

nitro — yet another init system

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a very short very incomplete historical overview

- 1971 Unix v1 `init(8)` respawns the login shell
- 1974 Unix v5 `init(8)` has reconfigurable `/etc/ttys`
- 1985 System V `init(8)`, as we know it today
- 1991 Ted Ts'o writes `ninit`, a supervisor for BIND
- 1997 Daniel J. Bernstein releases `daemontools`
- 2004 Gerrit Pape writes `runit`, can be used as PID 1
- 2011 Laurent Bercot writes `s6`, can be used as PID 1 (official support since 2015)
- later other supervisors get written

my personal involvement

2011 first distribution built on top of musl; exposure to runit via busybox.
init systems other than sysvinit exist!

2012 ignite, scripts for running runit on Arch Linux

2014– Void Linux switches to runit, I switch to Void Linux

2022 various experiments

2023– nitro

<skarnet> I KNEW IT, THE CHILDREN YOU ARE SPAWNING ARE DEMONS

runit vs nitro

```
PID CMD
  1 runit
536 runsvdir -P /run/runit/runsvdir/current log: .....
546 runsv agetty-tty1
553 login -- root
558 -bash
576 ps -o pid,cmd -H ax
548 runsv agetty-tty2
554 agetty tty2 38400 linux
544 runsv agetty-tty3
552 agetty tty3 38400 linux
545 runsv agetty-tty4
551 agetty tty4 38400 linux
547 runsv udevd
555 vlogger -t udevd -p daemon
556 udevd
561 runsv dhcpcd
562 vlogger -t dhcpcd -p daemon
563 dhcpcd: [manager] [ip4] [ip6]
```

```
PID CMD
  1 nitro
538 login -- root
769 -bash
780 ps -o pid,cmd -H ax
553 agetty tty2 38400 linux
536 agetty tty3 38400 linux
537 agetty tty4 38400 linux
548 dhcpcd: [manager] [ip4] [ip6]
549 vlogger -t dhcpcd -p daemon
550 udevd
552 vlogger -t udevd -p daemon
```

configuration

```
/
etc/
  nitro/
    SYS/
      setup*
      finish*
    agetty@/
      run*
      finish*
    agetty@tty1 -> agetty@/
    agetty@tty2 -> agetty@/
    agetty@tty3 -> agetty@/
    agetty@tty4 -> agetty@/
  dhcpcd/
    run*
  log/
    run*
  udevd/
    run*
  log/
    run*
```

nitroctl

```
# nitroctl downagetty@tty4
ok
# nitroctl
UP agetty@tty3 (pid 536) (wstatus 0) 1716s
DOWN agetty@tty4 (wstatus 15) 14s
UP agetty@tty1 (pid 538) (wstatus 0) 1716s
UP dhcpcd (pid 548) (wstatus 0) 1716s
UP dhcpcd/log (pid 549) (wstatus 0) 1716s
UP udevd (pid 550) (wstatus 0) 1716s
UP udevd/log (pid 552) (wstatus 0) 1716s
UP agetty@tty2 (pid 553) (wstatus 0) 1716s
# nitroctl restart dhcpcd
ok
# nitroctl Reboot
```

use cases

- PID 1 for a Linux machine for embedded, desktop or server purposes
- PID 1 for a Linux container (Docker/Podman/LXC/Kubernetes)
 - “side cars”, cron, ...
 - `nitroctl` across namespaces is possible
- unprivileged supervision system on POSIX systems
 - Works on FreeBSD!
 - Could replace your `.xsession`

nitro features

- boot and shutdown is driven by two scripts that already can use `nitroctl`
 - extremely flexible, many policies can be implemented outside PID 1
- service instances: `agetty@tty1`, but only one service definition needed
- ONESHOT services only have a start and finish script, but no daemon

nitro features

- all state is kept in RAM, works fine on read-only root file systems
- efficient event-driven, polling free operation
- zero memory allocations during runtime
- supports reliable restarting of services
- works independently of properly set system clock
- readable, portable code (≈ 2000 LoC) and freely licensed as CCo
- one single self-contained binary, plus one optional binary to control the system
- tiny static binary when using `musl libc`:

text	data	bss	dec	hex	filename
20468	172	63160	83800	14758	/bin/nitro

nitro roadmap

- so far, can boot Void Linux in a VM with a bunch of manual configuration
- planned: health checks to trigger restarts
- planned: more flexible pipe configuration between services
- planned: more robust and flexible shutdown scripts
- 90% feature complete, this will remain a minimalist thing
- observability: Prometheus exporter

Give it a spin: <https://git.vuxu.org/nitro/>

Thanks!

Questions?