

*Application Note
Using GPRS and TCP-IP with
the SEM GSM modules*

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1 Introduction

The GSM/GPRS system allows direct access into the internet enabling M2M applications to interface to web servers rather than going through the PSTN which gives faster and cheaper communications with greater flexibility.

This document is intended to explain how the overall system works and how the SEM GSM modems with their embedded TCP/IP stack enable transparent communications.

2 Overview of the GSM/GPRS system

In Figure 1 a simplified diagram of the overall system is shown, the major components of these are explained below.

2.1 *GSM module and application*

This is a GSM module with or without TCP/IP stack on board. If the unit does not have a TCP/IP stack on board it must be contained on the application be it microprocessor, PC, etc.

2.2 *GSM/GPRS network*

This includes the base station through to the APN with all of the associated IP backbone, etc. The network takes care of the mobility issues and getting data to the mobile station

2.3 *APN*

An APN is similar to a URL on the WWW, it is what the unit makes a GPRS 'call' to. The service provider is able to attach anything to an APN to create a VPN (Virtual Private Network) i.e. if a security company wanted its own APN it might have 'security' no one else would then have access to this, requirements for APN's to be assigned vary between the service providers.

Most service providers have an internet portal which they connect a DHCP server to giving access to the internet i.e. Vodafone UK use the APN 'internet' for their portal.

2.4 *DHCP server*

This is what you negotiate your IP address with and where all of the data goes through, it effectively acts as your service provider i.e. AOL.

2.5 *Internet*

The internet is the internet, no explanation should be required.

2.6 *Web server*

The users web server which has a static IP address or a URL that can be resolved by a server. This should be running the users application which can interpret and manipulate the data as required.

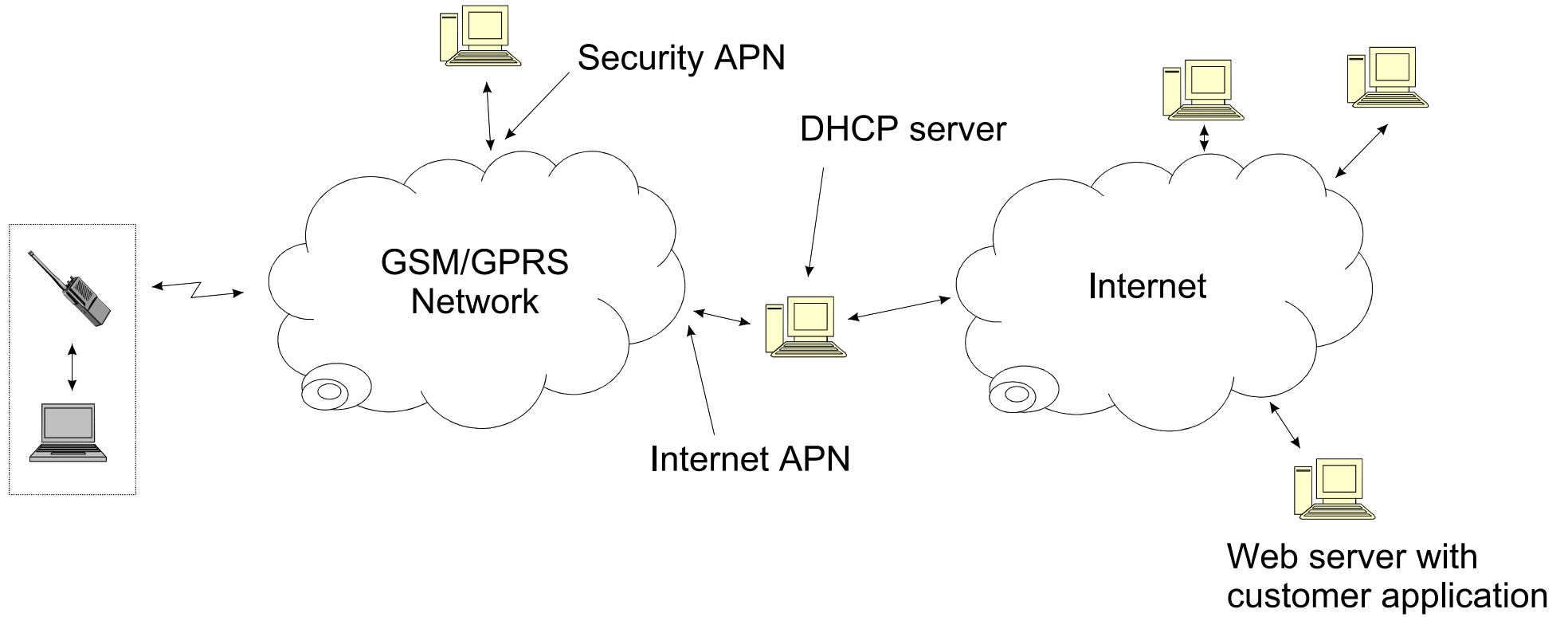


Figure 1 GSM/GPRS

3 Modes of operation

When using GPRS with the SEM modules some units have an embedded TCP/IP stack others do not, these are listed below:-

Units without the TCP/IP stack	- GM29
	- GM41
	- GM47/GM48
Units with the TCP/IP stack	- GR47/GR48
	- GT47/GT48

3.1 *GSM modules without TCP/IP stacks*

These modules have limited functionality in that they will provide communications across the network to the APN but the rest of the protocol stack needs to be provided by the application.

The sequence of events

1. Create a data account using the at+cgdcont command i.e. at+cgdcont=1,"IP","internet". This hold the necessary information required to make a GPRS 'call'.
2. Make a GPRS call using the standard dial command but using the dial string *99***1#
3. Once the unit has connected through to the APN correctly it will return a CONNECT message and enters V.250 online data mode.
4. At this point the application needs to initiate a PPP/TCP/IP conversation.

More details of the protocols and procedure used are available in GSM 7.60 or 3GPP 27.060.

3.1.1 **Running GPRS through Windows**

The fastest way to see how GPRS operates with a TCP/IP stack is to run it against windows. To do this use the following steps.

1. Power the unit up and create a data account using the command at+cgdcont=1,"IP","XXXXXX"
Where XXXXXX is the internet APN for the network you are using

2. Install the modem onto the PC using the latest modem driver that can be downloaded from the internet.
3. Set up a dial up networking session using the modem that you have just installed. Make sure that all parameters in both the dial up networking session and the modem properties are set to 9600bps.
4. Start to make the call using the dial string *99***1#, the unit should now negotiate an IP address with the server and enable the PC to surf the web.
Note : You may need to adjust some of your Internet explorer settings to allow it to accept data from the dial up network connection.

If the connection fails the most common errors are :-

Error 738 – The most common cause of this error is that the SIM does not have access rights to the internet DHCP server and it is unable to allocate the unit an IP address.

Error 692 – This is generally attributed to either the modem not being on or the PC talking at a different baud rate to that which the modem is talking at.

3.2 GSM units with TCP/UDP/IP stacks

The GSM units that have TCP/UDP/IP stacks on them allow the application to forget about how the communication takes places and allows transparent communication between the unit and the IP address which the users web server is sat on i.e. data will be passed to the MS it will then packet it up and the user will see it arrive at the port of the IP address that has been connected to.

The AT command operation of the TCP/IP stack is specified in Application note LZT 123 7631 R1A.

4 Practicalities of using GPRS

Below are a number of points that need to be considered when using GPRS

4.1 *Connection timing*

When using GPRS with a session running most service providers will monitor the traffic flow, if there is none for a predetermined period of time then it will shut the connection down at either the DHCP server or the APN, this is performed so that system resources are not taken up unnecessarily.

To stop this happening you will need to send periodic keep alive bytes, around 1 every five minutes would be sufficient.

4.2 *Dynamic IP addresses*

At present all of the IP address that are handed out by the networks are dynamically allocated i.e. each time you start a new session the unit will be assigned a new IP address. A session may be finished for a number of reasons

- The unit is powered off and then back on again
- There has been no activity on the line for a predefined period of time and the network has shut it down (see above).
- The unit has been out of coverage (or left coverage) for too long and the network has again shut it down.

These are the most common causes but are by no means the only ones.

4.3 *Static IP addressing*

Giving a unit a static IP address is not yet in wide spread use although they are being experimented with by some operators. A static IP address will allow you to keep the same address regardless of whether you power the unit off or not, it does present the operators with some problems but it does allow the unit to support server functions as well as client functions which are all that are currently implemented.

4.4 TCP and UDP protocols

The two main protocols that the unit supports are TCP and UDP a brief explanation about each is given below.

TCP – This provides a reliable connection to another point in the network i.e. numbers frames and keeps track of acknowledgements.

UDP – This is a 'fire and forget' protocol normally used with time critical information such as voice i.e. the unit will packet the data up and send it across the network.

In the future the units will be able to support higher level protocols such as XML, WBXML, etc.

5 References

Most official documentation about TCP/IP is available as RFC's from <http://www.ietf.org> and they can provide essential technical background for anyone requiring a deeper understanding of TCP/IP. A small sample of the more pertinent RFC's and their titles are outlined below but many more are available.

1. RFC 791 Internet protocol
2. RFC 792 Transmission Control Protocol
3. RFC 394 File Transfer Protocol
4. RFC 1180 TCP/IP Protocol
5. L2T 123 7631 R1A Using AT commands to control TCP/IP stack on GR47/GR48