# Module 18 – Recovery & Partial Sovereign Reentry (Final v4.1)

Version: 4.1 (Final CTO Edition)

Layer: Failure Recovery, Grace Reentry, Federation Repair, Ledger Downgrade Paths

Status: RELEASE

Dependencies: Modules 13, 14, 17, Capsule Alerts, Grace Engine, Federation

## 0. Purpose & Recovery Control Scope

This module defines sovereign recovery paths and capsule-bound reentry logic for systems that experience fork divergence, replay violations, incomplete audits, or trust degradation. It supports both full and partial recovery states using grace capsules, fork repair, federation reauthorization and trust-tier downgrade protocols.

## 1. Recovery Capsule Structure & Entry Conditions

Recovery is triggered by emitting:  
- `Frozen Execution Capsule (FEC)`  
- `Trust Downgrade Trigger (TDT)`  
- `Recovery Initiation Capsule (RIC)`  
Capsule state includes:  
`{ recovery\_id, origin\_hash, fork\_state\_ref, alert\_chain[], grace\_active, fed\_sync\_pending, reentry\_type }`

## 2. Grace Path Reentry & Trust Regeneration

Systems recovering via grace must:  
- replay capsule chain through Audit Engine (Module 14)  
- confirm `Grace Replay Confirmation Capsule (GRCC)` issued  
- declare trust tier rebinding (not escalation)  
- commit `Reentry Capsule (REC)` including zone, signature, GRCC and alert reference

## 3. Fork Reintegration & Federation Consensus

Fork recovery requires:  
- `Fork Anchor Capsule (FAC)` to validate fork path integrity  
- federation co-signature via updated FCC  
- `Federation Reconciliation Capsule (FRC)` containing replay evidence and zone justification  
- cross-ledger snapshot confirmation

## 4. Capsule Chain Repair & Alert Restoration

Recovered systems must:  
- restore capsule lineage via `Chain Repair Capsule (CRC)`  
- validate alert integrity and coverage window  
- publish reentry path to Audit Overlay and rebind ledger endpoint  
Failures to repair invalidate certification and trigger new FEC state.

## 5. Finalization & Certification Handoff

Successful recovery outputs:  
- `Recovery Finalization Capsule (RFC)`  
- updated CCC reference in Module 17  
- capsule reentry audit chain  
- trust zone re-registration (if modified)  
Full certification requires RFC and zero unresolved replay or alert capsules.