

DATASHEET

RTI Connex Professional

WORLD'S LEADING ARCHITECTURE FOR DEVELOPING INTELLIGENT DISTRIBUTED SYSTEMS

HIGHLIGHTS

DDS network protocol and API compliance

Powerful tools that accelerate integration, testing and debugging

Toolkit for integrating non-DDS systems

Interoperability across programming languages, operating systems and CPU families

Works over UDPv4, UDPv6, TCP, Shared memory, LAN and WAN

RTI Connex[®] Professional is the industry-leading DDS implementation customers trust to rapidly develop, integrate and evolve critical distributed systems. It delivers the low-latency, high reliability, scalability and security essential for mission-critical applications. The Connex[®] databus significantly reduces development, integration and maintenance costs.

THE SOFTWARE INFRASTRUCTURE FOR CRITICAL SYSTEMS

Connex Professional provides a comprehensive software infrastructure that enables the modular development of distributed real-time systems. It includes connectivity libraries, a suite of development and monitoring tools, and infrastructure services. It integrates with a wide variety of third-party applications, operating systems and toolchains. It supports over 100 platforms and 12 transports, connecting them all transparently. Connex Professional delivers the solid foundation needed to support critical applications.

Connex Professional is built on the Object Management Group[®] (OMG[®]) Data Distribution Service (DDS[™]) standard. DDS is the only connectivity standard designed to support the demanding Quality of Service (QoS) requirements of autonomous systems.

Connex Professional includes:

- DDS libraries proven in more than 2,000 systems with the world's most demanding reliability, scalability and performance requirements

- Toolkit and adapters to ease integration of application and devices that do not natively support DDS
- Powerful tools that accelerate integration, testing and debugging

Connex Professional is built upon and supported by RTI's unparalleled expertise in architecting, developing and deploying intelligent distributed systems.

A TRUSTED AND PROVEN DEVELOPMENT ENVIRONMENT FOR INTELLIGENT DISTRIBUTED SYSTEMS

Connex Core Libraries provide a native, DDS-compliant interface to the Connex databus for embedding directly into applications and devices.

Code Generator generates type-specific and type-safe DDS interfaces from IDL or XML data type descriptions. It generates example publishers and subscribers, makefiles and IDE projects.

Routing Service supports systems-of-systems or a layered databus architecture. It bridges data across transport protocols, physical networks and security domains. It monitors subscriptions and only forwards currently subscribed data for efficient bandwidth utilization. It can also transform data between applications that use incompatible data types.

Administration Console provides non-intrusive centralized visibility into a running system — including nodes, participants, topics, types, QoS and configuration mismatches. It allows you to visualize data being distributed, administer run-time services and view systemwide logging messages.

The Connex Observability Framework provides unprecedented insight into applications' health and performance by identifying and diagnosing issues, optimizing performance, and ensuring high availability.

System Designer allows software architects and developers to easily define and configure a Connex system using an intuitive web-based interface. It can be used to generate a complete XML specification of a Connex system for use by Connex XMLbased Application Creation.

Adapter SDK enables developers to create Routing Service adapters to easily integrate non-DDS applications. It includes the source code to several sample adapters (OPC UA, Modbus, MQTT) that can be customized to support a wide variety of standard and proprietary interfaces.

Monitor helps to optimize performance and identify problems using metrics emitted by Connex systems enabled with monitoring libraries. It displays comprehensive performance, health and resource utilization statistics in a graphical view.

Persistence Service makes historical data available to late-joining applications, even when the original publisher is no longer accessible.

Recording and Replay Service records high-throughput real-time data for future analysis and debugging. Recorded data can be replayed for testing and simulation using the original or modified QoS settings and data rates.

Ping and Spy are command-line utilities for checking system connectivity and inspecting packet contents.

RTI PerfTest measures network throughput and latency for a given publisher and subscriber configuration and message size. It helps users understand network capabilities and the impact of different configuration settings.

Distributed Logger provides a high-level API for publishing log messages using the Connex databus. Log messages can be visualized from RTI Monitor, Admin Console or subscribed from a custom tool.

Database Integration Service provides bi-directional integration between the Connex Databus and a relational database. It stores published data in the database and can publish database updates to subscriber applications.

Web Integration Service provides a RESTful HTTP interface to the databus for easy integration with web applications and scripting languages.

OPTIONAL COMPONENTS

Limited Bandwidth Plugins allow DDS applications to run in severely bandwidth-constrained networks, such as satellite or radio links. Use of the IP is not required. The plugins include a simulator for emulating and testing behavior over low-bandwidth networks.

Security Extensions enable system architects to protect and defend systems through flexible or fine-grained security options for optimal performance and efficiency, from device to cloud. Security Extensions support authentication, logging, encryption and access control based on the DDS-Security™ standard, as well as any Connex transport, including multicast. Security Extensions include Security Plugins, Lightweight Security Plugins, and TLS Support.

Security Plugins SDK allows developers to extend/customize the behavior of Security Plugins or Lightweight Security Plugins. This enables integration with crypto libraries beyond the included OpenSSL libraries. The SDK includes an example of integration with the wolfSSL libraries.

Real-Time WAN Transport provides reliable and responsive communications across wide-area networks. It can traverse NATs and maintain consistent communication as endpoints move or IP addresses change.

Cloud Discovery Service enables discovery in environments where UDP multicast may not be available. Cloud Discovery Service can be used with the Real-Time WAN Transport to create performant, scalable systems that span diverse public and private networks.

Micro Libraries offer a DDS-compliant interface to the Connex databus for resource-constrained embedded systems, ensuring reliable data exchange with minimal overhead.

TSS Libraries provide a commercial FACE TSS solution that can accelerate Future Airborne Capability Environment (FACE™) application component development and integration.

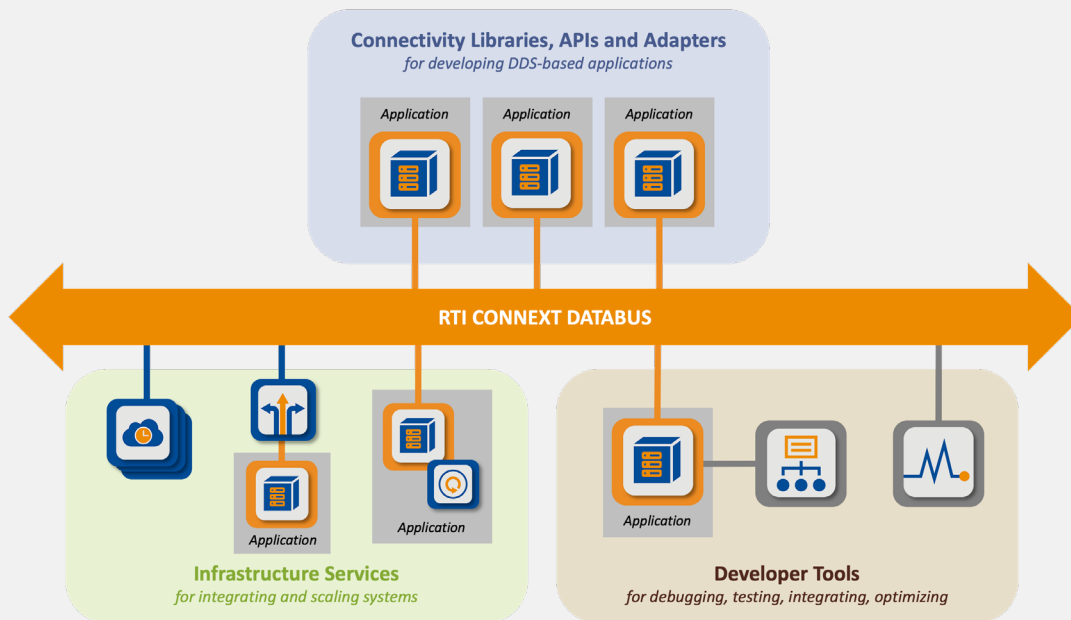
Ada Language Support enables developers to leverage Connex's powerful features, while maintaining compatibility with Ada development environments.

POWERFUL DATA-CENTRIC PARADIGM

The Connex databus simplifies application and integration logic with a powerful data-centric paradigm. Instead of traditional messaging, software components communicate via shared data objects. Connex handles the details of data distribution, synchronization and management, including serialization and life cycle management.

Key Benefits:

- **Decoupling:** Components remain agnostic to each other, facilitating seamless integration and scalability.
- **Easy integration:** Explicit and discoverable interfaces streamline integration without protocol reverse-engineering.
- **Robustness:** Connex maintains a consistent system state, ensuring reliability even in dynamic environments.



DECENTRALIZED ARCHITECTURE

Connext's decentralized architecture ensures minimal latency and maximum throughput. Publishers send updates directly to subscribers, eliminating intermediaries and single points of failure.

Benefits:

- **Low Latency:** No intermediate brokers or network hops ensure minimal latency.
- **Scalability:** Maximum throughput without broker bottlenecks.
- **Availability:** Non-stop availability with no single point of failure
- **Decentralized:** Easy embedding with no centralized services to deploy and administer
- **Security:** Inherent security with no single point of vulnerability

For scenarios requiring broader connectivity, RTI Routing Service bridges networks while maintaining peer-to-peer data flow. Multiple instances can be deployed for fault tolerance and load balancing.

COMMUNICATION PATTERNS

In addition to data-centric publish-subscribe, Connext supports additional communication patterns to ease development.

Request/Reply: Connext can issue a single request to multiple components and correlate multiple responses to a single request — for example, to track the execution status of a command.

Message Queuing: With the optional Queuing Service, Connext delivers each message to only one consumer, enabling efficient load balancing.

Historical Data Query: Applications can retrieve historical data from publishers' caches on demand, even if the data was not subscribed when originally written. This provides much more efficient and scalable access than speculatively subscribing to data that may not be needed.

OPTIMIZED FOR PERFORMANCE, SCALABILITY AND AVAILABILITY

Automatic discovery eliminates the need for deployment-time configuration. Applications are plug-and-play, self-forming and self-healing, facilitating use in dynamic and ad hoc systems. Connext automatically discovers and routes data between matching producers and consumers at run-time.

Transport protocol independence allows reliable communication over any network type, from the edge to the cloud, including:

- Shared memory within a node
- UDP multicast on a LAN
- UDP unicast or TCP over a WAN or where multicast is unavailable
- Non-IP radio or satellite links in the field

Seamless device mobility automatically re-locates and re-authenticates participants without data loss when their IP address changes. This can occur when roaming across networks or when switching between wired, wireless and mobile networks.

Reliable multicast provides scalable one-to-many and many-to-many data distribution. Messages only have to be sent over the network once, regardless of the number of subscribers.

Smart filtering maximizes efficiency and scalability. ConnexT can filter by specific content (not just metadata) and desired frequency of delivery, simplifying application logic. Filters are applied on the publisher's side to reduce network and processor overhead.

Quality of Service control eases integration of applications with disparate performance needs. The frequency, timeliness and reliability of data delivery are configurable per stream and per component.

Automatic failover between publishers and networks provides uninterrupted availability in the event of hardware and software failures.

Type extensibility allows data types to change over time without breaking interoperability with applications that use older or different versions of a type. This is essential for evolving intelligent distributed systems with long lifecycles and for those in which it is infeasible to update already-deployed applications.

PROGRAMMING INTERFACES

- DDS: C, C++, Modern C++, C#/.NET, Java, Ada JavaScript (node.js)^, Python
- LabVIEW*, Simulink*, REST/HTTP

TRANSPORTS

- Shared memory
- UDPv4, UDPv6
- Real-time WAN Transport
- unicast and multicast
- TCP
- TLS#
- Low bandwidth

OPERATING SYSTEMS

- Linux, Windows, macOS
- VxWorks, QNX, INTEGRITY
- Android, Deos, QNX OS for Safety, INTEGRITY-178, FreeRTOS, SafeRTOS, LynxOS-178, ThreadX, Helix Virtualization Platform, AUTOSAR

PROCESSOR FAMILIES

- x86, x64
- ARM
- PowerPC
- Custom®

DDS COMPLIANCE

- DDS 1.4**
 - » Minimum, Persistence and Ownership profiles
 - » ContentFilteredTopic & QueryCondition
- DDS Wire Protocol (RTPS) 2.2**
- DDS Security 1.1#***
- C++ Language DDS PSM 1.0
- XTypes: Extensible and Dynamic Topic Types 1.3**
- RPC over DDS 1.0**
- Web-Enabled DDS 1.0**
- DDS XML Syntax 1.0**
- IDL 4.2**

^ Experimental product

* Third-party product

Requires Security Extensions

® Through arrangement with RTI

** RTI is Lead Author

ABOUT RTI

Real-Time Innovations (RTI) is the infrastructure software company for smart-world systems. Across industries, RTI ConnexT® is the leading software framework for intelligent distributed systems. RTI runs a smarter world.

RTI is the market leader in products compliant with the Data Distribution Service (DDS™) standard. RTI is privately held and headquartered in Silicon Valley with regional offices in Colorado, Spain, and Singapore.

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