



# SIM7070\_SIM7080\_SIM7090 Series\_CoAP(S) \_Application Note

LPWA Module

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# About Document

## Version History

Version	Date	Owner	What is new
V1.00	2019.9.2	Wenjie.Lai	First Release
V1.01	2020.2.26	Wenjie.Lai	Added product types
V1.02	2020.7.8	Wenjie.Lai	All
V1.03	2021.6.16	Wei.zhang	Modify chapter 2 Add chapter 5.2 CoAPs Examples

## Scope

This document applies to the following products

Name	Type	Size(mm)	Comments
SIM7080G	CAT-M/NB	17.6*15.7*2.3	N/A
SIM7070G/SIM7070E	CAT-M/NB/GPRS	24*24*2.4	N/A
SIM7070G-NG	NB/GPRS	24*24*2.4	N/A
SIM7090G	CAT-M/NB	14.8*12.8*2.0	N/A

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# 1 Introduction

## 1.1 Purpose of the document

Based on module AT command manual, this document will introduce CoAP application process.

Developers could understand and develop application quickly and efficiently based on this document.

## 1.2 Related documents

[1] SIM7070\_SIM7080\_SIM7090 Series\_AT Command Manual

## 1.3 Conventions and abbreviations

Abbreviation	Description
APN	Access Point Name
CoAP	Constrained Application Protocol
DTLS	Datagram Transport Layer Security
HTTP	Hypertext Transfer Protocol
IoT	Internet of Things
PDN	Public Data Network
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
URL	Uniform Resource Locator

## 2 CoAP Introduction

### 2.1 CoAP Protocol Introduction

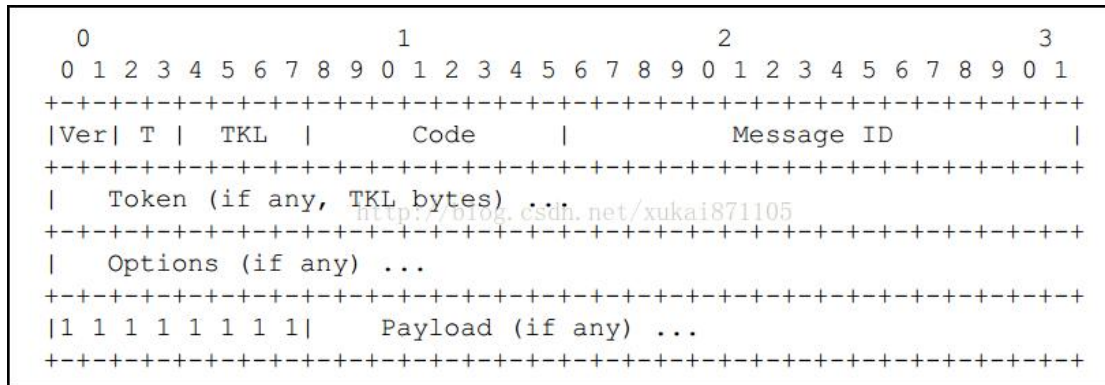
In the IoT application, there is a network between the device and the device, and they need to communicate with each other. However, because IoT devices are usually resource-constrained, limited CPU capacity, limited RAM, limited flash, and limited network bandwidth, the CoAP (Constrained Application Protocol) protocol borrows the HTTP protocol mechanism and simplifies for such special scenarios. The protocol Packet format. The communication between IoT devices is succinctly realized.

In order to allow small devices to access the Internet, the CoAP protocol was designed. CoAP is an application layer protocol, which runs on the UDP protocol instead of running on TCP like HTTP. The CoAP protocol is very small, and the smallest data packet is only 4 bytes.

### 2.2 CoAP Protocol Features

1. Based on message model, four message types are defined, and the message is the data communication carrier, and the data communication between devices is realized by exchanging network messages.
2. The operation of the CoAP Server cloud device resource is completed by the request and response mechanism. Similar to HTTP, the device can operate the server resource through four request methods (GET, PUT, POST, DELETE). The request and response packets are placed in the CoAP message for transmission.
3. Message-based two-way communication (M2M), both the CoAP Client and the CoAP server can send requests to each other independently. Both parties can be in the client or server role.
4. The protocol packet is lightweight and has a minimum length of only 4B.
5. Support reliable transmission, data retransmission, block transmission. Ensure that data arrives reliably
6. Support IP multicast, which can send requests to multiple devices at the same time (such as CoAP client search for CoAP Server)
7. Non-long connection communication for low power IoT scenarios.

## 2.3 CoAP Protocol Message Format



### 2.3.1 CoAP Message Format

The CoAP protocol has 4 message types:

- CON: A request that needs to be confirmed. If a CON request is sent, the other party must respond.
- NON: A request that does not need to be confirmed. If a NON request is sent, the other party does not need to respond.
- ACK: Answer message, the response of receiving CON message.
- RST: Reset message. When the message received by the receiver contains an error, the receiver parses the message or no longer cares about the content sent by the sender, then the reset message will be sent.

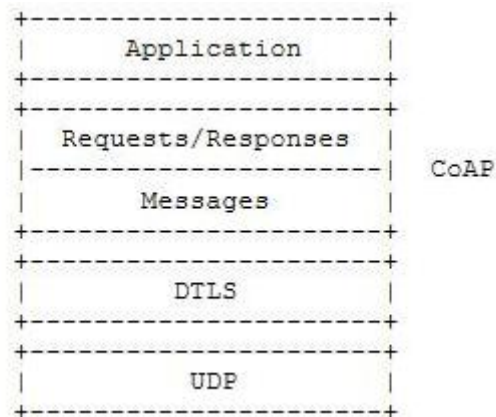
### 2.3.2 CoAP URL

The URL of CoAP is very similar to that of HTTP, starting with "coap" corresponding to "http" or "coaps" corresponding to "https".

The default port for HTTP is TCP 80, and the default port for CoAP is UDP 5683 (CoAPS is 5684).

## 2.4 CoAP Security

The security of CoAP is realized by DTLS encryption. DTLS is only applicable in unicast situations.



## 2.5 The difference between CoAP and HTTP

Feature	CoAP	HTTP
Protocol	It uses UDP.	It uses TCP.
Network layer	It uses IPv6 along with 6LoWPAN.	It uses IP layer.
Multicast support	It supports.	It does not support.
Architecture model	CoAP uses both client-Server & Publish-Subscribe models.	HTTP uses client and server architecture.
Synchronous communication	CoAP does not need this.	HTTP needs this.
Overhead	Less overhead and it is simple.	More overhead compare to CoAP and it is complex.
Application	Designed for resource constrained networking devices such as WSN/IoT/M2M.	Designed for internet devices where there is no issue of any resources.



## 3 AT Commands for CoAP(S)

Command	Description
<b>AT+CCOAPPDPID</b>	Select PDP Index for CoAP
<b>AT+CCOAPINIT</b>	Create CoAP object
<b>AT+CCOAPCFG</b>	Select CoAP Configure
<b>AT+CCOAPURL</b>	Configure CoAP URL
<b>AT+CCOAPPARA</b>	Assembling CoAP data Packet
<b>AT+CCOAPACTION</b>	Operate CoAP object
<b>AT+CCOAPHEAD</b>	Read head of CoAP packet
<b>AT+CCOAPREAD</b>	Read data of CoAP Packet
<b>AT+CCOAPTERM</b>	Delete CoAP object

For detail information, please refer to "SIM7070\_SIM7080\_SIM7090 Series\_AT Command Manual".

## 4 Bearer Configuration

Usually module will register PS service automatically.

### 4.1 PDN Auto-activation

//Example of PDN Auto-activation.

```
AT+CPIN? //Check SIM card status
+CPIN:READY

OK
AT+CSQ //Check RF signal
+CSQ: 20,0

OK
AT+CGATT? //Check PS service. 1 indicates PS has attached.
+CGATT: 1

OK
AT+COPS? //Query Network information, operator and network.
+COPS: 0,0,"CHN-CT",9 //Mode 9 means NB-IOT network.

OK
AT+CGNAPN //Query the APN delivered by the network after the
//CAT-M or NB-IOT network is successfully
//registered.
+CGNAPN: 1,"ctnb" // "ctnb" is APN delivered by the CAT-M or NB-IOT
//network. APN is empty under the GSM network.

OK
AT+CNCFG=0,1,"ctnb" //Before activation please use AT+CNCFG to set
//APN\user name\password if needed.

OK
AT+CNACT=0,1 //Activate network, Activate 0th PDP.

OK
+APP PDP: 0,ACTIVE
```

```

AT+CNACT? //Get local IP
+CNACT: 0,1,"10.94.36.44"
+CNACT: 1,0,"0.0.0.0"
+CNACT: 2,0,"0.0.0.0"
+CNACT: 3,0,"0.0.0.0"

OK

```

## 4.2 APN Manual Configuration

If not attached automatically, could configure correct APN setting.

//Example of APN Manual configuration.

```

AT+CFUN=0 //Disable RF
+CPIN: NOT READY

OK
AT+CGDCONT=1,"IP","ctnb" //Set the APN manually. Some operators need to
                             //set APN first when registering the network.

OK
AT+CFUN=1 //Enable RF

OK

+CPIN: READY
AT+CGATT? //Check PS service. 1 indicates PS has attached.
+CGATT: 1

OK
AT+CGNAPN //Query the APN delivered by the network after the
             //CAT-M or NB-IOT network is successfully
             //registered.

+CGNAPN: 1,"ctnb" // "ctnb" is APN delivered by the CAT-M or NB-IOT
                  //network. APN is empty under the GSM network.

OK
AT+CNCFG=0,1,"ctnb" //Before activation please use AT+CNCFG to set
                       //APN\user name\password if needed.

OK
AT+CNACT=0,1 //Activate network, Activate 0th PDP.

OK

```

+APP PDP: 0,ACTIVE

AT+CNACT?

//Get local IP

+CNACT: 0,1,"10.94.36.44"

+CNACT: 1,0,"0.0.0.0"

+CNACT: 2,0,"0.0.0.0"

+CNACT: 3,0,"0.0.0.0"

OK

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## 5 CoAP(S) Examples

### 5.1 CoAP Examples

//CoAP Examples

```

AT+CNACT=0,1 // Activating network bearing
OK

+APP PDP: 0,ACTIVE
AT+CCOAPINIT //Create CoAP object
OK
AT+CCOAPURL="coap://117.131.85.139:6011" //Configure CoAP URL
OK
AT+CCOAPPARA="CODE",1,uri-path,0,"home/ //Assembling CoAP data packet
query",uri-query,0,"address=1",payload,0,"hell
o world"
OK
AT+CCOAPACTION //Send data, Message id is 1
+CCOAPACTION: 0,1 //Received data, Message id is 1, data length is14
bytes, data payload is 9 bytes.

OK

+CCOAPRECV: 1,14,9
AT+CCOAPACTION=4 //Get receive queue.
+CCOAPACTION: 4,1,1 //The current receive queue has a total of 1 data
packet, and the first packet id is 1.

OK
AT+CCOAPHEAD=1,1 //Read the packet header with message id of 1
and print it parsed.

+CCOAPHEAD: 1,1,2,0,4.04,1,,,,,0,,,,,

OK
AT+CCOAPREAD=1 //Read the receive packet payload with message
id of 1
+CCOAPREAD: 9,Not Found //The total byte length is 9 and the content is Not
Found.

OK
AT+CCOAPTERM //Delete CoAP Object

```

```
OK
AT+CNACT=0,0 // Deactivating network bearing
OK
+APP PDP: 0,DEACTIVE
```

## 5.2 CoAPS Examples

```
//CoAPS Examples

AT+CNACT=0,1 // Activating network bearing
OK

+APP PDP: 0,ACTIVE
AT+CSSLCFG="PROTOCOL",0,2 //Set the protocol type of SSL with an identifier of
// 0. In this example,2 indicate DTLS
OK
AT+CSSLCFG="SSLVERSION",0,5 //Set the version type of SSL with an identifier of 0.
// In this example,5 indicate DTLS1.2
OK
AT+CSSLCFG="convert",3,"psktable.txt" //Set convertype is PSK TABLE.
OK
AT+CCOAPINIT //Create CoAP object
OK
AT+CCOAPCFG=ssl,0,"", "", "psktable.txt" //Configure SSL CoAP
OK
AT+CCOAPURL="coaps://117.131.85.139:6011" //Configure CoAP URL
"
OK
AT+CCOAPPARA="CODE",1,uri-path,0,"home/ //Assembling CoAP data packet
query",uri-query,0,"address=1",payload,0,"hell
o world"
OK
AT+CCOAPACTION //Send data, Message id is 1
+CCOAPACTION: 0,1 //Received data, Message id is 1, data length is14
// bytes, data payload is 9 bytes.

OK

+CCOAPRECV: 1,14,9
AT+CCOAPACTION=4 //Get receive queue.
```

```
+CCOAPACTION: 4,1,1 //The current receive queue has a total of 1 data
                        //packet, and the first packet id is 1.
OK
AT+CCOAPHEAD=1,1 //Read the packet header with message id of 1
                  //and print it parsed.
+CCOAPHEAD: 1,1,2,0,4.04,1,,,,,,,,0,,,,,,,,,
OK
AT+CCOAPREAD=1 //Read the receive packet payload with message
                //id of 1
+CCOAPREAD: 9,Not Found //The total byte length is 9 and the content is Not
                        //Found.
OK
AT+CCOAPTERM //Delete CoAP Object
OK
AT+CNACT=0,0 // Deactivating network bearing
OK
+APP PDP: 0,DEACTIVE
```

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