

THE GÉANT PROJECT (GN4-1) HIGHLIGHTS

This document presents the highlights of the EC funded GN4-1 project from 1 May 2015 to 30 April 2016 (and a four-month extension to 31 August 2016 for network costs).

GÉANT addresses the need for an open space for knowledge, innovation and growth by providing the best possible digital infrastructure to serve all users, from flagship big science to citizen research.

Together with Europe's National Research and Education Networks (NRENs), the pan-European GÉANT network reaches over 50 million users in 10,000 institutions, delivering advanced multi-domain services and facilitating joint-research activity that drives innovation.

GÉANT as the European Communication Commons

The overall objective of GN4-1 was to provide a stable, though innovative, environment for the growth of GÉANT as the European Communications Commons for the European Research Area (ERA), providing the best possible digital infrastructure to ensure that Europe remains at the forefront of research. In doing so, GÉANT makes a vital contribution to realising the aspirations of the EC: e-infrastructures to empower European researchers, increasing creativity and efficiency of research and bridging the divide between developed and less-developed regions. Over a relatively short timescale for such a substantial e-infrastructure project, GÉANT achieved its objectives through:

- Network evolution and cost-optimisation.
- Development of a portfolio of value-added key services.
- Engaging with industry leaders, working closely with e-infrastructures and welcoming new user communities to drive service take-up.

Network evolution and cost-optimisation

The GÉANT network continues to deliver cost-effective and extremely high performance for all users. GN4-1 saw large increases in traffic across the core network, as well as almost 50% growth in global traffic, illustrating the value of GÉANT's European and international connectivity.

- **Operational excellence:** key to achieving GN4-1 objectives was to maintain the operational excellence of the established GÉANT services, whilst achieving significant economies on the costs of the backbone network.
- **Traffic growth:** core IP traffic increased by over 47%, which, when combined with dedicated services for large users, resulted in total traffic volume of 1083 Petabytes over the duration of GN4-1.
- **Evolving the network:** the second iteration of the network evolution plan was developed, with great progress made in such areas as fibre sharing, SDN and packet optical integration. Future work will provide greater clarity on how the GÉANT network will need to evolve to meet the demands of researchers in the future and to assist in the delivery of the European Open Science Cloud.
- **GÉANT Testbed Service:** 5 new GTS nodes deployed in Europe, supporting innovative uses of the network, and developed the GTS roadmap through to 2017.
- **Regional connectivity:** recommendations from the regional study completed in GN3plus were implemented, including a number of newly procured 10Gbps circuits in Southern and Eastern Europe providing improved connectivity to the local NRENs at greatly reduced cost.

39 
partners
164 FTEs

50 
million users
in 10,000 institutions

1083 
Petabytes
total traffic volume

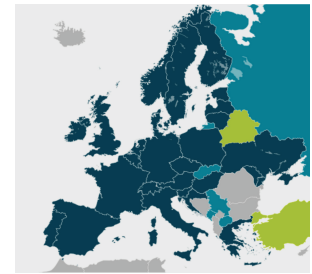
50% 
growth in global traffic

€3.2M 
cost savings achieved

Service development and delivery

GÉANT follows a Product Lifecycle Management process to ensure services are developed to user requirements and then transitioned to fully supported production services, within a portfolio covering networking, trust and identity, mobility, security and clouds. In GN4-1 significant progress was achieved in all service areas, particularly in cost optimisation of network services; growing use of trust and identity services; and development of cloud services.

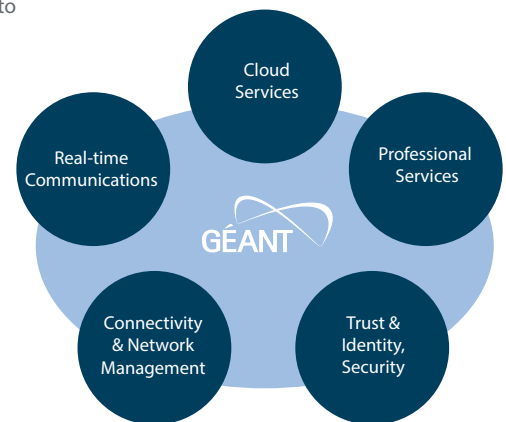
- **Growing cloud catalogue:** breakthrough agreements were negotiated with Amazon Web Services to waive data traffic charges for R&E users; and with Microsoft to connect cloud services directly to GÉANT via dedicated private ExpressRoute network connections.
- **Successful IaaS tender:** a pan-European tender for IaaS solutions was launched, establishing a potential €500M single digital market for the use of these services. The tender received strong interest from over 30 providers, with 36 NRENs involved in the tender to make the services available to their respective communities.
- **Clear service portfolio:** the service portfolio was consolidated into clear product families in line with an overall branding strategy to provide clarity to NRENs and end-users.
- **Development to production:** several services, such as Federation as a Service, were transitioned to production via three lifecycle stages – service transition, operation and continual improvement.
- **Growth in service usage:** use of key services such as eduroam and eduGAIN grew significantly during GN4-1. eduGAIN reached 38 of a possible 43 federations, whilst eduroam – marking its one billionth authentication during the project – grew by over 45%.
- **MD-VPN:** the PRACE project has adopted the Multi-Domain Virtual Private Network service to deliver future network connectivity.



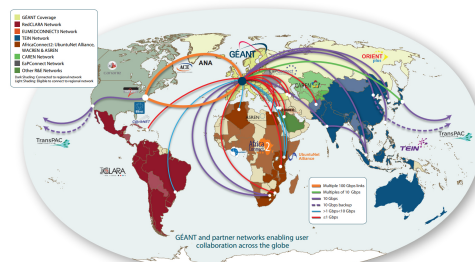
EDUGAIN EUROPEAN MEMBERSHIP STATUS



**1,000,000,000
AUTHORISATIONS**



OUTREACH TO THE GÉANT USER COMMUNITY



Working with NRENs, industry, e-infrastructures and users

By interconnecting Europe's NRENs and facilitating high-speed links with other global regions, GÉANT connects schools, universities and the world's largest research projects, helping deliver real societal benefit. This demands close collaboration with NRENs, large user projects, international networks and e-infrastructures. In GN4-1, several large user contracts were signed, and feedback from the annual survey showed further improvements in NREN satisfaction levels.

- **User satisfaction:** GÉANT's annual NREN survey showed 100% satisfaction with the performance of the GÉANT network, and near 100% satisfaction with positive interaction, responsiveness and knowledge.
- **Large users:** contracts were finalised with the European Space Agency to interconnect the Copernicus Earth Observation Centre's data centre with GÉANT (via DFN).
- **Collaborative user engagement:** a highly-successful user engagement workshop was held at the SC15 conference together with Internet2 and ESnet, with over 100 delegates from the project in attendance.
- **e-Infrastructure liaison:** an integrated approach to e-infrastructures was established with a clear focus on liaison with e-infrastructure partners to progress a joint service portfolio.
- **Closer links with industry:** GÉANT collaborated with technology partners Infinera and Corsa on joint announcements and events to illustrate the project's commitment to SDN technology.
- **Global relations:** GÉANT's global reach and relationships enabled significant contribution to the InfiniCortex project – a 'galaxy of supercomputers' formed by a worldwide network built on the InfiniBand networking communications standard known for high throughput and low latency.



SHOWCASING THE PROJECT AT MAJOR EVENTS

**GÉANT's annual
NREN survey showed
100%
satisfaction with
the performance
of the GÉANT
network**

To learn more about GN4-1 and its achievements visit www.geant.org/Projects/GEANT_Project_GN4-1