**Test Plan**

This section outlines the test plans for the verification and validation of the Movie Theatre Ticketing System (MTTS). The test plan is structured to ensure that the system performs as intended, and all requirements are fulfilled. Each test targets specific features of the design, with tests classified by **granularity**: unit tests, functional tests, and system tests. The design diagram has been modified to show the scope and targets of the tests, and specific failure scenarios are included where relevant.

**Test Objectives**

The objective of this test plan is to ensure that the MTTS system:

* Accurately processes user actions (e.g., login, movie selection, payment).
* Effectively communicates with the backend to retrieve and update data.
* Integrates and operates correctly across all components, including the **Rewards System** and **Email Notification System**.
* Handles error cases and edge cases effectively without breaking the user experience.

**Scope of the Test Plan**

The test plan covers:

* **Unit Tests**: Individual components like managers and databases will be tested to ensure their behavior in isolation.
* **Functional Tests**: Specific features like login, seat selection, and payment processing will be tested to verify they work as described in the specifications.
* **System Tests**: The system as a whole will be tested, including end-to-end booking processes, rewards application, and admin report generation.

**Test Cases**

Each test case has been designed to target a specific feature of the system. The test cases are divided across the three levels of granularity:

**Unit Testing**

* **Target Component**:
  + *User Manager*: Handles user authentication, registration, and profile updates.
* **Test Case**:
  + Validate that the User Manager correctly checks login credentials against the database.
  + **Test Vector**: Input correct/incorrect credentials and observe system behavior.
  + **Targeted Failures**: Failure to authenticate users or incorrect handling of login errors.
* **Target Component**:
  + *Payment Processor*: Handles payment requests and reward application.
* **Test Case**:
  + Ensure the Payment Processor applies rewards and discounts correctly.
  + **Test Vector**: Test with and without rewards applied, and ensure payment amounts are updated accordingly.
  + **Targeted Failures**: Incorrect application of rewards or failure to process payments.

**Functional Testing**

* **Target Feature**:
  + *Movie Selection*: Allow users to browse and select available movies.
* **Test Case**:
  + Verify that the movie listings are retrieved correctly based on the user’s selected genre.
  + **Test Vector**: Select a genre and observe the returned movie listings.
  + **Targeted Failures**: Missing or incorrect movie data.
* **Target Feature**:
  + *Seat Selection*: Allow users to select and reserve seats for a specific showtime.
* **Test Case**:
  + Test seat availability and ensure that seats are marked as reserved when selected.
  + **Test Vector**: Simulate multiple users selecting the same seat to verify handling of double-booking scenarios.
  + **Targeted Failures**: Incorrect seat availability status or failure to update seat reservations in the database.

**System Testing**

* **Target Feature**:
  + *End-to-End Booking Process*: Ensure the entire system operates as expected from login to booking confirmation.
* **Test Case**:
  + Simulate a user logging in, selecting a movie and seats, applying rewards, completing payment, and receiving a confirmation email.
  + **Test Vector**: Test the full flow, including normal booking and edge cases like rewards exceeding the payment amount.
  + **Targeted Failures**: System failures during transitions (e.g., from seat selection to payment) or failure to generate confirmation emails.
* **Target Feature**:
  + *Admin Report Generation*: Test the system’s ability to generate reports for admin users.
* **Test Case**:
  + Test the Report Generator feature to ensure that sales reports are generated based on booking data.
  + **Test Vector**: Test with a wide date range and varying booking data.
  + **Targeted Failures**: Missing or incorrect report data.

**Test Coverage and Strategy**

**Test Sets/Vectors**:

* **Granularity**: Each test is designed to address a specific granularity—unit, functional, or system—covering a range of inputs and outputs for each feature.
* **Failure Cases**: The test plan addresses a variety of potential failures, such as invalid inputs (e.g., wrong login credentials), system errors (e.g., database connection issues), and edge cases (e.g., concurrent seat selections).

**Test Plan Execution**:

* Each test case will be executed in the development environment and will include a detailed report of actual results compared to expected results.
* Testing will be repeated in the production environment to ensure the transition from development to production does not introduce bugs or errors.

**Validation and Verification Strategy**:

* **Verification**: Ensures the system meets the functional and technical requirements specified in the design.
* **Validation**: Ensures the system fulfills the end-user needs and performs as intended in real-world scenarios.
* **Example**: You can indicate the flow from **Login Page** → **User Manager** → **User Database** in unit tests, and label the path from **Movie Selection** → **Showtime Manager** → **Showtime Database** for functional testing.

**6. Conclusion**

This test plan ensures comprehensive testing of the MTTS, covering all key features and components. By identifying failure cases and outlining specific test vectors, we aim to validate the functionality of the system across all user scenarios, ensuring a robust and reliable user experience.