Hands-On Backend Development with MERN Stack

Author: Pi

Date: 2025.07.02

CONTENTS

01

Welcome to the backend development Workshop

Welcome to the backend development Workshop

Objective

Learn to build a backend using the MERN stack

Agenda

- MERN Stack Overview
- Node.js, Express, MongoDB, Mongoose
- Tools: npm, Postman, Dev Tools
- Security: Middleware, Bcrypt, CORS
- Data Handling: Async/Await, Axios, Zod
- Storage: Local Storage, Cookies, Headers

02

What is the MERN Stack?

What is the MERN Stack?

MERN

- MongoDB: NoSQL database for storing JSON-like data
- Express: Node.js framework for building RESTful APIs
- React: Frontend library (not covered in depth today)
- Node.js: JavaScript runtime for server-side development

Why MERN?

- Full JavaScript ecosystem
- Scalable and flexible for modern apps

03

Setting Up the Environment

Setting Up the Environment

Node.js & npm

- npm: Node Package Manager, installs dependencies
- Initialize project: npm init -y

package.json

- Stores project metadata and dependencies

```
{
  "name": "mern-workshop",
  "version": "1.0.0",
  "dependencies": {
    "express": "^4.18.2"
  }
}
```

04

Project Folder Structure

Project Folder Structure

Recommended Structure:

/mern-workshop ├── /node_modules ├── /controllers ├── /models ├── /routes ├── /middleware ├── .env ├── .gitignore ├── index.js ├── package.json

Purpose

- controllers: Business logic
- models: Database schemas
- routes: API endpoints
- middleware: Request processing

05

Express.js - Building the Backend

Express.js - Building the Backend

1 What is Express?

- Lightweight framework for Node.js
- Simplifies routing and middleware

2 Basic Boilerplate

```
const express = require('express'); const app = express(); app.use(express.json()); app.get('/', (req, res) => { res.send('Hello, MERN Workshop!'); }); app.listen(3000, () => {  console.log('Server running on http://localhost:3000'); });
```


06
Async/Await in Node.js

Async/Await in Node.js

Why Async/Await?

- Simplifies asynchronous code (e.g., database queries)
- Replaces callbacks and promises

Example

```
async function fetchData() {  try {  const data = await someAsyncOperation();  return data;  } catch (error) {  console.error('Error:', error);  } }
```

07

MongoDB and Mongoose

MongoDB and Mongoose

1 MongoDB

NoSQL database, stores data in JSON-like documents

2 Mongoose

ODM (Object Data Modeling) for MongoDB

3 Example Schema

```
const mongoose = require('mongoose'); const userSchema = new mongoose.Schema({    name: String,    email: { type: String, unique: true } }); const User = mongoose.model('User', userSchema);
```

Connection

```
mongoose.connect('mongodb://localhost:27017/mern-workshop');
```

08

Environment Variables with .env

Environment Variables with .env

Purpose

Store sensitive data (e.g., DB URI, API keys)

Setup

- Install: npm install dotenv
- Create .env:

MONGODB_URI=mongodb://localhost:27017/mern-workshop PORT=3000

Use in code

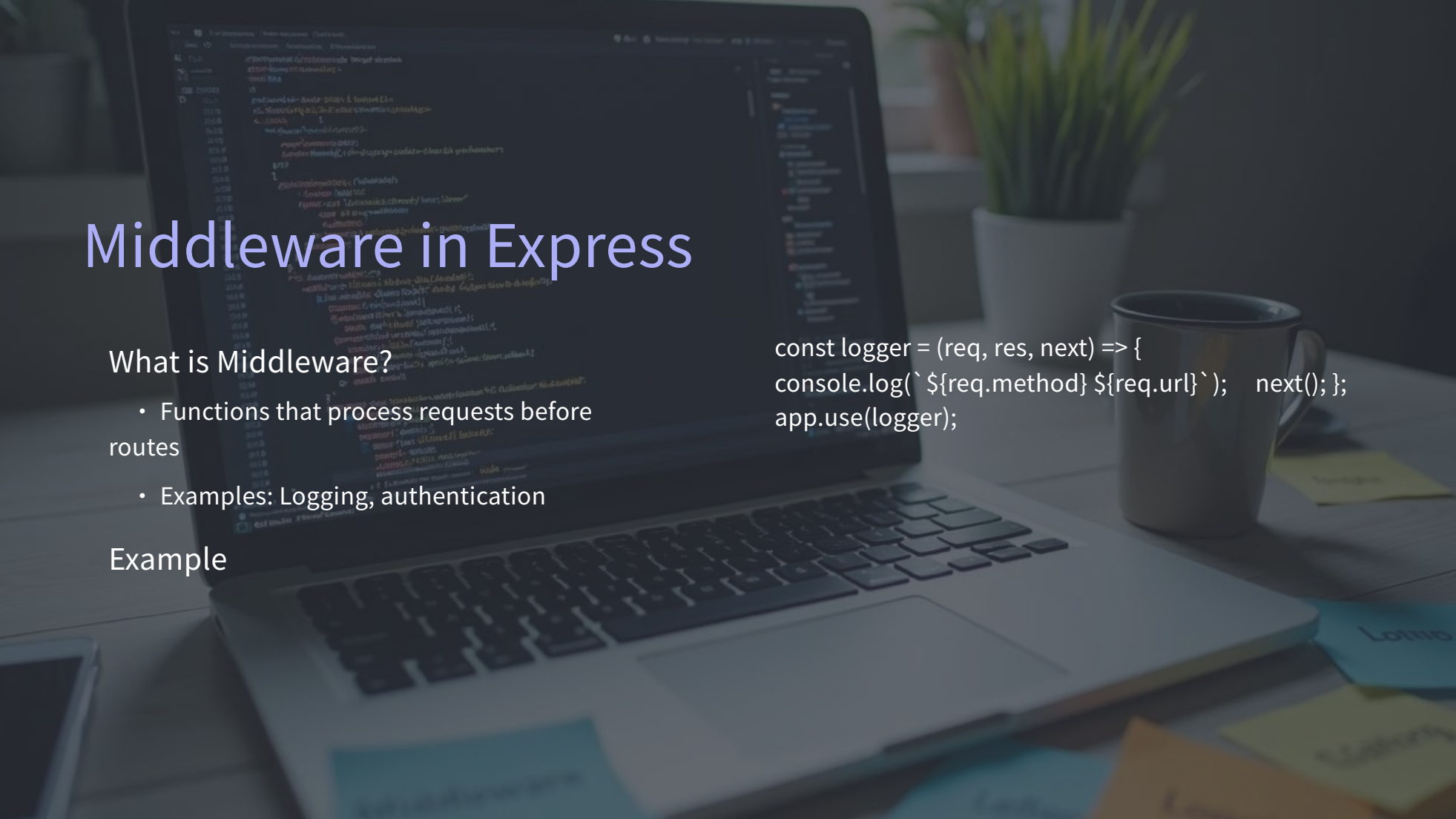
require('dotenv').config(); console.log(process.env.MONGODB_URI);

.gitignore

node_modules/ .env

09

Middleware in Express



Middleware in Express

What is Middleware?

- Functions that process requests before routes
- Examples: Logging, authentication

Example

```
const logger = (req, res, next) => {
console.log(`${req.method} ${req.url}`);    next(); };
app.use(logger);
```

10

Zod Validation

Zod Validation

1 2 3

Purpose

Validate incoming data

Setup

npm install zod

Example

```
const { z } = require('zod'); const userSchema = z.object({  name: z.string().min(3),  email: z.string().email() }); app.post('/users', (req, res) => {  try {  userSchema.parse(req.body);  res.status(201).send('Valid data');  } catch (error) {  res.status(400).send(error.errors);  } });
```

11

Bcrypt for Password Hashing

Bcrypt for Password Hashing

1

Purpose

Securely hash passwords

2

Setup

npm install bcrypt

3

Example

```
const bcrypt = require('bcrypt'); async function hashPassword(password) {     const salt = await bcrypt.genSalt(10);
return await bcrypt.hash(password, salt); } async function verifyPassword(password, hash) {     return await
bcrypt.compare(password, hash); }
```

12

Axios for API Requests

Axios for API Requests

1

Purpose

Make HTTP requests from Node.js or frontend

2

Setup

npm install axios

3

Example

```
const axios = require('axios'); async function fetchUsers() {  try {  const response = await axios.get('http://localhost:3000/users');  console.log(response.data);  } catch (error) {  console.error('Error:', error);  } }
```

13

CORS for Cross-Origin Requests

CORS for Cross-Origin Requests

Purpose

Allow frontend to access backend

Setup

npm install cors

Example

```
const cors = require('cors'); app.use(cors({    origin: 'http://localhost:3000' }));
```

14

Postman for API Testing

Postman for API Testing

What is Postman?

- Tool to test API endpoints (GET, POST, etc.)

Key Features

- Send requests and view responses
- Save collections for repeated testing

Example

- Create a POST request to http://localhost:3000/users
- Body: { "name": "John", "email": "john@example.com" }

15

Local Storage, Cookies, Headers

Local Storage, Cookies, Headers

1 Local Storage

- Browser storage for key-value pairs
- Example: localStorage.setItem('token', 'abc123');

2 Cookies

- Store data sent with requests
- Setup: npm install cookie-parser

```
const cookieParser = require('cookie-parser'); app.use(cookieParser()); app.get('/set-cookie', (req, res) => { res.cookie('session', '12345', { maxAge: 900000 });  res.send('Cookie set'); });
```

Headers

- Send metadata (e.g., Authorization)

```
app.get('/protected', (req, res) => {  const token = req.headers['authorization'];  res.send(`Token: ${token}`); });
```

16

Dev Tools / Inspect

Dev Tools / Inspect

Purpose

Debug backend and frontend

Key Features

- Network tab: Monitor API requests
- Console: View logs and errors

Example

- Open Chrome DevTools (F12) > Network > Test API call

17

Hands-On Project

Hands-On Project

Task

Build a simple User API

- Endpoints:
  - POST /users: Create user (validate with Zod, hash password with Bcrypt)
  - GET /users: List all users
- Use MongoDB/Mongoose for storage
- Test with Postman

Steps

- Set up Express server
- Create User model with Mongoose
- Add routes and middleware
- Test endpoints

Deliverable

Working API with 2 endpoints

18

Wrap-Up and Q&A

Wrap-Up and Q&A

Key Takeaways

- MERN stack for full JavaScript development
- Tools like npm, Postman, and DevTools streamline development
- Security with Bcrypt, CORS, and middleware

Next Steps

- Deploy backend to platforms like Render or Vercel

Q&A

Ask away!

Visuals

Use minimal text, large fonts, and code blocks with syntax highlighting. Include a diagram for folder structure (Slide 4) and a screenshot of Postman (Slide 14).

Thank You