# CS 255 System Design Document Template

## UML Diagrams

### UML Use Case DiagramA diagram of people with blue circles Description automatically generated

### UML Activity Diagrams

A close-up of a chart

Description automatically generatedA diagram of a flowchart

Description automatically generated

### UML Sequence Diagram

A diagram of a process

Description automatically generated

### UML Class Diagram

A diagram of a software application

Description automatically generated

## Technical Requirements

***Hardware Requirements***

* ***Servers:***
  + ***Application Server:***
    - *A high-performance server with at least 32 GB of RAM, 8-core CPU, and SSD storage is required to host the application. This server should be capable of handling multiple concurrent users, real-time data processing, and secure transactions.*
    - ***Operating System:*** *A Unix-based system like Ubuntu Server or CentOS, known for stability and security.*
  + ***Database Server:***
    - *A separate server with similar or slightly higher specifications than the application server to manage the database. This server should ensure data integrity, support high availability, and provide fast query processing.*
    - ***Storage:*** *RAID-configured SSDs with backup solutions to handle large volumes of data securely and efficiently.*
* ***Client Devices:***
  + ***Desktop/Laptop Computers:***
    - *For administrators, developers, and support staff, modern computers with at least 8 GB of RAM and multi-core processors to efficiently run development environments and administrative tools.*
  + ***Mobile Devices:***
    - *Students and drivers will need smartphones or tablets with internet access to interact with the DriverPass system. The devices should be capable of running web browsers and potentially mobile applications if developed.*

***2. Software Requirements***

* ***Operating Systems:***
  + ***Server:*** *Ubuntu Server or CentOS.*
  + ***Client:*** *Windows 10/11, macOS, or Linux distributions like Ubuntu for desktop environments.*
  + ***Mobile:*** *iOS 14+ or Android 10+ for smartphones and tablets.*
* ***Database Management System (DBMS):***
  + ***MySQL or PostgreSQL:*** *A relational database system to manage user data, reservations, payments, and other critical information. It should support ACID (Atomicity, Consistency, Isolation, Durability) properties for reliable transactions.*
* ***Web Server:***
  + ***Apache or Nginx:*** *To serve the web-based application to users, with support for HTTPS for secure communications.*
* ***Programming Languages:***
  + ***Backend Development:***
    - ***Java or Python:*** *For developing the core application logic. Java is known for its scalability, while Python offers quick development cycles and extensive libraries.*
  + ***Frontend Development:***
    - ***HTML5, CSS3, JavaScript:*** *For creating the user interface. JavaScript frameworks like React or Angular can be used for building dynamic and responsive user interfaces.*
  + ***Mobile Application Development (if applicable):***
    - ***Swift for iOS*** *and* ***Kotlin for Android:*** *For building native mobile applications, or* ***React Native*** *for a cross-platform solution.*
* ***Development Frameworks:***
  + ***Spring Boot (Java) or Django (Python):*** *For rapid development and deployment of web applications, providing built-in security and scalability.*
* ***Integrated Development Environment (IDE):***
  + ***IntelliJ IDEA or PyCharm:*** *For Java and Python development, respectively. These IDEs offer powerful tools for coding, debugging, and testing.*
  + ***Visual Studio Code:*** *As a lightweight, versatile editor for frontend development.*
* ***Version Control:***
  + ***Git:*** *For source code management, with repositories hosted on platforms like GitHub or GitLab.*
* ***Security:***
  + ***SSL/TLS Certificates:*** *To secure communications between the client and server.*
  + ***Firewall and Intrusion Detection Systems (IDS):*** *To protect the network and server infrastructure.*
  + ***Encryption:*** *For sensitive data like passwords, using industry-standard encryption algorithms like AES-256.*
* ***Monitoring and Logging:***
  + ***Prometheus and Grafana:*** *For monitoring server performance and application health.*
  + ***ELK Stack (Elasticsearch, Logstash, Kibana):*** *For centralized logging, analysis, and visualization of system logs.*

***3. Infrastructure Requirements***

* ***Network Infrastructure:***
  + ***High-Speed Internet Connectivity:*** *Essential for both the server and client sides to ensure smooth operation and low latency.*
  + ***Load Balancers:*** *To distribute incoming traffic across multiple servers, ensuring high availability and reliability.*
  + ***Content Delivery Network (CDN):*** *To improve the delivery speed of static assets like images, scripts, and stylesheets.*
* ***Cloud Infrastructure (Optional):***
  + ***Amazon Web Services (AWS), Microsoft Azure, or Google Cloud Platform (GCP):***
    - *These platforms can be used to host the DriverPass system, offering scalability, security, and managed services for databases, monitoring, and more.*
  + ***Containerization:***
    - ***Docker and Kubernetes:*** *For deploying the application in a scalable, efficient, and portable manner. Kubernetes would manage containerized applications across multiple hosts.*
* ***Backup and Disaster Recovery:***
  + ***Automated Backup Solutions:*** *Regular backups of databases and critical system files to an offsite location.*
  + ***Disaster Recovery Plan:*** *To ensure quick recovery and minimal downtime in case of hardware failure or data loss.*

***4. Tools Requirements***

* ***Diagramming Tools:***
  + ***Lucidchart:*** *For creating and maintaining UML diagrams and other system documentation.*
* ***Collaboration Tools:***
  + ***Jira or Trello:*** *For project management, issue tracking, and collaboration among team members.*
  + ***Slack or Microsoft Teams:*** *For communication within the development and support teams.*
* ***Testing Tools:***
  + ***JUnit or PyTest:*** *For unit testing of backend code.*
  + ***Selenium:*** *For automated testing of the web interface.*
  + ***Postman:*** *For API testing and validation.*
* ***Continuous Integration/Continuous Deployment (CI/CD):***
  + ***Jenkins or GitLab CI/CD:*** *For automating the build, test, and deployment processes.*