

Problem Statement:
5. Loan Management System

LoanSphere

Next-Gen Loan Management System

Secure, Scalable, and Smart Financial Processing

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Business Context

Banks, NBFCs, and financial institutions manage multiple loan products such as Personal Loans, Home Loans, Vehicle Loans, and Education Loans.

Common Challenges

Manual Processing: Manual or semi-automated loan processing.

Tracking Issues: Difficulty tracking loan status and approvals.

Limited Visibility: Limited visibility into EMI schedules and repayments.

Poor Audit: Poor audit and reporting mechanisms.

Security Risks: Security risks around customer financial data.

The Goal

"To build a Loan Management System that digitizes the complete loan lifecycle - from application to closure."

Project Overview

What it Does

The Loan Management System (LMS) is a robust enterprise-grade web application designed to streamline the entire loan lifecycle. It transforms traditional, paper-heavy lending processes into a seamless digital experience - from initial application to final closure.

High-Level Tech Stack

Frontend: Angular with Angular Material

Backend: ASP.NET Core Web API (.NET 9)

Database: SQL Server with Entity Framework Core

Security: JWT Authentication & Role-Based Access Control

The Solution: LoanSphere

A strictly digital, secure, and role-based lending platform.

Core Pillars

End-to-End Digitization:

Applied -> Under Review ->
Active(Approved)/Rejected -> Closed

Role-Based Access:

Dedicated portals for Admin, Officers, and
Customers.

Smart Intelligence

Real-Time:

Instant notifications and dynamic dashboards.

Secure:

JWT Auth, RBAC, Bcrypt Password Hashing.

Detailed Tech Stack & Implementation

FRONT END

- Angular (v20+) + Material Design
- Reactive Forms (Validation)
- Snackbars & Data Pipes
- Pagination, Search & Filter
- TypeScript Models & Interfaces

BACK END

- ASP.NET Core Web API (.NET 9)
- EF Core ORM (Code-First)
- JWT Auth & Custom Role Logic
- LINQ & DTOs (No Entity Exposure)
- Repository Pattern / Layered Arch.
- Global Exception Middleware

DATABASE & TOOLS

- SQL Server Database
- Swagger (OpenAPI) & Postman
- Git Version Control
- Database Seeder (DbInitializer)

Key Features (The "Wow" Factor)

Workflow Engine

Enforces strict status transitions (Applied -> Under Review -> Approved(Active)/Rejected -> Closed).

Maker-Checker Principle

2-level approval process: Verifier (Officer 1) cannot be Approver (Officer 2).

Smart EMI Engine

Auto-calculates amortization schedules and handles foreclosures.

Financial Tools

Integrated EMI and Foreclosure Calculators for transparency.

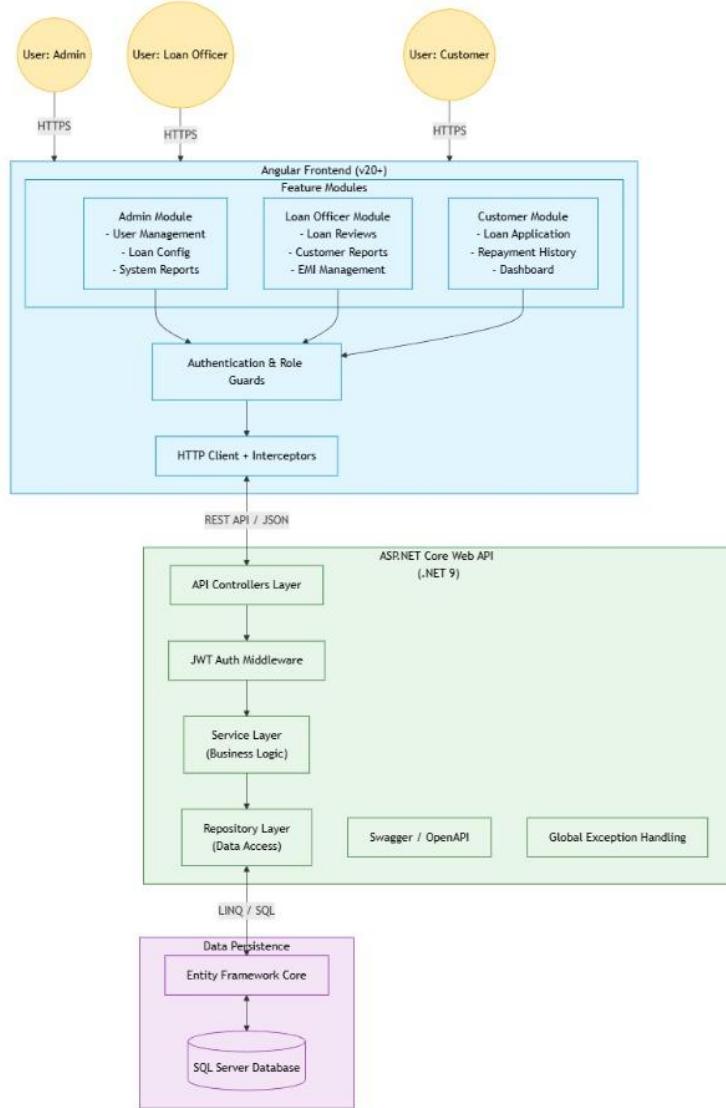
Moratorium Support

Education Loan: Repayment holiday during course + 6-12 months buffer.

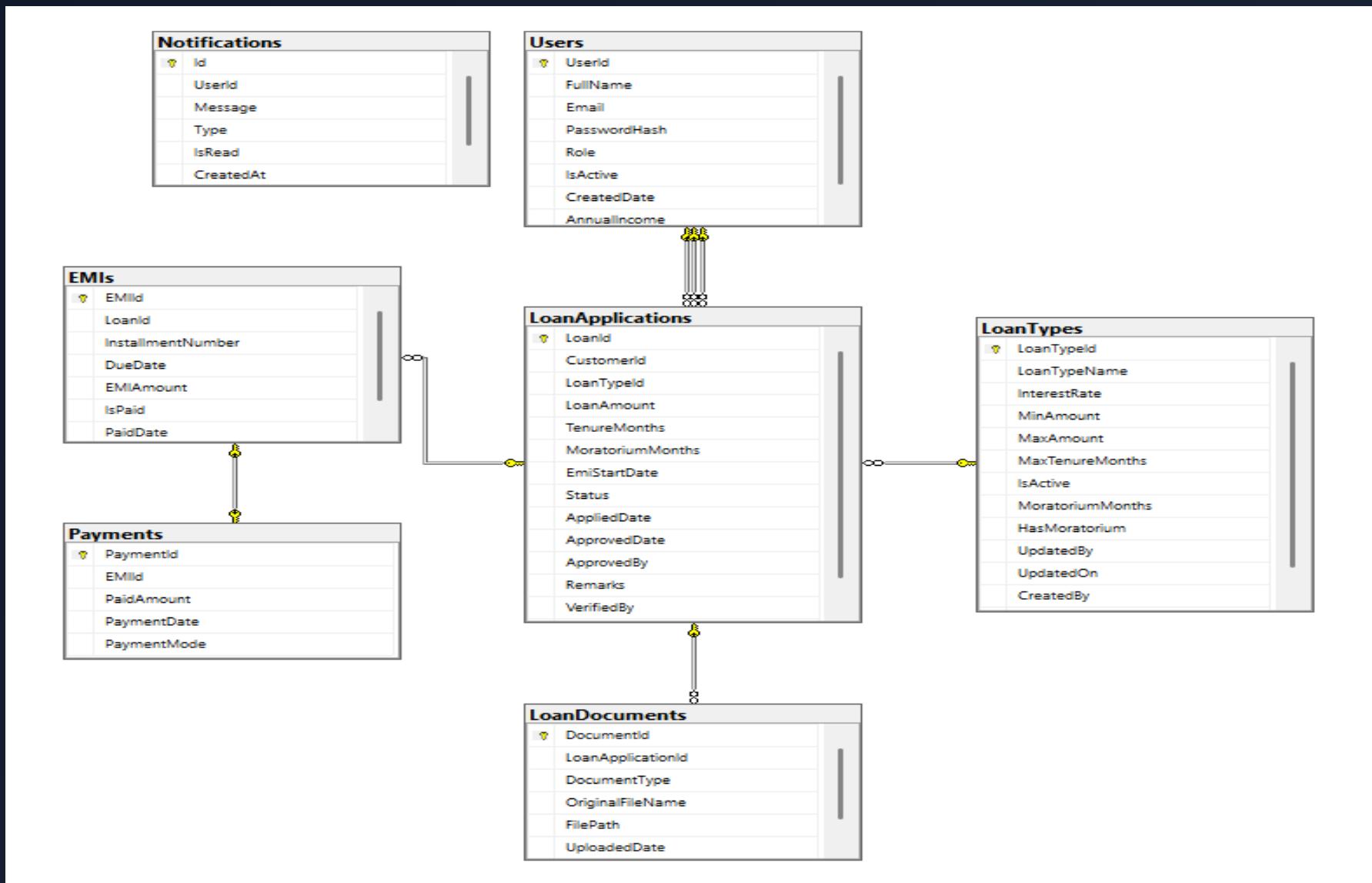
Live Notifications

Instant alerts for status changes, EMI payments, and doc uploads.

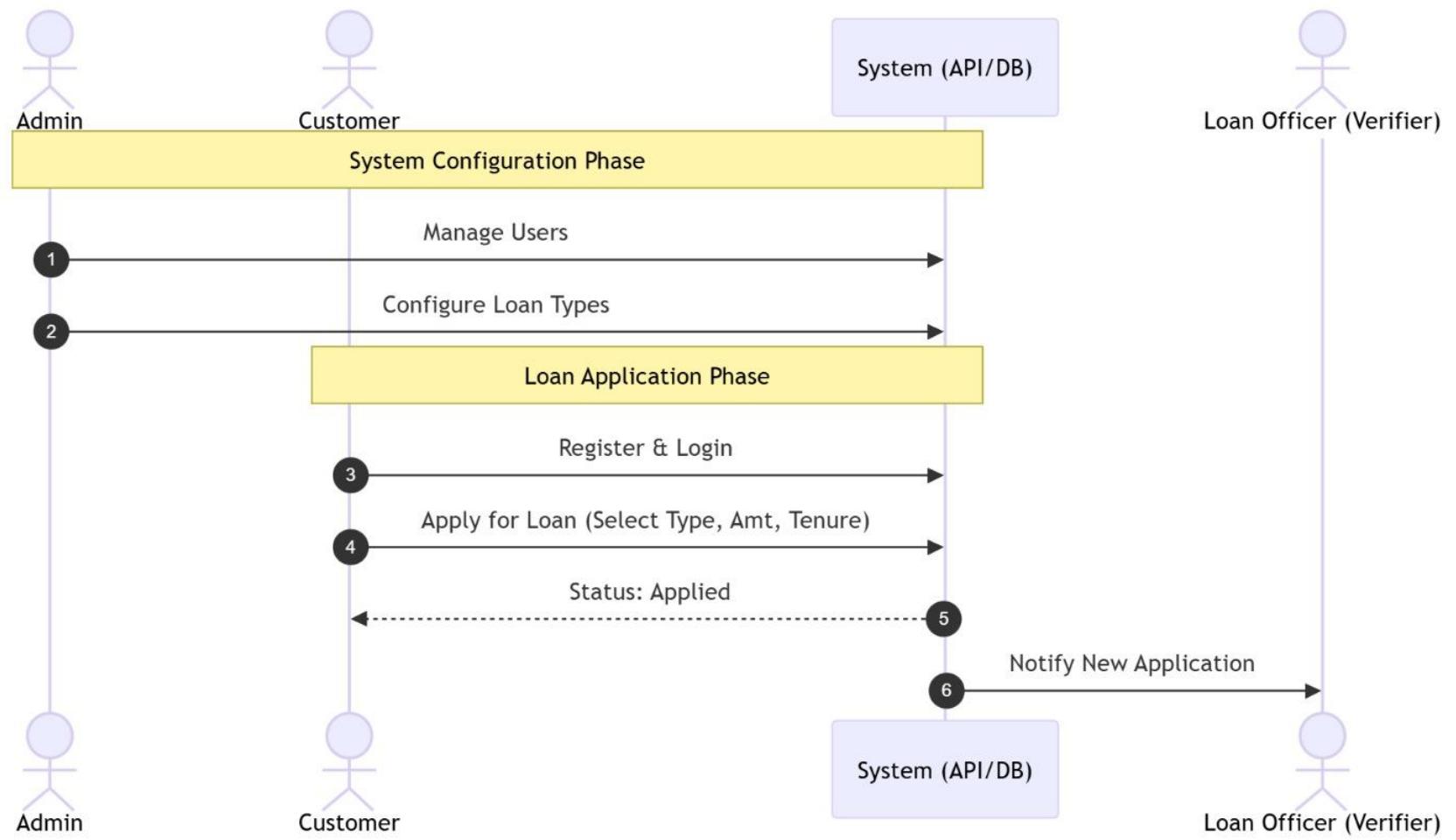
System Architecture



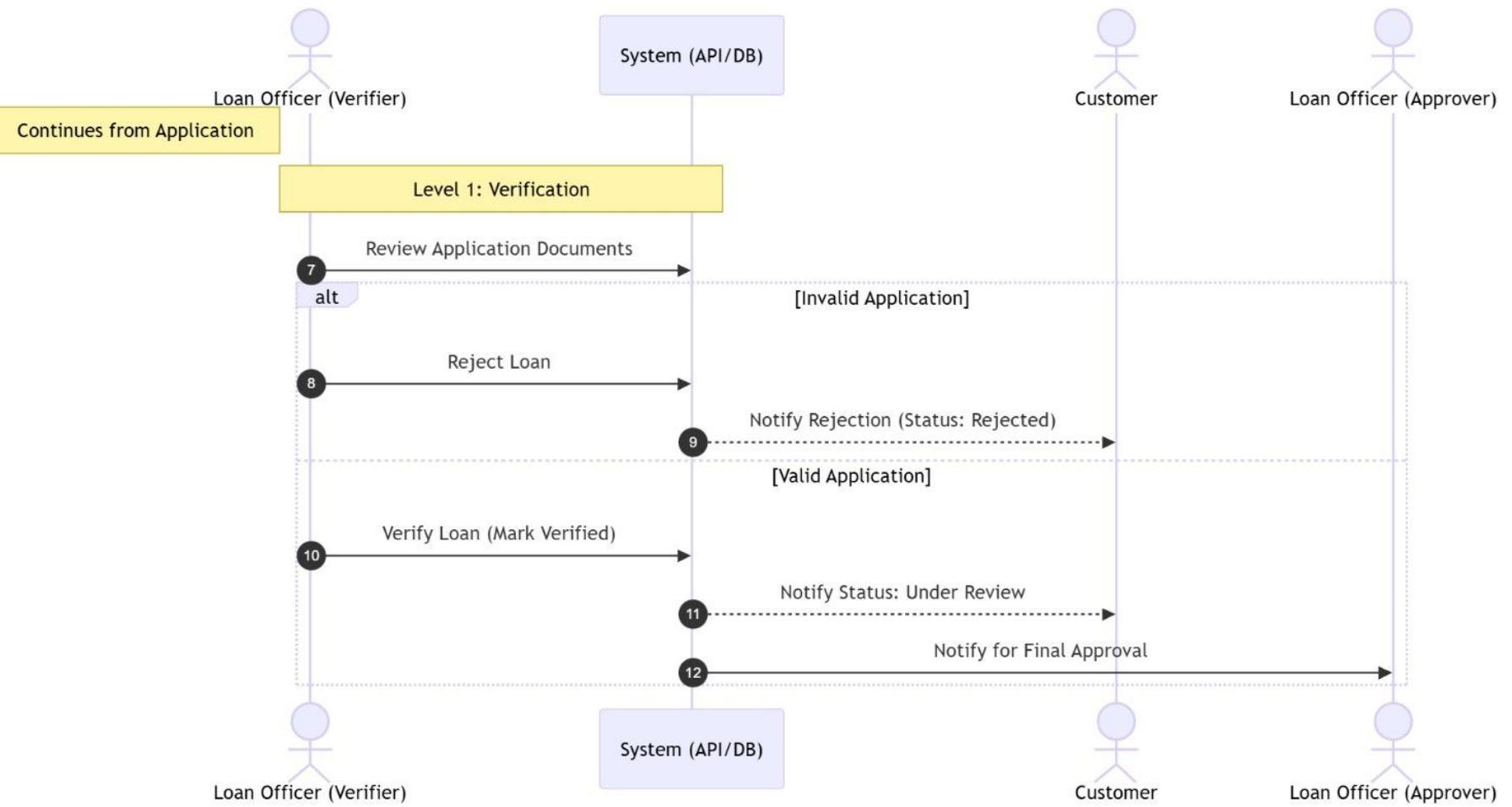
ER Diagram



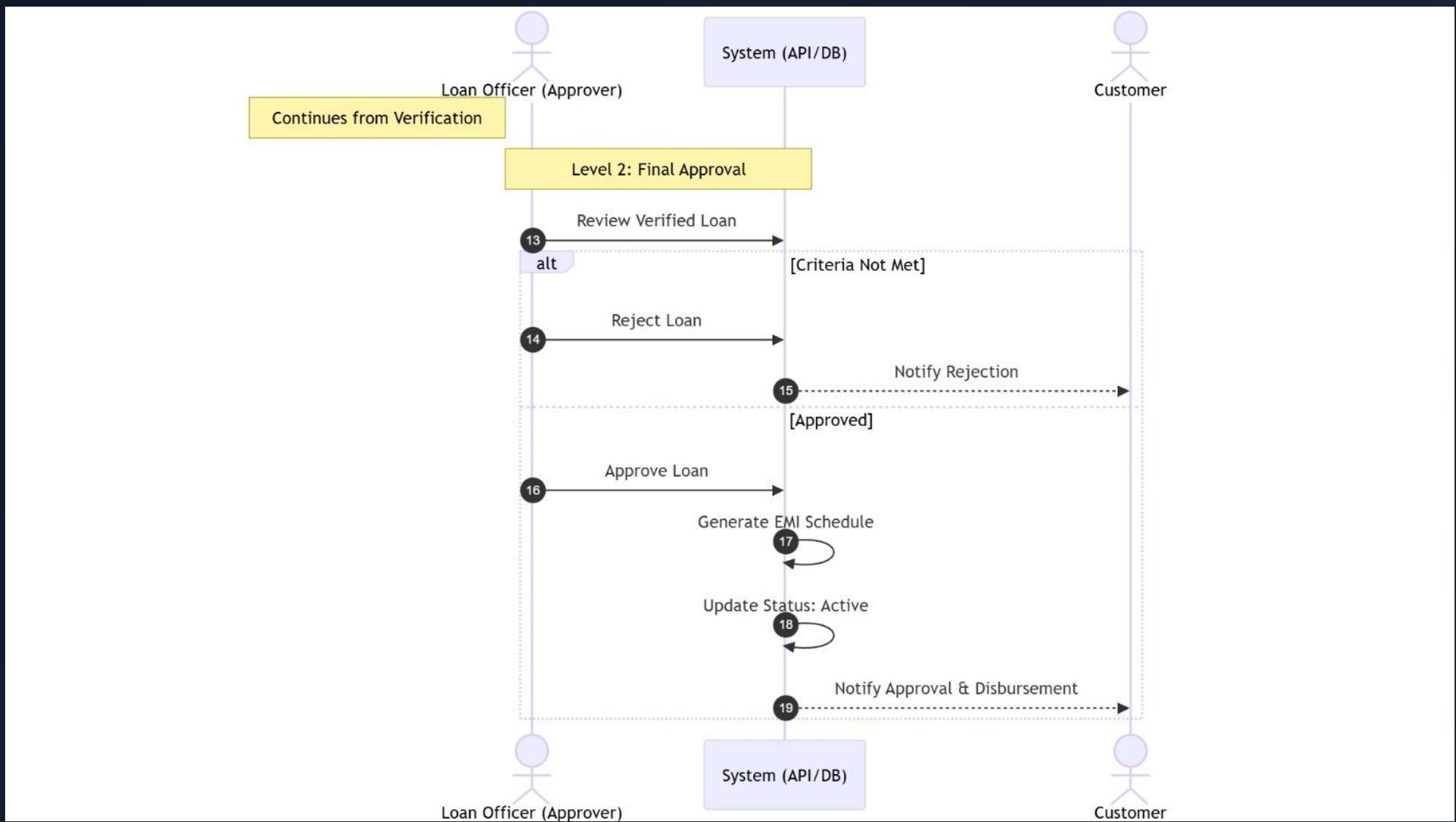
Work Flow



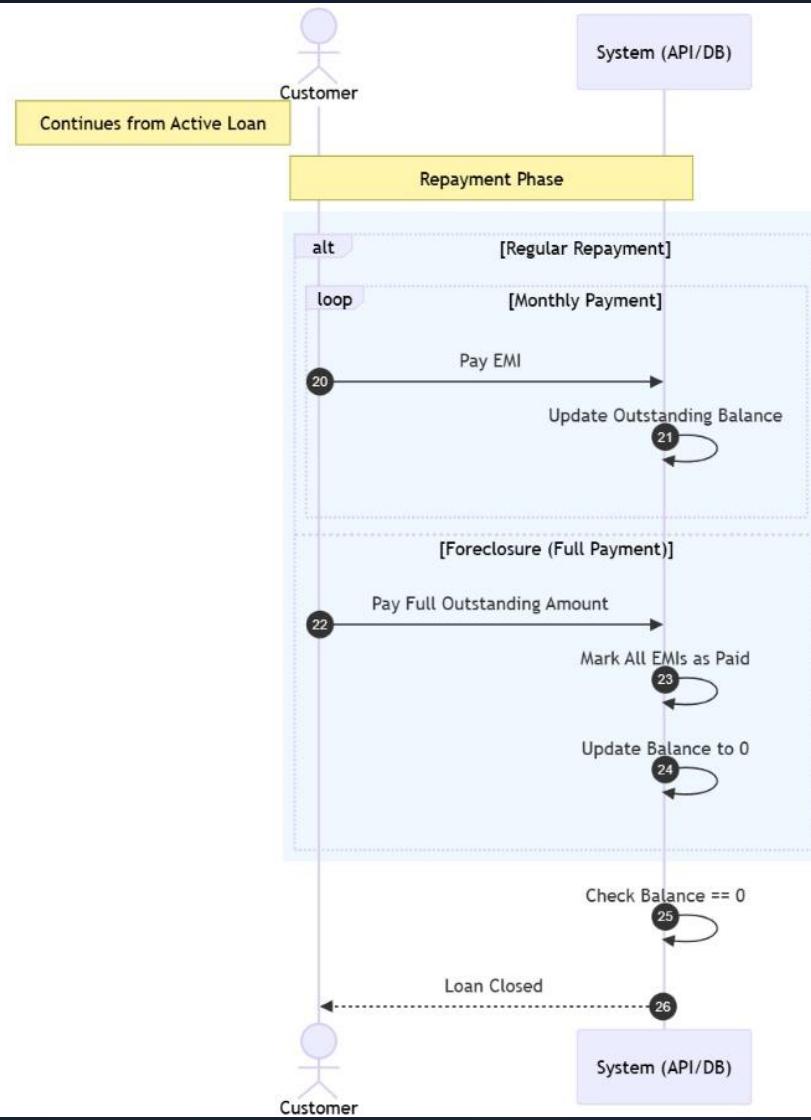
Work Flow



Work Flow



Work Flow



Testing

Test Explorer

▶ ▶ ⏪ ⏴ | ⚗ 39 | ✅ 39 | ❌ 0 | 🔍 ⏵ ⏴ ⏵ ⏴ ⏵ ⏴

Ready

Test

- LoanManagementSystem.Tests (39)
 - LoanManagementSystem.Tests.Services (39)
 - LoanTypeServiceTests (5)
 - ReportServiceTests (5)
 - LoanServiceTests (7)
 - NotificationServiceTests (6)
 - DocumentServiceTests (6)
 - EmiServiceTests (5)
 - AuthServiceTests (5)

▶ Run | 🔍 Debug

Group Summary

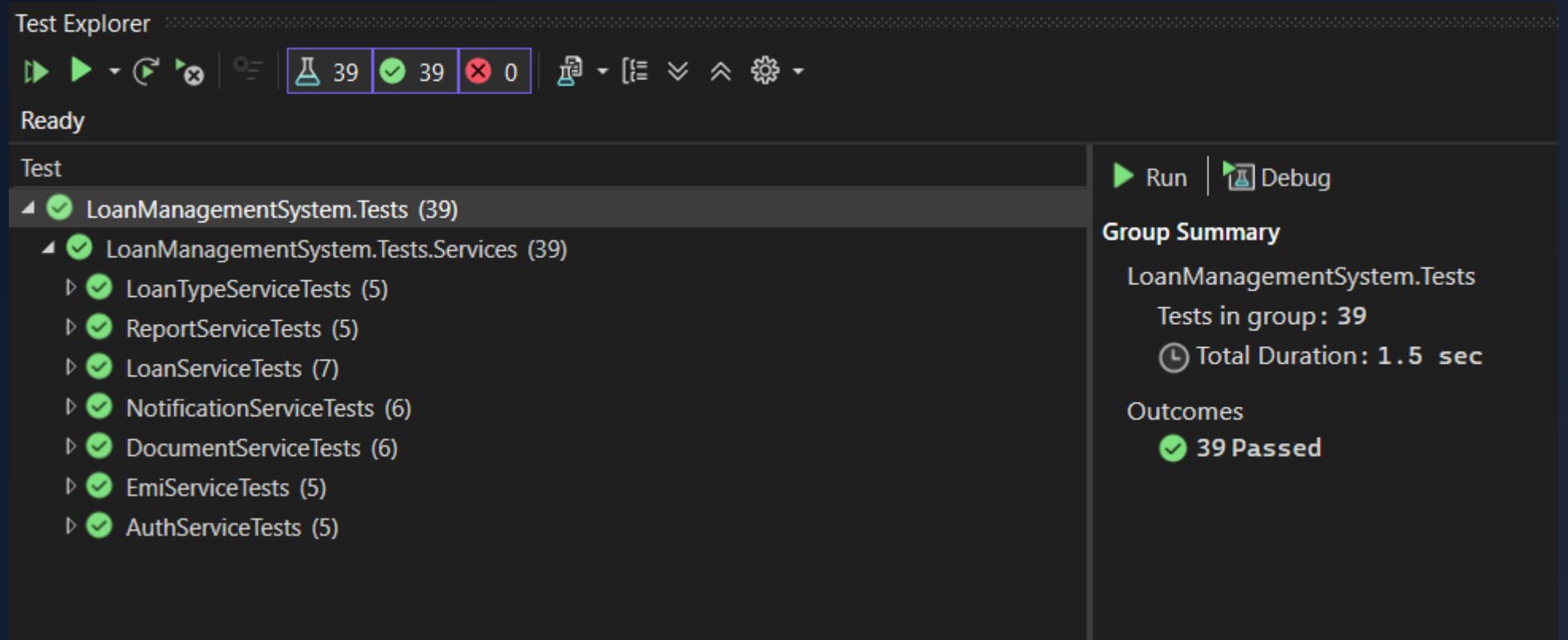
LoanManagementSystem.Tests

Tests in group: 39

⌚ Total Duration: 1.5 sec

Outcomes

✅ 39 Passed



UI Screens

Smart Loans for a Smarter Future

Secure, fast, and transparent loan management tailored to your financial goals.

[Get Started](#) [Login](#)



Streamlined Processing
Our dedicated loan officers ensure a quick, fair, and transparent approval process.

Secure & Private
Your financial data is encrypted with enterprise-grade security protocols.

Real-time Tracking
Monitor your EMI schedules and outstanding amounts in real-time.

Home Page

UI Screens

Register as Customer

1 Personal Details ————— 2 Financial Details

Full Name*

Email*

Password*

Confirm Password*

Next

Already have an account? [Login](#)

This screenshot shows the first step of a two-step customer registration process. It features a header 'Register as Customer' and a progress bar indicating '1 Personal Details' and '2 Financial Details'. Below the progress bar are four input fields: 'Full Name*', 'Email*', 'Password*', and 'Confirm Password*'. At the bottom is a blue 'Next' button.

Register as Customer

1 Personal Details ————— 2 Financial Details

Annual Income (₹)*

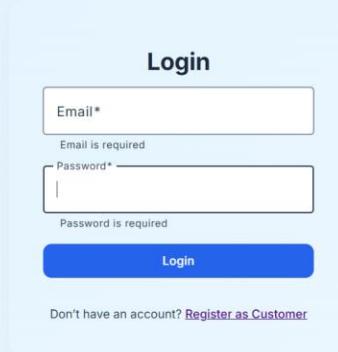
Back **Complete Registration**

Already have an account? [Login](#)

This screenshot shows the second step of the registration process. It has a header 'Register as Customer' and a progress bar. Below the progress bar is a single input field for 'Annual Income (₹)*'. At the bottom are 'Back' and 'Complete Registration' buttons, along with a link for existing users to 'Login'.

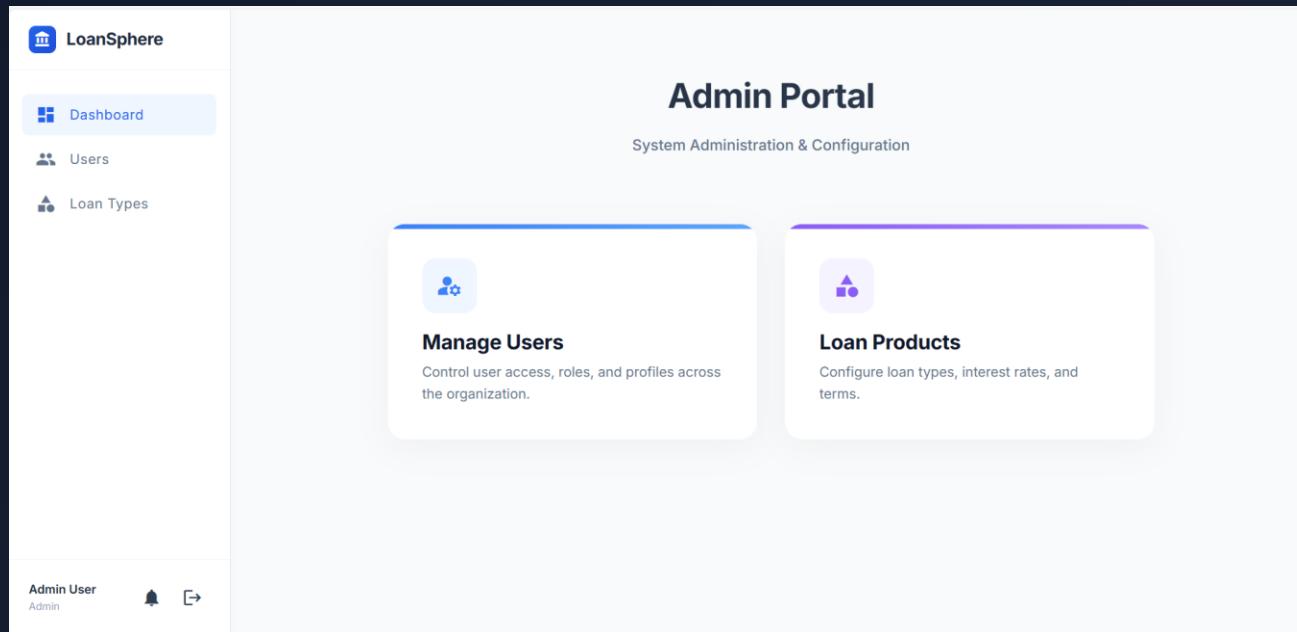
Customer
Registration Page

UI Screens



The screenshot shows a clean, modern login form titled "Login". It features two input fields: "Email*" and "Password*". Below each field is a placeholder text indicating it is required ("Email is required" and "Password is required"). A blue "Login" button is centered below the fields. At the bottom of the form, there is a link to register: "Don't have an account? [Register as Customer](#)".

Login Page



The screenshot displays the "Admin Portal" dashboard. On the left, a sidebar menu includes "LoanSphere" (with a bank icon), "Dashboard" (selected and highlighted in blue), "Users", and "Loan Types". The main content area is titled "Admin Portal" and "System Administration & Configuration". It features two primary cards: "Manage Users" (with a user icon) and "Loan Products" (with a money icon). Both cards have descriptive text below them: "Control user access, roles, and profiles across the organization." and "Configure loan types, interest rates, and terms." respectively. At the bottom left, there is a "Admin User" section showing "Admin" and icons for notifications and a profile.

Admin Dashboard

UI Screens

The screenshot shows the 'User Management' section of the LoanSphere application. The left sidebar includes 'LoanSphere' logo, 'Dashboard', 'Users' (which is selected and highlighted in blue), and 'Loan Types'. The main area has a title 'User Management' with a subtitle 'Manage system users, roles, and access.' Below is a table titled 'All Users' with columns: Name, Role, Annual Income, and Active status. The table lists five users: Abhinaya Motapothula (Customer, ₹1,200,000.00, Active), Admin User (Admin, -, Active), Blessy Moundru (Customer, ₹100,000.00, Active), Customer One (Customer, -, Active), and Customer Two (Customer, -, Active). A search bar, 'Export CSV' button, and a '+ New User' button are at the top right. Pagination controls show 'Items per page: 5' and '1–5 of 33'.

User Management

The screenshot shows the 'Loan Types Management' section of the LoanSphere application. The left sidebar includes 'LoanSphere' logo, 'Dashboard', 'Users', and 'Loan Types' (selected and highlighted in blue). The main area has a title 'Loan Types Management' with a subtitle 'Configure loan products, interest rates, and constraints.' Below is a table titled 'All Loan Types' with columns: Loan Type, Interest (%), Amount Range, Max Tenure, Moratorium, Active status, Created On, Updated On, and Actions. The table lists five loan types: Personal Loan (12%, ₹50,000 – ₹500,000, 60 months, No, Active, 04 Jan 2026, Edit), Home Loan (8.5%, ₹500,000 – ₹5,000,000, 240 months, No, Active, -, Edit), Vehicle Loan (9.5%, ₹100,000 – ₹1,500,000, 84 months, No, Active, -, Edit), Education Loan (9%, ₹100,000 – ₹2,000,000, 120 months, Yes, Active, -, Edit), and Gold Loan (20%, ₹300,000 – ₹5,000,000, 20 months, No, Inactive, 04 Jan 2026, Edit). A search bar, '+ Create Loan Type' button, and pagination controls are at the top right.

Loan Types Management

UI Screens

Create User

Full Name* Ex. John Doe

Email Address*

Role*

Cancel Create User

Edit Loan Type

Loan Type Name: Business Loan

Interest Rate (%)* 8 Max Tenure (Months)* 60

Min Amount* 40000 Max Amount* 800000

Has Moratorium Active

Created: 03 Jan 2026
Updated: 04 Jan 2026

Cancel Update

Create Loan Type

Loan Type Name: Ex. Personal Loan

Interest Rate (%)* 0 Max Tenure (Months)* 0

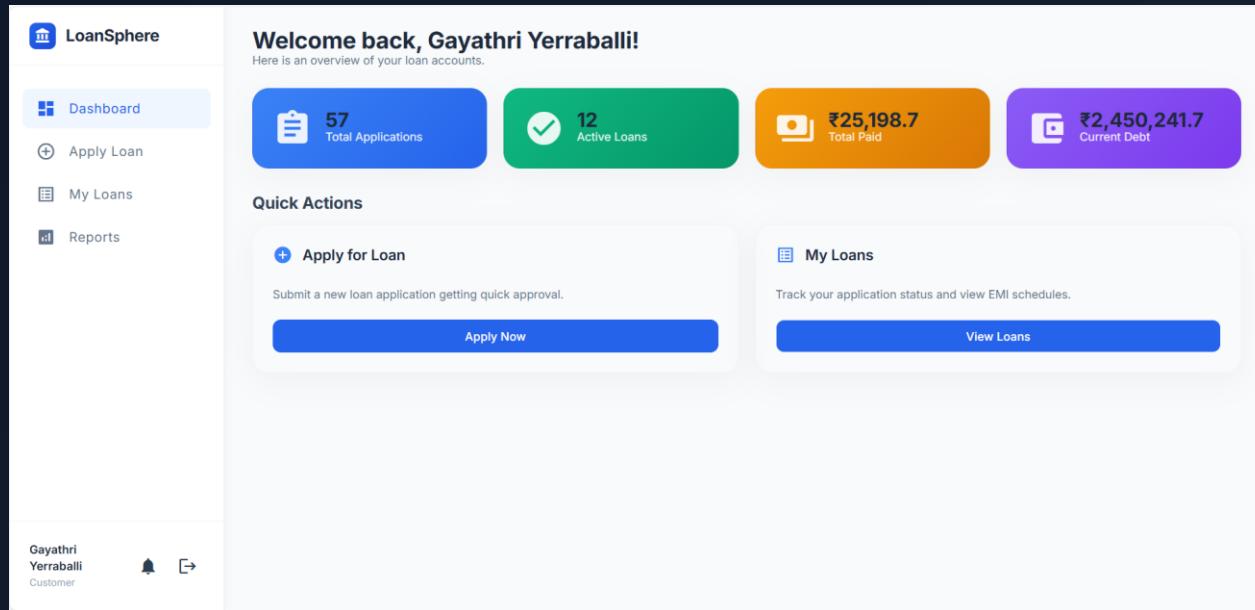
Min Amount* 0 Max Amount* 0

Has Moratorium Active

Cancel Create

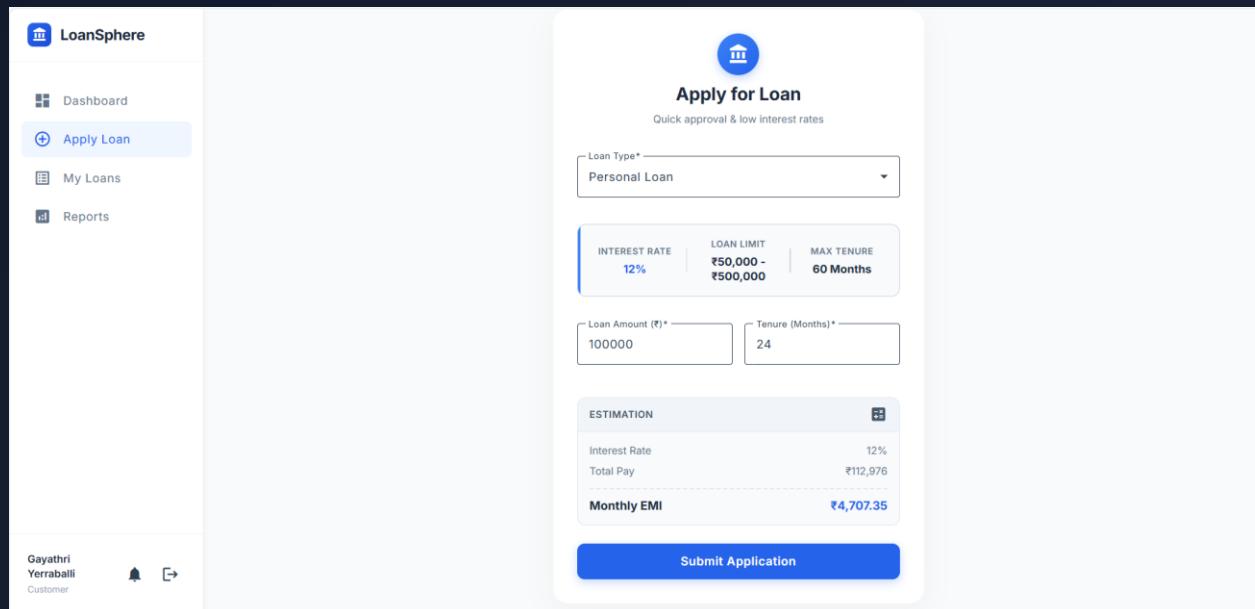
User & Loan Types Management

UI Screens



The screenshot shows the LoanSphere Customer Dashboard. At the top, it says "Welcome back, Gayathri Yerraballi!" with a note: "Here is an overview of your loan accounts." On the left is a sidebar with icons for Dashboard, Apply Loan, My Loans, and Reports. The main area has four colored boxes: blue (57 Total Applications), green (12 Active Loans), orange (₹25,198.7 Total Paid), and purple (₹2,450,241.7 Current Debt). Below these are "Quick Actions" sections for "Apply for Loan" (with "Apply Now" button) and "My Loans" (with "View Loans" button). At the bottom left is user info: "Gayathri Yerraballi" and "Customer".

Customer Dashboard



The screenshot shows the "Apply for Loan" page. It features a header with a bank icon and the title "Apply for Loan" with a subtitle "Quick approval & low interest rates". The sidebar on the left includes "Dashboard", "Apply Loan" (highlighted in blue), "My Loans", and "Reports". The main form starts with a "Loan Type" dropdown set to "Personal Loan". Below it are fields for "INTEREST RATE" (12%), "LOAN LIMIT" (₹50,000 - ₹500,000), and "MAX TENURE" (60 Months). Further down are "Loan Amount (₹)" (100000) and "Tenure (Months)" (24). An "ESTIMATION" section shows "Interest Rate" (12%), "Total Pay" (₹112,976), and "Monthly EMI" (₹4,707.35). A large blue "Submit Application" button is at the bottom.

Apply for Loan

UI Screens

The screenshot shows the 'Apply for Loan' page of the LoanSphere application. On the left, a sidebar menu includes 'Dashboard', 'Apply Loan' (which is selected and highlighted in blue), 'My Loans', and 'Reports'. Below the menu is a user profile for 'Gayathri Yerraballi' (Customer) with a notification bell icon and a share icon. The main content area features a blue circular icon with a white 'm' and the text 'Apply for Loan' followed by 'Quick approval & low interest rates'. A green checkmark icon indicates 'Application Submitted!' with the message 'Your Loan ID is #90'. Below this is a section titled 'Upload Documents (Required)' with the instruction 'Please upload your Identity or Income Proof to complete the process.' It includes a dashed box for file selection, a 'Click to browse files' button, a 'Submit Documents' button, and a 'Finish / Upload Later' button.

Proof Document Submission

The screenshot shows the 'My Loans' page of the LoanSphere application. The sidebar menu is identical to the previous screen, with 'Apply Loan' selected. The main content displays a table of loans with columns: Loan Type, Amount, Tenure, Status, Applied On, Actions, and Remarks. There are five entries, all marked as 'Active':

Loan Type	Amount	Tenure	Status	Applied On	Actions	Remarks
Personal Loan	₹100000	24 months	Active	06/01/2026		-
Education Loan	₹200000	24 months	Active	05/01/2026		-
Personal Loan	₹100000	24 months	Active	05/01/2026		-
Personal Loan	₹100000	24 months	Active	05/01/2026		-
Personal Loan	₹100000	24 months	Active	05/01/2026		-

At the bottom, there are pagination controls for 'Items per page:' (set to 5), '1–5 of 12', and navigation arrows.

My Loans

UI Screens

The image displays three mobile application screens for managing a loan:

- Loan Status** (Left): Shows the current status of the loan: Applied (Jan 6, 2026), Under Review (Jan 6, 2026), Active (Jan 6, 2026), and Closed (Pending). A "Close" button is at the bottom.
- Pay EMI** (Middle): A payment screen showing the EMI amount due as ₹4,707.00. It includes a dropdown for Payment Method (UPI / GPay / PhonePe), an input field for Amount to Pay (₹ 4707), and a "Pay ₹4,707.00" button.
- Close Loan** (Right): A payment screen showing the outstanding amount as ₹88,767.00. It includes a dropdown for Payment Method (UPI / GPay / PhonePe), an input field for Amount to Pay (₹ 88767), and a "Pay ₹88,767.00" button.

The image shows the EMI Schedule screen of the LoanSphere app:

- Navigation Bar:** Includes icons for Dashboard, Apply Loan, My Loans, and Reports.
- Header:** "EMI Schedule" and "View upcoming payments and track your loan progress".
- Buttons:** "Pay Full Outstanding" (red) and "Pay Now" (blue) for each row.
- Table:** Shows the EMI schedule with columns: #, Due Date, Amount, Status, and Action (Pay Now).
- Search Bar:** "Search schedule..." with a magnifying glass icon.
- Page Control:** "Items per page: 5" and navigation arrows.
- User Info:** "Gayathri Yerballi" and "Customer" at the bottom left.

Loan Status,
EMI Schedule,
Pay EMI,
Pay Outstanding

UI Screens

The screenshot shows the EMI Schedule page of the LoanSphere application. The left sidebar includes links for Dashboard, Apply Loan, My Loans, and Reports. The main content area has a header "EMI Schedule" with a sub-instruction "View upcoming payments and track your loan progress". A green notification bar at the top states "Loan is fully closed. No further EMIs pending." Below this are two tabs: "EMI Schedule" (selected) and "Payment History". A search bar labeled "Search history..." is present. The main table displays four payment records:

Ref ID	Installment	Paid Amount	Payment Date	Mode
#341	#4	+₹88,767	07/01/2026, 1:10 AM	UPI
#340	#3	+₹4,707	07/01/2026, 1:03 AM	UPI
#339	#2	+₹4,707	07/01/2026, 1:02 AM	UPI
#338	#1	+₹4,707	07/01/2026, 1:02 AM	UPI

At the bottom, there are controls for "Items per page:" (set to 5), page navigation (1–4 of 4), and a "Print Statement" button.

Payment History

The screenshot shows the "My Reports & Tools" page of the LoanSphere application. The left sidebar includes links for Dashboard, Apply Loan, My Loans, and Reports (which is selected). The main content area has a header "My Reports & Tools" with a sub-instruction "View your loan history and calculate future EMIs.". There are three tabs: "Loan Statement" (selected), "EMI Calculator", and "Foreclosure Calculator". A "Print Statement" button is located in the top right of the main area. The "Loan Account Statement" section tracks loan history and payment status. It includes a search bar "Search Loans" and a table of five entries:

Loan ID	Type	Principal	Tenure	Total Paid	Balance	Status
#90	Personal Loan	₹100,000	24 m	₹0	₹0	Applied
#89	Personal Loan	₹200,000	24 m	₹0	₹0	Applied
#88	Personal Loan	₹500,000	24 m	₹0	₹0	Applied
#87	Personal Loan	₹100,000	24 m	₹9,414	₹0	Closed
#86	Personal Loan	₹100,000	24 m	₹9,414	₹0	Closed

At the bottom, there are controls for "Items per page:" (set to 5), page navigation (1–5 of 58), and a "Print Statement" button.

Print Statement

UI Screens

LoanSphere

My Reports & Tools
View your loan history and calculate future EMIs.

Loan Statement EMI Calculator Foreclosure Calculator

EMI Calculator

Loan Amount: ₹ 100000
Interest Rate (% p.a): 12 %
Tenure (Months): 24 m



Monthly EMI: ₹4,707
Principal Amount: ₹100,000
Total Interest: ₹12,968
Total Payment: ₹112,968

Gayathri Yerraballi Customer

EMI Calculator

LoanSphere

My Reports & Tools
View your loan history and calculate future EMIs.

Loan Statement EMI Calculator Foreclosure Calculator

Foreclosure Estimator
Calculate expected savings by closing early.

Loan Amount: ₹ 500000
Total Tenure: 24 months
Interest Rate (% p.a): 10.5
EMIs Paid So Far: 12 paid

Comparison

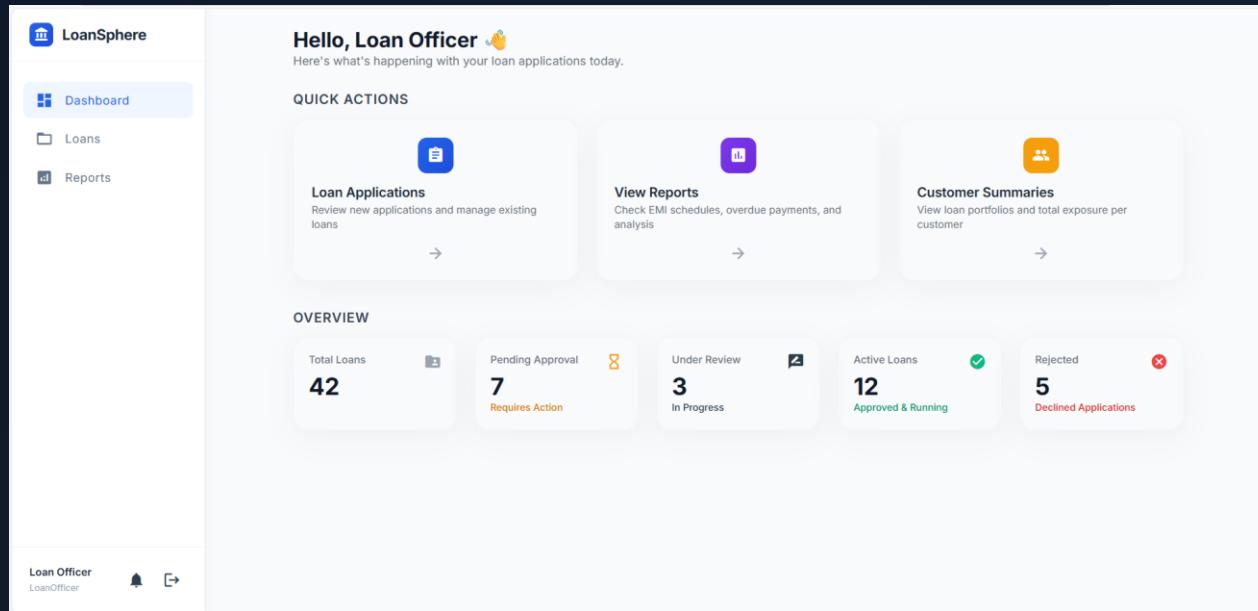
OPTION 1	V/S	OPTION 2
Continue Paying EMI ₹278,256 Total Remaining Cost		Foreclose Now ₹263,056 One-time Settlement
Remaining EMIs Monthly EMI		Loan Amount (-) Principal Paid
12 months ₹23,188		₹500,000 ₹236,944

YOU SAVE INTEREST WORTH
₹15,200

Gayathri Yerraballi Customer

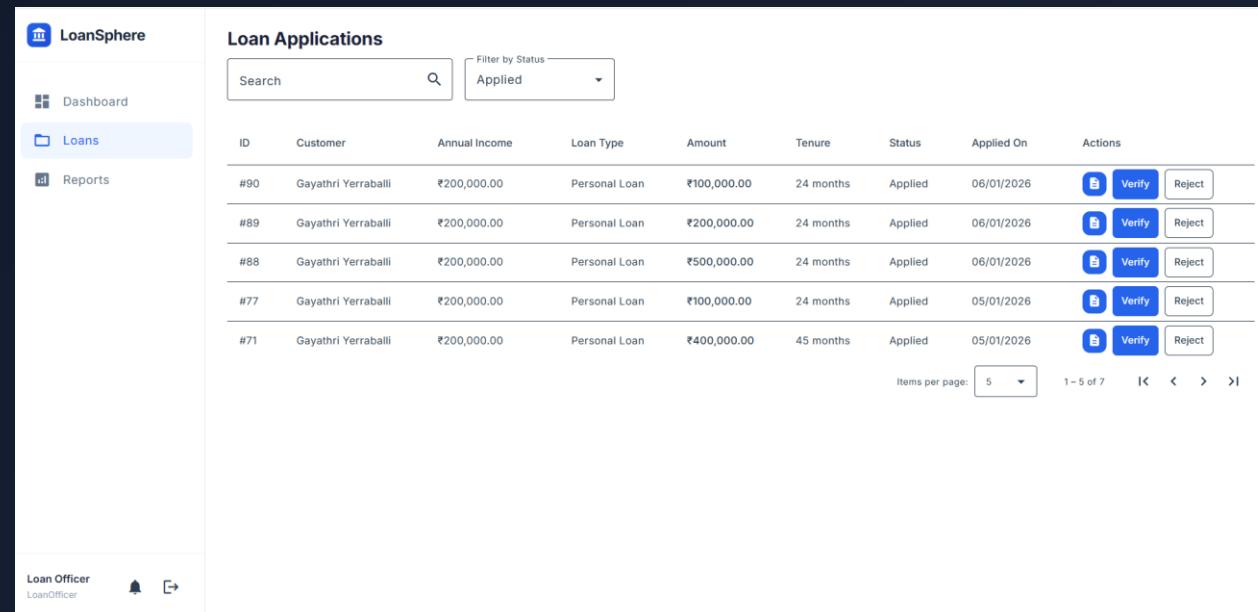
Foreclosure Calculator

UI Screens



The screenshot shows the Loan Officer Dashboard. On the left is a sidebar with the LoanSphere logo and navigation links: Dashboard (selected), Loans, and Reports. The main area starts with a greeting "Hello, Loan Officer" and a message about today's loan applications. It features three "QUICK ACTIONS" cards: "Loan Applications" (Review new applications and manage existing loans), "View Reports" (Check EMI schedules, overdue payments, and analysis), and "Customer Summaries" (View loan portfolios and total exposure per customer). Below this is an "OVERVIEW" section with counts for Total Loans (42), Pending Approval (7 Requires Action), Under Review (3 In Progress), Active Loans (12 Approved & Running), and Rejected (5 Declined Applications). At the bottom left is a user profile for "Loan Officer" and a notification bell icon.

Loan Officer Dashboard



The screenshot shows the "Loan Applications" screen. The sidebar includes the LoanSphere logo and navigation links: Dashboard (selected), Loans (selected), and Reports. The main content area is titled "Loan Applications" and features a search bar, a filter dropdown set to "Applied", and a table of loan applications. The table columns are: ID, Customer, Annual Income, Loan Type, Amount, Tenure, Status, Applied On, and Actions. The table contains five rows of data for loans #90 through #71, all applied by Gayathri Yerraballi. Each row has a "Verify" button and a "Reject" button in the Actions column. At the bottom of the table are pagination controls: "Items per page: 5", "1–5 of 7", and navigation arrows.

Loan Applications

UI Screens

Loan Documents

bag.jpg
Identity Proof Jan 5, 2026

Close

Outstanding Amounts

Check pending dues for specific loan accounts.

Find Loan Details

Loan ID # 27 | Enter the unique loan identifier

Check Status

TOTAL OUTSTANDING DUE ₹239,142.96

Loan Officer Reports

Loans by Status EMI Overdue Monthly EMI Outstanding Amount Active vs Closed Customer Summaries

Loans by Status

Overview of loan application statuses and distribution.

Distribution Overview



TOTAL 90

- Active/Approved 27
- Applied/Pending 7
- Under Review 3
- Rejected 20
- Closed 33
- Active 27

Detailed Breakdown

Status	Count
Active	27
Applied	7
Closed	33
Rejected	20
Under Review	3

Loan Documents & Officer Reports

UI Screens

Overdue Installments
Monitor accounts with missed payments

Search Overdue Accounts

LOAN REFERENCE	OUTSTANDING DUE	MISSSED EMIs
#31	₹3,484.00	1
#46	₹4,707.35	1
#53	₹4,707.00	1
#57	₹23,537.00	1
#60	₹4,707.00	1

Items per page: 1 – 5 of 9

Active vs Closed Loans

Active Loans **27**
Currently ongoing

Closed Loans **33**
Fully repaid

Ratio Analysis
Active (45%) Closed (55%)

You have 27 active loans compared to 33 closed ones.

Monthly EMI Collections
Track EMI payments and pending dues for a specific month.

Month — January Year — 2026 View Report

Paid: ₹124,958.00 (66%) Pending: ₹64,400.35

Details Search Report

Loan ID	Customer	Due Date	EMI Amount	Status
#4	Customer Two	01 Jan 2026	₹12,756.37	Paid
#30	Gayathri Yerraballi	03 Jan 2026	₹3,484.00	Paid
#31	Pallavi Velagandula	04 Jan 2026	₹3,484.00	Pending
#32	Gayathri Yerraballi	04 Jan 2026	₹3,484.00	Paid
#33	Gayathri Yerraballi	04 Jan 2026	₹3,484.00	Paid

Items per page: 1 – 5 of 33

Customer Loan Summaries
Overview of customer portfolios and risk exposure.

Search

ID	Customer	Email	Total Applications	Active	Total Borrowed	Outstanding Debt
#3	Customer One	customer1@lms.com	3	1	₹900,000.00	₹200,000.00
#4	Customer Two	customer2@lms.com	1	0	₹500,000.00	₹0.00
#5	Sharanya Velagandula	sharanyavelagandula@gmail.com	10	4	₹2,150,000.00	₹800,000.00
#11	Abhinaya Motapothula	abhinayamotapothula@gmail.com	9	6	₹2,220,000.00	₹1,320,000.00
#21	Customer10	customer10@lms.com	4	3	₹402,000.00	₹352,000.00

Items per page: 1 – 5 of 9

Reports

Swagger UI

Auth

`POST /api/auth/register`

`POST /api/auth/login`

Documents

`POST /api/Documents/upload`

`GET /api/Documents/{loanId}`

`GET /api/Documents/download/{id}`

Emi

`GET /api/emis/loan/{loanId}`

`PUT /api/emis/{emiId}/pay`

`PUT /api/emis/loan/{loanId}/pay-full`

`GET /api/emis/loan/{loanId}/foreclosure`

`GET /api/emis/loan/{loanId}/payments`

LoanApplications

`POST /api/loans/apply`

`GET /api/loans/my`

`GET /api/loans`

`GET /api/loans/{loanId}`

`GET /api/loans/officer/my-dashboard`

`PUT /api/loans/{loanId}/decision`

LoanTypes

`GET /api/loan-types`

`POST /api/loan-types`

`GET /api/loan-types/all`

`PUT /api/loan-types/{id}`

Notification

`GET /api/Notification`

`PUT /api/Notification/{id}/read`

`PUT /api/Notification/read-all`

Reports

`GET /api/reports/loans-by-status`

`GET /api/reports/outstanding/{loanId}`

`GET /api/reports/monthly-emi`

`GET /api/reports/emi-overdue`

`GET /api/reports/customer-summary`

Users

`GET /api/users`

`POST /api/users`

`PUT /api/users/{id}/status`

Results & Achievements

Project Highlights

Real-World Rules: Implemented real-world logic vs basic CRUD.

Security: JWT, RBAC, and strict validations (Bcrypts).

Data Integrity: Robust backend validations ensure consistency.

Dashboards: Tailored views for Admin, Officer, and Customer.

Technical Wins & Outcomes

Streamlined Workflow: "Maker-Checker" separation of duties.

User Experience: Responsive, modern UI across devices.

Performance: Optimized LINQ and indexing.

Reliability: 100% data integrity with error handling.

Conclusion

LoanSphere is a secure foundation for real-world fintech.

Impact:

Reduces processing time by 70%, increases transparency by 100%.

Thank You

Live Demo

Showcasing LoanSphere in Action