NODE.JS GLOBAL

Authentication. Validation. Security

OCTOBER, 2017

AGENDA

1. Validation with AJV
2. Authentication with Passport.js
3. JSON Web Tokens (JWT)
4. Security

VALIDATION

1. By schema
2. By chaining calls (fluent interface)
3. String validation

```
const Joi = require('joi');

const schema = Joi.object().keys({
    username: Joi.string().alphanum().min(3).max(30).required(),
    password: Joi.string().regex(/^[a-zA-Z0-9]{3,30}$/),
    access_token: [Joi.string(), Joi.number()],
});

// Return result.
const result = Joi.validate({ username: 'abc', birthyear: 1994 }, schema);
// result.error === null  => valid


const validator = require('validator');

validator.isEmail('foo@bar.com'); // => true
```

VALIDATION LIBRARIES

1. https://github.com/epoberezkin/ajv ★ 2 440
2. https://github.com/hapijs/joi ★ 6 157
3. https://github.com/chriso/validator.js ★ 8 825

* Stars are counted on the 24th of October 2017

AJV

```
const Ajv = require('ajv');
const ajv = Ajv({ allErrors:true, removeAdditional:'all' });
const employeeSchema = require('./employee.schema');
ajv.addSchema(employeeSchema, 'new-employee');

// error mapping
function errorResponse(schemaErrors) {
  let errors = schemaErrors.map((error) => {
    return {
      path: error.dataPath,
      message: error.message
    };
  })
  return {
    status: 'failed',
    errors: errors
  };
}

// create validation middleware
function validateSchema (schemaName) {
    return (req, res, next) => {
        let isValid = ajv.validate(schemaName, req.body);
        if(!isValid) {
            res.status(400).json(errorResponse(ajv.errors));
        } else {
            next();
        }
    }
}
```

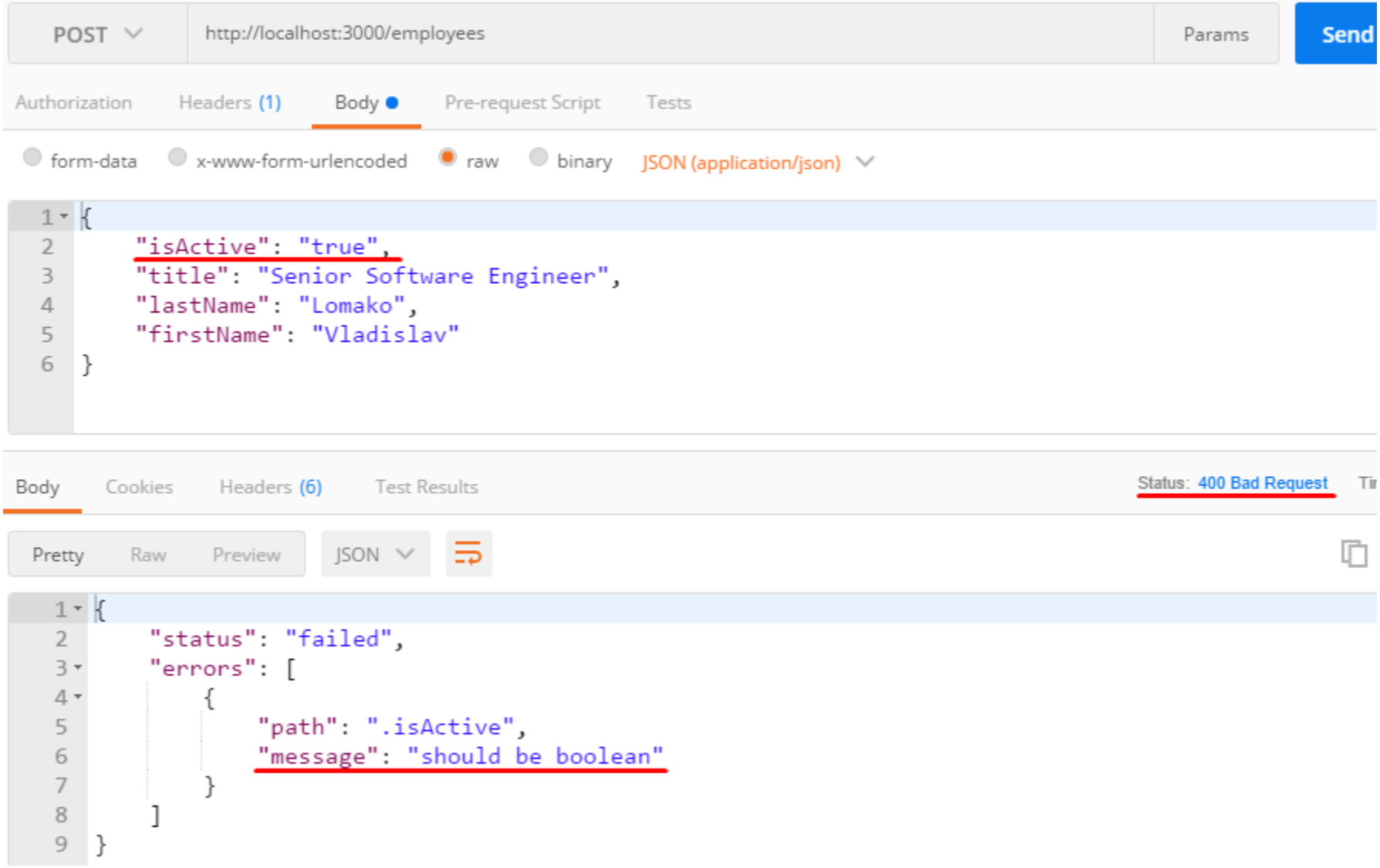
JSON SCHEMA

```
{
  "title": "new employee",
  "description": "Properties required to create an employee",
  "type": "object",
  "properties": {
    "firstName": {
      "type": "string",
      "description": "firstname of the account user"
    },
    "lastName": {
      "type": "string",
      "description": "lastname of the account user"
    },
    "title": {
      "type": "string",
      "description": "username of account"
    },
    "isActive": {
      "type": "boolean",
      "description": "whether the users email address should be remembered"
    }
  },
  "required": ["firstName", "lastName", "title", "isActive"]
}
```

APPLY SCHEMA

```
app.post('/employees', validateSchema('new-employee'), function (req, res) {
    let employee = req.body;

    employee.id = uuid.v4();

    data.push(employee);

    res.status(204).location(`/employees/${employee.id}`).send();
});
```

AJV RESPONSE



AUTHENTICATION

1. Passport.js
2. JSON Web Tokens

WHAT IS PASSPORT

1. Authentication middleware for Node.js
2. Extremely flexible and modular
3. Can be unobtrusively used with any Express application
4. 300+ strategies to choose from

GET IT WORK

1. Require passport module and initialize it
2. Configure passport with at least one Strategy
3. Specifying a route for authentication
4. Protect routes

SETUP LOCAL STRATEGY

```
passport.use(new LocalStrategy({
    usernameField: 'firstName',
    passwordField: 'lastName',
    session: false
}, function (username, password, done) {
    let employee = _.find(data, { firstName: username });

    if (employee === undefined || employee.lastName !== password) {
        done(null, false, 'Bad username/password combination');
    } else {
        done(null, employee);
    }
  }
));


// a piece of JSON with data
{
    "isActive": true,
    "title": "Senior Software Engineer",
    "lastName": "Williamson",
    "firstName": "Marsh",
    "id": "cdb24955-4de2-4ae2-9419-2dd509027de6"
},
```

CONNECT WITH EXPRESS

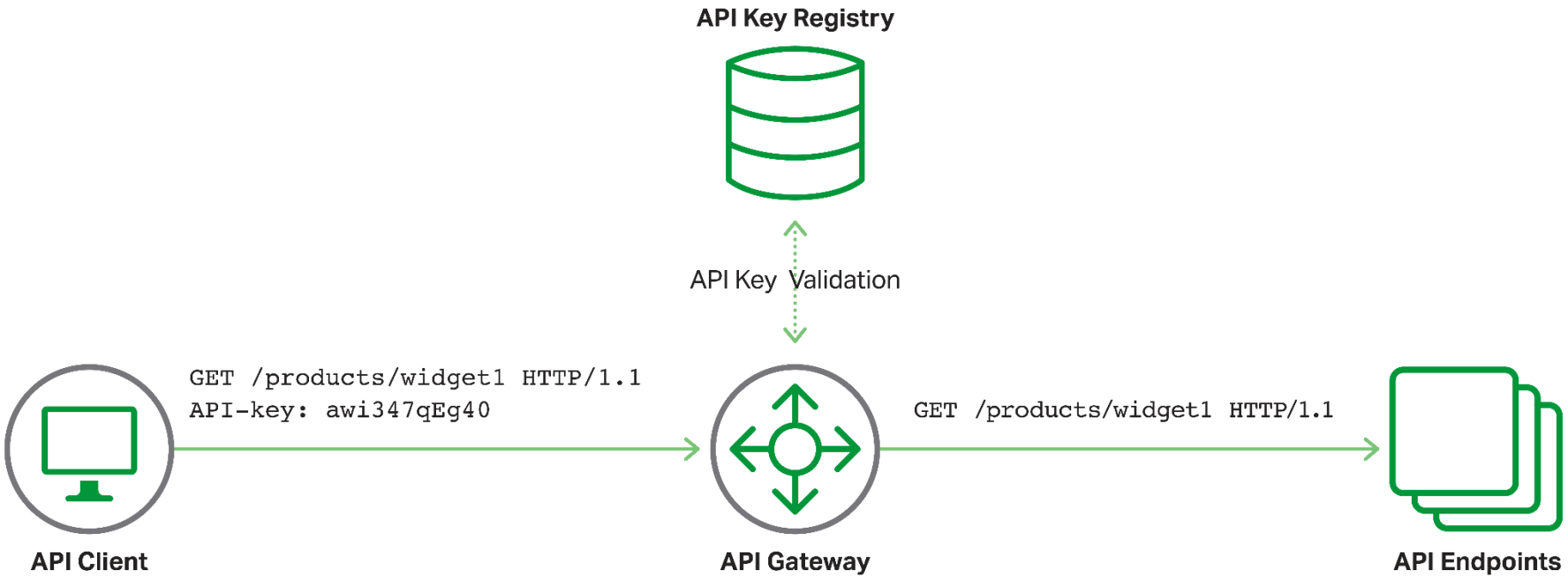
```
// setup authentication route with local strategy
app.post('/authenticate', passport.authenticate('local', { session: false }), function (req, res) {
        let token = _.find(tokens, { id: req.user.id });

        res.json(token);
    }
);

// protect endpoint with bearer strategy
app.get('/employees', passport.authenticate('bearer', { session: false }), function (req, res) {
    res.json(data);
});
```

```
// a piece of JSON with tokens
{
    "id": "cdb24955-4de2-4ae2-9419-2dd509027de6",
    "token": "TOKEN-6e87-4baf-b942-f984d9cd0635"
},
```

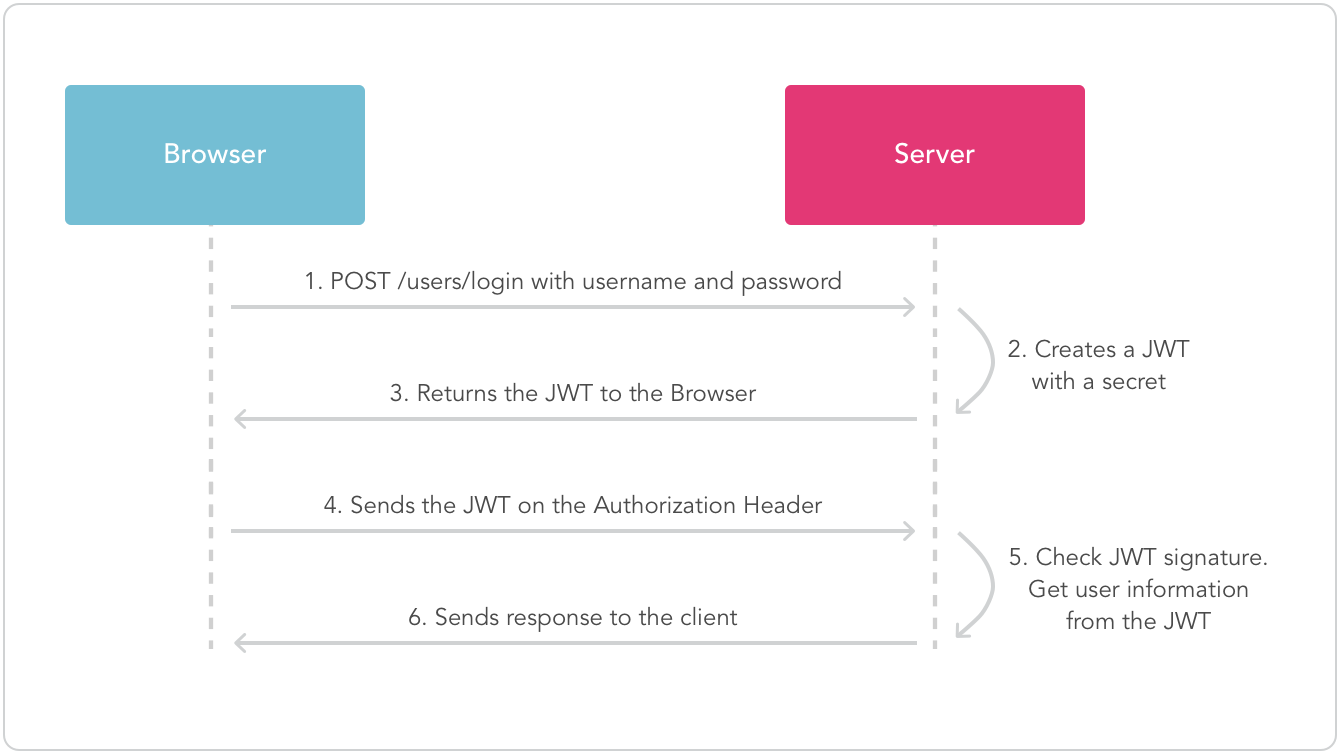
REQUESTS

1. POST request to the authentication route with data in body
2. Get JSON with ID and TOKEN in response
3. GET request to the protected authentication with bearer token

REGULAR TOKEN AUTH



HOW DOES IT WORK



COMPACT AND SELF-CONTAINED

Encoded PASTE A TOKEN HERE

```
eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJzdWIiOiIxMjM0NTY3ODkwIiwibmFtZSI6IkpvaG4gRG9lIiwiYWRtaW4iOnRydWV9.TJVA95OrM7E2cBab30RMHrHDcEfxjoYZgeFONFh7HgQ
```

Decoded EDIT THE PAYLOAD AND SECRET (ONLY HS256 SUPPORTED)

HEADER: ALGORITHM & TOKEN TYPE

```
{
  "alg": "HS256",
  "typ": "JWT"
}
```

PAYLOAD: DATA

```
{
  "sub": "1234567890",
  "name": "John Doe",
  "admin": true
}
```

VERIFY SIGNATURE

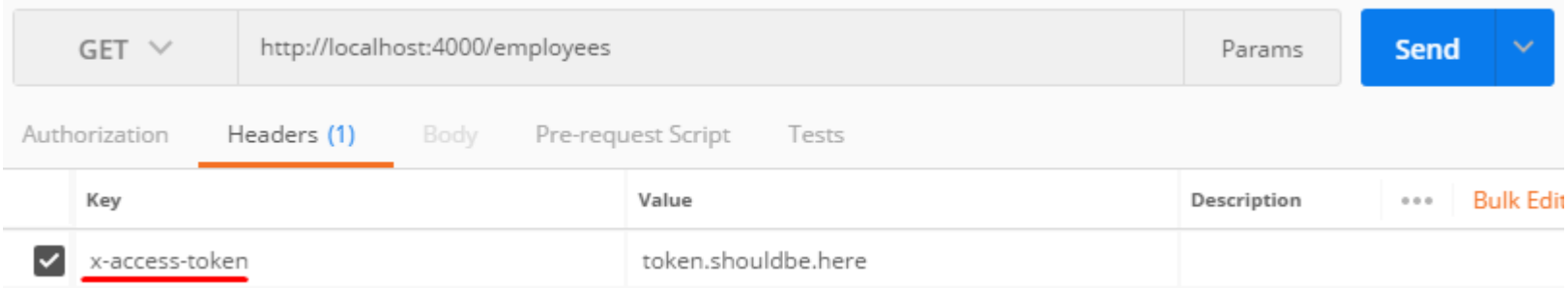
```
HMACSHA256(
  base64UrlEncode(header) + "." +
  base64UrlEncode(payload),
  secret
) secret base64 encoded
```

SETUP JWT

```
app.post('/authenticate ', function (req, res) {
    let employee = _.find(data, { firstName: req.body.firstName });

    if (employee === undefined || employee.lastName !== req.body.lastName) {
        res.status(403).send({ success: false,  message: 'Bad username/password combination.' });
    } else {
        let payload = { "sub": employee.id, "isActive": employee.isActive };
        let token = jwt.sign(payload, 'secret', { expiresIn: 10 });
        res.send(token);
    }
});

// middleware for token check
function checkToken(req, res, next) {
    let token = req.headers['x-access-token'];

    if (token) {
        jwt.verify(token, 'secret', function(err, decoded) {
            if (err) {
                res.json({ success: false, message: 'Failed to authenticate token.' });
            } else {
                // some business logic here
                next();
            }
        });
    } else {
        res.status(403).send({ success: false, message: 'No token provided.' });
    }
}
```

PROTECT ENDPOINT WITH JWT

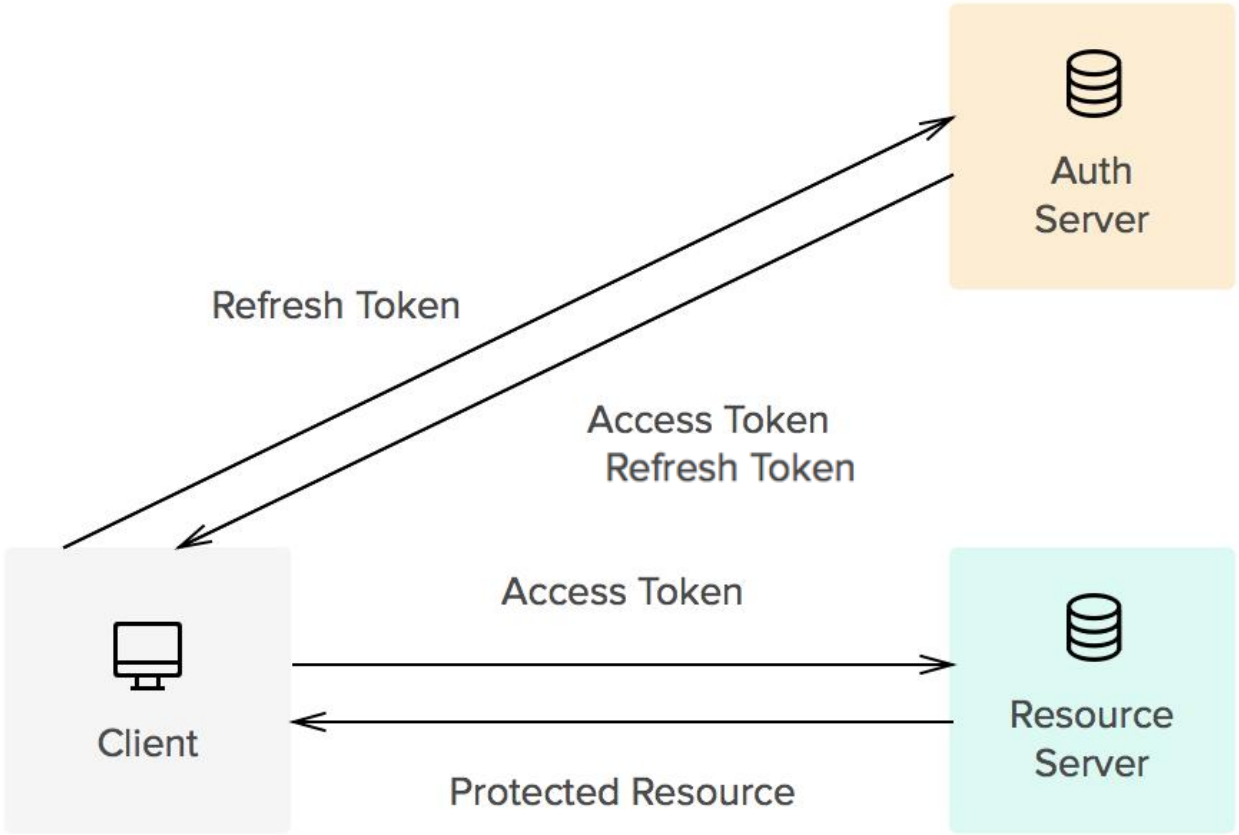
```
// middleware for token check
function checkToken(req, res, next) {
    let token = req.headers['x-access-token'];

    if (token) {
        jwt.verify(token, 'secret', function(err, decoded) {
            if (err) {···
            } else {
                // some business logic here
                next();
            }
        });
    } else {···
    }
}

// protect endpoint with JWT token
app.get('/employees', checkToken, function (req, res) {
    res.json(data);
});
```



JWT PROS AND CONS

- No server-side storage
- Easy to use (a lot of libs)
- Can be used across services
- One key rules all
- Can't be revoked permanently (in general)

ACCESS TOKEN AND REFRESH TOKEN



OWASP TOP 10

OWASP Top 10 2013	OWASP Top 10 2017
A1 Injection	A1 Injection
A2 Broken Auth and Session Management	A2 Broken Authentication
A3 Cross-Site Scripting (XSS)	A3 Sensitive Data Exposure
A4 Insecure Direct Object References	A4 XML External Entities (XXE)
A5 Security Misconfiguration	A5 Broken Access Control
A6 Sensitive Data Exposure	A6 Security Misconfiguration
A7 Missing Function Level Access Control	A7 Cross-Site Scripting (XSS)
A8 Cross-Site Request Forgery (CSRF)	A8 Insecure Deserialization
A9 Using Components with Known Vulnerabilities	A9 Using Components with Known Vulnerabilities
A10 Unvalidated Redirects and Forwards	A10 Insufficient Logging & Monitoring

NODE SECURITY

1. Static analysis
2. Sensitive data on the client side
3. Running process with superuser rights
4. Vulnerabilities in dependencies
5. Known vulnerabilities in your code
6. Error logging

API SECURITY

1. HTTPS
2. Access Control
3. Restrict HTTP methods
4. Input validation
5. Error handling
6. Audit logs
7. Security headers
8. Sensitive information in HTTP requests

HELMET

1. Hide Powered-By
2. HSTS
3. No Cache
4. .. and more

```
const express = require('express');
const helmet = require('helmet');
const app = express();

app.use(helmet())
```

USEFUL LINKS

- Design by contract
- JSON Schema
- Custom Passport strategy
- node-jsonwebtoken
- Open Web Application Security Project (OWASP)
- REST API Security Cheat Sheet
- Express Production Security Best Practices
- Retire.js, Node Security Platform, Snyk
- Helmet

NODE.JS GLOBAL

MIDDLEWARE. FRAMEWORKS

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