ORIENT

GÉANT2

GÉANT2 is an advanced pan-European backbone network that interconnects National Research and Education Networks (NRENs) across Europe. With an estimated 30 million research and education users in 34 countries across the continent connected via the NRENs, GÉANT2 offers unrivalled geographical coverage, high bandwidth, innovative hybrid networking technology and a range of user-focused services, making it the most advanced international network in the world. Together with the NRENs it connects, GÉANT2 has links totalling more than 50,000km in length and its extensive geographical reach interconnects networks in other world regions to enable global research collaboration. Europe's academics and researchers can exploit dedicated GÉANT2 point-to-point links, creating optical private networks that connect specific research centres.
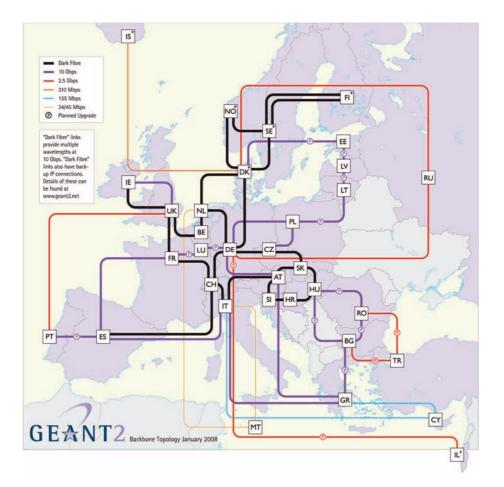

Legend:
- Dark Fibre
- 10 Gbps
- 2.5 Gbps
- 310 Mbps
- 155 Mbps
- 34/45 Mbps
- Planned Upgrade

"Dark Fibre" links provide multiple wavelengths at 10 Gbps. "Dark Fibre" links also have back-up IP connections. Details of these can be found at www.geant2.net
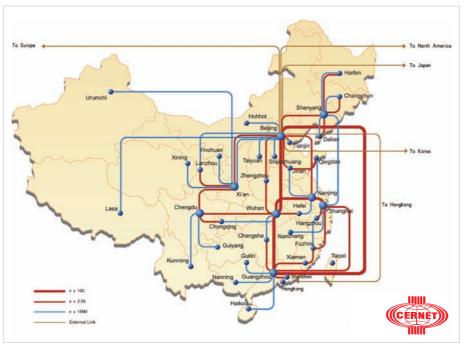
GÉANT2 Backbone Topology January 2008

CERNET

China Education and Research Network (CERNET), the nationwide academic network, is the largest non-profit network in China. It is funded by the Chinese Government, managed by the Ministry of Education (MOE), and constructed and operated by Tsinghua University.

Currently, CERNET has 10 regional centres, 38 provincial nodes, and the national centre is located at Tsinghua University. More than 2,000 research and education institutes connect to CERNET reaching an estimated 20 million end users.

CERNET was established in 1994 and was the first backbone research and education network in China. In 2007, the bandwidth of the CERNET backbone was between 2.5 Gbps and 10 Gbps, with regional bandwidth capacities of 155 Mbps and 2.5 Gbps reaching the 200+ cities distributed in 31 provinces in China. The bandwidth interconnecting CERNET with other global networks reaches capacities of 15 Gbps.

As an important national education and research infrastructure, CERNET supports many key national network applications, including on-line enrollment for university students, distance learning, digital libraries, GRID for education and research and makes an outstanding contribution to education information for China.

Legend:
- n x 10G
- n x 2.5G
- n x 155M
- External Link

ORIENT – Connecting Academic Networks in China and Europe

Opening Opportunities for Research and Education

www.dante.net/orient

Oriental Research Infrastructure to European Networks

COPENHAGEN

BEIJING

Overview

The ORIENT project, Connecting Academic Networks in China and Europe, provides for the first time a direct internet connection dedicated solely to the research and education communities of Europe and China. The project has procured and currently operates a high capacity data-communication link between the pan-European GÉANT2 backbone and the Chinese research and education network. Since the circuit became operational in early 2007, many Sino-European projects have benefited from this high quality infrastructure, including radio astronomy, high energy physics, grid computing and social sciences.

Achievements

The ORIENT project, working with the Asia-Pacific research and education network initiative TEIN2, has successfully procured a 2.5 Gbps link on the shortest-possible trans-Siberian route. This means that data sent via ORIENT reaches its destination around twice as quickly as that using a path via the United States. After a period of testing and optimisation, the circuit was brought into full production service in January 2007. Since then, ORIENT monitoring shows significant and increasing levels of data traffic – a positive sign that the circuit is being adopted by the research and education community.

Partners and Funding

The ORIENT project partners are six European National Research and Education Networks (NRENs) (JANET, UK; CESNET, Czech Republic; DFN, Germany; GARR, Italy; RENATER, France; GRNET, Greece), the Chinese NREN, CERNET, and DANTE, operator of the high bandwidth, pan-European GÉANT2 research network.

Project funding comes from the European Commission, the Ministry of Science and Technology of the People's Republic of China (MOST), the Ministry of Education of the People's Republic of China (MOE) and the 30 GÉANT2 NREN partners.

TEIN2

ORIENT is complemented by the TEIN2 project. TEIN2 (Trans-Eurasia Information Network) creates the first large-scale research and education backbone network for the Asia-Pacific region. By linking national research networks, it connects regional researchers with their counterparts in Europe via GÉANT2, the world's most advanced international research and education network, providing the Asia-Pacific countries with a gateway for global research collaboration. Initiated in 2004 and running until late 2008, TEIN2 is a key programme to improve research networking between Europe and Asia-Pacific, and is a key outcome of the Asia Europe Meeting (ASEM) process. A further programme, TEIN3, will continue and further develop this initiative to 2011.

> "ORIENT presents a unique opportunity for the Chinese academic community to engage in truly global collaborations"

Professor Jianping Wu, Director, CERNET

Who Can Benefit?

Research and Education networks are dedicated to the academic and not-for profit sectors. To use ORIENT you need to be connected to an NREN either in Europe or China. To find out more about these networks in your country, see the Useful Links Box on the right.

The number of users is growing all the time and ORIENT is enabling research collaborations which were previously impossible. A recent meeting of the Asia-Pacific Advanced Network (APAN) group saw a demonstration by the EXPReS project of radio telescopes being connected between Europe and China over the ORIENT circuit. The capacity of ORIENT allowed data to be transferred from China to Europe at the highest rate ever achieved.

Similarly, collaborations between the Institute of High Energy Physics (IHEP) in Beijing and its partners in Europe (INFN in Italy and IN2P3 in France) have seen the latency of the network path used by their data halved since the establishment of ORIENT.

Perhaps most importantly, the ORIENT project is helping to foster ever-closer ties between the two world regions, allowing scientists in Europe to collaborate with colleagues in China in much the same way as they would with researchers on their own continent.

Yet it will not just be scientists to benefit from the circuit. ORIENT will also support e-learning initiatives and thus have a positive impact on the wider population.

The ORIENT partners are continuing to work to facilitate the use of the link by appropriate projects and look forward to more user success stories over the project lifecycle.

User Focus: Global Collaborative eSocial Science

The INWA grid project bridges academia and the commercial world, demonstrating how a high-capacity network can meet the needs of global collaborative socio-economic science. Using grid technologies deployed over the ORIENT and TEIN2 infrastructures, and drawing on local market knowledge, researchers at EPCC (Edinburgh, Scotland), Curtin University of Technology (Perth, Western Australia) and the Chinese Academy of Sciences (Beijing, China) can analyse distributed market data and use the results to develop predictive models of consumer behaviour. The fusion of local know-how and global data gathered from commercial partners in global telecommunications and finance makes this grid-enabled application a powerful tool for understanding demand in highly volatile services-based markets.

In the past, data was routed through the USA and the research teams encountered considerable latency issues. Now the ORIENT and TEIN2 links allow data traffic to pass along the shortest possible network routes, significantly increasing the performance of this virtual collaboration.

ORIENT used in post-earthquake relief efforts

Following the catastrophic earthquake in Sichuan province in May 2008, researchers at the European Commission Joint Research Centre in Italy used the ORIENT circuit to transfer vital data to colleagues in China. The high-resolution satellite images of the stricken region have been used to identify the extent of the seismic impact and to aid post-disaster reconstruction.

DANTE GÉANT2 CERNET CESNET Renater DFN Deutsches Forschungsnetz grnet Consortium GARR ja.net