**Hospital Management System Documentation**

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**System Setup**

**Prerequisites**

* **Development Tool**: Visual Studio
* **Databases**: MongoDB, Microsoft SQL Server
* **Packages**:
  + MongoDB.Driver (MongoDB connection)
  + Newtonsoft.Json (JSON handling)
  + Microsoft.AspNetCore.SignalR (real-time web functionality)
  + Microsoft.EntityFrameworkCore.Tools (EF with SQL Server)
  + Microsoft.EntityFrameworkCore.SqlServer

**Installation Steps**

1. **Install Visual Studio**
   * Download and install Visual Studio
   * Select the following workloads during installation:
     + ASP.NET and web development
     + .NET Core cross-platform development
2. **Install MongoDB**
   * Download and install MongoDB
   * Follow the installation instructions on the MongoDB website.
3. **Install Microsoft SQL Server**
   * Download and install SQL Server
   * Follow the installation instructions on the Microsoft website.
4. **Set Up the Databases**
   * **MongoDB**:
     + Open MongoDB Compass or connect via the MongoDB shell.
     + Create a new database named HospitalDB.
     + Create a collection named user within HospitalDB.
   * **SQL Server**:
     + Open SQL Server Management Studio (SSMS).
     + Connect to your SQL Server instance.
     + Create a new database named HospitalManagementDB.
     + Create the following tables within HospitalManagementDB:
       - Appointment
       - Doctors
       - Patients
       - MedicalInventory
       - VitalSigns
       - Visits
       - Medication
5. **Install Required Packages**
   * Open your project in Visual Studio.
   * Use NuGet Package Manager to install the following packages:
6. MongoDB.Driver
7. Newtonsoft.Json
8. Microsoft.AspNetCore.SignalR
9. Microsoft.EntityFrameworkCore.SqlServer/Tools

# System Architecture

**Overview**

The Hospital Management System is designed to manage various aspects of hospital operations. The system is built using a combination of MongoDB for user data and SQL Server for hospital management data. The application uses ASP.NET Core for web-based interactions and a Windows Forms App (.NET Framework) for desktop interactions.

**Components**

1. **Frontend**: Developed using ASP.NET Core for web-based interactions and Windows Forms App (.NET Framework) for desktop application.
2. **Backend**:
   * **API Layer**: Developed using ASP.NET Core Web API to handle requests and responses.
   * **Database Layer**:
     + MongoDB for storing user-related information.
     + SQL Server for storing hospital management-related data.

**Database Schema**

**MongoDB (HospitalDB)**

* **users** Collection:
  + userId (String)
  + username (String)
  + password (String)
  + firstname (String)
  + lastname (String)
  + phoneNumber (String)
  + email (String)
  + accessLevel (int) - e.g., 1 - doctor / 2 - nurse / 3 - staff / 4 - patient

**SQL Server (HospitalManagementDB)**

* **Appointment** Table:
  + AppointmentId (Primary Key, int)
  + PatientId (Foreign Key, int)
  + DoctorId (Foreign Key, int)
  + AppointmentDate (DateTime)
  + Status (String)
  + Description (String)
* **Doctors** Table:
  + DoctorId (Primary Key, int)
  + UserId (String)
  + Expertise (String)
* **Patients** Table:
  + PatientId (Primary Key, int)
  + UserId (String)
  + DateOfBirth (DateTime)
  + Gender (String)
  + Address (String)
  + MedicalHistory (String)
* **MedicalInventory** Table:
* MedicalInventoryId INT PRIMARY KEY IDENTITY,
* ItemName VARCHAR(500),
* Quantity INT,
* SupplierName VARCHAR(500),
* SupplierPhone VARCHAR(500)
* **VitalSigns** Table:
* VitalId INT PRIMARY KEY IDENTITY,
* VisitId INT NOT NULL,
* HeartRate INT,
* BloodPressure VARCHAR(500),
* Temperature Decimal,
* TimeTaken DATE
  + **Visits** Table**:**
* VisitId INT PRIMARY KEY IDENTITY,
* PatientId INT NOT NULL,
* StaffId VARCHAR(500) NOT NULL,
* VisitReason VARCHAR(500),
* VisitStartDate DATE,
* VisitEndDate DATE,
* PatientStatus VARCHAR(500)
  + **Medication** Table**:**
* MedicationId INT PRIMARY KEY IDENTITY,
* PatientId INT NOT NULL,
* MedicationName VARCHAR(500),
* MedicationStatus VARCHAR(500),
* Dose INT,
* PrescribedDate DATE

**User Manual**

**User Roles**

1. **Doctor, Nurse, Staff**: Manages patient visits and appointments.
2. **Patient**: Manages personal appointments (only read/cancellation available for the patient) and views medical records.

**User Interface Guide**

**Doctor/Staff/Nurse Interface**

1. **Patient Management**
2. **Appointment Management**: View and manage appointments.
3. **Patient Admission**
4. **Real-Time Chat**
5. **Medical History**
6. **Data Analytics**

**Patient Interface**

1. **Profile Management**: Update personal information.
2. **Appointment Management**: View/cancel appointments.
3. **Real-Time Chat**

**Common Tasks**

**Logging In**

1. Open the application.
2. Enter your username and password.
3. Click on the login button.

**Registration**

1. Open the application.
2. Click the sign-up button.
3. Enter your required information (username, password, first name, last name, email, phone, role, expertise (only doctor required)).
4. Click the submit button or click the cancel button to go back to the login page.

**Patient Management**

1. Open the application.
2. Sign in and navigate to the Patient Management Page.
3. Enter the UID, Gender, Date of Birth, Address, and upload the Medical Record file (.txt/.csv).
   * **Note**: If logged in as a patient, only their own UID will appear in the combo box, allowing them to update only their information.
4. Click the Save button to update the patient information.

**Appointment Management**

**Nurse/Staff**

1. Open the application.
2. Sign in and navigate to the Appointment Management Page.
3. View all appointments.
4. To create a new appointment:
   * Select the patient, doctor, enter notes, and select the date from the calendar.
   * Click the "Make Appointment" button.
5. To update an appointment:
   * Select the appointment from the list.
   * Update the details as needed.
   * Click the "Update" button.
6. To delete an appointment:
   * Select the appointment from the list.
   * Click the "Cancel" button.

**Doctor**

1. Open the application.
2. Sign in and navigate to the Appointment Management Page.
3. View your own appointments.
4. To create a new appointment:
   * Select the patient, doctor, enter notes, and select the date from the calendar.
   * Click the "Create Appointment" button.
5. To update an appointment:
   * Select the appointment from your list.
   * Update the details as needed.
   * Click the "Update" button.
6. To cancel an appointment:
   * Select the appointment from your list.
   * Click the "Cancel " button.

**Patient**

1. Open the application.
2. Sign in and navigate to the Appointment Management Page.
3. View your own appointments.
4. To cancel an appointment:
   * Select the appointment from your list.
   * Click the "Cancel Appointment" button.
5. **Note**: If you need to update or create an appointment, you must request it through the staff/nurse or doctor.

**Medical Inventory Management**

**Staff**

1. Open the application.
2. Sign in and navigate to the Medical Inventory Page.
3. Click on the load button to view all the medical inventories.
4. Add new item in medical inventories:
   * Enter all four fields in the textboxes: Item Name, Quantity, Supplier Name, and Supplier Phone.
   * Click on “Add New Supply” button and the new item is loaded in the datagridview.
5. Update existing item in medical inventories:
   * Click on a cell in the datagridview of the item you want to update, and all values are showing up in the textboxes.
   * Choose which fields you want to update.
   * Click on “Update” button and the row is updated in the datagridview.
6. Delete existing item in medical inventories:
   * Click on a cell in the datagridview of the item you want to delete, and all values show up in the textboxes.
   * Click on “Delete” button and the row is removed and updated in the datagridview.

**Doctor/Nurse**

*Using signalR to refill stock:*

1. Open the application.
2. Sign in and navigate to the Medical Inventory Page.
3. Open the form for staff by repeating step 1 and 2.
4. Click on the load button to view all the medical inventories.
5. Consume item quantity in medical inventories:
   * Click on a cell in the datagridview of the item you want to consume and enter a quantity value less than 100.
   * Click on “Update” button and message box display for staff to let them know the item needs to be refill.
6. Refill item stock:
   * On the staff form, navigate to the Medical Inventory Page.
   * Click on the load button to view all the medical inventories.
   * Click on the cell in datagridview you want to restock.
   * Enter a quantity bigger than 100.
   * Click on “Update” button and the item has been refilled.
   * On the Doctor Medical Inventory Page, click on “Load” button again the item has been refilled.
7. Click “Exit” button to close the Medical Inventory Page.

**Data Analytics**

1. Open the application.
2. Sign in as staff and navigate to the Data Analytics Page.
3. Select which criteria you like to look at from the combo box choices.
4. Select the start date and end date from the date time picker.
5. Click the “Search” button and the information is display on the datagridview. A pop-up message will appear with a description based on the criteria you select with the date interval.

**Chat System**

1. Open the application.
2. Sign in and navigate to the Real Time Chat Page.
3. Repeat step 1 and 2 for other users.
4. Type in the message you like to send a message to another user.
5. Click on “Send” button and the message appeared in the message box below.
6. Repeat step 4 and 5 to send a message to the responder.
7. Click “Exit” button to close the page.

**Patient Admission Form**

1. Open the application.
2. Sign in as doctor, nurse or staff and navigate to the Patient Admission and Monitor Page.
3. Click on the “Search” button to load all the patients with the default choice “All patients” has been selected. A star in the textbox indicates to display all patients.
4. Search every criterion in the combo box (*For example Patients by birthday*)
   * The text on top of the textbox changes every time you select on of the criteria in the combo box.
   * Enter the textbox you want to search based on the criteria you pick. (*For example search “Patients by birthday” and enter the patient’s birthday in the form of MM/dd/YYYY”*
5. Triage patient:
   * Click on the “Search” button to load all the patients with the “All patients” selected in the combo box.
   * Click on the patient to be triage. Make the patient isn’t triage before on the status “N/A” or “Discharged”.
   * Select combo box for Visit Reason (*For example Chest pain*)
   * Select combo box for Visit Reason (*For example Regular admission*)
   * Click “submit” button and click “exit” to close the page.
   * Patient’s vital Signs page has been popping up:
     + Enter all three fields for patient’s vital signs.
     + Click “Update Vital Signs” button to add new patients vital.
     + Click “exit” button to close the page.

Update existing patient vital:

* + - Select which patient to update vital. (*Make sure the existing patient already been vital before by checking the patientstatus in the datagridview*)
    - Enter all three fields for patient’s vital signs.
    - Click “Update Vital Signs” button to update existing patients vital.
    - Click “exit” button to close the page.

Prescription Mediation:

* + - Click on “Patient Vital” button to load the page.
    - Add new medication:
      * Fill in all three requirement fields.
      * Press “Add New” button and the new medication has been added to the datagridview.
    - Update existing medication:
      * Click on which medication you want to update from the datagridview and MedicationID number text is displayed below.
      * Choose which field you want to update.
      * Press “Update” button and the selected column has been updated.
      * Click “exit” button to close the page.

Update Patient Status:

* + - Make sure the patient has already been triaged before.
    - Click on which patient you want to update status from the datagridview.
    - Select a combo box with the label “Patient Status” to update their status.
    - Click on “Update Patient Status” button to update patient status.
    - Discharged Patient: (*Follow this step if you want to dismiss patient from the hospital*)
      * + Click on which patient you want to discharged from the datagridview.
        + Select “discharged” from combo box with the label “Patient Status”
        + Click on “Update Patient Status” button to discharged that patient from the hospital. PatientStatus column should changed to “N/A” on the datagridview.

**Patient ER Monitor**

1. Open the application.
2. Login and the Patients ER Monitor page is showing up. (*Only doctors and nurses are allowed to access Patients ER Monitor*).
3. Navigate to “Patient Admission and Monitor” page.
4. Click on the “search” button to load existing patient in the datagridview.
5. Click on a patient from the datatgridview.
6. Select ICU or ER admission to send that patient to ER.
7. Click on “Update Patient Status” button and the selected patient is send to the ER (Patients ER Monitor page).
8. Remove Patient from ER. (*Follow this step if the patient is feeling better*)
   * Select which patient you want to remove in the ER in the datagrid view. (*Patient’s status has to be in ICU or ER admission in the first place*).
   * Choose the status from the combo box that is not ICU or ER.
   * Click on “Update Patient Status” button and the selected patient has been remove from the Patients ER Monitor page.
9. Send CODE RED ALERT message. (*Follow this step if patient is in critical condition*)
   * On the “Patient Admission and Monitor”, click on “Patient Vital” button.
   * Enter one or all three fields for critical condition (*Critical heart rate is below 40 or above 150. Critical body temperature is above 110oF*).
   * Click on “Update Patient Status” button and the code red alert message will display on Patients ER Monitor page on the right side of the page.
   * Exit the Patient Vital sign page.