Airline Catering Inventory System

May 15, 2025

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II. Project Description

A. Overview

The Airline Catering Inventory System aims to streamline the logistics management, mainly concerning warehouses, for in-flight meals, snacks, and beverages, ensuring accurate preparation and timely delivery for each flight. It upgrades the inventory software infrastructure of catering facilities to enhance operational efficiency, reduce waste, and quickly adapt to ever-changing flight schedules. The ultimate goal is to eliminate inefficiencies caused by layers of unnecessary manual processing, minimize waste, and prevent delays that could disrupt flight departures.

B. What this project does

This project implements a centralized database system that enables employees and managers to manage and track airline catering operations actively. Employees can update inventory counts in real-time, while managers can allocate resources, assign meal orders to specific flights, and monitor supplier deliveries. The system tracks detailed meal compositions (e.g., vegan, Italian) and ensures they align with passenger preferences and flight requirements. It also acts as a tool for monitoring catering facility inventory levels, identifying low stock, and generating restocking alerts. By offering a clear, real-time view of operations, the system allows facilities to make quicker decisions, reduce human errors, and maintain efficient workflows.

C. Why is it needed

Airline catering might sound simple, but it is complex and time-sensitive. Changes can happen every hour of the day, especially with the commonality of air travel. Each airline company has different inventory requirements, and each flight requires a different set of items. Any delay could lead to flight delays and financial losses. This project automates tedious tasks to reduce labor costs and increase efficiency. It can also reduce food waste, especially with large quantities of left-over supplies that can expire.

D. What Problem does it solve?

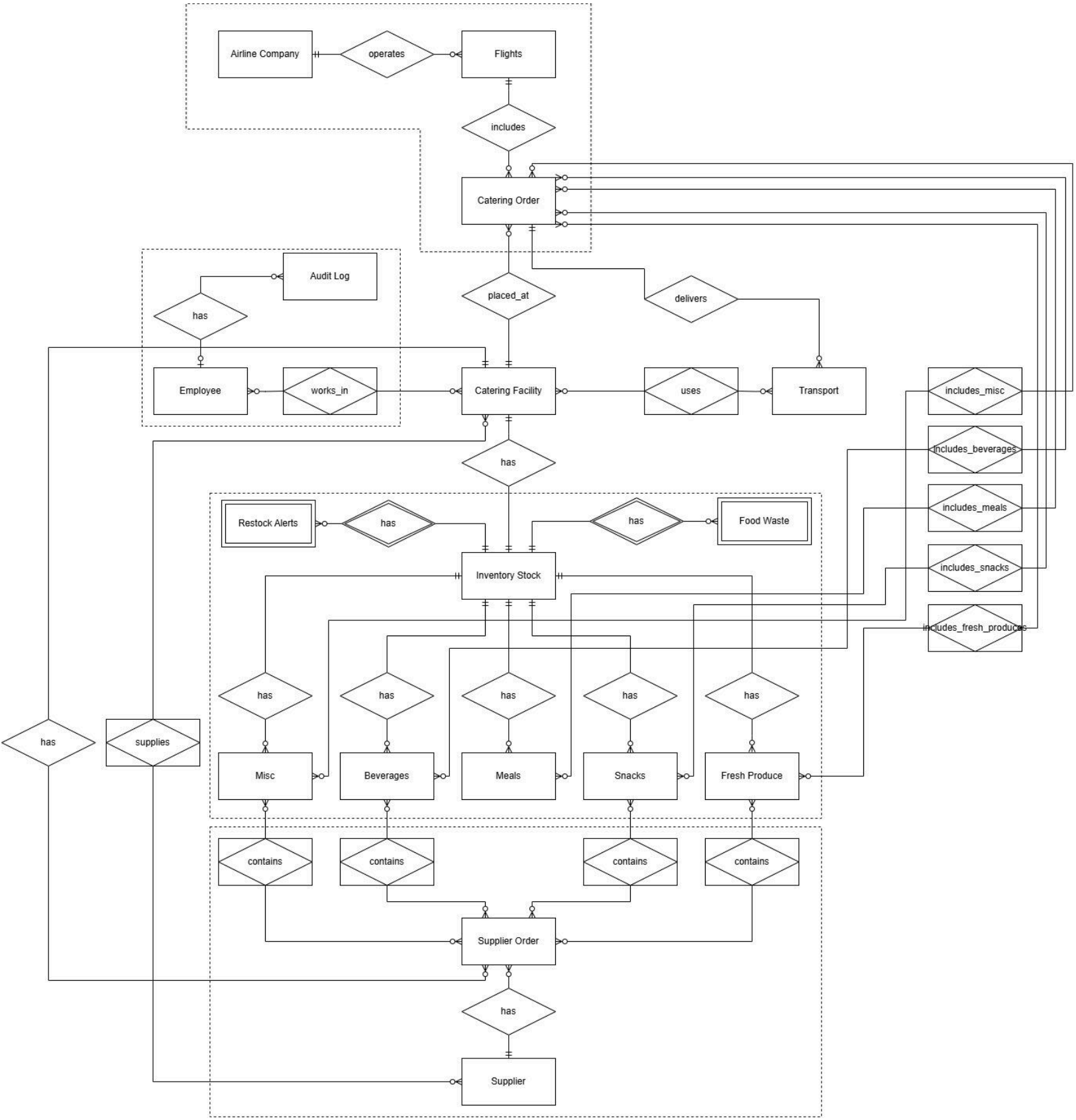
This project, inspired by my parent's workplace and its lack of software infrastructure, aims to improve inventory management through a more efficient, automated solution. Their outdated practices still rely heavily on manual tracking and basic Excel sheets. Believe it or not, many errors–especially in inventory tracking–stem from human miscounts of incoming and outgoing supplies. It's like a game of telephone, where inventory records are passed from person to person, increasing the likelihood of mistakes. These frequent errors ultimately fall on management, requiring additional effort and time to correct them.

E. Who does this benefit?

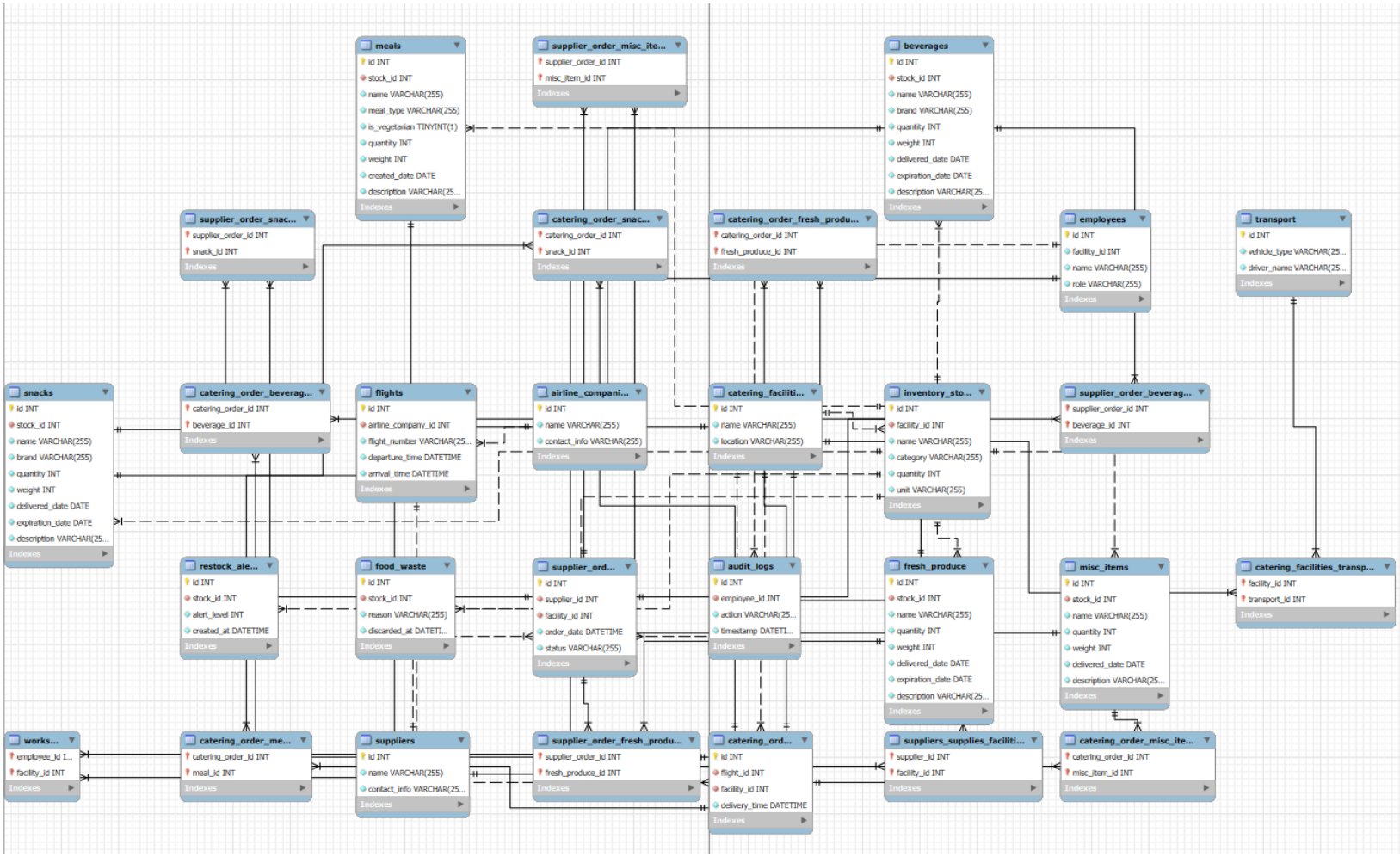
This system benefits airlines, catering companies, and passengers. Airlines will streamline operations, ensure timely flight departures, and improve the passenger

experience. Catering companies will optimize personnel use and increase profits by reducing costs associated with human error. Finally, passengers can enjoy their preferred meals and beverages without disappointment–after all, no one wants to hear, “Sorry, we’re out of that.”

F. ERD Diagram



G. EERD Diagram



III. List of Use Cases

A. List of Actors

1. Employees (either Inventory staff or Kitchen staff, but I'm avoiding encoded roles here)

Directly manage stock levels (incrementing/decrementing quantities) by updating the system for received and used inventory, tracking expiration dates, and handling storage logistics.

2. Managers

They inherit all the privileges of an employee. Additionally, they oversee inventory and audit logs, create supplier orders, add, edit, or remove catering orders, modify meal data, and adjust flight details to ensure proper catering services.

3. System Administrators

System administrators inherit all the privileges of the Manager. They can manage database security, change access controls, alter data, create employees, and perform maintenance.

B. List of Use Cases

1. Manage inventory levels (same for accounting new deliveries)

Actor: Employee

1) The employee accesses the inventory list.
2) Filter by inventory type: i.e., beverages.
3) The employee input quantity to increment/decrement.
4) The employee submits the audit to update the inventory level.

2. Manage food waste

Actor: Employee

1) The employee accesses the inventory list.
2) Employees filter the inventory by expiration date.
3) The employee finds an expired item and moves the item to the food waste.
4) The system updates the inventory and moves the item to the food waste record.

3. Creating a Catering order

SQL Statement 1:

```
GET_BEVERAGES_FOR_ORDER = SELECT b.id, b.inventory_id, b.name,
b.brand, cob.quantity AS quantity, b.weight, b.delivered_date,
b.expiration_date, b.description \
```

```
   FROM beverages b \
   JOIN catering_order_beverages cob \
   ON b.id = cob.beverage_id \
   WHERE cob.catering_order_id = ?
```

SQL Statement 2:

```
INSERT_BEVERAGE_TO_ORDER = INSERT INTO catering_order_beverages
(catering_order_id, beverage_id, quantity) VALUES (?, ?, ?)
```

Actor: Manager

1) The manager accesses the catering order system.
2) The manager selects the option to create a new catering order.
3) The system prompts the manager for the required details.
4) The manager provides the following information:
    a) Associated flight details
    b) Catering facility
    c) Requested snacks, beverages, and meals
    d) Additional miscellaneous items.
5) The manager submits the catering order, and the system confirms its creation.

4. Editing a Catering order (same as closing the order)

Actor: Manager

1) The manager accesses the catering order system.
2) The manager selects an existing catering order to edit.
3) The system retrieves and displays the order details.
4) The manager makes necessary modifications (e.g., adjusting items, changing transport, updating facility details).
5) The manager submits the changes.
6) The system validates the edits and confirms its successful update.

5. Adding a new inventory item

SQL Statement 3:

```
BEVERAGE_INSERT = INSERT INTO beverages \
   (inventory_id, name, brand, quantity, weight, delivered_date,
expiration_date, description) \
   VALUES (?, ?, ?, ?, ?, ?, ?, ?)
```

Actor: Manager

1) The manager accesses the inventory list.
2) The manager selects the option to add a new inventory item.
3) The system prompts the manager to enter item details.
4) The manager provides the following information:
    a) Item type (beverages/snacks/meals/fresh produce/misc)
    b) Name
    c) Description
5) The manager can then submit the form to create the new inventory item.

6. Editing an inventory item

Actor: Manager

1) The manager accesses the inventory list.
2) The manager selects an inventory item to edit.
3) The system retrieves and displays the item's details.
4) The manager updates the necessary information (e.g., name, description, item type).
5) The manager submits the changes.
6) The system confirms that the inventory item has been successfully updated.

7. Deleting an inventory item

Actor: Manager

1) The manager accesses the inventory list.
2) The manager selects an inventory item to delete.
3) The system prompts the manager for confirmation.
4) The manager confirms the deletion.
5) The system removes the item from the inventory.

8. Fix inventory error

Actor: Manager

1) The manager accesses the inventory list.
2) The manager finds the item they want to fix and opens it.
3) The manager will have an option to manually overwrite the quantity (the employee can only increment/decrement the amount).
4) They can then press the submit button to apply the changes.

9. Check Employee audit logs

Actor: Manager

1) The manager accesses the audit logs system.
2) The manager can browse and inspect the audits.
3) They can filter the audit by employees.

10. Check the restock alerts.

Actor: Manager

1) The manager accesses the inventory management system.
2) The manager views the list of restock alerts.
3) The manager reviews the alerts and inspects low-stock items.

11. Create a supplier order

Actor: Manager

1) The manager accesses the supplier order system.
2) The manager initiates a new supplier order, which will bring up a supplier order form.
3) The manager can then fill out the form:
    a) Select the supplier
    b) The requested inventory
4) They can then submit to create the order.

12. Add a new employee

Actor: System Administrators

1) Enter name
2) Enter role
3) Enter employee ID
4) Create login
5) Enter Catering Facility

- Each employee must be unique
- The employee must be assigned to an existing catering facility

13. Remove an employee

Actor: System Administrators

1) Open up the employee list
2) Locate the employee to be removed via employee ID or name
3) The admin selects the option to remove the employee.
4) The system prompts for confirmation and will remove the employee once it is confirmed.

14. Append to any entity (primarily Airlines, Suppliers, and Catering Facilities)

Actor: System Administrators

1) Open up the desired entity list
2) Add the new entity along with its details and descriptions.
3) Confirm, and the system will append the entity.

IV. Functional Database Requirements

A. List of Main Entities

1. **Airline Companies**
   Different airline companies require catering services for their flights.

2. **Flights**
   Individual flights that require catering services link to an airline company and a catering order.

3. **Catering Order**
   Individual catering requests for flights, specifying meals, snacks, misc, and beverages needs. It also tracks which catering facility the order goes to.

4. **Catering Facility**
   The physical location where inventory is stored, meals are prepared, and catering orders are processed.

5. **Employees**
   Mainly used to keep track of staff member accounts working at catering facilities and are responsible for managing inventory and processing orders. They could be any of the actors: employee, manager, or system administrator.

6. **Audit Log**
   Records system actions taken by employees, including inventory updates and modifications. It is mainly used for error checking and fixing.

7. **Inventory Stock**
   Represents all stored food and drink items, including meals, beverages, snacks, and miscellaneous items.

8. **Suppliers**
   The companies that provide raw materials, beverages, snacks, and other catering supplies.

9. **Supplier Order**
   The supplier order is a purchase order placed with suppliers to replenish inventory stock. It tracks delivery status and dates.

10. **Restock Alert**
    A log of alerts that trigger when inventory reaches a critical level, notifying staff to reorder stock. Critical when inventory is typically enormous.

11. **Beverages**
    The various drink options that are available for catering.

12. **Snacks**
The various packaged or prepared snack options for flights.

13. **Misc**
The non-food inventory items such as utensils, napkins, or packaging materials.

14. **Fresh Produce**
The perishable raw ingredients used for meal preparations, such as fruits and vegetables.

15. **Meals**
The different meal types served on flights, including dietary preferences.

16. **Food waste**
Logs wasted food, beverages, and fresh produce, tracking reasons and amount discarded.

17. **Transport**
Tracks the assignment/schedule of a facility's trucks/vehicle to a catering order, ensuring timely delivery of meals and inventory to airlines.

B. List of Relationships

1. **Airline Companies - Flights**
Airline Companies have a 1 to many relationship with Flights

- An airline can have zero or many flights.
- However, each flight belongs to one and only one airline company.

2. **Flights – Catering Order**
Flights have a 1 to many relationship with Catering Order.

- A flight can have zero or many catering orders.
- A catering order can only belong to one and only one flight.

3. **Catering Facility - Catering Order**
Catering Facility have a 1 to many relationship with Catering Order.

- A catering facility can have zero or many catering orders.
- Each catering order is linked to one and only one catering facility.

4. **Catering Facility - Transport**
Catering facility has a many-to-many relationship with Transport.

- A catering facility can have zero or many transport.
- Each transport can operate at zero or many catering facility.

5. **Catering Order - Transport**
Catering Order has a 1 to many relationship with Transport.

- A Catering Order can have zero or many transports to deliver items.
- Each transport can only operate on one and only one flight at a time.

6. Catering Facility - Employee

Catering Facility has a many-to-many relationship with Employee.

- A catering facility can have zero or many employees.
- An employee can work in zero or many catering facilities.

7. Employee - Audit Log

Employee has a 1 to many relationship with Audit Log.

- A employee can have zero or many audit logs.
- A audit log can only belong to zero (employee was removed; however, log must remain intact) or one employee.

8. Catering Facility - Inventory Stock

Catering Facility has a 1 to 1 relationship with Inventory Stock.

- A catering facility should only have one and only one inventory stock.
- A inventory stock can only belong to one and only one catering facility.

9. Inventory Stock - Beverages

Inventory Stock has a 1 to many relationship with Beverages.

- A inventory stock can have zero or many types of beverages.
- Each beverage belongs to one and only one inventory stock.

10. Inventory Stock - Snacks

Inventory Stock has a 1 to many relationship with Snacks.

- A inventory stock can have zero or many types of snacks.
- Each snack belongs to one and only one inventory stock.

11. Inventory Stock - Meals

Inventory Stock has a 1 to many relationship with Meals.

- A inventory stock can have zero or many types of meals.
- Each meal belongs to one and only one inventory stock.

12. Inventory Stock - Misc

Inventory Stock has a 1 to many relationship with Misc.

- A inventory stock can have zero or many types of Misc items.
- A misc item belongs to one and only one inventory stock.

13. Inventory Stock - Fresh Produce

Inventory Stock has a 1 to many relationship with Fresh Produce

- A inventory stock can have zero or many types of fresh produce.
- A fresh produce belongs to one and only one inventory stock.

14. **Inventory Stock - Restock Alerts**
Inventory Stock has a 1 to many relationship with Restock Alerts.

- A inventory stock can have zero or many restock alerts.
- A restock alert can only belong to one and only one inventory stock.

15. **Inventory Stock - Food Waste**
Inventory Stock has a 1 to many relationship with Food Waste.

- A inventory stock can have zero or many food waste.
- Each Food Waste record is associated with one and only one Inventory Stock.

16. **Suppliers - Supplier Order**
Suppliers has a 1 to many relationship with Supplier Order.

- A supplier can have zero or many supplier orders.
- A supplier order can only belong to one and only one supplier.

17. **Suppliers Order - Beverages**
Supplier Order has a many-to-many relationship with Beverages.

- A supplier order can include zero or many types of beverages.
- A beverage can appear in zero or many supplier orders.

18. **Supplier Order - Snacks**
Supplier Order has a many-to-many relationship with Snacks.

- A supplier order can include zero or many types of snacks.
- A snack can appear in zero or many supplier orders.

19. **Supplier Order - Fresh Produce**
Supplier Order has a many-to-many relationship with Fresh Produce.

- A supplier order can include zero or many types of fresh produce.
- A fresh product can appear in zero or many supplier orders.

20. **Supplier Order - Misc**
Supplier Order has a many-to-many relationship with Misc.

- A supplier order can include zero or many types of miscellaneous items.
- A miscellaneous item can appear in zero or many supplier orders.

21. **Catering Order - Snacks**
Catering Order has a many-to-many relationship with Snacks.

- A catering order can include zero or many types of snacks.
- A snack can be part of zero or many catering orders.

22. **Catering Order - Beverages**
Catering Order has a many-to-many relationship with Beverages.

- A catering order can include zero or many types of beverages.
- A beverage can be part of zero or many catering orders.

23. Catering Order - Meals

Catering Order has a many-to-many or zero relationship with Meals.

- A catering order can include zero or many types of meals.
- A meal can be part of zero or many catering orders.

24. Catering Order - Misc

Catering Order has a many-to-many relationship with Misc.

- A catering order can include zero or many types of miscellaneous items.
- A miscellaneous item can be part of zero or many catering orders.

25. Catering Order - Fresh Produce

Catering Order has a many-to-many relationship with Fresh Produce (fruits, cheese, etc.).

- A catering order can include zero or many types of fresh produce.
- A fresh produce item can be part of zero or many catering orders.

26. Catering Facility - Supplier

Catering Facility has a many-to-many relationship with Supplier.

- A catering facility can have zero or many suppliers.
- A supplier can supply to zero or many catering facilities.

27. Catering Facility - Supplier Order

Catering Facility has a 1 to many relationship with Supplier Order.

- A catering facility can have zero or many supplier orders.
- A supplier order can only belong to one and only one catering facility.

V. Non Functional Database Requirements

A. Performance

- The system must support 100,000 flights per year and 1 million meal orders.
- Queries for inventory status should be executed in 0.20 seconds or less.
- The system must be able to handle concurrent inventory changes.
- The system must handle 500 concurrent users without significant performance degradation.
- Inventory updates should reflect in real time across all users.
- The system must maintain 99.99% uptime due to the frequency of flights.

B. Backup

- There should be daily database backups to ensure data recovery.
- Order records are to be retained for 1 year for auditing purposes.

- Backups should be incremental to minimize storage costs while ensuring complete data recovery.
- Point-in-time recovery should be enabled to restore data to a specific moment in case of corruption.

C. Security

- Role-based access control for employees.
- Secure database connections using SSL/TLS encryption.
- Employee credentials should be encrypted.
- Two-factor authentication is required for all employees.
- Audit logs for all modifications to orders and inventory.
- Employee data should be masked for non-administrative users.