# 📄 Flow-Based Document Signing Models

This document outlines detailed workflows and flowcharts for each model described in model\_based\_steps.md. These workflows include personal and corporate document signing processes, integrating off-chain, on-chain, and hybrid approaches.

## 🔐 Model 1.1 – Off-Chain Single Signature (Personal)

**Description:** A single user signs the document off-chain.

**Flow:**

1. User registers and verifies identity.
2. Upload/prepare document.
3. Generate hash and sign.
4. Store signed document off-chain.
5. Serve verification tools.

sequenceDiagram  
 participant User  
 participant WebApp  
 participant DocService  
 participant Storage  
  
 User->>WebApp: Register & Verify  
 User->>WebApp: Upload Document  
 WebApp->>DocService: Generate Hash & Sign  
 DocService->>Storage: Store Signed PDF  
 WebApp-->>User: Provide Verification Tools

## 🏢 Model 1.2 – Off-Chain Multi-Signature (Corporate)

**Description:** Multiple users sign the document off-chain sequentially.

**Flow:**

1. Initiate document and define signer list.
2. Generate document hash.
3. Collect signatures sequentially.
4. After each signature:
   * Add signature to PDF
   * Generate new hash
   * Save updated PDF
   * Log metadata and update audit trail
   * Request next signer
5. Finalize and store document.

sequenceDiagram  
 participant WebApp  
 participant Requester  
 participant Manager  
 participant ClusterHead  
 participant StateHead  
 participant Storage  
  
 WebApp->>Requester: Request Signature  
 Requester->>WebApp: Sign PDF  
 WebApp->>Storage: Save + Hash + Log  
  
 WebApp->>Manager: Request Signature  
 Manager->>WebApp: Sign PDF  
 WebApp->>Storage: Save + Hash + Log  
  
 WebApp->>ClusterHead: Request Signature  
 ClusterHead->>WebApp: Sign PDF  
 WebApp->>Storage: Save + Hash + Log  
  
 WebApp->>StateHead: Request Signature  
 StateHead->>WebApp: Sign PDF  
 WebApp->>Storage: Finalize Document

## 🔐 Model 2.1 – Blockchain-Anchored Single Signature

**Description:** Single signature stored off-chain with hash anchored on blockchain.

sequenceDiagram  
 participant User  
 participant WebApp  
 participant Blockchain  
 participant Storage  
  
 User->>WebApp: Register & Upload Document  
 WebApp->>WebApp: Generate Hash  
 WebApp->>User: Request Signature  
 User->>WebApp: Sign Hash  
 WebApp->>Storage: Store PDF & Signature  
 WebApp->>Blockchain: Anchor Hash On-Chain

## 🏢 Model 2.2 – Blockchain-Anchored Multi-Signature

**Description:** Multiple signatures collected off-chain and anchored on-chain.

sequenceDiagram  
 participant WebApp  
 participant Signer1  
 participant Signer2  
 participant Blockchain  
 participant Storage  
  
 WebApp->>Signer1: Sign Document Hash  
 Signer1->>WebApp: Signature  
 WebApp->>Signer2: Sign Document Hash  
 Signer2->>WebApp: Signature  
 WebApp->>Storage: Store All Signatures  
 WebApp->>Blockchain: Anchor Proof Hash

## 🔐 Model 3.1 – On-Chain Single Signature

**Description:** Every step (including signature) is recorded on-chain.

sequenceDiagram  
 participant User  
 participant WebApp  
 participant Blockchain  
  
 User->>WebApp: Register & Upload  
 WebApp->>WebApp: Generate Hash  
 WebApp->>User: Request Signature  
 User->>Blockchain: Sign and Submit  
 Blockchain->>Blockchain: Store Signature

## 🏢 Model 3.2 – On-Chain Multi-Signature

**Description:** All signatures recorded and verified on-chain.

sequenceDiagram  
 participant SmartContract  
 participant Signer1  
 participant Signer2  
 participant Blockchain  
  
 Signer1->>SmartContract: Sign Document  
 SmartContract->>Blockchain: Record Signature  
 Signer2->>SmartContract: Sign Document  
 SmartContract->>Blockchain: Record Signature  
 Blockchain->>SmartContract: Finalize Document

## 🔐 Model 4.1 – Hybrid Single Signature

**Description:** Signature off-chain, hash anchored on-chain. Sync between systems.

sequenceDiagram  
 participant User  
 participant WebApp  
 participant Blockchain  
 participant Storage  
  
 User->>WebApp: Upload Document  
 WebApp->>WebApp: Generate Hash  
 WebApp->>User: Sign Hash  
 User->>WebApp: Return Signature  
 WebApp->>Storage: Store Document  
 WebApp->>Blockchain: Anchor Hash + Metadata

## 🏢 Model 4.2 – Hybrid Multi-Signature

**Description:** Multi-signature off-chain + final hash anchored on-chain. Workflow synced across systems.

sequenceDiagram  
 participant WebApp  
 participant Signer1  
 participant Signer2  
 participant Blockchain  
 participant Storage  
  
 WebApp->>Signer1: Request Signature  
 Signer1->>WebApp: Sign Hash  
 WebApp->>Signer2: Request Signature  
 Signer2->>WebApp: Sign Hash  
 WebApp->>Storage: Store Final Document  
 WebApp->>Blockchain: Anchor Final Hash

Let me know if you want the diagrams exported as images or need this in PDF/Word format.

need it in pdf