W&T connects

Interfaces for TCP/IP, Ethernet, RS-232, RS-485, USB, 20mA,
glass and plastic fiber optic cable, http, SNMP, OPC, Modbus TCP, I/O digital, I/O analog, ISA, PCI
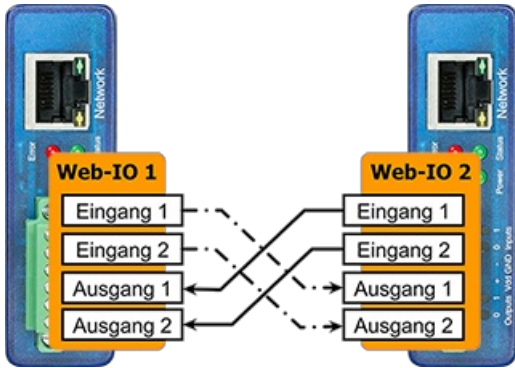
W&T

www.WuT.de

Practical example for transmitting switching states

Box-2-Box via MQTT with Web-IO 4.0
with CloudMQTT as broker

This step-by-step manual explains the setup of Box-2-Box operation of the Web-IO 4.0 Digital via the Internet of Things.

In Box-2-Box mode you connect two Web-IOs together so that switching signals present on the inputs of the one device are transmitted via MQTT to the outputs on the other device. The broker is CloudMQTT, a commercial, free provider for smaller applications.

To familiarize yourself with MQTT we recommend the page "Communication in the Internet of Things."

Structure of the MQTT system

To synchronize the in- and outputs, both Web-IOs exchange messages via MQTT. Each Web-IO publishes the states of its own inputs as a publisher to the broker.

At the same time the input states of the other device are received as a subscription. When a device receives a state change on an input of the opposite device, it changes the state of its corresponding output.
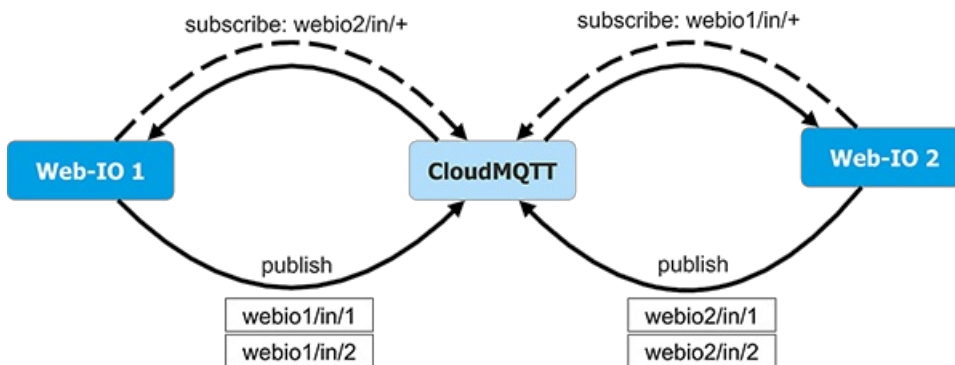
Part 1: Setting up the MQTT broker

To set up an MQTT communication system, you first need a broker. This serves as a messaging center and coordinates the communication flow between the participants.

In this manual a free, public broker for smaller applications called CloudMQTT is used. For larger scale use there are a large number of other providers available. With commercial and free software solutions you can also run your own MQTT brokers in the Internet or Intranet. Ready--to-use hardware appliances are available, from IBM for example. A detailed overview can be found on the page "MQTT Resources".

Broker authentication requires each Web-IO to have a user name and password. To ensure that no other device connected to the broker sends messages for the device topics, access authorization via ACLs is set up.

Summary of the broker configuration

|	Web-IO 1	Web-IO 2
User name	webio1	webio1
Password	Super$afe123	Super$afe123
Write access to	webio1/in/#	webio2/in/#
Read access to	webio2/in/#	webio1/in/#

	Web-IO 1	Web-IO 2

[info] Use of the wildcards + and # eliminates the need for explicitly list the rights for each individual topic. The + stands for all elements in a level of hierarchy, whereas # represents the entire subtree below a level.
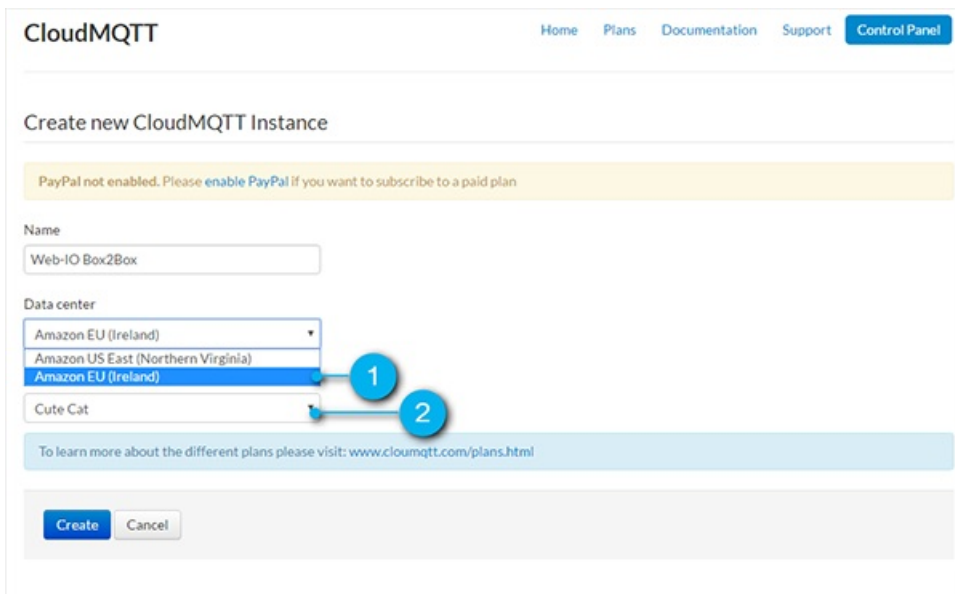
Creating a broker account

CloudMQTT offers the "CuteCat" package, a free online broker for up to 10 devices.
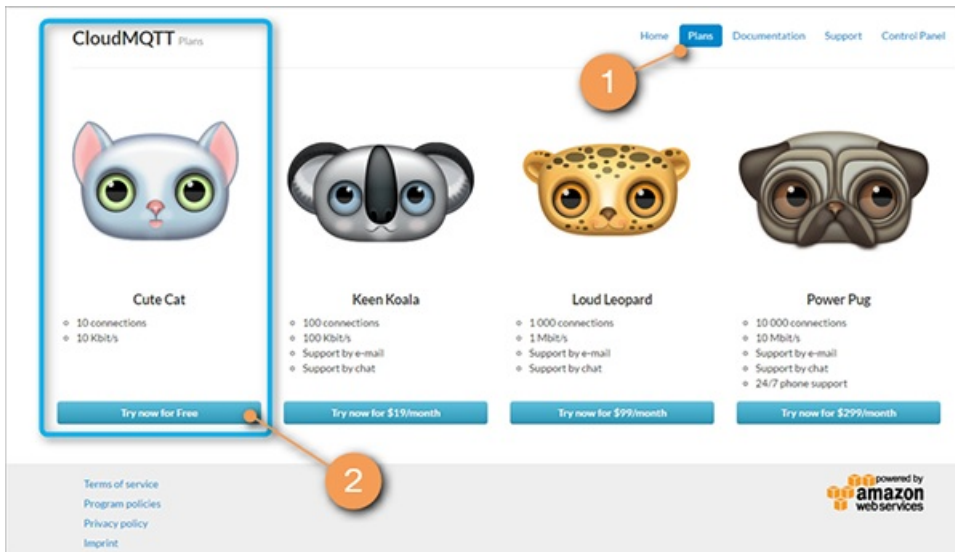
1 Open the site www.cloudmqtt.com and select the 'Plans' menu item.

2 Select the free plan CuteCat and follow the instructions on the screen.

Creating a broker instance

After logging on in the control panel you can create a new broker.

1 Select the Amazon data center in **Ireland** as well as

2 the free plan **CuteCat**.

Configuring the broker for Box-to-Box use

On the details page you can make the necessary settings of your broker for the Web-IO Box-2-Box application.

1 Next to your broker instance click on **Details**

Creating users

1 Create the users webio1 and webio2, each with the **2** password Super$afe123.

Assigning access rights

Now create the Access Control List (ACL). Here you will specify for each user **1** the rights **2** he has for writing **3** on a topic.

Recording connection data
In the last step scroll down to the very bottom of the details page and write down the connection data for your broker.

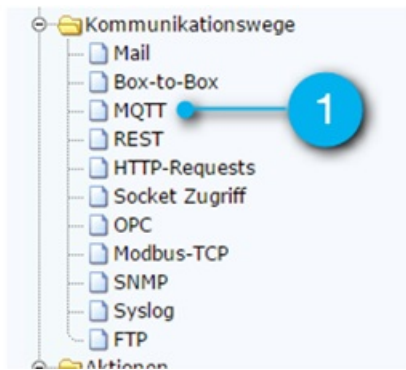You need the server address **1** and the port **2** .

Part 2: Setting up the Web-IOs

MQTT basic settings

Open the Web interface of the first Web-IO as described in the user's manual. Then log on with the administration user.

1 In the configuration area select the menu item **Communication paths >> MQTT**.

Now provide the connection data for the MQTT broker.

1 **Activate** MQTT.

2 Enter the **user name** for the first Web-IO.

3 Enter the corresponding **password**.

4 Finally, enter the **host name** and the

5 **port** of the MQTT broker.

6 For the Box-2-Box application to function, you must enable the outputs for **MQTT**.

After clicking on the **Apply** button the device shows a green checkmark to indicate that the changes have been applied.

Configuring actions for the inputs

An action determines how the Web-IO responds to a trigger. In addition to the general specifications 'Designation' and 'Activation status', an action consists of a trigger and an action which is performed when the trigger is applied.

When there is a state change on a device input, the other device needs to be informed of this via MQTT. This means an action is created for each input which performs an MQTT Publish when there is a state change.
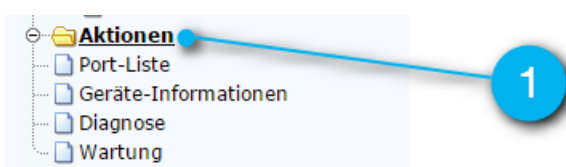
1 In the configuration area select the menu item **Actions**.

WEBIO-CAFE28 >> **Aktionen**

Aktionen

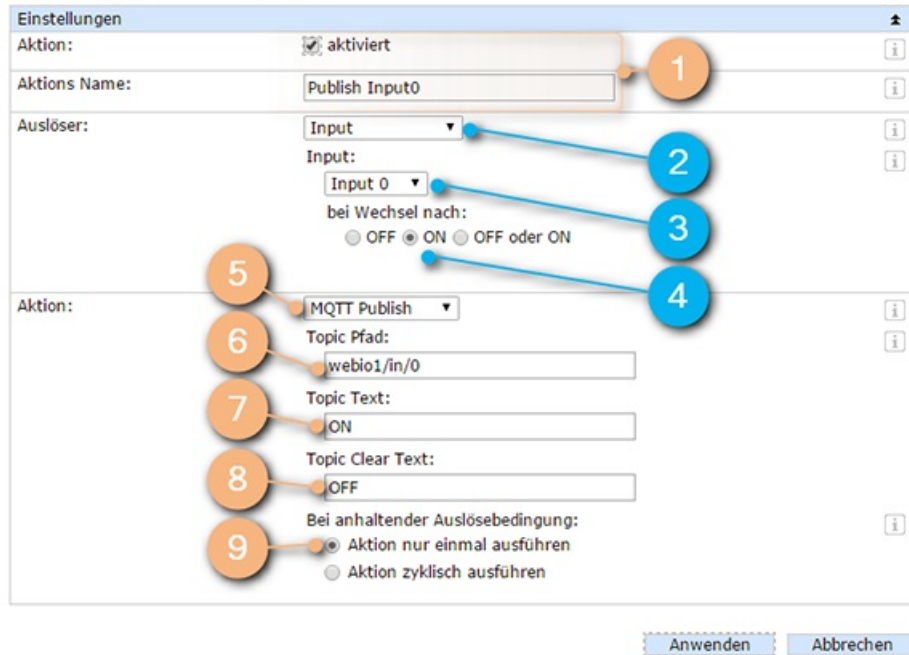Alarm Email, SNMP-Trap oder einen Output schalten. Bestimmen Sie, welche Aktion das Web-IO ausführen soll, wenn eine bestimmtes auslösendes Ereignis eintritt. So können Sie z.B. festlegen, dass bei Zustandsänderung an einem bestimmten Input eine Email verschickt wird.

Hinzufügen ●────────────────────**2**

2 Now click on the **Add** button.

Neue Aktion
Konfigurieren Sie hier die geplante Aktion

Einstellungen		⬆
Aktion:	☑ aktiviert	i
Aktions Name:	Publish Input0 **1**	i
Auslöser:	Input ▼ **2**	i
	Input:	i
	Input 0 ▼ **3**	
	bei Wechsel nach:	
	○ OFF ◉ ON ○ OFF oder ON **4**	
Aktion:	**5** MQTT Publish ▼	i
	6 Topic Pfad:	i
	webio1/in/0	
	7 Topic Text:	
	ON	
	8 Topic Clear Text:	
	OFF	
	Bei anhaltender Auslösebedingung:	i
	9 ◉ Aktion nur einmal ausführen	
	○ Aktion zyklisch ausführen	

Anwenden | Abbrechen

General information

1 **Activate** the action and assign a logical name. This allows you to more easily identify the action on the overview page and in the menu.

Instructions for the trigger

2 As the **trigger** select Input.

3 Select the first **input**, i.e. Input0.

4 Select for **when changing to** the value ON.

Instructions for the performed action

5 As action select **MQTT Publish.**

6 The messages for the first output of the first device are published under the **Topic** "webio1/in/0".

7 For **topic text** select "ON" as the message contents which should be published when the trigger is applied.

8 For **Topic Clear Text** enter the message contents to be sent when the trigger is no longer present. This is the case when the output is switched to OFF.

9 The message should be sent only once when the event occurs. Therefore select here "Perform action only once".

Then specify an action with the corresponding values for Input 1 (Topic: webio/in/1).

Setting up actions for the outputs

Neue Aktion
Konfigurieren Sie hier die geplante Aktion

Einstellungen			⬆
Aktion:	☑ aktiviert		[i]
Aktions Name:	Out0: on		[i]
Auslöser:	MQTT Subscribe ▼		[i]
	Topic Pfad:		[i]
	webio2/in/0		
	Topic Text:		
	ON		
Aktion:	Output schalten ▼		[i]
	⦿ Output dieses Web-IO schalten		
	Output 0 ▼		[i]
	In Zustand:		
	○ OFF ⦿ ON ○ UMSCHALTEN		
	○ Outputs eines anderen Web-IO schalten		

1 **2** **3** **4** **5** **6** **7** **8**

Anwenden   Abbrechen

General information

1 **Activate** the action and assign a logical name.

Instructions for the trigger

2 Here you select **MQTT Subscribe**

3 The **Topic** is "webio2/in/0" for the first input on the second device

4 **Topic text** stands for the received message contents, in this case "ON".

Instructions for the performed action

5 As the **action** "Switch output" is selected

6 A **local** output should be switched

7 The **output** which is switched is Output 0

8 The status which is set is **ON**

Now specify the three missing actions for "Output0 off", "Output1 on" and "Output1 off":

Title	Topic	Topic text	Action	Status
Output0 off	webio2/in0	OFF	Switch Output0	OFF
Output1 on	webio2/in1	ON	Switch Output1	ON
Output1 off	webio2/in1	OFF	Switch Output1	OFF

[info] Why are the switching actions carried out for the outputs individually?

If you want to save two actions, it may occur to you to send the message "TOGGLE" when there is a status change and select "TOGGLE" as the action instead of explicitly indicating the status change.

We do not advise this: The MQTT service quality for the Web-IO is set to QoS1. This means messages are repeated until the target has confirmed receipt.

If a confirmation gets lost due to a transmission error, the toggle message is sent again and the target switched once more. In this case both devices are no longer in synch.

Configuring second Web-IO

In the last step send the configuration to the second Web-IO. Don't forget to alter users and topics!

Actions for the outputs

Title	Topic	Topic text	Action	Status
Output0 on	webio2/in0	ON	Switch Output0	ON

Title	Topic	Topic text	Action	Status
Output0 off	webio2/in0	OFF	Switch Output0	OFF
Output1 on	webio2/in1	ON	Switch Output1	ON
Output1 off	webio2/in1	OFF	Switch Output1	OFF

Actions for the inputs

Title	Topic	Topic text	Clear Topic Text	when changing to
switch Input0	webio2/in0	ON	OFF	ON
Switch Input1	webio2/in0	OFF	OFF	OFF

Try it yourself

Would you like to try out MQTT? Our Web-IO Digital is the ideal entry into the IoT universe. Simply request the Web-IO Digital as a sample. If the sample is returned within 30 days, you pay only the return shipping costs. To keep the test unit, simply pay the accompanying invoice.

Questions about the Web-IO Digital with MQTT?

Mr. Thiel is ready to help you with any questions.
Phone: +49 202/2680-110 (Mon.-Fri. 8 a.m. to 5 p.m.)
E-mail: f.thiel@wut.de

W&T
www.WuT.de

We are available to you in person:

Wiesemann & Theis GmbH
Porschestr. 12
42279 Wuppertal
Phone: +49 202/2680-110 (Mon.-Fri. 8 a.m. to 5 p.m.)
Fax: +49 202/2680-265
info@wut.de

Data Privacy