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# Information technology — Open Virtualization Format (OVF) specification

*Technologies de l'information — Spécification du format de virtualisation ouvert (OVF)*

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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 http://www.iso.org/directives).

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For an explanation on the voluntary nature of Standard, the meaning of the ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword – Supplementary information

This document was prepared by ANSI (as INCITS 469-2015) and was adopted, under a special "fast-track procedure", by Joint Technical Committee ISO/IEC JTC 1, *Information technology*.

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American National Standard
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# Open Virtualization Format (OVF) Specification

## 1 Scope

The *Open Virtualization Format (OVF) Specification* describes an open, secure, efficient and extensible format for the packaging and distribution of software to be run in virtual systems.

The OVF package enables the authoring of portable virtual systems and the transport of virtual systems between virtualization platforms. This version of the specification (2.1) is intended to allow OVF 1.x tools to work with OVF 2.x descriptors in the following sense:

- Existing OVF 1.x tools should be able to parse OVF 2.x descriptors.
- Existing OVF 1.x tools should be able to give warnings/errors if dependencies to 2.x features are required for correct operation.

If a conflict arises between the schema, text, or tables, the order of precedence to resolve the conflicts is schema; then text; then tables. Figures are for illustrative purposes only and are not a normative part of the standard.

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A table may constrain the text but it shall not conflict with it.

The profile conforms to the cited CIM Schema classes where used. Any requirements contained in the cited CIM Schema classes shall be met. If a conflict arises the CIM Schema takes precedence.

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The profile conforms to the cited OVF XML Schema. It may constrain the schema but it shall not conflict with it. If a conflict arises the OVF XML Schema takes precedence.

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this American National Standard. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

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, *Common Information Model (CIM) Infrastructure Specification 2.7*, http://www.dmtf.org/standards/published_documents/DSP0004_2.7.pdf

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

DMTF DSP0230, *WS-CIM Mapping Specification 1.0*, http://www.dmtf.org/sites/default/files/standards/documents/DSP0230_1.0.2.pdf

DMTF DSP1001, *Management Profile Specification Usage Guide 1.1*, http://www.dmtf.org/standards/published_documents/DSP1001_1.1.pdf

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DMTF DSP1041, *Resource Allocation Profile (RAP) 1.1*, http://www.dmtf.org/standards/published_documents/DSP1041_1.1.pdf

DMTF DSP1043, *Allocation Capabilities Profile (ACP) 1.0*, http://www.dmtf.org/standards/published_documents/DSP1043_1.0.pdf

DMTF DSP1047, *Storage Resource Virtualization Profile 1.0*, http://www.dmtf.org/standards/published_documents/DSP1047_1.0.pdf

DMTF DSP1050, Ethernet Port Resource Virtualization Profile 1.0, http://www.dmtf.org/standards/published_documents/DSP1050_1.0.pdf

DMTF DSP1057, *Virtual System Profile 1.0*, http://www.dmtf.org/standards/published_documents/DSP1057_1.0.pdf

DMTF DSP8023, *OVF XML Schema Specification for OVF Envelope 2.0*, http://schemas.dmtf.org/ovf/envelope/2/dsp8023_2.0.xsd

DMTF DSP8027, *OVF XML Schema Specification for OVF Environment 1.1*, http://schemas.dmtf.org/ovf/environment/1/dsp8027_1.1.xsd

DMTF DSP8049, *Network Port Profile XML Schema,* http://schemas.dmtf.org/ovf/networkportprofile/1/dsp8049_1.0.xsd

IETF RFC1738, T. Berners-Lee, *Uniform Resource Locators (URL)*, December 1994, http://tools.ietf.org/html/rfc1738

IETF RFC1952, P. Deutsch, *GZIP file format specification version 4.3*, May 1996, http://tools.ietf.org/html/rfc1952

IETF RFC2616, R. Fielding et al, *Hypertext Transfer Protocol – HTTP/1.1*, June 1999, http://tools.ietf.org/html/rfc2616

IETF Standard 66, *Uniform Resource Identifiers (URI): Generic Syntax*, http://tools.ietf.org/html/rfc3986

IETF Standard 68, *Augmented BNF for Syntax Specifications: ABNF*, http://tools.ietf.org/html/rfc5234

ISO 9660, 1988 Information processing-Volume and file structure of CD-ROM for information interchange, http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=17505

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

ISO/IEC/IEEE 9945:2009: Information technology -- Portable Operating System Interface (POSIX®) Base Specifications, Issue 7
http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=50516

W3C, *XML Schema Part 1: Structures Second Edition.* 28 October 2004. W3C Recommendation. URL: http://www.w3.org/TR/2004/REC-xmlschema-1-20041028/

W3C, *XML Schema Part 2: Datatypes Second Edition.* 28 October 2004. W3C Recommendation. URL: http://www.w3.org/TR/2004/REC-xmlschema-2-20041028/

W3C, XML Encryption Syntax and Processing Version 1.1, 13 March 2012, W3C Candidate Recommendation
http://www.w3.org/TR/2012/CR-xmlenc-core1-20120313/

FIPS 180-2: Secure Hash Standard (SHS)
http://csrc.nist.gov/publications/fips/fips180-2/fips180-2.pdf

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## 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, DSP0223, and DSP1001 apply to this document. The following additional terms are used in this document.

**3.1**
**authoring function**
the creation of the OVF package

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**3.2**
**chassis**
a placement policy as defined in the class CIM_Chassis

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**3.3**
**conditional**
indicates requirements to be followed strictly to conform to the document when the specified conditions are met

**3.4**
**deployment function**
a function the result of which is a prepared virtual system

**3.5**
**geographic**
a placement policy referring to a geographic location (e.g., a country, a state, a province, a latlong)

**3.6**
**guest software**
the software that runs inside a virtual system

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**3.7**
**mandatory**
indicates requirements to be followed strictly to conform to the document and from which no deviation is permitted

**3.8**
**optional**
indicates a course of action permissible within the limits of the document

**3.9**
**rack**
a placement policy as defined in the class CIM_Rack

**3.10**
**site**
a placement policy as defined in Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment - Energy Efficiency and Key Performance Indicators; Part 2: Network sites; Sub-part 1: Operator sites, Technical Report, ETSI TR 105 174-2-1 V1.1.1 (2009-10)

**3.11**
**OVF package**
a single compressed file or a set of files that contains the OVF descriptor file and may contain associated virtual disks, operational metadata, and other files

**3.12**
**OVF descriptor**
an XML file that validates to DSP8023 and provides the information needed to deploy the OVF package

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**3.13**
**virtualization platform**
the hypervisor on which the virtual systems run

**3.14**
**virtual appliance**
a service delivered as a software stack that utilizes one or more virtual systems

**3.15**
**virtual hardware**
the processor, memory and I/O resources provided by a virtualization platform that supports a virtual system

**3.16**
**virtual system**
as defined in the Virtual System Profile plus the guest software if any

**3.17**
**virtual system collection**
a collection of virtual systems

**3.18**
**virtualization management**
the software that performs resource allocation and management of virtual systems

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# 4 Symbols and abbreviated terms

The abbreviations defined in DSP0004, DSP0223, and DSP1001 apply to this document. The following additional abbreviations are used in this document.

**4.1**
**CIM**
Common Information Model

**4.2**
**IP**
Internet Protocol

**4.3**
**OVF**
Open Virtualization Format

**4.4**
**VS**
virtual system

**4.5**
**VSC**
virtual system collection

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# 5 OVF package

## 5.1 OVF package structure

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An OVF package shall consist of the following files:

- one OVF descriptor with extension `.ovf`
- zero or one OVF manifest with extension `.mf`
- zero or one OVF certificate with extension `.cert`
- zero or more disk image files
- zero or more additional resource files, such as ISO images

The file extensions `.ovf`, `.mf` and `.cert` shall be used. See D.1 for an example.

An OVF package can be stored as either a single compressed file (.ova) or a set of files, as described in 5.3 and 5.4. Both modes shall be supported.

An OVF package may have a manifest file containing the SHA digests of individual files in the package. OVF packages authored according to this version of the specification shall use SHA256 digests. The manifest file shall have an extension `.mf` and the same base name as the `.ovf` file and be a sibling of the `.ovf` file. If the manifest file is present, a consumer of the OVF package should verify the digests in the manifest file in the OVF package by computing the actual SHA digests and comparing them with the digests listed in the manifest file. The manifest file shall contain SHA digests for all distinct files referenced in the `References` element of the OVF descriptor and for no other files. See 7.1

The syntax definitions below use ABNF with the exceptions listed in ANNEX A.

The format of the manifest file is as follows:

```
manifest_file = *( file_digest )
```

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```
  file_digest    = algorithm "(" file_name ")" "=" sp digest nl
  algorithm      = "SHA1" | "SHA256"
  digest         = *( hex-digit )
  hex-digit      = "0" | "1" | "2" | "3" | "4" | "5" | "6" | "7" | "8" | "9" | "a" |
"b" | "c" | "d" | "e" | "f"
  sp             = %x20
  nl             = %x0A
```

See D.1 for an example.

An OVF package may be signed by signing the manifest file. The digest of the manifest file is stored in a certificate file with extension `.cert` file along with the base64-encoded X.509 certificate. The `.cert` file shall have the same base name as the `.ovf` file and be a sibling of the `.ovf` file.

See ANNEX F for deployment considerations.

The format of the certificate file shall be as follows:

```
  certificate_file   = manifest_digest certificate_part
  manifest_digest    = algorithm "(" file_name ")" "=" sp signed_digest nl
  algorithm          = "SHA1" | "SHA256"
  signed_digest      = *( hex-digit)
  certificate_part   = certificate_header certificate_body certificate_footer
  certificate_header = "-----BEGIN CERTIFICATE-----" nl
  certificate_footer = "-----END CERTIFICATE-----" nl
  certificate_body   = base64-encoded-certificate nl
                       ; base64-encoded-certificate is a base64-encoded X.509
                       ; certificate, which may be split across multiple lines
  hex-digit          = "0" | "1" | "2" | "3" | "4" | "5" | "6" | "7" | "8" | "9" |
"a" | "b" | "c" | "d" | "e" | "f"
  sp                 = %x20
  nl                 = %x0A
```

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See D.1 for an example.

The manifest and certificate files, when present, shall not be included in the `References` section of the OVF descriptor (see 7.1). This ensures that the OVF descriptor content does not depend on whether the OVF package has a manifest or is signed, and the decision to add a manifest or certificate to a package can be deferred to a later stage.

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The file extensions `.mf` and `.cert` may be used for other files in an OVF package, as long as they do not occupy the sibling URLs or path names where they would be interpreted as the package manifest or certificate.

## 5.2 Virtual disk formats

OVF does not require any specific disk format to be used, but to comply with this specification the disk format shall be given by a URI that identifies an unencumbered specification on how to interpret the disk format. The specification need not be machine readable, but it shall be static and unique so that the URI may be used as a key by software reading an OVF package to uniquely determine the format of the disk. The specification shall provide sufficient information so that a skilled person can properly interpret the disk format for both reading and writing of disk data. The URI should be resolvable.

## 5.3 OVF package options

An OVF package may be stored as a compressed OVF package or as a set of files in a directory structure. A compressed OVF package is stored as single file. The file extension is `.ova` (open virtual appliance or application). See D.2 for an example.

All file references in the OVF descriptor are relative-path references and are described in section 7.1. Entries in a compressed OVF package shall exist only once.

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In addition, the entries shall be in one of the following orders inside the OVF package:

1) OVF descriptor
2) The remaining files shall be in the same order as listed in the References section (see 7.1). Note that any external string resource bundle files for internationalization shall be first in the References section (see clause 10).

or

1) OVF descriptor
2) OVF manifest
3) OVF certificate
4) The remaining files shall be in the same order as listed in the References section (see 7.1). Note that any external string resource bundle files for internationalization shall be first in the References section (see clause 10).

or

1) OVF descriptor
2) The intermediate files shall be in the same order as listed in the References section (see 7.1). Note that any external string resource bundle files for internationalization shall be first in the References section (see clause 10).
3) OVF manifest
4) OVF certificate

The ordering restriction ensures that it is possible to extract the OVF descriptor from a compressed OVF package without scanning the entire archive. The ordering restriction enables the efficient generation of a compressed OVF package-

A compressed OVF package shall be created by using the TAR format that complies with the USTAR (Uniform Standard Tape Archive) format as defined by the ISO/IEC/IEEE 9945:2009.

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## 5.4 Distribution as a set of files

An OVF package may be made available as a set of files. See D.2 for an example.

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# 6 OVF descriptor

The OVF descriptor contains the metadata about the OVF package. This is an extensible XML document for encoding information, such as product details, virtual hardware requirements, and licensing.

DSP8023 is the schema definition file for the OVF descriptor that contains the elements and attributes. The OVF descriptor shall validate against DSP8023.

Clauses 7, 8, and 9, describe the semantics, structure, and extensibility framework of the OVF descriptor. These clauses are not a replacement for reading the schema definitions, but they complement the schema definitions.

The XML namespaces used in this specification are listed in Table 1. The choice of any namespace prefix is arbitrary and not semantically significant.

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