GÉANT2

Connect. Communicate. Collaborate

Optical Private Network (OPN) support of e-Science Projects: A GÉANT2/NREN Service Model

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A European R&E Networking Model

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- Interconnects **34 National Research & Education Networks-NRENs** of the extended European Research Area (ERA)
- Connects more than **3500 Research & Education Institutions**
- Serves millions of end-users + ***eScience* Projects** (e.g. Grids) under *Accepted Usage Policy* (AUP) rules
- The model: **A 3-tier Federal Architecture**, partially subsidized by National and EU Research & Education funds:
  - The Campus Network (LAN/MAN)
  - The NREN (MAN/WAN)
  - The Pan-European Interconnection: **TEN34 → TEN155 → GÉANT** (GN1 in FP5) → **GÉANT2** (GN2 in FP6): **Hybrid Optical Backbone (+ Cross Border Fibers)**

GN2 EC Subsidy < 10% of total European R&E Networking Cost

- **Governance:** NREN Policy Committee
- **Project Management:** GN2 Exec, DANTE

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The NREN PC

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Austria (ACOnet)	Nordic Countries – Denmark, Finland, Iceland, Norway, Sweden (NORDUNET)
Belgium (BELNET)	Poland (PSNC)
Bulgaria (ISTF)	Portugal (FCCN)
Croatia (CARNet)	Romania (RoEduNet)
Czech Republic (CESNET)	Russia (JSCC)
Cyprus (CYNET)	Slovakia (SANET)
Germany (DFN)	Slovenia (ARNES)
Estonia (EENet)	Spain (RedIRIS)
France (RENATER)	Switzerland (SWITCH)
Greece (GRNET)	Turkey (ULAKBIM)
Hungary (HUNGARNET)	United Kingdom (UKERNA)
Ireland (HEANet)	
Israel (IUCC)	PLUS NON-VOTING MEMBERS:
Italy (GARR)	Delivery of Advanced Network Technologies to Europe Ltd. (DANTE)
Latvia (LATNET)	Trans-European Research & Education Networking Association (TERENA)
Lithuania (LITNET)	
Luxembourg (RESTENA)	PERMANENT OBSERVERS: CERN, AMREJ, MARNET
Malta (UoM)	
Netherlands (SURFNET)	

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eIRG Recommendation on Hybrid Networking & GÉANT

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"The eIRG stresses the importance of flexibly configurable, reliable end-to-end optical provision to European researchers and eScience projects. This service should co-exist with routed IP connectivity and follow the three tier hierarchical European paradigm: Campus LAN, NREN and Pan-European GÉANT network"

Den Haag, 19/11/2004

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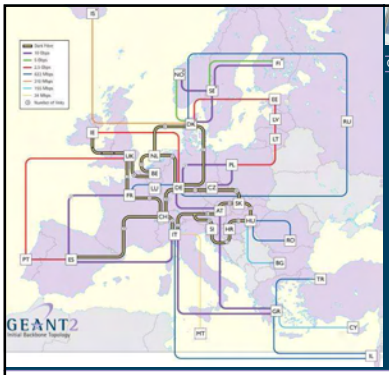

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GÉANT2 Topology

15+ NRENs interconnected within the Dark Fibre (DF) "cloud"

Rest, via leased "lambda" and SDH circuits

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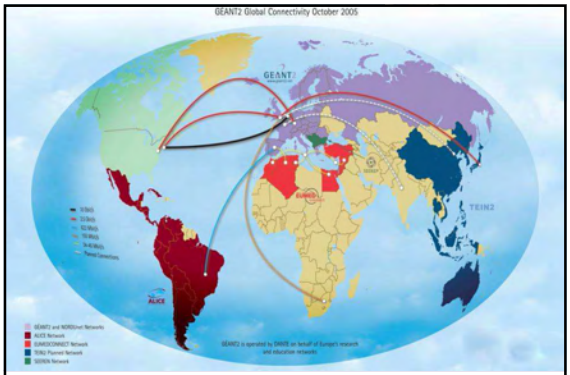

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GÉANT2 *eScience* Support: OPN Provision

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- e2e switched lightpaths (10 Gb/sec) provided to *eScience* (grid) end-users from GÉANT2 PoPs (local circuits provided by NRENs and Campuses)
- Optical Private Networks (OPNs) configured for large *eScience* projects using GÉANT2 facilities & NREN - campus lightpaths
- Cost sharing of e2e circuits: Marginal costing of DWDM GÉANT2 Dark Fibre, charged to projects via hosting NRENs
- Planning based on common understanding and "accurate" prediction of requirements (bandwidth, availability, delay, jitter …)
- Who, how and to what extend provisions, manages, monitors, charges, absorbs the costs, undertakes risks in a multi-domain network of Grid resources?

eVLBI, LHC T0 – T1, EGEE & DEISA OPNs pave the way & uncover hidden issues (technical & managerial)

LHC TIER*0* – TIER*1* Optical Private Network - OPN, scenario based on work by *Roberto Sabatino* DANTE

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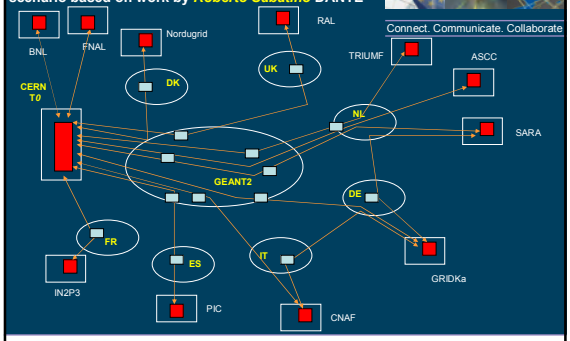

LHC Light - Wave Assignment on GÉANT2 Backbone

Hans Döbbeling, DANTE

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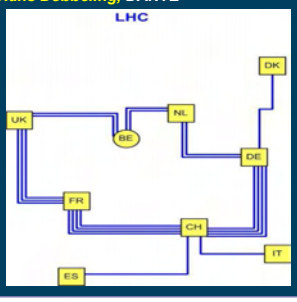
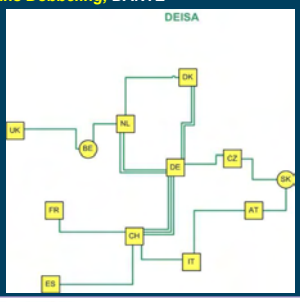


DEISA Light - Wave Assignment on GÉANT2 Backbone

Hans Döbbeling, DANTE

Connect. Communicate. Collaborate



LHC + DEISA Light - Wave Assignment on GÉANT2 Backbone

Hans Döbbeling, DANTE

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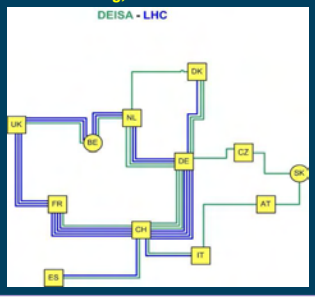

A view of the future: OPNs on GÉANT2 Backbone, *Hans Döbbeling,* DANTE

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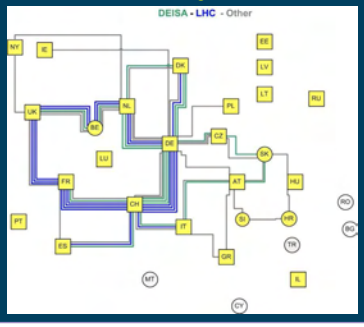

Why *eScience* projects should use GÉANT2 ?

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- GÉANT2 provides light-path ubiquitous connectivity within the Dark Fibre Cloud (DWDM footprint)
- + Global IP coverage (and progressing towards Global Hybrid networking)
- + Network management, resiliency and support. *eScience* Virtual Organisations obtain customized, production quality networking services via Optical Private Networks, beyond leasing p2p wave-lengths or dark fibre lines

LAST BUT NOT LEAST

- Affinity of Networking & Grid communities, sharing the same mission: Provision of leading-edge *eInfrastructures* for Research and advancement of HPCN technologies as European added value

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