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Open
Geospatial
Consortium

OGC GEOSPATIAL EXTENSIBLE ACCESS CONTROL MARKUP LANGUAGE (GEOXACML) 3.0

STANDARD
Implementation

APPROVED

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ABSTRACT

The Geospatial eXtensible Access Control Markup Language (GeoXACML) 3.0 defines a geospatial extension to the OASIS eXtensible Access Control Markup Language (XACML) Version 3.0 Standard. GeoXACML 3.0 supports the interoperable definition of access rights including geographic conditions based on the XACML 3.0 language, processing model and policy schema. GeoXACML 3.0 provides improvements based on enhancements to the XACML Standard, primarily the support of access conditions spanning different XACML categories. This enhancement empowers GeoXACML 3.0 to be a powerful decision engine with support for spatiotemporal access conditions.

As a result of the XACML 3.0 deployment model and corresponding implementation flexibility, GeoXACML 3.0 can be operated as a traditional Policy Decision Point or as a cloud-native API gateway.

The OGC GeoXACML 3.0 Standard defines different conformance classes that supports flexible implementation conformance. Implementation of the Core conformance class supports the ISO 19125 geometry model including topological test (spatial relations) functions which enables the indexing of access conditions-based geometry. The Spatial Analysis conformance class extends the topological test functions for defining access conditions including the processing of geometries. To support condition evaluation for geometries encoded in different Coordinate Reference System (CRS), the CRS Transformation conformance class enables a compliant implementation to undertake dynamic CRS transformation during decision-making unless prohibited per request. Finally, the API conformance class enables operating a GeoXACML 3.0 compliant implementation as an OGC API conformant service (Policy Decision Point).



KEYWORDS

The following are keywords to be used by search engines and document catalogues.

ogcdoc, OGC document, GeoXACML, XACML



SECURITY CONSIDERATIONS

As GeoXACML 3.0 defines and extension to XACML 3.0, all security considerations outlined in XACML Version 3.0 section 9 apply.

In addition, the GeoXACML 3.0 aspects outlined in Clause 6.2 should be considered.

IV

SUBMITTING ORGANIZATIONS

The following organizations submitted this Document to the Open Geospatial Consortium (OGC):

- Secure Dimensions GmbH
- Natural Resources Canada (NRCAN)
- Defense Information Systems Agency (DISA)

V

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1

SCOPE

1

SCOPE

NOTE: The Geospatial eXtensible Access Control Markup Language (GeoXACML) 3.0 Core Standard defines a geospatial extension to the OASIS eXtensible Access Control Markup Language (XACML) Version 3.0.

This Standard further defines requirements, conformance classes and abstract tests for implementing a geospatially-enriched Policy Decision Point (GeoPDP) as defined by the OASIS eXtensible Access Control Markup Language (XACML) Version 3.0.



2

CONFORMANCE

All requirements-classes and conformance-classes described in this document are owned by the Standard identified.

2.1. Introduction (informative)

GeoXACML 3.0 is defined as an extension to the XACML Version 3.0 Standard. Therefore a GeoXACML 3.0 Core implementation must be fully compliant with the XACML 3.0 specification, including the XACML Version 3.0 Errata 01. All data types and functions marked **mandatory** must be supported.

GeoXACML 3.0 introduces the data type `urn:ogc:def:geoxacml:3.0:data-type:geometry`. This type is compliant with the OGC Simple Features geometry model with the restriction that a Geometry Collection to be homogeneous¹. As such, GeoXACML 3.0 Core supports the use of geometry based on Well-Known-Text and Well-Known-Binary encoding as defined in OGC Simple Features.

The default GeoXACML 3.0 Coordinate Reference System (CRS) is compliant with the The GeoJSON Format using the value `urn:ogc:def:crs:OGC::CRS84` with the axis order longitude / latitude. The encoding of geometry values in another CRS can be done by using the GeoXACML specific attribute `srid` in conjunction with the `AttributeValue` XML element. The `srid` is the integer uniquely identifying the CRS.

In order for GeoXACML 3.0 Core to support spatial indexing of policies by target matching, the set of XACML 3.0 condition functions is extended by topology predicates as defined in OGC Simple Features, section 6.1.2.3.

The GeoXACML 3.0 Standard defines explicit error status codes to indicate processing termination caused by geometry ('geometry-error') and CRS ('crs-error') related errors. Processing a heterogeneous geometry collection will result in 'geometry-collection-error'.

The processing of geometry accuracy is supported via the GeoXACML specific attribute `precision` to be used with the `AttributeValue` XML element. The default precision of 'infinite' can be reduced to the number of decimal places: `precision=4` would indicate a geometry precision of four(4) decimal places. The use of `precision` is optional but can be used in the Authorization Decision Request to express a minimum level of accuracy when deriving the authorization decision. Requesting a higher precision than supported by the implementation or by the geometries in the policy or involved in the decision-making results in the processing being terminated with Indeterminate and value 'precision-error'.

¹all geometries of a homogeneous geometry collection must have the same type

GeoXACML 3.0 Core leverages the extension points as identified in the XACML Version 3.0 Standard. Therefore, a GeoXACML 3.0 policy instance document is compliant to the XACML 3.0 Schema defined in the XACML Version 3.0 XML Schema. In addition, a GeoXACML 3.0 Authorization Decision Request and Authorization Response encoded in XML is compliant with the XACML 3.0 schema defined in the XACML Version 3.0 XML Schema.

2.2. GeoXACML 3.0 Conformance Classes

The OGC GeoXACML 3.0 Standard defines one mandatory and three optional conformance classes.

Conformance to this Standard can be evaluated by using all the relevant tests specified in Annex A (normative) of this document. The framework, concepts, and methodology for testing, and the criteria to be achieved to claim conformance are specified in the OGC Compliance Testing Policies and Procedures and the OGC Compliance Testing web site.

In order to conform to this OGC® Standard, a software implementation SHALL implement the mandatory conformance class specified in Annex A (normative).

- **Core** (mandatory): Defines the data type *Geometry*, requirements for using the WKT and WKB geometry encoding, and a set of “simple” geometric functions based on OGC Simple Features Standard to support indexing of access conditions based on topology.

In addition to the Core conformance class, an implementation can further choose to be compliant with any combination of the following conformance classes.

- **Spatial Analysis** (optional): Defines an additional set of “spatial analysis” functions based on the OGC Simple Features Standard.
- **CRS Transformation** (optional): Enables an implementation to apply an ad-hoc CRS transformation while deriving an authorization decision.
- **API** (optional): Support OGC API compliance. An implementation provides an OGC API - Common - Part 1: Core² compliant landing page, conformance class listing, OpenAPI document and supports requesting an Authorization Decision via an HTTP POST request.

2.2.1. Conformance Model Illustration

The following UML diagram illustrates the GeoXACML 3 conformance classes and their dependencies.

²Draft OGC Standard at the time of writing

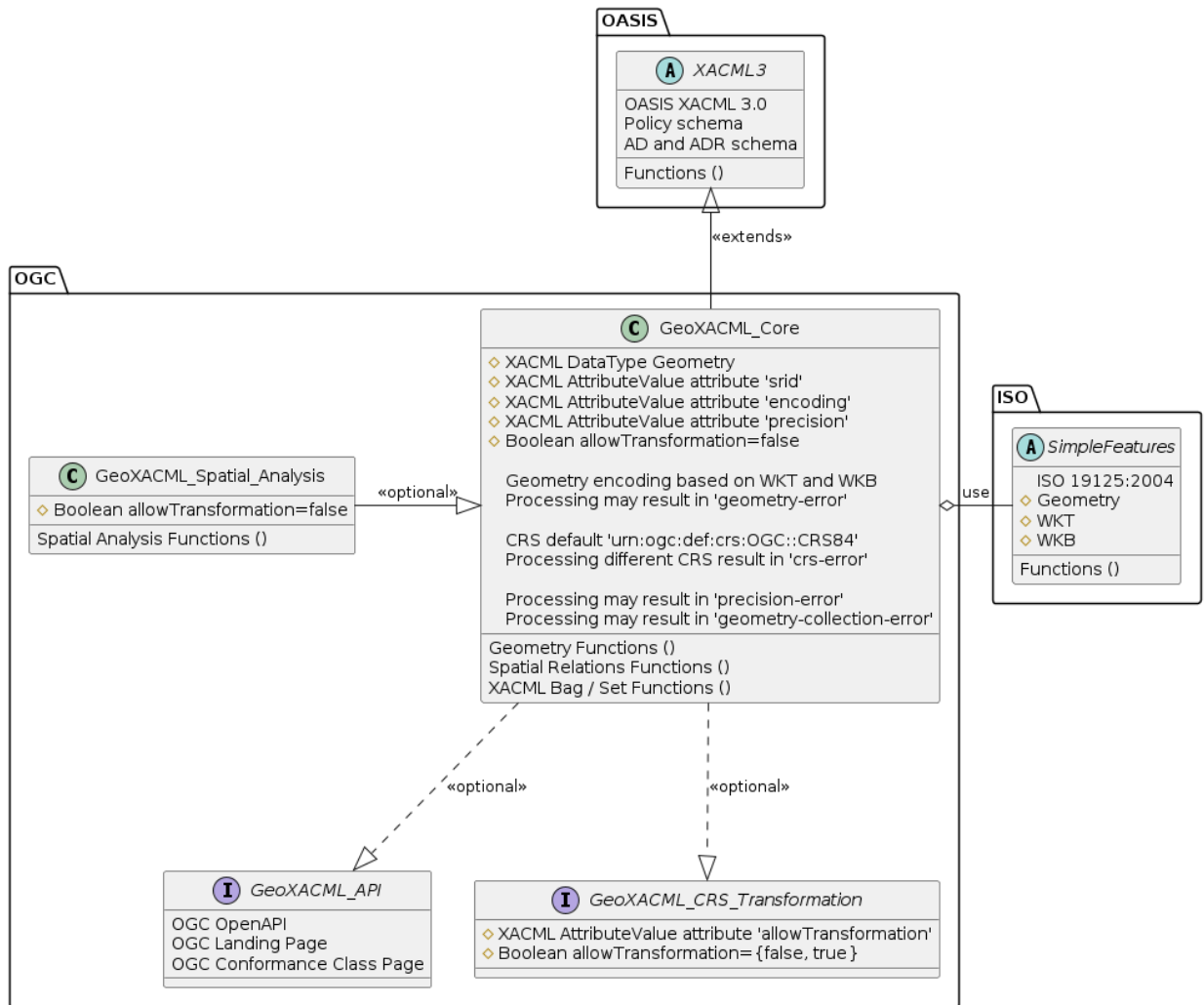


Figure 1 – Conformance Class Model

2.2.2. Conformance Class Core

The Core Conformance Class is defined as follows:

CONFORMANCE CLASS 1: CORE	
IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/core
REQUIREMENTS CLASS	Requirements class 1: http://www.opengis.net/spec/geoxacml/3.0/req-class/specification Requirements class 2: http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type Requirements class 3: http://www.opengis.net/spec/geoxacml/3.0/req-class/geometry-functions

CONFORMANCE CLASS 1: CORE

Requirements class 4: <http://www.opengis.net/spec/geoxacml/3.0/req-class/spatial-relations-functions>

Requirements class 5: <http://www.opengis.net/spec/geoxacml/3.0/req-class/xacml-bag-functions>

Requirements class 6: <http://www.opengis.net/spec/geoxacml/3.0/req-class/xacml-set-functions>

TARGET TYPE

Implementation

Conformance test A.1: <http://www.opengis.net/spec/geoxacml/3.0/conf/specification/definition>

Conformance test A.2: <http://www.opengis.net/spec/geoxacml/3.0/conf/core/wkt>

Conformance test A.3: <http://www.opengis.net/spec/geoxacml/3.0/conf/core/wkb>

Conformance test A.4: <http://www.opengis.net/spec/geoxacml/3.0/conf/core/geometry-error>

Conformance test A.5: <http://www.opengis.net/spec/geoxacml/3.0/conf/core/geometry-error-encoding-wkt>

Conformance test A.6: <http://www.opengis.net/spec/geoxacml/3.0/conf/core/geometry-error-encoding-wkb>

Conformance test A.7: <http://www.opengis.net/spec/geoxacml/3.0/conf/core/default-crs>

Conformance test A.8: <http://www.opengis.net/spec/geoxacml/3.0/conf/core/xacml-attribute-srid>

Conformance test A.9: <http://www.opengis.net/spec/geoxacml/3.0/conf/core/axis-order-crs84>

CONFORMANCE TESTS

Conformance test A.10: <http://www.opengis.net/spec/geoxacml/3.0/conf/core/axis-order-epsg4326>

Conformance test A.11: <http://www.opengis.net/spec/geoxacml/3.0/conf/core/crs-equal>

Conformance test A.12: <http://www.opengis.net/spec/geoxacml/3.0/conf/core/crs84-epsg4326>

Conformance test A.13: <http://www.opengis.net/spec/geoxacml/3.0/conf/core/crs-not-equal>

Conformance test A.14: <http://www.opengis.net/spec/geoxacml/3.0/conf/core/geometry-functions>

Conformance test A.15: <http://www.opengis.net/spec/geoxacml/3.0/conf/core/test-functions>

Conformance test A.16: <http://www.opengis.net/spec/geoxacml/3.0/conf/core/spatial-relations-functions>

Conformance test A.17: <http://www.opengis.net/spec/geoxacml/3.0/conf/core/spatial-analysis-functions>

Conformance test A.18: <http://www.opengis.net/spec/geoxacml/3.0/conf/core/xacml-bag-functions>

Conformance test A.19: <http://www.opengis.net/spec/geoxacml/3.0/conf/core/xacml-set-functions>

2.2.3. Conformance Class Spatial Analysis

The Spatial Analysis Conformance Class is defined as follows:

CONFORMANCE CLASS 2: SPATIAL ANALYSIS	
IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/spatial-analysis
REQUIREMENTS CLASS	Requirements class 7: http://www.opengis.net/spec/geoxacml/3.0/req-class/analysis
TARGET TYPE	Implementation
CONFORMANCE TEST	Conformance test A.20: http://www.opengis.net/spec/geoxacml/3.0/conf/core/advanced-functions

2.2.4. Conformance Class CRS Transformation

The CRS Transformation Conformance Class is defined as follows:

CONFORMANCE CLASS 3: CRS TRANSFORMATION	
IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/crs-transformation
REQUIREMENTS CLASS	Requirements class 8: http://www.opengis.net/spec/geoxacml/3.0/req-class/crs-transformation
TARGET TYPE	Implementation
CONFORMANCE TESTS	Conformance test A.21: http://www.opengis.net/spec/geoxacml/3.0/conf/crs-transformation/crs-transformation Conformance test A.22: http://www.opengis.net/spec/geoxacml/3.0/conf/crs-transformation/allow-transformation-1 Conformance test A.23: http://www.opengis.net/spec/geoxacml/3.0/conf/crs-transformation/allow-transformation-2 Conformance test A.24: http://www.opengis.net/spec/geoxacml/3.0/conf/crs-transformation/allow-transformation-3

2.2.5. Conformance Class OGC API

The OGC API Conformance Class is defined as follows:

CONFORMANCE CLASS 4: OGC API

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/ogc-api
REQUIREMENTS CLASS	Requirements class 9: http://www.opengis.net/spec/geoxacml/3.0/req-class/ogc-api
TARGET TYPE	Implementation
CONFORMANCE TESTS	Conformance test A.25: http://www.opengis.net/spec/geoxacml/3.0/conf/ogc-api/landing-page Conformance test A.26: http://www.opengis.net/spec/geoxacml/3.0/conf/ogc-api/openapi-page Conformance test A.27: http://www.opengis.net/spec/geoxacml/3.0/conf/ogc-api/conformance-page Conformance test A.28: http://www.opengis.net/spec/geoxacml/3.0/conf/ogc-api/decision-endpoint



3

NORMATIVE REFERENCES

NORMATIVE REFERENCES

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

OGC *Geographic information – Simple features access – Part 1: Common architecture*, ISO, 2004, https://portal.opengeospatial.org/files/?artifact_id=25355

eXtensible Access Control Markup Language (XACML) Version 3.0, OASIS, 2017, <http://docs.oasis-open.org/xacml/3.0/xacml-3.0-core-spec-os-en.html>

eXtensible Access Control Markup Language (XACML) Version 3.0 Errata 01, OASIS, 2017, <http://docs.oasis-open.org/xacml/3.0/errata01/os/xacml-3.0-core-spec-errata01-os.html>

OASIS eXtensible Access Control Markup Language (XACML) Version 3.0 XML Schema, OASIS, 2013, <http://docs.oasis-open.org/xacml/3.0/xacml-core-v3-schema-wd-17.xsd>

The GeoJSON Format, IETF, 2016, <https://www.rfc-editor.org/rfc/rfc7946>



4

TERMS, DEFINITIONS, AND ABBREVIATED TERMS

TERMS, DEFINITIONS, AND ABBREVIATED TERMS

4.1. Terms and definitions

4.1.1. GeoPDP

A Geospatial Policy Decision Point (PDP) is an implementation of GeoXACML 3.0 conformance class API. A PDP provides the capabilities to process the data-type Geometry and the functions defined in this OGC Standard. Because a GeoXACML compliant implementation must implement all XACML 3.0 mandatory capabilities, a GeoPDP is always capable of processing “pure” XACML 3.0 policies: Authorization Decision Request (ADR) and Authorization Decision (AD).

4.1.2. Homogeneous Geometry Collection

All geometries of a homogeneous geometry collection must have the same type.

4.1.3. XACML definitions

The following definitions, as defined in the XACML Version 3.0 Standard are listed here for ease of reading.

4.1.3.1. Authorization Decision (AD)

The result of evaluating applicable policy, returned by the PDP to the PEP. A function that evaluates to “Permit,” “Deny,” “Indeterminate,” or “NotApplicable” and (optionally) a set of obligations.

4.1.3.2. Bag

An unordered collection of values, in which there may be duplicate values.

4.1.3.3. Decision

The result of evaluating a rule, policy or policy set.

4.1.3.4. Authorization Decision Request (ADR)

The request to a PDP or GeoPDP to render an authorization decision.

4.1.3.5. Policy

A set of rules, an identifier for the rule-combining algorithm and (optionally) a set of obligations.

4.1.3.6. Policy decision point (PDP)

The system entity that evaluates applicable policy and renders an authorization decision. This term is defined in a joint effort by the IETF Policy Framework Working Group and the Distributed Management Task Force (DMTF)/Common Information Model (CIM) in [RFC3198]. This term corresponds to “Access Decision Function” (ADF) in [ISO10181-3].

4.1.3.7. Policy enforcement point (PEP)

The system entity that performs access control, by making decision requests and enforcing authorization decisions. This term is defined in a joint effort by the IETF Policy Framework Working Group and the Distributed Management Task Force (DMTF)/Common Information Model (CIM) in [RFC3198]. This term corresponds to “Access Enforcement Function” (AEF) in [ISO10181-3].

4.1.3.8. Policy information point (PIP)

The system entity that acts as a source of attribute values.

4.1.3.9. Rule

A target, an effect and a condition.

4.2. Abbreviated terms

AD	Authorization Decision
ADR	Authorization Decision Request
GeoPDP	A GeoXACML implementation of a PDP

GML	Geography Markup Language
PDP	Policy Decision Point
PEP	Policy Enforcement Point
PIP	Policy Information Point

5

CONVENTIONS

This Clause provides details and examples for any conventions used in this Standard. Examples of conventions are symbols, abbreviations, use of XML schema, or special notes regarding how to read the document.

5.1. Identifiers

The normative provisions in this Standard are denoted by the URI

<http://www.opengis.net/spec/geoxacml/3.0>

All requirements and conformance tests that appear in this document are denoted by partial URIs which are relative to this base.



6

GEOXACML 3.0 INTRODUCTION (INFORMATIVE)

GEOXACML 3.0 INTRODUCTION (INFORMATIVE)

This Clause introduces GeoXACML 3.0 concepts and how the extension points from XACML 3.0 are used to enable the declaration and enforcement of access conditions involving geographic conditions.

6.1. Defining an extension to XACML 3.0

The XACML 3.0 specification defines the extensibility points in (XACML Version 3.0, section 8). The `DataType`, `FunctionId`, `AttributeId`, and `StatusCode` are extended by GeoXACML 3.0.

NOTE: Please see the XACML 3.0 schema definitions in <http://docs.oasis-open.org/xacml/3.0/xacml-core-v3-schema-wd-17.xsd> for details.

6.1.1. Defining a new Data-Type

Section 8.1 of the XACML 3.0 specification states that *“The following XML attributes have values that are URIs. These may be extended by the creation of new URIs associated with new semantics for these attributes. ... Category, AttributeId, DataType, FunctionId, MatchId, ObligationId, AdviceId, PolicyCombiningAlgId, RuleCombiningAlgId, StatusCode, SubjectCategory.”*

This capability allows the definition of the `Geometry` datatype. The XACML compliant URN sd defined in this OGC Standard is `urn:ogc:def:geoxacml:3.0:data-type:geometry`.

6.1.2. Encoding of Data-Type Geometry

Section 8.2 of the XACML specification states that *“<xacml:AttributeValue> and <xacml-context:AttributeValue> elements MAY contain an instance of a structured XML data-type”*.

This provides two options for encoding a geometry.

1. As a string value to the `<AttributeValue>` element

The GeoXACML 3.0 Core defines the mandatory encoding for using the string value to use Well Known Text or Well Known Binary

2. As XML

The GeoXACML 3.0 Core defines an extension point such that Encoding Extension can define different XML encodings.

```

<xs:element name="AttributeValue" type="xacml:AttributeValueType"
substitutionGroup="xacml:Expression"/>
<xs:complexType name="AttributeValueType" mixed="true">
  <xs:complexContent mixed="true">
    <xs:extension base="xacml:ExpressionType">
      <xs:sequence>
        <xs:any namespace="##any" processContents="lax" minOccurs="0"
maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:attribute name="DataType" type="xs:anyURI" use="required"/>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>

```

Figure 2 – XACML schema definition of the <AttributeValue> element

Note: GeoXACML 3 Core does not support GML based geometry encoding.

```

<xacml3:AttributeValue
  DataType="urn:ogc:def:geoxacml:3.0:data-type:geometry"
  >POINT(-77.035278 38.889444)</xacml3:AttributeValue>

```

Figure 3 – Geometry encoding example based on WKT and default CRS

```

<xacml3:AttributeValue xmlns:geoxacml="http://www.opengis.net/geoxacml/3.0"
  DataType="urn:ogc:def:geoxacml:3.0:data-type:geometry"
  geoxacml:srid="4326"
  >POINT(38.889444 -77.035278)</xacml3:AttributeValue>

```

Figure 4 – Geometry encoding example based on WKT and explicit CRS definition

```

<xacml3:AttributeValue
  DataType="urn:ogc:def:geoxacml:3.0:data-type:geometry"
  >0101000002c11a8fe414253c0ccc0d4dd9714340</xacml3:AttributeValue>

```

Figure 5 – Geometry encoding example based on WKB and default CRS

```

<xacml3:AttributeValue xmlns:geoxacml="http://www.opengis.net/geoxacml/3.0"
  DataType="urn:ogc:def:geoxacml:3.0:data-type:geometry"
  geoxacml:srid="4326"
  >010100000ccc0d4dd97143402c11a8fe414253c0</xacml3:AttributeValue>

```

Figure 6 – Geometry encoding example based on WKB and explicit CRS definition

6.1.3. Defining a new Function

A <Function> element has an attribute named FunctionId, which is of type xs:anyURI. According to the XACML extension capabilities, additional functions can be defined by associating a unique FunctionId.

As specified in GeoXACML, this capability allows the definition of geo-specific functions.

```

<xs:element name="Function" type="xacml:FunctionType"/>
<xs:complexType name="FunctionType">
  <xs:attribute name="FunctionId" type="xs:anyURI" use="required"/>
</xs:complexType>

```

Figure 7 – XACML schema definition of the <Function> element

```

<xacml3:Apply FunctionId="urn:ogc:def:function:geoxacml:3.0:geometry-equals">
  <xacml3:Apply FunctionId="urn:ogc:def:function:geoxacml:3.0:geometry-one-
and-only">
    <xacml3:AttributeDesignator AttributeId="resource-location"
      DataType="urn:ogc:def:geoxacml:3.0:data-type:geometry"
      Category="urn:oasis:names:tc:xacml:3.0:attribute-category:resource"
      MustBePresent="false"/>
  </xacml3:Apply>
  <xacml3:AttributeValue xmlns:geoxacml="http://www.opengis.net/geoxacml/3.0"
    DataType="urn:ogc:def:geoxacml:3.0:data-type:geometry" geoxacml:srid=
"4326"
    >POINT(38.889444 -77.035278)</xacml3:AttributeValue>
</xacml3:Apply>

```

Figure 8 – Using GeoXACML functions example in XACML Apply

6.1.4. Functions that help indexing of policies based on geometry

A policy writer using GeoXACML 3.0 may structure access conditions based on topological relations such as “if subject-location is within the Polygon(...)`” or “if `device-location is within-distance to the requested resource”. Such a condition would, for example, fetch the subject-location or device-location from an ADR, the Polygon from the policy and the resource geometry from the resource itself (see XACML 3.0 Policy Information Point (PIP) for more information).

The geographic indexing of PolicySet, Policy or Rule matching takes place inside the Target element. A Match element may use any function identified via MatchId whose signature has two parameters and the result is of type boolean () as we can interpret from the XML schema definition below.

```

<xs:element name="Match" type="xacml:MatchType"/>
<xs:complexType name="MatchType">
  <xs:sequence>
    <xs:element ref="xacml:AttributeValue"/>
    <xs:choice>
      <xs:element ref="xacml:AttributeDesignator"/>
      <xs:element ref="xacml:AttributeSelector"/>
    </xs:choice>
  </xs:sequence>
  <xs:attribute name="MatchId" type="xs:anyURI" use="required"/>
</xs:complexType>

```

Figure 9 – XACML schema definition of the <Match> element

The order of the child elements in the Match element influence the way GeoXACML 3.0 defines matching functions such as is-within-distance, ensure-precision, srid-equals, etc. Those functions must have the geometry as the second parameter and the function specific parameter as the first parameter.

The following example illustrates the use of the srid-equals function to make a Rule to only match CRS84 (the SRID parameter is first).

```

<xacml3:Match MatchId="urn:ogc:def:function:geoxacml:3.0:geometry-srid-equals">
  <xacml3:AttributeValue DataType="http://www.w3.org/2001/XMLSchema#integer">
4326</xacml3:AttributeValue>
  <xacml3:AttributeDesignator
    Category="urn:oasis:names:tc:xacml:1.0:subject-category:access-subject"

```

```

    AttributeId="subject-location" DataType="urn:ogc:def:geoxacml:3.0:data-
type:geometry"
    MustBePresent="true" />
</xacml3:Match>

```

Figure 10 – Example of <Match> element for CRS84 geometries

The example Match above determines the CRS from the request attribute subject-location and compares it with the literal 4326 (the SRID for representing CRS84).

6.1.5. Defining a new StatusCode

A <StatusCode> element has an attribute names name, which is of type xs:anyURI. According to the XACML extension capabilities, additional identifiers can be defined by associating a unique StatusId.

```

<xs:element name="StatusCode" type="xacml:StatusCodeType"/>
<xs:complexType name="StatusCodeType">
  <xs:sequence>
    <xs:element ref="xacml:StatusCode" minOccurs="0"/>
  </xs:sequence>
  <xs:attribute name="Value" type="xs:anyURI" use="required"/>
</xs:complexType>

```

Figure 11 – XACML schema definition of the <StatusCode> element

```

<xacml3:Response xmlns:xacml3="urn:oasis:names:tc:xacml:3.0:core:schema:wd-17"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="urn:oasis:names:tc:xacml:3.0:core:schema:wd-17 http://docs.
oasis-open.org/xacml/3.0/xacml-core-v3-schema-wd-17.xsd">
  <xacml3:Result>
    <xacml3:Decision>Indeterminate</xacml3:Decision>
    <xacml3:Status>
      <xacml3:StatusCode Value="urn:ogc:def:function:geoxacml:3.0:geometry-
error"/>
    </xacml3:Status>
  </xacml3:Result>
</xacml3:Response>

```

Figure 12 – XACML schema compliant Response with GeoXACML <StatusCode>

```

<xacml3:Response xmlns:xacml3="urn:oasis:names:tc:xacml:3.0:core:schema:wd-17"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="urn:oasis:names:tc:xacml:3.0:core:schema:wd-17 http://docs.
oasis-open.org/xacml/3.0/xacml-core-v3-schema-wd-17.xsd">
  <xacml3:Result>
    <xacml3:Decision>Indeterminate</xacml3:Decision>
    <xacml3:Status>
      <xacml3:StatusCode Value="urn:ogc:def:function:geoxacml:3.0:geometry-
error"/>
      <xacml3:StatusMessage>Geometry must be encoded using specified SRID</
xacml3:StatusMessage>
      <xacml3:StatusDetail>
        <xacml3:MissingAttributeDetail
          Category="urn:oasis:names:tc:xacml:1.0:subject-category:access-subject"
          AttributeId="subject-location"
          DataType="urn:ogc:def:geoxacml:3.0:data-type:geometry">
          <xacml3:AttributeValue DataType="urn:ogc:def:geoxacml:3.0:data-type:
geometry"
            xmlns:geoxacml="http://www.opengis.net/geoxacml/3.0"

```

```
        geoxacml:srid="3857"/>
    </xacml3:MissingAttributeDetail>
</xacml3:StatusDetail>
</xacml3:Status>
</xacml3:Result>
</xacml3:Response>
```

Figure 13 – XACML schema compliant Response with GeoXACML <StatusCode> and <MissingAttributeDetail>

The <MissingAttributeDetail> indicates that the ADR should be repeated using the EPSG:3857 CRS for encoding the AttributeValue with AttributeId=subject-location and CategoryId=urn:oasis:names:tc:xacml:1.0:subject-category:access-subject. The reason for such a response could be that the implementation does not support CRS transformation and that the condition geometry in the GeoXACML 3.0 Policy/Rule is encoded in CRS EPSG:3857.

6.2. GeoXACML 3.0 Security and Privacy Considerations

In addition to the XACML 3.0 security and privacy considerations, GeoXACML 3.0 introduces geometry specific aspects.

6.2.1. User Privacy

Any deployment with policies that derive authorization decisions based on user location and requires that such information be submitted must evaluate the conditions such as, GDPR compliance, or if applicable more restrictive regulations, if applicable. This in particular is true when the request context requires containing additional Personal Information (e.g., name) or Personal Identifiable Information (e.g., IP address).

6.2.2. Geometry Precision

When deriving authorization decisions based on geographic conditions³ the precision of the coordinate values must be considered. Simply assuming a certain precision may result in false decisions.

To prevent false decision-making caused by precision, the GeoXACML 3.0 Standard defines geometry precision which can be used in a request (ADR) to express the minimum precision for all geometries involved in the decision-making. A GeoXACML 3.0 compliant implementation must terminate processing when the minimum requested precision cannot be achieved.

³the condition involves processing of AttributeValue with datatype Geometry

When crafting GeoXACML 3.0 policies (PolicySet, Policy, and Rule) always making the geometry precision explicit and matching the actual precision of the coordinates is recommended.

```
<xacml3:AttributeValue xmlns:geoxacml="urn:ogc:def:geoxacml:3.0:data-type:
geometry"
  DataType="urn:ogc:def:geoxacml:3.0:data-type:geometry"
  geoxacml:srid="4326"
  >POINT(38.88, -77.03)</xacml3:AttributeValue>
```

Figure 14 – Example where default precision is higher (default is infinite) to actual precision

```
<xacml3:AttributeValue xmlns:geoxacml="urn:ogc:def:geoxacml:3.0:data-type:
geometry"
  DataType="urn:ogc:def:geoxacml:3.0:data-type:geometry"
  geoxacml:srid="4326"
  geoxacml:precision="6"
  >POINT(38.889444, -77.035278)</xacml3:AttributeValue>
```

Figure 15 – Example where expressed precision meets the precision of the coordinate value

A policy writer can use the `-ensure-precision` function to index policies (PolicySet, Policy, and Rule) as illustrated in the following Rule snippet.

```
<xacml3:Rule RuleId="precision4" Effect="Permit">
  <xacml3:Target>
    <xacml3:AnyOf>
      <xacml3:AllOf>
        <xacml3:Match MatchId="urn:ogc:def:function:geoxacml:3.0:geometry-
ensure-precision">
          <xacml3:AttributeValue DataType="http://www.w3.org/2001/
XMLSchema#integer">4</xacml3:AttributeValue>
          <xacml3:AttributeDesignator
            Category="urn:oasis:names:tc:xacml:1.0:subject-category:access-
subject"
            AttributeId="subject-location" DataType="urn:ogc:def:
geoxacml:3.0:data-type:geometry"
            MustBePresent="true" />
          </xacml3:Match>
        </xacml3:AllOf>
      </xacml3:AnyOf>
    </xacml3:Target>
    <xacml3:Condition>
      <xacml3:Apply FunctionId="urn:ogc:def:function:geoxacml:3.0:geometry-
equals">
        <xacml3:AttributeValue DataType="urn:ogc:def:geoxacml:3.0:data-type:
geometry"
          xmlns:geoxacml="http://www.opengis.net/geoxacml/3.0"
          geoxacml:srid="4326"
          >POINT(38.8894 -77.0352)</xacml3:AttributeValue>
        <xacml3:Apply FunctionId="urn:ogc:def:function:geoxacml:3.0:geometry-
one-and-only">
          <xacml3:AttributeDesignator
            Category="urn:oasis:names:tc:xacml:1.0:subject-category:access-
subject"
            AttributeId="subject-location" DataType="urn:ogc:def:geoxacml:3.0:
data-type:geometry"
            MustBePresent="true" />
          </xacml3:Apply>
        </xacml3:Apply>
      </xacml3:Condition>
    </xacml3:Rule>
```

```

</xacml3:Condition>
</xacml3:Rule>

```

Figure 16 – Example Rule testing request `AttributeValue` for minimum precision

6.2.3. Geometry CRS

A GeoXACML 3.0 implementation that is compliant with the CRS Transformation conformance class may apply CRS transformation while deriving an authorization decision. Any CRS transformation produces a distortion that may result in false decision-making.

To prevent false decision-making caused by distortion, the GeoXACML 3.0 Standard defines the `allowTransformation` attribute that prevents dynamic CRS transformation by default whilst deriving an authorization decision. To explicitly allow a CRS transformation, the policy writer or the application requesting a decision must overwrite the default by adding `allowTransformation="true"` to the the `AttributeValue`.

When attempting to make authorization decisions based on the default `allowTransformation="false"`, the processing of policy and request geometries may stop “somewhere” and result in an Indeterminate decision. This is because the CRSs do not match. A policy writer that wants to craft different policies for different CRS can use the `urn:ogc:def:function:geoxacml:3.0:geometry-srid-equals` and `urn:ogc:def:function:geoxacml:3.0:geometry-bag-srid-equals` functions to index `PolicySet`, `Policy`, or `Rule` via Target matching.

```

<xacml3:Rule RuleId="crs84" Effect="Permit">
  <xacml3:Target>
    <xacml3:AnyOf>
      <xacml3:AllOf>
        <xacml3:Match MatchId="urn:ogc:def:function:geoxacml:3.0:geometry-srid-
equals">
          <xacml3:AttributeValue DataType="http://www.w3.org/2001/
XMLSchema#integer">4326</xacml3:AttributeValue>
          <xacml3:AttributeDesignator
            Category="urn:oasis:names:tc:xacml:1.0:subject-category:access-
subject"
            AttributeId="subject-location" DataType="urn:ogc:def:geoxacml:3.0:
data-type:geometry"
            MustBePresent="true" />
        </xacml3:Match>
      </xacml3:AllOf>
    </xacml3:AnyOf>
  </xacml3:Target>
  <xacml3:Condition>
    <xacml3:Apply FunctionId="urn:ogc:def:function:geoxacml:3.0:geometry-
equals">
      <xacml3:AttributeValue DataType="urn:ogc:def:geoxacml:3.0:data-type:
geometry"
        xmlns:geoxacml="http://www.opengis.net/geoxacml/3.0"
        geoxacml:srid="4326"
        >POINT(38.889444 -77.035278)</xacml3:AttributeValue>
      <xacml3:Apply FunctionId="urn:ogc:def:function:geoxacml:3.0:geometry-
one-and-only">
        <xacml3:AttributeDesignator
          Category="urn:oasis:names:tc:xacml:1.0:subject-category:access-
subject"

```

```
        AttributeId="subject-location" DataType="urn:ogc:def:geoxacml:3.0:
data-type:geometry"
        MustBePresent="true" />
    </xacml3:Apply>
</xacml3:Apply>
</xacml3:Condition>
</xacml3:Rule>
```

Figure 17 – Example Target matching for a Rule with geometry conditions using CRS84

7

GEOXACML 3.0 CORE REQUIREMENTS

7.1. Requirements Class Specification

REQUIREMENTS CLASS 1: SPECIFICATION

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/specification
OBLIGATION	requirement
TARGET TYPE	Implementation Specification
CONFORMANCE CLASS	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core
PREREQUISITES	OGC Simple Features XACML Version 3.0
NORMATIVE STATEMENTS	<p>Requirement 1: http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-urn-prefix</p> <p>Requirement 1-2: http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-identifier-prefix</p> <p>Requirement 1-3: http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-status-prefix</p> <p>Requirement 10: http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-function-urn-prefix</p> <p>Requirement 1-5: http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-geometry</p> <p>Requirement 5: http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-xacml-bag</p> <p>Requirement 6: http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-xacml-bag-crs</p> <p>Requirement 7: http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-iso</p> <p>Requirement 8: http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-homogeneous-collection</p> <p>Requirement 9: http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-heterogeneous-collection</p> <p>Requirement 11: http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-xml-namespace-uri</p> <p>Requirement 12: http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-default-crs</p>

REQUIREMENTS CLASS 1: SPECIFICATION

Requirement 13: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-axis-order>

Requirement 14: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-schema>

Requirement 15: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-xml-attribute-srid>

Requirement 16: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-xml-attribute-precision>

Requirement 17: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-xml-attribute-encoding>

Requirement 18: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-crs-error>

Requirement 19: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-geometry-error>

Requirement 20: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-geometry-collection-error>

Requirement 21: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-precision-error>

Requirement 22: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-subject-location>

Requirement 24: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-resource-extend>

Requirement 25: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-resource-bbox>

Requirement 26: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-device-location>

REQUIREMENT 1: URN PREFIX

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-urn-prefix
STATEMENT	GeoXACML 3.0 Core defines the non-resolvable URN base identifier <code>urn:ogc:def:geoxacml:3.0</code>

REQUIREMENT 2: GEOMETRY URN

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-geometry-urn
STATEMENT	GeoXACML 3.0 Core defines the URN identifier for the datatype Geometry as value <code>urn:ogc:def:geoxacml:3.0:data-type:geometry</code>

REQUIREMENT 3: STATUS URN PREFIX

IDENTIFIER `http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-status-urn-prefix`

STATEMENT GeoXACML 3.0 Core defines a non-resolvable URN base identifier for status codes `urn:ogc:def:geoxacml:3.0:status`

REQUIREMENT 4: IDENTIFIER URN PREFIX

IDENTIFIER `http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-identifier-urn-prefix`

STATEMENT GeoXACML 3.0 Core defines a non-resolvable URN base identifier for identifiers `urn:ogc:def:geoxacml:3.0:identifier`

REQUIREMENT 5: XACML BAG

IDENTIFIER `http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-xacml-bag`

STATEMENT A GeometryBag SHALL be an XACML bag with the datatype `urn:ogc:def:geoxacml:3.0:data-type:geometry`

REQUIREMENT 6: XACML BAG CRS

IDENTIFIER `http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-xacml-bag-crs`

STATEMENT All geometries in a GeometryBag SHALL have the same CRS.

REQUIREMENT 7: GEOMETRY MODEL

IDENTIFIER `http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-iso`

STATEMENT GeoXACML 3.0 Core SHALL be compliant with the geometry model defined in the OGC Simple Features Standard with the restriction of homogeneous GeometryCollection.

REQUIREMENT 8: HOMOGENEOUS COLLECTION

IDENTIFIER `http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-homogeneous-collection`

REQUIREMENT 8: HOMOGENEOUS COLLECTION

STATEMENT GeoXACML 3.0 Core constraints a GeometryCollection to be homogeneous. A homogeneous GeometryCollection is an OGC Simple Features compliant GeometryCollection where all geometries are of the same geometry type and not of type GeometryCollection.

REQUIREMENT 9: HETEROGENEOUS COLLECTION

IDENTIFIER `http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-heterogeneous-collection`

STATEMENT GeoXACML 3.0 Core supports a heterogeneous collection of geometries as a bag of geometries.

REQUIREMENT 10: FUNCTION URN PREFIX

IDENTIFIER `http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-function-urn-prefix`

STATEMENT GeoXACML 3.0 Core defines a non-resolvable URN base identifier for functions `urn:ogc:def:geoxacml:3.0:function`

REQUIREMENT 11: XML NAMESPACE

IDENTIFIER `http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-xml-namespace-uri`

STATEMENT GeoXACML 3.0 Core defines the XML namespace `geoxacml` with URI <http://www.opengis.net/geoxacml/3.0>.

REQUIREMENT 12: DEFAULT CRS

IDENTIFIER `http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-default-crs`

STATEMENT GeoXACML 3.0 Core defines a default CRS `urn:ogc:def:crs:OGC::CRS84` as defined in The GeoJSON Format.

REQUIREMENT 13: AXIS-ORDER

IDENTIFIER `http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-axis-order`

REQUIREMENT 13: AXIS-ORDER

STATEMENT GeoXACML 3.0 Core defines the axis order for the default CRS `urn:ogc:def:crs:OGC::CRS84` as defined in The GeoJSON Format to be longitude / latitude.

REQUIREMENT 14: XACML SCHEMA

IDENTIFIER <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-schema>

STATEMENT GeoXACML 3.0 Core SHALL adopt the XACML 3.0 Schema as defined in XACML Version 3.0 XML Schema for constructing a Policy, Authorization Decision Request and Authorization Decision.

REQUIREMENT 15: XML ATTRIBUTE SRID

IDENTIFIER <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-xml-attribute-srid>

STATEMENT GeoXACML 3.0 Core defines the XML attribute `srid` of type Integer in namespace <http://www.opengis.net/geoxacml/3.0> to be used in the `<AttributeValue>` element for expressing an explicit geometry SRID as defined in OGC Simple Features. The CRS identifier SHALL be valid in the EPSG authority namespace.

REQUIREMENT 16: XML ATTRIBUTE PRECISION

IDENTIFIER <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-xml-attribute-precision>

STATEMENT GeoXACML 3.0 Core defines the XML attribute `precision` of type Integer in namespace <http://www.opengis.net/geoxacml/3.0> to be used in the `<AttributeValue>` element for expressing the required minimum precision when processing a geometry. The default precision SHALL be infinite. The value of the `precision` attribute SHALL be a positive integer including zero (0). The value expresses the number of decimal places of the coordinate values that SHALL be considered when processing the geometry. When used in an ADR, a PEP SHALL use the `precision` for indicating the minimum precision for geometries involved in the decision-making. When used in an AD a PDP SHALL use the `precision` for indicating to the PEP the maximum possible precision that can be guaranteed when deriving a decision. An implementation SHALL abort processing with an Indeterminate decision using StatusCode value `urn:ogc:def:status:geoxacml:3.0:precision-error` when the expected precision cannot be guaranteed. The `StatusDetail` SHALL contain the `MissingAttributeDetail` for each involved geometry the corresponding `AttributeValue` including the maximum precision supported by the PDP. The `AttributeValue` SHALL not include a value.

REQUIREMENT 17: XML ATTRIBUTE ENCODING

IDENTIFIER <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-xml-attribute-encoding>

STATEMENT GeoXACML 3.0 Core defines the XML attribute encoding of type String in namespace <http://www.opengis.net/geoxacml/3.0> to be used in the <AttributeValue> element for expressing the geometry encoding. AS Core supports WKT and WKB geometry encoding, the value of the encoding attribute can either be WKT or WKB. If the encoding attribute is omitted, the WKT geometry encoding is the default.

REQUIREMENT 18: CRS ERROR

IDENTIFIER <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-crs-error>

STATEMENT GeoXACML 3.0 Core defines the StatusCode value `urn:ogc:def:geoxacml:3.0:status:crs-error` to indicate a processing error caused by CRS.

REQUIREMENT 19: GEOMETRY ERROR

IDENTIFIER <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-geometry-error>

STATEMENT GeoXACML 3.0 Core defines the StatusCode value `urn:ogc:def:geoxacml:3.0:status:geometry-error` to indicate that processing of a geometry caused an error.

REQUIREMENT 20: GEOMETRY COLLECTION ERROR

IDENTIFIER <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-geometry-collection-error>

STATEMENT GeoXACML 3.0 Core defines the StatusCode value `urn:ogc:def:geoxacml:3.0:status:geometry-collection-error` to indicate that processing of a GeometryCollection caused an error.

REQUIREMENT 21: PRECISION ERROR

IDENTIFIER <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-precision-error>

STATEMENT GeoXACML 3.0 Core defines the StatusCode value `urn:ogc:def:geoxacml:3.0:status:precision-error` to indicate that processing of a geometry was aborted due to requested precision could not be met.

REQUIREMENT 22: IDENTIFIER SUBJECT-LOCATION

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-subject-location
STATEMENT	GeoXACML 3.0 Core defines the AttributeId identifier <code>urn:ogc:def:geoxacml:3.0:identifier:subject-location</code> in the XACML subject-category to indicate the location of a user in the Authorization Decision Request.

REQUIREMENT 23: IDENTIFIER RESOURCE-LOCATION

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-resource-location
STATEMENT	GeoXACML 3.0 Core defines the AttributeId identifier <code>urn:ogc:def:geoxacml:3.0:identifier:resource-location</code> in the XACML resource-category to indicate the location of a resource in the Authorization Decision Request.

REQUIREMENT 24: IDENTIFIER RESOURCE-EXTEND

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-resource-extend
STATEMENT	GeoXACML 3.0 Core defines the AttributeId identifier <code>urn:ogc:def:geoxacml:3.0:0:identifier:resource-extend</code> in the XACML resource-category to indicate the boundary of a resource geometry in the Authorization Decision Request.

REQUIREMENT 25: IDENTIFIER RESOURCE-BBOX

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-resource-bbox
STATEMENT	GeoXACML 3.0 Core defines the AttributeId identifier <code>urn:ogc:def:geoxacml:3.0:identifier:resource-bbox</code> in the XACML resource-category to indicate the BBOX of a resource in the Authorization Decision Request.

REQUIREMENT 26: IDENTIFIER DEVICE-LOCATION

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-device-location
STATEMENT	GeoXACML 3.0 Core defines the AttributeId identifier <code>urn:ogc:def:geoxacml:3.0:identifier:device-location</code> in the XACML environment-category to indicate the location of a device in the Authorization Decision Request.

7.2. Requirements Class Geometry Data-Type

The standardization target for this requirements class is *implementation*.

The Geometry datatype is based on the definition from OGC Simple Features.

Any instance of a Geometry datatype requires a well-defined Coordinate Reference System (CRS). This Standard defines the default CRS and axis order in compliance with The GeoJSON Format as `urn:ogc:def:crs:OGC::CRS84` with axis order longitude/latitude.

The coordinate tuples of a Geometry datatype must be encoded compliant with the XACML 3.0 Policy schema. GeoXACML 3.0 Core supports Well-Known-Text and Well-Known-Binary encodings.

REQUIREMENTS CLASS 2: GEOMETRY DATA-TYPE

IDENTIFIER <http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type>

OBLIGATION requirement

TARGET TYPE Implementation

PREREQUISITES OGC Simple Features
XACML Version 3.0

NORMATIVE STATEMENTS

Requirement 27: <http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type/req-default-crs>

Requirement 28: <http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type/req-xacml-attribute-srid>

Requirement 29: <http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type/req-geometry-error>

Requirement 30: <http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type/req-srid-equal>

Requirement 31: <http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type/req-wkt>

Requirement 32: <http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type/req-wkb>

REQUIREMENT 27: DEFAULT CRS

IDENTIFIER <http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type/req-default-crs>

REQUIREMENT 27: DEFAULT CRS

STATEMENT An implementation SHALL use the default CRS when constructing a Geometry instance unless the AttributeValue element contains the attribute srid in the XML namespace <http://www.opengis.net/geoxacml/3.0>.

REQUIREMENT 28: XACML ATTRIBUTE SRID

IDENTIFIER <http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type/req-xacml-attribute-srid>

STATEMENT An implementation SHALL overwrite the default CRS with the definition from the XACML3 AttributeValue attribute srid defined in the XML namespace <http://www.opengis.net/geoxacml/3.0>.

REQUIREMENT 29: GEOMETRY ERROR

IDENTIFIER <http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type/req-geometry-error>

STATEMENT An implementation SHALL abort policy evaluation for any function processing a Geometry when the geometry instantiation results in an error. The resulting Authorization Response SHALL have the Decision value Indeterminate and StatusCode value `urn:ogc:def:geoxacml:3.0:status:geometry-error`

REQUIREMENT 30: SRID EQUAL

IDENTIFIER <http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type/req-srid-equal>

STATEMENT An implementation SHALL abort policy evaluation for any function with more than one input parameter of data-type Geometry when the SRID identifiers are **not** identical. The resulting Authorization Response SHALL have the Decision value Indeterminate and StatusCode value `urn:ogc:def:geoxacml:3.0:status:crs-error`.
The StatusDetail SHALL contain a MissingAttributeDetail element that lists all AttributeValue elements that are affected. The use of the srid attribute in namespace <http://www.opengis.net/geoxacml/3.0> is mandatory to express the CRS identifier to be used.
The use of the allowTransformation attribute in namespace <http://www.opengis.net/geoxacml/3.0> is optional but SHALL be used to indicate that a geometry in the expressed CRS SHALL not be transformed to another CRS.

```
<StatusDetail xmlns:geoxacml="http://www.opengis.net/geoxacml/3.0">
  <MissingAttributeDetail Category="access-subject" AttributeIdentifier="
subject-location" DataType="urn:ogc:def:geoxacml:3.0:data-type:geometry">
    <AttributeValue DataType="urn:ogc:def:geoxacml:3.0:data-type:
geometry" geoxacml:srid="4711" geoxacl:allowTransformation="true"/>
    <AttributeValue DataType="urn:ogc:def:geoxacml:3.0:data-type:
geometry" geoxacml:srid="3857" geoxacl:allowTransformation="true"/>
    <AttributeValue DataType="urn:ogc:def:geoxacml:3.0:data-type:
geometry" geoxacml:srid="4326" geoxacl:allowTransformation="false"/>
  </MissingAttributeDetail>
</StatusDetail>
```

REQUIREMENT 30: SRID EQUAL

```
</MissingAttributeDetail>  
</StatusDetail>
```

Example GeoXACML StatusDetail and MissingAttributeDetail to express supported CRS identifiers

REQUIREMENT 31: WKT ENCODING

IDENTIFIER <http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type/req-wkt>

STATEMENT An implementation SHALL support the WKT geometry encoding as defined in OGC Simple Features.

REQUIREMENT 32: WKB ENCODING

IDENTIFIER <http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type/req-wkb>

STATEMENT An implementation SHALL support the WKB geometry encoding as defined in OGC Simple Features and be able to construct a Geometry instance from the hex representation of the WKB's binary value.

7.3. Requirements Class Geometry Functions

The standardization target for this requirements class is *implementation*.

GeoXACML 3 Core supports functions on on the Geometry datatype as defined in OGC Simple Features section 6.1.2.2, 6.1.2.3 and the function "Distance" from section 6.1.2.4.

In addition, GeoXACML 3 Core supports functions on the Geometry datatype mandated by XACML Version 3.0.

REQUIREMENTS CLASS 3: GEOMETRY DATA-TYPE

IDENTIFIER <http://www.opengis.net/spec/geoxacml/3.0/req-class/geometry-functions>

OBLIGATION requirement

TARGET TYPE Implementation

REQUIREMENTS CLASS 3: GEOMETRY DATA-TYPE

PREREQUISITES	OGC Simple Features XACML Version 3.0
NORMATIVE STATEMENTS	Requirement 33: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-dimension Requirement 34: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-type Requirement 37: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-srid Requirement 35: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-is-empty Requirement 36: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-is-simple Requirement 38: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-srid-equals Requirement 39: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-ensure-srid Requirement 42: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-ensure-precision Requirement 43: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-length Requirement 44: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-area Requirement 45: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-distance Requirement 46: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-has-distance Requirement 47: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-is-within-distance

7.3.1. Requirement Function Dimension

REQUIREMENT 33: FUNCTION DIMENSION

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-dimension
OBLIGATION	requirement
STATEMENT	This function SHALL have the signature <code>Dimension(this:Geometry):Integer</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-dimension</code> This function SHALL be compliant with <code>Dimension():Integer</code> as defined in OGC Simple Features, section 6.1.2.2.

7.3.2. Requirement Function GeometryType

REQUIREMENT 34: FUNCTION GEOMETRYTYPE

IDENTIFIER	<code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-type</code>
OBLIGATION	requirement
STATEMENT	<p>This function SHALL have the signature <code>GeometryType(this:Geometry):String</code> and the identifier as</p> <p><code>urn:ogc:def:geoxacml:3.0:function:geometry-type</code></p> <p>This function SHALL be compliant with <code>GeometryType():String</code> as defined in OGC Simple Features, section 6.1.2.2.</p>

7.3.3. Requirement Function IsEmpty

REQUIREMENT 35: FUNCTION ISEMPY

IDENTIFIER	<code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-is-empty</code>
OBLIGATION	requirement
STATEMENT	<p>This function SHALL have the signature <code>IsEmpty(this:Geometry):Boolean</code> and the identifier as</p> <p><code>urn:ogc:def:geoxacml:3.0:function:geometry-is-empty</code></p> <p>This function SHALL be compliant with <code>IsEmpty():Integer</code> as defined in OGC Simple Features, section 6.1.2.2.</p> <p>This function SHALL return the value <code>False</code> if <code>IsEmpty()</code> returns the value <code>0</code> and the value <code>True</code> otherwise.</p>

7.3.4. Requirement Function IsSimple

REQUIREMENT 36: FUNCTION ISSIMPLE

IDENTIFIER	<code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-is-simple</code>
OBLIGATION	requirement

REQUIREMENT 36: FUNCTION ISSIMPLE

STATEMENT	<p>This function SHALL have the signature <code>IsSimple(this:Geometry):Boolean</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-is-simple</code></p> <p>This function SHALL be compliant with <code>IsSimple():Integer</code> as defined in OGC Simple Features, section 6.1.2.2.</p> <p>This function SHALL return the value <code>False</code> if <code>IsSimple()</code> returns the value <code>0</code> and the value <code>True</code> otherwise.</p>
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7.3.5. Requirement Function SRID

REQUIREMENT 37: FUNCTION SRID

IDENTIFIER	<code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-srid</code>
OBLIGATION	requirement
STATEMENT	<p>This function SHALL have the signature <code>SRID(this:Geometry):Integer</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-srid</code></p> <p>This function SHALL be compliant with <code>SRID():Integer</code> as defined in OGC Simple Features, section 6.1.2.2.</p>

7.3.6. Requirement Function SRIDEquals

REQUIREMENT 38: FUNCTION SRIDEQUALS

IDENTIFIER	<code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-srid-equals</code>
OBLIGATION	requirement
STATEMENT	<p>This function SHALL have the signature <code>SRIDEquals(srid:Integer, this:Geometry):Boolean</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-srid-equals</code></p> <p>This function SHALL return <code>True</code> if the geometry's SRID is identical to the given <code>srid</code> parameter and <code>False</code> otherwise.</p>

7.3.7. Requirement Function EnsureSRID

REQUIREMENT 39: FUNCTION ENSURESRID

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-ensure-srid
OBLIGATION	requirement
STATEMENT	<p>This function SHALL have the signature <code>EnsureSRID(srid:Integer, this:Geometry): Geometry</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-ensure-srid</code></p> <p>This function SHALL return a geometry where the <code>srid</code> parameter is used to calculate the coordinate values. This function SHALL raise an Indeterminate exception with <code>StatusCode</code> value <code>urn:ogc:def:geoxacml:3.0:identifier:crs-error</code> if the output geometry could not be created. The <code>MissingAttributeDetail</code> element SHALL be used to list the <code>AttributeValue</code> with acceptable SRID values. The <code>AttributeValue</code> value SHALL be empty.</p> <p>When this function is implemented as part of the Core conformance, this function basically asserts that the geometry's <code>srid</code> value equals a give value.</p> <p>When this function is implemented as part of the CRS Transformation conformance, this function SHALL attempt to do a CRS transformation on the geometry with the target CRS identified by the <code>srid</code> parameter.</p>

7.3.8. Requirement Function Precision

REQUIREMENT 40: FUNCTION PRECISION

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-precision
OBLIGATION	requirement
STATEMENT	<p>This function SHALL have the signature <code>Precision(this:Geometry):Integer</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-precision</code></p> <p>This function SHALL return a http://www.w3.org/2001/XMLSchema#integer value that is the geometry's precision.</p>

7.3.9. Requirement Function HasPrecision

REQUIREMENT 41: FUNCTION HASPRECISION

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-has-precision
OBLIGATION	requirement

REQUIREMENT 41: FUNCTION HASPRECISION

STATEMENT	This function SHALL have the signature <code>HasPrecision(precision:Integer,this:Geometry):Boolean</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-has-precision</code>
	This function SHALL return a http://www.w3.org/2001/XMLSchema#boolean . The function SHALL evaluate to True if and only if the value of the first argument is less or equal to the precision of the geometry represented by the second argument.

7.3.10. Requirement Function EnsurePrecision

REQUIREMENT 42: FUNCTION ENSUREPRECISION

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-ensure-precision
OBLIGATION	requirement
STATEMENT	This function SHALL have the signature <code>EnsurePrecision(precision:Integer,this:Geometry):Geometry</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-ensure-precision</code> This function SHALL return a geometry where the precision parameter is used to calculate the coordinate values. This function SHALL raise an Indeterminate exception with StatusCode value <code>urn:ogc:def:geoxacml:3.0:status:precision-error</code> if the precision parameter requests higher precision than given by the input geometry (in other words, the requested precision cannot be reached). The <code>MissingAttributeDetail</code> element SHALL be used to list the <code>AttributeValue</code> with maximum possible precision value. The <code>AttributeValue</code> value SHALL be empty.

7.3.11. Requirement Function Length

REQUIREMENT 43: FUNCTION LENGTH

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-length
OBLIGATION	requirement
STATEMENT	This function SHALL have the signature <code>Length(this:Geometry):Double</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-length</code> This function SHALL be compliant with <code>Length():Double</code> as defined in OGC Simple Features, section 6.1.3.2.

7.3.12. Requirement Function Area

REQUIREMENT 44: FUNCTION AREA

IDENTIFIER	<code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-area</code>
OBLIGATION	requirement
STATEMENT	This function SHALL have the signature <code>Area(this:Geometry):Double</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-area</code> This function SHALL be compliant with <code>Area():Double</code> as defined in OGC Simple Features, section 6.1.10.2.

7.3.13. Requirement Function Distance

REQUIREMENT 45: FUNCTION DISTANCE

IDENTIFIER	<code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-distance</code>
OBLIGATION	requirement
STATEMENT	This function SHALL have the signature <code>Distance(this:Geometry, another:Geometry):Double</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-distance</code> This function SHALL be compliant with <code>Distance(another:Geometry):Double</code> as defined in OGC Simple Features, section 6.1.2.4.

7.3.14. Requirement Function HasDistance

REQUIREMENT 46: FUNCTION HASDISTANCE

IDENTIFIER	<code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-has-distance</code>
OBLIGATION	requirement
STATEMENT	This function SHALL have the signature <code>HasDistance(distance:Double, this:Geometry, another:Geometry):Boolean</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-distance-equals</code>

REQUIREMENT 46: FUNCTION HASDISTANCE

This function is a convenience function to evaluate the distance between geometries using the function `Distance(another:Geometry):Double` as defined in OGC Simple Features, section 6.1.2.4. This function SHALL return true value if the given distance equals the distance between the two geometries.

7.3.15. Requirement Function IsWithinDistance

REQUIREMENT 47: FUNCTION ISWITINDISTANCE

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-is-within-distance
OBLIGATION	requirement
STATEMENT	This function SHALL have the signature <code>IsWithinDistance(d:Double,this:Geometry,another:Geometry):Boolean</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-is-within-distance</code> This function SHALL be compliant with <code>IsWitinDistance():Boolean</code> as defined in Java Topology Suite - <code>isWithinDistance()</code> .

7.4. Requirements Class Spatial Relations Functions

Definitions of testing functions on on the Geometry datatype as defined in OGC Simple Features section 6.1.2.3.

REQUIREMENTS CLASS 4: SPATIAL RELATIONS FUNCTIONS

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/spatial-relations-functions
OBLIGATION	requirement
TARGET TYPE	Implementation
PREREQUISITES	OGC Simple Features XACML Version 3.0
NORMATIVE STATEMENTS	Requirement 4-1: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-equal Requirement 48: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-equals

REQUIREMENTS CLASS 4: SPATIAL RELATIONS FUNCTIONS

Requirement 49: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-disjoint>

Requirement 50: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-intersects>

Requirement 51: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-touches>

Requirement 52: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-crosses>

Requirement 53: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-within>

Requirement 54: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-contains>

Requirement 55: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-overlaps>

Requirement 56: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-relate>

7.4.1. Requirement Function Equals

REQUIREMENT 48: FUNCTION EQUALS

IDENTIFIER <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-equals>

OBLIGATION requirement

STATEMENT This function SHALL have the signature `Equals(this:Geometry,another:Geometry): Boolean` and the identifier as `urn:ogc:def:geoxacml:3.0:function:geometry-equals`
This function SHALL be compliant with `Equals(Geometry):Integer` as defined in OGC Simple Features, section 6.1.2.3.
This function SHALL return the value `False` if `Equals()` returns the value `0` and the value `True` otherwise.

7.4.2. Requirement Function Disjoint

REQUIREMENT 49: FUNCTION DISJOINT

IDENTIFIER <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-disjoint>

OBLIGATION requirement

REQUIREMENT 49: FUNCTION DISJOINT

STATEMENT	<p>This function SHALL have the signature <code>Disjoint(this:Geometry,another:Geometry): Boolean</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-disjoint</code></p> <p>This function SHALL be compliant with <code>Disjoint(Geometry):Integer</code> as defined in OGC Simple Features, section 6.1.2.3.</p> <p>This function SHALL return the value <code>False</code> if <code>Disjoint()</code> returns the value <code>0</code> and the value <code>True</code> otherwise.</p>
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7.4.3. Requirement Function Intersects

REQUIREMENT 50: FUNCTION INTERSECTS

IDENTIFIER	<code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-intersects</code>
OBLIGATION	requirement
STATEMENT	<p>This function SHALL have the signature <code>Intersects(this:Geometry,another:Geometry): Boolean</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-intersects</code></p> <p>This function SHALL be compliant with <code>Intersects(Geometry):Integer</code> as defined in OGC Simple Features, section 6.1.2.3.</p> <p>This function SHALL return the value <code>False</code> if <code>Intersects()</code> returns the value <code>0</code> and the value <code>True</code> otherwise.</p>

7.4.4. Requirement Function Touches

REQUIREMENT 51: FUNCTION TOUCHES

IDENTIFIER	<code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-touches</code>
OBLIGATION	requirement
STATEMENT	<p>This function SHALL have the signature <code>Touches(this:Geometry,another:Geometry): Boolean</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-touches</code></p> <p>This function SHALL be compliant with <code>Touches(Geometry):Integer</code> as defined in OGC Simple Features, section 6.1.2.3.</p> <p>This function SHALL return the value <code>False</code> if <code>Touches()</code> returns the value <code>0</code> and the value <code>True</code> otherwise.</p>

7.4.5. Requirement Function Crosses

REQUIREMENT 52: FUNCTION CROSSES

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-crosses
OBLIGATION	requirement
STATEMENT	<p>This function SHALL have the signature <code>Crosses(this:Geometry,another:Geometry): Boolean</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-crosses</code></p> <p>This function SHALL be compliant with <code>Crosses(Geometry):Integer</code> as defined in OGC Simple Features, section 6.1.2.3.</p> <p>This function SHALL return the value <code>False</code> if <code>Crosses()</code> returns the value <code>0</code> and the value <code>True</code> otherwise.</p>

7.4.6. Requirement Function Within

REQUIREMENT 53: FUNCTION WITHIN

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-within
OBLIGATION	requirement
STATEMENT	<p>This function SHALL have the signature <code>Within(this:Geometry,another:Geometry): Boolean</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-within</code></p> <p>This function SHALL be compliant with <code>Within(Geometry):Integer</code> as defined in OGC Simple Features, section 6.1.2.3.</p> <p>This function SHALL return the value <code>False</code> if <code>Within()</code> returns the value <code>0</code> and the value <code>True</code> otherwise.</p>

7.4.7. Requirement Function Contains

REQUIREMENT 54: FUNCTION CONTAINS

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-contains
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REQUIREMENT 54: FUNCTION CONTAINS

OBLIGATION	requirement
STATEMENT	<p>This function SHALL have the signature <code>Contains(this:Geometry,another:Geometry): Boolean</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-contains</code></p> <p>This function SHALL be compliant with <code>Contains(Geometry):Integer</code> as defined in OGC Simple Features, section 6.1.2.3.</p> <p>This function SHALL return the value <code>False</code> if <code>Contains()</code> returns the value <code>0</code> and the value <code>True</code> otherwise.</p>

7.4.8. Requirement Function Overlaps

REQUIREMENT 55: FUNCTION OVERLAPS

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-overlaps
OBLIGATION	requirement
STATEMENT	<p>This function SHALL have the signature <code>Overlaps(this:Geometry,another:Geometry): Boolean</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-overlaps</code></p> <p>This function SHALL be compliant with <code>Overlaps(Geometry):Integer</code> as defined in OGC Simple Features, section 6.1.2.3.</p> <p>This function SHALL return the value <code>False</code> if <code>Overlaps()</code> returns the value <code>0</code> and the value <code>True</code> otherwise.</p>

7.4.9. Requirement Function Relate

REQUIREMENT 56: FUNCTION RELATE

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-relate
OBLIGATION	requirement
STATEMENT	<p>This function SHALL have the signature <code>Relate(intersectionPatternMatrix:String, this:Geometry,another:Geometry): Boolean</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-relate</code></p> <p>This function SHALL be compliant with <code>Relate(Geometry,String):Integer</code> as defined in OGC Simple Features, section 6.1.2.3.</p>

REQUIREMENT 56: FUNCTION RELATE

This function SHALL return the value `False` if `Relate()` returns the value `0` and the value `True` otherwise.

7.5. Requirements Class Bag Functions

Definitions of XACML bag functions on the datatype `Geometry` as mandated by XACML Version 3.0.

REQUIREMENTS CLASS 5: XACML BAG FUNCTIONS

IDENTIFIER	<code>http://www.opengis.net/spec/geoxacml/3.0/req-class/xacml-bag-functions</code>
OBLIGATION	requirement
TARGET TYPE	Implementation
PREREQUISITE	XACML Version 3.0
NORMATIVE STATEMENTS	<p>Requirement 57: <code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-bag-one-and-only</code></p> <p>Requirement 58: <code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-bag-size</code></p> <p>Requirement 59: <code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-is-in-bag</code></p> <p>Requirement 60: <code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-bag</code></p> <p>Requirement 5-5: <code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-geometry-collection-from-geometry-bag</code></p> <p>Requirement 5-6: <code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-geometry-bag-from-geometry-collection</code></p> <p>Requirement 63: <code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-geometry-bag-srid</code></p> <p>Requirement 64: <code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-geometry-bag-srid-equals</code></p>

7.5.1. Requirement Function `GeometryOneAndOnly`

REQUIREMENT 57: FUNCTION GEOMETRYONEANDONLY

IDENTIFIER	<code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-bag-one-and-only</code>
OBLIGATION	requirement
STATEMENT	<p>This function SHALL have the signature <code>GeometryOneAndOnly(bag:GeometryBag): Geometry</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-bag-one-and-only</code></p> <p>This function SHALL take a bag of <code>urn:ogc:def:geoxacml:3.0:data-type:geometry</code> values as an argument and SHALL return a value of <code>urn:ogc:def:geoxacml:3.0:data-type:geometry</code>. It SHALL return the only value in the bag. If the bag does not have one and only one value, then the expression SHALL evaluate to "Indeterminate".</p>

REQUIREMENT 58: FUNCTION GEOMETRYBAGSIZE

IDENTIFIER	<code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-bag-size</code>
OBLIGATION	requirement
STATEMENT	<p>This function SHALL have the signature <code>GeometryBagSize(bag:GeometryBag): Integer</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-bag-size</code></p> <p>This function SHALL take a bag of <code>urn:ogc:def:geoxacml:3.0:data-type:geometry</code> values as an argument and SHALL return an http://www.w3.org/2001/XMLSchema#integer indicating the number of values in the bag.</p>

REQUIREMENT 59: FUNCTION GEOMETRYISIN

IDENTIFIER	<code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-is-in-bag</code>
OBLIGATION	requirement
STATEMENT	<p>This function SHALL have the signature <code>GeometryIsIn(g:Geometry, bag:GeometryBag): Boolean</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-is-in-bag</code></p> <p>The function SHALL return True if and only if the first argument matches by the <code>urn:ogc:def:geoxacml:3.0:function:geometry-equals</code> any value in the bag.</p> <p>This function SHALL return False otherwise or if the argument is an empty bag.</p>

REQUIREMENT 60: FUNCTION BAG

IDENTIFIER `http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-bag`

OBLIGATION requirement

STATEMENT This function SHALL have the signature `Bag(Geometry):GeometryBag` and the identifier as `urn:ogc:def:geoxacml:3.0:function:geometry-bag`
This function SHALL take any number of arguments of `urn:ogc:def:geoxacml:3.0:data-type:geometry` and return a bag of `urn:ogc:def:geoxacml:3.0:data-type:geometry` values containing the values of the arguments. An application of this function to zero arguments SHALL produce an empty bag of the datatype `urn:ogc:def:geoxacml:3.0:data-type:geometry`.

REQUIREMENT 61: FUNCTION GEOMETRYBAGTOCOLLECTION

IDENTIFIER `http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-geometry-bag-to-collection`

OBLIGATION requirement

STATEMENT This function SHALL have the signature `GeometryBagToCollection(bag:GeometryBag):GeometryCollection` and the identifier as `urn:ogc:def:geoxacml:3.0:function:geometry-bag-to-collection`
This function SHALL return a homogeneous `GeometryCollection` as defined in ISO 19125 by adding each member of the bag as a geometry to the collection.
This function SHALL return an Indeterminate status with value `urn:ogc:def:geoxacml:3.0:status:geometry-collection-error` if the bag is heterogeneous (contains geometries of different types).

REQUIREMENT 62: FUNCTION GEOMETRYBAGFROMCOLLECTION

IDENTIFIER `http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-geometry-bag-from-collection`

OBLIGATION requirement

STATEMENT This function SHALL have the signature `GeometryBagFromCollection(GeometryCollection):GeometryBag` and the identifier as `urn:ogc:def:geoxacml:3.0:function:geometry-bag-from-collection`
This function SHALL return a bag of values of type `Geometry` by adding each geometry of the `GeometryCollection` as a member of type `Geometry`.

REQUIREMENT 63: FUNCTION GEOMETRYBAGSRID

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-geometry-bag-srid
OBLIGATION	requirement
STATEMENT	<p>This function SHALL have the signature <code>GeometryBagSRID(bag:GeometryBag): Integer</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-bag-srid</code></p> <p>This function SHALL return an Integer which value is the <code>srid</code> of the geometries of the bag.</p> <p>NOTE: Per GeoXACML definition, all geometries of a bag SHALL have the same <code>srid</code> value.</p>

REQUIREMENT 64: FUNCTION GEOMETRYBAGSRIDEQUALS

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-geometry-bag-srid-equals
OBLIGATION	requirement
STATEMENT	<p>This function SHALL have the signature <code>GeometryBagSRIDEquals(srid:Integer, bag:GeometryBag): Boolean</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-bag-srid-equals</code></p> <p>This function SHALL return a <code>True</code> value if the <code>srid</code> of the bag equals the value of the <code>srid</code> parameter and a <code>False</code> value otherwise.</p>

7.6. Requirements Class Set Functions

Definitions of XACML set functions on the `Geometry` datatype as mandated by XACML Version 3.0.

REQUIREMENTS CLASS 6: XACML BAG FUNCTIONS

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/xacml-set-functions
OBLIGATION	requirement
TARGET TYPE	Implementation
PREREQUISITE	XACML Version 3.0

REQUIREMENTS CLASS 6: XACML BAG FUNCTIONS

NORMATIVE STATEMENTS	Requirement 66: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-intersection
	Requirement 65: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-at-least-one-member-of
	Requirement 67: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-union
	Requirement 68: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-subset
	Requirement 69: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-set-equals

7.6.1. Requirement Function AtLeastOneMemberOf

REQUIREMENT 65: FUNCTION BAGATLEASTONEMEMBEROF

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-at-least-one-member-of
OBLIGATION	requirement
STATEMENT	This function SHALL have the signature <code>BagAtLeastOneMemberOf(bag1:GeometryBag, bag2:GeometryBag):Boolean</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-bag-at-least-one-member-of</code> This function SHALL take two arguments that are both a bag of <code>urn:ogc:def:geoxacml:3.0:data-type:geometry</code> values. It SHALL return a http://www.w3.org/2001/XMLSchema#boolean . The function SHALL evaluate to True if and only if at least one element of the first argument is contained in the second argument as determined by <code>urn:ogc:def:geoxacml:3.0:function:geometry-is-in-bag</code> .

7.6.2. Requirement Function Intersection

REQUIREMENT 66: FUNCTION INTERSECTION

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-intersection
OBLIGATION	requirement
STATEMENT	This function SHALL have the signature <code>Intersection(bag1:GeometryBag, bag2:GeometryBag):GeometryBag</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-bag-intersection</code>

REQUIREMENT 66: FUNCTION INTERSECTION

This function SHALL take two arguments that are both a bag of `urn:ogc:def:geoxacml:3.0:data-type:geometry` values. It SHALL return a bag of `urn:ogc:def:geoxacml:3.0:data-type:geometry` values such that it contains only elements that are common between the two bags, which is determined by `urn:ogc:def:geoxacml:3.0:function:geometry-equals`. No duplicates, as determined by `urn:ogc:def:geoxacml:3.0:function:geometry-equals`, SHALL exist in the result.

7.6.3. Requirement Function Union

REQUIREMENT 67: FUNCTION UNION

IDENTIFIER `http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-union`

OBLIGATION requirement

STATEMENT This function SHALL have the signature `Union(bag1:GeometryBag, bag2:GeometryBag): GeometryBag` and the identifier as `urn:ogc:def:geoxacml:3.0:function:geometry-bag-union`. This function SHALL take two arguments that are both a bag of `urn:ogc:def:geoxacml:3.0:data-type:geometry` values. It SHALL return a bag of `urn:ogc:def:geoxacml:3.0:data-type:geometry` such that it contains all elements of all the argument bags. No duplicates, as determined by `urn:ogc:def:geoxacml:3.0:function:geometry-equals`, SHALL exist in the result.

7.6.4. Requirement Function Subset

REQUIREMENT 68: FUNCTION SUBSET

IDENTIFIER `http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-subset`

OBLIGATION requirement

STATEMENT This function SHALL have the signature `Subset(bag1:GeometryBag, bag2:GeometryBag): Boolean` and the identifier as `urn:ogc:def:geoxacml:3.0:function:geometry-bag-subset`. This function SHALL take two arguments that are both a bag of `urn:ogc:def:geoxacml:3.0:data-type:geometry` values. It SHALL return "True" if and only if the first argument is a subset of the second argument. Each argument SHALL be considered to have had its duplicates removed, as determined by `urn:ogc:def:geoxacml:3.0:function:geometry-equals`, before the subset calculation.

7.6.5. Requirement Function SetEquals

REQUIREMENT 69: FUNCTION SETEQUALS

IDENTIFIER `http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-set-equals`

OBLIGATION requirement

STATEMENT This function SHALL have the signature `SetEquals(bag1:GeometryBag, bag2:GeometryBag):Boolean` and the identifier as `urn:ogc:def:geoxacml:3.0:function:geometry-set-equals`
This function SHALL take two arguments that are both a bag of `urn:ogc:def:geoxacml:3.0:data-type:geometry` values. It SHALL return the result of applying `urn:oasis:names:tc:xacml:1.0:function:and` to the application of `urn:ogc:def:geoxacml:3.0:function:geometry-bag-subset` to the first and second arguments and the application of `urn:ogc:def:geoxacml:3.0:function:geometry-bag-subset` to the second and first arguments.

8

GEOXACML 3.0 SPATIAL ANALYSIS REQUIREMENTS

GEOXACML 3.0 SPATIAL ANALYSIS REQUIREMENTS

8.1. Requirements Class Spatial Analysis

REQUIREMENTS CLASS 7: SPATIAL ANALYSIS

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/analysis
OBLIGATION	requirement
TARGET TYPE	Implementation
CONFORMANCE CLASS	Conformance class 2: http://www.opengis.net/spec/geoxacml/3.0/conf/spatial-analysis
PREREQUISITES	OGC Simple Features XACML Version 3.0
NORMATIVE STATEMENTS	<p>Requirement 70: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-envelope</p> <p>Requirement 71: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-boundary</p> <p>Requirement 72: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-buffer</p> <p>Requirement 73: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-convex-hull</p> <p>Requirement 74: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-intersection</p> <p>Requirement 75: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-union</p> <p>Requirement 76: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-difference</p> <p>Requirement 77: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-sym-difference</p> <p>Requirement 78: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-centroid</p>

8.1.1. Requirement Function Envelope

REQUIREMENT 70: FUNCTION ENVELOPE

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-envelope
OBLIGATION	requirement
STATEMENT	This function SHALL have the signature <code>Envelope(this:Geometry):Geometry</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-envelope</code> This function SHALL be compliant with <code>Envelope():Geometry</code> as defined in OGC Simple Features, section 6.1.2.2

8.1.2. Requirement Function Boundary

REQUIREMENT 71: FUNCTION BOUNDARY

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-boundary
OBLIGATION	requirement
STATEMENT	This function SHALL have the signature <code>Boundary(this:Geometry):Geometry</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-boundary</code> This function SHALL be compliant with <code>Boundary():Geometry</code> as defined in OGC Simple Features, section 6.1.2.2

8.1.3. Requirement Function Buffer

REQUIREMENT 72: FUNCTION BUFFER

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-buffer
OBLIGATION	requirement
STATEMENT	This function SHALL have the signature <code>Buffer(this:Geometry,distance:Double):Geometry</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-buffer</code> This function SHALL be compliant with <code>Buffer(Double):Geometry</code> as defined in OGC Simple Features, section 6.1.2.4

8.1.4. Requirement Function ConvexHull

REQUIREMENT 73: FUNCTION CONVEXHULL

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-convex-hull
OBLIGATION	requirement
STATEMENT	This function SHALL have the signature <code>ConvexHull(this:Geometry):Geometry</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-convex-hull</code> This function SHALL be compliant with <code>ConvexHull():Geometry</code> as defined in OGC Simple Features, section 6.1.2.4

8.1.5. Requirement Function GeometryIntersection

REQUIREMENT 74: FUNCTION INTERSECTION

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-intersection
OBLIGATION	requirement
STATEMENT	This function SHALL have the signature <code>Intersection(this:Geometry, another:Geometry):Geometry</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-intersection</code> This function SHALL be compliant with <code>Intersection(Geometry):Geometry</code> as defined in OGC Simple Features, section 6.1.2.4

8.1.6. Requirement Function GeometryUnion

REQUIREMENT 75: FUNCTION UNION

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-union
OBLIGATION	requirement
STATEMENT	This function SHALL have the signature <code>Union(this:Geometry, another:Geometry):Geometry</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-union</code>

REQUIREMENT 75: FUNCTION UNION

This function SHALL be compliant with `Union(Geometry):Geometry` as defined in OGC Simple Features, section 6.1.2.4

8.1.7. Requirement Function Difference

REQUIREMENT 76: FUNCTION DIFFERENCE

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-difference
OBLIGATION	requirement
STATEMENT	<p>This function SHALL have the signature <code>Difference(this:Geometry,another:Geometry):Geometry</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-difference</code></p> <p>This function SHALL be compliant with <code>Difference(Geometry):Geometry</code> as defined in OGC Simple Features, section 6.1.2.4</p>

8.1.8. Requirement Function SymDifference

REQUIREMENT 77: FUNCTION SYMDIFFERENCE

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-sym-difference
OBLIGATION	requirement
STATEMENT	<p>This function SHALL have the signature <code>SymDifference(this:Geometry,another:Geometry):Geometry</code> and the identifier as <code>urn:ogc:def:geoxacml:3.0:function:geometry-sym-difference</code></p> <p>This function SHALL be compliant with <code>SymDifference(Geometry):Geometry</code> as defined in OGC Simple Features, section 6.1.2.4</p>

8.1.9. Requirement Function Centroid

REQUIREMENT 78: FUNCTION CENTROID

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-centroid
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REQUIREMENT 78: FUNCTION CENTROID

OBLIGATION requirement

STATEMENT This function SHALL have the signature `Centroid(this:Geometry):Geometry` and the identifier as `urn:ogc:def:geoxacml:3.0:function:geometry-centroid`
This function SHALL be compliant with `Centroid():Point` as defined in OGC Simple Features, section 6.1.10.2

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GEOXACML 3.0 CRS TRANSFORMATION REQUIREMENTS

GEOXACML 3.0 CRS TRANSFORMATION REQUIREMENTS

9.1. Requirements Class CRS Transformation

REQUIREMENTS CLASS 8: OGC API

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/crs-transformation
OBLIGATION	requirement
TARGET TYPE	Implementation
CONFORMANCE CLASS	Conformance class 3: http://www.opengis.net/spec/geoxacml/3.0/conf/crs-transformation
PREREQUISITE	http://www.opengis.net/spec/geoxacml/3.0/req-class/core
NORMATIVE STATEMENTS	Requirement 79: http://www.opengis.net/spec/geoxacml/3.0/req-class/crs-transformation/req-allow-transformation Requirement 80: http://www.opengis.net/spec/geoxacml/3.0/req-class/crs-transformation/req-crs-transformation

9.1.1. Requirement Allow CRS Transformation

REQUIREMENT 79: ALLOW CRS TRANSFORMATION

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/crs-transformation/req-allow-transformation
OBLIGATION	requirement
STATEMENT	The GeoXACML 3.0 CRS Transformation requirements class defines the XML attribute <code>allowTransformation</code> of type <code>Boolean</code> in namespace http://www.opengis.net/geoxacml/3.0 to be used in the <code>AttributeValue</code> for expressing an explicit allowance that a coordinate transformation can be applied to the comprised geometry. The default value is <code>False</code> .

REQUIREMENT 79: ALLOW CRS TRANSFORMATION

When used in an ADR, the PEP SHALL use the `allowTransformation` for indicating to the GeoPDP (the GeoXACML implementation) the acceptance that the geometry may get transformed to another CRS while deriving an authorization decision.

When used in an AD (as part of the `MissingAttributeDetail`), the GeoPDP SHALL indicate to the PEP the assurance that a geometry with the indicated CRS would not be transformed to another CRS during processing.

9.1.2. Requirement Support CRS Transformation

REQUIREMENT 80: SUPPORT CRS TRANSFORMATION

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/crs-transformation/req-crs-transformation
OBLIGATION	requirement
STATEMENT	<p>An implementation SHALL apply CRS transformation to avoid having to abort processing. An implementation SHALL abort processing with <code>Decision of Indeterminate</code> and <code>Status Code urn:ogc:def:geoxacml:3.0:status:crs-error</code> if:</p> <ul style="list-style-type: none">• An error occurred during CRS transformation; or• The transformation cannot be accomplished based on the geometries' CRS definitions; or• At least one CRS definition is not understood. <p>The <code>StatusDetail</code> SHALL include a <code>MissingAttributeDetail</code> listing the <code>AttributeValue(s)</code> including the <code>srid</code> and the <code>allowTransformation</code> attributes to indicate which geometry CRSs are accepted by the policy.</p>

10

GEOXACML 3.0 OGC API REQUIREMENTS

10.1. Requirements Class OGC API

REQUIREMENTS CLASS 9: OGC API

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/ogc-api
OBLIGATION	requirement
TARGET TYPE	Implementation
CONFORMANCE CLASS	Conformance class 4: http://www.opengis.net/spec/geoxacml/3.0/conf/ogc-api
PREREQUISITES	https://opengeospatial.github.io/ogcna-auto-review/19-072.html http://www.opengis.net/spec/geoxacml/3.0/req-class/core
NORMATIVE STATEMENTS	Requirement 81: http://www.opengis.net/spec/geoxacml/3.0/req-class/ogc-api/req-api-landing-page Requirement 82: http://www.opengis.net/spec/geoxacml/3.0/req-class/ogc-api/req-api-conformance-page Requirement 83: http://www.opengis.net/spec/geoxacml/3.0/req-class/ogc-api/req-api-openapi-page Requirement 84: http://www.opengis.net/spec/geoxacml/3.0/req-class/ogc-api/req-api-decision Requirement 84: http://www.opengis.net/spec/geoxacml/3.0/req-class/ogc-api/req-api-decision

10.1.1. Requirement Landing Page

REQUIREMENT 81: LANDING PAGE

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/req-class/ogc-api/req-api-landing-page
OBLIGATION	requirement
STATEMENT	An implementation SHALL support the path / to display general information about the implementation.

REQUIREMENT 81: LANDING PAGE

An implementation SHALL support the response in JSON and HTML.

An implementation SHALL return the JSON representation of the landing page when the HTTP request contains the query string parameter `f=json` or the HTTP header `Accept: application/json`.

An implementation SHALL return the HTML representation of the landing page when the HTTP request contains the query string parameter `f=html` or the HTTP header `Accept: text/html`.

An implementation SHALL return the HTML representation of the landing page in all other cases.

10.1.2. Requirement Conformance Page

REQUIREMENT 82: CONFORMANCE PAGE

IDENTIFIER `http://www.opengis.net/spec/geoxacml/3.0/req-class/ogc-api/req-api-conformance-page`

OBLIGATION requirement

STATEMENT

An implementation SHALL support the path `/conformance` to display the supported conformance classes in format HTML or JSON.

An implementation SHALL return the JSON representation of the conformance page when the HTTP request contains the query string parameter `f=json` or the HTTP header `Accept: application/json`.

An implementation SHALL return the HTML representation of the conformance page when the HTTP request contains the query string parameter `f=html` or the HTTP header `Accept: text/html`.

An implementation SHALL return the HTML representation of the conformance page in all other cases.

10.2. Requirement OpenAPI Page

REQUIREMENT 83: API PAGE

IDENTIFIER `http://www.opengis.net/spec/geoxacml/3.0/req-class/ogc-api/req-api-openapi-page`

OBLIGATION requirement

STATEMENT An implementation SHALL support the path `/api` to display the OpenAPI document describing the API.

REQUIREMENT 83: API PAGE

An implementation SHALL return the JSON representation of the OpenAPI definition when the HTTP request contains the query string parameter `f=json` or the HTTP header `Accept: application/json`.

An implementation SHALL return the HTML representation of the OpenAPI page when the HTTP request contains the query string parameter `f=html` or the HTTP header `Accept: text/html`.

An implementation SHALL return the HTML representation of the OpenAPI definition in all other cases.

10.2.1. Requirement GeoXACML Decision

REQUIREMENT 84: API GEOPDP

IDENTIFIER `http://www.opengis.net/spec/geoxacml/3.0/req-class/ogc-api/req-api-decision`

OBLIGATION requirement

An implementation SHALL support the path `/decision` to support HTTP POST of a GeoXACML ADR compliant with the XACML 3 `<Request>` as defined in XACML Version 3.0 XML Schema. The response SHALL be a GeoXACML AD compliant with the XACML 3 `<Response>` as defined in XACML Version 3.0 XML Schema.

STATEMENT The implementation SHALL accept the media type `xacml+xml` and `geoxacml+xml` indicating a XACML 3.0 schema compliant ADR that may contain `AttributeValue` elements of type `Geometry`.

The implementation SHALL support the response media type `xacml+xml` and `geoxacml+xml` for a XACML 3.0 schema compliant AD.

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MEDIA TYPES FOR ANY DATA ENCODING(S)

OGC has registered the MIME-Type `application/geoxacml+xml` with IANA: <https://www.iana.org/assignments/media-types/application/geoxacml+xml>

A GeoXACML policy shall be exchanged using MIME-Type `application/geoxacml+xml`.

Any request to the OGC GeoXACML 3.0 PDP SHALL be XACML 3.0 schema compliant but use `Content-Type: application/geoxacml+xml` to indicate the use of GeoXACML 3.0 defined datatype `Geometry`. The optional parameter `version` can be used to indicate the GeoXACML version. Supported value is `3.0`.

A client (PEP) requesting a decision SHALL use `Accept: application/geoxacml+xml` to indicate that it is capable to handle GeoXACML 3.0 specific status codes.

A

ANNEX A (NORMATIVE) CONFORMANCE CLASS ABSTRACT TEST SUITE



ANNEX A (NORMATIVE) CONFORMANCE CLASS ABSTRACT TEST SUITE

This normative section defines the GeoXACML 3.0 conformance classes tests.

A.1. Conformance Class Specification (mandatory)

A.1.1. Requirements Class Specification

CONFORMANCE TEST A.1

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/specification/definition
REQUIREMENTS	<p>http://www.opengis.net/spec/geoxacml/3.0/conf/specification</p> <p>Requirement 1: http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-urn-prefix</p> <p>Requirement 1: http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-urn-prefix</p> <p>Requirement 2: http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-geometry-urn</p> <p>Requirement 3: http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-status-urn-prefix</p> <p>Requirement 4: http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-identifier-urn-prefix</p> <p>Requirement 5: http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-xacml-bag</p> <p>Requirement 6: http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-xacml-bag-crs</p> <p>Requirement 7: http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-iso</p> <p>Requirement 8: http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-homogeneous-collection</p>

CONFORMANCE TEST A.1

Requirement 9: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-heterogeneous-collection>

Requirement 10: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-function-urn-prefix>

Requirement 11: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-xml-namespace-uri>

Requirement 12: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-default-crs>

Requirement 14: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-schema>

Requirement 15: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-xml-attribute-srid>

Requirement 16: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-xml-attribute-precision>

Requirement 17: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-xml-attribute-encoding>

Requirement 18: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-crs-error>

Requirement 19: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-geometry-error>

Requirement 20: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-geometry-collection-error>

Requirement 21: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-precision-error>

Requirement 22: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-subject-location>

Requirement 23: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-resource-location>

Requirement 24: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-resource-extend>

Requirement 25: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-resource-bbox>

Requirement 26: <http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-device-location>

INCLUDED IN Conformance class 1: <http://www.opengis.net/spec/geoxacml/3.0/conf/core>

TEST PURPOSE Verify that the implementation supports the definitions.

TEST-METHOD-TYPE Manually Inspect

TEST METHOD Evaluate that the implementation uses all of the definitions in a compliant way.

A.2. Conformance Class Core (mandatory)

A.2.1. Requirements Class Geometry Data-Type

CONFORMANCE TEST A.2	
IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/core/wkt
REQUIREMENTS	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core Requirement 31: http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type/req-wkt
INCLUDED IN	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core
TEST PURPOSE	Verify that the implementation supports the instantiation of a <code>AttributeValue</code> of datatype <code>urn:ogc:def:geoxacml:3.0:data-type:geometry</code> based on Well-Known-Text.
TEST-METHOD-TYPE	Unit Tests
TEST METHOD	Execute the implementation on a GeoXACML policy that contains an <code>AttributeValue</code> of datatype <code>urn:ogc:def:geoxacml:3.0:data-type:geometry</code> with a value describing the geometry using Well-Known-Text.
DESCRIPTION	<pre><xacml3:AttributeValue DataType="urn:ogc:def:geoxacml:3.0:data-type: geometry" >POINT(-77.035278 38.889444)</xacml3:AttributeValue></pre> <p style="text-align: center;">Geometry encoding example based on WKT</p>

CONFORMANCE TEST A.3	
IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/core/wkb
REQUIREMENTS	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core Requirement 32: http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type/req-wkb
INCLUDED IN	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core
TEST PURPOSE	Verify that the implementation supports the instantiation of a <code>AttributeValue</code> of datatype <code>urn:ogc:def:geoxacml:3.0:data-type:geometry</code> based on Well-Known-Binary.
TEST-METHOD-TYPE	Unit Tests

CONFORMANCE TEST A.3

TEST METHOD	Execute the implementation on a GeoXACML policy that contains an AttributeValue of datatype urn:ogc:def:geoxacml:3.0:data-type:geometry with a value describing the geometry using WKB.
DESCRIPTION	<pre><xacml3:AttributeValue DataType="urn:ogc:def:geoxacml:3.0:data-type: geometry" >01010000002c11a8fe414253c0cccf0d4dd9714340</xacml3:AttributeValue></pre> <p style="text-align: center;">Geometry encoding example based on WKB</p>

CONFORMANCE TEST A.4

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/core/geometry-error
REQUIREMENTS	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core Requirement 29: http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type/req-geometry-error
INCLUDED IN	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core
TEST PURPOSE	Verify that the implementation aborts processing for an AttributeValue with a value not compliant to WKT and WKB.
TEST-METHOD-TYPE	Unit Tests
TEST METHOD	Execute the implementation on a GeoXACML policy that processes an erroneous geometry value. Verify that the processing is aborted using the Status Code urn:ogc:def:geoxacml:3.0:status:geometry-error.
DESCRIPTION	<pre><xacml3:AttributeValue DataType="urn:ogc:def:geoxacml:3.0:data-type: geometry" >foo bar</xacml3:AttributeValue></pre> <p style="text-align: center;">Geometry encoding example that results in a geometry error</p>

CONFORMANCE TEST A.5

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/core/geometry-error-encoding-wkt
REQUIREMENTS	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core Requirement 29: http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type/req-geometry-error http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type/req-xml-attribute-encoding
INCLUDED IN	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core

CONFORMANCE TEST A.5

TEST PURPOSE	Verify that the implementation aborts processing for an AttributeValue with a value not compliant with the encoding indicated via the encoding attribute.
TEST-METHOD-TYPE	Unit Tests
TEST METHOD	Execute the implementation on a GeoXACML policy that processes an erroneous geometry value. Verify that the processing is aborted using the Status Code urn:ogc:def:geoxacml:3.0:status:geometry-error.
DESCRIPTION	<pre><xacml3:AttributeValue xmlns:geoxacml="urn:ogc:def:geoxacml:3.0:data-type:geometry" DataType="urn:ogc:def:geoxacml:3.0:data-type:geometry" geoxacml:encoding="WKB" >POINT(-77.035278 38.889444)</xacml3:AttributeValue></pre> <p style="text-align: center;">Geometry encoding example that results in a geometry error</p>

CONFORMANCE TEST A.6

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/core/geometry-error-encoding-wkb
REQUIREMENTS	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core Requirement 29: http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type/req-geometry-error http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type/req-xml-attribute-encoding
INCLUDED IN	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core
TEST PURPOSE	Verify that the implementation aborts processing for an AttributeValue with a value not compliant with the encoding indicated via the encoding attribute.
TEST-METHOD-TYPE	Unit Tests
TEST METHOD	Execute the implementation on a GeoXACML policy that processes an erroneous geometry value. Verify that the processing is aborted using the Status Code urn:ogc:def:geoxacml:3.0:status:geometry-error.
DESCRIPTION	<pre><xacml3:AttributeValue xmlns:geoxacml="urn:ogc:def:geoxacml:3.0:data-type:geometry" DataType="urn:ogc:def:geoxacml:3.0:data-type:geometry" geoxacml:encoding="WKT" >01010000002c11a8fe414253c0ccccf0d4dd9714340</xacml3:AttributeValue></pre> <p style="text-align: center;">Geometry encoding example that results in a geometry error</p>

CONFORMANCE TEST A.7

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/core/default-crs
REQUIREMENTS	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core Requirement 27: http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type/req-default-crs
INCLUDED IN	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core
TEST PURPOSE	Verify that the implementation supports the instantiation of an <code>AttributeValue</code> of datatype <code>urn:ogc:def:geoxacml:3.0:data-type:geometry` using the default CRS `urn:ogc:def:crs:OGC::CRS84.</code>
TEST-METHOD-TYPE	Unit Tests
TEST METHOD	Execute the implementation on a GeoXACML policy that contains an <code>AttributeValue</code> of datatype <code>urn:ogc:def:geoxacml:3.0:data-type:geometry</code> with a value describing the geometry using WKT or WKB and verify that the geometry SRID is equal to the default CRS.

CONFORMANCE TEST A.8

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/core/xacml-attribute-srid
REQUIREMENTS	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core Requirement 28: http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type/req-xacml-attribute-srid
INCLUDED IN	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core
TEST PURPOSE	Verify that the implementation uses the <code>AttributeValue</code> XML attribute <code>srid</code> in namespace http://www.opengis.net/geoxacml/3.0 when constructing the geometry.
TEST-METHOD-TYPE	Unit Tests
TEST METHOD	Execute the implementation on a GeoXACML policy that contains the following <code>AttributeValue</code> where the value of the <code>srid</code> attribute is of value 3857. Verify that the instantiated geometry has CRS EPSG:3857.
DESCRIPTION	<pre><xacml3:AttributeValue xmlns:geoxacml="urn:ogc:def:geoxacml:3.0:data-type:geometry" DataType="urn:ogc:def:geoxacml:3.0:data-type:geometry" geoxacml:srid="3857" >POINT(-8571600.791082066 4579425.812870098)</xacml3:AttributeValue></pre> <p>Geometry encoding example based on WKT and explicit SRID definition</p>

CONFORMANCE TEST A.9

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/core/axis-order-crs84
REQUIREMENTS	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core Requirement 13: http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-axis-order
INCLUDED IN	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core
TEST PURPOSE	Verify that the implementation uses the correct axis order for CRS <code>urn:ogc:def:crs:OGC::CRS84</code> which is longitude/latitude.
TEST-METHOD-TYPE	Unit Tests
TEST METHOD	Execute the implementation on a GeoXACML policy that contains an <code>AttributeValue</code> of datatype <code>urn:ogc:def:geoxacml:3.0:data-type:geometry</code> with a value describing the geometry using WKT or WKB in CRS {CRS} and verify that the axis order is longitude/latitude.
DESCRIPTION	<pre><xacml3:AttributeValue xmlns:geoxacml="urn:ogc:def:geoxacml:3.0:data-type:geometry" DataType="urn:ogc:def:geoxacml:3.0:data-type:geometry" >POINT(-77.035278, 38.889444)</xacml3:AttributeValue></pre> <p style="text-align: center;">Location of Washington Monument in CRS84</p>

CONFORMANCE TEST A.10

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/core/axis-order-epsg4326
REQUIREMENTS	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core Requirement 13: http://www.opengis.net/spec/geoxacml/3.0/req-class/specification/req-axis-order
INCLUDED IN	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core
TEST PURPOSE	Verify that the implementation uses the correct axis order for CRS <code>EPSG:4326</code> which is latitude/longitude.
TEST-METHOD-TYPE	Unit Tests
TEST METHOD	Execute the implementation on a GeoXACML policy that contains an <code>AttributeValue</code> of datatype <code>urn:ogc:def:geoxacml:3.0:data-type:geometry</code> with a value describing the geometry using WKT or WKB in CRS <code>EPSG:4326</code> and verify that the axis order is latitude/longitude.
DESCRIPTION	<pre><xacml3:AttributeValue xmlns:geoxacml="urn:ogc:def:geoxacml:3.0:data-type:geometry" DataType="urn:ogc:def:geoxacml:3.0:data-type:geometry" geoxacml:srid="4326"</pre>

CONFORMANCE TEST A.10

>POINT(38.889444, -77.035278)</xacml3:AttributeValue>

Location of Washington Monument in EPSG:4326

CONFORMANCE TEST A.11

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/core/crs-equal
REQUIREMENTS	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core Requirement 30: http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type/req-srid-equal
INCLUDED IN	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core
TEST PURPOSE	Verify that the implementation processes two geometries or bags of geometries encoded in the identical CRS.
TEST-METHOD-TYPE	Unit Tests
TEST METHOD	Execute the implementation on a GeoXACML policy that contains all of the Core functions where all geometry CRS, represented by their SRID value are identical. Verify that the processing was not aborted.

CONFORMANCE TEST A.12

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/core/crs84-epsg4326
REQUIREMENTS	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core Requirement 30: http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type/req-srid-equal
INCLUDED IN	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core
TEST PURPOSE	Verify that the implementation supports processing of functions where parameters of type Geometry are encoded using CRS84 and EPSG:4326.
TEST-METHOD-TYPE	Unit Tests
TEST METHOD	Execute the implementation on a GeoXACML policy that contains all of the Core functions where both parameters are of type <code>urn:ogc:def:geoxacml:3.0:data-type:geometry</code> and the first geometry is encoded in the default CRS <code>urn:ogc:def:crs:OGC::CRS84</code> and the other geometry is encoded in the CRS <code>EPSG:4326</code> . Repeat the test with swapping parameters. Verify that the implementation applies axis swapping and produces correct results. A paramount test function is <code>{EQUAL}</code> or <code>urn:ogc:def:geoxacml:3.0:function:geometry-equals</code> .

CONFORMANCE TEST A.12

DESCRIPTION

```
<xacml3:Rule RuleId="swap-axis" Effect="Permit">
  <xacml3:Condition>
    <xacml3:Apply FunctionId="urn:ogc:def:function:geoxacml:3.0:
geometry-equals">
      <xacml3:AttributeValue DataType="urn:ogc:def:geoxacml:3.0:data-
type:geometry"
        >POINT(-77.035278, 38.889444)</xacml3:AttributeValue>
      <xacml3:AttributeValue DataType="urn:ogc:def:geoxacml:3.0:data-
type:geometry"
        xmlns:geoxacml="http://www.opengis.net/geoxacml/3.0" geoxacml:
srid="4326"
        >POINT(38.889444, -77.035278)</xacml3:AttributeValue>
    </xacml3:Apply>
  </xacml3:Condition>
</xacml3:Rule>
```

GeoXACML 3.0 Rule for testing axis-order swapping

CONFORMANCE TEST A.13

IDENTIFIER <http://www.opengis.net/spec/geoxacml/3.0/conf/core/crs-not-equal>

REQUIREMENTS
Conformance class 1: <http://www.opengis.net/spec/geoxacml/3.0/conf/core>
Requirement 30: <http://www.opengis.net/spec/geoxacml/3.0/req-class/data-type/req-srid-equal>

INCLUDED IN
Conformance class 1: <http://www.opengis.net/spec/geoxacml/3.0/conf/core>

TEST PURPOSE
Verify that the implementation aborts processing by returning the StatusCode with value urn:ogc:def:geoxacml:3.0:status:crs-error when processing a function that operates on at least two geometries and their CRS definitions are not identical and where CRS transformation would be required to complete the processing.

TEST-METHOD-TYPE
Unit Tests

TEST METHOD
Execute the implementation on a GeoXACML policy that contains all of the Core functions where both parameters are of datatype urn:ogc:def:geoxacml:3.0:data-type:geometry and processing would require a CRS transformation. Example CRS combination is EPSG:4326 and EPSG:3857. Verify that the implementation aborts processing with the status code urn:ogc:def:geoxacml:3.0:status:crs-error.

DESCRIPTION

```
<xacml3:Rule RuleId="swap-axis" Effect="Permit">
  <xacml3:Condition>
    <xacml3:Apply FunctionId="urn:ogc:def:function:geoxacml:3.0:
geometry-equals">
      <xacml3:AttributeValue DataType="urn:ogc:def:geoxacml:3.0:data-
type:geometry"
        >POINT(-77.035278, 38.889444)</xacml3:AttributeValue>
      <xacml3:AttributeValue DataType="urn:ogc:def:geoxacml:3.0:data-
type:geometry"
        xmlns:geoxacml="http://www.opengis.net/geoxacml/3.0" geoxacml:
srid="3857"
        >POINT(-8571600.791082066 4579425.812870098)</xacml3:
AttributeValue>
    </xacml3:Apply>
  </xacml3:Condition>
</xacml3:Rule>
```

CONFORMANCE TEST A.13

```
</xacml3:Condition>  
</xacml3:Rule>
```

GeoXACML 3.0 Rule for testing CRS error

A.2.2. Requirements Class Geometry Functions

CONFORMANCE TEST A.14: GEOMETRY FUNCTIONS CONFORMANCE TESTS

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/core/geometry-functions
REQUIREMENTS	<p>Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core</p> <p>Requirement 33: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-dimension</p> <p>Requirement 34: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-type</p> <p>Requirement 37: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-srid</p> <p>Requirement 35: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-is-empty</p> <p>Requirement 36: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-is-simple</p> <p>Requirement 38: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-srid-equals</p> <p>Requirement 39: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-ensure-srid</p> <p>Requirement 40: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-precision</p> <p>Requirement 41: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-has-precision</p> <p>Requirement 42: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-ensure-precision</p> <p>Requirement 43: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-length</p> <p>Requirement 44: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-area</p> <p>Requirement 45: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-distance</p> <p>Requirement 46: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-has-distance</p> <p>Requirement 47: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-is-within-distance</p>

CONFORMANCE TEST A.14: GEOMETRY FUNCTIONS CONFORMANCE TESTS

INCLUDED IN	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core
TEST PURPOSE	To validate that the implementation supports all functions of Requirements Class Geometry Functions .
TEST-METHOD-TYPE	Unit Tests
TEST METHOD	Instantiate the implementation with a GeoXACML 3.0 policy that contains all functions listed below:
A	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-dimension
B	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-type
C	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-srid
D	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-is-empty
E	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-is-simple
F	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-srid-equals
G	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-ensure-srid
H	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-precision
I	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-has-precision
J	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-ensure-precision
K	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-length
L	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-area
M	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-distance
N	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-has-distance
O	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-is-within-distance

A.2.3. Requirements Class Test Functions

CONFORMANCE TEST A.15: TEST FUNCTIONS CONFORMANCE TESTS

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/core/test-functions
REQUIREMENTS	<p>Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core</p> <p>Requirement 33: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-dimension</p> <p>Requirement 34: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-type</p> <p>Requirement 37: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-srid</p> <p>Requirement 35: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-is-empty</p> <p>Requirement 36: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-is-simple</p>
INCLUDED IN	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core
TEST PURPOSE	To validate that the implementation supports all functions of Requirements Class Test Functions .
TEST-METHOD-TYPE	Unit Tests
TEST METHOD	Instantiate the implementation with a GeoXACML 3.0 policy that contains all functions listed below:
A	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-dimension
B	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-type
C	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-srid
D	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-is-empty
E	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-is-simple

A.2.4. Requirements Class Spatial Relations Functions

CONFORMANCE TEST A.16: SPATIAL RELATIONS FUNCTIONS CONFORMANCE TESTS

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/core/spatial-relations-functions
REQUIREMENTS	<p>Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core</p> <p>Requirement 4-1: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-equal</p> <p>Requirement 48: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-equals</p> <p>Requirement 49: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-disjoint</p> <p>Requirement 50: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-intersects</p> <p>Requirement 51: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-touches</p> <p>Requirement 52: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-crosses</p> <p>Requirement 53: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-within</p> <p>Requirement 54: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-contains</p> <p>Requirement 55: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-overlaps</p>
INCLUDED IN	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core
TEST PURPOSE	To validate that the implementation supports all functions of Requirements Class Spatial Relations Functions .
TEST-METHOD-TYPE	Unit Tests
TEST METHOD	Instantiate the implementation with a GeoXACML 3.0 policy that contains all functions listed below:
A	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-equal
B	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-equals
C	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-disjoint
D	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-intersects
E	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-touches
F	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-crosses

CONFORMANCE TEST A.16: SPATIAL RELATIONS FUNCTIONS CONFORMANCE TESTS

G	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-within
H	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-contains
I	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-overlaps

A.2.5. Requirements Class Spatial Analysis Functions

CONFORMANCE TEST A.17: SPATIAL ANALYSIS FUNCTIONS CONFORMANCE TESTS

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/core/spatial-analysis-functions
REQUIREMENTS	<p>Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core</p> <p>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-jts-is-within-distance</p> <p>Requirement 46: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-has-distance</p> <p>Requirement 45: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-distance</p> <p>Requirement 56: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-relate</p> <p>Requirement 43: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-length</p> <p>Requirement 44: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-area</p>
INCLUDED IN	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core
TEST PURPOSE	To validate that the implementation supports all functions of Requirements Class Spatial Analysis Functions .
TEST-METHOD-TYPE	Unit Tests
TEST METHOD	Instantiate the implementation with a GeoXACML 3.0 policy that contains all functions listed below:
A	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-jts-is-within-distance
B	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-has-distance
C	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-distance

CONFORMANCE TEST A.17: SPATIAL ANALYSIS FUNCTIONS CONFORMANCE TESTS

D	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-relate
E	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-length
F	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-area

A.2.6. Requirements Class XACML Bag Functions

CONFORMANCE TEST A.18: XACML BAG FUNCTIONS CONFORMANCE TESTS

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/core/xacml-bag-functions
REQUIREMENTS	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core Requirement 57: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-bag-one-and-only Requirement 58: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-bag-size Requirement 59: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-is-in-bag Requirement 60: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-bag Requirement 61: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-geometry-bag-to-collection Requirement 62: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-geometry-bag-from-collection Requirement 63: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-geometry-bag-srid Requirement 64: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-geometry-bag-srid-equals Requirement 63: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-geometry-bag-srid Requirement 64: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-geometry-bag-srid-equals
INCLUDED IN	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core
TEST PURPOSE	To validate that the implementation supports all functions of Requirements Class XACML Bag Functions .
TEST-METHOD-TYPE	Unit Tests

CONFORMANCE TEST A.18: XACML BAG FUNCTIONS CONFORMANCE TESTS

TEST METHOD	Instantiate the implementation with a GeoXACML 3.0 policy that contains all functions listed below:
A	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-bag-one-and-only
B	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-bag-size
C	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-is-in-bag
D	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-bag
E	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-geometry-bag-to-collection
F	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-geometry-bag-from-collection

A.2.7. Requirements Class XACML Set Functions

CONFORMANCE TEST A.19: XACML SET FUNCTIONS CONFORMANCE TESTS

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/core/xacml-set-functions
REQUIREMENTS	<p>Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core</p> <p>Requirement 66: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-intersection</p> <p>Requirement 65: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-at-least-one-member-of</p> <p>Requirement 67: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-union</p> <p>Requirement 68: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-subset</p> <p>Requirement 69: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-set-equals</p>
INCLUDED IN	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core
TEST PURPOSE	To validate that the implementation supports all functions of Requirements Class XACML Set Functions .
TEST-METHOD-TYPE	Unit Tests

CONFORMANCE TEST A.19: XACML SET FUNCTIONS CONFORMANCE TESTS

TEST METHOD	Instantiate the implementation with a GeoXACML 3.0 policy that contains all functions listed below:
A	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-intersection
B	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-at-least-one-member-of
C	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-union
D	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-subset
E	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-set-equals

A.3. Conformance Class Spatial Analysis (optional)

CONFORMANCE TEST A.20: GEOMETRY ADVANCED FUNCTIONS CONFORMANCE TESTS

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/core/advanced-functions
REQUIREMENTS	Conformance class 1: http://www.opengis.net/spec/geoxacml/3.0/conf/core Requirement 70: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-envelope Requirement 71: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-boundary Requirement 72: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-buffer Requirement 73: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-convex-hull Requirement 74: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-intersection Requirement 75: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-union Requirement 76: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-difference Requirement 77: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-sym-difference Requirement 78: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-centroid

CONFORMANCE TEST A.20: GEOMETRY ADVANCED FUNCTIONS CONFORMANCE TESTS

INCLUDED IN	Conformance class 2: http://www.opengis.net/spec/geoxacml/3.0/conf/spatial-analysis
TEST PURPOSE	To validate that the implementation supports all functions of Requirements Class Geometry Advanced Functions .
TEST-METHOD-TYPE	Unit Tests
TEST METHOD	Instantiate the implementation with a GeoXACML 3.0 policy that contains all functions listed below:
A	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-envelope
B	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-boundary
C	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-buffer
D	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-convex-hull
E	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-intersection
F	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-union
G	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-difference
H	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-sym-difference
I	http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-geometry-centroid

A.4. Conformance Class CRS Transformation (optional)

CONFORMANCE TEST A.21: CRS TRANSFORMATION

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/crs-transformation/crs-transformation
REQUIREMENTS	Conformance class 3: http://www.opengis.net/spec/geoxacml/3.0/conf/crs-transformation Requirement 80: http://www.opengis.net/spec/geoxacml/3.0/req-class/crs-transformation/req-crs-transformation

CONFORMANCE TEST A.21: CRS TRANSFORMATION

Requirement 54: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-contains>
Requirement 52: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-crosses>
Requirement 49: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-disjoint>
Requirement 4-1: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-equal>
Requirement 48: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-equals>
Requirement 50: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-intersects>
Requirement 55: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-overlaps>
Requirement 51: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-touches>
Requirement 53: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-within>
Requirement 56: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-relate>
Requirement 47: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-is-within-distance>
Requirement 46: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-has-distance>
Requirement 45: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-distance>
Requirement 59: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-is-in-bag>
Requirement 65: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-at-least-one-member-of>
Requirement 66: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-intersection>
Requirement 67: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-union>
Requirement 68: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-subset>
Requirement 69: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-set-equals>
Requirement 39: <http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-ensure-srid>

INCLUDED IN

Conformance class 3: <http://www.opengis.net/spec/geoxacml/3.0/conf/crs-transformation>

TEST PURPOSE

To validate that the implementation supports a CRS transformation.

CONFORMANCE TEST A.21: CRS TRANSFORMATION

TEST-METHOD-TYPE	Manual Inspection
TEST METHOD	Validate the implementation via code inspection to ensure CRS transformation is implemented in all functions that process two or more geometries:
A	<code>urn:ogc:def:geoxacml:3.0:function:geometry-contains</code>
B	<code>urn:ogc:def:geoxacml:3.0:function:geometry-crosses</code>
C	<code>urn:ogc:def:geoxacml:3.0:function:geometry-disjoint</code>
D	<code>urn:ogc:def:geoxacml:3.0:function:geometry-equals</code>
E	<code>urn:ogc:def:geoxacml:3.0:function:geometry-intersects</code>
F	<code>urn:ogc:def:geoxacml:3.0:function:geometry-overlaps</code>
G	<code>urn:ogc:def:geoxacml:3.0:function:geometry-touches</code>
H	<code>urn:ogc:def:geoxacml:3.0:function:geometry-within</code>
I	<code>urn:ogc:def:geoxacml:3.0:function:geometry-relate</code>
J	<code>urn:ogc:def:geoxacml:3.0:function:geometry-is-within-distance</code>
K	<code>urn:ogc:def:geoxacml:3.0:function:geometry-distance-equals</code>
L	<code>urn:ogc:def:geoxacml:3.0:function:geometry-distance</code>
M	<code>urn:ogc:def:geoxacml:3.0:function:geometry-is-in-bag</code>
N	<code>urn:ogc:def:geoxacml:3.0:function:geometry-bag-at-least-one-member-of</code>
O	<code>urn:ogc:def:geoxacml:3.0:function:geometry-bag-intersection</code>
P	<code>urn:ogc:def:geoxacml:3.0:function:geometry-bag-union</code>
Q	<code>urn:ogc:def:geoxacml:3.0:function:geometry-bag-subset</code>
R	<code>urn:ogc:def:geoxacml:3.0:function:geometry-set-equals</code>
S	<code>urn:ogc:def:geoxacml:3.0:function:geometry-ensure-srid</code>

CONFORMANCE TEST A.22: ALLOWTRANSFORMATION CONFORMANCE TESTS

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/crs-transformation/allow-transformation-1
REQUIREMENTS	<p>Conformance class 3: http://www.opengis.net/spec/geoxacml/3.0/conf/crs-transformation</p> <p>Requirement 79: http://www.opengis.net/spec/geoxacml/3.0/req-class/crs-transformation/req-allow-transformation</p> <p>Requirement 54: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-contains</p> <p>Requirement 52: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-crosses</p> <p>Requirement 49: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-disjoint</p> <p>Requirement 4-1: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-equal</p> <p>Requirement 48: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-equals</p> <p>Requirement 50: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-intersects</p> <p>Requirement 55: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-overlaps</p> <p>Requirement 51: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-touches</p> <p>Requirement 53: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-within</p> <p>Requirement 56: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-relate</p> <p>Requirement 47: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-is-within-distance</p> <p>Requirement 46: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-has-distance</p> <p>Requirement 45: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-distance</p> <p>Requirement 59: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-is-in-bag</p> <p>Requirement 65: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-at-least-one-member-of</p> <p>Requirement 66: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-intersection</p> <p>Requirement 67: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-union</p> <p>Requirement 68: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-subset</p> <p>Requirement 69: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-set-equals</p>

CONFORMANCE TEST A.22: ALLOWTRANSFORMATION CONFORMANCE TESTS

	Requirement 39: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-ensure-srid
INCLUDED IN	Conformance class 3: http://www.opengis.net/spec/geoxacml/3.0/conf/crs-transformation
TEST PURPOSE	Verify that the implementation supports coordinate transformation if the geometries processed in a function have different CRS. Verify that processing does result in StatusCode with value urn:ogc:def:geoxacml:3.0:status:crs-error if CRS transformation is not allowed due to allowTransformation=false.
TEST-METHOD-TYPE	Unit Tests
TEST METHOD	Execute the implementation on a GeoXACML 3.0 policy that contains the following functions with geometries using different CRS and allowTransformation=true:
A	urn:ogc:def:geoxacml:3.0:function:geometry-contains
B	urn:ogc:def:geoxacml:3.0:function:geometry-crosses
C	urn:ogc:def:geoxacml:3.0:function:geometry-disjoint
D	urn:ogc:def:geoxacml:3.0:function:geometry-equals
E	urn:ogc:def:geoxacml:3.0:function:geometry-intersects
F	urn:ogc:def:geoxacml:3.0:function:geometry-overlaps
G	urn:ogc:def:geoxacml:3.0:function:geometry-touches
H	urn:ogc:def:geoxacml:3.0:function:geometry-within
I	urn:ogc:def:geoxacml:3.0:function:geometry-relate
J	urn:ogc:def:geoxacml:3.0:function:geometry-is-within-distance
K	urn:ogc:def:geoxacml:3.0:function:geometry-distance-equals
L	urn:ogc:def:geoxacml:3.0:function:geometry-distance
M	urn:ogc:def:geoxacml:3.0:function:geometry-is-in-bag
N	urn:ogc:def:geoxacml:3.0:function:geometry-bag-at-least-one-member-of
O	urn:ogc:def:geoxacml:3.0:function:geometry-bag-intersection

CONFORMANCE TEST A.22: ALLOWTRANSFORMATION CONFORMANCE TESTS

P	urn:ogc:def:geoxacml:3.0:function:geometry-bag-union
Q	urn:ogc:def:geoxacml:3.0:function:geometry-bag-subset
R	urn:ogc:def:geoxacml:3.0:function:geometry-set-equals
S	urn:ogc:def:geoxacml:3.0:function:geometry-ensure-srid

CONFORMANCE TEST A.23: ALLOWTRANSFORMATION CONFORMANCE TESTS

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/crs-transformation/allow-transformation-2
REQUIREMENTS	<p>Conformance class 3: http://www.opengis.net/spec/geoxacml/3.0/conf/crs-transformation</p> <p>Requirement 79: http://www.opengis.net/spec/geoxacml/3.0/req-class/crs-transformation/req-allow-transformation</p> <p>Requirement 54: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-contains</p> <p>Requirement 52: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-crosses</p> <p>Requirement 49: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-disjoint</p> <p>Requirement 4-1: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-equal</p> <p>Requirement 48: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-equals</p> <p>Requirement 50: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-intersects</p> <p>Requirement 55: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-overlaps</p> <p>Requirement 51: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-touches</p> <p>Requirement 53: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-within</p> <p>Requirement 56: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-relate</p> <p>Requirement 47: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-is-within-distance</p> <p>Requirement 46: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-has-distance</p> <p>Requirement 45: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-distance</p>

CONFORMANCE TEST A.23: ALLOWTRANSFORMATION CONFORMANCE TESTS

	<p>Requirement 59: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-is-in-bag</p> <p>Requirement 65: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-at-least-one-member-of</p> <p>Requirement 66: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-intersection</p> <p>Requirement 67: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-union</p> <p>Requirement 68: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-subset</p> <p>Requirement 69: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-set-equals</p> <p>Requirement 39: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-ensure-srid</p>
INCLUDED IN	Conformance class 3: http://www.opengis.net/spec/geoxacml/3.0/conf/crs-transformation
TEST PURPOSE	Verify that the implementation aborts processing with result StatusCode and value urn:ogc:def:geoxacml:3.0:status:crs-error if CRS transformation is not allowed due to allowTransformation=false.
TEST-METHOD-TYPE	Unit Tests
TEST METHOD	Execute the implementation on a GeoXACML 3.0 policy that contains the following functions with geometries using different CRS and allowTransformation=false:
A	urn:ogc:def:geoxacml:3.0:function:geometry-contains
B	urn:ogc:def:geoxacml:3.0:function:geometry-crosses
C	urn:ogc:def:geoxacml:3.0:function:geometry-disjoint
D	urn:ogc:def:geoxacml:3.0:function:geometry-equals
E	urn:ogc:def:geoxacml:3.0:function:geometry-intersects
F	urn:ogc:def:geoxacml:3.0:function:geometry-overlaps
G	urn:ogc:def:geoxacml:3.0:function:geometry-touches
H	urn:ogc:def:geoxacml:3.0:function:geometry-within
I	urn:ogc:def:geoxacml:3.0:function:geometry-relate
J	urn:ogc:def:geoxacml:3.0:function:geometry-is-within-distance

CONFORMANCE TEST A.23: ALLOWTRANSFORMATION CONFORMANCE TESTS

K	<code>urn:ogc:def:geoxacml:3.0:function:geometry-distance-equals</code>
L	<code>urn:ogc:def:geoxacml:3.0:function:geometry-distance</code>
M	<code>urn:ogc:def:geoxacml:3.0:function:geometry-is-in-bag</code>
N	<code>urn:ogc:def:geoxacml:3.0:function:geometry-bag-at-least-one-member-of</code>
O	<code>urn:ogc:def:geoxacml:3.0:function:geometry-bag-intersection</code>
P	<code>urn:ogc:def:geoxacml:3.0:function:geometry-bag-union</code>
Q	<code>urn:ogc:def:geoxacml:3.0:function:geometry-bag-subset</code>
R	<code>urn:ogc:def:geoxacml:3.0:function:geometry-set-equals</code>
S	<code>urn:ogc:def:geoxacml:3.0:function:geometry-ensure-srid</code>

CONFORMANCE TEST A.24: ALLOWTRANSFORMATION CONFORMANCE TESTS

IDENTIFIER	<code>http://www.opengis.net/spec/geoxacml/3.0/conf/crs-transformation/allow-transformation-3</code>
REQUIREMENTS	<p>Conformance class 3: <code>http://www.opengis.net/spec/geoxacml/3.0/conf/crs-transformation</code></p> <p>Requirement 79: <code>http://www.opengis.net/spec/geoxacml/3.0/req-class/crs-transformation/req-allow-transformation</code></p> <p>Requirement 54: <code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-contains</code></p> <p>Requirement 52: <code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-crosses</code></p> <p>Requirement 49: <code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-disjoint</code></p> <p>Requirement 4-1: <code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-equal</code></p> <p>Requirement 48: <code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-equals</code></p> <p>Requirement 50: <code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-intersects</code></p> <p>Requirement 55: <code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-overlaps</code></p> <p>Requirement 51: <code>http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-touches</code></p>

CONFORMANCE TEST A.24: ALLOWTRANSFORMATION CONFORMANCE TESTS

	<p>Requirement 53: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-within</p> <p>Requirement 56: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-relate</p> <p>Requirement 47: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-is-within-distance</p> <p>Requirement 46: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-has-distance</p> <p>Requirement 45: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-iso-distance</p> <p>Requirement 59: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-is-in-bag</p> <p>Requirement 65: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-at-least-one-member-of</p> <p>Requirement 66: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-intersection</p> <p>Requirement 67: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-union</p> <p>Requirement 68: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-subset</p> <p>Requirement 69: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-xacml-geometry-set-equals</p> <p>Requirement 39: http://www.opengis.net/spec/geoxacml/3.0/req-class/functions/req-ensure-srid</p>
INCLUDED IN	Conformance class 3: http://www.opengis.net/spec/geoxacml/3.0/conf/crs-transformation
TEST PURPOSE	Verify that the implementation aborts processing with result StatusCode and value urn:ogc:def:geoxacml:3.0:identifier:crs-error if CRS transformation is not allowed due to allowTransformation=false. Verify that the MissingAttributeDetail contains information about the accepted CRS where no transformation would be required (allowTransformation=false).
TEST-METHOD-TYPE	Unit Tests
TEST METHOD	Execute the implementation on a GeoXACML 3.0 policy that contains the following functions with geometries using different CRS and one geometry uses allowTransformation=false and the other allowTransformation=true. Verify that the MissingAttributeDetail contains a list of the AttributeValue(s) from the request with CRS and allowTransformation=false attributes to indicate a successful re-submission of the request:
A	urn:ogc:def:geoxacml:3.0:function:geometry-contains
B	urn:ogc:def:geoxacml:3.0:function:geometry-crosses

CONFORMANCE TEST A.24: ALLOWTRANSFORMATION CONFORMANCE TESTS

C	urn:ogc:def:geoxacml:3.0:function:geometry-disjoint
D	urn:ogc:def:geoxacml:3.0:function:geometry-equals
E	urn:ogc:def:geoxacml:3.0:function:geometry-intersects
F	urn:ogc:def:geoxacml:3.0:function:geometry-overlaps
G	urn:ogc:def:geoxacml:3.0:function:geometry-touches
H	urn:ogc:def:geoxacml:3.0:function:geometry-within
I	urn:ogc:def:geoxacml:3.0:function:geometry-relate
J	urn:ogc:def:geoxacml:3.0:function:geometry-is-within-distance
K	urn:ogc:def:geoxacml:3.0:function:geometry-distance-equals
L	urn:ogc:def:geoxacml:3.0:function:geometry-distance
M	urn:ogc:def:geoxacml:3.0:function:geometry-is-in-bag
N	urn:ogc:def:geoxacml:3.0:function:geometry-bag-at-least-one-member-of
O	urn:ogc:def:geoxacml:3.0:function:geometry-bag-intersection
P	urn:ogc:def:geoxacml:3.0:function:geometry-bag-union
Q	urn:ogc:def:geoxacml:3.0:function:geometry-bag-subset
R	urn:ogc:def:geoxacml:3.0:function:geometry-set-equals
S	urn:ogc:def:geoxacml:3.0:function:geometry-ensure-srid

A.5. Conformance Class OGC API (optional)

CONFORMANCE TEST A.25: LANDING PAGE CONFORMANCE TESTS

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/ogc-api/landing-page
REQUIREMENTS	Conformance class 4: http://www.opengis.net/spec/geoxacml/3.0/conf/ogc-api Requirement 81: http://www.opengis.net/spec/geoxacml/3.0/req-class/ogc-api/req-api-landing-page
INCLUDED IN	Conformance class 4: http://www.opengis.net/spec/geoxacml/3.0/conf/ogc-api
TEST PURPOSE	Verify that the implementation renders the landing page in the formats html and json.
TEST-METHOD-TYPE	Postman or Web Browser
TEST METHOD	Execute the root URL of the implementation and verify that the response contains the landing page in the requested format:
A	Use the URL query string <code>f=html</code> to request the HTML format of the landing page
B	Use the URL query string <code>f=json</code> to request the JSON format of the landing page

CONFORMANCE TEST A.26: OPENAPI PAGE CONFORMANCE TESTS

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/ogc-api/openapi-page
REQUIREMENTS	Conformance class 4: http://www.opengis.net/spec/geoxacml/3.0/conf/ogc-api Requirement 83: http://www.opengis.net/spec/geoxacml/3.0/req-class/ogc-api/req-api-openapi-page
INCLUDED IN	Conformance class 4: http://www.opengis.net/spec/geoxacml/3.0/conf/ogc-api
TEST PURPOSE	Verify that the implementation renders the OpenAPI page in the formats html and json.
TEST-METHOD-TYPE	Postman or Web Browser
TEST METHOD	Execute the <code>/api</code> URL of the implementation and verify that the response contains the landing page in the requested format:
A	Use the URL query string <code>f=html</code> to request the HTML format of the OpenAPI page
B	Use the URL query string <code>f=json</code> to request the JSON format of the OpenAPI page

CONFORMANCE TEST A.27: CONFORMANCE PAGE CONFORMANCE TESTS

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/ogc-api/conformance-page
REQUIREMENTS	Conformance class 4: http://www.opengis.net/spec/geoxacml/3.0/conf/ogc-api Requirement 82: http://www.opengis.net/spec/geoxacml/3.0/req-class/ogc-api/req-api-conformance-page
INCLUDED IN	Conformance class 4: http://www.opengis.net/spec/geoxacml/3.0/conf/ogc-api
TEST PURPOSE	Verify that the implementation renders the Conformance page in the formats html and json.
TEST-METHOD-TYPE	Postman or Web Browser
TEST METHOD	Execute the /conformance URL of the implementation and verify that the response contains the conformance page in the requested format:
A	Use the URL query string f=html to request the HTML format of the conformance page
B	Use the URL query string f=json to request the JSON format of the conformance page

CONFORMANCE TEST A.28: DECISION ENDPOINT CONFORMANCE TESTS

IDENTIFIER	http://www.opengis.net/spec/geoxacml/3.0/conf/ogc-api/decision-endpoint
REQUIREMENTS	Conformance class 4: http://www.opengis.net/spec/geoxacml/3.0/conf/ogc-api Requirement 84: http://www.opengis.net/spec/geoxacml/3.0/req-class/ogc-api/req-api-decision
INCLUDED IN	Conformance class 4: http://www.opengis.net/spec/geoxacml/3.0/conf/ogc-api
TEST PURPOSE	Verify that the implementation accepts ADR via HTTP POST and Content-Type application/geoxacml+xml and application/geoxacml+json if supported on the /decision path.
TEST-METHOD-TYPE	Postman or Web Browser
TEST METHOD	Execute a HTTP POST request with a compliant ADR to the path /decision using the following HTTP Headers:
A	Content-Type: application/geoxacml+xml (mandatory)
B	Content-Type: application/geoxacml+json (optional) but mandatory if the implementation is compliant to GeoXACML 3.0 JSON Profile v1.0



B

ANNEX B (INFORMATIVE) CONFORMANCE SUMMARY

B

ANNEX B (INFORMATIVE) CONFORMANCE SUMMARY

This appendix lists all identifiers and their conformance classes.

B.1. Conformance Class Core

B.1.1. GeoXACML Data-type *Geometry*

- `urn:ogc:def:geoxacml:3.0:data-type:geometry`

B.1.2. GeoXACML Functions Prefix

- `urn:ogc:def:geoxacml:3.0:function`

B.1.3. GeoXACML Identifier Prefix

- `urn:ogc:def:geoxacml:3.0:identifier`

B.1.4. GeoXACML Status Code Prefix

- `urn:ogc:def:geoxacml:3.0:status`

B.1.5. GeoXACML Error Codes

- `urn:ogc:def:geoxacml:3.0:status:crs-error`
- `urn:ogc:def:geoxacml:3.0:status:geometry-error`

- urn:ogc:def:geoxacml:3.0:status:geometry-collection-error
- urn:ogc:def:geoxacml:3.0:status:precision-error

B.1.6. GeoXACML Attribute Identifiers

- urn:ogc:def:geoxacml:3.0:identifier:subject-location
- urn:ogc:def:geoxacml:3.0:identifier:device-location
- urn:ogc:def:geoxacml:3.0:identifier:resource-location
- urn:ogc:def:geoxacml:3.0:identifier:resource-extend
- urn:ogc:def:geoxacml:3.0:identifier:resource-bbox

B.1.7. GeoXACML Default CRS

- urn:ogc:def:crs:OGC::CRS84

B.1.8. GeoXACML XML element AttributeValue attributes

- XML namespace: <http://www.opengis.net/geoxacml/3.0>
- XML attribute: srid
- XML attribute: precision
- XML attribute: encoding

B.1.9. Geometry Functions

- urn:ogc:def:geoxacml:3.0:function:geometry-dimension
- urn:ogc:def:geoxacml:3.0:function:geometry-type
- urn:ogc:def:geoxacml:3.0:function:geometry-is-empty
- urn:ogc:def:geoxacml:3.0:function:geometry-is-simple
- urn:ogc:def:geoxacml:3.0:function:geometry-srid
- urn:ogc:def:geoxacml:3.0:function:geometry-srid-equals
- urn:ogc:def:geoxacml:3.0:function:geometry-ensure-srid

- urn:ogc:def:geoxacml:3.0:function:geometry-precision
- urn:ogc:def:geoxacml:3.0:function:geometry-has-precision
- urn:ogc:def:geoxacml:3.0:function:geometry-ensure-precision

B.1.10. Topology Predicates

- urn:ogc:def:geoxacml:3.0:function:geometry-equals
- urn:ogc:def:geoxacml:3.0:function:geometry-disjoint
- urn:ogc:def:geoxacml:3.0:function:geometry-intersects
- urn:ogc:def:geoxacml:3.0:function:geometry-touches
- urn:ogc:def:geoxacml:3.0:function:geometry-crosses
- urn:ogc:def:geoxacml:3.0:function:geometry-within
- urn:ogc:def:geoxacml:3.0:function:geometry-contains
- urn:ogc:def:geoxacml:3.0:function:geometry-overlaps
- urn:ogc:def:geoxacml:3.0:function:geometry-relate

B.1.11. Analysis Functions

- urn:ogc:def:geoxacml:3.0:function:geometry-length
- urn:ogc:def:geoxacml:3.0:function:geometry-area
- urn:ogc:def:geoxacml:3.0:function:geometry-distance
- urn:ogc:def:geoxacml:3.0:function:geometry-distance-equals
- urn:ogc:def:geoxacml:3.0:function:geometry-is-within-distance

B.1.12. XACML Bag / Set Functions

- urn:ogc:def:geoxacml:3.0:function:geometry-bag-one-and-only
- urn:ogc:def:geoxacml:3.0:function:geometry-bag-size
- urn:ogc:def:geoxacml:3.0:function:geometry-is-in-bag
- urn:ogc:def:geoxacml:3.0:function:geometry-bag

- urn:ogc:def:geoxacml:3.0:function:geometry-bag-to-collection
- urn:ogc:def:geoxacml:3.0:function:geometry-bag-from-collection
- urn:ogc:def:geoxacml:3.0:function:geometry-bag-at-least-one-member-of
- urn:ogc:def:geoxacml:3.0:function:geometry-bag-intersection
- urn:ogc:def:geoxacml:3.0:function:geometry-bag-union
- urn:ogc:def:geoxacml:3.0:function:geometry-bag-subset
- urn:ogc:def:geoxacml:3.0:function:geometry-set-equals

B.2. Conformance Class Spatial Analysis

B.2.1. Analysis Functions

- urn:ogc:def:geoxacml:3.0:function:geometry-envelope
- urn:ogc:def:geoxacml:3.0:function:geometry-boundary
- urn:ogc:def:geoxacml:3.0:function:geometry-buffer
- urn:ogc:def:geoxacml:3.0:function:geometry-convex-hull
- urn:ogc:def:geoxacml:3.0:function:geometry-intersection
- urn:ogc:def:geoxacml:3.0:function:geometry-union
- urn:ogc:def:geoxacml:3.0:function:geometry-difference
- urn:ogc:def:geoxacml:3.0:function:geometry-sym-difference
- urn:ogc:def:geoxacml:3.0:function:geometry-centroid

B.3. Conformance Class CRS Transformation

B.3.1. GeoXACML XML element `AttributeValue` attribute

- XML namespace: <http://www.opengis.net/geoxacml/3.0>

- XML attribute: allowTransformation



ANNEX C (INFORMATIVE) ISSUES AND HOW THEY ARE RESOLVED



ANNEX C (INFORMATIVE) ISSUES AND HOW THEY ARE RESOLVED

Different conceptual issues were identified while creating the GeoXACML 3.0 Standard. This appendix explains the issues and how the issues got resolved.

C.1. Issue: Default CRS

The GeoXACML 3.0 Standard defines the Well-Known-Text (WKT) “string” and Well-Known-Binary (WKB) “hex-string” representation of a geometry. The WKT and WKB encoding does not include the value of the CRS that was used to calculate the values of the coordinates.

To support the WKT and WKB encoding of geometries, as specified in OGC Simple Features, the GeoXACML Core defines a default CRS. This default CRS is the same as the CRS defined in The GeoJSON Format.

Even though the definition of a default CRS ensures straight interoperability, a default CRS reduces flexibility where alternative CRS definitions are more appropriate. XACML defines two XML elements in XACML Version 3.0 XML Schema that allow specifying default key values:

- `<PolicySetDefaults>` allows setting a default for the given key that is valid within the realm of a `<PolicySet>`; and
- `<PolicyDefaults>` allows setting a default for the given key that is valid within the realm of a `<Policy>`.

It would be good if the GeoXACML core could specify a `<CRS>` element that contains the default CRS identifier for the scope of the `<PolicySet>` or `<Policy>` would be good. Unfortunately, XACML does **not** define these elements to be extendable:

```
<xs:element name="PolicySetDefaults" type="xacml:DefaultsType"/>
<xs:element name="PolicyDefaults" type="xacml:DefaultsType"/>
<xs:complexType name="DefaultsType">
  <xs:sequence>
    <xs:choice>
      <xs:element ref="xacml:XPathVersion"/>
    </xs:choice>
  </xs:sequence>
</xs:complexType>
```

```
<xs:element name="XPathVersion" type="xs:anyURI"/>
```

Figure C.1 – XACML Schema definition for the <PolicySetDefaults> and <PolicyDefaults>

To overcome the limitation of using the default CRS, any GeoXACML Policy or Authorization Decision Request (in XML) can override the default CRS by leveraging the AttributeValue attribute geoxacml:srid.

```
<xacml3:AttributeValue xmlns:geoxacml="http://www.opengis.net/geoxacml/3.0"
  DataType="urn:ogc:def:geoxacml:3.0:data-type:geometry"
  geoxacml:srid="4326"
  >POINT(38.889444 -77.035278)</xacml3:AttributeValue>
```

Figure C.2 – Geometry encoding example based on WKT and explicit SRID definition

C.2. Issue: CRS Processing Error

A GeoXACML 3.0 implementation can process multiple geometries in one function. In the case where the AttributeValue carries an explicit SRID definition, an implementation may have to abort processing when the SRID definition is not known, mis-understood or a coordinate transformation based upon the CRS results in an error. Furthermore, failure is possible for any function that has two or more parameters of type Geometry may fail when applying a coordinate transformation.

To signal that the cause is based on one or multiple SRID definitions, GeoXACML Core 3.0 defines the StatusCode value urn:ogc:def:geoxacml:3.0:status:crs-error.

To indicate the cause of the processing error, an application may list the involved SRIDs in the StatusDetail using the MissingAttributeDetail. The following example illustrates such a case.

```
<xacml3:Response xmlns:xacml3="urn:oasis:names:tc:xacml:3.0:core:schema:wd-17"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="urn:oasis:names:tc:xacml:3.0:core:schema:wd-17 http://docs.
  oasis-open.org/xacml/3.0/xacml-core-v3-schema-wd-17.xsd">
  <xacml3:Result>
    <xacml3:Decision>Indeterminate</xacml3:Decision>
    <xacml3:Status>
      <xacml3:StatusCode Value="urn:ogc:def:function:geoxacml:3.0:geometry-
      error"/>
      <xacml3:StatusMessage>Geometry must be encoded using specified SRID</
      xacml3:StatusMessage>
      <xacml3:StatusDetail>
        <xacml3:MissingAttributeDetail
          Category="urn:oasis:names:tc:xacml:1.0:subject-category:access-subject"
          AttributeId="subject-location"
          DataType="urn:ogc:def:geoxacml:3.0:data-type:geometry">
          <xacml3:AttributeValue DataType="urn:ogc:def:geoxacml:3.0:data-type:
          geometry"
            xmlns:geoxacml="http://www.opengis.net/geoxacml/3.0"
            geoxacml:srid="3857"/>
          </xacml3:MissingAttributeDetail>
        </xacml3:StatusDetail>
      </xacml3:Status>
    </xacml3:Result>
```

</xacml3:Response>

Figure C.3 – GeoXACML Response indicating processing error caused by SRID

NOTE: The `allowTransformation={True|False}` can occur on an `AttributeValue` element contained in a XACML Policy or Authorization Decision Request. When the `allowTransformation=True` is present in the policy, the policy writer indicates explicit agreement that a coordinate transformation can take place. When the `allowTransformation=True` is present in an Authorization Decision Request, the PEP indicates explicit consent that the provided geometry may undergo a coordinate transformation while deriving an authorization decision.

C.3. Issue: XACML bag/set of geometries vs. GeometryCollection

OGC Simple Features, §6.1.3 defines a `GeometryCollection` as follows: “A *GeometryCollection* is a geometric object that is a collection of some number of geometric objects.” with the following constraint: “All the elements in a *GeometryCollection* shall be in the same Spatial Reference System. This is also the Spatial Reference System for the *GeometryCollection*.”

OGC Simple Features, §7.2.2 defines the Well-Known-Text encoding of a `GeometryCollection`.

Operations on an OGC Simple Features geometry instance may involve a `GeometryCollection`. For example, the `ConvexHull` method may return an empty `GeometryCollection` if the input geometry has zero points (is empty). Also, operations like `Intersection` or `Union` allow the processing of or result in a `GeometryCollection`.

XACML Version 3.0, §7.3.2 defines a bag of attributes as follows: “XACML defines implicit collections of its data types. XACML refers to a collection of values that are of a single data-type as a bag. Bags of data-types are needed because selections of nodes from an XML resource or XACML request context may return more than one value.” The XACML `<AttributeDesignator>` and `<AttributeSelector>` produce a bag of attributes from an Authorization Decision Request. Also, XACML3 defines operations on a bag of attributes and on bags.

XACML Version 3.0, §A.3.10 defines bag functions and §A.3.11 defines set functions. The difference between a bag and set is that a set shall not contain any duplicates.

GeoXACML 3 Core inherits the `GeometryCollection` from OGC Simple Features by adopting the geometry model of the bag / set and their processing semantics from XACML Version 3.0.

In order to switch between the processing semantics from XACML 3.0 bag / set to Simple Features and vice versa, GeoXACML 3.0 Core defines the function `urn:ogc:def:geoxacml:3.0:function:geometry-bag-to-collection` and `urn:ogc:def:geoxacml:3.0:function:geometry-bag-from-collection`.

To avoid processing errors caused by a `GeometryCollection` containing different geometry types, the GeoXACML 3.0 Core restricts the use to **homogeneous** `GeometryCollection`. All geometries of a **homogeneous** `GeometryCollection` have the same type.

C.3.1. Example converting from XACML Bag to GeometryCollection

A Policy may specify a condition that requires an assertion of equality of all geometries in an Authorization Decision Request with a given GeometryCollection. The input to the Equals function can be a GeometryCollection but not a XACML bag of geometries as returned by the <AttributeDesignator> or <AttributeSelector>.

To calculate the GeometryCollection, the Policy writer may leverage the function urn:ogc:def:geoxacml:3.0:function:geometry-bag-from-collection as follows:

```
<xacml3:Condition>
  <xacml3:Apply FunctionId="urn:ogc:def:function:geoxacml:3.0:geometry-
equals">
  <!-- Result is Simple Features GeometryCollection -->
  <xacml3:Apply FunctionId="urn:ogc:def:function:geoxacml:3.0:geometry-
bag-to-collection">
    <!-- Result is XACML3 bag -->
    <xacml3:AttributeDesignator AttributeId="subject:location"
      DataType="urn:ogc:def:geoxacml:3.0:data-type:geometry"
      Category="urn:oasis:names:tc:xacml:3.0:attribute-category:access-
subject"
      MustBePresent="true"/>
    </xacml3:Apply>
    <xacml3:AttributeValue xmlns:geoxacml="http://www.opengis.net/geoxacml/
3.0"
      DataType="urn:ogc:def:geoxacml:3.0:data-type:geometry"
      >GEOMETRYCOLLECTION(Point (-122.4538755 37.8106729), POINT(-
77.035278 38.889444))</xacml3:AttributeValue>
    </xacml3:Apply>
  </xacml3:Condition>
```

Figure C.4 – GeoXACML Condition that converts the XACML bag of geometries to a GeometryCollection

```
<Request xmlns="urn:oasis:names:tc:xacml:3.0:core:schema:wd-17"
  ReturnPolicyIdList="false"
  CombinedDecision="false"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="urn:oasis:names:tc:xacml:3.0:core:schema:wd-17
http://docs.oasis-open.org/xacml/3.0/xacml-core-v3-schema-wd-17.xsd">
  <Attributes Category="urn:oasis:names:tc:xacml:3.0:attribute-category:
access-subject">
    <Attribute AttributeId="subject-location" IncludeInResult="false">
      <AttributeValue DataType="urn:ogc:def:geoxacml:3.0:data-type:
geometry">Point (-122.4538755 37.8106729)</AttributeValue>
    </Attribute>
    <Attribute AttributeId="subject-location" IncludeInResult="false">
      <AttributeValue DataType="urn:ogc:def:geoxacml:3.0:data-type:
geometry">Point (-77.035278 38.889444)</AttributeValue>
    </Attribute>
  </Attributes>
</Request>
```

Figure C.5 – GeoXACML Authorization Decision Request producing a bag of geometries

The request above produces a bag of Geometries with AttributeId value subject-location.

C.4. Issue: NULL Geometry

The GML encoding of geometry allows to defining a 'NULL' geometry.

GeoXACML 3 Core does support the encoding of geometries using WKT and WKB but not GML. Therefore, this issue of how to operate on a 'NULL' geometry must be addressed when writing a GeoXACML 3.0 GML Encoding Extension.

C.5. Issue: Circle Geometry

GeoXACML 3.0 Core does not support the geometry type Circle is not supported by GeoXACML 3.0 Core because it is not supported by the OGC Simple Features Standard. However, use cases exist that naturally would best be solved using a Circle geometry: Permit decision if the user's location (a Point is within the coverage of a GSM Cell described by a Circle). Such a condition can be expressed by leveraging the urn:ogc:def:geoxacml:3.0:function:geometry-is-within-distance function:

```
<xacml3:Rule Effect="Permit" RuleId="rule:isWithinDistance">
  <xacml3:Description>This rule constraints access based on a Point and
distance</xacml3:Description>
  <xacml3:Target/>
  <xacml3:Condition>
    <xacml3:Apply FunctionId="urn:ogc:def:function:geoxacml:3.0:geometry-is-
within-distance">
      <!-- distance is equal to radius in Meter because EPSG:3857 measures
in 'm'-->
      <xacml3:AttributeValue DataType="http://www.w3.org/2001/
XMLSchema#double">1500</xacml3:AttributeValue>
      <xacml3:Apply FunctionId="urn:ogc:def:function:geoxacml:3.0:geometry-
one-and-only">
        <!-- Point is center of circle -->
        <xacml3:AttributeValue DataType="urn:ogc:def:geoxacml:3.0:data-type:
geometry"
          xmlns:geoxacml="http://www.opengis.net/geoxacml/3.0"
          geoxacml:srid="3857"
          >POINT(-21180911.712903 12601672.604027)</xacml3:AttributeValue>
        <xacml3:AttributeDesignator AttributeId="subject-location"
          DataType="urn:ogc:def:geoxacml:3.0:data-type:geometry"
          Category="urn:oasis:names:tc:xacml:3.0:subject-category:access-
subject"
          MustBePresent="false"/>
        </xacml3:Apply>
      </xacml3:Apply>
    </xacml3:Condition>
  </xacml3:Rule>
```

Figure C.6 – GeoXACML Condition 'within a circle'

The above Rule fires Permit if the subject-location is within 1500m from the Washington Monument (the fictitious location of the GSM cell tower).

C.6. RFC Response: Backwards Compatibility

GeoXACML 3.0 extends the OASIS XACML 3.0 Standard. GeoXACML 1.0 extends the OASIS XACML 2.0 Standard. Because XACML 3.0 is not backwards compatible to XACML 2.0, GeoXACML 3.0 is not backwards compatible to GeoXACML 1.0. In particular, the following aspects illustrate the most important issues with backwards compatibility.

- The policy structure is not backwards compatible: Any XACML 2.0 policy cannot be used with a XACML 3.0 implementation. Therefore, a GeoXACML 1.0 policy cannot be used with a GeoXACML 3.0 policy.
- The AD/ADR structure is not backwards compatible: Any XACML 2.0 authorization decision / request cannot be used with a XACML 3.0 implementation.

However, GeoXACML 3.0 is using the same geometry model as GeoXACML 1.0. Therefore, any GeoXACML 1.0 policy can be transformed from the XACML 2.0 into the XACML 3.0 structure (e.g., using XSLT). When transferring a 1.0 policy to a 3.0 policy, all URN must be updated. This procedure should include a verification regarding the used CRS and a validation of the function signature.

C.7. RFC Response: Encoding

The recommendation to use the <AttributeValue> attribute encoding to separate between WKT and WKB encoded geometry values was adopted.

C.8. RFC Response: XACML 3.0 – 2017

The recommendation to update the normative reference for XACML 3.0 was adopted.



ANNEX D (INFORMATIVE) REVISION HISTORY



ANNEX D (INFORMATIVE) REVISION HISTORY

Table D.1

DATE	RELEASE	EDITOR	PRIMARY CLAUSES MODIFIED	DESCRIPTION
2022-11-07	0.1	Andreas Matheus	all	initial version
2022-12-13	0.2	Andreas Matheus	all	soundness of definitions
2022-12-23	0.3	Andreas Matheus	all	added Annex C containing a list of all identifiers per conformance class, use of AsciiDoc attributes to avoid redundancy with identifiers
2023-01-10	0.4	Andreas Matheus	all	applied changes from pull request
2023-01-13	0.5	Andreas Matheus	all	applied OGC NA-Policy to Metanorma annotations
2023-02-06	0.6	Andreas Matheus	all	Carl Reed comments incorporated
2023-05-02	0.7	Andreas Matheus	all	Comments from RFC incorporated and OGC-NA URN resolution applied



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BIBLIOGRAPHY

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