INTERNATIONAL STANDARD

ISO/IEC 17826

Second edition
2016-07-15

Information technology — Cloud Data Management Interface (CDMI)

Technologies de l'information — Interface de management des données du nuage informatique (CDMI)

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/IEC 17826:2016
https://standards.iteh.ai/catalog/standards/sist/90065525-0e51-4b28-abf9-ef3cae7eb110/iso-iec-17826-2016

Reference number
ISO/IEC 17826:2016(E)

© ISO/IEC 2016

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/IEC 17826:2016
https://standards.iteh.ai/catalog/standards/sist/90065525-0e51-4b28-abf9-ef3cae7eb110/iso-iec-17826-2016

COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2016, 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

 © ISO/IEC 2016 – All rights reserved

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 document 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 and IEC 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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

For an explanation on 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.

ISO/IEC 17826:2016
https://standards.iteh.ai/catalog/standards/sist/90065525-0e51-4b28-abf9-e13cae7e0170/iso-iec-17826-2016

ISO/IEC 17826 was prepared by SNIA and was adopted, under the PAS procedure, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

This second edition cancels and replaces the first edition (ISO/IEC 17826:2012), which has been technically revised.

© ISO/IEC 2016 – All rights reserved

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/IEC 17826:2016
https://standards.iteh.ai/catalog/standards/sist/90065525-0e51-4b28-abf9-ef3cae7eb110/iso-iec-17826-2016

Cloud Data Management Interface (CDMI™)

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Version 1.1.1

ABSTRACT: This CDMI International Standard is intended for application developers who are implementing or using cloud storage. It documents how to access cloud storage and to manage the data stored there.

ISO/IEC 17826:2016
https://standards.iteh.ai/catalog/standards/sist/9b6b9525-0e94-4828-9e15-ef3cae7eb110/iso-iec-17826-2016

This document has been released and approved by the SNIA. The SNIA believes that the ideas, methodologies, and technologies described in this document accurately represent the SNIA goals and are appropriate for widespread distribution. Suggestion for revision should be directed to http://www.snia.org/feedback/.

SNIA Technical Position

March 19, 2015

© SNIA

USAGE

The SNIA hereby grants permission for individuals to use this document for personal use only, and for corporations and other business entities to use this document for internal use only (including internal copying, distribution, and display) provided that:

1 Any text, diagram, chart, table or definition reproduced shall be reproduced in its entirety with no alteration, and,

2 Any document, printed or electronic, in which material from this document (or any portion hereof) is reproduced shall acknowledge the SNIA copyright on that material, and shall credit the SNIA for granting permission for its reuse.

Other than as explicitly provided above, you may not make any commercial use of this document, sell any excerpt or this entire document, or distribute this document to third parties. All rights not explicitly granted are expressly reserved to SNIA.

Permission to use this document for purposes other than those enumerated above may be requested by emailing tcmd@snia.org. Please include the identity of the requesting individual or company and a brief description of the purpose, nature, and scope of the requested use.

All code fragments, scripts, data tables, and sample code in this SNIA document are made available under the following license:

BSD 3-Clause Software License

Copyright (c) 2014, The Storage Networking Industry Association.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- Neither the name of The Storage Networking Industry Association (SNIA) nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 17826:2016
https://standards.iteh.ai/catalog/standards/sist/900b5525-0e51-4b28-ab19-e2aac7c0f10/iso-iec-17826-2016

© ISO/IEC 2016 – All rights reserved

DISCLAIMER

The information contained in this publication is subject to change without notice. The SNIA makes no warranty of any kind with regard to this specification, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. The SNIA shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this specification.

Suggestions for revisions should be directed to http://www.snia.org/feedback/.

Copyright © 2015 SNIA. All rights reserved. All other trademarks or registered trademarks are the property of their respective owners.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/IEC 17826:2016
https://standards.iteh.ai/catalog/standards/sist/90065525-0e51-4b28-abf9-ef3cae7eb110/iso-iec-17826-2016

© ISO/IEC 2016 – All rights reserved

© SNIA

Revision History

Version	Date	Originator	Comments
1.1.1	March 19, 2015	CDMI TWG	Released as a SNIA Technical Position.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 17826:2016
https://standards.iteh.ai/catalog/standards/sist/90065525-0e51-4b28-abf9-ef3cae7eb110/iso-iec-17826-2016

© ISO/IEC 2016 – All rights reserved

Contents

SECTION 1 - CDMI Preamble 1

Introduction 2

1 Scope 4

2 Normative references 4

3 Terms, acronyms, and definitions 6

4 Conventions 10

4.1 Interface format 10
4.2 Typographical conventions 10
4.3 Request and response body requirements 11
4.4 Key word requirements 11

5 Overview of cloud storage 13

5.1 Introduction 13
5.2 What is cloud storage? 13
5.3 Data storage as a Service 13
5.4 Data management for cloud storage 15
5.5 Data and container management 16
5.6 Reference model for cloud storage interfaces 16
5.7 Cloud Data Management Interface 17
5.8 Object model for CDMI 18
5.9 CDMI metadata 19
5.10 Object ID 20
5.11 CDMI object ID format 20
5.12 Security 21
5.12.1 Security objectives 21
5.12.2 HTTP security 22
5.12.3 Client authentication 22
5.12.4 Use of TLS and HTTP 23
5.12.5 Further information 23
5.13 Required HTTP support 23
5.13.1 RFC 2616 support requirements 23
5.13.2 Content-type negotiation 23
5.13.3 Range support 23
5.13.4 URI escaping 24
5.13.5 Use of URIs 24
5.13.6 Reserved characters 25
5.14 Time representations 25
5.15 Backwards compatibility 25
5.15.1 Value transfer encoding 25
5.15.2 Container export capabilities 26
5.16 Object references 26

SECTION 2 - Basic Cloud Storage 28

6 Data object resource operations using HTTP 29

6.1 Overview 29
6.2 Create a data object using HTTP 29
6.2.1 Synopsis 29

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 17826:2016
https://standards.iteh.ai/catalog/standards/sist/90065525-0e51-4b28-abf9-e15cae7eb110/iso-iec-17826-2016

© ISO/IEC 2016 – All rights reserved

6.2.2 Capabilities 29
6.2.3 Request headers 30
6.2.4 Request message body 30
6.2.5 Response headers 30
6.2.6 Response message body 30
6.2.7 Response status 30
6.2.8 Example 31
6.3 Read a data object using HTTP 31
6.3.1 Synopsis 31
6.3.2 Capabilities 31
6.3.3 Request header 31
6.3.4 Request message body 31
6.3.5 Response headers 32
6.3.6 Response message body 32
6.3.7 Response status 32
6.3.8 Examples 32
6.4 Update a data object using HTTP 33
6.4.1 Synopsis 33
6.4.2 Capabilities 33
6.4.3 Request headers 33
6.4.4 Request message body 34
6.4.5 Response header 34
6.4.6 Response message body 34
6.4.7 Response status 34
6.4.8 Examples 34
6.5 Delete a data object using HTTP 35
6.5.1 Synopsis 35
6.5.2 Capability 35
6.5.3 Request headers 35
6.5.4 Request message body 35
6.5.5 Response headers 35
6.5.6 Response message body 35
6.5.7 Response status 36
6.5.8 Example 36

7 Container object resource operations using HTTP 37

7.1 Overview 37
7.2 Create a container object using HTTP 37
7.2.1 Synopsis 37
7.2.2 Capability 37
7.2.3 Request headers 38
7.2.4 Request message body 38
7.2.5 Response headers 38
7.2.6 Response message body 38
7.2.7 Response status 38
7.2.8 Example 38
7.3 Read a container object using HTTP 38
7.4 Update a container object using HTTP 38
7.5 Delete a container object using HTTP 39
7.5.1 Synopsis 39
7.5.2 Capability 39
7.5.3 Request headers 39
7.5.4 Request message body 39
7.5.5 Response headers 39
7.5.6 Response message body 39
7.5.7 Response status 40
7.5.8 Example 40
7.6 Create (POST) a new data object using HTTP 40

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 17826:2016
https://standards.iteh.ai/catalog/standards/sist/90065525-0e51-4b28-abf9-ef3cae7eb110/iso-iec-17826-2016

© ISO/IEC 2016 – All rights reserved

7.6.1 Synopsis 40
7.6.2 Capabilities 41
7.6.3 Request headers 41
7.6.4 Request message body 41
7.6.5 Response header 41
7.6.6 Response message body 42
7.6.7 Response status 42
7.6.8 Examples 42

SECTION 3 - CDMI Core 43

8 Data object resource operations using CDMI 44

8.1 Overview 44
8.1.1 Data object metadata 45
8.1.2 Data object consistency 45
8.1.3 Data object representations 46
8.2 Create a data object using CDMI 46
8.2.1 Synopsis 46
8.2.2 Delayed completion of create 46
8.2.3 Capabilities 47
8.2.4 Request headers 47
8.2.5 Request message body 48
8.2.6 Response headers 51
8.2.7 Response message body 51
8.2.8 Response status 52
8.2.9 Examples 52
8.3 Read a data object using CDMI 55
8.3.1 Synopsis 55
8.3.2 Capabilities 55
8.3.3 Request headers 56
8.3.4 Request message body 56
8.3.5 Response headers 56
8.3.6 Response message body 57
8.3.7 Response status 59
8.3.8 Examples 59
8.4 Update a data object using CDMI 62
8.4.1 Synopsis 62
8.4.2 Capabilities 63
8.4.3 Request headers 63
8.4.4 Request message body 64
8.4.5 Response header 67
8.4.6 Response message body 67
8.4.7 Response status 67
8.4.8 Examples 67
8.5 Delete a data object using CDMI 71
8.5.1 Synopsis 71
8.5.2 Capability 71
8.5.3 Request header 71
8.5.4 Request message body 71
8.5.5 Response headers 71
8.5.6 Response message body 71
8.5.7 Response status 72
8.5.8 Example 72

9 Container object resource operations using CDMI 73

9.1 Overview 73

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 17826:2016
https://standards.iteh.ai/catalog/standards/sist/90065525-0e51-4b28-abf9-e5b7eb110/iso-iec-17826-2016

© ISO/IEC 2016 – All rights reserved

9.1.1 Container metadata 74
9.1.2 Reserved container names 74
9.1.3 Container object addressing 74
9.1.4 Container object representations 75
9.2 Create a container object using CDMI 75
9.2.1 Synopsis 75
9.2.2 Delayed completion of create 75
9.2.3 Capabilities 76
9.2.4 Request headers 76
9.2.5 Request message body 77
9.2.6 Response headers 79
9.2.7 Response message body 79
9.2.8 Response status 81
9.2.9 Examples 81
9.3 Read a container object using CDMI 83
9.3.1 Synopsis 83
9.3.2 Capabilities 83
9.3.3 Request headers 84
9.3.4 Request message body 84
9.3.5 Response headers 84
9.3.6 Response message body 84
9.3.7 Response status 86
9.3.8 Examples 86
9.4 Update a container object using CDMI 88
9.4.1 Synopsis 88
9.4.2 Delayed completion of snapshot 88
9.4.3 Capabilities 89
9.4.4 Request headers 89
9.4.5 Request message body 90
9.4.6 Response header 92
9.4.7 Response message body 92
9.4.8 Response status 92
9.4.9 Examples 92
9.5 Delete a container object using CDMI 93
9.5.1 Synopsis 93
9.5.2 Capability 93
9.5.3 Request header 94
9.5.4 Request message body 94
9.5.5 Response headers 94
9.5.6 Response message body 94
9.5.7 Response status 94
9.5.8 Example 94
9.6 Create (POST) a new data object using CDMI 95
9.6.1 Synopsis 95
9.6.2 Delayed completion of create 95
9.6.3 Capabilities 96
9.6.4 Request headers 97
9.6.5 Request message body 98
9.6.6 Response headers 101
9.6.7 Response message body 101
9.6.8 Response status 102
9.6.9 Examples 103
9.7 Create (POST) a new queue object using CDMI 105
9.7.1 Synopsis 105
9.7.2 Delayed completion of create 105
9.7.3 Capabilities 106
9.7.4 Request headers 107
9.7.5 Request message body 107

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 17826:2016
https://standards.iteh.ai/catalog/standards/sist/90065525-0e51-4b28-abf9-ef3cae7eb110/iso-iec-17826-2016

© ISO/IEC 2016 – All rights reserved

9.7.6 Response headers 108
9.7.7 Response message body 108
9.7.8 Response status 110
9.7.9 Example 110

SECTION 4 - CDMI Advanced 112

10 Domain object resource operations using CDMI 113

10.1 Overview 113
10.1.1 Domain object metadata 114
10.1.2 Domain object summaries 114
10.1.3 Domain object membership 117
10.1.4 Domain usage in access control 119
10.1.5 Domain object representations 120
10.2 Create a domain object using CDMI 120
10.2.1 Synopsis 120
10.2.2 Capabilities 120
10.2.3 Request headers 120
10.2.4 Request message body 121
10.2.5 Response headers 122
10.2.6 Response message body 122
10.2.7 Response status 123
10.2.8 Example 123
10.3 Read a domain object using CDMI 124
10.3.1 Synopsis 124
10.3.2 Capabilities 124
10.3.3 Request headers 124
10.3.4 Request message body 124
10.3.5 Response headers 125
10.3.6 Response message body 125
10.3.7 Response status 126
10.3.8 Examples 126
10.4 Update a domain object using CDMI 127
10.4.1 Synopsis 127
10.4.2 Capability 128
10.4.3 Request headers 128
10.4.4 Request message body 128
10.4.5 Response header 129
10.4.6 Response message body 129
10.4.7 Response status 130
10.4.8 Example 130
10.5 Delete a domain object using CDMI 130
10.5.1 Synopsis 130
10.5.2 Capability 131
10.5.3 Request header 131
10.5.4 Request message body 131
10.5.5 Response headers 131
10.5.6 Response message body 131
10.5.7 Response status 131
10.5.8 Example 132

11 Queue object resource operations using CDMI 133

11.1 Overview 133
11.1.1 Queue object metadata 134
11.1.2 Queue object addressing 134
11.1.3 Queue object representations 134

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 17826:2016
https://standards.iteh.ai/catalog/standards/sist/90065525-0e51-4b28-abf9-ef3cae7eb110/iso-iec-17826-2016

© ISO/IEC 2016 – All rights reserved

11.2 Create a queue object using CDMI 134
11.2.1 Synopsis 134
11.2.2 Delayed completion of create 135
11.2.3 Capabilities 135
11.2.4 Request headers 136
11.2.5 Request message body 136
11.2.6 Response headers 138
11.2.7 Response message body 138
11.2.8 Response status 139
11.2.9 Examples 140
11.3 Read a queue object using CDMI 141
11.3.1 Synopsis 141
11.3.2 Capabilities 141
11.3.3 Request headers 142
11.3.4 Request message body 142
11.3.5 Response headers 142
11.3.6 Response message body 142
11.3.7 Response status 145
11.3.8 Examples 145
11.4 Update a queue object using CDMI 148
11.4.1 Synopsis 148
11.4.2 Capability 148
11.4.3 Request headers 148
11.4.4 Request message body 149
11.4.5 Response header 150
11.4.6 Response message body 150
11.4.7 Response status 150
11.4.8 Examples 150
11.5 Delete a queue object using CDMI 151
11.5.1 Synopsis 151
11.5.2 Capability 151
11.5.3 Request header 151
11.5.4 Request message body 152
11.5.5 Response headers 152
11.5.6 Response message body 152
11.5.7 Response status 152
11.5.8 Example 152
11.6 Enqueue a new queue value using CDMI 152
11.6.1 Synopsis 152
11.6.2 Capabilities 153
11.6.3 Request headers 153
11.6.4 Request message body 153
11.6.5 Response headers 155
11.6.6 Response message body 155
11.6.7 Response status 156
11.6.8 Examples 156
11.7 Delete a queue object value using CDMI 159
11.7.1 Synopsis 159
11.7.2 Capability 159
11.7.3 Request header 159
11.7.4 Request message body 159
11.7.5 Response headers 160
11.7.6 Response message body 160
11.7.7 Response status 160
11.7.8 Examples 160

12 Capability object resource operations using CDMI 161

12.1 Overview 161

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 17826:2016
https://standards.iteh.ai/catalog/standards/sist/90065525-0e51-4b28-abf9-ef3cae7eb110/iso-iec-17826-2016

© ISO/IEC 2016 – All rights reserved

12.1.1 Cloud storage system-wide capabilities 162
12.1.2 Storage system metadata capabilities 165
12.1.3 Data system metadata capabilities 165
12.1.4 Data object capabilities 168
12.1.5 Container capabilities 169
12.1.6 Domain object capabilities 171
12.1.7 Queue object capabilities 172
12.1.8 Capability object representations 172
12.2 Read a capabilities object using CDMI 173
12.2.1 Synopsis 173
12.2.2 Capability 173
12.2.3 Request headers 173
12.2.4 Request message body 173
12.2.5 Response headers 174
12.2.6 Response message body 174
12.2.7 Response status 175
12.2.8 Examples 175

13 Exported protocols 177

13.1 Overview 177
13.2 Exported protocol structure 178
13.2.1 Mapping names from CDMI to another protocol 179
13.2.1.1 Capabilities 179
13.2.1.2 Domains 179
13.2.1.3 Caching 179
13.2.1.4 Groups 180
13.2.1.5 Synopsis 180
13.2.2 Administrative users 181
13.2.3 User and groupname mapping syntax and evaluation rules 182
13.3 Discovering and mounting containers via foreign protocols 183
13.4 NFS exported protocol 184
13.5 CIFS exported protocol 186
13.6 OCCI exported protocol 187
13.7 iSCSI export modifications 187
13.7.1 Read container 187
13.7.2 Create and update containers 188
13.7.3 Modify an export 188
13.8 WebDAV exported protocol 188

14 CDMI snapshots 190

15 Serialization/deserialization 191

15.1 Overview 191
15.2 Exporting serialized data 191
15.3 Importing serialized data 191
15.3.1 Canonical format 192
15.3.2 Example JSON canonical serialized format 192

16 Metadata 194

16.1 Access control 194
16.1.1 ACL and ACE structure 194
16.1.2 ACE types 194
16.1.3 ACE who 194
16.1.4 ACE flags 195
16.1.5 ACE bit masks 196
16.1.6 ACL evaluation 198
16.1.7 Example ACE mask expressions 200
16.1.8 Canonical format for ACE hexadecimal quantities 201

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 17826:2016
https://standards.iteh.ai/catalog/standards/sist/90065525-0e51-4b28-abf9-ef5cae7eb110/iso-iec-17826-2016

© ISO/IEC 2016 – All rights reserved