N. Aillery
C. Marais
Orange
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Versatile, Synchronous and Asynchronous, JSON Web Token (JWT) Assertion Profile for OAuth 2.0 Authorization Grants
draft-oauth-versatile-jwt-profile-01

Abstract

This specification defines the use of a JSON Web Token (JWT) Bearer Token as a mean for requesting an OAuth 2.0 access token in a versatile way, synchronous and asynchronous. This specification is a profile of [RFC6749] and an extension to [RFC7523].

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1. Introduction

1.1. Notational Conventions

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 RFC 2119 [RFC2119].

Unless otherwise noted, all the protocol parameter names and values are case sensitive.

1.2. Terminology

All terms are as defined in the following specifications: "The OAuth 2.0 Authorization Framework" [RFC6749], the OAuth Assertion Framework [RFC7521], [RFC7523], and "JSON Web Token (JWT)" [JWT].

1.3. Overview

The versatile JWT profile enables a Client to get an Access Token on the token endpoint. The versatile JWT profile is a profile to [RFC6749] that extends the synchronous JWT profile, defined in [RFC7523]. The versatile JWT profile enables the OP to respond either in a synchronous or asyncronous way, depending on the grant approval process.

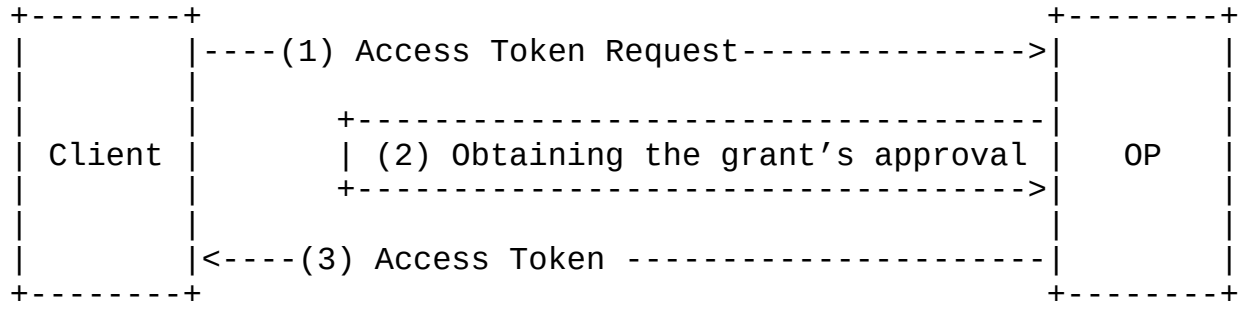
The versatile JWT profile, in abstract, follows the following steps.

1. The Client sends a Access Token Request to the OpenID Provider (OP).

2. The OP approves the grant (potentially involving the Resource Owner in an out of band mode).

3. The OP responds to the Client with an Access Token.

These steps are illustrated in the following diagram:



In order to obtain the grant's approval, the OP may reuse a previously approved grant. It may also have some interactions with other parties. This specification does not define the way a grant is approved.

In order to retrieve the Access Token, three flows are possible:

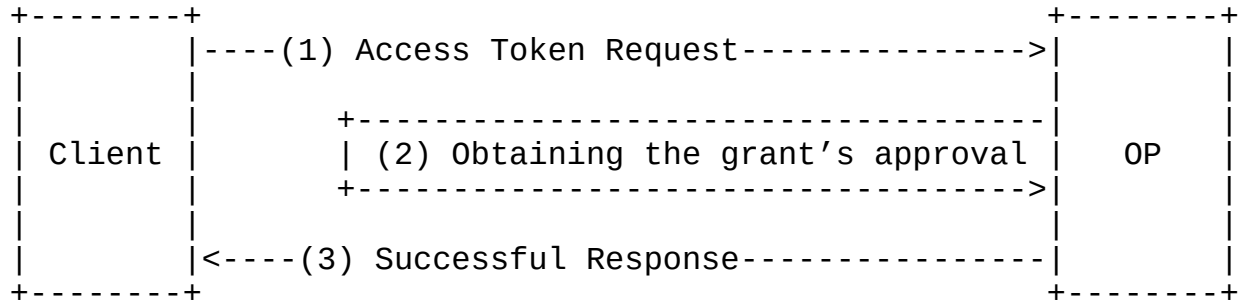
Synchronous flow: The Client gets the Access Token in the initial response. Refer to Section 1.3.1 for more details.

Asynchronous Poll flow: The Client regularly calls the "Token Endpoint". Refer to Section 1.3.2 for more details.

Asynchronous Push flow: The Client is notified on the "Client Notification Endpoint". Refer to Section 1.3.3 for more details.

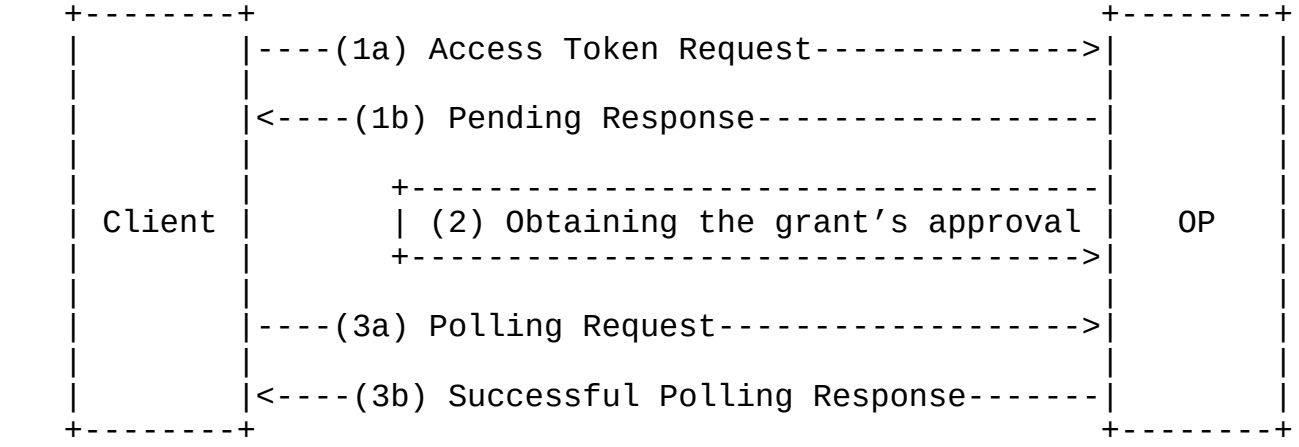
1.3.1. Synchronous flow

In this flow, the Client gets the Access Token in the initial response.



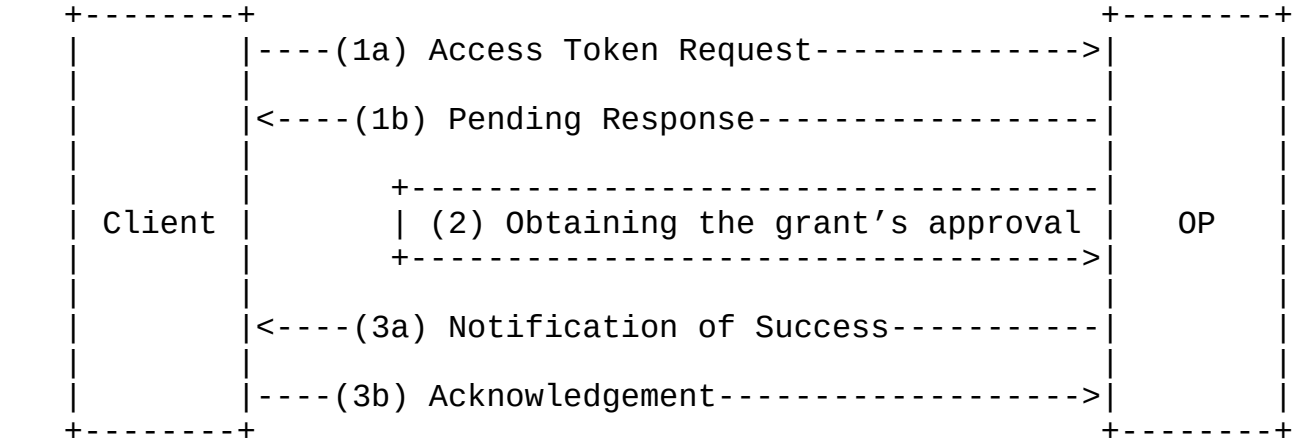
1.3.2. Asynchronous Poll flow

In this flow, the Client regularly calls the "Token Endpoint".



1.3.3. Asynchronous Push flow

In this flow, the Client is notified on the "Client Notification Endpoint".



2. Client registration

If the Client wants to use the Asynchrounous Push mode (Section 5), it MUST register its "client_notification_endpoint". The "client_notification_endpoint" is a callback URL on the Client. If the client does not use the Asynchrounous Push mode, it MUST obtain the result by using the Asynchrounous Poll mode (Section 4). Both mechanisms are mutual exclusive, i.e. a given "client_id" can only use one of these mechanisms.

3. Initial Access Token Request

3.1. Access Token Request

The initial Access Token Request to the token endpoint is defined in Section 2.1 of [RFC7523]. This specification proposes a specific "grant_type" and an additional parameter "client_notification_token":

grant_type MANDATORY. In order to enable an asynchronous mode, the "grant_type" value MUST be set to "urn:ietf:params:oauth:grant-type:jwt-bearer:versatile".

client_notification_token MANDATORY if the Client uses the Asynchronous Push mode described in Section 5. MUST NOT be used otherwise. The "client_notification_token" is an opaque token issued by the Client. The Client SHOULD use a random value with a level of entropy high enough to cover its security requirements. The "client_notification_token" is a Bearer Token used by the Client to authorize the OP when the OP sends the Token Response to the Client Notification Endpoint. The "client_notification_token" value is a case sensitive string.

The following is a non-normative example of an initial Access Token Request.

```
POST /token.oauth2 HTTP/1.1
Host: example.as.com
Authorization: Basic czZCaGRSa3F0MzpnWDFmQmF0M2JW
Content-Type: application/x-www-form-urlencoded

grant_type=urn%3Aietf%3Aparams%3Aoauth%3Agrant-type
   %3Ajwt-bearer%3Aversatile
&assertion=eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.
   ZhwP[...omitted for brevity...].
   paC4[...omitted for brevity...]
&scope=scope_a%20scope_b
&client_notification_token=vO4n2DAeRrcWE0VAlo4I
```

3.2. Access Token Responses

If the grant is approved, the token endpoint responds with a success response defined in Section 3.2.1; if the grant has not been approved yet, the token endpoint responds with a pending response defined in Section 3.2.2; otherwise it responds with an error, as defined in Section 3.2.3.

3.2.1. Successful Response

If the grant has been approved, the token endpoint responds with a success response defined in Section 5.1 of [RFC6749].

The following is a non-normative example of a Successful Response.

```
HTTP/1.1 200 OK
Content-Type: application/json
Cache-Control: no-store
Pragma: no-cache

{
    "access_token": "SlAV32hkKG",
    "token_type": "Bearer",
    "refresh_token": "8xLOxBtZp8",
    "expires_in": 3600
}
```

3.2.2. Pending Response

If the grant has not been aproved yet, the token endpoint responds with a HTTP 202 Accepted response. The response body contains JSON structure, with the following attributes.

transaction_id MANDATORY. The "transaction_id" attribute contains the "transaction_id" value. The "transaction_id" value is used to identify the transaction in the asynchronous modes defined in Section 4 and Section 5. The "transaction_id" value is a case sensitive string

expires_in OPTIONAL. The "expires_in" attribute contains the "expires_in" value. The "expires_in" value is lifetime in seconds of the "transaction_id". The "expires_in" value is an integer.

interval OPTIONAL. The "interval" attribute contains the "interval" value. The "interval" value is the minimum amount of time in seconds that the client SHOULD wait between polling requests to the token endpoint. The "interval" value is an integer.

The following is a non-normative example of a Pending Response.

```
HTTP/1.1 202 Accepted
Content-Type: application/json

{
    "transaction_id": "b0f9f8022e344f9984dcc7d3d4d4",
    "expires_in": 1800,
    "interval": 5
}
```

3.2.3. Error Response

If the Access Token Request can not be processed, the token endpoint responds with an error, as defined in Section 5.2 of [RFC6749].

The following is a non-normative example of an Error Response.

```
HTTP/1.1 400 Bad Request
Content-Type: application/json
Cache-Control: no-store

{
   "error":"invalid_grant",
   "error_description":"Audience validation failed"
}
```

4. Asynchronous Poll mode

In order to detect that a pending grant has been approved, the Client can poll the token endpoint. If the grant has been approved, the token endpoint reponds in the response. Else, the token endpoint responds with HTTP 400 Bad Request.

A Client configured with a "client_notification_endpoint" MUST NOT send a Polling Request.

4.1. Polling Request

The Polling Request to the token endpoint is defined in Section 2.1 of [RFC7523]. This specification proposes a specific "grant_type", an additional parameter "transaction_id" and the limitation to those two attributes:

grant_type MANDATORY. In order to indicate a Polling Request, the "grant_type" value MUST be set to "urn:ietf:params:oauth:grant-type:jwt-bearer:versatile:polling".

transaction_id MANDATORY. The "transaction_id" value contains the "transaction_id" received from the Pending Response (Section 3.2.2). The "transaction_id" value is a case sensitive string.

The parameters "grant_type" and "transaction_id" are the only attributes that the token endpoint SHOULD consider in a Polling Request.

The following is a non-normative example of an Polling Request.

```
POST /token.oauth2 HTTP/1.1
Host: example.as.com
Authorization: Basic czZCaGRSa3F0MzpnWDFmQmF0M2JW
Content-Type: application/x-www-form-urlencoded

grant_type=urn%3Aietf%3Aparams%3Aoauth%3Agrant-type%3Ajwt-bearer
   %3Aversatile%3Apolling
&transaction_id=b0f9f8022e344f9984dcc7d3d4d4
```

4.2. Polling Responses

If the grant has been approved, the token endpoint responds with a Successful Polling Response, defined in Section 4.2.1. Else, the token endpoint responds with an Error Polling Response defined in Section 4.2.2.

4.2.1. Successful Polling Response

If the grant has been approved, the token endpoint responds with a success response defined in Section 5.1 of [RFC6749].

The following is a non-normative example of a Successful Polling Response.

```
HTTP/1.1 200 OK
Content-Type: application/json
Cache-Control: no-store
Pragma: no-cache

{
    "access_token": "SlAV32hkKG",
    "token_type": "Bearer",
    "refresh_token": "8xLOxBtZp8",
    "expires_in": 3600
}
```

4.2.2. Error Polling Response

If the grant has not been approved yet or if the Polling Request can not be processed, the token endpoint responds with an error, as defined in Section 5.2 of [RFC6749], with the following additional error codes, specific for the versatile JWT profile:

authorization_pending The Access Token Request is still pending as the authorization has not been gained yet. The client should repeat the Access Token Request to the token endpoint.

slow_down The client is polling too quickly and should back off at a reasonable rate.

expired_transaction The "transaction_id" has expired. The client will need to make a new Access Token Request (Section 3.1).

invalid_transaction_id The Client sent a polling request for a "transaction_id" that does not exist or is not valid for the requesting Client.

forbidden The Client sent a Polling Request whereas it is configured with a "client_notification_endpoint".

The error codes "authorization_pending" and "slow_down" are considered soft errors. The client should continue to poll the token endpoint by repeating the Polling Request (Section 4.1) when receiving soft errors, increasing the time between polls if a "slow_down" error is received. Other error codes are considered hard errors; the client should stop polling and react accordingly. The interval at which the client polls MUST NOT be more frequent than the "interval" parameter returned in the Pending Response (Section 3.2.2).

The following is a non-normative example of an Error Polling Response.

```
HTTP/1.1 400 Bad Request
Content-Type: application/json
Cache-Control: no-store
{
   "error":"invalid_transaction_id",
   "error_description":"The transaction_id is not valid."
}
```

5. Asynchronous Push mode

If the Client registered a "client_notification_endpoint", the OP MUST notify the Client when a pending grant has been approved or an error occured. The Notification is sent to the Client using a HTTP POST on the Client Notification Endpoint.

Communication with the Client Notification Endpoint MUST utilize TLS.

A Client configured with a "client_notification_endpoint" MUST wait for a Notification on its "client_notification_endpoint".

5.1. Notification of Success

The OP sends the Notification of Success to the Client using HTTP POST.

The HTTP POST request MUST contain the following header:

Authorization MANDATORY. The "Authorization" value contains the "client_notification_token" specified in the Access Token Request and used as a [RFC6750] Bearer Token. The "Authorization" value is a case sensitive string.

A Notification of Success contains a JSON object, as defined in Section 5.1 of [RFC6749], with the additional attribute "transaction_id".

transaction_id MANDATORY. The "transaction_id" links the Notification with a Pending Response (Section 3.2.2).

The following is a non-normative example of a Notification of Success.

```
POST /notification  HTTP/1.1
Host: example.client.com
Authorization: Bearer vO4n2DAeRrcWE0VAlo4I
Content-Type: application/json

{
    "transaction_id": "b0f9f8022e344f9984dcc7d3d4d4",
    "access_token": "SlAV32hkKG",
    "token_type": "Bearer",
    "refresh_token":  "8xLOxBtZp8",
    "expires_in": 3600
}
```

5.2. Notification of Error

The OP sends the Notification of Error to the Client using HTTP POST.

The HTTP POST request MUST contain the following header:

Authorization MANDATORY. The "Authorization" value contains the "client_notification_token" specified in the Access Token Request and used as a [RFC6750] Bearer Token. The "Authorization" value is a case sensitive string.

A Notification of Error contains a JSON object, as defined in Section 5.2 of [RFC6749], with the additional attribute "transaction_id".

transaction_id MANDATORY. The "transaction_id" links the Notification with a Pending Response (Section 3.2.2).

The following is a non-normative example of a Notification of Error.

```
POST /notification  HTTP/1.1
Host: example.client.com
Authorization: Bearer vO4n2DAeRrcWE0VAlo4I
Content-Type: application/json

{
   "transaction_id": "b0f9f8022e344f9984dcc7d3d4d4",
   "error":"invalid_grant",
   "error_description":"Audience validation failed"
}
```

5.3. Processing the Authorization

The "Authorization" value is a "client_notification_token". This "client_notification_token" enables to retrieve the "transaction_id" received in the Pending Response (Section 3.2.2). The "transaction_id" in the Notification MUST match with the "transaction_id" received in the Pending Response (Section 3.2.2).

5.4. Acknowledgement

The acknowledgement MUST be a HTTP 200 OK. This HTTP response SHOULD be ignored by the OP.

The following is a non-normative example of an Acknowledgement.

```
HTTP/1.1 200 OK
```

6. Interoperability Considerations

For Interoperability Considerations, please refer to:

- Section 7 of [RFC7521]
- Section 5 of [RFC7523]

7. Security Considerations

For Security Considerations, please refer to:

- Section 10 of [RFC6749]
- Section 8 of [RFC7521]
- Section 6 of [RFC7523]
- Section 11 of [JWT]

8. Privacy Considerations

For Privacy Considerations, please refer to:

- Section 7 of [RFC7523]
- Section 12 of [JWT]

9. IANA Considerations

9.1. Sub-Namespace Registration of urn:ietf:params:oauth:grant-type:jwt-bearer:versatile

This section registers the value "grant-type:jwt-bearer:versatile" in the IANA "OAuth URI" registry established by "An IETF URN Sub-Namespace for OAuth" [RFC6755].

- URN: urn:ietf:params:oauth:grant-type:jwt-bearer:versatile
- Common Name: Versatile JWT Bearer Token Grant Type Profile for OAuth 2.0
- Change Controller: IESG
- Specification Document: Section 3.1 of this specification

9.2. Sub-Namespace Registration of urn:ietf:params:oauth:grant-type:jwt-bearer:versatile:polling

This section registers the value "grant-type:jwt-bearer:versatile:polling" in the IANA "OAuth URI" registry established by "An IETF URN Sub-Namespace for OAuth" [RFC6755].

- URN: urn:ietf:params:oauth:grant-type:jwt-bearer:versatile:polling
- Common Name: Polling for Versatile JWT Bearer Token Profile for OAuth 2.0
- Change Controller: IESG
- Specification Document: Section 4.1 of this specification

10. References

10.1. Normative References

[JWT] Jones, M., Bradley, J., and N. Sakimura, "JSON Web Token (JWT)", RFC 7519, May 2015, <http://www.rfc-editor.org/info/rfc7519>.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <http://www.rfc-editor.org/info/rfc2119>.

[RFC6749] Hardt, D., Ed., "The OAuth 2.0 Authorization Framework", RFC 6749, DOI 10.17487/RFC6749, October 2012, <http://www.rfc-editor.org/info/rfc6749>.

[RFC6750] Jones, M. and D. Hardt, "The OAuth 2.0 Authorization Framework: Bearer Token Usage", RFC 6750, DOI 10.17487/RFC6750, October 2012, <http://www.rfc-editor.org/info/rfc6750>.

[RFC7521] Campbell, B., Mortimore, C., Jones, M., and Y. Goland, "Assertion Framework for OAuth 2.0 Client Authentication and Authorization Grants", RFC 7521, May 2015, <http://www.rfc-editor.org/info/rfc7521>.

[RFC7523] Jones, M., Campbell, B., and C. Mortimore, "JSON Web Token (JWT) Profile for OAuth 2.0 Client Authentication and Authorization Grants", RFC 7523, DOI 10.17487/RFC7523, May 2015, <http://www.rfc-editor.org/info/rfc7523>.

10.2. Informative References

[RFC6755] Campbell, B. and H. Tschofenig, "An IETF URN Sub-Namespace for OAuth", RFC 6755, DOI 10.17487/RFC6755, October 2012, <http://www.rfc-editor.org/info/rfc6755>.

Acknowledgements

Authors' Addresses

Nicolas Aillery
Orange

EMail: nicolas.aillery@orange.com

Charles Marais
Orange

EMail: charles.marais@orange.com