



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:
5. Add signature to PDF
6. Generate new hash
7. Save updated PDF
8. Log metadata and update audit trail
9. Request next signer

10. 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