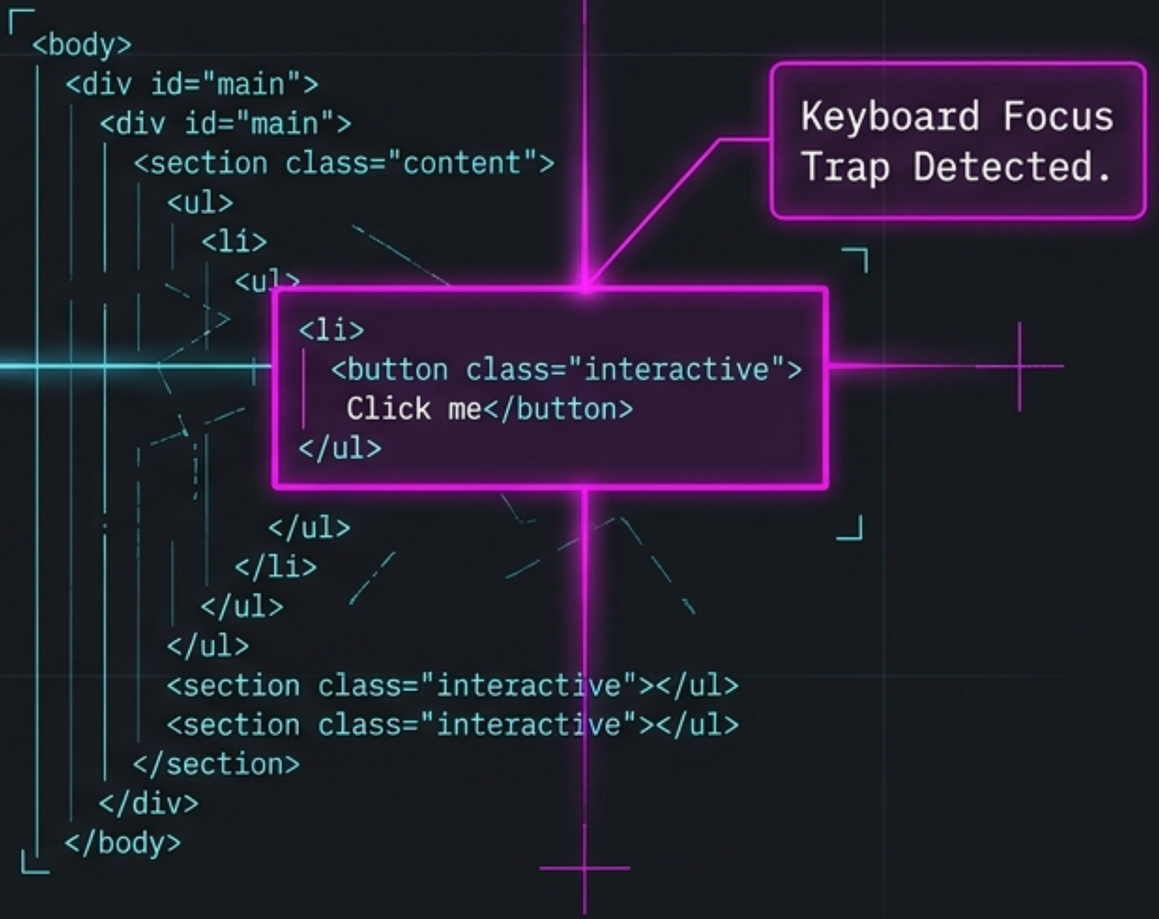
Building on S10E06, we now transition from the granular authoring of accessible content, images, and media to the rigorous verification of entire end-to-end user journeys.

Digital Accessibility: Testing, Auditing, and User Research

S10E07 — Moving beyond vanity scores to verify end-to-end accessible journeys.



Automated Lighthouse Score

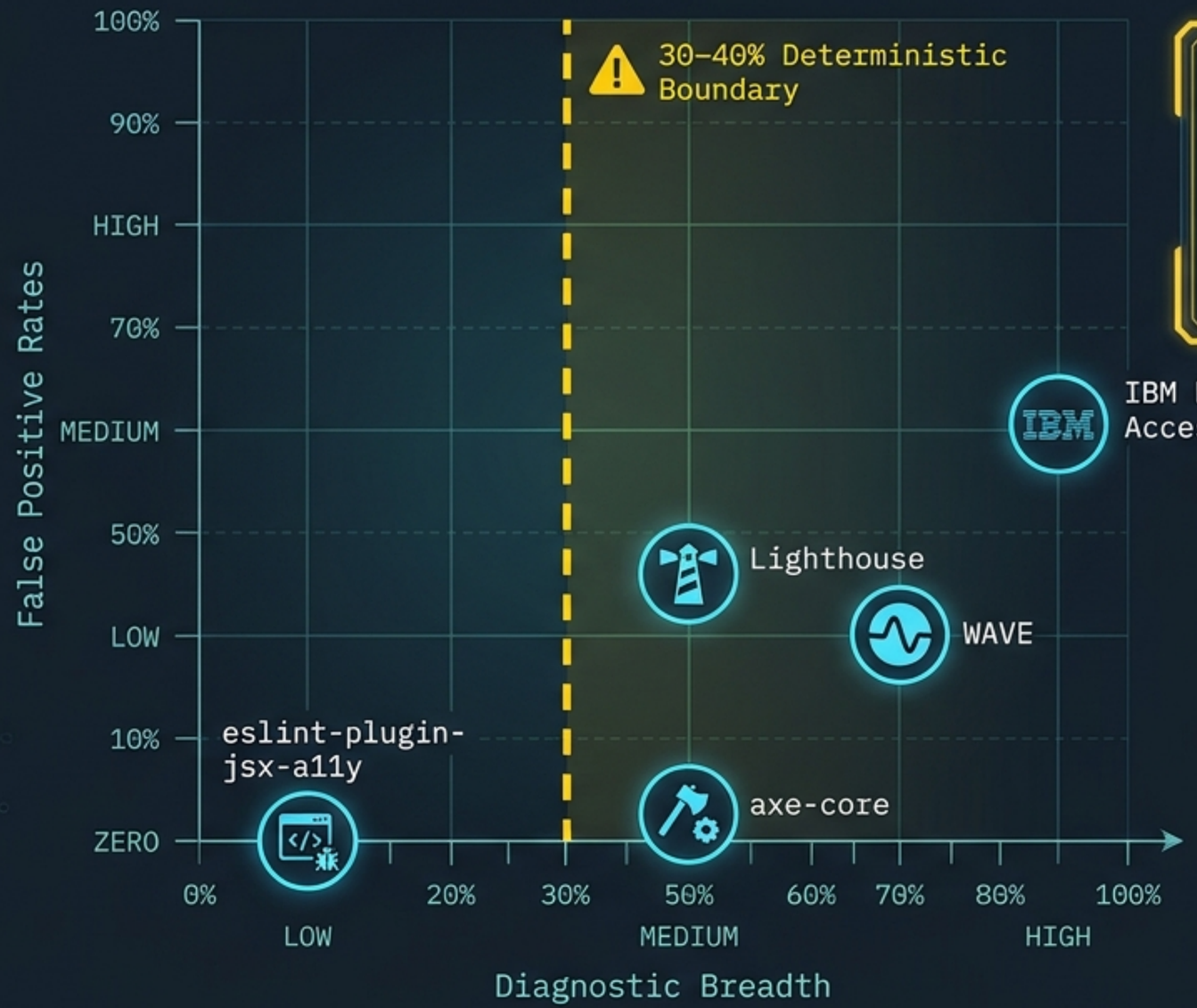


Gemini Notebook

1. The Automation Boundary: What Tools Actually Catch

The 30–40% Rule:
Even robust engines like axe-core deterministically catch only 30–40% of WCAG violations automatically.

The Strength:
These tools excel at deterministic DOM and contrast rules, returning zero false positives for missing ARIA attributes or syntax errors.



The Incomplete Flag:
Automation relies heavily on 'needsReview' and manual flags—warnings that build pipelines often ignore but are critical for compliance.

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The “Least-Accessible Webpage” Reality Check



Semantics: Structural pass for an alt attribute that contains useless filename strings (img_8842.jpg).

Layout: Sticky-header occlusion blocking focus visibility, and a confusing layout misallgned with the logical DOM reading order.

Interaction: JavaScript carousel functioning as a gesture-only widget, creating a complete keyboard trap.

The Metric: In GDS testing, 42 out of 143 deliberate accessibility barriers (29%) were completely missed by all automated tools tested.

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2. The Repeatable 15-Minute Pre-PR Manual Pass

Routine Phase 1 — The Mouse-Unplugged Traversal



Visible Focus: Verify distinct, unbroken focus rings (`:focus-visible`) on every interactive element.



Logical Traversal: Ensure Tab ordering strictly follows the visual top-to-bottom, left-to-right flow without skipping sections.

Widget Interaction: Test modal/dropdown dismissal using Escape and verify custom widget widget (tabs, sliders) navigation using Arrow keys.

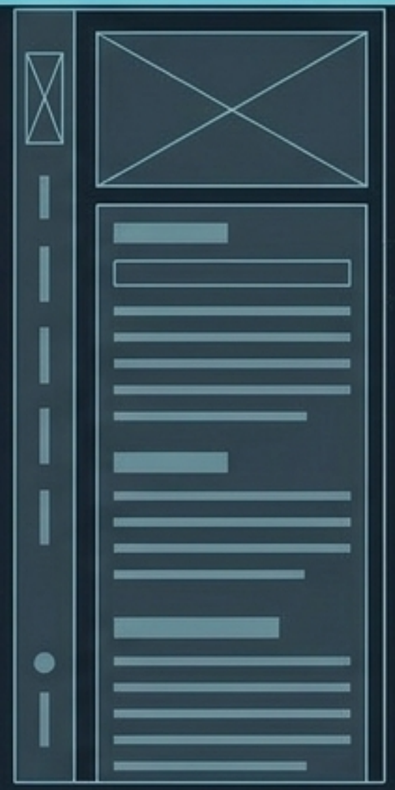
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Routine Phase 2 – Reflow, Zoom & Text Spacing

Desktop Base (1280px)



400% Zoom / Spacing Overrides



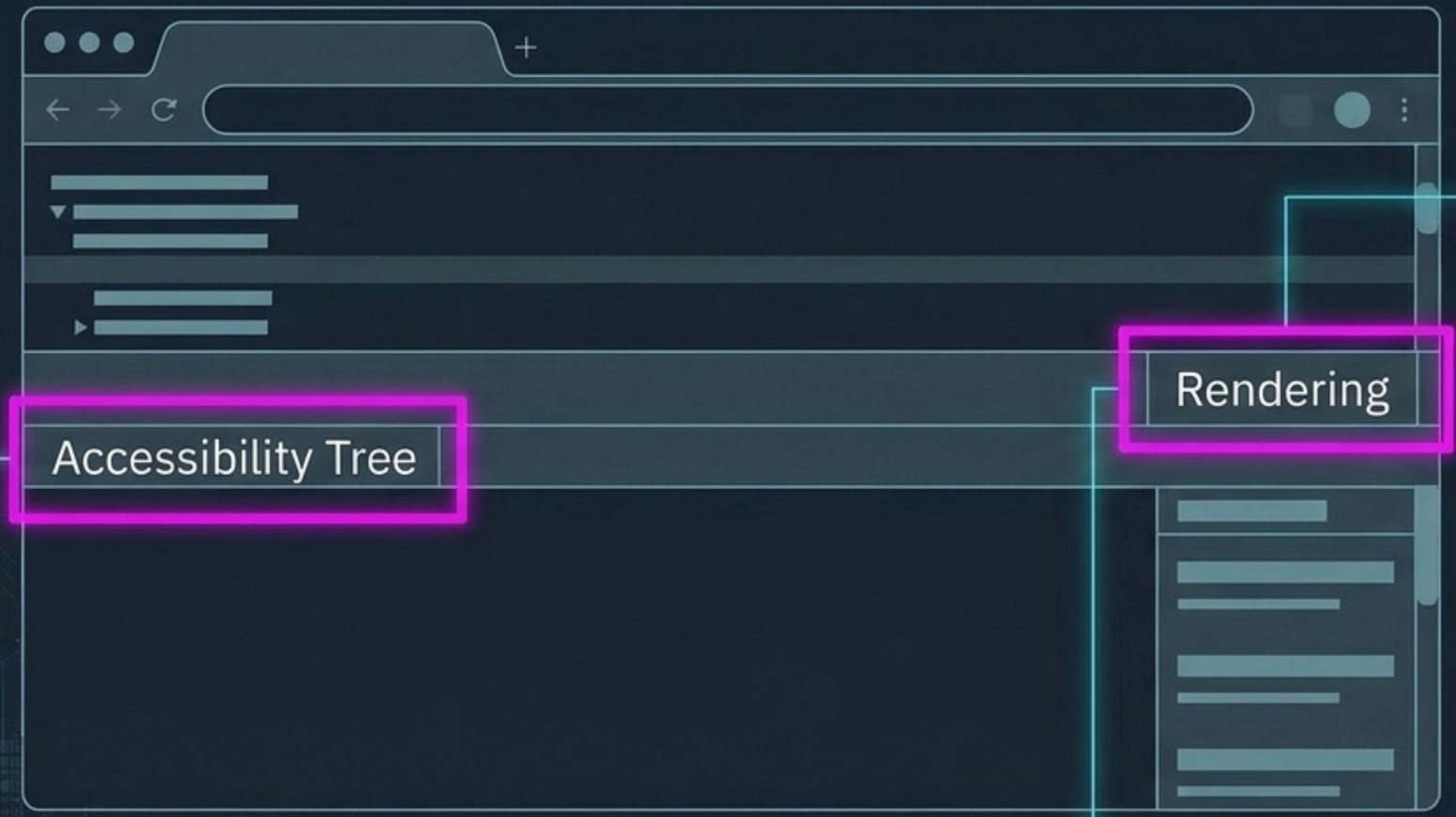
Reflow (WCAG 1.4.10): Render at 1280px resolution and scale to 400% zoom (320 CSS px mobile viewport width). Verify zero horizontal scrolling is required.

Text Resize: Verify usability at 200% base text zoom.

Spacing Override (WCAG 1.4.12): Apply bookmarklet overrides to force: 1.5 line-height, 0.12em tracking, 0.16em word spacing, and 2em paragraph margins. Check for clipped containers.

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Routine Phase 3 – Chrome DevTools & Contrast Themes



Rendering Emulations: Force CSS `prefers-reduced-motion` and `prefers-contrast` to reveal state-based flaws.

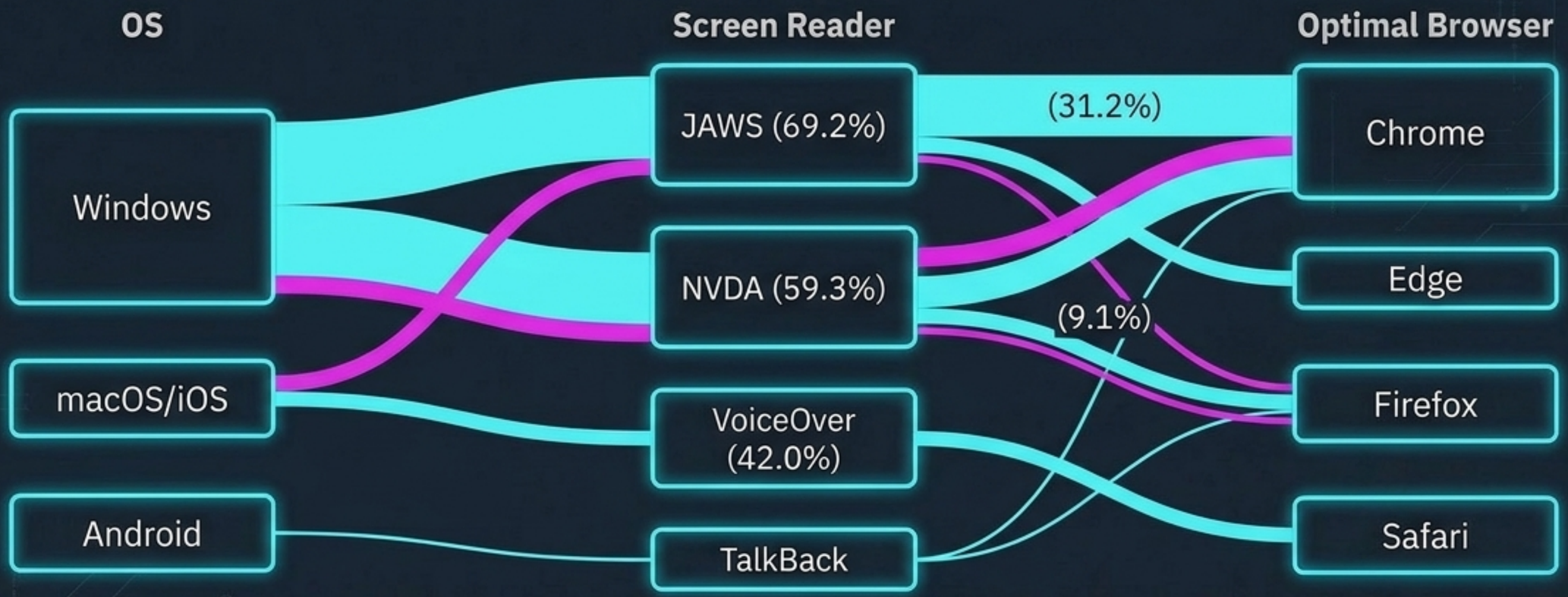
The Accessibility Tree: Inspect the specific hierarchy constructed for screen readers. Verify that ARIA roles and computed names map correctly, ignoring the visual DOM.

Forced-Colors Verification: Emulate Windows active Forced-Colors Themes (e.g., Night Sky/Desert) to ensure SVGs, focus rings, and custom borders do not vanish when system backgrounds change.

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3. Practical Screen-Reader Smoke Testing

The Matched Browser Pairings (WebAIM Survey #11 Data)

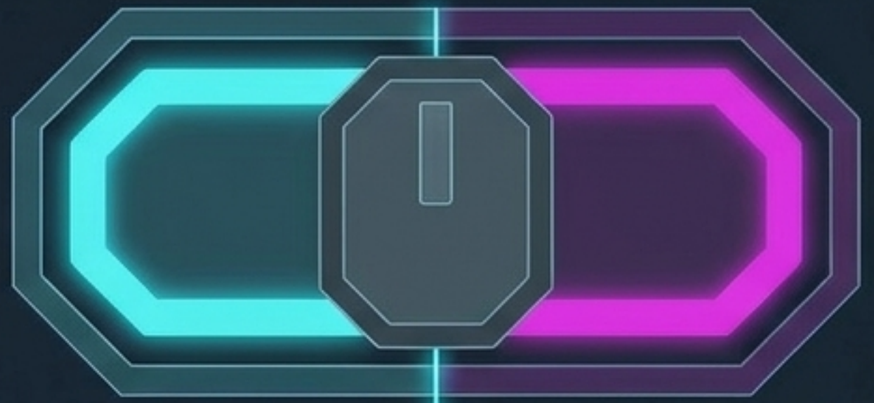


Diagnostic Rule: Never test indiscriminately. Always test using matched pairings engineered for accurate web API interpretation.

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Inspection Mechanics – Browse vs. Focus Modes

Browse Mode
(Reading)



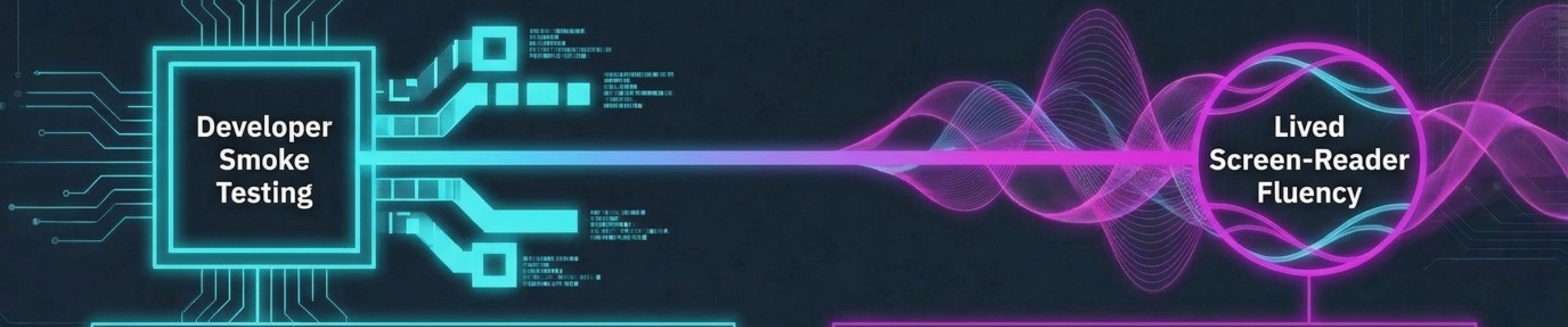
Focus / Forms Mode
(Interacting)

- The screen reader intercepts and hijacks keystrokes.
- Arrow keys read text node by node.
- Developers must utilize tools like the VoiceOver Web Rotor or NVDA Elements List (NVDA+F7) to navigate by headings, landmarks, and links.

- The screen reader passes keystrokes directly to the browser.
- Essential for testing complex ARIA widgets and forms.
- Ensures standard keyboard event listeners trigger correctly within interactive components.

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The Humility Boundary



Mechanical Verification: Verifies the technical integrity of the markup—names, roles, states, and values.

Confirms the data is structurally available.

Native Fluency: Daily users navigate at 300+ WPM using highly customized setups.

Developer tests do not replicate the cognitive load, ear-training, or structural navigation strategies of a native user.

The Rule: Passing a mechanical smoke test proves compliance; it does not guarantee genuine usability.

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4. 5-Modality Broken → Fixed Audit Walkthrough

Dissecting a “100%-Lighthouse” Build (Visual & Keyboard)

Visual Break (Windows Forced-Colors)



Boundary badges disappeared because they relied on CSS background-color.

Visual Fix



Replaced background colors with semantic, transparent CSS borders.

Keyboard Break



Focus leaked through a modal backdrop into a hidden background navigation drawer.

Keyboard Fix



Applied `aria-hidden='true'` and `inert` to the background DOM wrapper to trap focus.

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Dissecting the Build (Verbatim Screen Reader Speech)

```
[BROKEN RAW OUTPUT]
img_8842.jpg, graphic. Edit text, blank. Button.
```

Result: The user has no context of the image, the purpose of the input, or the action of the button.

```
[FIXED SEMANTIC OUTPUT]
Pathway Certificate Preview for Cohort Alpha, graphic. Learner
Email, required, invalid entry, Enter a valid institutional email
address, edit text. Approve Enrollment, button.
```

Result: The DOM now provides clear name, role, state, and explicit error validations.

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Dissecting the Build (Zoom & Mobile/Switch)

Zoom Break



[ZOOM BREAK & FIX]

Zoom Break: At 400% browser zoom, a fixed-position sticky toolbar consumed 65% of the viewport height.

Fix: Converted `position: fixed` to `position: relative` via media queries.

Mobile/Switch Break



[MOBILE/SWITCH BREAK & FIX]

Mobile/Switch Break (WCAG 2.5.7): Custom drag-and-drop pathing rendered the widget unusable for Switch/Voice users.

Fix: Built a single-tap alternative (click to select, click to drop).

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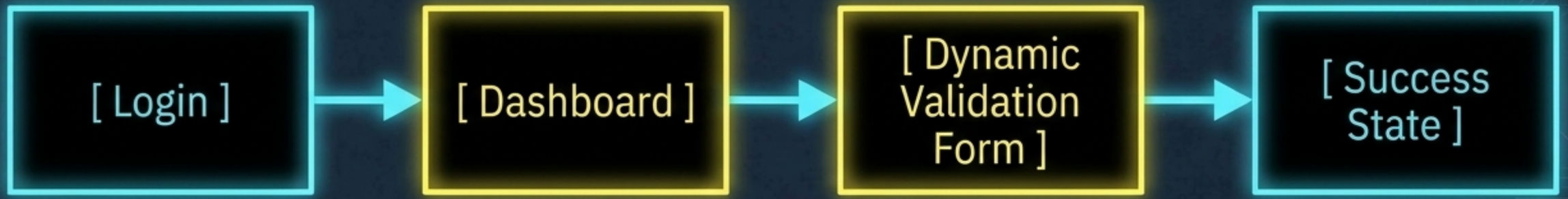
5. Structured Conformance Sampling

W3C's 5-Step Evaluation Methodology (WCAG-EM)



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Moving Beyond Static Marketing Pages (ACT Rules)



Process Sampling (WCAG-EM Step 3.3): Audits fail when they cherry-pick static sitemap pages. You must sample complete task processes, dynamic state changes, and error validation flows.

Dynamic States: Modals, expandable accordions, and asynchronous DOM injections are where accessibility usually breaks down.

ACT Rules: Leverage W3C Accessibility Conformance Testing (ACT) Rules to standardize the interpretation of WCAG criteria across dynamic web applications, removing subjective guesswork.

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6. Ethical, Paid Usability Research

Recruiting & Accessible Operations



Broad Recruitment

Source actively across diverse assistive technology profiles: screen-reader users, low-vision magnification users, voice/switch operators, d/Deaf, and neurodivergent individuals.



BYO AT (Bring Your Own Setup)

Allow users to test on their own configured devices and browsers. Forcing users onto sterile lab devices creates false friction and invalidates research data.



Buffer Time & Accessible Logistics

Schedule significantly longer sessions to avoid fatigue. Ensure consent forms and logistical emails are inherently accessible to screen readers before the session begins.

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7. Ethical Frameworks & Fair Market Compensation

Recruiting & Accessible Operations



Specialized Expertise

Operating assistive technology at a high level is a highly specialized skill. Disabled lived experience must be treated as professional consulting.

Fair Compensation

Pay participants at fair market professional rates. Do not rely on minimum-wage retail gift cards to extract accessibility data.

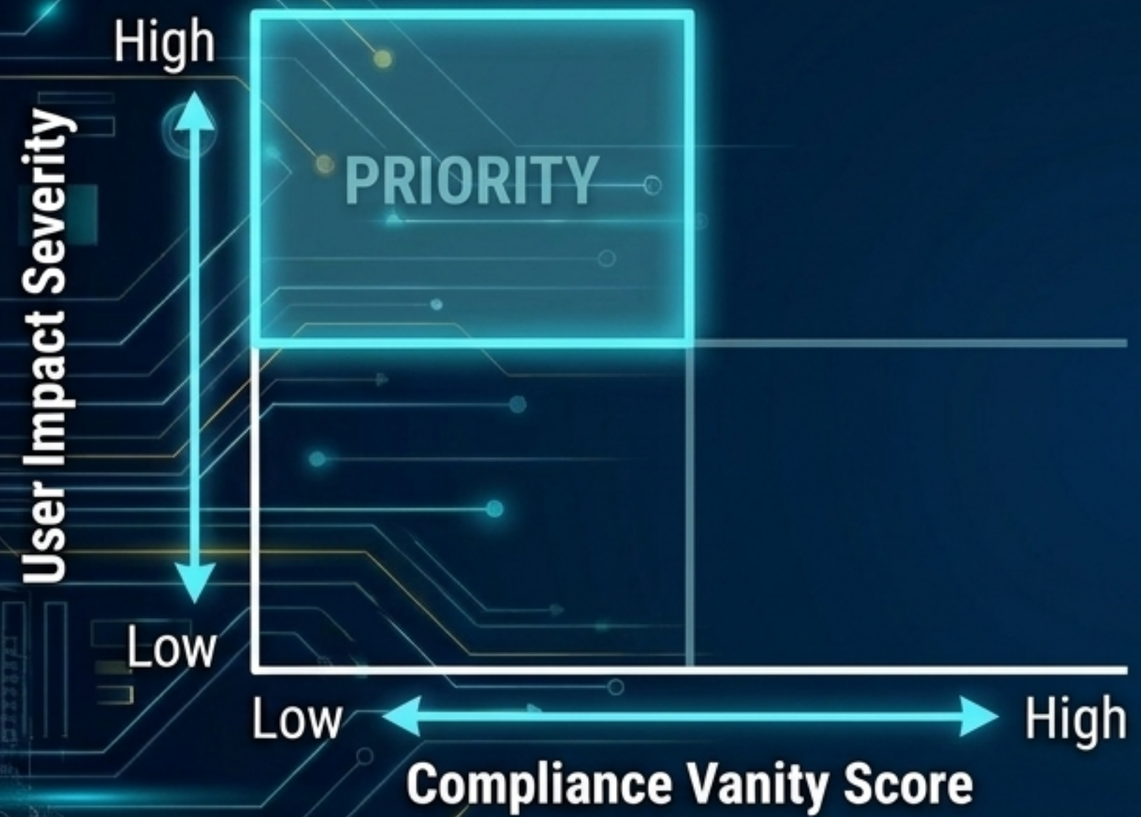
Proactive Accommodations

Eliminate logistical friction. Offer remote testing defaults, real-time captioning, accessible transit, and image-described wayfinding.

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7. The Impact-First Triage Matrix

Recruiting & Accessible Operations



DEFINITIONS

- **Blocker:** User is technically prevented from completing a core task (e.g., unlabelled checkout button, keyboard trap). Fix immediately.
- **Critical**: Task is technically possible but highly degraded, frustrating, or disorienting.
- **Degraded**: An annoyance that requires the user to invent workarounds to proceed.
- **Minor**: Technical WCAG code failure with negligible impact on actual lived experience.

The Triage Insight: Always prioritize fixing a single Blocker over fixing 50 Minor compliance flags that merely boost an automated vanity score.

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Hands-On Exercise & Next Up

The Exercise:

```
/* -
Review the 6-bug '100%-Lighthouse' audit
and the 5-participant research brief.

Draft an automated @axe-core/playwright
script utilizing wcag22aa tags to catch
deterministic DOM failures.

Draft an Impact-First triage report for
the remaining human-centric blockers.
```

Next Up: S10E08

Building and Maintaining an Accessible Product

Continuous Integration (CI)
Governance Policies | Scale

Closing Thesis: Automated scripts (axe-core) and human empathy are not competing methodologies—they are two interlocking halves of a mature, sustainable CI pipeline.

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