Intro to Digital

What is Aliasing? An Artifact!

It's easiest to describe aliasing in terms of a visual sampling system we all know and love—movies. If you've ever watched a western and seen the wheel of a rolling wagon seem to be going backwards, you've witnessed a kind of aliasing. The movie's frame rate isn't fast enough to properly show the wheel spinning, and it looks weird!

Aliasing happens in digital audio too. Here's an explanation:

Remember that the Nyquist Theorem says that our sampling rate has to be at least 2x our highest audio frequency. Aliasing is what happens when our sampling rate is LESS than 2x our highest audio frequency.

If your sampling rate is 32K, what is your highest possible audio frequency? It would be 16K. Let's call this the Nyquist frequency. OK, what if you try to reproduce an audio frequency of 18K but your Nyquist frequency is only 16K? What will happen?

Anything higher than 16K will be mirrored down by the same amount as it would have been above the Nyquist frequency. If you try to reproduce 18K, but your Nyquist is only 16K, then that's a difference of 2K.

$$18K - 16K = 2K$$

Since the system can't handle anything higher than 16K, it'll flip 18K sounds down BENEATH 16K, by 2K (since that was the difference before).

$$16K - 2K = 14K$$

In this case, 18K will be turned into 14K. You can hear that! It'll sound awful.

ALIASING is a mirror image of audio frequencies that are ABOVE the Nyquist frequency. Aliasing sounds like a metallic swirling in the sound.

Aliasing is one of several ARTIFACTS that are common in digital audio. Artifacts are unwanted 'extra' sounds that occur because of problems in the system. Pops and scratches are analog artifacts the come from old vinyl LPs. Buzz and hum are analog artifacts that come from electricity.

Digital artifacts include Aliasing, Quantization error, and Jitter.