# Digital Egypt Pioneers Initiative (DEPI)

# Graduation Project

# Documentation

**Project Name:** League Management System

**Track:** Software Development

**Job Profile:** Full Stack .NET Web Developer

**Company Name:** ACICT / AST

**Group Number:** CAI2_SWD5_S7

**Team Number:** 1

| Team Members |
| --- |
| سيف جمال عبد المنعم |
| محمد ابراهيم علي |
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| حسن سعيد حسن |

# Contents

# 1. Project Planning & Management

## 1.1 Project Proposal

### Overview

The League Management System (LMS) is a web-based platform designed to streamline the creation and management of leagues and tournaments across various game types, including Football, e-sports and ...etc. The system enables users to create leagues, register teams and players, schedule matches, track results, and manage leaderboards efficiently.

### Objectives

- Develop an intuitive and user-friendly platform for managing leagues and tournaments.
- Implement a robust backend using .NET Core MVC to handle data efficiently.
- Ensure scalability to accommodate various types of sports and gaming competitions.
- Provide role-based access control (Admin, Organizer, Player, Viewer).
- Automate match scheduling and leaderboard updates.

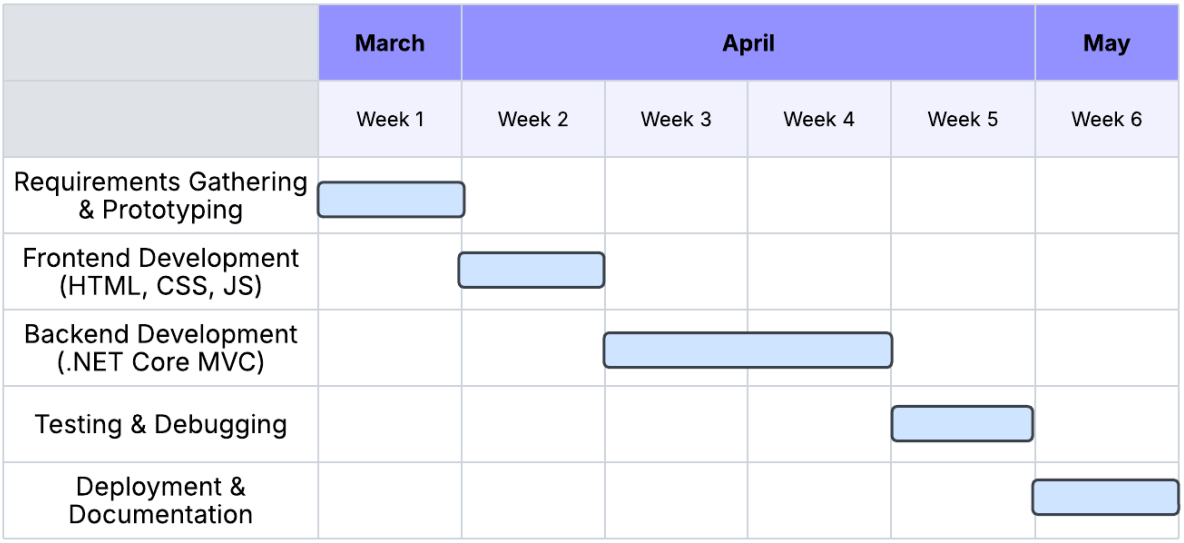
### Scope

- **Included Features:**
    - League creation and configuration
    - Team and player registration
    - Match scheduling and results tracking
    - Leaderboard and statistics display
    - User authentication and role management
- **Excluded Features (Future Enhancements):**
    - Live match tracking

- Mobile app integration
- AI-based match predictions

## 1.2 Project Plan

### Timeline (Gantt Chart)




### Milestones & Deliverables

- **Week 1:** Completed wireframes and UI mockups.
- **Week 2:** Functional static prototype.
- **Week 4:** Backend integration with database setup.
- **Week 5:** Functional testing and bug fixes.
- **Week 6:** Deployment and final project documentation.

### 1.3 Task Assignment & Roles

| Team Member | Role | Responsibilities |
|---|---|---|
| Mohamed Ibrahim | Backend Developer | Backend architecture, API development |
| Hasan Saeed | Frontend Developer | UI/UX design, JavaScript interactivity |
| Ali Mahmoud | Database Administrator | Database design, SQL optimization |
| Nour El Dein Ahmed | QA Tester | Testing, bug tracking, documentation |
| Seif Gamal | Project Manager | Task allocation, milestone tracking, risk management |

### 1.4 Risk Assessment & Mitigation Plan

| Risk | Impact | Mitigation Strategy |
|---|---|---|
| Scope Creep | High | Define strict requirements upfront |
| Team Availability Issues | Medium | Have a backup plan for tasks |
| Technical Challenges | High | Research & allocate extra debugging time |
| Security Vulnerabilities | High | Implement authentication & validation |
| Performance Bottlenecks | Medium | Optimize queries & caching |

### 1.5 Key Performance Indicators (KPIs)

| KPI | Description |
|---|---|
| System Uptime | Maintain 99.9% uptime |
| Response Time | Ensure response times < 1 sec |
| User Adoption Rate | Target 50+ users in first 3 months |
| Bug Resolution Time | Fix critical bugs within 24 hours |
| Feature Completion | Deliver all planned features on time |

# 2. Literature Review

## 2.1 Feedback & Evaluation

### Lecturer's Assessment

| Evaluation Criteria | Feedback |
|---|---|
| **Project Concept** | The idea of a League Management System is well-structured and applicable to multiple sports and e-sports. It effectively addresses the need for efficient tournament organization. |
| **Technical Implementation** | The project demonstrates a strong understanding of full-stack development, leveraging .NET Core MVC for backend and JavaScript for frontend interactivity. |
| **User Experience (UX)** | The UI design is intuitive and user-friendly, but improvements could be made to enhance mobile responsiveness and accessibility. |
| **Scalability & Performance** | The system has a solid foundation for handling multiple concurrent users, though further optimization in database queries and API response times is recommended. |
| **Security Considerations** | Role-based access control is well-implemented, but additional measures like two-factor authentication could enhance security. |

## 2.2 Suggested Improvements

### Enhancements & Future Scope

1. **Mobile App Integration** – Developing a mobile version of the platform for a better user experience.
2. **AI-Based Scheduling** – Implementing an AI-driven scheduling system to optimize match fixtures.

3. **Live Match Tracking** – Enabling real-time match updates with live scoreboards.
4. **Expanded Game Types** – Supporting more sports and gaming tournaments beyond the initial scope.
5. **Community Features** – Adding forums or chat functionalities for player engagement.
6. **Performance Optimization** – Enhancing database indexing and caching strategies for faster load times.

## 2.3 Final Grading Criteria

| Assessment Category | Weight (%) | Evaluation Factors |
|---|---|---|
| **Documentation** | 20% | Completeness, clarity, and professionalism of planning and technical documents. |
| **Implementation** | 40% | Functional correctness, adherence to best coding practices, and successful integration of frontend and backend components. |
| **Testing & Debugging** | 20% | Test case coverage, bug resolution efficiency, and overall system stability. |
| **Presentation & Demonstration** | 20% | Clarity in explaining the project, engaging presentation, and ability to answer questions confidently. |

# 3. Requirements Gathering

## 3.1 Stakeholder Analysis

### Key Stakeholders & Their Needs

| Stakeholder | Role | Needs |
|---|---|---|
| League Organizer | Creates and manages leagues | Easy-to-use tournament setup, match scheduling, leaderboard updates |
| Players | Participates in leagues | Registration, match details, and standings visibility |
| Spectators | Views league updates | Real-time results, leaderboards, and match schedules |
| Admin | Manages platform operations | User management, security enforcement, system monitoring |

## 3.2 User Stories & Use Cases

### User Stories

1. **As a league organizer**, I want to create a tournament by selecting the game type and format so that I can manage competitions efficiently.
2. **As a player**, I want to register for a league so that I can participate in matches.
3. **As an admin**, I want to manage user access levels so that the system remains secure.
4. **As a spectator**, I want to browse upcoming matches and leaderboards so that I can follow my favorite teams.

## Use Cases

### Use Case 1: Create a League

**Actor:** League Organizer
**Preconditions:** User is logged in as an organizer
**Steps:**

1. Navigate to “Create League” page.
2. Enter league details (name, sport type, format, teams count).
3. Configure scheduling options.
4. Submit and confirm league creation.

**Postcondition:** League is created and accessible to players.

### Use Case 2: Register a Player

**Actor:** Player
**Preconditions:** League is open for registration
**Steps:**

1. Navigate to available leagues.
2. Select a league to join.
3. Complete registration form.
4. Submit and receive confirmation.

**Postcondition:** Player is added to the league.

## 3.3 Functional Requirements

### Core Features

- **User Management:** Registration, login, role-based access.
- **League Creation:** Support for different tournament formats (round-robin, knockout, hybrid).
- **Team & Player Registration:** Ability to join leagues, manage teams.
- **Match Scheduling:** Automatic and manual scheduling options.
- **Results & Standings:** Score updates, leaderboard tracking.
- **Notifications:** Alerts for upcoming matches and updates.
- **Admin Panel:** User and league management controls.

## 3.4 Non-Functional Requirements

### Performance

- The system should handle 500+ concurrent users efficiently.
- Page load time should be under 2 seconds.

### Security

- Encrypted password storage and secure authentication.
- Role-based access control (RBAC) implementation.

### Usability

- Responsive design for mobile and desktop.
- Intuitive UI with minimal learning curve.

### Reliability

- Ensure 99.9% system uptime.
- Data backups to prevent loss in case of failure.

# 4. System Analysis & Design

## 4.1 Problem Statement & Objectives

### Problem Statement

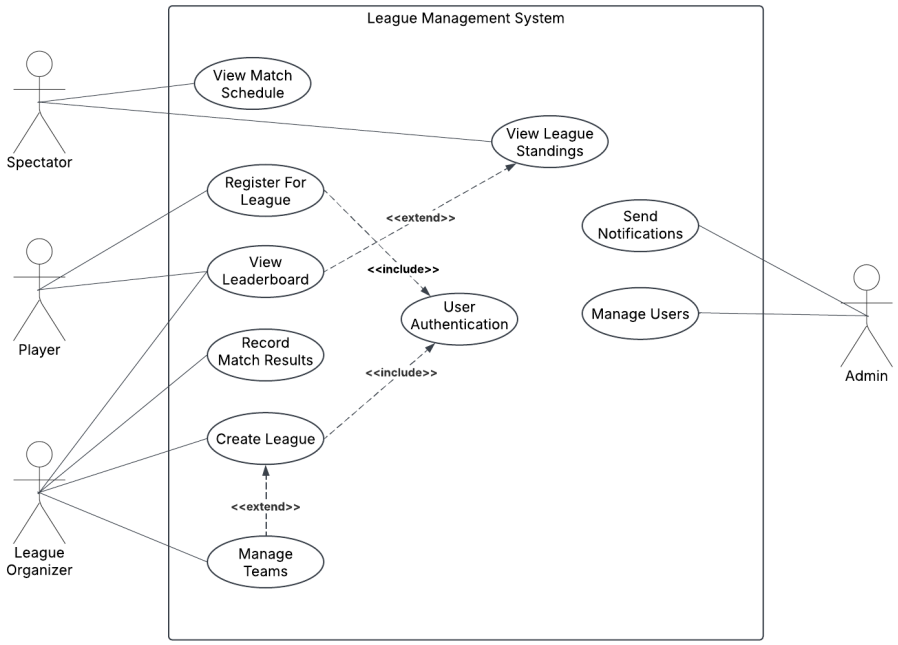
Managing sports and e-sports leagues manually is inefficient, error-prone, and lacks a centralized system for scheduling, team management, and result tracking. Our League Management System (LMS) provides an automated, user-friendly solution for organizing leagues and tournaments across various game types.

### Objectives

- Develop a web-based system for creating and managing leagues.
- Automate match scheduling and leaderboard updates.
- Provide secure role-based access control.
- Ensure scalability and responsiveness for optimal user experience.

## Use Case Diagram & Descriptions

**Use Case Diagram:**



## Actors & Interactions:

- **Admin:** Manages system users and configurations.
- **League Organizer:** Creates tournaments, manages teams, schedules matches.
- **Player:** Registers for leagues and views match schedules.
- **Spectator:** Views league standings and match results.

## Functional & Non-Functional Requirements

**Functional Requirements:**

- User authentication and role-based access.
- League creation and configuration.
- Match scheduling and result tracking.
- Automated leaderboard updates.
- Notifications for match events.

**Non-Functional Requirements:**

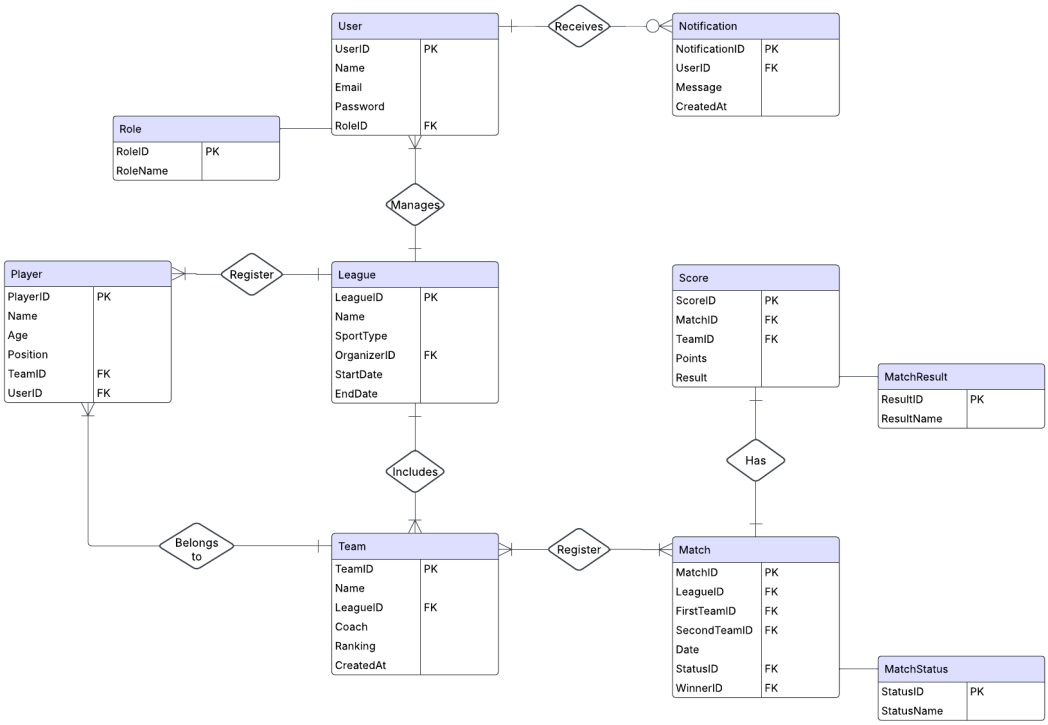
- Performance: Fast response times (< 2 seconds per request).
- Security: Secure authentication with encrypted passwords.
- Usability: Intuitive UI for easy navigation.
- Scalability: Support for multiple concurrent leagues.

## Software Architecture

- **Architecture Style:** MVC (Model-View-Controller) for separation of concerns.
- **Components:**
    - Frontend: HTML, CSS, JavaScript
    - Backend: .NET Core MVC
    - Database: SQL Server
    - APIs: RESTful services for data interactions.

## 4.2 Database Design & Data Modeling

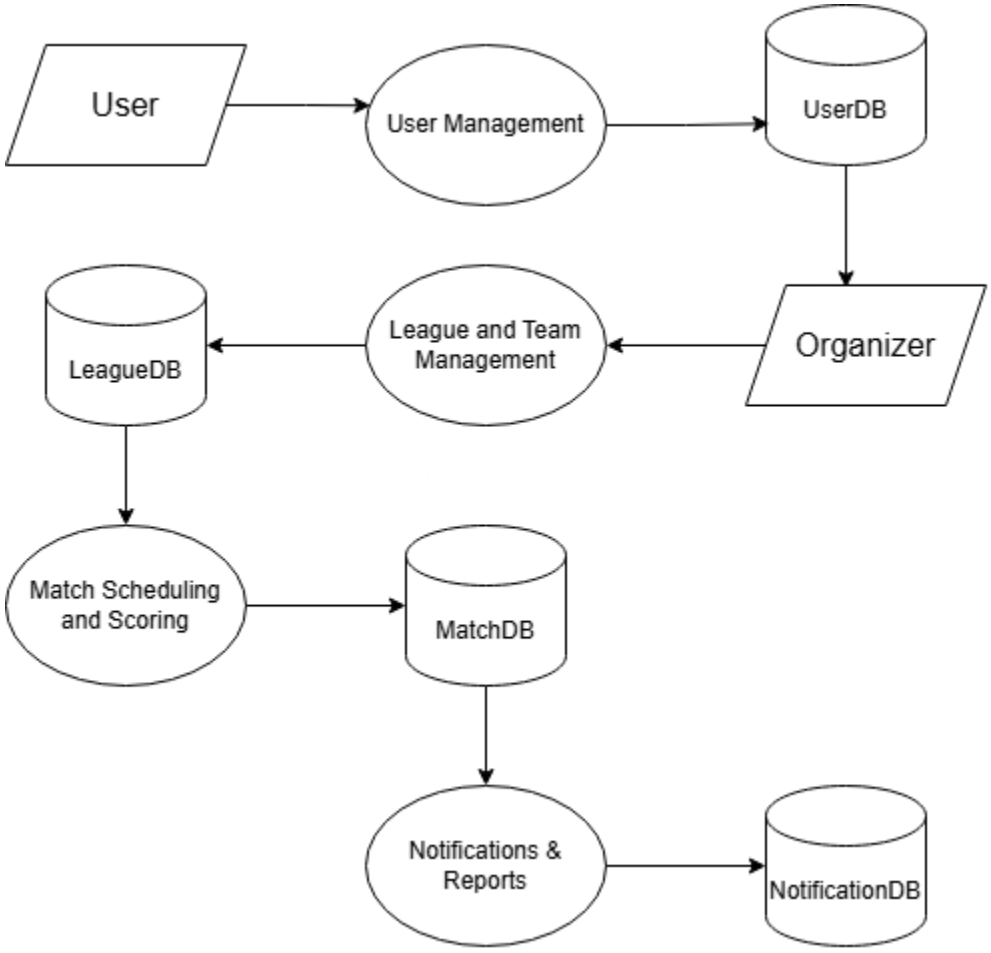
### ER Diagram - Logical & Physical Schema




Normalization considerations ensure data consistency and eliminate redundancy.

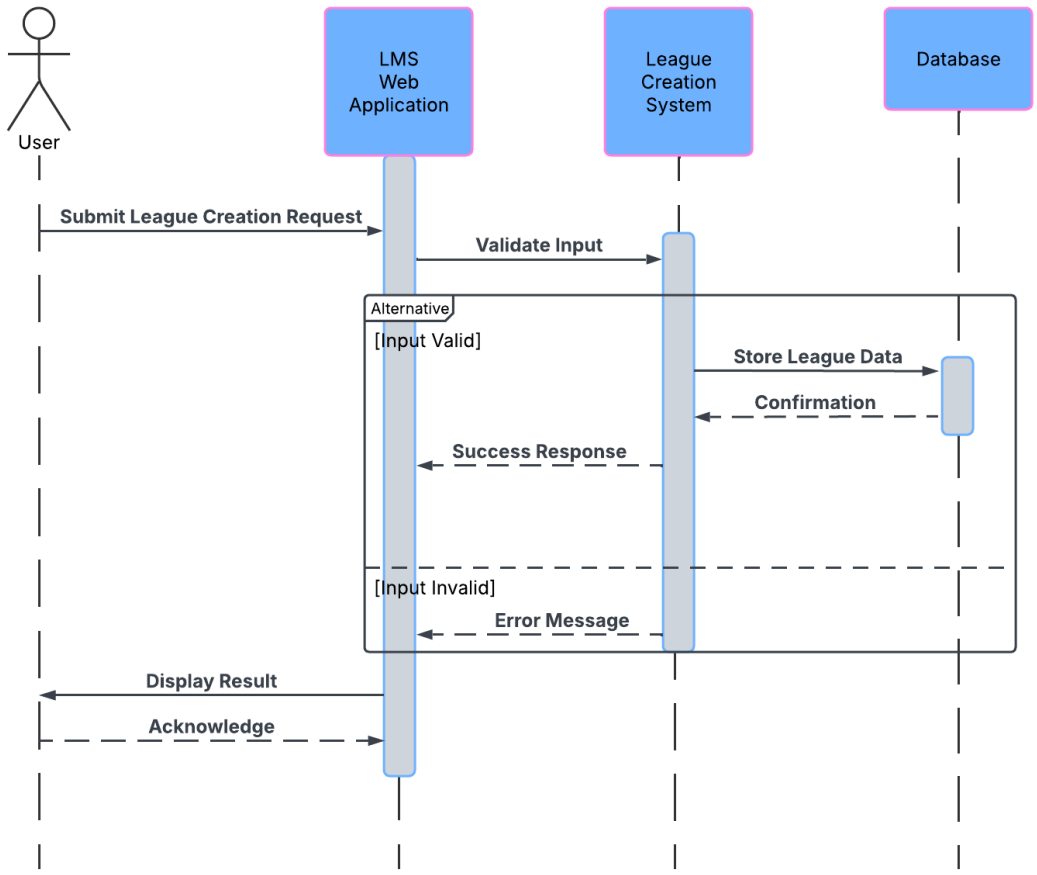
## 4.3 Data Flow & System Behavior

### Data Flow Diagram (DFD)



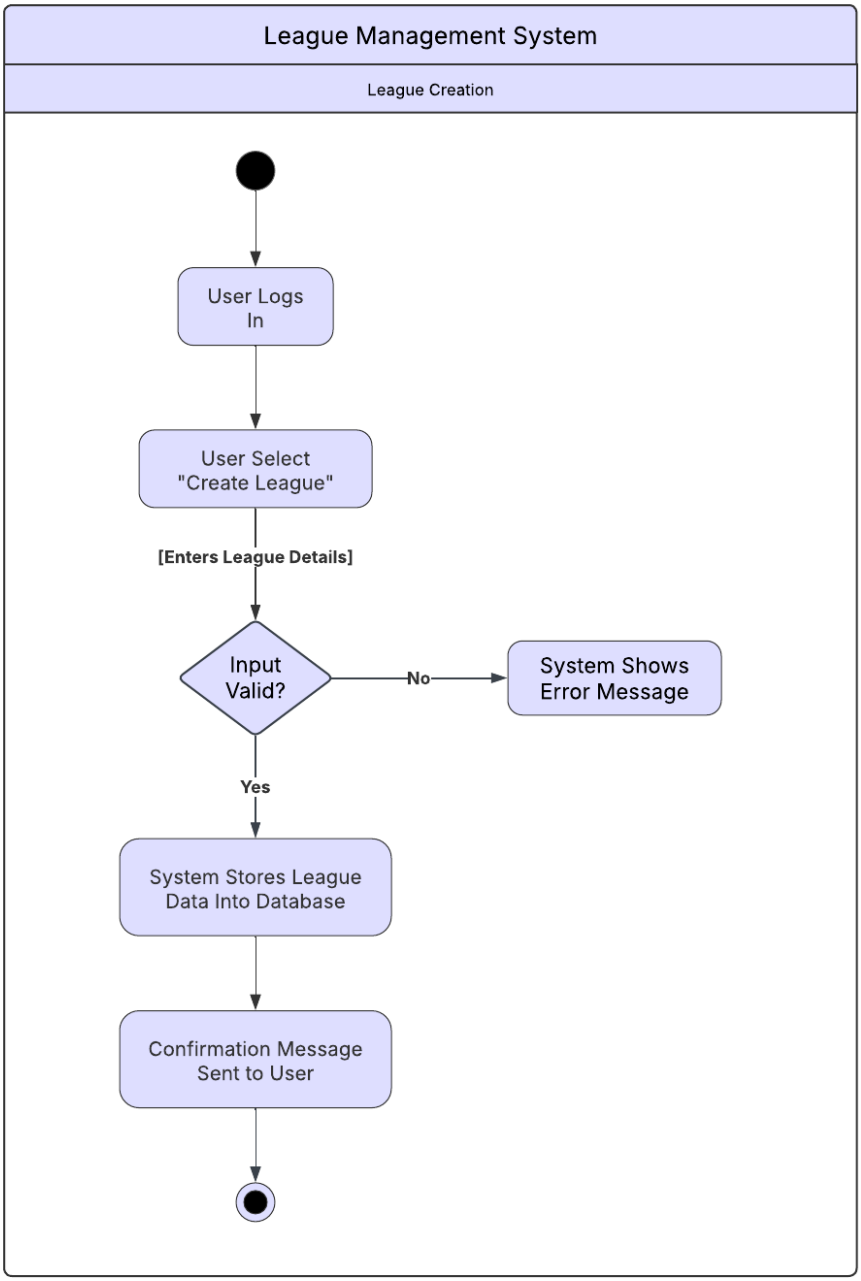
## Sequence Diagrams

Illustrates key interactions for league creation.



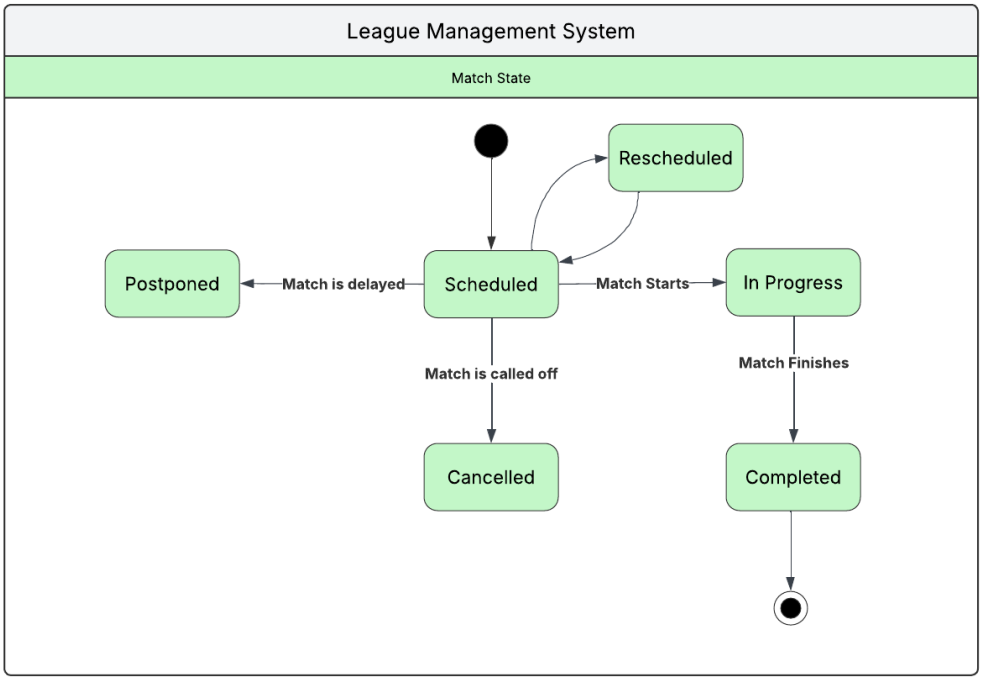
## Activity Diagram

Visualizes the process of registering a league and scheduling matches.



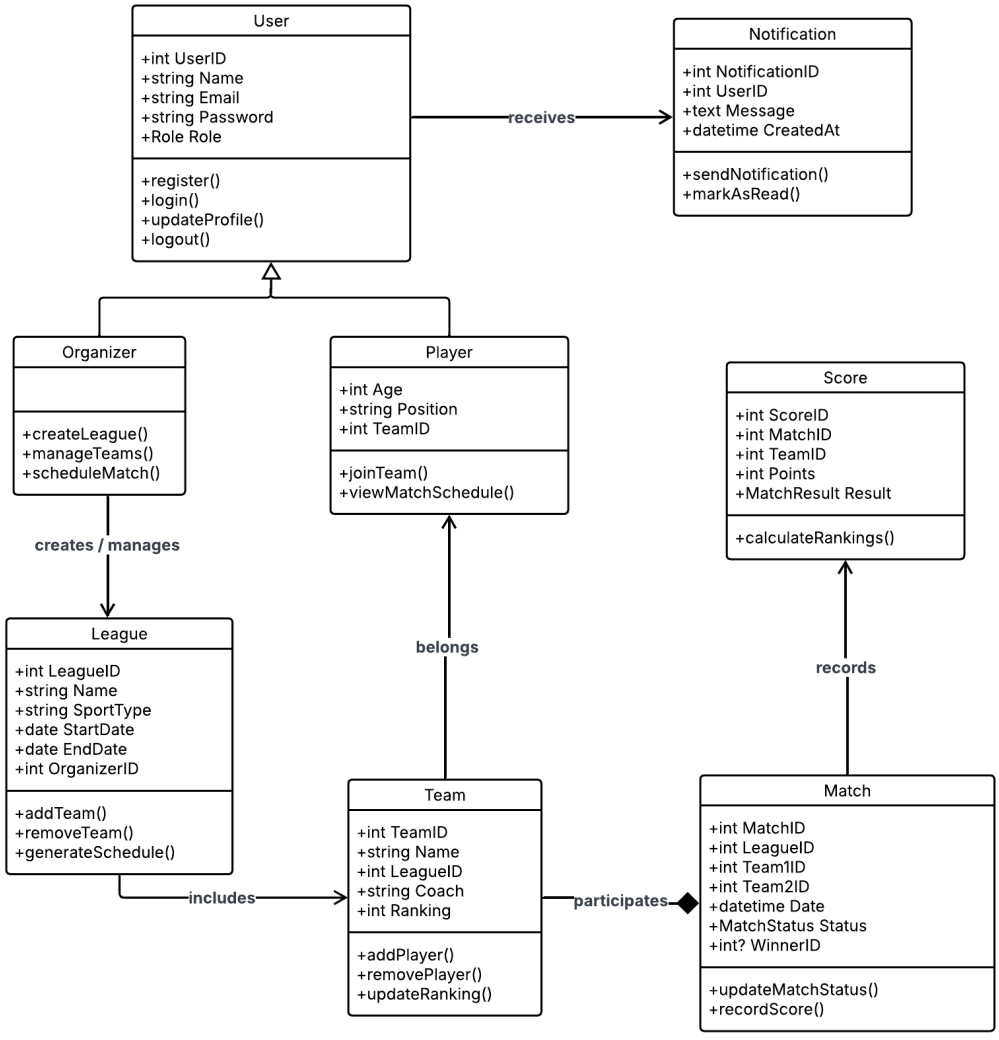
## State Diagram

Defines the different states of a match (Scheduled → In Progress → Completed).



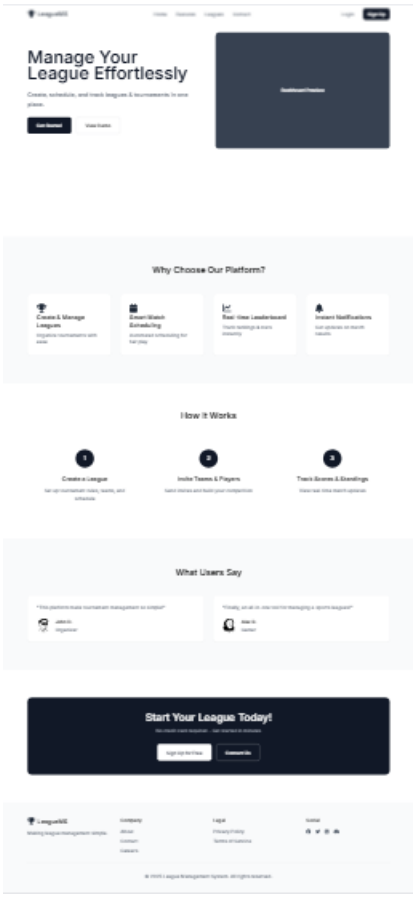
## Class Diagram

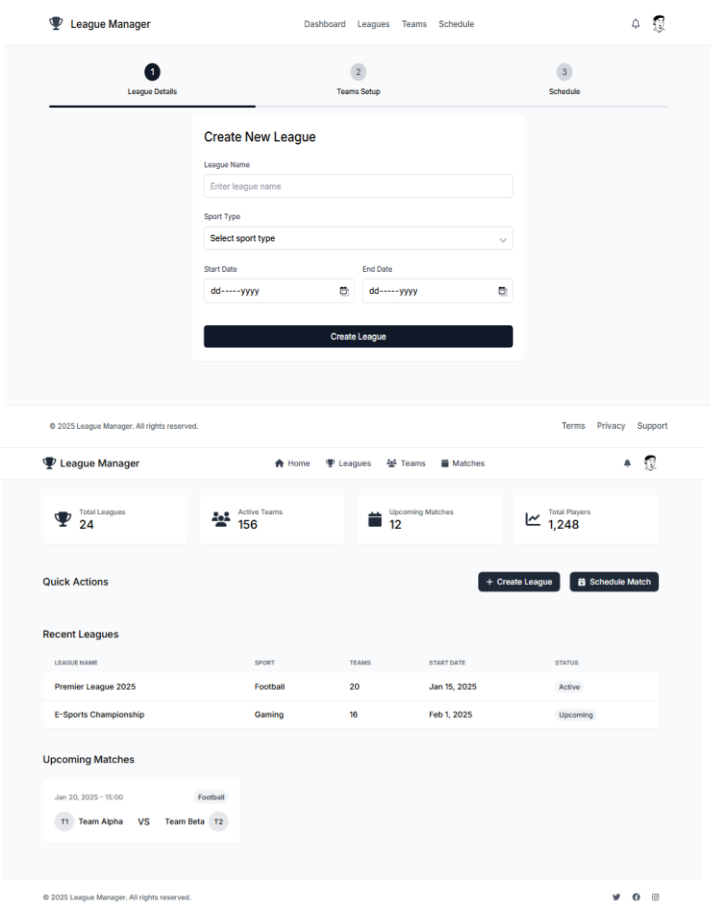
Depicts system classes, their attributes, and relationships.



## 4.4 UI/UX Design & Prototyping

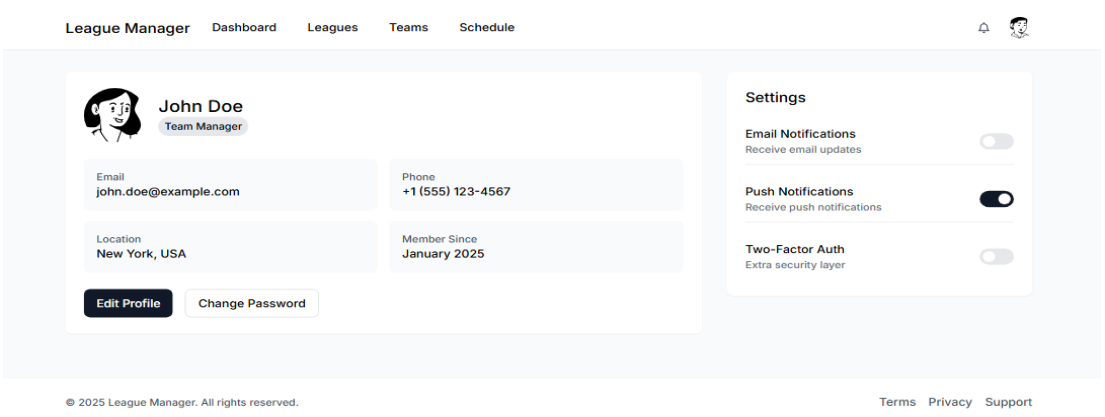
### Wireframes & Mockups










### UI/UX Guidelines

- **Color Scheme:** Modern, minimalistic theme with contrast for readability.
- **Typography:** Sans-serif fonts for clarity.
- **Accessibility:** WCAG-compliant design for inclusivity.

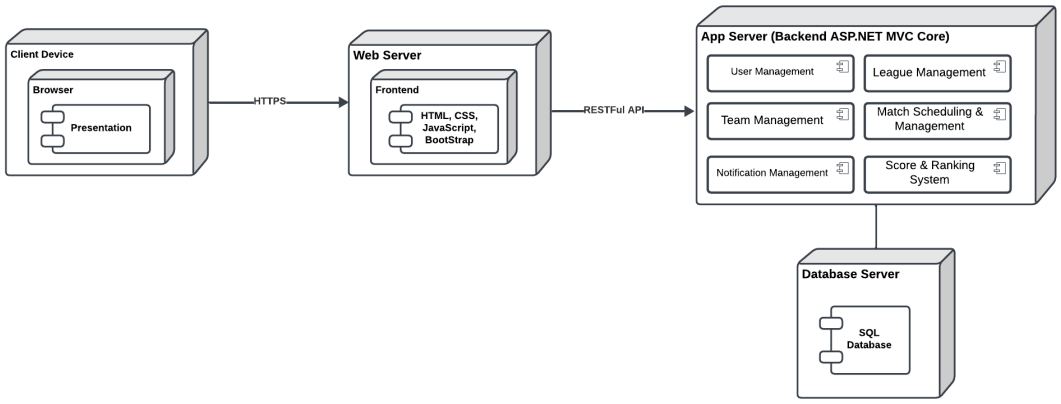
## 4.5 System Deployment & Integration

### Technology Stack

- **Frontend:** HTML, CSS, JavaScript
- **Backend:** .NET Core MVC
- **Database:** SQL Server
- **Deployment:** Azure/AWS cloud hosting

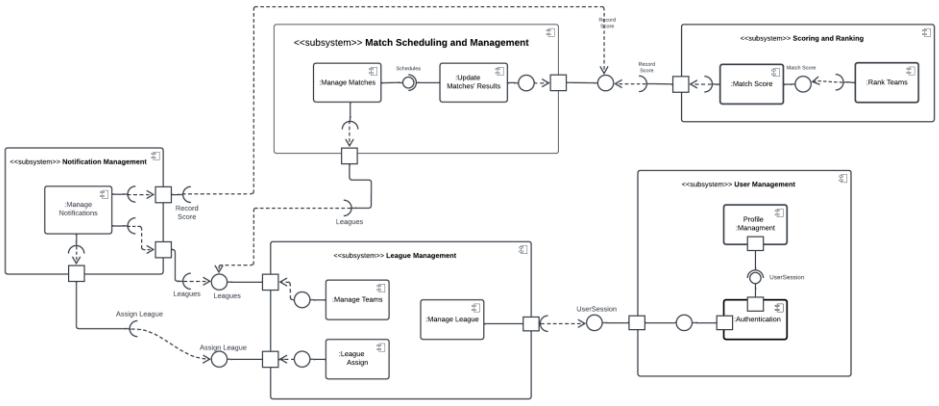
### Deployment Diagram

Illustrates how the system components are hosted across different servers.




### Component Diagram

Depicts high-level system components and their dependencies.



## 4.6 Additional Deliverables

### API Documentation

If the system includes APIs, detailed documentation should be provided for developers and integrators. This documentation should include:

- **Base URL & Authentication:**
    - Example: https://api.leaguemanagement.com/v1/
    - Authentication method: JWT Tokens / API Keys
- **Endpoints Overview:**
    - **User Management:**
        - POST /register – Register a new user.
        - POST /login – Authenticate user and return a token.
    - **League Management:**
        - POST /league – Create a new league.
        - GET /league/{id} – Retrieve league details.
        - PUT /league/{id} – Update league settings.
        - DELETE /league/{id} – Delete a league.
    - **Match Scheduling & Results:**
        - POST /match – Schedule a new match.
        - GET /match/{id} – Retrieve match details.
        - PUT /match/{id}/result – Submit match result.
- **Request & Response Formats:** JSON-based with example payloads.
- **Error Handling & Status Codes:** 400 (Bad Request), 401 (Unauthorized), 404 (Not Found), etc.

## Testing & Validation

To ensure the system functions correctly, a well-defined testing plan includes:

1. **Unit Testing**
   - **Objective:** Validate individual components (e.g., authentication, league creation).
   - **Tools:** NUnit, xUnit (for .NET), Jest (for frontend).
   - **Example:**
     - Test: "User cannot register with an existing email."
     - Expected Outcome: API returns 409 Conflict.
2. **Integration Testing**
   - **Objective:** Verify that different modules interact correctly.
   - **Tools:** Postman, Selenium.
   - **Example:**
     - Test: "Creating a league should allow adding teams and scheduling matches."
     - Expected Outcome: API correctly links teams to a league and schedules matches.
3. **User Acceptance Testing (UAT)**
   - **Objective:** Validate real-world usability from an end-user perspective.
   - **Approach:**
     - **Test Scenario 1:** Organizer successfully creates and manages a league.
     - **Test Scenario 2:** Players receive notifications about match updates.
   - **Success Criteria:**
     - Users complete tasks with minimal friction.
     - No major UI/UX usability issues reported.

## Deployment Strategy

**1. Hosting Environment:**

- **Cloud-Based:** Azure App Service / AWS EC2 / DigitalOcean.
- **Database:** SQL Server on Azure / AWS RDS.
- **Static Files:** Served via **CDN** for better performance.

**2. Deployment Pipelines:**

- **Version Control:** GitHub / GitLab.
- **CI/CD Pipeline:** GitHub Actions / Azure DevOps.
- **Deployment Stages:**
    - **Development** → Internal testing.
    - **Staging** → Pre-production testing.
    - **Production** → Live system.

**3. Scaling Considerations:**

- **Load Balancing:** Distribute traffic across multiple servers.
- **Database Optimization:** Indexing, caching (Redis).
- **Auto-scaling:** Scale based on traffic demand (e.g., Azure Autoscale, AWS Auto Scaling).