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Abstract:

Deliverable D5.3 describes the progress and the timetable for deploying different Points of Presence and data centres from Activities 5.3 and 5.4. Also the software that will be deployed at particular locations is described.

Keywords:

IPv6, applications, PoP, data centre

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Introduction

One of the activities within WP5 of the 6NET project is to deploy and maintain different Points of Presence (PoPs) and data centres around Europe. The purpose of these PoPs is to allow a user community to make use of services developed or ported within the 6NET project as well as allowing participants in the 6NET project to gain experience with deploying IPv6 services. The initial user community in most cases will be the 6NET community themselves. After gaining experience with the services the user community can be expanded to include people from outside the 6NET project.

The first chapter is intended to describe the different applications to be deployed at the different locations. The information itself however, is not in this Deliverable but on a web page that the first chapter refers to. This way the information can be kept up to date, by the developers themselves, without the need to constantly produce updates of this Deliverable. Additionally a brief overview of the conferencing architecture is provided.

The second chapter lists and briefly describes the PoPs and data centres separately.

1. Applications development

Deliverable D5.1 of the 6NET project (available at the 6NET website¹) lists the applications identified as potential candidates to run on 6NET's IPv6 network. D5.1 is a continuously changing Deliverable: several releases of the document will be made (and were made already). Subsequent releases will add (or possibly remove) applications from the list based on changing insights or new project partners.

Since the porting of applications to support IPv6 is not a 'static' activity, it is very difficult, if not impossible, to capture the status of the different applications mentioned in a single document. A possible solution to this problem would be to produce several releases of the same Deliverable over time. This solution is, of course, not ideal since every release of the Deliverable would be describing the status of the applications as they were some time ago (due to the very nature of 'paper' Deliverables). Therefore WP5 has decided that the applications list and current status would be in the form of a web page. This approach enables application 'owners' to keep the status of their porting effort up to date and additionally allows other interested people to keep track of the status, knowing that it is more up to date than a Deliverable downloaded from a web site.

The up-to-date list of 6NET applications is available at: <http://6NET.laares.info/apps.phtml>.

1.1. Conferencing Architecture

In this section we describe the multi-way conferencing architecture and data delivery based on standards being developed in the Internet Engineering Task Force (IETF). Such conferencing involves session announcement, followed by session selection and set up, leading to the instantiation of a session with media exchange, using such conferencing tools as detailed in Deliverable D5.1.

1.1.1. Multi-way operation

For large scale multi-way conferencing, the most efficient solution is to use multicast. In situations where multicast is unavailable, and for smaller scale conferencing, application level gateways and reflectors are a useful alternative. One such gateway has been deployed in Norway – see Deliverable D3.4.1. There are other alternatives such as the CINEMA Sip MCU.

In IPv4, there exists the MBone, that portion of the Internet which supports multicast data distribution. This was based on tunnelled connections but has now largely migrated to native connections where appropriate. An analogous network, M6Bone, using IPv6 is now available which currently operates over tunnels, this is largely due to the lack of multicast support for core router platforms. Native multicast is planned to be deployed in 6NET once multicast capable images are available for the core routers on the 6NET backbone.

1.1.2. Stream transport

With IETF based conferencing, each media stream is sent independently and if layered coding is used, a single media stream may even be sent as many independent streams. The continuous media streams are delivered over Real Time Transport Protocol (RTP), as they are in H.323 conferencing.

¹ <http://www.6net.org/publications/deliverables/D5.1.pdf>

The data transport is augmented by a control protocol (RTCP) to allow monitoring of the data delivery in a manner that is scalable to large multicast networks, and to provide minimal control and identification functionality. The separation of the individual streams can cause problems with voice/video synchronisation, but allows participants in heterogeneous networks to communicate. Thus, those using bandwidth-scarce (e.g. wireless) media may choose to receive only poor audio and/or low-bandwidth video, while their bandwidth-rich colleagues enjoy better audio and video. Additionally, mechanisms are available for the error protection of streams, using such techniques such as Forward Error Correction – some are implemented in the available tools, other more complex schemes are under discussion in and outside the IETF.

Additionally, other tools used in conferencing are shared workspaces of different types; these may require reliable data transfer. In the multicast environment, this requires some form of reliable multicast, usually implemented within the application.

1.1.3. Session advertisement

For a user to participate in a conference, the conference details need to be made available to the interested users. These details may be made available using a variety of techniques, including by way of a broadcast mechanism, or through access to a repository of some form. Sessions may be described by using the Session Description Protocol (SDP). This protocol provides for the description of a session including multicast addresses, ports, media formats and session times so that a receiver of the session description can join the session.

One method of announcing sessions is to regularly send the session description on a well-known multicast address, with a specific scope, using the Session Announcement Protocol (SAP). The announcement includes information such as the organiser of the conference, and the session description.

People wishing to participate in a particular conference must then listen for the SAP announcement, and start up their tools with the SDP details provided. Session Directory (SDR) is a tool that can receive these “broadcast” (usually multicast) session descriptions, browse through all sessions currently being announced, and then start up the relevant media viewers.

Alternatively, the information can be put into a depository known to the potential participants. This mechanism is convenient if potential participants can be expected to access the directory sufficiently often, or do not have multicast connectivity. A combination of the use of ordinary e-mail to announce the existence of a conference, together with a directory mechanism to update session information, is popular for a large class of applications. Specialised Web-based tools already allow browsing through lists of conferences, together with client plug-ins that can extract the relevant session description and start up the required tools. The Secure Conference Store (SCS) coupled with SPAR provides such a system.

1.1.4. Session Initiation

The Session Initiation Protocol (SIP) provides an alternate mechanism whereby a user may be invited to participate in a conference. SIP may be used whether the session is already ongoing, or is just being created. It is also flexible in that it may be used for small tightly coupled sessions or large broadcast sessions – it merely conveys an invitation to a user in a timely manner, inviting him/her to participate, providing enough information for them to be able to know what sort of session to expect. The session invitation contains an SDP payload indicating the desired communication addresses.

As many users may be mobile, it is important that such an invitation mechanism is capable of locating and inviting a user in a location-independent manner. Thus user addresses need to be used as a level of indirection rather than routing a call to a specific terminal, in the form of the Registration proxy. The invitation mechanism also provides for alternative responses, such as leaving a message or being referred to another user, in the form of a redirect server.

1.1.5. Security mechanisms

In multimedia conferencing, security can be provided in many ways. First there is the information about the existence and parameters of the conference. In completely open conferences, this can be sent freely over the network in a well-advertised, universally accessible, Session Announcement stream. It is possible to store the announcements in a depository, which is known openly and available; alternately its location may be known only to, or access provided only for, specific authorised individuals. Second there is the confidentiality of the streams themselves. These can be encrypted at the application level. There are two basic approaches – The first technique involves encrypting the complete packet, as detailed in the RTP specification. The second is a more recent extension of RTP to include a security-enhanced RTP (SRTP) whereby encryption and/or authentication may be provided, whilst leaving the headers in the clear and available to header compression mechanisms. Alternately, the streams may be secured at the network level, by using IPsec. Where large groups are involved, issues of group key distribution arise and are the subject of on-going work in and outside the IETF.

2. 6NET PoP and data centre deployment

The two activities in the (Annex 1- “Description of Work”) that relate to PoPs and data centers are Activity 5.3 and Activity 5.4. The border between these two Activities is now less obvious, since the IBM Edge Server will be an integrated part of the IBM WebSphere suite in version 5 (at the start of the 6NET project, the Edge Server was a separate product). The deployment activities of A5.3 and A5.4 are therefore described per location instead of per activity since they are so closely related.

The deployment locations mentioned here differ in the software deployed, the number of servers used, and the network connectivity. All servers will use RedHat 7.3 Linux distribution. The deployment and management of additional features that may be needed, such as firewalling, will be the responsibility of the 6NET partner responsible for the management of the PoP. The number of servers installed will depend, amongst others, on the load placed on the servers by the service itself and the number of users for that service.

The following sections describe the different PoP and data centre locations, the hardware used, the software that is planned to be installed and the deployment schedule if applicable. Of the software and services to be deployed only a summary is given. More in-depth information regarding specific applications can be found in Deliverable D5.1 available from the 6NET website². The current status of the different applications can be found at the web page mentioned in chapter 1.

2.1. PoP and data centre locations

Five locations are currently identified (Figure 2-1):

- SURFnet/Telin (NL)
- IBM (FR)
- UCL (UK)
- UoS (UK)
- GRnet (GR)

However, the planned deployment schedule and configuration of these locations differ. The schedules and configurations of these locations are described in more detail in the following sections. For the locations that will run IBM WebSphere v5.0 the deployment schedule depends upon the availability of an IPv6 enabled version of WebSphere; i.e. a WebSphere release packaged with J2EE version 1.4 instead of version 1.3 that is normally packaged with WebSphere v5. Version 1.4 of Java is needed since that is the first Java version with full IPv6 support.

Each WebSphere node will at least be configured with the following software:

- Websphere Portal Server v4.1
- Websphere Application server v5.0 enterprise edition
- Websphere Studio Application Developer v5.0
- VNC server
- IBM HTTP Server v2.0(IPv6) and v1.3(IPv4)
- Linux Redhat 7.3
- Java 1.4

² <http://www.6net.org/publications/deliverables/D5.1.pdf>



Figure 2-1: PoP and data centre deployment locations.

For most of these deployment sites, the initial target community will be the 6NET participants themselves. After gaining experience with the software deployed on those PoPs the user community can be expanded.

Exceptions to this approach are the UoS and GRNet PoPs:

- The University of Southampton, Electronics and Computer Science department (ECS), is investigating the possibility of using a WebSphere portal to present their alumni services (<http://www.zepler.org/>). These would include content provided by the department as well as additional services such as e-mail forwarding for life. The alumni server currently hosts services for approximately 730 people, both students and staff, with a growth of about 200 persons per annum.
- The GRNet PoP will be used to develop and host a portal for the student community of the National Technical University of Athens (NTUA).

2.2. Individual PoP and data center descriptions

2.2.1. SURFnet/Telin (Amsterdam, NL)

The hardware of this PoP will be located at the premises of SARA Computing and Networking services, the National High Performance Computing Centre (<http://www.sara.nl>). This location was chosen since it is close to the SURFnet backbone and SURFnet already has a hosting agreement with SARA. The Telematica Instituut (TELIN) will be responsible for the administration and maintenance of the software running at this PoP.

2.2.1.1 Hardware

One Netfinity Server (8664-81Y Xseries 240 server with 1GHz Processor, 2GB RAM and a 36.4GB HDD).

2.2.1.2 Network connectivity

Direct native IPv6 connectivity to the SURFnet backbone. (SARA houses a switch for the Amsterdam Internet Exchange AMS-IX, <http://www.ams-ix.net>).

2.2.1.3 Operating System

Linux

2.2.1.4 Software

The WebSphere configuration as described in section 2.1.

The initial plan is to host an IPv6 application database/portal specific for the 6NET project itself; i.e. it will only list applications developed or ported by the 6NET project. By using WebSphere, the parties responsible for porting an application to IPv6 can update the pages containing information about 'their' applications themselves. This will allow for more descriptive pages that can (for example) also include compilation/installation guides etc.

A VideoLAN server could also be deployed here. Whether VideoLAN will be deployed at this location depends on the availability of copyright-free suitable content and the possibility of it operating without disturbing the WebSphere environment.

2.2.1.5 Deployment schedule

The deployment of this PoP depends on the availability of a WebSphere version with IPv6 support. After that the deployment will happen in increments as the portal itself is developed.

2.2.2. IBM (La Gaude, FR)

2.2.2.1 Hardware

A number of Netfinity Servers (8664-81Y Xseries 240 server with 1GHz Processor, 2GB RAM and a 36.4GB HDD).

2.2.2.2 Network connectivity

This location will have direct IPv6 connectivity to the "RENATER" backbone (The French educational network) as well as a tunnelled connection over the IBM backbone to the "SWITCH" backbone (The Swiss educational and research network).

2.2.2.3 Operating System

Linux

2.2.2.4 *Software*

The WebSphere configuration as described in section 2.1.

The IBM PoP will focus on application level proxies or gateways.

2.2.2.5 *Deployment schedule*

The deployment depends upon the availability of a WebSphere version with IPv6 support.

2.2.3. UCL (London, UK)

Some services mentioned in D5.1 are already ported to IPv6, as for example PKI (<http://cornetto.cs.ucl.ac.uk>). The data centre at UCL will be used mainly for GRID related work and research.

2.2.3.1 *Hardware*

None specific. Existing hardware will be used; most of which is already running the IPv4 versions of the software mentioned.

2.2.3.2 *Network connectivity*

UCL has native a connection to 6NET via the University of London Computing Centre. It also has tunnelled connections for connection to M6Bone and certain other sites.

2.2.3.3 *Operating System(s)*

UCL runs (IPv6 capable) systems on Solaris, Linux, FreeBSD, as well as Windows based machines.

GLOBUS/OGSA

The GLOBUS toolkit is an open source middleware suite that supports GRID computing. The GLOBUS project is a community effort, led by Argonne National Laboratory and the University of Southern California's Information Sciences Institute (<http://www.globus.org>). UCL runs a number of GLOBUS GRIDs in other projects. UCL is in the process of porting Globus 2 to IPv6.

PKI

The purpose of a Public Key Infrastructure (PKI) is to provide the mechanisms and elements needed to manage and enable the effective use of public key encryption technology on a medium or large scale.

The PKIv6 deployment at UCL is done in collaboration with the Euro6IX project (the University of Murcia) (<http://www.euro6ix.org>, <https://pki.dif.um.es/>)

TZI Gateway

The TZI Gateway provides call signalling and media transcoding gateway functionality for connectivity between different kinds of endpoints interconnected through different types of networks. The TZI Gateway provides IPv4/IPv6 interworking. It consists of 3 parts: An IPv4/6 H.323 gatekeeper, a Media stream processor and an IPv4/6 SIP back-to-back user agent.

FunnelWeb

FunnelWeb is a system that runs on a node to provide an active services platform. FunnelWeb is an implementation of an Application Level Active Networking (ALAN) active networking execution environment (EE). Specifically, FunnelWeb provides an execution environment for Java based active applications, known as proxylets. The FunnelWeb EE is termed the Execution Environment

for Proxylets (EEP), which provides a Java environment with a Remote Method Invocation (RMI) control interface for loading, running, modifying operation and stopping proxylets.

A number of EEPs are running at UCL which are available over IPv6 and IPv4 which may be used to load and run the TAG or other proxylets.

TAG (Transcoding Active Gateway)

TAG builds upon FunnelWeb to provide its functionality. The TAG client application is separated into two components that communicate using RMI:

- The FunnelWeb EEP component of the client runs the Routing, Discovery and local Reflector proxylets and the Routing and Discovery proxylets that are used by the client to identify its location in relation to other parts of the Active Network.
- The user interface component of the client is used to communicate both with the EEP component and with a remote EEP via the RMI interface. The server configuration section of the user-interface allows the user to query the local Routing proxylet for information regarding the current EEPs available and the closest EEP in relation to the local host. Once an EEP has been selected the controls for starting, stopping and configuring media streams are enabled.

(<http://www-mice.cs.ucl.ac.uk/multimedia/software/tag/>)

2.2.3.4 Deployment schedule

IPv6 capable versions of software will be deployed as they become available. PKIPv6 and FunnelWeb are already operational.

2.2.4. UoS (Southampton, UK)

The Electronics and Computer Science (ECS) Department of the University of Southampton (UoS) is investigating the possibility of using WebSphere to present their alumni services (an improved version of what is currently available at <http://www.zepler.org/>). These would include content provided by the Department as well as additional services such as 'e-mail for life'. The alumni server currently hosts services for approximately 730 people, both students and staff, with an annual growth of about 200 (all new students now get Alumni service access on arrival). While this deployment would not see the Department's information services using WebSphere, interfacing to the Department's information sources (e.g. SQL databases) through WebSphere, with IPv4 and IPv6 access, would be an interesting test-bed environment.

UoS has also worked on two sets of porting activities during 2002 related to 6NET:

- IPv6-enabling the VOCAL SIP-based VoIP package
- IPv6-enabling the GLOBUS Toolkit (activity led by UCL)

These two porting activities are being done in conjunction with Euro6IX, with the view to promote joint use in both projects (e.g. VoIP calls between project members in 6NET and Euro6IX). UoS has also used the TZI SIP gateway in the 6WINIT project, and plans to support such a gateway for the 6NET project users (subject to TZI approval).

UoS is making audio and video streaming servers available, via unicast and multicast IPv6; this includes the local CRadio application, plus the availability of *icecast* and *VideoLAN*. UoS has a video archive of ECS seminars that could be broadcast, as could live seminars.

UoS has an ISABEL node running, which can be used for collaborative conferencing with other 6NET and Euro6IX partners. Currently vic, rat and nte are being used for conferencing in M6Bone tests.

Other applications and services are being added as the project progresses. Supporting IPv6 transition, UoS runs services including a tunnel broker (which uses IPv6 OpenLDAP), and a 6to4 router and relay. UoS is able to support gaming services, including MUD server(s), if required.

Messaging applications being developed in Euro6IX will be released to 6NET as and when they become available, and can be supported from the UoS PoP.

2.2.4.1 *Hardware*

A number of Netfinity Servers (8664-81Y Xseries 240 server with 1GHz Processor, 2GB RAM and a 36.4GB HDD).

The number of servers installed here depends upon the size and impact of the user community on server performance. Since the whole alumni services for the ECS department will be redesigned to run on IBM WebSphere and IPv6; it is unclear at the time of writing of this document how many servers will be needed. The specification will be refined when the IPv6-enabled Websphere product nears completion.

UoS has three GLOBUS IPv6 test-bed nodes on site (currently Linux, but other operating systems are possible), and is using Linux laptops for VOCAL. The TZI SIP gateway would run on Linux.

The media streaming servers (unicast and multicast) would run on Linux.

The ISABEL node runs SuSE Linux 8.1.

UoS' test-bed includes a number of rack-mount 1U-format servers, mainly running Linux. These also run local infrastructure services including IPv6 DNS. They also offer remote (ssh) login services.

2.2.4.2 *Network connectivity*

The Department connects to the UK JANET network via its campus network and its regional MAN (called LeNSE). UKERNA plans a native (dual-stack) JANET IPv6 service on its core during 2003 (the current service is tunnelled to the JANET IPv6 Pilot router). A native (dual-stack) service will also be required in the MAN, and on campus, both of which are presently under investigation.

UoS also has tunnelled connectivity to the M6Bone for multicast experiments, until the 6NET core network is able to run IPv6 PIM-SM natively.

2.2.4.3 *Operating System*

The WebSphere platform would be Linux.

Most applications are aimed at Linux, but we also run Solaris, Tru64, BSD and Windows platforms for application testing, with HP/UX and Irix having been tested briefly and possibly being made more generally available in our test-bed.

2.2.4.4 *Software*

The WebSphere configuration as described in section 2.1.

VOCAL is available now, as is the TZI SIP gateway.

GLOBUS porting continues.

Various media streaming servers are available now.

ISABEL is available now.

The tunnel broker is available now.

2.2.4.5 *Deployment schedule*

The development of the alumni services will start when an IPv6 enabled version of WebSphere is released (same as for most other PoPs). Other services are generally available now. GLOBUS will be available when porting is complete (currently being driven by UCL).

2.2.5. GRnet (Athens, GR)

The PoP in Athens will be used mainly for providing a portal to the academic community of the National Technical University of Athens (NTUA) including undergraduate-postgraduate students, researchers, academic staff and also support or operational staff. It will support services like e-mail, personalized calendar, “todo” lists, announcements etc. The service will originally be available to the 6NET community for testing.

2.2.5.1 *Hardware*

One Netfinity Server (8664-81Y Xseries 240 server with 1GHz Processor, 2GB RAM and a 36.4GB HDD).

2.2.5.2 *Network connectivity*

Native Gigabit Ethernet IPv6 connectivity, since it will be located at the NTUA site.

2.2.5.3 *Operating System*

Linux

2.2.5.4 *Software*

The WebSphere configuration as described in section 2.1.

The GRnet PoP will be used to develop and deploy a portal for NTUA community; a personalized service for NTUA similar to the current (IPv4 only) one at <https://my.ntua.gr> with limited functionality.

2.2.5.5 *Deployment schedule*

As for the other PoPs that depend upon WebSphere, this PoP will be used for the development of the application itself, meaning that the development will start once WebSphere is available. The deployment will then be in increments as new services are developed and become available. 2-3 months after hardware and software installation an initial prototype will be ready.

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