6NET coordination meeting – Lisbon 5, 6, 7 March 2003

A meeting of the whole 6NET consortium was held in Lisbon from 5th - 7th March, organised by Cisco's Portugal office. Individual Work Package progress meetings also took place, including an audioconference on multicast issues with the appropriate Cisco team in the US. A PMC meeting was also held.
Key points from the consortium Plenary meeting were:

- Connectivity has recently been provided to:
  - Hungarnet: STM-1
  - CESNET: STM-1
  - NTT (via UK): E1
- 6NET will operate in accordance with a simple AUP, to encourage the usage of the network for experimental purposes. Production and test traffic will be routed as appropriate via GÉANT or 6NET
- Tests have been defined at the network service level (QoS, routing, multicast, security, mobile IP, firewalls, netflow, ...) and at the application level. The testing teams will be given write access to all core routers for 10-day slots. The 6NOC will then re-install the original configuration
- Early in the project, about 10 common topics of interest were identified between Euro6IX and 6NET. Responsibles have been allocated and they will liaise with their counterparts in Euro6IX in order to define and perform the specific collaborative activities
- 6NET is organising its 1st open workshop in Zagreb (May)
- 6NET will collaborate with other IPv6 projects demonstrating at both the IST Conference in Milan (October) and a high profile "Global IPv6 Service Launch" event soon thereafter

Brian Carpenter (IBM) made a presentation on the concept and applicability of Grids, the GLOBUS toolkit, the Open Grid Services Architecture, and the role of IPv6. Prof. Jae-Whak Roh (Hansung University) informed about the connectivity and funding for the Trans Eurasia Information Network (TEIN) and invited partnerships for the demonstration and testing of applications in the areas of e-commerce and education.

6NET Workshop – Zagreb, 21 May 2003

The 1st 6NET Workshop was held on 21 May 2003 in conjunction with TNC-CNC 2003 in Zagreb, Croatia. The objective was to present various aspects of IPv6 deployment within 6NET, and how to make the transition from legacy networks. In addition, it considered the leading role that 6NET and related projects such as Euro6IX can play in the development of the next generation of networks. This one-day workshop was attended by 84 participants and featured speakers from a number of different organisations.

The opening session provided an overview of the 6NET and Euro6IX projects, as well as the introduction of IPv6 on the GÉANT pan-European research network.

The Euro6IX presentation was actually given via videoconference in a practical demonstration of Internet technology. An informational video about the 6NET project was also shown for the first time. The session concluded with a presentation on the future prospects of IPv6 in the forthcoming 6th Framework Programme.

The second session focused on IPv6 rollout issues. Harald Alvestrand, Chairman of the IETF, discussed the aspects of IPv6 that are available today, and those that require further work. There were also presentations on routing, management issues, and the applicability of IPv6 to the Grid.

The final session dealt with how to facilitate IPv6 applications. This included presentations on the M6Bone (a multicast overlay running over the 6NET network), mobility services on IPv6 networks, and the new challenges of securing IPv6 networks. It was noted that although many aspects of IPv6 are deployable today, many of the enhanced features require further consideration.

The full proceedings of the workshop can be found on the 6NET website at:

http://www.6net.org/events/workshop-2003/

Cooperation between 6NET and SEEREN IST projects

The South Eastern European Research & Educational Networking (SEEREN) initiative, funded by the European Commission under the Information Society Technologies Programme (IST-2001-38830), aims at expanding research networking in SE Europe by providing connections between the National Research and Education Networks (NRENs) in eligible countries and GÉANT.

The eligible countries are Greece, Hungary, Romania, Albania, Bosnia-Herzegovina, Bulgaria, Former Yugoslav Republic of Macedonia, and Serbia-Montenegro. Greece, Hungary and Romania already have GÉANT connectivity; the other countries listed are therefore intended to be the main beneficiaries of this initiative. The project will oversee the design and implementation of connectivity between the partner NRENs and the regional GÉANT points of presence via 2-34Mbps links. Furthermore, the project will leverage other European or International funds and coordinate them to maximise the impact on the region.

Current infrastructure in the SE European region lacks the technology advancements required for local scientists and researchers to take part in research initiatives in the field of advanced networking. However, the existence of poor infrastructure may become an advantage in some cases, as these regional NRENs are greenfield sites with few legacy systems and researchers are not inhibited by inherited technologies. These NRENs may therefore incorporate new technologies with less difficulties and take technology leaps which lessen the digital divide in comparison with more-advanced European NRENs. IPv6 is a good example of a technology that SEEREN NRENs may adopt more easily than other NRENs. As the regional interconnection infrastructure is currently being deployed, SEEREN partners are willing to set-up and exploit a range of new services and best current practices in their network, experiment with IPv6 technology from the beginning of the network operation and become familiar with IPv6 "peculiarities" and constrains. Consequently, there is a significant opportunity for SEEREN NRENs to build a human network in the field of IPv6, which will assist them to reduce the gap with other NRENs.

6NET and SEEREN will search for common grounds for cooperation that will be beneficial for the whole European research community. Common partners in the two projects, i.e. GRNET, HUNGARNET and CISCO (member of the SEEREN Industrial Advisory Board), will play an important role in the dissemination of experience, achievements and results of the 6NET project to the SEEREN NRENs. This will be accomplished via the distribution of publicity materials, such as Deliverables, making presentations at SEEREN planning and technical committees, organising common demonstrations in project events, and inviting SEEREN partners to 6NET workshops to learn of the new opportunities provided by the IPv6 technology. These activities will strengthen the foundation of the SEEREN network infrastructure and will encourage the SEEREN NRENs to further invest into IPv6. Obviously, by assisting the deployment of IPv6 technology to the SEEREN network, the 6NET project fulfils one of its major objectives and promotes the spread of IPv6 to research and academic communities in Europe.

6NET Consortium

Coordinator:

Cisco Systems International

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 la 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)

6net

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Newsletter n°3 June 2003

Large-scale International IPv6 Pilot Network

Editorial

Dear Reader,

Here is the third issue of the 6NET Newsletter. As the project is reaching its half-life, a number of remarkable achievements can already be presented, and it is quite clear that more successes are on the way, as 6NET – with its 35 partners - proves to be a winning team! In particular, such a large consortium has the natural effect of developing many relations with a wide range of research and commercial parties having direct interest in the development and deployment of IPv6 networks and applications. Enjoy your reading!

Interview with Jane Butler

- *Mrs. Butler, what is your function in CISCO and your role in the 6NET project?*

I am Head of Strategic Technology and Collaboration for Cisco in Europe, Middle East and Africa and I am Chair of the 6NET Consortium and Chair of the Project Management Committee.

- *You work for a large international private company and 6NET is a project partially financed by the European Commission, a large public institution. What do you think about this cooperation?*

I think this type of co-operation is vital to our understanding the future of technology both for commercial companies and public institutions such as the European Commission.

By bringing together the leading technologists in the commercial, scientific and academic worlds in an open and advanced collaborative environment such as 6NET, everyone can benefit from a deeper understanding of the technology direction and development.

- *What do you feel are the biggest challenges and opportunities of the 6NET project?*

The greatest opportunities are to really advance the understanding of IPv6 and its deployment in all types of networks, so that as it is adopted commercially, there is an authoritative group of individuals, institutions and publications that can support the work going forward. Apart from technical opportunities I also believe that everyone involved in 6NET has become much closer and has a much deeper understanding of how commercial and non-commercial organisations can collaborate successfully and there are now real opportunities to continue this work. I think the biggest challenge has been - and will continue to be - managing such a large Consortium, making sure there is a sense of involvement by all and an openness and commitment to work together for 3 years.

- *What is your opinion about the evolution of the market with regard to the acceptance of the IPv6 protocol? How do you position 6NET in this evolution?*

6NET is advancing the knowledge of IPv6 substantially and at the same time creating individual experts and groups of experts in various areas of IPv6 who will support the commercial use of IPv6 in such areas as broadband, wireless and mobility, and high speed core networks. In addition, those in the 6NET Consortium will of course be able to support commercial service providers as they begin to migrate their services to IPv6 as well as countries beginning to join or expand their use of the Internet. Last but not least, this group also plays an invaluable role in shaping Cisco's IPv6 plans too. So the 6NET community will be a vitally important group as the commercial world begins to adopt IPv6 over the coming years.

IPv6-Enabled Dynamic VPN Infrastructure Deployment

Virtual Private Network (VPN) technology has been, and increasingly continues to be widely deployed within IPv4 inter-network environments. However, such deployment usually involves a high degree of static configuration. Provisioning for dynamic VPN set-up is still very much an open research issue.

A VPN is a network built over the shared public IP infrastructure that operates with the security, management and Quality of Service (QoS) policies of a private network.

A VPN is a cost-effective means of building and deploying private communication networks for multi-site inter-connection by connecting multiple IP addresses at geographically dispersed sites so they appear to be within the same private network. VPNs can be considered a special case of what is known as overlay networks; isolated virtual networks created over an existing network, composed of nodes (hosts or routers) and tunnels (paths, i.e. multiple hops, on the underlying network that appear as links in the overlay).

The use of dynamic VPNs essentially involves the establishment of each tunnel in an on-demand fashion as and when they are required. In the ideal scenario, this would mean that all such configuration, including requesting, negotiation, key exchange, security policy application, set-up and tear down would be carried out dynamically with no prior configuration or requirements apart from perhaps the assumption that all parties have been issued with valid keys for the relevant negotiation. However, a number of issues arise that must be taken into account:

- VPN Management

Each VPN requires a management system responsible for setting up, keeping track of and tearing down tunnels, authentication and authorisation of nodes joining the VPN supported by a Public Key Infrastructure.

- Security Policy

Some form of policy infrastructure responsible for the specification, negotiation, authorisation and control of each VPN is required.

- Topology

The choice of topology and the way in which nodes are added must be considered in order to ensure the most efficient use of network resources and bandwidth, maintaining consistency in QoS, and allowing scalability to many nodes

- Routing

The routing mechanism through a series of tunnels comprising the overall VPN is also very important and depends upon the choice of topology. Routing is essential to achieve scalability for the same reason as its requirement in packet switched networks.

One of the aims of 6NET Work Package 4 is to be able to deploy an IPv6-enabled Dynamic VPN infrastructure over a significant number of nodes. UCL have been examining a number of projects aiming to provide dynamism within the setup of VPNs including a Policy Based Network Management System (UMU-PBNM) developed at the University of Murcia, Spain, and a Dynamic VPN Controller (DVC) system developed by NRNS Incorporated for Defence R&D Canada. UCL are in the process of determining how best to go forward to achieve the goal of a deployed IPv6-enabled, scalable, dynamic VPN infrastructure.

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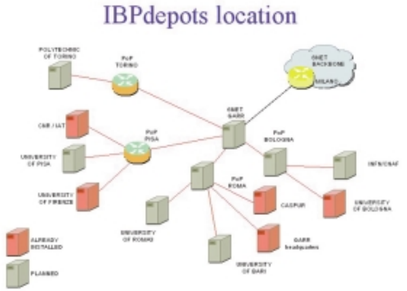
Network Storage

The validation phase of the IPv6 testbed, which implements the next generation protocol and allows to understand how to manage a next generation network, is proving to be a challenging one. In particular, it is necessary to increase the traffic level on the backbone in order to be able to understand the behaviour of IPv6 in a realistic environment.

A solution, which appears to be relevant in terms of increasing the traffic, is to provide a network storage environment. Such a system enables: the generation of IPv6 traffic independent from users being attached, the building of an IPv6 platform for content delivery that can provide a service which can easily be replicated for testing purposes, and, if necessary, the involvement of a mixed IPv4 / IPv6 infrastructure, using web pages on a dual-stack server.



The network storage system chosen for this experiment is the Internet Backplane Protocol middleware. This was selected because it provides a complete storage infrastructure inside the network (in the form of distributed data depots which allow users to deploy and temporarily store their data in a completely different fashion that more standard network storage systems). It also allows applications and end users to explicitly control data movement and staging, and the code is already IPv6 compliant.

The Italian participation in the 6NET project is made through GARR, who have a cooperation with 8 Universities and 2 Research Institutes, that are already actively testing and deploying IPv6. The Italian network topology is a star with the Milan PoP in the centre. This PoP is connected to the European core of 6NET. The other Italian PoPs are in Turin, Pisa, Bologna and Rome. The users involved are researchers and students.

The Internet Backplane Protocol is a middleware built to share distributed storage resources in any size of network. The key aspect of the IBP storage model, the capacity of allocating space on a shared network resource, can be seen as performing a C-like malloc (memory allocator) procedure on an Internet resource, with some outstanding differences, such as time limitation to prevent Denial-of-Use attacks. The IBP software, developed in C (for the server side) and C and java (for the client library), has been successfully tested for different OSs and hardware architectures (Linux on i686 and ia64, Solaris, Windows 2000, AIX, DEC alpha, FreeBSD).

The IBP middleware deployment that GARR is planning is divided in two parts. Initially, a set of IBP depots will be deployed in three core network PoPs (Rome, Milan, and Bologna). In parallel to this deployment, the Universities and Research Institutes participating to the Italian part of the 6NET project will designate some machines to serve as local IBP depots. This infrastructure will be used to distribute open source code, and a web site will be used as the front-end to offer a web content delivery service.

5th "Captain Kirk" award

I herewith have the pleasure to announce the 5th Captain Kirk:

'GABRIELLA PAOLINI'

Gabriella has been recognized by the other Captains for her work on operationally feasible IPv4/IPv6 coexistence on backbone networks, and for her efforts on large-scale "killer" applications for IPv6.

Congratulations and thank you from the whole 6NET consortium.

We are looking forward to your continuous contribution.

Theo De Jongh, project coordinator

6NET applications

The 6NET project is more than just another IPv6 network, and Work Package 5 is key to this difference. WP5 is committed to deploying and testing a significant number of applications over IPv6, and additionally to evaluating and reporting on the results of those tests. By doing so, we intend to show that advanced applications run smoothly over IPv6, with particular emphasis on IPv6's new facilities through the underlying network services (Mobile IPv6, IPv6 Multicast, etc.) provided by other Work Packages, and of course to identify any problems and difficulties that need to be corrected.

The applications to be tested as part of WP5 have been identified by the project partners and catalogued in Deliverable D5.1.

In addition, a constantly updated catalogue of the applications, with current information, is available on-line from the 6NET internal *WP5 Applications Website*. The full catalogue contains approximately 40 applications classified in 5 categories:

- *Real-time video-conferencing and media streaming (25),*
- *On-line games (3),*
- *e-business solutions (9),*
- *Edge services for IPv6 (2), and*
- *IPv6 support for Grids (1).*

It is clear that with such a large number of items in the applications catalogue, not all of them can be expected to be part of the final tests and evaluations. This is why the notion of *Trials* has been introduced. A Trial is an application that complies with the evaluation process defined in Deliverable D5.5. At the moment, 10 Class A (minimum of 3 named users at each of 5 named sites) and 16 Class C Trials (minimum of 2 named users at each of 2 named sites) have been identified. Formal reporting is required for each test performed in the Trial. The *Trial Coordinator* has the duty and responsibility to manage the Trial, to schedule the tests and to report the results of each test through the Test *Evaluation Form on the WP5 Applications Website*.

Information about the potential user communities identified for the applications catalogued in D5.1 may be found in Deliverables D5.2 and D5.4. The first user community comprises the WP5 partners, mainly for testing the applications, and then the population of 6NET-connected users. There is a noticeable challenge in motivating departments not directly involved in 6NET to participate. Extension to other communities outside 6NET such as Euro6IX and Internet2 is considered for specific applications.

NTT London – 6NET new link

The NTT London – 6NET new link was brought into service on the 1st of March 2003. This new NTT – 6NET link is a E1 circuit (2Mbps) established between NTT London and the UK 6NET router. It provides 6NET with an IPv6 native connection to Asian Research Networks such as WIDE and with a new peering to the North American Research and Educational Network Abilene.

The following diagram presents the topology of the 6NET core as of March 2003.