

## Another active 6NET Consortium Meeting



The 36 partners of the 6NET project meet regularly, twice a year, in very well-attended parallel and plenary sessions, for an intensive Consortium meeting.

This gives the opportunity to organise internal Workpackage meetings as well as to enhance the coordination and cross-fertilization between the many activities and people, through fruitful formal and informal gatherings.

The evening Belgian buffet has become quite a tradition at the September meeting, and the Spring will see the Consortium hosted again in Portugal.

Here are some of the hot topics addressed during the meeting held at CISCO offices in Brussels from September 17 to 19, 2003:

- QoS aspects, DiffServ testing and deployment
- Multicast
- Cookbooks
- Mobile IP
- Management tools
- Usage and traffic measurement

The pictures give an idea of the atmosphere during the plenary session.



## 2<sup>nd</sup> 6NET Project Review

The 2<sup>nd</sup> Project Review for 6NET was held on 17<sup>th</sup> October on the premises of RENATER (Paris).

Presentations of achievements, expenditures and future plans were given by the Workpackage leaders.

Three demonstrations were shown:

- multicast videoconferencing, incorporating an IPv6-IPv4 gateway (RENATER and UNINETT)
- HDTV, including the impact of providing QoS support (ETRI)
- a PC-based IPv6 router, named Liberouter (CESNET).

The summary from the reviewers was positive; recommending a continuation of the project, but with some modifications.

These include the concentration of the large number of Deliverables around so-called "Cookbooks", and the further promotion of IPv6 through liaison with related activities such as Grids.

Also, whilst 6NET is very active in the IETF v6ops WG (and provides one of the co-chairs), opportunities were identified for submitting contributions on other issues (especially Mobile IP).

There was no objection to the introduction of the Portuguese NREN (FCCN) as a new partner, to take over the leadership of WP3 (Basic Network Services) from ACONET.



## Announcing the Spring 2004 6NET Conference and Euro6 Showcase

Organized and hosted by ULB in Brussels on May 18 and 19, two simultaneous events will take place:

- the **Spring 2004 6NET Conference** will feature two days of presentations and discussions, one aimed at a technical audience and the other at a more managerial level; the registration fee will be kept very low to encourage attendance.
- the **Euro6 Showcase** is an exhibition with demonstrations of IPv6-enabled products and services which is organized by the Euro6 project (see [www.euro6.org](http://www.euro6.org)): access will be free.

6NET and Euro6 have already collaborated in September 2003, within the scope of the Euro6 Showcase organized at Hotel Plaza in Brussels (see [www.ipv6event.be](http://www.ipv6event.be)). IPv6-enabled telematics applications intended for integration in cars and other vehicles were demonstrated.

The May 2004 event is organized in full synergy between the two projects; it will be open to the public at-large, giving all interested parties the opportunity to learn more about 6NET and other projects, and about the latest evolution of IPv6 in Europe and worldwide.

This twin event will emphasize the complementary aspects between the activities of the 6NET project and other IPv6-related developments in Europe and worldwide. The participation of various industrial and institutional actors in the series of Euro6 Showcases gives their visitors the opportunity to build a vision of the potential positioning and impact of IPv6-enabled applications and services.



## 6NET Consortium

Coordinator:

Cisco Systems Internal BV

Principal Contractors:

Czech National Research and Education Network (CESNET), Delivery of Advanced Network Technology to Europe Ltd. (DANTE), Deutsche Forschungsnetz Verein (DFN), Electronics and Telecommunications Research Institute (ETRI), Greek Research & Technology Network (GRNET), Hungarian Academic and Research Network Association (HUNGARNET), Compagnie IBM France, Istituto Nazionale di Fisica Nucleare - Gruppo per l'Armonizzazione delle Reti della Ricerca (INFN-GARR), NORDUnet A/S, NTT Communications Corporation, Poznan Supercomputing and Networking Centre (PSNC), Réseau National de Telecommunication pour la Technologie, l'Enseignement et al Recherche (RENATER), Sony International (Europe) GmbH, SURFnet B.V, SWITCH Telematikdienste für Lehre und Forschung Foundation, Stichting Telematica Instituut (TELIN), Trans-European Research and Education Networking Association (TERENA), United Kingdom Education & Research Networking Association (UKERNA), Université Libre de Bruxelles (ULB), University College London (UCL), Lancaster University, University of Southampton, University of Vienna Computer Centre (ACOnet)

Assistant Contractors

Computer Technology Institute (CTI), Danmarks Tekniske Universitet (DTU), Fraunhofer Institute FOKUS (FhG), Institut National de Recherche en Informatique et en Automatique (INRIA), Invenia A/S, Oulu Polytechnic, Scientific Computing Ltd. (CSC), UNINETT A/S, Université Louis Pasteur (ULP), University of Oulu, Westfälische Wilhelms-Universität (WWU-JOIN)



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## Editorial

This fourth issue of the 6NET Newsletter marks the start of the third (and last) year of the project; the next two issues will be published in May and September. 6NET now has many results to show, and some of these technical highlights are presented here.

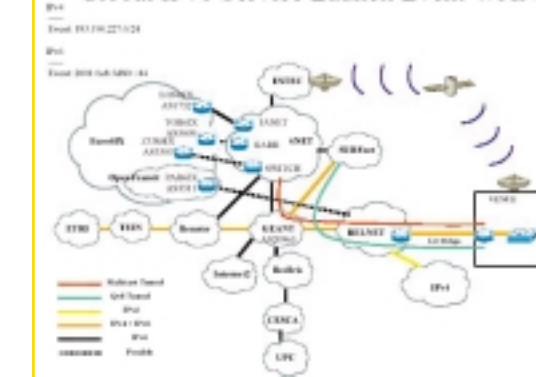
In addition, the visibility of the project - and of the evolution of IPv6 in Europe - is increasing every day, due to new dissemination activities, such as the **Global IPv6 Service Launch** event presented below (with the presence of Commissioner Erkki Liikkanen), and the forthcoming **Spring 2004 6NET Conference (May 18-19 in Brussels)**, announced elsewhere in this Newsletter.

The 6NET project was also presented at, among many other places, the meeting of the European Telecommunications Platform in December 2003, an advisory body to the European Commission grouping all the major telecom operators and ICT manufacturers.

If you want to know more about the 6NET project, the complete information can of course be found at: <http://www.6net.org>.

## European Commission showcases deployment of IPv6

### Global IPv6 Service Launch Event WAN



In February 2002, the European Commission adopted the Communication entitled 'IPv6: Priorities for Action'. The Communication calls for a European action plan to accelerate the rollout of IPv6 - a key technology for the New Generation of the Internet.

The European Commission, through its IST research projects, is a major supporter of this latest networking technology. To underline this fact, the Information Society Directorate-General of the European Commission is organising the 'Global IPv6 Service Launch Event' on January 15-16, 2004 in Brussels.

The event is co-sponsored by two of the largest IPv6-related R&D projects funded by the European Commission: 6NET and Euro6IX. The service launch showcases the new protocol and stresses its importance and impact in order to spur the deployment of IPv6 in all sectors and help trigger and inspire the European industry at large to understand the urgency of deployment of IPv6. Research results from a number of projects are demonstrated, validating the current successful deployment of IPv6 along with a number of innovative applications.

The highlight of the event is the formal inauguration of a global operational IPv6 connectivity service for the research community, which has involved the collaboration of the pan-European Research Network - GÉANT - with other research networks world-wide.

'IPv6 is a critical technology enabling integration of the Internet with mobile communications, an area where Europe leads the world,' said Erkki Liikkanen, European Commissioner for Enterprise and the Information Society. 'The importance of IPv6 to European competitiveness in general cannot be overestimated. Europe needs to match its world class research with political commitment to make IPv6 happen.'



Large-scale International IPv6 Pilot Network

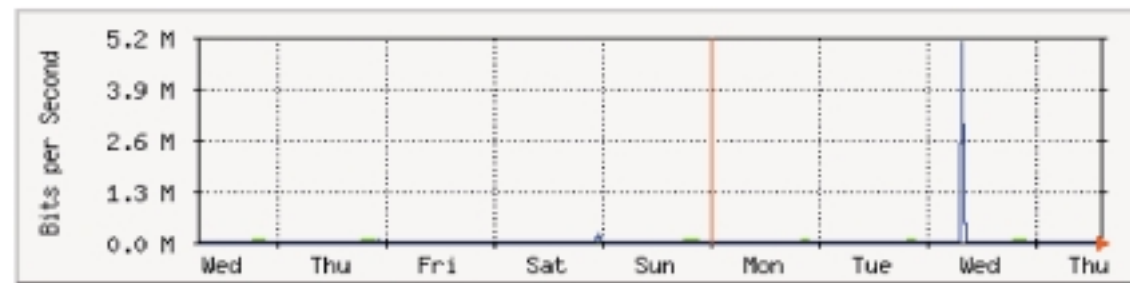


## Availability and performance in 6net network

The 6NET network is 'in good health'. After two years of the project we can claim that IPv6 deployment in the core and NREN networks is a complete success. All partners are currently connected by native IPv6, except for PSNC which is connected with a Layer 2 VPN solution to the 6NET core. The total availability of the access links (99.93%) and core trunks (99.82%) in the last 12 months is really high for a testbed network [\*].

Whilst the average traffic on the network is not very high (as can be expected for a test network), bursts have to be accommodated during times when tests are running between the partners. See as an example a weekly graph 1 [\*\*] taken in November 2003 from ACOnet access, which shows up a normal traffic of some ~kbps and ~5Mbps peak.

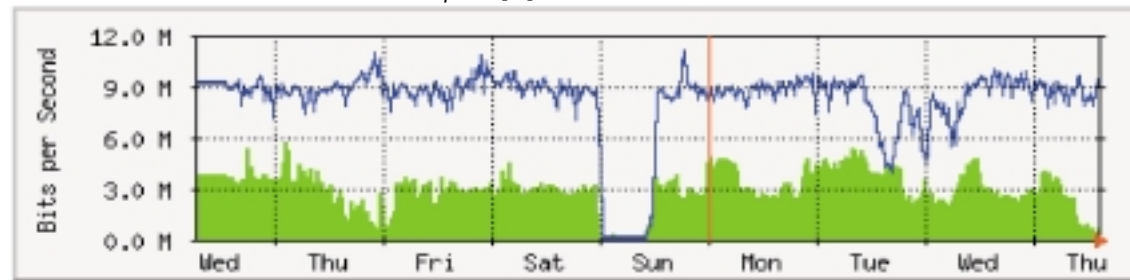
Graph 1



Max In: 122.4 kb/s (0.1%)      Average In: 55.0 kb/s (0.0%)      Current In: 6368.0 b/s (0.0%)  
 Max Out: 5063.1 kb/s (3.3%)      Average Out: 30.7 kb/s (0.0%)      Current Out: 10.3kb/s (0.0%)

A notable exception is between SWITCH and FUNET (part of the NORDUnet network) where a relatively high IPv6 traffic volume passes continuously through the 6NET network, due to a NNTP peer between them.

Graph 2 [\*\*] - Nordunet access



Max In: 5805.8 kb/s (0.2%)      Average In: 2998.1 kb/s (0.1%)      Current In: 723.4 kb/s (0.0%)  
 Max Out: 11.2 Mb/s (0.4%)      Average Out: 8221.5 kb/s (0.3%)      Current Out: 8753.2 kb/s(0.4%)

[\*] Data taken from 6net monthly service reports.

[\*\*] Graphs taken from 6net Weathermap <http://netmon.gnet.gr/6net.html>



### Contacts

6NET project Website: <http://www.6net.org>

E-mail: [info@6net.org](mailto:info@6net.org)

Project Coordinator

Theo de Jongh - Cisco Systems  
[tdejongh@cisco.com](mailto:tdejongh@cisco.com)

6NET Newsletter editorial team

Manuela Profili - Paul Van Binst - Rosette Vandenbroucke  
[paul.vanbinst@helios.ihe.ac.be](mailto:paul.vanbinst@helios.ihe.ac.be)

## Update on Mobile IPv6

The 6NET Deliverable D4.1.2 'Initial Mobile IPv6 Support Guide' was delivered in February 2003 and is a living document that describes the steps necessary to install, configure and operate the Mobile IPv6 implementations of Cisco, MIPL<sup>1</sup>, KAME<sup>2</sup>, Microsoft and Lancaster University. In addition, three case studies of Mobile IPv6 testbed deployment at Sony, FhG and Lancaster University are described.

Several partners, including ULANC, ULP, FhG, OULU, Invenia, INFN-GARR and UCL, have all established Mobile IPv6 testbeds using a variety of the available implementations. Each testbed has its own focus and provides for a rich set of implementation experiences, which are reflected in the practical documents that this 6NET activity produces. For example, Invenia have configured and tested their Mobile IPv6 testbed with different price/bandwidth policies while ULANC have constructed their testbed to specifically investigate fast handoff performance and QoS provision.

A theoretical analysis of multicast with Mobile IPv6 hosts has been conducted by ULP. Their analysis has identified that Multicast Listening Discovery (MLD) must be improved for mobile hosts and a solution has been proposed to handle the handover of a Source Specific Multicast (SSM) source in Mobile IPv6. A large number of NS simulations have also been conducted to compare the efficiency of different methods of group joining.

In July, the Internet Engineering Steering Group (IESG) approved version 24 of the draft Mobile IPv6 specification as a proposed Standard. This decision now provides a stable target for Mobile IPv6 implementors and allows 6NET partners to synchronise their efforts and begin to conduct inter-site testing and trials.

Mobile IPv6 Home Agents will be stationed at each participating site and the functionality of Home Agent, Mobile Node and Correspondent Node on each implementation will be tested for conformance and interoperability.

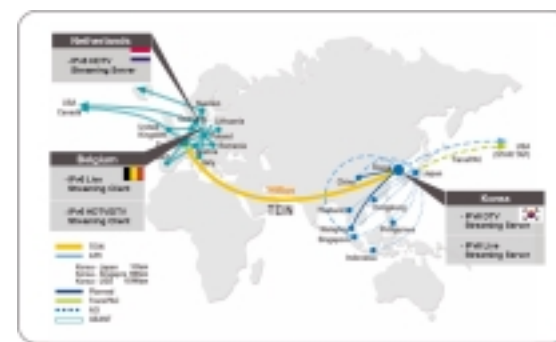
6NET partners will begin interoperability testing early in 2004, concentrating on Mobile IPv6 implementations from Cisco, Microsoft, KAME and MIPL. Both MIPL and KAME implementations are now supporting draft v24. Cisco IOS and Microsoft WinXP/Server2003/CE are planning to have v24 support by the time that 6NET testing starts.

Since 6NET runs until the end of 2004 it will provide a useful platform for long term interoperability testing that is unattainable at brief testing events such as TAHI<sup>3</sup>.

- 1 - MIPL project is organized by Helsinki University of Technology (HUT) to implement Mobile IPv6 on Linux.
- 2 - KAME Project is a joint effort of six companies in Japan to provide a free IPv6 and IPsec (for both IPv4 and IPv6) stack for BSD
- 3 - TAHI Project is the joint effort formed in Japan with the objective of developing and providing the verification technology for IPv6



## ETRI's IPv6 HDTV Streaming Demo



The 6NET partner ETRI is participating in the demonstration for Global IPv6 Service Launch Event, 15th-16th January 2004 in Brussels with their IPv6 HDTV streaming and IPv6 Live streaming services.

They are showing a high-quality video streaming application over the Global IPv6 internet, world-wide.

The demo is running in three places: Brussels (Belgium), SURFnet (Netherlands) and ETRI (Korea) over 6NET and the TransEurasia Information Network (TEIN).

The IPv6 HDTV source will be delivered from SURFnet with priority using the DiffServ mechanism) in order to preserve the HDTV streaming quality. They also deliver a live picture of the 6NET booth to the rest of the world by using IPv6 live streaming over the TEIN.

ETRI expects that this kind of high quality streaming service will facilitate the deployment of IPv6 advanced services around the world. They are also planning to develop a multi-channel IPv6 HDTV streaming service, in collaboration with European partners.

## 6NET pushes the boundaries of IPv6 technology innovation with IPv6 Multicast

The 6NET project has deployed the world's first large-scale international native IPv6 multicast network, spanning nine countries, and based on technology proposed by members of the project consortium. The use of the technology known as 'Embedded RP' offers a number of advantages over previous IPv4-based multicasting techniques, particularly with respect to scalability across multiple domains. The project has also experimented with BSR (Bootstrap Router) technology in the 6NET core with a view to implementing a dynamic and redundant control plane.

Multicasting is a technique which allows a single transmission to be sent to multiple hosts anywhere on the Internet, and therefore provides efficient delivery of data for high-bandwidth applications such as videoconferencing and multimedia streaming. It has traditionally been run over the Internet as a virtual network known as the 6Mbone, but 6NET has now demonstrated this technology on its new-generation IPv6 network (see diagram below). 6NET is interconnected to the 6Mbone through RENATER, in order to broaden access to the functionality, and to share the technology research experiences.

6NET provides the world's largest native IPv6 multicast environment and is trialling a number of new innovative mechanisms including Embedded RP and SSM. Embedded RP solves the problem of finding multicast rendezvous points (RPs), and significantly simplifies the management of the network. This is not possible with IPv4 as the 32-bit addresses that it uses are simply not large enough to incorporate the RP addresses. By comparison, IPv6 addresses are 128 bits long.

For the Multicast BSR control plane setup, there is one RP for the global multicast scope, configured and placed at RENATER. To serve local multicast streams, an extra multicast scope (scope B) has been configured on the 6NET routers in Germany and the UK.

Applications which typically use a lot of bandwidth suddenly become feasible when using multicast. Imagine having video-on-demand, stock exchange updates, multi-way videoconferences and high-definition television on your computer, mobile phone or PDA, all of which now become possible on a mass scale.

Jane Butler, Chair of the 6NET Consortium, said:

*"The work of the 6NET Consortium in evolving the functionality of IPv6 is fundamental to the advancement of the Internet, and the introduction of multicast is a significant step in this direction. It opens the way for high-volume usage of the Internet, and will touch most of the future deployments of public and private IP networking."*

Pekka Savola, one of the co-authors of Embedded RP, also said:

*"The 'Embedded RP' technique allows for easier and simpler deployment of IP multicast, and complements the IPv6 multicast architecture, especially when Source-Specific Multicast (SSM) is unavailable or unsuitable."*

The enhanced 6NET multicast infrastructure will serve as the main distribution network for the demonstrations at the IST Global IPv6 Service Launch event (<http://www.global-ipv6.net/index.htm>).

More information is available from the 6NET website at <http://www.6net.org/>

Further references:

- o <http://www.m6bone.net/>
- o <http://www.cisco.com/warp/public/732/Tech/ipv6/>
- o <http://www.ietf.org/internet-drafts/draft-ietf-mboned-embeddedrp-00.txt>
- o <http://www.ietf.org/internet-drafts/draft-hoerdt-mboned-multisource-ssm-00.txt>
- o <http://www.ietf.org/internet-drafts/draft-beck-mboned-ssm-source-discovery-protocol-00.txt>
- o <http://www.ietf.org/internet-drafts/draft-ietf-pim-sm-v2-new-08.txt>
- o <http://www.ietf.org/internet-drafts/draft-venaas-mboned-v4v6mcastgw-00>

