Core Emotion Framework (CEF): Technical Specification 19 (TS 19)

Reasoning Engine Architecture & Semantic Inference Layer

Canonical Architecture-Level Technical Document — Version 1.0

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0. Purpose and Canonical Position

TS-19 is the nineteenth Technical Specification in the CEF canon.

Where:

- **TS-18** defines the *computational ontology*
- **Appendices A–E** define the *schemas, classes, graph, validation, and examples*

TS-19 defines the CEF Reasoning Engine — the semantic inference layer that:

- interprets TS-18 ontology objects
- performs lawful reasoning
- enforces canonical constraints
- generates valid inferences
- supports simulation, prediction, and analysis
- powers semantic-web and AI integrations

TS-19 does **not** introduce new emotional constructs.
It defines the **computational logic** that operates on the constructs defined in TS-1 → TS-18.

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1. Definition of the CEF Reasoning Engine

The CEF Reasoning Engine is:

A constraint-preserving, ontology-driven inference system that computes lawful emotional, structural, and dynamic conclusions from TS-18 entities and relations.

It performs:

- identity-preserving inference
- directionality inference
- modulation inference
- stability inference
- predictive inference
- plasticity inference
- governance inference

It must never violate:

- TS-1 directionality
- TS-3 modulation rules
- TS-11 facet boundaries
- TS-12 stability constraints
- TS-13 predictive logic
- TS-16 plasticity limits
- TS-17 governance rules
- TS-18 ontology structure

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2. Architecture of the Reasoning Engine

The engine consists of **five canonical layers**:

1. **Input Layer**
2. **Normalization Layer**
3. **Inference Layer**
4. **Constraint Layer**
5. **Output Layer**

Each layer is defined below.

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3. Input Layer

The engine accepts:

- JSON-LD instances (Appendix A)
- RDF/OWL graphs (Appendix B)
- Knowledge Graph structures (Appendix C)

Inputs must pass **TS-2 validation** (Appendix D) before entering TS-19.

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4. Normalization Layer

This layer converts all inputs into a unified internal representation:

- operator vector
- facet vector
- center vector
- modulation matrix
- transition graph
- coherence scalar

Normalization ensures:

- identity preservation
- canonical ordering
- center fidelity
- no contamination

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5. Inference Layer

The core of TS-19.

The engine performs **seven classes of inference**, each tied to a TS document.

5.1 Identity Inference (TS-1, TS-11)

The engine infers:

- operator identity
- facet identity
- center identity
- lawful facet ordering

Example:
If facetPrecedes(F1, F2) and facetPrecedes(F2, F3), infer facetPrecedes(F1, F3).

5.2 Directionality Inference (TS-1)

The engine infers:

- lawful successor chains
- multi-step transitions
- transition reachability

Example:
If Sensing → Calculating and Calculating → Deciding, infer Sensing → Deciding (transitive closure).

5.3 Modulation Inference (TS-3)

The engine infers:

- modulation cascades
- modulation strength propagation
- modulation reciprocity

Example:
If Expanding modulates Constricting and Constricting modulates Accepting, infer Expanding modulates Accepting (indirect modulation).

5.4 Stability Inference (TS-12)

The engine computes:

- stability margins

- threshold proximity
- capacity utilization
- drift risk

Example:
If activationLevel approaches capacityLimit, infer stability risk.

5.5 Predictive Inference (TS-13)

The engine infers:

- drift trajectories
- collapse likelihood
- overflow probability
- long-horizon patterns

Example:
If modulationDecayRate increases, infer rising collapse probability.

5.6 Plasticity Inference (TS-16)

The engine infers:

- micro-adjustment effects
- facet reordering impacts
- center micro-shifts

Example:
If facetReorderingDelta is small but cumulative, infer long-term facet drift risk.

5.7 Governance Inference (TS-17)

The engine infers:

- self-correction pathways
- coherence protection behavior
- autonomous balancing

Example:
If coherenceProtectionFactor is high, infer reduced collapse probability.

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6. Constraint Layer

All inferences must pass:

- identity constraints
- structural constraints
- dynamic constraints
- predictive constraints
- plasticity constraints
- governance constraints

This layer ensures:

- no illegal transitions
- no illegal modulation
- no facet migration
- no center blending
- no coherence violations

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7. Output Layer

The engine outputs:

- validated inferences
- predicted states
- stability assessments
- modulation cascades
- transition chains
- governance recommendations
- plasticity adjustments

Outputs must be:

- canonical
- contamination-free
- identity-preserving
- center-bounded

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8. Canonical Constraints of TS-19

The Reasoning Engine must:

- never generate new operators
- never generate new facets
- never generate new centers
- never violate TS-1 → TS-18
- never override canonical directionality
- never override canonical modulation
- never override facet boundaries
- never override governance rules

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9. Canonical Status

TS-19 is the authoritative specification for the CEF Reasoning Engine.
It defines the computational logic that interprets and operates on the ontology defined in TS-18.

It is subordinate only to:

- Core Essence Document
- TS-1 → TS-18
