Audio Pops and Clicks

Pops and clicks are unwanted audio artifacts caused by the powering up and down of components within the audio subsystem. This is noticeable on PCs when an audio module is either loaded or unloaded (at module load time the sound card is powered up and causes a popping noise on the speakers).

Pops and clicks can be more frequent on portable systems with DAPM. This is because the components within the subsystem are being dynamically powered depending on the audio usage and this can subsequently cause a small pop or click every time a component power state is changed.

Minimising Playback Pops and Clicks

Playback pops in portable audio subsystems cannot be completely eliminated currently, however future audio codec hardware will have better pop and click suppression. Pops can be reduced within playback by powering the audio components in a specific order. This order is different for startup and shutdown and follows some basic rules:-

```
Startup Order :- DAC --> Mixers --> Output PGA --> Digital Unmute

Shutdown Order :- Digital Mute --> Output PGA --> Mixers --> DAC
```

This assumes that the codec PCM output path from the DAC is via a mixer and then a PGA (programmable gain amplifier) before being output to the speakers.

Minimising Capture Pops and Clicks

Capture artifacts are somewhat easier to get rid as we can delay activating the ADC until all the pops have occurred. This follows similar power rules to playback in that components are powered in a sequence depending upon stream startup or shutdown.

```
Startup Order - Input PGA --> Mixers --> ADC

Shutdown Order - ADC --> Mixers --> Input PGA
```

Zipper Noise

An unwanted zipper noise can occur within the audio playback or capture stream when a volume control is changed near its maximum gain value. The zipper noise is heard when the gain increase or decrease changes the mean audio signal amplitude too quickly. It can be minimised by enabling the zero cross setting for each volume control. The ZC forces the gain change to occur when the signal crosses the zero amplitude line.