Designing UPI – System Design

Designing a Unified Payments Interface (UPI) system involves creating an architecture that enables real-time inter-bank transactions through a seamless and secure platform. Key components include user interfaces, a central UPI switch managed by the National Payments Corporation of India (NPCI), backend systems of participating banks, and third-party service providers.

The system supports core functionalities such as user registration and authentication, payment initiation and authorization, inter-bank transaction processing, and real-time settlement.
Security measures like encryption and multi-factor authentication ensure compliance and protect against fraud, making UPI a reliable and efficient payment solution.
The UPI is a real-time payment system that facilitates inter-bank transactions by instantly transferring funds between two bank accounts on a mobile platform.

Important Topics for UPI system design

1. Functional Requirements for UPI System Design
2. Non-Functional Requirements for UPI System Design
3. Capacity Estimation for UPI System Design
4. High-Level Design(HLD) for UPI System Design
5. Low-Level Diagram(LLD) for UPI System Design
6. Microservices Used in UPI System Design
7. Scalability for UPI System Design

Functional Requirements for UPI System Design

Below are the functional requirements for UPI system design:
User Registration and Authentication- Users should be able to register and create a UPI account. Provide secure authentication mechanisms (e.g., PIN, biometric authentication).
Bank Account Linking- Users should be able to link multiple bank accounts to their UPI profile. Facilitate the management of linked bank accounts (e.g., add, remove, and update account details).
Payment Address Management- Users should be able to create and manage Virtual Payment Addresses (VPAs).
Money Transfer- Support person-to-person (P2P) transfers. Support person-to-merchant (P2M) payments. Enable scheduled and recurring payments.
Transaction History- Provide users with a detailed transaction history, including status and timestamps.
Notifications- Send real-time notifications for all transactions (e.g., payment success, failure).
Payment Requests- Allow users to request payments from other UPI users.
QR Code Payments- Generate and scan QR codes for quick and easy payments.
Bill Payments- Support utility bill payments through the UPI interface.

Non-Functional Requirements for UPI System Design