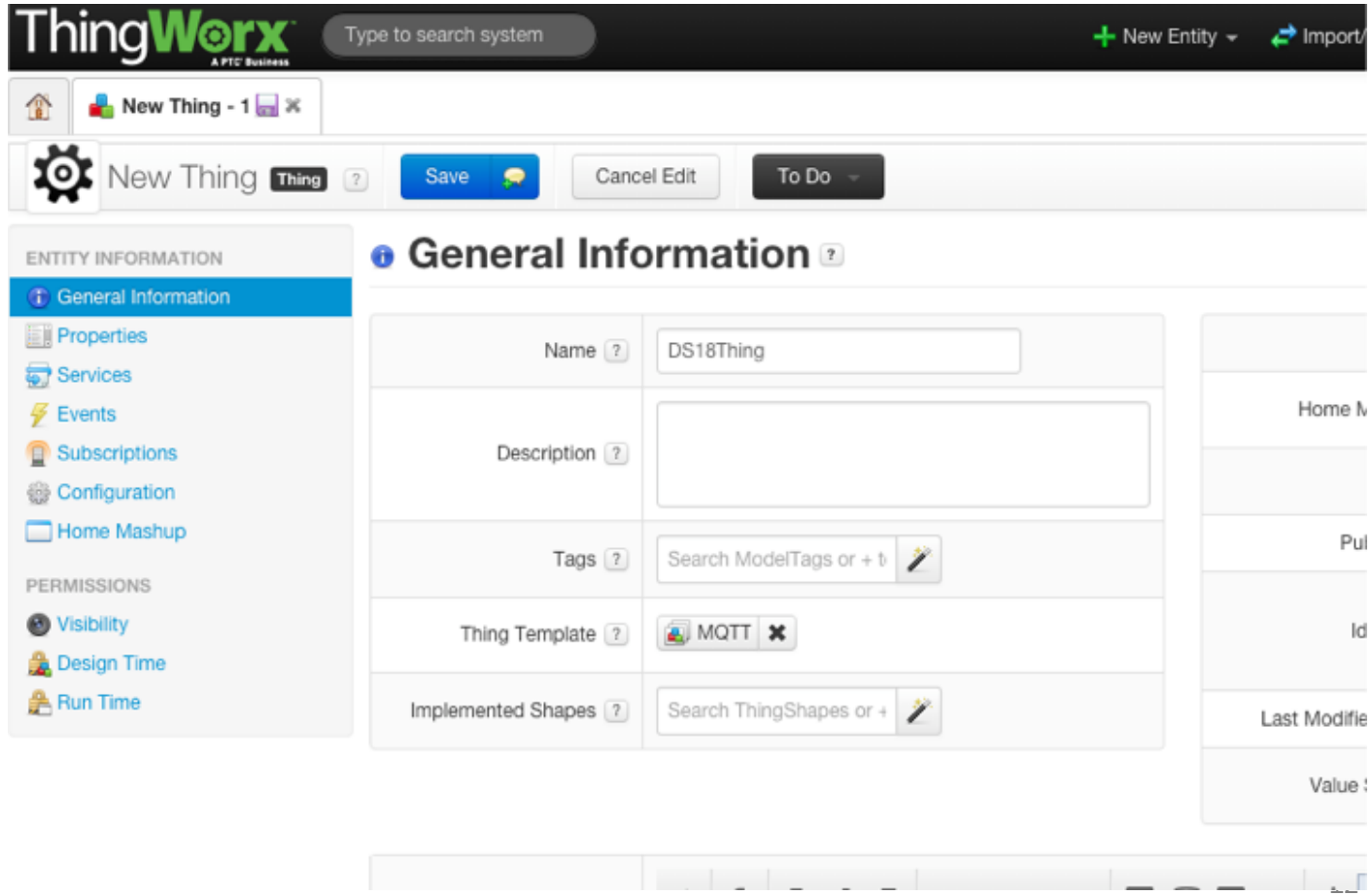


- After you do, confirm that you have the ThingTemplates shown below

MQTTSubscriber	MQTT subscriber interface	ThingTemplate
MQTTConnection	MQTT connection interface	ThingTemplate
MQTT	MQTT interface	ThingTemplate

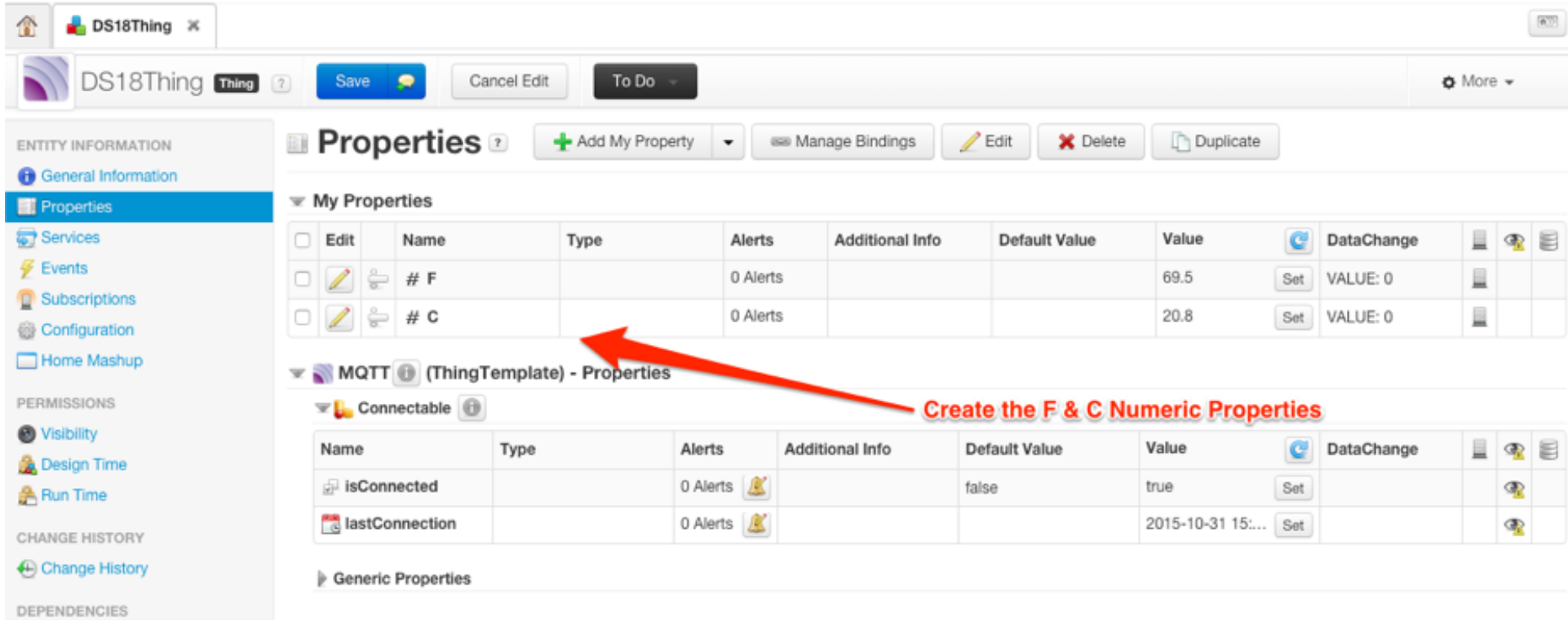
CREATING YOUR THING TO RECEIVE YOUR DATA

- Create a new Thing based on the MQTT ThingTemplate
- We will use the automatic mapping feature so your Thing name must match the MQTT Topic name “DS18Thing”



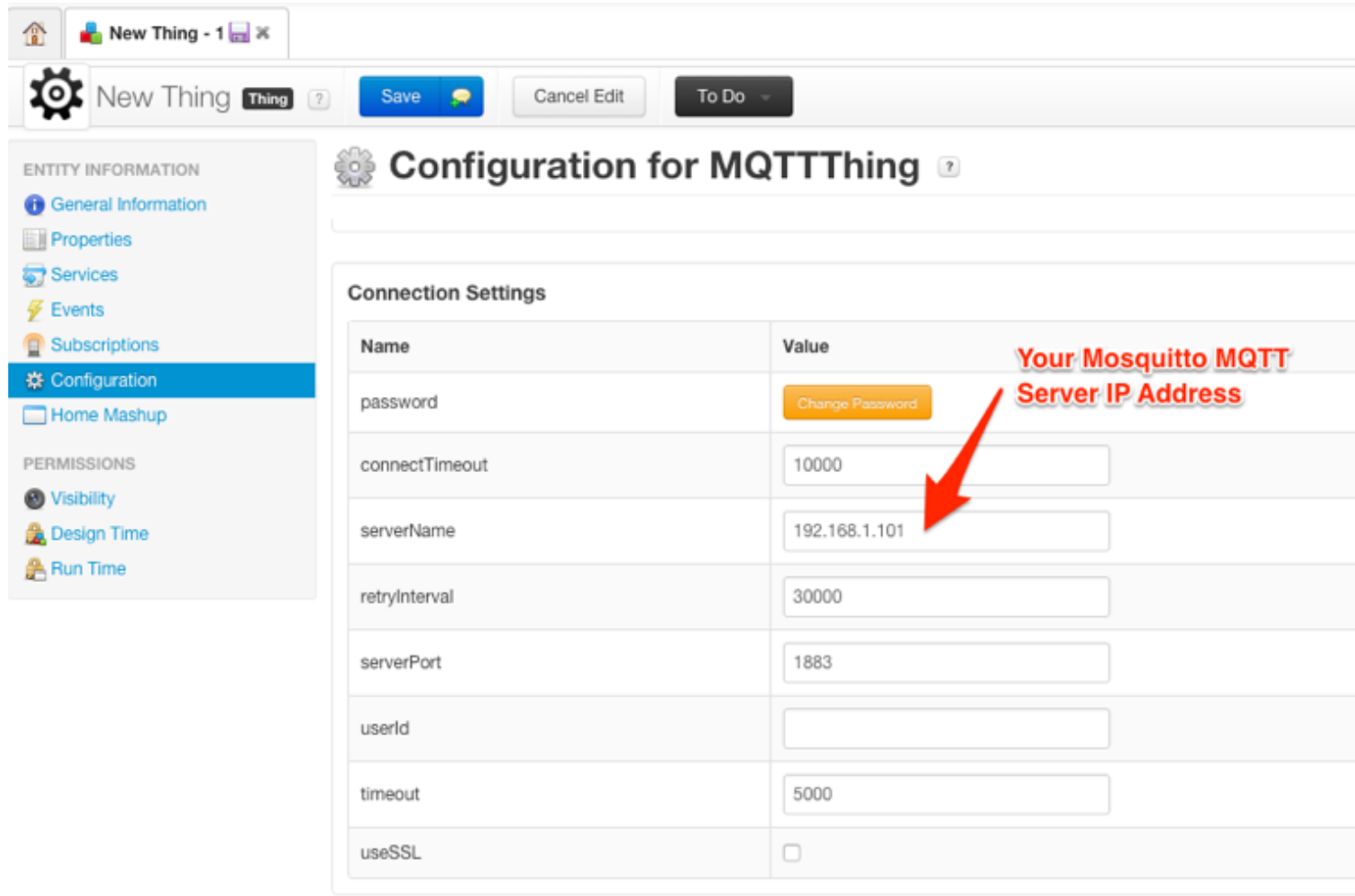
GIVE YOUR THING PROPERTIES

- Since our MQTT topics are /Thingworx/DS18Thing/F and /Thingworx/DS18Thing/C
- DS18Thing needs matching NUMERIC properties F & C
- Add Them and Save



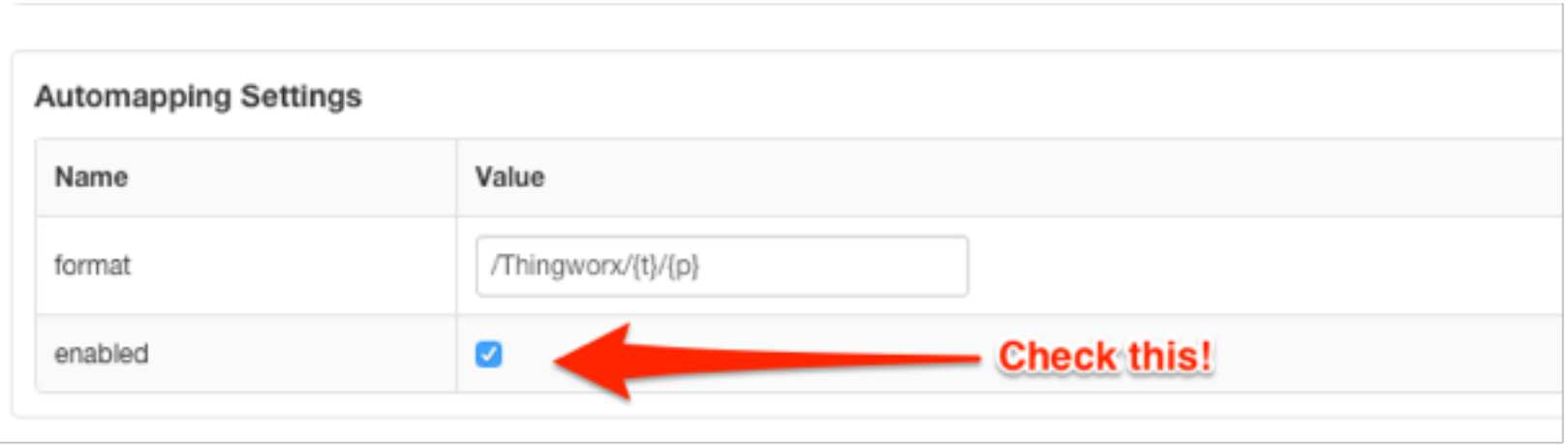
CONFIGURE YOUR THING

- Your MQTT Based Thing must know what MQTT server to get its topics from
- Use the “Configuration” section to add its IP address

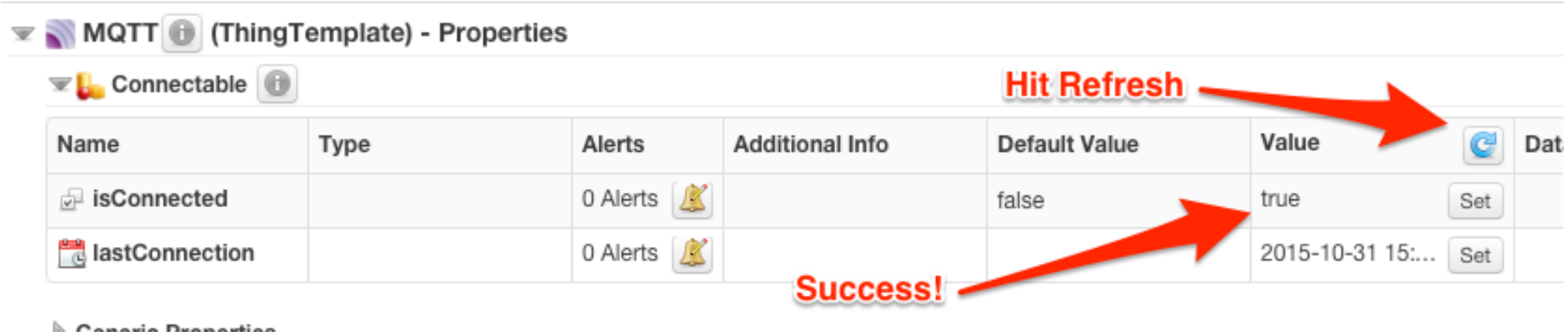


AUTOMATING PROPERTY MAPPING

- Scroll Down
- Enable Automapping

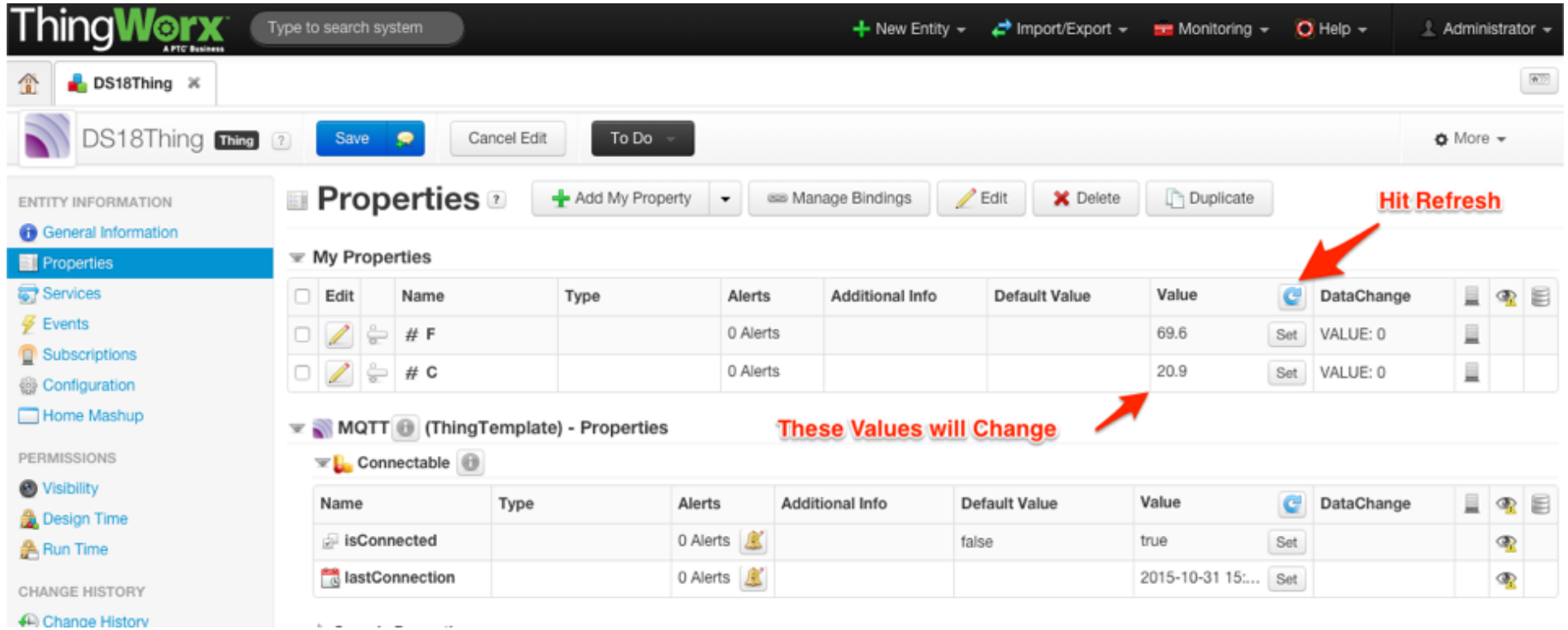


- Under properties Hit refresh and confirm that the isConnected property is now true and you are connected!



WATCH THE DATA ROLL IN

- Once your connection is established, touch the sensor
- Hitting the refresh button will allow you to observe the temperature changes



CONCLUSIONS

- MQTT Data Delivery:
  - Allows you to not have to worry about protocol specific details
  - Is easy to implement on an Arduino
  - Is lightweight and compact over the wire
  - Great for low resource platforms
  - Requires a MQTT Server
  - Integrates easily into ThingWorx

QUESTIONS?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