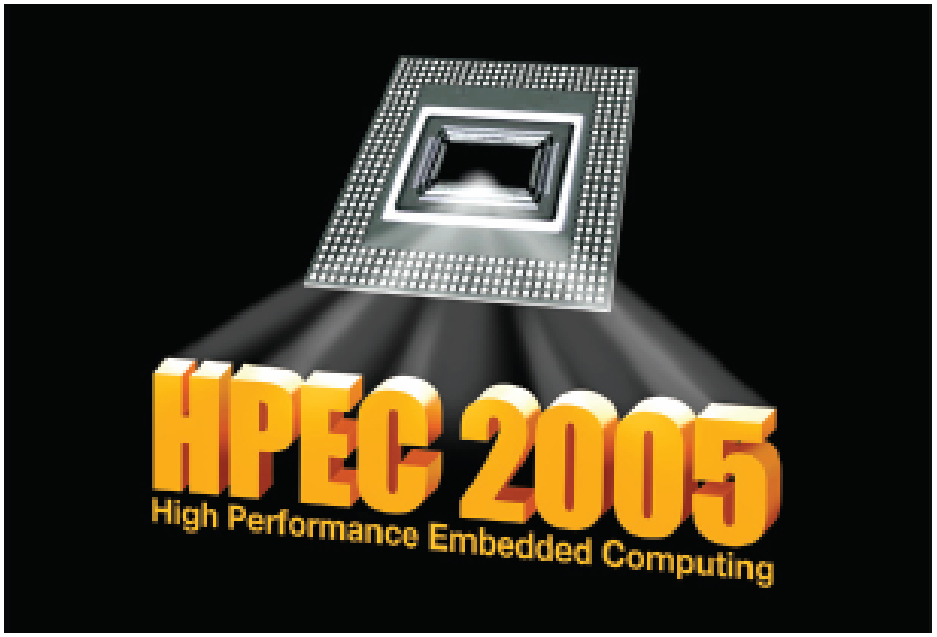


Bert Farabaugh
Joe Schlesselman
Real-Time Innovations

Agenda

- Part I. DDS Overview
  - Background
  - Communication model
  - DDS Entities
  - Listeners, Conditions, WaitSets
  - Quality of Service
- Part II. DDS Architecture Update
- Part III. Pervasive Distributed Data

Real-Time Publish-Subscribe DDS

- ***Efficient mechanism for data communications***

Publisher does not need to know who the subscribers are.

Subscribers do not need to know where the data "lives" or continually ask for it.

Producer(s)

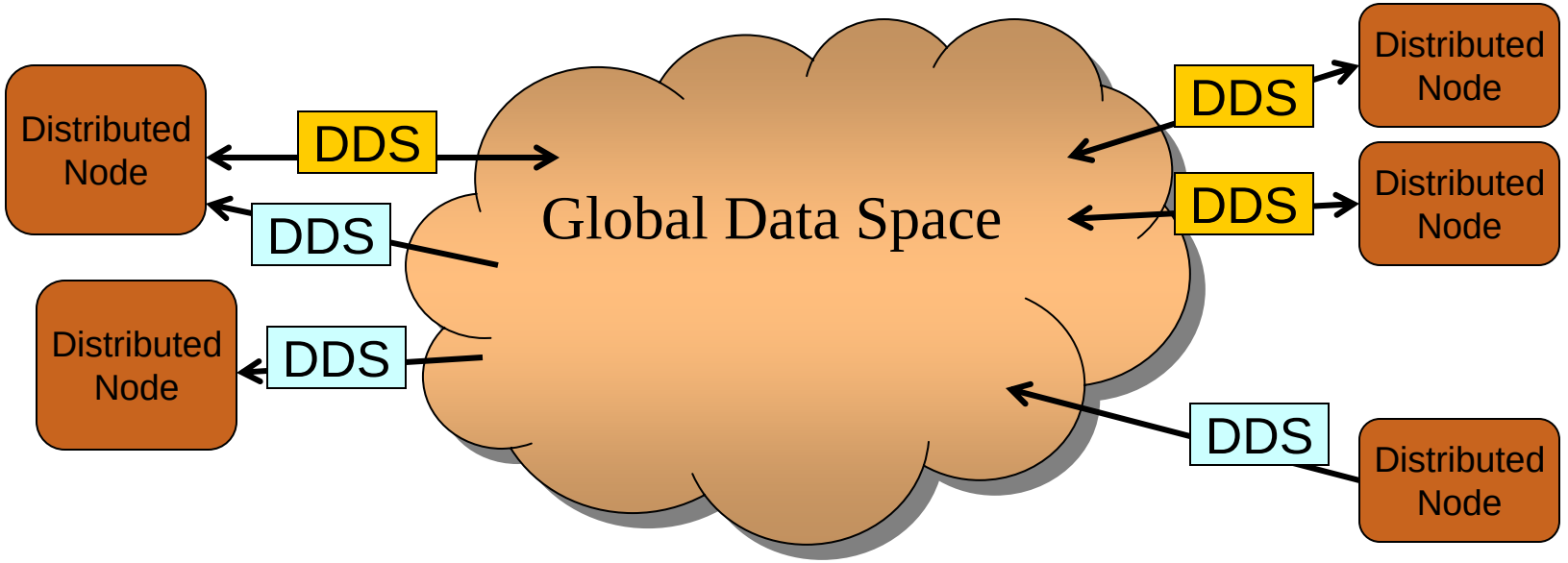
Middleware

Consumers

Distributed Application Solutions

Accessible to all interested applications:

- Data distribution (publishers and subscribers): DDS
- Rich QoS, Automatic discovery and configuration
- Real-time or High-performance
- Peer to Peer Auto Discoverable Network



DDS Standard

- Data Distribution Service for Real-Time Systems
  - Adopted in June 2003
  - Finalized in June 2004
  - Joint submission (RTI, THALES, MITRE, OIS)
  - API specification for Data-Centric Publish-Subscribe communication for distributed real-time systems.
  - Navy OACE, DISR Mandate

- RTI's role
  - Member of OMG since 2000
  - Co-authors of the original DDS RFP
  - Co-authors of the DDS specification adopted in June 2003
  - Chair of the DDS Finalization Task Force completed March 2004
  - Chair of the DDS Revision Task Force
  - Providers of a COTS implementation of the specification (NDDS.4.0)

RTI

Factors driving DDS

- Complex data flows
  - Controlled QoS: rates, reliability, bandwidth
  - Per-node, or per-stream differenc
  - Varied transports
  - Direct peer-to-peer transfer
  - Event-driven transfer

- Dynamic configurations
  - Fast location transparency

RTI

Factors driving DDS (continued)

Need for speed

- Large networks, multicast
- High data rates
- Natural asynchrony
- Tight latency requirements
- Continuously-refreshed data

Fault tolerance

- No single-points of failure
- Transparent failover
- Unreliable transports (e.g. wireless)

Ease of use

Match the Middleware to the App

- CORBA
- Distributed *object*
  - Client/server
  - Remote method calls
  - Reliable transport
- Best for
  - Remote command processing
  - File transfer
  - Synchronous transactions

- DDS
- Distributed *data*
  - Publish/subscribe
  - Multicast data
  - Configurable QoS
- Best for
  - Quick dissemination to many nodes
  - Dynamic nets
  - Flexible delivery requirements

DDS and CORBA address different needs

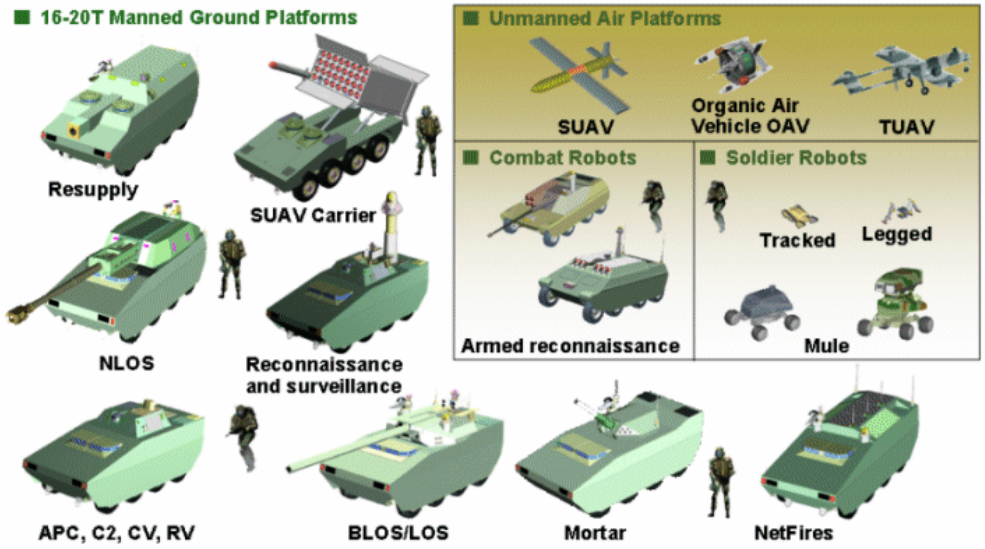
Application Examples

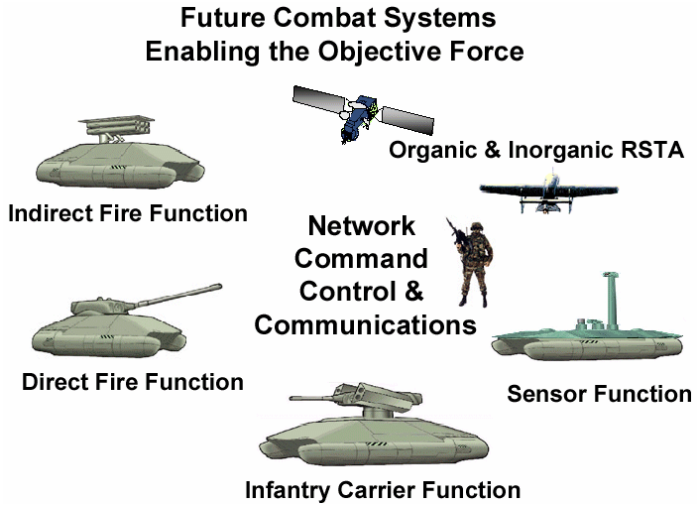
Navy OA projects adopting DDS

- DD(X)
- Ship Self Defense System (SSDS)
- LCS
- Spy OA
- Sea Slice*
- LPD 17*

Future Combat Systems (FCS)

- Has specified DDS as part of SoSCOE
- Large complex real-time data-distribution
- Wireless with intermittent connectivity
- Highly heterogeneous
- Highly dynamic





Data Distribution Service (DDS)

Design Details

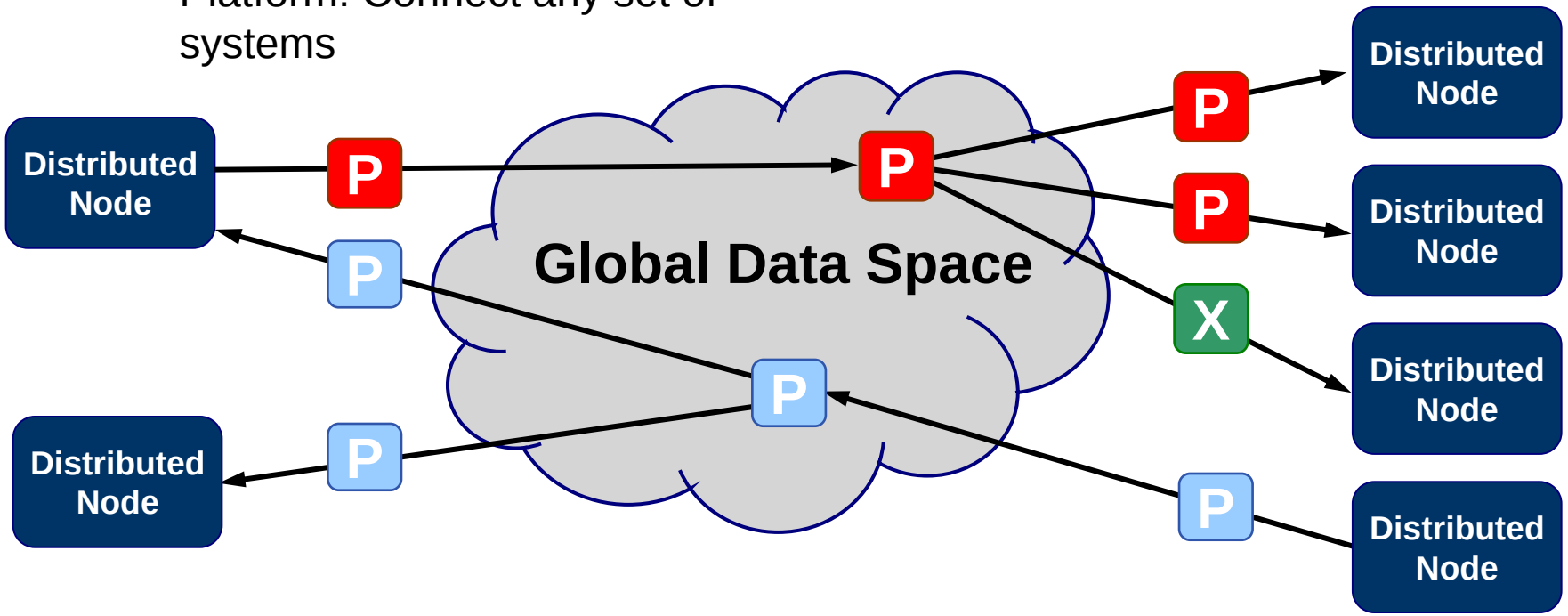
Why DDS?

Decoupling

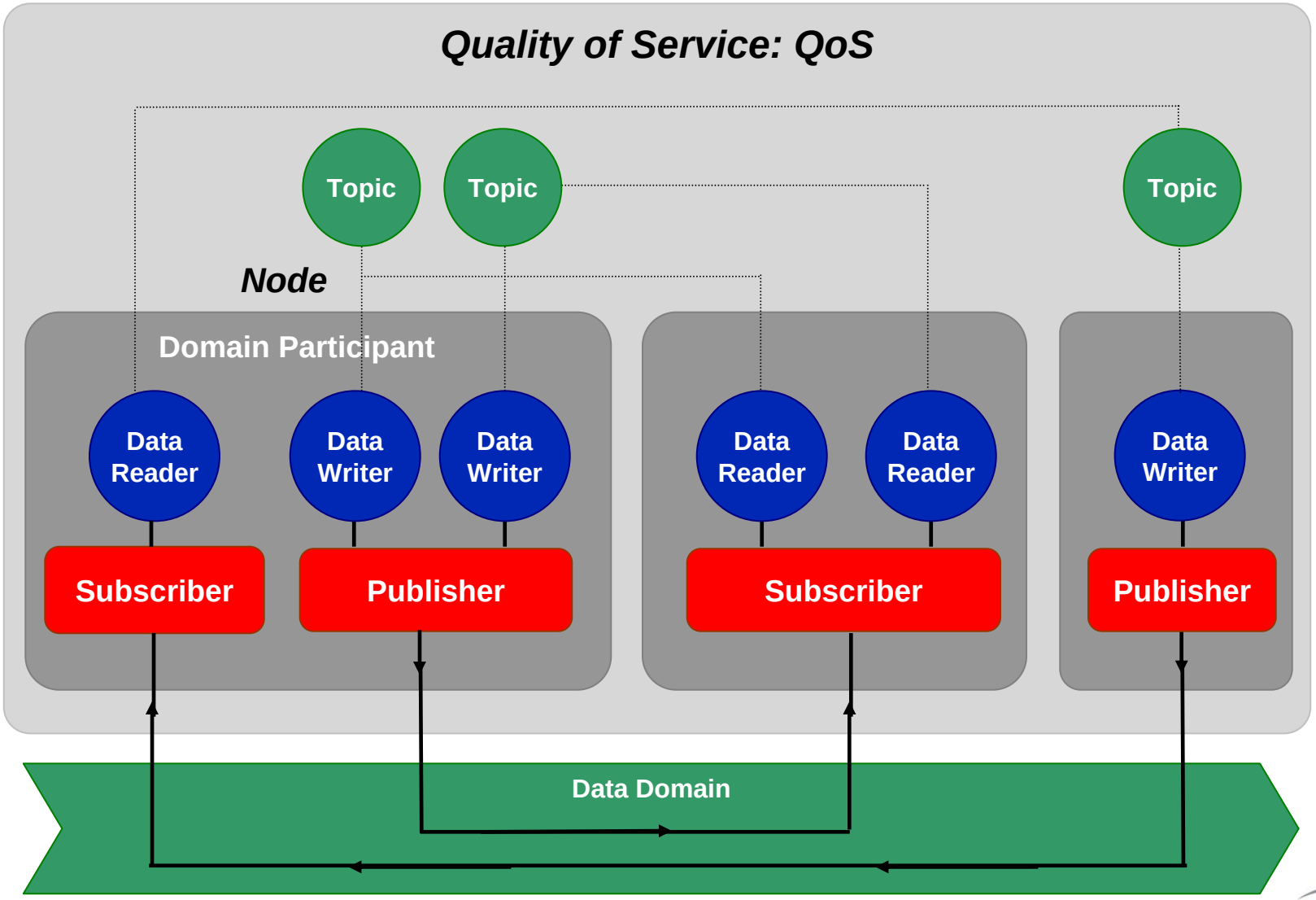
- Location: reduce dependencies
- Redundancy: multiple readers & writers
- Time: data when you want it
- Platform: Connect any set of systems

Benefits

- Modular structure
- Flexibility
- Power

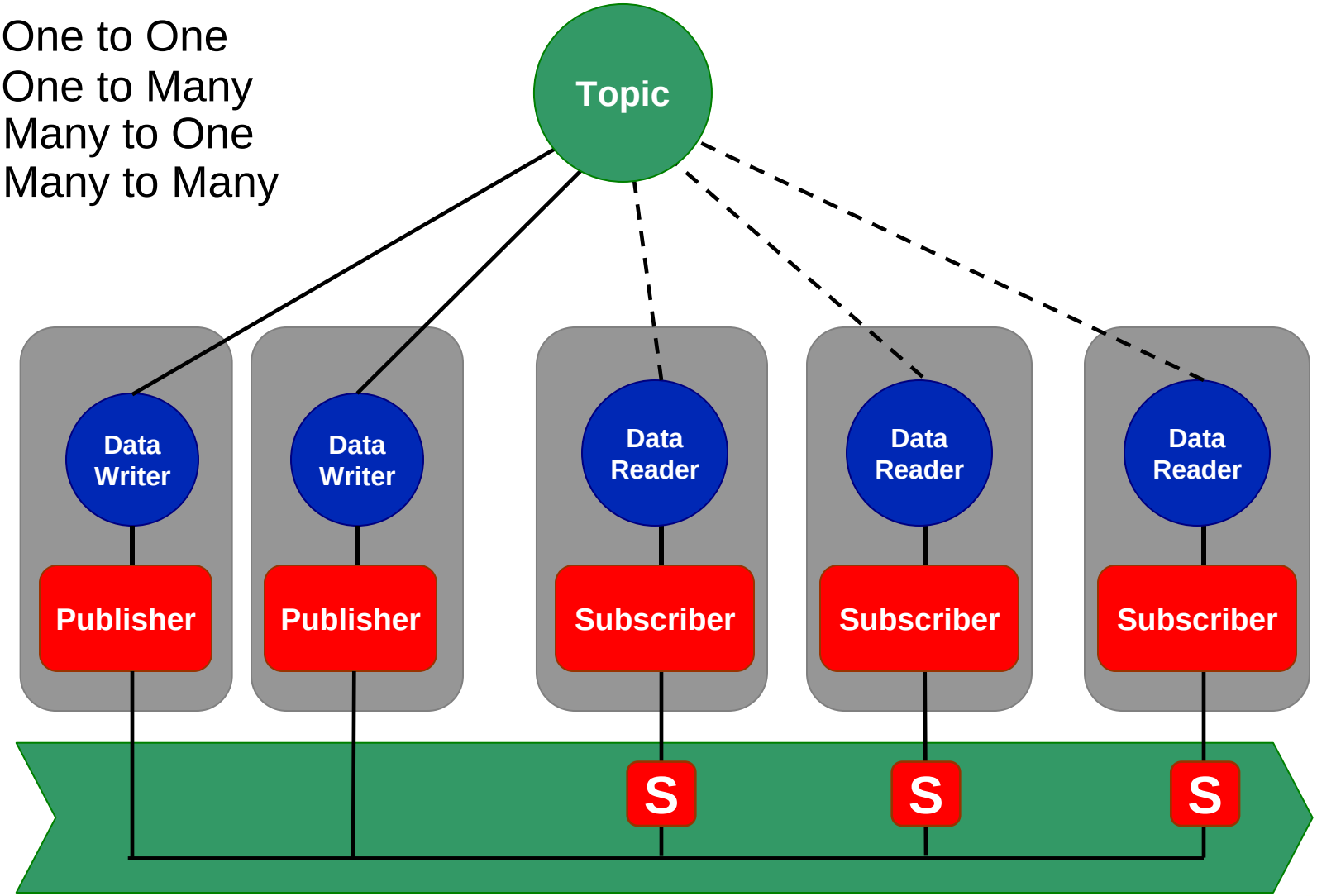


DDS: Publication Subscription Model



DDS: Pub/Sub Scenarios

One to One
One to Many
Many to One
Many to Many



QoS: Quality of Service: Architectural

QoS Policy	Concerns	RxO	Changeable
USER_DATA	DP,DR,DW	NO	YES
TOPIC DATA	T	NO	YES
GROUP DATA	P,S	NO	YES
ENTITY FACTORY	DP, P, S	NO	YES
PRESENTATION	P,S	YES	NO
OWNERSHIP	T	YES	NO
OWNERSHIP_STRENGTH	DW	N/A	YES
PARTITION	P,S	NO	YES
DURABILITY	T,DR,DW	YES	NO
HISTORY	T,DR,DW	NO	NO
RESOURCE_LIMITS	T,DR,DW	NO	NO

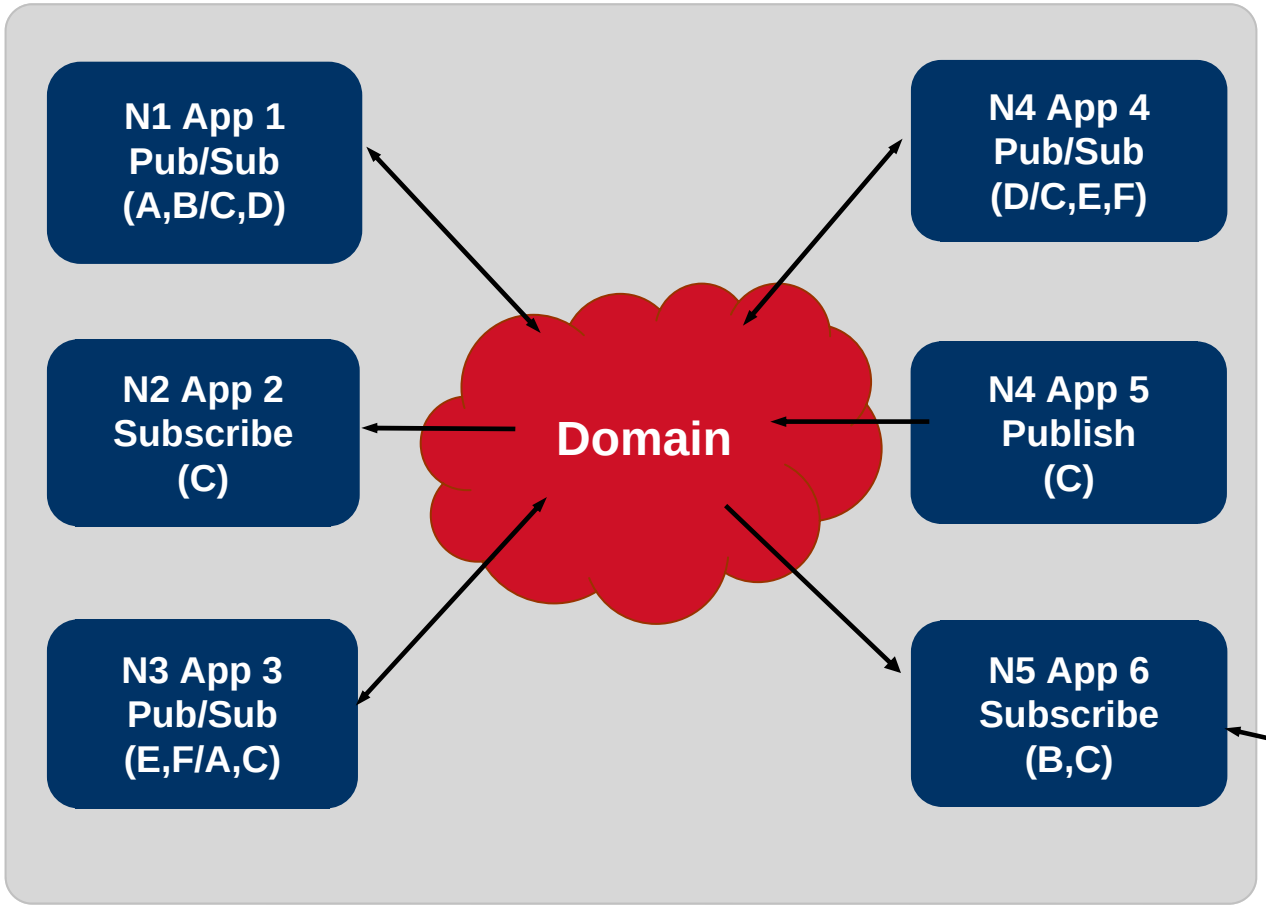
QoS: Quality of Service: Performance

QoS Policy	Concerns	RxO	Changeable
DEADLINE	T,DR,DW	YES	YES
LATENCY_BUDGET	T,DR,DW	YES	YES
READER DATA LIFECYCLE	DR	N/A	YES
WRITER DATA LIFECYCLE	DW	N/A	YES
TRANSPORT PRIORITY	T,DW	N/A	YES
LIFESPAN	T,DW	N/A	YES
LIVELINESS	T,DR,DW	YES	NO
TIME_BASED_FILTER	DR	N/A	YES
RELIABILITY	T,DR,DW	YES	NO
DESTINATION_ORDER	T,DR	NO	NO

Part II. Architecture Update

Evolving Design Patterns

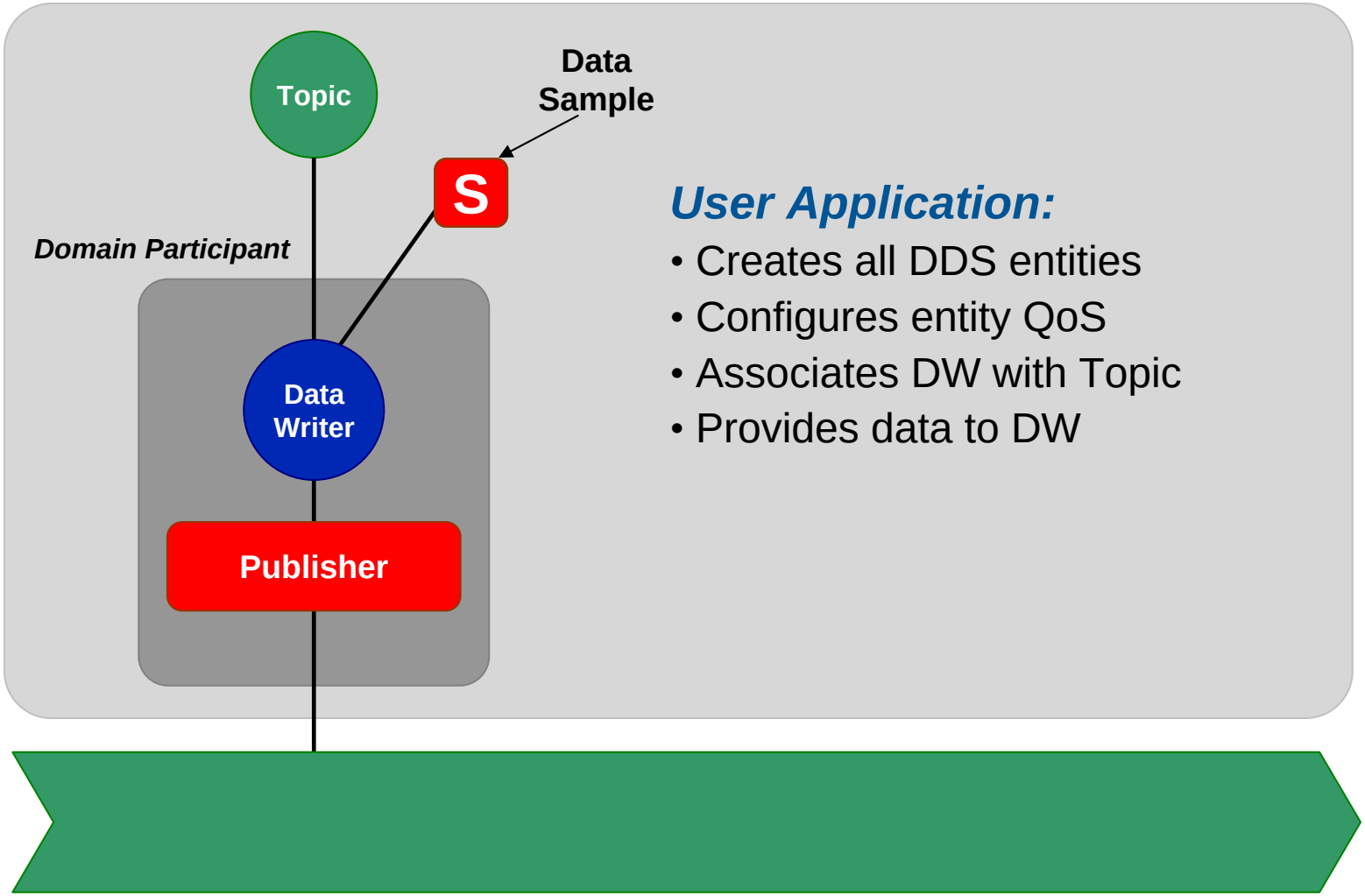
Domain and Domain Participants



Single 'Domain' System

- Container for applications that want to communicate
- Applications can join or leave a domain in any order
- New Applications are "Auto-Discovered"
- An application that has joined a domain is also called a "Domain Participant"

DDS Publication



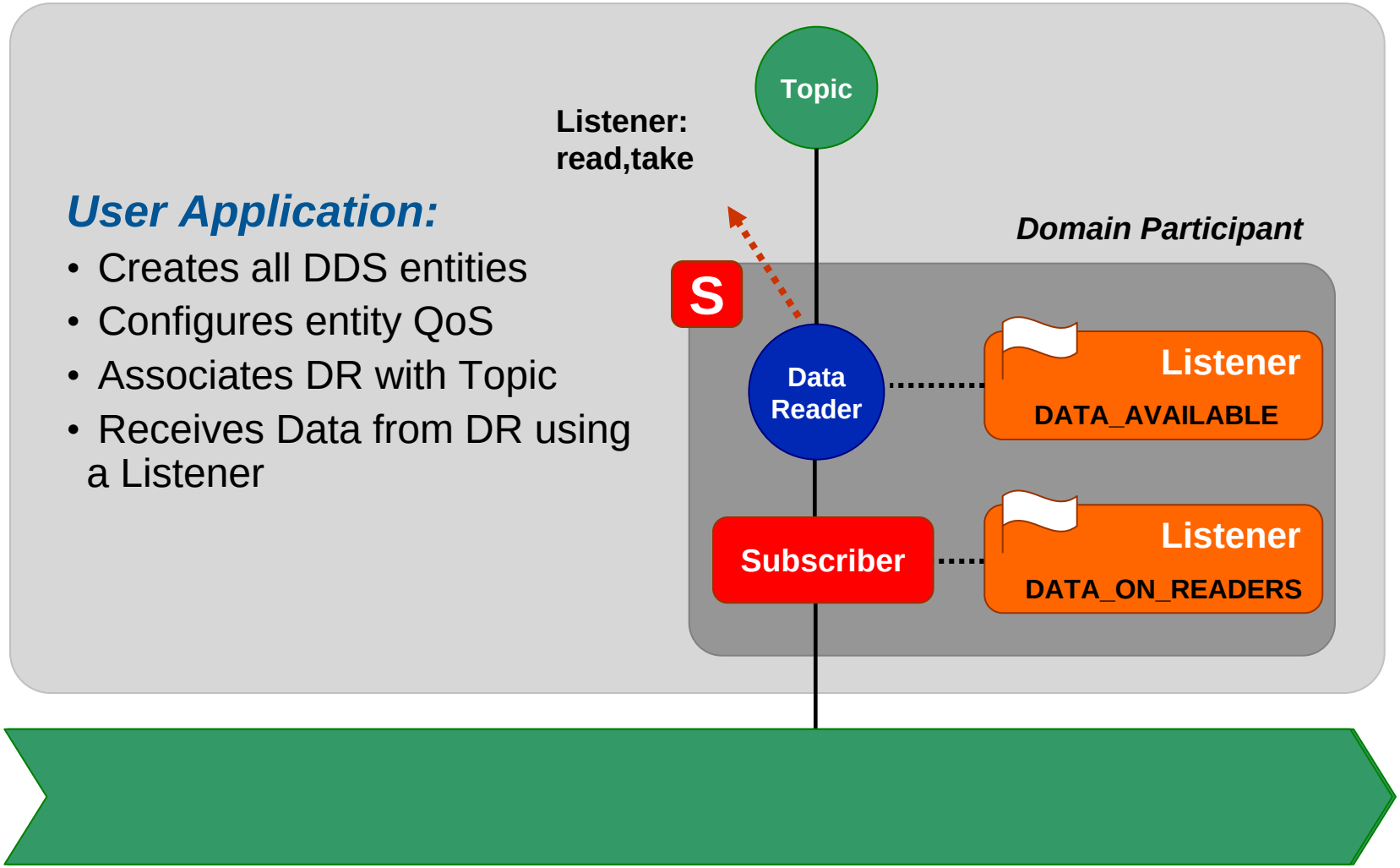
User Application:

- Creates all DDS entities
- Configures entity QoS
- Associates DW with Topic
- Provides data to DW

DDS Subscription Listener

User Application:

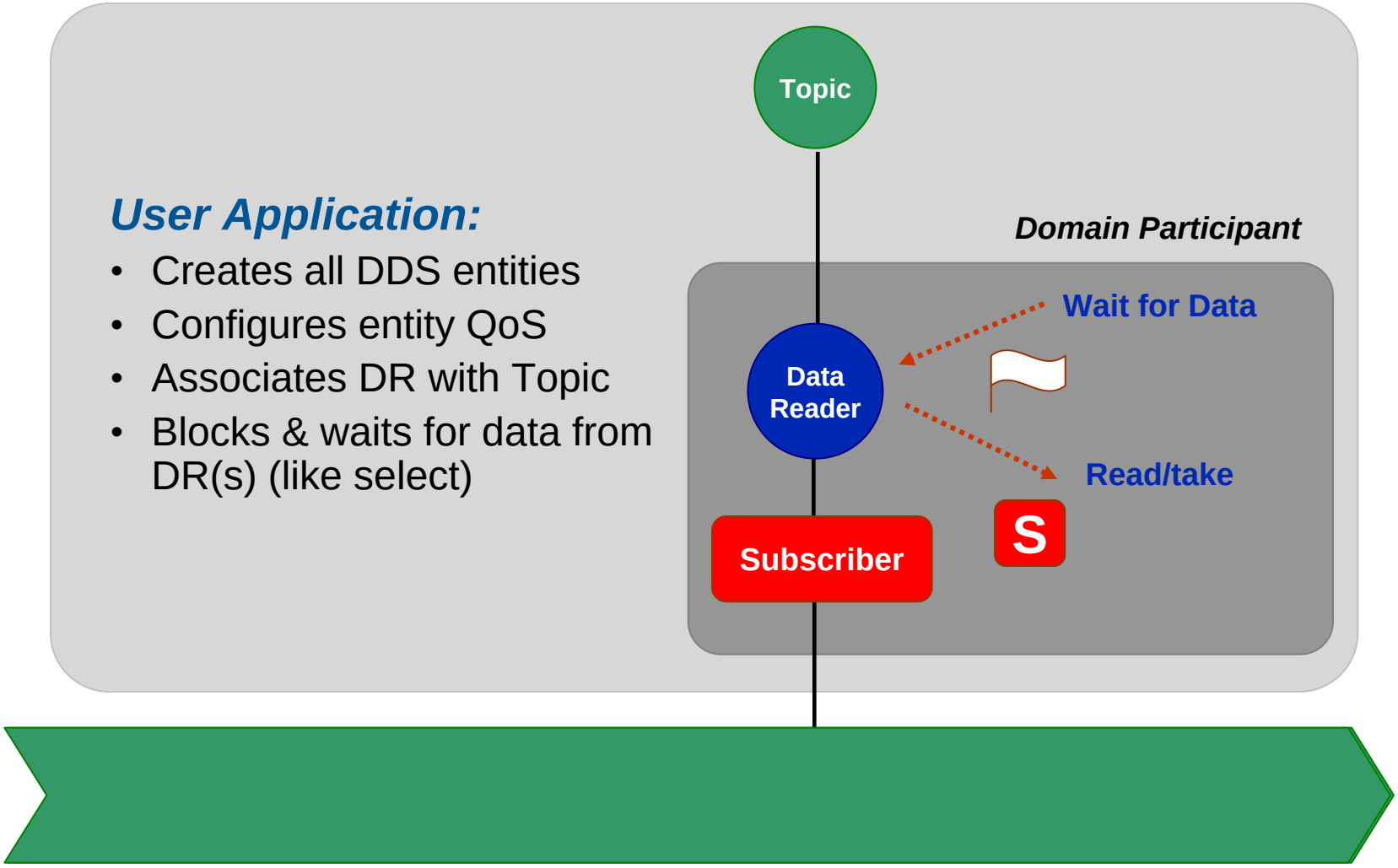
- Creates all DDS entities
- Configures entity QoS
- Associates DR with Topic
- Receives Data from DR using a Listener



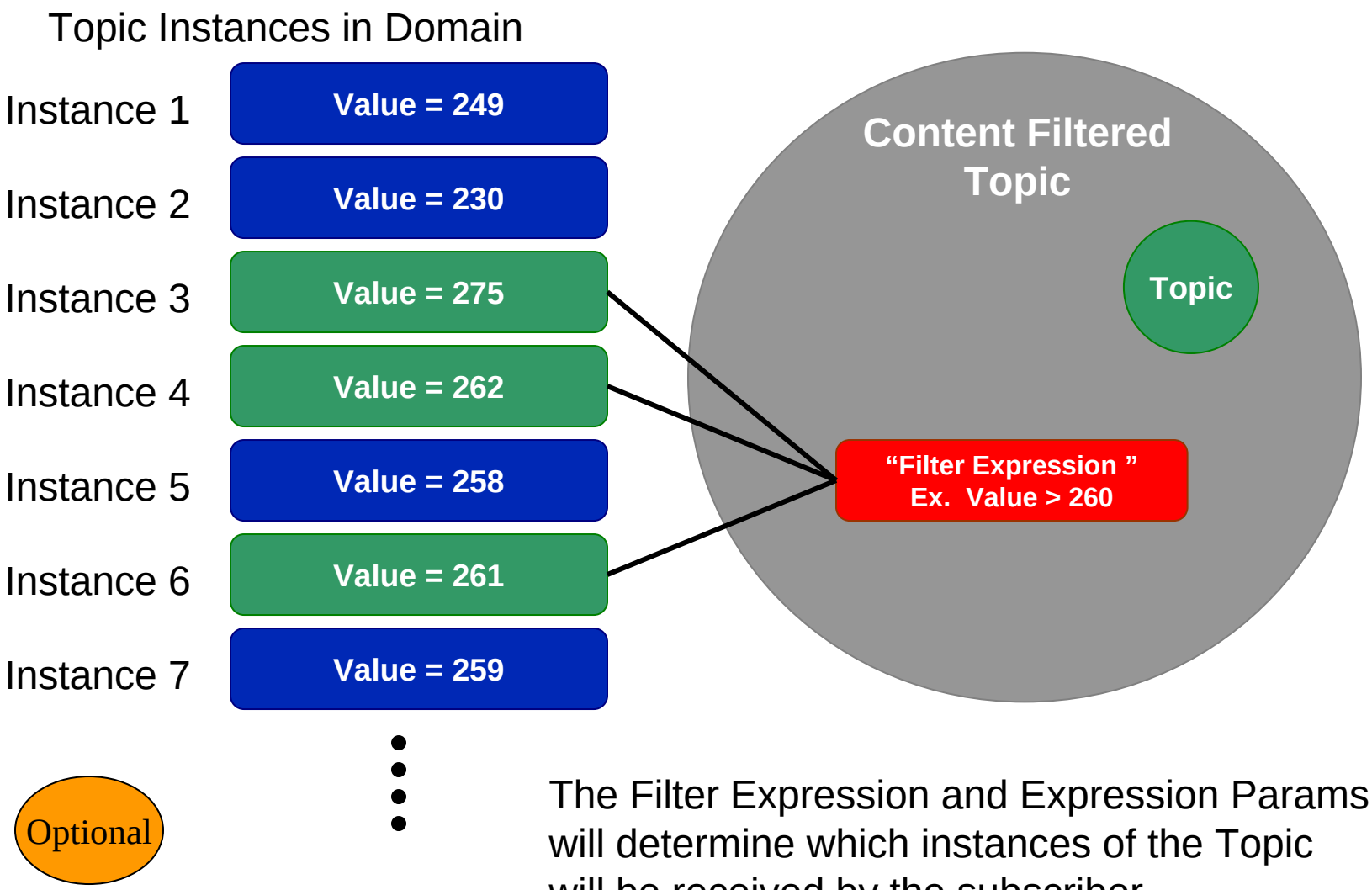
DDS Subscription Wait-Set

User Application:

- Creates all DDS entities
- Configures entity QoS
- Associates DR with Topic
- Blocks & waits for data from DR(s) (like select)



DDS Content Filtered Topics



The Filter Expression and Expression Params will determine which instances of the Topic will be received by the subscriber.

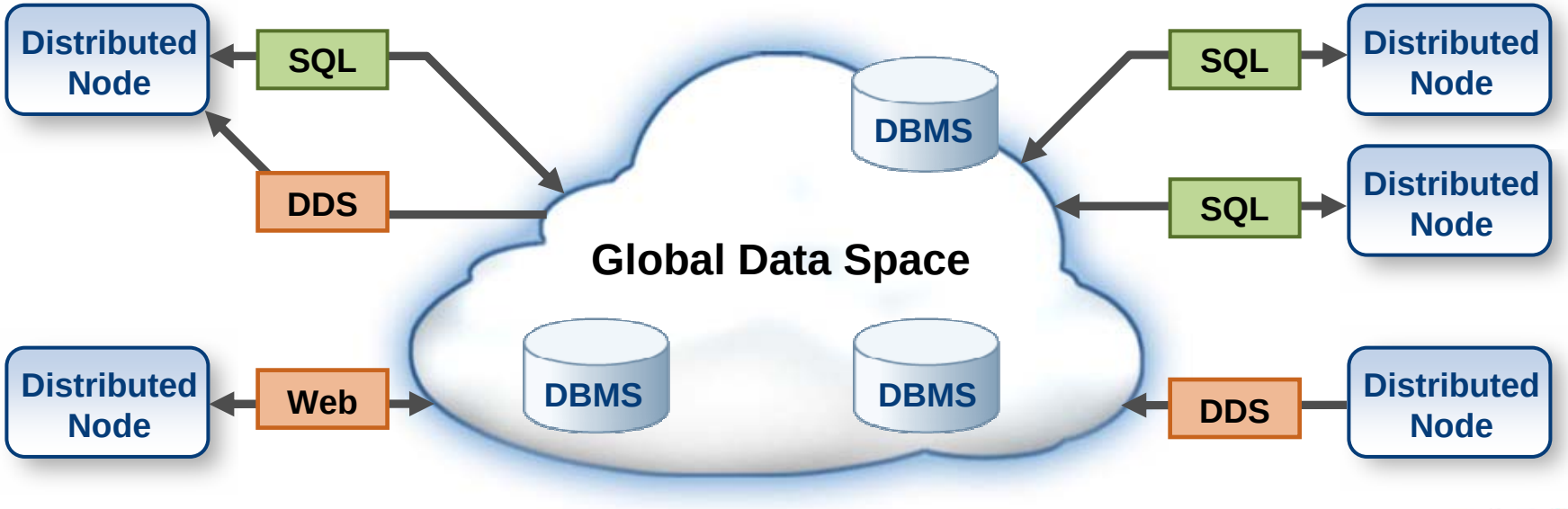
Part III. Pervasive Distributed Data

Embedded to Enterprise Bridging

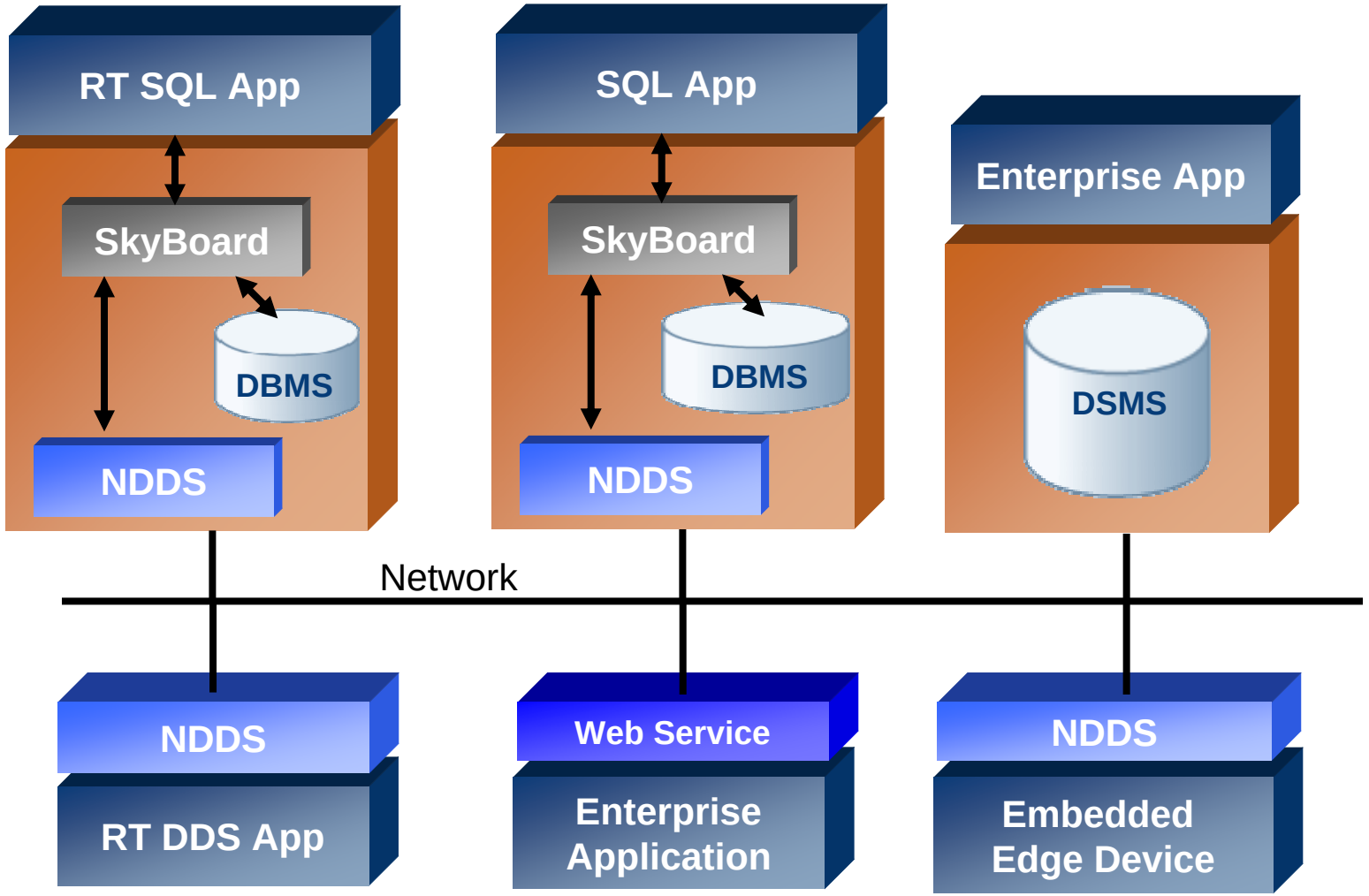
Database Interoperability

A 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



Embedded to Enterprise Bridging



Summary

DDS targets applications that need to distribute data in a real-time environment

DDS is highly configurable by QoS settings

DDS provides a shared "global data space"

- Any application can publish data it has
- Any application can subscribe to data it needs
- Automatic discovery
- Facilities for fault tolerance
- Heterogeneous systems easily accommodated

Pervasive Data Distributed

- Embedded to Enterprise Bridging
- Database Interoperability

Thank you for your time today!

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