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Node-RED Edge App

SIMATIC WinCC Unified (Engineering) V16
SIMATIC HMI Unified Comfort Panels
Device-managed EDGE

<https://support.industry.siemens.com/cs/ww/en/view/109778780>

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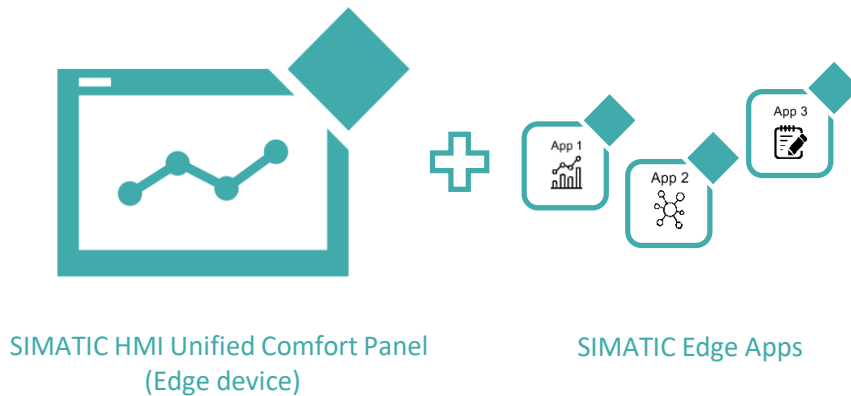
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1 Introduction

1.1 Overview

The SIMATIC HMI Unified Comfort Panels are part of the newly developed SIMATIC WinCC Unified system. In addition to many new functions offered by the new hardware and software, the SIMATIC HMI Unified Comfort Panel can also be used as an edge device.

Figure 1-1

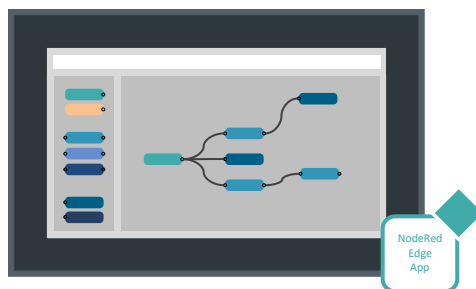


With the help of this additional option, the SIMATIC WinCC Unified system can be extended to carry out other functions and meet customer-specific requirements.

1.2 Principle of operation

This application example describes how you can create the Edge app "Node-RED" using the supplied source code. Via the "OpenPipe" interface, you can then import process values and alarms from the Unified Comfort Panel runtime into the Node-RED Edge app.

Figure 1-2



Note

SIMATIC Edge requires a license to be used in a production environment. You do not need a license for the app development and testing phase.

<https://www.siemens.com/comfort-edge-activation>

1.3 Required knowledge

The following knowledge is required for this application example:

- Programming knowledge in Node.js
- Knowledge working with Docker and Docker containers

1.4 Components used

The following hardware and software components were used to create this application example:

Table 1-1

Component	Quantity	Item number	Note
SIMATIC WinCC Unified V16 (Engineering) Update 1	1	6AV2153-....1-6...	Engineering in TIA Portal.
SIMATIC HMI Unified Comfort Panel MTP1200	1	6AV2128-3MB06-0AX0	Alternatively, any other SIMATIC HMI Unified Comfort Panel can be used.
Docker Desktop 2.3.0.2	1	-	Link: https://hub.docker.com/editions/community/docker-ce-desktop-windows/
Visual Studio Code	1	-	Link: https://code.visualstudio.com/ Any other editor can be used as an alternative.
Node-RED for Docker	1	-	Link: https://hub.docker.com/r/nodered/node-red-docker/
Siemens Industrial Edge Publisher	1		Link: https://support.industry.siemens.com/cs/ww/en/view/109778875

This application example consists of the following components:

Table 1-2

Component	File name
Documentation on the application	109778780_NodeRed_EdgeApp_V10_en.docx
Node-RED App Source Code	109778780_NodeRed_CODE_V12.zip

2 Engineering - Create and manage Node-RED Edge app

This chapter will show you how to create the Node-RED Edge app from the supplied source code.

Note

You can refer to this application example in the SendMail Edge app documentation or the Getting Started guide "Unified Comfort Panels for Industrial Edge" for which steps are generally necessary to create an Edge app:

<https://support.industry.siemens.com/cs/ww/en/view/109773259>

2.1 Configure: Create your own custom nodes (optional)

This chapter describes how to add user-defined nodes ("custom nodes") to the app. If you wish to proceed directly with the preconfigured custom nodes, you can skip directly to chapter [2.2](#).

Note

Detailed instructions on creating custom nodes for Node-RED can be found at the following link:

<https://nodered.org/docs/creating-nodes/>

In order to exchange data via OpenPipe with the Unified Comfort Panel runtime, custom nodes must be integrated. They contain the function for establishing a connection and running methods. They can then be used like normal nodes in the program.

The custom nodes consist of the following three files:

- ".html" file: to define the interface of the node
- ".js" file: to define the OpenPipe function
- ".json" file: to declare the node

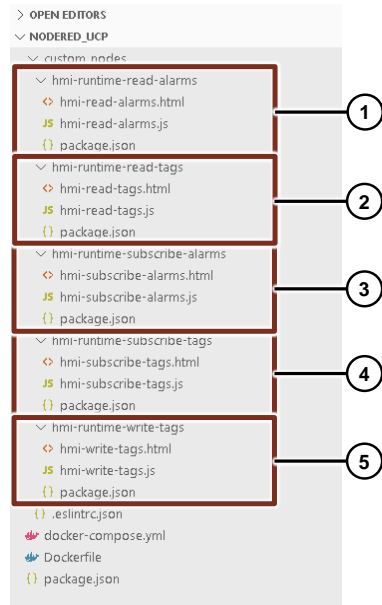
Example configuration

The source code of the supplied Node-RED Edge app contains three custom nodes with the following five OpenPipe methods:

1. Read Alarms
2. Read Tags
3. Subscribe Alarms
4. Subscribe Tags
5. Write Tags

The following figure shows how the folder structure is arranged for the application, including the five custom nodes mentioned earlier.

Figure 2-1



Then, the custom nodes still have to be integrated via the "package.json" file. In this file, the "Dependencies" of the custom nodes are assigned to the appropriate folder (lines 28–32).

Figure 2-2



Note

Check your Node-RED version and JavaScript Engine version in the package.json file.

Prerequisite: Your Engineering PC is connected to the Internet.

Node-RED version

1. Move your mouser over the Node-RED version in the code.

```
20     "name": "Nick O'Leary"
21   },
22   {
23     "name": "Low-code programming for event-driven applications"
24   }
25 ],
26 "dependencies": {
27   "node-red": "1.3.2",
28   "node-red-hmi-subscribe-alarms": "file:hmi-runtime-subscribe-alarms",
29   "node-red-hmi-subscribe-top": "file:hmi-runtime-subscribe-top"
30 }
```

2. A tooltip text will appear. Check the displayed version with your version. In the example, version 1.3.3 is higher than the one used in the code.

```
19   {
20     "name": "Nick O'Leary"
21   },
22   {
23     "name": "Low-code programming for event-driven applications"
24   }
25 ],
26 "dependencies": {
27   "node-red": "1.3.2",
28   "node-red-hmi-subscribe-alarms": "file:hmi-runtime-subscrib
29   "node-red-hmi-subscribe-top": "file:hmi-runtime-subscribe-top"
30 }
```

3. In this case, adjust your code to the new version. In the example: "V1.3.2 > 1.3.3".

JavaScript Engine version

If you get hints from the compiler (e.g. possible security hints), this may indicate that a new version is available.

1. Navigate to the engine version in the code.

```
37   "node-red-contrib-ftp": "*",
38   "node-red-contrib-s7": "*",
39   "node-red-contrib-alexa-home-skill": "*",
40   "node-red-contrib-alexa-cakebaked": "*"
41 },
42 "engines": {
43   "node": ">=15.10.0"
44 }
```

2. Search the Internet for more up-to-date versions and use them for your project.

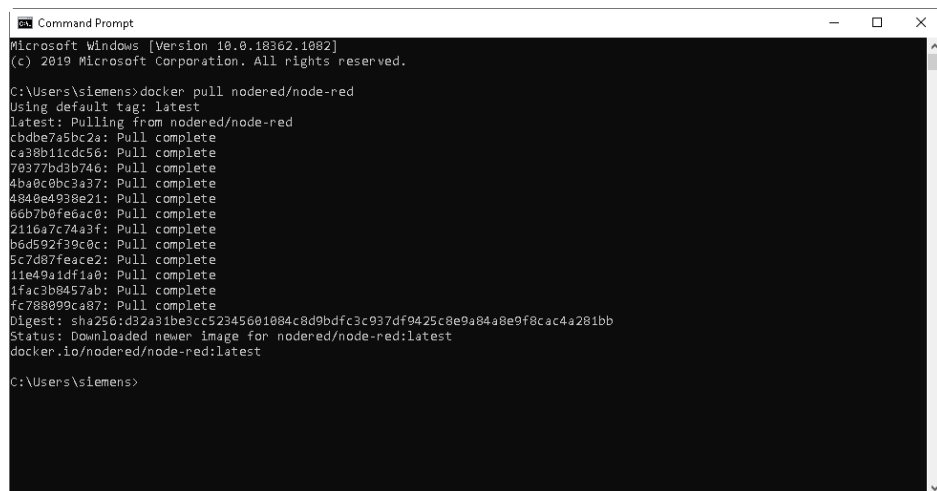
2.2 Create: Create Node-RED Docker images

This chapter will demonstrate how to create the Docker image from the supplied source code.

2.2.1 Download Docker image

1. Open a command line such as Visual Studio Code or the Windows Command Prompt.
2. Enter the following command into the command line to download a suitable Node-RED Docker image.

```
docker pull nodered/node-red
```



Note The image you download must match the specification in the file "Dockerfile" ("FROM" range).

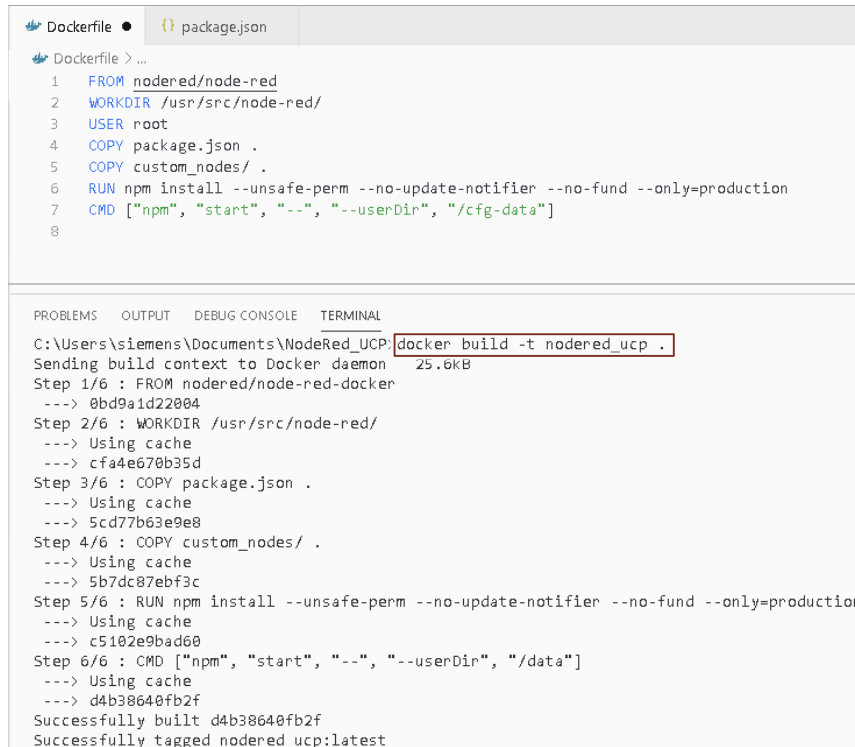
Note You can find an overview of the various Node-RED Docker images at the following link:

<https://github.com/node-red/node-red-docker>

2.2.2 Create Docker image

1. Download the file "Node-RED App" from this application example and extract it.
2. In the next step, use the command line (or in the Terminal of Visual Studio Code) to switch to the folder you extracted in step 1 (e.g. with the command "cd D:\").
3. Then execute the following command:

```
docker build -t nodered_ucp .
```



The screenshot shows a Visual Studio Code editor with a Dockerfile and its execution output in the terminal. The Dockerfile content is as follows:

```
Dockerfile > ...
1 FROM nodered/node-red
2 WORKDIR /usr/src/node-red/
3 USER root
4 COPY package.json .
5 COPY custom_nodes/ .
6 RUN npm install --unsafe-perm --no-update-notifier --no-fund --only=production
7 CMD ["npm", "start", "--", "--userDir", "/cfg-data"]
8
```

The terminal output shows the execution of the command `docker build -t nodered_ucp .` and the successful building and tagging of the Docker image `nodered_ucp:latest`.

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
C:\Users\siemens\Documents\NodeRed_UCP> docker build -t nodered_ucp .
Sending build context to Docker daemon 25.6kB
Step 1/6 : FROM nodered/node-red-docker
--> 0bd9a1d22004
Step 2/6 : WORKDIR /usr/src/node-red/
--> Using cache
--> cfa4e670b35d
Step 3/6 : COPY package.json .
--> Using cache
--> 5cd77b63e9e8
Step 4/6 : COPY custom_nodes/ .
--> Using cache
--> 5b7dc87ebf3c
Step 5/6 : RUN npm install --unsafe-perm --no-update-notifier --no-fund --only=production
--> Using cache
--> c5102e9bad60
Step 6/6 : CMD ["npm", "start", "--", "--userDir", "/data"]
--> Using cache
--> d4b38640fb2f
Successfully built d4b38640fb2f
Successfully tagged nodered_ucp:latest
```

The Docker image for the Node-RED Edge app is finished.

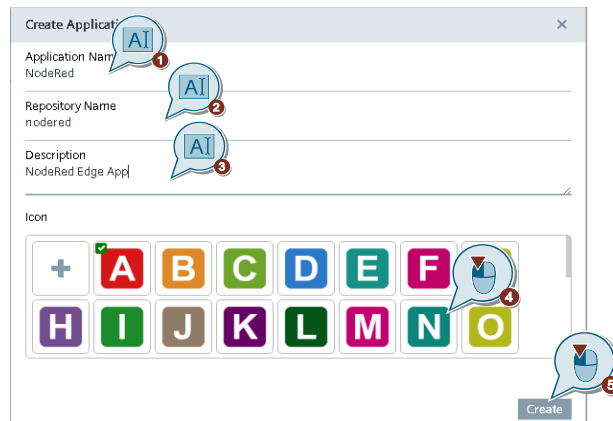
2.3 Generate: Generate Node-RED Edge app with Industrial Edge Publisher

This chapter will demonstrate how to generate an Edge app from the Docker images that you created.

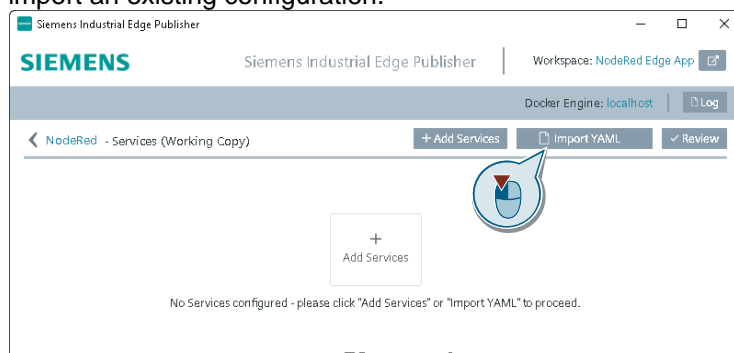
Note

For a detailed description of Industrial Edge Publisher and how to create an Edge app from a Docker image, please refer to chapter of this application example in the SendMail Edge app documentation, "2.3 Generate: Generating Edge app with Industrial Edge Publisher".

1. Start the Siemens Industrial Edge Publisher from the Windows Start Menu.
2. Then click "Create" to create a new Edge app.
3. Edit app properties
 - Enter the name ("Application Name") (1), "Repository Name" (2) and the description ("Description") (3) for the app.
 - Then select an "Icon" for the app (4).
 - Then click "Create" (5).

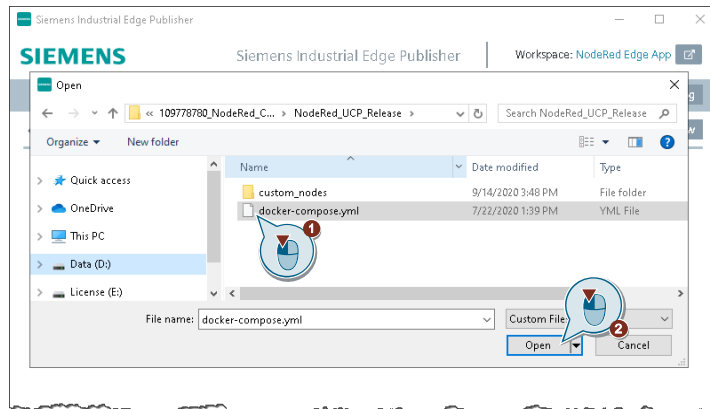


4. Open the app you created.
5. Click "+ Add New Version" to add a new version to the app (1). Then select a version and click "OK" (2).
6. You can now define the parameters via Add Service or use Import YAML to import an existing configuration.

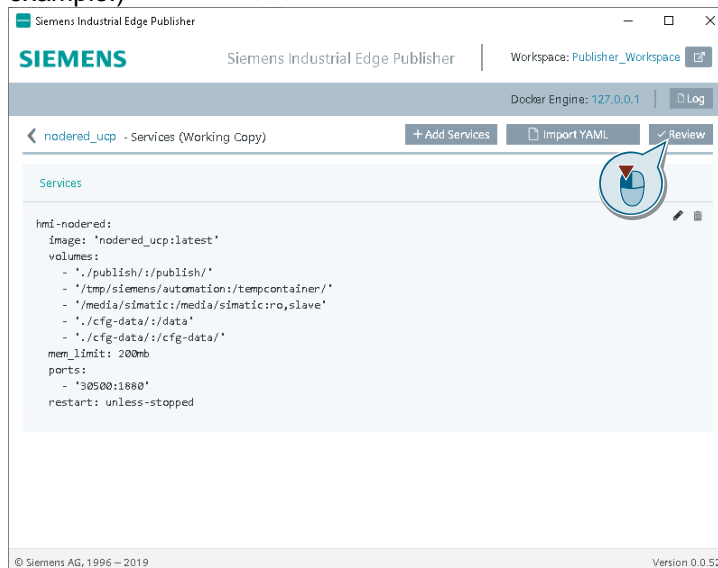


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7. Select the attached file "docker-compose.yml" from (1) and then click "Open" (2).

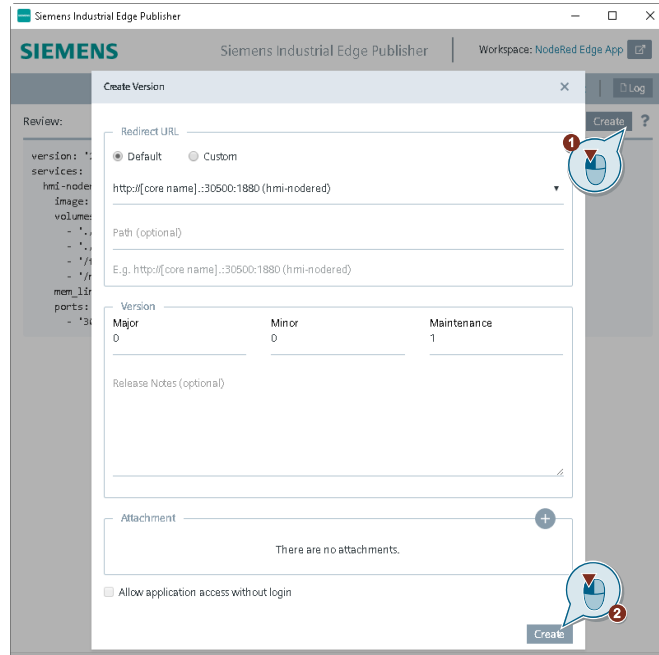


8. Confirm the configuration by clicking "Review". (If necessary, adjust the image name and path `image: 'nodered_ucp:latest'` if they differ from this example.)



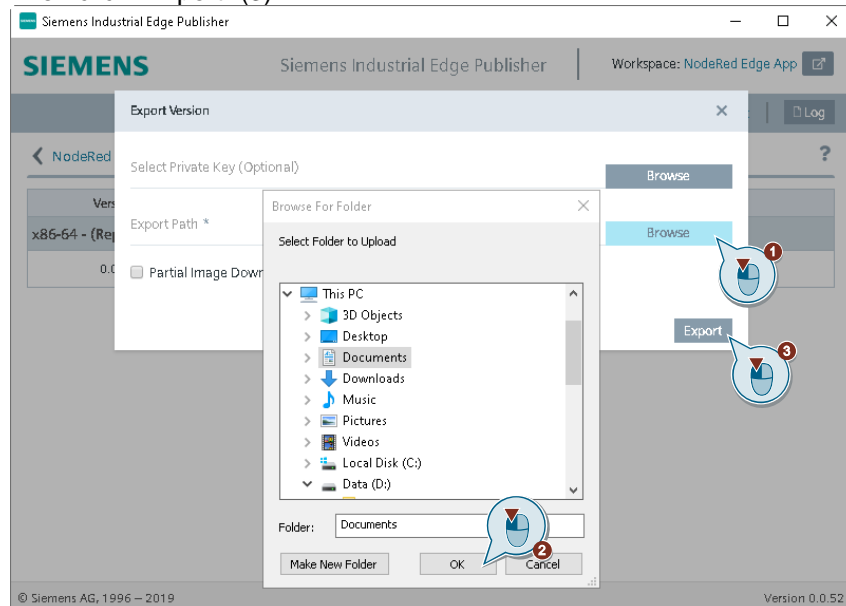
9. Create version
 - Click "Create" (1) The "Create Version" dialog opens.
 - In the next step, click on "Create" (3) again in the "Create Version" dialog window to create the version.

2 Engineering - Create and manage Node-RED Edge app



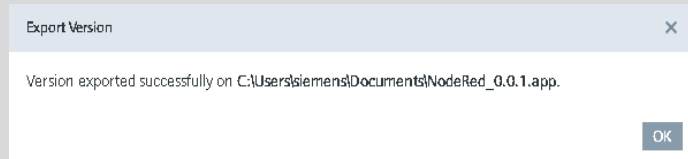
10. Export the app

- Click "Export Version" in Siemens Industrial Edge Publisher.
- Then click "Browse" (1).
- Select a folder where you want to export the app and confirm your selection with "OK" (2).
- Then click "Export" (3).



Note

The following message will appear when the app has exported successfully:



In the selected folder, you will be able to use the file "NodeRed_0.0.1.app" and transfer it to your SIMATIC HMI Unified Comfort Panel.

2.4 Manage: Manage Node-RED Edge app on the Unified Comfort Panel

This chapter describes how to install the exported Node-RED Edge app on your SIMATIC HMI Unified Comfort Panel.

Requirement

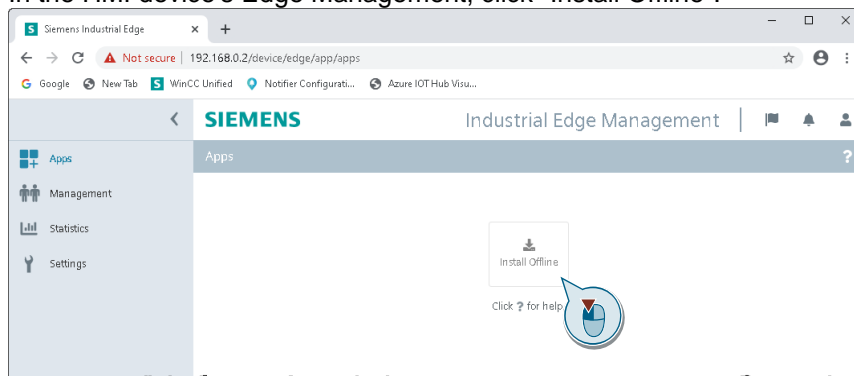
The following requirements must be met for you to install the SIMATIC Edge app on your operator device:

1. A TIA Portal project including all tags and one user with the role "HMI Administrator" has been transferred to the operator device.
2. SIMATIC Edge is activated on your operator device.
3. You are logged in to Edge Management (e.g. over the network).

Note

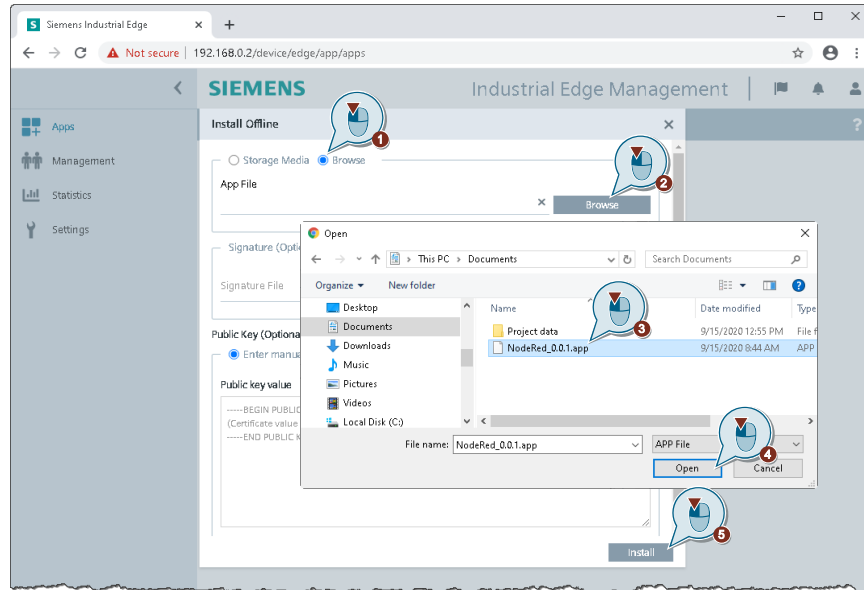
For a detailed description of how to complete the requirements, please refer to the SendMail Edge app documentation in chapter "2.4 Manage: Manage Edge app on the Unified Comfort Panel".

1. In the HMI device's Edge Management, click "Install Offline".



2. Select app
 - Select the "Browse" option (1) to browse your PC.
 - Then click "Browse" (2).
 - Select the exported Edge app (3) and click "Open" (4).
 - Then click "Install".

2 Engineering - Create and manage Node-RED Edge app



Once the "Node-RED" app has been successfully installed, the icon appears on the Edge Management start page.

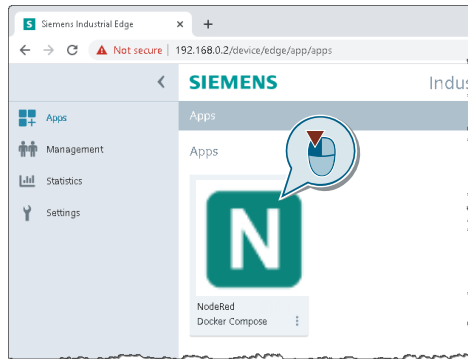
3 Operating the Node-RED Edge app

This chapter will show you how to open the Node-RED Edge app and then how to add custom nodes in the editor and interconnect them.

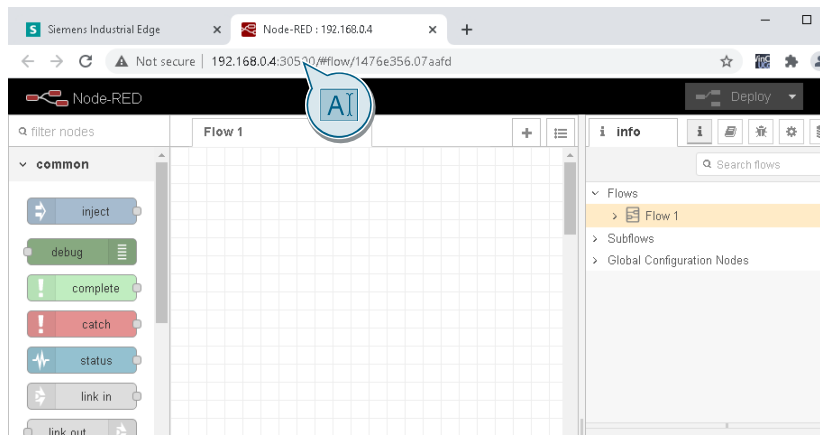
3.1 Open the Node-RED user interface

If you want to open the user interface for the Node-RED Edge app, you can do so in the following two ways:

- By clicking the Node-RED Edge app icon directly in Edge Management



- By launching the interface via the defined port. To do this, enter the following URL "https:<IP address>:30500" in your browser.



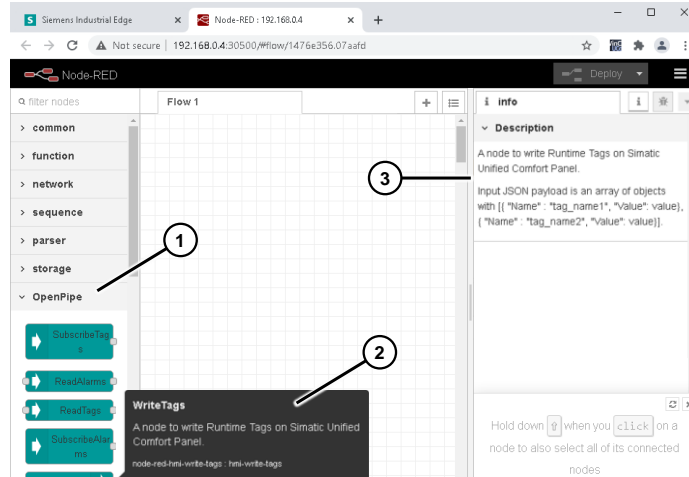
Note You can use both methods right on your SIMATIC HMI Unified Comfort Panel or with a PC that is connected to the network.

3.2 Using Node-RED custom nodes

Find custom nodes

The predefined custom nodes ("Subscribe Alarms", "Subscribe Tags" and "Write Tags") from chapter 2.1 can be found in the Nodes palette in the "OpenPipe" category (1).

Figure 3-1

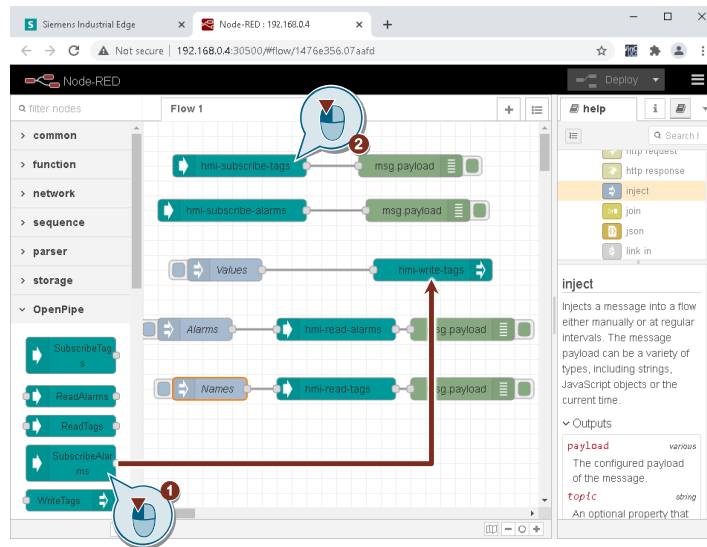


When you click on custom nodes or hover over them with the mouse, you will see a description of the individual nodes (2+3).

Adding custom nodes

Using the drag & drop function, you can create custom nodes in your flow (1), or connect them with other nodes (2).

Figure 3-2



After selecting the node, the right-hand pane under "Node Help" will display a help text that specifies the parameters that are being passed.

Note

Additional information on working with the editor can be found at the following link:

<https://nodered.org/docs/user-guide/editor/>

Copy template for OpenPipe nodes

Insert the following code as a flow through the import.

```
[{"id":"1476e356.07aafd","type":"tab","label":"Flow
1","disabled":false,"info":""},{id:"b2f6658.ff97d98","type":"hmi
-subscribe-tags","z":"1476e356.07aafd","name":"","tags":"HMI_Tag_1
HMI_Tag_2","x":130,"y":60,"wires":[["cc911bb4.79c3c8"]]}, {"id":"cc
911bb4.79c3c8","type":"debug","z":"1476e356.07aafd","name":"","act
ive":true,"tostidebar":true,"console":false,"tostatus":false,"compl
ete":"false","statusVal":"","statusType":"auto","x":360,"y":60,"wi
res":[]}, {"id":"d069b1a9.a258b","type":"hmi-subscribe-
alarms","z":"1476e356.07aafd","name":"","filter":"","languageid":"","
","systemname":"","x":120,"y":120,"wires":[["befb7a75.59c7c8"]]}, {"
id":"befb7a75.59c7c8","type":"debug","z":"1476e356.07aafd","name"
":"","active":true,"tostidebar":true,"console":false,"tostatus":fals
e,"complete":"false","statusVal":"","statusType":"auto","x":370,"y
":120,"wires":[]}, {"id":"81bf684a.5e7f88","type":"hmi-write-
tags","z":"1476e356.07aafd","name":"","x":390,"y":200,"wires":[]},
 {"id":"4c66f4d1.3d97ac","type":"hmi-read-
alarms","z":"1476e356.07aafd","name":"","x":260,"y":280,"wires":[[
"f0670d5f.b1912"]]}, {"id":"51d454c0.3f1f3c","type":"hmi-read-
tags","z":"1476e356.07aafd","name":"","x":260,"y":360,"wires":[["8
932d0ee.e31e8"]]}, {"id":"f0670d5f.b1912","type":"debug","z":"1476e
356.07aafd","name":"","active":true,"tostidebar":true,"console":fal
se,"tostatus":false,"complete":"false","statusVal":"","statusType"
:"auto","x":430,"y":280,"wires":[]}, {"id":"8932d0ee.e31e8","type":
"debug","z":"1476e356.07aafd","name":"","active":true,"tostidebar":
true,"console":false,"tostatus":false,"complete":"false","statusVa
l":"","statusType":"auto","x":430,"y":360,"wires":[]}, {"id":"de848
193.03f25","type":"inject","z":"1476e356.07aafd","name":"Alarms","
props":[{"p":"SystemName","v":"RUNTIME_1","vt":"str"}, {"p":"Filter
","v":"","vt":"str"}, {"p":"LanguageId","v":"1033","vt":"str"}],"re
peat":"","crontab":"","once":false,"onceDelay":0.1,"topic":"","x":
70,"y":280,"wires":[["4c66f4d1.3d97ac"]]}, {"id":"c0293901.15c958",
"type":"inject","z":"1476e356.07aafd","name":"Names","props":[{"p"
:"TagNames","v":"HMI_Tag_1
HMI_Tag_2","vt":"str"}],"repeat":"","crontab":"","once":false,"onc
eDelay":0.1,"topic":"","x":90,"y":360,"wires":[["51d454c0.3f1f3c"]
]}, {"id":"1a2db040.06eb1","type":"inject","z":"1476e356.07aafd","n
ame":"Values","props":[{"p":"TagNames","v":"HMI_Tag_1 HMI_Tag_2
HMI_Tag_3","vt":"str"}, {"p":"TagValues","v":"101 \\\"NodeRed\\
1","vt":"str"}],"repeat":"","crontab":"","once":false,"onceDelay":
0.1,"topic":"","x":110,"y":200,"wires":[["81bf684a.5e7f88"]]}]
```

4 Appendix

4.1 Service and support

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Industry Online Support app

You will receive optimum support wherever you are with the "Siemens Industry Online Support" app. The app is available for iOS and Android:

support.industry.siemens.com/cs/ww/en/sc/2067

4.2 Links and literature

Table 4-1

No.	Subject
\1\	Siemens Industry Online Support https://support.industry.siemens.com
\2\	Link to the article page of the application example https://support.industry.siemens.com/cs/ww/en/view/109778780
\3\	Download – Siemens Industry Edge Publisher https://support.industry.siemens.com/cs/ww/en/view/109778875
\4\	Programming manual - Industrial Edge Publisher https://support.industry.siemens.com/cs/ww/en/view/109778824
\5\	Operating manual - SIMATIC HMI WinCC Unified Open Pipe https://support.industry.siemens.com/cs/ww/en/view/109778823
\6\	Manual "Unified Comfort Panels for Industrial Edge" https://support.industry.siemens.com/cs/ww/en/view/109773259
\7\	Description for creating your own nodes https://nodered.org/docs/creating-nodes/
\8\	Node-RED under Docker https://nodered.org/docs/getting-started/docker

4.3 Change documentation

Table 4-2

Version	Date	Change
V1.0	10/2020	First edition
V1.1	05/2021	In the code changes storage location of the flows; Change in Copose File: Restart and Volume Mounting; new OpenPipe nodes: "hmi-runtime-read-tags" and "hmi-runtimge-read-alarms"
V1.2	12/2021	Chapter 2.3, Step 8; Note added: change image name if different from this example.