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TD

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Title: Initial draft Supplement ITU-T Y.sup.ccsr, "Supplement on Cloud Computing Standardization Roadmap" (Geneva, 27 June - 8 July 2016)

In ITU-T Q17/13 meeting (27 June – 8 July 2016, Geneva), it was agreed to initial a new supplement on cloud computing standard roadmap. This is the output draft of the initialled supplement Y.sup.ccsr, which was agreed during this meeting.

The following table shows discussion results for contribution during Q17/13 meeting, June/July 2016.

Contribution No.	Company	Contribution title and proposals	Result and actions
C1215	ETRI	Proposal of New Supplement for cloud computing standard roadmap	Accepted with modification
C1235	China Telecom	Proposal for Initial draft of Supplement on Cloud computing standardization roadmap	Accepted with modification

- This meeting receive two contributions from ETRI and China Telecom on initialization of new supplement for cloud computing standard roadmap. This meeting discussed the two contributions and agreed to merge them as the initial draft of Y.sup.ccsr.
- Clause 11 (ITU-T SG5) is updated base on LS reply from SG5 (**SG5 - LS 161)**.
- Clause 12 (ITU-T SG11) is updated base on LS reply from SG11.

Future contributions are invited for the following topics with high priority;

- Add new work item of ITU-T SG13 such as Y.dsf-reqts, Y.cccm-reqts, Y.ccpm-reqts, Y.csb-reqts, Y.ccdc-reqts, Y.CCICTM, and Y.CCICDM-Req
- Add analysis of ITU-T SG13 deliverables (clause 8.4)

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- Add texts on the introduction to ITU-T standardization activities (clause 7.1.2 ~ clause 7.1.5)
- But, not limited to.

_____

Draft Supplement to ITU-T Y-series Recommendations

ITU-T Y.3500-series – Supplement on Cloud Computing standardization roadmap

Summary

The purpose of this supplement is to provide the summary of cloud computing related deliverables in ITU-T SGs and other SDOs. For this purpose, it is necessary to collect all the information from ITU and other SDOs including their understanding of cloud computing and relation with cloud computing of their works.

Keywords

Cloud computing, Recommendation, standard, roadmap

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ITU-T Y.3500-series – Supplement on Cloud Computing standardization roadmap

1 Scope

This supplement describes the summary of cloud computing related deliverables in ITU-T SGs and other SDOs. Also, this supplement provides the common matrix for the mappting of the deliverables, and

2 References

The following ITU-T Recommendations and other references contain provisions, which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T Y.3500] Recommendation ITU-T Y.3500 (2014), *Cloud computing - Overview and Vocabulary.*

[ITU-T Y.3501] Recommendation ITU-T Y.3501 (2013), *Cloud computing framework and high-level requirements*

[ITU-T Y.3502] Recommendation ITU-T Y.3502 (2014), *Cloud computing - reference architecture.*

[ITU-T Y.3510] Recommendation ITU-T Y.3510 (2013), *Cloud computing infrastructure requirements.*

[TBD]

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 **cloud computing** [ITU-T Y.3500]: Paradigm for enabling network access to a scalable and elastic pool of shareable physical or virtual resources with self-service provisioning and administration on-demand.

3.1.2 **cloud service** [ITU-T Y.3500 | ISO/IEC 17788]: One or more capabilities offered via cloud computing invoked using a defined interface.

3.1.3 **cloud** service **category** [ITU-T Y.3500]: Group of cloud services that possess some common set of qualities.

3.1.4 **cloud service customer** [ITU-T Y.3500]: A person or organization that consumes delivered cloud services within a contract with a cloud service provider.

3.1.5 **cloud service customer data** [ITU-T Y.3500]: Class of data objects under the control, by legal or other reasons, of the cloud service customer that were input to the cloud service, or resulted from exercising the capabilities of the cloud service by or on behalf of the cloud service customer via the published interface of the cloud service.

3.1.6 **cloud service provider** [ITU-T Y.3500]: An organization that provides and maintains delivered cloud services.

3.1.7 **hypervisor** [ITU-T Y.3510]: A type of system software that allows multiple operating systems to share a single hardware host.

3.1.8 **Infrastructure as a Service** [ITU-T Y.3500]: Cloud service category in which the cloud capabilities type provided to the cloud service customer is an infrastructure capabilities type.

3.1.9 **infrastructure capabilities type** [ITU-T Y.3500]: Cloud capabilities type in which the cloud service customer can provision and use processing, storage or networking resources.

3.1.10 **open virtualization format** [b-ISO/IEC OVF]: An open, secure, portable, efficient and extensible format for the packaging and distribution of software to be run in virtual machines.

3.1.11 **party** [ITU-T Y.3500]: Natural person or legal person, whether or not incorporated, or a group of either.

3.1.12 **resource management** [ITU-T Y.3520]: The most efficient and effective way to access, control, manage, deploy, schedule and bind resources when they are provided by service providers and requested by customers.

3.1.13 **virtual machine** [b-DMTF OVF]: The complete environment that supports the execution of guest software.

3.2 Terms defined in this Recommendation

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

CSC Cloud Service Customer

CSP Cloud Service Provider

DaaS Desktop as a Service

IaaS Infrastructure as a Service

ICT Information and Communication Technology

NaaS Network as a Service

OVF Open Virtualization Format

PaaS Platform as a Service

SaaS Software as a Service

SDN Software-defined Networking

SNS Social Network Service

5 Conventions

None.

6 Landscape of Cloud Computing from ITU-T perspectives

[Editor's note on July 2016] In this section, it is required to describe the general description on cloud computing from ITU-T perspectives including characteristics.

Cloud computing is a paradigm for enabling network access to a scalable and elastic pool of shareable physical or virtual resources with self-service provisioning and administration on-demand.

The cloud computing paradigm is composed of key characteristics. Key characteristics of cloud computing described in [ITU-T Y.3500] are as follows:

- **Broad network access**: A feature where the physical and virtual resources are available over a network and accessed through standard mechanisms that promote use by heterogeneous client platforms. The focus of this key characteristic is that cloud computing offers an increased level of convenience in that users can access physical and virtual resources from wherever they need to work, as long as it is network accessible, using a wide variety of clients including devices such as mobile phones, tablets, laptops, and workstations;

- **Measured service**: A feature where the metered delivery of cloud services is such that usage can be monitored, controlled, reported, and billed. This is an important feature needed to optimize and validate the delivered cloud service. The focus of this key characteristic is that the customer may only pay for the resources that they use. From the customers' perspective, cloud computing offers the users value by enabling a switch from a low efficiency and asset utilization business model to a high efficiency one;

- **Multi-tenancy**: A feature where physical or virtual resources are allocated in such a way that multiple tenants and their computations and data are isolated from and inaccessible to one another. Typically, and within the context of multi-tenancy, the group of cloud service users that form a tenant will all belong to the same cloud service customer organization. There might be cases where the group of cloud service users involves users from multiple different cloud service customers, particularly in the case of public cloud and community cloud deployments. However, a given cloud service customer organization might have many different tenancies with a single cloud service provider representing different groups within the organization;

- **On-demand self-service**: A feature where a cloud service customer can provision computing capabilities, as needed, automatically or with minimal interaction with the cloud service provider. The focus of this key characteristic is that cloud computing offers users a relative reduction in costs, time, and effort needed to take an action, since it grants the user the ability to do what they need, when they need it, without requiring additional human user interactions or overhead;

- **Rapid elasticity and scalability**: A feature where physical or virtual resources can be rapidly and elastically adjusted, in some cases automatically, to quickly increase or decrease resources. For the cloud service customer, the physical or virtual resources available for provisioning often appear to be unlimited and can be purchased in any quantity at any time automatically, subject to constraints of service agreements. Therefore, the focus of this key characteristic is that cloud computing means that the customers no longer need to worry about limited resources and might not need to worry about capacity planning;

– **Resource pooling**: A feature where a cloud service provider's physical or virtual resources can be aggregated in order to serve one or more cloud service customers. The focus of this key characteristic is that cloud service providers can support multi-tenancy while at the same time using abstraction to mask the complexity of the process from the customer. From the customer's perspective, all they know is that the service works, while they generally have no control or knowledge over how the resources are being provided or where the resources are located. This offloads some of the customer's original workload, such as maintenance requirements, to the provider. Even with this level of abstraction, it should be pointed out that users might still be able to specify location at a higher level of abstraction (e.g., country, state, or data center).

The general requirements for cloud computing described in [ITU-T Y.3501] are as follows:

– **Service life-cycle management**: It is required that cloud service provider (CSP) supports automated service provisioning, modification and termination during the service life-cycle;

– **Regulatory**: It is required that all applicable laws and regulations be respected, including those related to the protection of Personally Identifiable Information (PII);

– **Security**: It is required that the cloud computing systems provided by CSP be appropriately secured to protect the interests of all involved parties (e.g. persons and organizations);

– **Accounting and charging**: It is recommended that cloud service provided by CSP supports various accounting and charging models and policies;

– **Efficient service deployment**: It is recommended that cloud service provided by CSP enables efficient use of resources for service deployment;

– **Interoperability**: It is recommended that cloud service provided by CSP comply with appropriate specifications and/or standards for allowing these systems to work together;

– **Portability**: It is recommended that cloud service provided by CSP supports the portability of software assets and data of cloud service customers (CSCs) with minimum disruption;

– **Service access**: CSP is recommended to provide CSCs with access to cloud services from a variety of user devices. It is recommended that CSCs be provided with a consistent experience when accessing cloud services from different devices;

– **Service availability, service reliability and quality assurance**: It is recommended that the CSP provides end-to-end quality of service assurance, high levels of reliability and continued availability of cloud services according to the service level agreement (SLA) with the CSC.

7 Overview of cloud computing standard roadmap

7.1 Introduction to Standard development organizations (SDOs) for cloud computing

7.1.1 ITU-T SG13

Study Group 13 is for studies relating to the requirements, architectures, capabilities and mechanisms of future networks including studies relating to service awareness, data awareness, environmental awareness and socio-economic awareness of future networks. Responsible for studies relating to cloud computing technologies such as virtualization, resource management, reliability and security.

- Q17/13 (Requirements, ecosystem, and general capabilities for cloud computing and big data)

The primary focus of this Question is to provide the necessary overall frameworks, definitions, and ecosystems including requirements and capabilities related to the integration and support of the cloud computing and big data model and technologies in telecommunication ecosystem. Also relationship between cloud computing and big data are developed. This Question is intended to develop new Recommendations for:

- cloud computing and big data definitions, overview, ecosystem, and use cases;
- cloud computing and big data high-level requirements, general capabilities;
- requirements for interoperability data portability and exchange information in cloud computing and big data;
- general and functional requirements for Desktop as a service (DaaS) including functional requirements and reference architecture;
- relationship between cloud computing and big data;

• Q18/13 (Cloud functional architecture, infrastructure and networking)

The primary focus of this Question is to provide the overall cloud computing architecture, cloud computing infrastructure and cloud networking views related to the integration and support of the cloud computing model and technologies in telecommunication ecosystems. Security is a transversal aspect of the cloud computing architecture. The Question needs to study the requirements for cloud computing from the perspective of security and identity management. The Question also needs to delve into details of security requirements for various layers and components specified in the reference architecture, as well as the interactions between those roles, layers and components, from the security and identity management perspective.

This Question is intended to develop new Recommendations for:

- cloud computing functional reference architecture;
- cloud computing infrastructure including cloud networking aspects.

• Q19/13 (End-to-end Cloud computing management and security)

The primary focus of this Question is cloud service and infrastructure management and the management of composite cloud services and components that use a variety of telecom and IT infrastructure resources. These cloud services are typically composed of individual services elements that may be acquired from or exposed to third parties. This is a very complex management environment and requires the study of standards that provide a means to enable consistent end-to-end, multi-cloud management and monitoring of services exposed by and across different service providers' domains and technologies. This Question also includes the study of security mechanisms and methods to stream line and manage service delivery mechanisms across the service life cycles so that services can be created and delivered efficiently.

7.1.2 ITU-T SG17

[Editor’s note on July 2016] It is requested the introductory texts including introduction to the cloud computing related question(s).

7.1.3 ITU-T SG5

[Editor’s note on July 2016] It is requested the introductory texts including introduction to the cloud computing related question(s).

7.1.4 ITU-T SG11

[Editor's note on July 2016] It is requested the introductory texts including introduction to the cloud computing related question(s).

7.1.5 ITU-T SG16

[Editor's note on July 2016] It is requested the introductory texts including introduction to the cloud computing related question(s).

7.1.6 JTC 1 SC 38 (Cloud Computing and Distributed Platforms)

SC 38 is a standardization subcommittee in ISO/IEC JTC 1 of the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). Currently, there are three working group under SC 38 like follows;

- WG 3 (Cloud Computing Service Level Agreements (CCSLA))
- WG 4 (Cloud Computing Interoperability and Portability (CCIP))
- WG 5 (Cloud Computing Data and its Flow (CCDF))

[Editor's note on July 2016] It is requested to revise the introductory texts.

7.1.7 DMTF (Distributed Management Task Force)

The DMTF is an industry standards organization working to simplify the manageability of network-accessible technologies through open and collaborative efforts by leading technology companies. DMTF creates and drives the international adoption of interoperable management standards, supporting implementations that enable the management of diverse traditional and emerging technologies including cloud, virtualization, network and infrastructure.

[Editor's note on July 2016] Also, it is required contribution or liaison for the revise the introductory texts as well as adding what is group for cloud computing standards.

7.1.8 TM Forum

TM Forum is the global member association for digital business. We provide a platform for hundreds of global members across a wide range of industries – communications, technology, cities and municipal government, finance, healthcare, and so on – to collaborate and partner to co-create, prototype, deliver, and monetize innovative digital services for their billions of customers.

[Editor's note on July 2016] Also, it is required contribution or liaison for the revise the introductory texts as well as adding what is group for cloud computing standards.

7.1.9 ETSI

ETSI, the European Telecommunications Standards Institute, produces globally-applicable standards for Information and Communications Technologies (ICT), including fixed, mobile, radio, converged, broadcast and Internet technologies. Our standards enable the technologies on which business and society rely.

The cloud activity that has previously taken place in ETSI technical committee CLOUD (closed now) is now included in TC NTECH, e.g. Specialist Task Force 486.

[Editor's note on July 2016] Also, it is required contribution or liaison for the revise the introductory texts as well as adding what is group for cloud computing standards.

7.1.10 ATIS

ATIS is where the leading ICT companies come for solutions when seeking industry alignment to advance their most critical priorities.

[Editor's note on July 2016] Also, it is required contribution or liaison for the revise the introductory texts as well as adding what is group for cloud computing standards.

7.1.11 Broadband Forum

Broadband Forum, a non-profit industry organization, is focused on engineering smarter and faster broadband networks.

[Editor's note on July 2016] Also, it is required contribution or liaison for the revise the introductory texts as well as adding what is group for cloud computing standards.

7.2 Analysis of deliverable to provide its category

For the analysis of deliverables from clause 7, this supplement provides analysis template in form of matrix table.

Table 7-1 – Matrix for analysis of deliverables

	General, definition	**Requirements Use Cases**	**Architecture**	**API, interface, profile**	**Format, schema**	**others**
Fundamental						
Cloud service category						
Security						
Management						
Inter cloud, CSB						
SLA, metering						
Testing						
Others						

[Editor's note on July 2017] The order of Y axes should be reversed.

The vertical axis describe the sub or related technology. The horizontal axis describes document category which cover the subject of application as following:

- General, definition: the standard which provides general description or terms and definitions of the technology;
- Requirements, use cases: the standard which provides use cases and derived general/functional requirements;
- Architecture: the standard which provides reference architecture;
- API, interface, profile: the standard which provides common interface, API and/or its profile;
- Data model, format, schema: the standard which provides data model or protocol including scheme and/or its encoding format;
- Others (e.g. guideline, technical report, etc.).

NOTE 1 – The items of horizontal axis are not subordinate to the different technologies.

NOTE 2 – The items of vertical axis can be modified with technology change

NOTE 3 – A standard has more than one location on a matrix. If a standard includes multiple document (horizontal axis) categories or related technologies (vertical axis), it should be mapped multiply.

8 ITU-T SG13

8.1 Q17

Title of deliverable	Current status	Starting date	Target date
ITU-T Y.3500|ISO/IEC 17788 Information technology – Cloud computing – Overview and vocabulary	Recommendation | IS	September 2012	August 2014
ITU-T Y.3501-ed2, Cloud Computing Framework and high-level requirements	Recommendation 2nd Edition Initiated	2012-06-15 2015-05-01	May 2013 4Q 2015
ITU-T Y.3503, Requirement of Desktop as a Service	Recommendation	2012-06-15	May 2014
ITU-T Y.3600, Big data – cloud computing based requirements and capabilities	Recommendation	06/2013	November 2015
ITU-T Y.3504, Functional architecture for Desktop as a Service	Draft Recommendation (AAP)	July 2014	June 2016

- **ITU-T Y.3500 | ISO/IEC 17788**: This Recommendation | International Standard provides an overview of cloud computing along with a set of terms, definitions and concepts. It is a terminology foundation for the cloud computing standardization work. This Recommendation | International Standard is applicable to all types of organization (e.g. commercial enterprises, government agencies, not-for-profit organizations).

  URI : http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=12210

- **ITU-T Y.3501:** This Recommendation provides a cloud computing framework by identifying high-level requirements for cloud computing. The Recommendation addresses the general requirements and use cases for:
  - cloud computing;
  - Infrastructure as a Service (IaaS), Network as a Service (NaaS), and Desktop as a Service (DaaS) cloud services;
  - inter-cloud, end-to-end resource management, and cloud infrastructure.

  The first release of this Recommendation addresses a set of use cases and related requirements which are included in Appendix I. Next release of this Recommendation will provide an update of this set of use cases and requirements. The release concept is described in Appendix II.

  URI : http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=11917
- **ITU-T Y.3503**: This Recommendation provides use cases, general requirements and functional requirements for Desktop as a Service (DaaS).

  URI : http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=12167
- **ITU-T Y.3600**: This Recommendation provides approach to use cloud computing to meet challenges existing in use of big data. It addresses the following subjects:
  - Overview of big data;
    - Introduction to big data;
    - Big data ecosystem and roles;
  - Relationship between cloud computing and big data;
  - Cloud computing based big data system context and benefits;
  - Cloud computing based big data requirements;
  - Cloud computing based big data capabilities.

  URI : http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=12584
- **ITU-T Y.3504**: This Recommendation provides functional architecture for Desktop as a Service (DaaS) to specify the detailed functional components and their relationships based on the general and functional requirements of Y.3503. It addresses the following subjects:
  - DaaS functionalities related with DaaS components
  - DaaS functional architecture;
  - Mapping DaaS functional architecture to the cloud computing reference architecture.

  URI : http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=12889

8.2 Q18

Title of deliverable	Current status	Starting date	Target date
ITU-T Y.3502|ISO/IEC 17789 Information technology — Cloud computing - Reference architecture	Recommendation | IS	September 2012	August 2014

ITU-T Y.3510, Cloud Computing Infrastructure Requirements	Recommendation 2nd Edition	2012-06-15 2015-05-01	May 2013 2016-02-13
ITU-T Y.3511, Framework of inter-cloud computing	Recommendation	2012-06-15	March 2014
ITU-T Y.3512, Cloud computing - Functional requirements of Network as a Service	Recommendation	2012-06-15	June 2013
ITU-T Y.3513, Cloud computing - Functional requirements of Infrastructure as a Service	Recommendation	02/2013	August 2014
ITU-T Y.CCNaaS-arch, Cloud computing - Functional Architecture of Network as a Service	Draft Recommendation	07/2014	06/2016
ITU-T Y.CCIC-arch, Cloud computing - Functional Architecture of inter-cloud computing	Draft Recommendation	05/2015	Q4 2016
ITU-T Y.BDaaS-arch, Functional architecture of Big Data as a Service	Draft Recommendation	05/2015	11/2016

- **ITU-T Y.3502|ISO/IEC 17789**: This Recommendation | International Standard specifies the cloud computing reference architecture (CCRA). The reference architecture includes the cloud computing roles, cloud computing activities as well as the cloud computing functional components and their relationships.

  URI : http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=12209

- **ITU-T Y.3510**: This Recommendation identifies requirements for cloud infrastructure capabilities to support cloud services. The scope of this Recommendation includes:
  - Overview of cloud infrastructure;
  - Requirements for compute resources;
  - Requirements for network resources;
  - Requirements for storage resources;
  - Requirements for resource abstraction and control.

  URI : http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=12713

- **ITU-T Y.3511**: This Recommendation describes the framework for interactions of multiple cloud service providers (CSPs) that is referred to as inter-cloud computing. Based on several use cases and consideration on different types of service offerings, this Recommendation describes the possible relationship among multiple CSPs; which are peering, federation, and intermediary. By introducing the concept of the primary CSP and /secondary CSPs, the Recommendation further describes CSP interactions in the cases of federation and intermediary patterns. The Recommendation also considers the network significance and its issues. Finally, relevant functional requirements are derived.

  URI: http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=12078

- **ITU-T Y.3512**: This Recommendation provides use cases and functional requirements of Network as a Service (NaaS), one of the representative cloud service categories. This Recommendation covers the following:

- High level concept of NaaS;
- Functional requirements of NaaS;
- Typical NaaS use cases.
- This Recommendation provides use cases and functional requirements of NaaS application, NaaS platform and NaaS connectivity.

URI: http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=12285

- **ITU-T Y.3512**: This Recommendation provides functional requirements and use cases of Infrastructure as a Service (IaaS), one of the representative cloud service categories. This Recommendation covers the following:
  - General description of IaaS;
  - Functional requirements of IaaS;
  - Typical IaaS use cases.

  URI: http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=12286
- **ITU-T Y.CCNaaS-arch**: This Recommendation specifies NaaS functional architecture, including functionalities, functional components as well as reference points and procedures, based on the functional requirements specified in Y.3512. The scope of this Recommendation consists of:
  - Overview of NaaS functional architecture;
  - Functionalities of NaaS;
  - Functional components of NaaS;
  - Reference points between functional components of NaaS;
  - Procedures for typical NaaS use cases.

  URI: http://www.itu.int/ITU-T/workprog/wp_item.aspx?isn=10229
- **ITU-T Y.CCIC-arch**: This proposed Recommendation specifies inter-cloud computing functional architecture, including functionalities, functional components as well as reference points and procedures, based on the framework specified in Y.3511. The scope of this recommendation includes, but is not limited to:
  - Analyses of functional requirements of inter-cloud computing;
  - Overview of inter-cloud computing functional architecture;
  - Functionalities of inter-cloud computing;
  - Functional components of inter-cloud computing;
  - Reference points between functional components of inter-cloud computing;
  - Procedures for typical inter-cloud computing use cases.

  URI: http://www.itu.int/ITU-T/workprog/wp_item.aspx?isn=10547
- **ITU-T Y.CCIC-arch**: This Recommendation specifies the functional components, functional architecture, and reference points of Big Data as a Service (BDaaS). The scope of this recommendation includes:

- Overview of Big Data as a Service functional architecture;
- The functional components of Big Data as a Service;
- The functional architecture of Big Data as a Service;
- The reference points between functional components of BDaaS.

URI: http://www.itu.int/ITU-T/workprog/wp_item.aspx?isn=10548

8.3 Q19

Title of deliverable	Current status	Starting date	Target date
ITU-T Y.3520, Cloud computing framework for end to end resource management	Recommendation 2nd Edition	2012-06-15 2015-05-01	June 2013 2015-09-29
ITU-T Y.CCTIC, Trusted inter-cloud computing framework and requirements	Draft Recommendation	05/2015	2Q 2017

- **ITU-T Y.3520**: This Recommendation provides a framework for end-to-end cloud computing resource management. This Recommendation includes:
  - general concepts of end to end cloud computing resource management;
  - a vision for adoption of cloud computing resource management in a telecommunication rich environment;
  - end-to-end management of cloud resource and services across multiple platforms, i.e. management of any hardware and software used in support of the delivery of cloud services.

  URI: http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=12585
- **ITU-T Y.CCTIC**: This Recommendation specifies framework of trusted inter-cloud computing and relevant use cases, based on the framework specified in ITU-T Rec. Y.3511. The scope of this Recommendation includes:
  - objectives of trusted inter-cloud computing;
  - requirements for security of trusted inter-cloud;
  - requirements for governance of trusted inter-cloud;
  - requirements for resiliency of trusted inter-cloud.

  URI: http://www.itu.int/ITU-T/workprog/wp_item.aspx?isn=10538

8.4 Analysis of ITU-T SG13 deliverables

Table 8-1 – Analysis of ITU-T SG13 deliverables

	General, definition	Requirements Use Cases	Architecture	API, interface, profile	Format, schema	others

Fundamental						
Cloud service category						
Security						
Management						
Inter cloud, CSB						
SLA, metering						
Testing						
Others						

[Editor's note on July 2016] The deliverables in this clause should be allocated in the table. Contributions or liaison are invited.

9 ITU-T JRG-CCM (Joint Rapporteur Group on Cloud Computing Management) of ITU-T SG13 and ITU-T SG2

Title of deliverable	Current status	Starting date	Target date
ITU-T Y.3521, Overview of end-to-end cloud computing management	Recommendation	02/2013	2016-03-15
ITU-T Y.e2ecslm-Req, End-to-end cloud service lifecycle management requirements	Draft Recommendation	06/2012	Q4 2016
ITU-T M.rcsm, Requirements for Cloud Service Management	Draft Recommendation	2013-01-31	Q4 2016
ITU-T M.mivrcc, Requirements and analysis for management interface of virtualized resources in cloud computing	Draft Recommendation (Suspended due to clarification of management architecture and requirements in M.3070, M.rcsm, etc.)	2013-01-31	N/A

- **ITU-T Y.3521**: Recommendation ITU-T Y.3521 presents the conceptual view and the common model of end-to-end (E2E) cloud computing management based on the service management interface (SMI) and cloud computing reference architecture, from the perspective of the telecommunications industry.

  URI: http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=12714

- **ITU-T Y.e2ecslm-Req**: This Recommendation specifies the functional requirement of the lifecycle for service management aspects of Cloud services. The Cloud service lifecycle management involves charging events management, policy management, management of role related information, service/application provisioning, resource management, context management, and content management.

URI: http://www.itu.int/ITU-T/workprog/wp_item.aspx?isn=9744

- **ITU-T M.rcsm**: The scope of this Recommendation is to define the general management requirements that support the cloud service fulfillment, delivery, operation and management, and to provide function framework for cloud services management. Also the relationship between cloud service management and cloud resource management will be described.

  URI: http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=9621

- **ITU-T M.mivrcc**: This Recommendation specifies the requirements and analysis for the management interface between the cloud operational support system (COSS) and the virtualized resource management (VRM) agent. This Recommendation follows the interface specification methodology described in [ITU-T M.3020].

  In this Recommendation, the VRM agent stands for the management and control aspects of abstraction and control functions within resource and network layer of the cloud computing reference architecture (CCRA) [ITU-T Y.CCRA]. The COSS represents an integrated management system across a global management domain which implements operational related management capabilities required in order to manage and control the cloud services offered to customers.

  In this Recommendation, the functional requirements for the management interface are specified, which include configuration management, fault management, and performance management. In the analysis part, the detailed information model supporting the above functions across the management interface is provided.

  This Recommendation only focuses on the computing and storage related virtualized resources in cloud computing environment, such as resource pool, template, virtual machine, virtual machine image, volume, and network interface. Networking related virtualized resources such as virtualized network, virtualized link, virtualized node, and virtualized port can be derived from the corresponding Information Object Classes (IOCs) defined in [ITU-T M.3160], which is out of the scope of this Recommendation.

  URI: http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=9623

Table 9-2 – Analysis of ITU-T JRG-CCM deliverables

	General, definition	**Requirements Use Cases**	**Architecture**	**API, interface, profile**	**Format, schema**	**others**
Fundamental						
Cloud service category						
Security						
Management	M.3070/Y.3521	M.rcsm, Y.e2ecslm-req	M.3070/Y.3521			
Inter cloud, CSB						
SLA, metering						
Testing						
Others						

[Editor's note on July 2016] The deliverables in this clause should be allocated in the table. Contributions or liaison are invited.

10 ITU-T SG17

Title of deliverable	Current status	Starting date	Target date
X.1601, Security framework for cloud computing	Recommendation	2010-04	2015-10-29
X.1631 | ISO/IEC 27017, Information technology - Security techniques - Code of practice for information security controls based on ISO/IEC 27002 for cloud services	Recommendation		2015-07-14
X.1642, Guidelines of operational security for cloud computing	Recommendation	2012-03	2016-03
X.1602, Security functional requirements for Software as a Service (SaaS) application environment	Recommendation	2011-04	2016-03
ITU-T X.1641, Guidelines for cloud service customer data security	Draft Recommendation	2014-09	2016-09 for approval
ITU-T X.dsms, Data security requirements for the monitoring service of cloud computing	Draft Recommendation	2015-09	Q4 2017 for determination
X.SRIaaS: Security requirements of public infrastructure as a service (IaaS) in cloud computing	Draft Recommendation	2016-03	Q4 2018 for determination

- **X.1601**: This Recommendation provides guidelines for cloud service customer data security in cloud computing, for those cases where the cloud service provider (CSP) is responsible for ensuring that the data is handled with proper security. This is not always the case, since for some cloud services the security of the data will be the responsibility of the cloud service customer (CSCs) themselves. In other cases, the responsibility may be mixed.

  For example, in some cases the CSP may be responsible for restricting access to the data, while the CSC remains responsible for deciding which cloud service users (CSUs) should have access to it, and the behaviour of any scripts or applications with which the CSU processes the data.

  This Recommendation identifies security controls for cloud service customer data that can be used in different stages of the full data lifecycle. These security controls may differ when the security level of the cloud service customer data changes. Therefore, the Recommendation provides guidelines on when each control should be used for best security practice.

  URI: http://www.itu.int/ITU-T/recommendations/rec.aspx?id=12613

- **ITU-T X.1631 | ISO/IEC 27017**: Recommendation ITU-T X.1631 | ISO/IEC 27017 provides guidelines for information security controls applicable to the provision and use of cloud services by providing:

  - additional implementation guidance for relevant controls specified in ISO/IEC 27002;
  - additional controls with implementation guidance that specifically relate to cloud services.

  This Recommendation | International Standard provides controls and implementation guidance for both cloud service providers and cloud service customers.

URI: http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=12490

- **ITU-T X.1642**: This Recommendation provides guideline of operational security for cloud computing, which includes guidance of service level agreement (SLA) and daily security maintenance for cloud computing. The target audiences of this Recommendation are cloud service providers, such as traditional telecom operators, ISPs and ICPs.

  URI: http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=12616

- **ITU-T X.1602**: This Recommendation provides a generic functional description for secure service oriented Software as a Service (SaaS) application environment that is independent of network types, operating system, middleware, vendor specific products or solutions. In addition, this Recommendation is independent of any service or scenarios specific model (e.g., web services, Parlay X or REST), assumptions or solutions. This Recommendation describes a structured approach for defining, designing, and implementing secure and manageable service oriented capabilities in telecommunication cloud computing environment.

  URI: http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=12615

- **ITU-T X.dsms**: Recommendation ITU-T X.dsms analyses data security requirements for the monitoring service of cloud computing which include monitoring data scope requirements, monitoring data lifecycle, security requirements of monitoring data acquisition and security requirements of monitoring data storage. Monitoring data scope requirements include the necessary monitoring scope that CSPs should provide to maintain the cloud security and the biggest monitoring scope of CSPs. Monitoring data lifecycle includes data creation, data store, data use, data migrate, data present, data destroy and data backup. Monitoring acquisition determines the security requirements of the acquisition techniques of monitoring service. Monitoring data storage determines the security requirements for CSPs to store the monitoring data.

  URI: http://www.itu.int/ITU-T/workprog/wp_item.aspx?isn=10636

- **ITU-T X.SRIaaS**: Infrastructure as a Service (IaaS) is one of the representative categories of cloud services, in which the cloud capabilities service provided to the CSC is an infrastructure capabilities type. IaaS environments and virtualized services are facing more challenges and threats than traditional information technology infrastructure and application. Platforms that share computing, storage, and network services need protections specific to the threats in the IaaS environment. If these threats are not carefully addressed, it will have very negative impact on the development of IaaS services. This recommendation aims to document the security requirements of public IaaS. This will be helpful for IaaS CSPs to improve the overall security level throughout the planning, constructing and operating stages of IaaS platform and services. This work also complements the security standardization activity related to Software Defined Networks, especially X.sdnsec.

  URI: http://www.itu.int/ITU-T/workprog/wp_item.aspx?isn=10903

Table 10-3 – Analysis of ITU-T SG17 deliverables

	General, definition	**Requirements Use Cases**	**Architecture**	**API, interface, profile**	**Format, schema**	**others**
Fundamental						
Cloud service category						

Security						
Management						
Inter cloud, CSB						
SLA, metering						
Testing						
Others						

[Editor's note on July 2016] The deliverables in this clause should be allocated in the table. Contributions or liaison are invited.

11 ITU-T SG5

Title of deliverable	Current status	Starting date	Target date
ITU-T L.1200, Direct current power feeding interface up to 400V at the input to telecommunication and ICT equipment	Recommendation		Approved 05/2012
ITU-T L.1300, Best practices for green data centres	Recommendation		Approved 06/2014
ITU-T L.1410, Methodology for environmental life cycle assessments of information and communication technology goods, networks and services	Recommendation		Approved 12/2014
ITU-T L.1301, Minimum data set and communication interface requirements for data centre energy management	Recommendation		Approved 05/2015
ITU-T L.1201, Architecture of power feeding systems of up to 400 VDC	Recommendation		Approved 03/2014
ITU-T L.1202, Methodologies for evaluating the performance of an up to 400 VDC power feeding system and its environmental impact	Recommendation		Approved 04/2015
ITU-T L.1420, Methodology for energy consumption and greenhouse gas emissions impact assessment of information and communication technologies in organizations	Recommendation		Approved 02/2012
ITU-T L.1430, Methodology for assessment of the environmental impact of information and communication technology greenhouse gas and energy projects	Recommendation		Approved 12/2013
ITU-T L.1302 (L.Assessments_DC) Assessment of energy efficiency on infrastructure in data centre and telecom centre	Draft Recommendation		Consented on 23.10.2015

ITU-T L.1320 (L.MandM_infra), Energy efficiency metrics and measurement for power and cooling equipment for telecommunications and data centres	Recommendation		Approved 03-2014
ITU-T L.renewable, Interfacing of renewable energy or distributed power sources to up to 400 VDC power feeding systems	Agreed to initiate the work	Dec. 2013	2016
ITU-T L.green_mgm_DC, Functionality requirements and framework of green data center energy-saving management system	WI approved	December 2014	2016
ITU-T L.1440, Methodology for environmental impact assessment of information and communication technologies at city level	Recommendation		Approved 23.10.2015
ITU-T L.1204 (L.ext_arch), Extented architecture of power feeding systems of up to 400 VDC	Draft Recommendation		Consented on 27.4.2016
ITU-T L. ENST1overview, Innovative energy storage technology for stationary use - Part 1: Overview of energy storage	Draft Recommendation		2016

- **ITU-T L.1200**: This Recommendation specifies the direct current (DC) interface between the power feeding system and ICT equipment connected to it. It also describes normal and abnormal voltage ranges, and immunity test levels for ICT equipment to maintain the stability of telecommunication and data communication services. The specified interface is operated from a DC power source of up to 400 V to allow increased power consumption and equipment power density, in order to obtain higher energy efficiency and reliability with less material usage than using a lower voltage such as -48 VDC or AC UPS power feeding solutions.

  URI: http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=11638

- **ITU-T L.1300**: This Recommendation specifies best practices aimed at developing green data centres. A green data centre can be defined as a repository for the storage, management, and dissemination of data in which the mechanical, lighting, electrical and computer systems are designed for maximum energy efficiency and minimum environmental impact. The construction and operation of a green data centre includes advanced technologies and strategies. The Recommendation provides a set of rules to be referred to when undertaking improvement of existing data centres, or when planning, designing or constructing new ones.

  URI: http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=12204

- **ITU-T L.1410**: Recommendation ITU-T L.1410 deals with environmental life cycle assessments (LCAs) of information and communication technology (ICT) goods, networks and services. It is organized in two parts:

  - Part I: ICT life cycle assessment: framework and guidance
  - Part II: "Comparative analysis between ICT and reference product system (Baseline scenario); framework and guidance".

  Part I deals with the life cycle assessment (LCA) methodology applied to ICT goods, networks and services. Part II deals with comparative analysis based on LCA results of an ICT goods, networks and services product system, and a reference product system.

URI: http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=12207

- **ITU-T L.1301**: Recommendation ITU-T L.1301 establishes a minimum data set necessary to manage data centres and telecommunication rooms in an environmentally responsible manner.

  The Recommendation specifies the communication interface and defines the parameters to be communicated depending on the equipment used in data centres, such as power systems (alternating current (AC)/direct current (DC) and uninterruptible power supply (UPS) and energy distribution), cooling systems and information and communication technology (ICT) equipment.

  URI: http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=12428

- **ITU-T L.1201**: Recommendation ITU-T L.1201 describes the architecture of power feeding systems of up to 400 VDC for information and communication technology (ICT) equipment in telecommunication centres, data centres and customer premises. It describes aspects such as configuration, redundancy, power distribution and monitoring, in order to construct safe, reliable and manageable power feeding systems. It can be used also as an architecture reference model for further Recommendations e.g., on the performance of DC power feeding systems.

  URI: http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=12135

- **ITU-T L.1202**: Recommendation ITU-T L.1202 is provided as a complement to Recommendation ITU-T L.1201, which describes the architecture of direct current (DC) power systems with an up to 400 VDC information and communication technology (ICT) equipment interface. The up to 400 VDC ICT equipment interface is described in Recommendation ITU-T L.1200.

  Recommendation ITU-T L.1202 provides a framework for assessing performances of up to 400 VDC power feeding systems and the savings incurred when compared to other power feeding systems such as the −48 VDC power system and the AC uninterruptable power system (UPS) commonly used in information and communication technology (ICT) sites.

  This Recommendation deals with performance factors such as efficiency, reliability/availability and environmental impact.

  URI: http://www.itu.int/ITU-T/recommendations/rec.aspx?id=12427

- **ITU-T L.1420**: Recommendation ITU-T L.1420 presents the methodology to be followed if an organization intends to claim compliance with this Recommendation when assessing its information and communication technology (ICT) related energy consumption and/or greenhouse gas (GHG) emissions.

  This Recommendation can be used to assess energy consumption and GHG emissions generated over a defined period of time for the following purposes: for assessment of related impact from ICT organizations or for assessment of impact from ICT related activities within non-ICT organizations.

  URI: http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=11431

- **ITU-T L.1430**: Recommendation ITU-T L.1430 is intended as a complement to ISO standard ISO 14064-2 and the Project Protocol of the Greenhouse Gas Protocol (GHG Protocol).

  This Recommendation provides guidance for the application of a specific methodology to assess the environmental impact of information and communication technology (ICT) greenhouse gas (GHG) and energy projects. This assessment methodology is specifically directed at quantifying and reporting GHG emission reductions, GHG removal enhancements, energy consumption reductions, and enhancement of energy generation and storage in ICT GHG and energy projects.

An ICT GHG project uses mainly ICT goods, networks and services (GNS) and is designed to reduce GHG emissions or increase GHG removals that are quantified by comparison between the environmental impact of a project activity and a corresponding baseline scenario.

An ICT energy project uses mainly ICT goods, networks and services to reduce energy consumption and improve energy efficiency.

From the ICT perspective, this Recommendation takes into account considerations based on existing project quantification guidelines and aims at covering ICT GHG and energy project activities within both the ICT and the non-ICT sectors.

This Recommendation recognizes the importance of project validation and verification for the credibility of project results but does not enforce the validation and verification procedures to be applied. It is expected that such procedures will be determined by the selected GHG programme, national regulations, the project proponent's internal policy or the intended user's request.

URI: http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=11904

- **ITU-T L.1302**: Recommendation ITU-T L.1302 contains the energy efficiency assessment methodology for data centre and telecom centre, test equipment accuracy requirements, assessment period, assessment conditions and calculation methods.

  For data centre and telecom centre, it was divided into assessment methods for whole data centre /telecom centre efficiency and partial data centre/telecom centre.

  As main energy consuming infrastructure in data centre/telecom centre are power feeding system (power supply system) and cooling system, both system energy efficiency measurement methodologies are covered in this Recommendation.

  It will take advantage of methodologies and best practices currently in used or in development in networks and data centre/telecom centre.

  This Recommendation aimed at reducing the negative impact of data centre and telecom centre through providing the methodologies of energy efficiency assessment. It is commonly recognized that data centre and telecom centre will have an ever-increasing impact on the environment in the future. The application of the assessment methods defined in this Recommendation can help owners and managers to build future data centres/telecom centres, or improve existing ones, to operate in an environmentally responsible manner.

  URI: http://www.itu.int/ITU-T/workprog/wp_item.aspx?isn=9653

- **ITU-T L.1320**: Recommendation ITU-T L.1320 contains the general definition of metrics, test procedures, methodologies and measurement profiles required to assess the energy efficiency of power and cooling equipment for telecommunications and data centres. More detailed measurement procedures and specifications can be developed in future related ITU-T Recommendations.

  Metrics and measurement methods are defined for power equipment, alternating current (AC) power feeding equipment (such as AC uninterruptible power supply (UPS), direct current (DC/AC) inverters), DC power feeding equipment (such as AC/DC rectifiers, DC/DC converters), solar equipment, wind turbine equipment and fuel cell equipment.

  In addition, metrics and measurement methods are defined for cooling equipment such as air conditioning equipment, outdoor air cooling equipment and heat exchanging cooling equipment.

  URI: http://www.itu.int/ITU-T/recommendations/rec.aspx?id=12136

- **ITU-T L.renewable**: Defining interface and architecture for injecting renewable energy and distributed power sources into an up to 400 V power system as defined in L.architecture.

URL: http://www.itu.int/ITU-T/workprog/wp_item.aspx?isn=10018

- **ITU-T L.green_mgm_DC**: This Recommendation describes Functionality requirements and framework of green data center energy-saving management system. The energy-saving will be realized through performance to increase the energy efficiency of data center. The scope of this Recommendation includes:
  - Characteristics and operation flow of green data center energy-saving management system
  - Functionality requirements of green data center energy-saving management system (eg: Real-time energy consumption data acquisition; Energy consumption data analysis and chart show; Energy consumption data query; Energy consumption monitoring and early warning; Strategy Optimization, etc.)
  - Capability needs of green data center energy-saving management system (eg: collect data from different communication interface; secure storage; control management, etc.)
  - Framework of green data center energy-saving management system

  Sensor definition, interface and protocol are not included in the scope of this Recommendation.

  URL: http://web.itu.int/ITU-T/workprog/wp_item.aspx?isn=10367

- **ITU-T L.1440**: Recommendation ITU-T L.1440 gives general guidance for city level environmental assessments related to ICT, and provides a description of methodologies to be used for the assessment of the environmental impact of ICT in cities.

  In this first edition of this Recommendation, the assessment is limited to energy consumption and GHG emissions.

  The present Recommendation is divided in two parts.
  - Part I relates to the first order effects from the use of ICT goods and networks in city´s organizations and households.
  - Part II relates to the first and second order effects from ICT projects and services applied in the city.

  This Recommendation provides specific guidance in setting the city boundaries, preparing and performing the assessment of ICT related GHG emissions and energy consumption at city level.

  URI: http://www.itu.int/ITU-T/recommendations/rec.aspx?id=12431

- **ITU-T L.1204**: Recommendation ITU-T L.1204 describes the extended architecture of power feeding systems of up to 400 volts DC (VDC) for information and communication technology (ICT) equipment in telecommunication centres, data centres and customer premises. It describes aspects such as configuration, redundancy, power distribution and monitoring, in order to construct safe, reliable and manageable power feeding systems. This Recommendation can be used also as an architecture reference model for future Recommendations e.g. on the performance of DC power feeding systems. This Recommendation describes extended power feeding architectures using up to 400 VDC e.g. hybrid redundant DC and AC power feeding based on Recommendation ITU-T L.1201.

  URI: http://www.itu.int/ITU-T/workprog/wp_item.aspx?isn=10716

- **ITU-T L. ENST1overview**: Overview of evolution of Energy Storage for stationary use for ICT/Telecom equipment. Global results of investigations from lab and field tests of solutions for site, network, data centre, and CPE resilience in smart sustainable city. Mobile and portable batteries are out of the scope.

URI: http://www.itu.int/ITU-T/workprog/wp_item.aspx?isn=10713

Table 11-4 – Analysis of ITU-T SG5 deliverables

	General, definition	Requirements Use Cases	Architecture	API, interface, profile	Format, schema	others
Fundamental						
Cloud service category						
Security						
Management						
Inter cloud, CSB						
SLA, metering						
Testing						
Others						

[Editor's note on July 2016] The deliverables in this clause should be allocated in the table. Contributions or liaison are invited.

12 ITU-T SG11

Title of deliverable	Current status	Starting date	Target date
ITU-T Q.4040, The framework and overview of Cloud Computing interoperability testing	Recommendation	2013-02	2016-02-13
Q. infra-iop, Interoperability testing of infrastructure capabilities type	Draft Recommendation		2017 2Q
Q.wa-iop, Cloud Interoperability testing about Web Application	Draft Recommendation	2016-04	2017 Q4

- **ITU-T Q.4040**: This Recommendation describes the framework and provides an overview of Cloud Computing interoperability testing. According to the identified target areas of testing, the framework Recommendation includes overview of cloud computing interoperability testing with common confirmed items, infrastructure capabilities type, platform capabilities type and application capabilities type interoperability testing.

  URI: http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=12703

- **ITU-T Q.infra-iop**: As described in Q.4040, there are three different type of cloud interoperability testing: infrastructure capabilities type interoperability testing, platform capabilities type interoperability testing, and application capabilities type interoperability testing. This document focuses on the interoperability testing of infrastructure capabilities type, in which the CSC can provision and use processing, storage or networking resources. Interoperability testing of infrastructure capabilities type in this document covers following four target areas:

  URI : http://www.itu.int/ITU-T/workprog/wp_item.aspx?isn=10510

- **ITU-T Q.wa-iop**: This document focuses on the Cloud interoperability testing about Web Application.

  URI: http://www.itu.int/ITU-T/workprog/wp_item.aspx?isn=10943

Table 12-5 – Analysis of ITU-T SG11 deliverables

	General, definition	Requirements Use Cases	Architecture	API, interface, profile	Format, schema	others
Fundamental						
Cloud service category						
Security						
Management						
Inter cloud, CSB						
SLA, metering						
Testing	ITU-T Q.4040					Q. infra-iop, Q.wa-iop
Others						

[Editor's note on July 2016] The deliverables in this clause should be allocated in the table. Contributions or liaison are invited.

13 ITU-T SG16

Title of deliverable	Current status	Starting date	Target date
ITU-T H.248.CLOUD, Gateway control protocol: Cloudification of packet gateways	Draft Recommendation	July 2014	2016

- **ITU-T H.248.CLOUD**: This Recommendation does not define any new signalling extensions for the H.248 gateway control protocol.

  URI: http://www.itu.int/ITU-T/workprog/wp_item.aspx?isn=10200

Table 13-6 – Analysis of ITU-T SG16 deliverables

	General, definition	Requirements Use Cases	Architecture	API, interface, profile	Format, schema	others
Fundamental						
Cloud service category						
Security						

Management						
Inter cloud, CSB						
SLA, metering						
Testing						
Others						

[Editor's note on July 2016] The deliverables in this clause should be allocated in the table. Contributions or liaison are invited.

14 ISO/IEC JTC 1 SC 38

Title of deliverable	Current status	Starting date	Target date
ITU-T Y.3500|ISO/IEC 17788, Information technology – Cloud computing – Overview and vocabulary	Recommendation | IS	September 2012	August 2014
ITU-T Y.3502|ISO/IEC 17789, Information technology — Cloud computing – Reference architecture	Recommendation | IS	September 2012	August 2014
ISO/IEC 19086-1, Cloud Computing – Service Level Agreement (SLA) Framework – Part 1 : Overview and Concepts	DIS	2013-02-23	Sept 2016
ISO/IEC 19086-2, Information Technology - Cloud Computing – Service Level Agreement (SLA) Framework – Part 2 : Metric Model	CD	2014-10-06	Mar 2017
ISO/IEC 19086-3, Information Technology - Cloud Computing – Service Level Agreement (SLA) Framework – Part 3 : Core Conformance Requirements	CD	2014-10-06	Mar 2017
ISO/IEC 19941, Information Technology - Cloud Computing – Interoperability and Portability	CD	Oct 2014	Oct 2017
ISO/IEC 19944, Information Technology - Cloud Computing - Data and their Flow across Devices and Cloud Services	CD	Oct 2014	Oct 2017

- **ITU-T Y.3500|ISO/IEC 17788**: This Recommendation | International Standard provides an overview of cloud computing along with a set of terms, definitions and concepts. It is a terminology foundation for the cloud computing standardization work.

  This Recommendation | International Standard is applicable to all types of organization (e.g. commercial enterprises, government agencies, not-for-profit organizations).

  URI: http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=12210

- **ITU-T Y.3502|ISO/IEC 17789**: This Recommendation | International Standard specifies the cloud computing reference architecture (CCRA). The reference architecture includes the cloud computing roles, cloud computing activities as well as the cloud computing functional components and their relationships.

URI: http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=12209

- **ISO/IEC 19086-1**: This international standard specifies: an overview of Service Level Agreements (SLA)s for cloud services, identification of the relationship between the master service agreement and the SLA, cloud SLA concepts that can be used to build SLAs, and terms commonly used in SLAs for cloud services. This standard is for the benefit and use for providers and customers.

  This standard does not provide a standard structure that would be used for cloud SLA contracts. Contracts are highly customized items between providers and customers so this standard seeks to establish a set of common cloud SLA building blocks (concepts, terms, definitions, contexts) that can then be used to create cloud SLAs that will help avoid confusion and facilitate common understanding between the cloud service providers and the cloud service customers. This international standard does not supersede any legal requirement.

  URI: http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=67545

- **ISO/IEC 19086-2**: This part of ISO/IEC 19086 defines a model for specifying metrics for Cloud Service Level Agreements (SLAs) and includes applications of the model with examples. This part of ISO/IEC 19086 establishes a common terminology and approach for specifying metrics.

  This standard is for the benefit and use of both cloud service providers and cloud service customers.

  This standard is intended to complement ISO/IEC 19086-1, ISO/IEC 19086-3 and ISO/IEC 19086-4.

  This part of ISO/IEC 19086 does not mandate the use of a specific set of metrics for cloud SLAs.

  This part of ISO/IEC 19086 does not supersede any legal requirement.

  URI: http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=67546

- **ISO/IEC 19086-3**: This international standard specifies: core conformance requirements for Service Level Agreements (SLA)s for cloud services for ISO/IEC 19086. This standard is for the benefit and use for providers and customers.

  This standard does not provide a standard structure that would be used for cloud SLA contracts.

  URI: http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=67547

- **ISO/IEC 19941**: This international standard specifies: cloud computing interoperability and portability types, the relationship and interactions between these two aspects, and common terminology and concepts used to discussing interoperability and portability and particularly relating to cloud services.

  URI: http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=66639

- **ISO/IEC 19944**: This International Standard provides the structure for transparency about data in portable devices and cloud services ecosystem and specify an expanded reference architecture for this ecosystem.

  URI: http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=66674

Table 14-7 – Analysis of JTC 1 SC 38 deliverables

	General, definition	**Requirements Use Cases**	**Architecture**	**API, interface, profile**	**Format, schema**	**others**

Fundamental						
Cloud service category						
Security						
Management						
Inter cloud, CSB						
SLA, metering						
Testing						
Others						

[Editor's note on July 2016] The deliverables in this clause should be allocated in the table. Contributions or liaison are invited.

15 DMTF

Title of deliverable	Current status	Starting date	Target date
DSP0263, Cloud Infrastructure Management Interface (CIMI) Model and REST Interface over HTTP – Version 1.0.1	Published		January 2012
DSP8009, CIMI XML Schema – Version 1.0.1	Published		January 2012
DSP0264, Cloud Infrastructure Management Interface - Common Information Model (CIMI-CIM) – Version 1.0.0	Published		January 2013
DSP0243, Open Virtualization Format Specification - Version 1.1	Published DMTF Standard INCITS 469-2010 ISO/IEC 17203:2011		January 2012
DSP0243, Open Virtualization Format Specification - Version 2	Published	January 2012	December 2012
DSP8023 OVF Envelope XSD - Version 2.0	Published		2012-01-01

- **DSP0263**: This specification describes the model and protocol for management interactions between a cloud Infrastructure as a Service (IaaS) Provider and the Consumers of an IaaS service. The basic resources of IaaS (machines, storage, and networks) are modeled with the goal of providing Consumer management access to an implementation of IaaS and facilitating portability between cloud implementations that support the specification. This document specifies a Representational State Transfer (REST)-style protocol using HTTP. However, the underlying model is not specific to HTTP, and it is possible to map it to other protocols as well.

  CIMI addresses the management of the lifecycle of infrastructure provided by a Provider. CIMI does not extend beyond infrastructure management to the control of the applications and services that the Consumer chooses to run on the infrastructure provided as a service by the Provider.

Although CIMI may be to some extent applicable to other cloud service models, such as Platform as a Service ("PaaS") or Storage as a Service ("SaaS"), these uses are outside the design goals of CIMI.

URI: http://dmtf.org/sites/default/files/standards/documents/DSP0263_1.0.1.pdf

- **DSP8009**: The XML Schema for the XML serialization of the CIMI model can be found at: http://schemas.dmtf.org/cimi/1/DSP8009.xsd

  The schema provided does not intend to reflect every single modeling constraint and requirement specified in the model. This schema is designed to apply more broadly to any model-related serialized material found in Consumer requests as well as in Provider responses, and is intended to provide a preliminary, non-exhaustive syntactic check on these.

  URI: http://schemas.dmtf.org/cimi/1/dsp8009_1.0.1.xsd

- **DSP0243**: DMTF's Open Virtualization Format (OVF) is a packaging standard designed to address the portability and deployment of virtual appliances. OVF enables simplified and error-free deployment of virtual appliances across multiple virtualization platforms.

  OVF is a common packaging format for independent software vendors (ISVs) to package and securely distribute virtual appliances, enabling cross-platform portability. By packaging virtual appliances in OVF, ISVs can create a single, pre-packaged appliance that can run on customers' virtualization platforms of choice.

  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.

  URI: http://dmtf.org/sites/default/files/standards/documents/DSP0243_1.1.0.pdf

- **DSP0243**: OVF 2 Features:
  - Support for Network Ports
  - Scaling at deployment time
  - Support for basic placement policies
  - Encryption of OVF packages
  - Disk sharing at runtime
  - Advanced Device Boot Order
  - Advanced Data Transfer to Guest OS
  - Support for Improved Internationalization - I18N
  - Support of HASH Improved
  - Updated CIM schema

  URI: http://dmtf.org/sites/default/files/standards/documents/DSP0243_2.0.0.pdf

- **DSP8023**: This document defines an XML schema for representing DMTF Open Virtualization Format for OVF Envelope 2.0 sections as defined in DMTF DSP1001 1.1. XML instance documents using this XML schema represent DMTF management profiles in a "machine-readable" form. This XML schema uses the "Venetian Blind" design pattern: Only the XML elements intended to be used as root elements are declared as global elements in the XML schema, and all relevant XML types are declared as global types.

URI: http://schemas.dmtf.org/ovf/envelope/2/dsp8023_2.0.0.xsd

Table 15-8 – Analysis of DMTF deliverables

	General, definition	Requirements Use Cases	Architecture	API, interface, profile	Format, schema	others
Fundamental						
Cloud service category						
Security						
Management						
Inter cloud, CSB						
SLA, metering						
Testing						
Others						

[Editor's note on July 2016] The deliverables in this clause should be allocated in the table. Contributions or liaison are invited.

16 TM Forum

Title of deliverable	Current status	Starting date	Target date
TMF061 Release 1.0, Service Delivery Framework (SDF) Reference Architecture, Release 1.0	Published		2009-07-28

- **TMF061 Release 1.0**: The SDF RA Release 1 defines the scope and characteristics of the essential elements which constitute the patterns that the SDF architecture must support.

  URI: http://www.tmforum.org/TechnicalSpecifications/TMF061ServiceDelivery/39341/article.html

Table 16-9 – Analysis of TM Forum deliverables

	General, definition	Requirements Use Cases	Architecture	API, interface, profile	Format, schema	others
Fundamental						
Cloud service category						
Security						
Management						
Inter cloud, CSB						

SLA, metering						
Testing						
Others						

[Editor's note on July 2016] The deliverables in this clause should be allocated in the table. Contributions or liaison are invited.

17 ETSI

18 ATIS

Title of deliverable	Current status	Starting date	Target date
ATIS-0200005, Cloud Framework for Telepresence Service	Published		2012-02
ATIS-0200008, Trusted Information Exchange (TIE)	Published		2012-10
ATIS-0200009, Cloud Service Lifecycle Checklist	Published		2012-11
ATIS-0200006: Virtual Desktop Requirements	Published		2012-05
ATIS-0200010: CDN Interconnection Use Cases and Requirements in a Multi-Party Federation Environment	Published		2012-12
ATIS-0200011, Multicast Delivery of Content to Mobile End User Devices	Approved		2014-02

- **ATIS-0200005**: This specification establishes a foundation for continuing ATIS work efforts on Unified Visual Communications. The specification explores a provider-agnostic and product-agnostic implementation. It will consider two primary aspects of the telepresence service. The first is use cases such as immersive telepresence that are deployed today. The second are future cases resulting from the application of the cloud and service evolution in the future.

  URI: http://www.atis.org/docstore/product.aspx?id=26079

- **ATIS-0200008**: This document describes the Trusted Information Exchange as an aggregated service and lists the high level requirements.

  URI: http://www.atis.org/docstore/product.aspx?id=26798

- **ATIS-0200009**: The Cloud Service Lifecycle checklist establishes a baseline of expectations between providers who are interoperating cloud services. The document will also be referenced in cloud service standards to provide a reference model for requirements development. Each enterprise has an existing governance model. The lifecycle checklist provides a way to extend the process model between participating companies.

  URI: http://www.atis.org/docstore/product.aspx?id=27854

- **ATIS-0200006**: This document addresses hosted virtual desktop services for medium and large enterprises. It specifies a federation framework to allow service providers to support high-performance virtual desktops beyond their normal coverage areas. The document also identifies

an initial set of infrastructure-service interfaces and related requirements. This is a logical basis for the work on cloud infrastructure federation.

URI: http://www.atis.org/docstore/product.aspx?id=26147

- **ATIS-0200010**: ATIS Standard ATIS-0200003 provided initial use cases and requirements for Content Distribution Network (CDN) Interconnection between two CDN providers via Cache-based Unicast delivery method. ATIS Standard ATIS-0200004 developed use cases and requirements for content distribution via Multicast-based delivery. This standard, ATIS-0200005, extends the use cases and requirements for an environment involving multiple CDN providers joining together to form a CDN Federation. The interconnection lifecycle use cases and requirements developed in the previous two ATIS standards are re-examined for the impact arising from a federation of multiple CDN providers. Additional emphasis is placed on the interconnection domain functionality such that guidance on the eventual development of network-network interconnect (NNI) architectures and supporting protocol requirements can be derived.

  URI: http://www.atis.org/docstore/product.aspx?id=27860

- **ATIS-0200011**: This document extends previous ATIS work on multicast-based content delivery methods to mobile End User devices. Three Use Cases describe potential situations where such devices can receive multicast-based broadcasts of specific live events/video content via the 3GPP Evolved Multimedia Broadcast Multicast System (eMBMS). Delivery processes, assumptions, Content Delivery Network interconnection implications, and supporting requirements are also provided.

  URI: https://www.atis.org/docstore/product.aspx?id=28155

Table 18-10 – Analysis of ATIS deliverables

	General, definition	**Requirements Use Cases**	**Architecture**	**API, interface, profile**	**Format, schema**	**others**
Fundamental						
Cloud service category						
Security						
Management						
Inter cloud, CSB						
SLA, metering						
Testing						
Others						

[Editor's note on July 2016] The deliverables in this clause should be allocated in the table. Contributions or liaison are invited.

19 Broadband Forum

Title of deliverable	Current status	Starting date	Target date
WT-302, Framework for Cloud Services in Broadband Networks	Draft	3Q2012	4Q2013

- **WT-302**: WT-302 describes use cases for Cloud Services in context with previous work at BBF and elsewhere, in order to help position potential future Multi Service Broadband Network (MSBN) features. Use cases and related gap analysis identify where additional work to support Cloud Services in the BBF defined MSBN may be required. Analysis determines implications on areas of MSBN architecture, network functionalities including interfaces, service model, security, billing and operations.

  URI: http://www.broadband-forum.org/

Table 19-11 – Analysis of Broadband Forum deliverables

	General, definition	Requirements Use Cases	Architecture	API, interface, profile	Format, schema	others
Fundamental						
Cloud service category						
Security						
Management						
Inter cloud, CSB						
SLA, metering						
Testing						
Others						

[Editor's note on July 2016] The deliverables in this clause should be allocated in the table. Contributions or liaison are invited.

20 Metro Ethernet Forum

Title of deliverable	Current status	Starting date	Target date
Carrier Ethernet Services for Cloud Use Cases	Working Drafts	March 2012	April 2014
Carrier Ethernet Services for Cloud Management Interface Profile	Working Drafts	March 2012	April 2014

- **Carrier Ethernet Services for Cloud Use Cases**:
  - Includes both Single and Multiple Ethernet Cloud Carrier Domain cases
  - Part1: for Cloud Provider Interconnect (CP to CP)

- Part2: for Enterprise Access to CP

URI: [TBD]

- **Carrier Ethernet Services for Cloud Management Interface Profile**:
  - Identify relevant Protocol Neutral MEF 7.x objects (and attributes)
  - Operational Use Cases and information requirements for CP to ECC management interface.
  - Focus on reconfiguration of specific Service Attributes (e.g., CIR)
  - Phase 1 approach: Changes to Service Attributes occur only when EVC/OVC is inactive or during a Maintenance Interval
  - Explore scheduled reconfiguration, and configuration durations.
  - Provide Interface Operational Requirements: Number of changes allowed over time (how long change should last); lead time for request fulfillment.
  - Describe SLSs for management interactions (performance metrics)

  URI: [TBD]

Table 20-12 – Analysis of Metro Ethernet Forum deliverables

	General, definition	**Requirements Use Cases**	**Architecture**	**API, interface, profile**	**Format, schema**	**others**
Fundamental						
Cloud service category						
Security						
Management						
Inter cloud, CSB						
SLA, metering						
Testing						
Others						

[Editor's note on July 2016] The deliverables in this clause should be allocated in the table. Contributions or liaison are invited.

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Bibliography