

The GÉANT2 Network as an enabler for Grids

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A European Model

- 30 National Research & Education Networks-NRENs of the extended European Research Area (ERA)
 - More than 3000 Research & Education Institutions
 - Millions of end-users + eScience Projects (e.g. Grids) under *Accepted Usage Policy* (AUP) rules
 - A 3-tier Federal Architecture, subsidized by National and EU Research & Education funds:
 - The Campus Network (LAN/MAN)
 - The NREN (MAN/WAN)
 - The Pan-European Interconnection: TEN34 → TEN155 → GÉANT (GN1 in FP5) → **GÉANT2 (GN2 in FP6)**
- NREN Policy Committee, DANTE, TERENA

GÉANT/GÉANT2:

The Pan-European Network *for Research & Research on* Next Generation Internet

The NREN PC



Austria (**ACOnet**)

Belgium (**BELNET**)

Bulgaria (**ISTF**)

Croatia (**CARNet**)

Czech Republic (**CESNET**)

Cyprus (**CYNET**)

Germany (**DFN**)

Estonia (**EENet**)

Fance (**RENATER**)

Greece (**GRNET**)

Hungary (**HUNGARNET**)

Ireland (**HEANet**)

Israel (**IUCC**)

Italy (**GARR**)

Latvia (**LATNET**)

Lithuania (**LITNET**)

Luxembourg (**RESTENA**)

Malta (**UoM**)

Netherlands (**SURFNET**)

Nordic Countries – Denmark, Finland,
Iceland, Norway, Sweden (**NORDUNET**)

Poland (**PSNC**)

Portugal (**FCCN**)

Romania (**RoEduNet**)

Russia (**JSCC**)

Slovakia (**SANET**)

Slovenia (**ARNES**)

Spain (**RedIRIS**)

Switzerland (**SWITCH**)

Turkey (**ULAKBIM**)

United Kingdom (**UKERNA**)

PLUS NON-VOTING MEMBERS:

Delivery of Advanced Network Technologies to
Europe Ltd. (**DANTE**)

Trans-European Research & Education Networking
Association (**TERENA**)

PERMANENT OBSERVERS: **CERN, AMREJ, MARNET**

GN2 project



- **Funded from FP6, under Research Infrastructures**
 - An Integrated Infrastructure Initiative
 - Combining in a single contract, several activities essential to reinforce research infrastructures and to provide an integrated service at the European level
 - Networking activities
 - Provision of access to transnational users
 - Joint Research Activities
- **32 partners**
 - 30 NRENs + DANTE + TERENA
- **Total expected budget: 178.643.730 €**
- **EC contribution: 93.000.000 €**
- **Duration: 4 years**

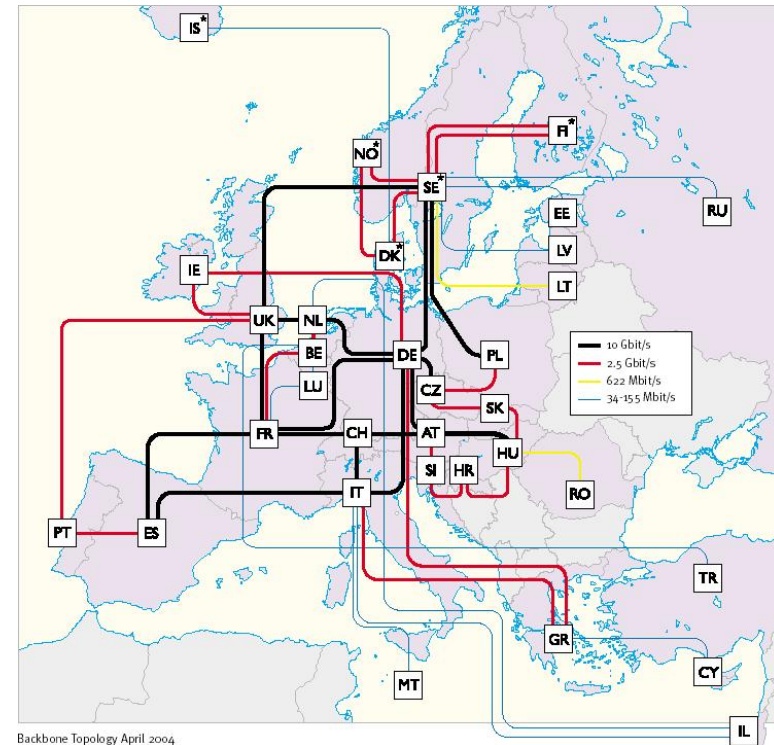
The EU (GN2) subsidy covers < 1% of the total Research & Education Networking European Infrastructure:

Campus LAN / MAN-WAN NREN / GÉANT-GÉANT2

(Assuming Cost factoring 100 / 10 / 1)

Scope

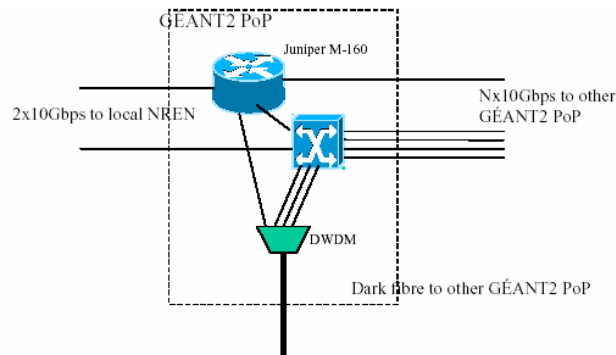
- Build on the GÉANT Pan-European **IP** R&E network – An international success story
- Deploy GÉANT2, a new generation **HYBRID** network backbone: IP(v6) + switched **end-to-end** provision across interconnected networks (over **DARK FIBER** among 15 countries & growing)
- Ubiquitous global services to users across NRENs & beyond via IPv6 and manageable e2e lower layer paths (e.g. WAN GigEthernet & Light-path switching)
- Gaining improved understanding of user needs – **Grids/eScience**
- End-user support, user access to e2e provisioning, AAA, collaborative services, roaming
- User basis: Universities, Research Centers, Schools (?), eScience Initiatives (Grids), Digital Libraries ...



Structure

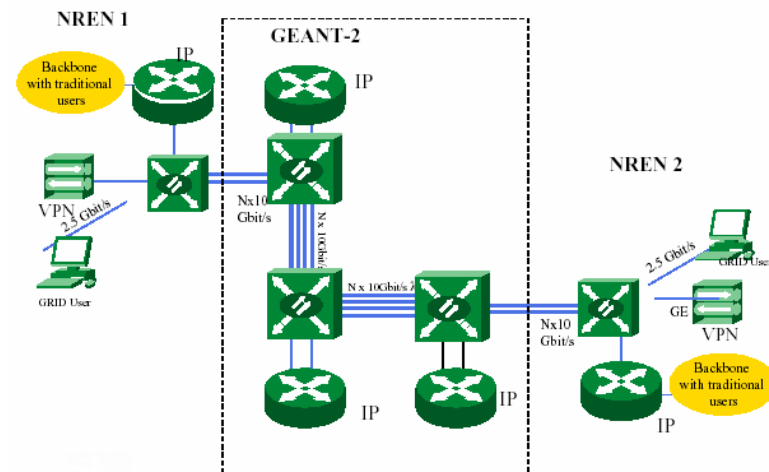
- **Networking activities (NAs)**
 - Mutual co-ordination and the pooling of resources among the consortium of participants
 - Spreading good practice, promoting common protocols and interoperability, encouraging complementarity
 - Strategic study
- **Service Activities (SAs)**
 - Coherent access to infrastructures so as to improve the overall services available to the research community
- **Joint Research Activities (JRAs)**
 - Joint research into higher performance techniques, instrumentation or technologies
 - Innovative and exploring new fundamental technologies or techniques underpinning the use of infrastructures

GÉANT2 : The network



- **Node architecture**

- **End-to-end services**



- **90% of the GN2 project budget allocated to GÉANT2 connectivity, transmission & switching**

Joint Research Activities

- **JRA1: Performance Measurements and Management**
 - End-to-end monitoring services
- **JRA2: Security**
 - Securing GN2 network elements and services
 - Security services
 - Coordination infrastructure
- **JRA3: New service development**
 - Bandwidth on Demand service (Extended layer-2 VLANs, Point-to-point switched layer-1 connections)
- **JRA4: Technology and service testing**
 - Distributed test bed in support for other activities and other FP6 projects
 - Technology testing
- **JRA5: Ubiquity and Roaming access to services**
 - Roaming among different networks and network technologies (like WLANs, UMTS and GPRS)
 - Inter-operable Authentication and Authorisation Infrastructures (AAI)

Policy Fora in *Research Infrastructures* (1)

General Research Infrastructures

- **ESFRI** emerged in 9/2000 as an initiative of the EC (DG RESEARCH), the French EU Presidency & ESF
 - Incubator for long-term roadmaps for Research Infrastructures (Neutron Sources, Marine Sciences, Free-Electron Lasers, Social Sciences & Humanities)
 - 3 **ESFRI Steering Groups**: Physical Sciences & Engineering, Biological & Medical Sciences, Social Sciences & Humanities
 - Working group on HPCN (established by D. Vandrome)

Policy Fora in *Research Infrastructures (2)*

Electronic Research Infrastructures (GÉANT/Grids)

- **eIRG** established in 2003, supported by Greek, Italian, Irish, Dutch & Luxembourg EU Presidencies (with EC motivation – DG INFSO)
 - Emphasis on *eInfrastructures* (**Grids/GÉANT**)
 - Policy drafting on interoperability issues for Grids e.g. AAI, single sign-on, roaming

Policy Fora in *Research Infrastructures (3)*

National Research & Education Networking Fora, Associations & Committees

- ENPG
 - NREN PC & Executive Committee
 - DANTE
 - TERENA
 - EUMED-Connect, ALICE, TEIN2, SEEREN ...
Committees
- +
- EGEE Networking Federation (Grids)

Guidelines for EU Policy to Support Research

- Communication from the Commission, 16.6.04, COM(2004) 353
- **3% objective** of EU GDP (**1% public, 2% private**) for research by 2010 (Barcelona European Council, March 2004)
- Complementarities of structural funds + research budget
- Emphasis on two new research areas: space + security
- Six major objectives
 - Create Centers of Excellence
 - Launch European Technological Initiatives (**platforms** around research agendas involving Industry, research institutions, financial world, regulatory authorities – e.g. IP type projects + Article 171 of the Treaty)
 - Stimulate Basic Research (open topics, competitive proposals)
 - Make Europe Attractive to Researchers (Marie Curie actions ...)
 - Improve Coordination of National Research Programmes
 - Develop **New** Research Infrastructures (TEN funding instruments + EIB + European Growth Initiative),
- **+ Increased support for GÉANT /Grid *el*nfrastructures using FP6 like instruments**

CAUTION: Careful Strategic (Business) Plan to avoid dead-ends!

Global Hybrid Networking

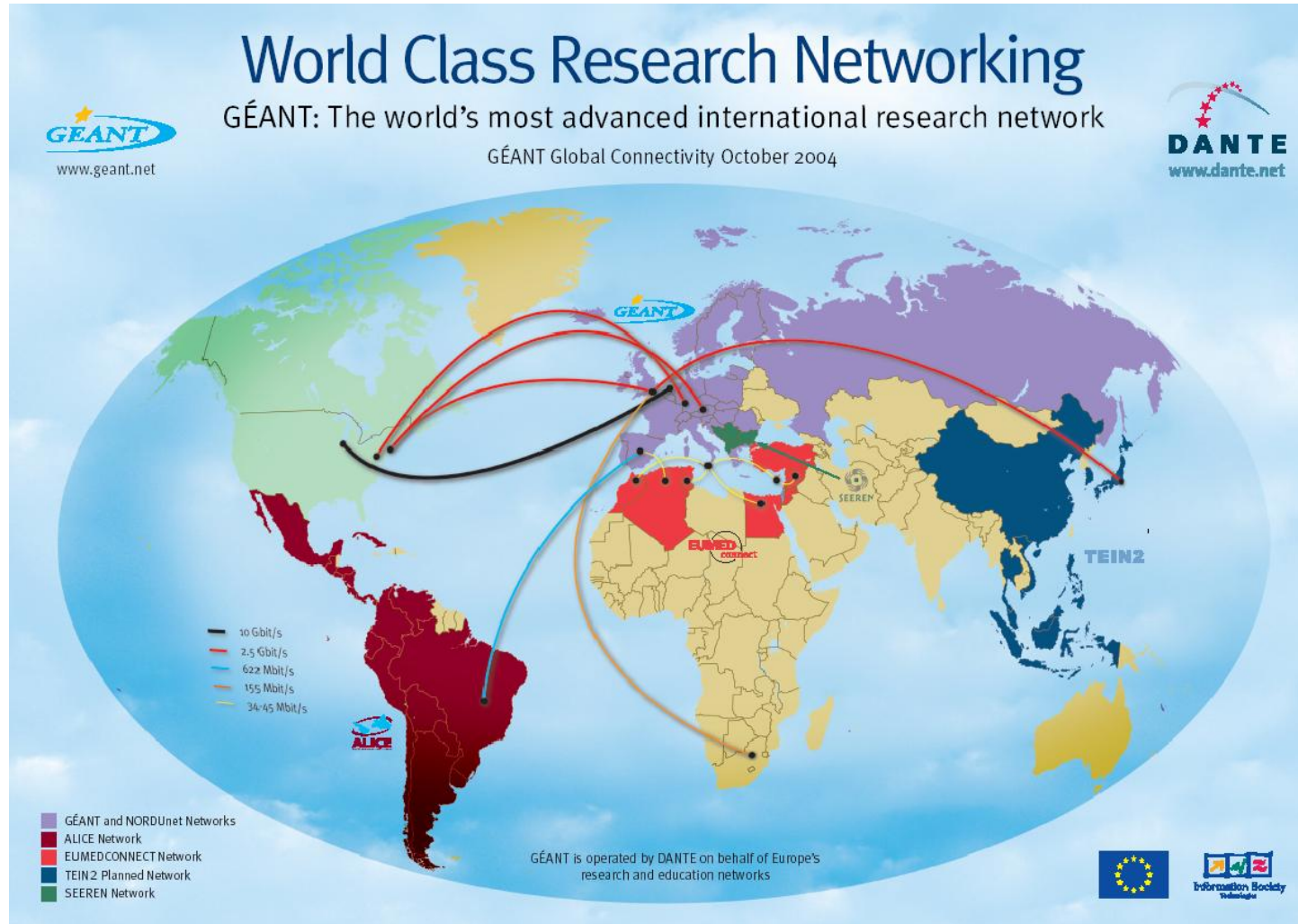


- The Internet enabled the ubiquitous global networking community based on IP services and the Web
- The Next Generation Hybrid Network will enable the global knowledge – based society by providing advanced collaborative platforms via hybrid IPv6 & Manageable Layer 1-2 (Ethernet & Light-path switching over Dark Fiber) Services
- GÉANT2 offers this new environment to European educators & researchers and paves the way for global, ubiquitous advanced networking services (cyber-services)
- The NREN - Grid /HPC communities test – develop - tailor and deploy network-based services & applications: Collaborative platforms, security, AAA, roaming...
- Key common issue: To integrate Hybrid Network control plane aspects within Grid Middleware (M/W)
- Grid (and HPCN) requirements motivated the design and deployment of GÉANT2 as a hybrid, dark-fiber network

Some open policy issues:

- Easing of *Digital Divides*
- Inclusion of wider user communities – Acceptable Usage Policies / AUPs – *Regulatory Status*
- Funding – sustainability - ownership - control of infrastructures: New *Business Models*
- Management & Control planes of hybrid networks: *Open Standards, Multi-domain, User access*
- Role of Open Source for Hybrid Networks and Grids: Towards an *Open HPCN Architecture?*

GÉANT2 Global Connectivity



GN2 – NREN



hot potatoes

- Assess NREN – GÉANT requirements & technology trends over the next 10 years (*foresight*)
 - Test & deploy “bleeding edge” technologies and adopt novel business models (e.g. based on nx40 Gbps over Dark Fibre provision)
 - Coordinate between Next Generation Networking (NREN PC, DANTE, TERENA) & High Performance Computing (LHC, Grids – EGEE, DEISA, SEEGRID ...) towards a *Global HPCN*
 - Test & deploy GÉANT - wide *Security & Monitoring* (prerequisite for eScience / Grids, eSchools, Digital Libraries, eGovernment, eHealth ...)
 - Establish *virtual collaborative environments* (e.g. VRVS, Access Grid)
 - Enhance *global connectivity* (USA, Canada, China, Japan, Korea, South Africa, Latin America, SEEREN, EUMED, *India* ...)
 - Help easing the *digital divides*
 - Promote NRENs – GÉANT – GÉANT2 as a *European success story*
 - Provide NREN inputs to CREST, ESFRI, eIRG
- +
- FP7 Decision Makers: EP – ITRE, European Council (Competitiveness), EC DG RESEARCH & DG INFSOM (*Media*)
- while at the same time*
- *Keep-up the good work* and meet new challenges in the GTREN – eScience world (deploy optical technologies, provide e2e L1/L2 connectivity, update cost sharing models, investigate new business models ...)

Not a mission impossible!



See you in June 14 – 15 in Luxembourg

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