Protect Your API with OAuth 2

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April 2017 ~ @akrabat

Authentication

Know who is logging into your API

- Rate limiting
- Revoke application access if its a problem
- Allow users to revoke 3rd party applications

How?

Authorization header:

```
GET /books/1 HTTP/1.1
Host: api.example.com
Accept: application/json
Authorization: Basic QWxhZGRpbjpPcGVuU2VzYW1l
```

```
base64_encode("Aladdin:OpenSesame")
    => QWxhZGRpbjpPcGVuU2VzYW1l
```

Problems

- All clients have to know user's credentials
- Credentials are passed in every request

OAuth2

The OAuth 2.0 authorization framework enables a third-party application to obtain limited access to an HTTP service

oauth.net

Roles

- The user *(Resource Owner)*
- The (third-party) application *(Client)*
- The API *(Resource Server)*
- The Authorisation server

Grant types

Grant type	Use case
Authorization code	3rd party web or native
Password	1st party
Client credentials	application (no user)
Implicit	3rd party JS app

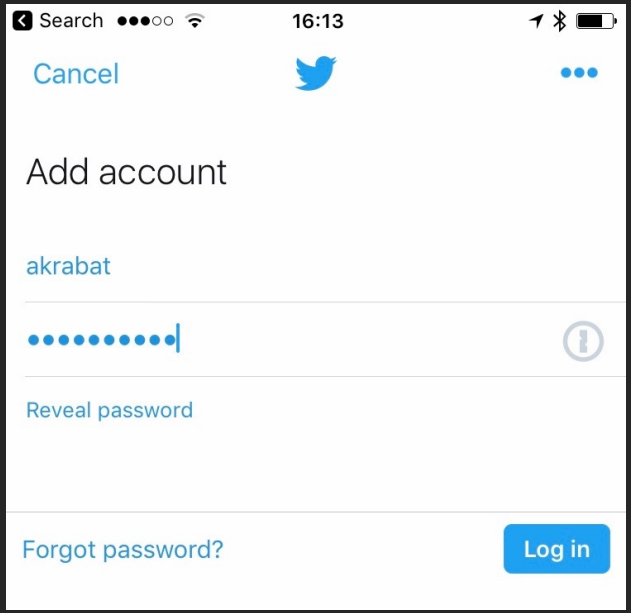
Tokens

OAuth uses a bearer token

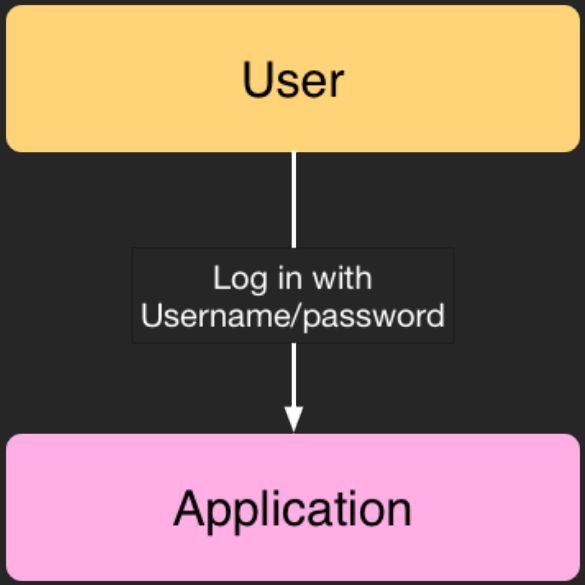
```
GET /books/1 HTTP/1.1
Host: api.example.com
Accept: application/json
Authorization: Bearer {some-string-here}
```

Password grant
(for 1st party apps)

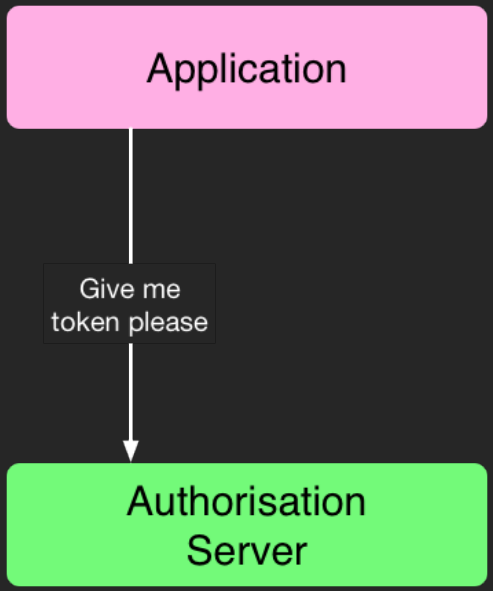
Password grant



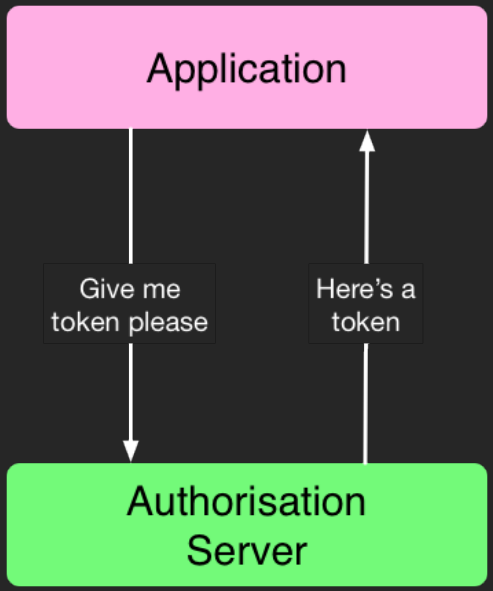
Password flow



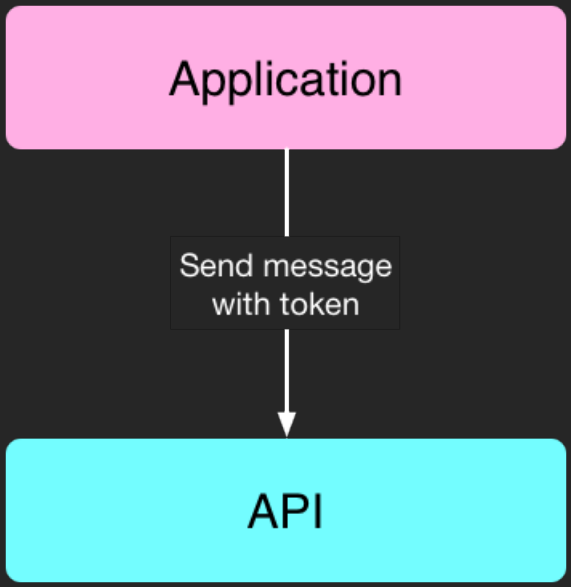
Password flow



Password flow



Password flow



Implementing in PHP

OAuth 2.0 Server PHP

by Brent Shaffer

```
$ composer require bshaffer/oauth2-server-php
```

- Implements Authorise and Token endpoints
- Mulitple storage backends: PDO, Redis, Mongo, Cassandra, DynamoDB, etc

Steps to implement

For the client and user credentials grants:

1. Set up the database tables
2. Register the OAuth2 Server
3. Implement the Authorise endpoint

Database tables

- `CREATE TABLE oauth_clients ...`
- `CREATE TABLE oauth_access_tokens ...`
- `CREATE TABLE oauth_authorization_codes ...`
- `CREATE TABLE oauth_refresh_tokens ...`
- `CREATE TABLE oauth_users ...`
- `CREATE TABLE oauth_scopes ...`
- `CREATE TABLE oauth_jwt ...`

(SQL is in the Cookbook in the docs)

Create a Server

```
1 use MyAuth\PdoStorage;
2 use OAuth2\GrantType\UserCredentials;
3
4 $container['OAuth2Server'] = function ($c) {
5     $pdo = $c->get('db');
6     $storage = new PdoStorage($pdo);
7
8     $server = new \OAuth2\Server($storage);
```

Add the grant

```
1  use MyAuth\PdoStorage;
2  use OAuth2\GrantType\UserCredentials;
3
4  $container['OAuth2Server'] = function ($c) {
5      $pdo = $c->get('db');
6      $storage = new PdoStorage($pdo);
7
8      $server = new \OAuth2\Server($storage);
9
10     /* Add the password grant type */
11     $userCreds = new UserCredentials($storage);
12     $server->addGrantType($userCreds);
13
14     return $server;
15 };
```

Aside: use Bcrypt

```
namespace MyAuth;

class PdoStorage extends \OAuth2\Storage\Pdo
{
  protected function checkPassword($user, $pwd)
  {
    return password_verify($pwd, $user['password']);
  }
}
```

Credentials

We need a client:

```
1 INSERT INTO oauth_clients
2   (client_id, client_secret, redirect_uri)
3 VALUES
4   ("mywebsite", "$2y$10$mzP0fR...BHu", null);
```

Credentials

We need a client:

```
1 INSERT INTO oauth_clients
2   (client_id, client_secret, redirect_uri)
3 VALUES
4   ("mywebsite", "$2y$10$mzP0fR...BHu", null);
```

& a user:

```
1 INSERT INTO oauth_users
2   (username, password, first_name, last_name)
3 VALUES
4   ("rob", "$2y$10$Qq1CsK...LV6", "Rob", "Allen");
```

Token endpoint

```
1  $app->post(
2    '/token',
3    function ($request, $response) {
4      $server = $this->get('OAuth2Server');
5      $req = \OAuth2\Request::createFromGlobals();
6
7      $server->handleTokenRequest($req)->send();
8      exit;
9    }
10 );
```

How does this work?

```
$ curl -i -X POST http://localhost:8888/token \
  -H "Accept: application/json" \
  -H "Content-Type: application/json" \
  -d $'{
      "grant_type": "password"
      "client_id": "mywebsite",
      "client_secret": "abcdef",
      "username": "rob",
      "password": "123456"
  }'
```

Response

```
HTTP/1.1 200 OK
Host: localhost:8888
Content-Type: application/json

{
  "access_token": "65077f90e3baae8aa863",
  "expires_in": 3600,
  "token_type": "Bearer",
  "scope": null,
  "refresh_token": "be071d2c6193d32a353d"
}
```

Protecting your API endpoints

Is the token valid?

```
1 /* test for valid Auth header */
2 $req = \OAuth2\Request::createFromGlobals();
3 if (!$server->verifyResourceRequest($req)) {
4   /* not valid */
5 }
6
7 /* get information */
8 $token = $server->getAccessTokenData($req);
9 $username = $token['user_id'];
```

Unauthorised API call

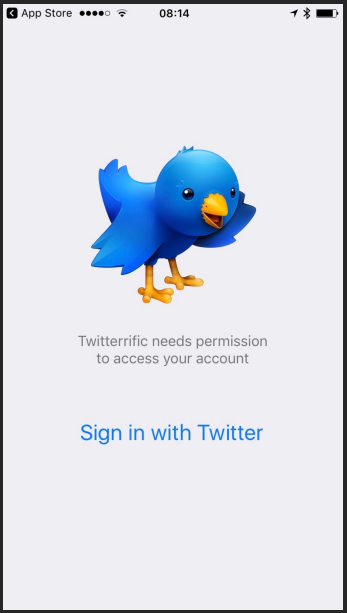
```
$ curl -i -H "Accept: application/json" \
  http://localhost:8888/authors

HTTP/1.1 401 Unauthorized
Host: localhost:8888
Connection: close
X-Powered-By: PHP/7.0.15
WWW-Authenticate: Bearer realm="Service"
Content-Type: application/json
```

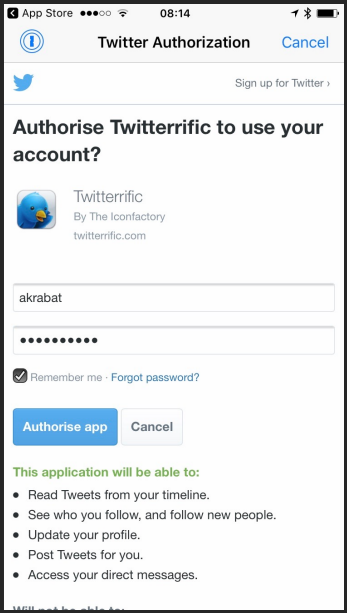
Authorised API call

```
$ curl -i -H "Accept: application/json" \
  -H "Authorization: Bearer 65077f90e3baae8aa863" \
  http://localhost:8888/authors

HTTP/1.1 200 OK
Host: localhost:8888
Connection: close
X-Powered-By: PHP/7.0.15
Content-type: application/hal+json

{
    "count": 6,
    "_links": {
...
```

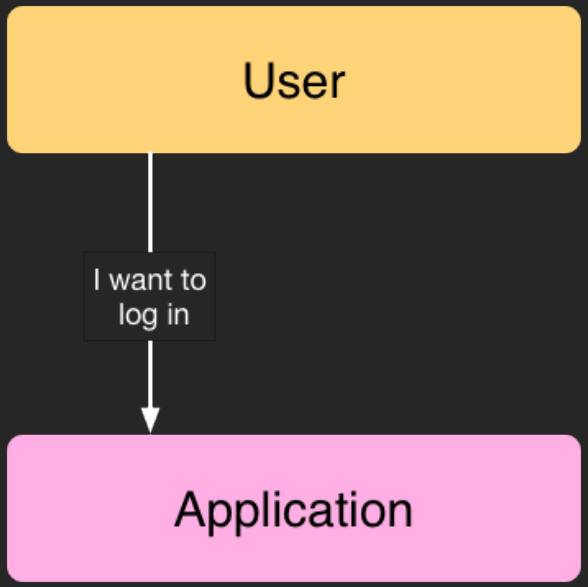
Authorisation Code
(for 3rd party apps)

Authorisation code

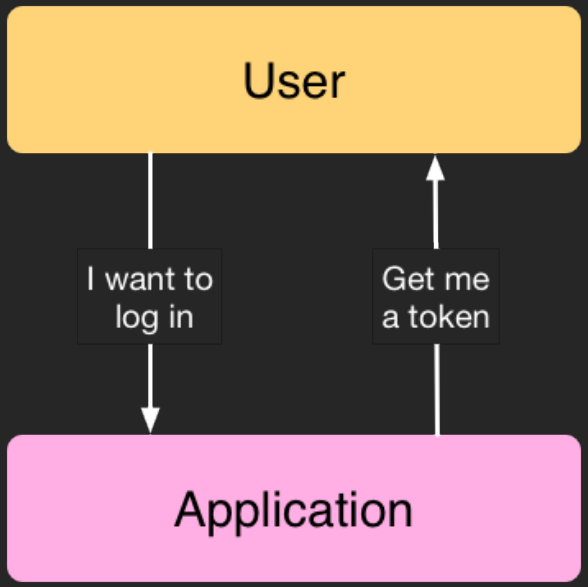




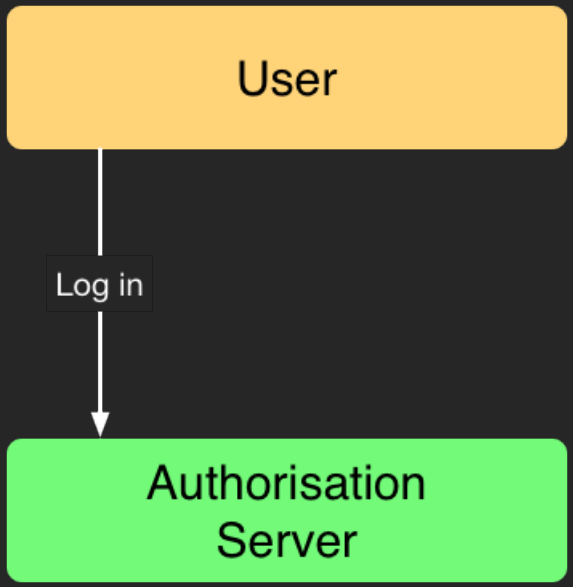
Authorisation code flow



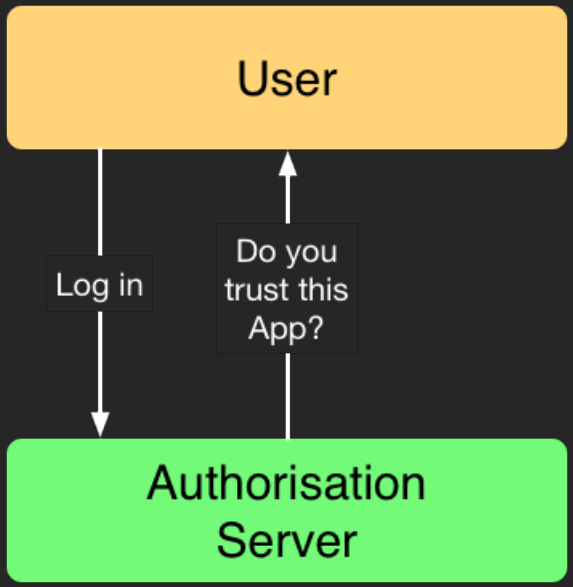
Authorisation code flow



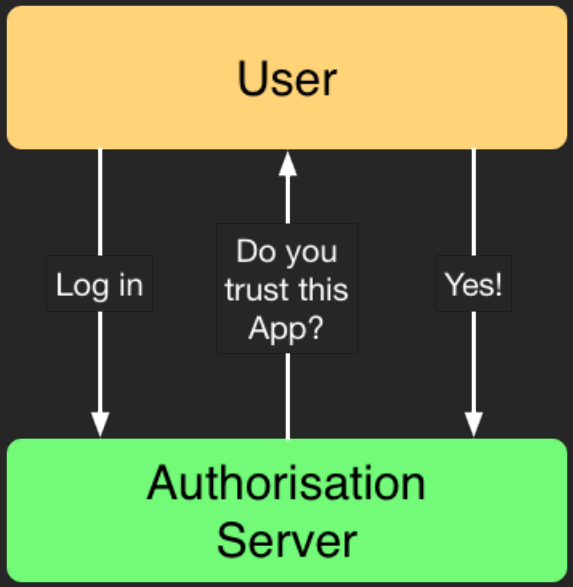
Authorisation code flow



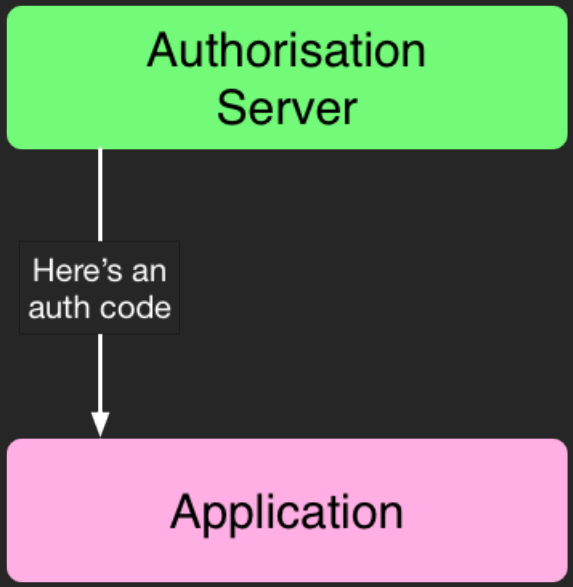
Authorisation code flow



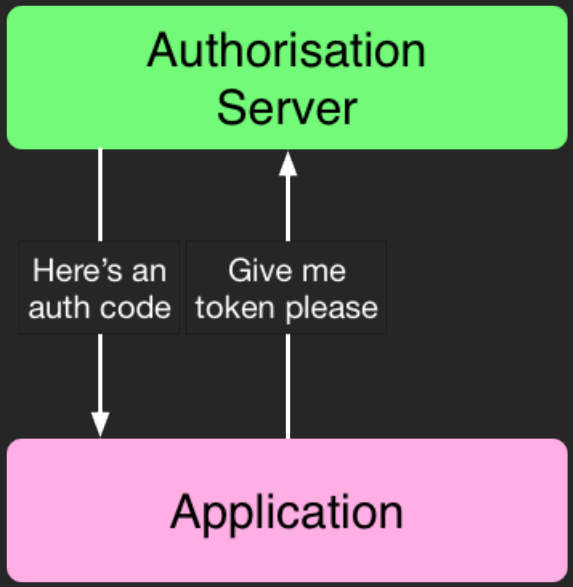
Authorisation code flow



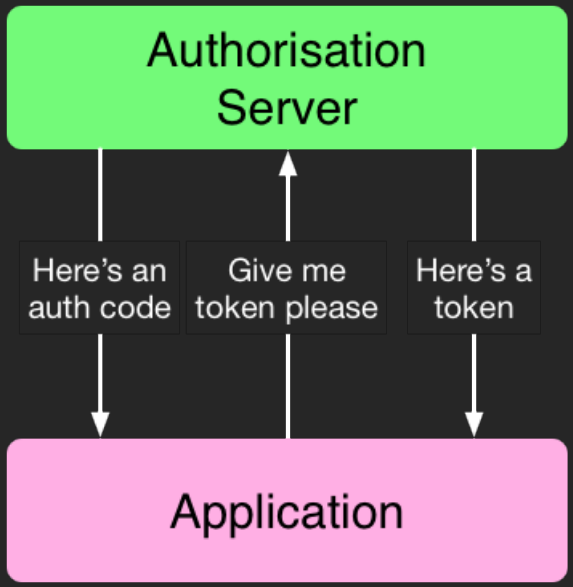
Authorisation code flow



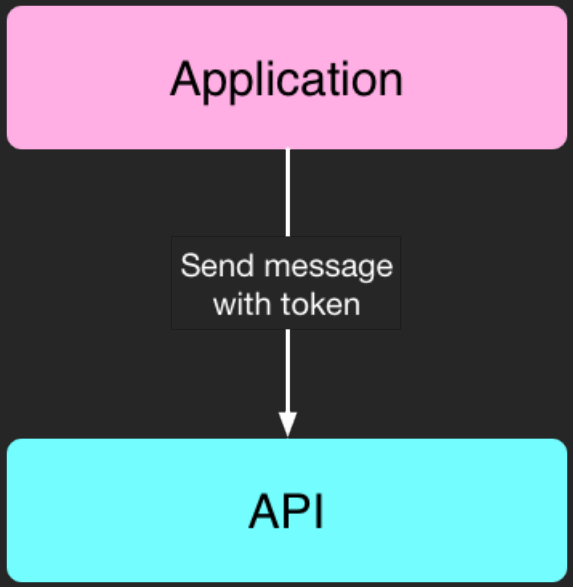
Authorisation code flow



Authorisation code flow



Authorisation code flow



Implementing in PHP

Required pieces

1. A website that talks to the Authorisation server
2. A new endpoint in the Authorisation server to provide auth codes

Process

1. 3rd party app sends user to our website:
2. User logs in to our website and authorises app
3. Our website gets code from our API
4. Our website redirects user back to app (or displays a code)

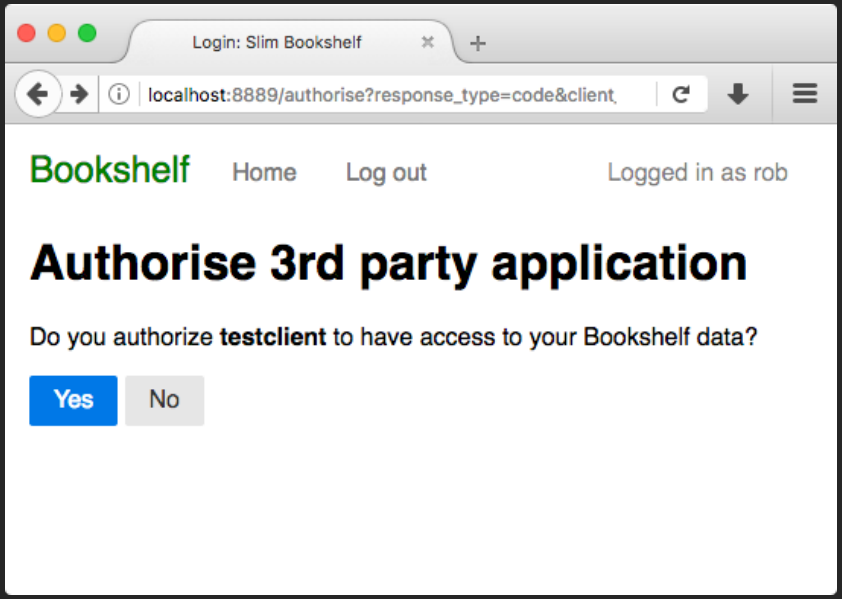
Add the grant

```
1  $container['OAuth2Server'] = function ($c) {
2      // ...
3      $server = new \OAuth2\Server($storage);
4
5      /* Add the password grant type */
6      $userCreds = new UserCredentials($storage);
7      $server->addGrantType($userCreds);
8
9      return $server;
10 };
```

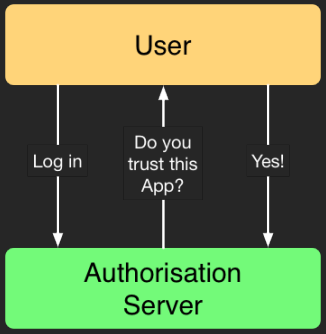
Add the grant

```
1  $container['OAuth2Server'] = function ($c) {
2      // ...
3      $server = new \OAuth2\Server($storage);
4
5      /* Add the password grant type */
6      $userCreds = new UserCredentials($storage);
7      $server->addGrantType($userCreds);
8
9      /* Add authorisation code grant type */
10     $authCode = new AuthorizationCode($storage);
11     $server->addGrantType($authCode);
12
13     return $server;
14 };
```

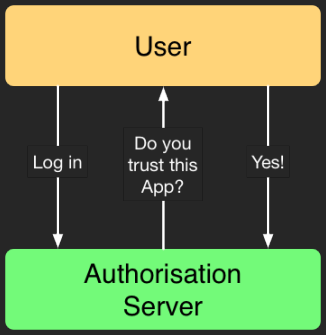
Authorise


Login: Slim Bookshelf
localhost:8889/authorise?response_type=code&client
Bookshelf
Home
Log out
Logged in as rob
Authorise 3rd party application
Do you authorize testclient to have access to your Bookshelf data?
Yes
No

Remember this?



It's more like this...



Website sends to API

Pressing *Yes* does this:

```
1  $data['code'] = 'token';
2  $data['client_id'] = $_GET['client_id'];
3  $data['redirect_uri'] = $_GET['redirect_uri'];
4  $data['state'] = $_GET['state'];
5
6  $apiResponse = $guzzle->post('/authorise', [
7    'json' => $data,
8    'headers' => [
9      'Authorization' => 'Bearer '.$webAccessToken,
10   ]
11 ]);
```

API handles authorisation

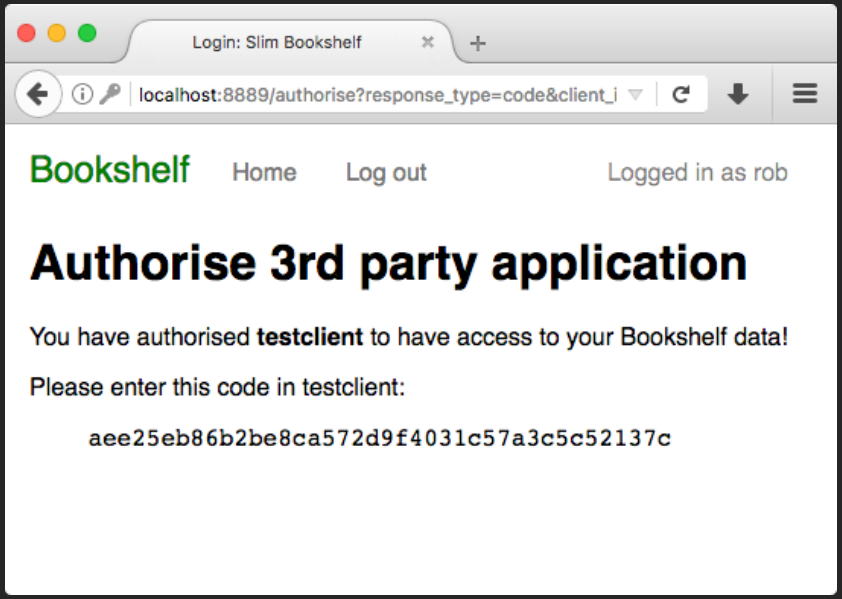
API's `/authorise` endpoint:

```
1 if (!$server->validateAuthorizeRequest($req, $res)) {
2     $srvResponse->send(); exit;
3 }
4
5 $server->handleAuthorizeRequest($req, $res, true);
6 $srvResponse->send(); exit;
```

Website handles response

```
1  if ($apiResponse->getStatusCode() != 302) {
2    throw new Exception("Failed to get code");
3  }
4  $loc = $apiResponse->getHeaderLine('Location');
5
6  if ($this->isValidUrl($loc)) {
7    /* location is valid - redirect */
8    return $response->withRedirect($loc);
9  }
10
11 /* invalid url - display the code to user */
12 parse_str($parts['query'], $queryParams);
13 return $renderer->renderPage($queryParams['code']);
```

Authorised


Login: Slim Bookshelf
localhost:8889/authorise?response_type=code&client_i
Bookshelf
Home
Log out
Logged in as rob
Authorise 3rd party application
You have authorised **testclient** to have access to your Bookshelf data!
Please enter this code in testclient:
aee25eb86b2be8ca572d9f4031c57a3c5c52137c

Get token from code

```
$ curl -X "POST" http://localhost:8888/token \
  -H "Accept: application/json" \
  -H "Content-Type: application/json" \
  -d $'{
   "grant_type": "authorization_code",
   "client_id": "testclient",
   "client_secret": "abcdef",
   "code": "aee25eb86b2be8ca572d9f4031c57a3c5c52137c",
  }'
```

Response

```
HTTP/1.1 200 OK
Host: localhost:8888
Connection: close
Content-Type: application/json

{
  "access_token": "df7fcb455efb9a2c9544",
  "expires_in": 3600,
  "token_type": "Bearer",
  "scope": null,
  "refresh_token": "bb87ffbef191bdda55b1"
}
```

JWT bearer tokens

JWT

- Cryptographically signed block of data
- Potentially faster
- A JWT consists of
  - Header
  - Payload
  - Signature

Also: JWT is pronounced *"jot"*

Payload

```
1  {
2    "id": "394a71988caa6cc30601e43f5b6569d52cd7f",
3    "jti": "394a71988caa6cc30601e43f5b6569d52cd7f",
4    "iss": "{issuer_id}",
5    "aud": "{client_id}",
6    "sub": "{user_id}",
7    "exp": 1483711650,
8    "iat": 1483708050,
9    "token_type": "bearer",
10   "scope": "read write delete"
11 }
```

Implementation

1. Update token creation to create JWT tokens
2. Update validation to check for JWT tokens

Previously

```
1 $container['OAuth2Server'] = function ($c) {
2   $pdo = $c->get('db');
3   $storage = new PdoStorage($pdo);
4
5   $server = new \OAuth2\Server($storage);
6
7   // ... add grants ...
```

Enable JWT

```
1 $container['OAuth2Server'] = function ($c) {
2   $pdo = $c->get('db');
3   $storage = new PdoStorage($pdo);
4
5   $server = new \OAuth2\Server($storage, [
6     'use_jwt_access_tokens' => true,
7   ]);
8
9   // ... add grants ...
```

Get a token

```
$ curl -i -X POST http://localhost:8888/token \
  -H "Accept: application/json" \
  -H "Content-Type: application/json" \
  -d $'{
      "grant_type": "password"
      "client_id": "mywebsite",
      "client_secret": "abcdef",
      "username": "rob",
      "password": "123456"
  }'
```

Response

```
HTTP/1.1 200 OK
Host: localhost:8888
Connection: close
Content-Type: application/json

{
  "access_token": "eyJ0eXAiOi...BLUWlojjm24HmNbOMg",
  "expires_in": 3600,
  "token_type": "Bearer",
  "scope": null,
  "refresh_token": "be071d2c6193d32a353d"
}
```

Validation

Use an in-memory OAuth2 Server:

```
1 $storage = new OAuth2\Storage\Memory([
2   'keys' => [
3     'public_key' => $publicKey,
4   ]
5 ]);
6
7 $server = new OAuth2\Server($storage, [
8     'use_jwt_access_tokens' => true,
9 ]);
```

Validation

The validation code doesn't change

```
1 /* test for valid Auth header */
2 $req = \OAuth2\Request::createFromGlobals();
3 if (!$server->verifyResourceRequest($req)) {
4   /* not valid */
5 }
6
7 /* get information */
8 $token = $server->getAccessTokenData($req);
9 $username = $token['user_id'];
```

Refresh tokens

Refresh tokens

- Access tokens expire quickly
- Use the refresh token to get a new access token
- Guard refresh tokens!

```
$ curl -i -X POST http://localhost:8888/token \
  -H "Accept: application/json" \
  -H "Content-Type: application/json" \
  -d $'{
      "grant_type": "refresh_token"
      "client_id": "testclient",
      "client_secret": "abcdef",
      "refresh_token": "be071d2c6193d32a353d"
  }'
```

Response

```
HTTP/1.1 200 OK
Host: localhost:8888
Connection: close
Content-Type: application/json

{
  "access_token": "eyJ0eXAiOi...tjD8whWBt8h4oRluOMA",
  "expires_in": 3600,
  "token_type": "Bearer",
  "scope": null
}
```

Summary

Summary

- Authorization header contains token
- Two actors
  - Client (id & secret)
  - User (username & password)
- Grants:
  - Password: 1st party apps
  - Authorisation code: 3rd party apps
- JWT for speed and scale

Resources

This talk:

- https://github.com/akrabat/slim-bookshelf-api
- https://akrabat.com/talks/#oauth2

Around the web:

- https://oauth.net/2/
- http://bshaffer.github.io/oauth2-server-php-docs
- https://aaronparecki.com/oauth-2-simplified/

Questions?

Feedback: https://joind.in/talk/ce818

Rob Allen ~ @akrabat

Thank you!

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