

COMPLAINT MANAGEMENT AND TRACKING SYSTEM

Design Report

Project Milestone 3



CSC-225 – Software Engineering

Namal University, Mianwali
Department of Computer Science

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Prepared by:

Arfa Tayyabah - NUM-BSCS-2024-16
Samra Zamurd - NUM-BSCS-2024-72
Muhammad Bilal - NUM-BSCS-2023-21

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Chapter 1

Introduction

1.1 Project Overview

The Complaint Management and Tracking System is a comprehensive mobile application designed to streamline the process of submitting, tracking, and resolving complaints within a university environment. The system serves as a centralized platform that connects students, faculty, staff, and administrators.

1.2 Purpose of This Document

This Design Report presents the complete system design translating the approved Software Requirements Specification (SRS) into detailed design artifacts including behavioral diagrams, structural diagrams, and prototypes.

1.3 Scope

The system encompasses:

- User authentication with university credentials
- Complaint submission with photo attachments
- Real-time tracking and status updates
- Advanced filtering and search
- Communication through comments
- Push notifications
- Feedback and rating system
- Administrator dashboard and reporting

Chapter 2

Design Assumptions and Constraints

2.1 Design Assumptions

2.1.1 User Assumptions

1. All users have valid university credentials
2. Users have mobile devices with camera capabilities
3. Users possess basic technical literacy
4. Stable internet connectivity is available

2.1.2 System Environment Assumptions

1. Integration with university authentication system (LDAP/AD)
2. University Personnel Directory is accessible

2.2 Design Constraints

2.2.1 Performance Constraints

1. UI operations must complete within 2 seconds
2. Session timeout: 30 minutes
3. Maximum 5 failed login attempts
4. Client-side image compression required

2.2.2 Data Constraints

1. Maximum 5 photos per complaint (2MB each)
2. Comments limited to 1000 characters
3. Feedback comments limited to 500 characters
4. Notification retention: 90 days

Chapter 3

Key Design Decisions

This section explains the UML diagrams in the context of the Complaint Management and Tracking System (as specified in the SRS). Each diagram is described with what it models, its main purpose, and its relation to the SRS, including relations to the system's requirements such as user authentication, complaint submission, tracking, notifications, and feedback.

3.1 Use Case Diagram

3.1.1 What it Models

Actors (e.g., Students, Faculty, Staff, Administrators) and use cases (e.g., Submit Complaint, Track Complaint Status, Add Comment, Provide Feedback, Receive Notifications) representing the functional goals of the system from the user's perspective.

3.1.2 Why it is Created

To capture and organize functional requirements from the user's viewpoint, defining system scope and interactions. For the Complaint Management System, it visualizes how users like students submit complaints with photos, administrators handle workflows, and all users receive updates, ensuring alignment with user needs.

3.1.3 Relation to SRS

Very common in SRS (especially Section 3 – Specific Requirements, Functional Requirements like 3.1.1 User Authentication, 3.1.2 Complaint Submission, 3.1.3 Tracking and Management). In this system, it directly maps to user characteristics (SRS 2.3) and product functions (SRS 2.2), such as Complaint Management and Workflow Management, helping to organize requirements like New Complaint (3.1.2.3) and Receive Push Notifications (3.1.4.4).

3.2 Activity Diagram

3.2.1 What it Models

Step-by-step workflows and processes, including decisions, parallel actions, and flows (e.g., the process of submitting a complaint: select department, capture photo, add description, submit; or filtering complaints by status/priority/date).

3.2.2 Why it is Created

To detail the behavior of key processes, showing how the system responds to user actions. In the Complaint Management System, it illustrates flows like complaint submission with attachments or error handling during offline mode, improving understanding of complex interactions.

3.2.3 Relation to SRS

Frequently included in SRS to explain complex use cases or business rules (e.g., SRS 3.1.2 Complaint Submission, 3.1.3 Tracking with filters like 3.1.3.3 Filter by Status, 3.1.7 Offline Functionality). For this system, it relates to operational constraints (SRS 2.4.4) and handling errors (3.1.9), providing visual clarity for workflows like View Complaint Details (3.1.3.2) or Submit Feedback (3.1.5.2).

3.3 Class Diagram

3.3.1 What it Models

High-level system entities (e.g., User, Complaint, Department, Attachment, Notification, Feedback), their attributes (e.g., Complaint: title, description, status, priority), and relationships (e.g., User submits Complaint, Complaint has Attachments).

3.3.2 Why it is Created

To create a system model, showing static structure. In the Complaint Management System, it defines entities like User Profile (with statistics) and Complaint (with comments and ratings), aiding data integrity.

3.3.3 Relation to SRS

Sometimes in SRS as a conceptual model (e.g., SRS 3.6.1 Database Requirements, Core Data Elements like Complaints, Users, Attachments). For this system, it relates to data constraints (SRS 3.2.1 Capacity, Field Size Limits) and external interfaces (3.5), providing a foundation for entities in functional requirements like View Attachments (3.1.4.3).

3.4 Data Flow Diagram (DFD)

3.4.1 What it Models

The flow of data through the system: inputs, outputs, transformations (processes), storage (data stores), and interactions with external entities (e.g., users like Students, Faculty, Administrators). It shows how data (e.g., complaint details, photos, comments, status updates) moves between processes, without showing control logic, decisions, or sequence timing.

3.4.2 Why it is Created

To provide a clear, hierarchical view of data movement and processing in the system (often in levels: Context/Level 0 for overview, Level 1+ for decomposition). It helps decompose major functions (as noted in Key Design Decisions 3.1), identify data dependencies, detect bottlenecks, and ensure all required data transformations (e.g., from submission to resolution) are captured.

3.4.3 Relation to SRS

It strongly relates to Functional Requirements (Section 3.1), such as Complaint Submission (3.1.2), Tracking & Management (3.1.3), Communication/Updates (3.1.4), Feedback (3.1.5), and data constraints (e.g., photo limits in 3.2.1). It also supports Database Requirements (3.6.1 Core Data Elements) and Performance (response times for data processing).

3.5 Sequence Diagram

3.5.1 What it Models

Dynamic interactions between objects/actors for scenarios (e.g., sequence of messages: User → App → Server → Database for submitting a complaint).

3.5.2 Why it is Created

To show runtime behavior and message flows for specific use cases. In the Complaint Management System, it details interactions like adding comments or push notifications.

3.5.3 Relation to SRS

It illustrates requirements (e.g., SRS 3.1.4 Communication like Add Comment 3.1.4.1, Receive Push Notifications 3.1.4.4).

3.6 Component Diagram

3.6.1 What it Models

Runtime components (e.g., Mobile App Frontend, Backend API, Database, Notification Service) and their interfaces/dependencies (e.g., App depends on Authentication Service).

3.6.2 Why it is Created

To depict modular structure and interfaces. In the Complaint Management System, it shows components like Complaint Handler, Reporting Module, and integrations with university auth, supporting scalability.

3.6.3 Relation to SRS

Design phase – not typically in SRS, but relates to system attributes (SRS 3.4 Security, Access Control) and external interfaces (3.5). For this system, it aligns with hardware constraints (3.3.1 Mobile Device Requirements) and dependencies (2.5.2), like cloud storage for attachments.

Chapter 4

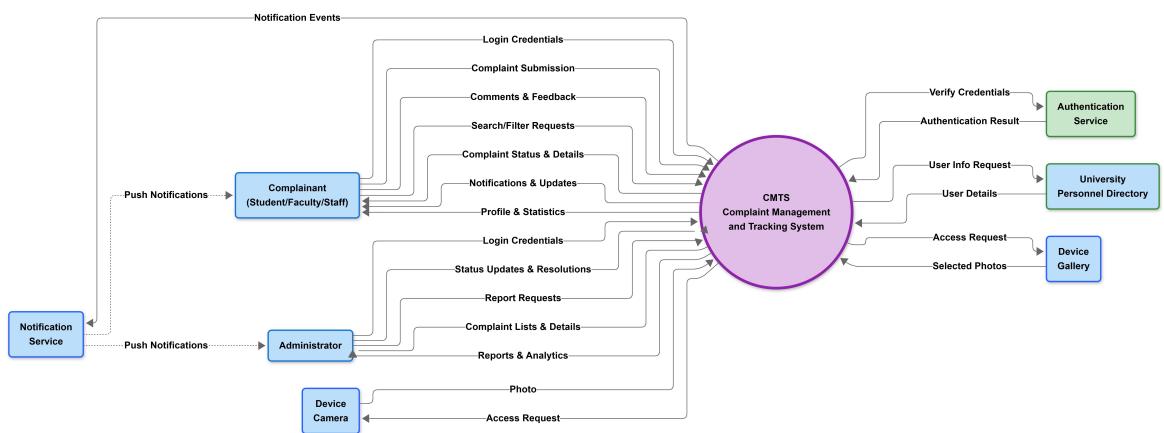
System Design Diagrams

4.1 Behavioral Diagrams

4.1.1 Data Flow Diagrams

Level 0 DFD

The context diagram shows the system as a single process interacting with Complainant and Administrator entities.

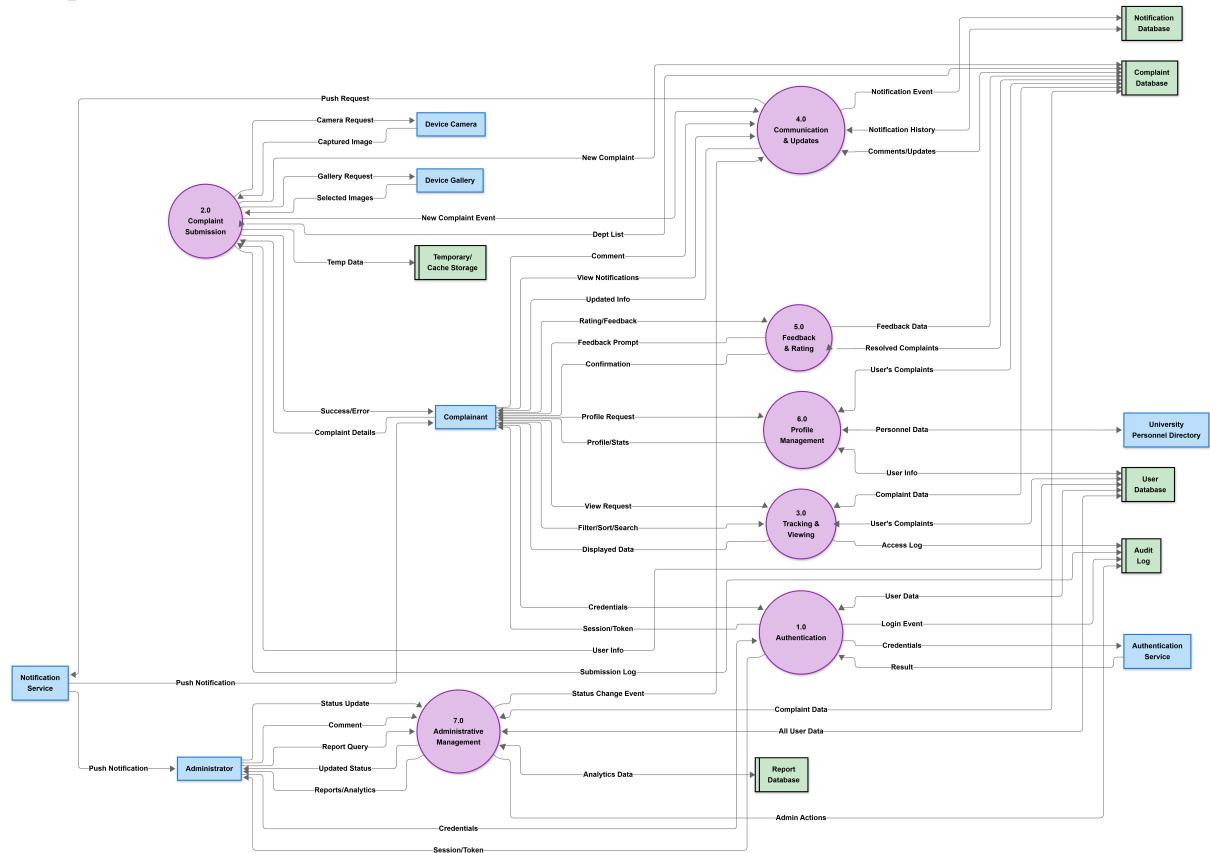


Level 1 DFDs

The Level 1 Data Flow Diagram provides an overview of the system by decomposing it into seven major processes:

1. User Authentication
2. Complaint Submission
3. View and Tracking
4. Communication and Updates
5. Feedback
6. Profile Management
7. Administrator Functions

The overview diagram is shown below, followed by the detailed Level 2 decompositions of each process.



Level 2 DFDs

The Level 1 Data Flow Diagram decomposes the system into seven major processes:

1. User Authentication (sub-processes 1.1–1.5)
2. Complaint Submission (sub-processes 2.1–2.6)
3. View and Tracking (sub-processes 3.1–3.8)
4. Communication and Updates (sub-processes 4.1–4.6)
5. Feedback (sub-processes 5.1–5.6)

6. Profile Management (sub-processes 6.1–6.5)

7. Administrator Functions (sub-processes 7.1–7.7)

The following figures show the detailed decomposition of each major process at Level 1.

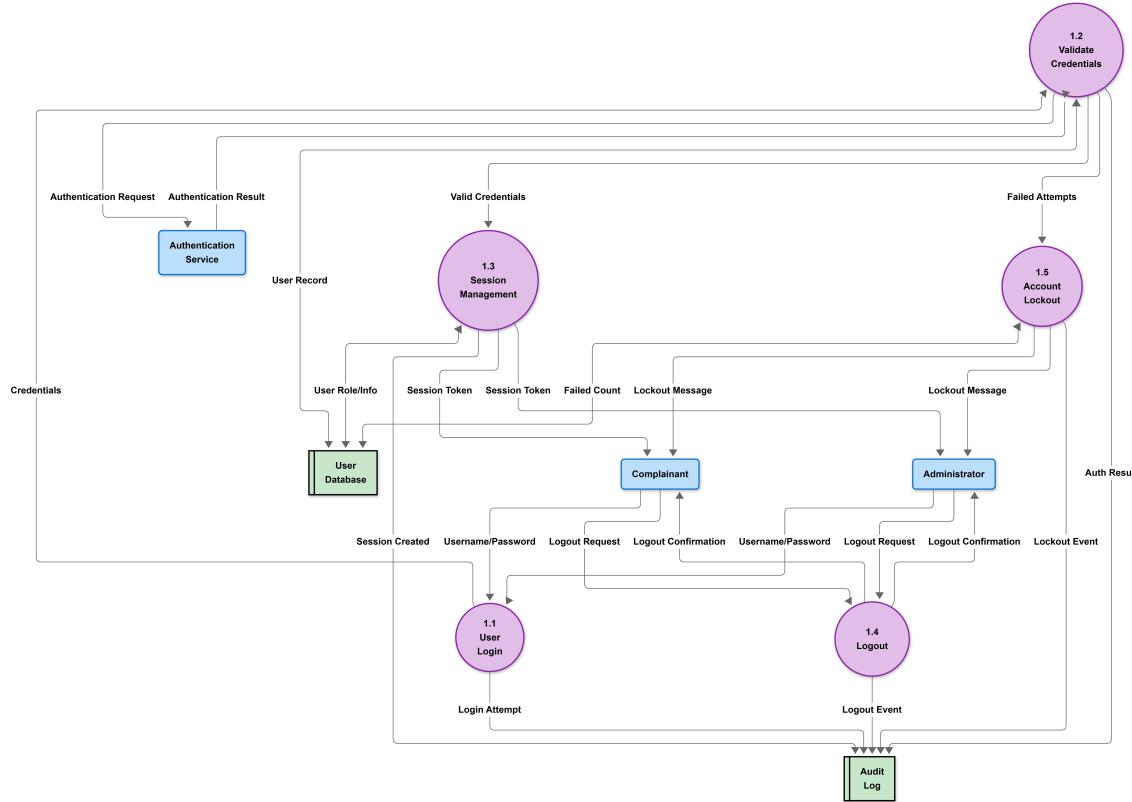


Figure 4.1: Level 1 DFD – Process 1: User Authentication (including login, session management, and security checks)

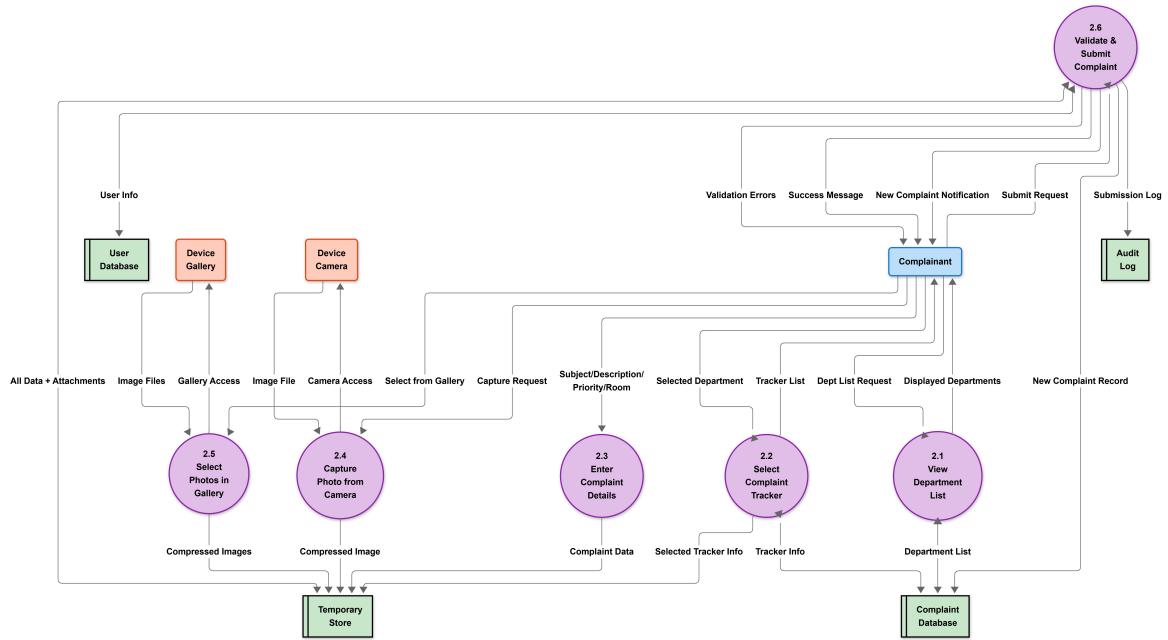


Figure 4.2: Level 1 DFD – Process 2: Complaint Submission (form filling, department selection, and photo attachment)

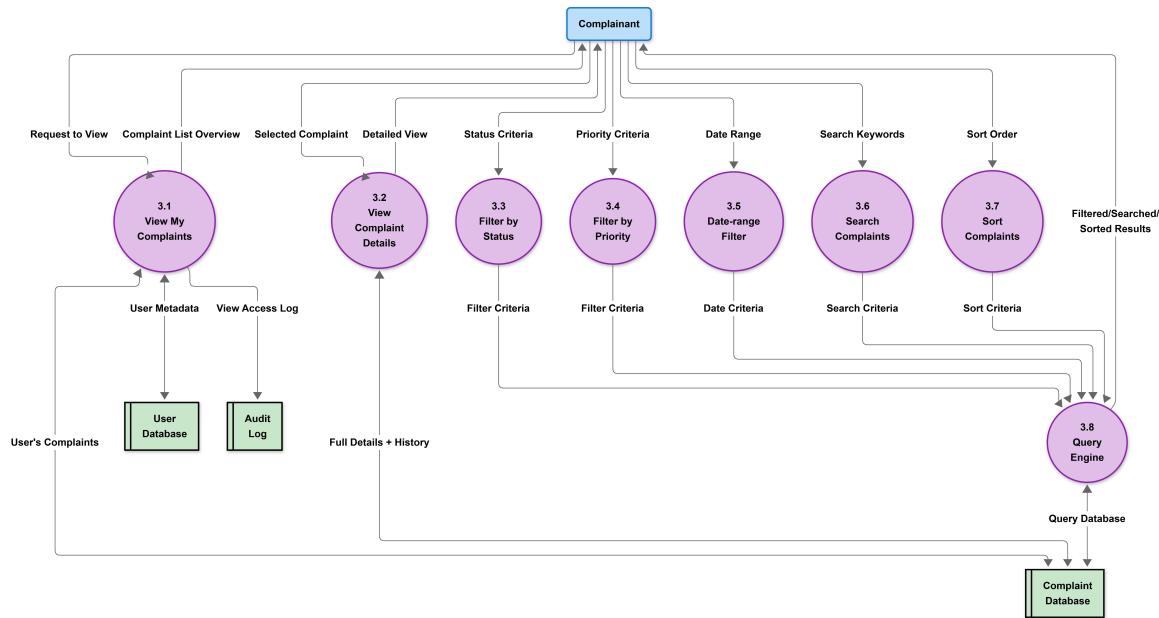


Figure 4.3: Level 1 DFD – Process 3: View and Tracking (complaint listing, status history, and detail view)

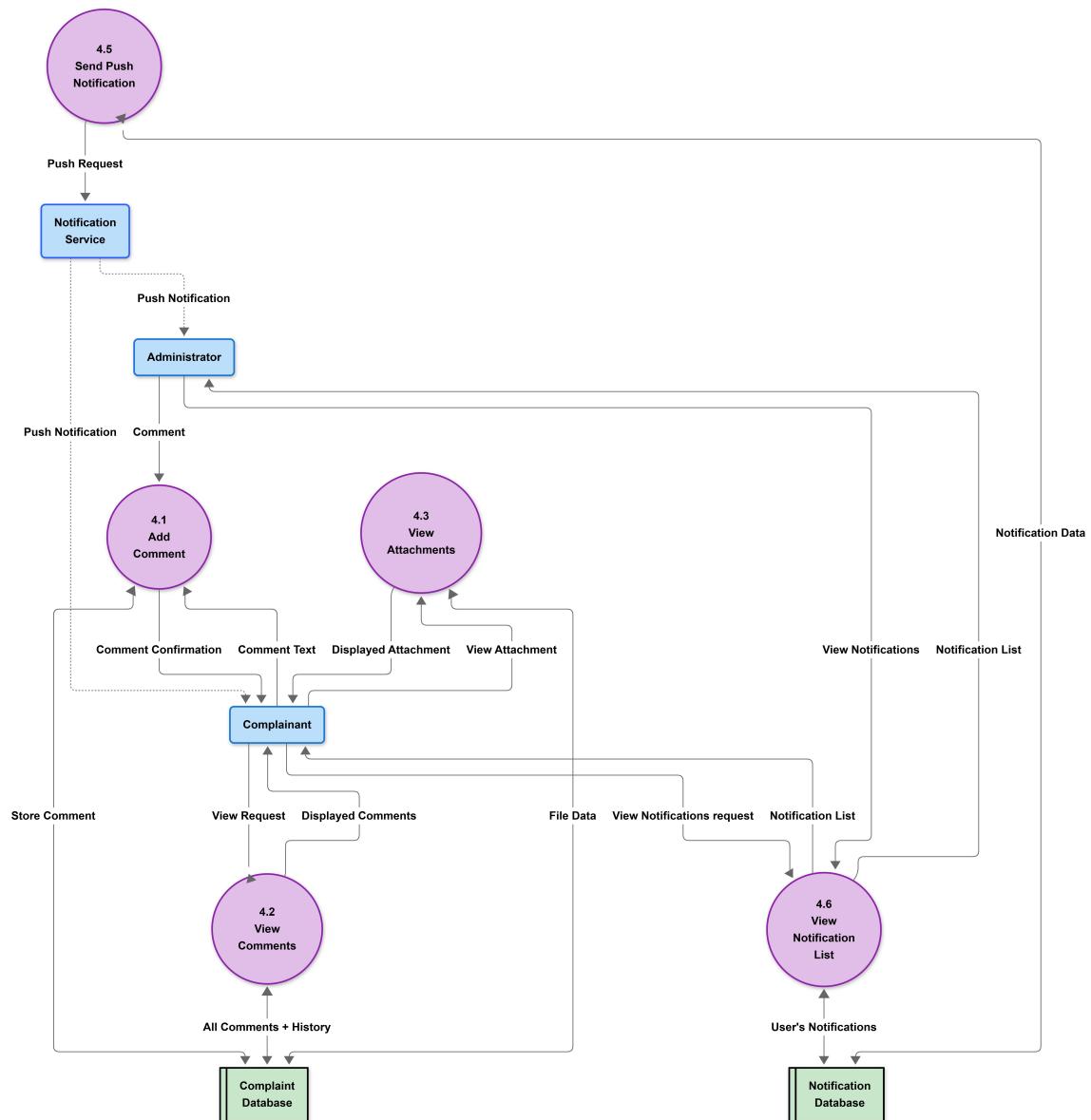


Figure 4.4: Level 1 DFD – Process 4: Communication and Updates (commenting, notifications, and status updates)

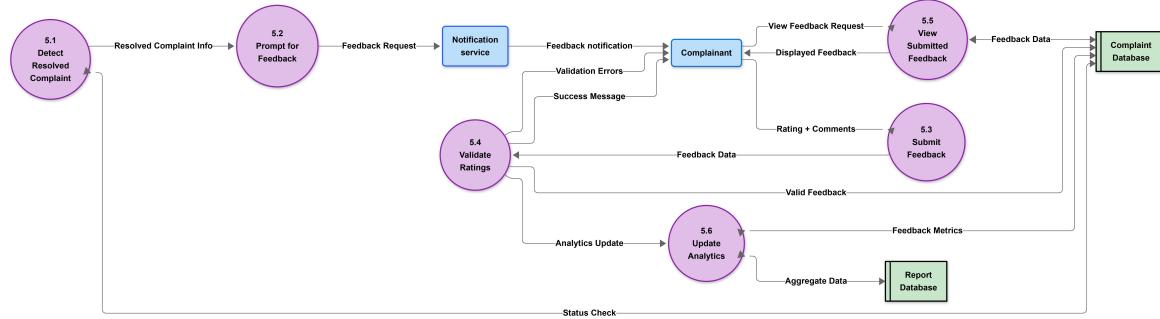


Figure 4.5: Level 1 DFD – Process 5: Feedback (rating submission, feedback comments, and analytics update)

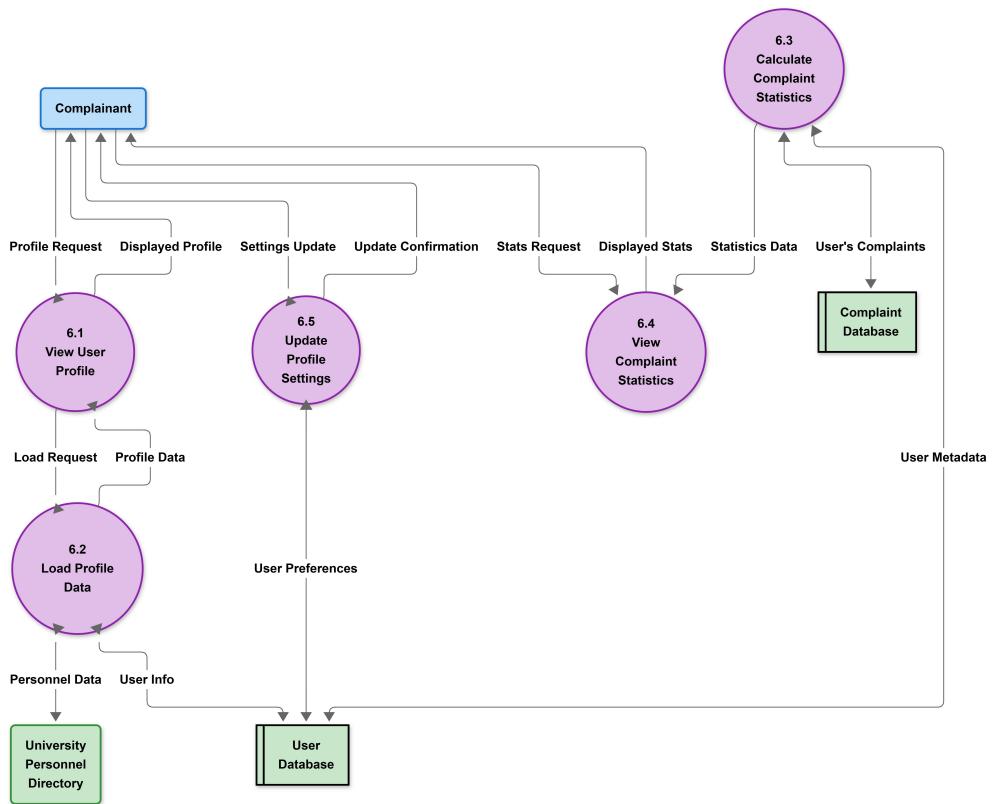


Figure 4.6: Level 1 DFD – Process 6: Profile Management (view/update profile, preferences, and personal data)

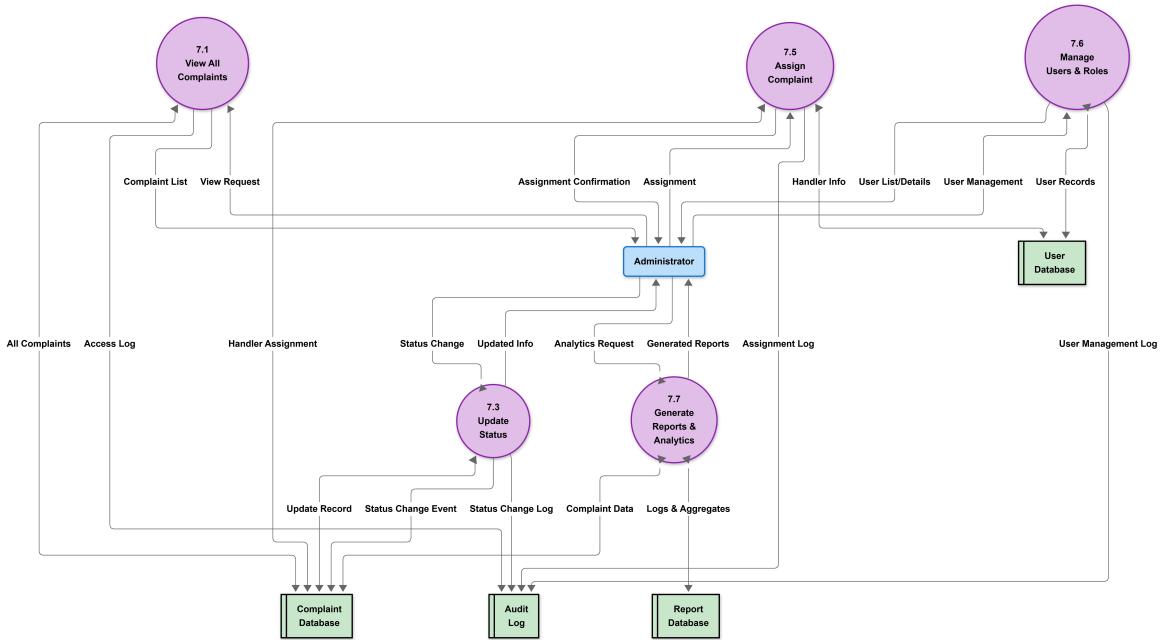


Figure 4.7: Level 1 DFD – Process 7: Administrator Functions (assignment, reporting, dashboard, and system management)

4.1.2 Sequence Diagrams

This section presents the eight sequence diagrams for the Complaint Management and Tracking System. Each diagram illustrates the detailed interactions between actors, mobile application components, backend services, and external systems for specific key functionalities.

Sequence Diagram 1: User Authentication (Login & Logout)

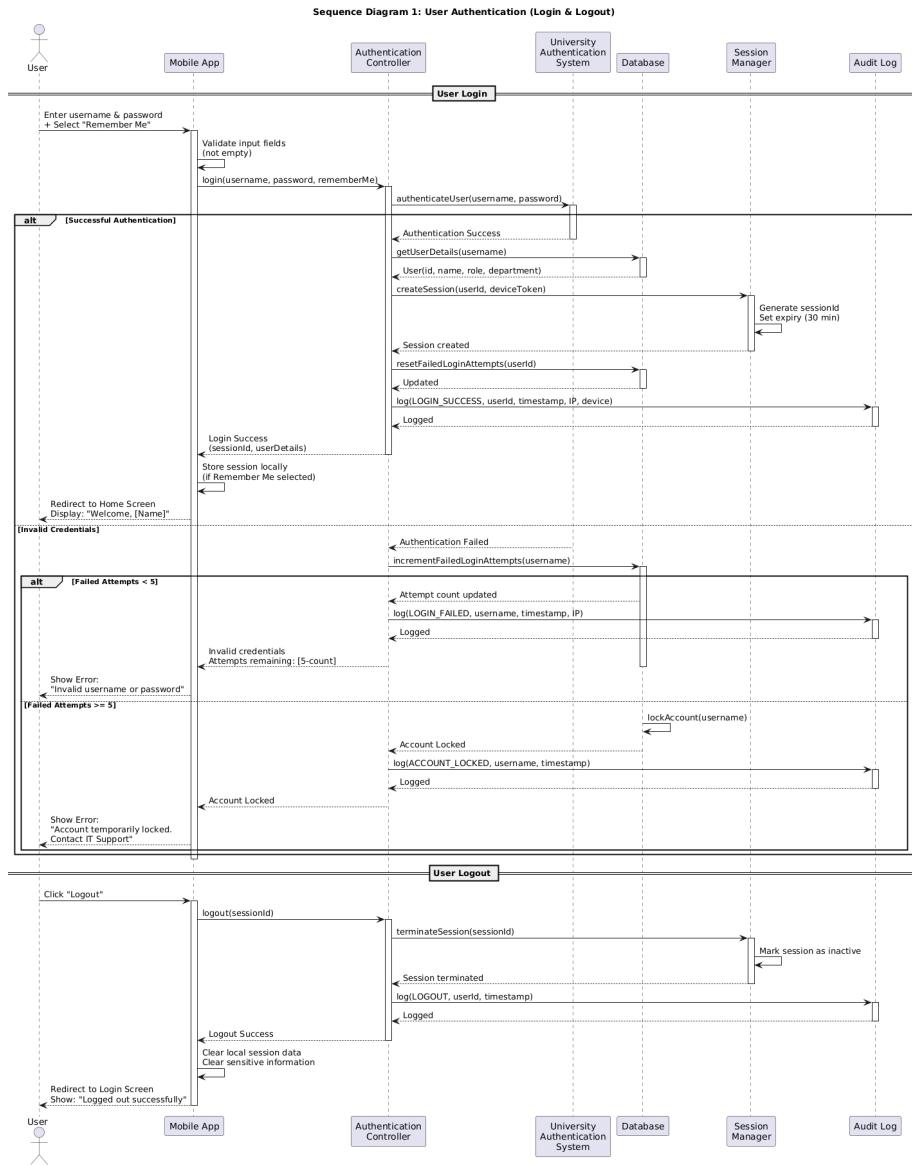


Figure 4.8: Sequence Diagram 1 – User Authentication: Login, session management, failed attempts handling, account lockout, and secure logout

Description: This diagram illustrates the complete authentication flow including university credential validation, session creation, "Remember Me" functionality, failed login tracking with lockout after 5 attempts, integration with external university authentication system (LDAP/AD), audit logging, and secure logout process with session termination.

Sequence Diagram 2: Complaint Submission Flow

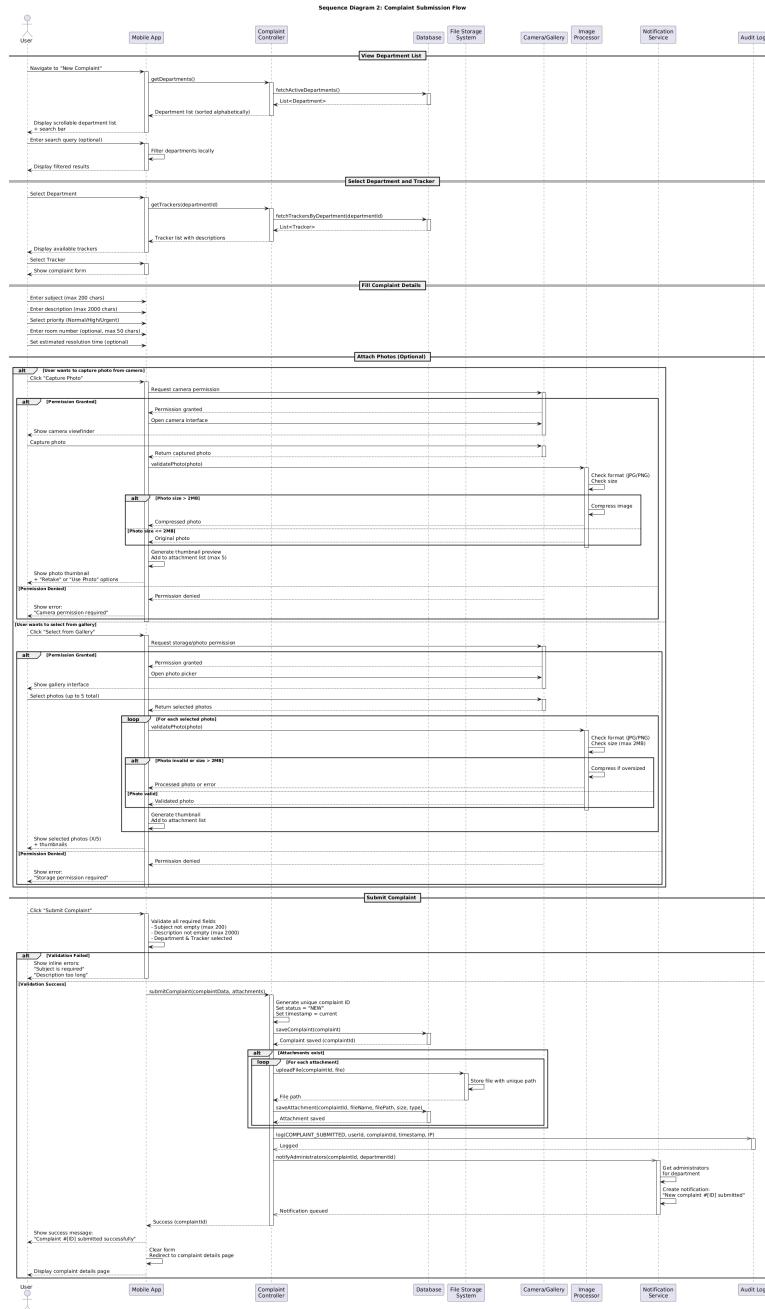


Figure 4.9: Sequence Diagram 2 – Complaint Submission: Complete end-to-end workflow including department/tracker selection and photo attachment

Description: This diagram depicts the full complaint submission process: department and tracker selection, form validation, photo capture/compression from camera or gallery, file upload to cloud storage, complaint creation in database, and immediate notification delivery to assigned administrators.

Sequence Diagram 3: View and Track Complaints

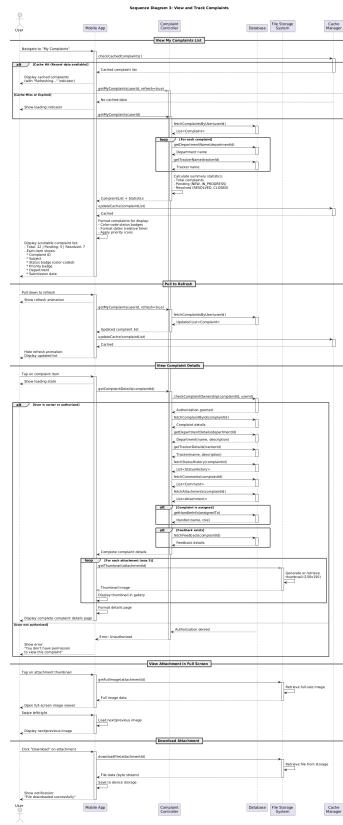


Figure 4.10: Sequence Diagram 3 – View and Track Complaints: List loading, details view, status history, and attachment handling

Description: This diagram shows how users view their complaint list (with caching and pull-to-refresh), access detailed information with proper authorization, view status history timeline, download/view attachments, and use full-screen image viewer for attached photos.

Sequence Diagram 4: Filter and Search Complaints

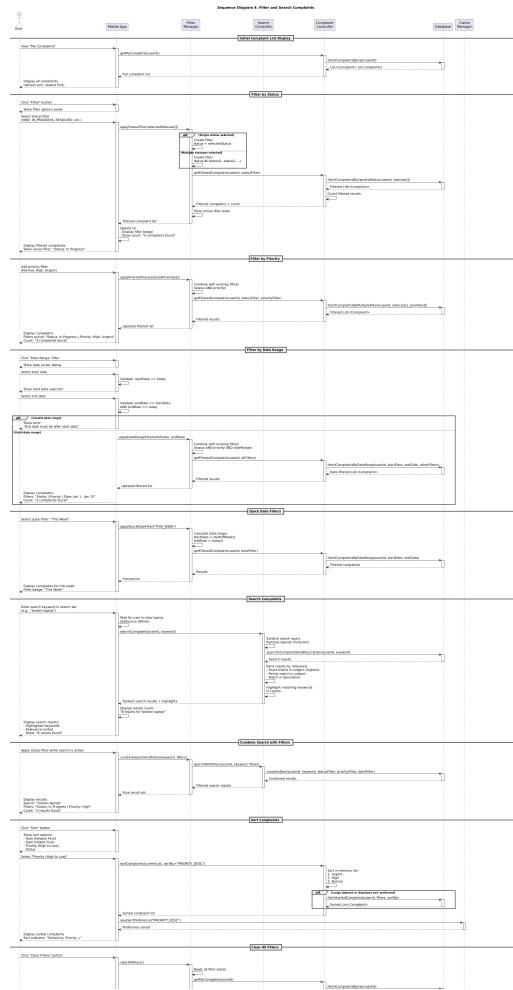


Figure 4.11: Sequence Diagram 4 – Filter and Search: Advanced filtering, keyword search, and sorting capabilities

Description: This diagram illustrates the advanced complaint filtering and search features including status/priority/date range filters, quick date presets, keyword search with result highlighting, multi-criteria combined logic, sorting options (date, priority, status), and persistent filter state management.

Sequence Diagram 5: Communication – Comments and Attachments

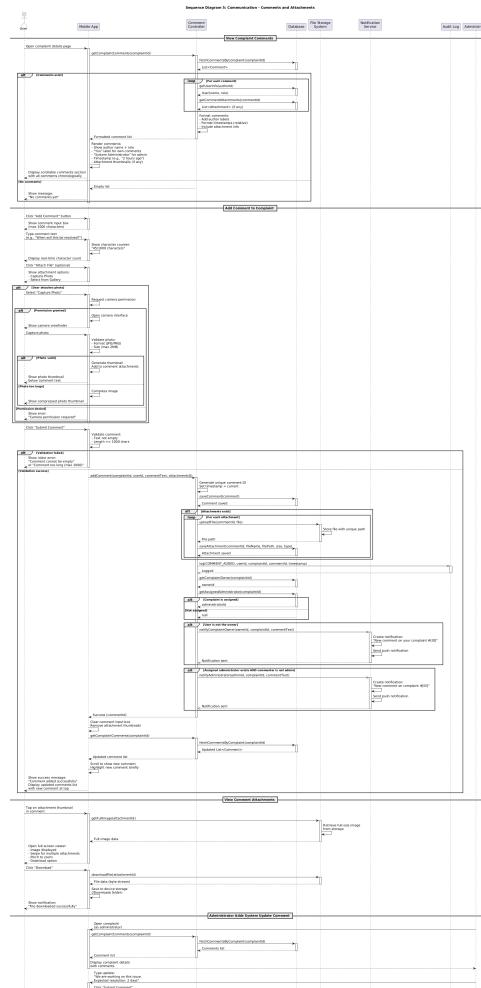


Figure 4.12: Sequence Diagram 5 – Communication: Adding comments with attachments and notification flow

Description: This diagram demonstrates bidirectional communication between users and administrators: adding comments (text + optional attachments), viewing comment history with author/time stamps, smart role-based notifications, and secure attachment download functionality.

Sequence Diagram 6: Push Notification System

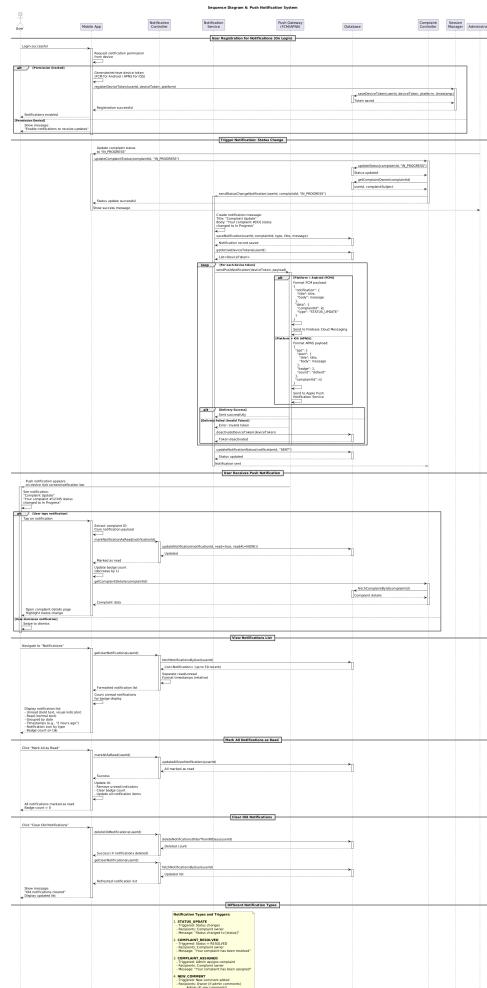


Figure 4.13: Sequence Diagram 6 – Push Notifications: Device registration, delivery, and management across platforms

Description: This diagram shows the complete push notification architecture: device token registration (iOS/Android), different notification types (status change, new comment, assignment, etc.), delivery via FCM/APNS, in-app notification list management, read/clear actions, and handling of invalid/expired tokens.

Sequence Diagram 7: Feedback Submission and Rating

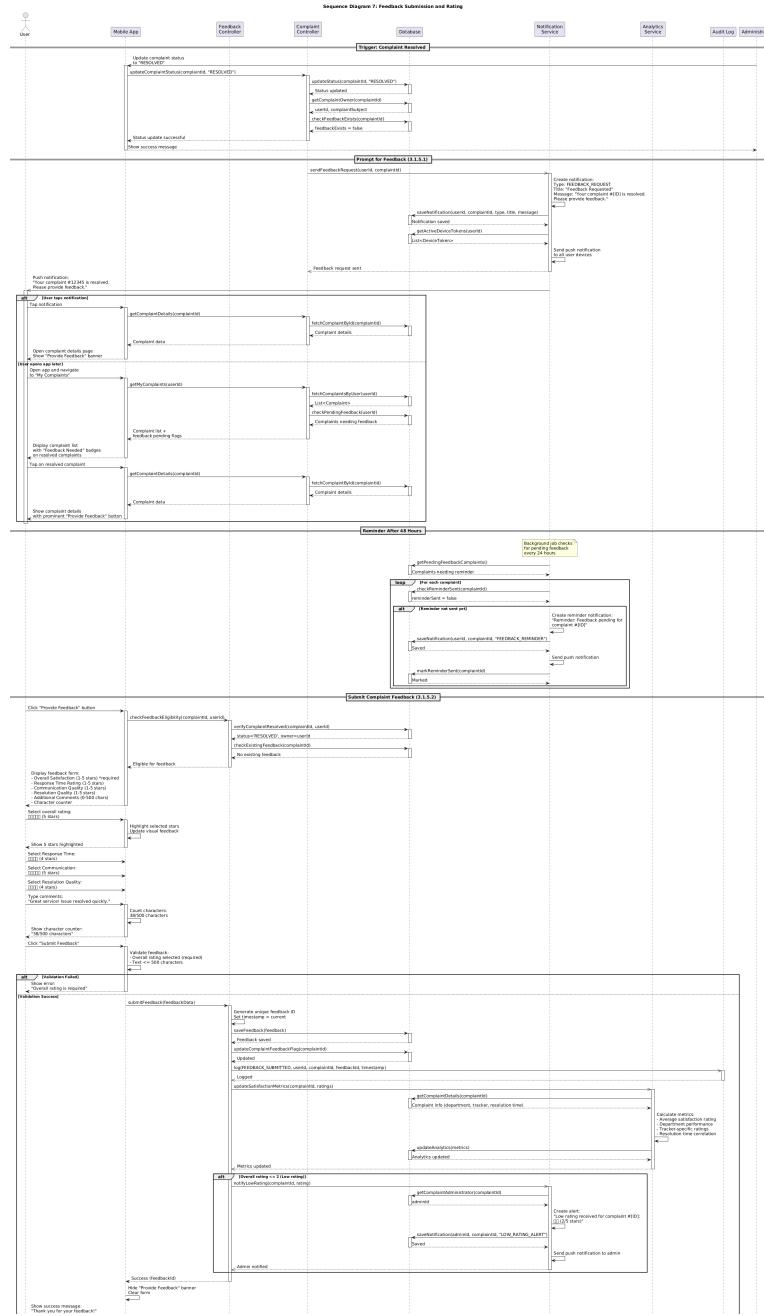


Figure 4.14: Sequence Diagram 7 – Feedback and Rating: Multi-criteria rating and analytics integration

Description: This diagram illustrates the post-resolution feedback mechanism: triggering feedback request, multi-criteria rating (overall satisfaction, response time, communication, resolution quality), optional comments, 7-day edit window, automatic reminders, low-rating alerts to administrators, and integration with analytics module.

Sequence Diagram 8: Administrator – Complaint Management



Figure 4.15: Sequence Diagram 8 – Administrator Functions: Dashboard, assignment, updates, and reporting

Description: This diagram presents key administrator workflows: dashboard statistics overview, complaint assignment to handlers/trackers, status/priority updates, admin comments, performance report generation (with CSV/PDF export), department-based filtering, basic user management, and system configuration options.

4.1.3 Use Case Diagram

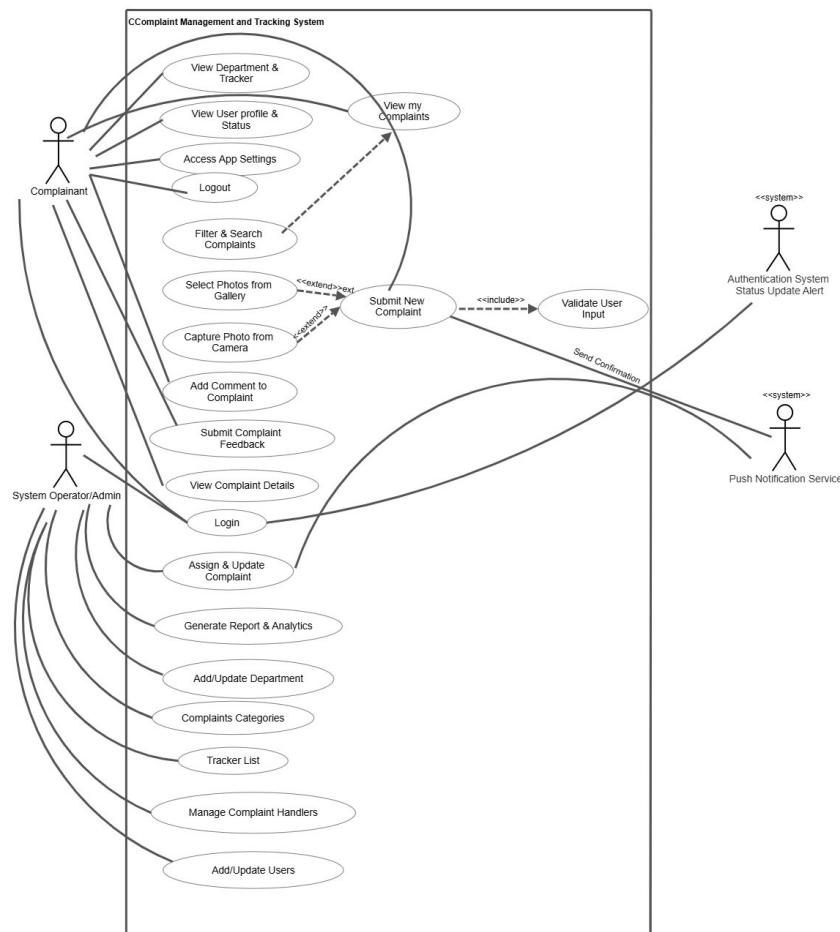


Figure 4.16: Shows all system functions and users

Main Points:

- Two main users: Regular users and Administrators
- Two external systems help: <<system>> Push notifications and <<system>> Authentication alerts
- Covers complete process from complaint submission to feedback
- Each function connects to SRS requirements

4.1.4 Activity Diagrams

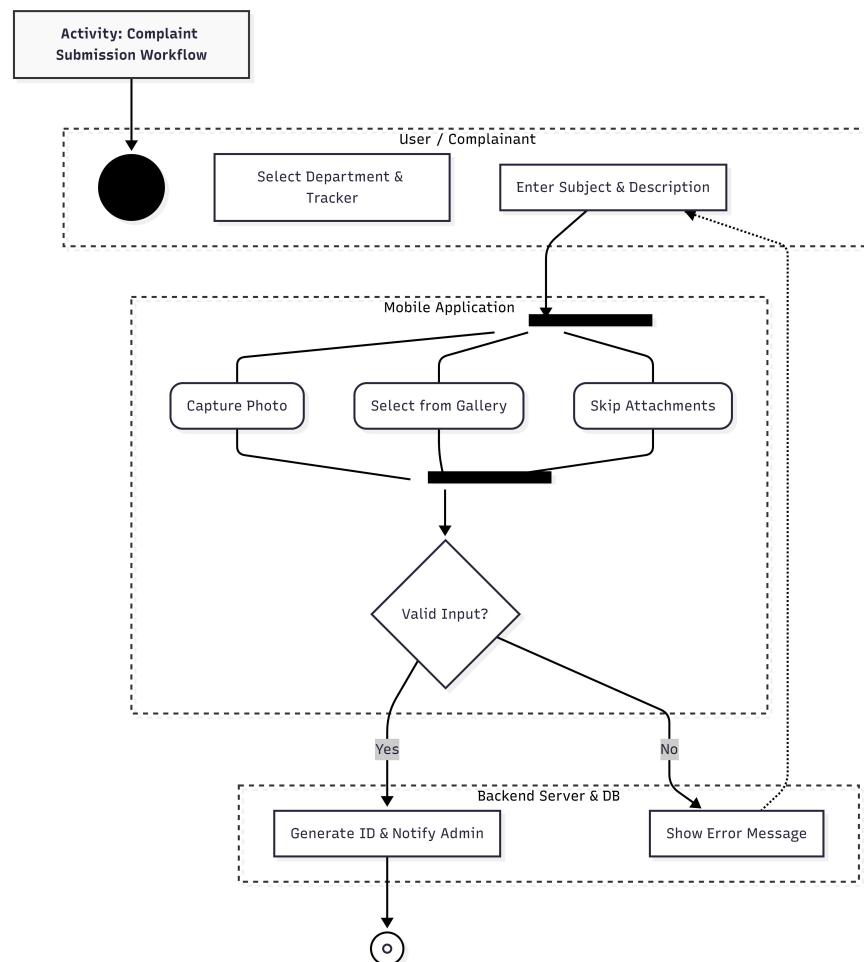


Figure 4.17: Shows how to submit a complaint

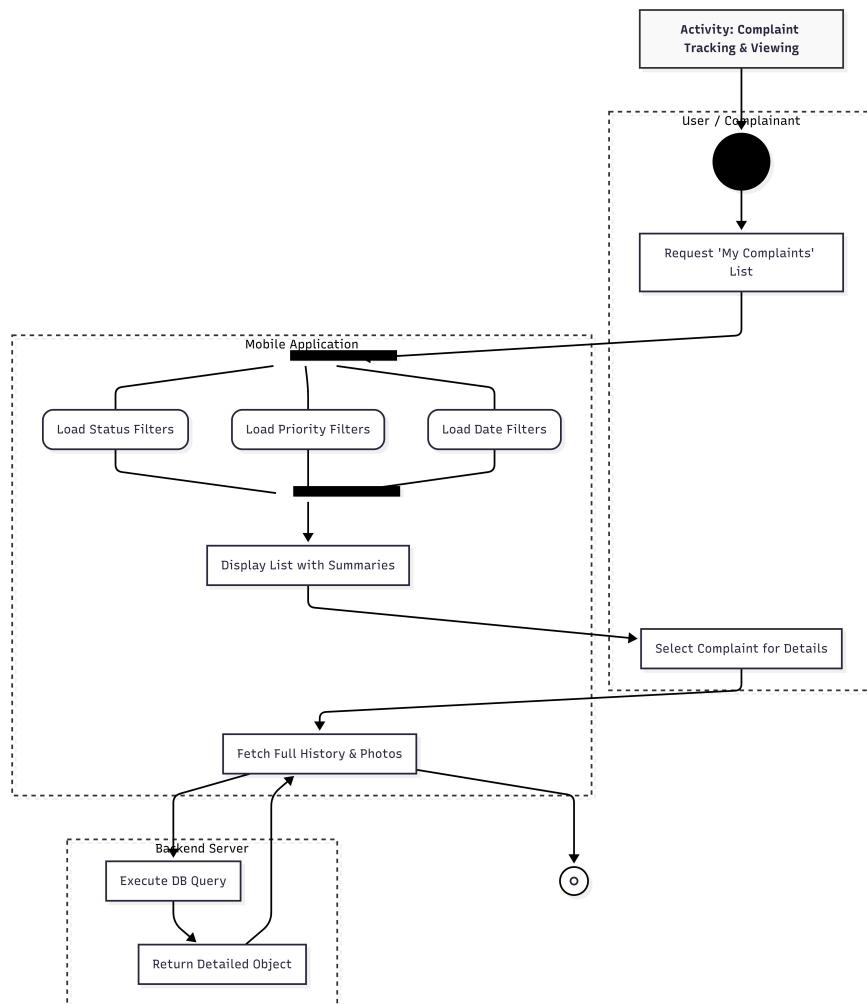


Figure 4.18: Shows how to view and track complaints

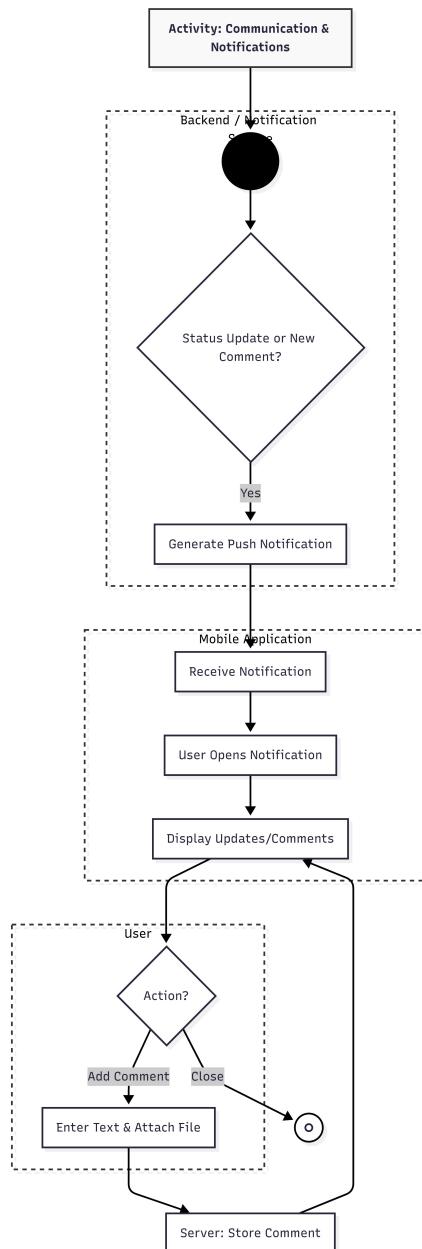


Figure 4.19: Shows notification and comment system

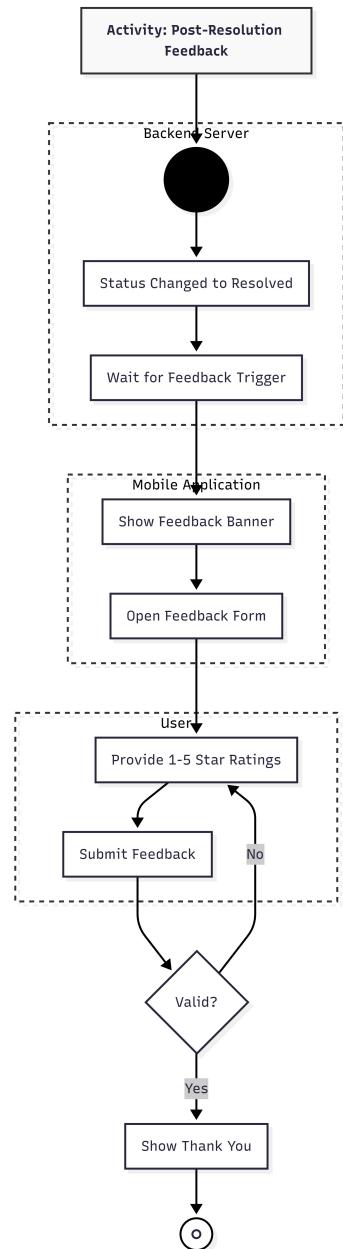


Figure 4.20: Shows feedback collection after complaint is resolved

4.2 Structural Diagrams

4.2.1 System Class Diagram

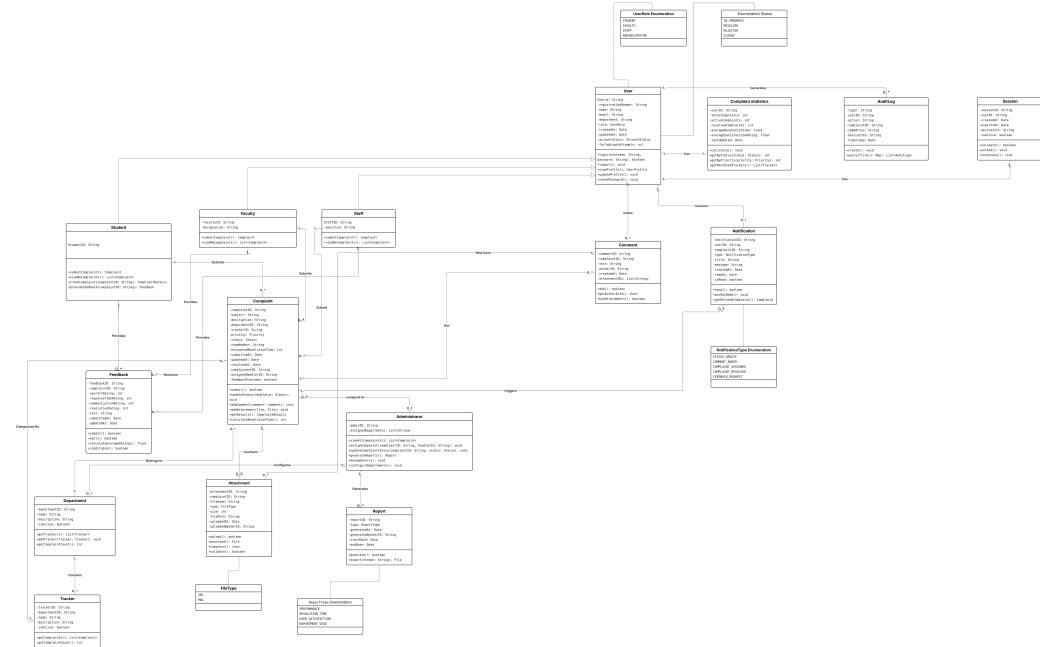


Figure 4.21: Complete Class Diagram - Complaint Management and Tracking System

Description: The class diagram illustrates the complete data model and relationships between all system entities. It includes user management, complaint handling, department organization, notification system, feedback mechanism, and administrative functions. The diagram shows attributes, methods, and relationships with proper cardinality notation.

4.2.2 Component Diagram

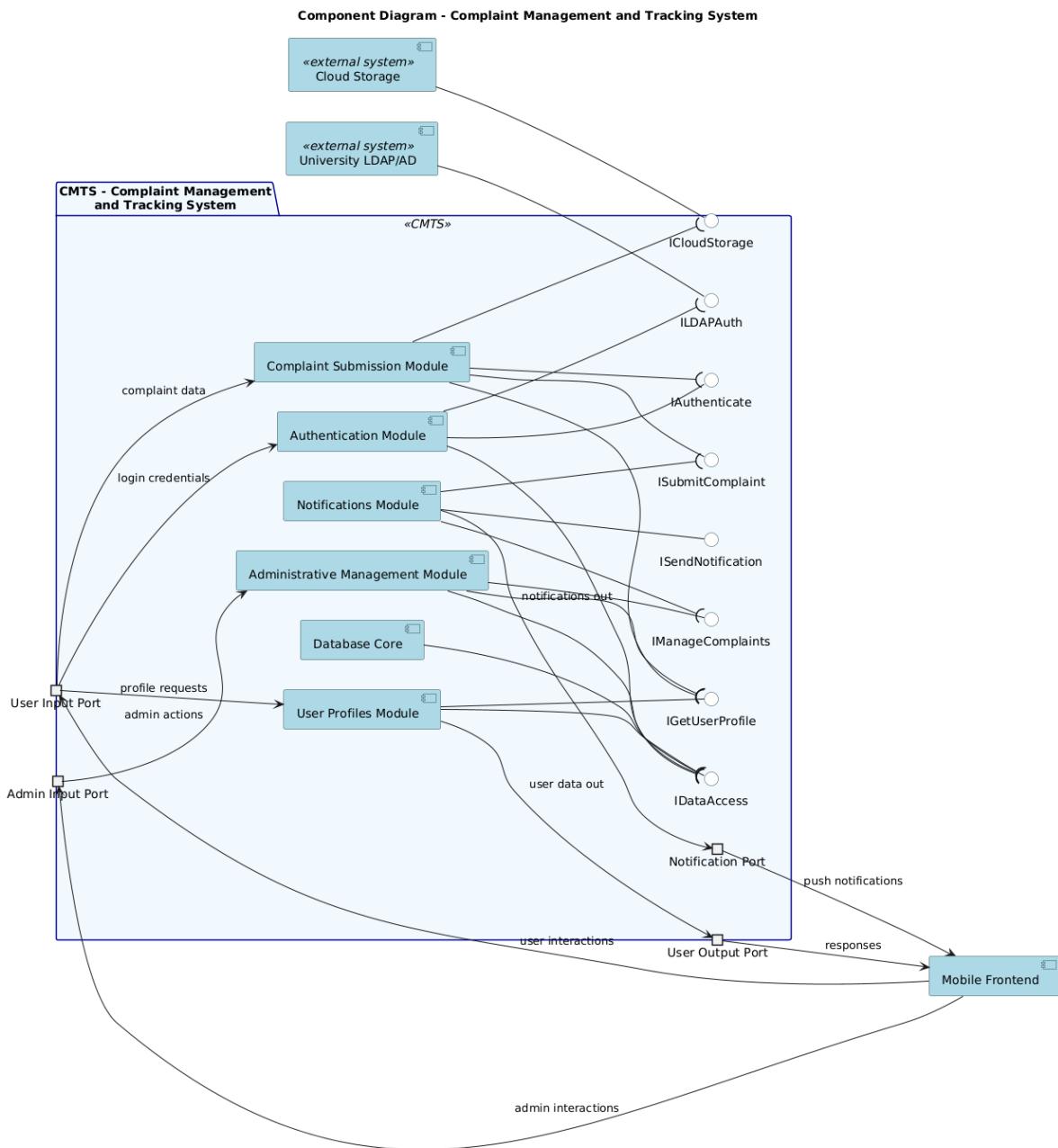


Figure 4.22: Component Diagram - Complaint Management and Tracking System

Chapter 5

Requirements-Design Traceability

FR ID	Short Description	Diagram Names
3.1.1	User Authentication	Use Case Diagram, Sequence Diagram 1: User Authentication, Level 2 DFD - Process 1: User Authentication, Activity Diagram: Communication (partial), System Class Diagram (User, Session, AuditLog)
3.1.1.1	Verify users with university credentials, session management, failed attempts handling	Sequence Diagram 1, Level 2 DFD - Process 1, System Class Diagram (User, Session)
3.1.1.2	Secure logout, clear session data	Sequence Diagram 1, Level 2 DFD - Process 1, System Class Diagram (Session)
3.1.2	Complaint Submission	Use Case Diagram, Activity Diagram: Complaint Submission, Sequence Diagram 2: Complaint Submission Flow, Level 2 DFD - Process 2: Complaint Submission, System Class Diagram (Complaint, Department, Tracker, Attachment)
3.1.2.1	List and search active departments	Activity Diagram: Complaint Submission, Sequence Diagram 2, Level 2 DFD - Process 2, System Class Diagram (Department)
3.1.2.2	Select tracker based on department	Activity Diagram: Complaint Submission, Sequence Diagram 2, Level 2 DFD - Process 2, System Class Diagram (Tracker)
3.1.2.3	Submit new complaint with details, priority, attachments	Activity Diagram: Complaint Submission, Sequence Diagram 2, Level 2 DFD - Process 2, System Class Diagram (Complaint)

FR ID	Short Description	Diagram Names
3.1.2.4	Take photos using device camera	Activity Diagram: Complaint Submission, Sequence Diagram 2, Level 2 DFD - Process 2, System Class Diagram (Attachment)
3.1.2.5	Choose photos from device gallery	Activity Diagram: Complaint Submission, Sequence Diagram 2, Level 2 DFD - Process 2, System Class Diagram (Attachment)
3.1.3	Tracking and Management of Complaints	Use Case Diagram, Activity Diagram: Complaint Tracking, Sequence Diagram 3: View and Track Complaints, Sequence Diagram 4: Filter and Search Complaints, Level 2 DFD - Process 3: View and Tracking, System Class Diagram (Complaint, StatusHistory)
3.1.3.1	List user's submitted complaints	Activity Diagram: Complaint Tracking, Sequence Diagram 3, Level 2 DFD - Process 3
3.1.3.2	Detailed view of selected complaint	Activity Diagram: Complaint Tracking, Sequence Diagram 3, Level 2 DFD - Process 3
3.1.3.3	Filter by complaint status	Activity Diagram: Complaint Tracking, Sequence Diagram 4, Level 2 DFD - Process 3
3.1.3.4	Filter by priority levels	Activity Diagram: Complaint Tracking, Sequence Diagram 4, Level 2 DFD - Process 3
3.1.3.5	Filter by date ranges	Activity Diagram: Complaint Tracking, Sequence Diagram 4, Level 2 DFD - Process 3
3.1.3.6	Keyword search in complaints	Activity Diagram: Complaint Tracking, Sequence Diagram 4, Level 2 DFD - Process 3
3.1.3.7	Sort by various criteria	Activity Diagram: Complaint Tracking, Sequence Diagram 4, Level 2 DFD - Process 3
3.1.4	Communication and Updates	Use Case Diagram, Activity Diagram: Communication, Sequence Diagram 5: Communication - Comments and Attachments, Sequence Diagram 6: Push Notification System, Level 2 DFD - Process 4: Communication and Updates, System Class Diagram (Comment, Attachment, Notification)

FR ID	Short Description	Diagram Names
3.1.4.1	Add comments to complaints	Activity Diagram: Communication, Sequence Diagram 5, Level 2 DFD - Process 4, System Class Diagram (Comment)
3.1.4.2	View comments history	Activity Diagram: Communication, Sequence Diagram 5, Level 2 DFD - Process 4
3.1.4.3	View and download attachments	Activity Diagram: Communication, Sequence Diagram 5, Level 2 DFD - Process 4, System Class Diagram (Attachment)
3.1.4.4	Push notifications for updates	Activity Diagram: Communication, Sequence Diagram 6, Level 2 DFD - Process 4, System Class Diagram (Notification)
3.1.4.5	List of received notifications	Activity Diagram: Communication, Sequence Diagram 6, Level 2 DFD - Process 4
3.1.5	Feedback and Rating	Use Case Diagram, Activity Diagram: Feedback after Resolution, Sequence Diagram 7: Feedback Submission and Rating, Level 2 DFD - Process 5: Feedback, System Class Diagram (Feedback, Analytics)
3.1.5.1	Prompt after resolution	Activity Diagram: Feedback after Resolution, Sequence Diagram 7, Level 2 DFD - Process 5
3.1.5.2	Submit ratings and comments	Activity Diagram: Feedback after Resolution, Sequence Diagram 7, Level 2 DFD - Process 5
3.1.5.3	View and edit submitted feedback	Activity Diagram: Feedback after Resolution, Sequence Diagram 7, Level 2 DFD - Process 5
3.1.6	User Profile	Use Case Diagram, Level 2 DFD - Process 6: Profile Management, System Class Diagram (User)
3.1.6.1	View profile information	Level 2 DFD - Process 6
3.1.6.2	View personal complaint stats	Level 2 DFD - Process 6
3.2	Administrator Functions	Use Case Diagram, Sequence Diagram 8: Administrator - Complaint Management, Level 2 DFD - Process 7: Administrator Functions, System Class Diagram (Administrator, Report, Analytics)
3.2.1	View Admin Dashboard	Sequence Diagram 8, Level 2 DFD - Process 7

FR ID	Short Description	Diagram Names
3.2.2	View All Complaints	Sequence Diagram 8, Level 2 DFD - Process 7
3.2.3	Update Complaint Status	Sequence Diagram 8, Level 2 DFD - Process 7, System Class Diagram (StatusHistory)
3.2.4	Assign Complaint to Handler	Sequence Diagram 8, Level 2 DFD - Process 7
3.2.5	Change Complaint Priority	Sequence Diagram 8, Level 2 DFD - Process 7
3.2.6	Generate Performance Reports	Sequence Diagram 8, Level 2 DFD - Process 7, System Class Diagram (Report, Analytics)
3.2.7	Export Reports (PDF, CSV, Excel)	Sequence Diagram 8, Level 2 DFD - Process 7
3.2.8	Manage Departments and Trackers	Sequence Diagram 8, Level 2 DFD - Process 7, System Class Diagram (Department, Tracker)
3.2.9	Manage User Accounts	Sequence Diagram 8, Level 2 DFD - Process 7
3.2.10	System Configuration	Sequence Diagram 8, Level 2 DFD - Process 7

Chapter 6

Conclusion

This Design Report presents a comprehensive system design for the Complaint Management and Tracking System. The design includes:

- 8 sequence diagrams modeling key interactions
- Class diagram with 14 entities and 104 attributes
- DFDs across 3 levels
- Complete traceability from 80+ requirements

All design decisions have been justified based on system constraints, performance requirements, and user needs. The architecture supports scalability, maintainability, and future enhancements while meeting all functional and non-functional requirements.

Stakeholder feedback from both RP meetings has been incorporated, ensuring the design aligns with user expectations. The system is ready for implementation.

Chapter 7

Appendices

- GitHub
- Diagrams
- Figma Prototypes