



Guide to Schematron Rules and Patterns

VIRT Schematron Guide

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Chapter 1 - Introduction

1.1 - Purpose

This is an informative supplement for VIRT. This guide is generated from the VIRT Schematron rules and provides a consolidated reference for the business rules of this specification.

1.2 - Overview

Chapter 2 is a listing of all the numbered rules in VIRT. For each rule, there is a rule description, a code description, and a code block with the Schematron rule.

Chapter 3 is a listing of abstract patterns used in VIRT. The abstract patterns may be used in numbered rules or provided as reference for use in rules developed by users of VIRT. Each abstract pattern has a code description and a code block with the abstract Schematron pattern.

Chapter 4 is a listing of the master VIRT Schematron file with all of the imports of rules and patterns. Many of the rules and patterns listed in Chapters 3 and 4 rely on functions and variables defined in the master file.

Chapter 5 is a listing of rules that have been deleted.

1.3 - Schematron

The business rules for VIRT are encoded using ISO Schematron. Schematron is a rule-based validation language that uses XML Path Language to make assertions about an XML document.

VIRT uses the XSLT 2.0 implementation of Schematron by Rick Jelliffe (2010-04-14) as its reference implementation. The only available identifying descriptors for this implementation are the implementer's name and date of release. This implementation may be found at the following URL: <http://code.google.com/p/schematron/>.



Important

The Schematron rules in this specification use XSLT 2.0 query binding.

1.4 - Conformance

This guide is informative. The Schematron rules listed here are normative in the sense that they convey criteria that a document **MUST** adhere to, exactly as English may be used to convey normative criteria. It is not necessary for implementers to use the specific Schematron encoding in this specification. Implementers **MAY** use any encodings, tools, or languages desired to implement validation schemes for conformance to this specification. However, to conform to the specification, validation schemes **MUST** match the behavior of the reference Schematron implementation. That is, a validator **MUST** find a document valid *if and only if* the reference Schematron implementation would find the document valid according to VIRT's Schematron rules.

Chapter 2 - Rules

All of the numbered Rules for VIRT are listed in this section. These rules may depend on patterns defined in the Abstract Patterns section or on variables defined in the Schematron Schema section.

Rules identifiers are all of the format VIRT-ID-XXXXX, with rule files named VIRT_ID_XXXXX.sch. Any other heading indicates a supporting file that may influence a rule but is not actually a numbered rule.

2.1 - ../Rules/globalConstraints/VIRT_ID_00001.sch

Rule Description

[VIRT-ID-00001][Error] Every attribute in the document must be specified with a non-whitespace value.

Code Description

For each element with at least one attribute specified, this rule normalizes the space of the value of each attribute and make sure that the resulting string has a length greater than zero, which indicates non-whitespace content.

Schematron Code

```
<?ICEA pattern?>
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-->

<sch:pattern id="VIRT-ID-00001">
    <sch:rule id="VIRT-ID-00001-R1" context="*">
        <sch:assert test="every $attribute in ./@virt:* satisfies string-length(normalize-space(string($attribute))) > 0"
                    flag="error"
                    role="error">[VIRT-ID-00001][Error] Every attribute in the document must be specified with a non-whitespace value.</sch:assert>
        </sch:rule>
    </sch:pattern>
```

2.2 - ../Rules/globalConstraints/VIRT_ID_00003.sch

Rule Description

[VIRT-ID-00003][Warning] virt:DESVersion attribute SHOULD be specified as version 202010.202205 (Version:2020-OCT Revision: 2022-MAY) with an optional extension.

Code Description

This rule supports extending the version identifier with an optional trailing hyphen and up to 23 additional characters. The version must match the regular expression “^202010.202205(-.{1,23})?\$”.

Schematron Code

```
<?ICEA pattern?>
<!-- Notices - Distribution Notice:
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-->

<sch:pattern id="VIRT-ID-00003">
    <sch:rule id="VIRT-ID-00003-R1" context="*[@virt:DESVersion]">
        <sch:assert test="matches(@virt:DESVersion, '^202010.202205(-.{1,23})?$' )"
            flag="warning"
            role="warning">[VIRT-ID-00003][Warning] virt:DESVersion attribute SHOULD be specified as version 202010.202205 (Version:2020-OCT Revision: 2022-MAY) with an
optional extension.</sch:assert>
    </sch:rule>
</sch:pattern>
```

2.3 - ../Rules/globalConstraints/VIRT_ID_00004.sch

Rule Description

[VIRT-ID-00004][Error] If there exists VIRT elements and/or attributes in a document, then a VIRT DESVersion attribute must be declared in the document as well.

Code Description

In a document, if elements or attributes with the VIRT namespace exists, then the VIRT DESVersion attribute must exist.

Schematron Code

```
<?ICEA pattern?>
<!-- Notices - Distribution Notice:
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-->

<sch:pattern id="VIRT-ID-00004">
    <sch:rule id="VIRT-ID-00004-R1" context="/">
        <sch:assert test="if (../virt:* or ../*[@virt:*]) then exists(../@virt:DESVersion) else true()"
                    flag="error"
                    role="error">[VIRT-ID-00004][Error] If there exists VIRT elements and/or attributes in a document, then a VIRT DESVersion attribute must be declared in the
document as well.</sch:assert>
        </sch:rule>
    </sch:pattern>
```


2.4 - ../Rules/globalConstraints/VIRT_ID_00005.sch

Rule Description

[VIRT-ID-00005][Error] If virt:VirtualCoverage exists, then it must include at least @virt:protocol or @virt:address.

Code Description

If virt:VirtualCoverage exists, then it must include at least @virt:protocol or @virt:address.

Schematron Code

```
<?ICEA pattern?>
<!-- Notices - Distribution Notice:
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-->

<sch:pattern id="VIRT-ID-00005">
    <sch:rule id="VIRT-ID-00005-R1" context="virt:VirtualCoverage">
        <sch:assert test="exists(./@virt:protocol) or exists(./@virt:address)"
                    flag="error"
                    role="error">[VIRT-ID-00005][Error] If virt:VirtualCoverage exists, then it must include at least @virt:protocol or @virt:address.</sch:assert>
    </sch:rule>
</sch:pattern>
```

Chapter 3 - Abstract Patterns

There are no Abstract Patterns currently defined for VIRT.

Chapter 4 - Schematron Schema

The top level Schematron file for VIRT is in this section. This file imports all of the others and also defines many global variables they are all dependent on.

4.1 - ../VIRT_XML.sch

Code Description

This is the root file for the specifications Schematron ruleset. It includes all of the Rule .sch files.

Schematron Code

```
<!--UNCLASSIFIED-->
<?ICEA master?>
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-->

<sch:schema queryBinding="xslt2">
    <sch:ns uri="urn:us:gov:ic:cve" prefix="cve"/>
    <sch:ns uri="http://www.w3.org/1999/xlink" prefix="xlink"/>
    <sch:ns uri="urn:us:gov:ic:ism" prefix="ism"/>
    <sch:ns uri="urn:us:gov:ic:virt" prefix="virt"/>
    <sch:ns uri="urn:us:gov:ic:ntk" prefix="ntk"/>
    <sch:ns uri="http://www.w3.org/2001/XMLSchema" prefix="xs"/>
    <!--*****-->
<!-- (U) VIRT Phases -->
<!--*****-->
<!--*****-->
<!-- (U) VIRT ID Rules -->
<!--*****-->
<!--(U) globalConstraints-->

<sch:include href="../Rules/globalConstraints/VIRT_ID_00001.sch"/>
    <sch:include href="../Rules/globalConstraints/VIRT_ID_00003.sch"/>
    <sch:include href="../Rules/globalConstraints/VIRT_ID_00004.sch"/>
    <sch:include href="../Rules/globalConstraints/VIRT_ID_00005.sch"/>
    <!--*****-->
<!-- (U) VIRT Phases -->
<!--*****-->
</sch:schema>

<!--UNCLASSIFIED-->
```

Chapter 5 - Removed Rules

All of the numbered Rules for VIRT that have been removed are listed in this section. This section is just a reference for what rule numbers have been dropped. In many but not all cases there will be a reason listed. In all cases the version that the rule was dropped in is listed.

5.1 - `./Rules/deleted/VIRT_ID_00002.sch`

Rule Description

[VIRT-ID-00002][Error] Rule removed in 2015-AUG. Covered by schema.