DATASHEET

RTI in Robotics

RTI CONNEXT DDS IS THE DATA CONNECTIVITY FRAMEWORK ENABLING PRODUCTION-GRADE ROBOTIC SYSTEMS TO WORK AS A SINGLE INTEGRATED SOLUTION FROM EDGE TO CLOUD

HIGHLIGHTS

Safe, secure platform with proven data-centric connectivity and real-time performance

Robust self-forming and self-healing resilient systems with no single point of failure

Extremely low latency with real-time Quality of Service (QoS)

Fast local control loop with reliable operation over harsh and unpredictable conditions

Extensive developer and debugging tools that compliment ROS assets

Migratory pathway from original ROS and direct integration with ROS2

RTI Connext® DDS seamlessly integrates robotic subsystems to process, analyze and act on high-volume, real-time data with low latency in a redundant, fault-tolerant architecture. As the only framework that can meet both safety certification and security requirements of connected robotics, it enables autonomy and decentralized control from cloud to edge and can evolve to meet tomorrow's requirements.

DEVELOP AND RUN HIGH-PERFORMANCE, HIGH-PRECISION ROBOTICS

Robotics and haptic systems are complex machines of interconnected autonomous, semi-autonomous and/or human controlled modules which often operate in harsh and unpredictable conditions. Terabytes of streaming data need to be processed in real-time for safe, effective operation. Compounding the communication challenges, a human operator often needs to control the robots across very large distances and over unreliable network transports.

Proven in robotic operations from the ocean floor to outer space, RTI Connext DDS is the connectivity platform to develop and run next-generation, high-precision robotics. It integrates a wide range of demanding robotic system requirements in one real-time data connectivity framework. Robotic and haptic systems built on Connext DDS are resilient, self-forming and self-healing with no single point of failure. Built-in security based on the proven DDS Security standard provides for confidentiality, authentication, non-repudiation and access control, keeping robots safe from security breaches.

Solving the challenges of complex, cooperative, and autonomous robotics systems, Connext DDS helps to:

- Scale the system with decentralized peer-to-peer communication and data-centric architectures
- Secure the network with a fine-grained security architecture that is transparent to application software, making it easy to develop, deploy and maintain
- Establish reliable communication over multiple physical networks and transport protocols, including intermittent and wireless channels
- Achieve physics-speed real-time response with low-latency and high-bandwidth performance that is tunable using extensive Quality of Service (QoS) settings
- Create modular architectures that support multiple nodes, multiple development teams, and future expansion of the system with a data-centric DDS compliant databus

FROM HUMAN CONTROLLED TO FULLY AUTONOMOUS

Connext DDS is used to connect and run interconnected human controlled, collaborative and fully-autonomous robotic systems. Its databus seamlessly distributes data in motion, allowing robotic subsystems to work as a single integrated solution – reliably, securely and in real time.

PERSISTENT CONNECTIVITY WITH REAL-TIME QOS

Robotic systems often operate in remote locations. Connext DDS delivers low latency with high throughput through real-time QoS, eliminating system bottlenecks and ensuring optimal performance even with fluctuating operating conditions. It offers reliable systems operation over low-bandwidth communication links with long transmission delays. Systems are self-forming and self-healing with no single point of failure.

Connext DDS runs across high-speed networks, Wi-Fi, radio and/or satellite links and provides tools to fine-tune the deployment for specific networking environments. Human operators remotely control motion and behavior to large teams of remote robots over very large distances, through unreliable network transports. The RTI Routing Service provides bridging between different network domains and technologies with zero programming. Connext DDS includes a Persistence Service that maintains system-critical configuration data on disk in the event of network disruptions.

ROS INTEGRATION AND MIGRATION PATHWAY

RTI offers a natural migration path from ROS-based systems to architectures that use RTI Connext DDS, either natively or with production-ready connectivity to a ROS2 architecture. Developers can integrate the original ROS ecosystem of drivers, applications and tools with production track development in native-DDS systems. By moving directly to the DDS platform, users gain optimized performance, fine-grained QoS control, world-class security and data modelling; simplified architecture and API layers; and standards-based interfaces.

CONNEXT DDS IN ACTION

Enabling human-to-robot communication in outer space

NASA's Human Exploration Telerobotics (HET) project takes routine, highly repetitive, dangerous or long-duration tasks out of human hands and improves the way humans live and work in space. NASA relies on Connext DDS because of its inherent tolerance of time delay and loss of signal that occur with signals sent across the vast distances separating the space station, satellites and land-based devices. The space program uses Connext DDS to test how astronauts on the International Space Station could remotely operate planetary rovers.

Transforming robotic surgery

Operating on a beating heart requires a surgeon to perceive a static view of the heart in order to have better control over precise cuts and stitches. It also requires a haptic feedback loop that connects the surgeon's touch – the most important of surgeons' skills – to remote surgical instruments. MIRO Lab uses Connext DDS in an innovative minimally invasive robotic surgery (MIRS) system to connect three robots, an endoscope, a surgeon's robot controllers and user interfaces for the surgeon and technician. The deterministic solution functions at rates between 1KHz and 3KHz, thus enabling the development of the distributed haptic closed control loop. It gives surgeons the necessary hand-eye capabilities and the "feel" needed to operate remotely.

Operating in the world's most difficult environments

FMC Technologies Schilling Robotics manufactures rugged remotely-operated vehicles and manipulator arms. The systems operate in harsh environments, from the crushing pressure of the ocean floor to the high radiation of nuclear reactors. Any fault in these systems can result in a very expensive equipment loss. Schilling relies on Connext DDS for tying together distributed computing architectures via a common connectivity API across a wide variety of processors and operating systems. It eliminates low-level network programming and enables the addition of new components without modifying existing ones.

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.

Download a free 30-day trial of the latest, fully-functional Connext DDS software today: https://www.rti.com/downloads.

Your systems. Working as one.

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