DDS Interoperability Demo
December 2010

PrismTech

Real-Time Innovations

OpenSplice|DDS

TwinOaks Computing

Gallium Visual Systems

Kongsberg

dds/2010-12-04
History: DDS the Standards

- Data Distribution Service for Real-Time Systems (DDS)
  - API for Data-Centric Publish-Subscribe distributed systems
  - Adopted in June 2003
  - Finalized in June 2004
  - Revised June 2005, June 2006
  - Spec version 1.2: \[http://www.omg.org/spec/DDS/1.2/\]
  - Adopted in July 2006
  - Revised in July 2007
  - Spec version 2.1: \[http://www.omg.org/spec/DDS-RTPS/2.1/\]

- Related specifications
  - DDS Extensible Topics
  - UML Profile for DDS
  - DDS for Light-Weight CCM

- Multiple (9+) Implementations
Who is participating?

PrismTech
Real-Time Innovations
OpenSplice™ DDS
RTI
TwinOaks Computing
Gallium Visual Systems
CoreDX
Gallium
KONGSBERG
About RTI

The Global Leader in DDS

- We are the DDS company
  - 100% focused on DDS
- Founded 1991 by researchers from Stanford Aerospace Robotics Lab
- Real-time middleware since 1996
- Over 500 unique applications
- Solid financials
  - Bootstrapped, no VC
  - History of profitability and growth
- http://www.rti.com
PrismTech Corporation

The World Leader in Open Source High Performance Middleware

- Global presence with active business in 50+ countries
- Supporting some of the most critical deployments around the globe, in Telco, Defense & Aerospace, Transportation, and Financial
- 110 Tech Jedi, including several Internationally acknowledged Middleware Experts, working hard to deliver you Performance, Openness, and Freedom!

http://www.opensplice.com

HQ Sites
USA: Burlington, MA
EMEA: Edinburgh, Scotland

Engineering Centres
Newcastle, UK | Fort Wayne, IN
Berlin, Germany | Paris, France
Hengelo, Netherlands

Field Offices / Distributors
London, UK | Saddle Brook, NJ
Houston, TX | San Francisco, CA
Helsinki, Finland | Seoul, South Korea | Beijing, China

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Supplier of software tools, turn key applications and services
- DoD Common Operating Environment
- Navy Open Architecture compliant
- ISO 9001:2008 Certified

Focused on mission-critical software applications
- Pioneered mapping and tracking systems in early 1980s
- Visualization products and services
- Middleware Communications Software

20+ Year focus on COTS software for
- Command & Control / Situational Awareness
- Air and Missile Defense
- Air Traffic Control
- Security
About Twin Oaks Computing

- Small business based in Colorado
- Specializing in high-performance data communications
  - DDS, RTPS
  - Networking protocols
  - Device drivers
  - Embedded computing environments
  - Tactical data links
- CoreDX DDS implementation
  - Targeted at high-performance, space-constrained, embedded environments
- Staff with over 30 years experience developing and supporting DoD systems
- [http://www.twinoakscomputing.com](http://www.twinoakscomputing.com)
What you will see today

- **#1 Interoperability works!**

- **#2 Multiple scenarios**
  - You will see interoperability along many dimensions:
    - Discovery
    - Different platforms (Linux, Windows)
    - Not-trivial Data-Types with Keys
    - Unicast & Multicast, both reliable and best efforts
    - One to Many and Many to one communications
    - Different Topics
    - Different Qos: RELIABILITY, OWNERSHIP, DURABILITY
    - Filters: time, content, ...

- **#3 Interoperability does not compromise performance**
  - Direct communication. No bridges!!
Eight demo scenarios

- Basic connectivity
- Request / Offered QoS (RELIABILITY, OWNERSHIP)
- Network Interruption
- Multiple Topics & Instances
- Exclusive Ownership
- Time and Content Filters

All this and more between multiple vendors across different platforms!!
Demo Setup

**OpenSplice™ DDS**

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**Global Data Space**

-three DDS Topics: Square, Circle, Triangle

- DDS Data type:
  - Shape:
    - color : string
    - x : long
    - y : long
    - size : long
  - Color is instance **Key**

- QoS:
  - Deadline, Liveliness
  - Reliability, Durability
  - History, Partition
  - Ownership
1. Basic Connectivity

You will see:
- Discovery
- Multi Platform
- Data Interoperability

Each vendor publishes one instance (color)
All vendors subscribe to Square and receive from everyone
2. Request/Offered QoS (RELIABILITY)

Each vendor publishes one instance of each Topic:
- Square RELIABLE
- Circle BEST_EFFORT
- Triangle BEST_EFFORT

Everybody subscribes to:
- Square RELIABLE
- Circle BEST_EFFORT
- Triangle RELIABLE

You will see:
- Square MATCH
- Circle MATCH
- Triangle no MATCH
3. Request/Offered QoS (OWNERSHIP)

Each vendor publishes one instance of Square, Circle, and Triangle

- Squares SHARED
- Circles EXCLUSIVE
- Triangle EXCLUSIVE

Everybody Subscribes to Square SHARED to Circle EXCLUSIVE to Triangle SHARED

You will see:
- QoS mis-match
- QoS agreement

For OWNERSHIP
4. Durability

RTI publishes instance of
- Square with DURABILITY TRANSIENT, HISTORY 400
- Circle with DURABILITY TRANSIENT, HISTORY 400

Everybody else Subscribes HISTORY 200
to Square VOLATILE
to Circle TRANSIENT

You will see:
- No historical data for VOLATILE
- Historical data for TRANSIENT
5. Robustness to network interruption

You will see:
- Connected nodes keep communicating
- Recovery after reconnect

Each vendor publishes one instance (color)
All vendors subscribe to Square and receive from everyone
Disconnect 2 nodes and then reconnect
6. PARTITION QoS

Each vendor publishes one instance of Square, Circle, and Triangle:
- Squares PARTITION “A”
- Circles PARTITION “B”
- Triangle PARTITION “*”

Everybody Subscribes to Square, Circle, Triangle all on PARTITION “A”

You will see:
- Square on ALL
- Circle on NONE
- Triangle on ALL
7. OWNERSHIP

Each vendor publishes one instance of Square OWNERSHIP EXCLUSIVE

Everybody Subscribes to Square EXCLUSIVE

Each vendor takes OWNERSHIP of the other vendor’s square

You will see:
- Take over when stronger writer appears
- Failover when stronger writer goes away
8. TIME_BASED Filter

Each vendor publishes one instance (color) of Square and Circle.

All vendors subscribe to Square without FILTER Circle with TIME_BASED filter.

You will see:
- All Square samples
- Sub-sampled Circle
9. Content-Based Filter

Each vendor publishes one instance (color) of Square
All vendors subscribe to Square with ContentBased Filter

You will see:
- Squares that pass the filter
Interoperability demonstrated along many dimensions

Today we demonstrated interoperability between 4 vendors for:

- Discovery
- Different platforms (Windows, several Linux distros)
- Different Topics and Data-Types
- Different Qos (RELIABILITY, DURABILITY, OWNERSHIP)
- Unicast & Multicast, both reliable and best efforts
- One to Many and Many to one communications
- Robustness to network interruption
- Time Based Filters
- Content Based Filter
Conclusions

- DDS Interoperability Works
  - We will continue working on additional scenarios
  - Vendors are committed to interoperability

- The DDS Standard and DDS-RTPS Interoperability standards are complete and usable
  - Two non-OMG vendors were able to use the OMG standard documents and produce interoperable DDS products

- DDS is the only portable and interoperable publish-subscribe infrastructure

- Come see more at the booths!