

OAuth Working Group
Internet-Draft
Intended status: Standards Track
Expires: June 17, 2016

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December 15, 2015

**Authentication Method Reference Values
draft-jones-oauth-amr-values-04**

Abstract

The "amr" (Authentication Methods References) claim is defined and registered in the IANA "JSON Web Token Claims" registry but no standard Authentication Method Reference values are currently defined. This specification establishes a registry for Authentication Method Reference values and defines an initial set of Authentication Method Reference values. It also defines the "amr_values" (requested Authentication Method Reference values) request parameter for requesting that a set of Authentication Method Reference values be used for processing the Authentication Request.

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1. Introduction

The "amr" (Authentication Methods References) claim is defined and registered in the IANA "JSON Web Token Claims" registry [[IANA.JWT.Claims](#)] but no standard Authentication Method Reference values are currently defined. This specification establishes a registry for Authentication Method Reference values and defines an initial set of Authentication Method Reference values. It also defines the "amr_values" (requested Authentication Method Reference values) request parameter for requesting that a set of Authentication Method Reference values be used for processing the Authentication Request.

The set of "amr" values defined by this specification is not intended to be an exhaustive set covering all use cases. Additional values can and will be added to the registry by other specifications. Rather, the values defined herein are an intentionally small set that are already actually being used in practice.

1.1. Requirements Notation and Conventions

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 [RFC 2119](#) [[RFC2119](#)].

1.2. Terminology

This specification uses the terms defined by JSON Web Token (JWT) [[JWT](#)] and OpenID Connect Core 1.0 [[OpenID.Core](#)].

2. Authentication Method Reference Values

The "amr" (Authentication Methods References) claim is defined by the OpenID Connect Core 1.0 specification [[OpenID.Core](#)] as follows:

amr

OPTIONAL. Authentication Methods References. JSON array of strings that are identifiers for authentication methods used in the authentication. For instance, values might indicate that both password and OTP authentication methods were used. The definition of particular values to be used in the "amr" Claim is beyond the scope of this specification. Parties using this claim will need to agree upon the meanings of the values used, which may be context-specific. The "amr" value is an array of case sensitive strings.

However, OpenID Connect does not specify any particular Authentication Method Reference values to be used in the "amr" claim. The following is a list of Authentication Method Reference values defined by this specification:

eye

Retina scan biometric

face

Facial recognition

fpt

Fingerprint biometric

geo

Use of geolocation information

hwk

Proof-of-possession (PoP) of a hardware-secured key. See [Appendix C of \[RFC4211\]](#) for a discussion on PoP.

kba

Knowledge-based authentication [[NIST.800-63-2](#)]

mca

Multiple-channel authentication. The authentication involves communication over more than one distinct channel.

mfa

Multiple-factor authentication [[NIST.800-63-2](#)]. When this is present, specific authentication methods used may also be included.

otp

One-time password. One-time password specifications that this authentication method applies to include [[RFC4226](#)] and [[RFC6238](#)].

pin

Personal Identification Number or pattern (not restricted to containing only numbers) that a user enters to unlock a key on the device. This mechanism SHOULD have a way to deter an attacker from obtaining the PIN by trying repeated guesses.

pwd

Password-based authentication

rba
Risk-based authentication [[JECM](#)]

sc
Smart card

sms
Confirmation using SMS message to the user at a registered number

swk
Proof-of-possession (PoP) of a software-secured key. See [Appendix C of \[RFC4211\]](#) for a discussion on PoP.

tel
Confirmation by telephone call to the user at a registered number

user
User presence test

vbm
Voice biometric

wia
Windows integrated authentication, as described in [[MSDN](#)]

[3.](#) Authentication Request Parameter

This section defines the following authentication request parameter, augmenting the set of authentication request parameters defined in [Section 3.1.2.1](#) of OpenID Connect Core 1.0 [[OpenID.Core](#)]:

amr_values
OPTIONAL. Requested Authentication Method Reference values. Space-separated string that specifies the "amr" values that the Authorization Server is being requested to use for processing this Authentication Request, with the values appearing in order of preference. The authentication methods used for the authentication performed are returned as the "amr" Claim Value.

[4.](#) Relationship to "acr" (Authentication Context Class Reference)

The "acr" (Authentication Context Class Reference) claim and "acr_values" request parameter are related to the "amr" (Authentication Methods References) claim and "amr_values" request parameter, but with important differences. An Authentication Context Class specifies a set of business rules that authentications are

being requested to satisfy. These rules can often be satisfied by using a number of different specific authentication methods, either singly or in combination. Interactions using "acr_values" request that the specified Authentication Context Classes be used and that the result should contain an "acr" claim saying which Authentication Context Class was satisfied. The "acr" claim in the reply states that the business rules for the class were satisfied -- not how they were satisfied.

In contrast, interactions using "amr_values" and/or "amr" make statements about the particular authentication methods that are being requested and that were used. This tends to be more brittle than using "acr", since the authentication methods that may be appropriate for a given authentication will vary over time, both because of the evolution of attacks on existing methods and the deployment of new authentication methods.

5. Privacy Considerations

The list of "amr" claim values returned in an ID Token reveals information about the way that the end-user authenticated to the identity provider. In some cases, this information may have privacy implications.

6. Security Considerations

The security considerations in OpenID Connect Core 1.0 [[OpenID.Core](#)], OAuth 2.0 [[RFC6749](#)], and the OAuth 2.0 Threat Model [[RFC6819](#)] apply to this specification.

As described in [Section 4](#), taking a dependence upon particular authentication methods may result in brittle systems, since the authentication methods that may be appropriate for a given authentication will vary over time.

7. IANA Considerations

7.1. Authentication Method Reference Values Registry

This specification establishes the IANA "Authentication Method Reference Values" registry for "amr" claim array element values. The registry records the Authentication Method Reference value and a reference to the specification that defines it. This specification registers the Authentication Method Reference values defined in [Section 2](#).

Values are registered on a Specification Required [[RFC5226](#)] basis after a three-week review period on the `jwt-reg-review@ietf.org` mailing list, on the advice of one or more Designated Experts. However, to allow for the allocation of values prior to publication, the Designated Experts may approve registration once they are satisfied that such a specification will be published.

Registration requests sent to the mailing list for review should use an appropriate subject (e.g., "Request to register Authentication Method Reference value: otp").

Within the review period, the Designated Experts will either approve or deny the registration request, communicating this decision to the review list and IANA. Denials should include an explanation and, if applicable, suggestions as to how to make the request successful. Registration requests that are undetermined for a period longer than 21 days can be brought to the IESG's attention (using the `iesg@ietf.org` mailing list) for resolution.

Criteria that should be applied by the Designated Experts includes determining whether the proposed registration duplicates existing functionality, whether it is likely to be of general applicability or whether it is useful only for a single application, whether the value is actually being used, and whether the registration description is clear.

IANA must only accept registry updates from the Designated Experts and should direct all requests for registration to the review mailing list.

It is suggested that the same Designated Experts evaluate these registration requests as those who evaluate registration requests for the IANA "JSON Web Token Claims" registry [[IANA.JWT.Claims](#)].

7.1.1.1. Registration Template

Authentication Method Reference Name:

The name requested (e.g., "otp"). Because a core goal of this specification is for the resulting representations to be compact, it is RECOMMENDED that the name be short -- that is, not to exceed 8 characters without a compelling reason to do so. This name is case sensitive. Names may not match other registered names in a case-insensitive manner unless the Designated Experts state that there is a compelling reason to allow an exception.

Authentication Method Reference Description:

Brief description of the Authentication Method Reference (e.g., "One-time password").

Change Controller:

For Standards Track RFCs, state "IESG". For others, give the name of the responsible party. Other details (e.g., postal address, email address, home page URI) may also be included.

Specification Document(s):

Reference to the document or documents that specify the parameter, preferably including URIs that can be used to retrieve copies of the documents. An indication of the relevant sections may also be included but is not required.

7.1.2. Initial Registry Contents

- o Authentication Method Reference Name: "eye"
- o Authentication Method Reference Description: Retina scan biometric
- o Change Controller: IESG
- o Specification Document(s): [Section 2](#) of [[this specification]]

- o Authentication Method Reference Name: "face"
- o Authentication Method Reference Description: Facial recognition
- o Change Controller: IESG
- o Specification Document(s): [Section 2](#) of [[this specification]]

- o Authentication Method Reference Name: "fpt"
- o Authentication Method Reference Description: Fingerprint biometric
- o Change Controller: IESG
- o Specification Document(s): [Section 2](#) of [[this specification]]

- o Authentication Method Reference Name: "geo"
- o Authentication Method Reference Description: Geolocation
- o Change Controller: IESG
- o Specification Document(s): [Section 2](#) of [[this specification]]

- o Authentication Method Reference Name: "hwk"
- o Authentication Method Reference Description: Proof-of-possession of a hardware-secured key
- o Change Controller: IESG
- o Specification Document(s): [Section 2](#) of [[this specification]]

- o Authentication Method Reference Name: "kba"
- o Authentication Method Reference Description: Knowledge-based authentication

- o Change Controller: IESG
- o Specification Document(s): [Section 2](#) of [[this specification]]

- o Authentication Method Reference Name: "mca"
- o Authentication Method Reference Description: Multiple-channel authentication
- o Change Controller: IESG
- o Specification Document(s): [Section 2](#) of [[this specification]]

- o Authentication Method Reference Name: "mfa"
- o Authentication Method Reference Description: Multiple-factor authentication
- o Change Controller: IESG
- o Specification Document(s): [Section 2](#) of [[this specification]]

- o Authentication Method Reference Name: "otp"
- o Authentication Method Reference Description: One-time password
- o Change Controller: IESG
- o Specification Document(s): [Section 2](#) of [[this specification]]

- o Authentication Method Reference Name: "pin"
- o Authentication Method Reference Description: Personal Identification Number or pattern
- o Change Controller: IESG
- o Specification Document(s): [Section 2](#) of [[this specification]]

- o Authentication Method Reference Name: "pwd"
- o Authentication Method Reference Description: Password-based authentication
- o Change Controller: IESG
- o Specification Document(s): [Section 2](#) of [[this specification]]

- o Authentication Method Reference Name: "rba"
- o Authentication Method Reference Description: Risk-based authentication
- o Change Controller: IESG
- o Specification Document(s): [Section 2](#) of [[this specification]]

- o Authentication Method Reference Name: "sc"
- o Authentication Method Reference Description: Smart card
- o Change Controller: IESG
- o Specification Document(s): [Section 2](#) of [[this specification]]

- o Authentication Method Reference Name: "sms"
- o Authentication Method Reference Description: Confirmation using SMS

- o Change Controller: IESG
- o Specification Document(s): [Section 2](#) of [[this specification]]

- o Authentication Method Reference Name: "swk"
- o Authentication Method Reference Description: Proof-of-possession of a software-secured key
- o Change Controller: IESG
- o Specification Document(s): [Section 2](#) of [[this specification]]

- o Authentication Method Reference Name: "tel"
- o Authentication Method Reference Description: Confirmation by telephone call
- o Change Controller: IESG
- o Specification Document(s): [Section 2](#) of [[this specification]]

- o Authentication Method Reference Name: "user"
- o Authentication Method Reference Description: User presence test
- o Change Controller: IESG
- o Specification Document(s): [Section 2](#) of [[this specification]]

- o Authentication Method Reference Name: "vbm"
- o Authentication Method Reference Description: Voice biometric
- o Change Controller: IESG
- o Specification Document(s): [Section 2](#) of [[this specification]]

- o Authentication Method Reference Name: "wia"
- o Authentication Method Reference Description: Windows integrated authentication
- o Change Controller: IESG
- o Specification Document(s): [Section 2](#) of [[this specification]]

[7.2.](#) OAuth Parameters Registration

This section registers the following parameter in the IANA "OAuth Parameters" registry [[IANA.OAuth.Parameters](#)] established in [RFC 6749](#) [[RFC6749](#)].

[7.2.1.](#) Registry Contents

- o Parameter name: "amr_values"
- o Parameter usage location: Authorization Request
- o Change controller: IESG
- o Specification document(s): [Section 3](#) of [[this specification]]
- o Related information: None

[8.](#) References

8.1. Normative References

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[Appendix A. Acknowledgements](#)

Caleb Baker participated in specifying the original set of "amr_values" values. John Bradley, Brian Campbell, William Denniss, and Nat Sakimura subsequently provided input on the set of "amr_values" values defined.

[Appendix B. Document History](#)

[[to be removed by the RFC editor before publication as an RFC]]

-04

- o Added the values "face" (facial recognition), "geo" (geolocation), "hwk" (proof-of-possession of a hardware-secured key), "pin" (Personal Identification Number or pattern), and "swk" (proof-of-possession of a software-secured key), and removed the value "pop" (proof-of-possession), based on input from members of the OpenID Foundation MODRNA working group.

-03

- o Added language about adding values based upon them being in actual use.

-02

- o Changed the identifier for risk-based authentication from "risk" to "rba", by popular acclaim.
- o Added "sc" (smart card).

-01

- o Added the values "mca" (multiple-channel authentication), "risk" (risk-based authentication), and "user" (user presence test).
- o Added citations in the definitions of Windows integrated authentication, knowledge-based authentication, risk-based authentication, multiple-factor authentication, one-time password, and proof-of-possession.
- o Alphabetized the values.
- o Added Tony Nadalin as an author and added acknowledgements.

-00

- o Defined the IANA "Authentication Method Reference Values" registry.

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