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Technical Report

Universal Mobile Telecommunications System (UMTS); Service aspects; Automatic Establishment of Roaming Relationships Version Approved by SMG#28 (UMTS 22.71 version 3.1.0)

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Foreword

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The contents of this TR are subject to continuing work within SMG and may change following formal SMG approval. Should SMG modify the contents of this TR it will then be re-released with an identifying change of release date and an increase in version number as follows:

Version 3.x.y

where:

3 UMTS SMG approved

y the third digit is incremented when editorial only changes have been incorporated in the specification;

x the second digit is incremented for all other types of changes, i.e. technical enhancements, corrections, updates, etc.

Introduction

The global success of GSM has resulted in a multitude of cellular networks which can interwork. One of the problems of this success is that the mechanisms used to setup and manage the interworking arrangements cannot handle this success in a cost-effective manner. This report discusses the limitations of the current methods, and outlines a proposed solution to meet these needs in UMTS, where many more parties are required to interwork on a commercial basis.

1 Scope

This document outlines a proposed framework for commercial and technical interworking between UMTS Home Environments and Serving Networks who have no direct prior commercial agreements with each other.
This document is applicable to UMTS standardisation within ETSI, and is produced with the intent to clarify the concepts involved, and identify those areas which require standardisation.

2 References

References may be made to:

a) specific versions of publications (identified by date of publication, edition number, version number, etc.), in which case, subsequent revisions to the referenced document do not apply; or

b) all versions up to and including the identified version (identified by "up to and including" before the version identity); or

c) all versions subsequent to and including the identified version (identified by "onwards" following the version identity); or

d) publications without mention of a specific version, in which case the latest version applies.

A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] TS 22.01 (V2.0 onwards): “Universal Mobile Telecommunications System (UMTS); UMTS Service Principles”.

3 Automatic Establishment of Roaming Agreements

3.1 Current GSM Interworking

When two GSM networks wish to interwork, they setup a roaming agreement which is based on the standard GSM MoU agreement. This involves opening a signalling connection for C7 MAP messages between the networks, and a commercial settlement procedure to exchange billing records and net charges within set timeframes. A standard set of tests has been written by MoU committees SERG and TADIG to check the functions of basic operation and billing record formats.
Typically this procedure takes 2-4 weeks to setup, test and put online. Additional technical problems for some networks include:

- access to a C7 SCCP signalling link - where these are unavailable, X.25 links have been used;
- conversion between ANSI SS7 and ITU-T C7 message formats - a conversion box is required for these links;
- handling billing records in many different currencies and formats - a small number of clearing houses are able to process and pass on billing records between networks, settling net charges in one currency.

When GSM MoU was first setup, it was envisaged that all networks would interwork with each other, much as fixed network PTT’s do at present. However, large networks are finding that with coverage provided by competing networks in many countries there is little additional to be gained by setting up further roaming agreements in those countries. There is also concern at possible commercial exposure when interworking with these smaller, newer operators. On the other hand, smaller networks have much to gain by interworking with larger operators, but don’t have the resource to fund setting up many agreements.

3.2 New GSM Developments

Recently, an International Roaming Platform has been developed which solves many of these problems. The platform is connected to networks for both online signalling and offline billing processing. Signalling messages are routed

transparently to the appropriate network without modification, whilst billing records are processed and reformatted offline. Networks wishing to setup roaming agreements, need only setup and test a single link to be able to interwork with most of the other networks. This functions in a similar manner to credit card transactions and clearing through VISA or MasterCard, where any bank in any country can automatically deal with any other through a central system.

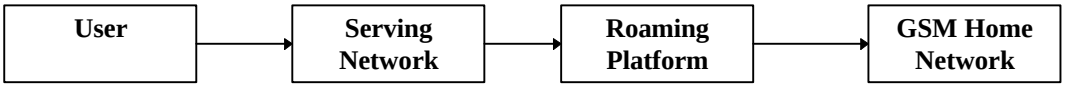
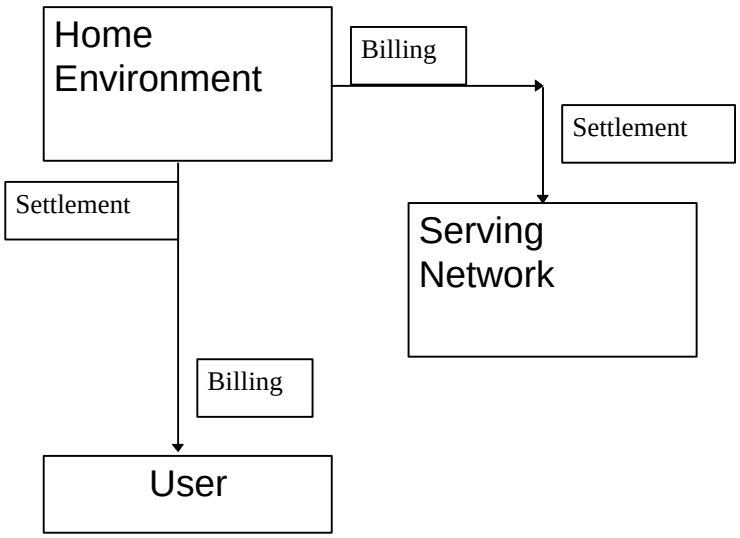


Figure 1 - Registration/Signalling Flow through Roaming Platform

Limitations of the scheme remaining include offline processing of billing records, which do not allow online credit control of charges being raised by any network. Currently, billing records which are not forwarded within a set timeframe do not require to be honoured by the recipient network, however this rarely occurs. It is therefore not possible to limit the charges incurred by any network in a real-time method.

3.3 UMTS Requirements

The basic requirements for commercial interv[illegible]billing[illegible]UMTS framework are best described in the context of the Role Model in 22.01 (UMTS Service Principles).



- Each of the roles in the role model must be able to setup a commercial agreement with any other party and obtain chargeable services up to the limit of his credit. This includes not only relationships between different roles such as user and home environment, but also between role peers such as between different serving network. Such agreements should be capable of being setup online, between parties which have not interworked before.

- There must not be any substantial overhead for any role to commercially interwork with any new role.

- There must be real-time credit control for the net charges incurred by any role.

- There must be good security to allow each role to authenticate each other prior to incurring charges.
- Serving Networks and Home Environments shall have the capability to block or veto particular roaming agreements.

3.4 Proposed System Solution For UMTS Interworking

The proposed scheme to meet the desired UMTS interworking requirements between these roles is an extension of the principles used in the Interworking Roaming Platform. Each Home Environment would interwork with one or more serving networks, with whom they would negotiate a commercial roaming agreement and test the interworking. Any user wishing to use the services of a particular network would register with that network, who would either directly or indirectly interwork with the Home Environment. Real-time online billing mechanisms would be used to ensure that charges incurred for UMTS services do not exceed the credit limits set.

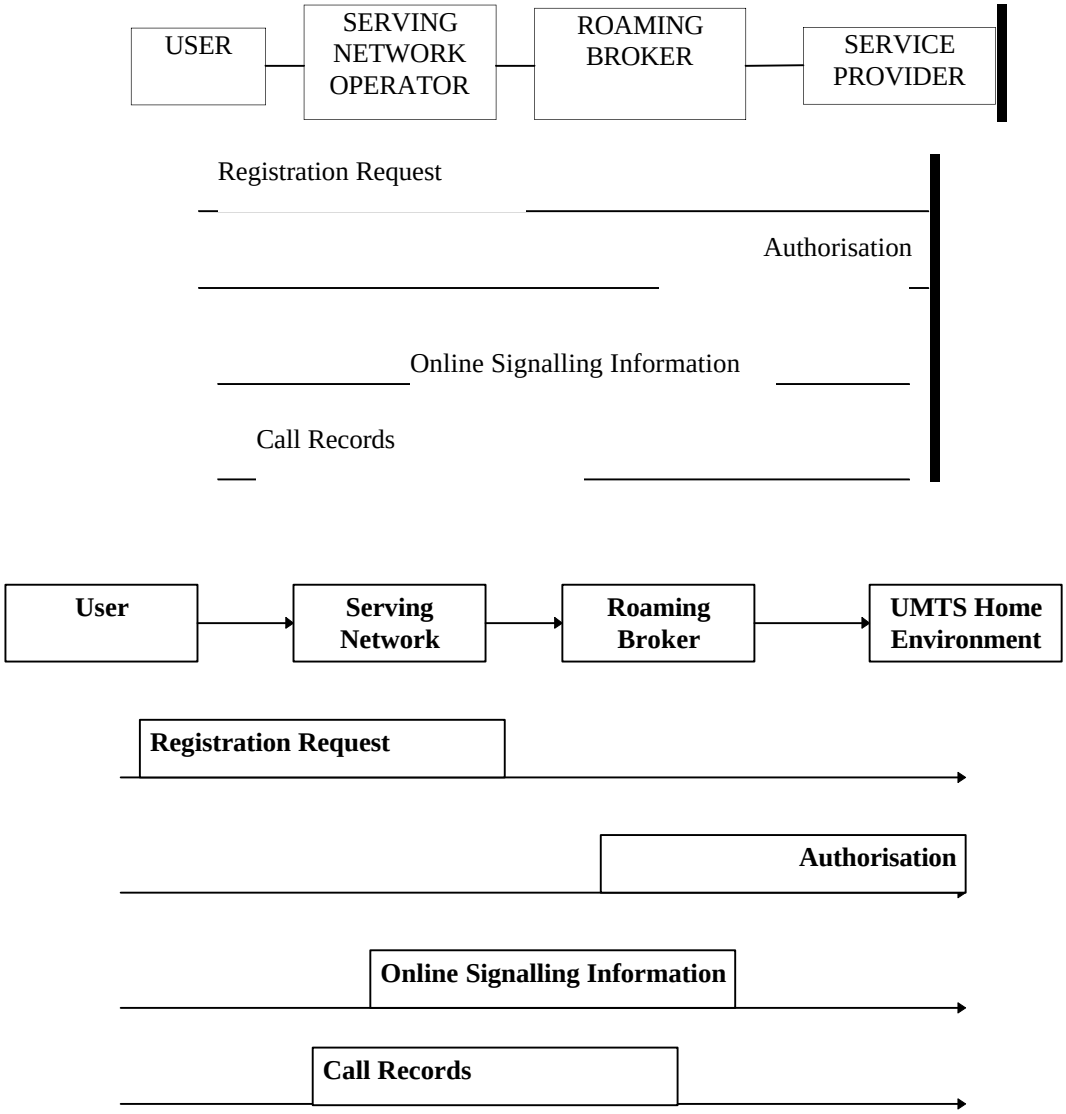


Figure 2 : Registration and Roaming Process

It is possible in some cases a chain of Roaming Brokers is involved in this process.
There are two key aspects which need to be dealt with to allow such a system to be deployed:

- How does the serving network know how to route the registration request?
- How does each party in the transaction charge for their services?

3.4.1 Routing the Registration Request

Clearly, some form of routing identification will be required to allow a serving network, which does not maintain its own list of all known Home Environments, to determine the appropriate route to reach a Home Environment. A number of alternative routes may be possible, and ideally the system should be capable of determining the lowest cost to the end user.
This will be an extension of the addressing scheme discussed in a separate report. The requirement is to allow each entity to determine an efficient route back to the Home Environment, probably based on the USIM number, through a C7 STP global title lookup or Internet DNS addressing request. Typically, smaller networks will only have a limited number of external connections to other networks or clearing houses, but may not know which one to use for an unknown (new) Home Environment. In this case, the serving network may make a number of inquiries for each route to determine the lowest cost route to handle the call.

3.4.2 Billing, Charging and Accounting

Billing, Charging and Accounting mechanisms used when roaming are discussed in an associated report 22.24.

4 Summary

"Automatic Negotiation of Roaming Agreements" as required by the GSM MoU can be achieved by routing the interworking traffic through trusted third parties. These can either be dedicated Interworking Roaming Platforms, such as are being developed for GSM today, or through existing network operators who are acting as clearing houses. Online (real-time) charging and billing will allow credit control between each of the parties involved in any transaction, replacing the need to process and handle billing records themselves. Settlement would occur in a wholesale basis between adjacent parties, at the end of agreed periods.

5 Impact on Standardisation

As discussed in this report, automatic establishment of roaming relations is already a reality. There are three components:

- a contractual relationship;
- a signalling interworking (for authentication, incoming call handling etc);
- an accounting and settlement procedure.

These components have been implemented as an International Roaming Platform, so that any network which interworks with the central roaming platform, also interworks with any other network also connected to it. No additional standardisation was required to make this a reality. Similarly, any of today's network operators could provide this functionality without any new standardisation effort.

5.1 Contractual Relationship

This is dealt with outside ETSI standardisation effort (either via GSM MoU or directly between network operators) and is outside the scope of standardsiation work.

5.2 Signalling Interworking

This uses standard GSM MAP signalling messages, and does not require any further additions to facilitate automatic roaming relationships.

5.3 Accounting and Settlement Procedure

This uses the current GSM accounting and settlement procedures, which are standardised by the GSM MoU. No additional/special changes to the standard billing record format (TAP format) is anticipated.

5.4 Conclusion

No special standardisation work is required to facilitate Automatic Establishment of Roaming Relationships because these can be implemented with current standards and procedures as discussed in this report.

Annex A (informative): Change history

Change history					
SMG No.	**TDoc. No.**	**CR. No.**	**Section affected**	**New version**	**Subject/Comments**
SMG#25				3.0.0	Version 3.0.0 Approved at SMG#25
SMG#27				3.0.1	Editorial correction. Change word specification to report and IPR clause and Foreword update
Pre-SMG#28	SMG1 Tdoc 98-0809	A001	Misc	3.1.0	Updated to reflect changes to 22.01 role model
SMG#28					Approved