

General Atomics Aeronautical Systems, Inc.

Unmanned Aircraft Systems (UAS) Ground Control Station (GCS)



“General Atomics had to meet strict requirements for data bandwidth and availability. They could have designed and implemented a custom solution for data integration on their own, but that would have significantly delayed the project. Plus the lifecycle cost of developing and maintaining a custom software solution for a specific project can be enormous.”

Stan Schneider,
Chief Executive Officer,
RTI

Customer overview

General Atomics Aeronautical Systems, Inc. (GA-ASI) is a leader in high-technology systems development ranging from the nuclear fuel cycle to remotely operated surveillance aircraft, airborne sensors, and advanced electric, electronic, wireless and laser technologies. Among its projects is the design and development of advanced cockpit ground control stations (GCSs) for unmanned aircraft systems (UASs) such as the military Predator drones. Unmanned aircraft systems are controlled and flown from GCSs on the ground, which require real-time data and control links to every sensor and control surface on the aircraft.

Application

General Atomics began design and development of the Advanced Cockpit GCS for the US Air Force in early 2006, and has continued with Advanced Cockpit development specifically for the MQ-1 Predator and MQ-9 Reaper UAS in 2007. As a part of this effort, the company required a solution for real-time data distribution across the network employed by the GCS for acquisition, analysis, and response for remote control of the UAS.

Because of their role in monitoring and controlling a UAS, CGSs generate and process large amounts of data. Multiple sensors onboard the UAS 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 UAS. The CGS monitors the mission parameters and data from the UAS, and makes adjustments as necessary. The GCS relies on real-time data from the UAS in order to monitor, make decisions, and adjust UAV flight characteristics.

The volume of data and the requirement for real-time analysis and response, with the control signals sent across significant distances to the UAS, are characteristics that demand both high performance and guaranteed response times. Data exchange between multiple nodes on a ground network that also communicates with sensors and control instrumentation on a flying platform is a challenging and complex problem.

Why RTI was selected

After evaluating both commercial distributed networking alternatives and potential in-house custom code, General Atomics selected RTI Data Distribution Service for real-time data exchange and processing for the GCS. RTI Data Distribution Service is a standards-based middleware product that enables the real-time exchange of data between nodes of a distributed system that consists of both data producers and data consumers. Using a publish-subscribe model for data availability, it provides a means to quickly and reliably move and share data in a distributed computing environment. RTI Data Distribution Service complies with the Object Management Group (OMG) Data Distribution Service for Real-Time Systems (DDS) specification for data distribution across large-scale networks.

RTI Data Distribution Service met General Atomics' requirements for real-time data distribution, bandwidth, and processing in the GCS. It enabled the company to implement the data distribution features needed the GCS without writing significant amounts of custom code. The use of the RTI Data Distribution Service enabled General Atomics to complete the major upgrade of the Advanced Cockpit GCS in only 14 months. The company successfully demonstrated the GCS solution during the flight of a mission-configured MQ-1 Predator UAS in July 2007.

Without a commercial middleware solution for real-time data distribution, General Atomics would have had to develop and maintain its own code to ensure data flowed between nodes within the required time constraints. While technically possible, such an approach almost certainly would not have been able to be accomplished within the tight time constraints required by the customer.

"If General Atomics had to develop a custom solution for real-time data distribution, it would have taken significantly longer even to demonstrate the technology solution," explained Schneider. "The use of RTI Data Distribution Service as a platform enabled the company to focus its efforts on electronics and software enhancement and integration, rather than building and maintaining a comprehensive data distribution mechanism as an integral part of the solution. The tight deadlines for demonstration could not have been met."

RTI provided General Atomics with the middleware solution to develop the distributed communications architecture that supports new features and mission capabilities required by the US Air Force. Using RTI enabled General Atomics designers and engineers to concentrate on integrating technologies such as intuitive touch-screen technology, superior ergonomic design, and wide-screen video presentations that dramatically expanded all visual cues provided to the pilot and sensor operator. Together, these enabled General Atomics to deliver improved situational awareness, reduced pilot workload, and better data coordination needed to effectively operate a UAS.

About RTI

Real-Time Innovations (RTI) provides high-performance infrastructure solutions for distributed real-time applications. RTI middleware delivers dramatic improvements in latency, throughput and scalability while slashing cost of ownership. A broad range of industries leverage RTI's software and design expertise, including defense, intelligence, simulation, industrial control, power generation, transportation, finance, medical and communications. Founded in 1991, RTI is privately held and headquartered in Sunnyvale, California. For more information, please visit www.rti.com.

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