

A man in a light blue shirt is shown from the side, holding a tablet computer. He is looking at the screen, which displays a dashboard with various charts and data. The background is a blurred industrial factory setting with white machinery and equipment.

SIEMENS

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SIMATIC IOT2000 OPC UA Client

SIMATIC IOT2020, SIMATIC IOT2040

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1 Task

1.1 Overview

Introduction

This application example shows how to implement an OPC UA Client via node-red on the IOT2000. As OPC UA Server a SIMATIC S7-1500 Software Controller V2.0 is used.

Goals

After working through this document you will know how to

- Use the node-red OPC UA Client
 - Subscribing a value
 - Writing a value
- Display the data on the node-red Dashboard

NOTICE	Precondition! To use this sample it is required that the Initial Operation in the Document "Setting up the SIMATIC IOT2000" has been executed once.
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2 Application Example – Subscribe

This chapter describes how an application can be created with node-red.

This application contains a node-red OPC UA Client subscribing a temperature value from the OPC UA Server of the SIMATIC S7-1500 Software Controller and writing a value to this server. The values are displayed on the node-red dashboard.

2.1 Install node-red OPC UA node

From version V2.1.2 of the example image the program node-red is preinstalled.

The additional node for OPC UA communication has to be installed by the user.

NOTE For installing an internet connection is required!

The following table shows how to install the additional node.

Table 2-1

No.	Action
1.	Open a valid Putty Connection to your IOT2000
2.	Type in cd /usr/lib/node_modules to go to the node-red directory
3.	Type in npm install node-red-contrib-opcua to install the node

```

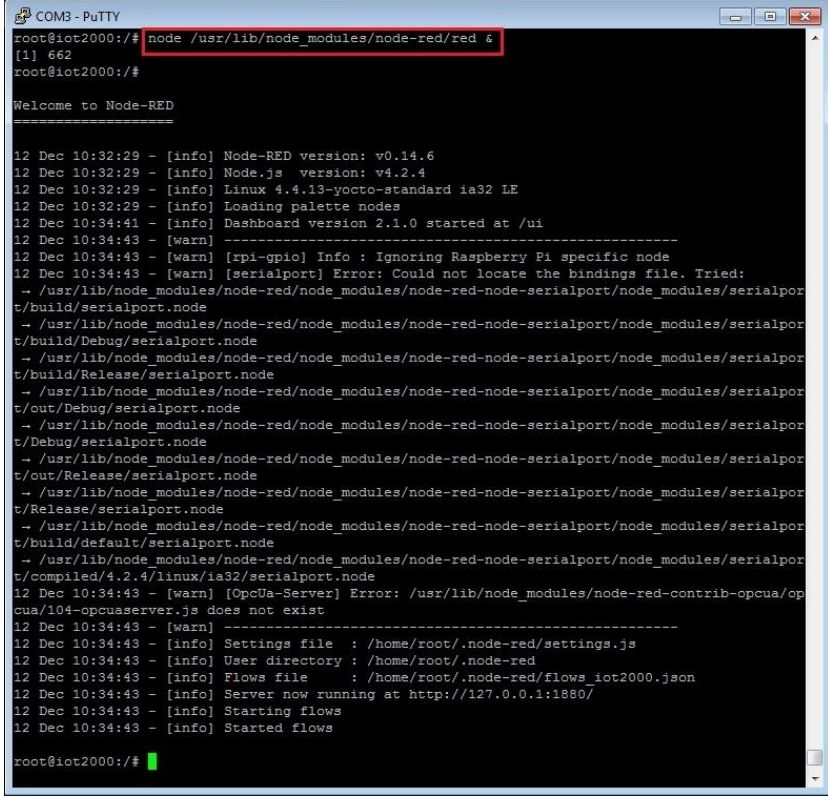
COM3 - PuTTY
root@iot2000:/# cd /usr/lib/node_modules/
root@iot2000:/usr/lib/node_modules# npm install node-red-contrib-opcua
mmcb1k0: Timeout waiting for hardware interrupt.
mmcb1k0: error -110 transferring data, sector 2429848, nr 1024, cmd response 0x900, card statu
s 0xc00
> node-opcua@0.0.54 postinstall /usr/lib/node_modules/node-red-contrib-opcua/node_modules/node
-opcua
> node postinstall.js

Executing node bin/generate_opcua_classes.js --clear
done ... (0)
Executing node bin/crypto_create_CA.js
done ... (0)
npm WARN unmet dependency /usr/lib/node_modules/node-red/node_modules/node-red-node-serialport
/node_modules/serialport/node_modules/tar-pack requires debug@'~2.2.0' but will load
/node_modules/serialport/node_modules/debug,
npm WARN unmet dependency which is version 2.3.3
node-red-contrib-opcua@0.2.11 node-red-contrib-opcua
├── treeify@1.0.1
├── collections@3.0.0 (weak-map@1.0.5)
├── async@2.1.4 (lodash@4.17.2)
├── node-opcua@0.0.54 (easy-table@1.0.0, dequeue@1.0.5, bomstrip@0.1.4, sprintf@0.1.5, humaniz
e@0.0.3, underscore@1.8.3, q@1.4.1, progress@1.1.8, hexy@0.2.7, delayed@1.0.1, once@1.4.0, nod
e-jssasign@0.0.7, xml-writer@1.6.0, colors@1.1.2, exit@0.1.2, better-assert@1.0.2, ensatz-nod
e-expat@0.1.6, backoff@2.5.0, byline@4.2.1, fgdn@0.0.3, wget-improved@1.4.0, ssh-key-to-pem@0.
11.1, pem@1.8.1, del@2.2.2, requirish@0.3.0, unzip@0.1.11, yargs@4.8.1, async@2.0.0-rc.3)
root@iot2000:/usr/lib/node_modules#
    
```

2.2 Start node-red

The following table shows how to start node-red.

Table 2-2


No.	Action
1.	<p>Type in <code>node /usr/lib/node_modules/node-red/red &</code> to start node-red</p> 

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2.3 Open node-red Web interface

The following table shows how to open the Web interface of node-red.

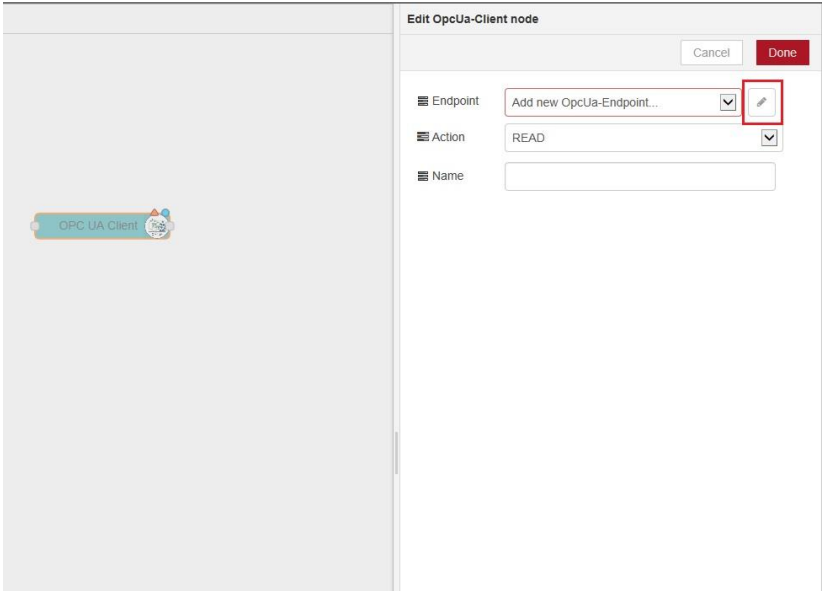
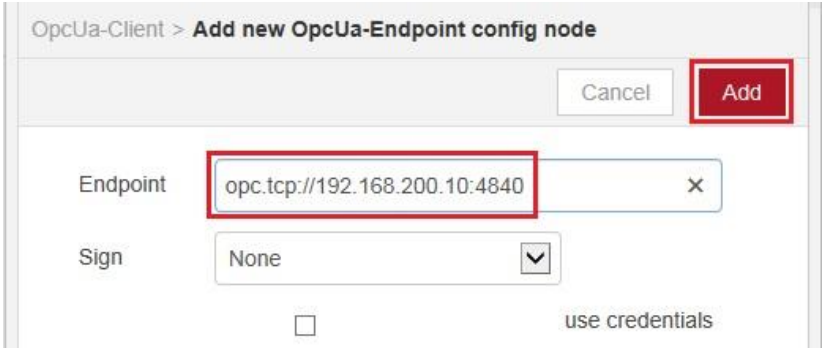
Table 2-3

No.	Action
1.	<p>Add the IP-Address of the IOT2000 and the port 1880 to a browser (i.e <code>http://192.168.200.1:1880</code>)</p> 

2.4 Configure node-red program

Configure OPC UA Client node

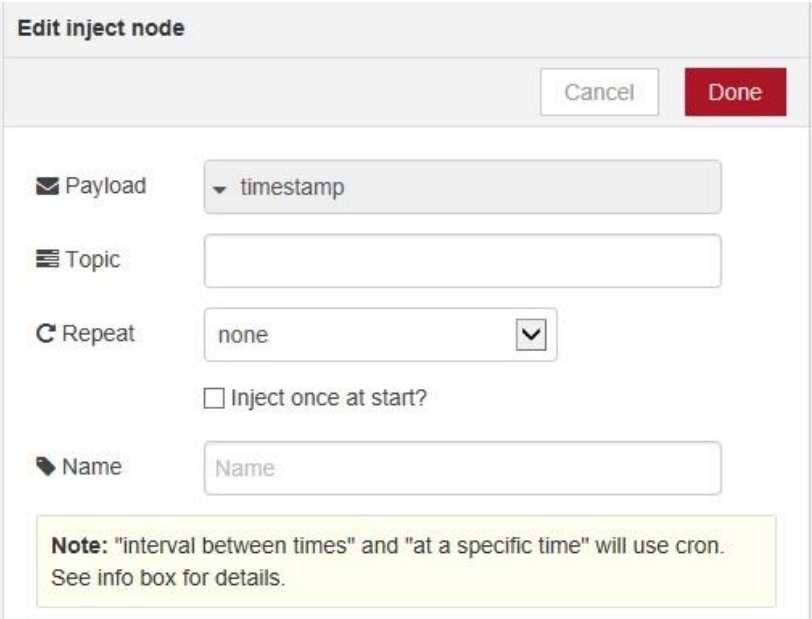
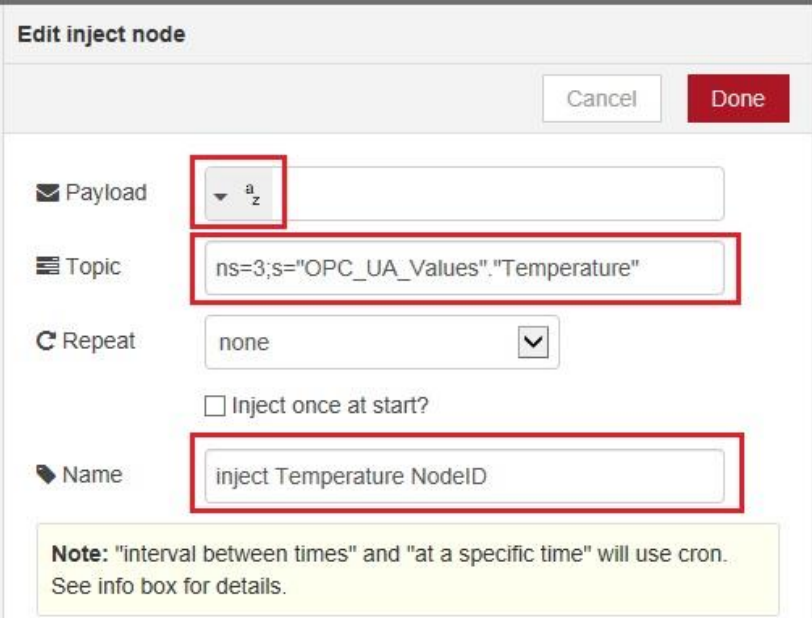
Table 2-4

No.	Action
1.	Scroll down the left bar to “opcua”
2.	Choose “OpcUa Client” and add it per Drag&Drop to the middle
3.	Double-click on the node 
4.	Add a new Endpoint with IP address and port from the OPC UA Server and click “Add” 

No.	Action
5.	<p>Choose Subscribe as Action, the required interval and give the node an optional name. Click Done</p> <div data-bbox="555 365 1358 815"><p>Edit OpcUa-Client node</p><p>Cancel Done</p><p>Endpoint: opc.tcp://192.168.200.10:4840</p><p>Action: SUBSCRIBE</p><p>Interval: 2 second(s)</p><p>Name: Subscribe Temperature</p></div>

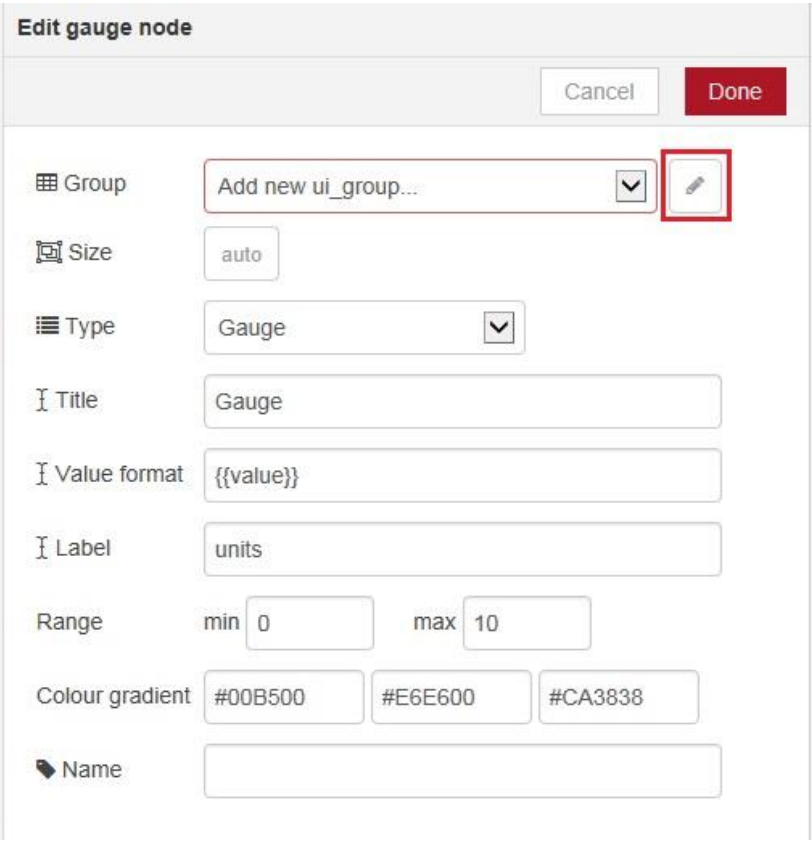
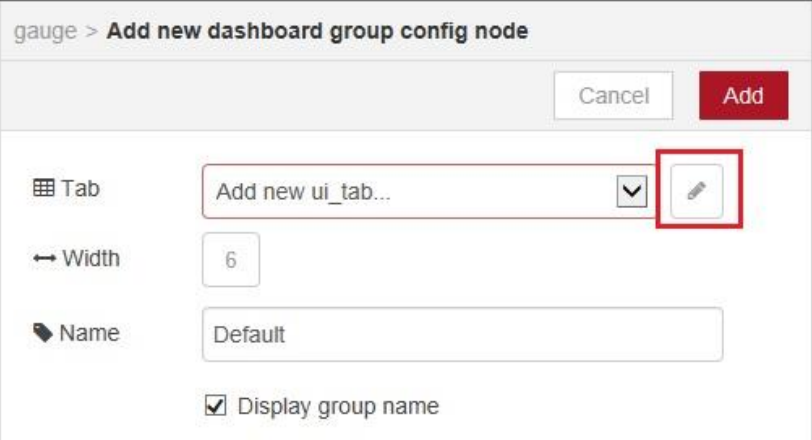
Configure Inject node

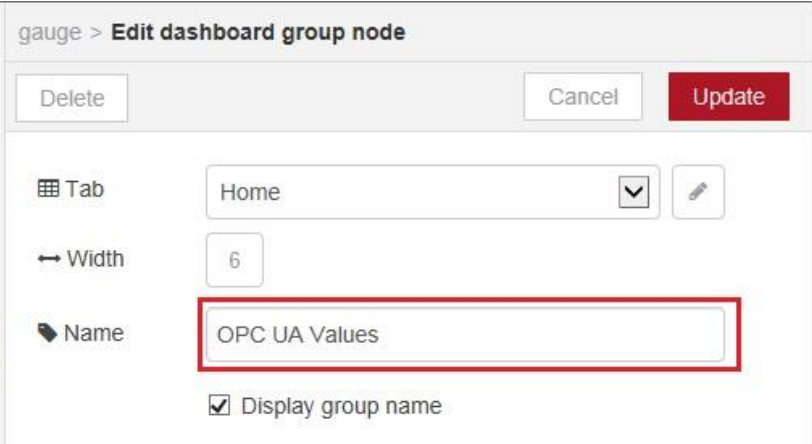
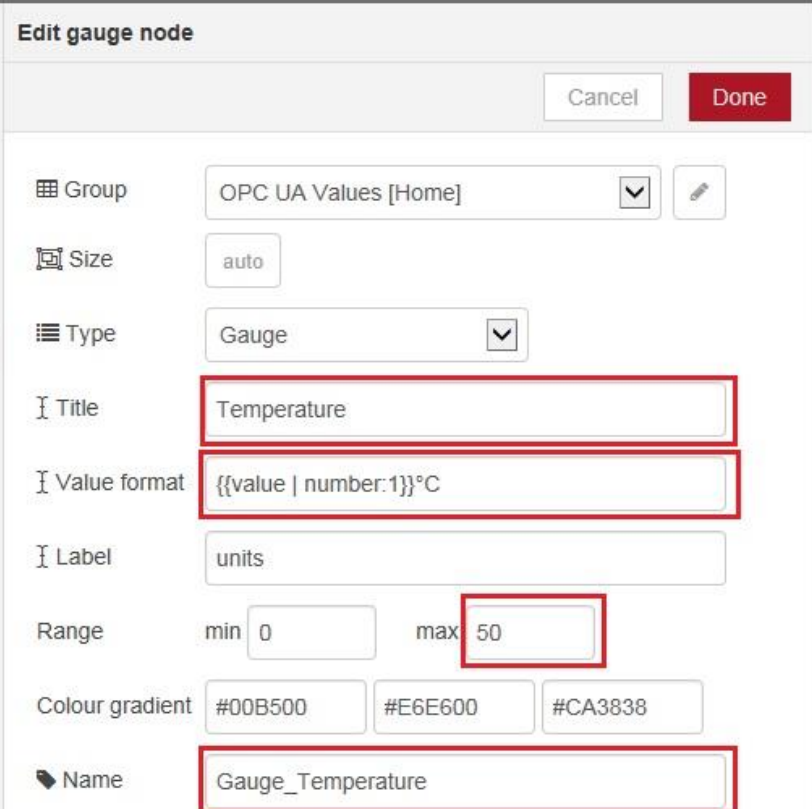
Table 2-5

No.	Action
1.	Scroll the left bar to the top
2.	Choose the “inject” node and add it per Drag&Drop to the middle
3.	<p>Double-click on the node</p>  <p>Edit inject node</p> <p>Cancel Done</p> <p>✉ Payload timestamp</p> <p>☰ Topic</p> <p>🔄 Repeat none</p> <p><input type="checkbox"/> Inject once at start?</p> <p>📌 Name Name</p> <p>Note: "interval between times" and "at a specific time" will use cron. See info box for details.</p>
4.	<p>Choose String, add the NodeID of the required value to Topic and give the node an optional name. Click Done</p>  <p>Edit inject node</p> <p>Cancel Done</p> <p>✉ Payload a-z</p> <p>☰ Topic ns=3;s="OPC-UA-Values"."Temperature"</p> <p>🔄 Repeat none</p> <p><input type="checkbox"/> Inject once at start?</p> <p>📌 Name inject Temperature NodeID</p> <p>Note: "interval between times" and "at a specific time" will use cron. See info box for details.</p>

Configure Dashboard

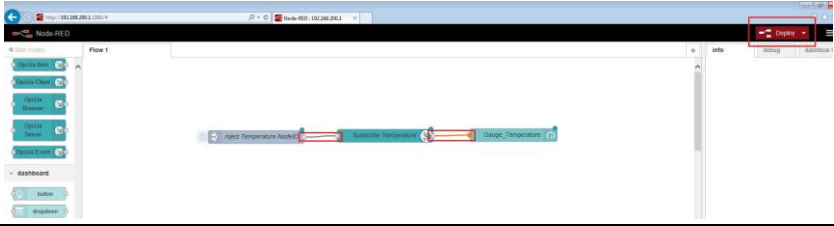
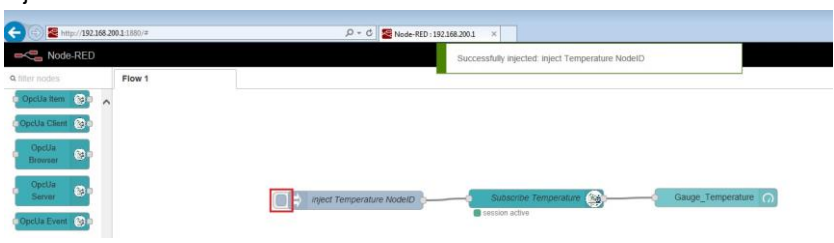
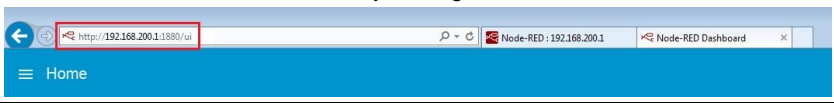
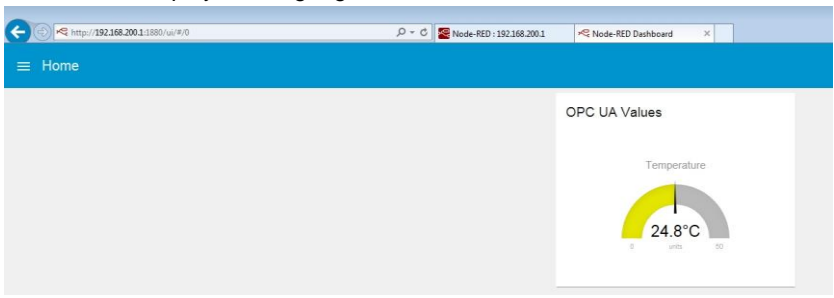
Table 2-6

No.	Action
1.	Scroll the left bar to dashboard
2.	Choose the "gauge" node and add it per Drag&Drop to the middle
3.	Double-click on the node
4.	<p>Add a new ui_group</p>  <p>Edit gauge node</p> <p>Cancel Done</p> <p>Group Add new ui_group... [edit icon]</p> <p>Size auto</p> <p>Type Gauge</p> <p>Title Gauge</p> <p>Value format {{value}}</p> <p>Label units</p> <p>Range min 0 max 10</p> <p>Colour gradient #00B500 #E6E600 #CA3838</p> <p>Name</p>
5.	<p>Add new ui_tab</p>  <p>gauge > Add new dashboard group config node</p> <p>Cancel Add</p> <p>Tab Add new ui_tab... [edit icon]</p> <p>Width 6</p> <p>Name Default</p> <p><input checked="" type="checkbox"/> Display group name</p>

No.	Action
6.	<p>Give the ui_group a name</p>  <p>gauge > Edit dashboard group node</p> <p>Delete Cancel Update</p> <p>Tab Home</p> <p>Width 6</p> <p>Name OPC UA Values</p> <p><input checked="" type="checkbox"/> Display group name</p>
7.	<p>Configure the gauge</p>  <p>Edit gauge node</p> <p>Cancel Done</p> <p>Group OPC UA Values [Home]</p> <p>Size auto</p> <p>Type Gauge</p> <p>Title Temperature</p> <p>Value format {{value number:1}}°C</p> <p>Label units</p> <p>Range min 0 max 50</p> <p>Colour gradient #00B500 #E6E600 #CA3838</p> <p>Name Gauge_Temperature</p>

Load and start the program

Table 2-7

No.	Action
1.	Wire the nodes via Drag&Drop
2.	Click on Deploy to download the program 
3.	Inject the NodeID to the OPC UA Client by clicking on the left square of the inject node 
4.	Go to the dashboard of node-red by adding /ui to the address 
5.	The value is displayed in a gauge 

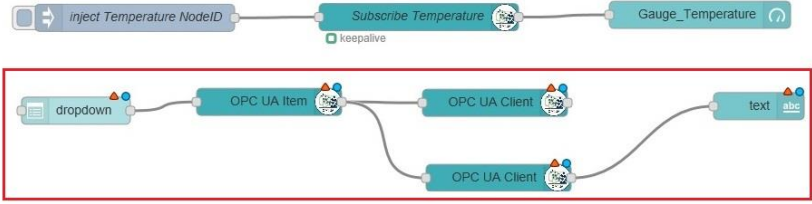
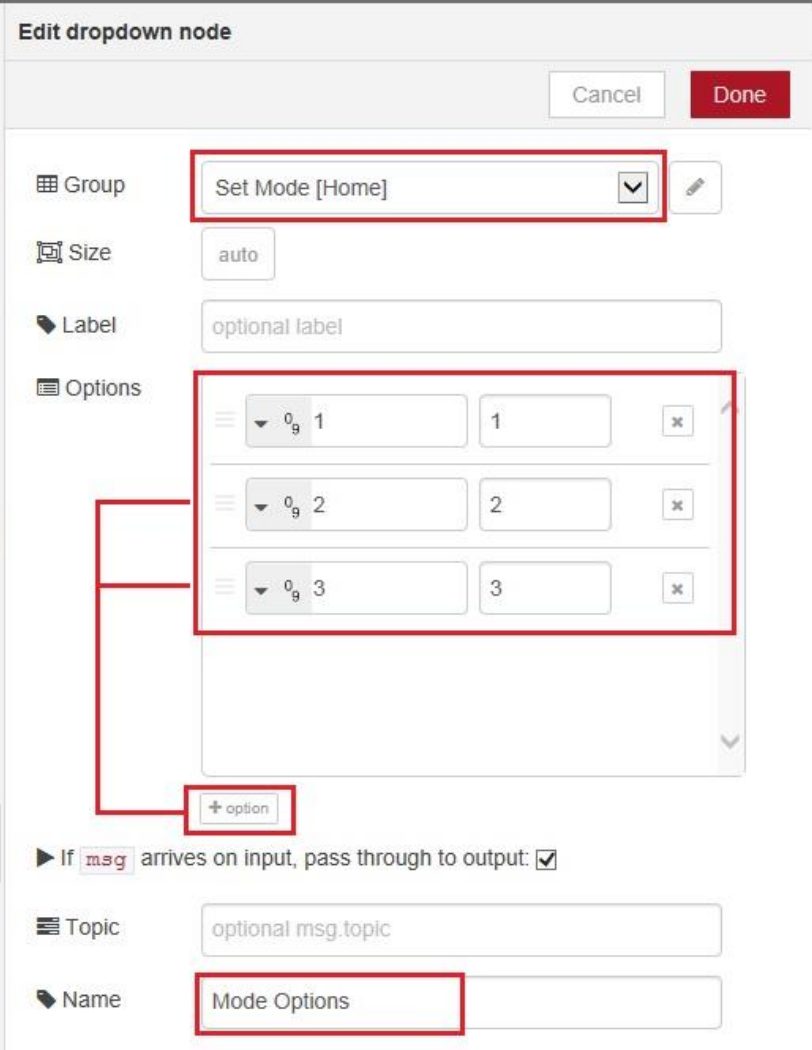
3 Application Example – Write

3.1 Configure the node-red program

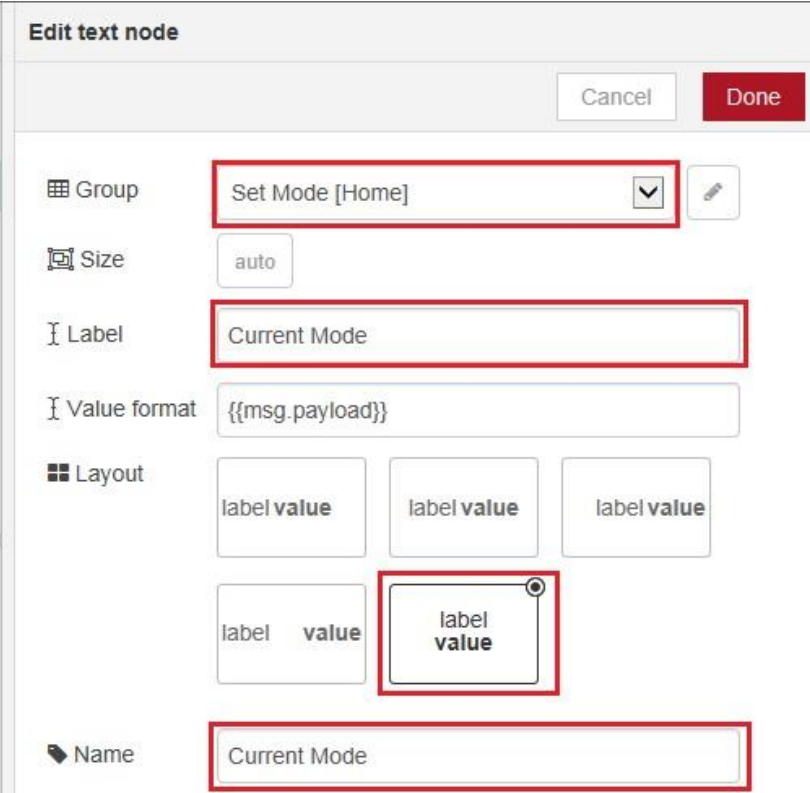
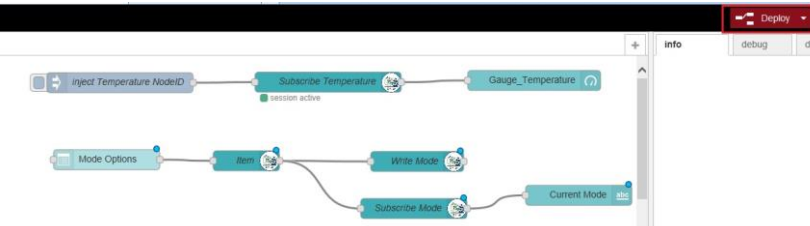

In addition to the program in the last chapter add the nodes shown in the following table.

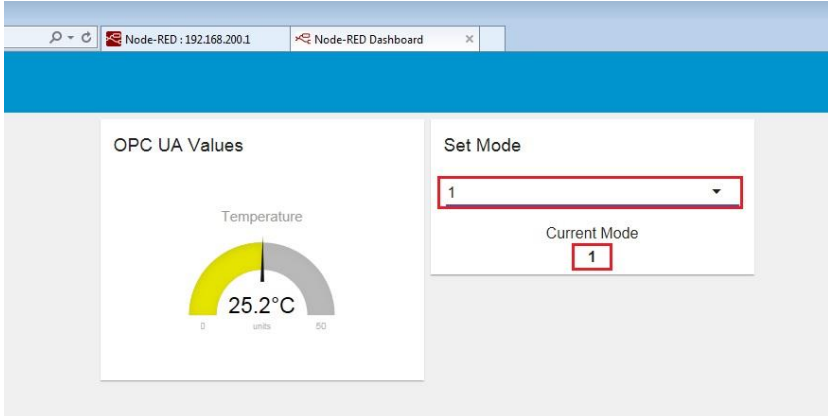
With this program you can change the value of the variable “Mode” in the S7-1500 Software Controller with a dropdown menu in the dashboard of node-red. The current value is displayed too.

Table 3-1

No.	Action
1.	<p>Add the following nodes and wire them:</p> <ol style="list-style-type: none"> Dropdown OPC UA Item OPC UA Client OPC UA Client text 
2.	<p>Configure the Dropdown node. Add a new UI Group and add the options to write</p> 

No.	Action
3.	<p>Configure the OPC UA Item. Add the NodeID of the value to write to Item and choose its datatype</p> <div data-bbox="555 365 1361 835" style="border: 1px solid gray; padding: 5px;"> <p>Edit OpcUa-Item node</p> <p style="text-align: right;">Cancel Done</p> <p>Item: ns=3;s="OPC-UA-Values"."Mode"</p> <p>Type: Int16</p> <p>Value: </p> <p>Name: Item</p> </div>
4.	<p>Configure the OPC UA Client to write. Add the IP-Address and the Port of the OPC UA Server to Endpoint and choose Write as Action</p> <div data-bbox="555 913 1361 1294" style="border: 1px solid gray; padding: 5px;"> <p>Edit OpcUa-Client node</p> <p style="text-align: right;">Cancel Done</p> <p>Endpoint: opc.tcp://192.168.200.10:4840</p> <p>Action: WRITE</p> <p>Name: Write Mode</p> </div>
5.	<p>Configure the OPC UA Client to subscribe. Add the IP-Address and the Port of the OPC UA Server to Endpoint, choose Subscribe as Action and choose the required Interval</p> <div data-bbox="555 1395 1361 1854" style="border: 1px solid gray; padding: 5px;"> <p>Edit OpcUa-Client node</p> <p style="text-align: right;">Cancel Done</p> <p>Endpoint: opc.tcp://192.168.200.10:4840</p> <p>Action: SUBSCRIBE</p> <p>Interval: 500 millisecond(s)</p> <p>Name: Subscribe Mode</p> </div>

No.	Action
6.	<p>Configure the text output-node. Choose the UI Group created in the Dropdown node and choose a Layout</p> 
7.	<p>Click on Deploy to download the program to the IOT2000</p> 
8.	<p>Open a browser and go to the dashboard of node-red</p> 

No.	Action
9.	<p>The variable can be written to the OPC UA Server by choosing a value from the dropdown menu</p>  <p>The screenshot shows a web browser window with two tabs: 'Node-RED : 192.168.200.1' and 'Node-RED Dashboard'. The dashboard content is divided into two panels. The left panel, titled 'OPC UA Values', features a gauge labeled 'Temperature' with a scale from 0 to 50 units. The needle is positioned at 25.2°C. The right panel, titled 'Set Mode', contains a dropdown menu with the value '1' selected and a 'Current Mode' label with a small box containing the value '1' below it.</p>

4 Checklist

This chapter contains a Checklist which summarizes all important steps in this application example.

Table 4-1

No.	Action
1.	Install OPC UA node
2.	Start node-red
3.	Open node-red Web interface
4.	Configure node-red program for subscribing
5.	Configure node-red program for writing

5 Related links

Table 5-1

	Topic
\1\	SIMATIC IOT2000 forum www.siemens.com/iot2000-forum
\2\	SIMATIC IOT2000 Setting Up https://support.industry.siemens.com/tf/ww/en/posts/155642/
\3\	SIMATIC IOT2000 Getting Started https://support.industry.siemens.com/tf/ww/en/posts/155643/

6 History

Table 6-1

Version	Date	Modifications
V1.0	12/2016	First version
V1.0	12/2016	Corrected some typing errors