Access to HPC resources in Italy and Europe
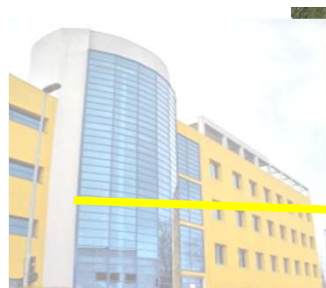
Paolo RAMIERI

p.ramieri@cineca.it

SuperComputing Applications and Innovation Department

www.hpc.cineca.it

CINECA 2.0

CINECA
is a non profit Consortium, made up of 70 Italian Universities, 4 research Institutions and MIUR.

CINECA is now the largest Italian computing centre, one of the most important worldwide. .
The High Performance Systems department (SCAI: SuperComputing Applications and Innovation) offers support to scientific and technological research through supercomputing and its applications.

The Story

1969:	CDC 6600	1st system for scientific computing
1975:	CDC 7600	1st supercomputer
1985:	Cray X-MP / 4 8	1st vector supercomputer
1989:	Cray Y-MP / 4 64	
1993:	Cray C-90 / 2 128	
1994:	Cray T3D 64	1st parallel supercomputer
1995:	Cray T3D 128	
1998:	Cray T3E 256	1st MPP supercomputer
2002:	IBM SP4 512	1 Teraflops
2005:	IBM SP5 512	
2006:	IBM BCX	10 Teraflops
2009:	IBM SP6	100 Teraflops
2012:	IBM BG/Q	2 Petaflops
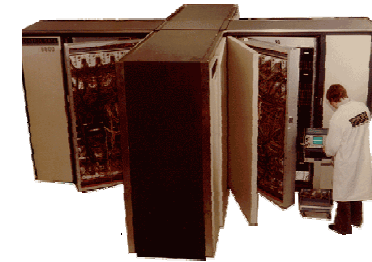
TOP500

#7 june 2012

Rank	Site	Computer
1	DOE/NNSA/LLNL United States	**Sequoia** - BlueGene/Q, Power BQC 16C 1.60 GHz, Custom IBM
2	RIKEN Advanced Institute for Computational Science (AICS) Japan	K computer, SPARC64 VIIIfx 2.0GHz, Tofu interconnect Fujitsu
3	DOE/SC/Argonne National Laboratory United States	**Mira** - BlueGene/Q, Power BQC 16C 1.60GHz, Custom IBM
4	Leibniz Rechenzentrum Germany	**SuperMUC** - iDataPlex DX360M4, Xeon E5-2680 8C 2.70GHz, Infiniband FDR IBM
5	National Supercomputing Center in Tianjin China	**Tianhe-1A** - NUDT YH MPP, Xeon X5670 6C 2.93 GHz, NVIDIA 2050 NUDT
6	DOE/SC/Oak Ridge National Laboratory	**Jaguar** - Cray XK6, Opteron 6274 16C 2.200GHz, Cray Gemini interconnect, NVIDIA 2090
7	CINECA Italy	**Fermi** - BlueGene/Q, Power BQC 16C 1.600 IBM
8	Germany	**JUQUEEN** IBM
9	CEA/TGCC-GENCI France	**Curie thin nodes** - Bullx B510, Xeon E5-2680 8C 2.700GHz, Infiniband QDR Bull
10	National Supercomputing Centre in Shenzhen (NSCS) China	**Nebulae** - Dawning TC3600 Blade System, Xeon X5650 6C 2.66GHz, Infiniband QDR, NVIDIA 2050 Dawning
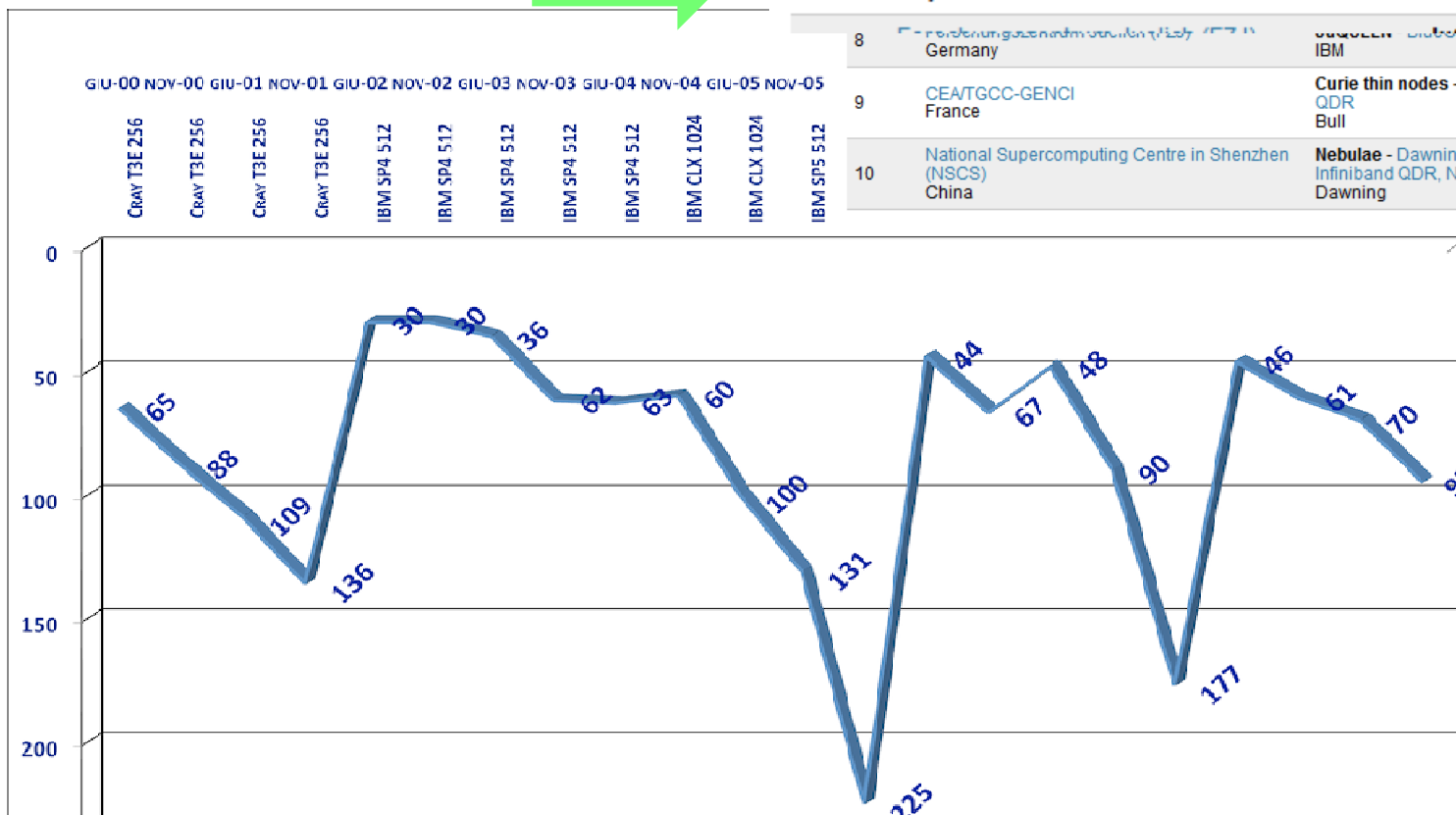
FERMI

High-end system, only for extremely scalable applications

Name: Fermi

Architecture: BlueGene/Q (10 racks)

Processor type: IBM PowerA2 @1.6 GHz

Computing Nodes: 10.240

Each node: 16 cores and 16 GB of RAM

- Computing Cores: 163.840

RAM: 1 GByte / core (163 TByte total)

Internal Network: 5D Torus

Disk Space: 2 PByte of scratch space

Peak Performance: 2 PFlop/s

Power Consumption: 820 kWatts

N. 12 in Top 500 rank (June 2013)

National and PRACE Tier-0 calls

GALILEO

Name: Galileo

Model: IBM NeXtScale

- **Architecture:** IBM NeXtScale

Processor type: Intel Xeon Haswell@ 2.4 GHz

Computing Nodes: 516

Each node: 16 cores, 128 GB of RAM

- **Computing Cores:** 8.256

RAM: 66 TByte

Peak Performance: 1.2 PFlops

Internal Network: Infiniband 4xQDR switches (40 Gb/s)

Accelerators: 768 Intel Phi 7120p (2 per node on 384 nodes)

+ 80 Nvidia K80 (2 per node on 40 nodes)

X86 based system for production of medium scalability applications

- National and PRACE Tier-1 calls

MARCONI (2016)

- Complessivamente:
- 16,5 PFs peak performance,
- 10 PB storage
- 3 MW di potenza assorbita

- Caratteristiche tecniche:
- Rete interna: Intel OmniPath
- Architettura: Lenovo NeXtScale
- A1: Broadwell 2x18 core, 2.3 GHz; 1500 nodi, 2 PFlops
- A2: KnightsLanding 68 core, 1.4 GHz; 3600 nodi, 11 PFlops
- A3: SkyLake 2x20 core, 2.3 GHz; 1500 nodi, 4,5 PFlops

BigData - PICO

CINECA

*Storage and processing
of large volumes of data*

Name: Pico
Model: IBM NeXtScale
Processor type: Intel Xeon Ivy Bridge@2,5Ghz
Computing Nodes: 66+
Each node: 20 cores, 128 GB of RAM
Computing Cores: 1.320+
RAM: 6,4 GB/core

plus

2 Visualization nodes (with 2 GPU NVIDIA K40)
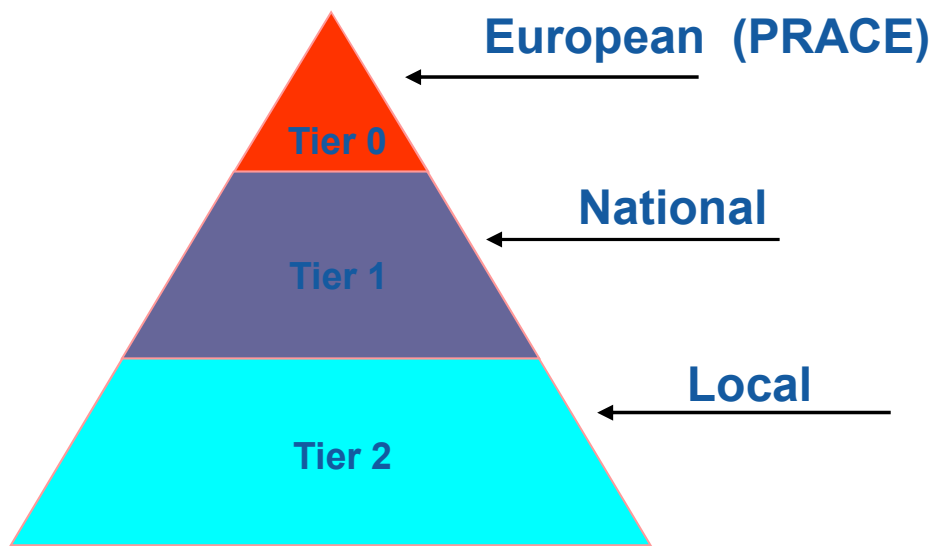**2 Big Mem nodes (512 GB RAM)**
4 BigInsight nodes (32 TB of local disk)
2 Very Large Mem nodes (1TB RAM)

PARTNERSHIP FOR ADVANCED COMPUTING IN EUROPE

The European HPC-Ecosystem

- PRACE Research Infrastructure (www.prace-ri.eu): the top level of the European HPC ecosystem

European (PRACE)

Tier 0

National

Tier 1

Local

Tier 2

Creation of a European HPC ecosystem involving all stakeholders

- ✓ **HPC service providers on all tiers**
- ✓ **Scientific and industrial user communities**
- ✓ **The European HPC hw and sw industry**

- **CINECA:**
- - represents Italy in PRACE
- - hosting member in PRACE
- - Tier-0 system

  BG/Q 2 PFlop/s
- - Tier-1 system

  > 5 % GALILEO
- - involved in PRACE 1IP, 2IP,3IP
- - PRACE 2IP prototype EoI

Our objectives:

✓ Providing Italian and European researchers with an advanced computational environment

✓ Supporting Italian researcher for increasing their competitiveness

✓ Following Italian researchers in their path towards Tier 0

✓ Soliciting large-scale and computationally intensive projects

Basic principles:

✓ Transparency

✓ Fairness

✓ Conflict of Interest management

✓ Confidentiality

Italy

Europe

The aim of ISCRA is to ensure adequate support to Italian scientists and engineers.

The allocation is of 600M core hours per year on

- FERMI

The access is by

- Online submission of proposals
- Peer-review process by an international panel

The proposal are scientifically evaluated by international reviewers and technically evaluated by Cineca experts.

Applications and codes are evaluated on the basis of their computational readiness.

Class B:

Standard Projects; two calls / year

1-10M core hours

duration: 12 months

FERMI only

Class C: Small Projects

continuous submission, 12 selections per year

>50K core hours

up to 1M core hours on FERMI

up to 200K core hours on GALILEO

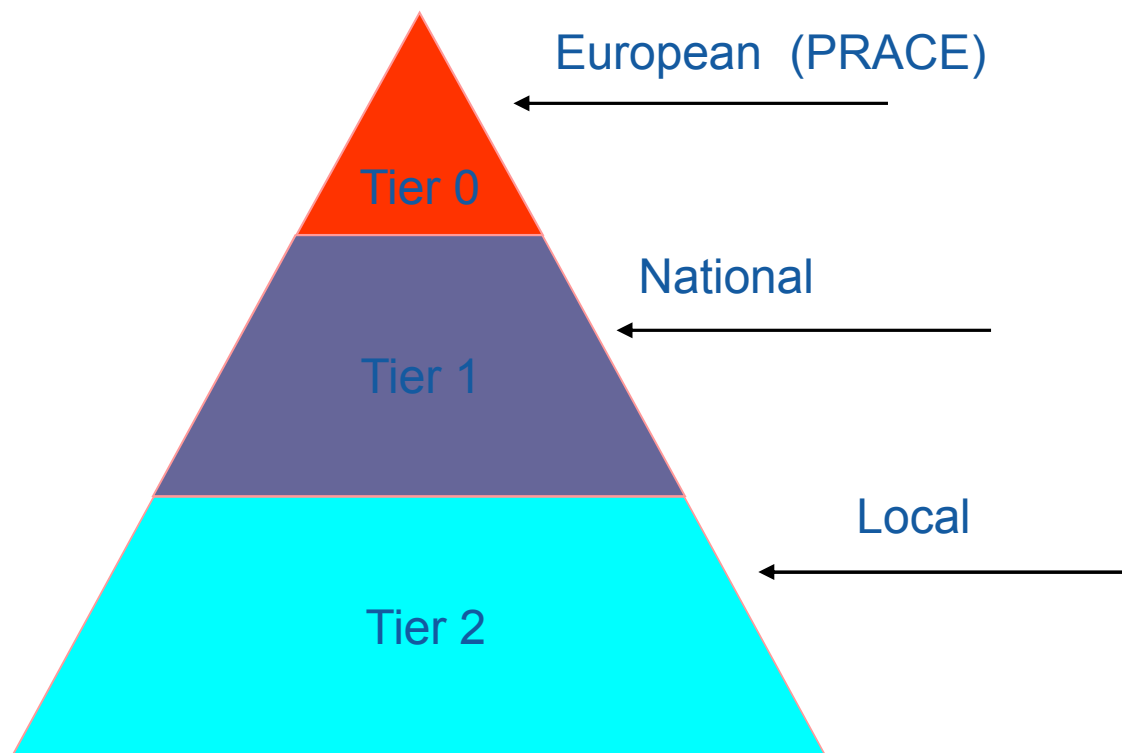only two C projects approved per year per user

duration: 9 months

Trial: on demand

Computing provisioning pyramid

European (PRACE)

Tier 0

National

Tier 1

Local

Tier 2

PRACE offers access to Tier 0 (and Tier 1) systems

- **Preparatory Access**
  - Intended for preliminary resource use required to prepare proposals for Project Access
  - Technical review
 - Continuously open calls

- **Project Access**
  - Intended for individual researchers and research groups including multi-national research groups
  - Technical and Scientific review

PRACE Tier 0 Access: CURRENT CALL

- Applications accepted on call

- For projects which use codes that have been previously tested and must have demonstrated high scalability and optimisation

Projects dimension

PRACE PROJECT

ISCRA B

ISCRA C

PRACE PA
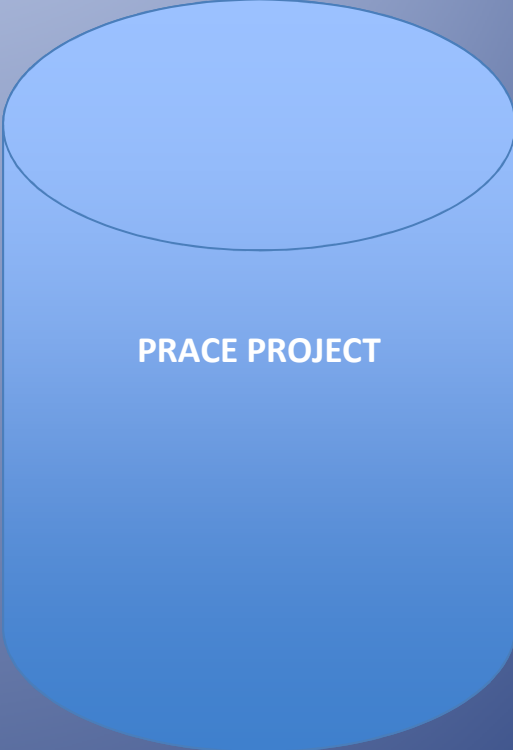
typ 20K   typ 1M   typ 3M   typ 10-70M

Useful links

- ISCRA: http://www.hpc.cineca.it/services/iscra

- PRACE: www.prace-ri.eu/hpc-access?lang=en