NASA Human Exploration Telerobotics (HET)

ROBUST CONNECTIVITY SOFTWARE SUPPORTS HUMAN-TO-ROBOT COMMUNICATION BETWEEN LAND AND SPACE

"NASA relies on the Connext DDS solution because of its ability to tolerate time delay and loss of signal that can occur with signals bouncing between the space station, satellites and land-based devices."

Stan Schneider
CEO, RTI

HIGHLIGHTS

- NASA's goal with the HET project is to take repetitive, dangerous or long-duration tasks out of human hands and replace them with robots to increase both safety and scientific ROI.

- Connext DDS met NASA's advanced connectivity requirements for signals sent between the vast distances separating the space station, satellites and land- based devices.

EXPLORING THE USE OF TELEROBOTICS

The National Aeronautics and Space Administration (NASA) pioneers developments in aerospace exploration and research to benefit both space and domestic technology.

Led by a team at the Ames Research Center in Moffett Field, California, the NASA Human Exploration Telerobotics (HET) project is focused on improving NASA's ability to remotely control a variety of robotic arms, rovers and other devices. The project's goal is to take routine, highly repetitive, dangerous or long-duration tasks out of human hands and improve the way humans live and work in space.

The HET project is testing robots remotely operated by controllers on the ground and by astronauts in space. Using robotics, researchers hope to coordinate human and robot activities more effectively to maximize crew safety, mission success and scientific return on investment.

CHALLENGE

NASA was looking for a software architecture and communications infrastructure that enabled reliable, standards-based messaging between the International Space Station and Earth. They would eventually support communications between spacecraft and other planet surfaces. Challenges of working in space include time delays, intermittent connectivity, packet loss and a rugged production environment.

Despite variations in purpose, technology and design, all HET robots are equipped for both high-speed (local) and low-bandwidth delayed (satellite) communications. Terry Fong, director of the Intelligent Robotics Group at NASA Ames, evaluated the communications requirements early in the project.

The problem was finding a common, flexible, interoperable data communications interface that would readily integrate across each robot's disparate applications and operating systems. A common architecture was mandatory and standardization was also important.

SOLUTION

In 2008, NASA identified the Object Management Group (OMG) Data Distribution Service (DDS) for Real-Time Systems — a widely recognized standard — for use as robotic middleware. DDS offers flexible parameters that support a common data interface and enables integration across systems.

For the last six years, Fong's team has leveraged RTI Connext™ DDS software for its flexible service parameters and durability.

For the HET project, NASA relies on the Connext DDS solution because of its inherent tolerance of time delay and loss of signal that occurs with signals sent between the vast distances separating the space station, satellites and land-based devices.

As part of the telerobotics project, NASA Ames used RTI Connext DDS to test how astronauts on the space station could remotely operate planetary rovers.

BENEFITS

NASA Ames was one of the first RTI customers in the early 1990s. The agency has continued to use RTI Connext DDS in other projects over the last 20 years.

In addition to meeting the needs of demanding, mission-critical applications with data-centric messaging, NASA also takes advantage of loosely coupled integration that significantly reduces long-term software maintenance effort and costs.

ABOUT RTI

Real-Time Innovations (RTI) is the largest software framework provider for smart machines and real-world systems. The company's RTI Connext® product enables intelligent architecture by sharing information in real time, making large applications work together as one.

With over 1,500 deployments, RTI software runs the largest power plants in North America, connects perception to control in vehicles, coordinates combat management on US Navy ships, drives a new generation of medical robotics, controls hyperloop and flying cars, and provides 24/7 medical intelligence for hospital patients and emergency victims.

RTI is the best in the world at connecting intelligent, distributed systems. These systems improve medical care, make our roads safer, improve energy use, and protect our freedom.

RTI is the leading vendor of products compliant with the Object Management Group® (OMG) Data Distribution Service™ (DDS) standard. RTI is privately held and headquartered in Sunnyvale, California with regional headquarters in Spain and Singapore.
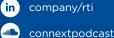
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Working as one.**

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