Document Number: DSP-IS0202

Date: 2010-04-15

Version: 1.0.0

CIM-RS Binding to JSON

Document Type: Specification

Document Status: DMTF Informational Specification

Document Language: en-US

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Foreword

The *CIM-RS Binding to JSON* (DSP-IS0202) informational specification was prepared by the DMTF CIM-RS Incubator.

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Acknowledgments

The DMTF acknowledges the following individuals for their contributions to this document:

- Andreas Maier, IBM (editor)
- Cornelia Davis, EMC
- George Ericson, EMC
- Johannes Holzer, IBM
- Robert Kieninger, IBM
- Larry Lamers, VMware
- Marvin Waschke, Computer Associates

Introduction

The information in this document should be sufficient to unambiguously identify the representation of payload elements of the CIM-RS protocol defined in DSP-IS0201, in JavaScript Object Notation (JSON).

The target audience for this specification is typically implementers who are writing WBEM servers, WBEM clients, or WBEM listeners supporting the CIM-RS protocol with a payload representation in JSON.

Document conventions

Typographical conventions

The following typographical conventions are used in this document:

- Document titles are marked in *italics*.
- Important terms that are used for the first time are marked in *italics*.
- Terms include a link to the term definition in the "Terms and definitions" clause, enabling easy navigation to the term definition.
- ABNF rules are in `monospaced font`.

ABNF usage conventions

Format definitions in this document are specified using ABNF (see RFC5234), with the following deviations:

- Literal strings are to be interpreted as case-sensitive Unicode characters, as opposed to the definition in RFC5234 that interprets literal strings as case-insensitive US-ASCII characters.

CIM-RS Binding to JSON

1 Scope

This informational specification describes the representation of payload elements of the CIM-RS protocol defined in DSP-IS0201 in JavaScript Object Notation (JSON).

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated or versioned references, only the edition cited (including any corrigenda or DMTF update versions) applies. For references without a date or version, the latest published edition of the referenced document (including any corrigenda or DMTF update versions) applies.

DMTF DSP0004, *CIM Infrastructure Specification 2.6,*
http://www.dmtf.org/standards/published_documents/DSP0004_2.6.pdf

DMTF DSP0223, *Generic Operations 1.0,*
http://www.dmtf.org/standards/published_documents/DSP0223_1.0.pdf

DMTF DSP-IS0201, *CIM Operations Over RESTful Services 1.0*,
http://www.dmtf.org/standards/published_documents/DSP-IS0201_1.0.pdf

ECMA-262, *ECMAScript Language Specification, 5th Edition, December 2009*,
http://www.ecma-international.org/publications/standards/Ecma-262.htm
For its errata dated 2010-06-24 or later, see
http://wiki.ecmascript.org/doku.php?id=es3.1:es3.1_proposal_working_draft

IETF RFC4627 (Informational), *The application/json Media Type for JavaScript Object Notation (JSON)*,
http://tools.ietf.org/html/rfc4627

IETF RFC5234, *Augmented BNF for Syntax Specifications: ABNF*,
http://tools.ietf.org/html/rfc5234

IETF RFC-json-schema (Internet-Draft), *A JSON Media Type for Describing the Structure and Meaning of JSON Documents*, March 2010,
http://tools.ietf.org/html/draft-zyp-json-schema-02
This version of this document uses a draft of the upcoming draft version 03, available at
http://groups.google.com/group/json-schema/browse_thread/thread/5dc7d56a18abd81b

ISO/IEC 10646:2003, *Information technology -- Universal Multiple-Octet Coded Character Set (UCS)*,
http://standards.iso.org/ittf/PubliclyAvailableStandards/c039921_ISO_IEC_10646_2003(E).zip

ISO/IEC Directives, Part 2, *Rules for the structure and drafting of International Standards (2004, 5th edition)*,
http://isotc.iso.org/livelink/livelink.exe?func=ll&objId=4230456&objAction=browse

The Unicode Consortium, *The Unicode Standard, Version 5.2.0, Annex #15: Unicode Normalization Forms*,
http://www.unicode.org/reports/tr15/

3 Terms and definitions

In this document, some terms have a specific meaning beyond the normal English meaning. Those terms are defined in this clause.

The terms "shall" ("required"), "shall not," "should" ("recommended"), "should not" ("not recommended"), "may," "need not" ("not required"), "can" and "cannot" in this document are to be interpreted as described in ISO/IEC Directives, Part 2, Annex H. The terms in parenthesis are alternatives for the preceding term, for use in exceptional cases when the preceding term cannot be used for linguistic reasons. Note that ISO/IEC Directives, Part 2, Annex H specifies additional alternatives. Occurrences of such additional alternatives shall be interpreted in their normal English meaning.

The terms "clause," "subclause," "paragraph," and "annex" in this document are to be interpreted as described in ISO/IEC Directives, Part 2, Clause 5.

The terms "normative" and "informative" in this document are to be interpreted as described in ISO/IEC Directives, Part 2, Clause 3. In this document, clauses, subclauses, or annexes labeled "(informative)" do not contain normative content. Notes and examples are always informative elements.

The terms defined in DSP0004 and DSP0223 apply to this document. The following additional terms are used in this document.

3.1

JSON schema

a description of the structure and meaning of a JSON object, using the syntax defined in RFC-json-schema

3.2

link

a named relation targeting a resource or a resource collection. For details, see 7.4

3.3

MIME media type

a string identification for media types in Internet protocols, as defined in RFC2045 and RFC2046

3.4

Normalization Form C

a normalization form for UCS characters that avoids the use of combining marks where possible and that allows comparing UCS character strings on a per-code-point basis. It is defined in The Unicode Standard, Annex #15.

3.5

REST resource

any entity that is accessed through and targeted by a RESTful service

3.6

RESTful service

a service accessible using REST concepts

3.7
UCS character

a character from the Universal Character Set defined in ISO/IEC 10646:2003. See also DSP0004 for an overview.

3.8
UCS code position

a numeric identification for a UCS character in the range of 0x0 to 0x10FFFF, as defined in ISO/IEC 10646:2003. See also DSP0004 for an overview.

3.9
Unicode character

an alternate term for UCS character

3.10
WBEM client

a CIM client (see DSP0004) that supports a WBEM protocol. A WBEM client originates WBEM operations for processing by a WBEM server. For details, see DSP0223.

3.11
WBEM indication

an interaction within a WBEM protocol that is originated on a WBEM server and processed by a WBEM listener. For details, see DSP0223. This release of this document does not cover WBEM indications.

3.12
WBEM listener

a CIM listener (see DSP0004) that supports a WBEM protocol. A WBEM listener processes WBEM indications originated by a WBEM server. For details, see DSP0223.

3.13
WBEM operation

an interaction within a WBEM protocol that is originated by a WBEM client and processed by a WBEM server. For details, see DSP0223.

3.14
WBEM protocol

a communications protocol between WBEM client, WBEM server and WBEM listener. A WBEM protocol defines how the WBEM operations and WBEM indications work, on top of an underlying protocol layer (for example, HTTP, SOAP, or TCP). For details, see DSP0223.

3.15
WBEM resource identifier

a URI that addresses a REST resource in a WBEM server. Some but not all of those REST resources correspond to CIM objects in a WBEM server. Also called "resource identifier" in this document.

3.16
WBEM server

a CIM server (see DSP0004) that supports a WBEM protocol. A WBEM server processes WBEM operations originated by a WBEM client, and originates WBEM indications for processing by a WBEM listener. For details, see DSP0223.

4 Symbols and abbreviated terms

The abbreviations defined in DSP0004 and DSP0223 apply to this document. The following additional abbreviations are used in this document.

4.1

ABNF

Augmented Backus-Naur Form, as defined in RFC5234

4.2

CIM

Common Information Model, as defined by DMTF

4.3

CIM-RS

CIM Operations Over RESTful Services, as defined in DSP-IS0201

4.4

CQL

CIM Query Language, as defined in DSP0202

4.5

ECMAScript

a scripting language that is the standard version of what was called JavaScript. It is defined in ECMA-262.

4.6

HTTP

Hyper Text Transfer Protocol. HTTP version 1.1 is defined in RFC2616.

4.7

IANA

Internet Assigned Numbers Authority; see http://www.iana.org

4.8

JSON

JavaScript Object Notation, as defined in ECMA-262

4.9

MIME

Multipurpose Internet Mail Extensions, as defined in IANA MIME Media Types

4.10

REST

Representational State Transfer, as originally and informally described in *Architectural Styles and the Design of Network-based Software Architectures*

4.11

UCS

Universal Character Set, as defined in ISO/IEC 10646:2003

4.12

URI

Uniform Resource Identifier, as defined in RFC3986

4.13

UTF-8

UCS Transformation Format 8, as defined in ISO/IEC 10646:2003

4.14

WBEM

Web Based Enterprise Management, as defined by DMTF

4.15

XML

eXtensible Markup Language, as defined by W3C

5 Concepts

This clause defines concepts that are the basis for the definition of the representation of CIM-RS payload elements in JSON.

In most cases, the CIM-RS payload elements are represented as JSON objects with attributes that match the generic properties of the payload element as defined in DSP-IS0201.

In most cases of using JSON arrays, the array members are named JSON objects based on the value of a generic property defining the name, in order to provide a name-based direct access to the array member.

Embedded CIM instances are represented as nested JSON objects.

6 Conformance

A representation of CIM-RS payload elements in JSON conforms to this document only if it conforms to all normative rules stated in this document.

The term "CIM-RS representation in JSON" shall be used only for representations of CIM-RS payload elements in JSON that conform to this document.

7 CIM-RS binding to JSON

This clause defines the binding of CIM-RS to JSON.

7.1 General

A CIM-RS payload element represented in JSON shall conform to the grammar defined by the symbol *JSONText* defined in clause 15.12.1 ("The JSON Grammar") of ECMA-262.

Care should be taken to distinguish text in ECMA-262 that applies to the JSON language from text that applies to the ECMAScript language. Because the use of JSON for the representation of CIM represents a different usage context than the use of JSON within ECMAScript, rules defined outside of but referenced from within clause 15.12.1 of ECMA-262 shall apply to this document unless otherwise noted.

NOTE: Although RFC4627 defines the grammar of the JSON language consistently with clause 15.12.1 of ECMA-262, RFC4627 is an informational RFC whose purpose is to describe the MIME media type for JSON but not to be the normative definition of the JSON grammar. For this reason, this document references ECMA-262 as the normative definition of the JSON grammar.

7.2 Character repertoire, representation, and escaping

The JSON grammar defined in clause 15.12.1 of ECMA-262 references the *SourceCharacter* symbol defined in its clause 6 as the basis for its characters. The definition of the *SourceCharacter* symbol applies to the ECMAScript use of JSON and uses the character repertoire of Unicode V3, requires a representation of UCS characters in Normalization Form C, and effectively implies a requirement for an encoding in UTF-16 (or one of its little endian and big endian derivatives).

The following rules apply to a use of the *SourceCharacter* symbol for the representation of CIM-RS payload elements in JSON:

1) The character repertoire of *SourceCharacter* shall be that defined for values of the CIM string type (defined in DSP0004).

   NOTE: That character repertoire is larger than that defined by ECMA-262.

2) *SourceCharacter* shall be represented in Normalization Form C.

3) *SourceCharacter* shall be encoded in UTF-8.

ECMA-262 defines backslash-based escaping for certain characters including the representation of UCS characters using their UCS code positions. However, in the definition of the *UnicodeEscapeSequence* symbol in its clause 7.8.4 ("String Literals"), ECMA-262 limits the representation of UCS code positions to a value range of four hex digits. This is not sufficient for representing the character repertoire defined for values of the CIM string type (and also not for representing the character repertoire used by ECMA-262 itself).

Therefore, the representation of CIM-RS payload elements in JSON shall support the following extended definition of the *UnicodeEscapeSequence* symbol:

```
UnicodeEscapeSequence ::
    u HexDigit HexDigit HexDigit HexDigit
    u HexDigit HexDigit HexDigit HexDigit HexDigit
    u HexDigit HexDigit HexDigit HexDigit HexDigit HexDigit
```

NOTE: This extended definition is consistent with the four-to-six-digit form of the short identifier for UCS characters defined in clause 6.5 of ISO/IEC 10646:2003 (for example, U+000A, U+12345, and U+10FFFF).

7.3 MIME media type

DSP-IS0201 requires that CIM-RS payload representation descriptions define a unique MIME media type that identifies the representation.

RFC4627 defines "application/json" as the MIME media type for JSON. This media type is registered with IANA (see IANA MIME Media Types). That media type does not allow distinguishing between different uses of JSON. Because JSON does not have a strong notion of a schema for defining a particular use of JSON, this document defines a MIME media type that expresses the particular use of JSON for representing payload elements of the CIM-RS protocol.

The MIME media type identifying the representation of CIM-RS payload elements in JSON shall be:

```
application/vnd.dmtf.cimrs+json
```

The version of this document shall be used to identify the version of the JSON representation. That version shall be included in the MIME media type as a media type parameter named "version".

For example, the current version of the JSON representation results in the following MIME media type:

```
application/vnd.dmtf.cimrs+json;version=1.0.0
```

7.4 Representation of links

DSP-IS0201 requires that CIM-RS payload representation descriptions define how links are represented.

A set of links shall be represented in JSON as a JSON property named "links" whose value is a JSON object that conforms to the following JSON schema:

```
{
  "id": "http://schemas.dmtf.org/cimrs/is1/json/is1/links",
  "description": "Object type of 'links' property.",
  "type": "object",
  "properties": {
    "links": {
      "description": "A set of links.",
      "type": "object",
      "additionalProperties": {
        "description": "Each additional JSON property shall represent a link. The
JSON property name shall be the link name.",
        "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link"
      }
    }
  }
}
```

A single link shall be represented in JSON as a JSON property that is named with the link name and whose value is a JSON object that conforms to the following JSON schema:

```
{
  "id": "http://schemas.dmtf.org/cimrs/is1/json/is1/link",
  "description": "Object type of a link property.",
  "type": "object",
  "properties": {
    "href": {
      "description": "The target of the link.",
      "type": "string",
      "format": "uri",
      "required": true
    }
  }
}
```

NOTE: This definition for a set of links is similar to that of the *link description object* defined in RFC-json-structure. The difference is the usage of associative arrays in this definition whereby the link set is represented as a JSON object with properties named with the link names, while in RFC-json-structure the link set is represented as a JSON array with items that are JSON objects whose "rel" property has a value that is the link name. Using the associative array approach has the advantage of providing direct access to a link by link name.

EXAMPLE:

```
"links": {
  "self": {
    "href": "http://my.server/my/path"
  },
  "parent": {
    "href": "http://my.server/my"
  }
}
```

This example defines a JSON property representing a set of links consisting of two links: A link named "self" targeting "http://my.server/my/path" and a link named "parent" targeting "http://my.server/my".

7.5 Representation of protocol payload elements

DSP-IS0201 requires that CIM-RS payload representation descriptions define how the payload elements defined in DSP-IS0201 are represented. This is defined in the subclauses of this clause.

7.5.1 NamespaceCollection payload element

A NamespaceCollection payload element shall be represented as a JSON object that conforms to the following JSON schema:

```
{
  "id": "http://schemas.dmtf.org/cimrs/is1/json/is1/namespacecollection",
  "description": "A NamespaceCollection payload element.",
  "type": "object",
  "properties": {
    "links": {
      "description": "The set of links of this payload element. For the meaning of
each link and for the requirement to specify this property and each link, see the
CIM-RS operations defined in DSP-IS0201 that use this payload element.",
      "type": "object",
      "properties": {
        "self": {
          "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link",
          "required": true
        }
      }
    },
    "namespaces": {
      "description": "The set of namespaces in the collection. When no child
properties are specified, this property may be specified or omitted.",
      "type": "object",
      "additionalProperties": {
        "description": "Each additional JSON property shall represent a namespace.
The JSON property name shall be the namespace name.",
        "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/namespace"
      }
    }
  }
}
```

EXAMPLE:

```
{
  "links": {
    "self": {
      "href": "http://acme.com:5988/cimrs/namespaces"}
  },
  "namespaces": {
    "root/cimv2": { # A namespace, as defined in 7.5.2.
      "links": {
        "self": {
          "href": "http://acme.com:5988/cimrs/namespaces/root%2Fcimv2"},
        "classes": {
          "href": "classes"},
        "qualifiers": {
          "href": "qualifiers"},
        "instancequery": {
          "href": "instancequery"}
      }
    },
    . . . # more namespaces
  }
}
```

7.5.2 Namespace payload element

A Namespace payload element shall be represented as a JSON property that is named with the namespace name and whose value is a JSON object that conforms to the following JSON schema:

```
{
  "id": "http://schemas.dmtf.org/cimrs/is1/json/is1/namespace",
  "description": "Object type for the namespace property of a Namespace payload
element.",
  "type": "object",
  "properties": {
    "links": {
      "description": "The set of links of this payload element. For the meaning of
each link and for the requirement to specify this property and each link, see the
CIM-RS operations defined in DSP-IS0201 that use this payload element.",
      "type": "object",
      "properties": {
        "self": {
          "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link",
          "required": true
        },
        "classes": {
          "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link",
          "required": true
        },
        "qualifiers": {
          "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link",
          "required": true
        },
        "instancequery": {
          "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link",
          "required": true
        }
      }
    }
  }
}
```

EXAMPLE:

```
"root/cimv2": {
  "links": {
    "self": {
      "href": "http://acme.com:5988/cimrs/namespaces/root%2Fcimv2"},
    "classes": {
      "href": "classes"},
    "qualifiers": {
      "href": "qualifiers"},
    "instancequery": {
      "href": "instancequery"}
  }
}
```

7.5.3 ClassCollection payload element

A ClassCollection payload element shall be represented as a JSON object that conforms to the following JSON schema:

```
{
  "id": "http://schemas.dmtf.org/cimrs/is1/json/is1/classcollection",
  "description": "A ClassCollection payload element.",
  "type": "object",
  "properties": {
    "links": {
      "description": "The set of links of this payload element. For the meaning of
each link and for the requirement to specify this property and each link, see the
CIM-RS operations defined in DSP-IS0201 that use this payload element.",
      "type": "object",
      "properties": {
        "self": {
          "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link",
          "required": true
        },
        "namespace": {
          "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link",
          "required": true
        }
      }
    },
    "classes": {
      "description": "The set of classes in the collection. When no child
properties are specified, this property may be specified or omitted.",
      "type": "object",
      "additionalProperties": {
        "description": "Each additional JSON property shall represent a class. The
JSON property name shall be the class name.",
        "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/class"
      }
    }
  }
}
```

EXAMPLE:

```
{
  "links": {
    "self": {
      "href": "http://acme.com:5988/cimrs/namespaces/root%2Fcimv2/classes"},
    "namespace": {
      "href": ".."}
  },
  "classes": {
    "CIM_SubClass1OfExample": { # A class, as defined in 7.5.4.
      "links": {
        "self": {
          "href": "http://acme.com:5988/cimrs/namespaces/root%2Fcimv2/classes/CIM_S
ubClass1OfExample"},
        "namespace": {
          "href": "../.."},
        "instances": {
          "href": "instances"},
        "methodinvocation": {
          "href": "methodinvocation"},
        "associators": {
          "href": "associators"},
        "references": {
          "href": "references"}
      },
      "superclass": "CIM_Example",
      "qualifiers": { . . . }, # for details, see 7.5.4.
      "methods": { . . . },    # for details, see 7.5.4.
      "properties": { . . . }  # for details, see 7.5.4.
    },
    . . . # more classes
  }
}
```

7.5.4 Class payload element

A Class payload element shall be represented as a JSON property that is named with the class name and whose value is a JSON object that conforms to the following JSON schema:

```
{
  "id": "http://schemas.dmtf.org/cimrs/is1/json/is1/class",
  "description": "Object type for the class property of a Class payload element.",
  "type": "object",
  "properties": {
    "links": {
      "description": "The set of links of this payload element. For the meaning of
each link and for the requirement to specify this property and each link, see the
CIM-RS operations defined in DSP-IS0201 that use this payload element.",
      "type": "object",
      "properties": {
        "self": {
          "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link",
          "required": true
        },
        "namespace": {
          "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link",
          "required": true
        },
        "instances": {
          "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link",
          "required": true
        },
        "methodinvocation": {
          "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link",
          "required": true
        },
        "associators": {
          "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link",
          "required": true
        },
        "references": {
          "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link",
          "required": true
        }
      }
    },
    "superclass": {
      "description": "The name of the superclass of this class, if any.",
      "type": "string",
      "format": "cim-classname"
    },
    "qualifiers": {
      "description": "The set of qualifier values of this class. When no child
properties are specified, this property may be specified or omitted.",
      "type": "object",
      "additionalProperties": {
        "description": "Each additional JSON property shall represent a qualifier
value. The JSON property name shall be the qualifier name. For details on the JSON
type used to represent the value, see 7.6.5.",
        "type": "any"
      }
    },
    "methods": {
      "description": "The set of method declarations of this class. When no child
properties are specified, this property may be specified or omitted.",
      "type": "object",
      "additionalProperties": {
        "description": "Each additional JSON property shall represent a method
declaration. The JSON property name shall be the method name.",
        "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/methoddeclaration"
      }
    },
    "properties": {
      "description": "The set of property declarations of this class. When no child
properties are specified, this property may be specified or omitted.",
      "type": "object",
      "additionalProperties": {
        "description": "Each additional JSON property shall represent a CIM
property declaration. The JSON property name shall be the CIM property name.",
        "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/propertydeclaration"
      }
    }
  }
}
```

EXAMPLE:

```
"CIM_RegisteredProfile": {
  "links": {
    "self": {
      "href": "http://acme.com:5988/cimrs/namespaces/root%2Fcimv2/classes/CIM_Regis
teredProfile"},
    "namespace": {
      "href": "../.."},
    "instances": {
      "href": "instances"},
    "methodinvocation": {
      "href": "methodinvocation"},
    "associators": {
      "href": "associators"},
    "references": {
      "href": "references"}
  },
  "superclass": "CIM_RegisteredSpecification",
  "qualifiers": {
    "Version": "2.26.0",
    . . . # more qualifier value specifications on the class
  },
  "methods": {
    "CloseConformantInstances": {
      "qualifiers": {
        "Experimental": true,
        . . . # more qualifier value specifications on the method
      },
      "returnvalue": {
        "type": "uint32"
      },
      "parameters": {
        "EnumerationContext": {
          "qualifiers": {
            "In": true,
            . . . # more qualifier value specifications on the parameter
          },
          "type": "string"
        },
        . . . # more parameter declarations
      }
    },
    . . . # more method declarations
  },
  "properties": {
    "SpecificationType": {
      "qualifiers": {
        "Override": "SpecificationType",
        "ValueMap": ["2"],
        "Values": ["Profile"],
        . . . # more qualifier value specifications on the property
      },
      "type": "uint16"
    },
    . . . # more property declarations
  }
}
```

7.5.5 InstanceCollection payload element

An InstanceCollection payload element shall be represented as a JSON object that conforms to the following JSON schema:

```
{
  "id": "http://schemas.dmtf.org/cimrs/is1/json/is1/instancecollection",
  "description": "An InstanceCollection payload element.",
  "type": "object",
  "properties": {
    "links": {
      "description": "The set of links of this payload element. For the meaning of
each link and for the requirement to specify this property and each link, see the
CIM-RS operations defined in DSP-IS0201 that use this payload element.",
      "type": "object",
      "properties": {
        "self": {
          "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link",
          "required": true
        },
        "class": {
          "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link",
          "required": true
        }
      }
    },
    "instances": {
      "description": "The set of instances in the collection. When no child
properties are specified, this property may be specified or omitted.",
      "type": "array",
      "items": "http://schemas.dmtf.org/cimrs/is1/json/is1/instance"
    }
  }
}
```

EXAMPLE:

```
{
  "links": {
    "self": {
      "href": "http://acme.com:5988/cimrs/namespaces/root%2Fcimv2/classes/CIM_Sourc
eExample/instances"},
    "class": {
      "href": ".."}
  },
  "instances": [
    { # An instance, as defined in 7.5.6.
      "links": {
        "self": {
          "href": "http://acme.com:5988/cimrs/namespaces/root%2Fcimv2/classes/CIM_R
egisteredProfile/instances/DMTF%3AFan%3A1.1.0"},
        "class": {
          "href": "../.."},
        "methodinvocation": {
          "href": "methodinvocation"},
        "associators": {
          "href": "associators"},
        "references": {
          "href": "references"}
      },
      "class": "CIM_RegisteredProfile",
      "properties": {
        "InstanceID": "DMTF:Fan:1.1.0",
        "RegisteredName": "Fan",
        "RegisteredOrganization": 2,
        "RegisteredVersion": "1.1.0",
        . . . # more properties
      }
    },
    . . . # more instances
  ]
}
```

7.5.6 Instance payload element

An Instance payload element shall be represented as a JSON object that conforms to the following JSON schema:

```
{
  "id": "http://schemas.dmtf.org/cimrs/is1/json/is1/instance",
  "description": "An Instance payload element.",
  "type": "object",
  "properties": {
    "links": {
      "description": "The set of links of this payload element. For the meaning of
each link and for the requirement to specify this property and each link, see the
CIM-RS operations defined in DSP-IS0201 that use this payload element.",
      "type": "object",
      "properties": {
        "self": {
          "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link"
        },
        "class": {
          "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link"
        },
        "methodinvocation": {
          "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link"
        },
        "associators": {
          "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link"
        },
        "references": {
          "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link"
        }
      }
    },
    "class": {
      "description": "The name of the creation class of this instance.",
      "type": "string",
      "format": "cim-classname",
      "required": true
    },
    "properties": {
      "description": "The set of property values of this instance. When no child
properties are specified, this property may be specified or omitted.",
      "type": "object",
      "additionalProperties": {
        "description": "Each additional JSON property shall represent a property
value. The JSON property name shall be the CIM property name. For details on the
JSON type used to represent the value, see 7.6.5.",
        "type": "any"
      }
    }
  }
}
```

EXAMPLE:

```
{
  "links": {
    "self": {
      "href": "http://acme.com:5988/cimrs/namespaces/root%2Fcimv2/classes/CIM_Regis
teredProfile/instances/DMTF%3AFan%3A1.1.0"},
    "class": {
      "href": "../.."},
    "methodinvocation": {
      "href": "methodinvocation"},
    "associators": {
      "href": "associators"},
    "references": {
      "href": "references"}
  },
  "class": "CIM_RegisteredProfile",
  "properties": {
    "InstanceID": "DMTF:Fan:1.1.0",
    "RegisteredName": "Fan",
    "RegisteredOrganization": 2,
    "RegisteredVersion": "1.1.0",
    . . . # more properties
  }
}
```

7.5.7 QualifierTypeCollection payload element

A QualifierTypeCollection payload element shall be represented as a JSON object that conforms to the following JSON schema:

```
{
  "id": "http://schemas.dmtf.org/cimrs/is1/json/is1/qualifiertypecollection",
  "description": "A QualifierTypeCollection payload element.",
  "type": "object",
  "properties": {
    "links": {
      "description": "The set of links of this payload element. For the meaning of
each link and for the requirement to specify this property and each link, see the
CIM-RS operations defined in DSP-IS0201 that use this payload element.",
      "type": "object",
      "properties": {
        "self": {
          "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link",
          "required": true
        },
        "namespace": {
          "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link",
          "required": true
        }
      }
    },
    "qualifiertypes": {
      "description": "The set of qualifier types in the collection. When no child
properties are specified, this property may be specified or omitted.",
      "type": "object",
      "additionalProperties": {
        "description": "Each additional JSON property shall represent a qualifier
type. The JSON property name shall be the qualifier name.",
        "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/qualifiertype"
      }
    }
  }
}
```

EXAMPLE:

```
{
  "links": {
    "self": {
      "href": "http://acme.com:5988/cimrs/namespaces/root%2Fcimv2/qualifiertypes"},
    "namespace": {
      "href": ".."}
  },
  "qualifiertypes": {
    "Abstract": { # A qualifier type, as defined in 7.5.8.
      "links": {
        "self": {
          "href": "http://acme.com:5988/cimrs/namespaces/root%2Fcimv2/qualifiers/Ab
stract"},
        "namespace": {
          "href": "../.."}
      },
      "type": "boolean",
      "default": false,
      "scope": [ "class", "association", "indication" ],
      "flavor": [ "Restricted" ]
    },
    . . . # more qualifier types
  }
}
```

7.5.8 QualifierType payload element

A QualifierType payload element shall be represented as a JSON property that is named with the qualifier name and whose value is a JSON object that conforms to the following JSON schema:

```
{
  "id": "http://schemas.dmtf.org/cimrs/is1/json/is1/qualifiertype",
  "description": "Object type for the qualifier property of a QualifierType payload
element.",
  "type": "object",
  "properties": {
    "links": {
      "description": "The set of links of this payload element. For the meaning of
each link and for the requirement to specify this property and each link, see the
CIM-RS operations defined in DSP-IS0201 that use this payload element.",
      "type": "object",
      "properties": {
        "self": {
          "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link",
          "required": true
        },
        "namespace": {
          "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/link",
          "required": true
        }
      }
    },
    "type": {
      "description": "The CIM datatype of this qualifier type. For details, see
7.6.5.",
      "type": "string",
      "enum": [ "boolean", "string", "char16", "uint8", "sint8", "uint16",
                "sint16", "uint32", "sint32", "uint64", "sint64", "datetime",
                "real32", "real64" ],
      "required": true
    },
    "isarray": {
      "description": "Indicates whether the CIM datatype of this qualifier type is
an array. For details, see 7.6.5.",
      "type": "boolean",
      "default": false
    },
    "default": {
      "description": "The default value of this qualifier type, if any. For details
on the JSON type used to represent the value, see 7.6.5.",
      "type": "any"
    },
    "scope": {
      "description": "The scope of this qualifier type.",
      "type": "array",
      "required": true,
      "minItems": 1,
      "items": {
        "description": "A CIM element type contributing to the scope of this
qualifier type.",
        "type": "string",
        "enum": [ "class", "association", "indication", "property", "reference",
"method", "parameter", "any" ]
      }
    },
    "flavor": {
      "description": "The flavor of this qualifier type. When no array items are
specified, this property may be specified or omitted.",
      "type": "array",
      "default": [ "tosubclass", "enableoverride" ],
      "items": {
        "description": "A single flavor contributing to the overall flavor of this
qualifier type. See DSP0004 for valid combinations.",
        "type": "string",
        "enum": [ "restricted", "tosubclass", "enableoverride", "disableoverride",
"translatable" ]
      }
    }
  }
}
```

EXAMPLE:

```
"Abstract": {
  "links": {
    "self": {
      "href": "http://acme.com:5988/cimrs/namespaces/root%2Fcimv2/qualifiers/Abstra
ct"},
    "namespace": {
      "href": "../.."}
  },
  "type": "boolean",
  "default": false,
  "scope": [ "class", "association", "indication" ],
  "flavor": [ "Restricted" ]
}
```

7.5.9 MethodInvocationRequest payload element

A MethodInvocationRequest payload element shall be represented as a JSON property that is named with the method name and whose value is a JSON object that conforms to the following JSON schema:

```
{
  "id": "http://schemas.dmtf.org/cimrs/is1/json/is1/methodinvocationrequest",
  "description": "Object type for the method property of a MethodInvocationRequest
payload element.",
  "type": "object",
  "properties": {
    "parameters": {
      "description": "The set of input parameter values for the method to be
invoked. When no child properties are specified, this property may be specified or
omitted.",
      "type": "object",
      "additionalProperties": {
        "description": "Each additional JSON property shall represent a parameter
value. The JSON property name shall be the parameter name. For details on the JSON
type used to represent the value, see 7.6.5.",
        "type": "any"
      }
    }
  }
}
```

EXAMPLE:

```
"SomeMethod": {
  "parameters": {
    "Parm1": "Some input data",
    . . . # more parameters
  }
}
```

7.5.10 MethodInvocationResponse payload element

A MethodInvocationResponse payload element shall be represented as a JSON property that is named with the method name and whose value is a JSON object that conforms to the following JSON schema:

```
{
  "id": "http://schemas.dmtf.org/cimrs/is1/json/is1/methodinvocationresponse",
  "description": "Object type for the method property of a MethodInvocationResponse
payload element.",
  "type": "object",
  "properties": {
    "returnvalue": {
      "description": "The return value of the method that was invoked. For details
on the JSON type used to represent the value, see 7.6.5.",
      "type": "any",
      "required": true
    },
    "parameters": {
      "description": "The set of output parameter values for the method that was
invoked. When no child properties are specified, this property may be specified or
omitted.",
      "type": "object",
      "additionalProperties": {
        "description": "Each additional JSON property shall represent a parameter
value. The JSON property name shall be the parameter name. For details on the JSON
type used to represent the value, see 7.6.5.",
        "type": "any"
      }
    }
  }
}
```

EXAMPLE:

```
"SomeMethod": {
  "returnvalue": 42,
  "parameters": {
    "Parm2": "Some output data",
    . . . # more parameters
  }
}
```

7.5.11 InstanceModificationRequest payload element

An InstanceModificationRequest payload element shall be represented as a JSON object that conforms to the following JSON schema:

```
{
  "id": "http://schemas.dmtf.org/cimrs/is1/json/is1/instancemodificationrequest",
  "description": "An InstanceModificationRequest payload element.",
  "type": "object",
  "properties": {
    "replace": {
      "description": "The set of properties whose values are to be replaced. When
no child properties are specified, this property may be specified or omitted.",
      "type": "object",
      "additionalProperties": {
        "description": "Each additional JSON property shall represent a CIM
property value. The JSON property name shall be the CIM property name. For details
on the JSON type used to represent the value, see 7.6.5.",
        "type": "any"
      }
    }
  }
}
```

This version of this document defines value replacement as the only type of property value modification. Future support for other types of property value modifications can be provided by adding sibling (JSON) properties to the "replace" property.

EXAMPLE:

```
{
  "replace": {
    "Caption": "A changed caption",
    . . . # more properties to be replaced
  }
}
```

7.5.12 InstanceQueryRequest payload element

An InstanceQueryRequest payload element shall be represented as a JSON object that conforms to the following JSON schema:

```
{
  "id": "http://schemas.dmtf.org/cimrs/is1/json/is1/instancequeryrequest",
  "description": "An InstanceQueryRequest payload element.",
  "type": "object",
  "properties": {
    "querystring": {
      "description": "The instance query to be executed.",
      "type": "string",
      "required": true
    }
    "querylanguage": {
      "description": "The query language used to express the instance query.",
      "type": "string",
      "required": true
    }
  }
}
```

EXAMPLE:

```
{
  "querystring": "SELECT OBJECTPATH(CIM_StorageExtent) AS Path, ElementName
                  FROM CIM_StorageExtent",
  "querylanguage": "DMTF:CQL"
}
```

7.5.13 ErrorResponse payload element

An ErrorResponse payload element shall be represented as a JSON object that conforms to the following JSON schema:

```
{
  "id": "http://schemas.dmtf.org/cimrs/is1/json/is1/errorresponse",
  "description": "An ErrorResponse payload element.",
  "type": "object",
  "properties": {
    "statusCode": {
      "description": "The CIM status code of the error response.",
      "type": "integer"
    },
    "statusDescription": {
      "description": "The CIM status description of the error response.",
      "type": "string"
    },
    "errors": {
      "description": "The set of CIM_Error instances describing the errors. When no
child properties are specified, this property may be specified or omitted.",
      "type": "array",
      "items": "http://schemas.dmtf.org/cimrs/is1/json/is1/instance"
    }
  }
}
```

EXAMPLE:

```
{
  "statusCode": 2,
  "statusDescription": "The CIM instance does not exist."
}
```

7.6 Representation of values used within payload elements

This clause describes the JSON representation of values used within the payload elements defined in 7.5, that are not defined in 7.5. The representation of these values is described by means of JSON object types that are identified by their "id" property.

7.6.1 Method declaration

A method declaration shall be represented as a JSON property that is named with the method name and whose value is a JSON object that conforms to the following JSON schema:

```
{
  "id": "http://schemas.dmtf.org/cimrs/is1/json/is1/methoddeclaration",
  "description": "A method declaration.",
  "type": "object",
  "properties": {
    "qualifiers": {
      "description": "The set of qualifier values of this method. When no child
properties are specified, this property may be specified or omitted.",
      "type": "object",
      "additionalProperties": {
        "description": "Each additional JSON property shall represent a qualifier
value. The JSON property name shall be the qualifier name. For details on the JSON
type used to represent the value, see 7.6.5.",
        "type": "any"
      }
    },
    "returnvalue": {
      "description": "The declaration of the return value.",
      "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/returnvaluedeclaration",
      "required": true
    },
    "parameters": {
      "description": "The set of parameters of this method declaration. When no
child properties are specified, this property may be specified or omitted.",
      "type": "object",
      "additionalProperties": {
        "description": "Each additional JSON property shall represent a parameter
declaration. The JSON property name shall be the parameter name.",
        "type": "http://schemas.dmtf.org/cimrs/is1/json/is1/parameterdeclaration"
      }
    }
  }
}
```

EXAMPLE:

```
"SomeMethod": {
  "qualifiers": {
    "Static": true,
    . . . # more qualifier value specifications on the method
  },
  "returnvalue": {
    "type": "uint32"
  },
  "parameters": {
    "Parm1": {
      "qualifiers": {
        "In": true,
        . . . # more qualifier value specifications on the parameter
      },
      "type": "uint32"
    },
    . . . # more parameter declarations
  }
}
```

7.6.2 Return value declaration

A return value declaration shall be represented as a JSON property named "returnvalue", whose value is a JSON object that conforms to the following JSON schema:

```
{
  "id": "http://schemas.dmtf.org/cimrs/is1/json/is1/returnvaluedeclaration",
  "description": "A method return value declaration.",
  "type": "object",
  "properties": {
    "type": {
      "description": "The CIM datatype of the return value. For details, see
7.6.5.",
      "type": "string",
      "enum": [ "boolean", "string", "char16", "uint8", "sint8", "uint16",
                "sint16", "uint32", "sint32", "uint64", "sint64", "datetime",
                "real32", "real64", "reference", "object", "instance" ],
      "required": true
    },
    "referenceClass": {
      "description": "The name of the CIM class of any referenced instances. This
property is required if the 'type' property has a value of 'reference' and is not
allowed otherwise. For details, see 7.6.5.",
      "type": "string",
      "format": "cim-classname"
    }
  }
}
```

EXAMPLE: See 7.6.1.

7.6.3 Parameter declaration

A parameter declaration shall be represented as a JSON property that is named with the parameter name and whose value is a JSON object that conforms to the following JSON schema:

```
{
  "id": "http://schemas.dmtf.org/cimrs/is1/json/is1/parameterdeclaration",
  "description": "A method parameter declaration.",
  "type": "object",
  "properties": {
    "qualifiers": {
      "description": "The set of qualifier values of this parameter. When no child
properties are specified, this property may be specified or omitted.",
      "type": "object",
      "additionalProperties": {
        "description": "Each additional JSON property shall represent a qualifier
value. The JSON property name shall be the qualifier name. For details on the JSON
type used to represent the value, see 7.6.5.",
        "type": "any"
      }
    },
    "type": {
      "description": "The CIM datatype of the parameter. For details, see 7.6.5.",
      "type": "string",
      "enum": [ "boolean", "string", "char16", "uint8", "sint8", "uint16",
                "sint16", "uint32", "sint32", "uint64", "sint64", "datetime",
                "real32", "real64", "reference", "object", "instance" ],
      "required": true
    },
    "isarray": {
      "description": "Indicates whether the CIM datatype of the parameter is an
array. For details, see 7.6.5.",
      "type": "boolean",
      "default": false
    },
    "referenceClass": {
      "description": "The name of the CIM class of any referenced instances. This
property is required if the 'type' property has a value of 'reference' and is not
allowed otherwise. For details, see 7.6.5.",
      "type": "string",
      "format": "cim-classname"
    }
  }
}
```

EXAMPLE: See 7.6.1.

7.6.4 Property declaration

A property declaration shall be represented as a JSON property that is named with the property name and whose value is a JSON object that conforms to the following JSON schema:

```
{
  "id": "http://schemas.dmtf.org/cimrs/is1/json/is1/propertydeclaration",
  "description": "A property declaration.",
  "type": "object",
  "properties": {
    "qualifiers": {
      "description": "The set of qualifier values of this property. When no child
properties are specified, this property may be specified or omitted.",
      "type": "object",
      "additionalProperties": {
        "description": "Each additional JSON property shall represent a qualifier
value. The JSON property name shall be the qualifier name. For details on the JSON
type used to represent the value, see 7.6.5.",
        "type": "any"
      }
    },
    "type": {
      "description": "The CIM datatype of the property. For details, see 7.6.5.",
      "type": "string",
      "enum": [ "boolean", "string", "char16", "uint8", "sint8", "uint16",
                "sint16", "uint32", "sint32", "uint64", "sint64", "datetime",
                "real32", "real64", "reference", "object", "instance" ],
      "required": true
    },
    "isarray": {
      "description": "Indicates whether the CIM datatype of the property is an
array. For details, see 7.6.5.",
      "type": "boolean",
      "default": false
    },
    "referenceClass": {
      "description": "The name of the CIM class of any referenced instances. This
property is required if the 'type' property has a value of 'reference' and is not
allowed otherwise. For details, see 7.6.5.",
      "type": "string",
      "format": "cim-classname"
    },
    "default": {
      "description": "The default value of this property, if any. For details on
the JSON type used to represent the value, see 7.6.5.",
      "type": "any"
    }
  }
}
```

EXAMPLE:

```
"SomeProperty": {
  "qualifiers": {
    "ValueMap": ["0", "1", "5", ".."],
    "Values": ["Unknown", "Other", "Enabled", "DMTF Reserved"],
    . . . # more qualifier value specifications on the property
  },
  "type": "uint32",
  "default": 5
}
```

7.6.5 CIM value

A CIM value shall be represented as a JSON value (that is, a *JSONValue* entity as defined in ECMA-262) that conforms to the JSON data type corresponding to the CIM data type of the CIM value, as defined in Table 1.

Table 1 also defines the values of the JSON properties "type", "isarray" and "referenceClass" for each CIM data type. These JSON properties are used to specify the data type of a CIM value, as defined in 7.5 and 0.

Table 1 – Representation of CIM values by data type

CIM data type	JSON data type	"type" property	"isarray" property	"referenceClass" property
boolean	boolean	"boolean"	false (default)	not specified
string	string	"string"	false (default)	not specified
char16	string	"char16"	false (default)	not specified
uint8	integer	"uint8"	false (default)	not specified
sint8	integer	"sint8"	false (default)	not specified
uint16	integer	"uint16"	false (default)	not specified
sint16	integer	"sint16"	false (default)	not specified
uint32	integer	"uint32"	false (default)	not specified
sint32	integer	"sint32"	false (default)	not specified
uint64	integer	"uint64"	false (default)	not specified
sint64	integer	"sint64"	false (default)	not specified
datetime	string	"datetime"	false (default)	not specified
real32	number	"real32"	false (default)	not specified
real64	number	"real64"	false (default)	not specified
<classname> ref	string	"reference"	false (default)	name of class of referenced instances
string, with EmbeddedInstance qualifier	object, see 0	"instance"	false (default)	not specified
string, with EmbeddedObject qualifier	object, see 0	"object"	false (default)	not specified
boolean [ ]	boolean	"boolean"	true	not specified
string [ ]	string	"string"	true	not specified
char16 [ ]	string	"char16"	true	not specified
uint8 [ ]	integer	"uint8"	true	not specified
sint8 [ ]	integer	"sint8"	true	not specified
uint16 [ ]	integer	"uint16"	true	not specified
sint16 [ ]	integer	"sint16"	true	not specified
uint32 [ ]	integer	"uint32"	true	not specified
sint32 [ ]	integer	"sint32"	true	not specified

CIM data type	JSON data type	"type" property	"isarray" property	"referenceClass" property
uint64 [ ]	integer	"uint64"	true	not specified
sint64 [ ]	integer	"sint64"	true	not specified
datetime [ ]	string	"datetime"	true	not specified
real32 [ ]	number	"real32"	true	not specified
real64 [ ]	number	"real64"	true	not specified
<classname> ref [ ]	string	"reference"	true	name of class of referenced instances
string [ ], with EmbeddedInstance qualifier	object, see 0	"instance"	true	not specified
string [ ], with EmbeddedObject qualifier	object, see 0	"object"	true	not specified

7.6.6 Embedded instances

CIM values that are embedded instances declared with the EmbeddedInstance qualifier shall be represented as a JSON object that conforms to the JSON schema for Instance payload (see 7.5.6), and that contains the links as defined in Table 2:

Table 2 – Links of embedded instance

Link name	Absolute / Relative	Requirement	Targeted resource
self	N/A	Prohibited	N/A
class	Absolute or relative to self link of outermost embedding instance	Mandatory	creation class of the represented embedded instance
method-invocation	N/A	Prohibited	N/A
associators	N/A	Prohibited	N/A
references	N/A	Prohibited	N/A

EXAMPLE:

This example shows an instance of class CIM_Outer that contains a property Emb1 representing an embedded instance of class CIM_Embedded that contains a property Prop1.

```
{
  "links": {
    "self": {
      "href": "http://acme.com:5988/cimrs/namespaces/root%2Fcimv2/classes/CIM_Outer
/instances/acme1"},
    "class": {
      "href": "../.."},
    "methodinvocation": {
      "href": "methodinvocation"},
    "associators": {
      "href": "associators"},
    "references": {
      "href": "references"}
  },
  "class": "CIM_Outer",
  "properties": {
    "InstanceID": "acme1",
    "Emb1: { # The property value is an embedded instance
      "links": {
        "class": {
          "href": "../../../CIM_Outer"},
      },
      "class": "CIM_Embedded",
      "properties": {
        "Prop1": "value1"
      }
    }
  }
}
```

7.6.7 Embedded objects

CIM values that are embedded objects declared with the EmbeddedObject qualifier shall be represented dependent on whether they represent instances or classes, as follows:

- If the CIM value represents an instance, it shall be represented as a JSON object that conforms to the JSON schema for an Instance payload element (see 7.5.6) that does not contain the properties "links" or "class".
- If the CIM value represents a class, it shall be represented as a JSON object that conforms to the JSON schema for a Class payload element (see 7.5.4) that does not contain the property "links".

EXAMPLE:

This example shows an instance of class CIM_Outer that contains a property Emb1 representing an embedded object that is an instance of class CIM_Embedded that contains a property Prop1.

```
{
  "links": {
    "self": {
      "href": "http://acme.com:5988/cimrs/namespaces/root%2Fcimv2/classes/CIM_Outer
/instances/acme1"},
    "class": {
      "href": "../.."},
    "methodinvocation": {
      "href": "methodinvocation"},
    "associators": {
      "href": "associators"},
    "references": {
      "href": "references"}
  },
  "class": "CIM_Outer",
  "properties": {
    "InstanceID": "acme1",
    "Emb1: { # The property value is an embedded object that is an instance
      "properties": {
        "Prop1": "value1"
      }
    }
  }
}
```

ANNEX A
(informative)

Change log

Version	Date	Description
1.0.0a	2010-10-11	Released as Work in Progress (of an Informational Specification)
1.0.0	2011-04-15	Released as DMTF Draft Informational Specification

Bibliography

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