CINECA resources for scientific computing

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CINECA - HPC and Innovation Unit
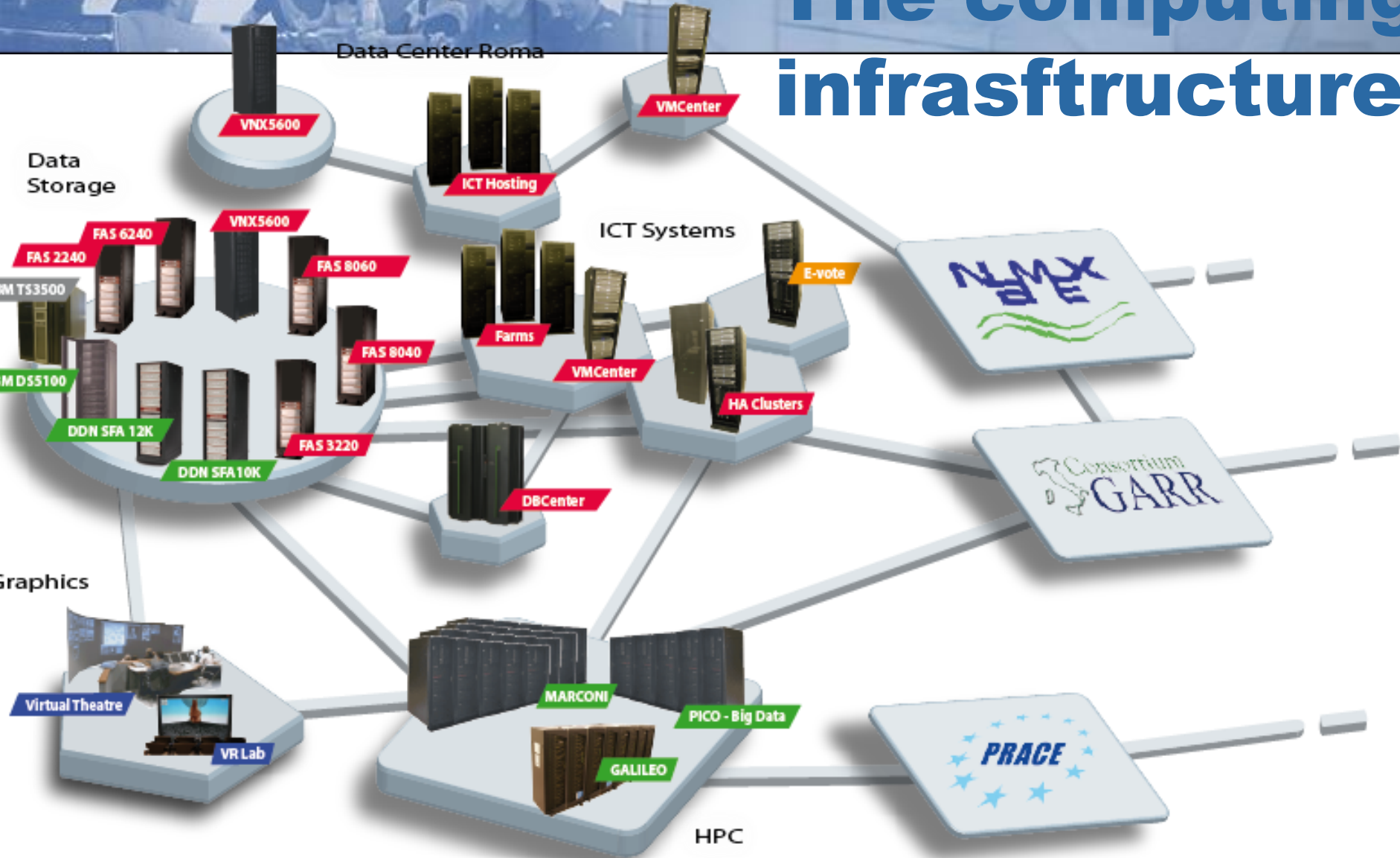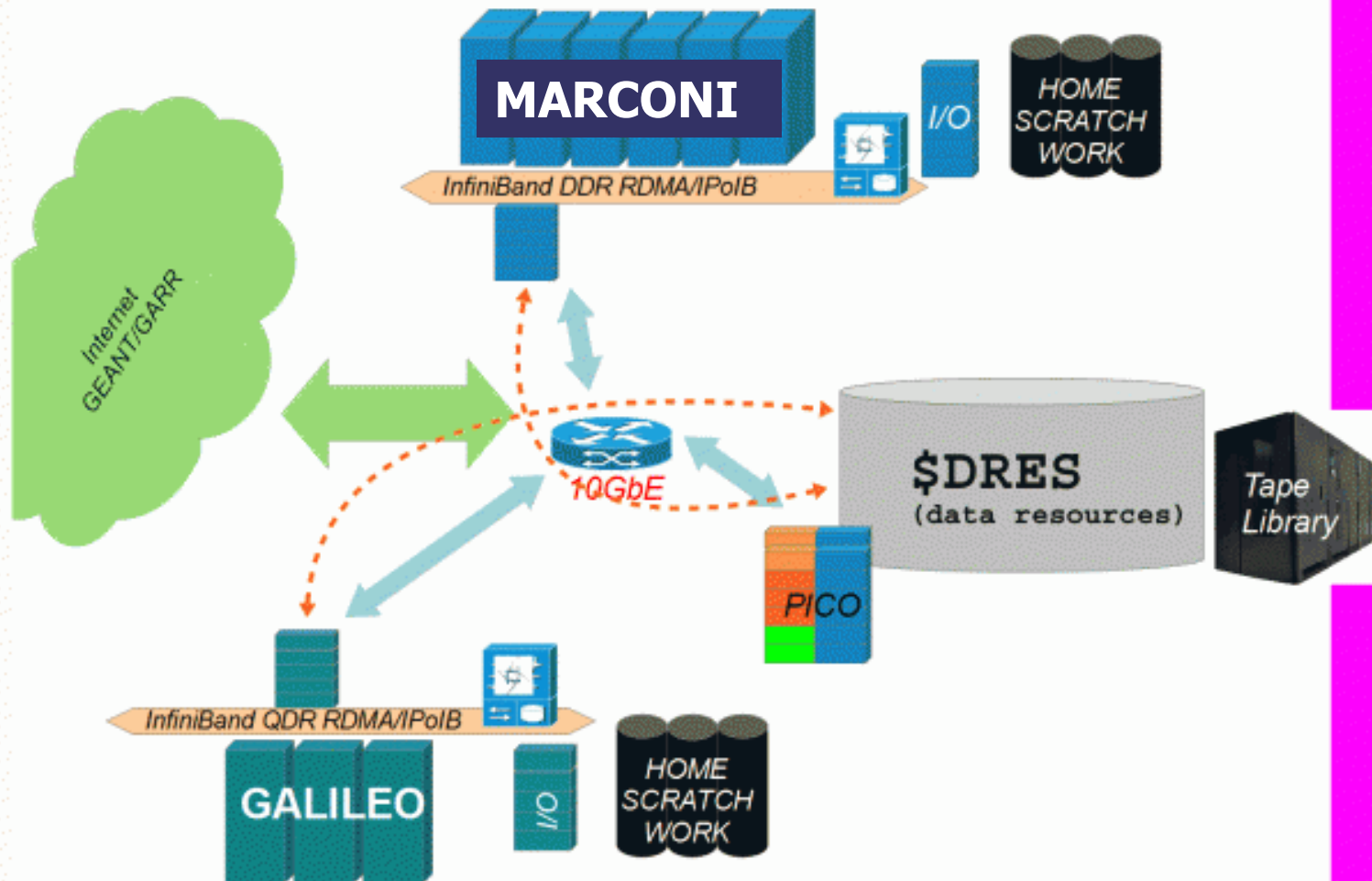**Italy**

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 computing infrasftructure

CINECA — Consorzio Interuniversitario

Data Center Roma

Data Storage

VNX5600

FAS 6240
VNX5600
FAS 2240
FAS 8060
IBM TS3500
FAS 8040
IBM DS5100
DDN SFA 12K
DDN SFA10K
FAS 3220

ICT Hosting
VMCenter

ICT Systems

Farms
VMCenter
E-vote
HA Clusters
DBCenter

Graphics

Virtual Theatre
VR Lab

MARCONI
PICO - Big Data
GALILEO

HPC

NAMEX
Consortium GARR
PRACE

MARCONI

InfiniBand DDR RDMA/IPoIB

I/O

HOME
SCRATCH
WORK

Internet
GEANT/GARR

10GbE

$DRES
(data resources)

Tape
Library

PICO

InfiniBand QDR RDMA/IPoIB

I/O

HOME
SCRATCH
WORK

GALILEO

Tier0: FERMI
Tier1: GALILEO
BigData: PICO

Tier0: **MARCONI**
Tier1: GALILEO
BigData: PICO

Tier0: **MARCONI+**
Tier1: GALILEO
BigData: PICO

2016

1H 2016

2H 2016

High-end system, only for extremely scalable applications
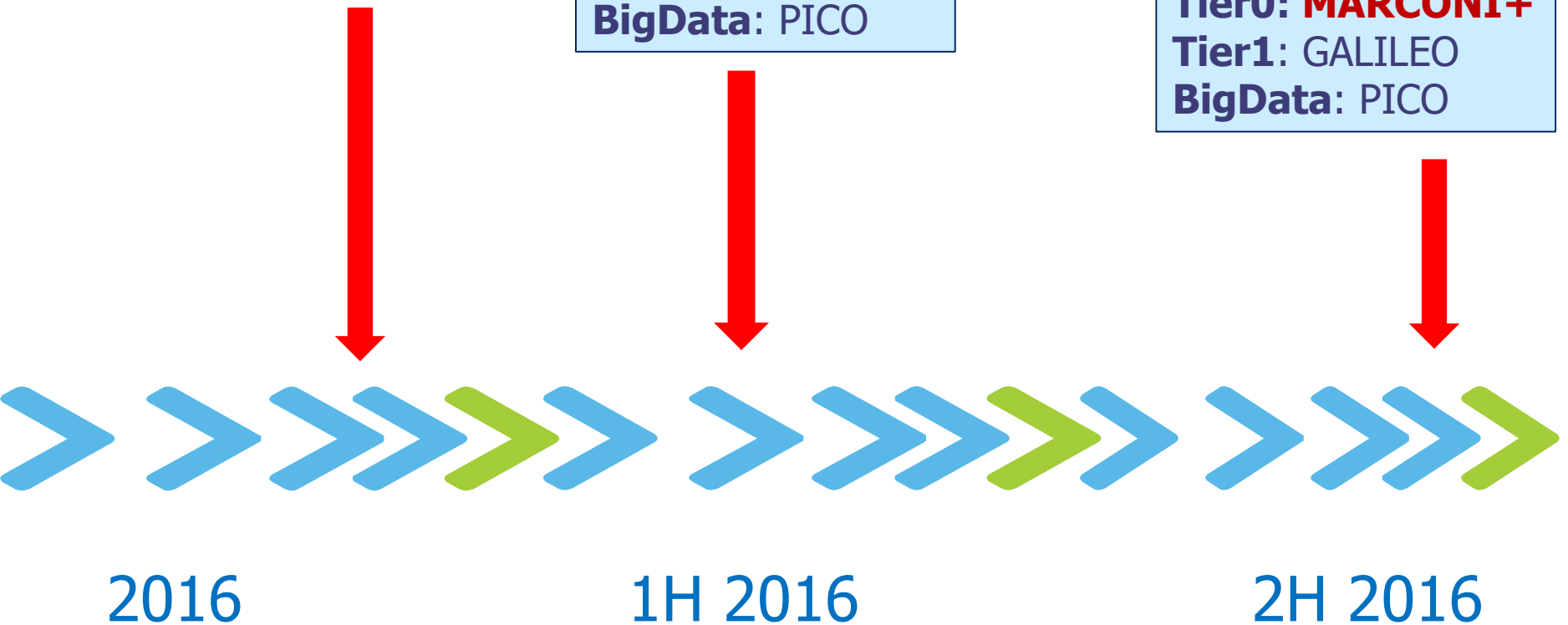
Name: Fermi
Architecture: BlueGene/Q (10 racks)
Processor type: IBM PowerA2 @1.6 GHz
Computing Nodes: 10.240
Each node: 16 cores and 16 GB of RAM
Computing Cores: 163.840
RAM: 1 GByte / core (163 TByte total)
Internal Network: 5D Torus
Disk Space: 2 PByte of scratch space
Peak Performance: 2 PFlop/s
Power Consumption: 820 kWatts

N. 12 in Top 500 rank (June 2013)

National and PRACE Tier-0 calls

X86 based system for production of medium scalability applications

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)

- National and PRACE Tier-1 calls

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)

TAPE

- 12PB → 16PB
- New hw: 10 drives shoud guarantee 2.5GBs troughput

DISKs

- 5PB distributed storage (GPFS) to be used across diffente platforms.
- Servers for Tiering and data migration

COMPUTE

- 70 nodes, 20 cores/each NeXtScale
- Intel Xeon E5-2600 v2 "Ivy Bridge"
- Mem: 128-512 GB/node
- 4 nodes BigInsight
- 40TB SSD disk
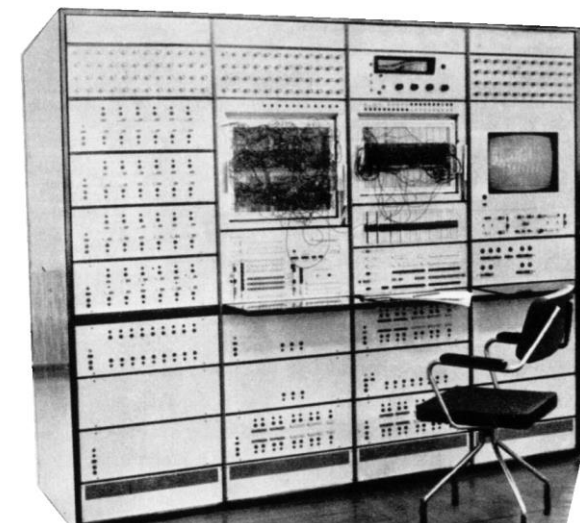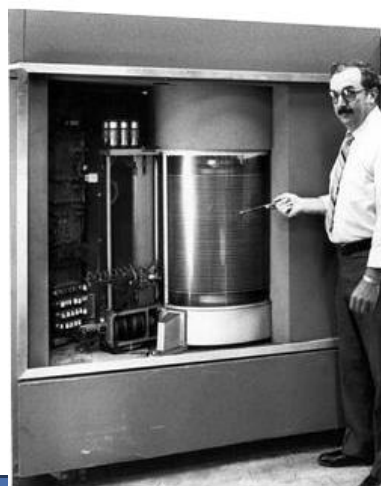
A new Supercomputer (codename: MARCONI) has been installed at CINECA, available for Italian and European research community

It is a Lenovo NeXtScale system based on Intel technology, with a final peak performance around 20PFlop/s. Deployment of Marconi is started July 2016, the complete delivery expected as July 2017. The first part (2 PFlop/s conventional "Broadwell" based) is in full production as July 2016.
The second part (11 Pflop/s meny-core "Knights landing" based) is in full production as January 2017. The third part (5PF conventional Skylake based) expected for july 2017

Guglielmo Marconi
Radio Pioneer

In total:

- 18 -20 PFs peak performance,
- 10 PB storage
- 3 MW di electric power

Technical data:

- Internal Network: Intel OmniPath
- Architecture: Lenovo NeXtScale
- A1: Broadwell 2x18 cores, 2.3 GHz; 1500 nodes 2 PFlops
- A2: KnightsLanding 68 cores, 1.4 GHz; 3600 nodes, 11 PFlops
- A3: SkyLake 2x20 cores, 2.3 GHz; 1500 nodes, 5 PFlops

CINECA
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Technical Features:

- Intel based
- Architecture: Lenovo NeXtScale
- Fabric: Intel OmniPath

A2
KNL 68cores, 1.4 GHz;
3600 nodes, 11 PFs

A3
 SKL 2x20 cores, 2.3 GHz;
1500 nodes, 5 (+2) PFs

A1
BRD 2x18 cores, 2.3GHz
1500 nodes, 2PFs

A1

Peak Perf.	Comp. Nodes	Socket	RAM/CN	Interconnect	Rack #
2PFs	1512	2x Intel Broadwell 18cores @2.3GHz	128 GB	Intel OmniPath 2:1 100Gb/s	21

Core tot: 54.432
Core-h/anno=476.824.320

A2

Peak Perf.	Comp. Nodes	Socket	RAM/CN	Interconnect	Rack #
11 PFs	3600	Intel KnightsLanding 68cores @1.4 GHz	96 GB	Intel OmniPath 2:1 100Gb/s	50

Core tot: 244.800
Core-h/anno=2.144.448.000

A3

Peak Perf.	Comp. Nodes	Socket	RAM/CN	Interconnect	Rack #
5PFs	1512	2x Intel SkyLake 20cores @2.3GHz	192 GB	Intel OmniPath 2:1 100Gb/s	21

Core tot: 60.480
Core-h/anno=529.804.800 (500 M core-h/y)