

# Let's Get Digital

Bjorn Roche  
XO Audio, LLC

# Outline

- Basic Kinds of Audio Processing
- Some differences between analog and digital
  - Is one better than the other?
- How to use the basic kinds of processing (EQ, Compression, Reverb)
- How to combine the basic processing in a mix

# Analog Lives!

- Analog tape continued to be used for years, even when computers were less expensive and more flexible.
- Most projects in the late 90s were using both tape and computers.
- Today, many engineers use analog gear, analog tape simulators, and even analog tape. Many consumers still love vinyl, although commercially, it's value is probably exaggerated.

# Common Audio Processing

- Gain
- EQ
- Reverb
- Compression/Limiters/Expanders/Gate
- Delay/Echo
- Distortion/Waveshaping
- Flanger/Chorus/Phaser
- Pitch Shifting/Time Stretching

# Why Choose Analog or Digital

- Audio starts and ends as analog, so we always need some analog processing (even if it's just gain).
- We can do just about everything else digitally, and a lot of what we need to do in analog. Why choose one or the other?

# Why do we like analog?

- Real sounds distort when they reflect off of surfaces, interact with elements in the environment -- even the air and our ears create distortion.
- This distortion is “harmonic.”
  - Harmonic distortion is musical.
  - Harmonic distortion tends to enhance the natural musical qualities of sound.

# Why do we like analog?

- Analog electronics, even badly designed analog electronics, usually exhibits the same kind of distortions: harmonic distortion.
- Harmonic distortion has become a natural and important part of how we hear modern genres of music, especially rock.

# Digital

- Digital distortion is different.
- Without careful treatment it's
  - Non-harmonic (mostly inter-modular)
    - Unnatural
    - Harsh



# Digital

- ...but properly designed (and usually expensive) digital equipment doesn't have these properties.

# Digital

- Digital can be abused
- Since louder sounds better, engineers and producers (mostly under pressure from labels) have used modern technology to make recordings as loud as possible.
- Digital technology excels at this.
- This has resulted in the so-called “Loudness Wars”

# Summary

- The qualities we like about analog gear is not that it has less distortion, but that the distortion it has is something we like.
- Digital, when badly designed (or abused), sounds harsh, cold and unnatural. When correctly designed and used, sounds like nothing.

# What's the Most Important Gear?

- Most engineers find that these effects are their bread and butter:
  - EQ
  - Compression
  - Reverb

# EQ

- EQ is one of the most fundamental tools of combining sounds.
- It can be used as a special effect, such as creating the sound of a telephone.
- We will focus on it's use in crafting a mix.

# EQ

- When two instruments occupy part of the frequency spectrum, they may compete with each other for the listener's attention.
- This results in muddiness, and a poor mix.
- Assuming the problem is not the arrangement, you can help the different instruments “get along” better with EQ.

# EQ

- For example, if two instruments occupy the mid frequencies (like guitar and vocals) take some of the mid frequencies out of the less important instrument to make room for the other.
- Tip: If you err on the side of removing (“cutting”), rather than adding (“boosting”), you will do well.

# EQ

- There are lots of tips and guides to EQ on the interwebs.
- Give little heed to ones that are overly specific (eg. "I add 3dB at 1.5 kHz to my snare drum to make it pop.") because every recording and mix is different. They may prove to be useful starting points, or things to try, but that's it.
- Pay more attention to ones that teach you the concepts and how to translate what you hear into what knobs to tweak.



# EQ

- Digital EQ comes in two flavors: FIR (“Linear Phase”) and IIR (“Minimum Phase”).
- IIR sounds more like analog, is more responsive, and, if designed right, sounds more musical. If designed badly, sounds bad. This is the most common kind by far, and should be your goto EQ.
- FIR, if designed right, can sound very transparent, and can be useful for “surgically” fixing problems. You will probably have to pay extra for this kind, so you will usually know if that’s what you are using.
- People get in fist fights about IIR vs FIR, but they are both useful.

# Compression

- Compression is a tool usually use to smooth out the dynamics of a recording.
- Compression can also bring out quieter details (including mistakes!).
- Compression can change the timber of an instrument.

# Compression

- In a mix, one instrument might get too loud sometimes, and compression can help.
- Prefer volume automation to compression for evening out a performance that sometimes gets too loud and sometimes gets lost in the mix.

# Compression

- Almost every instrument, mix and submix in a pop song is a candidate for compression.
- It's not uncommon for a vocal track to be compressed 6 times: once during tracking, three times during the mix session (once on the track, once on the submix, and once on the mixbus), and two or three times in mastering.

# Compressors

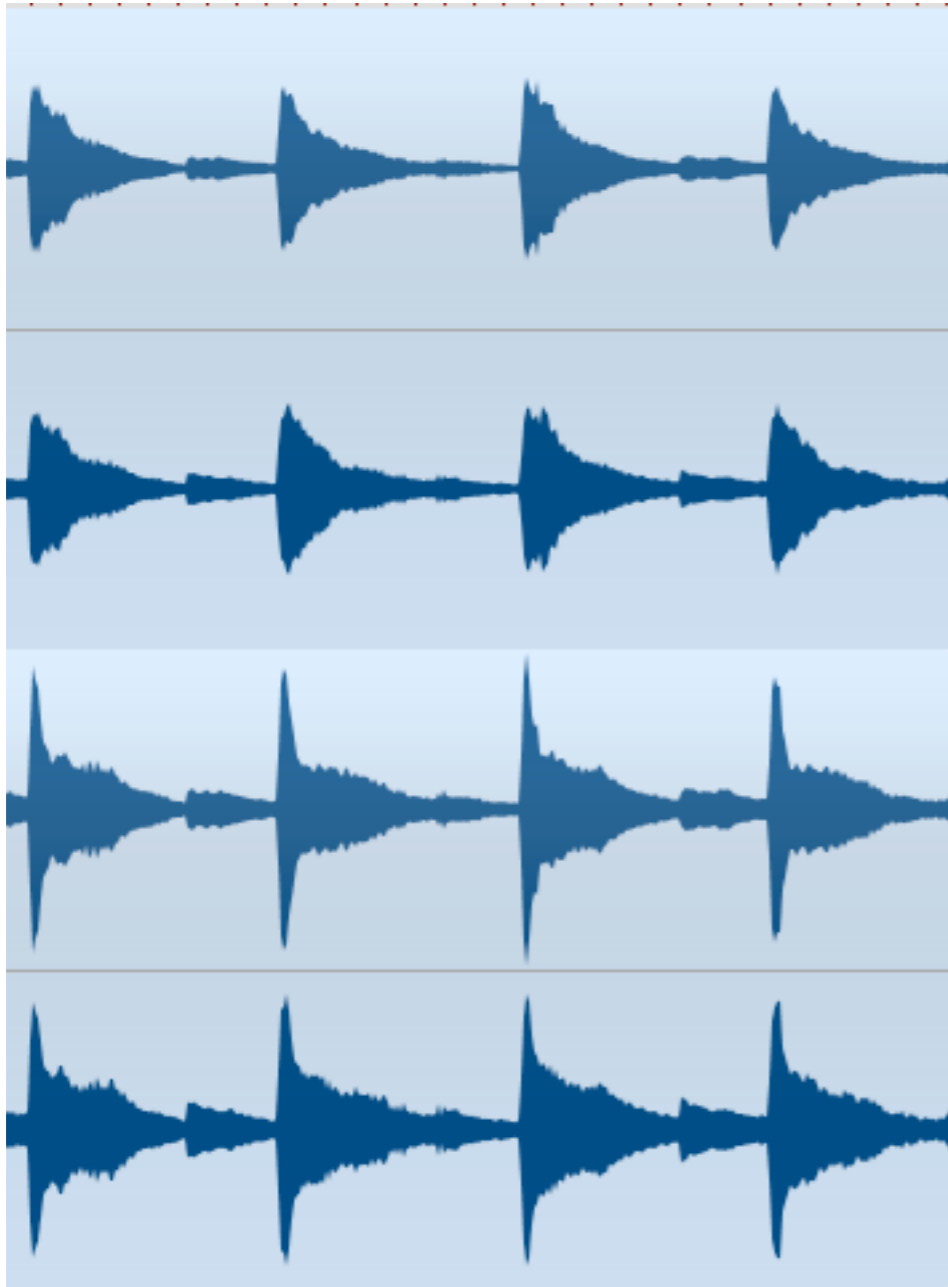
- Different compressors sound different and so might be useful in different circumstances.
- It is helpful to have a variety of compressors at your disposal, but, in my opinion, too many is just confusing.
- One of the main defining characteristics of a compressor is its attack. You may want to find a compressor with different kinds of attacks (not just different attack times).

# Compression

- Compression takes lots of practice. Different compressor types and settings are used on different instruments.
- Compression is associated with reducing dynamics, but it doesn't always serve that purpose. eg. you can use a slow attack setting on a compressor to increase the dynamics of a percussion track. This can really make a percussion track snap!

# Compression

(Slow Attack!)



Original

Compressed (with slow attack)

(remember this is not a typical use for compression, but it is very useful!)

# Limiting

- Extreme compressors are called limiters.
- Limiters are useful for preventing signal from going out of range and distorting.
- Limiters can also be designed to almost completely eliminate dynamics.
- Average volumes can be increased which, at a given volume setting, makes the music sound louder.
- Digital limiters are the primary technology used to make new releases louder and louder.



# Reverb

- Reverb gives us context. It puts the music in a place. Do the vocals sound up close and personal, or a million miles away? The answer is in the reverb! (and, of course, the performance)

# Reverb

- Reverb is the sugar on your mix.
- But reverb is also a drug: don't get addicted!
- If you use too much, you will lose the savory quality of your mix.

# Reverb

- Reverb tends to wash out transients, reducing the impact.
- Reverb tends to make music more muddy, so you lose detail and clarity. Why? Each sound now has to compete with old echoed copies of itself!

# Reverb

- In my personal experience, a top notch reverb sounds amazing by itself, but you may not hear that difference in a dense mix.
- However, for a sparse mix, you may benefit from a top notch reverb.
- For many projects, you can live with an inexpensive reverb.

# Reverb

- From least to most realistic sounding:
  - Spring (Analog)
  - Plate (Analog)
  - Simulated (Digital)
  - Convolution (Digital)

# A Typical (Simple) Mix

