

W&T

www.WuT.de

Operating instructions

Commissioning and application

MQTT.box

valid for the product:
#55990 MQTT.box

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Errors and omissions excepted:

Because we can make mistakes, none of our statements should be used without verification. Please report any errors or misunderstandings that come to your attention so that we can identify and correct them as quickly as possible.

Only carry out work on or with W&T products if it is described here and you have read and understood the instructions in full. Unauthorized action can cause hazards. We are not liable for the consequences of unauthorized actions. In case of doubt, please contact us or your dealer again!

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1. Security and law

Notes

This manual contains instructions concerning your personal safety. They are introduced by a signal word expressing the seriousness of the danger:


DANGER means an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING indicates a possible hazard that could result in death or serious injury.

CAUTION indicates a possible hazard that may result in injury.

In each case, the signal word of the highest applicable hazard level is used in a warning. This means that if there is an indication of danger to life, there may also be a danger of injury.

If a warning refers to an entire section or to a sequence of work steps, it precedes them and is structured as follows.

 SIGNAL WORD	Nature and source of the hazard
Consequences of the danger	
➔ An action step to avert the consequences of the danger	
➔ Another action step to ward off the consequences of the danger	

A warning notice that refers to an individual work step immediately precedes it and is structured as follows:

1. Previous work step

 **SIGNAL WORD: Nature and source of the hazard**

Consequences of the danger

➔ Action step to avert the danger

➔ Further action step to avert the danger

2. Work step to which the note refers

3. Subsequent work step

Some other information within this guide is also highlighted:

! Note: Risk of property damage imminent

Circumstances that can lead to property damage

i General information

General information on the following text section

📖 Further information

Reference to further information

P Produkt

The following section refers only to a specific product.

👤 Target groups

The following section or sequence of actions is aimed at a specific target group.

Instructions for action

Tasks for achieving specific goals are instructions for action in the form of step-by-step instructions. These have the following structure:

🎯 Solve task

The introductory paragraph summarizes the task and points out general prerequisites needed to perform it. The following is a list of

- items needed for implementation and
 - concrete requirements that must be met
1. first action step
 2. second action step
 3. third action step

Achieved result and, where applicable, a performance review.

Other design elements

References to websites:

 www.wut.de

User input:

129.11.121.1


Sourcecode:

```
print(„This is a programming example“)
```

Emphasis in text:

Identifiers, such as **button labels**, are highlighted in the body text.

Qualified personnel

 **WARNING** Danger to life due to electric current

Improper installation can lead to accidents with electric current

- ➔ Installation by qualified personnel only
 - ➔ Observe documentation
 - ➔ Observe safety regulations
-

The products described in this manual may only be installed and started up by personnel qualified for the task in hand. The documentation corresponding to the respective task must be observed; in particular the safety and warning instructions contained therein.

Qualified personnel, based on their training and experience, are capable of recognizing risks and avoiding possible hazards when handling the products described.

Intended use

The MQTT.box is a communication gateway for networking systems that implement the MQTT protocol. It is intended to be permanently installed in control cabinets. Any other use is not in accordance with the intended purpose. Wiesemann & Theis GmbH is not liable for any damage resulting from improper use.

Product modifications

Product modifications are not permitted. Wiesemann & Theis GmbH shall not be liable for any damage resulting from unauthorized product modification.

Electrical safety

- Before starting any work on the MQTT.box, completely disconnect the power supply by taking suitable measures and secure it against being switched on

again.

- Only use the device in closed and dry rooms.
- Do not expose the device to high ambient temperatures or direct sunlight. Observe restrictions with regard to the maximum ambient temperature.
- Keep ventilation openings free and maintain a distance of at least 10cm between the MQTT.box and neighboring heat sources.
- Observe nominal values for input voltage and output currents.
- During installation, ensure that no free-hanging wires protrude into the interior of the device. Make sure that no individual wires are sticking out of stranded wires. Use wire end ferrules.
- Screw the terminals tightly.
- Screw down unused terminals.
- Only use power supplies that ensure safe isolation of the low-voltage side from the supply mains in accordance with EN62368-1 and have „LPS“ property.

Electromagnetic compatibility

! Note: Electromagnetic interference

To ensure electromagnetic compatibility, use only shielded network cables!

The MQTT.box meets the industrial limits for immunity as well as the stricter emission limits for household and small business. There are no EMC-based restrictions with regard to the usability of the devices in these environments.

Conformity to standards

📄 Complete declarations of conformity

The complete declarations of conformity for your device can be found on the associated online data sheet at www.wut.de/55990

The MQTT.box is compliant with the following standards and normative documents:

- EN 55032: 2012 Kl. B
- EN 61000-3-2: 2014
- EN 61000-3-3: 2013
- EN 61000-4-2: 2009
- EN 61000-4-3: 2006 + A1: 2008 + A2: 2010
- EN 61000-4-4: 2012
- EN 61000-4-5: 2014 +A1

- EN 61000-4-6: 2014
- EN 61000-4-8: 2010
- EN 61000-4-11: 2004
- EN 61000-6-2: 2005
- EU Directive 2011/65/EU (RoHS)

Storage

Store the MQTT.box in a dry room. Make sure to comply with the ambient conditions. The temperature must be between -40°C and +70°C, the humidity must not exceed 95% rel. humidity. We recommend storage in the original packaging.

Transportation

No special restrictions apply with regard to transport. To protect the product from mechanical stress, we nevertheless recommend transporting it exclusively in its original packaging.

Disposal

Electronic devices must not be disposed of with household waste, but must be taken to a professional electronic waste disposal. The MQTT.box is marked according to 2012/19/EU on waste electrical and electronic equipment. This directive regulates the Europe-wide take-back and recycling of waste electronic equipment. You can dispose of the device via existing collection and return systems or return it to your specialist dealer.

2. Product information

Manufacturer

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Porschestr. 12
42279 Wuppertal
Germany

Tel: +49 (0)202 26800
Fax: +49 (0)202 2680265
E-Mail: info@wut.de
www.wut.de

WEEE registration: DE 77008276
BattG registration: 21000788

Product labeling

The unique identification of the product type is done via the article number on the device label. The unique device identification is found in the form of the MAC address on the underside of the device. This consists of twelve characters (six bytes in hexadecimal representation), starting with the manufacturer identification 00:c0:3d. The following 6 characters uniquely identify your device.

***i* Damage to or loss of the device label**

Part number and MAC address can be read out via the web interface and via the WuTility tool (www.wut.de/wutility) if the device label is damaged or lost.

Scope of delivery

The scope of delivery includes:

- MQTT.box (#55990)
- Connector (#11111)
- Quick guide
- Device passport
- Risk information

Accessories and spare parts

For reliable operation we recommend the use of original W&T accessories:

Connector (#11111)

2-pole, 5.08 mm pitch for power supply connection

www.wut.de/11111

Power supply with Euro plug (#11021)

Output: 24V DC, 500mA, energy efficiency: Level VI, no-load power < 0.075W

www.wut.de/11021

15 Watt Top Hat Rail Power Supplyl (#11080)

Universal LPS power supply with wide range input 100-240V, 1 TE



www.wut.de/11080

Ethernet-Switch Industrie, 4 Port (#55604)

Industrial PoE switch with four ports

www.wut.de/55604

Symbols on the products

Symbol	Explanation
	CE marking The product complies with the requirements of the applicable EU directives.
	WEEE marking The product must not be disposed of with household waste, but in accordance with the disposal regulations for electrical waste applicable at the place of installation.

3. Installation

Installers

The following section is intended for the installers of the MQTT.box and assumes appropriate expertise.

Mounting in the control cabinet

Mount on top hat rail

Note: Risk of property damage imminent

Please observe the safety instructions in chapter 1.

The MQTT.box can be mounted on DIN rail (TH 35).

1. Place the MQTT.box slightly angled upwards with the receptacle on the upper edge of the top-hat rail.
2. Press the device against the top-hat rail from the top front until the holder clicks into place.

The MQTT.box is now firmly mounted on top-hat rail.

Set up power supply

Set up power supply via PoE

The MQTT.box can be electrically supplied via network socket 1 as a device of power class 2 via PoE according to IEEE802.3af. For this you need

- A PoE switch or a PoE injector

1. Connect the network socket 1 of the MQTT.box to the PoE switch / the PoE injector via a shielded network cable.

The MQTT.box starts operation.

Set up power supply via external power supply unit

WARNING Danger to life due to electric current

The use of an incorrect power supply can lead to accidents with electric current and fire

- ➔ Only use power supplies according to the specification
 - ➔ Observe documentation
 - ➔ Observe safety regulations
-

The MQTT.box can be supplied with voltage via an external power supply unit. Such a power supply must be potential-free and the reference ground for the output voltage must not have a direct connection to the protective earth. Furthermore, a safe isolation between the extra-low voltage side and the supply network according to EN60950-1, as well as LPS property are mandatory.

- a power supply unit that meets the specifications (see Accessories section)
- a screwdriver

1. Attach the green terminal adapter to the power supply unit
2. Plug the green terminal adapter into the socket on the device

The MQTT.box starts operation.

Connect network cable

The MQTT.box is equipped with two network interfaces. These network interfaces can be configured independently in the user interface. For the connection to a network you need:

- a patch cable

1. Connect the MQTT.box via a patch cable to the network in which you want to integrate the device.

The MQTT.box is connected to the network.

4. Commissioning

Network Administrator

This section is intended for network administrators and assumes knowledge of network configuration. If you as a user do not know what to do with the steps described here, please contact your system administrator.

Make network settings

To perform the tasks described below, you will need the following information:

- MAC addresses of the devices to be configured
- Network parameters of the device to be configured: IP addresses, subnet definitions, gateways, DNS and time servers.

Make network settings via the WuTility


In this section, you assign a basic network configuration to the MQTT.box using the WuTility configuration software. If you want to configure multiple devices, make a note of the respective MAC addresses, which you can find on the bottom of the device. For the implementation you need:

- a current web browser
 - the software WuTility ( www.wut.de/wutility)
1. Open the Wutility
 2. Select the device you want to configure by its MAC address from the list of available devices.
 3. In the toolbar at the top, click the **IP Address** button
 4. Set the desired network parameters
 5. Click **Next**

The MQTT.box adopts its setting and then restarts.

Make network settings via DHCP

If automatic configuration via DHCP is enabled in your network, your box will obtain a configuration after you have connected it to the network. To find out the IP address of your MQTT.box, you need either

- Access to the leases of your DHCP server, for example via the log file or via the display of network subscribers on your router.
- the software WuTility ( www.wut.de/wutility)

1. Open the log file of your DHCP server or the overview of the network participants at your router to determine its IP address based on the MAC address of the MQTT.box.
2. If necessary, configure a fixed lease for the MQTT.box so that it is always accessible under the same IP address.

The MQTT.box can now be reached via the IP address assigned by the DHCP server.

Make network settings via the default IP

In this section, you assign an IP configuration to the MQTT.box via the web interface. To do this, use the preset default IP of the device. For the implementation you need:

- Administration rights for the network interface of your PC
 - a current web browser
1. Assign a temporary or secondary IP configuration to your network interface on network 190.107.233/24.
 2. Open your web browser.
 3. Enter the IP address 190.107.233.110 in the address line.
 4. Log in as an administration user.
 5. Click on **Basic Settings**.
 6. Click **Network**.
 7. Enter the desired network configuration.
 8. Click the **Save** button at the bottom right.

The MQTT.box adopts your setting and is accessible via the assigned IP address.

Call web interface

Calling up the web interface via IP address

The web interface can be accessed via the IP address of the MQTT.box.

1. Open your web browser.
2. Enter the IP address of the MQTT.box in the address bar.

The web interface is displayed.

Calling up the web interface via the WuTility

The web interface can be accessed via the WuTility.

1. Open the WuTility.
2. Select the device whose web interface you want to access from the list of

available devices.

3. Click the **Browser** button in the toolbar at the top.

The web interface of the MQTT.box is opened in your web browser.

Make language settings

The web interface is available in German and English translation.

1. Click the **circle with the country flag** in the upper right corner of the web interface.
2. Select the language in which you want the web interface to be displayed based on the country flag.

The language of the web interface changes.

Make further settings via the web interface

General notes on the web interface

All other settings of the MQTT.box are made in the administration area of the web interface. Here you will find the following controls:

- Crumb navigation (top)
- Administration menu (left)
- Save button
- Reload button
- Buttons in dialog boxes

Log in administration user

To make settings via the web interface, you must first log in as an administration user. No password is set in the delivery state.

1. Call up the web interface.
2. Click the **Login** button in the upper right corner of the user interface.
3. Specify the password for the administration user, if you have assigned one.
4. Click **Login**.

You can now make settings via the web interface.

Configure second network interface

The device can be connected to another network segment via the second network interface.

1. Log in to the web interface as an administration user.
2. Click **Network** in the **Basic Settings** section of the Administration menu.


3. Make the configuration of the second network interface.
4. Click **Save** to apply the changes.

The second network interface can now be used.

Set date and time

i **Manually set time is not stored permanently**

Note that a manually entered time will be lost after a few days if the power supply is interrupted.

The MQTT.box is set in the delivery state so that the time is automatically obtained from  ntp.org when Internet access is functioning. Alternatively, you can configure your own time servers or specify the time manually.

1. Open the web interface as an administration user.
2. Click the **Basic Settings** button in the **Administration menu**.
3. Then click **Date and Time**.
4. Activate the **External time server** option and specify up to two time servers. Alternatively, deactivate the External time server function and specify the current time in Manual configuration.
5. Select the **time zone** that applies to the device location.
6. Click **Save**.

The MQTT.box takes over the configuration for date and time.

Change device information

The MQTT.box displays information about the device and the manufacturer on the web interface. In the delivery state, this information refers to the product and to Wiesemann & Theis as the manufacturer. You can customize this information, for example if you use the MQTT.box as a component in your own product.

1. In the administration area, under the **Basic settings** menu item, select **Information**.
2. Enter details about the product in the **Device Information** area.
3. In the **Manufacturer Information** area, enter information about the manufacturer.
4. Save the changes.

On the start page of the MQTT.box, the changed information is displayed under the menu item „Properties“.

Set/change login password

Note: Danger from cyber attacks

No login password is set in the factory setting. To prevent unauthorized access, you should set a secure password for the administration area.

To protect the MQTT.box from unauthorized access, the administration area can be protected by a password.

- To set or change a password for the administration area, you must be logged in to the administration area.

1. Select **Password** in the left menu under the **Basic Settings** item.
2. To set a password for the first time, click the **Set password** button. If a password is already set, click the **Change password** button.
3. Enter the new password in the dialog box and confirm it by entering it again.
4. Then click the **Save** button.

The administration area of the MQTT.box is now password protected.

5. Configuration of the MQTT broker

Introduction to the MQTT protocol

These instructions cover the commissioning and configuration of the MQTT.bro. For an overview of the functionality and various application scenarios for the MQTT protocol, see our topic page www.wut.de/mqtt.

Basic settings for the MQTT service

Enable MQTT broker

To use the MQTT service, you must enable it.

1. Open the web interface as an administration user.
2. Click the **Broker** button in the Administration menu under the **MQTT Settings** item.
3. In the Broker area, select the **Enable** checkbox.
4. Click **Save**.

The MQTT service is started.

Configure MQTT port

The default port assigned by IANA for the unencrypted MQTT service is port 1883. For TLS-encrypted MQTT, the default port is 8883. You can customize these ports for your needs.

1. Click the **Broker** button in the left menu under the **MQTT Settings** item.
2. In the **Broker** area, specify the desired port in the **MQTT Port** field.
3. Click the **Save** button to apply the changes.

The MQTT port is now configured.

Enable TLS encryption for the MQTT service

Note: Risk from cyber espionage

Unencrypted MQTT communication can be read.

To encrypt the communication between the MQTT.box and its clients, enable TLS (Transport Layer Security).

1. Click the **Broker** button in the Administration menu under the **MQTT Settings** item.
2. In the **Encryption** area, select the **SSL/TLS certificate** option.
3. To issue the server certificate for host names in addition to the IP addresses of the two network interfaces, specify them, separated by commas, in the **Device name(s) (DNS)** field.
4. Click the **DOWNLOAD SERVER/CA-CERTIFICATE** button.

The generated multi-domain certificate can now be installed on the clients. Please refer to their product documentation. Afterwards, the encrypted communication between MQTT.box and the clients is established.

Set access rights for the MQTT service

Access to the MQTT service can be granted in three different ways:

- anonymous access
- Access with user name and password
- Access restrictions through access control lists (ACL)

Note: Danger from cyber attacks

Allow anonymous access only if you can assume a secure environment. This option allows an attacker to read or manipulate MQTT communication.

Information: Higher security through the use of ACLs

By using ACLs for access control of anonymous and authenticated users, read and write permissions can be reduced to individual topics.

Enable user management

Access via user and password allows authenticated users to participate in MQTT communication.

1. Open the web interface as an administration user.

2. Click the **User Management** button in the left menu under the **MQTT** item.
3. In the **Authentication** item, activate the **User and Password** option.
4. Click **Save**.

MQTT communication for authenticated users is now enabled. If the use of ACLs is disabled, every created user gets full access to all topics.

Set up user

By setting up users, you grant different systems access rights to the MQTT service.

1. Open the web interface as an administration user.
2. Click the **User Management** button in the left menu under the **MQTT** item.
3. Click **Add**.
4. Enter a user name and password in the following dialog.
5. Accept the entries with **Add**.
6. Click **Save**.

MQTT communication for the created user is now enabled. Set up ACLs to further restrict access rights.

Allow anonymous access

By enabling the anonymous user, any system can access the MQTT service without having to authenticate.

1. Open the web interface as an administration user.
2. Click in the left menu under the item **MQTT** on the button **User Management**.
3. Activate the **Anonymous access** option in the **Authentication** section.
4. Click **Save**.

Anonymous systems can now access the MQTT service. If the use of ACLs is disabled, these systems have full access to all topics.

Enable access restrictions via Access Control Lists

With ACLs enabled, user access rights (including those of the anonymous user) can be configured.

1. Open the web interface as an administration user.
2. Press the **Access Control List (ACL)** button in the left menu under the **MQTT** item.
3. Set the **Enable** option in the **Access Control List (ACL)** area.

Control of access rights via ACLs is now enabled.

Set up Access Control Lists (ACL)

Setting up Access Control Lists allows configuring access rights for all MQTT users including that of the anonymous user at the topic level.

- To create an authorization, at least one user must be created or anonymous access must be allowed.

1. Click the **Access Control List (ACL)** button in the left menu under the **MQTT** item.
2. Click the **Add** button to create a permission.
3. In the **Add ACL** entry dialog, select the user for whom an authorization is to be created.
4. Select the **access type** (read, write, read + write) for the permission.
5. Then, in a comma-separated list, specify the **topics** for which you are creating this permission. In addition to the wildcards # and +, you can also use the variables %c for the client ID and %u for the user name.
6. Accept the entries with **Add**.
7. Click **Save**.

The access restriction is now active.

MQTT-Log

The MQTT.box records events of the broker and provides this data for evaluation. The following event types are available:

- Error: Error
- Warning: Circumstances that can lead to errors
- Notice: Notes that are worth noting
- Information: General information about the broker
- Subscribe: MQTT-Subscribe-Events
- Unsubscribe: MQTT-Unsubscribe-Events
- Debug: debug information

Configure log level

By means of the log level you determine which broker events are to be recorded.

1. In the administration navigation, under the **MQTT** section, open the **Log** menu item.
2. In the **Log level** area, select the events you want to record. Betätigen Sie die Schaltfläche **Speichern**.

The selected events will now be recorded.

Download log outputs

The log outputs are available for viewing and downloading in the web interface.

1. In the administration navigation, under the **MQTT** section, open the **Log** menu item.
2. In the upper area you can view the past events.
3. Press the **DOWNLOAD MQTT-LOG** button to download the log outputs.

You will now find the log file named **mqtt.log** in your download folder.

Empty log outputs

Log outputs that are no longer needed can be deleted.

1. In the administration navigation, under the **MQTT** section, open the **Log** menu item.
2. Press the **Clear Log** button.

The memory is now cleared and the recording of events starts again from the beginning based on the selected log level.

6. Maintenance

Open housing

! Note: Risk of property damage due to electrostatic discharge

Electrostatic discharges can destroy components on the board. Therefore, if you do not have ESD equipment, touch the metal surround on the network interface before opening the housing to establish equipotential bonding.

Some maintenance work requires access to the circuit board. For this purpose, you can open the housing.

1. Remove the power supply and the network cables.
2. Dismount the MQTT.box from the DIN rail.
3. Touch the metal surround of a network socket to perform equipotential bonding.
4. Press the narrow housing sides of the MQTT.Box slightly together so that the plastic lugs on the long sides of the bezel detach from the housing body.
5. Pull off the front cover.

You can now pull the board out of your guide to perform maintenance.

Restore factory settings on the hardware side

Using a jumper inside the device, the MQTT.box can be reset to factory settings.

1. Open the housing of the MQTT.box according to the previous instructions.
2. Pull the board out of the guide.
3. In the center of the board you will find two jumpers, each of which is only on one contact pin.
4. Close the contact jumper of the jumper pointing to the rear side of the device.
5. Supply the board with voltage.
6. The recovery process is indicated by the following blink code: short on, long off.
7. Nach erfolgreicher Durchführung wird das Blinkmuster invertiert: Lang an, kurz aus.
8. Disconnect the board from the power supply.
9. Set the jumper back to the uncontacted initial position.
10. Close the housing.

You can now mount the MQTT.box again and put it into operation.

Restore factory settings on the software side

You can also reset the MQTT.box in the administration area of the web interface.

1. Click on the **Maintenance** menu item in the administration navigation.
2. Click the **FACTORY DEFAULTS** button in the **Reset** area
3. Confirm the reset in the following dialog.
4. Observe the status LED. During the reset, it flashes in the following pattern: short on, long off.
5. After successful execution, the flashing pattern is inverted: Long on, short off.

You can now start up the MQTT.box again.

Perform firmware update

This section describes a firmware update using the WuTility tool. For the execution you need:

- the software WuTility

 www.wut.de/wutility

- the latest firmware for your product

 www.wut.de/55990

1. Download the latest firmware from the above Internet address.
2. Unzip the zip file.
3. Open the WuTility.
4. Select the device whose firmware you want to update from the list of available devices.
5. Click the **Firmware** button in the toolbar.
6. Select the UHD file with the current firmware.
7. Click **Next** to perform the update.
8. Wait for the feedback in WuTility.
9. After successful update, click the Finish button to complete the process.

The MQTT.box restarts with the changed firmware and is accessible via the network again after a short time.

Warm start

You can restart the MQTT.box in the administration area of the web interface.

1. Click on the **Maintenance** menu item in the administration navigation.
2. Click on **RESTART DEVICE** in the **Reset** area.

3. Confirm the restart in the following dialog.
After a successful restart, the web interface is reloaded.

7. Decommissioning

Dismounting the device from the DIN rail

The MQTT.box can be easily detached from the DIN rail. For the implementation you need:

- a small slotted screwdriver

1. Remove the network cable and the power supply.
2. Below the MQTT.box there is a black tab at the height of the DIN rail. Use the screwdriver to pull it down.
3. Tilt the front of the MQTT.box upwards to lift the device from the DIN rail.

You can now maintain, store or dispose of the MQTT.box.

Proper disposal

Electrical appliances must not be disposed of with household waste.

1. Please dispose of the MQTT.box at the local collection point or return it to your specialist dealer.

Thank you very much!

8. Technical data

Online data sheets

Detailed information about the product, as well as tools and the latest firmware, can be found in the online data sheet at www.wut.de/55990.

Connections and displays

Network:	2 x 100/1000BaseT Autosensing/Auto-MDIX, RJ45
Galvanic isolation:	RJ45-Network connection min. 1500V
Supply voltage:	Power over Ethernet (PoE) or 24 ... 48V DC (+/- 10%) per screw terminal
Current consumption:	PoE Class 2 (3,84 ... 6,49W) typ. 140mA at 24V DC external supply
Displays:	LEDs for system, error and network status

Hardware and software

Processor and memory:	Marvell 88F6820 Flash: 4GB (eMMC) RAM: 1GB (DDR3)
MQTT broker:	Mosquitto

Housing and other data

Housing:	Plastic housing with integrated DIN rail mounting 105 x 22 x 77mm (L x W x H)
Weight:	approx. 100g
Storage temperature:	-40...+70°C
Operating temperature:	0...60°C
Permissible humidity:	0...95% Relative humidity, non-condensing



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