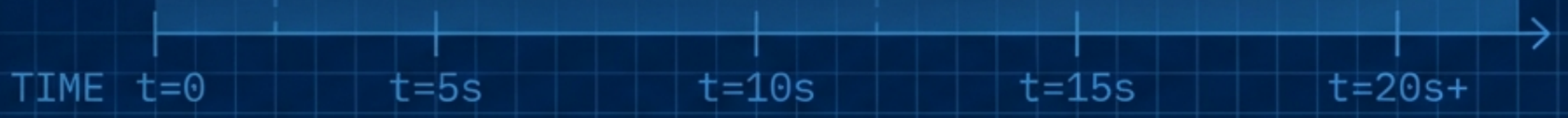
MODULE S11E05



UX Laws and Principles: How People Experience Time

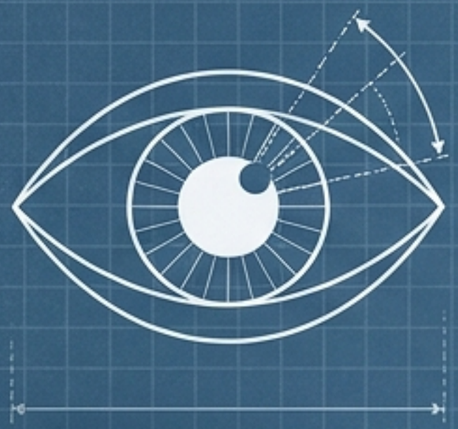
Responsiveness, Feedback, and the Psychology of Waiting



Building on S11E04’s exploration of 4±1 working-memory prosthetics and persistent task resumption, this module shifts from how human memory stores data to how the human brain perceives causality, responsiveness, and asynchronous latency.

Gemini Notebook

SEC 01 // PSYCHOPHYSICS OF TIME



<= 100 ms

Perceptual Causality

The “I caused this” threshold (Robert B. Miller, 1968 / Jakob Nielsen). Feedback feels instantaneous. No special UI required beyond the visual result.

SPEC: VISUAL FEEDBACK LATENCY, REV 1.2
HUNAN PERCEPTION INTERFACE // MODULE A



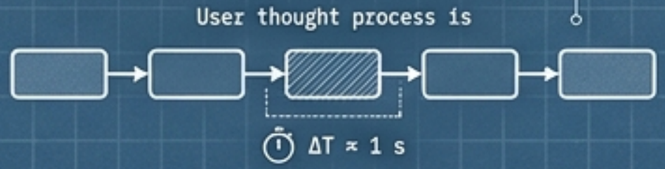


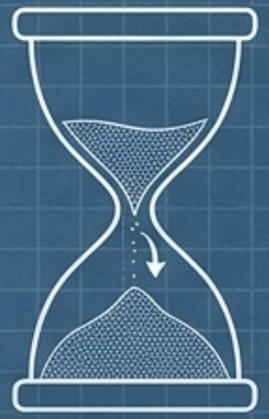
<= 1.0 s

Uninterrupted Flow

The limit for an unbroken train of thought. Users notice the delay, but retain their mental context. The system is perceived as “working.”

SPEC: COGNITIVE CONTEXT RETENTION, REV 1.1
HUNAN PERCEPTION INTERFACE // MODULE B





<= 10.0 s

Attention Retention

The absolute ceiling for maintaining active focus. Beyond this, users context-switch and require a UI re-orientation upon return.

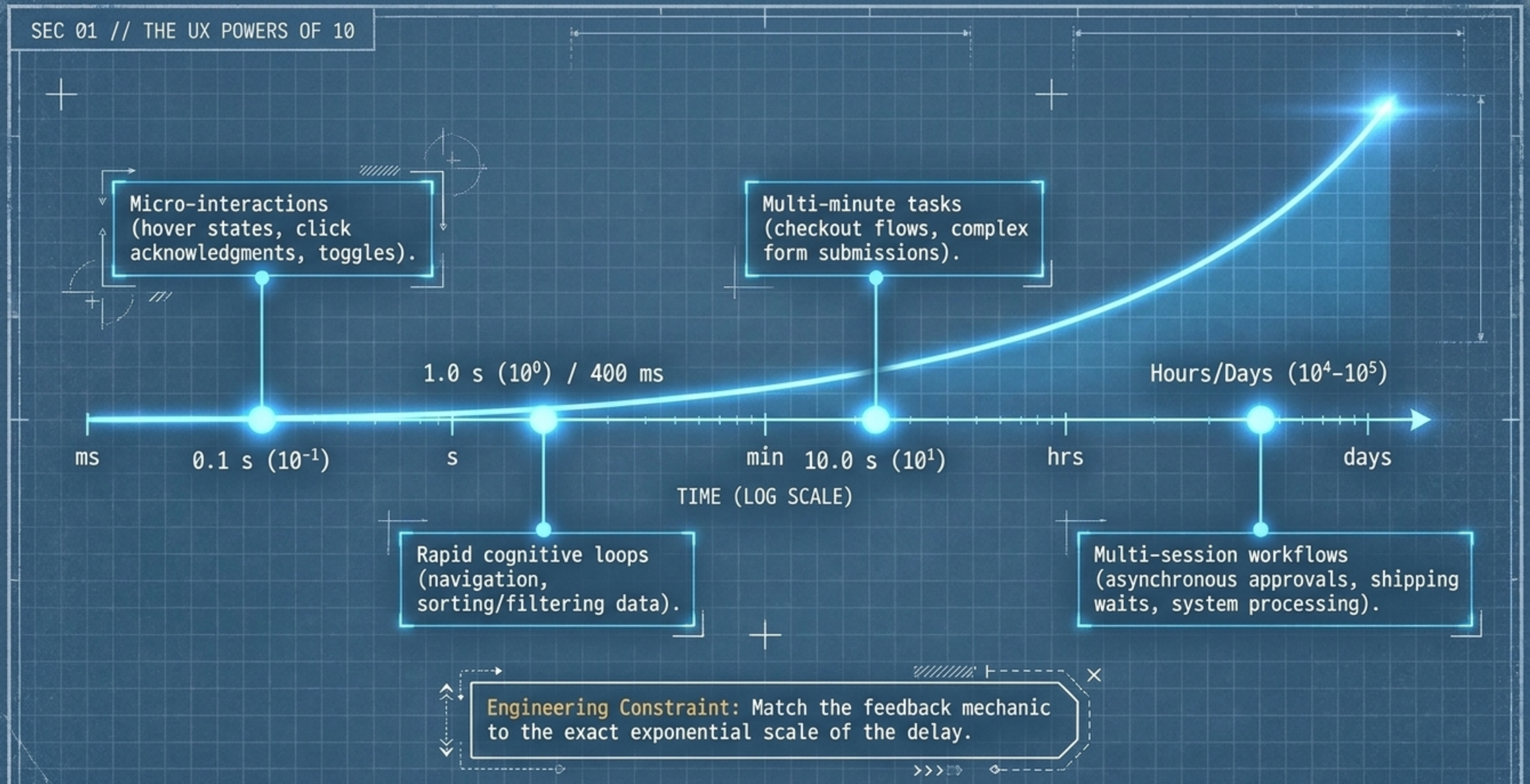
SPEC: MAX FOCUS DURATION, REV 1.3
HUNAN PERCEPTION INTERFACE // MODULE C



GLOBAL ENGINEERING SPEC: INTERFACE LATENCY & HUMAN PERCEPTION THRESHOLDS // REV 1.0 - CONFIDENTIAL

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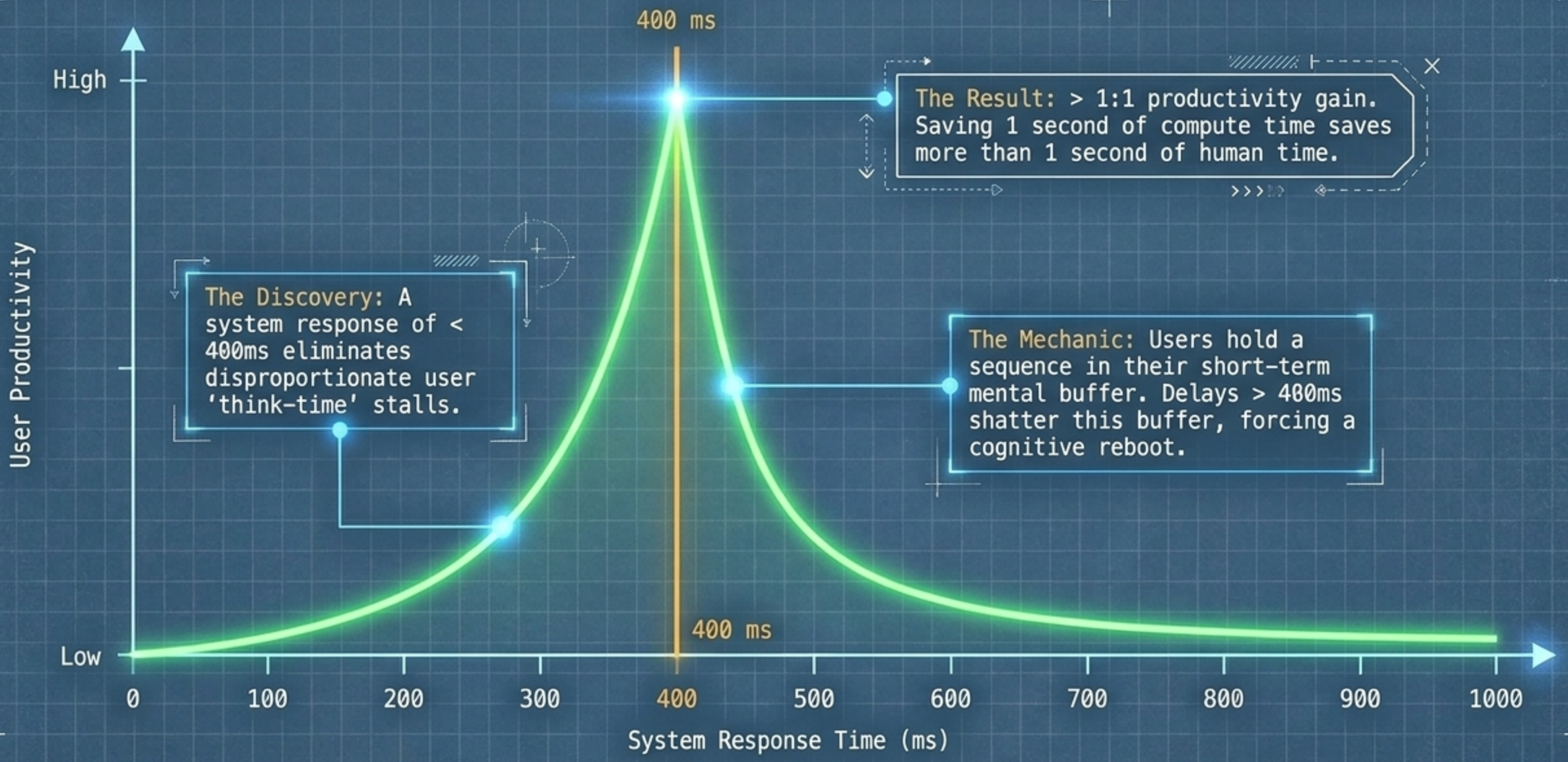
SEC 01 // THE UX POWERS OF 10



Engineering Constraint: Match the feedback mechanic to the exact exponential scale of the delay.

Gemini Notebook

SEC 02 // THE DOHERTY THRESHOLD (< 400 MS)



The Result: > 1:1 productivity gain. Saving 1 second of compute time saves more than 1 second of human time.

The Discovery: A system response of < 400ms eliminates disproportionate user 'think-time' stalls.

The Mechanic: Users hold a sequence in their short-term mental buffer. Delays > 400ms shatter this buffer, forcing a cognitive reboot.

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SEC 02 // DECONSTRUCTING INP (INTERACTION TO NEXT PAINT)

⟵ Good <= 200 ms | Needs Improvement 200–500 ms | Poor > 500 ms ⟶



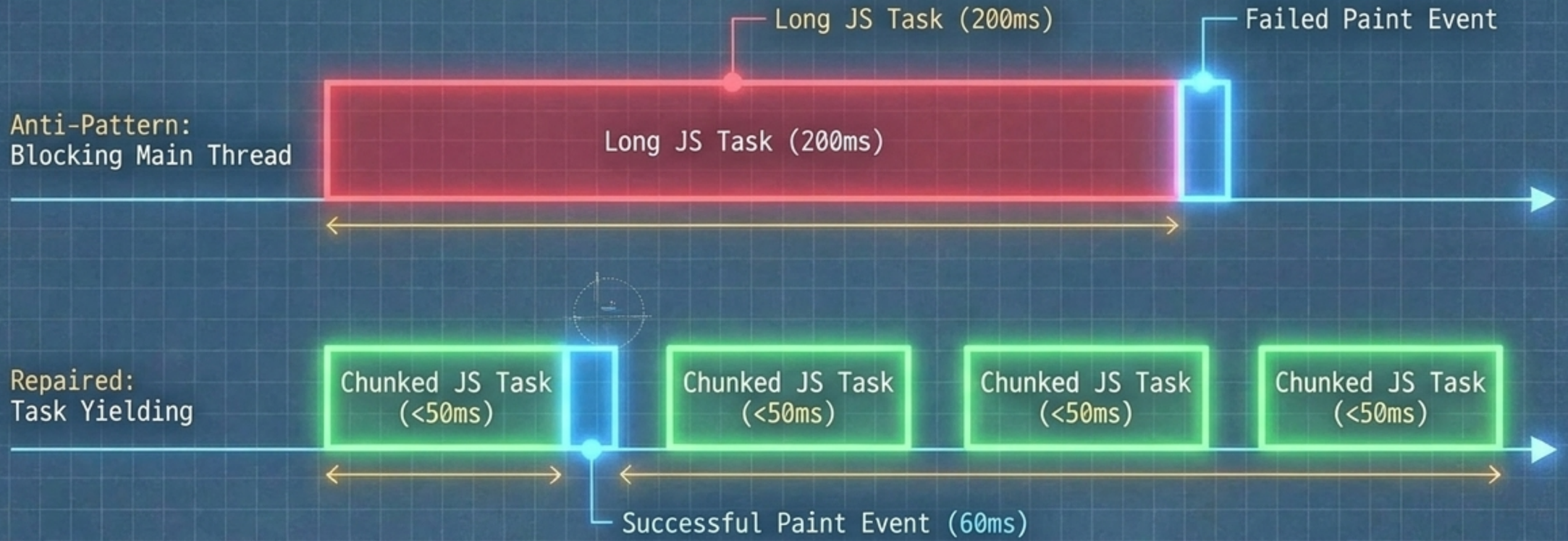
Phase 1: Input Delay
Time from user action to event handler execution.

Phase 2: Processing Duration
The execution time of JavaScript callbacks.

Phase 3: Presentation Delay
Time for the browser to calculate layout and paint the next frame.

Constraint Note: The final INP value represents the longest interaction observed during the page lifecycle (ignoring outliers).

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The Goal: Keep visual press acknowledgement crisp (< 100ms).
The Method: Decompose asynchronous network work. Yield the main thread every < 50ms.
The Takeaway: Even if the background action takes 2 seconds, the interaction (INP) remains <= 200ms because the UI updates instantly.

Gemini Notebook

Anxiety Inducing	Tolerance Building
Unoccupied Time	Occupied Time
Engineering Action: Provide content to read or determinate animations to watch (occupy the mind).	
Unexplained / Uncertain Delay	Explained / Finite Delay
Engineering Action: Explicitly state reasons for delays (e.g., weather issues vs. a silent terminal).	
Waiting Pre-process	Waiting In-process
Engineering Action: Acknowledge the user instantly so the wait transitions to in-process.	

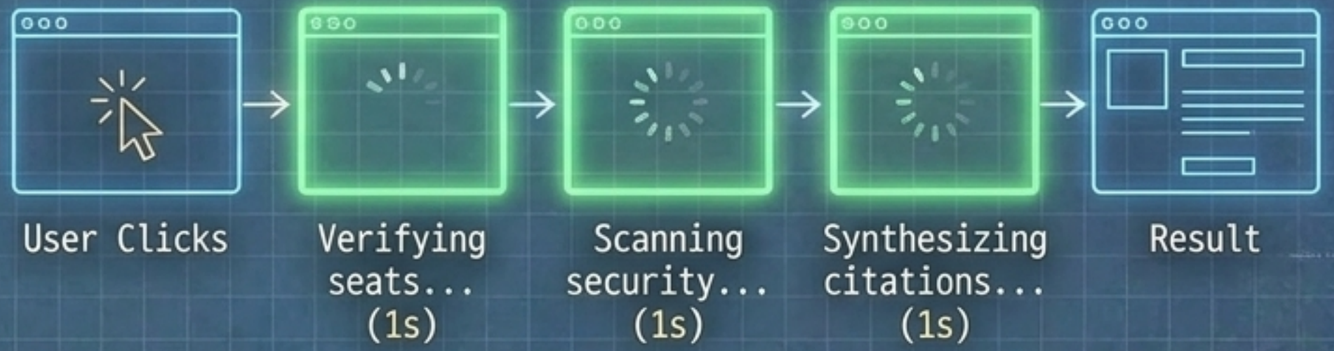
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Path A: Opaque Instant



Yields lower perceived value for high-stakes tasks.

Path B: Transparent Labored

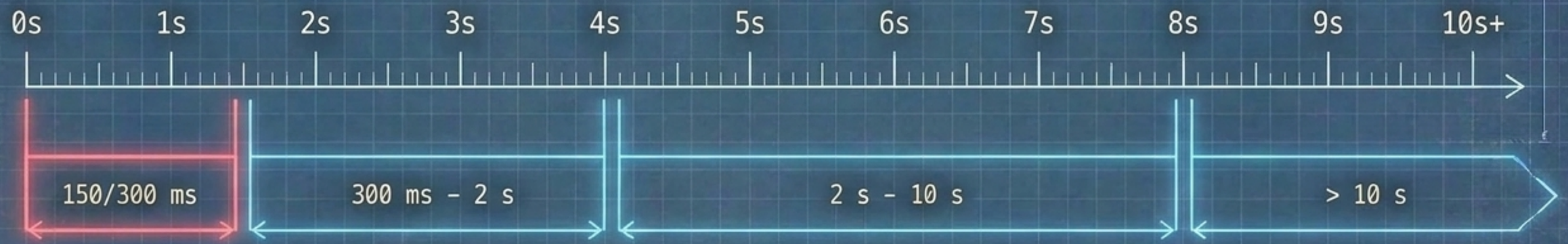


Yields higher trust and perceived value.

- The Rule: 1–3s of real, visible operational steps increases perceived value over an opaque instant result.
- The Ethical Boundary (Benevolent Deception limits): Fabricated setTimeout delays backfire ethically and technically. Never fake time; explicitly expose real, underlying system labor to the UI.

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SEC 04 // THE ANTI-FLICKER TIMELINE (HYSTERESIS)



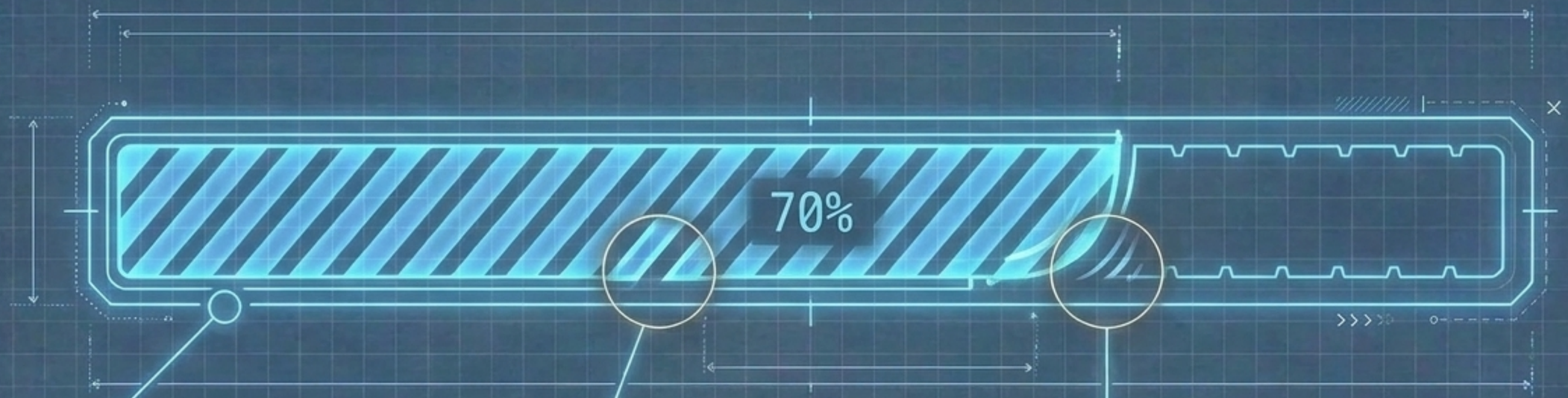
Architectument:
No UI change. Bypass spinner entirely for fast networks to prevent strobe flicker.

Architectura measure:
Delayed subtle indicator. Enter spinner state, but enforce a >= 400ms minimum-hold. Ensures cognitive processing and avoids micro-flash.

Architecturaton:
Skeleton Screen or Step Progress

Architecturent:
Determinate Progress. Background execution / explicit cancel escape routes required.

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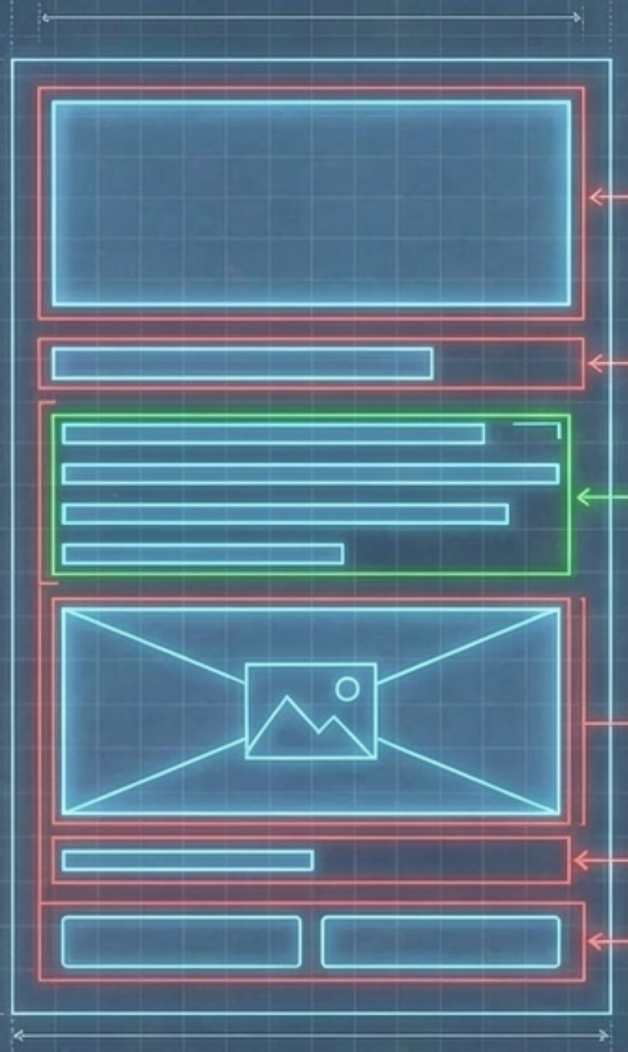


Anxiety Reduction
Anxiety Reduction (Brad Myers, 1985): The fundamental necessity of the percent-done bar for reducing uncertainty and anxiety.

Optical Acceleration
(Chris Harrison, CHI 2010): (Chris Harrison, CHI 2010): Backward-ribbing animations (stripes moving against the fill direction) make the wait feel ~11% shorter.

Non-Linear Pacing:
Progress bars that artificially accelerate near the end are perceived as significantly faster than mathematically linear ones.

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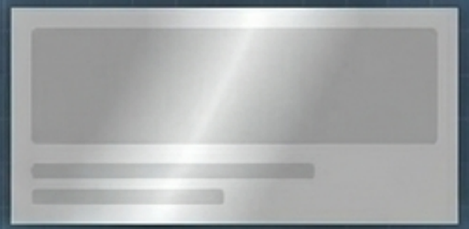


CLS Strictness (CLS <= 0.1): Enforce exact geometric DOM reservation. Skeleton-to-content swaps must not shift the layout. Zero jumping text.

```
@media (prefers-reduced-motion: reduce) {
  .skeleton-shimmer {
    animation: none;
    background: #e0e0e0; /* Static color */
  }
}
```

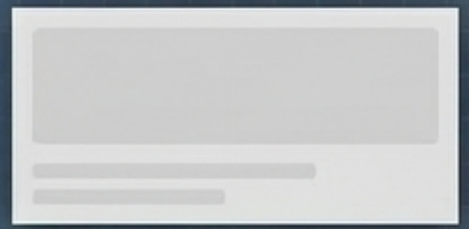
Accessibility (WCAG 2.3.3): Honor prefers-reduced-motion.

Standard Motion



Standard Motion

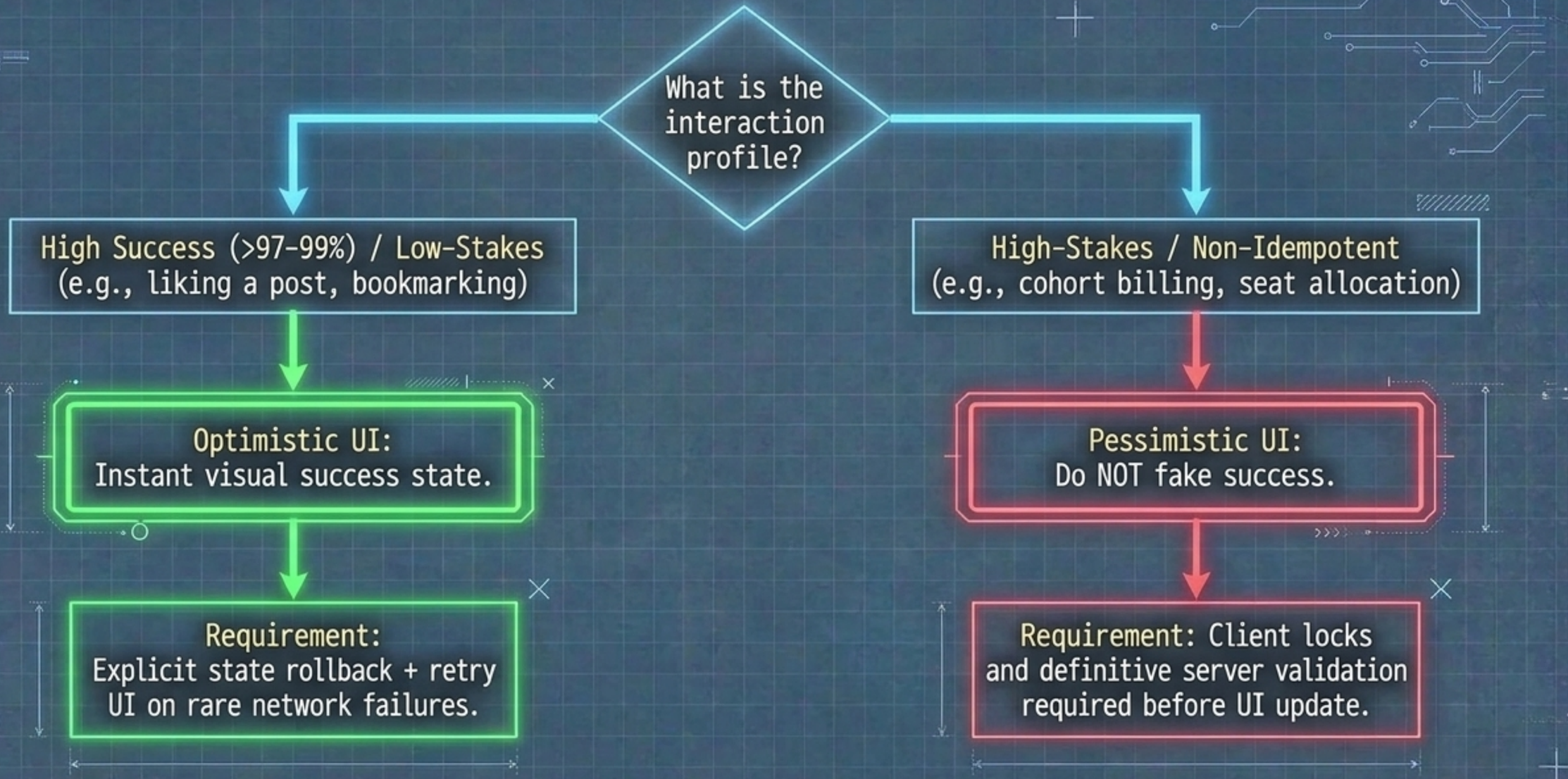
Reduced Motion



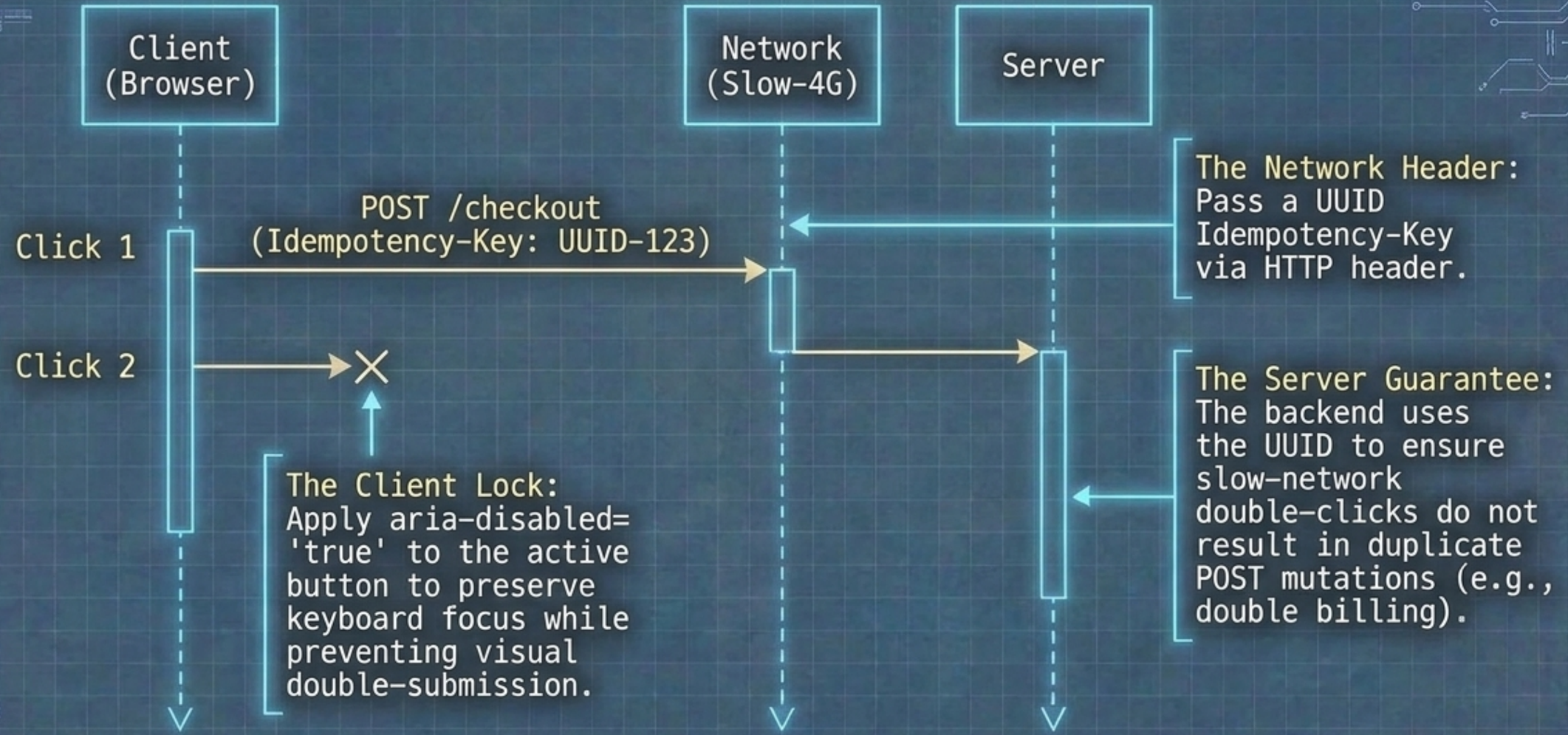
Static Block/Soft Fade

Fallback Strategy: Replace sweeping shimmer animations with calm static blocks or soft-fade placeholders to prevent vestibular triggers in sensitive users.

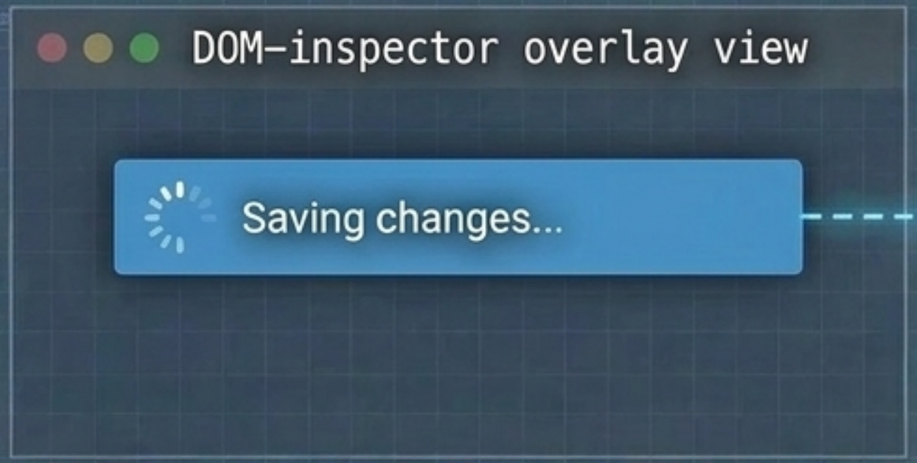
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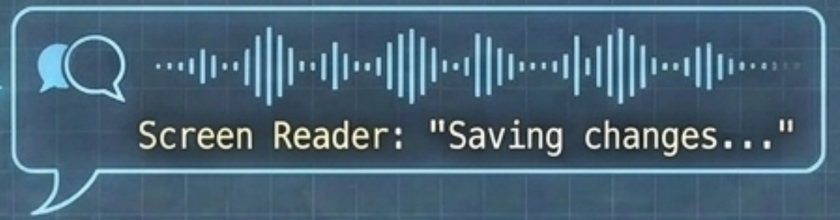
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```
<div class='toast' role='status'
 or aria-live='polite'>
```



Status Messages (WCAG 4.1.3): Visual state changes must have non-spammy auditory announcements. Avoid aria-live='assertive' unless critical.




```
<button id='extend-btn'>
Focusable Extension Method</button>
```

Timing Adjustable (WCAG 2.2.1): Users must be warned before session/token timeouts occur. Provide a simple, focusable method to request more time before data is lost.

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Broken Execution

650 ms frozen click
(Failed INP > 200ms).



120 ms spinner flash
(Hysteresis failure / strobe effect).

Lost keyboard focus due
to <button disabled>.

Repaired Execution

Optimistic UI applied.
Immediate active state (< 50ms).



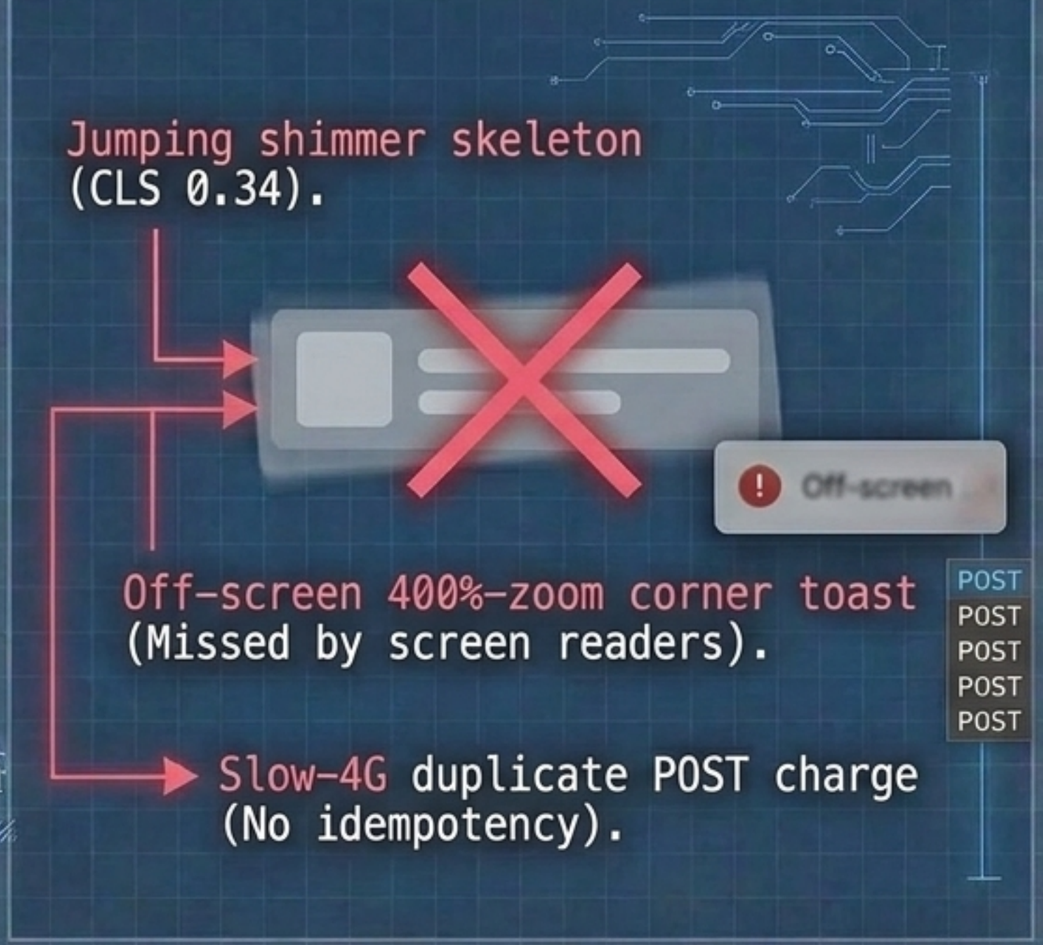


Network request hidden
in background.

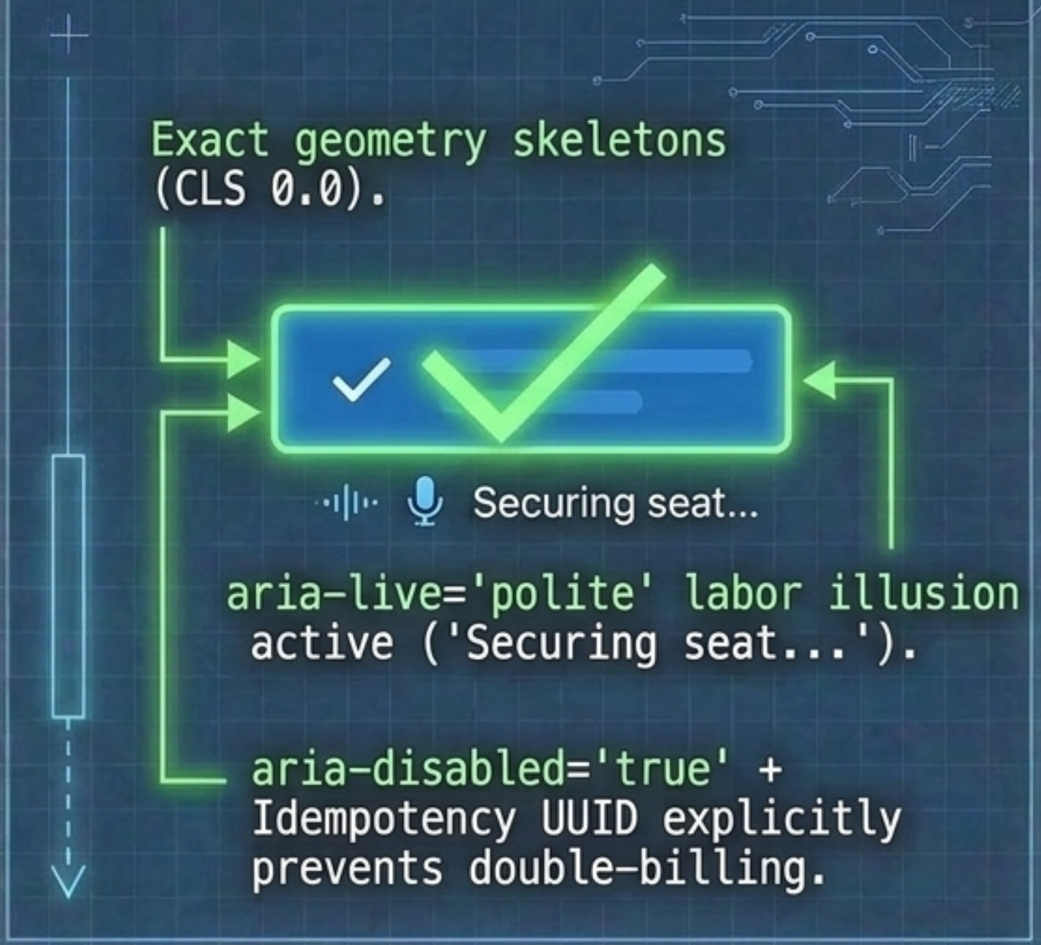
Focus maintained on button.
Silent rollback logic attached
in case of 500 error.

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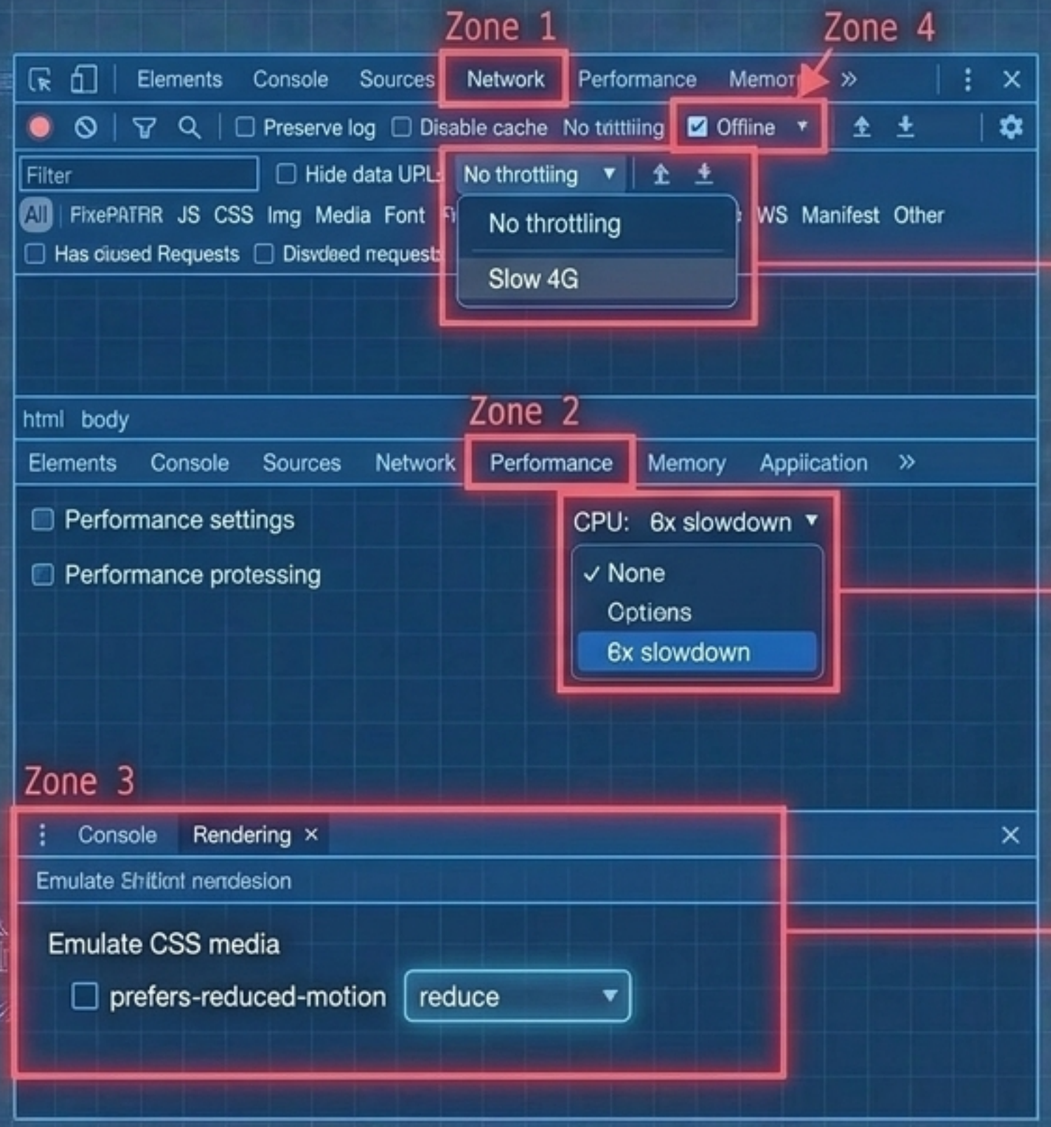
Broken Execution



Repaired Execution



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The 15-Minute Stress Test Checklist:

1. **Network:** Throttle to Slow 4G (Exposes >400ms Doherty failures).
2. **CPU:** 4x or 6x slowdown (Exposes JS main-thread blocking >50ms).
3. **Rendering:** Emulate CSS media feature prefers-reduced-motion: reduce (Tests skeleton WCAG compliance).
4. **Network (Offline):** Disconnect completely to verify Optimistic UI rollback states and error toasts.

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SPECIFICATION	VALUE / THRESHOLD
JS Task Length:	<= 50 ms
Visual Ack:	<= 100 ms
INP Budget:	<= 200 ms
Doherty Loop:	<= 400 ms
Spinner Gate:	150-300 ms delay (>=400ms min-hold)
CLS Strictness:	<= 0.1
WCAG Specs:	2.2.1 (Timeouts), 2.3.3 (Motion), 4.1.3 (Status)

Coming in S11E06: How People Experience Progress — Motivation, Goal-Gradient Mechanics, and the Peak-End Rule.

Gemini Notebook