IAI Aviation Group

OPERATIONAL AVIONICS LAYER (OPAL)

"Thanks to RTI Connext® DDS, our OPAL solution is able to give avionics customers a real-time Common Operating Picture, with a uniform language between all of the different entities. This is a major step forward towards comprehensive FACE™ compliance, as customers using a variety of airborne, naval and ground-based platforms can now use OPAL to develop cross-platform capabilities and implement new applications in a fraction of the time, based on proven standards."

Ilan Zaharan
Director of Net-Centric Warfare
IAI Aviation Group

HIGHLIGHTS

- IAI uses RTI Connext for real-time connectivity as part of its OPAL Application Framework to achieve real-time situational awareness and unified communication for different aircraft types

- Using Connext, IAI's OPAL framework is able to help customers introduce a new application in a matter of months instead of years, while reducing effort and operational costs

- OPAL is aligned to the FACE™ technical standard 3.1, and can enable companies to meet MOSA program requirements

ABOUT IAI

IAI (Israel Aerospace Industries) is a leader in defense, aerospace and commercial markets. Able to act as a prime contractor or subcontractor, IAI is involved in dozens of large programs for aerospace, land, sea and cyber domains, including multi-domain applications. IAI's technology expertise ranges from systems and solutions for reconnaissance satellites and radars to all aspects of command, control and communications.

IAI's Aviation Group covers the full spectrum of technologies and capabilities for the design, integration, testing, certification, manufacturing, marketing and product support of manned and unmanned aircraft. As part of the IAI's Military Upgrades and Conversions division, the Aviation Group is also focused on simplifying application onboarding and ensuring comprehensive interoperability among different forces.

CHALLENGE

Few engineering marvels are more awe-inspiring than a fleet of fighter jets flying in tight training formation and executing split-second maneuvers at speeds in excess of 1,000 miles per hour. For pilots, it's an environment where every second counts. But under combat conditions, the challenges can multiply exponentially and without warning. Variables such as poor visibility and unpredictable enemy behavior emphasize why it's vital that warfighter teams must be able to maintain secure and reliable network communication at all times.

The reason for establishing a Common Operating Picture (COP) is clear. Once a highly reliable COP is established, teams can communicate without revealing locations, monitor troops, adjust to threats, avoid mid-air collisions and safeguard mission success. The key capability needed to make it happen is the ability to share data in real time among different fighter planes and across disparate domains. Ironically, the biggest obstacle is not the communication methodology or radio spectrum, but often the aircraft platform itself. Why?

Because traditional air platforms are very large and composed of four different layers, with unique avionics blocks for each different aircraft type. The first layer is hardware and drivers, while the second layer is typically commercial interfaces. The third is the service layer and the fourth is the application layer. Each of these layers tends to be highly proprietary with unique symbology and dictionary for different aircraft types. So, another inherent challenge has been that if customers want to add on their own software or customize anything, they could only go back to the OEM who created the platform to propose a work-around.

For network-centric warfare (NCW), what complicates next-level communication across these layers is typically the lack of a unified development environment. Without the right technology in place, important data can easily remain hung up in operational silos on the customer side and not instantly accessible to Command-and-Control (C2) system operators. Conquering this barrier and introducing real-time interoperability capabilities is vital for getting optimal results from any innovative new avionics application that is added to an air platform.

Until recently, the process of adding these new and much-needed applications to an air platform and achieving full integration could easily take upwards of five to eight years and cost hundreds of millions of dollars. Countering this phenomenon was the primary mission for IAI when it started developing its Operational Avionics Layer (OPAL) application framework. IAI then turned to RTI and Connext to help turn those multi-year implementation cycles into a matter of months.

data publisher or data subscriber and contribute to the overall operational picture data. OPAL then disseminates that data to all members on the network.

When it comes to adding applications to an air platform, this approach is revolutionary. Any customer who has struggled with using legacy tactical datalinks to connect a 4th generation fighter to a 5th generation platform, for example, knows that some tactical data links only cover part of the platform, so with different models it can get confusing. By contrast, OPAL enables different entities to quickly achieve a COP with enhanced situational awareness, as well as advanced application-based situation management for any type of aircraft.

OPAL uniquely enables customers to make their own changes to air platforms without requiring OEM time and effort. This is possible because OPAL can decouple this dependency, allowing end users or designated third-party vendors to develop independent software and capabilities and then integrate them into the air platform on their own.

"Our goal is freeing customers from operational complexity. With OPAL, for example, developing a new capability on one type of fighter jet, platform block means it can automatically work on all of the same fighter jet blocks," says Zaharan. "What makes it even more amazing is that the same capability can then be migrated over to other types of fighter jets, as well as to other platforms, so pilots and C2 operators don't have to struggle with lengthy platform hurdles. This rapid deployment can in turn give OEMs new revenue opportunities too, so everyone wins."

SOLUTION

OPAL serves as the infrastructure for networking connectivity, data sharing and operative actions. And a crucial part of the OPAL solution is that it uses Connext – which is based on the Data Distribution Service™ (DDS) standard – to handle all communications. What DDS enables OPAL to do is to form a unified data dictionary, for which all users can either be a

RESULTS

Zooming out to the big picture, OPAL and Connext together succeeded in reducing the process of adding applications to air platforms by a dramatic margin – from roughly 60 months to around five months from an implementation standpoint. "What RTI helped us achieve is a turnkey approach that enables customers to introduce new applications faster than
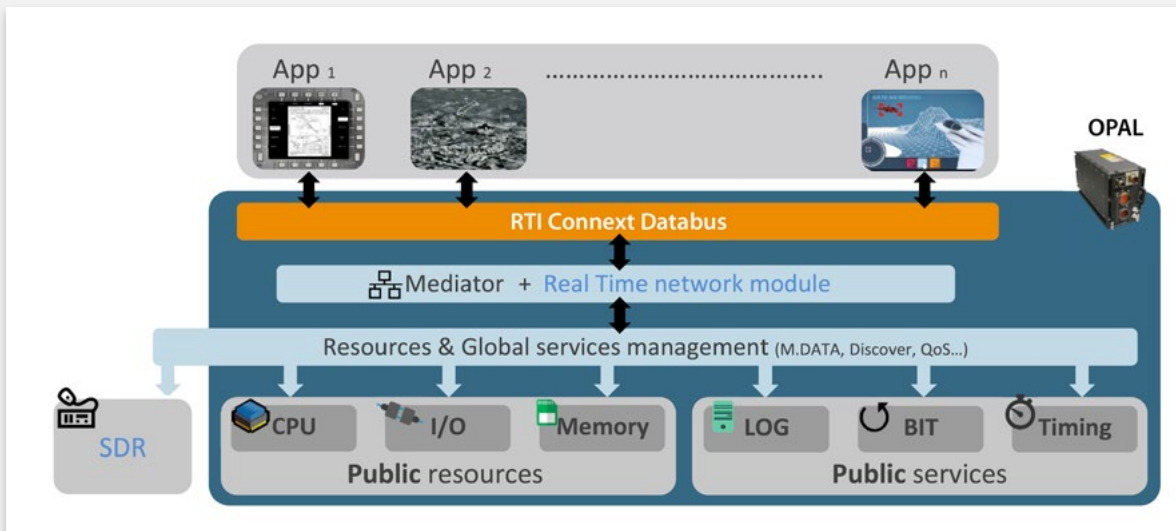
Application Implementation with IAI-OPAL and Connext

was ever possible before in the aviation industry. And the ramifications of that can be huge, in terms of a much shorter time to market and major cost savings for customers."

Best of all, the communication functions are all transparent and universal to customers, who don't even need to be familiar with DDS to use the OPAL system. In particular, the ability to develop new applications once and then migrate them across multiple platforms is an amazing benefit, which simply did not exist before the creation of OPAL. This opens the door to other net-new capabilities, such as the ability to replace dedicated, pod-based, training systems with OPAL, so that the system that a pilot trains on can be the same as the one used in combat.

And when it comes to decentralized battle management, OPAL's real-time network capabilities can integrate seamlessly with C2 systems and share data among different entities on air, land and sea. Thanks to its secure application framework, OPAL is also able to provide next-level collision avoidance features, so pilots flying in tight formation not only see a collision warning light, but also see that the right evasive move to make is lit up on the screen – without even having to look up from their instrument controls.

Another key highlight of basing OPAL on the DDS standard is that OPAL is presently aligned to the Future Airborne Capability Environment (FACE™) technical standard 3.1, which defines an open avionics environment for all military airborne platform types. Relying on the Integrated Modular Avionics (IMA) architecture enables OPAL to introduce new applications in keeping with the FACE approach. In this manner, OPAL can continue to evolve and deliver even broader compatibility. In addition, the OPAL application framework built on Connext will readily enable companies to meet Modular Open Systems Approach (MOSA) program requirements.

"Our ability to offer major operational process improvements for our customers can be traced back directly to the decision we made to adopt the Publish/Subscribe architecture and features of Connext," says Zaharan. "From a technical point of view, RTI and Connext have definitely played a huge role in our success."

ABOUT RTI

Real-Time Innovations (RTI) is the largest software framework company for autonomous systems. RTI Connext® is the world's leading architecture for developing intelligent distributed systems. Uniquely, Connext shares data directly, connecting AI algorithms to real-time networks of devices to build autonomous systems.

RTI is the best in the world at ensuring our customers' success in deploying production systems. With over 1,500 designs, RTI software runs over 250 autonomous vehicle programs, controls the largest power plants in North America, coordinates combat management on U.S. Navy ships, drives a new generation of medical robotics, enables flying cars, and provides 24/7 intelligence for hospital and emergency medicine. RTI runs a smarter world.

RTI is the leading vendor of products compliant with the Object Management Group® (OMG®) Data Distribution Service™ (DDS) standard. RTI is privately held and headquartered in Sunnyvale, California with regional offices in Colorado, Spain and Singapore.

Download a free 30-day trial of the latest, fully-functional Connext software today: https://www.rti.com/downloads.

Your systems.
Working as one.

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