

OAuth Working Group	N. Sakimura, Ed.
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## Request by JWS ver.1.0 for OAuth 2.0

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### Abstract

The authorization request in OAuth 2.0 utilizes query parameter serialization. This specification defines the authorization request using JWT serialization. The request is sent through request parameter or by reference through request\_uri parameter that points to the JWT, allowing the request to be optionally signed and encrypted.

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## 1. Introduction

The parameters `request` and `request_uri` are introduced as additional authorization request parameters for the [OAuth 2.0](#) [RFC6749] flows. The `request` parameter is a JSON Web Token (JWT) [RFC7519] whose JWT Claims Set holds the JSON encoded OAuth 2.0 authorization request parameters. The [RFC7519] can be passed to the authorization endpoint by reference, in which case the parameter `request_uri` is used instead of the `request`.

Using [RFC7519] as the request encoding instead of query parameters has several advantages:

1. The request may be signed so that integrity check may be implemented. If a suitable algorithm is used for the signing, then non-repudiation property may be obtained in addition.
2. The request may be encrypted so that end-to-end confidentiality may be obtained even if in the case TLS connection is terminated at a gateway or a similar device.

There are a few cases that request by reference are useful such as:

1. When it is detected that the User Agent does not support long URLs: Some extensions may extend the URL. For example, the client might want to send a public key with the request.
2. Static signature: The client may make a signed Request Object and put it on the client. This may just be done by a client utility or other process, so that the private key does not have to reside on the client, simplifying programming.
3. When the server wants the requests to be cache-able: The `request_uri` may include a sha256 hash of the file, as defined in [FIPS180-2](#) [FIPS180-2], the server knows if the file has changed without fetching it, so it does not have to re-fetch a same file, which is a win as well.
4. When the client wants to simplify the implementation without compromising the security. If the request parameters go through the Browser, they may be tampered in the browser even if TLS was used. This implies we need to have signature on the request as well. However, if HTTPS `request_uri` was used, it is not going to be tampered, thus we now do not have to sign the request. This simplifies the implementation.

This capability is in use by OpenID Connect [\[openid\\_ab\]](#).

### 1.1. Requirements Language

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].

## 2. Terminology

For the purposes of this specification, the following terms and definitions apply.

### 2.1. Request Object

[JWT](#) [RFC7519] that holds OAuth 2.0 authorization requests as JWT Claims Set

### 2.2. Request Object URI

Absolute URI from which the [Request Object](#) [request\_object] can be obtained

## 3. Request Object

A [Request Object](#) [request\_object] is used to provide authorization request parameters for OAuth 2.0 authorization request. It contains [OAuth 2.0](#) [RFC6749] authorization request parameters including extension parameters. It is a [JSON Web Signature \(JWS\)](#) [RFC7515] signed [JWT](#) [RFC7519]. The parameters are included as the top-level members of [JSON](#) [RFC7159]. Parameter names and string values MUST be included as JSON strings. Numerical values MUST be included as JSON numbers. It MAY include any extension parameters. This [JSON](#) [RFC7159] constitutes the [\[RFC7519\]](#) Claims Set.

The Request Object MAY be signed or unsigned (plaintext). When it is plaintext, this is indicated by use of the none algorithm [\[RFC7518\]](#) in the JWS header. If signed, the Authorization Request Object SHOULD contain the Claims iss (issuer) and aud (audience) as members, with their semantics being the same as defined in the [JWT](#) [RFC7519] specification.

The Request Object MAY also be encrypted using [JWE](#) [RFC7516] after signing, with nesting performed in the same manner as specified for JWTs [\[RFC7519\]](#). The Authorization Request Object MAY alternatively be sent by reference using request\_uri parameter.

REQUIRED OAuth 2.0 Authorization Request parameters that are not included in the Request Object MUST be sent as a query parameter. If a required parameter is not present in neither the query parameter nor the Request Object, it forms a malformed request.

If the parameter exists in both the query string and the Authorization Request Object, they MUST exactly match.

Following is the example of the JSON that constitutes the [\[RFC7519\]](#) Claims Set.

```
{
  "redirect_url":"https://example.com/rp/endpoint_url",
  "cliend_id":"http://example.com/rp/"
}
```

The following is a non-normative example of a [\[RFC7519\]](#) encoded authorization request object. It includes extension variables such as "nonce", "userinfo", and "id\_token". Note that the line wraps within the values are for display purpose only:

JWT algorithm = HS256

HMAC HASH Key = 'aaa'

JSON Encoded Header = '{"alg":"HS256","typ":"JWT"}'

```
JSON Encoded Payload = {"response_type":"code id_token",
  "client_id":"s6BhdRkqt3",
  "redirect_uri":"https://client.example.com/cb",
  "scope":"openid profile",
  "state":"af0ifjsldkj",
  "nonce":"n-0S6_WzA2Mj",
  "userinfo":{"claims":{"name":null,"nickname":{"optional":true},
    "email":null,"verified":null,
    "picture":{"optional":true}},"format":"signed"},
  "id_token":{"max_age":86400,"iso29115":"2"}}
```

```
JWT = eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJyZXNwb25zZV90eXBlljoiY29kZSBpZl90b2tlbilsImNsaWVudF9pZCI6ImM2QmhhkUmtxdDMiLCJyZWRpcmVjdF91cmkiOiJodHRwczpcL1wvY2xpZW50LmV4YW1wbGUuY29tXC9jYiIsInNjb3BlIjoib3BlbmlkIHB5b2ZpbGUiLCJzdGF0ZSI6ImFmMGImanNsZGtqliwidXNlcmluZm8iOnsiY2xhaW1zIjpw71m5hbWUiOm51bGwslm5pY2tuYW11Ijpw71m9wdGlvbmFsljpw0cnVlfiSviZW1haWwiOm51bGwslm51bGwslm5pY2tuYW11Ijpw71m9wdGlvbmFsljpw0cnVlfiX0slmZvcmlhdCI6ImNpZ25lZCJ9LCJpZl90b2tlbil6eyJtYXhfYWdlIjo4NjQwMCwiaXNvMjkxMTUiOiilyIn19.2OiqRgrbrHkA1FZ5p_7bc_RSdTbH-wo_Agk-ZRpD3wY
```

## 4. Request Object URI

Instead of sending the Request Object in an OAuth 2.0 authorization request directly, this specification allows it to be obtained from the Request Object URI. Using this method has an advantage of reducing the request size, enabling the caching of the Request Object, and generally not requiring integrity protection through a cryptographic operation on the Request Object if the channel itself is protected.

The Request Object URI is sent as a part of the OAuth Authorization Request as the value for the parameter called `request_uri`. How the Request Object is registered at Request Object URI is out of scope of this specification, but it MUST be done in a protected channel.

NOTE: the Request Object MAY be registered at the Authorization Server at the client registration time.

When the Authorization Server obtains the Request Object from Request Object URI, it MUST do so over a protected channel. If it is obtained from a remote server, it SHOULD use either HTTP over TLS 1.2 as defined in [\[RFC5246\]](#) AND/OR [\[RFC7515\]](#) with the algorithm considered appropriate at the time.

When sending the request by `request_uri`, the client MAY provide the sha256 hash as defined in [FIPS180-2](#) [FIPS180-2] of the Request Object as the fragment to it to assist the cache utilization decision of the Authorization Server.

## 5. Authorization Request

The client constructs the authorization request URI by adding the following parameters to the query component of the authorization endpoint URI using the application/x-www-form-urlencoded format:

`request`

REQUIRED unless `request_uri` is specified. The [Request Object](#) [aro] that holds authorization request parameters stated in the section 4 of [OAuth 2.0](#) [RFC6749].

`request_uri`

REQUIRED unless `request` is specified. The absolute URL that points to the [Request Object](#) [aro] that holds authorization request parameters stated in the section 4 of [OAuth 2.0](#) [RFC6749].

`state`

RECOMMENDED. [OAuth 2.0](#) [RFC6749] state.

The client directs the resource owner to the constructed URI using an HTTP redirection response, or by other means available to it via the user-agent.

For example, the client directs the end-user's user-agent to make the following HTTPS request (line breaks are for display purposes only):

```
GET /authorize?request_uri=https%3A%2F%2Fclient%2Eexample%2Ecom%2Fcb HTTP/1.1
Host: server.example.com
```

The authorization request object MAY be signed AND/OR encrypted.

Upon receipt of request\_uri in the request, the authorization server MUST send a GET request to the request\_uri to retrieve the authorization request object unless it is already cached at the Authorization Server.

If the response was signed AND/OR encrypted, it has to be decoded accordingly before being processed.

Then, the Authorization Server MUST reconstruct the complete client request from the original HTTP request and the content of the request object. Then, the process continues as described in Section 3 of [OAuth 2.0 \[RFC6749\]](#) .

## 6. Authorization Server Response

Authorization Server Response is created and sent to the client as in Section 4 of [OAuth 2.0 \[RFC6749\]](#) .

In addition, this document defines additional 'error' values as follows:

invalid\_request\_uri

The provided request\_uri was not available.

invalid\_request\_format

The Request Object format was invalid.

invalid\_request\_params

The parameter set provided in the Request Object was invalid.

## 7. IANA Considerations

This document registers following error strings to the OAuth Error Registry.

invalid\_request\_uri

The provided request\_uri was not available.

invalid\_request\_format

The Request Object format was invalid.

invalid\_request\_params

The parameter set provided in the Request Object was invalid.

## 8. Security Considerations

In addition to the all [the security considerations discussed in OAuth 2.0 \[RFC6819\]](#), the following security considerations SHOULD be taken into account.

When sending the authorization request object through request parameter, it SHOULD be signed with then considered appropriate algorithm using [\[RFC7515\]](#). The alg=none SHOULD NOT be used in such a case.

If the request object contains personally identifiable or sensitive information, the "request\_uri" MUST be of one-time use and MUST have large enough entropy deemed necessary with applicable security policy. For higher security requirement, using [\[RFC7516\]](#) is strongly recommended.

## 9. Acknowledgements

Following people contributed to creating this document through [the OpenID Connect 1.0](#) [openid\_ab].

Breno de Medeiros (Google), Hideki Nara (TACT), John Bradley ( Ping Identity) <author>, Nat Sakimura (NRI) <author/editor>, Ryo Itou (Yahoo! Japan), George Fletcher (AOL), Justin Richer (MITRE), Edmund Jay (Illumila), (add yourself).

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## 10. Revision History

-02

- Now that they are RFCs, replaced JWS, JWE, etc. with RFC numbers.

-01

- Copy Edits.

## 11. References

### 11.1. Normative References

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## Authors' Addresses

**Nat Sakimura** (editor)

Nomura Research Institute  
1-6-5 Marunouchi, Marunouchi Kitaguchi Bldg.  
Chiyoda-ku, Tokyo 100-0005  
Japan  
Phone: +81-3-5533-2111  
EMail: [n-sakimura@nri.co.jp](mailto:n-sakimura@nri.co.jp)  
URI: <http://nat.sakimura.org/>

**John Bradley**

Ping Identity  
Casilla 177, Sucursal Talagante  
Talagante, RM  
Chile  
Phone: +44 20 8133 3718  
EMail: [ve7jtb@ve7jtb.com](mailto:ve7jtb@ve7jtb.com)  
URI: <http://www.thread-safe.com/>