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Abstract:

This document provides a report of the 1st 6NET Training Workshop held on 14-15 May 2002 in Brussels, Belgium.

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Introduction

The 1st 6NET Training Workshop was held on 14-15 May 2002 in Diegem, Belgium. The objectives were to inform the project partners about IPv6 and the proposed 6NET network, and to ensure the engineers working on the project had a common knowledge base.

The opening session of the workshop on Tuesday morning provided a general overview of the 6NET project, IPv6 technology and transitional issues. For the second session on Tuesday afternoon, the participants were divided into two parallel groups where the 6NET design was reviewed, the problems encountered during the staging phase were discussed, and the deployment schedule outlined.

The next day, the participants were divided into three smaller parallel groups to familiarise themselves with the network installation phase. This included visits to the staging laboratory where the network equipment had been pre-configured for verification and troubleshooting purposes. These sessions were mainly interactive and ensured the participants were comfortable with all aspects of the forthcoming deployment. Finally, there was a short plenary session to summarise the activities of the two days.

Twenty-eight participants attended the workshop from twelve partner organisations; mostly those involved with setting-up and operating the 6NET network. The full proceedings can be found on the 6NET website at:

http://www.6net.org/events/training-2002/

Figure 1 – Participants at the workshop

Programme

Tuesday, 14 May 2002			
10.30-11.30	6NET Project Overview – *Bruno Ciscato*		
11.30-12.30	Internet Directions and Issues – *Patrick Grossetete*		
13.30-14.30	6NET Design – *Gunter Van de Velde*	6NET Deployment – *Michel Danthine*	
14.30-15.00	The Staging Experience – Gunter Van de Velde	TAC Support – *Theo de Jongh*	
15.00-15.30	6NET Deployment – *Michel Danthine*	6NET Design – *Gunter Van de Velde*	
16.30-17.30	6NET Update – *Bruno Ciscato*	The Staging Experience – *Gunter de Velde*	
17.30-18.00	TAC Support – *Theo de Jongh*	6NET Update – *Bruno Ciscato*	
Wednesday, 15 May 2002			
09.30-10.30	Implementation Training – *Michel Danthine*	6NET Design Q&A – *Gunter Van de Velde*	Laboratory Visit – *Bruno Ciscato*
10.30-11.00	6NET Design Q&A – *Gunter Van de Velde*	Laboratory Visit – *Bruno Ciscato*	Implementation Training – *Michel Danthine*
11.30-12.00	Laboratory Visit – *Bruno Ciscato*	Implementation Training – *Michel Danthine*	6NET Design Q&A – *Gunter Van de Velde*
12.30-13.00	Conclusions		

6NET Project Overview

Bruno Ciscato, Cisco

6NET is a three-year IST project to demonstrate that continued growth of the Internet can be met using new IPv6 technology. It also aims to help European research and industry play a leading role in defining and developing the next generation of networking technologies.

The project is building a native IPv6-based network with both static and mobile components in order to gain experience of IPv6 deployment and migration from existing IPv4-based networks. This will be used to extensively test a variety of new IPv6 services and applications, as well as interoperability with legacy applications.

6NET exploits the synergy between European NRENs and major industrial partners, and cooperates with other IPv6 projects and activities, both in Europe and the rest of the world. The aim is for Europe to gain a technological advantage in the next-generation Internet and to create new business opportunities. There are currently 31 partners, although another 3 partners have recently been accepted into the project.

The project budget is EUR 17 million of which EUR 9.5 million is being provided by the European Commission. The total effort within the project equates to 1100 man-months.

The work is divided into seven work packages (plus coordination). An overview of the core network was provided, including information on routing protocols and address allocation.

This presentation can be found on the web at:

http://www.6net.org/events/training-2002/ciscato.pdf

Internet Directions and Issues

Patrick Grossetete, Cisco

The Internet has increasing amounts of bandwidth available, in both the wide-area and local-area, but this is under-utilised at present. In some cases, traffic amounts to less than 10% of the total bandwidth. Even in the present slow economy, Internet traffic growth is still increasing, but service providers need to better utilise their investment in infrastructure. This will require new applications that consume bandwidth and which can be charged for. Examples of such applications would be multi-player interactive games.

Unfortunately, there is a mismatch in what service providers wish to provide, and what users actually want. Service providers want to provide entertainment such as video-on-demand that requires client-server applications. Users on the other hand, want to entertain themselves and therefore require peer-to-peer applications. In addition, broadband deployment has not occurred as quickly as expected. Even third-generation mobile communications will lack sufficient bandwidth for many modern applications.

There are still a number of issues to solve in the Internet. There are the technical issues such as scalability, security, reliability, and application development, but there are also the non-technical issues such as accounting, billing and political regulation.

The advantage of client-server architectures are that security can be controlled by the organisation running the server, who would generally be expected to be proficient. However, peer-to-peer architectures can have wide variations in security policy, and are often run by inexperienced users. This means global authentication mechanisms are going to be required, which in turn means clients need to be directly addressable.

With many of the current applications, it's possible to have clients located in private address spaces, with servers in the public address space. However, this is making it difficult to deploy the new generation of peer-to-peer applications. In other words, an end-to-end naming and addressing architecture is necessary, but is simply not possible to achieve with IPv4.

The IPv4 protocol specification was published in 1981. By 1985, one-sixteenth of the total address space had been allocated. The amount of allocated addresses increased to one-eighth in 1990, one-quarter in1995, and one-half in 2000. This was despite increasing conservation efforts such as DHCP, CIDR, NAT and address reclamation.

In principle, IPv4 can support up to 4 billion devices, but it has been estimated the practical limit is 250 million (RFC 3194). There are already estimated to be 530 million computer users, and this is projected to increase to 945 million by 2004. This does not include the current 1 billion mobile phone users, the 1 billion vehicles estimated for delivery by 2008, or any home or industrial appliances.

All these devices are likely to require their own IP addresses, but it can clearly be seen that IPv4 is unable to provide them.

IPv6 is also an opportunity to fix the shortcomings of IPv4. or example, server-less reconfiguration, security and mobile IP. At the same time, it is possible to remove many of the redundant features in IPv4.

All major operating systems now have an IPv6 stack at some stage of completeness; including all Unix variants, Windows XP, MacOS X, and OpenVMS. Attention is therefore mostly focused on developing and porting applications to IPv6. However, there are still some major vendors that need to be signed-up.

There are also a number of political initiatives to promote IPv6. This includes the European IPv6 Task Force, the North America IPv6 Task Force, and the Japanese IPv6 Promotion Council.

Several market sectors plan to bootstrap IPv6 deployment over the next 12 months. A number of IPv6-enabled Internet Exchanges will be implemented, commercial ISPs will start running trials, and the mobile market in particular will strongly drive deployment. IPv6 is an important part of mobile telecommunications as some wireless networks already run IPv6, and is mandatory in 3GPP.

The aim is for the Internet to be both ubiquitous and plug-and-play, without any complicated configuration being necessary (at least from the end-users perspective). This going to be required if the Internet is to each communities around the world.

This presentation can be found on the web at:

http://www.6net.org/events/training-2002/grossetete.pdf

Infrastructure of the 6NET Project
Gunter Van de Velde, Cisco

The project aims to keep the initial set-up of the network as simple as possible and to have realistic assumptions. The plan is to create awareness of the initial configuration and not to put routing and security policies in place that make it difficult to migrate to advanced and agreed policies.

The network design was formulated at a WP1 meeting in early January and was based on topology information supplied by DANTE and laboratory testing experience. This was modified after feedback from the staging phase, and from the information provided in Deliverables D1.1.1 and D3.1.1.

The network topology was displayed, and the naming convention was outlined. In addition, the proposed addressing scheme was discussed.

The routing policies were then discussed – the use of ISIS for internal purposes, and mBGP for external routing. This included details of announcements, authentication and filtering.

This presentation can be found on the web at:

http://www.6net.org/events/training-2002/vandevelde-infrastructure.pdf

6NET Staging Experience
Gunter Van de Velde, Cisco

The Staging Phase was where the 6NET network equipment was pre-configured in a laboratory environment in advance of the rollout. This allowed the network topology to be verified and any problems to be identified and resolved much more easily.

A staging document had been produced that outlined the topology, the rack layouts, the addressing scheme and the equipment serial numbers. It also described the tests that were undertaken, and the results that should be expected.

The Staging Phase had highlighted a number of issues such as CEF (Cisco Express Forwarding) inconsistencies, BGP password authentication failures, and problems with ATM ptp IPv6 addresses and ISIS tuning. Fortunately, there were workarounds for these issues.

This presentation can be found on the web at:

http://www.6net.org/events/training-2002/vandevelde-staging.pdf

6NET Deployment
Michel Danthine, Cisco

All the key milestones had been met thus far. The network design had been completed, the equipment ordered and delivered, and the PoP (Point of Presence) site surveys undertaken. The test deployment had also taken place in Amsterdam two weeks previously.

The next stages were the training of the Cisco AS Project Engineers, shipping the pre-configured equipment to the PoP locations for installation, and testing the network in-situ before the handover. The Cisco AS Project Engineers would be based at Paris NOC during the deployment, but on-site engineers would also be available at all core locations. Remote support and installation instructions would be provided to the NRENs (National Research and Education Networks) and universities, although these organisations needed to order their own cables.

This presentation can be found on the web at:

http://www.6net.org/events/training-2002/danthine.pdf

TAC Support
Theo de Jongh, Cisco

The Cisco Technical Assistance Centre (TAC) provides round-the-clock technical support services for Cisco products and technologies. This service will be available to 6NET partners throughout the project.

There are four priority levels: P1 where an existing network is down and where Cisco will commit all necessary resources to resolve the problem; P2 where the operation of a network is severely degraded and where Cisco will work full-time during normal business to resolve the situation; P3 where the operation of the network is impaired and where Cisco is prepared to resources during normal business hours to restore satisfactory performance; and P4 where information or assistance is required on Cisco product capabilities, installation and/or configuration.

Both P3 and P4 cases can be opened online at http://www.cisco.com/tac/caseopen/. For P1 and P2 issues, the cases can be opened by calling +32 2 704 5555.

When opening a case, the following information needs to be on-hand: service and support contract number, network topology, equipment configuration information, description of the problem and/or symptoms, and software version. A case number will be assigned, along with the current status of the case. This can also be tracked online at: http://www.cisco.com/tac/trackcase/.

The TAC website also carries detailed technical solutions for the most frequently reported network problems worldwide. There is step-by-step troubleshooting advice, configuration examples, and other helpful information. In addition, it is possible to download software upgrades and utilities such as Cisco Live, a suite of Java applets that allow Cisco TAC Engineers to conduct collaborative sessions.

The Cisco TAC information leaflet can be found on the web at:

http://www.6net.org/events/training-2002/cisco-tac.pdf

Participants

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