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European
IPv6 Task Force

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1. FIRST RECOMMENDATIONS FOR POLICY

The European Commission and the Nation States should consider following immediate and concrete recommendations:

1.13.1. EU Member states are called upon to:

- Increase their support towards the integration of IPv4 and IPv6 in the networks and services associated with the public sector, in the context of public applications requiring the use of new Internet generation tools and technologies. The integration of IPv6 in existing e-government, e-learning and e-health services and applications towards IPv6, will notably offer users greater reliability, enhanced security and privacy, and user friendliness, in a more open and dynamic environment. IPv6 future-proofing should be considered in application procurements, especially considering the life cycle of such public networks is often longer than commercial counterparts. Network infrastructure can be procured IPv6-capable even if IPv6 is not immediately turned on.
- Establish and launch IPv6 competence centres and educational programmes on IPv6 tools, techniques and applications, so as to significantly improve the quality of training on IPv6 at professional level, and create the required base of skills and knowledge. A mixture of academic and commercial expertise should be drawn upon for the centres; university and academic sites may be among the early adopters and thus have key expertise.
- Promote the adoption of IPv6 through awareness raising campaigns and co-operative research activities, by small and medium size enterprises, Internet service providers and wireless service providers and operators, so as to educate the stakeholders, boosting their technological know-how and strengthening their ability to operate on a European, if not, on an international basis.
- Promote open source Linux implementation of IPv6. <http://www.bieringer.de/linux/IPv6>
- Continue to stimulate the wide spread use of Internet across Europe and encourage the integration of IPv6 through the creation of a favourable, stable and harmonised regulatory environment. Broadband access using IPv6 to the home and to small and medium size enterprises is a key requirement to maximise the benefit of future end-to-end, converged network services. Existing broadband promotion focuses on high-speed downloads and customers being Internet consumers; governments should promote symmetric broadband deployment, with high uplink speeds and IPv6 capability enabling customers to offer Internet services. This will stimulate new services running home-to-home and business-to-business.
- Strengthen the financial support towards national and regional research networks, with a view to enhance their integration in European wide networks and increase the operational experience on novel Internet services and applications based on the use of IPv6. It should be understood that the move towards native IPv6 is a major step for Europe to keep its dominant position in the Mobile Industry.
- Provide the required incentives towards the development, trials and testing of native IPv6 products, tools, services and applications in the new economy sectors such as consumer electronics, telecommunications service provisioning, IT equipment manufacturing, construction, transportation, public education and health, banking, insurance and trade.

- Call to include IPv6 in the procurement guidelines for new equipment and applications for the public sector and education to protect investments in equipment.
- Call to the universities to add IPv6 as a specialisation topic in the curriculum of Graduates and PhD in order to ensure the new generation of network engineers are IPv6 trained.
- Support the National IPv6 Task Force tasked with:
 - The assessment, at national or regional level, of current developments and degree of take-up of IPv6, as well as with the formulation of guidelines and dissemination of best practises relating to the efficient transition towards IPv6. The IPv6 Task Force should be guided by the imperative need for harmonisation and by the economical benefits achievable through the wide spread of the IPv6 technology in all ICT sectors and should duly take into account the requirements for an all inclusive information society as well as the digital divide dimension.
 - Developing measures aiming at the alignment of IPv6 integration schedules favouring a cohesive IPv6 take-up and ensuring that Europe gains a competitive advantage on the next Generation Internet.
 - Ensuring the active participation of national experts in the work of European and International standards and specification bodies tasked with IPv6 matters, such as ETSI, 3GPP, IETF, RIPE.
 - Drawing the attention of potential IPv6 systems or application developers to funding opportunities available at a national or European level

1.13.2 The European Commission is called upon to:

- Call to include IPv6 in the procurement guidelines for new equipment and applications for the public sector and education to protect investments in equipment
- Call to support the creation of IPv6 Competence Centres in the 25 European states
- Promote open source Linux implementation of IPv6. <http://www.bieringer.de/linux/IPv6>
- Call to the universities to add IPv6 as a specialisation topic in the curricula of Graduates and PhD in order to assure that the new generation of network engineers are IPv6 trained.
- In the context of the 7th Framework programme, strengthen its R&D support towards further development of native IPv6 high-speed and high capacity network infrastructures and large scale trials and testing of IPv6 based services at European level, for GRID networks, mobile and Satellite communications.
- Encourage European-funded IST projects to consider IPv6 by default in their project outputs and deliverables. Such deliverables should be capitalised on where possible; thus the Commission should seek to promote concertation amongst appropriate projects where possible. IPv6-enabled applications will be in demand, e.g. for GRID, Security, IMS within 3GPP.
- Encourage the research and manufacturing communities to produce a European Code Base for IPv6, notably by funding projects in the 7th Framework Programme that commit towards this code development work and produce open source code and implementations and by stimulating the establishment of a virtual “European IPv6 Competence Centre” initiative, where open source solutions for IPv6 could be studied and developed.

- Carry out a thorough and long range socio-economic and market study addressing the key sectors of the new economy that are to be impacted by the integration of IPv6 networking infrastructures, tools, services and applications. Such a study should notably address aspects relating to the benefits generated by IPv6, namely security, privacy, user friendliness and easier management as well as their associated regulatory and policy aspects.
- Take all required actions aiming at the continuation of the work already performed within the “European IPv6 Task Force” with an enlarged participation and renewed mandate. Concerning the enlarged participation, the Task Force is requested to strengthen the participation of senior representatives of all economic and industrial sectors likely to be impacted by IPv6. Concerning its renewed mandate the Task Force is requested to:
- Focus on industry and win the major players to adopt IPv6 in their strategy plans. Select the target markets that are likely to be impacted first with the time-to-market risk compared to Asia
- Ensure a working liaison with on-going work on IPv6 carried out in standards and awareness fora and industrial bodies such as ISOC, IETF, ITU-T, RIPE, 3GPP, ETSI, IPv6 Forum, Eurescom, ETNO, UMTS Forum and GSMA, e.g. to harmonise activity, to encourage the fair availability of IPv6 addresses for mobile operators and other Internet providers,
- Provide a regularly updated review and plan action (“the European IPv6 Roadmap”) on the development and future perspectives of IPv6 in order to co-ordinate European efforts on IPv6 and to assist the pan-European integration of and transition to IPv6,
- Conduct studies, develop guidelines and IPv6 integration benchmarks, exchange best practices and launch awareness campaigns (to educate the stakeholders),
- Establish collaboration arrangements and working relationships with similar initiatives being launched in other world regions with a view to align IPv6 work programmes, promote innovation, develop global IPv6 concerted actions and disseminate best practises.
- Initiate a discussion of IPv6 within the appropriate regulatory committees with a view to address at an early stage and where needed, all issues relating to IPv6 notably its address allocation policies, its privacy and security dimensions, and the associated requirements for an open and fully competitive market place. It is indeed necessary to ensure that development of an open and fully competitive market place for IPv6 is not unduly constrained or limited and that IPv6 addresses are made available to all concerned sectors of the industry at the numbers needed and at reasonable prices not leading to unnecessary costs for users.
- Organise a high level conference or summit aimed at raising IPv6 awareness, its development status and perspectives, its economic and policy dimensions and the actions required to consolidate and harmonise European efforts.
- Encourage deployment of new security and firewall modes using IPv6 combined with the use of Public Key Infrastructure (PKI) with appropriate level of trust and business processes needed to enable PKI-supported systems and the applications that serve the emerging new Internet generation. Promote the development of secure networking applications and environments through the trials, deployment and use of IPv6 IPsec protocols

2. EUROPEAN COMMISSION PUBLIC CONSULTATION ON HURDLES & TRIGGERS

The Public Consultation was organised by the European Commission/DG INFSO in order to identify triggers and hurdles to the deployment of the IPv6 technology and identify potential next steps.

This consultation was carried out in the context of policy reflections linked to the i2010 initiative and aims to provide a new impetus to IPv6 adoption in Europe; the results of this consultation are key inputs for a forthcoming “Communication to the Council and Parliament” on the matter.

The Consultation was conducted in February 2006 for 2.5 weeks and collected 260 answers mostly from Europe. The short period, the targeted population and the quality of the comments make the EC services very confident that these answers are genuine and relevant.

The main conclusions arising from this Consultation are:

1) When it comes to evaluate triggers, technical arguments are clearly relevant for the respondents (mobility, IP addressing, plug and play, multicasting). They are the ones for which IPv6 has been designed and as such remain key in the perception of respondents.

2) The top 3 triggers are:

- **Mobility:** seen as the top trigger, confirming the role IPv6 could play in the Fix-Mobile convergence and therefore highlighting the strategic importance of IPv6 for Europe.

- **End-to-end transparency:** IPv6 is seen as restoring the original architectural design of the Internet and be able to overcome limitations introduced by NAT (Network Address Translation)/private address.

- **Convergence** of ICT technologies and services: IPv6 is seen as a factor to realize convergence.

It is interesting to observe that regulation enforcing IPv6 is not seen as a very relevant factor. Furthermore the lack of IPv4 addresses is not perceived as a major trigger, while this aspect becomes more evident in other region such as Asia.

3) The top 3 hurdles (leading the rest by far) are:

- Lack of **market demand**
- Lack of **available IPv6 services**
- Lack of **available applications**

This indicates that IPv6 deployment may suffer from the vicious circle where the lack of demand does not bring incentives to application and service development and vice-versa.

However, it is generally accepted that **IPv6 is a stable and mature technology**.

4) In terms of timing for **wide availability of IPv6, the average estimation is 4 to 5 years**.

There are some perceived differences on a per sector basis: Service providers are the most optimistic (3.6 years in their sector and 4.6 years in their region) while Manufacturers/Suppliers and End-users are less optimistic for their sector (4.7 years) and researchers for their region (5.3 years).

5) The top three **policy initiatives** identified as potentially relevant for adoption by the European Commission and Member States are

- Stimulation of the IPv6 **Public Procurement**: as an emerging technology, IPv6 could usefully benefit from Public Sector investment
- Stimulation of **sectorial initiatives and applications**
- Financial support for **IPv6 enabled infrastructures**

All these actions would help to break the vicious circle where IPv6 is now by creating demand, applications and services.

The complete presentation can be accessed here:

www.ipv6.eu/admin/bildbank/uploads/Documents/Paris_2006_Presentations/Keynote_JeanLuc_Dorel_-_EC.pdf

2.1.1 Results from the convergence Conference in Vienna

The event organised by the EC jointly with the TF-SC has generated a new momentum in addressing the challenges and hurdles and distil the right messages. In the TF-SC report, a set of ten key messages have been drawn from the event and conclude with a selection of interesting quotes taken from the speakers at the event. http://www.ipv6-convergence-vienna.net/index.php?option=com_frontpage&Itemid=1#

The key messages from the event can be summarised as follows:

1. IPv6 is a mature technology with significant deployment experience worldwide. The majority of deployment is in academic networks but commercial deployment is now growing, particularly in the Far East.
2. IPv6 has clear technical advantages but these need to be translated to business advantages for various sectors, with detailed but clear business models. This is a task for economists rather than standards developers and implementers.
3. IPv6 supported fully by Microsoft; they have deployed it in their own worldwide enterprise network, and Windows Vista will ship preferring use of IPv6 by default.
4. A number of companies have decided to support IPv6 as a core strategy, building products and services in advance of demand (e.g. Microsoft, NTT, KDDI).
5. A wide range of new IPv6 application scenarios is available to be exploited; many of these are green field scenarios (e.g. supply chain, sensor networks or transport networks) that can use IPv6 from the outset.
6. IPv6 networks can enrich educational experiences, with the right support and vision.

The Greek schools network serves as an example.

7. IPv6 can facilitate convergence both between delivery platforms and between business sectors. This has the potential for streamlining services.
8. Commodity IPv6 devices are required for consumer (SOHO) deployment, in particular there are no IPv6 DSL routers available to the European market; this hinders ISP deployment.
9. For IPv6 to be widely deployed in all commercial sectors, the immediate and realistic market needs need to be addressed, in particular site multi-homing and ISP independence, but also IPv6 capability in OSS and management tools.
10. Training and education capacity needs to be increased. Best practice, roadmap and guidance documents are still required (e.g. defining 'IPv6 capable' for those making public sector IT procurements).

2.1.2 The TF-SC Addressing the Hurdles & Triggers by sector

The IPv6 Task Force Steering Committee project intends to gather the experience of various industry players to identify and investigate their respective challenges from a business perspective. It will take into account the differences that might exist between services and applications. Up to now, IPv6 arguments have primarily taken on a technical and educational spin with quite a bit of effort made in scientific research for certain functionalities. As the industry moves beyond networking bits and bytes, real world business challenges are also beginning to surface, questioning, and rightly so, the viability of its application within practical business models.

A methodology of the analysis will be adopted to define what level of impact each identified challenge is detrimental to IPv6 uptake. It will also lay out a list of the industry areas and applications which will be addressed. These areas have been selected mainly for their relevance to the European industry and market context for converging broadband communications and services, taking into account as well emerging and popular applications believed to be potential drivers for IPv6 uptake.

Following this methodology, each of the industry sectors identified will be addressed in order to try and answer these broad questions:

- What is the v6 requirement profiling for the sector and the related solutions or components to cover features/RFC support, performance, adaptation to application-specific protocols or user plane, conformance test for application-specific needs, etc?
- Who are the players and what are the components needed in the value chain or supply chain for the sector? Are they ready with their products/solutions? Are required standards and interfaces ready? What examples or best practices exist?
- Is there a co-existence implementation use case or success story to learn from for each application sector? Or are there solutions or methods that have worked elsewhere and

can be duplicated or re-applied here? Can any of these illustrate a positive business model or demonstrate clear CAPEX/OPEX savings?

- What particular new benefits or services can fit into the sector to contribute to longer term growth and business continuity?

2.2 Preliminary Recommendations: The Way Forward

Above discussed sectors will deliver in the long run IPv6 services. Now, we need to achieve short-term successes to ramp up deployment of IPv6 in immediate infrastructure and applications over the course of the coming years.

The European Industry is called upon to:

- Promote IPv6 over Broadband: as a benchmark, the Taiwanese and Japanese success story with broadband access using IPv6 is the first visible service where IPv6 can be deployed immediately and in larger scale. Taiwan will deploy IPv6 broadband access for 6 Mio users by 2008 and Japan's Softbank will deliver IPv6 by end of 2006 to its 5 Mio users. These are two examples for European ISPs to look into and win experience from. The Korean strategy is to drive WiBro with IPv6. The EUv6TF has published a Communication for this potential deployment.
<http://www.european-ipv6-tf.org/Whitepapers/Forms/AllItems.aspx>
- Promote VoIP over IPv6: The other immediate and strategic area where IPv6 could be introduced immediately is in VoIP. An effort in convincing the European Telecom industry and operators is key since in the US corporate operators are deploying VoIP to eat their own lunch. The European operators need to be convinced to have a new approach to VoIP using IPv6.
- Promote European IPv6 ready technologies and the European companies working in the ICT domains, facilitating the development and growth of SMEs working in new innovative ICT fields and promote the use of SMEs products by the large European groups. One domain we should focus in Europe is Software. Innovation comes mainly from software. A case in point is the unique success story of 6WIND. 6WIND provided for example its software to Samsung, Mercury and Ibit in Korea to let them develop new ranges of IPv6 ready equipments in a few months. Off-the-shelf networking software reduces drastically the Time to Market and Costs.
- Promote open source Linux implementation of IPv6. <http://www.bieringer.de/linux/IPv6>
- Promote IPv6 over Satellite and HDTV over IPv6: One of the areas where Europe has developed leadership is in the Satellite Communications. With the advent of the all-digital TV by 2010 in Europe, there is a clear potential for Europe to retain its leadership in this strategic market. SES being based in Luxembourg, an EU project has been proposed to SES to work with industry. It would be highly recommended to promote High Definition Video Delivery Service over IPv6 Internet by:

- Establishing operation and extension of IPv6 network infra for HDV contents delivery service.
- Applying network-monitoring tools for analyzing the number of users and IPv6 traffics with VoD service.
- Developing HDV contents service techniques based on VoD and its management schemes.
- Building VoD server & its web site for HDV contents (e.g., cultural, medical, educational multimedia contents) service and Testing operation and by
- Developing multi-user remote videoconference system based on HD video delivery service and encouraging it.
- Europe could take leadership in researching and investing in:
 - Two-way Satellite Communications
 - Mobile Satellite Services
 - DVB-S2 usage (Astra has a test carrier already up and running) for IP data delivery,
 - Contribution to the emerging standard for IP over DVB-S2
 - Use of DVB-S (2) and IP for television contribution links
 - Delivering HDTV over IPv6 over DVB-S (or DVB-S2).
 - As a benchmark, NTTPC Communications announced that it started offering an IPv6 Enabled High Quality Video Conference System (“ViPr”) in Japan. “ViPr” is manufactured by and imported from Marconi Corporation plc (“Marconi”, based in London, UK). On May 16, NTTPC Communications launched the Broadband TV Conference Solution, a marriage between the Marconi system and the NTTPC’s network.

The all-in-one system ViPr overcomes the challenges of conventional videoconference systems, such as high installation cost and complex operation, and enables a high-end videoconference system at a lower cost. ViPr supports not only conventional IP networks but also IP multicast, IPv6, SIP control, and MPEG2.

Marconi provides a wide range of network equipments for telcos to enterprises with proven records in the high level of technology. ViPr allows videoconference with clear voice quality and DVD-equivalent video quality using MPEG2 CODEC, with ease-of-use of one-touch operation on the touch panel. Multi-point (up to 15 sites) videoconference is possible without an MCU (multipoint control unit), where participants to the conference can scan and distribute what are on their PC screen or use applications simultaneously. ViPr is already in use in the United States for such applications as remote trials, remote medicine, and distance learning.

- Promote IPv6 in the home networking. The EUv6TF communication addressed to CENELEC outlines the technical guidelines and practices to achieve successful use of IPv6 in the home connectivity market: <http://www.european-ipv6-tf.org/Whitepapers/Forms/AllItems.aspx>
- Fully participate in the R&D activities to be supported in the context of the 6-7th Framework programme, with a view to put in place an integrated and structured set of IPv6 activities, covering the full range of IPv6 aspects, from basic research through the development of service enablers and associated software suites, to the large scale trialling

and testing of IPv6 features, for a diversity of applications, in a European wide environment.

- Actively contribute towards the acceleration and alignment of on-going IPv6 work within standards and specifications bodies and urgently develop key guidelines permitting the rapid integration of IPv6 infrastructures and interoperability of IPv6 services and applications, especially in the ETSI testing events ETSI Plugtests. <http://www.etsi.org/plugtests/IPv6.htm>, and within the auspices of the GO4IT IST project in which ETSI is a key member.
- Where appropriate, develop roadmaps for the design, development and deployment of IPv6 services, equipment and networks, to include technologies such as AAA, DNS, xDSL, etc.
- Contribute actively to the work of the National IPv6 Task Forces, ensure the collectively increase of IPv6 awareness and permit their members to individually derive their own perspective of the IPv6 business case and their own IPv6 integration strategy.
- Devote efforts towards the establishment of a European wide, vendor independent, training and education programme on IPv6, in cooperation with 6DISS (which is funded to do so in developing regions around the world but including South East Europe)
- Consider in their manufacturing plans that the majority of mobile devices, and a growing number of household and consumer-electronic devices will require some form of IP connectivity and that the simplest way to offer these devices the fullest range of services is to have a unique globally routable IPv6 address available for all network-enabled components.
- Seek to develop innovative IPv6-enabled devices, e.g. biometric security devices, “IP in a chip” embedded systems components, in-car sensor devices. Seek to design and implement innovative peer-to-peer applications where appropriate, e.g. peer-to-peer gaming in the entertainment industry.
- Take early steps to obtain adequate IPv6 address allocations and where appropriate, and to either accelerate the offer of IPv6 capable services or consider on a priority basis how best to rapidly evolve towards IPv6.
- Address the multi-vendor interoperability issues impeding the wide-scale deployment of PKI and to conduct extensive trials with IP security in IPv6 and the parallel implementation of a PKI.

3. TECHNOLOGY VALUE

3.1 First Recommendations

- Software developers should begin taking advantage of IPv6 today by making their applications IPv6-capable. This will enrich the applications with global reachability over IPv6, utilize network address translator (NAT) traversal with Teredo and make use of capabilities offered by new APIs such as the Microsoft Peer-to-Peer Software Development Kit (SDK). Developers must consider their product strategy 2-3 years in advance, and IPv6 will have a much wider reach in that time frame. Developers need to start transitioning their applications now.
- Service providers should procure IPv6 capable equipment, begin training their staff in IPv6 technology, and begin adding IPv6 capability to their OSS components in preparation for a production IPv6 service. Operators also need to conduct native IPv6 pilots and gain experience with new services and support issues. All new product purchases need to require IPv6 in order to future-proof the new investments and minimize the overall cost of future network upgrades.
- Network administrators interested in learning IPv6 should deploy an IPv6 testbed in their own network to gain early experience, tunnelling if necessary to an appropriate IPv6 provider for external connectivity. Learning how to manage a new network will take time, so starting out early, conservatively, and transparently to users is the most logical approach. Organizations should also future-proof their investments now by requesting IPv6 capabilities in new product purchases and services. These capabilities might remain dormant in a network in the beginning, but this policy ensures a cost-effective way to acquire IPv6 capability while minimizing expenses. Dual-stack deployment is the recommended interim IPv6 deployment method. Gradually, as the network traffic sent over native IPv6 increases either internally or externally, you can move your network to support native rather than IPv4-encapsulated IPv6 traffic. Let your network traffic and application benefits drive your network upgrade schedule toward IPv6.

4. APPLICATIONS AVAILABILITY & REQUIREMENTS

4.1 Recommendations on Applications & Access

4.1.1 Broadband

Recommendation

- Broadband deployment and IPv6 deployment are in the same time-line (over 2006), so, we recommend to the European ISP's to synchronize and align these two deployment strategies and the associated processes. In that context, dual stack broadband deployment in the access networks shall be recommended and more precisely this dual-stack scenario shall become the rule in order to provide parallel IPv4 and IPv6 connectivity simultaneously to the end users.
- "Broadband access services" and IPv6 technology is a unique opportunity for all the actors of the value chain in the access networks (fixed & Mobile) for developing this market. European stakeholders should seize this opportunity.

4.1.2 Multi-play

Recommendation

Take advantage of the intensive effort already done by European operators and ISPs in deploying massively broadband access in one hand, and exploit the huge IPv6 experience and practices gained during the last five years in the framework of IST IPv6 projects in the other hand in order to put Europe in good position in this IPv6 applications market.

- * Involvement in the standardization bodies dealing with Triple or multiple play works These actions must be more targeted to the right WGs (SG 16 of ITU, 3GPP TS & ETSI/TISPAN, and DSL Forum).
- * Favour the IPv6 option in the IMS architecture as an enabler of Fixed-Mobile convergence

4.1.3 Home networking

Recommendations

- * TF-SC must pursue supporting CENELEC and Smarthouse Forum by promoting IPv6 scenario in their conferences
- * TFSC must also support Net-atHome initiative by promotion IPv6 scenarios. TS-SC will participate in Net-atHome2006 Conference by presenting a communication. It is an opportunity to set up a liaison.

4.1.4 IPv6 applications in transportation sector

Recommendation

Car, Bus, Railway, airlines companies need to be supported in their trials and developments
Support to standardisation activity on IPv6 for these business case

4.1.5 IPv6 applications in emergency & Crisis context

Recommendation

- * These IPv6 business cases in the context of emergency and crisis context must be developed, standardised and generalised for all European countries
- * Cooperation with other regions (US, Asia) working in the same area need to be established. Such liaisons are already established by the u-2010 project.
- * TF-SC must support this initiative

4.1.6 Social networks applications

Recommendation

- * Follow the movement of the Internet 2.0 and take part in the relevant initiatives.
- * Analyse deeply the impact of IPv6 in the social networks and get prepared to influence the movement

4.1.7 RFID, M2M, communicating object networks, sensors networks

Recommendation

We should strengthen these collaborations and liaisons with ITU, NAV6TF, and initiate others with the main stockholders working in communicating objects, sensors networks, RFID during 2006 and encourage the development of concrete business cases such as those of IST u-2010 project

4.1.8 Push applications

Recommendation

Promote Push services over all kind of networks (mainly mobile networks). It is a solid vector enabling IPv6 deployment and meeting operators and content providers requirements because there is a large business behind these Push services.

4.1.9 Costs migrations

Recommendation

Economic issues will be investigating looking at both the provider and client end.
Technological areas will be looking at from the vendors' perspective. We will look at vendors as manufacturers of hardware and software products and services, reviewing also their roadmaps and future development programmes.

Undertake a review of current and projected societal trends. Looking at the differing needs in various age groups, and the likely communication needs within the next 5 years.

Review the trends in the marketplace and the potential needs for communication services in both the European and other regions.

Business model guideline must be developed and provided as code of practices for the stakeholders

5. RESULTS FROM EUROPEAN RESEARCH PROJECTS

5.1 Lessons learned

Pushing IPv6 results to commercial deployment requires expertise to be available to those making the deployment. The production deployment in academic networks (from 6WINIT, 6NET and GEANT) can give confidence, but a wider range of knowledge and training is required, in areas such as QoS, security and AAA, as well as the right products being available (e.g. commodity IPv6 DSL devices). Organisations that have the IPv6 experience from completed or ongoing IST projects should be encouraged to pass the information on to those who need it. In addition, many IST projects will not be including IPv6 where they could be; such projects should be identified and targeted where appropriate.

The open question is how results achieved to date can be driven to commercial deployment, and be adopted by industry in general.

The steps required to help this drive will need to be coordinated with roadmaps for IPv6 deployment. Factors are likely to include:

1. *Feedback and experience from existing (academic network) deployments.* In principle, commercial operators can study and talk to the NRENs who have deployed IPv6 in academic networks, and ISPs who have done trials in Euro6IX, for example.
2. *Viability determined from IPv6 showcases and demonstrators.* Projects such as EUROLABS play an important role here, but their availability needs to be given a high profile.
3. *Availability of high quality training.* Material from projects such as 6DISS should be reusable by European industry.
4. *Availability of applications.* The applications category was the most popular eTIP result category. It should be possible to bring the application developers with IPv6 experience together with developers interested in porting or new applications.

The knowledge for many areas is present, the challenge is to bring those seeking knowledge in contact with those that have it, and for there to be incentives for both parties to meet.

The lack of 'business cases' is often cited for lack of IPv6 deployment. However, many industries are likely to be willing to invest in gaining IPv6 knowledge, even if not for immediate commercial deployment.

5.2 Consultation by subject matter

One option for the European Task Force to consider is whether subject matter focus groups could be formed, as a channel to bring people together, using representatives of projects who have gained expertise already from IST funding.

For example, the following categories could be formed:

- *Security*: SEINIT, Euro6IX, 6WINIT, MOBY DICK, 6NET
- *Access Technologies (including wireless)*: MUSE, 6POWER, Euro6IX, 6WINIT, MOBY DICK, 6NET
- *Training and Awareness*: IPV6TF-SC, EUROv6, 6LINK, NGNI, 6NET
- *Management and Monitoring*: 6QM, MOBY DICK, Euro6IX, 6NET
- *ISP deployment*: Euro6IX, MOBY DICK, 6NET
- *Application porting/development*: LONG, Euro6IX, GCAP, 6WINIT, 6NET

The categories of industry to be targeted should probably include:

- ISPs, including SOHO/DSL access
- Vendors (router)
- Vendors (OS)
- Application developers
- Security consultants
- Consultancies

The feedback from the author's national IPv6 Task Force (UK) is that the main current deterrents to IPv6 deployment are lack of OSS tools (management, monitoring, accounting tools) and commodity DSL devices. For IPv6 to be deployed widely, the ISPs must be ready to deliver service. Thus involving them is very important, and thus ISPs who have experience from IST projects should be encouraged to share their experiences as fully as possible (given commercial confidentiality constraints).

On behalf of the European IPv6 Task Force, we would like to thank you
for your continued support and commitment to this effort.