

Veri-Store Security Model

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1 Introduction

1.1 Document Purpose

1.2 System Overview

2 Scoping

2.1 In Scope

2.2 Out of Scope

3 Use Scenarios

3.1 Primary Use Case

3.2 Anti-Scenarios

4 Dependencies

4.1 External Libraries

- galois:
- numpy:
- Python standard library:

4.2 System Dependencies

- Network stack:
- File system:
- Operating system:

5 Implementation Assumptions

- placeholder
- placeholder
- placeholder
- placeholder
- placeholder

6 Trust Levels

6.1 Administrator

6.2 Authenticated Client

6.3 Storage Server

6.4 Untrusted Network

7 Entry Points

7.1 Client API

- Store operation:
- Retrieve operation:
- Verify operation:

7.2 Inter-Server Communication

- Fingerprint exchange:
- Fragment retrieval:

7.3 Storage Subsystem

- Fragment write:
- Fragment read:
- Fingerprint storage:

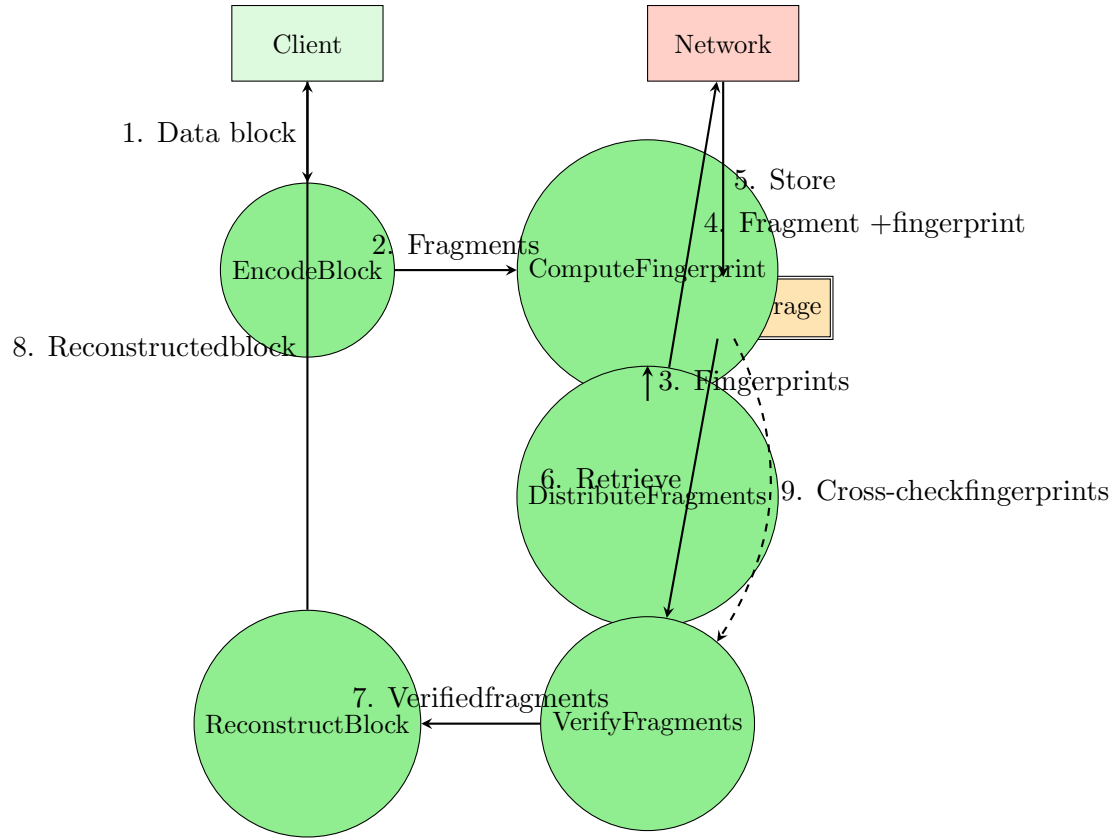


Figure 1: High-level data flow diagram for veri-store store and retrieve operations.

8 Protected Assets

8.1 Data Blocks

8.2 Erasure-Coded Fragments

8.3 Homomorphic Fingerprints

8.4 System Resources

9 Data Flow Diagram

9.1 DFD Component Descriptions

9.1.1 Client

9.1.2 Encode Block

9.1.3 Compute Fingerprint

9.1.4 Distribute Fragments

9.1.5 Network

9.1.6 Fragment Storage

9.1.7 Verify Fragments

9.1.8 Reconstruct Block

10 Threat Analysis: STRIDE

10.1 Spoofing

10.1.1 S.1: Client Impersonation

10.1.2 S.2: Server Impersonation

10.1.3 S.3: Fingerprint Source Forgery

10.2 Tampering

10.2.1 T.1: Fragment Corruption in Storage

10.2.2 T.2: Fragment Modification in Transit

10.2.3 T.3: Fingerprint Tampering

10.2.4 T.4: Erasure Code Parameter Manipulation

10.3 Repudiation

10.3.1 R.1: Anonymous Data Storage

10.3.2 R.2: Fragment Deletion Without Logging

10.3.3 R.3: Untrackable Verification Failures

10.4 Information Disclosure

10.4.1 I.1: Fragment Eavesdropping

10.4.2 I.2: Storage Server Data Access

10.4.3 I.3: Fingerprint Analysis

10.4.4 I.4: Error Message Information Leakage

- Resolution:
- Owner:
- Testing:

11.1.1.2 S.2: Server Impersonation

- Status:
- Resolution:
- Owner:
- Testing:

11.1.1.3 S.3: Fingerprint Source Forgery

- Status:
- Resolution:
- Owner:
- Testing:

11.2 Tampering Threat Resolutions

11.2.1 T.1: Fragment Corruption in Storage

- Status:
- Resolution:
- Owner:
- Testing:

11.2.2 T.2: Fragment Modification in Transit

- Status:
- Resolution:
- Owner:
- Testing:

11.2.3 T.3: Fingerprint Tampering

- Status:
- Resolution:
- Owner:
- Testing:

11.2.4 T.4: Erasure Code Parameter Manipulation

- Status:
- Resolution:
- Owner:
- Testing:

11.3 Repudiation Threat Resolutions

11.3.1 R.1: Anonymous Data Storage

- Status:
- Resolution:
- Owner:
- Testing:

11.3.2 R.2: Fragment Deletion Without Logging

- Status:
- Resolution:
- Owner:
- Testing:

11.3.3 R.3: Untrackable Verification Failures

- Status:
- Resolution:
- Owner:
- Testing:

11.4 Information Disclosure Threat Resolutions

11.4.1 I.1: Fragment Eavesdropping

- Status:
- Resolution:
- Owner:
- Testing:

11.4.2 I.2: Storage Server Data Access

- Status:
- Resolution:
- Owner:
- Testing:

11.4.3 I.3: Fingerprint Analysis

- Status:
- Resolution:
- Owner:
- Testing:

11.4.4 I.4: Error Message Information Leakage

- Status:
- Resolution:
- Owner:
- Testing:

11.5 Denial of Service Threat Resolutions

11.5.1 D.1: Storage Exhaustion

- Status:
- Resolution:
- Owner:
- Testing:

11.5.2 D.2: Fragment Unavailability

- Status:
- Resolution:
- Owner:
- Testing:

11.5.3 D.3: Verification Flooding

- Status:
- Resolution:
- Owner:
- Testing:

11.5.4 D.4: Network Bandwidth Exhaustion

- Status:
- Resolution:
- Owner:
- Testing:

11.6 Elevation of Privilege Threat Resolutions

11.6.1 E.1: Code Injection via Malformed Input

- Status:
- Resolution:
- Owner:
- Testing:

11.6.2 E.2: Verification Bypass

- Status:
- Resolution:
- Owner:
- Testing:

11.6.3 E.3: Cryptographic Parameter Override

- Status:
- Resolution:
- Owner:
- Testing:

11.6.4 E.4: Server-to-Server Privilege Escalation

- Status:
- Resolution:
- Owner:
- Testing:

12 External Security Notes

12.1 Deployment Recommendations

12.2 Known Limitations

12.3 Integration Considerations

13 Verification and Testing Plan

13.1 Security Test Suite

13.2 Code Review Process

13.3 Regression Testing

14 Document Maintenance

14.1 Review Schedule

14.2 Change Process

14.3 Version History

- **Version 0.1** (February 16, 2026): Initial draft - high-level security model with component stubs