

TECHNICAL ARCHITECTURE & DESIGN SPECIFICATION

Employee Management System (EMS)

CONFIDENTIAL DOCUMENT

Technical Architecture & System Documentation

Employee Management System (EMS)

?? 1. Infrastructure & Tech Stack Rationale

1.1 Core Architecture

The system follows a **Decoupled Client-Server Architecture**, ensuring that the Frontend and Backend can scale independently and communicate via a secure RESTful API.

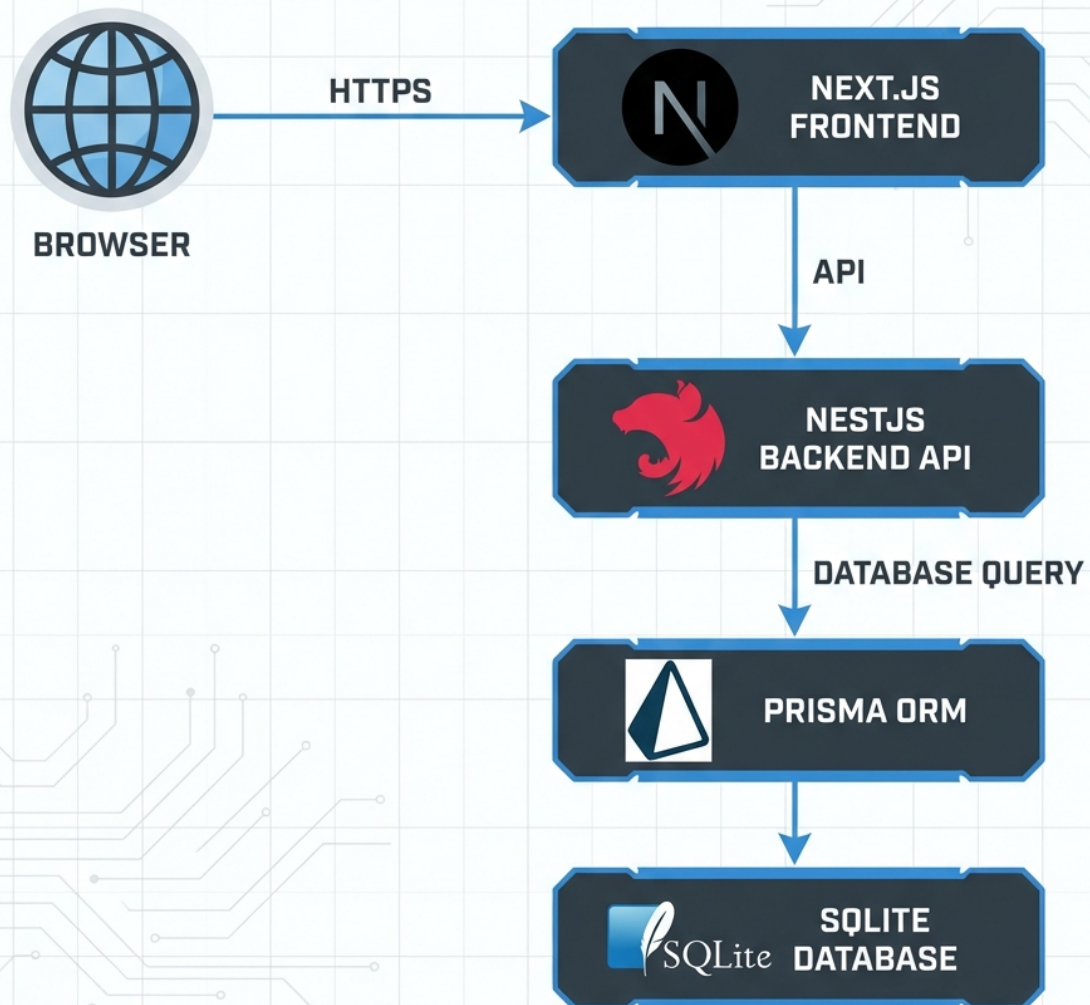
1.2 The Stack

Component	Technology	Rationale
Backend	NestJS	Provides a robust, disciplined architecture with built-in support for Dependency Injection and modularity.
Frontend	Next.js 15	App Router and React Server Components bring superior performance and SEO capabilities.
Build Tool	Turbopack	Hand-picked for the frontend to provide the fastest possible HMR and build speeds in a modern React environment.
ORM	Prisma	Offers unparalleled type safety and auto-generated clients, reducing runtime errors and boilerplate.
Database	SQLite	Chosen for local development to ensure zero-config setups and 100% portability via a single file (<code>dev.db</code>).

? 2. System Flow & Diagrams

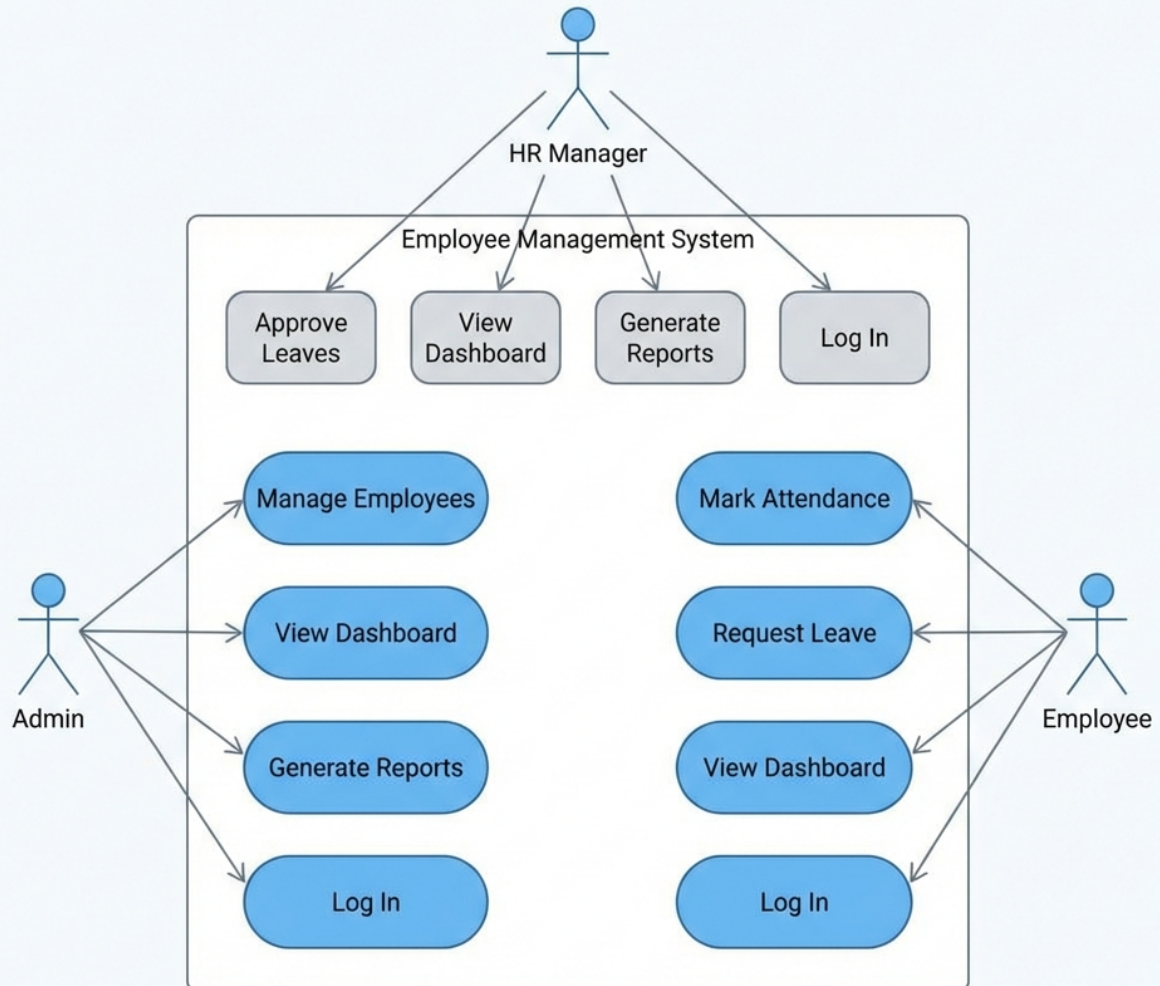
2.1 High-Level System Architecture

WEB APPLICATION ARCHITECTURE

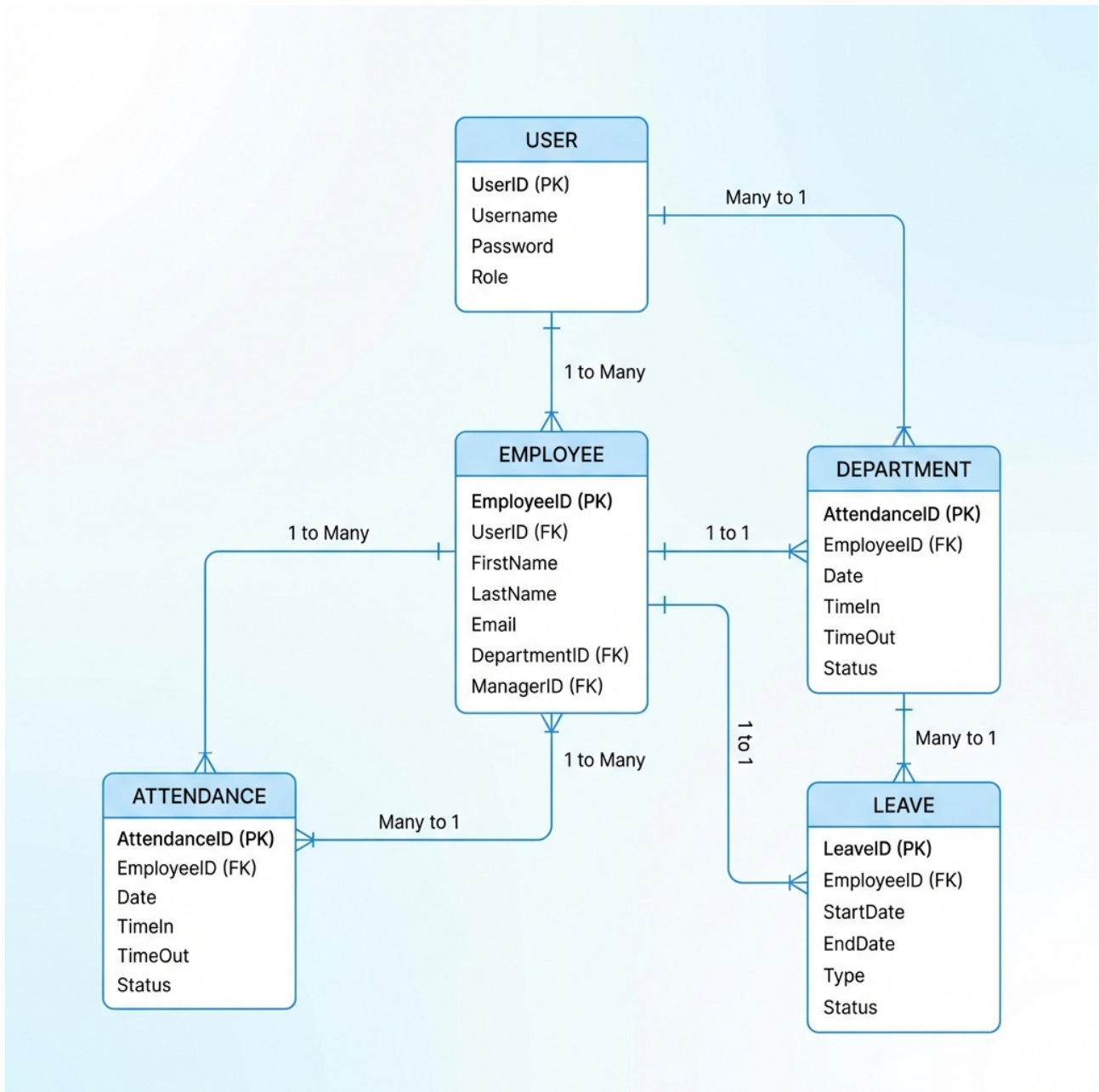


2.2 Functional Use Case Diagram

Employee Management System - Use Case Diagram

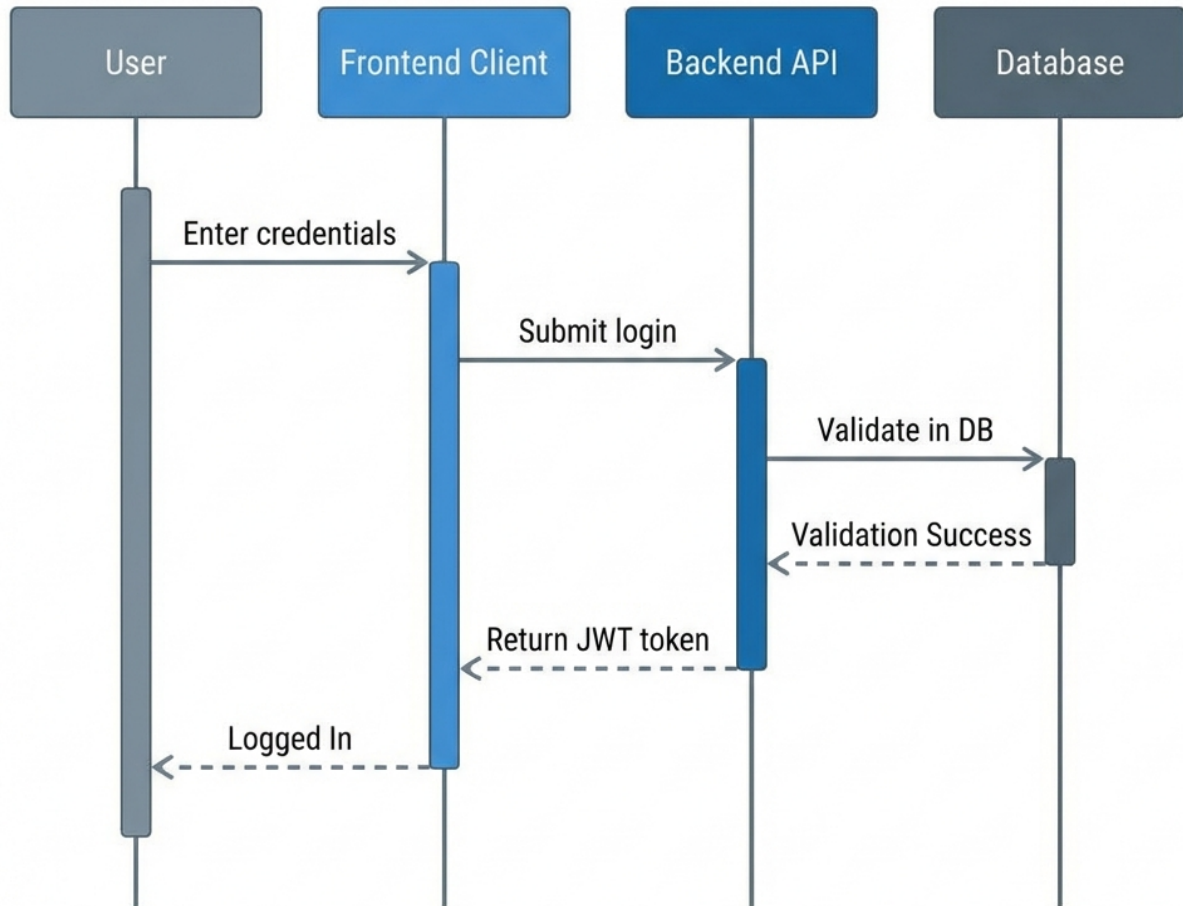


2.3 Database Entity Relationship (ER) Diagram



2.4 Authentication Flow (Sequence Diagram)

SEQUENCE DIAGRAM: AUTHENTICATION FLOW



?? 3. Core Logic Implementation

3.1 Role-Based Access Control (RBAC)

The system utilizes a custom `@Roles()` decorator and a `RolesGuard`. This ensures that sensitive operations (like deleting an employee or approving a leave) are strictly limited to authorized roles.

****Access Matrix:****

- ****ADMIN****: Global system access, user management, and configuration.

- **HR**: Operational management including record tracking, attendance monitoring, and leave approvals.
- **EMPLOYEE**: Personal dashboard access, attendance logging, and leave request submission.

3.2 Attendance Monitoring System

The attendance module implements a strict daily integrity constraint.

- **Automated Logging**: Captures specific check-in and check-out timestamps.
- **Status Classification**: Automatically assigns statuses based on time thresholds:
- **PRESENT**: On-time check-in.
- **LATE**: Check-in after the grace period.
- **ABSENT**: No check-in recorded for the operational window.

3.3 Leave Management Lifecycle

The leave system follows a state-machine workflow:

1. **Submission**: Employee submits request with type (SICK, ANNUAL, etc.) and reason.
 2. **Review**: HR/Admin reviews the request in a centralized queue.
 3. **Decision**: Request is either Approved or Rejected with relevant notes.
 4. **Audit**: All actions are timestamped and signed by the reviewer for administrative accountability.
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? 4. Performance & Scalability

4.1 Native Turbopack Optimization

By utilizing Next.js 15 with Turbopack, the frontend benefits from an incremental compilation engine. This results in **700x faster execution** of changes during development compared to traditional Webpack setups.

4.2 Portable Database Strategy (SQLite to Enterprise)

The use of Prisma as an abstraction layer enables a "Zero-Friction" migration path. While we currently use SQLite for its zero-config benefits and portability, transitioning to a production-grade PostgreSQL or MySQL cluster requires only a single environment variable update.

? 5. Conclusion

This Employee Management System represents a fusion of modern performance tools (Turbopack, Next.js 15) and structured backend practices (NestJS, Prisma). It provides a secure, fast, and scalable

foundation for corporate HR operations.