



CINECA supports ground-breaking scientific research with a state-of-the-art supercomputing solution



Overview

High-performance computing at CINECA in Italy enables scientists to transform data into new insight across disciplines including physics, chemistry, astronomy, medicine, and urban planning. To maintain the institution's status as a major global player in academic research, and to help teams conduct vital research in topics such as the human brain and precision medicine, CINECA decided to deploy its new supercomputing architecture, Marconi, rolled out in phases and expected to be completed in June 2017.

CINECA is a non-profit consortium that includes 70 Italian universities, four research institutions and the Italian Ministry of Education. Employing more than 700 people, CINECA is the largest Italian computing center and one of the most renowned worldwide. CINECA is also a founding partner of the Lenovo HPC Innovation Center that opened in Stuttgart, Germany, in March 2015.

Sanzio Bassini, HPC Director at CINECA, explains: "Our mission is to support the scientific and academic communities in their journey towards research, discovery and innovation. To achieve this, we provide state-of-the-art supercomputing solutions as well as highly sophisticated data processing and data management capabilities within our recently developed big data environment."

To meet constant demands from researchers for more advanced, scalable and energy-efficient solutions, CINECA decided to deploy a new supercomputing architecture.

Putting energy efficiency at the heart of the project

The project for a new supercomputer was sponsored and co-funded by the Italian National Institute for Nuclear Physics as well as several Italian universities. This demonstrates the wide scope and importance of the deployment on a national level.

"We started off the Marconi project with a very definite idea of what our 'ideal' solution would be – and Lenovo met all our requirements."

— **Sanzio Bassini**,
HPC Director,
CINECA



CINECA established four main criteria for the new high-performance computing environment; lower energy consumption and footprint, high-density computational capabilities, proven maturity and cost-efficiency. The organization issued a European public tender, and after reviewing multiple proposals chose the Lenovo offering.

Sanzio Bassini says: “The solution offered by Lenovo ticked all the boxes and provided great value – something that none of the competing brands could deliver.”

Powerful, state-of-the-art solutions

The latest project CINECA is steadily rolling out its new, Tier-0 system supercomputer, named Marconi. The supercomputer, co-designed by CINECA and Lenovo, is based on the Lenovo NeXtScale platform powered by the latest Intel® Xeon® E5 v4 family of processors, and is one of the biggest Intel Omni-Path Architecture – Intel’s high speed interconnect fabric – deployments to date. When fully deployed, Marconi is expected to feature 6,600 servers – 3,600 of which will use multi-core microprocessor technology – and reach a total computational power of about 50Pflop/s while keeping an eco-friendly footprint. This state-of-the-art technology will provide the scientific community with access to a technologically advanced, energy-efficient HPC solution.



CINECA's new Lenovo supercomputer, called “Marconi”. Photo credit: CINECA

While Marconi becomes fully operational, CINECA's second largest supercomputing environment, Galileo, continues to support valuable research for the European scientific community. It is based on 520 Lenovo NeXtScale System nx360 M5 servers, each with two eight-core Intel Xeon E5 v4 processors that provide an optimal combination of density, performance and efficiency. Some 380 of the 520 servers also include two Intel Xeon Phi™ Coprocessor 7120p cards that work synergistically with the standard Intel Xeon processors to enable dramatic performance gains for highly parallel code. The servers in this cluster are

Solution components

Hardware

Lenovo NeXtScale System nx360 M5 with Intel® Xeon® E5 family of processors
 Lenovo System x with Intel Xeon Phi™ 7250
 Lenovo System x GPFS Storage Server
 Lenovo Rear Door Heat eXchanger Intel Omni-Path Architecture

Software

CentOS 7
 IBM Spectrum Scale (GPFS)

Services

Lenovo Professional Services for system set-up, on-going and three-years' support

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interconnected using Intel® True Scale Fabric. In addition, the Lenovo NeXtScale System nx360 M5 servers feature the innovative Rear Door Heat eXchanger, which uses chilled water to cool individual server cabinets, helping to eliminate the recirculation of hot air in the data center – contributing to the solution’s small environmental and economic footprint.



View inside CINECA's data center. Photo credit: CINECA

With Lenovo servers at the heart of its supercomputers, CINECA supports the scientific community by enabling researchers from universities and from the Italian National Institute for Nuclear Physics to submit projects and reviews.

Modeling the brain

The new Marconi system will also be dedicated to big data. By accessing data on a multi-tier storage architecture – based on IBM Spectrum Scale (General Parallel File System, GPFS) and Linear Tape File System (LTFS) – the system will support efficient data access and migration within this landscape, which processes data and interoperates with the supercomputer.

The core big data project is the Human Brain Project. Developed by CINECA, this software is able to align 2D photonic imaging of a mouse brain to represent the 3D brain image. CINECA's aim within this project is to deliver an ultra-powerful supercomputing environment that will help researchers to model the human brain in unprecedented detail.

Advanced technology to advance innovation

Thanks to the Lenovo solutions, CINECA is well positioned to keep supporting the scientific community with best-of-breed technology, fostering progress, discovery and innovation. For example, one of the most cutting-edge projects supported by Marconi is Human Technopole.

“The price-performance and energy efficiency offered by Lenovo will enable CINECA’s new Marconi system cluster to expand its support to innovative research projects, meeting the requirements of public and private researchers alike across Italy and Europe.”

– **Sanzio Bassini**,
HPC Director,
CINECA



Sanzio Bassini states: “Together with Human Brain, Human Technopole is one of our current flagship projects. Using Marconi as an open-access tool, scientists across Europe will be able to carry out innovative research on precision medicine, which integrates bioinformatics, system biology and life sciences. This is a significant step forward for global medical research, and we are proud to be the first institution to promote it.

“We started off the Marconi project with a very definite idea of what our ‘ideal’ solution would be – and Lenovo met all our requirements. We are especially pleased with the energy-efficiency and the cost-effectiveness of the Lenovo solution, which were key differentiators during the public tender. These, in fact, will enable CINECA’s Marconi and Galileo systems to expand their support to innovation in an environmentally conscious and economically affordable way, while meeting the ever-growing requirements of public and private researchers alike.”

He concludes: “Thanks to the expert and trusted partnership with Lenovo and with the project’s funders, we were able to implement just the right type of architecture to suit our needs. This is strengthening our expertise, reputation and capabilities, positioning CINECA as one of the most advanced and renowned supercomputing institutions in the world.”

For more information

To learn more about Lenovo Data Center Systems solutions, contact your Lenovo Sales Representative or Lenovo Business Partner, or visit: lenovo.com/systems

For more information about CINECA, visit: www.cineca.it/en



Close up of Lenovo NeXtScale System M5.

Photo credit: CINECA



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