FROST & SULLIVAN

Real-Time Innovations

2022 ENABLING TECHNOLOGY LEADER

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. Real-Time Innovations (RTI) excels in many of the criteria in the software framework for autonomous systems space.

AWARD CRITERIA

Technology Leverage	*Customer Impact*
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, Creativity, and Application Diversity

Autonomous systems are power-efficient and responsive and require few human operators. They provide a competitive edge to companies and are usually safer than human-operated systems. However, managing autonomous systems has its challenges. These systems typically have tens of millions of lines of code. For example, a fully autonomous level 4 or 5 self-driving car might have 100 million lines of code spread across different services, microservices, and applications. With that many lines of code, companies need hundreds if not thousands of developers from multiple teams or suppliers. Autonomous systems become more complex each time a different or new software, device, or algorithm is added. It is difficult for developers to rework or change the millions of lines of code to accommodate new additions. Keeping autonomous systems from becoming too complex is challenging as technologies and requirements continually evolve.

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>
> ***– Sankara Narayanan, Senior Industry Analyst***

Autonomous systems also have demanding technical requirements. For example, these systems have to process gigabytes of data consistently within microseconds or milliseconds. Because they are mission-critical systems, their reliability and resiliency are vital to prevent any single point of failure. When an issue arises, autonomous systems must detect it, put themselves in fail-safe mode, and perform the

necessary remediation. Security is another essential yet challenging requirement of autonomous systems. Companies have to ensure nothing else in the system is affected when they implement security.

Amid this scenario, California-based RTI provides the RTI Connext® software framework for companies building autonomous systems. RTI Connext® overcomes the aforementioned challenges and enables modularity for agile development and life cycle cost control.

RTI Connext® offers a unique combination of four core products (Connext Professional, Connext Secure, Connext Anywhere, and Connext Drive) and two add-on products (Connext Micro and Connext Cert):

- Connext Professional is deployed in a closed or controlled-access environment where customers are not concerned about security; for example, robotic medical applications
- Connext Secure has the same application programming interfaces (API) as Professional but allows users to configure the system's security properties, including optimized security for operational technology (OT) systems, authentication, encryption, and access control
- Connext Anywhere caters to geographically distributed and mobile systems across the edge and cloud, supporting real-time communication over public and wide area networks, including cellular
- Connext Drive offers additional capabilities for autonomous and electric vehicles
- Connext Micro serves power and memory-strapped devices
- Connext Cert is for systems that require safety certifications, such as ISO 26262 for road vehicles, DO-178C for avionics, and IEC 61508 for industrial equipment

All Connext products share three main components: connectivity libraries and APIs to develop data distribution service (DDS)-based applications; developer tools for system debugging, testing, and optimization and user productivity improvement; and infrastructure services that customers can deploy to integrate and scale the systems. The core Connext products are transparent and compatible; customers can buy one product and upgrade or move to another seamlessly. For example, Connext Professional is the base product, and Connext Secure builds on Connext Professional.

Most companies build their own software framework for autonomy because no off-the-shelf solution is available to meet stringent technical requirements (such as performance and reliability) and provide modularity. These companies tend to compromise modularity by building something in-house without a formal or well-documented framework or architecture. However, these systems become complex over time to the point where system maintenance is impossible. Maintenance is also challenging if the original developers are no longer available and nobody new wants to touch a single line of code. Without clean, well-defined interfaces between the system's components, companies will either rewrite the code or move to open architecture.

For modularity, the information technology (IT) industry does offer services similar to loose couplings, such as enterprise web services and microservices. These services address modular development but are unable to meet the technical requirements of autonomous systems.

Frost & Sullivan finds RTI's solution unique in supporting agile, modular development while satisfying autonomous systems' demanding technical requirements such as high data volumes, low latency, high resilience, reliability, and security. RTI Connext® is a set of software capabilities application developers of mission-critical systems can use to build and scale applications in the systems easily with minimal coding.

The solution provides modularity by enabling developers to upgrade autonomous systems efficiently and affordably over the systems' life cycle. RTI's customers also enjoy low latency, high throughput, and communication with no single point of failure in the system.

RTI Connext® is a data bus that implements all software components in a modular, decoupled way where no component requires knowledge of another in the system. RTI Connext® adopts a data-centric (completely decoupled from the data source), decentralized, distributed, and transparent approach that allows adding new capabilities without affecting other components in the system. The data bus is a logical concept without a physical server, broker, or bus.

RTI also offers agility with its solution. RTI's open architecture enables customers to integrate components from multiple suppliers and scale up their applications easily. RTI Connext® detects applications joining the autonomous system and automatically establishes transparent peer-to-peer communication between the different applications or modules that require it. RTI ensures its solution complies with the DDS standard for portability and interoperability. Applications built with Connext products also have interfaces with a well-defined schema and data model, making the interfaces discoverable and allowing users to deploy the system without needing to know how a module is implemented. This advantage is valuable and cost-effective for RTI customers to avoid tightly coupled systems, where changing one module leads to expensive changes in another.

What further differentiate RTI from the competition are the difficult-to-obtain safety certifications it has. Not all in-house or competing framework solutions offer these certifications as such solutions are tested in only one system. Frost & Sullivan commends RTI for its solid foundation and demonstrating its technology as a secure, scalable software framework for autonomous systems.

Customer Ownership, Purchase, and Service Experience

RTI reportedly has $50 million in annual revenue with 25% compound annual growth rate. RTI Connext® has been deployed in autonomous systems across industries, making decisions autonomously in real time faster and more reliably than a human operator. The solution facilitates autonomous systems to make decisions as simple as moving a car or complex as moving a ship, controlling the power grid, or executing the final countdown for a rocket launch at the Kennedy Space Center. To this end, RTI has customers in many industries, such as drones, robotic surgery, intelligent transportation, autonomous cars, command and control systems, wind farms, aircraft carriers, and smart cities. RTI Connext® caters to all types and sizes of autonomous systems. RTI's three largest markets are defense (mission-critical missile defense type systems, ships, and planes), medical (medical robots for minimally invasive diagnostics and surgery, medical imaging devices, and remote patient monitoring for patient safety), and automotive (autonomous vehicles). RTI delivers significant customer value by reducing the total cost of ownership through minimal coding and low support costs, and maximizing productivity.

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Frost & Sullivan finds RTI has the technology leadership and expertise to gain customer confidence. RTI has been specializing and innovating in the software framework for autonomous systems space for 15 years. Customers usually find it hard to predict their future needs and integrate new applications in existing systems. The successful deployment of RTI's solution in autonomous systems of diverse requirements boosts customer confidence as RTI has demonstrated its versatility in supporting new or emerging requirements. To this end, RTI goes beyond being a vendor and positions itself as an ideal partner for long-term success with the ability to meet future needs.

Compared to in-house developed software frameworks, RTI is often viewed as the safer choice as it has exposed its solution to diverse situations. For instance, RTI has a proven track record of 1,700 design wins (different real-world mission-critical systems use its solution) and supports more than 750 active university, government, or commercial research programs. RTI also has an internal research team that constantly improves the solution.

RTI offers an enhanced customer experience by working closely with customers to help them develop scalable real-world systems. One of the primary factors contributing to its success is its highly efficient talent pool with unmatched industry expertise in mission-critical systems. The RTI team understands every aspect of the customer's business and requirements and sets up Connext rapidly, cost-effectively, and with minimal risk. The company's quality service also includes on-site and remote training through the RTI Academy to ensure customers receive the maximum value from its solution. RTI's basic, essential, and premium support plans offer customers high flexibility as the company can customize a plan based on project and budget needs. Frost & Sullivan lauds RTI for its comprehensive solution and customer-centric services.

Conclusion

Companies need a software framework that enables modularity for agile development and life cycle cost control of autonomous systems. In-house solutions usually fail to meet technical requirements or provide the needed modularity. RTI's software framework for autonomy successfully addresses these challenges. The Connext suite of products supports different autonomous systems, ensuring modularity, transparency, agility, and enhanced total cost of ownership. All core products offer connectivity libraries and APIs, developer tools, and infrastructure services. Connext Cert also caters to companies requiring safety certifications for road vehicles, avionics, and industrial equipment. RTI Connext® offers customers minimal coding, maximum productivity, low latency, high resilience, and security. RTI's strong track record and proven ability to address emerging needs enhance its customer value proposition.

With its strong overall performance, RTI earns Frost & Sullivan's 2022 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

About Frost & Sullivan

Frost & Sullivan is the Growth Pipeline Company™. We power our clients to a future shaped by growth. Our Growth Pipeline as a Service™ provides the CEO and the CEO's growth team with a continuous and rigorous platform of growth opportunities, ensuring long-term success. To achieve positive outcomes, our team leverages over 60 years of experience, coaching organizations of all types and sizes across 6 continents with our proven best practices. To power your Growth Pipeline future, visit Frost & Sullivan at http://www.frost.com.

The Growth Pipeline Engine™

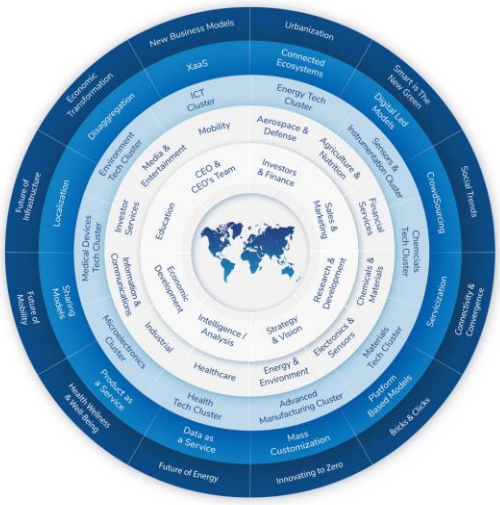
Frost & Sullivan's proprietary model to systematically create ongoing growth opportunities and strategies for our clients is fuelled by the Innovation Generator™.
Learn more.

Key Impacts:

- **Growth Pipeline:** *Continuous Flow of Growth Opportunities*
- **Growth Strategies:** *Proven Best Practices*
- **Innovation Culture:** *Optimized Customer Experience*
- **ROI & Margin:** *Implementation Excellence*
- **Transformational Growth:** *Industry Leadership*

The Innovation Generator™

Our 6 analytical perspectives are crucial in capturing the broadest range of innovative growth opportunities, most of which occur at the points of these perspectives.



Analytical Perspectives:

- Mega Trend (MT)
- Business Model (BM)
- Technology (TE)
- Industries (IN)
- Customer (CU)
- Geographies (GE)