HCI Modernization Kit — Windows 11 + KDE Plasma + GNOME (2025 posture)

Drop-in replacement for Sections 1–3, updated metrics, and cross-desktop test templates.

# Section 1 — Internationalization & System Integration (2025, Cross-Desktop)

## 1(a) Language, Encoding, Layout

* Encoding: UTF‑8 end-to-end (storage, IPC, network). Use ICU/CLDR for collation, casing, transliteration.
* BiDi & Complex Text: Enable Unicode BiDi and shaping (Arabic, Hebrew, Indic). Verify mixed-direction strings in fields, lists, dialogs.
* Input Methods: Test IMEs (CJK), dead keys, compose sequences, emoji. Ensure fields handle surrogate pairs and variation selectors.
* Plural/Format: Use message catalogs with plural rules (CLDR). Avoid string concatenation; use parameterized messages.

## 1(b) Theming, Colors, and Modes

* Dark/Light & High Contrast: Auto-follow OS theme; provide explicit override. Respect forced-colors/high-contrast modes.
* Accent & Transparency: On Windows 11, adopt Fluent tokens; on KDE/GNOME, inherit system palette without hard-coding.
* Iconography: Provide vector assets (SVG/ICO) and symbolic icons where supported (GNOME).

## 1(c) Layout, Scaling, and Input

* HiDPI & Mixed-DPI: Verify 100–300% scale; handle per-monitor DPI awareness on Win11 and fractional scaling on Wayland.
* Touch/Trackpad: Support touch targets ≥ 40 px and common gestures (two-finger scroll/zoom where applicable).
* Keyboard Access: Full accelerator coverage; predictable Tab order; access keys surfaced in menus/dialogs.
* Assistive Tech: Screen readers (Narrator/NVDA on Win11; Orca on GNOME), AT‑SPI on Linux; live region updates and focus visibility.

## 1(d) Files, Portals, and Sandboxing

* Windows: Prefer modern file pickers; support MSIX/AppContainer storage locations.
* Linux: Use xdg-desktop-portal for file open/save, sandbox breaks, and default apps; verify on Flatpak/Snap/AppImage where relevant.

## 1(e) Notifications & System Services

* Notifications: Win11 Action Center; GNOME/KDE notifications. Provide action buttons and respect Do Not Disturb.
* Power & Background: Respect battery saver modes; pause heavy work on low-power signals; expose progress to OS if supported.

# Section 2 — Metrics & Decision Framework (2025)

## 2(a) Core KPIs

* ΔT (T1–T3) and Error Decay (e1/e3) across input modalities (mouse, touch, keyboard).
* Mode Robustness: success rate parity between Light vs Dark; 100% vs 200% scale; Wayland vs Win11 multi‑DPI.
* A11y Success: task success with screen reader enabled; focus visibility score; shortcut discoverability.
* Stability UX: zero-crash tolerance in file dialogs/portals; resilience to permission denials.

## 2(b) Modern KLM Operator Times (reference)

Use KLM for baseline estimates; adjust for touch. Reference operators (desktop, mouse/keyboard): K=0.18s, P=1.0s, B=0.10s, H=0.35s, M=1.1s. For touch: Tap=0.16s, Point(move)=0.9s (device variance expected).

## 2(c) Override Rule

Prefer variants with robust parity across themes/scales/compositors even if slightly slower on first-use. Log explicit trade-offs and mitigation if a faster design degrades under HI‑DPI or dark mode.

# Section 3 — Batch File Converter UX (Cross-Desktop)

* Single-window design remains optimal. Respect platform controls: WinUI/Fluent (Windows), Qt/GTK patterns (Linux).
* File Access: Always route open/save via native pickers/portals; show origin and destination clearly; support drag‑drop between sandboxes where permitted.
* Theme/Scale: Live-respond to theme/scale changes without restart; ensure list/table rows reflow cleanly.
* Power/Background: Long conversions run as cancellable jobs with progress in system tray/notification area; persist state on app restarts.

# Appendix A — KLM Examples (Desktop vs Touch)

Example: Rename file (desktop): P → B (select) → F2 (K) → type (K×n) → Enter (K). Touch variant uses Tap and virtual keyboard keystrokes.

# Appendix B — Methods & Metrics (2025 Playbook)

* Participants: 10–16; include screen-reader users and non‑Latin first-language users.
* Environments: Win11 (light/dark; 100/200%); GNOME & KDE on Wayland (fractional scaling 125/150/200%).
* Instrumentation: event logs + screen capture; a11y tree snapshots; theme/scale toggles mid‑task.

# Appendix C — A/B Results Template

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Task | Design | Device | Theme | Scale | Compositor/OS | T1 (s) | T3 (s) | ΔT | Errors S1/S2 | Notes |
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# Appendix D — Risk Register (Modern)

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| --- | --- | --- | --- | --- | --- |
| Risk ID | Failure Mode | Condition (Theme/Scale/Portal) | Mitigation | Residual Risk | Owner/Status |
| R-01 |  |  |  |  |  |
| R-02 |  |  |  |  |  |
| R-03 |  |  |  |  |  |
| R-04 |  |  |  |  |  |
| R-05 |  |  |  |  |  |
| R-06 |  |  |  |  |  |
| R-07 |  |  |  |  |  |
| R-08 |  |  |  |  |  |
| R-09 |  |  |  |  |  |
| R-10 |  |  |  |  |  |

# Appendix E — Study Notes (Cross-Desktop)

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| --- | --- | --- | --- | --- | --- | --- | --- |
| Participant | OS/Desktop | Theme/Scale | Input (Mouse/Touch/Kbd) | Events | Observations | Follow-ups | Timestamp |
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