CRitical S**YST**em Engineering **A**cce**L**eration

Report on Standardisation Work – V3
D601.033

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CHANGE HISTORY

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CONTENT

Contents

1 Introduction

1.1 Role of deliverable

In order to make the CRYSTAL interoperability specification a sustainable result, it is important to gather experience and to start communication with existing bodies regarding interoperability standardization (or de-facto standardization). This deliverable documents and reports on activities and achievements with regard to the standardization of the Interoperability Specification. Furthermore the alignments with other projects are documented and evaluated.

1.2 Relationship to other CRYSTAL Documents

This document is highly related to this Interoperability Specification deliverables D601.021, D601.022 and D601.023

1.3 Structure of this document

Chapter 2 describes the overall strategy for standardization in CRYSTAL, while Chapter 3 describes the current status of the IOS with respect to standardization. Chapter 4 gives an overview over standardization-related events to which CRYSTAL contributed.

1.4 What is new

This document is an update of D601.032. The updated content is marked with [Y3] … [\Y3]

2 Overall Standardization Strategy

A major goal of CRYSTAL and ARTEMIS is to drive the standardization of the Interoperability Specification (IOS). Since the IOS is structured in different layers, where those layers have different maturity level, and a different usage scope (industrial or technology domain) it is reasonable to standardize the different parts of the IOS separately. This is also supported by the fact that the IOS is built on already existing and emerging standards where multiple standardization organizations are involved.

To realize this approach, the IOS group identifies which IOS parts are suitable units for standardization, and which standardization organizations fit for these parts. For the existing and emerging standards, where standardization already takes place, the project aims to have a prominent representation with the corresponding standardization organization on steering and working level. In addition, to support the project activities and increase the visibility within the standardization organization, ARTEMIS (or ECSEL) should have also a close collaboration with these organizations.

Summary of the overall standardization strategy in CRYSTAL:

- The IOS should be standardized according to its technology layers and scope
- Already started standardization activities should be supported by active participation on steering and working level
- Support by ARTEMIS/ECSEL to increase visibility in standardization organizations is highly appreciated
- Activities to standardize the IOS in different projects should be aligned whenever reasonable
- Standardization activities consist of these three areas:
  - Standard Governance
  - Standard Eco System
  - Standard Specification

All three areas are equally important and will be driven as much as possible during the project. The Standard Specification activities (including releasing the standard) typically take longer than a project timespan. Therefore, a clear process will be established how CRYSTAL concepts from use cases, as described in the IOS deliverable (e.g., generic engineering methods, IOS specifications) should be handled (see sustainability concept).

Nevertheless, since CRYSTAL decided to build on existing and emerging standards, there are already some tangible results which have been and will be achieved during the project (see standardization activities of the different IOS parts).

3 Status of the IOS Standardization

As described in the Deliverable D601.021, the IOS is vertically organized in (a) interoperability for Lifecycle Management and (b) other interoperability topics (e.g., co-simulation). The actual version of this standardization report focuses on the lifecycle management part of the IOS. Additional standardization activities will be reported in V3 of this deliverable which is due at the project end.

3.1 Lifecycle Management

Lifecycle Management is a major part of the CRYSTAL IOS. Predecessor projects (e.g. CESAR, iFEST, MBAT) evaluated the emerging standard OSLC for this area. The promising results of proof of concepts with OSLC by theses project lead to the decision to use OSLC as a major part of the CRYSTAL IOS. Besides the sound technical concept, OSLC had the advantage that the standardization process was already started before the CRYSTAL project. From the very beginning of the CRYSTAL project, partners were involved in the OSLC standardization activities in all three standardization areas mentioned above (governance, ecosystem, and specification). With the contributions of CRYSTAL, it was already possible to achieve tangible standardization results. These results include the following highlights:

- Multiple engineering domains and core specifications are available in revision 2.0
- Multiple tool vendors support OSLC interfaces out-of-the-box in the recent versions of their tools
- The OSLC organization has matured from a self-organized community to a Member Section (MS) with a   clear, well defined governance model under the Open standard organization OASIS
- The CRYSTAL project is well connected with the OASIS-OSLC MS with representatives in the Steering Committee, contributors and observers of Working Groups.
    - CRYSTAL partners in the OSLC Steering Committee (The Steering Committee consists of nine members. Five of them are CRYSTAL partners): PTC, IBM, Airbus, CIT, Siemens
    - CRYSTAL partners active in the OSLC Technical Committees, User Groups and Community: PTC, IBM, Airbus, Siemens

This progress was possible due to a joined effort with other projects, organizations and tool users and tool providers sharing the same vision of Lifecycle Interoperability.

3.1.1 Time line of OSLC-related Standardization Activities since CRYSTAL start

Before the CRYSTAL project, the OSLC initiative was just an open community with a self-defined governance model created in 2008 by IBM and some major customers. OSLC was primarily targeted towards supporting the Software development lifecycle, for any industry application area, the domains emerged with strong interest from the embedded and safety critical communities - especially for requirements and architecture. The earliest and now widest usage and adoption is in Change Management largely due to it's contribution to managing work without the need to resolve or align a wide range of domain or application specific representations. This has been fuelled by the uptake of IBM's Collaborative Lifecycle Management solution for Application Lifecycle management across many industries. The next greated adoption has been in Requirements Management, especially around IBM DOORS and Doors Next Generation, often in the safety and mission critical industries like Aerospace, Defence, Automotive, Rail and Nuclear. These communities have provide strong input over the life of OSLC on areas such as needs for quality, configuration management, product, system breakdown and traceability across domains and encouraged the involvement of vendors relevant to these industries, beyond IBM, such as Siemens PLM, PTC, Mentor Graphics, Aras, Dassualt Systemes, pure-systems and National Instruments.

Even before the CRYSTAL project, some partners were already part of the community, based on their activities in predecessor projects. There were already plans to transform the community into a standardization organization, but at that time no standard existed. With the start of CRYSTAL, the following activities have been started which were partially or completely motivated by the project and driven by CRYSTAL partners:
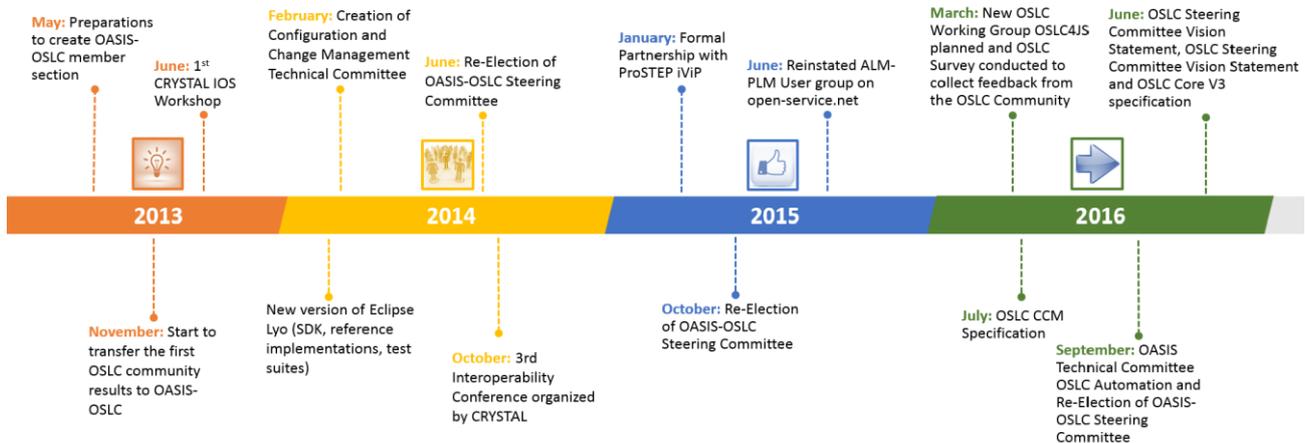
Report on Standardisation
Work – V3

Figure 1: Timeline of OSLC-related standardization activities

- May 2013: preparations to create OASIS-OSLC member section
    o definition "Roles of Procedures" (RoP:governance rules) for the member section,
    o request creation of member section (4 out of 22 supporter were CRYSTAL partner)

- June 2013: 1st CRYSTAL IOS workshop
    o OSLC main topic; Information exchange with OSLC Community

- June 2013: Creation of the OASIS-OSLC member section
    o part of the international recognized standardization organization OASIS
    o governed by the OASIS policies and the OASIS-OSLC RoP
    o Steering Committee installed as defined in RoP
        (4 of the 7 initial members were CRYSTAL partner)

- Nov. 2013: Start to transfer the first OSLC community results to OASIS-OSLC
    o OSLC-Core Technical Committee created as part of the OASIS-OSLC member section

- Feb. 2014: Creation of Configuration and Change Management Technical Committee
    o OSLC-CCM TC becomes part of the OASIS-OSLC Member Section
    o CRYSTAL partner are contributor and observer of this TC
    o Begin standardization work on this topic which is addressed in many parts of the IOS
    o Several meetings conducted between OSLC-CCM and CRYSTAL, especially the IOS team

- Oct. 2014: 3rd Interoperability Conference organized by CRYSTAL
    o Many talks, presentations and poster session bringing the CRYSTAL project and the OSLC community closer together

- June 2014: Re-Election of OASIS-OSLC Steering Committee
    o Two new members from embedded system ecosystem (Ericsson and Mentor Graphics) show strong relationship of OSLC in this community

- Xxx 2014: new version of Eclipse Lyo (SDK, reference implementations, test suites)

- Jan. 2015 Formal Partnership with ProSTEP iViP
  - OASIS-OSLC and ProSTEP iViP agreed on formal partnership to improve the interoperability of engineering environments
  - Several joined activities are planned including conferences, workgroups and other activities

- June 2015: Reinstated ALM-PLM User group on open-service.net
  - Define Use case for combined ALM PLM scenarios to identify gaps in existing OSLC specs
  - Experiences from CRYSTAL use cases will be taken into account

- Oct. 2015: Re-Election of OASIS-OSLC Steering Committee
  - Two additional members of from the embedded/safety critical systems community

[Y3]

- March 2016: New OSLC Working Group OSLC4JS planned
  - OSLC4JS Browser: browsing across multiple repositories
  - OSLC4JS Client API: a logical API abstraction layer on top of the OSLC REST services.
  - OSLC4JS Service: JS middleware service for general and generic OSLC Domains
  - OSLC4JS Server: generic OSLC server e.g. used with Cloud deployments
  - Presented at the CRYSTAL Implementer Forum - 2016/03/01

- March 2016: OSLC Survey conducted
  - Collect Feedback from the OSLC Community
  - Results available at: https://www.surveymonkey.com/results/SM-2XVJT6CR/

- June 2016: OSLC Steering Committee Vision Statement
  - http://open-services.net/wiki/steering-committee/vision/

- June 2016: New OASIS Technical Committee – OSLC Domains
  - Future home of all OSLC Domain specification
  - Planned: Migration of the OSLC V2 Domain specification from open-services.net

- June 2016: OSLC Core V3 specification
  - Community review completed
  - Public review in preparation
  - Release as OASIS standard by OASIS board (planned)

- July 2016: OSLC CCM Specification
  - Community review started
  - Public review in preparation
  - Release as OASIS standard by OASIS board (planned)

- Sept. 2016: OASIS Technical Committee OSLC Automation
  - Will be migrated to new OSLC Domains Technical Committee
  - Will be closed as separate Technical Committee

- Sept. 2016: Re-Election of OASIS-OSLC Steering Committee
  - 3 of 9 seats are up for election
  - Excellent opportunity to strengthen the influence on OSLC by the CRYSTAL and ARTEMIS-IA community.

[\Y3]

3.1.2 Standardization of OSLC Configuration Management

CRYSTAL members are in regular contact with the OASIS Technical Committee which is responsible to deliver the OSLC Configuration Management to ensure to needs from CRYSTAL partners are taken into account. Key stakeholders of the OASIS Technical Committee have presented the underlying configuration management concept and progress on the specification.

[Y3]
Community review of the OSLC CCM specification started. Next steps will be the public review followed by the release as OASIS standard by OASIS board.

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3.2 Collaboration with other organizations

The communication with other organizations has been established. Goal of the communication is to evaluate whether standards from those organization can be candidates for enhancing the CRYSTAL IOS and how a collaboration between these originations can help to promote the goals of the CRYSTAL IOS and build an ecosystem around it

These organizations include:

- OASIS-OSLC
- ProSTEP iViP
- ASAM
- OMG
- INCOSE
- ARTEMIS-IA
- EIT Digital

3.2.1 OASIS-OSLC ProSTEP iViP Collaboration

The OASIS OSLC Member Section has established a formal partnership with the ProsSTEP iViP association to jointly drive interoperability issues under the ProSTEP iViP "Codex of PLM Openness". CRYSTAL partners are members of both organization and have a vital interest that a common approach is taken.

CRYSTAL members helped to build this partnership. Planning for a joint event for fall 2015, on Interoperability between ProSTEP iViP, OASIS-OSLC and European funded projects (including CRYSTAL) is in progress. This event also aims to promote and foster the acceptance of the OSLC standard, which is part of the CRYSTAL IOS deliverable.

3.2.2 ALM-PLM Interoperability (A ProSTEP iViP – OSLC-OASIS Project)

[Y3]

Motivation:

In the last couple of years, many data exchange standards evolved to make engineering information exchangeable between engineers of different departments or organizations. Successful integration of Application Lifecycle Management (ALM) and Product Lifecycle Management (PLM), along with Model Based Systems Engineering, is a key aim for reducing costs in the development process and being competitive in future. Open Services for Lifecycle Collaboration (OSLC) is a promising solution to meet the described challenges by decoupling the data models of different software vendors and their tools and enabling unified access to resources. New availability of data and user interfaces will offer excellent prospects to re-organize and optimize development processes.

Project:

At the ProSTEP iViP OSLC Day in October 2015 (which was co-organized by CRYSTAL), a clear statement for deriving uses cases and giving real-life application support was given by the 120 international participants. Thus, CRYSTAL partners co-operated with ProSTEP iViP and OSLC-OASIS to create a project in which key use cases for ALM-PLM interoperability will be derived, related benefits gathered and technological recommendations for realization support exploiting and driving standards will be given.

The project kick-off will be in early Q3/2016. Before this, a field study will be conducted for figuring out industry's hot topics in the envisioned field of application. To maximize the project benefits, a network to and within other active standardization bodies will be formed.

Ramp-Up Workshop ALM-PLM Interoperability on 06 July 2016 at ProSTEP iViP Darmstadt

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3.2.3 Big Data Technologies for ASAM ODS

[Y3]

ASAM ODS (Open Data Services) is a major interoperability standard in the automotive domain. It focuses on the persistent storage and retrieval of testing data. The standard is primarily used to set up a test data management system on top of test systems that produce measured or calculated data from testing activities. Components of a complex testing infrastructure can store data or retrieve data as needed for proper operation of tests or for test data post-processing and evaluation.

A typical scenario for ODS in the automotive industry is the use of a central ODS server, which handles all testing data produced by vehicle test beds. The major strength of ODS as compared to non-standardized data storage solutions is that data access is independent of the IT architecture and that the data model of the database is highly adaptable yet still well-defined for different application scenarios.

AVL List GmbH (the CRYSTAL coordinator) actively contributes to the ASAM project "Big Data Technologies for ASAM ODS". The goal of this project is to identify and propose changes needed to the ASAM ODS standard and/or supporting standards for the interface between the ODS server and data storage solutions. One example are the Web APIs to enable ODS to leverage Big Data storage and analytics. The final result will be a document that describes today's best Big Data solutions for automotive testing. This paper will then provide the foundation for the further development of ASAM ODS and related standards.

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4 Participation to standardization-related events

To foster the collaboration with standardization bodies and related projects, CRYSTAL participated to several events in order to meet the relevant stake holders.

Event: ARTEMIS and Standardization Working Group Workshop

Date and location: 16th September 2013, Vienna

Role of CRYSTAL:

- Main organizer of this workshop
- Presenter

Comments: At this event CRYSTAL gave project presentation to representatives of ASAM, ProSTEP, OASIS and the ARTEMIS Standardization Working Group. A major topic of this meeting was the collaboration of recognized standardization bodies with CRYSTAL and other ARTEMIS projects

Event: ASAM International Conference:

Date and location: 4th December 2013, Dresden

Role of CRYSTAL: To raise awareness of the CRYSTAL project within the ASAM community the project was presented at the ASAM International Conference.

Comments: ASAM is an incorporated association under German law. Its members are primarily international car manufacturers, suppliers and engineering service providers from the automotive industry. The association coordinates the development of technical standards, which are developed by working groups composed of experts from its member companies. CRYSTAL will collaborate with ASAM to standardize the relevant parts of the interoperability specification.

Event: ARTEMIS and Standardization Working Group Workshop

Date and location:

- 17th January 2014, Brussels
- 5th February 2014, Brussels

Role of CRYSTAL: As the largest IOS-related project, CRYSTAL was a major contributor to the discussions

Comments: As a follow-up of the September workshop, the goal of this workshops was to refine the standardization concept of the interoperability specification, in particular to consolidate the results of other ARTEMIS IOS-related projects and to ensure their sustainability after the life-time of the project.

Event: ARTEMIS Spring Event

Date and location: 18th and 19th March, Amsterdam

Role of CRYSTAL: Participation in the ARETMIS Working Group Tool Platforms, Working Group Standardisation

Comments: CRYSTAL members where key participants of the ARTEMIS Working Group Tool Platforms, Working Group Standardisation. The major objective was to develop a plan and a process to enable the collaboration of IOS-related projects and to ensure the sustainability of a consolidated IOS also after the life time of the individual projects. These efforts resulted finally in a proposal for an Innovation Action in the H2020-ICT-2014-1 call.

Event: ProSTEP iViP

Version	Nature	Date	Page
V01.00	R	2016-08-11	12 of 14

Date and location: 13th-14th May 2014, Berlin

Role of CRYSTAL:

- Booth presentation
- Workshop organizer

Comments: ProSTEP iViP is one of the most important standardization organizations in the field of product data management and virtual product creation. . Most of the major OEMs are members of the ProSTEP iViP association and the ProSTEP Symposium is a top-class event with excellent networking opportunities where the key decision makers meet. CRYSTAL organized a workshop at this event and was also present with a project booth on both days of the symposium.

Event: OASIS-OSLC monthly Steering Committee Meetings

Date: ongoing since foundation of the OASIS-OSLC Member Section and before at OSLC Community Steering Committee

Location: Web meetings and presence meeting at least once a year

Role of CRYSTAL: currently 2 representatives of CRYSTAL partners are appointed/elected as permanent OASIS-OSLC Steering Committee members

Event: ProSTEP iViP

Date and location: 5th-6th May 2015, Stuttgart

Role of CRYSTAL:

- 3 CRYSTAL-related presentations

Comments: ProSTEP iViP is one of the most important standardization organizations in the field of product data management and virtual product creation. . Most of the major OEMs are members of the ProSTEP iViP association and the ProSTEP Symposium is a top-class event with excellent networking opportunities where the key decision makers meet. CRYSTAL organized three presentations promoting the CRYSTAL IOS.

[Y3]
Event: 5. Interoperability Conference in conjunction with CRYSTAL Final Dissemination Event.
Date and location: 15th-16th June 2016, Madrid

Event: 20. SafeTRANS Industrial Day
Date and location: 3rd June 2016, Berlin
Role of CRYSTAL:

       Panel discussion with CRYSTAL and CP-SETIS members:

       Interoperable Development Tools & Interoperability Specification

(presentation of the sustainability concept for the development and standardisation of the Interoperability Specification IOS)

Event: OSLC Conference
OSLC Conference planned for Nov. 2016 in Long Beach, California
Will be held in conjunction with the IBM Continuous Engineering for the Internet of Things 2016

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