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Information Society
Technologies

The 6NET project

**An IPv6 testbed
for the
European Research Community**



Programme Outline

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Project Overview

Hot Topics

Future work

Project Overview

What we've been doing

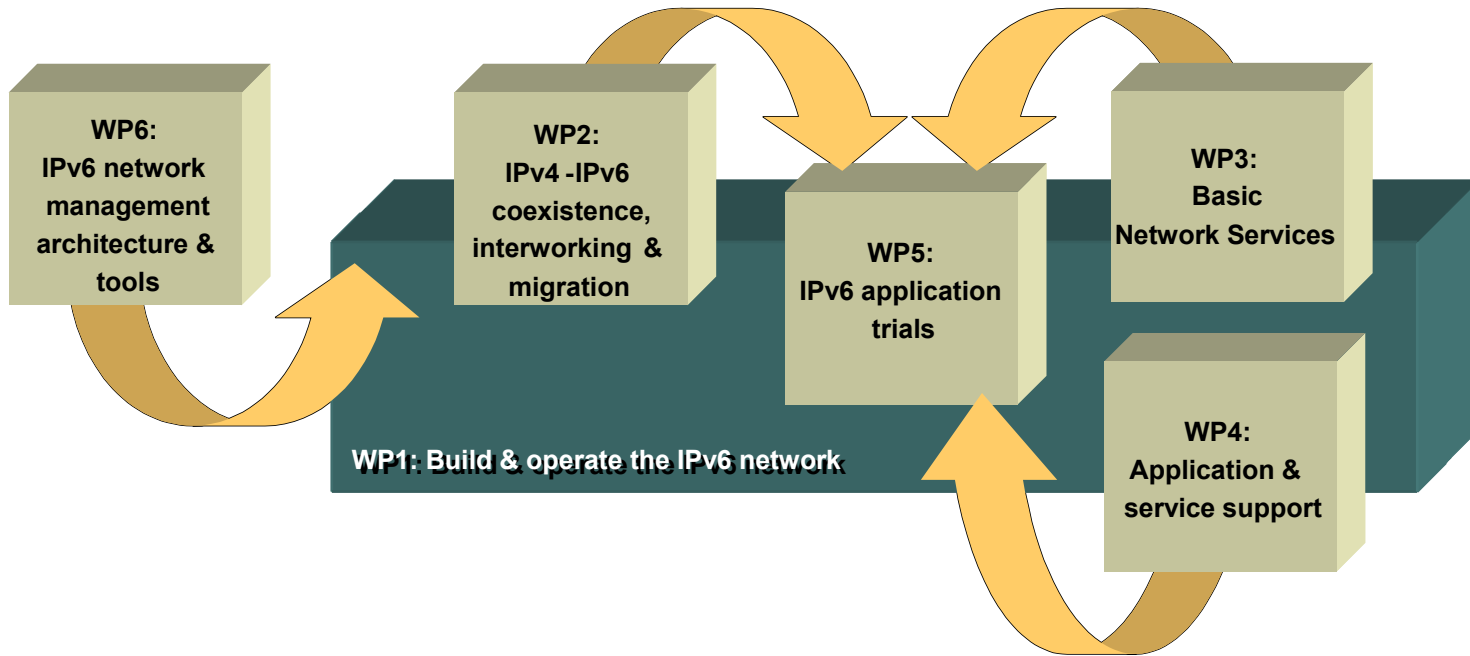
Project Objectives



- To build and operate a dedicated international IPv6 network, and use this network to validate that the demands for the continuous growth of the global Internet can be met with the new IPv6 technology.
- To help European research and industry to play a leading role in defining the next generation of networking and application technologies that go beyond the current state of the art.

Project Workflow

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WP0 - Project management and technical management
WP7 - Dissemination and exploitation

6NET impact

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- **Technical Leadership**
- **Technology integration**
- **Network evolution**
- **IPv6 Service Launch Event**
- **Dissemination**

Technical Leadership



- **IETF**
 - Multicast, DHCPv6, v6ops**
 - Multihoming, renumbering**
- **GGF**
- **RIPE**
- **EC Task Force**
- **Moonv6, Internet2**

Technical Leadership



- "draft-savola-v6ops-firewalling-02.txt" (firewalling)
- "draft-shin-v6ops-application-transition-02.txt" (application transition)
- "draft-ietf-v6ops-isp-scenarios-analysis-01.txt" (ISP scenarios/analysis)
- "draft-lind-v6ops-isp-scenarios-01.txt" (IPv6 transition scenarios)
- "draft-ksinant-v6ops-isp-analysis-00.txt" (IPv6 transition solutions)
- "draft-savola-v6ops-transarch-02.txt" (issues to consider when planning IPv6 transition)
- "draft-ietf-v6ops-ipv4survey-*" (IPv4 survey documents).
- "draft-savola-v6ops-security-overview-02.txt" (security overview)
- "draft-ietf-v6ops-6to4-security-02.txt" (6to4 security considerations)
- "draft-savola-v6ops-tunneling-00.txt"
- "draft-savola-v6ops-multicast-issues-03.txt" (describing IPv6 multicast issues)
- "draft-savola-v6ops-conftun-setup-01.txt" (simple configured tunnel set-up procedures)

Technical Leadership



- "draft-savola-bcp38-multihoming-update-01.txt" (describing ingress-filtering issues with multihoming)
- "draft-savola-bcp38-multihoming-update-02.txt", provided comments to the multihoming threats
- "draft-savola-bcp38-multihoming-update-03.txt", (ingress filtering for multihomed networks)
- "draft-nordmark-multi6-threats-00.txt"
- "draft-baker-ipv6-renumbering-01"
- "draft-ietf-mboned-embeddedrp-02.txt" (embedded-RP specification)
- "draft-savola-mboned-mroutesec-00.txt" (multicast routing security issues, based on embedded-RP feedback)
- "draft-ietf-dnsop-ipv6-dns-issues-04.txt" (e.g. added operational considerations and issues with IPv6 DNS)
- "draft-savola-multi6-asn-pi-01.txt" (a trivial multihoming mechanism)
- "draft-chown-v6ops-unmanaged-connectivity-00.txt" (IPv6 connectivity issues in unmanaged networks).

Technical Leadership



- "draft-venaas-dhc-lifetime-01" (lifetime option for DHCPv6)
- "draft-vijay-ipv6-icmp-refresh-otherconf-00" (ND support to trigger the nodes that refresh the other configuration)
- "draft-chown-dhc-stateless-dhcpv6-renumbering-00" (renumbering requirements for stateless DHCPv6)
- "draft-thaler-ipv6-ndproxy-01.txt" (a NAT replacement solution and ND proxying)
- "draft-ietf-v6ops-mech-v2-01.txt" (a transition mechanisms update)
- "draft-ietf-v6ops-unmaneval-00.txt" (an unmanaged evaluation document)
- "draft-ietf-v6ops-onlinkassumption-00.txt" (IPv6-on-by-default document)
- "draft-ietf-v6ops-v6onbydefault-00.txt" (IPv6-on-by-default document)
- "draft-chown-v6ops-port-scanning-implications-00.txt" (port scanning implications)
- "draft-chown-v6ops-vlan-usage-00.txt" (use of VLANs for IPv4-IPv6 coexistence in enterprise networks)

Technical Leadership



- "draft-ietf-v6ops-ent-scenarios-00.txt" (IPv6 enterprise network scenarios)
- "draft-chown-v6ops-unmanaged-connectivity-00" (considerations for IPv6 tunnelling solutions in small end sites)
- "draft-chown-v6ops-vlan-usage-00" (use of VLANs for IPv4-IPv6 coexistence in enterprise networks)
- "draft-chown-v6ops-port-scanning-implications-00" (IPv6 implications for TCP/UDP port scanning)
- "draft-chown-dhc-stateless-dhcpv6-renumbering-00"
- "draft-ietf-ipv6-flow-label-08.txt" (IBM and Nokia)
- "draft-ietf-ipv6-deprecate-site-local-01.txt" (IBM and Microsoft)
- "draft-ietf-ipv6-flow-label-09.txt" (IBM and Nokia)
- "draft-join-v6ops-guide-v4mapping-00.txt"
- "draft-cadar-dhc-dhcpv6-v4options-00.txt"
- "draft-chown-dhc-dual-stack-00.txt"

43 submissions – 31 new, 12 updates

Technical Leadership



- **GGF** - UoS produced 2 GGF draft documents, and UCL produced 4 papers for the 2 GGF meetings held during this reporting period:
 - Guidelines for IP version independence in GGF specifications
 - Survey of IPv4 Dependencies in Global Grid Forum Specifications
 - Two documents on porting to IPv6

Technology integration – Demonstrators Concept



- **Maturity of WP work**
- **Towards high impact Demonstrators**
- **On going refinement**
- **Look for deployment scenarios**

Technology integration - Current thoughts on demonstrators

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- VoIP with SIP (SIP Express Router) + voice user agent (eg. Kphone IPv6) + PSTN gateway + MCU + VPN functionality
- Flute. The 1st demonstration will include ASM functionality, and the 2nd demonstration will include SSM functionality
- Streaming between mobile hosts, including Mobile IP functionality
- Open H323
- Globus (GT3) for home medical devices, gene sequencing analysis, e-protein and weather station sensors (demonstrations will use Grid FTP)
- AccessGrid (large sessions), including IPv4-v6 gateway and multicast functionality
- Home Networking: GnomeMeeting + IPv4-v6 gateway, Cisco 800 routers, weather station sensors and H323 functionality

- *Car-to-car (MobileIPv6)*
- *Mobile library (MobileIPv6)*
- *Mobile ambulance (MobileIPv6)*
- *Mountain rescue (MobileIPv6)*

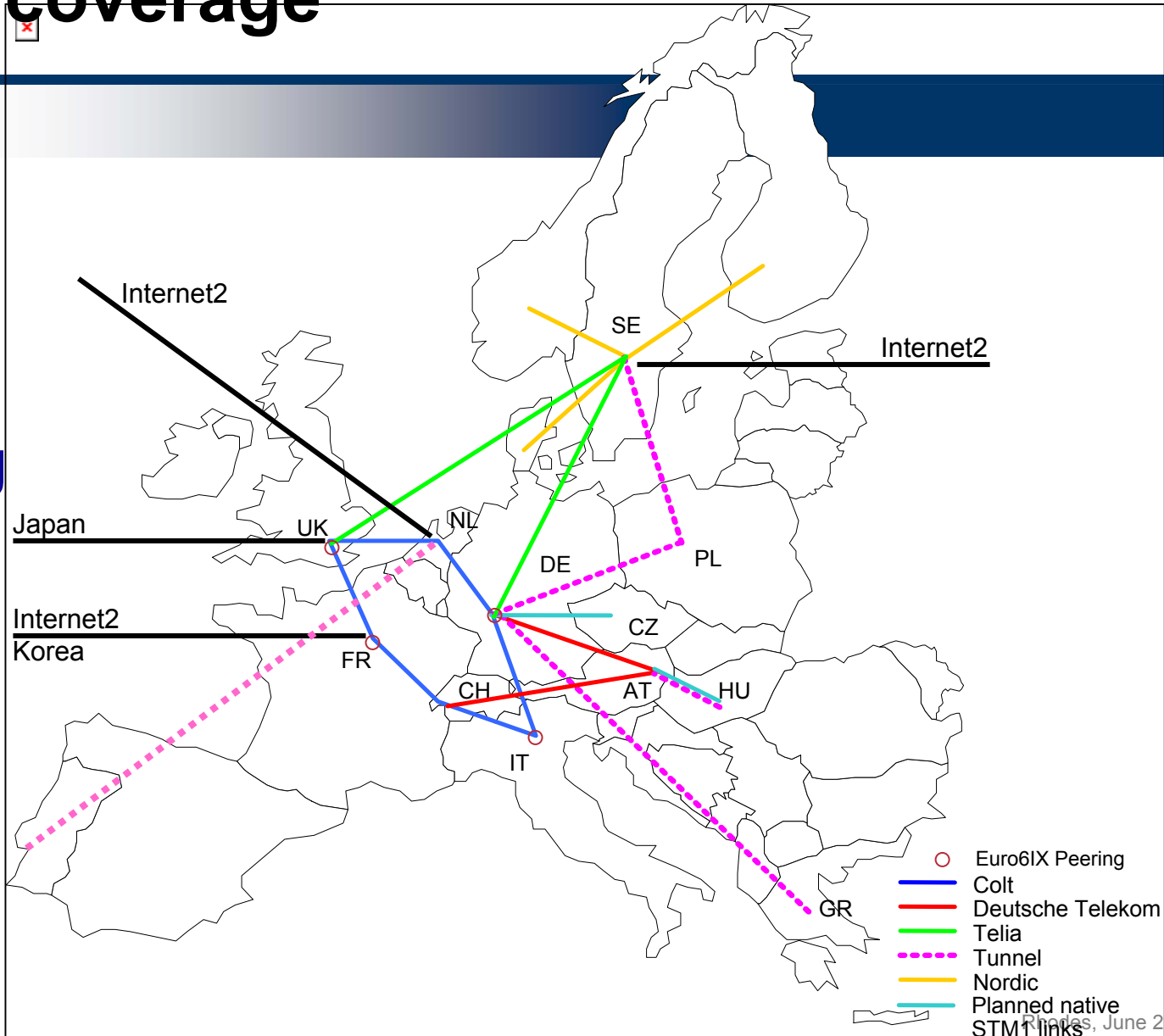


Network evolution

Wider coverage

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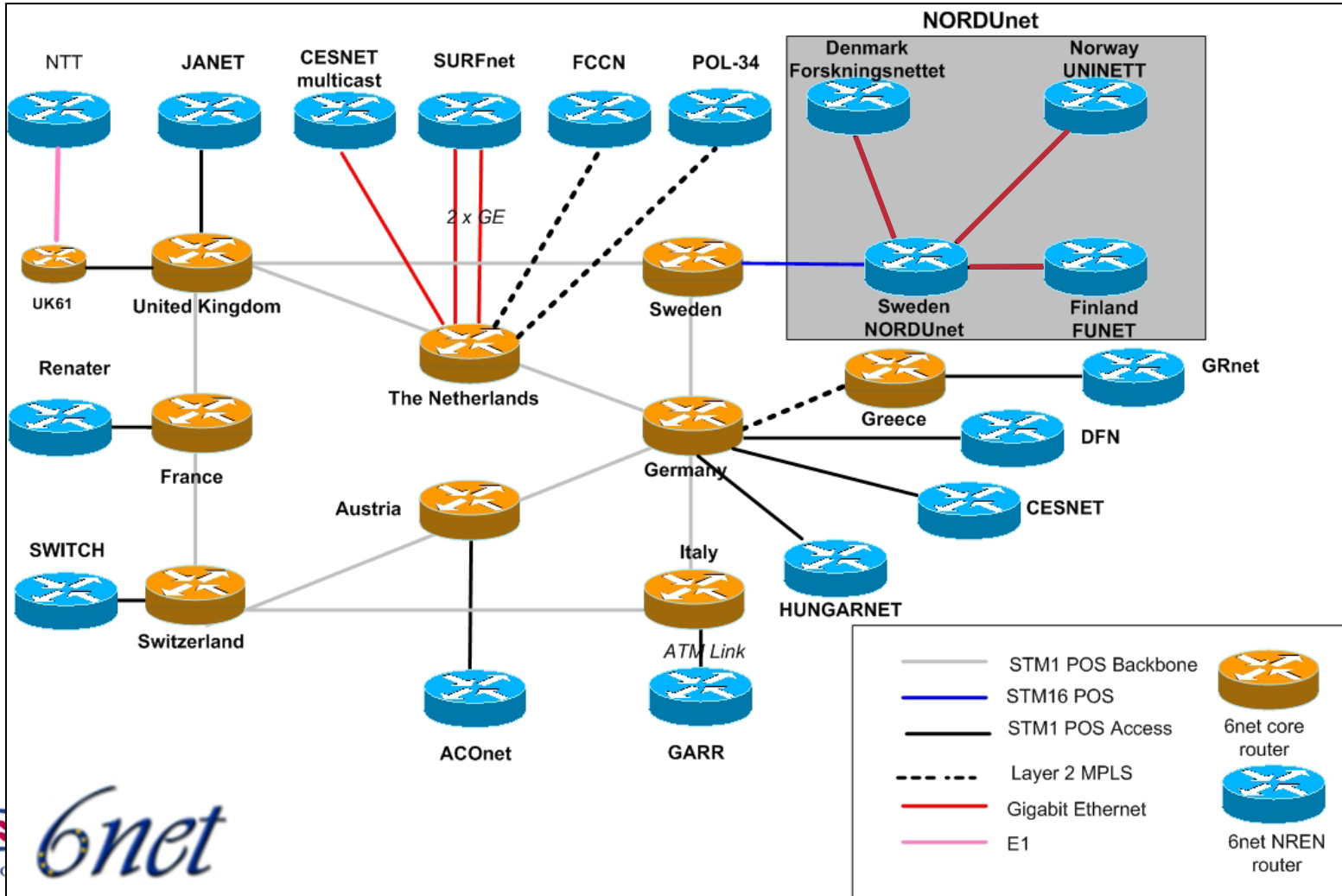
Up and running



Network evolution

Higher speeds

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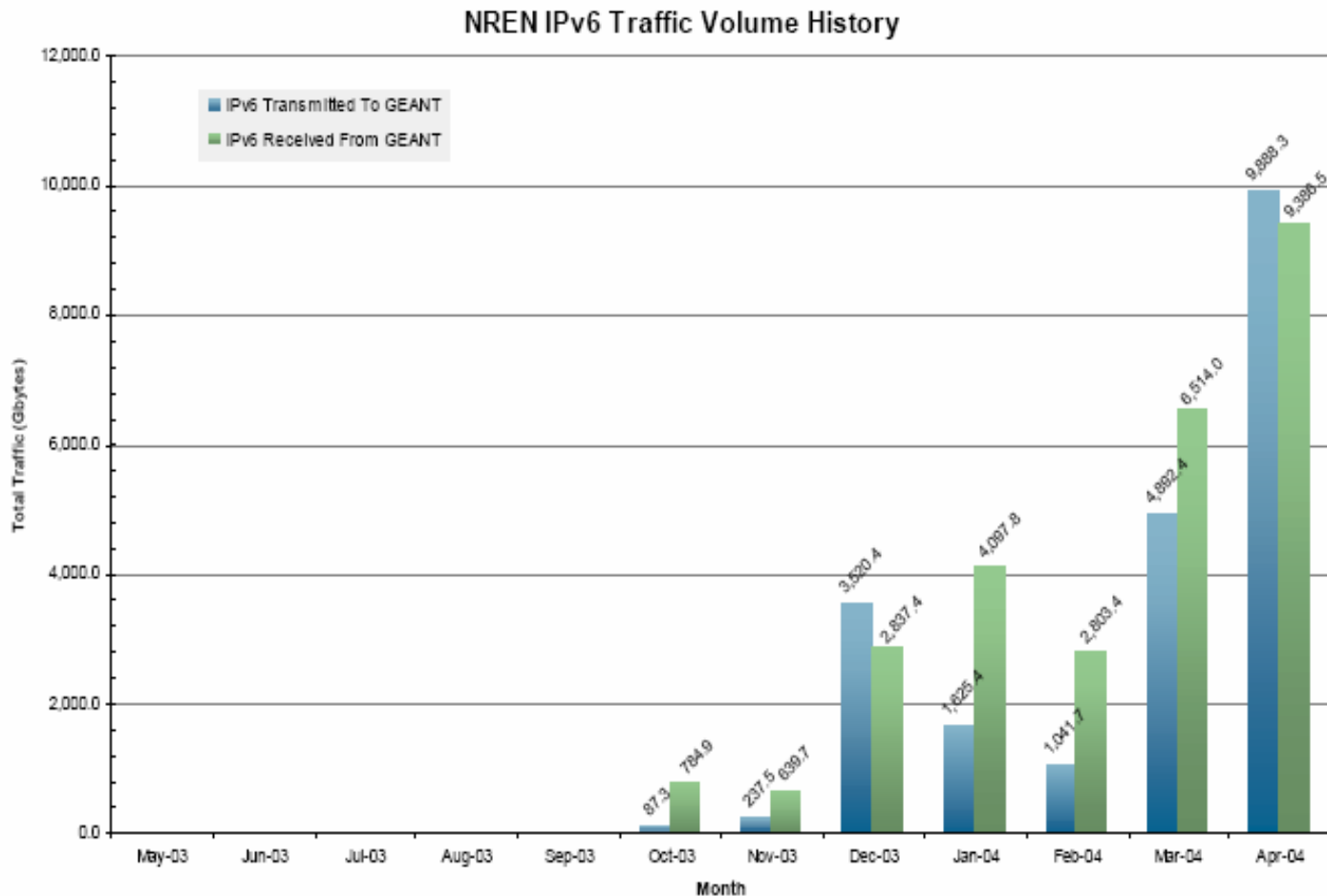


Network evolution

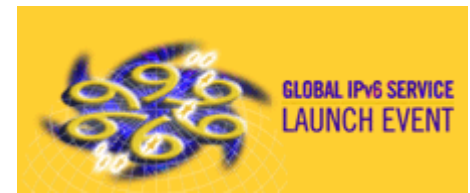
GÉANT Performance Figures

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IPv6 Transfer Volume in the European Backbone Network



IPv6 Service Launch Event



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- **Brussels, 15-16 January**
- **The Global IPv6 Service Launch Event is co-organised by the Information Society Directorate General of the European Commission and the European projects 6NET and Euro6IX.**
- **GÉANT, the IPv6 Cluster, Eurov6 and the European IPv6 Task Force are giving their support to this event as well.**

IPv6 Service Launch Event - before

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IPv6 Service Launch Event - after

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Dissemination – major improvements



- **Major effort**
- **6NET Spring Event May 18 & 19**
- **Website redesign**
- **More Newsletters**
- **Professional PR**
- **Dissemination to other regions**

Hot Topics

Things to stay tuned for

Hot Topics

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- **Cookbooks**
- **Technology updates**
- **Management tools and NOC Tutorial**
- **Demonstrators**

Cookbooks and Technology updates

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Management tools and NOC Tutorial



Spread out information about IPv6 management

- Web access to the tested IPv6 tools

<http://tools.6net.org>

- Tutorial for NOCs
- Dissemination : conferences, tutorials, trainings, ...

<http://sem2.renater.fr/presentations/index.html>

Project Demonstrators



- **Systems Integration, with cross-WP activity**
- **Seek widespread use, inside and outside 6NET**
- **Identified in Feb'04 Applications Workshop**

SIP-based VoIP

SSM multicast reliable file transfer

Globus Toolkit - weather station, eProtein

AccessGrid

Mobile streaming

H.323 conferencing

Home networking

WP5 - SIP-based VoIP



- **VoIP seen as an important commercial driver**
 - IPv6 removes NATs, enables end-to-end**
 - SIP an important emerging technology**
- **Components:**
 - SER, IPv6 Kphone, PSTN, Cisco IPv4 handset**
- **Cross-WP activity:**
 - QoS, Mobile IPv6, IPv4-IPv6 interworking, VPN,**
 - Management and monitoring**
- **(Status shown at ULB demo yesterday)**

WP5 - SSM Multicast



- **6NET is doing leading edge IPv6 Multicast work**
 - Testing SSM applications on backbone**
 - SSM viewed as simpler to deploy than ASM**
- **Flute is a reliable multicast file transfer protocol**
 - Mad application is now IPv6-enabled, for ASM only**
 - Working now to port for SSM operation**
 - Currently using IETF documents, planning ISO images, RPMs and MP3's for IPv6 radio stations**
 - Can include multicast gateway for IPv4-IPv6**

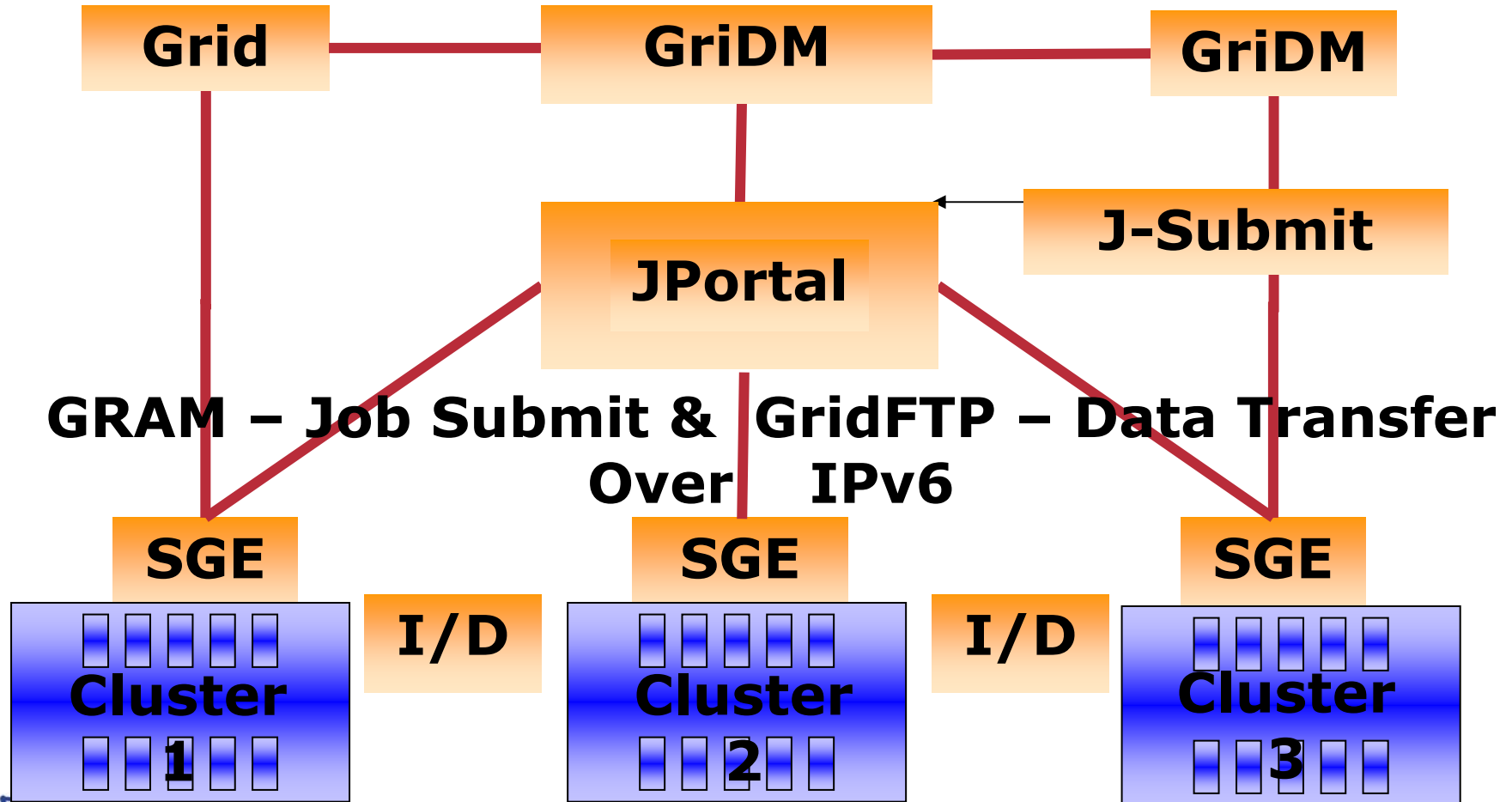
WP5 - Globus Toolkit



- **Globus Toolkit 3 porting already near complete**
 - Lessons and activity documented, and fed back to Argonne team
 - Important for future Grids, including EGEE, to have the IPv6 capability ready and proven when it's needed
- **Showing IPv6 capability in GT applications**
 - IPv6 weather station (sensor network)
 - eProtein (computational network)
- **Cross-WP activity:**
 - IPv4-IPv6 interworking. Use of MIPv6 for sensor nodes

WP5 - Grid Demo

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WP5 - AccessGrid



- **Very high quality conferencing tool**
 - Based on proven components (vic, rat, ...)**
 - May be room based or personal system (“pig”)**
- **Cross-WP activity:**
 - May use 10’s of Mbit/s in bandwidth**
 - Will thus stress IPv4-IPv6 gatewaying tools**
 - Learn more on porting complex multimedia apps**
 - May draw on QoS, will require IPv6 Multicast**
 - New components to investigate, e.g. Python**

WP5 - Mobile Streaming



- **Mobility seen as an important IPv6 advantage**
 - Seek to demonstrate in multimedia context
 - Use mobile receiver (PDA)
- **Cross-WP activity:**
 - Visualisation tool has been developed by TELIN
 - May require QoS
 - May investigate transition, multicast in MIPv6 context
 - Leads to more complex MIPv6 demonstrators (U.Lanc)
- **(Status shown at ULB demo yesterday)**

WP5 - H.323 conferencing



- **6NET has ported Open.H323 toolkit to IPv6**
Used by GnomeMeeting, includes multi-party MCU tool
Excellent home networking application (in use now)
- **Potential for cross-WP effort:**
Allows IPv4-IPv6 interworking via MCU as an ALG
Have shown usage over OpenVPN tunnelling
Also potential for QoS, MIPv6
Performance analysis being undertaken
- **(Status shown at ULB demo yesterday)**

WP5 - Home networking



- **A big potential market**

Aim to demonstrate, in researcher/student context

Point-to-point or group communication between homes

- **Cross WP effort**

IPv6 access over IPv4 (6to4, OpenVPN)

A range of WP5 applications, e.g. H.323, Jabber, streaming (includes DVR)

Peer-to-peer file sharing

QoS for ADSL lines, line usage monitoring

Firewalling IPv6 home network

WP5 eBusiness Application

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- **Distributed Management Platform**
- **Security Demonstrator**
- **Web Services in other integrators**

Future Work

Next months per WP view

Future Work

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- **Renumbering work**
- **Deployment Tiger teams**
- **Mobile router demonstrators**

Research Area: IPv6 Network Renumbering



- **Features in IPv6 support renumbering:**
 - Stateless address autoconfiguration
 - Preferred and Valid prefix lifetimes
 - Recommendation for assigning /64 prefixes to links
- **Renumbering is a key advantage to IPv6**
 - Mobility, especially mobile networks
 - Provider-independent addressing
 - Network reconfiguration
- **But...address and prefix assignment is only part of the story; see:**
 - “Procedures for Renumbering an IPv6 Network without a Flag Day” <draft-ietf-v6ops-renumbering-procedure>, written by Baker, Lear, Droms

Research Proposal



Proposal: Conduct experiment in network renumbering based on framework in Baker-Lear-Droms document

Establish test network: router (with ACLs), routing protocols, variety of hosts, one prefix, DNS service

Introduce new prefix for “make-before-break” transition

Remove old prefix once new prefix is in place

What works? What breaks?

Outline of Research



Project will consist of four experiments:

1. home / small networks (SoHo)
2. core networks (mesh of routers that represent a core network)
3. enterprise networks (core network, a number of hosts and application layer services)
4. ISP level networks (IPv6 renumbering while maintaining an uninterrupted service to customers)

Project goals



- **Estimation of work involved in renumbering; does IPv6 meet the goals for renumbering such as provider independent addressing?**
- **Identification of details not described in Baker-Lear-Droms document**
- **Identification of methods, tools, protocols needed to improve renumbering**

Deliverable documents



Deliverables identified for this project:

- **D.A1. "Results from and Documentation of Experiments"**
- **D.A2. "Recommendations"**
- **D.A3. "Problems with Two Prefixes on a Single Link"**
- **D.B1. "Background and Prior Art" (pre-experimental)**
- **D.B2. "Results and Recommendations for Future Work" (post-experimental)**

Deployment Assistance Tiger Teams



- **Deployment assistance teams will be set up in the 6NET groups with the knowledge already acquired with the specific missions:**

To assist new communities to transition to IPv6

To assist both the new and existing communities, inside and outside 6NET, to deploy IPv6-specific techniques, technology and generic applications

To assist deployment of specific applications already developed under 6NET and related projects, in new application domains – both inside and outside 6NET

- **The teams will work both with those needing the information, and national groups with similar aims**
- **The teams will be pro-active in promoting their existence, expertise and willingness to consult**



Mobile Router Demonstrators



- **Mobile IPv6 in the context of mobile routing**
- **Identified scenarios include:**
 - Remote Network Support**
 - Mobile library**
 - Disaster Recovery / Mobile Ambulance**
 - Mountain Rescue**

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<http://www.6net.org>



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