

Executive Summary

This report is an initial study of the naming, addressing and identification issues that concern UMTS. Because part of UMTS will be based on the core network architecture developed for GPRS, some of its conclusions are also relevant to GPRS.

UMTS is expected to be a very important step in the development of telecommunications because:

- Mobile communications are achieving very high penetration levels and becoming substitutes for fixed telephony services
- UMTS is being designed as a truly multi-service platform
- UMTS will be one of the first "traditional public telecommunications services" to use IP technology in its core network initially as an overlay and ultimately throughout the network. Therefore UMTS is at the forefront of the convergence to IP.

However, although there are significant changes and new terminology to be learned by both the mobile telecommunications and the IETF cultures, the fundamental concepts of names and addresses that have already been developed still apply. Failure to apply these fundamental concepts is the cause of some of the concern and confusion that this report seeks to remove.

A. General Issues

There does not appear to be adequate information on the relationship between the core networks of the mobile operators and ISPs/Intranets that can be selected by users for access. This is an important area for market development and competition as it affects the creation of a separate competitive layer of service providers on top of the layer of competing network operators.

The report highlights the need for agreements and formal documentation giving technical guidelines about the relationships and connection arrangements between network operators and ISPs/Intranets. It should cover items such as:

1. interconnect guidelines;
2. the implication of interconnect guidelines regarding the allocation of the IP address to the mobile;
3. the identification and development of technical specifications required to implement technical guidelines.

The GSM Association should take responsibility for this work. It is a matter of urgency that standardisation in 3GPP receives clear advice on these items. The UMTS Forum may assist with expertise, if required.

B. Naming

Each service capability description should specify the form of identification to be used, which may be a name that would be resolved into an address, or just an address. Names offer the benefits of increased user friendliness, a degree of network independence and various degrees of portability.

Third generation mobile technology can support multiple services and hence more than one type of name, therefore there is no unique naming solution for UMTS.

The two main naming schemes available for UMTS services are E.164 and Internet names (user@domain) and both schemes will be used for different services. The report provides considerable information about work on these schemes by ITU-T, ETSI and IETF.

The issues covered in the report include:

- The choice of naming scheme
- The allocation of appropriate naming capacity, whether under different number ranges on E.164 or new TLDs
- The support of name to address resolution
- The support of portability
- Selection of ISPs and Intranets
- Future issues

Detailed recommendations are as follows:¹

Operators should:

1. Check that the GSM Association is willing to continue its role with respect to Access Point Names
2. Ensure that there are published and non-discriminatory principles for the registration of Access Point Names
3. Ensure the support of name (number) portability for E.164 numbers for services similar to those provided on GSM
4. If practicable, build in the capability to support the portability of Internet names in order to ensure compatibility with any future requirements
5. Explore the possibility of using a single E.164 number to be used for telephony, fax and data instead of having separate numbers.

Service providers (ISPs) should:

6. Consider the use of a domain name for individuals that is not explicitly related to their service provider
7. Ensure that their administrative systems and procedures can support name (number) portability for E.164 numbers.

¹ The recommendations and conclusions on naming and addressing are numbered together in one sequence for ease of reference. This sequence extends through sections B and C of the Executive Summary.

Manufacturers should :

8. Consider adherence to ITU-T Recommendation E.161 for the association of alphabetic characters to the numbers of the keypads of UMTS terminals and supplement it with a standard presentation for the "@" symbols.

Regulators should :

9. Consider if any regulation is needed on the portability of E.164 names (numbers) in countries where it is not already required. This would include portability between operators, between operators and service providers and between different service providers and, for called party pays, portability between fixed and mobile services
10. Consider if any regulation is required on the portability of Internet names
11. Consider which numbering ranges in E.164 should be used for services on UMTS (provided that the services/tariffs are similar, there is a good case for using the same ranges as for GSM as this will enable portability between GSM and UMTS)
12. Consider the use of new ranges of E.164 numbers for new emerging services, especially multimedia services under UMTS Release 5.

In addition, further study is needed on the support of packet data-only terminals and the use of E.164 numbers by these terminals, as the use of E.164 numbers by these terminals could cause capacity problems in some countries and is not strictly necessary for receiving incoming calls. This could be a substantial potential market.

C. Addressing

Addressing issues are covered in some depth. Three types of address are considered:

- IP addresses
- Mobile station roaming numbers
- Routing prefixes for E.164 numbers

The main focus is IP addressing. The issues covered include:

- The support of mobility
- NATs, firewalls, security and the end-to-end paradigm
- Choice of IP version and migration from IPv4 to IPv6
- Temporary or permanent assignment to the terminal

Areas of IPv6 are identified that are still being investigated.

The following are the main conclusions and recommendations on IP addressing:

13. The protocol and addressing version issues for the SGSNs and internal PLMN core networks are independent from those for the terminals, and connected ISPs or Intranets, at least until IP multimedia is introduced. However, SGSNs will have to be compatible with:
 - internal network equipment
 - the terminals to which they will assign addresses, both home and visiting terminals
 - SGSNs in other networks to which they support GTP tunnels.

14. GPRS/UMTS operators will need global IPv4 addresses for their core network infrastructure because IPv4 is the default protocol at least for Releases 3 and 4.
15. IPv4 address exhaustion is difficult to predict but may be felt in the 2004-2006 timeframe and so network operators should ensure that they obtain adequate public IPv4 address allocations for their core networks.
16. A new version of the mobile operators' internal DNS that is compatible with IPv6 and IPv4 (e.g. BIND9.x) will be needed when operators start to use IPv6 in their core networks.
17. There is no absolute need for UMTS operators to synchronise the introduction of IPv6 in their internal core networks. However as GGSNs allocate IP addresses to mobiles and establish tunnels with SGSNs in other networks, they will need to know which other networks support IPv6 and therefore they need a system for exchanging information about the introduction of IPv6 through dual stack operation. The operators may also wish to set common dates for introducing dual stack to reduce the administrative work so that they can change the arrangements with a whole group of networks at the same time.
18. The GSM Association should facilitate the introduction of IPv6 by providing mechanisms for operators to exchange information about their plans for introducing IPv6 and the transition tools that they will use.
19. The GSM Association should produce a guide and recommended procedure for the introduction of IPv6. Although operators may not need to start migrating to IPv6 immediately, it is important that this work should be undertaken reasonably soon to obtain a deeper understanding of the issues and the time that will be needed for migration.
20. Address assignments to terminals appear to need to be temporary if terminals are to be able to establish PDP Contexts with visited GGSNs. This may conflict with the need for IPv6 to use static assignments for many of the feature advantages of IPv6 to be realised. This area needs further study.
21. The UMTS Forum cannot judge at this time how well founded are concerns about network boundaries. No forecast can be made on how soon operators will be willing to return to or at least towards the end-to-end paradigm. Further study of these issues, especially in relation to migration to IPv6, is needed.

For circuit-switched services, regulators will need to make additional allocations of MSRN numbering space and routing numbers for number portability for operators without GSM networks, but these areas are unlikely to cause any particular problems.

D. Other identifiers

D.1 Mobile Network Codes and IMSIs

MNCs may be used by various networks in the future. If substantial growth develops in some countries in the number of:

- Mobile Virtual Network Operators
- Mobility services in fixed networks
- Other networks (e.g. TETRA)

then a shortage of Mobile Network Codes may arise. This situation does not yet appear to be imminent but should be kept under review.

The current system of IMSI allocation is inefficient and may lead to premature exhaustion of existing MNCs. The problem is that IMSIs that cease to be used as a result of customers churning are not recovered and re-used after a period of sterilisation. Therefore the high levels of churn are generating excessive consumption of IMSIs. Operators should investigate a mechanism for recovering and re-using IMSIs.

D.2 IMEIs

The International Mobile Equipment Identifier (IMEI) identifies the mobile terminal. It has been introduced, originally, in relation to the type approval of terminals but is also used for tracking stolen terminals and for fraud prevention. Although type approval is no longer a requirement in large parts of the world, the IMEI has become increasingly important for network operators, regulators, manufacturers and users. The industry considers the IMEI an important market requirement, therefore the advantages of IMEI and some of its main uses must be retained.

Rules for the assignment and administration of the IMEI have to be reconsidered and adapted to the new regulatory requirement. The implementation of UMTS networks will entail an increasing demand for IMEI numbers. This must be taken into account. In addition, adequate security features must be incorporated.

Manufacturers and operators are presently jointly reviewing the IMEI scheme and the allocation procedure. This work has started in the "Global IMEI Strategy Forum", a joint initiative of manufacturers and the GSM Association. Agreements on a number of important issues have already been achieved. Other items require further discussion. A change in the format of the IMEI, i.e. a move to hexadecimal notation, has been suggested. This is a very sensitive matter for network operators and deserves careful consideration.

D.3 Issuer Identifier Numbers

These numbers are stored on SIM cards for use with applications supplementary to mobile communications. They are a particularly scarce resource and national regulatory authorities should ensure that national rules for allocation of issuer identifiers according to ITU-T Recommendation E.118 are in place, and that they take account of the limited number available and the increasing importance of identification cards in an emerging M-Commerce environment.