
**Information technology — Redfish
scalable platforms management API
specification —**

**Part 1:
Redfish Specification v1.13.0**



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2022

All rights reserved. Unless otherwise specified, or required in the context of its implementation, 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
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

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.

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 (see www.iso.org/directives or www.iec.ch/members_experts/refdocs).

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) or the IEC list of patent declarations received (see <https://patents.iec.ch>).

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

For an explanation of 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 www.iso.org/iso/foreword.html. In the IEC, see www.iec.ch/understanding-standards.

This document was prepared by DMTF (as DMTF Redfish Specification, DSP0266, Version 1.13.0) and drafted in accordance with its editorial rules. It was adopted, under the JTC 1 PAS procedure, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*.

This first edition cancels and replaces the first edition (ISO/IEC 30115:2018), which has been technically revised.

The main changes are as follows:

- a number of clauses have been added expanding the functionality of the protocol, including additions for controlling software-defined composable systems, for performing software or firmware updates and for aggregating multiple service instances;
- the protocol itself has been enhanced to provide a number of optional query parameters to enable more efficient transactions;
- the specification and its data model have been enhanced to provide compatibility with the OpenAPI v3.0 specification allowing the use of the OpenAPI toolchain for both documentation and code generation.

A list of all parts in the ISO/IEC 30115 series can be found on the ISO and IEC websites.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

Copyright Notice

Copyright © 2015-2021 DMTF. All rights reserved.

DMTF is a not-for-profit association of industry members dedicated to promoting enterprise and systems management and interoperability. Members and non-members may reproduce DMTF specifications and documents, provided that correct attribution is given. As DMTF specifications may be revised from time to time, the particular version and release date should always be noted.

Implementation of certain elements of this standard or proposed standard may be subject to third party patent rights, including provisional patent rights (herein "patent rights"). DMTF makes no representations to users of the standard as to the existence of such rights, and is not responsible to recognize, disclose, or identify any or all such third party patent right, owners or claimants, nor for any incomplete or inaccurate identification or disclosure of such rights, owners or claimants. DMTF shall have no liability to any party, in any manner or circumstance, under any legal theory whatsoever, for failure to recognize, disclose, or identify any such third party patent rights, or for such party's reliance on the standard or incorporation thereof in its product, protocols or testing procedures. DMTF shall have no liability to any party implementing such standard, whether such implementation is foreseeable or not, nor to any patent owner or claimant, and shall have no liability or responsibility for costs or losses incurred if a standard is withdrawn or modified after publication, and shall be indemnified and held harmless by any party implementing the standard from any and all claims of infringement by a patent owner for such implementations.

For information about patents held by third-parties which have notified the DMTF that, in their opinion, such patent may relate to or impact implementations of DMTF standards, visit <http://www.dmtf.org/about/policies/disclosures.php>.

This document's normative language is English. Translation into other languages is permitted.

CONTENTS

1 Foreword {-}	11
1.1 Acknowledgments {-}	11
2 Introduction {-}	13
3 Scope	14
4 Normative references	15
5 Terms, definitions, symbols, and abbreviated terms	17
5.1 Hardware terms	17
5.1.1 baseboard management controller (BMC)	17
5.1.2 IPMI	17
5.1.3 KVM-IP	18
5.1.4 NIC	18
5.1.5 PCI	18
5.1.6 PCIe	18
5.2 Web development terms	18
5.2.1 CORS	18
5.2.2 CRUD	18
5.2.3 CSRF	18
5.2.4 event	18
5.2.5 excerpt	18
5.2.6 HTTP	19
5.2.7 HTTPS	19
5.2.8 hypermedia API	19
5.2.9 IP	19
5.2.10 JSON	19
5.2.11 member	19
5.2.12 message	19
5.2.13 OData	19
5.2.14 OData service document	19
5.2.15 operation	20
5.2.16 parent resource	20
5.2.17 property	20
5.2.18 request	20
5.2.19 response	20
5.2.20 subscription	20
5.2.21 task	20
5.2.22 task monitor	20
5.2.23 TCP	20
5.2.24 TLS	21
5.2.25 XSS	21
5.3 Redfish terms	21
5.3.1 collection	21

5.3.2 Redfish client	21
5.3.3 Redfish protocol	21
5.3.4 Redfish schema	21
5.3.5 Redfish service	21
5.3.6 resource	21
5.3.7 resource collection	22
5.3.8 resource tree	22
5.3.9 resource type	22
5.3.10 service root	22
5.3.11 subordinate resource	22
6 Typographical conventions	23
7 Overview	24
7.1 Goals	24
7.2 Design tenets	25
7.3 Limitations	25
7.4 Additional design background and rationale	26
7.4.1 REST-based interface	26
7.4.2 Data-oriented	26
7.4.3 Separation of protocol from data model	26
7.4.4 Hypermedia API service root	26
7.4.5 OpenAPI v3.0 support	26
7.4.6 OData conventions	27
7.5 Service elements	27
7.5.1 Synchronous and asynchronous operation support	27
7.5.2 Eventing mechanism	27
7.5.3 Actions	28
7.5.4 Service discovery	28
7.5.5 Remote access support	28
7.6 Security	28
8 Protocol details	29
8.1 Universal Resource Identifiers	29
8.2 HTTP methods	31
8.3 HTTP redirect	32
8.4 Media types	32
8.5 ETags	32
8.6 Protocol version	33
8.7 Redfish-defined URIs and relative reference rules	34
9 Service requests	36
9.1 Request headers	36
9.2 GET (read requests)	39
9.2.1 GET (read requests) overview	39
9.2.2 Resource collection requests	39
9.2.3 Service root request	40

9.2.4 OData service and metadata document requests	40
9.3 Query parameters	41
9.3.1 Query parameter overview	41
9.3.2 The \$expand query parameter	43
9.3.3 The \$select query parameter	45
9.3.4 The \$filter query parameter	46
9.4 HEAD	47
9.5 Data modification requests	48
9.5.1 Data modification requests overview	48
9.5.2 Modification success responses	48
9.5.3 Modification error responses	49
9.6 PATCH (update)	49
9.7 PATCH on array properties	50
9.8 PUT (replace)	51
9.9 POST (create)	51
9.10 DELETE (delete)	52
9.11 POST (action)	52
9.12 Operation apply time	54
9.13 Deep operations	57
10 Service responses	61
10.1 Response headers	61
10.2 Link header	63
10.3 Status codes	63
10.4 OData metadata responses	66
10.4.1 OData metadata responses overview	66
10.4.2 OData \$metadata	66
10.4.2.1 Referencing other schemas	67
10.4.2.2 Referencing OEM extensions	67
10.4.3 OData service document	68
10.5 Resource responses	68
10.6 Error responses	69
11 Data model	71
11.1 Resources	71
11.2 Resource types	71
11.3 Resource collections	72
11.4 OEM resources	72
11.5 Common data types	73
11.5.1 Primitive types	73
11.5.2 Empty string values	73
11.5.3 GUID and UUID values	74
11.5.4 Date-Time values	74
11.5.5 Duration values	74
11.5.6 Reference properties	75

11.5.7 Non-resource reference properties	75
11.5.8 Array properties	76
11.5.9 Structured properties	76
11.5.10 Message object	77
11.5.10.1 Overview	77
11.5.10.2 MessageId format	78
11.6 Properties	79
11.6.1 Properties overview	79
11.6.2 Resource identifier (@odata.id) property	79
11.6.3 Resource type (@odata.type) property	79
11.6.4 Resource ETag (@odata.etag) property	80
11.6.5 Resource context (@odata.context) property	80
11.6.6 Id	81
11.6.7 Name	81
11.6.8 Description	81
11.6.9 MemberId	81
11.6.10 Count (Members@odata.count) property	81
11.6.11 Members	82
11.6.12 Next link (Members@odata.nextLink) property	82
11.6.13 Links	82
11.6.13.1 Reference to a related resource	82
11.6.13.2 References to multiple related resources	83
11.6.14 Actions property	83
11.6.14.1 Action representation	83
11.6.14.2 Action responses	84
11.6.15 Oem	84
11.6.16 Status	85
11.7 Naming conventions	85
11.7.1 Naming rules	85
11.7.2 URI naming rules	86
11.8 Extending standard resources	87
11.8.1 Extending standard resources overview	87
11.8.2 OEM property format and content	87
11.8.3 OEM-specified object naming	87
11.8.4 OEM resource types	88
11.8.5 OEM registries	88
11.8.6 OEM URIs	89
11.8.7 OEM property examples	89
11.8.8 OEM actions	90
11.9 Payload annotations	91
11.9.1 Payload annotations overview	91
11.9.2 Allowable values	91
11.9.3 Extended information	92

11.9.3.1 Extended object information	92
11.9.3.2 Extended property information	93
11.9.4 Action info annotation	93
11.9.5 Settings and settings apply time annotations	94
11.9.6 Operation apply time and operation apply time support annotations	94
11.9.7 Maintenance window annotation	94
11.9.8 Collection capabilities annotation	95
11.9.9 Requested count and allow over-provisioning annotations	97
11.9.10 Zone affinity annotation	97
11.9.11 Supported certificates annotation	98
11.9.12 Deprecated annotation	98
11.10 Settings resource	98
11.11 Special resource situations	101
11.11.1 Overview	101
11.11.2 Absent resources	101
11.12 Registries	101
11.13 Schema annotations	102
11.13.1 Schema annotations overview	102
11.13.2 Description annotation	102
11.13.3 Long description annotation	103
11.13.4 Resource capabilities annotation	103
11.13.5 Resource URI patterns annotation	103
11.13.6 Additional properties annotation	104
11.13.7 Permissions annotation	105
11.13.8 Required annotation	105
11.13.9 Required on create annotation	105
11.13.10 Units of measure annotation	105
11.13.11 Expanded resource annotation	105
11.13.12 Owning entity annotation	106
11.13.13 Deprecated annotation	106
11.14 Versioning	106
11.15 Localization	107
12 File naming and publication	108
12.1 Registry file naming	108
12.2 Profile file naming	108
12.3 Dictionary file naming	108
12.4 Localized file naming	108
12.5 DMTF Redfish file repository	109
13 Schema definition languages	111
13.1 OData Common Schema Definition Language	111
13.1.1 OData Common Schema Definition Language overview	111
13.1.2 File naming conventions for CSDL	111
13.1.3 Core CSDL files	111

13.1.4 CSDL format	112
13.1.4.1 Referencing other CSDL files	112
13.1.4.2 CSDL data services	113
13.1.5 Elements of CSDL namespaces	113
13.1.5.1 Qualified names	114
13.1.5.2 Entity type and complex type elements	114
13.1.5.3 Action element	115
13.1.5.4 Action element for OEM actions	116
13.1.5.5 Action with a response body	116
13.1.5.6 Property element	117
13.1.5.7 Navigation property element	118
13.1.5.8 Enum type element	118
13.1.5.9 Annotation element	119
13.2 JSON Schema	122
13.2.1 JSON Schema overview	122
13.2.2 File naming conventions for JSON Schema	122
13.2.3 Core JSON Schema files	122
13.2.4 JSON Schema format	123
13.2.5 JSON Schema definitions body	123
13.2.5.1 Resource definitions in JSON Schema	123
13.2.5.2 Enumerations in JSON Schema	124
13.2.5.3 Actions in JSON Schema	125
13.2.5.4 OEM actions in JSON Schema	126
13.2.5.5 Action with a response body	127
13.2.6 JSON Schema terms	128
13.3 OpenAPI	129
13.3.1 OpenAPI overview	129
13.3.2 File naming conventions for OpenAPI schema	129
13.3.3 Core OpenAPI schema files	129
13.3.4 openapi.yaml	130
13.3.5 OpenAPI file format	132
13.3.6 OpenAPI components body	132
13.3.6.1 Resource definitions in OpenAPI	132
13.3.6.2 Enumerations in OpenAPI	133
13.3.6.3 Actions in OpenAPI	133
13.3.6.4 OEM actions in OpenAPI	135
13.3.7 OpenAPI terms used by Redfish	135
13.4 Schema modification rules	136
14 Service details	138
14.1 Eventing	138
14.1.1 Eventing overview	138
14.1.2 POST to subscription collection	138
14.1.3 Open an SSE connection	139

14.1.4 EventType-based eventing	140
14.1.5 Subscribing to events	140
14.1.6 Event formats	141
14.1.7 OEM extensions	142
14.2 Asynchronous operations	142
14.3 Resource tree stability	144
14.4 Discovery	144
14.4.1 Discovery overview	144
14.4.2 UPnP compatibility	145
14.4.3 USN format	145
14.4.4 M-SEARCH response	145
14.4.5 Notify, alive, and shutdown messages	146
14.5 Server-sent events	146
14.5.1 General	146
14.5.2 Event service	147
14.5.2.1 Event message SSE stream	149
14.5.2.2 Metric report SSE stream	150
14.6 Update service	151
14.6.1 Overview	151
14.6.2 Software update types	151
14.6.2.1 Simple updates	151
14.6.2.2 Multipart HTTP push updates	151
15 Security details	154
15.1 Transport Layer Security (TLS) protocol	154
15.1.1 Transport Layer Security (TLS) protocol overview	154
15.1.2 Cipher suites	154
15.1.3 Certificates	155
15.2 Sensitive data	155
15.3 Authentication	155
15.3.1 Authentication overview	155
15.3.2 Authentication requirements	156
15.3.2.1 Resource and operation authentication requirements	156
15.3.2.2 HTTP header authentication requirements	156
15.3.2.3 Authentication failure requirements	156
15.3.3 HTTP Basic authentication	157
15.3.4 Redfish session login authentication	157
15.3.4.1 Redfish login sessions	157
15.3.4.2 Session login	158
15.3.4.3 Session lifetime	159
15.3.4.4 Session termination or logout	159
15.4 Authorization	159
15.4.1 Authorization overview	159
15.4.2 Privilege model	160

15.4.2.1 Roles	160
15.4.2.2 Restricted roles and restricted privileges	161
15.4.2.3 OEM privileges	162
15.4.3 Redfish service operation-to-privilege mapping	162
15.4.3.1 Why specify operation-to-privilege mapping?	162
15.4.3.2 Representing operation-to-privilege mappings	162
15.4.3.3 Operation map syntax	163
15.4.3.4 Mapping overrides syntax	164
15.4.3.5 Property override example	164
15.4.3.6 Subordinate override	165
15.4.3.7 Resource URI override	166
15.4.3.8 Privilege AND and OR syntax	167
15.5 Account service	168
15.5.1 Account service overview	168
15.5.2 Password management	168
15.5.3 Password change required handling	169
15.6 Asynchronous tasks	169
15.7 Event subscriptions	169
16 Redfish Host Interface	170
17 Redfish composability	171
17.1 Composition requests	172
17.1.1 Composition requests overview	172
17.1.2 Specific composition	172
17.1.3 Constrained composition	173
17.1.4 Expandable resources	174
17.2 Updating a composed resource	174
18 Aggregation	175
18.1 Classes of aggregators	175
18.1.1 Implicit and complex aggregators	175
18.1.2 Use cases	176
18.2 Aggregation service	176
18.2.1 Aggregation service overview	176
18.2.2 Aggregator requirements	176
18.2.3 Aggregates	177
18.2.4 Aggregation sources and connection methods	177
19 ANNEX A (informative) Change log	179
20 Bibliography	192

1 Foreword {-}

The Redfish Forum of the DMTF develops the Redfish standard.

DMTF is a not-for-profit association of industry members that promotes enterprise and systems management and interoperability. For information about the DMTF, see [DMTF](#).

This version supersedes version 1.12.1. For a list of the changes, see [ANNEX A \(informative\) Change log](#).

1.1 Acknowledgments {-}

The DMTF acknowledges the following individuals for their contributions to the Redfish standard, including this document and Redfish schemas, interoperability profiles, and message registries:

- Rafiq Ahamed - Hewlett Packard Enterprise
- Richelle Ahlvers - Broadcom Inc.
- Jeff Autor - Hewlett Packard Enterprise
- David Black - Dell Inc.
- Jeff Bobzin - Insyde Software Corp.
- Patrick Boyd - Dell Inc.
- David Brockhaus - Vertiv
- Richard Brunner - VMware Inc.
- Sean Byland - Cray Inc.
- Lee Calcote - Seagate Technology
- Keith Campbell - Lenovo
- P Chandrasekhar - Dell Inc.
- Barbara Craig - Hewlett Packard Enterprise
- Chris Davenport - Hewlett Packard Enterprise
- Gamma Dean - Vertiv
- Daniel Dufresne - Dell Inc.
- Samer El-Haj-Mahmoud - Arm Limited, Lenovo, Hewlett Packard Enterprise
- George Ericson - Dell Inc.
- Wassim Fayed - Microsoft Corporation
- Kevin Ferguson - Vertiv
- Mike Garrett - Hewlett Packard Enterprise
- Steve Geffin - Vertiv
- Joe Handzik - Hewlett Packard Enterprise
- Jon Hass - Dell Inc.

ISO/IEC 30115-1:2022(E)

- Jeff Hilland - Hewlett Packard Enterprise
- Chris Hoffman - Vertiv
- Cactus Jiang - Vertiv
- Barry Kittner - Intel Corporation
- Steven Krig - Intel Corporation
- Jennifer Lee - Intel Corporation
- John Leung - Intel Corporation
- Magnus Lundmark - Ericsson AB
- Steve Lyle - Hewlett Packard Enterprise
- Gunnar Mills - IBM
- Jagan Molleti - Dell Inc.
- Milena Natanov - Microsoft Corporation
- Scott Phuong - Cisco Systems, Inc.
- Michael Pizzo - Microsoft Corporation
- Chris Poblete - Dell Inc.
- Michael Raineri - Dell Inc.
- Joseph Reynolds - IBM
- Irina Salvan - Microsoft Corporation
- Bill Scherer - Hewlett Packard Enterprise
- Hemal Shah - Broadcom Inc.
- Jim Shelton - Vertiv
- Tom Slaight - Intel Corporation
- Josiah Smith - Eaton
- Donnie Sturgeon - Vertiv
- Pawel Szymanski - Intel Corporation
- Paul Vancil - Dell Inc.
- Joseph White - Dell Inc.
- Linda Wu - NVIDIA Corporation, Super Micro Computer, Inc.

2 Introduction {-}

Redfish is a standard that uses RESTful interface semantics to access a schema based data model to conduct management operations. It is suitable for a wide range of devices, from stand-alone servers, to composable infrastructures, and to large-scale cloud environments.

The initial Redfish scope targeted servers. The DMTF and its alliance partners expanded that scope to cover most data center IT equipment and other solutions, and both in- and out-of-band access methods.

Additionally, the DMTF and other organizations that use Redfish as part of their industry standard or solution have added educational material.

This document defines the RESTful interface protocol and the various concepts and services necessary to implement a Redfish interface. The definition of the schema based data model and standard messages for the Redfish interface are covered separately in the following documents:

- DMTF DSP8010, *Redfish Schema Bundle*, <https://www.dmtf.org/dsp/DSP8010> contains the individual schema definition files in multiple schema description languages.
- DMTF DSP0268, *Redfish Schema Supplement*, <https://www.dmtf.org/dsp/DSP0268> contains the normative descriptions and example payloads for all standard Redfish schema in a single reference guide.
- DMTF DSP8011, *Redfish Standard Registries Bundle*, <https://www.dmtf.org/dsp/DSP8011> contains the message registries used for error reporting and event messages.

3 Scope

This specification defines the required protocols, data model, behaviors, and other architectural components for an interoperable, multivendor, remote, and out-of-band capable interface. This interface meets the cloud-based and web-based IT professionals' expectations for scalable platform management. While large and hyperscale environments are the primary focus, clients can use the specification for individual system management.

The specification defines the required elements for all Redfish implementations, and the optional elements that system vendors and manufacturers can choose. This specification also defines at which points an implementation can provide OEM-specific extensions.

The specification sets normative requirements for [Redfish services](#) and associated materials, such as Redfish schema files. In general, the specification does not set requirements for Redfish clients but indicates how a client can successfully and effectively access and use a Redfish service.

The specification does not require that implementations of the Redfish interfaces and functions require particular hardware or firmware.

4 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

- DMTF DSP0270, *Redfish Host Interface Specification*, https://www.dmtf.org/sites/default/files/standards/documents/DSP0270_1.0.0.pdf
- Redfish Schema: RedfishExtensions v1.0.0, https://redfish.dmtf.org/schemas/v1/RedfishExtensions_v1.xml
- *Transport Layer Security (TLS) Parameters*, <https://www.iana.org/assignments/tls-parameters/tls-parameters.xhtml>
- *JSON Schema: A Media Type for Describing JSON Documents draft-handrews-json-schema-01*, <https://tools.ietf.org/html/draft-handrews-json-schema-01>
- *JSON Schema Validation: A Vocabulary for Structural Validation of JSON draft-handrews-json-schema-validation-01*, <https://tools.ietf.org/html/draft-handrews-json-schema-validation-01>
- IETF RFC1738, T. Berners-Lee et al, *Uniform Resource Locators (URL)*, <https://tools.ietf.org/html/rfc1738>
- IETF RFC3986, T. Berners-Lee et al, *Uniform Resource Identifier (URI): Generic Syntax*, <https://tools.ietf.org/html/rfc3986>
- IETF RFC5280, D. Cooper et al, *Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile*,
- IETF RFC6585, M. Nottingham et al, *Additional HTTP Status Codes*, <https://tools.ietf.org/html/rfc6585>
- IETF RFC6901, P. Bryan, Ed. et al, *JavaScript Object Notation (JSON) Pointer*, <https://tools.ietf.org/html/rfc6901>
- IETF RFC7230, R. Fielding et al, *Hypertext Transfer Protocol (HTTP/1.1): Message Syntax and Routing*, <https://tools.ietf.org/html/rfc7230>
- IETF RFC7231, R. Fielding et al, *Hypertext Transfer Protocol (HTTP/1.1): Semantics and Content*, <https://tools.ietf.org/html/rfc7231>
- IETF RFC7232, R. Fielding et al, *Hypertext Transfer Protocol (HTTP/1.1): Conditional Requests*, <https://tools.ietf.org/html/rfc7232>
- IETF RFC7234, R. Fielding et al, *Hypertext Transfer Protocol (HTTP/1.1): Caching*, <https://tools.ietf.org/html/rfc7234>
- IETF RFC7525, Y. Sheffer et al, *Recommendations for Secure Use of Transport Layer Security (TLS) and Datagram Transport Layer Security (DTLS)*, <https://tools.ietf.org/html/rfc7525>
- IETF RFC7578, L. Masinter et al, *Returning Values from Forms: multipart/form-data*, <https://tools.ietf.org/html/rfc7578>
- IETF RFC7617, J. Reschke et al, *The 'Basic' HTTP Authentication Scheme*, <https://tools.ietf.org/html/rfc7617>
- IETF RFC8259, T. Bray, Ed., *The JavaScript Object Notation (JSON) Data Interchange Format*, <https://tools.ietf.org/html/rfc8259>
- IETF RFC8288, M. Nottingham, *Web Linking*, <https://tools.ietf.org/html/rfc8288>

ISO/IEC 30115-1:2022(E)

- ISO 639-1:2002, *Codes for the representation of names of languages – Part 1: Alpha-2 code*, <https://www.iso.org/standard/22109.html>
- 24 February 2014, *OData Version 4.0 Part 1: Protocol*, <https://docs.oasis-open.org/odata/odata/v4.0/os/part1-protocol/odata-v4.0-os-part1-protocol.html>
- 24 February 2014, *OData Version 4.0 Part 3: Common Schema Definition Language (CSDL)*, <https://docs.oasis-open.org/odata/odata/v4.0/os/part3-csdl/odata-v4.0-os-part3-csdl.html>
- 10 March 2016, *OData Version 4.0 Plus Errata 03 OASIS Standard incorporating Draft 01 of Errata 03*, <https://docs.oasis-open.org/odata/odata/v4.0/errata03/csd01/complete/vocabularies/Org.OData.Measures.V1.xml>
- 20 November 2014, *SNIA TLS Specification for Storage Systems*, https://www.snia.org/tech_activities/standards/curr_standards/tls
- *The OpenAPI Specification*, <https://swagger.io/specification/>
- *The Unified Code for Units of Measure*, <https://ucum.org/ucum.html>
- 24 December 2020, *Fetch Living Standard*, <https://fetch.spec.whatwg.org/>
- 9.2 *Server-sent events* in the *HTML Living Standard*, <https://html.spec.whatwg.org/multipage/server-sent-events.html>