



D3.1

Micro XRCE-DDS for ROS Software Release Y1

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Abstract	This document provides links to the released software and documentation for deliverable D3.1 <i>Micro XRCE-DDS for ROS Software Release Y1</i> of the Task 3.1 <i>micro-RTPS Additional Features</i> .



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1 Summary

eProxima Micro XRCE-DDS is a software solution which allows to communicate eXtremely Resource Constrained Environments (XRCEs) with an existing DDS network. This implementation complies with the specification proposal, “eXtremely Resource Constrained Environments DDS (DDS-XRCE)” submitted to the Object Management Group (OMG) consortium.

Micro XRCE-DDS implements a client-server protocol to enable resource-constrained devices (clients) to take part in DDS communications. Micro XRCE-DDS Agent (server) makes possible this communication. The Micro XRCE-DDS Agent acts on behalf of the Micro XRCE-DDS Clients and enables them to take part as DDS publishers and/or subscribers in the DDS Global Data Space. Micro XRCE-DDS provides both, a plug and play Micro XRCE-DDS Agent and an API layer which allows you to implement your Micro XRCE-DDS Clients.

2 Acronyms and keywords

Acronym	Explanation
CDR	Common Data Representation
DDS	Data Distribution Service
DDS-XRCE	DDS For Extremely Resource Constrained Environments
GA	Grant Agreement
OFERA	Open Framework for Embedded Robotic Applications
OMG	Object Management Group
ROS	The Robot Operating System
RTPS	Real Time Publish Subscribe

3 Overview to Results

This document provides links to the released software and documentation for deliverable D3.1 *Micro XRCE-DDS for ROS Software Release Y1* of Task 3.1 *micro-RTPS Additional Features*.

A minor deviation from the OFERA Grant Agreement is the name of this deliverable. micro-RTPS is no more called micro-RTPS. With its first official release eProxima, changed its name to Micro XRCE-DDS as it is a more accurate name regarding the implemented protocol implemented.

The work done on the task 3.1 was to improve and adapt the previous versions to the needs of micro-ROS. In this direction:

- Serial transport is available in Micro XRCE-DDS
- Cross-compilation tools and demonstrations for NuttX are available with Micro XRCE-DDS.

The annexe of this document includes a copy of the official product information page. A documentation annexe has been omitted due to its extension. However, links have been provided.

4 Links to Software Repositories

Micro XRCE-DDS is distributed as an open source software. The full suite is composed by multiple repositories:

Micro XRCE-DDS Client:

- Git repository: <https://github.com/eProsima/Micro-XRCE-DDS-Client>
Commit: [0639fbf02b92f23212eb7c0274463bea6e4c8424](https://github.com/eProsima/Micro-XRCE-DDS-Client/commit/0639fbf02b92f23212eb7c0274463bea6e4c8424)

Micro XRCE-DDS Agent:

- Git repository: <https://github.com/eProsima/Micro-XRCE-DDS-Agent>
Commit: [1e5864aeb6ac8324077a4a9329c22056d89be166](https://github.com/eProsima/Micro-XRCE-DDS-Agent/commit/1e5864aeb6ac8324077a4a9329c22056d89be166)

a central repository, Micro XRCE-DDS:

- Git repository: <https://github.com/eProsima/Micro-XRCE-DDS>
Commit: [11dcc79ae7761952f0e94998a3d36683931c970f](https://github.com/eProsima/Micro-XRCE-DDS/commit/11dcc79ae7761952f0e94998a3d36683931c970f)

and a readthedocs documentation:

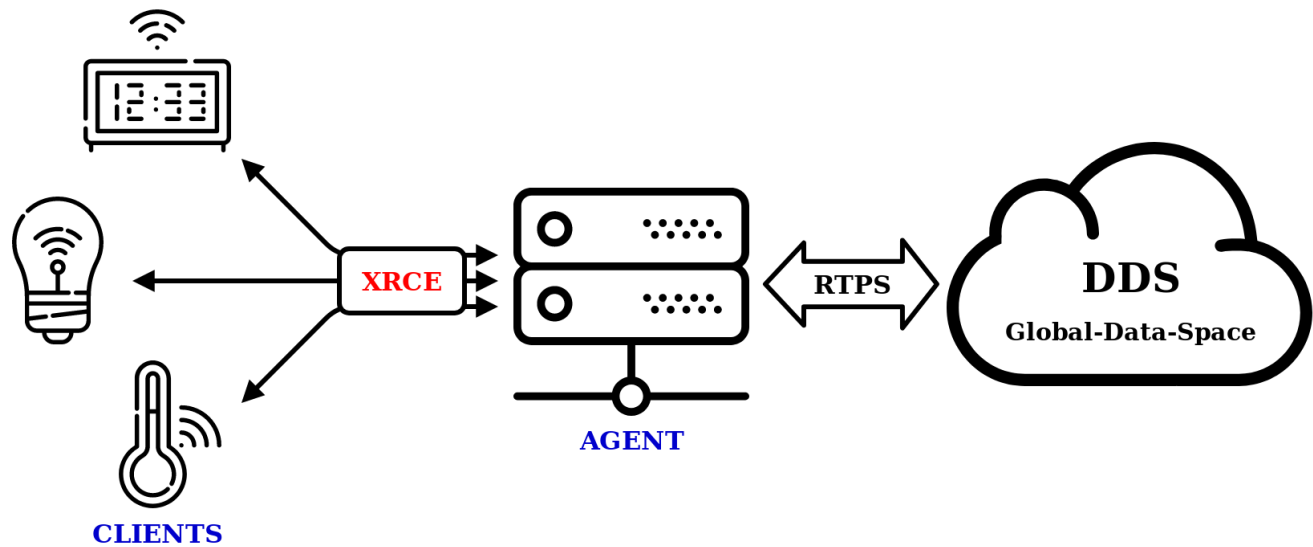
- Documentation: <https://micro-xrce-dds.readthedocs.io/en/latest/>

5 Annex 1: eProsima Micro XRCE-DDS

Content of product description web from eProsima from 17th December 2018 (To be published).

5.1 An XRCE Open Source Solution

eProsima Micro XRCE-DDS is an open source wire protocol that implements the OMG DDS for eXtremely Resource Constrained Environment standard ([DDS-XRCE](#)). The aim of the DDS-XRCE protocol is to provide access to the DDS Global-Data-Space from resource-constrained devices. This is achieved thanks to a **client-server** architecture, where low resource devices, called XRCE Clients, are connected to a server, called XRCE Agent, which acts on behalf of its clients in the DDS Global-Data-Space.



Micro XRCE-DDS is composed by two main elements:

- [Micro XRCE-DDS Agent](#): a **C++11 out-of-the-box application** which implements the XRCE Agent functionality.
- [Micro XRCE-DDS Client](#): a **C99 library** which implements the XRCE Client side functionality.

Apart of these, Micro XRCE-DDS uses other two components:

- [Micro CDR](#): a **de/serialization engine** used in the Client library.
- [Micro XRCE-DDS Gen](#): a **code generator tool** used for generating *Micro CDR* de/serialization function and Client apps examples from IDL sources.

5.2 Application

Micro XRCE-DDS is focused on microcontroller applications which require a publisher/subscriber architecture. Some examples of this kind of applications are those found in sensor network, IoT or robotics. On this last regard, some companies such as [Renesas](#) and [ROBOTIS](#) are using Micro XRCE-DDS as the middleware solution. Furthermore, [micro-ROS](#) project, whose target is to put ROS2 onto microcontroller, has adopted Micro XRCE-DDS as the middleware layer.

5.3 Main Features

5.3.1 Low Resource Consumption

As it was aforementioned, Micro XRCE-DDS is focused on microcontroller applications, therefore the design and implementation of this middleware have been carried out taking into account the memory restriction of this kind of devices. Proof of this is the fact that Micro XRCE-DDS Client is completely dynamic memory free. From the point of view of memory footprint, the [latest](#) version of this library has a memory consumption of less than **75 KB of Flash memory** and **2.5 KB of RAM** for a complete publisher and subscriber application.

5.3.2 Multi-Transport Support

In contrast to other IoT middleware such as MQTT and CoaP which work over only a particular transport layer, XRCE support multiple transport protocol natively. In particular, the latest version of Micro XRCE-DDS support: **UDP**, **TCP** and a custom **Serial** transport protocol.

Apart from this, Micro XRCE-DDS has a transport interface for both Agent and Client which allows to implement custom transport in a straight forward manner. This makes the port of Micro XRCE-DDS to different platforms and the addition of new transports a task that any user can undertake.

5.3.3 Multi-Platform Support

Micro XRCE-DDS Client support **Windows**, **Linux** and **NuttX** as embedded RTOS. On the other hand, Micro XRCE-DDS Agent support Windows and Linux platform.

5.4 Roadmap

The following is a list of future features planned for Micro XRCE-DDS:

- Peer-to-peer communication.
- Message fragmentation support.
- Programmable Agent through modern C++ API.
- FreeRTOS support.
- Application configuration.

5.5 Other links

- [Manual](#)
- [GitHub](#)