Request / Response Interface based on JSON and HTTP for Profile of XACML 3.0
Version 1.0

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Technical Committee:
OASIS eXtensible Access Control Markup Language (XACML) TC

Chairs:
Hal Lockhart (hal.lockhart@oracle.com), Oracle
Bill Parducci (bill@parducci.net), Individual

Editor:
David Brossard (david.brossard@axiomatics.com), Axiomatics AB

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Abstract:
The aim of this profile is to propose a standardized interface between a policy enforcement point and a policy decision point using JSON. The decision request and response structure is specified in the core XACML specification. This profile leverages it.
**Status:**

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1 Introduction

[All text is normative unless otherwise labeled]

{Non-normative}

The XACML architecture promotes a loose coupling between the component that enforces decisions, the policy enforcement point (PEP) and the component that decides based on XACML policies, the policy decision point (PDP).

The XACML standard defines the format of the request and the response between the PEP and the PDP. As the default representation of XACML is XML and is backed by a schema, the request and response are typically expressed as XML elements or documents. Depending on the PDP implementation, the request and response could be embedded inside a SOAP message or even a SAML assertion as described in the SAML profile of XACML.

With the rise in popularity of APIs and its consumerization, it becomes important for XACML to be easily understood in order to increase the likelihood it will be adopted.

This profile aims at defining a JSON format for the XACML request and response. It also defines the transport between client (PEP) and service (PDP).

In writing this document, the authors have kept three items in mind:

1. Equivalence: a XACML request and response expressed in XML need not be strictly equivalent in structure to a XACML request expressed in JSON so long as the meaning remains the same and so long as the JSON and XML requests would lead to the same response (decision, obligation, and advice).
2. Lossless behavior: it MUST be possible to translate XACML requests and responses between XML and JSON representations in either direction at any time without semantic loss.
3. Transport-agnostic nature: the JSON representation MUST contain all the information the XACML request and / or response contains: this means the transport layer cannot convert XACML decisions into HTTP codes e.g. HTTP 401 for a Deny decision.

1.1 Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

1.2 Normative References

1.3 Non-Normative References

[XACMLREST] R. Sinnema, REST Profile of XACML v3.0 Version 1.0, 24 April 2012


2 Vocabulary

{Non-normative}

XML introduces the notion of elements. The equivalent notion in JSON is an object. XML introduces the notion of attributes. The equivalent notion in JSON is a member.
3 Overview of the translation mechanisms

3.1 Assumed default values

To avoid bloating the JSON request and response, certain parts of a request and response have default values which can then be omitted. As an example, the default value for the data-type of an attribute value is `String` ([http://www.w3.org/2001/XMLSchema#string](http://www.w3.org/2001/XMLSchema#string)).

The user should refer to the XACML 3.0 specification document for a normative definition of the request and response elements.

3.2 Objects

3.1.1 Object names

Unless otherwise stated, JSON object names MUST match the XACML XML element and / or attribute names exactly, including case.

The following XML elements and attributes have been renamed:

- The name of the XACML XML `Attributes` element has been changed in JSON to the `Category` object. It makes more sense to call the parent element that way since it represents an instance of a category from a XACML sense.
- The `AttributeValue` element in the XML representation no longer exists. The information it bears in XML is moved to the parent `Attribute` object in the JSON representation. A `Value` property has been introduced in the JSON `Attribute` object to bear the information contained in the XML `AttributeValue` element as specified in 4. The XACML request.
- The `AdviceId` and the `ObligationId` attributes of the `<Advice/>` and the `<Obligation/>` XML elements respectively have been renamed to `Id` in JSON.

3.2.2 Object order

The order of the objects and values in XACML does not matter. Therefore, the order of objects and values in the serialized form (JSON) does not matter.

3.1.2 Object cardinality

When in the XACML specification, an object (XML element) can occur more than once (e.g. `0..*` or `1..*`), the JSON equivalent MUST use an array of objects.

The class diagram in 4.1. Class Diagram states the cardinality and relationship between objects.

3.2.3 Data Types

This section defines how data-types are represented and handled in the JSON representation. Chapter 10, section 10.2.7 in the XACML 3.0 specification as well as section A.2 list the data-types that are defined in XACML. These are listed in the table below in section 3.3.1. It lists the shorthand value that MAY be used when creating a XACML attribute in the JSON representation.

3.2.3.1 Supported Data Types

The full XACML data type URI can also be used in JSON as the JSON shorthand type codes are a convenience, not a replacement.

It is also possible to omit for certain XACML data types the JSON property `DataType` when it can safely be inferred from the value of the attribute.
<table>
<thead>
<tr>
<th>XACML data type identifier</th>
<th>JSON shorthand type code</th>
<th>Mapping / Inference Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="http://www.w3.org/2001/XMLSchema#string">http://www.w3.org/2001/XMLSchema#string</a></td>
<td>string</td>
<td>JavaScript: &quot;JSON&quot; <em>String&quot;</em></td>
</tr>
<tr>
<td><a href="http://www.w3.org/2001/XMLSchema#boolean">http://www.w3.org/2001/XMLSchema#boolean</a></td>
<td>boolean</td>
<td>JavaScript: &quot;JSON&quot; <em>Boolean&quot;</em></td>
</tr>
<tr>
<td><a href="http://www.w3.org/2001/XMLSchema#integer">http://www.w3.org/2001/XMLSchema#integer</a></td>
<td>integer</td>
<td>JavaScript: &quot;JSON&quot; <em>Number&quot;</em> with no fractional portion and within the integer range defined by the XML schema in [XMLDatatypes].</td>
</tr>
<tr>
<td><a href="http://www.w3.org/2001/XMLSchema#double">http://www.w3.org/2001/XMLSchema#double</a></td>
<td>double</td>
<td>JavaScript: &quot;JSON&quot; <em>Number&quot;</em> with fractional portion or out of integer range as defined in [XMLDatatypes].</td>
</tr>
<tr>
<td><a href="http://www.w3.org/2001/XMLSchema#time">http://www.w3.org/2001/XMLSchema#time</a></td>
<td>time</td>
<td>None – inference must fail.</td>
</tr>
<tr>
<td><a href="http://www.w3.org/2001/XMLSchema#date">http://www.w3.org/2001/XMLSchema#date</a></td>
<td>date</td>
<td>None – inference must fail.</td>
</tr>
<tr>
<td><a href="http://www.w3.org/2001/XMLSchema#dateTime">http://www.w3.org/2001/XMLSchema#dateTime</a></td>
<td>dateTime</td>
<td>None – inference must fail.</td>
</tr>
<tr>
<td><a href="http://www.w3.org/2001/XMLSchema#dayTimeDuration">http://www.w3.org/2001/XMLSchema#dayTimeDuration</a></td>
<td>dayTimeDuration</td>
<td>None – inference must fail.</td>
</tr>
<tr>
<td><a href="http://www.w3.org/2001/XMLSchema#yearMonthDuration">http://www.w3.org/2001/XMLSchema#yearMonthDuration</a></td>
<td>yearMonthDuration</td>
<td>None – inference must fail.</td>
</tr>
<tr>
<td><a href="http://www.w3.org/2001/XMLSchema#anyURI">http://www.w3.org/2001/XMLSchema#anyURI</a></td>
<td>anyURI</td>
<td>None – inference must fail.</td>
</tr>
<tr>
<td><a href="http://www.w3.org/2001/XMLSchema#hexBinary">http://www.w3.org/2001/XMLSchema#hexBinary</a></td>
<td>hexBinary</td>
<td>None – inference must fail.</td>
</tr>
<tr>
<td><a href="http://www.w3.org/2001/XMLSchema#base64Binary">http://www.w3.org/2001/XMLSchema#base64Binary</a></td>
<td>base64Binary</td>
<td>None – inference must fail.</td>
</tr>
<tr>
<td>urn:oasis:names:tc:xacml:1.0:data-type:rfc822Name</td>
<td>rfc822Name</td>
<td>None – inference must fail.</td>
</tr>
<tr>
<td>urn:oasis:names:tc:xacml:1.0:data-type:x500Name</td>
<td>x500Name</td>
<td>None – inference must fail.</td>
</tr>
<tr>
<td>urn:oasis:names:tc:xacml:2.0:data-type:dnsName</td>
<td>dnsName</td>
<td>None – inference must fail.</td>
</tr>
</tbody>
</table>

For all of the XACML data types that cannot be inferred from the value, the following MUST be observed:

- The JSON **DataType** property MUST be specified and the value expressed in the XACML string representation of the value.
- **JavaScript** Implementation-specific (e.g. Javascript) code may choose to parse the XACML string values into internal numeric representations for internal use, such as for **DateTime** or **Duration** values, but the JSON transport representation must always express the value in the serialized XACML string representation of the XACML data type.
3.2.2.2.3.2 Arrays of values

In the case of an array of values, and if the `DataType` member is not specified, it may not be possible to infer the `DataType` until all the values have been inspected.

Inference for an array of values works according to the inference rules as set in 3.3.1. For example, an array that contains integers except for the last value which is a double e.g. [4,3,5,2.5] is in fact an array of double values.

An array of values that are all integer is inferred to be an array of values of the integer datatype rather than double.

If a given data type cannot be inferred and there is no `DataType` member specified then the array of values will be considered as an array of string.

If an array of values contains integers and doubles only (excluding non-numerical values), then the inference will make the array an array of double.

Any other combination of values will make the inference fail and the array will be considered as an array of string.

3.2.3.3.3 The xpathExpression Datatype

Values of the xpathExpression data-type are represented as JSON objects. Each such object contains the following properties:

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Type</th>
<th>Mandatory/Optional</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>XPathCategory</td>
<td>URI</td>
<td>Mandatory</td>
<td>None. The shorthand notation defined in 4.2.2.1, Shorthand notation for standard XACML categories None can be used as values here.</td>
</tr>
<tr>
<td>Namespaces</td>
<td>Array of NamespaceDeclaration</td>
<td>Optional</td>
<td>None</td>
</tr>
<tr>
<td>XPath</td>
<td>String</td>
<td>Mandatory</td>
<td>None</td>
</tr>
</tbody>
</table>

The XPath property contains the XPath expression `[XPATH]` from the XACML value. The Namespaces property contains namespace declarations for interpreting qualified names `[NAMESPACE]` in the XPath expression.

A NamespaceDeclaration object contains the following properties:

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Type</th>
<th>Mandatory/Optional</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prefix</td>
<td>String</td>
<td>Optional</td>
<td>None</td>
</tr>
<tr>
<td>Namespace</td>
<td>URI</td>
<td>Mandatory</td>
<td>None</td>
</tr>
</tbody>
</table>

Each NamespaceDeclaration object describes a single XML namespace declaration `[NAMESPACE]`.

The Prefix property contains the namespace prefix and the Namespace property contains the namespace name. In the case of a namespace declaration for the default namespace the Prefix property SHALL be absent.

The Namespaces array MUST contain a NamespaceDeclaration object for each of the namespace prefixes used by the XPath expression. The Namespaces array MAY contain additional NamespaceDeclaration objects for namespace prefixes that are not used by the XPath expression. There SHALL NOT be two or more NamespaceDeclaration objects for the same namespace prefix.

3.2.3.13.3.3.1 Example

{Non-normative}
This example shows the XML representation of an XACML attribute with a value of the `xpathExpression` data-type and its corresponding representation in JSON.

- **As XML:**

  ```xml
  <Attribute xmlns="urn:oasis:names:tc:xacml:3.0:core:schema:wd-17"
             AttributeId="urn:oasis:names:tc:xacml:3.0:content-selector">
    <AttributeValue xmlns:md="urn:example:med:schemas:record"
                     XPathCategory="urn:oasis:names:tc:xacml:3.0:attribute-category:resource"
                     DataType="urn:oasis:names:tc:xacml:3.0:data-type:xpathExpression">
      md:record/md:patient/md:patientDoB
    </AttributeValue>
  </Attribute>
  ```

- **As JSON:**

  ```json
  {"Attribute": {
    "id": "AttributeId": "urn:oasis:names:tc:xacml:3.0:content-selector",
    "DataType": "xpathExpression",
    "Value": {
      "XPathCategory": "urn:oasis:names:tc:xacml:3.0:attribute-category:resource",
      "Namespaces": [{
        "Namespace": "urn:oasis:names:tc:xacml:3.0:core:schema:wd-17",
        "Prefix": "md",
        "Namespace": "urn:example:med:schemas:record"
      }],
      "XPath": "md:record/md:patient/md:patientDoB"
    }
  }}
  ```

### 3.2.43.3.4 Special numeric values

The following special numeric values are not supported by the profile. Should the request contain such values, the Policy Decision Point MUST reply with an Indeterminate with a status value of `urn:oasis:names:tc:xacml:1.0:status:syntax-error` as defined in Appendix B, section 8 of [XACML30] also be handled.

Additional behavior of the PDP when returning `urn:oasis:names:tc:xacml:1.0:status:syntax-error` is specified in sections 5.57 and B.8 of [XACML30].

- **IEEE 754-2008** NaN ➞ "(NaN)"
- **JavaScript** IEEE 754-2008 positive infinity ➞ "(+INF)"
- **JavaScript** IEEE 754-2008 negative infinity ➞ "(-INF)"
- **JavaScript** positive zero ➞ 0
- **JavaScript** negative zero ➞ 0 (-0 is a valid text representation, but the sign will be ignored by XACML in comparisons, per XML #double defined in.)
- **IEEE 754-2008** negative zero (-0)

### 3.3.4 Example

(Non-normative)

The example below illustrates possible notations and the behavior of the JSON interpreter:

<p>| Equivalent examples |</p>
<table>
<thead>
<tr>
<th>Attribute representation explicitly stating the data-type</th>
<th>Attribute representation omitting the data-type</th>
</tr>
</thead>
</table>
| ```json
  { "Attribute": {
    "Id": "AttributeId",
    "document-id": {
      "DataType": "integer",
      "Value": 123
    }
  }
} ``` | ```json
  { "Attribute": {
    "Id": "AttributeId",
    "document-id": {
      "Value": 123
    }
  }
} ``` |

In the latter example where the JSON `DataType` property is omitted, the JSON translation must use the closest data type, in this case integer.
4 The XACML request

4.1 Class Diagram

The following class diagram represents the XACML request structure for the JSON representation. It is not a representation of the XACML request as expressed in XML.

The key differences are:

- The `AttributeValue` element in the XML representation no longer exists. The information it bears in XML is moved to the parent `Attribute` object in the JSON representation.
- There are 4 new objects for attributes belonging to the most commonly used categories.

```
4.2 Representation of the XACML request in JSON

4.2.1 The Request object representation

The JSON object name for the request will MUST be Request.

The Request object contains the following properties:

- `ReturnPolicyIdList` of type Boolean
- `CombinedDecision` of type Boolean
- `XPathVersion` of type String
```
These properties are represented as members. The JSON representation assumes the following default values:

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Type</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ReturnPolicyIdList</td>
<td>Boolean</td>
<td>False. The ReturnPolicyIdList can be omitted in the JSON representation.</td>
</tr>
<tr>
<td>CombinedDecision</td>
<td>Boolean</td>
<td>False. The ReturnPolicyIdList can be omitted in the JSON representation.</td>
</tr>
<tr>
<td>XPathVersion</td>
<td>String</td>
<td><a href="http://www.w3.org/TR/1999/REC-xpath-19991116">http://www.w3.org/TR/1999/REC-xpath-19991116</a>. The XPathVersion can be omitted in the JSON representation. There is no default value. The attribute is optional. It is REQUIRED if the XACML request contains XPath expressions.</td>
</tr>
</tbody>
</table>

In addition to these properties, the Request element also contains the following objects:

- Category: this is represented as a JSON array of Category objects; the Category object corresponds to the XML Attributes element. Much like the Attributes element is specific to a given attribute category, the Category object in JSON is specific to a given category.
- MultiRequests: this is an optional object and can be omitted. It serves to support the Multiple Decision Profile [XACMLMDP].

The representation of these objects is elicited in the following relevant sections.

Note that, in the XACML XML schema, the XML Request element contains a RequestDefaults element. To simplify things and since the RequestDefaults element contained a single element XPathVersion with a single value, the RequestDefaults element was flattened into a single JSON property called XPathVersion as mentioned in the above table.

4.2.1.1 Example

```json
{ "Request": {
  "XPathVersion": "http://www.w3.org/TR/1999/REC-xpath-19991116"
}
```

4.2.2 The Category object representation

The JSON Category object contains the following properties:

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Type</th>
<th>Mandatory/Optional</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CategoryId</td>
<td>anyURI</td>
<td>Mandatory</td>
<td>None – the identifier used in the XML representation shallMUST be used in its JSON representation except where shorthand notations have been defined – see 4.2.2.1 Shorthand notation for standard XACML categories.</td>
</tr>
<tr>
<td>Id</td>
<td>String</td>
<td>Optional</td>
<td>The Id property is optional in the JSON representation. There is no default, assumed, value for the Id in JSON. If there is a value</td>
</tr>
</tbody>
</table>
specified in the XML representation, it must also be specified in the JSON representation.

| Content | String | Optional | None. The value of the Content property must be escaped or encoded as explained in 4.2.3. |

In addition to these properties, the Category object also contains:

- Attribute: this is an array of Attribute objects as defined in 4.2.4 The Attribute Object representation

The Category object is the equivalent of the <Attributes/> element in the XACML XML representation.

The structure and default values for the aforementioned are elicited in the following relevant sections.

### 4.2.2.1 Shorthand notation for standard XACML categories

The following table defines a shorthand notation for the standard categories defined in [XACML30].

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Short name</th>
</tr>
</thead>
<tbody>
<tr>
<td>urn:oasis:names:tc:xacml:3.0:attribute-category:resource</td>
<td>Resource</td>
</tr>
<tr>
<td>urn:oasis:names:tc:xacml:3.0:attribute-category:action</td>
<td>Action</td>
</tr>
<tr>
<td>urn:oasis:names:tc:xacml:3.0:attribute-category:environment</td>
<td>Environment</td>
</tr>
<tr>
<td>urn:oasis:names:tc:xacml:1.0:subject-category:access-subject</td>
<td>AccessSubject</td>
</tr>
<tr>
<td>urn:oasis:names:tc:xacml:1.0:subject-category:recipient-subject</td>
<td>RecipientSubject</td>
</tr>
<tr>
<td>urn:oasis:names:tc:xacml:1.0:subject-category:intermediary-subject</td>
<td>IntermediarySubject</td>
</tr>
<tr>
<td>urn:oasis:names:tc:xacml:1.0:subject-category:codebase</td>
<td>Codebase</td>
</tr>
</tbody>
</table>

The shorthand notation MAY be used as described in section 4.2.2.2 and section 4.2.2.

### 4.2.2.2 Default Category objects

To simplify the JSON representation, this profile also defines four optional default objects that are semantically equivalent to the Category object. These default objects assume a default value for the CategoryId property so that it need not be explicitly written. The object names correspond to the short names as defined in 4.2.2.1 Shorthand notation for standard XACML categories. The following table summarizes these four objects and the default values.

<table>
<thead>
<tr>
<th>Name</th>
<th>Default value for the child Category property</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject</td>
<td>urn:oasis:names:tc:xacml:1.0:subject-category:access-subject</td>
</tr>
<tr>
<td>Action</td>
<td>urn:oasis:names:tc:xacml:3.0:attribute-category:action</td>
</tr>
<tr>
<td>Resource</td>
<td>urn:oasis:names:tc:xacml:3.0:attribute-category:resource</td>
</tr>
<tr>
<td>Environment</td>
<td>urn:oasis:names:tc:xacml:3.0:attribute-category:environment</td>
</tr>
</tbody>
</table>

In order to facilitate Note that JSON does not allow for the duplication of objects that bear the creation of multiple decisions, Subject, Action, Resource, same name, e.g., "AccessSubject" and "AccessSubject". Consequently, the optional default objects (based on 4.2.2.1 Shorthand notation for
standard XACML categories (Environment) can also be an array instead of single-valued in order to cater for multiple decision requests as defined in [XACMLMDP].

### 4.2.2.2.2.3 Example

(Non-normative)

```json
{
    "Request": {
        "Category": [{
            "CategoryId": "custom-category",
            "Attribute": [...]
        }, {
            "CategoryId": "another-custom-cat",
            "Attribute": [...]
        }]
    }
    "Action": [{
        "Attribute": [...]
    }, [...],{
        "Attribute": [...]
    }]
}
```

### 4.2.3 The Content Object representation

There are two possible ways to represent the XML content of a XACML request in the JSON representation: XML escaping or Base64 encoding. Both ways are exclusive one of another.

In both cases, any XML content sent in a JSON request MUST include all Namespace definitions needed to parse that Content.

#### 4.2.3.1 XML Escaping

The JSON Content object data-type is a string which MUST be null or contain an XML payload per the XACML specification.

XML Content must be escaped before being inserted into the JSON request. JSON dictates double quotes (""") be escaped using a backslash (\). This profile therefore follows this behavior.

In addition, since the XML content could itself contain backslashes and possibly the sequence `\v`, it is important to also escape backslashes.

#### 4.2.3.2 Base64 Encoding

In the case of Base64 encoding, the XML content shall be converted to its Base64 representation as per [BASE64].
4.2.3.3 Example:

The following is an example using XML escaping as defined in 4.2.3.1.

```
{"Request":
 +
     ""AccessSubject": {
     "Content": ":
<catalog><book
    id="bk101" author="Gambardella, Matthew" title="XML Developer's Guide" genre="Computer" price="44.95" publish_date="2000-10-01" description="An in-depth look at creating applications with XML."/></catalog>
"
 +
})
```

The following is an example using Base64 encoding as defined in 4.2.3.2.

```
{"Request":
 {
 "Content":
 "PD94bWwgdmVyc2lvbj0iMS4wIiBlbmNvZGluZyB3d3cgd2luZG4ndGVsbG8gbGF5IHdyYWxlIHRyYWN0IG1hbmFnPTJhMjU4IENvbnRlbnQuZGl0bGUgZm9yIHRlc3QgY2F0YWxvZ2UgYSB0aGlzIGlub24gc2NvZGUgZ2VuZXJpbmFsIGZvciB0byB0aGlzIEJyb3dzZXIgYWxvZ2UgYm9yZGVyIGZvciBtb2JlIHN0cmluZw==
 ",
 "AccessSubject":{
  "Content":
 "PD94bWwgdmVyc2lvbj0iMS4wIiBlbmNvZGluZyB3d3cgd2luZG4ndGVsbG8gbGF5IHdyYWxlIHRyYWN0IG1hbmFnPTJhMjU4IENvbnRlbnQuZGl0bGUgZm9yIHRlc3QgY2F0YWxvZ2UgYSB0aGlzIGlub24gc2NvZGUgZ2VuZXJpbmFsIGZvciB0byB0aGlzIEJyb3dzZXIgYWxvZ2UgYm9yZGVyIGZvciBtb2JlIHN0cmluZw==
 "
 })
```

4.2.4 The Attribute Object representation

The JSON Attribute object contains an array of Attribute objects. The Attribute object contains the following properties:
<table>
<thead>
<tr>
<th>Property name</th>
<th>Type</th>
<th>Mandatory/Optional</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attributeld</td>
<td>URI</td>
<td>Mandatory</td>
<td>None – the identifier used in the XML representation of a XACML attribute shall be used in its JSON representation</td>
</tr>
<tr>
<td>Value</td>
<td>Either of String, Boolean, Number (which maps to either a XACML integer or double as defined in Supported Data Types), Object, Array of String, Array of Boolean, Array of Number, Array of Object, or a mixed Array of String and Number where the String values represent a numerical value.</td>
<td>Mandatory</td>
<td>None – the value must be specified.</td>
</tr>
<tr>
<td>Issuer</td>
<td>String</td>
<td>Optional</td>
<td>Null</td>
</tr>
<tr>
<td>DataType</td>
<td>URI</td>
<td>Optional</td>
<td>The DataType value can be omitted in the JSON representation. Its default value will be <a href="http://www.w3.org/2001/XMLSchema#string">http://www.w3.org/2001/XMLSchema#string</a> unless it can be safely assumed according to the rules set in 3.3.1 Supported Data Types. In the case of an array of values, the DataType cannot be inferred from the values, inference works as described in 3.3.2. Arrays of values the array and the DataType JSON property must be specified.</td>
</tr>
<tr>
<td>IncludeInResult</td>
<td>Boolean</td>
<td>Optional</td>
<td>False.</td>
</tr>
</tbody>
</table>

4.2.4.1 Example

{Non-normative}

```
"{"Attribute": [{ "Attrubuteld": "urn:oasis:names:tc:xacml:2.0:subject:role", "Value": ["manager","administrator"] ]}
```

4.2.5 The MultiRequests object representation

The MultiRequests object is optional in the JSON representation of XACML. Its purpose is to support the Multiple Decision Profile [XACMLMDP].

The MultiRequests object contains an array of RequestReference objects. There must be at least one RequestReference object inside the MultiRequests object.
4.2.6 The RequestReference object representation

The RequestReference object contains a single property called ReferenceId which is an array of string. Each ReferenceId value must be the value of a Category object Id property.

4.2.6.1 Non-normative example

```json
"MultiRequests": {
  "RequestReference": [{
    "ReferenceId": ["foo1","bar1"],
  },
  {
    "ReferenceId": ["foo2","bar1"],
  },
  {
    "ReferenceId": ["foo3","bar1"],
  }
}
```
5 The XACML response

5.1 Class Diagram

```
5.2 Representation of the XACML response in JSON

5.2.1 The Response object representation

The Response property in its JSON representation will contain an array of Result objects. The Result object representation is detailed hereafter. The array MUST contain at least one Result object and is unbounded.

The JSON representation effectively eliminates an unnecessary nesting of Response and Result as introduced in XACML’s XML schema. The notion of an array of values is used to convey the nesting.

5.2.2 The Result object representation

The Result object in JSON will contain the following properties:

<table>
<thead>
<tr>
<th>Property name</th>
<th>Type</th>
<th>Mandatory/Optional</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decision</td>
<td>String</td>
<td>Mandatory</td>
<td>None – in addition there are only 4 valid values which are &quot;Permit&quot;, &quot;Deny&quot;, &quot;NotApplicable&quot;, &quot;&quot;</td>
</tr>
</tbody>
</table>
In addition to the aforementioned properties, the `Result` object also contains the following objects:

- `Status`: this object is optional.
- `Obligations`: this object is optional.
- `AssociatedAdvice`: this object is optional.
- `AttributesCategory`: this object is optional. It can be single-valued or an array of `Category` objects.
- `PolicyIdentifierList`: this object is optional.

### 5.2.3 The Status object representation

The `Status` object in JSON will contain the following properties:

<table>
<thead>
<tr>
<th>Property name</th>
<th>Type</th>
<th>Mandatory/Optional</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>StatusMessage</td>
<td>String</td>
<td>Optional</td>
<td>None.</td>
</tr>
<tr>
<td>StatusDetail</td>
<td>String</td>
<td>Optional</td>
<td>None.</td>
</tr>
</tbody>
</table>

In addition to the above properties, the `Status` object in JSON also contains a `StatusCode` object detailed hereafter. The `StatusCode` object is optional.

`StatusDetail` may contain arbitrary XML as well. In the case that `StatusDetail` does contain XML, the XML content must be escaped using the same technique as specified in 4.2.3 The Content Object representation.

`StatusDetail` may contain an array of `MissingAttributeDetail` object.

### 5.2.4 The MissingAttributeDetail object

The `MissingAttributeDetail` object in JSON contains the following properties:
<table>
<thead>
<tr>
<th>Property name</th>
<th>Type</th>
<th>Mandatory / Optional</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attributeld</td>
<td>URI</td>
<td>Mandatory</td>
<td>None – the identifier used in the XML representation of a XACML attribute shall be used in its JSON representation</td>
</tr>
<tr>
<td>Value</td>
<td>Either of String, Boolean, Number (which maps to either a XACML integer or double as defined in Supported Data Types), Object, Array of String, Array of Boolean, Array of Number, Array of Object, or a mixed Array of String and Number where the String values represent a numerical value.</td>
<td>Optional</td>
<td>None – the value must be specified.</td>
</tr>
<tr>
<td>Issuer</td>
<td>String</td>
<td>Optional</td>
<td>Null</td>
</tr>
<tr>
<td>DataType</td>
<td>URI</td>
<td>Optional</td>
<td>The <code>DataType</code> value can be omitted in the JSON representation. Its default value will be <code>http://www.w3.org/2001/XMLSchema#string</code> unless it can be safely assumed according to the rules set in 3.3.1 Supported Data Types. In the case of an array of values, inference works as described in section 3.4.2.</td>
</tr>
<tr>
<td>Category</td>
<td>URI</td>
<td>Mandatory</td>
<td>Note that the shorthand notation for default XACML 3.0 categories may be used. See 4.2.2.1 Shorthand notation for standard XACML categories.</td>
</tr>
</tbody>
</table>

### 5.2.45.2.5 The StatusCode object representation

The `StatusCode` object in JSON contains the following properties:

<table>
<thead>
<tr>
<th>Property name</th>
<th>Type</th>
<th>Mandatory/Optional</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>URI</td>
<td>Optional</td>
<td><code>&lt;urn:oasis:names:tc:xacml:1.0:status:ok&gt;</code></td>
</tr>
</tbody>
</table>

In addition, the `StatusCode` object may contain a sequence of `StatusCode` objects – hence potentially creating a recursive nesting of `StatusCode` objects.

### 5.2.4.15.2.5.1 Example

{Non-normative}
5.2.55.2.6 The Obligations object representation

The Obligations property in the JSON representation is simply an array of ObligationOrAdvice objects. The ObligationOrAdvice object is detailed hereafter.

5.2.65.2.7 The AssociatedAdvice object representation

The AssociatedAdvice property in the JSON representation is simply an array of ObligationOrAdvice objects. The Advice object is detailed hereafter.

5.2.75.2.8 The ObligationOrAdvice object representation

The ObligationOrAdvice object contains the following properties in its JSON representation:

<table>
<thead>
<tr>
<th>Property name</th>
<th>Type</th>
<th>Mandatory/Optional</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Id</td>
<td>URI</td>
<td>Mandatory</td>
<td>None</td>
</tr>
</tbody>
</table>

Note that the ObligationOrAdvice object maps to either of an Advice or Obligation element in the XACML XML representation. Where in the XML representation, each element has an attribute called AdviceId and ObligationId respectively, in the JSON representation, the naming has been harmonized to Id.

The ObligationOrAdvice object contains an unbounded array of AttributeAssignment objects.

5.2.85.2.9 The AttributeAssignment object representation

The AttributeAssignment object contains the following properties in its JSON representation:

<table>
<thead>
<tr>
<th>Property name</th>
<th>Type</th>
<th>Mandatory/Optional</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AttributeId</td>
<td>URI</td>
<td>Mandatory</td>
<td>None</td>
</tr>
<tr>
<td>Value</td>
<td>Variable</td>
<td>Mandatory</td>
<td>None</td>
</tr>
<tr>
<td>Category</td>
<td>URI</td>
<td>Optional</td>
<td>None. The shorthand notation defined in Shorthand notation for standard XACML categories None may be used.</td>
</tr>
<tr>
<td>DataType</td>
<td>URI</td>
<td>Optional</td>
<td>The default value depends on the inference rules defined in Supported Data Types String.</td>
</tr>
<tr>
<td>Issuer</td>
<td>String</td>
<td>Optional</td>
<td>None</td>
</tr>
</tbody>
</table>
5.2.95.2.10 The Attributes object representation

The JSON representation of the Attributes object in a XACML response respects is identical to the representation defined in 4.2.2 The Category object representation.

5.2.105.2.11 The PolicyIdentifier object representation

The PolicyIdentifier object contains 2 properties in its JSON representation:

<table>
<thead>
<tr>
<th>Property name</th>
<th>Type</th>
<th>Mandatory/Optional</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PolicyIdReference</td>
<td>Array of IdReference</td>
<td>Optional</td>
<td>None.</td>
</tr>
<tr>
<td>PolicySetIdReference</td>
<td>Array of IdReference</td>
<td>Optional</td>
<td>None</td>
</tr>
</tbody>
</table>

5.2.115.2.12 The IdReference object representation

The IdReference object representation contains the following properties in its JSON representation:

<table>
<thead>
<tr>
<th>Property name</th>
<th>Type</th>
<th>Mandatory/Optional</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Id</td>
<td>URI</td>
<td>Mandatory</td>
<td>Represents the value stored inside the XACML XML PolicyIdReference or PolicySetIdReference.</td>
</tr>
<tr>
<td>Version</td>
<td>String</td>
<td>Optional</td>
<td>None.</td>
</tr>
</tbody>
</table>
6 Transport

The XACML request represented in its JSON format MAY be carried from a PEP to a PDP via an HTTP [HTTP] POST request as defined in the REST profile of XACML [XACMLREST]. HTTP Headers which may be used are:

- Content-Type: application/json
- Accept: application/json

The REST profile of XACML [XACMLREST] defines means of sending a XACML request to a PDP and how a response is returned.

6.1 Transport Security

{Non-normative}

The use of SSL/TLS [HTTPS] is RECOMMENDED to protect requests and responses as they are transferred across the network.
7  IANA Registration

The following section defines the information required by IANA when applying for a new media type.

7.1 Media Type Name

apPLICATION

7.2 Subtype Name

xacml+json

7.3 Required Parameters

None.

7.4 Optional Parameters

version: The version parameter indicates the version of the XACML specification. Its range is the range of published XACML versions. As of this writing that is: 1.0, 1.1, 2.0, and 3.0. These and future version identifiers are of the form x.y, where x and y are decimal numbers with no leading zeros, with x being positive and y being non-negative.

7.5 Encoding Considerations

Same as for application/xml [RFC4627].

7.6 Security Considerations

Per their specification, application/xacml+json typed objects do not contain executable content.

XACML requests and responses contain information which integrity and authenticity are important. To counter potential issues, the publisher may use the transport layer’s security mechanisms to secure xacml+json typed objects when they are in transit. For instance HTTPS, offer means to ensure the confidentiality, authenticity of the publishing party and the protection of the request / response in transit.

7.7 Interoperability Considerations

XACML 3.0 uses the urn:oasis:names:tc:xacml:3.0:core:schema:wd-17 XML namespace URI. XACML 2.0 uses the urn:oasis:names:tc:xacml:2.0:policy XML namespace URI.

7.8 Applications which use this media type

Potentially any application implementing XACML, as well as those applications implementing specifications based on XACML or those applications requesting an authorization decision from a XACML implementation.

7.9 Magic number(s)

Per [RFC4627], this section is not applicable.

7.10 File extension(s)

Per [RFC4627], .json.
7.11 Macintosh File Type Code(s)

Text

7.12 Intended Usage

Common
8 Examples

(Non-normative)

8.1 Request Example

(Non-normative)

The following is a sample XACML request expressed in JSON.

```json
{ "Request": {
  "AccessSubject": {
    "Attribute": {
      "Id": "AttributeId": "subject-id",
      "Value": "Andreas"
    },
    "Attribute": {
      "Id": "AttributeId": "location",
      "Value": "Gamla Stan"
    }
  },
  "Action": {
    "Attribute": {
      "Id": "AttributeId": "action-id",
      "Value": "http://www.xacml.eu/example.com/buy",
      "DataType": "anyURI"
    }
  },
  "Resource": {
    "Attribute": {
      "Id": "AttributeId": "book-title",
      "Value": "Learn German in 90 days"
    },
    "Attribute": {
      "Id": "AttributeId": "currency",
      "Value": "SEK"
    },
    "Attribute": {
      "Id": "AttributeId": "price",
      "Value": 123.34
    }
  }
}
```
8.2 Response Example

{Non-normative}

The following is a sample XACML response expressed in JSON.

```json
{
    "Response": [{
        "Decision": "Permit"
    }
}
```
9 Conformance

An implementation may conform to this profile if and only if both the XACML request and the response are correctly encoded into JSON as previously described in sections 3 through 5 and follows the transport requirements as specified in section 6.
Appendix A. Acknowledgements

The following individuals have participated in the creation of this specification and are gratefully acknowledged:

Participants:

Steven Legg, ViewDS
Rich Levinson, Oracle
Hal Lockhart, Oracle
Bill Parducci,
Erik Rissanen, Axiomatics
Anil Saldhana, Red Hat
Remon Sinnema, EMC
Danny Thorpe, Dell
Paul Tyson, Bell Helicopters
# Appendix B. Revision History

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Editor</th>
<th>Changes Made</th>
</tr>
</thead>
<tbody>
<tr>
<td>WD 01</td>
<td>2 Jul 2012</td>
<td>David Brossard</td>
<td>Initial working draft</td>
</tr>
<tr>
<td>WD 02</td>
<td>9 Jul 2012</td>
<td>David Brossard</td>
<td>Integrated comments from XACML list. Enhanced the section on data-types. Added a class diagram for clarity. Changed tense to present. Removed overly explicit comparisons with XML representation.</td>
</tr>
<tr>
<td>WD 03</td>
<td>19 Jul 2012</td>
<td>David Brossard</td>
<td>Started work on the XACML response</td>
</tr>
<tr>
<td>WD 04</td>
<td>20 Aug 2012</td>
<td>David Brossard</td>
<td>Finalized work on the XACML response, added a note on HTTPS. Restructured the document to extract paragraphs common to the Request and Response section.</td>
</tr>
<tr>
<td>WD 05</td>
<td>20 Sep 2012</td>
<td>David Brossard</td>
<td>Took in comments from the XACML TC list (technical comments and typographical corrections)</td>
</tr>
<tr>
<td>WD 06</td>
<td>29 Oct 2012</td>
<td>David Brossard</td>
<td>Removed the Non-normative section in the appendix. Completed the conformance section. Added non-normative tags where needed. Also added a sample response example. Added the section on IANA registration.</td>
</tr>
<tr>
<td>WD07</td>
<td>15 Nov 2012</td>
<td>David Brossard</td>
<td>Removed the XPathExpression from the supported DataTypes. Fixed the examples as per Steven Legg’s email. Fixed the XML encoding of XML content as per conversations on the XACML TC list.</td>
</tr>
<tr>
<td>WD08</td>
<td>27 Nov 2012</td>
<td>David Brossard</td>
<td>Fixed the Base64 encoding section as per Erik Rissanen’s comments</td>
</tr>
<tr>
<td>WD09</td>
<td>24 Dec 2012</td>
<td>David Brossard</td>
<td>Addressed comments and fixed errors as per emails sent on the XACML TC list in December.</td>
</tr>
<tr>
<td>WD10</td>
<td>4 Feb 2013</td>
<td>David Brossard</td>
<td>Fixed the IANA registration section. Fixed inconsistent DataType spelling. DataType is always the XACML attribute and JSON property name. Data type refers to the English notion. Fixed the status XML content encoding to be consistent with the Request XML encoding technique. Fixed a non-normative section label. Fixed the formatting of JSON property names. Fixed the XACML to JSON data type inference by adding references to the relevant XML data types.</td>
</tr>
<tr>
<td>Workitem</td>
<td>Date</td>
<td>Author</td>
<td>Changes</td>
</tr>
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<tr>
<td>WD11</td>
<td>5 Feb 2013</td>
<td>David Brossard</td>
<td>Fixed the AttributeAssignment section</td>
</tr>
<tr>
<td>WD13</td>
<td>14 June 2013</td>
<td>David Brossard</td>
<td>Fixed the final issue re. Category vs. Attributes.</td>
</tr>
<tr>
<td>WD14</td>
<td>12 July 2013</td>
<td>David Brossard</td>
<td>Cleaned up the documents and comments.</td>
</tr>
</tbody>
</table>
| WD15     | 02 September 2013 | David Brossard | Fixed document based on feedback from Steven Legg:  
  - The naming of Attributes vs. Category in section 5.2.2  
  - Fixed the name of ObligationOrAdvice in section 5.2.6  
  Also fixed subjective line in introduction based on email xacml-comment from David Webber. |
| WD16     | 17 March 2014 | David Brossard |  
  - Fixed issues with special numerical values: based on input from the XACML TC, special values (NaN, Inf, -0) are now excluded  
  - Rewrote section 3.4.2 and added reference to 3.4.1  
  - Added a section defining the shorthand notation for standard XACML categories  
  - Added normative reference to XACML 3.0 standard  
  - Added optional category objects for all default categories in XACML 3.0 instead of the 4 most common ones only.  
  - Updated example in 4.2.4.1  
  - Fixed the Transport section to reference the REST profile.  
  - Fixed broken samples  
  - Added references to IEEE 754-2008 rather than Javascript for the special numerical values  
  - Fixed the Content section to include the namespaces requirement  
  - Fixed the default value for |
<table>
<thead>
<tr>
<th>WD17</th>
<th>14 April 2014</th>
<th>David Brossard</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>XPathVersion to be in accordance with [XACML30].</td>
</tr>
<tr>
<td></td>
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<td>- Added the MissingAttributeValue object definition.</td>
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<tr>
<th>WD17</th>
<th>14 April 2014</th>
<th>David Brossard</th>
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<tbody>
<tr>
<td></td>
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<td>Updated the profile title per conversation on the XACML TC list</td>
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<tr>
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<td>Updated section 3.2.1 on object names in JSON</td>
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<tr>
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<td></td>
<td>Fixed broken reference to 3.3.1 in 3.3.2</td>
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<tr>
<td></td>
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<td>Updated the inference rule for double and integers to remove any doubt as to the potential datatypes</td>
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<tr>
<td></td>
<td></td>
<td>Fixed wording in section 4.2.1 (much like vs. just like)</td>
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<tr>
<td></td>
<td></td>
<td>Simplified the wording of section 4.2.2.2</td>
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<tr>
<td></td>
<td></td>
<td>Updated the example in section 4.2.2.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed the shorthand name subject to access-subject to be consistent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added the Indeterminate behavior for invalid numerical values</td>
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<tr>
<td></td>
<td></td>
<td>Fixed the base 64 encoding example in section 4.2.3.3</td>
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<tr>
<td></td>
<td></td>
<td>Fixed the examples (wrong attribute names, missing parents, missing curly braces)</td>
</tr>
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<td></td>
<td></td>
<td>Changed the MS Word quotes into proper quotes</td>
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<thead>
<tr>
<th>WD18</th>
<th>22 April 2014</th>
<th>David Brossard</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Changed the shorthand names to use Title Case instead. resource becomes Resource, access-subject becomes AccessSubject, and so on.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Updated the XPathCategory so that one can use the category shorthand notation as a valid value instead.</td>
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