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Third-Party Authentication for Session Initiation Protocol (SIP) draft-ietf-sipcore-sip-authn-01

Abstract

This document defines an authentication mechanism for SIP, that is based on the OAuth 2.0 and OpenID Connect Core 1.0 specifications, to enable the delegation of the user authentication to a dedicated third-party IdP entity that is separate from the SIP network elements that provide the SIP service.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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This Internet-Draft will expire on March 30, 2018.

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1. Introduction

The SIP protocol [RFC3261] uses the framework used by the HTTP protocol for authenticating users, which is a simple challenge-response authentication mechanism that allows a server to challenge a client request and allows a client to provide authentication information in response to that challenge.

OAuth 2.0 [RFC6749] defines a token based authorization framework to allow clients to access resources on behalf of their user.

The OpenID Connect 1.0 [OPENID] specifications defines a simple identity layer on top of the OAuth 2.0 protocol, which enables clients to verify the identity of the user based on the authentication performed by a dedicated IdP entity, as well as to obtain basic profile information about the user.

This document defines an authentication mechanism for SIP, that is based on the OAuth 2.0 and OpenID Connect Core 1.0 specifications, to enable the delegation of the user authentication to a dedicated third-party IdP entity that is separate from the SIP network elements that provide the SIP service.

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. Roles

resource owner

An entity capable of granting access to a protected resource. When the resource owner is a person, it is referred to as an end-user.

In a typical SIP network, it is the management element in the system that acts as a resource owner.

resource server

The server hosting the protected resources or services, capable of accepting and responding to protected resource and services requests using access tokens.

OAuth 2.0 client

An application making protected resource requests on behalf of the resource owner and with its authorization. The term "client" does not imply any particular implementation characteristics (e.g., whether the application executes on a server, a desktop, or other devices).

SIP client

An application making requests to access SIP services on behalf of the end-user.

authorization server

The server issuing tokens to the OAuth 2.0 client or SIP Client after successfully authenticating the resource owner and obtaining authorization.

Identity Provider (IdP)

This definition is borrowed from [MITKB]

"IdP (Identity Provider), is a system that creates, maintains, and manages identity information for principals (users, services, or systems) and provides principal authentication to other service providers (applications) within a federation or distributed network. It is a trusted third party that can be relied upon by users and servers when users and servers are establishing a dialog that must be authenticated. The IdP sends an attribute assertion containing trusted information about the user to the SP".

1.3. ID Token

ID token, as defined in the OpenID document, is a security token that contains claims about the authentication of an end-user by an authorization server.

1.4. SIP User Agent Types

[RFC6749] defines two types of clients, confidential and public, that apply to the SIP User Agents.

- Confidential User Agent: is a SIP UA that is capable of maintaining the confidentiality of the user credentials and any tokens obtained using these user credentials.

- Public User Agent: is a SIP UA that is incapable of maintainings the confidentiality of the user credentials and any obtained tokens.

1.5. Authentication Types

There are two types of user authentications in SIP:

- Proxy-to-User: which allows a server that is providing a service to authenticate the identity of a user before providing the service.

- User-to-User: which allows a user receiving a request to authenticate the identity of the remote user before processing the request.

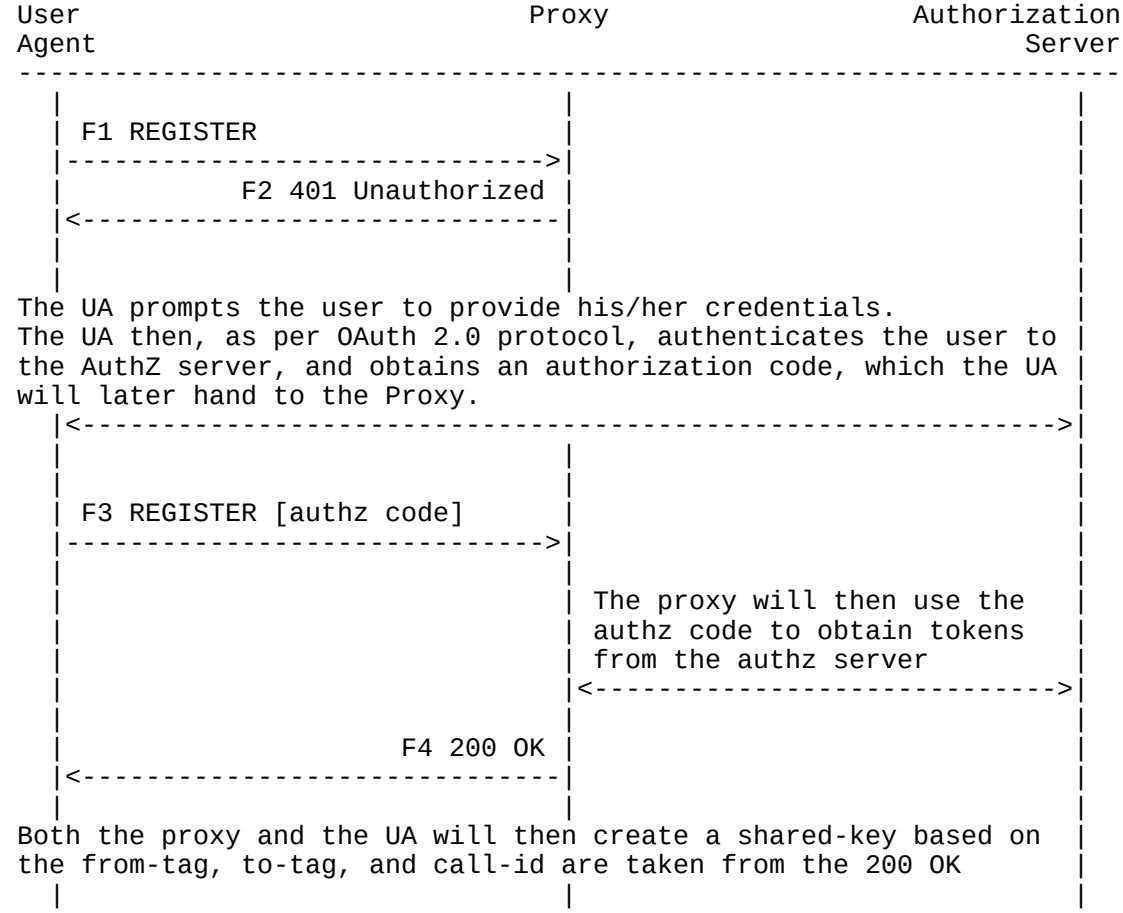
The mechanism defined in this document addresses the proxy-to-user authentication only. For user-to-user authentication refer to the mechanism defined in [STIR].

2. Authentication using the Authorization Code Flow

Authorization Code Flow is used by the SIP UA to authenticate to a third-party IdP entity to obtain an authorization code that would be later used by the SIP Proxy to obtain tokens to allow the SIP UA to register and get service from the SIP network.

2.1. Public UA with Rich UI

The following figure provides a high level view of flow of messages for the user authentication using a Public UA that has a rich UI that would prompt the user for his credentials:



The UA initially sends a REGISTER request (F1) without providing any credentials. The proxy redirects the UA by responding with 401 Unauthorized (F2).

The UA will then contact the Authorization Server and obtain an authorization code to be used with the SIP proxy.

The UA then retries the request (F3) and includes the authorization code in the body of the request.

The proxy then contacts the Authorization Server and exchanges the authorization code for tokens. If the proxy is successful in exchanging the authorization code with the tokens, the proxy then replies with 200 OK to complete the registration process, and locally generates the shared-key with the UA for this user.

When the UA receives the 200 OK, it will follow the same procedure used by the proxy and calculate its shared-key locally.

2.1.1. Registration

The UA initiates the process by sending a REGISTER request (F1) to the proxy. The proxy will redirect the UA to the Authorization Server by responding with 401 Unauthorized (F2) that includes the address of the Authorization Server in the form of an HTTP URI in a Location header field, as defined in RFC7231, section 7.1.2.

[[OPEN ISSUE]] The above text suggests defining a new Location header to carry the authorization server URL. Is that reasonable? other ideas?

The UA will then contact the Authorization Server and obtain an authorization code to be used with the SIP proxy. The method used by the UA to obtain the code is out of scope for this document.

The UA will then send a new REGISTER request (F3) and include the authorization code in the body of the request with the following parameters:

grant_type (REQUIRED)

Value MUST be set to "authorization_code".

code (REQUIRED)

The authorization code received from the authorization server.

The proxy then contacts the Authorization Server and exchanges the authorization code for access token, refresh token, and maybe ID token. The method used by the UA to obtain the tokens is out of scope for this document.

If the proxy is successful in exchanging the authorization code with the tokens, the proxy then responds with 200 OK (F4) to the UA to complete the registration process.

2.1.2. Shared-Key

After sending the 200 OK to the UA to complete the registration process, the proxy and the UA use the HMAC-SHA256(key, message) to calculates the shared-key associated with this user as follows:

key

The authorization code obtained from the Authorization Server.

message

The concatenation of the ’from-tag’, ’to-tag’, and ’call-id’ of the 200 OK that completes the registration process.

This shared-key will be used to allow the UA to re-register to the proxy, in case of a connection loss to the proxy, without the need to obtain a new code or prompt the user for his credentials.

2.1.3. Re-Registration Requests

When the UA loses its connection to the proxy and it wants to send a new registration request to the proxy, the UA will send a new REGISTER request and include the proof-of-possession (pop) of the shared-key in the body of the request:

grant_type (REQUIRED)

Value MUST be set to "proof_of_possession".

pop (REQUIRED)

The pop calculated the first time the UA registered with the proxy.

The pop is calculated using the shared-key as follows:

```
pop = HMAC-SHA256(shared-key, digest-string)
```

See rfc4474, section 9, for the SIP headers to hash to create digest-string.

[[OPEN ISSUE]] Is there any issue with using digest-string as defined in RFC4474?

[[OPEN ISSUE]] Should pop not be limited to re-registration, and instead be used with all subsequent requests? If the answer is yes, a new header should be defined to carry the pop instead of carrying it in the payload.

2.1.4. Token Refresh

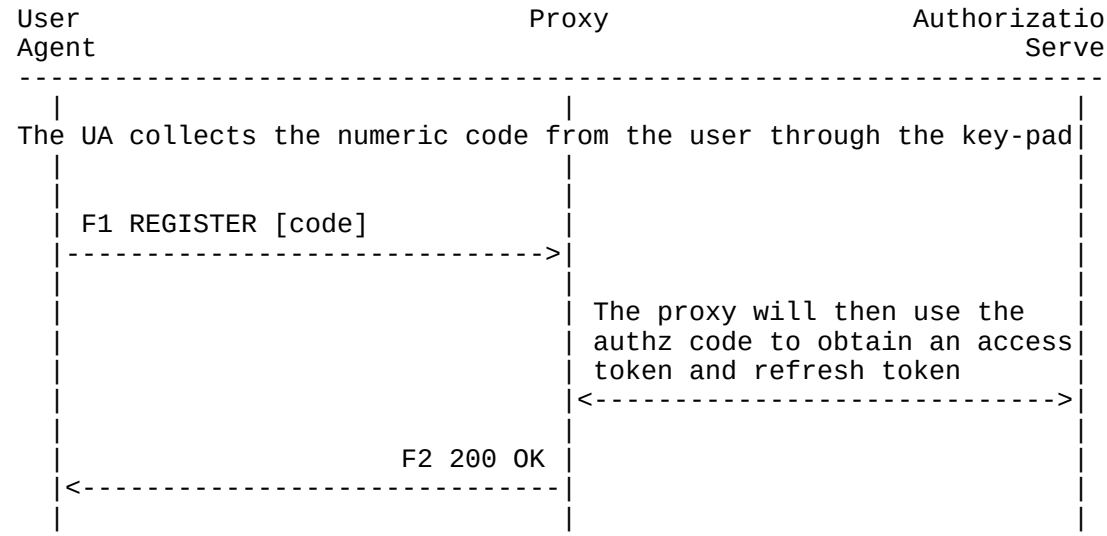
Before the tokens expire, the proxy makes a refresh request to the Authorization Server to try to obtain new tokens. The method used by the UA to refresh the tokens is out of scope for this document.

If the proxy fails to refresh the tokens, then it MUST challenge the next request from the UA, and as a result the UA MUST go through the authorization process again.

2.2. Public UA with Limited UI

The following figure provides a high level view of flow of messages for the user authentication using a Public UA that has a limited UI that cannot prompt the user for his credentials.

This use case requires the user to use his browser to authenticate to the Authorization Server and obtain a short lived numeric authorization code that would be used by the phone to register with the SIP proxy.



2.2.1. Registration

The UA will send a REGISTER request (F1) and include the code in the body of the request with the following parameters:

grant_type (REQUIRED)

Value MUST be set to "authorization_code".

code (REQUIRED)

The code received from the authorization server through the browser.

The proxy then contacts the Authorization Server and exchanges the authorization code for access token, refresh token, and maybe an ID token. The method used by the UA to obtain the tokens is out of scope for this document.

If the proxy is successful in exchanging the authorization code with the tokens, the proxy then responds with 200 OK (F2) to the UA to complete the registration process.

2.2.2. Shared-Key

After sending the 200 OK to the UA to complete the registration process, the proxy and the UA use the HMAC-SHA256(key, message) to calculates the shared-key associated with this user as follows:

key

The authorization code obtained from the Authorization Server.

message

The concatenation of the 'from-tag', 'to-tag', and 'call-id' of the 200 OK that completes the registration process.

This shared-key will be used to allow the UA to re-register to the proxy, in case of a connection loss to the proxy, without the need to obtain a new authorization code.

2.2.3. Token Refresh

Before the tokens expire, the proxy makes a refresh request to the Authorization Server to try to obtain new tokens. The method used by the UA to refresh the tokens is out of scope for this document.

If the proxy fails to refresh the tokens, then it MUST challenge the next request from the UA, and as a result the UA MUST go through the authorization process again.

2.2.4. Re-Registration Requests

When the UA loses its connection to the proxy and it wants to send a new registration request to the proxy, the UA will send a new REGISTER request and include the proof-of-possession (pop) of the shared-key in the body of the request:

grant_type (REQUIRED)

Value MUST be set to "proof_of_possession".

pop (REQUIRED)

The pop calculated the first time the UA registered with the proxy.

The pop is calculated using the shared-key as follows:

pop = HMAC-SHA256(shared-key, digest-string)

See rfc4474, section 9, for the SIP headers to hash to create digest-string.

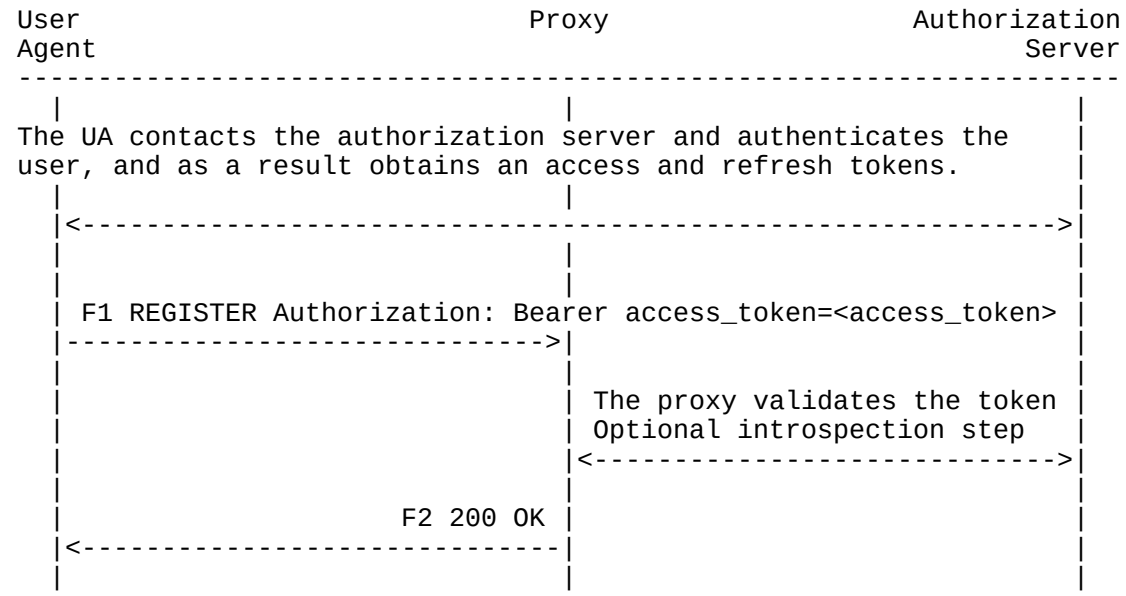
[[OPEN ISSUE]] Should this be not limited to re-registration, and instead be used with all subsequent requests?

3. Authentication using the Resource Owner Password Credentials flow

The resource owner password credentials flow is used by a Confidential UA with rich UI to authenticate to a third-party IdP entity and to directly obtain tokens to be able to register and get service from the SIP network.

3.1. Overview

The following figure provides a high level view of flow of messages for the OAuth Resource Owner Password Credentials flow:



3.2. Registration

The UA first contacts the Authorization Server to authenticate the user and obtain tokens to be used to get access to the SIP network. The method used by the UA to obtain the tokens is out of scope for this document.

The UA starts the registration process with the SIP proxy by sending a REGISTER request (F1) with the access token it obtained previously.

The UA includes an Authorization header field with the Bearer scheme in the request to carry the access token obtained previously.

The proxy then validates the token, and MAY perform an introspection step to get more information about the token and its scope. The introspection step is out of scope for this document.

When the proxy is satisfied with the token, it then replies with the 200 OK to complete the registration process.

3.3. Subsequent Requests

All subsequent requests from the UA MUST include a valid access token. The UA MUST obtain a new access token before the access token expiry period to continue to get service from the system.

4. Authorization Header Syntax

This section describes the syntax of the authorization header with the Bearer scheme.

```
Authorization = "Authorization" HCOLON "Bearer" LWS
                "access_token" EQUAL access_token
access_token = quoted-string
```

5. Security Considerations

<Security considerations text>

6. IANA Considerations

<IANA considerations text>

7. Acknowledgments

<Acknowledgments text>

8. Normative References

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[RFC6749] Hardt, D., "The OAuth 2.0 Authorization Framework", RFC 6749, October 2012.

[RFC7662] Richer, J., "OAuth 2.0 Token Introspection", RFC 7662, October 2015.

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