

# PKCE-enhanced Authorization Code

*PKCE* - Proof Key for Code Exchange



User





User

Tap

Mobile App

Connect to  
API Service

Authorization request

?response\_type=code&scope={Scopes}&state={CSRF}&...

Facebook, Google,  
Your API

API Service

Authorization  
Server

Response

http://localhost:8083/callback

?state=h4u8fF2okGBio38uE

&code=b06c44f3-71be-4525-81f8-9c88472154c6.20af20a8-7146-4a97-a636-a59c784ad59b.0c9b74af-f0cb-48b8-9762-1bd23841c73a

curl --location --request POST

'http://localhost:8080/auth/realms/appsdeveloperblog/protocol/openid-connect/token'

'code=b06c44f3-71be-4525-81f8-9c88472154c6.20af20a8-7146-4a97-a636-a59c784ad59b.0c9b74af-f0cb-48b8-9762-1bd23841c73a'


'code\_verifier=c3cxd2UzNHJmZGUzNHJneWh1NzhpazFxd2U0cmZkZXI1NnI1N3lnZnJONmpiraW85NHJkc3dlcg'

## Request for an OAuth Code

```
curl --location --request GET
'http://localhost:8080/auth/realms/appsdeveloperblog/protocol/openid-connect/auth
?client_id=photo-app-pkce
&response_type=code
&scope=openid
&redirect_uri=http://localhost:8083/callback
&state=h4u8fF2okGBio38uE
&code_challenge=NDEyYjM0YzhkZTZhNWVlMzE3YWVjYmJkZWJiYTg4ZDFhMTIxNjQyMGQwZTU0NjE1NjlmZjMzNTg0NzkwODVlYQ
&code_challenge_method=S256'
```

## Exchange OAuth Code for an Access Token

```
curl --location --request POST
'http://localhost:8080/auth/realms/appsdeveloperblog/protocol/
openid-connect/token' \
--header 'Content-Type: application/x-www-form-urlencoded' \
--data-urlencode 'grant_type=authorization_code' \
--data-urlencode 'client_id=photo-app-pkce' \
--data-urlencode
'code=b06c44f3-71be-4525-81f8-9c88472154c6.20af20a8-7146-4a97-
a636-a59c784ad59b.0c9b74af-f0cb-48b8-9762-1bd23841c73a' \
--data-urlencode 'redirect_uri=http://localhost:8083/callback'
\
--data-urlencode
'code_verifier=c3cxd2UzNHJmZGUzNHJneWh1NzhpaZFx d2U0cmZkZXI1Nn1
1N3lnZnJ0NmpraW85NHJkc3dlcg'
```



# Generating **Code Verifier**

## 4. Protocol

### 4.1. Client Creates a Code Verifier

The client first creates a code verifier, "code\_verifier", for each OAuth 2.0 [\[RFC6749\]](#) Authorization Request, in the following manner:

- code\_verifier = high-entropy cryptographic random STRING using the
- unreserved characters [A-Z] / [a-z] / [0-9] / "-" / "." / "\_" / "~"
- from [Section 2.3 of \[RFC3986\]](#), with a minimum length of 43 characters
- and a maximum length of 128 characters.

ABNF for "code\_verifier" is as follows.

```
code-verifier = 43*128unreserved
unreserved = ALPHA / DIGIT / "-" / "." / "_" / "~"
ALPHA = %x41-5A / %x61-7A
DIGIT = %x30-39
```

- NOTE: The code verifier SHOULD have enough **entropy** to make it impractical to guess the value. It is RECOMMENDED that the output of a suitable random number generator be used to create a 32-octet sequence. The octet sequence is then base64url-encoded to produce a 43-octet URL safe string to use as the code verifier.

```
package com.appsdeveloperblog.pkce;

import java.io.UnsupportedEncodingException;
import java.security.MessageDigest;
import java.security.NoSuchAlgorithmException;
import java.security.SecureRandom;
import java.util.Base64;

public class PkceUtil {

    String generateCodeVerifier() throws UnsupportedEncodingException {
        SecureRandom secureRandom = new SecureRandom();
        byte[] codeVerifier = new byte[32];
        secureRandom.nextBytes(codeVerifier);
        return
Base64.getUrlEncoder().withoutPadding().encodeToString(codeVerifier);
    }

    }

5GluDRih4mQPRoG4C4WylsHp0l--aBbOcwGO1MPEfLA
```



# Generating **Code Challenge**

## 4.2. Client Creates the Code Challenge

The client then creates a code challenge derived from the code verifier by using one of the following transformations on the code verifier:

plain

code\_challenge = code\_verifier

S256

4

3

2

1

code\_challenge = BASE64URL-ENCODE(SHA256(ASCII(code\_verifier)))

If the client is capable of using "S256", it MUST use "S256", as "S256" is Mandatory To Implement (MTI) on the server. Clients are permitted to use "plain" only if they cannot support "S256" for some technical reason and know via out-of-band configuration that the server supports "plain".

The plain transformation is for compatibility with existing deployments and for constrained environments that can't use the S256 transformation.

ABNF for "code\_challenge" is as follows.

code-challenge = 43\*128unreserved

unreserved = ALPHA / DIGIT / "-" / "." / "\_" / "~"

ALPHA = %x41-5A / %x61-7A

DIGIT = %x30-39

```
String generateCodeChallange(String codeVerifier) throws  
UnsupportedEncodingException, NoSuchAlgorithmException {
```

```
    byte[] bytes = codeVerifier.getBytes("US-ASCII");  
    MessageDigest messageDigest =  
MessageDigest.getInstance("SHA-256");  
    messageDigest.update(bytes, 0, bytes.length);  
    byte[] digest = messageDigest.digest();  
  
    return  
Base64.getUrlEncoder().withoutPadding().encodeToString(digest);  
}
```

**ZQNn8kfypf2X6j0HFdoApXgndA1LJr2-jm6kKJgsNDQ**