

1.1 GSM Development Worldwide

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If one takes into account the number of countries which have adopted it as their standard for public wireless communications and the corresponding amount of potential subscribers in the world, GSM is certainly on the way of becoming *the* world-wide standard for digital cellular communications. Of course, it does not mean that alternative systems, new or not, may not appear or continue to be developed, but GSM has already met a success which has exceeded the one that the first supporters expected.

This success is not only due to the technical choices - the advanced digital technology or the flexibility in adapting various national standards for the interconnection with the PSTN - but also due to the way GSM has been developed by a group of operators, which are convinced of the necessity of joining their efforts for its expansion.

This presentation will attempt to describe the current development of the GSM standard and will focus on the outstanding issues which require today or in the near future the most efforts for the success of the GSM implementation.

Organisation of the MoU

The GSM Memorandum of Understanding was originally signed in 1987 by European signatories from 17 countries. This document gave the group of network operators and regulatory authorities who had committed themselves to the GSM standard with the name of "GSM MoU". An Addendum to the Memorandum was signed in 1991, in order to allow membership for countries outside CEPT who were also adopting the GSM standard and to authorise the participation, with a special status, of the DCS 1800 operators.

This group has evolved to the point where, today, there are 90 signatories in 59 countries (50 signatories in Europe, 24 in Asia and Oceania, 6 in Africa, 10 in the Middle East), with 31 additional applicants.

The GSM MoU relies on two basic principles of co-operation among its members:

- implementation of the international roaming service, a feature which is mandatory to implement, when becoming a MoU signatory, with every other member.
- definition of a common position vis à vis the environment of the GSM operators: regulatory framework, ETSI/SMG (the Committee in charge of the standard development) and the suppliers of mobile stations and infrastructure systems.

The GSM MoU is organised around several working groups which deal with the major issues of the co-operation between signatories:

- Business Development Implementation of services
- Terminal Development Type Approval of mobiles, relationships with the suppliers
- BARG Billing and Accounting
- TADIG Transfer Account Data Interexchange Group
- IREG International Roaming expert Group
- SG Security Group
- Legal and Regulatory Issues

A Permanent Secretariat is located in Dublin and the GSM MoU has recently appointed a Technical Executive, who will be in charge of the technical co-ordination of working groups and of the promotion of the standard.

Up until now, members of the MoU have paid their share of agreed costs relating to the MoU promotional undertakings and the costs associated with the running of the Permanent Secretariat. Because of upcoming activities, the MoU is currently in the process of restructuring and should become a legal entity which can more easily accomplish the necessary tasks, rather than the loose "volunteer" organisation that has worked thus far.

Main areas of activities of the GSM MoU

The MoU work encompasses a very large variety of issues in the technical, commercial, regulatory or legal areas. The main areas of past and present activities can be summarised as follows:

- Harmonisation of the introduction of GSM networks and services
- Definition of billing and accounting principles for the international roaming service
- Definition of a standard roaming agreement between GSM operators
- Follow-up of the type approval procedures for the mobile stations
- Security and data protection aspects
- Strategies for the evolution of the GSM standard
- Promotion of the standard
- Policy for an open standard (IPR issues)
- Funding of various activities (installation of the Permanent Secretariat, CEIR implementation, coverage information...)

I will discuss more specifically three important issues where the MoU has an important role to play: type approval procedures; the development of GSM services; the implementation of international roaming service.

Type approval of mobile stations

Since its origin, although not being a regulatory body, the GSM MoU has always been involved in the procedures of type approval of mobile stations.

In the current phase 1 of the GSM standard, type approval was firstly based on old CEPT procedures, the principles of which were to rely on PTT administrations to select the tests to be performed by the terminal, from a general test specification written by ETSI/SMG (11 series).

In order to support this procedure, it was necessary to provide for suitable tools (simulators) and to validate the test cases obtained. For that purpose, a small group of "big" GSM operators formed a "Buyers' Club" which took the responsibility for the procurement of this equipment from Rohde & Schwarz.

In the meantime, the European Commission, thanks to a Council Directive passed in 1990, took over the responsibility of fixing the type approval procedures. Therefore, the old CEPT ITA (Interim Type Approval) regime was to be fully superseded by CTR (Common Test Regulation) at the end of this year.

For the upcoming Phase 2 of the standard, the GSM MoU will try to use the lessons learned from this experience. The Phase 2 effort is not very different from the previous phase, as it requires updating of the current Rohde & Schwarz simulator to primarily meet the new radio-related requirements, provisioning of suitable test tools for signalling tests and - not least - validation of all test cases. But the situation is complicated by the necessity to transfer the responsibility from the Buyers' Club (in charge of the development of the Phase 1 programme) to the whole GSM MoU.

Consequently, for the sake of Phase 2 success, the GSM MoU will initiate the procurement of this equipment - which is estimated to cost several million ECU's - and then allow accredited test houses to procure production samples for their own use at commercial prices, based on GSM MoU initiated development.

In parallel, the GSM MoU has set up a legal entity "GSM Facilities Ltd" to handle the request for quotation and the subsequent contract and management on the basis of up-front payments by GSM MoU signatories on the proviso that a substantial part of this investment will be recovered by contributions from the manufacturing industry, from the successful GSM network operators and from external funding (CEU).

GSM services

The introduction of the GSM services is a challenge not only for every GSM operator but also for the GSM success in general.

On the one hand, it is clear that the competition between operators will quickly move from the field of the basic radiotelephone service (i.e. offering to the customer connection to the PSTN with the best coverage at the cheapest price) to the area of value-added services. The implementation of such services as data transmission, Short Message Service (SMS), voice mail... will be the key features which will differentiate the GSM operators from each other. Also, the success of GSM will depend on its flexibility when connecting a large number of

subscribers while maintaining good call quality and a variety of services. To stimulate and favour the development of these services, the GSM MoU undertakes two types of actions.

- First, support and, when necessary, direction of the works currently undertaken by ETSI for the development of the standard, and especially for the next phases (Phase 2+). The MoU has already indicated its views for the prioritisation of the various services which are planned for this extended phase.
- Secondly, harmonisation of the implementation dates for these services and the access to these services on GSM networks; this process allows a speedier introduction of these services (by putting pressure on the manufacturers and network operators) and to ensure, as much as possible, seamless international roaming service for any GSM subscriber.

International roaming

International roaming is one of the basic tenets of MoU philosophy. Based on a general framework set up by the GSM MoU, members work out their own bilateral agreements, which are now total more than 400.

It is interesting to note that the first roaming agreements between European and non-European operators have started to appear. Nevertheless, these types of agreement raise some difficulties, as differences in signalling standards between countries make the interconnection between networks more complicated. The following chart shows the arrangements which have been reported to be finalised so far:

GSM Roaming Arrangements Status February 1994																															
		Australia - Vodafone Pty	Austria - PTT Austria	Belgium - Belgacom	Denmark - Sonofon	Denmark - Teledanmark	Estonia - Estonian Mobile	Finland - Telecom Finland	Finland - Radiolinja	France - Itineris	France - SFR	Germany - D1 (DeTeMobil)	Germany - D2 (Mannesmann Mobilfunk)	Greece - Panafon	Greece - Teleset	Hungary - Westel	Ireland - Eircell	Italy - SIP	Luxembourg - LUXGSM	Netherlands - PTT Telecom	Norway - Telemobil	Norway - Netcom	Portugal - TMN	Portugal - Telecel	Sweden - Comvik	Sweden - Nordic Tel	Sweden - Telia Mobitel	Switzerland - PTT	UK - Cellnet	UK - Vodafone	
Country	Carrier																														
Australia	Vodafone Pty	X			X																									X	
Austria	PTT Austria		X								X	X																			
Belgium	Belgacom			X						X	X	X							X	X											
Denmark	Sonofon	X	X							X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Teledanmark				X					X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Estonia	Estonian Mobile				X					X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Finland	Telecom Finland				X	X	X			X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Radiolinja				X	X				X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
France	Itineris			X	X	X	X	X	X		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	SFR			X	X	X	X	X	X		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Germany	D1 (DeTeMobil)		X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	D2 (Mannesmann Mobilfunk)		X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Greece	Panafon				X						X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Teleset			X							X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Hungary	Westel					X									X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ireland	Eircell				X	X	X	X		X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Italy	SIP				X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Luxembourg	LUXGSM			X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Netherlands	PTT Telecom			X							X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Norway	Telemobil				X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Netcom				X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Portugal	TMN				X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Telecel				X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sweden	Comvik				X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Nordic Tel				X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Telia Mobitel				X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Switzerland	PTT				X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
UK	Cellnet				X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Vodafone	X			X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

There are already millions of calls made by roaming customers in the various operating networks, which shows the success of this feature only available in GSM.

Procedures for the transfer of call data between network operators in different countries are constantly being reviewed and updated. Operators are aware of the need to transfer data on a regular and frequent basis to minimise the occurrences of fraud while roaming and to provide the customer as little delay as possible between the day he made his call and the day he will receive the bill for it. Procedures for network operators to communicate warning of suspected fraud are currently implemented, and various working groups of the MoU are constantly considering ways to improve such procedures.

Upcoming issues and future objectives

In addition to these main present activities, there are some major objectives for the MoU to pursue in order to reinforce GSM successes.

Migration towards Phase 2

The implementation of Phase 2 is a "must" for the GSM network operators, especially those which have already experienced significant growth. Together with its introduction, several extensions and enhancements are planned, such as:

- Improvement of system performance
- Provisions for use of additional GSM frequencies
- Optimisation of operation within a micro cell network
- Additional services such as call hold, call waiting, 3-way calling, ...
- Half-rate codecs to double traffic capacity with the existing base stations

There are several problems which need to be solved before this Phase can be integrated on existing networks with 100% backward-phase compatibility, so that the customer using Phase 1 mobiles will not perceive any degradation in the functionality or quality of service. These problems are increased by the fact that the upgrading of Phase 1 to Phase 2 will involve modification of almost every part of the system (SIM, MS, BSS,...). Different versions of these modules will coexist during the transition, resulting in huge variety of call and network combinations.

These problems will require specific attention of the GSM MoU and a very close attention between the network operators and ETSI/SMG to solve the technical problems and to implement marketing efforts in order to explain these enhancements to customers.

Promotion of the GSM standard

Promoting the GSM standard is necessary to increase the number of countries which adopt it as their standard. Existing operators could have two advantages resulting from this expansion: decreasing access costs to this technology due to the economies of scale and the improvement of the international roaming service.

Up until now, the involvement of the GSM MoU in the promotion of GSM has been minimal. Taking into account the importance of the possible membership of countries such as China, Russia and American States (the USA is already experimenting with the GSM platform in the 1900 MHz range), it has been decided recently to increase these efforts for the future.

Interconnection with other systems and preparation of UMTS

Although GSM is presented as a global system, it does not preclude possible combination with other radio communication systems. For example, the combination between GSM networks and the DECT technology, which is very well adapted to indoor penetration and high dense areas, appears to be very attractive. Therefore the GSM MoU is working closely with ETSI/SMG to produce the relevant standards which will allow this combination.

At the same time, the MoU pays attention to the current studies for the development of the UMTS (Universal Mobile Telephone System) which is presented as the next generation of radio communication system. It is of interest to GSM operators that these new developments be based, as much as possible, on the GSM platform so that a smooth evolution can be planned in the future.

Conclusion

To conclude this presentation of the MoU activities, one can summarise the benefits of this co-operation framework as follows:

- First of all, the GSM MoU works to protect the necessary compatibility between the networks, guaranteeing international roaming service and supply diversity of equipment (terminals or infrastructure systems).
- Secondly, the MoU has proved to be effective in putting pressure on suppliers, in helping type approval authorities solve some of their difficulties, and in advising standardisation bodies. It is obvious that each operator would have more difficulties emphasising their point of view alone rather than as part of a larger group.

The tasks of this organisation are becoming more complex as the number and the diversity of operators (European/Non-European, historical/newcomers, etc...) increases. It is a challenge for the GSM MoU to find solutions which will keep the spirit of efficiency and co-operation that has prevailed since the beginning of the GSM story and which will guarantee its success.