MPC-06: Capsule Execution Trace & Replay

System: MaxProcess

Module ID: MPC-06

Title: Capsule Execution Trace & Replay

Version: 1.0

Classification: Auditability & Verification Module

Responsible: TBYD MaxAudit Interoperability Unit

License Model: TBYD License v2.2 / Audit Addendum A

Standards Reference: ISO/IEC 15408, TBYD Capsule Protocol v2.1

Applicability: MaxOneOpen v4.1+

# 1. Purpose

This module defines how MaxProcess capsules are traced, recorded, exported, and replayed for verification or forensic purposes. It ensures complete auditability of all process steps, including delegation, refusal, override, and coordination events.

# 2. Trace Components

Every ProcessCapsule creates a trace capsule in MaxAudit upon activation, completion, refusal, or override. Each trace contains:  
- capsule\_id and step\_id  
- actor or delegate identity reference  
- action timestamp and signature hash  
- result state (executed, refused, frozen)  
- governance impact if present (override, escalation)  
- parent and child capsule links (for chain reconstruction)

# 3. Replay Logic

Replayable execution means that any process chain can be reviewed, validated, and reconstructed in order. This supports:  
- internal audits and cross-checks  
- treaty inspections and third-party reviews  
- post-incident forensic validation  
- trace publication for governance transparency

# 4. Export Format

Trace data is exportable as signed, portable `.trace.json` or capsule-linked `.audit.yaml` bundles. These can:  
- be verified independently  
- support capsule-level governance reviews  
- link back to MaxProcess and MaxWorkRoles logic

# 5. CTO Summary

MaxProcess ensures not only runtime enforcement, but also post-event validation and trust replay. Its trace-and-replay model is a structural substitute for traditional logging, supporting real procedural trust across institutional and OSS domains.