How to connect USB Camera to Raspberry PLC

Industrial Raspberry PLC Usage

LINK

Explanation

TAKING PICTURES

1. Connect the Raspberry PLC to a WIFi network.

2. Open up a terminal window and issue the following command to install the fswebcam package:

```
sudo apt update
sudo apt install fswebcam
```

3. Add your user to the video group:

```
sudo usermod -a -F video <username>
```

4. Enter the command fswebcam followed by a filename. A picture will be taken using the webcam, and saved to the filename specified:

```
fswebcam image.jpg
```

5. Specify the resolution using the -r flag:

```
fswebcam -f 1280x720 image.jpg
```

For more information, go to:
https://www.raspberrypi.org/documentation/usage/webcams/

How to connect USB Camera to Raspberry PLC

Industrial Raspberry PLC Usage

LINK

Explanation

RECORDING VIDEOS

1. Install the ffmpeg packages:

```
sudo apt update
sudo apt install ffmpeg
```

2. Exec the next command to record a video from an input file, an save it to an output file:

```
ffmpeg -i <input file> <output file>
```

Check out the ffmpeg documentation for more details:
https://www.ffmpeg.org/ffmpeg.html

Related links

- How to connect Raspberry PLC to Wi-Fi
- Basics about Raspberry Pi PLC analog outputs
- How to find your perfect industrial PLC
- How to program Raspberry PLC interrupt inputs with Python
- Raspberry PLC family products
- TouchBerry Pi family products

Most Useful Raspberry Pi Commands

Raspberry Usage

Raspberry Pi

LINK

Introduction

Raspberry Pi commands allow us to work on a wide range of applications. From building a prototype to developing an existing software, Raspberry Pi can provide the support.
In this blog, you will learn 5 really useful command-line tools to use your Raspberry Pi or Raspberry PLC in a safe environment.

Explanation

Vcgencmd measure_temp

Vcgencmd is a command-line utility that can get various pieces of information from the VideoCore GPU on the Raspberry Pi.

```
pi@raspberrypi:~ $ vcgencmd measure_temp
temp=49.6'C
```

It is important to know the raspberry temperature, because excessive heat can lead you to unwanted situations. In fact, those who overclocked the processor of the Raspberry must check the temperature frequently, because all the Raspberry pi models perform a degree of thermal management to avoid overheating under heavy load. The SoCs have an internal temperature sensor, which software on the GPU polls to ensure that temperatures do not exceed a predefined limit.

When the core temperature is between 80ºC and 85ºC, a warning icon showing a red half-filled thermometer will be displayed, and the ARM cores will be progressively throttled back.

So, use **measure_temp** option, to get the temperature of the SoC (System on Chip) as measured by the on-board temperature sensor, to help you with the temperature control of your device.

Check out the next URL to know more about vcgencmd:
https://www.raspberrypi.org/documentation/raspbian/applications/vcgencmd.md

Most Useful Raspberry Pi Commands

Raspberry Usage

LINK

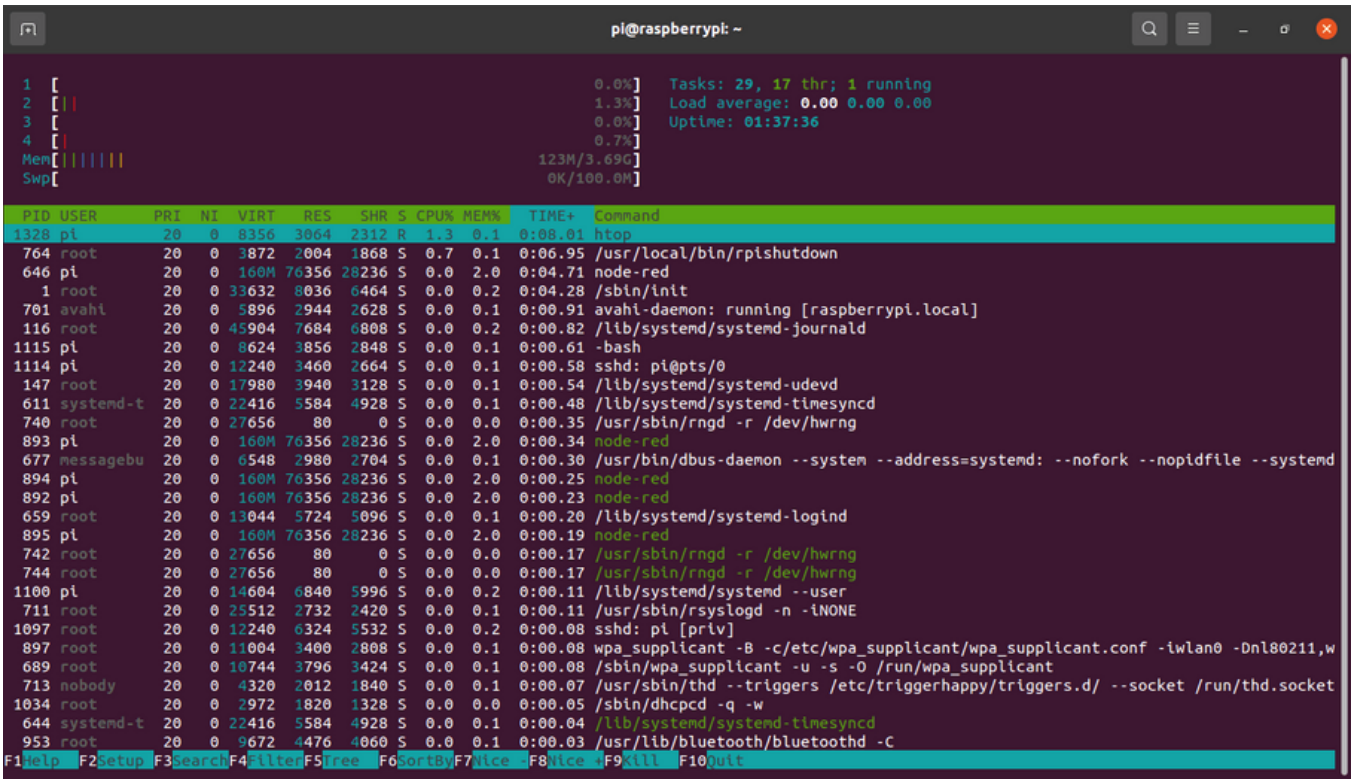
Explanation

Htop

Htop is a really powerful command-line utility that allows you to interactively monitor your system's vital resources or server processes in real-time.
It is quite similar to the *top* command. However, since *htop* is a newer program compared to *top*, it offers many improvements.
Htop also supports mouse operations, uses colors in its outputs and gives visual indications about processor, memory and swap usage.
It also prints full command lines for processes and allows one to scroll both vertically and horizontally for processes and command-lines respectively.
You can install it by doing:

```
sudo apt update
sudo apt install htop
```

So, if you run **htop** in the command line, you will get something like this:



Most Useful Raspberry Pi Commands

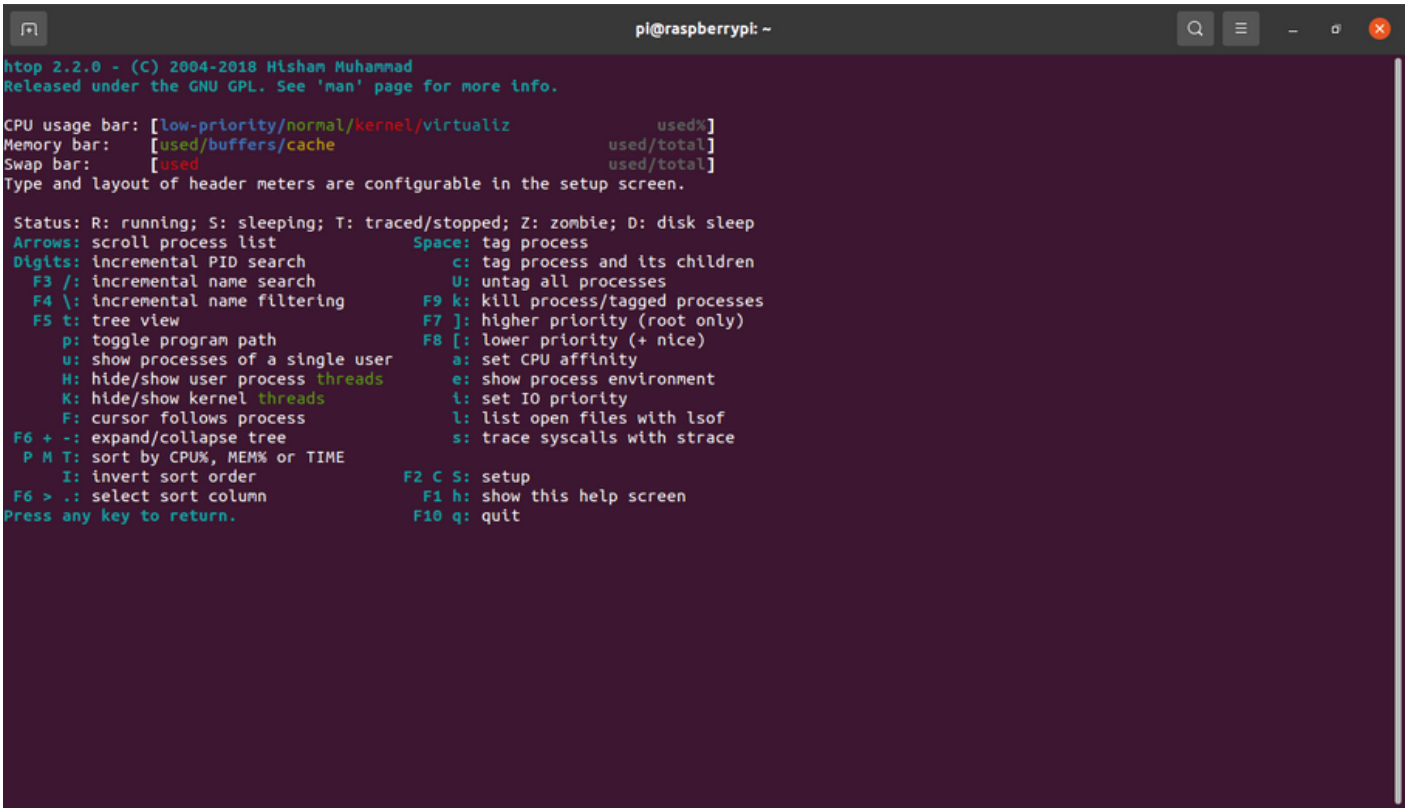
Raspberry Usage

LINK

Explanation

Htop

Finally, if you click on **F1**, you will get some help about the possibilities and you will see how it works.



Dmesg

The Linux kernel is the core of the operating system that controls access to the system resources, such as CPU, I/O devices, physical memory, and file systems. The kernel writes several messages to the kernel ring buffer during the boot process and when the system is running.

The kernel ring buffer is a portion of the physical memory that holds the kernel's log messages. It has a fixed size, which means that once the buffer is full, the older logs records are overwritten.

Most Useful Raspberry Pi Commands

Raspberry Usage

LINK

Explanation

Dmesg

Dmsg is used to examine or control the kernel ring buffer. It is really useful for examining kernel boot messages and debugging hardware-related issues. The default action is to display all messages from the kernel ring buffer.

So, just execute it like:

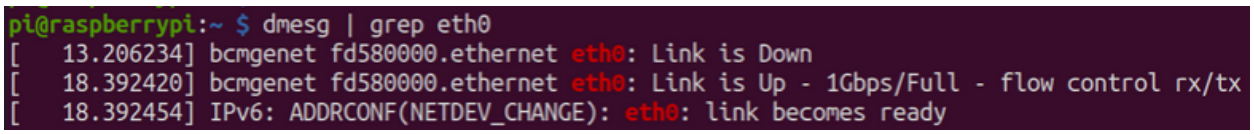
```
dmesg
```

Usage

```
dmesg [options]
```

If you see that the dmesg command shows too many messages that you are not able to read, then find the words you really want to find using | grep:

```
dmesg | grep eth0
```



To know more about this command and its options, just type:

```
dmesg -h
or
man dmesg
```

Most Useful Raspberry Pi Commands

Raspberry Usage

LINK

Explanation

Comma and braces operators

We can do a lot with comma and braces operations, to make our life easier, let's see few usages:

- **Rename and backup operations with comma & braces operators**
- **Pattern matching with comma & braces operator**
- **Rename and backup (prefixing name) operations on long file names**
- **To copy files from a parent directory without typing two times the long path**

1. To backup hello.txt to hello.txt.bak:

```
cp hello.txt{,.bak,}
```

2. To revert the file from hello.txt.bak to hello.txt:

```
mv hello.txt{.bak,}
```

3. To rename the file with prefix "1-":

```
cp hello.txt 1-!#^
```

4. To copy files from a parent directory without typing two times the long path:

```
cp firstDir/secondDir/thirdDir/{hello.txt,bye.txt}
```

```
pi@raspberrypi:/tmp $ pwd
/tmp
pi@raspberrypi:/tmp $ ls firstDir/secondDir/thirdDir/
pi@raspberrypi:/tmp $ touch firstDir/secondDir/thirdDir/hello.txt
pi@raspberrypi:/tmp $ ls firstDir/secondDir/thirdDir/
hello.txt
pi@raspberrypi:/tmp $ cp firstDir/secondDir/thirdDir/{hello.txt,bye.txt}
pi@raspberrypi:/tmp $ ls firstDir/secondDir/thirdDir/
bye.txt  hello.txt
pi@raspberrypi:/tmp $
```

Most Useful Raspberry Pi Commands

Raspberry Usage

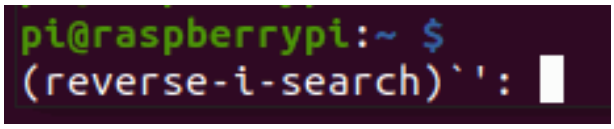
LINK

Explanation

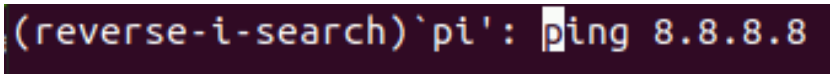
Ctrl + R

Can you imagine that you could autocomplete your commands with the ones that you typed before? Something like Google Autocomplete. Would be really useful, right? That is possible opening up terminal windows and just trying the following:

1.Ctrl + R



2. Start typing your command and some suggestion will appear:

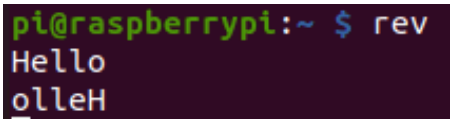


3. If you want to type the suggested command, then click on the Tab, or the right arrow of your keyboard, and that suggested command will be set on your commandline ready to use. In case you want to see more suggested commands, then try Ctrl + R again until you see the command you want to execute.

Finally, some tricky commands

1.Type "rev" to reverse the message to type:

```
rev
```



Most Useful Raspberry Pi Commands

Raspberry Usage

LINK

Explanation

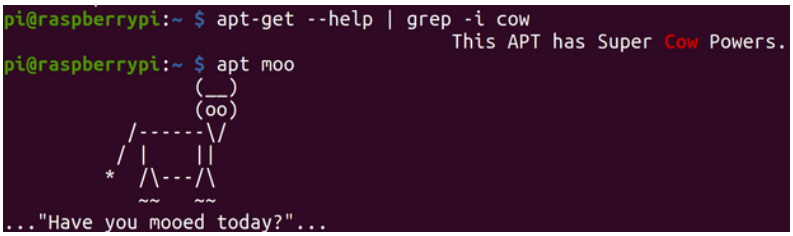
Finally, some tricky commands

2. Type "factor <number>" to factor any number:

3. Finally, just type the following, and see what happens:

```
apt moo

apt-get --help | grep -i cow
```



Related links

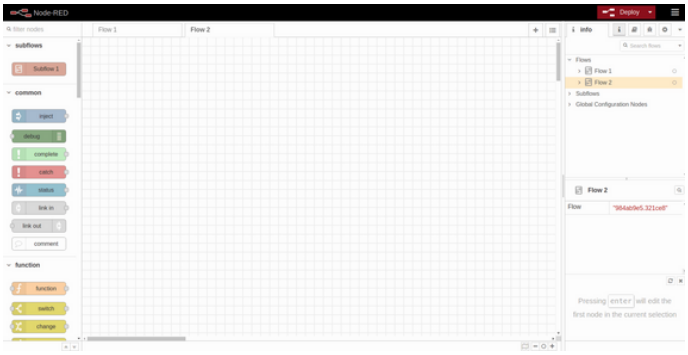
- How to connect Raspberry PLC to Wi-Fi
- Basics about Raspberry Pi PLC analog outputs
- How to find your perfect industrial PLC
- How to program Raspberry PLC interrupt inputs with Python
- Raspberry PLC family products
- TouchBerry Pi family products

Node-RED & Raspberry tutorial: How to capture data from the sensor

Industrial Raspberry PLC and Node-RED applications: capturing values from the weight sensor

Introduction

LINK



To know more about Node-RED click on the image

Node-RED

Node-RED is a programming tool for wiring together hardware devices. APIs and online services in new and interesting ways.

It provides a browser-based editor that makes it easy to wire together flows using the wide range of nodes in the palette that can be deployed to its runtime in a single click.

In this blog, you will learn how to develop the Node-RED application that was shown in this link.

Raspberry Pi

Explanation

NODE-RED BASICS

As we said in the introduction, Node-RED provides a browser-based editor that makes it easy to wire together flows using the wide range of nodes in the palette that can be deployed to its runtime in a single click.

So, let's go to discover the basics:

1. Node-RED has a wide range of nodes that offers you a lot of possibilities. If you go to the nodes menu on the left, you will find the nodes that come by default. They are easy to use; you just have to drag and drop them in your flow so that you can start using them.

2. Moreover, if you already know what node you want, there is a search bar to filter nodes and find exactly the one you want.

3. If you double-click on the Flow 1 tab, a configuration window will be displayed, where you can change its name, or disable it, for example. In the same bar, there is a + tab that adds another Flow tab, so that you can use as many as you want.

4. Once you have your nodes connected and you want to Deploy your changes, click on the Deploy button.

Node-RED & Raspberry tutorial: How to capture data from the sensor

Industrial Raspberry PLC and Node-RED applications: capturing values from the weight sensor

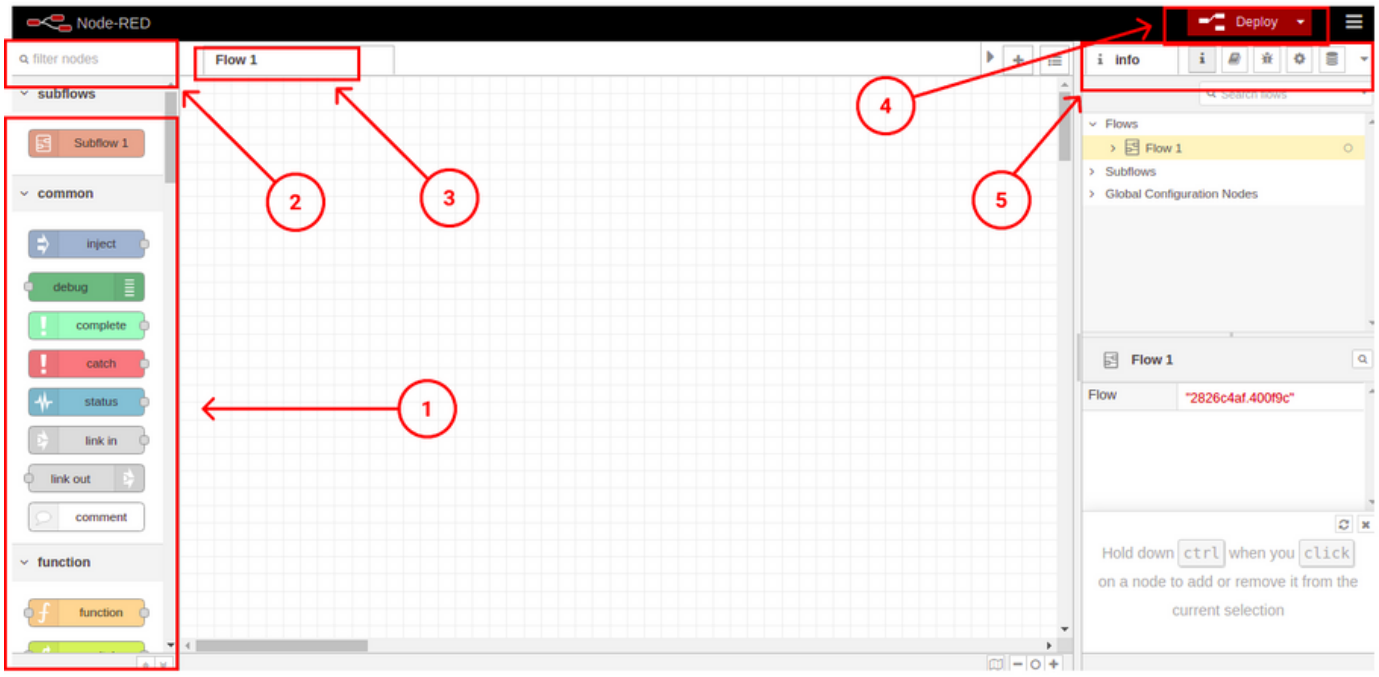
Explanation

LINK

NODE-RED BASICS

5. Finally, in the right bar where the info tab is displayed, there are more important tabs such as:

- **Information:** to get general information on the flows.
- **Help tab:** which gives you information about the node you clicked on.
- **Debug messages:** this is a really useful tab to know the errors you got, or to display the debug node messages.
- **Configuration nodes:** It shows the configuration nodes from the flows.
- **Dashboard:** This tab allows you to set the dashboard layout, site configuration and theme.



Node-RED & Raspberry tutorial: How to capture data from the sensor

Industrial Raspberry PLC and Node-RED applications: capturing values from the weight sensor

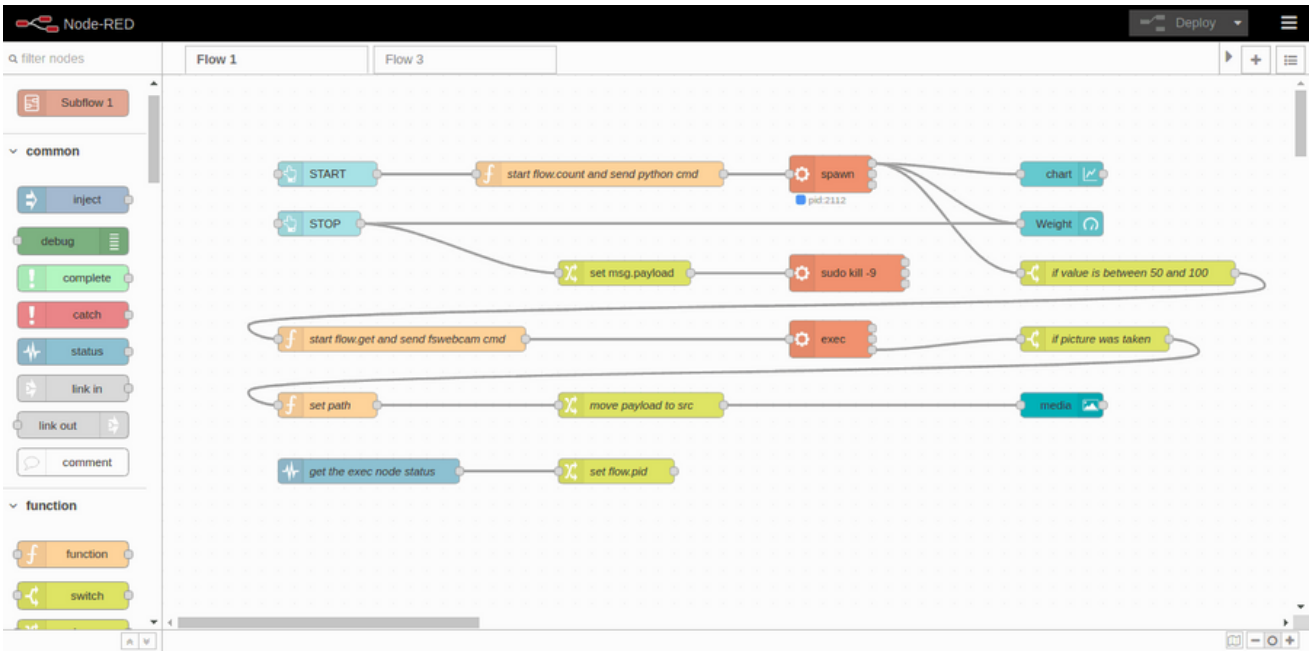
Explanation

LINK

OUR NODES

So, now you know the basics, let's introduce the nodes we are going to use:

- **Ui_button node:** Adds a button to the user interface. Clicking the button generates a message with msg.payload set to the Payload field. If no payload is specified, the node id is used.
- **Function node:** A JavaScript function to run against the messages being received by the node. The messages are passed in as a JavaScript object called msg. By convention, it will have a msg.payload property containing the body of the message.
- **Exec node:** Runs a system command and returns its output. The node can be configured to either wait until the command completes, or to send its output as the command generates it. The command that is run can be configured in the node or provided by the received message.
- **Change node:** Set, change, delete or move properties of a message, flow context or global context. The node can specify multiple rules that will be applied in the order they are defined.
- **Switch node:** Route messages based on their property values or sequence position.
- **Ui_chart node:** Plots the input values on a chart. This can either be a time-based line chart, a bar chart (vertical or horizontal), or a pie chart.
- **Ui_gauge node:** Adds a gauge type widget to the user interface. The msg.payload is searched for a numeric value and is formatted in accordance with the defined Value Format.
- **Ui_media node:** Displays media files and URLs on the Dashboard.
- **Status node:** Report status messages from other nodes on the same tab.



Node-RED & Raspberry tutorial: How to capture data from the sensor

Industrial Raspberry PLC and Node-RED applications: capturing values from the weight sensor

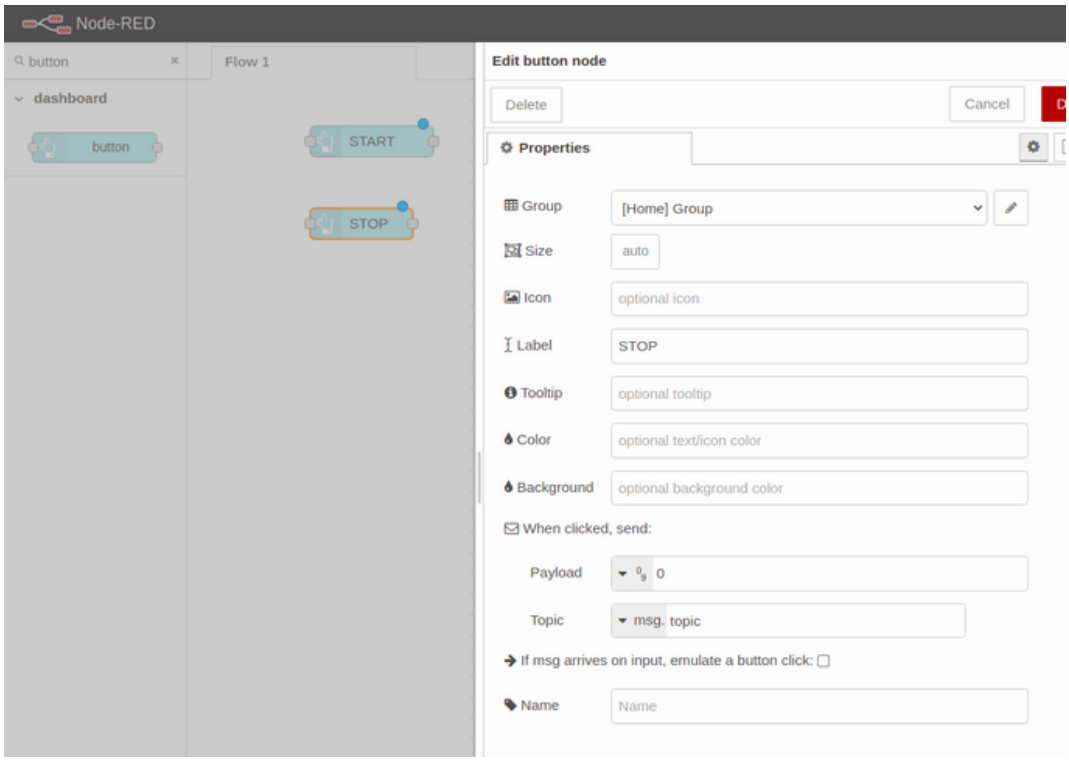
Explanation

LINK

GETTING THE WEIGHT VALUE

What we are going to do is to start getting the values from a weight sensor, and when the application finds the value we set, the USB camera will take a picture.
So, let's start developing our application!

1. First of all, you are going to add two dashboard buttons: the first one to start the application, and the other one to stop it.
So, go to the filter nodes search bar and type: button. Add two buttons to the flow, and double-click to edit them.
In the first one, you must create a UI Group and a UI Tab to display our dashboard. Once done, it will work for all the Dashboard nodes, so it is only necessary once. After that, you will type a label to be displayed, in our case: START.
Likewise, the stop button will have the same configuration; you will select the group and tab where you want to display it, you will type: STOP as a label and we will add a 0 to the payload, so that the value for the gauge sets to 0 when the application stops, instead of stopping in the last value.



Node-RED & Raspberry tutorial: How to capture data from the sensor

Industrial Raspberry PLC and Node-RED applications: capturing values from the weight sensor

Explanation

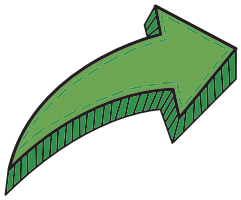
LINK

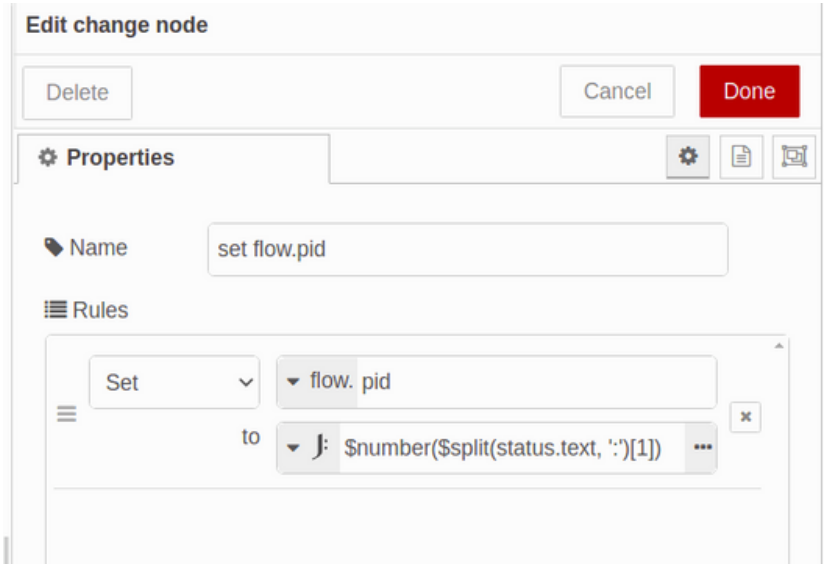
GETTING THE WEIGHT VALUE

2. You are going to add a function node next to the start button and wire it.
In the start node, you are going to initialize a flow variable named count to 0, which you are going to use later on when you name the pictures, and you are going to send the message with the command to execute for the app to start.

```
var count = flow.get('count')||0;
flow.set('count', count);
var newMsg = {payload: "python -u /home/pi/hx711py/example.py"};
return newMsg;
```

You can give a name to the function node as you would like to see it in your flow. In this case: start flow.count and send python cmd. Finally, wire an Exec node and edit it. Select the output: "while the command is running - spawn mode", and click on the checkbox to append the msg.payload.





3. When there is an exec node running as spawn mode, that generates a PID of the running process, that you will have to get to be able to kill it. So that is what you are going to do right now.
Add a status node, go to "Report status from" and select "Selected nodes". Choose the exec node, and click on Done. After that, wire a Change node, and edit it to set the flow.pid as shown below:

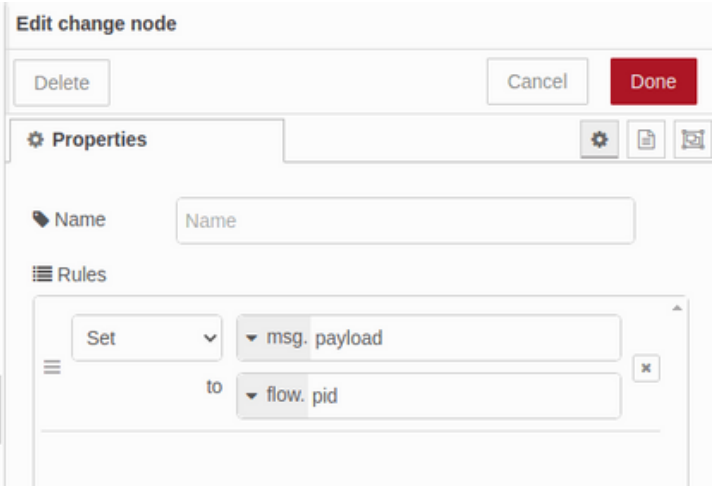
Node-RED & Raspberry tutorial: How to capture data from the sensor

Industrial Raspberry PLC and Node-RED applications: capturing values from the weight sensor

Explanation

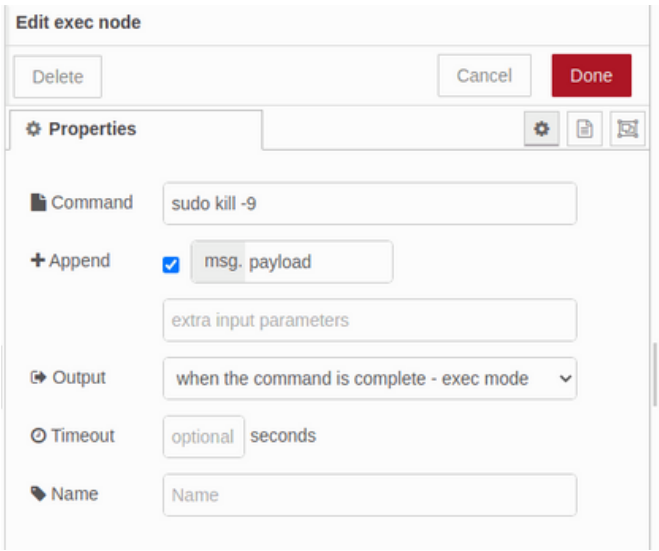
LINK

GETTING THE WEIGHT VALUE



So, now the pid is the msg.payload. Add an exec node as an exec mode to kill the pid, and edit it:

Finally, add another change node next to the stop button and connect them. As we set the flow.pid in the previous change node, now we are going to set the msg.payload to flow.pid. By doing this, when you click on the Stop button, the msg.payload will be sent through the node.



Node-RED & Raspberry tutorial: How to capture data from the sensor

Industrial Raspberry PLC and Node-RED applications: capturing values from the weight sensor

Explanation

LINK

GETTING THE WEIGHT VALUE

At the moment your flow will look like:

```
[{"id":"2826c4af.400f9c","type":"tab","label":"Flow
1","disabled":false,"info":""},
{"id":"bce0df4f.bc788","type":"ui_button","z":"2826c4af.400f9c","name":"","gro
up":"c4c1bcc1.49c24","order":16,"width":"7","height":"2","passthru":false,"lab
el":"START
","tooltip":"","color":"","bgcolor":"","icon":"","payload":"","payloadType":"s
tr","topic":"topic","topicType":"msg","x":140,"y":140,"wires":
[["882b392c.ab71b8"]]},
{"id":"222e70bc.56f6","type":"ui_button","z":"2826c4af.400f9c","name":"","grou
p":"c4c1bcc1.49c24","order":15,"width":0,"height":0,"passthru":false,"label":"
STOP","tooltip":"","color":"","bgcolor":"","icon":"","payload":"0","payloadTyp
e":"num","topic":"topic","topicType":"msg","x":130,"y":220,"wires":
[["63e42d5b.dee384"]]},
{"id":"882b392c.ab71b8","type":"function","z":"2826c4af.400f9c","name":"start
flow.count and send python cmd","func":"var count =
flow.get('count')||0;\nflow.set('count', count);\n\nvar newMsg = {payload:
\"python -u /home/pi/hx711py/example.py\"};\nreturn
newMsg;","outputs":1,"noerr":0,"initialize":"","finalize":"","libs":
[],"x":410,"y":140,"wires":[["9628a2eb.2a5d3"]]},
{"id":"2abcf1ce.f1931e","type":"status","z":"2826c4af.400f9c","name":"","scope
":["9628a2eb.2a5d3"],"x":140,"y":60,"wires":[["b7fab428.f4fb78"]]},
{"id":"9628a2eb.2a5d3","type":"exec","z":"2826c4af.400f9c","command":"","addpa
y":"payload","append":"","useSpawn":"true","timer":"","oldrc":false,"name":"",
"x":690,"y":140,"wires":[[],[],[]]},
{"id":"b7fab428.f4fb78","type":"change","z":"2826c4af.400f9c","name":"","rules
":[{"t":"set","p":"pid","pt":"flow","to":"$number($split(status.text, ':')
[1])","tot":"jsonata"}],"action":"","property":"","from":"","to":"","reg":fals
e,"x":410,"y":60,"wires":[[]]},
{"id":"63e42d5b.dee384","type":"change","z":"2826c4af.400f9c","name":"","rules
":
[{"t":"set","p":"payload","pt":"msg","to":"pid","tot":"flow"}],"action":"","pr
operty":"","from":"","to":"","reg":false,"x":420,"y":220,"wires":
[["46ba8b75.815004"]]},
{"id":"46ba8b75.815004","type":"exec","z":"2826c4af.400f9c","command":"sudo
kill
-9","addpay":"payload","append":"","useSpawn":"false","timer":"","oldrc":false
,"name":"","x":690,"y":220,"wires":[[],[],[]]},
{"id":"c4c1bcc1.49c24","type":"ui_group","name":"Group","tab":"cbda5f28.c75ad"
,"order":1,"disp":true,"width":"20","collapse":false},
{"id":"cbda5f28.c75ad","type":"ui_tab","name":"Home","icon":"dashboard","disab
led":false,"hidden":false}]
```

Node-RED & Raspberry tutorial: How to capture data from the sensor

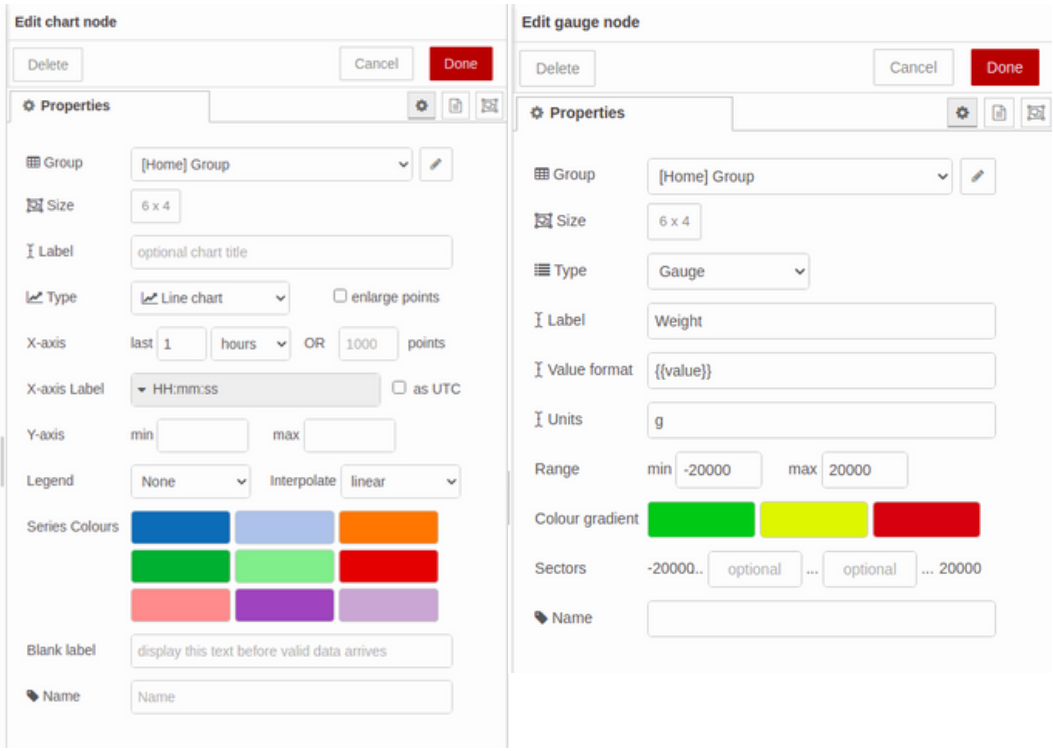
Industrial Raspberry PLC and Node-RED applications: capturing values from the weight sensor

Explanation

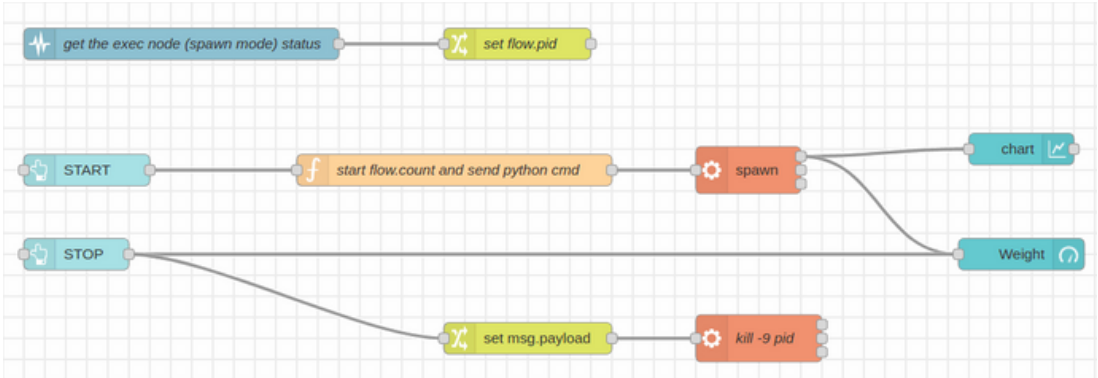
LINK

GETTING THE WEIGHT VALUE

4. Now, you are going to see the values from the last 1 hour in a line chart, and also in real-time in a gauge. Then, drag and drop a chart node and a gauge node, and let's edit them.
In the chart node, set de X-axis to the last 1 hour, or the time you would like to register, add the Tab and Group you would like to display in and click on Done.
Edit the gauge node by choosing the same Tab and Group and setting a label to display as its title, also type the units. Finally, set the minimum and the maximum value to set the range:



Finally, connect them as shown below:



Node-RED & Raspberry tutorial: How to capture data from the sensor

Industrial Raspberry PLC and Node-RED applications: capturing values from the weight sensor

Explanation

LINK

WEIGHT! PICTURE THIS!

Once you got the values of our Raspberry scale and you displayed them to your Dashboard, it is time to take some photos.
For the following steps it is necessary to install the node-red-contrib-ui-media, so if you did not do it yet, please go to the last post to know how: **https://www.industrialshields.com/blog/arduino-industrial-1/post/how-to-take-a-picture-when-a-load-cell-value-is-detected-289.**

5. Now, you are going to add a switch node and set if a property is between 50 and 100 to take a picture. The values are up to you, just choose the value rules, choose the number field, and add the number you want to feature. Connect this node to the spawn node.

6. Connected to the output of the last change node, add a function node to send the fswebcam command and set the flow.count to name the pictures with a counter as follows:

```
var count = flow.get('count');
count++;

msg.payload = "fswebcam -r 1280x720 --no-banner /home/pi/images/image" + count +
".jpg";

flow.set('count', count);
return msg;
```

You should add three parameters to the fswebcam command:

1. **- r** to set the photo resolution.
2. **--no-**banner to skip the camera banner
3. The **path** to say where to save the images, and how are they be going to be named.

7. The function node will send a msg.payload, so you are going to add an exec node appending the msg.payload to execute the command in your industrial Raspberry Pi PLC controller.

Node-RED & Raspberry tutorial: How to capture data from the sensor

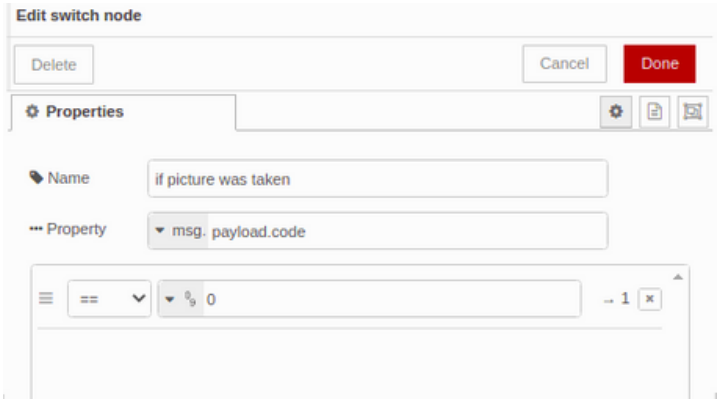
Industrial Raspberry PLC and Node-RED applications: capturing values from the weight sensor

Explanation

LINK

WEIGHT! PICTURE THIS!

8. The exec mode has three outputs. The first one returns the stdout, the second one returns the stderr and the last one, returns the return code. So in this case, connect the third output, the return code, to a switch node to continue with the flow if there was no error.
So, in the switch node, set the property to msg.payload.code and set the value rule to equal number 0, to be sure that the fwwebcam command was executed with no errors.



9. After that, connect a function node to send the name of the picture it was just taken so that it can be displayed in the Node-RED Dashboard. Once edited as shown below, connect a change node to move the msg.payload to msg.src:

```
let count = flow.get('count');
msg.payload = "/image" + count + ".jpg";
return msg;
```

10. Finally, add the media node and just add a Group to it, or configure the layout as you want.

Node-RED & Raspberry tutorial: How to capture data from the sensor

Industrial Raspberry PLC and Node-RED applications: capturing values from the weight sensor

Explanation

LINK

WEIGHT! PICTURE THIS!

Now, your Node-RED aplication should look something like this:

```
[{"id":"2826c4af.400f9c","type":"tab","label":"Flow
1","disabled":false,"info":""},
{"id":"9b234a13.0256e8","type":"exec","z":"2826c4af.400f9c","command":"","addpay"
:"payload","append":"","useSpawn":"false","timer":"","oldrc":false,"name":"","x":
510,"y":260,"wires":[[],[],["3f27e8b4.d02378"]]},
{"id":"ec5481a.4fbf28","type":"exec","z":"2826c4af.400f9c","command":"","addpay":
"payload","append":"","useSpawn":"true","timer":"","oldrc":false,"name":"","x":87
0,"y":60,"wires":[["36307784.3144e8","372e8f7b.f9752","d4e34cd5.f423e"],[],[]]},
{"id":"36307784.3144e8","type":"switch","z":"2826c4af.400f9c","name":"if value is
between    50    and    100",    "property":"payload","propertyType":"msg","rules":
[{"t":"btwn","v":"50","vt":"num","v2":"100","v2t":"num"}],"checkall":"true","repa
ir":false,"outputs":1,"x":990,"y":160,"wires":[["fb666c7f.c2ff9"]]},
{"id":"3f27e8b4.d02378","type":"switch","z":"2826c4af.400f9c","name":"if  picture
was                taken","property":"payload.code","propertyType":"msg","rules":
[{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":1,"x":
1030,"y":260,"wires":[["7646b60e.83a318"]]},
{"id":"7646b60e.83a318","type":"function","z":"2826c4af.400f9c","name":"set
path","func":"let count = flow.get('count');\nmsg.payload = \"/image\" + count +
\".jpg\";\nreturn
msg;","outputs":1,"noerr":0,"initialize":"","finalize":"","libs":
[],"x":140,"y":360,"wires":[["a4078c82.e803a"]]},
{"id":"a4078c82.e803a","type":"change","z":"2826c4af.400f9c","name":"move  payload
to                                                                  src","rules":
[{"t":"move","p":"payload","pt":"msg","to":"src","tot":"msg"}],"action":"","prope
rty":"","from":"","to":"","reg":false,"x":560,"y":360,"wires":
[["3385b59c.06c81a"]]},
{"id":"8771f8be.e44f68","type":"ui_button","z":"2826c4af.400f9c","name":"","group
":"c4c1bcc1.49c24","order":5,"width":7,"height":2,"passthru":false,"label":"STOP
LOAD
CELL","tooltip":"","color":"","bgcolor":"","icon":"","payload":"0","payloadType":
"num","topic":"","topicType":"str","x":170,"y":160,"wires":
[["e053ecae.bca31","d4e34cd5.f423e"]]},
{"id":"d4e34cd5.f423e","type":"ui_gauge","z":"2826c4af.400f9c","name":"","group":
"c4c1bcc1.49c24","order":13,"width":6,"height":4,"gtype":"gage","title":"Weight",
"label":"g","format":"{{value}}","min":"-2000","max":"2000","colors":
["#00b500","#e6e600","#ca3838"],"seg1":"","seg2":"","x":1070,"y":100,"wires":[]},
{"id":"372e8f7b.f9752","type":"ui_chart","z":"2826c4af.400f9c","name":"","group":
"c4c1bcc1.49c24","order":11,"width":6,"height":4,"label":"","chartType":"line","l
egend":"false","xformat":"HH:mm:ss","interpolate":"linear","nodata":"","dot":fals
e,"ymin":"","ymax":"","removeOlder":1,"removeOlderPoints":"","removeOlderUnit":"3
600","cutout":0,"useOneColor":false,"useUTC":false,"colors":
["#1f77b4","#aec7e8","#ff7f0e","#2ca02c","#98df8a","#d62728","#ff9896","#9467bd",
"#c5b0d5"],"outputs":1,"useDifferentColor":false,"x":1070,"y":60,"wires":[[]]},
```

Node-RED & Raspberry tutorial: How to capture data from the sensor

Industrial Raspberry PLC and Node-RED applications: capturing values from the weight sensor

Explanation

LINK

WEIGHT! PICTURE THIS!

Now, your Node-RED aplication should look something like this:

```
{"id":"99be7e29.78696","type":"ui_button","z":"2826c4af.400f9c","name":"","group"
:"c4c1bcc1.49c24","order":3,"width":7,"height":2,"passthru":false,"label":"START
LOAD
CELL","tooltip":"","color":"","bgcolor":"","icon":"","payload":"","payloadType":"
str","topic":"","topicType":"str","x":180,"y":60,"wires":[["615b1ef6.53963"]]},
{"id":"615b1ef6.53963","type":"function","z":"2826c4af.400f9c","name":"start
flow.count and send python cmd","func":"var count =
flow.get('count')||0;\nflow.set('count', count);\n\nvar newMsg = {payload: \"sudo
python -u /home/pi/hx711py/example.py\"};\nreturn
newMsg;","outputs":1,"noerr":0,"initialize":"","finalize":"","libs":
[],"x":610,"y":60,"wires":[["ec5481a.4fbf28"]]},
{"id":"3385b59c.06c81a","type":"ui_media","z":"2826c4af.400f9c","group":"c4c1bcc1
.49c24","name":"","width":6,"height":4,"order":15,"category":"","file":"","layout
":"expand","showcontrols":true,"loop":true,"onstart":false,"scope":"local","toolt
ip":"","x":1070,"y":360,"wires":[[]]},
{"id":"16de31a2.e4a6de","type":"status","z":"2826c4af.400f9c","name":"get the
exec node status","scope":["ec5481a.4fbf28"],"x":190,"y":600,"wires":
[["9bb820b3.87fbe"]]},
{"id":"9bb820b3.87fbe","type":"change","z":"2826c4af.400f9c","name":"set
flow.pid","rules":
[{"t":"set","p":"pid","pt":"flow","to":"$number($split(status.text, ':')
[1])","tot":"jsonata"}],"action":"","property":"","from":"","to":"","reg":false,"
x":410,"y":600,"wires":[["b99c988c.86bf98"]]},
{"id":"b99c988c.86bf98","type":"function","z":"2826c4af.400f9c","name":"set kill
cmd","func":"let pid = flow.get('pid');\nvar kill = \"kill -9 \" +
pid;\nflow.set('kill', kill);\nreturn
msg;","outputs":1,"noerr":0,"initialize":"","finalize":"","libs":
[],"x":590,"y":600,"wires":[[]]},
{"id":"e053ecae.bca31","type":"function","z":"2826c4af.400f9c","name":"killall
python","func":"msg.payload = \"sudo killall python\";\nreturn
msg;","outputs":1,"noerr":0,"initialize":"","finalize":"","libs":
[],"x":530,"y":160,"wires":[["ec5481a.4fbf28"]]},
{"id":"fb666c7f.c2ff9","type":"function","z":"2826c4af.400f9c","name":"start
flow.get and send fswebcam cmd","func":"var count =
flow.get('count');\ncount++;\n\nmsg.payload = \"fswebcam -r 1280x720 --no-banner
/home/pi/images/image\" + count + \".jpg\";\n\nflow.set('count',
count);\n\nreturn
msg;\n\n","outputs":1,"noerr":0,"initialize":"","finalize":"","libs":
[],"x":230,"y":260,"wires":[["9b234a13.0256e8"]]},
{"id":"5771d86a.220b58","type":"comment","z":"2826c4af.400f9c","name":"In case
you want to kill the flow pid and not the python processes, replace the \"killall
python\" function node, for the \"killall pid\" function node --
>","info":"","x":550,"y":540,"wires":[]},
```

Node-RED & Raspberry tutorial: How to capture data from the sensor

Industrial Raspberry PLC and Node-RED applications: capturing values from the weight sensor

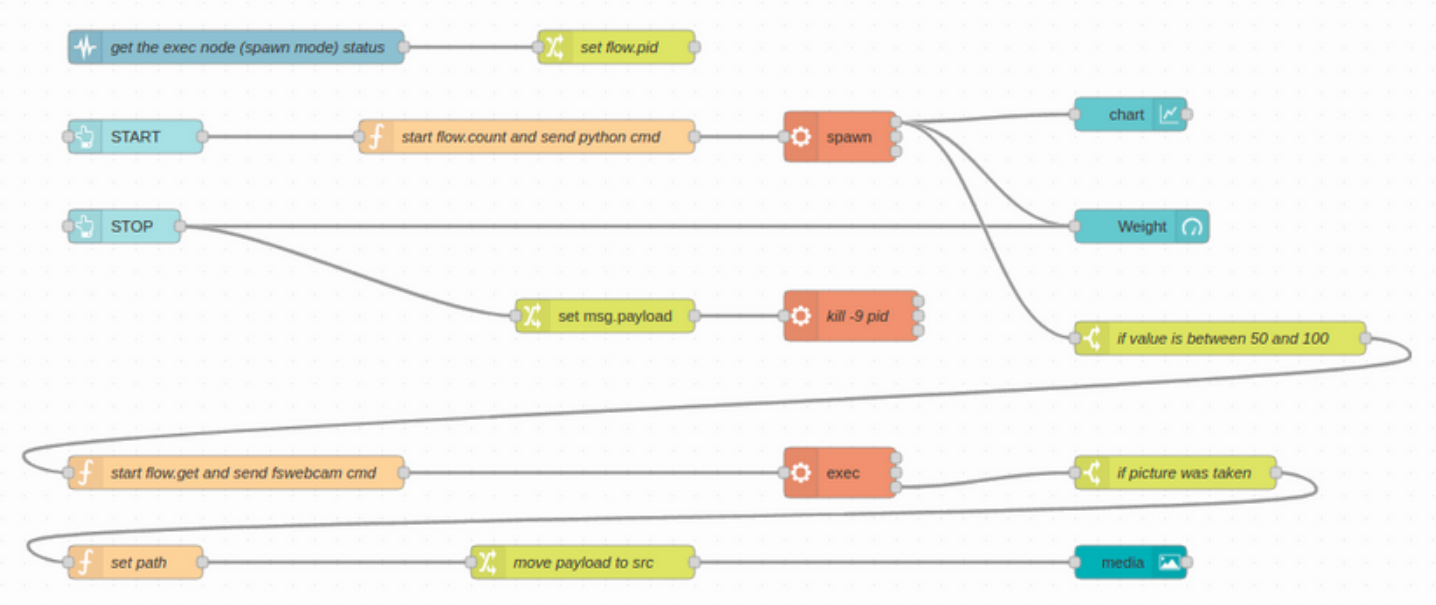
Explanation

LINK

WEIGHT! PICTURE THIS!

Now, your Node-RED aplication should look something like this:


```
{"id":"b88b67eb.03f068","type":"function","z":"2826c4af.400f9c","name":"killall
pid","func":"msg.payload                =                flow.get('kill');\nreturn
msg;","outputs":1,"noerr":0,"initialize":"","finalize":"","libs":
[],"x":1100,"y":540,"wires":[[]]},
{"id":"c4c1bcc1.49c24","type":"ui_group","name":"","tab":"cbda5f28.c75ad","order"
:1,"disp":true,"width":"20","collapse":false},
{"id":"cbda5f28.c75ad","type":"ui_tab","name":"Home","icon":"dashboard","disabled
":false,"hidden":false}]
```

Node-RED & Raspberry tutorial: How to capture data from the sensor

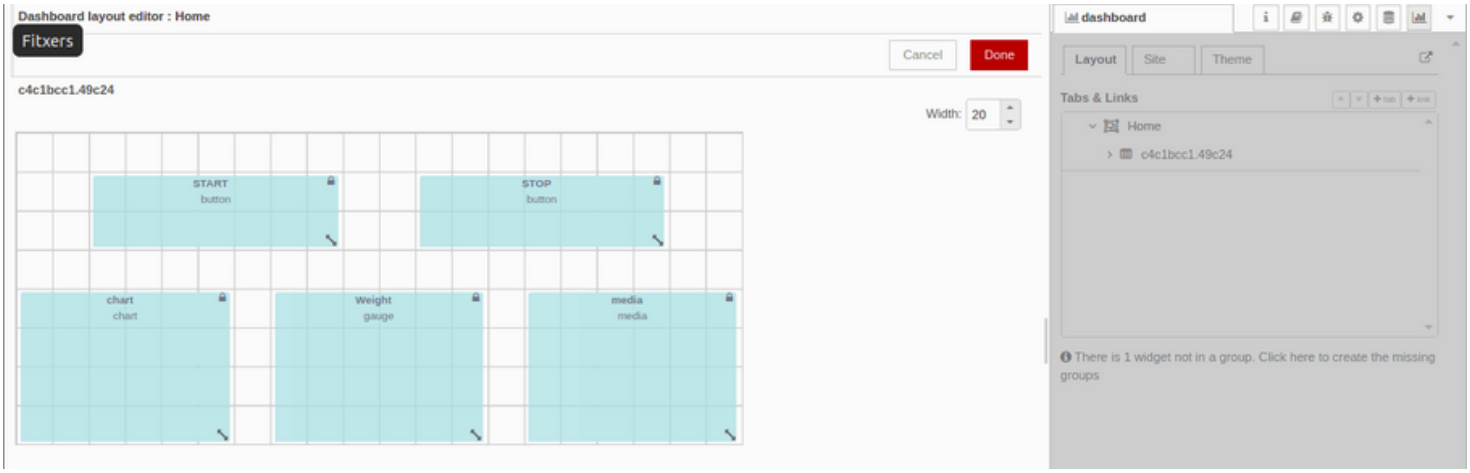
Industrial Raspberry PLC and Node-RED applications: capturing values from the weight sensor

Explanation

LINK

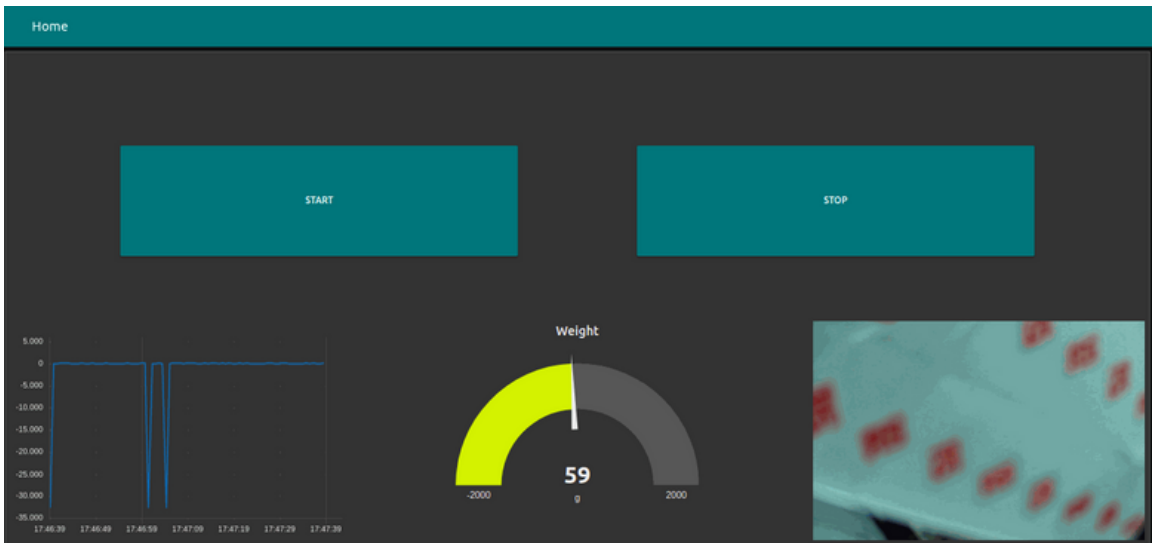
TIPS

If you go to the right menu, in the Dashboard tab, and you hover on your tab, you will see appear three buttons: group, edit and layout. So, if you click on layout, you will see the Dashboard layout editor, where it is possible to display your ui nodes as you want.



If you see that you cannot resize the widgets, go to every Dashboard node, and in the Size section, you will see that is set as auto, so just set any manual size, go back to the Dashboard layout editor, where the changes will be applied.

Finally, go to **http://10.10.10.20:1880/ui/** to check out your Node-RED dashboard!

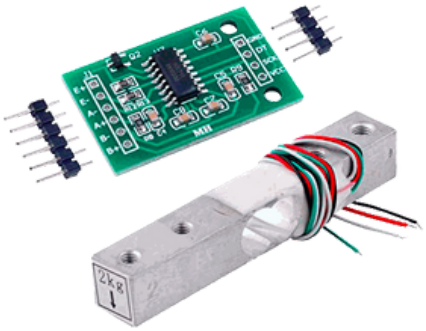


How to take a picture when a load cell value is detected

Industrial Raspberry PLC and Node-RED applications

LINK

Introduction



Wearable sensors are an emerging market that is rapidly gaining recognition in the global market, especially in the industrial sector. Raspberry Pi-based PLC family offers a wide range of possibilities to control and monitor this innovative technology.
In this blog, you will learn how to take a picture using a USB camera when a load cell detects a specific value, controlled by an industrial Raspberry Pi PLC and monitoring it using Node-RED.

Explanation

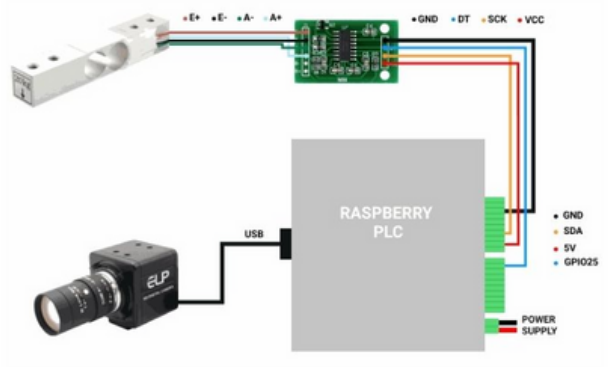
Raspberry Pi

Requirements

- 1x Weight Sensor
- 1x HX711 Load Cell Transmitter Module
- 4x cables
- 1x USB camera
- 1x Raspberry Pi industrial PLC

Connecting hardware

Connect the hardware as shown below to proceed with the software:



WEIGHTING SENSOR	HX711	RASPBERRY PLC	USB CAMERA
RED CABLE	E+		
WHITE CABLE	A+		
BLACK CABLE	E-		
GREEN CABLE	A-		
	GND	GND	
	DT	GPIO 25	
	SCK	SDA	
	VCC	5V	
		USB	USB CABLE

How to take a picture when a load cell value is detected

Industrial Raspberry PLC and Node-RED applications

LINK

Explanation

Weight sensor setup

1. First, let's clone a project that contains an example file that shows a function of the library. So, open up a terminal window in your Raspberry Pi PLC controller and type the following:

```
git clone https://github.com/tatobari/hx711py
```

2. Once the repository was cloned, a directory named hx711py will appear with the file named example.py. So, go to that file to adjust some changes:

```
cd hx711py
sudo nano example.py
```

3. Inside the file, let's modify some lines, so that the code looks as follows:

```
#! /usr/bin/python2

import time
import sys

EMULATE_HX711=False

referenceUnit = -1

if not EMULATE_HX711:
    import RPi.GPIO as GPIO
    from hx711 import HX711
else:
    from emulated_hx711 import HX711

def cleanAndExit():
    print("Cleaning...")

    if not EMULATE_HX711:
        GPIO.cleanup()

    print("Bye!")
    sys.exit()
```

How to take a picture when a load cell value is detected

Industrial Raspberry PLC and Node-RED applications

LINK

Explanation

Weight sensor setup

```
hx = HX711(25, 2)
hx.set_reference_unit(referenceUnit)
hx.reset()

hx.tare()

print("Tare done! Add weight now...")

def func():
while True:
 try:
 val = hx.get_weight(5)
 yield val
 hx.power_down()
  hx.power_up()
  time.sleep(0.1)

 except (KeyboardInterrupt, SystemExit):
cleanAndExit()

function = func()
for i in function:
print(i)
```

4. Once the code was modified, exit with Ctrl + X, type 'Y' to save the file with the same name and Enter.

Test the Raspberry scale

1. For a correct calibration and to be able to get the right weight, you need a comparison object whose weight you know. It is recommended to choose an average value of the maximum the load cell can get. For example, if your weight scale can get up to 20 kgs, then it is recommended to choose an object its weight is 10 kgs.

2. First of all, you need to comment the next line as follows:

```
#hx.set_reference_unit(referenceUnit)
```

How to take a picture when a load cell value is detected

Industrial Raspberry PLC and Node-RED applications

LINK

Explanation

Test the Raspberry scale

3. And then, place the object on the scale and run it with the following command:

```
sudo python example.py
```

4. You will see that the displayed values will be both positive and negative. In this case, they are displayed at 24500 values around -22200. So we referenced the values like:

$$-22200 \div 24500 = -0.9$$

5. After getting that value, go back to the line we commented earlier, and uncommented it removing the hashtag, and typing the value you got as a reference unit like:

```
hx.set_reference_unit(referenceUnit)
referenceUnit = -1
```

If you have achieved a successful calibration, you will see that the value of the weight scale will be around 0. Otherwise, you can modify the referenceUnit variable to get the right calibration.

Getting the values with Node-RED

1. By default, our Raspberry PLC images have Node-RED already installed. If you do not have the Node-RED installed in your device, first go to the following URL to proceed with the installation: https://nodered.org/docs/getting-started/raspberrypi

2. Once Node-RED is ready, from your computer go to your browser and type: http://10.10.10.20:1880/ if you are connected through Ethernet, or http://wlan0-pi-address:1880/ if you want to connect through the WiFi.

3. After opening up a new Node-RED window, go to the right menu, click on **Manage palette > Install > Type: node-red-contrib-ui-media and install it.**

How to take a picture when a load cell value is detected

Industrial Raspberry PLC and Node-RED applications

LINK

Explanation

Getting the values with Node-RED

4. After that, click on Import, and paste the following flows.json and click on the Deploy button:


```
[{"id":"2826c4af.400f9c","type":"tab","label":"Flow 1","disabled":false,"info":""},
{"id":"9b234a13.0256e8","type":"exec","z":"2826c4af.400f9c","command":"","addpay":"payloa
d","append":"","useSpawn":"false","timer":"","oldrc":false,"name":"","x":510,"y":260,"wir
es":[[],[],["3f27e8b4.d02378"]]},
{"id":"ec5481a.4fbf28","type":"exec","z":"2826c4af.400f9c","command":"","addpay":"payload
","append":"","useSpawn":"true","timer":"","oldrc":false,"name":"","x":870,"y":60,"wires"
:[["36307784.3144e8","372e8f7b.f9752","d4e34cd5.f423e"],[],[]]},
{"id":"36307784.3144e8","type":"switch","z":"2826c4af.400f9c","name":"if value is between
50 and 100","property":"payload","propertyType":"msg","rules":
[{"t":"btwn","v":"50","vt":"num","v2":"100","v2t":"num"}],"checkall":"true","repair":fals
e,"outputs":1,"x":990,"y":160,"wires":[["fb666c7f.c2ff9"]]},
{"id":"3f27e8b4.d02378","type":"switch","z":"2826c4af.400f9c","name":"if picture was
taken","property":"payload.code","propertyType":"msg","rules":
[{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":1,"x":1030,"y"
:260,"wires":[["7646b60e.83a318"]]},
{"id":"7646b60e.83a318","type":"function","z":"2826c4af.400f9c","name":"set
path","func":"let count = flow.get('count');\nmsg.payload = \"/image\" + count +
\".jpg\";\nreturn msg;","outputs":1,"noerr":0,"initialize":"","finalize":"","libs":
[],"x":140,"y":360,"wires":[["a4078c82.e803a"]]},
{"id":"a4078c82.e803a","type":"change","z":"2826c4af.400f9c","name":"move payload to
src","rules":
[{"t":"move","p":"payload","pt":"msg","to":"src","tot":"msg"}],"action":"","property":"",
"from":"","to":"","reg":false,"x":560,"y":360,"wires":[["3385b59c.06c81a"]]},
{"id":"8771f8be.e44f68","type":"ui_button","z":"2826c4af.400f9c","name":"","group":"c4c1b
cc1.49c24","order":5,"width":7,"height":2,"passthru":false,"label":"STOP LOAD
CELL","tooltip":"","color":"","bgcolor":"","icon":"","payload":"0","payloadType":"num","t
opic":"","topicType":"str","x":170,"y":160,"wires":
[["e053ecae.bca31","d4e34cd5.f423e"]]},
{"id":"d4e34cd5.f423e","type":"ui_gauge","z":"2826c4af.400f9c","name":"","group":"c4c1bcc
1.49c24","order":13,"width":6,"height":4,"gtype":"gage","title":"Weight","label":"g","for
mat":"{{value}}","min":"-2000","max":"2000","colors":
["#00b500","#e6e600","#ca3838"],"seg1":"","seg2":"","x":1070,"y":100,"wires":[]},
{"id":"372e8f7b.f9752","type":"ui_chart","z":"2826c4af.400f9c","name":"","group":"c4c1bcc
1.49c24","order":11,"width":6,"height":4,"label":"","chartType":"line","legend":"false","
xformat":"HH:mm:ss","interpolate":"linear","nodata":"","dot":false,"ymin":"","ymax":"","r
emoveOlder":1,"removeOlderPoints":"","removeOlderUnit":"3600","cutout":0,"useOneColor":fa
lse,"useUTC":false,"colors":
["#1f77b4","#aec7e8","#ff7f0e","#2ca02c","#98df8a","#d62728","#ff9896","#9467bd","#c5b0d5
"],"outputs":1,"useDifferentColor":false,"x":1070,"y":60,"wires":[[]]},
{"id":"99be7e29.78696","type":"ui_button","z":"2826c4af.400f9c","name":"","group":"c4c1bc
c1.49c24","order":3,"width":7,"height":2,"passthru":false,"label":"START LOAD
CELL","tooltip":"","color":"","bgcolor":"","icon":"","payload":"","payloadType":"str","to
pic":"","topicType":"str","x":180,"y":60,"wires":[["615b1ef6.53963"]]},
{"id":"615b1ef6.53963","type":"function","z":"2826c4af.400f9c","name":"start flow.count
and send python cmd","func":"var count = flow.get('count')||0;\nflow.set('count',
count);\n\nvar newMsg = {payload: \"sudo python -u
/home/pi/hx711py/example.py\"};\nreturn
newMsg;","outputs":1,"noerr":0,"initialize":"","finalize":"","libs":
[],"x":610,"y":60,"wires":[["ec5481a.4fbf28"]]},
```

How to take a picture when a load cell value is detected

Industrial Raspberry PLC and Node-RED applications

LINK

Explanation

Getting the values with Node-RED


```
{"id":"3385b59c.06c81a","type":"ui_media","z":"2826c4af.400f9c","group":"c4c1bcc1.49
c24","name":"","width":6,"height":4,"order":15,"category":"","file":"","layout":"exp
and","showcontrols":true,"loop":true,"onstart":false,"scope":"local","tooltip":"","x
":1070,"y":360,"wires":[[]]},
{"id":"16de31a2.e4a6de","type":"status","z":"2826c4af.400f9c","name":"get the exec
node status","scope":["ec5481a.4fbf28"],"x":190,"y":600,"wires":
[["9bb820b3.87fbe"]]},
{"id":"9bb820b3.87fbe","type":"change","z":"2826c4af.400f9c","name":"set
flow.pid","rules":
[{"t":"set","p":"pid","pt":"flow","to":"$number($split(status.text, ':')
[1])","tot":"jsonata"}],"action":"","property":"","from":"","to":"","reg":false,"x":
410,"y":600,"wires":[["b99c988c.86bf98"]]},
{"id":"b99c988c.86bf98","type":"function","z":"2826c4af.400f9c","name":"set kill
cmd","func":"let pid = flow.get('pid');\nvar kill = \"kill -9 \" +
pid;\nflow.set('kill', kill);\nreturn
msg;","outputs":1,"noerr":0,"initialize":"","finalize":"","libs":
[],"x":590,"y":600,"wires":[[]]},
{"id":"e053ecae.bca31","type":"function","z":"2826c4af.400f9c","name":"killall
python","func":"msg.payload = \"sudo killall python\";\nreturn
msg;","outputs":1,"noerr":0,"initialize":"","finalize":"","libs":
[],"x":530,"y":160,"wires":[["ec5481a.4fbf28"]]},
{"id":"fb666c7f.c2ff9","type":"function","z":"2826c4af.400f9c","name":"start
flow.get and send fswebcam cmd","func":"var count =
flow.get('count');\ncount++;\n\nmsg.payload = \"fswebcam -r 1280x720 --no-banner
/home/pi/images/image\" + count + \".jpg\";\n\nflow.set('count', count);\n\nreturn
msg;\n\n","outputs":1,"noerr":0,"initialize":"","finalize":"","libs":
[],"x":230,"y":260,"wires":[["9b234a13.0256e8"]]},
{"id":"5771d86a.220b58","type":"comment","z":"2826c4af.400f9c","name":"In case you
want to kill the flow pid and not the python processes, replace the \"killall
python\" function node, for the \"killall pid\" function node --
>","info":"","x":550,"y":540,"wires":[]},
{"id":"b88b67eb.03f068","type":"function","z":"2826c4af.400f9c","name":"killall
pid","func":"msg.payload = flow.get('kill');\nreturn
msg;","outputs":1,"noerr":0,"initialize":"","finalize":"","libs":
[],"x":1100,"y":540,"wires":[[]]},
{"id":"c4c1bcc1.49c24","type":"ui_group","name":"","tab":"cbda5f28.c75ad","order":1,
"disp":true,"width":"20","collapse":false},
{"id":"cbda5f28.c75ad","type":"ui_tab","name":"Home","icon":"dashboard","disabled":f
alse,"hidden":false}]
```

How to take a picture when a load cell value is detected

Industrial Raspberry PLC and Node-RED applications

LINK

Explanation

Getting the values with Node-RED

5. Go to your Raspberry terminal again, and type:

```
cd
mkdir images
sudo nano /home/pi/.node-red/settings.js
```

- ***cd :*** It leads to the /home/pi directory.
- ***mkdir images :*** This command makes a new directory called 'images' in the current directory. This directory will store all the images taken by the camera.

Finally, we are going to modify a line to be able to get the images from a source.

6. Find the line with the httpStatic parameter and do the following:

```
//httpStatic:   '/home/nol/node-red-static/',   ------------>   Replace
this
httpStatic: '/home/pi/images',              ------------> For this
```

7. Reboot your open-source PLC Raspberry Pi.

8. After rebooting, go again to your browser and type http://10.10.10.20:1880/ui.

9. If everything went right, you can test and enjoy your application!

Related links

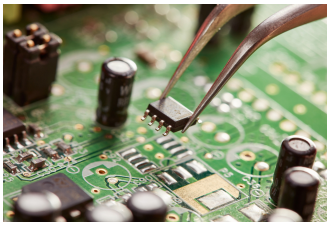
- How to connect Raspberry PLC to Wi-Fi
- How to program Raspberry PLC interrupt inputs with Python
- How to find your perfect industrial PLC
- Raspberry PLC family products
- Basics about Raspberry Pi PLC analog outputs
- TouchBerry Pi family products

How to connect industrial Raspberry PLC to Wi-Fi

Industrial Communications

LINK

Introduction



Raspberry Pi-based PLC family devices have Wi-Fi wireless connectivity by default.
It uses the two most common frequencies: 2.4GHz and 5GHz. It also uses the IEEE 802.11.b/g/n/ac bands. And, to connect them to the Wi-Fi network, you have to follow some specific steps.

Requirements

The key points to consider are as follows:

- Industrial Raspberry Pi PLC family
- **PLC access:** shh. A tutorial on how to access the device via Linux or Windows can be found in the Raspberry Pi PLC controller User Guide

Explanation

To connect this PLC with your Wi-Fi network, you must modify the wpa_supplicant file inside the Raspberry:

```
sudo nano /etc/wpa_supplicant/wpa_supplicant.conf
```

And you must configure the file with the configuration parameters of the Wi-Fi network (it may change depending on the specific configuration of each case):

```
ctrl_interface=DIR=/var/run/wpa_supplicant GROUP=netdev
update_config=1
country=GB

network={
ssid="NETWORK SSID"
psk="NETWORK PASSWORD"
key_mgmt=WPA-PSK
}
```

And that is all, after that you must restart the networking services to apply the changes:

```
sudo service networking restart
```

Or you can reboot the system to apply the changes:

```
sudo reboot
```

How to connect industrial Raspberry PLC to Wi-Fi

Industrial Communications

LINK

Explanation

To connect this PLC with your Wi-Fi network, you must modify the wpa_supplicant file inside the Raspberry:

```
sudo nano /etc/wpa_supplicant/wpa_supplicant.conf
```

And you must configure the file with the configuration parameters of the Wi-Fi network (it may change depending on the specific configuration of each case):

```
ctrl_interface=DIR=/var/run/wpa_supplicant GROUP=netdev
update_config=1
country=GB

network={
ssid="NETWORK SSID"
psk="NETWORK PASSWORD"
key_mgmt=WPA-PSK
}
```