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| **Deliverable D1.15**<br>**Report from the 14th Workshop in Guayaquil (WALC2011)** | | | 1.0 |

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|---|
| Alvaro Vives, Consulintel |

| Abstract: |
|---|
| This deliverable presents a report from the workshops held in Guayaquil (Ecuador) from 10th - 14th October 2011. The presentation material is listed, the attendees and their affiliations are given, and the opportunities for further co-operation and follow-up actions are described. |

| Keywords: |
|---|
| IPv6, Support, Training, LAC, Testbeds, Modules, 6DEPLOY, 6DEPLOY-2 |

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# Executive Summary

One of the main activities in the 6DEPLOY-2 project is to organise workshops to train the different Internet communities in the areas of IPv6 deployment, configuration, and usage. This project is a follow up of previous project activities within and outside the Framework Programmes of the European Commission.

This deliverable presents a report from the workshop held in Guayaquil (Ecuador) from 10$^{th}$ - 14$^{th}$ October 2011. The following workshop details are described in this report: a) the workshop attendees and their affiliations, b) the programme outline, c) the material presented, d) hands-on exercises, e) an assessment of the opportunities for further co-operation and follow-up actions planned, and f) an analysis of the feedback questionnaires from the participants.

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# 1. INTRODUCTION

## 1.1 6DEPLOY-2 Objectives

The following comprise the 6DEPLOY-2 objectives:

- to support the deployment of IPv6, in Europe and developing regions

- to sustain the wealth of 6DEPLOY training material (e-learning package with subtitles in national languages, presentation material, exercises, etc.)

- to create a catalyst of global IPv6 expertise through the installation of strategically-placed sustainable IPv6 training labs

- to synchronise with the training schedules of AfriNIC and LACNIC (and also APNIC) to exploit training opportunities cost effectively in Africa, Latin America and Asia

- to revive the IPv6 Cluster

- to describe deployment examples on the project Website

- to exploit the expertise and high quality training material from 6DEPLOY, including presentations, the e-learning course and the available IPv6 Labs, and - whilst continuing to offer professional training to organisations in Europe and developing countries - focus on supporting real deployments

- to maintain and update the 6DEPLOY material and include new training media, and multiply its training effectiveness through courses which educate other trainers about the basics of IPv6, so that they can teach others ("training trainers")

- to extend to global scale the IPv6 Labs. Sustainability is achieved initially through the careful selection of locations for the installations (e.g. within NRENs) where the connectivity, funding and qualified staff support are all secured

- to support the (human) networking between the Lab managers with regular workshops.

One of the main activities in the 6DEPLOY-2 project is therefore to organise workshops to train the different Internet communities in the areas of IPv6 deployment, configuration, operation, and management. This activity is a follow up of previous project's activities within and outside the Framework Programmes of the European Commission.

## 1.2 6DEPLOY-2 Workshop Methodology

The 6DEPLOY-2 methodology relating to the workshops is shown in the diagram below:

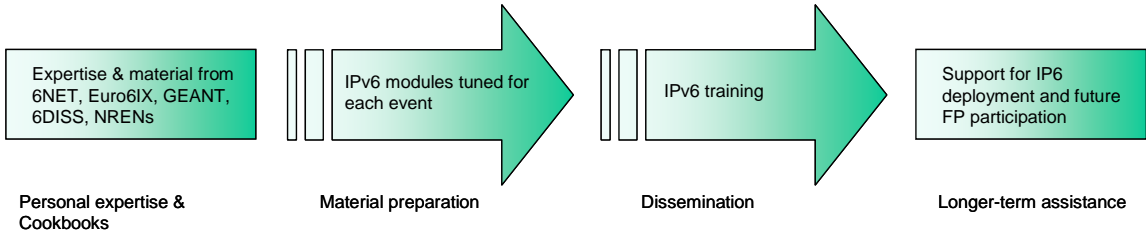| Expertise & material from 6NET, Euro6IX, GEANT, 6DISS, NRENs | IPv6 modules tuned for each event | IPv6 training | Support for IP6 deployment and future FP participation |
|---|---|---|---|
| Personal expertise & Cookbooks | Material preparation | Dissemination | Longer-term assistance |

**Figure 1-1: 6DEPLOY-2 methodology (diagrammatically)**

The approach is to use course material available from 6DEPLOY and elsewhere that relates to IPv6, the e-learning course, and the 6NET IPv6 Deployment Guide book, together which form the basis of the training material. This training material is supplemented with knowledge from partners' participation in events such as IPv6 Forum meetings, IPv6 Task Force meetings, Internet2 meetings, and the IETF, and from the experience of similar activities brought to the project by the representatives of the Internet Registries in North and South America, the Asia-Pacific region, Africa, and Europe. The knowledge is disseminated through training sessions that, for practical reasons, are often held in conjunction with AfriNIC, LACNIC, APNIC, AfNOG, APRICOT, and ISOC meetings.

After each workshop, feedback reports are collected from the participants, enabling 6DEPLOY-2 to assess the impact of the presentations and to identify any areas that need improvement.

The full set of dissemination materials (including the e-learning course and an increasing number of managed testbeds) is available from 6DEPLOY and partners´ own sources. This includes presentation slides on all issues of Internet deployment and evolution; especially IPv4-IPv6 transition strategies, DNS, DHCP, routing, QoS, MobileIP, multicast, renumbering, auto-configuration, security, monitoring and management tools, and applications. This material was described in the deliverable D1.1.1: "Report of the available training material and the assignment of partners responsible for maintaining each item".

This deliverable presents a report from the workshop held in Guayaquil (Ecuador) from 10th - 14th October 2011. The workshop comprised both slide presentations and hands-on exercises using remote testbeds for routing exercises.

Chapter 2 of this document explains the general motivation for running IPv6

workshops, and Chapter 3 describes the specific details of this workshop, in terms of the attendees, the modules that were presented, and the "hands-on" exercises that were performed. Chapter 4 identifies opportunities for further collaboration in the region and follow up actions, Chapter 5 summarises the analysis of the feedback questionnaires that were filled in by the participants, and Chapter 6 provides some general conclusions.

## 2. THE WORKSHOPS (GENERAL)

Workshops are one of the main mechanisms used by 6DEPLOY-2 to transfer information and to build collaboration.

6DEPLOY-2 is structured to provide an ideal platform for the discussion of deployment scenarios and the exchange of best practices, thereby avoiding duplication of effort, by preventing the waste of time on techniques that are known not to have been deprecated, and generally making the most efficient use of the available resources in a region. Partners in 6DEPLOY-2 have deployed IPv6 on a production basis in their own NRENs and University networks, and have documented their experiences in Cookbooks and in IETF informational/best common practice RFCs. The manufacturer in the consortium is building IPv6 products.

The workshops are not only intended to lead to an improved quality of the Internet infrastructure in developing countries, but will also raise the competence of the attendees and, in exploiting the personal contacts made through 6DEPLOY-2, facilitate and encourage the participation of their organisations in future FP7 calls and beyond.

Impacts from the workshops will include:

- a positive effect towards preventing the "brain drain" from developing countries by bringing interesting and state-of-the-art activities into these regions, thus making information and knowledge resources accessible to scholars both locally and globally;

- an expansion of the conditions for growth by enabling the exchange of ideas, launching joint experiments and projects, disseminating RTD results, and activating market forces; all of which are substantial elements in the process of regional development;

- making European research and industrial concerns aware of the highly skilled personnel who can contribute to the urgently needed improvement of ICT infrastructures, resulting in an increase of the demand for specialized services provided by the highly skilled academics and researchers of the region; and

- the identification of IPv6 deployment activities in the region and an exchange of information about deployment experiences.

While IPv6 standards and services are quite stable, regional variations in practices and operations will require slightly different approaches for collaboration and dissemination. Therefore, the material for these workshops was collected, and the workshop

schedules, formats, and contents were tailored in conjunction with the local organisers so as to suit the type of participants, the subjects to be addressed, the location, the host organisation, the sponsors, etc.

# 3. THE 6DEPLOY-2 WORKSHOP IN GUAYAQUIL (ECUADOR)

This IPv6 Workshop was held in Guayaquil (Ecuador) from 10th - 14th October 2011. This workshop was part of WALC2011 Event organized by EsLaRed (Latin American Networking School Foundation). In the following paragraphs we provide information about the workshop, including the programme outline, and the material that was presented.

Details of the workshop and the training material used can be found in 6DEPLOY's project web site:

http://www.6deploy.eu/index.php?page=20111010_guayaquil_ecuador

## 3.1 Overview

This 5-day workshop covered all the IPv6-related topics, using both theory and practice contents. More details on the content provided will be given in the following sections.

The 6DEPLOY-2 representative at the workshop was: Alvaro Vives, from Consulintel. Other people supported by giving some of the presentations: Fernando Gont (SI6 Networks) gave the IPv6 Security content, Christian O'Flaherty (ISOC) gave the IPv6 Routing theory, and Marco Zennaro (ICTP) gave a talk about Wireless Sensor Networks.

The presentations were conducted in Spanish, in order to accommodate the local audience.

## 3.2 Attendees

Below is a list of people that attended:

| No. | Name | Affiliation |
|-----|------|-------------|
| 1 | Aldo René Martínez Delgadillo | Univ. Nacional Autónoma de Nicaragua - León |
| 2 | Aurora Lucía Ochoa Alvarez | N/A |
| 3 | Carlos Luis Corredor Vasquez | Fundación EsLaRed |
| 4 | Cesar Elias Rodríguez Novoa | UNIV. PRIVADA DEL NORTE |
| 5 | Christian Alfredo Muyón Rivera | ESPE |
| 6 | Cristian David Maldonado Moyolema | ESPE |
| 7 | Dagoberto Secundino Gutiérrez | INSTITUTO UNIVERSITARIO DE TECNOLOGIA ALONSO GAMERO |
| 8 | Ricardo Daniel  Burbano Ferrin | UNIV. TECNICA ESTATAL DE QUEVEDO |
| 9 | David Fernando Correa Aguirre | CELPLUS S.A. |
| 10 | Doris Quintero Rincón | Instituto para el Desarrollo Economico del Municipio |

| | | Alberto Adriani |
|----|----|----|
| 11 | Erick Gonzalo Albán Recalde | ESPE |
| 12 | Javier Richard Quinto Ancieta | INICTEL-UNI |
| 13 | Jhonathan Fernando Correa Aguirre | N/A |
| 14 | Jorge Luis González Briceño | Univ. Centroccidental Lisandro Alvarado |
| 15 | Jorge Hernando Ramón Suárez | Univ. Industrial de Santander |
| 16 | Jorge Sergio Herrera Tapia | Univ. Laica Eloy Alfaro de Manabí |
| 17 | José Roberto Patiño Sánchez | Escuela Superior Politécnica del Litoral |
| 18 | Juan Carlos Maruri Sigüenza | Motorola |
| 19 | Leonardo Andrés Gavidia Guerra | Esc. Superior Politécnica del Litoral |
| 20 | Marco Tulio Trujillo Silva | Universidad Antenor Orrego |
| 21 | María Fernanda Molina Miranda | Esc. Superior Politécnica del Litoral |
| 22 | María Mayela Uzcátegui Briceño | Fundación EsLaRed |
| 23 | Mariela Alexandra Espin Briones | Esc. Superior Politecnica del Litoral |
| 24 | Marelvys Alejandra Rangel Rangel | Netsite Corporacion C.A |
| 25 | Mauricio Ernesto Garcia Eguizabal | Universidad de El Salvador |
| 26 | Milton Patricio Navas Moya | Esc. Superior Politecnica del Ejercito |
| 27 | Pablo Echeberria Latorre | LACNIC |
| 28 | Rafael Borja | Secretaría Técnica de Planificación |
| 29 | Ricardo Xavier Proaño Alulema | Univ. Tecnica de Ambato |
| 30 | Walter Moisés La Madriz Guerra | CENTRO NACIONAL DE INNOVACION TECNOLOGICA / Movilnet |
| 31 | Kenya Anmarit Guerrero Goyes | INSTITUTO TECNICO SUP. EUGENIO ESPEJO |

**Table 3-1: Guayaquil (Ecuador) Workshop list of participants**

The participants represented a broad sector of the ICT community. They were technical people whose knowledge about IPv6 ranged from almost no knowledge at all to having significant experience with IPv6 deployment. Some had already performed IPv6 experiments or were planning some level of deployment at their institutions.

## 3.3 Workshop programme

The agenda was agreed on after close collaboration with the local organisers. The meeting agenda and the related material were submitted in advance so that the local organisers could decide which topics should be prioritised and so manage the logistics accordingly. The program of the workshop is presented in the following table:

| Date | Time | Title of session |
|------|------|------------------|
| 10/10/2011 | 10:30 | Introducción a IPv6 |
| | 14:00 | Formatos de cabeceras y tamaño de paquetes |
| | 14:30 | Direccionamiento IPv6 |
| | 16:00 | ICMPv6, Neighbor Discovery y DHCPv6 |
| | 17:00 | Práctica 1: Instalación de IPv6 en host y configuración básica |

| | 17:30 | Practica 2: Direcciones, manejo prefijos IPv6 |
|---|---|---|
| 11/10/2011 | 8:00 | Seguridad IPv6 |
| | 10:30 | Práctica 3: Seguridad IPv6 |
| | 14:00 | DNS IPv6 |
| | 15:00 | Practica 4: Servidores IPv6 |
| 12/10/2011 | 8:00 | Encaminamiento con IPv6 |
| | 14:00 | Prácticas Routing |
| 13/10/2011 | 8:00 | Mecanismos de Transición |
| | 10:30 | Gestión de Red IPv6 |
| | 11:30 | Practica 5: Gestión de Red |
| | 14:00 | Introduction to Wireless Sensors Networks |
| | 15:30 | Practica 6: Herramientas Gestión Direcciones |
| 14/10/2011 | 8:00 | Calidad de Servicio (QoS) |
| | 8:45 | IPv6 sobre MPLS |
| | 9:30 | Movilidad IPv6 |
| | 10:30 | Multi-Homing |
| | 12:00 | Porting de Aplicaciones |
| | 15:00 | Multicast |

**Table 3-2: Guayaquil (Ecuador) Workshop program**

## 3.4 Presentation material

The following material was presented:

| Modules | Presented by | Affiliation |
|---|---|---|
| Introducción a IPv6 | Alvaro Vives | Consulintel |
| Formatos de cabeceras y tamaño de paquetes | | |
| Direccionamiento IPv6 | | |
| ICMPv6, Neighbor Discovery y DHCPv6 | | |
| Práctica 1: Instalación de IPv6 en host y configración básica | | |
| Práctica 2: Direcciones, manejo prefijos IPv6 | | |
| Seguridad IPv6 | Fernando Gont | SI6 Networks |
| Práctica 3: Seguridad IPv6 | | |
| DNS IPv6 | Alvaro Vives | Consulintel |
| Práctica 4: Servidores IPv6 | | |
| Encaminamiento con IPv6 | Christian O'Flaherty | ISOC |
| Prácticas Routing | Alvaro Vives | Consulintel |
| Mecanismos de Transición | | |
| Gestión de Red IPv6 | | |
| Práctica 5: Gestión de Red | | |
| Introduction to Wireless Sensors Networks | Marco Zennaro | ICTP |
| Práctica 6: Herramientas Gestión Direcciones | Alvaro Vives | Consulintel |

| | | |
|---|---|---|
| Calidad de Servicio (QoS) | | |
| IPv6 sobre MPLS | | |
| Movilidad IPv6 | | |
| Multi-Homing | | |
| Porting de Aplicaciones | | |
| Multicast | | |

**Table 3-3: Guayaquil (Ecuador) Workshop list of modules used**

### 3.4.1 Modules

Below is a brief description of each module's content:

- **Introducción a IPv6:** This module explains why a new version for IP, IPv6, has been developed. A brief history of IPv6, its motivation and benefits are given.

- **Formatos de cabeceras y tamaño de paquetes:** This module describes IPv6 packet header, extensions headers and differences with IPv4 headers. Packet size issues and upper layer considerations are also treated.

- **Direccionamiento IPv6:** This module explains the IPv6 addressing architecture, the different types of addresses (unique local IPv6 addresses, interface IDs, multicast addresses), their textual representation, how these are built and related to a layer 2 address.

- **Práctica 2: Direcciones, manejo prefijos IPv6:** Small practice to get used with IPv6 addresses and to do some practical exercises with subnetting in IPv6. An example topology is introduced and the attendees have to divide the assigned /32 prefix for each part of the network.

- **ICMPv6, Neighbor Discovery y DHCPv6:** This module describes new protocols associated to IPv6: e.g. Neighbour Discovery Protocol, SEND, ICMPv6, MLD, DHCPv6, etc.

- **Seguridad IPv6:** Several issues are covered like the IPsec model, privacy extensions, ND threats, IPv4 vs. IPv6 Threat Analysis, IPv6 security issues, practical IPv6 security issues and firewalling IPv6. The distributed security model is introduced. Security issues from transition and coexistence point of view are also provided.

- **Práctica 3: Seguridad IPv6:** Some open source tools were used to send specially crafted packets and observe the results.

- **DNS IPv6:** This module describes new Resource Records for IPv6 DNS, availability of IPv6 in the root servers zone and CC-TLDs, etc.

- **Encaminamiento con IPv6:** This module mainly describes the differences between IPv4 and IPv6 routing protocols for OSPFv3, EIGRP, RIPng, BGP4+, ISIS and MPLS.

- **Mecanismos de transición:** This module explains different approaches to deploy IPv6 in an IPv4 environment. Transition concepts are introduced and several transition mechanisms are covered: Dual Stack, tunnels, tunnel broker, 6to4, Teredo, Softwires and translation (at various layers).

- **Gestión de Red IPv6:** This module explains how to manage an IPv6 network using SNMP. The different ways to retrieve management information are described (MIBs).

- **Calidad de Servicio (QoS):** This module describes how to implement IPv6 QoS with Classes of Services (configuration examples, performance tests) and discusses IPv6 Flow Label usage.

- **IPv6 sobre MPLS:** This module describes different options to deploy IPv6 in a network with MPLS.

- **Movilidad IPv6:** This module describes IPv6 mobility and news features compared to IPv4 mobility.

- **Multi-homing:** This module introduces the multi-homing issue with IPv6, how it is solved in IPv4 and the proposed solutions to be used with IPv6.

- **Porting de Aplicaciones:** This module describe things that have changed with the introduction of IPv6 from the programming point of view, and points to be taken into account in order to add IPv6 support to an IPv4-ready application.

- **Multicast:** After giving some multicast concepts the following topics are covered: multicast addresses, Multicast Listener Discovery (MLD) protocol, multicast routing, PIM-ASM and PIM-SSM. Some practical issues are included as well.

### 3.4.2 Hands-on exercises

To help ensure the workshop attendees will be able to install IPv6 in their own environment after the course is over, a set of practical routing exercises has been designed, known as 'hands-on modules'. These exercises are performed both on local equipment and on remote testbeds, thanks to Cisco donations. The labs used in this workshop were ones installed in Budapest and Madrid.

Below is a brief description of the hands-on exercises that were performed:

- **Práctica 1: Instalación de IPv6 en host y configración básica:** These

exercises illustrate how to install IPv6 on several platforms, mainly Linux, Vista, and Windows XP operating systems. Use of link-local addresses, ping and traceroute. Configuration of static addresses. Concepts like addresses, autoconfiguration, and neighbor discovery protocol using hosts.

- **Práctica 4: Servidores IPv6**: Practice to install and configure IPv6-capable DNS and web servers.

- **Prácticas Routing**: IPv6 routing protocols are configured by the trainees on the testbed routers. Internal Gateway Protocol (OSPF) and External Gateway Protocol (BGP) are tested.

- **Práctica 5: Gestión de Red**: Installation and configuration of open source tools to monitor IP addresses and services.

- **Práctica 6: Herramientas Gestión Direcciones**: Installation and configuration of open source tools to manage IPv6 prefixes.

Following are more details about the routing lab, with a brief description of the testbeds used and the exercises carried out.

### 3.4.2.1 Hands-on exercises using the IPv6 Testbed in Budapest

Routers were configured beforehand to accept telnet connections from the training location. The following figure illustrates the used topology.



**Figure 3-1: Budapest testbed**

### 3.4.2.2 Hands-on exercises using the IPv6 testbed in Madrid

The Madrid IPv6 installation more or less mirrors the procedures and functionality of the Budapest testbed. Routers were configured beforehand to accept telnet connections from the training location. The following figure illustrates the used topology.
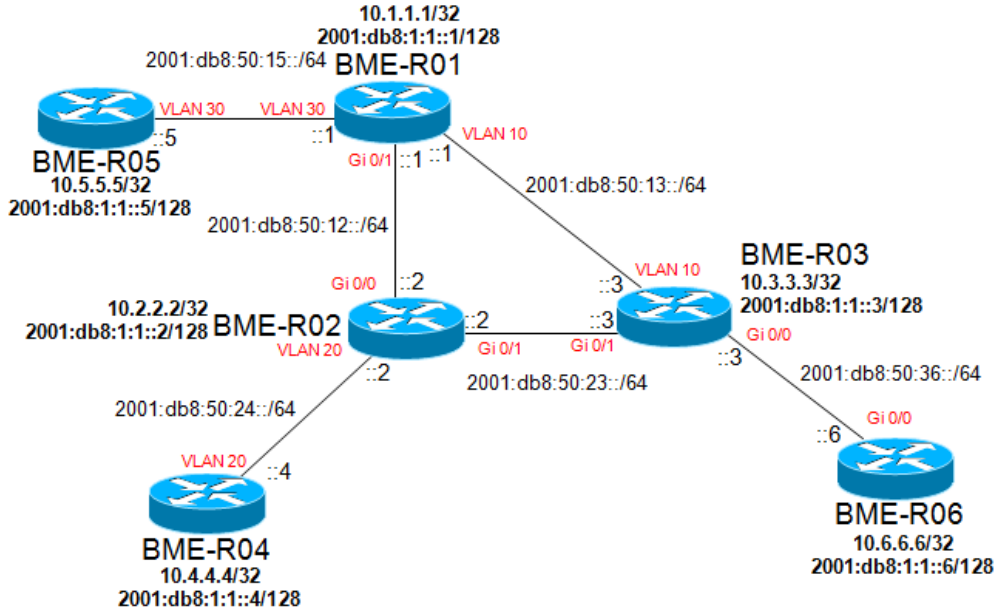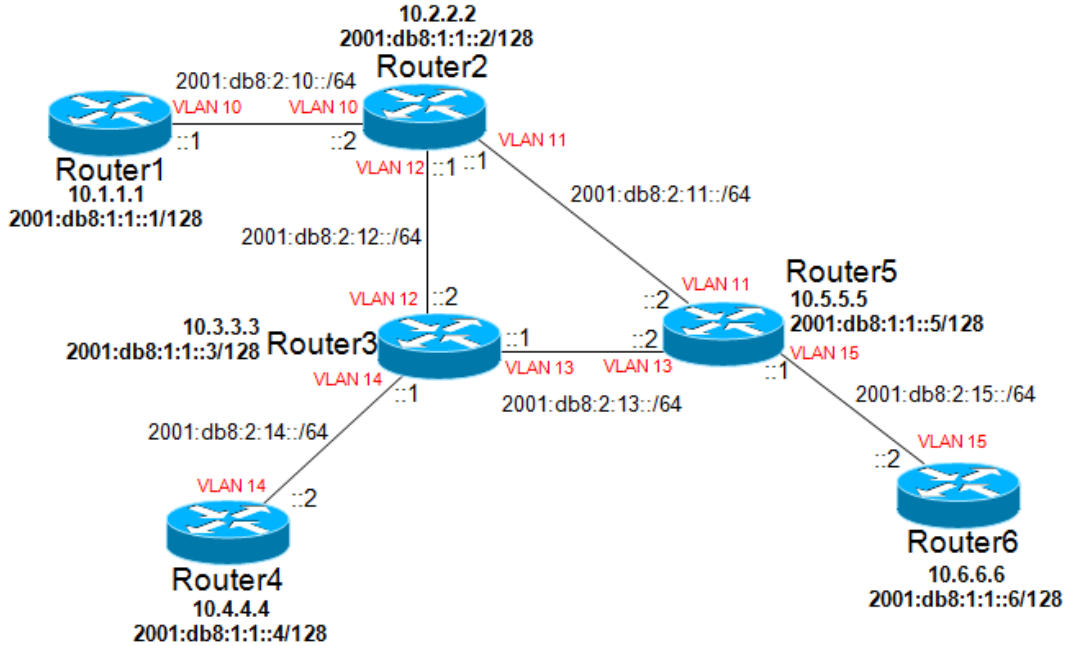


**Figure 3-2: Madrid testbed**

### 3.4.2.3 Common tasks

Groups of one or two people were created and each group was assigned one router.

Three main tasks were proposed within the routing labs:
- Task 1: Configure Loopback and interfaces IPv6 addresses.
- Task 2: Configure OSPF routing.
- Task 3: Configure BGP routing.

## 3.5 Photographs taken at the event



**Figure 3-3: Attendees to the workshop**



**Figure 3-4: Attendees to the workshop**

**Figure 3-5: Attendees to the workshop**



**Figure 3-6: IPv6 Workshop Group Photo**

## 4. OPPORTUNITIES FOR FURTHER CO-OPERATION

In all the workshops, the attendees were informed on how to stay in contact with the 6DEPLOY partners in case they have questions regarding IPv6 deployment, addressing plans, etc. In this respect, the role of the *helpdesk* was explained as being the way to submit questions. An e-mail to helpdesk@6deploy.eu will be distributed to a mailing list composed of volunteers who are available to answer (or forward) any kind of questions, requests, etc. Also a web form can be used to send requests to the project.

Additionally, the attendees (and trainers from the region) can follow the e-learning course and/or check the availability of the 6DEPLOY-2 remote labs and use these.

The collaboration of 6DEPLOY-2 with the WALC event started an 2009, being this workshop the third given during this event. We hope that this collaboration continues as long as the 6DEPLOY-2 project exists. It has to be noted that EsLaRed (http://www.eslared.org.ve) is an organization that has being providing technical training for 20 years, being recognized with the John Postel's award in 2008.

# 5. ANALYSIS OF THE FEEDBACK QUESTIONNAIRES

A questionnaire has been specially designed for the purpose of getting feedback from the participants regarding the suitability of the course material, and the presenters´ ability to convey information, and the relevance of the information to the expectations of the attendees.

Personal information was not mandatory, so as to allow for anonymous responses.

Each participant was first asked to indicate:

- his/her organisation and job responsibilities, and
- his/her plans for IPv6 deployment in his/her organisation.

Then, for each theoretical presentation and "hands-on" session, each participant was requested to assess "usefulness", "quality of presentation", "familiarity with the topic", "quality of the course documentation", "general organisation", etc.

## 5.1 General questions related to participants and IPv6

| About the participants | | |
|---|---|---|
| 31 participants were present, 22 questionnaires were returned | | |
| **Employment sector** | Government | 4 |
| | University or other higher education | 12 |
| | Schools or further education | 0 |
| | Research | 3 |
| | Health | 0 |
| | Commercial | 1 |
| | Other (please specify) | (2)* |
| | | |
| **Job function** | Government Advisor | 0 |
| | Senior Manager | 1 |
| | IT Manager | 2 |
| | Systems Administrator | 2 |
| | Network Administrator | 8 |
| | Researcher / Postgraduate | 3 |
| | Undergraduate | 3 |
| | Other (please specify) | (1)* |
| **Usage of IPv6** | | |
| Do you use IPv6 yourself? | Yes | 4 |
| | No | 14 |
| | | |
| Does your organisation use IPv6? | Yes | 1 |
| | No, but planned in this year | 1 |
| | No, but planned in the next year | 3 |
| | No, but planned in the longer term | 5 |
| | No, and no plans as yet | 8 |

\* See the graphics section for more information

**Table 5-1: General questions related to participants and IPv6**

## 5.2 Questions regarding the workshop

| About the Workshop | | | | |
|---|---|---|---|---|
| **Usefulness of the topic** | Very useful | Useful | Slightly useful | Not useful |
| | | | | |
| Presentación 1 – Introducción básica a IPv6 | 16 | 1 | 0 | 0 |
| Presentación 2 – Formatos de cabeceras y tamaño de paquetes | 13 | 4 | 0 | 0 |
| Presentación 3 – Direccionamiento IPv6 | 15 | 2 | 0 | 0 |
| Presentación 4 – ICMPv6, Neighbor Discovery y DHCPv6 | 14 | 3 | 0 | 0 |
| Presentación 5 – Seguridad IPv6 | 14 | 3 | 0 | 0 |
| Presentación 6 – Encaminamiento con IPv6 | 14 | 3 | 0 | 0 |
| Presentación 7 – Mecanismos de Transición | 14 | 2 | 1 | 0 |
| Presentación 8 – Movilidad IPv6 | 12 | 3 | 2 | 0 |
| Presentación 9 – Calidad de Servicio (QoS) | 11 | 5 | 1 | 0 |
| Presentación 10 – Multicast | 11 | 5 | 1 | 0 |
| Presentación 11 – Multi-Homing | 11 | 6 | 0 | 0 |
| Presentación 12 – Porting de Aplicaciones | 12 | 5 | 0 | 0 |
| Presentación 13 – Gestión SNMP sobre IPv6 | 13 | 3 | 1 | 0 |
| Presentación 14 – IPv6 sobre MPLS | 15 | 1 | 1 | 0 |
| Presentación 15 – DNS IPv6 | 13 | 4 | 0 | 0 |
| Práctica 1 – IPv6 en Hosts | 15 | 2 | 0 | 0 |
| Práctica 2 – Servidores | 17 | 0 | 0 | 0 |
| Práctica 3 - Routing | 16 | 1 | 0 | 0 |
| Práctica 4 - Direccionamiento | 15 | 1 | 1 | 0 |
| Práctica 5 - Seguridad | 15 | 2 | 0 | 0 |
| Práctica 6 - Gestión de Red | 10 | 7 | 0 | 0 |
| | | | | |
| **Quality of the presentation** | Excellent | Good | Average | Poor |
| | | | | |
| Presentación 1 – Introducción básica a IPv6 | 16 | 1 | 0 | 0 |
| Presentación 2 – Formatos de cabeceras y tamaño de paquetes | 15 | 2 | 0 | 0 |
| Presentación 3 – Direccionamiento IPv6 | 15 | 2 | 0 | 0 |
| Presentación 4 – ICMPv6, Neighbor Discovery y DHCPv6 | 13 | 4 | 0 | 0 |
| Presentación 5 – Seguridad IPv6 | 15 | 2 | 0 | 0 |
| Presentación 6 – Encaminamiento con IPv6 | 13 | 3 | 1 | 0 |
| Presentación 7 – Mecanismos de Transición | 14 | 2 | 1 | 0 |
| Presentación 8 – Movilidad IPv6 | 13 | 3 | 1 | 0 |
| Presentación 9 – Calidad de Servicio (QoS) | 12 | 4 | 1 | 0 |
| Presentación 10 – Multicast | 14 | 2 | 1 | 0 |
| Presentación 11 – Multi-Homing | 14 | 2 | 1 | 0 |
| Presentación 12 – Porting de Aplicaciones | 13 | 4 | 0 | 0 |
| Presentación 13 – Gestión SNMP sobre IPv6 | 13 | 3 | 1 | 0 |
| Presentación 14 – IPv6 sobre MPLS | 12 | 4 | 1 | 0 |
| Presentación 15 – DNS IPv6 | 13 | 4 | 0 | 0 |
| Práctica 1 – IPv6 en Hosts | 17 | 0 | 0 | 0 |
| Práctica 2 – Servidores | 15 | 1 | 1 | 0 |
| Práctica 3 - Routing | 14 | 2 | 1 | 0 |
| Práctica 4 - Direccionamiento | 15 | 2 | 0 | 0 |
| Práctica 5 - Seguridad | 13 | 4 | 0 | 0 |

| Práctica 6 - Gestión de Red | 14 | 2 | 1 | 0 |
|---|---|---|---|---|
| | | | | |
| **Familiarity with the topic?** | None | Some | Most | All |
| | | | | |
| Presentación 1 – Introducción básica a IPv6 | 1 | 7 | 6 | 3 |
| Presentación 2 – Formatos de cabeceras y tamaño de paquetes | 2 | 7 | 6 | 2 |
| Presentación 3 – Direccionamiento IPv6 | 3 | 8 | 4 | 2 |
| Presentación 4 – ICMPv6, Neighbor Discovery y DHCPv6 | 6 | 6 | 5 | 0 |
| Presentación 5 – Seguridad IPv6 | 6 | 7 | 4 | 0 |
| Presentación 6 – Encaminamiento con IPv6 | 5 | 8 | 4 | 0 |
| Presentación 7 – Mecanismos de Transición | 5 | 7 | 5 | 0 |
| Presentación 8 – Movilidad IPv6 | 6 | 8 | 3 | 0 |
| Presentación 9 – Calidad de Servicio (QoS) | 7 | 8 | 2 | 0 |
| Presentación 10 – Multicast | 5 | 7 | 4 | 1 |
| Presentación 11 – Multi-Homing | 6 | 7 | 4 | 0 |
| Presentación 12 – Porting de Aplicaciones | 8 | 6 | 3 | 0 |
| Presentación 13 – Gestión SNMP sobre IPv6 | 9 | 5 | 3 | 0 |
| Presentación 14 – IPv6 sobre MPLS | 8 | 6 | 3 | 0 |
| Presentación 15 – DNS IPv6 | 5 | 7 | 5 | 0 |
| Práctica 1 – IPv6 en Hosts | 4 | 6 | 5 | 2 |
| Práctica 2 – Servidores | 3 | 9 | 5 | 0 |
| Práctica 3 - Routing | 3 | 7 | 6 | 1 |
| Práctica 4 - Direccionamiento | 5 | 5 | 6 | 1 |
| Práctica 5 - Seguridad | 6 | 7 | 4 | 0 |
| Práctica 6 - Gestión de Red | 5 | 8 | 4 | 0 |
| | | | | |
| **Quality of the course documentation** | Excellent | Good | Average | Poor |
| | 15 | 1 | 1 | 0 |
| | | | | |
| **General workshop organisation** | Excellent | Good | Average | Poor |
| | 16 | 1 | 0 | 0 |
| | | | | |
| **Recommend to your colleagues?** | yes | no | | |
| | 17 | 0 | | |

**Table 5-2: Questions regarding the workshop**

## 5.3 Results graphics

Following are some graphics that represent the above results in a more friendly way, so as to ease their interpretation.
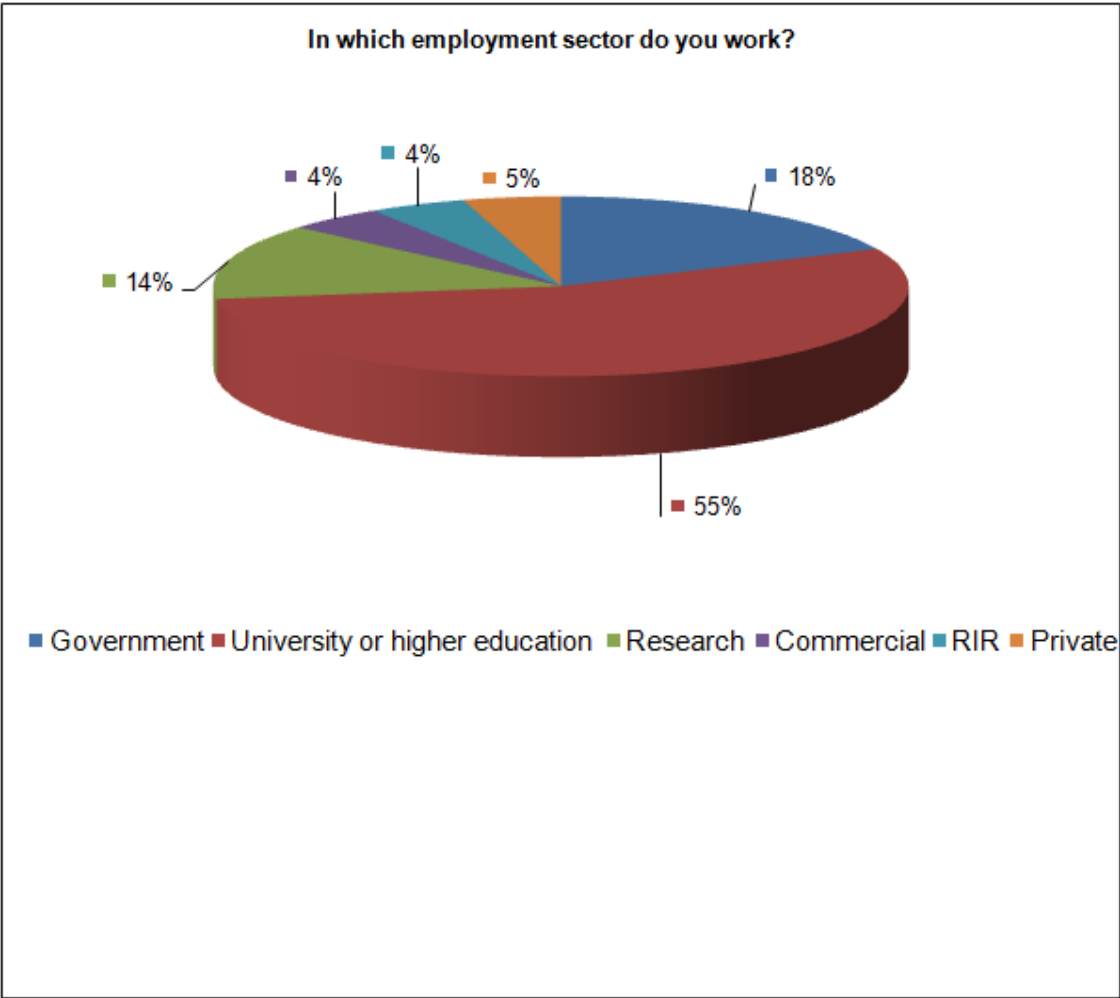
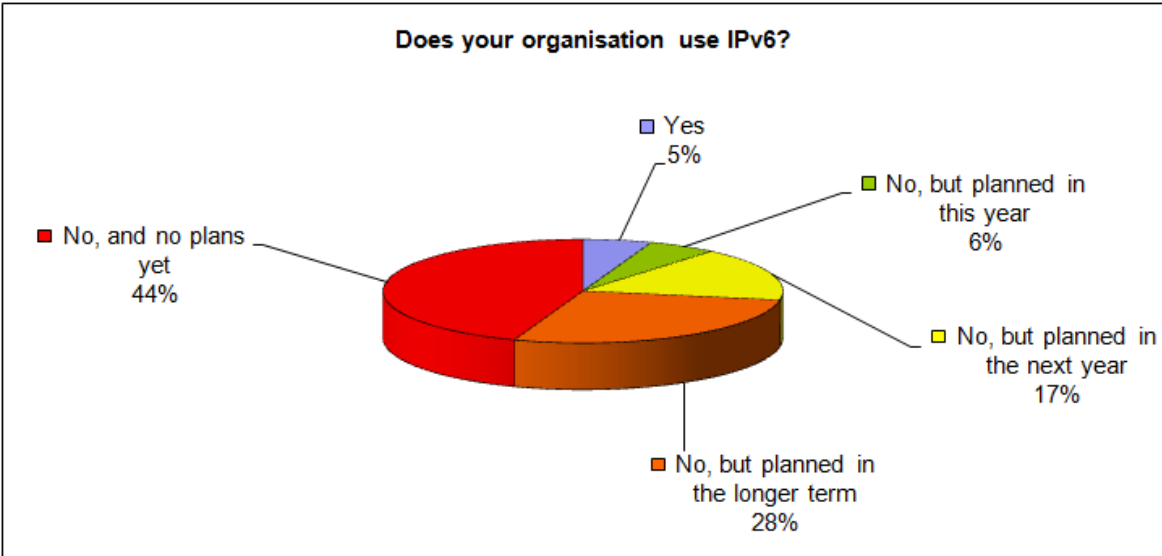**Figure 5-1: In which employment sector do you work?**



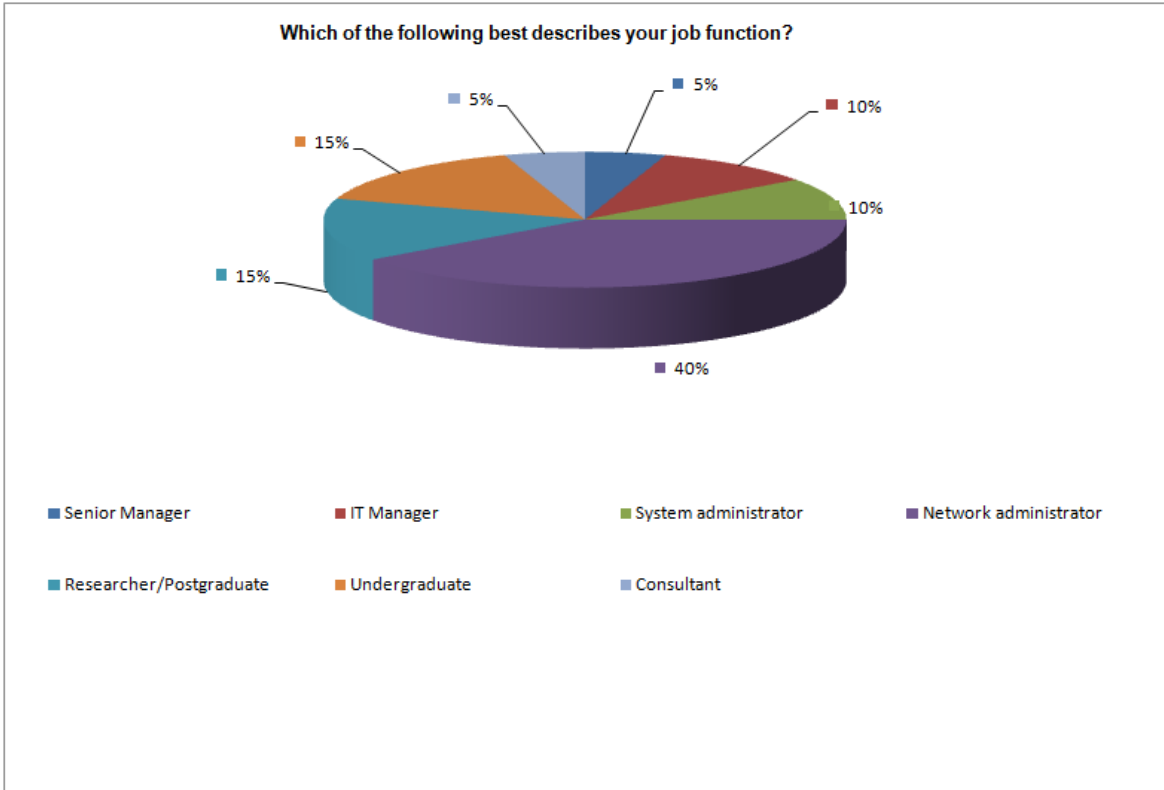**Figure 5-2: Does your organisation use IPv6?**

**Which of the following best describes your job function?**



**Figure 5-3: Which of the following best describes your job function?**
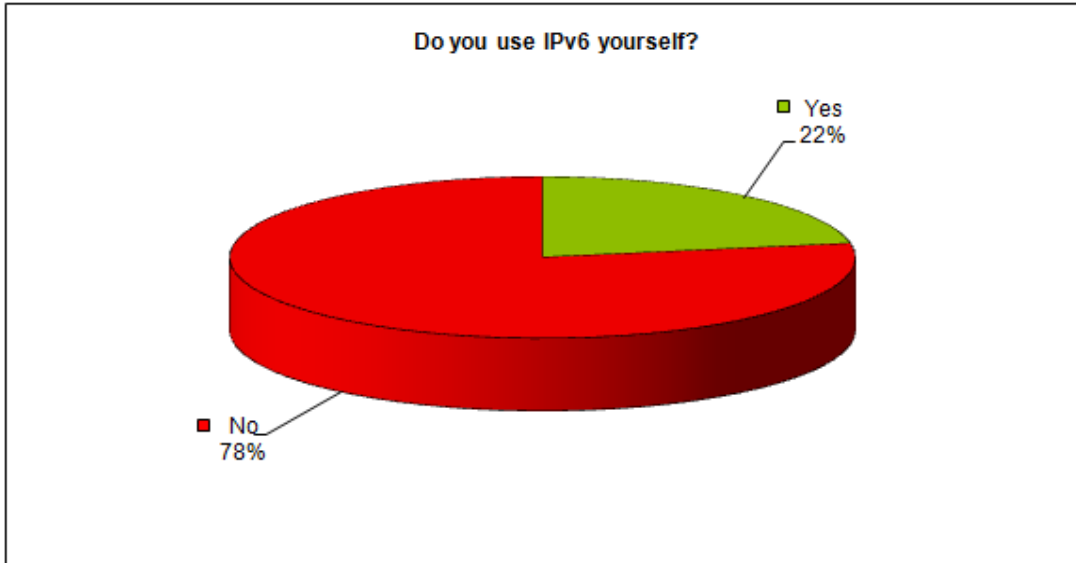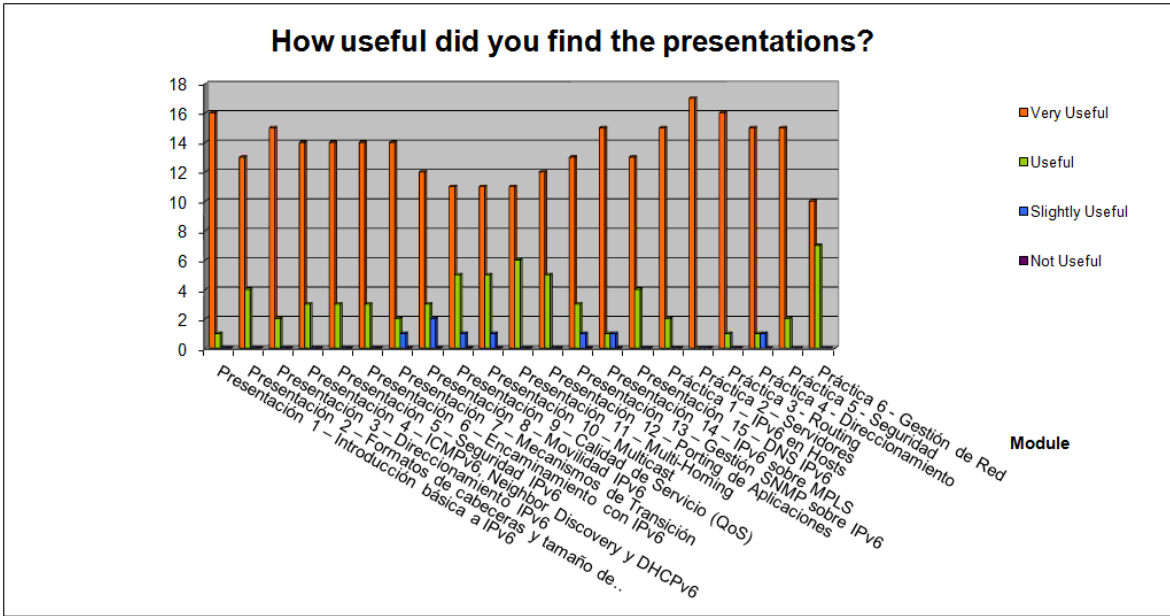


**Figure 5-4: Do you use IPv6 yourself?**

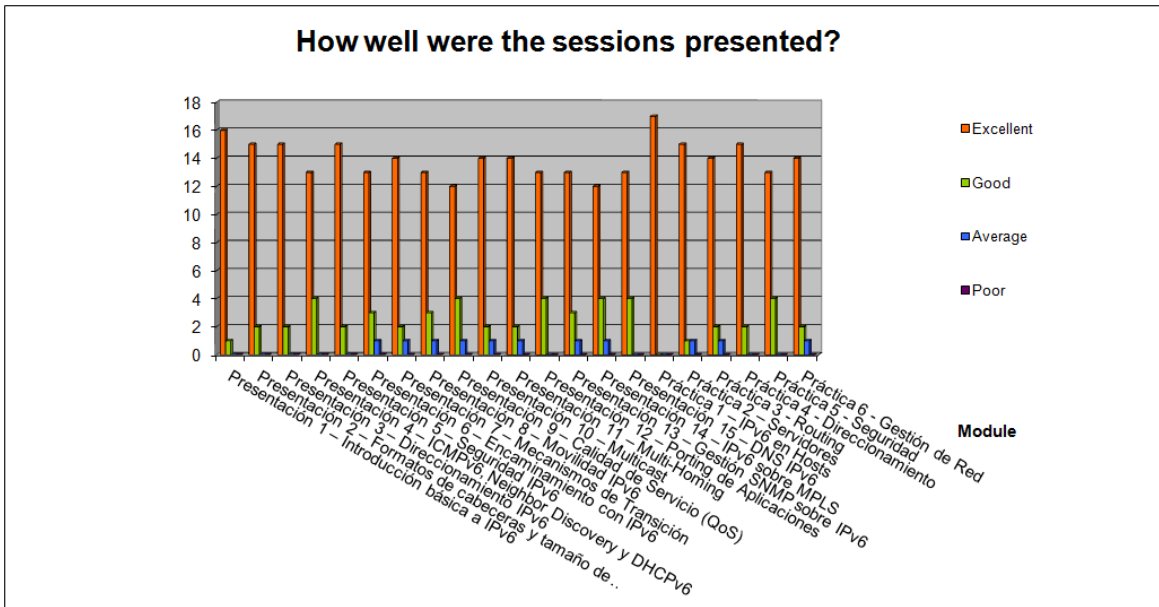**Figure 5-5: How useful did you find the presentations?**
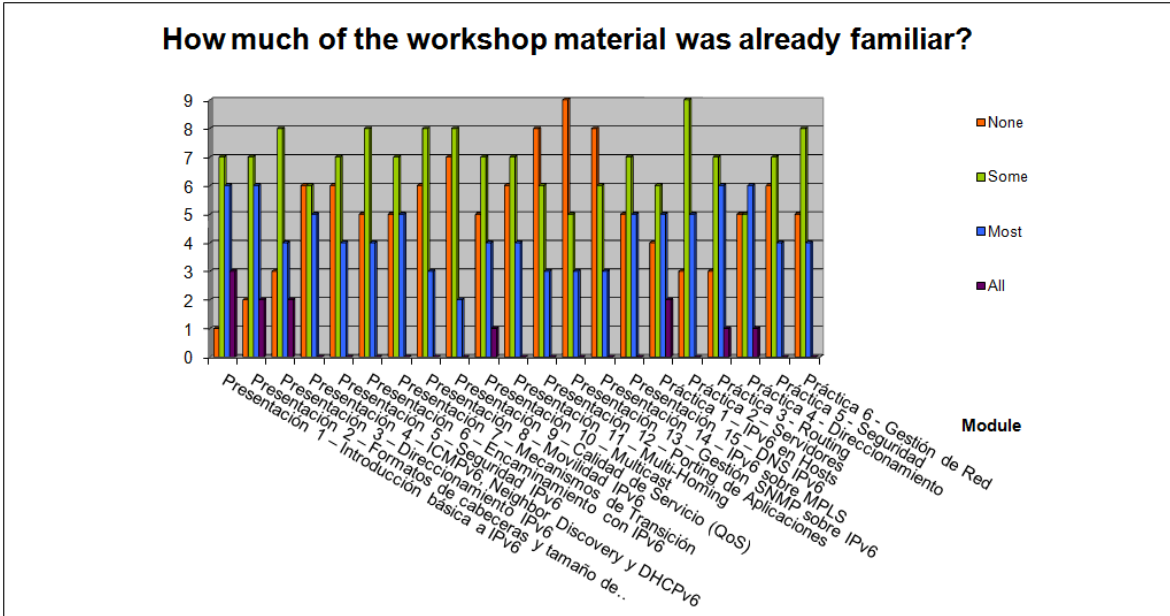


**Figure 5-6: How well were the sessions presented?**

**How much of the workshop material was already familiar?**

Figure 5-7: How much of the workshop material was already familiar?
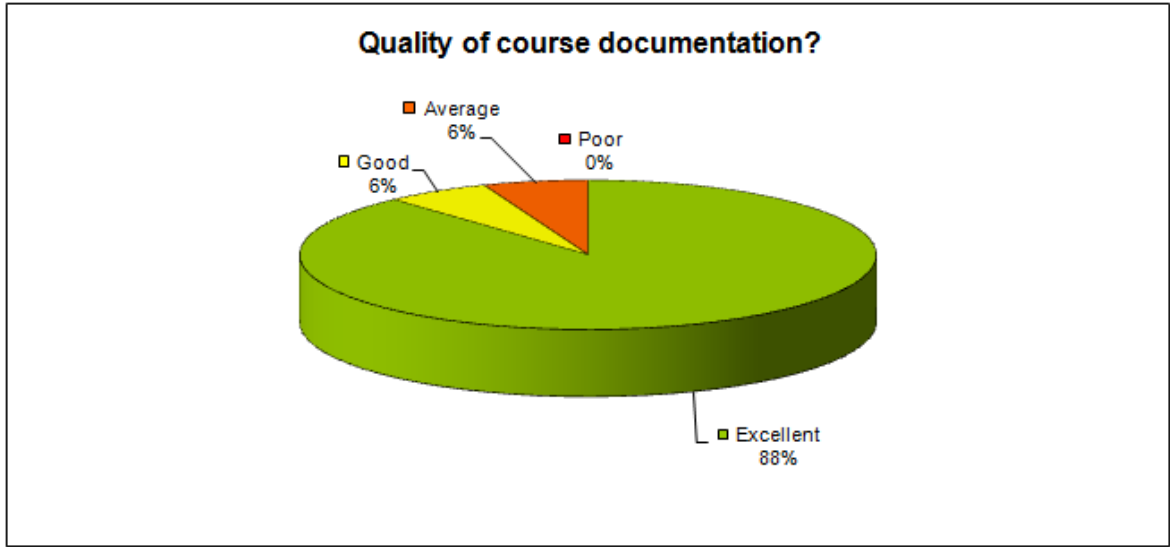
**Quality of course documentation?**

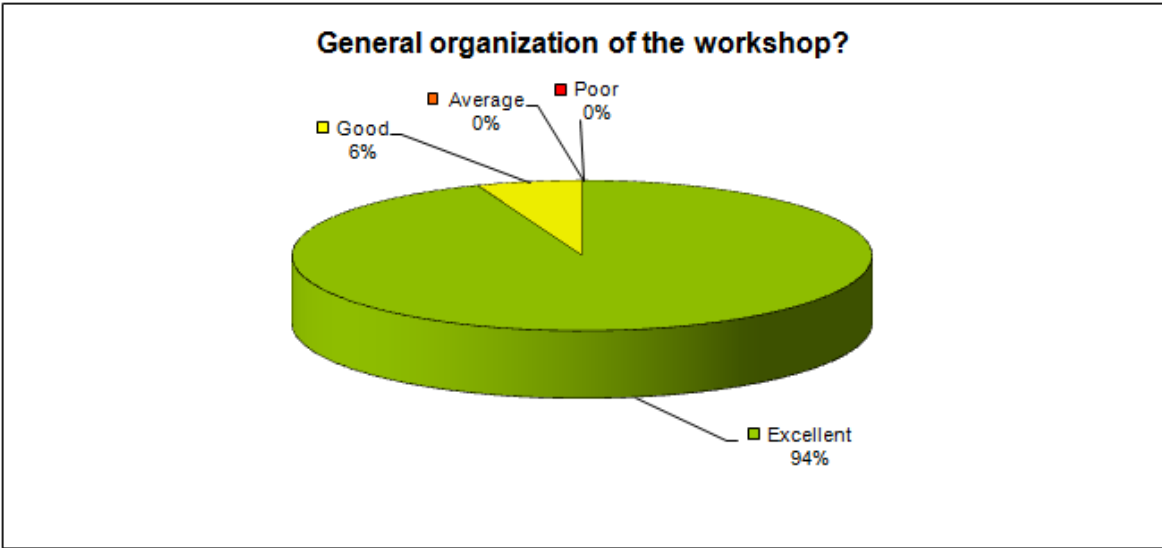Figure 5-8: Quality of course documentation?

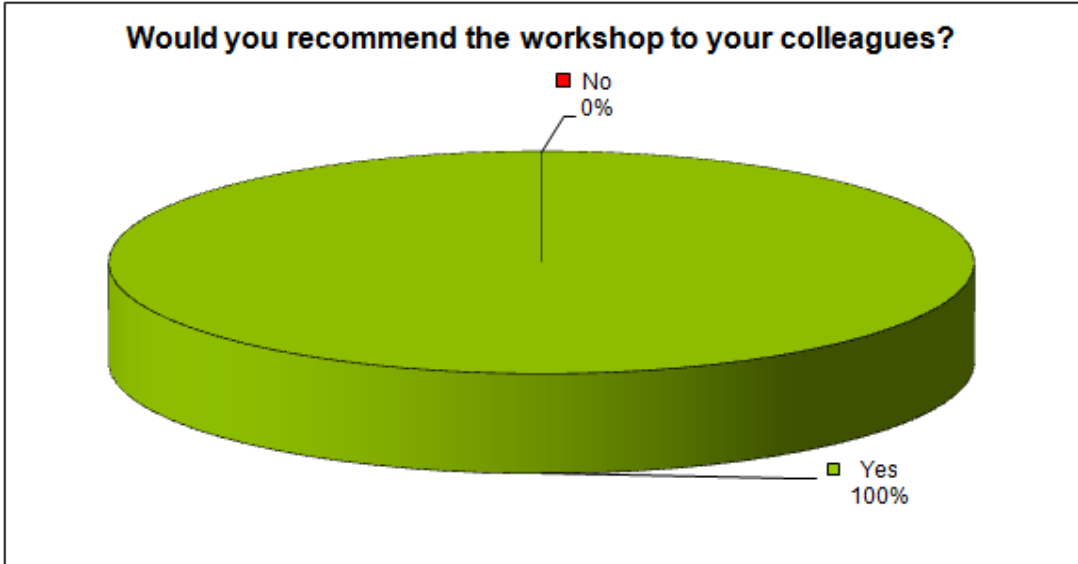**Figure 5-9: General organization of the workshop?**



**Figure 5-10: Would you recommend the workshop to your colleagues?**

## 5.4 Participants comments

It should be noted that the participants had different technical backgrounds. For example, some were network engineers (and therefore more interested in routing protocols and troubleshooting practices) while others were system administrators (and therefore more interested in applications and monitoring tools). Depending upon their background, some participants would have preferred to spend more time on Management, Applications, "hands-on", or to have a "hands-on" session related to security issues.

Within the questionnaire there were three open questions where the trainees could give their feedback on the workshop. Below are almost all of the responses. Note that some are repeated (number put between parentheses).

Here are some comments provided by the trainees:

== Begin of the excerpts

*What topics would you have liked to* **hear more about***?:*

- *(4)  Security.*
- *(4)  Routing.*
- *(2)  Transition mechanisms practice.*
- *(1)  Wireless sensors.*
- *(1)  IPv6 support on different vendor's equipment.*
- *(1)  More time for the final practice.*

*What topics would you have liked to* **hear less about***?*

- *(1)  IPv6 Routing.*
- *(1)  Network Management.*
- *(1)  Practice.*
- *(1)  IPv6 Introduction.*
- *(1)  MPLS.*

*Any* **other comments***:*

- *(1)  Congratulations to the lecturer. He knows a lot and is patient*
- *(1)  Excellent organization*
- *(1)  Thanks for the given information, excellent, Thanks Alvaro very good exposition*
- *(1)  Excellent!*
- *(1)  Continue with this trainings that are necessary and very important*
- *(1)  Excellent and accurate material*
- *(1)  Focus the practice on 6to4 and 6rd transition mechanisms*
- *(1)  Improve labs practice, correct some errors and present in a step by step basis*
- *(1)  Is it possible to give information about IPv6 deployment policies and normative*

End of the excerpts ==

## 6. CONCLUSIONS

Workshops are a key mechanism through which information, knowledge, and know-how are transferred to less experienced countries and participants. The workshops enable us to build constituencies and raise awareness; disseminate, benchmark, and validate the research results from the EU's Framework Programmes; promote European technologies; exchange best practices; and offer information related to standards and interoperability issues.

The 6DEPLOY workshop took place in Guayaquil, Ecuador, from October 10th - 14th 2011. This Workshop was held in collaboration with EsLaRed (http://www.eslared.org.ve) organization who organized everything for the workshop in conjunction with local organizers. Thanks to previous projects and training activities, most of the IPv6 education material needed to start 6DEPLOY-2 workshop training was available from the very beginning. The material included several IPv6 issues. 6DEPLOY Budapest and Madrid testbeds were used for practical routing exercises.

Approximately 31 network engineers, system administrators, network administrators and regulators participated in the workshop. The topics presented were selected according to the participants' requirements, trying to provide a fruitful theoretical and practical IPv6 workshop.

According to the evaluation forms and the comments from the participants at the workshop, it is clear that the workshop was a success, and that there is significant interest in more practical issues. The participants expressed positive comments on the workshop's usefulness and organisation.

During the 6DEPLOY-2 lifetime, stakeholders will continue to enhance today's "knowledge database". The reader and interested parties are referred to the 6DEPLOY-2 website to check for new material.

In summary, this workshop should be considered a success with regard to the dissemination of IPv6 and future collaboration with WALC events is foreseen.

# 7. REFERENCES

6DEPLOY-2 website:        http://www.6deploy.eu

Hands-on modules: http://www.6deploy.eu/index.php?page=hands-on

How-to organise an IPv6 workshop:

> http://6diss.6deploy.eu/workshops/workshop-guidelines.pdf

Training the trainers workshop: http://6diss.6deploy.eu/workshops/ttt/

e-learning package: http://www.6deploy.eu/index.php?page=e-learning

6DEPLOY-2 Workshops Agenda and detailed information:

> http://www.6deploy.eu/index.php?page=workshops2