



CAPABILITY
BRIEF

The Connected Digital OR

REDEFINING THE OPERATING ROOM OF THE FUTURE THROUGH REAL-TIME DATA STREAMING

RTI Connex[®] provides the data circulatory system for real-time, interoperable data exchange. This framework enables a new generation of intelligent, software-defined, physical AI systems and unlocks the power of the fundamental technologies that are driving the future of the digital operating room.

HIGHLIGHTS

- » Proven, production-ready data streaming framework enabling intelligent, integrated, and connected surgical systems
- » Streamlined development and integration of AI-enabled applications that require diverse data sources
- » Data-centric architecture delivers interoperability across distributed applications, devices, diverse data sources, and networks, with seamless plug-and-play integration of legacy and next-generation systems
- » Deterministic, low-latency, fault-tolerant communications provides highly reliable and performant closed-loop control, feedback, and monitoring
- » Secure-by-design communication addresses regulatory guidance and protects data in motion

Technology is Reshaping the Future of the Digital OR

Conventional surgical suites are transitioning from standalone devices to a connected, software-defined digital ecosystem that is powered by real-time data, physical AI, and edge computing. These trends will transform patient care and clinical efficiency while delivering business benefits for hospitals and medical OEMs. What are the enablers for the digital OR?

- **Edge AI and Computer Vision:** On-device inference and real-time image processing bring recognition, tracking, and decision-making directly into the OR, without waiting on a round trip to the cloud.
- **Data-Centric, Software-Defined Architectures:** Applications communicate via a shared data model, abstracting messaging from the application and enabling highly modular, evolveable systems.
- **Multimodal Data Fusion:** Video, kinematic, and physiological data streams are fused in real time for intraoperative feedback, automation, and visualization.
- **Robotics:** Robotically-assisted systems enable increasingly precise and repeatable surgeries.
- **Ambient Intelligence and Smart OR Sensing:** Cameras and multi-modal sensors can now track procedural workflow to automatically generate reports, track surgical instruments, and optimize OR turnover.

Today, the foundation for the digital OR is the invisible data orchestration that integrates technologies and data flows across those devices to distributed monitoring, viewing, and robotic systems. A new era of AI agents can interoperate across the clinical workflow to optimize setup, provide intraoperative guidance, and automate clinical reporting.

For device manufacturers, these trends are redefining the design and development of next-generation surgical systems. Instead of siloed devices and applications, systems must be designed on digital architectures that enable scalability, interoperability, and integration. Systems must evolve faster, with software-defined, differentiating features that provide meaningful clinical value. Manufacturers must navigate how best to leverage data-driven and AI-enabled solutions that support emerging business models and integration. The value to device manufacturers, the hospital, and the patients will move beyond the device itself to an integrated, data-driven solution, able to improve outcomes and clinical efficiency within a larger digital ecosystem.

For hospitals and patients, the future of the digital OR will usher in a wave of urgently needed solutions that deliver safer, more effective treatments while increasing procedural throughput and extending equipment lifespans.

To get there, we must solve the challenge of real-time data flow in the OR setting. Disparate devices (robotics, cameras, imaging systems, monitoring devices) operate on different platforms and networks. This results in fragmented systems, data siloes, and inefficient clinical workflows. Legacy architectures and patchwork communication protocols create bandwidth and latency bottlenecks. These inflexible, costly systems are slow to evolve and pose significant reliability and cybersecurity risks. For development teams, that translates into schedule risk: Integration work that should take a few weeks stretches into quarters and beyond, and every new device, application, or protocol potentially poses the same problem.

Solving the Challenges of the Digital OR

RTI Connex provides these challenges with a trusted data infrastructure. Its real-time data streaming software framework for physical AI systems enables applications, devices, and platforms to seamlessly exchange data across systems, data sources, and networks. Connex serves as the foundation for flexible and scalable platforms across programs and product portfolios, simplifying product architectures and enabling development teams to focus on clinical applications over infrastructure.

The Right Data Architecture for the Digital OR

Connex's shared data foundation enables robotics, imaging, monitoring, and orchestration systems to seamlessly work as one integrated system, from edge to cloud. Unlike traditional message-centric approaches, Connex enables modular and scalable system architectures that are designed for the data itself as the interface.

Built on the Data Distribution Service (DDS®) standard, Connex uniquely enables highly decoupled integration through a shared data model. Within this framework, applications may access secure, reliable, and context-relevant data on demand, from any location in the connected system.

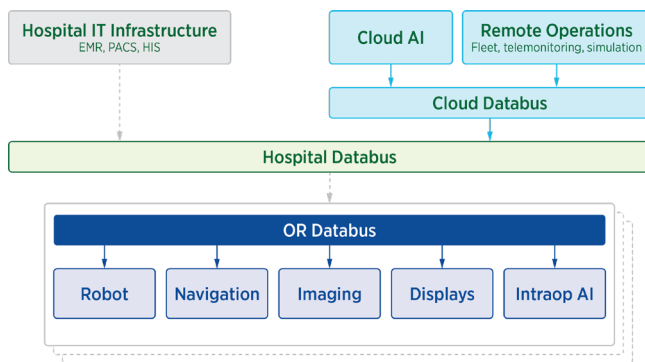


Figure 1: Connex provides real-time data connectivity for the Digital OR through a shared databus that distributes data in real time.

RTI Connex provides:

Edge AI Integration: Connex integrates real-time data sources, robotic and device control, and AI/ML applications with physical AI. It integrates with high-performance GPU processing platforms, such as NVIDIA® Holoscan®, to accelerate development of AI-enabled systems.

Robust Cybersecurity: Built-in DDS-Security™ enforces fine-grained access control, encryption, and authentication of the data itself for protection over and above the physical network, firewalls, and network perimeters.

Seamless Integration and Interoperability: Connex establishes a common connectivity infrastructure for real-time data streaming that unifies diverse data sources, applications, and subsystems. Physiological signals, kinematic, and video data are seamlessly integrated for intraoperative guidance, automation, and visual overlays.

Reduced Project Risk: Connex supports the development of modular and evolvable systems that are easier to build and maintain. Simplifying and accelerating development of software-defined features with reusable architectures helps customers accelerate development and reduce project risk.

QoS for Real-Time and Reliable Communications: Configurable Quality of Service (QoS) parameters optimize data flow for each type of data and application ensuring that data only goes where it is needed and protecting network bandwidth.

Transforming the Future OR through the Connected Data Flywheel

In the digital OR, data is the primary asset. Hospitals are transforming into robotic, digital, AI ecosystems powered by integrated, real-time data. Unlike legacy systems, these platforms require digital-first open architectures and AI-enabled infrastructure. Beyond the OR, data is increasingly captured pre, intra, and post-operatively to power a “data flywheel”; clinical teams stand to leverage vital insights from patients, devices, and procedures to inform further advances in clinical workflow and precision treatment and monitoring.

With decades of experience across safety-critical industries, RTI is a leader in powering intelligent distributed systems and a trusted technology partner to the leading medical device companies in the world. www.rti.com/healthcare.

ABOUT RTI

RTI is the real-time data streaming company for intelligent distributed systems. RTI Connex® software is the critical nervous system for over 2,000 designs across Aerospace and Defense, MedTech, Automotive, and Robotics.

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