Guzzle:
Extraordinary HTTP Client

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Why HTTP clients in PHP?

Talking to web services

- Authentication with 3rd parties
- Social media interaction
- Remote APIs

HTTP clients in PHP

- file_get_contents()
- curl_exec()
- PHP library (There are plenty to choose from!)

Guzzle is a PHP library

Guzzle

- Uses cURL or PHP stream handler
- Persistent connections
- Concurrent & asynchronous requests
- Extensible
- PSR-7

Why Guzzle?

- Much easier to use
- Async!
- PSR-7
- Easier to test
- Popular

Segue: HTTP & PSR-7

HTTP

`HTTP/0.9` - 1990
`HTTP/1.0` - May 1996 (RFC 1945)
`HTTP/1.1` - January 1997 (~~RFC 2068~~, ~~RFC 2616~~, RFC 723*)
`HTTP/2` - May 2015 (RFC 7540)

HTTP/2

- Binary on the wire
- Multiplexed: many requests on one TCP/IP connection
- Servers can push responses proactively to client
- Request priorities
- Same HTTP status codes and methods

For this talk, we don't care!

(It looks the same to PHP)

HTTP messages

HTTP is a stateless request/response protocol that operates by exchanging messages.

RFC 7230

Request & Response

Request:

```
{METHOD} {URI} HTTP/1.1
Header: value1,value2
Another-Header: value

Message body
```

Response:

```
HTTP/1.1 {STATUS_CODE} {REASON_PHRASE}
Header: value
Some-Header: value

Message body
```

Request

```
GET / HTTP/1.1
Host: akrabat.com
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10.11; rv:45.0)
    Gecko/20100101 Firefox/45.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
Accept-Language: en-GB,en;q=0.5
Accept-Encoding: gzip, deflate, br
Connection: keep-alive
If-Modified-Since: Mon, 04 Apr 2016 16:21:02 GMT
Cache-Control: max-age=0
```

Response

```
HTTP/1.1 200 OK
Server: nginx/1.11.2
Date: Sun, 28 Aug 2016 12:05:52 GMT
Content-Type: text/html; charset=UTF-8
Content-Length: 120299
Connection: keep-alive
Keep-Alive: timeout=65
Vary: Accept-Encoding
Vary: Accept-Encoding, Cookie
Cache-Control: max-age=3, must-revalidate
Last-Modified: Sun, 28 Aug 2016 12:04:38 GMT
Strict-Transport-Security: max-age=15768000

<!DOCTYPE html>
<head>
```

Status codes

- **1xx** = Informational
- **2xx** = Success
- **3xx** = Redirection
- **4xx** = Client error
- **5xx** = Server error

Headers

- **Host**: Domain name and port of server
- **Accept**: List of acceptable media types for payload
- **Authorization**: Authentication credentials

- **Cache-Control**: Can this response can be cached?
- **ETag**: Identifier for this specific object
- **Link**: Relationship with another resource
- **Location**: Redirection

- **Content-Type**: Information on how to decode payload
- **Content-Length**: Authentication credentials

How do we do this in PHP?

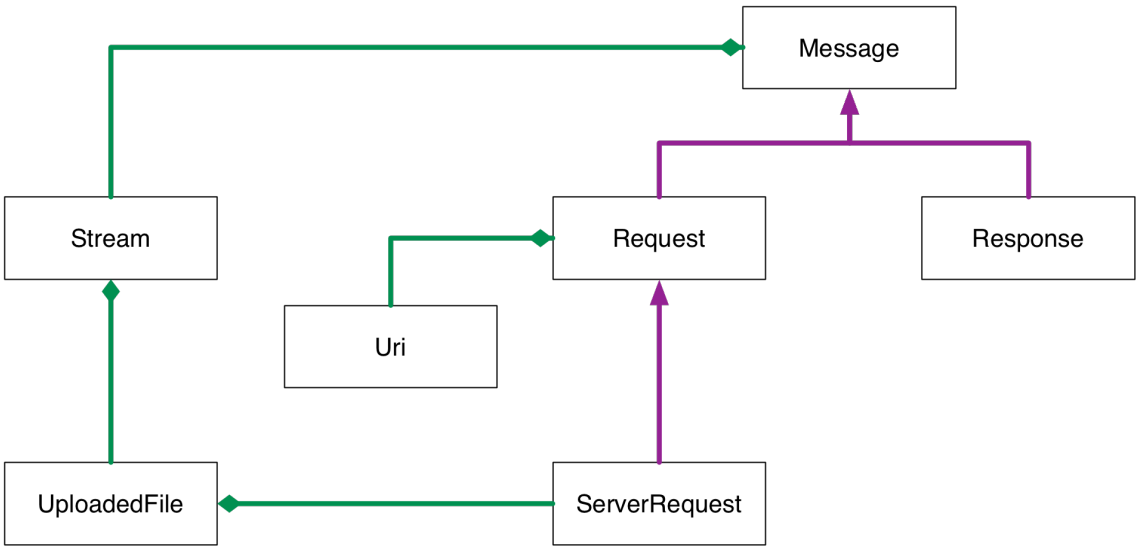
Request:

- $_SERVER, $_GET, $_POST, $_COOKIE, $_FILES
- `apache_request_headers()`
- `php://input`

Response:

- `header()` & `http_response_code()`
- `header_list()` / `headers_sent()`
- `echo` (& `ob_*()` family)

PSR-7: a set of interfaces



Key feature 1: Immutability

`Request`, `Response`, `Uri` & `UploadFile` are *immutable*

```
1 $uri = new GuzzleHttp\Psr7\Uri('https://api.joind.in/v2.1/events');
2 $uri2 = $uri->withQuery('?filter=upcoming');
3
4 $request = (new GuzzleHttp\Psr7\Request())
5     ->withMethod('GET')
6     ->withUri($uri2)
7     ->withHeader('Accept', 'application/json')
8     ->withHeader('Authorization', 'Bearer 0873418d');
```

Key feature 2: Streams

Message bodies are *streams*

```
1 $body = GuzzleHttp\Psr7\stream_for(json_encode(['hello' => 'world']));
2
3 // or
4
5 $resource = fopen('/path/to/file', 'r');
6 $body = GuzzleHttp\Psr7\stream_for($resource);
7
8 $request = $request->withBody($body)
9 $response = $client->send($request);
```

Interoperability

Both Slim & Guzzle implement PSR-7…

```
1 $app->get('/random', function ($request, $response, $args) {
2     $choice = mt_rand(1, 15);
3     $filename ='image_' . $choice . '.jpg';
4
5     $guzzle = new \GuzzleHttp\Client();
6     $apiResponse = $guzzle->get("https://i.19ft.com/$filename");
7
8     return $apiResponse;
9 }
```

HTTP clients in PHP

Using Guzzle

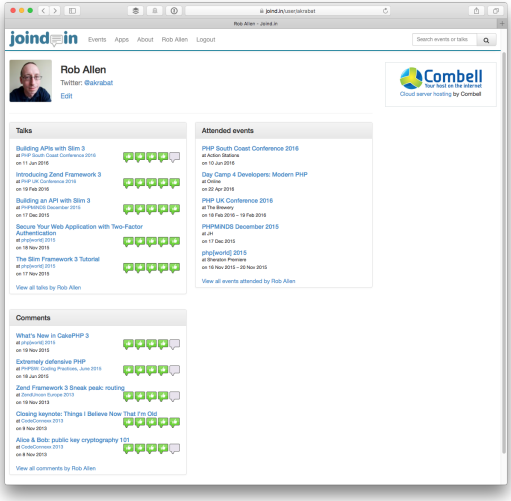
```
1 $client = new \GuzzleHttp\Client();
2
3 $response = $client->request('GET', 'https://api.joind.in/v2.1/events');
4 $data = json_decode($response->getBody(), true);
```

Shortcuts:

```
$response = $client->get();
$response = $client->post();
$response = $client->put();
$response = $client->patch();
$response = $client->delete();
```

Actually, joind.in is a great case-study…

Joind.in's user profile page



Code:

```
 1 $user      = $userApi->getUserByUsername(
 2                $username);
 3 $talks     = $talkApi->getCollection(
 4                $user->getTalksUri());
 5 $attended  = $eventApi->getCollection(
 6                $user->getAttendedEventsUri());
 7 $hosted    = $eventApi->getCollection(
 8                $user->getHostedEventsUri());
 9 $comments  = $talkApi->getComments(
10                $user->getTalkCommentsUri());
```

Let's do this in Guzzle!

```
1 $client = new \GuzzleHttp\Client([
2     'base_uri' => 'https://api.joind.in/v2.1/',
3 ]);
```

Let's do this in Guzzle!

```
 1 $client = new \GuzzleHttp\Client([
 2     'base_uri' => 'https://api.joind.in/v2.1/',
 3 ]);
 4
 5 $response = $client->get('users', [
 6     'query' => 'username=akrabat&verbose=yes',
 7     'headers'  => [
 8         'Accept' => 'application/json',
 9     ]
10 ]);
```

Let's do this in Guzzle!

```php
$client = new \GuzzleHttp\Client([
    'base_uri' => 'https://api.joind.in/v2.1/',
]);

$response = $client->get('users', [
    'query' => 'username=akrabat&verbose=yes',
    'headers'  => [
        'Accept' => 'application/json',
    ]
]);

if ($response->getStatusCode() == 200) {
    $data = json_decode($response->getBody(), true);
    $user = $data['users'][0];
    print_r($user);
}
```

Result

```
Array
(
    [username] => akrabat
    [full_name] => Rob Allen
    [twitter_username] => akrabat
    [gravatar_hash] => 79d9ba388d6b6cf4ec7310cad9fa8c8a
    [uri] => https://api.joind.in/v2.1/users/14
    [verbose_uri] => https://api.joind.in/v2.1/users/14?verbose=yes
    [website_uri] => https://joind.in/user/akrabat
    [talks_uri] => https://api.joind.in/v2.1/users/14/talks/
    [attended_events_uri] => https://api.joind.in/v2.1/users/14/attended/
    [hosted_events_uri] => https://api.joind.in/v2.1/users/14/hosted/
    [talk_comments_uri] => https://api.joind.in/v2.1/users/14/talk_comments/
)
```

Hypermedia

Links to additional resources related to this user are embedded in the response:

```
[talks_uri] => https://api.joind.in/v2.1/users/14/talks/
[attended_events_uri] => https://api.joind.in/v2.1/users/14/attended/
[hosted_events_uri] => https://api.joind.in/v2.1/users/14/hosted/
[talk_comments_uri] => https://api.joind.in/v2.1/users/14/talk_comments/
```

Handling errors

All exceptions live in the namespace: `\GuzzleHttp\Exception`
All exceptions implement `GuzzleException`

```
\RuntimeException
├── TransferException
│   ├── RequestException
│   │   ├── BadResponseException
│   │   │   ├── ClientException          <- 4xx status code returned
│   │   │   └── ServerException          <- 5xx status code returned
│   │   └── ConnectException             <- Networking error
│   └── TooManyRedirectsException        <- More than 5 (by default) redirects
└── SeekException
```

Handling errors

```
 1 try {
 2     $response = $client->get('users', [
 3         'query' => 'username=akrabat&verbose=yes',
 4         'headers'  => [
 5             'Accept' => 'application/json',
 6         ]
 7     ]);
 8 } catch (\GuzzleHttp\Exception\ClientException $e) {
 9     // process 4xx
10 } catch (\GuzzleHttp\Exception\ServerException $e) {
11     // process 5xx
12 } catch (\GuzzleHttp\Exception\ConnectException $e) {
13     // process networking error
14 } catch (\GuzzleHttp\Exception\TransferException $e) {
15     // process any other issue
16 }
```

Multiple requests

```
 1 $response = $client->get('users?username=akrabat&verbose=yes');
 2 $user = json_decode($response->getBody(), true)['users'][0];
 3
 4 $response = $client->get($user['talks_uri']);
 5 $talks = json_decode($response->getBody(), true)['talks'];
 6
 7 $response = $client->get($user['attended_events_uri']);
 8 $attended = json_decode($response->getBody(), true)['events'];
 9
10 $response = $client->get($user['hosted_events_uri']);
11 $hosted = json_decode($response->getBody(), true)['events'];
12
13 $response = $client->get($user['talk_comments_uri']);
14 $comments = json_decode($response->getBody(), true)['comments'];
```

It's a bit sequential…

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We can do better!

Asynchronous requests

- Multiple requests all at once!
- Chaining to perform operations after a request returns
- Uses `curl_multi_exec` behind the scenes

Promises

*A **promise** represents the eventual result of an asynchronous operation. The primary way of interacting with a promise is through its* `then` *method, which registers callbacks to receive either a promise's eventual value or the reason why the promise cannot be fulfilled.*

-- https://promisesaplus.com

Promises

Create a pending promise:

```
1 $promise = $client->getAsync('users?username=akrabat&verbose=yes', [
2     'headers'  => [ 'Accept' => 'application/json' ]
3 ]);
4
5 echo $promise->getState();  // pending
```

Promises

A pending promise may be resolved by being...

- Fulfilled with a result
- Rejected with a reason

```
public function then(
    callable $onFulfilled = null,
    callable $onRejected = null
) : Promise;
```

then()

```
1 $promise->then(
2     function (\GuzzleHttp\Psr7\Response $response) {
3         /* do something with the valid response */
4     },
5     function (\GuzzleHttp\Exception\RequestException $e) {
6         /* handle error */
7     }
8 );
```

Putting it together

```
 1 $promise = $client->getAsync(
 2     'users?username=akrabat&verbose=yes',
 3     [ 'headers'  => [ 'Accept' => 'application/json' ] ]
 4 )->then(
 5     function ($response) {
 6         $user = json_decode($response->getBody(), true)['users'][0];
 7         print_r($user);
 8     },
 9     function ($e) {
10         $response = $e->getResponse();
11         print_r($response->getStatusCode());
12     }
13 );
14
15 GuzzleHttp\Promise\settle([$promise])->wait();
```

Chaining requests

After retrieving some data, get some more!

```
 1 $promise = $client->getAsync('users?username=akrabat&verbose=yes')
 2   ->then(function ($response) use ($client) {
 3
 4     $user = json_decode($response->getBody(), true)['users'][0];
 5     return $client->getAsync($user['talks_uri']);
 6 });
 7
 8 $responses = GuzzleHttp\Promise\unwrap([$promise]);
 9
10 $talks = json_decode($responses[0]->getBody(), true);
```

Concurrent requests

```
 1 $promises = [
 2   'talks'    => $client->getAsync($user['talks_uri']),
 3   'attended' => $client->getAsync($user['attended_events_uri']),
 4   'hosted'   => $client->getAsync($user['hosted_events_uri']),
 5   'comments' => $client->getAsync($user['talk_comments_uri']),
 6 ];
 7
 8 $responses = Promise\unwrap($promises);
 9
10 $talks    = json_decode($responses['talks']->getBody(), true)['talks'];
11 $attended = json_decode($responses['attended']->getBody(), true)['talks'];
12 $hosted   = json_decode($responses['hosted']->getBody(), true)['talks'];
13 $comments = json_decode($responses['comments']->getBody(), true)['talks'];
```

Pools

Step 1: Create a list of Requests

```
 1 use \GuzzleHttp\Psr7\Request;
 2 $response = $client->get('https://api.joind.in/v2.1/events/6002/talks');
 3 $talks = json_decode($response->getBody(), true)['talks'];
 4
 5 $requests = [];
 6 foreach ($talks as $talk) {
 7   foreach ($talk['speakers'] as $speaker) {
 8     if (isset($speaker['speaker_uri'])) {
 9       $requests[] = new Request('GET', $speaker['speaker_uri']);
10     }
11   }
12 }
```

Pools

Step 2: Create a pool

```
 1 $twitterHandles = [];
 2 $pool = new \GuzzleHttp\Pool($client, $requests, [
 3     'concurrency' => 3,
 4     'fulfilled' => function ($response, $index) use (&$twitterHandles) {
 5         $user = json_decode($response->getBody(), true)['users'][0];
 6         $twitterHandles[] = $user['twitter_username'];
 7     },
 8     'rejected' => function ($reason, $index) {
 9         /* handle error */
10     },
11 ]);
```

Pools

Step 3: Execute

```
1 // Generate a promise for the pool
2 $promise = $pool->promise();
3
4 // complete all the requests in the pool
5 $promise->wait();
6
7 print_r($twitterHandles); // list of speaker Twitter handlers
```

Sending data

```php
$client = new \GuzzleHttp\Client([
    'base_uri' => 'https://api.joind.in/v2.1/',
    'headers' => [
        'Accept' => 'application/json',
        'Authorization' => 'Bearer f9b4f1a9b30bdc0d',
    ]
]);

$response = $client->request(
    'POST',
    'talks/139/comments',
    [
        'body' => '{"comment": "Great talk. Learnt lots!!", "rating": 5}',
        'headers' => [ 'Content-Type' => 'application/json' ],
    ]
);
```

Automatically encode JSON

```php
$data = [
    'comment' => 'Great talk. Learnt lots!',
    'rating' => 5,
];

$client = new \GuzzleHttp\Client();
$response = $client->post(
    'https://api.joind.in/v2.1/talks/139/comments',
    [
        'json' => $data,
        'headers' => [
            'Accept' => 'application/json',
            'Authorization' => 'Bearer f9b4f1a9b30bdc0d',
        ]
    ]
);
```

Upload files

```
 1 $response = $client->get('events/1234&verbose=yes');
 2 $event = json_decode($response->getBody(), true)['users'][0];
 3
 4 $options['multipart'] = [
 5     [
 6         'name' => 'image',
 7         'contents' => fopen($filename, 'r')
 8     ]
 9 ];
10 $request = new \GuzzleHttp\Psr7\Request('POST', $event['images_uri']);
11 $response = $client->send($request, $options);
```

Middleware

Modify the request before it is handled.

Middleware

Modify the request before it is handled.
Implemented as a higher order function of the form:

```php
use Psr\Http\Message\RequestInterface as Request;

function my_middleware()
{
    return function (callable $handler) {
        return function (Request $request, array $options) use ($handler) {
            return $handler($request, $options);
        };
    };
}
```

Add auth header

```php
function add_auth_header($token)
{
  return function (callable $handler) use ($token) {
    return function (Request $request, array $options) use ($handler, $token) {
      $request = $request->withHeader('Authorization', $token);
      return $handler($request, $options);
    };
  };
}
```

Add middleware to client

Assign to Guzzle's `HandlerStack` and attach to client:

```
1 $stack = \GuzzleHttp\HandlerStack::create();
2 $stack->push(add_auth_header('f9b4f1a9b30bdc0d'));
3
4 $client = new \GuzzleHttp\Client([
5     'base_uri' => 'https://api.joind.in/v2.1/',
6     'handler' => $stack
7 ]);
```

Useful middleware

- `eljam/guzzle-jwt-middleware`
- `hannesvdvreken/guzzle-profiler`
- `megahertz/guzzle-tor`
- `rtheunissen/guzzle-log-middleware`
- `rtheunissen/guzzle-rate-limiter`
- `rtheunissen/guzzle-cache-handler`
- `wizacha/aws-signature-middleware`

To sum up

Questions?

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Thank you!

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