

Survey of the Cloud Computing Standards Landscape 2015

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Abstract: Cloud Computing is increasingly used as the platform for IT infrastructure provisioning, application/systems development and end user support of a wide range of core services and applications for businesses and organisations. Cloud Computing is drastically changing the way IT is delivered and used. However, many challenges remain to be tackled. Concerns such as security, vendor lock-in, interoperability and accessibility are examples of issues that need to be addressed. Standards and certification programs play an important role in terms of increasing the market confidence in Cloud Computing. The availability of Cloud Computing standards and certification schemes that address current concerns will ensure that both customers/users as well as providers are likely to regard Cloud Computing with the same level of reliability, trust and maturity as traditional IT. In February 2015, the Cloud Standards Coordination Phase 2 (CSC-2) was launched by ETSI to address issues left open after the initial Cloud Standards Coordination work was completed at the end of 2013. CSC-2 is investigating some specific aspects of the Cloud Computing Standardization landscape, in particular from the point of view of the Cloud Computing users (e.g., SMEs, Administrations). In this paper, we will present final results of the work.

1 INTRODUCTION

The Cloud Standards Coordination (CSC) project took place in 2013 and primarily addressed the Cloud Computing standards roadmap. In December 2013, the results were publicly presented in a workshop organised by the European Commission (EC), and published as the CSC Final Report (ETSI, 2013). The CSC final report provides a snapshot of the Cloud Computing standardisation landscape at the end of 2013. Even though the Cloud standards landscape was found to be structured and on its way to become mature, important gaps were identified in the domains of interoperability, security, privacy, service level agreements as well as in regard of regulation, legal and governance aspects.

Given the dynamics of the Cloud Computing market and standardization situation, a new study - CSC Phase 2 - was launched in February 2015 in order to

complement the work done in CSC.

The main stakeholders involved in the preparation of the CSC (called CSC Phase 1 in this paper to distinguish it from the CSC Phase 2 project) standards snapshot were found in the Cloud Computing (CC) industry, in particular Cloud Computing providers. Their focus was on the coherence and completeness of the standards landscape. CSC Phase 2 took a different approach by focusing on the needs of Cloud Computing customers and their requirements and priorities related to Cloud Computing, thus, further assessing the maturity of Cloud Computing standards.

To support these objectives, CSC Phase 2 has created a survey used to collect input from the Cloud Computing community in terms of needs, benefits, challenges and areas of concerns regarding the adoption of Cloud Computing. The goal is to evaluate the perceived maturity of Cloud Computing standards as well as to understand the interest and requirements

of Cloud Computing stakeholders regarding certification. The survey is therefore targeting current and future Cloud Computing Customers in the private and public sectors, SMEs as well as large organisations in all vertical sectors/industries.

The rest of the paper is organised as follows: Section 2 highlights some related work, Section 3 presents the rationale for conducting the survey, Section 4 presents the content of the survey, the methodology used for its preparation and distribution, information about the feedback collected as well as lessons learned when conducting the survey, Section 5 provides detailed results based on the analysis of the collected survey feedback, Section 6 highlights initial recommendations based on the survey analysis. Finally, Section 7 summarises the results and lessons learned and presents future work.

2 RELATED WORK

The CSC Phase 1 project launched by the European Commission and ETSI¹ in 2012 delivered an overview of the Cloud standards landscape. The CSC Phase 1 project presented the results of the project in a report published in 2013 (ETSI, 2013). These results are used as groundwork for the CSC Phase 2 project.

Moreover, during the last couple of years there have been a number of surveys with different objectives related to the usage and experiences in the Cloud Computing space. Most of them have been user-oriented and targeted to identify areas where users see a need for improvement or missing standards, e.g., the 2014 Trusted Cloud survey of the European Commission (ECTCES, 2014), (ECTCESeval, 2014). In many different surveys, security, data protection, or Service Level Agreements are among the top ranked concerns related to Cloud Computing. However, to our best knowledge none of the previous surveys have focused on users awareness and experience of standards to the same degree as the 2015 Cloud Standards Coordination survey.

In (Sill, 2015) the author presents examples of different valid styles of Cloud standards developments. In particular, the article discusses the roles and rules of Standards Definition Organisations and Open Source projects. The article draws similar conclusions as the authors do in section 7.2.1.

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3 MOTIVATION FOR CONDUCTING THE SURVEY

3.1 Cloud Standards Coordination (Phase 1): Findings and Limitations

One essential direction for the work of CSC (Phase 1) was the analysis of the standards roadmap at the time of the work, which has been undertaken during 2013 and finalised at the end of November 2013. This was a collective and collaborative effort in which the Cloud Computing community was engaged on a voluntary basis. Two main questions were addressed: (i) is Cloud Computing standardization a fragmented landscape (a jungle of standards) and (ii) are Cloud Computing standards mature enough to start implementing Cloud Computing projects beyond the circle of early adopters.

To answer these questions, a specific methodology was designed, based on the identification of relevant Standards Development Organisations (SDOs) and the identified list of Cloud Computing related standards (and other significant documents) that were available at the time of the CSC 1 project. Using a number of typical Use Cases, these standards were mapped to various phases and activities of the Cloud Computing Service life cycle, thus allowing the identification of potential areas of too much proliferation or lack of standards.

The CSC 2013 final report (ETSI, 2013) brought precise answers to the two above questions: (i) the CC landscape is not a jungle (a series of oases rather than a continuous forest as pointed out in the European Commission feedback), and (ii) there are enough standards to start with. The report also outlined some limits and areas where an improved maturity was required. Some of these areas were of technical nature, in particular related to Service Level Agreements and Security. Others were more linked to the overall Cloud Computing industry environment (e.g., regulation or legal framework).

The European Commission concluded that it is essential to address some of the open issues identified after CSC Phase 1 and subsequently agreed on the funding of a new study (namely CSC Phase 2) to be undertaken by ETSI in 2015. Some of the CSC Phase 1 open issues have been left unaddressed, such as the legal and regulatory framework (not in the scope of ETSI work) or SLA (subject to several ongoing efforts, in particular in the EC Research projects and the ISO/IEC development of a framework for Cloud SLA, ISO/IEC 19086). An important conclusion resulting from the CSC 1 project is that Secu-

rity is a key area in need of progress. A high level of trust in Security and the availability of standards to support Cloud Computing security mechanisms is essential in order to build confidence and trust amongst future Cloud Computing adopters. The interplay of security standards and certification is a key element of the approach taken for the CSC 2 study. In addition, the role of Open Source and its relation with Standardization has become another important element of CSC Phase 2.

3.2 Understanding the User Needs

The objective of CSC Phase 2 is to assess the maturity of Cloud Computing standards at the end of 2015 (roughly two years after Phase 1). This new assessment (called Snapshot 2 in the CSC Phase 2 work plan) is meant to be undertaken with a different approach (and methodology) than the previous CSC project. In particular, CSC Phase 1 concluded that there are enough standards to start with: Consequently it is now significant to analyse the maturity and applicability of the available standards, mapping the standards to the identified needs of the Cloud Computing users. Among these users specific target groups are prioritised: Small and Medium Enterprises (29 Million of SMEs in Europe) and administrations. The rationale for this prioritisation is that these users typically have a reduced capacity in terms of resources and the skills necessary in order to adopt and reap the benefits of Cloud Computing.

CSC Phase 2 is therefore aiming at assessing the maturity of Cloud Computing standards on the basis of the needs of these very important users. The CSC Phase 2 analysis is based on the responses to questions such as (i) What are the typical use cases that users want to implement in the short to medium term; (ii) What are their expectations and perceived concerns that limits the adoption of Cloud Computing; (iii) What are the assets and possible investment made in Cloud Computing; (iv) How are they going to deal with existing investments (legacy); (v) Which role are they expecting to play in the Cloud Computing value chain; (vi) What support from standards are they expecting; (vii) What is the significance of certification schemes.

To create the basis for the analysis, a survey has been designed and conducted over the first months of the study. Even though the survey is targeting a specific set of users (SMEs, etc.), it is also using the input from larger actors. The survey has also been distributed as many industry sectors as possible, in order to cover this particular aspect (i.e., industry / vertical sector specific concerns).

4 THE SURVEY

4.1 Overview of the Survey

Cloud Standards Coordination Phase 2 is conducted by a group of 6 experts that have been recruited by ETSI through an open consultation and selection process. The first task of the experts has been to design the CSC Phase 2 survey. The survey has a key role in the work of CSC Phase 2: all the other topics addressed rely on the results of the survey, in particular the new snapshot of the maturity assessment. The survey was expected to provide indications on the priorities and major subjects of interest or concerns of the Cloud Computing users. It has been essential to ensure that the survey is:

- Addressing all the aspects of Cloud Computing in terms of the users expectations, priorities, preferred use cases, and more, not just the standards aspects;
- Reaching the targeted types of organisations;
- Collecting results in a variety of sectors.

The design of the survey has been based on the Cloud Computing knowledge and experiences of the experts, on previous surveys with a similar goal, on the feedback of a few external testers that have pointed to inconsistencies or ambiguities found in the survey.

4.2 Methodology, Structure, Information Capture

The ETSI experts have designed the survey in a way that it will address the questions listed in the section 3.2. To this extent, apart from questions related to obtaining information about the respondents (organisation type and size, sector, country, etc.), a total of 45 key questions addressing the specificities of Cloud Computing Standards have been asked, in the following categories (each representing one page of the survey):

- Moving to Cloud Computing: expected benefits and challenges to face (Expectations and challenges to the organisation, Perceived challenges related to the maturity of Cloud Computing)
- Adoption of Cloud Computing in the organisation (Scope of Cloud Computing usage - level of adoption, Cloud Computing roles and availability of resources)
- Cloud Computing adoption: preparing the organisation (Status of IT alignment of the organisation,

- e.g. Data Classification, SOA, Software Licenses,)
- Cloud Computing: Deployment models and Service categories (Used deployment model (one or more), Dominant service categories - use case(s); IaaS, PaaS and/or SaaS)
 - Emerging service Categories (Use case(s) for CaaS, CompaaS, NaaS and/or DSaaS, or other)
 - Cloud Computing and Standards: overview (Expected impact of Cloud Computing standards, General awareness and use of Cloud Computing standards)
 - Cloud Computing Standards: a detailed view (Level of knowledge of specific Cloud Computing standards)
 - Cloud Computing Certification Standards (Role of certification as an enabler of trust, Areas of certification, Types of certification)
 - Awareness of CCSL and the certification schemes within, Plans to use certification in the organisation)

Even though a long survey might be difficult to complete for some respondents, the ETSI experts have opted for completeness. When analysing the results, we have seen that the rate of answers to the key questions was decreasing over the course of pages, but the typical number of answers in the final pages was still above 60% of the number of answers in the first pages.

The survey was created using the survey tool "Survey Monkey"². The results have been collected and analysed only by the ETSI experts and a strict privacy/confidentiality policy has been adopted: answers to the survey have been shared and used only amongst the ETSI CSC Phase 2 experts. Only aggregated results have been and will be published.

ETSI is hosting the CSC web site³ where all information regarding CSC Phase 1 and Phase 2 is made publicly available (including the link to access to survey).

4.3 Distribution of the Survey

The survey has been launched on March 30th, 2015 and was kept open for almost 6 months to ensure the largest possible number of answers. A distribution letter has been made available to all organisations that were willing and able to use it for advertising the survey. Over 120 different channels have been contacted to relay the survey and have distributed the survey URL.

²www.surveymonkey.com

³<http://csc.etsi.org>

A large range of different distribution channels have been used: (i) European Commission DGs web sites and distribution list (emails, Twitter, etc.), (ii) Standards Setting Organisations, global, regional or national, (iii) ETSI memberships (750 organisations from various industry sectors), (iv) Industry Associations, (v) Administrations, (vi) LinkedIn groups, (vii) Open Source projects.

5 SURVEY ANALYSIS

5.1 Significant Findings Analysis and Conclusions

The following findings are based on the evaluation of the 376 responses that had been received by mid-September 2015. **General Purpose Information Regarding Respondents Organisations:** More respondents are coming from SME organisations (up to 249 employees) than from large organisations (more than 249 employees). The ICT sector is dominating (43%) followed by academia and public administration. Some industry sectors are so far not represented at all. Note: the industry classification used is based on the EC sector classification.

Benefits and Challenges: Reduction of CAPEX, improved business agility and faster time to market are seen as the major positive factors for adopting Cloud Computing while security and privacy/integrity are viewed as the most critical challenges with SLA, performance and efficiency, resiliency, vendor or data lock-in and interoperability across vendor solutions ranked among the highest concerns.

Adoption and Scope: A majority of respondents (57%) have already started adopting Cloud computing, probably including a significant part of the respondents from the ICT sector. The main use of Cloud Computing is as the platform for ICT resources with IaaS as the most probable starting point. 40% of organisations are playing the role of Cloud Computing Customer. Regarding the level of resources and support to Cloud Computing, nearly half of respondents mention that they receive an adequate support from their IT team but a third of the respondents have a dedicated Cloud Computing support team.

Cloud Computing Adoption: Preparing your Organisation Some typical aspects need to be considered and some conditions must be met in order to make the transition to the Cloud in a secure and reliable way. Nearly half of respondents claim that data categorisation and classification is on-going in their organisations. Data security awareness and level con-

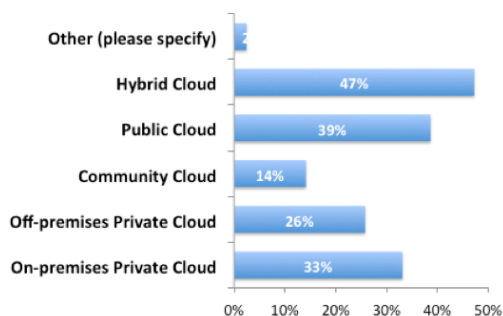


Figure 1: Which Cloud deployment model seems best fit to your needs (Question 25).

rol is seen as an important aspect to be tackled by a majority of the respondents. Regarding software provisioning and compensations models, a third of respondents indicate that negotiations is on-going with the software vendor responsible for running the Cloud Computing software / service while approximately 25% of the respondents mention that no action is seen as necessary (not needed or already achieved?).

Cloud Deployment Model and Service Categories: Private cloud clearly dominates followed by hybrid cloud and public cloud deployment models. Concerning cloud service categories, high-availability is seen as the top application for the cloud computing category IaaS while software development is also seen as the top capability for PaaS. Concerning SaaS, general data storage is the dominating usage area for SaaS while specialised applications such as ERP, CRM or E-Business are less frequently mentioned (see Figure 1). It should be noted that - in answers to another question - 54% of respondents indicate an interest in emerging Cloud Computing service categories such as CaaS, NaaS, DSaaS and CompaaS.

Cloud Computing and Standards: Security, privacy and integrity, performance and portability across vendor solutions are ranked highest regarding the impact that standards have on the organisations concerns. Regarding how standards are considered in the organisations, 45% indicate that standards are used while 35% say that standards are considered. This indicates a promising insight into the value and importance of standards. Concerning areas of importance for standards, security and data protection are mentioned, in line with responses to other questions (see Figure 2). Regarding the detailed feedback on individual standards, the number of responses to the survey is not yet significant enough, making the analysis unreliable until further survey results are obtained.

Security - Privacy and Integrity: Security and Privacy and integrity are recurring concerns in the web survey. These areas rank high both in terms of aspects seen as important for the respondent and its

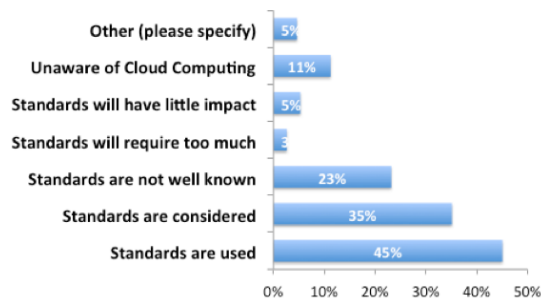


Figure 2: Degree of Cloud Computing Standards consideration or usage in your organization (Question 35).

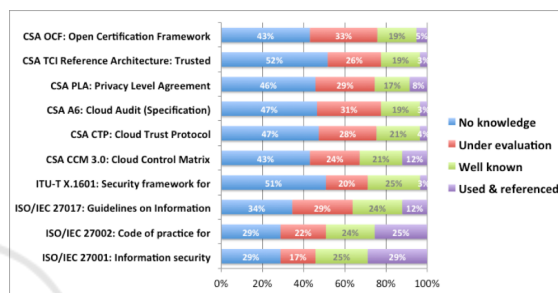


Figure 3: Adoption and use of Cloud Computing standards: Security (Question 39).

organization and also when it comes to related standards that are seen as most critical for Cloud Computing. In several questions, security or a particular type of security (data security) and Privacy and integrity come out at top.

Some observations that can be made:

- The use of SaaS for processing sensitive data (incl. personal data) ranks low in terms of usage areas. This observation is consistent with how Security ranks as a concern; the conclusion might be that there is simply not yet sufficient confidence in Cloud Computing for the users to provision and process sensitive data in the cloud computing space.
- There are different legal barriers across Europe and no up-to-date European Data Protection Directive yet.
- Among the low number of respondents, ISO/IEC 27001 is the standard most known and used.
- Security is a complex, slightly ambiguous and imprecise concept. It can be and probably is interpreted in many different ways. Security can for instance map to and concern one or more of the following areas:
 - Data protection (and information classification, data encryption etc.)
 - Data access

- Identity management
- Authorization
- Authentication
- Data privacy
- Data integrity
- Accessibility
- Operations

and probably some additional domains / areas. It is likely that Security and Privacy and Integrity are in fact grouped together and seen as a single concern by the respondents.

Security at large is without doubt a major concern for most users, customers and providers alike, in particular in a Cloud setting, as the resources typically are shared and the data integrity as a consequence needs additional attention to ensure a retained confidence in the ownership of data. Many users are concerned about losing the control of data, in many cases probably justifiably so. Unless Security - all relevant aspects of Security related to Cloud Computing - is fully addressed and the users made aware of available options and existing protocols and standards that can be used to build reliable Cloud Computing offerings, the adoption of Cloud Computing is likely to continue to grow slowly (see Figure 3).

Interoperability: One of the recurring concerns raised by the web survey respondents concerns interoperability, or - rather - the lack thereof. Answers to the following questions indicate or support the claim that Interoperability is one of the top concerns among the respondents. Some highlighted aspects of interoperability include:

- Interoperability is a key success factor to ensure Increased business agility. Unless a high level of interoperability in solutions internal to the organization as well as interoperability with external stakeholders (collaborators, customers, suppliers, subsidiaries etc.) is secured, it will be difficult to obtain a high level of business agility. Interoperability (and Portability) across vendor solutions is also seen as a major concern for many organizations.
- Interoperability is also seen as main concern among many of the respondents, both in terms of a general issue for the organization of the respondent and in terms of lack of support for interoperability standards.

The web survey strongly suggests that SDOs providing interoperability standards for Cloud Computing must accelerate their efforts. The ongoing work in ISO/IEC on providing guidance for this domain (ISO/IEC 19041: "Cloud Computing Interoperability

& Portability concepts") is an example of an activity that is likely to provide valuable information in this respect.

Cloud Computing Certification Standards: Almost 75% consider certification as a positive means to increase the confidence in Cloud Computing service providers. Regarding the domains in which certification is seen as very important, data security and data privacy are dominating. Cloud service certification (per cloud service, covering all partners and providers in the end-to-end chain) and cloud provider certification are considered as the preferred types of certification while self-certification is only seen as an acceptable certification scheme. A majority of the respondents are unaware of the Cloud Certification Schemes List (CCSL) defined by ENISA while in this list, the well-known ISO/IEC 27001 Certification comes first as a scheme for cloud certification. A majority of the cloud service customers indicate that they plan to include one of these certification schemes in their Cloud purchasing processes. A majority of cloud service providers also plans to certify their cloud service offering.

5.2 Identification of Trends and Patterns

Based on the responses received mid-June 2015, it is possible to make some tentative and high-level analysis. From this analysis, some patterns emerge that will have to be clarified and confirmed by a final analysis made at the conclusion of the survey. The trends that are assessed as the most significant are presented below.

Security, Integrity and Data Privacy: these topics are seen as major concerns. This is not a new finding, but the fact that it is still very much present is a clear indication on the perceived challenge ahead for security standards and Cloud certification in particular (see Figure 4).

Interoperability and Portability: these areas are

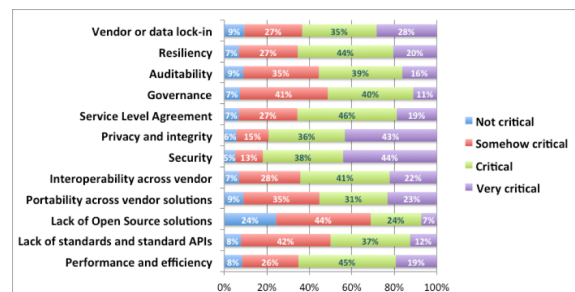


Figure 4: Maturity of Cloud Computing: critical issues (Question 11).

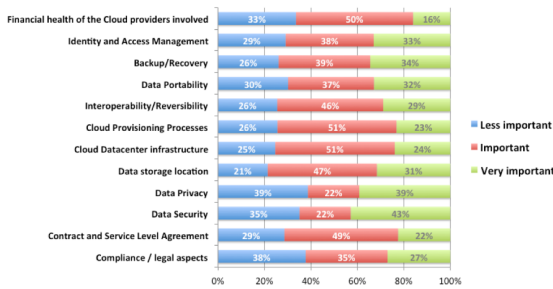


Figure 5: Ranking Cloud Certification areas according to their importance (Question 48).

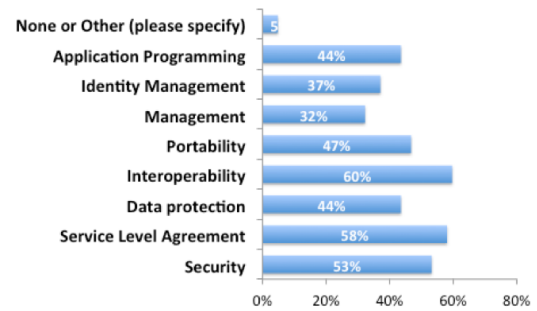


Figure 8: Domains of lacking of Cloud Computing standards (Question 37).

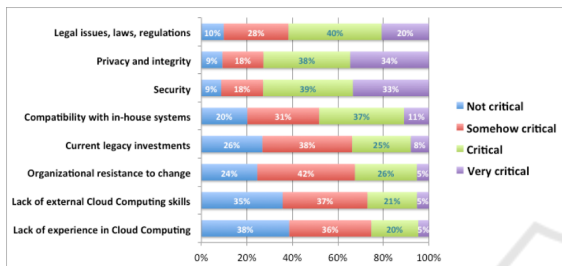


Figure 6: Maturity of your organization: critical challenges (Question 9).

ranked high. Concern in this area is most likely linked to the issue of vendor lock-in, the unclear capabilities of individual cloud service offerings ability to move data from one service to another and the lack of portability standards for cross-Cloud scenarios in general (see Figure 8).

Moving to the Cloud: there is a high perception from the respondents that the transition to Cloud Computing should be carefully planned and organized, in particular in areas pertinent to data (classification, storage, etc.), processes and security (see Figure 6).

Standards: in general, the role of standards is seen as important and there is a growing level of awareness, to a smaller extent even in terms of knowledge on the existing set of standards. It is to be noted that, in this perspective, the benefit from standards re-

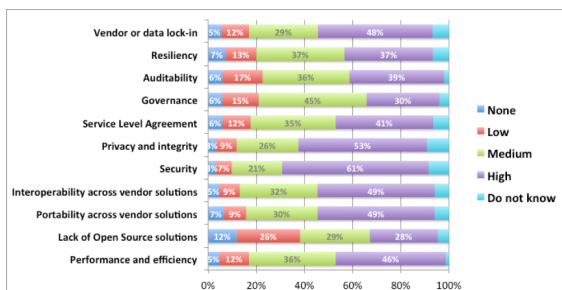


Figure 7: Impact of Cloud Computing Standards on your organization's concerns (Question 34).

lated to Cloud Computing is seen as more critical than Open Source: this finding is however subject to further analysis (see Figure 7).

Certification: a very large majority (79%) of the respondents confirm the role of certification as a very useful way to improve confidence in Cloud Computing. However the selection of Cloud Certification schemes is complex: the Cloud Certification Scheme List (CCSL) is an attempt to make a selection of such schemes but the survey shows that only 31 of respondents are aware of this list. This is clearly showing a need for increasing the awareness of the Cloud Computing community on CCSL and all the means to have access to a pre-analyzed and recommended list of schemes (see Figure 5).

6 RECOMMENDATIONS

Based on the principal areas of concern as identified from the survey results the Cloud Standards Coordination Phase 2 experts have listed below some recommendations following the findings in the web survey.

Collaboration across Key Cloud Computing Stakeholders: Encourage and increase collaborations across the various relevant initiatives in Europe as well across standards development organizations (formal, de jure and de facto) to avoid and minimize fragmentation and overlap in the Cloud Computing related standardization efforts. During the CSC-2, contacts have been made with the US standardization agency, NIST as well as for example the EuroCIO organization. Both contacts have resulted in follow-up activities that will add further value to the CSC-2 results as well as securing awareness of the CSC work. **Dissemination and Education:** Make sure that Cloud Computing stakeholders (users, customers and providers) are made aware of existing standards and certification programs. The relatively low response and awareness found among the respondents of the web survey strongly suggests that the impor-

tance and potential benefits of standards and certification schemes need to be further advocated and marketed by using in the relevant channels through the appropriate EU agencies and also by the SDOs. **Conduct the Cloud Web Survey Regularly:** Keeping track of the end users perception of Cloud Computing benefits and challenges provides an excellent backdrop for ongoing as well as future efforts to close the identified gaps and address the challenges disclosed by the web survey. The experts see the web survey as a good tool to gauge the progress and state-of-affairs in the CloudComputing space and recommend that the web survey is reopened and run on a regular basis, tentatively on an annually basis. **Security aspects - a Key Concern:** Security, as a concept, is without doubt a major concern for most users, customers and providers alike, in particular in a Cloud setting, as the resources typically are shared and data integrity confidentiality and availability, as a consequence need additional attention to ensure a retained confidence in the ownership of data. Many users are concerned about losing the control of data, in many cases probably justifiably so. Unless Security - all relevant aspects of Security related to Cloud Computing - is fully addressed and the users made aware of available options and existing protocols and standards that can be used to build reliable Cloud Computing offerings, the adoption of CloudComputing is likely to continue to grow slowly. **Certification adds Confidence:** The analysis supports the provisioning of certification schemes, where certification of vendors and the cross cutting aspects data storage location (one aspect of privacy), cloud data centre infrastructure, cloud provisioning process and interoperability/reversibility are top priorities. These aspects are general concerns that need to be addressed to accelerate the adoption of Cloud Computing.

7 CONCLUSIONS

7.1 Results

The present report indicates that running a web survey on Cloud standards may yield relevant findings even though the number of respondents is limited and the composition of the respondents resulting from the invitation to selected stakeholders is representative for the overall population only to an unknown extent. The findings made during the analysis of the survey support the continued strive towards closing the identified gaps in terms of support for Cloud Computing standards. It also shows a growing awareness of the importance of standards, in general and for Cloud Com-

puting in particular.

The main result is the identification of trends from the outcome of the survey described in section 5. Intermediate results of the survey including early recommendations were published mid-June 2015 as a draft for public comments. The comments received have been discussed in a public workshop and the feedback from the users' community allowed for the publication of the final report (WP1Report, 2015) by mid-November 2015.

7.2 Lessons Learned

Designing a survey is a complex task. The main difficulty for its authors has been to fight against length and complexity. However, completeness was somehow at this cost. It was even more difficult to battle against ambiguity: many questions could be interpreted in a different (sometimes totally opposite) manner depending on the role of the respondent in the Cloud computing eco-system. To overcome this, two important elements have been helpful. The most important - as already pointed above - was the feedback from reviewers: we could never have enough of this! Another positive element was the existence of a clear definition of the roles in Cloud Computing: we have seen a lot of maturation from the CSC Phase 1 to Phase 2.

7.2.1 Open Source and Standards

Cloud Computing is certainly one of the areas of ICT where Open Source Software (OSS) is playing a really crucial role. A lot of OSS projects are undertaken and some OSS products are becoming the de facto reference in the global Cloud Computing architecture. This evolution is creating tensions as well as opportunities with respect to standards. Another task of CSC Phase 2 is the in-depth analysis of the interplay between Open Source and Standards. A draft version of the report was published in July 2015 as a draft for public comments. The comments received have been discussed in a public workshop and the feedback from the users' community allowed for the publication of the final report (WP2Report, 2015) by end of November 2015.

7.2.2 Evaluation of Cloud Security Work

Two of the early trends clearly identified by the survey (and that could be fully confirmed at the time of final publication of results) are: (i) the continuing crucial role of security and privacy for creating trust in Cloud Computing, and (ii) the need for most of the users to rely on proven, useful and affordable certification

schemes. The second task of CSC Phase 2 analyses the relationship between those two aspects and provides a set of recommendations. A draft version of the report was published in July 2015 as a draft for public comments, as with the other reports the comments received have been discussed in a public workshop and the feedback from the users' community allowed for the publication of the final report (WP3Report, 2015) by end of November 2015.

7.2.3 Update of CSC Phase 1 Cloud Standards Snapshot

The final task of CSC Phase 2 is more precisely linked to the current status of the Cloud Computing standards landscape. The survey has provided indications on users expectations vis--vis standards. The work done in the "snapshot" was an analysis based on the identification of the current set of standards (Cloud Computing standards or related ones) and the mapping of user needs on this set of standards. As expected we found areas of stabilisation, areas of progress as well as areas of insufficient maturity and possibly remaining gaps. A draft version of the report was published August 2015 as a draft for public comments. The comments received have been discussed in a public workshop and the feedback from the users' community allowed for the publication of the final report (WP4Report, 2015) by end of November 2015. The four reports are available on the CSC webpages⁴.

7.3 Future Work

The work of CSC Phase 2 on the survey that we have described also is, as already mentioned, a foundation for the global approach of the rest of the work. The three other tasks have been accomplished by October 2015: (i) interplay between Open Source and Standards, (ii) evaluation of Cloud security work, and (iii) update of the CSC Phase 1 Cloud standards snapshot. These tasks in CSC Phase 2 have been, to a large extent, relying on the main results of the survey, and on the identification of users needs, challenges and expectations. After a feedback phase the final versions have been published by end of November 2015. The next step starting negotiations with the EC LATER 2016 on a possible continuation according to the recommendations described in Section 6.

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