

A Star is Born: Gran Telescopio Canarias (GTC)

VxWorks Powers One of the World's Most Powerful Telescopes

To provide scientists with fresh answers to age-old questions about space, a collaboration of scientific and academic organizations launched the Gran Telescopio Canarias (GTC) project in 1996. The project aims to develop the largest telescope in the world—one that will enable scientists to view the furthest and palest cosmic bodies in the universe. The telescope, located on the island of La Palma in the Canary Islands, is expected to be fully operative by mid-2008.

The GTC has a primary mirror, or lens, that is approximately 34 feet in diameter. The telescope's total measurements are approximately 89 feet high by 43 feet wide. In comparison, the world-famous Hubble Space Telescope's primary lens is approximately 8 feet in diameter.

The telescope's computerized onboard system is extremely sophisticated. The GTC is controlled by a high-capacity, high-performance IT architecture called the GTC Control System (GCS). A set of subsystems, physically distributed throughout the GTC, controls functions and compensates for the adverse effects of variables such as wind, temperature, hygrometry, distortion of parts, and vibration. A network of interconnected equipment, such as computers and sensors, supervises these subsystems and provides a homogenous user interface.

"After considering several alternatives, we chose Wind River's VxWorks because we needed a sufficiently stable and high-performance real-time operating system so that we were free to concentrate on developing applications."

— Martí Pi i Puig, Head of the Control Group, GTC Project

Gran Telescopio Canarias (GTC)

Industry

Aerospace

Solutions

Wind River General Purpose Platform, VxWorks Editions

Benefits

- High-performance, reliable real-time operating system (RTOS)
- Less time spent configuring the operating system and solving problems
- More time spent focusing on core application development

Because the telescope uses diverse equipment and instruments, the GTC's software architecture must be open, flexible, and object-oriented. The telescope's software architecture consists of a set of highly integrated systems, distributed via networks and organized as a layered architecture. This architecture provides scientists, regardless of their location, with access to different distributed services.

The GCS operates in real time, with a hierarchy of control layers and inter-processor communications. As is often the case in research fields, real-time guarantees are required in the communication networks, operating systems, and underlying middleware components, in order to satisfy quality of service requirements.

The end result is distributed middleware that provides a "plug-and-play" skeleton onto which the GTC's different software components are connected. This architecture provides a homogeneous environment, reducing the time and cost of development.

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FOCUSING IN ON VXWORKS

When the collaboration began searching for an operating system that would support the telescope's stringent requirements, it did not take long to focus in on the VxWorks® platform from Wind River®.

"Many of the GTC's subsystems — such as motors, encoders, sensors, and cameras — require supervision on a material level and real-time results. But traditional operating systems did not meet the requirements we had identified for our onboard computers," explains Martí Pi i Puig, head of the Control Group, responsible for designing, deploying, and supervising GTC's material and software infrastructure. "After considering several alternatives, we

chose VxWorks because we needed a sufficiently stable and high-performance real-time operating system so that we were free to concentrate on developing applications."

Choosing VxWorks also meant the project could use VMEbus equipment and Motorola motherboards, which were poorly supported by other environments. Another convincing selling point was the fact that the GCS uses the distributed object management standard CORBA, which is soundly integrated in VxWorks.

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A JOINT UNDERTAKING

This project is a joint undertaking of the Canary Islands Institute of Astrophysics, the Institute of Astronomy at the National Autonomous University of Mexico, the Mexican National Institute for Astrophysics, Optics and Electronics, and the Astronomy Department of the University of Florida.

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