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Insitu Takes Off with RTI Data Distribution System

Distributed data communications for unmanned autonomous aircraft operation and control

The Problem

Insitu Inc., is a pioneer developer of long-endurance, unmanned autonomous aircraft (UAV). UAVs designed and built by Insitu serve increasingly strategic roles in a broad range of applications, including military reconnaissance, border patrol, and search missions.

UAVs generate, process, and exchange large amounts of data. Multiple sensors onboard collect data on flight conditions, airframe configuration, onboard instrument status, and position and direction, and use that data to both maintain mission characteristics and provide the ground control station with current data on the mission profile and health of the UAV.

At the same time, the UAV ground control station also collects and processes data. It monitors the mission parameters and data from the UAV, and makes adjustments as necessary. The ground control station relies on real time data from the UAV in order to monitor, make decisions, and adjust UAV flight characteristics.

The volume of data, the number of collection, analysis, and response nodes, and the requirement for real time data access, analysis, and response place severe constraints on the design of the UAV and support systems. While data acquisition and response have historical roots in real time, data exchange between multiple nodes across a network is a challenging and complex problem. Insitu had to address this problem in order to build its next-generation unmanned air vehicles, including the company's ScanEagle and newer platforms.

According to Gary Viviani, vice president of Software Engineering at Insitu, "Historically, we put in a great deal of time and expertise in the communication

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Gary Viviani
Vice President of Software Engineering
Insitu

systems for our platform. Despite that, transferring data was the source of many of our problems and most of our consternation." Insitu needed a broad-based data communications solution that delivered real time performance with high Quality of Service parameters, yet without expensive and time-consuming maintenance requirements.

The Solution

After evaluating commercial networking alternatives as well as in-house custom code, Insitu selected the RTI Data Distribution Service as its solution for real time communications onboard the UAV platform, in the ground control stations, and in future air-to-ground communications. RTI Data Distribution Service is a standardsbased middleware product that enables the real time exchange of data between data sources and consumers. Using a publish-subscribe model for data availability, it provides a means of quickly and reliably moving data around in a distributed computing environment.

RTI Data Distribution Service exceeded Insitu's requirements for real time data distribution, both in the air and on the ground. Viviani notes that they tested the middleware product rigorously before committing to it. "We stress-tested the RTI Data Distribution Service during our evaluation. We now have significant development under our belts, and so far there's no hint of an issue. It has performed well with very low processor utilization. We also give top marks to RTI's services and support teams."

Insitu is currently using the RTI Data Distribution Service as the primary mechanism for data communications on its next-generation UAV platform, as well as on ground control stations. Viviani expressed a high level of satisfaction with the engineering outcomes through the use of the product. "Now, with minimal resources, we have seen at least a 30 percent increase in productivity by using RTI middleware for data communication," he explained.

The Impact

Could Insitu have continued with the development and use of in-house communications code for its UAV platforms, even as the communications problems became more complex? While technically possible, such an approach almost certainly would not have been commercially practical. "If we had continued to develop our own communications solutions, we would have had increasing difficulties in maintaining them and adding new features," explained Viviani. The use of RTI Data Distribution Service as a platform lets Insitu concentrate on its core competencies, rather than on building and maintaining a comprehensive data distribution mechanism.

The RTI Data Distribution Services provided Insitu with the foundation to develop the distributed communications architecture that supports new features necessitated by modern UAV mission requirements. It also enabled Insitu to invest in those unique features to advance and differentiate its platform, rather than expend resources on its own distributed communications design. Thanks to RTI Data Distribution Service, Insitu designers and engineers can focus on bringing the best technologies to bear in advanced integrated command, control, and video tools for intelligence, surveillance and reconnaissance, as well as for missions such as rescue, border patrol, and meteorology.

About Real-Time Innovations

RTI is the world leader in fast, scalable communications software that addresses the challenges of building and integrating real-time operational systems. RTI Connext solutions meet the needs of enterprise-wide integration— from the operational edge to the enterprise data center. The RTI standards-based software infrastructure improves the efficiency of operational systems while facilitating better decisions, actions and outcomes for the business enterprise.

For over ten years, RTI has delivered industry-leading products and solutions for customers in markets ranging from Aerospace & Defense, Process Automation, Financial Services, Energy, Automotive, Health Sciences and Transportation Management.

Founded in 1991, RTI is privately held and headquartered in Sunnyvale, California.

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