RFC-015: Versioning and Rollback

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Abstract

This RFC specifies user-visible versioning and rollback semantics for Cyberspace vaults, providing clear mental models for version management, safe rollback operations, and recovery from mistakes.

Motivation

Users need simple answers to simple questions:

- **What version am I on?**
- **What versions exist?**
- **How do I go back?**
- **What if I make a mistake?**

Git provides mechanisms. Cyberspace provides semantics:

```
seal-version        → "2.1.0"
seal-versions       → [1.0.0, 1.1.0, 2.0.0, 2.1.0]
seal-rollback 2.0.0 → Done. Now at 2.0.0.
seal-recover        → Here's what you can recover.
```

Specification

Version Model

```
                         HEAD
                          ↓
    1.0.0 ──→ 1.1.0 ──→ 2.0.0 ──→ 2.1.0
      │                   │
      │                   └── seal-rollback target
      │
      └── seal-archive snapshots
```

Versions are semantic (X.Y.Z), immutable, signed.

HEAD is current working state.

Rollback creates forward commit that restores past state.

Core Operations

seal-version Report current version.

```
(seal-version)
;; => "2.1.0" or "2.1.0+3" (3 commits past release)
```

Output format: - `X.Y.Z` - Exactly at release - `X.Y.Z+N` - N commits past release - `X.Y.Z-dev` - Development branch - `unversioned` - No releases yet

seal-versions List all versions.

```
(seal-versions)
;; => ("1.0.0" "1.1.0" "2.0.0" "2.1.0")

(seal-versions verbose: #t)
;; =>
;; 1.0.0  2026-01-01  "Initial release"
;; 1.1.0  2026-01-05  "Bug fixes"
;; 2.0.0  2026-01-10  "New governance model"
;; 2.1.0  2026-01-15  "Performance improvements"
```

seal-rollback Roll back to specific version.

```
(seal-rollback "2.0.0")
```

Process: 1. Verify version exists 2. Check for uncommitted changes (abort or stash) 3. Create rollback commit with contents of target version 4. Record in audit trail 5. Optionally create rollback tag

Rollback commit message:

```
Rollback to 2.0.0

Restored vault state to version 2.0.0.
Previous HEAD was 2.1.0+3.

Reason: [user-provided or "Manual rollback"]
```

NOT a git reset. History preserved. Rollback is a forward operation.

seal-diff Compare versions.

```
(seal-diff "2.0.0" "2.1.0")
;; Shows what changed between versions

(seal-diff "2.0.0")
;; Shows what changed since 2.0.0
```

seal-recover Recovery options for mistakes.

```
(seal-recover)
;; =>
;; Recovery options:
;;   1. Uncommitted changes (stashed 5 minutes ago)
;;   2. Last commit (seal-undo)
;;   3. Version 2.1.0 (seal-rollback "2.1.0")
;;   4. Archive vault-2.0.0.archive (seal-restore)
```

Rollback Semantics

Forward Rollback (Default)

```
Before:  1.0.0 → 1.1.0 → 2.0.0 → 2.1.0 → HEAD
                          ↑
                    rollback target

After:   1.0.0 → 1.1.0 → 2.0.0 → 2.1.0 → [rollback commit]
                          │                       │
                          └───────────────────────┘
                               contents match
```

History preserved. Audit trail shows rollback.

Hard Rollback (Dangerous)

```
(seal-rollback "2.0.0" hard: #t)
```

Actually resets to version. **Destroys history.**

Requires: - Explicit `hard: #t` flag - Confirmation prompt - Audit entry before destruction

Rollback with Stash

```
(seal-rollback "2.0.0" stash: #t)
```

Stashes uncommitted changes before rollback. Can recover with:

```
(seal-stash-pop)
```

Version Tags

Automatic Tagging

```
(seal-release "2.1.0")
;; Creates:
```

```
;;   - Git tag: 2.1.0
;;   - Signature: .vault/releases/2.1.0.sig
;;   - Audit entry
```

Rollback Tags

```
(seal-rollback "2.0.0" tag: "rollback-2026-01-15")
;; Creates additional tag marking rollback point
```

Tag Listing

```
(seal-tags)
;; =>
;; 1.0.0              2026-01-01  release
;; 1.1.0              2026-01-05  release
;; 2.0.0              2026-01-10  release
;; 2.1.0              2026-01-15  release
;; rollback-2026-01-15 2026-01-15  rollback
```

Recovery Scenarios

Scenario 1: Bad Commit

```
;; Oops, committed broken code
(seal-undo)                    ; Undo last commit
;; or
(seal-rollback "2.1.0")        ; Back to last release
```

Scenario 2: Bad Release

```
;; Released 2.2.0 but it's broken
(seal-rollback "2.1.0")        ; Back to good version
(seal-release "2.2.1")         ; Patch release
```

Scenario 3: Lost Changes

```
;; Accidentally discarded work
(seal-recover)                 ; See options
(seal-stash-pop)               ; If stashed
;; or
(seal-reflog)                  ; Find lost commits
```

Scenario 4: Corrupted Vault

```
;; Something went very wrong
(seal-restore "vault-2.0.0.archive" verify-key: "alice.pub")
```

Audit Integration

Every version operation recorded:

```
(audit-entry
  (action
    (verb seal-rollback)
    (object "2.0.0")
    (parameters
      (from "2.1.0+3")
      (method forward)
      (reason "Production incident")))
  (seal ...))
```

Audit trail answers: - Who rolled back? - When? - From what version? - Why? (if reason provided)

CLI Interface

```
# Current version
$ seal version
2.1.0+3

# List versions
$ seal versions
1.0.0   2026-01-01   Initial release
1.1.0   2026-01-05   Bug fixes
2.0.0   2026-01-10   New governance model
2.1.0   2026-01-15   Performance improvements

# Rollback
$ seal rollback 2.0.0
Rolling back to 2.0.0...
√ Rollback complete. Now at 2.0.0.

# Rollback with reason
$ seal rollback 2.0.0 --reason "Production incident #123"

# Compare versions
$ seal diff 2.0.0 2.1.0
 M config.scm
 A new-feature.scm
 D deprecated.scm
```

```
# Recovery options
$ seal recover
Recovery options:
  1. seal undo          - Undo last commit
  2. seal rollback 2.1.0 - Return to last release
  3. seal stash pop     - Recover stashed changes
```

Safety Mechanisms

Uncommitted Changes

```
(seal-rollback "2.0.0")
;; Error: Uncommitted changes detected.
;; Use --stash to save changes, or --force to discard.
```

Protected Versions

```
(vault-config 'protected-versions '("1.0.0" "2.0.0"))

(seal-rollback "0.9.0")
;; Warning: Rolling back past protected version 1.0.0
;; This may break compatibility. Continue? [y/N]
```

Rollback Limits

```
(vault-config 'max-rollback-distance 10)

(seal-rollback "0.1.0")
;; Error: Rollback distance (20 versions) exceeds limit (10).
;; Use --force to override.
```

Implementation

seal-rollback Implementation

```
(define (seal-rollback version #!key hard stash force reason tag)
  "Roll back vault to specified version"

  ;; Validate version exists
  (unless (tag-exists? version)
    (error "Version not found" version))

  ;; Check for uncommitted changes
  (when (uncommitted-changes?)
    (cond
      (stash (seal-stash))
      (force (void))
      (else (error "Uncommitted changes. Use stash: or force:"))))

  ;; Record current state
  (let ((current (seal-version)))

    ;; Perform rollback
    (if hard
        (hard-rollback! version)
        (forward-rollback! version reason))

    ;; Create tag if requested
    (when tag
      (run-command "git" "tag" tag))

    ;; Audit
    (audit-append
      actor: (get-vault-principal (vault-config 'signing-key))
      action: (list 'seal-rollback version)
      motivation: (or reason (sprintf "Rollback from ~a to ~a" current version)))

    (print "✓ Rolled back to " version)))

(define (forward-rollback! version reason)
  "Create rollback commit (preserves history)"
  (run-command "git" "checkout" version "--" ".")
  (run-command "git" "commit" "-m"
    (sprintf "Rollback to ~a\n\n~a" version (or reason ""))))

(define (hard-rollback! version)
  "Reset to version (destroys history)"
  (print "WARNING: Hard rollback destroys history")
  (run-command "git" "reset" "--hard" version))
```

Security Considerations

Rollback Attacks

Attacker forces rollback to vulnerable version.

Mitigation: - Threshold signatures for rollback (RFC-007) - Protected version list - Audit trail detection

History Manipulation

Hard rollback can hide evidence.

Mitigation: - Prefer forward rollback - Audit before hard rollback - Federation replication preserves history

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References

1. Semantic Versioning 2.0.0 (semver.org)
2. Git Reset, Checkout, and Revert (git-scm.com)
3. RFC-003: Cryptographic Audit Trail
4. RFC-006: Vault System Architecture

Changelog

- **2026-01-06** - Initial specification

Implementation Status: Proposed **Operations:** seal-version, seal-versions, seal-rollback, seal-diff, seal-recover **Rollback Model:** Forward commit (history-preserving)