Computing in Italy-LHCb

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Present status

- Due to historical reasons, INFN has **not** its own Computing Centre (*tier 1* in MONARC terminology) like RAL or CCIN2P3/Lyon
  - The lack of INFN CC leaded to the usage of CC consortia (CINECA, CILEA, CASPUR) in the early days of LEP
  - Computing and networking technology evolution made later needlessly the usage of CC consortia for LEP experiments
- Computers are distributed among INFN sites

The typical INFN site

- In a typical INFN site, computers are mainly owned by experiments and distributed among offices
  - Mainly workstations (exceptions: a few servers)
  - Priority to personal use
    - Background (batch) processes are usually allowed to run if they don't slow down too much the foreground processes
- In MONARC terminology, INFN has, at present, mainly *tiers 4* (individual desktop) and a few *tiers 3* (workgroup servers)

Group owned computers

- INFN groups involved (at present or formerly) in other experiments can use, for LHCb, the computers which they already own (of course, in sharing with the other experiments)
  - If the other experiment is terminated, probably computers are old (and slow)
  - If the other experiment is still running or in an analysis phase, probably the time slices for LHCb are very thin

Hidden computing resources

- Nevertheless there are *hidden* computing resources
  - Personal workstations are mainly used for interactive processing during work time and usually *idle after hours* (sometimes they are also used for batch processing, but not continuously)
  - During work time the load of a single CPU is always oscillating between saturation peaks and *long idleness periods*
  - The global CPU batch load is by far *not balanced* among workstations

Condor

- **Condor** can exploit these hidden resources
  - Allows the use of idle workstations
  - No impact on the speed of foreground processes for the workstation owner
    - When the owner is using the workstation, Condor jobs don't start on that workstation
    - If the owner starts using the workstation when some Condor job is running, then the job is suspended and, eventually, a checkpoint of the job is done and the job migrates
  - The owner of the workstation feels safe
    - It doesn't require the kernel to be recompiled
    - It doesn't run root processes

The INFN Condor farm

CPU type	CPU #	MIPS
Alpha	115	45794
Intel	77	29840
PA-RISC	10	1366
Sparc	11	2559
Total	**213**	**79559**

Condor limitations

- There is a critical resource: the mass storage
  - It should be accessible from everywhere via gigabit links
  - Buffering is required to access large amounts of data
  - Simultaneous accesses to a large set of data have, at present, no solution in Condor technology
- At present Condor architecture is suitable for Monte Carlo production but not for analysis

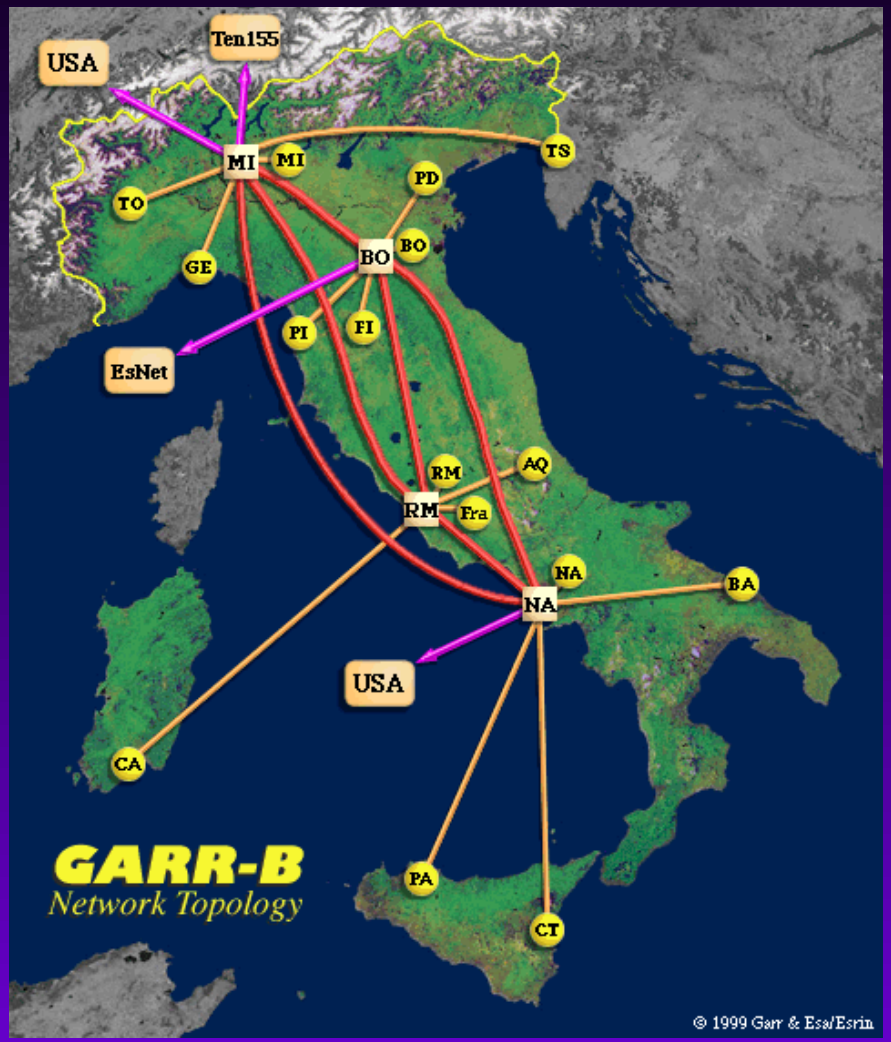
Allocation of new computing resources

- BaBar experience shows that problems don't scale
  - A reasonably sized (10%?) testbed is required in a few years to verify software and hardware solutions
- **But**
- An early and graduated purchase of computers requires more money
  - The allocation of 10% of the final computing power for the end of 2003 means an additional charge of about 50%
- People are reluctant to spend money today for tomorrow computing

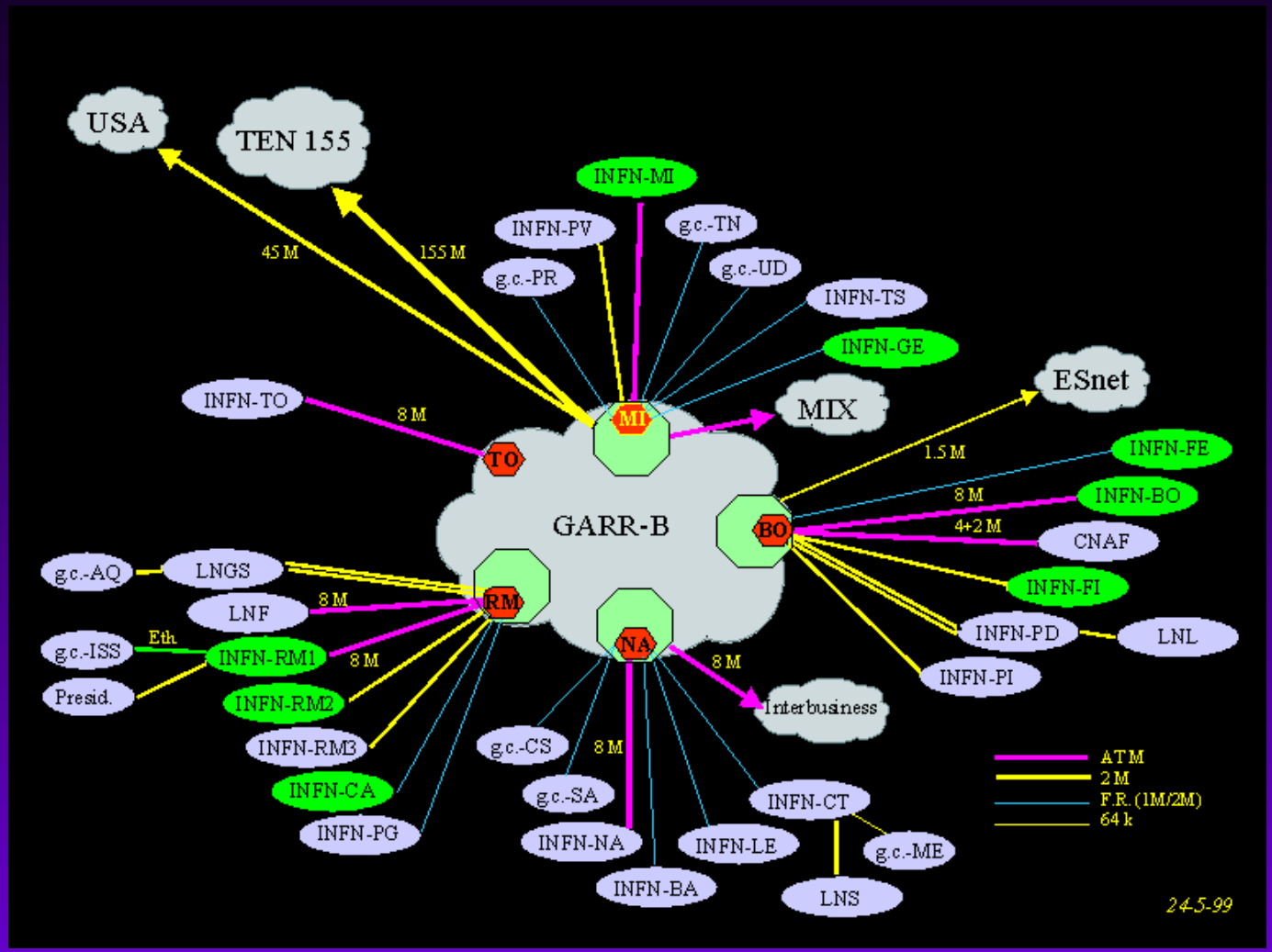
Summary

- INFN has **not** its own Computing Centre
- At present, group owned computers and the INFN Condor farm can be used for Monte Carlo production and architecture tests
- Allocation of new computing resources is required, but groups should be awakened to the need

GARR-B network



GARR-B is the network connecting Italian Scientific Research entities

MI-Ten155	155	Mbps
MI-USA	45	Mbps
BO-MI	155	Mbps
FE-BO	34	Mbps
FI-BO	155	Mbps
RM-MI	155	Mbps
GE-MI	34	Mbps
CA-RM	34	Mbps

INFNet to GARR-B connections