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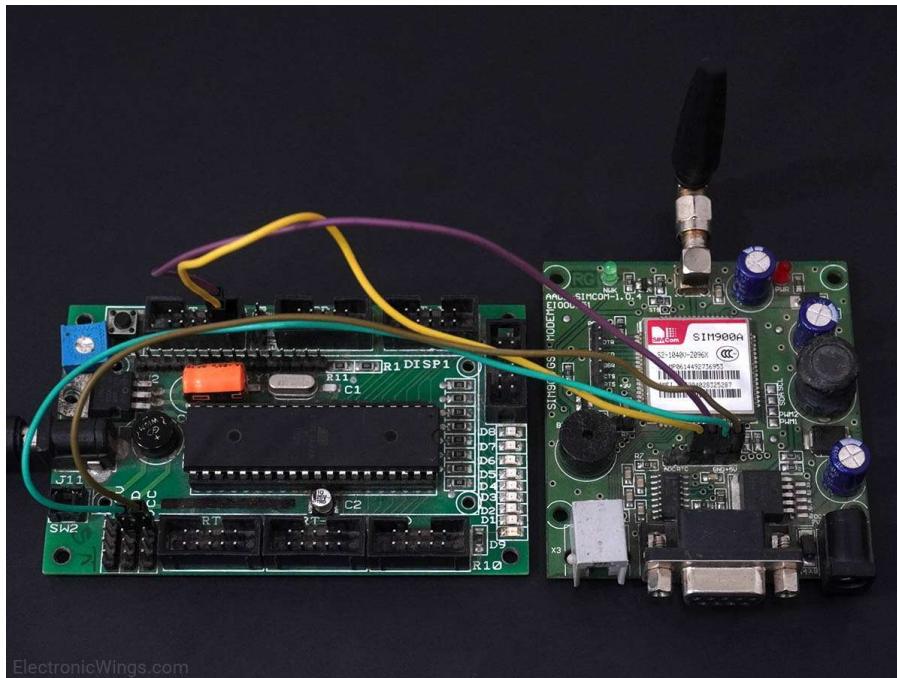
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+ Project (/publish/project) BorisDmitrenko

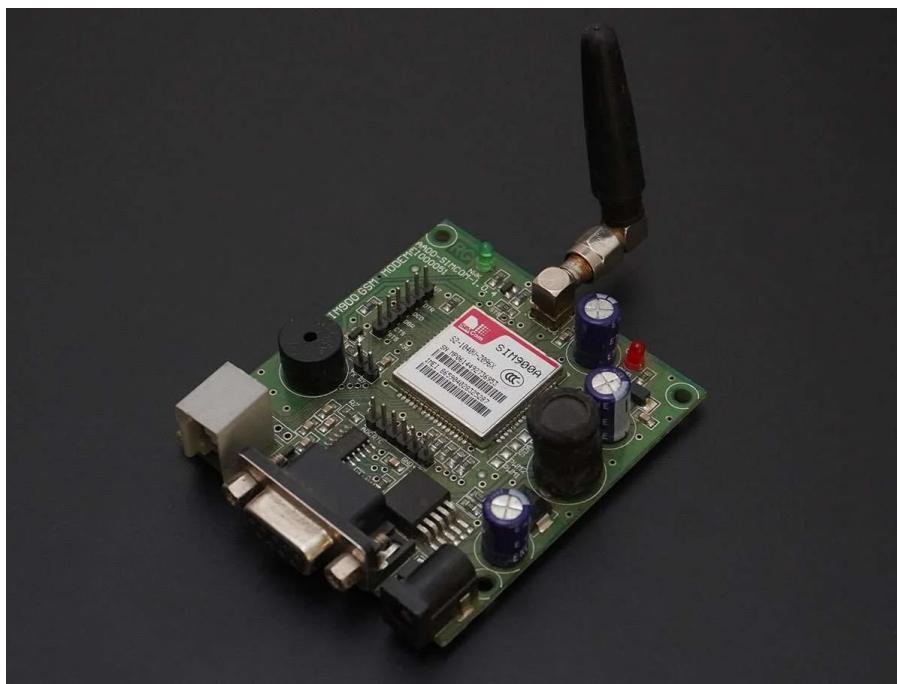


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MQTT Client using SIM900A GPRS and AVR ATmega16



Introduction




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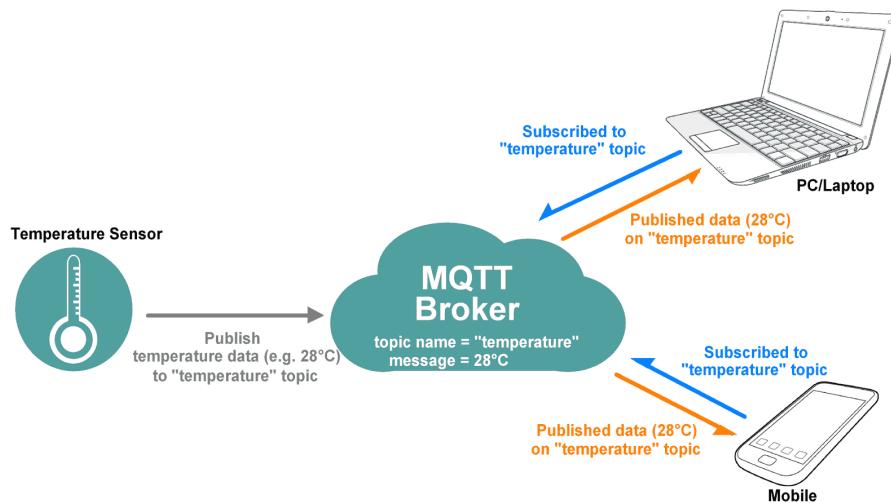
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SIM900

SIM900 enables GPRS to embedded applications. We can implement the **MQTT** (<https://en.wikipedia.org/wiki/MQTT>) Client protocol using SIM900 TCP function AT Commands.

MQTT is a lightweight publish-subscribe-based messaging protocol.

- It is quicker (faster) than other request-response based APIs like HTTP.
- It is developed on the basis of TCP/IP protocol.
- It allows remote location devices to connect, subscribe, publish, etc. to a specific topic on the server with the help of a message broker.
- MQTT Broker/Message broker is a module in between the sender and the receiver. It is an element for message validation, transformation, and routing.
- The broker is responsible for distributing messages to the interested clients (subscribed clients) of their interested topic.



- For example, if the temperature sensor publishes the temperature data (message) on the topic "temperature" then interested clients who have subscribed to the "temperature" topic get that published temperature data as shown in the above figure.

MQTT is widely used in IOT (Internet Of Things) embedded applications, where every sensor will be connected to a server over the internet and we have access to control them.

To know about SIM900 GSM/GPRS Module refer to **SIM900**

(<http://electronicwings.com/sensors-modules/sim900a-gsmgprs-module>)



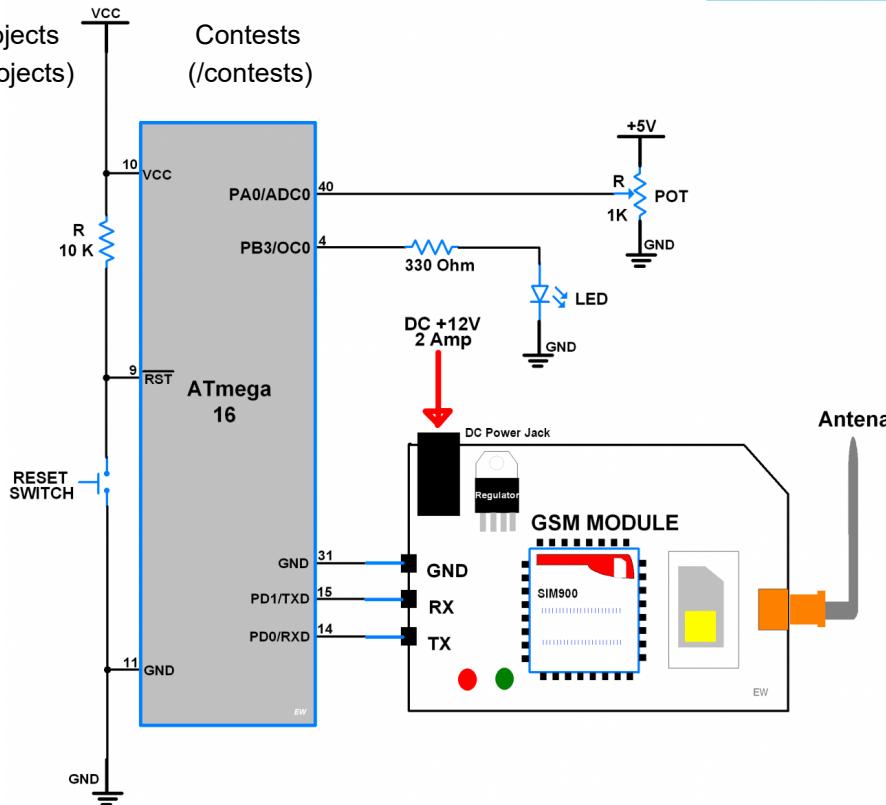
SIM900 Interfacing With Atmega16/32

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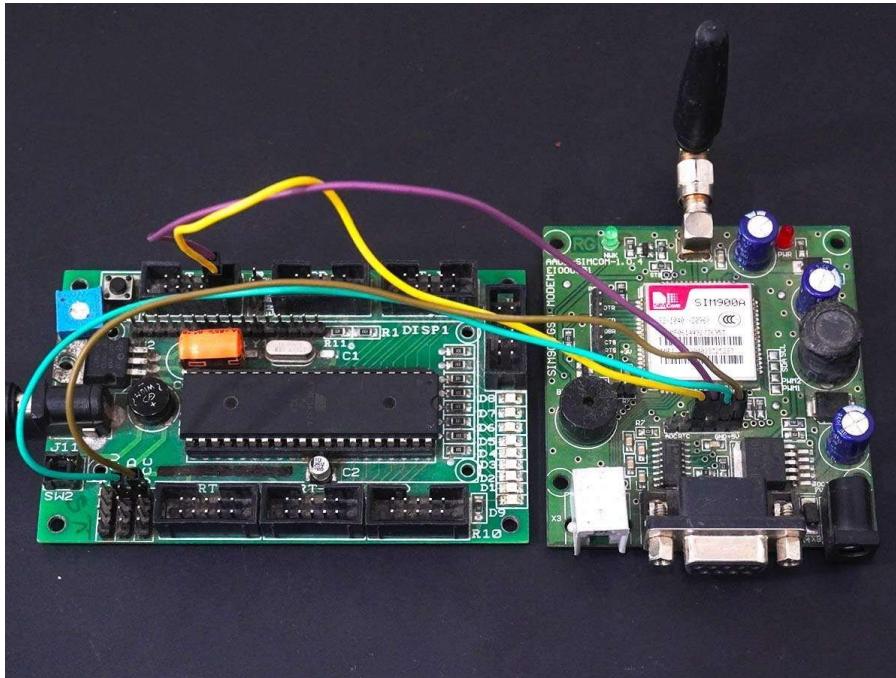

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Atmega16 interface with SIM900



MQTT Client over GPRS

Let's program AVR based ATmega16 to configure SIM900A as MQTT Client and Subscribe/Publish data from/to Server using GPRS.

Here we are using the Adafruit server for MQTT Client demo purpose.



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In the IOT platform, Adafruit IO Dashboard allows us to visualize and control the connected device to the internet. Anyone can visualize and analyze live data from their sensor devices. To learn more and start with Adafruit IO Dashboard refer link <https://learn.adafruit.com/adafruit-io-basics-dashboards/creating-a-dashboard> (<https://learn.adafruit.com/adafruit-io-basics-dashboards/creating-a-dashboard>)

Just sign up and create a dashboard. After the successful creating of the dashboard, we will get the AIO key which is later used to access feed data.

Example

Now let's program ATmega16 to control LED brightness and monitor POT status on a remote location from the Adafruit dashboard.

Once we created a dashboard on Adafruit we can add various blocks that can be used to control devices as well as monitor the status of devices. To see more about blocks, refer link <https://learn.adafruit.com/adafruit-io-basics-dashboards/adding-blocks> (<https://learn.adafruit.com/adafruit-io-basics-dashboards/adding-blocks>)

In the below program of MQTT Client, do the following

For MQTT Client Subscribe Demo

```
#define SUBSRCIBE_DEMO          /* Define SUBSRCIBE demo */
#ifndef PUBLISH_DEMO           /* Define PUBLISH demo */
```

For MQTT Client Publish Demo

```
##define SUBSRCIBE_DEMO          /* Define SUBSRCIBE demo */
#define PUBLISH_DEMO            /* Define PUBLISH demo */
```

Edit Fields below with respective data

```
/* Define Required fields shown below */
#define AIO_SERVER      "io.adafruit.com" /* Adafruit server */
#define AIO_SERVER_PORT    "1883"           /* Server port 8883 for SSL */
#define AIO_BASE_URL     "/api/v2"         /* Base URL for api */
#define AIO_USERNAME      "Enter Username" /* Enter username here */
#define AIO_KEY          "Enter AIO key"   /* Enter AIO key here */
#define AIO_FEED          "Enter Feed Key" /* Enter feed key */

#define APN             "internet"
#define USERNAME        ""
#define PASSWORD        ""
```

In the below program, we are using response-based functions to get the better status if things deviate from normal.

MQTT Packet Formation

MQTT uses many packet formats that used to connect to the server and subscribe or publish to the topic on the server.

Refer below link for MQTT OASIS standard. It will help to understand MQTT packet formations.



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http://docs.oasis-open.org/mqtt/mqtt/v3.1.1/os/mqtt-v3.1.1.html#_Toc398718027[+ Project //publish/project](#)Platforms
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MQTT Client Code for Atmega16/32

```

/*
 * ATmega16_GPRS_MQTTClient
 * http://www.electronicwings.com
 *
 */

#define F_CPU 8000000UL      /* Define CPU clock Frequency e.g. here */
#include <avr/io.h>          /* Include AVR std. library file */
#include <util/delay.h>        /* Include delay header file */
#include "SIM900TCPClient.h" /* Include TCP Client header file */

#define min(a,b) ({ __typeof__(a) _a = (a); __typeof__(b) _b = (b); _a < _b ? _a : _b })

#define MQTT_PROTOCOL_LEVEL     4

#define MQTT_CTRL_CONNECT      0x1
#define MQTT_CTRL_CONNECTACK   0x2
#define MQTT_CTRL_PUBLISH      0x3
#define MQTT_CTRL_PUBACK       0x4
#define MQTT_CTRL_PUBREC       0x5
#define MQTT_CTRL_PUBLISHACK   0x6

```



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[\(https://www.mouser.in?utm_source=electronicswing&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0\)](https://www.mouser.in?utm_source=electronicswing&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0)

ATmega 16
ATmega 16 X 1

(https://www.mouser.in/ProductDetail/Microchip-Technology-Atmel/ATMEGA16L-8PU?qs=%2Fha2pyFaduiGCJtTvs2wv8fVZbVAalLu7Iq%2FgITS0tALAx6fMenLvg%3D%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0)

Datasheet ([/components/atmega-16/1/datasheet](https://www.mouser.in/components/atmega-16/1/datasheet))

Atmega32
Atmega32 X 1

(https://www.mouser.in/ProductDetail/Microchip-Technology-Atmel/ATMEGA32-16PU?qs=aqrBurbvGdpkmjg7RWmsQ%3D%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0)

Datasheet ([/components/atmega32/1/datasheet](https://www.mouser.in/components/atmega32/1/datasheet))



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(https://www.mouser.in?utm_source=electronicswing&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0)

SIM900A GSM GPRS Module

SIM900A is dual band GSM/GPRS 900/1800MHz module...

X 1

(https://www.mouser.com/ProductDetail/M5Stack/M031-D?qs=%2Fha2pyFadugEKx3cUjc5DGB4hxkc1iwAkV7YxEmv6c%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0)

Datasheet (</components/sim900a-gsm-gprs-module/1/datasheet>)

CP2103 USB TO UART BRIDGE

CP2103 is single chip USB to UART Bridge. It su...

X 1

(https://www.mouser.com/ProductDetail/Silicon-Labs/CP2103-GMR?qs=Zq62GxwlckYrXEgTuxpNRg%3D%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0)

Datasheet (</components/cp2103-usb-to-uart-bridge/1/datasheet>)

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		ATmega16 GPRS MQTT Client Project file	
		SIM900 AT Commands	Dow (/api/download/platf nloa orm-attachment/381) d
		SIM900 TCPIP Application Note	Dow (/api/download/platf nloa orm-attachment/382) d

Comments



Comment



kartikmehetre17
(/users/kartikmehetre17/profile)
2018-11-11 01:52:14

How can one include the tcp client header file in the code

Reply Like



lokeshc
(/users/lokeshc/profile)
2018-11-12 17:19:54

you can directly right click on a project and add existing item. In existing item, provide a path of TCP client header file.

Reply Like 1



kartikmehetre17
(/users/kartikmehetre17/profile)
2018-11-12 17:47:21

Thanks

Reply Like



kartikmehetre17
(/users/kartikmehetre17/profile)
2018-11-12 17:48:15

Also can you provide me with some explanation about the code you wrote for the subscribe and publish demo.. as there are no comments on the code

Reply Like

nishanchettri10

(/users/nishanchettri10/profile)
2018-12-02 08:20:07 • Edited

can mqtt part done with ESP8266 and AVR instead of gsm?

Reply Like

lokeshc

(/users/lokeshc/profile)
2018-12-03 06:44:26

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nishanchettri10(/users/nishanchettri10/profile)
2018-12-05 04:44:08

I am new to AVR and want to use Esp8266 instead of GSM... Could you help....

Reply Like

zezomoro123

(/users/zezomoro123/profile)
2019-02-05 01:27:35 • Edited

Thank you so much for that code

I ask you why you used const with the topic pointer in MQTT_publishPacket function?

Reply Like 1 ↗

authorized

(/users/authorized/profile)
2019-02-06 11:43:18i think we should use const if we are passing some const argument to function.
and we should provide same data type what the function expects at its input.e.g. in above example "Nivya151/feeds/test" constant string is passed to
function which never gone change like array contents we modify,

i mean neither the contents of that string, nor the pointer itself, can be changed.

you can use just char* but then you need to pass const string with typecast like
(char*)"Nivya151/feeds/test".

Reply Like

kishankishanbhamrebhamre

(/users/kishankishanbhamrebhamre/profile)
2020-07-06 08:09:56how can we connect 2 or more sim900 devices to single MQTT server (same username
and password)?

Reply Like

AshutoshP

(/users/AshutoshP/profile)
2021-05-17 18:02:24I am able to publish with this programm But cant subscribe. That is I dont see any data
in Buffer eventhough I enter data in AIO feed.Also when we send connect packet Why cant we see CONNACK received in the serial
buffer array. I cant see any ack recived in serral buffer register.

Please guide

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