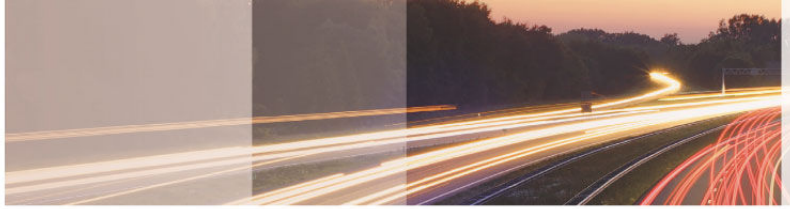


GARR

The Italian Academic & Research Network

www.garr.it

GARR-X and LHC networking

New project and new challenges

Marco Marletta

LHCOPN meeting, Bologna, 10-11.12.2009

Consortium GARR

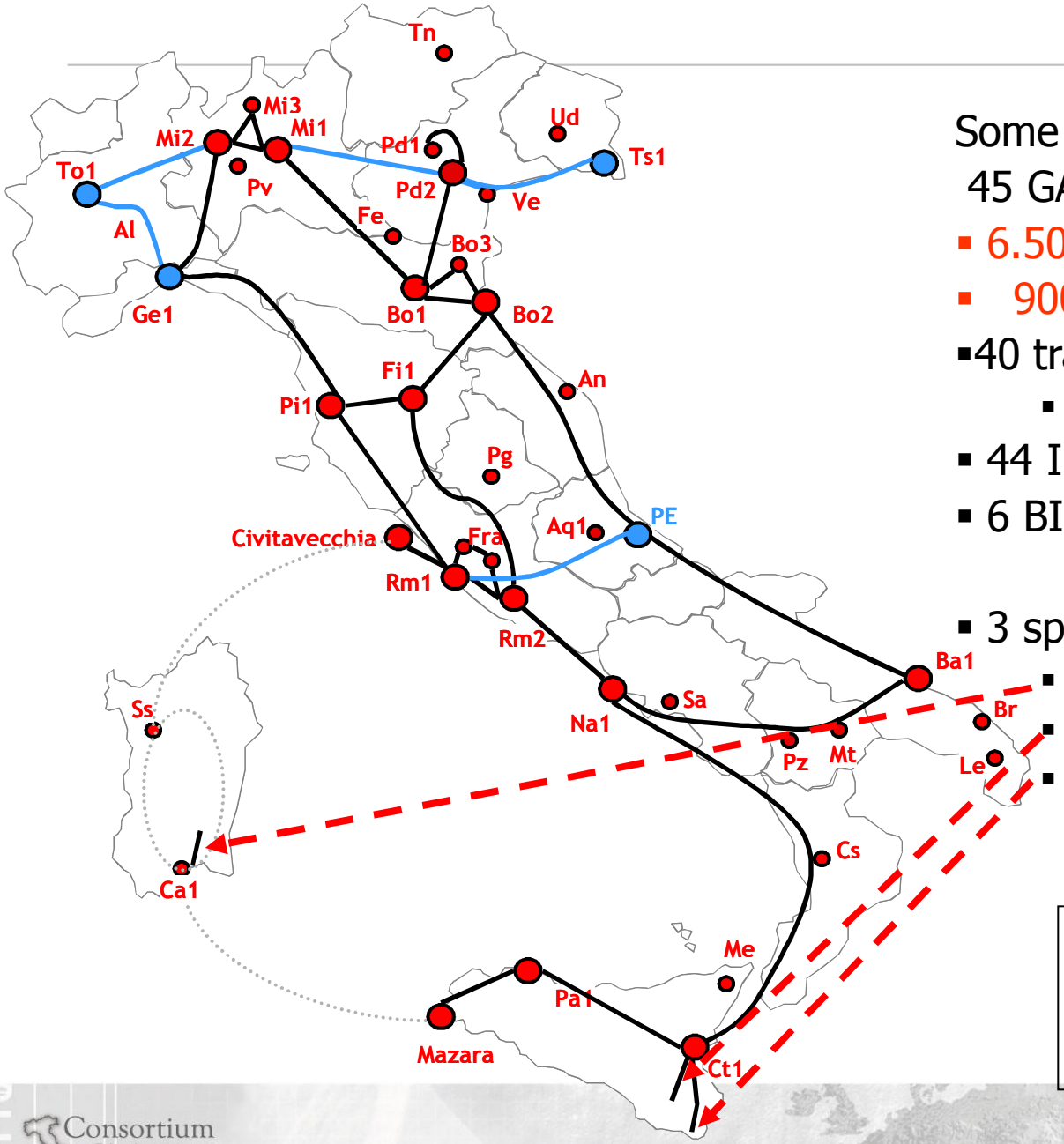
GARR-X

- The next generation GARR network
- 7 years' project (2009-2016)
- First installation 2Q10
- First phase (65% of the whole project) operational 4Q10
- The rest of the fiber will be acquired as soon as users will require it (now served by leased circuits)
- 10G now, 100G ready
- No 40G POS, maybe 40GE
- 100GE service in 2H11 (or before, if available)
- 4 different tenders (or RFP, if you prefer so)

The 4 GARR-X tenders (RFPs..)

1. 6 years loa[...] ackbone and user acces[...]
   COMPLETE
   - Including maintenance and shelter housing
2. 3 years loan of backbone and access circuits
   COMPLETE
   - To comple[...] re
   - will be replaced by fiber links in the future
3. Transmission equipments
   - Including support and maintenance for 6 years
4. Routers and switches
   - Including support and maintenance for 5 years
   - Including integration of current routers

New GARR-X fiber backbone Phase 0 + Phase 1



Some figures:

45 GARR PoPs hosted by user sites

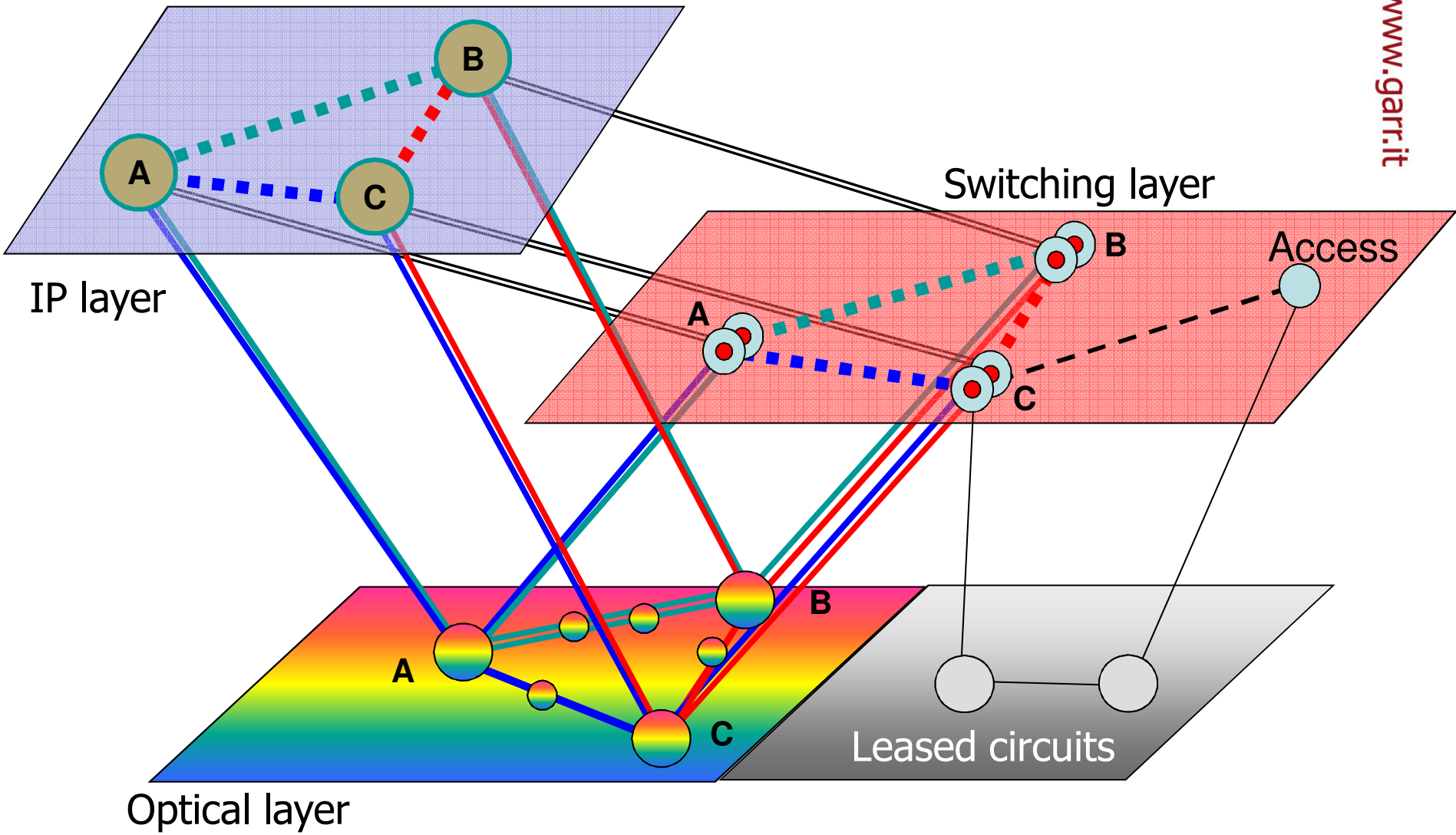
- 6.500 km backbone fiber
- 900 km user access fiber links
- 40 transmission equipments
  - 100 amplification sites
- 44 IP/MPLS switches
- 6 BIG routers "only"

- 3 special projects
  - Sardinia Radiotelescope 60km
  - Noto radiotelescope 134km
  - NEMO Capo Passero 151km

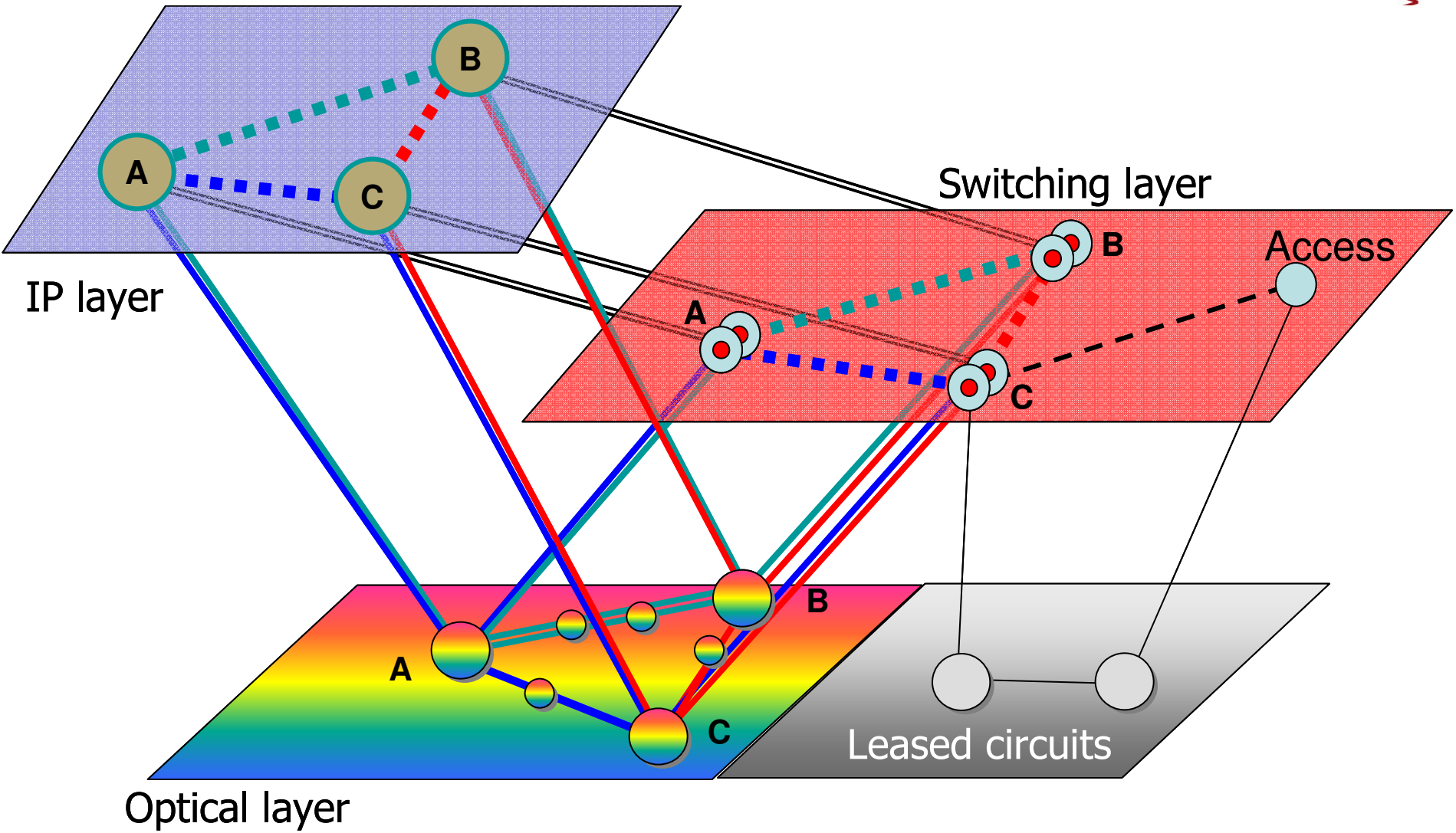
Legenda

- Phase0 fiber
- Phase1 fiber
- Sardinia project

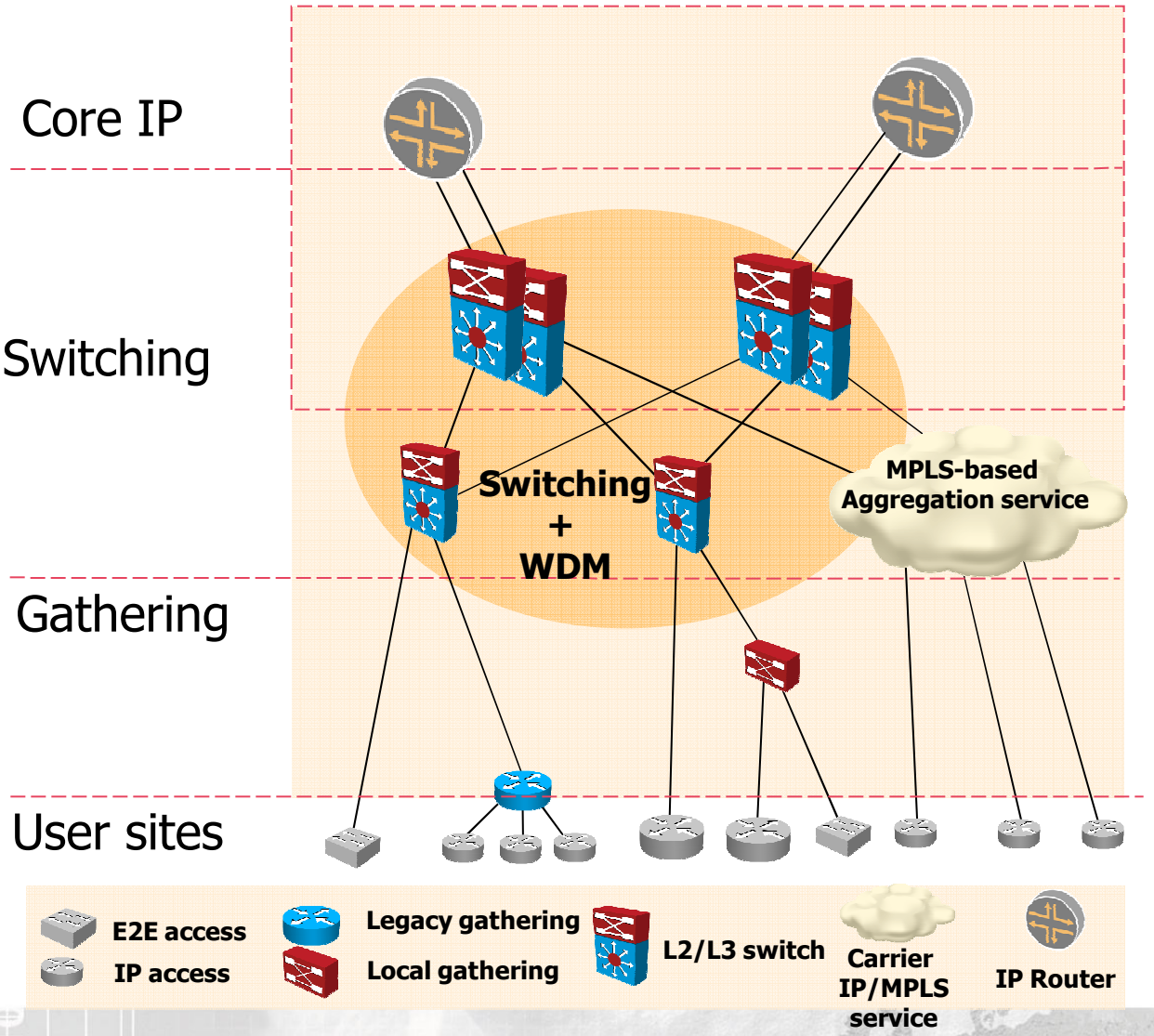
3 layers architecture



Connecting the users

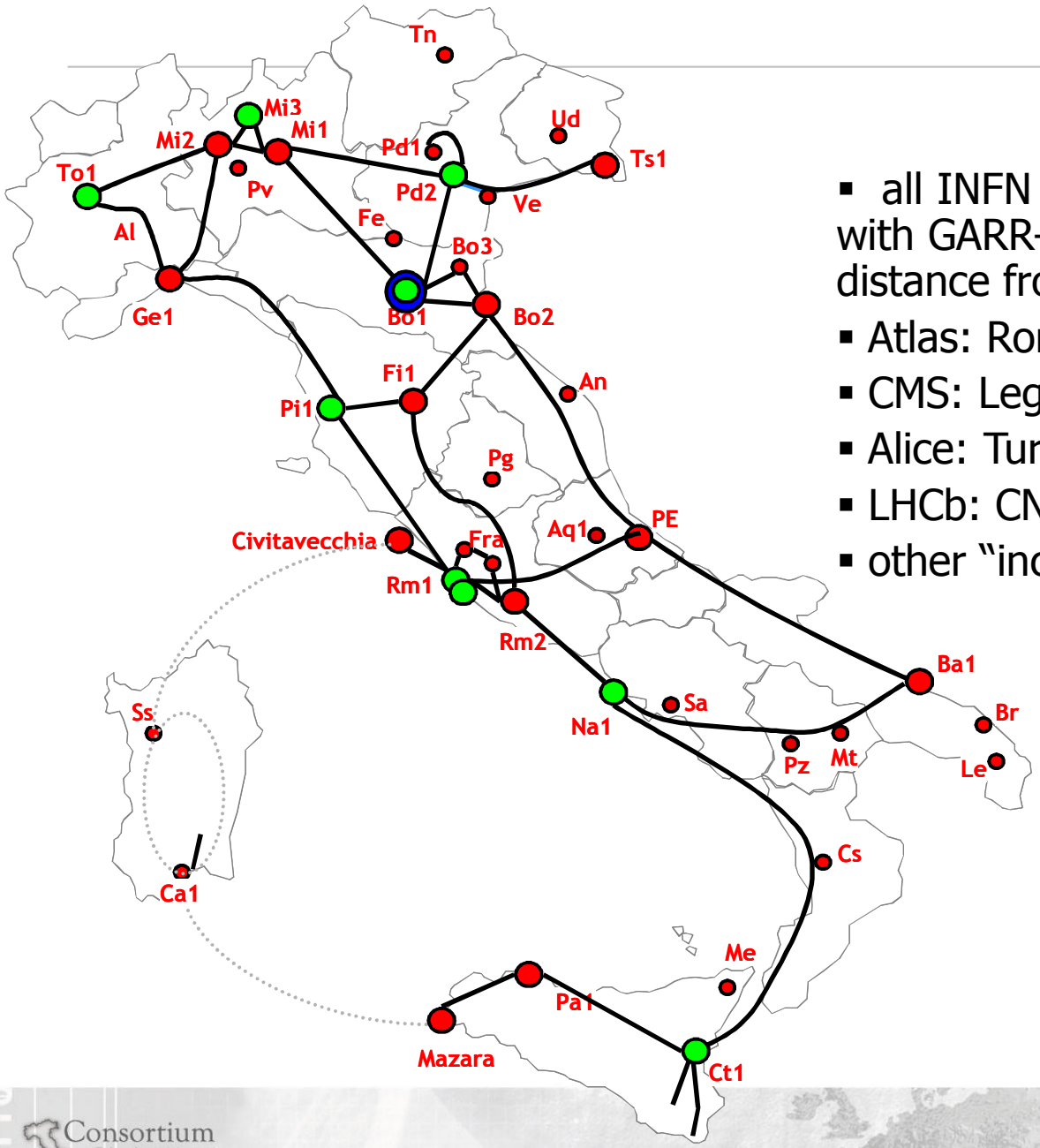


Network schematics

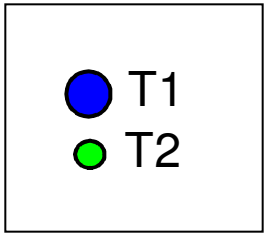


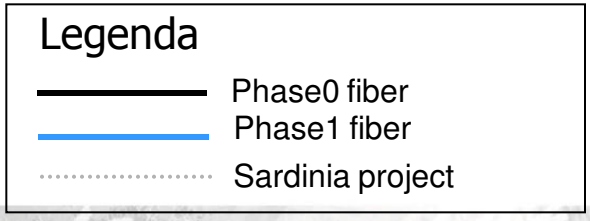
- All-ethernet
- Route only when you need
- Switch as much as you can
- The gathering of low bandwidth (<100Mbps) users is not performed by GARR

GARR-X and the italian LHC sites



- all INFN Tier sites are co-located with GARR-X PoPs or within campus distance from GARR-X PoPs
- Atlas: Roma1, Milan, Naples
- CMS: Legnaro (Padua), Pisa, Roma1
- Alice: Turin, Catania
- LHCb: CNAF (Bologna)
- other "incubation" T2s: Bari, Frascati





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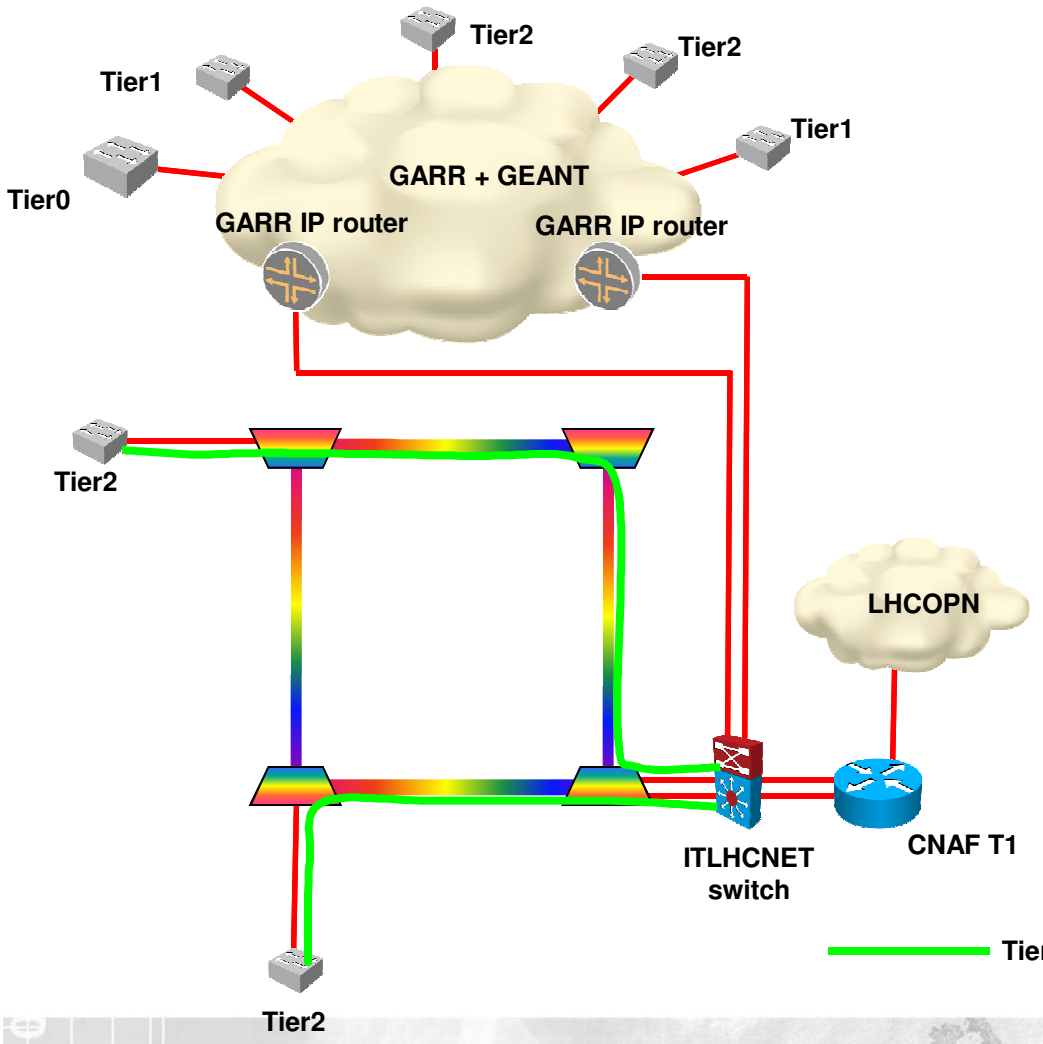
The Italian Tier2 architecture

- The GARR-X network will provide either L1 (DWDM) and L2 (Ethernet) E2E services
- Protection is left to Ethernet and IP layers
- Two solutions using each service were presented side by side to INFN highlighting pros and cons
- The final decision has not been taken yet
- GARR-X is able to support both solutions without distinction

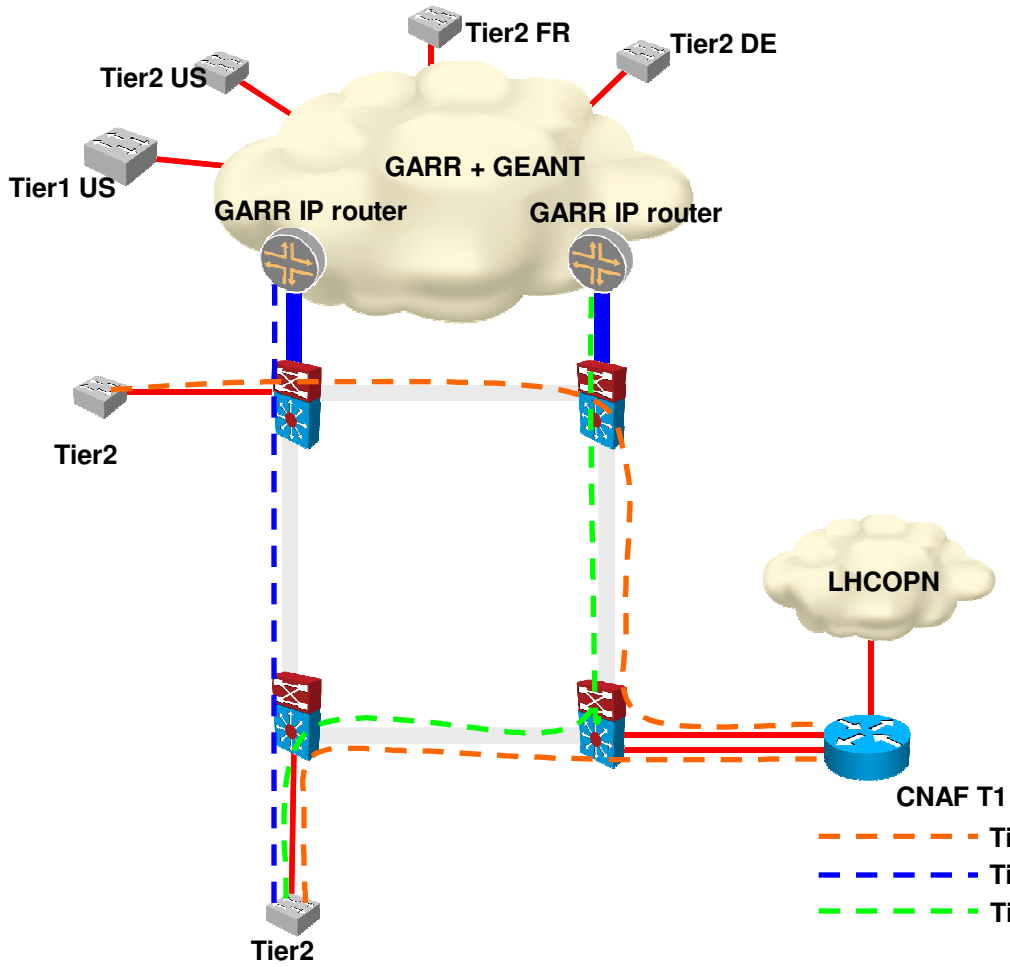
The lambda solution



- One, dedicated 10GE lambda from each T2 to CNAF
- access to IP world is centralised via one or more switches
- Possible lower capacity backup via switched infrastructure

- Pros: dedicated capacity, predictable delay
- Cons: higher costs to double the central switch, low resilience
  - For a 2000km lambda, annual availability can be around 98%
  - Doubling the lambda more than doubles the costs

The ethernet solution



- one 10GE access to the switched infrastructure for each T2
- one e-line to CNAF for T1-T2 networking
- two e-lines to IP routers for redundant access to IP network
- distribute bandwidth between 3 services according to needs

- Pros: low cost, highly redundant
- Cons: statistical multiplexing

Some strategy considerations

- We don't see dynamic circuit provisioning as a strategic service for our LHC users
- We rather see a stable, overprovisioned IP service as a key factor
- In any case GARR is ready to provide lightpaths between the italian T2s and any other T1/T2 outside Italy, on INFN request
- We will seek for redundant GEANT access in Italy (2 different PoPs)
  - We will continue and extend CBF activities
- We will provide CNAF-T1 a 100G L2 or L3 connection whenever it will be possible (2011?)

Thank you