

## THE TALE OF FAUST AND ZYNTHIAN

*No concerts since September 2020. Since then, red zone, quarantine and so on. Really a lot of time at home. That's how Faust and Zynthian became friends.*

What's Faust? Faust (Functional Audio Stream) is a programming language for sound synthesis and audio processing with a strong focus on the design of synthesizers, instruments, audio effects.

You can find info about Faust here <https://faust.grame.fr/>

I also would suggest a complete online course on it, by Stanford University.

<https://www.kadenze.com/courses/real-time-audio-signal-processing-in-faust/info>

What's Zynthian? Zynthian is a fabulous multitimbral synthesizer, audio and MIDI processor. It sounds great. It is a community-driven project. Free software on Open hardware. It is not available as a finished product. You have to build your own unit, completely configurable and fully hackable. Funny! A few weeks ago I decided to buy a Zynthian. Here : <https://zynthian.org/>

Faust can create almost everything has to do with sound, and allows to put the anything you create into a something: a Bela, a Teensy, an Owl pedal, a mobile phone, a website, anything.

Well, let's go back to my quarantine. After many weeks at home, this is the situation:

I've completed the online course on Faust, which is the only programming language I know, a bit.

I bought a Zynthian, which is the only synth I own.

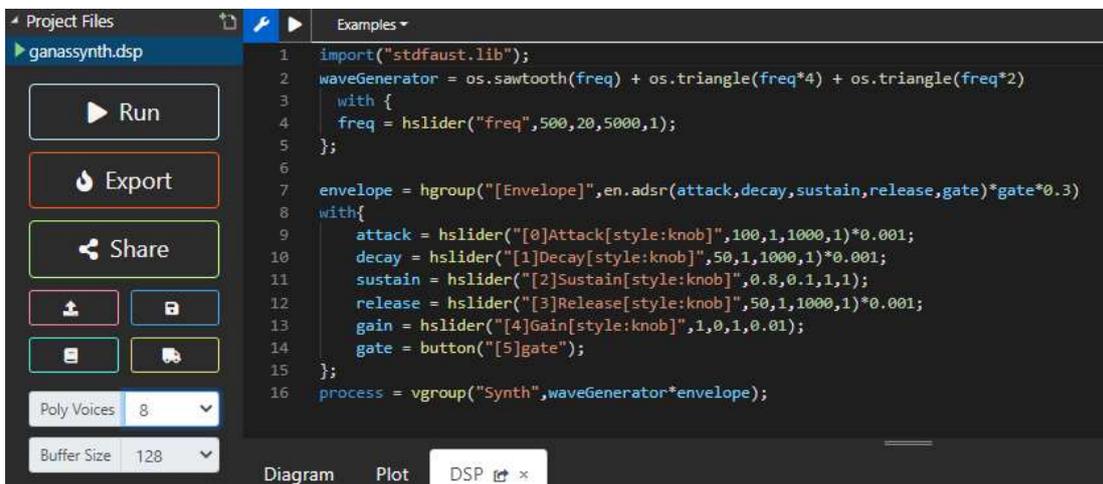
Before buying anything else, I must try to combine these two elements. But....

But Faust doesn't compile for Zynthian. You can export for Linux, lv2 plugins. But it won't work. Zynthian is based on Raspberry, ARM processor. Files and directories you will create on your computer will not appear on Zynthian. Faust online IDE exports to linux but not for ARM processor. Maybe Intel, or only God knows for which processor.

This is the plan, after reading a few threads on discourse.zynthian about this topic: installing Faust in Zynthian, copying into the Zynthian the .dsp file previously coded and saved on my computer, compiling it on Zynthian. So, let's start from the beginning.

<https://faustide.grame.fr/> is the place where your ideas can become concrete, by coding and testing. The IDE comes with a lot of examples you can access to from the menu on left top of the window. On the left, there's a small truck icon. Click on it and, yes, you can export a file (Faust files are .dsp files) to different platforms and architectures. You can generate a QR code for downloading the .apk file, as well, if you have created a mobile app, for example, and want to share it.

Well, let's try to go faster. Less 'quarantine novel' and more 'pre-covid tutorial'.



```
1 import("stdfaust.lib");
2 waveGenerator = os.sawtooth(freq) + os.triangle(freq*4) + os.triangle(freq*2)
3   with {
4     freq = hslider("freq",500,20,5000,1);
5   };
6
7 envelope = hgroup("[Envelope]",en.adsr(attack,decay,sustain,release,gate)*gate*0.3)
8 with{
9   attack = hslider("[0]Attack[style:knob]",100,1,1000,1)*0.001;
10  decay = hslider("[1]Decay[style:knob]",50,1,1000,1)*0.001;
11  sustain = hslider("[2]Sustain[style:knob]",0.8,0.1,1,1);
12  release = hslider("[3]Release[style:knob]",50,1,1000,1)*0.001;
13  gain = hslider("[4]Gain[style:knob]",1,0,1,0.01);
14  gate = button("[5]gate");
15 };
16 process = vgroup("Synth",waveGenerator*envelope);
```

The screenshot shows the Faust IDE interface. On the left, there is a 'Project Files' panel with a file named 'ganassynth.dsp'. Below it are buttons for 'Run', 'Export', and 'Share', along with a 'Poly Voices' slider set to 8 and a 'Buffer Size' slider set to 128. The main area is a code editor showing the DSP code for a synthesizer. The code includes imports, signal generation, envelope processing, and a final process block. The bottom of the window has tabs for 'Diagram', 'Plot', and 'DSP'.

On <https://faustide.grame.fr/> create your code.

This is for example a very very simple synth. You can easily recognize the ADSR part in it. If you don't want to start studying Faust now, copy this code into the IDE. My file is ganassynth.dsp as you can see on the top left.

Once you have coded the file online, on the left side of the page, set Poly Voices to an integer value greater than 1. Let's say 8. And double check that on the right side of the page MIDI Input is set to your keyboard, or anything else I cannot imagine. But don't set it to None. You need a MIDI input. Be careful. These are very important details. Uhm...

Honestly, I am not sure they are, but I like giving unsolicited advices. Makes me feel important.

To see if everything is ok, click on Run, play something on your keyboard. Close your eyes and enjoy the sound. Save and download the zipped file.

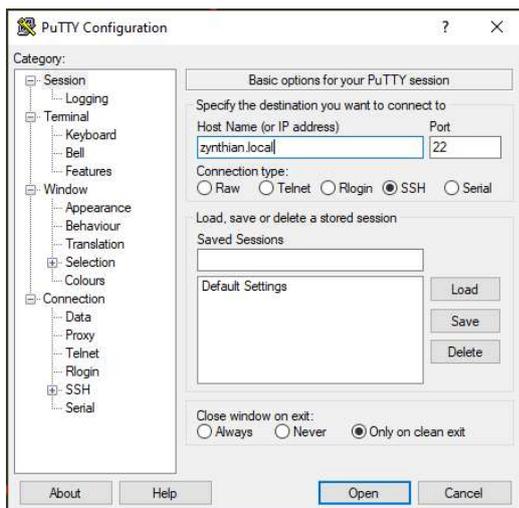
Extract the .dsp file from the zip archive on your computer, upload the dsp file to github.com.

The github part is quite intuitive, almost like working with every other Drive or Cloud. So, sign in or sign up if you don't own an account on github, create a directory, upload the file, commit changes, check if everything is ok, you're done. Your file is reachable by your Zynthian.

Think that this part could be done in many other ways. Using Filezilla, for example. I prefer github.

Activate wi-fi Hotspot (from the Admin menu) on your Zynthian.

Connect your computer to Zynthian – I mean check for available wi-fi connections and choose 'zynthian'. Password required. If you haven't set it, it is 'raspberrypi'. The same on terminal.



On your computer, if you haven't ever used it before, download PuTTY from [www.putty.org](http://www.putty.org). Set in the form Host name : zynthian.local. Open.

You can do the same on Webconf, connecting via your browser to <http://zynthian.local> and then opening Terminal <http://zynthian.local/zynterm>

The result is the same. But I prefer PuTTY, since on Webconf Terminal I had some scaling issues. Don't know why.

We want to install Faust in Zynthian. Ups! Is your Zynthian connected to the net? Well. Probably no. To me the easiest way is: connecting via USB cable your mobile to USB Zynthian port, and allowing USB Tethering on your mobile. Super easy.

(Whenever you reboot Zynthian, don't forget to reactivate tethering on mobile, and eventually check if wi-fi hotspot is active and your computer is connected to Zynthian)

Now your PC is connected to Zynthian via wi-fi (Zynthian works as an hotspot) and Zynthian is connected to the rest of the world (your mobile tethering).

I have found important info about Faust on ARM Linux on the article by Tatsuya Shiozawa:

'Faust / FaustLive を Raspberry Pi でビルドしてみた'

available here <https://qiita.com/COx2/items/98cc4f94165fac929378>

On PuTTY login as 'root', pwd 'raspberrypi' or the one you have previously set.

Then it's time to work a bit.

```
root@zynthian:~# cd /zynthian
root@zynthian:/zynthian# git clone https://github.com/grame-cncm/faust.git
root@zynthian:/zynthian# cd faust
root@zynthian:/zynthian/faust# git submodule update --init
root@zynthian:/zynthian/faust# sudo apt-get install llvm-dev
root@zynthian:/zynthian/faust# sudo apt-get install libmicrohttpd-dev
root@zynthian:/zynthian/faust# sudo make
```

*this will take a long while  
Time for a coffee break or a bit of Instagram scrolling*

```
root@zynthian:/zynthian/faust# sudo make install
```

About next steps, there are different paths, the most relevant help is on discourse.zynthian forum, on thread 'Faust lv2 plugin' <https://discourse.zynthian.org/t/faust-lv2-plugin/4387>

Now, download your .dsp files to Zynthian, from github.com. My account on github is *myname* and my dsp files are into the directory */dsp*. So why not downloading to Zynthian all the dsp files I have coded and uploaded to github so far? On Putty type

```
root@zynthian:/zynthian/faust# git clone http://github.com/myname/dsp
```

Now, move into the directory.

```
root@zynthian:/zynthian/faust# cd dsp
```

Drumroll, please.

Here comes the fireworks. Let's say we want to use on Zynthian an object called *snth.dsp*. We can finally employ the script *faust2lv2* that on *faust.grame.fr* would create lv2 plugin for Linux, that wouldn't work on ARM. Here, since we run the script on Zynthian, we will finally have as result an object playable on Zynthian. The desired maximum number of voices can be configured with the *-nvoices* option. Here set to *8* just because I use to set to *8* the value Poly Voice before exporting .dsp file. Ok, ready, go!

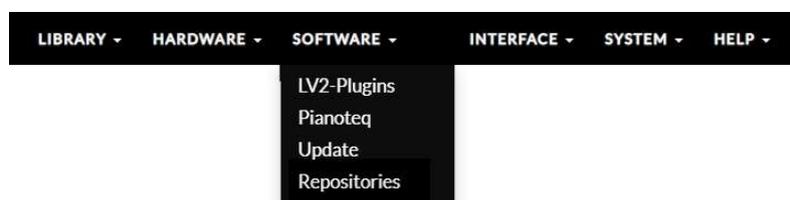
```
root@zynthian:/zynthian/faust/dsp# faust2lv2 -nvoices 8 snth.dsp
```

Now we have in our */dsp* directory a new directory *snth.lv2* containing .ttl and .so files. Let's copy this directory into the correct location, the Zynthian lv2 plugins directory.

```
root@zynthian:/zynthian/faust/dsp# cp -r snth.lv2 /zynthian/zynthian-plugins/lv2
```

Incredible. Your object is ready to be found, activated and played.

Open Webconf at <http://zynthian.local/> and go to > Software > LV-2 Plugins



On the top of the page click on the large button 'Search for new plugins and presets' and wait.  
When Zynthian has finished, look for the new object. Your snth is waiting to be played. Flag it!  
And Click on 'Save' on the bottom of the page.  
Reboot Zynthian. Finally, your object will appear in the list of available Layers.

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Special thanks to Sergio Marchesini for suggesting me this new dimension of creativity and research. Check out his website here <http://www.sergiomarchesini.it/>

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