International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

FG Cloud TR

Version 1.0
(02/2012)

Focus Group on Cloud Computing
Technical Report

Part 6: Overview of SDOs involved in cloud computing

ITU-T

FOREWORD

The procedures for establishment of focus groups are defined in Recommendation ITU-T A.7. The ITU-T Focus Group on Cloud Computing (FG Cloud) was established further to ITU-T TSAG agreement at its meeting in Geneva, 8-11 February 2010, followed by ITU-T study group and membership consultation.

Even though focus groups have a parent organization, they are organized independently from the usual operating procedures of the ITU, and are financially independent. Texts approved by focus groups (including Technical Reports) do not have the same status as ITU-T Recommendations.

INTELLECTUAL PROPERTY RIGHTS

The ITU draws attention to the possibility that the practice or implementation of this Technical Report may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU-T Focus Group participants or others outside of the Technical Report development process.

Table of Contents

1. Scope

The scope of this Technical Report is to provide an overview of SDOs and to map the ITU-T FG Cloud Working Group and Technical Reports, to these SDOs. This Technical Report will provide a basis for a gap analysis that will result in identification of unique areas that can be under the ITU-T purview, specifically from a telecommunication perspective.

2. Introduction

The TSAG has requested ITU-T FG Cloud to submit a list of cloud computing related standards/Recommendations and associated roadmap, in coordination with other relevant cloud computing standardization organizations, forums and consortia.

This output is based on the repository document prepared in May 2010 by the Policy and Technology Watch Division of ITU Telecommunication Standardization Bureau, and updates introduced at the first and second ITU-T FG Cloud meetings, June and September 2010 respectively.

3. Cloud SDO activities and planned output documents

3.1 Cloud ecosystem, telecom-centric use cases, requirements and business deployment scenarios

3.1.1 SG 2 service definition living list

SG 2 is the lead ITU-T study group for service definition (living list).

3.1.2 National Institute of Standards and Technology (NIST)

Cloud Computing Project: NIST's role in cloud computing is to promote the effective and secure use of the technology within government and industry by providing technical guidance and promoting standards.

Name/Title	Type	Version	Date
NIST definition of cloud computing		v15	2009-10
NIST Cloud Computing Standards Roadmap	Working draft	12th	2011.05-24

NIST is preparing to publish an inter-agency report for the rest of the US Federal Government titled *Cloud Computing Technology Roadmap* in November 2011. This report is prepared by the NIST"s staff, based on the reports provided by the five cloud computing working groups that are moderated by NIST, and attended by a large number of volunteers from the industry.

1. Reference Architecture Working Group
2. SAJACC Technical Use Cases Working Group
3. Security Working Group
4. Standards Roadmap & Gap Analysis Working Group
5. Target Business Use Cases Working Group

The five working groups are nearing completion, and their reports will be individually published, and then rolled up into the inter-agency report. This report will be widely available, and will be referenced by the ITU-T FG Cloud.

3.1.3 ISO/IEC JTC1 SC38

In the final report, the Study Group on Cloud Computing makes the following recommendations:

- Initiate New Work Item Proposals for projects that are essential to facilitating the cited governance and execution mechanisms on:
    - Cloud Computing Terms and Definitions
    - Cloud Computing Reference Architecture.
- Investigate requirements for new work to address critical areas of need for cloud computing that have already been identified but for which standards are not yet being developed

Name/Title	Type	Version	Date
Final Report: Study Group on Cloud Computing	report	final	2011-09

3.1.4 Cloud Computing Use Case Discussion Group

This open discussion group exists to define use cases for cloud computing.

Name/Title	Type	Version	Date
Cloud computing use cases • Definitions and taxonomy • Use case scenarios • Customer scenarios • Developer requirements • Security scenarios and use cases • SLA	White Paper	v4	2010-07

3.1.5 Global Inter-Cloud Technology Forum (GICTF)

The Global Inter-Cloud Technology Forum aims to promote standardization of network protocols and the interfaces through which cloud systems inter-work with each other, and to enable the provision of more reliable cloud services.

Name/Title	Type	Version	Date
Use Cases and Functional Requirements for Inter-Cloud Computing	White Paper	v1	2010-08

3.1.6 Cloud Computing Use Case Discussion Group

Name/Title	Type	Version	Date
Cloud computing use cases Definitions and taxonomy Use case scenarios Customer scenarios Developer requirements Security Scenarios and use case SLA	White Paper	v4	2010-07

3.1.7 ETSI Cloud

Name/Title	Type	Version	Date
Use Cases for Cloud Service Scenarios	Technical Report	v1	2010-2011

3.1.8 DMTF

DMTF is a not-for-profit association of industry members dedicated to promoting enterprise and systems management and interoperability. One of the key standards it maintained is the Common Information Model (CIM) .

Name/Title	Type	Version	Date
Use cases and interactions for managing clouds DSP-IP0103	White Paper	v1	2010-6-18

3.2 Functional requirements and reference architecture

3.2.1 ITU-T SG 13

Name/Title	Type	Version	Date
Requirements and capabilities for NGN service integration and delivery environment ITU-T Y.2240	Recommendation	Draft	2011-01

This Recommendation provides requirements and capabilities for a service integration and delivery environment in NGN (NGN-SIDE) in order to support various main functionalities in the NGN-SIDE ecosystem. These include the provision of mechanisms for the support of diverse applications, including cloud services, machine-to-machine, and ubiquitous sensor network applications.

NGN-SIDE can be viewed as the next generation service delivery platform (SDP), which is in the context of ITU-T Y.2240 targeted for NGN, but whose framework can conceptually be applicable to other telecommunication environments (e.g., mobile networks).

Some requirements (general requirements and capabilities) related to the support of cloud services (including for SDPaaS) are identified. Appendix III (Cloud services and supporting role played by NGN-SIDE) provides an overview about how NGN-SIDE can support different cloud service categories (SaaS, PaaS, CaaS, IaaS, NaaS).

[Further studies and developments are required to specify the details of cloud services support by NGN-SIDE].

3.2.2 DMTF

Name/Title	Type	Version	Date
Interoperable Clouds (DSP-IS0101)	White Paper	v1.0.0	2009-11-11
Architecture for Managing Clouds (DSP-IS0102)	White Paper	v1.0.0	2010-6-18
Cloud Management Interface Requirements on Protocol, Operations, Security & Message	Specification	v1.0.0	At the latest by 2011-12-31

3.2.3 GICTF

Name/Title	Type	Version	Date
Use Cases and Functional Requirements for Inter-Cloud Computing	White Paper	v1	2010-08

3.2.4 ETSI Cloud

Name/Title	Type	Version	Date
Standardization requirements for cloud services (ETSI TR102 997)	TR	v1	2010-2011

3.2.5 NIST

Name/Title	Type	Version	Date
NIST Cloud Computing Reference Architecture		v1.0	2011-09-06

3.3 Security, audit, and privacy, including network and business continuity

3.3.1 ITU-T SG 17

During the last ITU-T SG 17 meeting of September 2011, it was agreed to propose a new question (Q8/17) focused on "cloud computing security" for the next study period (2013-2016). This question should lead studies on cloud computing security in ITU-T SG 17 and coordinate with other SDOs, such as ISO/IEC JTC 1/SC 27 and CSA, as well as within the related questions in SG 17. There is a need to develop best practices and guidelines that will provide guidance on how to provide security in a cloud computing based environment. These activities on cloud security should consider the output of the FG on Cloud Computing. This new question (Q8/17) will collaborate with related questions such as Q3/17, Q4/17, Q7/17 and Q10/17 to develop Recommendations on cloud computing security.

Study items to be considered in this question include, but are not limited to:

a) What can telecommunication providers, ISPs, national bodies, and other key industry stakeholders do to promote sharing of cloud computing best practices and security in the cyber space?

b) What are the required security mechanisms for enabling cloud computing services?

c) What are the security assurance mechanisms and associated risks assessment and management in telecommunication-based cloud computing services?

d) What are the means for the secure discovery and the secure invocation of network and higher-level applications, and/or business level services, among distributed cloud computing based domains?

e) What are the means to secure telecommunication-based cloud computing services?

f) What means need to be established for assessing risks and threats associated with telecommunication-based cloud computing services?

g) What kind of security services in cloud computing environment are required and how can they be provided?

Name/Title	Type	Version	Date
Q4 Cybersecurity			
Q3 Telecommunication information security management			
Q7 Secure application services			
Q8 Service-oriented architecture security X.ccsec, Security guidelines for cloud computing in the telecommunication area	SG17, TD 1704	Draft	2011-04
Q8 Service-oriented architecture security X.srfctse, Security requirement and framework of the cloud-based telecommunication service X.srcse, Security functional requirements for software as a services(SaaS) application	SG17 TD 1767 TD 1710rev.3	Draft Draft	2011-04 2011-04
Q10 Identity management architectures and mechanism	TD1675rev.2	Draft	2011-04

X.idmcc – Requirements of IdM in cloud computing	Rev.2		

3.3.2 Cloud Security Alliance (CSA)

Name/Title	Type	Version	Date
Top Threats to Cloud Computing	White Paper	v1.0	2010-03
Security Guidance for Critical Areas of Focus in Cloud Computing	White Paper	v3	Q4 2011
CSA Cloud Control Matrix Trusted Cloud Initiative	Controls framework	v1.1	2011-2
Trusted Cloud Initiative	Certification	v1	Q4 2010
Cloud audit / cloud trust protocols	White Paper	v1	Q4 2011

3.3.3 ISO/IEC JTC1 SC27

The working groups in ISO/IEC JTC1/SC 27 (IT Security techniques) are dealing with topics such as information security management, risk management, application and network security, cybersecurity, business continuity, privacy, and identity management. In 2010-10, SC27 decided to establish a six-month study period (cloud computing security, and privacy) to investigate the security requirements for cloud computing and what would be a feasible programme of standards work to meet these requirements during the following WGs:

WG1: Information Security Management

WG4: Security Control and Services

WG5: Identity Management, Privacy Technology and Biometrics

Consequently, it was decided by SC 27/WG1 to register the following project for NP balloting. "Guidelines on information security controls for the use of cloud computing services based on ISO/IEC 27002".

3.3.4 DMTF

Name/Title	Type	Version	Date
Architecture for Managing Clouds(DSP-IS0102)	White Paper	v1.0.0	2010-6-18
Use cases and Interactions for Managing Clouds(DSP-IS0103)	White Paper	v1.0.0	2010-6-18

3.3.5 European Network and Information Security Agency (ENISA)

The European Network and Information Security Agency (ENISA), supported by a group of experts comprising representatives from industry, academia, and governmental organizations, is a centre of excellence in network and information security for the European Member States and European institutions. , ENISA provides advice and recommendations, and acts as a switchboard for information on good practices. In the context of the emerging and future risk framework project, it has conducted a risks assessment on cloud computing business models and technologies.

Name/Title	Type	Version	Date
Cloud Computing Information Assurance Framework			2009-11-20
Cloud computing benefits, risks and recommendations for information security			2009-11-20

3.3.6 OASIS:

Identity in the Cloud Technical Committee (TC)

The OASIS IDCloud (Identity in the Cloud) TC works to address the serious security challenges posed by identity management in cloud computing, and gaps in existing standards. The purpose of the TC is to harmonize definitions/terminologies/vocabulary of Identity in the context of cloud computing; to identify and define use cases and profiles; and to identify gaps in existing Identity management standards as they apply in the cloud.

[Scope]

1 The TC will identify and may collect and publish new and/or existing definitions, terminologies and vocabulary of Identity for cloud computing as the TC determines.

2 The TC will define use cases for identity deployment, provisioning, and management in a cloud computing context. These may be existing use cases or new use cases, as the TC determines.

3 The TC will define interoperability profile(s) of existing protocols and formats for usage of Identity in the Cloud, based on the identified use cases. Profiles are subsets of specifications and combinations of such subsets.

4 The TC will identify gaps in existing identity management interoperability protocols and format standards at OASIS and other standards bodies, and utilize the OASIS liaison process for communicating the gaps.

5 In all of its work, the TC should, to the extent feasible, prefer widely implementable and interoperable, modular standards, extensions, profiles, and methods that permit use by a variety of participants.

6 The TC will build on and use existing standards and specifications when possible. When there is a need to extend existing OASIS Standards, then the TC will not undertake that exercise but will work with the Technical Committee representing the standard to provide the extension as part of that Technical Committee.

7 The TC will build profiles for Identity in Cloud computing.

Name/Title	Type	Version	Date
A document describing in detail the specific use cases of identity deployment, provisioning and management in a cloud computing context that the TC plans to address in their work product.			July 2010.
A set of profiles and gaps, as described in paragraphs #3 and #4 under Scope, to be approved as a	Committee Specification	V1 V2	December 2010 June 2011
Optionally, other Technical Reports within the scope listed in paragraphs 1-6 (including collections of definitions, terminology and vocabularies, and risk/threat assessments),			June 2011

3.4 Cloud services and resource management, platform and middleware

Since the term Service and Resource *Management* has a broad meaning, the management objectives have been categorized as follows:

- From Provider's perspective
    - Computer resource management
    - Data storage resource management
    - Network resource management

- Security resource management

- From Service User's perspective
  - Service management

The result of the above categorization based on the analysis by FG Cloud members is shown in the tables in clause 3.

3.4.1 ITU-T SG 13, Q4

Q4 "Requirements and frameworks for QoS enablement in the NGN" is working on Resource control and management of virtual networks for cloud services (VNCs). The scope of this Recommendation is to address resource control and management issues in virtual networks for cloud services (VNCS) which represent a network aspect of cloud service infrastructure.

Name/Title	Type	Version	Date
Resource control and management of virtual networks for cloud services (ITU-T Y.VNCS)	Draft	TD693 GEN-NGNGSI	2011-05

3.4.2 DMTF

Name/Title	Type	Version	Date
Architecture for Managing Clouds(DSP-IS0102)	White Paper	v1.0.0	2010-6-18
Use cases and Interactions for Managing Clouds(DSP-IS0103)	White Paper	v1.0.0	2010-6-18
Cloud Service Management Models	Specification	v.1.0.0	At the latest by 2011-12-31

NOTE - In August 2010, DeltaCloud API specification for Apache Delta cloud was submitted to the Distributed Management Task Force (DMTF) to be a candidate standard for inter-cloud operations.

3.4.3 TMF

The primary objective of TM Forum's Managing Cloud Services Initiative is to help the industry overcome these barriers and assist the growth of a vibrant commercial marketplace for cloud-based services. In May, 2010, TMF released TMF523 Single Sign-On and Single Sign-Off for the OSS World Release 1.0, including SSO business scenarios and use cases in a cloud computing environment.

TMF is currently working on the cloud services management to cover:

- Cloud business process framework
- Cloud service definitions
- Cloud Billing Interest Group

Name/Title	Type	Version	Date
Managing Cloud Services SLA		v1	2010-2011
Single Sign-On Business Agreement		V0.10	2010-05

3.4.4 OGF

The Open Cloud Computing Interface working group (OCCI-WG) of the OGF was established in 2009. The purpose of this group is the creation of a practical solution to interface with cloud infrastructures exposed as a service (IaaS). It focuses on the creation of an API for interfacing IaaS

Cloud computing facilities, which is sufficiently complete to allow for the creation of interoperable implementations.

Name/Title	Type	Version	Date
Open Cloud Computing Interface Specification			2009-09

3.4.5 SNIA

The common goal of the Storage Networking Industry Association (SNIA) is to promote acceptance, deployment, and confidence in storage-related architectures, systems, services, and technologies, across IT and business communities.

Cloud Data Management Interface CDMI: This specification defines an interface for interoperable transfer and management of data in a cloud storage environment. This interface provides the means to access cloud storage and to manage the data stored there.

Name/Title	Type	Version	Date
Cloud data management interface (CDMI)	Standard	v1.0	2010-04
Storage Management Technical Specification,	Standard	V.1.5	2010-12
Cloud Storage for Cloud Computing	White paper	V 1.0	2009-09
Managing Data Storage in the Public Cloud	White paper	V 1.0	2009-10

3.4.6 GICTF

Name/Title	Type	Version	Date
Specification for inter cloud computing	Draft standard	v1	Q3-2011

3.4.7 ITU-T SG 16

Question 2 and Question 12 of ITU-T SG16 are examining whether to consider certain functions, such as Gatekeeper, MCU, and gateways, for deployment in the cloud. It is also possible to deploy session border controllers (SBCs) and iPBX (softswitch) devices in the cloud.

Q13/16: Is interested in Cloud IPTV, but currently there is no work item on this issue.

Q3/16: has started a new work item on virtual media gateways H.248.MGINST *Gateway control protocol: Media Gateway Instance Package.*

Editor's comment: Q26 activity on accessibility is listed in section 2.7

3.4.8 The Open Group

The Open Group Cloud Work Group exists to create a common understanding among buyers and suppliers of how enterprises of all sizes and scales of operation can include cloud computing technology in a safe and secure way in their architectures to realize its significant cost, scalability and agility benefits.

Name/Title	Type	Version	Date
Building Return on Investment from Cloud Computing	White paper	V1.0	2010-04
Cloud Computing Business Scenario Workshop	Workshop report	V1.0	2009-08

3.4.9 ITU-T SG9

Question 10 of ITU-T SG9 is studying service provider interface connecting service operators with a cable operator's platform to provide various cable television related services. Question 8 is

working on enhanced broadcasting for the support of IPTV with digital program insertion advertising system interface. Question 3 is working on security requirements. Question 7 is studying resource management mechanisms of broadcasting video delivery over cable networks using DOCSIS.

3.5 Infrastructure and network enabled cloud

3.5.1 ITU-T FG FN /SG13 Q21

The ITU-T FG activity related to network virtualization was transferred to the new Question 21 of SG13 in January 2011.

Name/Title	Type	Version	Date
Future Network Objectives and Design Goals, ITU-T Y.3001	Recommendation	TD674-GEN-NGNGSI	2011-05
Framework of network virtualization for future network	Draft	TD675-GEN-NGNGSI	2011-05

3.5.2 DMTF

The Open Virtualization Format (OVF) Specification describes an open, secure, portable, efficient and extensible format for the packaging and distribution of software to be run in virtual machines

Name/Title	Type	Version	Date
Open Virtualization Format (DSP0243) ANSI INCITS 469-2010	Standard	v1.0	2009-02
Open Virtualization Format (DSP0243)	Draft	v2.0a	2011-06

NOTE - ISO/IEC JTC 1 SC38 has approved OVF v1 as an ISO standard under a Fast Track procedure (ISO/IEC 17203:2011)

3.5.3 IEEE

The IEEE 802.1 DCB TG is working to address the impact of server virtualization technology through specifications for edge virtual bridging (EVB) and port extenders.

Name/Title	Type	Version	Date
IEEE 802.1 Qbg (Edge Virtual Bridging)	Draft standard	Draft 1.3	Work in process
IEEE 802.1 Qbh (Bridge Port Extension)	Draft standard	Draft 1.1	Work in process

3.5.4 IETF cloud status as of IETF-81

Editor's Note the follow list includes some cloud related individual drafts.

There is discussion to charter a Data Centre Ops WG [dcops], that may fall under the operations area purview. As of IETF-81, the following documents have been drafted:

one draft in Apps Area (Virtual Desktop Infrastructure Problem Statement draft-wang-appsawg-vdi-problem-statement-01), and

16 active cloud drafts in OPSA WG, falling into the following nine categories:

1. Virtual Resource Operations and Management (3 drafts)

- Virtual Resource Operations & Management in the Data Centre (http://tools.ietf.org/html/draft-tsou-vrom-problem-statement-02)
- Virtual Network Management Information Model (http://tools.ietf.org/id/draft-okita-ops-vnetmodel-04.txt)
- Virtual Resource Management in Cloud (http://www.ietf.org/id/draft-junsheng-opsawg-virtual-resource-management-00.txt)

2. Cloud Service State Migration (3): the mechanism to migrate the states related to cloud services between DCs.
   - Survey and Gap Analysis for Policies and Dynamic Information Migration in Data Centre (http://www.ietf.org/id/draft-wang-opsawg-policies-migration-gap- analysis-00.txt)
   - Policies and dynamic information migration in DCs: Solution Survey (http://www.ietf.org/id/draft-gu-opsawg-policies-migration-solution-survey-00.txt)
   - Policies and dynamic information migration in DCs (http://www.ietf.org/id/draft-gu-opsawg-policies-migration-00.txt)
3. DC Network Mobility (2): The mechanism to migrate VMs and virtualized network resources between Virtual Subnets and/or DCs
   - Managing Service Mobility for Virtualized Networks (http://www.ietf.org/id/draft-yokota-opsawg-virtnw-service-management-01.txt)
   - Network Portability Requirements and Models for Cloud Environment (http://tools.ietf.org/id/draft-shima-cloud-net-portability-reqs-and-models-00.txt)
4. DC Resources Discovery and Brokering (2): The mechanism to obtain cloud services related information, and use the aggregated information from multiple service providers to deliver differentiated services
   - Problem Statement for Setting Up Dynamic Virtual Network (http://tools.ietf.org/id/draft-ko-dvn-problem-statement-00.txt)
   - Cloud Service Broker (http://www.ietf.org/id/draft-shao-opsawg-cloud-service-broker-00.txt)
5. Cloud Work Survey for SDO Coordination (2): Surveys of Cloud Standard Organizations and Work Items to be used by IETF for standard development coordination work
   - Cloud SDO Activities Survey and Analysis (http://www.ietf.org/id/draft-khasnabish-cloud-sdo-survey-01.txt)
   - Cloud Industry Workitem Survey Results (http://www.ietf.org/id/draft-khasnabish-cloud-industry-workitems-survey-01.txt)
6. Data Centre (DC) Reporting and Diagnostics (1): Cloud service monitoring, reporting, and trouble shooting in DCs
   - Syslog Extension for Cloud Using Syslog Structured Data (http://www.ietf.org/id/draft-golovinsky-cloud-services-log-format-)
7. VPN for DC (VPN4DC) (1): Extending VPN into DCs to provide resource separation, VM mobility restriction, service provisioning control and end-to-end management capabilities for L2/L3VPN customers.
   - Requirement and Framework for VPN-Oriented Data Centre Services (http://tools.ietf.org/id/draft-so-vdcs-00.txt)
8. Cloud Reference Framework (1): Reference framework for organizing the Cloud infrastructure to demonstrate various cloud components and how they fit together in delivering an end-to-end service

- Cloud Reference Framework (http://www.ietf.org/id/draft-khasnabish-cloud-reference-framework-01.txt)

9. Cloud Security (1): The requirements, framework, best practices, and solutions to ensure security of cloud infrastructure and services.
   - Security Framework for Virtualized Data Centre Services (http://www.ietf.org/id/draft-karavettil-vdcs-security-framework-00.txt)

Status as of IETF-82: No change in status of drafts below

It is expected to have a new item in IETF-83 (March 2012) and to move towards a formation of new WG DC Ops for Data Centre Operation. The following drafts are to be updated for IETF-83:

- draft-karavettil-vdcs-security-framework-00.txt
- draft-khasnabish-cloud-reference-framework-01.txt
- draft-khasnabish-cloud-sdo-survey-01.txt
- draft-khasnabish-cloud-industry-workitems-survey-01.txt
- draft-junsheng-opsawg-virtual-resource-management-00.txt

3.5.5 IRTF Virtual Network Research Group VNRG

Name/Title	Type	Version	Date

3.6 Inter-cloud procedures and interfaces for multiple-cloud resource allocation and SLA

3.6.1 ATIS

The Cloud Services Forum (CSF), was created to focus on cloud, cloud peering and the "inter-cloud". This Forum was established with the intent to deliver a data model supporting five key service enablers across use cases which drive "inter-cloud" demand (UNI, NNI, security, provider, and customer management)

3.6.3 IEEE

Two working groups on cloud portability and intercloud interoperability have started work. The effort is kicking off with the approval of two new standards development projects, IEEE P2301™, Draft Guide for Cloud Portability and Interoperability Profiles, and IEEE P2302™, Draft Standard for Intercloud Interoperability and Federation.

3.7 User friendly accessibility, virtual terminals and eco-friendly cloud computing

3.7.1 ITU-T-SG 5

ITU-T SG5 is working on ICT and climate change. The SG5 Technical Reports will highlight how ICTs can reduce the impact on climate change, particularly by the use of cloud computing.

3.7.2 ITU-T SG16

ITU-T SG 16 Question 26, the multimedia accessibility, had a strong interest in cloud computing. There will be future implications between FG Cloud and ITU-T SG 16/Q26 to explore cloud accessibility features and definite benefits for:

- Accessibility for poorer and emerging countries, with multi-language support
- Human access for seniors and people with disabilities
- Access Anywhere from public and private places (home, school, library, enterprise, hospitality, etc.) anytime and from any connected devices (fixed, mobile, TV, etc.)

- Rapid access to secure cloud services with lower CapEx
- Friendly user and rich web browser access interface

3.7.3 The Green Grid TGG

TTG is a global consortium of IT companies and professionals seeking to improve energy efficiency in data centres and business computing ecosystems around the globe. The organization seeks to unite global industry efforts to standardize on a common set of metrics, processes, methods and new technologies to further its common goals. The power usage effectiveness (PUE) and DCIE (data centre infrastructure efficiency) metrics are most famous and generally accepted. TGG is currently developing carbon usage effectiveness (CUE) and water usage effectiveness (WUE) metrics for promoting eco-friendly data centres.

Name/Title	Type	Version	Date
Green grid data centre power efficiency metrics: PUE and DCIE	White Paper		2008
PUE scalability metric and statistical analyses	White Paper	V 1.0	Jan. 28 2009
Carbon usage effectiveness (CUE): a green grid data centre sustainability metric	White Paper		2010
Water usage effectiveness (WUE): a green grid data centre sustainability metric	White Paper		2010
Using virtualization to improve data centre efficiency	White Paper	V 1.0	2009
Impact of virtualization on data centre physical infrastructure	White Paper		2010
An analysis of server virtualization utility incentives	White Paper		2011

3.8 Other organizations

The Open Data Center Alliance (ODCA) is an independent IT consortium comprised of global IT leaders who have come together to provide a unified customer vision for long-term data centre requirements. One of the ODCA missions is to collaborate with industry standards bodies to define required industry standard development aligned with Alliance priorities.

ODCA has delivered the first customer requirements for cloud computing, documented in eight Open Data Center Usage Models which identify member-prioritized requirements to resolve the most pressing challenges facing cloud adoption.

Name/Title	Type	Version	Date
I/O Control	Usage Model	Version1.0	Done, 2011.6
Virtual Machine Interoperability	Usage Model	Version1.0	Done, 2011.6
Security Monitoring	Usage Model	Version1.0	Done, 2011.6
Provider Security Assurance	Usage Model	Version1.0	Done, 2011.6
Standard Units of Measure	Usage Model	Version1.0	Done, 2011.6
Service Catalog	Usage Model	Version1.0	Done, 2011.6
Regulations	Usage Model	Version1.0	Done, 2011.6
Carbon Footprint Values	Usage Model	Version1.0	Done, 2011.6

4. Gap analysis

Focus Group Cloud concluded during meeting #8 that:

- Almost all the forums dealing with cloud computing have developed their own architecture for their own purpose. Unfortunately, they are not identical.
- DMTF, SNIA, SCA, and OGF have developed their forum standard and some interfaces for virtualization technique.
- There is not an SDO or forum which shows the total picture of cloud computing standardization. De jure standard organizations, such as ITU-T or ISO/IEC JTC1, are expected to play a role in developing an umbrella document as an "end-to-end overall system view".

It is recommended that ITU-T play a leading role for functional architecture, inter-cloud security and management, and SLA study areas.

It is also expected that ITU-T and ISO/IEC JTC1 will conduct complementary standardization work, in order to pursue efficiency and avoid work overlap.

5. Mapping of relevant SDOs and forums to ITU-T FG cloud activities

	Ecosystem, use cases, requirements	Functional requirements and reference architecture	Security, audit and privacy	Service and resource management	Infrastructure and network-enabled	Inter-cloud, procedure and interfaces	User accessibility, eco- friendly
ISO/IEC JTC 1	X		X				
NIST	X	X	X				
ETSI	X						
CSA		X	X				
DMTF	X	X	X	X[computer], [service]	X		
GICTF	X			X [network], [service]	X	X	
OGF				X[computer]			
SNIA				X[storage], [service]			
TMF				X[service]			
IETF	X			X[network]	X	X	
OASIS			X	X [service]			
IEEE						X	
ATIS				X[service]		X	
Open Group	X	X		X[service]			
Use Case Group	X	X	X				
ODCA	X		X		X		

First Contributions

1 *Repository on activities in cloud computing standardization v1*, June 2010 cloud-o-0006

2 *Repository on activities in cloud computing standardization v2.1*, September 2010 cloud-i-045

3 *Proposed structure and maintenance process of Roadmap*, September 2010 cloud-i-040

4 *DMTF New Open Cloud Incubator Documents*, September 2010 cloud-i-034

5 *Cloud on use cases and functional requirements for inter-cloud*, September 2010 cloud-i-038