DBA 210 FINAL PROJECT- ALYSSA'S KITCHEN ATLAS

Introduction

"Alyssa's Kitchen Atlas" is a restaurant that sells all of Alyssa's favorite meals from various cuisines. It is intended to be a small sit-down cafe that specializes in to-go food ordered via an online ordering application. The purpose of this project is to create and document a database system to manage customers and their orders efficiently.

Database Access Information:

- **URL:** http://20.121.52.23/phpmyadmin
- **Username:** atlas_readonly
- **Password:** Professor2025!

Entity Relationship Narrative

The database consists of 11 core tables managing customers, orders, menu items, ingredients, loyalty transactions, and operational data.

Link to ERD: https://dbdiagram.io/d/Alyssas-Kitchen-Atlas-6883259fcca18e685caf6a91

Business Rules:

- Orders must have at least one item
- Customers can choose to eat in the café or get their food to-go
- Customers can call or use the online ordering software to schedule a pick-up order
- Customers have the option to include a note or special request when placing an online order
- Customers can include any allergies and/or dietary restrictions in their customer profile
- Customers can exclude any ingredient in a menu item
- An automatic 4% gratuity is added to all orders for the kitchen staff
- Customers have the option to leave gratuity for the servers/FOH staff on all orders
- Customers can accrue points per dollar spent with a loyalty rewards program (1pt per $1)
- When 100 pts are accrued, customers can have $5 off their order total
- If a customer can prove that he/she is a member of the local MADabolic gym (via a MADperks card), then he/she will receive 10% off their order
- The online ordering software allows users to view the real-time waiting list for café seats and the estimated wait time for to-go orders (depending on order-size)
- Estimated wait times for to-go food will be dependent on the number of total items the kitchen is making per 15 min period
- Each order will need a timestamp (to calculate kitchen load/wait times)
- The online ordering software will show an "order status" ('pending', 'preparing', 'ready')
- The online ordering software will reflect items that are out of stock/not-available

Database Constraints

The database enforces business rules through the following constraints:

- **Order total validation:** Ensures total_amount = subtotal + kitchen_gratuity + server_gratuity - madperks_discount - loyalty_discount
- **Kitchen gratuity enforcement:** Automatically calculates as exactly 4% of subtotal
- **Loyalty points validation:** Prevents negative loyalty point balances
- **Email uniqueness:** Ensures no duplicate customer email addresses
- **Allergen logic enforcement:** Allergen ingredients must specify allergen type
- **Price validation:** All prices and quantities must be positive values

Operational Features:

- **Kitchen Load Tracking:** Real-time monitoring via kitchen_load table updates every 15 minutes
- **Ingredient Exclusions:** order_excluded_ingredients table allows customers to remove specific ingredients
- **Wait Time Estimation:** Calculated based on prep times and current kitchen capacity

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Database Normalization

First Normal Form

A Table is in First Normal Form if:

1. All attributes contain atomic (indivisible) values
2. Each column contains values of a single type
3. Each column has a unique name
4. The order of rows and columns doesn't matter

Steps Taken to Achieve 1NF:

1. Separated composite fields: Split full names into first_name and last_name
2. Atomic pricing: Separated order totals into individual components (subtotal, gratuities, discounts)
3. Single-value attributes: Ensured each column contains only one type of data
4. Eliminated repeating groups: Used separate tables instead of multiple values in single fields

Second Normal Form

A Table is in Second Normal Form if:

1. It is in First Normal Form (1NF)
2. All non-key attributes are fully functionally dependent on the entire primary key
3. No partial dependencies exist (relevant only for composite primary keys)

Steps Taken to Achieve 2NF:

1. Identified composite keys: Found tables where primary key consists of multiple attributes
2. Verified full dependency: Ensured all non-key attributes depend on the complete primary key
3. Eliminated partial dependencies: Moved attributes that only depend on part of a composite key to separate tables
4. Created proper relationships: Used foreign keys to maintain data relationships

Third Normal Form

A Table is in Third Normal Form if:

1. It is in Second Normal Form (2NF)
2. No transitive dependencies exist (non-key attributes don't depend on other non-key attributes)
3. All non-key attributes depend directly on the primary key

Steps Taken to Achieve 3NF:

1. Identified transitive dependencies: Found attributes that depend on other non-key attributes
2. Created separate tables: Moved transitively dependent attributes to their own tables
3. Established foreign key relationships: Connected tables using appropriate foreign keys
4. Verified direct dependencies: Ensured all remaining attributes depend directly on primary keys

Benefits of Normalization

- Data integrity and consistency
- Elimination of data redundancy, thus reduced storage requirements and optimized performance
- Enhanced data security via user accounts and access controls (for example, protecting customers' payment information from restaurant staff)
- Flexible database evolution: schema changes are easier when one change doesn't affect multiple tables at once

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Database Setup

Prerequisites

- MySQL 8.0+ or Azure Database for MySQL
- MySQL Workbench for database management
- Admin privileges for user creation

Installation Steps

Step 1: Database Creation

```
-- Run the main schema script
mysql -u admin -p < kitchen_atlas_schema.sql

-- Run additional components
mysql -u admin -p < kitchen_atlas_complete.sql
```

Step 2: Verify Installation

```
-- Check table creation
USE alyssas_kitchen_atlas;
SHOW TABLES;

-- Verify sample data
SELECT COUNT(*) FROM customers;    -- Should return 5
SELECT COUNT(*) FROM menu_items;   -- Should return 15
```

```
8. SELECT COUNT(*) FROM orders;       -- Should return 8
```

Step 3: Test Core Functionality

```
1. -- Test views
2. SELECT * FROM popular_dishes_view LIMIT 5;
3.
4. -- Test stored procedure
5. CALL CalculateEstimatedWaitTime(1, '[{"menu_item_id": 1, "quantity": 1}]',
@minutes, @ready_time);
6. SELECT @minutes, @ready_time;
```

Views, Stored Procedures, and Test Queries

Views

1. **popular_dishes_view**
   - Tracks menu item popularity and sales performance
   - Key metrics: total orders, quantity sold, revenue, popularity status
   - Business value: identifies hot-selling items and items needing promotion
2. **customer_order_history_view**
   - Comprehensive customer analytics and segmentation
   - Key metrics: total spent, order frequency, loyalty usage, customer tier
   - Business value: enables targeted marketing and VIP customer identification
3. **kitchen_performance_view**
   - Daily operational metrics and completion tracking
   - Key metrics: order volume, completion rates, revenue trends
   - Business value: operations management and performance optimization

Stored Procedures

1. **CalculateEstimatedWaitTime**
   - Calculates estimated wait time based on order items and current kitchen load
   - Uses JSON input for flexible order processing
   - Combines base prep times with kitchen capacity factors
2. **ApplyLoyaltyDiscount**
   - Calculates maximum loyalty discount available for customer
   - Enforces business rule: 100 points = $5 discount, maximum 25% of order total
3. **ProcessCompleteOrder**
   - End-to-end order processing with automatic calculations
   - Handles loyalty points, MADperks discounts, and gratuity calculations
   - Creates order and updates customer loyalty points automatically
4. **UpdateMenuItemAvailability**
   - Updates menu item availability status with audit logging
   - Used by kitchen staff to mark items as out of stock

Backup Strategy

Backup Schedule

- **Daily:** Azure automated backups with 7-day retention
- **Weekly:** Manual MySQL Workbench exports with 4-week retention
- **Monthly:** Archive backups to Azure Blob Storage with 12-month retention

Backup Methods

Azure Automated Backups

- Point-in-time restore capability with 5-minute granularity
- Geo-redundant storage with automatic failover
- No additional configuration required

Manual Backup Process Using MySQL Workbench

1. Open MySQL Workbench
2. Connect to Azure MySQL database
3. Go to Server → Data Export
4. Select 'alyssas_kitchen_atlas' database
5. Choose "Export to Self-Contained File"
6. Include Create Schema, MySQL Routines, and MySQL Events
7. Set filename: alyssas_kitchen_atlas_backup_YYYYMMDD.sql
8. Click "Start Export"

Nightly Automatic Backup Script

```
@echo off
set BACKUP_DATE=%date:~-4,4%%date:~-10,2%%date:~-7,2%
set BACKUP_DIR=C:\Database_Backups\AlyssasKitchenAtlas
set BACKUP_FILE=%BACKUP_DIR%\alyssas_kitchen_atlas_nightly_%BACKUP_DATE%.sql

mysqldump -h your-azure-server.mysql.database.azure.com -u atlas_admin -p --single-transaction --routines --triggers alyssas_kitchen_atlas > "%BACKUP_FILE%"

if %ERRORLEVEL% EQU 0 (
    echo Backup completed successfully: %BACKUP_FILE%
) else (
    echo Backup failed!
)
```

Recovery Procedures

- Recovery Time Objective (RTO): 2 hours maximum downtime
- Recovery Point Objective (RPO): 15 minutes maximum data loss
- Azure Portal: Point-and-click restore for automated backups

- Manual Restore: MySQL Workbench Data Import for manual backups

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User Account Management

PhpMyAdmin: http://20.121.52.23/phpmyadmin

Database User Accounts

Database Administrator

- Privileges: Full database privileges
- Purpose: schema changes, user management, maintenance
- Username: atlas_admin
- Password: AdminKitchen2025!

Restaurant Manager

- Privileges: SELECT privileges on all tables, views, and reporting procedures
- Purpose: business analytics and performance reporting
- Username: atlas_manager
- Password: ManagerView2025!

Kitchen Staff

- Privileges: Order status updates, menu availability management
- Purpose: operational order management
- Username: atlas_kitchen
- Password: KitchenStaff2025!

Customer Service

- Privileges: Customer data access, order processing, wait list management
- Purpose: customer support and order assistance
- Username: atlas_service
- Password: ServiceDesk2025!

Application Access

- Privileges: Limited menu viewing, order placement capabilities
- Purpose: web/mobile application backend
- Username: atlas_app
- Password: AppAccess2025!

Instructor Access

- Privileges: SELECT privileges on all database objects
- Purpose: project evaluation and grading
- Username: **atlas_readonly**
- Password: **Professor2025!**

User Account Security Implementation

- Customer passwords stored using SHA-256 hashing: SHA2('password123', 256)
- Principle of least privilege applied to all user accounts
- SSL/TLS encryption enforced for all database connections

Server Monitoring Strategy

MySQL Workbench Monitoring Tools

Performance Dashboard

- Access: Server → Performance Dashboard in MySQL Workbench
- Monitor: network traffic, MySQL connections, throughput, InnoDB operations
- Schedule: daily 2-minute review, weekly 10-minute analysis

Server Status Variables

- Access: Server → Server Status in MySQL Workbench
- Key metrics: connection count, slow queries, buffer pool efficiency
- Critical queries: SHOW STATUS LIKE 'Threads_connected', 'Slow_queries', 'Innodb_buffer_pool%'

Client Connections Monitoring

- Access: Server → Client Connections in MySQL Workbench
- Monitor: active connections, long-running queries, blocked processes
- Daily check: look for queries running longer than 30 seconds

Azure Portal Monitoring

- **CPU Usage:** Alert when > 85% for 5+ minutes
- **Storage Usage:** Alert when > 85% capacity
- **Connection Count:** Monitor against connection limits
- **Failed Connections:** Alert on > 10 failures per minute

Conclusion

The Alyssa's Kitchen Atlas database successfully implements a comprehensive restaurant management system with advanced features including real-time kitchen load monitoring, sophisticated loyalty programs, allergen management, and multi-channel ordering capabilities.