CS 255 Assignment Module Seven– Project Two

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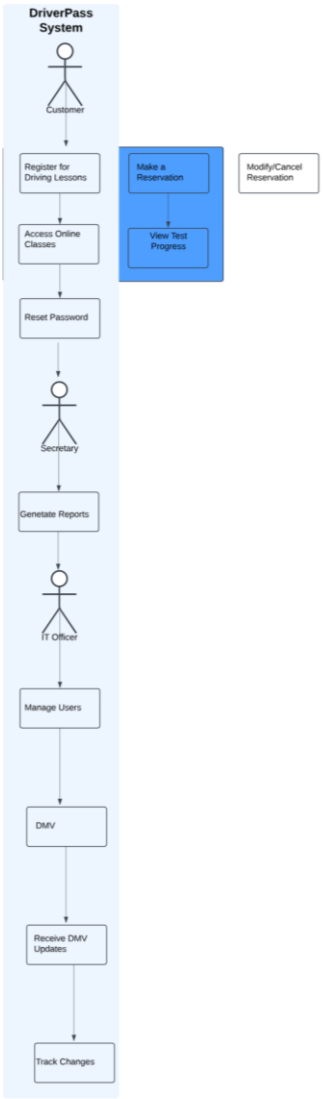
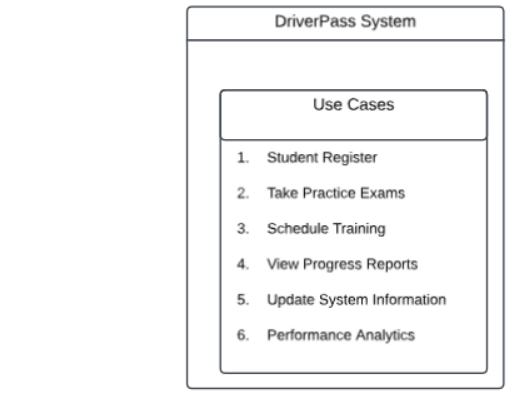
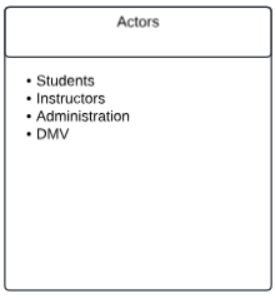
CS 255 System Design Document

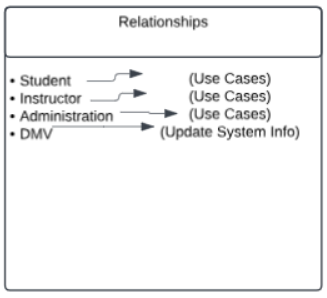
UML Diagrams

UML Use Case Diagram (Respective to UML Activity Diagrams)

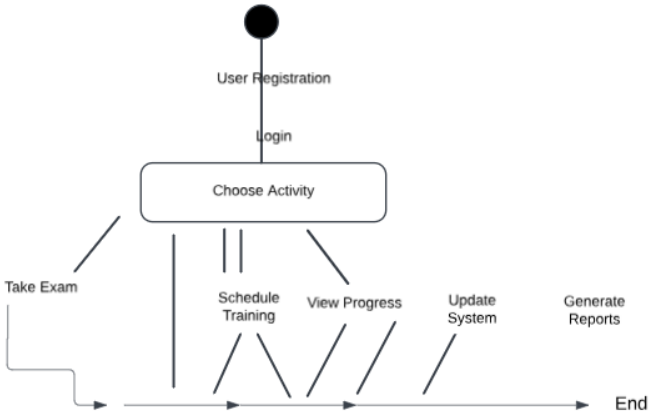


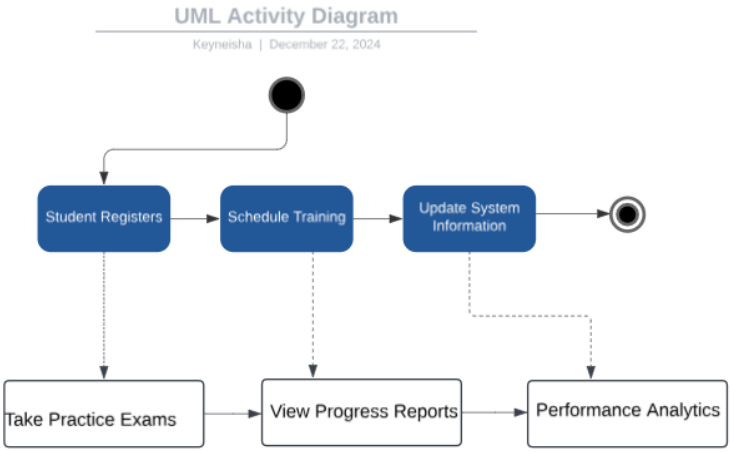




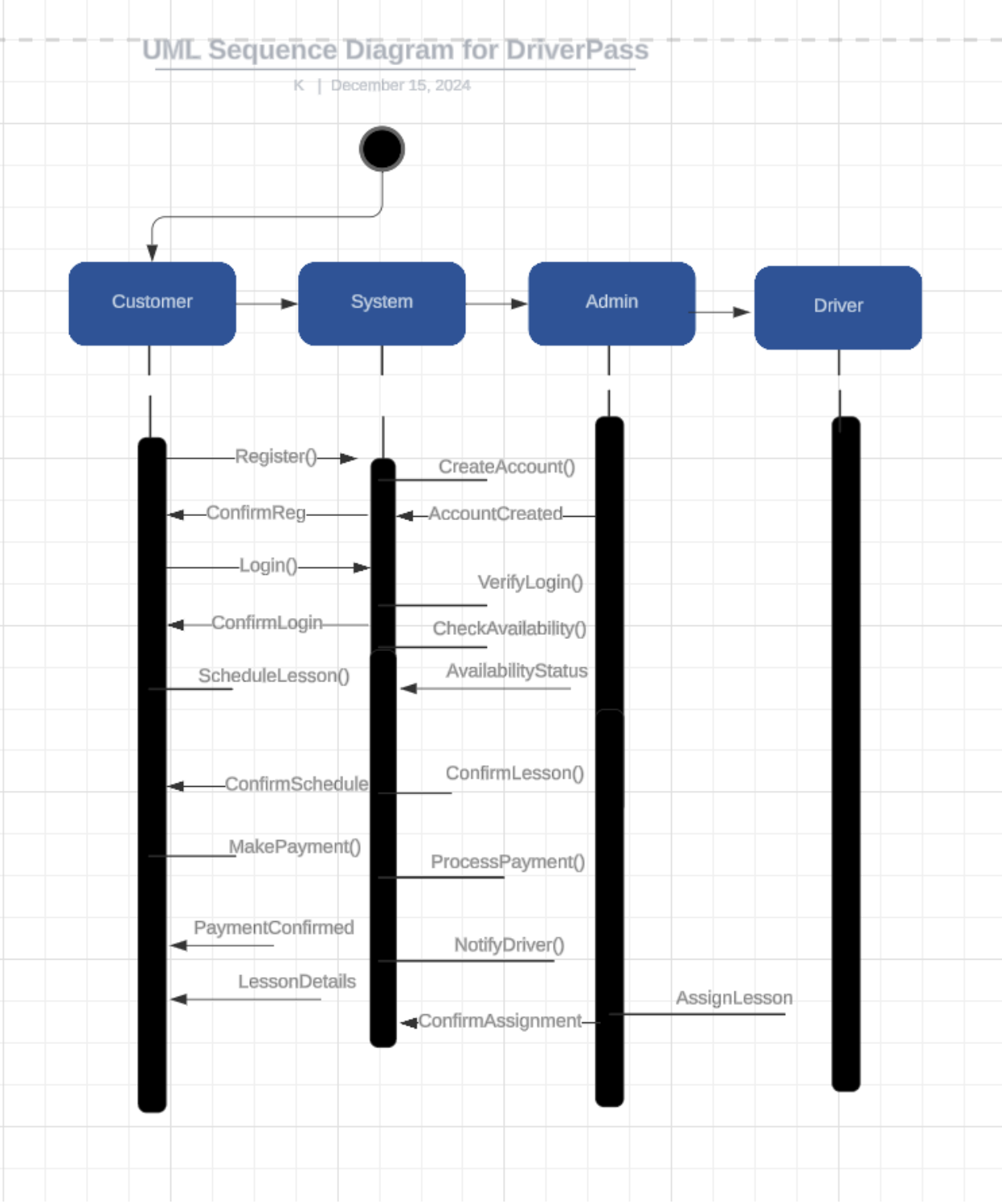


UML Activity Diagrams

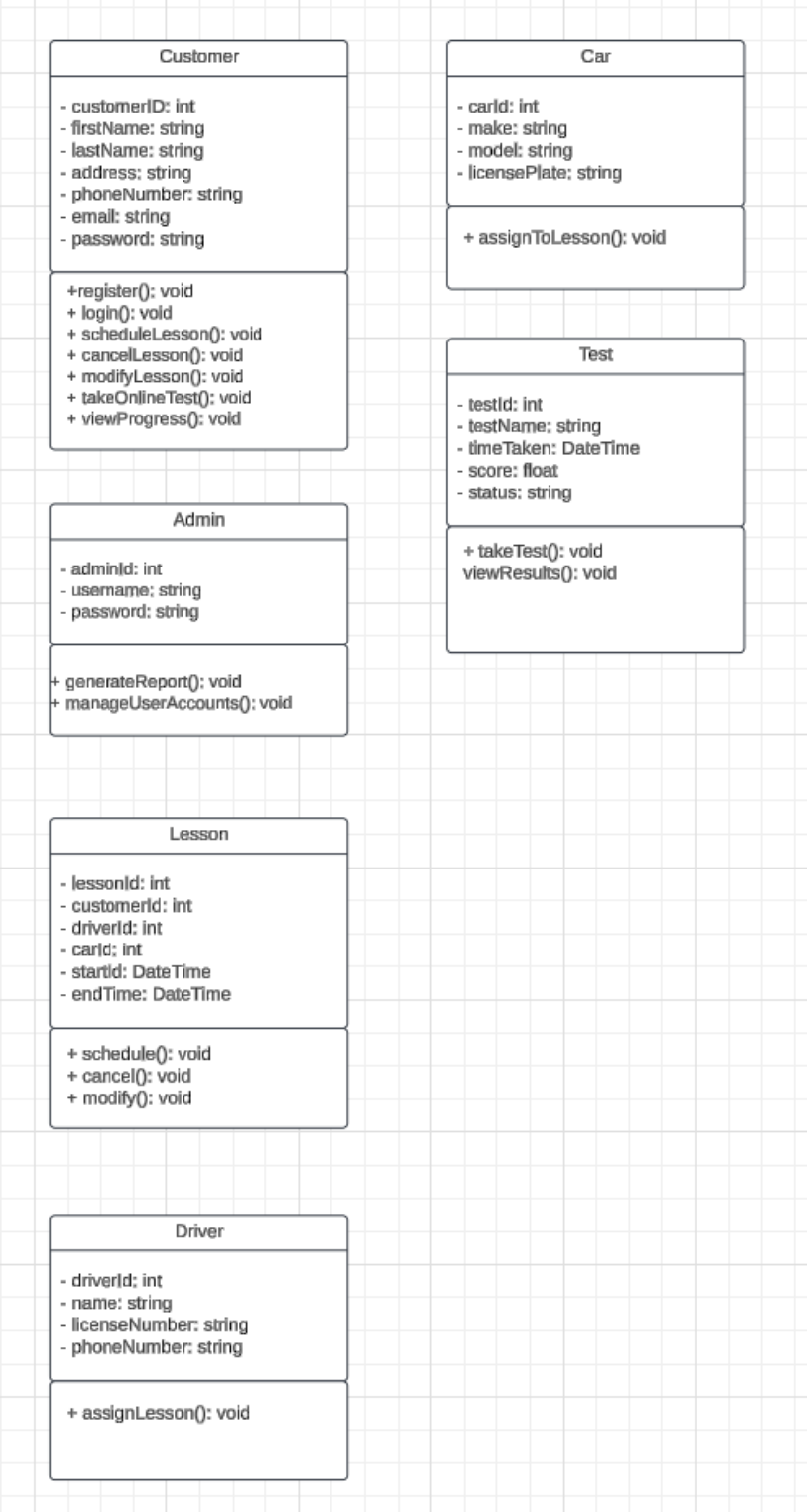




UML Sequence Diagram



UML Class Diagram



Technical Requirements

Hardware Requirements

Servers:

- High-performance web servers are essential for hosting the application and managing multiple concurrent users.
- Database servers must have sufficient storage capacity to manage user data, lesson schedules, test results, and other critical information.
- Backup servers are required for regular data backup and disaster recovery, ensuring data integrity and availability.

Network Infrastructure:

- High-speed internet connectivity is necessary to support real-time data exchange and communication between customers, drivers, and the system.
- Firewalls and network security devices are crucial for protecting the system from unauthorized access and cyber threats.

Client Devices:

- Computers, tablets, and smartphones used by customers, administrators, and drivers are essential for accessing the system.
- Peripheral devices such as printers are needed for generating physical reports and documents.

Software Requirements

Operating Systems:

- Compatibility with major operating systems such as Windows, macOS, and Linux is essential for server-side operations.
- Client-side compatibility with Windows, macOS, iOS, and Android ensures broad accessibility.

Web Server Software:

- Apache HTTP Server or Nginx should be used to serve the web application.
- Load balancers are necessary to distribute incoming traffic and ensure high availability and reliability.

Database Management System (DBMS):

- MySQL, PostgreSQL, or Oracle Database are suitable choices for managing and querying relational data.
- Database replication and clustering are required for scalability and fault tolerance.

Application Frameworks:

- A robust web application framework such as Django (Python), Spring Boot (Java), or ASP.NET Core (C#) is necessary for developing and maintaining the system.
- Front-end frameworks like React, Angular, or Vue.js are essential for building interactive and responsive user interfaces.

Security Software:

- SSL/TLS certificates are required for secure communication between clients and servers.
- Authentication and authorization libraries are needed to manage user roles and permissions.
- Regular security audits and vulnerability assessments are essential for identifying and mitigating risks.

Tools and Utilities

Development Tools:

- Integrated Development Environments (IDEs) like Visual Studio Code, PyCharm, or IntelliJ IDEA are necessary for efficient coding and debugging.
- Version control systems such as Git, and platforms like GitHub or GitLab, are essential for collaborative development and version management.

Monitoring and Logging:

- Monitoring tools like Prometheus and Grafana are required to track system performance and resource usage.
- Logging tools such as ELK Stack (Elasticsearch, Logstash, Kibana) are necessary for real-time log analysis and troubleshooting.

Continuous Integration and Deployment (CI/CD):

- Jenkins, CircleCI, or GitHub Actions are essential for automating the build, testing, and deployment processes.
- Containerization tools like Docker, and orchestration platforms like Kubernetes, are necessary for deploying and managing applications in a scalable and portable manner.

Infrastructure

Cloud Services:

- Cloud platforms like Amazon Web Services (AWS), Microsoft Azure, or Google Cloud Platform (GCP) are necessary to host and manage the application's infrastructure.
- Services such as Elastic Compute Cloud (EC2), Azure Virtual Machines, or Google Compute Engine provide scalable computing resources.
- Managed database services like Amazon RDS, Azure SQL Database, or Cloud SQL are essential for database management.

Storage Solutions:

- Cloud storage services like Amazon S3, Azure Blob Storage, or Google Cloud Storage are necessary for storing files, backups, and static assets.
- Persistent storage for database servers ensures data durability and high availability.

Backup and Recovery:

- Automated backup solutions are required for regular data backups and recovery.
- Disaster recovery plans and tools are essential to ensure business continuity in case of system failures or data loss.

Functional and Non-functional Requirements

Functional Requirements:

Training Materials: The system must provide access to online classes and practice tests to facilitate comprehensive driver education.

Reservation System: The system should enable customers to make, cancel, and modify reservations for driving lessons, ensuring flexibility and convenience.

Tracking and Reporting: The system must track user activities and generate comprehensive reports to monitor progress and performance.

Lesson Scheduling: The system should allow scheduling of driving lessons, including the selection of packages and matching with specific drivers and cars, to optimize resource management.

Password Management: The system should implement an automated password reset functionality to enhance user convenience and security.

Nonfunctional Requirements:

Performance Requirements: The system should operate efficiently in a web-based environment, offering fast data retrieval and updates, thereby ensuring a seamless user experience.

Platform Constraints: The system must be compatible with major operating systems such as Windows and Unix, and deployable on a cloud platform to ensure scalability and minimal maintenance overhead.

Accuracy and Precision: The system must ensure accurate data entry and retrieval, distinguishing between different users by unique identifiers, thereby maintaining data integrity.

Adaptability: The system should allow modifications such as adding, removing, or updating user information without requiring code changes, ensuring flexibility to accommodate future needs.

Security: The system must include strong user authentication mechanisms, secure data exchange protocols, and account lockout features after multiple failed login attempts to safeguard sensitive information.

Infrastructure:

These requirements encompass both functional and nonfunctional aspects, providing a robust framework for the system.

Cloud Services: Cloud platforms are essential for hosting and managing the system's infrastructure, ensuring scalability and reliability.

Storage Solutions: Cloud storage services are necessary for backups and data management, ensuring data durability and availability.

Backup and Recovery: Automated backup solutions and disaster recovery plans are crucial for ensuring business continuity in case of system failures or data loss.

Tools and Utilities:

These requirements support the development and operational aspects of the system.

Development Tools: Integrated Development Environments (IDEs) and version control systems are essential for efficient coding, debugging, and collaborative development.

Monitoring and Logging: Tools for performance monitoring and log analysis are necessary for tracking system performance and troubleshooting issues.

CI/CD: Continuous integration and deployment tools are essential for automating the build, testing, and deployment processes, ensuring a streamlined development workflow.

This detailed overview of the functional and nonfunctional requirements, along with infrastructure and tools, provides a comprehensive foundation for the DriverPass system, ensuring its efficiency, reliability, and scalability.