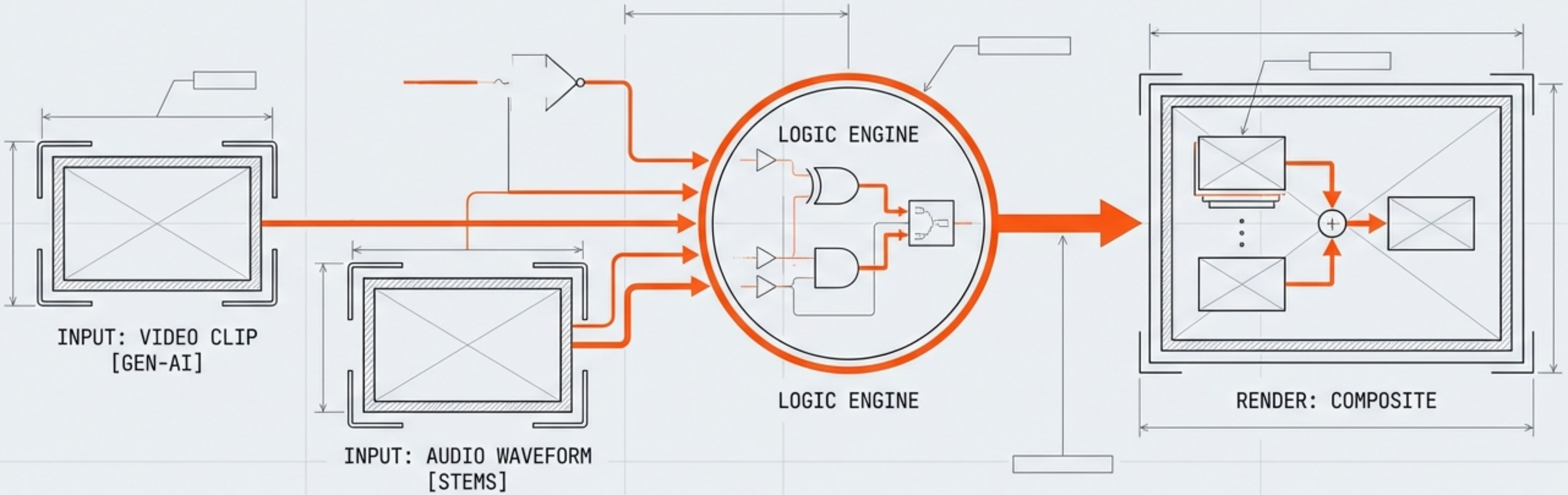
Gen-AV: Technical Blueprint

From Static Playback to Audio-Reactive Generative Synthesis



VERSION: 1.0 // STATUS: ARCHITECTURAL PLAN	TARGET: HYBRID WEB/DESKTOP STACK	OBJECTIVE: ZERO-LATENCY AUTO-EDITING

THE HYBRID INFRASTRUCTURE

LAYER 1: THE SHELL (ELECTRON)

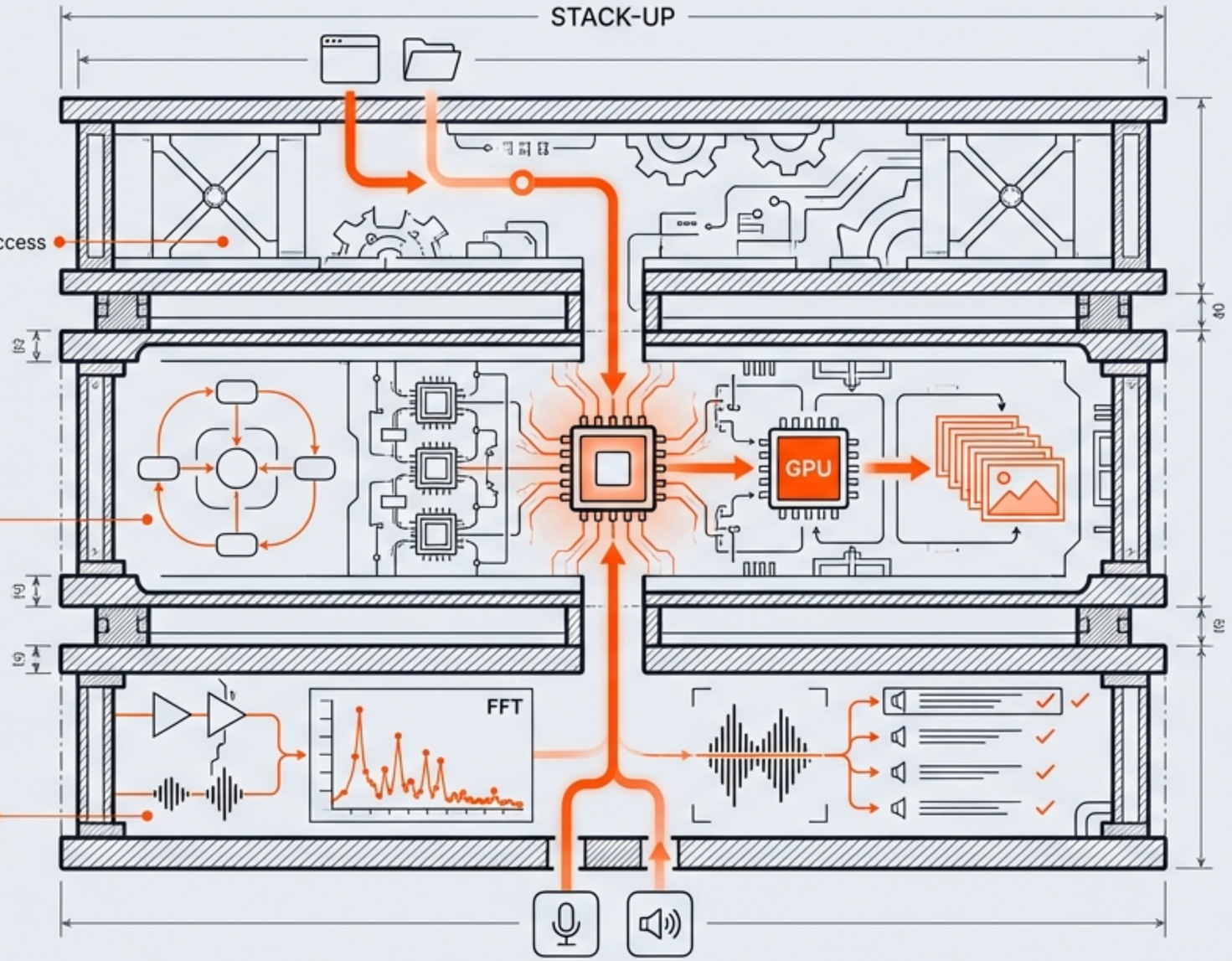
Native Window Mgmt // Local File System Access

LAYER 2: THE ENGINE (REACT + WEBGPU)

State Mgmt // 60fps Texture Rendering

LAYER 3: THE EARS (WEB AUDIO API)

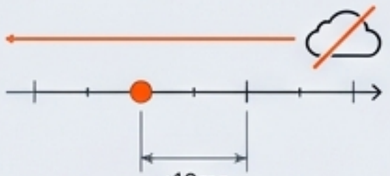
FFT Analysis Thread // Input Device Enum



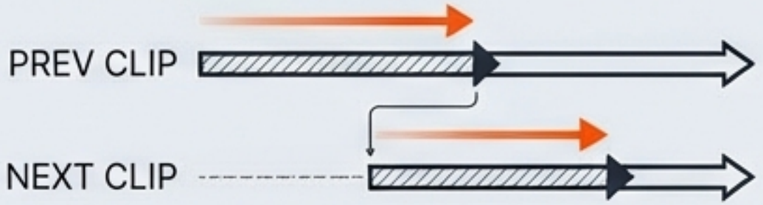
CRITICAL CONSTRAINT: LIVE SAFETY

The system must operate fully offline. No cloud rendering dependencies during performance.

Local execution ensures <10ms latency.

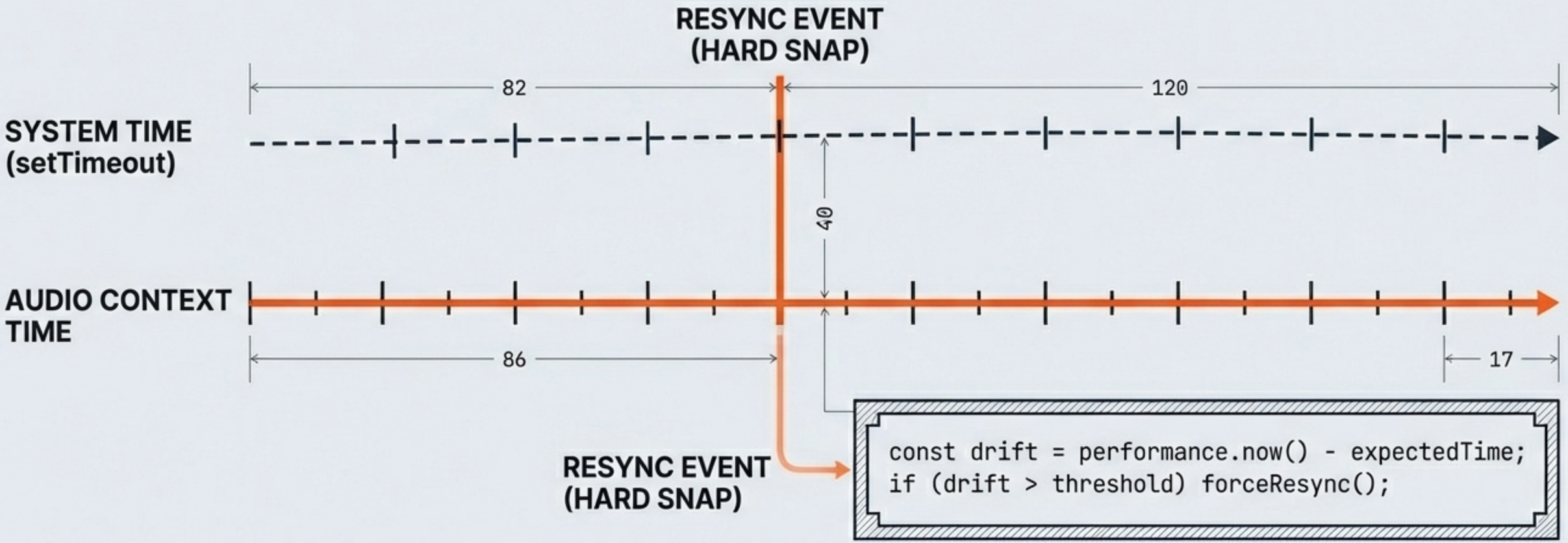


PRINCIPLE 1: TRANSPORT & PLAYBACK LOGIC

	USER CONCEPT	CODE IMPLEMENTATION
LOOP		`buffer.loop = true;`
BOUNCE		`if (t >= duration)` `  rate = -1;`
RELATIVE TRIGGER		`nextClip.time =` `  (prev.time / prev.dur) * next.dur;`

STATE MANAGEMENT: **“Restart”** resets playhead to 0. **“Continue”** recalls lastKnownTimestamp from state tree.

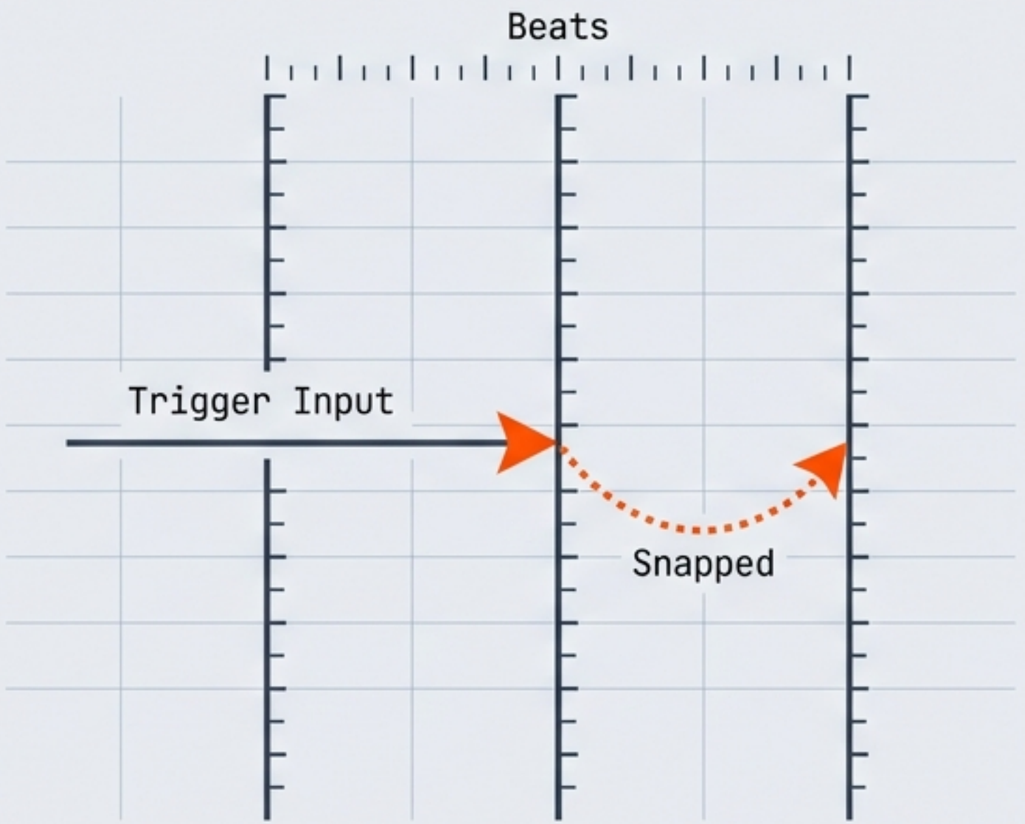
Principle 2: Global Clock & Drift Correction

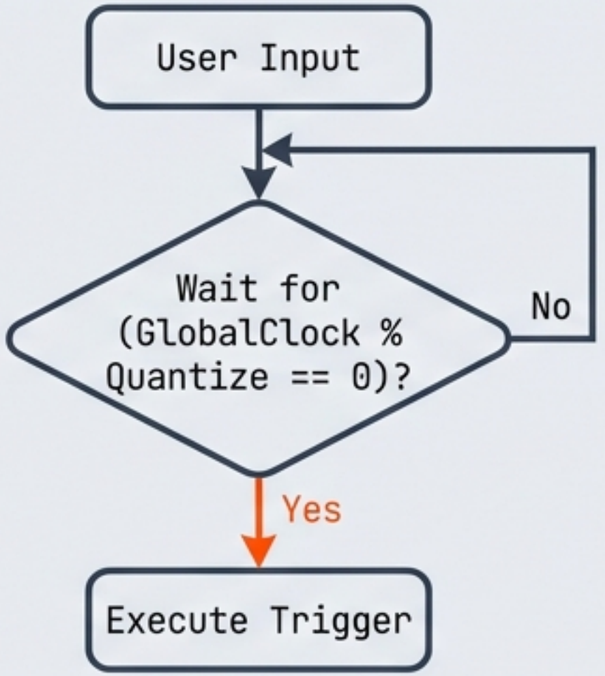


The Problem: JavaScript timers drift.

The Solution: A Master Clock module comparing delta against Audio Context.

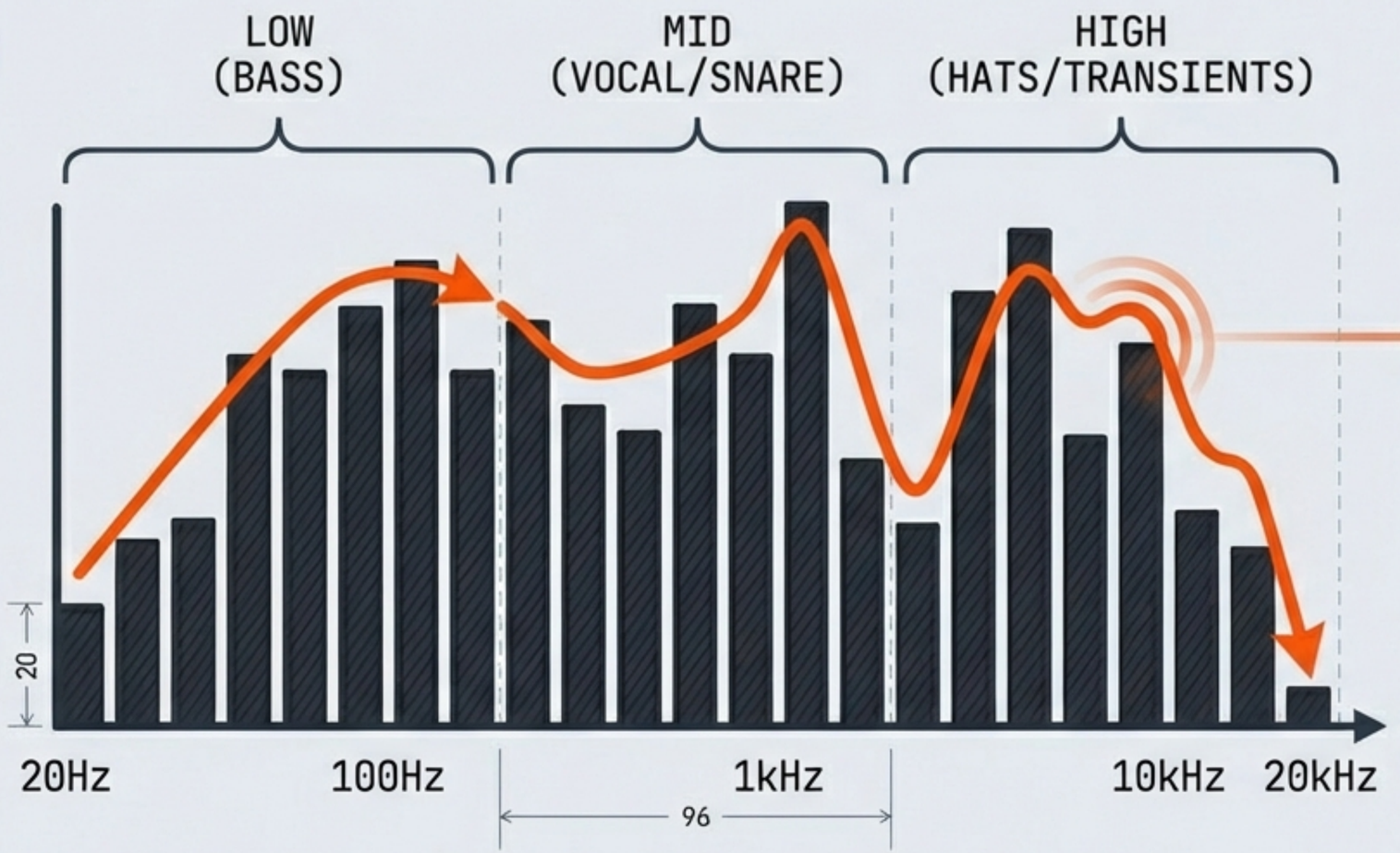
PRINCIPLE 3: QUANTIZATION & BEAT LOOPING






```
DYNAMIC LOOPING: // Buildup Engine
loopLength = [4, 2, 1, 0.5, 0.25]; // Beats
currentTime = globalTime % (beatDuration * loopLength[i]);
```

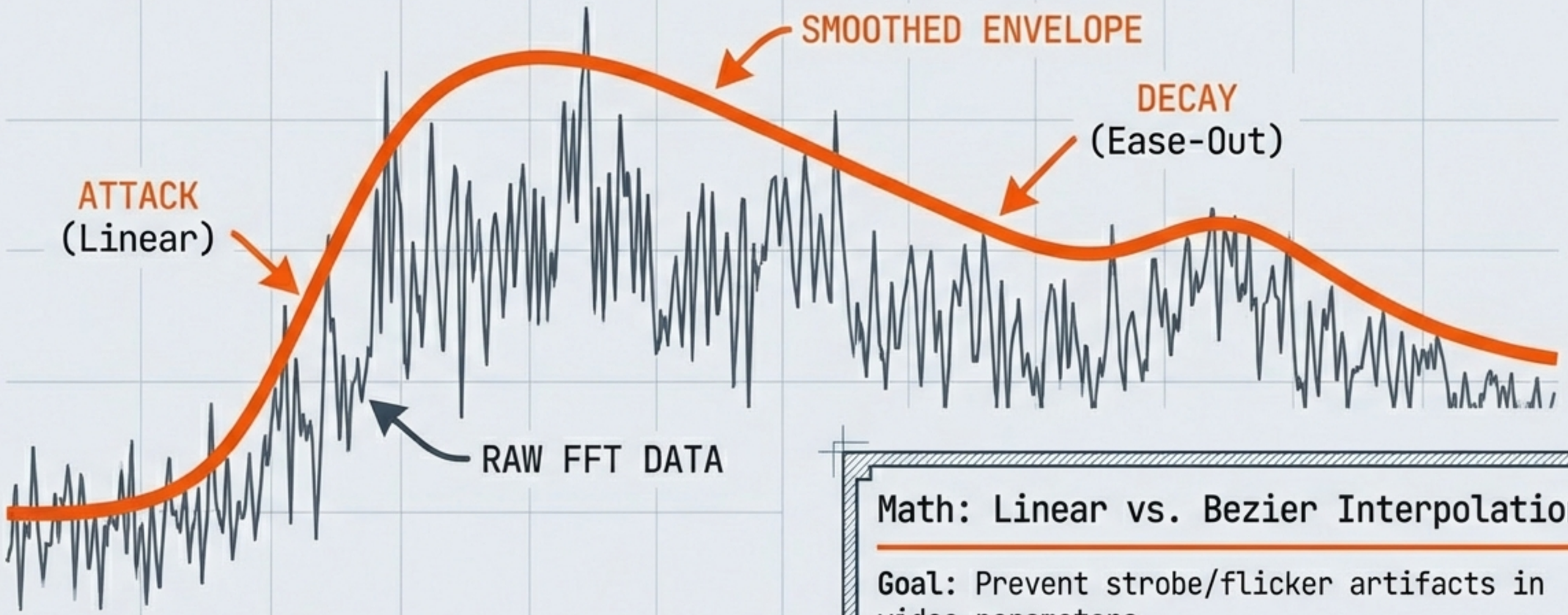
Principle 4: Audio FFT Integration



Tech Stack

- **API:**
  Web Audio AnalyserNode
- **INPUT:**
  navigator.mediaDevices
  .enumerateDevices()
- **FALLBACK:**
  Internal Clip Audio
  Buffer

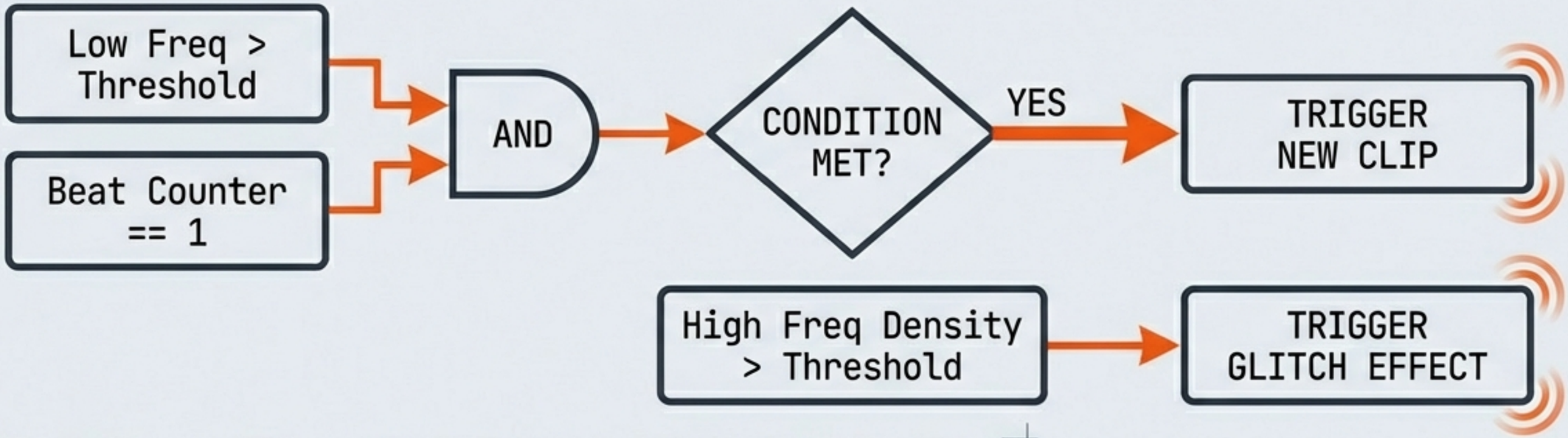
Principle 5: Envelopes & Interpolation



Math: Linear vs. Bezier Interpolation

Goal: Prevent strobe/flicker artifacts in video parameters.

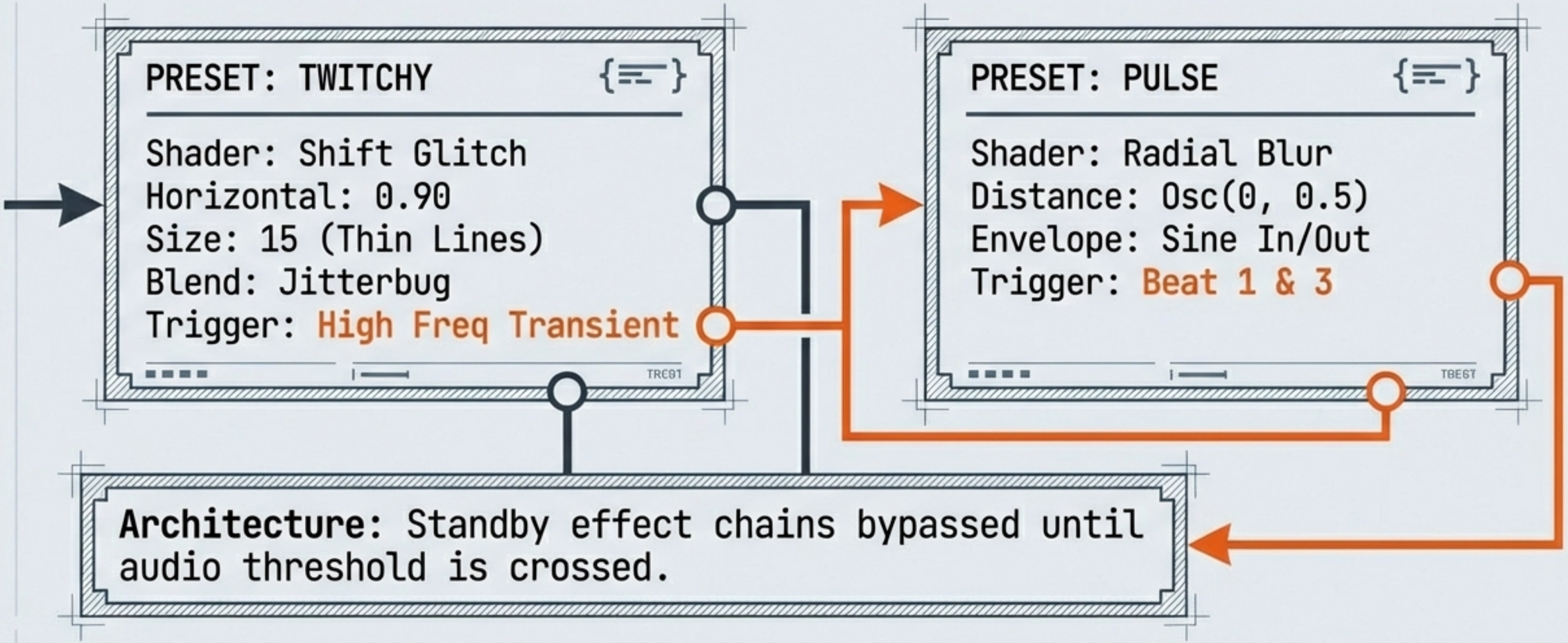
Principle 6: The Auto-Edit Algorithm



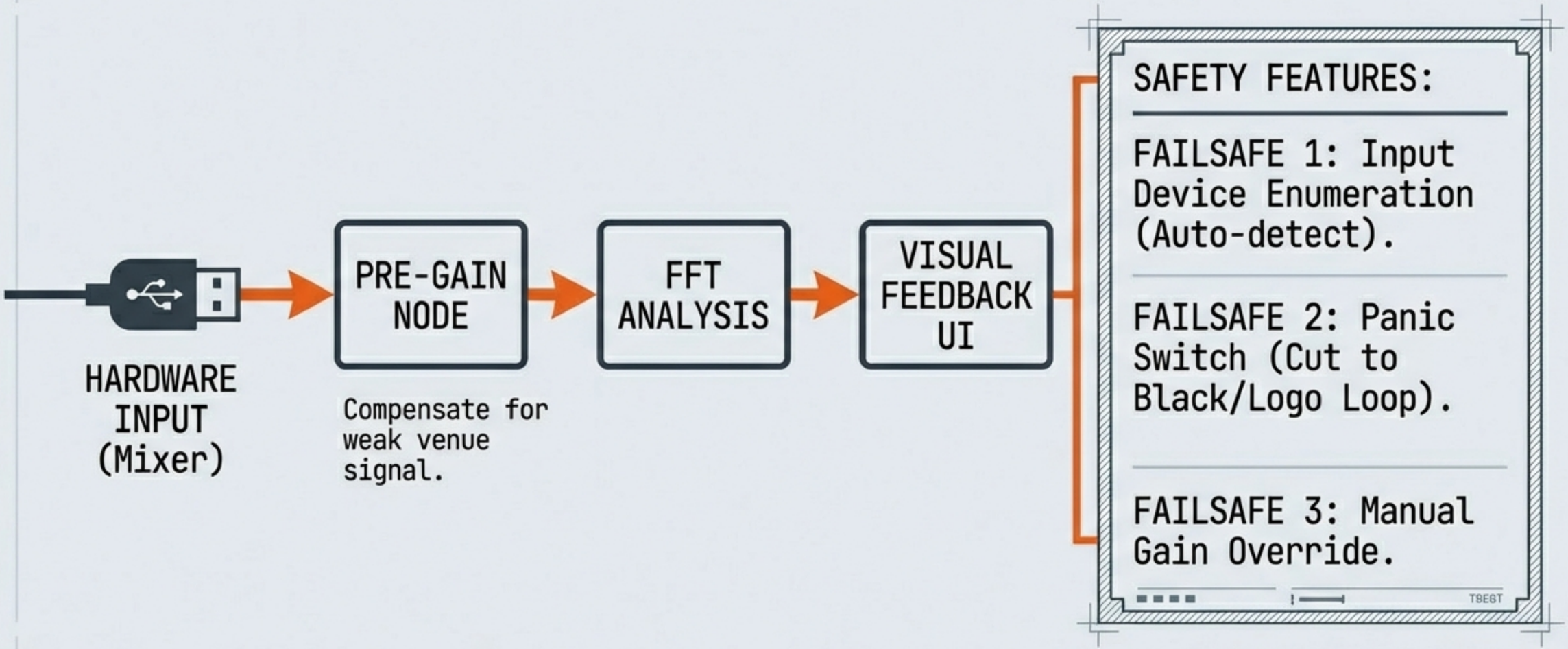

```
IF (Audio.Bass > 0.8 && GlobalClock.isDownbeat) {
  VideoEngine.triggerNext(transition: 'cut');
}
```

THE DIRECTOR: Autonomous decision making based on audio density.

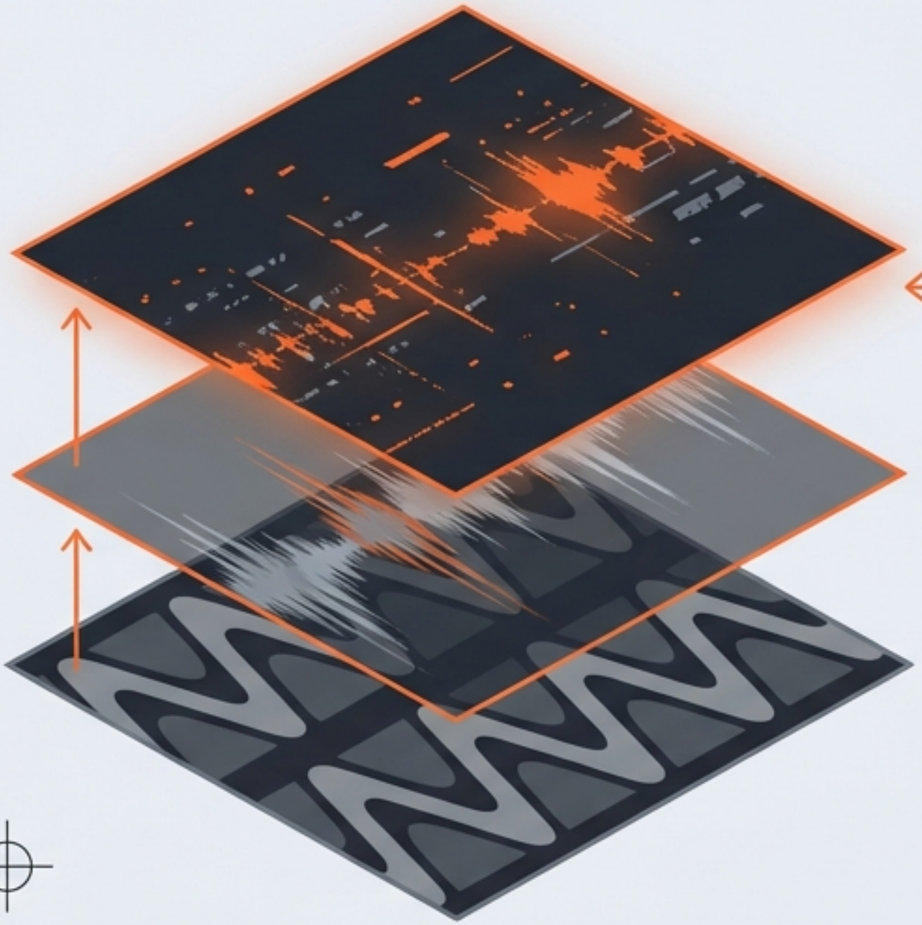
Principle 7: Accents & Effects System



Live Input Strategy & Gain Staging



Polyphony: Visual Chords



Glitch Overlay (Transient)
Additive Blend

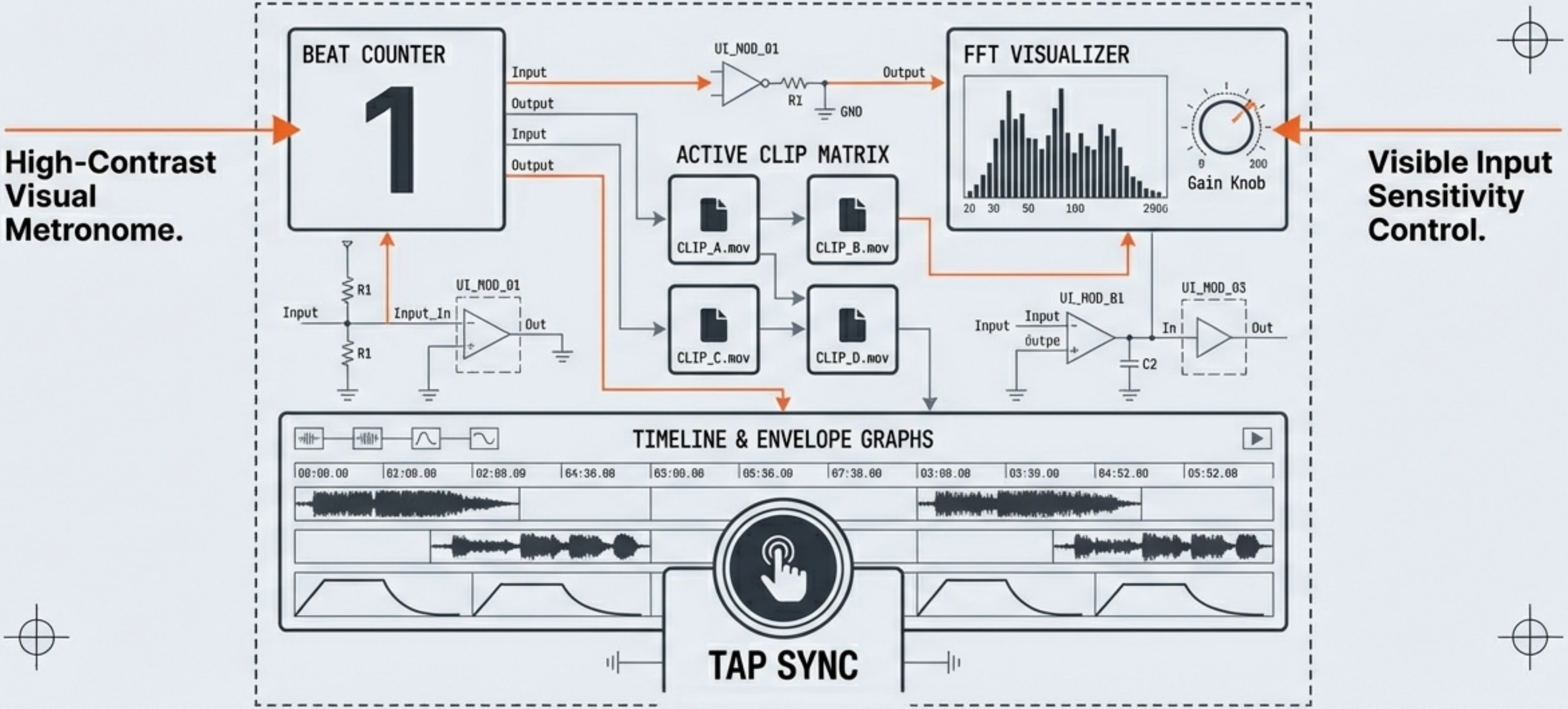
Accent Clip (Melody)
50% opacity

Base Loop (Rhythm)

***Piano Mode:** Trigger acts as "Note On/Note Off".

****Free Layer Logic:** Dynamic pool of video players allows multiple Gen AI clips to overlap based on audio complexity.

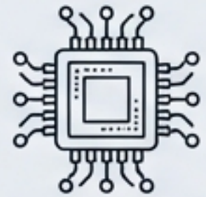
UI/UX: High-Stakes Performance



Implementation Roadmap

PHASE 1: THE CORE

Electron Shell // Playback Engine // Buffer Logic



PHASE 2: THE EAR

Web Audio API // FFT Extraction // Global Clock

PHASE 3: THE NERVOUS SYSTEM

Modulation Matrix // Envelopes // Interpolation

PHASE 4: THE BRAIN

Auto-Edit Algorithm // Visual Chords // Polyphony

RESULT: A fully autonomous, reactive visual instrument.