

**ARTIST**  
**FP7-317859**



*Advanced software-based seRvice provisioning and  
migrATion of legacy Software*

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**Deliverable D2.2.2**

**Standardization Report and follow-up roadmap**

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<b>Editor(s):</b>	Leire Orue-Echevarria Juncal Alonso
<b>Responsible Partner:</b>	TECNALIA
<b>Status-Version:</b>	Final – v1.0
<b>Date:</b>	17/09/2015
<b>Distribution level (CO, PU):</b>	PU

<b>Project Number:</b>	FP7-317859
<b>Project Title:</b>	ARTIST

<b>Title of Deliverable:</b>	Standardization Report and follow-up roadmap
<b>Due Date of Delivery to the EC:</b>	30/09/2015

<b>Workpackage responsible for the Deliverable:</b>	WP2 – Scientific and Technical Coordination
<b>Editor(s):</b>	Juncal Alonso (TECNALIA) Leire Orue-Echevarria (TECNALIA)
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<b>Approved by:</b>	All Partners
<b>Recommended/mandatory readers:</b>	WP4 and WP3

<b>Abstract:</b>	This report will document all the standardization activities performed in the project during the whole duration
<b>Keyword List:</b>	OMG, CloudML, TOSCA, UML2, ATL, fUML, ISO 17789
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## Document Description

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### Document Revision History

<i>Version</i>	<i>Date</i>	<i>Modifications Introduced</i>	
		<i>Modification Reason</i>	<i>Modified by</i>
v0.1	20/08/15	First draft version	TECNALIA
v0.2	17/09/15	Final version	TECNALIA

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## Terms and abbreviations

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EC	European Commission
OMG	Object Modeling Group
UML	Unified Modeling language
CCRA	Cloud Computing Reference Architecture
ISO	International Standard Organisation
fUML	Foundational UML
GML	Goal Modeling Language
TFT	Technical Feasibility Tool
SbSp	Service Based Software Providers
MAT	Maturity Assessment tool
KDM	Knowledge Discovery Model
MUT	Model Understanding Tool

## Executive Summary

The purpose of this document is threefold. Firstly, it aims to summarize the standards related activities carried out in the timeframe of the project. Secondly, it updates the strategy already defined in M6 and updated in M18. Thirdly, it aims to describe which the next steps are in standard-related activities beyond the existence of the project. This is a key document wrapping the work being carried out in all technical workpackages.

The ARTIST standardization strategy has the following goals:

1. All ARTIST tools should be based on standards in order to foster the uptake of the ARTIST solution by the industry. Members of the Special Interest Group (SIG) have expressed this requirement in order for ARTIST to have a wide impact in the industry.
2. Evaluate if any of the results can contribute to extend existing standards. Should this be the case, evaluate then how they can be extended and the procedure to follow
3. Evaluate if any of the results can have an impact as a new standard. Should this be the case, evaluate which standardization body is the most suitable one, and which procedures these bodies have.

This strategy has been realized and ARTIST Tools are based on standards from different organization committees. Furthermore, significant effort is being devoted to include a metric definition template mechanism for better abstraction in the ISO 19086 standard, and to have the SbSp certification model listed in ENISA's Cloud Certification Scheme List.

The document is structured as follows. Section 1 summarizes the standards that have been used in the ARTIST solution. Section 2 presents the standardization strategy defined for ARTIST. Section 3 discusses the next steps regarding this matter after the project finishes through the ARTIST club. Finally, section 4 presents the conclusions and future steps.

## 1 Relevant Standards for ARTIST

This section will position the ARTIST work and strategy against the various concerned, existing and upcoming standards. A detailed list of ARTIST related standards can be found in D2.1 [1] and in D2.2.1 [2] [ref]. In the context of the project, some of the standards that appeared in these two deliverables have become standards as such. This has happened with the initially known ISO CCRA [3] which now is known as ISO/IEC 17789:2014 “Information technology — Cloud computing — Reference architecture” [4]. ARTIST has kept a close monitoring of these standards and included them already in the relevant ARTIST tool(s).

As explained in previous deliverables, quite a large number of standards related to the ARTIST work and falling have been analysed. The relevant research fields in scope for the ARTIST project are as follows:

- Software modelling and meta-modelling
- Cloud Computing
- Business modelling
- Reverse engineering
- Forward engineering
- Methodologies

The following table summarizes the standards that have finally been used in the different ARTIST tools.

**Table 1. Use of the relevant standards for ARTIST**

Standard	Tool	WP	Extending / using?
PIM4Cloud (*)	CloudML@ARTIST profile	WP7 and WP9	Extending to include aspects such as security, cost, availability and also the IaaS, PaaS and SaaS characteristics.
SPEM2.0 [5]	Methodology Process Tool (MPT), Methodology	WP6	Using
ITIL [6]	MAT, BFT, SbSp certification model	WP11, WP5	Using
KDM [7]	TFT, MDT	WP5, WP8	Using
UML2 [8]	TFT, MDT, MUT, Forward Engineering Integrated Environment, End-user based tests, behavioural equivalence tests, non-functional tests	WP5, WP8, WP9, WP11	Using. The subset used is the one provided by Eclipse ecore, since most of ARTIST tools are Eclipse-based.
MARTE [9]	Model-based simulation in the context of NFP computations (verification of non-functional tests)	WP11	Using
ATL [10]	MDT, MUT, Forward Engineering Integrated Environment	WP8, WP9	Using
TOSCA [11]	MAT, Deployment tool	WP5 / WP9	Using

Standard	Tool	WP	Extending / using?
fUML [12]	model-level simulations of the migrated application to evaluate functional and non-functional migration goals (verification of functional tests)	WP11	Using
ISO 17789:2014 [4]	MAT, Certification Model	WP5, WP11	Using

(\*) PIM4Cloud branched into CloudML in 2013, after this project had started



## 2 Standardization strategy in ARTIST

Already in early stages of the project and as detailed in D2.1. [1], the ARTIST consortium identified standardization as a key activity for the project. As recommended by the EC in [5] standardization has to be considered from the proposal phase with the idea that the earlier standardization is taken into account, the more benefit can be obtained from it.

In the case of ARTIST, the goal of including a standardization task as part of the project has been twofold. On one hand, the ARTIST consortium aimed at creating a set of methods and tools that are to be adopted by the industry. In order to achieve that, these tools must be based on, or be compliant with, existing standards. Otherwise, the uptake from the industry is not assured, minimizing the impact of the project results. On the other hand, the project aimed at extending existing standards, if applicable and if feasible, with the research results attained in the context of the project.

While the project has been clearly successful on the first aspect, with tools being compliant with and based on standards and best practices, the second goal is still a work in progress. ARTIST consortium members have had several contacts with Simon Moser (IBM), co-chair of the OASIS Technical Committee, where the potential contributions and terms of participation were addressed but the most adequate way in which to contribute to OASIS is still being discussed at project level.

In D2.1 [1] and D2.2.1 [2] we established a standardization strategy consisting of the following activities: 1) screening existing standards, 2) contribute to existing standards or develop new ones, 3) Identify results that can be standard-able.

### **Activity 1: Monitor existing standards to include them, if relevant, in the ARTIST solution**

Over the whole timeframe of the project, the project consortium has evaluated and monitored standards relevant to ARTIST as already mentioned beforehand. In this last period, from M18 to M36, the ISO Cloud Computing Reference Architecture, which was a draft when the project started, has become a full standard, now ISO 17789:2014. The final text of the standard does not show significant changes with respect to the draft version that had been used in the creation of several ARTIST tools.

The final updated version of the standards considered in the project is shown next:

- Software modelling and meta-modelling: KDM [6],UML2 [7], MARTE [8], fUML [9], CloudML [10]
- Cloud Computing: CloudML, ISO 17789 [4], OASIS TOSCA [11]
- Business modelling: ITIL [12], SPEM2.0 [13], ISO 17789
- Reverse engineering: KDM, ATL [14],UML2
- Forward engineering: KDM, ATL

### **Activity 2: Contribute to on-going standardization activities**

ARTIST's first aim is to use existing standards in its solution; secondly, extending existing ones if they do not cover the purposes of the ARTIST tools and thirdly, if a relevant result can be standardized, perform the necessary activities for getting them under a standard.

The main asset that falls into this category is CloudML@ARTIST. CloudML@ARTIST is the CloudML extension created for the needs of the ARTIST project. Two other dialects have been created in the context of other European projects, PaaSage and MODAClouds. In this last year of the project, all three projects focused on obtaining a common understanding among all

three CloudML extensions by creating the necessary transformations. During the lifetime of the project, a joint task had been established to acquire this common understanding of the different CloudMLs, as reported in WP4 deliverables. As a result of this task force, a joint paper has been published with these achievements [15]. The evaluation of whether these results are relevant for the contribution to the OASIS TOSCA standard is still being evaluated.

Another relevant issue to be able to extend existing standards is to participate in existing standardization bodies. These bodies often identify gaps that could be solved with projects like ARTIST. Partners of ARTIST are active members of OMG, CEN CENELEC and ISO CCRA JT/SC38. In this last period, however, no activities relevant to ARTIST have been carried out in these standardization groups.

### **Activity 3: Identification of potential standard able results**

ARTIST does not have as first aim the creation of new standards. However, during the whole period of the project, ARTIST assets have been thoroughly analysed so as to identify whether they could be submitted to become a new standard or not, based on the needs of the industry. A significant effort is currently being made to have the ARTIST SbSp Certification Model included as part of ENISA's Cloud Certification Scheme List (CCSL) [16]. The inclusion or not of the ARTIST SbSp in that list will be decided beyond the timeframe of the project but while the ARTIST Club is alive and in charge of providing ARTIST related services.

Furthermore, following the implementation of 3Alib and the experiences gathered from the process of auditing commercial public SLAs, we have contributed with the proposal of a metric definition template mechanism for better abstraction and at the same time a better definition of the involved metrics and how they are measured, even at a sample level. This has been performed in collaboration with the SLALOM project and in order to provide input towards the ISO/IEC JTC 1/SC 38/WG 3 (Cloud Computing Service Level Agreements (CCSLA)) meeting in Dublin in October 2015, that is currently working towards the 19086 standards series [3].

### 3 Next Steps after the end of the project

Even though the project is coming to an end, the standardization activities will continue in the ARTIST Club (more information can be found in D3.4 Final Exploitation plan). The ARTIST Club is the sustainability option selected for the continuation of ARTIST activities. As detailed there, these activities encompass consultancy services but also maintenance and extension of the developed tools. This extension and maintenance will always be performed having in mind that:

- 1) All tools shall comply with existing standards to ensure the uptake of the tools: this involves the tools already created in the context of the project as well as new tools that might result from the activities of the ARTIST Club. The first aim of the tools is the uptake by the industry and as mentioned before, be compliant with standards is often the most adequate way for that to happen.
- 2) Relevant assets can still be considered standardise-able and therefore prone to be submitted as a new standard: created assets as well as newly developed assets can still become candidates to be submitted to different standardisation committees. The ARTIST Club structure will guarantee that.
- 3) The work already started with TOSCA is likely to continue in order to extend the existing standard with the ARTIST View, if accepted by the OASIS Technical Committee. This is also extendable to other standardization committees where ARTIST Club Members have presence (CENELEC, ISO).

## 4 Conclusion

Throughout the life of the project, ARTIST has analysed several standards [1] [2] so as to convene whether the final ARTIST solution should be compliant with them or not. The application of standards in the different tools deemed to be a key priority for the ARTIST Consortium members in order to ensure the usage and adoption of the ARTIST tools. However, not only the project has analysed a plethora of standards but also monitored them in order to detect as soon as possible, potential changes in their status that might affect the provided solution. This, for example, happened with the ISO standard Cloud Computing Reference architecture that passed from a draft status to a final status and become ISO 17789:2014.

An additional activity to the one already mentioned, is the extension of existing standards or the creation of new standards based on ARTIST results. Significant effort has been devoted to this activity and especially relevant is the work performed alongside PaaSage and MODAClouds EU Projects for the common understanding of CloudML and how it can potentially extend the existing standard OASIS Tosca. Furthermore, ARTIST has maintained several conversations with OASIS TOSCA Co-Chair in order to analyse how ARTIST, as project, could contribute to this standard.

The project is now coming to an end. However, the mechanism defined for its sustainability, the ARTIST Club, will ensure that these activities could also be carried out also as part of the ARTIST Club regular activities such as source code maintenance, consultancy services, and so on.

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