Domoticz MicroPython Projects
- Block Diagrams -

<Have Fun/>

Addendum to the Domoticz Homeautomation Workbook.
By rwbl

Introduction

Purpose

To explore how to use the MicroPython programming language running on embedded hardware, the Microcontroller Unit MCU, interfacing with the Domoticz Home Automation System.

The core of the projects uses the Raspberry Pi Pico W, with actuators & sensors, acting as a Web Server to communicate with the Domoticz Home Automation System.

The projects can function as a base for projects or to trigger ideas for use.

The intention is to provide some practical guidance and not to explain Domoticz nor programming languages.

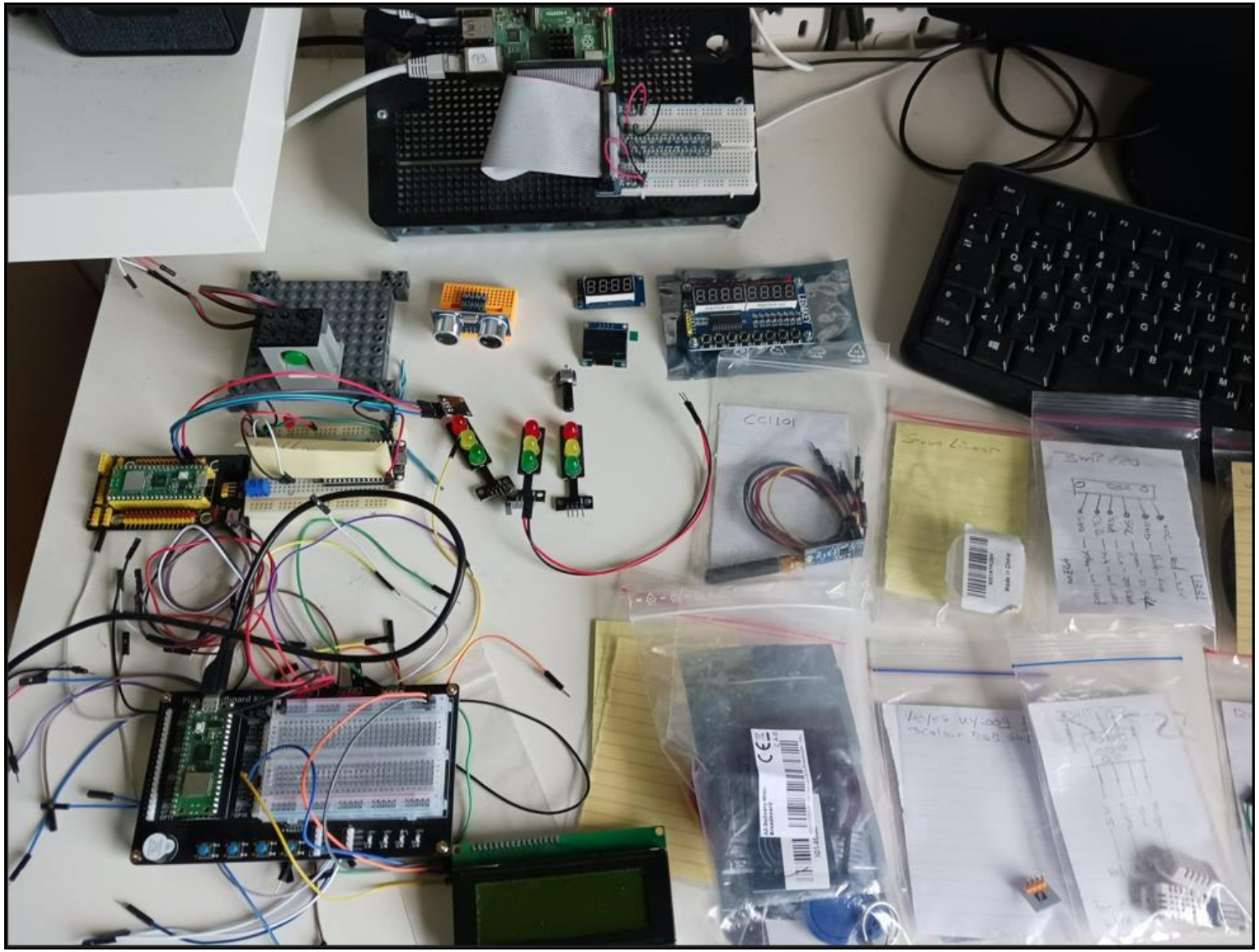
Prerequisites

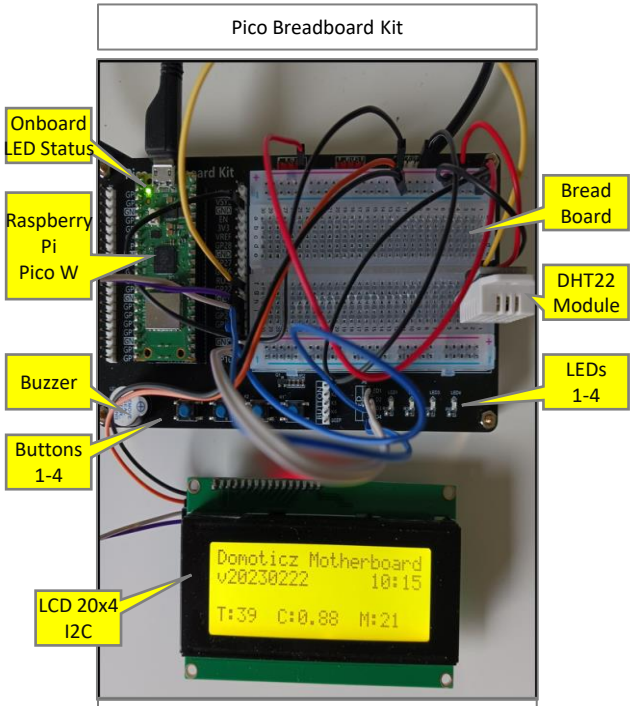
Basic knowledge of

- Domoticz
- Domoticz Automation Event system dzVents & Lua
- Python and MicroPython
- Raspberry Pi Pico / Pico W microcontrollers
- Thonny Integrated Development Environment

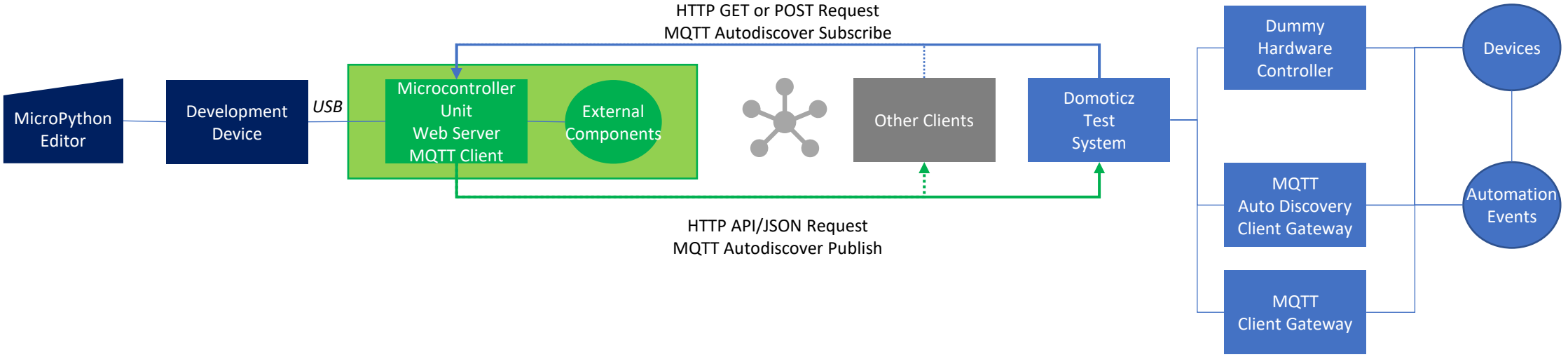
Workbench

Overview of the Author's workbench



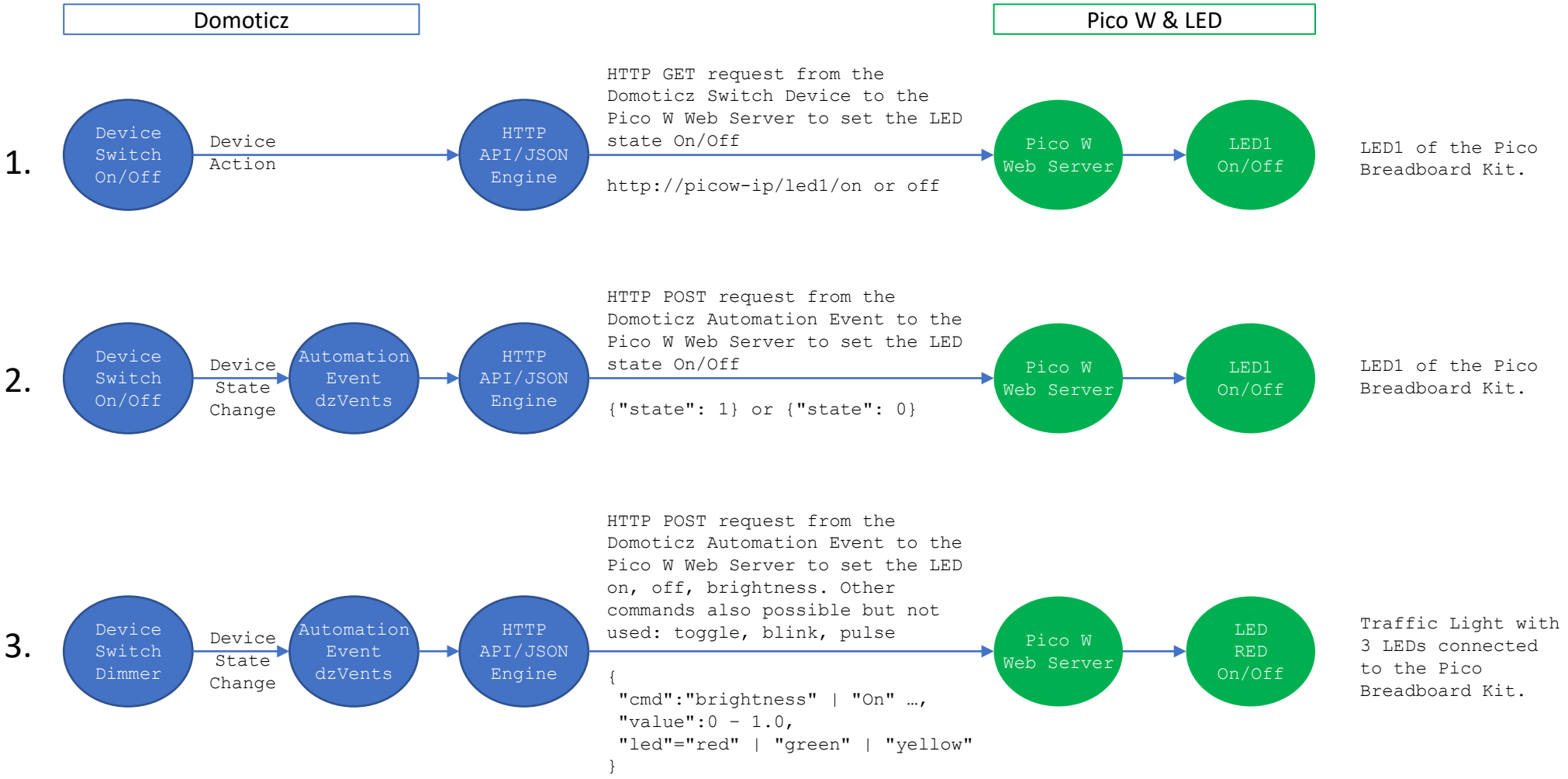


Blockdiagram Setup



Project LED Control

Domoticz Switch Device triggers Device On/Off/Brightness Action to set the Pico W LED1 of the Pico Breadboard Kit.

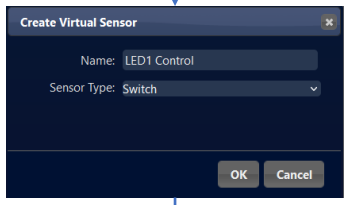


Project LED Control - Direct Action

Domoticz Switch Device triggers Device On/Off Action to set the Pico W LED1 of the Pico Breadboard Kit On/Off.

Domoticz Hardware Dummy

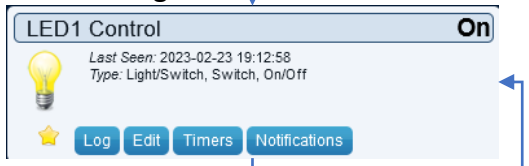
Idx	Name	Enabled	Type	Address	Port	Data Timeout
3	VirtualSensors	Yes	Dummy (Does nothing, use for virtual switches only) Create Virtual Sensors			Disabled

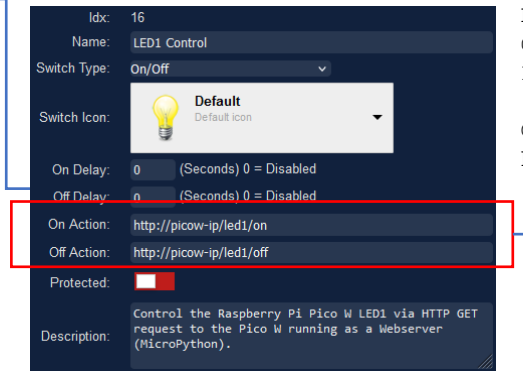


Device created

Idx	Hardware	ID	Unit	Name	Type	SubType	Data
16	VirtualSensors	00014060	1	LED1 Control	Light/Switch	Switch	On

Device Widget

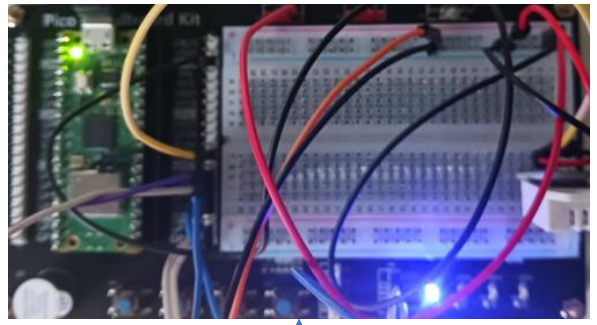




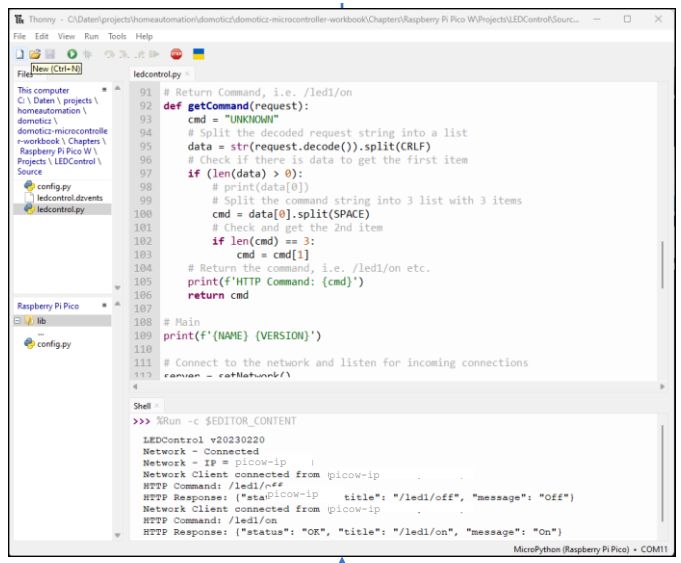
Edit Switch Device Properties with HTTP GET request actions set to switch the Pico W LED1 On / Off

On/Off Action Command:
http://picow-ip/led1/on or off

Pico W with Breadboard Kit & LED1 On



Thonny - Pico W Web Server MicroPython Script & Log



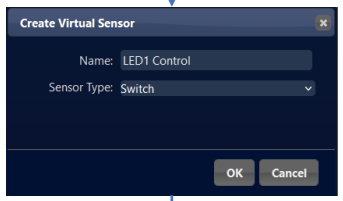
Device HTTP On / Off Actions to Pico W Web Server

Project LED Control - Custom Event

Domoticz Switch Device State Change triggers Automation Event to set the Pico W LED1 of the Pico Breadboard Kit On/Off.

Domoticz Hardware

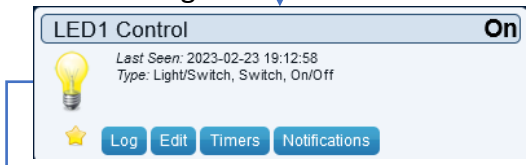
Idx	Name	Enabled	Type	Address	Port	Data Timeout
3	VirtualSensors	Yes	Dummy (Does nothing, use for virtual switches only) Create Virtual Sensors			Disabled

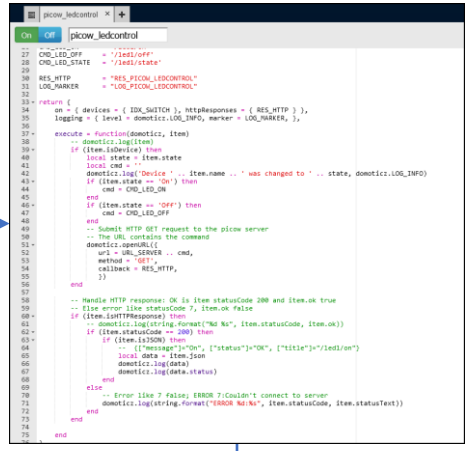


Domoticz Devices

Idx	Hardware	ID	Unit	Name	Type	SubType	Data
16	VirtualSensors	00014060	1	LED1 Control	Light/Switch	Switch	On

Device Widget



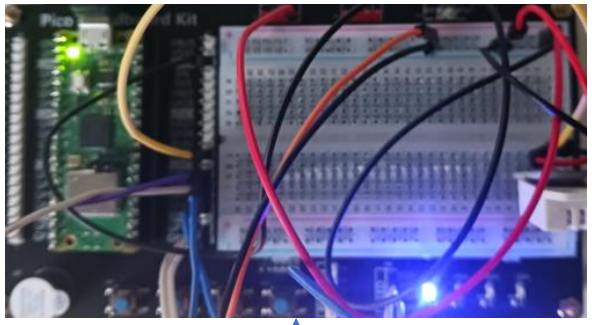


Domoticz Automation Event dzVents triggered by state change of the Domoticz Switch device (IDX=16).

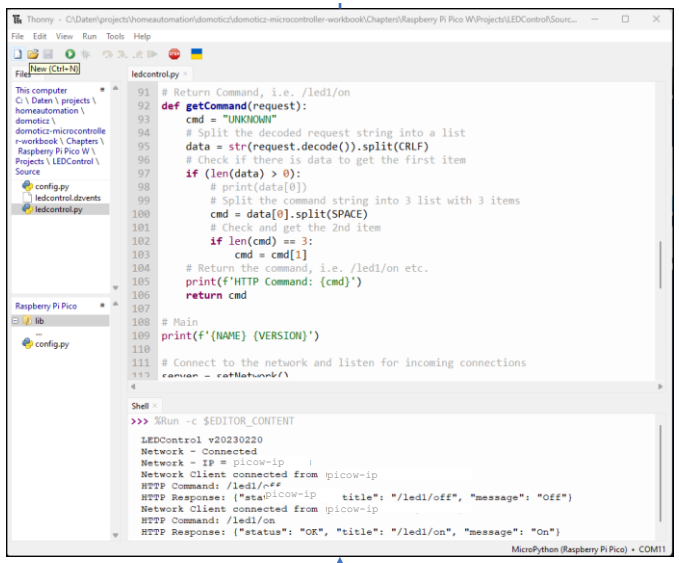
The event submits a HTTP GET request to the Pico W Web Server to switch the LED1 On/Off.

Device HTTP On / Off Actions to the Pico W Web Server

Pico W with Breadboard Kit & LED1 On



Thonny - Pico W Web Server MicroPython Script & Log

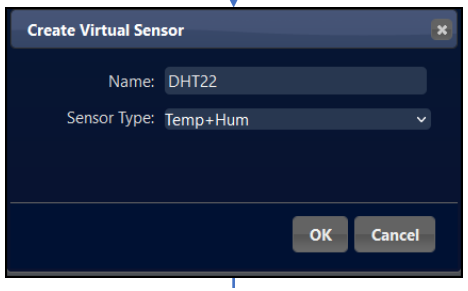


Project DHT22 - HTTP API/JSON

Pico W samples DHT22 sensor data and triggers updating the Domoticz Temp + Humidity device.

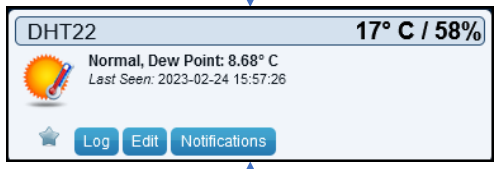
Domoticz Hardware

Idx	Name	Enabled	Type	Address	Port	Data Timeout
3	VirtualSensors	Yes	Dummy (Does nothing, use for virtual switches only) Create Virtual Sensors			Disabled

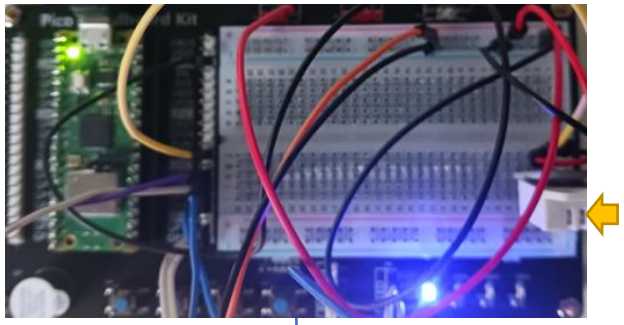


Domoticz Devices

Idx	Hardware	ID	Unit	Name	Type	SubType	Data
15	VirtualSensors	1405F	1	DHT22	Temp + Humidity	THGN122/123/132, THGR122/228 /238/268	17.0 C, 58 %

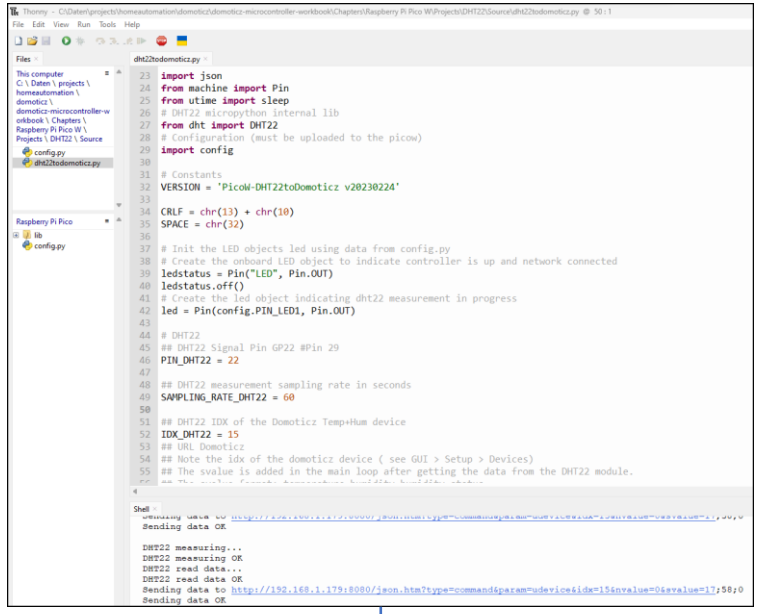


Pico W with Breadboard Kit & DHT22



Get DHT22 Data

Thonny - Pico W Web Server MicroPython Script & Log



```
import json
from machine import Pin
from utime import sleep
# DHT22 micropython internal lib
from dht import DHT22
# Configuration (must be uploaded to the picow)
import config

# Constants
VERSION = 'PicoW-DHT22toDomoticz v20230224'

CRLF = chr(13) + chr(10)
SPACE = chr(32)

# Init the LED objects led using data from config.py
# Create the onboard LED object to indicate controller is up and network connected
ledstatus = Pin("LED", Pin.OUT)
ledstatus.off()
# Create the led object indicating dht22 measurement in progress
led = Pin(config.PIN_LED1, Pin.OUT)

# DHT22
## DHT22 Signal Pin GP22 #Pin 29
PIN_DHT22 = 22

## DHT22 measurement sampling rate in seconds
SAMPLING_RATE_DHT22 = 60

## DHT22 IDX of the Domoticz Temp+Hum device
IDX_DHT22 = 15
## URL Domoticz
## Note the idx of the domoticz device ( see GUI > Setup > Devices)
## The svalue is added in the main loop after getting the data from the DHT22 module.
```

```
Sending data OK

DHT22 measuring...
DHT22 measuring OK
DHT22 read data...
DHT22 read data OK
Sending data to http://192.168.1.179:8080/json.htm?type=command&param=udevice&idx=15&nvalue=0&svalue=17;58;0
Sending data OK
```

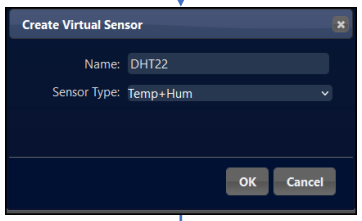
Pico W Web Server HTTP API/JSON GET request to Domoticz to update the device.
Example HTTP URL:
http://domoticz-ip:8080/json.htm?type=command&param=udevice&idx=15&nvalue=0&svalue=17;58;0

Project DHT22 - Custom Event

Pico W samples DHT22 sensor data and triggers Automation Event to update the Domoticz Temp + Humidity device.

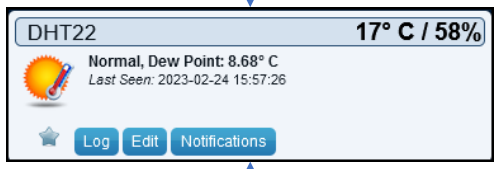
Domoticz Hardware

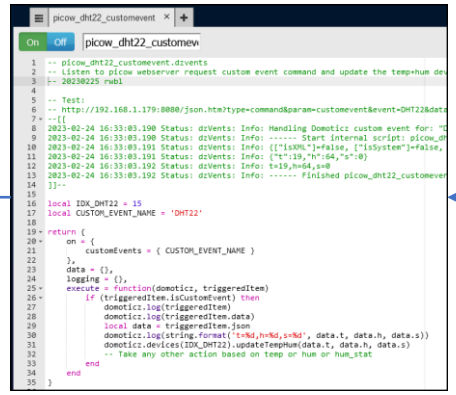
Idx	Name	Enabled	Type	Address	Port	Data Timeout
3	VirtualSensors	Yes	Dummy (Does nothing, use for virtual switches only) Create Virtual Sensors			Disabled



Domoticz Devices

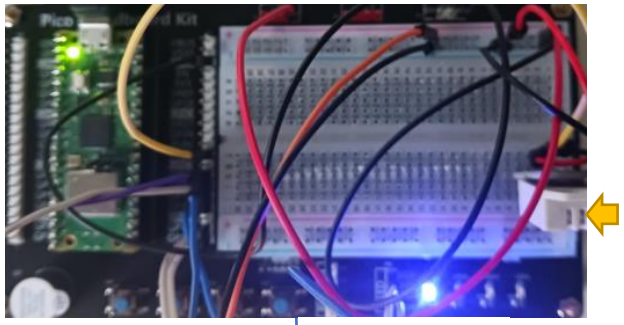
Idx	Hardware	ID	Unit	Name	Type	SubType	Data
15	VirtualSensors	1405F	1	DHT22	Temp + Humidity	THGN122/123/132, THGR122/228 /238/268	17.0 C, 58 %





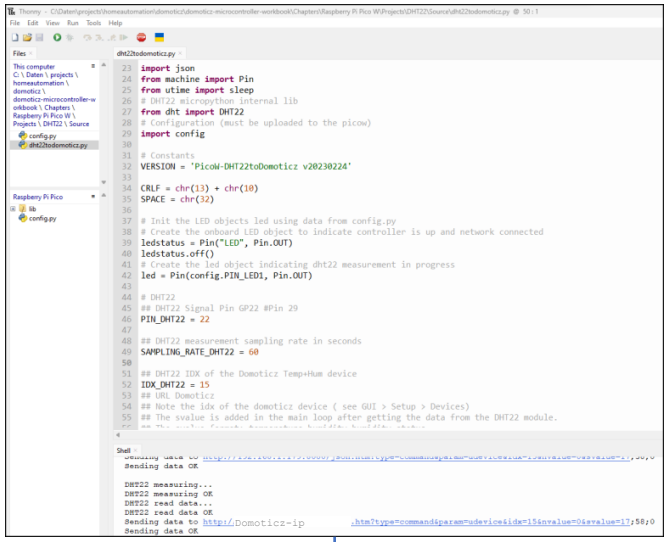
Domoticz Automation Event dzVents
Trigger: Custom Event

Pico W with Breadboard Kit & DHT22



Get DHT22 Data

Thonny - Pico W Web Server MicroPython Script & Log



Pico W Web Server HTTP API/JSON POST request to Domoticz Automation Event to update the device.
Example HTTP URL:
http://domoticz-ip:8080/json.htm?type=command&param=customevent&event=DHT22&data={"h": 58, "t": 17, "s": 0}

Project DHT22 - MQTT Autodiscover

Pico W publishes MQTT Config & State Messages to Domoticz MQTT Auto Discovery Client Gateway.

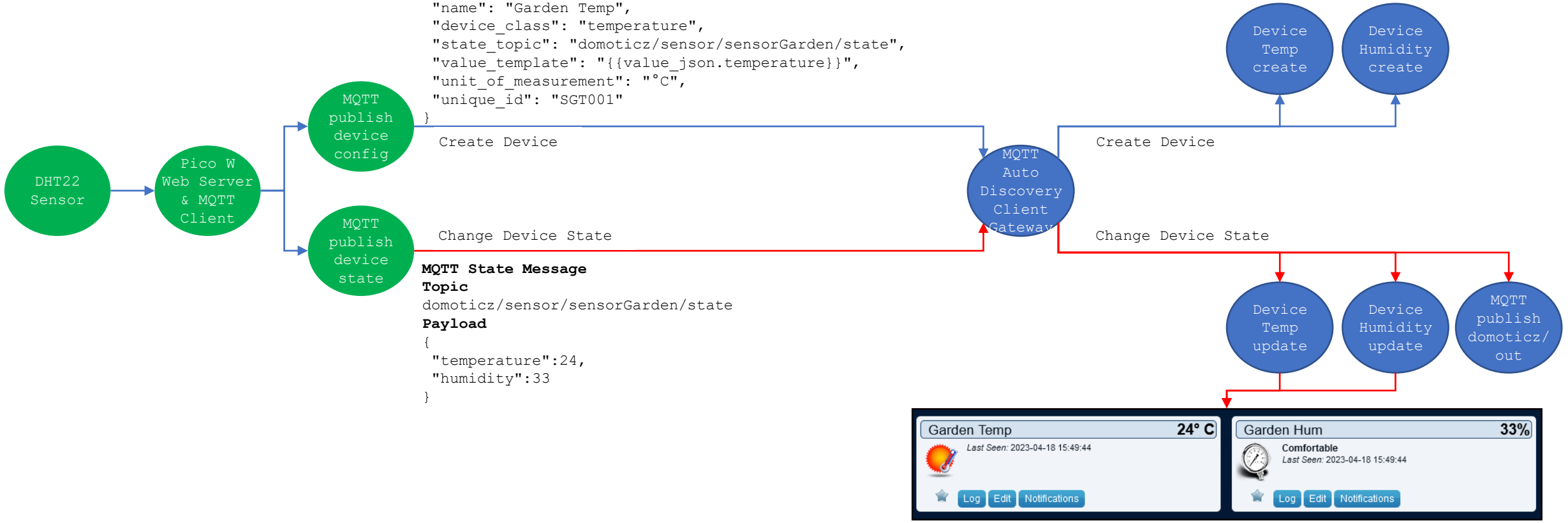
Pico W

MQTT Configuration Message
Example Temperature
Topic
domoticz/sensor/sensorGardenT/config
Payload

```
{
 "name": "Garden Temp",
 "device_class": "temperature",
 "state_topic": "domoticz/sensor/sensorGarden/state",
 "value_template": "{{value_json.temperature}}",
 "unit_of_measurement": "°C",
 "unique_id": "SGT001"
}
```

MQTT State Message
Topic
domoticz/sensor/sensorGarden/state
Payload

```
{
 "temperature":24,
 "humidity":33
}
```

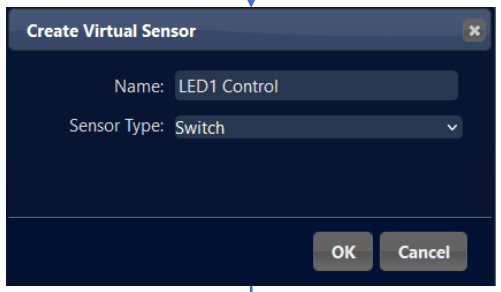


Project LCD LED Control

Domoticz Switch Device State Change triggers Automation Event to set the Pico W LED1 & LCD2004 display.

Domoticz Hardware

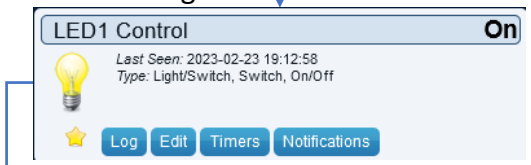
Idx	Name	Enabled	Type	Address	Port	Data Timeout
3	VirtualSensors	Yes	Dummy (Does nothing, use for virtual switches only) Create Virtual Sensors			Disabled

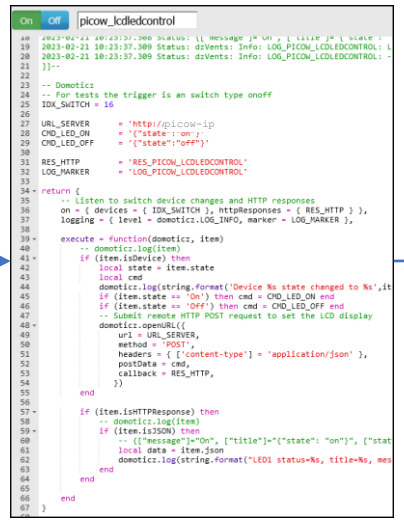


Domoticz Devices

Idx	Hardware	ID	Unit	Name	Type	SubType	Data
16	VirtualSensors	00014060	1	LED1 Control	Light/Switch	Switch	On

Device Widget



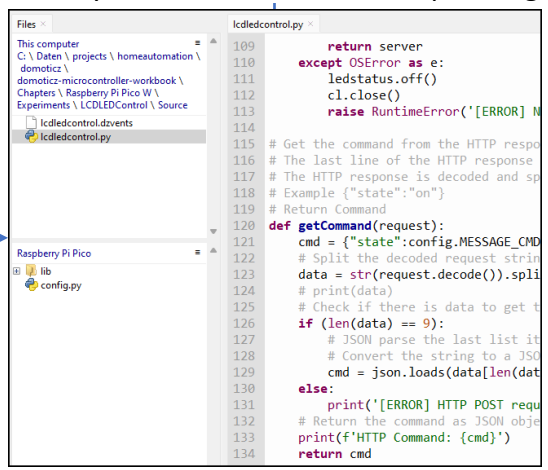


Domoticz Automation Event dzVents triggered by state change of the Domoticz Switch device (IDX=16).

The event submits a HTTP POST request to the Pico W Web Server to switch the LED1 On/Off and set the state on the LCD2004.

Pico W with Breadboard Kit & LCD 20x4 & LED1 On

Thonny - Pico W Web Server Script & Log



Project LCD Motherboard

Domoticz sends RPi Motherboard sensor data to set the LCD 20x4 I2C display connected to the Pico W.

Domoticz Hardware

Idx	Name	Enabled	Type	Address	Port	Data Timeout
5	RPi Motherboard	Yes	Motherboard sensors			Disabled

Domoticz Devices (selective)

Idx	Hardware	ID	Unit	Name	Type	SubType	
18	RPi Motherboard	0001	1	Internal Temperature	Temp	LaCrosse TX3	38.9 C
26	RPi Motherboard	0000044D	1	CPU_Usage	General	Percentage	0.41%
22	RPi Motherboard	0000044C	1	Memory Usage	General	Percentage	18.35%

On Off picow_lcdmotherboard

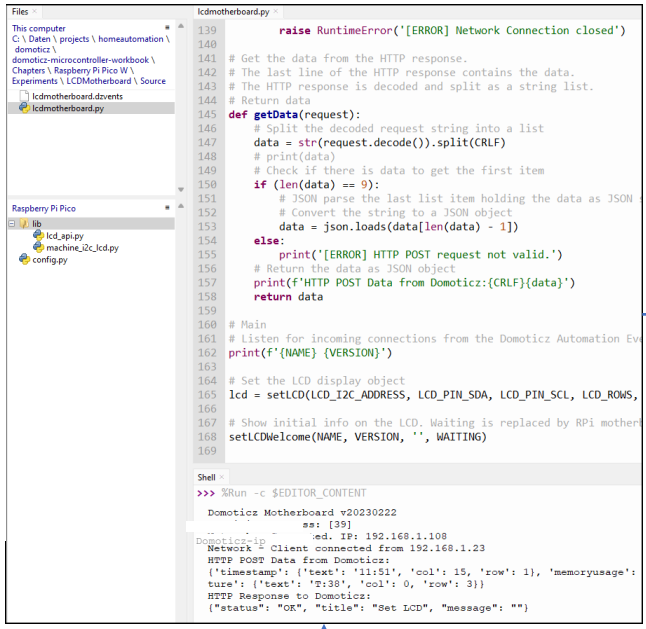
```
-- setSensor(3,5,'T:',round(domoticz.devices(IDX_INTERNALTEMPERATURE
local function setSensor(row,col,pre,data)
    return setText(row,col,string.format('%s%s', pre, tostring(data))
end

-- {["internaltemperature"]={["col"]=5, ["data"]="T:39.4", ["row"]=3

local function getMotherboardData(domoticz)
    local data = {}

    -- row=1, col=15, data=HH:MM len=5, range 15+5-1=19
    data['timestamp'] = setText(1, 15, string.sub(domoticz.time.rawT

    -- row=3, col=0, data=T:NN len=4, range = 0+4-1=3
    data['internaltemperature'] = setSensor(3, 0, 'T:', round(domotic
    -- row=3, col=6, data=C:NN.NN len=5, range = 6+5-1=10
    data['cpuusage']            = setSensor(3, 6, 'C:', round(domotic
    -- row=3, col=14, data=M:NN len=4, range = 14+4-1=17
    data['memoryusage']         = setSensor(3, 14, 'M:', round(domot

    --[[
    data['internaltemperature'] = round(domoticz.devices(IDX_INTERNA
    data['armclockspeed']       = round(domoticz.devices(IDX_ARMCLOCK
    data['v3dclockspeed']       = round(domoticz.devices(IDX_V3DCLOCK
    data['coreclockspeed']      = round(domoticz.devices(IDX_CORECLO
    data['memoryusage']         = round(domoticz.devices(IDX_MEMORYU
    data['processusage']        = round(domoticz.devices(IDX_PROCESSU
    data['hddboot']             = round(domoticz.devices(IDX_HDDBOOT
    data['hdd']                 = round(domoticz.devices(IDX_HDD)).pe
    data['cpuusage']            = round(domoticz.devices(IDX_CPUUSAG
    ]]--

    -- Test embedding json: r=row 0-3, c=col 0-19, d=data
    --[[
    local x = {}
    x['r']=3
    x['c']=5
    x['d']=string.format('T:%s', tostring(data['internaltemperature'
    data['temp'] = x
    ]]--
    domoticz.log(data)
    return data
end
```

Domoticz Automation Event dzVents
Trigger: Timer
An event is reading in regular intervals the RPi motherboard data.

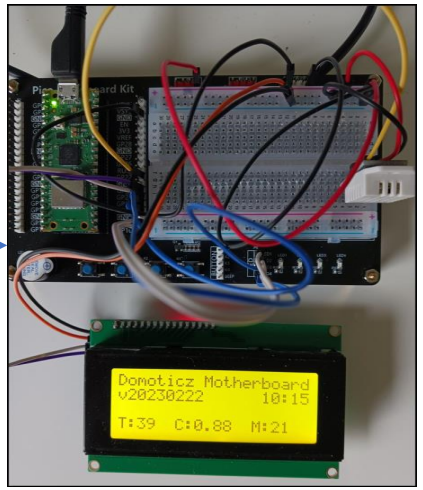
The data is converted to a JSON object and sent as HTTP POST request to the Pico W Web Server.

```
{
 ["internaltemperature"]=
  {["col"]=0,["text"]="T:38", ["row"]=3},
 ["timestamp"]=
  {["col"]=15,["text"]="16:19",["row"]=1},
 ["memoryusage"]=
  {["col"]=14,["text"]="M:21",["row"]=3},
 ["cpuusage"]=
  {["col"]=6,["text"]="C:0.35",["row"]=3}
}
```

Thonny - Pico W Web Server Script & Log

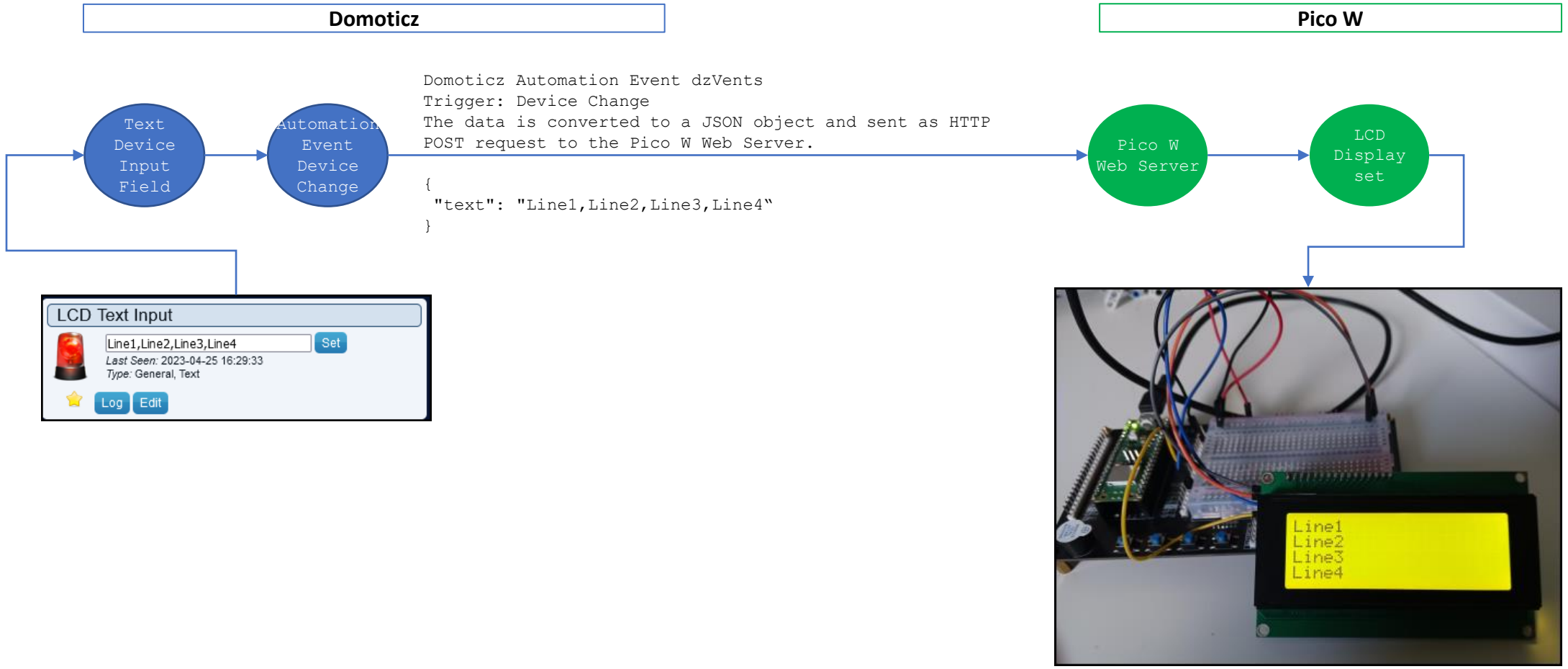


Pico W with Breadboard Kit & LCD 20x4



Project LCD Text Input

Domoticz sends text from a Text Device enabling Input to set the LCD 20x4 I2C display connected to the Pico W.



Inspired by this Domoticz Forum Post (thanks for sharing).

Project LED Display TM1637

Domoticz sends RPi Motherboard Internal Temperature to set the 4-Digit 7-Segment display connected to the Pico W.

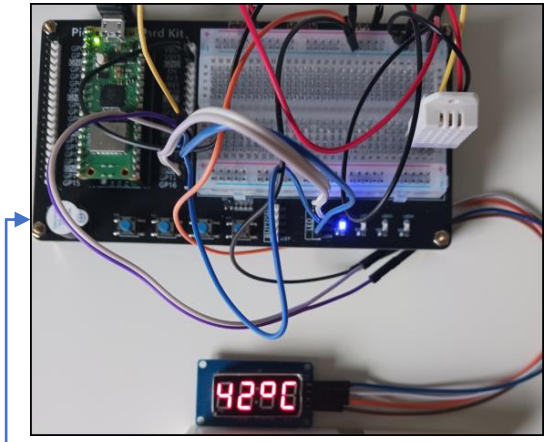
Domoticz Hardware

Idx	Name	Enabled	Type	Address	Port	Data Timeout
5	RPi Motherboard	Yes	Motherboard sensors			Disabled

Domoticz Devices

Idx	Hardware	ID	Unit	Name	Type	SubType	
18	RPi Motherboard	0001	1	Internal Temperature	Temp	LaCrosse TX3	37.0 C

Pico W with Breadboard Kit & TM1637



picow_tm1637_motherboard_internal_temperature

On Off picow_tm1637_motherb

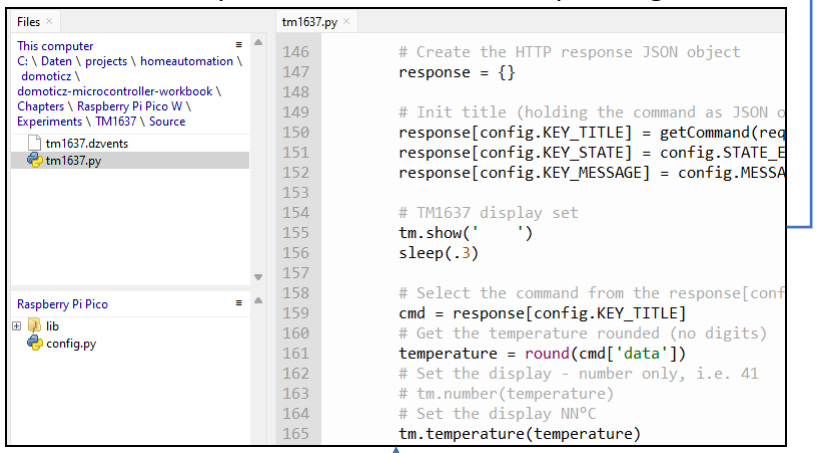
```
20 HTTP_RES         = 'RES_PICOW_LCDLEDCONTROL'
21
22 LOG_MARKER       = 'LOG_PICOW_LCDLEDCONTROL'
23
24 TIMER_RULE = "every minute"
25
26 -- Helpers
27 local function round(number, decimals)
28     local power = 10^decimals
29     return math.floor(number * power) / power
30 end
31
32 -- Post Data to the Pico W Webserver.
33 -- The data is a JSON object with the temperature roun
34 local function HTTPPost(domoticz)
35     local data = {}
36     data['data'] = domoticz.devices(IDX_INTERNAL_TEMPE
37     domoticz.log(string.format('device=%s, temperature
38     domoticz.log(data)
39     -- Submit remote HTTP POST request to set the tm16
40     domoticz.openURL({
41         url = HTTP_URL,
42         method = 'POST',
43         headers = { ['content-type'] = 'application/js
44         postData = data,
45         callback = HTTP_RES,
46        })
47 end
```

Domoticz Automation Event dzVents
Trigger: Timer or Switch
An event is reading in regular intervals the RPi motherboard internal temperature sensor.

The data is converted to a JSON object and sent as HTTP POST request to the Pico W Web Server.

```
{
 ["data"]=40.900001525879
}
```

Thonny - Pico W Web Server Script & Log



Project Servo Control

Domoticz Dimmer Device State Change triggers Automation Event to set the angle of a servo motor connected to the Pico W.

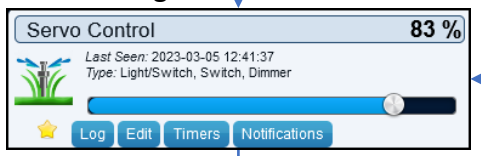
Domoticz Hardware

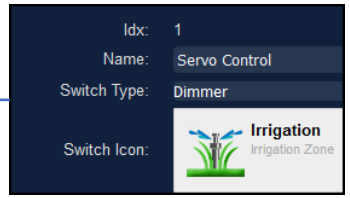
Idx	Name	Enabled	Type	Address	Port	Data Timeout
3	VirtualSensors	Yes	Dummy (Does nothing, use for virtual switches only) Create Virtual Sensors			Disabled

Domoticz Devices

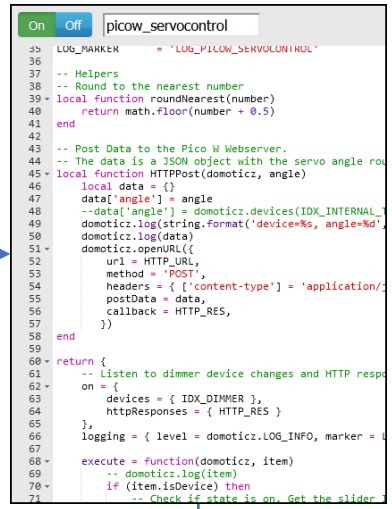
	Idx	Hardware	ID	Unit	Name	Type	SubType	
	1	VirtualSensors	00014051	1	Servo Control	Light/Switch	Switch	Set Level: 83 %

Device Widget





Edit Set Switch Type to Dimmer and Switch Icon to Irrigation

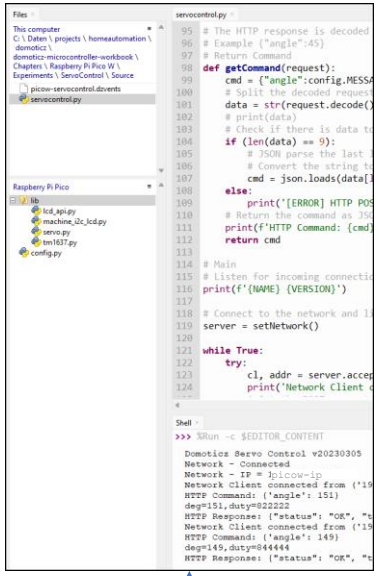


Domoticz Automation Event dzVents triggered by state change of the Domoticz Dimmer device (IDX=1).
The servo angle is converted from the dimmer level 0-100% to 0-180 deg.
83% = 149 deg.

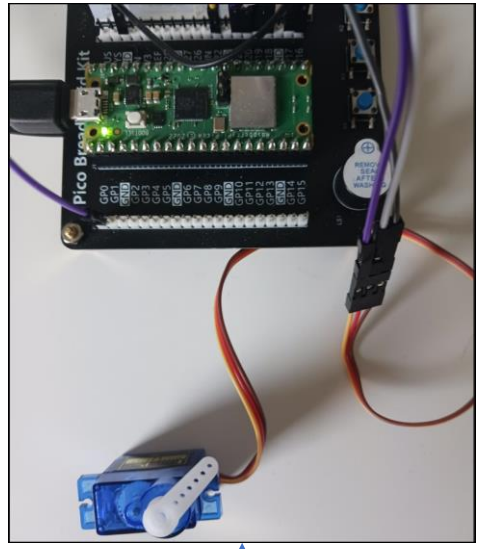
The event submits HTTP POST request to the Pico W Web Server to set the servo angle.
The post-data is a JSON Object:

```
{"angle": 149}
```

Thonny - Pico W Web Server MicroPython Script & Log



Pico W with Breadboard Kit & Servo Motor SG90

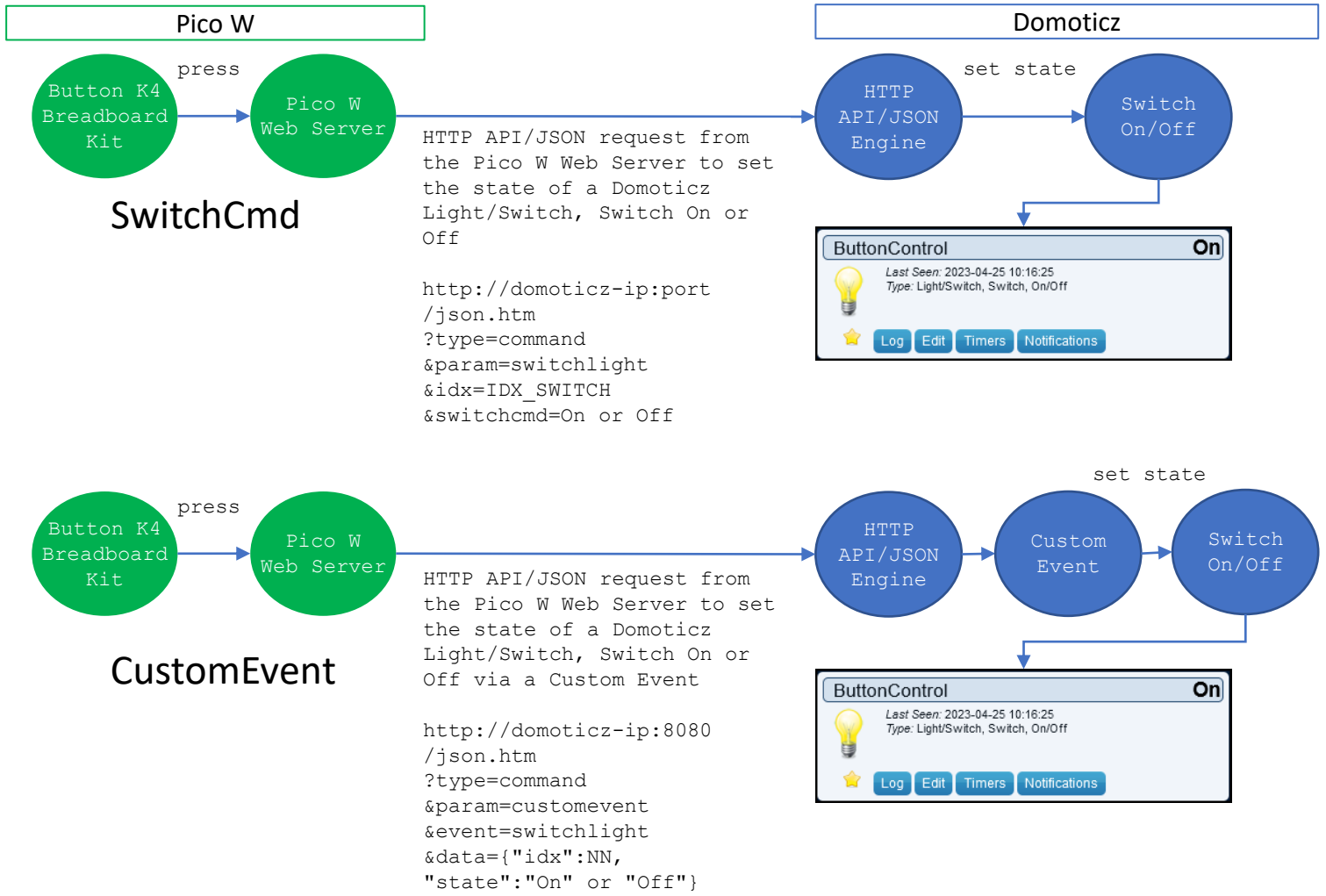


Servo Angle
149 deg

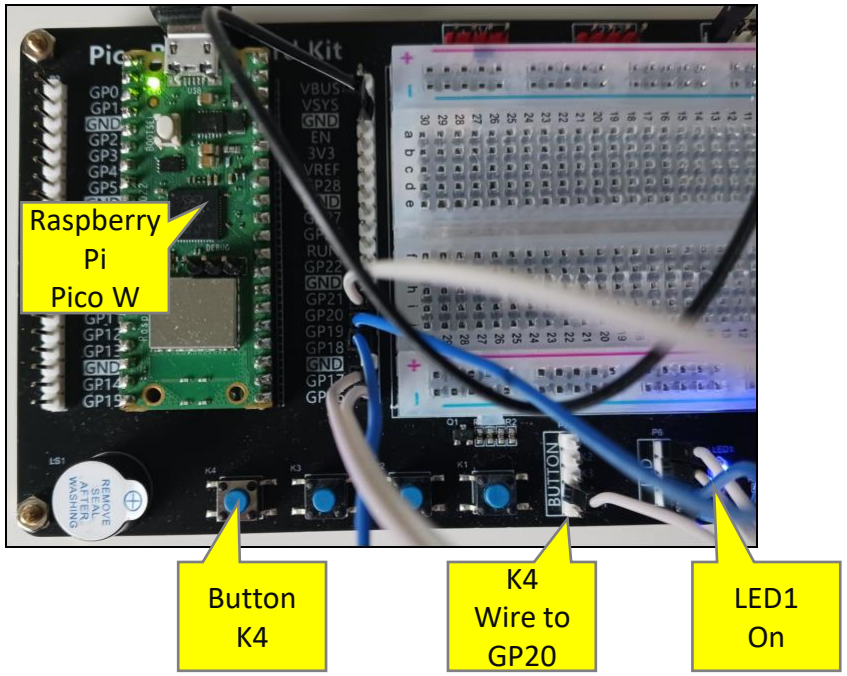
Device HTTP POST Request to Pico W Web Server

Project Button Control

Pico W with Pushbutton to set the state of a Domoticz Switch On/Off Device.

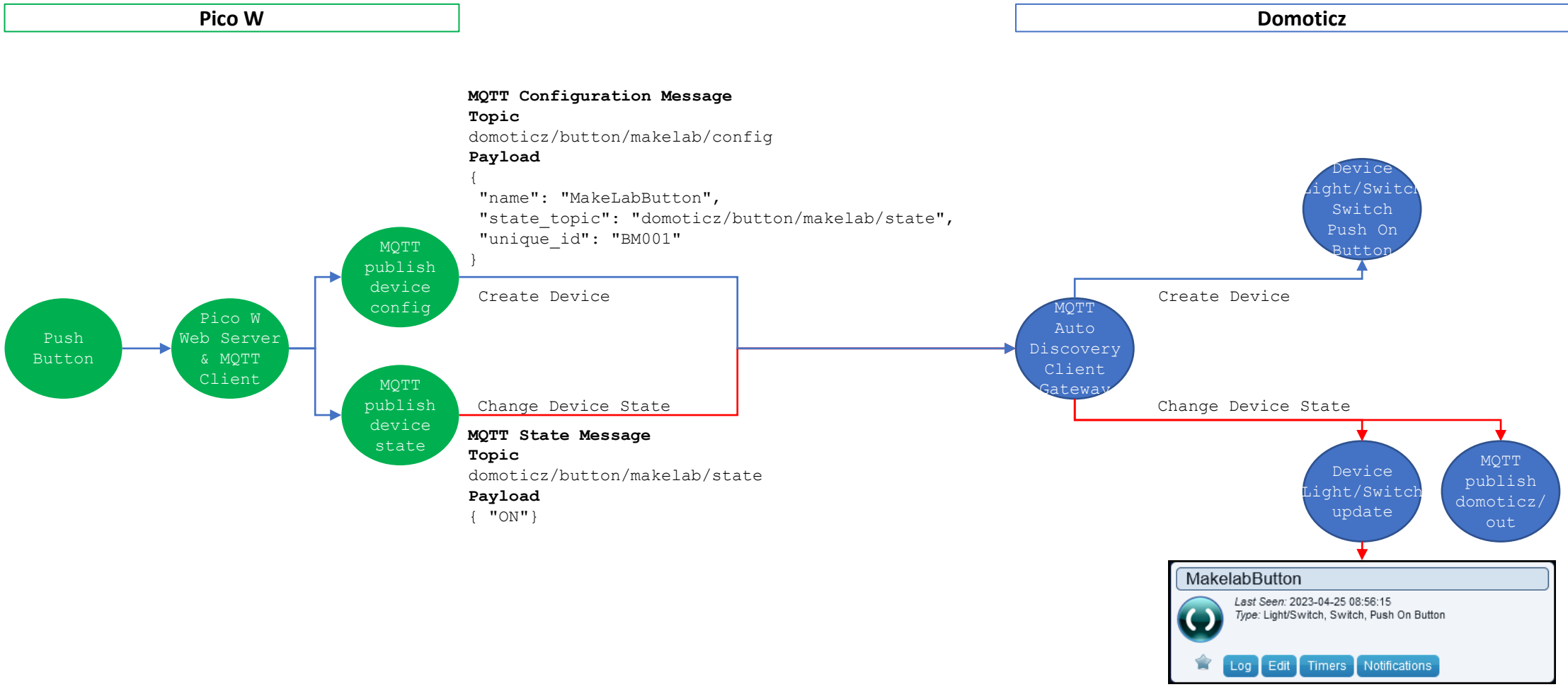


Pico W with Breadboard Kit Button K4 connected



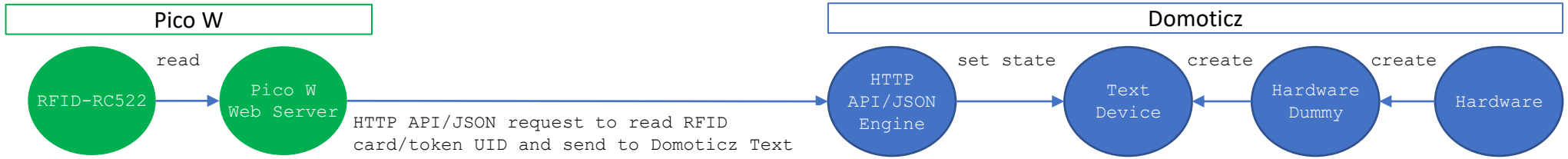
Project Button Control - MQTT Autodiscover

Pico W Push button set state of Domoticz Push On Button Device using Domoticz MQTT Auto Discovery Client Gateway.



Project RFID Reader

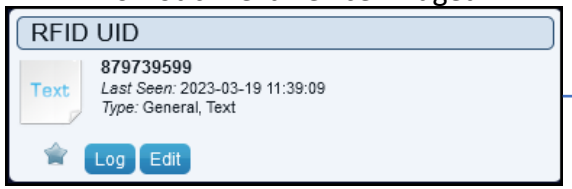
Pico W to read RFID cards/tokens via RFID-RC522 module and send the UID to a Domoticz Text Device.



HTTP API/JSON request to read RFID card/token UID and send to Domoticz Text Device

```
http://domoticz-ip:port
/json.htm
?type=command
&param=udevice
&idx=IDX_RFID
&nvalue=0
&svalue=879739599
```

Domoticz Text Device Widget

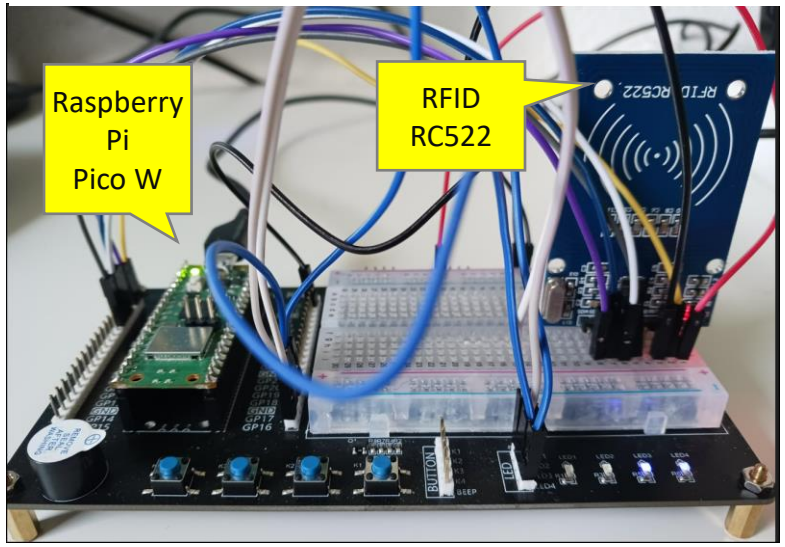


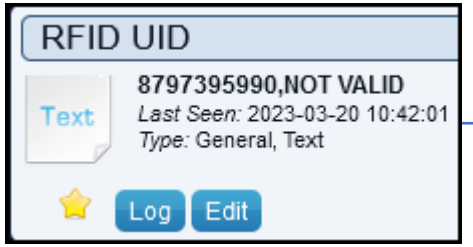

```
The RFID card/token UID is:
879739599 (HEX 346FC2CF).
The card type is 10.
```

Domoticz Text Device Log

Date	
2023-03-19 12:04:31	1446518016
2023-03-19 12:04:26	879739599
2023-03-19 12:04:19	249942437
2023-03-19 11:39:08	879739599
2023-03-19 11:39:04	1446518016
2023-03-19 11:37:42	879739599
2023-03-19 11:37:22	1446518016
2023-03-19 11:32:21	879739599

Pico W with Breadboard Kit & RFID-RC522 connected



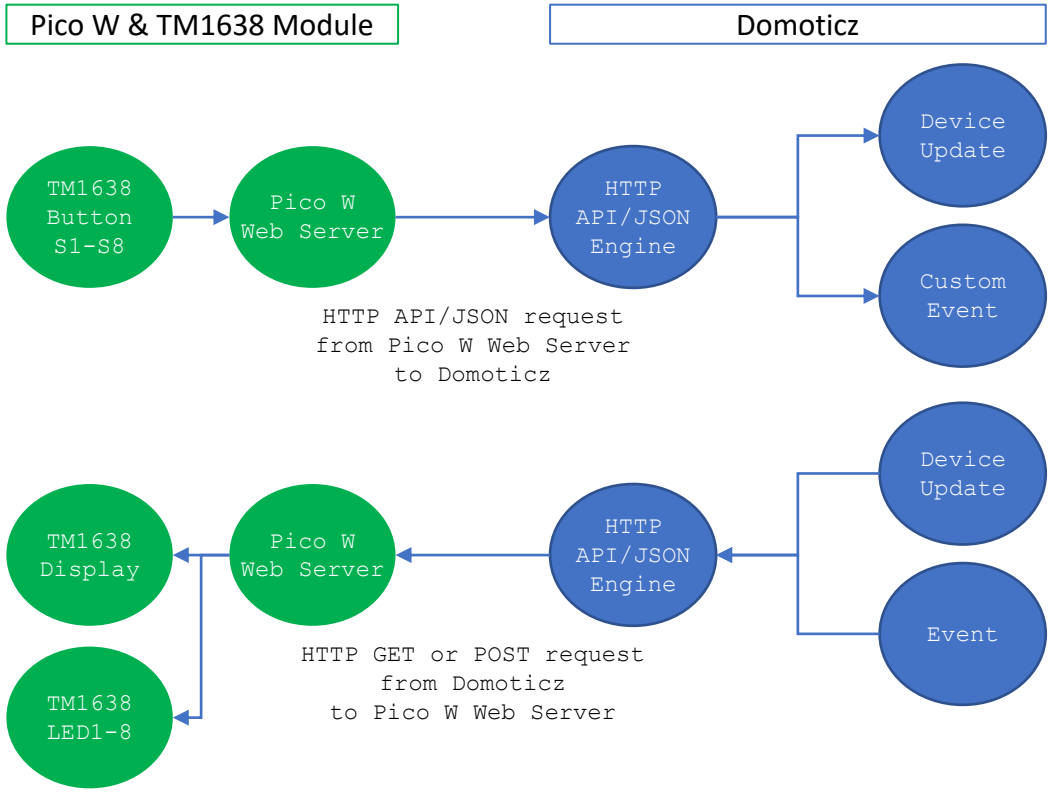


Domoticz Text Device Log with Flag

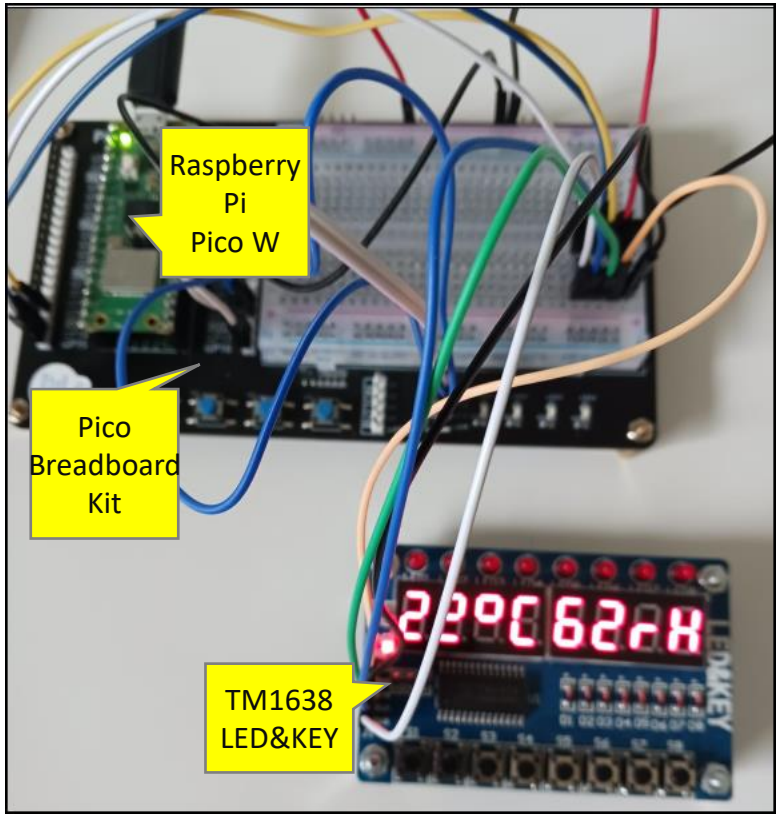
Date	
2023-03-20 10:42:01	8797395990,NOT VALID
2023-03-20 10:42:01	8797395990
2023-03-20 10:41:49	879739599,VALID
2023-03-20 10:41:49	879739599

Project TM1638 LED&KEY

Pico W with TM1638 to trigger Domoticz device action or Domoticz to set TM1638 LED or Display.



Pico W with Breadboard Kit & TM1638 LED&KEY



Project OLED Motherboard

Domoticz sends RPi Motherboard sensor data to set the 0,96” I2C OLED display connected to the Pico W.

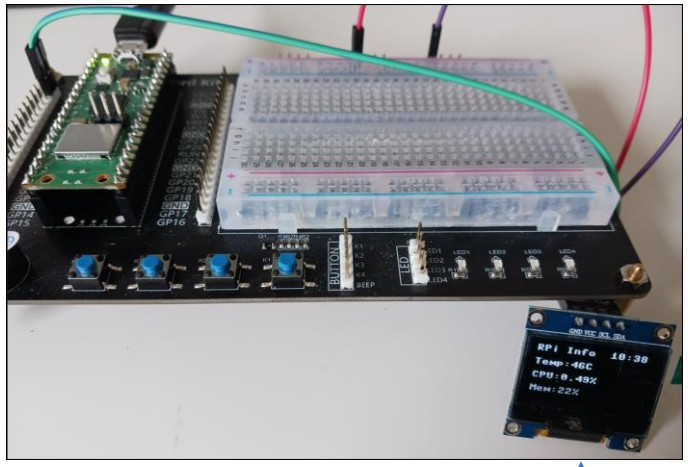
Domoticz Hardware

Idx	Name	Enabled	Type	Address	Port	Data Timeout
5	RPi Motherboard	Yes	Motherboard sensors			Disabled

Domoticz Devices (selective)

	Idx	Hardware	ID	Unit	Name	Type	SubType	
	18	RPi Motherboard	0001	1	Internal Temperature	Temp	LaCrosse TX3	38.9 C
	26	RPi Motherboard	0000044D	1	CPU_Usage	General	Percentage	0.41%
	22	RPi Motherboard	0000044C	1	Memory Usage	General	Percentage	18.35%

Pico W with OLED Display



Automation Event dzVents

Domoticz Automation Event dzVents
Trigger: Timer
The event is reading in regular intervals the RPi motherboard data.
The data is converted to a JSON object and sent as HTTP POST request to the Pico W Web Server.

HTTP API/JSON Engine

```
{
 ["timestamp"]={["row"]=0,["col"]=0,["text"]="RPi Info 10:52"},
 ["cpuusage"]={["row"]=2,["col"]=0,["text"]="CPU:0.4%"},
 ["memoryusage"]={["row"]=3,["col"]=0,["text"]="Mem:18%"},
 ["internaltemperature"]={["row"]=1,["col"]=0,["text"]="Temp:39C"}
}
```

Pico W Web Server

OLED Display

HTTP POST request from Domoticz to Pico W Web Server

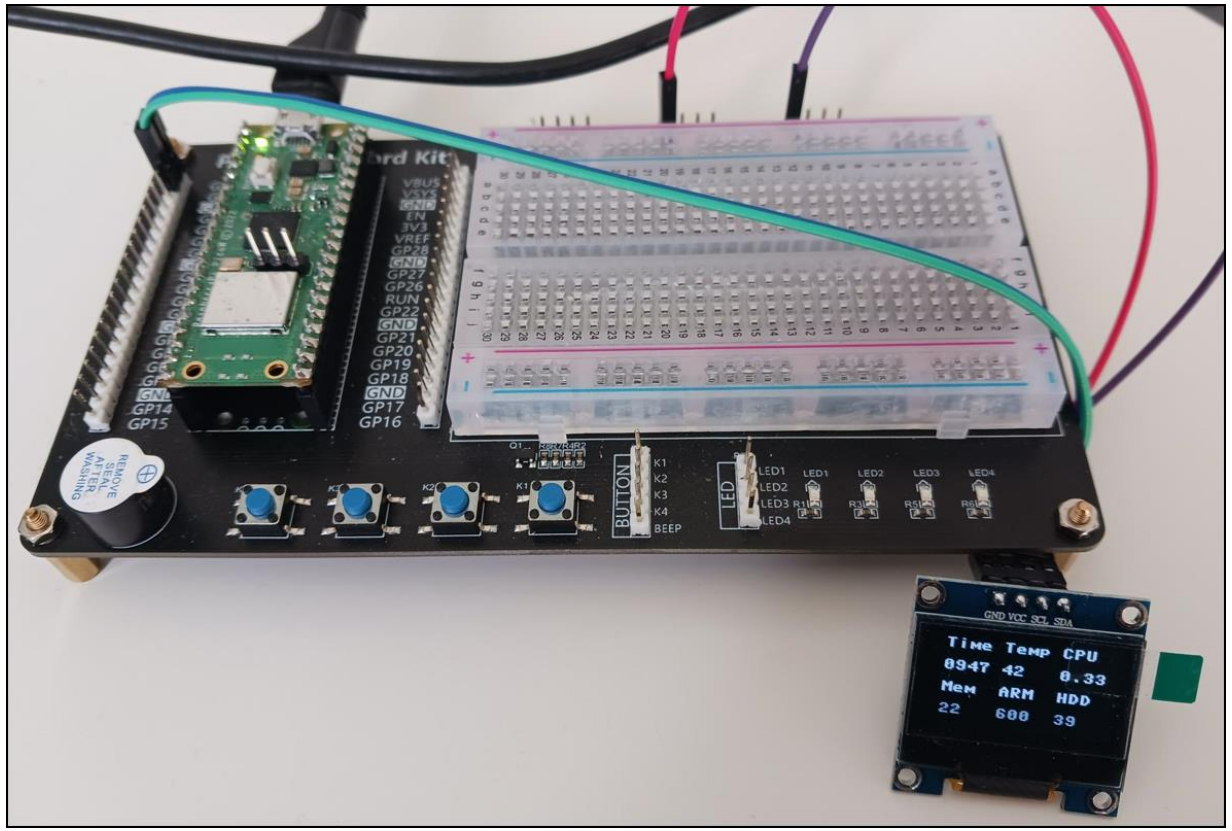
Project OLED Motherboard /2

Domoticz sends RPi Motherboard sensor data to set the 0,96” I2C OLED display connected to the Pico W.
The sensor data is displayed in up-to 6 blocks with title & value

OLED Display 6 Blocks Setup
Each block 2 rows with 4 characters

Col	0 1 2 3 4	5	6 7 8 9	10 11 12 13 14 15
Row				
0	Title Value		Title Value	Title Value
1				
2	Title Value		Title Value	Title Value
3				

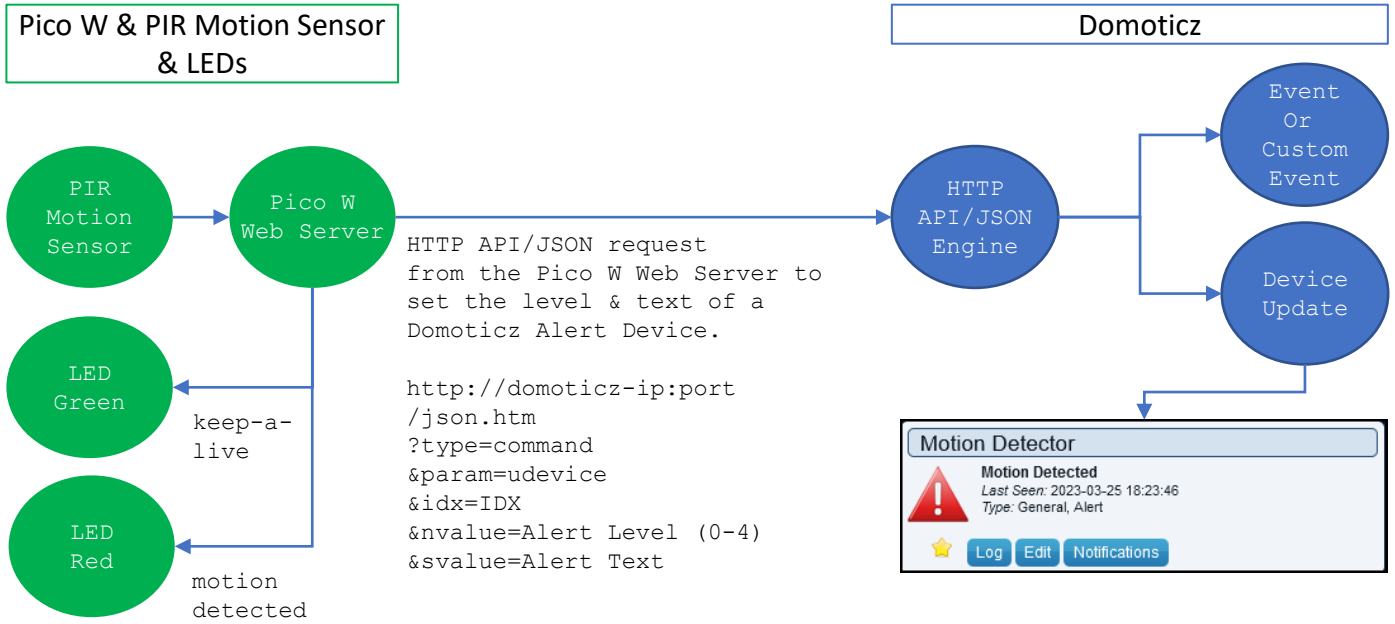
```
Block Data generated by Domoticz Automation Event.
Example JSON array with 6 blocks:
[
 {'block': 1, 'title': 'Time', 'value': '0947’},
 {'block': 2, 'title': 'Temp', 'value': 42},
 {'block': 3, 'title': 'CPU', 'value': 0.33},
 {'block': 4, 'title': 'Mem', 'value': 22},
 {'block': 5, 'title': 'ARM', 'value': 600},
 {'block': 6, 'title': 'HDD', 'value': 39}
]
```



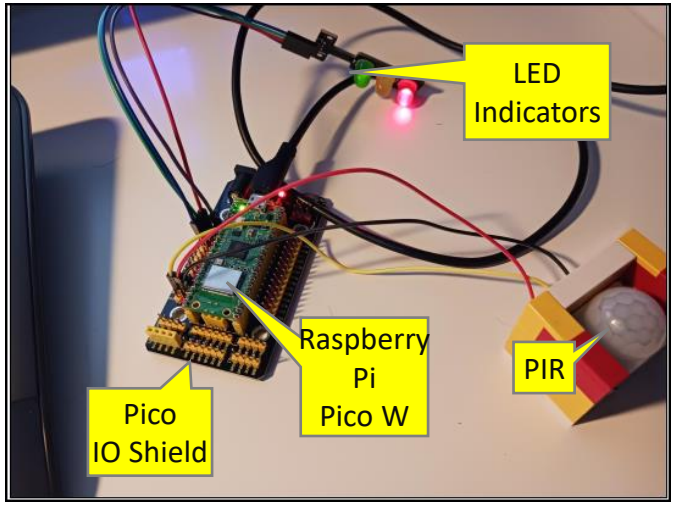
Pico W with OLED Display showing 6 blocks with RPi Motherboard sensor data

Project PIR Motion Sensor

PicoW to detect motion and sent message to a Domoticz Alert sensor.



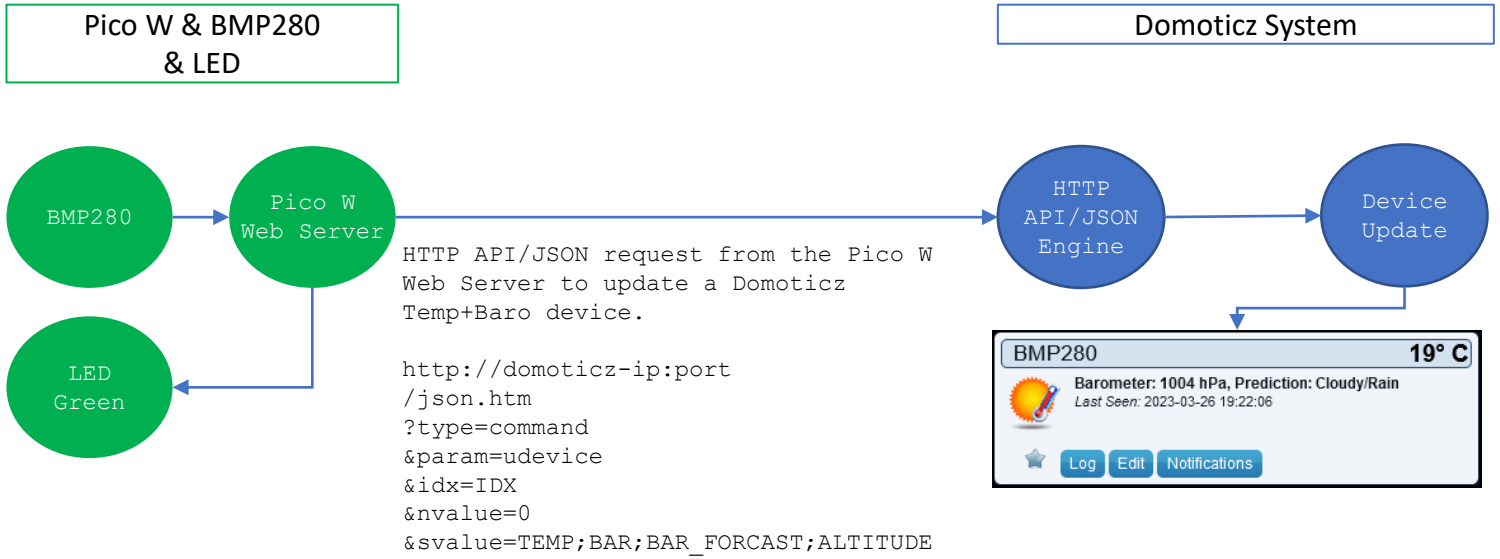
Pico W with PIR connected, and motion detected



Note: The yellow LED from the LED traffic light is not used.

Project BMP280

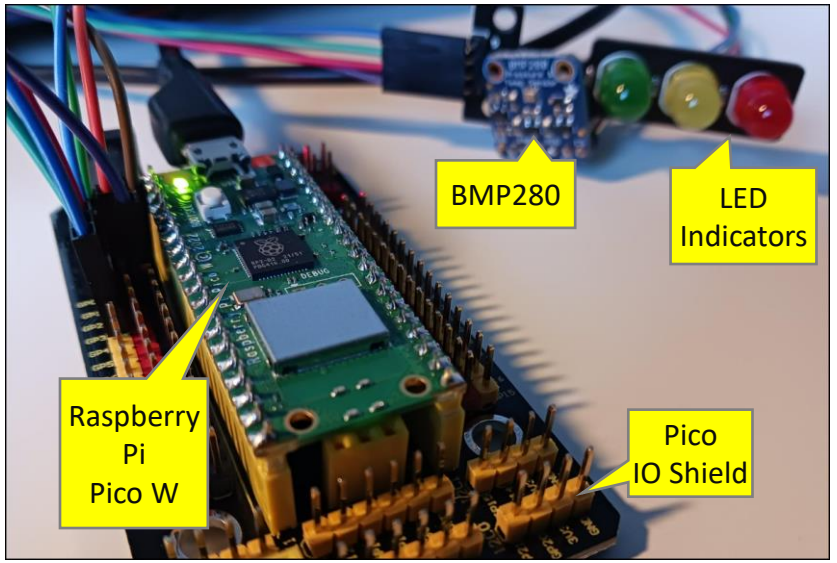
Pico W samples BMP280 sensor data and triggers updating the Domoticz Temp+Baro device.



HTTP API/JSON request from the Pico W Web Server to update a Domoticz Temp+Baro device.

```
http://domoticz-ip:port
/json.htm
?type=command
&param=udevice
&idx=IDX
&nvalue=0
&svalue=TEMP;BAR;BAR_FORCAST;ALTITUDE
```

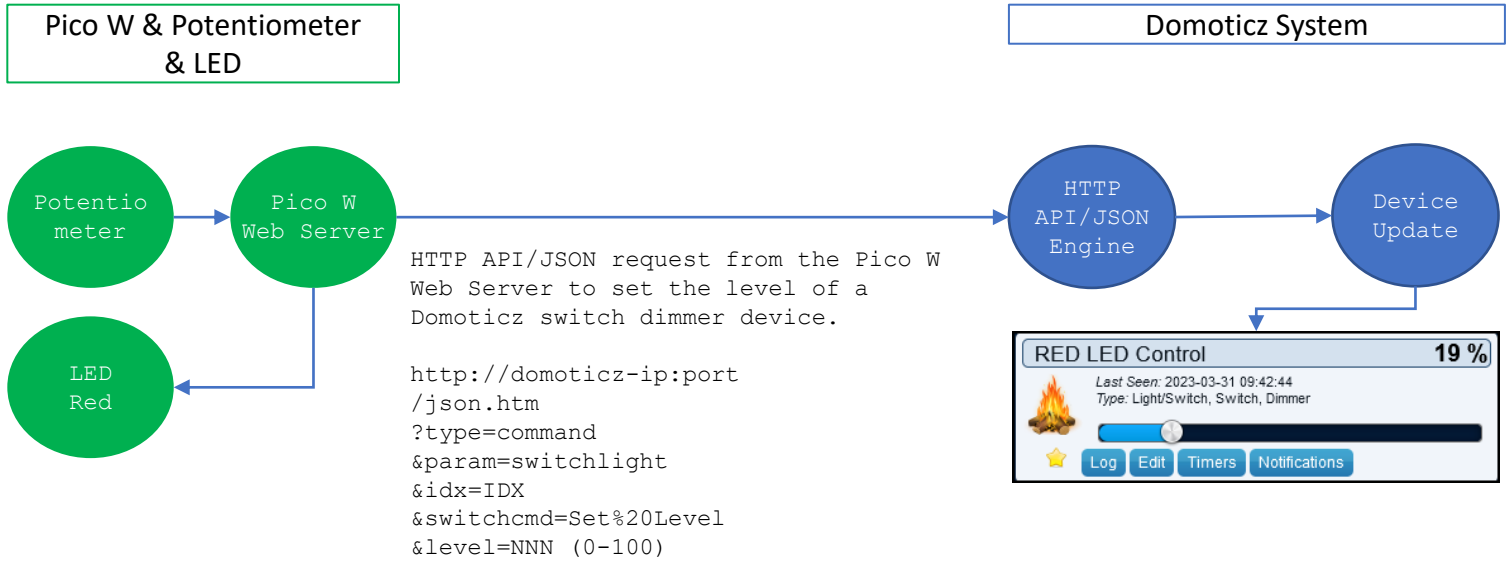
Pico W with Pico IO Shield & BMP280 & LEDs



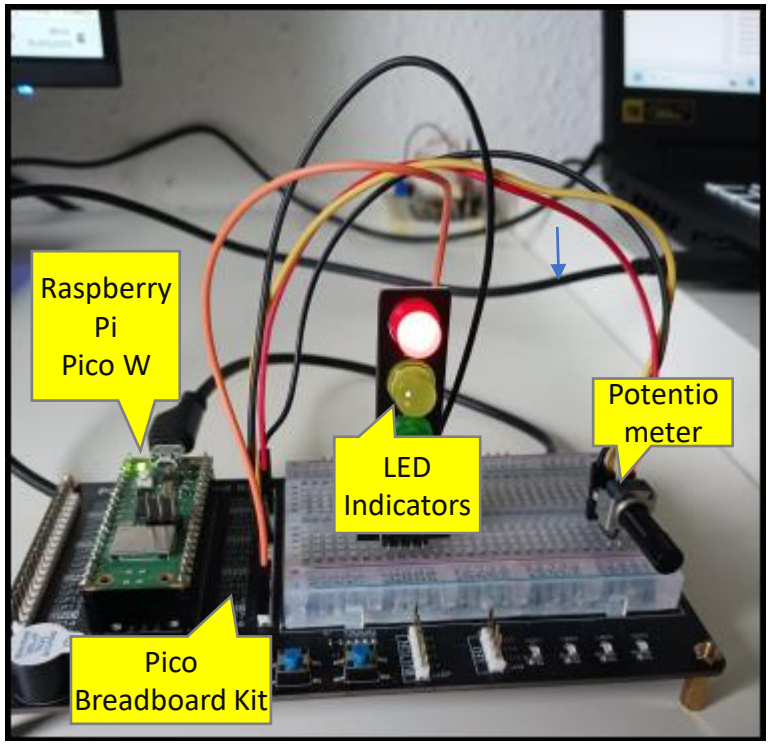
Note: The green LED is used only from the LED traffic light.

Project Potentiometer Dimmer

Pico W to set the level of a Domoticz Switch Dimmer device via Potentiometer.



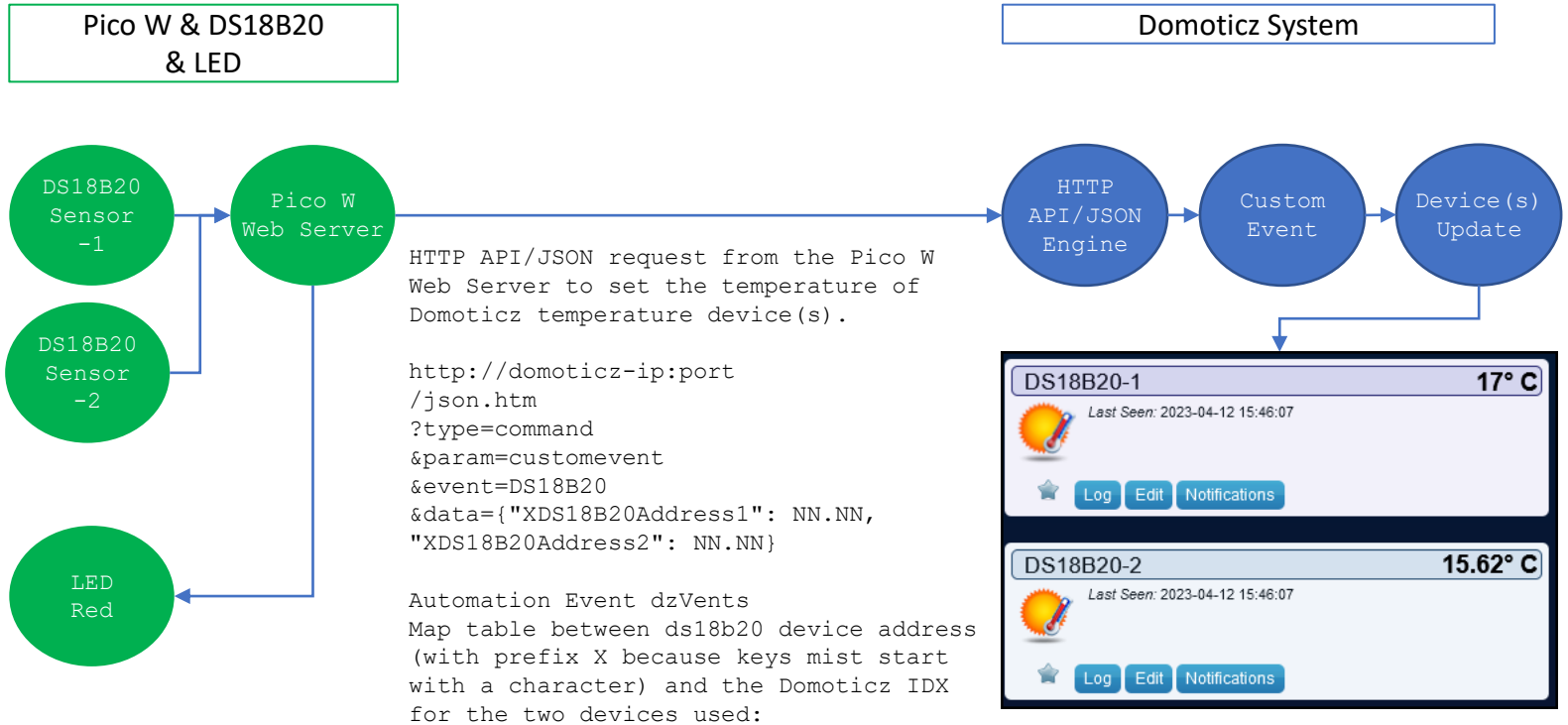
Pico W with Breadboard Kit & Potentiometer & LED



Note: The red LED is used only from the LED traffic light.

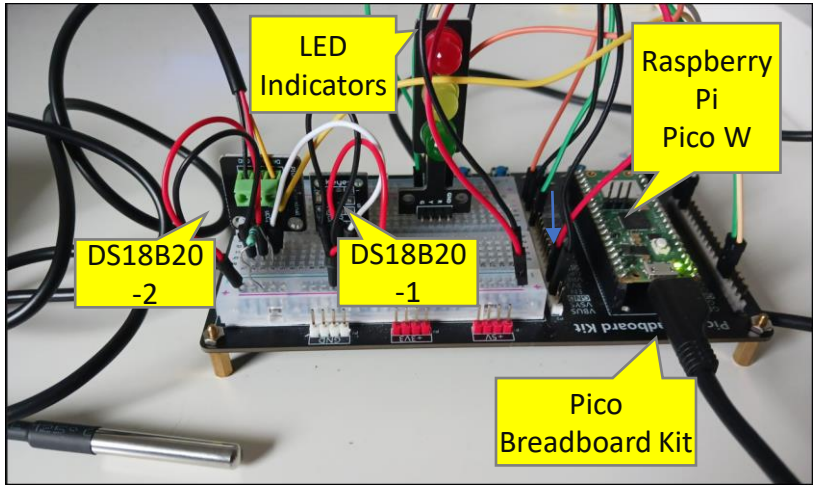
Project DS18B20 - Custom Event

Pico W samples DS18B20 sensor data and triggers Automation Event to update the Domoticz Temperature devices.




```
HTTP API/JSON request from the Pico W
Web Server to set the temperature of
Domoticz temperature device(s).

http://domoticz-ip:port
/json.htm
?type=command
&param=customevent
&event=DS18B20
&data={"XDS18B20Address1": NN.NN,
"XDS18B20Address2": NN.NN}

Automation Event dzVents
Map table between ds18b20 device address
(with prefix X because keys mist start
with a character) and the Domoticz IDX
for the two devices used:

local devices = {
  X28FF5E1804150334 = 31, -- DS18B20-1
  X28330A9497040373 = 32  -- DS18B20-2
}
```

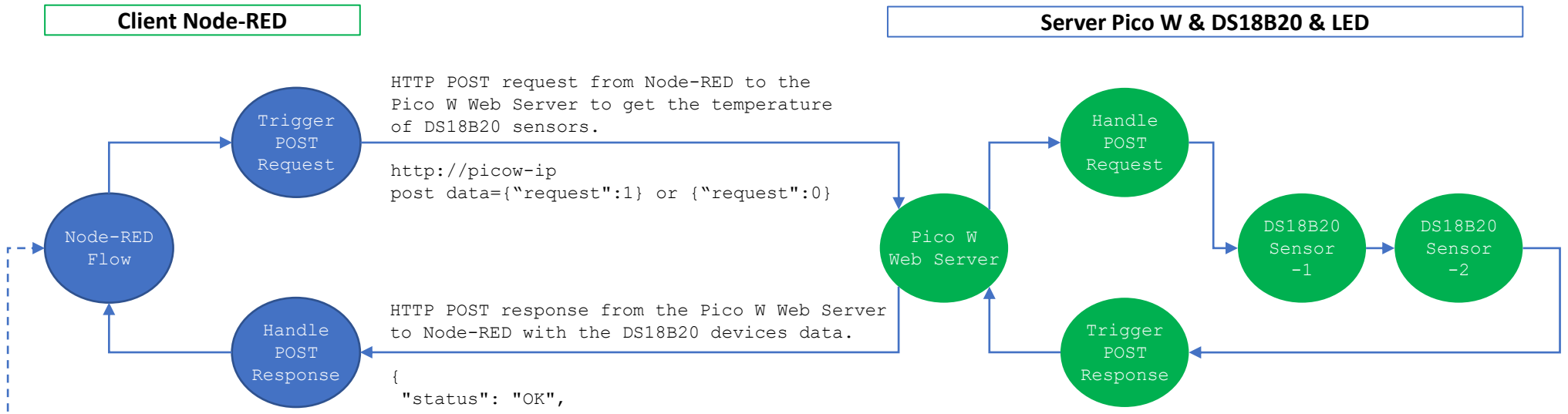
Pico W with Breadboard Kit & DS18B20 & LED

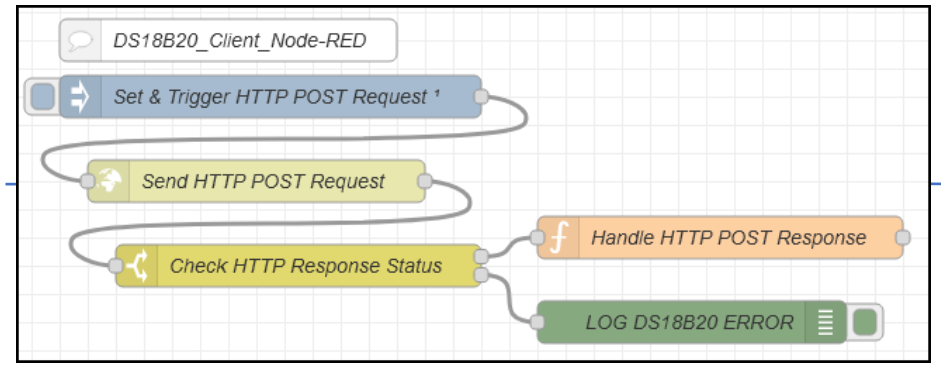


Note: There are two DS18B20 connected (DS18B20-1, DS18B20-2).
From the LED traffic light, the red LED is used only.

Project DS18B20 - Node-RED (PULL)

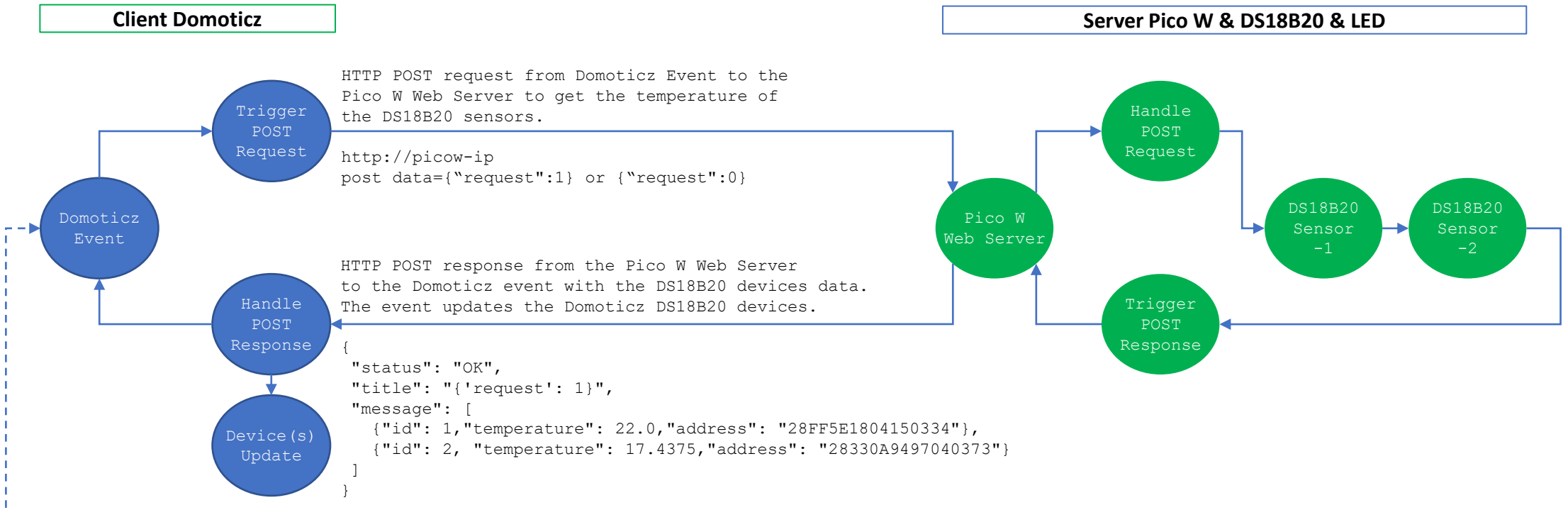
Pico W Web Server listens to HTTP POST request from Node-RED and sends response with DS18B20 sensor data.





Project DS18B20 - Domoticz (PULL)

Pico W Web Server listens to HTTP POST request from Domoticz and sends response with DS18B20 sensor data.




```
dzVents Logic
return {
    on = {
        timer = { TIMER_RULE },
        devices = { IDX_SWITCH },
        httpResponses = { RES_HTTP }
    },
    execute = function(domoticz, triggeredItem)
        if (triggeredItem.isDevice or triggeredItem.isTimer) then
            requestData(domoticz)
        end
        if (triggeredItem.isHTTPResponse) then
            local data = triggeredItem.json
            domoticz.log(data)
            updateDevices(domoticz, data.message)
        end
    end
}
```

```
Start internal script: ds18b20_client_domoticz: Device: "PicoW Switch Control (Virtu
Finished ds18b20_client_domoticz
Start internal script: ds18b20_client_domoticz: HTTPResponse: "RES_DS18B20_REQUEST"
{["title"]="{'request': 1}", ["message"]={{["temperature"]=20.75, ["address"]="28FF
Updated: idx=31, name=DS18B20-1, a=28FF5E1804150334, t=20.75
Updated: idx=32, name=DS18B20-2, a=28330A9497040373, t=16.38
```