

## Agenda

1. Quick introduction to SOUL
2. Getting your machines setup
3. Let's write a synth
4. Q/A

## What is SOUL?

- SOUL is a new Domain Specific Language (DSL) for writing the real-time parts of an audio algorithm
- The language is designed to be JIT compiled to run on heterogeneous CPUs and DSPs
- SOUL includes a run-time platform to execute the code, both locally and remotely

Get your machines set up for coding

Download tooling from GitHub

<https://github.com/soul-lang/SOUL/releases>

```
$ curl -L https://github.com/soul-lang/SOUL/releases/download/0.9.37/  
binaries-osx-x64.zip --output binaries-osx-x64.zip  
$ unzip binaries-osx-x64.zip  
$ alias soul=$PWD/osx/x64/soul
```

Get your machines set up for coding

## Install/Setup VS Code with SOUL syntax highlighting

- Install VS Code <https://code.visualstudio.com/>
- Install the VS Code extension for SOUL  
(see [SOUL/tools/editors/vs\\_code\\_extension](#))

Follow the examples on soul-dev

The steps can be reached at:

<https://soul.dev/lab?id=MonoSynth-1>

<https://soul.dev/lab?id=MonoSynth-2>

<https://soul.dev/lab?id=MonoSynth-3>

<https://soul.dev/lab?id=MonoSynth-4>

## Let's write a synth!

### 1. Create a new soulpatch

Use the soul command to create a new instrument soulpatch

```
$ soul create MonoSynth --synth --output=MonoSynth
```

### 2. Try playing it

```
$ soul play MonoSynth/MonoSynth.soulpatch
```

Let's write a synth!

## 3. Add a waveshaper

- Waveshapers transform input to output samples using a transfer function

$$y = f(x(t))$$

- We are going to use the function `tanh()`
- We will provide a drive parameter to control the depth of the effect

Let's write a synth!

## 4. Adding the waveshaper to the audio graph

- connections only defined in graphs
- connect inputs to output of the same type
- graphs form directed graphs\*



Let's write a synth!

## 5. Add an envelope

- Let's create an Attack/Release envelope
- Linear Attack
- Exponential Release
- Remove envelope from oscillator
- Connect the envelope after the waveshaper

Let's write a synth!

## 6. Further Enhancements

- Aliasing problems - apply an oversampling factor to the waveshaper
- Zipper noise - add slewRates for stream parameters
- Consider restructuring to create a voice
- Add polyphony
- More controller inputs, velocity, pitch bend etc

Q/A