Building an API with Apigility

Rob Allen
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APIs are becoming commonplace

APIs are hard

Things to consider

Content negotiation
Error reporting
Discovery
Authentication
Documentation

HTTP method negotiation
Versioning
Validation
Authorisation

API Architecture

RPC (Remote Procedure Call)

- client executes procedure on server
- `POST /send_email` or `GET /current_time`

REST (REpresentational State Transfer)

- client uses HTTP verbs to manage resources on server
- stateless
- `GET /albums` or `PUT /albums/1`

Apigility: Opinionated API builder

Simplify the creation and maintenance of useful, easy to consume, and well structured application programming interfaces.

- Administration system
- Runtime API engine
- PHP, built on Zend Framework 2

Getting Started

Install:

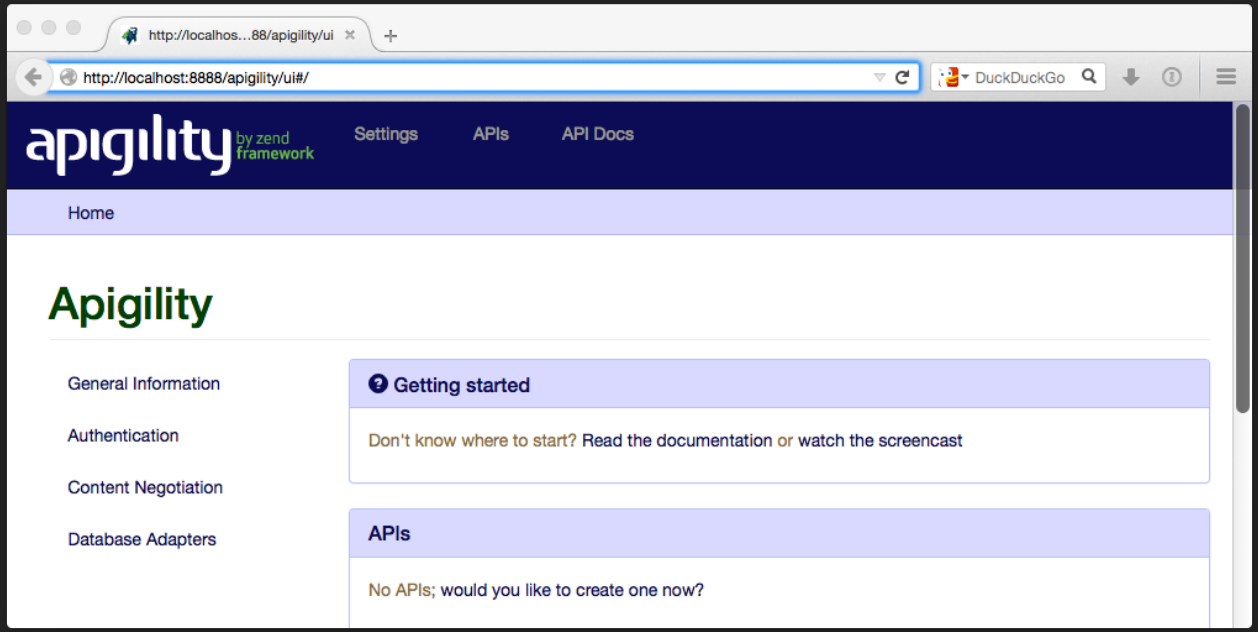
```
$ composer.phar create-project -sdev zfcampus/zf-apigility-skeleton music
```

Development Mode:

```
$ cd music
$ php public/index.php development enable
```

Run the admin web UI:

```
$ php -S 0:8888 -t public/ public/index.php
```


http://localhos...88/apigility/ui
http://localhost:8888/apigility/ui#/
DuckDuckGo
apigility by zend framework
Settings
APIs
API Docs
Home
Apigility
General Information
Authentication
Content Negotiation
Database Adapters
Getting started
Don't know where to start? Read the documentation or watch the screencast
APIs
No APIs; would you like to create one now?

Let's write
"Hello world"

(Screencast: Hello World)

What do we get?

Code

Apigility has creates a module called `Ping` for our API.

The code is in the `src/Ping/V1/Rpc/Ping` directory

Classes:

- `PingControllerFactory`
- `PingController` (contains `pingAction()`)

You need to write the action's code!

JSON

```
$ httpie -j http://localhost:8888/ping

HTTP/1.1 200 OK
Host: localhost:8888
Connection: close
X-Powered-By: PHP/5.6.5
Content-Type: application/json; charset=utf-8

{"ack":1423431025}
```

Method negotiation

```
$ httpie -j POST http://localhost:8888/ping

HTTP/1.1 405 Method Not Allowed
Host: localhost:8888
Connection: close
X-Powered-By: PHP/5.6.5
Allow: GET
Content-type: text/html; charset=UTF-8
```

OPTIONS handling

```
$ httpie -j OPTIONS http://localhost:8888/ping

HTTP/1.1 200 OK
Host: localhost:8888
Connection: close
X-Powered-By: PHP/5.6.5
Allow: GET
Content-type: text/html; charset=UTF-8
```

Error reporting (http-problem)

```
$ httpie -j http://localhost:8888/asdf

HTTP/1.1 404 Not Found
Connection: close
Content-Type: application/problem+json
Host: localhost:8888
X-Powered-By: PHP/5.6.5

{
   "detail": "Page not found.",
   "status": 404,
   "title": "Not Found",
   "type": "http://www.w3.org/Protocols/rfc2616/rfc2616-sec10.html"
}
```

ref: https://tools.ietf.org/html/draft-ietf-appsawg-http-problem

Accept checking

```
$ httpie http://localhost:8888/ping Accept:application/xml

HTTP/1.1 406 Not Acceptable
Connection: close
Content-Type: application/problem+json
Host: localhost:8888
X-Powered-By: PHP/5.6.5

{
   "detail": "Cannot honor Accept type specified",
   "status": 406,
   "title": "Not Acceptable",
   "type": "http://www.w3.org/Protocols/rfc2616/rfc2616-sec10.html"
}
```

Versioning

Media type:

```
Accept: application/vnd.ping.v1+json
Accept: application/vnd.ping.v2+json
```

URL-based:

`/ping`, `/v1/ping`, `/v2/ping`

Versioning

New version changes the *namespace*

```php
<?php
namespace Ping\V2\Rpc\Ping;

use Zend\Mvc\Controller\AbstractActionController;

class PingController extends AbstractActionController
{
    public function pingAction()
    {
        return ['ack' => date('Y-m-d H:i:s')];
    }
}
```

Versioning

```
$ httpie -b -j http://localhost:8888/v1/ping
{"ack":1422936306}

$ httpie -b http://localhost:8888/ping 'Accept: application/vnd.ping.v1+json'
{"ack":1422936306}

$ httpie -b -j http://localhost:8888/v2/ping
{"ack":"2015-02-03 04:05:06"}

$ httpie -b http://localhost:8888/ping 'Accept: application/vnd.ping.v2+json'
{"ack":"2015-02-03 04:05:06"}
```

Note that the default is version 1:

```
$ httpie -b -j http://localhost:8888/ping
{"ack":1422936306}
```

RESTful features of Apigility

Two types

Database connected API

- Use DB adapter, specify table, All done!
- Hard to significantly customise

Code connected API

- You do all the work
- Functionality is all down to you (fill out the stubs)
- Persistence is your problem too

(Screencast: Create a REST API)

What did we get?

- Full RESTful CRUD access to the *album* table
- Hypermedia links in the JSON output
- Pagination
- Everything we got with RPC APIs too!
    - Versioning
    - HTTP method control
    - Accept & Content-Type checking
    - Error reporting

Code

Apigility has creates a module called `Music` for our API.

The code is in the `src/Music/V1/Rest/Album` directory

Classes:

`AlbumCollection`	album collection (Paginator)
`AlbumEntity`	single album (ArrayObject)

There is *no need* to alter these classes

Hypermedia in JSON (Single album)

Hypermedia Application Language (HAL): application/hal+json

```
{
    "_links": {
        "self": {
            "href": "http://localhost:8888/albums/3"
        }
    },
    "artist": "Mark Ronson",
    "id": "3",
    "title": "Uptown Special"
}
```

HATEOAS - Hypertext as the Engine of Application State
http://roy.gbiv.com/untangled/2008/rest-apis-must-be-hypertext-driven

Hypermedia in JSON (Collection)

Hypermedia Application Language (HAL): application/hal+json

```
{
  "_embedded": {
    "album": [ /* Array of Album resources here */ ]
  },

  "_links": {
    "first": { "href": "http://localhost:8888/albums" },
    "last": { "href": "http://localhost:8888/albums?page=2" },
    "self": { "href": "http://localhost:8888/albums?page=1" }
  },

  "page_count": 1,
  "page_size": 50,
  "total_items": 66
}
```

Hyperlinking: Pagination

Automatic via `Zend\Paginator\Paginator`

```
{
    _links: {
        self: { href: "/api/albums?page=3" },
        first: { href: "/api/albums" },
        last: { href: "/api/albums?page=14" },
        prev: { href: "/api/albums?page=2" },
        next: { href: "/api/albums?page=4" }
    }
}
```

Validation & filtering

Validation

- Built into the Apigility admin
- Tested when routing: very fast to fail
- Correct 4xx return codes:
  - `400 Client Error` if no fields match
  - `422 Unprocessable Entity` when validation errors occur

(Screencast: Validation)

Validation

POST with an an empty artist to the collection

```
$ curl -s -X POST -H "Content-type: application/json" \
  -H "Accept: application/vnd.music.v1+json"  \
  -d '{"title":"Greatest Hits", "artist":""}' \
  http://localhost:8888/albums |  python -mjson.tool
```

Response

Header:

```
HTTP/1.1 422 Unprocessable Entity
```

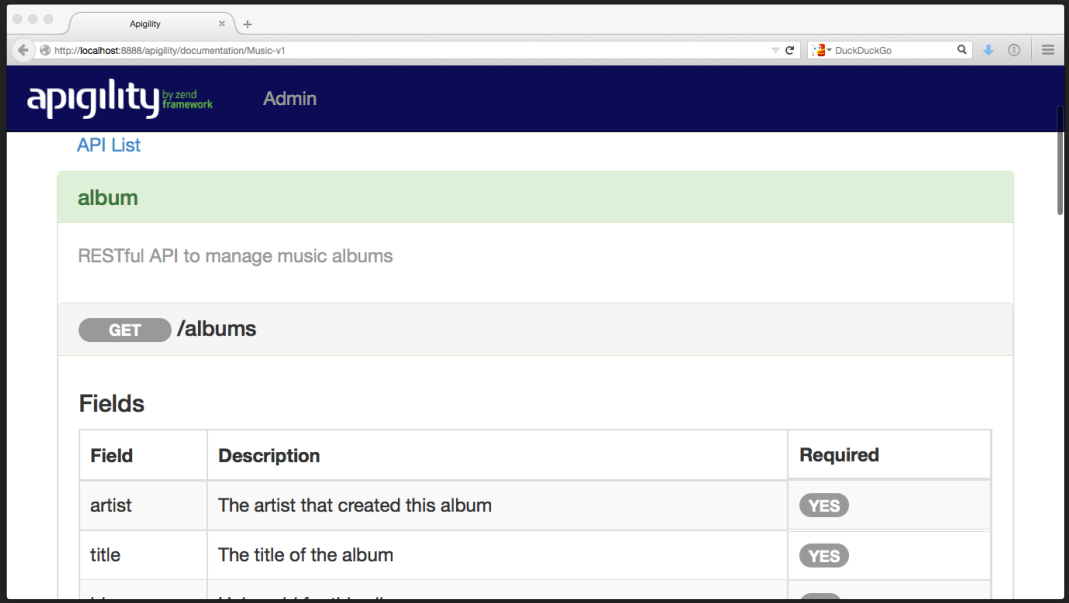
Body:


```
{
    "detail": "Failed Validation",
    "status": 422,
    "title": "Unprocessable Entity",
    "type": "http://www.w3.org/Protocols/rfc2616/rfc2616-sec10.html",
    "validation_messages": {
        "artist": {
            "isEmpty": "Value is required and can't be empty"
        }
    }
}
```

Documentation

- Written within admin while setting up API
- Automatically populated via validation admin
- User documentation:
    - apigility/documentation/{API name}/V1
    - JSON or HTMl based on accept header
    - Swagger available too

Documentation



Code-connected services

Code-connected services

For more complicated endpoints: `src/Music/V1/Rest/Loan`

Classes:

`LoanResource`	entry point to service
`LoanCollection`	a collection of loans
`LoanEntity`	a single album

LoanResource class

Methods for the collection: `/loans`

Class method	HTTP method	Notes
`fetchAll`	GET	retrieve all items
`create`	POST	create an item
`replaceList`	PUT	replace all items
`deleteList`	DELETE	Delete all items

LoanResource class

Methods for a single resource: `/loans/[loan_id]`

Class method	HTTP method	Notes
`fetch`	GET	retrieve an item
`patch`	PATCH	update some fields
`update`	PUT	replace an item
`delete`	DELETE	delete an item

The data model is your code!

```
// Fill in LoanEntity
class LoanEntity
{
    protected $id;
    protected $artist;
    protected $title;
}

// Create other classes as required
class LoanService
{
  public function fetchAll() { /* .. */ }
  public function fetchOne() { /* .. */ }
  public function createLoan() { /* .. */ }
  public function saveLoan() { /* .. */ }
  public function deleteLoan() { /* .. */ }
}
```

LoanResource code

```
class LoanResource extends AbstractResourceListener
{
  public function fetchAll($params = array())
  {
    // return a LoanCollection
    return $this->service->fetchAll($params);
  }

  public function create($data) { /* create a new loan */ }

  public function delete($id) { /* delete a loan */ }
  public function fetch($id) { /* fetch a loan*/ }
  public function patch($id, $data) { /* update a loan */ }
  public function update($id, $data) { /* replace a loan */ }
}
```

Your code controls everything!

Authentication

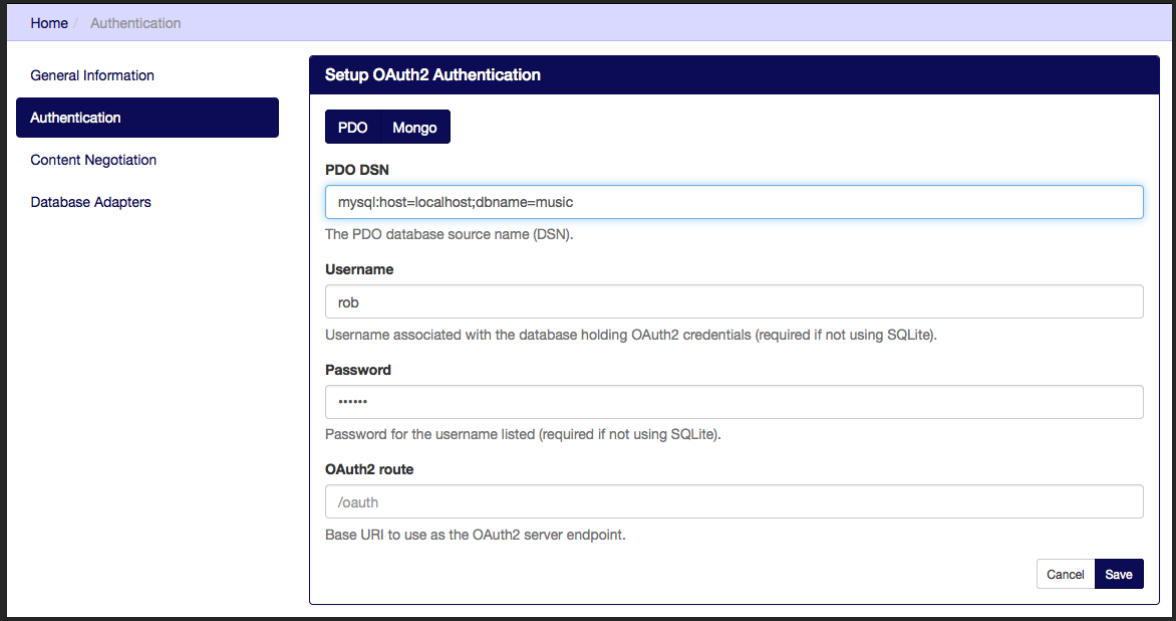
Authentication

- HTTP Basic and Digest (for internal APIs)
- OAuth2 (for public APIs)
- Event-driven, to accommodate anything else
- Returns problem response early
- Correct errors: 401, 403, etc.

Authentication

- HTTP Basic uses htpassword file
- HTTP Digest uses htdigest file
- OAuth2 uses database.
    - knpuniversity.com/screencast/oauth/intro
    - bshaffer.github.io/oauth2-server-php-docs/

OAuth2


Home / Authentication
General Information
Authentication
Content Negotiation
Database Adapters
Setup OAuth2 Authentication
PDO
Mongo
PDO DSN
mysql:host=localhost;dbname=music
The PDO database source name (DSN).
Username
rob
Username associated with the database holding OAuth2 credentials (required if not using SQLite).
Password
••••••
Password for the username listed (required if not using SQLite).
OAuth2 route
/oauth
Base URI to use as the OAuth2 server endpoint.
Cancel
Save

OAuth2 process

1. Get an access token.
2. Send it on all subsequent requests:

```
Authorization: Bearer 5ce33e13e66c5ff723f997387e183c
```

Password grant type

Send username/password & get back a token - good for trusted clients

```
POST /oauth
```

```
{ "grant_type": "password",
  "client_id" : "testclient",
  "username": "rob@akrabat.com",
  "password": "password" }
```

Returns:

```
{
  "access_token": "7f4ac44eb70616204748c41c457b8867e",
  "expires_in": 3600,
  "token_type": "Bearer",
  "scope": null,
  "refresh_token": "3f0d94d87dd891813feddcb4b24f0963"
}
```

Request authorization code

Redirect user to this URL:

http://localhost:8888/oauth/authorize?response_type=code
&client_id=testclient&redirect_uri=/oauth/receivecode

Clicking *Yes* will redirect to 'redirect_uri' with the *authorization code* in the query string.
(You can customise the style!)

Convert authorization code to token

Request access token using authorisation code

```
POST /oauth
```

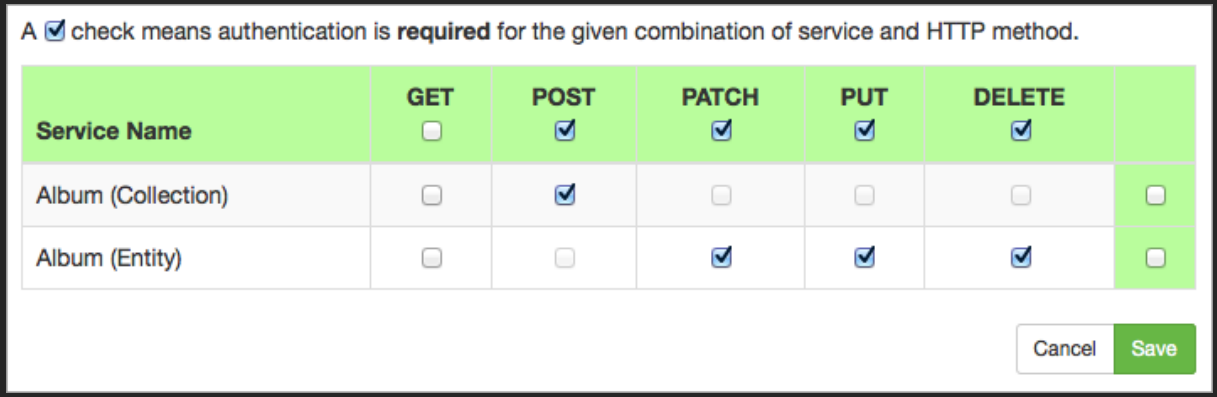
```
{
  "grant_type": "authorization_code",
  "client_id" : "testclient",
  "client_secret": "testpass",
  "code": "a4dd64ffb43e6bfe16d47acfab1e68d9c"
}
```

Returns:

```
{
  "access_token": "907c762e069589c2cd2a229cdae7b8778",
  "expires_in": 3600,
  "token_type": "Bearer",
  "refresh_token": "43018382188f462f6b0e5784dd44c36f"
}
```

Protect your API

via configuration; fails early.



Protect your API

via code in your `Resource` class:

```
use ZF\MvcAuth\Identity\AuthenticatedIdentity as Identity;


// within a method:
if ($this->getIdentity() instanceof Identity) {
    $identity = $this->getIdentity()
    $user = $identity->getAuthenticationIdentity();
}
```

To sum up

Apigility provides the boring bits of API building:

- Content negotiation
- Discovery (HATEOS) via application/hal+json
- Error reporting via application/problem+json
- Versioning
- Validation
- Authentication
- Documentation