

Building Microservices using Node.js

Duration: 5 days

Prerequisites:

- Proficiency in JavaScript
- Familiarity with web development concepts
- Basic understanding of RESTful APIs

Module 1: NodeJS Essentials and Runtime Fundamentals

- Introduction to NodeJS
- Understanding the NodeJS runtime and event loop
- Using the REPL and running JS scripts with Node
- Understanding Modules: CommonJS and ES Modules
- Intro to package.json and npm
- Basic HTTP server with built-in modules
- Writing and executing asynchronous code (callback, promise, async/await)
- File system, path, and OS modules
- Debugging Node applications
- Hands-on: Build a simple server that serves JSON

Module 2: ExpressJS Fundamentals

- Introduction to ExpressJS
- Creating RESTful APIs
- Request/response lifecycle
- Middleware and route handling
- Error handling strategies

Module 3: Introduction to Microservices Architecture

- Monolith vs Microservices
- Benefits and challenges
- 12-Factor App methodology
- Service decomposition strategies
- Bounded contexts and DDD overview

Module 4: Building Microservices with Express

- Creating modular, independent services
- Connecting each service with MongoDB or PostgreSQL
- Environment management and .env files
- Input validation (e.g. using Joi or Zod)
- Structuring service folders (controller/service/repo)

Module 5: API Documentation & Testing

- OpenAPI/Swagger basics
- API documentation tools (e.g., Swagger UI, Redoc)
- Unit testing with Mocha/Chai or Jest

- Integration testing with Supertest
- Mocking and test doubles

Module 6: Inter-Service Communication

- REST-based service calls
- Using Axios or Fetch within Node
- Service discovery concepts (e.g., custom registry or Consul basics)
- Asynchronous communication: Introduction to RabbitMQ / Kafka
- Event-driven design principles

Module 7: Securing Microservices

- Introduction to API security
- Role-based access control (RBAC)
- Authentication with JWT
- OAuth2 overview
- CORS and HTTPS setup

Module 8: Observability – Logging, Monitoring, Tracing

- Structured logging with Winston/Bunyan
- Error tracking & correlation IDs
- Distributed tracing with OpenTelemetry
- Monitoring with Prometheus and Grafana (Node exporters)
- Log aggregation overview (e.g., ELK stack)

Module 9: API Gateway & Rate Limiting

- Role of API Gateway
- Using Express Gateway or NGINX
- Path-based routing, load balancing
- Rate limiting and throttling with middleware (e.g., express-rate-limit)
- Circuit breakers with opossum or integration with Resilience libraries

Module 10: Containerization & Deployment

- Dockerizing NodeJS microservices
- Docker Compose for multi-service orchestration
- CI/CD pipelines (GitHub Actions / Jenkins)
- Kubernetes basics and deploying containers
- Deployment strategies: Blue/Green, Canary