رواد مصر الرقمية

وزارة الاتصالات
وتكنولوجيا المعلومات

ICU Reservation & Management System

DEPI PROJECT

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Project Idea

The Challenge

ICU bed allocation is often done via manual phone calls and paper logs, leading to human error, delays, and double-booking during critical cases.

The Solution

A smart, automated ICU Reservation & Management platform that digitizes the workflow between receptionists, ICU managers, and ambulance staff using real-time dashboards and automated workflows.

The Value

Real-time visibility of ICU beds, integrated ambulance tracking, and automatic status updates ensure every bed is used efficiently and response time is minimized.

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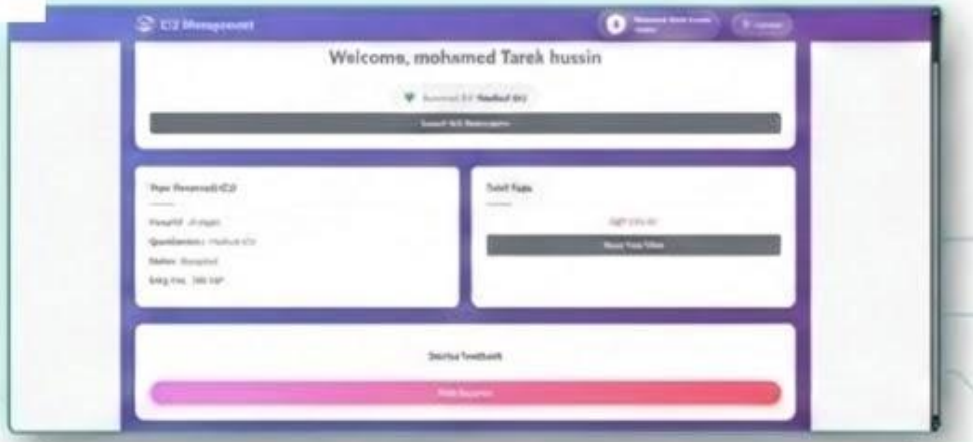
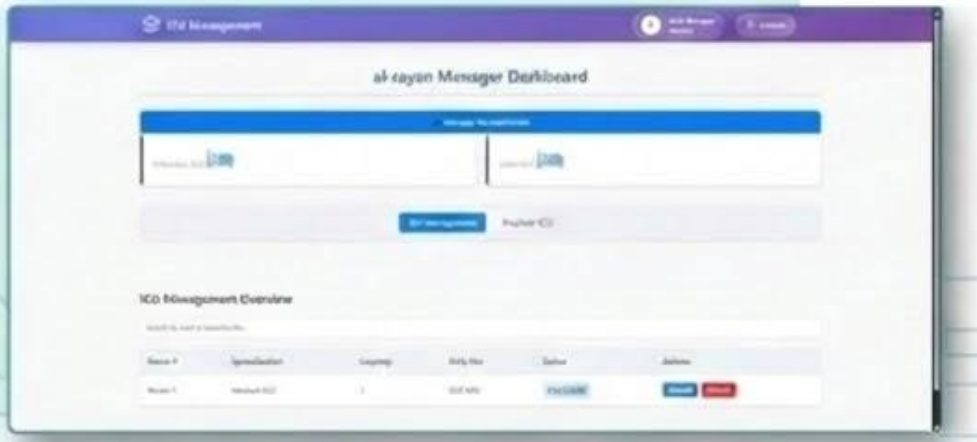
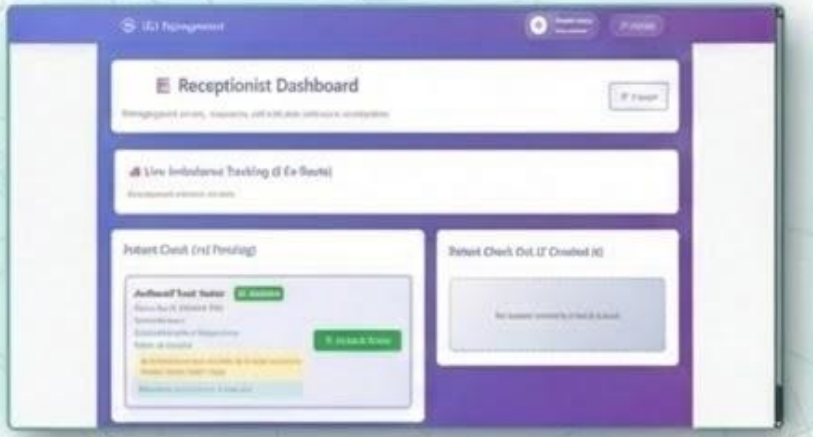
System Dashboards & User Interfaces



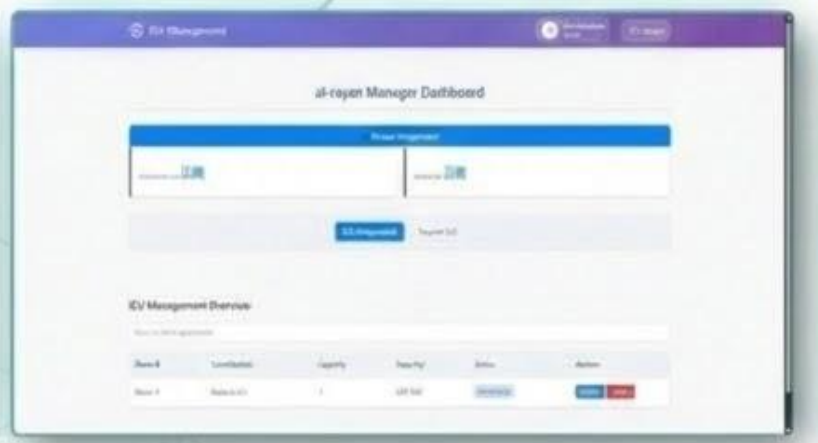
Patient Dashboard



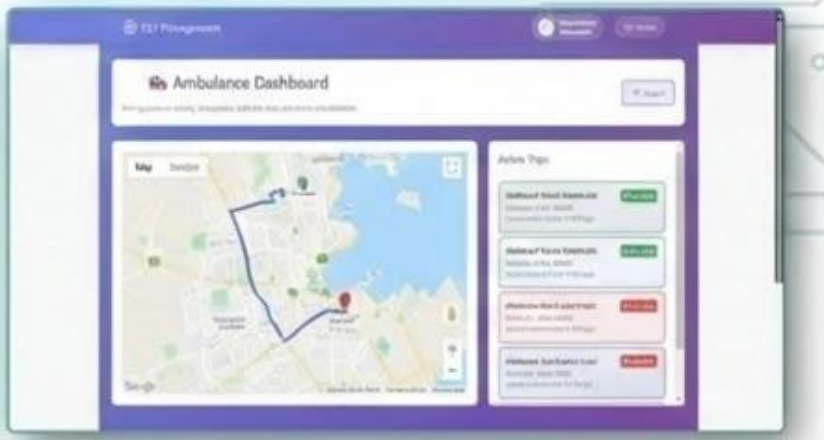
Administrator Dashboard



Receptionist Dashboard



Manager Dashboard



Ambulance Dashboard

Mission & Vision

Mission & Vision

"To create a smart, automated, and safe ICU management system that minimizes human error and ensures every bed is used efficiently."

Smart

Automated

Safe

Why It Matters

In critical care, seconds matter. The system replaces manual phone calls and paper logs with real-time digital coordination, ensuring that when an ambulance arrives, the hospital is ready.

Critical Care

Real-Time Digital

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End Users & Key Features

Primary End Users

- **Receptionists** – handle ICU requests and patient registration.
- **ICU Managers / Doctors** – manage ICU capacity and patient priorities.
- **Ambulance Staff** – coordinate transport and confirm ICU bed before moving.
- **System Admins** – configure hospitals, ICUs, and user access (RBAC).

Key Features

- **Real-Time Bed Management:** live dashboard for Available / Occupied / Maintenance.
- **RBAC:** role-based interfaces for Admins, Managers, Receptionists, Ambulance staff.
- **Automated Workflows:** automatic status updates on check-in and discharge.
- **Ambulance Integration:** status (En Route / Arrived) and optional GPS tracking.
- **System Safety & Auditing:** full activity logging and system health monitoring.

How Features Solve Problems

- **Receptionists** avoid double-booking using a single, real-time bed view.
- **ICU managers** can prioritize critical patients using accurate occupancy data.
- **Ambulance staff** only move when a specific bed is confirmed.
- **Admins** keep the system secure and auditable through RBAC and logs.

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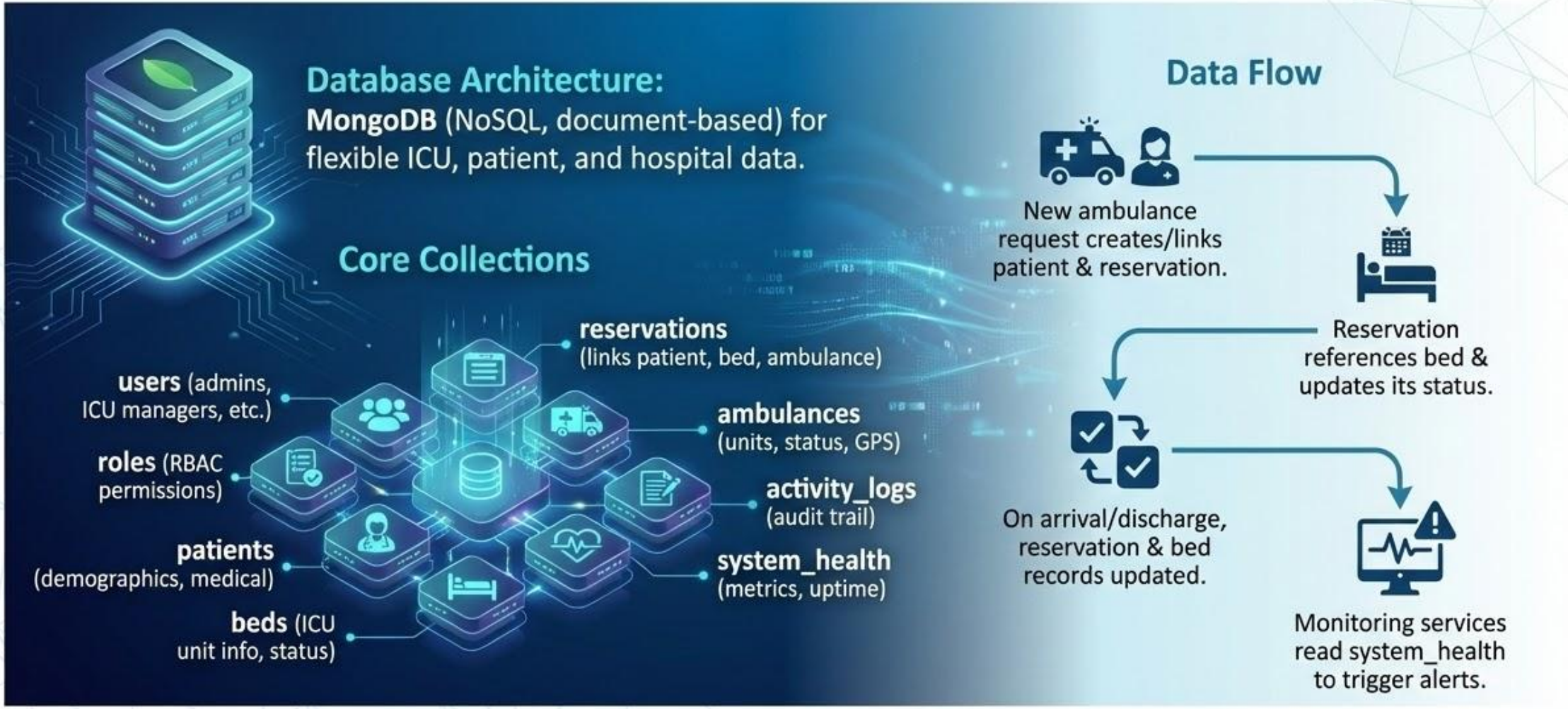
Data Structure (MongoDB)



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Programming Languages & Frameworks

Languages

- **TypeScript** – main language for React frontend and some backend logic.
- **JavaScript** – runtime language in Node.js environment.

Frontend

- **React 18 (TypeScript)** – SPA for ICU dashboards and user flows.
- **CSS** – utility-first styling for responsive UI.
- **Socket.io-client** – real-time updates for bed and ambulance status.

Backend & Database

- **Node.js & Express.js** – REST API and business logic layer.
- **MongoDB** – NoSQL database for ICU, patient, and reservation data.
- **Socket.io** – bi-directional communication between server and clients.

Infrastructure, CI/CD & Monitoring

- **Docker** – containerization of frontend, backend, and database services.
- **Kubernetes** – orchestration and scaling in cluster environments.
- **Terraform** – infrastructure as code to provision AWS resources.
- **AWS** – cloud provider for hosting and networking.
- **GitHub Actions** – CI/CD pipelines for automated build and deploy.
- **Prometheus & Grafana** – monitoring, metrics. and dashboards.

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Live Application & Testing

Live / Deployment Status

Kubernetes & AWS

Services are containerized (frontend, backend, MongoDB) and can be deployed on Kubernetes in AWS as a beta or production environment.

Testing Phases

Unit Testing
check reservation rules, RBAC logic, and validations.

Integration Testing
test API endpoints with MongoDB.

End-to-End Testing
simulate full flow from ambulance request to ICU discharge.

Performance Testing
ensure system can handle peak emergency traffic.

User Feedback & QA

- Pilot test with a small group of receptionists, ICU staff, and ambulance teams.
- Collect feedback on usability, clarity, and response time.
- Use monitoring dashboards and logs to detect errors and improve reliability.

Deliverables

Main Deliverables

- ICU Reservation & Management web application (frontend + backend).
- Source code repository with clear structure and documentation.
- System architecture and design document.
- API reference documentation.
- Deployment guide (Docker, Kubernetes, Terraform, AWS).
- User manual for all roles (reception, ICU, ambulance, admin).
- Testing report with results and coverage.

Timeline (High Level)

Project Team & Roles

Team Members

Mahmoud Mohamed Mahmoud
Frontend development, DevOps.

Mohamed Tarek
Backend development & API design, CI/CD.

Moahmed Hosam
Backend development, CI/CD.

Saad Elsokkary
DevOps, and cloud infrastructure.

Nourhan Mohamed
Frontend development & UX.

Collaboration

Agile-style iterations
Weekly sync meetings.

GitHub
Version control, pull requests, and issues.

Task tracking & documentation
Using online tools (e.g., Trello/Notion).

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Thank You

Questions & Discussion

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