The Data-Centric Future
Pervasive Data

- Today’s newly-connected distributed systems are just the beginning
- Pervasive data will drive the vast distributed applications of the future
RTI Market Leadership

- ~400 different publish-subscribe applications
  - 75 DDS API applications
    - 20+ major Navy programs
    - All major US primes
  - Thousands of deployments

LOCKHEED MARTIN

NORTHROP GRUMMAN

Raytheon

GENERAL DYNAMICS

BOEING
The US Navy’s LPD-17’s sophisticated Ship-Wide Area Network (SWAN) includes:

- shipboard, machinery, damage and steering controls
- Mission control, navigation and communication systems
- Many other components

The challenge is the complexity of coordinating such a large number of disparate systems.

RTI forms the backbone for the entire SWAN to synchronize & manage this wide-ranging set of control systems.
Lockheed Martin US Navy Aegis Open Architecture Weapon System

- Next-generation of the U.S. Navy Aegis Weapon System
- Challenge to share time-critical data across highly distributed system including radar, weapons, displays and controls
- Need to maximize future scalability and flexibility
- RTI provides real-time communication infrastructure. Standards-based & extensible for future system enhancements
Navy Open Architecture
Ship Self Defense System (SSDS)

- Project to employ standards throughout ship systems (frameworks, OS, etc.)
- Goal: Reduce total cost of ownership, ease system upgrades, reduce interoperability issues
- RTI selected as middleware: its extensibility enables an open architecture throughout Navy!
- RTI provided advanced integration, support & consulting
Littoral Combat System (LCS)

- Distributed combat and control system for U.S. Navy ship
- Concerned with extensibility of system, compatibility between vendors, easy upgrades
- OMG DDS is the specified standards-based middleware in US Navy Open Architecture
- RTI selected on performance, extensions and advanced services
High-Performance Distributed Computing (HiPer-D) program tracks thousands of targets, coordinates hundreds of computers on multiple ships.

System requirement to be real-time (microseconds) and deterministic (100% of the time).

RTI provided COTS technology that met HiPer-D’s stringent requirements for real-time & deterministic response in a distributed computing environment.
Sperry Marine NavDDS seamlessly interfaces electronic navigation sensors with shipboard systems.

Challenge to scale from single sensors to large-scale, multiple-sensor system distributing time-critical data.

DDS does not require specific design knowledge of remote devices, enabling easy integration of new data sources.

DDS auto-discovery means can add new systems to architecture without reconfiguring existing subsystems.
Navy Open Architecture Ship Self Defense System (SSDS)

- Project to employ standards throughout ship systems (frameworks, OS, etc.)
- Goal: Reduce total cost of ownership, ease system upgrades, reduce interoperability issues
- RTI Services provided advanced integration, support & consulting
- First deployment at sea now
Developed under the DD(X) destroyer program, DDG 1000 Zumwalt is the lead ship in a class of next-generation, multimission surface combatants.

RTI powers the Total Ship Computing Environment Infrastructure (TSCEI), the backbone of the network computing system and basis for all DDG 1000 application software programs.

“The selection of RTI came through a process which uses formal evaluation criteria and a source selection board to ensure that the Navy gets the best value. This is an emerging product market and it was determined that the offering from RTI, a small privately held company, provides the best value to the Navy.”

-- Raytheon DDG 1000 System Software Development Director Bob Martin
U.S. Army and University of Iowa Driving Simulator

- The National Advanced Driving Simulator provides state-of-the-art real-time driving simulation.
- High number of systems – visual, motion, controls, etc. - exchanging and processing data in real-time.
- Real-time performance was critical: other middleware such as CORBA and DCOM were simply not fast enough.
CAE SimXXI Flight Simulation

- State-of-the-art full-flight simulator from CAE

- Challenge is communication between subsystems (over IEEE 1394) with low-latency data transfer

- RTI chosen because it excels in real-time performance and is simple to use and integrate
FORCE trains ship captains by using accurate simulations of actual locales worldwide.

- Performance - many components need to come together and share data in real-time.
- Scalability - Want to integrate systems more rapidly.
- RTI delivered on the performance and scalability requirements. RTI also helped design the application.
High-Value Mobile Asset Tracking

- System used to wirelessly monitor high-value mobile assets such as locomotives, industrial equipment and marine vessels
- Biggest challenge was wireless bandwidth issues
- RTI addressed critical issues such as tuneability and discovery process over wireless network
- Company brought DDS knowledge from General Motors, chose Pub-Sub model, then chose RTI as vendor
Highway Traffic Monitoring in Tokyo

- The City of Tokyo provides real-time information to commuters and officials about traffic problems.
- Hundreds of traffic monitors and information kiosks along the highway.
- Challenge to deliver information to a variety of server & client platforms, via links varying in bandwidth & location.
- RTI enables reliable delivery of information over heterogeneous systems and with minimal bandwidth.
U.S. Army Munitions Transfers

- The US Army built a “smart” robotic crane to automate manpower-intensive munitions transfer process.
- Challenge to coordinate multifaceted system requiring high level of precision.
- RTI offered the performance and reliability required for complex system.
- RTI integrated hardware and software systems from many vendors.
Modern factories require the exchange of up-to-the-minute data on manufacturing processes, even with resource-constrained devices.

Challenge to incorporate devices with limited memory or processing power.

RTI with Schneider created a compact real-time publish-subscribe service – resides & executes in under 100 kb!
Harmonic Digital TV Video-on-Demand

- Harmonic builds transmission equipment to enable video-on-demand worldwide
- Challenge delivering data over WAN to and from disparate hardware
- RTI offers richer feature set than other solutions. Also enables scalability and future extensibility of the system
- Standard commercial off-the-shelf solution key to meeting tight schedule, lowering costs
Varian provides leading edge tools and solutions for diverse, high growth applications in the life science industry.

Varian needed a new software architecture to seamlessly handle its expanding product line of magnetic instruments.

RTI provided the flexible and powerful QoS needed. Using RTI has greatly simplified system integration and connection.

Varian is today shipping RTI middleware in their entire NMR instruments product line.

"RTI delivered great functionality at a low cost. Using RTI middleware saved us a lot of money, time, and effort compared to our previous in-house developed solution."
DARPA Flying Fox Autonomous Vehicle Systems

- Autonomous vehicle in the 2005 DARPA Grand Challenge race
- Unique characteristic of FireFox: adaptive vision system – vehicle “learns” through example
- Complex network of control and vision systems, sensors, processors, operating systems
- RTI integrates all kinds of data sources, shares data with minimal latency
AWACS Radar System Upgrade

- Airborne control system for surveillance, command & control and battle management
- Upgrading system to be open, supportable, less expensive to maintain and extend
- RTI is standards-based, open and extensible, reducing integration risk
- RTI is a proven COTS solution, reducing total cost of ownership over in-house development
DDS B-1B Tactical Systems Upgrade

- Adding new command & control and communications capabilities that need to work with legacy control system
- Need architecture that is open & modular for future extensions and upgrades
- RTI is open and scalable, reducing integration risk, standards-based ensuring supportability
Insitu Unmanned Air Vehicle

“...we have seen a 30% increase in productivity based on not having to handle data communication issues.” Gary Viviani, VP of Engineering

- Insitu is a recognized leader in the exploding UAV space

- The next generation of UAV’s including the Scan Eagle and newer platforms

- Challenge is to have a successful UAV mission which requires impressive autonomy and reliable ground control

- RTI enables an information flow that is much more orchestrated and flexible allowing seamless switch control between multiple ground stations while connecting reliably over unreliable links

Military
RTI Leadership

- Market leader
  - #1 in embedded middleware market share* (encompassing all middleware types)
  - >70% worldwide share of DDS market**
- Experience leader
  - Fourth-generation maturity
    - Based on experience with ~400 different designs since 1996
    - Proven in real-world, mission- and life-critical applications
  - Wide and deep platform support (over 65 platforms)
- Technology leader
  - Consistently highest performance
  - Standards compliant, both API and wire spec
  - Flexibility: Modular, pluggable architecture
  - Zero-configuration deployment
  - Advanced protocol: Strict reliability, large-data-type support
  - Services leader
- Thought leader
  - Led standardization at OMG
  - Contributed interoperability protocol RTPS
  - Led SIG, DDS portal, DDS info days

*Embedded Market Forecasters, June 2006; **VDC Analyst Report, Nov 2006
What’s New at RTI?

- RTI Data Distribution Service 4.1 released
- RTI Real Time Connect to Oracle introduced
- RTI Developer tool suite released
- RTI Architecture Study service offered
- RTI CORBA solution announced
- RTI Event Processing launched
- RTI Ecosystem growing
New in…
RTI Data Distribution Service 4.1d

- Large data-type support
  - Even send video!
- Asynchronous data publishing
  - More efficient throughput
- IPv6 built-in transport
  - Including transport priority mapping
- Native support for 64-bit Linux, Solaris, Windows
  - Work with large data stores
- Multi-language support for Content Filtered Topics
- Port mapping
- C++ support for DDS Namespace
- Improved performance
Asynchronous Publishing

- synchronous send path:
  - rapid write() return
  - network traffic shaping

- asynchronous send path:
  - rapid write() return
  - network traffic shaping
  - coalesce data samples
Introducing…
RTI Real-Time Connect to Oracle

Real-Time

Enterprise

DDS application

Real-time messages

RTI Real-Time Connect

Database changes

In-Memory Database

Enterprise infrastructure

Table.Passengers
Flt   Name  Addrs
----------
C129  A. Johnson …
C054  J. Smith …
...

Table.Tracks
Flt     Lat.   Long.
-------------------
C129   34.5   102.3
C054   27.7   46.8
...

RTI Real-Time Connect to Oracle
Delivers the first step towards the pervasive-data “e2E” vision
- All data is accessible to all applications with standard APIs
- The system can provide any information, past or present, to any location at any time.
- Data models map transparently
- No need for application-level bridging
Introducing…
RTI Developer Platform

- RTI Analyzer
  - Understand connections and data flow
  - Tune QoS properties without changing code
- RTI Scope
  - Capture and monitor packet payloads
  - Collect time histories of Topic values
- RTI Protocol Analyzer
  - Sniff the wire and analyze traffic
Introducing…
CORBA Integration and Support

- RTI now distributing and supporting CORBA
  - Partnership with OCI
  - OCI ACE TAO 1.4a source-code
    - RHEL 4.0 (32-bit & 64-bit)
    - Solaris 2.10 & Solaris 2.9
    - Windows

- Support CORBA and DDS applications with a common IDL file and language mapping
  - Generation of type-specific code that is compatible with OMG CORBA IDL mappings
  - Support for Java CORBA types
Introducing... Architecture Studies

- Leverage RTI’s deep experience
  - Reduce risk
  - Make the right decisions upfront
- Meet requirements:
  - Performance
  - Scalability
  - Availability
  - Integration
  - Selection and configuration of hardware and network
- Avoid costly rework late in development cycle
- Maximally leverage RTI products
- Identify risk areas and mitigation strategies
RTI’s Expert Consulting

- Integration services
  - Custom drivers
  - Legacy hardware support
  - Hardware/software interface
  - Integrating multiple teams or vendors

- Networking solutions
  - Evolving requirements → implementation → support
  - Custom DDS middleware

- Architecture studies
  - Design assistance, audits, reviews

- Critical on-site testing and debugging support
Introducing…
RTI Event Processing

- CEP == an “inverse database”
- High-performance, intuitive decision processing
- Natural integration with DDS data model
Introducing… SL Enterprise RTView

Enterprise RTView™

innovative | lightweight | real-time
MONITORING AND DISPLAY SOLUTION
Sparx Enterprise Architect and RTI Data Distribution Service Integration
RTI’s Thriving Ecosystem

- Third parties go with the market leader
- Best-of-class technologies
  - *Coral8: Complex Event Processing
  - *Object Computing Inc. (OCI): ACE-TAO CORBA
  - *Oracle: In memory and enterprise databases
  - *Sherrill Lubinski (SL): Dashboard and GUI building
  - SparxSystems: UML and MDA tools
  - Themis: Application Management Tools
  - Dot21: Track Analysis and Visualization Tools
  - Motorola: Hardware integration
  - Arrow: Enclosures, packaged product
  - Wind River, LynuxWorks, Green Hills: RTOS
- The ecosystem can deliver whatever you may need

*RTI resells these technologies
RTI’s Commitment to Customer Success

- Effective testing process
  - Extensive unit, feature, performance, stress tests
  - Fully-automated *nightly* build & test
  - Complete distributed lab facility
    - 100s of CPUs, many architectures, operating systems
- Formal development and support processes
  - Formal design requirements and tracability
  - Formal version control and release management
  - Formal issue tracking and prioritization
  - Formal release process and criteria
    - 65 OS+CPU+Compiler combinations supported as standard product (!)
  - Formal patch and hot-fix process
- Results (300+ users surveyed):
  - Would you recommend RTI products to others?
    - 98% of respondents said yes
How Can You Learn More?

- **Webinar overviews**
  - DDS Introduction
  - Data-centric design
  - Enterprise integration

- **QuickStart training**
  - DDS basics
  - Hands-on RTI product training
  - Tools use
  - Over 350 graduates!

- **Advanced training**
  - Tuning
  - Design
  - Testing
  - On-site tailored programs
RTI Shapes Demo

• Download includes
  – Demo application
  – Guide with background material and illustrative examples

• Goals
  – Teach DDS concepts in a “fun” way
  – Explain PS concepts, QoS, multiple connections, ease of configuration

• Where
  – www.rti.com
  – Live now!
The Data-Centric Future

- Pervasive data will change the future
- DDS is key to this data-centric future
  - High performance
  - Fine delivery control
  - Enterprise integration
- The real change is a profound thought shift:
  - Code/architecture-centric
    - Where are clients & servers?
    - What objects & methods?
    - How do I access info?
    - How synchronized?
  - Data-centric
    - What information?
    - How fast/reliable/flexible?
    - When is it available?
    - How is it stored?
- We’ve only just begun
  - Huge problems remain: integrating many technologies, scalability, impedance matching, technology adoption
The RTI Difference

- **Lowest risk**
  - Market and thought leadership
  - Field-proven, mature technology
  - Broad and deep expertise
  - Standards compliance (DDS, SQL and others)
  - Corporate reliability and stability
  - 98% customer satisfaction

- **Superior technology**
  - Pervasive-data vision
  - Industry-leading performance
  - Rich capabilities and Quality of Service control
  - Advanced tools and ecosystem
  - Mature, proven process