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Abstract:


This Deliverable describes the overall strategy for the dissemination and exploitation of 6NET's results, forthcoming plans for the dissemination of knowledge gained during the work, and the exploitation plans for the consortium as a whole, for individual participants, and groups of participants. It identifies the target groups and the strategic impact of the project in terms of improvement of competitiveness or creation of market opportunities for the participants.

One of the purposes of this Deliverable is to disseminate information about the project, and its progress, in such a way that other workers in the area can make use of the results, or see how they can feed information into the project. In this way it acts as a vehicle for the cross-fertilisation of ideas and a means of establishing co-operation. This document is updated every 6 months.

Following the recommendations from the 2nd project Review, this version has a new structure, enabling the dissemination *plans* to be more visible.

Keywords:

Exploitation, dissemination, demonstrations, standards

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1. Executive Summary

In the scope of the 6NET project, new concepts and technological results are being derived that will have an impact on the future of the Internet. It is therefore important to publish and disseminate the results from the project through the appropriate channels and in a timely fashion.

This *Dissemination and Use Plan* is a living document, meaning that it will be updated during the life of the project. It has several purposes:

- to document the overall strategy for the dissemination and exploitation of the knowledge gained from the project
- to provide a snapshot of upcoming events during the next 6 months, at which 6NET partners will disseminate their results and achievements
- to document partners' exploitation plans for the knowledge they have gained
- to contain the history of publications, articles, standards contributions, etc. that have been made since the start of the project
- to generally disseminate information about the project, and its progress, in such a way that other workers in the area can make use of the results, see how they can feed information into the project, and/or collaborate.

In this way, the document serves as a vehicle for the cross-fertilisation of ideas and a means of establishing co-operation. Since the plans may be of interest for other projects, the document is classified as *public*, and is therefore available from the publicly-accessible area of the project Website.

Based on the recommendations from the project Review in October 2003, this version of the document has a new structure, such that the dissemination *plans* are more prominent.


The new structure is as follows:

- Overall Strategy for the Dissemination and Exploitation of the Knowledge gained from the Project
- Plans for the Dissemination of Knowledge:
 - IETF, GGF, ETSI, RIPE
 - Events and publications
 - Press releases
- Plans for Deployments
- Plans for Raising the Visibility of the Project:
 - Demonstrations
 - Collaborations
- Partner Plans for Exploitation
- Dissemination Achievements in the Current Reporting Period
 - Standards
 - Publications
 - Other Disseminations
 - Other Achievements
 - Deliverables

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2. Overall Strategy for the Dissemination and Exploitation of the Knowledge gained from the Project

From the 3rd Review, it was confirmed that the main target of dissemination should be the academic and research community. This was in accordance with the project objectives and the relationships of the project partners. As IPv6 was already being rolled out in NRENs, there should be a particular focus on universities, further education institutes, and schools who could take advantages of the benefits of technology. Of course, the government, health and commercial sectors should not be excluded from the dissemination activities where it is advantageous and convenient to include them, or where specific requests for advice or assistance are made.

The main method for dissemination is via the website as this allows the entire repository of knowledge built-up within the project to be made available. However, it is recognised that this needs to be publicised, and it is suggested that general promotional material (leaflets, t-shirts, mugs etc..) be produced for distribution at appropriate conferences and events (e.g. IST 2004). Presentations about 6NET at national and international events are also a useful method of attracting visitors to the website, and it is expected that these will be stepped-up in the remaining months of the project.

The project also aims to produce specific literature targeted at those with less specialised knowledge of networking, and more specifically IPv6. It is therefore proposed to produce a series of white papers that are written at a fairly high-level and which make the case for various aspects of IPv6. These would be aimed at IT managers, general system/network administrators and programmers, although specific papers might be considered for higher-level management as well. The initial list would include the following: deployment on NREN/backbone networks, deployment on campuses, upgrading IPv4 services to IPv6, application development and transition, IPv6 monitoring and management (one of the barriers to deployment is often a lack of management tools), and case studies of where IPv6 has been used. These papers would outline the things to consider, and the practical benefits of using IPv6.

In most cases, the proposed white papers would be applicable to most sectors of society, but a specific paper could be targeted at the commercial sector in collaboration with Euro6IX and the European IPv6 Task Force.

The project will also work to publish a deployment guide that summarises the work and experiences of 6NET. There are already a number of publications about IPv6, but most lack practical information about rolling-out an IPv6 network or transitioning from an existing IPv4 network. The aim is to produce this publication in conjunction with a professional technical author, and to primarily target it at network administrators. Much of the material is already available in the existing 'cookbooks', so it is a case of combining this into a commercial publication.

In addition, a number of demonstrations will be developed to show that IPv6 is functional and stable enough to be used for real-world applications. Already the project has demonstrated the technology with transport, health and mobile multimedia applications, not to mention that the pan-European GEANT network runs dual-stack. These success stories will be publicised through appropriate channels.

The project will continue to contribute to standards bodies such as the IETF and GGF; feeding its deployment and operational experience into the development cycle. It will also continue to submit scientific papers on topics of interest to appropriate symposiums and journals.

3. Plans for the Dissemination of Knowledge

3.1. Standards Bodies

3.1.1. IETF

The most important body in terms of Internet standards is the Internet Engineering Task Force (IETF). Meeting three times a year, the IETF embraces all aspects of Internet technology. For IPv6, there are three directly relevant working groups:

- ipv6: Defining the IPv6 standards (formerly known as *IPng*)
- v6ops: Defining methods for IPv4 and IPv6 transition, integration and coexistence (formerly known as *ngtrans*)
- multi6: Defining methods for site and network multihoming in IPv6

Other working groups of interest include:

- mip6: Mobile IPv6, recently split from the mobileip group)
- manet: Mobile ad-hoc networks, currently typically using ad-hoc 802.11b WLANs)
- zeroconf: Zero configuration)
- dnsex: DNS extensions)
- dhc: Dynamic host configuration, including DHCPv6).

The following 6NET partners are active in the IETF and will attend the next (60th) meeting in San Diego (1st - 6th August, 2004) and the IETF61 (Washington DC) to present new, or updated, Internet Drafts based on the following work done in 6NET:

Partner	WG	Area of contribution
CSC	v6ops (co-chair)	Firewalls Application transition IPv4-v6 transition scenarios Security Multicast IPv6 on by default
	multi6	Site multihoming
	ipv6	Renumbering, IPv6 DNS
	mboned	Embedded RP
	dhc	DHCPv6 implementation guide
UoS	v6ops	IPv4-v6 transition mechanisms IPv6 on by default IPv6 implications for TCP/UDP port scanning Use of VLANs for IPv4-IPv6 coexistence in enterprise networks IPv6 enterprise network scenarios Considerations for IPv6 tunnelling solutions in small end sites
	dhc	Dual-stack issues, Renumbering requirements for stateless DHCPv6
UNINETT	dhc	Lifetime option for DHCPv6
IBM	ipv6	Flow label usage
RENATER	ipv6	Multicast address allocation for IPv6 groups

3.1.2. GGF

The Global Grid Forum is the standards body for Grid computing, which operates in a way very similar to the IETF. Following the initiative of 6NET, it now has one working group specifically for IPv6 issues. Brussels University is organising the 12th meeting of the GGF in Brussels (September). The following partners are planning contributions in the areas mentioned in the table below.

Partner	WG	Area of contribution
IBM	ipv6 (co-chair)	Specific IPv6 dependencies and requirements for Grids
UCL	ipv6 (co-chair)	Globus Toolkit Porting Grid applications to IPv6 (e.g. Access Grid) Guidelines for IP version independence in GGF specifications
UoS	ipv6	Globus Toolkit

3.1.3. ETSI

There are no immediate plans for dissemination of the 6NET results to ETSI. The most likely collaboration with ETSI will be within the framework of the Interoperability Plugtests.

ULB in particular, is closely associated with the IPv6 Interoperability Plugtest events. They took part in the *re-routing* tests in Cannes (September 2002), and were responsible for organising the infrastructure and hosting the IPv6 Plugtests event that took place in Brussels in September 2003. The latter event was combined with a one-day International Workshop on IPv6 Testing, Certification and Market Acceptance, and with an IPv6 Showcase exhibition organised by the Eurov6 project, in synergy with NGN-LAB and 6NET.


3.1.4. RIPE

The RIPE (Réseaux IP Européens) NCC is the European Internet Registry responsible for the management of Internet address assignments in the European region. It allocates IPv4 and IPv6 address space, Autonomous System numbers, and reverse address delegations (for IPv6, under ip6.int). Meetings are open, and held 4-monthly. They are attended by technical experts running IP networks in Europe. 6NET contributes to the determination of address assignment policies and towards establishing best practices for organisational and site addressing for IPv6. 6NET has gained operational experience of DNS servers and reverse delegations (under ip6.int or ip6.arpa). The experience from 6NET is fed back via the IPv6 Working Group. AConet and RENATER represents 6NET in these meetings.

3.2. Events and Publications

6NET partners will actively participate in the following events over the next 6 months:


Date	Event	Location
3 June	IPv6 Summit Switzerland 2004 *6NET (SWITCH) speaking*	Zürich, Switzerland
4-9 June	Global Grid Forum 11 *6NET (IBM and UCL) co-chairing the ipv6 WG, and making contributions - see 2.1.2 above*	Honolulu, USA
7-10 June	TERENA Networking Conference 2004 *6NET (via TERENA) is involved in the organisation, and UCL is giving a keynote speech*	Rhodes, Greece
9 June	2nd 6NET Workshop *6NET organising and speaking*. For example: <ul style="list-style-type: none"> • Cisco gives an update on 6NET and talks about IPv6 prospects • RENATER presents 6NET's multicasting • UoS presents their transition experiences • ULANC presents on deploying Mobile IPv6 and transitioning mnngt. • HUNGARnet presents on security 	Rhodes, Greece

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14-17 June	North American IPv6 Task Force Summit	Santa Monica, USA
24 June	UK IPv6 Business Conference	London, UK
June	UKv6 Task Force meeting *6NET (UCL) speaking*	London, UK
June	Access Grid Retreat *6NET (UCL) speaking*	Toronto
29 June - 1 July	German IPv6 Summit *6NET speaking*	Bad Godesberg, Germany
2-7 July	18th APAN Meeting *6NET (UCL) speaking*	Cairns, Australia
4-6 July	Global IPv6 Summit Korea	Seoul, South Korea
25-29 July	International Symposium on Performance Evaluation of Computer and Telecommunication Systems (SPECTS'04) *6NET (CTI) presenting the paper: "Quality of Service aspects in an IPv6 domain"*	San Jose
1-6 August	IETF 60 *6NET (CSC) co-chairing the v6ops WG, and making contributions – see 2.1.1 above*	San Diego, USA
15-20 August	Global IPv6 Summit Brazil	Sao Paulo, Brazil
20-23 September	Global Grid Forum 12 *6NET (IBM and UCL) co-chairing the ipv6 WG, and making contributions - see 2.1.2 above*	Brussels, Belgium
20-24 September	RIPE 49 *6NET contributing via AConet - see 2.1.4 above*	Manchester, UK
21-23 September	UK IPv6 Summit 2004 (provisional)	TBC, UK
27 Sep. - 1 October	Internet2 Members Meeting	Austin, USA
7-8 October	Portuguese NREN Conference *6NET (FCCN) presenting*	Leiria, Portugal
7-12 November	IETF 61 *6NET (CSC) co-chairing the v6ops WG, and making contributions - see 2.1.1 above*	Washington DC, USA
15-17 November	IST2004 *6NET has offered its new demonstrations*	Den Hague
24-26 November	5 th GARR Workshop Rome *6NET (GARR) will give the tutorial: "IPv6: Technical Reference for Use"* http://www.garr.it/ws5/pdf/TutorialIPv6.pdf	Rome

In addition to publications through the above events:

- A guide for deployment and operation (based on the 6NET Cookbooks) is being discussed with Sunny Connections (Zurich). This could potentially be sold as a commercial publication.
- RENATER is preparing an IPv6 tutorial with other WP6 partners in order to train the NREN NOCs for managing their IPv6 network (often managed by other dedicated entities in many NRENs). 3 tutorials for NOCs are planned before the end of 2004.
- UoS will:
 - Contribute with UCL to a paper for the AccessGrid Retreat in June 2004
 - Organise the UK IPv6 Summit in September 2004
- CTI will:
 - submit for publication a journal a paper with title "Performance Evaluation of the impact of Quality of Service mechanisms in an IPv6 network for IPv6-capable real time applications".
 - prepare and send an article for either the project Website or Newsletter
 - complete the writing of an IPv6 book in Greek, targeted at a wide audience that includes network engineers, students, developers and technicians. The book will contain:
 - a presentation of the current IPv6 technology

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- the porting of IPv4 applications to IPv6
- the mechanisms for IPv4 to IPv6 transition.
- present IPv6 technologies and the experience acquired from the 6NET project to the administrators of the Greek School Network.
- WWU(JOIN) will write HOWTO guides and tutorials in order to educate administrators and users, on:
 - Usage of DHCPv6 and deployment scenarios
 - Partitioning of the end sites SLA address space
 - integrating IPv6 into existing networks (especially into routing structures)
 - end site migration
- PSNC is organising a Polish IPv6 Task Force workshop in the near future.
- Dissemination is one of the main activities of GARR in 6NET. Two tutorial are planned in the third quarter of 2004 in different towns in Italy in cooperation with Universities and Research Institutes.
- In 2003, the EU IPv6 Task Force identified a number of “Barriers to IPv6 Deployment”. Many of these barriers have been resolved by achievements within 6NET, and these 6NET results will be formally notified by Cisco to the IPv6 Task Force.

3.3. Press Releases

3.3.1. TV broadcasting over IPv6

GRnet has recently made an agreement with the Greek TV broadcaster ERT to be allowed to "broadcast" (stream) the ERT Sat Channel over IPv6. This will be officially announced in the TNC2004 meeting in Rhodes, in parallel with a demonstration of IPv6 streaming using the Darwin Streaming Server (DSS), which has not been demonstrated so far in 6NET. The software is already installed in a new server and GRnet is performing the final tests.

The 6NET contribution is twofold: WP5 partners contributed to the IPv6 porting for DSS, and the activity will be a major form of dissemination within WP7; a new IPv6 service with many potential (Greek) users. This is the first time that a commercial TV programme will be continuously transmitted over IPv6, and will be the subject of a Press Release.

3.3.2. Success Stories

WP7 is discussing with Sunny Connections (Silvia Hagen) concerning the placement of 6NET achievements (“Success Stories”) in newspapers and other (less technical) journals, and the production of higher-level documentation for decision-makers in government and industry. Budget has been set aside for this in Amendment 4.

Specific work items being discussed are:

- White papers targeted at governments and commercial companies (executives and strategy departments); why they should move to IPv6, and the advantages it offers.
- Success stories targeted at special interest publications. 6NET has demonstrated that IPv6 is functional and stable enough to be used in a production network. This has lead to the adoption of dual-stack operation in GÉANT and a number of NRENs.
- Other successes include the IPv6-enabled Renault car, the use of IPv6 for home automation, IPv6 used in sport and healthcare industries, the integration of IPv6 and SIP, streaming between mobile hosts, multicast, TV programmes in Greece broadcast over IPv6, etc. The potential advantages conferred by IPv6 mobility can also make a good story.

4. Plans for Deployments

UoS will:

- Develop IPv6 testbeds and experiments in areas including IPv6 multicast (on M6NET and M6Bone) and Mobile IPv6 (a local testbed), leading to the production use of these technologies in their campus network, during 2004/05.
- Deploy IPv6 in the local Southampton community wireless network (SOWN) to enable richer communication and application possibilities for the community users.
- Use their RIPE NCC membership to gain an IPv6 SubTLA for offering IPv6 connectivity and addressing to local (wireless) community networks and homes.

SWITCH interacts directly with a large part of the Swiss Internet users that hold domain names (600'000 second-level domain name delegations). The registry function has been enhanced to support IPv6. DNS server for *.ch and *.li second level domains may now have IPv6 addresses beside the still mandatory IPv4 ones. (<http://www.switch.ch/id/>). This new functionality will officially be announced at the upcoming IPv6 Summit Switzerland 2004 (3rd June 2004).

WWU(JOIN) will:

- broaden the user base by connecting more DFN customers to the 6WiN
- help the DFN to integrate IPv6 in the next version of their core network
- integrate IPv6 in the network of the University of Münster
- deploy new services like IPv6 Multicast (e.g. IPv6-NetNews)
- enhance and debug current set of tools (esp. for monitoring IPv6 networks)
- deploy JOIN's software router (to encourage facilities to deploy IPv6 in their networks it is not only necessary to have external connectivity but also to distribute IPv6 connectivity in their local network. JOIN is developing a software based routing solution to ease this step for administrators. The "JOIN software router" already exists as a beta version and it is about to be beta tested a number of R&D facilities.

ULP (Université Louis Pasteur, Strasbourg) will deploy a large-scale IPv6 wireless network for production uses. This network will consist of 100 Access Points, covering 9 buildings/faculties. The deployment will start in September 2004 and is expected to end in January 2005. This network will be opened to all the students of ULP (i.e. 18'000 students) and to all the academic staff. ULP will also promote the use of this wireless network via a partnership with vendors of laptop computers : this is to stimulate the purchase of laptop computers by students. A second deployment stage is under study in order to cover the entire University (i.e. this may require another 800 Access Points). ULP is still looking for financial support for this project.

ULP works in collaboration with the Centre Réseau et Communication (CRC - Networking and Telecom Center) which is the operator of the academic metropolitan network OSIRIS. The OSIRIS network infrastructure is undergoing a major upgrade, from an ATM backbone to a Gigabit Ethernet backbone, with new routers and level 2 VLAN switches. This is an opportunity to improve IPv6 support at the routing level but also to migrate all CRC servers to full IPv6 support (DNS, email, ftp, ...). Through the University participation in 6NET, there is also a strong intention to promote the adoption of IPv6. A forum has already been organized with the council of the Alsace region (based in Strasbourg) in order to promote the use and deployment of IPv6. The objective is to stimulate projects and initiatives around IPv6. The University is also looking to extend its partnerships with local companies to promote the use and adoption of IPv6.

The transition to dual-stack of the entire GARR network is planned for the end of 2004. In the second half of 2004, GARR will be able to provide native IPv6 connectivity to all end-users.

5. Plans for Raising the Visibility of the Project

6NET has several new plans for raising the visibility of the project over the coming months, beyond the plans for the dissemination of knowledge listed in Section 3, namely through:


- Demonstrations
- Collaborations

5.1. Demonstrations

The following demonstrations have been identified and described. They have been deliberately chosen to involve the closer co-operation between WPs 2, 4 and 5, and to be of interest to a broader field of users. Applications (from WP5) will be shown that exploit 6NET developments in areas such as: Mobility, QoS, VPNs (from WP4), multicast (WP3) and Grids (WP5).

Demo	Description	Due	Partners
D1	VoIP with SIP (SIP Express Router) + voice user agent (eg. Kphone IPv6) + PSTN gateway + MCU The demo will incorporate VPN functionality and mobility	May	UCL, TELIN, FhG-Fokus, UoS, ULANC
D2.1	Flute. The demo will include ASM functionality	May	ULP, FCCN, SURFnet, UNINETT, UoS, HUNGARnet
D2.2	Flute. The demo will include SSM functionality	October	
D3	Streaming between mobile hosts. The demo will include Mobile IP functionality	May	TELIN, PSNC, ULANC
D4	Open H323	May	JOIN, UCL, FhG-Fokus, UoS, CTI
D5.1	Globus (GT3) for home medical devices, gene sequencing analysis and e-protein (demos will use Grid FTP)	October	UoS, UCL
D5.2	Globus (GT3) for weather station sensors	October	
D6	Access Grid (large sessions). The demo will include IPv4-v6 gateway and multicast functionality	October	UoS, UCL, PSNC
D7.1	Home Networking: GnomeMeeting + IPv4-v6 gateway, Cisco 800 routers and H323 functionality (D4)	May	UoS, JOIN
D7.2	Home Networking including weather station sensors from D5.2	October	
D8	MIPv6 (remote network support)	October	ULANC, Cisco
D9	MIPv6 (car-to-car)	2005 ¹	ULANC, Cisco
D10	MIPv6 (mobile library)	2005 ¹	ULANC, Cisco
D11	MIPv6 (mountain rescue)	2005 ¹	ULANC, Cisco

¹ An Amendment 5 is proposed, through which the project would be extended by 6 months, with the focus of the extension period to be placed on dissemination (e.g. through further demonstrations of 6NET features) and exploitation.

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The first of these inter-WP collaborations were realised through demonstrations of the items shown in the above table as “due in May” at the 6NET conference organized by ULB in Brussels on May 18th - 19th. Moreover, this event was operated in conjunction with the Eurov6 project, which provided a platform for inter-project collaboration, for example with 6QM (on IPv6 QoS issues).

5.2. Collaborations

GRnet

Following on from the TV broadcasting over IPv6 mentioned in Section 3.3.1, GRnet plans to get the permission from more Greek TV (or radio) broadcasting companies and offer other IPv6 (only) streaming services.

GRnet provides support to the Aegean University network in order to upgrade its internal network to IPv6. GRnet will also continue to collaborate with the SEEREN project, in making tests with IPv6, preparing the addressing plan, discussing the technical solutions to be followed, making presentations, giving training, and keeping the SEEREN partners informed of the new 6NET Deliverables.

A Greek IPv6 Forum will be initiated, with the support of GRnet, and a Polish IPv6 Task Force will be initiated, with the support of PSNC.

RENATER - EUMED-Connect

RENATER will disseminate information on 6NET to the countries in the EUMED-Connect (Mediterranean) and ALICE (Latin America) projects.

UCL - DARPA - Canadian National Defence - Euro6IX - SEINIT - GGF – SILK - ESA

UCL has been co-ordinating activities with a number of projects in the use of IPv6-enabled VPNs. These have included activities in the DARPA-sponsored Xbone, the Canadian National Defence-sponsored DVC system and the Euro6IX security infrastructure. UCL hosted two workshops, in July and November 2003, to evaluate and compare the technologies. Peter Kirstein chaired the workshops, and Manish Lad gave talks at them. This resulted in both Xbone and DVC giving much higher priority to the IPv6 migration of the two systems. The work is also being disseminated in other projects including Euro6IX and SEINIT.


UCL also hosted a meeting in February 2004 to evaluate which directions to pursue for large-scale demonstrators. This paved the way for several of the demonstrators shown at the Spring Conference at ULB in May 2004 and in the 3rd project Review. UCL leads the Voice/IP demonstrator, which shows SIP-based telephony, interworking between IPv4/IPv6, multi-party voice and voice over VPNs.

UCL has maintained a high profile in introducing IPv6 into the Global Grid Forum (GGF). Following from an initiative of UCL and IBM in 2003, an IPv6 Working Group (IPv6WG) was set up, with Piers O’Hanlon (UCL) as co-chair with Brian Carpenter (IBM). The Working Group is producing the following three drafts, which are currently in last call:

- Guidelines for IP version independence in GGF specifications
- Status for Java Developers Kit API for IPv6
- Survey of IPv4 Dependencies in Global Grid Forum Specifications

At GGF9 in Chicago (October 2003) and GGF10 in Berlin (March 2004), UCL co-chaired the meetings and presenting the drafts. UCL has also participated in the examination of Globus top-down (protocols and APIs) and bottom-up (network related source code). This is a moving target, but it has greatly increased the awareness of the Argonne National Laboratory (ANL) of the needs raised by IPv6, and has influenced their code developments. The work is not complete, since some important parts like GridFTP have not yet been ported. IPv6 support is also needed in associated applications and the container environments (Tomcat, WebSphere and .Net). Because of their work with the porting, their reporting on the Globus Bugzilla list has more credibility.

A key component of the interaction between Grid scientists has been the use of the Access Grid (AG) developed also at ANL. AG is based heavily on the RAT audio tool and VIC video tool, developed further in

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6NET WP5. As part of A5.5, AG is being ported to IPv6 by UCL and UoS. This activity has given credibility to 6NET's work in that area, and UCL has been asked to give a talk on the work at the next AG retreat in June 2004 in Toronto.

Another aspect of UCL's 6NET dissemination is aimed towards communities who are less advanced. Peter Kirstein chairs the SILK Board, a NATO-sponsored project (with many other supporters) to provide satellite-based Internet connectivity to the NRENs of the Southern Caucasus and Central Asia. Under 6NET auspices, and organised by Peter Kirstein and UCL, it was agreed that we provide IPv6 connectivity also to those communities. To do this properly requires some special IPv6/DVB hardware. As part of a liaison activity with the European Space Agency (ESA), it will be tested and deployed over the SILK Network with support from 6NET. As part of this work, 6NET is also participating in an IPv6 workshop - mainly funded by ISOC. 6NET will also assist in making IPv6 facilities available to the SILK communities.

FCCN – Latin America

FCCN will write articles on IPv6 deployment for the Portuguese Research Network, including mailings to Brazilian, Angolan and Mozambique Universities. A 6NET presentation will be made in FCCN's Networking Conference (Leira, October), and at a similar conference organized by the Brazilian Research Network.

Cisco

Cisco-Portugal is starting to promote IPv6 to schools and Universities, which can benefit from 6NET's Cookbooks.

UoS, WWU(JOIN) - Cisco NMRC (US)

Collaboration with Cisco's Network Management Research Centre has just started for the refinement of the Internet Drafts on renumbering. This will lead to an RFC, and to a new 6NET Cookbook (D3.6.1) for IPv6 network renumbering for home/SOHO and core networks. This Deliverable will describe the tools and procedures available for both home/SOHO and core networks for IPv6 renumbering.

ULB – CENELEC

ULB will continue the collaboration with CENELEC regarding common activities in the field of Smart House broadband applications.

TERENA - Sunny Connections

The 6NET and Sunny Connection Websites will be linked. The sites are very complementary; the 6NET Website provides more technical details, whereas the Sunny Website offers more information for the general public, for example books on IPv6 (which already reference information from 6NET).

6. Partner Plans for Exploitation

6.1. Exploitation Plans for the project as a whole

WP7 has been established to co-ordinate the dissemination activities of the project. The objective of this workpackage is to provide an analytical and comprehensive approach and concrete basis for the strategies of visibility, dissemination, implementation and exploitation of the research results.

Obvious forms of dissemination are through the professional Website, presentations at workshops and conferences, journal papers, and contributions to the IETF, TF-NGN, etc. Disseminating information on 6NET to people active in standardisation bodies, technical development work and the operations of networks, and receiving feedback from them, brings significant added value to both parties. Results from 6NET are being taken on board in the work of, among others, the IETF, TF-NGN and operational networks. Conversely, the inputs from standardisation bodies, technology development groups and operational networks contribute to the steering of the 6NET project. Information on 6NET is also being disseminated via press releases, leaflets, newsletters and brochures.

The dissemination and liaison activities have until now focused on the research and education networks in Europe, including those that are not themselves participating in 6NET. In this way, the results of 6NET are made available to the European research and education networking community at large, thereby promoting the widespread deployment. Research networking organisations outside Europe are also being targeted, eg. Internet2 and CANARIE in North America, APAN in the Asia-Pacific region and ENRED in Latin America. An enquiry for collaboration has also been received recently from the Australian NREN (ARNet), which will receive \$42.5 million over the next two years to invest in bandwidth infrastructure for Australian universities.

The 6NET work has featured at all TERENA Networking Conferences. These annual conferences are prominent events bringing together leading figures from the research networking community in Europe and worldwide.

6NET is also addressing a wider community, as shown by the upcoming demonstrations, which are more oriented towards the general public (car-to-car communication, mobile streaming, mobile libraries), the Cisco initiative towards the deployment of IPv6 in schools, ULB's contact with CENELEC's SmartHouse work, GRnet's broadcasting of TV programmes over IPv6, the exploitation of PR-oriented expertise from Sunny Connections, etc.

6.2. Exploitation plans of the individual partners


6.2.1. CISCO Systems

Cisco Systems (Europe) is a leading global provider of internetworking solutions. Cisco solutions are the internetworking foundation of thousands of companies, universities, utilities and government agencies worldwide. Cisco is a driving force behind the global Internet.

6.2.1.1 Dissemination Activities

Cisco is using the 6NET network to:

- test out new features on a large scale in conditions that can “break” the network. These features include:
 - co-existence and migration strategies for integrating IPv6 with the existing IPv4 infrastructure (core and access networks), including the utilisation of standard PC architectures and open source operating systems and software
 - transition tools (inc. dual stack)
 - interoperability between IPv6 implemented in different devices based on various network technologies such as ATM and Ethernet
 - access to new IPv6 applications, legacy IPv4 applications and content
 - auto-configuration techniques to enable a large numbers of IP hosts to easily discover the network and get an IPv6 address associated with their location. Nodes can assemble their own addresses with stateless auto configuration
 - support for class-of-service (‘Traffic Class’ field) compliant with the IETF Differentiated Services (DiffServ) model
 - security (IPSec)
 - mobility (many facets are considered, ranging from wireless-only LAN networks in an end-site environment, through to the convergence of mobile and fixed network technologies). Specifically: MIPv6 support, handoff latencies, the relationship between auto-configuration and User/Terminal management, multihoming, multicast, performance, and roaming
 - VPNs (current methods of managing the establishment, maintenance and teardown of VPNs are also largely manual, relatively time consuming, and not scalable. Automation will be introduced into these procedures. Operations staff and end users will be provided with web-based systems to make their interactions with the services as easy to use as possible)
 - network management tools for (as a minimum):
 - configuration management
 - performance and capacity management
 - fault management
 - security management
 - availability management
 - network services like DNS (names to address resolution: IPv4 - IPv6), registries, multicast routing, etc.
 - testing under high traffic loads
- testing of the handling of traffic class segregation (eg. for QoS, security) under real operating conditions
- exploit the synergy between the work they are doing and that being performed on IPv6 by other manufacturers such as IBM and Sony, European NRENs and Universities.
- validate that the demands for the continuous growth of the global Internet can be met with the new IPv6 technology.

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Cisco is disseminating the results, and exploring broader exploitation opportunities via the academic and research networking communities, including in the Newly Associated States (3 new partners from the Czech Republic, Hungary and Poland were incorporated into the project in September 2002 as a result of such activities by Cisco).

All of these activities map closely onto the main aims of the project, in so far as they will generally play a leading role in defining the next generation of networking technologies that go beyond the current state of the art.

6.2.2. Universite Libre de Bruxelles (ULB)

6.2.2.1 Dissemination Activities

Activities that will further allow ULB to disseminate and use the 6NET project results involve:

- participation in the BEGrid and EGEE projects,
- hosting the Global Grid Forum # 12 conference at VUB in Brussels in September 2004,
- participation (as coordinator) in the new IST EUROLABS project,
- participation in the new IST EC-Bridge project, involving the organization of a conference in Shanghai in December 2004 on Research Networks and Broadband Solutions,
- a contract with CENELEC to promote their SmartHouse project in collaboration with the IPv6 Forum (under a grant from DG ENTER).

ULB is involved in the 6NET project to foster its management and dissemination, in synergy with a number of other activities related to IPv6 and Next Generation Internet, carried out at the Belgian and international levels. In that way, ULB plays a significant role in the Dissemination and Use of the 6NET results.


On the dissemination side, ULB regularly produces the 6NET Newsletters, now at a rhythm of three times per year. The Newsletter was originally a full-colour, six-page, glossy paper document, which has been upgraded to eight pages in view of the amount of quality material submitted for publication by the project partners. The Newsletter is circulated to a targeted worldwide mailing list of about 3000 ICT professionals, administrations and press. Many partners request additional copies which are bulk mailed to them for national or regional distribution. Of course the Newsletter is also available in .pdf format on the 6NET Website.

In order to be well aware of the project progress and achievements, and therefore to be able to produce the best quality dissemination material, ULB participates in a number of project activities such as Consortium Meetings, 6NET/Euro6IX meetings, 6NET workshops, as well as Project Management Committee meetings and WP7 meetings.

The information gathered and produced as described above is also enhanced by the participation of ULB in the TERENA TF-NGN meetings and in the activities of the European IPv6 Task Force.

On top of these activities which are directly related to its involvement in the 6NET project, ULB also has a number of other communication actions that directly Use and promote the results of the 6NET project:

- coordination of the Belgian IPv6 Task Force (see www.ipv6tf.be), where 6NET appears as one of the main links. The Task Force presently has more than 100 members from all parts of the private and public sectors, and is regularly fed with information about IPv6 in the world, including reports of 6NET activities. In particular, the Belgian Task Force is supported by BELNET, BELTUG (the Belgian Telecommunications Users Group – 400 members), ISPA (the Belgian ISPs association) and DNS.BE (the .be ccTLD organization) which are all regularly informed, and are often further disseminating the information.
- support contract with BELNET, the Belgian NREN, which offers native IPv6 services, largely because of ULB (and VUB) activities, and which regularly provides (for free) the connectivity to 6NET for the different events organized in Brussels.

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- ULB runs Isabel over 6NET, and we regularly participate in the Isabel worldwide seminars; people from the EC and from industry have come repeatedly to EuroDemo to attend these events or participate as speakers.
- ULB organized the first ETSI IPv6 remote Interoperability Plugtest event in September 2002, which was the first usage of 6NET to do formal interoperability testing; that had been requested to ULB by ETSI because of our EuroDemo facility and IPv6 connectivity. It was found to be such a good idea that the European Commission (DG Enterprise) asked ULB to host the ETSI IPv6 Interoperability Plugtest event in Brussels in September 2003 (using BELNET and 6NET for external connectivity). On that occasion, there was an International Workshop on IPv6 Testing, Certification and Market Acceptance, opened by Mr. Fabio Colasanti and including a large number of top-level international speakers (see www.ipv6event.be).
- We have teaching activities at ULB directed to adults already engaged in the professional life; all our lectures include information over IPv6 and references to European projects, including 6NET; hundreds of (adult, professional) students follow these lectures.
- ULB is deeply involved in R&D and training activities with Belgian and international companies and institutions; the present demand for information about IPv6 is growing enormously, and we always refer of course to the latest developments, including 6NET. A list of recent direct contacts include Alcatel, Ascom, Belgacom, Mobistar, 6Wind, Worldcom, as well as the Brussels, Flemish, Walloon and Federal Governments.

6.2.3. DANTE

6.2.3.1 Dissemination Activities

DANTE has a long-standing experience of building and operating pan-European research networks, including the liaison with network service providers. They have therefore been able, on one hand, to deploy and operate the 6NET network efficiently, based on the experience gained in GÉANT in the last years, and on the other hand to use the experience from 6NET to introduce IPv6 into the GÉANT network more rapidly than would otherwise have been the case.

The main role of DANTE is the leadership of WP1 (Build and Operate an IPv6 Network). DANTE supervises the provisioning of the native IPv6 connectivity that the project needs to fulfil its commitments; both in the core of the network and in local loops. The initial phase of 6NET in the first year was to build an IPv6 dedicated network across Europe. Once the initial 6NET network was implemented, the major responsibility of DANTE has been the day-to-day operation and management of the core network and access loops to the NRENs. They also collaborate in coordinating the individual tests that are performed over the network after the research groups and WPs have specified their requirements for such tests. A good example of this is the successful implementation of multicast IPv6 over 6NET network and connectivity to the individual partners.

DANTE also collaborates actively in WP3 - designing and implementing IPv6 services, and in WP6 - developing and testing appropriate management tools for IPv6 core networks.


6.2.4. TERENA

TERENA is the Leader of WP7 (Dissemination and Exploitation of Results) and is responsible for a number of activities within this work package.

6.2.4.1 Dissemination Activities

TERENA has a specific role in the project for the dissemination of technical information concerning the project results. TERENA has built on its long-standing relationships with the European NRENs to provide a two-way information conduit between the project partners and the academic and research community.

Their main activity is the ongoing maintenance and operation of the project Web server (<http://www.6net.org/>), which underwent a substantial re-design in January 2004 in order to better present the numerous results coming out of the project. A Web-based project management system was also

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developed to integrate document storage and retrieval, mailing list archives, a contacts database and scheduling system. All these facilities are reachable via IPv6 as well as IPv4, over a 1 Gbps connection provided by SURFnet.

Another major activity is the organisation of annual workshops, and the first of these was the joint 6NET/Euro6IX Workshop on 5 June 2003 during TNC 2002 in Limerick, Ireland. This attracted 85 participants who heard presentations from Harald Alvestrand (Cisco), Steve Deering (Cisco) and Guy Almes (Internet2) amongst others. These covered the areas of standards, security, mobility, videoconferencing and end-user support, as well as providing an overview of the 6NET and Euro6IX projects. The workshop concluded with a panel session where the audience was able to put questions to those directly involved in IPv6 activities. The proceedings be found at <http://www.6net.org/events/workshop-2002/>

The next event they organised was the 1st 6NET Workshop on 21 May 2003 during TNC 2003 in Zagreb, Croatia. This attracted 84 participants and included discussions on various aspects of IPv6 deployment and how to make the transition from legacy networks. It focused on the current state of the technology, with particular reference to multicasting, security and mobility, whilst considering how 6NET and related projects such Euro6IX can play a leading role in the development of next generation networks. The proceedings can be found at <http://www.6net.org/events/workshop-2003/>

TERENA also organised and chaired a meeting between 6NET and Euro6IX on 12 May 2003 in Madrid, Spain to discuss possible areas of collaboration between the two projects. This lead to the identification of interconnectivity, multicasting and security as activities where collaboration was either possible or already ongoing. A joint mailing list was also established for discussing issues of mutual interest.

In addition, TERENA liaises with the IPv6 Cluster (through the 6LINK project), TF-NGN, Internet2, APAN (Asia Pacific Advanced Network) and the CCIRN (Coordinating Committee for International Research Networking). Various 6NET activities have been presented at these forums, which provide an important mechanism for disseminating information about the project to a wider audience.

TERENA's Web servers all support IPv6, and the Office LAN is fully-enabled for IPv6. TERENA also operates an IPv6-enabled webcam (<http://www.terena.nl/~dick/cam2.aspx>) which started off as an experiment, but has proved extremely popular with the online community after being announced on a number of popular portals.

6.2.4.2 Future Activities

TERENA is organising the 2nd 6NET Workshop on 9 June 2004 during TNC 2004 in Rhodes, Greece. This will be followed by an IPv6 Cluster Meeting. In addition, a joint 6NET/Euro6IX meeting will be hosted on 8 June 2004.

TERENA will participate in the 18th APAN Meeting & CCIRN Meeting scheduled for 2-7 July 2004.

TERENA is involved in the organisation of the SILK Training Workshop that is planned for June/July 2004.

The 3rd and final 6NET Workshop is currently scheduled for December 2004, but it is proposed to re-schedule this during TNC 2004 in Poznan, Poland (subject to the forthcoming Contract Amendment 5). This will ensure the best possible audience and will provide the opportunity for applications to be demonstrated.


TERENA will continue to coordinate the dissemination efforts of the project. This includes the solicitation of informational articles, the production of technical documentation, compiling a calendar of IPv6-related events, liaising with other projects and activities, and handling requests for information from third parties.

6.2.5. SONY

Sony withdrew from the consortium in March 2004.

6.2.6. IBM

IBM has been a leading participant in IPv6 design since its inception. IBM staff have co-authored numerous IPv6 specifications, and IBM was a founding member of the IPv6 Forum. IBM launched the first commercial UNIX IPv6 product (AIX) in 1997, and each AIX release since then, including the current AIX 5L version,

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has enhanced those initial capabilities. The z/OS Operating System on the z-Series platform (formerly System 390) is being IPv6 enabled as a key element in the IBM server family of products. IPv6 functionality is being phased in over various releases of z/OS as market requirements emerge, with an initial release in the z/OS V1R4 version in September 2002. Similarly, OS/400 on the IBM iSeries platform was also IPv6 enabled in a phased approach, with initial support in version V5R2 in September 2002. IPv6 is available on the Linux and Windows operating systems on IBM platforms. IBM also supported IPv6 on its Network Processor chips. IBM's Linux Technology Center now has the lead on Mobile IPv6 for Linux, and is collaborating with 6NET WP4.

6.2.6.1 Dissemination Activities

IBM's Tivoli Netview, the premier z/OS network management system, will be enabled with IPv6 capability in conjunction with the z/OS platform IPv6 enablement. This will impact every aspect of NetView panels, code logic, GUI displays, and IP services used and provided by NetView. IPv4 applications will continue to be supported but v4 addressing will be virtual addresses for backward compatibility and will be mapped to IPv6 actual addresses.

IBM is starting the process of enabling its middleware to support IPv6, based on market needs, especially the recent US Department of Defence requirement, and IPv4/v6 interoperability requirements. This evolution will be done product by product according to emerging market demand, but 6NET is very important in this context as it gives us both technical experience in porting and deploying middleware over IPv6, and initial feedback on user requirements and operational issues. Thus IBM's leadership of WP5 feeds directly back into our corporate approach to IPv6 enablement. It also fits our strategy of partnering with both other vendors and customers during the early stages of IPv6 deployment. Specifically, an IPv6-enabled version of IBM Websphere is delivered to four 6NET partners, and also to at least one major commercial customer. In parallel with 6NET, the programme of middleware enablement is continuing despite the industry slowdown. IBM is collaborating closely with the Globus project, and is strongly encouraging the IPv6 enablement of Globus and its deployment and testing within 6NET, led by UCL. IBM has recently released its Grid Toolbox 3 and it is intended to test this with appropriate 6NET partners.

In addition to laboratory tests and our planned connection to 6NET, IBM is finalising a strategy for progressive internal deployment of IPv6, initially for testing and familiarisation. The contacts made within 6NET are crucial for this. This will require us to:

- Obtain an IPv6 prefix for the IBM Intranet
- Define the address allocation methods world-wide for IBM
- Create a strategy and standards document for IBM internal use
- Port the strategy and knowledge into our commercial e-business services
- Gather requirements from IBM Business Units active in IPv6 working with the internal Internet / software team

IBM uses the success of 6NET as a reference point when discussing IPv6 adoption with its customers worldwide. IBM Global Services is receiving requests on IPv6 from customers who want to consider or use this technology in their operations. Our activities in WP5 and other 6NET workpackages is feeding our experience database to help in customer projects ranging from consulting and planning to integration and operations both at the infrastructure level as well as at the IT solution and application levels.

Recently IBM has pioneered experimental IPv6 access to its main Website (<http://www.ipv6-test.ibm.com> from an IPv6-enabled browser). Although this was not developed by IBM's 6NET team, it uses techniques developed in discussion with that team.

Dr. Brian Carpenter is the co-chair of the newly-formed IPv6 WG within the Global Grid Forum, and is promoting the case for IPv6 in terms of the larger address space, auto-configuration, better aggregation of routing tables, a complete solution for mobile IP, IP sec end-to-end globally, simplified header format, provision for QoS Flow Label in addition to the DSCP/TOS byte.

6.2.7. NTT Comm - NTT Communications Corporation

6.2.7.1 Dissemination Activities

NTT Com provides an IPv6 link into the Asia-Pacific region from the UK.

6.2.8. RENATER

RENATER is involved in 3 main topics:

1. IPv6 network management (WP6)
2. IPv6 multicast (WP3)
3. IPv6 tutorial for NOCs

6.2.8.1 Dissemination Activities

RENATER has a strong involvement in WP3's multicast activity. It is the initiator and coordinator of the M6Bone, an IPv6 multicast network, spreading over 85 networks worldwide (<http://www.m6bone.net/sites-map.html>). It collects all information related to the IPv6 multicast technology and makes it available on the M6Bone Website <http://www.m6bone.net>

Moreover, RENATER arbitrates the M6Bone mailing list. Every 6NET partners involved in IPv6 multicast are subscribed to this mailing list. Both the Website and the mailing list contribute a lot to the spreading of the knowledge gained throughout the 6NET project as the 6NET experts redistribute their experience to all the people having expressed their interest in IPv6 multicast. For example, thanks to the MBGP tests achieved in the 6NET core network, the technology became mature and documented and now some networks use this technology for IPv6 multicast routing (ASCC in Taiwan, NYSERNET in USA, UdeG in Mexico, CNIT in Italy...). Since the beginning of the M6Bone project, RENATER manages the only global Rendez Vous Point (RP) for multicast sessions to be registered. It intends to keep this activity until alternate solutions (embedded RP is being tested in the 6NET core) arise.

RENATER is working on research areas like IPv6 multicast interdomain routing jointly with Cisco's team in San José and with other vendors like Juniper and 6Wind. RENATER recently also set up a collaboration on IPv6 multicast features and implementations tests with Procket. Tests are planned to be conducted soon. Last but not least, RENATER is writing an Internet Draft on Multicast address allocation for IPv6 groups. This draft will be presented at the IETF60 meeting in San Diego (1st - 6th August, 2004).

RENATER is also the leader of the 6NET WP6 activity: Monitoring an IPv6 backbone and designing the management infrastructure. In this activity, RENATER pushes a lot to disseminate as much as possible any information regarding IPv6 monitoring and 6NET management. The 6NET Website <http://tools.6net.org> maintained by DANTE informs the general public about the day-to-day status of the 6NET core network. Moreover, every test of IPv6 monitoring tools conducted in 6NET project is made available through this Web page.

In the context of WP6, RENATER is in charge of

- building a repository -accessible via the 6NET Website- on IPv6 management and monitoring tools. In the same way that 6NET has pages about IPv6 applications (from WP5), RENATER is in the process of publishing a set of sheets with the tools that have been worked on. A questionnaire has been issued to determine which tools 6NET partners are using for managing their IPv6 networks today.
- preparing a tutorial on IPv6 management for NOCs. RENATER is gathering material from different partners to build a tutorial dedicated for NOCs staffs. A first session is planned for Summer 2004.

Furthermore, RENATER is one of the founders of the French IPv6 Task Force, and supports these dissemination and operation activities under its own budget. RENATER organises also several training sessions every year in Montpellier about IPv6 (<http://www.renater.fr/Reseau/Formations/Index.htm>).

Moreover, at every meeting of the G6, RENATER feeds the IPv6 research community with the latest news from the 6NET project.

As a production service, RENATER has deployed a full native IPv6 connectivity on all its national backbone (which is extended to the Internetv6 either from GÉANT or OpenTransit (France Telecom) to go to North America, and into the Asia Pacific rim through the TEIN link). RENATER manages also DNS functions for IPv6 name resolution either directly or in partnership with the French ccTLD organisation (AFNIC). Furthermore, RENATER provided the installation since December 2003 of a replicate of the F.root.server, one of the 13 root zone servers for the DNS. This server is located at Sfinx in Paris and available to the ISPs (80+) connected at this IXP. It can handle both IPv4 and IPv6 DNS requests.

RENATER is in the process of installing a replicate of another root zone server at SFINX; the M.root.server.

6.2.9. UKERNA

UKERNA is participating in the 6NET workpackages WP1, WP2, WP4, WP6 and WP7. Our participation in 6NET helps to support the JANET IPv6 development programme. Specific benefits to UKERNA are:

- to further our understanding of the issues involved with migrating to IPv6 over a production network;
- to gain operational experience of running IPv6; and
- to support the provision of IPv6 enabled services to the JANET community.

UKERNA has been supporting the IPv6 work carried out by UCL, UoS (leader of 6NET WP2) and ULANC (leader of 6NET WP4) since the mid 1990s, and will continue to support these three UK Universities in terms of facilitating the provision of connectivity into the 6NET backbone across JANET.

Since the 6NET project commenced, UKERNA has implemented dual stack on the SuperJANET backbone and is currently encouraging and supporting the JANET Regional Networks to do the same on their networks. UKERNA has had an IPv6 prefix since the early 1990's, and during the last few years appropriate mechanisms have been put in place to formally assign IPv6 address space to the JANET community, as per the IPv4 address assignment mechanism. For those sites who can not currently obtain native IPv6 connectivity via their Regional Networks, IPv6 in IPv4 tunnel support has been made available since 2001 via the JANET IPv6 Experimental Service, details can be found at:

http://www.ja.net/development/ipv6/experimental_service.html

6.2.9.1 Dissemination Activities

UKERNA uses a number of dissemination routes to promote 6NET, including:

- Regular articles in "UKERNA News" (published on a quarterly basis)
- Presence on the JANET WWW, which is updated on a frequent basis.
- Presentations given at events such as the annual UK Networkshop event, attended by UK academic network managers (eg. 6th - 8th April 2004); and also the JANET IPv6 Conference held in February 2003.

6.2.10. NORDUnet


NORDUnet is the Nordic Internet highway to research and education networks in Denmark, Finland, Iceland, Norway and Sweden, and provides the Nordic backbone to the Global Information Society. NORDUnet has its roots in the NORDUNET programme, which was financed by the Nordic Council of Ministers.

NORDUnet participates mainly in WP1, and organises the connectivity for the NRENs in the Nordic countries. Apart from Sweden, this includes, for 6NET: Denmark, Finland and Norway.

NORDUnet upgraded its backbone to dual-stack already in 2003, and has provided native IPv6 access to the Nordic NRENs from the start of 2004. In addition, advanced international research projects exploiting IPv6 receive expert support.

6.2.10.1 Dissemination Activities

NORDUnet uses the following dissemination routes to promote 6NET:

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- IPv6 pages in the Websites of NORDUnet and the Nordic national R&E networks
- Articles in the newsletters from Forskningsnet, FUNET, and UNINETT
- IPv6 presentations at the NORDUnet Conferences
- Support for Nordic NRENs in arranging IPv6 events

See www.nordu.net and www.csc.fi for further information.

6.2.10.1.1 Previous conference / workshop presentations:

Two NORDUnet conferences were held in 2003 (at CSC in Finland (April) and in Reykjavik, Iceland (August)). A full day was reserved for IPv6 research networking with Jari Miettinen, Pekka Savola and Tim Chown giving presentations. The 6NET project was introduced in detail by Pekka Savola. Both Jari Miettinen and Tim Chown gave recognition to the work done by the project in their talks. The conference Web pages can be found at: <http://www.nordunet2003.is/programme.php>

There are no NORDUnet conferences in 2004, but IPv6 will be a topic for the 22nd NORDUnet conference as well that will take place in April 2005. The 6NET dissemination work will be included in an IPv6 session. The possibility to have a small exhibition stand is being investigated.

NORDUnet supports and encourages the individual Nordic NRENs in arranging IPv6 events. These events will be promoted with the dissemination material available from WP7.

6.2.11. DFN

6.2.11.1 Dissemination Activities

The DFN-Verein has followed the IETF IPng development actively since the beginning of the 90s and ran several generations of IPv6 projects to enhance theoretical and operational knowledge and raise the awareness in the research and educational environment in Germany. The current project is called JOIN, and is operated by the Westfälische Wilhelms-Universität (WWU) in Münster. WWU is also a partner in 6NET (see Section 6.2.26). While IPv6 address registration is done by DFN, the operation of a dedicated infrastructure (6WiN) is currently provided by JOIN.

6WiN is connected natively to the 6NET infrastructure and tunnelled to GÉANTv6.

JOIN is the main actor at the DFN operational meeting "Betriebstagung" that twice a year gives IPv6 information and presentations to the DFN users. The web pages www.join.uni-muenster.de are well known in Germany as a rich source of knowledge and contact point for IPv6 interested universities and institutes. About 30 institutions are already connected to the 6WiN.

DFN is migrating the network G-WiN to a dual-stack network, making the dedicated 6WiN obsolete. The 6NET experience, especially WP2, WP3 and WP6 results and deliverables, are very important for DFN as a source of practical and theoretical background to achieve a dual stack solution.

DFN is a member and one of the founders of the IPv6 Forum and of the German IPv6 Task Force. These and other relationships, conferences and regular published journals (DFN- Mitteilungen) are used as a forum to promote IPv6.

In the 6NET project DFN has, additionally to WWU, another German partner: the Fraunhofer Institute (FhG) Fokus (see Section 6.2.27). This organisation is mainly working in WP4 and WP5. The special set-up in Berlin allows a native IPv6 access to 6WiN/6NET infrastructure enabling FhG-Fokus to have very good conditions for IPv6 QoS research and for other experiments. FhG-Fokus is contributing to MIPv6, AAA and SIPv6, in close co-operation with the DFN-Verein.

There are also commercial ISPs in Germany with IPv6 offerings. DFN is peering with the majority of them at different exchange points, mostly at the DE-CIXv6. However the IPv6 services to DFN users are still experimental.

6.2.12. SURFnet

As part of the 6NET's WP3 activities, SURFnet has setup IPv6 multicast on its test network and provides IPv6 multicast connectivity from there to several institutions, including the SURFnet office production network. Integrating IPv6 multicast in the production SURFnet5 network is one of the activities for 2005.

Because of the growing importance of IPv6 in SURFnet it was decided to upgrade the SURFnet5 network to be able to support IPv6. During 2003 new hardware was added to the network and during 2004 6PE (IPv6 over MPLS) was implemented to achieve this.

It is the goal of SURFnet to provide production services both via IPv4 and IPv6. Already the Webservers (HTTP), nameservers (DNS), newsservers (NNTP), file distribution (FTP) and time services (NTP) are available both via IPv4 and IPv6. Videostreaming (both unicast and multicast) and Internet telephony are experimental services via IPv6.

SURFnet focuses its 6NET activities on IPv6 multicast in WP3 and leads the corresponding Activity (A3.4). The major part of the work is devoted to disruptive testing on the 6NET infrastructure of new multicast protocols and their implementation, and supplying assistance and expertise to application groups that need IPv6 multicast connectivity.

On the applications level SURFnet contributes to the 6NET WP5 by testing several multimedia applications over IPv6. In 2004 SURFnet focuses within WP5 on conferencing and high-quality streaming on both unicast and multicast IPv6. IPv6 videostreaming is a standard offer when broadcasting events. These events are announced at <http://www.surfnet-tv.nl>.

6.2.12.1 Dissemination Activities

IPv6 events and milestones are made public through 'SURFnet News', an electronic weekly in the Dutch language that informs users of the SURFnet network and other interested parties. The SURFnet Website also includes information describing the IPv6 production services that are offered and about the new developments, including those from 6NET activities.

6.2.13. SWITCH

As the Internet Service Provider to the Swiss Education and Research community, SWITCH favours an implementation-oriented approach to dissemination. SWITCH is also a founding member of the Swiss IPv6 Task Force, and leads the Network Group within that organisation.

6.2.13.1 Dissemination Activities


6.2.13.1.1 Educational and research organisations

SWITCH works closely with these customers to both apply the results from the 6NET project to their own network, and help their customers apply them to theirs. Through the 6NET participation of the University of Geneva as subcontractor of SWITCH, they are gaining insights into the IPv6 requirements and deployment issues of a large campus network, which is helping them understand the needs of other types of customers.

In their role as subcontractor of SWITCH, the University of Geneva has gained insights into the IPv6 requirements and deployment issues. Experiences with IPv6 were made with a IPv6 network separated from the University backbone and the staff of the Universities information services were trained. IPv6 was advertised inside the University at several meetings and through papers. The plan is to offer native IPv6 all over the University (dual stack mode) within 2004.

As of May 2004, the entire SWITCHlambda IP-over-DWDM backbone is IPv6-capable, running IPv4 and IPv6 over the same links in a dual-stack configuration. This enables us to provide IPv6 access to all universities, either in dual-stack mode over the same access configuration (preferred) or through a separate connection where required by the customer. The IPv6 service has been engineered to be of the same quality as the IPv4 service in terms of reliability and performance.

SWITCH has advertised IPv6 at several national meetings and papers (see <http://home.adm.unige.ch/~reuland/ipv6/>), with the result that Universities besides the University of Geneva

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began to build IPv6 testbeds. ETHZ has had IPv6 connectivity from SWITCH since 2003, the University of Lausanne is starting with IPv6 in 2004. To further promote the usage of IPv6, SWITCH does not charge the Universities for IPv6 traffic.

6.2.13.1.2 Regional ISPs

SWITCH has peering relationships with the main commercial ISPs in Switzerland as well as with a few international ones. Due to its early involvement in 6Bone, SWITCH has become a natural point of contact when such ISPs want to experiment with IPv6. SWITCH has been providing tunnelled IPv6 connectivity to ISPs in Switzerland for quite some time.

The two major exchange points in Switzerland - TIX Zurich (<http://www.tix.ch/>) and CIXP Geneva (<http://cixp.web.cern.ch/cixp/>) were IPv6 enabled in 2004. At the moment, approximately 25% of all peerings that SWITCH maintains are IPv6 capable.

6.2.13.1.3 General Public

In this category, SWITCH includes commercial and other Internet users that have a general interest in IPv6 for the evolution of the Internet. As a service organisation for a basically closed group, SWITCH has limited outreach to the general public, although they do have a few publication channels that enjoy distribution above and beyond their member community.

There is one important exception to the closed-user-group aspect of SWITCH, and that is the domain name registry function that they perform for the .CH and .LI top-level domains. With 600'000 second-level domain name delegations, the Internet Identifiers division of SWITCH interacts directly with a large part of the Swiss Internet users that hold domain names. The registry function has been enhanced to support IPv6. DNS server for *.ch and *.li second level domains may now have IPv6 addresses beside the still mandatory IPv4 ones. (<http://www.switch.ch/id/>). This new functionality will officially be announced at the upcoming IPv6 Summit Switzerland 2004.

SWITCH has also enabled IPv6 on its well know anonymous information server (<http://mirror.switch.ch/>). The user gets informed in case he/she connects with IPv6 to this server.

6.2.13.1.4 Co-ordination Committee Meetings

The "Co-ordination Committee" meeting is a regular one-day gathering to which SWITCH invites representatives of all connected sites. This serves as a forum for informing about updates on SWITCH's service offerings, as well as providing an opportunity to exchange information between the sites. They regularly update their user community on the progress within the 6NET project, in particular concerning intra-site deployment issues.

6.2.13.1.5 Website

SWITCH has been maintaining Web pages on its IPv6 activities for more than 5 years, and this well-established site is being continually enhanced to include up-to-date information on SWITCH's 6NET activities.


Reference: <http://www.switch.ch/network/ipv6/>

6.2.13.1.6 Dedicated Workshops

If and when there is sufficient interest in IPv6 within the user community - stimulated by the dissemination measures mentioned above - SWITCH will hold theme-specific workshops on IPv6-related topics.

6.2.13.1.7 One-to-One Deployment and Assistance

The 6NET participants both at SWITCH and the University of Geneva are also active in the day-to-day operations of their respective networks, and so are directly involved in bringing IPv6 to their users.

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6.2.13.1.8 *SwiNOG Meetings*

The Swiss Network Operators' Group (SwiNOG) is an informal association of Internet Service Providers, focussed on technical issues. It holds meetings about twice a year, as a forum for technical presentations and discussions. SWITCH made a presentation on IPv6 operations issues at the March 2001 meeting. As commercial interest in IPv6 services increases, there will be other opportunities to disseminate specific 6NET results in this forum.

Reference: <http://www.swinog.ch/>

See above for a presentation that SWITCH and other participants in the Swiss IPv6 Task Force's Peering Project gave at the SwiNOG8 meeting in March 2004.

6.2.13.1.9 *SWITCH Journal*

The SWITCH Journal is a paper publication that is issued approximately twice a year. It is widely distributed within member sites and to a number of outside subscribers. In the issue July 2004 SWITCH will announce IPv6 as an official network service to its customers.

Reference: <http://www.switch.ch/about/switch-journal.html>

6.2.13.1.10 *IPv6 Summit Switzerland 2004*

SWITCH has actively participated in the IPv6 Summit Switzerland 2003 and does this again at the Summit of this year. The event is organised by SICTA (<http://www.sicta.ch>). SWITCH is one of the main sponsors and will have a booth there. Our slogan: "If you bring your laptop, SWITCH employees will show you what to do to give your computer IPv6 capability". SWITCH is responsible for IPv6 (and IPv4) connectivity for the event.

6.2.13.2 *Summary*

The effort taken to enable and promote IPv6 is considerable. There is a clear impact on the network services staff at the Universities. Apart from their daily business University staff slowly begins to think about offering IPv6 in addition to IPv4. But there is only marginal impact on the end users at this time.

6.2.14. AConet

6.2.14.1 *Dissemination Activities*

AConet hosted the IETF meeting in July 2003 and together with Telekom Austria, bmvit and the National Telecom Regulatory Agency jointly put on a show to introduce IPv6 in Austria at the "1st Austrian IPv6 Colloquium" in Vienna. AConet's engagement in the 6NET project, and the project itself, was explicitly mentioned during the event, which saw a lot of publicity. TV and radio interviews were given, as well as multiple press interviews: A couple of these interviews can be found at:


<http://news.google.lu/news?q=ipv6+austria&hl=de&lr=&ie=UTF-8&oe=UTF-8&sa=N&tab=nn>.

6.2.15. GRnet

6.2.15.1 *Dissemination Activities*

GRnet, as the Greek NREN, continuously organises activities that disseminate information about IPv6 technology and 6NET project in Greece. The main objectives for these activities is the wide spread of knowledge and awareness of IPv6 technology and 6NET achievements to the research, academic and (commercial) Internet communities in Greece. Also, significant effort is put on informing potential end-users and service providers about the IPv6 state-of-the-art applications and services in order to facilitate the introduction of IPv6 to current production networks.

GRnet distributes 6NET publicity material, e.g. deliverables and presentations, to local Universities and research Institutes in order to facilitate the installation and testing of new IPv6 applications and services. Also, it promotes IPv6 technology and organises demonstrations in various academic events in Greece. IPv6 technology is being integrated into the new GRnet core network, called GRnet2, which will provide dual

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stack (or native) IPv6 connectivity to local universities and institutes. For the time being, operational experience in running IPv6-enabled 6NET network has already assisted GRnet engineers to introduce IPv6 services to current legacy backbone network. Finally, GRnet, as the operator of the Athens Internet Exchange (<http://www.aix.gr>), which is the peering point between commercial Greek ISPs, exploits the results of 6NET and co-operate with them for the promotion of IPv6 to the commercial Greek Internet.

GRnet promotes IPv6 and 6NET awareness to the South East Europe research area through linking and co-operating with the SEEREN (South East European Research Networking) project (<http://www.seeren.net>). GRnet, as a common partner in both projects, provided information related to IPv6 technology to SEEREN partners, e.g. public 6NET deliverables, and encourages the SEEREN countries to deploy IPv6 technology in their local and international networks.

Finally, GRnet, as one of the NRENs in the consortium, has an important role to the dissemination of information about the project with the presentation of papers in conferences, workshops, and writing papers in journals. GRnet, in cooperation with the other NRENs, exchanges information with the related European and International Research Task Forces, such as TF-NGN and Internet2.

Further exploitation is expected to be performed during the 6th Framework Programme by the continuation of 6NET research and development, while education/training based on 6NET results is being planned.

Further details about 6NET and IPv6 are provided via the GRnet Websites <http://www.grnet.gr/6net> and <http://www.grnet.gr>

6.2.16. INFN-GARR (see 4.2.36)

6.2.17. UCL - University College London

Members of the University College London are recognised experts in the IPv6 field, and, through their contacts, facilitate liaison with other IPv6 initiatives, worldwide.


UCL is deeply involved in many areas of 6NET - in particular VoIP and conferencing, Virtual Private Networks (VPNs) and Grid Activities. In each they have been very active both in the development and dissemination of IPv6. Because of their general contacts, the dissemination has been much broader than just these specific activities.

6.2.17.1 Dissemination Activities

Piers O'Hanlon regularly presents IPv6 papers based on 6NET activities to the Global Grid Forum, where UCL and IBM have the co-chairmanship of the IPv6 WG. IPv6 Grids have massive scaling potential, simplification of networking for virtual organisations, auto-configuration, enable peer-to-peer communication and have better mobility support. From an initial analysis of Globus GT2 with UoS, it was apparent that it was fairly straightforward to use IPV4 or IPv6, but that using both is difficult.

GT3 has now been released and is written mainly in Java. Evaluation has shown that GT3 needs some tweaking to be compliant with RFC2732. Address configuration (initialisation and runtime) and DNS naming issues are needed. GridFTP already needs RFC2428 needs to be applied. A new area to look at is the Globus XIO, which is based on GT2's Globus IO – which will form the foundation for GridFTP. Other protocols are being examined. It is preferable to make these changes before standardisation but this isn't always possible. IPv6 support is also needed in associated applications including JDBC (for RFT) and the container environments (Tomcat, WebSphere and .Net). Porting stages were identified: IPv6 only, IPv4 and IPv6 dual stack, and interconnection of IPv4-only and IPv6-only (transition mechanisms and application gateways).

The test environment at UCL comprises 8 linux redhat-8.0 machines, installed GT3 alpha release, uses host/user certificates and packet level network monitoring. Test services are the standard shipped test services and the OGSA service browser. UCL test projects include material simulation (modelling Aspirin molecule), e-protein (currently GT2) and a multimedia gateway in development (within context of 6NET). GGF community services are welcome. Tests have been successfully carried with pure-IPv6 across the network, though some IPv4 traffic is seen on the loopback interfaces. These tests only required configuration modifications to GT3. The GT3 container, tomcat4LE, and Postgresql have been tested on IPv6.

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UCL is reporting bugs to the globus bugzilla. Future work includes operating with a variety of services over IPv6, interest in mobility and security and transition/co-existence services.

6.2.17.1.1 Previous conference / workshop presentations:

Peter Kirstein has given several talks on 6NET, for example to the Interworking 2002 conference in Perth (October), the International Collaboration Board (ICB) engaged in defence collaboration in Washington (May 2003) and London (November 2003) and the SILK Board in Baku (September 2003).

6.2.18. UoS - University of Southampton

The School of Electronics and Computer Science at the University of Southampton has been running IPv6 since 1996/97, and is currently involved in a wide range of IPv6 projects. In the context of the EU 5th Framework Programme, those projects include 6INIT (completed), 6WINIT (completed), 6NET, Euro6IX, 6LINK and the IPv6 Task Force Steering Committee.

In the UK, the department is active in assisting UKERNA in deploying IPv6 in the UK academic community, and in building the UK IPv6 Task Force. The University of Southampton also acts in an advisory capacity for - and gives presentations and workshops to - various UK groups, eg. at the UKUUG (Unix Users Group) Winter Conferences in 2003 and 2004.

6.2.18.1 Dissemination Activities

UoS uses a number of dissemination routes to promote 6NET, including:

- Active contribution to the IST IPv6 Cluster, as a partner of 6LINK and various European projects
- Active contribution to the EU and UK IPv6 Task Forces
- Membership of the IPv6 Forum, and presence on the Forum's Technical Directorate
- IPv6-enabled web hosting for public sites including the IPv6 Forum and IST IPv6 Cluster
- Attendance of - and collaboration with - Internet2 events and IPv6 partners
- An active role in the deployment of IPv6 in the UK academic network (JANET)
- An active role in IPv6 experiments for GÉANT (chairing the TERENA TF-NGN IPv6 activity)
- Publishing IPv6 papers, e.g. at the IEEE SAINT 2003 Conference in Orlando, Florida, January 2003, and the IPv6 transition paper in the May/June 2003 issue of the IEEE Internet Computing magazine
- Building novel IPv6 application demonstrators
- Giving IPv6 presentations and workshops for external groups
- Providing an IPv6 advisory role for external commercial groups
- Liaison between 6NET and Euro6IX through membership of both projects
- Attendance and presentations at IPv6 Forum events

6.2.18.1.1 Previous conference / workshop presentations:


UoS has attended a large number of meetings and conferences related to IPv6, as described in the quarterly management report summaries.

6.2.18.2 Future events

Planned UoS attendance at dissemination events for 2004 include:

- Demonstrating at the 6NET Workshop in Brussels in May 2004
- Presenting transition experience at TNC2004 in June
- Contributing with UCL to a paper for the AccessGrid Retreat in June 2004
- Organising the UK IPv6 Summit in September 2004
- Demonstrating at IST2004 in October

The active usage and standardisation contribution plans of UoS include:

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- Development of IPv6 testbeds and experiments in areas including IPv6 multicast (on m6net and m6bone) and Mobile IPv6 (a local testbed), leading to production use of these technologies in our campus network, during 2004/05.
- Active contributions to the IETF (UoS contributed to at least seven IPv6-specific Internet Drafts in 2003). During 2004, IETF contributions have been submitted on enterprise transition analysis, IPv6 renumbering and dual-stack DHCP.
- Active contributions to the GGF (UoS contributed to two IPv6-specific drafts in 2003, and already 2 in 2004)
- Using IPv6 in pervasive computing and Grid environments, feeding back knowledge gained to the standards and associated communities
- Promoting IPv6 use in other related research projects in the University, leading to wider adoption of IPv6 in new areas.


6.2.18.3 *Exploitation Plans*

The exploitation plans include:

- Developing and deploying IPv6-capable wireless roaming solutions through contributing to groups such as the UKERNA Wireless Advisory Group and the TERENA TF-Mobility WG
- Local deployment of IPv6 to 1,500 potential users in the department, including using IPv6 in our campus Wireless LAN environment.
- Offering consultancy to industry, including government bodies, broadening the university's consultancy portfolio.
- Building best practice for enterprise network IPv6 transition, for the benefit of other potential IPv6 adopters, and marketing that expertise to commercial organisations.
- Deploying IPv6 in the local Southampton community wireless network (SOWN) to enable richer communication and application possibilities for the community users.
- Introducing IPv6 to government funded initiatives, including the DTI Pervasive Computing in the Environment centre (sensor networks) and the Open Middleware Initiative Institute (OMII), to broaden the adoption of the technology.
- Development of IPv6-enabled applications (including porting work on the Vocal VoIP package and the Globus v3.0 Toolkit)
- Using our RIPE NCC membership to gain an IPv6 SubTLA for offering IPv6 connectivity and addressing to local (wireless) community networks and homes
- Establishing new IPv6-related research projects within the UK and also under the IST 6th Framework Programme, and introducing IPv6 to existing projects

6.2.18.4 *Examples of Lessons Learned*

- In the European academic environment, dual-stack networking is the only current likely deployment scenario. Building a full dual-stack environment enables subsequent deployment of IPv6-only devices with full service support.
- A good toolbox of transition mechanisms exists, with the most common tools being manually configured tunnels, 6to4 and the tunnel broker.
- The tools and packages are in place for a significant enterprise IPv6 deployment. Open source support is very good. The main areas lacking are commercial applications (e.g. MS Exchange) and IPv6 routing support in enterprise switch-router equipment (e.g. some Cisco catalyst equipment).
- The IPv6 deployment (on the wire) at UoS has been quite robust for some time, and includes use of IPv6 multicast, using out-of-band BSD routing and protocol-based VLANs to enable dual-stack subnets/links.
- Application porting can be a simple process, but may also be laborious if the application was not cleanly written (e.g. using four integers to represent an IP address). Language support is growing (including C, Java, Perl and Python).

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- Early IPv6 adoption areas could be home networking (requiring transition tools in the absence of a broadband ISP service) or campus wireless networks. We are already seeing usage of 6to4 between student household networks to enable simpler usage of direct applications (typically people-oriented ones, like GnomeMeeting H.323 conferencing).
- Native IPv6 is now widely available in GÉANT and NREN networks; the challenge is now to encourage university adoption; there are millions of students and researchers who, when connected, could develop new IPv6 applications (particularly if they can run these applications into their home networks to/from wireless devices).
- The most valuable initiatives to help boost IPv6 deployment would be ISP IPv6 support for broadband and new IPv6 applications.

UoS believes in gaining experience of IPv6 through deployment in its own production network. Early deployment has seen parallel IPv4 and IPv6 service; subsequent deployment of dual-stack on the wire and for wireless services is being documented as a case study within 6NET WP2.

6.2.19. ULANC - University of Lancaster

6.2.19.1 Dissemination Activities

Lancaster University has followed multiple dissemination routes to promote 6NET and its related activities:

6.2.19.1.1 UK IPv6 Task Force

- Participation in the UK IPv6 Task Force

6.2.19.1.2 Previous conference / workshop presentations:

- “Overview of IPv6 - the Benefits and Deployment Issues”, presented by Christopher Edwards at the JANET IPv6 Conference, 12th February 2003. Presentations slides available from http://www.ja.net/conferences/ipv6/feb_03/CE.pdf
- “Case study: Mobile IPv6 Activities at Lancaster University”, presented by Martin Dunmore at the JANET IPv6 Conference, 12th February 2003. Presentation slides available from: http://www.ja.net/conferences/ipv6/feb_03/Martin_Dunmore.pdf

6.2.19.1.3 Previous published papers:


- "A Scenario based Review of IPv6 Transition Tools", published in IEEE Internet Computing, Moving Toward an IPv6 Future, May/June 2003 (Vol. 7, No.3).

6.2.19.1.4 Meetings

- Participation at joint 6NET-Euro6ix meetings. These include discussions with Euro6ix representatives regarding collaboration on Mobile IPv6 and IPv6 QoS activities between the two projects.
- Participation at UK WAG (Wireless Advisory Group) meetings, the first of which was in London on 30th May 2003. This included a discussion of ULANC’s wireless testbed and associated 6NET activities including deploying MIPv6 and access control to the testbed. Several meetings have been held since then (every 3 months) which ULANC have been part of. The UK WAG is about to launch a Location Independent Networking (LIN) trial which will investigate the issue of authentication and access control in wireless networks from the point of view of inter-institutional roaming. ULANC will be part of the trial and will have specific interest in IPv6 support. Dissemination between 6NET and the UK WAG has been - and will continue to be - a two-way process.

6.2.19.1.5 Website

- ULANC maintains the UK IPv6 Resource Centre Website

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6.2.20. TELIN - Telematica Institute

6.2.20.1 Dissemination Activities

TELIN present their 6NET work at conferences, and actively disseminates the objectives of 6NET within their own community (see www.telin.nl).

TELIN use the knowledge obtained in 6NET with respect to the status of IPv6 deployment on both the network and the application layer in its joint projects with various partners, ranging from vendors, mobile network operators and ISPs to end-user communities.

They are promoting 6NET as an opportunity to link national testbed programmes on advanced networking with international parties.

TELIN's dissemination plan is to:

1. actively contribute to the Dutch (ministry of economic affairs) policy on IPv6. First contributions have already been made to a study on the need for a Dutch action plan. This will hopefully result in a task force that advocates the pro's and con's of transitioning towards ipv6. We are lined up for participation in this taskforce in order to disseminate the application-level knowledge obtained in this project.
2. write articles in a popular technical magazines in The Netherlands, focussing on the technical IT-experts (in Dutch), explaining the type of trials that we did with IPv6.
3. reuse the 6NET results as background knowledge in new projects.

6.2.21. UNINETT (Assistant Contractor to NORDUnet)

UNINETT is the Norwegian network for research and education. UNINETT has deployed IPv6 in the core network and are offering IPv6 connectivity to a number of Norwegian universities and colleges. Experiences from 6NET have been very helpful in this work, and it also gives UNINETT and the connected sites, better IPv6 connectivity and better opportunities for IPv6 experiments.

6.2.21.1 Dissemination Activities


UNINETT is disseminating IPv6 to its members (Norwegian universities and colleges) in several ways. Articles in UNINETT's quarterly magazine, talks at UNINETT's annual conference, and meetings with network administrators. UNINETT is also presenting IPv6 at other events in Norway. IPv6 and experiences from 6NET, in particular multicast, has also been presented at TF-NGN meetings, Global IPv6 summit in Madrid, 6NET workshops in Zagreb and Rhodes, and *mboned* Working Group at the IETF. This is expected to continue throughout the remainder of the 6NET project.

6.2.22. CSC/FUNET (Assistant Contractor to NORDUnet)

6.2.22.1 Dissemination Activities

FUnet is a NREN, and thus CSC's main target group regarding the dissemination of the knowledge generated under the 6NET project are the network maintenance persons in FUnet member organisations. Two of the FUnet member organisations, University of Oulu and Oulu Polytechnic are also participating in the 6NET project. The FUnet core network is already dual-stack, fully supporting IPv6. Pilot experiments together with the FUnet member organisations have been ongoing (e.g. to enable dual-stack access instead of separate IPv4 and IPv6 network access). The pilot projects are planned to exchange information and explore the IPv6 deployment.

IPv6 and the 6NET project are presented and discussed in various events, e.g. in the annual FUnet Technical Days for the maintenance persons in member organisations. In April 2003 CSC hosted the Nordic IPv6 Workshop organised by NORDUnet and the 6NET project. The 6NET project was presented also in the NORDUnet Networking Conference in August 2003. The active participation of the CSC 6NET team in the IETF standardisation workgroups also helps to disseminate the results of the 6NET project.

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In particular, Pekka Savola is making a significant contribution in the IETF concentrating mainly on IPv6 issues. He is a co-chair of IETF v6ops (IPv6 operations) working group, managing the IPv6 transition and co-existence, and a member of IPv6, operations, and addressing directorates. CSC also represents the FUnet community in the national IPv6 group organised by Finnish Communications Regulatory Authority. In March 2004, FICORA held a seminar on IPv6 - ready for adoption, where CSC is also represented (Pekka spoke about IPv6 standardization status). This participation/dissemination of information/experience will continue in the future.

A FUnet IPv6 discussion list and a national language FUnet IPv6 Web page (<http://www.csc.fi/proj/ipv6/>) have been set up to introduce the FUnet IPv6 services. The Web page gives general information of using and implementing IPv6 in the campus network, and information and guidelines for building IPv6 services. It includes instructions and tutorials on IPv6 systems, organizing IPv6 nameservice, using IPv4 services on IPv6, 6to4 technique and information on IPv6 addresses and connectivity, FUnet IPv6 topology and IPv6 applications. FUnet member organisations have the possibility to connect their own IPv6 network to the national and international IPv6 networks through FUnet IPv6 network. They can order IPv6 addresses and connectivity from CSC. CSC also gives expertise in the field of IPv6 and aims to develop new basic services to support IPv6 usage. The Web page also includes a number of IETF-drafts, publications, presentations, tutorials and articles in CSC's magazines on IPv6 by the CSC 6NET team members. 6NET public deliverables will be announced via the FUnet IPv6 discussion list and placed on the national IPv6 Website.

The dissemination inside CSC is in progress, and its role is being increased. Also, more dissemination activities toward FUnet member organizations is being considered.

CSC/FUNET has participated to all the IETF meetings since IETF51 in 2001, London. Some of these have been partially funded by the 6NET project.

6.2.23. Polytechnic Institute Oulu (Assistant Contractor to NORDUnet)

Oulu Polytechnic/Institute of Technology has been running IPv6 since 1996. First in small Linux test network and 1997 - 2001 as member of 6bone network via ATM-connection to FUnet using Cisco routers and Cisco beta IOS code.

Currently the Oulu Polytechnic/Institute of Technology runs IPv6 in dual-stack production network under most of the conventional IP applications like NNTP, IRC, SMTP, HTTP, NFS, DNS etc. Connection to the 6NET network is via a Gigabit Ethernet interface to FUnet's dual-stack national backbone network.


6.2.23.1 Dissemination Activities

Oulu Polytechnic/Institute of Technology has the following dissemination strategies:

- Active role in pushing IPv6 to other FUnet member networks (Finnish universities and research organizations)
- Advisory role for PTT's and high tech enterprises in the Oulu area.
- Integrate IPv6 related aspects into courses about IP technology and mobile communications.

During 2002-2003, Oulu Polytechnic/Institute of Technology has:

- Brought IPv6 into its production network
- Tested services and equipment needed in campus network. This includes OSPFv3, access control, multicast routing, routing performance, IPv6 layer 3 switching etc.
- Provided "content" to multimedia streaming services over multicast or unicast v6 ("6NET People" and some Windows Media streams).
- Provided services like NetNews, IRC, NFS, SMB etc over IPv6 for external users for trialling and testing purposes.
- Provided open WLAN access to IPv6 users in Oulu area (Public Access Network Oulu or PanOULU).

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6.2.24. University of Oulu (Assistant Contractor to NORDUnet)

6.2.24.1 Dissemination Activities

The transition cookbooks defined in the 6NET project are being used in defining the IPv6 transition strategy for the University campus network. IPv6 connectivity provided by the project is being utilised by other IPv6 project inside Centre for Wireless Communications.

These include another IST project, 6HOP (IST-2001-37385), in which testbed is connected to IPv6 Internet. Centre for Wireless Communications has also developed an optimised IP stack for low-power, short range wireless devices. These devices can be made addressable from IPv6 Internet through a special gateway, developed also by CWC. IPv6 connectivity provided by 6NET project, will be used as a testing platform for this project.

6.2.25. INVENIA Innovation (Assistant Contractor to NORDUnet)

6.2.25.1 Dissemination Activities

INVENIA Innovation's exploitation strategy is to act as a catalyst for larger partners, and to focus locally. This strategy has proved to be successful.

- The (by far) largest Norwegian Telecom operator (Telenor) has a research facility in Tromsø (Telenor Research and Development). INVENIA has actively targeted them, and in cooperation with the Department of Computer Science, has assisted in the designing and building of an IPv6-only network, spanning the city of Tromsø. Telenor now has an active group working on in IPv6 in Tromsø.
- The Tromsø County (Tromsø Fylke) has, together with 25 municipalities ("kommuner") in the region, established a company to build a high-speed network spanning the county; the company is named Bredbåndsfylket Troms AS. Tromsø County is 25'000 sq km and has 150'000 inhabitants. INVENIA had several meeting with them explaining the importance of building in IPv6 from the beginning. At the end, the company decided to run dual-stack IPv4 and IPv6, and the tender for routers (as well as other electronics for the network) had IPv6 as a requirement. According to the company, this could be done because there is a vibrant IPv6 community in Tromsø. INVENIA is one of the major contributors to this.


INVENIA will continue to work closely with Bredbåndsfylket Troms AS, and they have planned several pilot-projects to demonstrate the usefulness of the infrastructure. One of them is to multicast political meetings from Tromsø (via IPv6 only) to all municipalities.

The second part of the dissemination strategy has been to focus on IPv6-only networking: They wanted to demonstrate that IPv6-only is viable and try to spread understanding of IPv6 in this way. This has been a success.

- When running IPv6-only, a tool to deal with DNS is needed. 6NET has enabled us to develop and refine such a tool; it is named ToT («Trick or Treat»). ToT is now widespread and the software is downloaded at an average rate of 150 per month from the main site alone, and is distributed with the NetBSD and FreeBSD operating systems, and exists as packages for various Linux distributions. ToT is discussed in the newly published book «IPv6: Theory, Protocol, and Practice» by Pete Loshin (page 316).

INVENIA also works closely with the University Department of Computer Science to ensure that IPv6 is available to all staff and students, that routing is actively maintained, and that networking services (such as ToT and Faith) are kept up to date.

As a general IPv6 dissemination activity, INVENIA has purchased the domain IPng.no. The site is run on hardware donated by INVENIA to the Department of Computer Science for this purpose. At the site www.IPng.no INVEINA has established a Norwegian language site discussing IPv6. INVENIA will continuously develop the site, add news and «how-to» guides, etc. INVENIA will also use the domain to

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offer a tunnel broker, and a 6to4 gateway. These activities will be supported by documentation (in Norwegian). It is a problem that there is no «IPv6 Tasks Force» in Norway and INVENIA hope to firmly establish IPng.no as a focal point for IPv6 in this country.

INVENIA Innovation continuously develops its portfolio of IPv6 offerings. The latest contract was with the Norwegian Defence Logistics Organization (department for ICT)

6.2.26. WWU/JOIN - Westfälische Wilhelms-Universität Münster (Assistant Contractor to DFN)

6.2.26.1 Dissemination Activities

The Westfälische Wilhelms-Universität Münster (WWU) [<http://www.uni-muenster.de>] hosts the JOIN project [http://www.join.uni-muenster.de/Join/index_join.php?lang=en]. It has been exclusively researching IPv6 since 1996 and acts as an IPv6 competence and reference centre for Germany and the German research and education community. The project is executed on behalf of the German research network (DFN) [<http://www.dfn.de>], Germany's NREN.

One of JOIN's main goals is the propagation and distribution of IPv6 in the German R&D facilities. To achieve this goal, different solutions to migrate to IPv6 for a large range of possible network scenarios are being developed. JOIN also actively supports R&D facilities with the integration of IPv6 into their network, software and management environment by answering questions and helping with specific problems during the transition process. By doing this work, JOIN shares knowledge acquired while working in the 6NET project and at the same time new experiences are gained which can be contributed back to the 6NET project.

6.2.26.2 Ongoing Activities and Constant Services

6.2.26.2.1 6WiN

6.2.26.2.1.1 Connectivity

The JOIN team has built and still operates the IPv6 network 6WiN [<http://www.6win.de>] on behalf of the DFN. In the beginning, the 6WiN was conceived as a test network, which is used nowadays as a to a stable and productive IPv6 backbone for the German research and education facilities which are customers of the DFN. So far, 31 customers have been connected to the 6WiN, of which four are natively connected [http://www.6win.de/6WiN/list_6win_active_tunnels.php?lang=en].


6.2.26.2.1.2 Testing

New protocols like IS-IS for IPv6, OSPFv3 and IPv6 multicast are tested in the 6WiN environment and in most cases permanently integrated in it. If possible, the latest IPv6 capable services are offered to 6WiN customers. Experiences are gathered during this process, and the resulting knowledge is shared within the German R&D and commercial communities in the form of presentations [<http://www.join.uni-muenster.de/Dokumente/folien.php?lang=en>] and HOWTO guides or even software on JOIN's public Web page [http://www.join.uni-muenster.de/Dokumente/Howtos/index_howtos.php?lang=en].

6.2.26.2.2 6Bone

In 1998, JOIN was one of the first groups to operate a 6Bone POP. JOIN still operates this POP and offers tunnelled IPv6 connectivity to the 6Bone to parties and companies who need a /48 prefix but are not offered IPv6 connectivity by their provider. Since the DFN usually assigns prefixes to R&D facilities and since these facilities are directly connected to the 6WiN, the 6Bone policy is primarily designed for small and medium commercial companies or developers.

Plans are to keep this service available until the end of the Bone in June 2006.

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6.2.26.2.3 Offered Services

6.2.26.2.3.1 Connectivity

As mentioned above, JOIN offers IPv6 connectivity to third parties. R&D facilities, which are customers of DFN, get connected to the 6WiN. All others - especially commercial German companies - may get access to the IPv6 Internet via the JOIN 6Bone POP if no other IPv6 connectivity is available to them.

6.2.26.2.3.2 IPv6 Multicast

Within the 6WiN JOIN established IPv6 multicast connectivity. This service is offered to all 6WiN customers. So far the University of Münster and the Fraunhofer Gesellschaft Birlinghoven use this service.

6.2.26.2.3.3 FTP Server

JOIN has been operating an IPv6 FTP server [<ftp://ftp.join.uni-muenster.de>] for several years now. It mirrors several important Linux/BSD distributions and software packages (data volume of available files > 1TB).

6.2.26.2.3.4 Time Server

Since 2003, JOIN offers a public stratum-1 time service [<time.join.uni-muenster.de>].

6.2.26.2.3.5 Jabber Server (with MUC and ICQ gateway)

Since 2004, JOIN offers a closed jabber server for usage within the 6NET project. The server provides client-to-client communication, a group chat room facility (Multi User Conference - MUC) and an ICQ gateway, all reachable via IPv6.

6.2.26.2.3.6 Simple Monitoring Tools

A set of simple tools is available on JOIN's web pages to the public [http://www.join.uni-muenster.de/TestTools/index_testtools.php?lang=en], which can be used to check the status and the reachability of the IPv6 network and the connectivity.

- Ping: (simple ping6)
- Traceroute : (simple traceroute)
- Tracepath: (simple traceroute variant)
- Dig: (nameserver lookup)
- v6spy: (tool to check IPv6 availability of a Web page)
- Lookingglass: (tool to monitor some outputs on a router)
- ASPATHtree: (tool to display current BGP table)

6.2.26.2.4 IPv6 Forum

DFN organizes meetings for their customer (DFN-Betriebstagung [<http://www.dfn.de/content/beratung-weiterbildung/betriebstagung>]) on a regular basis twice a year. Part of these meetings is the IPv6-Forum [<http://www.dfn.de/content/beratung-weiterbildung/betriebstagung/ipv6/>] which is hosted by the JOIN team. It is used as a platform to report the status of IPv6 and to disseminate information regarding new IPv6 developments and IPv6 technologies to the audience (R&D facilities in Germany). While sometimes third party speakers are invited, most presentations are given by JOIN team members.

6.2.26.2.5 Liaisons with other groups

JOIN is also an active member of TERENA's TF-NGN [<http://archive.dante.net/tf-ngn/>] and the German IPv6 Task Force [<http://www.ipv6tf.de/index2.php>]. JOIN is one of the founding members of latter and runs their Website and mailing list. In the past, JOIN has been a member of the GÉANT IPv6 Task Force, which ended in the middle of 2003.

6.2.26.2.6 Web Pages

The JOIN team maintains and hosts several IPv6-related Web pages:

- JOIN Project: Homepage of the JOIN project with a lot of IPv6-related information

- 6WiN: 6WiN Homepage with status information, monitoring tools and subscription information
- IPv6 Task Force Germany: Homepage of the German IPv6 Task Force

6.2.26.2.7 Mailing Lists

The JOIN team hosts several IPv6-related mailing lists located on listserv.uni-muenster.de.

- ipv6: general discussion list for IPv6 (German language)
- 6win: announcement and discussion list for 6WiN customers
- ipvtf-de: discussion list for all TF members
- ipv6tf-de-intern: Discussion list for TF founding members

6.2.26.3 Achieved Goals

The following is a list of achievements of the JOIN team so far.

6.2.26.3.1 6WiN

JOIN has built and been operating the 6WiN. This includes several important tests, namely IS-IS functionality for IPv6 and Multicast for IPv6.

6.2.26.3.2 Previous conference presentations

JOIN chaired several IPv6-Forum events on the regular DFN-Betriebstagung:

- 36. DFN-Betriebstagung (Berlin, 27./28. March 2002)
- 37. DFN-Betriebstagung (Berlin, 12./13. November 2002)
- 38. DFN-Betriebstagung (Berlin, 4./5. March 2003)
- 39. DFN-Betriebstagung (Berlin, 11./12. November 2003)
- 40. DFN-Betriebstagung (Berlin, 9./10. March 2004)

During these events, presentations about 6NET were often given.

- 'IPv6 in der EU' (36. DFN-Betriebstagung, Berlin/Germany, 27. March 2002)
- '6WiN, IPv6 in the DFN' (TERENA Networking Conference, Limerick/Ireland, 4. June 2002)
- '6WiN, native IPv6 backbone' (8th TF-NGN meeting, Berlin/Germany, 2. July 2002)
- 'Mini-Workshop, Wie bringt man IPv6 ins LAN' (37. DFN-Betriebstagung, Berlin/Germany, 12. November 2002)
- '6NET, Large-scale international IPv6 testbed' (37. DFN-Betriebstagung, Berlin/Germany, 12. November 2002)
- 'GnomeMeeting and IPv6' (11th TF-NGN meeting, Poznan/Poland, 9. May 2003)
- 'DHCPv6' (39. DFN-Betriebstagung, Berlin/Germany, 11. November 2003)

There are more presentations about IPv6 related issues, which were held by JOIN team members and that are not directly connected to the 6NET project. They are listed on JOIN's Web pages [<http://www.join.uni-muenster.de/Dokumente/folien.php?lang=en>], as well as all other presentations above.

JOIN team members constantly publish HOWTO guides and descriptive documents on various IPv6 related topics. All of them can be found on the HOWTO page on JOIN's Web server.

So far, JOIN team members have published HOWTOs and descriptions on the following topics:

- GnomeMeeting
- ISATAP
- IPv6-in-IPv4 tunnel
- Transport Relay Translator (TRT)
- IPv6 name service with bind
- How to enable/install IPv6 in the OS

- OpenVPN based IPv6 tunnel broker

6.2.26.3.3 Press Releases

- Article about status of IPv6 including report on start of 6NET (December 2001 [<http://www.uni-muenster.de/ZIV/inforum/2001-3/a03.html>])
- Article about DFN's native IPv6 network 6WiN (November 2003 [<http://www.uni-muenster.de/ZIV/inforum/2002-3/a03.html>])
- Articles about JOINs IPv6 ftp server (November 2002 [<http://www.uni-muenster.de/ZIV/inforum/2002-3/a04.html>] and December 2003 [<http://www.uni-muenster.de/ZIV/inforum/2003-3/a12.html>])
- Article about JOINs IPv6 time server (December 2003 [<http://www.uni-muenster.de/ZIV/inforum/2003-3/a07.html>])

6.2.26.3.4 Tools

6.2.26.3.4.1 JOINtv

JOIN has developed a weather map tool, which displays IPv6 traffic geographically. It is used to monitor 6WiN traffic and is publicly available on the 6WiN web pages [<http://www.6win.de>].

6.2.26.3.4.2 v6spy

A simple tool to check the availability of a Web page from an IPv4 host without IPv6 connectivity.

6.2.26.4 Future Plans

A major goal to achieve is the substantial deployment of IPv6 within the German research and education environment. The creation of the 6WiN and the knowledgeable support in the IPv6 area has been a vital start to achieve this goal.

In order to encourage more facilities to deploy and use IPv6, further support for and education of administrators and users is necessary. JOIN plans to also provide this support in the future.

6.2.26.4.1 Details

To achieve this JOIN is going to address the following tasks for the remainder of the project:

- broaden the user base by connecting more DFN customers to the 6WiN
- help the DFN to integrate IPv6 in the next version of their core network
- integrate IPv6 in the network of the University of Münster
- deploy new services like IPv6 Multicast (e.g. IPv6-NetNews)
- enhance and debug current set of tools (esp. for monitoring IPv6 networks)
- deploy JOIN's software router (see below)


In detail, there are a number of applications that need further development and testing to smoothen the integration of IPv6. JOIN is going to work on the following applications in the future:

- DHCPv6
- tunnel broker (e.g. for dial-in users)
- OSPFv3/IS-IS tests; switching between different IGP's in the core network
- others

6.2.26.4.2 Publications

Results of these efforts will be published in several ways. JOIN will continue to write HOWTO guides and tutorials in order to educate administrators and users. These will concern:

- The usage of DHCPv6 and deployment scenarios
- The partitioning of the end sites SLA address space

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- Integrating IPv6 into existing networks (especially into routing structures)
- End site migration

If the opportunity arises, JOIN team members will give presentations or demos on these topics.

6.2.26.4.3 *Software Router*

To encourage facilities to deploy IPv6 in their networks it is not only necessary to have external connectivity but also to distribute IPv6 connectivity in their local network. JOIN is developing a software based routing solution to ease this step for administrators. The "JOIN software router" already exists as a beta version and it is about to be beta tested a number of R&D facilities.

6.2.26.4.4 *IPv6 Demos*

JOIN plans to participate in the VoIP and H.323 demos of 6NET, as well as in the home networking demos.

6.2.27. FhG-Fokus - Fraunhofer Gesellschaft (Assistant Contractor to DFN)

6.2.27.1 *Dissemination Activities*

During recent years FhG-Fokus has established strong connections to different companies and potential customers in the areas of VoIP, AAA and Mobile IP. The results of 6NET in the form of knowledge and innovative components will further enhance these relations. For future business, FhG-Fokus is targeting customers such as operators, ISPs and further research opportunities.

6.2.27.1.1 ISPs and Networks Operators

Network operators are aiming at expanding their service with roaming and mobile computing services as well as VPN and secure communication support. FhG-Fokus has a close relation with Deutsche Telekom as a network operator and the German research network (DFN) as an ISP. Collaboration has involved the investigation and evaluation of the usage of Mobile IP as the basis for supporting mobile communication. In these co-operations FhG-Fokus has provided technical support, products, prototyping and consulting as well as research in innovative areas such as AAA and QoS.


Based on the expected results of 6NET, such collaborations are expected to be intensified in the area of security and provide thereby a missing cornerstone that would enable those ISPs and operators to support not only for mobile but also for secure communication. The knowledge gained and components realized in 6NET will build the basis for joint projects between FhG-Fokus and 3G network operators in which FhG-Fokus provides consulting, research and prototyping.

6.2.27.1.2 Research Projects

FhG-Fokus is currently engineering a proprietary UMTS testbed and development environment (<http://www.fokus.fhg.de/news/umts/content062002-en.html>) which is a division of their 3Gb test lab, specializing in network technologies such as Bluetooth, WLAN 802.11a and 802.11b, fixed Internet, GSM, GPRS, UMTS FDD and TDD, Satellite IP and DVB-T. One main purpose is to create and implement a seamless all-IP based communications infrastructure for the development of mobile services and applications. The FhG-Fokus UMTS testbed is designed as one of the Berlin UMTS cells of T-Mobile Deutschland. For increased capacity, it may be linked with other cells, thus providing the testbed user with a fully seamless infrastructure. The work dedicated to this item as well as the experience gained in this context build the cornerstone for supporting further work on transparent mobility enabling technology for UMTS and IPv6 based wireless LAN and fixed networks.

The *IPv6 Showcase* (<http://www.ipv6-showcase.de/>) is an IPv6 pilot trial of Deutsche Telekom (T-Systems), which provides high quality nationwide IPv6 network access to companies and other interested parties such as universities and research organizations. Additionally, IPv6 services and applications, and access to the other national and international IPv6 networks, will be made available.

Some of the main research subjects of FhG-Fokus in the area of mobile communication are directed towards providing all-IP VPNs based on Mobile IP. 6NET provides some of the major building blocks for supporting

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such a service namely security and Mobile IP components. The work to be done in 6NET as well as the expected experience will present the basis for this work.

The results will be presented in conferences and used as input for standardisation groups.

In 2003, FhG-Fokus changed over to an own IPv6 address prefix (2001:0638:0806::/48) substituting the former connection via the BERKOM IPv6 network where FhG-Fokus was kindly allowed to use temporarily parts of the BERKOM IPv6 addresses.

6.2.27.2 Exploitable Results

A main value for FhG-Fokus on the technical side is to advance their understanding and operational experience of the IPv6 technology implemented in a large-scale IPv6 network. There are three significant areas, which are of main interest for FhG-Fokus in this respect:

6.2.27.2.1 Voice over IP

Multimedia applications are a significant area of attention in 6NET. The testing and evaluation of Voice over IP functionality as an integrated part of the IPv6 protocol is of high importance. FhG-Fokus provides one of the most advanced VoIP platforms. Based on the work and experience to be gained during 6NET, FhG-Fokus' VoIP platform was extended with IPv6 specific enhancements. Further, a major output is the knowledge and experience gained about the appropriate integration strategy for deploying VoIP in IPv6 networks. An open source implemented VoIPv6 capable infrastructure based on SIP is provided. Appropriate translation and mechanisms enabling the co-operation of IPv6 and IPv4 users have been developed and investigated.

6.2.27.2.2 WLAN

Wireless LAN access shows an explosive growth worldwide. Support of IPv6-only WLAN access will be an important step to the provision of IPv6 "end-to-end". Mobile IPv6, AAA and performance issues with respect to header compression techniques and TCP improvements will be treated.

6.2.27.2.3 AAA Infrastructure

An evaluation of the issues relating to AAA within an IPv6-only wireless LAN is of particular importance.

In all of these fields, 6NET will allow FhG-Fokus to develop its expertise on these technologies. Also, practical experience gained in deploying - and interworking between - these technologies on the basis of a large-scale IPv6 network will enable FhG-Fokus to take part in realizing the next Internet generation.

6.2.28. CTI - Research Academic Computer Technology Institute (Assistant Contractor to GRnet)

The Research Academic Computer Technology Institute (CTI) is a research institute supervised by the Greek Ministry of Education & Religious Affairs. CTI collaborates with public and private constitutions, universities and educational constitutions of the country. Moreover, it can set up branches in Greece and abroad, receive loans and furnish postgraduate and postdoctoral scholarships.


6.2.28.1 Dissemination Activities

CTI has a close relationship with the University of Patras and the Greek School Network, and as a result, CTI disseminates the 6NET results within the Greek academic community, which will benefit from the new capabilities of IPv6. Moreover, CTI, through its participation to the 6NET project, is supporting one PhD postgraduate student and one MSc postgraduate student, who conduct research in IPv6. In addition, CTI provides first-line support both to end users and business users (for example Greek ISPs) in the area of IPv6 real time applications and QoS.

CTI disseminates 6NET results by publishing papers in international journals and conferences.

6.2.28.1.1 Previous conference presentations

CTI made four presentations to the technical IPv6 workshop which was jointly organized by CTI and GRnet in July, 2003 (Patras). The objectives of that event were to present IPv6 technology to the network engineers

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in research or commercial NOCs, and to encourage them to deploy and test IPv6 services in their internal networks. The presentations “Introduction to IPv6 Porting” and “IPv6 Porting” described aspects of the 6NET project.

The workshop was attended by over 100 network engineers, students, academics, professionals, telecommunication providers that came from various parts of Greece. It generated long discussions on several issues regarding IPv6, mainly focused on IPv6 deployment and IPv6 benefits for each participant’s organization.

In September 2003 CTI took part at the preparation of the following document for the GGF Grid Forge: “Survey of IPv4 Dependencies in Global Grid Forum Specifications” (UoS, UCL, CTI, FCCN) - (http://forge.gridforum.org/projects/ggf-editor/document/Survey_of_IPv4_Dependencies_in_Global_Grid_Forum_Specifications/en/1)

6.2.29. DTU (Assistant Contractor to NORDUnet)

6.2.29.1 Dissemination Activities

The Danish Forskningsnet serves Universities and research institutions. So far the IPv6 connection has been extended to the Technical University in Lyngby and to University of Copenhagen.

Connections to other Danish Universities in Odense, Aarhus and Aalborg are planned and the needed lines are available. Other institutions may be connected through tunnels based on FreeBSD machines. At the same time the Forskningsnet is planning to promote the use of the IPv6 network. This includes the use of IPv6 multicast.

The University of Copenhagen has extended the central Web (www.ku.dk) and mail services to support IPv6. Apache Web Proxy servers have been inserted in front of some IPv4 only backend servers.

6.2.30. INRIA (Assistant Contractor to RENATER)

6.2.30.1 Dissemination Activities

INRIA contributes to the 6NET project in WP 6 (network management and monitoring tools).


Their main research areas are autonomous management and functional areas like security, service configuration, provisioning and automated instrumentation. It brings a large experience of IPv4 network management (the open source MODERES information model environment is an example of contributions made by the team to the management community). INRIA has worked on IPv6 since 1994, experimenting and validating new platforms and management applications.

It specifically investigates, designs and defines new tools, with features that are for native IPv6 networks. It defined the native IPv6 Looking Glass for the pilot RENATER II network management platform and the tools were extended and made available to the community in the 6NET project. Dissemination of these tools continues through online support.

For the 6NET project, they implemented the IPv6 MIBs able to manage either IPv4 and IPv6 networks. This was done inside the net-snmp package.

They also worked on a IPv6 LAN topology discovery tool. The tool was developed and distributed on the net. The publication of the underlying algorithms in IFIP/IEEE NOMS 2002, and CFIP 2002 is the major dissemination activity of this topic. They will continue to improve the algorithms and communicate on potential results.

INRIA recently ported the open source ntop-monitoring environment to IPv6. The porting was very successful and is now part of the official distribution (www.ntop.org) ensuring the largest possible dissemination. INRIA will continue to support the contribution to this open source software and encourage its use through several presentations, as part of its dissemination plan.

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6.2.31. ULP - UNIVERSITÉ LOUIS PASTEUR (Assistant Contractor to RENATER)

The Université Louis Pasteur (Strasbourg, France) is represented by members of the Networks and Protocols Team of the LSIIT laboratory (UMR 7005 CNRS-ULP). They work in collaboration with the Centre Réseau et Communication (CRC - Networking and Telecom Center) which is the operator of the academic metropolitan network OSIRIS is also involved in the project.

6.2.31.1 Dissemination Activities

The OSIRIS network already offers a native IPv6 Internet connection to interested faculties, departments and laboratories on Strasbourg University campuses. This network also offers IPv6 multicast via the RENATER network.

In 2002, ULP deployed an experimental IPv6-only wireless network in one of its building. The main objective was to evaluate the feasibility and the technical constraints of the use and deployment of IPv6 and Mobile IPv6. This experimental network consisted of 10 Cisco wireless Access Points and 3 Cisco routers with a Cisco beta version of the Home Agent functionality. This wireless network was available for use by students from the Computer Science department at Master level, and offered the following IPv6-based services :

- Video on-Demand (VideoLAN server and clients)
- Instant Messaging (Jabber server and clients developed at ULP)
- Dual Stack Proxy for HTTP and FTP protocols (access to IPv4 servers)

The University has already a number of teaching activities around IPv6. The computer science department proposes a teaching module at Master level, which includes IPv6, Mobile IPv6 and BGP4+, and a graduate course including IPv6 in its PhD program. Finally, the Networks and Protocols Team conducts a number of research projects around IPv6 with students at both PhD and Master levels. Results from these projects are made available through journal papers, conferences and workshops. Some of them are presented at the IETF as drafts.

6.2.32. PSNC (Instytut Chemii Bioorganicznej Pan W Poznaniu)

6.2.32.1 Dissemination Activities

6.2.32.1.1 Polish IPv6 Task Force

The creation of the Polish IPv6 Task Force has been announced by PSNC in March 2004. All new partners from industry partners as well as research, government and education institutions and also Internet service providers, telecommunication providers are welcome to join.


6.2.32.1.2 Website

A new Website has been created and published: <http://www.pl.ipv6tf.org/>, which presents the initiative of PSNC to establish Polish IPv6 Task Force. It describes the idea of Task force and encouraged everybody to join this initiative. This is the main page of Polish IPv6 Task Force.

PSNC maintains the Website <http://www.ipv6.man.poznan.pl> which contains description of all activities within IPv6 technology. These pages show an overview of the 6NET project and describe in detail the activities performed by PSNC and also provide a Web interface to the network monitoring tools and network statistics. This site is accessible via both IPv4 and IPv6.

PSNC is also active in developing and testing IPv6 enable software especially concerning network monitoring and multimedia streaming. These tools are disseminated on the following pages:

- <http://www.ipv6.man.poznan.pl/6net/ttsnmp-frame/index.html> - presents *The IPv6 Management Gateway* which main purpose is to enable the existing IPv4 network management platforms to monitor, configure and manage the native IPv6 network. It translates SNMP and ICMP protocol messages between IPv4 and IPv6 networks.

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- <http://icecast-ipv6.man.poznan.pl/> - presents *Icecast*, which is an audio broadcasting system that streams music in the Ogg Vorbis format. This is IPv6 enabled version of *Icecast2*. There are five local radio station broadcasted live using IPv6 on this Website.
- <http://beaconserver.m6bone.pl/> - presents The Multicast Beacon, which is a popular measurement tool to monitor multicast traffic (also IPv6 traffic).. This site offers web presentation of the server to the end user.
- <http://muvi.man.poznan.pl/> - presents The Multicast Visualization Tool (MUVI), which is a Java application to monitor multicast network.

The first tool in the list is being developed within WP6, the rest are only tested using 6NET network resources.

6.2.32.1.3 Previous conference presentations

Artur Binczewski, Bartosz Gajda, Wiktor Procyk, Maciej Stroiński, Robert Szuman “Management of IPv6 Networks with IPv4/IPv6 SNMP Gateway”, Terena Networking Conference 2003 Zagreb, 19 - 22 May 2003.

6.2.32.1.4 Technical Polish NREN POL34/622 members meetings

PSNC as a network operator of a National Academic Broad-band Network POL-34/622 arranges and participates in frequent meetings of Metropolitan Area Networks operators where the 6NET project is being continuously disseminated.

6.2.32.1.5 Mailing list

A new mailing list has been created for all new members of Polish IPv6 Task Force: ipv6-tf@pl.ipv6tf.org. The archive of this mailing list is also available on the Website: <http://www.pl.ipv6tf.org/>

6.2.33. CESNET (Zajmove Sdruzeni Pravnickyh Osob)

6.2.33.1 Dissemination Activities

CESNET addresses the performance and configuration weaknesses of PC-based IPv6 router implementations, by developing a hardware accelerator (“*Liberouter*”) for IPv6 routing and related functions in the form of a PCI board using programmable gate arrays (FPGA). They also provide the project with a comprehensive public repository of IPv6 open source software, and operate an on-line version control system (CVS or similar) for most software development, documentation and configuration activities.

The *Liberouter* project, has its own Web server <http://www.liberouter.org> (also accessible via IPv6). This site contains news about all developments and events related to the project and documentation of all aspects of the work, and also serves as an entry point to special information sources (CVS, mailing lists, bug-tracking system etc.). Important achievements of the project are also publicised through CESNET press releases.

6.2.34. HUNGARnet

6.2.34.1 Dissemination Activities


6.2.34.1.1 Website

The Website was moved to a new server and made IPv6 accessible in January 2003. The Website is continuously updated according to the 6NET project and the IPv6 project of NIIF/HUNGARNET.

6.2.34.1.2 Previous conference presentations

"IPv6 in EU FP 5 programs: point of view from 6NET and GÉANT" presented by János Mohácsi at Matáv-PKI (Hungarian Telecommunication Company Development and Research Center) meeting, Budapest, Hungary (8 April 2003).

"IPv6 service at HUNGARNET: When?" presented by János Mohácsi at Networkshop 2003, Pécs, Hungary, 14 April 2003. The presentation is available at <http://nws.iif.hu/ncd2003/>

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"Practical IPv6" - tutorial, given by János Mohácsi at Networkshop 2003, Pécs, Hungary, 13 April 2003.

6.2.34.1.3 NIIF/HUNGARnet Technical Council meeting

Discussion about the IPv6 deployment at NIIF/HUNGARNET.

Decision about the IPv6 deployments of further sites and Hungarian IPv6 tutorials (25 April 2003)

6.2.34.1.4 Other meetings

"NIIF/HUNGARNET IPv6 project" - presented by János Mohácsi at Siemens Hungary Rt., Discussion about NIIF/HUNGARNET IPv6 strategy (2 June 2003)

6.2.35. ETRI (Electronics and Telecommunications Research Institute)

ETRI is a government-funded forefront R&D institute in Korea. It promotes the development of economy and society and produces qualified manpower in the IT field. ETRI has much experience in IPv6 network management and in the development of IPv4/IPv6 transition tools. ETRI is a member of the IPv6 Forum and has connectivity to Japanese and other international networks.

6.2.36. Consortium GARR (formerly INFN-GARR)

The knowledge acquired in 6NET has been transferred to the production environment of the GARR network. Currently, a large part of the GARR Gigabit Backbone is dual-stack. The IPv6 service for end-users is available in an experimental environment as either native IPv6 or using v6-in-v4 tunnels. Many users are involved in the deployment of the GARR-IPv6 network.

6.2.36.1 Dissemination Activities

The Italian Academic and Research Network carried out the following dissemination activities:

6.2.36.1.1 Website

The site <http://www.6net.garr.it> contains all the information about GARR's 6NET activities and network tools, and is the co-ordination area for Italian partners.

Several Italian local partners (Universities and research institutes) are involved in the local 6NET testbed and have realized their own local Websites, containing information about their own specific activities:

- <http://www.caspur.6net.garr.it>
- <http://www.polito.6net.garr.it/>
- <http://www.unibo.6net.garr.it/>
- <http://www.unifi.6net.garr.it/>
- <http://www.uniroma3.6net.garr.it/>
- <http://www.cnr.6net.garr.it>

These Websites are available in IPv4 and in IPv6.


6.2.36.1.2 Previous conference presentations

GARR has made the following presentations on 6NET and IPv6:

- "Applications and Advanced Services on the Next Generation GARR Network", at the 4th GARR-B Workshop, held in Bologna in June 2002
- "Advanced Applications: Logistical Networking as an Advanced Engineering Testbed", Spring 2003 Internet2 Meeting, Arlington, VA, April 9-11, 2003

GARR organised 3 IPv6 tutorials during 2002, in Turin (September), Rome (October) and Florence (December), and also 3 IPv6 tutorials during 2003, in Bari, (March), Milan (March) and Naples (July).

Each tutorial is divided into two parts: a tradition tutorial during the first day and a "IPv6 Live session" with hands-on experience in configuration, routing, services and mobility for all the people attending the tutorial. The number of participants is always around 100.

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The Rome tutorial was also transmitted live over the Internet using streaming media technologies. The archives are available on-line at: <http://www.6net.garr.it/tutorial/>

6.2.36.1.3 Press Releases

GARR wrote a Press Release in 2002 about their participation in 6NET. Other news has been published in specialized press releases.

The public national radio station carried out an interview about 6NET and IPv6:
<http://www.radio.rai.it/grr/tema/vediuna.cfm?CodeNot=15274>

7. Dissemination Achievements in the Current Reporting Period

7.1. Standards

7.1.1. IETF


Pekka Savola (CSC) is making a significant contribution in the IETF, on behalf of 6NET. He is a co-chair of IETF *v6ops* (IPv6 operations) working group, managing the IPv6 transition and co-existence, and a member of IPv6, operations, and addressing directorates. CSC also represents the FUnet community in the national IPv6 group organised by Finnish Communications Regulatory Authority. In March 2004, FICORA held a seminar on IPv6 - ready for adoption, where CSC is also represented (Pekka spoke about IPv6 standardization status).

In addition to management and oversight activities in the IETF, Pekka Savola has also made many technical contributions, during this reporting period, including writing/updating the following Internet Drafts:

- "draft-savola-v6ops-firewalling-02.txt" (firewalling)
- "draft-shin-v6ops-application-transition-02.txt" (application transition)
- "draft-ietf-v6ops-isp-scenarios-analysis-01.txt" (ISP scenarios/analysis)
- "draft-lind-v6ops-isp-scenarios-01.txt" (IPv6 transition scenarios)
- "draft-ksinant-v6ops-isp-analysis-00.txt" (IPv6 transition solutions)
- "draft-savola-v6ops-transarch-02.txt" (issues to consider when planning IPv6 transition)
- "draft-ietf-v6ops-ipv4survey-*" (IPv4 survey documents).
- "draft-savola-v6ops-security-overview-02.txt" (security overview)
- "draft-ietf-v6ops-6to4-security-02.txt" (6to4 security considerations)
- "draft-savola-v6ops-tunneling-00.txt"
- "draft-savola-v6ops-multicast-issues-03.txt" (describing IPv6 multicast issues)
- "draft-savola-v6ops-conftun-setup-01.txt" (simple configured tunnel set-up procedures)
- "draft-savola-bcp38-multihoming-update-01.txt" (describing ingress-filtering issues with multihoming)
- "draft-savola-bcp38-multihoming-update-02.txt", provided comments to the multihoming threats
- "draft-savola-bcp38-multihoming-update-03.txt", (ingress filtering for multihomed networks)
- "draft-nordmark-multi6-threats-00.txt"
- "draft-baker-ipv6-renumbering-01"
- "draft-ietf-mboned-embeddedrp-02.txt" (embedded-RP specification)
- "draft-savola-mboned-mroutesec-00.txt" (multicast routing security issues, based on embedded-RP feedback)
- "draft-ietf-dnsop-ipv6-dns-issues-04.txt" (e.g. added operational considerations and issues with IPv6 DNS)
- "draft-savola-multi6-asn-pi-01.txt" (a trivial multihoming mechanism)
- "draft-chown-v6ops-unmanaged-connectivity-00.txt" (IPv6 connectivity issues in unmanaged networks).

CSC reviewed:

- "draft-thaler-ipv6-ndproxy-01.txt" (a NAT replacement solution and ND proxying)
- "draft-ietf-v6ops-mech-v2-01.txt" (a transition mechanisms update)
- "draft-ietf-v6ops-unmaneval-00.txt" (an unmanaged evaluation document)
- "draft-ietf-v6ops-onlinkassumption-00.txt" (IPv6-on-by-default document)
- "draft-ietf-v6ops-v6onbydefault-00.txt" (IPv6-on-by-default document)
- "draft-ietf-dhc-dhcpv6-stateless-02.txt" (DHCPv6 implementation guide)

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CSC were also involved in discussions on the provisioning of 6to4 reverse DNS using DNS techniques, in the *DNSOP* IETF WG. They provided feedback on a number of DHCPv6 renumbering documents, as well as on the new PIM-SM specification, and made a presentation at IETF59 on "6to4 Relay Traffic Statistics and Observations".

They reviewed the latest Teredo specification and worked on the next revision of the 3GPP analysis document.

UNINETT took part in the IETF58 and IETF59 meetings (*mboned*, *multicast*, *dhc* and *v6ops* WGs). They presented and discussed the WP2 Internet Drafts: "draft-chown-dhc-dual-stack-00.txt" and "draft-chown-dhc-stateless-dhcpv6-renumbering-00.txt", and the Internet Draft: "draft-venaas-dhc-lifetime-01.txt".

UNINETT authored/co-authored and/or provided comments to the following documents:

- "draft-venaas-dhc-lifetime-01" (lifetime option for DHCPv6)
- "draft-vijay-ipv6-icmp-refresh-otherconf-00" (ND support to trigger the nodes that refresh the other configuration)
- "draft-chown-dhc-stateless-dhcpv6-renumbering-00" (renumbering requirements for stateless DHCPv6)
- "draft-savola-v6ops-conftun-setup-01.txt"
- "draft-thaler-ipv6-ndproxy-01.txt" (a NAT replacement solution and ND proxying)
- "draft-ietf-v6ops-mech-v2-01.txt" (a transition mechanisms update)
- "draft-ietf-v6ops-unmaneval-00.txt" (an unmanaged evaluation document)
- "draft-ietf-v6ops-onlinkassumption-00.txt" (IPv6-on-by-default document)
- "draft-ietf-v6ops-v6onbydefault-00.txt" (IPv6-on-by-default document)
- "draft-chown-v6ops-port-scanning-implications-00.txt" (port scanning implications)
- "draft-chown-v6ops-vlan-usage-00.txt" (use of VLANs for IPv4-IPv6 coexistence in enterprise networks)

UoS authored/co-authored the following Internet Drafts (4 in *v6ops*, 3 in *dhc* WG):

- "draft-ietf-v6ops-ent-scenarios-00.txt" (IPv6 enterprise network scenarios)
- "draft-chown-v6ops-unmanaged-connectivity-00" (considerations for IPv6 tunnelling solutions in small end sites)
- "draft-chown-v6ops-vlan-usage-00" (use of VLANs for IPv4-IPv6 coexistence in enterprise networks)
- "draft-chown-v6ops-port-scanning-implications-00" (IPv6 implications for TCP/UDP port scanning)
- "draft-venaas-dhc-lifetime-01.txt" (lifetime option for DHCPv6)
- "draft-chown-dhc-stateless-dhcpv6-renumbering-00"
- "draft-vijay-ipv6-icmp-refresh-otherconf-00" (ND support to trigger the nodes that refresh the other configuration)

IBM co-authored the following Internet drafts:

- "draft-ietf-ipv6-flow-label-08.txt" (IBM and Nokia)
- "draft-ietf-ipv6-deprecate-site-local-01.txt" (IBM and Microsoft)
- "draft-ietf-ipv6-flow-label-09.txt" (IBM and Nokia)

WWU(JOIN) team members wrote or contributed to the following Internet Drafts:

- draft-join-v6ops-guide-v4mapping-00.txt
- draft-cadar-dhc-dhcpv6-v4options-00.txt
- draft-chown-dhc-dual-stack-00.txt

7.1.2. GGF

UoS produced 2 GGF draft documents, and UCL produced 4 papers for the 2 GGF meetings held during this reporting period:

- Guidelines for IP version independence in GGF specifications
- Survey of IPv4 Dependencies in Global Grid Forum Specifications
- Two documents on porting to IPv6

7.1.3. ETSI

The European Telecommunications Standards Institute (ETSI) has a focus more directed at wireless and 3G systems, but also has a strong reputation for other services including hosting of interoperability tests. 6NET seeks to take advantage of such services where appropriate in the project. Interaction with ETSI is of direct benefit to Europe.

ULB in particular, is closely associated with the IPv6 Interoperability Plugtests events. They took part in the *re-routing* tests in Cannes (September 2002), and were responsible for organising the infrastructure and hosting the IPv6 Plugtests event that took place in Brussels in September 2003. The event was combined with a one-day International Workshop on IPv6 Testing, Certification and Market Acceptance, and with an IPv6 Showcase exhibition organised by the Eurov6 project, in synergy with NGN-LAB and 6NET.

7.1.4. CENELEC


The more sensors that are installed in homes, the greater will be the need for IP addresses. A Press Release announcing co-operation between CENELEC and the IPv6 Forum was issued in January 2004.

ULB made a contract with CENELEC to promote their SmartHouse project in collaboration with the IPv6 Forum (under a grant from DG ENTER). The SmartHouse project was presented at the 6NET Spring Conference, organised by ULB.


7.2. Publications

Many publications have been made by partners in journals, conferences and to IETF meetings, during the reporting period. The following table summarises most of them (Internet Drafts are not included, as they are already covered in 6.1.1, above):

Topic	Journal/Conference status	Company	Date
"IPv6 Transitioning Management"	IP Operations and Management (IPOM) 2003, Kansas	ULANC	1 October 2003
"Adding IPv6 support to H323 Gnomemeeting/openH323 port"	11th International Conference on Software, Telecommunications and Computer Networks (SoftCOM 2003), Croatia	CTI-Alcatel	7-10 October 2003
"Performance Evaluation of Multicast Transmissions with Mobile Sources"	IEEE ICON'03, Sydney	ULP	October 2003
"IPv6 multicast and the 6NET project"	CUDI event, Mexico (presented using videoconference over IPv6 multicast)	RENATER	October 2003

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“IPv6 deployments in Europe” (including the 6NET project and the M6Bone)	JRES conference sessions were transmitted to Interop using VideoLAN over IPv6 multicast	RENATER	November 2003
Plenary Presentation: "30 Years of International Networks Lessons of the past, visions of the future" with specific emphasis on IPv6	Cisco Public Summit at the Nobel Prize week	UCL	December 2003
2 nd version: “Survey of IPv4 Dependencies in Global Grid Forum Specifications”	GGF Grid Forge	UniBw, UCL, CTI	December 2003
“The innovative aspects of IPv6 multicast and the research topics actually worked on with 6NET framework” (including embedded-RP, address allocation, ...)	G6 Meeting	RENATER	December 2003
	Grid and Cooperative Computing 2003, Shanghai	UCL	December 2003
“The latest news from the 6NET project regarding IPv6 network management”	G6 Meeting	RENATER	January 2004
“Introduction to Wireless Networking”	JANET Wireless Event, Coventry, UK	ULANC	26 February 2004
“Wireless Futures”	JANET Wireless Event, Coventry, UK	ULANC	26 February 2004
	SILK Meeting, Antalya, Turkey	UCL	February
“Neues von IPv6 und JOIN“	40 th DFN Betriebstagung	WWU(JOIN)	9-10 March 2004
“IPv6: Fragen, Antworten und Diskussion“	40 th DFN Betriebstagung	WWU(JOIN)	9-10 March 2004
“JOIN Software-Router”	40 th DFN Betriebstagung	WWU(JOIN)	9-10 March 2004
“IPv6-Tunnelbroker leicht gemacht: OpenVPN“	40 th DFN Betriebstagung	WWU(JOIN)	9-10 March 2004
“IPv6 Multicast“	40 th DFN Betriebstagung	WWU(JOIN)	9-10 March 2004
“Performance Evaluation of an IPv6 - capable H323 Application”	The 18th International Conference on Advanced Information Networking and Applications (AINA 2004), Fukuoka, Japan	CTI	29-31 March 2004
"A Source Discovery Protocol for ASM Applications in SSM Network"	3 rd International Conference on Networking (ICN04)	ULP	March 2004
"Hardware Router's Lookup Machine and its Formal Verification"	3 rd International Conference on Networking, ICN'04	CESNET	March 2004
	10 th Global Grid Forum Meeting, Berlin	UCL	March 2004
“IPv6 management standards, techniques and tools”	RIPE Meeting	RENATER	5 May 2004
	6NET Spring Conference	ULB (organisation)	18-19 May 2004
“Introduction to IPv6 and the 6NET Project”	6NET Spring Conference	CISCO	18-19 May 2004

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“IPv6 support in the CISCO product range”	6NET Spring Conference	CISCO	18-19 May 2004
“Network Management issues” “Multicasting in IPv6 Networks”	6NET Spring Conference	RENATER	18-19 May 2004
“Fixed and Mobile IPv6 applications”	6NET Spring Conference	IBM	18-19 May 2004
“IETF IPv6 status and the critical next steps in deployment”	6NET Spring Conference	CSC	18-19 May 2004
Demonstration of IPv6 management standards, techniques and tools	6NET Spring Conference	RENATER	18-19 May 2004
Tutorial: “IPv6 multicast techniques and applications”	6NET Spring Conference	RENATER	18-19 May 2004
	SILK Meeting, Ashgebat	UCL	May 2004
	INET/IGC2004, Barcelona	UCL	May 2004
“Szóstka na rozbiegu” (english: “Six taking a run-up”)	Polish issue of Computerworld http://www.computerworld.pl/artykuly/39918.html	PSNC	Issue 13/2004
“Polska Grupa Robocza” (english: “Polish IPv6 Task Force”)	Polish issue of Computerworld	PSNC	Issue 14/2004

7.3. Other Dissemination

6NET had a major role in the EU Global IPv6 Service Launch event (Brussels, January 2004). DANTE, Cisco, ULB, RENATER and others provided logistic support and demonstrations for the very successful event. For example, RENATER presented multiuser videoconferencing and high quality video streaming over 6NET’s IPv6 multicast core network.

TERENA

TERENA made a substantial re-design of the 6NET Web server (<http://www.6net.org/>) in January 2004, in order to better present the numerous results coming out of the project. A Web-based project management system was also developed to integrate document storage and retrieval, mailing list archives, a contacts database and scheduling system. All these facilities are reachable via IPv6 as well as IPv4, over a 1 Gbps connection provided by SURFnet.

WWU(JOIN)

WWU(JOIN) issued a Press Release about their IPv6 time server (December 2003 [<http://www.uni-muenster.de/ZIV/inforum/2003-3/a07.html>]).


CESNET

In October 2003, CESNET organised a workshop "IPv6 – development and implementation", aimed primarily at Czech ISPs. The official part consisted of 5 presentations:

- Jan Gruntorad: Presentation of CESNET
- Pavel Satrapa: The state-of-the-art in IPv6 standards
- Ladislav Lhotka: Global IPv6 infrastructure
- Martin Pustka: Experiences with IPv6 deployment in the CESNET2 network
- Jiri Novotny: Project Liberouter

The presentations (including video) are available from <http://www.cesnet.cz/doc/seminare/20031022/>

The official part was complemented by informal discussions. The workshop was attended by approximately 65 persons and their feedback was very positive. A similar workshop is being prepared for June 1, 2004, this time it is oriented towards the academic community.

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On October 30, 2003, Ladislav Lhotka gave a 15 min. interview to the Czech Radio about IPv6 and the 6NET project.

CESNET's 6NET team members publish regularly on the Czech technological portal Lupa (<http://www.lupa.cz>). The contributions from the last year are:

- Pavel Satrapa: IPv6 in European academic networks
- Pavel Satrapa: M6Bone
- Miroslav Matuska: IPv6 Summit 2003
- Pavel Satrapa: DNS for IPv6 - the end of the schism
- Pavel Satrapa: IPv6 addresses become simpler
- Pavel Satrapa: Flows in IPv6

ULB:

In synergy with the Eurov6 project, which ULB is coordinating, the 6NET results have also been disseminated, demonstrated and used in a number of "showcases", e.g.:

- the Belgian IPv6 event organized at the Plaza hotel in Brussels in September 2003, with more than 200 participants (in coordination with the ETSI Plugtests event and the DG ENTER supported Workshop described above),
- the Global IPv6 Service Launch event in January 2004 at the Residence Palace, Brussels
- the 6NET Spring 2004 conference organised at ULB in May 2004 which attracted 80 participants.

SWITCH

In the Swiss IPv6 Task Force, SWITCH leads a project dedicated to IPv6 peering. Within this project, Swiss ISPs with an interest in IPv6 can come together and discuss peering and other IPv6 deployment issues. A presentation was made of 6NET and the current status of IPv6 peering in Switzerland, to the 8th meeting.


ULANC gave a tutorial on Mobile IPv6 and IPv4/IPv6 transition to Telekom Austria. The outcome was that Telekom Austria, armed with greater knowledge of IPv6 and related issues, were able to move forward with their IPv6 research and deployment strategy. This culminated in the formation of an Austrian IPv6 Task Force and its subsequent launch at the Austria IPv6 Colloquium at Telekom Austria, Vienna on 31st March 2004. During this event Lancaster University ran live demos on IPv6 streaming, Mobile IPv6 and IPv4/IPv6 transitioning. These highlighted how Mobile IPv6 can support heterogeneous technologies, work across commercial router implementations, provide backward compatibility with IPv4 and that high quality applications are a viable option. ULANC also showed homegrown MPEG 2 video streaming over DSL and IPv6 and Cisco VoIP over 4in6.

7.4. Other achievements

As of May 2004, the entire SWITCHlambda IP-over-DWDM backbone is IPv6-capable, running IPv4 and IPv6 over the same links in a dual-stack configuration. This enables them to provide IPv6 access to all Swiss Universities, either in dual-stack mode over the same access configuration (preferred) or through a separate connection where required by the customer. The IPv6 service has been engineered to be at the same quality as the IPv4 service in terms of reliability and performance.

7.5. Deliverables

Almost all Deliverables from the project are available as public material. All public Deliverables are placed on the project's Web server. Below is the list of all the Deliverables produced during this reporting period, including a short description of the content of each of them.

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D1.5.4: Six-monthly report on the usage of 6NET - *30 January 2004*

Author: DANTE

This document gives details of the usage of the 6NET network over the six-month period, and lists the activities supported.

D2.2.3: Updated IPv4 to IPv6 transition Cookbook for organisational/ISP (NREN) and backbone networks - *25 May 2004*

Author: UoS

We describe the IPv6 transition mechanisms available to the National Research and Education Networks (NRENs) who are part of the 6NET project. The mechanisms need to operate to complement those that provide an IPv6 service to the end users in the universities. We review the mechanisms, state the current usage of those mechanisms, and describe some of the scenarios for NREN transition. This "cookbook" of transition mechanisms and experience will be updated throughout the duration of the 6NET project.

D2.3.3: Updated IPv4 to IPv6 transition cookbook for end site networks / universities - *15 March 2004*

Author: WWU(JOIN)

This is the third version of an IPv4 to IPv6 transition cookbook for end site networks and/or universities. After an introduction to the basics of transitioning from IPv4 to IPv6 (which presently is generally done by moving to dual-stack networking) and a brief description of each mechanism on a theoretical basis, we give a description of some example scenarios to give the reader an idea of where and when to employ certain transition methods and how different mechanisms work together and complement each other. The next part of the document then focuses on installation and configuration examples.

D4.1.3v1: Mobile IPv6 Handovers - Performance Analysis and Evaluation - *21 May 2004*

Author: ULANC

This provides a detailed analysis of handovers in Mobile IPv6 and highlights the factors that cause unacceptable delays to certain types of applications. We show how features such as router discovery, duplicate address detection and the registration of new addresses are too inefficient to allow for seamless handovers in Mobile IPv6.

D4.1.5v1: Multicast with mobile hosts: analysis and performance evaluation - *19 December 2003*

Author: ULP

This document aims to provide an analysis of the issues relative to IP multicasting in the presence of mobile nodes. The objective is to make people aware of the specific concerns rose by the combination of multicasting and mobility. This deliverable also presents and evaluates some of the solutions that have been proposed to handle this particular situation. It is hoped that this document will provide a solid introduction for readers that may want to deploy such services.

D5.8: Second phase of applications development and PoP deployment progress report - *13 February 2004*


Author: IBM/UCL

Deliverable D5.8 is an update to deliverable D5.3. It describes the current status of the deployment of the Points of Presence (PoP) and data centres from Activities 5.3 and 5.4 installed at the five selected sites, namely: TELIN (NL), IBM (F), UCL and UoS (UK) and GRnet (GR).

The software environment and the applications being deployed at each particular location are described.

D6.2.3v2: Interim report on development and test, 2nd version - *27 January 2004*

Author: PSNC

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Interim document reporting on any specific development carried out and performed tests of tools and management applications.

D7.2v4: Dissemination and Use Plan, Fourth Version - *January 2004*

Author: ULB

This Deliverable describes the plans for the dissemination of knowledge gained during the work, and (to the extent that can be foreseen at this stage) the exploitation plans of the results for the consortium as a whole, for individual participants, and groups of participants. It expresses as far as possible in concrete terms, the dissemination strategies, the target groups and the strategic impact of the project in terms of improvement of competitiveness or creation of market opportunities for the participants.

One of the purposes of this Deliverable is to disseminate information about the project, and its progress, in such a way that other workers in the area can make use of the results, or see how they can feed information into the project. In this way it acts as a vehicle for the cross-fertilisation of ideas and a means of establishing co-operation.

D3.2.1v2: IPv6 DNS service for the 6NET Network, 2nd Version - *9 April 2004*

Author: AConet, Cisco

This document describes the requirements, some DNS technology background and documents the initial setup for the DNS service for 6NET (both forward DNS and reverse DNS), which is required to support the early operational phase of 6NET.

D3.3.1v2: Contribute and report on discussions on IPv6 support in RIPE database - *19 May 2004*

Author: AConet

This document describes the upcoming new version of the Routing Policy Specification Language, RPSLNg, in particular how it adds support for address families beyond IPv4 unicast, so that it can be used to document IPv6 routing policy. This deliverable updates an earlier version with reports from the standardisation process as well as from experiments with a prototype RPSLNg registry and RPSLNg-aware tools.

D4.3.2: Upgraded X-Bone Facilities running over the full network - *26 March 2004*

Author: UCL

This document details the continued efforts being carried out in order to achieve the goal of a full-scale deployment of a dynamic IPv6-enabled VPN infrastructure across the 6NET network.

D4.4.2v1: Report on IPv6 QoS tests - *6 April 2004*

Author: GRnet

This presents the first phase QoS tests performed in 6NET. Most of the partners analysed the operation and interaction of QoS mechanisms, e.g. shaping or queuing, in IPv6 testbeds or production networks and validated the performance of QoS implementations for different platforms. Finally, the last section presents the second phase of QoS tests that are planned to be performed in 6NET and describes the different Classes of Service that will be supported at the core.

D6.2.2v2: Operational procedures for secured management with transition mechanisms, 2nd Version - *14 May 2004*


Author: WWU(JOIN)

This document examines the operational security and management issues behind various methods employed when migrating to native IPv6 network interconnection.

D7.2v5: Dissemination and Use Plan, Fifth Version (Draft) - *May 2004*

Author: ULB

Following the recommendations from the 2nd project Review, this version has a new structure to the previous ones, enabling the dissemination *plans* to be more visible. Though the final version is not due until the end of

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June, this preliminary version of the document has been produced prior to the 3rd Review, in order that comments on the new style can be received and taken into account.

8. Conclusion

As seen by this fifth version of the Dissemination and Use Plan, the new structure of the document gives special prominence to the *plans* of the 6NET partners to promote the project and exploit the availability of this large-scale wide area test facilities for the testing, validation and demonstration of applications, services and features associated specifically with the new IPv6 technology.

The dissemination - and the reporting of the dissemination - has been significantly improved, and plans are in place to further raise the visibility of the project. The scientific and technical achievements of the project are excellent, with exploitation routes directly into the development departments of major industrial companies, and key people and organisations in the standards arenas. The synergy with GÉANT optimises the EC economic investment in this network. The synergy with the ETSI Plugtests events further reinforces the high visibility of the project.