Smart Queue Management System

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Team Members and Their Jobs

Amaar Abdullah El Segaey (202402094) – Queue Manager
What he will do:
• Modular Priority Engine (2 points)
• Dynamic Priority Updates (2 points)
• Fairness Monitor (2 points)
His job: Make the main queue work. Calculate who goes first. Update priorities when people wait too long. Make sure everyone gets served fairly.

Yossuf Hosameldin Mohammed (202402592) – System Builder
What he will do:
• Multiple Queues with Merging (3 points)
• Simulation Mode (3 points)
His job: Handle different types of queues (VIP, Regular, Emergency). Move people between queues when needed. Create fake scenarios to test the system.

Mostafa Ali (202202262) – Interface Designer
What he will do:
• Advanced Reporting and Sorting (1 point)
• Admin Console (1 point)
His job: Make the admin panel where we can change settings. Create reports that show how well the system works.

What Each Feature Does

1. Priority Engine (Amaar's Work)
What it does: Decides who gets served first by giving everyone a score.
Example: Person comes in: ID=101, Very urgent (5/5), Emergency service. Score = 4.5

2. Priority Updates (Amaar's Work)
What it does: People who wait longer get higher scores so they don't wait forever.
Example: Person 102 waited 20 minutes. New score = 8.5

3. Multiple Queues (Yossuf's Work)
What it does: Different lines for VIP, Regular, and Emergency people. Can combine them.
Example: VIP line empty, move regulars to VIP counter.

4. Fairness Check (Amaar's Work)
What it does: Boost scores if someone waits too long.
Example: Person 401 waited 30 minutes. Boost = 2.5 points.

5. Simulation (Yossuf's Work)
What it does: Create fake people to test system.
Example: Run for 60 min. Show arrivals and scores.

6. Reports (Mostafa's Work)
What it does: Show system performance.
Example: Person 302 waited 45 min, served in 12 min.

7. Admin Panel (Mostafa's Work)
What it does: Change system settings.
Example: Change urgency weight. System confirms.

Why We Chose These Data Structures

Max Heap (Priority Queue)
Tree where highest number on top. Used to get highest score first. Time: O(log n), Space: O(n)

Hash Table (Dictionary)
Like a phone book. Used for settings. Time: O(1), Space: O(k)

Array (List)
Simple list. Used for queues and history. Time: Add O(1), Search O(n), Space: O(n)

How We Will Code It

Priority Calculation (Amaar's Part)
FUNCTION calculateScore(person): ...
FUNCTION addPerson(person): ...

Update Scores (Amaar's Part)
FUNCTION updateAllScores(): ...
FUNCTION checkIfWaitedTooLong(): ...

Handle Multiple Queues (Yossuf's Part)
FUNCTION combineQueues(...): ...
FUNCTION runSimulation(...): ...

Admin and Reports (Mostafa's Part)
FUNCTION changeSetting(...): ...
FUNCTION makeReport(...): ...

Our Work Plan

Week 1: Basic Setup
• Amaar: Make basic queue and score calculation
• Yossuf: Set up different queue types
• Mostafa: Create settings system and simple admin page

Week 2: Add Advanced Features
• Amaar: Add score updates and fairness checking
• Yossuf: Add queue combining and simulation
• Mostafa: Finish reports and improve admin page

Testing Plan
Each person tests own part, then test together, then run full simulations