D7.7

Annual Report on Standardization

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Author	Bosch
Contributors	eProsima, ALR
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Abstract	This report gives an overview to the standardization activities in the OFERA project. In particular, it summarizes the consortium's monitoring of and contribution to relevant standardization activities.

Contents

1 Introduction

All products are affected by national and international standards for their respective domains and a considerable amount of effort is expended by manufacturers to ensure standards compliance. For physical products, standards on safety, resource (such as power) use, environmental impact and performance are particularly relevant. In addition, for framework software, standards (including de-facto standards) relating to modularity and interoperability are important as well.

In the ROS eco-system, standards compliance has traditionally been left to the companies using it, because on the generic framework level, ROS forms its own de-facto standard, and the other levels are typically product or market specific. However, with the move towards embedded devices, a significant market which shares important characteristics is being addressed. Therefore, the OFERA consortium believes that monitoring and where necessary contributing to the relevant standards bodies furthers the project's overall goals.

In this document, we summarize the consortium's monitoring of and contribution to relevant standardization activities.

1.1 Structure

The remainder of this deliverable is organized by standards body, so that we can provide the general context for that body and our work in close proximity. The following table links these sections to the relevant work packages. Work packages not listed here are not relevant for new standards activities.

WP	Item	Related Standardization Body
3	DDS-XRCE	OMG
3, 4	HRIM	ISO TC 299, OPC Foundation
4	Client Library	ISO TC 299
6	Use-Case Indego	IEC TC 116

2 OMG DDS-XRCE

2.1 Structure and process

The Object Management Group (OMG) follows a strict process to accept and adopt new specifications. These new technology adoptions revolve around the RFP, or Request for Proposals. Basically, after passing a series of votes on a technical committee (TC), the RFP becomes the requirements document for a future specification.

From that RFP, initial submissions from OMG members are accepted. Once the initial submissions deadline is meet, OMG members read those initial proposals and comment them during an OMG technical meeting week. From this meeting and taking the comments from other OMG members, submitters have the chance to publish subsequent revised versions of their submission. Once the deadline for this revised submissions is meet, and the OMG members agree on the viability and validity of these submissions, a series of votes begins.

In the next OMG meeting from the revised submission deadline, the voting series is started, and as a result of that, an official OMG Adopted Specification is chosen. Once an official OMG specification is officially accepted, a Finalization Task Force (FTF) is formed, which will resolve all the issues submitted to the OMG regarding the new specification. After an FTF revised version of the specification is issued a series of votes starts again to accept and provide it with a release number. Typically, the time the specification gets a release number is also the time in which the products reach the market. From this point, the specification enters a maintenance cycle where reports and revisions are issued on a regular basis.

This entire process is endeavour by OMG members. The members play one of two primary roles during the process:

- A large group of OMG members participate in writing the RFP, evaluating the submissions that arrive in response, and voting on the results. We'll call this group the voters.
- A smaller group write and edit the submissions. We'll call this group the Submitters. The members of this group are identified on OMG's web page for each standards effort. All submitters are automatically also voters, but not all voters are submitters.

2.2 Participation and Relevance

In the case of OFERA and more concrete in the case of Micro XRCE-DDS. Micro XRCE-DDS is the OMG DDS-XRCE specification implementation provided by OFERA consortium member, eProsima.

DDS-XRCE specification is a response to the OMG RFP "eXtremely Resource Constrained Environments DDS (DDS-XRCE)" (mars/2016-03-21). This OMG RFP ask the submitters for a client-agent protocol, targeting extremely resource-constrained environments. These extremely resource-constrained environments are those devices with aggressive sleep cycles requirements, small MTUs, low bandwidth and computational power capabilities.

OFERA member eProsima is a member of OMG, and as a such, participates in the OMG standardizations processes. The role of eProsima in the standardization of DDS-XRCE is double, submitter and voter function (In the previous explained OMG process). The DDS-XRCE specification is the result of a joint effort between Gerardo Pardo-Castellote, PhD (lead) CTO, Real-Time Innovations, Inc., Clark Tucker, CEO, TwinOaks Computing, Inc. and Jaime Martin-Losa, CTO, eProsima.

Apart from participating in the joint submission and following revisions of the DDS-XRCE specification, currently eProsima keeps active on the standardization process, identifying and submitting issues to the OMG private issue tracker system.

eProsima, Being an active member of the OMG and being one of the submitters and participants on the DDS-XRCE specification allows the OFERA consortium to get first-hand news and changes from the standardisation body. Apart from standard specification submission, eProsima provides the Micro XRCE-DDS implementation, which by the time of this report is the only publicly available implementation of the OMG DDS-XRCE standard.

2.3 Status and next steps

The latest standard specification version, and also the last specification driving Micro XRCE-DDS development, dates from March 2018. This specification currently is on a beta status, so there is an

ongoing process of submitting specification issues to an internal issue tracker system, and later on, on March 2019 a first revision of the standard including fixes to the detected defects will be released.

The following table summarises pass and future remarkable dates for the DDS-XRCE specification:

Event	Date	Notes
Base document(s)	March/18-02-11	(DDS-XRCE Joint Revised Submission)
Voting List Deadline	March 23, 2018	
Beta 1 Specification	June 30, 2018	ptc/18-05-42
Publication FTF Comments Due Date	September 30, 2018	(DDS-XRCE Beta 1 document)
FTF Report Due Date	February 18, 2019	
FTF Recommendation and Report Deadline	March 29, 2019	
Veto Power	September 21, 2019	

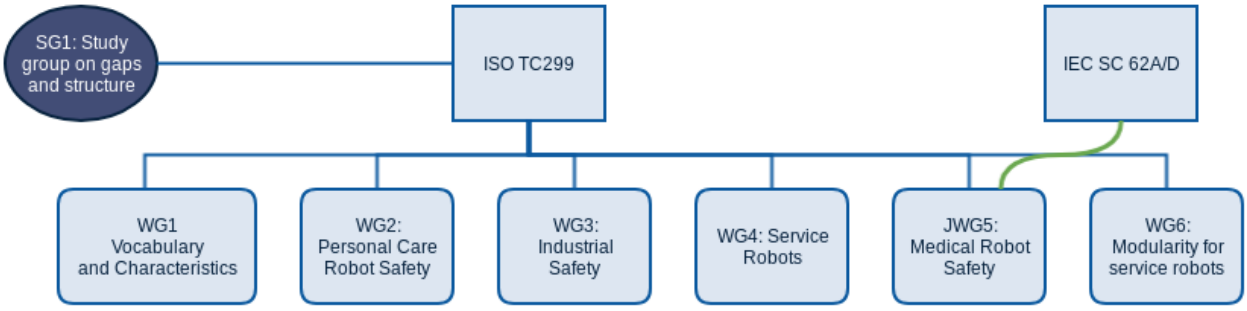
3 ISO TC299 "Robotics"

3.1 Structure

Technical Committee (TC) 299 of the International Standards Organisation (ISO) started in 1983, as sub-committee (SC) 2 *robots for manufacturing environments* of the TC 184 *industrial automation*. Safety has been the primary focus, and the scope was extended to safety for service robots in 2006. In 2016, the scope has again been widened to include performance and safety aspects, thus promoting it to a full TC.

Recently, a study group on gaps and structure has been formed, to again revisit and adjust the structure. Its report is expected in 2020.

The current structure of the TC is shown in the following image.



Two notes regarding this structure: 1) Working group 2 on *personal care robot safety* has applied to the ISO secretariat to extend its scope to the large majority of service robots. A decision on this is pending. 2) Working group 4, which is somewhat misleadingly named *service robots* is really only concerned with *performance* of service robots.

At the same time, working group 3 on industrial safety is discussing whether to include service robots used for manufacturing, because the – by now largely arbitrary – distinction between service and industrial robots is causing discrepancies.

3.2 Scope and Scope Exclusions

Despite the name, TC299 does *not* cover all areas of robotics. First and foremost, all electronic household appliances (such as robotic vacuums and lawnmowers) are standardized by the International Electrotechnical Commission, IEC.

For other machinery, relevant TCs, without claim of completeness, include the following:

TC	Name	Robotics-related topic
8	Ships and marine technology	Remotely Operated Vehicles Autonomous Underwater Vehicles
20	Aircraft and Space Vehicles	Unmanned Arial Vehicles
21	Equipment for fire protection and fire fighting	Rescue Robots
22	Road Vehicles	Autonomous Road Vehicles
23	Tractors and machines for agriculture and forestry	Agricultural Robots
96	Cranes	Autonomous Cranes
110	Industrial Trucks	Driverless Industrial Trucks
127	Earth Moving Machinery	Autonomous Trucks / Excavators
254	Safety of amusement rides and devices	Amusement Robots

3.3 Participation and Relevance

Technical Experts from Partners Bosch and ALR are nominated for TC299, involved in WG's 2, 4 and 6. Moreover, partner Bosch is involved in the German national mirror committee for TC299, organized by the Association of German Machinery and Plant Manufacturers (Verband Deutscher Maschinen- und Anlagenbauer, VDMA) on behalf of the German Institute for Standardization (Deutsches Institut für Normung, DIN).

Currently, the work of working groups 2 and 4 is considered not to be of direct relevance for this project. WG2 deals with safety, which is beyond the scope of OFERA. WG4 is only concerned with performance at the functional level, and its stipulations are so general as to be no particular issue for the framework level.

Working group six is currently drafting ISO 22166-1, *Modularity for service robots, part 1: General requirements*. It covers both hardware- and software-related modularity and is thus generally relevant for framework-level projects such as this. This draft has reached committee draft 2 (CD.2) stage.

3.3.1 Draft of ISO 22166-1: Modularity

The current working draft of ISO 22166-1 is, obviously, still subject to revision. These revisions are expected to be substantial, therefore care should be taken with the information given in the following. Moreover, the draft is still confidential.

The standard is very general, and most of its provisions are already fulfilled by ROS, because it is designed to encompass many approaches. The standard is also expected to be completely optional. Nevertheless, being aware of its provisions is certainly useful.

For these reasons, we will limit ourselves to pointing out a few areas where the standard differs from what is already present in ROS 2.

1. The standard will likely require an explicit component model, potentially containing information such as rates of execution, which ROS currently does not make explicit.
2. The standard contains a component lifecycle, which is a subset of the current ROS 2 component lifecycle (the only thing it omits is the `inactive` state). Note, however, that in ROS 2, the lifecycle is optional.
3. The standard also asks for errors to be classified as safety-relevant or not. This is something that is typically very application specific and only applies to entire components. Nevertheless, it is something which ROS 2 currently does not support.
4. An information model for data types and interfaces is a core part of the standard, but is currently not very well developed. It mainly contains metadata relevant for execution management, but is not on the level of sophistication of meta-model based approaches, currently.

At this moment, we do not believe that complying with ISO 22166 would require significant additional effort within OFERA. The only major point is safety-classification of errors, which is currently beyond the scope of OFERA.

3.3.2 HRIM

In order to obtain acceptance of the Hardware Robot Information Model (HRIM, see D3.10 for details), ALR is actively working in WG6 of TC299.

4 IEC TC 116

The International Electrotechnical Commission's (IEC) Technical Committee (TC) 116 is in charge of *Safety of motor-operated electric tools*. In principle, safety is not in scope of this project, but Bosch has the opportunity to monitor this TC for requirements related to platforms. Bosch Lawn and Garden Ltd, a linked third party in this project, is active in this TC and has chaired Working Group (WG) 10 *Electric motor-operated lawn and garden machinery* for the past years, through Bosch associate Jeremy Duszynski.

In particular, most recently Bosch has contributed to IEC 60335-2-107 *Household and similar electrical appliances – Safety – Part 2-107: Particular requirements for robotic battery powered electrical lawnmowers*. This standard, amongst other things, also relates to "programmable electronic circuits" and their software.

Even though the most recent edition is from just December 2017, revisions of other standards have necessitated restarting this activity, which happened in November 2018. Therefore, 2019 will most likely see renewed activity in this TC.