Guide to Schematron Rules and Patterns

RevRecall Schematron Guide

Version 2021-NOVr2022-MAY

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Chapter 1 - Introduction

1.1 - Purpose

This is an informative supplement for RevRecall. This guide is generated from the RevRecall 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 RevRecall. 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 RevRecall. The abstract patterns may be used in numbered rules or provided as reference for use in rules developed by users of RevRecall. Each abstract pattern has a code description and a code block with the abstract Schematron pattern.

Chapter 4 is a listing of the master RevRecall 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 RevRecall are encoded using ISO Schematron. Schematron is a rule-based validation language that uses XML Path Language to make assertions about an XML document.

RevRecall 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 RevRecall's Schematron rules.

Chapter 2 - Rules

All of the numbered Rules for RevRecall 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 RevRecall-ID-XXXXX, with rule files named RevRecall_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/generalConstraints/RevRecall_ID_00001.sch

Rule Description

[RevRecall-ID-00001][Error] All elements in the RevRecall namespace except Link must have content.

Code Description

All elements in the RevRecall namespace except Link context="rr:*[not(local-name() = 'Link')]" must have content.

Schematron Code

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

<sch:pattern id="RevRecall-ID-00001">
            <sch:rule id="RevRecall-ID-00001-R1" context="rr:*[not(local-name() = 'Link')]">
                <sch:assert test="normalize-space(.)" flag="error" role="error">[RevRecall-ID-00001][Error] All elements in the RevRecall namespace except Link must have content.</
sch:assert>
            </sch:rule>
        </sch:pattern>
```

2.2 - .//Rules/generalConstraints/RevRecall_ID_00003.sch

Rule Description

[RevRecall-ID-00003][Error] All xlink attributes on RevRecall elements must have non-whitespace values.

Code Description

All attributes in the xlink namespace that are on elements in the RevRecall namespace must have non-empty, non-whitespace values.

Schematron Code

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

<sch:pattern id="RevRecall-ID-00003">
              <sch:rule id="RevRecall-ID-00003-R1" context="rr:*[@xl:*]">
                  <sch:assert test="every $attr in @xl:* satisfies normalize-space($attr) != ''"
                              flag="error"
                              role="error">[RevRecall-ID-00003][Error] All xlink attributes on elements in the RevRecall namespace must have non-empty, non-whitespace values.</sch:assert>
              </sch:rule>
          </sch:pattern>
```

2.3 - .//Rules/generalConstraints/RevRecall_ID_00004.sch

Rule Description

[RevRecall-ID-00004][Error] A RevRecall assertion must contain an ActionInstruction element if @action="MANUAL_INSTRUCTION".

Code Description

A RevRecall assertion must contain an ActionInstruction element if @action="MANUAL_INSTRUCTION".

Schematron Code

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

<sch:pattern id="RevRecall-ID-00004">
            <sch:rule id="RevRecall-ID-00004-R1"
                    context="rr:*[contains(@rr:action, 'MANUAL_INSTRUCTION')]">
                <sch:assert test="child::rr:ActionInstruction" flag="error" role="error">[RevRecall-ID-00004][Error] A RevRecall assertion must contain an ActionInstruction element if
@action="MANUAL_INSTRUCTION".</sch:assert>
            </sch:rule>
        </sch:pattern>
```

2.4 - .//Rules/generalConstraints/RevRecall_ID_00005.sch

Rule Description

[RevRecall-ID-00005][Error] A RevRecall assertion must not contain an ActionInstruction element unless @action="MANUAL_INSTRUCTION".

Code Description

A RevRecall assertion must not contain an ActionInstruction element unless @action="MANUAL_INSTRUCTION".

Schematron Code

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

<sch:pattern id="RevRecall-ID-00005">
            <sch:rule id="RevRecall-ID-00005-R1" context="rr:ActionInstruction">
              <sch:assert test="parent::node()[contains(@rr:action, 'MANUAL_INSTRUCTION')]"
                        flag="error"
                        role="error">[RevRecall-ID-00005][Error] A RevRecall assertion must not contain an ActionInstruction element unless @action="MANUAL_INSTRUCTION".</
sch:assert>
              </sch:rule>
            </sch:pattern>
```

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2.5 - .//Rules/generalConstraints/RevRecall_ID_00006.sch

Rule Description

[RevRecall-ID-00006][Error] TDF elements must have no more than one Revision Recall assertion.

Code Description

Verify that the number of Revision Recall assertions is not more than 1.

Schematron Code

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

<sch:pattern id="RevRecall-ID-00006">
              <sch:rule id="RevRecall-ID-00006-R1"
                        context="tdf:*[count(tdf:HandlingAssertion/tdf:HandlingStatement/rr:RevisionRecall) &gt; 1]">
                  <sch:assert test="false()" flag="error" role="error">[RevRecall-ID-00006][Error] TDF elements must have no more than one Revision Recall assertion.</sch:assert>
              </sch:rule>
          </sch:pattern>
```

2.6 - .//Rules/generalConstraints/RevRecall_ID_00007.sch

Rule Description

[RevRecall-ID-00007][Error] For a Trusted Data Object, RevRecall handling assertions must have @tdf:scope with the value "TDO".

Code Description

Given a Revision Recall handling assertion for a TDO -- context="tdf:HandlingAssertion[child::tdf:HandlingStatement/rr:RevisionRecall]" -- assert that there exists @tdf:scope with the value "TDO"

Schematron Code

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

<sch:pattern id="RevRecall-ID-00007">
                <sch:rule id="RevRecall-ID-00007-R1"
                        context="tdf:TrustedDataObject/tdf:HandlingAssertion[child::tdf:HandlingStatement/rr:RevisionRecall]">
                <sch:assert test="@tdf:scope = 'TDO'" flag="error" role="error">[RevRecall-ID-00007][Error] For a Trusted Data Object, RevRecall handling assertions must have
@tdf:scope with the value "TDO".</sch:assert>
                </sch:rule>
            </sch:pattern>
```

2.7 - .//Rules/generalConstraints/RevRecall_ID_00008.sch

Rule Description

[RevRecall-ID-00008][Error] For a Trusted Data Collection, RevRecall handling assertions must have @tdf:scope with the value "TDC".

Code Description

Given a Revision Recall handling assertion for a TDC -- context="tdf:HandlingAssertion[child::tdf:HandlingStatement/rr:RevisionRecall]" -- assert that there exists @tdf:scope with the value "TDC"

Schematron Code

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

<sch:pattern id="RevRecall-ID-00008">
            <sch:rule id="RevRecall-ID-00008-R1"
                    context="tdf:TrustedDataCollection/tdf:HandlingAssertion[child::tdf:HandlingStatement/rr:RevisionRecall]">
                <sch:assert test="@tdf:scope = 'TDC'" flag="error" role="error">[RevRecall-ID-00008][Error] For a Trusted Data Collection, RevRecall handling assertions must have
@tdf:scope with the value "TDC".</sch:assert>
            </sch:rule>
        </sch:pattern>
```

2.8 - .//Rules/generalConstraints/RevRecall_ID_00009.sch

Rule Description

[RevRecall-ID-00009][Error] Revision Recall assertions must be Handling Assertions.

Code Description

The RevisionRecall element must be the grandchild of a HandlingAssertion element. This rule is tested from the RevisionRecall context to ensure that non-compliant assertions are flagged.

Schematron Code

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

<sch:pattern id="RevRecall-ID-00009">
            <sch:rule id="RevRecall-ID-00009-R1" context="rr:RevisionRecall">
                <sch:assert test="../parent::tdf:HandlingAssertion" flag="error" role="error">[RevRecall-ID-00009][Error] Revision Recall assertions must be Handling Assertions.</sch:assert>
                </sch:rule>
            </sch:pattern>
```

2.9 - .//Rules/generalConstraints/RevRecall_ID_00010.sch

Rule Description

[RevRecall-ID-00010][Error] If the attribute @rr:dateTime of type xs:dateTime exists, it must have a timezone. Human Readable: The RevRecall attribute dateTime must have a timezone.

Code Description

The RevRecall attribute rr:dateTime must have a timezone. According to http://www.w3.org/TR/xmlschema-2/#dateTime, datetime is represented by: '-'? yyyy '-' mm '-' dd 'T' hh ':' mm ':' ss ('.' s+)? (zzzzzz)? where the timezone zzzzzz is represented by: (('+' | '-') hh ':' mm) | 'Z' This rule enforces and makes the timezone zzzzzz mandatory.

Schematron Code

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

<sch:pattern id="RevRecall-ID-00010">
                <sch:rule id="RevRecall-ID-00010-R1" context="rr:RevisionRecall[./@rr:dateTime]">
                    <sch:assert test="matches(@rr:dateTime, '^-?\d{4}-\d{2}-\d{2}T\d{2}:\d{2}:\d{2}(\.\d+)?(((\+|-)\d{2}:\d{2})|Z)$')"
                                flag="error"
                                role="error">[RevRecall-ID-00010][Error] If the attribute @rr:dateTime of type xs:dateTime exists, it must have a timezone. Human Readable: The RevRecall
attribute dateTime must have a timezone.</sch:assert>
                </sch:rule>
            </sch:pattern>
```

2.10 - .//Rules/generalConstraints/RevRecall_ID_00011.sch

Rule Description

[RevRecall-ID-00011][Warning] rr:DESVersion attribute SHOULD be specified as version 202111.202205 (Version:2021-NOV 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 "^202111.202205(-.{1,23})?$".

Schematron Code

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

<sch:pattern id="RevRecall-ID-00011">
            <sch:rule id="RevRecall-ID-00011-R1" context="*[@rr:DESVersion]">
                <sch:assert test="matches(@rr:DESVersion, '^202111.202205(\-.{1,23})?$')"
                        flag="warning"
                        role="warning">[RevRecall-ID-00011][Warning] rr:DESVersion attribute SHOULD be specified as version 202111.202205 (Version:2021-NOV Revision: 2022-MAY) with
an optional extension.</sch:assert>
            </sch:rule>
        </sch:pattern>
```

2.11 - .//Rules/generalConstraints/RevRecall_ID_00012.sch

Rule Description

[RevRecall-ID-00012][Error] If @type has the value of "FISA_COMPLIANCE_RECALL" then @action MUST be "PURGE", "RETAIN_HIDE", or "MANUAL_INSTRUCTION".

Code Description

If @type has the value of "FISA_COMPLIANCE_RECALL" then @action MUST be "PURGE", "RETAIN_HIDE", or "MANUAL_INSTRUCTION".

Schematron Code

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

<sch:pattern id="RevRecall-ID-00012">
                <sch:rule id="RevRecall-ID-00012-R1"
                        context="rr:*[@rr:type=('FISA_COMPLIANCE_RECALL')]">
                    <sch:assert test="@rr:action=('PURGE', 'RETAIN_HIDE', 'MANUAL_INSTRUCTION')"
                            flag="error"
                            role="error">[RevRecall-ID-00012][Error] If @type has the value of "FISA_COMPLIANCE_RECALL" then @action MUST be "PURGE", "RETAIN_HIDE", or
"MANUAL_INSTRUCTION".</sch:assert>
                </sch:rule>
            </sch:pattern>
```

2.12 - .//Rules/generalConstraints/RevRecall_ID_00013.sch

Rule Description

[RevRecall-ID-00013][Error] Regardless of the version indicated on the instance document, the validation infrastructure MUST use a version of 'ISM' that is version '202111' (Version:2021-NOV) or later. NOTE: This is not an error of the instance document but of the validation environment itself.

Code Description

This rule uses an abstract pattern to consolidate logic. It verifies that the validation infrastructure is using the version specified in parameters.

Schematron Code

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

<sch:pattern id="RevRecall-ID-00013" is-a="ValidateValidationEnvSchema">
                <sch:param name="MinVersion" value="'202111'"/>
                <sch:param name="SpecToCheck" value="'ISM'"/>
                <sch:param name="pathToDocument" value="'../../Schema/ISM/IC-ISM.xsd'"/>
                <sch:param name="RuleID" value="'RevRecall-ID-00013'"/>
            </sch:pattern>
```

Chapter 3 - Abstract Patterns

All of the Abstract Patterns for RevRecall are listed in this section. These patterns may depend on variables defined in the Schematron Schema section.

3.1 - .//Lib/ValidateValidationEnvCVE.sch

Code Description

This abstract pattern checks to see if the validation environment has at least the version / revision of the CVE as of the writing of this specification. The calling rule must pass in $MinVersion, $SpecToCheck, $pathToDocument, $RuleID.

Schematron Code

```xml
<!--
    This abstract pattern checks to see the version of a CVE is greater than or equal to a passed in parameter.

    $MinVersion              := the version that SpecToCheck must be equal to or greater than.
    $SpecToCheck             := Name the spec whose version in the infrastructure is being checked.
    $pathToDocument          := Relative path to the document cve that has ther version string
    $RuleID                  := The number of the rule in the concrete file.

-->

<sch:pattern xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
                            abstract="true"
                            id="ValidateValidationEnvCVE">
                <sch:rule id="ValidateValidationEnvCVE-R1" context="/">
                    <sch:assert test="document($pathToDocument)//cve:CVE//@specVersion castable as xs:double and document($pathToDocument)//cve:CVE//@specVersion &gt;= $MinVersion"
                            flag="error"
                            role="error">[
        <sch:value-of select="$RuleID"/>][Error] Version [
        <sch:value-of select="document($pathToDocument)//cve:CVE//@specVersion"/>] of
        <sch:value-of select="$SpecToCheck"/>found; Version [
        <sch:value-of select="$MinVersion"/>] or later is required. The latest version of
        <sch:value-of select="$SpecToCheck"/>is not being used in the validation infrastructure. Regardless of the version indicated on the instance document, the validation infrastructure needs
to use a version of
        <sch:value-of select="$SpecToCheck"/>that is version [
        <sch:value-of select="$MinVersion"/>] or later. NOTE: This is not an error of the instance document but of the validation environment itself. The incorrect value was found in
        <sch:value-of select="document-uri(document($pathToDocument))"/>
                            </sch:assert>
                    </sch:rule>
                </sch:pattern>
```

3.2 - .//Lib/ValidateValidationEnvSchema.sch

Code Description

This abstract pattern checks to see if the validation environment has at least the version / revision of the Schema as of the writing of this specification. The calling rule must pass in $MinVersion, $SpecToCheck, $pathToDocument, $RuleID.

Schematron Code

```xml
<!--
    This abstract pattern checks to see the version of a Schema is greater than or equal to a passed in parameter.

    $MinVersion             := the version that SpecToCheck must be equal to or greater than.
    $SpecToCheck            := Name the spec whose version in the infrastructure is being checked.
    $pathToDocument         := Relative path to the document xsd that has ther version string
    $RuleID                 := The number of the rule in the concrete file.

-->

<sch:pattern xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
                            abstract="true"
                            id="ValidateValidationEnvSchema">
                <sch:rule id="ValidateValidationEnvSchema-R1" context="/">
                    <sch:assert test="document($pathToDocument)//xsd:schema//@version castable as xs:double and document($pathToDocument)//xsd:schema//@version &gt;= $MinVersion"
                                flag="error"
                                role="error">[
    <sch:value-of select="$RuleID"/>][Error] Version [
    <sch:value-of select="document($pathToDocument)//xsd:schema//@version"/>] of
    <sch:value-of select="$SpecToCheck"/>found; Version [
    <sch:value-of select="$MinVersion"/>] or later is required. The latest version of
    <sch:value-of select="$SpecToCheck"/>is not being used in the validation infrastructure. Regardless of the version indicated on the instance document, the validation infrastructure needs
to use a version of
    <sch:value-of select="$SpecToCheck"/>that is version [
    <sch:value-of select="$MinVersion"/>] or later. NOTE: This is not an error of the instance document but of the validation environment itself. The incorrect value was found in
    <sch:value-of select="document-uri(document($pathToDocument))"/>
                        </sch:assert>
                    </sch:rule>
                </sch:pattern>
```

Chapter 4 - Schematron Schema

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

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4.1 - .//RevRecall_XML.sch

Schematron Code

```xml
<!--UNCLASSIFIED-->
<?ICEA master?>
<!-- Notices - Distribution Notice:
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        -->
<!-- WARNING:
    Once compiled into an XSLT the result will
    be the aggregate classification of all the CVES
    and included .sch files
-->

<sch:schema queryBinding="xslt2">
                    <sch:ns uri="urn:us:gov:ic:revrecall" prefix="rr"/>
                    <sch:ns uri="http://www.w3.org/1999/xlink" prefix="xl"/>
                    <sch:ns prefix="tdf" uri="urn:us:gov:ic:tdf"/>
                    <!-- ********************************** -->
<!-- * Abstract Rule and Pattern Includes * -->
<!-- ********************************** -->

<sch:include href="./Lib/ValidateValidationEnvSchema.sch"/>
                    <sch:include href="./Lib/ValidateValidationEnvCVE.sch"/>
                    <!--*****************************-->
<!-- (U) RevRecall Phases -->
<!--*****************************-->
<!--*****************************-->
<!-- (U) RevRecall ID Rules -->
<!--*****************************-->
<!--(U) generalConstraints-->

<sch:include href="./Rules/generalConstraints/RevRecall_ID_00001.sch"/>
                    <sch:include href="./Rules/generalConstraints/RevRecall_ID_00003.sch"/>
                    <sch:include href="./Rules/generalConstraints/RevRecall_ID_00004.sch"/>
                    <sch:include href="./Rules/generalConstraints/RevRecall_ID_00005.sch"/>
                    <sch:include href="./Rules/generalConstraints/RevRecall_ID_00006.sch"/>
                    <sch:include href="./Rules/generalConstraints/RevRecall_ID_00007.sch"/>
                    <sch:include href="./Rules/generalConstraints/RevRecall_ID_00008.sch"/>
                    <sch:include href="./Rules/generalConstraints/RevRecall_ID_00009.sch"/>
                    <sch:include href="./Rules/generalConstraints/RevRecall_ID_00010.sch"/>
                    <sch:include href="./Rules/generalConstraints/RevRecall_ID_00011.sch"/>
                    <sch:include href="./Rules/generalConstraints/RevRecall_ID_00012.sch"/>
                    <sch:include href="./Rules/generalConstraints/RevRecall_ID_00013.sch"/>
                    <!--*****************************-->
<!-- (U) RevRecall Phases -->
<!--*****************************-->
</sch:schema>
                    <!--UNCLASSIFIED-->
```

Chapter 5 - Removed Rules

All of the numbered Rules for RevRecall 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/RevRecall_ID_00002.sch

Rule Description

[RevRecall-ID-00002][Error] Rule removed in 2014-DEC (201412). Rule context covered by check for schema validity.