

Agreeing Upon SOA Terminology – Lessons Learned*

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Abstract. Building service-based systems with the Service Oriented Architecture (SOA) requires knowledge and experience from diverse domains, including user interaction, service-oriented computing, as well as service platforms and infrastructures. These domains are addressed by different research communities. Therefore, joint research activities between these communities are key to provide novel service technologies for the Future Internet. As each community uses its own language, this poses significant communication challenges. To foster a common understanding of researchers, this paper reports on the process, the results and the lessons learned in devising an agreed terminology within the context of the NEXOF initiative. This terminology is freely accessible on the Web.

Keywords: Services, Service-based Systems, Service Oriented Architecture, Glossary, Evolution Process, Future Internet

1. Introduction

Due to steady innovations in modern information and communication technologies, the ICT environment at home, at work as well as for mobile usage has changed and advanced in various ways, leading to a continuously increasing number and diversity of software services. Such software services, together with innovative service engineering methods and service technologies will thus become central to the development of the Future Internet and will shape its evolution. Devising these technologies requires knowledge and experience from diverse domains. This paper reports on the process, the results and the lessons learned in devising an agreed terminology to foster a common understanding of researchers of those various domains.

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The agreed terminology exists in web-accessible form as a glossary, consisting of a list of terms and their definitions. It is part of the NESSI[†] strategic project NEXOF-RA that aims at defining a SOA reference architecture (see Section 2). The glossary definition process as well as the lessons learned described in this paper reflect the work and experience of the NEXOF-RA project.

The remainder of the paper is structured as follows: In Section 2 the NEXOF-RA project is briefly introduced. Section 3 presents the goals and purpose of the NEXOF-RA glossary. In Section 4 related approaches for the definition of glossaries are discussed. Section 5 gives an overview of the NEXOF-RA glossary definition process as well as its outcomes. In Section 6 the lessons learned during the glossary definition process are presented. Section 6 summarizes the paper and highlights future research activities.

2. The NEXOF-RA Project

In Europe, initiatives that allow and support joint research activities regarding service-based systems include, besides others, the “Internet of Services” initiative of the European Commission, the “Future Internet Assembly” as well as the European Technology Platform NESSI (Networked European Software & Services Initiative).

NESSI aims at promoting the transformation of the EU economy into a service economy. Central to NESSI’s research efforts is NEXOF, the NESSI Open Service Framework. NESSI defines the Open Framework as “[...] an integrated, consistent and coherent set of technologies and associated methods and tools intended to:

1. provide European Industry and the Public Sector with efficient services and software infrastructures to improve flexibility, interoperability and quality;
2. master complex software systems and their provision as service oriented utilities; establish the technological basis, the strategies and deployment policies to speed up the dynamics of the services eco-system;
3. develop novel technologies, strategies and deployment policies that foster openness, through the increased adoption of open standards and open source software as well as the provision of open services;
4. fostering safety, security and the well-being of citizens by means of new societal applications, enhanced efficiency of industry and administrations, and competitive jobs.”

A first step to achieve those goals is NEXOF-RA, an integrated project (IP) whose overall ambition is to deliver a reference architecture for the NESSI Open Service Framework. This SOA reference architecture ranges from the infrastructure up to the interfaces with the end users, leveraging research in the area of service-based systems to consolidate and trigger innovation in service-oriented economies. The consortium is composed of 16 partners from eight different countries (Spain, Italy, Germany, UK, Ireland, Israel, The Netherlands and France).

[†] www.nessi-europe.com

3. Goals and Purpose of the NEXOF-RA Glossary

Since the NEXOF-RA project unites several different communities and domains, the agreement on terms and reaching a common understanding is crucial to the success of the initiative. Although the aim is to find consensus and agree on a well-defined definition of terms several definitions might also be the result as the concise definition of a term can depend on the context in which it is used. Nevertheless, it is crucial to gain a common understanding about all those definitions and the specific contexts in which they are used within the project to avoid miscommunication.

To understand the process described in this paper, first the objectives that have been set for this glossary will be described. These objectives are mainly identified according to the different groups of glossary users. As the project includes different groups of contributors the definition of the glossary aims at addressing all of those groups for different purposes. The objectives can be summarized as follows:

- **Baseline for NEXOF-RA internal activities:** To define a common terminology the project includes the creation of a conceptual model of the reference architecture as well as the definition of a glossary. It contains and defines the concepts of the model as well as the central terms of the specification definition. The glossary should be used and referenced in all project-internal activities and deliverables.
- **Integration of results of NESSI strategic projects (NSPs):** Within the NESSI initiative several different projects have been launched which focus on different aspects of service-based systems (e.g. SOA4All, RESERVOIR, SLA@SOI). The results of their research activities should be included and considered in NEXOF-RA in order to prevent that effort is spent on topics that already have been discussed. The integration of these results also makes a common terminology desirable. The NSPs are asked to provide the aspects of their results that are relevant for the definition of a reference architecture based on the agreed terminology. Accordingly, the projects are also involved and can actively participate in the definition and agreement of the glossary definition.
- **Reference for the NEXOF community:** Besides the integration of results from existing projects NEXOF-RA also performs an “Open Construction Cycle”[‡] in which external contributors (e.g. the S-Cube Network of Excellence) are asked to submit their solutions to specific topics of a SOA. The work done within this process should be based on the agreed terminology covered by the glossary. Since the external contributors use the definitions and it is expected that new insight are gained by their work, they can also influence the evolution of the glossary by suggesting changes. However, they cannot actively participate in the agreement and decisions.

Accordingly, the NEXOF glossary provides a common source of reference for all NEXOF partners as well as for partners involved in the community process of defining the NEXOF reference architecture.

[‡] http://www.nexof-ra.eu/?q=open_construction_process

4. Related Work

The literature on building glossaries is mainly focussed on automatic or semi-automatic derivation of glossary terms and their definitions. In the European Network of Excellence INTEROP, Velardi et al. describe their method for building a glossary [7]. Therein, the glossary is part of a Knowledge Map Acquisition Chain, beside a lexicon, a taxonomy and an ontology. To build the glossary, they use an automated terminology extraction algorithm that analyzes a large set of collected documents within a community or project (e.g. State-of-the-Art surveys and papers, deliverables, workshop proceedings, etc.). Thus, this approach bases on existing documents. In the case of NEXOF-RA, such an automated approach was not feasible. The glossary definition process could not rely on documents produced within the project, because the glossary definition started on day one of the project. Of course, quite a few documents exist in the different research communities. However, these have not been consolidated by taking into account the scope and the goals of NEXOF-RA.

One promising paradigm for creating collaborative knowledge is Open Authoring. This is realized by wikis [1], which allow users to create and edit any page in a web site. It is exciting in that it encourages democratic use of the web and promotes content composition by all users [1]. In the context of NEXOF-RA however, normally only one person per partner was assigned to work on the glossary. Therefore, it appeared that the community that “creates” the glossary using the wiki would not be large enough. Further, the people involved in the creation of the project had conflicting domain knowledge, which they proposed as definitions. Accordingly, the free authoring approach could have resulted in rewriting and especially overwriting terms almost arbitrarily. This mutual overwriting of definitions without tracing what knowledge about a term already has been proposed and deleted could have resulted in cycles of definitions. Although, the wiki approach always allows to make a roll-back to an earlier version this is not a step a of a constructive knowledge consolidation process. Doing a roll-back the new information would get lost instead of being consolidated with existing information. With this conflicting knowledge no collaborative knowledge creation could be performed as intended.

5. The NEXOF-RA Glossary Definition Process and its Outcomes

The key idea behind the NEXOF-RA glossary definition process is to exploit elicitation techniques that are used in Requirements Engineering in order to drive the consolidation. Specifically, written surveys ([3], [4]) are performed which provide input for a consolidation workshop following the format described by Pohl [2] and Leffingwell and Widrig [6].

The NEXOF-RA glossary definition process is structured into three main phases:

- **Phase 1 - Survey of initial terms:** collect initial list of definitions of terms from the participants
- **Phase 2 - Construction and consolidation of term definitions:** build a first consolidated version and participants comment on this version as baseline for a workshop in which an agreement and consolidated version is defined

- **Phase 3 - Change and evolution:** evolve the definitions by collecting requests for changes and agreeing upon changes. This phase of the process is iterative in order to allow a step-wise evolution of the glossary.

5.1. Phase 1: Survey of initial terms

As mentioned above, the used approach for the survey is geared to elicitation techniques of the written survey (cf. [3] and [4]). It offers the possibility to elicit an initial set of requirements and term definitions respectively from a large number of stakeholders [5]. It also identifies new sources for term definitions, e.g. other glossaries.

Thus, phase 1 started with sending the template for defining terms to all participants. They were encouraged to fill in the template and define terms that they would like to be considered in the glossary. Each participant was asked to define terms, which are the most relevant ones for the glossary in the project context (e.g. Service, Service Level Agreement, Orchestration, Composition, etc.), and also to add new terms if needed. The mentioned terms and all additional terms had to be described in four sections:

- **Description:** Describe the term short and precise, but as detailed as necessary
- **Reference:** Reference to literature or to domain where term is used
- **Rationale:** Rationale for the definition
- **Synonyms:** List of words with the same meaning

A template was used to support the survey and the following construction and consolidation phase in different ways. First of all, it assured that all participants would fill in the information needed to construct the glossary as well as that the proposed definitions could easily be integrated. The reference section was helpful since it made clear that existing maybe commonly accepted standards or sources were referenced. Besides this, own rationales have been asked in order to strengthen the different positions during the discussions and to communicate the different considered aspects before the discussions started.

Outcomes: Terms considered as relevant for the glossary cover all terms that are considered as relevant in the whole NEXOF-RA project. This is the main reason for the large number of terms defined after phase 1 (over 200 terms, including multiple definitions for one term).

5.2. Phase 2: Construction and consolidation of term definitions

Based on the terms received from the participants, a preliminary version of the glossary was built and made accessible via the NEXOF-RA web based common working environment. While building this preliminary version, a first consolidation was performed with regard to multiple definitions and synonyms for a term by the glossary moderator. Thus, a web page for a given term was structured as follows: the first definition on a page was the current definition that is “accepted”. Alternative definitions (if existing) were listed below. Finally, there was a section for comments.

Since every contribution of a participant was included at that stage, there have been terms that were only NEXOF-RA related from the point of view of one domain.

Therefore, participants were encouraged to indicate whether a given term is NEXOF-RA relevant or not. The first separation of relevant and non-relevant terms revealed

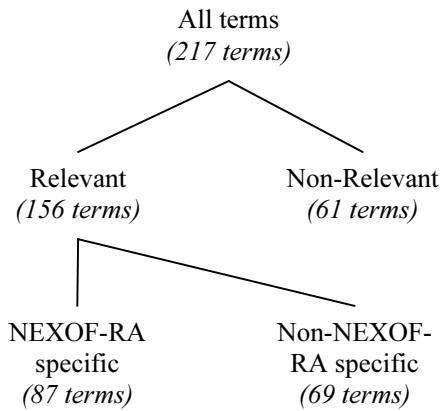


Figure 1 Structuring principles of the NEXOF-RA glossary

categories: NEXOF-RA specific and non-NEXOF-RA specific terms. Specific terms include all terms, which are closely associated to the NEXOF-RA context. All other terms are non-specific. Figure 1 illustrates the decomposition.

To consolidate the proposed definitions, a consolidation workshop, according to the workshop format described by Pohl [2] and Leffingwell and Widrig [6], was organized open to all participants. During the workshop, groups of participants from similar domains discussed the proposed definitions. They had also to identify overlaps in the definitions which needed to be harmonized. Thereafter, the results were discussed and approved in the plenary. First, the specific terms were discussed and after reaching an agreement, the non-specific terms were in the focus. However, some of these terms needed some substantial rewriting. Thus, this task was postponed and executed by the designated identified expert. The rewritten definitions were reviewed by other participants.

Outcomes: In the project glossary 61 of the existing terms were considered of not being relevant. Out of the 156 terms that have been considered as being relevant for the NEXOF-RA project, 87 were marked as NEXOF-RA specific and 69 as non-NEXOF-RA specific. The output from this phase was distributed to all participants. Before the first version has been frozen, it was ensured that participants of the NSPs had the possibility to provide feedback to the glossary and add terms that had not been considered till this point. Afterwards, this first version of the glossary was published on the NEXOF-RA portal in order to allow external contributors to access the terminology, to use it in their contributions as well as to provide further feedback that can be incorporated into the glossary during the revision phase.

that only few of the existing terms were not relevant. In order to build a basis for discussion for the consolidation, the participants were furthermore encouraged to add comments on the definitions and in case they do not agree with a “proposed” definition to propose an alternative wording. Thereby, it was crucial that added comments could be referenced by other comments. The commenting showed that some participants have concentrated on specific terms and did not comment every definition of terms. Thereof, the decision was reached to further separate the relevant terms in two

5.3. Phase 3: Change and evolution

As described in the previous section, the current version of the glossary has been accepted by all participants and representatives of the NSPs and it has been made publicly available. From now on, multiple changes are expected to occur regarding the existing definitions for terms included in the glossary due to newly gained insights concerning the research activities. To allow for the baseline glossary to evolve over time according to the needs identified during the project, a defined and structured change and evolution phase is implemented.

This process will be carried out multiple times in the remaining duration of the NEXOF-RA project.

A single iteration of this change and evolution phase is described as follows:

1. **Submission of Requests for Change (RfCs):** All participants and external contributors are able to send Requests for Change (RfC) to the glossary moderator. These RfCs should address defined terms in the current glossary (the current status will always be available in an *internal* wiki) as well as new terms that have not been considered. Each request should contain:
 - a revised (or new) definition of the term
 - the rationale for the request
 - a literature reference (if available)
 - the context in which the request emerged (e.g. from which project results).
2. **Agreement on changes:** Since each RfC is potentially changing a consolidated and agreed definition in the glossary, each RfC needs to be accepted by all participants as well as the representatives of the NSPs. In order to reach such an agreement, all RfCs will be made available in the wiki for comments at least one week prior to the discussion about the acceptance of these RfCs in the project plenary. During this discussion, the requester or a representative of the requester needs to justify the request.
3. **Acceptance by all participants:** After the construction of a revised and consolidated version of the glossary, it has to be accepted by all participants, possibly involving an adaptation with respect to the external contributors.

Outcomes: At the time of writing around 150 RfCs have been submitted and will be discussed in the next plenary meeting of the project. It is expected that several iterations of this change and evolution phase will be performed till the end of the project. This process makes the glossary a living document.

6. Lessons Learned

The following experiences and lessons learned have been gained during the glossary definition and consolidation process:

6.1. Traceability supported the consolidation of terms:

We experienced that tracing the sources of definitions as well as provided rationales has been supportive in order to assist the consolidation and agreement activities on

proposed definitions. When commenting on definitions, the rationales could be used to understand the intention of the authors as well as the aspects that should be stressed by a specific definition. In the NEXOF-RA context this knowledge helped in uncovering conflicting misunderstandings. This also saved time during the consensus finding in the glossary workshop since we could assume that the intention of a definition was known by the other participants and did not need to be clarified.

6.2. Structuring the contributions was helpful for the consolidation:

We observed that structuring the glossary improved the readability, usability and navigation of the definitions. It also improved the creation and consolidation phase. During the definition of the glossary in the NEXOF-RA context, we noticed that the level and quality of submitted terms of the survey and of comments were quite different. Furthermore, some participants tended to spend a lot of their time on commenting definitions of terms that are not part of the terms most crucial to the project. In order to avoid the mis-prioritization of terms and work effort, a first structuring of the glossary into two categories has been performed. Accordingly, the glossary is divided into two categories as described: NEXOF-RA specific and non-NEXOF-RA specific terms. NEXOF-RA specific terms include all terms which are associated to NEXOF-RA core activities. All other terms are non-NEXOF-RA-specific. This also allowed focusing on a pre-selection of most relevant and crucial terms. We think that this structuring has also been shown to be reasonable for grouping terms according to different topics. These topics could be assigned and discussed in smaller groups according to identified competences. Furthermore, we experienced that structuring the comments also supported the agreement process since it could be traced which comments are suggested by which participant. We observed that comments referred to other comments and they were used in order to ask for justification and resolution of conflicts.

6.3. Defining rules guided the agreement:

We observed that some comments that have been submitted before as well as in the glossary workshop have been repeated several times. Thus, it has been agreed that some basic rules were defined which should be used and checked during each agreement on term definitions. Such a rule was for example: “Combined terms should be avoided. If necessary, it should be a specialization of the single term”. We observed that these rules were cited several times during the workshop and thus avoided redundant discussion on a topic.

6.4. Guidance has increased the homogenous quality of contributions:

In order to ensure that the results have a certain quality and that the contributions are on a similar level of detail and thereby comparable, the survey and consolidation in the NEXOF-RA context have been guided. Accordingly, a template that explicitly defines and describes all needed information has been distributed to improve the contribution of term definitions. Furthermore, we observed that the provision of terms

that should be in the core of the submitted definitions has been a good starting point for the contributors and have led to further detailed knowledge provisioning. We expect our experiences about guidance to also be valid for the change and evolution phase. Regarding the context in which the glossary is defined, it had to be considered carefully if the definition and construction process of the glossary should be completely decentralized. In this case no authority would guide the definition process. Based on our experience the assignment of a moderator was adequate in the NEXOF-RA context in order to increase the glossary quality.

6.5. Highlighting the objectives of the glossary assisted in focusing:

A tendency that has been observed during the glossary definition process is that the participants wanted to define the “whole world” in the glossary in order to capture everything that eventual might be relevant for the project. This was reflected in the received definitions during the survey phase. In order to stay in control of the effort needed in the consolidation phase, in the glossary workshop we clearly stated and reminded of the objectives of the glossary. Accordingly, the first step in the consolidation workshop was to identify those terms that are out of scope for the glossary since they are not related to the core activities performed within the project. Thus, the boundaries have been defined and considered during the discussion and agreement of possible terms as well as during the submission of RfCs.

6.6. Consolidation workshop fostered the common agreement:

We observed in the glossary workshop that the main obstacle to the agreement on terms was the tendency to stick with a formerly adopted definition. Accordingly, in the NEXOF-RA context it was difficult for involved partners to detach from existing research contexts in order to promote the gained experience in new fields. The discussions that emerged at the workshop showed these obstacles. However, these face-to-face discussions resulted in an agreement on definitions supported by all partners.

7. Conclusion and Future Work

The paper described the process of defining an agreed SOA terminology within the NEXOF-RA project. It has been discussed why a more controlled and triggered process of term collection, consolidation and agreement has been performed. The result of that process is a glossary that currently contains about 160 SOA related terms from several different domains and research communities. The glossary is made available to the whole research community on the NEXOF-RA web site.

To support its evolution the glossary provides the possibility to cope with changing terminology in a structured way. The future work will mainly focus on optimizing the way in which the change and evolution phase is performed and new or changed terms are consolidated within the broader community. This includes the dissemination of

the glossary outside the already existing NEXOF-RA and NESSI community into related research communities. The NEXOF-RA glossary is an evolving and living document which aims at being valid beyond the boundaries and the duration of the project.

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