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Introduction

This phase focuses on implementing database triggers and stored procedures to enhance our database automation. The assignment involves developing multiple triggers to automate relevant database tasks and creating stored procedures for database operations.

We have made some changes in our database to fix the errors from the previous stage. Noticeable changes are: We removed padded zeros from GuestID, SSN and TransactionID's Insert Into statements, renamed Use table to P_Use due to MySQL's naming conventions, fixed erroneous many-to-many table relationships into one-to-many by fixing primary keys or adding "UNIQUE" keyword when needed, added int daysParked to Parking table to track how many days a car of a specific guest has been parked, changed ResOwner to Bool.

Triggers

Room Vacancy Check:

The 'check_room_vacancy' trigger prevents double-booking by verifying room availability before allowing new reservations. It checks if the requested room is vacant and not already reserved with another active status. If the room is occupied or has an existing reservation, it blocks the new reservation with an error message. When a valid reservation is created, it automatically updates the room's vacancy status to FALSE.

Inside before_trigger_3 we can see the room 650 reserved by James Davis, after_trigger_3.png shows us the attempt of adding a GuestID 6 as a ResOwner(ResStatus is Confirmed) to this room(commented out with --). However room 650 already has a ResOwner so at action 14 we can see the error message that this room is already occupied.

```
DELIMITER //

CREATE TRIGGER check_room_vacancy
BEFORE INSERT ON Reserve
FOR EACH ROW
BEGIN
    DECLARE room_is_vacant BOOLEAN;
    DECLARE existing_reservation VARCHAR(40);

    -- Check if the room is vacant in the Rooms table
    SELECT Vacancy INTO room_is_vacant
    FROM Rooms
    WHERE RoomID = NEW.RoomID;

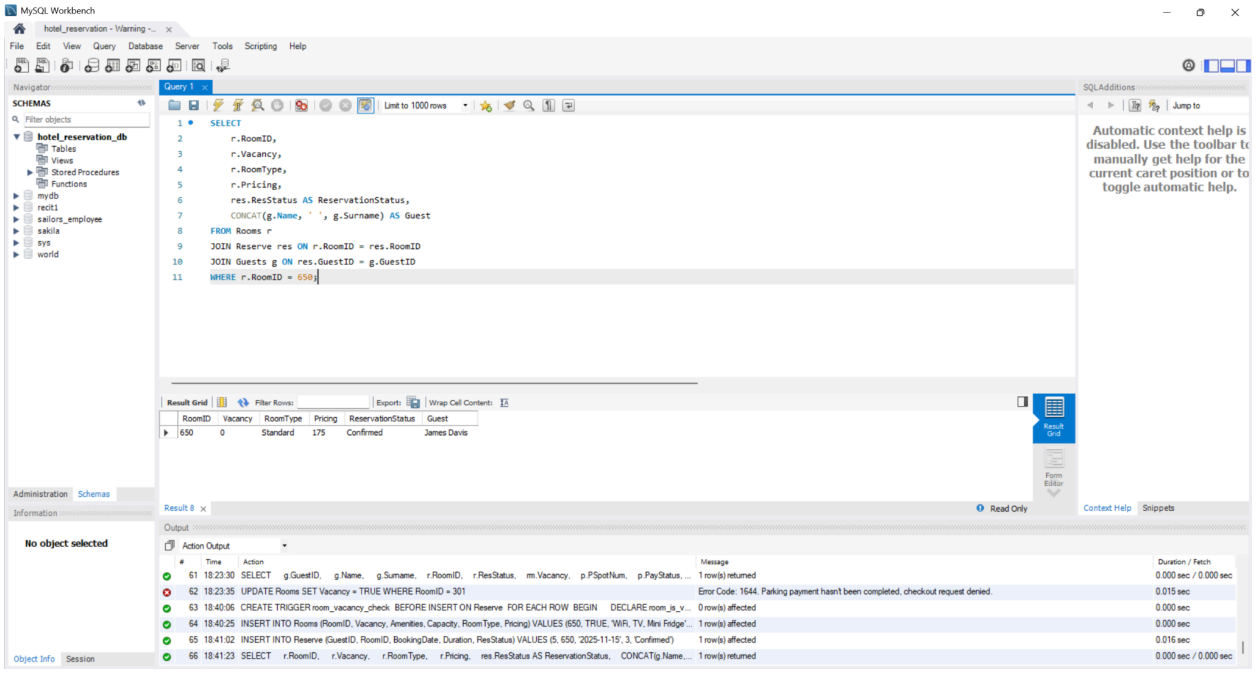
    -- Check if there's already an active reservation for this room
    SELECT ResStatus INTO existing_reservation
    FROM Reserve
    WHERE RoomID = NEW.RoomID
    AND ResStatus IN ('Confirmed', 'Pending', 'Waiting List')
    LIMIT 1;

    -- If room is not vacant raise the 45000
    IF room_is_vacant = FALSE OR existing_reservation IS NOT NULL THEN
        SIGNAL SQLSTATE '45000'
        SET MESSAGE_TEXT = 'Cannot reserve room: Room is already occupied or
reserved';
    END IF;

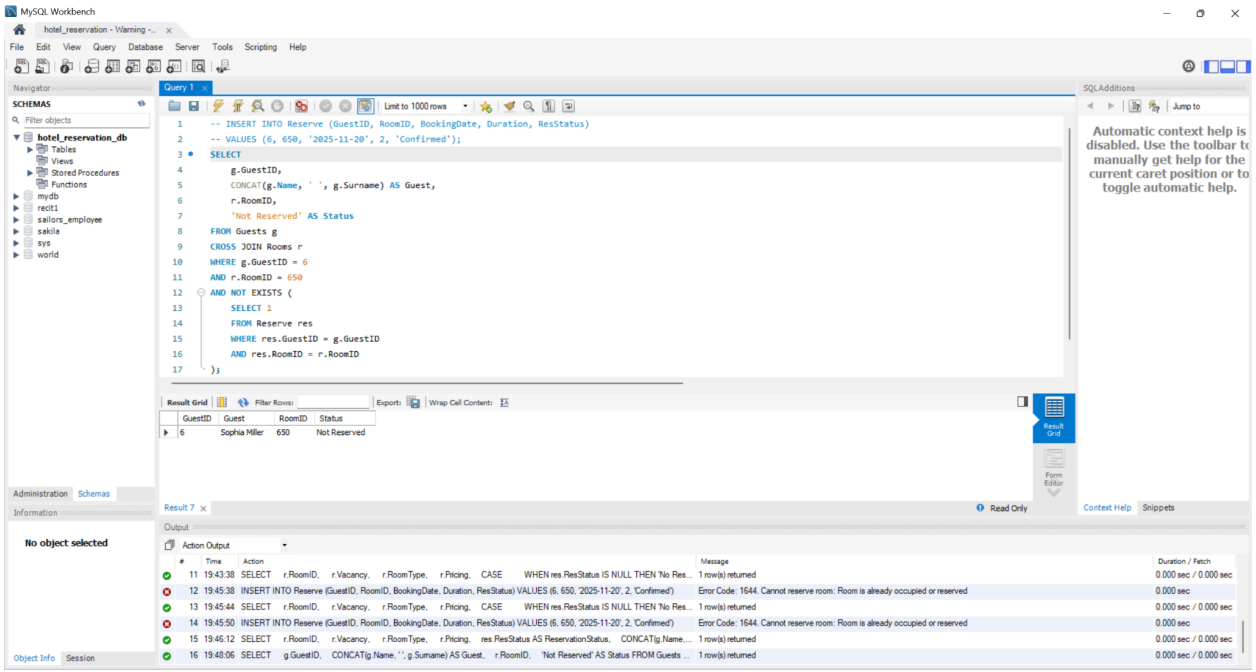
    -- If new reservation is not set to 'Cancelled', update room vacancy to false
    IF NEW.ResStatus IN ('Confirmed', 'Pending', 'Waiting List') THEN
        UPDATE Rooms SET Vacancy = FALSE WHERE RoomID = NEW.RoomID;
    END IF;
END //

DELIMITER ;
```

Here is the status of our database before the execution of this trigger:



Here is the status after the trigger has occurred:



Parking Payment:

The 'check_parking_payment' trigger prevents room checkout (vacancy update to TRUE) if a guest has unpaid parking fees. It verifies the parking payment status when a room's vacancy changes and blocks the checkout process with an error message if the parking payment status is incomplete(if PayStatus is FALSE).

Before_trigger_2.png shows us the guest with GuestID 7 who is still inside a room, had parked a car and haven't paid their payment for the car. After_trigger_2.png tries to set the vacancy of the room where GuestID 7 was residing in, but since they haven't paid for their parking, the room cannot be made vacant, so we get the Error message at Action 62 as our trigger result since a guest cannot checkout without paying for their parking first.

Guest Age Check:

The 'check_guest_age' database trigger validates that all guests making reservations are at least 18 years old. It executes before any insertion into the Reserve table, calculates the reserver's age based on their date of birth, and prevents underage reservations by returning an error message if the age requirement isn't met.

In the before_trigger_1.png, we can see person named Underage Teen who has age of 15 with ResOwner status of false. Inside after_trigger_1.png we try to insert this guest into Reserve table, trying to make this underage guest a reservation owner by making their ResStatus "Confirmed". This results in the action 52 inside Action Owner to occur, the Trigger Error Message stating that this person cannot be a ResOwner because of their age

Stored Procedures

Applying Loyalty Discount:

This Stored Procedure named calculate_guest_bill calculates the final bill for the guest that has reserved this room. If the procedure is called upon a guest who is the reservation owner, if their loyalty is "Applied", their final bill will get a 5% discount. To do this, first we check if their ResOwner status is true, if not we throw an error message stating that they cannot see the bill and it wont be calculated. Else, to calculate first we get their loyalty status, then the Room ID they reserved, how long they have stayed in the room, how much the room costs for a day, calculate how much the room costs normally. Then we look at if they have a car parked in. If they did, we take the days this car has been parked and charge 20$ for parking the car for each day. With this we have calculated the total bill before loyalty. If this reservation owner isn't in loyalty program they will pay this price, else they will pay with 5% discount. Then we print the table to see the details for this guest.

```
DELIMITER //

CREATE PROCEDURE calculate_guest_bill(IN guest_id_param INT)
BEGIN
    DECLARE guest_loyalty VARCHAR(20);
    DECLARE room_id_val INT;
    DECLARE duration_val INT;
    DECLARE room_price DECIMAL(10,2);
    DECLARE total_room_price DECIMAL(10,2);
    DECLARE parking_spot INT;
    DECLARE days_parked INT;
    DECLARE parking_price DECIMAL(10,2);
    DECLARE total_bill DECIMAL(10,2);
    DECLARE final_bill DECIMAL(10,2);
    DECLARE discount_rate DECIMAL(5,2);
    DECLARE is_res_owner BOOLEAN;
    DECLARE has_parking BOOLEAN DEFAULT FALSE;
```

```
    -- Check if the guest is the ResOwner
    SELECT ResOwner INTO is_res_owner
    FROM Guests
    WHERE GuestID = guest_id_param;

    -- error if not RewOwner
    IF is_res_owner = FALSE THEN
        SIGNAL SQLSTATE '45000'
        SET MESSAGE_TEXT = 'Only reservation owners can view bills';
        -- Exit the procedure
    END IF;

    -- Get the loyalty program
    SELECT LoyaltyProg INTO guest_loyalty
    FROM Guests
    WHERE GuestID = guest_id_param;

    -- Get the room details and duration
    SELECT r.RoomID, r.Duration INTO room_id_val, duration_val
    FROM Reserve r
    WHERE r.GuestID = guest_id_param;

    -- Get room price
    SELECT Pricing INTO room_price
    FROM Rooms
    WHERE RoomID = room_id_val;

    -- total room price
    SET total_room_price = room_price * duration_val;

    -- Check if guest has a parking spot
    SELECT COUNT(*) > 0 INTO has_parking
    FROM P_Use
    WHERE GuestID = guest_id_param;

    -- Initialize parking variables
    SET parking_spot = NULL;
    SET days_parked = 0;
    SET parking_price = 0;

    -- Calculate parking if the guest has a parking spot
    IF has_parking THEN
        SELECT PSpotNum INTO parking_spot
```

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        FROM P_Use
        WHERE GuestID = guest_id_param;

        -- total days parked
        SELECT DaysParked INTO days_parked
        FROM Parking
        WHERE PSpotNum = parking_spot;

        -- total parking price (20$ per day)
        SET parking_price = days_parked * 20;
    END IF;

    -- total bill before loyalty
    SET total_bill = total_room_price + parking_price;

    -- Apply loyalty discount if "Applied"
    IF guest_loyalty = 'Applied' THEN
        SET discount_rate = 0.05; -- 5% discount
        SET final_bill = total_bill * (1 - discount_rate);
    ELSE
        SET final_bill = total_bill;
    END IF;

    -- Result table
    SELECT
        guest_id_param AS GuestID,
        guest_loyalty AS LoyaltyStatus,
        room_id_val AS RoomID,
        room_price AS RoomPricePerDay,
        duration_val AS DaysStayed,
        total_room_price AS TotalRoomPrice,
        parking_spot AS ParkingSpotNumber,
        days_parked AS DaysParked,
        parking_price AS TotalParkingPrice,
        total_bill AS TotalBillBeforeDiscount,
        CASE
            WHEN guest_loyalty = 'Applied' THEN 'Yes (5%)'
            ELSE 'No'
        END AS DiscountApplied,
        final_bill AS FinalBill;
END //

DELIMITER ;
```

Updating Loyalty Status:

The “LoyaltyGiver” stored procedure takes GuestID as a parameter and checks if the given GuestID exists within the database. If it exists, the procedure checks if that guest booked a reservation from the hotel 5 times or more, updates the guest’s LoyaltyProg status from “Not Applied” to “Applied” and outputs a message indicating that the guest has the Loyalty Status. If the guest reserved a room from the hotel less than 5 times, the procedure outputs a message stating that the guest doesn’t have the Loyalty Status.

Listing Tours Guests Attended:

The "GetGuestTours" stored procedure takes a guest's Name and Surname as parameters and checks if the given guest exists within the database. If found, the procedure joins the Guests, Attend, and Tours tables to retrieve all tours that guests have attended. The procedure returns the tour name, tour type, and tour company for each matching record. If no tours are found for the specified guest, the procedure will return an empty result set.