

International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Series Q
Supplement 65
(07/2014)

SERIES Q: SWITCHING AND SIGNALLING

Cloud computing interoperability activities

ITU-T Q-series Recommendations – Supplement 65

ITU-T

ITU-T Q-SERIES RECOMMENDATIONS
SWITCHING AND SIGNALLING

SIGNALLING IN THE INTERNATIONAL MANUAL SERVICE	Q.1–Q.3
INTERNATIONAL AUTOMATIC AND SEMI-AUTOMATIC WORKING	Q.4–Q.59
FUNCTIONS AND INFORMATION FLOWS FOR SERVICES IN THE ISDN	Q.60–Q.99
CLAUSES APPLICABLE TO ITU-T STANDARD SYSTEMS	Q.100–Q.119
SPECIFICATIONS OF SIGNALLING SYSTEMS No. 4, 5, 6, R1 AND R2	Q.120–Q.499
DIGITAL EXCHANGES	Q.500–Q.599
INTERWORKING OF SIGNALLING SYSTEMS	Q.600–Q.699
SPECIFICATIONS OF SIGNALLING SYSTEM No. 7	Q.700–Q.799
Q3 INTERFACE	Q.800–Q.849
DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 1	Q.850–Q.999
PUBLIC LAND MOBILE NETWORK	Q.1000–Q.1099
INTERWORKING WITH SATELLITE MOBILE SYSTEMS	Q.1100–Q.1199
INTELLIGENT NETWORK	Q.1200–Q.1699
SIGNALLING REQUIREMENTS AND PROTOCOLS FOR IMT-2000	Q.1700–Q.1799
SPECIFICATIONS OF SIGNALLING RELATED TO BEARER INDEPENDENT CALL CONTROL (BICC)	Q.1900–Q.1999
BROADBAND ISDN	Q.2000–Q.2999
SIGNALLING REQUIREMENTS AND PROTOCOLS FOR THE NGN	Q.3000–Q.3999

For further details, please refer to the list of ITU-T Recommendations.

Supplement 65 to ITU-T Q-series Recommendations

Cloud computing interoperability activities

Summary

Supplement 65 to ITU-T Q-series Recommendations provides the summary information for cloud computing interoperability activities of existing standards development organizations (SDOs) and the groups, forums and open sources developing the specifications that have the potential to utilize cloud computing interoperability testing tools. This supplement should also be helpful for the development of cloud testing specifications.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T Q Suppl. 65	2014-07-16	11	11.1002/1000/12212

* To access the Recommendation, type the URL <http://handle.itu.int/> in the address field of your web browser, followed by the Recommendation's unique ID. For example, <http://handle.itu.int/11.1002/1000/11830-en>.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this publication, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this publication is voluntary. However, the publication may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the publication is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the publication is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this publication 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 members or others outside of the publication development process.

As of the date of approval of this publication, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this publication. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at <http://www.itu.int/ITU-T/ipr/>.

© ITU 2015

All rights reserved. No part of this publication may be reproduced, by any means whatsoever, without the prior written permission of ITU.

Table of Contents

		Page
1	Scope.....	1
2	References.....	1
3	Abbreviations and acronyms	2
4	Introduction.....	3
5	Existing cloud computing interoperability activities	4
5.1	Standards development organizations for cloud computing interoperability	4
5.2	Testing groups, open sources and tools for cloud computing testing.....	14
5.3	Cloud security standardization activities.....	18
6	Potential interoperability testing areas of cloud computing	18
	Appendix I – Summaries of referenced documents	21
I.1	3CPP references and associated summaries	21
I.2	CSMIC references and associated summaries.....	21
I.3	DMTF references and associated summaries	21
I.4	ETSI references and associated summaries.....	21
I.5	GICTF references and associated summaries.....	22
I.6	IEEE references and associated summaries	22
I.7	IETF references and associated summaries.....	23
I.8	ISO/IEC JTC 1 references and associated summaries	23
I.9	NIST references and associated summaries	23
I.10	OASIS references and associated summaries.....	24
I.11	ODCA references and associated summaries.....	24
I.12	OGF references and associated summaries	24
I.13	SNIA references and associated summaries.....	25
I.14	TMF references and associated summaries	25
I.15	ITU-T draft Recommendation	26

Supplement 65 to ITU-T Q-Series Recommendations

Cloud computing interoperability activities

1 Scope

This supplement describes the summary information of cloud computing interoperability activities of existing standards development organizations (SDOs) and the groups, forums and open sources developing the specifications that have potential to utilize cloud computing interoperability testing tools. This supplement also provides summary list of activities by the SDOs including those of cloud computing interoperability testing areas.

2 References

ITU-T references

- [ITU-T Y.3500] Recommendation ITU-T Y.3500 (2014), *Information technology –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), *Information technology — Cloud computing -Reference architecture.*
- [ITU-T Y.3510] Recommendation ITU-T Y.3510 (2013), *Cloud computing infrastructure requirements.*
- [ITU-T Y.3512] Recommendation ITU-T Y.3512 (2014), *Cloud computing - Functional requirements of Network as a Service.*
- [ITU-T Y.3513] Recommendation ITU-T Y.3513 (2014), *Cloud computing - Functional requirements of Infrastructure as a Service.*
- [ITU-T Y.3520] Recommendation ITU-T Y.3520 (2013), *Cloud computing framework for end to end resource management.*

ETSI references

- [ETSI TR 102 997] ETSI TR 102 997 V1.1.1 (2010), *CLOUD; Initial analysis of standardization requirements for Cloud services.*
- [ETSI TR 103 125] ETSI TR 103 125 V1.1.1 (2012), *CLOUD; SLAs for Cloud services.*
- [ETSI TR 103 126] ETSI TR 103 126 V1.1.1 (2012), *CLOUD; Cloud private-sector user recommendations.*
- [ETSI TS 103 142] ETSI TS 103 142 V1.1.1 (2013), *CLOUD; Test Descriptions for Cloud Interoperability.*

IEEE references

- [IEEE P2301] IEEE P2301, *Guide for Cloud Portability and Interoperability Profiles (CPIP).*
- [IEEE P2302] IEEE P2302, *Standard for Intercloud Interoperability and Federation (SIIF).*

IETF references

- [IETF RFC 2330] IETF RFC 2330 (1998), *Framework for IP Performance Metrics*

- [IETF RFC 4110] IETF RFC 4110 (2005), *A Framework for Layer 3 Provider-Provisioned Virtual Private Networks*.
- [IETF RFC 6749] IETF RFC 6749 (2012), *The OAuth 2.0 Authorization Framework*.

NIST references

- [NIST SP 500-292] NIST SP 500-292 (2011), *NIST Cloud Computing Reference Architecture*.
- [NIST SP 500-293vol1] NIST SP 500-293, *US Government Cloud Computing Technology Roadmap Volume I Release 1.0: High-Priority Requirements to Further USG Agency Cloud Computing Adoption*.
- [NIST SP 500-293vol2] NIST SP 500-293, *US Government Cloud Computing Technology Roadmap Volume II Release 1.0: Useful Information for Cloud Adopters*.
- [NIST SP 800-145] NIST SP 800-145 (2011), *The NIST Definition of Cloud Computing*.

OASIS references

- [OASIS TOSCA-v1.0] OASIS TOSCA-v1.0, *Topology and Orchestration Specification for Cloud Applications Version 1.0*.

TM Forum references

- [TMF GB917] TMF GB917, *SLA Management Handbook*.
- [TMF GB963] TMF GB963, *Cloud SLA Application Note*.
- [TMF TR174] TMF TR174, *Enterprise-Grade External Compute IaaS Requirements*.
- [TMF TR178] TMF TR178, *Enabling End-to-End Cloud SLA Management*.
- [TMF TR194] TMF TR194, *Multi-Cloud Service Management Accelerator Pack-Introduction*.

3 Abbreviations and acronyms

This supplement uses the following abbreviations and acronyms:

3CPP	China Cloud Computing Promotion and Policy Forum
BPaaS	Business Process as a Service
CCI	Cloud Computing Interoperability
CDMI	Cloud Data Management Interface
CIMI	Cloud Infrastructure Management Interface
CMI	Cloud Management Initiative
CPIP	Cloud Portability and Interoperability Profile
CSC	Cloud Service Customer
CSMIC	Cloud Services Measurement Initiative Consortium
CSP	Cloud Service Provider
CT-CCVOCAB	Collaborative Teams on Cloud Computing Overview and Vocabulary
DAPS	Distributed Application Platforms and Services
DMTF	Distributed Management Task Force
ENISA	European Network Information Security Agency

ETSI	European Telecommunications Standards Institute
GICTF	Global Inter-Cloud Technology Forum
IaaS	Infrastructure as a Service
ICT	Information and Communication Technology
IEEE	Institute of Electrical and Electronics Engineers
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
IT	Information Technology
NaaS	Network as a Service
NIST	National Institute of Standards and Technology
OASIS	Organization for the Advancement of Structured Information Standards
OCC	Open Cloud Consortium
OCCI	Open Cloud Computing Interface
OCCI-WG	OCCI Working Group
ODCA	Open Data Center Alliance
OGF	Open Grid Forum
OVF	Open Virtualization Format
PaaS	Platform as a Service
PoC	Proof of Concept
REST	Representational State Transfer
SaaS	Software as a Service
SAJACC	Standards Acceleration to Jumpstart the Adoption of Cloud Computing
SCIM	System for Cross-domain Identity Management
SDO	Standards Development Organization
SIIF	Standard for Inter-cloud Interoperability and Federation
SLA	Service Level Agreement
SMI	Simple Management Interface
SNIA	Storage Networking Industry Association
SOA	Service Oriented Architecture
SPEC	Standard Performance Evaluation Corporation
VM	Virtual Machine

NOTE – Abbreviations not described in this supplement can be found in [ITU-T Y.3500] and other reference documents listed in clause 2.

4 Introduction

The purpose of this supplement is to provide the list of existing cloud computing interoperability and testing related activities. Clause 5 describes cloud computing interoperability activities by different standards development organizations (SDOs) while clause 6 identifies potential cloud computing

interoperability testing areas. This supplement is intended to be of help for developing cloud computing interoperability testing Recommendations.

5 Existing cloud computing interoperability activities

5.1 Standards development organizations for cloud computing interoperability

Many SDOs are developing cloud standards. Some of them are listed in ITU-T FG-Cloud technical reports. From an interoperability testing perspective, some SDOs do not conduct testing themselves but conduct joint/collaborative/sponsored testing groups as described in clause 5.2. For example, Distributed Management Task Force (DMTF), European Telecommunications Standards Institute (ETSI), Organization for the Advancement of Structured Information Standards (OASIS), Storage Networking Industry Association (SNIA) and some SDOs sponsored Cloud Plugfest as part of the Cloud Interoperability Week where, during the testing of specifications, they improved such Cloud standards as cloud data management interface (CDMI), open cloud computing interface (OCCI), cloud infrastructure management interface (CIMI) and open virtualization format (OVF). Open Data Center Alliance (ODCA) proof of concept (PoC) shows how OASIS topology and orchestration specification for cloud applications (TOSCA) standard can be used to fulfil industry requirements for application portability in the enterprise cloud. TM Forum, OASIS, W3C cover platform as a service (PaaS)/software as a service (SaaS) level cloud interoperability and testing to some extent.

This clause lists and briefly describes representative cloud computing SDOs' activities/specifications which are used in cloud interoperability testing.

5.1.1 DMTF

The mission of Distributed Management Task Force (DMTF) is to create standards that enable interoperability among multi-vendor systems, tools and solutions within the enterprise.

DMTF works on cloud computing management interface related aspects of common core identifiers (CCIs).

DMTF's cloud management initiative (CMI) is focused on developing interoperable cloud infrastructure, management standards and promoting adoption of those standards in the industry.

Cloud management working group (CMWG) and Open virtualization format working group (OVFWG) of DMTF are developing cloud computing interoperability related standards. The CIMI developed by CMWG is a self-service interface for infrastructure clouds, allowing cloud users to dynamically provision, configure and administer their cloud usage using a high level interface that abstracts away much of complexity of system management. OVF developed by OVFWG 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.

Table 5-1 – DMTF documents and work items related to CCI

Reference	Name/Title	Status
DSP-IS0101	Interoperable clouds	Published
DSP0264	CIMI-CIM specification	Published
DSP0263	CIMI model and RESTful HTTP-based protocol	Published
DSP0243	Open virtualization format specification	Published

5.1.2 ETSI

The European Telecommunications Standards Institute (ETSI) is an independent, non-profit, standardization organization in the telecommunications industry (equipment makers and network operators) in Europe, with worldwide projection.

The goal of ETSI Technical Committee CLOUD (ETSI TC CLOUD, TC GRID renamed TC CLOUD in 2010) is to address issues associated with the convergence between information technology (IT) and telecommunications, paying particular attention to the lack of interoperable cloud solutions.

ETSI works on definitions, service level agreements (SLAs) and testing methodologies related to aspects of CCI.

ETSI TC CLOUD has developed technical reports on standardization requirements for cloud services. Portability and interoperability of clouds is one of the main requirements [ETSI TR 102 997].

ETSI TC CLOUD have also developed CCI testing related standards including interoperability testing specification for OCCI and CDMI [ETSI TS 103 142] and cloud specific SLA standards [ETSI TR 103 125].

Test descriptions for cloud interoperability [ETSI TS 103 142] specifies interoperability test descriptions for OCCI and CDMI standards.

SLAs for cloud services [ETSI TR 103 125] aims to review previous work on SLAs and to derive potential requirements for cloud specific SLA standards.

Table 5-2 – ETSI documents and work items related to CCI

Reference	Name/Title	Status
[ETSI TS 103 142]	CLOUD; Test descriptions for cloud interoperability	Published
[ETSI TR 103 125]	CLOUD; SLAs for cloud services	Published
[ETSI TR 103 126]	CLOUD; Cloud private-sector user recommendations	Published
[ETSI TR 102 997]	CLOUD; Initial analysis of standardization requirements for Cloud services	Published

5.1.3 GICTF

Global Inter-Cloud Technology Forum (GICTF) aims to promote standardization of network protocols and the interfaces through which cloud systems interwork with each other and to enable the provision of more reliable cloud services.

GICTF works on standardization of inter-cloud interoperability, including functional requirements and interface.

GICTF has developed requirements for inter-cloud computing and inter-cloud interface specification. The functional requirements of inter-cloud systems have been identified and the inter-cloud interface has been developed. Three reference points for the interface specified in GICTF's documents are the interface between inter-cloud service controls, the interface between inter-cloud service controls and data centre operation systems, and the interface between the inter-cloud service controls and the network operation systems.

Table 5-3 – GICTF documents and work items related to CCI

Reference	Name/Title	Status
GICTF WhitePaper 2012-2	Intercloud interface specification draft (Cloud resource data model)	published