Project no. 015926

6DISS

IPv6 Dissemination and Exploitation

Instrument: SPECIFIC SUPPORT ACTION

Thematic Priority 2

D14: Final Report

Due date of deliverable: 30th September 2007
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Start date of project: April 1st 2005   Duration: 30 months

Organisation name of lead contractor for this deliverable: Martel GmbH

Revision: V1.0

Abstract

This report concludes the 6DISS project by summarising the achievements obtained, the main outputs, and the resources spent. It covers the full period of the project from April 1st 2005 - September 30th 2007 and is the Final Report from the project.

It has been compiled from the 3 Periodic Activity Reports (April 1st - December 31st 2005, January 1st - December 31st 2006 and January 1st - September 30th 2007) delivered separately to the EC.

It demonstrates that the 6DISS project operated successfully and completed all its contractual commitments on schedule.

There was a very high demand for its services and as many workshops as possible (many more than contractually committed) have been organised with the available budget.

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1 Publishable Executive Summary

6DISS exploited the IPv6 experiences from the major EU R&D projects: 6NET, Euro6IX and GÉANT. The partners aided the deployment of new Internet protocols and services in the specific targeted regions of South-Eastern Europe (Balkan countries), Mediterranean partner countries, Sub-Saharan Africa, Southern Africa, the Newly-Independent States, the Caribbean, the Asia-Pacific region, and South and Central America. Exchanges of information and best practices have also taken place with organisations deploying IPv6 in China and India.

6DISS provided training courses and practical workshops to those responsible for the installation, operation and maintenance of the National Research and Education Networks and other ISPs in these developing regions, and also informed strategists/decision makers in these countries of the benefits of deploying IPv6. The local organisations were heavily involved in the planning of the workshops, the selection of the attendees and the topics to be taught. Furthermore, training of additional trainers was offered, and information was given by equipment manufacturers about new features and products. 6DISS continues the support and collaboration beyond these workshops, through access to experts (the so-called "Tiger Team") for technical queries and operational support.

As expected, collaboration with these countries led to their inclusion in proposals addressing subsequent IST Calls.

Objectives:

The 2 main objectives of 6DISS were:

1. To establish and operate a Specific Support Action of information exchange for the optimal transfer of knowledge on Internet deployment and evolution to emerging research network operators, Universities, commercial organisations, ISPs, governments and regulators in the following regions:
   - The Asia-Pacific region
   - Africa (Southern Africa and Sub-Saharan Africa)
   - South and Central America
   - Mediterranean partner countries
   - South-Eastern Europe (Balkan countries)
   - Newly-Independent States (NIS) of Central Asia
   - The Caribbean

2. To enhance the knowledge base of the partners by exchanging deployment experiences with especially India and China.

Technical Approach:

The 6DISS project prepared and disseminated information relating to IPv6 deployment that had been collected through partners' participation in several European initiatives, such as the 6NET, Euro6IX and GÉANT projects. In this way, existing European R&D results were given increased value and visibility through a structured programme of information exchange and practical support.

The goal of this action was twofold:

- to assist less developed regions to deploy the latest technology in the most efficient manner, and help them to gain experience with IPv6 to be ready for the Next Generation Internet

- to build contacts to organisations in these regions to support and enable their subsequent participation in projects within the IST Programme

The collaboration with the developing regions was ensured and optimised by including in 6DISS those partners who already had close working associations with the research networking communities in the regions, through significant (often leading) roles in ongoing projects (eg. SEEREN, SEE-GRID, SEEFIRE, EUMEDConnect, ALICE, SILK, SPONGE, TEIN2) in precisely those geographic regions being targeted.

Achievements:

The following elements were components of the measure of success of the 6DISS project:

- 8 contractual Workshops were organised during the 30-month duration of the project (2 took place during 2005 (Asia and Southern Africa) and 4 during 2006 (South-Eastern Europe, the Mediterranean countries, South and Central America, and the Sub-Saharan region). The final 2 took place in 2007.

- The extent of further on-going local training/contacts (many additional Workshops were held)

- The number of trained personnel (more than 300 people attended the Workshops)

- Feedback analysis from each Workshop (attendee survey)

- Improvement of the knowledge base in the regions

- Participation to IPv6 Fora, IPv6 Task Forces (national/regional), RIR meetings

Additionally, the project obtained from the regions, information about the status of their Internet deployment. 6DISS also supported the participation of organisations from the visited regions in new IST Calls for Proposals. Two proposals were submitted to the IST Call 6 (April ´06) which included partners discovered through the 6DISS workshops, but unfortunately they were not successful. A further one was submitted in September 2007; the outcome is not yet known.

Dissemination:

The project's public communication strategy was through its Website, EU events, e-learning material, publications, the free availability of the course material, and the "Tiger Team" operating as an open *helpdesk* service. The "Tiger Team" comprised experts within the project, willing to answer questions via e-mail and maintain a list of FAQs regarding equipment configuration, hardware and software requirements, RFCs, etc.

The Tiger Team:

- Can still be reached via the project Website, and offers access to appropriate information to assist in the deployment of IPv6.

- Supports concrete cases of transition to - or coexistence with - IPv6

- Provides details of applications built or ported by other projects

- Maintains the *www.6journal.org* Website (adding new presentations and papers)

- Interfaces to/assist national IPv6 Task Forces and IPv6 Forum as appropriate

- Creates links to interesting IPv6 applications, IPv6 resources, and national resources

The workshops were the main mechanism through which information is transferred to the developing countries. The workshops built constituencies and raised awareness of IPv6, disseminated, benchmarked and validated the research results from IST, promote European technologies, exchanged best practices and explained about activities related to standards and interoperability issues.

Project participants:

1. Martel GmbH, CH (Co-ordinator)
2. Cisco Systems International BV, NL
3. Réseau National de Telecommunication pour la Technologie, l'Enseignement et la Recherche (RENATER), FR
4. Greek Research and Technology Network (GRNET), GR
5. University College London (UCL), UK
6. Trans European Research and Education Networking Association (TERENA), NL
7. University of Southampton (Soton-ECS), UK
8. Fundação para a Computação Científica Nacional (FCCN), P
9. Alcatel CIT, FR
10. Nemzeti Informacios Infrastruktura Fejlesztesi Iroda (HUNGARNET), H

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Total project budget:

€1´053'265

Total EU funding:

€899'908

2 Objectives and major achievements during the full duration of the project

2.1 General Overview

The Strategic Objectives addressed by 6DISS were defined in the Call for Proposals as being:

(i) to enable European researchers to access knowledge, skills, technology and facilities available outside the EU,

(ii) to strengthen Europe's participation in international R&D activities and accompanying measures,

(iii) to exploit R&D and policy complementarities so as to explore mutual benefits of the co-operation and increase access to market opportunities.

6DISS met all of these objectives, targeting precisely the developing regions addressed by the Call, with the subject focus being the way that the Internet (arguably one of the most important structural facilities for any country) should be deployed and evolved. It achieved this objective by exploiting the results of (mainly) the 6NET, Euro6IX and GÉANT projects, which pioneered the deployment of the future Internet protocol (IPv6) throughout European research networks, and whose participants were in the ideal position to assist less developed countries to make this deployment in the most efficient manner. This practical co-operation not only led to an improved quality of the Internet research infrastructure in these countries, but also raised the competence of the organisations and - exploiting the personal contacts made through 6DISS - encouraged their participation in FP7 Calls for Proposals.

The 2 main objectives of 6DISS were stated in the Description of Work as being:

1. To establish and operate a Specific Support Action of information exchange for the optimal transfer of knowledge on Internet deployment and evolution to emerging research network operators, Universities, commercial organisations, ISPs, governments and regulators in the following countries[1]:

    - The Asia-Pacific region
    - Africa[2]
    - South and Central America
    - Mediterranean partner countries[3]
    - South-Eastern Europe (Balkan countries[4])
    - Newly-Independent States (NIS)[5] of Central Asia
    - The Caribbean.

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[1] The specific countries targeted in each region have been selected on the basis that:

- the developing countries are precisely those identified by the Call,

- the countries are generally lagging behind in the deployment of broadband and preparedness for IPv6, and can therefore benefit most from the support of projects which already have the experience,

- the countries are precisely those with which 6DISS partners have very close working relationships,

- the developing countries in Europe are those that - in the longer term - might become candidates for membership of the EU, or are amongst those with which the EU has special international collaborative agreements for participation in the RTD Programmes.

[2] Including sub-Saharan Africa, South Africa, Angola and Mozambique.

[3] Including Turkey

[4] Including the Associated Countries of Bulgaria and Romania. Turkey and the Republic of Moldova will be invited too

[5] Including the neighbouring country of Afghanistan

2. To enhance the knowledge base of the partners by exchanging deployment experiences with especially India and China.

In order to elaborate on these main objectives, the following sub-objectives were identified to explain in more detail the first objective of
"*…establishing and operating a Specific Support Action of information exchange …*" These map directly to objectives specified in the Workprogramme:

- To exploit the skills and knowledge gained by key persons who have had leading roles in the successful major EU R&D projects dealing with the *deployment and evolution of the Internet*: 6NET, Euro6IX and GÉANT. Their knowledge will be enhanced through co-operation with national IPv6 Forums, and international IETF activities, and initiatives in other parts of the world, such as North America (eg. Internet2), India, China and other Asian countries.
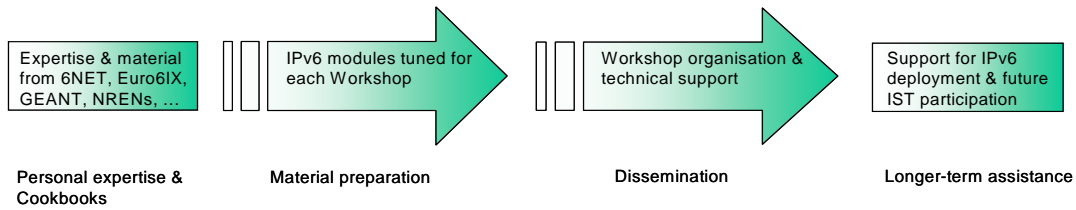
- To disseminate information about IPv6 deployment and migration in fixed and wireless environments contained in so-called "Cookbooks" and "Deployment Guides", presentation slides, and an e-learning course. The material originates from (mainly) the same pathfinder EU IST R&D projects mentioned above (6NET, Euro6IX and GÉANT) which from 2002 - 2005 were directly concerned with the evolution of the Internet through the deployment of IPv6. This is the topic selected by 6DISS as being most appropriate for the targeted developing countries, both for their general economic growth, and for enabling their participation in future IST projects. It is also a subject on which the EC has invested heavily in the 4th and 5th Framework Programmes, and in which Europe is consequently in a leading position, and able to share its experiences regarding deployment in both research and commercial environments.
  Specific material includes how to install IPv6 versions of: DNS, DHCP, routing, multicast, QoS, renumbering, monitoring and management, and applications. The presentation material is being improved throughout the project lifetime, taking into account feedback from the workshops and other events used to build constituencies, raise awareness, and exchange best practices.

- To improve the opportunity for developing countries to participate in European R&D activities, through awareness campaigns, information exchange, the establishment of personal contacts with the relevant organisations, and a better knowledge of the skills and facilities available in these countries. Partners in 6DISS have excellent professional working relations (including also in many cases being responsible for their Internet connectivity to the rest of the world). These countries map perfectly to those that are targeted by the Strategic Objective that this Call addressed.

- To help create a critical mass of state-of-the-art infrastructure in the countries, through the practical assistance and training given. Through 6DISS, the targeted countries now have the opportunity to learn from previous experiences within 6NET, Euro6IX and GÉANT and, having fewer legacy installations, can upgrade more easily and catch up quickly with their counterparts in the more developed regions

- To promote European technologies. The next generation of the Internet is becoming IPv6 enabled; Europe has a strong competence in this technology, helped by the co-funding by the EU of many projects in this area within the 4th, 5th and 6th Framework Programmes.

- To inform the workshop participants of the key activities related to standards and interoperability. 6DISS partners participate in the IETF, Internet2, many national IPv6 Forums, and other IST projects, from where they will bring this knowledge.

Diagrammatically, the key thread of the 6DISS approach is shown following:

Personal expertise & Cookbooks   Material preparation   Dissemination   Longer-term assistance

The target countries for 6DISS were ones most likely to benefit from IPv6 adoption, due to their current shortage of global IPv4 addresses. All of the Internet Registries in these regions have issued statements in 2007 recommending ISPs in their continents to move now to IPv6 (see Annex 3 of this report).

2.2 State-of-the-Art

2.2.1 Background information about the projects 6NET, GÉANT, EURO6IX
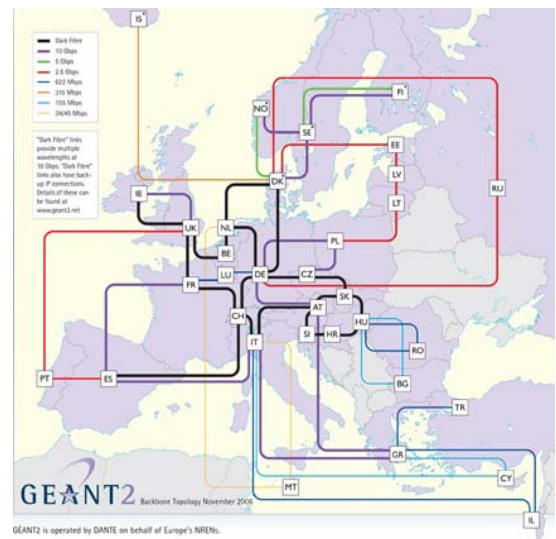
6NET (www.6net.org)

Starting in January 2002, the 6NET project built the largest native IPv6 network in Europe. Partners used this testbed to define and document strategies and procedures for the migration from IPv4 to IPv6 and the deployment of DNS, DHCP, Routing, QoS, Mobile IP, Multicast, Renumbering, Monitoring and Management tools, and Applications. These documents, termed "Cookbooks" *(how-to* manuals), have been used in the preparation of practical training material, and supplemented with knowledge from other regions (eg. N. America and Asia).
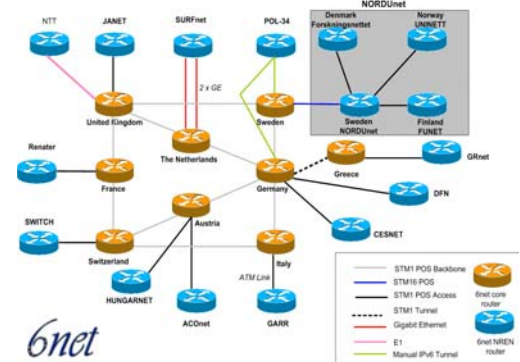
GÉANT (www.dante.net/geant)

The GÉANT project provides and manages the pan-European production Internet network for the research community. This network covers all European countries (not just the EU member states), and is closely associated with similar initiatives in N. America (Internet2), Japan (WIDE) and Latin America. DANTE and the European NRENs implemented the initial GÉANT network in late 2001. It now forms the world's largest research and education network, connecting over 4,000 academic and research centres in 34 countries with an overall capacity across the network in excess of 180 Gbps. GÉANT is the 6th generation of European research network and has been funded in part by the EC since November 2000, with 28 European NRENs as participants and DANTE as the Coordinating Partner. GN2, a successor programme to GÉANT, obtained EC funding support through FP6 and

started on 1st September 2004. Of the South-Eastern European countries, only Greece, Croatia, Hungary, Romania and Turkey are already connected to the GÉANT network. Bulgaria will be connected to GÉANT in the GN2 project. The rest of the South-Eastern European countries (Albania, Bosnia-Herzegovina, FYR of Macedonia, and Serbia-Montenegro) are not connected to GÉANT directly, but their connectivity is provided via GRNET (a partner in 6DISS).

Other partners in 6DISS provide additional connectivity to Korea, the Mediterranean countries (EUMEDConnect), South and Central America (ALICE), Sub-Saharan Africa and Central Asia (SPONGE/SILK). GÈANT recently connected to India (ERNET) and discussions are ongoing concerning connectivity from Europe to China.

EURO6IX (www.euro6ix.org)

The goal of the Euro6IX project was to support the rapid introduction of IPv6 in Europe. It was based on a Pan-European network (native IPv6), and included activities such as network design, deployment, research on advanced network services, development of applications, and dissemination activities, including events and conferences, contributions to standards (IETF and RIPE among others).

Whereas 6NET developed IPv6 network services and built an IPv6 network for the *research* community, Euro6IX installed Internet Exchanges and services at national and regional levels for *commercial* users (i.e. Internet Service Providers). These Internet Exchange Points are operated mainly by the traditional telco organisations. Those represented in the project were: Telefonica, British Telecom, France Telecom, Portugal Telecom, Telecom Italia, and T-Systems.

Both 6NET and Euro6IX identified applications that could take advantage of the new Internet protocol, and these were often developed, tested and demonstrated jointly.

2.2.2 Background information about the projects SEEREN, EUMEDConnect, ALICE, SILK/SPONGE

SEEREN (www.seeren.org)

The South Eastern European Research and Education Networking initiative (SEEREN) aimed at expanding European research networking in SE Europe by providing connections between GÉANT and the NRENs in Greece, Hungary, Romania, Albania, Bosnia-Herzegovina, Bulgaria, FYR of Macedonia, and Serbia-Montenegro. Greece, Hungary and Romania already have GÉANT connectivity; the other countries listed were therefore intended to be the main beneficiaries of SEEREN. SEEREN supervised the design and implementation of the connectivity between the partner NRENs and the regional GÉANT points of presence. These international connections opened doors for the beneficiaries to the many scientific and educational communities of the European Union. The partners that participated in the SEEREN FP5 IST project are shown in the figure alongside.

EUMEDConnect (www.dante.net/eumedconnect)

EUMEDConnect is the name given to the principal infrastructure project being funded by the EUMEDIS Programme. The project was formulated through a series of expert meetings hosted by the European Commission in early 2001 with representatives from research networks from Europe and the Mediterranean regions. The outcome was a two-phase project to plan and deploy IP infrastructure in the Mediterranean region with links to the Pan-European research network, GÉANT.
The first phase started in December 2001 and completed in June 2002. Phase 2 started in November 2002 and included the tendering for the connectivity needed as a result of the first phase planning studies. Connections for Mediterranean NRENs started to be provided from January 2004.

ALICE (http://europa.eu.int/alice and www.dante.net/alice)

The project ALICE (America Latina Interconectada Con Europa) puts into practice the declaration made during an EU-LAC Summit held in Madrid in June 2002, where Heads of State and Government of both regions agreed that "scientific research and technical development are fundamental elements in our relations and are an essential condition for the successful insertion of countries into a globalised world. It is convenient to share knowledge, technology and information, taking advantage of the connectivity of infrastructure and to encourage all peoples to gain universal access". This constituted a step towards a broader co-operation for the development of a World Wide Research and Education Network, as proposed in the Commission Communication on the UN World Summit on Information Society.

SILK/SPONGE (http://www.silkproject.org)

The ancient Silk Road was not only a trade route but also an all-important road for the transfer of information and knowledge between major regions of the world. The SILK project is bringing cost effective, global Internet connectivity to nine former Soviet republics (NISs) through state-of-the-art satellite technology, thus creating a *virtual* SILK information highway. The aim of the SILK project is to increase significantly the exchange of information with, and between, academic and educational institutions in these regions. The network is now operational in eight countries.

There are some technical novelties - like the way bandwidth is shared, caching, some use of Voice/IP and experiments in IPv6. It has had a significant impact in the region – and has included video conferences involving several Heads of State. It also includes a training function, and this experience has been exploited for the benefit of 6DISS.

2.2.3   State of the art in IPv6 standardisation

Relevant IETF WGs that are currently active include:
- Site Multihoming by IPv6 Intermediation (shim6)
- IPv6 Tunnelling Mechanisms (softwire)
- IPv6 over low power WPAN (6lowpan)
- Dynamic Host Configuration (dhc)
- Mobility for IPv6 (mip6)
- Mobility for IP: Performance, Signaling and Handoff Optimization (mipshop)
- Network Mobility (nemo)
- Mobile Nodes and Multiple Interfaces in IPv6 (monami6)
- IPv6 Maintenance (6man)

Site Multihoming by IPv6 Intermediation (shim6 WG)

Site multi-homing is an arrangement by which a site may use multiple paths to the rest of the Internet, to provide better reliability for traffic passing in and out of the site than would be possible with a single path. Some of the motivations for operators to multi-home their network are described in [RFC3582].

In IPv4, site multi-homing is achieved by introducing the additional state required to allow session resilience over re-homing events to the global Internet routing system (sometimes referred to as the

Default-Free Zone, or DFZ) [I-D.ietf-multi6-v4-multihoming]. There is concern that this approach will not scale [RFC3221].

In IPv6, site multi-homing in the style of IPv4 is not generally available to end sites due to a strict route aggregation in the DFZ, coupled with Regional Internet Registry (RIR) allocation policies which prohibit the direct assignment of provider-independent (PI) addresses to most end users. Site multi-homing for sites without PI addresses is achieved by assigning multiple addresses to each host, one from each provider. This multi-homing approach provides no transport-layer stability across re-homing events.

Shim6 introduces transport-layer mobility across re-homing events using a layer-3 shim approach. State information relating to the multi-homing of two endpoints exchanging unicast traffic is retained on the endpoints themselves, rather than in the network.

Communications between *shim6*-capable hosts and *shim6*-incapable hosts proceed as normal, but without the benefit of transport-layer stability. The *shim6* approach is thought to have better scaling properties than the IPv4 approach, at the expense of somewhat reduced operational capability.

IPv6 Tunnelling Mechanisms (softwires WG)

The *softwires* WG is specifying the standardisation of discovery, control and encapsulation methods for connecting IPv4 networks across IPv6 networks, IPv6 networks across IPv4 networks in a way that will encourage multiple, interoperable vendor implementations.

An important aspect of the problem is that softwires are to be used in IP based networks to forward both unicast and multicast traffic. They are also assumed to be non-ephemeral in nature, thus they are persistent or long-lived. Last, the setup time of a softwire is expected to be a very small fraction of the total setup time of the CPE/Address Family Boundary Router (AFBR)

The issue has been separated into two separate "sub-problems", referred to as "Hub and Spoke" and "Mesh". The primary difference between these two problems is how many connections and associated routes are managed by each IPv4 or IPv6 island. "Hub and Spoke" is characterised with one connection and associated static default route, and "Mesh" is characterised by multiple connections and routing prefixes.

During the solution phase of the WG, these problems will be treated as related, but separable, problem spaces. Similar protocols and mechanisms will be used when necessary, but may vary when necessary to optimize for the requirements of the given problem space.

IPv6 over low power WPAN (6lowpan)

Well-established fields such as control networks, and emerging ones such as sensor networks, are increasingly being based on wireless technologies. Most of these nodes are amongst the most constrained that have ever been networked wirelessly. Extreme low power (such that they will run potentially for years on batteries) and extreme low cost are seen as essential enablers towards their deployment in networks.

The IEEE 802.15.4 standard is very promising for the lower (physical and link) layers. As for higher layer functions, there is considerable interest from non-IETF groups in using IP technology (the ZigBee Alliance[6], for example, is currently studying what such a work item might entail). This WG is expected to coordinate and interact with such groups.

The scope of *6lowpan* is to:

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[6] www.zigbee.org

- Produce problem statements, assumptions and goals for *6lowpan* networks (draft-ietf-lowpan-goals-assumptions-xx.txt)
- Define the basic packet formats and sub-IP adaptation layer for the transmission of IPv6 packets over IEEE 802.15.4. This includes framing, adaptation, header compression and address generation. (Furthermore, IEEE 802.15.4 devices are expected to be deployed in mesh topologies, and as such, the WG may also work on an informational document to show how to apply an existing MANET protocol to *6lowpan* networks (eg., AODV, OLSR, DYMO, etc).

Dynamic Host Configuration (dhc)

DHCPv6 is currently a "Proposed Standard" and is documented in RFC 3315. Subsequent RFCs document additional options and other enhancements to the specifications.

The current DHCPv4 and DHCPv6 specifications (RFC 2131, RFC 2132, RFC 3315 and subsequent RFCs) do not explicitly explain how a dual-stack host uses DHCP to obtain configuration settings for both IP stacks. The *dhc* WG is therefore evaluating solutions for the configuration of dual-stack hosts through DHCP and will select a solution that will be developed and published by the WG.

The *dhc* WG will also evaluate solutions for informing DHCPv6 clients of changes in configuration information and select a solution that will be developed and published by the WG. RFC 3315 includes a mechanism (stateless DHCPv6) through which clients can obtain other configuration information without obtaining an address or addresses. However, RFC 3315 includes no provision for notifying DHCPv6 clients using stateless DHCPv6 of changes in the configuration information supplied to the client, nor any recommendations as to when a client should obtain possibly updated information.

Mobility for IPv6 (mip6)

The *mip6* WG specifies routing support which permits an IPv6 host to continue using its home address as it moves around the Internet, enabling continuity of sessions. Mobile IPv6 supports transparency above the IP layer, including maintenance of active transport level sessions. The base specifications for Mobile IPv6 are RFC 3775 and RFC 3776.

The primary goal of the *mipv6* WG is to enhance base IPv6 mobility by continuing work on developments that are required for wide-scale deployments. Additionally the WG will ensure that any issues identified by implementation and interoperability experience are addressed, and that the base specifications are maintained. The WG will also produce informational documentation, such as design rationale documents or description of specific issues within the protocol. Deployment considerations call for work to reduce per-mobile node configuration and enrollment effort, solutions to enable dual stack operation, mechanisms to support high-availability home agents, and ways to employ Mobile IPv6 in the presence of firewalls.

Mobility for IP: Performance, Signaling and Handoff Optimization (mipshop)

Mobile IPv6 enables IPv6 mobile nodes to continue using a given "home address" in spite of changes in its point of attachment to the network. Such changes may otherwise cause packet loss, and also represent overhead traffic on the network. The original *mipshop* charter directed the group to continue the work started by the Mobile IP WG on two technologies to address these issues; namely:

- Hierarchical Mobile IPv6 (HMIPv6, RFC 4140), which reduces the amount and latency of signalling between a Mobile Node, its Home Agent and one or more correspondent nodes, and
- Fast Handovers for Mobile IPv6 (FMIPv6, RFC 4068), which reduces packet loss by providing fast IP connectivity as soon as the mobile node establishes a new point of attachment at a new link.

As part of its previous set of work items, *mipshop* published these two protocols as experimental RFCs. Further implementation work by the community has increased the understanding of how FMIPv6 behaves or should behave on other link layers. Similarly, further implementation and experimentation with HMIPv6 has resulted in better understanding of the protocol. Accordingly, the *mipshop* work will continue to prepare the HMIPv6 and FMIPv6 RFCs as proposed standards.

Network Mobility (nemo)

The *nemo* WG is concerned with managing the mobility of an entire network, which changes, as a unit, its point of attachment to the Internet and thus its reachability in the topology. The mobile network includes one or more mobile routers (MRs) which connect it to the global Internet.

A mobile network is assumed to be a leaf network, i.e. it will not carry transit traffic. However, it could be multihomed, either with a single MR that has multiple attachments to the Internet, or by using multiple MRs that attach the mobile network to the Internet. Initially, the WG is assuming that none of the nodes behind the MR will be aware of the network's mobility, thus the network's movement needs to be completely transparent to the nodes inside the mobile network. This assumption will be made to accommodate nodes inside the network that are not generally aware of mobility. A basic approach for network mobility support is for each MR to have a Home Agent (HA), and use bidirectional tunnelling between the MR and HA to preserve session continuity while the MR moves. The MR will acquire a "Care-Of" address from its attachment point, much like what is done for Mobile Nodes using Mobile IP. This approach allows the nesting of mobile networks, since each MR will appear to its attachment point as a single node. The WG will take a stepwise approach by standardising some basic support mechanisms based on the bidirectional tunnelling approach, and at the same time study the possible approaches and issues with providing more optimal routing than can be had with (potentially nested) tunnelling.

Mobile Nodes and Multiple Interfaces in IPv6 (monami6)

There is currently rapid development in the area of new wireless standards (802.11*, 802.16, 802.20, UMTS, Bluetooth and others). At the same time, terminals which have radio and protocol support for multiple standards are appearing. This opens the possibility of using multiple access types simultaneously, with each access used to transport the traffic for which it is most appropriate. For instance, an intermittent, but high-bandwidth access type might be used for file transfers (eg. music download) while a low-bandwidth, high reliability access might simultaneously be used for a voice call. In the meantime, IP-level mobility support protocols such as Mobile IPv6 (RFC 3775) and NEMO Basic Support (RFC 3963) have been conceived by the IETF to support handoffs for IPv6 mobile hosts and routers, respectively. However, these protocols do not today provide standardised support for simultaneous differentiated use of multiple access technologies, although several proposals exist for such support, and some of them have been implemented and tested.

The objective of the *monami6* WG is to produce a clear problem statement and to produce standard track specifications to the straightforward problems associated with the simultaneous use of multiple addresses for either Mobile Hosts using Mobile IPv6 or Mobile Routers using NEMO Basic Support and their variants (FMIPv6, HMIPv6, etc). Where the effects of having multiple prefixes on a single interface is identical to the effects of having multiple interfaces each with a single prefix, *monami6* considers a generalised approach to cater for multiple prefixes available to a Mobile Host/Router. Once this is done, the WG might re-charter in order to work on more generic issues that prevent taking advantage of the multiple "Care-Of" addresses and Home addresses available to Mobile Nodes and Routers.

IPv6 maintenance (6man)

The core IPv6 standards are stable, to the extent that they can be deployed today. This status is reflected by the fact that the IPv6 Working Group in the IETF has been closed and replaced with one entitled '6man' which is responsible for the maintenance, upkeep, and advancement of the core IPv6 protocol specifications. No further core IPv6 standards developments are seen to be required; the '6man' Working Group will address protocol limitations/issues discovered during deployment and operation. In parallel, the research community and the IETF are working on specifying associated protocols and mechanisms (e.g. IPv6 on Customer Premises Equipment, IPv6 on WiMAX, IPv4-IPv6 transition, IPv6 firewalls, IPv6-only networks, and an improved solution for multi-homing), so that the capabilities and functionality of IPv6-enabled networks are being continuously extended.

2.3   Objectives and results for the project as a whole

WP0 objectives:
- To confirm that the overall resources used are consistent with the work performed
- To ensure the correct progress of the work so that the results of the project adhere to the contract
- To ensure that there is adequate collaboration among the teams working on different WPs
- To organise and co-ordinate the production of Deliverables, meetings, workshops
- To resolve any project internal conflicts and build evaluation into the project's work
- To administer the project resources and monitor project spending
- To report to the EC the project progress
- To represent the project actively in whatever relevant concertation mechanisms may be established and liaise with other projects with which a close association can be beneficial

WP1 objectives:
- To finalise the programme of workshops
- To produce and maintain the project slide pack containing presentations on all relevant topics
- To liaise with the organisations responsible for the workshop logistics, to agree the specific material and expertise that is required
- To disseminate the information through practical workshops to the identified developing countries
- To follow-up these workshops through the "Tiger Team", giving support for specific technical queries
- To report on the status of Internet connectivity and (especially IPv6) deployment in the regions
- To encourage and assist the organisations throughout all these activities, with their participation in future responses to IST Calls for Proposals

WP2 objectives:
- To train a set of experienced people so they can organise training session in their own region.
- To establish a "trainers club" to continue to exchange experience and skills on Internet / IPv6 teaching
- To build a specific set of tutorial material suited to Internet / IPv6 trainers' needs.

- To develop an IPv6 training course for engineers (e.g. deployment engineers, maintenance engineers, NOC personnel)
- To give IPv6 training to engineers (e.g. deployment engineers, maintenance engineers, NOC personnel) in a testbed laboratory
- To provide e-learning material ranging from an animated introduction to IPv6 and where 6NET Cookbook can be found, through to an interactive "hands-on" configuration exercise on remote testbed equipment

WP3 objectives:

- To design, produce and host a high-quality Website, with public and private areas.
- To populate the Website with all public material from 6DISS, and to add links to appropriate related projects.
- To add features for assisting the project management (e.g. mailing lists and other electronic services that may be required internally (e.g. meeting scheduler)).
- To make available the proceedings of each workshop on the Website
- To produce CD-ROMs of the proceedings of workshops for those regions where Internet connectivity is poor and the material cannot be easily downloaded from the 6DISS Website.
- To obtain feedback from the participants of each workshop, in order to continually improve the quality of the courses.
- To provide a comprehensive report on each workshop.

16 Deliverables (all public) were produced by the project:

Del. No.	Deliverable name	WP no.	Lead particip-ant	Estimated person-months	Del. type	Security	Delivery (project month)
D01	Project Presentation	0	Martel	0.5	Report	Public	M01
Outline: This Deliverable is a 2-page description of the project. It will be used to publicise the project on the EC Website and in EC publications, and as an introduction for other projects considering liaison with 6DISS.							
D02	Workshop Schedule	1	Martel	1	Report	Public	M03
Outline: This Deliverable gives the final schedule of the workshops, the locations, the parallel events with which synergy will be exploited, the local organiser, the lead partner from 6DISS and the partners that will also attend for support.							
D03	Report on the workshop and status of Internet connectivity in Southern Asia	1	Soton-ECS	3	Report	Public	M07
Outline: This document presents the status of the major Internet connectivity links deployed by the NRENs in Southern Asia at the time of the 6DISS workshop. A report from the workshop is included in the form of: a) the presentation material, b) the attendees and their affiliations, c) an assessment of the opportunities for further co-operation and follow-up actions planned, d) an analysis of the feedback questionnaire.							
D04	Report on the workshop	1	Cisco	3	Report	Public	M10

	and status of Internet connectivity in Southern Africa						

Outline: This document presents the status of the major Internet connectivity links deployed by the NRENs in Southern Africa at the time of the 6DISS workshop. A report from the workshop is included in the form of: a) the presentation material, b) the attendees and their affiliations, c) an assessment of the opportunities for further co-operation and follow-up actions planned, d) an analysis of the feedback questionnaire.

D05	Report on the workshop and status of Internet connectivity in South and Central America	1	TERENA	3	Report	Public	M15

Outline: This document presents the status of the major Internet connectivity links deployed by the NRENs in South and Central America[7] at the time of the 6DISS workshop. A report from the workshop is included in the form of: a) the presentation material, b) the attendees and their affiliations, c) an assessment of the opportunities for further co-operation and follow-up actions planned, d) an analysis of the feedback questionnaire.

D06	Report on the workshop and status of Internet connectivity in the Mediterranean partner countries	1	RENATER	3	Report	Public	M16

Outline: This document presents the status of the major Internet connectivity links deployed by the NRENs in the Mediterranean partner countries at the time of the 6DISS workshop. A report from the workshop is included in the form of: a) the presentation material, b) the attendees and their affiliations, c) an assessment of the opportunities for further co-operation and follow-up actions planned, d) an analysis of the feedback questionnaire.

D07	Report on the workshop and status of Internet connectivity in the Balkan countries	1	GRNET	3	Report	Public	M17

Outline: This document presents the status of the major Internet connectivity links deployed by the NRENs in the Balkan countries at the time of the 6DISS workshop. A report from the workshop is included in the form of: a) the presentation material, b) the attendees and their affiliations, c) an assessment of the opportunities for further co-operation and follow-up actions planned, d) an analysis of the feedback questionnaire.

D08	Report on the workshop and status of Internet connectivity in the sub-Saharan Africa countries	1	RENATER	3	Report	Public	M23

Outline: This document presents the status of the major Internet connectivity links deployed by the NRENs in the sub-Saharan Africa countries at the time of the 6DISS workshop. A report from the workshop is included in the form of: a) the presentation material, b) the attendees and their affiliations, c) an assessment of the opportunities for further co-operation and follow-up actions planned, d) an analysis of the feedback questionnaire.

D09	Report on the workshop	1	UCL	3	Report	Public	M27

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[7] This information will be extracted from information available from ALICE

	and status of Internet connectivity in the NIS countries						

Outline: This document presents the status of the major Internet connectivity links deployed by the NRENs in the NIS countries at the time of the 6DISS workshop. A report from the workshop is included in the form of: a) the presentation material, b) the attendees and their affiliations, c) an assessment of the opportunities for further co-operation and follow-up actions planned, d) an analysis of the feedback questionnaire.

D10	Report on the workshop and status of Internet connectivity in the Caribbean	1	TERENA	3	Report	Public	M29

Outline: This document presents the status of the major Internet connectivity links deployed by the NRENs in the Caribbean at the time of the 6DISS workshop. The report from the workshop is included in the form of: a) the presentation material, b) the attendees and their affiliations, c) an assessment of the opportunities for further co-operation and follow-up actions planned, d) an analysis of the feedback questionnaire.

D11	"Training the Trainers" Material	2	Cisco	2	Report	Public	M06

Outline: This Deliverable represents the full set of course material that will be made available to persons who will be responsible for training in the local regions.

D12	"IPv6 Training" Material	2	Cisco	2	Report	Public	M12

Outline: This Deliverable comprises the set of training material that will be given to engineers who attend the hands-on training courses in the Brussels laboratory.

D13	E-learning Material	2	Cisco	2	Report	Public	M06

Outline: This Deliverable is an on-line software package that will explain to users the main features of IPv6 and guide them to appropriate reference material (e.g. 6NET Cookbooks, IETF standards). It will also incorporate the capability to remotely configure routers and to "see" the results.

D14	Final Report	0	Martel	1	Report	Public	M30

Outline: This report concludes the project by summarising the achievements obtained, the main outputs, and the resources spent.

D15	Report on Raising Public Participation and Awareness	1, 3	Soton-ECS, TERENA	1	Report	Public	M30

Outline: This report summarises the way that an increase in public awareness has been achieved, eg. through the workshops, the Tiger Team services, and downloads of project documents from the Website.

D16	Initial/Final Plan for Using and Disseminating Knowledge	0	Martel	1	Report	Public	M6 M30

Outline: The first version of this Deliverable identifies the target group of recipients of the 6DISS information, and documents the plans for reaching these people within the project timeframe. The final version summarises the dissemination that was made, and reports on the plans for continuing any co-operations (within a research environment or commercially) beyond the end of the project.

In addition, WP0 produced bi-monthly progress reports and periodic reports for the project reviews. These are not specifically listed in the above table as Deliverables.

All of the 20 contractual milestones were also successfully met:

Workshop Milestones:

01:	1st Workshop (in Asia)	Y1/Q2 (August 2005)
02:	2nd Workshop (in Southern Africa)	Y1/Q2 (September 2005)
03:	3rd Workshop (in South- and Central America)	Y1/Q4 (March - April 2006)
04:	4th Workshop (in the Mediterranean countries)	Y2/Q1 (April 2006)
05:	5th Workshop (in the Balkans)	Y2/Q1 (April 2006)
06:	6th Workshop (in Sub-Saharan Africa)	Y2/Q3 (October - December 2006)
07:	7th Workshop (in the Newly-Independent States)	Y3/Q1 (April - June 2007)
08:	8th Workshop (in the Caribbean)	Y3/Q2 (July - September 2007)

Other Milestones were:

09:	Website operational with public and private areas	Month 01
10:	Slide pack complete	Month 03
11:	Workshop schedule defined	Month 03
12:	E-learning modules ready	Month 06
13:	Remote configuration of testbed equipment enabled	Month 06
14:	1st Project Review successfully completed	Month 10
15:	1st "Training the Trainers" course held	Month 12
16:	Subsequent "Training the Trainers" courses (according to demand)	Month 13-30
17:	1st "IPv6 Training" course held	Month 15
18:	Subsequent "IPv6 Training" courses (according to demand)	Month 16-30
19:	2nd Project Review successfully completed	Month 22
20:	Project successfully completed	Month 30

10 Plenary Meetings were held:

- Kick-off meeting, Brussels, 18th- 19th April, 2005
- Plenary Meeting/ General Assembly, Paris, June 13th, 2005
- Plenary Meeting/ General Assembly, Paris, September 12th- 14th September, 2005
- Plenary Meeting/ General Assembly, London, 17th – 19th January, 2006
- 1st Project Review, Brussels, 1st February, 2006
- Plenary Meeting/ General Assembly, Lisbon, 11th- 12th May, 2006
- Plenary Meeting/ General Assembly, Brussels, 16th October, 2006
- 2nd Project Review, Brussels, 5th - 6th February, 2007
- Plenary Meeting/General Assembly, Athens, 31st May - 1st June, 2007
- 3rd Project Review, Brussels, 1st October, 2007

2 testbeds were built (Brussels and Paris) for anyone to access remotely and make IPv6 experiments. At the end of the project, the remote testbed in Brussels was donated by Cisco to GRNET and moved

to Sofia (Bulgaria) in order to guarantee its sustainability. The Bulgarian Research and Education Network (BREN) will use the testbed for internal IPv6 training purposes, and also guarantee its availability (with priority) for any IPv6 training courses run by 6DISS or a follow-on project. GRNET will supervise the operation and maintenance of the testbed.

The material for all the IPv6 training modules was continually checked and updated. .pdf versions are freely available from the Website.

The project was very active regarding dissemination. Apart from the several contractual - and additional - workshops and training sessions, 6DISS partners made presentations at the following conferences/workshops:

- 6DISS attended and made presentations at all the AfriNIC meetings (AfriNIC-4, Nairobi, AfriNIC-5, Mauritius), since initially starting the collaboration with this organisation in Cairo in December ´05 (AfriNIC-3).

- Conference/Workshop presentations mentioning 6DISS were given at:
    - ICCI2005, Beijing, June 26th – 29th, 2005
    - IPv6 Summit, Beijing, April 4th – 5th, 2005
    - IPv6 Summit, Barcelona, June 6th – 10th, 2005
    - RIPE 50, Stockholm, May 4th, 2005
    - RIPE 51, Amsterdam, October 10th – 14th, 2005
    - TF-NGN, Athens, October 19th, 2005
    - AfriNIC, Cairo, November 22nd – 24th November, 2005
    - 1st Campus IPv6 workshop, Budapest, 1st – 5th October, 2005
    - A meeting with a delegation from New Zealand visiting the EC on 20th March, 2005
    - FCCN prepared and presented "SSM with IPv6" by video-conference from Lisbon to the CUDI Spring Meeting 2006 (4 April, Oaxaca, Mexico)
    - The IST/Go4IT interoperability event in Beijing (http://www.go4-it.org/modules/news/article.php?storyid=2) together with the China IPv6 summit (12-14 April ´06). Cisco presented the 6DISS activities there in a parallel session related specifically to IPv6
    - The IST-Africa Conference (Pretoria, 1-5 May), organised by the "eChallenges" Unit of the EC, together with the South African Department of Science & Technology, the Council for Scientific & Industrial Research and the Meraka Institute
    - The eInfrastructures workshop on 2 May in Pretoria
    - The IPv6 DFI'06 (Deploying the Future Infrastructure) workshop in California on 16-18 July ´06
    - The IPv6 TD´06 workshop (Today - Technology and Deployment) in Bucharest (http://www.6diss.org/workshops/ipv6td/), which took place on 1-2 August ´06
    - The ISOC/IPv6 Forum meeting, Dakar, Senegal (23 October ´06)
    - The IQPC Softswitching Conference, Berlin (26 October ´06)
    - The French World IPv6 Summit, Cannes (13 November ´06)
    - The Concertation Meeting for testbed projects, Helsinki (20 November ´06)
    - The IST2006 (Helsinki) "Networking session" on Emergency Communications (22 November ´06)

- Posters and leaflets were on display at the Swiss ICT Summit in Lausanne (4 December ´06)
- The eInfrastructure Concertation Meeting in New Delhi (14-15 December´06). This event gave 6DISS the opportunity to exchange information regarding IPv6 deployment in India, which is one of the objectives of the project.
- Interworking 2006 Conference, Santiago, Chile, January 15th - 17th 2007
- Cisco "Networkers" Conference, Cannes, 30th January, 2007
- IARIA and IPv6TD conferences, Guadeloupe, 5th - 8th March, 2007
- IPv6 Summit, Rabat, Morocco, 27th March, 2007
- TERENA Networking Conference 2007, Lyngby, Denmark, 21st -24th May, 2007
- IPv6DFI 2007, Athens, 27th - 29th June, 2007
- 24th APAN Meeting, Xi'an, China, 27th - 31st August, 2007

6 newsletters were produced:
- 6DISS project to deliver IPv6 message worldwide - *1 Jun '05*
- 6DISS IPv6 Training Workshops - *19 Aug '05*
- 6DISS supports IPv6 deployment in Africa - *19 Oct '05*
- 6DISS supports IPv6 training at AfriNIC-3 - *12 Jan '06*
- 6DISS strengthens its collaboration with AfriNIC and AfNOG - *30 Apr '06*
- 6DISS goes Latin - *4 Aug '06*

2 information sheets were written:
- IPv6 Deployment Guide - *5 Oct '05*
- 6DISS Informational Sheet - *16 Oct '06*

3 newsletters were compiled:
- 6DISS in South-East Europe Newsletter No.1 - *Oct '05*
- 6DISS in South-East Europe Newsletter No.2 - *Jan '06*
- 6DISS in South-East Europe Newsletter No.3 - *Jun '06*

6DISS has allowed the IST FP6 BELIEF project to put all public 6DISS information (including the e-learning course) into their Digital Library. This information can be reached at http://belief02.isti.cnr.it/ following the "Browse + Projects + 6DISS" tabs/commands sequence, or entering the Digital Library environment from the project's website at http://www.beliefproject.org/.

The Website www.6diss.org (with public and private pages) remains operational and has been populated with many useful entries, including a calendar of related events, schedules for the upcoming workshops, information for workshop hosts, reports from the workshops that have been held, press releases, links to appropriate external documentation, etc.

Russian and Portuguese sub-titles were added to the e-learning course.

3 Workpackage progress for the period

3.1   WP0: Project Administrative and Technical Management

WP0 dealt with the day-to-day management of the project, payments, Contract Amendments, cost statements, liaison with the Commission and other projects, reporting, etc.

3.1.1   WP0 Achievements

In the **first year** of 6DISS, a project handbook was produced, containing the contact details of partners, an overview of the project, document numbering scheme, payment cycle, reporting and Deliverable templates, etc. A Consortium Agreement was approved. The kick-off meeting was organised and held successfully in Brussels, hosted by Cisco. Two more Plenary meetings were held subsequently, in Paris; one at Alcatel's headquarters on 13th June and one at RENATER's headquarters on 12th - 14th September 2005. The minutes were sent to the project officer. Some work in support of the technical activities was also performed by WP0. For example, WP1 and WP3 were helped in the planning of the Asia-Pacific and Southern Africa workshops (ie. liaison with the organisers, defining the modules to be presented, selecting the 6DISS partners who will attend, obtaining travel permissions, providing Website content, reminding representatives of the information to be collected for the Deliverables D03 and D04, etc.).

During the **second year** of 6DISS, all of the contractual Deliverables and Milestones were achieved, and - due to enormous interest in its IPv6 workshops - partners made several additional practical training sessions around the world. The EC was requested to allow unused budget originally allocated for local organisational expenses to be used for funding the extra personnel and travel costs for satisfying these additional demands for workshops. It was also necessary for some partners to spend budget originally anticipated for personnel costs on travel. The first major achievement in Year 2 was the successful completion of the 1st Review, which was held in Brussels on 1 February ´06. The report from the reviewers was generally very positive, and it was pleasing to see that the hard work in the project was appreciated. Some recommendations were made by the reviewers, and these were taken into account as the project moved forward. Contract Amendment 1 (mainly to incorporate HUNGARNET and change the official Cisco partner from Belgium to The Netherlands) was accepted by the EC.

The Cost Claims for the first 9 months of the project were collected from the partners. All of the EC requests for clarifications regarding Cost Claim 1 were answered, and the EC contracts department processed the next pre-payment. The money was distributed to the partners in accordance with the tables given in the PMR.

WP0 built collaboration with the IST projects Go4IT, ISSeG and BELIEF:

- Go4IT organised an interoperability event in Beijing where IPv6 vendors were invited to test their solutions against others (http://www.go4-it.org/modules/news/article.php?storyid=2). The event was held together with the China IPv6 summit (12-14 April). Cisco attended and presented the 6DISS activities there in a session related specifically to IPv6.
- Liaison with ISSeG (Integrated Site Security (ISS) for Grid centres). A link to ISSeG has been made from the 6DISS "Related Activities" Webpage http://www.6diss.org/related/ under "IST Projects" expressing the intention that the two projects will identify technical areas of mutual interest, which overlap the wide-area networking domain of 6DISS and the site security domain of ISSeG and will

organise - as appropriate - actions of mutual benefits such as the cross-referencing of educational material. ISSeG has made a similar reference to co-operation with 6DISS on their Website.

- 6DISS has allowed the BELIEF project to put all its public information (including the e-learning course) into their Digital Library. This information can be reached at http://belief02.isti.cnr.it/ following the "Browse + Projects + 6DISS" tabs/commands sequence, or entering the Digital Library environment from the BELIEF website at http://www.beliefproject.org/.

6DISS also achieved another of its main objectives during Year 2; namely, to involve organisations from the targeted regions in new EU/FP project proposals:

- AfriNIC, APNIC and LACNIC were included in a proposal ("6DISS-2") in the 6th IST Call to extend 6DISS in terms of both duration and scope (with a focus on practical hands-on training). Unfortunately, the proposal was rejected mainly because it focused solely on IPv6 technology thus failing to cover broader IST technologies of common interest and relevance to cooperation in the identified countries and/or regions.

- The Ubuntunet Alliance (comprising fledgling NRENs in Southern and Eastern Africa), AfriNIC and TENET (the S. African NREN) were included in a proposal ("AFRINET") in the 6th IST Call to study the networking requirements from collaborating organisations in Europe and Southern / Eastern Africa. The proposal was rejected mainly because it only addressed infrastructure and connectivity, and geographically was also only covering a subset of the African countries.

3 Plenary meetings were held:

- 17-19 January, at UCL, London
  The main goals were to report on the status of the Deliverables (submitted and upcoming) and Milestones, disseminate feedbacks from the Southern Africa workshop, the AfriNIC (Cairo) hands-on session and the meeting with the EC and TENET (South Africa NREN), finalise the Review documentation and plan for the Review presentations. There was also some time available to review two new modules (Applications and Transition).

- 11-12 May, at FCCN, Lisbon
  The status of the project was discussed, including the lessons learned from the workshops that had been held in SE Europe (March) and Malta (April), and the forthcoming events (especially the South / Central America workshop in Quito, the role of 6DISS in the French IPv6 Summit in November, and the several collaborations with AfriNIC). The responses to the reviewers´ comments from the 1st project review were discussed and the text was revised and sent to the project officer for further distribution.

- 16 October, at Cisco, Brussels
  The status of the project (Deliverables and Milestones) was discussed. Feedback was given from the workshops that had been held in Lomé (Togo), South / Central America (Quito) and St. Louis. Planning was made for the immediately-following "Training the Trainers" course, the French IPv6 Summit, a 6DISS presentation at AfriNIC-5 (Mauritius), participation at the eInfrastructures Concertation meeting in New Delhi, the Cisco "Networkers" event and upcoming workshops in Senegal, Guatemala, Guadeloupe and Central Asia. The budget situation was also discussed, in view of the high demand for extra workshops. Budget is available from the funding set aside for the local organisations, which (due to the fact that the workshops are generally held in conjunction with other events) is rarely needed. Consequently, the Co-ordinator requested the approval of the EC for this money to be transferred for personnel and travel costs associated with extra workshops.

6DISS exchanged IPv6 deployment information with India, through the BELIEF project eInfrastructure Concertation Meeting, which was held in New Delhi on 14-15 December ´06. UCL presented 6DISS on 15 December and chaired a session on 14 December.

The planning for the remaining 2 contractual workshops in the Description of Work (Caribbean and Central Asia) went well and these Milestones were met, ensuring a successful and timely conclusion to the project.

During the **third year** of the project, the 2nd 6DISS Review took place in Brussels on February 6th, 2007. All partners were represented, except for HUNGARNET, who have a very low budget, which they are using for supporting as many of the workshops as possible. All of the Deliverables were accepted. The panel congratulated the project team on their achievements made so far and recommended that the project should continue. Some recommendations were made, which have been addressed (see previous section of this report).

A request was received from the Irish National IPv6 Task Force to use the 6DISS Security Module. This request has been accepted, on condition that an acknowledgement is made to 6DISS, and that it is an EC-funded project.

Following the 6DISS presentation at the Interworking2006 conference (Santiago, January 2007), two requests have been received from the University of Argentina (an organisation spread over 16 sites): (i) to use all the 6DISS modules as teaching material, and (ii) for assistance in deploying IPv6 in a campus environment. The request to use the modules has been accepted, on condition that an acknowledgement is made to 6DISS, and that it is an EC-funded project. Assistance in deploying IPv6 will be done through the Tiger Team, with more practical support offered through a potential follow-on project in FP7.

A Plenary Meeting was hosted by GRNET in Athens from 31st May - 1st June 2007.

The short papers requested by the reviewers on "IPv6 Deployment and Risks" (for strategists) and 6DISS´s "Exit Strategy" have been written and were sent to the Project Officer. Electronic versions were sent both to the Project Officer and the reviewers. The "IPv6 Deployment and Risks" (for strategists) was also published on the Website.

WP0 Deliverables

Del. no.	Deliverable name	WP no.	Date due	Actual delivery date	Estimated indicative person-months	Used indicative person-months	Lead contractor
D01	Project Presentation	0	April 2005	April 2005	0.5	0.5	Martel
D16	Initial Plan for Using and Disseminating Knowledge	0	September 2005	September 2005	1.0	2.0	Martel
D14	Final Report	0	September 2007	October 2007	1.0	1.0	Martel
D16	Final Plan for Using and Disseminating Knowledge	0	September 2007	September 2007	1.0	1.0	Martel

12 bi-monthly progress reports, 3 PARs and 3 PMRs were also produced in the project, however, these are not listed formally as Deliverables in the Description of Work.

D01: Project Presentation

Abstract: This Deliverable is a 2-page description of the project. It will be used to publicise the project on the EC Website and in EC publications, and as an introduction for other projects considering liaison with 6DISS.

D16: Initial Plan for Using and Disseminating Knowledge

Abstract: The first version of this Deliverable identified the target group of recipients of the 6DISS information, and documented the plans for reaching these people within the project timeframe.

D14: Final Report

Abstract: This report concludes the project by summarising the achievements obtained, the main outputs, and the resources spent.

Since the precise details of the resources spent by all partners cannot be known until after the end of September 2007, this Deliverable will be produced during October.

D16: Final Plan for Using and Disseminating Knowledge

Abstract: The final version of this Deliverable summarises the dissemination that was made, and reported on the plans for continuing any co-operations (within a research environment or commercially) beyond the end of the project.

WP0 Milestones

Milestone no.	Milestone name	WP	Date due	Actual delivery date	Lead contractor
09	Website operational (public and private pages)	0	April 2005	April 2005	Martel
14	1st Project Review successfully completed	0	January 2006	February 2006	Martel
19	2nd Project Review successfully completed	0	January 2007	February 2007	Martel
20	Project successfully completed	0	September 2007	October 2007	Martel

3.2   WP1: Workshop Preparation and Information Dissemination

WP1 was the central part of the project. It is in this Workpackage that the material for the workshops was collected and updated, and where the workshops were tailored in conjunction with the targeted regions, in terms of the type of participants, the focus of the material to be presented, location, host organisation, sponsoring, etc.

3.2.1 WP1 Achievements

The 8 contractual Workshops were organised during the 30-month duration of the project (2 took place during 2005 (Asia and Southern Africa) and 4 during 2006 (South-Eastern Europe, the Mediterranean countries, South and Central America, and the Sub-Saharan region). The final 2 took place in 2007.

- *Asia-Pacific Workshop, Taipei, Taiwan, 22ⁿᵈ – 23ʳᵈ August, 2005:* This workshop was aimed at network administrators in the Asia-Pacific region, particularly those working for NRENs or ISPs. It provided practical IPv6 training on addressing, migration from IPv4 to IPv6, multihoming, as well as mobility and security issues. The programme included practical hands-on sessions, along with access to a remote testbed for more complex configurations. In addition, specific deployment cases were considered.

- *South African Workshop, Port Elizabeth, South Africa, 19ᵗʰ - 20ᵗʰ September 2005:* This workshop was aimed at network administrators in Southern Africa and drew 23 participants from universities and ISPs. It provided practical IPv6 training on addressing, migration from IPv4 to IPv6, multihoming, as well as mobility and security issues. Specific deployment cases were also presented. The workshop was held in conjunction with the DITCHE National Techie Event 2005.

- *1ˢᵗ South East European IPv6 Training Workshop, Kopaonik, Serbia & Monte Negro, 3ʳᵈ – 4ᵗʰ March, 2006:* This workshop was aimed at network administrators in South-East Europe and drew 54 participants from NRENs, ISPs, and universities. It provided practical IPv6 training on addressing, autoconfiguration, routing, and migration from IPv4 to IPv6, as well as setting-up basic IPv6 services, applications, security and management. Specific deployment scenarios were also presented, using the remote 6DISS testbed in Brussels.

- *European IPv6 Training Workshop, Malta, 4ᵗʰ - 6ᵗʰ April, 2006:* This workshop was aimed at network administrators in the Mediterranean Region and drew 29 participants from NRENs, ISPs, universities and telcos. It provided practical IPv6 training on addressing, autoconfiguration, routing, and migration from IPv4 to IPv6, as well as setting-up basic IPv6 services, applications, security and management. Specific deployment cases were also presented, with particular reference to EUMEDCONNECT partners.

- *South and Central American IPv6 Training Workshop, Quito, Ecuador, 26ᵗʰ - 28ᵗʰ July, 2006:* This workshop was aimed at network administrators in South and Central America and drew 21 participants from NRENs, universities and commercial providers. It combined both theoretical presentations with hands-on exercises, and in particular aimed to convey how to practical operational experiences. The first day focused on addressing schemes, configuration and deployment, with the second day dealing with routing and network management. The final day concentrated on security aspects and DNS configuration. The participants had unlimited access to six Cisco routers, and worked through a number of specific deployment scenarios using this equipment. The workshop was organised in cooperation with CLARA and was held in conjunction with WALC 2006. In line with this event, the workshop was conducted in Spanish.

- *Sub-Saharan Africa IPv6 Training Workshop, Dakar, Senegal, 24th - 26th October, 2006:* This workshop was aimed at network administrators in the Sub-Saharan Africa Region and drew 35 participants from NRENs, ISPs, universities and telcos. It provided practical IPv6 training on addressing, autoconfiguration, routing, and migration from IPv4 to IPv6, as well as setting-up basic IPv6 services, applications, security and management. Specific case studies were also presented.

- *Caribbean Workshop, Gosier, Guadeloupe, 5th - 8th March 2007*: The Caribbean workshop was aimed at network administrators in the region, particularly those working for education and research institutions. It provided practical IPv6 training on addressing, deployment, autoconfiguration, routing and management, as well as how to configure basic services. The programme included practical "hands-on" sessions, using both local and remote testbeds. The workshop was held in conjunction with ICCGI 2007. A Workshop CD-ROM was produced.

- *Central Asian Workshop, Ashkebad, Turkmenistan, 24th - 26th April, 2007:* This workshop was aimed at network administrators and academics in the Central Asia Region, and drew 19 participants from universities and telecommunications providers. It provided practical IPv6 training on addressing, deployment, autoconfiguration, routing and management, as well as how to configure basic services. The programme included practical "hands-on" sessions using a local testbed. The workshop was organised in cooperation with the Silk Project.

The following "extra" workshops were held:

- *AfriNIC event in Cairo (12-13 December 2005).* Two presentations about 6DISS were also given in the AfriNIC conference.

- *Lomé (Togo) 6-7 July ´06*, as part of AfriNIC's programme of training on the subjects of Internet Resource (Address) management, requesting Internet Resources, and how to use efficiently the AfriNIC database. Especially for this event, 6DISS added some specific topics to the standard set of modules, including: Reverse DNS setup, DNSsec and IPv6 Basics.

- *Bucharest 1-2 August 2006*, in conjunction with the IARIA IPv6 TD´06 workshop (Today - Technology and Deployment) (http://www.6diss.org/workshops/ipv6td/).

- *University of Lancaster: 13-14 September, 2006* - UKERNA IPv6 workshop.

- *St. Louis, USA: 8 October, 2006*. A "*Networking with IPv6*" hands-on workshop took place in conjunction with the joint NANOG 38 and ARIN XVIII meeting. The aim was to provide the attendees with real experience in working with IPv6 in a network environment.
  The hands-on workshop was led by Jordi Palet Martinez, who was assisted by the 6DISS member Gunter Van de Velde (Cisco). Gunter made a practical presentation including live experiments. Both of the 6DISS testbeds (in Brussels and Paris) were accessed from the conference.

- *The French IPv6 Worldwide Summit in Cannes (16 November, 2006)*, where RENATER, Cisco, Alcatel and GRNET supported the 1-day hands-on IPv6 training. 50 participants attended this session.

- *Cisco "Networkers" 2007 event (Cannes, January 30th - February 2nd).* A "hands-on" session and other IPv6 presentations were given. Cisco "Networkers" is one of the most important user conferences for networking professionals. It is a customers' one-stop opportunity for training and information necessary to keep up with Cisco's technologies, solutions and products.

- *Central American Workshop, Guatemala City, Guatemala, 30th January - 1st February, 2007:* This extra workshop was requested at the Quito workshop in July 2006. It was organised by TERENA, with the presentations and local support given by FCCN and UCL. It was aimed at network administrators by providing practical IPv6 training on addressing, autoconfiguration, and routing, as well as setting-up basic IPv6 services, applications, security and management. It attracted 19 participants from the academic, telecommunications and military sectors. Specific case studies were also presented.

- *1st Northern Africa Workshop, Rabat, Morocco, 28th - 30th March, 2007*: This workshop was aimed at network administrators and academics interested in organising IPv6 training in the Northern Africa Region, and drew 40 participants from universities and telecommunications providers. It provided practical IPv6 training on addressing, deployment, autoconfiguration, routing and management, as well as how to configure basic services. The programme included practical "hands-on" sessions using a local testbed. The workshop was organised in cooperation with ISOC Morocco and was held in conjunction with the 1st Moroccan IPv6 Summit.

- *South Eastern European Workshop, 27th - 29th June, 2007:* 6DISS experts gave technical presentations on IPv6-related technologies, such as transitions mechanisms, routing protocols, and applications. In addition to the theoretical sessions, "hands-on" training was given at the local PC lab. Participants were asked to complete simple technical exercises and create a small IPv6-enabled network, and use some of the available applications. After the end of the training, participants were able to build an IPv6 testbed on their own in parallel to their IPv4 production network and connect it with an IPv6 upstream Internet provider.

- *2nd Northern Africa Workshop, Rabat, Morocco, 16th - 20th July, 2007*: This was a 2nd workshop given in Rabat, along the same lines as the 1st one, which could not accommodate all the people who wanted to participate.

- *IPv6 training to the FP6 project u-2010, Luxembourg, 19th - 20th September, 2007:* The idea arose from the recognition that there are EC projects which are unaware of the benefits of IPv6 (or which have committed in their Description of Work to incorporate IPv6, but do not know how to proceed). With the remaining resources, some partners therefore agreed to give IPv6 training to the u-2010 project[8]. u-2010 is an Integrated Project dealing with ubiquitous IP-centric government and enterprise Next Generation Networks. It is planning to exploit the benefits of IPv6 to provide the most capable means of communication and the most effective access to information to everybody required to act in cases of public safety accidents, incidents, catastrophes or crises. They are planning to use IPv6 to:
    - o interconnect existing services and networks
    - o leverage redundant communication channels
    - o use automatic redirection and/or service transformation in case of failures
    - o use new research results in the area of wireless ad-hoc networks.

- *The 24th APAN meeting in Xi'an, China, August 27th- August 31st*: This 5-day event highlighted tutorials, oral presentations and demonstrations covering advanced network technologies and applications. 6DISS selected this event to exploit the opportunity to interact with researchers and practitioners from Asia Pacific and beyond concerning IPv6 deployment experiences. A 1-day session (partly chaired by 6DISS) was accepted for Tuesday 28th August. Details can be found at: http://www.apan.net/meetings/xian2007/schedule.html. There were more than 150

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[8] www.u2010.eu

registrants, and Peter Kirstein (UCL) was further invited as a keynote speaker in the main event. Apart from Peter Kirstein, Tim Chown (Soton-ECS) and Stig Venaas represented the project. Presentations included:

- o IPv6 Deployment in Academic Networks (Dr.Tim Chown, 6DISS/UK)
- o IPv6 updates in Japan (Prof.Hiroshi Esaki, WIDE/Japan)
- o IPv6 Auditing Tools (Prof.Sureswaran Ramadass, NAv6/Malaysia)
- o IPv6 updates in AARNET (Bruce Morgan, AARNET/Australia)
- o IPv6 in Emergency Communications (Jim Bound, NAv6 Task Force)
- o TEIN2-APAN update (Jilong, WANG/CERNET)
- o Status of IPv6 Activities in Philippines (Dr.Ceejay Dideles, Philippines)
- o An overview of IPv6 multicast (Stig Venaas)
- o IPv6 in CSTNET (Dr. Ms.Jinglin Chen, CSTNET/CN)
- o Transforming BDIX platform to IPv6 in Bangladesh (Dr. Hakikur Rahman, BRACU/Bangladesh)
- o Updates on IPv6 activities in Thailand (Chalermpol Charnsripinyo, NECTEC/Thailand)
- o IPv6 Deployment Status in Korea
- o Internet2 update on IPv6 activities (Matthew J Zekauskas, Internet2/US)
- o Panel Discussion: The collaboration opportunity between APAN/6DISS

An additional document has been produced by 6DISS and has been uploaded to the 6DISS website (Material/hands-on area). It contains descriptions of the "hands-on" exercises and configurations used during the workshops (Host configuration, Routing, DNS, Applications/Services, Management and Security) and is being continuously updated with the latest "hands-on" material.

WP1 Deliverables

Del. no.	Deliverable name	WP no.	Date due	Actual delivery date	Estimated indicative person-months	Used indicative person-months	Lead contractor
D02	Workshop Schedule	1	June 2005	July 2005 v1.0 Dec. 2005 v1.1	1.0	1.1	Martel
D03	Report on the workshop and status of Internet connectivity in Southern Asia	1	October 2005	November 2005	1.0	1.0	Soton-ECS
D04	Report on the workshop and status of Internet connectivity in Southern Africa	1	January 2006	December 2005	1.0	1.0	Cisco
D05	Report on the workshop and status of Internet connectivity in South and Central America	1	December 2005	November 2006	3.0	2.0	TERENA

D06	Report on the workshop and status of Internet connectivity in the Mediterranean partner countries	1	July 2006	January 2007	3.0	2.0	RENATER
D07	Report on the workshop and status of Internet connectivity in the Balkan countries	1	December 2006	May 2006	3.0	2.0	GRNET
D08	Report on the workshop and status of Internet connectivity in the sub-Saharan Africa countries	1	February 2007	September 2007	3.0	3.0	RENATER
D09	Report on the workshop and status of Internet connectivity in the NIS countries	1	June 2007	August 2007	3.0	2.0	UCL
D10	Report on the workshop and status of Internet connectivity in the Caribbean	1	August 2007	September 2007	3.0	2.0	RENATER
D15	Report on Raising Public Participation and Awareness	1, 3	September 2007	September 2007	3.0	2.0	Soton-ECS, TERENA

D02: Workshop Schedule

Abstract: This Deliverable gives the final schedule of the workshops, the locations, the parallel events with which synergy will be exploited, the local organiser, the lead partner from 6DISS and the partners that will also attend for support.

D03: Report on the workshop and status of Internet connectivity in Southern Asia

Abstract: This document presents the status of the major Internet connectivity links deployed by the NRENs in Southern Asia at the time of the 6DISS workshop. A report from the workshop is included in the form of: a) the presentation material, b) the attendees and their affiliations, c) an assessment of the opportunities for further co-operation and follow-up actions planned, d) an analysis of the feedback questionnaire.

D04: Report on the workshop and status of Internet connectivity in Southern Africa

Abstract: This document presents the status of the major Internet connectivity links deployed by the NRENs in Southern Africa at the time of the 6DISS workshop. A report from the workshop is included in the form of: a) the presentation material, b) the attendees and their affiliations, c) an assessment of the opportunities for further co-operation and follow-up actions planned, d) an analysis of the feedback questionnaire.

D05: Report on the workshop and status of Internet connectivity in South and Central America

Abstract: This document presents the status of the major Internet connectivity links deployed by the NRENs in South and Central America[9] at the time of the 6DISS workshop. A report from the workshop is included in the form of: a) the presentation material, b) the attendees and their affiliations, c) an assessment of the opportunities for further co-operation and follow-up actions planned, d) an analysis of the feedback questionnaire.

D06: Report on the workshop and status of Internet connectivity in the Mediterranean partner countries

Abstract: This document presents the status of the major Internet connectivity links deployed by the NRENs in the Mediterranean partner countries at the time of the 6DISS workshop. A report from the workshop is included in the form of: a) the presentation material, b) the attendees and their affiliations, c) an assessment of the opportunities for further co-operation and follow-up actions planned, d) an analysis of the feedback questionnaire.

D07: Report on the workshop and status of Internet connectivity in the Balkan countries

Abstract: This document presents the status of the major Internet connectivity links deployed by the NRENs in the Balkan countries at the time of the 6DISS workshop. A report from the workshop is included in the form of: a) the presentation material, b) the attendees and their affiliations, c) an assessment of the opportunities for further co-operation and follow-up actions planned, d) an analysis of the feedback questionnaire.

D08: Report on the workshop and status of Internet connectivity in the sub-Saharan Africa countries

Abstract: This document presents the status of the major Internet connectivity links deployed by the NRENs in the sub-Saharan Africa countries at the time of the 6DISS workshop. A report from the workshop is included in the form of: a) the presentation material, b) the attendees and their affiliations, c) an assessment of the opportunities for further co-operation and follow-up actions planned, d) an analysis of the feedback questionnaire.

D09: Report on the Workshop and Status of Internet connectivity in the NIS Countries

Abstract: This Deliverable provides a detailed report on the workshop held on 24th - 26th April, 2007 in Ashgabat, Turkmenistan. There was wide attendance from the NIS countries and Afghanistan. The workshop received high level media and political coverage in Turkmenistan, being opened by government officials and covered on national television. The Deliverable also reports on the status of the Internet connectivity in the NIS countries and Afghanistan provided by SILK-2 and OCCASION.

D10: Report on the workshop and status of Internet connectivity in the Caribbean

Abstract: This Deliverable is a report from the 6DISS IPv6 technical workshop that took place on 5th - 8th of March 2007 in Gosier (La Guadeloupe). This workshop specifically targeted the countries of the Caribbean region to which RENATER has committed to provide training on IPv6 technologies. The report includes information on the IPv6 workshop programme, the technical presentations and the "hands-on" training in the local and remote labs. In addition, the report includes dissemination material that has been distributed to the participants, summary of the feedback questionnaire, the analysis of the workshop expenditures and information on the workshop sponsors.

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[9] This information will be extracted from information available from ALICE

D15: Report on the Workshop and Status of Internet connectivity in the NIS Countries

Abstract: This report summarises the way that an increase in public awareness has been achieved, eg. through the workshops, the Tiger Team services, and downloads of project documents from the Website.

WP1 Milestones

Milestone no.	Milestone name	WP	Date due	Actual delivery date	Lead contractor
01	1st workshop (Asia-Pacific region)	1	September 2005	August 2005	Soton-ECS
02	2nd workshop (Southern Africa)	1	September 2005	September 2005	Cisco
03	3rd Workshop in South/Central America completed	1	April 2006	July 2006	TERENA
04	4th Workshop in the Mediterranean completed	1	April 2006	April 2006	RENATER
05	5th Workshop in the Balkans completed	1	April 2006	March 2006	GRNET
06	6th Workshop in Sub-Saharan Africa completed	1	December 2006	October 2006	RENATER
07	7th workshop (Newly-Independent States)	1	June 2007	April 2007	UCL
08	8th workshop (Caribbean)	1	September 2007	April 2007	RENATER
10	Slide pack complete	1	June 2005	June 2005	RENATER
11	Workshop schedule defined	1	June 2005	July 2005	Martel

3.3 WP2: Complementary (non-workshop) Training

Due to time and budget constraints, WP1 could not commit to visit each region more than once. WP2 therefore complemented WP1 by providing training through other means than the workshops, i.e:

• Training the Trainers
• IPv6 Technical Training
• e-Learning Package

Training the Trainers (related to Deliverable D11)

The "Training the Trainers" course material was intended for (semi-)professional trainers who are, however, not fully familiar with all the technical aspects of IPv6 covered by the 6DISS material. The attendees of these courses will be given the full set of 6DISS presentations, together with supplementary information. The trained persons will then be able to further disseminate information on any of the 6DISS topics within their regions. Access will be provided to IPv6-capable equipment, and support will be available for answering specific technical questions.

Ideally, this training of local trainers should take place either just before or after the workshop organised by WP1.

IPv6 Technical Training (related to Deliverable D12)

Within the 6NET project, two "hands-on" technical training courses were given for engineers that would have to work with IPv6 equipment. These courses were extremely successful, and the material (supplemented by new inputs) is made available for 6DISS.

The course could be oriented towards whatever specific training is required (eg. deployment engineers, maintenance engineers, NOC personnel).
These courses enabled the trained persons to configure and operate IPv6 routers and host equipment. Support is also available via the Tiger Team for answering specific technical questions.

E-learning Package (related to Deliverable D13)

Content is considered to be the most critical element of success in e-learning. It must be both attractive, in order to motivate the learning process, and effective, so that the learning objectives are really met. Therefore, the proposed approach for 6DISS e-learning dissemination poses high demands on an attractive and effective e-learning format. *Attractiveness* is obtained through a well-balanced combination of audio (voice), graphical and animation components. *Effectiveness* is ensured through an integrated instructional design, including a modular structure, interactivity, simulation and individual learning flexibility. The combination of these high levels of attractiveness and effectiveness is also known as "high impact learning".

3.3.1 WP2 Achievements

Training the Trainers

In the **first year** of the project, the requirements for the "Training the Trainers" course were discussed in detail, and the associated Deliverable (D11) has been produced.

Additional information has also been added to the slides for those trainers who may not be familiar with all of the subjects, and/or may not realise which slides are mandatory and which are optional.

RENATER had a leading role in an event "Formation de Formateurs en Technologies de l'Information" (FFTI-2), held in Conakry, Guinée (20th - 24th June 2005). The general lessons learned were useful input for our Deliverable D11.

During the **second year** of the project, the first "Training the Trainers" course was held in Brussels on 17th – 19th October 2006.
The administrative co-ordination was handled by Cisco, and the technical co-ordination was led by RENATER. Soton-ECS and Cisco supported RENATER with the technical content. Instrux!on (the creators of the 6DISS e-learning package) participated to explain about basic teaching skills.

The targeted attendees were potential tutors and organisers of workshops. The pre-requisites were that they should have:
- some IPv6 knowledge
- read Deliverable D11 (The "Training the Trainers" Material)
- followed the complete e-learning course

On the 1st day, we:
- Explained some basic teaching skills
- Prepared the attendees for making presentations of the Modules themselves

- Described how to organise a Workshop, in terms of:
  - the infrastructure needed
  - the requirements of the participants
  - examples of events of we have done

- Introduced all the 6DISS material and services, and ensured that the trainers:
  - understood what they can find in each Module
  - were aware of the messages to be passed to the participants

On the 2nd day, we:
- Assessed the attendees making presentations of some Modules
- Informed about how to access the remote labs
- Showed how to make practical hands-on sessions using the remote labs to:
  - configure PCs/routers, routing, ACLs, dns
  - add security
  - manage a network
  - install applications

On the 3rd day, we:
- Obtained feedback from the attendees
- Held a de-briefing session among the 6DISS partners, to assess the course

As a first priority, the organisers of the past workshops (Southern Africa, Mediterranean countries, SE Europe, South and Central America) were invited. This attracted participants from SE Europe, but nowhere else. The attendance was then opened through the Website, personal contacts, EC contacts, etc. The participation was still low, but was useful to assess the structure of the course. Future courses may be held locally in the regions, since this will remove the cost of the travel for the participants

In the **third year** of the project, an IPv6 Workshop was organised in Ghent, Belgium on 6th July, 2007 by one of the attendees of the 1st "Training for Trainers" course, held in October 2006. This one-day "hands-on" workshop on IPv6 was aimed at network administrators, engineers and IT specialists. The objective of the training was to provide a deeper technical insight into IPv6 configuration and management. This event was organised by the Flemish Interdisciplinary institute for BroadBand Technology (IBBT), Ghent University (UGent) and Université Libre de Bruxelles (ULB), in cooperation with 6DISS. 6DISS supported the workshop with its technical training material, the e-learning package and the testbed in Paris which consists of Cisco and Alcatel equipment. Due to the "hands-on" exercises, the number of participants was restricted to 18.

IPv6 Technical Training

In Year 1, the laboratories in Brussels and Paris were built. They can be used both for remote access from the workshops and for the IPv6 technical training courses.

The original intention was to run additional technical training sessions in Paris or Brussels at the 6DISS labs. However, the workshops - including practical "hands-on" sessions - have proved overwhelmingly successful, precisely because the training is provided locally, on site, at the point of the demand.

It has been relatively straightforward to combine such workshops with already-scheduled events organised by (for example) AfriNIC, meaning that the additional costs for the local organisation and

the attendees are minimal. This particular part of the 6DISS budget is therefore not being used, but is instead being spent for the extra time and travel expenses associated with partners giving the training on site, rather than in Paris or Brussels. The lab equipment in Paris and Brussels is still being used - but remotely.

In Year 2, the first such IPv6 "technical training" session was at the AfriNIC-4 technical training event on 8th – 14th May 2006 in Nairobi (as mentioned in the 1st Review). This was formally claimed as meeting the Milestone M17: "1st IPv6 Training course held".

Subsequent "technical training" events have been held at:

- Lomé (Togo) 6-7 July 2006, as part of AfriNIC's programme of training on the subjects of Internet Resource (Address) management, requesting Internet Resources, and how to use efficiently the AfriNIC database. Especially for this event, 6DISS added some specific topics to the standard set of modules, including: Reverse DNS setup, DNSsec and IPv6 Basics
- Bucharest 1-2 August 2006, in conjunction with the IARIA IPv6 TD´06 workshop (Today - Technology and Deployment) (http://www.6diss.org/workshops/ipv6td/)
- University of Lancaster: UKERNA IPv6 workshop, 13-14 September 2006
- St. Louis, USA on 8 October 2006. A "*Networking with IPv6*" hands-on workshop took place in conjunction with the joint NANOG 38 and ARIN XVIII meeting. The aim was to provide the attendees with real experience in working with IPv6 in a network environment.
  The hands-on workshop was led by Jordi Palet Martinez, who was assisted by the 6DISS member Gunter Van de Velde (Cisco). Gunter made a practical presentation including live experiments. Both of the 6DISS testbeds (in Brussels and Paris) were accessed from the conference
- The French IPv6 Worldwide Summit in Cannes (16 November 2006), where RENATER, Cisco, Alcatel and GRNET supported the 1-day hands-on IPv6 training. 50 participants attended this session.

These sessions are all contributions towards the achievement of the Milestone M18: "Subsequent "IPv6 Training" courses".

E-Learning

The E-learning package comprises the following modules:
0. The role of the E-learning package within the whole 6DISS dissemination framework
1. Introduction to IPv6
2. IPv6 Addressing
3. The IPv6 Header
4. IPv6 Basic Services
5. IPv6 Security
6. IPv6 routing, mobility and management
7. Migration and Coexistence with IPv4

The material comprises animated slides with "voice-over", key messages that appear as sub-titles and questions to test understanding.

6DISS received a request from Comcast Corporation to use the E-learning course within their organisation. Comcast Corporation is the US's leading provider of cable, entertainment and communications products and services, with 23.3 million cable customers, 10 million high-speed Internet customers and 1.6 million voice customers. Comcast is principally involved in the

development, management and operation of broadband cable networks and in the delivery of programming content. Alain Durand, IPv6 Architect and Chief Technology Officer of Comcast wrote that "…. He found the web-based presentation very well done ….".

The sub-titling of the voice-over phrases has been completed and integrated into the e-learning package (see: www.6diss.org/e-learning/). A version of the e-learning module with sub-titles in Portuguese has been uploaded onto the 6DISS website at http://www.6diss.org/e-learning/portuguese/. It is also announced on the 6DISS homepage, and linked from 'Hot Topics'.

Collaboration with India and China

6DISS attended the eInfrastructure Concertation Meeting in New Delhi (14-15 December ´06), made a presentation about the project and chaired one session. This event gave 6DISS the opportunity to exchange information regarding IPv6 deployment in India, which is one of the objectives of the project.

6DISS scheduled a session during the 24th APAN meeting in Xi'an (27-31 August 2007) for an exchange of information related to dissemination and deployment.

WP2 Deliverables

Del. no.	Deliverable name	WP no.	Date due	Actual delivery date	Estimated indicative person-months	Used indicative person-months	Lead contractor
D11	"Training the Trainers" Material	2	September 2005	September 2005	2.0	2.0	Cisco
D12	"IPv6 Training" Material	2	March 2006	V1.0 April 2006 V1.1 November 2006	2.0	3.0	Cisco
D13	"E-learning Material"	2	September 2005	September 2005	2.0	2.0	Cisco

WP2 Milestones

Milestone no.	Milestone name	WP	Date due	Actual delivery date	Lead contractor
12	E-learning modules ready	2	September 2005	November 2005	Cisco
13	Remote configuration of testbed equipment enabled	2	September 2005	September 2005 (Brussels) December 2005 (Paris)	Cisco
15	1st "Training the Trainers" course held	2	March 2006	March 2006	Cisco
16	Subsequent "Training the Trainers" courses (according to demand)	2	April 2006 - September 2007	*	*
17	1st "IPv6 Training" course held	2	June 2006		
18	Subsequent "IPv6 Training" courses (according to demand)	2	July 2006 - September 2007	**	**

*   An IPv6 Workshop was organised in Ghent, Belgium on 6th July, 2007 by one of the attendees of the 1st "Training for Trainers" course, held in October 2006 (and supported by 6DISS).

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Date	Event	Activity	Responsible Partner(s)
December 2005	AfriNIC-3, Cairo	Presentations and "hands-on" sessions	RENATER
July 2006	AfriNIC, Lomé (Togo)	"Hands-on" training	RENATER
August 2006	IARIA IPv6 TD´06 workshop, Bucharest	"Hands-on" training	Cisco
September 2006	UKERNA IPv6 workshop, Lancaster	"Hands-on" training	Soton-ECS
October 2006	NANOG 38 and ARIN XVIII meeting, St. Louis (USA)	"Hands-on" training	Cisco
November 2006	French IPv6 Summit, Cannes	"Hands-on" training	RENATER
January 2007	2nd South / Central America workshop in Guatemala	Presentations and "hands-on" sessions	FCCN, TERENA
January 2007	Cisco "Networkers" event, Cannes	6DISS presentations and "Case Study" example	RENATER
March 2007	1st Workshop hosted by Marwan (the Morocco NREN) in Rabat	"IPv6 training" course	RENATER
June 2007	2nd IPv6 workshop in SE Europe (Uni Plovdiv, Bulgaria), in conjunction with SEEREN and SEE-Grid	Presentation and "hands-on" sessions	GRNET
July 2007	2nd Workshop hosted by Marwan (the Morocco NREN) in Rabat	"IPv6 training" course	RENATER
September 2007	Workshop for the u-2010 project in Luxembourg	Presentation and "hands-on" sessions	CISCO

D11: "Training the Trainers"

Abstract: This Deliverable represents the full set of course material that is made available to persons who will be responsible for training in the local regions.

D12: "IPv6 Training" Material"

Abstract: This Deliverable describes the material that is made available to participants of the IPv6 technical training courses, which are intended mainly for ISP operational staff.

The document contains a description of the two 6DISS test laboratories, followed by details of the exercises that will be performed, in order to give the attendees a deep and practical understanding of how to manage in a practical way the deployment of the following important fundamental IPv6 features:

- Basic IPv6 commands

- Enabling IPv6 on client terminals

- IPv6 routing protocols (OSPF, IS-IS, BGP and Multicast) for the Brussels 6DISS Lab

- IPv6 Routing protocols for the Paris 6DISS Lab

- IPv6 addressing and routing protocols overview for the Brussels 6DISS Lab

- Transitioning with tunnels

- Multicast using the Paris 6DISS Lab

- Other exercises (DHCPv6, Basic IPv6, HTTPD, Traffic Filters, Stateless configuration for clients)

D13: "eLearning Material"

Abstract: This Deliverable is an on-line software package that will explain to users the main features of IPv6 and guide them to appropriate reference material (e.g. 6NET Cookbooks, IETF standards). It will also incorporate the capability to remotely configure routers and to "see" the results.

3.4   WP3: Project Support and Visibility

WP3 supported the smooth operation of the project, by establishing and maintaining features for enabling an efficient information exchange between partners. In this category are functions such as e-mail lists, the document repository, collaborative working areas in which WPs can compile their Deliverables, etc. Furthermore, this Workpackage builds and maintains the project's Website, which is the place where all the public information is visible and downloadable, and where partners, the organisations in the developing regions and other visitors alike, can keep updated of the upcoming events and news from the regions visited. Other activities towards increasing the visibility of the project include presentations made in conferences and similar events, and liaisons made with other IST projects.

3.4.1   WP3 Achievements

Website

TERENA maintained the Website professionally since the beginning of the project, keeping it operational and up to date with information produced by project partners (Deliverables, papers, presentations, past and future events, module material, …) that is intended for public dissemination. Relevant documents produced by external sources (eg. documents for strategists planning to deploy IPv6) are collected and linked from the Website homepage. The public area includes all the presentations that have been made at the workshops and in conferences, plus press releases, etc. Statistics are collected concerning the number of visits and downloads. A calendar is maintained of upcoming events especially related to IPv6. The link to the e-learning package is visible from the homepage, and links are continuously being established to related sites.

FCCN has put the Portuguese subtitled version of the e-learning module on the 6DISS website at: http://www.6diss.org/e-learning/portuguese/. It is also announced on the homepage, and linked from 'Hot Topics'.

A link was added on the website to an IPv6 Applications Database containing information on the IPv6 status of various applications and tools; whether they are IPv6 enabled; which versions they are; and if a patch is required to make them so, where you can locate this patch. From this site one can browse the database, based on certain criteria or search the entire database, based on a whole range of different fields. Administrators of this database can also create new entries into the database as well as edit existing ones.

Papers, presentations and publications

The project was very active regarding dissemination. Apart from the several contractual - and additional - workshops and training sessions, 6DISS partners made presentations at the following conferences/workshops:

- 6DISS attended and made presentations at all the AfriNIC meetings (AfriNIC-4, Nairobi, AfriNIC-5, Mauritius), since initially starting the collaboration with this organisation in Cairo in December ´05 (AfriNIC-3).
- Two project proposals were submitted in the 6th Call of FP6 incorporating AfriNIC (and one proposal including LACNIC and APNIC), but these were unsuccessful
- Conference/Workshop presentations mentioning 6DISS were given at:
  - ICCI2005, Beijing, June 26th – 29th, 2005
  - IPv6 Summit, Beijing, April 4th – 5th, 2005
  - IPv6 Summit, Barcelona, June 6th – 10th, 2005
  - RIPE 50, Stockholm, May 4th, 2005
  - RIPE 51, Amsterdam, October 10th – 14th, 2005
  - TF-NGN, Athens, October 19th, 2005
  - AfriNIC, Cairo, November 22nd – 24th November, 2005
  - 1st Campus IPv6 workshop, Budapest, 1st – 5th October, 2005
  - A meeting with a delegation from New Zealand visiting the EC on 20th March, 2005

- FCCN prepared and presented "SSM with IPv6" by video-conference from Lisbon to the CUDI Spring Meeting 2006 (4 April, Oaxaca, Mexico)
- The IST/Go4IT interoperability event in Beijing (http://www.go4-it.org/modules/news/article.php?storyid=2) together with the China IPv6 summit (12-14 April ´06). Cisco presented the 6DISS activities there in a parallel session related specifically to IPv6
- The IST-Africa Conference (Pretoria, 1-5 May), organised by the "eChallenges" Unit of the EC, together with the South African Department of Science & Technology, the Council for Scientific & Industrial Research and the Meraka Institute
- The eInfrastructures workshop on 2 May in Pretoria
- The IPv6 DFI'06 (Deploying the Future Infrastructure) workshop in California on 16-18 July ´06
- The IPv6 TD´06 workshop (Today - Technology and Deployment) in Bucharest (http://www.6diss.org/workshops/ipv6td/), which took place on 1-2 August ´06
- The ISOC/IPv6 Forum meeting, Dakar, Senegal (23 October ´06)
- The IQPC Softswitching Conference, Berlin (26 October ´06)
- The French World IPv6 Summit, Cannes (13 November ´06)
- The Concertation Meeting for testbed projects, Helsinki (20 November ´06)
- The IST2006 (Helsinki) "Networking session" on Emergency Communications (22 November ´06)
- Posters and leaflets were on display at the Swiss ICT Summit in Lausanne (4 December ´06)
- The eInfrastructure Concertation Meeting in New Delhi (14-15 December´06). This event gave 6DISS the opportunity to exchange information regarding IPv6 deployment in India, which is one of the objectives of the project.
- Interworking 2006 Conference, Santiago, Chile, January 15th - 17th 2007
- Cisco "Networkers" Conference, Cannes, 30th January, 2007
- IARIA and IPv6TD conferences, Guadeloupe, 5th - 8th March, 2007
- IPv6 Summit, Rabat, Morocco, 27th March, 2007
- TERENA Networking Conference 2007, Lyngby, Denmark, 21st -24th May, 2007
- IPv6DFI 2007, Athens, 27th - 29th June, 2007
- 24th APAN Meeting, Xi'an, China, 27th - 31st August, 2007

6 newsletters were produced:

- 6DISS project to deliver IPv6 message worldwide - *1 Jun '05*
- 6DISS IPv6 Training Workshops - *19 Aug '05*
- 6DISS supports IPv6 deployment in Africa - *19 Oct '05*
- 6DISS supports IPv6 training at AfriNIC-3 - *12 Jan '06*
- 6DISS strengthens its collaboration with AfriNIC and AfNOG - *30 Apr '06*
- 6DISS goes Latin - *4 Aug '06*

2 informational sheets were written:

- IPv6 Deployment Guide - *5 Oct '05*
- 6DISS Informational Sheet - *16 Oct '06*

3 newsletters were compiled:

- 6DISS in South-East Europe Newsletter No.1 - *Oct '05*
- 6DISS in South-East Europe Newsletter No.2 - *Jan '06*
- 6DISS in South-East Europe Newsletter No.3 - *Jun '06*

3 papers were posted on the website:

- IPv6 Deployment and Associated Risks (for Strategists) - *24 Aug '07*
- Worldwide IPv6 Initiatives - *M. Potts, Interworking 2006, 15-19 Jan '07*
- A Pragmatic Report on IPv4 Address Consumption - *T. Hain, Internet Protocol Journal, Volume 8, Number 3, Sep '05*

8 Presentations are available on the website:

- IPv6 Security Issues: thinking outside the NAT box - *Tony Hain, AfriNIC-3, 13 Dec '05*
- IPv6 Network Deployments - *Philippe Bereski & Athanassios Liakopoulos, AfriNIC-3, 13 Dec '05*
- The 6DISS Project: IPv6 Dissemination and Exploitation - *Patrick Grossetete, Global IPv6 Summit China, 14 Apr '06*
- The 6DISS Project: Objectives, Data, Toolkit & Experiences - *Martin Potts, eInfrastructures Partnership Workshop, 2 May '06*
- The 6DISS Project and its Opportunities for the African Continent - *Martin Potts, IST-Africa 2006, 5 May '06*
- IPv6 International Efforts - *Martin Potts, Research Networking Testbeds Concertation Meeting, 20 Nov '06*
- The 6DISS Project: Objectives, Data, Toolkit & Experiences - *Martin Potts, AfriNIC 5, 29 Nov '06*
- The 6DISS Project: Objectives, Data, Toolkit & Experiences - *Martin Potts, Euro-Africa S&T Collaboration Event, 14 Dec '06*

6DISS has allowed the IST FP6 BELIEF project to put all public 6DISS information (including the e-learning course) into their Digital Library. This information can be reached at http://belief02.isti.cnr.it/ following the "Browse + Projects + 6DISS" tabs/commands sequence, or entering the Digital Library environment from the project's website at http://www.beliefproject.org/.

Russian and portuguese sub-titles were added to the e-learning course.

Recent collaborations:

- Veena Merz from the Cisco Networking Academy Program in Brisbane, Australia is organising a workshop on IPv6 for Questnet (http://www.questnet.net.au/) members, which is non-profit activity for Queensland based university network operators. Mrs. Merz's request to able to get the tutorial material was accepted. The Cisco networking academy lab is equipped with Cisco routers and switches to demonstrate the "hands-on" exercises.

- A request has been received from ProCurve (the networking division of HP) to give an IPv6 workshop to their (40) EMEA technical consultants in Q1 2008. It is also a declared intension of 6DISS in its "Exit Strategy" paper to give training to European-based commercial organisations through a future project (if accepted). Since the timing for a follow-up project is too short to meet ProCurve´s needs, we are investigating if any partners are willing and able (contractually) to organise a course for them privately.

- ▪ In-line with the goals and the declared Exit Strategy of 6DISS, a project proposal was submitted for a follow-on project in the 2nd INFRA Call of FP7 incorporating AfriNIC, LACNIC and APNIC.

Helpdesk

The "Helpdesk" feature is another mechanism through which information about IPv6 and the 6DISS project is disseminated by WP3. Soton-ECS is responsible for managing the 6DISS helpdesk service, but they have access to a so-called "Tiger Team" of experts (both from within the 6DISS Consortium and also other volunteers) who can answer queries on specific subjects. Queries are sent by email to helpdesk@6diss.org, and this generates an autoreply with a reference ID to the sender, and also sends an alert to specific experts authorised to watch the Helpdesk queue on the tracker system. The tracker can be accessed via http://rt.6pack.org, with a username and password. The person seeing the alert can log in and either:

a) delete the ticket (spam)

b) move the ticket to the appropriate queue, which will alert watchers for that queue by email.

The Helpdesk queue watchers are Tim Chown (Soton-ECS) and Carlos Friacas (FCCN). The Tiger Team of experts for specific subjects currently comprises:

Addressing Plans:	Tim Chown, Carlos Friacas
Applications:	Tim Chown, Stig Venaas, Piers O'Hanlon, Janos Mohacsi
Host Configuration:	Tim Chown, Carlos Friacas, Janos Mohacsi
Mobility:	Tim Chown, Martin Dunmore, Chris Edwards
Multicast:	Tim Chown, Stig Venaas, Jerome Durand
Network Management:	Tim Chown, Jerome Durand, Janos Mohacsi, Athanassios Liakopoulos
Routing:	Tim Chown, Stig Venaas, Jerome Durand, Carlos Friacas
Transition:	Tim Chown, Janos Mohacsi, Athanassios Liakopoulos
Website:	Tim Chown, Kevin Meynell

WP3 Deliverables

Del. no.	Deliverable name	WP no.	Date due	Actual delivery date	Estimated indicative person-months	Used indicative person-months	Lead contractor
D15	Report on Raising Public Participation and Awareness	1, 3	September 2007	September 2007	3.0	2.0	Soton-ECS, TERENA

D15: Report on the Workshop and Status of Internet connectivity in the NIS Countries

Abstract: This report summarises the way that an increase in public awareness has been achieved, eg. through the workshops, the Tiger Team services, and downloads of project documents from the Website.

WP3 Milestones

Milestone no.	Milestone name	WP	Date due	Actual delivery date	Lead contractor
01	1st workshop (Asia-Pacific region)	3	September 2005	August 2005	Soton-ECS
02	2nd workshop (Southern Africa)	3	September 2005	September 2005	Cisco
03	3rd Workshop in South/Central America completed	3	April 2006	July 2006	TERENA
04	4th Workshop in the Mediterranean completed	3	April 2006	April 2006	RENATER
05	5th Workshop in the Balkans completed	3	April 2006	March 2006	GRNET
06	6th Workshop in Sub-Saharan Africa completed	3	December 2006	October 2006	RENATER
07	7th workshop (Newly-Independent States)	3	June 2007	April 2007	UCL
08	8th workshop (Caribbean)	3	September 2007	April 2007	RENATER
09	Website operational (public and private pages)	3	April 2005	April 2005	TERENA

4 Consortium management

4.1 Overall project management

The consortium management activities that have been performed during project were described within WP0 (Section 3.1 of this report). In particular, Project Reviews were carried out successfully, the recommendations were addressed, and all contractual Workshops have been performed.

The 6DISS project management procedures were designed to ensure that the project ran smoothly, by ensuring that the goals were clearly defined and understood, the Workpackages represented a sensible division of the work and comprisde the necessary expertise to fulfil the objectives, responsibilities were clearly assigned, and there were transparent lines of communication among the participants. The full potential of existing telecommunications and information technology (eg. email, teleconferences) were exploited, in order to minimise the level of resources needed to manage the project and thus optimise the resources available for technical work. The exchange of documents was made via specifically designated areas of the password-protected part of the Website.

The project's Website was also used to make all the public information visible and downloadable, and remains the place where partners, the organisations in the targeted regions and other visitors alike, can keep updated of the upcoming events and news from regions visited.

Progress reports were collected by the Project Manager on a monthly basis, and reported to the project officer bi-monthly.

This project was sufficiently small that all partners could be involved in the decision-making process, and as no research was carried out in the project, and the source material was public, the complexities of handling IPR matters were not relevant.

The overall management of the project was the mandate of the General Assembly (GA), chaired by Martel. The GA was the ultimate project authority, with collective responsibility for the project as a whole and for long-term strategic decisions within the project.

The GA main management goals were:
- to manage and direct the project,
- to confirm that the overall resources used are consistent with the work performed,
- to ensure that the progress of the work adheres to the contract,
- to control the progress of all Workpackages,
- to establish the right basis for the successful implementation of results,
- to ensure that the agreements for contracts conform to the obligations of the contract with the EC and maintain copies of the agreements for inspection by the EC.

The GA main technical goals and functions were:
- to assume the responsibility of the technical direction of the project.
- to co-ordinate the internal review of EC Deliverables,
- to maintain the technical coherence of the project,
- to solve any technical conflicts between tasks,
- to make all decisions related to technical matters,
- to organise working sessions and visits of technical staff to contractors' sites when necessary,

- to design a quality control discipline,
- to supervise the progress of all technical Workpackages.
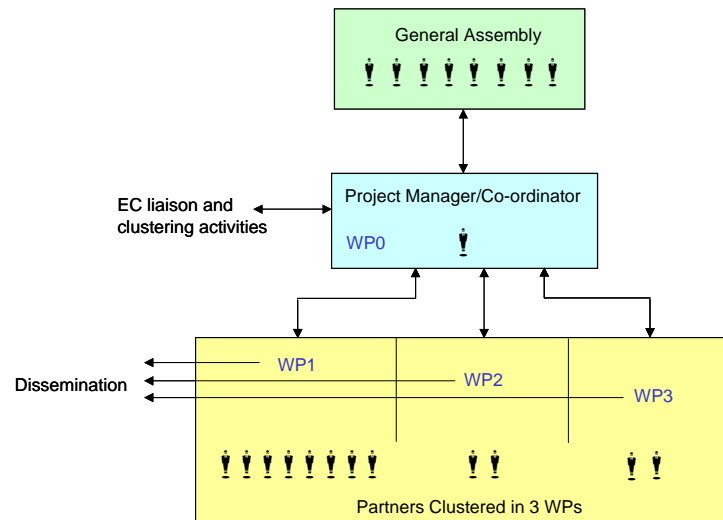
Figure 1: Flow of information between partners and external bodies

One person from each Contractor in the Consortium was entitled to be represented on the GA, and had an equal status, as regards voting rights. The members of the GA representing each of the contractors were responsible for representing the interests of their organisations and of their associated collaborators and had the authority to make management and strategic decisions on behalf of those.

The GA met formally at least every 4 months, but took the opportunity of being together at events, to discuss any matter than could not be solved via phone or e-mail.

10 Plenary Meetings were held during the project:
- Kick-off meeting, Brussels, 18th- 19th April, 2005
- Plenary Meeting/ General Assembly, Paris, June 13th, 2005
- Plenary Meeting/ General Assembly, Paris, September 12th- 14th September, 2005
- Plenary Meeting/ General Assembly, London, 17th – 19th January, 2006
- 1st Project Review, Brussels, 1st February, 2006
- Plenary Meeting/ General Assembly, Lisbon, 11th- 12th May, 2006
- Plenary Meeting/ General Assembly, Brussels, 16th October, 2006
- 2nd Project Review, Brussels, February 5th - 6th, 2007
- Plenary Meeting/General Assembly, Athens, May 31st - June 1st, 2007
- 3rd Project Review, Brussels, October 1st – 2nd, 2007

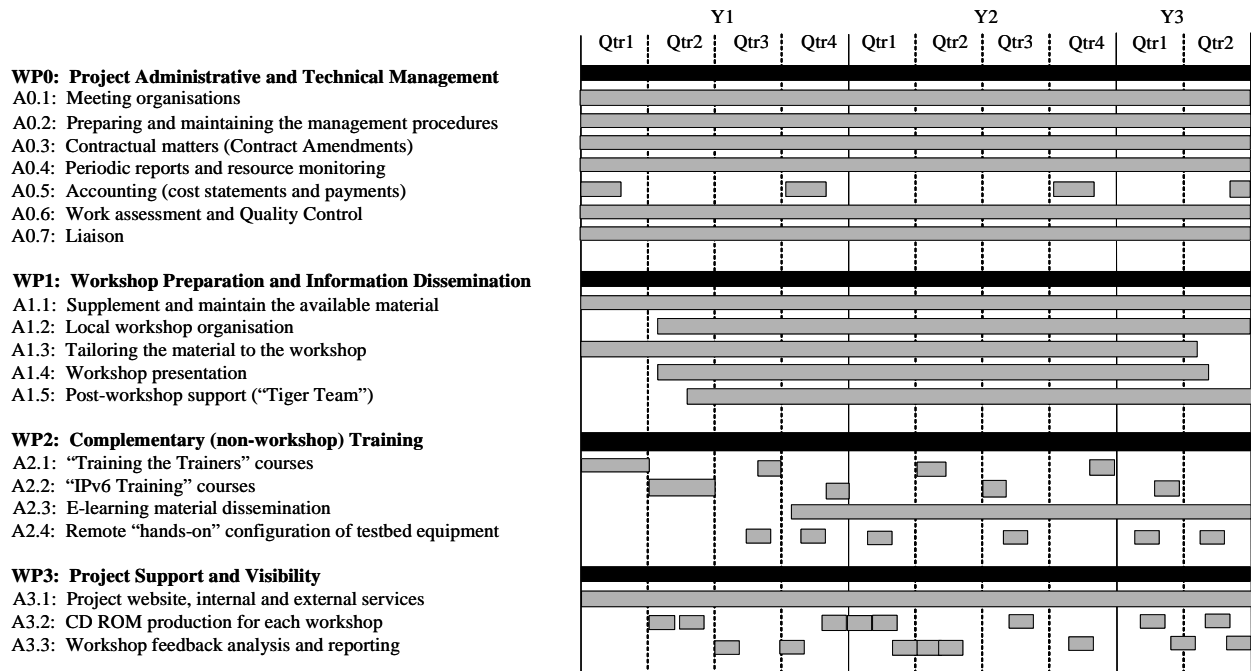## 4.2   Problems encountered and corrective actions

Issues:

1. Although the precise information on costs is not yet available, it seems to be the case that some partners have overspent their budget (eg. Martel, Cisco, UCL), whereas others have underspent

(eg. Soton-ECS, RENATER, Alcatel). It is expected that an adjustment can be made between partners, providing that the maximum EC Contribution for the project as a whole is not exceeded.

2. Due to the number of workshops supported, Alcatel and Hungarnet overspent on personnel and underspent on travel. The following adjustments were made:
   - Alcatel: EUR 10K was transferred from Travel to Personnel budget
   - Hungarnet: EUR 4K was transferred from Travel to Personnel budget

4.3   Timetable (GANTT Chart)

WP0: Project Administrative and Technical Management
A0.1: Meeting organisations
A0.2: Preparing and maintaining the management procedures
A0.3: Contractual matters (Contract Amendments)
A0.4: Periodic reports and resource monitoring
A0.5: Accounting (cost statements and payments)
A0.6: Work assessment and Quality Control
A0.7: Liaison

WP1: Workshop Preparation and Information Dissemination
A1.1: Supplement and maintain the available material
A1.2: Local workshop organisation
A1.3: Tailoring the material to the workshop
A1.4: Workshop presentation
A1.5: Post-workshop support ("Tiger Team")

WP2: Complementary (non-workshop) Training
A2.1: "Training the Trainers" courses
A2.2: "IPv6 Training" courses
A2.3: E-learning material dissemination
A2.4: Remote "hands-on" configuration of testbed equipment

WP3: Project Support and Visibility
A3.1: Project website, internal and external services
A3.2: CD ROM production for each workshop
A3.3: Workshop feedback analysis and reporting

4.4 Use of resources

6DISS MMs chart
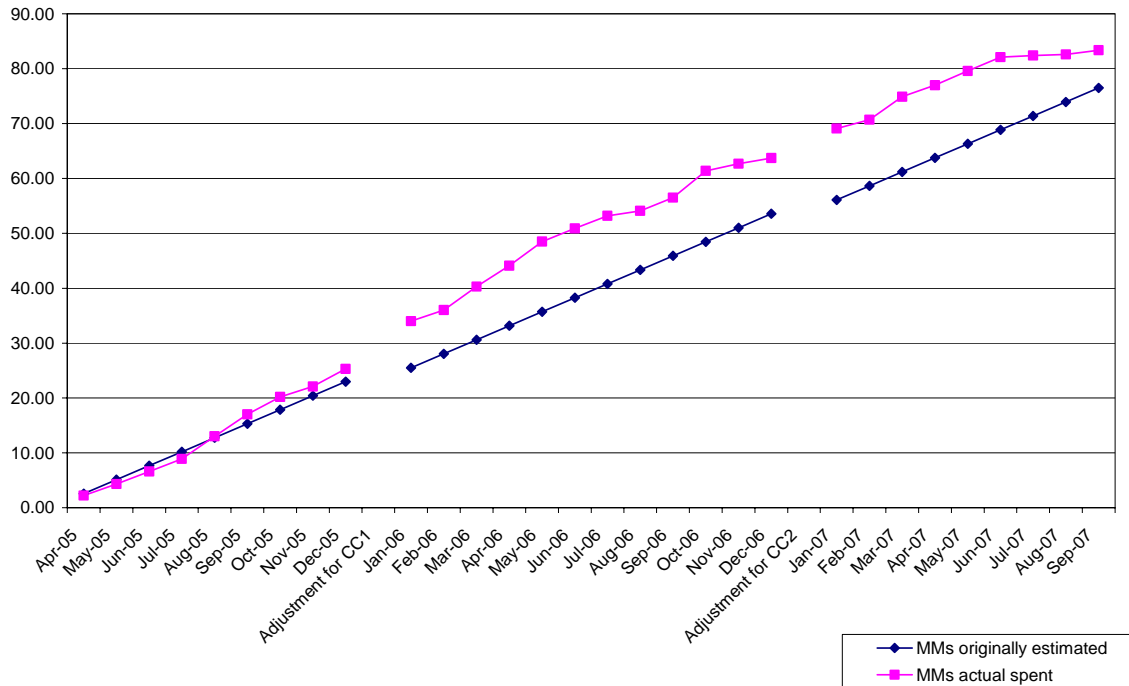
The above chart shows that the total reported man-month expenditure for the project as a whole (83.4) is higher than that originally planned (76.5). This is due to the enormous interest in the 6DISS IPv6 workshops. Budget was available for the extra PMs from money originally allocated (but not always needed) for local organisational expenses. A request to use this money for supporting additional personnel costs for the extra workshops was forwarded to the Project Officer.

4.5 Changes in the consortium

There were no changes in the consortium other than those included in Contract Amendment 1 (to add HUNGARNET).

5 Other issues

5.1   Deviations from project workprogramme and corrective actions taken

Some minor adjustments were made in the dates of the workshops, compared with the originally planned schedule. This was mainly to align the workshops with other events at which the appropriate persons would be present – thereby optimising travel costs and local expenses (eg. for the meeting rooms).

A Annex 1: Plan for using and disseminating the knowledge

A.1. Exploitable knowledge and its Use

6DISS was a Specific Support Action (SSA), and as such did not perform R&D work, that might have lead to commercially-exploitable results. Nevertheless, the project had material which may be considered as being potentially exploitable by the partners themselves, or by others, and so this is listed here for information.

This section therefore presents the exploitable results, defined as knowledge[10] having a potential for industrial or commercial application in research activities or for developing, creating or marketing a product or process or for creating or providing a service.

It provides an overview, per exploitable result, of how the knowledge could be exploited or used in further research (if relevant).

Being an SSA project, technical knowledge was not acquired from the project that will be subsequently exploited commercially in the traditional way, through patents (as is expected from STREPs and IPs). Nevertheless, the teaching material and the e-learning package is important information, which was refined throughout the project in accordance with feedback from the workshops and new outputs from the standards bodies. In this sense, the results of workshops have been exploited through the improvement of the training material. This training material will continue to be used by the partners in University courses and within their organisations. Whilst the slide-sets used in the workshops are considered to be public (they are based essentially on freely-available specifications from the IETF) it can be imagined that a commercial organisation may take the material and include it in a product for IPv6 training. Each module is therefore listed below as a (potentially) exploitable result.

The e-learning package is based on a platform from the company Instrux!on. If there is an opportunity for selling the material to other companies, then this will be done by Instrux!on, since they have the tools and expertise to make the necessary adaptations. Indeed, whilst the basic input data for the e-learning modules is provided by - and the results are checked by - 6DISS partners, Instrux!on receives no funding from the project. Their motivation to participate is therefore related to their ability to exploit contacts made within the consortium, to re-use the knowledge gained and incorporate the results into a commercial product.

Furthermore, it was a goal of the project to encourage the participation of the targeted regions in future IST project proposals. This collaboration has led to a subsequent EC project proposal, which (if successful) is also a form of exploitation of the results.

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[10] **Knowledge:** means the results, including information, whether or not they can be protected, arising from the *project* governed by this *contract*, as well as copyrights or rights pertaining to such results following applications for, or the issue of patents, designs, plant varieties, supplementary protection certificates or similar forms of protection (Article II.1.14 of the contract)

A.1.1. Survey of Exploitable knowledge

Exploitable Knowledge	Exploitable product(s) or measure(s)	Sector(s) of application	Timetable for commercial use	Patents or other IPR protection	Owner and other Partner(s) involved
Module 010 – General IPv6 introduction	Slide set	The *material* can be used by companies/ institutes in the education and training business. The *knowledge* is useful for operators of large corporate/ campus networks, end users, ISPs, carriers	Immediately usable	None	RENATER, HUNGARNET, Cisco
Module 130 – IPv4 -> IPv6 transition mechanisms and co-existence scenarios – esp. dual stack	As above	As above	As above	As above	SOTON-ECS, RENATER
Modules 020 and 040 – IPv6 and associated protocols	As above	As above	As above	As above	RENATER
Modules 03x – Addressing (including Renumbering and Multihoming)	As above	As above	As above	As above	RENATER, SOTON-ECS
Module 110 – Security	As above	As above	As above	As above	UCL
Module 070 – Multicast	As above	As above	As above	As above	RENATER
Module 120 – Mobility	As above	As above	As above	As above	Cisco
Module 160 – QoS	As above	As above	As above	As above	GRNET
Module 090 – DNS	As above	As above	As above	As above	FCCN
Module 080 – Auto-configuration and DHCP	As above	As above	As above	As above	FCCN
Module 10x – Routing (and RPSLng)	As above	As above	As above	As above	FCCN
Module 140 – Applications	As above	As above	As above	As above	UCL
Module 170 – Ipv4-Ipv6 Transition	As above	As above	As above	As above	Soton-ECS
Course material 1 – IPv6 Technical Training	Material and laboratory equipment for IPv6 technical training	As above	As above	As above	Cisco
Course material 2 – Training the Trainers	Material and laboratory equipment for training the trainers	As above	As above	As above	Cisco
E-learning package	7 e-learning modules	As above	As above	As above	Instrux!on, Cisco

A.2. Dissemination of knowledge

A.2.1. Summary of Dissemination Activities

Planned/ actual Dates	Type	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
March 2005	TERENA Executive Newsletter No. 6	General public	World		TERENA
April 2005	"European IPv6 Deployments" publication	Technical	China		RENATER
May 2005	"From IPv6 testbeds to large scale deployments" publication	Technical	Europe		RENATER
May 2005	Press Release: "6DISS project to deliver IPv6 message worldwide"	General	Worldwide		Martel TERENA EC
June 2005	IPv6 renumbering technical meeting, San Jose, USA	Technical	USA	30 -40	SOTON-ECS Cisco
June 6th 2005	IPv6 Summit, Barcelona	Technical	Europe	80 – 100	SOTON-ECS
20th-24th June 2005	Présentation «Formation de Formateurs en Technologies de l'Information» (FFTI-2), Conakry, Guinée	Technical	Guinée		RENATER
26th-27th June 2005	ICCI2005, Beijing: "IPv6 interconnection Services using 6PE over Carrier Supporting Carrier - The SEEREN Case"	Technical	China		GRNET Cisco
22nd-23rd August 2005	**1st 6DISS Workshop in Taipei**	Technical	Asia Pacific	45	SOTON-ECS Cisco HUNGARnet
19th-20th September 2005	**2nd 6DISS Workshop, Cape Town**	Technical	Southern Africa	20 - 30	FCCN RENATER HUNGARnet
October 12th 2005	RIPE51 IPv6 WG meeting http://www.ripe.net/ripe/meetings/ripe-51/meeting-venue.html	Technical	Europe	100	RENATER
11th-14th December 2005	AfriNIC, Cairo: Presentations and "hands-on" session	Technical	Africa	20-40	Alcatel GRNET
March 2006	**3rd 6DISS Workshop, Quito, Ecuador**	Technical	Central and Southern America	20 - 30	TERENA FCCN GRNET
March 2006	**4th 6DISS Workshop, Malta**	Technical	Mediterranean countries	20 - 30	RENATER GRNET
April 2006	**5th 6DISS Workshop, Ochrid, FYRoM**	Technical	Balkan countries	20 - 30	GRNET ALCATEL UCL

Planned/ actual Dates	Type	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
October - December 2006	**6th 6DISS Workshop, Dakar, Senegal**	Technical	Sub-Saharan Africa	20 - 30	RENATER Cisco
15th December 2006	BELIEF website Euro-India conference, New Delhi, "Bridging the Digital Divide"	Scientific	World	175	UCL
January 30th 2007	Presentation at Cisco "Networkers" event in Cannes: "6DISS: a worldwide IPv6 training experience"	Scientific	World	100	RENATER
January 15th-17th 2007	Presentation at the Interworking 2006 Conference, Santiago, Chile, "World-wide IPv6 Initiatives"	Researchers	World	80	Martel
5th - 8th March 2007	Presentation at IARIA, Guadeloupe, "Integrating VoIP Services in IPv4 and IPv6 Networks"	Scientific	World	50	UCL (given by RENATER)
27th March 2007	Presentation at the IPv6 Summit, Rabat, "IPv6 deployment in the education area"	Scientific	World	100	RENATER
April - June 2007	**7th 6DISS Workshop, Ashkebad**	Technical	NIS countries and Central Asia	20 - 30	UCL, SOTON-ECS
16th – 21st July 2007	INPT Summer School – Education in IPv6	Students	Europe	35	RENATER
June - September 2007	**8th 6DISS Workshop, Guadeloupe**	Technical	The Caribbean	20 - 30	RENATER TERENA FCCN
19th -. 20th November 2007	Presentation at the Ni Hao Conference, Beijing, China, "FIRE vs. GENI with a link to IPv6"	Telecoms researchers and industry	Global	100	Martel

B Annex 2: Future Plans

6DISS has built up a wealth of excellent material and expertise on IPv6 that must not be allowed to disappear, or become outdated.

This is particularly important precisely at this time, bearing in mind that:

- Microsoft Vista has been released with IPv6 turned on as the default,

- Many industries that we are aware of are considering the benefits of deploying this new Internet protocol,

- ARIN (the American Registry for Internet Numbers) decided (7th May, 2007) - in view of the limited IPv4 addresses still available - to advise the Internet community that migration to IPv6 numbering resources is necessary for any applications which require ongoing availability from ARIN of contiguous IP numbering resources, see http://www.arin.net/v6/v6-resolution.html, and

- AT&T, Level 3, MCI, Qwest and Sprint were awarded telecommunications contracts worth up to $20 billion over 10 years by the US General Services Administration (1st June, 2007) to provide voice, Internet Protocol (IP), wireless, satellite and IP-centric services to 135 federal agencies, using an IP and MultiProtocol Label Switching (MPLS)-based network, compliant with Internet Protocol version 6 (IPv6).

The project also knows that there is a significant world-wide demand for IPv6 training, as demonstrated by the fact that in most regions where 6DISS Workshops have taken place, there has been a request for subsequent events, the Cisco Academy training material has just been enhanced with specific sections on IPv6, and the project has been requested in the last month to give technical training and a "training the trainers" course to two major companies (Questnet (http://www.questnet.net.au/) and ProCurve (the networking division of HP)).

On the other hand, lessons have been learned during 6DISS, and so any follow-up project should take advantage of this knowledge, and not just propose to do "more of the same".

The following three separate follow-up actions reflect our plans for exploiting the outcome of 6DISS for the benefit of (i) users world-wide, (ii) FP6/7 projects and (iii) European industry.

1.   Organisation of IPv6 dissemination activities targeted at developing regions inside and outside of Europe

Although the philosophy behind this idea is similar to the work done in 6DISS, there is innovation in that:

- given the proven success of working closely with AfriNIC[11] to make IPv6 training at most of their joint meetings with AfNOG[12], it is proposed to extend this style of co-operation to APNIC[13] (for the Asia-Pacific region) and LACNIC[14] (for the Latin-America region),

- now that we have a course for "Training Trainers", this aspect would be given a stronger emphasis, so that we can exploit the multiplier effect of training more trainers, who can then train others

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[11]   AfriNIC: African Network Information Centre (and Regional Internet Address Registry)
[12]   AfNOG: African Network Operators Group
[13]   APNIC: Asia-Pacific Network Information Centre (and Regional Internet Address Registry)
[14]   LACNIC: Latin America and Caribbean Network Information Centre (and Regional Internet Address Registry)

- the 6DISS partners have been asked about the possibility of giving practical support (i.e. beyond the 6DISS "helpdesk" service) for real deployment activities, such as supporting campus deployments in Colombia, Nigeria and Argentina. This requires certain technical skills (eg. to evaluate whether it is practical to make an IPv6-only deployment, design an addressing plan) and new modules, but would help organisations to surmount one of the hurdles to deployment; namely, not having the skills or the confidence to make the first step towards deployment

2. Establishing a centre of IPv6 technical expertise that will support dissemination activities and provide "marketing" advice to FP6/7 projects, and industries.

This represents a shift towards a more-commercial target audience, and a re-focusing on Europe. The 6DISS Consortium would extend its service portfolio in order to address the specific needs of multiple European industry sectors, such as environment, health, schools, broadcast, transport, ad-hoc network companies, etc. For example, 6DISS partners have close contacts to the European "Emergency Service" community -through the RUNES, u-2010 and NARTUS projects, where there is a clear need for IPv6 training and dissemination activities. The 6DISS Consortium expects that more emphasis will be put on socially-sensitive topics in forthcoming FP7 Calls, where new services/applications/systems shall use - to some extent - IPv6 protocols as the common underlying technology for digital communications and data exchange.

Our strategy for reaching European industries would be through:

- the FP7 Clustering and Concertation mechanism
- the National IPv6 Task Forces, which comprise industries interested to know more about deploying IPv6
- the EVAN Association, which is investigating the benefits of IPv6 in specific industry sectors

Proposed actions are:

- tailoring the existing presentation material in order to address specific industry sectors
- document deployment activities in Europe and provide technical answers to specific questions
- write brief papers for strategists on the advantages of IPv6 and its impact on various industries

3. Integrating IPv6 training as a dedicated WorkPackage within future project proposals

Items "1" and "2" fit with the new Co-ordination and Support Actions in Call 2 from Unit F3 and with the International Collaboration activities. Item "3" could be part of a project in many areas, such as environment (where IPv6 offers advantages for networking many sensors), transport (since IPv6 has better mobility features than IPv4), etc.

In all of the above cases, we would use the participation in a new project to additionally:

- maintain the existing presentation material
- augment the presentation slides with new ones answering the following questions:
  - what to consider before starting to deploy IPv6
  - what does being "IPv6 ready" mean?
  - what is the implementation status today for IPv6 equipment and services?
  - which are the basic guidelines for today deployments?

- extend the e-Learning package with new modules and sub-titles in new languages
- write brief papers for strategists on the advantages of IPv6 and its impact on various industries
- incorporate new media (eg. DVD clips) to reinforce the training material
- write exercises based on a simulated IPv6 environment, i.e. without needing real equipment
- follow-up contacts made within and outside of Europe regarding the promotion of IPv6
- liaise with new FP7 projects (and be the centre of IPv6 expertise for the programme)
- guarantee the operation of the 2 remote 6DISS testbeds in Paris and Sofia; maintain and support them, giving preferential access for significant events
- prepare a "lab in a box" that can be taken to sites for "hands-on" training

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If no follow-up project is accepted, then the "Future Plans" will have to be reduced to what is feasible to do in the time available before the end of the project, and with the existing project resources (bearing in mind that we have spent as much of the budget as possible by making more than twice as many Workshops than were originally planned).

In this case, 6DISS will:
- aim to ensure the sustainability of the material, by transferring the documentation and expertise through partners to other projects or organisations, such as SEEREN, AfriNIC, etc.
- aim to ensure the long term availability of the remote labs in Paris and Sofia (the operators of these facilities have been selected due to their interest in IPv6 but no preference for IPv6 experiments could be guaranteed)
- make all the 6DISS training material available from the website, e.g. the slides in their original (MS PowerPoint) format and the e-Learning package in "iso" format for optimum downloading and re-use. Also, improve the indexing to the material
- allow the IPv6 Community to upload new - or enhance the existing - "hands-on" exercises to the website
- continue to make available on the website the various concise strategy papers on why people should deploy IPv6 and what are the risks of (not) doing so
- maintain the helpdesk (on a voluntary basis)
- write a final press release informing about the 6DISS training material, i.e. the remote testbeds, e-learning package, technical presentations, etc.

C Annex 3: Announcements from AfriNIC, LACNIC and APNIC

One of the goals of 6DISS was to involve organisations from the targeted regions into future EC projects, thereby strengthening the co-operation between Europe and developing regions of the world, particularly on the topic of the Next Generation Internet. These regions have a shortage of IPv4 addresses and (having minimal existing IPv4 infrastructure) can catch up very quickly with the US, Europe and Japan.

Through contacts built in 6DISS, the project proposal 6DEPLOY for the 2nd INFRA Call of FP7 was able to incorporate the Internet Registries for Africa (AfriNIC), Latin America (LACNIC) and the Asia Pacific region (APNIC) as partners.

This is extremely relevant, given the fact that:

1. The facilities of AfriNIC, LACNIC and APNIC bring enormous potential for reaching out to organisations in their respective regions that can take benefit from the 6DEPLOY services, whether directly, by attending the workshops, or more indirectly, by being made aware of the wealth of training material that is freely accessible from the Website.

2. 6DEPLOY is perfectly in-line with official resolutions they have publicised recently (Summer 2007):

LACNIC announcement (20th June 2007):

" As a response to the forecasts prepared by several investigators indicating that by the year 2011 the central pool of version 4 (IPv4) Internet addresses could be completely depleted, LACNIC announces it is launching a regional campaign so that all the region's networks will be adapted to the new version 6 of the protocol (IPv6) before January 1st, 2011.

It is a fact that IP addresses based on the current version of the protocol (IPv4) will be exhausted in the short term; it is estimated that less than 18% of the total number of IPv4 addresses are still available," said LACNIC's Executive Director, Raúl Echeberría. He also noted that companies, governments and institutions should make the necessary previsions to adopt the protocol IPv6 as soon as possible.

We do not wish to create panic, but IPv4 addresses are on the way to depletion. Therefore, we recommend preparing regional networks as soon as possible for using IPv6. There are still many aspects that need to be decided in relation to the consumption of IPv4 addresses that remain unutilized. The impact of some of these decisions could allow us more time, while others could bring IPv4 depletion date even closer. LACNIC will periodically report to the community so that we can all be prepared," added Mr. Echeberría.

In order to promote the transition and adaptation of the region's networks, IPv6 resource allocations by LACNIC have no associated costs. Many strategic applications, such as those utilized by companies and government bodies, must be preserved, and awareness must be created of the consequences of not implementing adequate measures sufficiently in advance. "

AfriNIC Advise Operators for Immediate Action on IPv6 (25th July 2007):

" Internet Protocol version 4 (IPv4), the protocol used today to run the Internet for more than 20 years now has started showing its limits with mainly the running out of number resources associated to it, known as Internet Protocol addresses (IP addresses). This is essentially due to the steady growth of Internet usage during the past few years. Only 18% of the total IPv4 space is

now available and at the rate of actual consumption despite the very strict evaluation measures implemented by all regional Internet registries, this would not last longer than till 2010-2011.

Soon (within three to four years), AfriNIC will not be able to continue to allocate IPv4 addresses to Network Operators with a guarantee for aggregation. It is our responsibility, to avoid such a situation where the development of our region's network infrastructure is drawn back by the unavailability of these version 4 addresses, to urge Network Operators in the Africa region to take clear actions toward implementing Internet Protocol version 6 (IPv6) in their Network Infrastructure in cohabitation with IPv4. While the time is not for panic, it is rather important that action be taken NOW to avoid a situation of urgency later.

IPv6, the protocol designed and defined as a standard by the Internet Engineering Task Force (IETF) since the late 90s, allows the availability of Billions of Billions of IP addresses with an improvement of several embedded features of the protocol as the result of lessons learned and experiences gained from IPv4 deployment and usage. It is a fact that the long term solution and strategic move for emerging economies like in our region is to not struggle with IPv4 only network deployment any more, but rather deploy IPv6-Ready infrastructure as from now on.

Since 2005, AfriNIC has launched a campaign to introduce IPv6 to Operators and Policy Makers around the African continent. This campaign has taken us for training sessions in more than 12 countries with more than 500 people trained and informed about IPv6.

The AfriNIC Board has approved a plan to intensify this campaign by reaching out to every country and Operators across the continent by the end of 2010. This includes training of technical resources on various transition mechanisms for smooth deployment of IPv6. This decision will also imply the use of different means of communication to reach the majority of stakeholders by the targeted date.

Since advanced planning is a key factor for a successful and affordable transition, we are hereby urging operators in the AfriNIC region to take immediate action. "

APNIC resolution (7th September 2007):

" We recognise that at current rates of allocation, the remaining free pool of IPv4 address space will be consumed within the next 2 to 4 years.

We agree that this situation requires a concerted effort by this community, working for the common good, to seek, examine and adopt responsible measures for the management of remaining IPv4 address space. We recognise that during this period, we will be learning and adapting, and that address management policies may also change to adapt to new circumstances.

We recognise the critical importance of IPv6 to the future success of the Internet, and will actively promote the adoption of IPv6, and focus our efforts towards comprehensive deployment of IPv6 in the Asia Pacific region.

We reassert our support for open, bottom-up and consensus-based decision making, but we also call upon the leading senior and expert members of this community to provide strong leadership in the search for solutions to these issues of IPv4 address management and transition to IPv6, both within the Asia Pacific region and globally. "