



Serverless PHP Applications

Rob Allen

Nineteen Feet

JUNE 6

Serverless

A Serverless solution is one that costs you nothing to run if nobody is using it

... excluding data storage costs.

Paul D. Johnston

as a Service

Storage *as a Service*

Database *as a Service*

Cache *as a Service*

Auth *as a Service*

Search *as a Service*

Function *as a Service*

Function as a Service

- Your code
- Deployed to the cloud
- Runs when needed
- Scaled automatically
- Pay only for execution

Use-cases

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Synchronous

Service is invoked and provides immediate response
(HTTP requests: APIs, chat bots)

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Synchronous

Service is invoked and provides immediate response
(HTTP requests: APIs, chat bots)

Asynchronous

Push a message which drives an action later
(web hooks, timed events, database changes)

Challenges

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- Start up latency

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- Time limit

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- State is external

Challenges

- Start up latency
- Time limit
- State is external
- Different way of thinking

It's about value

**Beau** @BeauVrolyk · 30m
Replying to @akrabat @kelseyhightower
1) "Serverless" is a point on the path to true app isolation. Apps want to just run, their authors don't care about infrastructure at all.
  1   2

**Beau** @BeauVrolyk · 29m
Replying to @akrabat @kelseyhightower
2) The App author should not need to know, anymore than a Journalist knows about printing presses or what the voltage of the power used.
 1  1   2

**Beau** @BeauVrolyk · 25m
Replying to @akrabat @kelseyhightower
3) We are relearning what was known in the time-share days. Pricing needs to be based on something customers value, not infra. items like VMs
   

When should you use serverless?

- Responding to web hooks

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- PWA/Static site contact form, et al.

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- Variable traffic levels

When should you use serverless?

- Responding to web hooks
- PWA/Static site contact form, et al.
- Additional features without extending current platform
- Variable traffic levels
- When you want your costs to scale with traffic

Serverless platforms



Google Cloud Platform



IBM Cloud



Serverless platforms with PHP support



Google Cloud Platform

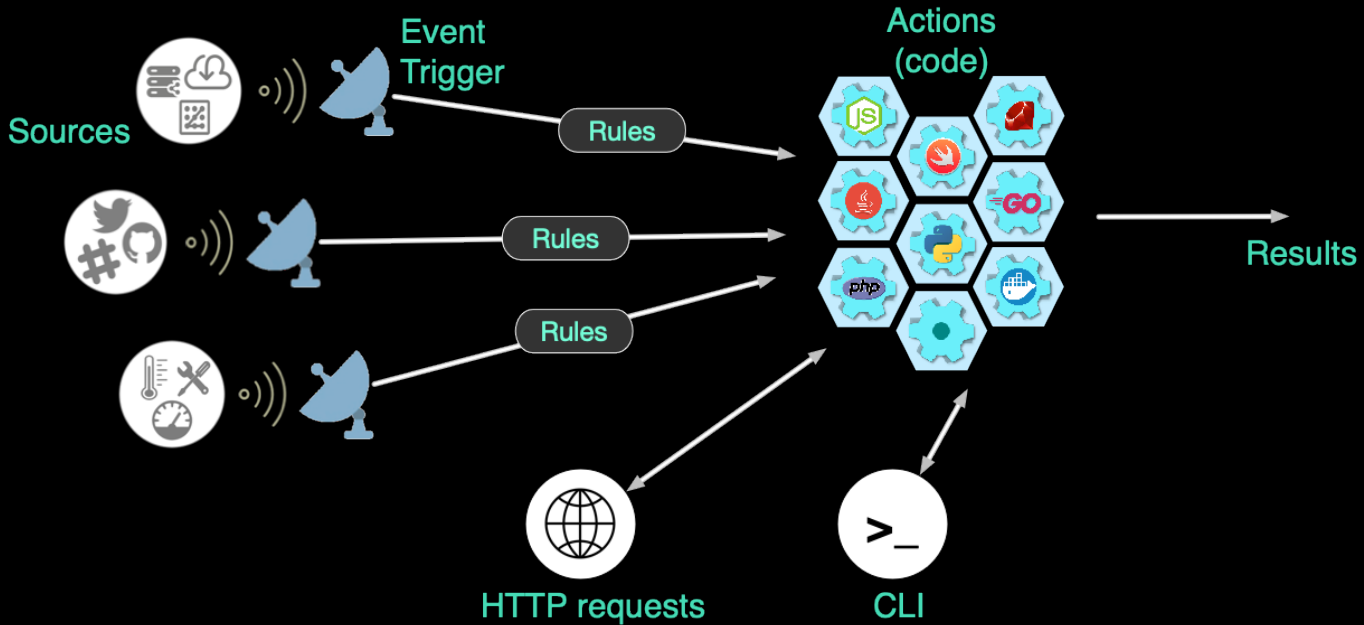




APACHE

OpenWhisk

Concepts







Hello world in PHP

```
1 <?php
2 function main(array $args) : array
3 {
4     $name = $args["name"] ?? "World";
5
6     return [ "msg" => "Hello $name" ];
7 }
```

Hello world in PHP

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1 <?php
2 function main(array $args) : array
3 {
4     $name = $args["name"] ?? "World";
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6     return [ "msg" => "Hello $name" ];
7 }
```

Entry point

Event parameters

Service result

Upload your action

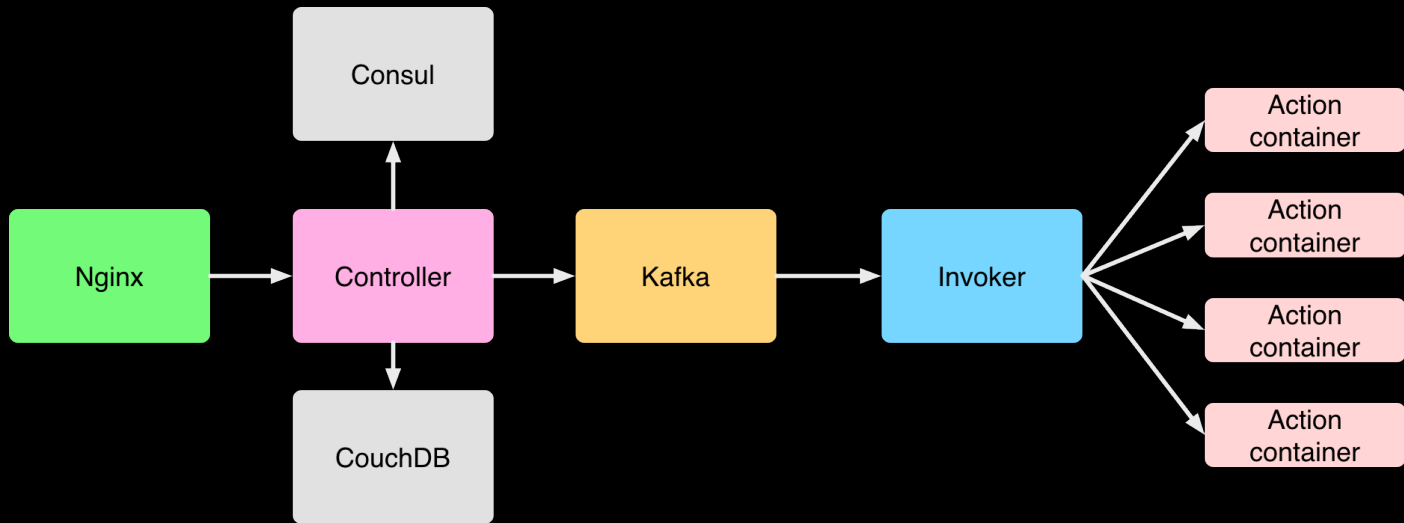
```
$ wsk action update hello hello.php  
ok: updated action hello
```

Run your action

```
$ wsk action invoke hello --result  
{  
  "msg": "Hello World"  
}
```

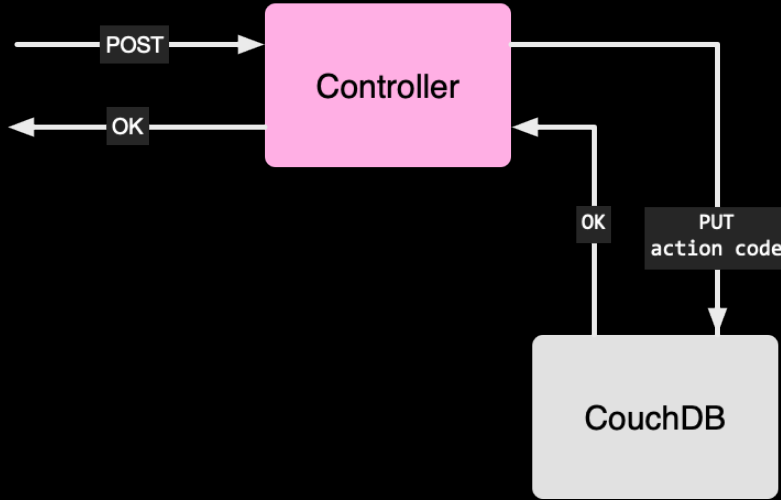
Segue: How did it do this?

OpenWhisk's architecture



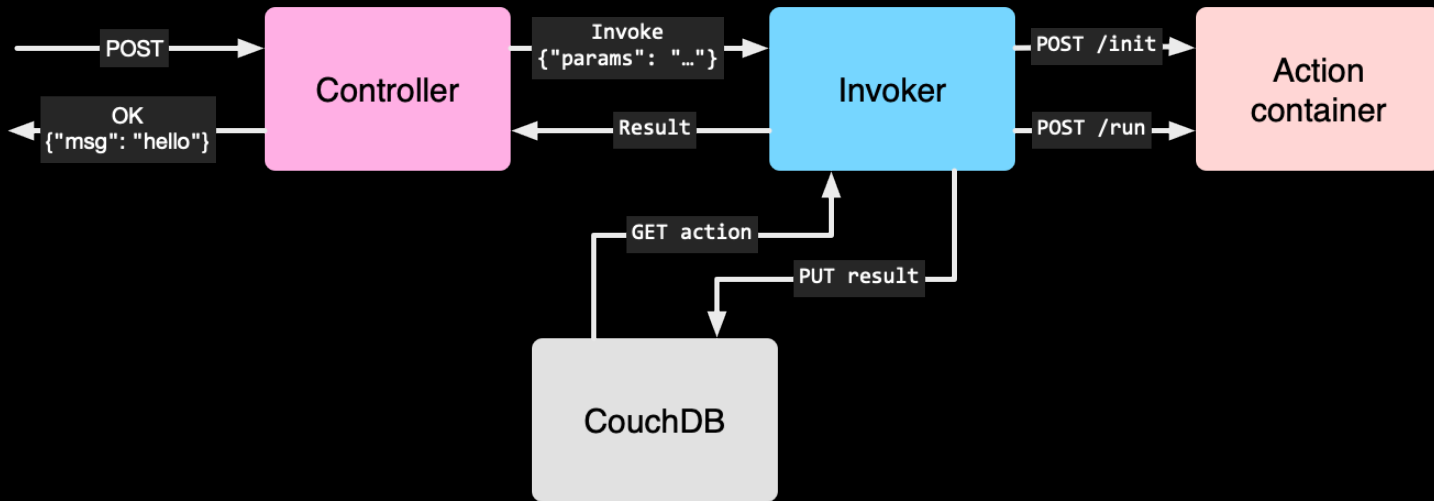
Create an action

```
$ wsk action create hello hello.php
```



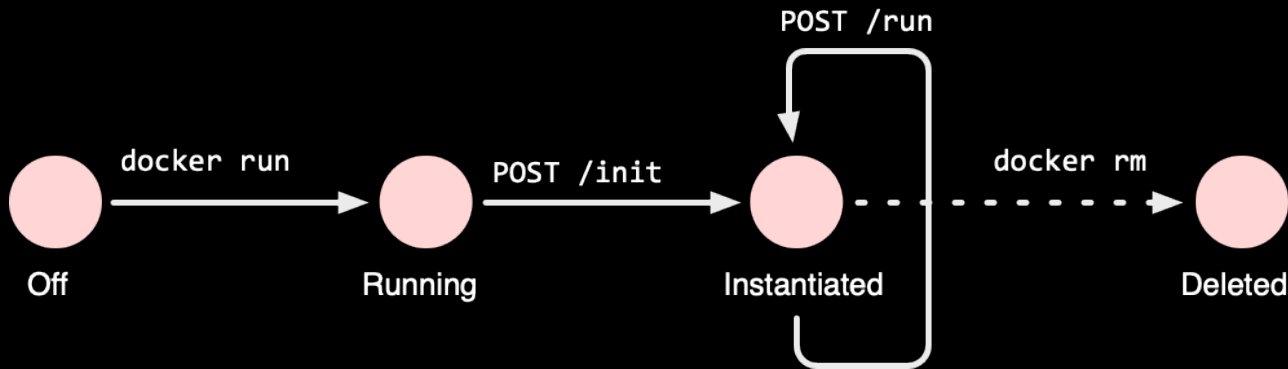
Invoke an action

```
$ wsk action invoke hello -r
```



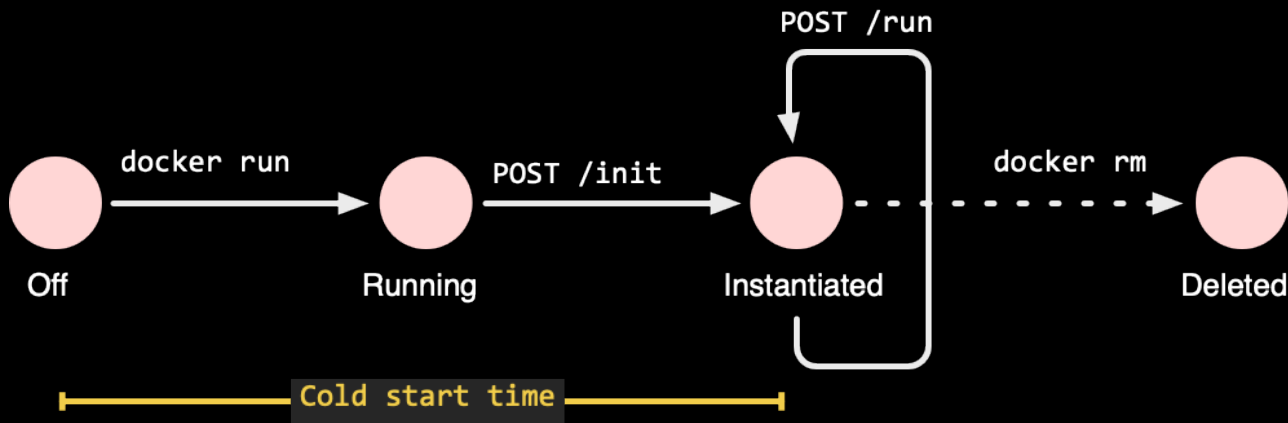
Action container lifecycle

- Hosts the user-written code
- Controlled via two end points: `/init` & `/run`



Action container lifecycle

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End Segue

Turn it into an API

Add the `--web` flag:

```
$ wsk action update hello hello.php --web true
```

Turn it into an API

Add the `--web` flag:

```
$ wsk action update hello hello.php --web true
$ curl https://openwhisk.ng.bluemix.net/api/v1/web/ \
    19FT_demo/default/hello.json
{
  "msg": "Hello World"
}
```

API Gateway

When you want to do more with HTTP endpoints

- Route endpoint methods to actions
- Custom domains
- Rate limiting
- Security (API keys, OAuth, CORS)
- Analytics

API Gateway



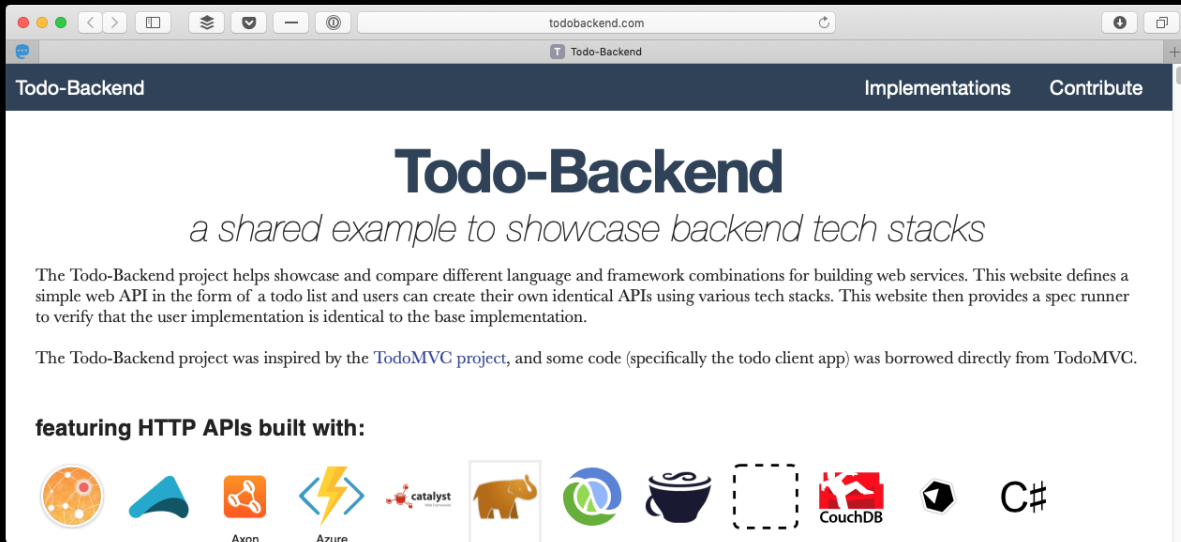
```
$ wsk api create /demo /hello GET hello  
ok: created API /demo/hello GET for action /_/hello
```

API Gateway



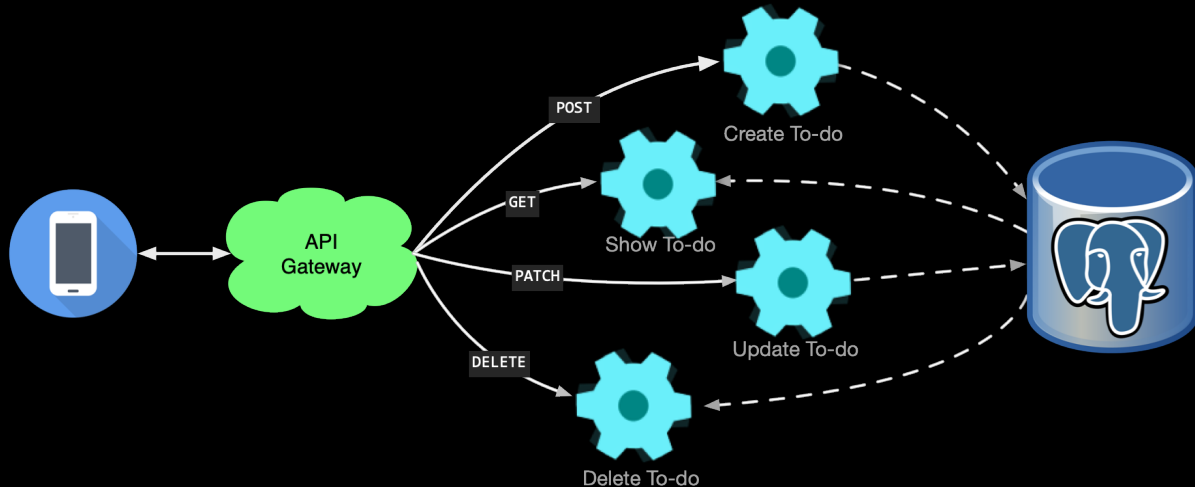
```
$ curl https://ow.akrabort.com/demo/hello?name=Rob
{
  "message": "Hello Rob!"
}
```


A Serverless API



Todo-Backend

An OpenWhisk PHP implementation of a to-do list API



Serverless Framework

Deployment tooling for serverless applications

```
serverless.yml:
```

```
service: ow-todo-backend
```

```
provider:
```

```
  name: openwhisk
```

```
  runtime: php
```

```
plugins:
```

```
  - serverless-openwhisk
```

Configure action

```
functions:  
  edit-todo:  
    handler: "src/actions/editTodo.main"  
    name: "todo-backend/edit-todo"
```

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Configure API Gateway

```
functions:
  edit-todo:
    handler: "src/actions/editTodo.main"
    name: "todo-backend/edit-todo"
  events:
    - http:
        path: /todos/{id}
        method: patch
```

Configure API Gateway

```
functions:
  edit-todo:
    handler: "src/actions/editTodo.main"
    name: "todo-backend/edit-todo"
    events:
      - http:
          path: /todos/{id}
          method: patch
```


Project files

```
.  
├── src/  
├── vendor/  
├── composer.json  
├── composer.lock  
└── serverless.yml
```

Project files

```
.
├── src/
├── vendor/
├── composer.json
├── composer.lock
├── serverless.yml
└── src/
    ├── Todo/
    │   ├── Todo.php
    │   ├── TodoMapper.php
    │   └── TodoTransformer.php
    ├── actions/
    │   ├── addTodo.php
    │   ├── deleteTodo.php
    │   ├── editTodo.php
    │   ├── listTodos.php
    │   └── showTodo.php
    └── AppContainer.php
```

editTodo.php

```
function main(array $args) : array
{
    try {
        $parts = explode("/", $args['__ow_path']);
        $id = (int)array_pop($parts);

        $data = json_decode(base64_decode($args['__ow_body']), true);
        if (!is_array($data)) {
            throw new InvalidArgumentException('Missing body', 400);
        }

        $container = new AppContainer($args);
        $mapper = $container[TodoMapper::class];

        $todo = $mapper->loadById($id);
        $mapper->update($todo, $data);

        $transformer = $container[TodoTransformer::class];
        $resource = new Item($todo, $transformer, 'todos');
        $fractal = $container[Manager::class];

        return [
            'statusCode' => 200,
            'body' => $fractal->createData($resource)->toArray(),
        ];
    } catch (Throwable $e) {
        var_dump((string)$e);
        $code = $e->getCode() < 400 ? $e->getCode(): 500;
        return [
            'statusCode' => $code,
            'body' => ['error' => $e->getMessage()]];
    }
}
```

editTodo.php: Error handling

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function main(array $args) : array
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    try {
        // do stuff
    } catch (Throwable $e) {
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```

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```

editTodo.php: Grab input

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$parts = explode("/", $args['__ow_path']);  
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$data = json_decode($body, true);  
if (!is_array($data)) {  
    throw new Exception('Missing body', 400);  
}
```

editTodo.php: Grab input

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}
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editTodo.php: Do the work

```
$container = new AppContainer($args);  
$mapper = $container[TodoMapper::class];
```

```
$todo = $mapper->loadById($id);  
$mapper->update($todo, $data);
```

editTodo.php: Do the work

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```

editTodo.php: Present results

```
$transformer = $container[TodoTransformer::class];  
$resource = new Item($todo, $transformer, 'todos');  
$fractal = $container[Manager::class];  
  
$output = $fractal->createData($resource);  
  
return [  
    'statusCode' => 200,  
    'body' => $output->toArray(),  
];
```

editTodo.php: Present results

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$transformer = $container[TodoTransformer::class];  
$resource = new Item($todo, $transformer, 'todos');  
$fractal = $container[Manager::class];  
  
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    'statusCode' => 200,  
    'body' => $output->toArray(),  
];
```

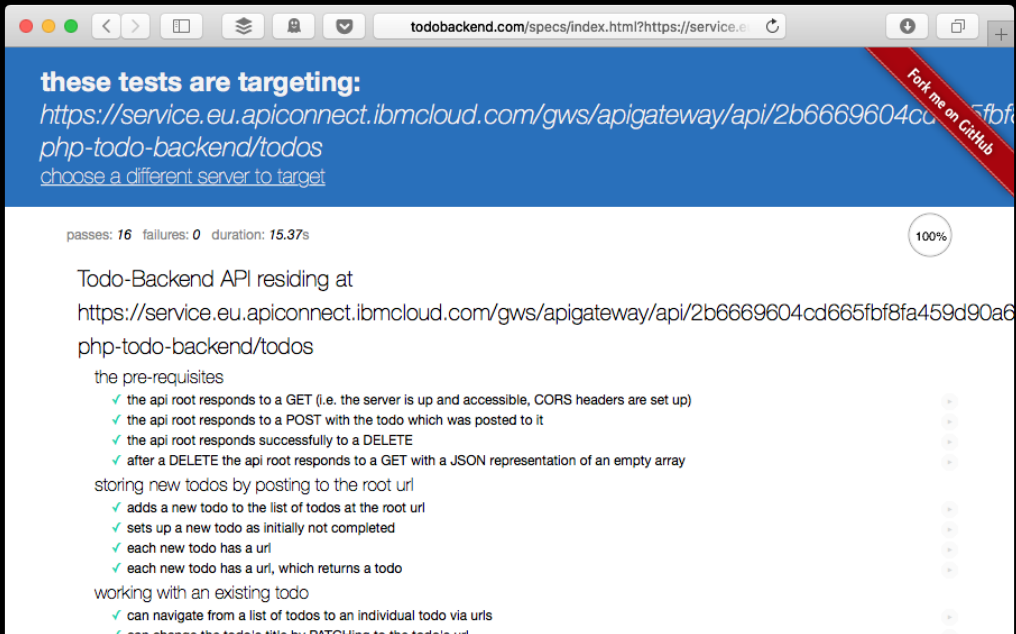
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$output = $fractal->createData($resource);  
  
return [  
    'statusCode' => 200,  
    'body' => $output->toArray(),  
];
```


Deploy

```
$ serverless deploy
Serverless: Packaging service...
Serverless: Compiling Functions...
Serverless: Compiling Packages...
Serverless: Compiling API Gateway definitions...
Serverless: Compiling Rules...
Serverless: Compiling Triggers & Feeds...
Serverless: Compiling Service Bindings...
Serverless: Deploying Packages...
Serverless: Deploying Functions...
Serverless: Deploying API Gateway definitions...
[...]
```

A working API!





AWS Lambda with PHP

Only *sensibly* possible since November 2018 with the introduction of *layers*

AWS Lambda with PHP

Only *sensibly* possible since November 2018 with the introduction of *layers*

Process:

1. Create a layer containing:
 1. the PHP executable
 2. a bootstrap script
2. Write the PHP function!

brief

running PHP made simple

Everything you need to easily
deploy and run serverless PHP applications.



Bref

- Maintained PHP runtimes for AWS Lambda
- Deployment via Serverless Framework
- Great documentation!

Bref PHP function

```
<?php declare(strict_types=1);  
  
require __DIR__ . '/vendor/autoload.php';  
  
return function($event) {  
    return 'Hello ' . ($event['name'] ?? 'world');  
}
```


serverless.yml

```
service: helloapp
provider:
  name: aws
  runtime: provided
```

```
functions:
  hello:
    handler: index.php
    layers:
      - ${bref:layer.php-73}
```

serverless.yml

```
service: helloapp
provider:
  name: aws
  runtime: provided
```

```
functions:
  hello:
    handler: index.php
    layers:
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```

serverless.yml

```
service: helloapp
provider:
  name: aws
  runtime: provided
```

```
functions:
  hello:
    handler: index.php
    layers:
      - ${bref:layer.php-73}
```

Deploy

```
$ serverless deploy
Serverless: Packaging service...
...
Serverless: Stack update finished...
```

```
Service Information
service: helloapp
stage: dev
stack: helloapp-dev
functions:
  hello: helloapp-dev-hello
```

Run

```
$ serverless invoke -f hello  
"Hello world"
```

Run

```
$ serverless invoke -f hello  
"Hello world"
```

```
$ serverless invoke -f hello -d '{"name": "Rob"}'  
"Hello Rob"
```

Run locally in Docker

```
$ serverless invoke local --docker -f hello  
Serverless: Building Docker image...
```

```
...
```

```
REPORT RequestId: 6a653a94-ee51-1f3e-65c7-1f1954842f29  
  Init Duration: 265.93 ms Duration: 145.37 ms  
  Billed Duration: 200 ms Memory Size: 1024 MB  
  Max Memory Used: 27 MB
```

```
"Hello world"
```

Xdebug also works!

Add AWS API Gateway

```
serverless.yml:
```

```
functions:
```

```
  hello:
```

```
    handler: index.php
```

```
    ...
```

```
  events:
```

- http: "GET /hello"
- http: "GET /hi/{name}"

Return a PSR-15 RequestHandler

```
class HelloHandler implements RequestHandlerInterface
{
    public function handle(ServerRequest $request): Response
    {
        $name = ($request->getQueryParams()['name'] ?? 'world');
        $body = 'Hello ' . $name;

        return new Response(200,
            ['Content-Type' => 'text/plain'],
            $body);
    }
}
```

Deploy

```
$ serverless deploy
Serverless: Packaging service...
...
```

Service Information

```
service: helloapp
```

```
stage: dev
```

```
stack: helloapp-dev
```

```
endpoints:
```

```
  GET - https://l1v6cz13zb.execute-api.eu-west-2
        .amazonaws.com/dev/hello
```

Test

```
$ curl -i https://l1v6cz...naws.com/dev/hello?name=Rob
HTTP/2 200
content-type: text/plain
content-length: 9
```

Hello Rob

Project 365

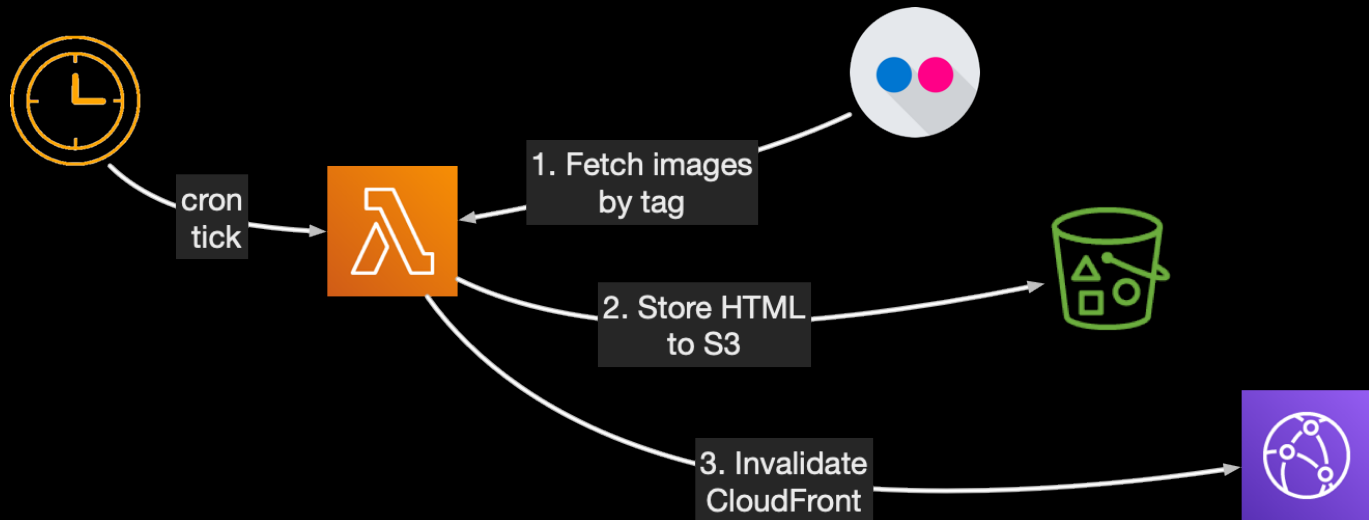
My photo-a-day website

Project 365

Static website to display my photo-a-day picture for each day of the year.

- Hosted on S3
- CloudFront CDN
- Lambda/PHP function

Lambda/PHP function



Serverless configuration

```
functions:
  update:
    handler: index.php
    events:
      - schedule:
          name: project365-build
          rate: cron(0 */2 * * ? *)
```

Serverless configuration

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Serverless configuration

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functions:
  update:
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    events:
      - schedule:
          name: project365-build
          rate: cron(0 */2 * * ? *)
```

main()

```
function main(array $eventData) : array
{
    $year = $eventData['year'] ?? date('Y');

    $pageCreator = new PhotoPageCreator();
    $html = $pageCreator->update($year);
    $uploader = new Uploader($cloudFrontId);
    $uploader->uploadOne($year, $html, $s3Bucket);
    $uploader->invalidateCache(['/' . $year]);
}
```

main()

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    $uploader->invalidateCache(['/' . $year]);
}
```

Fetch photos from Flickr

```
$url = '?' . http_build_query([  
    'api_key' => $this->flickrApiKey,  
    'user_id' => $flickrUserId,  
    'extras' => 'url_z, date_taken, owner_name',  
    'method' => 'flickr.photos.search',  
    'tags' => $year,  
]);  
  
$response = $this->client->get($url);  
$data = json_decode($response->getBody(), true);  
return $data['photos'];
```

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    'tags' => $year,  
]);  
  
$response = $this->client->get($url);  
$data = json_decode($response->getBody(), true);  
return $data['photos'];
```

Upload to S3

```
$s3 = new S3Client([  
    'version' => 'latest',  
    'region'  => getenv('AWS_DEFAULT_REGION')  
]);
```

```
$s3->putObject([  
    'Bucket' => $bucketName,  
    'ACL'    => 'public-read',  
    'Key'    => "$year.html",  
    'Body'   => $data,  
    'ContentType' => 'text/html',  
]);
```

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    'Body'   => $data,  
    'ContentType' => 'text/html',  
]);
```

Invalidate CloudFront

```
$cft = new CloudFrontClient([ .. ]);

$result = $cft->createInvalidation([
    'DistributionId' => $cloudFrontId,
    'InvalidationBatch' => [
        'CallerReference' => date('YmdHis'),
        'Paths' => [
            'Items' => ["/$year.html"],
            'Quantity' => 1,
        ],
    ],
]);
```

Invalidate CloudFront

```
$cft = new CloudFrontClient([ .. ]);

$result = $cft->createInvalidation([
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        'Paths' => [
            'Items' => ["/$year.html"],
            'Quantity' => 1,
        ],
    ],
]);
```

Invalidate CloudFront

```
$cft = new CloudFrontClient([ .. ]);

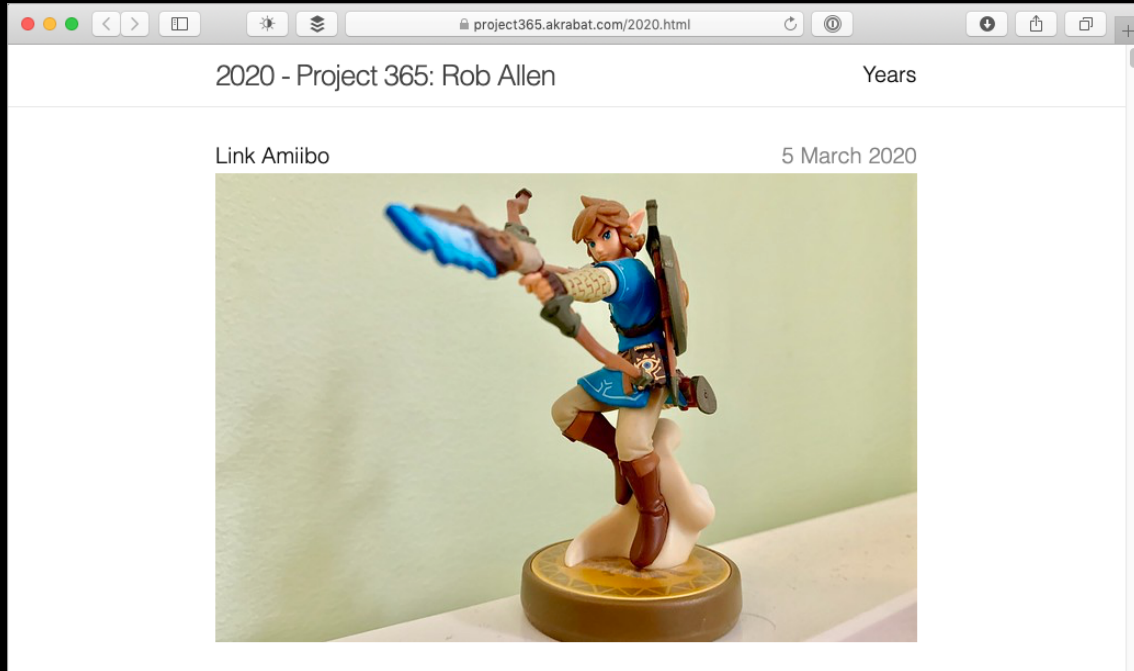
$result = $cft->createInvalidation([
    'DistributionId' => $cloudFrontId,
    'InvalidationBatch' => [
        'CallerReference' => date('YmdHis'),
        'Paths' => [
            'Items' => ["/$year.html"],
            'Quantity' => 1,
        ],
    ],
]);
```


Invalidate CloudFront

```
$cft = new CloudFrontClient([ .. ]);

$result = $cft->createInvalidation([
    'DistributionId' => $cloudFrontId,
    'InvalidationBatch' => [
        'CallerReference' => date('YmdHis'),
        'Paths' => [
            'Items' => ["/$year.html"],
            'Quantity' => 1,
        ],
    ],
]);
```

The finished website



To sum up

Resources

- <https://akrobat.com>
- <https://www.martinfowler.com/articles/serverless.html>
- <https://github.com/akrobat/ow-php-todo-backend>
- <https://github.com/akrobat/project365-photos-website>
- <http://www.openwhisk.org>
- <https://aws.amazon.com/lambda/>
- <https://bref.sh>

Thank you!

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