Mobile IPv6 – Workpackage 4.1

Workpackage 4 of the 6NET project aims to identify and provide all the features necessary for supporting the specified IPv6 applications and services to be trialed in Workpackage 5. Activity 4.3 is concerned with Mobile IPv6 (MIPv6) and, more specifically, the configuration, testing and possible enhancement of MIPv6 over the large IPv6 network instead of 6NET. In this relatively early stage of the 6NET project, one of the first tasks of Activity 4.3 is to investigate the available IPv6 implementations that we may wish to deploy within the 6NET testbed. Consequently, this deliverable provides a survey and evaluation of existing IPv6 implementations. The MIPv6 implementation survey consists of all the implementations that could be handled 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 unknown IPv6 implementations.

From our investigation, it is evident that existing MIPv6 implementations vary in their support of IPv6 features and offer to which draft version they are based on. Based 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, new implementations have support for PAN and a suitable key distribution algorithm. However, the incorporated nature of current MIPv6 implementations is likely to be expected at a time when the level of support that a protocol is still being deployed. While 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 availability of MIPv6 implementations currently available.

The MIPv6 implementations are summarized in this table.

**IPv6 Routing Plan for the 6NET Network – Workpackage 3.1**

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

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

Each 6NET PoP has its own address range for use on links, LANS, etc. There is a naming convention for the equipment used in the 6NET project that basically consists of the two letter country codes with net-id appended to it.

The IPv6 routing protocol to be used for both IPv4 and IPv6 as the Interior Gateway Protocol for distributing the addresses of the core routers. The initial 6NET deployment has to have a fast convergence when there is an outage. BGP will be used to distribute the 6NET IPv6 prefixes into the core network. IGP will be used to exchange IPv6 prefixes between the 6NET core and NRENs and between the 6NET core and external organizations. As for each core PoP, the 6NET router will be connected to the PE router to provide IPv6 Internet access to the 6NET network. The 6NET router will also be connected to the GEANT router to provide Internet access to the 6NET network. An initial configuration template is also described for the routers.

**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 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. 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 capital investment in 6NET will be close to 17 M€ requiring 1200 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 additional countries. The network will be protected against cyber attacks by an IBM-developed firewall. Sophos will supply Sophos products to protect its throughput and core software adapted for IPv6. Sony Europe will bring to the project existing 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 GEANT and MONET networks to support 6NET. The MONET, together with DANTE, TERAENA and the university partners will supply 850 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 and uninterrupted growth of the global Internet can be met by the new IPv6 technology. The deployment and manageability of a large IPv6 network are therefore to be considered including physical infrastructure, addressing and registries, routing, multicast and DNS. Mobile IPv6 and IPv6 strategies for the project, and migration strategies for integrating IPv6 within the existing IPv6 infrastructure are access networks will be implemented.

Happy reading.

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 forget to visit the 6NET website or to contact us if you wish more specific information.

Paul VAN BINST
Cisco Advanced Services has found when working with large, complex networks and network technology, it is good practice to fully test and configure the Cisco IOS suite of services before handing over the complete 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.

IPv4 - IPv6 co-existence, interworking and migration

Experience is extensive and widely applicable concerning the transition strategies for evolving from IPv4 to IPv6 for backbone, full end and edge networks, with consideration of logical issues, to demonstrate how to achieve a smooth integration co-existence of IPv4 and IPv6, through the deployment of a variety of transition methods, including those specified by the IETF “transition” working group to deploy IPv6-only networks at full and edge sites, including including UNI,ANUI and identify further standards, implementations and vendor support required for day-to-day routine use of such networks.

IPv6 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 IPv6 multicasting. This workshop examines these services in their IPv6 environment, but also with respect to their IPv4 equivalents.

IPv6 application and service support

Objectives to identify and provide a framework for the services needed by applications and service providers using IPv6. This work is supported by a number of other projects, such as the IPv6 Networks Technical Working Group (TPWG), which is established to enhance the deployment of IPv6 by providing a comprehensive overview of the issues involved in deploying IPv6 networks, in terms of physical infrastructure, address allocation, registries, routing, DNS operation, network management, etc.

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 of the project, working closely with the hardware suppliers to provide the right 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

Experience is extensive and widely applicable concerning the transition strategies for evolving from IPv4 to IPv6 for backbone, full end and edge networks, with consideration of logical issues, to demonstrate how to achieve a smooth integration co-existence of IPv4 and IPv6, through the deployment of a variety of transition methods, including those specified by the IETF “transition” working group to deploy IPv6-only networks at full and edge sites, including including UNI,ANUI 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 IPv6 multicasting. This workshop 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 a framework for the services needed by applications and service providers using IPv6. This work is supported by a number of other projects, such as the IPv6 Networks Technical Working Group (TPWG), which is established to enhance the deployment of IPv6 by providing a comprehensive overview of the issues involved in deploying IPv6 networks, in terms of physical infrastructure, address allocation, registries, routing, DNS operation, network management, etc.

WP5 - IPv6 middleware and user application trials in demanding environments

Objectives to understand the impact of new, 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 applications and promote the use of the IPv6 among 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) and network management architecture requirements 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 workshops and with IPv6 with focus, to propose a network management and monitoring architecture to help deploy the proposed solution in the 6NET pilot networks, to incorporate the management and monitoring tools into the operational procedures used by RNP and the recommendations for manufacturer management facilities in their equipment, to propose management architectures and monitoring solutions for transition mechanisms experiment implementations to point out security issues for management traffic; staff and special equipment IPv6 transition techniques and make recommendations to handle such situations; to define the required needs to set up an NGG entity and put into operation and define operational procedures for the NOC functioning.

These workpackages are supported by both administrative and technical management tasks (WMP, Project and technical management), and a specific workpackage WMP, dissemination and exploitation of results has been defined for ensuring that the results from the project are thoroughly disseminated and exploited through the network management and monitoring architectural to the other 6NET IPv6 Based pilot project EU/6X and which has been incorporated in the activities in WP6.

The opening session provided an overview of the 6NET and Euro6IX projects as well as the forthcoming 6th Framework Program projects. The 6NET project has received an IPv6 allocation suitable to be used as test and demonstration network to speed up the IPv6 transition in Europe. This allocation was obtained through the Internet号码分配局 (IANA) and it is a strong commitment of the 6NET project partners to foster the use of IPv6.

The discussions focused on the barriers to IPv6 deployment. There was a clear understanding of the technical benefits of IPv6 but also of the costs involved in the transition, and the financial support a business case combined with user-friendly applications. It was noted that IPv6 was superior in applications that made use of the benefits of IPv6 in terms of scalability, security, mobility, etc. The discussions also focused on the serious interest for IPv6 transition by the European community. It was agreed that IPv6 is an important opportunity as it provides a unique approach for the European community to support IPv6 research and development.

The joint 6NET-Euro6IX workshop was held on 5 June 2002 in Limerick, Ireland. The workshop was held in conjunction with the TERENA Networking Conference 2002, which 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 traveling to Limerick, it was still possible to arrange a full programme. The workshop was well attended and was attended by approximately 60 participants.