APPLICATION NOTE: **AN-0567**

AC500 & CP600 MQTT

FAQS

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1 Introduction

1.1 Scope of the document

The most raised questions regarding MQTT are listed here.

Please check also our Whitepaper for further information regarding Cyber Security. The most raised questions, regarding AC500 Cyber Security are listed here: FAQs

Some additional information can be found in the Automation Builder help.

1.2 Compatibility

The application note explained in this document has been used with the engineering system versions below. They should also work with other versions, nevertheless some small adaptations may be necessary for future versions.

- AC500 V2 or V3 PLC
- Automation Builder

1.3 Application Examples and Notes

You can find following application examples and notes for MQTT:

- AC500 MQTT & MS Azure - First steps and configuration
- AC500 MQTT & Mosquitto - First steps and configuration
- AC500 – MQTT library
- AC500 V3 as Drive MQTT Gateway
- CP600 MQTT – First steps and configuration

2 FAQs

2.1 General Information

2.1.1 Which PLC types are supporting MQTT?

AC500 V2: PM556 and above

AC500 V3: PM5032 and above

2.1.2 Which Panel types are supporting MQTT?

All active CP600 panels are supporting MQTT

The old CP600 1st generation panels are not supporting MQTT

2.1.3 How to resolve the domain name into an IP address?

- Function block ETHx_DNS_RESOLVE (V2) / EthDnsResolve (V3)
- For V3 PLCs with FW 3.7.0 or higher and Automation Builder 2.7 or higher a DNS server address can be set with the IP configuration tool. Then no additional function blocks are required in the code to resolve the IP address.
- In the panel the DNS Server address can be set in system settings – Network – DNS

2.1.4 What is the required hardware infrastructure to send data to the MQTT Broker?

- AC500 V2, V3 or CP600
- Gateway e.g. router that is able to establish the connection to the internet.

2.1.5 Is online change supported?

AC500 V2: Not supported

AC500 V3: Supported

2.1.6 Can the PLC or panel also work as MQTT broker?

No, the PLC and panel are only MQTT client. It is also not planned to support this in future.

2.1.7 Is a battery needed for MQTT functionality?

MQTT itself does not require a battery.

In most cases, encrypted communication via TLS is mandatory for cloud connection. TLS uses certificates which have a validation time and therefore date and time inside the PLC has to be up to date.

This can be archived via a battery (not needed for AC500-eCo V3).

Instead of a battery, a NTP client can be used. The combination of both is recommended to continuously update the date and time and to buffer it during power loss.

2.1.8 Can a coupler be used for MQTT communication?

AC500 V2: CM597-ETH is not supporting MQTT

AC500 V3: CM5640-2ETH is supporting MQTT

2.2 AC500 MQTT library

2.2.1 What is the correct library to be used for MQTT communication?

AC500 V2 has only one MQTT library

AC500 V3 has 2 MQTT libraries as of AB2.7.0

- AC500_Mqtt is compatible with the V2 library and can be used for existing and updated projects.
- MQTT Client SL is the new MQTT library for V3 with more functionalities. It's recommended to use this library for new projects.

Note: AC500_Mqtt is still supported but will no longer maintained in form of feature updates.

2.2.2 Can I easily update my project from AC500_Mqtt to MQTT Client SL library?

It is not possible to replace the function blocks one by one with the new library. The application example AC500 – MQTT library shows how the two libraries can be used for the same use case.

2.2.3 Is AC500 supporting Sparkplug protocol?

- AC500 V2 is not supporting Sparkplug protocol
- AC500 V3 has no tested Sparkplug library. An open-source libraries for sparkplug for AC500 V3 PLCs can be found in CODESYS Forge. ABB can neither confirm that the functionality in these libraries is compatible with AC500 V3 nor can support theses libraries.

2.3 CP600 MQTT interface

2.3.1 Where can I find the MQTT protocol in Panel Builder?

The "MQTT" object can be found below "Interfaces"

2.3.2 Where can I find documentation about the MQTT interface?

Please check: Help – Contents – Welcome – MQTT Interface

2.3.3 Is CP600 supporting Sparkplug protocol?

There is no specific support for Sparkplug at the moment. It's a feature that we are currently evaluating for inclusion it into Panel Builder.

2.4 Connectivity

2.4.1 Is a Router required to connect to the internet?

Yes, the PLC must be connected to the internet via router to securely communicate outside of the network, e.g. by establishing a VPN connection or by isolating the networks. The IP address and Gateway must be set accordingly, either by enabling DHCP for the PLC/CP600 or by set them manually.

2.4.2 Is a DNS server required in the PLC to connect to the internet?

The hostname of the MQTT broker must be resolved. This can either be done via EthDnsResolve (V3) / ETHx_DNS_RESOLVE (V2) or via a specified DNS server in the PLC. This can be set for AC500 V3 PLCS as of Automation Builder 2.7 using the IP-Configuration tool.

2.4.3 What is the minimum specification for internet connection e.g. internet speed?

There is no minimum bandwidth requirement. With 6 Mbit/s we were able to run a stable connection.

2.4.4 Do I need any special communication module or license to connect to the Internet?

In case internet connectivity has been established in a secure way (see 2.4.1) no further devices or licenses are required.

2.4.5 AC500 and CP600 support only Ethernet based internet. Is there any possibility to run MQTT, if customer has only a Wi-Fi connection available?

Yes, a router can be used as access point. Typically, routers have some ethernet interfaces to connect devices via cable. The router receives the Wi-Fi signal and forwards the information to the devices via the cable connection.
In addition, there are also Wi-Fi Repeater on the market available which provide the possibility to connect a network cable directly to it.

2.4.6 Does MQTT affect other protocols like Modbus TCP or reduce the communication speed?

Different protocols like Modbus TCP, MQTT, CODESYS ETH, UDP etc. can be used on the same ethernet slot. Depending on the load of the other protocols and the publish rate for MQTT the CPU load and ergo the response time can increase.

2.4.7 What is the limit of data which can be transferred by using MQTT in one cycle?

MQTT is TCP based which means maximum 1460-byte data can be transferred in a single telegram. If the payload is bigger, the TCP stack will separate it into multiple telegrams. This is TCP standard. For the maximum MQTT payload size there is only the limit of PLC memory / library parameters.

2.4.8 How can the publish rate be defined?

The communication speed is dependent of the cycle time in the PLC and how fast the MqttPublish() function block gets triggered.

In the panel it is configurable how fast the data should be published or if the publish is done event based on change (higher load)

2.4.9 Are there any limitation of tags in MQTT?

MQTT has no limitations of how many tags you can send to the broker.

The complexity and size limits of JSON payload can be changed with the library parameters of the MQTT Client SL / JSON Utilities SL library.

2.4.10 Can a parallel communication with multiple IOT Hubs be established?

Multiple instances of the MqttClient / MqttConnectWithCert function blocks can be used in parallel. The CP600 can only establish one MQTT connection at the same time.

2.4.11 In case of internet disconnection, is there any option in PLC to locally buffer the data and restore buffered data with the timestamp once the internet connectivity resumes?

The data will not be stored automatically if no internet connection is available. This must be programmed manually or using Data Logger library.

The ICMP Ping function block can be used to check if you can ping a server on the internet.

2.4.12 If data is stored with timestamp (data during the disconnection). How the system will prioritize the data transfer for current and old data (data from disconnection time).

There is no buffer or function that provides this feature. The system integrator is fully responsible for the reliability and priority of the data.

2.4.13 How fast data can be send/published to a broker?

It depends on the application, the cycle time, the PLC load, performance of the PLC type and the requirement. When an application publishes temperature values it’s mostly enough to publish this data each minute. Temperature changes are not so fast.
Some other applications, where fast calculations are required, the data can be published much faster, down to less milliseconds depending on the cycle time, PLC load and the performance of the PLC type.

2.5 Services in the Cloud

2.5.1 What settings / knowledge is needed for customer to store / view data on the cloud?

Different cloud providers offer an MQTT interface. The application note AC500 MQTT & MS Azure - First steps and configuration shows how a connection to MS azure can be established. The settings will differ depending on the used solution.

ABB is not offering an own solution.

2.5.2 What is the hardware infrastructure like type/capacity of servers etc. required for building an on-premise cloud infrastructure?

The cloud hardware and software are not covered by ABB. Please check with the responsible person that host the cloud services.

2.5.3 What are the licenses /subscriptions required for cloud connectivity?

For AC500 PLCs no licenses / subscriptions are needed. Please check with the cloud provider (e.g. Azure support) which licenses and subscriptions are required. For testing, mostly a free account is available.

2.5.4 What Edge services are required?

There is no Edge device required.
The AC500 PLC can be directly connected to the MQTT broker, if a gateway having internet access, is in the PLC network.

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