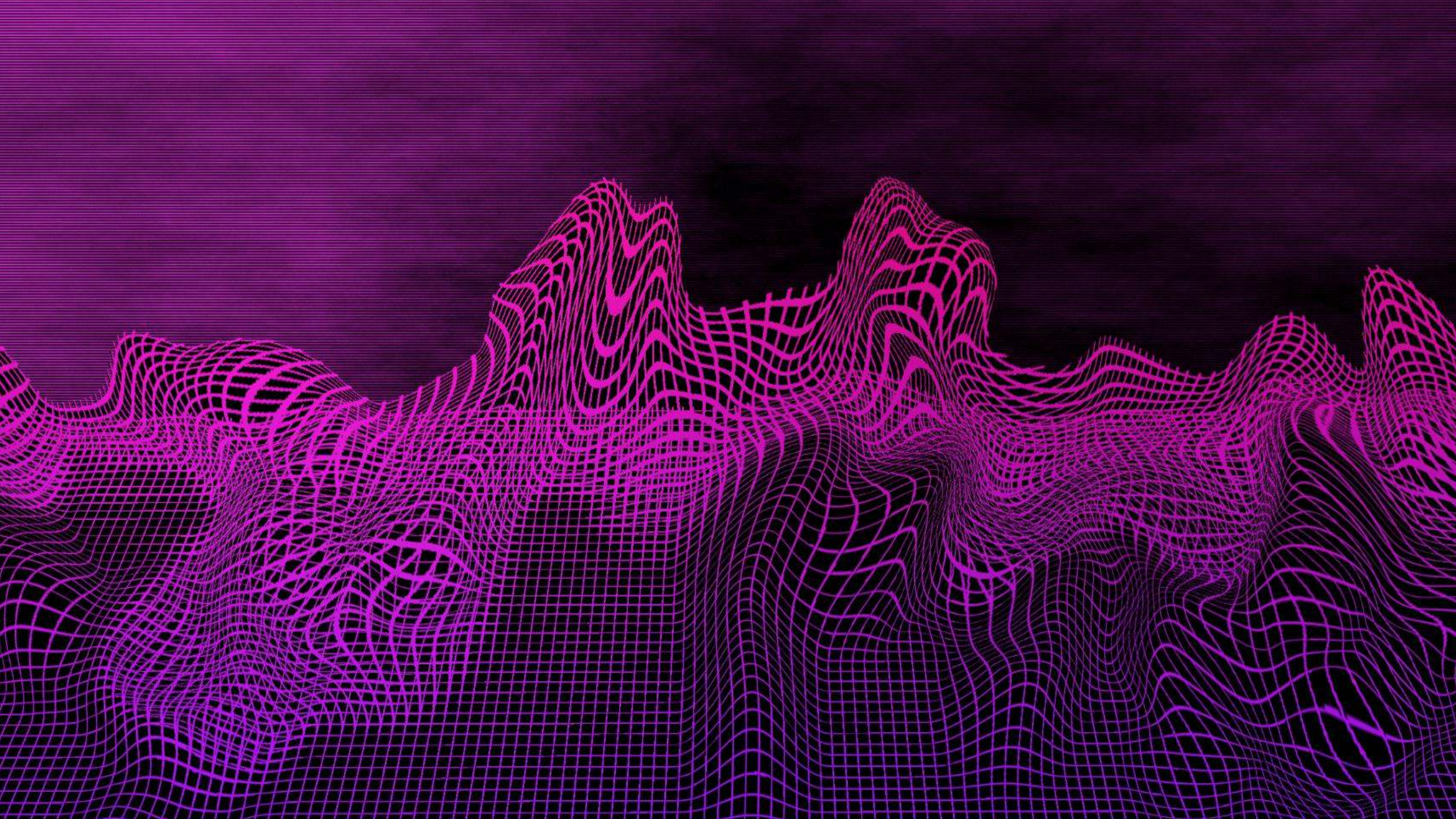
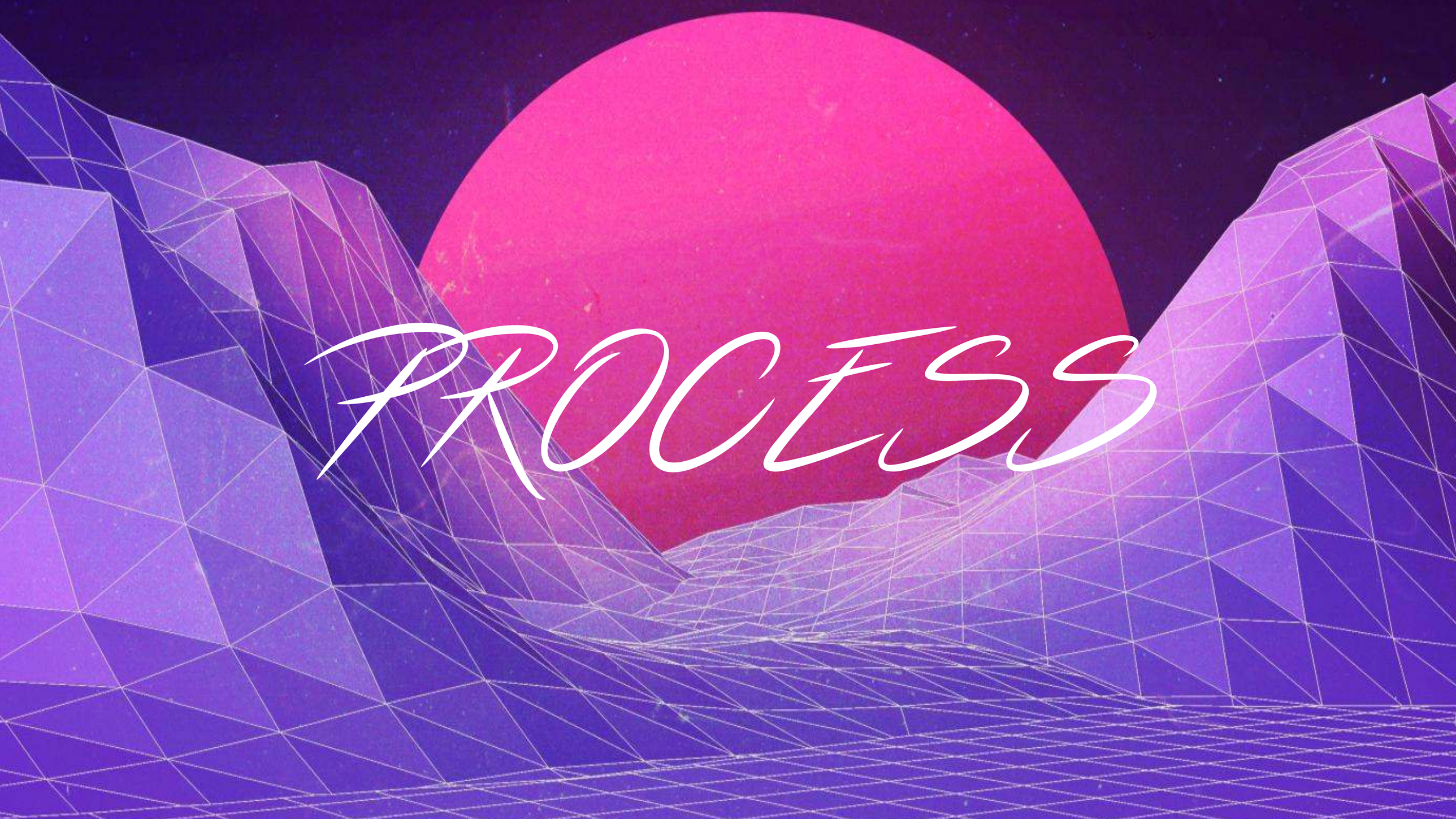
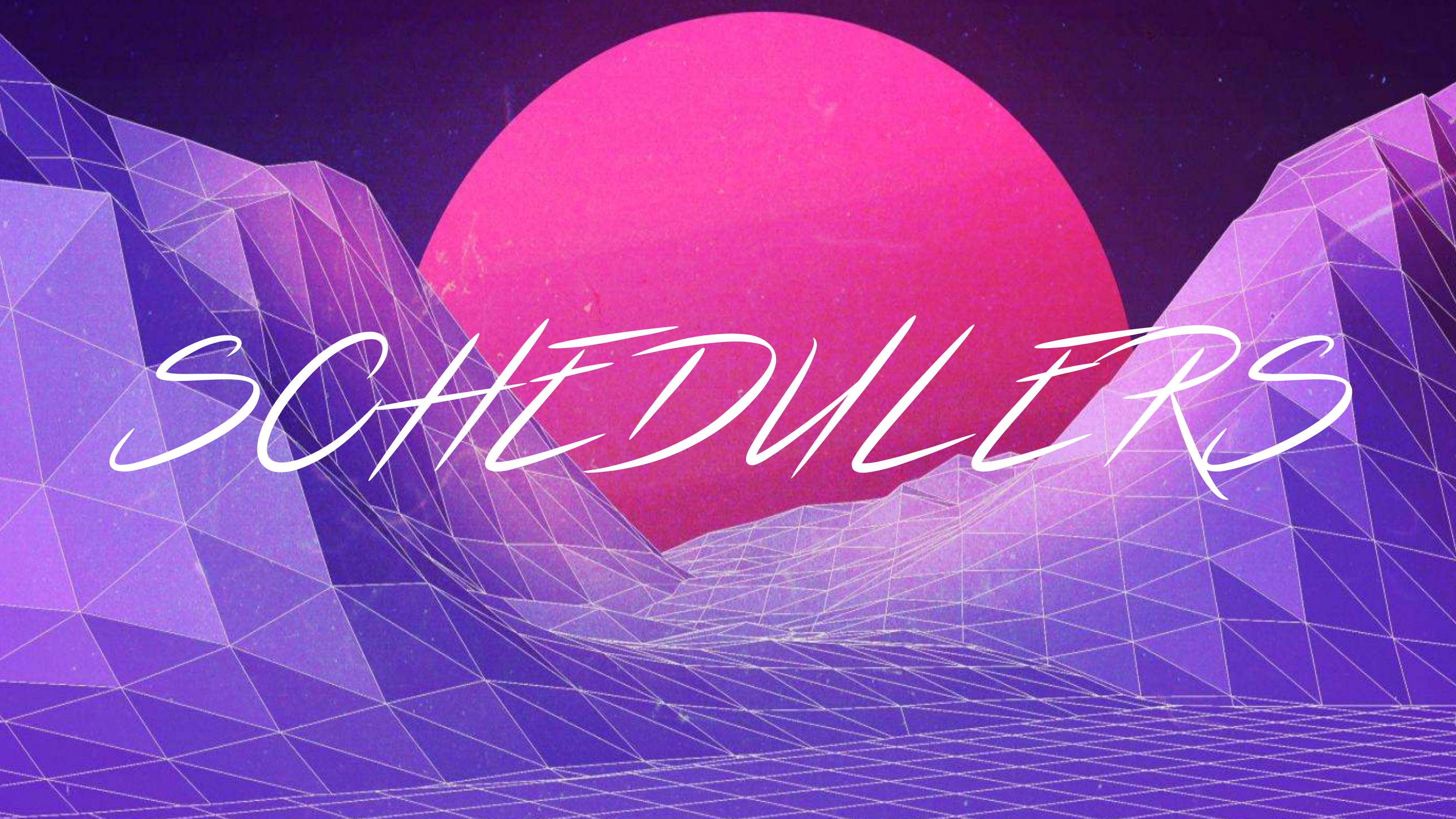
THAT ONE, FOR NOW

@bgmarx



PHOENIX REQUEST

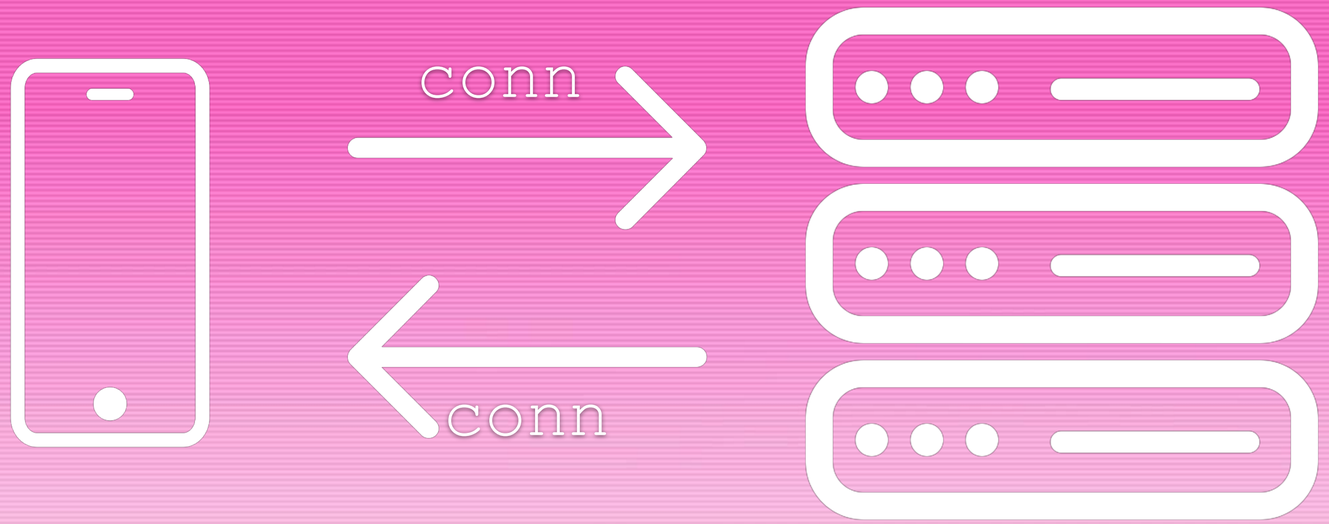

PROCESS


SCHEDULERS

SINGLE SCHEDULER

MULTIPLE SCHEDULERS (SMP)

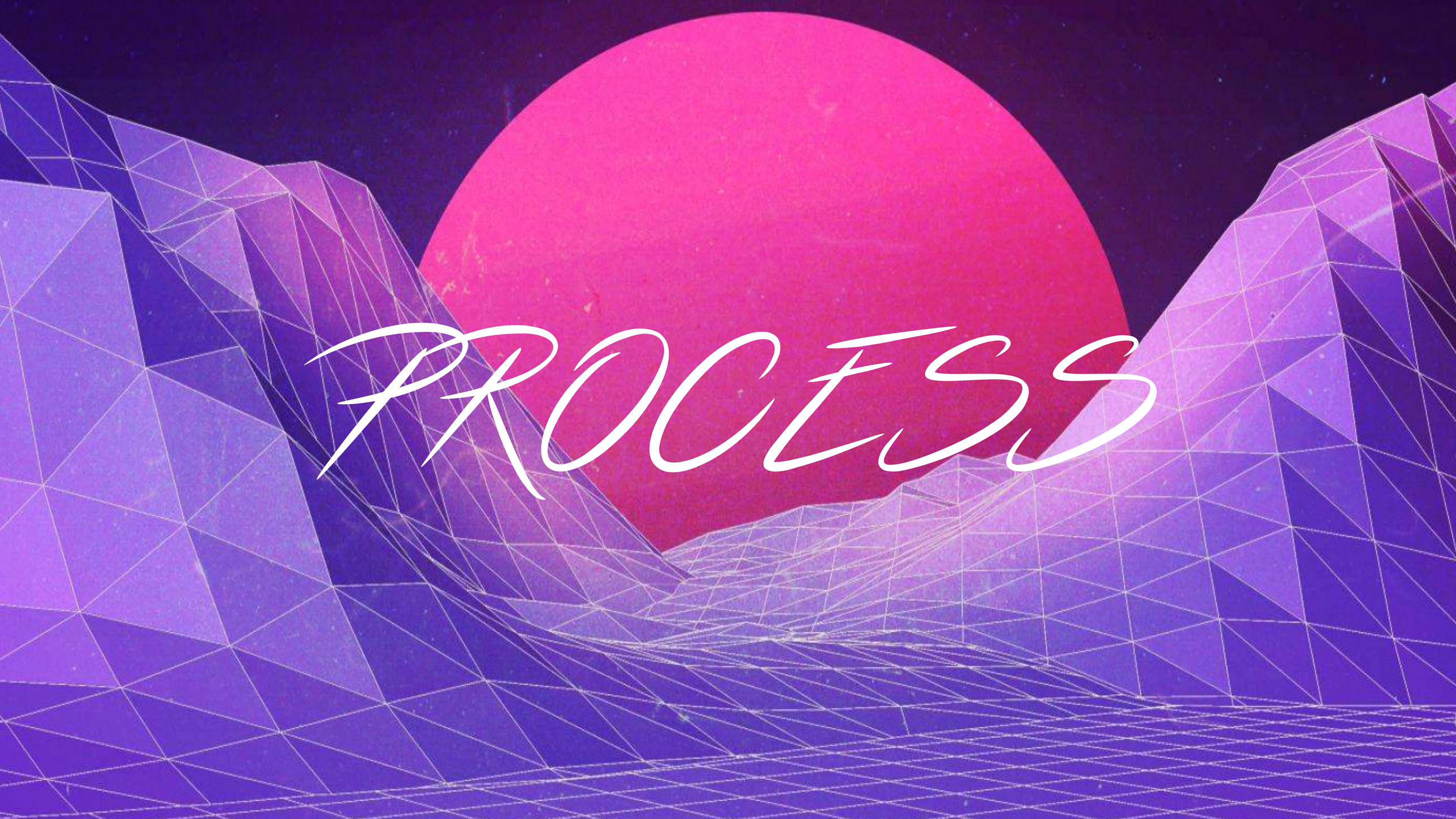
PHOENIX REQUEST



transformations

endpoint
plugs
router
pipeline
controller
view
template

PHOENIX REQUEST


PROCESS

LIGHTWEIGHT

System statistics / limit

Atoms:	22458 / 1048576 (2 % used)
Processes:	248 / 262144 (0 % used)
Ports:	8 / 65536 (0 % used)
ETS:	58 / 8192 (1 % used)
Distribution buffer busy limit:	1048576

ISOLATED

In simple relativity theory the concept of simultaneity just does not exist. The point is that in reality objects do not share state, I believe its not a good idea to model what cannot exist in reality in software

…

Everything that can be achieved with sharing and locks can also be achieved with pure message passing and no locks. The [sic] is the Erlang way.

HTTPS://ARMSTRONGONSOFTWARE.BLOGSPOT.COM/2006/09/WHY-I-DONT-LIKE-SHARED-MEMORY.HTML

EXECUTES
CODE

FOUR BLOCKS OF MEMORY

MAILBOX

HEAP

PCB

STACK

MAILBOX

Pid	Name or Initial Func	Reds	Memory	MsgQ	Current Function
<0.256.0>	Elixir.Plug.Supervisor	1	7104	0	gen_server:loop/7
<0.241.0>	ranch_sup	1	7104	0	gen_server:loop/7
<0.221.0>	hackney_sup	1	7104	0	gen_server:loop/7
<0.203.0>	Elixir.Logger.Supervisor	1	7104	0	gen_server:loop/7
<0.380.0>	erlang:apply/2	2581	8756	0	timer:sleep/1
<0.145.0>	Elixir.Hex.State	1	8844	0	gen_server:loop/7
<0.202.0>	application_master:start_it/4	1	8888	0	application_master:loop_it/4
<0.394.0>	observer_port_wx:init/1	2	8904	0	wx_object:loop/6
<0.247.0>	cowboy_clock	265	8932	0	gen_server:loop/7

PROCESS CONTROL BOARD

```
    Uint32 rcount;  /* suspend count */
    int  schedule_count; /* Times left to reschedule a low prio
process */
    Uint reds;    /* No of reductions for this process  */
    Eterm group_leader;  /* Pid in charge (can be boxed) */
    Uint flags;    /* Trap exit, etc (no trace flags anymore) */
    Eterm fvalue;  /* Exit & Throw value (failure reason) */
    Uint freason;  /* Reason for detected failure */
    Eterm ftrace;  /* Latest exception stack trace dump */
```

HTTPS://GITHUB.COM/ERLANG/OTP/BLOB/OTP-21.0/ERTS/EMULATOR/BEAM/ERL_PROCESS.H#L927

PROCESS STATES

FREE

WAITING

RUNNABLE

RUNNING

EXITING

GARBING

SUSPENDED

garbing computer science

All Images Videos News Shopping More Settings Tools

About 120,000 results (0.45 seconds)

Did you mean: ***garbage*** computer science

"NORMAL" STATES

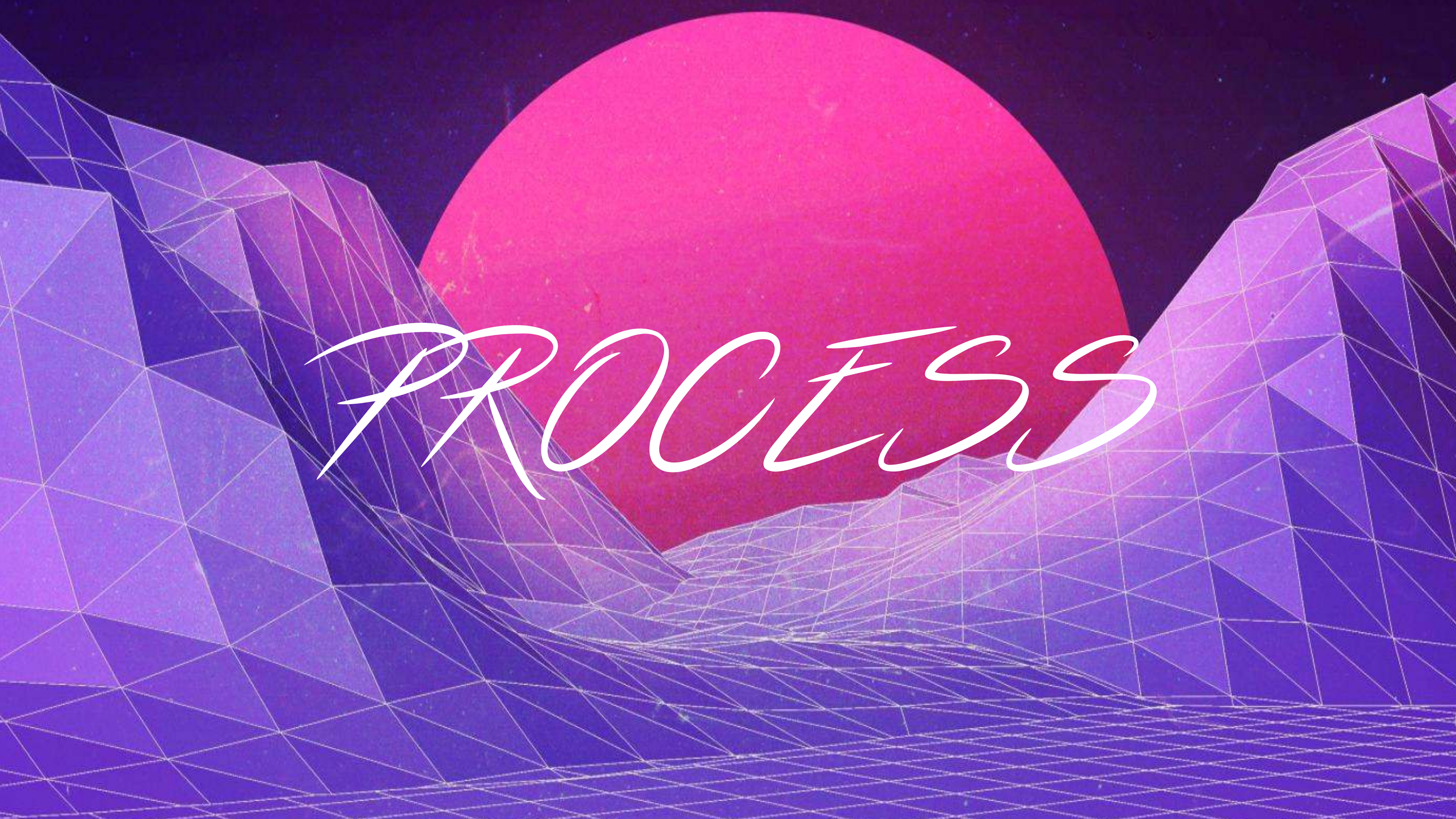
WAITING

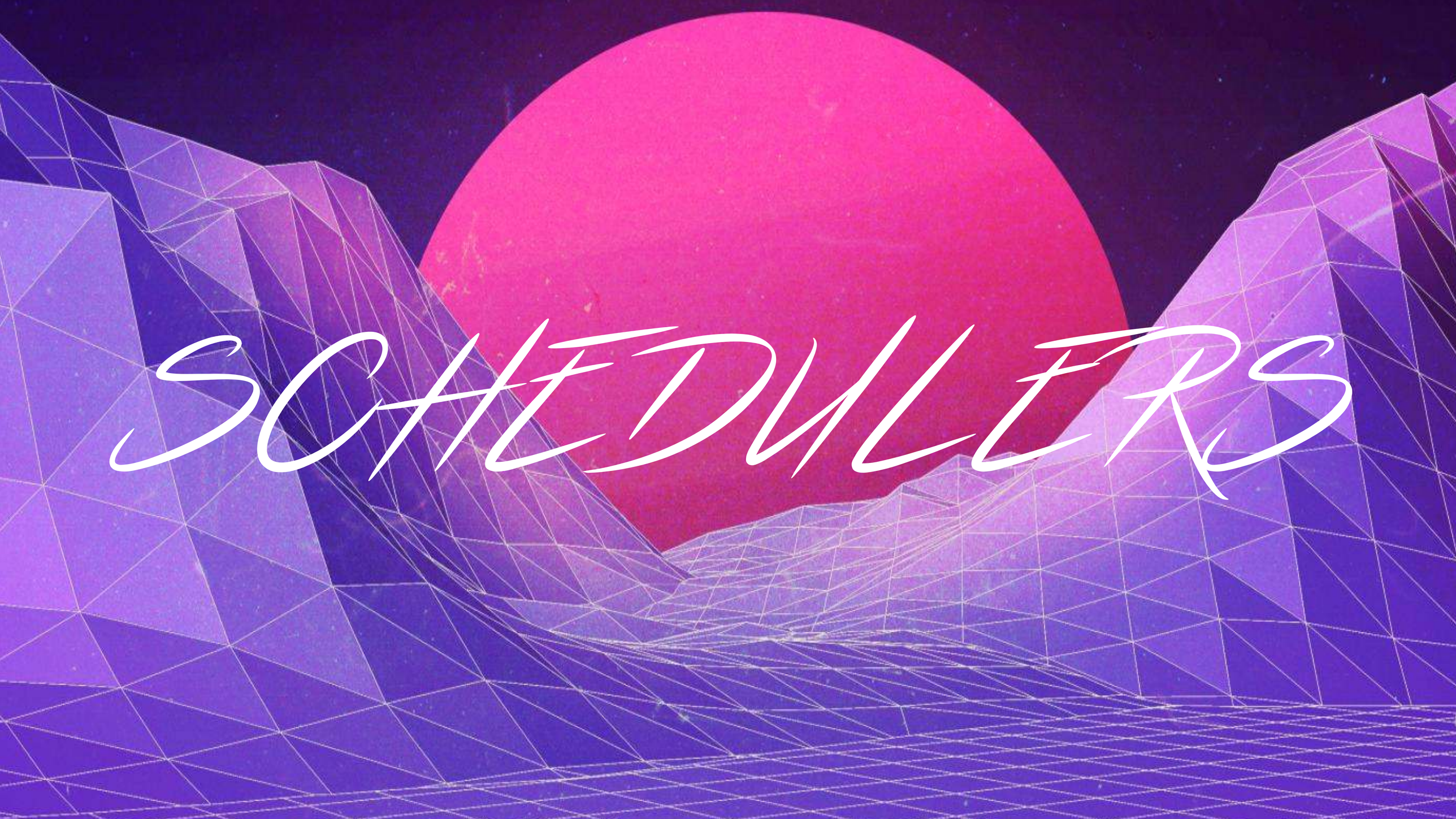
RUNNABLE

RUNNING

```
iex(5)> :erlang.process_info self(), :status
  {:status, :running}
```

HTTP://ERLANG.ORG/DOC/MAN/ERLANG.HTML#PROCESS_INFO-1


PROCESS


SCHEDULERS

SINGLE SCHEDULER

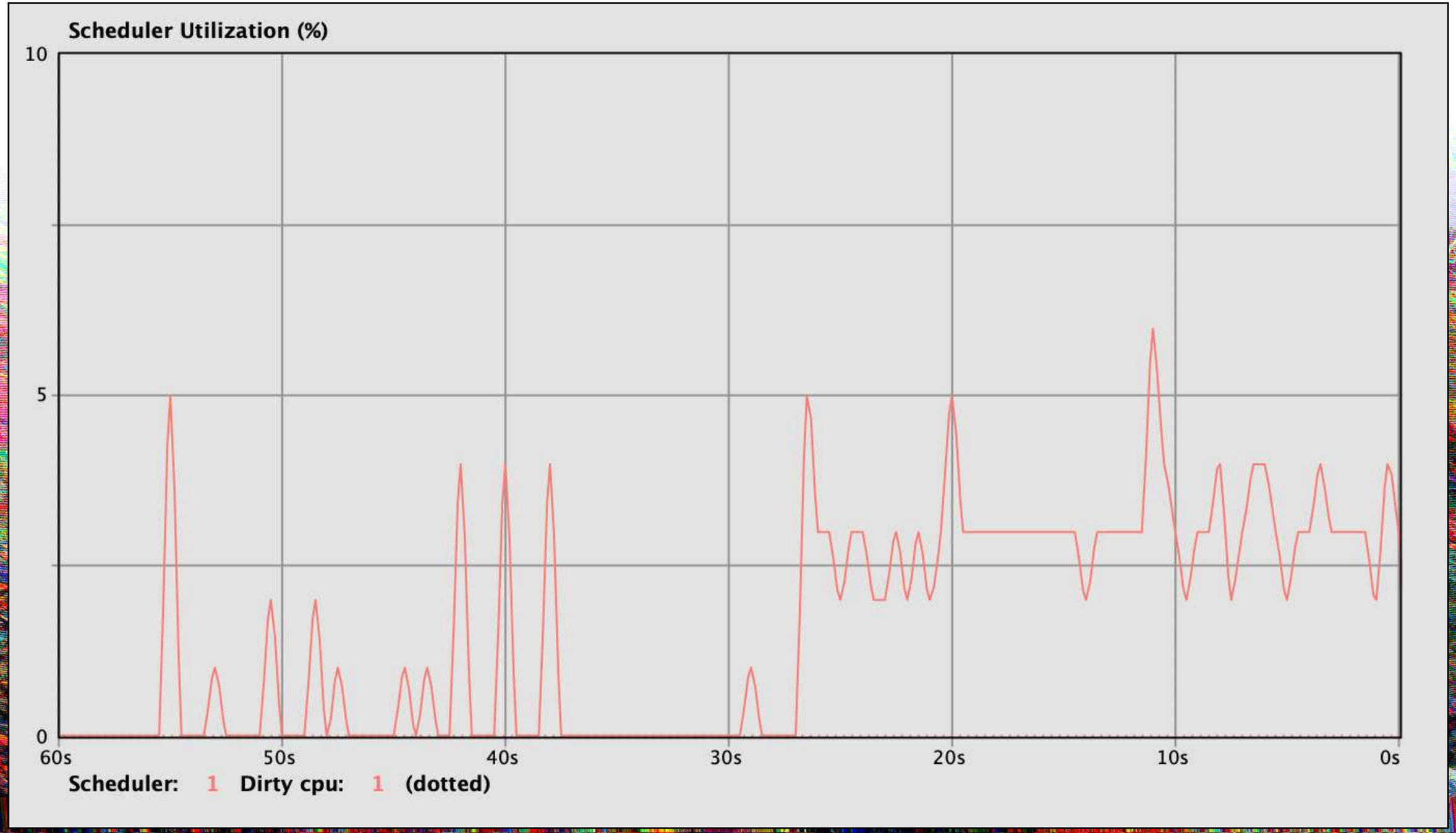
```
iex(1)> :erlang.system_info:(smp_support)
      true
 iex(2)> :erlang.system_info :schedulers_online
   4
```

HTTP://ERLANG.ORG/DOC/MAN/ERLANG.HTML#SYSTEM_INFO-1

```
~> iex --erl "+S 1"
Erlang/OTP 21 [erts-10.0] [source] [64-bit] [smp:1:1] [ds:1:1:10] [async-threads:1] [hipe]

Interactive Elixir (1.7.3) - press Ctrl+C to exit (type h() ENTER for help)
iex(1)> :erlang.system_info :schedulers_online
1
```

HTTP://ERLANG.ORG/DOC/MAN/ERL.HTML#EMULATOR-FLAGS


Scheduler Utilization (%)
10
5
0
60s
50s
40s
30s
20s
10s
0s
Scheduler: 1 Dirty cpu: 1 (dotted)

```
iex(25)> Process.sleep(10_000)
[info] GET /
[debug] Processing with SimpleWeb.PageController.index/2
  Parameters: %{}
  Pipelines: [:browser]
[info] Sent 200 in 150µs
```

PREEMPTIVE*

REDUCTIONS

4000 REDUCTIONS

#DEFINE CONTEXT_REDS 4000 /* SWAP PROCESS OUT AFTER THIS NUMBER */

HTTPS://GITHUB.COM/ERLANG/OTP/BLOB/MASTER/ERTS/EMULATOR/BEAM/ERL_VM.H#L39

RUN QUEUE

WAITING

↓

RUNNABLE → RUNNING

SCHEDULER

RUN QUEUE

TASK 1

TASK 2

TASK N

```
iex(1 1)> :erlang.statistics(:run_queue)
0
```

HTTP://ERLANG.ORG/DOC/MAN/ERLANG.HTML#STATISTICS-1

SCHEDULER

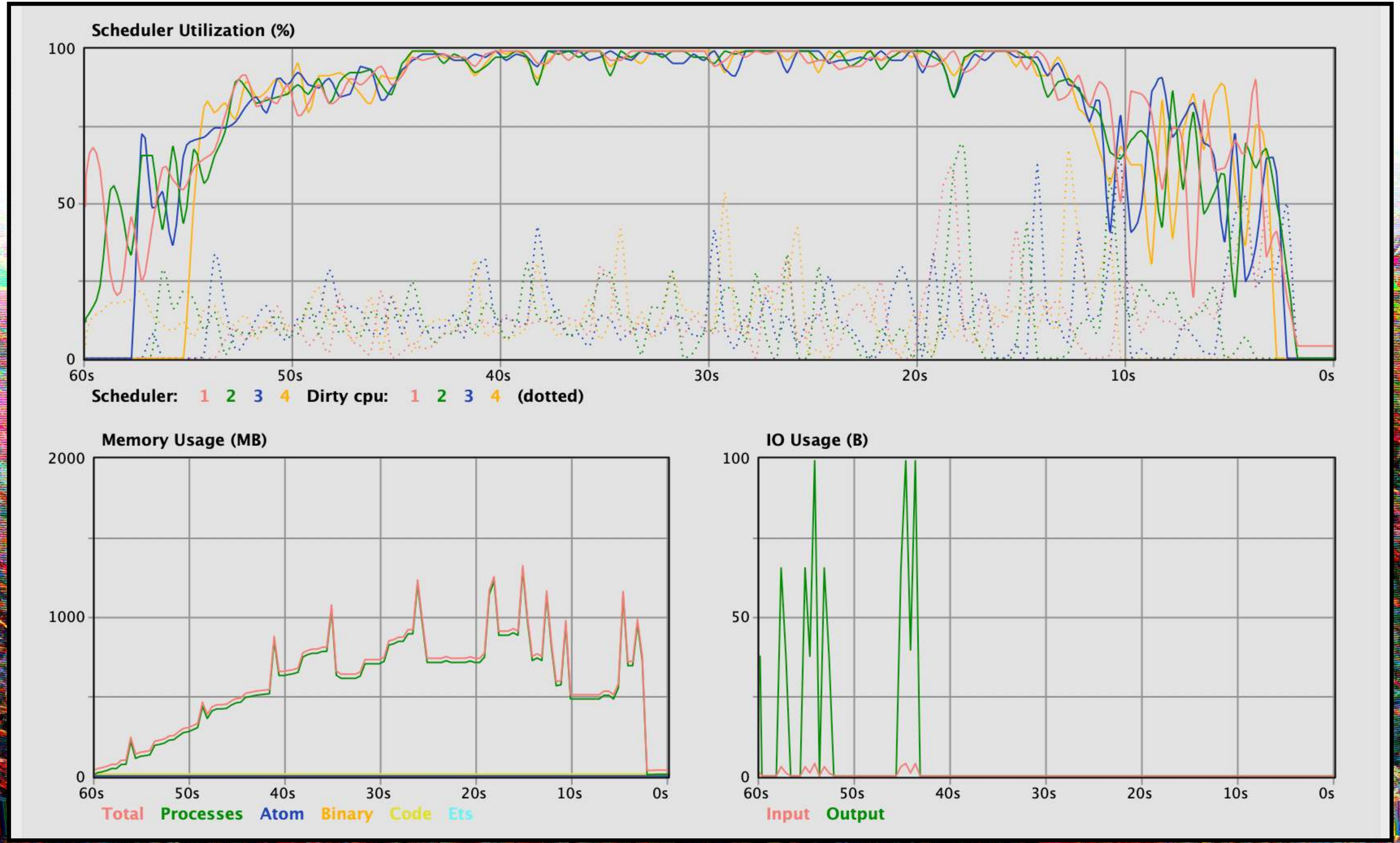
RUN QUEUE

TASK 1

TASK 2

TASK N

MULTIPLE SCHEDULERS (SMP)


Scheduler Utilization (%)
100
50
0
60s
50s
40s
30s
20s
10s
0s
Scheduler: 1 2 3 4 Dirty cpu: 1 2 3 4 (dotted)
Memory Usage (MB)
2000
1000
0
60s
50s
40s
30s
20s
10s
0s
Total Processes Atom Binary Code Ets
IO Usage (B)
100
50
0
60s
50s
40s
30s
20s
10s
0s
Input Output

RUN QUEUE

SCHEDULER →

MAX PRIORITY

HIGH PRIORITY

NORMAL & LOW

LOAD BALANCING

TASK STEALING

MIGRATION LOGIC

SCHEDULER 1 ⇄ SCHEDULER 2

MIGRATION LOGIC

SCHEDULER1	RUN QUEUE 1
SCHEDULER 2	RUN QUEUE 2
SCHEDULER N	RUN QUEUE N

FINELY TUNED

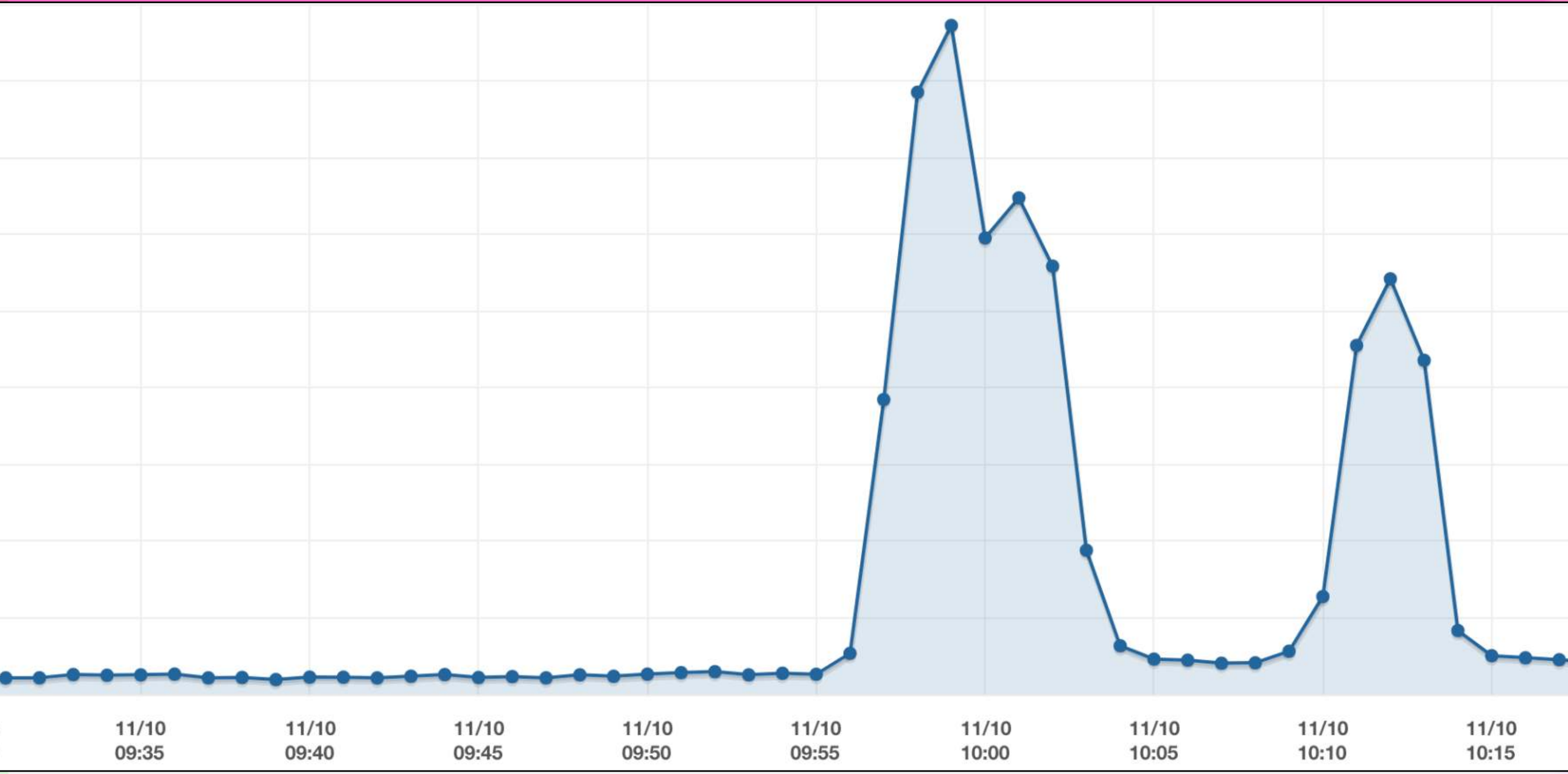
SCHEDULER FLAGS

elixir --erl "+sbt ns" #etc

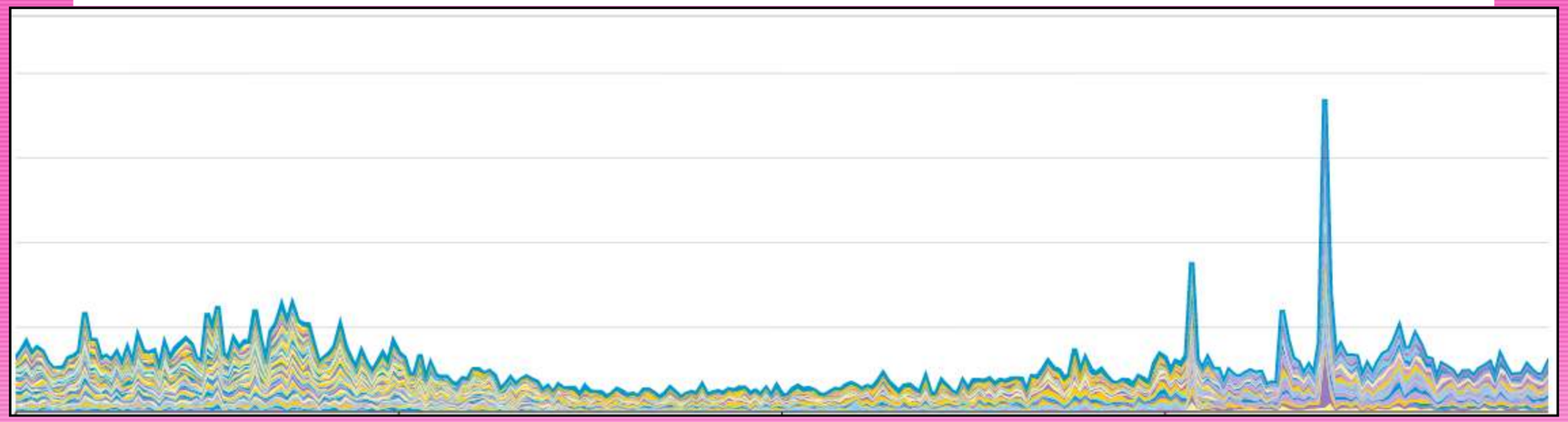
HTTP://ERLANG.ORG/DOC/MAN/ERL.HTML#FLAGS

MOCHI SCHEDULERS

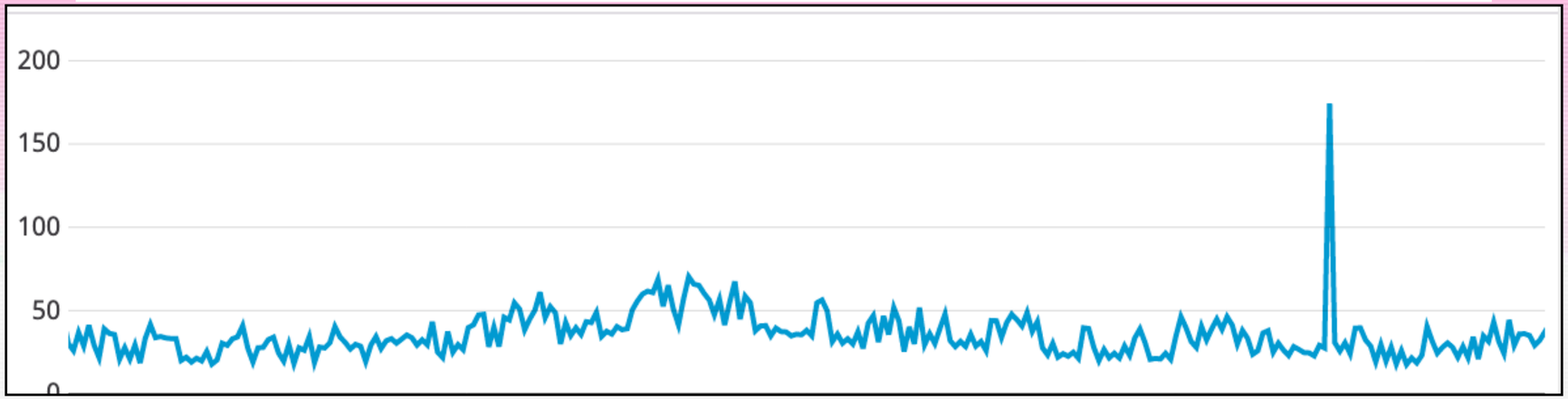
HOW HAS THIS HELPED?


11/10
09:35
11/10
09:40
11/10
09:45
11/10
09:50
11/10
09:55
11/10
10:00
11/10
10:05
11/10
10:10
11/10
10:15

RUN QUEUE



LATENCY



REQUEST

SCHEDULER ASSIGNED

ADDED TO RUN QUEUE

TRANSFORMATIONS

RESPONSE

IMAGE CREDITS

https://wallpaper-gallery.net/single/vaporwave-background-hd-14.html

http://www.desktopimages.org/preview/770453/1920/1080/

https://www.wallpapervortex.com/wallpaper-52083_1_miscellaneous_digital_art_vaporwave_image_glitch.html

https://www.deviantart.com/epix0r/art/R-o-a-d-W-a-y-1920-x-1080-HD-629299503

https://wallpaper-gallery.net/single/glitch-wallpaper-hd-11.html

RESOURCES

The BEAM Book - https://github.com/happi/theBeamBook

https://jlouisramblings.blogspot.com/2013/01/how-erlang-does-scheduling.html

http://www.erlang-factory.com/upload/presentations/105/KennethLundin-ErlangFactory2009London-AboutErlangOTPandMulti-coreperformanceinparticular.pdf

https://hamidreza-s.github.io/erlang/scheduling/real-time/preemptive/migration/2016/02/09/erlang-scheduler-details.html

DZIĘKUJĘ

@bgmarx