Connect. Communicate. Collaborate

GÉANT2 & EGEE:
A strategic e-Infrastructures synergy for European Research

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National Technical University of Athens - NTUA

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, GN2 Exec, DANTE, TERENA

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The NREN PC

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Austria (ACOnet)
Belgium (BELNET)
Bulgaria (ISTF)
Croatia (CARNet)
Czech Republic (CESNET)
Cyprus (CYNET)
Germany (DFN)
Estonia (EENet)
France (RENATER)
Greece (GRNET)
Hungary (HUNGARNET)
Ireland (HEANet)
Israel (IUCC)
Italy (GARR)
Latvia (LATNET)
Lithuania (LITNET)
Luxembourg (RESTENA)
Malta (UoM)
Netherlands (SURFNET)

Nordic Countries – Denmark, Finland, Iceland, Norway, Sweden (NORDUNET)
Poland (PSNC)
Portugal (FCCN)
Romania (RoEduNet)
Russia (JSCC)
Slovakia (SANET)
Slovenia (ARNES)
Spain (RedIRIS)
Switzerland (SWITCH)
Turkey (ULAKBIM)
United Kingdom (UKERNA)

PLUS NON-VOTING MEMBERS:

Delivery of Advanced Network Technologies to Europe Ltd. (DANTE)

Trans-European Research & Education Networking Association (TERENA)

PERMANENT OBSERVERS: CERN, AMREJ, MARNET

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

Global Hybrid Networking & GÉANT2

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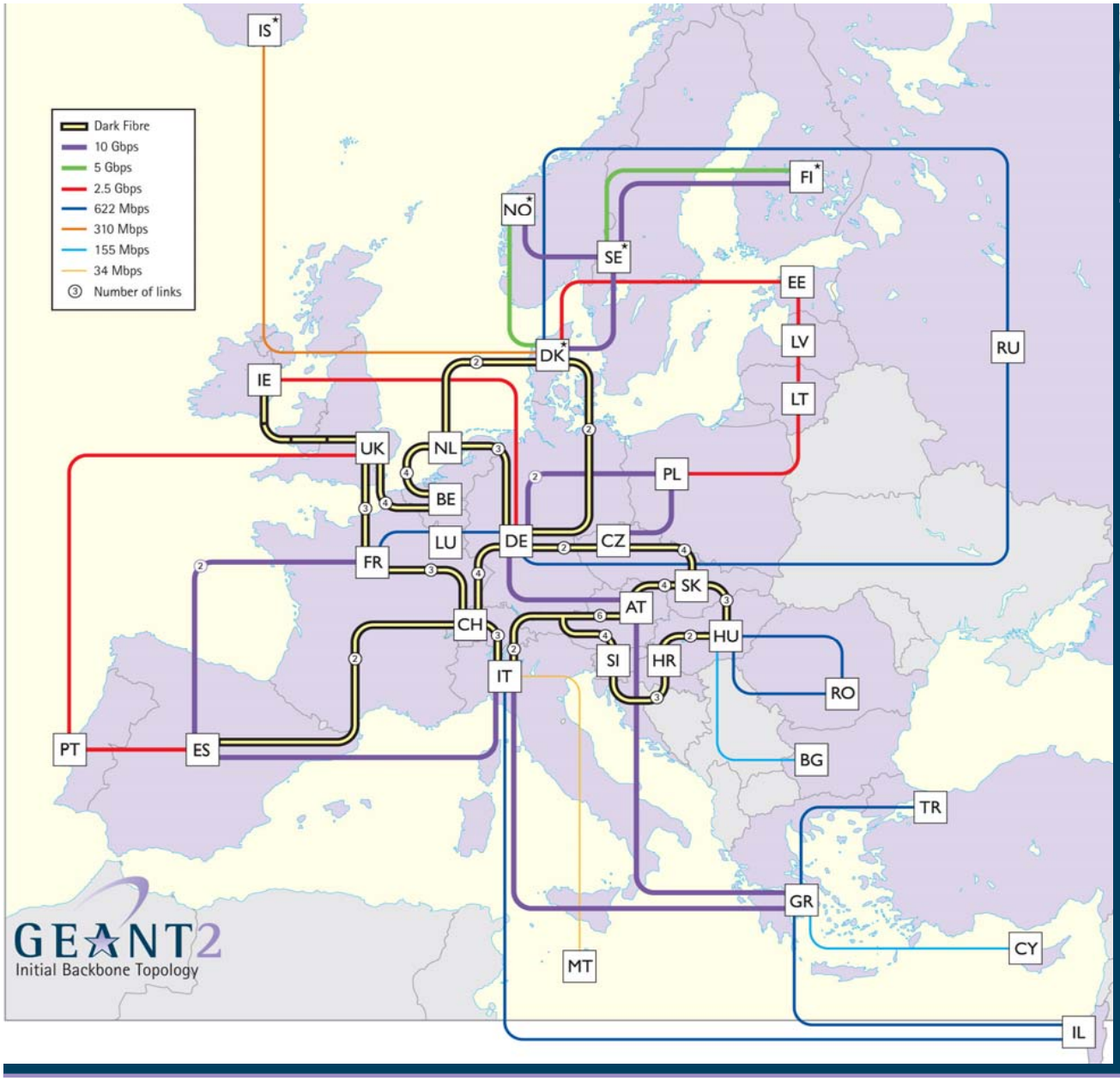
- The Internet enabled the ubiquitous global networked community based on IP services & the Web
- The Next Generation ***Hybrid Networks*** enable the global knowledge – based society by providing advanced collaborative platforms via hybrid IP - IPv6 routing & Light-path switching over Dark Fiber
- R&E HPCN and Grid requirements motivated the design and deployment of GÉANT2 as a ***hybrid, Dark-Fibre (DF) network***
- The NREN - Grid /HPC communities test – develop - tailor and deploy network-based services & collaborative applications: monitoring resources, SLA drafting and enforcing, security management, AAA, roaming of R&E users …
- GÉANT2 offers this new environment to European Researchers & Educators and paves the way for **global, ubiquitous advanced networking** services (cyber-services)



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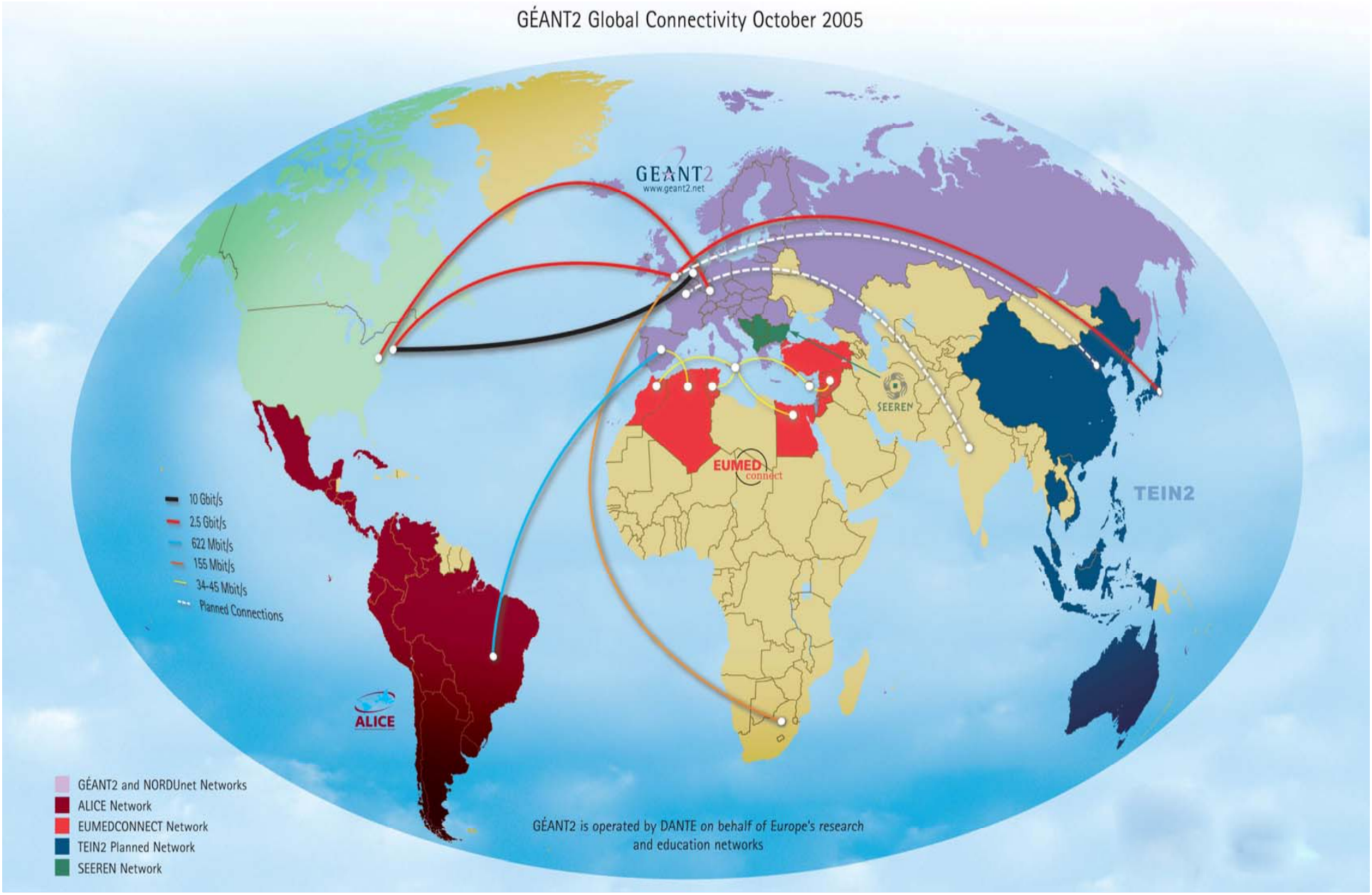
GÉANT2 Topology

GÉANT2

EGEE 4th Conference, Pisa, October 2005



GÉANT2

EGEE 4th Conference, Pisa, October 2005

Global Initiatives: EUMEDCONNECT

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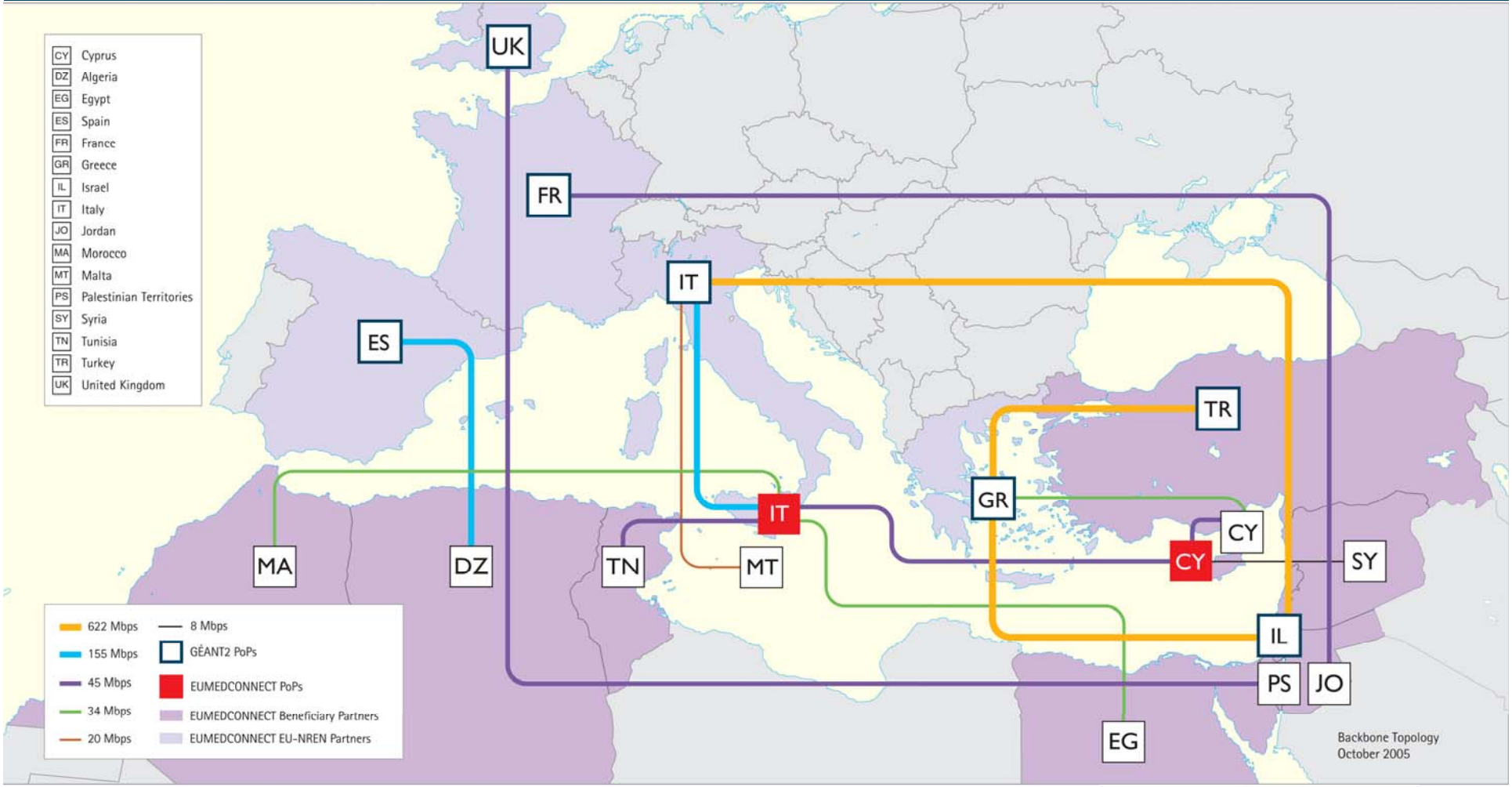

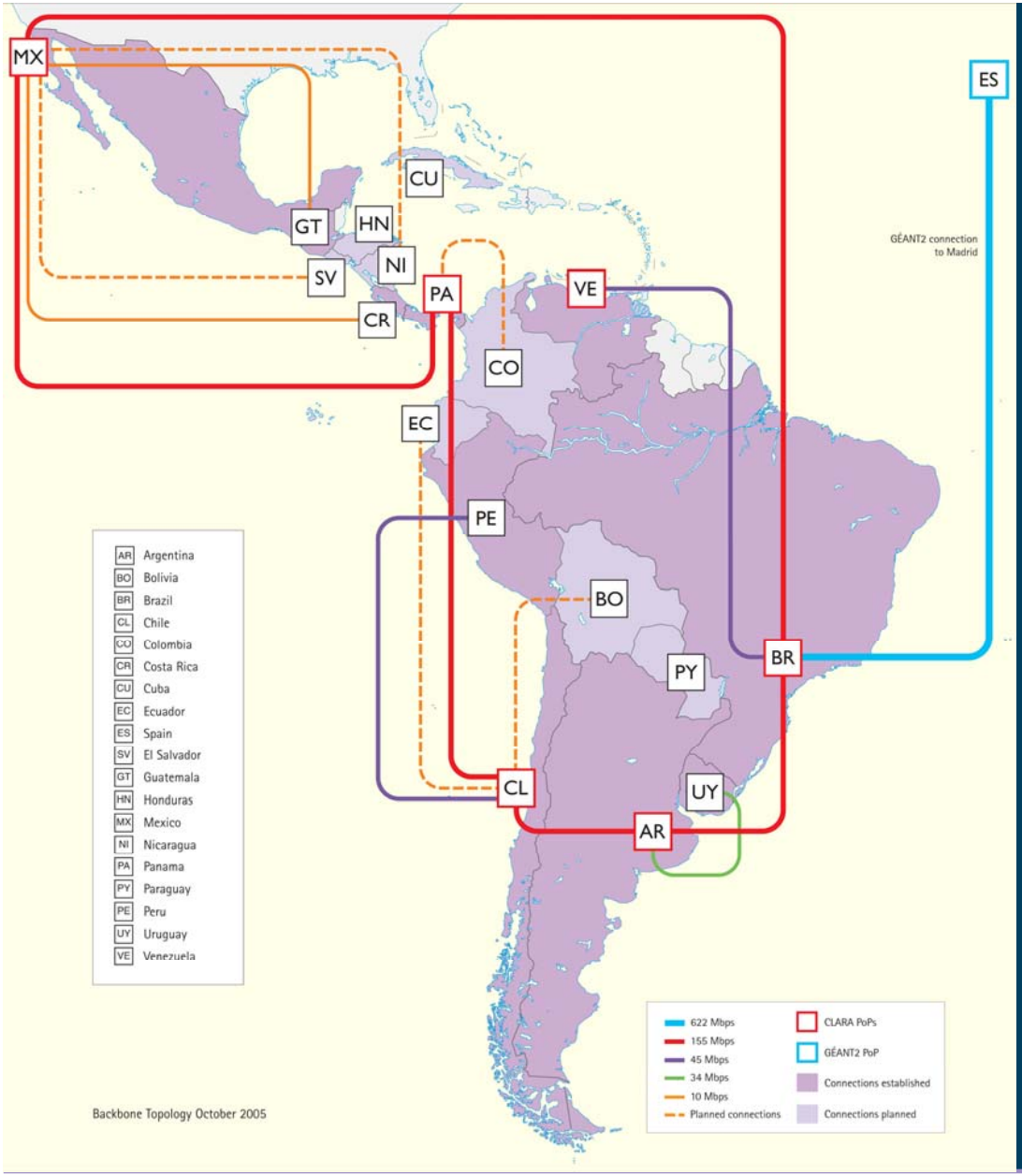

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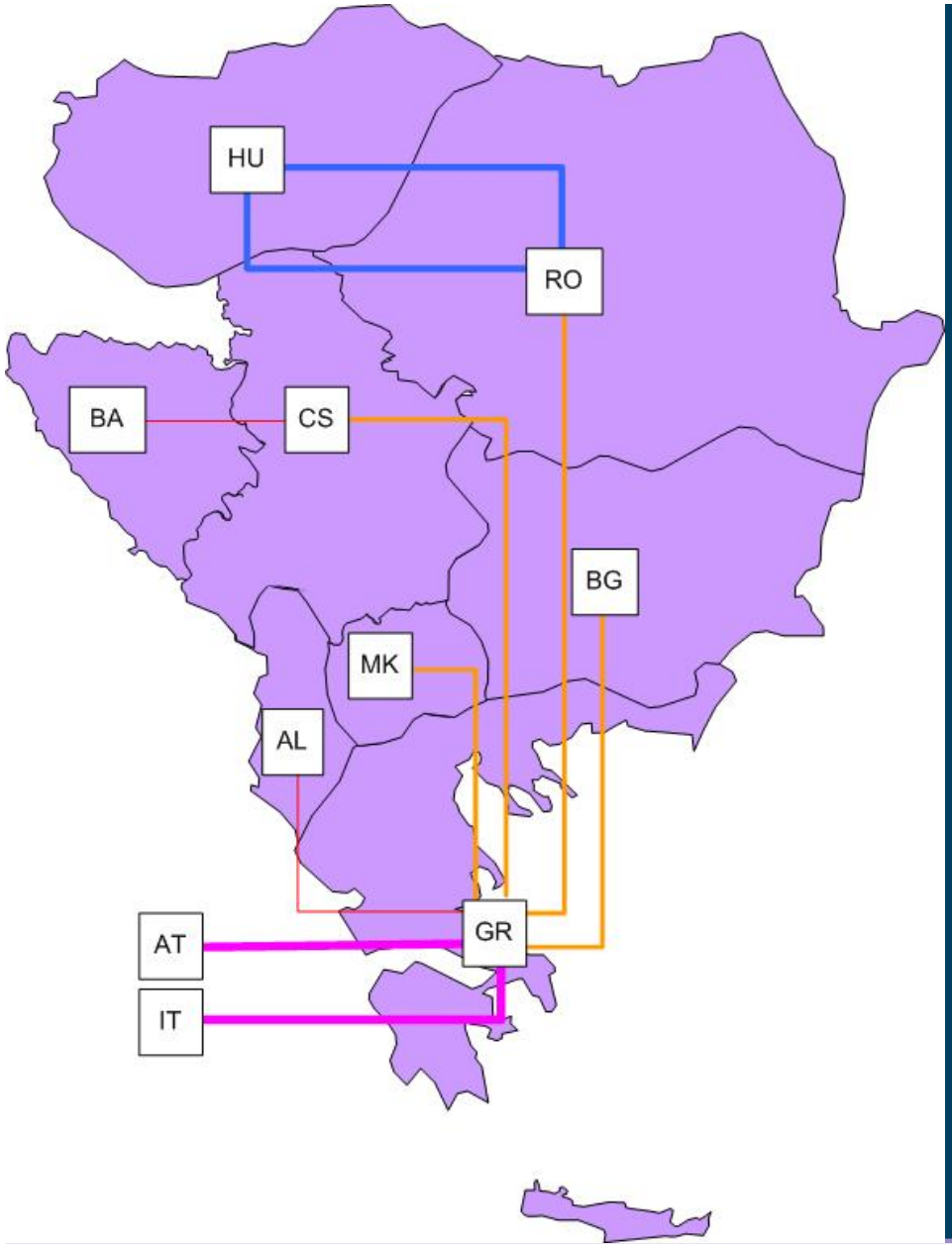
Global Collaborations:

CETRAL – SOUTH AMERICA

ALICE Topology October 2005



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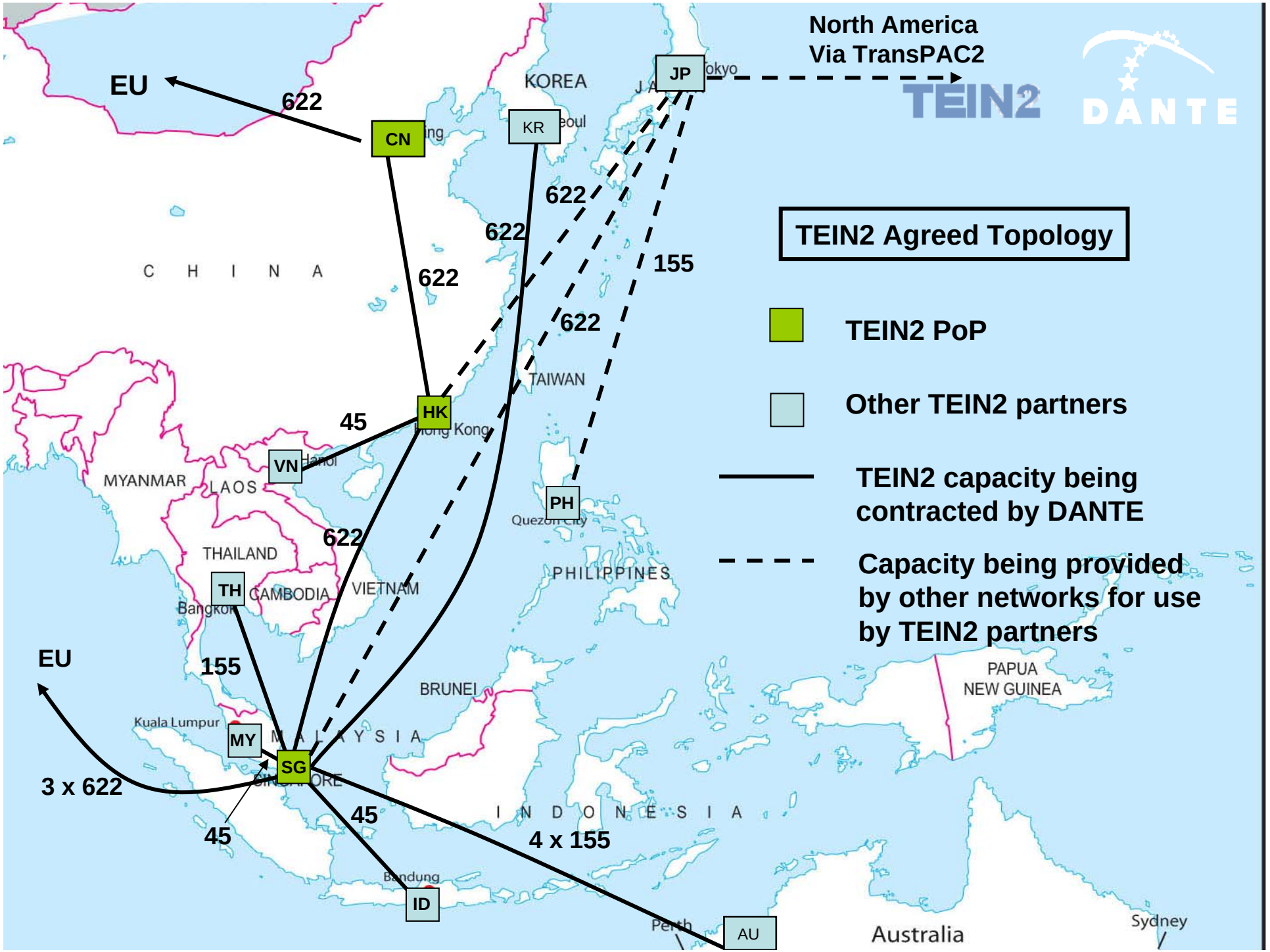
South – Eastern European Networking:

SEREEN1, a platform for SEEGRID

2 Mbps
34 Mbps
622 Mbps
10 Gbps


North America
Via TransPAC2
TEIN2
DANTE
EU
622
CN
KR
JP
KOREA
622
622
155
622
622
C H I N A
TEIN2 Agreed Topology
TEIN2 PoP
Other TEIN2 partners
TEIN2 capacity being contracted by DANTE
Capacity being provided by other networks for use by TEIN2 partners
TAIWAN
45
HK
Hong Kong
VN
MYANMAR
LAOS
PH
622
THAILAND
TH
CAMBODIA
VIETNAM
PHILIPPINES
EU
155
BRUNEI
PAPUA
NEW GUINEA
Kuala Lumpur
MY
SG
3 x 622
45
45
I N D O N E S I A
4 x 155
ID
AU
Australia
Sydney

Research *eInfrastructures* Implementation Blocks

(from "Roadmap for RI" presented by *M. Campolargo*, EC DG INFSO, Brussels May 2005)

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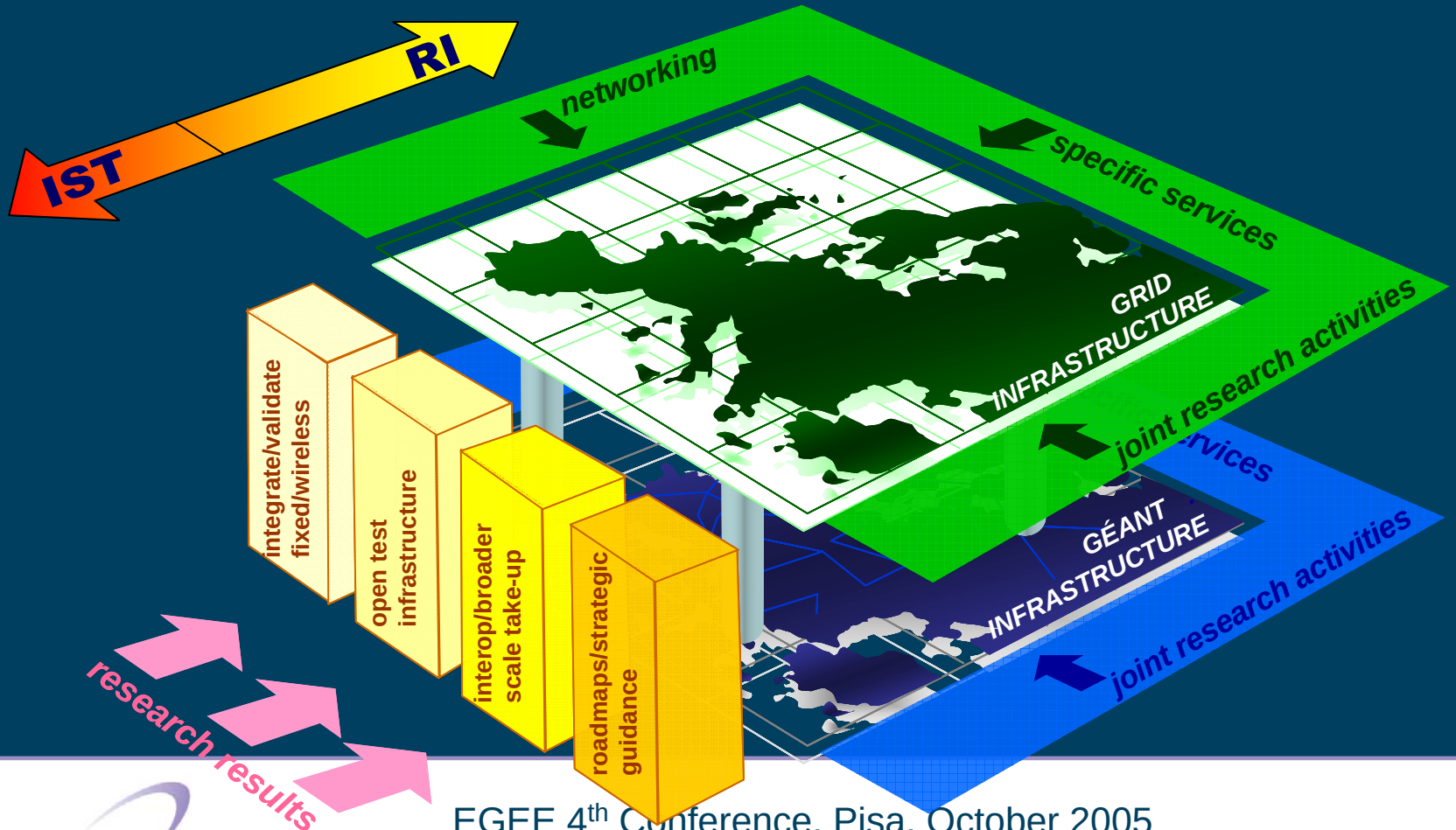

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GÉANT2 & EGEE Shared Objectives

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- Advance HPCN infrastructures in Europe by common collaborative activities on:
  - Provisioning of Premium IP and e2e L1 or L2 (switched) light-paths by GÉANT2, NRENs and Campus Networks to EGEE Resource Centers
  - Integration within Grid Middleware of network management and control plane functionality
  - Definition of complementary SLAs for network and Grid resource sharing
  - Deployment of multi-domain, multi-level monitoring, security, AAI
- Share cost – pricing - business model experience between NRENs + GÉANT and National Grid Initiatives + EGEE, DEISA, SEEGRID
- Plan network upgrades considering Grid requirements (including Global connectivity)

EGEE & GÉANT2 Challenges

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- Reaching the Grid end-users from GÉANT2 PoPs (local circuits provided by NRENs and Campuses)
- Integrating GÉANT2 facilities & Cross Border Fibers (CBFs) in Optical Private Networks (OPNs)
- Cost sharing of e2e circuits
- 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?
  - *The LHC T0 – T1 paradigm paves the way and uncovers 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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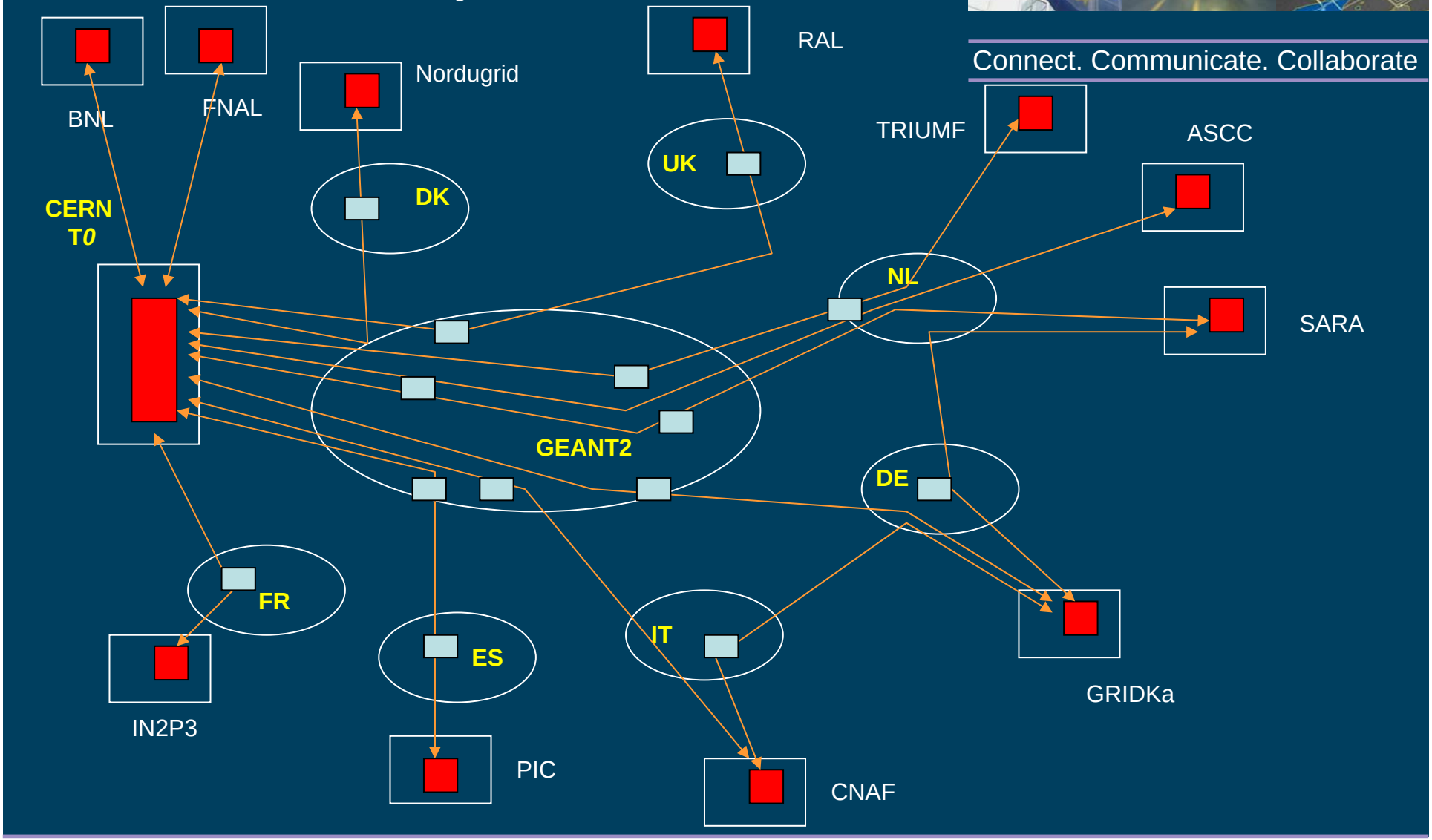

LHC Light - Wave Assignment on GÉANT2 Backbone

Hans Döbbeling, DANTE

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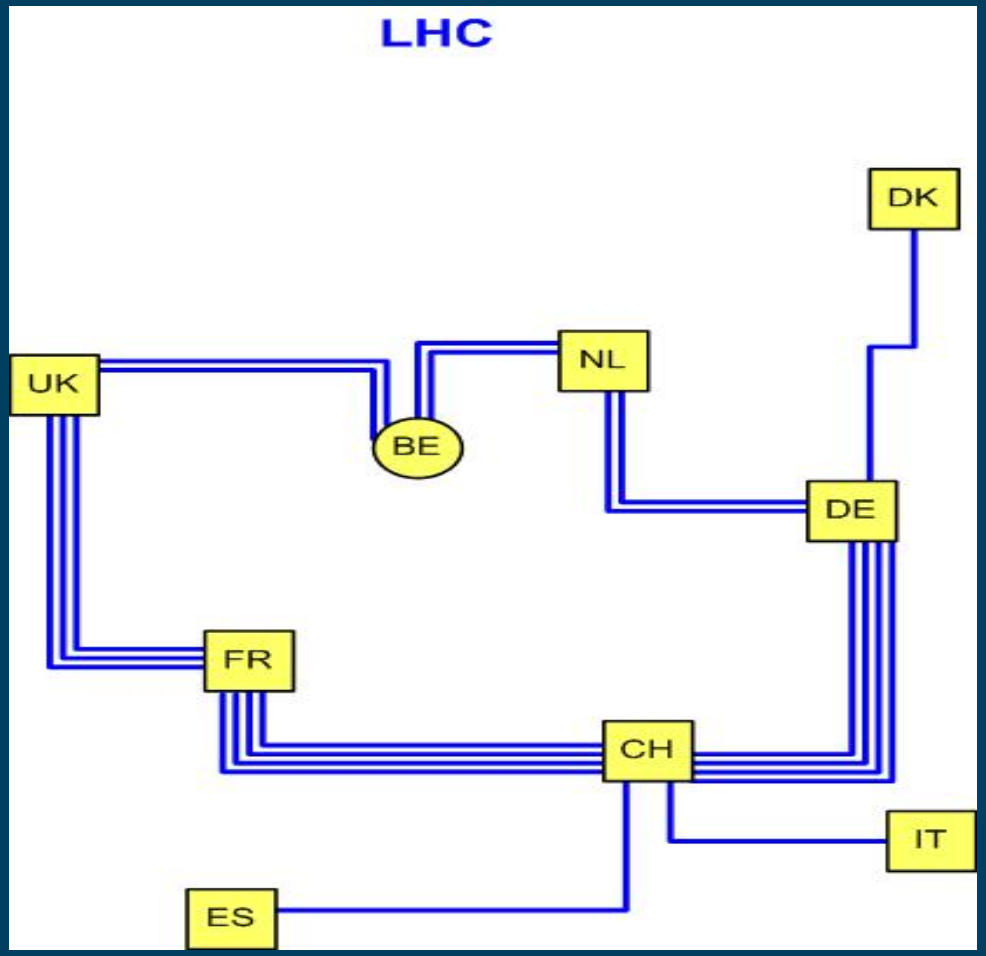

DEISA Light - Wave Assignment on GÉANT2 Backbone

Hans Döbbeling, DANTE

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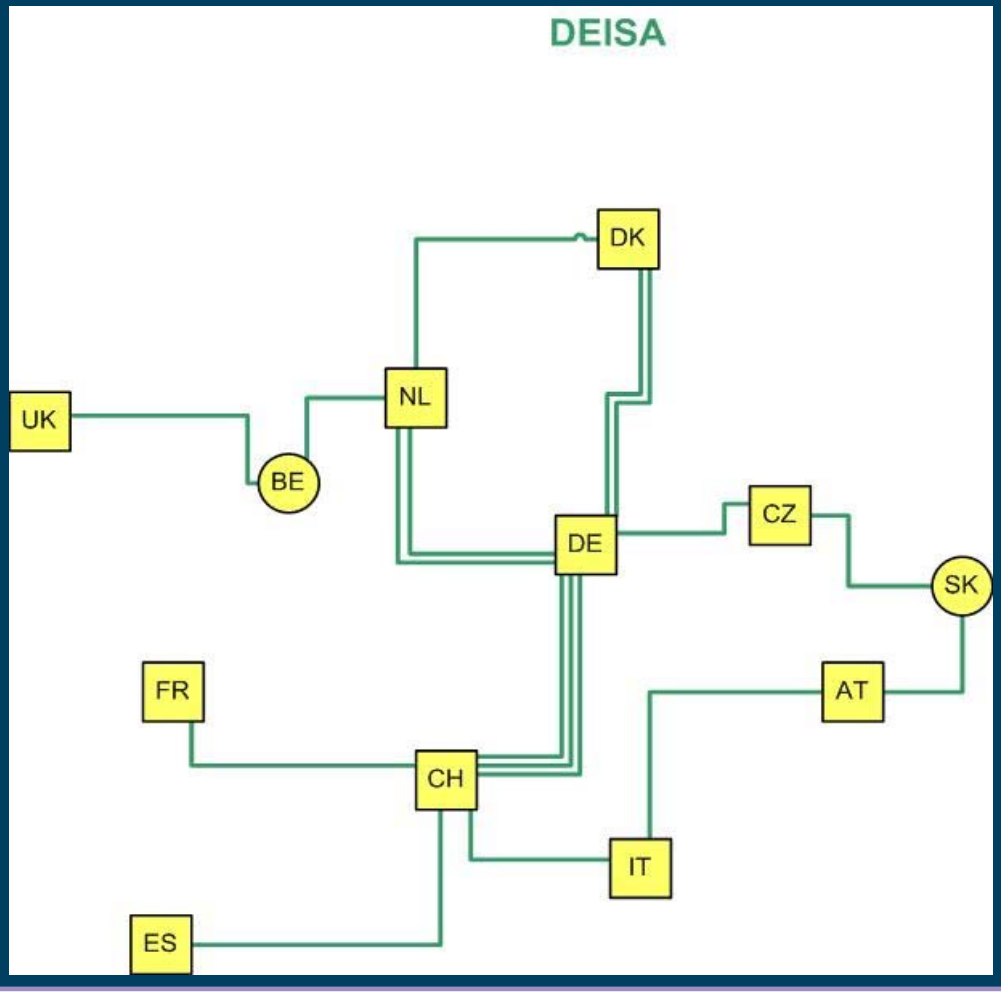

LHC + DEISA Light - Wave Assignment on GÉANT2 Backbone

Hans Döbbeling, DANTE

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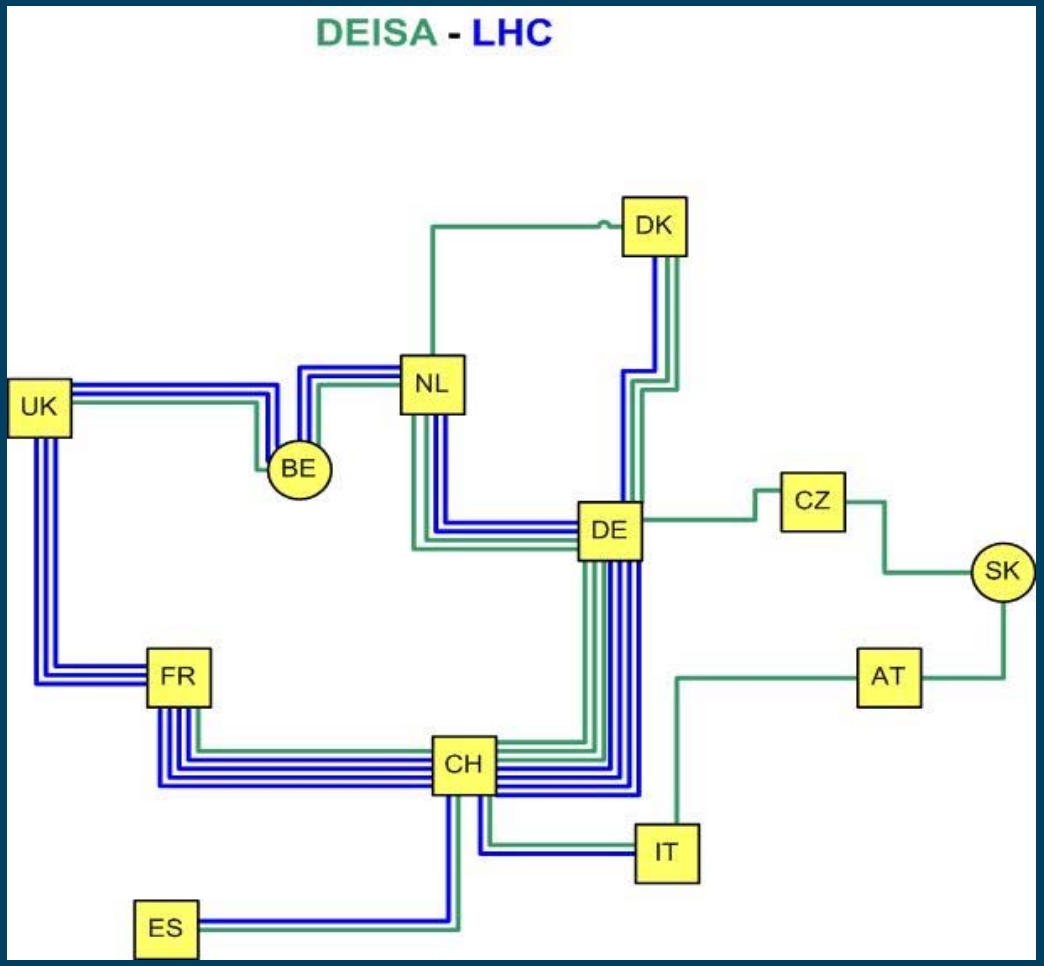

A view of the future: OPNs on GÉANT2 Backbone, *Hans Döbbeling,* DANTE

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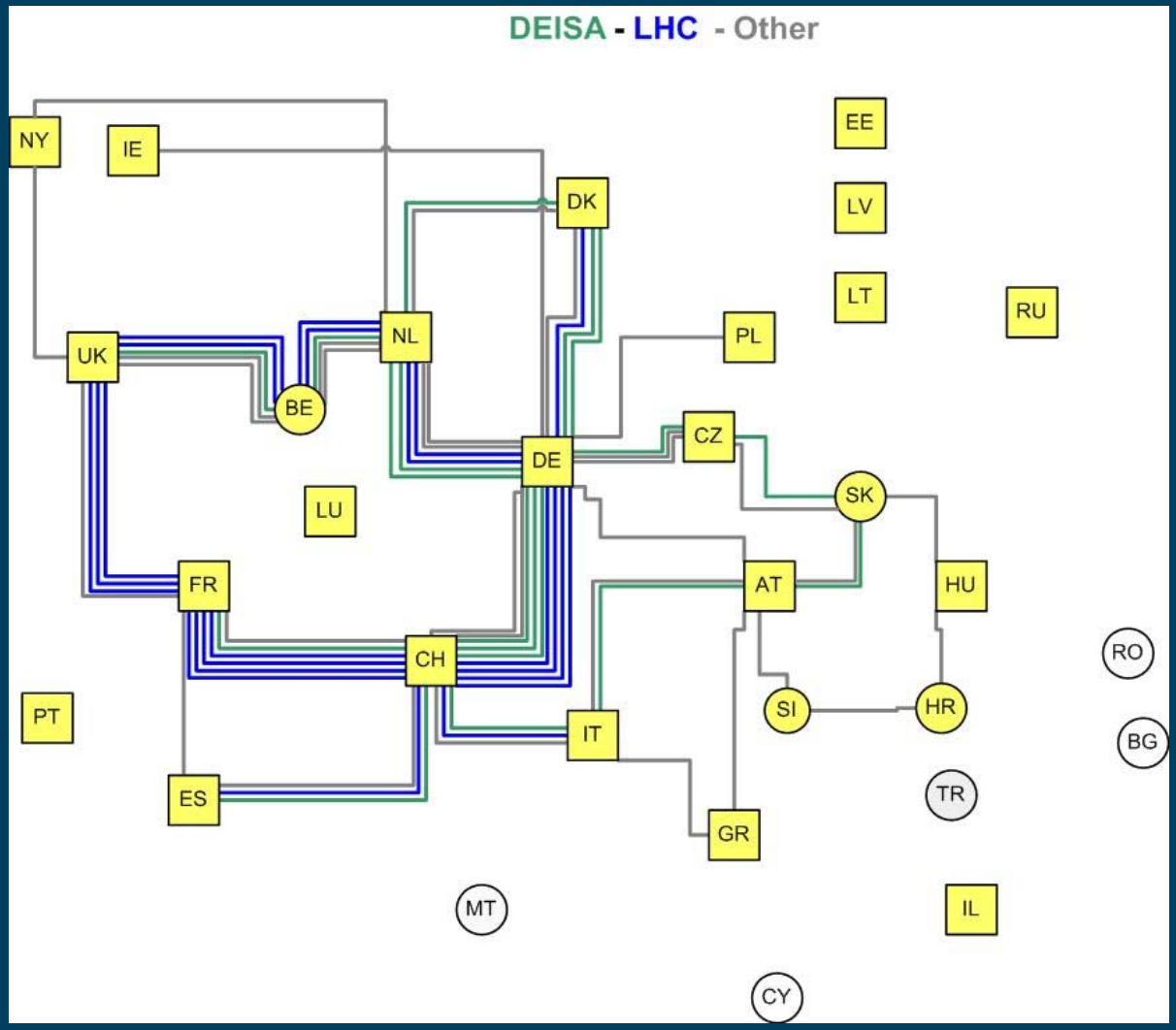

Why Grids (and EGEE) should use GÉANT2 ?

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- GÉANT2 provides light-path ubiquitous connectivity within the GÉANT2 Dark Fiber DWDM footprint
- + Global IP coverage (and progressing towards Global Hybrid networking)
- + Network management, resiliency and support. EGEE VOs obtain customized, production quality networking services via Optical Private Networks, beyond leasing p2p wave-lengths or dark fiber 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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