

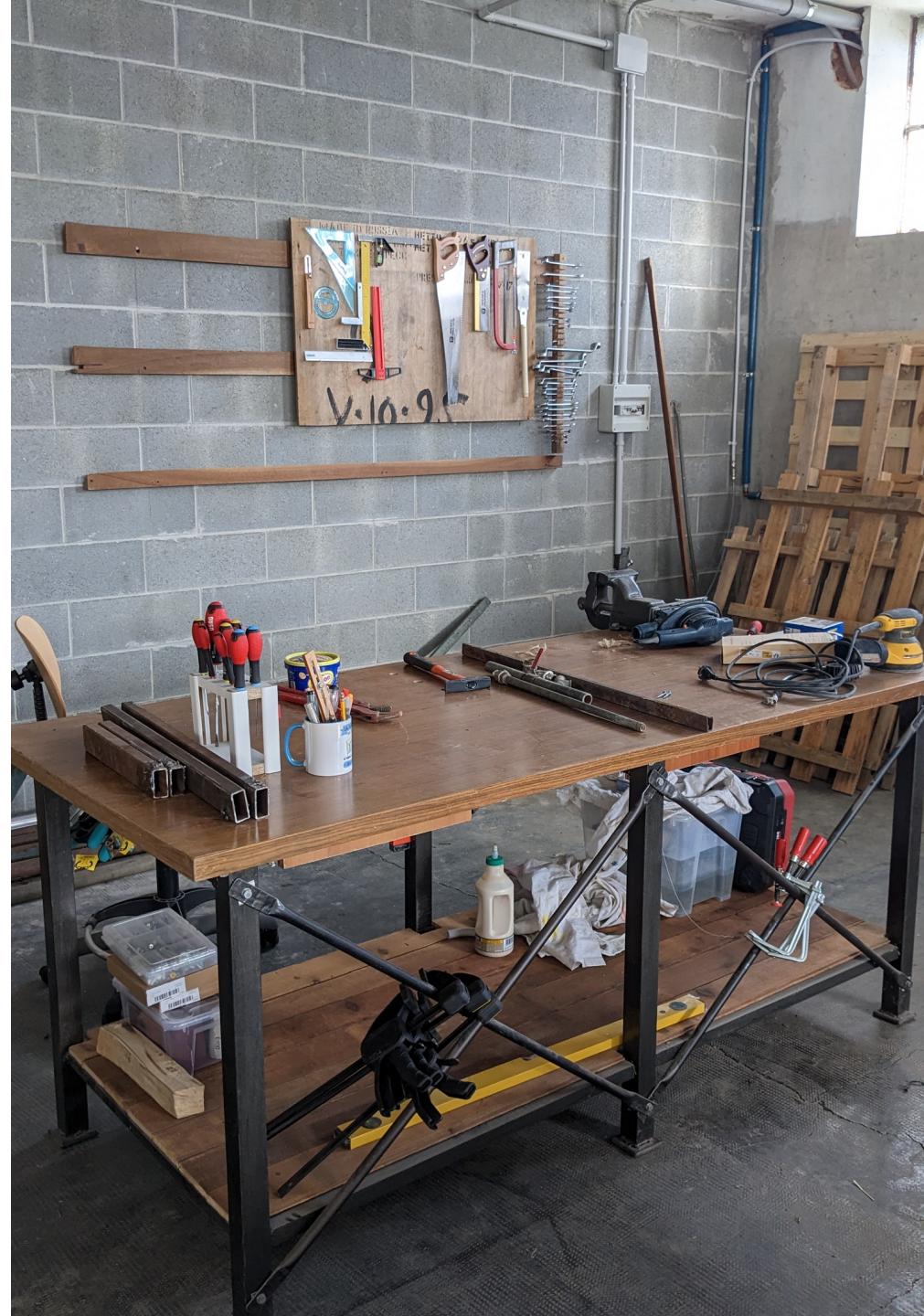
NixOS is great!

Ergonomic and ecosystems

- Code, git, tests
- Reproduce your workflow everywhere: locally, in production, CI/CD
- Hard to figure out? Ask about it!
 - <https://discourse.nixos.org/>
 - Matrix
- Hard to figure out? ~~Copy it!~~

Gianluca who?

- Crazy ball bouncing between dev and ops
- Currently focused on Generative AI, Synthetic Data at rockfish.ai
- 3D printing, woodworking, gardening and so on...
- gianarb.it



Who has a homelab?

Who needs a homelab?

Everyone deserves a homelab!

I have an Ephemeral homelab

Ephemeral: lasting for a very short time.

It leaves in a box



It has a SPOF

```
gianarb@dieci ~/dotfiles (main=) $ ssh root@192.168.1.50
Last login: Mon Jan 30 13:28:01 2023 from 192.168.1.156

[root@snowflake:~]# systemctl status
● snowflake
  State: running
    Jobs: 0 queued
   Failed: 0 units
   Since: Mon 2023-01-30 13:25:56 UTC; 2min 37s ago
  CGroup: /
      └─init.scope
          └─1 /run/current-system/systemd/lib/systemd/systemd
  ● system.slice
      └─dbus.service
          └─691 /nix/store/w2ra60ygdq6894n5fmg9smrlg074r2gn-dbus-1.14.0/bin/dbus-daemon --system --address=systemd: --nofork --nopidfile
  ● dhcpcd.service
      └─711 "dhcpcd: [manager] [ip4] [ip6]"
      └─712 "dhcpcd: [privileged proxy]"
      └─713 "dhcpcd: [network proxy]"
      └─714 "dhcpcd: [control proxy]"
      └─870 "dhcpcd: [BPF ARP] enp2s0 192.168.1.50"
  ● nscd.service
      └─927 nscd
  ● pixiecore.service
      └─834 /nix/store/f0qv6z63a8j6zjsgv5qaj01hsvgb8krh-pixiecore-2020-03-25/bin/pixiecore boot /nix/store/d56x4ya63c2qbwji4qfadmgz
  ● sshd.service
      └─839 "sshd: /nix/store/2x6xalip32xkw8q3xhqzv6x4nrlrm3mx.openssh-9.0p1/bin/sshd -D -f /etc/ssh/sshd_config [listener] 0 of 10
  ● systemd-journald.service
      └─452 /nix/store/qiw8azfj58l3mfbgi48nlshipjgwx7vp-systemd-250.4/lib/systemd/systemd-journald
  ● systemd-logind.service
      └─706 /nix/store/qiw8azfj58l3mfbgi48nlshipjgwx7vp-systemd-250.4/lib/systemd/systemd-logind
  ● systemd-timesyncd.service
      └─559 /nix/store/qiw8azfj58l3mfbgi48nlshipjgwx7vp-systemd-250.4/lib/systemd/systemd-timesyncd
  ● systemd-udevd.service
      └─463 /nix/store/qiw8azfj58l3mfbgi48nlshipjgwx7vp-systemd-250.4/lib/systemd/systemd-udevd
  ● user.slice
      └─user-0.slice
          └─session-1.scope
              └─837 /nix/store/iq26v4prjj3larqwp3h92rjx1hwc65nq-shadow-4.11.1/bin/login -f
                  └─867 -bash
          └─session-4.scope
              └─960 "sshd: root@pts/0"
                  └─962 -bash
                  └─965 systemctl status
                  └─966 less
  ● user@0.service
      └─init.scope
          └─860 /nix/store/qiw8azfj58l3mfbgi48nlshipjgwx7vp-systemd-250.4/lib/systemd/systemd --user
              └─861 "(sd-pam)"
```

I call it snowflake

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I try to automate as much as I can

Obviously...

SPOF: showflake

Provisioned with NixOS

```
services.openssh.enable = true;  
  
services.pixiecore.enable = true;  
services.pixiecore.openFirewall = true;  
services.pixiecore.debug = true;  
services.pixiecore.kernel = "${pkgs.lab.blackhole}/bzImage";  
services.pixiecore.initrd = "${pkgs.lab.blackhole}/initrd";  
services.pixiecore.cmdLine = lib.readFile "${pkgs.lab.blackhole}/init";
```

<https://github.com/gianarb/dotfiles/blob/main/nixos/machines/lab-generic-netbooting/snowflake.nix>

Showflake dispatches what is needed to netboot any other machine via [Pixiecore](#)

Pixiecore is a tool to manage network booting of machines. It can be used for simple single shot network boots, or as a building block of machine management infrastructure.

blackhole is the operating system I build and distribute via pixiecore. It does not do much, but it is as powerful as NixOS can be!

```
{ config, pkgs, lib, modulesPath, ... }: with lib;
{
  imports = [
    (modulesPath + "/installer/netboot/netboot-base.nix")
  ];
  ....
  services.openssh.enable = true;
  system.build.myInit = pkgs.runCommand "init" { } ''
    mkdir -p $out
    echo -n "init=${config.system.build.toplevel}/init initrd)initrd loglevel=4" > $out/init
  '';
```

<https://github.com/gianarb/dotfiles/blob/main/nixos/machines/lab-generic-netbooting/blackhole.nix>

Netbooting from zero to hero

It more or less works this way:

1. A new server boots
2. It does not have an operating system installed
3. Usually the BIOS as last booting option tries to boot via network (netbooting)
4. It tells the DHCP that it is ready to boot
5. The DHCP replies with a package containing various informations:
 - The IP assigned to it
 - The location of a TFTP kernel, init ramdisk to boot
6. The server downloads what it needs and boots up!

```
l -f -xe -u pixiecore.service
temd[1]: Started Pixiecore server.
ninit pixiecore.service has finished successfully
```

<https://devel.susedesktop.org/mailman/listinfo/systemd-devel>

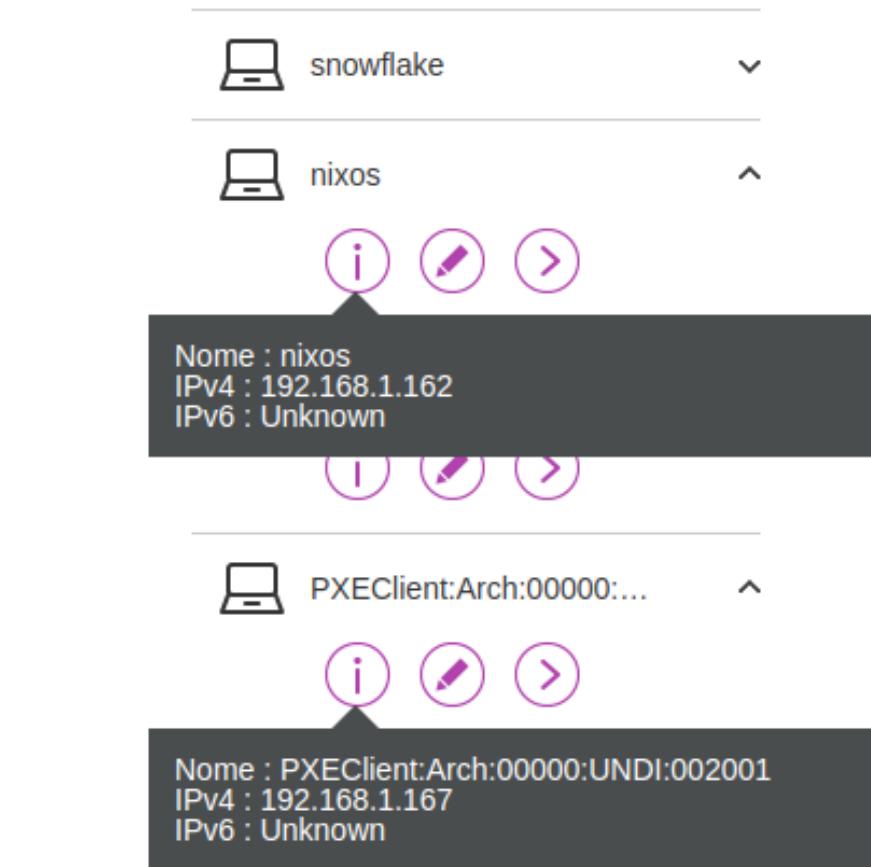
core.service has finished successfully.

```
iecore[834]: [Init] Starting Pixiecore goroutines
iecore[834]: [DHCP] Got valid request to boot f4:4d:30:64:8e:0f (IA32)
iecore[834]: [DHCP] Offering to boot f4:4d:30:64:8e:0f
iecore[834]: [DHCP] Ignoring packet from f4:4d:30:64:8e:0f: packet is DHCPREQUEST, not DHCPDISCOVER
iecore[834]: [TFTP] Send of "f4:4d:30:64:8e:0f/0" to 192.168.1.162:2070 failed: "192.168.1.162:2070": sending OACK: client aborted transfer: TFTP Abort
iecore[834]: [TFTP] clamping blocksize to "192.168.1.162:2071": 1456 -> 1450
iecore[834]: [TFTP] Sent "f4:4d:30:64:8e:0f/0" to 192.168.1.162:2071
iecore[834]: [DHCP] Got valid request to boot f4:4d:30:64:8e:0f (IA32)
iecore[834]: [DHCP] Offering to boot f4:4d:30:64:8e:0f
iecore[834]: [DHCP] Ignoring packet from f4:4d:30:64:8e:0f: packet is DHCPREQUEST, not DHCPDISCOVER
iecore[834]: [HTTP] Get bootspec for f4:4d:30:64:8e:0f took 1.013µs
iecore[834]: [HTTP] Construct ipxe script for f4:4d:30:64:8e:0f took 149.814µs
iecore[834]: [HTTP] Sending ipxe boot script to 192.168.1.162:56333
iecore[834]: [HTTP] Writing ipxe script to f4:4d:30:64:8e:0f took 12.088µs
iecore[834]: [HTTP] handleIpxe for f4:4d:30:64:8e:0f took 480.704µs
iecore[834]: [HTTP] Sent file "kernel" to 192.168.1.162:56333
iecore[834]: [HTTP] Sent file "initrd-0" to 192.168.1.162:56333
iecore[834]: [DHCP] Ignoring packet from f4:4d:30:64:8e:0f: not a PXE boot request (missing option 93)
iecore[834]: [DHCP] Ignoring packet from f4:4d:30:64:8e:0f: packet is DHCPREQUEST, not DHCPDISCOVER
```

```
[0] 0:bash 1:ssh- 2:ssh*
gianarb@dieci ~/dotfiles (main)= $ ssh root@192.168.1.162
The authenticity of host '192.168.1.162 (192.168.1.162)' can't be established.
ED25519 key fingerprint is SHA256:L5fp1BwvVTgGhSmIZ0J90CIelPnao2mSvkS6rEytmNw.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.1.162' (ED25519) to the list of known hosts.
Last login: Mon Jan 30 13:33:32 2023

[root@nixos:~]# 
```

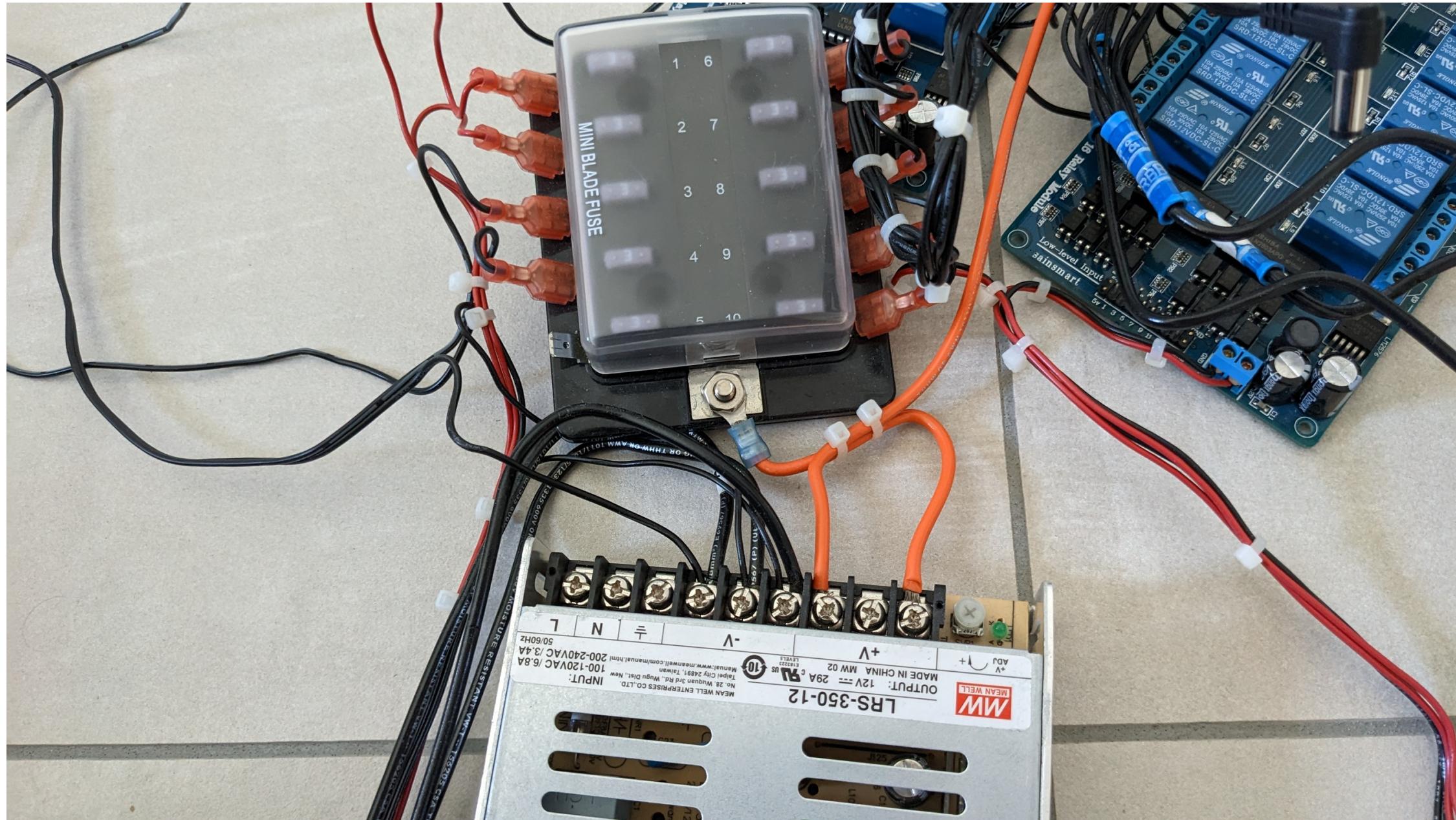
I would like to move to something a bit more advanced, Consul, or CoreDNS, or even Tailscale but for now, I use my router.



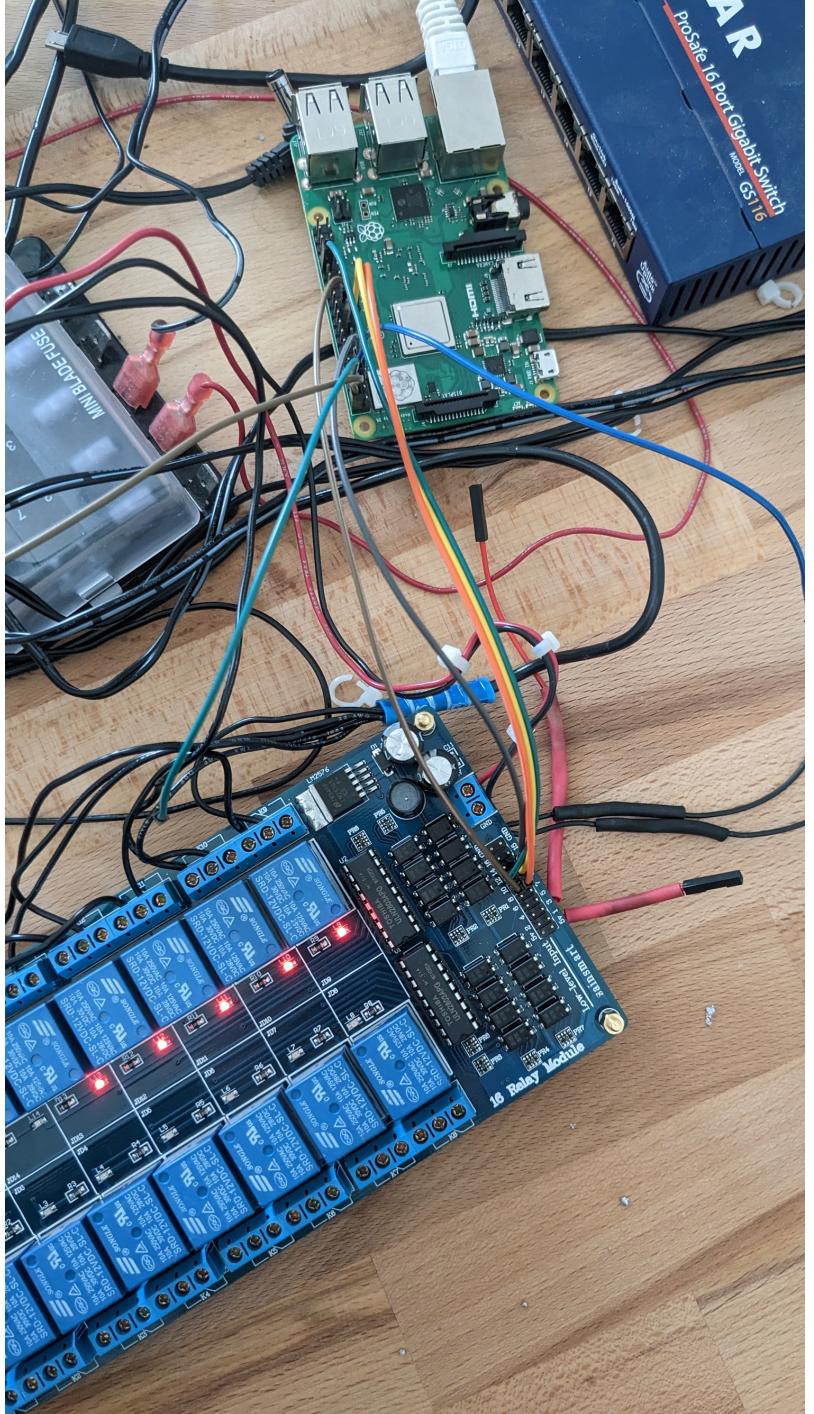
What is netbooting useful for?

- Inventory management
- Provisioning
 - format and partition disk
 - Download and write an operating system to disk
 - reboot
- Recovery
 - force netboot and inspect what is going on on disk
- A lot more

Some of hardware have disk attached others do not. I do not "persist" an operating system, I rely on what can stay in RAM.



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Replace the RaspberryPI with an ESP32



I got two fancy boxes I want to use:

