项目文档

# Functional Requirement

1.1 Asset Registration Function   
 Function ID: FR-01   
 Description: Administrators can register new assets into the system by entering essential details.   
 Input: Asset details including Name, Description, Category, Status, PurchaseDate, and Location.   
 Output: A new Asset entity is stored in the database with a generated AssetID.  
  
1.2 Asset Information Update Function   
 Function ID: FR-02   
 Description: Administrators can update the details of an existing asset.   
 Input: AssetID and updated fields such as Name, Description, Category, Status, PurchaseDate, and Location.   
 Output: The updated Asset entity is stored in the database.  
  
1.3 Asset Deletion Function   
 Function ID: FR-03   
 Description: Administrators can delete an asset from the system after confirming it is not in use.   
 Input: AssetID and a confirmation to proceed with deletion.   
 Output: The Asset entity is removed from the database, and the deletion is logged.  
  
1.4 Asset Usage Assignment Function   
 Function ID: FR-04   
 Description: Administrators can assign a specific usage to an asset, including details and usage type.   
 Input: AssetID, UsageDate, UsageType, and UsageDetails.   
 Output: A new AssetUsage entity is created and stored in the database, linked to the corresponding Asset.  
  
1.5 Asset Usage Modification Function   
 Function ID: FR-05   
 Description: Administrators can modify the usage details of an existing asset usage record.   
 Input: UsageID and updated fields such as UsageDate, UsageType, and UsageDetails.   
 Output: The modified AssetUsage entity is stored in the database.  
  
1.6 Asset Usage Deletion Function   
 Function ID: FR-06   
 Description: Administrators can delete a specific asset usage record.   
 Input: UsageID and a confirmation to proceed with deletion.   
 Output: The AssetUsage entity is removed from the database, and the deletion is logged.  
  
1.7 Asset Usage History Viewing Function   
 Function ID: FR-07   
 Description: Administrators can view the usage history of an asset, including timestamps and usage types.   
 Input: AssetID or a search query to identify the asset.   
 Output: A list of UsageHistory records is retrieved and displayed, linked to the selected AssetUsage.  
  
1.8 Email Notification Sending Function   
 Function ID: FR-08   
 Description: Administrators can send email notifications to users regarding asset usage.   
 Input: UsageID, ToAddress, FromAddress, Subject, and Content of the notification.   
 Output: An Email entity is created and sent through the integrated email system.  
  
1.9 Notification Record Management Function   
 Function ID: FR-09   
 Description: The system automatically tracks and records the status and details of each email notification sent.   
 Input: UsageID and EmailID from the system's internal records.   
 Output: A NotificationRecord entity is created and stored in the database with SendStatus and SendDate.  
  
1.10 Administrator Account Management Function   
 Function ID: FR-10   
 Description: System Administrators can create, update, or delete other administrator accounts.   
 Input: AdminID (for update/delete), or new administrator details (Name, Role, EmailID, Department).   
 Output: A new or modified Administrator entity is stored in the database, or the account is deleted and logged.  
  
1.11 Administrator Account Deletion Function   
 Function ID: FR-11   
 Description: System Administrators can delete another administrator account from the system.   
 Input: AdminID and a confirmation to proceed with deletion.   
 Output: The Administrator entity is removed from the database, and the deletion is logged.  
  
1.12 Administrator Information Viewing Function   
 Function ID: FR-12   
 Description: System Administrators can view the details of other administrator accounts.   
 Input: AdminID or a search query to identify the administrator.   
 Output: The selected Administrator entity's details are retrieved and displayed.

# External Description

# 2. External Interfaces  
  
This chapter describes the external interfaces of the system, including user interfaces, hardware interfaces, software interfaces, and communication interfaces. Each interface is defined and described to ensure clear understanding and implementation by developers.  
  
## 2.1 User Interface Output  
  
The user interface is the primary means of interaction between the system and administrators. It provides a graphical and intuitive way for administrators to manage assets, asset usage, and administrator accounts.  
  
- \*\*Function FR-01 to FR-12\*\*: These functions are all accessed and executed through the system's user interface. The interface allows administrators to enter, update, delete, and view asset and administrator information.  
- \*\*Inputs via UI\*\*:  
 - Asset registration form (Name, Description, Category, Status, PurchaseDate, Location)  
 - Asset update form (AssetID, updated fields such as Name, Description, Category, Status, PurchaseDate, Location)  
 - Asset deletion confirmation dialog (AssetID, confirmation)  
 - Asset usage assignment form (AssetID, UsageDate, UsageType, UsageDetails)  
 - Asset usage modification form (UsageID, updated fields such as UsageDate, UsageType, UsageDetails)  
 - Asset usage deletion confirmation dialog (UsageID, confirmation)  
 - Asset usage history search and display (AssetID or search query)  
 - Email notification sending form (UsageID, ToAddress, FromAddress, Subject, Content)  
 - Administrator account management form (AdminID or new administrator details such as Name, Role, EmailID, Department)  
 - Administrator deletion confirmation dialog (AdminID, confirmation)  
 - Administrator information search and display (AdminID or search query)  
- \*\*Outputs via UI\*\*:  
 - Confirmation messages after asset, asset usage, or administrator account operations  
 - Display of asset usage history records  
 - Display of administrator account details  
 - Status of email notifications (e.g., sent, failed)  
  
The user interface must be responsive, accessible, and provide clear feedback to the user for each action taken.  
  
## 2.2 Hardware Interface Output  
  
The system does not require direct interaction with any external hardware devices. Therefore, there are no hardware interfaces defined in this section.  
  
## 2.3 Software Interface Output  
  
The system interacts with several software components, including a database for storing and retrieving data, and an email system for sending notifications.  
  
### 2.3.1 Database Interface  
  
- \*\*Description\*\*: The system uses a database to store and manage Asset, AssetUsage, Email, and Administrator entities. All data persistence and retrieval operations are conducted through this interface.  
- \*\*Entities\*\*:  
 - \*\*Asset\*\*: Represents an asset in the system with fields such as Name, Description, Category, Status, PurchaseDate, Location, and AssetID.  
 - \*\*AssetUsage\*\*: Represents a usage record of an asset, including UsageDate, UsageType, UsageDetails, and a foreign key linking to the Asset entity.  
 - \*\*Email\*\*: Represents an email notification with fields such as ToAddress, FromAddress, Subject, Content, and EmailID.  
 - \*\*Administrator\*\*: Represents an administrator account with fields such as Name, Role, EmailID, Department, and AdminID.  
 - \*\*NotificationRecord\*\*: Represents the status and details of an email notification, including SendStatus, SendDate, UsageID, and EmailID.  
- \*\*Interaction Method\*\*:  
 - \*\*Insert\*\*: Create new records in the database (e.g., inserting a new Asset or Email entity).  
 - \*\*Update\*\*: Modify existing records (e.g., updating an Asset or AssetUsage entity).  
 - \*\*Delete\*\*: Remove records from the database (e.g., deleting an Asset or Administrator entity).  
 - \*\*Select\*\*: Retrieve records based on criteria such as AssetID, UsageID, or AdminID.  
  
The database interface must support ACID (Atomicity, Consistency, Isolation, Durability) properties to ensure data integrity and reliability.  
  
### 2.3.2 Email System Interface  
  
- \*\*Description\*\*: The system integrates with an external email system to send notifications to users regarding asset usage. This interface is responsible for creating and sending Email entities.  
- \*\*Inputs\*\*:  
 - UsageID: Identifies the asset usage record associated with the notification.  
 - ToAddress: Recipient email address.  
 - FromAddress: Sender email address.  
 - Subject: Title of the email notification.  
 - Content: Body of the email notification.  
- \*\*Outputs\*\*:  
 - Email entity created and sent.  
 - NotificationRecord entity stored in the database to track the status of the sent email.  
  
The email system interface must support secure email transmission and provide feedback on the success or failure of the email delivery.  
  
## 2.4 Communication Interface Output  
  
The communication interface is primarily used for sending email notifications and managing their status.  
  
### 2.4.1 Email Notification Interface  
  
- \*\*Description\*\*: This interface is used to send email notifications to users when asset usage is assigned or modified. It also tracks the status of each email notification.  
- \*\*Inputs\*\*:  
 - UsageID: Identifies the asset usage record associated with the notification.  
 - ToAddress: Email address of the recipient.  
 - FromAddress: Email address of the sender.  
 - Subject: Title of the email.  
 - Content: Body of the email.  
- \*\*Outputs\*\*:  
 - The email is sent to the recipient.  
 - A NotificationRecord is created in the database with the SendStatus and SendDate.  
  
The communication interface must ensure timely and reliable delivery of email notifications, with proper error handling and logging for failed deliveries.

# Use Case

Use Case Name: Register Asset   
Use Case ID: UC-01   
Actors: Administrator   
Preconditions:   
1. The system is operational and accessible.   
2. The Administrator is authenticated and has the necessary permissions to register assets.   
  
Postconditions:   
1. A new asset is successfully added to the system.   
2. The asset information is stored in the database.   
3. The Administrator receives a confirmation message of successful registration.   
  
Main Flow:   
1. The Administrator accesses the asset registration interface.   
2. The Administrator enters the asset details including name, type, and description.   
3. The Administrator selects the appropriate usage category for the asset.   
4. The Administrator verifies the entered information for accuracy.   
5. The system saves the new asset information to the database.   
6. The system displays a confirmation message indicating the asset was successfully registered.   
  
Alternative Flow:   
1. If the entered asset details are incomplete or invalid, the system displays an error message.   
2. The Administrator corrects the information and resubmits the registration request.   
3. If the system fails to save the asset information, the system logs the error and notifies the Administrator.  
  
Use Case Name: Update Asset Information   
Use Case ID: UC-02   
Actors: Administrator   
Preconditions:   
1. The system is operational and accessible.   
2. The Administrator is authenticated and has the necessary permissions to update asset information.   
3. The asset to be updated already exists in the system.   
  
Postconditions:   
1. The asset information is successfully updated in the system.   
2. The updated asset information is saved in the database.   
3. The Administrator receives a confirmation message of successful update.   
  
Main Flow:   
1. The Administrator accesses the asset management interface.   
2. The Administrator searches for and selects the asset to be updated.   
3. The Administrator modifies the asset details such as name, type, or description.   
4. The Administrator selects the updated usage category for the asset, if necessary.   
5. The Administrator verifies the updated information for accuracy.   
6. The system saves the modified asset information to the database.   
7. The system displays a confirmation message indicating the asset information was successfully updated.   
  
Alternative Flow:   
1. If the entered asset details are incomplete or invalid, the system displays an error message.   
2. The Administrator corrects the information and resubmits the update request.   
3. If the system fails to save the updated asset information, the system logs the error and notifies the Administrator.  
  
Use Case Name: Delete Asset   
Use Case ID: UC-03   
Actors: Administrator   
Preconditions:   
1. The system is operational and accessible.   
2. The Administrator is authenticated and has the necessary permissions to delete assets.   
3. The asset to be deleted already exists in the system.   
  
Postconditions:   
1. The selected asset is successfully removed from the system.   
2. The deletion is recorded in the system logs.   
3. The Administrator receives a confirmation message that the asset was deleted.   
  
Main Flow:   
1. The Administrator accesses the asset management interface.   
2. The Administrator searches for and selects the asset to be deleted.   
3. The Administrator confirms the deletion request.   
4. The system removes the asset information from the database.   
5. The system displays a confirmation message indicating the asset was successfully deleted.   
  
Alternative Flow:   
1. If the asset is in use or referenced elsewhere, the system displays a warning message.   
2. The Administrator chooses to cancel or proceed with the deletion.   
3. If the deletion is canceled, the system returns to the asset management interface.   
4. If the system fails to delete the asset, it logs the error and notifies the Administrator.  
  
Use Case Name: View Asset Details   
Use Case ID: UC-04   
Actors: Administrator   
Preconditions:   
1. The system is operational and accessible.   
2. The Administrator is authenticated and has the necessary permissions to view asset details.   
3. At least one asset exists in the system.   
  
Postconditions:   
1. The selected asset's details are displayed to the Administrator.   
2. The system logs the access of asset details.   
  
Main Flow:   
1. The Administrator accesses the asset management interface.   
2. The Administrator searches for and selects an asset to view.   
3. The system retrieves the asset details from the database.   
4. The system displays the asset's name, type, description, and usage category.   
  
Alternative Flow:   
1. If the selected asset does not exist, the system displays an error message.   
2. The Administrator is redirected back to the asset management interface.   
3. If the system fails to retrieve the asset details, it logs the error and notifies the Administrator.  
  
Use Case Name: Assign Asset Usage   
Use Case ID: UC-05   
Actors: Administrator   
Preconditions:   
1. The system is operational and accessible.   
2. The Administrator is authenticated and has the necessary permissions to assign asset usage.   
3. At least one asset exists in the system.   
  
Postconditions:   
1. The asset is successfully assigned to a specific usage.   
2. The usage assignment is recorded in the database.   
3. The Administrator receives a confirmation message of the successful assignment.   
  
Main Flow:   
1. The Administrator accesses the asset usage assignment interface.   
2. The Administrator selects an asset from the list of available assets.   
3. The Administrator chooses a usage type from the available options.   
4. The Administrator confirms the selected usage assignment.   
5. The system updates the asset's usage information in the database.   
6. The system displays a confirmation message indicating the asset usage was successfully assigned.   
  
Alternative Flow:   
1. If the selected asset does not have valid usage options, the system displays an error message.   
2. If the Administrator cancels the assignment, the system returns to the asset management interface.   
3. If the system fails to update the asset usage, it logs the error and notifies the Administrator.  
  
Use Case Name: Modify Asset Usage   
Use Case ID: UC-06   
Actors: Administrator   
Preconditions:   
1. The system is operational and accessible.   
2. The Administrator is authenticated and has the necessary permissions to modify asset usage.   
3. The asset to be modified already exists in the system.   
  
Postconditions:   
1. The asset's usage information is successfully updated.   
2. The updated usage information is saved in the database.   
3. The Administrator receives a confirmation message of the successful modification.   
  
Main Flow:   
1. The Administrator accesses the asset usage modification interface.   
2. The Administrator searches for and selects the asset whose usage needs to be modified.   
3. The Administrator updates the asset's current usage with a new usage type.   
4. The Administrator confirms the modification.   
5. The system updates the asset's usage in the database.   
6. The system displays a confirmation message indicating the asset usage was successfully modified.   
  
Alternative Flow:   
1. If the new usage type is invalid or not available, the system displays an error message.   
2. The Administrator corrects the usage selection and resubmits the modification request.   
3. If the Administrator cancels the modification, the system returns to the asset management interface.   
4. If the system fails to update the usage, it logs the error and notifies the Administrator.  
  
Use Case Name: View Asset Usage History   
Use Case ID: UC-07   
Actors: Administrator   
Preconditions:   
1. The system is operational and accessible.   
2. The Administrator is authenticated and has the necessary permissions to view asset usage history.   
3. The asset to be viewed already exists in the system.   
4. The asset has a recorded usage history.   
  
Postconditions:   
1. The asset's usage history is displayed to the Administrator.   
2. The system logs the access of the usage history.   
  
Main Flow:   
1. The Administrator accesses the asset management interface.   
2. The Administrator searches for and selects an asset to view its usage history.   
3. The system retrieves the usage history records for the selected asset from the database.   
4. The system displays the usage history, including timestamps, usage types, and any relevant details.   
  
Alternative Flow:   
1. If the selected asset has no recorded usage history, the system displays a message indicating this.   
2. If the system fails to retrieve the usage history, it logs the error and notifies the Administrator.   
3. The Administrator is redirected back to the asset management interface if they cancel the view request.  
  
Use Case Name: Send Asset Usage Notification via Email   
Use Case ID: UC-08   
Actors: Administrator   
Preconditions:   
1. The system is operational and accessible.   
2. The Administrator is authenticated and has the necessary permissions to send notifications.   
3. The asset exists in the system and has an assigned usage.   
4. The email system is configured and operational.   
  
Postconditions:   
1. The asset usage notification is sent to the designated recipient via email.   
2. The system logs the notification event.   
3. The Administrator receives a confirmation message that the notification was sent.   
  
Main Flow:   
1. The Administrator accesses the asset notification interface.   
2. The Administrator selects an asset for which a usage notification is to be sent.   
3. The Administrator specifies the recipient email address and the message content.   
4. The Administrator confirms the email notification request.   
5. The system generates the notification message with asset usage details.   
6. The system sends the email notification through the configured email service.   
7. The system logs the notification event and displays a confirmation message to the Administrator.   
  
Alternative Flow:   
1. If the email address is invalid or missing, the system displays an error message.   
2. The Administrator corrects the email address and resubmits the notification request.   
3. If the system fails to send the email, it logs the error and notifies the Administrator.   
4. If the Administrator cancels the notification, the system returns to the asset management interface.  
  
Use Case Name: Manage Administrator Account   
Use Case ID: UC-09   
Actors: System Administrator   
Preconditions:   
1. The system is operational and accessible.   
2. The System Administrator is authenticated and has the necessary permissions to manage administrator accounts.   
3. At least one administrator account exists in the system.   
  
Postconditions:   
1. The administrator account is either created, updated, or deleted as per the action taken.   
2. The change is recorded in the system database and logs.   
3. The System Administrator receives a confirmation message of the action performed.   
  
Main Flow:   
1. The System Administrator accesses the administrator account management interface.   
2. The System Administrator selects the desired action: create, update, or delete an administrator account.   
3. If creating, the System Administrator enters the new administrator's details (e.g., username, password, role).   
4. If updating, the System Administrator selects an existing account and modifies its details.   
5. If deleting, the System Administrator selects an existing account and confirms the deletion.   
6. The system verifies the input data and processes the requested action.   
7. The system displays a confirmation message indicating the success of the operation.   
  
Alternative Flow:   
1. If the input data is invalid or incomplete, the system displays an error message.   
2. The System Administrator corrects the data and resubmits the request.   
3. If the requested administrator account does not exist (for update or delete), the system displays an error message.   
4. If the system fails to process the action, it logs the error and notifies the System Administrator.   
5. If the System Administrator cancels the operation, the system returns to the account management interface.  
  
Use Case Name: Remove Administrator   
Use Case ID: UC-10   
Actors: System Administrator   
Preconditions:   
1. The system is operational and accessible.   
2. The System Administrator is authenticated and has the necessary permissions to remove administrators.   
3. The administrator account to be removed exists in the system.   
4. The administrator to be removed is not the currently logged-in user.   
  
Postconditions:   
1. The selected administrator account is successfully removed from the system.   
2. The removal is recorded in the system logs.   
3. The System Administrator receives a confirmation message that the administrator was removed.   
  
Main Flow:   
1. The System Administrator accesses the administrator account management interface.   
2. The System Administrator searches for and selects the administrator account to be removed.   
3. The System Administrator confirms the deletion request.   
4. The system removes the administrator account from the database.   
5. The system logs the removal action.   
6. The system displays a confirmation message indicating the administrator was successfully removed.   
  
Alternative Flow:   
1. If the selected administrator is the currently logged-in user, the system displays a warning message.   
2. If the System Administrator cancels the removal, the system returns to the administrator account management interface.   
3. If the system fails to delete the administrator account, it logs the error and notifies the System Administrator.  
  
Use Case Name: View Administrator Information   
Use Case ID: UC-11   
Actors: System Administrator   
Preconditions:   
1. The system is operational and accessible.   
2. The System Administrator is authenticated and has the necessary permissions to view administrator details.   
3. At least one administrator account exists in the system.   
  
Postconditions:   
1. The selected administrator's details are displayed to the System Administrator.   
2. The system logs the access of administrator information.   
  
Main Flow:   
1. The System Administrator accesses the administrator account management interface.   
2. The System Administrator searches for and selects an administrator account to view.   
3. The system retrieves the administrator's details from the database.   
4. The system displays the administrator's username, role, and other relevant information.   
  
Alternative Flow:   
1. If the selected administrator account does not exist, the system displays an error message.   
2. The System Administrator is redirected back to the account management interface.   
3. If the system fails to retrieve the administrator information, it logs the error and notifies the System Administrator.  
  
Use Case Name: Delete Asset Usage   
Use Case ID: UC-12   
Actors: Administrator   
Preconditions:   
1. The system is operational and accessible.   
2. The Administrator is authenticated and has the necessary permissions to delete asset usage.   
3. The asset exists in the system and has an assigned usage.   
  
Postconditions:   
1. The selected asset usage is successfully removed from the system.   
2. The deletion of the asset usage is recorded in the system logs.   
3. The Administrator receives a confirmation message that the asset usage was deleted.   
  
Main Flow:   
1. The Administrator accesses the asset usage management interface.   
2. The Administrator searches for and selects the asset whose usage needs to be deleted.   
3. The Administrator chooses the specific usage record to be deleted.   
4. The Administrator confirms the deletion of the selected usage.   
5. The system removes the selected usage record from the database.   
6. The system logs the deletion event and displays a confirmation message to the Administrator.   
  
Alternative Flow:   
1. If the selected asset usage is currently in use or has dependencies, the system displays a warning message.   
2. The Administrator chooses to cancel or proceed with the deletion.   
3. If the deletion is canceled, the system returns to the asset usage management interface.   
4. If the system fails to delete the asset usage, it logs the error and notifies the Administrator.