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Cloud Standards Coordination Phase 2; Identification of Cloud user needs

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Foreword

This Special Report (SR) has been produced by ETSI Technical Committee Network Technologies (NTECH).

The present document is approved by the NTECH Technical Committee and for publication on the Cloud Standards Coordination website (http://csc.etsi.org).

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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Introduction

Cloud Computing is increasingly used as the platform for ICT infrastructure provisioning, application/systems development and end user support of a wide range of core services and applications for businesses and organizations.

Cloud Computing is drastically changing the way ICT is delivered and used. However, many challenges remain to be tackled. Concerns such as security, vendor lock-in, interoperability and accessibility, service level agreements more oriented towards users are examples of issues that need to be addressed. The survey discussed in the present report aims at collecting information on the respondents' awareness of those concerns.

Standards and certification programs play an important role in terms of increasing the market confidence in Cloud Computing. The promotion of Cloud Computing standards and certification schemes that address current concerns is necessary in order to ensure that both customers/users as well as providers will regard Cloud Computing with the same level of reliability, trust and maturity as traditional ICT.

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. Cloud Standards Coordination Phase 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). It will also generate a new snapshot regarding the state of standards and investigate the interaction and relation between standardization and open source based software and solutions.

The present document presents the results of the web survey conducted in April - September 2015.

1 Scope

The present document presents the results of the web survey conducted in April - September 2015.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

Not applicable.

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] Recommendation ITU-T Y.3500: "Information technology - Cloud computing - Overview and vocabulary".

NOTE: Same as [i.5].

[i.2] Gartner, G00271282: "Budgeting for the SaaS Security Gap", January 28, 2015.

[i.3] Skyhigh: "Cloud Adoption & Risk Report", Q1 2015.

[i.4] Statistical Classification of Economic Activities in the European Community, Rev. 2 (2008).

NOTE: See: http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST_NOM_DTL&StrNom=NACE_REV2.

[i.5] ISO/IEC 17788: "Information technology -- Cloud computing -- Overview and vocabulary".

[i.6] ISO/IEC 17789: "Information technology -- Cloud computing -- Reference architecture".

[i.7] Recommendation ITU-T Y.3502: "Information technology - Cloud computing - Reference architecture".

NOTE: Same as [i.6].

[i.8] ISO/IEC 27001: "Information technology-- Security techniques -- Information security management systems - Requirements".

[i.9] ISO/IEC 19086-1:"Information technology -- Cloud computing -- Service level agreement (SLA) framework and technology Part 1: Overview and concepts".

[i.10] ISO/IEC 19941: "Cloud Computing Interoperability & Portability".

[i.11] ISO/IEC 27018: "Information technology -- Security techniques -- Code of practice for protection of personally identifiable information (PII) in public clouds acting as PII processors".

[i.12] ETSI SR 003 382: "Cloud Computing Standards and Open Source".

[i.13] ETSI SR 003 391: "Interoperability and Security in Cloud Computing".

[i.14] ETSI SR 003 392: "Cloud Computing Standards Maturity Assessment".

3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AICPA	American Institute of Certified Public Accountants
API	Application Programming Interface
CaaS	Communications as a Service
CAPEX	CAPital EXpenditures
CC	Cloud Computing
CCSL	Cloud Certification Schemes List
CEF	Connecting Europe Facility
CompaaS	Compute as a Service
CRM	Customer Relationship Management
CSA	Cloud Security Alliance
CSC	Cloud Service Customer
CSC-1	Cloud Standards Coordination Phase 1
CSC-2	Cloud Standards Coordination Phase 2
DsaaS	Data Storage as a Service
DSI	Digital Service Infrastructure
EGI	European Grid Infrastructure
ENISA	European Union Agency for Network and Information Security
ERP	Enterprise Resource Planning
HR	Human Resources
IaaS	Infrastructure as a Service
IAM	Identity and Access Management
ICT	Information and Communications Technology
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
ITIL	Information Technology Infrastructure Library
ITU	International Telecommunication Union
ITU-T	ITU Telecommunication Standardization Sector
NaaS	Network as a Service
NIST	National Institute of Science and Technology
OASIS	Organization for the Advancement of Structured Information Standards
OCCI	Open Cloud Computing Interface
OCF	Open Certification Framework
OGF	Open Grid Forum
PaaS	Platform as a Service
PII	Personally Identifiable Information
SaaS	Software as a Service
SDO	Standards Development Organization
SIG	Special Interest Group
SLA	Service Level Agreement
SME	Small or Medium Enterprise
SOA	Service Oriented Architecture
SSO	Standards Setting Organization
STF	Specialist Task Force (an ETSI structure for internal projects)
WP	Work Package

4 The rationale for the survey

4.1 Survey goals and objectives

The Cloud Standards Coordination project (CSC)

Cloud Standards Coordination Phase 1 (CSC-1) took place in 2013 as a community effort supported by ETSI and primarily addressed the Cloud Computing standards roadmap. In December 2013 the results were publicly presented in a workshop organized by the European Commission (EC), the CSC-1 Final Report being available at: http://ec.europa.eu/digital-agenda/en/news/cloud-standards-coordination-final-report

The report provided a maturity assessment "snapshot" on the Cloud Computing standardization landscape at the end of 2013. Important gaps in the Cloud Computing standards landscape were identified such as in the domains of interoperability, security, privacy, service level agreement and regulation, legal and governance aspects.

Cloud Standards Coordination Phase 2

Given the dynamics of the Cloud Computing market and standardization, Cloud Standards Coordination Phase 2 (CSC-2) was launched in February 2015 with the objective of producing an updated version of the "snapshot" of the Cloud Computing standardization landscape.

The main involved stakeholders for the preparation of the CSC-1 snapshot were from the Cloud Computing industry, in particular Cloud Computing providers. On the other hand, CSC-2 aims to better take into account the needs of Cloud Computing customers on their Cloud related requirements and priorities. This has helped CSC-2 to further assess the maturity of Cloud Computing standards and evaluate how standards can support the Cloud Computing customers' priorities.

Cloud Standards Coordination Phase 2 survey

To support these objectives, CSC-2 has created a survey for collecting feedback from the Cloud Computing community in terms of needs, benefits, challenges and areas of concerns regarding the adoption of Cloud Computing. The outcome of the survey will be the primary material for evaluating the perceived maturity of Cloud Computing standards. The results will also help to understand the interest and requirements of Cloud Computing stakeholders regarding certification.The survey is therefore targeting current and future Cloud Customers in the private and public sectors, SMEs as well as large organizations in all vertical sectors. Other stakeholders from the entire Cloud Computing eco-system (e.g. Cloud Computing providers) were also invited to answer.

4.2 Content of the report

Clause 5 of the present document presents the content of the survey, the methodology used for its preparation and distribution, information about the collected feedback as well as lessons learnt through the execution of the survey.

Clause 6 provides details resulting from the analysis of the collected survey feedback allowing to understand the needs of the Cloud Computing community on a more granular scale and to derive main trends and patterns as a result.

Clause 7 highlights conclusions and recommendations from the survey. This includes an identification of the cloud stakeholders' highest priorities leading to possible refinements of the CSC Phase 1 report conclusions.

Clause 8 suggests some areas for further work.

Annex A contains a detailed presentation of the survey results, including charts and tables.

Annex B lists the channels through which the survey has been distributed.

Annex C shows the survey as it has been proposed on the CSC web site (at http://csc.etsi.org).

5 Survey presentation

5.1 Survey goal and structure

To create the basis for the analysis, a survey has been designed and conducted from April to September 2015. 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 to as many industry sectors as possible, in order to identify any industry specific aspects and concerns that might exist.

The survey comprises **59** questions grouped in **14** pages stretching from general questions regarding the respondent's company and Cloud Computing experience, through increasingly specialized questions regarding Cloud Computing standards, to a final block of questions regarding certification. Taking the entire survey would approximately require 20-30 minutes. Apart from a number of core questions for most questions answers were not mandatory. The individual answers are treated confidentially and only aggregated results will be published.

Per September 25th 2015, at the closure of the web survey, 376 respondents have completed it.

5.2 Survey methodology & main target areas

The survey collects responses to questions such as:

- What are the typical use cases that users want to implement in the short to medium term?
- What are their expectations and perceived concerns that limits the adoption of Cloud Computing?
- What are the assets and possible investments made in Cloud Computing?
- How are they going to deal with existing investments (legacy)?
- Which role are they expecting to play in the Cloud Computing value chain?
- To which extent individual Cloud Computing standards are known and have already been used?
- What support from standards are they expecting?
- What is the significance of certification schemes and what is the intended use?

5.3 Survey distribution

The main target group for the survey is end users in SMEs in the private sector, but any potential and existing cloud customer is welcome to complete the survey.

The survey was launched on March 30th, 2015. A distribution letter has been made available to all organizations that were willing and able to use it for promoting the survey. Over 120 different channels have been contacted to relay the survey and have distributed the survey URL.

A wide range of different distribution channels have been used like:

- European Commission DGs web sites and distribution list (emails, Twitter, etc.).
- Standards Setting Organizations, global, regional or national.
- ETSI membership (750 organizations from various industry sectors).
- Industry Associations (e.g. Eurocloud).
- Public Administrations (across Europe, but predominantly in countries where the experts of the CSC reside).
- LinkedIn® groups.
- Open Source projects.
- European projects (e.g. CloudWatch, Cloud4Europe, CloudingSME).

- Cloudscape.
- European Grid Infrastructure (EGI).

To ensure the largest possible number of answers, the survey has been left open as long as possible, i.e. up to September 25th, the last day of the public commenting phase for the four CSC-2 reports.

A list of contacted individuals and organizations is presented in Annex B.

5.4 Survey achievements and limitations

As pointed out earlier in the present document, the number of responses (376 per 25/09/2015) is deemed sufficient enough in order to identify high-level trends and patterns. The results are also assessed as sufficient in order to do high-level comparisons between CSC -1 and CSC-2. In this respect, it can be argued that the output resulting from the Work Package 1 of STF 486 (the web survey and related activities) is considered successful. As presented in the below sections, responses in many parts of the survey are encouraging in terms of awareness of the importance of standards and certification schemes among many of the survey respondents.

However, the present survey is based on the voluntary contribution of a sample of respondents on which the promoters of the survey had little capacity to anticipate and no control. Only best effort attempts have been made to collect the largest number of answers possible, with the largest possible span of organization sizes, countries, sectors, etc. Therefore, the number of responses may not be significant enough to allow in-depth and conclusive analysis at a detailed level for all of the questions of the survey. Any reader of the present document should therefore be cautious about making any decisive conclusion based on the materials of this report.

Another aspect when assessing the results of the survey that needs to be acknowledged is that the benefits, concerns and challenges chosen by the respondents might vary based on the organization (in terms of size), on the sector (private or public) in which it operates, etc. It is important to keep in mind that some of the issues presented as major in a certain user category might very well be seen as insignificant or even non-existent in another: this may be addressed in some significant cases (see clause 8).

5.5 Other lessons learned

Designing a survey is a complex task. The main objective has been to cover a number of different topics in order to encompass the target areas identified as relevant for the query, while attempting to keep the survey's length and complexity at a minimum. Keeping the questions relevant and unambiguous has been another important task. Depending on the role of the respondent in the Cloud Computing eco-system, the questions might in some circumstance be interpreted differently. To overcome the identified challenges, two important elements have been helpful. The most important element to mitigate the issues identified was the feedback from reviewers of the draft survey text. Another positive element was the existence and use of clear definitions of the roles in Cloud Computing: a significant maturation from the CSC-1 to CSC-2 was recognized in this respect. Where applicable in the survey, the vocabulary provided in the standard "ISO/IEC 17788 [i.5] and Recommendation ITU-T Y.3500 [i.1] has been used.

6 Survey analysis

6.1 Significant findings

General-purpose information regarding respondents' organizations: Respondents are nearly equally representing SME organizations (up to 249 employees) and large organizations (more than 249 employees). The ICT sector is dominating (43 %) followed by Academia and Public Administrations. Some industry sectors are not represented at all.

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 compatibility with in-house systems, security, 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. It can be noted that the lack of Open Source solutions is not seen as a major Cloud Computing challenge (see ETSI SR 003 382 [i.12] for further information on Cloud Computing standards and Open Source solutions).

Adoption and scope: A majority of the respondents (58 % - 2015-06-04)) have already started to adopt Cloud Computing probably reflecting the fact that the respondents are mainly from the ICT sector. It should also be noted that none (0 %) of the respondents stated that they are NOT planning to adopt Cloud Computing. The main usage area for Cloud Computing is IaaS as the most prominent starting point. 40 % of the respondents are playing the role of the Cloud Service Customer in their respective organizations. Regarding the level of resources and support to Cloud Computing, nearly half of respondents claim that they are receiving an adequate support from their ICT team and a third of them have a dedicated cloud support team.

Cloud Computing adoption: preparing your organization: To make the transition to the Cloud in a secure and reliable way some aspects need to be considered and some conditions have to be met; the organization making the leap to the Cloud need to be prepared. Nearly half of respondents claim that efforts related to data categorization (43 %) and data classification (35 %) are on-going in their organizations. Data security awareness and level control is seen as a highly important aspect that needs to be tackled by a majority of the respondents. Regarding software licenses, 37 % of the respondents indicate that negotiations are on-going with the software vendors providing Cloud Computing software & services while 21 % of them mention that no action is deemed necessary (further analysis is needed on this point; it is not entirely clear if answers in this category indicate that actions are not needed or if necessary measures have already been taken).

Cloud Deployment Models and Cloud Service Categories: Private Cloud deployment models clearly dominate followed by Hybrid Cloud and Public Cloud deployments. Concerning Cloud Service Categories, high-availability is seen as the top usage area for IaaS while software development is also seen as the top capability for PaaS. Concerning SaaS, the general data storage type of application is ranked high while specialized applications supporting for example supply chain services, HR, ERP or CRM are less frequently mentioned. Notably, 54 % of the respondents indicate an interest in emerging Cloud 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 high regarding the impact that standards have on the concerns of organizations. In terms of how standards are considered in the organizations of the respondents, 38 % indicate that standards are used while 27 % that they are considered. This shows a promising insight into the value and importance of standards.

In line with the responses regarding impact of standards, interoperability, security, service level agreements, portability and APIs are mentioned as top priorities. The feedback also indicates that recently published standards are now becoming known by a small number of respondents. Examples of standards used or considered are ISO/IEC 17788 [i.5] - Recommendation ITU-T Y.3500 [i.1] - ISO/IEC 17789 [i.6] and Recommendation ITU-T Y.3502 [i.7]. However, the number of answers is too insignificant to claim that the Cloud Computing specific standards are now part of the Cloud strategy for most organizations.

Cloud computing certifications: Almost 75 % of the respondents see certification schemes as a positive way of increasing confidence in Cloud Service Providers. Amongst the cross-cutting aspects, the two (security, privacy and integrity) seen as both most critical for the maturity of cloud computing [Q11] and as aspects where standards are expected to have highest impact [Q34], certifications for these aspects are actually ranked as close to the least important [Q48]. The most important issues for certification are: data storage location (one aspect of privacy), cloud datacentre infrastructure, cloud provisioning process and interoperability/reversibility. A more detailed analysis is found in clause A.11 of the present document. 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 [i.8] 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 Computing procuring processes. A majority of Cloud Service Providers also plans to certify their Cloud Service offerings.

6.2 Trends and patterns

Based on the responses received, 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 for cloud maturity and for standards impact, although not for certification. 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.

Interoperability and Portability: These areas are 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.

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.

Standards: In general, the role of standards is seen as important and there is a growing level of awareness, even in terms of knowledge of the existing set of standards. It is to be noted that, in this perspective, the benefit from standards related to Cloud Computing is seen as more critical than Open Source: this finding is however subject to further analysis. This topic is further explored in ETSI SR 003 382 [i.12].

Certification: A very large majority (over 80 %) 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-analysed and recommended list of certification schemes.

6.3 Detailed findings

6.3.1 Adoption of Cloud Computing

The web survey clearly indicates which Cloud Computing Service Categories (SaaS, PaaS, IaaS, etc.) and Cloud Computing Deployment Models (Public, Community, Private or Hybrid) are most common in terms of usage; IaaS and provisioning infrastructure as well as general data storage constitute the most popular Service Categories and usage areas where the Private Cloud Deployment Models come out first as the Deployment Model. The adoption of Cloud Computing and Cloud Computing based services continues to grow across Europe.

Studies also show that the use of Cloud Computing services is steadily growing worldwide. In a recent study published by Skyhigh "Cloud Adoption & Risk Report" [i.3], the use of Cloud services continues to increase quite significantly. However, our analysis will point out later that this adoption is not uniform.

Based on how the result of questions related to the adoption and use of Cloud Computing is interpreted, the answers received might show some discrepancies. Consider figure 1:

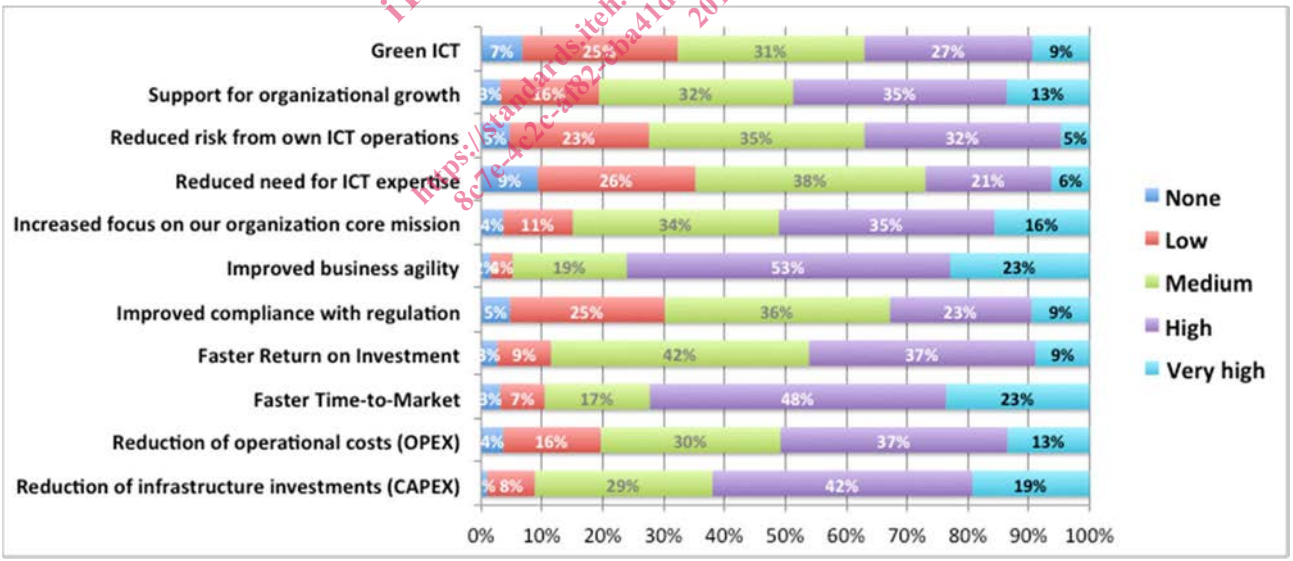

Figure 1: Expectations on potential Cloud Computing benefits (Question 7)

Figure 1 shows a significant interest in using Cloud Computing to improve business agility and to obtain a faster time-to-market for product & services provided. However, when looking at the actual, current usage of Cloud Computing, the full potential of Cloud Computing is still largely unexplored, based on the answers collected through the web survey.