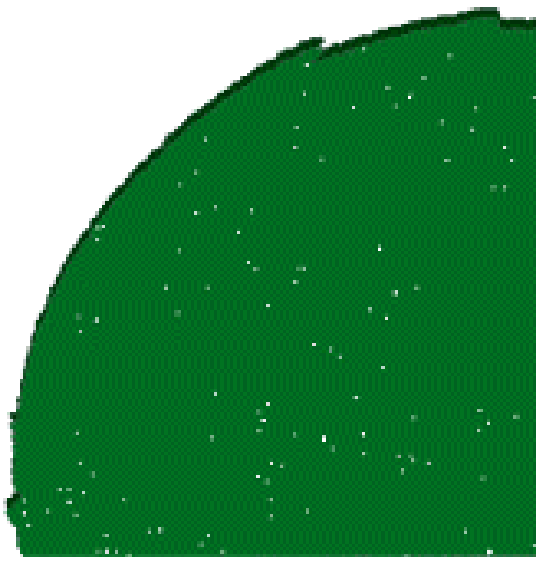
STUDY

July 2003

GPRS roaming

Summary of the study by BIPE for
Autorité de régulation des télécommunications



ART Autorité de Régulation des Télécommunications
www.art-telecom.fr

Warning

ART has commissioned a study from BIPE in order to better understand the issues underlying GPRS roaming.

In a concern for transparency and open information, it has decided to make this study public.

BIPE bears sole responsibility for the method used and the results obtained. ART cannot be held responsible in any way.

Interested parties are invited to submit their comments to ART.

GPRS and roaming

When the common European GSM standard was introduced, operators used it to promote roaming between European countries and then later worldwide. By offering transmission over a continuous connection, the GPRS[1] standard has significantly increased speeds for data transmission. Until GPRS was introduced, mobile operators had only partially installed bridges between their switched networks and data networks. The purpose of this study is to illustrate the new architectures needed for GPRS roaming and the resulting economic implications.

Mobile operators and GPRS roaming

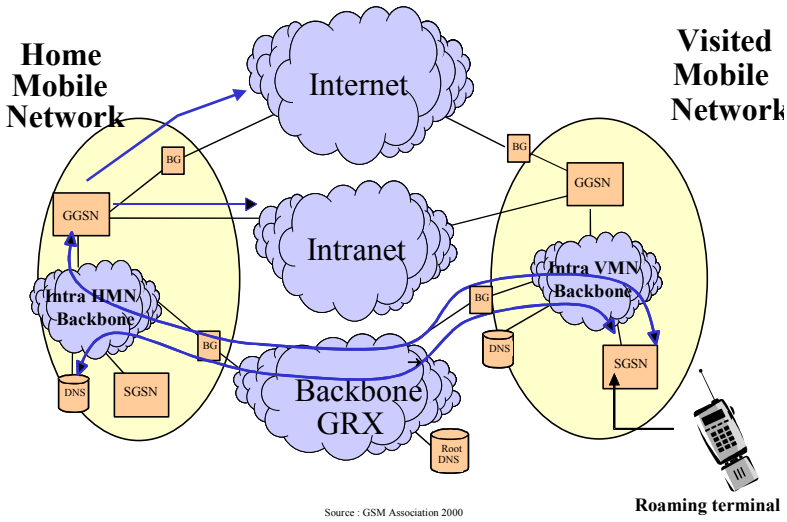
Now that the mobile Internet is a reality, mobile operators who are able to offer their subscribers Internet access must form relationships with operators from the data world. Sometimes, mobile operators graft themselves onto the existing Internet architectures but generally they prefer their own dedicated infrastructures that only open the access to the public Internet when it is really necessary, in order to limit the risks to the quality and security of communications.

This meant that to carry the roaming data flow, mobile operators had to create links between mobile networks in each of the countries. Operators opted for a solution proposed by the IP backbone operators: GRXs.

Why GRXs?

There are several ways of establishing the link between different mobile operators GPRS/IP networks: direct connection between mobile operators, indirect connection by the intermediary of the Internet and indirect connection by connection to GRXs (GPRS Roaming eXchange).

GPRS roaming : General technical mechanism



Direct connection between operators provides the greatest security and the best quality of service but also costs most. Conversely, indirect connection by the intermediary of the Internet is cheapest to install but provides mediocre security and quality of service.

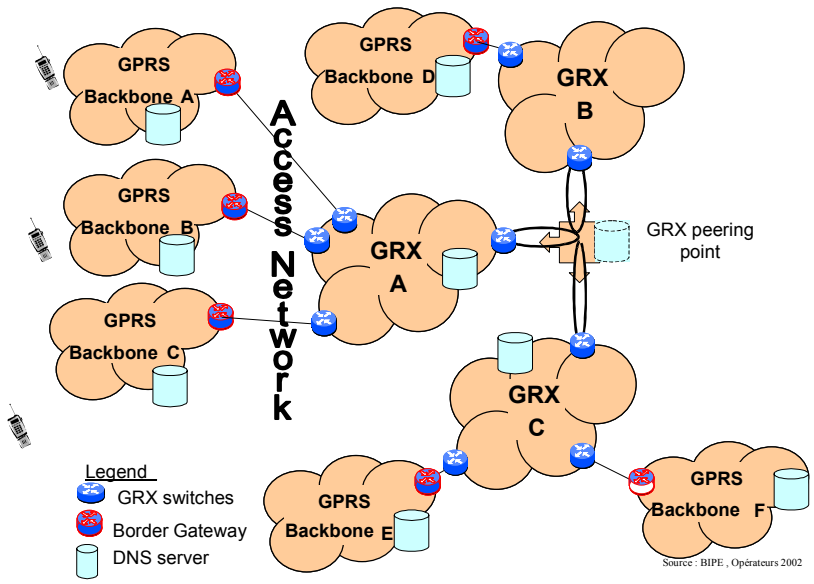
Therefore, operators had to arbitrate between quality/security and installation costs leading them to prefer the GRX solution, which has the best quality to cost ratio of all the solutions available.

The GRX operators: the international GPRS infrastructure

[1] General Packet Radio Service

GRX providers are a new class of players. They have various origins and first appeared in daylight following the action of the GSM Association during 2000. This "officialisation", which recognised a close relationship with mobile operators was necessary to facilitate the deployment of GPRS roaming worldwide. Most GRX operators have international IP infrastructures and have had to resolve complex technical problems in order to offer a private Internet very strongly differentiated from the public Internet.

GRX Architecture



The new structure of the relationships between the GRX operators and their mobile operator customers is of great benefit to the pan-European mobile operators. In practice, even if the GRX is selected autonomously by each of the foreign mobile subsidiaries, in most cases, the GRX operator common to the group is selected.

By this “selection”, the GRX operator common to the group increases the value of its network, to the detriment of the other GRX operators.

Points of exchange between GRXs: the limited number reflects the immaturity of the market

To get round the model's intrinsic limitations, GRX operators have set up the principle of points of exchange, on the model of those on the Internet (with GRX specific features). At present, there is only one, located in Amsterdam and called AMSIX, where 15 GRX operators interconnect: Belgacom, BT, Deutsche Telekom, France Télécom, Sonera (with Equant), Telecom Italia, Telefonica Data, Telenor, Telia International Carrier, Cable & Wireless, UUNet, Equant (with Sonera), Aicent, Comfone and TSI. This point of exchange (based on free *peering*) partially resolves the inherent imbalance of the architecture.

This point is still unique in Europe but should soon be joined by at least one supplementary point in Asia. Nevertheless, if we compare this limited number of points to the multitude of points of exchange that currently exist of the public Internet we can see it as a consequence of the immaturity of the national GPRS markets.

The central DNS problem

Nevertheless, one problem is still unresolved, that of the central DNS for resolving addresses between the GRX operators' DNSs. All the players are currently thinking about the advantages and disadvantages of setting up a centralised DNS ("master root DNS") capable of handling all the resolutions of addresses between GRX operators and mobile operators. However, though the method is known, discussions are still taking place because the advantages of a centralised DNS server are not clearly apparent to all the parties concerned:

the GRXs that federate a large number of mobile operators have less interest in setting up this structure than their smaller counterparts.

Finally, the roaming of content has not been resolved. At present, a roaming user has access to the same content as he or she has on his or her home network. This characteristic potentially limits the services offered when roaming.

GRX: infrastructures without traffic flows but ready for the UMTS

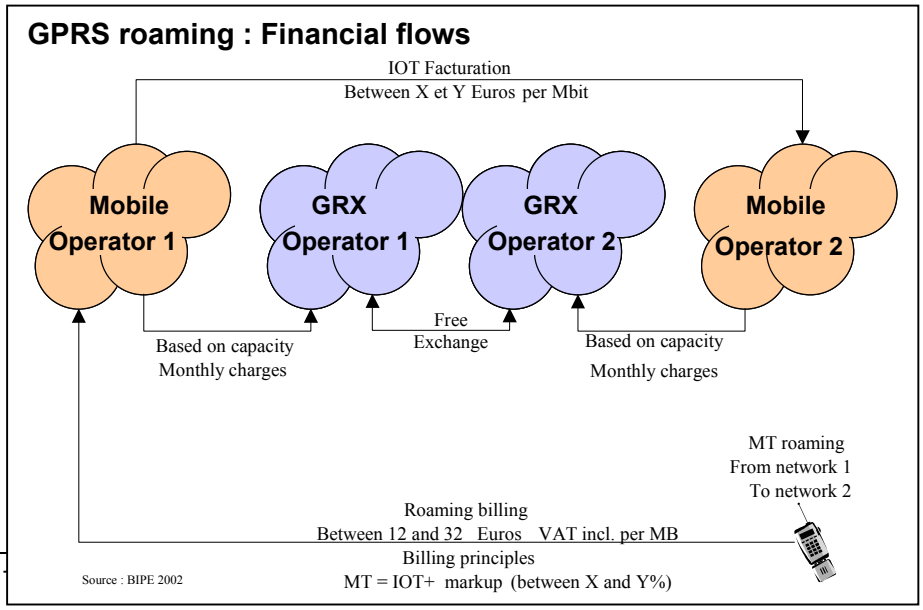
The most important problem facing all the GRX operators at present is the insufficiency of the GPRS roaming traffic flows that cannot adequately employ the international infrastructures deployed. Forecasters estimate that the GPRS service should take off in 2003. For this reason, mobile operators will keep the central place they had in the GSM market.

The modifications to the core network for the change to the UTMS will certainly be less fundamental than those affecting the radio part. Depending on the technological choices made (migration of the IP networks currently operated or construction of ad hoc IP networks for the mobile Internet flows), the GRXs are ready for this development.

GPRS roaming billing flows: a new model that will develop

New players and new processes and billing keys have been introduced with GPRS. Because of the change from billing by time to billing by volume (the kilobyte has become the reference value), operators have had to significantly modify their billing systems and the associated processes. Mobile operators, at the heart of the problem because of their direct relationship with the end customers, have deployed innovative billing methods for roaming. But, for the moment, prices for roaming are still dissuasive. Operators still have to resolve the twin problems of providing attractive content and their prices.

The financial flows are separated according to whether they are flows between GRX operators (currently based on free exchange) or flows between mobile operators (based on the roaming agreements concluded between them and contain at heart amongst other things the IOT[2]). The retail prices for roaming, which at present are still prohibitive, may drop as the service develops. Finally, the financial flows destined for the content providers and aggregators using the GPRS have not yet been perfectly clarified. All these flows between mobile and GRX operators are show in the diagram below:



[2] IOT : Inter Operator

These financial flows only show the transport segment and do not predict the financial flows to service providers.

Finally, roaming prices are high and vary according to the different European countries selected. This helps contribute to difficulty of getting a clear view of the prices billed to roaming customers. One thing is certain, in the very short term customers would like to have uniform prices that do not vary from €12 to 32 depending on the country in which they are roaming.

Pan-European operators at the centre of GPRS roaming

Pan-European operators will occupy a central position in this new world created by the introduction of GPRS. As the main customers of GRX operators, they will give them the power to stake out an essential position in the market. This means that if all or some of the national subsidiaries of a pan-European operator select a GRX operator, it gives that operator a very market structuring competitive advantage. If we add to this competitive advantage the inherent dissymmetries in roaming traffic flows, pan-European mobile operators really do represent key players for the business of GRX operators.

For the moment, GPRS traffic flows are low and are not generating significant tensions between the various players. In practice, customers are only making marginal use of the roaming function, due both to the national under-development of the use of GPRS services and the wide variations in prices from one country to the other. Within this context, pan-European operators could exert significant influence of the prices proposed.