

## **GSM NETWORKS – CIRCUIT SWITCHED DATA – MODEM DEVICES**

### **Background**

Snapblue/Snapsoft/Snapcells (SNAP) products are encrypting modem devices designed to transmit and receive encrypted calls over a GSM network. The transmission is routed over the network using CSD (circuit switched data) Asynchronous Data at 9600/14,400 BPS. This is not GPRS or EDGE data (refer to diagram on page 3 for illustration). The SNAP products are designed to automatically detect the proper network settings for transmitting encrypted information over the network using CSD. The setting for CSD can be adjusted by within the connection settings. There are two types of CSD protocols in the SNAP products (V.32- Analog and V.110-Digital).

GSM service providers will treat all data calls differently than regular voice calls and there is no uniform standard in which all GSM providers will route, connect, prioritize, and receive data calls. Unlike other solutions the SNAP software has built-in compatibility to operate on both transparent and non-transparent networks and all four GSM frequencies (850/900/1800/1900). The SNAP products have been known to operate in over 40 countries with different GSM networks. New countries are added periodically to our known list as users purchase and travel to different countries.

### **Calls dropping before you get connected**

Some GSM networks will not permit data transmissions when using prepaid SIM cards. Therefore, it is always recommended that you have a post paid (i.e. an account) with your GSM service provider.

### **Receiving Data Calls when Roaming**

In some countries the CSD feature is included as part of your voice services and no additional measures are needed to request it. In other countries you may be required to pay a monthly fee for this feature. Under either condition we recommend that you ask your provider to establish a second number (data number).

Establishing a data number will greatly reduce problems associated with routing of data calls to your SNAP device.

The data number is very useful when roaming. When your service provider establishes the data number on your SIM all calls sent to that data number will be treated as a data call. Otherwise, when roaming on a different GSM network you may experience failures in receiving data calls without a data number.

### **Delay and Echo (Quality)**

SNAP products are designed to minimize echo and delay during an encrypted conversation. The encrypted conversation takes place on the Data network of the Mobile Network and is therefore treated differently than a regular voice transmission. Factors that can affect call quality during transmission over the Data such as network congestion are typically referred to as delay. This describes the period of time it takes for your voice to reach the receiving party. This time gets longer if the transmission of the encrypted voice over the network takes longer, or transmission errors occur. Reasons for longer than normal delay are usually either bad GSM coverage and/or network congestion.

Network congestion can often be circumvented by setting up the call again. Sometimes you may get a “bad line”. When making encrypted calls over any GSM network you may experience a certain amount of delay caused by the architecture of the GSM network. The GSM network handles data with lower priority than voice transmissions. So even if the network has optimal factors, there is always a certain noticeable delay of 300ms-700ms, much like transcontinental phone calls.

If the overall line quality becomes bad you may experience dropped calls. Other factors that can affect call quality include the multiple operators involved in switching calls which can try to minimize their costs by technical measures (compression, low bandwidth, saturation, etc)

If the Delay is bad, please try to find a place with better GSM coverage and redial. This will often solve the problem if you get a “bad line”.

### **Call completion**

Some providers may restrict the reception of GSM data calls, such as needed for the SNAP products. The practice is becoming increasingly rare, but a GSM-provider may only allow incoming data calls to subscribers that have a special ‘data subscription’, or only subscribers with post-paid (i.e. a subscriber account) which comes with a special second phone number.

**Note: It is always optimal to ask your GSM provider to establish a second phone number (i.e. data number) to ensure that all calls that you receive from other SNAP users are routed properly.**

Some providers may not recognize that a number you are calling a GSM/ISDN number, and erroneously try to handle the call via a modem. This can be recognized by the called party because and will hear a modem sound when picking up the phone. Some providers may not pass data calls to certain other network providers at all. For additional information regarding CSD availability contact our customer service department.

All of the above conditions may make it impossible to use the SNAP products in one or both directions. As a work-around if you are roaming try switching providers. These problems are inherent to all modems using the CSD data call and apply to all data call types over GSM. Our customer service department has details for certain countries but not all countries with data call procedures.

**Note: All phones that are used for encryption of cellular communications use CSD. Future versions of the SNAP products will use the packet switched network for secure calls. Contact our customer service department for additional details.**

### **Secure Calls while moving**

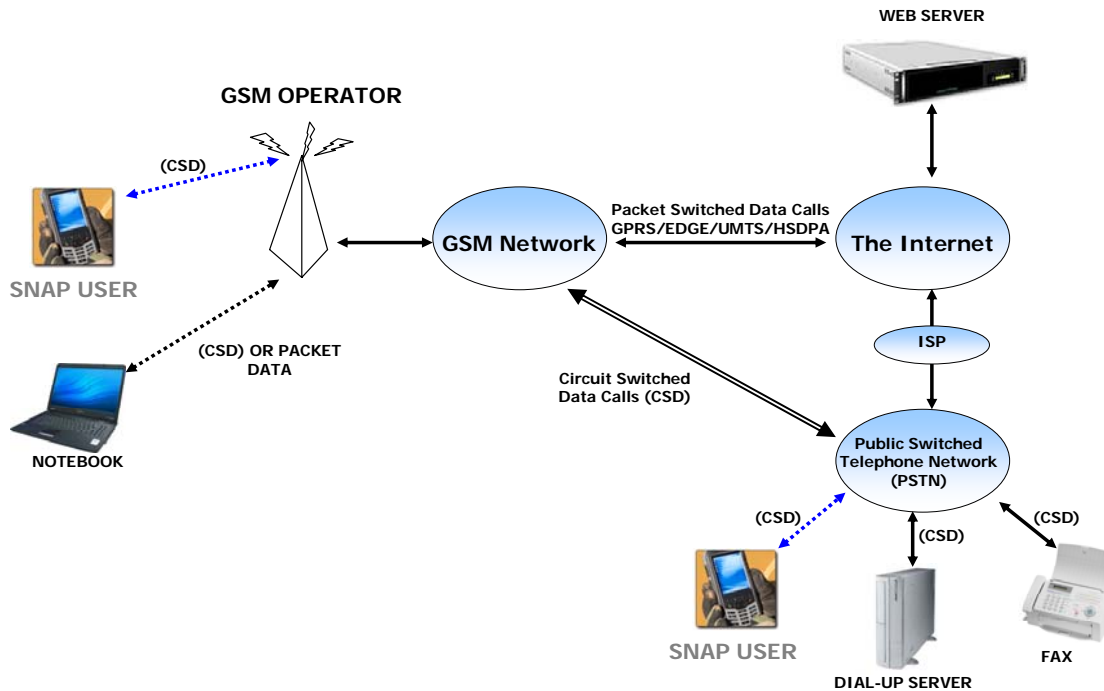
Please note that when using the SNAP products while moving fast (doing more than 48mph or 80km/h in a car or a train), you may experience a general degradation in call quality and periodic short dropouts every few minutes during a call. These dropouts are the result of a so called “handover” that occurs when you move from the coverage zone of one GSM tower to the next. During the handover the data connection is interrupted for a longer period than a voice transmission would be. To prevent important call contents from getting lost, the SNAP products, unlike other encrypted voice systems, accelerates the speed of decoding for a moment after the dropout to catch up with the lost transmission time. In general it is recommended that you place secure calls while driving slower than 48 mph or 80 km/h. It is ideal to make secure calls in a stationary location rather than a moving vehicle.

### **Receiving Data Calls -- Data Number**

When using the SNAP products to call users on a different network the receiving party may need to have a data number to receive the inbound secure call. This is due to different issues when the network providers route data transmissions from one network to another. The procedure of receiving data calls depends on your network and subscription. If you have different numbers for voice, fax and data, this is referred to as “multi numbering.” This means you can have up to three numbers on your SIM card. If you only have one number for all call types this is referred to as single numbering. Your SNAP product will still be able to function if you only have one number for all call types. If your network and subscription support multi numbering, the type of incoming call is shown automatically on the display of the mobile phone without any user intervention.

Secure calls which originate AND terminate within the same network provider may not need a data number. Making a simple test call between two units will help you determine the best settings for your needs

### GSM Data Transmission- CSD and Packet Data calls



NOTE: Future versions of SNAP mobile security devices will support secure voice calls using Packet data transmission.

There are two different types of data calls supported by most mobile phones or modem devices, packet switched and circuit switched data calls. Packet switched calls are routed from the Mobile Network to the Internet. Packet switched calls treat data as packets and do not consume network resources if there is no data to transmit. Circuit-switched calls are routed from the Mobile Network to the Public Switched Telephone Network (PSTN). Circuit-switched calls setup an over-the-air connection to the PSTN and are provided a dedicated channel for the uplink/downlink over the Mobile Network for the duration of the call. The dedicated circuit is what allows for greater sound quality versus Packet data on GSM networks.

Mobile operators treat Packet data calls differently; they provide what is known as “best effort”. Best effort is not a dedicated channel and therefore the bandwidth can be vary different between the two modems using Packet data calls even if both parties are connected on the same Mobile network. Packet switched data is ideal for applications that are not in real-time (i.e. SMS text message, MMS, email, etc). In the future Mobile operators will support real-time data application and with quality of service (QoS) to mobile phones that support it.