Mobile IPv6—Workpackage 4.1

Workpackage 4 of the 6NET project aims to identify and provide all the features necessary for supporting the sophisticated IPv6 applications and services to be trialled in Workpackage 5. Activity 4.1 is concerned with Mobile IPv6 (MIPv6) and, more specifically, the configuration, testing and possible enhancement of MIPv6 over the large IPv6 network testbed of 6NET.

In this relatively early stage of the 6NET project, one of the first tasks of Activity 4.1 is to investigate the available MIPv6 implementations that we may wish to deploy within the 6NET testbed. Consequently, this deliverable provides a survey and evaluation of existing MIPv6 implementations. The MIPv6 implementation survey consists of all the implementations that could be found at the time of writing. The ensuing evaluation is restricted to those implementations with which consortium partners have existing knowledge of and/or experience. At this early stage of the project, there has been little opportunity, or available resources to evaluate previously untried MIPv6 implementations.

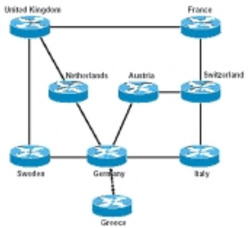
From our investigation, it is evident that existing MIPv6 implementations have varying levels of support for MIPv6 features and differ to which draft version they are based upon. In most cases, MIPv6 functionality does not come 'built-in' and must be either applied as a separate software patch or explicitly enabled on the target system. Furthermore, few implementations have support for IPsec and a suitable key distribution algorithm. However, the incomplete nature of current MIPv6 implementations is only to be expected at a time when implementers are at various stages of supporting a protocol that is still being designed. Whilst the deployment of MIPv6 on a production network may be some years away, the deployment of MIPv6 within the experimental 6NET network will be greatly aided by the experimental MIPv6 implementations currently available.

The MIPv6 implementations are summarized in this table.

	MIPL	Cisco	Microsoft	KAME	ULANC	6WIND
Platform	Linux	Cisco IOS	2000/XP/CE	FreeBSD	Linux	FreeBSD
Draft version	15	13	13	15	13	13
Modes	MN/HA/CN	HA/CN	MN/HA/CN	MN/HA/CN	MN/HA/CN	HA/CN
PND	Yes	Yes	Yes	Yes	Yes	Yes
IPv6-in-IPv6 tunneling	Yes	Yes	Yes	Yes	Yes	Yes
DHAAD	Yes	No	No	Yes	No	No
Binding management	Yes	Yes	Yes	Yes	Yes	Unknown
HAO	Yes	Yes	Yes	Yes	Yes	Yes
Movement detection	RAs	N/A	RAs and NDIS notifications	RAs	RAs and PCMCIA traps	N/A
Smooth handoff	Yes	Yes	Yes	No	Yes	N/A
IPsec/AAA	IPsec	No	IPsec and CAM	IPsec	No	No
Key exchange	MD5 or SHA-1	No	Sagen utility	manual	No	No
Support for notebooks/PDAs	Yes	N/A	Yes	Poor	Yes	N/A
MIPv6 built-in	No	Yes	No	Yes but not enabled by default	No	Yes but not enables by default
No. of patches	1	0	1 (XP and CE) 2 (2000)	0	1	0
Set-up tools	mipdiag	command line tools	Auto-configuration and MIPv6Conf	Command line tools	mipv6_ config	Command line tools

IPv6 Routing Plan for the 6NET Network—Workpackage 3.1

The initial configuration of the 6NET core network consists of a ring between the UK, FR, CH, IT, DE, SW, and back to the UK. NL is connected to both the UK and DE, AT is connected to both CH and DE. GR is connected initially to DE.



RIPE has allocated IPv6 address space to DANTE, and DANTE has made part of this address space available to the 6NET project for use in the core network. All participants have their own address space allocated to them by RIPE.

Each 6NET PoP has its own address range for use on links, LANs, etc. There is also a naming convention for the equipment used in the PoPs, which basically consists of the two letter country codes with 6net.org appended to it.

The IS-IS routing protocol will be used for both IPv4 and IPv6 as the Interior Gateway Protocol for distributing the addresses of the core links. There will be some initial tuning of the IS-IS parameters to achieve a fast convergence when there is an outage. iBGP will be used to distribute the NREN IPv6 prefixes within the core network. eBGP will be used to exchange IPv6 prefixes between the 6NET core and NRENs and between the 6NET core and external organizations.

At each core PoP, the 6NET router will be connected to the GEANT router to provide inband IPv4 access to the 6NET router. The 6NET router will also be connected to the GEANT out of band network. An initial configuration template is also described for the routers.

6NET Partners

Coordinator

Principal Contractors

Assistant Contractors

Large-scale International IPv6 Pilot Network

IST-2001-32063

Newsletter n° 1 June 2002

Editorial

Dear Reader,

Welcome to the first issue of the 6NET Newsletter. It will appear six times during the three years of the project to keep you informed about its development.
Don't hesitate to visit the 6NET website or to contact us if you wish more specific information.

Happy reading,

Paul VAN BINST

The 6NET Project
Europe to build the world's highest-capacity IPv6 network

* The 31 project partners represent a rich combination of research and industrial organizations. They will enable IPv6 technology to be transferred from 6NET into production equipment and services in industry and academia across Europe, strengthening Europe's position for future economic growth.

* The 6NET project consortium will provide a native IPv6 network on an international scale, spanning to North America and the Asia-Pacific region, for test and demonstration purposes.

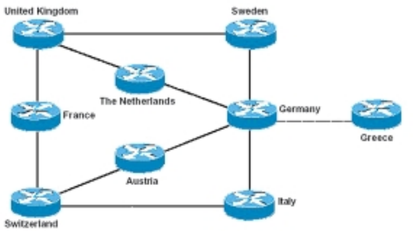
* The 6NET infrastructure will connect more countries at a higher capacity than any other native IPv6 network deployed to date. 6NET will install, operate and support a pan-European native IPv6 network, initially spanning nine countries, with links of up to 2.5Gbit/s.

* The total consortia investment in 6NET will be close to 17 M€ requiring 1100 person-months. The potential contribution from the EC's Information Society Technologies Programme is over 9.5 M€ over a period of three years.

The industry partners in the project will make specific contributions. Cisco, the project coordinator, is providing high-end routers for the nine core nodes, with further edge devices in at least nine universities. IBM (France) will supply Edge Servers with WebSphere e-business and Grid software adapted for IPv6. Sony (Europe) will bring to the project exciting new IPv6-oriented applications.

During its three-year duration, 6NET will bring IPv6 services to at least eleven National Research and Education Networks (NRENs), which have a strong interest and skills in IPv6 and which will make available some of the resources of the GÉANT and NORDUnet networks to support 6NET. The NRENs, together with DANTE, TERENA and the university partners will supply 800 person-months to support the investigations, developments, testing and demonstration activities.

6NET will build and operate a dedicated international IPv6 network, and use this network to validate that the demands for the continuous growth of the global Internet can be met with the new IPv6 technology. The deployment and manageability of a large IPv6 network will therefore be considered; including physical infrastructure, address allocation, registries, routing, multicast and DNS. Mobile IPv6 and VPNs are also topics for the project, and migration strategies for integrating IPv6 with the existing IPv4 infrastructure (core and access networks) will be implemented and evaluated.



6NET Staging Experience

Cisco Advanced Services has found when working with large scattered networks and leading edge technologies it is a good practice to fully test and configure the network components before starting with the rollout of an EMEA (European, Middle Eastern and African) wide infrastructure.

Staging is a tool, which is used within Cisco Advanced Services to catalyse the verification of a design and hardware in a totally controlled laboratory environment. All 6NET CORE infrastructure is for that purpose shipped to the Cisco Technical Assistance Center, where the complete network is rebuilt to reflect the full 6NET testbed topology.

During the Staging phase all the network components will undergo a series of Hardware tests before the Cisco Engineers start to pre-configure the Cisco 6NET components. Once all equipment is configured and the Cisco IOS is correctly uploaded, a series of IPv6 protocol tests were executed and proper IPv6 operation verified. When all tests and configurations have been documented, the 6NET test-bed is sent towards the final PoP locations for installation.

Any issues found during the staging Phase, were immediately resolved, due to direct communication between the experienced Advanced Services Engineers, IPv6 engineering teams and the Cisco Technical Assistance Centre. All interesting experiences discovered during Staging have been documented and made available for the 6NET consortium as part of Cisco's commitment to share IPv6 knowledge and experiences as a full partner in the 6NET research project.

6net

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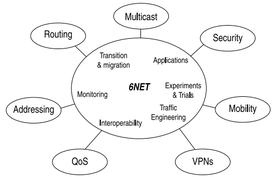
6NET Workplan

In order to meet the objectives of the project, six technical workpackages have been defined:

WP1 - Build and operate the IPv6 network



Objectives: to implement and operate the network infrastructure for the project; to identify locations and capabilities; to provide equipment and connectivity; to perform acceptance testing; to make the network operational; to develop an understanding of the issues involved in deploying IPv6 networks, in terms of physical infrastructure, address allocation, registries, routing, DNS operation, network management, etc.

WP2 - IPv4-IPv6 co-existence, interworking and migration

Objectives: to examine and validate all aspects concerning the transition strategies for evolving from IPv4 to IPv6 for backbone, NREN and end site networks, with consideration of logistical issues; to demonstrate how to achieve a smooth integration and co-existence of IPv4 and IPv6, through the deployment of a variety of transition methods, including those specified by the IETF "ngtrans" working group; to deploy IPv6-only networks at end user sites, including wireless LAN/MANs, and identify further standards, implementations and vendor support required for day-to-day routine use of such networks.

WP3 - Basic Network Services

Objectives: to design, implement, test and document basic network services that are needed to run an IPv6 network. These services include IPv6 routing (both intra-domain and inter-domain), IPv6 DNS support, IPv6 QoS and Security and IPv6 multicast. This workpackage examines these services in their IPv6 environment, but also with respect to their IPv4 equivalents.

WP4 - IPv6 application and service support

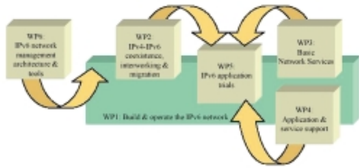
Objectives: to identify and provide all the features necessary for supporting the sophisticated applications and services to be trailed in WP4; to include the integration and interworking of IPv6 network technologies for core and access networks, to enable increased levels of interactivity and mobility across local and wide area networks. Specific features will include mobility and VPNs.

WP5 - IPv6 middleware and user application trials in demanding environments

Objectives: to understand the impact of novel, demanding applications on an IPv6 infrastructure, and to assess and report on the benefits of IPv6 (in contrast to IPv4) when used to deliver those applications; to select a number of user communities with specific demanding application requirements and promote the use of the applications amongst user groups over the project infrastructure.

WP6 - IPv6 network management architecture and tools

Objectives: to take into account the various network management platforms and tools (for both access and core networks); to investigate network management applications needed to be developed to complement the existing ones; to develop, test and validate such applications; to participate and contribute to IETF network management and monitoring WGs with IPv6 focus; to propose a network management and monitoring architecture; to help to deploy the proposed solution in the 6NET pilot network; to incorporate the management and monitoring tools into the operational procedures used by WP1; to write recommendations for manufacturers on management facilities to implement in their equipment; to propose management architectures and monitoring solutions for transition mechanisms experimentation/implementations; to point out security issues for management traffic itself and especially for IPv4 to IPv6 transition techniques and make recommendations to handle such situations; to define the required needs to set up a NOC entity and put it into operation and define operational procedures for the NOC functioning.



These workpackages are supported by both administrative and technical management skills (WP0: Project and technical management), and a specific workpackage (WP7: Dissemination and exploitation of results) has been defined for ensuring that the results from the project are thoroughly disseminated and exploited. Liaison with the other IST IPv6 testbed project EURO6IX has been incorporated in new Activities in WP7.

Joint 6NET-Euro6IX workshop

The Joint 6NET/Euro6IX Workshop was held on 5 June 2002 in conjunction with the TERENA Networking Conference in Limerick, Ireland. The objective was to publicise the 6NET and Euro6IX project activities, as well as discuss IPv6 developments elsewhere. It also provided an opportunity for feedback from the European research networking community.

Although the workshop happened to coincide with an airline strike that created difficulties for some of the speakers and participants travelling to Limerick, it was still possible to arrange a full programme. The workshop ran for a full day and was attended by approximately 85 participants.

The opening session provided an overview of the 6NET and Euro6IX projects as well the forthcoming 6th Framework Programme. This was followed by a presentation on IPv6 standards development from Steve Deering, Co-Chair of the IETF IPv6 Working Group.

The second session focused on IPv6 applications such as ISABELv6, a videoconferencing tool that had been ported to IPv6, and the use of VPNs and PKIv6. The following session concentrated on user expectations of IPv6, in particular those of home users. It is not only necessary to provide all the services currently available on the Internet, but also enable them to work with Mobile IP.

The final session dealt with IPv4-to-IPv6 transitional issues. Harald Alvestrand, General Area Director of the IETF, provided a comprehensive overview of the issues and also advanced some possible solutions. This was followed by a question and answer session with the audience.

The discussions focused on the barriers to IPv6 deployment. There was a clear understanding of the technical issues, the costs involved in the transition, and the current lack of a business case combined with user-friendly applications. It was noted that few IPv6 applications are superior to IPv4 legacy applications and that most of the technological limitations of IPv4 have workarounds. It was therefore considered important that the EU and national governments provide their political patronage to those working to deploy IPv6.

The full proceedings of the workshop can be found on the 6NET website at:
http://www.6net.org/events/joint-workshop/

TERENA Conference - Limerick

The TERENA Networking Conference 2002 a great opportunity for people involved in the 6NET, Euro6IX and other IST IPv6 projects, to meet each other and gain an understanding of the different activities. A large number of partners means a large number of scientists, engineers, researchers, managers and students who are focused on the same objective, but this also means it can sometimes be difficult to get to know each other.

The workshop provided participants with the opportunity to better understand the efforts and results of other partners. Thematic sessions focused on specific aspects of the different IPv6 projects; with both technical and management points of view.

Limerick's pubs complimented the formal activities and encouraged human contacts and friendship, whilst ancient castles offered a unique ambience for the after-conference meetings, allowing people to discuss their work in a relaxing and friendly atmosphere.