THE GSM SHORT MESSAGE SERVICE

Kevin Holley

Introduction

Although many diverse messaging systems have been available for some time, GSM saw a need for a new service which would be integrated with the pan-European digital mobile telephone system, providing essentially acknowledged message paging, but extending the functionality to suit the requirements of the mobile telephone user. The GSM Short Message Service (SMS) has been designed to meet the messaging needs of the mobile telephone user over and above the real-time speech and data services.

Current Messaging Systems

Many methods of transferring messages from one place to another have been developed to suit the various market requirements. Since people on the move tend to require non real-time communication facilities, messaging has traditionally been associated with mobility. Although there are well-established "fixed" messaging systems such as facsimile, telex and electronic mail, specifically mobile systems have emerged in recent years.

The main public mobile systems in use are:

- alphanumeric radiopaging
- voice messaging

Alphanumeric radiopaging is a system which sends textual messages to a small portable device carried by the subscriber. The messages are not acknowledged and therefore not guaranteed.

Voice messaging systems such as the Cellnet Messaging Service provide storage of incoming speech messages for later retrieval by the subscriber. Such systems have the advantage over alphanumeric radiopaging that the user can carry a single terminal (ie. a cellphone) to access the messaging system *and* respond to messages.

Although these systems meet many of the market requirements, there is a gap for an integrated bidirectional textual messaging system for people on the move.

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Development of SMS within GSM

In developing the GSM specifications, the participating operators wanted to ensure that the new system would be attractive compared with the existing analogue networks, in order to be able to compete effectively. Thus it was desirable to include unique features which offer useful services to the customer, where they are technically feasible.

Because of the traditional link between mobility and messaging, GSM decided to look into defining an integrated messaging service. Alphanumeric radiopaging has become popular in recent years but to be able to receive both text and voice calls, customers have had to carry two devices and take out two subscriptions. Even then, the customer is unable to send textual messages. GSM saw that there would be a significant market for an integrated messaging service within the GSM public land mobile network (PLMN). Since the service is *integrated*, it is a straightforward matter to make the service bidirectional (ie. messages to *and* from the mobile). Two GSM services were defined, known as "Short Message Service, Point-to-Point", "Mobile Terminated" and "Mobile Originated".

To make the services usable whilst keeping the network overheads low, it was necessary to arrive at a compromise on the message length. Too short a message would limit the applications, whilst too long a message would be expensive to transfer. In the event, GSM decided on a length of 160 characters. A typical message might be: "Mr Brown came in to see you. I explained that you had been called away on urgent business. He would like to arrange a meeting for the 23rd - Rita."

Because of the nature of cellular telephone usage, it is quite likely that the mobile will be unavailable on many occasions when a message is sent. GSM therefore decided to adopt a store-and-forward approach, so that messages could be stored until a link could be established to the mobile. The "SMS Service Centre" was defined to be the store and forward centre for short messages. The Service Centre interfaces to the GSM PLMN on one side, and a variety of other systems on the other side, eg. a bank of operators taking messages over the phone, electronic mail systems, etc.

Whilst the point-to-point services meet many of the messaging needs of the mobile subscriber, GSM saw that the transmission of messages on a broadcast basis would also be useful. The "Short Message Service, Cell Broadcast" was designed to be similar to teletext services, where a user selects a "page" or "pages" of interest. The Cell Broadcast "pages" are sent out repeatedly, typically once every 2 minutes or so. As new information becomes available, the page transmissions are modified accordingly. Since the transmissions are particular to individual cells they can provide local information. Typical applications are information about local services, weather, traffic information etc.

Services and Features provided by SMS

Mobile Terminated

The Mobile Terminated point-to-point service provides the transmission of short messages to a GSM mobile subscriber. The architecture is shown in figure 1. A message of up to 160 characters is generated (eg. from an operator terminal or from an incoming electronic mail message). This message is transferred from the Service Centre to the SMS gateway MSC. The gateway MSC then finds the MSC which is currently serving the mobile (the VMSC) by performing an HLR enquiry as for an ordinary GSM terminating speech call. If the mobile is available, the message is transferred between MSCs using capacity on the signalling links, rather than setting up a dedicated circuit switched connection. The message is transferred to the mobile using signalling resources on the radio interface. If the mobile is not available then a failure message is sent back to the Service Centre.

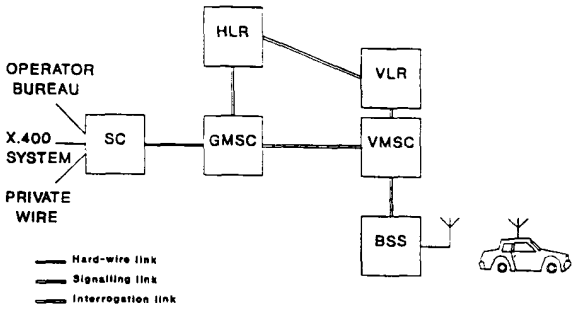

Figure 1 : Architecture for Mobile Terminated SMS

There is a high probability that a mobile will be switched off when a message first arrives. One way to ensure that the message reaches its destination would be for the SC to attempt to send it periodically (eg. once every hour). However, this would be a waste of resources. GSM therefore defined an *alerting* mechanism so that the SC could be informed when the mobile becomes available again. This means that the message can be transferred almost as soon as the mobile is switched on.

A mobile is able to receive a short message whether or not there is an existing speech or data call. Because only signalling resources are used, in such cases there is no interruption to the existing call. This makes the service much more useful, since the GSM mobile is effectively never engaged when a delivery is attempted, and therefore a message can always be sent if the mobile is switched on and in coverage.

Mobile Originated

The Mobile Originated point-to-point service provides the transmission of short messages from a GSM mobile subscriber to a Service Centre (figure 2). A message of up to 160 characters is generated by MMI at the mobile. This message will be transferred across the GSM PLMN to the Service Centre. The Service Centre then transfers the message to its destination, whether it is another GSM mobile or a terminal in a different network. (eg. by electronic mail, fax, etc.)

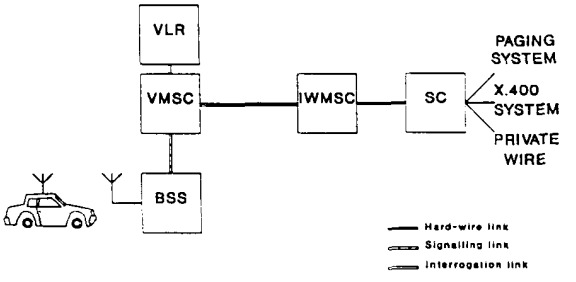

Figure 2 : Architecture for Mobile Originated SMS

Just as for the mobile terminated case, a mobile may submit a short message whether or not there is a speech or data call in progress. Again, in such cases there is no interruption to the existing call.

Cell Broadcast

The Cell Broadcast service provides the transmission of messages of up to 93 characters to all mobiles in a given cell (figure 3). Since the service is a point-to-multipoint service, messages are not acknowledged and therefore not guaranteed. However, the fact that the messages are repeated means that the mobile will get more than one chance to receive them correctly.

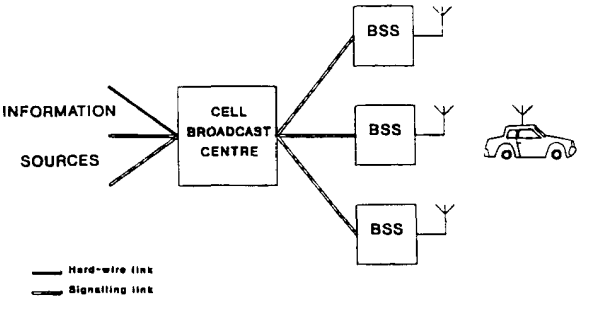

Figure 3 : Architecture for Cell Broadcast SMS

The messages are defined by the PLMN operator and generally provided free of charge. They are sent out repeatedly, typically once every 2 minutes or so, but the precise repeat rate is left for the PLMN operator to define.

Unlike the point-to-point services, the Cell Broadcast messages may only be received when the mobile is idle (ie. not engaged in a speech, data or SMS call).

Potential Enhancements

Whilst the GSM Short Message services provide transmission of textual information to and from a mobile user in their basic form, it is possible to layer applications on top of the basic services and to this end GSM has defined some extra functionality.

Within the SMS procedures, GSM has defined signalling to specify whether the message should be displayed as text, or sent to some ancillary equipment connected to the mobile station. It is therefore possible to design applications where equipment outside of the mobile station is controlled by the transmission of short messages. Data despatch services, such as taxi and courier services, could also use SMS applications. The potential for enhancement is only limited by the imagination of the operators and users!

Conclusion

We have seen that for the mobile user, the many existing messaging systems do not provide for simple, straightforward two-way text communication. GSM has designed-in a simple and effective means to meet this requirement, leading to an integrated cellular telephone and messaging tool, with the added bonus of service availability throughout the whole GSM coverage area in countries across Europe. In addition, GSM has provided for enhanced messaging services to enable the network operator to fine-tune the offered products to market requirements.

Acknowledgements

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