

TECHNOLOGY STACK DOCUMENTATION

Project Name: PetClinic Management System

Type: Full Stack Web Application

Architecture: RESTful API with Client-Server Model

Main Purpose: Learn & implement Spring Boot with real-world full-stack experience

BACKEND TECHNOLOGY STACK

1. Programming Language

Java 17+

- Object-oriented language for writing business logic and REST APIs.
- Strong type system, robust ecosystem.

2. Framework

Spring Boot

- Simplifies Java backend development by auto-configuring essential components.
- Starter modules for web, data, validation, and security.
- Embedded Tomcat server (no external deployment needed).

3. ORM (Object-Relational Mapping)

Spring Data JPA + Hibernate

- Simplifies data access with repository pattern.
- Hibernate handles the mapping between Java objects and MySQL tables.
- Supports complex relationships (OneToMany, ManyToOne, etc.).

4. Database

MySQL 8+

- Relational database used for storing all persistent data (users, pets, appointments).
- ACID-compliant, widely supported, and easy to integrate with Spring Boot.
- Use MySQL Workbench or DBeaver for visual DB management.

5. REST API

Spring Web (spring-boot-starter-web)

- Build and expose HTTP endpoints for CRUD operations.
- JSON request/response format.
- Controllers map frontend requests to backend services.

6. Security

Spring Security + JWT (JSON Web Token)

- Handles authentication (login) and authorization (role-based access).
- Stateless API secured using JWT tokens passed in headers.
- Roles: ADMIN, VET, OWNER

7. Validation

Hibernate Validator (JSR 380)

- Input validation for request DTOs using annotations like @NotBlank, @Email, @Min, etc.

8. Build Tool

Maven (or Gradle)

- Dependency management and project build lifecycle.
- Handles plugins, packaging, and test execution.

9. Testing

JUnit 5 + Mockito

- Unit testing and mocking dependencies for services and controllers.

- Ensures application reliability and test coverage.

FRONTEND TECHNOLOGY STACK

1. Programming Language

JavaScript (ES6+) with JSX

- Primary language for building dynamic web interfaces with React.

2. Framework

React.js

- Component-based frontend library for building SPA (Single Page Application).
- Efficient DOM rendering and strong ecosystem.

3. Routing

React Router DOM

- Manages navigation and routing between frontend pages/components.
- Enables protected/private routes based on user role.

4. UI Library

TailwindCSS

- Utility-first CSS framework for rapid styling and responsiveness.
- Enables clean and modern UI with minimal custom CSS.

ShadCN

- Headless UI components built on top of Radix and TailwindCSS.
- Professional-looking forms, modals, tables, etc.

5. HTTP Client

Axios (or Fetch API)

- Handles HTTP requests to backend APIs.
- JWT token added to Authorization header for secure endpoints.

6. Form Handling

React Hook Form

- Handles form inputs and validation efficiently.
- Integrates with schema validators like Zod or Yup (optional).

7. State Management

React Context API (*optional: Redux Toolkit*)

- Shares authentication and user state across components.
- For larger apps, Redux Toolkit can be introduced.

DEVOPS & DEPLOYMENT (Optional)

1. Version Control

Git + GitHub

- Track source code, manage branches, and collaborate.

2. Deployment

Backend Deployment

- Railway / Render / AWS EC2
- Expose backend on a public domain
- Use environment variables for DB, JWT secret, etc.

Frontend Deployment

- Vercel / Netlify
- Connect with GitHub for CI/CD pipeline
- Configure proxy for API requests

3. Database Hosting

- PlanetScale (MySQL-compatible, cloud native)
- Railway (with free MySQL tier)
- AWS RDS (Production-ready)

TOOLS & UTILITIES

- **IDE:** IntelliJ IDEA / VS Code
- **API Testing:** Postman / Thunder Client
- **DB Management:** MySQL Workbench / DBeaver
- **Diagramming:** dbdiagram.io / Lucidchart for ERD & UML
- **Browser Tools:** React DevTools, Redux DevTools
- **Linting/Formatting:** ESLint, Prettier for frontend

Layer	Technology
Frontend	React.js, TailwindCSS, ShadCN, Axios, React Hook Form
Backend	Java, Spring Boot, Spring Data JPA, Spring Security, Hibernate
Database	MySQL
Security	JWT + Spring Security
Build Tools	Maven, Vite (React)
Testing	JUnit, Mockito
Deployment	Railway, Vercel, PlanetScale