

GN 2

GÉANT 2 – RI

Summary: GÉANT2 is the successor network to the pan-European GÉANT network. It will provide researchers across Europe with a much enhanced service, focusing on performance and user support. It will employ a new 'hybrid architecture' encompassing optical transmission and switching technologies to cater for the different types of traffic that are an increasing feature of network usage as researchers exploit the exceptional performance that GÉANT has made available. The network itself is complemented by a targeted programme of research activities and publicity and dissemination.

Objectives: The project's overall objectives are:

- to plan, build and operate a multi-gigabit pan-European backbone research network interconnecting Europe's national research and education networks (NRENs), over which a suite of advanced services will be offered to meet the increasingly demanding requirements of Europe's research and education community;
- to conduct joint research into the development of networking technologies and services, with the primary aim of developing ideas from concept to production service to directly serve the users of GÉANT2 and its connected NRENs;
- to support effectively and directly projects and users who have advanced networking requirements;
- to pursue initiatives targeted at closing the 'digital divide', through both in-depth analysis of the picture of research networking in developing areas and the provision of direct support;
- to examine the future of research networking, exploring the case for sustaining research and education networking beyond the conclusion of the project.

Action plan: New technology to be implemented in GÉANT2 will provide an enhanced portfolio of networking services across Europe. In particular, it will offer the new and ground-breaking ability to configure high-performance 'point-to-point' service connections in such a way that collaborating research projects will be able to have what appears to them to be their own dedicated connectivity, whilst taking advantage of the economies of scale and secure management environment of GÉANT2.

In addition, the GÉANT2 project will develop and implement much improved user support to ensure that the performance and service quality, available to users, is meeting their increasingly demanding requirements.

With the increasing integration of network connectivity and computing (e.g. grids), it is often difficult to determine where performance problems occur. A particular element of GÉANT2 is the Performance Enhancement Response Team, which, together with widely deployed network performance monitoring technology, will ensure that network performance, rather than just the networking connectivity, is the main objective of pan-European networking.

User communities: GÉANT2 connects 30 European national research

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CYNET	CY
DFN-Verein	DE
EENet	EE
FCCN	PT
GARR	IT
GRNET	EL
HEAnet	IE
NIIFI	HU
ISTF	BG

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and education networks (NRENs) which serve 34 countries. The NRENs connect research and educational institutions within their respective countries. Thus, more than three million end-users in over 3 500 institutions will be connected via GÉANT2 and the NRENs, having access to state-of-the-art networking facilities despite the very wide disparities in the cost and availability of networking infrastructure across Europe. With over three million users, the applications of the network are almost limitless. Any type of research can make use of the facilities that GÉANT2 offers. These may be projects with high bandwidth demands or less demanding users keen to make use of GÉANT2's geographical reach.

International aspects: In a global context, GÉANT2 will build upon the existing links with similar networks in other world regions. Good connectivity already exists with North and Latin America, the Balkans, the Mediterranean, South Africa and with parts of Asia, most notably Japan and Korea. Russia is a partner in GÉANT2 and thus is fully inter-connected with it.

It is intended to enhance these connections by seeking to develop common service capabilities along the lines of the service portfolio developed in GÉANT2. Additionally, connections will be provided to develop the global connectivity available between European researchers and researchers in other world regions. Where possible, this will be provided on a regional basis to maximise efficiency and performance.

Joint research activities: GÉANT2 is not just about the deployment of state-of-the-art networking technology. There is also a major effort devoted to new developments in telecommunications services. With this objective in mind, the GÉANT2 project has five areas of research that will be further reviewed and extended as the project matures. These are described below.

(1) *Bandwidth on demand* Currently, researchers requiring dedicated connectivity can only be serviced via special engineering. The objective of the bandwidth on demand activity is to develop technologies whereby large network capacities can be directly provided between European researchers as and when they are required. It represents a major step forward in terms of Internet technology.

(2) *Advanced measurement technologies* Network performance becomes increasingly crucial as new applications are implemented which demand a high-performance and predictable service for their networking needs. The network performance activity will deploy measurement devices, not just across GÉANT2 but also across national research networks and university campuses. This way, network operators and users can observe network performance by themselves. The advanced measurement activity will define useful metrics for network performance as well as control policies to authorise access to network measurements. In recognition of the global nature of the issues involved, there is active cooperation with researchers in similar fields outside Europe.

(3) *Security* Network security remains a continuous challenge. As network defences improve, our networks become more sophisticated. The security activity will examine major issues of network security in the context of GÉANT2. It will propose new defence mechanisms. It will also act as the basis of best practice in network security.

(4) *Network test bed* The network test bed will be implemented independently from the production network to enable testing to take place on experimental work without incurring disruptions to the normal production service.

(5) *Mobility* The success of personal mobility which GSM telephony has achieved is capable of being replicated in the context of computer users. The mobility activity aims to allow users of computing and networking resources to exploit them independently of the user's physical location. It addresses the issues of access control, authorisation, authentication and single sign-on.

Networking activities: GÉANT2 has been designed with a number of activities aimed at developing knowledge and awareness of research networking and providing a strategic networking agenda. These activities include, in addition to the general conference and dissemination activities, specific work programmes that will:

- (a) analyse and compare the activities of the different NREN's across Europe with the objective of producing an annual compendium that includes comparisons of specific areas of spend, performance, etc.;
- (b) coordinate and enhance the general research and development activities among NRENs, with a view to identifying new research areas within GÉANT2;
- (c) produce a new strategic blueprint to continue the work of the successful SERENATE study.

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 with other EC-
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