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# Renater dark fiber "project" architecture

## users feedback

Philippe d'Anfray September 12, 2006

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CCGSC-2006





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# Renater dark fiber "project" architecture

users...lack of feedback

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# RENATER

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RENATER is the French National Telecommunications network for Technology, Teaching and Research (a NREN...). Open to industry for non profit use.

RENATER is a "public interest group", members are:

- French ministry of education and research;
- leading research institutions CNRS, INRIA, CEA, CNES, INSERM,...;





# RENATER

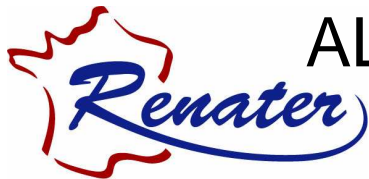
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Renater provides

- national (including overseas territories) and international connectivity at very high bandwidth;
- access to contents and services (e-learning, video conferencing, ...);

and also

- "internet services" (DNS, delivers IP addresses,...);
- international collaborations (DANTE, TERENA, ALICE, EUMEDCONNECT, TEIN).





# RENATER

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Renater is a "small" organization (less than 35 people) including:

A technical department:

- metrology, security, specific tech. (QoS), ...

R&D activities

- within GEANT 2 (protocols, IPV6, ...)
- **users support, Grid Coordination.**





# RENATER-4

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RENATER-4 architecture (deployed, end of 2005):

- 30 POPs in France, 7 overseas;
- 2,5Gbit/s mesh (leased lines);
- 837 establishments (1120 sites) connected through regional or metropolitan networks;
- interconnection with GEANT-2 (European NRENs, other research networks US, Japan, ... );
- SFINX (Global Internet Exchange point for ISPs).

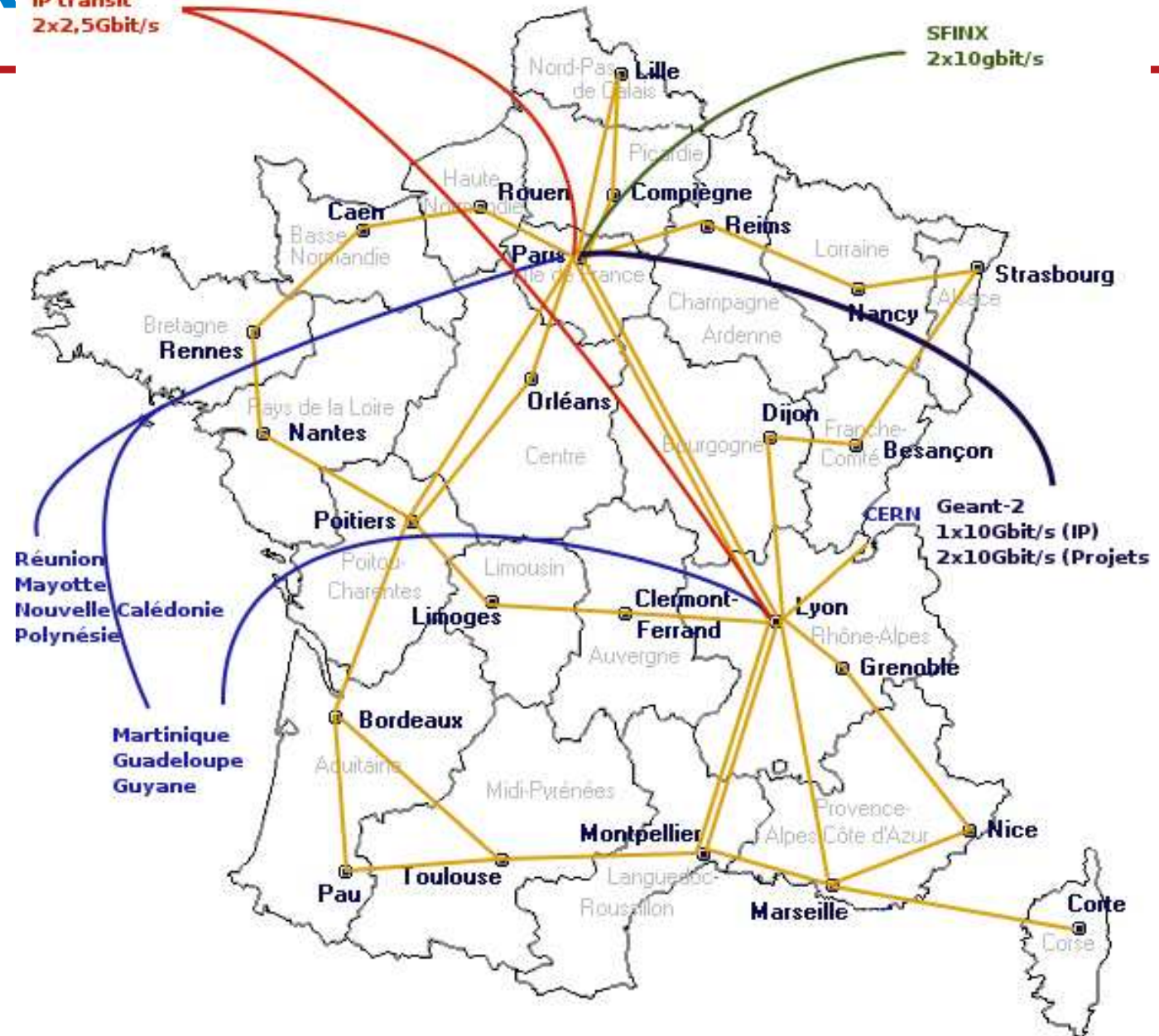




# RENATER

IP transit  
2x2,5Gbit/s

SFINX  
2x10gbit/s





# RENATER-4

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Paris area (île de France):

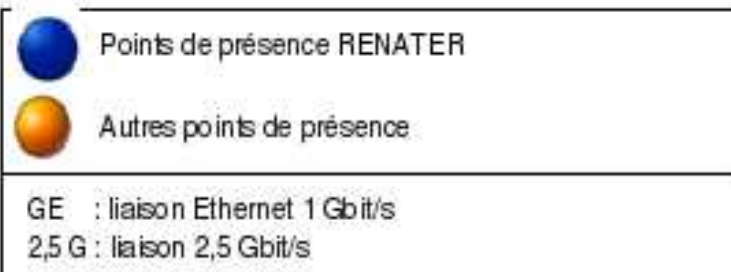
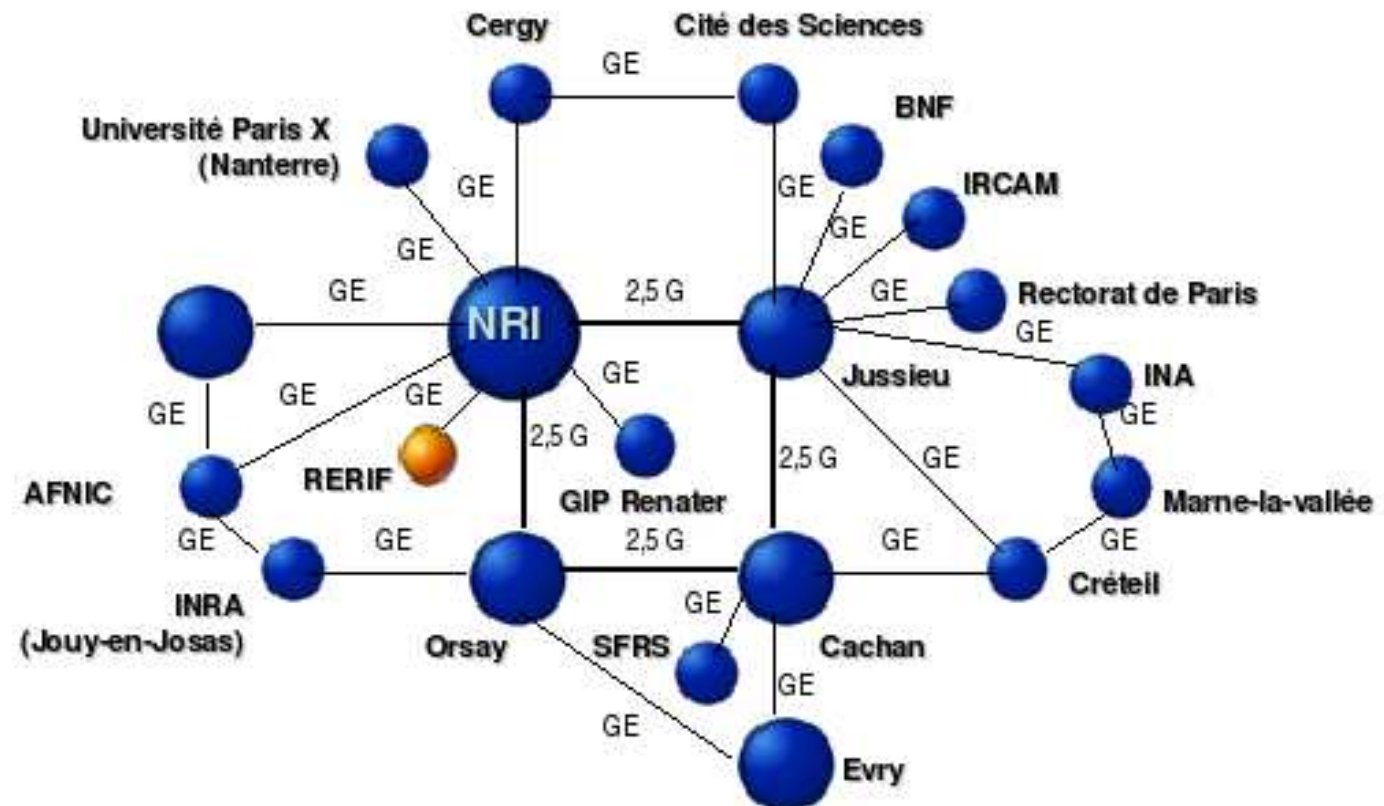
- no regional or metropolitan network; a lot of institutions, universities;
- tighter mesh: many sites are directly connected to the RENATER backbone (typically: BNF -French National Library-, ...).





# RENATER-4

Paris area (île de France):





# Users, Grids

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Grids are about better **sharing** of resources:

- computing power, memory, storage, networks;
- applications, software;
- information: data bases, data sources (sensors, scientific instruments);
- people !.

All scientific (but also industrial, commercial) projects now have some "grid dimension" mainly because they involve communities.





# Users, Grids

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Characterization of users applications:

- cpu..., data..., IO..., **network** intensive;
- distributed applications (number of sites);
- dynamicity (load balancing, adaptative application, fault tolerance);
- synchronicity (emb. parallel, MPI, etc...);
- does it scale ? (bounded by the numerical method, the language, etc...)
- **performance on the grid, (benchmark ?).**





# Users, Grids

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Why users support, grid coordination at RENATER ?

- we are more and more involved in users projects related to network intensive applications;
- middlewares have many functionalities some of them will "migrate" to "*grid-aware OS*" others will be integrated into the network layer as services.

There is a need to investigate/understand users needs, usages and work practices.





# Who are the users ??

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Providers e.g. Renater	occasionally meet	Network Teams e.g. Inria, CNRS





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# Who are the users ??

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Providers e.g. Renater	occasionally meet users ?	Network Teams e.g. Inria, CNRS
Network Teams	are contacted by users ?	"HPC people"





# The Grand Challenge

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Providers e.g. Renater	occasionally meet users	Network Teams e.g. Inria, CNRS
Network Teams	are contacted by users	"HPC people"
Providers	would like to talk to users <sup>2</sup>	"HPC people"





# Project Infrastructure

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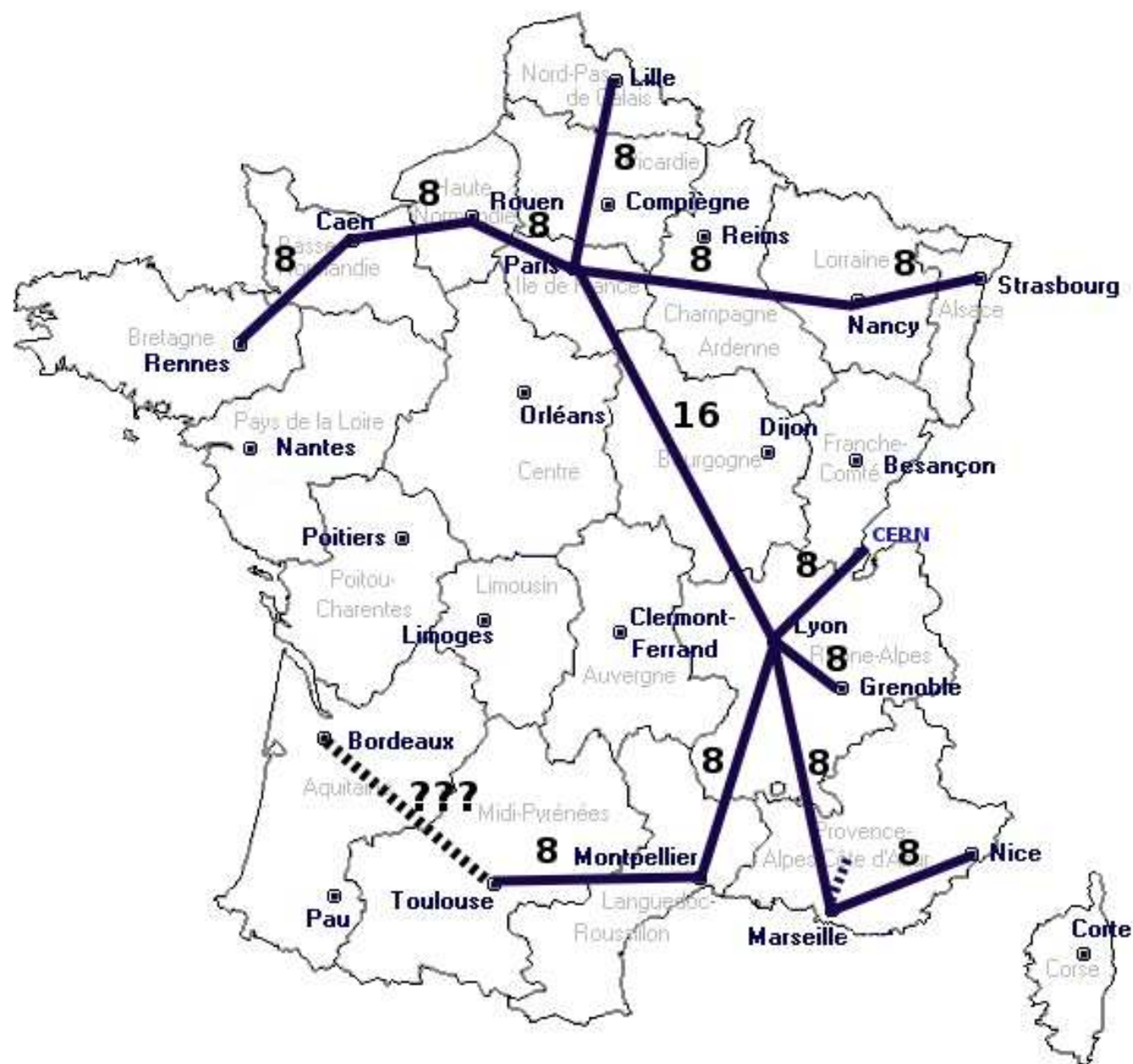
New dark fiber "project" infrastructure:

- each link supports up to 8 lambdas (16 for the Paris-Lyon backbone)
- each lambda providing a 10Gb/s bandwidth;
- extension to the CERN, interco. with GEANT;
- lambdas are dedicated to specific research projects:
  - Grid5000;
  - LHC (CERN);
  - DEISA;
  - then ITER, etc...



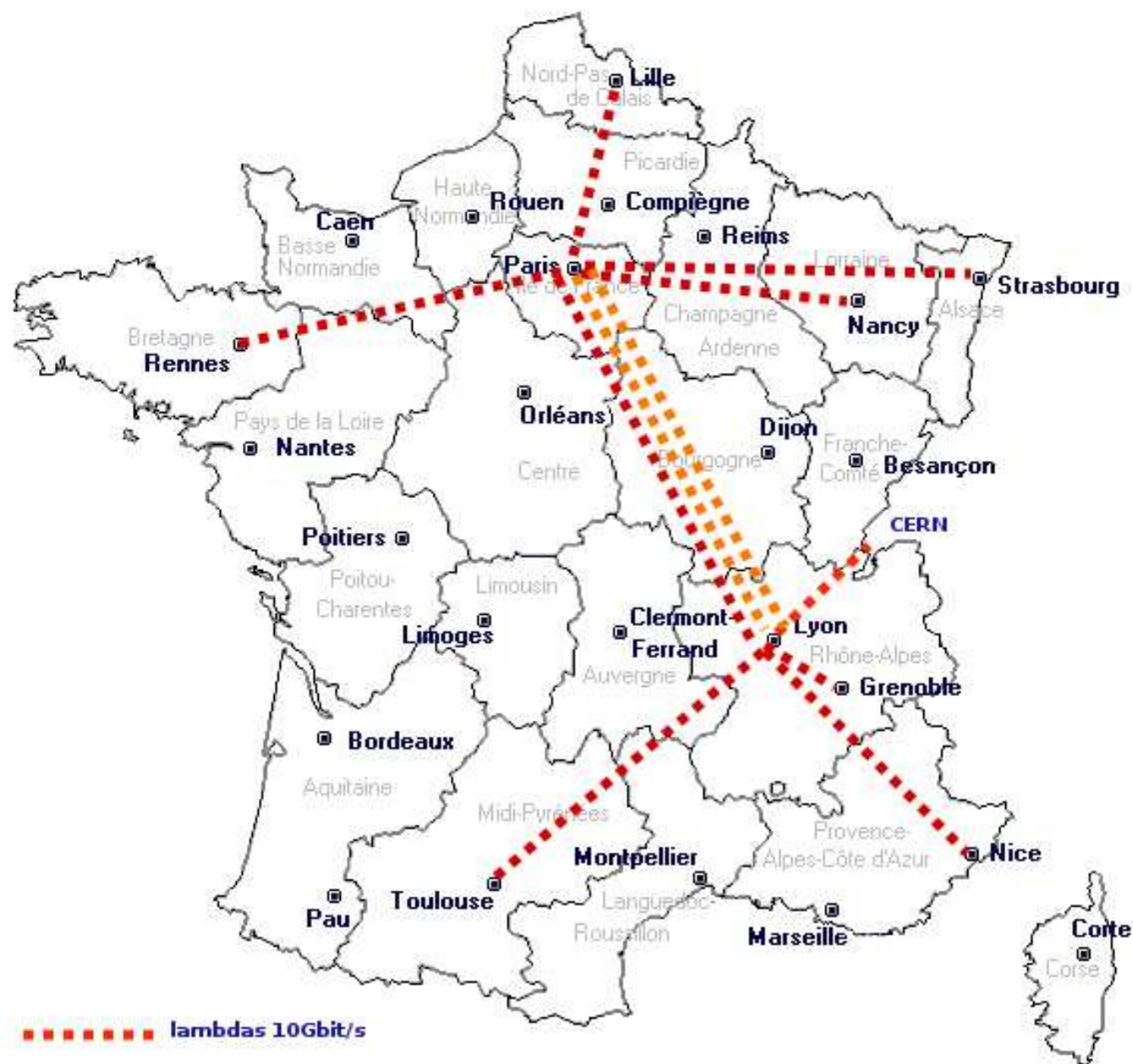


# Dark fibre





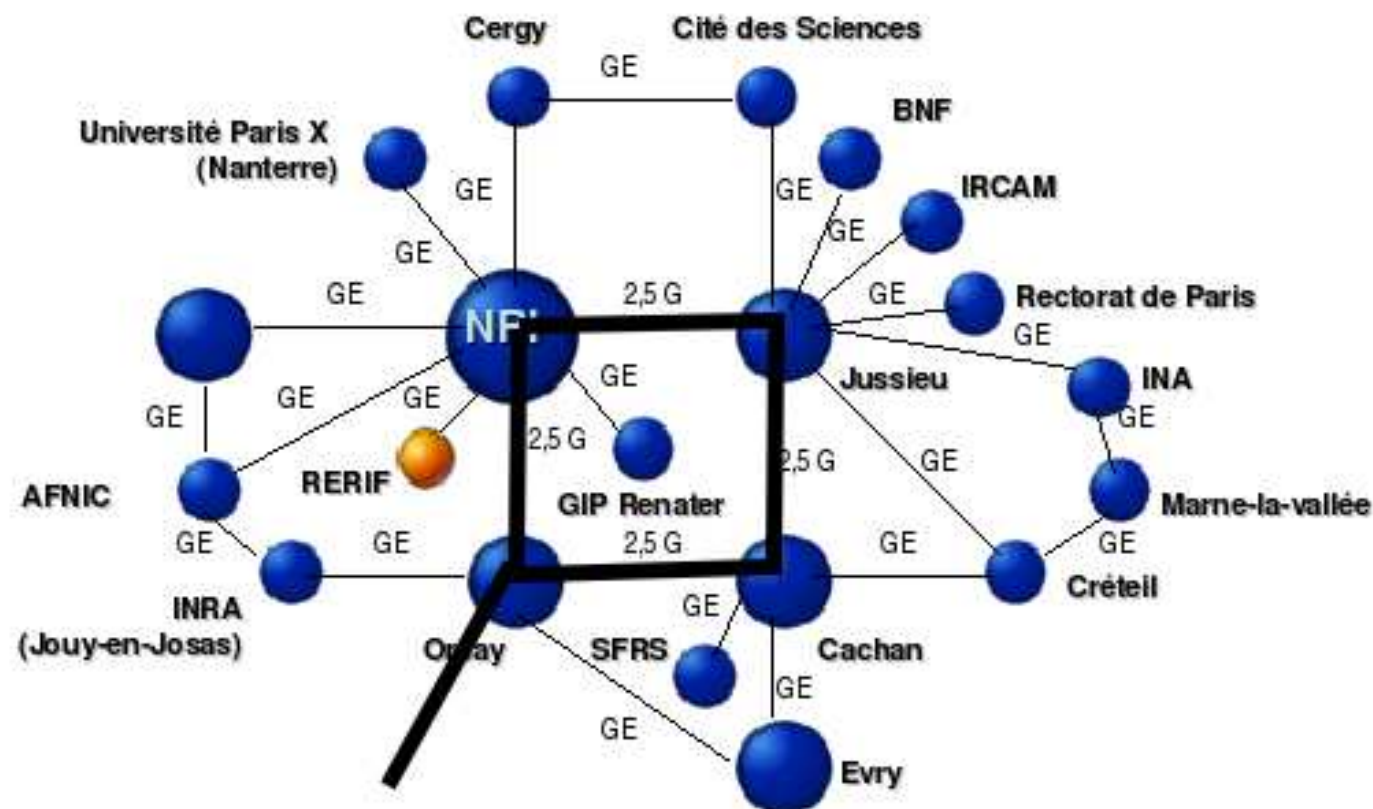
# Dark fibre







# Dark fibre

Paris area (île de France):



	Points de présence RENATER
	Autres points de présence
GE : liaison Ethernet 1 Gbit/s	
2,5 G : liaison 2,5 Gbit/s	



# Project: Grid5000

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lambdas have been allocated for the Grid5000 project (9 sites). This provides dedicated 10Gb/s point to point optical interconnection inside a single VLAN.

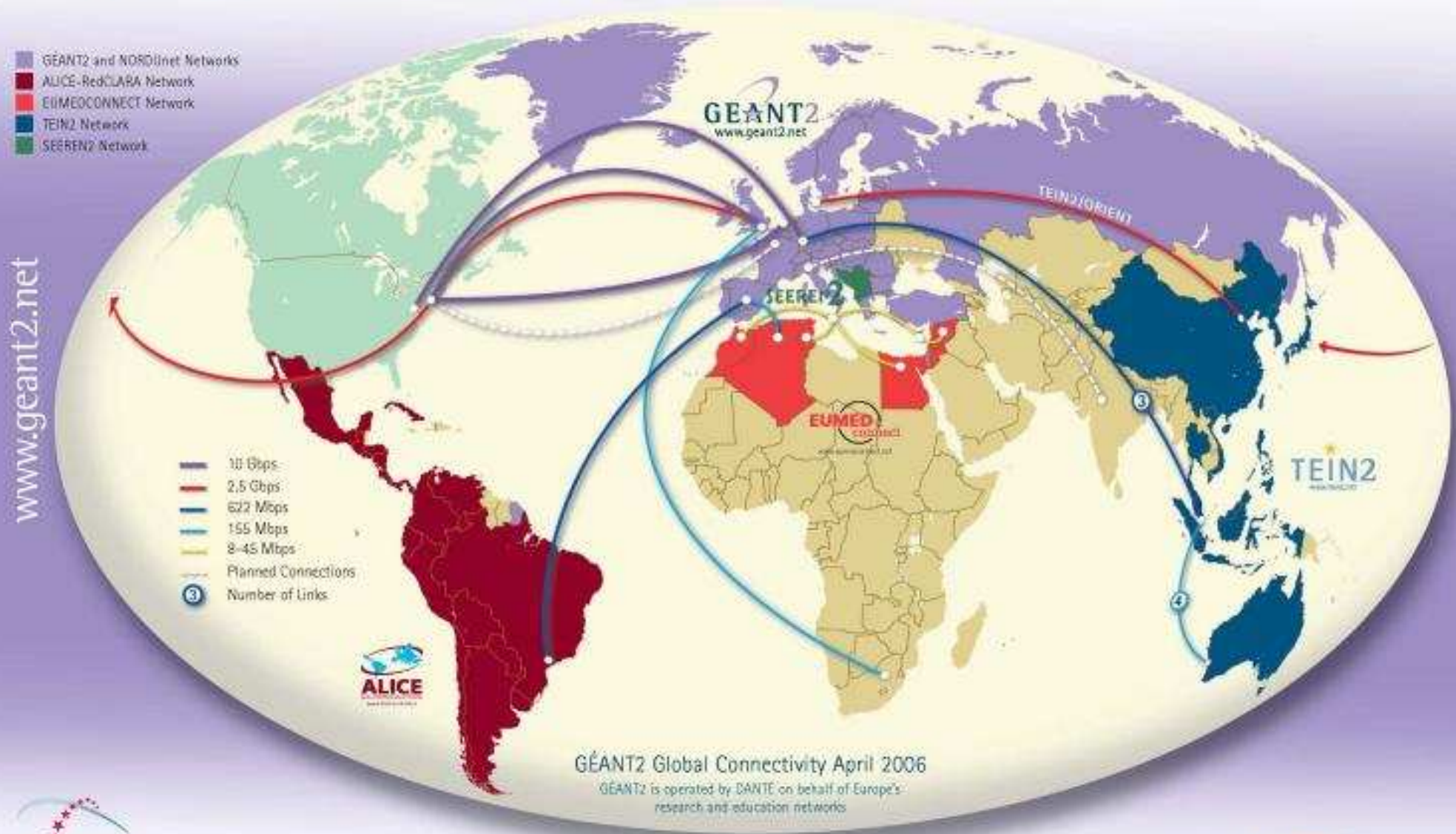
Interconnection with Geant allows for international testbeds:

- dedicated lambda in GEANT to reach the dutch grid DAS-3;
- acces to research networks in US, Japan, etc....





# GEANT2 At the heart of Global Research Networking





# Back to Users...(1)

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Users need 10Gb/s, but... few feedback and our "pipes" seems to stay rather empty except for "data challenge" experiments (mainly point to point, gridftp). Same observation in DAS-3 which offers too 10Gb/s links.

- are applications dimensioned to use large bandwidth ?
- how to make a benchmark ?
- how to help application users to quantify their need ?





# Back to Users...(2)

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Users need network services... typically QoS "classes of services"

e.g. Premium IP offered for projects in RENATER-4, only used in production mode by DEISA (which will migrate to the project infrastructure).

Classes of Service are now offered to all RENATER users. This is available also for the EGEE users but not much used.

- what are the relevant criterias ?
- how to help application users to quantify their need ?





# Back to users...(3)

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*When we changed from 1Gb/s to 10Gb/s this did not improve the latency (which is even worse) ?*





# Back to users...(3)

---

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*[...] I use **ping** to measure the latency [...] not the "online weather map of the network"*





# Back to users...(3)

---

*When we changed from 1Gb/s to 10Gb/s this did not improve the latency (which is even worse) ?*

*[...] I use **ping** to measure the latency [...] not the "online weather map of the network"*

*ping is an application.. same as I get 100 Mflops with my C++ code on my new GigaFlops machine*

- what should be measured, how ?
- how to help application users to interpret their experiments ?





# Grid Coordination

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We need to know how this infrastructure and associated services fits users requirements:

- how it behaves under heavy load;
- when do applications start "to struggle" for resources.

This is useful to dimension the "next generation", probably 40Gb/s but 4x10Gb/s might be enough, etc...

c.f. new tools developped in Grid5000 to inject traffic,  
...





# Grid Coordination

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"network monitoring at the application level":

- what can be measured (optical level, switches, routeurs, some information may be confidential, some acquisition cards very expensive, interoperability of proprietary supervision software) ?
- what is relevant for the user (aggregated traffics ???);





# Grid Coordination

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- design a measurement/monitoring tools suite (mostly intelligent encapsulation of existing tools and filtering of existing measures) that allows user to understand the behaviour of the network layer for his application.

Targets projects: Grid5000, IGTMD (Interconnection between IN2P3 in Lyon and the Fermi Labs in Chicago, fundamental physics), Network (or Grid) Benchmark ??







Connexion à  
l'Internet mondial

SFINX  
Global Internet eXchange, accès aux autres  
prestataires de service Internet en France

GEANT2 [www.geant2.net](http://www.geant2.net)  
Connexion vers les réseaux  
de la Recherche en Europe,  
et les réseaux de la Recherche :  
des pays méditerranéens  
  
de la zone Asie Pacifique  
  
de l'Amérique du sud  
  
de l'Amérique centrale  
  
CLARA



Connexion  
vers les DOM-TOM

CCGSC-2006

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