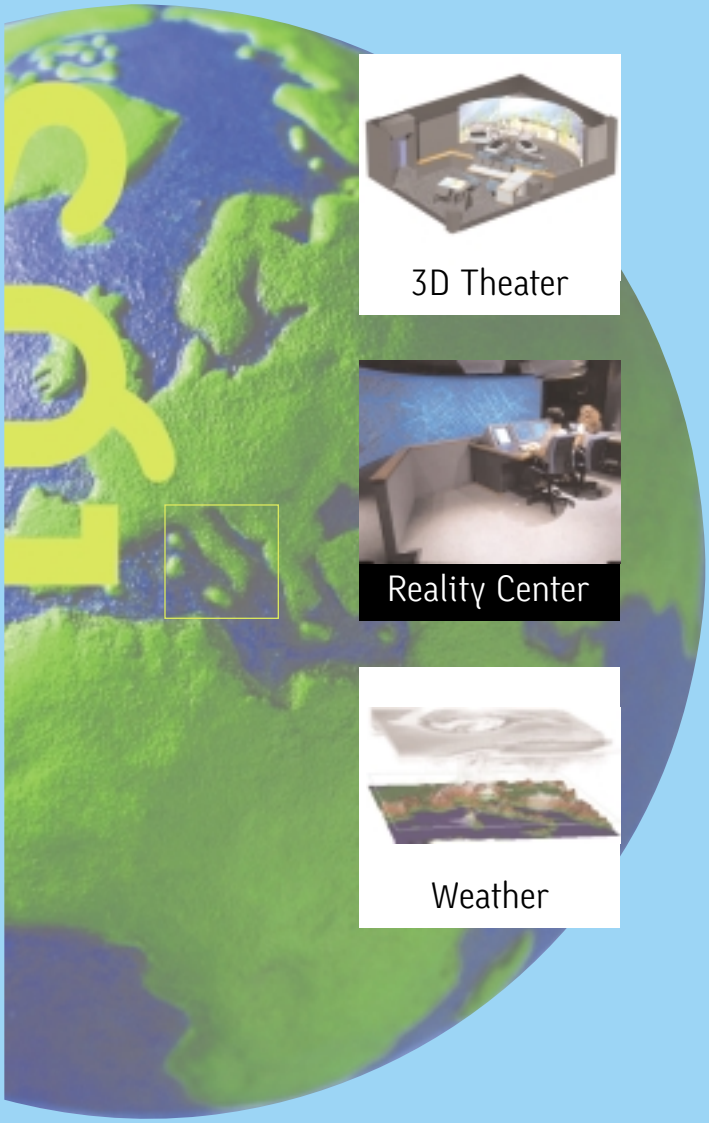
Success Story

"Cineca is at the cutting edge of applied computing and visualization in scientific research in Italy."

—Marco Lanzarini, Director, Cineca

New Horizons for Scientists

Cineca of Bologna Uses SGI™ Technology in Its Virtual Theater



3D Theater

Reality Center

Weather

In 1969 the Universities of Bologna, Florence, and Padua pooled resources to set up Cineca, a computing center designed to service the research faculties in all three universities. Cineca immediately became the biggest computing center in Italy and has developed from there. Its current processing capacity of 300 billion operations per second makes it one of the 10 most important centers in Europe and puts it in the top 50 worldwide. The consortium now includes 15 universities and the center employs 160 full-time researchers.

Cineca's corporate mission is to provide Italian researchers with state-of-the-art computing tools enabling research results to be displayed using cutting-edge graphic technologies. Of course, the computing requirements of corporate and individual researchers who work within Cineca or use its services have changed over the past 30 years, along with the available technology. As data output increased, the near impossibility of interpreting hundreds of pages of results created the need to display the results in graphic form. The 1970s saw the advent of the first two-dimensional plotters, which could display results in the form of static graphs on paper. Gradually, more powerful and sophisticated equipment became available, and now graphics technology has improved to the point where we can use immersive three-dimensional graphic applications and virtual reality to visualize data.

"Cineca is at the cutting edge of applied computing and visualization in scientific research in Italy," stated Marco Lanzarini, Cineca's director. "We use immersive techniques in the applied research conducted in our center to improve our understanding of certain dynamics. In the long run this technique will improve our quality of life, both in terms of our physical health and our ability to make the most of the environment we live in."

Cineca's newest venture is a sophisticated SGI™ Reality Center™ facility, which applies the center's computing potential to three basic areas: technical and scientific visualization, culture, and environmental impact.

Scientific visualization accounts for the lion's share of Cineca's research work, with applications in fields as diverse as pharmacology, meteorology, engineering, and medicine. The Reality Center facility, for example, can be used to create animated three-dimensional models of complex concepts such as the dynamics involved when a drug's active ingredient bonds with a protein—a particularly useful resource in the fast-moving field of pharmaceutical research.

Cineca is also examining new applications, including potential applications of virtual reality in the field of surgery. Possible uses include the simulation of surgical interventions or medical teaching applications. Three-dimensional visualization is also very useful when assessing environmental impact as part of town-planning studies because of the very precise assessment that the technique allows. Possible uses of this include the reclassification of derelict areas as well as the recovery and preservation of major archaeological assets such as the town of Pompei.

Features of the System
The heart of Cineca's Reality Center facility is its graphics engine, which consists of a Silicon Graphics® Onyx2® InfiniteReality2™ supercomputer. This platform can be linked to up to 12 channels to enable different options requiring different levels of flexibility and graphics power.

The Onyx2 graphics supercomputer is configured with eight processors, 4GB of memory, three InfiniteReality2 graphics pipelines with a total of eight Raster Managers, and more than 200GB of disk space. The Reality Center facility is equipped with a 155-degree cylindrical screen served by three Barco® projectors and a built-in switching system.

"We opted for SGI technology because it represents the state of the art as far as intensive computing and advanced graphics are concerned," stated Sanzio Bassini, manager of Cineca's high-performance system sector. "The SGI computers are so powerful and their applications are so flexible that we can create very complex, multifaceted mathematical models to simulate the effects analyzed by our researchers." Cineca's Reality Center facility opens up new research horizons and provides a fertile training ground for the new skills that will be required as advanced visualization technologies become more widely used.

SGI Professional Services
SGI Professional Services has tremendous experience installing and integrating Reality Center facilities. SGI Professional Services can not only provide the consulting needed in numerous related disciplines, but also handle all of the project management.

The domain of expertise includes the following aspects:
- Strategy workshop for identifying areas or workflows that can be improved by the use of immersive solutions
- Determination of requirements for the process integration of immersive solutions
- ROI analysis, design for multiusage
- Identification of scope of application deliverables
- Facilities assessment regarding all boundary conditions
- Draft selection and design of the system, software, hardware, and all other components
- Training and operational scope
- Proposal generation and customer presentation
- Software application design
- Creation, porting, or modification of applications
- Conversion of software to multipipe model (e.g., make it immersive solution–ready)
- Performance tuning
- Data conversion/preparation or creation of batch tools for conversion
- Execution against software-specific deliverables and software testing
- Software installation and setup
- Training and postinstallation consulting

At Cineca, many of those capabilities have been effectively deployed, such as the initial immersive environment awareness presentations, the site planning and layout advice, the handling of technical contractors, the configuration and implementation of the graphics supercomputer layout and the switching system, advice on the audio system requirements, the programming toolkits, user training, and numerous other aspects.

And the result is there, operational since November 1999. The range of applications implemented is impressive and reflects the academic and research nature of Cineca's environment. Actual research activities are as diverse as galaxy collisions and interaction, molecular modeling, architectural reconstruction, Adriatic sea depth and structure analysis, historical city reconstruction, 3D orthopedic prosthesis analysis, ancient Egyptian mummy reconstruction, atmospheric analysis, manufacturing design, image analysis, and more.

SGI provides a broad range of high-performance computing and advanced graphics solutions that enable customers to understand and conquer their toughest computing problems. Visit *www.sgi.com* to learn more.

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