IST-2001-32063

Newsletter n°5 May 2004

Large-scale International IPv6 Pilot Network

Editorial

Dear Reader,

The 6NET project is progressing well, and its Newsletter is doing the same! Indeed we had so much material to publish that we're able to bring you 8-pages instead of the previous 6-page format. As we go to press, we had just completed another successful dissemination activity: the 6NET Spring 2004 Conference, coupled with demonstrations of IPv6 applications and services, and a "showcase" prepared in collaboration with the Eurov6 project. This two-day event drew about 80 people to ULB in Brussels: 15 speakers, more than 50 attendees and about 15 engineers, researchers and staff involved in the demonstrations and organisation. After the very successful Global IPv6 Service Launch event in January, this shows that interest remains high in IPv6 matters.

Interview with Brian Carpenter, IBM

What is your position within IBM and with respect to the 6NET project?

I am a Distinguished Engineer in IBM's Systems Group, where I work on standards and development priorities for networking support. In 6NET, I am a technical advisor to IBM's 6NET team. I'm based in Switzerland and the rest of the team is in La Gaude, France.

After two years, how would you rate the success of the project? Has it lived up to the expectations? What are the main remaining challenges?

It's excellent to see the network up and running and to see an impressive list of public domain applications under test.

I'm also very glad that the IBM Websphere points of presence have been installed at four partner sites (University of Southampton, University College London, GRNET in Greece, and the Telematics Institute in the Netherlands, in close cooperation with SURFnet and the SARA computing centre).

From the point of view of Work Package 5, which IBM is leading, we now need to concentrate on consolidating the applications already under test, and realising our remaining goals related to Web Services and to the Open Grid Services Architecture over IPv6. The lead for the latter is taken by UCL and Southampton, but we have established very close collaboration with the open source team responsible the principal Grid software package known as Globus. Things look good to have IPv6 Grid access running by the end of the project.

Did the large and diverse partnership perform well? Are some partners playing particularly leading roles?

As in any large project, there are some normal performers and some above average, but for a project of this size, things have worked remarkably well. I hesitate to name organizations or individuals, because that means leaving other people out. The spirit has been very collaborative throughout and I have made new friends as well as meeting up again with old ones.

How do you see the IPv6 market evolving in the mid-term future?

I see it growing in unconventional areas first - new markets in a geographical sense, or new markets in a technical and business sense. Frankly, IPv6 isn't very exciting for old-fashioned web browsing.

Its role should be for innovative applications such as massive scale and pervasive computing on demand. That's maybe where the EU should look next, now that 6NET has proved the basic viability of IPv6 and applications running over it.

6NET H.323 Conferencing Deployment Plan

H.323 Conferencing fills a very useful niche, and several 6NET partners have dedicated conferencing facilities based on commercial H.323 offerings. While these work well, they are currently all IPv4 only. This article describes a H.323 Conferencing demonstrator based on an IPv6-enabled software solution: Gnomemeeting and OpenMCU. JOIN will lead any technical development.

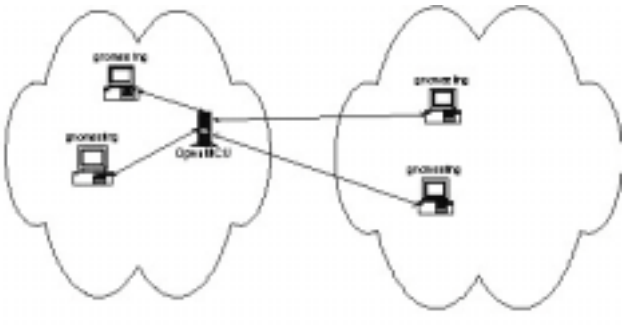


Figure H.323 scenario

H.323 Conferencing requires a workstation supporting audio, video and messaging. It requires that the Conferencing workstations be connected to each other by a H.323 connection; a virtual call is then established on an end-end basis.

For multi-way communication a Multiplexing Control Unit (MCU) is required. Both the basic H.323 signalling and the MCU are now IPv6 enabled. A complete system demonstrator is quite feasible with no extra development from 6NET.

The OpenH.323-based Gnomemeeting provides full audio and video conferencing functionality on several Linux environments. Currently it is IPv6-enabled over Linux, and several audio and video cards are supported. The OpenMCU provides multiplexing and is both IPv6 and IPv4 capable.

Each participating site needs only a Linux PC equipped with audio and video cards, running Gnomemeeting. In addition, UCL and JOIN will each run a PC equipped with OpenMCU.

JOIN already runs the requisite equipment; it will be put up at UCL by April 2004. Three-way tests have already been undertaken, and Class A 5-user tests should be completed by May 2004. It is hoped to have 10-20 sites available by the time of the Project Review in June. It is hoped to be able to run the MCU in dual-stack mode, allowing mixed IPv4/IPv6 conferences by July 2004, but the feasibility of this scenario has yet to be determined.

It is expected that many Work Packages will be able to hold their complete project meetings using this platform, and further investigations will be undertaken to determine whether this could be extended to others outside the project.

The main risks are that the OpenH323 or the OpenMCU are unstable, difficult to use, or do not scale to large conferences. There may be problems in getting the transition scenario to work with this software.

The intention is not to spend much effort in this area as the Mbone tools have the capability of being secured at the application level. However instead of using this feature, it is intended to mount both sets of tools above one of the VPN technologies that have been developed under WP4. A detailed plan is unnecessary for this activity as there are already plans for the deployment of VPNs and H.323 Conferencing. We would expect that their integration will uncover few additional problems. We would not expect to put this into production use until after the June Review.

6net

Contacts

6NET project Website: **http://www.6net.org**
E-mail: **info@6net.org**

Project Coordinator

Theo de Jongh
tdejongh@cisco.com

6NET Newsletter editorial team

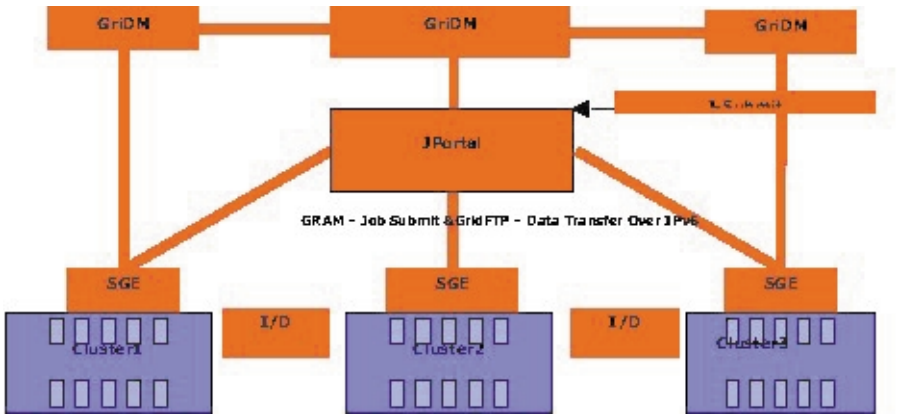
Manuela Profili - Paul Van Binst - Rosette Vandenbroucke
paul.vanbinst@helios.iihe.ac.be

IPv6-enabled Globus Demo for 6NET

UCL and UoS have spent considerable effort in ensuring that the Globus GT-3 toolkit is IPv6 enabled. This work has been jointly undertaken between the two groups, and a demonstration has been devised to show usage of the IPv6-enabled Globus Toolkit infrastructure for a large protein analysis (eProtein) grid application from UCL. While it would be highly desirable to distribute these applications across the 6NET network, this is not possible for this demonstration, because only a limited number of sites in the UK currently run the application.

Initially the demonstration will involve three clusters in different domains (see figure below), all located in the Department of Computer Science of University College London.

They will communicate with each other via IPv6. Eventually this demonstration will be extended to involve one cluster from Department of Biochemistry of University College London and another one from Imperial College. Details of the diagram are given elsewhere



Schematic of eProtein Applications

Jportal, a web-services module, submits tasks and transfer the requisite files through the IPv6-enabled Globus Toolkit infrastructure.

While the computing jobs are submitted through Grid Resource Allocation Manager (GRAM), the files are transferred between the clusters through GridFTP. Inside a single cluster, the cluster-local scheduler schedules the tasks according to the queue status. The results are returned to the cluster-local scheduler from the cluster nodes, before the cluster-local scheduler returns results to JPortal. JPortal integrates them to be the final return.

It is possible to monitor and invoke the Grid services using the graphic Grid Service Brower of Globus. All the communication between the GriDMs (i.e. the clusters), the JPortal and the GriDM, and the graphic Grid Service Browser and the JPortal, is done over IPv6.

Because only the existing sites will run the calculations, their configuration requirements are not too important.

Early versions of a GT3 version of GriDM, JPortal and graphic Grid Service Browser with an IPv6 stack exist, but because of recent significant changes in Globus they must be re-tested.

The users of this package will be the UCL researchers themselves in the first instance. The intention of this application is to demonstrate to the UK and international Grid funding community that they should treat seriously the concept that their applications can run in IPv6 and mixed IPv4/IPv6 environments without serious extra burden. The aim is not to provide extensive WAN use of Globus as few grid applications have reached that status even over IPv4.

A phased demonstration is proposed. By May 2004, a complete system of graphic Grid Browser, JPortal, GriDM, SGE and one domain operating over IPv4 will be established. The computations will be steered from the Grid Browser.

By July 2004, the communication between the different modules, with three domains, will operate over IPv6. Finally, it is hoped to attain a true heterogeneous environment by October 2004.

Global IPv6 Service Launch Event, Brussels, January 2004

Commissioner Erkki Liikanen was one of the many participants from all over the world who attended the high-level event organised at the "Residence Palace" in Brussels. The 6NET and Euro6IX projects were actively involved in the success of this event, particularly through a number of demonstrations such as the "IPv6 Car" described hereunder in an interview jointly prepared by Renault and Cisco.

The IPv6 Car Demo

Why Cisco-Renault Prospect & Research Division collaboration?

Both parties have an interest in exploring and proposing solutions for the mobile users in vehicles: besides classical end-user mobility services (such as location based system or customized information), there is a set of emergent applications such as vehicle remote diagnostic, centralized support, off-broad navigation system...which are easily enabled by IP technologies.

Recognizing such trend and requirements for customers, Renault Prospect & Research Division and Cisco identified each other as complementary partners capable of adding value to single vendor solution.

Renault Prospect & Research Division (IT Department), with its understanding of the consumer space and deep advanced technology innovation in the vehicle automation space, identified in Cisco the leader for IP technology satisfying their requirements in terms of technology (wireless, wireline, contact centre...) and partnership.

What is the collaboration?

The goal of the common development is to enable a vehicle with IPv6 mobile connectivity.

Within such framework multiple applications have been identified and developed:

- end user (ie passenger) Internet access;
- wireless connectivity within the vehicle to connect PDA and other wireless devices;
- wireless connectivity from the vehicle to the infrastructures including WiFi, GSM data, GPRS and capable of accommodating future radio systems;
- in-vehicle diagnostic system: the alarm and general-purpose diagnostic environment of the vehicle has been IP-enabled allowing the central support centre to monitor and initiate actions remotely;
- Enhanced fleet management system based on the "always-on, always reachable" concepts.
- GPS localization system is also carried and integrated onto the IP infrastructure for enhanced real-time services based on actual position.

What is the common vision of the future IP connected car?

Always connected always reachable wherever you are, and "Service continuity" are the bases of the shared vision. Applications like remote-diagnosis, safety, event notification, navigation and fleet management will benefit from this implementation. This will be the enabler of a multitude of new application domains like home land security, emergency services... On the other hand, a car is always becoming more complex and now includes more and more computers. The concept of routing is evolving among the manufacturers.

What are the commitments from both parties?

The current collaboration is between Renault Prospect & Research Division (IT Department) and Cisco Technology Center to exploit the technology, create innovative solutions, and promote implementation in standardization bodies.

What is it? How does it work? What does it accomplish?

Mobile Router support for Mobile IPv6 deployment. This innovation is focusing on enhancing IPv6 and mobility functionalities - the idea and the implementation has been promoted within the IETF and a specific working group (NEtwork MObility, NEMO) has been founded on this basis.

The proposed architecture will enable constant connectivity among networks deployed on mobile entities such as vehicles, trains, aircrafts, boats and even on people.

The scheme that the team proposed and implemented is based on introducing new capabilities to IPv6 and is based on the following basic functions:

- Movement detection and packet forwarding based on IETF draft (http://www.ietf.org/internet-drafts/draft-thubert-nemo-reverse-routing-header-02.txt)
- Tree topology and discover algorithm: using RRH, the Mobile Routers which get connected to each other over wireless links will build a logical tree
- Optimized convergence for movement detection: in mobile scenario and thanks to the previous 2 technologies, Mobile Router will rapidly detect a change of the topology and will be able to re-establish IP connectivity rapidly

Further enhancements will also allow introducing an IP packet forwarding mechanism which will benefit of such architecture.

The innovation allows mobile users to build mobile infrastructure and networks instead of obliging them to have separate radio links for each wireless device they own: imagine that all your devices (including but not limited to PC, PDA, cellular phone, pagers, any other portable device, audio systems in vehicles....) will benefit for being connected over a local network, this network being mobile. The Mobile Router Mobile IPv6 innovation will then take care of establish and maintaining IP connectivity while you are moving. Furthermore, the innovation is radio-independent since the system will naturally roam from one radio technology to another as they become available. In other words, the system will support GSM, GPRS, GSM data, CDMA, CDPD, WiFi (multiple flavours...) with consequent added-value in terms of technology migration, customer's investment protection and full service availability.

Why is this innovation important?

The innovation is the first step into a seamless integration of IP technology with multiple wireless transmission. It potentially represents a set of new markets with which to penetrate with IP technology and Cisco solutions, those markets being defence and security wireless systems, public safety systems, public transportation systems, enterprise mobile workforce (really on the road such as utility workforces) and ultimately the consumer area within his private vehicles.

How does the innovation change the way the Internet is used?

The proposed innovation may facilitate the deployment of Internet technology on devices and places where we have no access today: public transportation, personal vehicles, and persons themselves...traversing radio technology and therefore being transparent to radio technology migration.

For enterprises and vertical markets such as the Homeland Security Initiative and defence applications, it will allow the integration of information, video and audio on a single infrastructure which can be delivered to the emergency forces in a timely manner.

What is the single most important aspect about this innovation?

The transparency of the system to multiple radio systems and the constant reachability of the end user.

The Silk Project and IPv6

The Silk Project has been described in several publications previously – www.silkproject.org/. It is mainly funded by NATO, with the management funded by the SPONGE project of the European Commission, along with sizable donations from Cisco and DESY. It employs a VSAT system to connect the National Research Networks (NRENs) from the eight Newly Independent States (NIS) of the Southern Caucasus and Central Asia to the Internet. Fig. 2 shows the remote earth stations currently installed.

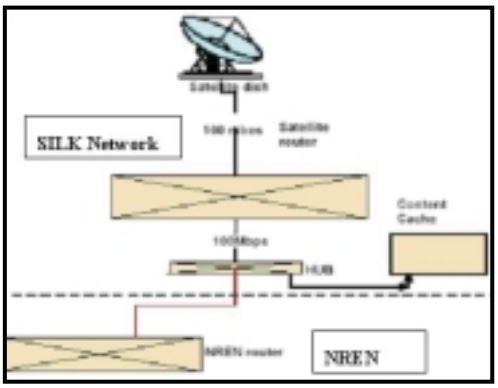


Fig. 1. Schematic of Equipment at each hub

The hub of the VSAT is located at DESY in Hamburg, Germany. The dishes in the remote sites are 2.4 or 3.8m, and the hub station has a 5.6m dish. Each remote station uses a Single Channel Per Carrier (SCPC), and with the current 2W transmitter this can attain 1.5 Mbps. In the West-> East direction, a common DVB return channel is able to operate with 40 Mbps of DVB data.

At each site there is the equipment shown in Fig. 1. The satellite router, the NREN router and the Content Engine are all from Cisco. At DESY the NREN router is attached to their local network and hence, though DFN, to GEANT. In the remote sites they are attached directly to the NREN, but up until now, the network has only been run in IPv4 mode.

The NRENs have expressed interest in finding out more about IPv6, provided it does not interfere with the IPv4 service. With this in mind, two initiatives are being undertaken.

- First, the Cisco routers will be run dual stack – at the current levels of the bandwidth being used, there will be no performance problems.
- Second, experiments will be run with new equipment developed by GCS and being provided by ESA/IABG, to run IPv6/DVB on a second, separate carrier.

Without the GCS equipment, it would be necessary to run the IPv6 in tunnel mode because the transmitter cards in the DESY hub automatically insert IPv4/DVB.

The ESA/IABG/6WIND equipment must be provided both at the hub and the remote stations.

The GCS equipment must be provided both at the hub and the remote stations. At the hub, there will be an extra DVB gateway with routing functionality from GCS, which contains a card to do IPv6/DVB encapsulation based on the ULE specification. It is mainly an IP router (IPv4 and IPv6) and as such plays an active role in the IP world (e.g. routing, filtering), but it also has some satellite link management capabilities.

Any IPv6 traffic to the Eastern sites will be routed through this new DVB gateway from GCS rather than the normal one from Harmonic. On the Receive side, there will be another PC router, with an extra card doing IPv6/DVB decoding. In the East-West direction, the normal SCPC channel can be run directly with the dual stack traffic. Of course, it is necessary to ensure that the correct traffic goes through the different DVB equipment.

It is expected that a GCS DVB gateway and five DVB receiver cards will be supplied by ESA/IABG. In addition, the NRENs will provide a PC to contain the receiver cards, and will ensure that they have some end-user IPv6-enabled terminal equipment.

ESA and Eurasiasat will provide extra satellite bandwidth for testing the new equipment; initially only for a few months. The NRENs will also ensure that they can participate in the IPv6 operations.

6NET is financing a limited amount of extra bandwidth to run an IPv6 service, which is being undertaken by dissemination and training work package. It is hoped that the IPv6 service will be available from July until the end of the current Silk Project.

As part of this dissemination activity, ISOC has agreed to finance at least one IPv6 workshop – given mainly in Russian. This will include hands-on training with the IPv6 facilities both on the terrestrial and satellite equipment.

The 6NET project will not only explore ordinary IPv6 computing, but also Voice/IP and conferencing in the IPv6 environment. By using the facilities provided above, it is hoped to extend this 6NET activity to the Silk NRENs. This close collaboration is greatly helped by the overlapping of personnel between the 6NET, Silk and other projects under IST Framework auspices.

We wish to acknowledge the support of NATO under the Silk Project, the EC under the 6NET project, ESA/IABG/GCS under their "Preparation for Introduction of IPv6 in Satellite Communications" and "Standardisation Support of Enhanced IETF IP Encapsulation Techniques" projects, Cisco for their support via their donation programme, Eurasiasat under their testing programme, and ISOC under their training programme. It is these agencies agreeing to support this activity that has made it possible to bring IPv6 to this emerging Internet community.

Fig. 1 Location of Current Earth Stations in Silk Countries

Facilitate the graceful renumbering of a site's machines

One of the key design goals for IPv6 [RFC2460] is to "facilitate the graceful renumbering of a site's machines" [RFC2462]. By "renumbering a network", we mean replacing the use of an existing (or "old") prefix throughout a network with a new prefix. IPv6 neighbour discovery [RFC2461] and stateless address autoconfiguration [RFC2462] are examples of features in IPv6 designed to facilitate and automate the process of renumbering. The ideal situation would be to allow for renumbering of a network without a flag day and without interruption of service to users during the renumbering process.

As of now, there is a lack of operational experience in IPv6 network renumbering. The primary goal of this study is to research and document the effects that a procedure as described in the Internet Draft "Procedures for Renumbering an IPv6 Network without a Flag Day" has on a production network.

The research is not limited to the networking level. Rather, it also includes looking at other layers that are affected by IPv6 renumbering, such as application layers where services such as SMTP, DNS and others reside. To effectively conduct the research, the study is going to be divided into different phases that allow an isolated look at partial aspects of IPv6 renumbering and that allow the use of these results in following phases until all aspects of the renumbering processes are covered. The results gained by this study will, among other uses, be used to revise [renumbering-procedure]. Additional goals for the project include the development of requirements for new mechanisms and protocols and the identification of "best practices" for IPv6 renumbering.

Participants in the project include Christian Strauf of JOIN and Tim Chown of the University of Southampton. Support for the project will be provided by Cisco Systems and 6NET.

6NET Deployment - Case study CTI

CTI's IPv6 network interconnected with GRNET's IPv6 service

CTI, using its experience and participation within 6NET, was able to successfully study and deploy IPv6 on its internal experimental network. Because of this, every employee of CTI can use both IPv4 and IPv6.

Additionally, CTI was responsible for designing and deploying an IPv6 service for GRNET. The service is available on GRNET's network and CTI is already connected to GRNET.

Finally, CTI is in contact with the Greek School Network that has decided to deploy IPv6 on its backbone.

Captain Kirk awards

Gunter Van de Velde

Gunter has been recognized by the other captains for his work on designing the 6NET backbone network, and for his efforts and enthusiasm in resolving any IOS related problem, sometimes even before they happen! He has also made a great contribution towards the general technical work of the 6NET project.

Jérôme Durand

Jerome has been one of the candidates for some time, but has now finally won the award. His work on Multicast and the NOC tutorials is extraordinary and he deserves the appreciation of the rest of the project. His constant contributions in meetings and on the mailing lists also underline this choice.

Congratulations from the other Captains, the PMC and the whole Consortium.

6NET Consortium

Coordinator:

Cisco Systems Internal BV

Principal Contractors:

Czech National Research and Education Network (CESNET), Delivery of Advanced Network Technology to Europe Ltd. (DANTE), Deutsche Forschungsnetz Verein (DFN), Electronics and Telecommunications Research Institute (ETRI), Greek Research & Technology Network (GRNET), Hungarian Academic and Research Network Association (HUNGARNET), Compagnie IBM France, Istituto Nazionale di Fisica Nucleare - Gruppo per l'Armonizzazione delle Reti della Ricerca (INFN-GARR), NORDUnet A/S, NTT Communications Corporation, Poznan Supercomputing and Networking Centre (PSNC), Réseau National de Telecommunication pour la Technologie, l'Enseignement et al Recherche (RENATER), SURFnet B.V, SWITCH Telematikdienste für Lehre und Forschung Foundation, Stichting Telematica Instituut (TELIN), Trans-European Research and Education Networking Association (TERENA), United Kingdom Education & Research Networking Association (UKERNA), Université Libre de Bruxelles (ULB), University College London (UCL), Lancaster University, University of Southampton, University of Vienna Computer Centre (ACOnet)

Assistant Contractors

Computer Technology Institute (CTI), Danmarks Tekniske Universitet (DTU), Fraunhofer Institute FOKUS (FhG), Institut National de Recherche en Informatique et en Automatique (INRIA), Invenia A/S, Oulu Polytechnic, Scientific Computing Ltd. (CSC), UNINETT A/S, Université Louis Pasteur (ULP), University of Oulu, Westfälische Wilhelms-Universität (WWU-JOIN)