TCPIP Application Note for WCDMA Solution V3.2
Scope
SIM5218, SIM5215, SIM5216, SIM5320, SIM6216, SIM6320

Reference
SIMCOM_SIM5320_ATC_EN_V1.30.doc
Content

1. External PPP Setting .....................................................................................................................3
2. SIMCom Internal TCPIP Protocol .................................................................................................3
  2.1 Network Environment .............................................................................................................3
  2.2 PDP Context Enable/Disable .................................................................................................4
  2.3 Command Mode (Non-transparent mode) ..............................................................................4
    2.3.1 TCP Client ....................................................................................................................5
    2.3.2 UDP Connetion ..............................................................................................................5
    2.3.3 Extended Information .....................................................................................................6
    2.3.4 TCP SERVER ..................................................................................................................7
    2.3.5 Connection Status Checking .........................................................................................8
  2.4 Data mode (Transparent mode) ...............................................................................................9
    2.4.1 TCP Client .....................................................................................................................9
    2.4.2 TCP Server ...................................................................................................................10
  2.5 Switch between data mode and command mode ..................................................................11
  2.6 TCP retransmission information .............................................................................................11
  2.7 Set TCP maximum timeout value ..........................................................................................12
  2.8 Set DNS maximum timeout value ..........................................................................................12
Contact us ........................................................................................................................................14
1. External PPP Setting

Port: USB->modem / UART, Hardware flow control

AT command:
AT+CGDCONT=1,"IP","apn"
ATD*99#

Note, Sequence of +++ could be issued to exit data mode.

2. SIMCom Internal TCPIP Protocol

2.1 Network Environment

TCPIP application is based on GPRS network; so, ensure GPRS network is available before TCPIP setup. Following is the recommended steps.

AT+CSQ
+CSQ: 23,0

OK
AT+CREG?
+CREG: 0,1

OK
AT+CPSI?
+CPSI: GSM,Online,460-00 0x1816,63905,81 EGSM 900,-68,0,31-31

OK
AT+CGREG?
+CGREG: 0,1

OK
2.2 PDP Context Enable/Disable

APN setting:
AT+CGSOCKCONT=1,"IP","CMNET"
OK
AT+CSOCKSETPN=1
OK

*Note, usually CSOCKAUTH and CSOCKSETPN parameter are kept default if not care about.*

Enable PDP context:

AT+CIPMODE=0  // command mode, if not configured, it’s 0 as default. If want data mode, please configure before Net open.
OK
AT+NETOPEN
OK

+NETOPEN: 0

AT+IPADDR
+IPADDR: 10.113.43.157

OK

Disable PDP context:

AT+NETCLOSE
OK

+NETCLOSE: 0

2.3 Command Mode (Non-transparent mode)

Command mode is sometimes called non-transparent mode, which is default configured by module. Multi sockets are available under this mode.
2.3.1 TCP Client

AT+CIPOPEN=0,"TCP","116.236.221.75",8011 // only IP address is supported
OK

+CIPOPEN: 0,0

AT+CIPSEND=0,5 // only supports fixed-length to send
>HELLO
OK

+CIPSEND: 0,5,5

AT+CIPOPSE=0 // close by local
OK

+CIPCLOSE: 0,0

Note, if connection closed by remote server, following URC will return:
+IPCLOSE: 0, 1
Here, the meaning of second parameter in this URC is following,
0 - closed by local, active
1 - closed by remote, passive
3 - Reset

2.3.2 UDP Connection

One socket could communicate with multiple UDP channels.

AT+CIPOPEN=0,"UDP","9000" // here 9000 is local port
+CIPOPEN: 0,0
OK

AT+CIPSEND=0,5,"16.236.221.75",9015
>hello
OK

+CIPSEND: 0,5,5

AT+CIPSEND=0,5,"16.236.221.75",8058
>12345
OK

+CIPSEND: 0,5,5

AT+CIPCLOSE=0
+CIPCLOSE: 0,0
OK

2.3.3 Extended Information

Command AT+CIPHEAD is used to show IP head (data length) information, and command AT+CIPSRIIP is used to show remote IP address and port once data received.

AT+CIPHEAD=1
AT+CIPSRIIP=0
AT+CIPOPEN=0,"TCP","116.236.221.75",8011
OK

+CIPOPEN: 0,0

AT+CIPSEND=0,5
>11111
OK

+CIPSEND: 0,5,5

// here, remote data is coming
+IPD13
hello from pc
AT+CIPSRIIP=1
OK
// here, remote data is coming
RECV FROM:116.236.221.75:8011
+IPD15
hello from pc 2
AT+CIPCLOSE=0
OK

+CIPCLOSE: 0,0
2.3.4 TCP SERVER

Module supports 4 sockets to listen.

AT+CGSOCKCONT=1,"IP","CMNET"
OK
AT+NETOPEN
OK

+NETOPEN: 0,0

AT+SERVERSTART=8080,0
OK
AT+SERVERSTART=9090,1
OK
AT+SERVERSTART=7070,2
OK
AT+SERVERSTART=6060,3
OK

//If a socket is accepted, the following URC will be reported:
+CLIENT: 0,1,192.168.108.5:57202
//User can use AT+CIPOPEN? to check the accepted socket
AT+CIPOPEN?
+CIPOPEN: 0,"TCP","192.168.108.5",57202,1// last parameter of 1 indicates this is an accepted
socket, this server index is 1
+CIPOPEN: 1
+CIPOPEN: 2
+CIPOPEN: 3
+CIPOPEN: 4
+CIPOPEN: 5
+CIPOPEN: 6
+CIPOPEN: 7
+CIPOPEN: 8
+CIPOPEN: 9

OK

AT+CIPSEND=0,5 // only supports fixed-length to send
>HELLO
OK

+CIPSEND: 0,5,5
AT+SERVERSTOP=0  // if unspecified, will close 0 channel
+SERVERSTOP: 0,0
OK
AT+SERVERSTOP=1
+SERVERSTOP: 1,0
OK
AT+SERVERSTOP=2
+SERVERSTOP: 2,0
OK
AT+SERVERSTOP=3
+SERVERSTOP: 3,0
OK

AT+NETCLOSE
OK

+NETCLOSE: 0

Note, we can check connection status with command AT+CIPOPEN. If some socket needs to close, please issue command AT+CIPCLOSE=<linked_num>.

2.3.5 Connection Status Checking

AT+CIPOPEN?
+CIPOPEN: 0
+CIPOPEN: 1
+CIPOPEN: 2
+CIPOPEN: 3
+CIPOPEN: 4
+CIPOPEN: 5
+CIPOPEN: 6
+CIPOPEN: 7
+CIPOPEN: 8
+CIPOPEN: 9

OK
AT+CIPOPEN=0,"TCP","116.236.221.75",8011
OK

+CIPOPEN: 0,0
+IPD15
hello from pc 3
AT+CIPOPEN?
+CIPOPEN: 0, "TCP","116.236.221.75",8011,-1  // last parameter of -1 indicates this connection is active, this socket acts as client
+CIPOPEN: 1
+CIPOPEN: 2
+CIPOPEN: 3
+CIPOPEN: 4
+CIPOPEN: 5
+CIPOPEN: 6
+CIPOPEN: 7
+CIPOPEN: 8
+CIPOPEN: 9

OK

2.4 Data mode (Transparent mode)

Currently, only one socket is available under transparent mode, either TCP client or TCP server. Command AT+CIPCCFG could be configured several parameters for data transmission under transparent mode. Before using data mode, the AT+CIPMODE=1 must be called first. Note: In transparent mode, server and client cannot be used together.

2.4.1 TCP Client

AT+NETOPEN
OK

+NETOPEN: 0
AT+CIPOPEN=0,"TCP","116.236.221.75",8011//only <link_num>=0 is allowed in transparent mode.
CONNECT 115200
// sequence of +++ to quit data mode
OK
ATO       // command ATO to quit command mode
CONNECT 115200
// sequence of +++ to quit data mode
OK
AT+CIPCLOSE=0
OK

CLOSED
+CIPCLOSE: 0,0

AT+NETCLOSE
OK

+CIPCLOSE: 0

## 2.4.2 TCP Server

ATS0=7 // ATS0 should be configured for TCP server application
OK
AT+CIPMODE=1
OK
AT+NETOPEN
OK

+CNETOPEN: 0
AT+SERVERSTART=8080, 0//only <server_index>=0 is allowed in transparent mode.
OK

+CLIENT: 0,0,192.168.108.5:57202
CONNECT 115200 // sequence of +++ to quit data mode
OK
AT+CIPCLOSE=0 // close client connection
OK

CLOSED
+CIPCLOSE: 0,0

AT+SERVERSTOP=0 // close server socket
+SERVERSTOP: 0,0
OK

Note, the factors which influence data rate are following:
AT&E1 the data rate should be the serial connection rate;
AT&E0 the data rate is the wireless connection speed (based on QOS, refer to command
AT+CGSOCKQREQ/AT+CGSOCKEQREQ/AT+CGSOCKQMIN/AT+CGSOCKEQMIN).
2.5 Switch between data mode and command mode

Hardware flow control is recommended. Currently, USB->modem port, USB->AT port and UART port all support hardware flow control.

Software switching: escape sequence ++++. Please take care, this is a complete command, do not separate each character, also take care that the time delay before and after this sequence should be more than 1000 milliseconds, the interval of each character should not more than 900 milliseconds.

Hardware switching: DTR pin could be used to trigger data mode and command mode changed. Command AT&D1 should be configured before application.

2.6 TCP retransmission information

Each sending TCP packet needs to get a TCP ACK packet from peer socket. If the TCP ACK packet is not got in time, the module shall resend the same packet. The waiting for TCP ACK packet interval is $3 \times 2^{(n-1)}$ seconds, while n is the retry times. Also for a packet sending, the total trying send time is 2 minutes. For example:

1. Send the TCP packet
2. Wait 3 seconds, and if TCP ACK packet is not got, resend the packet
3. Wait another 6 seconds, and if TCP ACK packet is not got, resend the packet
4. Wait another 12 seconds, and if TCP ACK packet is not got, resend the packet
5. Wait another 24 seconds, and if TCP ACK packet is not got, resend the packet
6. Wait another 48 seconds, and if TCP ACK packet is not got, resend the packet
7. Wait another 27 seconds, and if TCP ACK packet is not got, regards socket sending failure and close the socket. (Here only 27 seconds waiting is because that the total trying time is 2 minutes).
8. If the TCP ACK packet is got within the previous steps, the packet is regarded as sending successfully.

User can modify the total allowed retrying send times by set the first parameter of AT+CIPCCFG. For example, if AT+CIPCCFG=3, then the packet sending should be as following:

1. Send the TCP packet
2. Wait 3 seconds, and if TCP ACK packet is not got, resend the packet
3. Wait another 6 seconds, and if TCP ACK packet is not got, resend the packet
4. Wait another 12 seconds, and if TCP ACK packet is not got, resend the packet
5. Wait another 24 seconds, and if TCP ACK packet is not got, regards socket sending failure and close the socket
6. If the TCP ACK packet is got within the previous steps, the packet is regarded as sending successfully.

User also can modify the minimum waiting interval by setting the 7th parameter of AT+CIPCCFG. For example, if AT+CIPCCFG=,......,10000, then the packet sending interval should be as following:

1. Send the TCP packet
2. Wait MAX(10, 3*2^(n-1)) = 10 seconds, and if TCP ACK packet is not got, resend the packet
3. Wait another MAX(10, 3*2^(n-1)) = 10 seconds, and if TCP ACK packet is not got, resend the packet
4. Wait another MAX(10, 3*2^(n-1)) = 12 seconds, and if TCP ACK packet is not got, regards socket sending failure and close the socket
5. Wait another MAX(10, 3*2^(n-1)) = 24 seconds, and if TCP ACK packet is not got, resend the packet
6. Wait another MAX(10, 3*2^(n-1)) = 48 seconds, and if TCP ACK packet is not got, resend the packet
7. Wait another 16 seconds, and if TCP ACK packet is not got, regards socket sending failure and close the socket. (Here only 16 seconds waiting is because that the total trying time is 2 minutes).
8. If the TCP ACK packet is got within the previous steps, the packet is regarded as sending successfully.

The two parameters can be used together and they may affect AT+CIPOPEN/AT+CIPSEND/AT+CIPCLOSE.

2.7 Set TCP maximum timeout value

User can set the maximum timeout value for AT+NETOPEN, AT+CIPOPEN and AT+CIPSEND using AT+CRIPTIMEOUT command:

AT+CRIPTIMEOUT=<netopen_timeout>,<connect_timeout>,<send_timeout>,
for example:
AT+CRIPTIMEOUT=40000, 30000, 25000

2.8 Set DNS maximum timeout value

User can set the maximum timeout value for DNS query using AT+CIPDNSSET command:

AT+CIPDNSSET=<max_net_retries>,<net_timeout>,<max_query_retries>.

The timeout value for performing DNS query is <net_open_time> + 3000ms + 1000ms*<dns_query_retry_counter>. Here <net_open_time> is the time for opening PS network. <dns_query_retry_counter> is the retry counter for sending DNS query using UDP packet. By default, the maximum DNS query time is long, so the AT+CIPDNSSET=0,30000,5 is
recommended to be used, for this setting, the maximum timeout value is 63 seconds.
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