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Editorial

Dear Reader,

6NET wishes you a very happy new year! Here is more news about the many activities and achievements that are being generated as the 6NET project enters its final semester.

We would like to present you the 7th version of the 6NET Newsletter, featuring an article by Latif Ladid, the "best-known face" in the IPv6 world!

Happy reading,

The Editorial Team

IPv6: The two-way Internet

Latif Ladid

Chair, European IPv6 Task Force - President, IPv6 FORUM

Get Ready, Get Moving!

Moving from the current monotonous, asymmetric, non-interactive Internet applications and services to new generation symmetric and interactive applications is a challenging undertaking, as it requires a rejuvenated Internet infrastructure based on the original Internet model called the end-to-end model.

This might sound like a nostalgic line to some, but it is indeed a vital architectural feature to lead the Internet where it should head to and where it has not gone before. Simply said, the TWO-WAY Internet is in the making: The New Internet.

IPv6 is not a fashion! IPv6 is a necessary upgrade for building the New Internet. It is the investment of the 21st century for enabling the networking of everyone and everything.

IPv6 is predestined to become the convergence glue for all networks (fixed, mobile, GRID, etc.) and should therefore become a fundamental piece in the strategy plans of any corporation, SME, research institution and academia.

In this world of technology fashion, especially in the access domain - today WIFI, tomorrow WiMax and after tomorrow WiGig - the end-user is lost in this maze and simply wants to know: "what's in it for me?" This is the moment where some serious work has to be done before one can respond with great confidence on what this technology can do for each one of us.

Three big steps to enable the giant leap!

Research on paper and Standard-setting: Just some 30 IETFers among the couple of thousands digging away in the mountain of packet-oriented specifications found a giant rough diamond that they kept polishing until it started to shine in 1998, when they decided to show it to the world. Some of this core group is now the Technical Directorate of the IPv6 Forum.

<http://www.ipv6forum.com/modules.php?op=modload&name=News&file=article&sid=10>

Research and Deployment: In-house and open research and deployment started fostering the implementation of the various pieces of jewels cut out of that giant diamond.



The IPv6 Forum members around the world pioneered a myriad of IPv6 research and deployment projects. Vendors started lining up v6-ready products.

Test beds and production networks began to be deployed to verify and validate this new technology. Governments funded large-scale projects (6NET, Euro6IX, CNGI,..). Moonv6 was pioneered. Today, the word of IPv6 is well spread around the globe.

Advocacy and Business Practices: The origin of the foundation of the IPv6 Forum goes back to an IETF IPv6 WG meeting in February 2nd – 5th, 1999 in Grenoble, where Jim Bound's Deployment WG was converted to the IPv6 Forum strategy. A formal proposal was made at the IETF meeting in Minneapolis in March 1999, which was accepted by a large proportion of the attendees. The promotion WGs were created during the Oslo IETF meeting in July 1999. There are now 10 IPv6 Forum chapters and 25 IPv6 Task Forces around the globe organising a total of 12 IPv6 Summits per year, attracting and educating over 25,000 people in 2004.

The IPv6 Forum is by far the large non-formal IPv6 University in the world. The creation of the IPv6 Ready program introduced a level of quality assurance of v6-ready products and created a level of confidence that such branded products are interoperable. A five-year long chain of successful events and achievements has reinforced the mission of the IPv6 Forum, winning governments and industry for a smooth adoption of IPv6, based on its merits and potential. 2005 looks even more exciting with more concrete milestones and potential breakthroughs.

The **6NET project** is one these major and strategic milestones in the process of validation and verification of the quality of IPv6-enabled networks and services. In the history of European networking, 6NET is the first all-out effort initiative to embrace all European research networks and seamlessly make them cooperate. Through this project, significant development results have been achieved and pioneering lessons for service deployment have been learned by European industry and academia. The level of partnership is exemplary under the championship of Cisco's smooth coordination, which can only be commended for a highly successful project.

Cheers to 6NET and to IPv6!



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Tiger Team

As the 6NET project enters the final stage, the emphasis of its work is shifting towards the demonstration of its results and the dissemination of its expertise. The newly formed "Tiger Team" acts as the first point of contact for advice on IPv6 deployment issues. They operate a virtual "Help Desk" service for assisting administrators and end users, particularly those in universities, colleges and schools. However, the Tiger Team area of the Website will also serve commercial enquiries, which may lead to further exploitation of the 6NET knowledge from research to commercial deployment

The Website area will include:

- o Links to appropriate literature (including 6NET *Cookbooks*)
- o 2-3 page fact sheets on IPv6 deployment, e.g. IPv6 VPN, DHCPv6, ... as extracted from the 6NET *Cookbooks*
- o Links to applications built or ported by 6NET
- o A discussion forum for specific technology (eg. hosts, routers, etc.)
- o A set of IPv6 training slides for basic skills
- o A filter mechanism, to forward specific technology questions to nominated subject matter experts
- o A bug tracker system for issues raised
- o IPv6 news items (eg. from www.ist-ipv6.org)

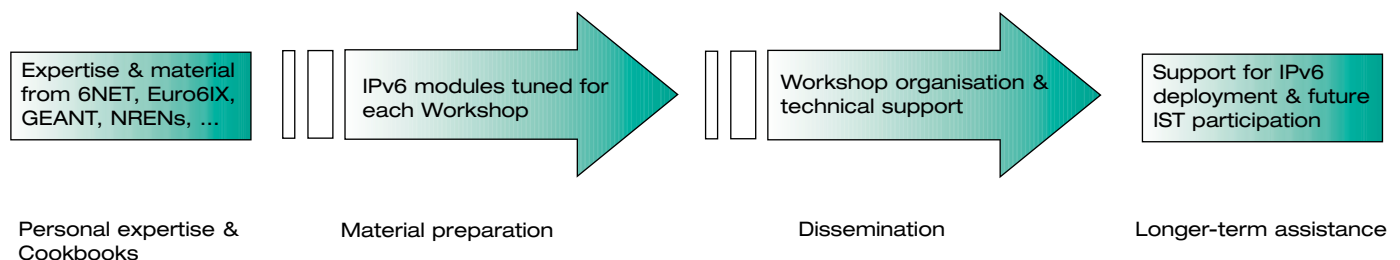
New EU FP6 Project 6DISS (under negotiation)

6DISS is a Specific Support Action, that aims to support the deployment of advanced Internet connectivity and services in: the Balkans, Mediterranean countries, the Newly-Independent States, Africa, the Caribbean and Pacific region, South and Central America. It will also exchange experiences with relevant organisations in China and India.

6DISS will give the early adopters of the new technology - typically the research networking community - strategists, decision makers and Non-Governmental Offices in these countries the opportunity to learn of deployment experiences from the major relevant EU R&D projects: 6NET, Euro6IX and GÉANT.

The practical collaboration will be via workshops that will include presentations and hands-on instruction. Beyond these workshops, 6DISS will continue the support and collaboration through access to experts for technical queries and operational support through the so-called "Tiger Teams" initiated within 6NET. 6DISS also provides access to modern laboratory facilities in Brussels for engineers, and for training additional trainers from those regions.

Diagrammatically, the key thread of the 6DISS approach is shown in the following diagram:



Partners: Martel (Co-ordinator), Cisco, TERENA, RENATER, GRNET, FCCN, University College London, University of Southampton

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SIP Based Communication in Heterogeneous Environments

Internet-Telephony is currently one of the most promising technologies with regard to revolutionizing the telecommunication market and providing technological and financial impulses for the Internet economy. This is evidenced by the tremendous growth in public IP-Telephony offers from ISPs and ASPs of various sizes.

While early offers for VoIP services have been based on H.323 technology, current services are generally based on the Session Initiation Protocol (SIP). SIP has not only been the choice for Internet-Telephony, but also the basis for providing multimedia services in next generation networks.

Currently, one of the major difficulties of deploying VoIP services is the wide usage of network address translators and private addresses in the Internet. With the wider deployment of VoIP services and the introduction of VoIP services in next generation wireless networks (3GPP), the lack of addresses in the IPv4 world will impose even larger problems and roadblocks in from of a successful deployment of the VoIP solutions. In this context, Internet-Telephony will profit greatly from the large range of IPv6 addresses in addition to the general advantages of the IPv6 technology, such as auto-configuration and better support for mobility and security.

However, regardless of the great advantages of the IPv6 technology, it is a well-accepted assumption, that IPv6 networks will only be introduced gradually with relatively long transition periods in which both IPv4- and IPv6 networks and devices will need to coexist and be able to communicate with each other.

In the context of the 6NET project, Fraunhofer Fokus has been working at providing a technical solution that not only enables VoIP services in IPv6 networks, but also in heterogeneous environments comprised of IPv4- and IPv6 networks. To further promote the developed solutions, wide area trials as well as a public IPv6-based VoIP services are provided.

To provide a VoIP solution for heterogeneous IPv4/IPv6 environments, a SIP-based VoIP infrastructure was developed consisting of:

- o VoIP signalling infrastructure: Establishing a VoIP session involves the exchange of signalling messages as well as the authentication and registration of users. A platform widely used in the Internet by various commercial ISPs and ASPs is an open-source project under the name of the SIP Express Router (SER), which is well known for its flexibility and robustness. To support VoIP communication in IPv6 networks, SER was extended to support IPv6 as well.
- o VoIP soft agents: To enable users to actually start a VoIP call, they can either use a dedicated IP-based phone or a software tool running on a PC. To enable IPv6 communication, in the 6NET project an open-source VoIP tool called KPhone was extended to support IPv6.
- o Translation mechanisms: As shown in the figure below, to support communication between IPv4 and IPv6 users, some means of translating SIP messages between the two worlds is needed. For this reason, a translating gateway was developed that:
 - o translates SIP messages so as to allow IPv4- or IPv6 SIP devices to communicate with each other without requiring any additional intelligence, and translates the media traffic (RTP) between IPv4 and IPv6 networks.

Besides the components that were developed by the 6NET partners, the 6NET VoIP activities are complemented by the first IPv6 hardware phones available on the market. These phones are offered by FreeBit Co., Ltd. of Japan, and are used in the context of 6NET as VoIP terminals for tests and demonstrations, as well as for the communication between the partners.

Besides the development work, a considerable number of trials was started to evaluate the quality of VoIP communication in IPv6 networks as well as the quality and reliability of the developed tools and infrastructure.

To achieve a wide public exposure, the popular VoIP site www.iptel.org was also made IPv6 capable. As a public presentation platform, www.iptel.org allows IPv6 users to access a VoIP server, request a VoIP identity and use a number of services such as call logs, voicemail and such. Using the allocated VoIP addresses, users can utilize the VoIP service from their IPv6 networks.

Summary:

To facilitate the introduction of VoIP services in IPv6 networks, the 6NET project has developed and tested a complete VoIP infrastructure that not only provides services with a similar quality to the current commercial VoIP services in the IPv4 world, but also supports VoIP communication between IPv4 and IPv6 networks.

Besides the technological development, 6NET has undergone considerable testing and trials of the developed technology as well as offering the first publicly available VoIP service in an IPv6 network.

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The SIP Protocol Gateway (PGW)

Greek Schools' Network

Aims and Objectives of the Greek Schools Network

The Greek Schools' Network (GSN - www.sch.gr) is the educational intranet of the Ministry of Education and Religious Affairs (www.ypepth.gr), which interlinks all schools and provides basic and advanced telematics' services. The implementation of the Greek Schools' Network is funded by the Framework Programme for the Information Society (www.infosoc.gr), in close cooperation between the Ministry of Education as well as 12 Research Centers and Higher Education Institutes, specialized in network and Internet technologies. The GSN project was initiated to address the Primary and Secondary Education institutions' requirements for innovative educational methods, access to digital content and collaboration between geographically distributed users' groups.

GSN Description

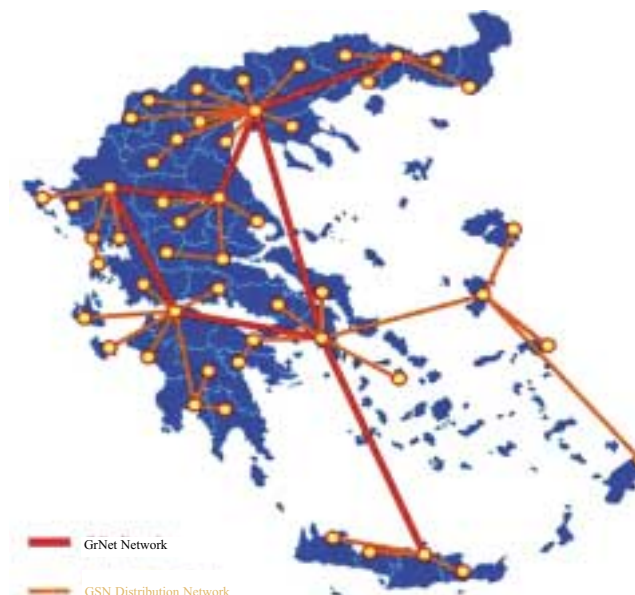
GSN is a nation-wide network that spans to all fifty one (51) prefectures of Greece. A three-layered architecture was used in order to manage with the complexity and the large number of sites that had to be covered. The remote sites that connect on the GSN use one of the following technologies (PSTN, ISDN, Serial links over Leased Lines - with the use of Baseband Modems -, VDSL and ADSL).

Reasons for deploying IPv6 in GSN (Aims and Objectives)

All sites connected to the GSN currently use a combination of static NAT and dynamic NAT in order to establish one-to-one relationship between the global IP address and the private IP of one or two servers inside the site. This scheme was a necessity when we were designing the network, because of the unavailability of IP addresses. Although the use of this scheme enabled us to interconnect about 5000 sites all over Greece, we have many problems when trying to provide some services (e.g. teleconferencing) to the remote sites, because of the NAT. Moreover, using NAT complicates the operation and administration of the network. In general, IPv6 removes the necessity of NAT and we consider it to be the status in our network in future years. Surely, the transition to IPv6 will be a continual process that will last a long time, and it will establish a need for experienced personnel in IPv6. Therefore, we believe the best way to reach our goal in the next few years is to realize a series of actions and projects that will study and deploy IPv6 in our network step by step, focusing on the different applications that we already provide.

Collaboration with 6NET

Collaboration with 6NET is of great importance. 6NET has produced state of the art deliverables regarding transitioning, routing and managing IPv6 networks. Therefore, we expect to receive consulting services from 6NET in the areas of addressing, routing and education. GSN will provide a proposed plan in the areas of addressing, routing, transition and coexistence of services, and the 6NET WP will provide feedback, recommendations, etc. Furthermore, 6NET will provide educational services to the GSN NOC members.



IPv6 VoIP IST2004 Demonstrator

At IST2004 in The Hague, UCL, in collaboration with Fraunhofer (FhG) Fokus, demonstrated a comprehensive SIP based VoIP system showing full IPv6-4 in-operation.

The core system is based upon FhG's SIP Express Router (SER) and their IPv4-6 gateway Mini-SIP Proxy (MSP), in combination with Asterisk.org's voice conference server and Public Switch Telephone Network (PSTN) gateway. The demonstration utilised a SIP User Agent developed by UCL based upon VOVIDA/Cisco's SIPset SIP agent in conjunction with UCL's Robust Audio Tool (RAT) to provide for high-quality, low-latency audio.

RAT was also enhanced to provide Dual Tone Multi-Frequency (DTMF) functionality, which enabled dial-pad control of certain core system functions, in a similar way to a conventional phone.

The figure above shows the SER as the front-end for SIP-based Internet telephony, acting as the SIP proxy for both IPv4 and IPv6. SER provided for the routing of the calls to and from the different entities, including implementing the logic for IPv4-6 translation and redirection of calls to utilise Asterisk's functionality. Asterisk runs on the same Linux PC and provides SIP-PSTN gateway functionality through an ISDN BRI line, thus allowing mobile phone and residential line users to interconnect with the UCL VoIP infrastructure. It is currently only IPv4-enabled, but IPv6 development is underway. UCL and 6NET will be alpha testers of the software.

Using Asterisk, UCL has setup and deployed a number of additional telephony services, most notably Interactive Voice Response functionality, using pre-recorded and synthesised voice samples, controllable by DTMF tones. The Asterisk MeetMe multi-way audio conferencing is deployed with conference invitation functionality available, which may be sent to any PSTN or SIP phone. Furthermore, Asterisk provides for voicemail, with "message waiting" notifications, or voice attachments via e-mail, phone directory, call queuing and music-on-hold.

Various SIP UAs have been tested on this system. However, whilst most user agents perform adequately over the LAN, few of them perform well in the wide area. Therefore, UCL integrated the IPv6-capable RAT with Sipset to provide good audio quality over the wide area 6NET in all the scenarios described below. Kphone, and Linphone have also been used with IPv6, as well as other IPv4 UAs available at our site, such as Cisco 7960 and X-lite.

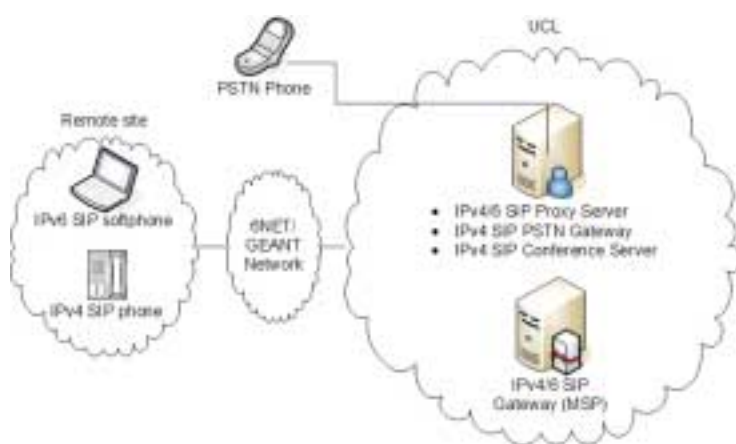
The UCL demonstration showed a number of scenarios in conjunction with three sites: IST2004, FhG and UCL. The scenarios included:

- o IPv6-to-IPv6 Point-to-Point Communication
- o IPv6-to-IPv4 Point-to-Point Communication, using MSP IP6-4 gateway
- o IPv6 and IPv4 Group Communication, using MSP in conjunction with Asterisk Meetme conference server
- o IPv6-to-PSTN Point-to-Point Communication, using MSP in conjunction with Asterisk PSTN gateway.

Furthermore, the H.323 to SIP interconnection has been achieved through Asterisk. This means that H.323 terminals such as Gnomeeting can now be called either in a one-to-one conversation from an IPv6/IPv4 SIP phone, or to a voice conference via the MeetMe service. As Gnomeeting and openGK (the H.323 GateKeeper) are both IPv6 enabled, users will be able to place native IPv6 calls between SIP and H.323 terminals when Asterisk is fully IPv6 capable. Currently, the MSP gateway shown in the figure above is used for such interconnection as well as for SIP-to-SIP IPv4/IPv6 calls via SER and Asterisk.

User database registration is now being investigated for authorised access to the VoIP system. This will also facilitate user/extension management, as well as call logging and possibly billing for PSTN usage. A web interface has already been provided to the MeetMe conference for administration purposes. We plan to use the system for 6NET voice conferences in 2005.

In the future, integration of the IPv6-enabled vic with Sipset could be investigated to allow interconnection with H.323 videophones via Asterisk. SMS message notification may also become available.



6NET goes East!



Since China boasts the fastest growing economy in the world today, 6NET didn't fail to be represented at the the Chinese-European Networking Symposium, in Shanghai in December 2004 on the theme of "Research Networks, Advanced Networks and Broadband Solutions". The symposium was organised by CERNET (the Chinese Education and Research Network) and ULB in the scope of the EC-Bridge project (see www.ec-bridge.org for complete information including the webcast of the whole event).

Valentino Cavalli from TERENA presented the project to the almost 400 participants attending this conference, and the 6NET newsletters were distributed at the booth of the Eurolabs project in the exhibition area.

There were a number of EC representatives participating in this event, lead by Mario Campolargo, Head of Unit "Research Infrastructures".



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Czech National Research and Education Network (CESNET), Delivery of Advanced Network Technology to Europe Ltd. (DANTE), Deutsche Forschungsnetz Verein (DFN),

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