VIETNAM AUSTRALIA Vocational College

React Advance
Bài 4: Xây dựng middleware và API

daynghevietuc.com

Nội dung

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2. Sử dụng middleware
3. Xử lý lỗi - Error handling
4. Debugging
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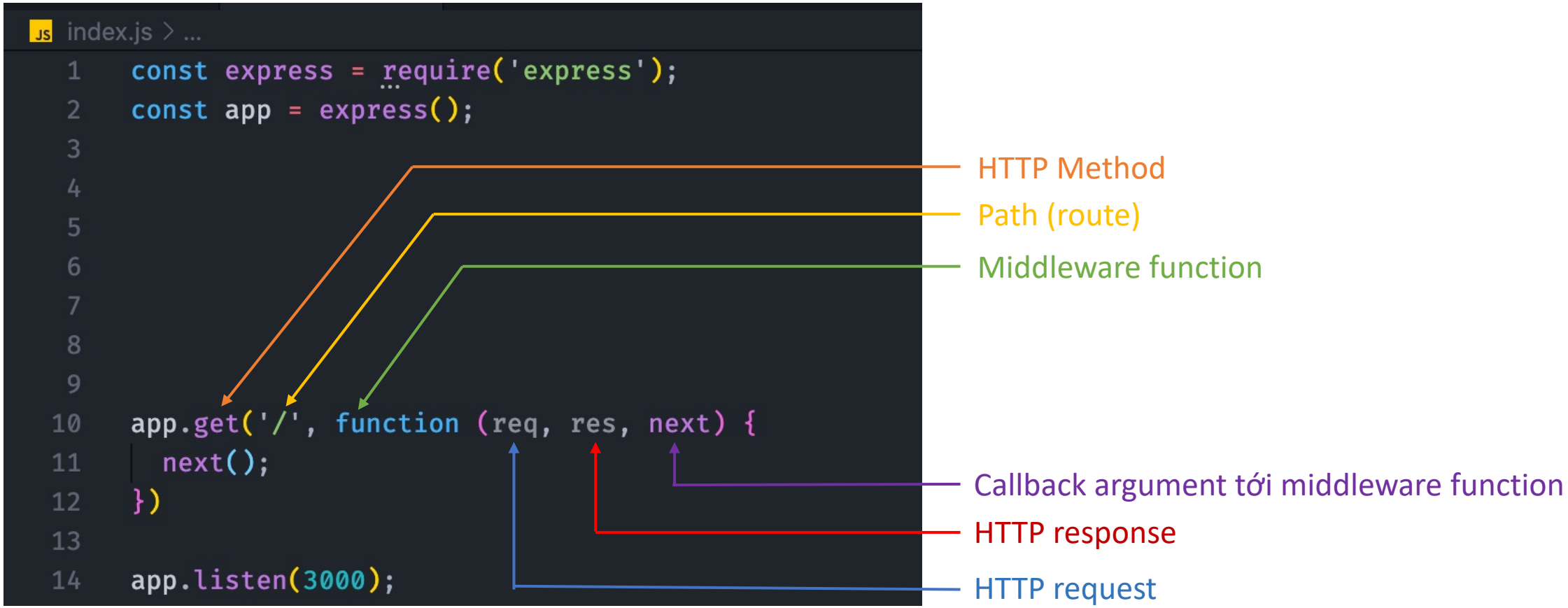
6. Xây dựng API

1. Cài đặt Middleware

Cài đặt Middleware

- Middleware là hàm cho phép truy cập tới request object (***req***) và response (***res***) và hàm next trong request-response circle của ứng dụng.
- Next function là một hàm trong Express router để gọi và thực thi các hàm middleware kế tiếp.
- Middleware function có công dụng:
  - Thực thi một đoạn code.
  - Thay đổi thông tin của các Request và Response objects.
  - Kết thúc một vòng request-response cycle.
  - Gọi tiếp một hàm middleware trong stack.

Cài đặt middleware



Cài đặt middleware

- Ví dụ ở demo “hello world” ở bài đầu tiên của express.
  - Khi có một request gửi đến chỉ đơng giản là phản hồi lại chuỗi “Hello world”

index.js > ...

```
1  const express = require('express');
2  const app = express();
3
4  app.get('/', (req, res) => {
5    res.send('Hello world!!!');
6  })
7
8  app.listen(3000);
```

  - Tuy nhiên giờ muốn log lại thông tin như requestTime thì sẽ phải sử dụng middleware để làm chuyện này

```
const myLogger = (req, res, next) => {
  console.log('Logged');
  next();
}
```

Cài đặt Middleware – sử dụng đối tượng *app.use()*

index.js > ...

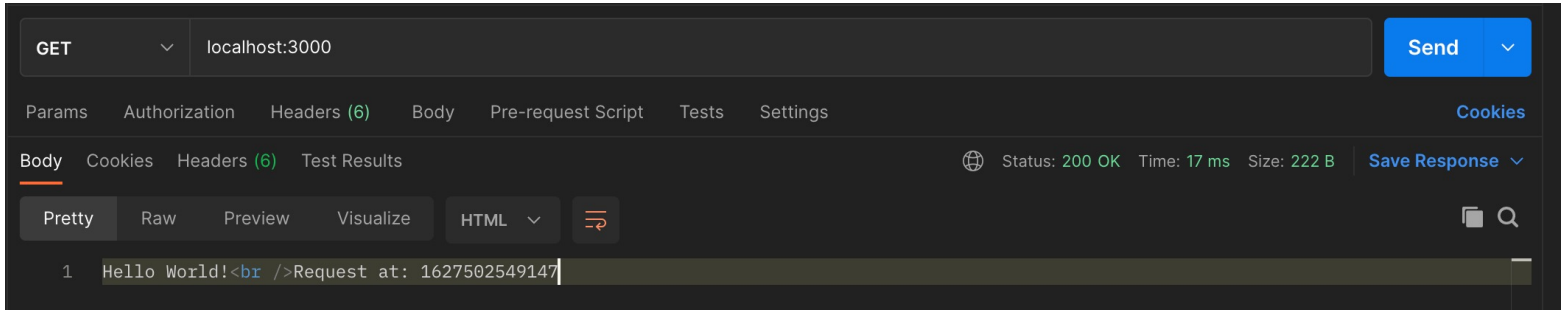
```
1   const express = require('express');
2   const app = express();
3
4   const myLogger = (req, res, next) => {
5     console.log('Logged');
6     next();
7   }
8
9   app.use(myLogger);
10
11  app.get('/', (req, res) => {
12    res.send('Hello world!!!');
13   })
14
15  app.listen(3000);
16
```

Middleware funtion - requestTime

- Cài đặt hiển thị thời gian mà request gửi đến server

index.js > ...

```
1  const express = require('express');
2  const app = express();
3
4  const requestTime = (req, res, next) => {
5    req.requestTime = Date.now();
6    next();
7  }
8
9  app.use(requestTime);
10
11 app.get('/', (req, res) => {
12   var responseText = `Hello World!<br />Request at: ${req.requestTime}`;
13   res.writeHead(200, {'Content-Type': 'text/html'});
14   res.end(responseText);
15  })
16
17 app.listen(3000);
```



Middleware function - validateCookies

```
❯ npm install cookie-parser --save

up to date, audited 53 packages in 737ms

found 0 vulnerabilities
```

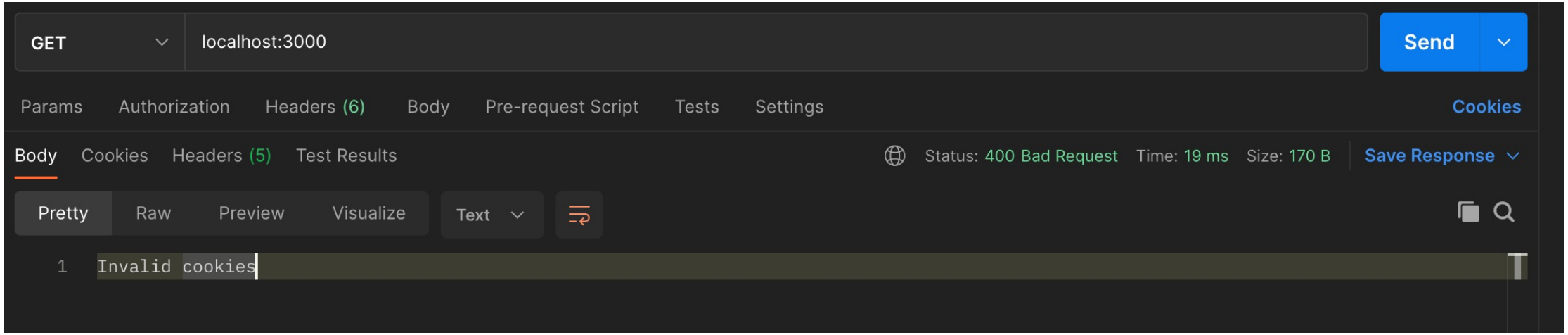
cookieValidator.js

```
1  const cookieValidator = async (cookies) => {
2    try {
3      if(cookies.testCookie != null)
4        console.log(`=> Cookies.testCookes = ${cookies.testCookie}`);
5      else
6        throw new Error('Invalid cookies');
7    } catch (e) {
8      throw e;
9    }
10 }
11
12 module.exports = cookieValidator;
```

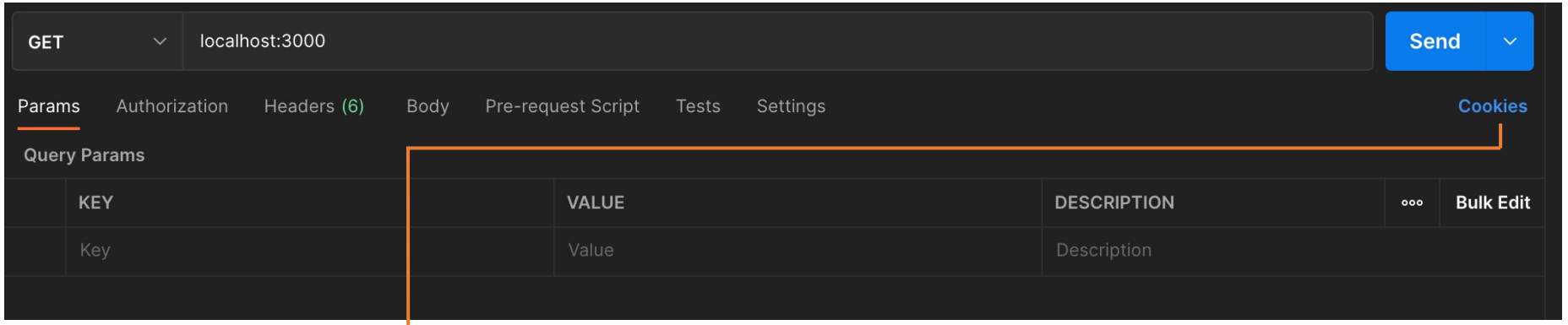
index.js

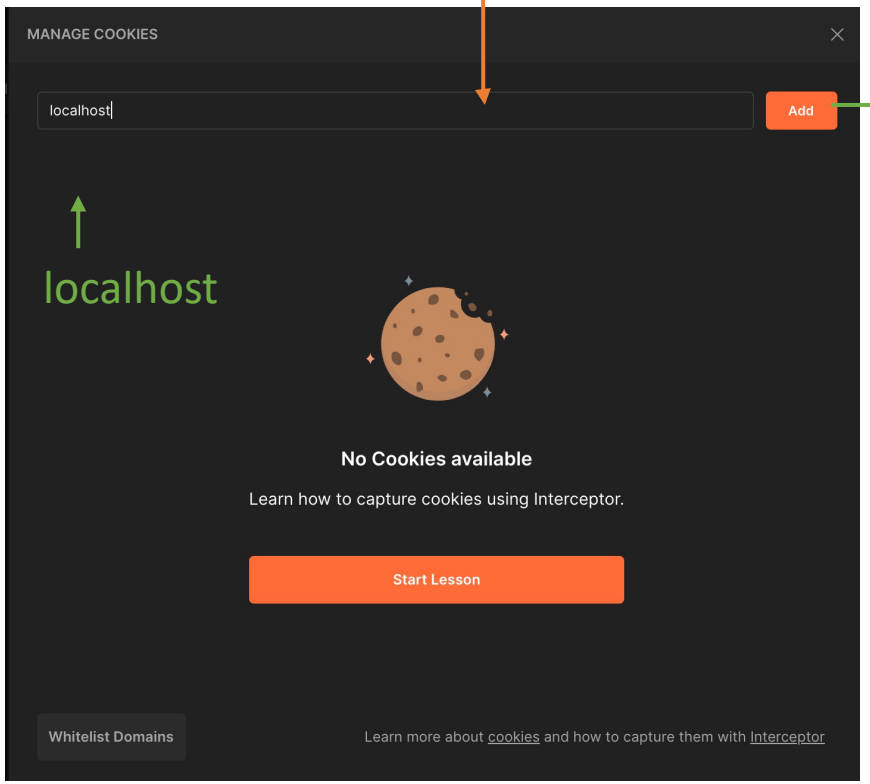
```
1  const express = require('express');
2  const cookieParser = require('cookie-parser');
3  const cookieValidator = require('./cookieValidator');
4
5  const app = express();
6
7  const validateCookies = async (req, res, next) => {
8    try {
9      await cookieValidator(req.cookies);
10     next();
11   } catch (e){
12     next(e);
13   }
14 }
15
16 app.use(cookieParser());
17 app.use(validateCookies);
18
19 // error handler
20 app.use(function(error, req, res, next){
21   res.status(400).end(error.message);
22 })
23
24 app.get('/', (req, res) => {
25   res.writeHead(200, {'Content-Type': 'text/html'});
26   res.end(`Hello World! Cookies.testCookie = ${req.cookies.testCookie}`);
27  })
28
29 app.listen(3000);
```

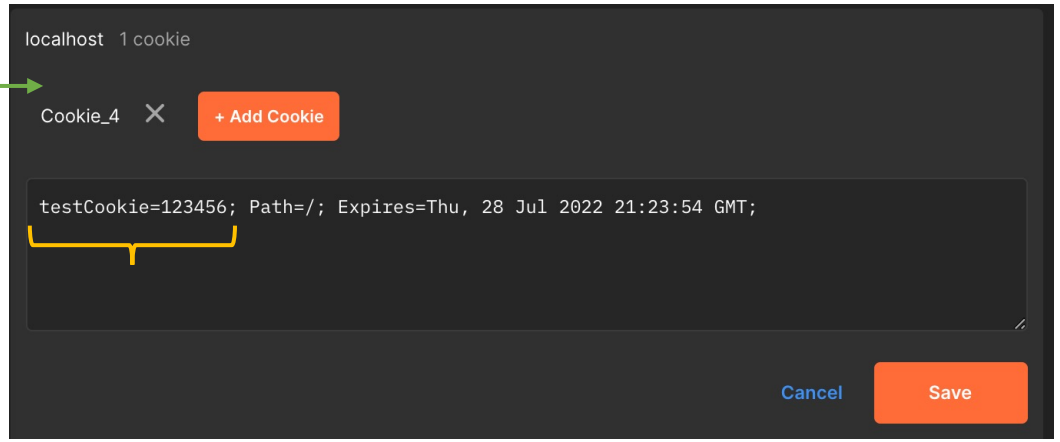
Middleware function – validateCookies – Không có cookies



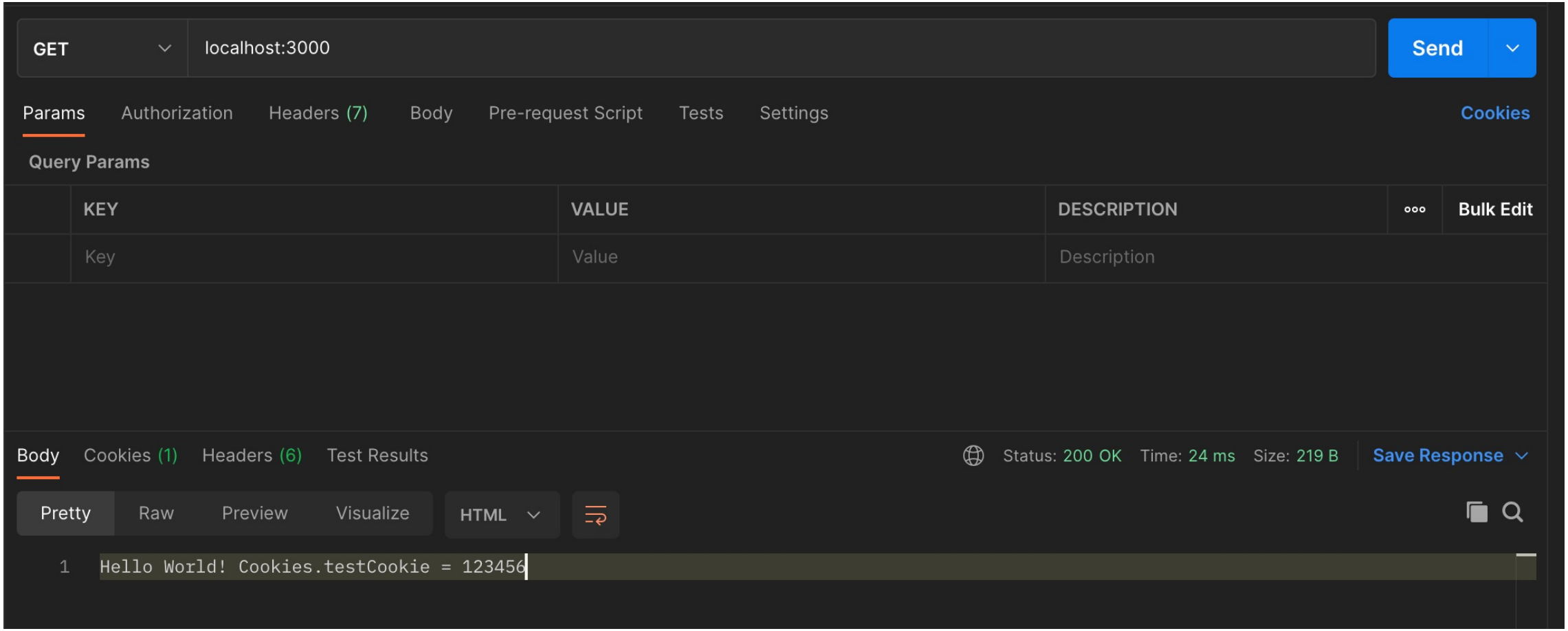
Middleware function – validateCookies – set biến cookies







Middleware function – validateCookies – với cookies



Configurable middleware

middleware.js > ...

```
1  module.exports = (opotions) => {
2    return (req, res, next) => {
3      //? Code  hàm xử lý middleware ở đây
4      next();
5    }
6  }
```

```
const mid = require('./middleware');

app.use(mid({option_1: '1', option_2: '2'}));
```

2. Sử dụng Middleware

Sử dụng Middleware

- Ứng dụng Express có thể sử dụng các loại middleware sau
  - Application-level middleware
  - Router-level middleware
  - Error-handling middleware
  - Build-in middleware
  - Third-party middleware
- Thường dùng application-level và router-level middleware với option mounth path để xây dựng router cho các ứng dụng Express

Application-level middleware

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

app.use((req, res, next) => {
  console.log('Time:', Date.now());
  next()
})
```

```
app.use('/user/:id', (req, res, next) => {
  console.log('Request Type:', req.method);
  next();
})
```

```
app.get('/user/:id', (req, res, next) => {
  res.send('USER');
})
```

Application-level middleware

```
app.use('/user/:id', (req, res, next) => {
  console.log('Request URL:', req.originalUrl);
  next();
}, (req, res, next) => {
  console.log('Request Type:', req.method);
  next();
})
```

```
app.get('/user/:id', (req, res, next) => {
  console.log('ID:', req.params.id);
  next();
}, (req, res, next) => {
  res.send('User Information');
})

//? handler for the user/:id path, which prints the user ID
app.get('/user/:id', (req, res, next) => {
  res.send(req.params.id);
})
```

Application-level middleware – middleware sub-stack

```
app.get('/user/:id', (req, res, next) => {
  //? if user ID la 0, skip to the next route
  if (req.params.id === '0')
    next('route');
  else
    //? otherwise pass the control to the next middleware function in this stack
    next();
}, (req, res, next) => {
  //? send a regular response
  res.send('Regular');
})

//? handler for the /user/:id path, which sends a special response
app.get('/user/:id', (req, res, next) => {
  res.send('Special');
})
```

Application-level middleware – array for reusability

```
const logOriginalUrl = (req, res, next) => {
  console.log('Request URL:', req.originalUrl);
  next();
}

const logMethod = (req, res, next) => {
  console.log('Request Type:', req.method);
  next();
}

var logStuff = [logOriginalUrl, logMethod];
app.get('/user/:id', (req, res, next) => {
  res.send('User Information');
})
```

Router-level middleware – sử dụng *express.Router()*

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

const app = express();
const router = express.Router();

//? a middleware function with no mount path. This code is executed for every request to the router
router.use((req, res, next) => {
  console.log('Time:', Date.now());
  next();
})

//? a middleware sub-stack shows request info for any type of HTTP request to the /user/:id path
router.use('/user/:id', (req, res, next) => {
  console.log('Request URL:', req.originalUrl);
  next();
}, (req, res, next) => {
  console.log('Request Type:', req.method);
  next();
})

//? a middleware sub-stack that handles GET requests to the /user/:id path
router.get('/user/:id', (req, res, next) => {
  //? if the user ID is 0, skip to the next router
  if (req.params.id === '0')
    next('route');
  else
    //? otherwise pass control to the next middleware function in this stack
    next();
}, (req, res, next) => {
  //? render a regular page
  res.render('Regular');
})

//? handler for the /user/:id path, which renders a special page
router.get('/user/:id', (req, res, next) => {
  console.log(req.params.id);
  res.render('Special');
})

//? mount the router on the app
app.use('/', router);
```

Router-level middleware – sử dụng *express.Router()*

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

const app = express();
const router = express.Router();

//? predicate the router with a check and bail out when needed
router.use((req, res, next) => {
  if(!req.header['x-auth'])
    return next('router');
  next();
})

router.get('/user/:id', (req, res) => {
  res.send('Hello, user!');
})

//? use the router and 401 anything falling through
app.use('/admin', router, (req, res) => {
  res.sendStatus(401);
})
```

Error – handling middleware

Error.handling.js > ...

```
1   const express = require('express');
2
3   const app = express();
4   const router = express.Router();
5
6   app.use((err, req, res, next) => {
7     console.error(err.stack);
8     res.status(500).send('Something broken!');
9   })
10
11  app.listen(3000);
```

Build-in middleware

- Bắt đầu từ version 4.x của Express
- Express hỗ trợ các hàm build-in middleware sau:
  - express.static – để cấu hình các static assets như HTML file, CSS, image …
  - express.json – để parse dữ liệu của request với định dạng JSON
  - express.urlencođe – parse dữ liệu của requét với URL-encoded

Third-party middleware

- Third-party middleware cho phép gắn thên các hàm, thư viện hỗ trợ express
- Ví dụ module ***cookie-parser***

Third.party.js > ...

```
1   const express = require('express');
2   const cookieParser = require('cookie-parser');
3
4   const app = express();
5
6   //? load the cookie-parsing middleware
7   app.use(cookieParser());
8
9   app.listen(3000);
10
```

3. Xử lý lỗi – Error Handling

Error handling – Catching Errors

```
app.get('/', (req, res) => {
  //? Express will catch this on its own
  throw new Error('BROKEN');
})
```

```
app.get('/user/:id', async (req, res, next) => {
  var user = await getUserById(req.params.id);
  res.send(user);
})
```

```
app.get('/', (req, res, next) => {
  fs.readFile('/file-does-not-exist', (err, data) => {
    if(err) {
      //? Pass errors to Express
      next(err);
    } else {
      res.send(data);
    }
  })
})
```

```
app.get('/', [
  (req, res, next) => {
    fs.writeFile('/inaccessible-path', 'data', next);
  },
  (req, res) => {
    res.send('OK')
  }
])
```

Error handling – Catching Errors

```
app.get('/', (req, res, next) => {
  setTimeout(() => {
    try {
      throw new Error('BROKEN');
    } catch (err) {
      next(err);
    }
  }, 100);
})
```

```
app.get('/', (req, res, next) => {
  Promise.resolve().then(() => {
    throw new Error('BROKEN');
  }).catch(next);          //? Errors will be passed to Express
})
```

```
app.get('/', [
  (req, res, next) => {
    fs.readFile('/maybe-valid-file', 'utf-8', (err, data) => {
      res.local.data = data;
      next(err);
    })
  },
  (req, res) => {
    res.locals.data = res.locals.data.split(',')[1];
    res.send(res.locals.data);
  }
])
```

Default error handler

- Thường cần phải set ***res***.*statusCode* và ***res***.*statusMessage*

```
const errorHandler = (err, req, res, next) ⇒ {
  if (res.headersSent) {
    return next(err);
  }
  res.statusCode(500);
  res.send('Error', {error: err});
}
```

Writing Error handlers

```
app.use((err, req, res, next) => {
  console.log(err.stack);
  res.status(500).send('Something broke!');
})
```

Error.hander.js > ...

```
1   const express = require('express');
2   const app = express();
3
4   app.use((err, req, res, next) => {
5     console.log(err.stack);
6     res.status(500).send('Something broke!');
7   })
8
9   const bodyParser = require('body-parser');
10  const methodOverride = require('method-override');
11
12  app.use(bodyParser.urlencoded({
13    extended: true
14  }))
15  app.use(bodyParser.json())
16  app.use(methodOverride())
17  app.use((err, req, res, next) => {
18    //? code logic here
19  })
```

Writing error handlers

```
const express = require("express");
const bodyParser = require("body-parser");
const methodOverride = require("method-override");

const app = express();

app.use(
  bodyParser.urlencoded({
    extended: true,
  })
);

app.use(bodyParser.json());
app.use(methodOverride());
app.use(logErrors);
app.use(clientErrorHandler);
app.use(errorHandler);
```

```
const logErrors = (err, req, res, next) => {
  console.error(err.stack);
  next(err);
};
```

```
const clientErrorHandler = (err, req, res, next) => {
  if (req.xhr) res.status(500).send({ error: "Something failed!" });
  else next(err);
};
```

```
const errorHandler = (err, req, res, next) => {
  res.status(500);
  res.render("Error", { error: err });
};
```

```
app.get(
  "/a_route_behind_paywall",
  function checkIfPaidSubscriber(req, res, next) {
    if (!req.user.hadPaid) {
      //? continue handling this request
      next("route");
    } else {
      next();
    }
  },
  function getPaidContent(req, res, next) {
    PaidContent.find((err, doc) => {
      if (err) return next(err);
      res.json(doc);
    });
  }
);
```

4. Debugging

Debugging trong Express

- Chạy câu lệnh sau để vào chế độ debugging trong Express
- Thông start server các modules

```
❯ DEBUG=express:* node index.js
```

```
express:application set "x-powered-by" to true +0ms
express:application set "etag" to 'weak' +2ms
express:application set "etag fn" to [Function: generateETag] +0ms
express:application set "env" to 'development' +1ms
express:application set "query parser" to 'extended' +0ms
express:application set "query parser fn" to [Function: parseExtendedQueryString] +0ms
express:application set "subdomain offset" to 2 +0ms
express:application set "trust proxy" to false +0ms
express:application set "trust proxy fn" to [Function: trustNone] +0ms
express:application booting in development mode +0ms
express:application set "view" to [Function: View] +0ms
express:application set "views" to '/                                    /Lab03/views' +0ms
express:application set "jsonp callback name" to 'callback' +1ms
express:router use '/' query +0ms
express:router:layer new '/' +0ms
express:router use '/' expressInit +1ms
express:router:layer new '/' +0ms
express:router use '/' cookieParser +0ms
express:router:layer new '/' +0ms
express:router use '/' validateCookies +0ms
express:router:layer new '/' +0ms
express:router use '/' <anonymous> +0ms
express:router:layer new '/' +0ms
express:router:route new '/' +0ms
express:router:layer new '/' +0ms
express:router:route get '/' +0ms
express:router:layer new '/' +1ms
```

Debugging trong Express

- Khi có request gửi tới server

```
  express:router dispatching GET / +11m
  express:router query  : / +1ms
  express:router expressInit  : / +1ms
  express:router cookieParser  : / +1ms
  express:router validateCookies  : / +1ms
=> Cookies.testCookes = 123456
  express:router <anonymous>  : / +6ms
```

- Nếu sử dụng Application generated của Express thì các câu lệnh sau đổi lại như sau

```
❯ DEBUG=Lab03:* node ./bin/www
```

```
❯ DEBUG=http,mail,express:* node index.js
```

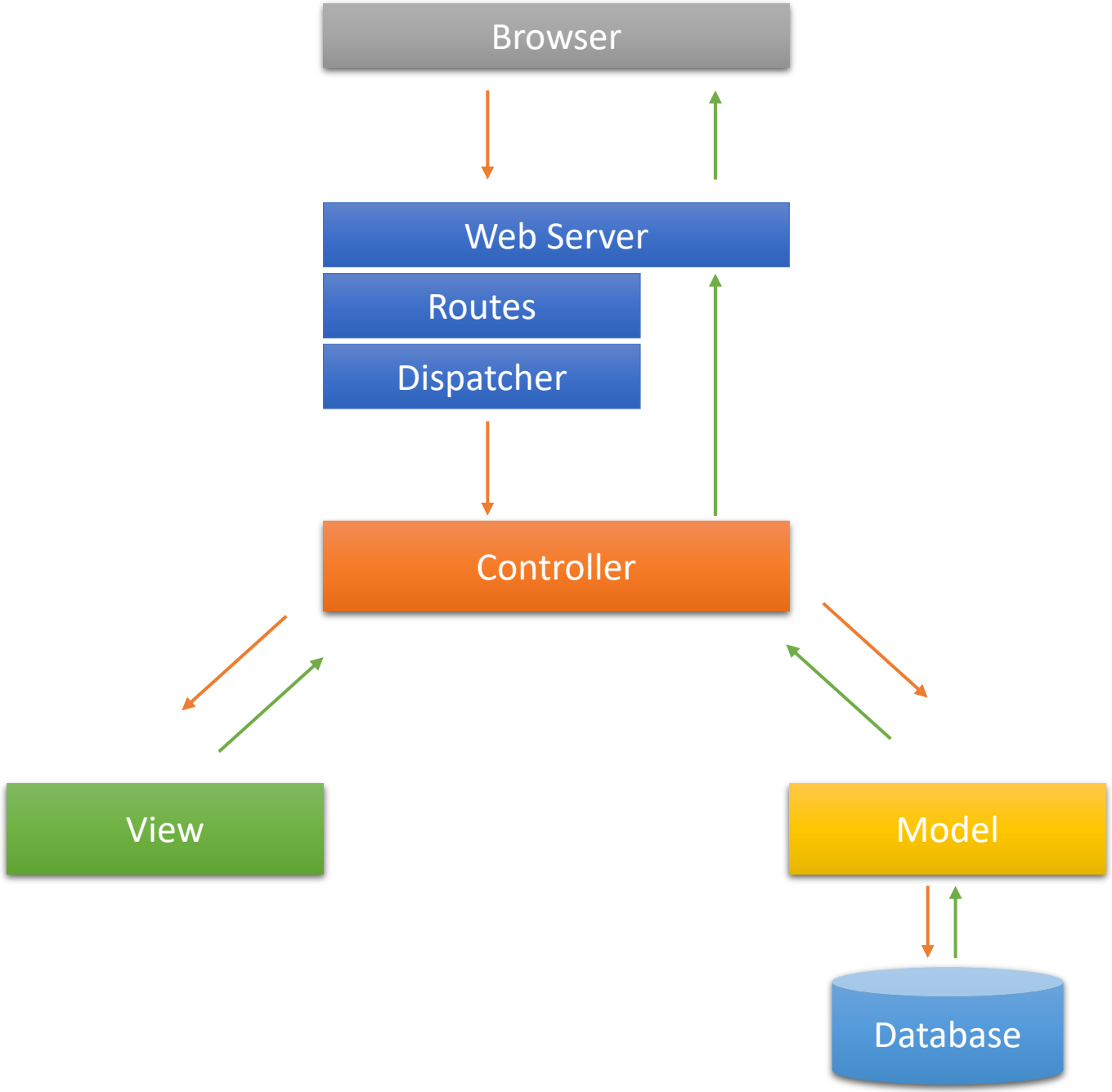
Debugging trong Express

- Các option nâng cao – Advanced options

Tên	Mục đích
DEBUG	Enables/disables chế độ debugging
DEBUG_COLORS	Bật/tắt chế độ hiển thị màu trong console debugging
DEBUG_DEPTH	Độ sâu của đối tượng debugging
DEBUG_FD	Mô tả file log thông tin debugging
DEBUG_SHOW_HIDDEN	Hiển thị các thuộc tính ẩn trong các đối tượng khi debugging

5. Kiến trúc MVC trong ExpressJS

Kiến trúc MVC



6. Xây dựng API

Xây dựng API – Express-generator

- Cài đặt express-generator

```
❯ npm install -g express-generator
```

- Khởi tạo project express application với express-generator không có View

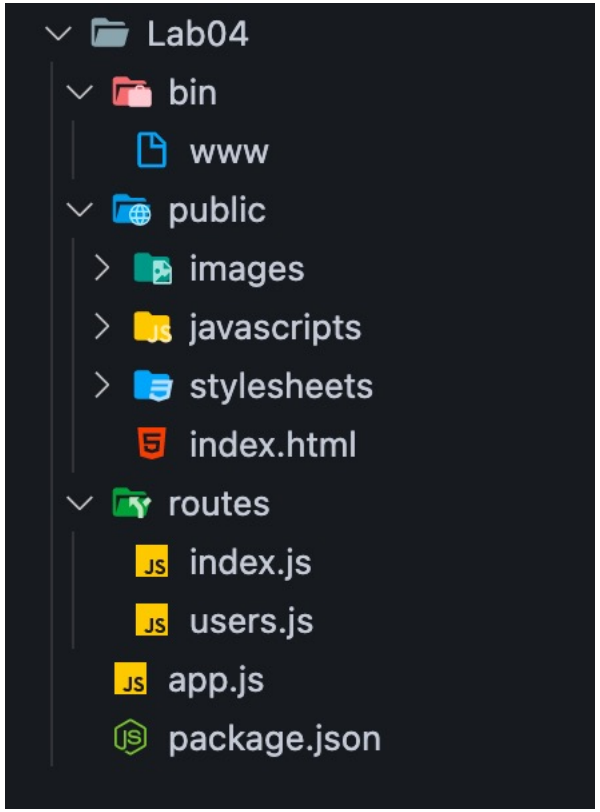
```
❯ express --no-view Lab04

   create : Lab04/
   create : Lab04/public/
   create : Lab04/public/javascripts/
   create : Lab04/public/images/
   create : Lab04/public/stylesheets/
   create : Lab04/public/stylesheets/style.css
   create : Lab04/routes/
   create : Lab04/routes/index.js
   create : Lab04/routes/users.js
   create : Lab04/public/index.html
   create : Lab04/app.js
   create : Lab04/package.json
   create : Lab04/bin/
   create : Lab04/bin/www

   change directory:
     $ cd Lab04

   install dependencies:
     $ npm install

   run the app:
     $ DEBUG=lab04:* npm start
```



Xây dựng API – Express-generator

- Khởi tạo project express application với express-generator với view engine EJS

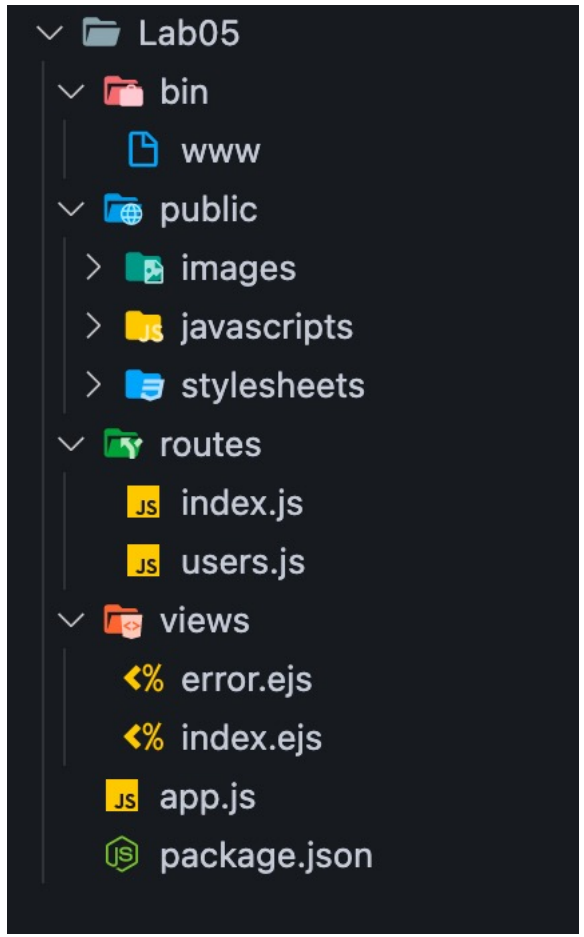
```
❯ express --view=ejs Lab05

   create : Lab05/
   create : Lab05/public/
   create : Lab05/public/javascripts/
   create : Lab05/public/images/
   create : Lab05/public/stylesheets/
   create : Lab05/public/stylesheets/style.css
   create : Lab05/routes/
   create : Lab05/routes/index.js
   create : Lab05/routes/users.js
   create : Lab05/views/
   create : Lab05/views/error.ejs
   create : Lab05/views/index.ejs
   create : Lab05/app.js
   create : Lab05/package.json
   create : Lab05/bin/
   create : Lab05/bin/www

   change directory:
     $ cd Lab05

   install dependencies:
     $ npm install

   run the app:
     $ DEBUG=lab05:* npm start
```



Bài tập về nhà

- Xây dựng một ứng dụng ExpressJS thực hiện các yêu cầu sau:
  - Xây dựng middleware Authentication thực hiện việc kiểm tra (5 điểm)
    - Nếu request có Cookies.isLogin = true thì cho phép chuyển tiếp vào middleware ‘/’ tiếp theo
    - Nếu request không có Cookies.isLogin hoặc Cookies.isLogin = false thì sẽ thông báo lỗi ”Access denied”
  - Xây dựng route.get(‘/’) để xử lý in ra thông tin của isLogin (5 điểm)
    - Nếu request có Cookies.UID thì in UID ra (với UID là User ID)
    - Nếu không có thì trả về thông báo ”You are not Admin"