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JSON Web Token Tutorial: An Example in Laravel and AngularJS

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#Authentication #Authorization #JWT #NoCookies

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With the rising popularity of single page applications, mobile applications, and RESTful API services, the way web developers write back-end code has changed significantly. With technologies like AngularJS and BackboneJS, we are no longer spending much time building markup, instead we are building APIs that our front-end applications consume. Our back-end is more about business logic and data, while presentation logic is moved exclusively to the front-end or mobile applications. These changes have led to new ways of implementing authentication in modern applications.

Authentication is one of the most important parts of any web application. For decades, cookies and server-based authentication were the easiest solution. However, handling authentication in modern Mobile and Single Page Applications can be tricky, and demand a better approach. The best known solutions to authentication problems for APIs are the OAuth 2.0 and the JSON Web Token (JWT).

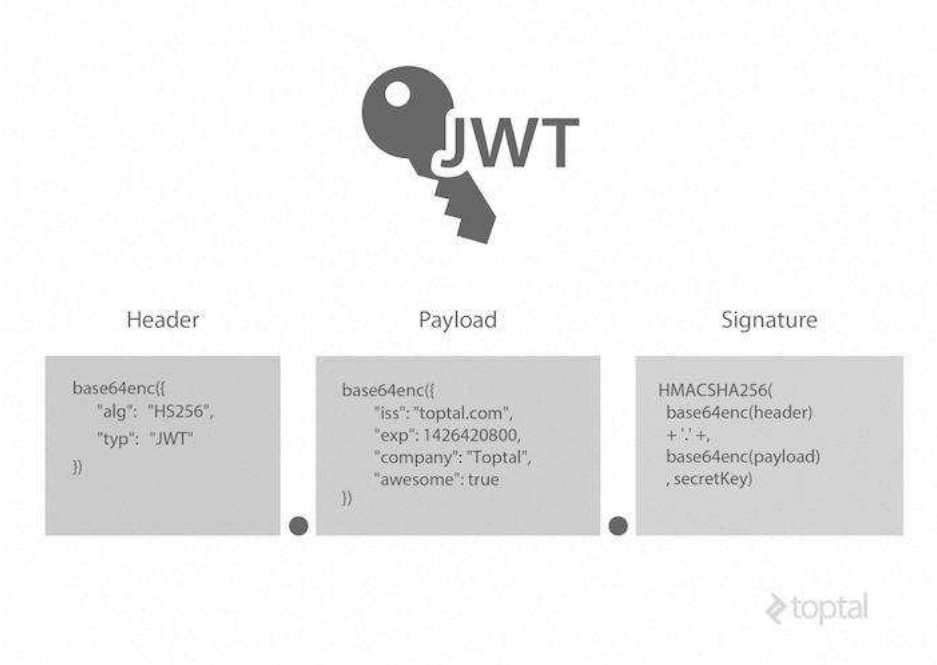
What is a JSON Web Token?

A JSON Web Token, or JWT, is used to send information that can be verified and trusted by means of a digital signature. It comprises a compact and URL-safe JSON object, which is cryptographically signed to verify its authenticity, and which can also be encrypted if the payload contains sensitive information.

Because of it's compact structure, JWT is usually used in HTTP `Authorization` headers or URL query parameters.

Structure of a JSON Web Token

A JWT is represented as a sequence of base64url encoded values that are separated by period characters.



JSON Web Token example:

```
eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.
eyJpc3MiOiJ0b3B0YWwuY29tIiwiZXhwIjoxNDI2NDIwODAwLCJodHRwOi8vdG9wdGFsLmNvbS9qd3RfY2xhaW1zL2lzX2FkbWluIjp0cnVlLCJjb21wYW55IjoiVG9wdGFsIiwiYXdlc29tZSI6dH
yRQYnWzskCZUxPwaQupWkiUzKELZ49eM7oWxAQK_ZXw
```

Header

The header contains the metadata for the token and it minimally contains the type of signature and the encryption algorithm. (You can use a JSON formatter tool to prettify the JSON object.)

Example Header

```
{
  “alg”: “HS256”,
  “typ”: “JWT”
}
```

This JWT Header declares that the encoded object is a JSON Web Token, and that it is signed using the HMAC SHA-256 algorithm.

Once this is base64 encoded, we have the first part of our JWT.

```
eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9
```

Payload (Claims)

In the context of JWT, a claim can be defined as a statement about an entity (typically, the user), as well as additional meta data about the token itself. The claim contains the information we want to transmit, and that the server can use to properly handle authentication. There are multiple claims we can provide; these include registered claim names, public claim names and private claim names.

Registered Claims

These are the claims that are registered in the IANA JSON Web Token Claims registry. These claims are not intended to be mandatory but rather to provide a starting point for a set of useful, interoperable claims.

These include:

- **iss**: The issuer of the token
- **sub**: The subject of the token
- **aud**: The audience of the token
- **exp**: Token expiration time defined in Unix time
- **nbf**: “Not before” time that identifies the time before which the JWT must not be accepted for processing
- **iat**: “Issued at” time, in Unix time, at which the token was issued
- **jti**: JWT ID claim provides a unique identifier for the JWT

Public Claims

Public claims need to have collision-resistant names. By making the name a URI or URN naming collisions are avoided for JWTs where the sender and receiver are not part of a closed network.

An example of a public claim name could be: `https://www.toptal.com/jwt_claims/is_admin`, and the best practice is to place a file at that location describing the claim so that it can be dereferenced for documentation.

Private Claims

Private claim-names may be used in places where JWTs are only exchanged in a closed environment between known systems, such as inside an enterprise. These are claims that we can define ourselves, like user IDs, user roles, or any other information.

Using claim-names that might have conflicting semantic meanings outside of a closed or private system are subject to collision, so use them with caution.

It is important to note that we want to keep a web token as small as possible, so use only necessary data inside public and private claims.

Example Payload

```
{
  “iss”: “toptal.com”,
  “exp”: 1426420800,
  “https://www.toptal.com/jwt_claims/is_admin”: true,
  “company”: “Toptal”,
  “awesome”: true
}
```

This example payload has two registered claims, one public claim and two private claims. Once it is base64 encoded, we have the second part of our JWT.

```
eyJpc3MiOiJ0b3B0YWwuY29tIiwiZXhwIjoxNDI2NDIwODAwLCJodHRwOi8vdG9wdGFsLmNvbS9qd3RfY2xhaW1zL2lzX2FkbWluIjp0cnVlLCJjb21wYW55IjoiVG9wdGFsIiwiYXdlc29tZSI6dH
```

Signature

The JWT standard follows the JSON Web Signature (JWS) specification to generate the final signed token. It is generated by combining the encoded JWT Header and the encoded JWT Payload, and signing it using a strong encryption algorithm, such as HMAC SHA-256. The signature’s secret key is held by the server so it will be able to verify existing tokens and sign new ones.

```
$encodedContent = base64UrlEncode(header) + “.” + base64UrlEncode(payload);
$signature = hashHmacSHA256($encodedContent);
```

This gives us the final part of our JWT.

```
yRQYnWzskCZUxPwaQupWkiUzKELZ49eM7oWxAQK_ZXw
```

Security and Encryption with JWT

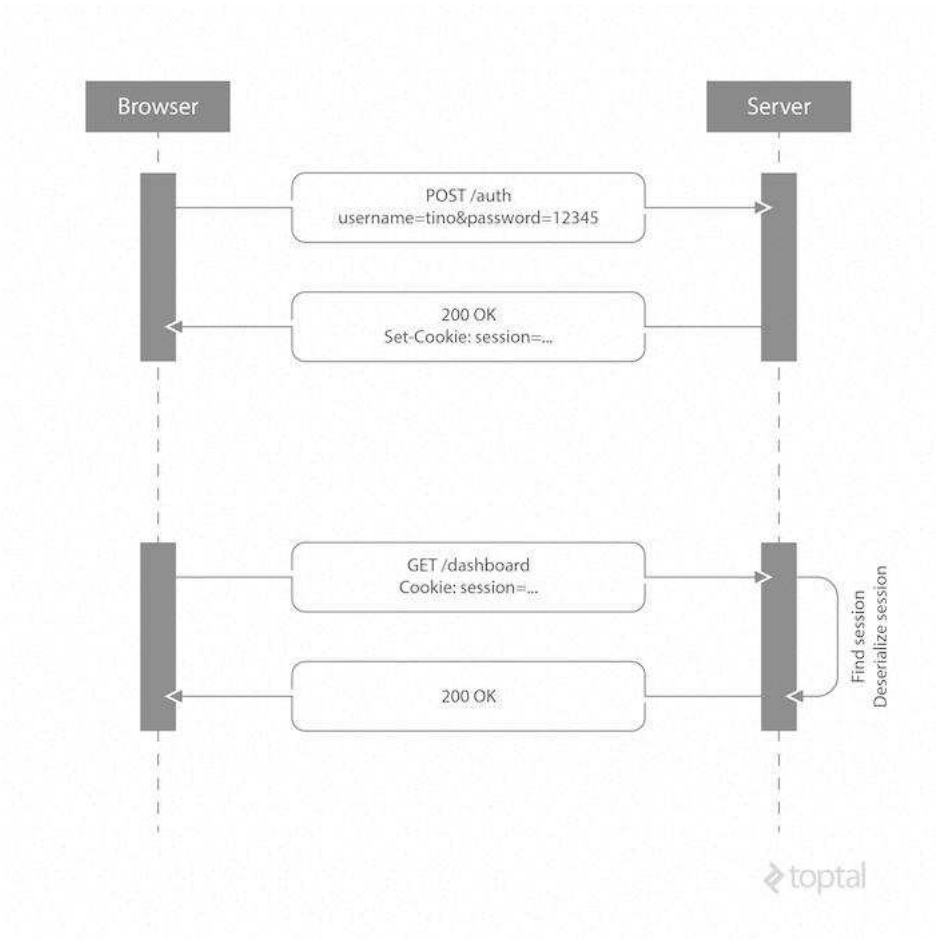
It is critical to use TLS/SSL in conjunction with JWT, to prevent man-in-the-middle attacks. In most cases, this will be sufficient to encrypt the JWT payload if it contains sensitive information. However, if we want to add an additional layer of protection, we can encrypt the JWT payload itself using the JSON Web Encryption (JWE) specification.

Of course, if we want to avoid the additional overhead of using JWE, another option is to simply keep sensitive information in our database, and use our token for additional API calls to the server whenever we need to access sensitive data.

Why the need for Web Tokens?

Before we can see all the benefits of using token authentication, we have to look at the way authentication has been done in the past.

Server-Based Authentication



Because the HTTP protocol is stateless, there needs to be a mechanism for storing user information and a way to authenticate the user on every subsequent request after login. Most websites use cookies for storing user’s session ID.

How it Works

The browser makes a POST request to the server that contains the user's identification and password. The server responds with a cookie, which is set on the user's browser, and includes a session ID to identify the user.

On every subsequent request, the server needs to find that session and deserialize it, because user data is stored on the server.

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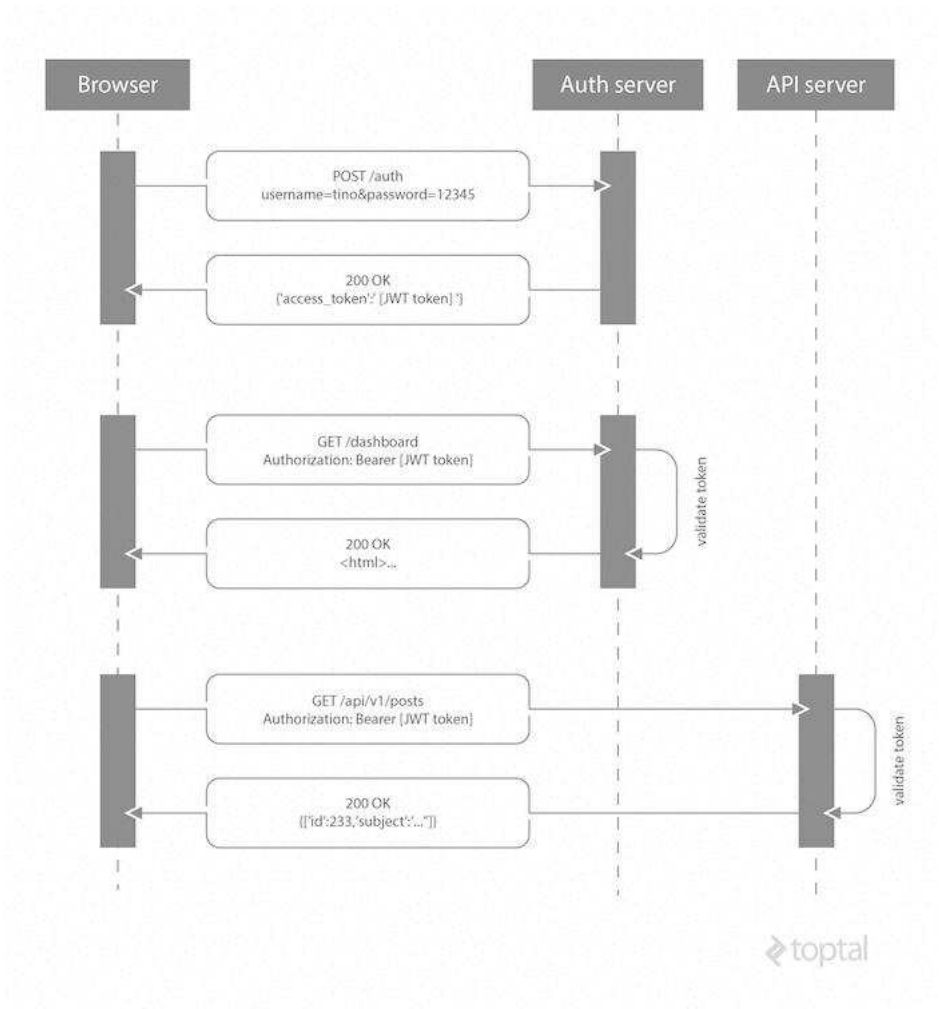
Drawbacks of Server-Based Authentication

- **Hard to scale**: The server needs to create a session for a user and persist it somewhere on the server. This can be done in memory or in a database. If we have a distributed system, we have to make sure that we use a separate session storage that is not coupled to the application server.
- **Cross-origin request sharing (CORS)**: When using AJAX calls to fetch a resource from another domain (cross-origin) we could run into problems with forbidden requests because, by default, HTTP requests don't include cookies on cross-origin requests.
- **Coupling with the web framework**: When using server-based authentication we are tied to our framework's authentication scheme. It is really hard, or even impossible, to share session data between different web frameworks written in different programming languages.

Token-Based Authentication



Token based authentication is stateless, so there is no need to store user information in the session. This gives us the ability to scale our application without worrying where the user has logged in. We can easily use the same token for fetching a secure resource from a domain other than the one we are logged in to.

How JSON Web Tokens Work

A browser or mobile client makes a request to the authentication server containing user login information. The authentication server generates a new JWT access token and returns it to the client. On every request to a restricted resource, the client sends the access token in the query string or `Authorization` header. The server then validates the token and, if it's valid, returns the secure resource to the client.

The authentication server can sign the token using any secure signature method. For example, a symmetric key algorithm such as HMAC SHA-256 can be used if there is a secure channel to share the secret key among all parties. Alternatively, an asymmetric, public-key system, such as RSA, can be used as well, eliminating the need for further key-sharing.

Advantages of Token-Based Authentication

Stateless, easier to scale: The token contains all the information to identify the user, eliminating the need for the session state. If we use a load balancer, we can pass the user to any server, instead of being bound to the same server we logged in on.

Reusability: We can have many separate servers, running on multiple platforms and domains, reusing the same token for authenticating the user. It is easy to build an application that shares permissions with another application.

Security: Since we are not using cookies, we don't have to protect against cross-site request forgery (CSRF) attacks. We should still encrypt our tokens using JWE if we have to put any sensitive information in them, and transmit our tokens over HTTPS to prevent man-in-the-middle attacks.

Performance: There is no server side lookup to find and deserialize the session on each request. The only thing we have to do is calculate the HMAC SHA-256 to validate the token and parse its content.

A JSON Web Token Example using Laravel 5 and AngularJS

In this tutorial I am going to demonstrate how to implement the basic authentication using JSON Web Tokens in two popular web technologies: Laravel 5 for the backend code and AngularJS for the frontend Single Page Application (SPA) example. (You can find the entire demo here, and the source code in this GitHub repository so that you can follow along with the tutorial.)

This JSON web token example will not use any kind of encryption to ensure the confidentiality of the information transmitted in the claims. In practice this is often okay, because TLS/SSL encrypts the request. However, if the token is going to contain sensitive information, such as the user's social security number, it should also be encrypted using JWE.

Laravel Backend Example

We will use Laravel to handle user registration, persisting user data to a database and providing some restricted data that needs authentication for the Angular app to consume. We will create an example API subdomain to simulate Cross-origin resource sharing (CORS) as well.

Installation and Project Bootstrapping

In order to use Laravel, we have to install the Composer package manager on our machine. When developing in Laravel I recommend using the Laravel Homestead pre-packaged "box" of Vagrant. It provides us with a complete development environment regardless of our operating system.

The easiest way to bootstrap our Laravel application is to use a Composer package Laravel Installer.

```
composer global require "laravel/installer=~1.1"
```

Now we are all ready to create a new Laravel project by running `laravel new jwt`.

For any questions about this process please refer to the official Laravel documentation.

After we have created the basic Laravel 5 application, we need to set up our `Homestead.yaml`, which will configure folder mappings and domains configuration for our local environment.

Example of a `Homestead.yaml` file:

```
---
ip: "192.168.10.10"
memory: 2048
cpus: 1

authorize: /Users/ttkalec/.ssh/public.psk

keys:
    - /Users/ttkalec/.ssh/private.ppk
folders:
    - map: /coding/jwt
      to: /home/vagrant/coding/jwt
sites:
    - map: jwt.dev
      to: /home/vagrant/coding/jwt/public
    - map: api.jwt.dev
      to: /home/vagrant/coding/jwt/public
variables:
    - key: APP_ENV
      value: local
```

After we've booted up our Vagrant box with the `vagrant up` command and logged into it using `vagrant ssh`, we navigate to the previously defined project directory. In the example above this would be `/home/vagrant/coding/jwt`. We can now run `php artisan migrate` command in order to create the necessary user tables in our database.

Installing Composer Dependencies

Fortunately, there is a community of developers working on Laravel and maintaining many great packages that we can reuse and extend our application with. In this example we will use `tymon/jwt-auth`, by Sean Tymon, for handling tokens on the server side, and `barryvdh/laravel-cors`, by Barry vd. Heuvel, for handling CORS.

jwt-auth

Require the `tymon/jwt-auth` package in our `composer.json` and update our dependencies.

```
composer require tymon/jwt-auth 0.5.*
```

Add the `JWTAuthServiceProvider` to our `app/config/app.php` providers array.

```
'Tymon\JWTAuth\Providers\JWTAuthServiceProvider'
```

Next, in `app/config/app.php` file, under the `aliases` array, we add the `JWTAuth` facade.

```
'JWTAuth' => 'Tymon\JWTAuth\Facades\JWTAuth'
```

Finally, we will want to publish the package config using the following command: php artisan config:publish tymon/jwt-auth

JSON Web tokens are encrypted using a secret key. We can generate that key using the `php artisan jwt:generate` command. It will be placed inside our `config/jwt.php` file. In the production environment, however, we never want to have our passwords or API keys inside configuration files. Instead, we should place them inside server environment variables and reference them in the configuration file with the `env` function. For example:

```
'secret' => env('JWT_SECRET')
```

We can find out more about this package and all of it's config settings on Github.

laravel-cors

Require the `barryvdh/laravel-cors` package in our `composer.json` and update our dependencies.

```
composer require barryvdh/laravel-cors 0.4.x@dev
```

Add the `CorsServiceProvider` to our `app/config/app.php` providers array.

```
'Barryvdh\Cors\CorsServiceProvider'
```

Then add the middleware to our `app/Http/Kernel.php`.

```
'Barryvdh\Cors\Middleware\HandleCors'
```

Publish the configuration to a local `config/cors.php` file by using the `php artisan vendor:publish` command.

Example of a `cors.php` file configuration:

```
return [
    'defaults' => [
        'supportsCredentials' => false,
        'allowedOrigins' => [],
        'allowedHeaders' => [],
        'allowedMethods' => [],
        'exposedHeaders' => [],
        'maxAge' => 0,
        'hosts' => [],
    ],

    'paths' => [
        'v1/*' => [
            'allowedOrigins' => ['*'],
            'allowedHeaders' => ['*'],
            'allowedMethods' => ['*'],
            'maxAge' => 3600,
        ],
    ],
];
```

Routing and Handling HTTP Requests

For the sake of brevity, I will put all my code inside the routes.php file that is responsible for Laravel routing and delegating requests to controllers. We would usually create dedicated controllers for handling all our HTTP requests and keep our code modular and clean.

We will load our AngularJS SPA view using

```
Route::get('/', function () {
    return view('spa');
});
```

User Registration

When we make a `POST` request to `/signup` with a username and password, we will try to create a new user and save it to the database. After the user has been created, a JWT is created and returned via JSON response.

```
Route::post('/signup', function () {
    $credentials = Input::only('email', 'password');

    try {
        $user = User::create($credentials);
    } catch (Exception $e) {
        return Response::json(['error' => 'User already exists.'], HttpResponse::HTTP_CONFLICT);
    }

    $token = JWTAuth::fromUser($user);

    return Response::json(compact('token'));
});
```

User Sign In

When we make a `POST` request to `/signin` with a username and password, we verify that the user exists and returns a JWT via the JSON response.

```
Route::post('/signin', function () {
   $credentials = Input::only('email', 'password');

   if ( ! $token = JWTAuth::attempt($credentials)) {
       return Response::json(false, HttpResponse::HTTP_UNAUTHORIZED);
   }

   return Response::json(compact('token'));
});
```

Fetching a Restricted Resource on the Same Domain

Once the user is signed in, we can fetch the restricted resource. I've created a route `/restricted` that simulates a resource that needs an authenticated user. In order to do this, the request `Authorization` header or query string needs to provide the JWT for the backend to verify.

```
Route::get('/restricted', [
   'before' => 'jwt-auth',
   function () {
       $token = JWTAuth::getToken();
       $user = JWTAuth::toUser($token);

       return Response::json([
           'data' => [
               'email' => $user->email,
               'registered_at' => $user->created_at->toDateTimeString()
           ]
       ]);
   }
]);
```

In this example, I'm using `jwt-auth` middleware provided in the `jwt-auth` package using `'before' => 'jwt-auth'`. This middleware is used to filter the request and validate the JWT token. If the token is invalid, not present, or expired, the middleware will throw an exception that we can catch.

In Laravel 5, we can catch exceptions using the `app/Exceptions/Handler.php` file. Using the `render` function we can create HTTP responses based on the thrown exception.

```
public function render($request, Exception $e)
{
  if ($e instanceof \Tymon\JWTAuth\Exceptions\TokenInvalidException)
  {
     return response(['Token is invalid'], 401);
  }
  if ($e instanceof \Tymon\JWTAuth\Exceptions\TokenExpiredException)
  {
     return response(['Token has expired'], 401);
  }

  return parent::render($request, $e);
}
```

If the user is authenticated and the token is valid, we can safely return the restricted data to the frontend via JSON.

Fetching Restricted Resources from the API Subdomain

In the next JSON web token example, we'll take a different approach for token validation. Instead of using `jwt-auth` middleware, we will handle exceptions manually. When we make a `POST` request to an API server `api.jwt.dev/v1/restricted`, we are making a cross-origin request, and have to enable CORS on the backend. Fortunately, we have already configured CORS in the `config/cors.php` file.

```
Route::group(['domain' => 'api.jwt.dev', 'prefix' => 'v1'], function () {
   Route::get('/restricted', function () {
       try {
           JWTAuth::parseToken()->toUser();
       } catch (Exception $e) {
           return Response::json(['error' => $e->getMessage()], HttpResponse::HTTP_UNAUTHORIZED);
       }

       return ['data' => 'This has come from a dedicated API subdomain with restricted access.'];
   });
});
```

AngularJS Frontend Example

We are using AngularJS as a front-end, relying on the API calls to the Laravel back-end authentication server for user authentication and sample data, plus the API server for cross-origin example data. Once we go to the homepage of our project, the backend will serve the `resources/views/spa.blade.php` view that will bootstrap the Angular application.

Here is the folder structure of the Angular app:

```
public/
  |-- css/
      `-- bootstrap.superhero.min.css
  |-- lib/
      |-- loading-bar.css
      |-- loading-bar.js
      `-- ngStorage.js
  |-- partials/
      |-- home.html
      |-- restricted.html
      |-- signin.html
      `-- signup.html
  `-- scripts/
      |-- app.js
      |-- controllers.js
      `-- services.js
```

Bootstrapping the Angular Application

`spa.blade.php` contains the bare essentials needed to run the application. We'll use Twitter Bootstrap for styling, along with a custom theme from Bootswatch. To have some visual feedback when making an AJAX call, we'll use the angular-loading-bar script, which intercepts XHR requests and creates a loading bar. In the header section, we have the following stylesheets:

```
<link rel="stylesheet" href="//maxcdn.bootstrapcdn.com/bootstrap/3.2.0/css/bootstrap.min.css">
<link rel="stylesheet" href="/css/bootstrap.superhero.min.css">
<link rel="stylesheet" href="/lib/loading-bar.css">
```

The footer of our markup contains references to libraries, as well as our custom scripts for Angular modules, controllers and services.

```
<script src="http://cdnjs.cloudflare.com/ajax/libs/jquery/2.1.1/jquery.min.js"></script>
<script src="http://maxcdn.bootstrapcdn.com/bootstrap/3.3.2/js/bootstrap.min.js"></script>
<script src="http://cdnjs.cloudflare.com/ajax/libs/angular.js/1.3.14/angular.min.js"></script>
<script src="http://cdnjs.cloudflare.com/ajax/libs/angular.js/1.3.14/angular-route.min.js"></script>
<script src="/lib/ngStorage.js"></script>
<script src="/lib/loading-bar.js"></script>
<script src="/scripts/app.js"></script>
<script src="/scripts/controllers.js"></script>
<script src="/scripts/services.js"></script>
</body>
```

We are using `ngStorage` library for AngularJS, to save tokens into the browser's local storage, so that we can send it on each request via the `Authorization` header.

In the production environment, of course, we would minify and combine all our script files and stylesheets in order to improve performance.

I've created a navigation bar using Bootstrap that will change the visibility of appropriate links, depending on the sign-in status of the user. The sign-in status is determined by the presence of a `token` variable in the controller's scope.

```
<div class="navbar-header">
   <button type="button" class="navbar-toggle collapsed" data-toggle="collapse" data-target=".navbar-collapse">
       <span class="sr-only">Toggle navigation</span>
       <span class="icon-bar"></span>
       <span class="icon-bar"></span>
       <span class="icon-bar"></span>
   </button>
   <a class="navbar-brand" href="#">JWT Angular example</a>
</div>
<div class="navbar-collapse collapse">
   <ul class="nav navbar-nav navbar-right">
       <li data-ng-show="token"><a ng-href="#/restricted">Restricted area</a></li>
       <li data-ng-hide="token"><a ng-href="#/signin">Sign in</a></li>
       <li data-ng-hide="token"><a ng-href="#/signup">Sign up</a></li>
       <li data-ng-show="token"><a ng-click="logout()">Logout</a></li>
   </ul>
</div>
```

Routing

We have a file named `app.js` which is responsible for configuring all our front end routes.

```
angular.module('app', [
   'ngStorage',
   'ngRoute',
   'angular-loading-bar'
])
   .constant('urls', {
       BASE: 'http://jwt.dev:8000',
       BASE_API: 'http://api.jwt.dev:8000/v1'
   })
   .config(['$routeProvider', '$httpProvider', function ($routeProvider, $httpProvider) {
       $routeProvider.
           when('/', {
               templateUrl: 'partials/home.html',
               controller: 'HomeController'
           }).
           when('/signin', {
               templateUrl: 'partials/signin.html',
               controller: 'HomeController'
           }).
           when('/signup', {
               templateUrl: 'partials/signup.html',
               controller: 'HomeController'
           }).
           when('/restricted', {
               templateUrl: 'partials/restricted.html',
               controller: 'RestrictedController'
           }).
           otherwise({
               redirectTo: '/'
           });
```

Here we can see that we have defined four routes that are handled by either `HomeController` or `RestrictedController`. Every route corresponds to a partial HTML view. We have also defined two constants that contain URLs for our HTTP requests to the backend.

Request Interceptor

The $http service of AngularJS allows us to communicate with the backend and make HTTP requests. In our case we want to intercept every HTTP request and inject it with an `Authorization` header containing our JWT if the user is authenticated. We can also use an interceptor to create a global HTTP error handler. Here is an example of our interceptor that injects a token if it's available in browser's local storage.

```
$httpProvider.interceptors.push(['$q', '$location', '$localStorage', function ($q, $location, $localStorage) {
   return {
       'request': function (config) {
           config.headers = config.headers || {};
```

```
            if ($localStorage.token) {
                config.headers.Authorization = 'Bearer ' + $localStorage.token;
            }
            return config;
        },
        'responseError': function (response) {
            if (response.status === 401 || response.status === 403) {
                $location.path('/signin');
            }
            return $q.reject(response);
        }
    };
}]);
```

Controllers

In the `controllers.js` file, we have defined two controllers for our application: `HomeController` and `RestrictedController`. `HomeController` handles sign-in, sign-up and logout functionality. It passes the username and password data from the sign-in and sign-up forms to the `Auth` service, which sends HTTP requests to the backend. It then saves the token to local storage, or shows an error message, depending on the response from the backend.

```
angular.module('app')
   .controller('HomeController', ['$rootScope', '$scope', '$location', '$localStorage', 'Auth',
       function ($rootScope, $scope, $location, $localStorage, Auth) {
           function successAuth(res) {
               $localStorage.token = res.token;
               window.location = "/";
           }

           $scope.signin = function () {
               var formData = {
                   email: $scope.email,
                   password: $scope.password
               };

               Auth.signin(formData, successAuth, function () {
                   $rootScope.error = 'Invalid credentials.';
               })
           };

           $scope.signup = function () {
               var formData = {
                   email: $scope.email,
                   password: $scope.password
               };

               Auth.signup(formData, successAuth, function () {
                   $rootScope.error = 'Failed to signup';
               })
           };

           $scope.logout = function () {
               Auth.logout(function () {
                   window.location = "/"
               });
           };
           $scope.token = $localStorage.token;
           $scope.tokenClaims = Auth.getTokenClaims();
       }])
```

`RestrictedController` behaves the same way, only it fetches the data by using the `getRestrictedData` and `getApiData` functions on the `Data` service.

```
   .controller('RestrictedController', ['$rootScope', '$scope', 'Data', function ($rootScope, $scope, Data) {
       Data.getRestrictedData(function (res) {
           $scope.data = res.data;
       }, function () {
           $rootScope.error = 'Failed to fetch restricted content.';
       });
       Data.getApiData(function (res) {
           $scope.api = res.data;
       }, function () {
           $rootScope.error = 'Failed to fetch restricted API content.';
       });
   }]);
```

The backend is responsible for serving the restricted data only if the user is authenticated. This means that in order to respond with the restricted data, the request for that data needs to contain a valid JWT inside its `Authorization` header or query string. If that is not the case, the server will respond with a 401 Unauthorized error status code.

Auth Service

The Auth service is responsible for making the sign in and sign up HTTP requests to the backend. If the request is successful, the response contains the signed token, which is then base64 decoded, and the enclosed token claims information is saved into a `tokenClaims` variable. This is passed to the controller via the `getTokenClaims` function.

```
angular.module('app')
   .factory('Auth', ['$http', '$localStorage', 'urls', function ($http, $localStorage, urls) {
       function urlBase64Decode(str) {
           var output = str.replace('-', '+').replace('_', '/');
           switch (output.length % 4) {
               case 0:
                   break;
               case 2:
                   output += '==';
                   break;
               case 3:
                   output += '=';
                   break;
               default:
                   throw 'Illegal base64url string!';
```

```
            }
            return window.atob(output);
        }

        function getClaimsFromToken() {
            var token = $localStorage.token;
            var user = {};
            if (typeof token !== 'undefined') {
                var encoded = token.split('.')[1];
                user = JSON.parse(urlBase64Decode(encoded));
            }
            return user;
        }

        var tokenClaims = getClaimsFromToken();

        return {
            signup: function (data, success, error) {
                $http.post(urls.BASE + '/signup', data).success(success).error(error)
            },
            signin: function (data, success, error) {
                $http.post(urls.BASE + '/signin', data).success(success).error(error)
            },
            logout: function (success) {
                tokenClaims = {};
                delete $localStorage.token;
                success();
            },
            getTokenClaims: function () {
                return tokenClaims;
            }
        };
    }
    ]);
```

Data Service

This is a simple service that makes requests to the authentication server as well as the API server for some dummy restricted data. It makes the request, and delegates success and error callbacks to the controller.

```
angular.module('app')
    .factory('Data', ['$http', 'urls', function ($http, urls) {

        return {
            getRestrictedData: function (success, error) {
                $http.get(urls.BASE + '/restricted').success(success).error(error)
            },
            getApiData: function (success, error) {
                $http.get(urls.BASE_API + '/restricted').success(success).error(error)
            }
        };
    }
    ]);
```

Conclusion

Token-based authentication enables us to construct decoupled systems that are not tied to a particular authentication scheme. The token might be generated anywhere and consumed on any system that uses the same secret key for signing the token. They are mobile ready, and do not require us to use cookies.

JSON Web Tokens work across all popular programming languages and are quickly gaining in popularity. They are backed by companies like Google, Microsoft, and Zendesk. Their standard specification by Internet Engineering Task Force (IETF) is still in the draft version and may change slightly in the future.

There is still a lot to cover about JWTs, such with how to handle the security details, and refreshing tokens when they expire, but the examples above should demonstrate the basic usage and, more importantly, advantages of using JSON Web Tokens.

Related: How to Do JWT Authentication with an Angular 6 SPA

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Tino Tkalec, Croatia
member since October 3, 2014
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Tino is a software engineer with over 10 years of experience in creating native Windows and Web Applications. He has a strong experience with the LAMP stack and the ability to refactor spaghetti code into reusable and testable code. [click to continue...]
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Andy Roddam • 3 years ago
Brilliant article. I was just wondering, if all of my authentication is now using the JWT token, does this mean that we do not need Laravel to create a XSRF-TOKEN and laravel_session for each response to the front-end? Similarly, does this also mean that we do not need AngularJS to create the XSRF-TOKEN cookie and X-XSRF-TOKEN header?

I am still a little confused as to whether these techniques should be combined with JWT authorization in some way??? :)
10 • Reply • Share ›

Gopal G ➚ Andy Roddam • 2 years ago
Read the description on github it says - "This app is not meant to be used in Production environment.
It's a very basic example, that lacks any kind of input validation, handling of expired tokens, local storage fallback to cookies or any other storage."
This might help - https://stormpath.com/blog/...
• Reply • Share ›

Andy ➚ Gopal G • 2 years ago
I have fully implemented a solution similar to the article using JWT tokens. I am not sure how to stop Laravel creating the XSRF-TOKEN. I should be able to reduce the header packet size if i can prevent Laravel from creating the XSRF-tokens. Do you have any experience with this? Is it worth reducing the packet size?
• Reply • Share ›

Ahmed Abdel Razzak • 3 years ago
My only concern, is how to log out the user... You might delete the token from the local storage. but as long as it's not expired, it can be reused again.

A simple solution is keep a reference on which token is expired by user (manually logout) and delete that token... And keep a reference on the token id in the jwt instead of the user id.

I know it's feels like smelly code... But really couldn't find any other solution... Any ideas ?
4 • Reply • Share ›

Tino Tkalec ➚ Ahmed Abdel Razzak • 3 years ago
There is no way to easily invalidate the token without involving a database. You might want to look at the refresh tokens to help you with this.
https://auth0.com/docs/refr...

If you just delete the token on the client, it does nothing for the server side security. I think the best way is to keep token expiry times short and rotate them often. This also has it's drawbacks. Token security and best practices are a broad subject, worthy of another blog post.
4 • Reply • Share ›

Ahmed Abdel Razzak ➚ Tino Tkalec • 3 years ago
+1 for the refresh token
1 • Reply • Share ›

Syrine Jamel ➚ Tino Tkalec • 9 months ago
Please how can i log out the user from all devices ? Thanks
• Reply • Share ›

Ahmed Abdel Razzak ➚ Ahmed Abdel Razzak • 3 years ago
Just to make sure that everybody have an idea on how I solved the issue (for reference and suggestions)
1 - I've added a authentication token model to the database which has only 2 field (id, token)
2 - I've added the id of the token to the payload

1- when a user logout (DELETE /sign_out) It deletes the token from the server
2- I have an hourly worker that cleans up the expired tokens
this way every hour the old expired tokens are cleared...
3- If a user tries to login with a token, just check if the id in the payload (or the token itself) exists or not... If it doesn't then he must have been logged out before...

PS This solution should work with only the id field, and in fact it's more secure (incase of a breach), but I needed to save the token and many

other "session" info for other purposes)

If you think that this might have a problems... please share with me what you think :D

1 ▲ | ▼ • Reply • Share ›

Sean Tymon ➚ Ahmed Abdel Razzak • 3 years ago

Just FYI, my jwt-auth package has token invalidation & refreshing built-in. It uses Laravel's cache driver by default, but any key value store will suffice. See here for reference (not completed docs fully yet) - https://github.com/tymondes...

3 ▲ | ▼ • Reply • Share ›

Ahmed Abdel Razzak ➚ Sean Tymon • 3 years ago

Too bad that I'm not into php... And definitely will check if the jwt-ruby implements those same features or not

▲ | ▼ • Reply • Share ›

jameswagoner ➚ Ahmed Abdel Razzak • 3 years ago

Shouldn't it be stateless? You pass the token with every request, see if it's valid and move on, 40x if not. If there is no token you are not authorized.

Then next time they authenticate, they get a new token. So no reuse of an old token.

▲ | ▼ • Reply • Share ›

Ahmed Abdel Razzak ➚ jameswagoner • 3 years ago

Yes it should... But how else would you revoke a valid token ? Say a user got his phone stolen and he needs to invalidate the sessions (tokens) ? (Like Facebook session management)

▲ | ▼ • Reply • Share ›

jameswagoner ➚ Ahmed Abdel Razzak • 3 years ago

Point taken there. Multiple devices does pose more thought.

▲ | ▼ • Reply • Share ›

Ahmed Abdel Razzak ➚ jameswagoner • 3 years ago

On other hand... I don't think that this solution is stateful...
And correct me if I'm wrong, The server doesn't save any "state" about the user... And the user token (as a resource) save info about it's own state much like a user post...
It belong to a user and much like a user post... He can delete it...
I think of the jwt much like a "handshake" between the received request and the api... Not as a token of authenticity...

The server issues it and validate its validity (and more importantly its) existence with each request... Which I don't think (IMHO) invalidate the stateless principle...

One last note about the scenario you are describing... From what I understand... You oppose that if a user generated (forged) a valid token (that was not generated by the api) the request should be authenticated correctly and valid... If that is correct, I feel that its insecure solution... A token that the API didn't generate is valid ?

▲ | ▼ • Reply • Share ›

Barbaros Kurt ➚ Ahmed Abdel Razzak • 3 years ago

imho, when user logout, you put token to redis server as a black list, and when authenticate with same token at server side first you check if it's in black list or not. if black list send 401 else no problem. if user lost his token force to logout so token will be in black list (if you store them in a db).

▲ | ▼ • Reply • Share ›

Eduardo Pereira ➚ Ahmed Abdel Razzak • 3 years ago

You can check in database if the user is logged (boolean), also check if the token already expired or marked as invalid, the JWT claims may help you to achieve that. As stated before there is no easy way to logout JWT tokens, without involve some backend database.

▲ | ▼ • Reply • Share ›

Vitaly Dyatlov ➚ Ahmed Abdel Razzak • 3 years ago

The same applies to cookies. You can delete cookie but it's still possible to use it for authentication.

Unless you notify server about your changes - you're at risk.

▲ | ▼ • Reply • Share ›

Alex Xela ➚ Vitaly Dyatlov • 3 years ago

It is not the same. Cookie stores session is synchronized on client and on server side. So server could invalidates client's session (by timeout or by request). That is strong pros of "stateful" app. I put "stateful" in quotes because it differs with commonly use of term "stateful". For example application with DB backend could be stateless but keep user sessions.

▲ | ▼ • Reply • Share ›

Neerav • 3 years ago

Thank you very much Tino for the wonderful, tutorial with detailed explanation of concepts.

I am just beginning to explore the possibility of using angularjs with laravel 5. While going through many articles regarding using angular for beginners, I came across a strong opinion that says "DO NOT USE JQUERY IN ANGULAR PROJECT" and "THINK IN ANGULAR", meaning try avoiding jquery as long as you can while developing with angularjs which will force one to try and get solutions which are angular specific and not dirty quick fixes.

Going by those opinions, is there a way to not use jquery and still achieve what you have demonstrated here?

Is it possible to get the example working with jqlite included with angular? Or is the full jQuery library required?

I am planning on using ui-router, so instead of using $httpProvider interceptor, I will have to push the request and responseError to $stateProvider interceptor - Am I right?

Please excuse me if you find my questions to be silly. I will really appreciate your help in understanding these things.

2 ▲ | ▼ • Reply • Share ›

Rohan Deshpande • 3 years ago

Just a note, when I tried to run `php artisan config:publish tymon/jwt-auth` it said the command did not exist, I tried vendor:publish and it gave an exception saying "Too many arguments" not sure about why this happened, but I just got the config file sample from the repo and then generated my key.

2 ▲ | ▼ • Reply • Share ›

SamMonk ➚ Rohan Deshpande • 3 years ago

For laravel 5 you would use:
php artisan vendor:publish --provider="Tymon\JWTAuth\Providers\JWTAuthServiceProvider"

4 ▲ | ▼ • Reply • Share ›

Rohan Deshpande ➚ Rohan Deshpande • 3 years ago

I'm also wondering about the middleware because when I check the files, inside of JWTAuthServiceProvider.php in the registerJWTAuthMiddleware() method, it seems to be referenced as tymon.jwt.auth. I'm not too sure, because I thought middlewares had to be registered in app/Http/Kernel.php but maybe there is some different way to do it and I'm missing something

▲ | ▼ • Reply • Share ›

John johnson • a year ago

Hands-down the best explanation of JWT I've read. Thank you!

1 ▲ | ▼ • Reply • Share ›

Pavel • 3 years ago

When registering the user, you should hash the password, otherwise the login won't work, I spent hours trying to find why it the authentification fails.

1 ▲ | ▼ • Reply • Share ›

Nick • 3 years ago

I am trying to go through your steps but no matter how much I try I get ...[Symfony\Component\Debug\Exception\FatalErrorException]

Class 'Barryvdh\Cors\CorsServiceProvider' not found

I am using Laravel 5.

1 ▲ | ▼ • Reply • Share ›

Bruno Santana ➚ Nick • 3 years ago

I think I did it!

instead of composer require barryvdh/laravel-cors 0.4.x@dev, use composer require barryvdh/laravel-cors 0.7.x (the current version as I write this comment);
in config/app.php, use Barryvdh\Cors\ServiceProvider instead of tutorial's,
in Kernel.php, use \Barryvdh\Cors\HandleCors without the "middleware"

1 ▲ | ▼ • Reply • Share ›

Bruno Santana ➚ Nick • 3 years ago

HI,
I'm getting the same problem. I'm trying to use the most recent version of laravel-cors (version 7 or something like this)

1 ▲ | ▼ • Reply • Share ›

nikhil gaikwad ➚ Nick • 2 years ago

@Nick and **@Bruno Santana**
Did u solve the issue... I am also facing the same issue. I am using L5 and laravel cors 0.8.*

▲ | ▼ • Reply • Share ›

Cesar Fernandes • 3 years ago

Great article! Just one thing. I downloaded your code, and it is running here almost 100% ok. The only point i have doubt is on checking out... I have to click 3 or more times to get it ou from restricted area... it is like the token keeps alive after the first clicks. Do you have any idea about what can be causing this? Cheers!

1 ▲ | ▼ • Reply • Share ›

Cesar Fernandes ➚ Cesar Fernandes • 3 years ago

Just to let you know.. there ir a problem with the ngStorage within the github project.. i replaced it with this version https://github.com/raynode/... and it is ok now

▲ | ▼ • Reply • Share ›

Jonathan Gravois • 3 years ago

Great Article! Very timely since there isn't really another Laravel 5/AngularJS JWT tutorial on the web yet.

I have a slightly different use case than your sample. I want (need) to decouple the applications so the Laravel 5 API is a totally separate application from the AngularJS client application. The reason I need this is because I will actually end up with a "Staff" client app (Angular), a "Client" client app (Angular), a "Client" mobile app (Ionic) that will all consume the Laravel API.

I read your article and then I went back through it and followed along and was able to reproduce your example. Can you point me in the right direction as to the changes I will need to make to now adapt your example into my use case. I think I will need to make the /login route part of the API and create the login page on the client where a successful login will receive and locally store the JWT but I am not sure how to accomplish this.

1 • Reply • Share ›

Ahmed Abdel Razzak ➚ Jonathan Gravois • 3 years ago

Check this angular module https://github.com/sahat/sa...
It work with oauth and jwt... Checking the examples (and configurations) will give you an idea

• Reply • Share ›

Alex Xela • 3 years ago

Thank you for intertesting article, but for me pros and cons of each approach looks quite weak. For example, using JWT your server has an overhead exposed by token validation on each request (i.e. the same as in cookie-based). CORS issue wasn't described at all. Last point - remove coupling with framework looks true. But!.. At this time we coupled with library which handles JWT (its standard is still discussing).

Finally it is interesting new approach, but actually it does not provide any strong reasons to use it instead of cookie-based one.

1 • Reply • Share ›

Tino Tkalec ➚ Alex Xela • 3 years ago

JWTs are not appropriate for everything but they give us more flexibility that using cookie-based auth, especially for the mobile apps. I didn't want to go in depth into CORS, because it's a beast on it's own.

Token validation has less overhead than finding the session in the database and deserializing it.
You aren't coupled to the library which handles JWT, because every library will yield the same looking JWT as an output.
JWT's standard is still not finalized, but there certainly won't be any major changes there, and the libraries will adapt accordingly.

1 • Reply • Share ›

Vitaly Dyatlov ➚ Alex Xela • 3 years ago

it's really easier for mobile apps.
You can't use cookies in restful apps

1 • Reply • Share ›

ljiang510 ➚ Alex Xela • 3 years ago

It's pain in the ass for a native app to use session based authentication. You have to ask a user to log in every time while he wants to use your app.

• Reply • Share ›

Agustín Santiago Castaño • 3 years ago

Very interesting and current stuff!

1 • Reply • Share ›

Ehtesham Mehmood • 5 months ago

Great effort, Thumbs up. Here is another list of angular 4 authentication examples. http://www.phpcodify.com/an...

Angular 4 Authentication Login example

• Reply • Share ›

Daniel Wolf • a year ago

To publish the config in Laravel 5 use:

$ php artisan vendor:publish --provider="Tymon\JWTAuth\Providers\JWTAuthServiceProvider"

You can find the Installation Configuration here: https://github.com/tymondes...

• Reply • Share ›

adhiana mastur • 2 years ago

Thank you.

• Reply • Share ›

Jhansi Pasupuleti • 2 years ago

Can we implement JWT in php? can you help me out?.

• Reply • Share ›

The Brain™ ➚ Jhansi Pasupuleti • a year ago

Laravel is a PHP Framework.

• Reply • Share ›

Andrie Tri Laksono • 2 years ago

im get an error in signup

POST http://localhost:8000/signup 409 (Conflict)

how to solve this?

Reply • Share ›

Muhammad Ali • 2 years ago

learn lots of concepts from article

Reply • Share ›

Abraham Bosch • 2 years ago

for publishing configs, the correct command is : "php artisan vendor:publish --tag=config"

Reply • Share ›

Kashyap Gandhi • 2 years ago

How to create JWT token without credential for guest api response for all future calls?

My plan is app developer first call my guest api, in that api we match some logic for valid request, based on successful match lumen generate guest token without any credential and return back in response.

This guest token further use for all future api calls. If any user take login/signup then we generate new token and return back in api response. Please help me to generate the guest token which will work same as authorize token.

Reply • Share ›

Lokesh L M • 2 years ago

It Clear's my confusions and got clear solutions for API authentication and Token generation. Thanks for posting awasome article.

Reply • Share ›

Raees Uzhunnan • 2 years ago

Can someone help me here ; can JWT be implemented with GET ?

Reply • Share ›

Dmitry Litvinenko • 2 years ago

Excellent article! Very neat solution.

Reply • Share ›

Mathieu Rossignol • 2 years ago

May I ask you what tool did you use for your beautiful network flow charts? Something with mscgen as engine or a specialized tool for network charts? Or just A classical drawing tool? If it's a dedicated tool I'd like to use it. Thx

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About the author

Tino Tkalec
PHP Developer
Tino is a software engineer with over 10 years of experience in creating native Windows and Web Applications. He has a strong experience with the LAMP stack and the ability to refactor spaghetti code into reusable and testable code.

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