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Deliverable DS4.0.1: A Development Plan for Global Connectivity



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Abstract

This Deliverable describes the planned development of global connectivity associated with the implementation of the GEANT2 network and more precisely in the regions of North America, Latin America, Asia and Africa, as well as further extensions of international connectivity in Europe.

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0 Executive Summary

Now that the basic topology, service portfolio, and structure of the GÉANT2 network has been defined and implementation has started, it is appropriate to develop the associated global connectivity. The development focuses on three separate themes:-

- i. The capacity connecting Europe to other world regions. In general it is preferable to consolidate global connectivity to achieve the maximum economies of scale. Where organisational structures exist for the organisation of Research Networking in other world regions, these are the preferred interlocutors. In practice Europe is very effectively organised with the NREN consortium. The only direct equivalent is the CLARA organisation in Latin America. APAN performs a weaker, although useful role, in Asia/Pacific. Thus discussions are being held with the most representative bodies on the development of Global connectivity.
- ii. The service portfolio available. GÉANT2 is implementing a mixture of point-to-point services and IP services. It is intended that, where possible, these should be extended on a global basis. Likewise, common approaches to network monitoring and performance information will be important in providing enhanced support for users. It has to be recognised that the development of the service portfolio is dependant upon the availability of equivalent developments in other world regions. In particular, this is strongly related to the capacity available in those regions as well as the cost and availability of interconnecting capacity
- iii. The possibility of interconnecting testbed facilities for network and technology experimentation. The creation of a test-bed is a Joint Research Activity in GN2.

The proposed actions are described, on the basis of the world regions that they are seeking to address

1 North America

The current connectivity to North America consists of 3 * 2.5 Gbps circuits. The new tender has been defined which aims to acquire at least two 10 Gbps circuits between Europe and North America. The objective will be to maximise the physical diversity of the connectivity in a cost-effective manner. It is probable that the existing GÉANT PoP in New York will be maintained. There is the possibility of establishing a second PoP in North America which will be examined when the tender results are known. The intention will be to offer both point-to-point circuits as well as traditional IP services. It is possible that GÉANT2 switching equipment will be located in North America to assist in the provision of point-to-point services.

An encouraging development in respect if co-funding of trans-Atlantic connectivity has taken place in the last twelve months. The Internet2 organisation has ordered a 10 Gbps circuits to connect with GÉANT2 in London. The National Science Foundation, International Research Network Connectivity (IRNC) solicitation has resulted in an award for connectivity between the Abilene network and GÉANT. This will result in a further 10 Gbps link between New York and London.

All of the connectivity that is being procured is based on unprotected wave-lengths. A series of meetings has been held between DANTE and North American line operators, specifically Internet2, ESnet and Canarie to develop a mutual back-up scheme as well as closer operational integration of Network Operations.

The development of a much richer service portfolio, in the context of GÉANT 2, including work being carried out by JRA's 1 and 3 mirrors equivalent activities in North America. Technical cooperation meetings are being held bi-annually between GÉANT engineers and their North American opposite numbers. This is resulting in a much closer alignment of technical developments. In addition, as noted above there is active co-operation with Internet 2 to establish a link. This will connect with their Hybrid optical Packet (HOPI) testbed and can be used for global test-bed activities.

2 Latin America

The main focus of global connectivity in respect of Latin America is the ALICE initiative. ALICE has provided a 622 Mbps connectivity between the Latin American networks connected to the CLARA network and GÉANT. This initiative has resulted in significant improvement in connectivity between Europe and Latin America as well as a catalyst of the creation of an open Latin American research network. There are no short term plans to increase the Latin-America – Europe connectivity. The capacities are not currently sufficiently big within Latin America to consider the issue of providing point-to-point services or testbed facilities. We will continue to cooperate with CLARA with the further development of connectivity in this region. An important factor that will influence future developments is the IRNC programme of the National Science Foundation which promises to significantly improve connectivity between North and South America.

3 Asia

The main connectivity between GÉANT and Asia to date is the 2.5 Gbps link with Japan. This is supplemented by a 155 Mbps link between Europe and Korea. In addition to these operational links the TEIN2 initiative is reaching a point where it will make a significant addition to connectivity between Asia Pacific and Europe.

Discussions are taking place with the Japanese about upgrading a Japan-Europe link to 10 Gbps and we have had further discussions with Korea about an upgrade to the link between Korea and Europe. In respect of the Japanese link, which is provided to the super SINET network in Japan, the possibility has been discussed of offering limited point-to-point services based on switched Gigabit Ethernet.

The issue of connectivity to China remains a major challenge. The NRENPC has agreed the co-funding of a direct China-Europe link as part of a project submission known as “Orient”. In addition the TEIN2 initiative will provide further Europe-Asia connectivity as well as contributing to the organisation of intra-regional research networking in Asia. It is anticipated that each of these initiatives will enable separate connections of at least 622 Mbps between the region and Europe. The precise end points of the connectivity is the subject of ongoing discussions with CERNET in China and the TEIN2 partners. It will only be used initially for Best Efforts IP services.

A separate initiative is the procurement of a direct connection between ERNET, the Indian research network, and GEANT. This has been under discussion for sometime. ERNET have finally agreed to co-fund the connection. Work will start shortly. The text of an initial invitation to tender has already been agreed with the Indians. It is likely that this will be a limited capacity connection (no more than 155 Mbps) between West India and Europe.

4 Further Extensions in Europe

In cooperation with PIONEER, the Polish research network, discussions have taken place with the research networks of Ukraine and Belarus in the context of developing links with these countries and GEANT.

Two of the former SEEREN circuits, those to Serbia and FYROM are being incorporated in GEANT. DANTE has taken responsibility for these contracts.

In addition, the SEEFIRE initiative is aimed at looking at fibre optics for NRENS which will provide further impetus for global expansion. The partners are AMREJ, BIHARNET, CESNET, DANTE, ISTF, INIMA, GRNET, MARNET, NIIF/HUNGARNET and RoEduNet, with TERENA as the co-ordinating partner.

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5 Africa

The only active initiative with respect to Africa is the Eumedconnect project. The Eumedconnect connectivity is effectively integrated into the GEANT network. Capacities are limited by the high price of connectivity within the region. It can be anticipated that there will be organic growth in access speeds but capacities will not be greater than 622Mbps in the next two years. We have co-operated with South Africa in the tunnelled connection from TENET to GEANT and have promised to provide further assistance to US efforts to improve connectivity with Sub Saharan Africa. In general the issue with Africa is the establishment of connectivity. In many countries NREN organisations are weak or non-existent. There is no short term scope for any advanced co-operation.