

# Introducing GÉANT

David West, DANTE  
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# A Gateway for European Research



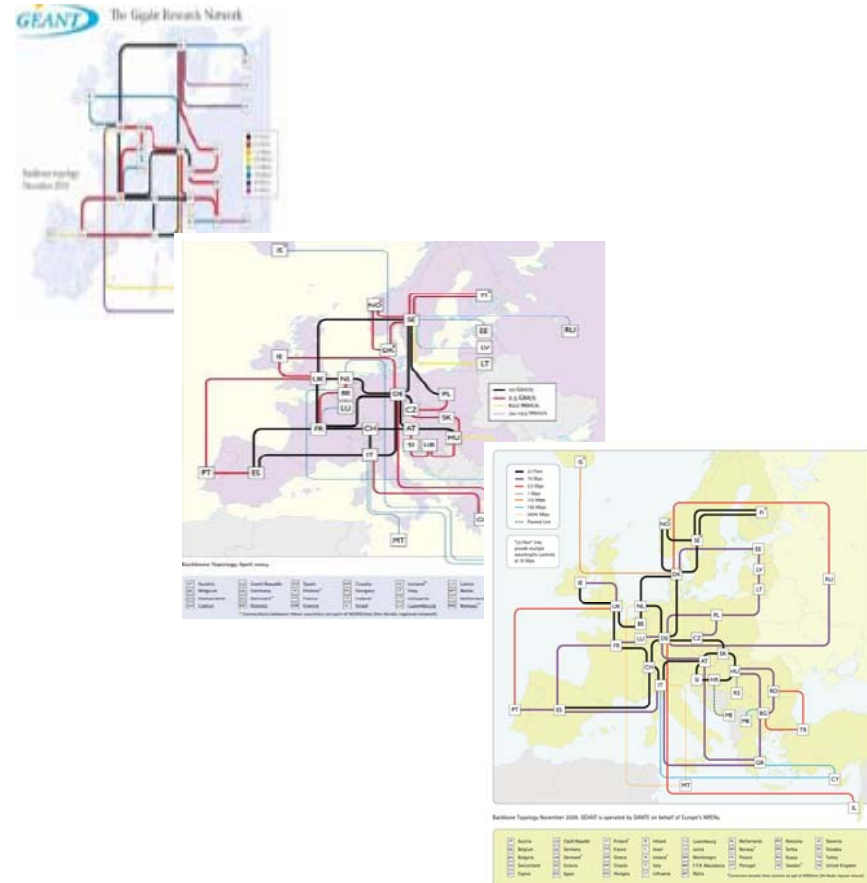
- The GÉANT network is the high-bandwidth, high-performance pan-European communications infrastructure serving Europe's research and education community
- Together with Europe's National Research and Education Networks (NRENs), GÉANT connects 40 million users in over 8,000 institutions across 40 countries
- Co-funded by Europe's NRENs and the European Commission (EC) under the Seventh Framework Programme for Research and Technological Development (FP7)
- Project Partners are 32 European NRENs, TERENA and DANTE



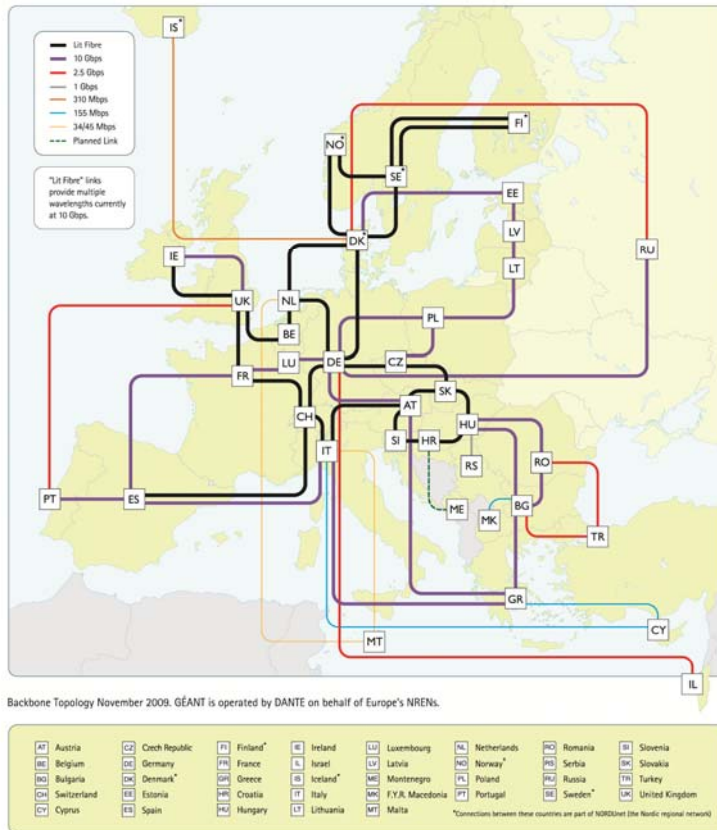
# History of a Success Story



- 2000-2004: GN1 Project
  - GÉANT Network
- 2004-2009: GN2 Project
  - GÉANT2 Network
  - Other Services
  - Joint Research Activities
  - Networking Activities
- 2009-2013: GN3 Project
  - GÉANT Network
  - Wider Range of Services
  - Joint Research Activities
  - Networking Activities

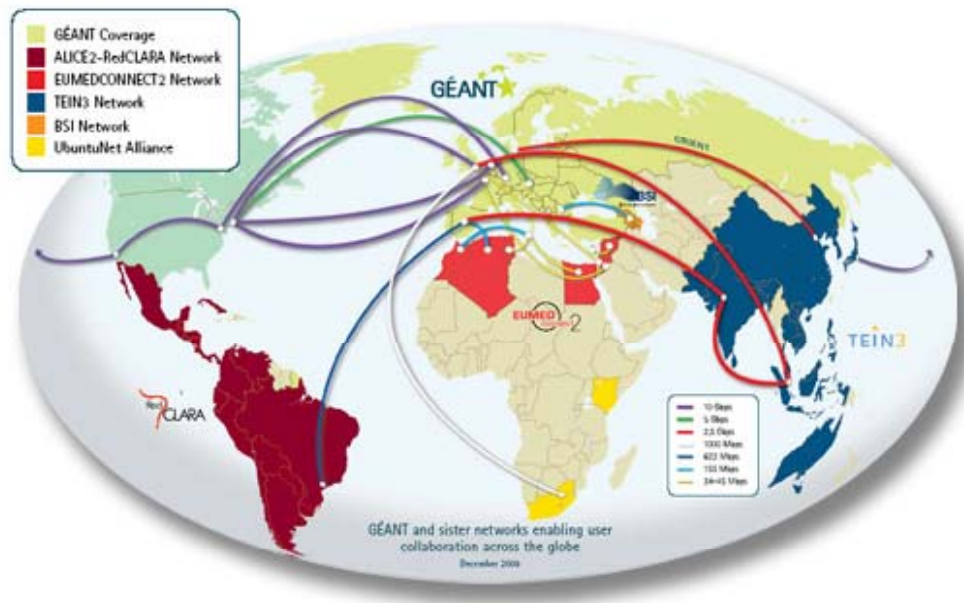


# Innovative Topology



- Local campus networks link to national research networks that span specific countries, and these then interconnect via the GÉANT backbone
- Offers data transfer speeds of up to 10Gbps across 50,000 km of network infrastructure, of which 12,000 km is based on our own lit fibre.
- 25 Points of Presence (PoPs), 44 routes and 18 dark fibre routes
- Ongoing trial of 40Gbps over 1,400 km Frankfurt-Geneva-Milan route

# The Global Research Village

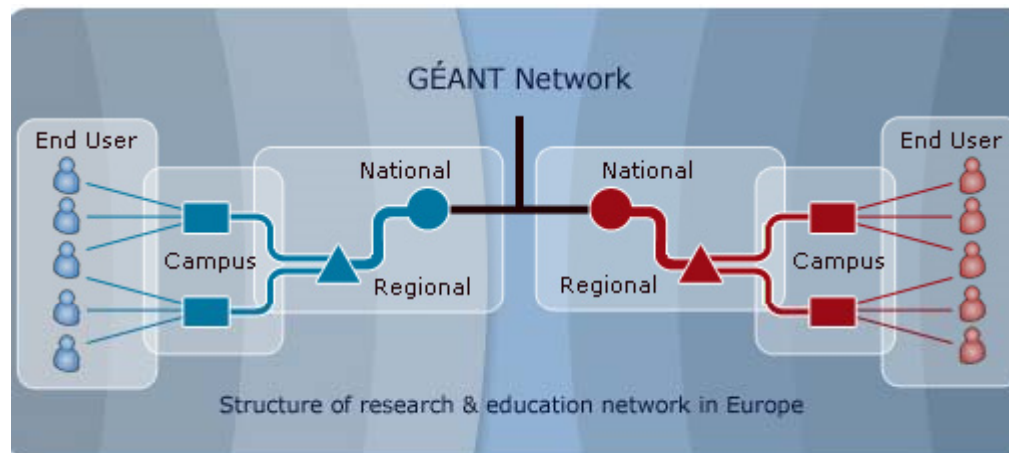


- The GÉANT network has high speed links to networks in other world regions, to connect researchers across the globe:
  - Asia-Pacific
  - Caucasus
  - Central Asia
  - China
  - Latin America
  - North America
  - Southern and Eastern Africa
  - Southern Mediterranean

# Enhancing the User Experience



- In collaboration with Europe's NRENs, GÉANT is committed to developing advanced services to enhance the user experience, and rolling these out across the GÉANT Service Area – a network of networks that spans the backbone and the national networks
- The GÉANT Service Portfolio covers connectivity, network performance and end user applications, all designed to offer a seamless user experience across borders and domains



# GÉANT Service Portfolio



## Connectivity Services

GÉANT IP

GÉANT Plus

GÉANT Lambda

## Network Performance

Performance monitoring

Performance enhancement

Network provisioning

Security

## Access and Roaming

eduGAIN

eduROAM

eduPKI

# Connectivity Services (1)



- **GÉANT IP** (Internet Protocol)
  - A level of service available to all of Europe's research and education community with a connection to their NREN
    - *Restricted for R&E traffic, therefore greater bandwidth and greatly improved reliability compared to commercial providers*
- **GÉANT Plus**
  - A service created by a second parallel network running on the fibre infrastructure already in place
  - Available to more demanding research projects who can reserve a portion of this infrastructure through their NREN
    - *Restricted for individual use*
    - *A virtual private network at a fraction of the cost*



## Connectivity Services (2)



- **GÉANT Lambda**

- A bespoke service for users with extraordinary data transfer challenges
- As with GÉANT Plus, it provides dedicated point-to-point connections across Europe, however:
  - *Each 10Gbps wavelength is created specifically for that user on standalone equipment*
  - *Multiple 10Gbps wavelengths available to meet specific user needs*

# Network Performance Services



- **Performance measuring and monitoring**
  - Multi-domain monitoring to give visibility to users and administrators across point-to-point connections
- **Performance enhancement**
  - An investigation and consulting service designed to address network performance issues. National teams combine through a federated structure to foster knowledge sharing
- **Network provisioning**
  - Takes the concept of dedicated capacity via point-to-point connections one step further to offer bandwidth-on-demand, offering users the bandwidth they need, when they need it
- **Security**
  - A proactive approach to maintain the integrity of the network infrastructure, providing strategies for incident prevention, detection and handling

- A set of interoperable systems that enable “roaming access” by verifying users’ identities and rights and granting access to resources as appropriate
  - eduGAIN
    - *Enabling organisations associated with different federations to seamlessly and securely exchange information as though part of the same federation*
  - eduroam
    - *Secure, roaming access for the global research and education community based on reciprocal institutions*
  - eduPKI
    - *A ‘trust-factory’ to support GN3 services in defining trust requirements and providing digital certificates*

## The GN3 Project

## GN3 Overview



- A sequence of projects maintaining a pan-European research network infrastructure: EuropaNET TEN34 TEN155 GÉANT GN2 GN3
- Total GN3 cost: 45 M€/year shared equally by the EC & NRENs
- Provides extensive international connectivity to other world regions
- Governance by NREN Policy Committee, Executive Committee
- Project co-ordination by DANTE via a Project Management Team of Activity Leaders and Coordinators
- > 400 NREN staff involved, ca 200 active contributors

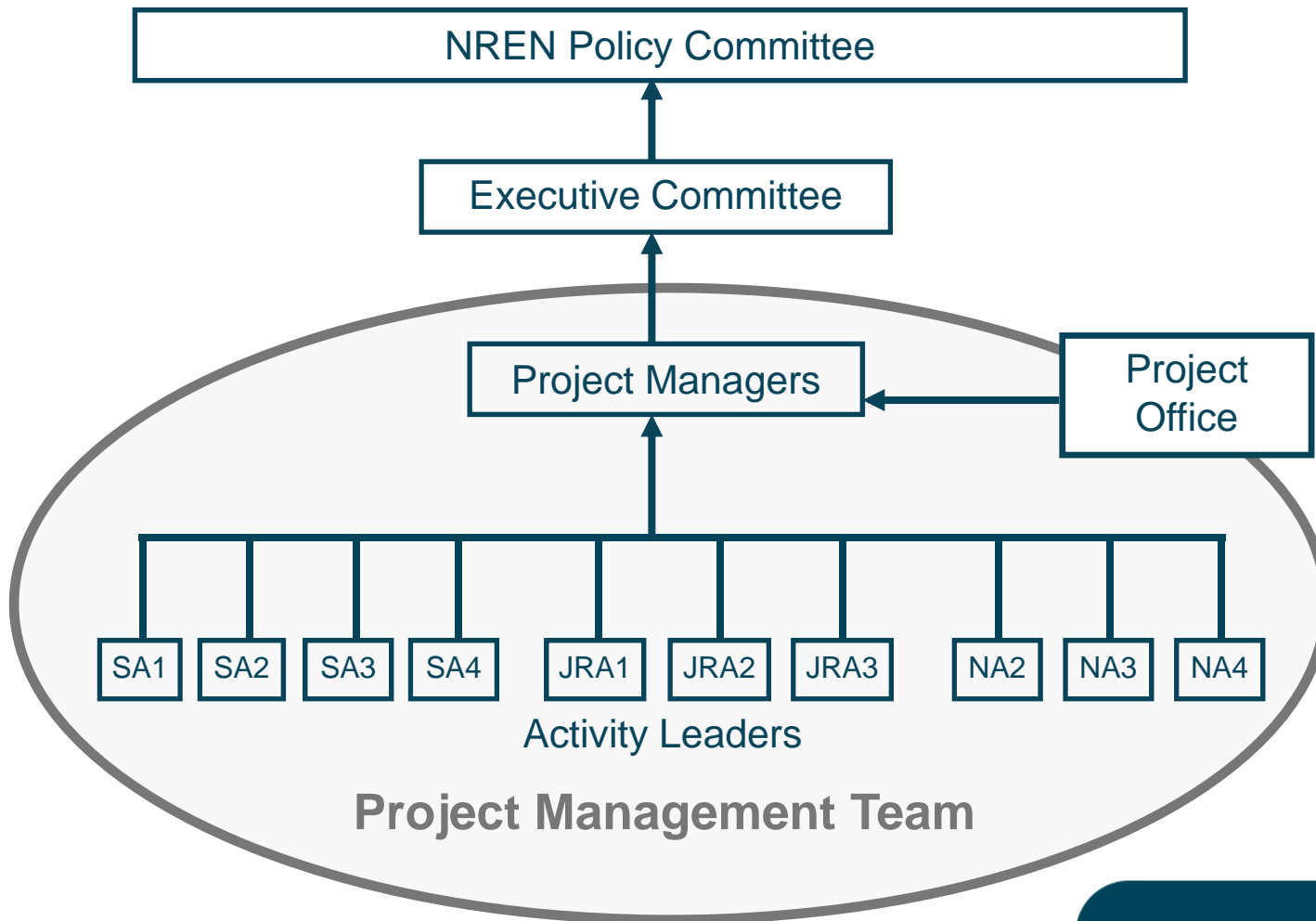
## Links to the ICT Industry



- The GN3 project expends ca 45 M€ per year
- 1/3 goes into coordination, operations, and the development programme
- 2/3 flows into the ICT industry for equipment and services

In creating services for R&E GÉANT maintains a regular dialog with partners from the ICT industry

# GN3 Project Governance



# GN3 Activities and Coordination



## ● Joint Research Activities

- JRA1: Future Network
- JRA2: Multi-Domain Network Services Research
- JRA3: Multi-Domain User Applications Research

## ● Networking Activities

- NA1: Project Management
- NA2: Communications & Promotion
- NA3: Status & Trends
- NA4: Liaison & Support

## ● Service Activities:

- SA1: Network Build and Operations
- SA2: Multi-Domain Network Services
- SA3: Multi-Domain User Applications
- SA4: Software Governance

## ● Coordination roles within the Project Office:

- Technical
- Security
- IPR
- Services
- Standards
- Financial Administration
- Meeting Logistics
- Training
- Technical Writing



# GN3 Project Challenges



- Regional differences and geographic divide
- Common service concept in the GÉANT Service Area
- Balancing service delivery and continuous innovation
- Shaping the new GN3 architecture
- Providing a common support interface for European and global organisations
- Defining appropriate identity service components and trust models for remote access and distributed virtual organisations

## GN3 Mission (1)



- To create an innovative ***multi-domain hybrid networking*** environment, using advanced transmission & switching technologies
- To enable R&E users through their Organizations with ***flexible and scalable production quality services*** via the constituent NRENs
- To be an enabler for Global R&E networking supporting international e-Science initiatives, creating a ***Global Virtual Research Community*** connecting researchers & educators around the world
- To contribute to standards as a key participant in European & Global efforts towards the ***Network of the Future***

## GN3 Mission (2)



- Bridge the geographic and economic *Digital Divide* and enable access to the *Information Society*
- Create a homogeneous *GÉANT Service Area*, advance the multi-domain toolset and federated operations
- Expand the GÉANT customer base
- Develop world-wide connectivity and collaboration (IP & circuits)
- Test and deploy *leading-edge technologies*
- Foster innovation, be the platform on which the *network of the future* is developed

## GN3 Progress



- Regular GN3 Partner meetings since September 2008
- Monthly Project Management Team meetings since Dec. 2008
- Activity/Task Leader Kick-Off – 12 May 2009
- GN3 Architecture Workshops, 3<sup>rd</sup> WS 7-8 July 2009
- GN3 Kick Off Meeting (All-Hands) 8-10 September 2009
- GN3 Launch, Stockholm – December 2009
- Project Website – December 2009
- Project Intranet – April 2010