

American National Standard

INCITS/ISO/IEC 19941:2017 (2019)

(ISO/IEC 19941:2017, IDT)

*Information technology - Cloud computing -
Interoperability and portability*

Developed by



Where IT all begins



INCITS/ISO/IEC 19941:2017 (2019)

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

Adopted by INCITS (InterNational Committee for Information Technology Standards) as an American National Standard.

Date of ANSI Approval: 3/8/2019

Published by American National Standards Institute,
25 West 43rd Street, New York, New York 10036

Copyright 2019 by Information Technology Industry Council
(ITI). All rights reserved.

These materials are subject to copyright claims of International Standardization Organization (ISO), International Electrotechnical Commission (IEC), American National Standards Institute (ANSI), and Information Technology Industry Council (ITI). Not for resale. No part of this publication may be reproduced in any form, including an electronic retrieval system, without the prior written permission of ITI. All requests pertaining to this standard should be submitted to ITI, 1101 K Street NW, Suite 610, Washington DC 20005.

Printed in the United States of America

First edition
2017-12

Information technology — Cloud computing — Interoperability and portability

Technologies de l'information — Informatique en nuage — Interopérabilité et portabilité



Reference number
ISO/IEC 19941:2017(E)

© ISO/IEC 2017



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2017, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

This is a preview of "INCITS/ISO/IEC 19941...". Click here to purchase the full version from the ANSI store.

Contents

	Page
Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
3.1 Interoperability terms.....	1
3.2 Data portability terms.....	2
3.3 Application portability terms.....	2
4 Abbreviated terms	3
5 Overview of cloud computing interoperability and portability	4
5.1 Description of cloud computing interoperability and portability.....	4
5.1.1 General.....	4
5.1.2 Considerations for cloud interoperability.....	5
5.1.3 Considerations for portability in a cloud computing environment.....	6
5.1.4 Relationship between cloud interoperability and cloud portability.....	9
5.2 Cloud interoperability and portability facet models.....	9
5.2.1 Cloud interoperability facet model.....	9
5.2.2 Cloud data portability facet model.....	13
5.2.3 Cloud application portability facet model.....	16
5.3 Key challenges related to interoperability and portability in cloud computing.....	18
5.3.1 General.....	18
5.3.2 Security.....	18
5.3.3 Identity and Access Management (IdAM).....	20
5.3.4 Security during migration.....	21
5.3.5 Dynamic migration.....	21
5.3.6 Interfaces, APIs and interoperability.....	21
5.3.7 Open source.....	22
6 Interoperability and portability considerations related to cloud capabilities types	22
6.1 General.....	22
6.2 Functional components of interoperability.....	27
6.3 Functional components of data portability.....	28
6.4 Functional components of application portability.....	28
6.4.1 General.....	28
6.4.2 Functional views based on capabilities types.....	31
7 Cloud interoperability	36
7.1 Cloud interoperability types.....	36
7.1.1 General.....	36
7.1.2 Transport interoperability.....	38
7.1.3 Syntactic interoperability.....	39
7.1.4 Semantic data interoperability.....	39
7.1.5 Behavioural interoperability.....	39
7.1.6 Policy interoperability.....	40
7.1.7 Interoperability with connected devices consuming cloud services of application capabilities type.....	41
8 Cloud data portability	42
8.1 Cloud data portability types.....	42
8.2 Data syntactic portability.....	42
8.2.1 General.....	42
8.2.2 Data syntactic portability for infrastructure capabilities type cloud services.....	43
8.2.3 Data syntactic portability for platform capabilities type cloud services.....	43
8.2.4 Data syntactic portability for application capabilities type cloud services.....	44

This is a preview of "INCITS/ISO/IEC 19941...". Click here to purchase the full version from the ANSI store.

8.3	Data semantic portability	45
8.3.1	General.....	45
8.3.2	Data semantic portability for infrastructure capabilities type cloud services.....	45
8.3.3	Semantic data portability for platform capabilities type cloud services.....	45
8.3.4	Data semantic portability for application capabilities type cloud services.....	45
8.4	Data policy portability.....	47
8.5	Considerations for cloud data portability of “cloud service derived data”	47
9	Cloud application portability	49
9.1	Cloud application portability types.....	49
9.2	Considerations for cloud application portability	50
9.3	Application portability for infrastructure capabilities type cloud services.....	53
9.3.1	Application portability from non-cloud to cloud service.....	53
9.3.2	Application portability from a cloud service to another cloud service	55
9.4	Application portability for platform capabilities type cloud services.....	57
9.4.1	Application portability from non-cloud to cloud service deployments	57
9.4.2	Application portability from one cloud service to another cloud service.....	60
9.5	Application portability for application capabilities type cloud service.....	62
9.6	Application portability: Policy facet	62
9.6.1	General.....	62
9.6.2	Law and regulations.....	62
9.6.3	Contracts and licenses.....	63
9.6.4	Organizational policies.....	63
	Bibliography	64

This is a preview of "INCITS/ISO/IEC 19941...". Click here to purchase the full version from the ANSI store.

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 38, *Cloud Computing and Distributed Platforms*.

Introduction

This document is intended to establish a common understanding of cloud computing interoperability and portability. In particular, it is of interest to cloud stakeholders focusing on cloud service agreements concerning interoperability or portability between cloud services.

Cloud computing is defined as 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. ISO/IEC 17788 and ISO/IEC 17789 provide a starting point for understanding of different types of interoperability and portability, relationships with activities and roles and cloud capabilities types. Interoperability, data portability and application portability are essential to the use of cloud services. The goal of interoperability is to enable the interaction between non-cloud and cloud services, as well as between cloud services, in addition to enabling composition of new services from multiple services. The goal of portability is to enable cloud service customers (CSCs) to move their data or applications between non-cloud and one or more cloud services and between cloud services. The benefits of interoperability include lower costs of integration and increasing the value of services through enrichment or new functionality provided by composing cloud services. The benefits of portability include greater efficiency by lowering the costs of migration. Both interoperability and portability offer more choices to CSCs by limiting the effects of being locked in to any cloud service or cloud service provider (CSP). While there is no disagreement that interoperability and portability are advantages to cloud computing, there is no single way of handling either capability. Declaring interoperability or portability without doing a detailed analysis of what specifically is to be ported or is to be made interoperable is meaningless and does not lead to cloud solutions that meet the CSC's and CSP's business goals, which has led to significant and on-going confusion in the industry and needs to be resolved.

Interoperability is the ability of two or more systems or applications to exchange information and to mutually use the information that has been exchanged. In the context of cloud computing, interoperability should be viewed as the capability of public cloud services, private cloud services and other cloud service customer systems to understand each other's interfaces, configuration, forms of authentication and authorization, etc. in order to cooperate and work with each other.

Interoperability is a complex subject in the context of cloud computing because of the number of interactions involved and the potential variations for each interaction. While interoperability and standards add significant value and are advantageous to cloud computing, there are no comprehensive solutions. Many existing IT standards contribute to enabling interoperability between CSC applications and cloud services and between cloud services themselves. Using standards can be one way to build interoperable cloud services. Other techniques such as well-documented API specifications can also help.

Cloud computing services that enable portability using defined policies, standards or documented formats can ensure that CSCs are able to get their data into or out of cloud services in a reasonably easy and cost-effective manner, as this allows CSCs to move to a cloud service of another CSP and also to drive integration of heterogeneous cloud services.

As presented in ISO/IEC 17788, portability is the ability of a CSC to move their data or their applications between two different cloud services at a low cost and with minimal disruption. Portability is significant in cloud computing since CSCs are interested in avoiding lock-in when they choose to use cloud services. Therefore, in the context of cloud computing, portability can have multiple aspects depending on what is being ported (moved) and which cloud services are involved. For portability, there are no specific requirements for the source and target systems to be directly connected.

Portability in a cloud computing environment is not a binary concept. It would be a mistake to think of cloud services and the associated cloud applications and data as being either 100% portable or not portable at all. Almost all applications running in a cloud service can be ported to another cloud service offering equivalent capabilities if enough resources are invested. The critical considerations for portability discussions are the porting cost, the risks associated with the porting and how to control the costs and risks compared to the expected benefits.