User Management System (Multi-Tier Architecture)

We will build a User Management System with the following core features:

- ✓ User login
- ✓ User dashboard to list all users.
- ✓ User Add/Edit/Delete operations

This solution will be multi-tier architecture

Tier 1: Frontend (Angular)

- ✓ Developed using Angular
- ✓ Key pages:
  - Login Page
  - User Dashboard With user's list and Add, Edit and Delete button
  - Add/Edit page
- ✓ Authenticated via UserId + Password
- ✓ Connects to backend via HTTP services
- ✓ Dockerized for containerized deployment
- ✓ Will be accessible on http://localhost:8080

Tier 2: Backend API (Node.js + Express)

- ✓ RESTful API built using Node.js and Express
- ✓ Validate user credentials for login and business logic
- ✓ Routes for:
  - POST /login - user authentication
  - POST /add - create user
  - GET /users - list all users
  - GET /users:{id} – fetch user by id
  - DELETE /delete/:id - delete user by id
- ✓ Dockerized for containerized deployment
- ✓ Will be expose on http://localhost:3000

Tier 3: Database (MongoDB)

- ✓ Stores user information and roles
- ✓ Sample schema:
- ✓ User: { userid, password (hashed), userType, isActive, id }
- ✓ Dockerized MongoDB container for containerized deployment
- ✓ Will be expose on http://localhost:27017
- ✓ Redis Caching implementation, caching expiration time is 60 seconds.
- ✓ If any Add/Delete action taken, then dashboard will load from database and cache will be refresh.

Security Implementation

1. All Docker images are officially verified on Docker hub

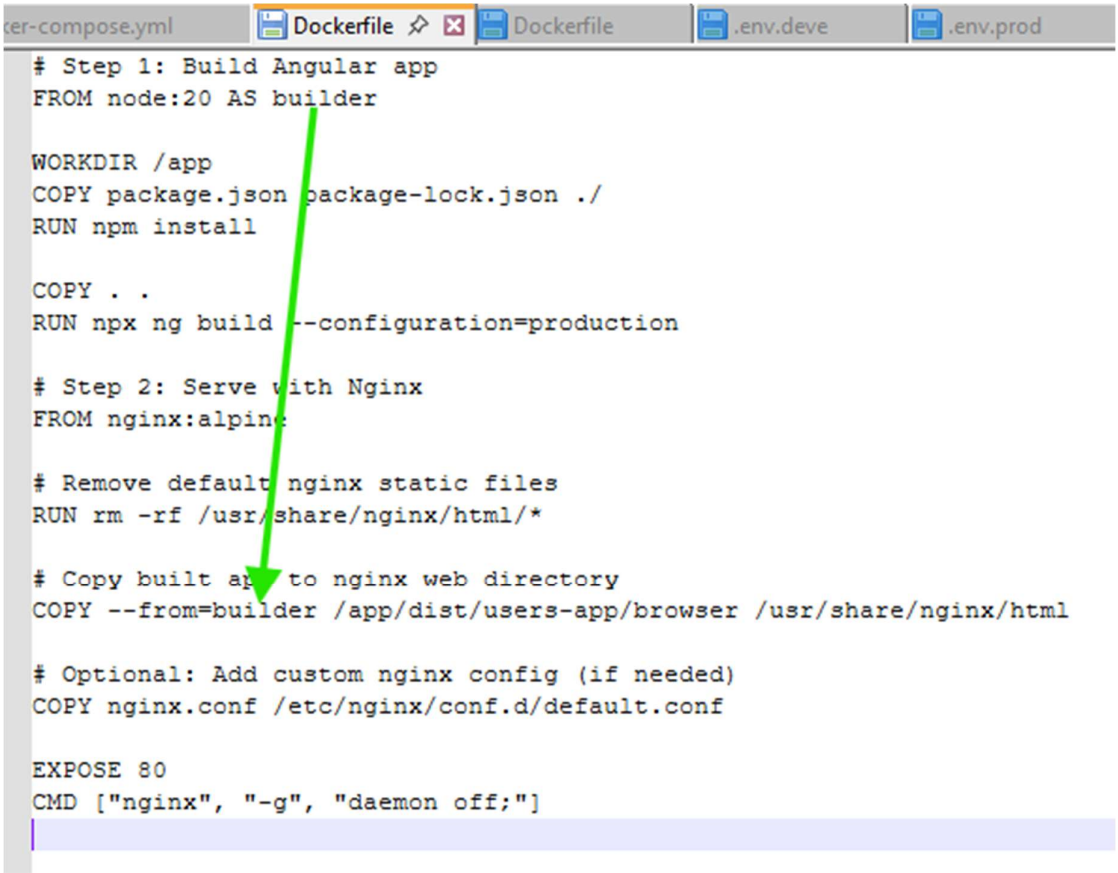
2. I used small sized images specified over docker hub
3. Added a .dockerignore file in both solutions, kindly refer git repositories.

4. I have use specific image version

```yaml
    mongodb:
        image: mongo:8.0
        container_name: mongodb
        environment:
            MONGO_INITDB_ROOT_USERNAME: ${MONGO_UID}
            MONGO_INITDB_ROOT_PASSWORD: ${MONGO_PWD}
        ports:
            - "27017:27017"
        volumes:
            - mongo-data:/data/db
        networks:
            - app-network

    cache-service:
        image: redis:8.2.0
        container_name: cache-service
        command: redis-server --appendonly yes --save
        ports:
            - "6379:6379"
        volumes:
            - redis-data:/data
        networks:
            - app-network
```

5. Optimized caching layers by Docker file command orders
6. Multistage build has been implemented by correct ordering on command in Docker file



Application Features

- ✓ Login/Auth flow using JWT
- ✓ User CRUD from UI with REST API integration

Docker Features

- ✓ Docker Compose setup for full application configuration and run container.
- ✓ Docker common Network for service communication to each other, refer above screen shot.
- ✓ Docker Volume to persist data for database and caching too, refer above screen shot.