Enhancement Layer Specification v1

1. Purpose

The Enhancement Layer provides **controlled, optional extensions to baseline caption behaviour**, enabling richer communication beyond standard subtitling.

Enhancements may include:

- Emotion and prosody representation
- Semantic sound annotation
- Reactive typography
- Spatial caption behaviour
- Visual system integration (e.g. WallSpace)

Enhancements must always operate **within the compliance floor and policy constraints**.

---

2. Scope

The Enhancement Layer is responsible for:

- Proposing enhancement behaviours
- Modifying rendering parameters (when approved)
- Adapting caption presentation based on additional signals
- Integrating captions with external visual systems

The Enhancement Layer is **not permitted to enforce behaviour independently**.

---

3. Core Design Principles

Enhancements must not silently alter caption meaning or structure.

3.1 Subordination to Constraints

Enhancements must never override rules or policy constraints.

3.2 Optionality

All enhancements must be optional and controllable via profiles.

3.3 Bounded Behaviour

Enhancement effects must operate within defined limits.

3.4 Graceful Degradation

Enhancements must degrade safely when data is unavailable or unreliable.

3.5 Non-Disruption

Enhancements must not reduce readability, stability, or comprehension.

---

4. Enhancement Lifecycle

Propose → Validate → Approve / Modify / Reject → Apply → Monitor → Log

---

5. Inputs

Enhancement proposals may be based on:

- Emotion or sentiment analysis
- Audio features (volume, pitch, rhythm)
- Semantic sound detection
- Speaker behaviour
- External control signals (e.g. OSC, MIDI)
- Environmental context

---

6. Outputs

Enhancements may modify:

- text styling (colour, weight, emphasis)

- font size (within limits)
- timing behaviour (limited)
- spatial positioning
- additional visual indicators
- external visual system parameters

---

7. Enhancement Categories

7.1 Emotion and Prosody

Represents emotional tone or delivery.

Examples:

- emphasis (shouting, stress)
- whispering
- sarcasm or tone indicators

7.2 Semantic Sound Annotation

Adds meaning beyond speech.

Examples:

- [music playing]
- [door slams]
- [laughter]

7.3 Reactive Typography

Modifies visual appearance based on input signals.

Examples:

- subtle size variation
- colour shifts
- timing-based emphasis

7.4 Spatial Behaviour

Places captions relative to:

- speaker position
- sound source
- scene context

7.5 External Visual Integration

Connects captions to visual systems.

Examples:

- triggering visuals in WallSpace
- controlling lighting or projection
- driving shader parameters

---

8. Constraint Enforcement

Enhancements must comply with:

- readability and accessibility constraints
- timing constraints
- visual safety constraints
- speaker clarity rules

---

9. Enhancement Evaluation Criteria

Every enhancement must satisfy:

- Improves comprehension or context
- Does not reduce readability
- Has defined limits
- Has a fallback mode
- Can be disabled or scaled
- Does not conflict with higher-priority constraints

---

10. Enhancement Constraints

10.1 Size Constraints

- Font scaling must be bounded
- Must not cause reflow

10.2 Motion Constraints

- Movement must be minimal
- Must not distract from reading

10.3 Colour Constraints

- Must preserve contrast
- Must not override speaker identification

10.4 Timing Constraints

- Must not alter reading time
- Must not introduce delay

---

11. Conflict Handling

Enhancements must be:

- reduced when conflicts occur
- suppressed when constraints cannot be satisfied

Example

Enhancement: emotion-based scaling
Constraint: layout stability

Decision:
→ scaling reduced or disabled

---

12. Low Confidence Behaviour

When input confidence is low:

- enhancements must be reduced
- unreliable signals must be ignored
- fallback behaviour must be applied

---

13. Enhancement Profiles

Enhancements must be controlled via profiles:

Profile	Behaviour
compliance	disabled
enhanced	limited
immersive	spatial enabled
experimental	extended

---

14. Integration with Policy Engine

The Enhancement Layer must:

- submit proposals to Policy Engine
- accept approval or modification
- apply only approved changes

The Policy Engine has final authority over all enhancement proposals and may reject any enhancement without modification.

---

15. Integration with Renderer

Enhancements must:

- operate within rendering constraints
- not modify layout unpredictably
- not introduce instability

16. Integration with Decision Logs

Each enhancement must log:

- proposal
- evaluation result
- constraints applied
- final action
- reasoning

17. Performance Considerations

- Enhancements must not degrade rendering performance
- Must support real-time operation
- Must allow selective disabling

18. Testing Requirements

Tests must verify:

- enhancement safety
- constraint compliance
- correct suppression behaviour
- graceful degradation

19. Claude Integration

Claude can:

- evaluate enhancement usefulness
- detect unsafe behaviour
- suggest improvements
- validate constraints

20. Future Extensions

- adaptive emotion modelling
- user-personalised enhancements
- cross-modal feedback (haptics, visuals)
- AI-driven semantic enrichment

🔚 **Summary**

The Enhancement Layer:

- Extends caption meaning beyond text
- Enables expressive and immersive behaviour
- Operates under strict constraints
- Integrates with external systems
- Maintains compliance and readability
