Enabling Global Data

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Agenda – Enabling Global Data

- What is DDS?
- DDS in Action!
- What makes DDS different?
- The Future
  - Enabling Unified Global Data
  - A Real-Time “Service” Bus
What is DDS? DDS the Standard

- Data Distribution Service for Real-Time Systems
  - Adopted in June 2003
  - Finalized in June 2004
  - Revised June 2005
  - Joint submission (RTI, THALES, OIS)
  - Specification of API for Data-Centric Publish-Subscribe in real-time distributed systems.

- Multiple Implementations
  - 3 commercial
  - 3 open source
  - Several more in-house

- Interoperability in progress at OMG
  - Expected adoption June 06
What is DDS? DDS/DCPS

Provides a “Global Data Space” that is accessible to all interested applications.

- Data objects addressed by **Topic** and **Key**
- Subscriptions are **decoupled** from Publications
- Contracts established by means of **QoS**
- Automatic discovery and configuration
What is DDS? DDS/DLRL

Provides “Local Object Caches” built from the Global Data Space.

- Objects manipulated with a “natural” language binding
  - Inheritance, Object Graphs, supported as language objects
- Actions on local objects cause updates to DCPS Global Data
- No need for a “global” object model
- QoS contracts still available via underlying DCPS

Distributed Node
Distributed Node
Global Data Space
Distributed Node
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DDS Adoption

- DISR (formerly JTA)
  - DoD Information Technology Standards Registry

- Navy Open Architecture

- FCS SOSCOE
  - Future Combat System – System of System Common Operating Environment

- RETF
  - Railroad Electronics Task Force

- Navy FORCEnet
DDS Adoption

UK Air Traffic Control

UK Air Traffic Control

RETF (USA) Train Communications

Boeing Army Future Combat System

RETF (USA) Train Communications

Boeing AWACS program

Tokyo Japan Traffic Control

US Navy, DD(X) LCS, LPD-17 SeaSlice and 13 other Navies

Tokyo Japan Traffic Control

Boeing AWACS program
DDS Adoption

- Aerospace & Defense
  - BAE (Joint Strike Fighter avionics)
  - USA, CAE, NADS, Boeing (Simulators)
  - TCG, Lincoln Labs, General Dynamics (C4ISR)
  - Boeing, Lockheed, Northrop (Navy OA)
  - SAIC (Ground vehicle control)

- Industrial Automation
  - Schneider (Factory automation)
  - Applied Materials, Nikon (Semiconductor equipment)
  - Ferag (Post printing assembling and binding)
  - Schilling (Robotics)
  - Max Planck (Power research)

- Telecomm/Datacomm
  - Accom (Digital video control)
  - Tekelec (Network test equipment)
  - IPC (Telecomm equipment)
  - Infinera (Optical switch control)
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Address in Global Data Space = (Topic, Key)

- Each topic corresponds to a multiple data instances
- Each DataWriter can write to multiple instances of a single topic
- Multiple DataWriters may write to the same instance
- Each DataReader can receive updates from multiple instances of a single topic
- Multiple DataReaders may read from the same instances
Publisher declares information it has and specifies the Topic
- and the offered QoS contract
- and an associated listener to be alerted of any significant status changes

Subscriber declares information it wants and specifies the Topic
- and the requested QoS contract
- and an associated listener to be alerted of any significant status changes

DDS automatically discovers publishers and subscribers
- DDS ensures QoS matching and alerts of inconsistencies
# QoS: Quality of Service

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<th>QoS Policy</th>
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<td>CONTENT FILTERS</td>
<td>TRANSPORT PRIORITY</td>
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</table>

**Infrastructure**

- Vitality
- Delivery
- Redundancy
- Transport

**User QoS**

- Presentation

**RTI**
Data-Distribution and Real-Time

- Java/RMI
- Java/JMS
- CORBA
- RTSJ (soft RT)
- RTSJ (hard RT)
- Web Services
- Data Distribution Service / DDS
- MPI

Adapted from NSWC-DD OA Documentation
What makes DDS different?

- **Data-centricity**
  - High level of data abstraction: Topic, Key
  - Proven scalable model for RT systems
  - “Smart” services such as:
    - Ownership, ContentFilteredTopics, KeepLast History
  - Automatic discovery
  - Directly supports state propagation/caching

- **Configurability by QoS**
  - Wide range of applicability: Enterprise to real-time
  - P2P infrastructure:
    - High-performance and scalability
    - Fault-tolerance
    - Scalability
  - Subsumes message-oriented and data-centric

- **Object model built as local cache**
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Until now: Different Data Solutions

- **Database Management Systems**
  - Good for: Complex queries, dynamic sorting, standard SQL I/F, enterprise solution
  - But... No RT performance, centralized, non-distributed

- **Data Distribution Services**
  - Good for: High performance, dynamic architectures, real-time solution
  - But... what do you do with the data once you get it there?
A new model is possible: Standards-Based Global Data Space

- Data accessible to all interested applications:
  - Data distribution (publishers and subscribers): DDS
  - Data management (storage, retrieval, queries): SQL
  - Rich QoS, automatic discovery and configuration
  - Real-time and/or high-performance access to data
Global Data & End-to-End Integration

- Data access from the Web Services or Enterprise networks does not hinder the real-time performance Network
- Additional portals to other systems can be added dynamically
OMG Opportunity

- Open, Standard Platform Enabling Integration
  - from the Enterprise Service Bus (ESB)
  - to the Real-Time Service Bus (RTSB)

OMG Technologies: DDS, CORBA, ODMG mappings, SOA mappings

Enterprise Databases
Web Services
Real-Time Systems
Thank you

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