

# MARVEL

# SKILL&TELL

# MOBA //

# MobAI problem announcement and elicitation

A SkillnTell initiative

February 11, 2026

## 1 Welcome to MOBAI !

Welcome to the third edition of the MobAI.

This year, we invite you to take on a focused technical challenge centered on building a mobile system enhanced with an AI agent. The goal is simple: apply your skills to a real operational context and deliver a solid, functional solution.

Since its creation, our hackathon has always aimed to benefit the community. Our mission is to create meaningful learning experiences, encourage collaboration, and contribute to raising technical standards within our ecosystem.

Whether you are experienced or just starting out, this is an opportunity to build, think critically, and create something that has real impact.

## 2 Warehouse Operations Flow

In this hackathon, you'll be building a mobile WMS that manages the end-to-end flow of warehouse operations. The system is role-based, with three key roles: **ADMIN**, **SUPERVISOR**, and **EMPLOYEE**. Supervisors and Admins can override the AI agent's suggestions (e.g., for preparation or picking orders), but Employees have an abstraction layer and should only see the orders as final, without visibility into overrides.

The orders in the system include:

- **Command Order:** Initiates the receipt process.
- **Preparation Order:** Specifies products and quantities for delivery preparation.
- **Picking Order:** Guides the picking of products into racks.
- **Delivery Validation/Failure:** Records the outcome of delivery.

The core operations are:

- **Receipt:** Receiving merchandise.
- **Transfer:** Moving products to storage.
- **Picking:** Selecting and placing products in picking racks.
- **Delivery:** Final expedition of products.

Here's the step-by-step flow of operations in the warehouse:



1. **Receipt:** Employees receive a Command Order from the office, indicating the preparation for receiving merchandise. This triggers the Receipt operation, where incoming products are logged and validated.
2. **Transfer:** Once received, employees proceed to the Transfer operation, moving the products to designated storage floors for long-term holding.
3. **Preparation:** Employees then receive a Preparation Order, which highlights which products and in what quantities are to be prepared for delivery. This order is generated by the AI agent's forecasting service, allowing preparation to occur one day in advance to optimize efficiency.
4. **Picking:** Next comes the Picking operation, where products are placed into picking racks based on a Picking Order. This specific order is generated by the AI agent, which selects picking locations based on the shortest distance to the expedition zone, minimizing travel time and improving throughput.
5. **Delivery:** Finally, the Delivery operation is executed, followed by recording Delivery Validation or Failure to close the loop.

The AI agent plays a crucial role: it provides forecasting for Preparation Orders and optimization for Picking Orders. Overrides by Supervisors or Admins require justification and are logged, ensuring accountability while maintaining operational flexibility.

### 3 Functional Requirements (FRs)

#### 3.1 Security and Access Control

- FR-1: System shall require authentication.
- FR-2: System shall enforce role-based access.
- FR-3: Roles: ADMIN, SUPERVISOR, EMPLOYEE.
- FR-4: ADMIN shall manage users.
- FR-5: SUPERVISOR shall validate AI outputs.
- FR-6: EMPLOYEE shall see validated orders only.
- FR-7: Only ADMIN and SUPERVISOR may override AI decisions.
- FR-8: Overrides shall require justification.
- FR-9: All actions shall be logged.

#### 3.2 Warehouse CRUD

- FR-10: Create warehouse.
- FR-11: Update warehouse.
- FR-12: Delete warehouse.
- FR-13: Create storage floors.



- FR-14: Create picking locations.
- FR-15: Update locations.
- FR-16: Delete locations.
- FR-17: Enforce unique location codes.

### 3.3 SKU and Inventory

- FR-20: Create SKU.
- FR-21: Update SKU.
- FR-22: Delete SKU.
- FR-23: Track stock per SKU per location.
- FR-24: Prevent negative stock.
- FR-25: Log stock movements.
- FR-26: Maintain historical stock data.
- FR-27: Compute total stock per SKU.

### 3.4 Chariot

- FR-30: Create chariot.
- FR-31: Update chariot.
- FR-32: Delete chariot.
- FR-33: Assign chariot to operations.
- FR-34: Ignore chariot capacity.

### 3.5 Orders

- FR-40: Create Command Order.
- FR-41: Generate Preparation Order via forecast.
- FR-42: Generate Picking Order via optimization.
- FR-43: Record Delivery Validation.
- FR-44: Supervisor override Preparation Order.
- FR-45: Supervisor override Picking Order.
- FR-46: Admin override any AI output.
- FR-47: Log overrides separately.



### 3.6 Operations

- FR-50: Execute Receipt.
- FR-51: Execute Transfer.
- FR-52: Execute Picking.
- FR-53: Execute Delivery.
- FR-54: Ensure transaction atomicity.
- FR-55: Validate stock availability before move.
- FR-56: Prevent partial commit.
- FR-57: Ensure concurrency safety.

### 3.7 Offline and UI

- FR-70: Support offline mode.
- FR-71: Sync automatically when connection restored.

## 4 Non-Functional Requirements (NFRs)

- NFR-1: System shall operate offline for minimum 4 hours without sync.
- NFR-2: Sync conflict resolution must preserve stock consistency.
- NFR-3: 100% of stock movements must be traceable.
- NFR-4: Role restrictions enforced server-side.
- NFR-5: System must preserve data integrity under concurrent operations.
- NFR-6: All overrides auditable permanently.
- NFR-7: UI clarity must distinguish decision vs execution layers.
- NFR-8: Error messages must be explicit.
- NFR-9: No data loss during sync.
- NFR-10: Historical logs must be immutable.

## 5 Optimization Concept Explanation

Optimization is a fundamental component of the MobAI system. The AI agent must minimize operational effort while maximizing warehouse efficiency.

## 5.1 Distance Optimization

The system must compute the minimum travel distance across two major flows:

1. From **Receipt Zone → Storage Location**.
2. From **Storage Location → Expedition Track**.

The objective is to reduce:

- Employee / Chariot walking distance.
- Product handling time.
- Operational congestion. ( generated path for the chariots should not interfere )

## 5.2 Optimization Factors

The AI agent should consider multiple variables:

- **Product Weight:** Heavy products should be stored closer to ground level or expedition zones.
- **Product Demand Frequency:** Frequently picked products should be stored nearer to picking racks.
- **Delivery Frequency:** High-turnover SKUs should minimize storage-to-delivery distance.
- **Reception Frequency:** Products received often should have easily accessible storage slots.
- **Slot Availability:** AI must dynamically assign based on free space.

Participants are free to implement optimization using algorithms such as shortest path computation, clustering, heuristic placement, or AI-driven learning models.

## 6 Additional Information

This section provides key domain knowledge and warehouse structure details to guide your implementation.

### 6.1 Domain Definitions

- **SKU (Stock Keeping Unit):** A unique identifier for each product variant in the inventory, used for tracking and management.
- **Stock Ledger:** A record of all stock movements, including receipts, transfers, picks, and deliveries, maintaining a historical audit trail of inventory levels over time.
- **Chariot:** Refers to carts or trolleys used in operations for moving products; capacity is ignored in this system for simplicity.

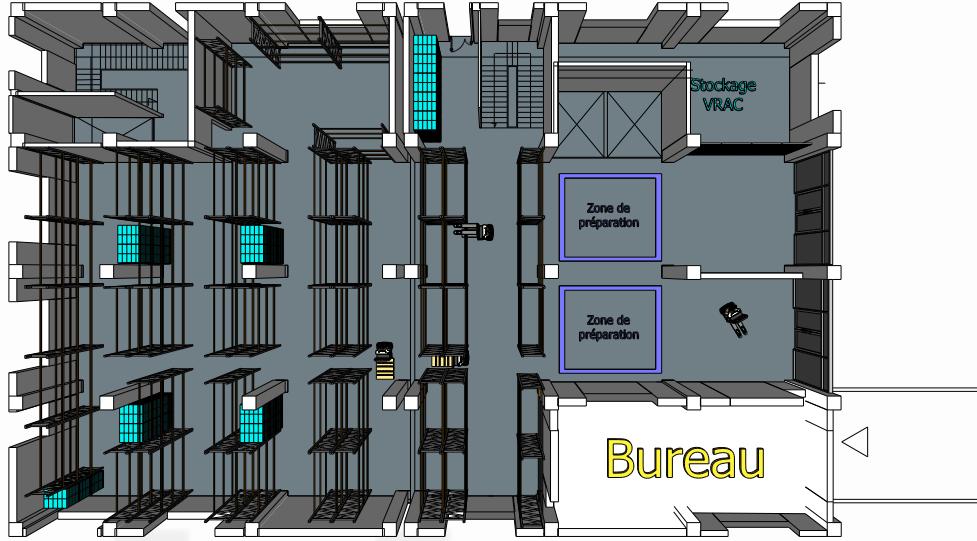


Figure 1: 3D View of picking floor

## 6.2 Warehouse Structure

The warehouse focuses on Depot B7 only. It includes storage floors (étages 1 to 4) and picking locations.

- **Picking Locations:** These are ground-level areas formatted as B7-0A-XX-YY, where 0A indicates ground level, XX is the row number (e.g., 01), and YY is the column number (e.g., 01).

- **Storage Locations:** These are on higher floors, formatted as B7-NZ-CW, where NZ indicates the level (e.g., N1 for niveau 1/first floor), and CW is the slot code (e.g., C7). There are no racks in storage; products are stored on palettes, each occupying 1 square meter. Thus, volume is not a metric to consider—focus on area and slot availability.

## 7 Operational Task Simulation

This section simulates the day-to-day workflow of each role within the warehouse system. The goal is to illustrate how users interact with the mobile WMS and AI agent in real operational contexts.

### 7.1 EMPLOYEE Task Simulation

Employees interact only with validated operational tasks. They do not see AI decision logic or override history.

1. Employee logs into the mobile application.
2. The dashboard displays assigned operational tasks for the day.

#### 3. Receipt Operation:

- Employee checks whether the commanded products have physically arrived.
- Counts received quantities.
- Records received stock in the system.

### Plan de stockage RDC

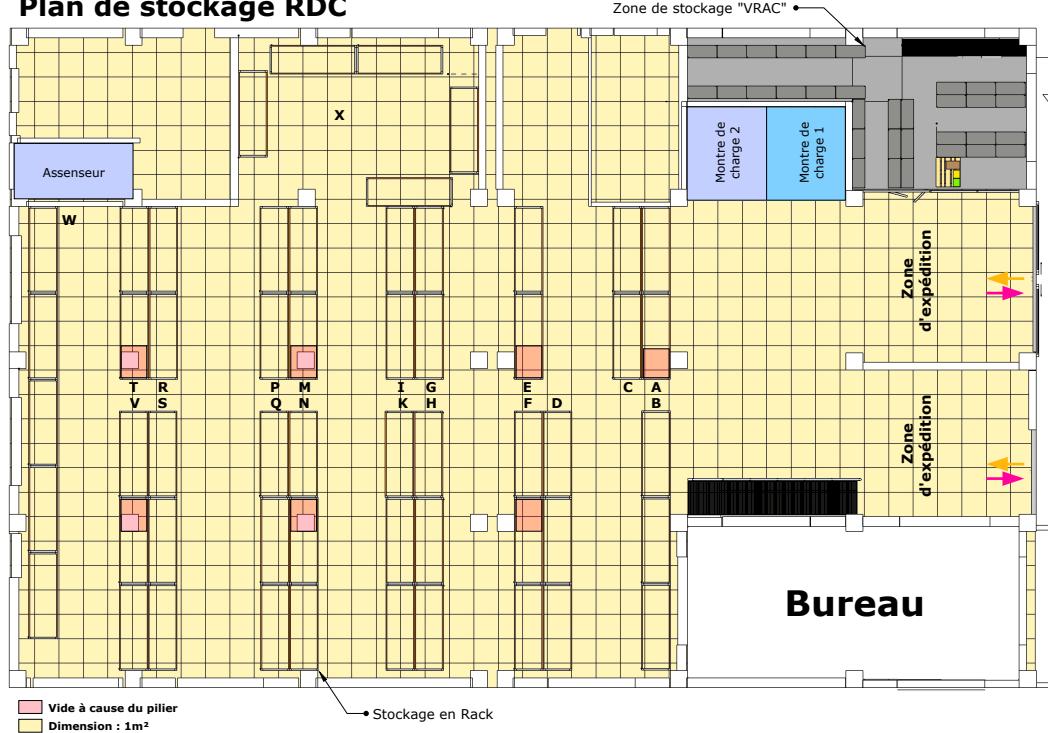


Figure 2: Logical view of picking floor

### Plan de stockage 1er et 2ème

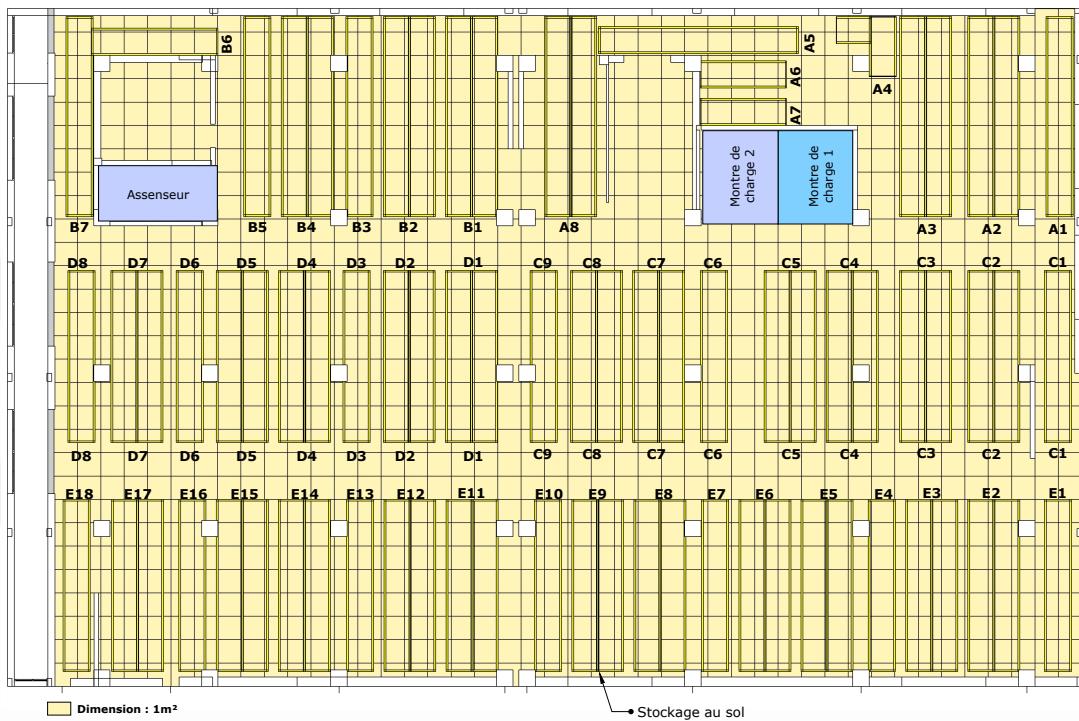


Figure 3: First and second storage floors

### Plan de stockage 3ème et 4ème

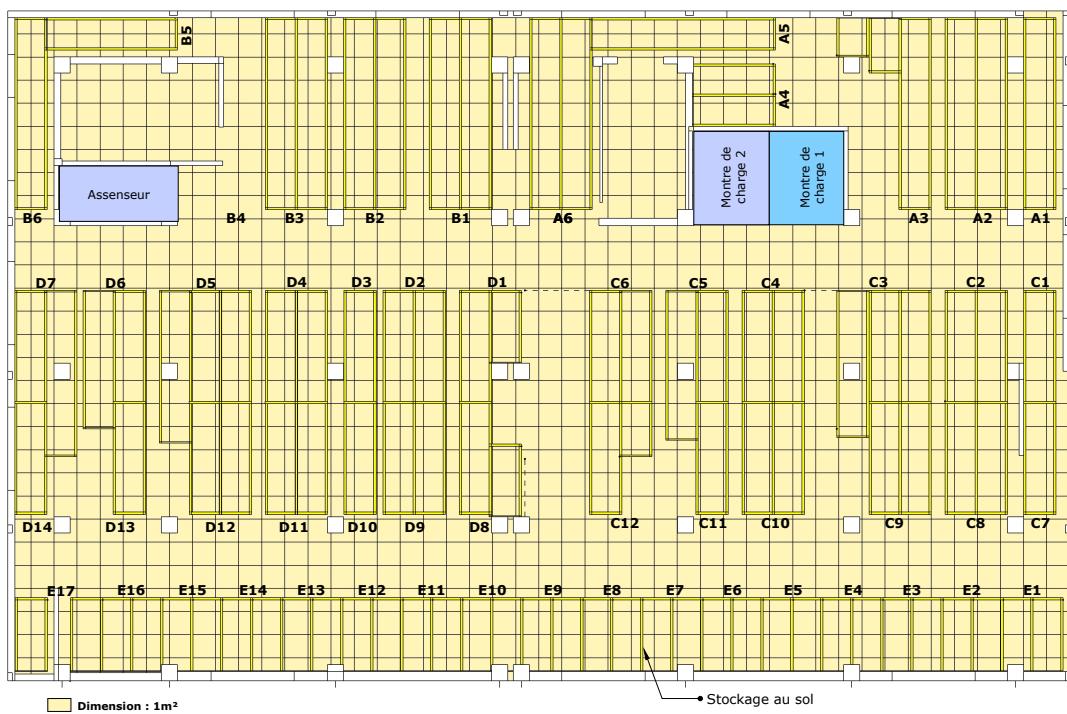


Figure 4: Third and fourth storage floors

- Flags discrepancies if quantities differ.

#### 4. Storage Assignment:

- Employee receives storage instructions generated by the AI agent.
- Instructions specify exact floor and slot location.
- Employee transports products to the assigned storage area.
- Employee validates storage completion in the system.

#### 5. Picking Assignment:

- Employee receives Picking Orders optimized by the AI agent.
- Instructions specify exact picking rack locations.
- Employee retrieves products from storage.
- Places products into designated picking racks.

#### 6. Delivery Execution:

- Employee transports picked products to the expedition track.
- Confirms delivery placement.
- Validates task completion in the system.

## 7.2 SUPERVISOR Task Simulation

Supervisors oversee operations, validate AI outputs, and monitor warehouse activity in real time.

1. Supervisor logs into the system dashboard.
2. Reviews AI-generated Preparation Orders, storage assignments, and picking routes.
3. May approve or override AI decisions.
  - Provides justification.
  - Assigns alternative locations or routes.
4. Monitors operational execution in real time:
  - Receipt, storage, picking, and delivery progress.
  - Live employee locations (via warehouse matrix/cartography view).
  - Zone occupancy and congestion between chariots.
  - AI-generated chariot paths.
  - Last known chariot positions (return to standby zone or remain in place).
5. Handles operational incidents:
  - Missing or damaged products.
  - Location conflicts.
  - Workflow bottlenecks.

### 7.3 ADMIN Task Simulation

Admins manage system configuration, users, and global warehouse control.

1. Admin logs into the administrative dashboard.
2. Manages user accounts:
  - Create users.
  - Assign roles.
  - Disable accounts.
3. Monitors AI system performance:
  - Forecast accuracy.
  - Optimization efficiency.
4. May override any AI or Supervisor decision.
5. Reviews audit logs:
  - Stock movements.
  - Overrides.
  - Operational validations.
6. Ensures system integrity and data consistency.

## 8 AI Integration Tasks

The AI agent supports warehouse decision-making through forecasting and operational optimization. Teams must design a multi-service agent integrated with real-time warehouse workflows.

### 8.1 Forecasting Service

Generates Preparation Orders by analyzing historical stock and delivery data.

- Predict required products and quantities.
- Trigger preparation one day in advance.
- Improve accuracy over time.

### 8.2 Storage Optimization Service

Determines optimal storage locations after receipt.

- Considers weight, demand frequency, slot availability, and distance.
- Outputs exact floor and slot assignment.



### 8.3 Picking Optimization Service

Generates optimized Picking Orders for delivery preparation.

- Compute shortest routes.
- Minimize travel time.
- Prioritize high-frequency SKUs near expedition zones.

### 8.4 Override Handling

Supervisors and Admins may override AI outputs with justification. All overrides are logged, and Employees execute validated decisions only.

## 9 Final Deliverables

By the end of the hackathon, your team must submit:

- An APK file for the mobile WMS app.
- A UI/UX prototype (e.g., Figma or similar design files).
- Defined User Workflows / diagrams for:
  - Warehouse Employee (Operator)
  - Warehouse Supervisor
  - Warehouse Manager / Admin
- An AI implementation, including:
  - The multi-service agent for forecasting and optimization.
  - A decision flow diagram explaining AI integration with operations.
  - A comparative analysis between a naive baseline solution and your proposed algorithm.
  - Technical documentation covering models, optimization logic, and evaluation methodology. ( max 4 pages )

## 10 Let's Get Started!

Never forget that a hackathon is all about learning, networking and having a good time. Do your best, don't overwhelm yourselves with challenges, we tried our maximum to give you a theme that will be valuable on your portfolios and CV's. For now, enjoy the moment, because this is also MobAI !