



ACAL v1.0 JSONPath Profile Version 1.0

Committee Specification Draft 01

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OASIS eXtensible Access Control Markup Language (XACML) TC

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- Bill Parducci (bill@parducci.net), Individual

Secretaries

- Bill Parducci (bill@parducci.net), Individual

Editors

- Steven Legg (steven.legg@viewds.com), ViewDS Identity Solutions
- Cyril Dangerville (cyril.dangerville@thalesgroup.com), THALES

Abstract

This specification is a profile of ACAL that provides ACAL extensions based on the JSONPath standard, such as JSONPath-based AttributeSelector.

Citation Format

When referencing this document, the following citation format should be used:

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Related Work

This document is related to:

- *Attribute-Centric Authorization Language (ACAL) Version 1.0.*

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1 Scope

This ACAL profile defines concrete types of [ACAL-Core-1.0] `AttributeSelector` and `EntityAttributeSelector` using JSONPath [RFC9535] expressions to extract attributes from ACAL Request's Content.

Concrete representations (data formats) are to be provided as separate specifications and therefore out of scope of this document.

2 Definitions and Acronyms

2.1 Definitions

2.1.1 Terms Defined Elsewhere

This document uses the following terms defined elsewhere:

See Section 2 of [ACAL-Core-1.0].

2.1.2 Terms Defined in this Document

None.

2.1.3 Related terms

None.

2.2 Abbreviations and Acronyms

None.

3 Document Conventions

3.1 Key Words

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

3.2 Typographical Conventions

None.

4 Introduction (non-normative)

4.1 Requirements

JSON is a common format to represent structured objects that may be supplied by the PEP as subject attribute or resource attribute's Content inside the Request to the PDP, typically a JSON Web token (JWT) in the case of subject attributes (JWT is commonly used in OpenID Connect and OAuth protocols), or any JSON document as resource data. JSON is a common data exchange format used by Web APIs. For such cases, supporting JSONPath [RFC9535] expressions in ACAL is the standard way and therefore a must-have to extract the necessary values from the JSON content for policy evaluation. For instance, a common rule of a privacy policy is that a person should be allowed to read records (in JSON) for which he or she is the subject. The corresponding policy must contain a reference - JSONPath expression - to the subject identified in the information resource - JSON record - itself.

4.2 Policies Based on Subject and Resource Attributes

Attribute selectors (`AttributeSelectorType` objects) defined by this profile use a JSONPath expression [RFC9535] over the `ContentType` object of the subject (resp. resource) to identify a particular subject (resp. resource) attribute value by its location in the context (see Section 4.11 of [ACAL-Core-1.0] for an explanation of context).

4.3 Changes From the Previous Version

None. This is the first version of this profile.

5 Structures

5.1 ContentType restrictions

This profile applies to a **Content** object (defined in [ACAL-Core-1.0]) in the Request if and only if:

- The **MediaType** property is set to `application/json`.
- The **Body** property value is a JSON object. *Note that it is always possible to encapsulate a JSON array inside a JSON object if a JSON array is really needed.*

5.2 ACAL extensions

The structures in this profile are extensions to [ACAL-Core-1.0] model and described here in abstract terms. The concrete representations of these structures are defined for a variety of syntaxes each in a separate profile.

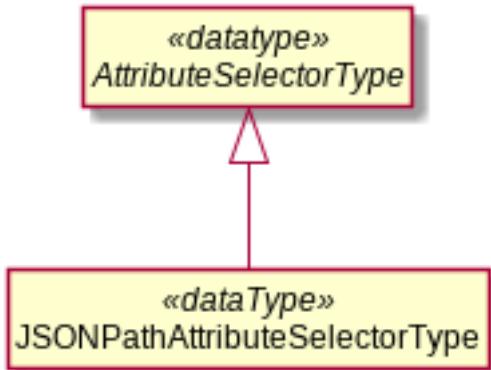
The types **AttributeSelectorType** and **EntityAttributeSelectorType** used in the next UML models are defined in [ACAL-Core-1.0].

5.2.1 AttributeSelectorType extension - JSONPathAttributeSelectorType

A **JSONPathAttributeSelectorType** object is a concrete type of **AttributeSelectorType** from [ACAL-Core-1.0] that uses JSONPath (RFC9535) for Path expressions and expects a JSON object as value of the **Body** property of a **RequestEntityType** object's **Content** object. More precisely, the returned values shall be constructed from the node(s) selected by applying the JSONPath expression given by the attribute selector's **Path** property to the JSON object in the **Body** property of the **Content** object in the **RequestEntityType** object matching the attribute selector's **Category** property.

See the section 9 for details of attribute selector evaluation.

UML definition (class diagram):



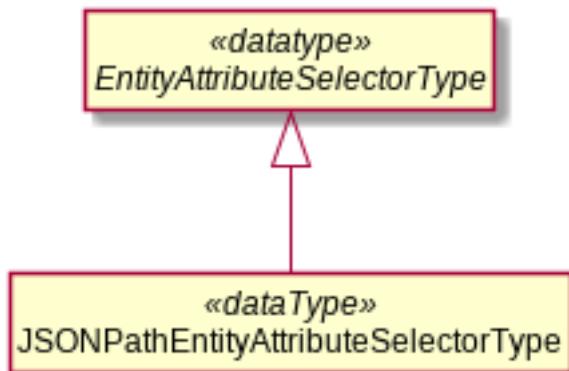
In the context of this profile, the required **Path** property inherited from the supertype **AttributeSelectorType** SHALL be a JSONPath expression RFC9535.

5.2.2 EntityAttributeSelectorType extension - JSONPathEntityAttributeSelectorType

A **JSONPathEntityAttributeSelectorType** object is a concrete type of **EntityAttributeSelectorType** [ACAL-Core-1.0] that uses JSONPath RFC9535 for Path expressions and expects a JSON object in the value returned by the attribute selector's **Expression** property. In other words, the values shall be constructed from the node(s) selected by applying the JSONPath expression given by the entity attribute selector's **Path** property to the JSON object of the **Body** property of the **Content** object in either an attribute category in the request context (**RequestEntity**) or the value of the `urn:oasis:names:tc:acal:1.0:data-type:entity` data type returned by its **Expression** evaluation.

See the Section 9 for details of entity attribute selector evaluation.

UML definition (class diagram):



The Path property is also defined the same as in `JSONPathAttributeSelectorType`.

6 Attribute Selector Evaluation

A `JSONPathAttributeSelectorType` or `JSONPathEntityAttributeSelector` object SHALL be evaluated according to the following processing model.

Note: It is not necessary for an implementation to exactly follow this model. It is only necessary to produce results identical to those that would be produced by following this model.

The first steps are already described in [ACAL-Core-1.0] section 9.4.7 and provided here as a reminder:

- If the attribute category given by the `Category` property is not found or does not have a `Content` property, then the return value is either `Indeterminate` or an empty bag as determined by the `MustBePresent` property.
- If the `Expression` property of an `JSONPathEntityAttributeSelector` object evaluates to a value of the `urn:oasis:names:tc:acal:1.0:data-type:entity` data type and that value does not have a `Content` property, then the return value is either `Indeterminate` or an empty bag as determined by the `MustBePresent` property.
- If the `Expression` property of an `JSONPathEntityAttributeSelector` object evaluates to a value of the `urn:oasis:names:tc:acal:1.0:data-type:anyURI` data type and an attribute category with that value as its `Category` is not found or does not have a `Content` property, then the return value is either `Indeterminate` or an empty bag as determined by the `MustBePresent` property.

If the designated attribute category or entity value has a `Content` property, then follow the steps below:

1. Construct a JSON object (RFC 8259) from the value of the `Body` property of the `Content` property. If the content is not a valid JSON object, then the attribute selector MUST return `Indeterminate` with status code `urn:oasis:names:tc:acal:1.0:status:syntax-error`.
2. The root node of the data structure (JSON object) shall be used as context node of evaluation (JSONPath *query argument*).
3. Evaluate the JSONPath expression given in the `Path` property against the context node selected in the previous step, according to the syntax and semantics of the JSONPath standard [RFC9535].
4. The result of the previous step is a nodelist that is converted to a bag of values of the data type specified by the `DataType` property. In most cases the conversion depends on the string value of a node's JSON value, defined as follows:
 - The string value of a JSON string value is the sequence of Unicode characters represented by the text *between* the surrounding double quotes, i.e., with each escape sequence replaced with its equivalent Unicode character.
 - The string value of the special JSON value `true`, `false` or `null` is the equivalent sequence of Unicode characters.

- The string value of a JSON number is the equivalent sequence of Unicode characters.
- The string value of a JSON array is the empty string.
- The string value of a JSON object is the empty string.

The nodelist is converted to a bag of values of the data type specified by the `DataType` property as follows:
If the specified data type is `urn:oasis:names:tc:acal:1.0:data-type:boolean`, then convert the string value of each node using the `xs:boolean()` constructor function from [XF] Section 18.1.

If the specified data type is `urn:oasis:names:tc:acal:1.0:data-type:string`, then convert the string value of each node using the `xs:string()` constructor function from [XF] Section 18.1.

If the specified data type is `urn:oasis:names:tc:acal:1.0:data-type:integer`, then convert the string value of each node using the `xs:integer()` constructor function from [XF] Section 18.1.

If the specified data type is `urn:oasis:names:tc:acal:1.0:data-type:double`, then convert the string value of each node using the `xs:double()` constructor function from [XF] Section 18.1.

If the specified data type is `urn:oasis:names:tc:acal:1.0:data-type:dateTime`, then convert the string value of each node using the `xs:dateTime()` constructor function from [XF] Section 18.1.

If the specified data type is `urn:oasis:names:tc:acal:1.0:data-type:date`, then convert the string value of each node using the `xs:date()` constructor function from [XF] Section 18.1.

If the specified data type is `urn:oasis:names:tc:acal:1.0:data-type:time`, then convert the string value of each node using the `xs:time()` constructor function from [XF] Section 18.1.

If the specified data type is `urn:oasis:names:tc:acal:1.0:data-type:hexBinary`, then convert the string value of each node using the `xs:hexBinary()` constructor function from [XF] Section 18.1.

If the specified data type is `urn:oasis:names:tc:acal:1.0:data-type:base64Binary`, then convert the string value of each node using the `xs:base64Binary()` constructor function from [XF] Section 18.1.

If the specified data type is `urn:oasis:names:tc:acal:1.0:data-type:anyURI`, then convert the string value of each node using the `xs:anyURI()` constructor function from [XF] Section 18.1.

If the specified data type is `urn:oasis:names:tc:acal:1.0:data-type:yearMonthDuration`, then convert the string value of each node using the `xs:yearMonthDuration()` constructor function from [XF] Section 18.1.

If the specified data type is `urn:oasis:names:tc:acal:1.0:data-type:dayTimeDuration`, then convert the string value of each node using the `xs:dayTimeDuration()` constructor function from [XF] Section 18.1.

If the specified data type is `urn:oasis:names:tc:acal:1.0:data-type:entity` and the value of every node in the nodelist is a JSON object, then convert each node to an ACAL `EntityType` object. Each `EntityType` object SHALL have a `Content` property and SHALL NOT have an `Attribute` property. The `Content` property SHALL have a `MediaType` property set to `application/json` and the value of the `Body` property SHALL be a copy of the JSON object.

If the data type is one of the types referred to above and the result of step 3 does not satisfy any of the cases, then the attribute selector MUST return `Indeterminate` with status code `urn:oasis:names:tc:acal:1.0:status:syntax-error`.

If the data type is not one of the types referred to above, then the return values shall be constructed from the nodelist in a manner specified by the particular data type extension specification. If the data type extension does not specify an appropriate conversion function, then the attribute selector MUST return `Indeterminate` with status code `urn:oasis:names:tc:acal:1.0:status:syntax-error`.

If an error occurs when converting the values returned by the expression to the specified data type, then the result of the attribute selector MUST be `Indeterminate`, with status code `urn:oasis:names:tc:acal:1.0:status:processing-error`

If the result of step 3 is an empty nodelist, then the return value is either `Indeterminate` with status code `urn:oasis:names:tc:acal:1.0:status:syntax-error`, or an empty bag, as determined by the `MustBePresent` property.

An implementation can be optimized to emit errors without going to the effort of generating the string value of node values. For example, the string value of a JSON number will never have the correct format for a `urn:oasis:names:tc:acal:1.0:data-type:dateTime` ACAL value, so this combination will always produce an error.

7 Safety, Security, and Data Protection Considerations

Refer to [ACAL-Core-1.0] section 10, and Section 4 (Security Considerations) of RFC 9535.

8 Conformance

8.1 Introduction

The specification addresses the following aspect of conformance:

The specification defines a number of functions, etc. that have somewhat special applications, therefore they are not required to be implemented in an implementation that claims to conform with this specification.

8.2 Conformance Tables

This section lists those portions of the specification that MUST be included in an implementation of a PDP that claims to conform to this profile.

Note: "M" means mandatory-to-implement. "O" means optional.

The implementation MUST follow Section 5, Section 6 and Annex D where they apply to implemented items in the following tables.

Many of these items are associated with versions of XACML preceding ACAL but have been assigned new identifiers with the `urn:oasis:names:tc:acal:1.0:` prefix. The older XACML identifiers have been listed in the tables as deprecated identifiers. Implementations MUST support a new identifier defined in this specification but MAY recognize the corresponding deprecated identifier as equivalent. It is RECOMMENDED that these deprecated identifiers not be used in new policies and requests; they are planned to be removed in a subsequent version of ACAL. Note that some items appear to be carried over from a preceding version of XACML but do not list the XACML identifier. This is because ACAL has redefined the item in some way that means it is no longer identical to the original definition in XACML, and so the identifiers can no longer be considered equivalent. Items new to ACAL 1.0 will also not list an XACML identifier.

8.2.1 Object Types

The implementation MUST support the object types that are marked M.

Object Type	M/O
JSONPathAttributeSelectorType	M
JSONPathEntityAttributeSelectorType	O

Annex A License, Document Status and Notices

(This annex forms an integral part of this Specification.)

A.1 Document Status

This document was last revised or approved by the OASIS eXtensible Access Control Markup Language (XACML) TC on the above date. The level of approval is also listed above. Check the "Latest version" location noted above for possible later revisions of this document. Any other numbered Versions and other technical work produced by the Technical Committee (TC) are listed at <https://groups.oasis-open.org/communities/tc-community-home2?CommunityKey=67afe552-0921-49b7-9a85-018dc7d3ef1d#technical>.

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Annex B References

(This annex forms an integral part of this Specification.)

This section contains the normative and informative references that are used in this document.

Normative references are specific (identified by date of publication and/or edition number or version number) and Informative references are either specific or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies. While any hyperlinks included in this section were valid at the time of publication, OASIS cannot guarantee their long term validity.

B.1 Normative References

The following documents are referenced in such a way that some or all of their content constitutes requirements of this document.

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[XPath]

XML Path Language (XPath) 3.1, W3C Recommendation 21 March 2017, <https://www.w3.org/TR/xpath-31/>

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W3C XQuery, XPath, and XSLT Functions and Operators Namespace Document (XPath and XQuery Functions and Operators 3.1) 21 March 2017, <https://www.w3.org/2005/xpath-functions/>

[XSLT]

XSL Transformations (XSLT) Version 1.0, W3C Recommendation 16 November 1999, <https://www.w3.org/TR/xslt/>

B.2 Informative References

The following referenced documents are not required for the application of this document but may assist the reader with regard to a particular subject area.

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Annex C ACAL Identifiers

(This annex forms an integral part of this Specification.)

This section defines standard identifiers for commonly used definitions.

C.1 ACAL Namespaces

This ACAL Profile is defined using this identifier.

`urn:oasis:names:tc:acal:1.0:jsonpath:schema`

Annex D How to generate HTML and PDF versions

Online generation

HTML/PDF versions are generated automatically online via Github Actions after each update pushed to the main branch of OASIS XACML TC Github repository. Go to Github Actions on the github repository, then go to the latest workflow run, and, if the run succeeded, the summary should display the links to the generated HTML/PDF documents.

Offline generation

Prerequisites

Install Pandoc, Graphviz and PlantUML on your system; or simply use Docker with the following shell alias:

```
$ alias pandoc='docker run --rm --volume "$(pwd):/data" cdang/pandoc-plantuml'
```

The Dockerfile (named Dockerfile) of the docker image used in the alias above is provided in the pandoc folder next to this markdown file for your convenience if you wish to build it yourself.

OASIS staff are currently using pandoc 3.0 from <https://github.com/jgm/pandoc/releases/tag/3.0>.

Git clone or get a local copy of OASIS XACML TC Github repository, open a terminal and **change your working directory to the root directory of your local copy of the repository**.

CSS stylesheet

The generation command uses a CSS stylesheet file (-c argument) provided by OASIS. It may be changed to one of these (or the local version in the **styles** folder) to get a different style of output:

- <https://docs.oasis-open.org/templates/css/markdown-styles-v1.7.3.css>
- <https://docs.oasis-open.org/templates/css/markdown-styles-v1.7.3a.css> (this one produces HTML that resembles the github display more closely, especially for blocks of code) This template already includes a reference (in HTML code) to this .css file.

HTML generation

Run the following command line to generate HTML from this markdown file (`acal-jsonpath-v1.0-csd01.md`) to an output file `/tmp/acal-jsonpath-v1.0-csd01.html`:

```
$ pandoc -f gfm+definition_lists -t html -c styles/markdown-styles-v1.7.3a.css -s --lua-filter pandoc/diagram.lua --defaults pandoc/default.lua
```

Note this command generates a Table of Contents (TOC) in HTML which is located at the top of the HTML document, and which requires additional editing in order to be published in the expected OASIS style. This editing will be handled by OASIS staff during publication.

PDF generation

For PDF output (file `/tmp/acal-jsonpath-v1.0-csd01.pdf`), the command line is the following (different -t and -H arguments):

```
$ pandoc -f gfm+definition_lists -t pdf -c styles/markdown-styles-v1.7.3a.css -H pandoc/custom_latex_header_for_pandoc_pdf_output.tex
```

Appendix 1 Acknowledgments

(This appendix does not form an integral part of this Specification and is informational.)

Leadership

The following individuals have had significant leadership positions during the development of this document, not just this version of the document, and they are gratefully acknowledged:

- Chairs
 - Bill Parducci, Individual
- Secretaries
 - Bill Parducci, Individual
- Editors
 - Steven Legg, ViewDS Identity Solutions
 - Cyril Dangerville, THALES

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- Steven Legg, ViewDS Identity Solutions
- Cyril Dangerville, THALES

Participants

The following individuals were members of this committee during the creation of this document, not just this version of the document, and their contributions are gratefully acknowledged:

XACML TC Members:

- Hal Lockhart, Individual
- Bill Parducci, Individual
- Steven Legg, ViewDS Identity Solutions
- Cyril Dangerville, THALES

Appendix 2 Changes From Previous Version

(This appendix does not form an integral part of this Specification and is informational.)

This is the first version of this profile.

Revision History

Latest revision history can be obtained from OASIS XACML TC's github repository.
