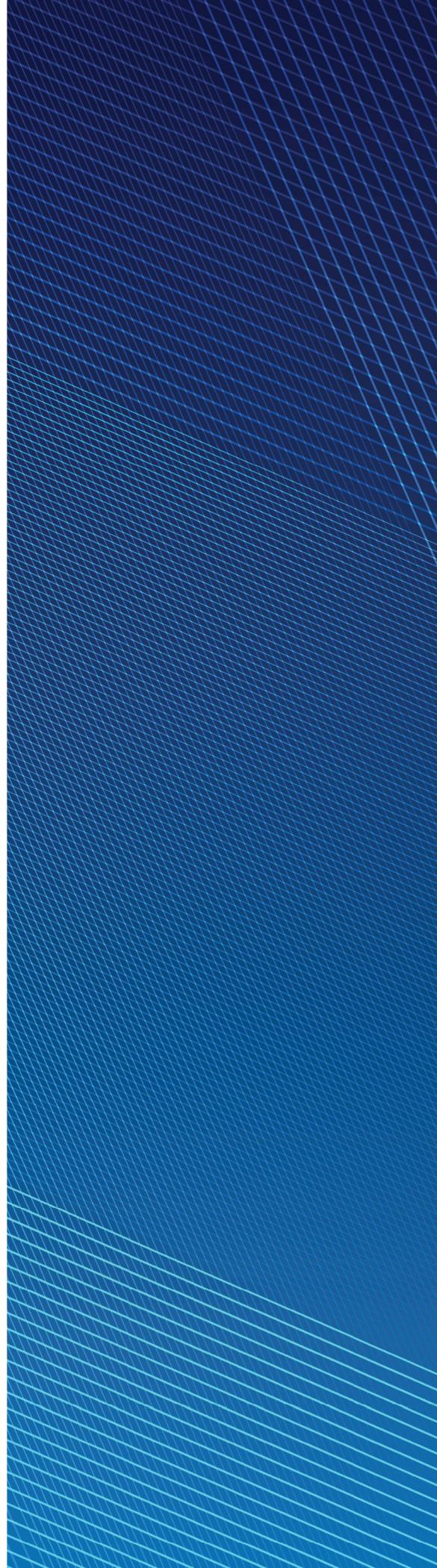


REAL-TIME INNOVATIONS

ENABLING TECHNOLOGY LEADERSHIP AWARD

*Identified as best in class in the North American
software framework for autonomous systems industry*



Best Practices Criteria for World-Class Performance

Frost & Sullivan applies a rigorous analytical process to evaluate multiple nominees for each award category before determining the final award recipient. The process involves a detailed evaluation of best practices criteria across two dimensions for each nominated company. RTI excels in many of the criteria in the software framework for autonomous systems space.

AWARD CRITERIA	
<i>Technology Leverage</i>	<i>Customer Impact</i>
Commitment to Innovation	Price/Performance Value
Commitment to Creativity	Customer Purchase Experience
Stage Gate Efficiency	Customer Ownership Experience
Commercialization Success	Customer Service Experience
Application Diversity	Brand Equity

Commitment to Innovation, Commitment to Creativity, and Application Diversity

Mission-critical cyber physical autonomous systems are software intensive with tens of millions of lines of code; can process gigabytes of data consistently within a few microseconds or milliseconds; and have demanding security and technical requirements, such as high reliability and resiliency, to prevent any single point of failure. In addition, such autonomous systems become more complex when a different or new software, device, or algorithm is added; therefore, managing autonomous systems can be challenging because companies would need hundreds of developers. To maintain and evolve these systems over long

“RTI’s Connex product suite supports agile, modular development while meeting autonomous systems’ demanding technical requirements, such as high data volumes, low latency, high resilience, reliability, and security.”

***- Sankara Narayanan,
Industry Principal***

lifecycles, building in-house solutions without a formal or well-documented framework or architecture will not suffice, whereas solutions from IT departments fail to meet the technical requirements of autonomous systems. In addition, these systems are expensive and have long lifecycles; therefore, having a modular, scalable, and flexible architecture is important.

Amid this scenario, California-based Real-Time Innovations (RTI) offers its Connex product suite, a software framework for autonomous systems. RTI has been specializing and innovating in the software framework for autonomous systems space for 15 years, providing non-stop availability, low latency, high reliability, scalability, and security, which are essential for mission-critical systems based on the following fronts:

The Connex product suite includes Connex Professional, Connex Secure, Connex Anywhere, Connex Drive, Connex Cert, and Connex Micro, with each product addressing specific requirements of autonomous systems.

Connex Professional is RTI's base product, a software framework for systems that typically operate in a controlled access environment and not over a wide area network or wireless network. Connex Professional is used where there are no perceived security concerns and is used in a box, such as a medical imaging device where the interface is not exposed outside of the imaging system, or used in some defense applications where it can operate on a ship with physical security and where only authorized people have access.

Connex Secure adds sophisticated security capabilities to Connex Professional, has the same application programming interface (API) as Connex Professional, and is used in environments where people may not have controlled access or in environments where different applications may have different authorizations to access data or where different users might have different authorizations. For example, Connex Secure is used in patient monitoring versus medical imaging, provides a comprehensive security framework, and includes optimized security for operational technology (OT) systems.

Connex Anywhere is an extension of Connex Secure and is used over wide area networks and public networks and in highly geographically distributed environments. Connex Anywhere includes edge components; cloud components; and significant optimization for running over lower bandwidth, higher delay, or less reliable networks.

Connex Professional, Connex Secure, and Connex Anywhere are RTI's three general-purpose products. The company offers specialized, customized products for automotive and aviation systems, whereas medical, industrial automation, and defense systems use RTI's general-purpose products. To this end, Connex Drive is the first complete automotive-grade connectivity solution for autonomous vehicle development that is certified to ISO 26262 ASIL D (SEooC); proven-in-use with production vehicles on the road; designed to meet all autonomous, next-generation architecture use cases in automotive; comes with a comprehensive tool suite; has a complete ECU-to-cloud framework; and has a future-proof, data-centric architecture to support industry evolution.

Connex Cert is designed for safety-certifiable systems and is for applications that have rigorous safety certification requirements, such as ISO 26262 for road vehicles and DO-178C for avionics, which the Federal Aviation Administration (FAA) uses to certify aircraft components and aircraft engines. Connex Cert, therefore, comes in two designs: one for automotive and one for aviation; however, safety certifications are difficult to obtain. In-house or competing framework solutions do not offer these certifications, and most such solutions are tested in only one system, whereas RTI has proven successful in diverse autonomous systems.

Connex Micro serves power and memory-strapped devices with size, weight, and power constraints; is for applications that run on microcontrollers; and is included as part of Connex Drive.

All Connex products are transparent and compatible; share connectivity libraries and APIs to develop Data Distribution Service (DDS™)-based applications; share developer tools for system debugging, testing, and optimization; and share infrastructure services that customers can deploy to integrate and scale the

systems. RTI has one more add-on product, ConnexT TSS, that supports a specific aviation standard called Future Airborne Capability Environment (FACE), which is an avionic standard designed to ease the integration of the aviation system.

Frost & Sullivan commends RTI for displaying its leadership in software framework for autonomy based on the following fronts:

Companies often build their own software framework for autonomous systems; however, such in-house solutions only meet some technical requirements, such as performance and reliability, but do not support modularity. While technologies in IT can address modular development, they cannot meet the technical requirements of autonomous systems.

RTI's ConnexT product suite supports agile, modular development while meeting autonomous systems' demanding technical requirements, such as high data volumes, low latency, high resilience, reliability, and security. RTI ConnexT is a data bus that implements all software components in a modular, decoupled way and adopts a data-centric (i.e., completely decoupled from the data source), decentralized, distributed, and transparent approach that allows for the addition of new capabilities without affecting other components in the system. To this end, RTI ConnexT, which is built to handle complex dataflows, enables modular, scalable, and evolvable systems. Application developers of mission-critical systems can use RTI ConnexT to build and scale applications in systems easily, with minimal coding. Other benefits of RTI ConnexT include real-time performance and scalability, and users can write once and deploy anywhere. Such benefits of RTI ConnexT are all differentiators in the context of cyber physical systems.

Existing and competing technologies are not domain appropriate, whereas RTI provides domain-appropriate open architecture framework for mission-critical cyber physical systems. For instance, in systems with human users, single points of failure and failover are usually fine, and for such systems to be offline for tens of milliseconds, hundreds of milliseconds, or sometimes seconds is tolerable. For the mission-critical cyber physical systems that RTI is in, such as autonomous vehicles and surgical robotics, having the system go offline even for tens of milliseconds could be catastrophic; therefore, there can be no downtime, no single point of failure, and no failover in mission-critical cyber physical systems. RTI is unique because customers can enjoy low latency, high throughput, and communication with no single point of failure or failover in the system.

ConnexT Drive 2.0: According to a 2022 Frost & Sullivan research paper titled "Global Electric Vehicle Battery Manufacturer Profiles and Growth Opportunities," automotive sales in 2021 continued the shift to electric vehicles (EVs) that began in 2020. In addition, connectivity, mobility-as-a-service, autonomous driving, and eMobility trends are rapidly changing vehicle technologies. Higher levels of autonomy are now being deployed in agriculture, construction, and mining (i.e., off road trucking). OEMs, therefore, are transitioning to electric, autonomous, and software-defined vehicles (SDV).

RTI released a new version of ConnexT Drive, ConnexT Drive 2.0, to reinforce its commitment to overcome the current architectural challenges in the automotive market. ConnexT Drive 2.0 is the production-grade connectivity framework for SDVs, and with the new capabilities, it now provides full stack/ecosystem integration. For example, the solution accelerates direct integration into ROS 2 and AUTOSAR Classic, which simplifies the design and evolution of DDS-enabled automotive ECUs. In addition, ConnexT Drive

2.0 enables autonomous and EV innovation. To meet the safety lifecycle requirements set by ISO 26262, Connex Drive is now TÜV SÜD-certified to automotive safety integrity level (ASIL) D, which addresses the highest degree of automotive hazard.

Customer Ownership, Purchase, and Service Experience

RTI's software runs many of the most complex systems worldwide, and customers are located across the automotive, industrial automation, aerospace and defense (US Navy ships), energy (power plants), healthcare, and transportation industries. Automotive and medical are the fastest growing industries for RTI.

RTI has more than 50 automotive programs and is working with more than half of the top 10 funded vehicles newcomers, with Connex running in multiple production vehicles. To this end, RTI had a compound annual growth rate (CAGR) of 30% from 2019 to 2022 in the automotive industry.

"RTI can win customer confidence because of the successful deployment of its solution in diverse autonomous systems, such as passenger vehicles; EV startups; flying taxi services; autonomous ships; underwater robots; and land, sea, and air defense systems."

***- Sankara Narayanan,
Industry Principal***

RTI has more than 1,800 design wins, is standards driven, and is a leader in more than 20 industry standards. The company supports more than 750 research programs and is used in more than 100s of major defense applications (e.g., land, sea, and air). The common characteristic across all these markets is the cyber physical systems in which RTI's technology is used, with operating-faster-than-human speed and having independent decision making as elements of the system. For example, surgical robotics can make

adjustments and have much finer control, compared to a surgeon's hands. Even though the surgeon is still controlling the surgery, the robot provides finer grain control. Moreover, the robot conducts any adjustments in real time to make it easier for the surgeon.

RTI delivers significant customer value and accelerates time to value by reducing the total cost of ownership through minimal coding and low support costs and by maximizing productivity. Customers can buy one product and upgrade or move to another seamlessly. RTI Connex provides modularity by enabling developers to upgrade autonomous systems efficiently and affordably over the systems' lifecycle. RTI can win customer confidence because of the successful deployment of its solution in diverse autonomous systems, such as passenger vehicles; EV startups; flying taxi services; autonomous ships; underwater robots; and land, sea, and air defense systems. To this end, RTI Connex caters to all types and sizes of autonomous systems, whereas competing technologies do not. When customers find it hard to predict their future needs and integrate new applications in existing systems, RTI transitions from being a vendor only, positioning itself as an ideal partner for long-term success, with the ability to meet future needs because it has demonstrated its versatility in supporting new or emerging requirements.

V-Charge is a collaborative research program with Volkswagen AG (VW), ETH Zurich, and Bosch to investigate driverless value parking that is automated through a mobile app. VW selected RTI Connex DDS as the integration connectivity framework for its flexible architecture and QoS capabilities, enabling the research team to develop and update system components independently.

According to Wojciech Derendarz, Project Manager for V-Charge, VW, “Using DDS simplified the integration challenge every research program has to address when dealing with multiple collaborators. We’d recommend any research program to look closely at the benefits derived from a decoupled communications infrastructure.”

Mission Robotics, a company that makes it easier for people to operate and connect systems so they can focus on their missions, has used RTI Connex 6.1 to optimize communications and accelerate the deployment and monitoring of remotely operated vehicles (ROVs).

RTI will advance automotive connective capabilities on Renesas’ R-Car SoCs. In addition, RTI’s Professional Services team, which has extensive and proven experience working with mission-critical, DDS-based Connex systems worldwide and in a variety of industries, works with customers to get Connex systems up and running on time, within budget, and with minimal risk while eliminating any errors in designing, integrating, and deploying intelligent distributed systems. RTI provides flexible service options and packages, such as live and on-demand training sessions, to achieve project milestones, increase efficiency, and drive project success. For example, RTI Academy, which is an on-demand, virtual learning platform, provides customers with flexible access to Connex product training.

Conclusion

Companies across industries need a software framework for intelligent, high-performance autonomous systems, and RTI’s Connex software framework successfully addresses this need. Connex, which is based on the DDS standard, meets the demanding technical requirements of autonomous systems and enables modularity for the agile development and lifecycle cost control of autonomous systems.

Chief among RTI’s milestones in 2022 is the release of Connex Drive 2.0 that accelerates the direct integration into AUTOSAR Classic and ROS 2. RTI differentiates from competitors based on its products and based on its expertise and global presence. To this end, RTI has proved to be a secure, scalable software framework provider for autonomous systems, such as in autonomous vehicle programs, power plants, US Navy ships, medical robotics, flying cars, and hospital and emergency medicine worldwide. The company plans to enhance its solutions in 2023 and beyond to make it even easier to design and deploy intelligent real-world systems in demanding environments.

With its strong overall performance, RTI earns Frost & Sullivan’s 2023 North American Enabling Technology Leadership Award in the software framework for autonomous systems market.

What You Need to Know about the Enabling Technology Leadership Recognition

Frost & Sullivan's Enabling Technology Leadership Award recognizes the company that applies its technology in new ways to improve existing products and services and elevate the customer experience.

Best Practices Award Analysis

For the Enabling Technology Leadership Award, Frost & Sullivan analysts independently evaluated the criteria listed below.

Technology Leverage

Commitment to Innovation: Continuous emerging technology adoption and creation enables new product development and enhances product performance

Commitment to Creativity: Company leverages technology advancements to push the limits of form and function in the pursuit of white space innovation

Stage Gate Efficiency: Technology adoption enhances the stage gate process for launching new products and solutions

Commercialization Success: Company displays a proven track record of taking new technologies to market with a high success rate

Application Diversity: Company develops and/or integrates technology that serves multiple applications and multiple environments

Customer Impact

Price/Performance Value: Products or services provide the best value for the price compared to similar market offerings

Customer Purchase Experience: Quality of the purchase experience assures customers that they are buying the optimal solution for addressing their unique needs and constraints

Customer Ownership Experience: Customers proudly own the company's product or service and have a positive experience throughout the life of the product or service

Customer Service Experience: Customer service is accessible, fast, stress-free, and high quality

Brand Equity: Customers perceive the brand positively and exhibit high brand loyalty

