**GSM Europe**
The European interest group of the GSM Association

# The Migration to Ipv6

## GSM Europe Policy Statement for the IPv6 Task Force-

GSME, 6 August 2001

## 1. Background

Current network deployments of the Internet Protocol (IP) are based upon Version 4 of the IETF specifications, and represent a planned 10-year investment since they were produced. The IP protocol provides the basic transport capability of the Internet and is also the basis for the majority of applications. IP is the universal feature, which has lead to the enormous growth of the Internet. There is, however, a perceived need to migrate to a more advanced and newer version of the protocol, known as IPv6, in view of the technical limitations of IPv4.

IPv6 potentially offers enhancements, which include increased addressing capacity and capabilities, QoS control, mobility, built in IPSEC security and improved routing efficiency. These improvements and corresponding limitations to IPv4 are seen as the main drivers for adopting the new protocol. In particular, the rapid growth of the mobile market and the convergence of telecomms, mobile and internet technologies are factors which are causing concerns over the shortage of addressing space and reinforce the need to migrate to IP v6.

Mobile operators are in the process of introducing packet services using GPRS – an IP based solution for GSM and 3G UMTS networks which is being initially implemented using IPv4.

In the longer term (~2004) IP based Multi-media services are expected to be launched on 3G networks. These will be supported using functionality known as the IP Multi-media Sub-system (IMS) which is being specified as part of 3GPP Release 5, currently planned for completion in December 2001. The IMS will make exclusive use of IPv6 and is being designed (initially) to operate over GPRS packet transport capabilities. The reasons for adopting IPv6 exclusively within the IMS include the "always on" paradigm combined with the rapid growth in cellular devices and the potential lack of public IPv4 addresses. Additionally, adopting IPv6 from then outset eliminates the need for future migration. It should be noted, however, that the supporting GPRS network can be either IPv4 or IPv6 based; the IMS can make use of, and co-exist with, existing IPv4 based GPRS deployments.

The IMS is being specified to support IP multimedia applications that combine some or all of the following media: sound, graphics, pictures text and data, based upon already standardised protocols (e.g. the IETF Session Initiation Protocol – SIP) in order to enable operators to move smoothly towards the full-IP multimedia target.

IMS will open a significant number of new business opportunities and is expected to be an important part of future mobile networks. It represents one of the key UMTS features by which operators will be able to differentiate themselves from competitors. In addition for UMTS Operators it represents a key differentiator from present GSM 2G and 2.5G networks. Consequently it should be introduced as early as possible in order to maximise service opportunities and customer benefits.

The introduction of IMS implicitly requires the introduction of IPv6 within 3G networks, however it can make use of and coexist with IPv4 GPRS networks and, importantly, does not require GPRS IPv4 deployments to migrate to IPv6.

## 2. GSME Policy Statement

IPv6 represents the goal for the longer term evolution of IP and it must be assumed, therefore, that it will eventually be adopted throughout all IP based networks – including 2G as well as future 3G mobile networks. The following high-level policy statements therefore underpin this assumption:

**Policy Statement: Our objective is to migrate, in the longer term, to use IPv6 throughout Mobile networks.**

**In order to realise this objective**, the transition to IPv6 must be justified in terms of:
⇒ The new (user) service opportunities and customer benefits that will result from adopting IPv6;
⇒ The operational benefits, including network efficiency;
⇒ Cost Effectiveness (i.e. potential reduction of future operating costs)
⇒ Minimising industry-wide disruption during the transition (e.g. commercial risk, loss of market confidence).

**The time-scales for migration need to take due account of:**
⇒ The significant investment in legacy IPv4 infrastructure (including GSM and other non-cellular networks);
⇒ The real impact of IPv4 deficiencies (such as address exhaustion);
⇒ Establishing a pragmatic and coherent technical IPv4 to v6 migration strategy, including interworking;
⇒ The maturity of IPv6 technology and related specifications (e.g. QoS, security etc);
⇒ Reaching industry wide consensus –Mobile networks cannot adopt IPv6 in isolation;
⇒ The availability of IPv6 Applications and a supporting skill base.

GSM Europe fully supports the EU initiative to facilitate the introduction of IPv6 through the establishment of IPv6 Task Force. We are also pleased to be able to make a contribution towards the development of a constructive set of Recommendations that will benefit the European telecommunications industry and its customers.

**It is proposed, therefore**, that the Task Force focuses upon the above issues and develops Recommendations which will result in justifying the overall objective for supporting the migration to IPv6 in the longer term and support the development of commercially viable industry-wide framework for its introduction.

It needs to be recognised, however, that the migration to IPv6 is a global issue and any European initiatives resulting from the recommendations of the Task Force need to form part of an overall Global strategy.

**Some specific topics,** which the IPv6 Task Force could study, include:

- **IPv4 address exhaustion** – This is perceived to be the major driver for the adoption of IPv6. Within Europe it has been estimated that IPv4 can support a maximum 450 million public IP addresses, whilst the addressing capabilities of IPv6 are virtually limitless (theoretical maximum of $2^{128}$). There is a need to establish a consistent view

regarding the timescales, scenarios and assumptions that lead to the prediction that the current IPv4 address space will be fully used. What are the alternatives (e.g. continued use of private addresses, Network Address Translation (NAT) etc) and why are these not suitable for the future?

- **New Service Opportunities and customer benefits** - what are the new service opportunities and user benefits arising from the use of IPv6? There is a need to identify the specific benefits in terms of the services/capabilities that are enabled as a result of using IPv6.

- **IPv4/IPv6 Interworking** – at the outset there will be a significant base of IPv4 applications and infrastructure which will be required to co-exist and interwork with IPv6. What are the possible interworking scenarios and issues? Which solutions should be supported across the industry?

- **IPv6 Fora** – there are a number of international bodies addressing IPv6 (e.g. IETF, IPv6 forum, 3GPP etc). What are the specific actions that need to be taken within these bodies in order to further the interests of European industry – specifically operators and service providers?

## 3. Comments on the Task Force Terms of Reference

We have studied the Draft terms of reference for both the Task Force and the mobile sub-group and have the following comments:

### 3.1 Comments On The Overall Task Force Draft ToR

The GSME view is that the Draft ToR appear to reflect a set of possible draft recommendations from the Task Force, and to some extent, prejudge the discussion that needs to take place in the coming months. In view of the short timescales, however, it is proposed that discussion should focus upon the structure and content of the overall set of recommendations for inclusion in the final Task Force report (to be completed in December 2001), rather than refining the ToR.

The draft ToR of the Task Force, with specific comments reflecting the views of GSME, is contained in the following table. The comments reflect views upon the statements as either part of the ToR or as the basis for possible recommendations.

| Draft Terms of Reference | GSME Comment |
|---|---|
| The IPv6 Task Force which includes representatives of European ISPs, telecom operators, mobile operators, equipment supply industries, research networks, and key "application" sectors is invited to develop a comprehensive action plan **by end 2001**, aiming at ensuring the timely availability of IPv6. The following key specific targets are to be considered by the IPv6 Task Force: | The migration to IPv6 must be planned and executed on the basis of sound commercial criteria. It is therefore essential that the recommendations resulting from the Task Force have to be driven by operators and service providers, and fully supported by vendors and researchers. |
| • With a view to implement IP Multimedia under Release 5 in 2003, industry will be requested to submit contributions to 3GPP to accelerate the pace of development of specifications work on IPv6 for 3G mobile communication systems (UMTS); | Release 5 is currently scheduled for completion by the 3GPP in December 2001, with a possible slippage to March 2002. Whilst a recommendation to accelerate this work is fully supported, it is likely to have limited impact upon the current 3GPP Release 5 activity, and should perhaps be focused upon future Releases (6, 7…). The 3GPP specifications draw heavily upon work in other bodies (e.g. ETF) – these should also be included within the scope of this recommendation. |
| • 3G operators to establish mechanisms for exchanging information on the use of IPv6 with a view to develop guidelines and best practises on the transition to IPv6; | Work has already been initiated within the GSM Association and GSME fully supports the need for dialogue with other industry bodies. |
| • Operators and service providers, to consider on a priority basis how best to evolve towards IPv6 and to take early steps to obtain adequate IPv6 address allocations, while ensuring the users rights are safeguarded; | This is an industry-wide issue. The Task Force should make specific recommendations on how best to progress the evolution towards IPv6, the requirement for address allocation, and the steps needed to obtain it. |
| • Service providers (providing access through, telephony links, xDSL, Cable, fixed wireless to Internet services) to offer IPv6 capable services, by end 2003, | |
| • Telecommunications operators to complete conversion of all "legacy" systems to IPv6 capability by end 2005; | This is an unacceptable statement for inclusion either the ToR or the draft set of recommendations. The timescale for the "complete conversion" from IPv4 will need to take account of commercial factors, the maturity of the IPv6 specifications, product availability and the significant investment required to replace existing IPv4 infrastructure. |
| • Conversion to IPv6 of Europe's Research and Education Networks (comprising the National Research and Education Networks and the European backbone GEANT), by 2003-2004 | |
| • Introduction of IPv6-based systems in cars, aircraft and freight-transport vehicles and infrastructures by end 2004; | This recommendation is likely to be facilitated as a result of the expected introduction of Release 5 in 2003/4. |

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| • IPv6 connectivity in all new consumer-electronic devices by 2005; | |
| • Enabling IPv6-based m-commerce by 2005; | |
| • Increase and re-focus of the EU support to RTD and Trans-European Networks to accelerate and facilitate the coherent transition to IPv6 in the period from 2002-2004. | Whilst IPv6 is likely to be introduced in this timeframe, there will still be a significant IPv4 deployment; the word "transition" appears to be inappropriate. |
| • Strengthening of IPv6 R&D activities within the IST Programme (and proposal of measures for FP6) notably on those aspects relating to inter-working and interoperability between systems and networks, to the development of innovative IPv6 based services and applications, and to middle-ware and management tools, by end 2001. | GSME fully supports increased R&D activities relating to IPv6 and the development of new innovative applications. |

### 3.2 Comments on the "Mobile Wireless" Sub-group Draft ToR

In line with our comments relating to the overall Task Force ToR, the focus of discussion should be upon the recommendations that will be contained in the final Task Force report. The comments in the following table reflect that approach.

| EU IPv6 Task Force - Mobile Wireless Working Group Draft ToR | GSME Comment |
|---|---|
| **i)** Develop **requirements for an IPv6 market study**. The objective is to recommend a study that would examine the many Industrial sectors (including market segments beyond the mobile sector) where IPv6 will be called upon to be deployed, with a view to providing a market perspective. | The focus of this study should be to identify the key drivers for the migration to IPv6 which need to include the new (user) services/capabilities that IPv6 will enable, and the benefits for the operator/service provider. |
| **ii) To educate** the broader Telecoms Industry on new opportunities offered and their accompanying measures. | These need to be tangible commercial opportunities and not simply technical niceties. |
| **iii) Identify the essential missing elements** of what is still required to support the delivery of all services and applications in cellular Network. Particular attention should be given to the role of Wireless Application Service Providers (WASP) and Mobile Internet Service Providers (MISP) in a IPv6 environment. | The overall impact of introducing IPv6 upon service providers is of major significance and needs to be determined. The migration to IPv6 should not, however, be confused with the overall evolution of the roles of the commercial organisations in the cellular environment, which we consider to be beyond the scope of the Task Force. |
| **iv)** Discuss and propose **measures to align the Roadmaps of IPv6 related activities** in both IETF, 3GPP and MWIF. | There is a need to recognise the already substantive co-operation between the 3GPP and IETF; the focus should be to align the work of other key groups. |
| **v)** Study **IPv6 & 3G Numbering and Addressing** issues. This would include the consideration of the strategic aspects of numbering and addressing issues and the preparation of a baseline document aiming at clarifying these issues. Liaison with the IPv6 Forum Tech Directorate. DNS/DHCP7Bind9 appears to be required. | The major driver for migrating to IPv6 appears to be the potential exhaustion of public IPv4 addresses. This study also needs to address the scenarios and timescales which will result in IPv4 address exhaustion and the migration strategies (interworking/co-existence) during the evolution towards IPv6 when both addressing schemes will be in use. |
| **vi)** Consider the related issues of **security, privacy** and develop a common understanding of the actions required to ensure the deployment of trustworthy services and applications. | This study needs to focus upon the issues specifically as a result of adopting IPv6, rather than a broader study of both Security and Privacy. The migration from IPv4 based security mechanisms will be of critical importance. |

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