



# **eProsima RPC over DDS: Integrating Services in the Cloud**

**Cloud-based Service Platforms for  
the Future Internet  
November, 29, 2012**

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# Agenda

- **Introduction**
- **About eProsima**
- **What is DDS?**
- **eProsima RPC over DDS**
  - **Features**
  - **Performance**
  - **RoadMap**
- **DDS DataBus**



**eProsima**

Middleware Experts

# Introduction

# Introduction

- "Cloud Middleware is software used to integrate services, applications and content available on the cloud"
- The facto standard: Web Services & REST
- New tendencies:
  - Apache Thrift (facebook)
  - Google Protocol Buffers
  - MessagePack
  - Apache Avro
  - ...
  - MQ: RabbitMQ, ActiveMQ, IBM MQ...



# About eProsima

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- Experts on middleware, focused on DDS.
- OMG Members.



# About eProsima: Products And Services

- eProsima Products:
  - DDS based: Plugins, add-ons, adaptors, etc
- Services:
  - Communication modules, App development, DDS training, Support.
- R&D:
  - R&D Projects with enterprises and universities.
- Quality: ISO 9001
  - Design, Development, Marketing and Support of Software.



# Customers (I)

- **Amper Programas:**
  - BMS
  - Simacet (Main Spanish C2 System)
- **Cassidian:**
  - UAVs - Neuron, Atlante
    - Ground Station Comm Server
  - Comfut
- **INDRA:**
  - Defense (BMS, UAV PASI)
  - Air Traffic Control,
  - SESAR, ATC Interoperability
- **Spanish Army:**,
  - IDT :Tactical Data Interface





# Customers (II)

- Isdefe
- Spanish Army: JCISAT, DGAM
- CATEC-FADA: R&D Aerospacial
- Santa Barbara: Armoured Vehicles
- RTI
- GMV



**GENERAL DYNAMICS**  
Santa Bárbara Sistemas



# Customers (III)

- Tecnobit: COSMOS, Reserved Projects.
- IKERLAN: R&D.
- Navantia: F105 (Aegis)
- Boeing: Atlantida, Swim suit



# eProsima Products.- Index

- **eProsima Low Bandwidth Tools for DDS:**
  - Set of plugins to enable DDS communications over low bandwidth links, optimizing the protocol and compressing the data.
  - Includes a simulation plugin to simulate different links such Tactical Radios and Satellites
- **eProsima RPC over DDS:**
  - Request/Reply over DDS
- **eProsima DDS-Web Services Bridge**
  - Enables DDS Enterprise Integration
- **eProsima DDS Non-Intrusive Recorder.**
  - Stores DDS communication history in a data base.

# Ongoing Project

- FP7: KIARA, Future Internet Middleware
  - Based on DDS & RPC over DDS
  - Lots of new features:
    - Improved IDL
    - Direct Use of Application native types
    - New formats of marshalling (SOAP, RestFul)
    - Web Services compatibility
    - Protocol negotiation
    - Extended transport support
    - High performance dispatching agent (RPC)



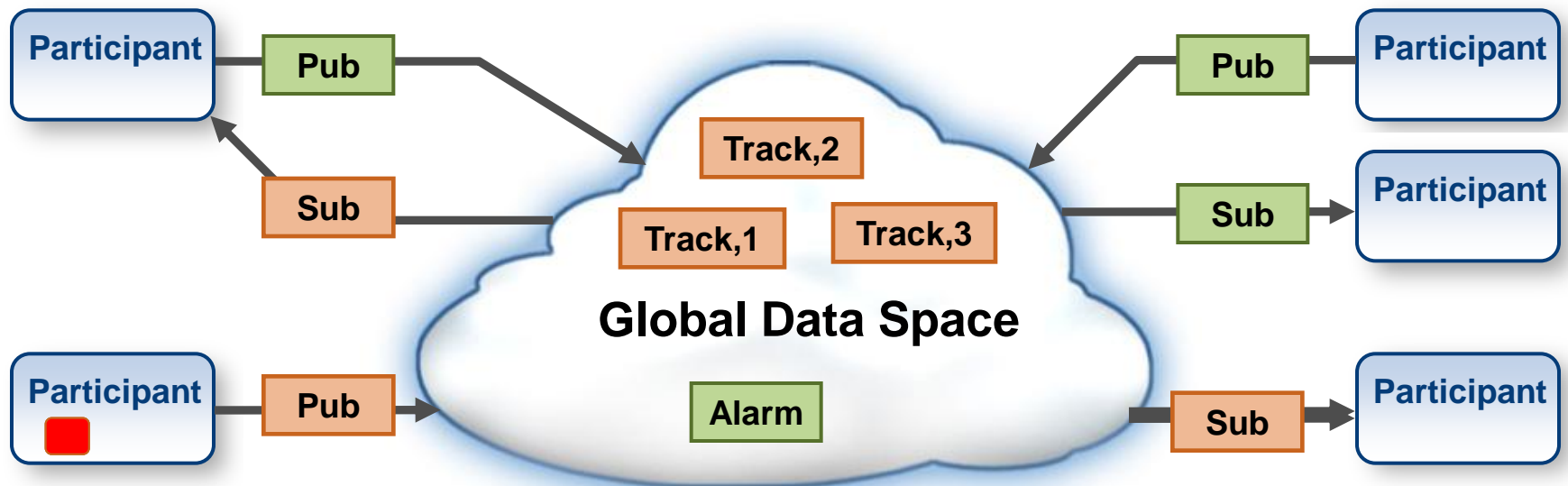
**What is DDS?**

# DDS

- DDS (Data Distribution Service for Real-Time Systems) is a OMG specification for a pub/sub data centric model (DCPS, Data Centric Publish/Subscribe) for Real-Time data comms in distributed systems.
- DDS is a networking middleware that:
  - Simplifies and Standardizes data flows in distributed real-time systems.
  - Provides robust comms (no single point of failure) and efficient (minimum latency)
  - Provides all kind of QoS to shape the data flows and deliver predictable results.

# DDS

DDS uses the concept of Global Data Space. In this Space we define topics of data, and the publishers publish samples of these topics. DDS distributes these samples to all the subscribers of those topics. Any node can be a publisher or a subscriber.





# eProsima RPC over DDS



# RPC over DDS

- DDS implements a pub/sub model, but no a direct way to do Remote Procedure Calls (RPC)
- DDS Can be used thought for RPC with some effort: We can create a couple of topics, one for the in parameters of the function we want to call, and the other one for the out parameters, and then implement the client-server interaction through a couple of pub-sub.

# Client-Server comms over DDS

- myService.idl:

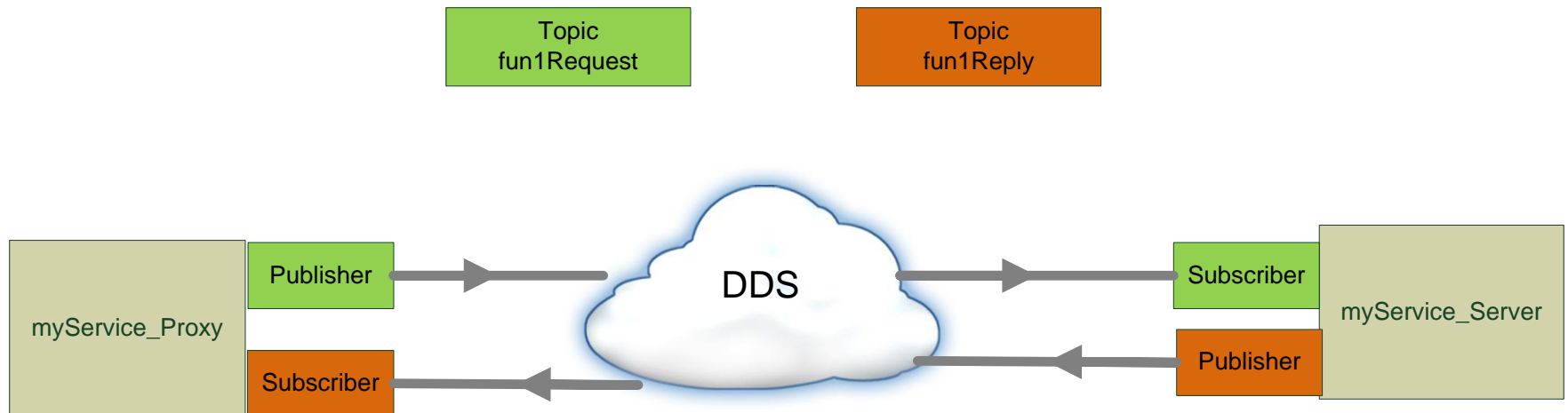
```
typedef sequence<octet,128> Key;
```

```
interface myService{
```

```
    long fun1(in Key param1, inout string param2, out string param3);
```

```
    long fun2(in Key param2);
```

```
}
```

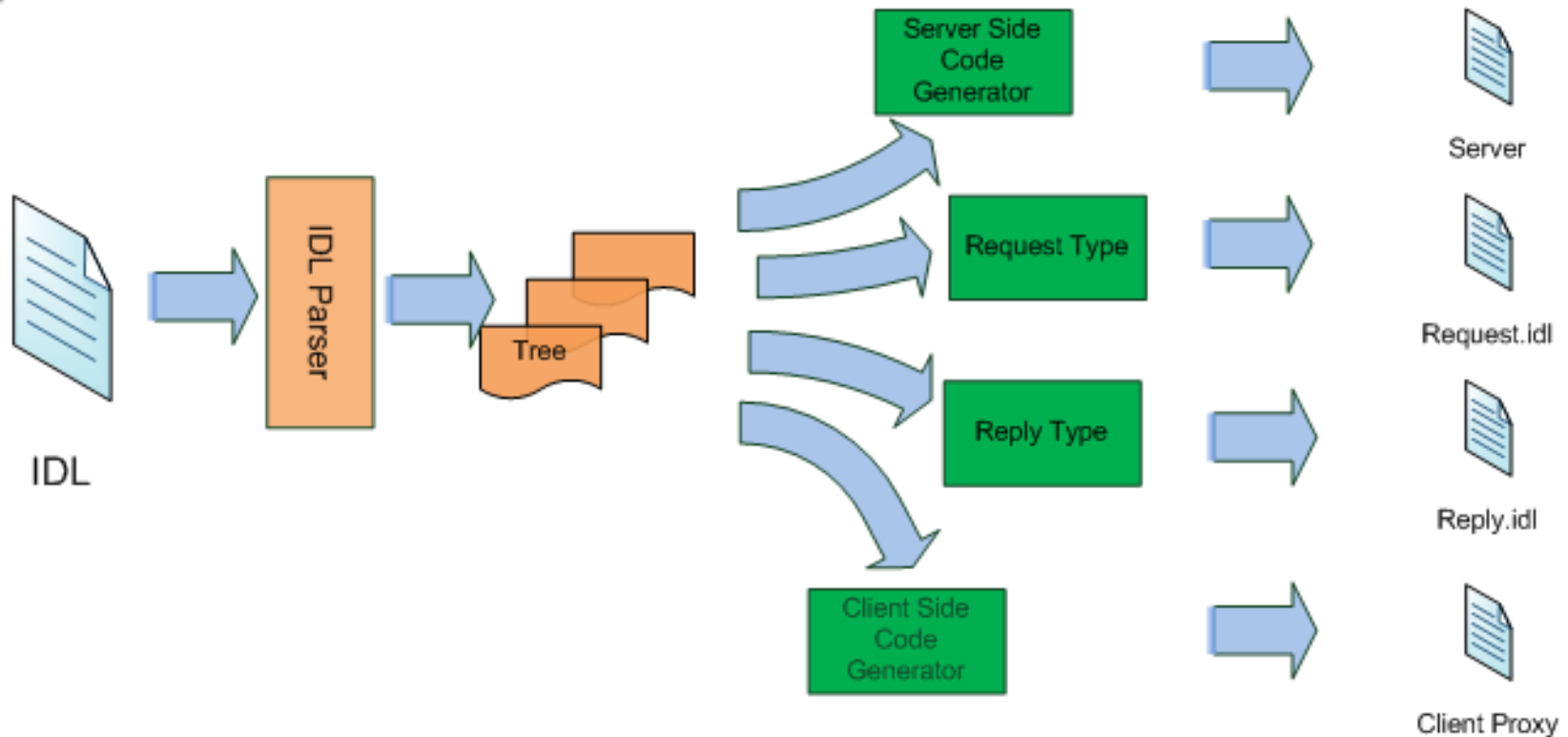


# Client-Server comms over DDS: Manual Steps

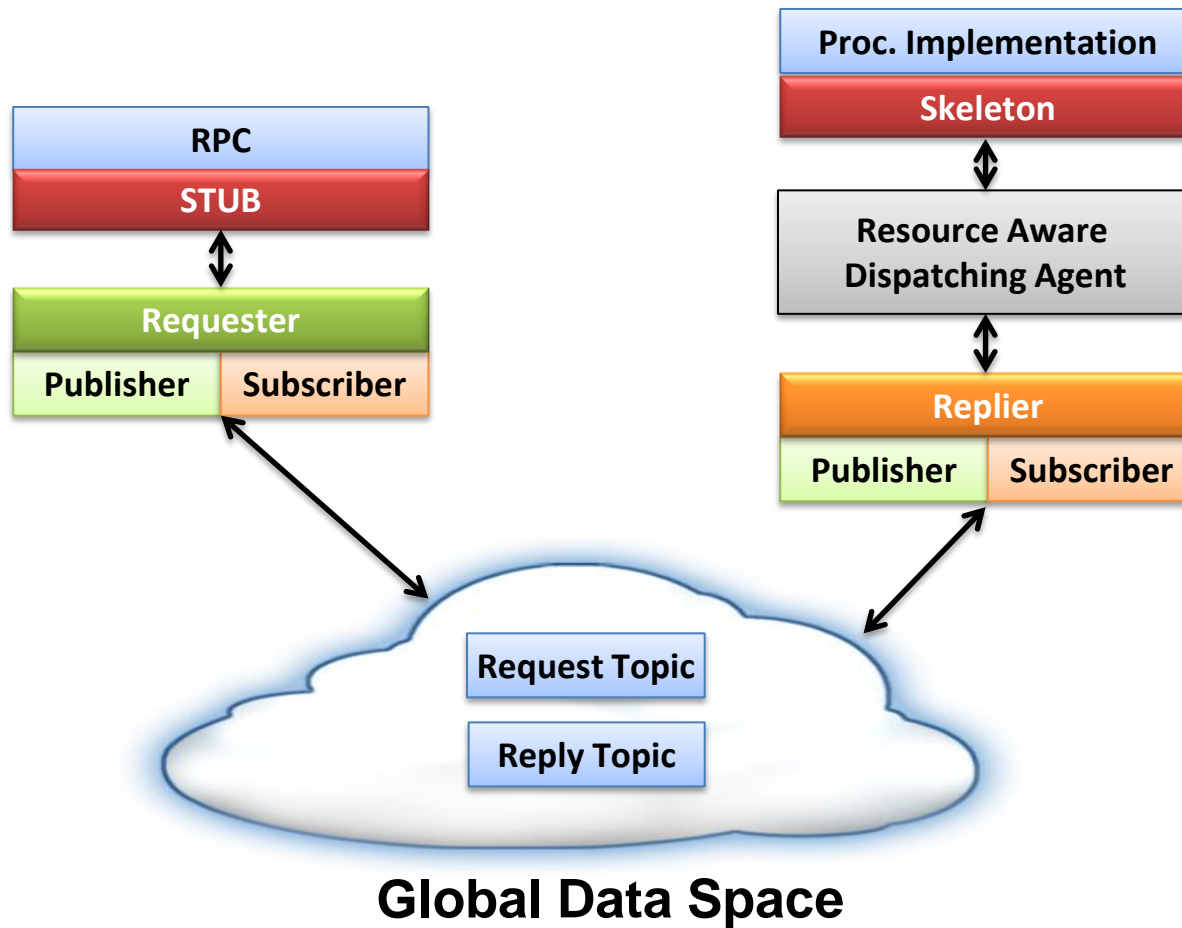
- For each interface:
  - myService, myServiceSupport, myServicePlugin (ddsgen)
  - myServiceProxy, myServiceServer
  - Client main, Server main.
  - Client and Server code for data flow management, initialization and setup of DDS entities, server threading...
- For each method:
  - fun1Request, fun1RequestSupport, fun1RequestPlugin (rtiddsgen)
  - fun1Reply, fun1ReplySupport, fun1ReplyPlugin (rtiddsgen)
  - Client and Server code to manage function calls/return-values, parameters...

# Client-Server comms over DDS: Automatic (using eProsima RPC over DDS)

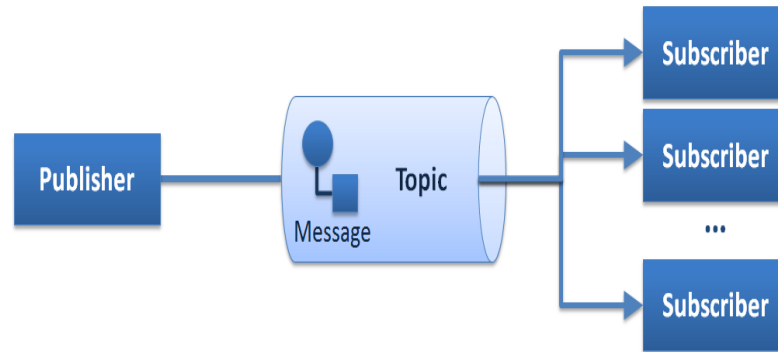
- A parser (RPCDDSGen) creates all the stuff you need.
- For each method, just implement the behavior.



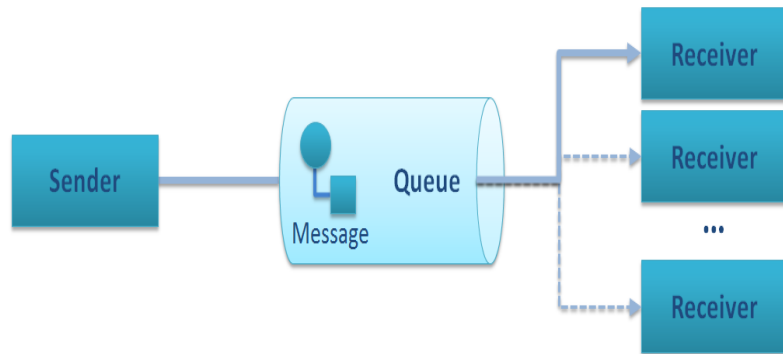
# Architecture



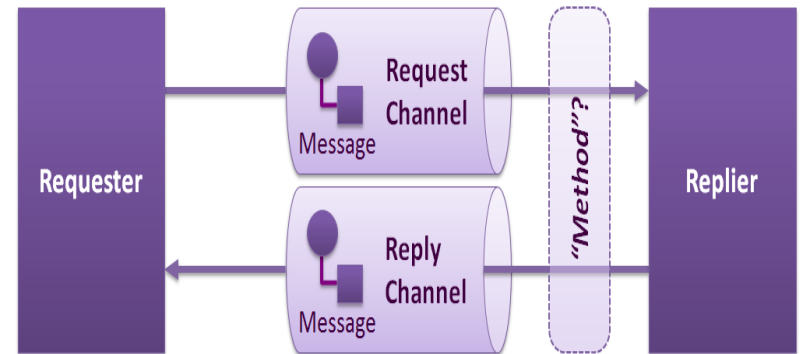
# Pub/Sub as Pattern Generator



**Publish/Subscribe**

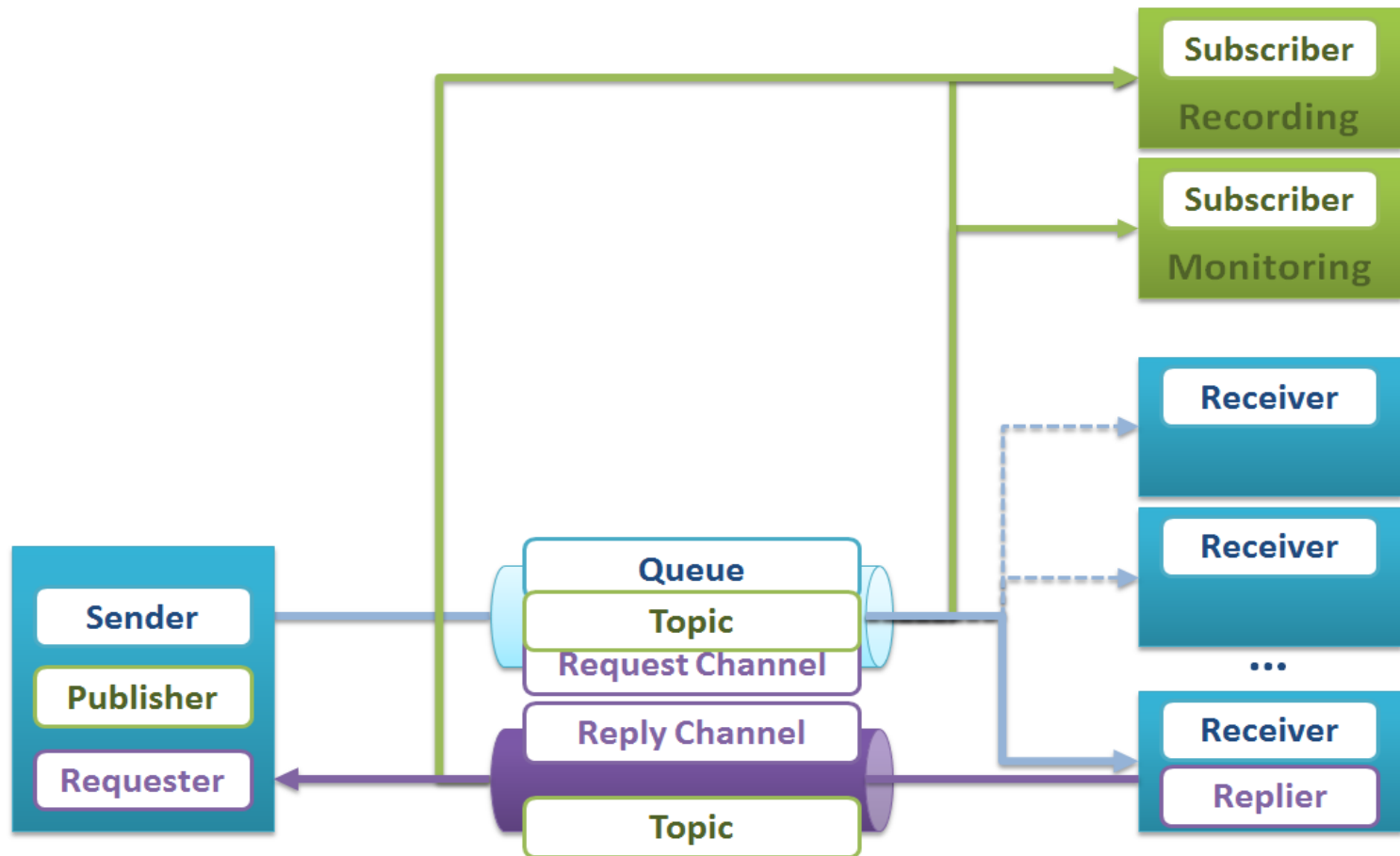


**Point to Point**



**Request/Reply**

# Combining patterns through Pub/Sub



# eProsima RPC over DDS: Advantages

- Allows to the developer focus in the development of his application.
- Approach similar to CORBA, but easier to use and with configurable QoS
- Transparent.
- Multithreaded Server.
- Automatic Generation of:
  - Client and Server Code.
  - Request and Reply Topic
  - Development enviroment files: Visual Studio projects or makefiles



# eProsima RPC over DDS 1.0

- RC1 Available.
  - GPL and Commercial licenses.
  - GAR Announcement: December 2012
- Main Features:
  - Windows and Linux support (32 and 64 bits)
    - Project and makefile generation for VS2010 & gcc 4.x
  - Synchronous, asynchronous and one way operations
  - Different Server threading models
    - Single threaded, thread by request and thread pool
  - Internet enabled:
    - udp (unicast/multicast) and TCP support
  - 100% Standard: ISO C++ and OMG DDS
    - RTI DDS and OpenDDS supported

# Standardization

- OMG Standard ongoing
  - RPC over DDS RFP (public)
  - eProsima, RTI and Prismtech present submissions
    - First submission: November, 12th , 2012 (**Done!**)
    - Standard due: May 2012

# Base for FI-WARE Middleware

- FP7: KIARA, Future Internet Middleware
  - Based on DDS & RPC over DDS
  - Lots of new features:
    - Improved IDL
    - Direct Use of Application native types
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# >33 Initial Users!

**Telefonica**

SAP

IBM

Thales

Atos

Alcatel

Ericsson

Intel

Nec

Nokia

Siemens

...

France telecom

Telecom Italia

Deuche Telecom

Fraunhofer

...

Universities

...

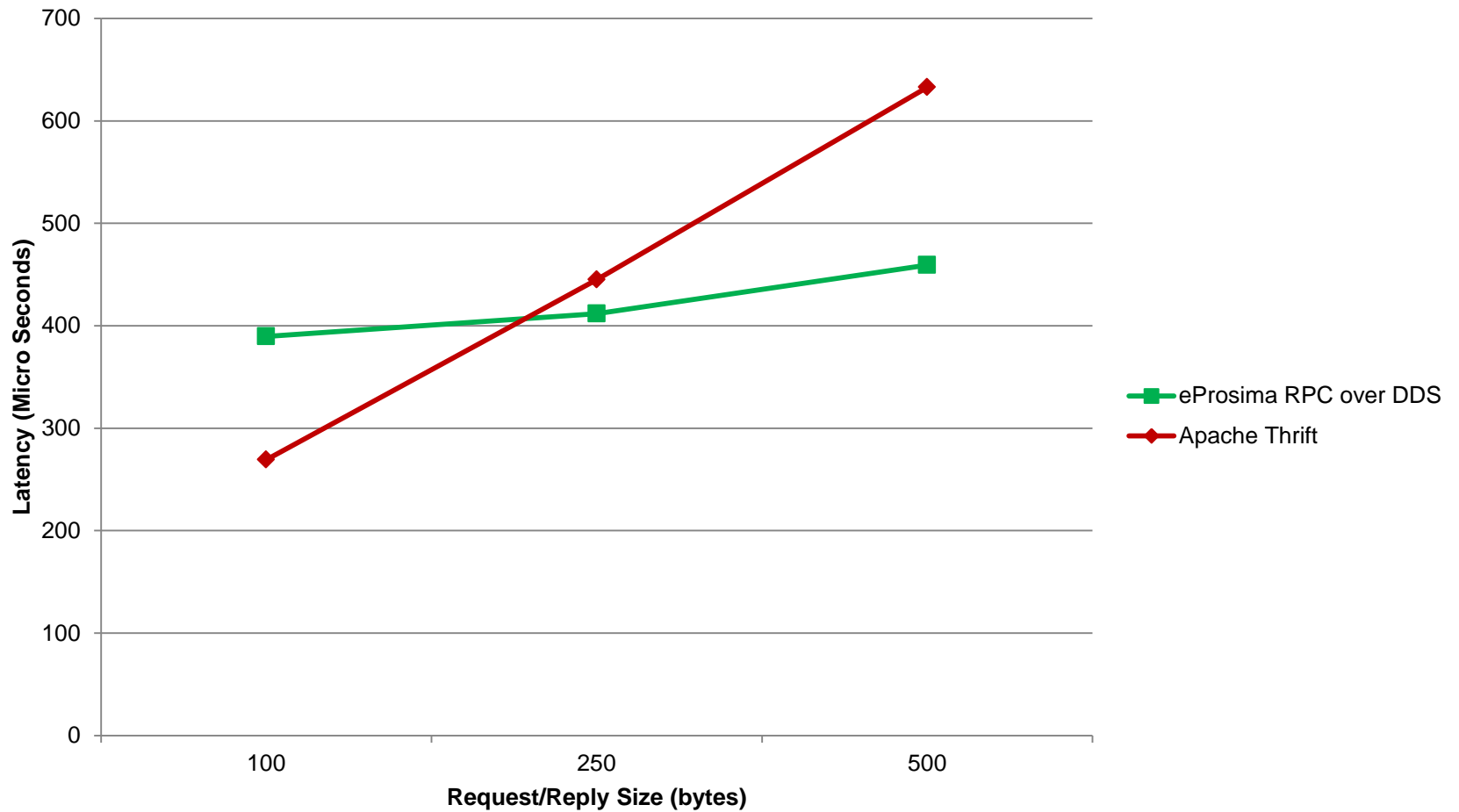


# eProsima RPC over DDS

## Performance

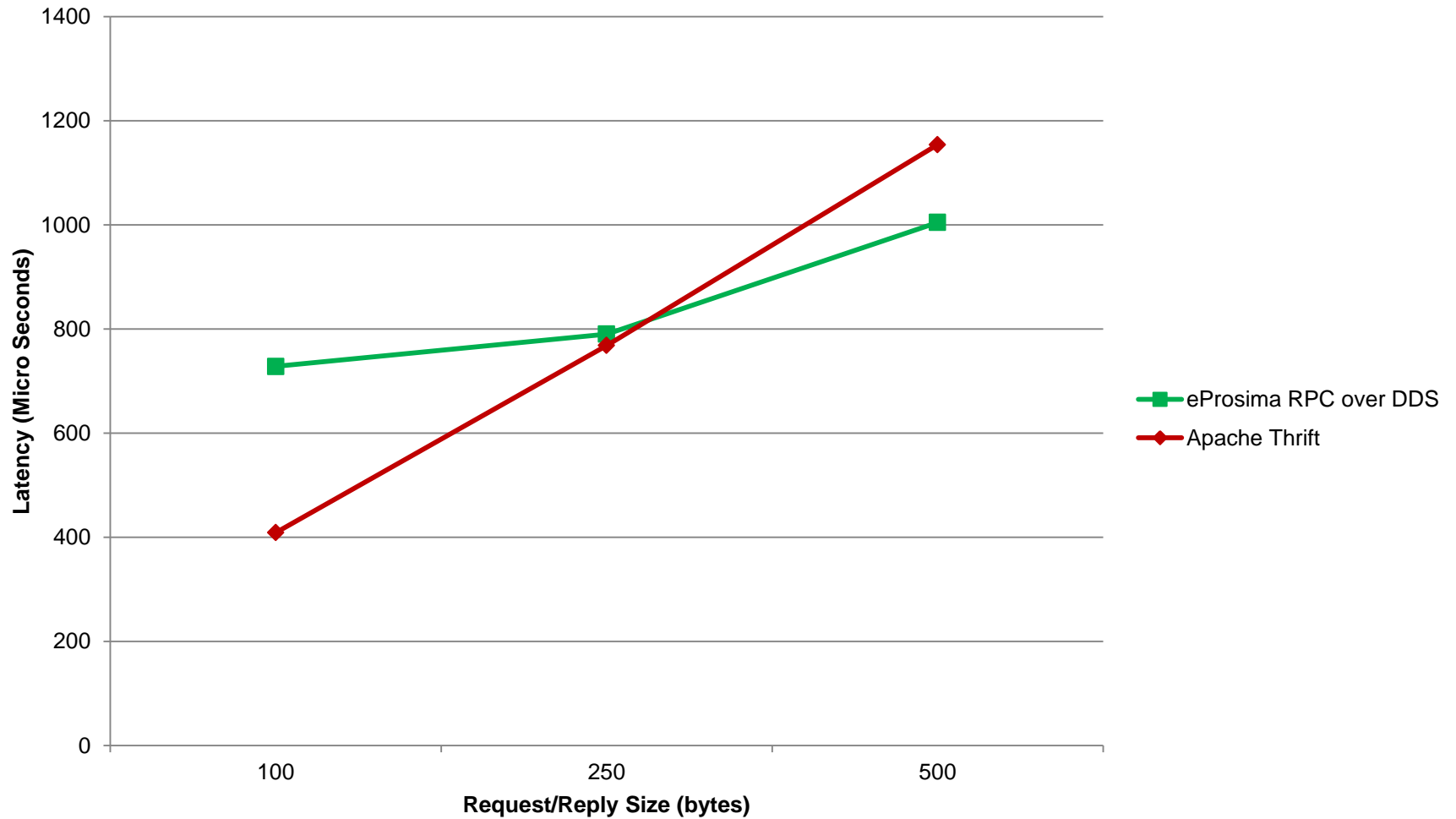
# Performance

## One to One Latency



# Performance

## Four to One Latency





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# RoadMap



# RoadMap

- Rest/Web Services/Thrift Support .- March 2013
- Native Data Support .- Jun 2013
- Message Persistence (MQ) .- Sep 2013

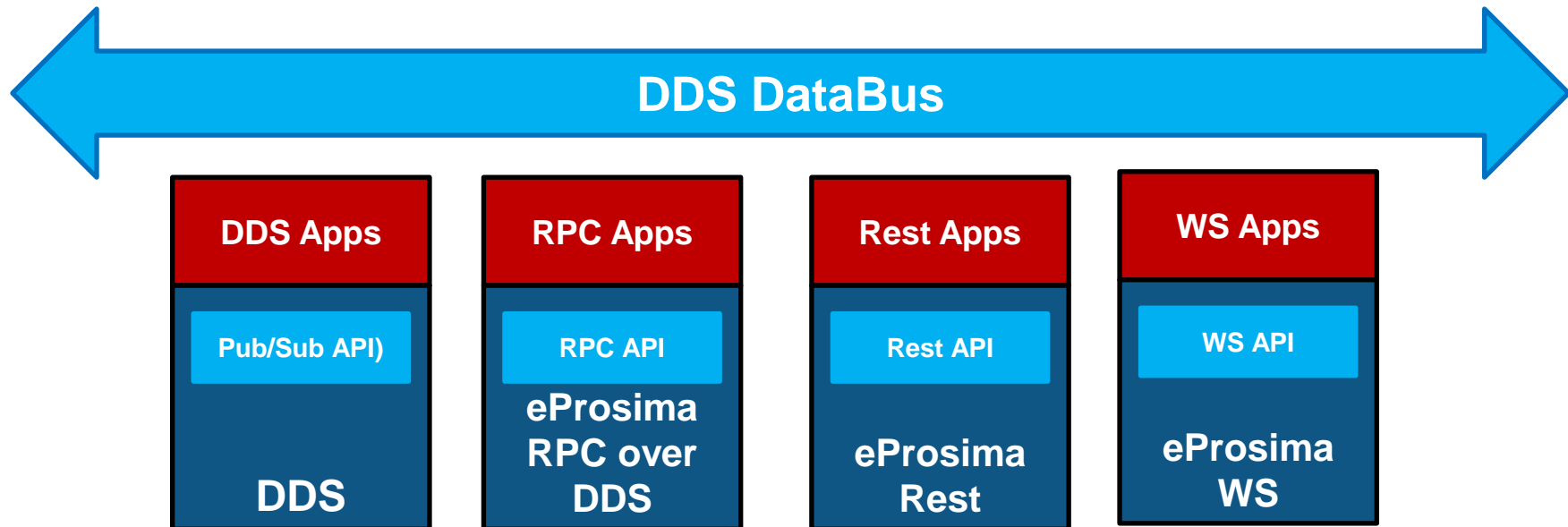


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# DDS Databus

# DDS Databus .- Possibilities





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**Thank you!**

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