EC2x&EG9x&EM05 QuecLocator Application Note

LTE Module Series

Rev. EC2x&EG9x&EM05_QuecLocator_Application_Note_V1.0

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GENERAL NOTES

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About the Document

History

Revision	Date	Author	Description
1.0	2018-09-17	Slark WANG	Initial

Contents

Table Index

1 Introduction

QuecLocator is a cellular location service developed by Quectel. It allows Quectel modules to get location information through base station (Cell ID) information. The service can enhance and complement stand-alone GNSS performance particularly in challenging signal environments, such as urban canyon, indoors, enclosed park houses or when GNSS jamming signals are present.

Customers can simply issue an AT command to initiate a request towards a server and the server will calculate a position and return it to Quectel module, which in turn will report the position to customers.

This application guide mainly describes how to enable this functionality via AT commands.

The document is applicable to the following Quectel modules:

- EC2x (including EC25, EC21, EC20 R2.0 and EC20 R2.1)
- EG9x (including EG91 and EG95)
- EM05

NOTE

QuecLocator is a value-added function provided by Quectel, with service fee collected. For more details about the function, please contact Quectel Sales Representatives or Technical Supports.

2 QuecLocator Overview

2.1. General Overview

Global Navigation Satellite System (GNSS) has been widely used because of its accurate and stable positioning capability. But it is not always possible in the challenging signal environments, such as when GNSS receiver works indoors, in urban canyon, under the elevated bridge or the GNSS signal is mitigated or jammed.

As cells of cellular network are widely available in urban and rural environments, QuecLocator service can be enabled to estimate the position on the basis of surrounding cellular network information.

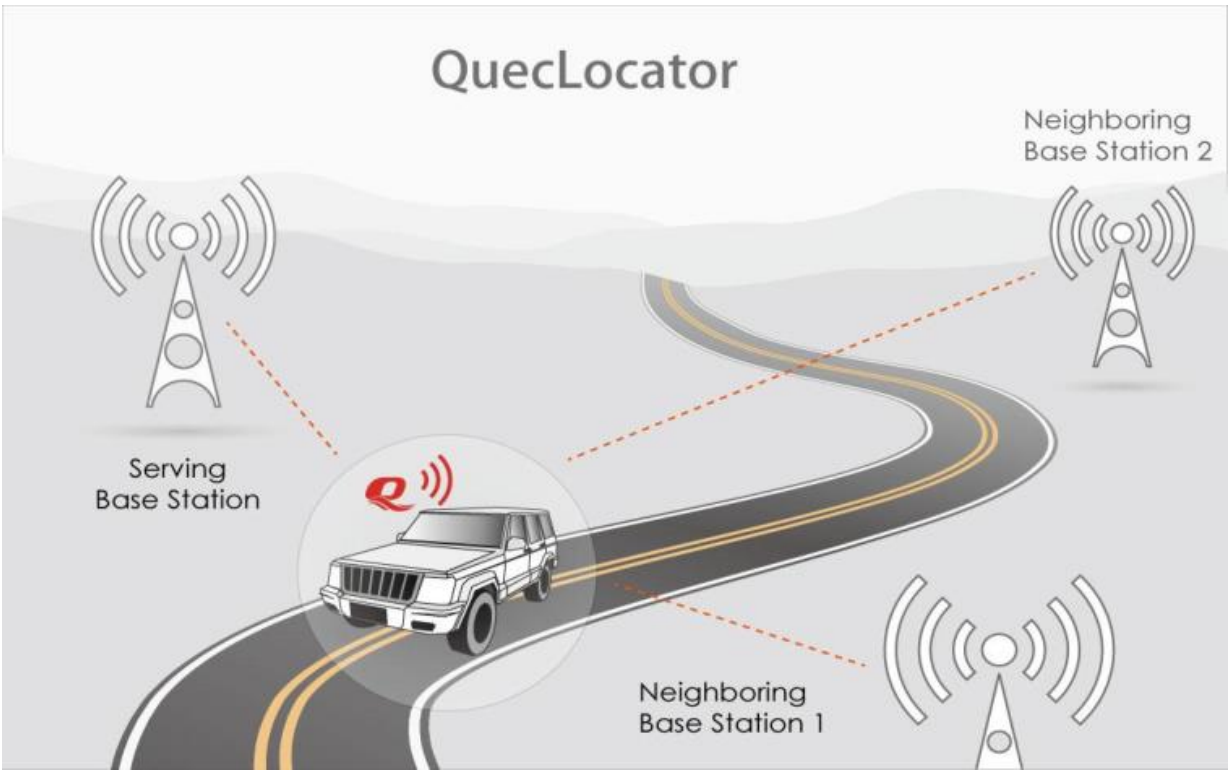

Figure 1: QuecLocator

2.2. Benefits of QuecLocator

The benefits of using QuecLocator are as follows:

- Worldwide Outdoor and Indoor Positioning
  QuecLocator partners with first tier positioning service providers on the market to provide both outdoor and indoor positioning service worldwide.

- Easy to Use
  Pre-built AT commands for easy location request. The current location can be easily displayed via QuecLocator.

- Enhancing GNSS Performance
  QuecLocator is based on the density of network cells. Assisted by QuecLocator, Quectel modules can show their locations even without GNSS or under GNSS outage condition.

- Cost-saving
  For some specific applications, a rough estimate of the position is enough. Then a GNSS module can be retrenched.

2.3. General Process of QuecLocator

Step 1: Configure and activate a PDP context.

1) Configure <APN>, <username>, <password> and other parameters of a PDP context by AT+QICSGP command. Please refer to *Quectel_EC2x&EG9x&EM05_TCP(IP)_AT_Commands_Manual* for details. If the context needs to be used in multiple ways or multiple PDNs with the same APN profile need to be established, configure them by AT+QCFG="PDP/DuplicateChk",1. If QoS settings need to be updated, configure them by AT+CGQMIN, AT+CGEQMIN, AT+CGQREQ, and AT+CGEQREQ commands. For more details about these commands, please refer to *Quectel_EC25&EC21_AT_Commands_Manual* & *Quectel_EM05_AT_Commands_Manual*.
2) Activate the PDP context by AT+QIACT.
3) Configure the PDP context ID for QuecLocator by AT+QLOCCFG="contextid",<contextID>.

Step 2: Get the location information by AT+QCELLLOC. Step 2 can be repeated.

3 Description of QuecLocator AT Commands

3.1. AT Command Syntax

Table 1: Types of AT Commands and Responses

Test Command	**AT+<x>=?**	This command returns the list of parameters and value ranges set by the corresponding Write Command or internal processes.
Read Command	**AT+<x>?**	This command returns the currently set value of the parameter or parameters.
Write Command	**AT+<x>=<…>**	This command sets the user-definable parameter values.
Execution Command	**AT+<x>**	This command reads non-variable parameters affected by internal processes in the UE.

3.2. AT+QLOCCFG Configure Parameters for QuecLocator

AT+QLOCCFG Configure Parameters for QuecLocator	
Test Command **AT+QLOCCFG=?**	Response **+QLOCCFG: "contextid",(1-16)** **+QLOCCFG: "timeout",(1-300)** **+QLOCCFG: "token",<token_value>** **+QLOCCFG: "server",<address>** **OK**
Read Command **AT+QLOCCFG?**	Response **+QLOCCFG: "contextid",<contextID>** **+QLOCCFG: "timeout",<timeout>** **+QLOCCFG: "token",<token_state>** **+QLOCCFG: "server",<address>**

	OK
Write Command **AT+QLOCCFG="contextid"[,<contextID>]**	Response If **<contextID>** is not omitted: **OK** Or **+CME ERROR: <err>** If **<contextID>** is omitted, query the current context ID: **+QLOCCFG : "contextid",<contextID>** **OK**
Write Command **AT+QLOCCFG="timeout"[,<timeout>]**	Response If **<timeout>** is not omitted: **OK** Or **+CME ERROR: <err>** If **<timeout>** is omitted, query the current timeout value: **+QLOCCFG: "timeout",<timeout>** **OK**
Write Command **AT+QLOCCFG="token"[,<token_value>]**	Response If **<token_value>** is not omitted: **OK** Or **+CME ERROR: <err>** If **<token_value>** is omitted, query the current token state: **+QLOCCFG: "token",<token_state>** **OK**
Write Command **AT+QLOCCFG="server"[,<address>]**	Response If **<address>** is not omitted: **OK** Or +CME ERROR: <err> If **<address>** is omitted, query the server address and port information. **+QLOCCFG: "server",<address>** **OK**

Parameter

<token_value>	String type. Access token. The string length should be 16 numbers.
<address>	The customer-defined address and port of a server for QuecLocator service. The server address can be an IP address or a domain name. The range of the port is 1-65535. And if the port number is not entered, the default port is 80.
<contextID>	Numeric type. PDP context ID. The range is 1-16 and the default value is 1.
<timeout>	After executing the AT+QLOCCFG command, the maximum time waiting for data to be returned from the server. If there is no data returned from the server within the timeout value, the command will time out and return the corresponding result. The value range is 1-300, and the default value is 60. Unit: second.
<token_state>	Current token state. "exist" <token_value> has been set. "empty" <token_value> has not been set.

3.3. AT+QCELLLOC Get Location Information by QuecLocator

AT+QCELLLOC Get Location Information by QuecLocator	
Test Command **AT+QCELLLOC=?**	Response **OK**
Execution Command **AT+QCELLLOC**	Response **+QCELLLOC: <longitude>,<latitude>** **OK** Or +CME ERROR: <err>

Parameter

<longitude>	Float type. The longitude of the location information. The range is from -180.000000 to 180.000000.
<latitude>	Float type. The latitude of the location information. The range is from -90.000000 to 90.000000.
<err>	Integer type. It indicates the operation error code. It is the type of error (Please refer to the ***Chapter 6***).

4 Example

```
//Step 1: Configure and activate the PDP context.
AT+QICSGP=1,1,"UNIWAP","","",1          //Configure PDP context 1, APN is “UNIWAP” for China Unicom.
OK

AT+QIACT=1                              //Activate PDP context 1.
OK                                      //Activated successfully.

AT+QIACT?                               //Query the state of PDP context.
+QIACT: 1,1,1,"10.7.157.1"

OK

AT+QLOCCFG="contextid",1                //Set the PDP context ID as 1. The PDP context must be activated first.
OK


AT+QLOCCFG="contextid"                  //Query the PDP context ID.
+QLOCCFG: "contextid",1

OK

AT+QLOCCFG="timeout",10                 //Configure the timeout value.
OK

AT+QLOCCFG="timeout"                    //Query the current timeout value.
+QLOCCFG: "timeout",10

OK

AT+QLOCCFG="token","1234567812345678"   //Configure the token value.
OK

AT+QLOCCFG="token"                      //Query the current token state.
+QLOCCFG: "token",exist

OK
```

```
AT+QLOCCFG="server","47.74.213.211:80"          //Configure the server address and port information.
OK

AT+QLOCCFG="server"                             //Query the current server address and port information.
+QLOCCFG: "server",47.74.213.211:80

OK


//Step 2: Get the location information by QuecLocator.
AT+QCELLLOC                                     //Get the serving cell location.
+QCELLLOC: 117.206001,31.847601

OK
```

5 Error Handling

5.1. Executing QuecLocator AT Command Fails

When executing QuecLocator AT commands, if response “ERROR” is received from the module, please check whether the SIM/USIM card is inserted, and whether it is “+CPIN: READY” returned when executing AT+CPIN?.

5.2. PDP Activation Fails

If it is failed to activate a PDP context by AT+QIACT command, please check the following configurations:

1. Query whether the PS domain is attached or not by AT+CGATT? command. If not, please execute AT+CGATT=1 command to attach PS domain.

2. Query the network registration status by AT+CGREG? command and make sure the PS domain has been registered.

3. Query the PDP context parameters by AT+QICSGP command and make sure the APN of specified PDP context has been set.

4. Make sure the specified PDP context ID is neither used by PPP nor activated by AT+CGACT command.

If all above configurations are correct, but activating PDP context by AT+QIACT command still fails, please reboot the module to resolve this issue. After booting the module, please check the configurations mentioned above at least three times and each time at an interval of 10 minutes to avoid frequently rebooting the module.

5.3. Error Response of AT+QCELLLOC

If “+CME ERROR: <err>” is returned after executing AT+QCELLLOC, please re-execute the command. If it fails again, deactivate the PDP context by AT+QIDEACT command, and then try again (Please refer to ***Chapter 5.2***).

6 Summary of Error Codes

<err> indicates an error related to mobile equipment or network. The details about <err> are described in the following table.

Table 2: Summary of Error Codes

<err>	Meaning
701	HTTP unknown error
703	HTTP busy
706	HTTP network busy
707	HTTP network open failed
708	HTTP network no configuration
709	HTTP network deactivated
710	HTTP network error
714	HTTP DNS error
715	HTTP socket create error
716	HTTP socket connect error
717	HTTP socket read error
718	HTTP socket write error
719	HTTP socket close
720	HTTP data encode error
721	HTTP data decode error
722	HTTP read timeout
723	HTTP response fail
727	Wait data timeout
728	Wait HTTP response timeout

729	Fail to allocate memory
730	Invalid parameter
731	Fail to get location
732	Timeout

7 Appendix A Reference

Table 3: Related Documents

SN	Document Name	Remark
[1]	Quectel_EC2x&EG9x&EM05_TCP(IP)_AT_Commands_Manual	EC2x&EG9x&EM05 TCP(IP) AT Commands Manual
[2]	Quectel_EC25&EC21_AT_Commands_Manual	EC25&EC21 AT Commands Manual
[3]	Quectel_EM05_AT_Commands_Manual	EM05 AT Commands Manual

Table 4: Terms and Abbreviations

Abbreviation	Description
APN	Access Point Name
HTTP	Hyper Text Transfer Protocol
GNSS	Global Navigation Satellite System
PDP	Packet Data Protocol
PPP	Point-to-Point Protocol
RTC	Real-Time Clock