Inside DDS
Virtual ConnextCon

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Agenda
RTI Applications, Consortia

Autonomous Vehicles/Transportation

Energy

Aerospace & Defense

Healthcare
Challenges when building such a system

- Scale: need to integrate thousands of subsystems
- Modularity / flexibility: lots of subsystems change with different launch vehicles
- Needs to accommodate very different dataflows
- Must be robust
- Must be cost-effective
Kennedy Space Center

Challenges:

• Scale: need to integrate thousands of subsystems
Scalability
Challenges:

• Scale: need to integrate thousands of subsystems

• Modularity / flexibility: lots of subsystems change with different launch vehicles
Modularity, Flexibility

How the system is initially designed

What happens to the system when it needs to evolve
Modularity, Flexibility

What happens to the system when it needs to evolve
Communications Model: Not only Pub/Sub

Request/Reply

Requestor

Request

Request Topic

Reply Topic

Reply

Replier

Request

Reply

Multiple Repliers

Requester

Request

Replier A

Reply

Replier B

Replier C

Transformation

Producer

Msg #1

Consumer

Msg #2

Consumer

Msg #3

Consumer

Splitter

Message Translator

Content Remover

Content Enricher

Aggregator
Challenges:

• Scale: need to integrate thousands of subsystems

• Modularity / flexibility: lots of subsystems change with different launch vehicles

• Need to accommodate very different dataflows
## Dataflow Challenge

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Data Type</th>
<th>Data Volume</th>
<th>Data Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cameras</td>
<td>Video Stream</td>
<td>🟦</td>
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<tr>
<td>Lidar</td>
<td>Data List</td>
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<tr>
<td>Radar</td>
<td>Point cloud</td>
<td>🟦</td>
<td>🟦</td>
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<tr>
<td>GPS</td>
<td>Bin data struct</td>
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<tr>
<td>Control Cmd</td>
<td>Bin data struct</td>
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<td>🟦</td>
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<tr>
<td>Error</td>
<td>Text String</td>
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</tbody>
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What if you could use a **single solution** for all your dataflows?
Solution: Dataflow QoS

### DDS QoS Features

- Reliability
- In-Order Delivery
- Batching
- Resource Limits
- Partition
- Deadline
- Content Filtering
- Presentation
- Ownership
- Transports
- Time Based Filter
- Durability
- Lifespan
- Flow Control
- Multi-Channel
- Liveliness
- Latency Budget
- History
- User, Group, Topic Data
- Async Publisher

### Transport

- UDP
- TCP
- Shared Memory
- RS-232
Kennedy Space Center

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Must be robust

Testlab with 80+ different platforms

1500+ production projects => millions of hours of operation

TRL 9

DO-178C DAL A

Driving standardization and innovation

Professional Services Team – leverage the experience of RTI
Challenges:

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<table>
<thead>
<tr>
<th>Network Stack</th>
<th>Functional Tests</th>
<th>Perf Tests</th>
<th>Documentation</th>
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</thead>
<tbody>
<tr>
<td>Business logic</td>
<td>Functional Tests</td>
<td>Perf Tests</td>
<td>Documentation</td>
</tr>
<tr>
<td>Message Filtering</td>
<td>+ Analysis Tools</td>
<td>+ Analysis Tools</td>
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<tr>
<td>Caching and Persistence</td>
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<td>Quality of Service</td>
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<tr>
<td>Node and Service Discovery</td>
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<td>Addressing</td>
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<td>Serialization / Marshaling</td>
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<td>Encryption and Authentication</td>
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<td>Socket Programming</td>
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</table>
Kennedy Space Center

- The NASA KSC launch control is the world’s largest single-system SCADA
- It combines 300k points, at 400k msgs/sec
- RTI Connext DDS powers launch control, in-flight monitoring, UAV reentry-tracking ground station, and the recovery ship

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Healthcare

Challenges:

• Human errors due to alarm fatigue
• Patients need to be moved frequently
• Not all information is needed everywhere
• Most information needs to be secured
• Need to integrate existing subsystems
• You may not be a DDS expert
Challenges:

- Human errors due to alarm fatigue
- Patients need to be moved frequently
- Not all information is needed everywhere
Healthcare System

IT Systems Database

- HIS
- PACS
- LIS
- Recording Services
- Mobile

Ward Database

- Nurses Station
- Decision Support

Ward

Room

- Smart Alarming
- Patient Monitor
- Infusion Pump
- Temp
- BP
- EKG
- Ventilator
- Data Recording

IT/Cloud

- Cloud Server

Fog

- Room, Operating Room or ICU Database

Edge

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Healthcare

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DDS Security Standard

- DDS entities are authenticated
- DDS enforces access control for domains/Topics/…
- DDS maintains data integrity and confidentiality
- DDS provides availability through reliable access to data

…while maintaining DDS interoperability & high performance
Healthcare

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Other Technologies, Integrated

- Simulink Block
  - DDS BlockSet
- LabView Instrument
  - DDS Toolkit for LV
- dSpace Module
  - DDS Toolkit

- Generic DDS App
  - DDS API
  - App Types
- Connector App
  - Connectors API
  - App Types

CONNEXT DATABUS

- Gazebo World
  - DDS
  - Gazebo.dds_plugins
  - DDS

- DDS-WEB Gateway
  - HTTP

OPC UA
DDS-XRCE
Healthcare

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DDS experts – Start Off on the Right Track

Architecture, Security & System Planning

Performance Characterization & Tuning

Application Development Team Training

Proof of Concept Development & Custom Projects

Design Mentoring & Best-practice
GE Healthcare’s smart distributed architecture will connect 300 types of devices with RTI software.
Connext 6: Platform for Distributed System Connectivity

- **Connext DDS Professional**: Connectivity software for developing and integrating IIoT systems.
- **Connext DDS Secure**: Designed for systems requiring robust, fine-grained security.
- **Connext DDS Micro**: Designed for resource-constrained systems.
- **Connext DDS Cert**: Designed for safety-certifiable systems.

Features:
- Code Generation
- Data Routing
- Data Persistence
- Data Queuing
- Recording & Replay
- System Administration
- System Introspection
- System Monitoring
- Database Integration
- Web Integration
- Spreadsheet Integration
- 3rd Party Integrations
Try a full version of Connext DDS for 30 days

TRY CONNEXT AT RTI.COM/DOWNLOADS

Includes resources to get you up and running fast