IPv6 in GÉANT

TNC 2003,

Zagreb 19-22 May

Marian García Vidondo

DANTE - Operations Manager

What are DANTE and GÉANT?

- **DANTE**

  – Non-profit organisation established in 1993 by the National Research and Educational Networks (NRENs).

  – Role: Organise, manage and build the GÉANT network .

- **GÉANT**

  – 10 Gpbs Pan-European Research Network

    – 32 countries connected

    – Serving 3500 research and education establishments across Europe

    – Providing international connectivity to other world regions => Abilene, CANARIE, Esnet and SINET

  – Funded jointly by NRENs and European Commission

Multi-Gigabit pan-European Research Network

Backbone Topology December 2002
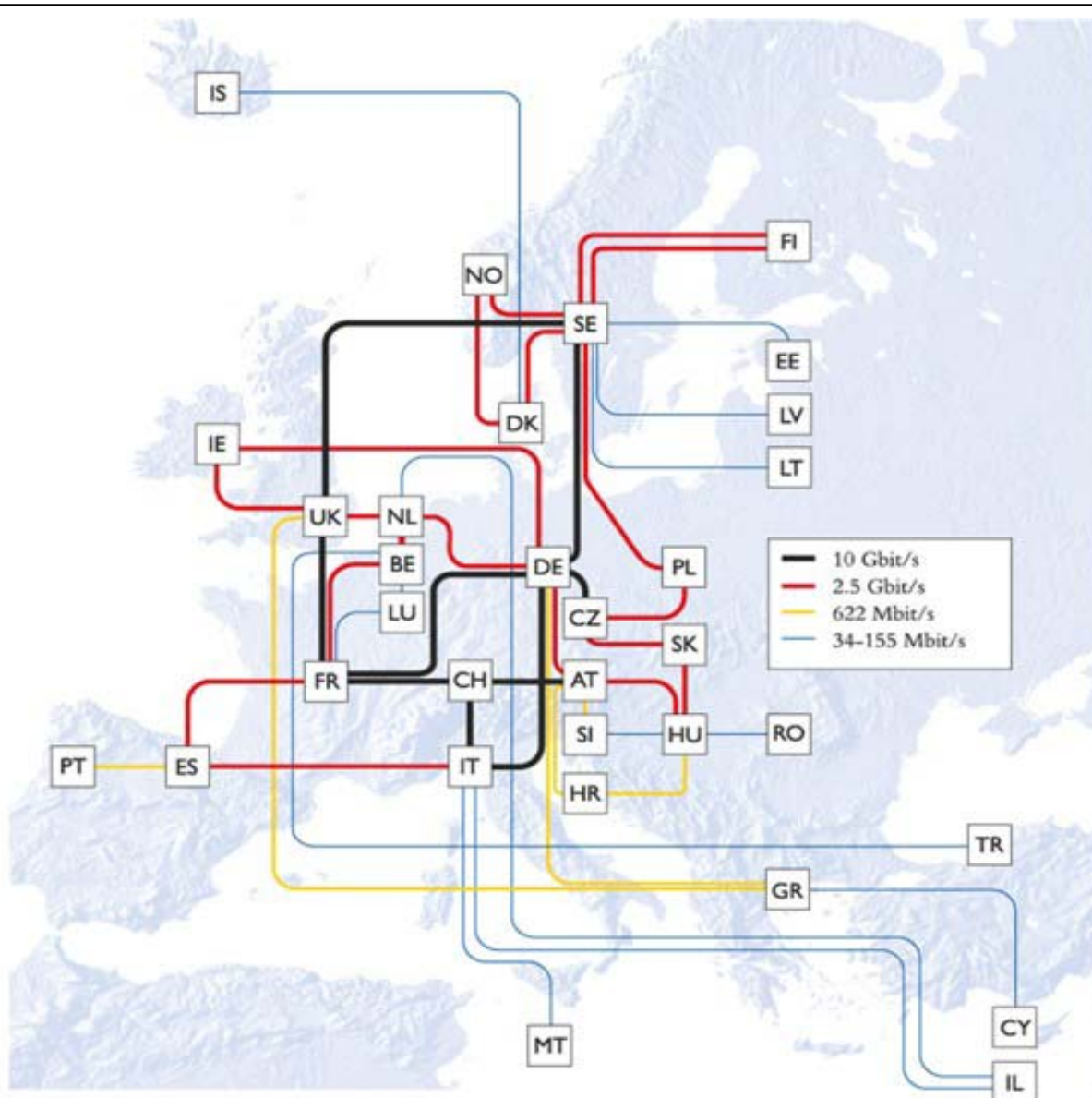
- Connecting 32 European Countries and 28 NRENs

- Backbone capacity in the range of: 34Mb/s-10Gb/s

Legend:
- 10 Gbit/s
- 2.5 Gbit/s
- 622 Mbit/s
- 34–155 Mbit/s

IPv6 Roll-out plan

- **GÈANT v6 Core Configuration – February 2003 √**

- **First Connections – April 2003 √**

- **Pilot service – June 2003**

- **IPv6 production service – October 2003**

IPv6 Design

- One IGP => IS-IS handling v4 and v6 routes
  - With a congruent topology for both protocols

- BGP Design => One TCP session for v4 and v6?
  - Advantage: TCP sessions not duplicated
  - Disadvantage: Next hop chosen by IPv6 NLRI is derived form the IPv4 address => Not real IPv6 address exchanged by IGP. Use static routes!
  - Two TCP sessions!!

IS-IS Design

- Only ISIS Level-2 routers

- ISIS Net addresses (12 bytes):

49 . 51e5 .0001 .0620.4010.2001 .00

AFI	Area Id	System ID	n-selector
(private domain)		(loopback 0 of the router)	

- ISIS Metrics :   OSPF costs x 10

- Juniper routers :   JunOS 5.5R3 (M160 and M40)

- Cisco routers :   IOS 12.2(13)T on LU and IL. (7507)

Addressing Plan

- 2001:0798/32 has been allocated by RIPE
    - 2001:0798:0/35 for 6NET
    - **2001:0798:2/35 for GEANT**
    - 2001:0798:4/35=> For delegation of /40 and /48 for projects
    - 8 ranges of /36 reserved for NRNs delegation
    - 2001:0798:E/35 => reserved for Migration

Addressing the core

- 2001:0798:20/40 **for the core backbone**

PoPs Addressing

- PoPs addressing 2001:0798:20PX::/48
  - Where PX is the PoP number (8 bits)

- In each PoP we allocated classes for
  - VLANS => 2001:0798:20PX:0X::/56
  - ACCESS LINKS => 2001:0798:20PX:R_i0AA::/64
  - TUNNELS => 2001:0798:20PX:R_i0DD::/64
  - LOOPBACKS => 2001:0798:20PX:R_i0FF::/64
  - Testbed => 2001:0798:20PX:EE00::/56
  - **R stands for Router Number (4 bits)**

Access links

- Each Access link on a router got a /126 network allocated

- Example on DE1 (POP "14", Router "1" in Germany)
  - 2001:0798:20PX:R¡0AA::/64

2001:0798:2014:10AA::/64	ACCES RANGE	
2001:0798:2014:10AA::/126	Native Access link 1	
2001:0798:2014:10AA::4/126	Native Access link 2	
2001:0798:2014:10AA::8/126	Native Access link 3	
2001:0798:2014:10AA::C/126	Native Access link4	

Trunk addressing

- Addressing range 2001:0798:20CC/48

- For each trunk in GEANT a /80 range is allocated:

  - 2001:0798:20CC:P_iX0R_i:P_jY0R_j::/80

    - P_iX = the lowest PoP number, 8 bits
    - R_i = the router number for PX, 4 bits
    - P_jY= the highest PoP number, 8 bits
    - R_j = the router number for PY, 4 bit

- From the /80 trunk range is issued a /126 subnetwork for each parallel links

Routing Policy: NRENs connections

- Import routing policy
  - Accept prefixes from /35 to /32 based on prefix list => only from National Research Entities
  - Accept 2002::/16
  - Accept 6bone prefixes for a limited period of time based on specific requests => As a transition phase

- Export routing policy
  - Originate 2001:0798/32
  - Announce: Other NRENs, Abilene, Canarie, Esnet and Sinet

Current Status I: GÉANT and NRENs

- GÉANT core dual stack since February

- NRENs connected

    - Native: RedIRIS (ES), RENATER (FR), FCCN (PT), SURFNet (NL), HEANET (IE), GARR(IT), PSCN (PL), EENet (EE), Roedunet (RO)

    - Tunnels: IUCC (IL), Switch (CH), Cern (CH), LITNet (LT), Aconet (AT)

Current Status II: Other Research Networks

- Abilene => Configured
  - Native connection
  - 220 routes received
  - ARIN Region: DoD (22), Canarie (6509), VBNS (145), Univ.Wiscosin (2381), Univ.Indiana (22398)
  - LACNIC Region: Mexico (18592)
  - APNIC Region:Wide (2500), Australia NREN (7570), Singapore NREN (7610), Taiwan NREN (9264), (south)Korea NREN (17579)

Current Status II: Other Research Networks

- Working on:
  - Esnet (US)
    - Native connection
  - Sinet (Japan)
    - Tunnel connection
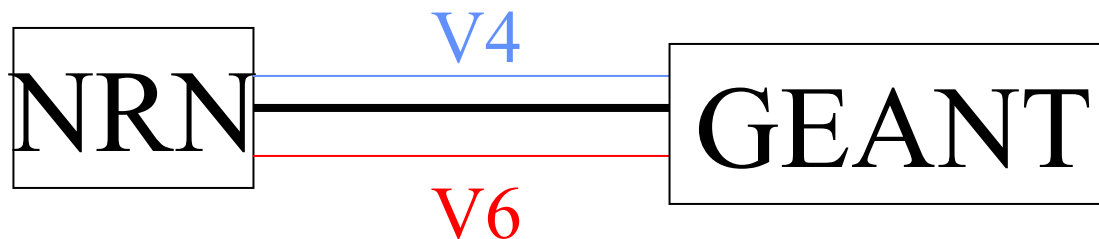
Current Status III: Other networks

- Configured:
  - Telia: Tunnel connection in experimental basis
- Working on:
  - Global Crossing: Tunnel connection in experimental basis

Ongoing

- The routing policy between GEANT and 6NET to be implemented ->
Providing transit between NRENs only connected to GÉANT and NRENs only connected to 6NET

- Monitoring

- Definition of the service

IPv6 Service Monitoring

- First option: Using firewall filters in interfaces
- Other option: To distinguish v4 traffic from the v6 traffic change framing of the accesses from POS to Frame Relay
  - Different DLCIs for v4 than v6
  - Needs to be tested

- *References*
  - GEANT V6 task force:
  - http://www.join.uni-muenster.de/geantv6/
  - geantv6@dante.org.uk

  - *DANTE*
  - http://www.dante.net/nep/ipv6/index.html
  - nep@dante.org.uk, operations@dante.org.uk

Thanks!