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# Deutsches Forschungsnetz





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# X-WiN - an Infrastructure for High Performance Applications

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Challenges of LOFAR

Jülich, 15 Dezember 2005

# Why Research Networks ?



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Science and Research have requirements for data communication, which are not met by the general (commercial) internet:

- high data rates

- high volume

- high percentage of international traffic

- other requirements ...

In all countries, National Research and Education Networks (NRENs) organise infrastructures for the science, research and education sector

# Organisational Structure (1)



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DFN (Deutsches Forschungsnetz = German Network for Research) is an association under German law  
Currently approx. 400 members (universities, polytechnicals, research labs, Max-Planck-Society, Fraunhofer Society, research labs from industry, government agencies, ...)

Main office in Berlin (organisation, planning, supervision, consultancy, finance, projects, administration, international contacts, ...)

# Organisational Structure (2)



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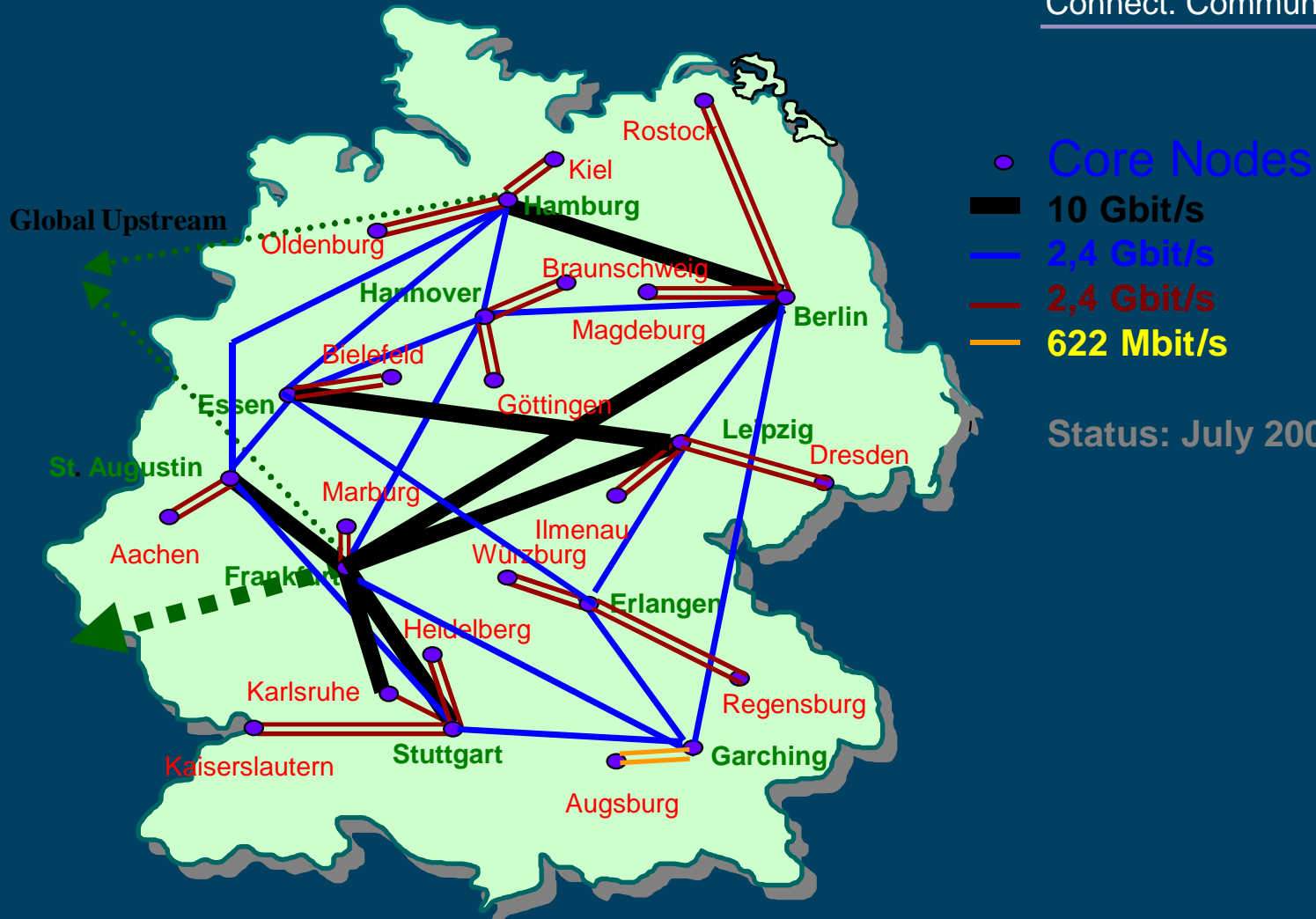
Network Operations and Services (DFN Video Conference Service) provided by DFN office in Stuttgart

Quality Control, test lab: at University of Erlangen  
Computer Emergency Response Team (CERT),  
Computer Security Consultation, Certification, Public  
Key Infrastructure (PKI), provided by DFN-CERT  
Services GmbH in Hamburg

# Current Network



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Status: July 2005

# Why a new network for DFN ?



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Contract with current operator (TSI, subsidiary of Deutsche Telekom) ends at the end of 2005  
Market situation has changed significantly  
(availability of dark fibre, lower prices)  
Requirements of users have changed a lot. In particular increased demand for  
    high capacities between relatively few sites  
    improved reliability and availability



# Objectives for new Network



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## Better Performance

- ✓ Improvement by factor of 4 (1 January 2006)
- ✓ Additional increase of performance expected

## Improved Flexibility

- ✓ No Volume Limitations (flat rate)
- ✓ Ethernet as additional access technology
- ✓ Hybride Nodes allow for VPNs

## Increased Availability and Reliability

- ✓ Availability was always in focus during Planning phase (network elements, topology)

# Main Objectives in Planning



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- Reduction of active network elements
  - less sources for problems
  - reduced configuration ("human factor")
  - more reserves for power and air condition
- Fault-tolerant active network elements
  - Duplication of important parts
  - Hot-swap (no interrupts for maintenance)
- Protection of network elements
  - Protection against damage
  - Fast restoration of service

# Introduction of P2P Services



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Between any of the X-WiN nodes P2P links can be implemented at relatively low cost.

Possible interfaces / framing:

- 1 GE
- STM-16
- STM-64
- 10 GE LANPHY

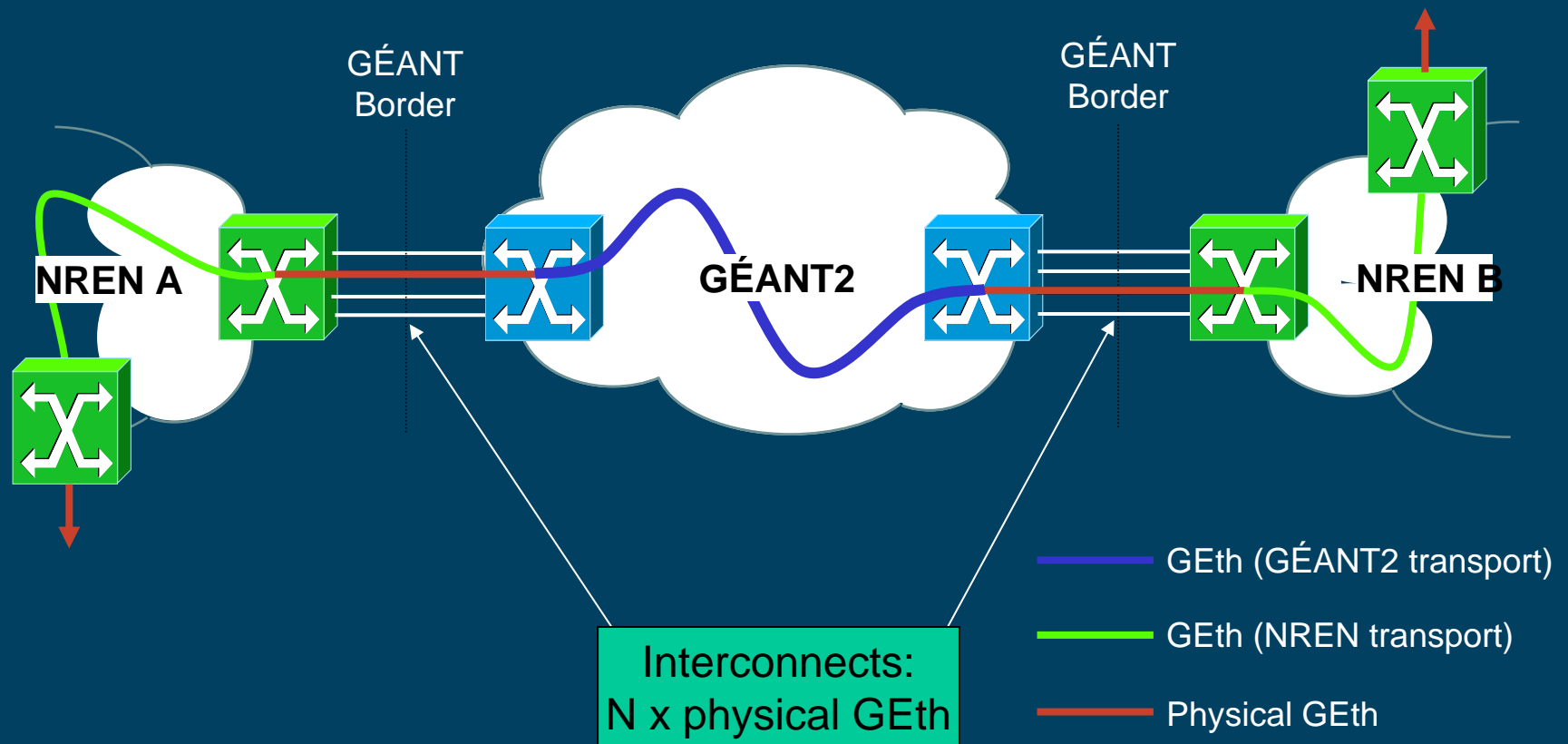
International P2P links are possible via GEANT2

# Technology Scenario: P2P GEth



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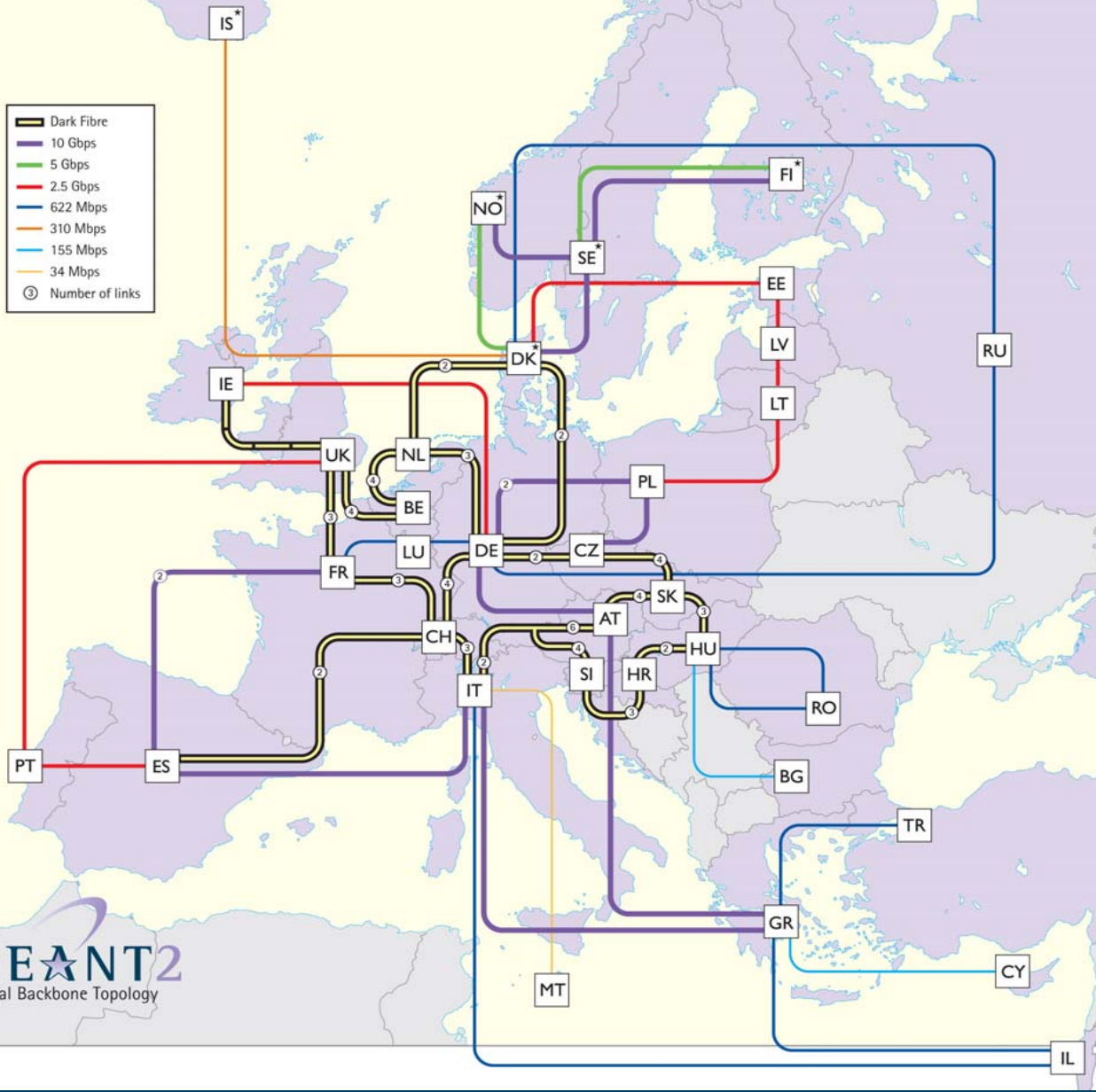
(GÉANT borders: physical GEth – physical GEth)





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- Dark Fibre
- 10 Gbps
- 5 Gbps
- 2.5 Gbps
- 622 Mbps
- 310 Mbps
- 155 Mbps
- 34 Mbps
- ③ Number of links



# GÉANT2 Topology

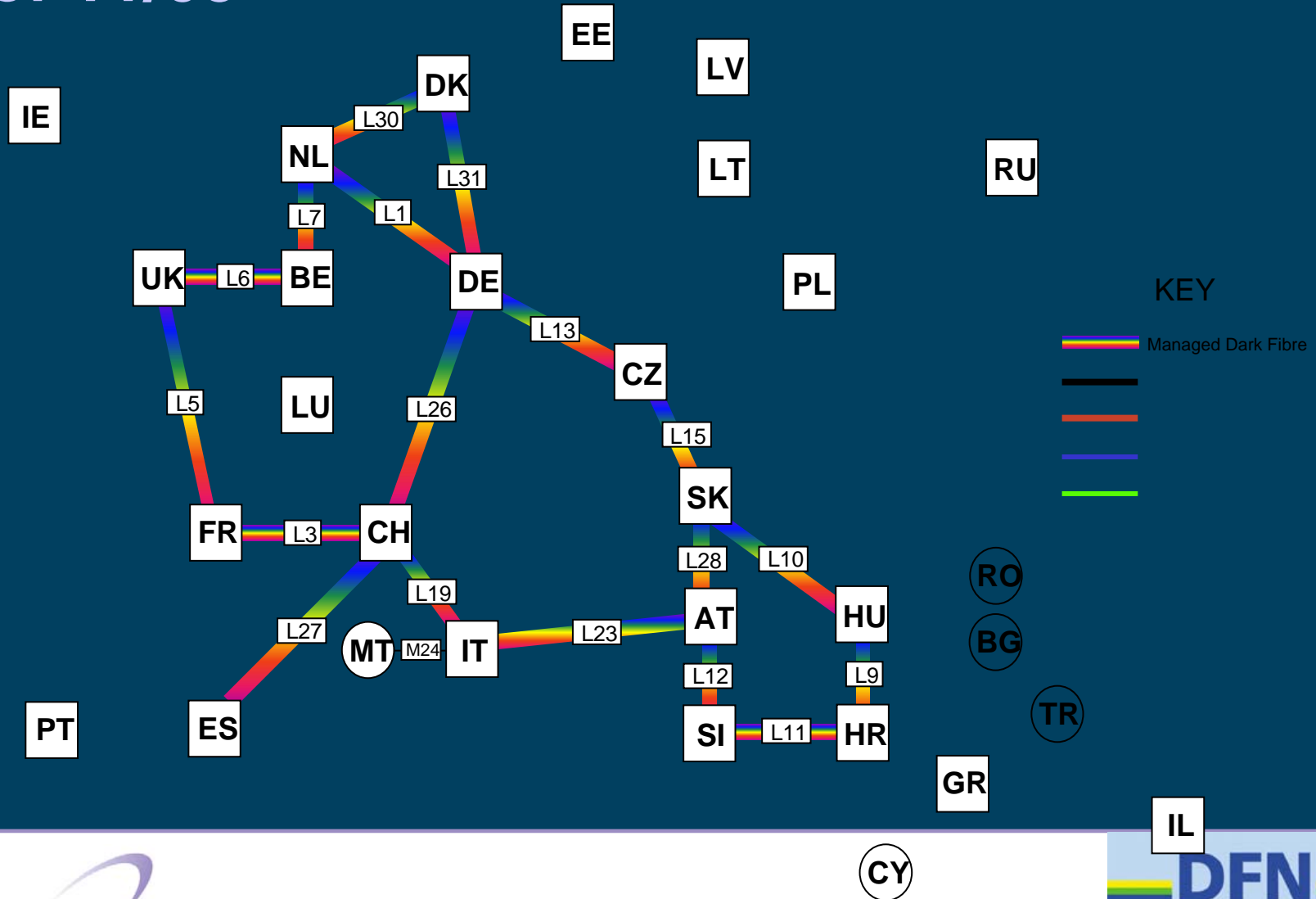
GEANT2  
Initial Backbone Topology



# Geant2- Fibre Footprint as of 11/05



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# Cross Border Fibre (CBF)



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- GEANT2 connectivity is complemented by direct dark fibre links between neighbouring countries (Cross Border Fibres = CBF)
- CBF can be used to increase resilience for P2P links.

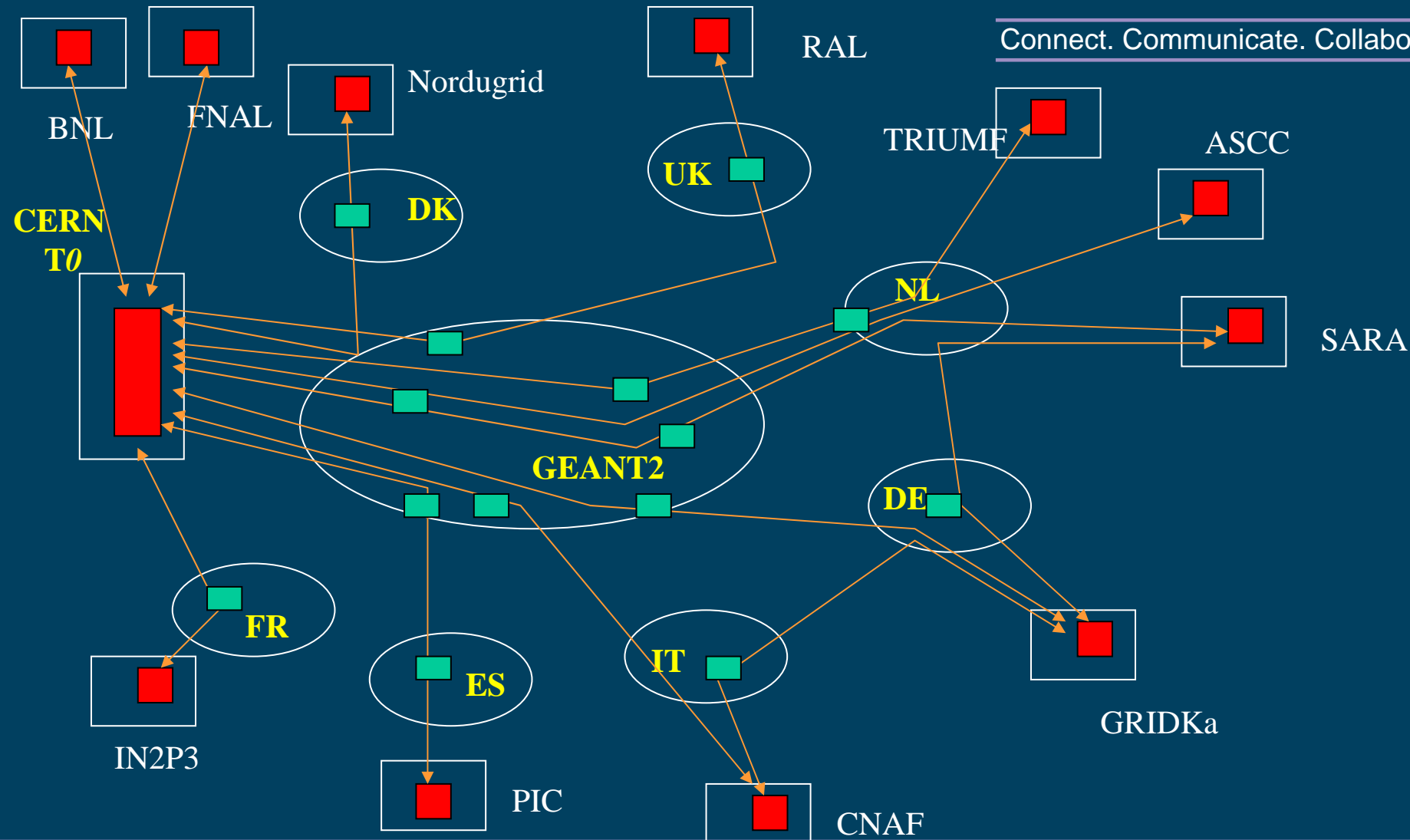


# LCG T0 – T1 Optical Private Network

source: *Roberto Sabatino* DANTE



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# Conclusion



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- X-WiN will provide a communications platform that can be easily adapted to the requirements of national and international research projects.
- Together with GEANT2 and the CBF concept requirements for high performance international connectivity can be satisfied at affordable price. Please consult your NREN of confidence ;-)

# Questions ...?



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