

DATASHEET

# RTI Connex Product Suite

PROVEN SOFTWARE ARCHITECTURE FOR CONNECTING  
SMART MACHINES AND REAL-WORLD SYSTEMS

## CONNEXT ENABLES:

- Robust, secure and highly-performant connected systems
- Rapid data sharing between devices and from edge to cloud
- Modular and flexible systems that evolve with requirements
- Lower total costs across the complete product life cycle
- Faster time to market by providing powerful, field-proven architecture

RTI Connex<sup>®</sup> is the world's leading software infrastructure for intelligent distributed systems. Uniquely, Connex users can build systems that combine advanced sensing, fast control, and AI algorithms. It delivers the low-latency, high reliability, scalability and security needed for mission-critical applications. Connex provides a proven, integrated solution that lowers the total cost of ownership, enables a sharper focus on applications and speeds time to market.

Real-Time Innovations (RTI) is the infrastructure software company for smart-world systems. Its flagship offering is RTI Connex, a product suite that enables hundreds of applications to securely share information in real-time and work as one integrated system.

Built on the Data Distribution Service (DDS<sup>™</sup>) standard, Connex provides the non-stop availability, reliability and low latency that is essential for robust, real-time systems, while significantly reducing development, integration and maintenance costs. RTI Connex Tools, product support and consulting services can significantly reduce the time required to design, develop and test DDS-compliant applications. The completeness of the offerings are just one of the reasons why Connex software is the choice for demanding distributed systems, including autonomous vehicles, aerospace & defense, healthcare, energy systems, industrial automation, transportation and more.

Critical systems that cannot tolerate even short down times, require millisecond-speed response or coordinate complex team-written software, rely on a robust framework. For systems

that depend on real-time reliability, customers trust RTI to deliver. RTI has decades of experience supporting hundreds of deployed applications and hands-on expertise with more than 2,000 critical distributed systems.

## RTI CONNEXT: A DATA-CENTRIC SOLUTION FOR RELIABLE, SECURE AND SCALABLE COMMUNICATIONS

Connex provides a comprehensive software library, a suite of development and monitoring tools and many infrastructure services. It integrates with a wide variety of third-party applications, operating systems and toolchains. It supports over 100 platforms and 12 transports, connecting them all transparently. Connex provides the data-centric foundation needed to support critical applications and connect systems, with the ability to optimize data flow in the network to achieve the desired connections and performance. The value of this unique data-centric approach is described in the following pages.

**Achieve Optimal Performance and Productivity at Scale**

Connex provides unmatched performance, whether measured in terms of latency, throughput or real-time determinism. All of this can be achieved by tuning parameters within the Quality of Service (QoS) configuration. The ability to filter data allows Connex to optimize bandwidth utilization and only deliver the data of interest to each application within a complex system. With a peer-to-peer architecture, Connex does not use brokers or servers, and messages flow directly from publishers to subscribers with minimal overhead. All of the functionality of a broker, including discovery, routing and naming, is handled in a light-weight, fully-distributed, reliable approach behind the scenes, requiring no special server software or hardware.

**Develop Safety Certified Systems**

For teams developing safety-critical applications, RTI can meet the stringent requirements of various safety standards through certified software, certification evidence and architecting services. Partnering with RTI to build modular, standards-based safety certified systems significantly reduces the cost of initial safety development and subsequent system re-certifications.

**RAPID DATA SHARING BETWEEN DEVICES AND FROM EDGE TO CLOUD**

**Rapidly Connect Applications**

Connex speeds integration with its ability to rapidly connect any number of applications from just a few to hundreds of thousands. Applications and devices automatically discover each other and then communicate in a fully distributed, peer-to-peer architecture. No message brokers or servers are required, so there are no single-points-of-failure, no decisions about where to host servers, and no performance bottlenecks.

Since applications interface only with the shared data, they are loosely coupled without unwanted dependencies. Changes in the network such as new participants, flow rates or software versions do not impact running subsystems. The software understands the data, so it can filter to deliver only what is needed, automatically transform data between platforms and operating systems, and compress and optimize data flow.

**Seamlessly Integrate Communications**

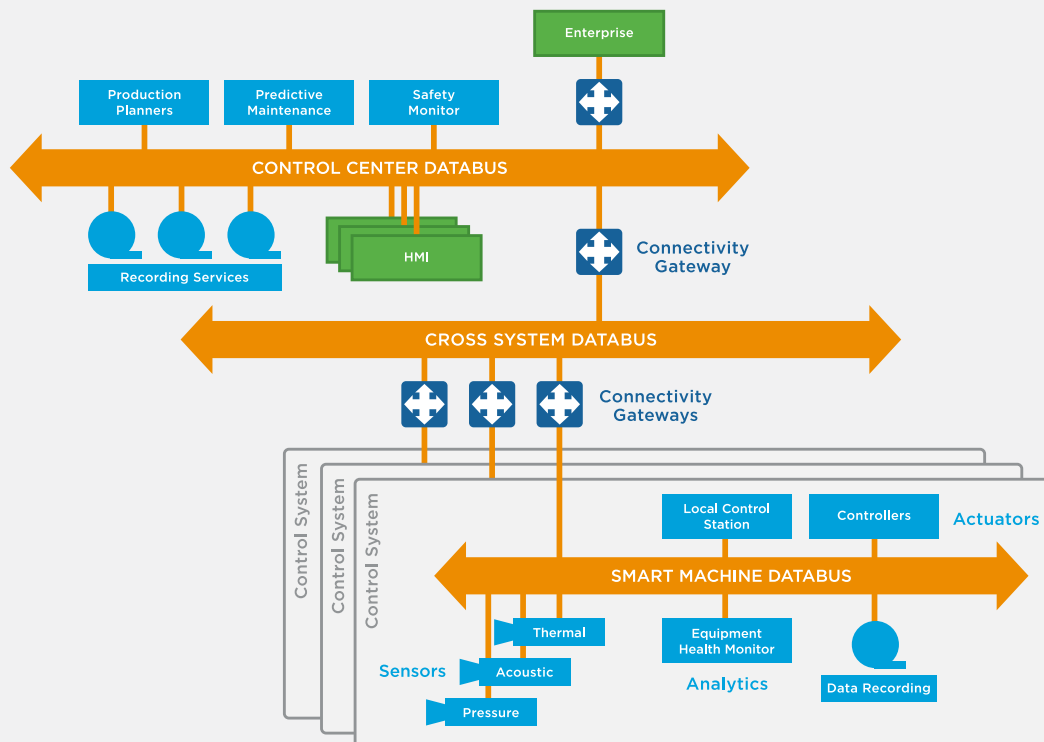
Connex also enables users to deploy applications across a diverse set of complex and demanding system architectures. It offers support for modular software infrastructure that efficiently distributes data and control signals from edge to cloud. Connex allows ease of interoperability of new systems with legacy systems.

Additional modular infrastructure services, such as RTI Routing Service and RTI Recording Service, can be layered on top of the core connectivity framework and utilized by various applications to enable high performance, distributed and secure peer-to-peer hierarchical architectures (described below) for large systems of systems. Connex provides mechanisms to integrate legacy technologies, bridge to different domains and enable pervasive interoperability. Connex interoperates with leading third-party visualization, test and code generation tools.

**MODULAR AND FLEXIBLE SYSTEMS THAT EVOLVE WITH REQUIREMENTS**

**Create a Scalable Distributed System with a Layered Databus Architecture**

Connex interconnects systems with a data-centric databus, which makes all system data virtually appear in the memory of every algorithm and device. This design enables fast data access without unwanted coupling and dependencies.



Connex in action: An example of a layered databus architecture to enable modularity at scale

As systems grow, they must separate into modular subsystems to isolate changes between components, reduce coupling and ease team coordination. RTI Routing Service is an intelligent gateway that interconnects subsystems into a hierarchical design known as the layered databus architecture. Features of a layered databus architecture include:

- Automatic data and application discovery within and between layered databuses
- Scalable integration, encompassing hundreds of thousands of devices and applications
- Natural redundancy, allowing for extreme availability and fault tolerance
- Hierarchical subsystem isolation, enabling modular development of complex systems

#### Develop Once and Keep Using it as Requirements Evolve

Connext provides a flexible framework for communications by utilizing open DDS standards from the Object Management Group® (OMG®). The DDS-based databus approach enables applications to exchange data regardless of where they are located on a network. Connext protects the integrity and reliability of communications over non-deterministic or intermittently available networks and allows transparent mobility of edge nodes across different types of networks. Components of a solution that are initially deployed at the edge can be moved to the cloud, and vice versa, without rewriting the application or rearchitecting the data sharing or communications mechanisms in the system.

#### FASTER TIME TO MARKET AS SOLUTIONS ARE BUILT ON A PROVEN FRAMEWORK

Proven technology, efficient tools and decades of experience combine to outpace the development of homegrown connectivity frameworks.

#### Faster time to Market with Mature, Field-tested and Robust Connectivity Framework

Connext offers a thoroughly-tested, standards-based technology that has a proven track record for excellence. RTI brings two decades of cumulative expertise to enable smart

connectivity and has applied this extensive experience to every RTI product. Connext provides a rich set of high-performance, built-in networking features — often applied without having to write a single line of additional code. RTI technology has been used to build the foundation of many critical, complex distributed systems over the past 25 years. Today, Connext is an integral part of mission-critical, real-world systems in aerospace and defense; in complex medical robotics, imaging, and monitoring; and in more than 250 autonomous vehicle projects.

#### LOWER TOTAL COSTS ACROSS THE COMPLETE PRODUCT LIFECYCLE

When it comes to building the right system, some companies decide to code from scratch. But why reinvent the wheel?

#### Proven Connectivity Lowers Risk and Costs

The initial cost of a custom design may seem tempting, but as engineers know, a well-proven, robust architecture can take years to evolve. Sometimes application projects begin with minimal connectivity requirements. However, as the project progresses or as new requirements are added, additional functionality and capabilities are needed from the communications layer. This can add unplanned costs to both development and maintenance. A field-tested, widely-used design assures the best performance and functionality that will scale with the distributed application as it matures. Proven connectivity helps avoid the risk and opportunity costs of going down the wrong path.

#### Simplify the Complete Product Lifecycle

Connext can be utilized throughout the project lifecycle — from proof-of-concept or prototype, through deployment at scale. Users can quickly prototype and develop distributed systems on complex network topologies using built-in configuration profiles and graphical development and debugging tools. Extensive support for common programming languages and operating environments further reduce dependence on a specific software stack to avoid vendor lock-in. Applications built with Connext will meet current requirements and are less likely to require changes at the communications layer as future requirements arise. Languages, platforms, scalability, security and safety are built into Connext, while access to deep and broad expertise in intelligent systems is readily available through the RTI Professional Services team.

#### RTI OFFERS A FULL SUITE OF PRODUCTS AND SERVICES TO GET YOUR COMPLEX SYSTEMS RUNNING FROM PROTOTYPE TO PRODUCTION.

[Connext Professional](#) for complex systems development

[Connext Drive](#) for autonomous vehicle development

[Connext TSS](#) for FACE-compliant avionics systems

[Connext Micro](#) for resource-constrained applications

[Connext Cert](#) for safety-certified systems

[RTI Security Extensions](#) for system integrity

[RTI WAN and Cloud Discovery Service](#) for seamless communication between edge and cloud

[RTI Connext Tools](#) to accelerate system development

[RTI Labs](#) for early access to experimental software

[RTI Professional Services](#) and Customer Success for support throughout the project lifecycle

**CONNEXT IN ACTION**

Connex provides the software connectivity framework for some of the most innovative companies in the world. With over 2,000 deployments, RTI software runs over 250 autonomous vehicle programs, supports dozens of automotive ADAS and software-defined architectures, controls the largest power plants in North America, integrates over 400 major defense programs, drives a new generation of MedTech systems and robotics, and underlies Canada’s air traffic control and NASA’s launch control systems. The following use cases are examples of critical applications built on Connex:

**AUTOMOTIVE**

Aptiv Autonomous Mobility is a global technology company that develops safer, greener and more connected solutions enabling the future of mobility. Aptiv selected RTI’s connectivity framework to provide secure, in-vehicle communication for its autonomous vehicles.

**SPACE EXPLORATION**

RTI Connex provides NASA’s Kennedy Space Center with the communications software that is a critical core component of the launch-certified Spacecraft Command and Control System (SCCS) for NASA’s Artemis 1 Mission. Connex is also used in the launch infrastructure — Exploration Ground Systems — to develop and operate the systems necessary to launch rockets and spacecraft.

**AEROSPACE & DEFENSE**

The U.S. Navy’s Ship Self Defense System (SSDS) provides the “last line of defense” by coordinating high-speed radar systems, targeting defensive missiles and directing 1,000+ rounds/second at incoming cruise missiles. Connex fuels SSDS functionality by delivering critical system data in real-time, which serves to enhance situational awareness and protect warfighters in action.

**ENERGY SYSTEMS**

Connex is the trusted connectivity framework that controls the largest power plant in North America, the 6.8-gigawatt Grand Coulee Dam. Connex satisfies this highly-critical system’s requirements for extreme availability, wide area communications, multi-level routing, heightened security and support for over 300,000 data points, enabling the fastest-responding major power source on the Western Grid to operate 24x7.

**HEALTHCARE**

General Electric (GE) Healthcare is combining AI with advanced Clinical Decision Support (CDS) to improve patient outcomes, reduce errors and lower costs. Connex is being used to connect hundreds of device types, support 1,000+ patients in a hospital and connect 200,000+ devices over wired and wireless connections to a critical system that needs to support 100% uptime.

**ROBOTICS**

The European Space Agency (ESA) uses Connex for communication and video to demonstrate long-distance haptic object control from aboard the International Space Station (ISS). Connex enabled developers to manage complex communications from ISS to an earthbound exploration robot, while operating the robot’s gripper via remote control to work with the precision and dexterity of a human hand.

**MODELING, SIMULATION & TRAINING**

The Reconfigurable Virtual Collective Training System (RVCTS) incorporates the latest mixed reality technology to deliver the highest immersive fidelity of any collective training system. By leveraging Connex in their RVCTS, Kratos can ensure reliable backend communication among hardware and software real-time systems. Kratos’ RVCTS has subsequently been deployed under real-world conditions as the UH-IMP-AVET Mixed Reality trainer.



To manage complex communications on land, by air, underwater and in outer space, these organizations rely on RTI Connex

## WHEN IS CONNEXT THE RIGHT FIT?

Take the short quiz to determine if Connex is right for your project. If the answer is “yes” to one or more of the following questions, Connex would be an optimal connectivity framework for your distributed system:

### Is it a big problem if your system goes down for a short time?

For systems that can't afford to be down for even a second, high-reliability is a critical consideration. Because Connex does not require servers, there is no single point of failure between peer applications and no requirement to wait for a server reboot before re-establishing a connection to a restarted application. It supports several transports to optimize reconnections and data access, including systems where edge nodes cross network boundaries or need to communicate large data quickly and securely. Connex also has features to help you build redundancy into your system, making it resilient to component failures.

### Are milliseconds important in your communications?

Connex provides full control over how data flows. It can enable information to be sent directly between peers, achieving data delivery with extremely low latency that can be measured in milliseconds or microseconds. Connex can use multicast intelligently to deliver data to multiple subscribers using minimal network bandwidth, while efficiently meeting delivery deadline requirements at runtime.

### Do you have more than 10 software engineers?

Connex provides an interface standard for integrating components of your system developed by different software teams. It is based on a modular databus architecture and allows your system architects to define a system-wide data model. This allows teams of software engineers to work independently, then seamlessly integrate and test their modules with the rest of the system. The data model includes not only type information, but also QoS, such as deadlines, sensor availability and flow rates. The datatypes are formally defined and then enforced at runtime.

### Are you sending data to many places?

The more complex the data-flow topology is in a system, the more a publish/subscribe communication pattern is needed to decouple application logic from the source and destination of data streams. Connex features, such as content-filtering, help to manage and optimize network utilization, while a myriad of QoS policies can be used to tune Connex to work on and between networks that have different physical characteristics such as bandwidth, latency and reliability.

### Are you building a next-generation smart machine or a real-world system?

If so, Connex can help manage the evolution of systems that must undergo upgrades or expansions throughout their lifespan. Its flexible data modeling helps to facilitate interoperability in system components as they evolve, to support both incremental and major updates to the overall system with minimal redesign or downtime. This capability is important for large, real-world systems that are continuously and incrementally upgraded while deployed.

## TRY IT FOR YOURSELF

### Try a Fully-Functional Version of Connex

Ready to test it for yourself? RTI provides a free trial of Connex. There's no cost and no obligation — just full access to a fully-functioning version of the world's leading framework to explore:

<https://www.rti.com/free-trial>

### Contact RTI

For information on how the Connex product suite can help you build and run your distributed system, please contact [info@rti.com](mailto:info@rti.com).

*\*Free trial is only available for Linux and Windows on Intel processors.*

## ABOUT RTI

Real-Time Innovations (RTI) is the infrastructure software company for smart-world systems. Across industries, RTI Connex® is the leading software framework for intelligent distributed systems. RTI runs a smarter world.

RTI is the market leader in products compliant with the Data Distribution Service (DDS™) standard. RTI is privately held and headquartered in Silicon Valley with regional offices in Colorado, Spain, and Singapore.

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