

XT5000

Industrial Internet of Things (IIoT) Cloud Communications

1. Introduction

The XT5000 is programmed to send and receive messages with a Cloud server. The Cloud server is Hologram. The Hologram uses Socket API that provides a low-level TCP socket interface for XT5000 to communicate with the Hologram Cloud server. Hologram Dashboard is a platform that will connect and manage XT5000. The Hologram Dashboard is used to send messages to XT5000 and also used to receive messages from XT5000 device. It can both send and receive messages at same time. Protocol of XT5000 communication is full-duplex. Additionally, the connectivity is M2M.

As mentioned before, XT5000 is programmed to communicate with Hologram Cloud server and also programmed to process the received messages that are sent from the Hologram Dashboard. Therefore, there are several specific messages that should be sent from Hologram Dashboard in order to manage XT5000 and then XT5000 can monitor and control and collect data of machines/sensors/slave devices that are connected with the IO interface ports of XT5000.

Actually, XT5000 is receiving messages from the Hologram Dashboard and processing these messages and response back with related messages to the Hologram Dashboard.

There are different kinds of the specific messages that should be used at communications with XT5000 according to the different hardware functions in XT5000. Therefore, there are different following groups of the specific message as shown below.

1. Group of messages for Digital input.
2. Group of messages for Digital output.
3. Group of messages for Analog to Digital Converter.
4. Group of messages for SPI Communications.

This **document** includes details on the above groups messages that should be used in the Hologram Dashboard when it communicates with XT5000 device. Hologram Dashboard can communicate with unlimited numbers of XT5000 devices at same time.

It recommended to read the document “**XT5000 User Manual**” if you did not read yet before you continue reading this **document**. Furthermore, create a free account in Hologram Dashboard in order to send and receive messages with XT5000.

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2. Cloud Messages for Digital input

There are 3 messages that can be sent from Hologram Dashboard to XT5000 device in order to monitor and read the state of the digital inputs in IO interface ports A and B.

When user wants to send any one of these 3 messages to XT5000 device, be aware that it should wait for the response from XT5000 device before sending new message.

2.1 Reading the state of the Digital inputs

The first message that should be typed in Hologram Dashboard and it should be sent to XT5000 device for reading the state of the Digital inputs in IO interface ports A and B is showed in figure 2-1 below. The response from XT5000 to Hologram Dashboard for reading the state of the digital inputs is showed in figure 2-2 below.

```
DI_STATE:
```

Figure 2-1. Sent message to XT5000 for reading the state of the Digital inputs in port A and B

```
{"DI0":0, "DI1":1, "DI2":0, "DIW":1}
```

Figure 2-2. Response from XT5000 to Hologram Dashboard for reading the state of the digital inputs in port A and B

Note: The highlighted characters with green color above are the state of the Digital inputs where 0 is off and 1 is ON. Here it showed example of the Digital inputs state where DI0 is off, DI1 is ON, DI2 is off and DIW is ON.

2.2 Monitor the state of the Digital inputs

The second message that should be typed in Hologram Dashboard and it should be sent to XT5000 device for monitoring the state of the Digital inputs in IO interface ports A and B is showed in figure 2-3 below. After sending this message to XT5000 device in figure 2-3 and receiving the response in Hologram Dashboard as showed in figure 2-4 below, the monitor function will be set in XT5000 device which will continually monitor the state of the Digital inputs and only send message to Hologram Dashboard for the state of the digital inputs as showed in figure 2-5 below when its Digital inputs state are changed in IO interface port A or B.

```
DI_MONITOR_START:
```

Figure 2-3. Sent message to XT5000 to set monitoring function in XT5000 in order to monitor the state of Digital inputs in port A and B

```
{DI_MONITOR_START:OK}
```

Figure 2-4. Response from XT5000 to Hologram Dashboard when monitoring function setting is confirmed in XT5000

```
{“DI0”:0, “DI1”:1, “DI2”:0, “DIW”:1}
```

Figure 2-5. Sent message from XT5000 to Hologram Dashboard when monitoring function is set in XT5000 and state of the digital inputs are changed

Note: The highlighted characters with green color above are the state of the Digital inputs where 0 is off and 1 is ON. Here it showed example of the Digital inputs state where DI0 is off, DI1 is ON, DI2 is off and DIW is off.

2.3 Stop monitoring the state of the Digital inputs

The third message that should be typed in Hologram Dashboard and it should be sent to XT5000 device for removing the setting of monitoring the state of the Digital inputs in IO interface ports A and B is showed in figure 2-6 below. The response from the XT5000 device to Hologram Dashboard for confirming the stopping of the monitoring is showed in figure 2-7 below.

```
DI_MONITOR_STOP:
```

Figure 2-6. Sent message to XT5000 to stop monitoring the state of Digital inputs in port A and B

```
{DI_MONITOR_STOP:OK}
```

Figure 2-7. Response from XT5000 to Hologram Dashboard when monitoring the state of Digital inputs in port A and B is stopped

3. Cloud Messages for Digital output

There are 2 messages that can be sent from Hologram Dashboard to XT5000 device in order to set and read the state of the digital outputs in IO interface ports A and C.

When user want to send any one of these 2 messages to XT5000 device, be aware that it should wait for the response from XT5000 device before sending new message.

3.1 Set the state of the Digital outputs

The first message that should be typed in Hologram Dashboard and it should be sent to XT5000 device for setting the state of the Digital outputs in IO interface ports A and C is showed in figure 3-1 below. The response from XT5000 to Hologram Dashboard for confirming the setting of the state of the digital outputs is showed in figure 3-2 below.

```
DO_SET:DO0:0,DO1:1,DO2:1,DO3:0
```

Figure 3-1. Sent message to XT5000 for setting the state of the Digital outputs in port A and C

Note: The highlighted characters with green color above are the state of the Digital outputs that should be set and typed by the user where 0 is off and 1 is ON. Here it showed example of the Digital outputs state that has been set by the user where DO0 is set to be off, DO1 is set to be ON, DO2 is set to be ON and DO3 is set to off.

```
{DO_SET:OK}
```

Figure 3-2. Response from XT5000 to Hologram Dashboard for confirming the setting of the state of Digital outputs in port A and C

3.2 Reading the state of the Digital outputs

The second message that should be typed in Hologram Dashboard and it should be sent to XT5000 device for reading the state of the Digital outputs in IO interface ports A and C is showed in figure 3-3 below. The response from XT5000 to Hologram Dashboard for reading the state of the digital outputs is showed in figure 3-4 below.

```
DO_STATE:
```

Figure 3-3. Sent message to XT5000 for reading the state of the Digital outputs in port A and C

```
{"DO0":0, "DO1":1, "DO2":1, "DO3":0}
```

Figure 3-4. Response from XT5000 to Hologram Dashboard for reading the state of the digital outputs in port A and C

Note: The highlighted characters with green color above are the state of the Digital outputs where 0 is off and 1 is ON. Here it showed example of the Digital outputs state that has been set by the user where DO0 is set to be off, DO1 is set to be ON, DO2 is set to be ON and DO3 is set to off.

4. Cloud Messages for Analog to Digital Converter

There are 5 messages that can be sent from Hologram Dashboard to XT5000 device in order to measure ADC values in IO interface port B. XT5000 can measure ADC values in IO interface port B and then sending the measured ADC values to Hologram Dashboard as single time and continually and by timer function setting.

When user wants to send any one of these 5 messages to XT5000 device, be aware that it should wait for the response from XT5000 device before sending new message.

4.1 Measuring the ADC values as single time

The first message that should be typed in Hologram Dashboard and it should be sent to XT5000 device for measuring the ADC values as single time in IO interface port B is showed in figure 4-1 below. The response from XT5000 to Hologram Dashboard for measuring the ADC values is showed in figure 4-2 below.



```
ADC_S:
```

Figure 4-1. Sent message to XT5000 for measuring the ADC values as single time in port B



```
{"AI0":130, "AI1":550, "AI2":1000}
```

Figure 4-2. Response from XT5000 to Hologram Dashboard for measuring the ADC values as single time in port B

Note: The highlighted characters with green color above are the measured ADC values in port B where the range of the measured ADC values is 0-1023. Here it showed example of the measured ADC values where the ADC value of AI channel 0 is 130, AI channel 1 is 550 and AI channel 2 is 1000.

4.2 Measuring the ADC values continually

The second message that should be typed in Hologram Dashboard and it should be sent to XT5000 device for setting the function of measuring the ADC values continually in IO interface port B is showed in figure 4-3 below. In this setting, XT5000 measures ADC values continually and send the measurements to Hologram Dashboard.

The response from XT5000 to Hologram Dashboard should be messages for the ADC values measurement in port B and these messages will be sent continually to Hologram Dashboard and it is showed in figure 4-4 below. After receiving one of these messages in Hologram Dashboard, it means the setting of function for measuring the ADC values continually has been confirmed and then it can send a new message from Hologram Dashboard to XT5000 device.

```
ADC_C:
```

Figure 4-3. Sent message to XT5000 for setting the function of measuring the ADC values continually in port B

```
{"AI0":130, "AI1":550, "AI2":1000}
```

Figure 4-4. Sent message from XT5000 to Hologram Dashboard for measuring the ADC values in port B

Note: The highlighted characters with green color above are the measured ADC values in port B where the range of the measured ADC values is 0-1023. Here it showed example of the measured ADC values where the ADC value of AI channel 0 is 130, AI channel 1 is 550 and AI channel 2 is 1000.

4.3 Stopping measuring the ADC values continually

The third message that should be typed in Hologram Dashboard and it should be sent to XT5000 device for removing the setting of function of measuring the ADC values continually in IO interface port B is showed in figure 4-5 below. The response from the XT5000 device to Hologram Dashboard for confirming the stopping of the measuring the ADC values continually is showed in figure 4-6 below.

```
ADC_C_STOP:
```

Figure 4-5. Sent message to XT5000 for removing the setting of function of measuring the ADC values continually in port B

```
{ADC_C_STOP:OK}
```

Figure 4-6. Response from XT5000 to Hologram Dashboard for confirming of stopping measuring the ADC values continually in port B

4.4 Measuring the ADC values with timer setting

The fourth message that should be typed in Hologram Dashboard and it should be sent to XT5000 device for function setting of measuring the ADC values with timer set in IO interface port B is showed in figure 4-7 below. In this setting, the timer will be set to specific time for hours and up to 24 hours and then XT5000 will measure ADC values according to that specific time every time and send the ADC values measurements to Hologram Dashboard.

For example, as shown in figure 4-7 below, it has been set the timer to 2 hours. In this setting, XT5000 will measure ADC values in IO interface port B every 2 hours and then send the ADC values measurements to Hologram Dashboard.

The response from XT5000 to Hologram Dashboard for confirming the function setting of measuring the ADC values with timer set in XT5000 is showed in figure 4-8 below. After receiving this message in Hologram Dashboard, it means the setting of function for measuring the ADC values with timer set has been confirmed. Then XT5000 device starts sending a message with the ADC values measurements to Hologram Dashboard according the timer set as showed in figure 4-9 below.

A screenshot of a text message sent to an XT5000 device. The message is "ADC_T:2". The character "2" is highlighted in green, indicating it is the specific time value in hours.

Figure 4-7. Sent message to XT5000 for function setting of measuring the ADC values with timer set in port B

Note: The highlighted character with green color above is the specific time for hours that should be chosen and typed by the user for measuring the ADC values with timer set in port B where the range of the specific time can be 1-24 hours and with a step of 1 hour. Here it showed example for setting the function of measuring the ADC values with timer set to 2 hours.

```
{ADC_T:OK}
```

Figure 4-8. Response from XT5000 to Hologram Dashboard for confirming the function setting of measuring the ADC values with timer set in XT5000

```
{"AI0":130, "AI1":550, "AI2":1000}
```

Figure 4-9. Sent message from XT5000 to Hologram Dashboard for measuring the ADC values with timer set in port B

Note: The highlighted characters with green color above are the measured ADC values in port B where the range of the measured ADC values is 0-1023. Here it showed example of the measured ADC values where the ADC value of AI channel 0 is 130, AI channel 1 is 550 and AI channel 2 is 1000.

Another example of the fourth message for measuring the ADC values in port B with timer set where the timer should be set to 14 hours this time, then the sent message from Hologram Dashboard to XT5000 will be like this: **ADC_T:14** and the response from XT5000 to Hologram Dashboard will be the same as in the figure 4-8. Then XT5000 send a message to Hologram Dashboard every 14 hours with ADC values measurements in port B.

4.5 Stopping measuring the ADC values with timer setting

The fifth message that should be typed in Hologram Dashboard and it should be sent to XT5000 device for removing the setting of function of measuring the ADC values with timer set in IO interface port B is showed in figure 4-10 below. The response from the XT5000 device to Hologram Dashboard for confirming the stopping of measuring the ADC values with timer set is showed in figure 4-11 below.

```
ADC_T_STOP:
```

Figure 4-10. Sent message to XT5000 for removing the setting of function of measuring the ADC values with timer set in port B

```
{ADC_T_STOP:OK}
```

Figure 4-11. Response from XT5000 to Hologram Dashboard for confirming of stopping measuring the ADC values with timer set in port B

5. Cloud Messages for SPI Communications

There are 5 messages that can be sent from Hologram Dashboard to XT5000 for SPI communications with a Slave device which is connected in IO interface port C in XT5000.

The sent message from Hologram Dashboard to XT5000 device includes bytes in Hex code. The XT5000 device receive these bytes and then send them to Slave device over SPI communications. At the same time, the Slave device will response and send bytes to the XT5000 device that will forward these bytes to Hologram Dashboard.

XT5000 can send and receive bytes to and from a Slave Device over SPI communications as single time or continually or by timer function setting.

When user wants to send any one of these 5 messages to XT5000 device, be aware that it should wait for the response from XT5000 device before sending new message.

5.1 Sending and receiving bytes for single time over SPI

The first message that should be typed in Hologram Dashboard and it should be sent to XT5000 device for sending and receiving bytes for a single time over SPI in IO interface port C is showed in figure 5-1 below. The response from XT5000 to Hologram Dashboard for sending and receiving bytes for a single time over SPI is showed in figure 5-2 below. Here below in figure 5-1, it showed example of sending 6 bytes and receiving 6 bytes from SPI Slave device and its response is showed in the figure 5-2.

A screenshot of a terminal window with a light gray background. The text 'SPIS(6,6):05CDAB0F0234' is displayed. The '6' in '(6,6)' is highlighted in red, and the second '6' is highlighted in yellow. The hex string '05CDAB0F0234' is highlighted in green.

Figure 5-1. Sent message to XT5000 for sending and receiving bytes for a single time over SPI in port C

Note: The highlighted character with red color above in figure 5-1 is the number of the bytes that should be chosen and typed by a user who wants to send bytes to SPI Slave device where this number can be 1, 2, 3, 4, 5, or 6. The maximum number of bytes that can be sent in one message is 6 bytes.

The highlighted character with yellow color above in figure 5-1 is the number of the bytes that should be chosen and typed by a user who wants to receive bytes from SPI Slave device where this number can be 0, 1, 2, 3, 4, 5, or 6. The maximum number of bytes that can be received in one message is 6 bytes.

The highlighted characters with green color above in figure 5-1 are bytes that should be typed by a user who wants to send bytes to SPI Slave device where bytes should be typed here in Hex code format with two digits. Furthermore, the number of sent bytes in the message should be the same as the number of the typed bytes here.

Here above in figure 5-1 it showed example of sending 6 bytes to SPI Slave device and receiving 6 bytes from it where the bytes that will be sent to the SPI Slave device are:

byte 1:05 byte 2:CD byte 3:AB byte 4:0F byte 5:02 byte 6:34

```
{“B1”:10, “B2”:3, “B3”:223, “B4”:55, “B5”:9, “B6”:26}
```

Figure 5-2. Response from XT5000 to Hologram Dashboard for receiving bytes for a single time over SPI in port C

Note: The highlighted characters with green color above in figure 5-2 are the received bytes from SPI Slave device and they are in decimal number format. Here it showed example of receiving 6 bytes from the SPI Slave device where the received bytes are:

byte 1:10 byte 2:3 byte 3:223 byte 4:55 byte 5:9 byte 6:26

Another example for the first message that should be typed in Hologram Dashboard and it should be sent to XT5000 device for sending and receiving bytes for a single time over SPI in port C is to send bytes to SPI Slave device without receiving back any bytes from it. In this example it will send 4 bytes to SPI Slave device without receiving any bytes from the SPI Slave device, then the sent message from Hologram Dashboard to XT5000 will be like this: **SPIS(4,0):09CB67D0** and the response from XT5000 to Hologram Dashboard for confirming the sending of bytes to the SPI Slave device is showed in the figure 5-3 below.



```
{SPIS:OK}
```

Figure 5-3. Response from XT5000 to Hologram Dashboard for confirming sending of bytes for a single time over SPI in port C

5.2 Sending and receiving bytes continually over SPI

The second message that should be typed in Hologram Dashboard and it should be sent to XT5000 device for sending and receiving bytes continually over SPI in IO interface port C is showed in figure 5-4 below. This message will set a function in XT5000 to communicate with SPI Slave device in order to send and receive bytes from SPI Slave device continually and send the received bytes from the SPI Slave device to Hologram Dashboard.

The response from XT5000 to Hologram Dashboard should be messages for the received bytes from SPI Slave and these messages will be sent continually to Hologram Dashboard and it is showed in figure 5-5 below. After receiving one of these messages in Hologram Dashboard, it means the setting of the function has been confirmed and then it can send a new message from Hologram Dashboard to XT5000 device.



```
SPIC(6,6):05CDAB0F0234
```

Figure 5-4. Sent message to XT5000 to set a function for sending and receiving bytes continually over SPI in port C

Note: The highlighted character with red color above in figure 5-4 is the number of the bytes that should be chosen and typed by a user who wants to send bytes to SPI Slave device where this number can be 1, 2, 3, 4, 5, or 6. The maximum number of bytes that can be sent in one message is 6 bytes.

The highlighted character with yellow color above in figure 5-4 is the number of the bytes that should be chosen and typed by a user who wants to receive bytes from SPI Slave device where this number can be 0, 1, 2, 3, 4, 5, or 6. The maximum number of bytes that can be received in one message is 6 bytes.

The highlighted characters with green color above in figure 5-4 are bytes that should be typed by a user who wants to send bytes to SPI Slave device where bytes should be typed here in Hex code format with two digits. Furthermore, the number of sent bytes in the message should be the same as the number of the typed bytes here.

Here above in figure 5-4 it showed example of sending 6 bytes to SPI Slave device and receiving 6 bytes from it where the bytes that will be sent to the SPI Slave device are:

byte 1:05 byte 2:CD byte 3:AB byte 4:0F byte 5:02 byte 6:34



```
{\"B1\":10, \"B2\":3, \"B3\":223, \"B4\":55, \"B5\":9, \"B6\":26}
```

Figure 5-5. Sent message from XT5000 to Hologram Dashboard for receiving bytes continually over SPI in port C

Note: The highlighted characters with green color above in figure 5-5 are the received bytes from SPI Slave device and they are in decimal number format. Here it

showed example of receiving 6 bytes from the SPI Slave device where the received bytes are:

byte 1:10 byte 2:3 byte 3:223 byte 4:55 byte 5:9 byte 6:26

5.3 Stopping sending and receiving bytes continually over SPI

The third message that should be typed in Hologram Dashboard and it should be sent to XT5000 device for removing the function setting of sending and receiving bytes continually over SPI in IO interface port C is showed in figure 5-6 below. The response from the XT5000 device to Hologram Dashboard for confirming the stopping of sending and receiving bytes continually over SPI is showed in figure 5-7 below.

```
SPIC_STOP:
```

Figure 5-6. Sent message to XT5000 for removing the function setting of sending and receiving bytes continually over SPI in port C

```
{SPIC_STOP:OK}
```

Figure 5-7. Response from XT5000 to Hologram Dashboard for confirming of stopping sending and receiving bytes continually over SPI in port C

5.4 Sending and receiving bytes over SPI with timer setting

The fourth message that should be typed in Hologram Dashboard and it should be sent to XT5000 device for sending and receiving bytes over SPI in port C with timer setting includes two messages below:

- The first sent message to XT5000 has the bytes that should be sent to SPI Slave device with timer set and the number of the sent bytes, also the number of bytes that should be received from SPI Slave device with timer set as shown in figure 5-8. The response of this message from XT5000 to Hologram Dashboard can be seen in figure 5-9. be aware that it should wait for the response from XT5000 device before sending the second message below.
- The second sent message to XT5000 has the timer setting for SPI in XT5000, this message will set the timer to specific time for hours and up to 24 hours and then XT5000 will send and receive bytes over SPI according to that specific time every time and also forwarding the received bytes to Hologram Dashboard. The second sent message to XT5000 can be seen in figure 5-10. The response of this message from XT5000 to Hologram Dashboard can be seen in figure 5-11 and it will confirm the function setting of the timer for SPI in XT5000.



```
SPIS(6,6):05CDAB0F0234
```

Figure 5-8. The first sent message to XT5000 to set a function of timer for sending and receiving bytes over SPI in port C

Note: The highlighted character with red color above in figure 5-8 is the number of the bytes that should be chosen and typed by a user who wants to send bytes to SPI Slave device where this number can be 1, 2, 3, 4, 5, or 6. The maximum number of bytes that can be sent in one message is 6 bytes.

The highlighted character with yellow color above in figure 5-8 is the number of the bytes that should be chosen and typed by a user who wants to receive bytes from SPI Slave device where this number can be 0, 1, 2, 3, 4, 5, or 6. The maximum number of bytes that can be received in one message is 6 bytes.

The highlighted characters with green color above in figure 5-8 are bytes that should be typed by a user who wants to send bytes to SPI Slave device where bytes should be typed here in Hex code format with two digits. Furthermore, the number of sent bytes in the message should be the same as the number of the typed bytes here.

Here above in figure 5-8 it showed example of sending 6 bytes to SPI Slave device and receiving 6 bytes from it where the bytes that will be sent to the SPI Slave device are:

byte 1:05 byte 2:CD byte 3:AB byte 4:0F byte 5:02 byte 6:34

```
{“B1”:10, “B2”:3, “B3”:223, “B4”:55, “B5”:9, “B6”:26}
```

Figure 5-9. Response from XT5000 to Hologram Dashboard for receiving bytes over SPI in port C with timer setting

Note: The highlighted characters with green color above in figure 5-9 are the received bytes from SPI Slave device and they are in decimal number format. Here it showed example of receiving 6 bytes from the SPI Slave device where the received bytes are:

byte 1:10 byte 2:3 byte 3:223 byte 4:55 byte 5:9 byte 6:26

```
SPI_T:13
```

Figure 5-10. The second sent message to XT5000 to set a function of timer for sending and receiving bytes over SPI in port C

Note: The highlighted character with green color above in figure 5-10 is the specific time for hours that should be chosen and typed by the user for sending and receiving bytes over SPI with timer set where the range of the specific time can be 1-24 hours and with a step of 1 hour. Here it showed example to set a function of timer for sending and receiving bytes over SPI in port C with timer set to 13 hours.

```
{SPI_T:OK}
```

Figure 5-11. Response from XT5000 to Hologram Dashboard for confirming the function setting of the timer for sending and receiving bytes over SPI in port C

5.5 Stopping SPI communications with timer setting

The fifth message that should be typed in Hologram Dashboard and it should be sent to XT5000 device for removing of function setting of the timer for sending and receiving bytes over SPI in port C is showed in figure 5-12 below. The response of this message from XT5000 to Hologram Dashboard can be seen in figure 5-13 below.

```
SPI_T_STOP:
```

Figure 5-12. Sent message to XT5000 for removing the function setting of the timer for sending and receiving bytes over SPI in port C

```
{SPI_T_STOP:OK}
```

Figure 5-13. Response from XT5000 to Hologram Dashboard for confirming removing the function setting of the timer for sending and receiving bytes over SPI in port C

6. Response in XT5000

Every time, a message is sent to XT5000 device from Hologram Dashboard, the device receives this message and start processing this message and then send a response back to Hologram Dashboard.

It usually takes 30 second from sending a message from Hologram Dashboard to XT5000 device and processing the message in XT5000 device and sending a response back and then receiving the response in Hologram Dashboard.

Additionally, when user type a message in the Hologram Dashboard to send the message to XT5000 device, the user should wait few seconds after finishing typing the message and then click on “Send message” because the Hologram Dashboard needs time to upload the typed message before clicking on the “Send message”.

If the user sends a syntax error message from Hologram Dashboard to XT5000 device, then the XT5000 device will send a response back to Hologram Dashboard as showed in figure 6-1 below.



```
{UNDEFINED_MESSAGE_FORMAT}
```

Figure 6-1. Response from XT5000 to Hologram Dashboard when it sent syntax error message to XT5000

7. Hologram Routes with XT5000

Routes in the Hologram ecosystem provide convenient methods to trigger actions (data storage, Email, webhooks, and many more), which are triggered by the presence or even absence of a device message's topic. Routes can be configured on the Hologram Dashboard. More details on how users can create routes with XT5000, it can be found in "Hologram Routes" in support.hologram.io address.

Users can set up a route to pass messages sent from XT5000 to some external service/Cloud such as **ubidots** and **ThingSpeak** via webhook and then users can for example, visualizing data of the messages. For example, users can create a route to pass data messages sent from XT5000 to industrial IoT platform **ubidots** by configuring Advanced Webhook Builder in Hologram Routes. Furthermore, users can send messages to XT5000 via inbound webhook and via REST API and Hologram Dashboard.

8. Message Topic in Routes with XT5000

The Routes in hologram Dashboard can be created for the received data messages. Therefore, XT5000 sends all the messages with topics. XT5000 sends data messages to the Hologram Dashboard with topics in order to route specific messages in Hologram Dashboard and forwarding these messages to some outer Cloud/Application service as shown in figure 8-1 below. The table 8-1 describes the topic for each data message that are sent form XT5000 to Hologram Dashboard and they can be routed.

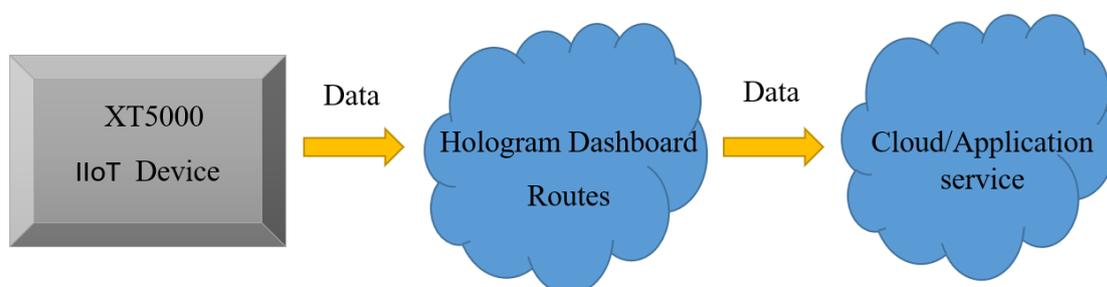


Figure 8-1. Hologram Routes

Topic	Messages
SDCxxxxxxx	Data message for Digital input
SDDxxxxxxx	Data message for Digital output
SDExxxxxxx	Data message for Analog to Digital Converter (ADC)
SDFxxxxxxx	Data message for SPI Communications

Table 8-1. Topic of the data messages that are sent from XT5000 to Hologram Dashboard and they can be routed

The topic format of the messages in the table 8-1 are built by two parts. The first part is the first 3 characters (SDC, SDD, SDE and SDF), this part is for recognizing the messages that are related to the functions of XT5000 (Digital input, Digital output, ADC and SPI Communications) at routing in Hologram Dashboard. The second part is the rest of the characters in the topic (xxxxxxx) which are Device Key for device XT5000 that is registered in Hologram Dashboard, this part is for recognizing the devices XT5000 if there are more than one device registered in Hologram Dashboard and it needs to routes messages of these devices.

Note: The characters xxxxxxxx in table 8-1 is just example for Device key of XT5000 that is registered in Hologram Dashboard. Each device of XT5000 which is registered in Hologram Dashboard has a unique Device Key that can be found in the Device page in Hologram Dashboard.