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Deliverable DS4.0.4: A Review of Policy Issues for the Development of Global Connectivity



Deliverable DS4.0.4

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Abstract

This deliverable sets out the “non-cost sharing” policy issues on global connectivity that have been developed in GÉANT2.

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0 Executive Summary

This deliverable reviews the development of policy concerning global connectivity during the lifetime of the GÉANT2 network. It considers the way technology and service development is influencing global policy of the GN2 consortium, and describes co-operative initiatives underway in the context of GÉANT2. It also looks at policy development from a geographic scope point of view, considering the questions of future membership of GÉANT as well as policy related to connectivity with Aid-supported Research Network Initiatives (such as ALICE). The development of policy with respect to IP transit traffic is also described.

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1 Introduction

There are a number of important themes relating to the development of global connectivity policy in the context of GÉANT2. While it is true that a policy within the GN2 footprint area is evolving, it is also true that other world regions are still developing their own technology platforms and approaches to service. The review of global policy is, therefore, very much a work in progress.

A major change has taken place in the approach of services that are available globally. In particular, the provision of “point-to-point” services, where circuits are dedicated to individual user groups, has meant a significant re-think in terms of the way services are provided.

This deliverable discusses these issues. Other important topics considered are the definition of the geographic scope of GÉANT2, a formalisation of policy regarding transit traffic and the policy that has been adopted regarding interconnection with networking initiatives funded from the European Commission aid budget. A separate deliverable (DS4.0.3: Review of Global Cost Sharing) deals with the issue of global cost sharing.

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2 Portfolio Development

Historically, the only service that has been available globally is a “Best Efforts” IP service. This remains the case for many locations, but the gradual development of hybrid networking is leading to a more complicated global service environment. Point-to-point services and the need to provide improved assistance in resolving performance problems have led to the need to enhance technical and operational co-operation. To deal with this, technical co-operation has been enhanced, particularly within North American research networks. A series of meetings have been held involving Canarie (Canada), ESNET and Internet2 (USA) and GÉANT2 technical experts. To date these have concentrated on three key areas of work:

- Performance Monitoring and Measurement, where it is planned to roll out a common PerfSONAR infrastructure capable of handling multi-domain monitoring in a supported environment.
- Implementation of point-to-point services between research networks in North America and Europe, where co-operation has focussed on the routine provision of Gigabit Ethernet connections between GÉANT2 connected NRENs and locations in the USA, which are connected to the US research and education networks.
- Bandwidth-on demand, where there has been co-operation between the development groups on both sides of the Atlantic in the area of control plane specification, design and implementation. The two main respective developments (JRA3 for GN2, DRAGON for I2) have agreed a set of specifications for the interoperability of their respective control planes based on XML. Also addressed is the exchange of topology and path-finding information, resource signalling and resource scheduling.

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3 Geographic Scope of GÉANT2

In considering the development of global policy, an important factor is whether a country might reasonably be considered to be within the geographic scope of GÉANT2 and therefore be a possible member of the consortium of NREs. Within the consortium, decisions are governed by the existing Consortium Agreement. For countries outside the consortium, connections are subject to bilateral agreements. This has important consequences in respect of cost-sharing. NREs within GÉANT2 share the total cost of the activity, according to a cost-sharing algorithm related to the international cost of connectivity to a country and the capacity provided to that country. NREs outside the geographic scope are not subject to these rules. A separate deliverable (DS4.0.3: Review of Global Cost Sharing) deals with the issue of global cost sharing.

In general, NREs in countries wishing to become part of the GÉANT2 footprint can be included in the cost-sharing algorithm. This implies that all costs associated with connecting an NREN in a new country (mainly circuit costs) are regarded as part of the total cost of GÉANT, and the share of cost that such NREN would pay is determined by the cost sharing algorithm. Alternatively an NREN from a new country can pay its own access circuit costs and make some contribution to the overall costs of GÉANT2. The factors implied by these different approaches have to be analysed on a case by case basis as there is no clear pattern.

In general, NREs in countries adjacent to the GÉANT2 footprint will have far less competitive telecommunications market places. This implies that the cost of international connections will be expensive, and will probably imply low capacity infrastructure. It is likely that adding NREs from countries with uncompetitive international telecommunications markets in the GÉANT2 cost-sharing algorithm will lead to an increase in subscriptions among the current set of GÉANT2 members.

The policy that has operated for several years is that the issues surrounding an NREN from each country applying to join the GÉANT2 footprint are considered individually. This is in line with the consortium agreement among the members of the GÉANT2 project. In the period of GÉANT2 this has led to agreement to connect the Ukrainian NREN to GÉANT2, but on the basis that they fund the cost of connection.

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4 GÉANT2 Definition of Transit and IP Transit Traffic

In the context of GÉANT2, transit is defined as traffic that starts and terminates outside the geographic footprint of GÉANT2 having made use of GÉANT2 resources in the process. It is assumed that this traffic is Research and Education traffic. This simple definition is based on the assumption that the geographic scope of GÉANT2 is unambiguous. In reality, issues such as the status of EUMEDCONNECT NRENs in respect of GÉANT2, and possible geographic extension to new Eastern and Southern European NRENs, mean that this issue is not quite so simple. The NRENPC agreed, that from the point of view of routing policy that the EUMEDCONNECT NRENs and the SEEREN NRENs not currently members of the consortium but connected to GÉANT2 are within the geographic scope of GÉANT2. In practice, for nearly all of these NRENs, GÉANT2 is their only global research network access.

The matrix showing the principle interconnection with partners of GÉANT and the routes that they see is provided in Appendix A.

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5 Attitude of Connected Networks to Transit

Transit policy does not exist in isolation. Relevant to transit is the concept of “mutuality”, which is the policy among those networks with whom the GN2 consortium interconnects towards transit traffic. Some offer Geant2 transit (for example, ABILENE), and some do not. ERNET (the Indian NREN) specifically asked for transit to the USA but has no useful transit that they can offer to GÉANT2. A practical factor which affects policy in relation to allowing transit is whether it is something that is also of benefit to GÉANT2.

Another factor relating to transit is the volume of traffic involved. The GÉANT2 network’s internal capacity is based on multiple 10 Gbps for most of its footprint. Some inter-connected network organisations are interconnecting at low speed (for example, 155 Mbps or lower). The issues involved in providing transit to such networks, assuming they terminate at a well-connected point on the GÉANT2 network, do not materially affect the network. The only question that arises is whether transit traffic would be so dominant on a limited capacity connection that the connectivity to Europe would suffer. At higher speeds this argument is less easy to apply. If, for example, a 2.5 Gbps connection involved more than one Gbps of transit traffic, some real costs could be incurred when compared with GÉANT2 NREN subscriptions without any commensurate benefit to GÉANT2.

The other factor to be considered is the cost of the global links. This is really only relevant in the case of low capacity, high cost links. If they are 100% funded by the connecting party, as is the case with Ubuntunet (South Africa and surrounding region), the implications of transit traffic are not significant. In the case of India, where the link is co-funded, the Indian NREN specifically requested transit to Internet2 as part of the arrangement. Provided that there is no link congestion, and the transit traffic is not the dominant traffic flow, it has been decided that no quantitative restrictions on transit will be imposed.

Transit traffic raises a number of practical issues regarding traffic routing. It is generally an area that would benefit from greater inter-NOC co-operation. Transit can raise questions of the appropriateness of certain individual routes. A recent example was the request from Australia for transit to India via GÉANT2. This implies that intra-Asian traffic would travel from Australia to Frankfurt, between Frankfurt and Milan via GÉANT2, and then from Milan to India. The issue of transit traffic can be seen as an imperative to improve routing co-operation. Nevertheless, these examples need longer term planning and co-operation to resolve them, and routing issues per-se are not yet a primary influence on the policy issues relating to transit traffic.

The following policy principles have been decided by the NRENPC regarding transit traffic:

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1. The definition of GÉANT2 for transit purposes is restricted to NRENs that are part of the cost sharing, as well as EUMEDCONNECT NRENs and those other European NRENs currently receiving the GÉANT service.
2. For small capacity interconnections (e.g. Ubutunet) there should be no real restriction on transit. The only restriction that might be imposed is that the transit element should not create link congestion or be the dominant traffic flow. These qualitative tests are enough to enable the policy to be managed.
3. In larger capacity interconnections other issues need to be considered. If Europe has an interest in receiving transit from the connecting network, it is logical to agree to provide it on a reciprocal basis. It can again be managed on the basis that the transit element should not create link congestion or be the dominant traffic flow, but a more quantitative test is appropriate. A pragmatic agreed limit is that no more than 50% of the link capacity is transit traffic.

Where there is no mutuality of interest, transit can still be offered but practical limits shall be imposed on the levels of traffic so that it makes up no more than 20% of the total link capacity.

6 Aid Supported Research Network Initiatives

The EC has, via its aid budgets, provided significant financial support for the creation and development of regional networks (similar in concept to GÉANT2) in Latin America, South East Asia, South East Europe and the Southern Mediterranean region. The initiatives are characterised by having 80% EC funding and 20% funding from the beneficiaries. In the case of TEIN2, additional resources are promised by a number of non-beneficiaries within the region.

Each of these initiatives includes a connection between the regional initiative and GÉANT2. These connections are accepted without charge by GÉANT2. As the connections are shared by a number of beneficiaries they generally represent an efficient and cost-effective solution to global connectivity, exploiting the economies of scale in the pricing of the telecommunications community.

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7 Conclusions

A number of areas of global policy have developed in GÉANT2. In particular, a policy has been agreed regarding transit traffic. As the complexity of services implemented increases, the need to have a broader global consensus on technical and service developments has been recognised. Co-operation, initially with North American NRENs, has been developed to this end. Support for Aid-related activities has continued with connections established with SEEREN and TEIN2 initiatives.

All these policy developments serve one basic goal: to create a top-level global network environment for the research and education community in Europe and other world regions.

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8 References

None.

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9 Acronyms

None.

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Appendix A **Appendix A: GÉANT2 IPv4 Routing - 13** **February 2007**

See figure on following page.

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**GEANT2 IPv4
Routing (13th FEB
2007)**

Mar-07

Advertise to:	GÉANT2 NRENS	AARnet	Abilene	CANARIE	CLARA	ERnet	ESNET	EUMED	NLR	SINET	TEIN2	TENET
Receive routes from:												
GÉANT2 NRENS	0	X	X	X	X	X	X	X	X	X	X	X
AARnet	X	0				X						X
Abilene	X		0		X	X		X			X	X
CANARIE	X			0	X	X		X				X
CLARA	X		X	X	0		X	X		X		X
ERnet	X	X	X	X		0	X		X			
ESNET	X				X	X	0	X				X
EUMEDConnect	X		X	X	X		X	0	X	X	X	X
NLR	X					X		X	0		X	X
SINET	X				X			X		0		X
TEIN2	X		X					X	X		0	X
TENET	X	X	X	X	X		X	X	X	X	X	0

Notes:

1. Routes from NRENS are grouped under "GEANT2 NRENS"

2. List of TEIN2 countries

China Indonesia, Japan, Korea,
Malaysia, Philippines, Singapore,
Thailand, Vietnam, Australia

3. List of EUMEDCONNECT countries

Algeria, Cyprus, Egypt, Israel, Jordan,
Lebanon, Malta, Morocco, Palestinian
Authority, Syria, Tunisia, Turkey

4. ERNet = Indian NREN, AARNet, Australian NREN

5. TENET represents UbuntuNet, an alliance of African countries (Kenya, Malawi, Mozambique, Rwanda and South Africa). TENET is the South African Research and Education Network

6. SEEREN connects via GRNET and HUNGARNET

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