**List of occurring Problems and how to solve them**

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This file contains most of the problems known until now regarding the Fischertechnik model factory. The list should be updated continuously with new arising problems. In the optimal case, a possible solution should also be rewritten and perhaps also how the problem can be avoided.

1. General Error

A multitude amount of errors can happen (e.g. a Fischertechnik module does not perform the way it should). The first solution you should try is t reboot the plant. This can be done by resetting the MES (Node-RED in the cloud) first. This can be done by clicking on the reset button in the dashboard (see Figure 1) or by sending a command via the chatbot.

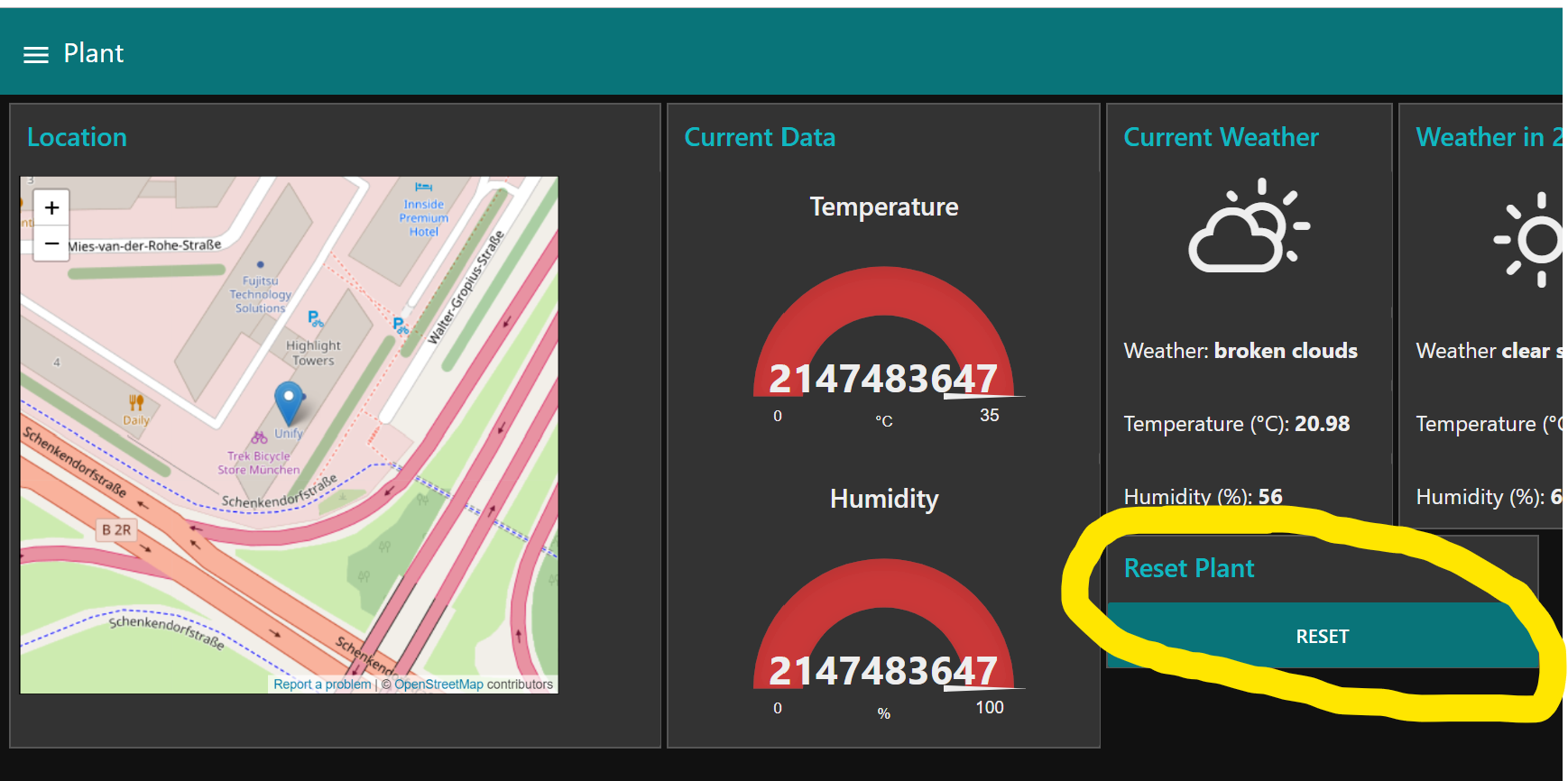


Figure 1:Reset Button

After the MES has been reset all the Fischertechnik controllers must bee restarted. You don’t have to power them down. Usually it is sufficient to reload the program as explained in the Figures 2-3:

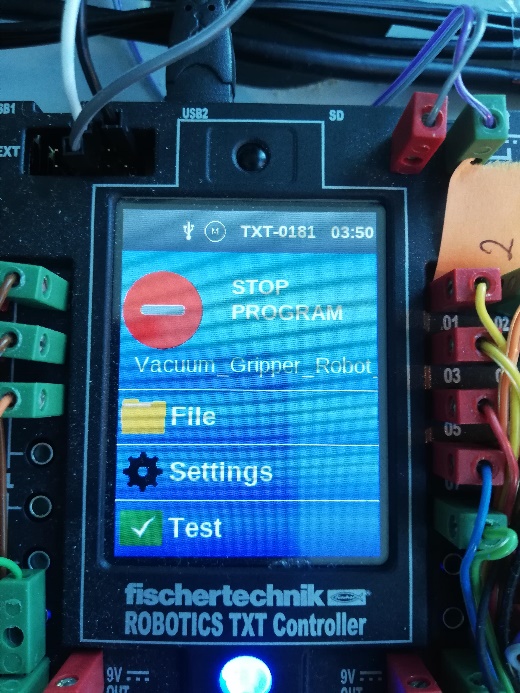
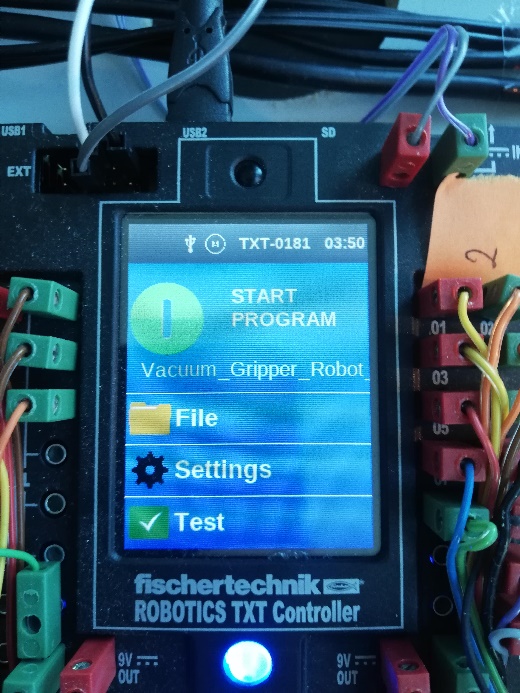
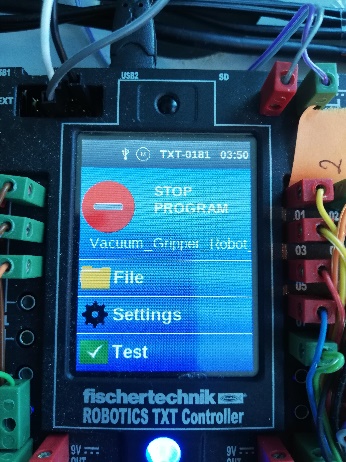


Figure 2: Stop Programm Figure 3: Start Programm

1. Fischertechnik Controller has no Program preloaded

Usually the Fischertechnik controller load the correct program on their own when they are started. When not you can load it manually and set it again for auto-load. Follow

 Select “File”

 Select “RoBoPro”

 Select the first program. In this case “Vacuum\_Gripper\_...”

 Select “Load” and “Auto Start”. Then go back to initial screen

1. Vacuum Gripper loses a workpiece

Sometimes the vacuum gripper loses a workpiece while transporting it from one module to another. This is mostly caused by a bad picking-up process. When the vacuum gripper is not positioned 100% over the flat surface of the workpiece, the connection between sucker and workpiece is not airtight and so a vacuum cannot be held up. In this case no solution is available because the modules sometimes don’t take their designated position due to some tolerances. In the case a workpiece is lost you can put it manually in the next module and usually the process can continue without a problem.

Another reason why workpieces are lost can be a poor surface of the workpieces. Even if the gripper picks up the workpieces in the right position, it may still be the case that the connection is not airtight. Sometimes it is sufficient if the surface is simply cleaned a bit.

One more reason for losing a workpiece can be caused by the vacuum gripper itself. If there is an air leakage somewhere in the system the workpiece can not be held in place. Here it occurred, that the sucker part (made out of silicone) wasn’t tight anymore and had to be replaced.

1. A workpiece falls of the turning table (processing station)

The vacuum gripper of the processing station brings the workpiece form the oven to the turning table. Sometimes the workpiece is not placed a 100% correct and then it can happen that the workpiece falls of the turning table when this one moves to the next position. This incident can’t be prevented in all cases. Sometimes the workpiece is not in the right position on the moving tray of the oven (put there by the vacuum gripper). When it is now gripped by the vacuum gripper (the one of the processing station), it is afterwards also placed in a wrong position on the turning table. The only way to “solve” this problem is to supervise the process and if the workpiece is not in place you have to manually adjust it.

When this problem happens more often it is perhaps necessary to change some values in the RoboPro code. There you can adjust the positions where the workpieces are picked up and dropped down.

Even if the workpieces are placed correctly on the turning table, they can fall down to a jerky movement of the turning table. This can be caused by a bad connection of the gears between motor and turning table. If some teeth are skipped, the table stops and then accelerates again. This creates the jerky movement. To solve this problem, the motor has to be pressed against the gear of the turning table. This can be done by clamping an object like some paper. This has already been done, but sometimes the paper becomes lose and must be replaced.

1. Changing IP of the Raspberry Pi

All 3 Raspberry Pis are connected to the local WiFi network (Name IOTDEMOS). Because we don’t have access to the router configuration we can not assign static IPs to the devices used. So it can happen that they change their IP over time, which can not be prevented. One way to assign a static Ip is to follow these [instructions](https://thepihut.com/blogs/raspberry-pi-tutorials/how-to-give-your-raspberry-pi-a-static-ip-address-update). However this does not always work and in other cases the installation of the dhcp server can prevent the Node-Red instances installed on some Raspberry pis from working correctly. Until now I didn’t find a perfect solution for this problem. In regular usage you don’t need the IP of the Raspberry Pi which makes the connection between the pant and the cloud and the one responsible for the visual recognition. These two IPs are only needed when you want to make some changes to the Node-RED flows. However the IP of the third Raspberry Pi is needed to access the video stream. When this Ip now changes, the link in the Node-red dashboard will not work anymore.

One way to get the new IPs is to connect the concerned Raspberry Pi to a Monitor and use the console.

Another way is to start the Raspberry pi (connect it to a power supply) so that it connects to the Network on its own. Then you can use the software “[Advanced IP Scanner](http://www.advanced-ip-scanner.com/de/)” on a pc which is connected to the SAME network (IOTDEMOS). You can then find the PIs under the producer “Raspberry Pi foundation” or “Edimax” (this is the manufacturer of the wifi dongle)

1. Visual Inspection does not work

The visual inspection is carried out on the Raspberry Pi connected to the camera in the processing station. (By carrying out I mean take a photo and send it to the Watson Visual Recognition). Sometimes it can now happen, that the visual inspection does not work due to an error of the Node-RED flow. This error can show due to an error message on the dashboard (a simple notification). The easiest thing to do is to reboot the Raspberry Pi (Pull power plug and plug in again). Then wait about 2 minutes and restart the plant (via Reset button on the dashboard or by sending the command via chatbot)

Because this Problem occurs more often a time switch has been implemented. Usually the processing station waits until the visual recognition has been finished. If however this takes too long (simple example: the Raspberry pi is not on), the process is continues by the MES (Cloud Node-RED after 15 seconds). This ensures, that the malfunctioning of the visual inspection does not have any influence on the demonstation.

1. IoT Platform doesn’t respond anymore

We are using the lite plan for the IoT platform. So it can happen, that the resource is deleted after 30 days on inactivity. When this happen you can follow these instructions to set up a new platform.

* 1. Create a new Resource in the IBM Cloud

First you have to create a new resource in the IBM cloud account. To do so ask Michael Monger to give you the needed permissions. You can name the Platform as you want. This does not have any influence.

When you have created the IoT platform you have to add devices.

The following devices with the device type ‘Communication’ (same for all devices) have to be created:

* PlantMunich
* ESP32
* Raspberry\_Pi\_Visual\_Recognition
* Processing\_Station\_Munich
* Sorting\_Line\_Munich
* VacuumGripperMunich\_1
* VacuumGripperMunich\_2
* WarehouseMunich\_1
* WarehouseMunich\_2
* Pressure\_Sensor
* Ping\_IoT\_Platform

Do do so click on the button ‘Add Device’ and enter as device type ‘Communication’ and as Device Id the name of the device as shown in Figure 1.

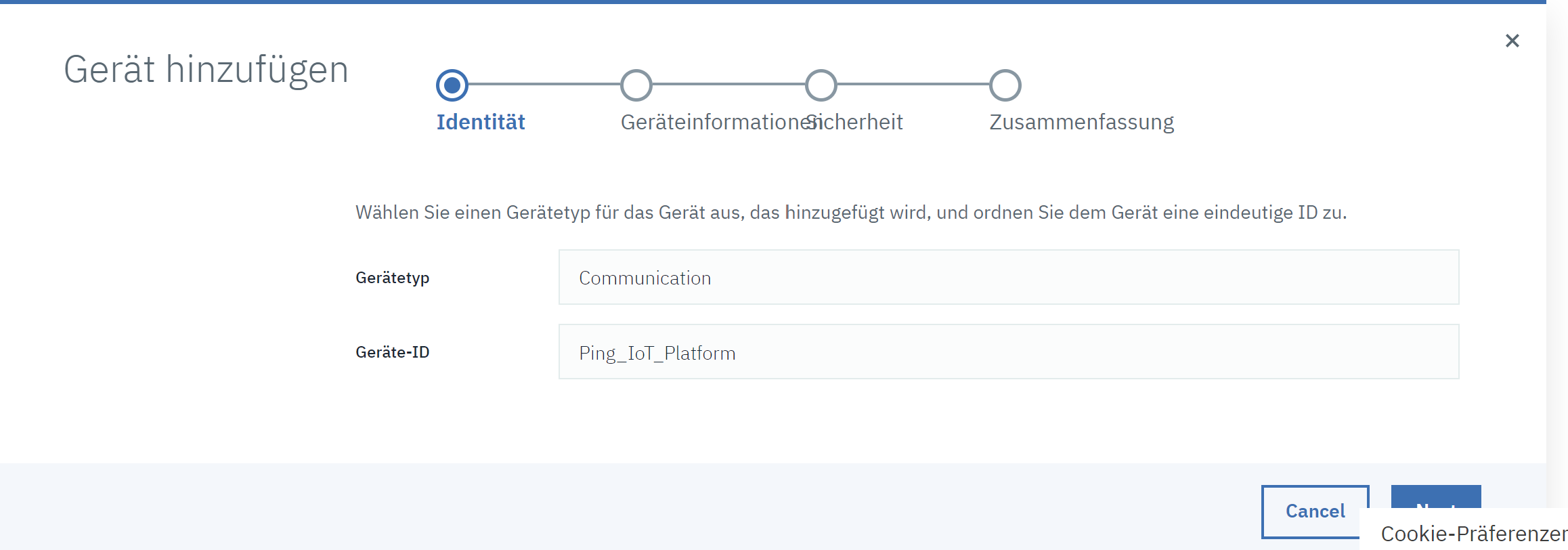


Figure 4: IoT Platform add a Device

Click on next. In the following sites you don’t have to insert any values. Just click on the ‘NEXT’ button until you reach the site shown in Figure 2. You have to store the shown credentials. Please search for the file ‘Credentials\_IoT.txt’ an replace the stored values with the new ones.



Figure 5: IoT Platform Save the Credentials

Once you have added all the devices, we can start to connect all the needed instances to The IoT platform. To do so we first need to create an API-key in the IoT Platform. Please switch to the “Apps” tab and click on the “create API-key” button (See Figure 3). You can add a description, but this on is not necessary. Click on ‘Next’ and select the ‘standard application’ as role. Again click on ‘Next’. Now you have ceated the needed API-key. Please store/replace the API-key and the Authentication Token in the ‘Credentials\_IoT.txt’ file.

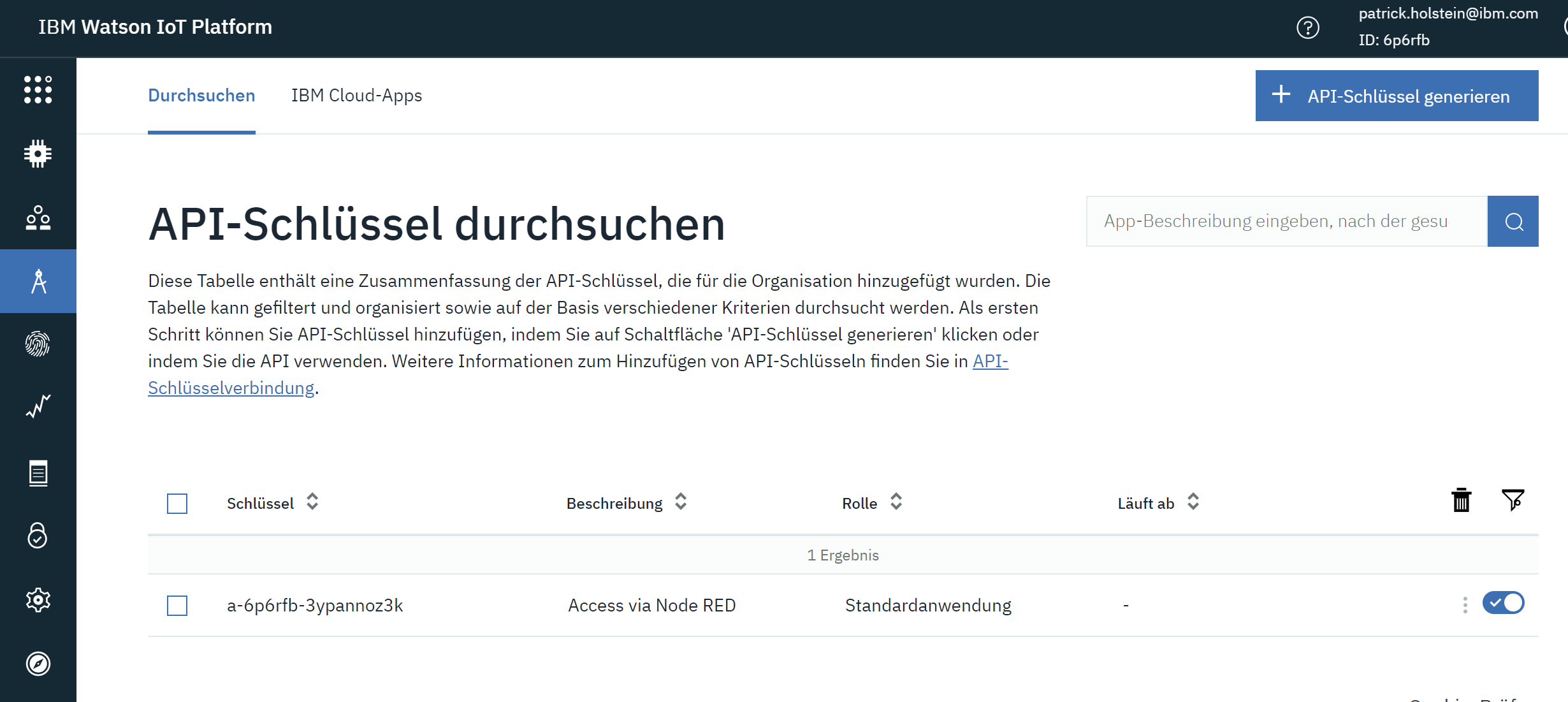


Figure 6: IoT Platform Create API-key

After this step we have made all the needed settings for the moment at the IoT platform. We will come back later to establish the connection between IoT platform and Cloudant database, but we will configure the devices first.

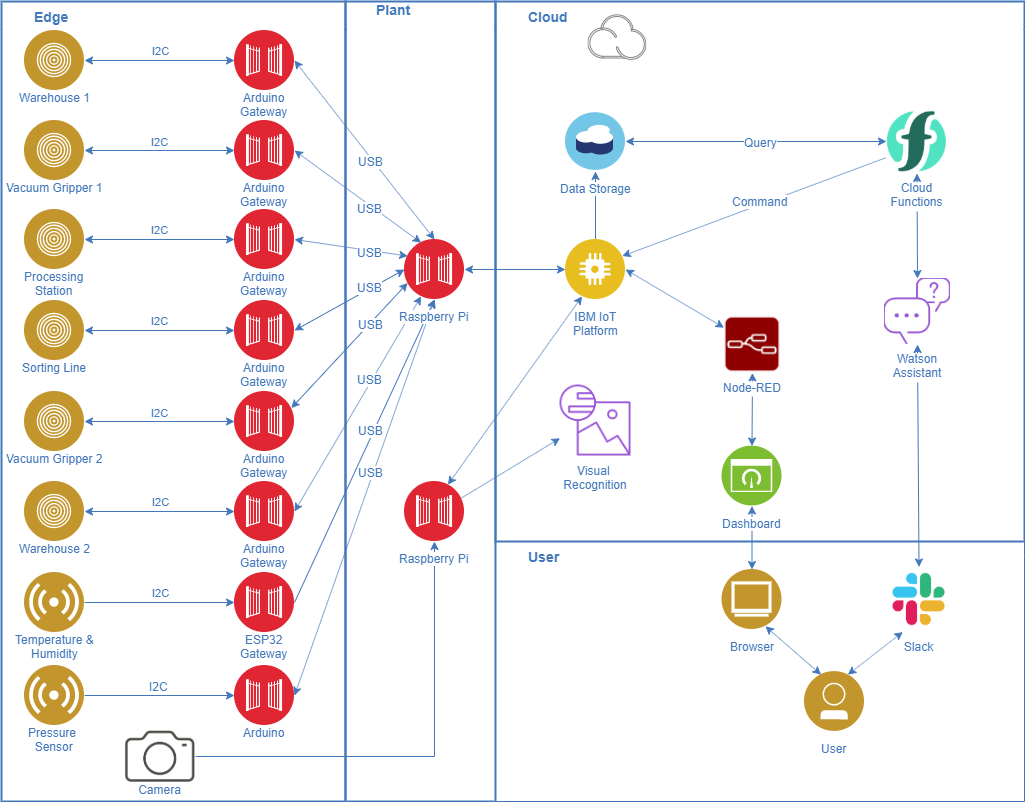


Figure 7: IT Architecture

As you can see in Figure 1, the IoT platform is connected to 5 services. When the IoT platform has been deleted, all of these connections have to be restored.

* 1. Restore the connection to the Node-RED on the Gateway Pi

Let’s start with the Node-RED running on the Raspberry Pi in the closet (taking the role as gateway). You have to be in the same WiFi network “IOTDEMOS” as the raspberry pi (this one must of course be connected to a power supply). Search for its IP with the ‘Advanced IP scanner’ software (if the IP is not 9.236.65.140). Then enter the link as in Figure 4. Then select one of the blue IoT nodes (which one does not matter. When you update one, the others will follow on their own). The page shown in Figure 5 should open. Please click on the pencil symbol, which should direct you to the page in Figure 6.

There you have to enter the previously created and saved API-Key and Authentication Token. Click on Update, then on Done. Then deploy the changes (See Figure 7: Button in the right upper corner). After de deploy has been executed, all the IoT nodes (the blue ones) should change to the state connected as it is the case in Figure 4. When not something went wrong.

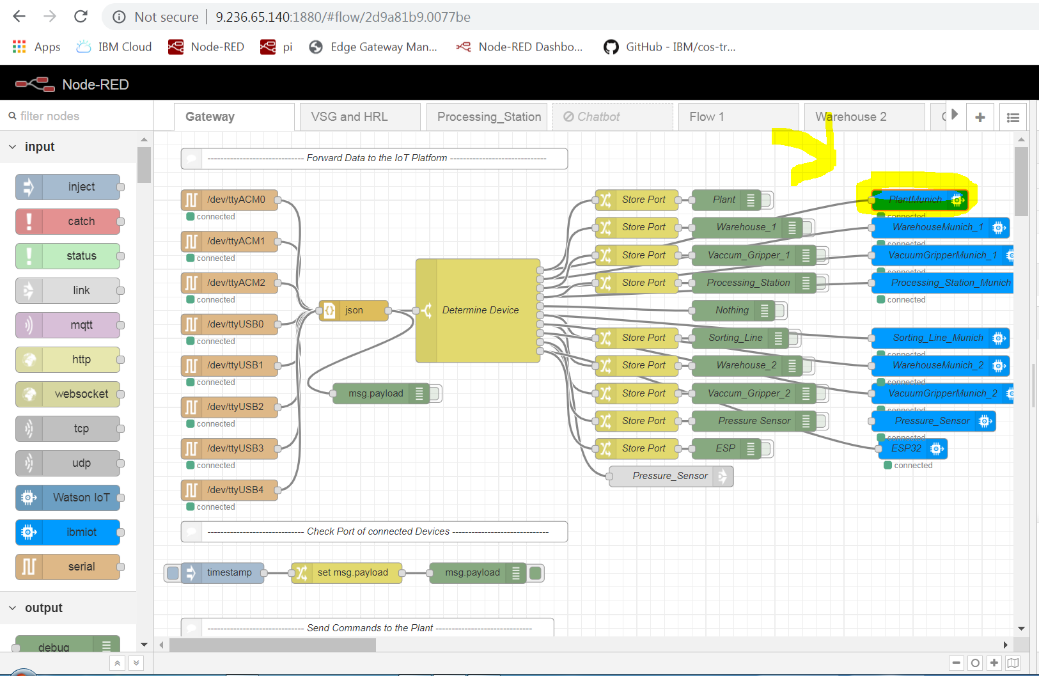


Figure 8: Raspberry Pi Node RED 1

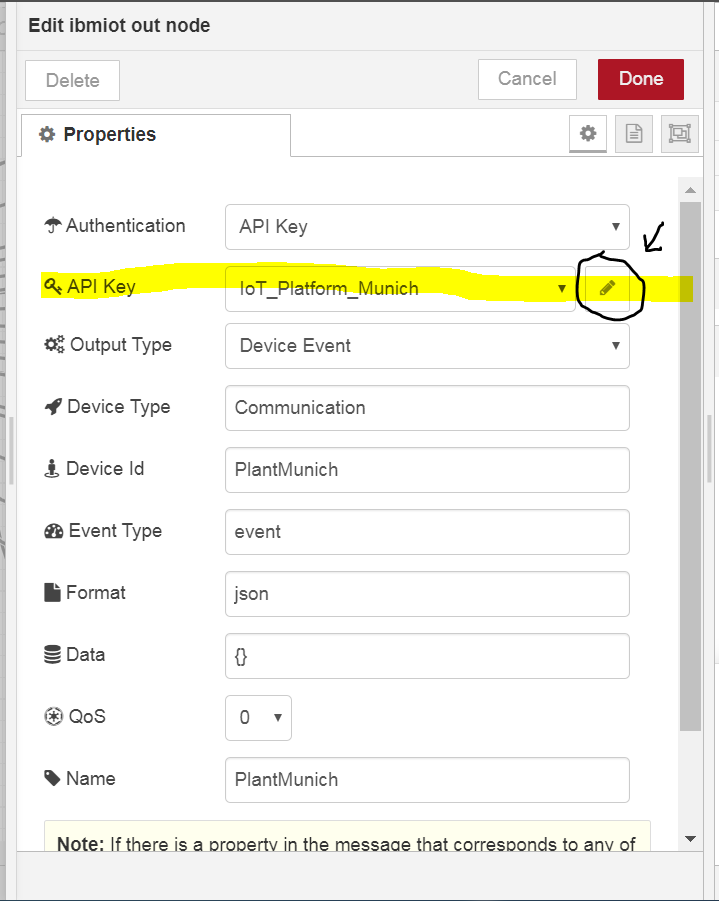
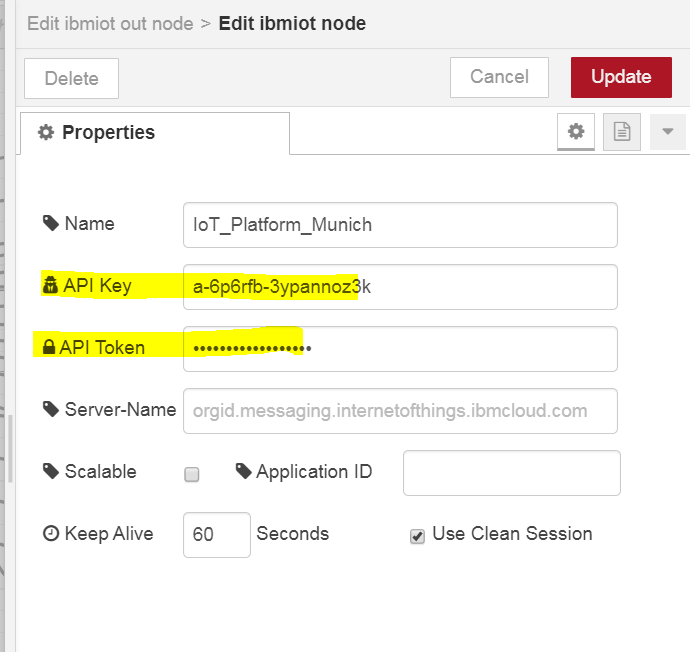


Figure 9: Raspberry Pi Node RED 2 Figure 10:Raspberry Pi Node RED 3

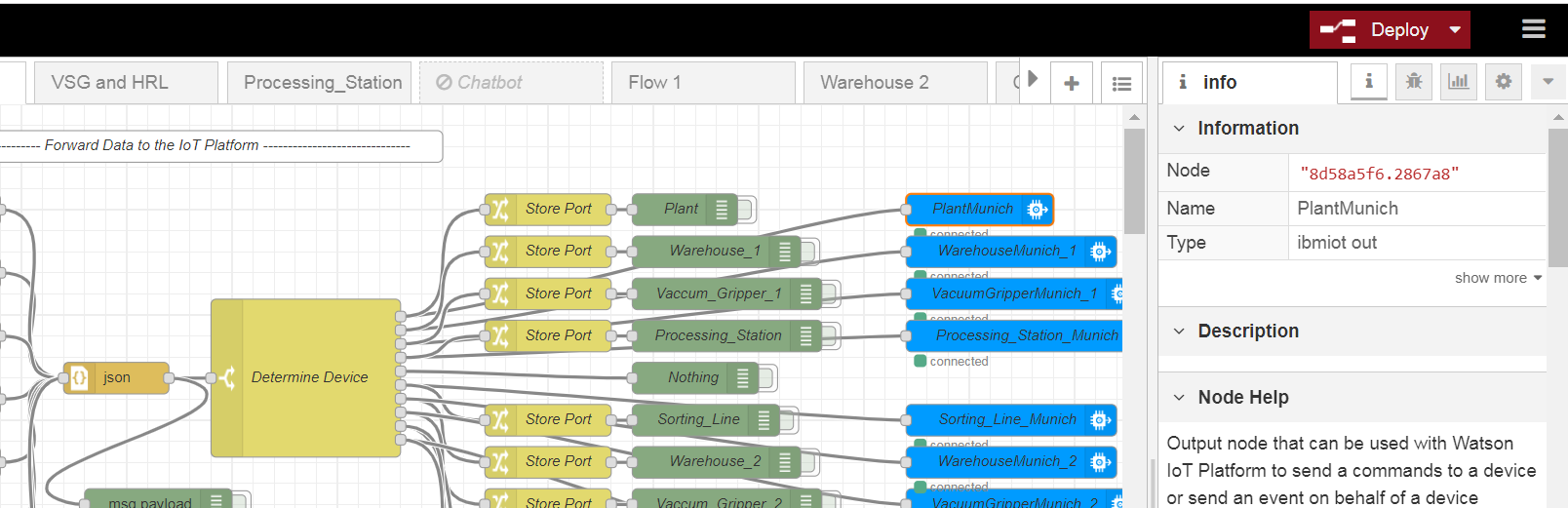


Figure 11:Raspberry Pi Node RED 4

* 1. Restore the connection to the Visual Recognition Pi

After you have updated the Raspberry Pi in the closet we must update the one responsible for the visual inspection. The procedure is almost the same. First search for the IP (producer=Edimax). Here are some screenshots:

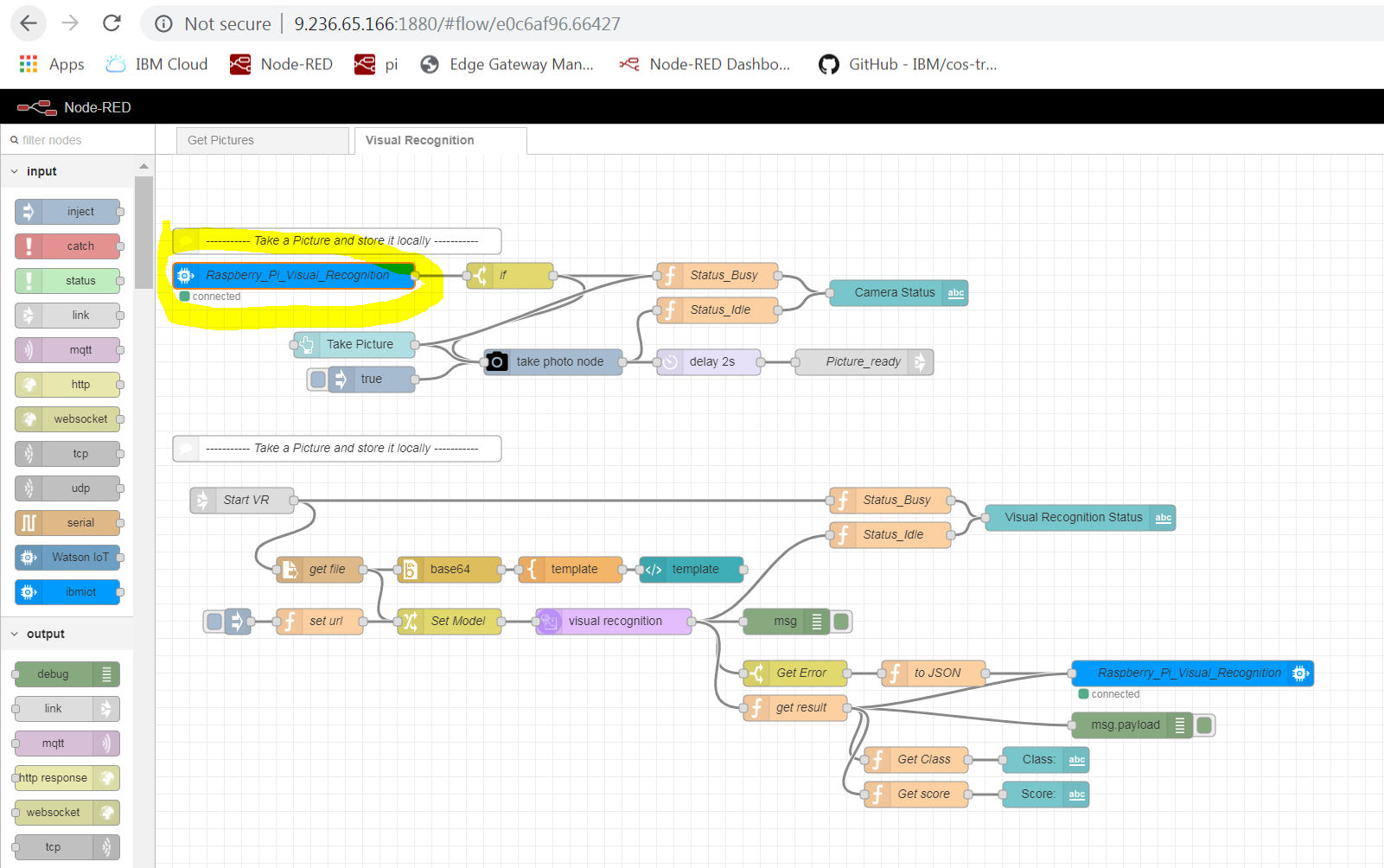


Figure 12: Visual Inspection Node RED 1

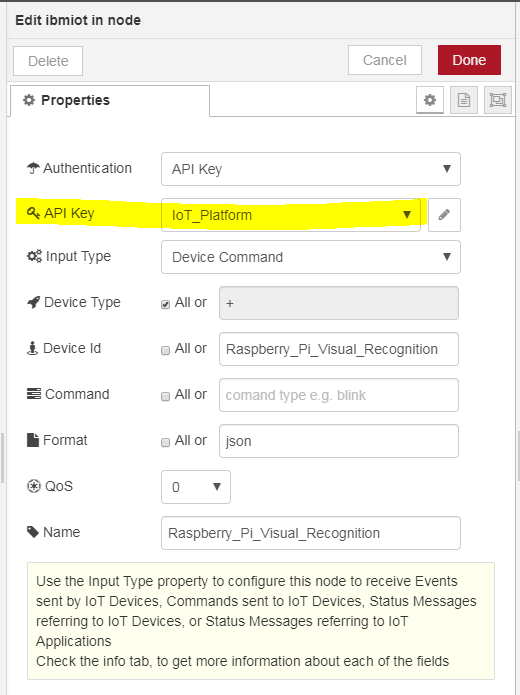


Figure 13: Visual Inspection Node Red 2

* 1. Restore the Connection to the Cloud Node-RED

Now you have updated the 2 Raspberry Pi’s. What is missing now is the Node-RED instance in the cloud. Go back to the [IBM Cloud](https://cloud.ibm.com/) and search for the deployed Node-RED instance named “Node-RED-Fischertechnik-Munich". Use the following login data:

Username: showroom\_Fischertechnik

Password: Cognitive4Facory2021

Once you are logged in the Cloud Node-RED instance you can perform the same steps as with the Raspberry pi’s. Select one IBM IoT node (again the blue ones) then update the API-key and authentication token and redeploy the flow.

When you have finished this step the connection between the 3 node-RED instances and the IoT platform should be fine again. You can check if everything works fine when calling the dashboard and check if the current temperature and humidity are displayed (Provided the system is switched on)

* 1. Update the cloud functions

After the connection to all the 3 Node-RED instances has been restored, you have to update the cloud function in the IBM cloud account ([eurbmtt@de.ibm.com](https://cloud.ibm.com/account/cloud-foundry/eurbmtt%40de.ibm.com?accountId=cb15a62293f89c173d53fca202e44d76)). The search for “functions” in the search bar as shown in Figure 11

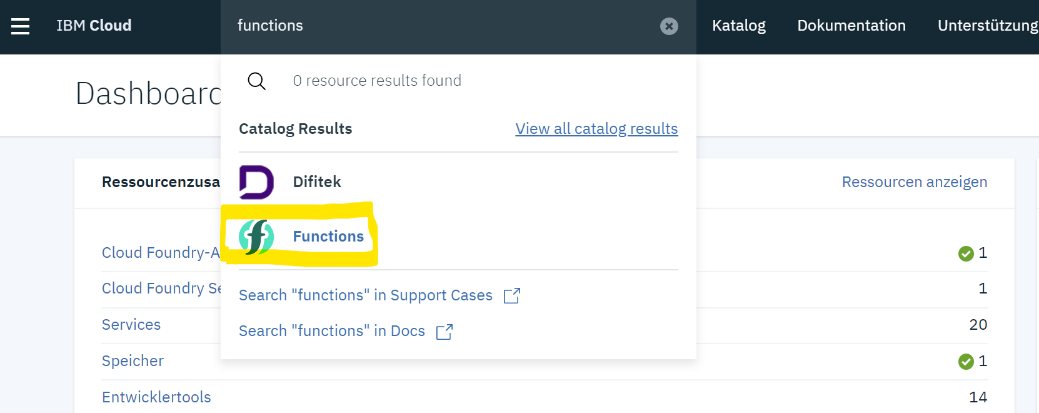


Figure 14: Search for Cloud functions

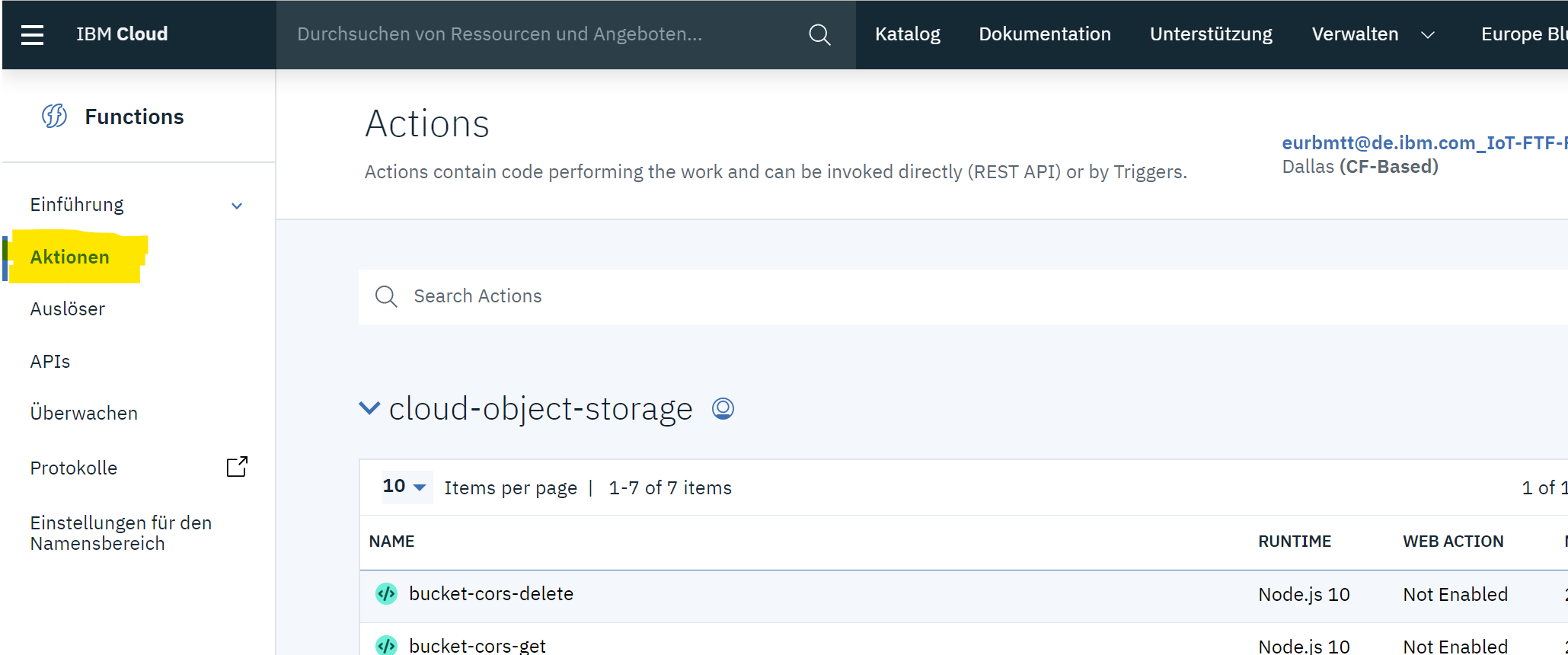


Figure 15: Cloud Functions overview

After you have been redirected to the Cloud functions page, switch to the “actions” tab as shown in Figure 12. Now you can see all the available cloud functions. They are devided in 3 categories/packages:

* cloud-object-storage (not important here)
* factory-cloudant-queries (used to make queries in the Cloudant database)
* factory-iotplatform-commands (used to send commands to the IoT platform)

All the functions of the last category (factory-iotplatform-commands) have to be updated, because they need the new credentials to access the IoT platform. First off all we need the organization ID of the newly created IoT platform. This one can be found after opening the IoT platform in the upper right corner. It has the following format: “6p6rfb”. The other values we need are the API-key and the authorisation token we already saved in a previous step. However, we cant insert these 2 values directly in the code of the cloud functions. Instead they must be base64 encrypted. For doing so use this [website](https://www.blitter.se/utils/basic-authentication-header-generator/) (See Figure 13). Enter the API-key as username and the authentication token as password. For the future steps wee need the created Authentification code.



Figure 16:Base64 encyption

Once we have all the necessary credentials, we can proceed to update the cloud functions. Every of the (at the moment) 11 cloud functions in the package ‘factory-iotplatform-commands’ have an integrated function named “concatUrl” (See Figure 14). In this function we have to make the changes. First update the created authorisation code an then the organization ID (both values are marked in Figure 14). After replacing the 2 values you must save the changes (click on the button). Afterwards you can test the code by clicking on “invoke”. When no error occurs you can switch to the dashboard and check if the Node-red has received the command (command should be in the waiting list of the concerned module). Repeat this for every of those 11 cloud functions.



Figure 17:ConcatUrl Function

* 1. Restore the connection to the Cloudant database

What’s missing now is the connection between