**✅ Use Case 1: Basic App-Only Sound Design Workflow**

**Title:**

**"One-Shot Audio Processing with Export"**

**User Story (Simple):**

*“I want to load a WAV file, apply some sound effects using the visual DSP tool stack, preview the results, and export the processed version as a new WAV.”*

**Flow Steps:**

**1. Launch App**

* User opens the DSP Toolkit App.
* UI loads: Toolbox on left, signal stack grid center, controls on bottom, file menu at top.

**2. Load Input File**

* User clicks “Load Audio” or drag-and-drops a .wav into the interface.
* The waveform appears in the timeline/playback area.
* Playback controls (play/pause/stop) become active.

**3. Build Effect Chain**

* User drags DSP tools from the toolbox into the signal stack grid.
* User clicks each module to tweak parameters via the control panel.
* Modules can be reordered or removed as desired.

**4. Audition the Effect Chain**

* User hits Play.
* The loaded audio file plays through the DSP stack.
* Output can be monitored in real time via headphones or speakers.
* Visual tools (e.g., spectrum analyzer, waveform display) update live.

**5. Export Result**

* User clicks “Export Processed Audio.”
* Dialog prompts for filename and output location.
* The app renders the WAV using the currently active signal chain and saves it to disk.

**System Responsibilities:**

| **Step** | **System Action** |
| --- | --- |
| 2 | Load file, extract audio buffer, initialize transport |
| 3 | Instantiate DSP modules, build processor graph |
| 4 | Route playback engine through graph, update analyzers |
| 5 | Render audio buffer offline through graph, write to new WAV file |

**Assumptions:**

* All DSP modules are **real-time safe** and also support **offline render**.
* Config file export is **optional** in this use case (user just wants to render).
* Export can be 16-bit or 24-bit WAV (with settings UI TBD).

**Visual Indicators & UX Notes:**

* Timeline view with waveform + playhead
* "Stack" view shows active modules (in use-order)
* Audio meters + analyzer give visual confirmation of changes
* Progress bar during export (especially for longer files)

**✅ Outcome:**

* User has processed a sound using a visual toolchain.
* No plugin or DAW needed.
* A new WAV file is created with all effects applied—ready for sampling, layering, or importing into a DAW.