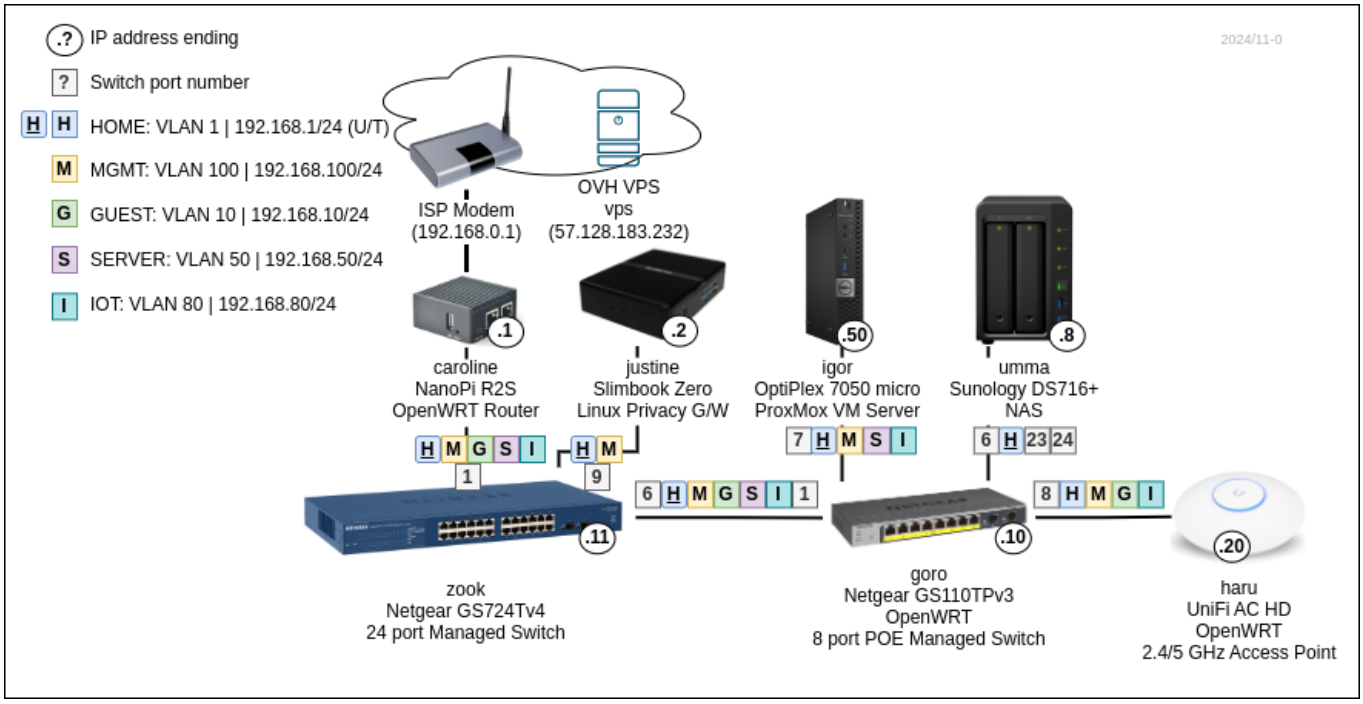
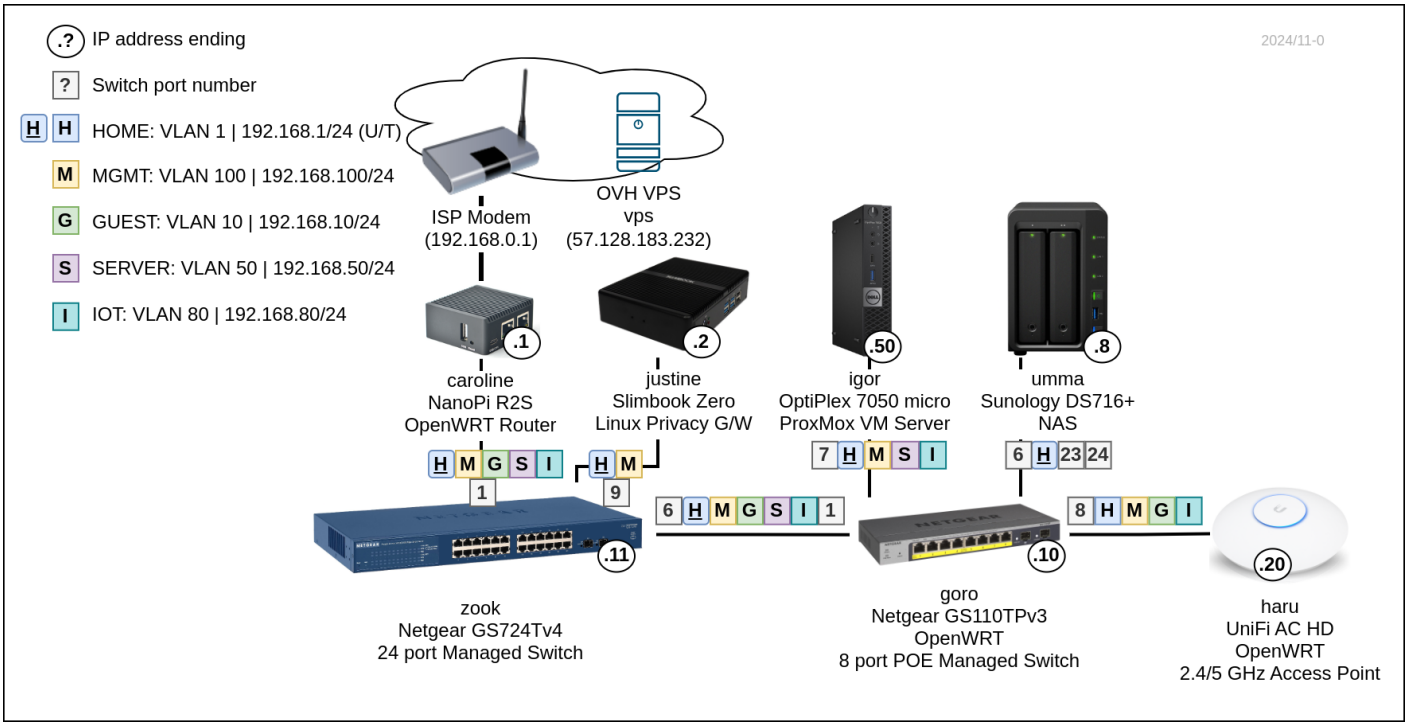
Home Network

Networks & Switching

Editable diagram





VLANs

Name	Tag	Network	Description	Gateways
HOME	1	192.168.1.0/24	Internal home network	caroline: 192.168.1.1 justine: 192.168.1.2 (DHCP default)
GUEST	10	192.168.10.0/24	Isolated network	caroline: 192.168.10.1 (DHCP default)
SERVER	50	192.168.50.0/24	Internet exposed servers	caroline: 192.168.50.1 (DHCP default)
IOT	80	192.168.80.0/24	IoT devices	carolone: 192.168.100.1 (DHCP default)
MGMT	100	192.168.100.0/24	Management network	carolone: 192.168.100.1 justine: 192.168.100.2 (DHCP default)

Connectivity

Caroline does VLAN routing.

Name	Internet access G/W	DNS	WiFi SSID	Access to
HOME	Justine (VPN), Caroline	Justine (PiHole), Caroline	Haru, Haru Legacy (2.4GHz)	SERVER, IOT
GUEST	Caroline	Caroline	Toudi, Toudi Legacy (2.4GHz)	
SERVER	Caroline	Caroline		
IOT	Caroline	Caroline	Haru IoT (2.4GHz)	
MGMT	Justine (VPN), Caroline	Justine (PiHole), Caroline	Haru MGMT (2.4GHz)	SERVER

Subnets

Base range	Subnet 1 / Usage	Subnet 2 / Usage	Subnet 3 / Usage

10.0.0.0/8	*reserved for work VPNs*		
172.16.0.0/12 (to 172.31.)			
	172.17.1.1/24	Justine VPN: `vpn`	
	172.17.2.1/24	Justine VPN: `outpust`	
	172.17.100.1/24	VPS VPN: `vps`	
	172.18.0.0/16	Justine Docker	
	172.19.0.0/16	Igor Kubenretes	
	172.20.0.0/24	Igor Sandbox VMs	
192.168.0.0/16			
	192.168.1.0/24	HOME VLAN	
	192.168.10.0/24	GUEST VLAN	
	192.168.50.0/24	SERVER VLAN	
	192.168.80.0/24	IOT VLAN	
	192.168.100.0/24	MGMT VLAN	

Adding networks

Caroline

- *Network -> Interfaces -> Devices*
  - Add `VLAN (802.1q)` on `eth1` for new VLAN tag
- *Network -> Interfaces*
  - Add interface for the new device
  - Configure DHPC server on the new interface with options for default G/W and DNS server
    - `3,192.168.80.1`
    - `6,192.168.80.1`
- *Network -> Firewall -> Zones*
  - Add zone for the new interface

- *Network -> Firewall -> Traffic rules*
  - Add rule for DHCP (`UDP 67`)
  - Add rule for DNS (`UDP+TCP 53`)
  - Add rule for ICMP
- *Network -> DHCP and DNS -> Devices & Ports*
  - Add new interface to DHCP server *Listen interfaces*

Switch configuration

> **OpenWRT edit VLAN tag assignment**
> Network -> Interfaces -> Devices -> `switch` (Bridge device) -> Configure... -> Bridge VLAN filtering

Gateways & Routing

ISP

Virgin Media Fiber:

- 1Gbit/s down
- 100Mbit/s up
- XGS-PON (10-Gigabit-capable passive optical network; 10 Gbit/s shared symmetric capacity)
- MTU: ~~1468~~ `1460` for IPv4 (IPv4 in IPv6),
- no IPv4 on router - IPv6 DS-Lite (IPv4 tunneled in IPv6 to DS-Lite carrier-grade NAT),
- no router bridge mode.

ISP gateway MTU

From VPS:

```
ping -s 1472 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 1472(1500) bytes of data.
1480 bytes from 8.8.8.8: icmp_seq=1 ttl=110 time=1.34 ms
```

From router itself max ping size `1440` (IP packet size: `1468`). For IPv6 it is `1500` (`1452 + 40 + 8`).

From network (via Caroline/no VPN):

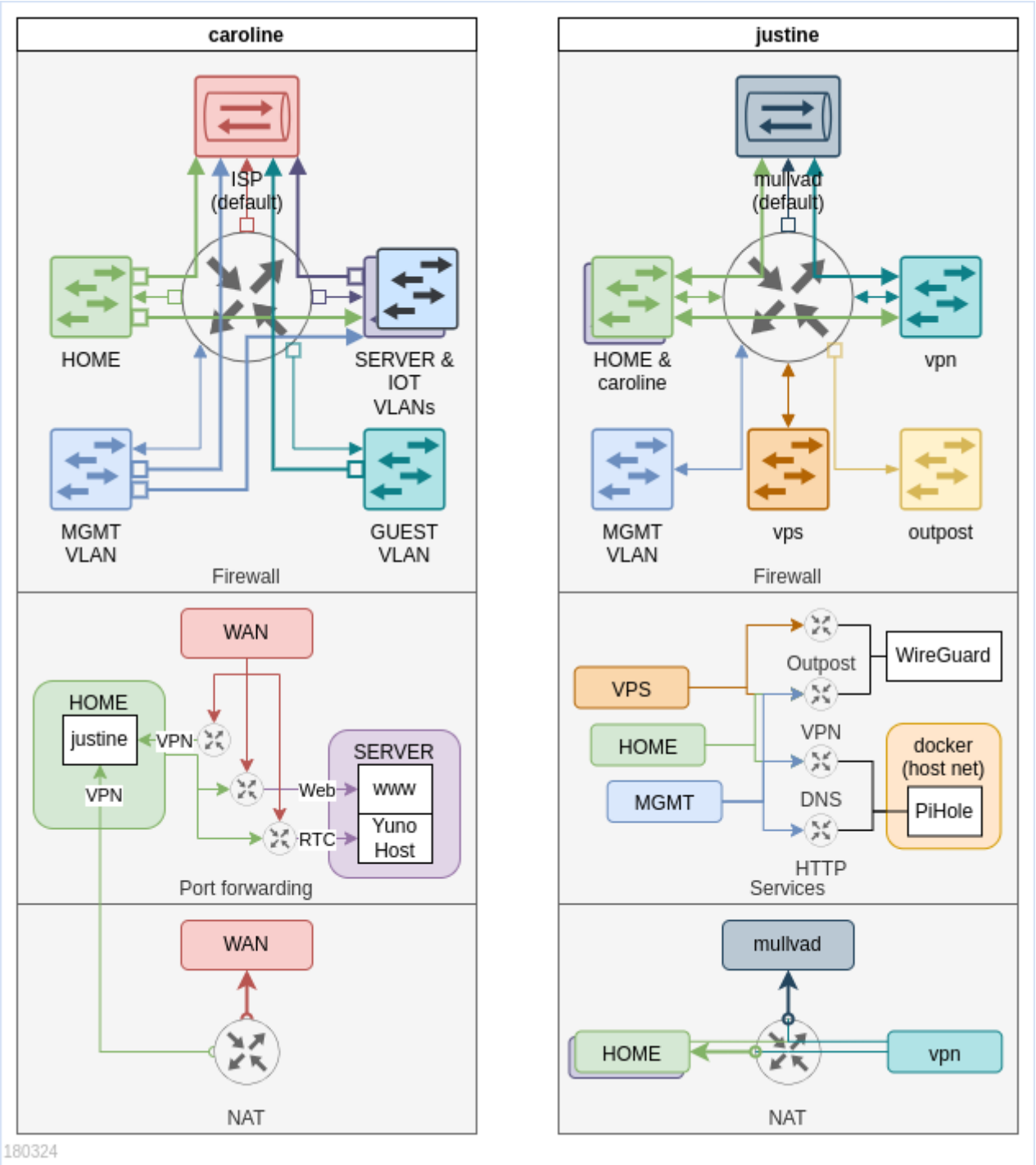
```
ping -s 1440 57.128.183.232
PING 57.128.183.232 (57.128.183.232) 1440(1468) bytes of data.
1448 bytes from 57.128.183.232: icmp_seq=1 ttl=48 time=25.1 ms
```

Router configuration:

- `Gateway MTU size    2000 (1280-1500)` ???
  - When set to `1500` MTU drops to `1460` and I cannot go back! They took 8 byte WTF is this?!?!?!
    - Looks like I was getting extra 8 bytes (`1508`) with `2000` setting.

IPv6 header occupies 40 bytes so IPv4 in IPv6 gets `1500 - 40 = 1460` MTU.

Two gateways



There are two gateways on the network:

1. **caroline** - exposed to the internet, provides access to internet and forwards connections to servers in SERVER VLAN
2. justine - VPN G/W that connects to Mullvad and terminates incoming WireGuard VPN connections

Clients use **caroline** as G/W for direct internet access and **justine** as G/W for Mullvad protected internet access. Additionally **caroline** runs DNS server that uses the ISP DNS server, while **justine**

will use PiHole and Mullvad's DNS server.

Routing with two gateways

Things get very complicated with two gateways setup. Clients need to be able to direct traffic to correct gateway in response to connections coming from one or the other gateway.

Gateway forwarded connections:

1. **caroline** forwards from the internet to access internal network to:
    1. public SERVER network services from outside: blog, younohost etc.
    2. **justine** WireGuard VPN
2. **justine** forwards from internet VPN connected devices to:
    1. HOME network
    2. to **caroline** for SERVER network

This creates the challenge where devices can be configured with any G/W and need to be able to forward the traffic to the other G/W in some cases:

1. local IP & bridge - VPN clients could be bridged directly and assigned bridged network IP
2. NAT - packets coming into the network are MASQUERADE'd to G/W IP address (how it is done currently)
3. static route - push static routes to all clients so response to packets coming from G/W terminated IPs (e.g. VPN) are forwarded back to correct G/W
4. ICMP redirect - both G/W could be configured to inform clients on the correct G/W to use for packets destination

Problems:

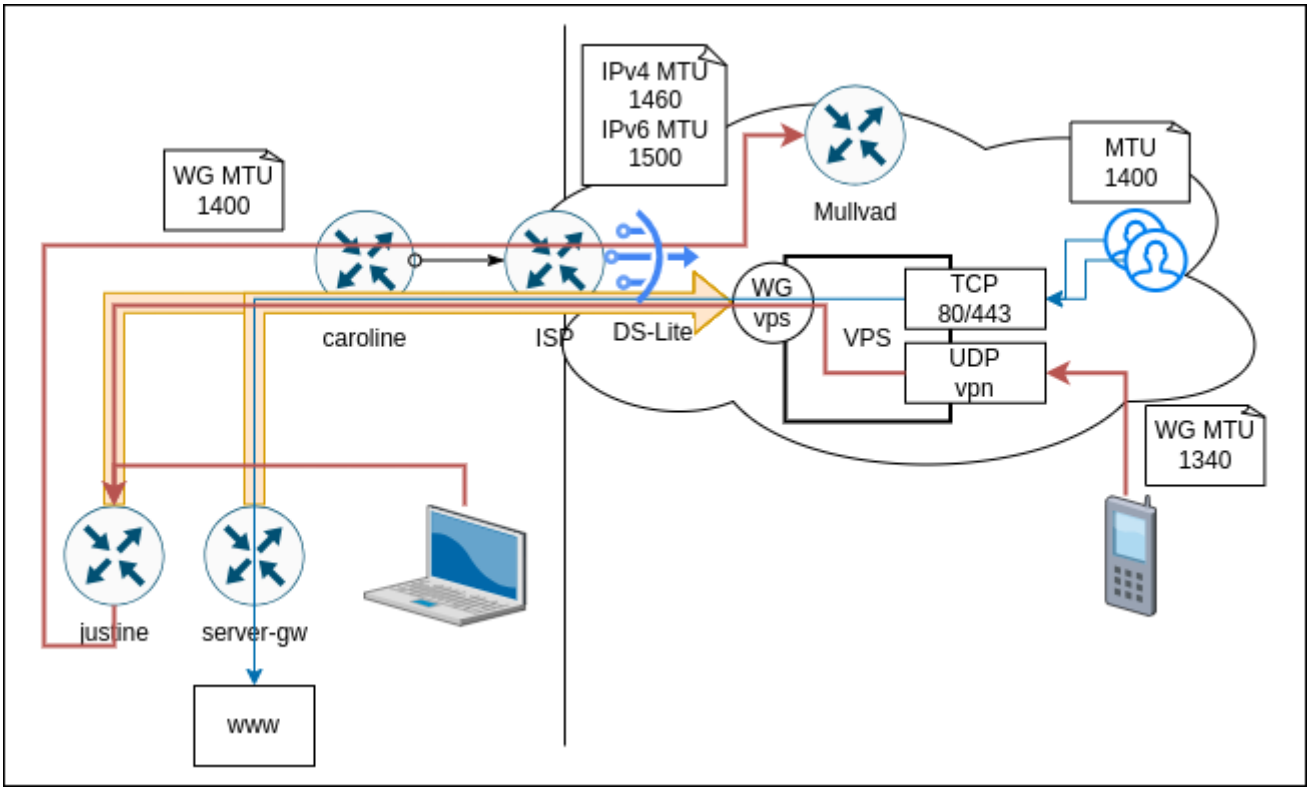
- NAT will obscures the source IP address making troubleshooting, monitoring and accounting more difficult.
- Static routes or redirects will work if G/W can be deduced from destination IP address.
- ICMP redirects many not work reliably, will probably drop first packet?
- Pushing routes to clients requires client support, NAT makes things transparent to clients.

Inbound connectivity

Since ISP does not provide direct IPv4 (DS-Lite - only IPv6 inbound connection forwarding is supported) in I use a VPS service and WireGuard VPN to establish inbound channels.

Vps server uses firewall rules to SNAT/DNAT incoming connections over incoming `vps` WireGuard tunnels to:

- Justine: for inbound VPN connections for roaming,
- Server-gw: for inbound HTTP connections for this wiki and other services.



MTU

Given this layered approach calculating correct MTU for WireGuard endpoints becomes tricky. Default WireGuard MTU of `1420` assumes IPv6 (as worst case) connection to WireGuard server over full `1500` MTU link.

Protocol overhead:

- IPv4 - 20 bytes
- IPv6 - 40 bytes
- UDP + WireGuard - 40 bytes

Link type	Link MTU	IPv4 max payload	IPv6 max payload	WireGuard MTU (IPv4)
Ethernet/Wi-Fi (LAN connectivity)	`1500`	`1480`	`1460`	`1440`
ISP link (DS-Lite)	`1500`	`1440` (IPv4 in IPv6)	`1460`	`1400`
vps VPN (WG IPv4) over ISP link	`1400`	`1380`	`1360`	`1340`

WireGuard MTU settings

Source	Destination	Bottleneck Link	WireGuard MTU
Justine	Mullvad (IPv4)	ISP DS-Lite	`1400`
Justing & Server-gw	Vps (IPv4)	ISP DS-Lite	`1400`
In-LAN (Laptop)	Mullvad via Justine (IPv4)	ISP DS-Lite	`1400`
Roaming (Phone, Laptop)	Mullvad via Justine via Vps (IPv4)	Vps VPN over ISP DS-Lite	`1340`

Server VLAN

Uses dedicated VM `server-gw` that uses WireGuard VPN to connect to Vps server. It acts as default G/W for all SERVER VLAN hosts and routes traffic out via Vps over the VPN connection. This way all servers have Vps public IP as their outgoing IP.

Incoming traffic is forwarded by Vps over same VPN connection to `server-gw` and from there to `www` for HTTP(S) termination and also to `younohost` service for Jitsi meet streams.

Sanbox VM network

Igor runs dedicated network (vnet) with `sanbox-gw` instance acting as default G/W for VMs connected to it. It runs Mullvad VPN and this way provides private connectivity out to the internet. There is no port forwarding into the network. The network is isolated from all other networks.

Devices & VMs

Devices

Name	IP	Location	Role	OS	Model
caroline	HOME: 192.168.1.1 (S) GUEST: 192.168.10.1 (S) SERVER: 192.168.50.1 (S) MGMT: 192.168.100.1 (S)	TV shelf over Umma	• Router • DNS • DHCP	OpenWRT	FriendlyARM NanoPI R2S
justine	HOME: 192.168.1.2 (S) MGMT: 192.168.100.2 (S)	TV shelf in the back	• VPN router • WireGuard • DNS (PiHole)	Void Linux	Slimbook Zero; i3-8145U; 4GB
sandbox-gw	HOME: 192.168.1.5 (S) SERVER: 192.168.50.175 (DHCP) sandbox: 172.20.0.1 (S)	Network cabinet	• Router and VPN G/W for VM in sandbox network	Void Linux	Igor VM
goro	MGMT: 192.168.100.10 (S)	Network cabinet	• VLAN switch	OpenWRT	Netgear GS110TPv3
zook	MGMT: 192.168.100.11 (S)	Behind TV	• VLAN switch	Netgear	Netgear (24 port)

haru	MGMT: 192.168.100.20 (S)	Hotpress room	• Wi-Fi access point	OpenWRT	UniFi AC HD
hifumi	HOME: 192.168.1.202 (DHCP/?)	Office desk	• Print server (CUPS)	Void Linux	FriendlyARM NanoPI R2S
igor	HOME: 192.168.0.50 (S) SERVER: 192.168.100.50 (S)	Network cabinet	• VM server • www VM • Yuno Host VM	Proxmox/Ubuntu	Dell OptiPlex 7050 micro i7-6700T
umma	HOME: 192.168.1.8 (S)	NAS	• NFS, SMB • HTTP • iSCSI	DiskStation Manager	Sunology DS716+
ann	HOME: 192.168.1.174 (DHCP/S)	TV shelf top	• Multi media (Kodi) • Game (Batocera) • VNC (Void Linux)	Depending on USB key used	Dell
nami	HOME: 192.168.1.216 (S)	TV		Android TV	Philips
zummi	HOME: 192.168.1.175 (S)	TV		Firefox OS	Panasonic

VMs

Name	**IP**	**Host**	**Role**	**OS**

www	SERVER: 192.168.50.159 (DHCP/S)	igor	• Web server / proxy (Caddi)	Void Linux
yunohost	SERVER: 192.168.50.137 (DHCP/S)	igor	• YunoHost apps	Ubuntu
zabbix	HOME: 192.168.0.40 (S) SERVER: 192.168.50.40 (S) MGMT: 192.168.100.40 (S)	igor	• Monitoring	AlmaLinux

VPS

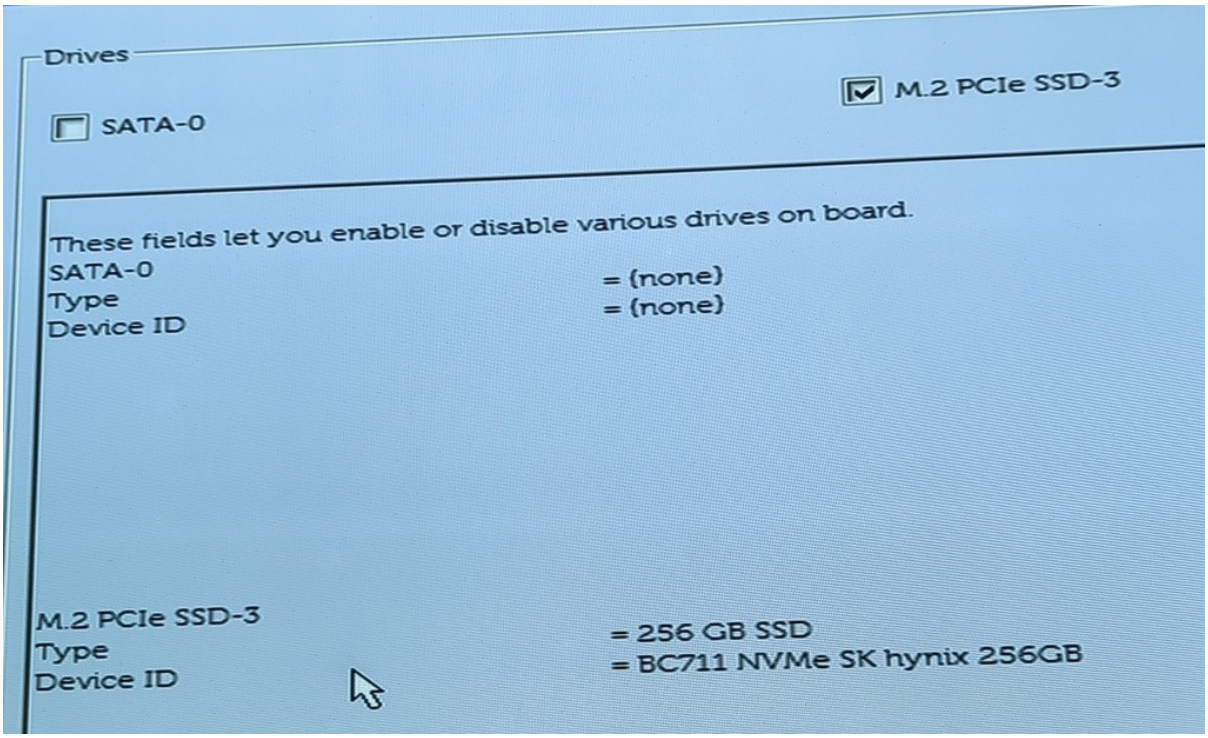
Name	**IP**	**Location**	**Role**	**OS**	**Type**
vps	IPv4: `57.128.183.232` IPv6: `fe80::f816:3eff:fe78:d4a7/64`	London `os-uk2`	• Terminate HTTP and VPN-in to lab networks	AlmaLinux 9	`vps2020-starter-1-2-20` (1 vcore, 2 GiB RAM, 20 GB HDD)

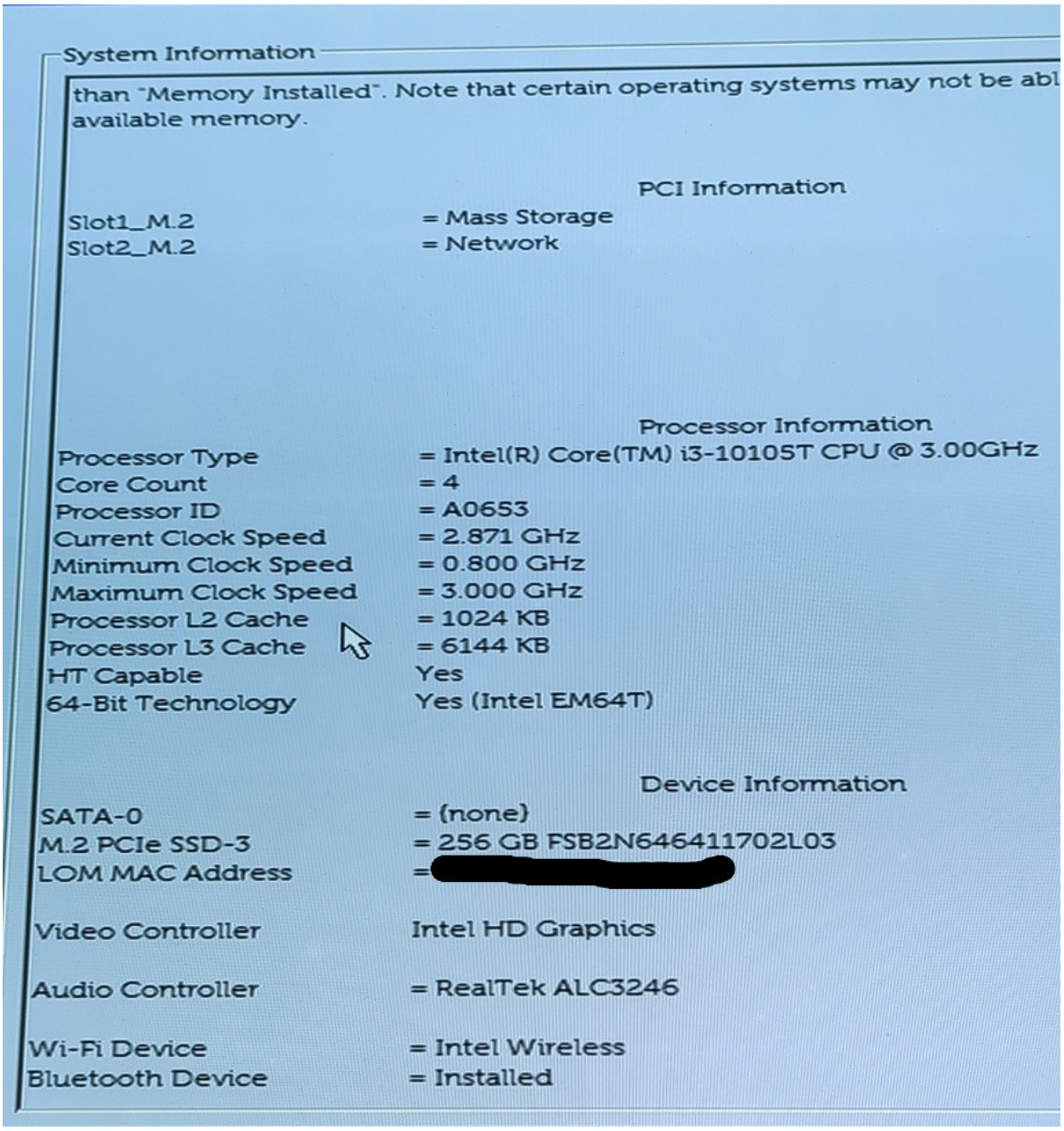
Hardware Specs

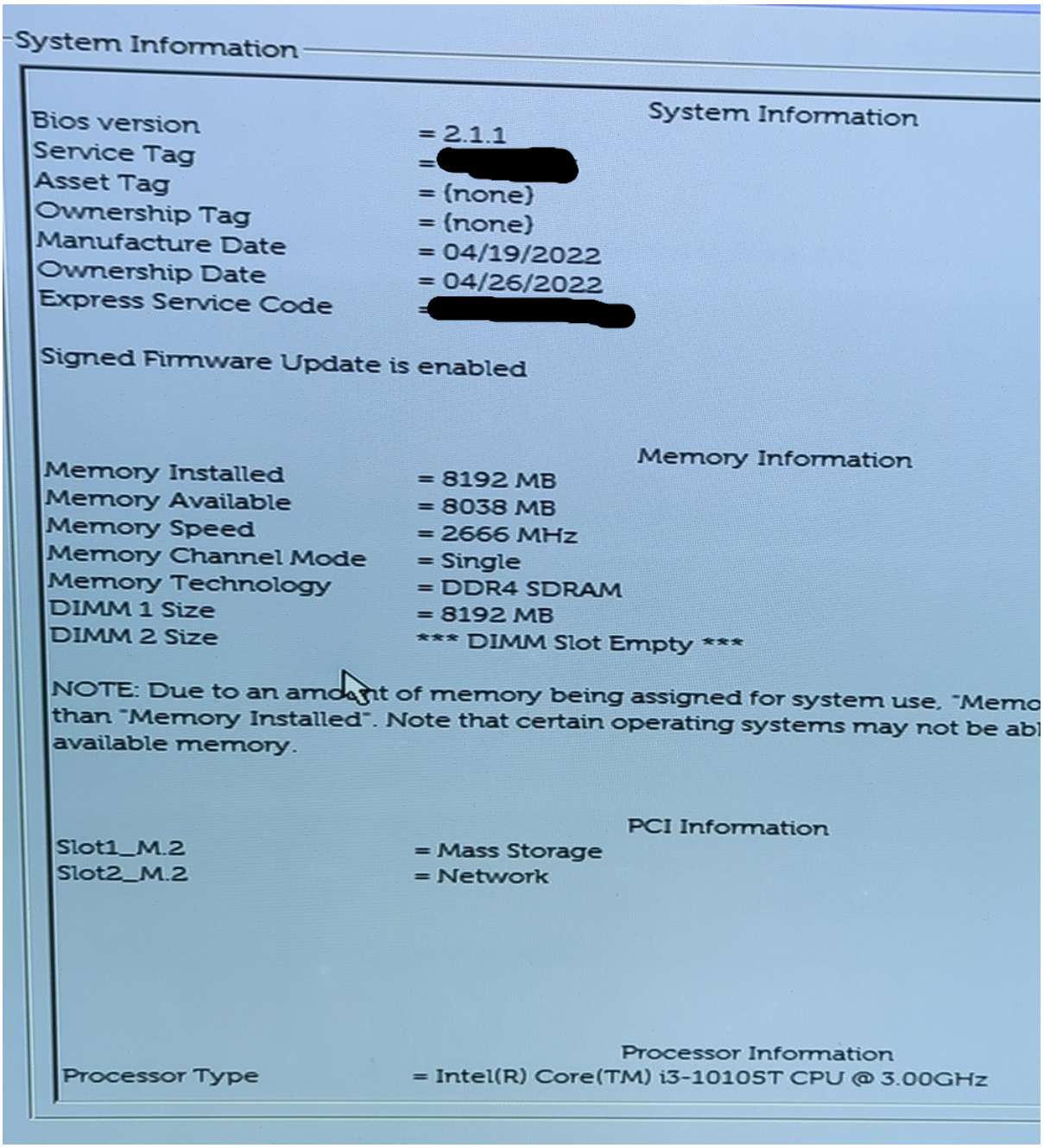
Hardware Specs

Ann

BIOS




System Information
than "Memory Installed". Note that certain operating systems may not be abl
available memory.
PCI Information
Slot1_M.2 = Mass Storage
Slot2_M.2 = Network
Processor Information
Processor Type = Intel(R) Core(TM) i3-10105T CPU @ 3.00GHz
Core Count = 4
Processor ID = A0653
Current Clock Speed = 2.871 GHz
Minimum Clock Speed = 0.800 GHz
Maximum Clock Speed = 3.000 GHz
Processor L2 Cache = 1024 KB
Processor L3 Cache = 6144 KB
HT Capable Yes
64-Bit Technology Yes (Intel EM64T)
Device Information
SATA-0 = (none)
M.2 PCIe SSD-3 = 256 GB FSB2N646411702L03
LOM MAC Address = [redacted]
Video Controller Intel HD Graphics
Audio Controller = RealTek ALC3246
Wi-Fi Device = Intel Wireless
Bluetooth Device = Installed



Hardware

RAM

- 1x 8GB 1Rx16 PC4-3200AA SOSIMM SK hynix
- DDR4-3200 (1600MHz) PC4-25600
- SODIMM DDR4 Synchronous 3200 MHz (0.3 ns)
- HMAA1GS6CJR6N-XN


SK hynix
CHINA
8GB 1Rx16 PC4 – 3200AA – SC0 – 13
HMAA1GS6CJR6N – XN N0 AC 2145
[redacted]
UK
CA
ECO

SSD


SK hynix
[redacted]
SSD(固態硬碟)
CAN ICES-3(B)/NMB-3(B)
BC711 NVMe SK hynix 256GB
S/N [redacted]
D P/N 0KFV6T WW : 2207
M/N(型號) : HFM256GD3GX013N BC
RATED(額定) : DC + 3.3V 2.5A
KR-0KFV6T-SK500-22L-0HFB-A03
R-R-HNX-BC711M230S
[redacted]
FW : 41002131
[redacted]
PSID : GRHZDACD F0000EGN
RLWS1448 C159222M
C
M.2 PCIe SSD-3
SATA-0

WiFi/BT

OS reported

```
    product: OptiPlex 3090 (0B8A)
    vendor: Dell Inc.
    serial: XXXX
    width: 64 bits
    capabilities: smbios-3.2.0 dmi-3.2.0 smp vsyscall32
    configuration: boot=normal chassis=desktop family=OptiPlex sku=0B8A uuid=XXX
  *-core
       description: Motherboard
       product: 02459H
       vendor: Dell Inc.
       physical id: 0
       version: A00
       serial: XXXX
     *-firmware
          description: BIOS
          vendor: Dell Inc.
          physical id: 0
```

```
          version: 2.1.1
          date: 12/13/2021
          size: 64KiB
          capacity: 32MiB
          capabilities: pci pnp upgrade shadowing cdboot bootselect edd int13floppy1200
int13floppy720 int13floppy2880 int5printscreen int9keyboard int14serial int17printer acpi usb
biosbootspecification netboot uefi
     *-memory
          description: System Memory
          physical id: 9
          slot: System board or motherboard
          size: 8GiB
        *-bank:0
             description: SODIMM DDR4 Synchronous 3200 MHz (0.3 ns)
             product: HMAA1GS6CJR6N-XN
             vendor: Hynix Semiconductor (Hyundai Electronics)
             physical id: 0
             serial: XXXX
             slot: DIMM1
             size: 8GiB
             width: 64 bits
             clock: 3200MHz (0.3ns)
        *-bank:1
             description: [empty]
             physical id: 1
             slot: DIMM2
     *-pci
          description: Host bridge
          product: 10th Gen Core Processor Host Bridge/DRAM Registers
          vendor: Intel Corporation
          physical id: 100
          bus info: pci@0000:00:00.0
          version: 03
          width: 32 bits
          clock: 33MHz
          configuration: driver=skl_uncore
          resources: irq:0
        *-display
             description: VGA compatible controller
             product: CometLake-S GT2 [UHD Graphics 630]
```

```
             vendor: Intel Corporation
             physical id: 2
             bus info: pci@0000:00:02.0
             version: 03
             width: 64 bits
             clock: 33MHz
             capabilities: pciexpress msi pm vga_controller bus_master cap_list rom
             configuration: driver=i915 latency=0
             resources: irq:135 memory:d0000000-d0ffffff memory:c0000000-cfffffff
ioport:4000(size=64) memory:c0000-dffff
        *-generic:0 UNCLAIMED
             description: System peripheral
             product: Xeon E3-1200 v5/v6 / E3-1500 v5 / 6th/7th/8th Gen Core Processor
Gaussian Mixture Model
             vendor: Intel Corporation
             physical id: 8
             bus info: pci@0000:00:08.0
             version: 00
             width: 64 bits
             clock: 33MHz
             capabilities: msi pm cap_list
             configuration: latency=0
             resources: memory:d1323000-d1323fff
        *-network
             description: Wireless interface
             product: Comet Lake PCH CNVi WiFi
             vendor: Intel Corporation
             physical id: 14.3
             bus info: pci@0000:00:14.3
             logical name: wlan0
             version: 00
             serial: c4:03:a8:e8:a7:79
             width: 64 bits
             clock: 33MHz
             capabilities: pm msi pciexpress msix bus_master cap_list ethernet physical
wireless
             configuration: broadcast=yes driver=iwlwifi driverversion=6.3.13_1
firmware=74.a5e9588b.0 QuZ-a0-hr-b0-74.u latency=0 link=no multicast=yes wireless=IEEE 802.11
             resources: irq:19 memory:d1314000-d1317fff
        *-pci:0
```

```
              description: PCI bridge
              product: Comet Lake PCI Express Root Port #17
              vendor: Intel Corporation
              physical id: 1b
              bus info: pci@0000:00:1b.0
              version: f0
              width: 32 bits
              clock: 33MHz
              capabilities: pci pciexpress msi pm normal_decode bus_master cap_list
              configuration: driver=pcieport
              resources: irq:122 memory:d1200000-d12fffff
            *-nvme
                 description: NVMe device
                 product: BC711 NVMe SK hynix 256GB
                 vendor: SK hynix
                 physical id: 0
                 bus info: pci@0000:01:00.0
                 logical name: /dev/nvme0
                 version: 41002131
                 serial: XXXX
                 width: 64 bits
                 clock: 33MHz
                 capabilities: nvme pm msi msix pciexpress nvm_express bus_master cap_list
                 configuration: driver=nvme latency=0 nqn=nqn.2022-02.com.skhynix:nvme:nvm-
subsystem-sn-XXXX state=live
                 resources: irq:16 memory:d1200000-d1203fff memory:d1205000-d1205fff
memory:d1204000-d1204fff
               *-namespace:0
                    description: NVMe disk
                    physical id: 0
                    logical name: hwmon0
               *-namespace:1
                    description: NVMe disk
                    physical id: 2
                    logical name: /dev/ng0n1
               *-namespace:2
                    description: NVMe disk
                    physical id: 1
                    bus info: nvme@0:1
                    logical name: /dev/nvme0n1
```

```
                  size: 238GiB (256GB)
                  capabilities: gpt-1.00 partitioned partitioned:gpt
                  configuration: guid=XXX logicalsectorsize=512 sectorsize=512 wwid=XXX
               *-volume
                    description: EFI partition
                    physical id: 1
                    bus info: nvme@0:1,1
                    logical name: /dev/nvme0n1p1
                    logical name: /mnt/nvme
                    serial: XXXX
                    capacity: 238GiB
                    configuration: mount.fstype=btrfs
mount.options=rw,relatime,ssd,discard=async,space_cache=v2,subvolid=5,subvol=/ state=mounted
        *-pci:1
             description: PCI bridge
             product: Intel Corporation
             vendor: Intel Corporation
             physical id: 1c
             bus info: pci@0000:00:1c.0
             version: f0
             width: 32 bits
             clock: 33MHz
             capabilities: pci pciexpress msi pm normal_decode bus_master cap_list
             configuration: driver=pcieport
             resources: irq:123 ioport:3000(size=4096) memory:d1100000-d11fffff
          *-network
               description: Ethernet interface
               product: RTL8111/8168/8411 PCI Express Gigabit Ethernet Controller
               vendor: Realtek Semiconductor Co., Ltd.
               physical id: 0
               bus info: pci@0000:02:00.0
               logical name: eth0
               version: 1b
               serial: XXXX
               size: 1Gbit/s
               capacity: 1Gbit/s
               width: 64 bits
               clock: 33MHz
               capabilities: pm msi pciexpress msix vpd bus_master cap_list ethernet physical
tp mii 10bt 10bt-fd 100bt 100bt-fd 1000bt-fd autonegotiation
```

```
                configuration: autonegotiation=on broadcast=yes driver=r8169
driverversion=6.3.13_1 duplex=full firmware=rtl8168h-2_0.0.2 02/26/15 ip=192.168.0.176
latency=0 link=yes multicast=yes port=twisted pair speed=1Gbit/s
                resources: irq:16 ioport:3000(size=256) memory:d1104000-d1104fff
memory:d1100000-d1103fff
```

```
Architecture:            x86_64
  CPU op-mode(s):        32-bit, 64-bit
  Address sizes:         39 bits physical, 48 bits virtual
  Byte Order:            Little Endian
CPU(s):                  8
  On-line CPU(s) list:   0-7
Vendor ID:               GenuineIntel
  BIOS Vendor ID:        Intel(R) Corporation
  Model name:            Intel(R) Core(TM) i3-10105T CPU @ 3.00GHz
    BIOS Model name:     Intel(R) Core(TM) i3-10105T CPU @ 3.00GHz  CPU @ 2.8GHz
    BIOS CPU family:     206
    CPU family:          6
    Model:               165
    Thread(s) per core:  2
    Core(s) per socket:  4
    Socket(s):           1
    Stepping:            3
    CPU(s) scaling MHz:  91%
    CPU max MHz:         3900.0000
    CPU min MHz:         800.0000
    BogoMIPS:            6000.00
    Flags:               fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat
pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm
constant_tsc art arch_perfmon pebs bts
                          rep_good nopl xtopology nonstop_tsc cpuid aperfmperf pni pclmulqdq
dtes64 monitor ds_cpl vmx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid sse4_1 sse4_2 x2apic
movbe popcnt tsc_deadline_tim
                         er aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault
epb invpcid_single ssbd ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid
ept_ad fsgsbase tsc_adjust b
                         mi1 avx2 smep bmi2 erms invpcid mpx rdseed adx smap clflushopt
intel_pt xsaveopt xsavec xgetbv1 xsaves dtherm ida arat pln pts hwp hwp_notify hwp_act_window
hwp_epp md_clear flush_l1d arc
                         h_capabilities
```

```
Virtualization features:
  Virtualization:        VT-x
Caches (sum of all):
  L1d:                   128 KiB (4 instances)
  L1i:                   128 KiB (4 instances)
  L2:                    1 MiB (4 instances)
  L3:                    6 MiB (1 instance)
NUMA:
  NUMA node(s):          1
  NUMA node0 CPU(s):     0-7
Vulnerabilities:
  Itlb multihit:         KVM: Mitigation: VMX disabled
  L1tf:                  Not affected
  Mds:                   Not affected
  Meltdown:              Not affected
  Mmio stale data:       Vulnerable: Clear CPU buffers attempted, no microcode; SMT vulnerable
  Retbleed:              Mitigation; Enhanced IBRS
  Spec store bypass:     Mitigation; Speculative Store Bypass disabled via prctl
  Spectre v1:            Mitigation; usercopy/swapgs barriers and __user pointer sanitization
  Spectre v2:            Mitigation; Enhanced / Automatic IBRS, IBPB conditional, RSB filling,
PBRSB-eIBRS SW sequence
  Srbds:                 Vulnerable: No microcode
  Tsx async abort:       Not affected
```

Igor

Resources

- Manual: optiplex-7050-desktop-micro-owners-manual-en-us.pdf

Hardware

- Model: Dell OptiPlex 7050 micro
- CPU: Intel Core i7-6700T (QC/8MB/8T/2.8GHz/35W)
- RAM: 16GB
- Disk: 2 TB SSD

CPU

- Installed: Intel Core i7-6700T (QC/8MB/8T/2.8GHz/35W)
- Available:
  - Intel Core i3-6100 (DC/3MB/4T/3.7GHz/65W)
  - Intel Core i3-6100T (DC/3MB/4T/3.2GHz/35W)
  - Intel Core i5-6400T (QC/ 6MB/4T/2.2GHz/35W)
  - Intel Core i5-6500 (QC/6MB/4T/3.2GHz/65W)
  - Intel Core i5-6500T (QC/6MB/4T/2.5GHz/35W)
  - Intel Core i5-6600 (QC/6MB/4T/3.3GHz/65W)
  - Intel Core i5-6600T (QC/6MB/4T/2.7GHz/35W)
  - Intel Core i7-6700 (QC/8MB/8T/3.4GHz/65W)
  - Intel Core i7-6700T (QC/8MB/8T/2.8GHz/35W)
  - Intel Core i3-7100 (DC/3MB/4T/3.9GHz/65W)
  - Intel Core i3-7100T (DC/3MB/4T/3.5GHz/35W)
  - Intel Core i3-7300T (DC/4MB/4T/3.5GHz/35W)
  - Intel Core i5-7400T (QC/ 6MB/4T/2.4GHz/35W)
  - Intel Core i5-7500 (QC/6MB/4T/3.4GHz/65W)
  - Intel Core i5-7500T (QC/6MB/4T/2.7GHz/35W)
  - Intel Core i5-7600 (QC/6MB/4T/3.5GHz/65W)
  - Intel Core i5-7600T (QC/6MB/4T/2.8GHz/35W)
  - Intel Core i7-7700 (QC/8MB/8T/3.6GHz/65W)
  - Intel Core i7-7700T (QC/8MB/8T/2.9GHz/35W) - 12% faster than installed

RAM

- Installed: 16GB - 2x 8GB
- Max: 32GB
- Type: SODIMM DDR4 2400 MT/s (running 2133 MT/s)

```
root@igor2:~# dmidecode --type memory
# dmidecode 3.4
Getting SMBIOS data from sysfs.
SMBIOS 3.0.0 present.

Handle 0x0009, DMI type 16, 23 bytes
Physical Memory Array
	Location: System Board Or Motherboard
	Use: System Memory
	Error Correction Type: None
	Maximum Capacity: 32 GB
	Error Information Handle: Not Provided
	Number Of Devices: 2

Handle 0x000A, DMI type 17, 40 bytes
Memory Device
	Array Handle: 0x0009
	Error Information Handle: Not Provided
	Total Width: 64 bits
	Data Width: 64 bits
	Size: 8 GB
	Form Factor: SODIMM
	Set: None
	Locator: DIMM1
	Bank Locator: Not Specified
	Type: DDR4
	Type Detail: Synchronous Unbuffered (Unregistered)
	Speed: 2400 MT/s
	Manufacturer: 802C0000802C
	Serial Number: xxxx
	Asset Tag: xxxxx
	Part Number: 8ATF1G64HZ-2G3B1
	Rank: 1
	Configured Memory Speed: 2133 MT/s
```

	Minimum Voltage: Unknown
	Maximum Voltage: Unknown
	Configured Voltage: 1.2 V

Handle 0x000B, DMI type 17, 40 bytes
Memory Device
	Array Handle: 0x0009
	Error Information Handle: Not Provided
	Total Width: 64 bits
	Data Width: 64 bits
	Size: 8 GB
	Form Factor: SODIMM
	Set: None
	Locator: DIMM2
	Bank Locator: Not Specified
	Type: DDR4
	Type Detail: Synchronous Unbuffered (Unregistered)
	Speed: 2400 MT/s
	Manufacturer: 802C0000802C
	Serial Number: xxxxx
	Asset Tag: xxxx
	Part Number: 8ATF1G64HZ-2G3B1
	Rank: 1
	Configured Memory Speed: 2133 MT/s
	Minimum Voltage: Unknown
	Maximum Voltage: Unknown
	Configured Voltage: 1.2 V

Device Setup

Justine

Interfaces

enp1s0

- HOME VLAN; untagged

```
ip link set enp1s0 up
ip addr replace 192.168.1.2/24 dev enp1s0
ip route add default via 192.168.1.1 dev enp1s0
```

mgmt@enp1s0

- MGMT VLAN; tagged VLAN 100

```
ip link add link enp1s0 name mgmt type vlan id 100
ip link set mgmt up
ip addr replace 192.168.100.2/24 dev mgmt
```

docker0

- 172.18.0.1/16

Set up automatically by docker.

Docker namespaces use virtual interface that gets bridged with docker0.

Routing

Forwarding

Enabled but packets dropped by default on firewall.

```
sysctl net.ipv4.ip_forward=1
iptables -P FORWARD DROP
```

Mullvad

Mullvad VPN outgoing traffic is MASQUERADEed for it to get Mullvad assigned internal IP.

```
# Mullvad gateway
iptables -t nat -A POSTROUTING -s 192.168.1.0/24 -o mullvad -j MASQUERADE
iptables -t nat -A POSTROUTING -s 172.17.1.0/24 -o mullvad -j MASQUERADE
```

When Mullvad VPN is up/down additional firewall rules are added:

```
PostUp = iptables -A FORWARD -o mullvad -i enp1s0 -j ACCEPT && iptables -A FORWARD -i mullvad
-o enp1s0 -j ACCEPT
PreDown = iptables -D FORWARD -o mullvad -i enp1s0 -j ACCEPT && iptables -D FORWARD -i mullvad
-o enp1s0 -j ACCEPT
```

This will allow forwarding between mullvad (VPN) and enp1s0 (HOME) networks.

Vpn

When this WireGuard endpoint is enabled additional rules are added:

```
PostUp = iptables -A FORWARD -o vpn -i enp1s0 -j ACCEPT && iptables -A FORWARD -i vpn -o
enp1s0 -j ACCEPT && iptables -A FORWARD -o vpn -i mullvad -j ACCEPT && iptables -A FORWARD -i
vpn -o mullvad -j ACCEPT
PreDown = iptables -D FORWARD -o vpn -i enp1s0 -j ACCEPT && iptables -D FORWARD -i vpn -o
enp1s0 -j ACCEPT && iptables -D FORWARD -o vpn -i mullvad -j ACCEPT && iptables -D FORWARD -i
vpn -o mullvad -j ACCEPT
```

This will allow:

1. vpn users to access local network (HOME),
2. vpn users to access the internet via mullvad VPN interface.

Docker

Allow traffic from Docker (IPHole) to be originating from justine IP if routed through default HOME VLAN gateway (caroline) - this is when VPN is turned off to keep DNS working.

```
# VPN gateway (used if mullvad is stopped)
iptables -t nat -A POSTROUTING -s 172.17.1.1/24 -o enp1s0 -j MASQUERADE
```

> PIHole uses Mullvad's hosted DNS server at: 193.138.218.74. It is accessible over VPN and also without it.

> Any DNS port 53 packet going over Mullvad VPN will be SNAT'ed to Mullvads DNS server transparently to prevent DNS leaks. This means that running DNS resolved (unbind) makes no sense since all DNS requests will end up on Mullvad's server anyway.

Local networks

Allow access to other local networks via caroline:

```
ip route add 192.168.1.0/16 dev enp1s0 via 192.168.1.1
```

VPN

Outpost

- caroline UDP port: `34564`
- justine UDP port: `51822`

Used for devices to connect in to Justine (no forwarding is set up currently).

vpn

- caroline UDP port: `34563`
- justine UDP port: `51821`

For all devices to VPN-in to the G/W from internal networks and also from the internet.

VPN access from outside the network

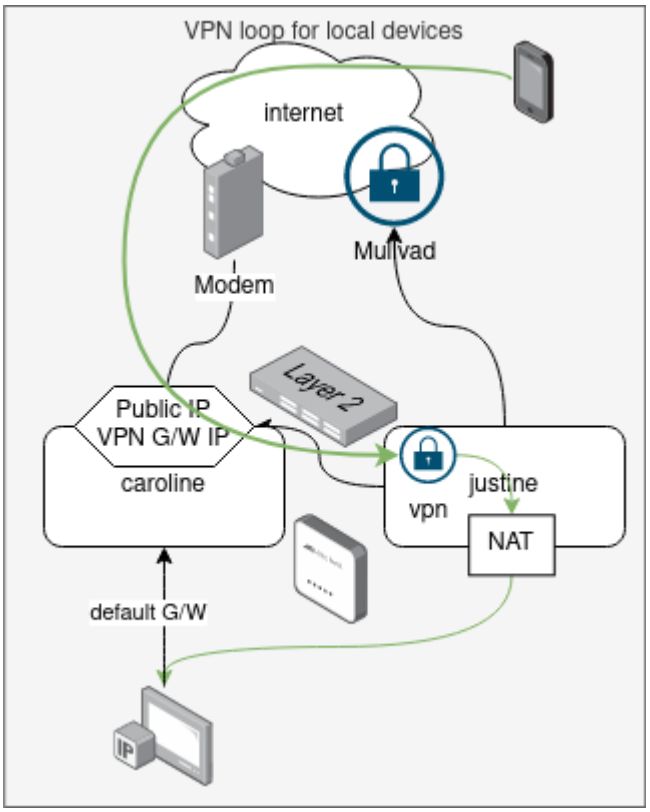
> DEPRECATED: This is no longer the case as I don't have ability to forward IPv4 ports into the network or set ISP router in bridge mode.

> TODO: Document how VPN connection is established from Justine to Vps and there incoming VPN connections are forwarded back to Justine. Justine to not route this connection to Vps via mullvad...

```
iptables -t nat -A POSTROUTING -s 172.17.1.0/24 -o enp1s0 -j MASQUERADE
```

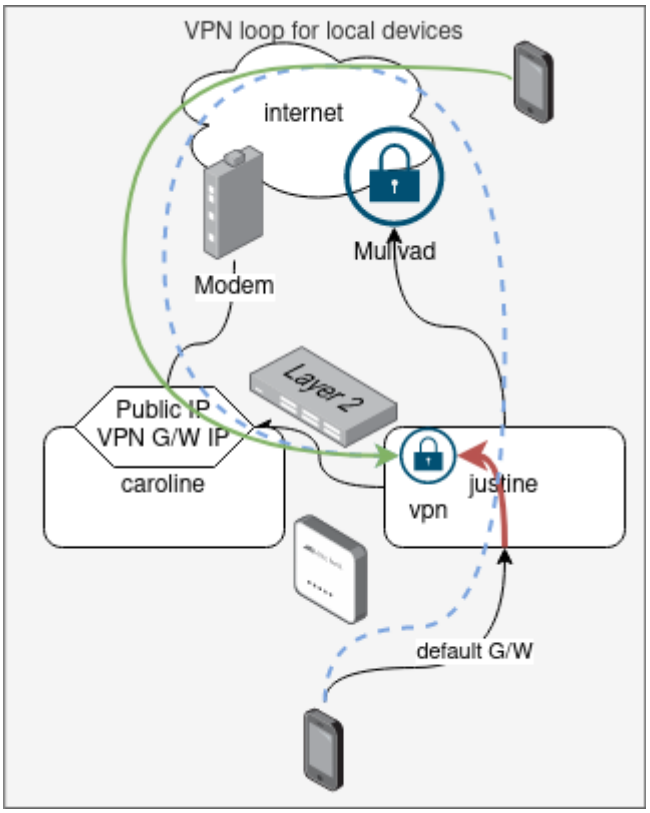
Traffic from VPN (`172.17.1.0/24`) needs to be MASQUERADE'ed when going out to internal network because there are devices configured with **caroline** as default G/W. Also **justine**, when not connected to Mullvad will use **caroline** as default G/W.

This means that all traffic from external devices will looks like coming from **caroline**.



VPN access from withing the network

Devices like laptop or phone will be on always-on home VPN. This means that they will be connecting to VPN via public IP to reach justine.



This entry will capture attempt from devices that route via justine (default G/W `192.168.1.2`) to justine to prevent traffic going out to Mullvad and comming back to caroline and down to justine.

```
iptables -t nat -A PREROUTING -s 192.168.1.0/16 -d 57.128.183.232 -p udp --dport 34563 -j DNAT
--to-destination 192.168.1.2:51821
```

> The /16 prefix is used so this rule captures all internal subnets.

> Public IP in the rule will need to be updated if it ever changes! This IP is the IP of VPN endpoint - caroline public DHCP assigned IP/Virgin Media IP.

> MYSTERY
> - this only gets few packet hit, so bulk traffic is bypassing this rule
> - when connected to MGMT with laptop the traffic to HOME network is slow, looks like it is going through the loop

Hifumi: Printer server

Hardware - R2S

Network

- `eth0` - RTL8211E
- `eth1` - RTL8153

The RTL8153 device needs MAC assignment as it will use random value by default:

/etc/udev/rules.d/10-network-mac-addr.rules

```
SUBSYSTEM=="net", ACTION=="add", KERNEL=="eth1", PROGRAM="/sbin/ip link set %k address
8a:f4:c8:41:48:35"
```

Leds

Make red sys led bright when we have booted to runit:

/etc/runit/core-services/03-_led.sh

```
echo "1" > /sys/class/leds/nanopi-r2s:red:sys/brightness
```

Make red sys to blink on SD card activity and wan/lan on data transfers between eth0 and eth1 (GUEST/internet network access):

/etc/rc.local

```
modprobe ledtrig-netdev
echo "netdev" > /sys/class/leds/nanopi-r2s:green:lan/trigger
```

```
echo "eth0" > /sys/class/leds/nanopi-r2s:green:lan/device_name
echo "1" > /sys/class/leds/nanopi-r2s:green:lan/link
echo "1" > /sys/class/leds/nanopi-r2s:green:lan/tx
echo "0" > /sys/class/leds/nanopi-r2s:green:lan/rx
echo "netdev" > /sys/class/leds/nanopi-r2s:green:wan/trigger
echo "eth1" > /sys/class/leds/nanopi-r2s:green:wan/device_name
echo "1" > /sys/class/leds/nanopi-r2s:green:wan/link
echo "1" > /sys/class/leds/nanopi-r2s:green:wan/tx
echo "0" > /sys/class/leds/nanopi-r2s:green:wan/rx
echo "mmc0" > /sys/class/leds/nanopi-r2s:red:sys/trigger
```

Printer setup

Configure and unpause all printers

```
#!/bin/sh -x
lpstat -le | grep ' permanent ' | cut -f1 -d' ' | while read P; do
lpadmin -p "$P" -o printer-error-policy=retry-current-job
lpadmin -p "$P" -o printer-is-shared=true
lpadmin -p "$P" -E
done
```

Printer status

```
lpstat -t
```

Guest VLAN bridge

This will bride `eth0` to GUEST VLAN (10) on `eth1`.

in `/etc/rc.local`:

```
ip link set eth0 addrgenmode none up
ip link add link eth1 name guest type vlan id 10
ip link add br-guest type bridge
```

```
ip link set guest master br-guest
ip link set eth0 master br-guest addrgenmode none
ip link set br-guest addrgenmode none up
```

Prevent DHCP from running on `eth0`.

In `/etc/sv/dhcpcd/conf`:

```
OPTS="-M --denyinterfaces eth0"
```

Ann: Minecraft Server

Server setup

Java install:

```
xi openjdk21-jre
xbps-alternatives -s openjdk21-jre
```

Generic fabric server

Download correct server JAR from: https://fabricmc.net/use/server/

Run script (fix the jar file name):

```
#!/bin/sh
exec java -Xmx4G -jar fabric-server-mc.1.20.1-loader.0.14.22-launcher.0.11.2.jar nogui
```

EULA file `eula.txt`:

```
#By changing the setting below to TRUE you are indicating your agreement to our EULA
(https://account.mojang.com/documents/minecraft_eula).
#Mon May 02 18:35:52 IST 2022
eula=true
```

Server settings `server.properties`:

```
#Minecraft server properties
#Sat Jun 01 12:08:44 IST 2024
enable-jmx-monitoring=false
level-seed=xxx
rcon.port=25575
enable-command-block=false
gamemode=survival
enable-query=false
```

```
generator-settings={}
enforce-secure-profile=true
level-name=HxD
motd=HxD Mods
query.port=25565
pvp=false
generate-structures=true
max-chained-neighbor-updates=1000000
difficulty=normal
network-compression-threshold=256
require-resource-pack=false
max-tick-time=60000
max-players=20
use-native-transport=true
enable-status=true
online-mode=true
allow-flight=true
initial-disabled-packs=
broadcast-rcon-to-ops=true
view-distance=12
resource-pack-prompt=
server-ip=
allow-nether=true
server-port=25565
enable-rcon=true
sync-chunk-writes=true
op-permission-level=4
prevent-proxy-connections=false
hide-online-players=false
resource-pack=
entity-broadcast-range-percentage=100
simulation-distance=10
player-idle-timeout=0
rcon.password=xxx
force-gamemode=false
rate-limit=0
hardcore=false
white-list=false
broadcast-console-to-ops=true
```

```
spawn-npcs=true
previews-chat=false
spawn-animals=true
function-permission-level=2
initial-enabled-packs=vanilla,fabric
level-type=minecraft\:normal
text-filtering-config=
spawn-monsters=true
enforce-whitelist=false
resource-pack-sha1=
spawn-protection=16
max-world-size=29999984
```

Backups

Backup script :

```
#!/bin/fish
install -d backup
set LEVEL (cat server.properties | grep '^level-name=' | cut -d= -f2)
tar cv "$LEVEL" | zstd > "backup/"(date -Ins)"-$LEVEL.tar.zstd"
ls -tr backup/*-$LEVEL.tar.zstd | head -n -10 | while read F
  rm -v "$F"
end
```

Master backup script - assuming server games are in `games` directory and there is a `minecraft` runit service set up:

```
#!/bin/sh
sudo sv stop minecraft
sudo sv stop minecraft || exit 1
sync
cd games/`ls games/*/logs/latest.log -t | head -n1 | awk -F '/' '{print $2}'`/ && ./backup.sh
echo syncing...
sync
```

Autostart Minecraft client

```
#!/bin/sh
sleep 2
notify-send -u normal -a autostart -r 99001 "Waiting for controller..."
while ! bluetoothctl info AC:FD:93:98:FE:F7 | grep -q 'Connected: yes'; do echo -n "."; sleep
1; done
notify-send -u normal -a autostart -r 99001 "Waiting for network..."
while ! ping -c 1 -q microsoft.com >/dev/null; do echo -n 'x'; sleep 1; done
notify-send -u low -a autostart -r 99001 "Running Minecraft"
cd bin/MultiMC && ./run.sh
```

```
#!/bin/sh
exec ./MultiMC --launch 'HxD Mods III' --server localhost:25565 --profile $PROFILE_NAME
```

Using rcon

XBPS template:

```
# Template file for 'mcrcon'
pkgname=mcrcon
version=0.7.2
revision=0
build_style=gnu-makefile
short_desc="Console based Minecraft rcon client for remote administration and server
maintenance scripts"
maintainer="Orphaned <orphan@voidlinux.org>"
license="Zlib"
homepage="https://sourceforge.net/projects/mcrcon/"
distfiles="https://github.com/Tiiffi/mcrcon/archive/refs/tags/v${version}.tar.gz"
checksum=1743b25a2d031b774e805f4011cb7d92010cb866e3b892f5dfc5b42080973270
```

Install: `xi mcrcon`

```
#!/bin/sh
MCRCON_HOST=localhost MCRCON_PORT=25575 MCRCON_PASS=xxxxx mcrcon
```

Allow-listing players

```
whitelist add player123
whitelist list
```

VM setup

- IP: `192.168.50.152`
- port: `25565` rcon: `25575`

> Needed to set MTU to 1400 to fix authentication issues with MS server

In `/etc/rc.local`:

```
# curl -v https://13.107.246.52 --insecure
ip link set eth0 mtu 1400
```

Igor

Network

After reboot need to add default route manually for Igor to find access to internet.

```
ip route add default via 192.168.100.1
```

Backups

Local

They run to `/var/lib/vz/dump` which is the root volume that has 94GB in total so only keep 2 backups max.

Umma over SMB

Backups go to SMB mount at `/mnt/pve/umma` on Igor that mounts `Igor` share from Umma.

Failing backups

Looks like compression is not on the fly but it first dumps data uncompressed and then runs compression which fails on SMB mount... https://community.nethserver.org/t/proxmox-help-needed-proxmox-backup-ends-with-broken-pipe/18537/2

Can set where the "temp" file is created so it goes to local drive first:

/etc/vzdump.conf

```
tmpdir: /var/lib/vz/dump/temp
```

This is not true for VM backups... I see files with `.dat` created during backup where size matches compressed size and "tmpdir" is not used much.

Looks like the problem is on CIFS level:

```
[9092263.225010] CIFS: Attempting to mount \\192.168.0.8\Igor
[9092263.385599] CIFS: VFS: parse_server_interfaces: malformed interface info
[9092318.751704] CIFS: VFS: \\192.168.0.8 Error -104 sending data on socket to server
[9092318.925726] CIFS: reconnect tcon failed rc = -11
[9092329.032446] CIFS: VFS: \\192.168.0.8 Error -32 sending data on socket to server
[9092338.103933] CIFS: VFS: \\192.168.0.8 Error -104 sending data on socket to server
[9092348.628780] CIFS: VFS: \\192.168.0.8 Error -32 sending data on socket to server
[9092358.347996] CIFS: VFS: \\192.168.0.8 Error -104 sending data on socket to server
[9092368.365350] CIFS: VFS: \\192.168.0.8 Error -32 sending data on socket to server
[9092368.367144] CIFS: VFS: \\192.168.0.8 Error -512 sending data on socket to server
[9092378.738559] CIFS: VFS: \\192.168.0.8 Error -104 sending data on socket to server
[9092379.353289] CIFS: VFS: No writable handle in writepages rc=-11
...
[9092379.387539] CIFS: VFS: No writable handle in writepages rc=-9[9092768.976150] CIFS: VFS:
\\192.168.0.8 Error -32 sending data on socket to server
[9092788.488714] CIFS: VFS: \\192.168.0.8 Error -104 sending data on socket to server
[9092788.936658] CIFS: VFS: \\192.168.0.8 Error -104 sending data on socket to server
...
```

On Umma I have checked:

- Disable multiple connection from the same IP address
- Enable asynchronous read (auto select for next option)
- Enable SMB3 Multichannel

And now I don't get `parse_server_interfaces: malformed interface info` and full backup worked with no errors.

Umma disks can't hibernate

Every 10 seconds Igor probes disk causing Umma to log:

```
User [igor] from [IGOR(192.168.0.50)] via [CIFS(SMB3)] accessed shared folder [Igor].
```

This is known issue https://forum.proxmox.com/threads/high-rate-access-the-smb-shared-folder.140759/ and complete disregard from ProxMox devs :/

The probing stops when storage is disable, and starts when re-enabled.

```
pvesm set umma --disable true
pvesm set umma --disable false
```

I have set up crontab jobs to enable/disable storage around backup time `crontab -e`:

```
SHELL=/bin/sh
PATH=/usr/local/sbin:/usr/local/bin:/sbin:/bin:/usr/sbin:/usr/bin

55 1 * * mon pvesm set umma --disable false
0 4 * * mon pvesm set umma --disable true
```

Alternatively disable connection checking (require a reboot/pve services restart):

> Make sure you can access ProxMox via SSH. If you make a mistake PVE services may fail to start and there won't be UI available.

```
--- /usr/share/perl5/PVE/Storage/CIFSPlugin.pm.orig 2024-02-26 17:50:07.546260476 +0000
+++ /usr/share/perl5/PVE/Storage/CIFSPlugin.pm 2024-02-26 18:06:23.136144956 +0000
@@ -254,6 +254,7 @@
     }
 }

+=begin
 sub check_connection {
     my ($class, $storeid, $scfg) = @_;

@@ -287,6 +288,7 @@

     return 1;
 }
+=cut

 # FIXME remove on the next APIAGE reset.
 # Deprecated, use get_volume_attribute instead.
```

Igor: Zabbix

Templates

- Synology DiskStation SNMPv3 (modified): Synology DiskStation SNMPv3.yaml
- Switch Interfaces SNMPv2: Switch Interfaces SNMPv2.yaml

Ann: Kodi

SSL certificate for web UI

1. Put certificate in `/storage/.kodi/userdata/server.pem` (*pem*) and key in `/storage/.kodi/userdata/server.key` (unencrypted; *pem*)
2. Go to **Settings** / **Services** / **Control** and turn on **Enable SSL**.

Device Setup

OVH VPS

Since I no longer have public IPv4 assigned to my modem/router and no way to enable modem/bridge mode I use VPS to terminate incoming traffic for HTTP and VPN-in.

- Type: VPS `vps2020-starter-1-2-20` (1 vcore, 2 GiB RAM, 20 GB HDD)
- Location: London `os-uk2`
- OS: AlmaLinux 9
- IPv4: `57.128.183.232`
- IPv6: `fe80::f816:3eff:fe78:d4a7/64`

Justine (`172.17.100.3`) and Server-gw (`172.17.100.2`) establish VPN connection to it on port `51322` using `172.17.100.1/24` VPS.

```
[Interface]
PrivateKey = <REDACTED>
MTU = 1380
ListenPort = 51322
Address = 172.17.100.1/24

[Peer]
PublicKey = PTu13g5XRIVt+i1DL3g5QujHwL6TJaHkC9z8Kw7pwQE=
AllowedIPs = 172.17.100.2/32
PersistentKeepalive = 300

[Peer]
PublicKey = EnRj9UgoE1qyQ9qK9OU3jZ39tpAo24FTZMdT6nQN0wY=
AllowedIPs = 172.17.100.3/32
PersistentKeepalive = 300
```

IP tables configuration is used to forward packets to Justine and Server-gw:

```
iptables -P INPUT DROP
iptables -A INPUT ! -i vps -d 172.17.100.0/24 -j DROP
iptables -A INPUT -p icmp -j ACCEPT
iptables -A INPUT -m state --state RELATED,ESTABLISHED -j ACCEPT
iptables -A INPUT -m tcp -p tcp --dport 22 -m recent --rcheck --seconds 30 --name SSH -j
ACCEPT
```

```
iptables -A INPUT -m tcp -p tcp --dport <REDACTED> -m recent --set --name SSH -j DROP
iptables -A INPUT -p udp -m udp --dport 51322 -j ACCEPT

sysctl net.ipv4.ip_forward=1
iptables -P FORWARD DROP
iptables -A FORWARD -o vps -i eth0 -j ACCEPT
iptables -A FORWARD -i vps -o eth0 -j ACCEPT

iptables -t nat -A POSTROUTING -o eth0 -j MASQUERADE
iptables -t nat -A POSTROUTING -o vps -d 172.17.100.3 -j MASQUERADE
iptables -t nat -A PREROUTING -i eth0 -p tcp --dport 80 -j DNAT --to-destination
172.17.100.2:80
iptables -t nat -A PREROUTING -i eth0 -p tcp --dport 443 -j DNAT --to-destination
172.17.100.2:443
iptables -t nat -A PREROUTING -i eth0 -p tcp --dport 4443 -j DNAT --to-destination
172.17.100.2:4443
iptables -t nat -A PREROUTING -i eth0 -p udp --dport 10000 -j DNAT --to-destination
172.17.100.2:10000
iptables -t nat -A PREROUTING -i eth0 -p tcp --dport 25565 -j DNAT --to-destination
172.17.100.2:25565
iptables -t nat -A PREROUTING -i eth0 -p udp --dport 34563 -j DNAT --to-destination
172.17.100.3:51821
iptables -t nat -A PREROUTING -i eth0 -p udp --dport 34564 -j DNAT --to-destination
172.17.100.3:51822
```

Vps acts as VPN router for all traffic for Server-gw and by extension for all SERVER VLAN hosts. This way enter and exit IP for servers is the public IP of Vps. Servers can also see original client IP as it is not NATed on the way in.

For VPN-in Vps will NAT connections to Justine since Justine uses Mullvad or ISP IP as default G/W.

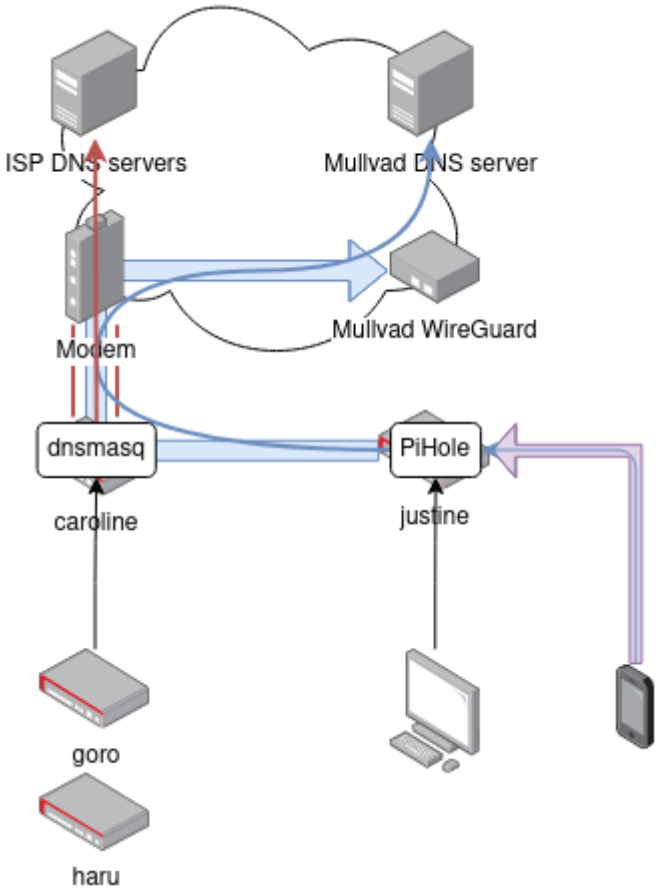
Blocking forwarded traffic

```
ipset create forward-drop hash:net
iptables -I FORWARD 1 -m set --match-set forward-drop src -j DROP
```

List IP and add IP to block list:

```
ipset list
ipset add forward-drop 66.249.0.0/16
```

DNS



DNS provider settings

Host	Provider	Method	IP
caroline	ISP provided	dnsmasq	127.0.0.1
justine	Mullvad	resolv.conf	193.138.218.74
haru	caroline / ISP	resolv.conf	192.168.100.1
goro	caroline / ISP	resolv.conf	192.168.100.1
HOME DHCP devices	justine / PiHole / Mullvad	DHCP	192.168.1.2
VPNed DHCP devices	justine/ PiHole / Mullvad	DHCP	172.17.1.1

Troubleshooting

Known problems

Default G/W for Igor

Igor can't find it's local network:

```
hxd@morgana ~/net> ssh -J igor.lan 192.168.50.159
channel 0: open failed: connect failed: open failed
stdio forwarding failed
kex_exchange_identification: Connection closed by remote host
Connection closed by UNKNOWN port 65535
```

Use web UI to access console and exec as root:

```
ip route add default via 192.168.100.1
```

Troubleshooting

Default G/W for Igor

Igor can't find it's local network:

```
hxd@morgana ~/net> ssh -J igor.lan 192.168.50.159
channel 0: open failed: connect failed: open failed
stdio forwarding failed
kex_exchange_identification: Connection closed by remote host
Connection closed by UNKNOWN port 65535
```

Use web UI to access console and exec as root:

```
ip route add default via 192.168.100.1
```

TCP dump

Installing on OpenWRT:

```
opkg update
opkg install tcpdump
```

DHCP

```
tcpdump -vvv -i any udp port 67 and port 68
```

Network Issues

Wi-Fi slow

Slow access to HOME from laptop on MGMT wi-fi.

UPDATE: 2023-10-28

Looks like laptop gets very low Rx rate (throughput from haru to Morgana) of ~17Mbit or even 6Mbit:

```
iperf3 -c 192.168.100.20 -p 2345 -R -t 9999
Connecting to host 192.168.100.20, port 2345
Reverse mode, remote host 192.168.100.20 is sending
[  5] local 192.168.100.161 port 42966 connected to 192.168.100.20 port 2345
[ ID] Interval           Transfer     Bitrate
[  5]   0.00-1.00   sec  1.75 MBytes  14.7 Mbits/sec
[  5]   1.00-2.00   sec  1.64 MBytes  13.8 Mbits/sec
[  5]   2.00-3.00   sec  1.64 MBytes  13.8 Mbits/sec
[  5]   3.00-4.00   sec  1.55 MBytes  13.0 Mbits/sec
[  5]   4.00-5.00   sec  1.62 MBytes  13.6 Mbits/sec
[  5]   5.00-6.00   sec  1.63 MBytes  13.6 Mbits/sec
^C[  5]   6.00-6.14   sec   252 KBytes  14.4 Mbits/sec
- - - - - - - - - - - - - - - - - - - - - - - - -
[ ID] Interval           Transfer     Bitrate
[  5]   0.00-6.14   sec  0.00 Bytes  0.00 bits/sec                  sender
[  5]   0.00-6.14   sec  10.1 MBytes  13.8 Mbits/sec                  receiver
```

At the same time I get like 60Mbit sending data out:

```
iperf3 -c 192.168.100.20 -p 2345 -t 9999
Connecting to host 192.168.100.20, port 2345
[  5] local 192.168.100.161 port 45200 connected to 192.168.100.20 port 2345
[ ID] Interval           Transfer     Bitrate         Retr  Cwnd
[  5]   0.00-1.00   sec  10.1 MBytes  85.0 Mbits/sec    0    469 KBytes
[  5]   1.00-2.00   sec  6.71 MBytes  56.3 Mbits/sec    0    469 KBytes
[  5]   2.00-3.00   sec  7.08 MBytes  59.4 Mbits/sec    0    502 KBytes
[  5]   3.00-4.00   sec  6.40 MBytes  53.7 Mbits/sec    0    529 KBytes
[  5]   4.00-5.00   sec  7.77 MBytes  65.2 Mbits/sec    0    529 KBytes
[  5]   5.00-6.00   sec  7.77 MBytes  65.2 Mbits/sec    0    529 KBytes
[  5]   6.00-7.00   sec  7.01 MBytes  58.8 Mbits/sec    0    587 KBytes
[  5]   7.00-8.00   sec  8.47 MBytes  71.0 Mbits/sec    0    621 KBytes
^C[  5]   8.00-8.40   sec  2.41 MBytes  50.4 Mbits/sec    0    621 KBytes
- - - - - - - - - - - - - - - - - - - - - - - - -
[ ID] Interval           Transfer     Bitrate         Retr
[  5]   0.00-8.40   sec  63.8 MBytes  63.7 Mbits/sec    0             sender
[  5]   0.00-8.40   sec  0.00 Bytes  0.00 bits/sec                  receiver
```

Haru reports low MCS values of 10 or lower.

Server	SSID	Channel	Client	Location	Client -> Server Mbit	Server <- Client Mbit	
Justine	Haru Legacy	6	L (android)	living room	25	25	
Justine	Haru Legacy	6	futaba	living room	21	9	
Justine	Haru Legacy	6	futaba	kitchen	25	10	
Justine	Haru Legacy	6	futaba	by Haru	26	11	
Justine	Haru Legacy	11	futaba	living room	26	11	
Justine	Haru MGMT	11	morgana	living room	53	23	
Justine	Haru Legacy	6	morgana	living room	50	11	
Justine	Haru	?	morgana	living room	89	72	
Justine	Haru (IE)	52	morgana	living room	95	95	
Justine	Haru MGMT (IE)	11	morgana	living room	92	92	

Justine	Haru MGMT (IE)	11	morgana	kitchen	95	94	
Justine	Haru (IE/1G)	11	morgana	kitchen	53	321	*1
Justine	Haru MTMT (IE/1G)	52	morgana	kitchen	44	92	*1

*1 - both washing and drying going on

Config changes:

- Set max power to 30dBm
  - channel switched to 5 (was 6): 15-25 on morgana and 13 on futaba
  - channel 11: 10 to 25 on moragna, 16 on futaba
- Setting region to IE(!):
  - 95/95 morgana -> justine over Haru channel 52
  - BINGO!: 92/92 on MGMT channel 11
  - This get me to 100Mbit; but I get much higher rates reported for wifi like 866/780 Mbit on Haru
- eth0 on Speed: 100Mb/s!
  - Looks like faulty cable but I also rebooted Haru so could be that as well, although on secondary port I was getting 1Gbit with laptop before restart.
  - goro reports only lan8 (haru) at 100Mbit/s but others at 1Gbit

```
Mon Oct 30 19:30:27 2023 kern.info kernel: [8584550.111467] RTL8380 Link change: status: 1, ports 8000
Mon Oct 30 19:30:28 2023 kern.info kernel: [8584550.992936] rtl83xx-switch switch@1b000000 lan8: Link is Up - 100Mbps/Full - flow control rx/tx
Mon Oct 30 19:30:28 2023 kern.info kernel: [8584551.003123] switch: port 8(lan8) entered blocking state
Mon Oct 30 19:30:28 2023 kern.info kernel: [8584551.009306] switch: port 8(lan8) entered forwarding state
Mon Oct 30 19:30:28 2023 daemon.notice netifd: Network device 'lan8' link is up
```

  - I have replaced the cable and now have 1Gbps

```
Mon Oct 30 20:32:29 2023 kern.info kernel: [8588272.090512] rtl83xx-switch switch@1b000000 lan8: Link is Up - 1Gbps/Full - flow control rx/tx
```

UPDATE: 2023-11-05

There was a packet drop between Haru and Goro. I have replaced the cable that goes from Goro to power supply (for Haru).

After replacing the cable link dropped to 100Mbps, reconnecting it got me 1Gbit.

I have also switched channels for 5GHz radio to use:

- channel: 104 (5520MHz)
- width: 160MHz

Now everything is very fast. In kitchen I got 356/407 Mbps using Haru!

UPDATE: 2023-11-11

After power issue the network went up in bad state.

I was getting 300Mbit one way and only 46Mbit and high packet loss the other way.

I decided to route another cable to Haru.

Looks like Primary interface is the only one that can take power so I left it connected to the power supply but disconnected it from the swich.

New, longer cable now connects switch to Haru Secondary port which is part of a bridge setup with Primary port so no configuration changes was needed.

Now I am getting up from Morgana in kitchen 657Mbit and down 334Mbit from Justine.

DHCP no responses, no IP assigned

Looks like Graphene OS uses random MAC for every connection attempt to Haru:

```
13:34:45.185659 IP 0.0.0.0.68 > 255.255.255.255.67: BOOTP/DHCP, Request from
b2:7f:5d:03:bf:61, length 288
13:34:46.144502 IP 0.0.0.0.68 > 255.255.255.255.67: BOOTP/DHCP, Request from
b2:7f:5d:03:bf:61, length 288
13:34:48.135488 IP 0.0.0.0.68 > 255.255.255.255.67: BOOTP/DHCP, Request from
b2:7f:5d:03:bf:61, length 288
13:34:52.237864 IP 0.0.0.0.68 > 255.255.255.255.67: BOOTP/DHCP, Request from
b2:7f:5d:03:bf:61, length 288
13:35:00.303513 IP 0.0.0.0.68 > 255.255.255.255.67: BOOTP/DHCP, Request from
b2:7f:5d:03:bf:61, length 288
13:35:10.015298 IP 0.0.0.0.68 > 255.255.255.255.67: BOOTP/DHCP, Request from
8a:ba:ab:74:33:23, length 288
13:35:11.105965 IP 0.0.0.0.68 > 255.255.255.255.67: BOOTP/DHCP, Request from
8a:ba:ab:74:33:23, length 288
13:35:13.292155 IP 0.0.0.0.68 > 255.255.255.255.67: BOOTP/DHCP, Request from
8a:ba:ab:74:33:23, length 288
```

```
13:35:17.375826 IP 0.0.0.0.68 > 255.255.255.255.67: BOOTP/DHCP, Request from
8a:ba:ab:74:33:23, length 288
13:35:24.972812 IP 0.0.0.0.68 > 255.255.255.255.67: BOOTP/DHCP, Request from
8a:ba:ab:74:33:23, length 288
13:43:05.585122 IP 0.0.0.0.68 > 255.255.255.255.67: BOOTP/DHCP, Request from
5a:88:7a:60:55:fd, length 288
13:43:06.607297 IP 0.0.0.0.68 > 255.255.255.255.67: BOOTP/DHCP, Request from
5a:88:7a:60:55:fd, length 288
13:43:08.473318 IP 0.0.0.0.68 > 255.255.255.255.67: BOOTP/DHCP, Request from
5a:88:7a:60:55:fd, length 288
13:43:12.547523 IP 0.0.0.0.68 > 255.255.255.255.67: BOOTP/DHCP, Request from
5a:88:7a:60:55:fd, length 288
13:43:21.310413 IP 0.0.0.0.68 > 255.255.255.255.67: BOOTP/DHCP, Request from
5a:88:7a:60:55:fd, length 288
13:43:27.942393 IP 0.0.0.0.68 > 255.255.255.255.67: BOOTP/DHCP, Request from
ca:9a:d3:13:a3:1c, length 288
13:43:28.860544 IP 0.0.0.0.68 > 255.255.255.255.67: BOOTP/DHCP, Request from
ca:9a:d3:13:a3:1c, length 288
13:43:30.774370 IP 0.0.0.0.68 > 255.255.255.255.67: BOOTP/DHCP, Request from
ca:9a:d3:13:a3:1c, length 288
13:43:34.697002 IP 0.0.0.0.68 > 255.255.255.255.67: BOOTP/DHCP, Request from
ca:9a:d3:13:a3:1c, length 288
13:43:43.292732 IP 0.0.0.0.68 > 255.255.255.255.67: BOOTP/DHCP, Request from
ca:9a:d3:13:a3:1c, length 288
```

This may lead to depletion of IP addresses (pool has up to 150 to allocate).

To clean up the pool SSH to Caroline:

```
service dnsmasq stop
mv /tmp/dhcp.leases /tmp/dhcp.leases.bac
service dnsmasq start
```

To mitigate the issue I have reduced leas time from 30 days to 24 hours.

VPN clients coming from outside are NAT'ed

They will looks like **justine**, not their actual VPN IP, since devices can use **caroline** as their default G/W.

No access to SERVER VLAN from HOME with justine G/W

VPN clients can access justine MGMT interface IP

```
11:06:10.811023 vpn   In  IP 172.17.1.10 > 192.168.100.2: ICMP echo request, id 44951, seq
814, length 64
11:06:10.811041 vpn   Out IP 192.168.100.2 > 172.17.1.10: ICMP echo reply, id 44951, seq 814,
length 64
```

I have set up more strict forwarding rules:

```
Chain FORWARD (policy DROP 52 packets, 4368 bytes)
num   pkts bytes target     prot opt in     out     source               destination
9       35  5441 ACCEPT     all  --  enp1s0 vpn     192.168.0.0/24       0.0.0.0/0
10      32  5244 ACCEPT     all  --  vpn    enp1s0  0.0.0.0/0            192.168.0.0/24
```

but this does not help.

This is because it is not going through FORWARD but through INPUT:

```
iptables -A INPUT -i vpn -d 192.168.100.0/24 -j LOG
```

```
[604557.640819] IN=vpn OUT= MAC= SRC=172.17.1.10 DST=192.168.100.2 LEN=84 TOS=0x00 PREC=0x00
TTL=64 ID=56812 DF PROTO=ICMP TYPE=8 CODE=0 ID=44951 SEQ=1064
```

Adding the above rule will block it. But is this normal that any IP assigned to any interface can be used when routing to a G/W?

> FIXED: I have added the following rule:

```
iptables -A INPUT ! -i mgmt -d 192.168.100.0/24 -j DROP
```

> FOLLOWUP: Is this the same for other devices? Try static route to them and access MGMT IP.

```
ip route add 192.168.100.50 via 192.168.0.50 dev wlan0
```

And it will ping on 192.168.100.50. So services bound only to 192.168.100.50 will be exposed to HOME VLAN devices.

> CONCLUSION: Binding to selected IP address does not protect service from being accessed from another network interface without extra firewall rule to prevent this!

What makes localhost (`lo`) interface special - services bound to it are not accessible from other interfaces? It has `local` routing tables set up by default.

Same problem for caroline

Same with **caroline:**

```
ip route add 192.168.100.1 via 192.168.0.1 dev wlan0
```

I can now access https://192.168.100.1/cgi-bin/luci/ while on HOME VLAN, probably will work form SERVER and any other as well!

> FIXED: DROP all INPUT on all interfaces apart from MGMT. Added ACCEPT rules for LAN, GUEST and SERVER VLANs for DHCP (UDP 67), DNS (TCP/UDP: 53) and ICMP.

> I could not use the negative interface setup as in case of justine. Probably should use default INPUT DROP on justine as well and only allow mgmt interface traffic as well.

Would this be same for goro and haru?

They don't have IP on HOME network but they have interface. Injecting packet for MGMT IP to their HOME interface may be (using MAC/ARP) possible but they would not respond since they have no routing to HOME network?

Access to web services from internal network

Need to manually add static route for devices using default DHCP G/W (justine) when going to local server services like video.hexadust.net.

```
ip route add 46.7.126.16 dev eth0 via 192.168.0.1
ping video.hexadust.net
```

Things to try:

1. Try to push static routes from DHCP - this did not work for some reason

2. Set up static route on justine
3. Set up SNAT on justnie
4. Use bridge layer DNAT: https://ebtables.netfilter.org/br_fw_ia/br_fw_ia.html
5. Set up split DNS
    1. `video.hexadust.net 192.168.50.159`
    2. This would require justine to forward to SERVER VLAN since ann uses 0.2 as default G/W
6. Set up separate DNS for internal access

No more IPs on DHCP

Looks like Horizon box eats up leases: https://www.boards.ie/discussion/2057720465/my-new-virgin-media-stb-issued-two-lan-i-ps

I have removed leases from /var/lib/dhcp.lease file on caroline.

Justine access is laggy; DNS is slow

Happens after OpenWRT updates.

Try disconnecting and connecting network cables for Haru and uplink on goro.

UPDATE: 2023-11-05: I have replaced both cables that connect Haru and Goro. The link tends to drop to 100Mbit if Goro end is disconnected, reconnecting fixes it.

Igor does not set it's default route after boot

While it is configured in web UI it is not taking effect on boot and results in it unable to find local network. VMs stuff will work OK though.

TODO

YunoHost access to internet via default IP instead of VPN

Not good for IRC etc.

1. Clone the VM and put copy in HOME VLAN, remove public web stuff from it, remove web clients from SERVER VLAN one.
2. Better yet. Create DMZ VLAN that has only access to Caroline and will run `www` server. Use SERVER VLAN to only have access to Justine, so out traffic goes out of the VPN, add interface to YunoHost that is in DMZ VLAN so that it can get requests from www server, but have it default G/W to use Justine over DMZ?
3. Create SANDBOX VLAN that only has access to justine as G/W.
4. Create VM that connects to Justinve via WireGuard and pit it in HOME network and in virtual network that it will be G/W for, put other VMs in that sandbox virtual network.
5. Create VM that uses SERVER VLAN to make connection to Mullvad (dedicated key) and act as a G/W for sandbox virtual network for other VMs.

24/09: WWW access very slow

Downloading file from www server (Caddy) is slow.

Phone over 5G with VPN (to justine): ~1-2 MB/s

Phone over Haru with VPN: ~2-3 MB/s

From laptop (VPN + Mullvad): ~3 MB/s [NOTE: Even using local SERVER IP it goes over Mullvad IP!]

```
> curl --insecure -o /dev/null --connect-to 192.168.50.159:443
https://jpastuszek.net/links/data --http1.1
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
  1  412M    1 5216k    0     0  50859      0  2:21:39  0:01:45  2:19:54 63055
```

From laptop but using port 8080 (darkhttpd) and no TLS: ~38 MB/s [NOTE: NAT'ed by 192.168.0.2 justine]

```
> curl --insecure -o /dev/null http://192.168.50.159:8080/links/data
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100  412M  100  412M    0     0  37.9M      0  0:00:10  0:00:10 --:--:-- 38.0M
```

From SDF: ~1 MB/s

```
$ curl -o /dev/null https://jpastuszek.net/links/data --http1.1
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
```

```
                                 Dload  Upload   Total   Spent    Left  Speed
  5  412M    5 22.8M    0     0   884k      0  0:07:57  0:00:26  0:07:31  957k^C

$ curl -o /dev/null https://jpastuszek.net/links/data
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
  2  412M    2 11.9M    0     0   796k      0  0:08:49  0:00:15  0:08:34 1007k
```

From Igor VM in the same VLAN (SERVER): ~85 MB/s

```
hxd@void ~> curl --insecure -o /dev/null --connect-to 192.168.50.159:443
https://jpastuszek.net/links/data --http1.1
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100  412M  100  412M    0     0  84.8M      0  0:00:04  0:00:04 --:--:-- 87.0M
hxd@void ~> curl --insecure -o /dev/null --connect-to 192.168.50.159:443
https://jpastuszek.net/links/data
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100  412M  100  412M    0     0  83.7M      0  0:00:04  0:00:04 --:--:-- 85.6M
```

Same but to dakrhttpd (no TLS): ~700 MB/s:

```
> curl --insecure -o /dev/null http://192.168.50.159:8080/links/data
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100  412M  100  412M    0     0   691M      0 --:--:-- --:--:-- --:--:--  691M
```

iperf3 between laptop and www: 300 Mbit/s, 37 MB/s [NOTE: it is NAT'ed by 192.168.0.2 justine]

```
hxd@morgana /tmp [1]> iperf3 -c 192.168.50.159 -t 9999 -R
Connecting to host 192.168.50.159, port 5201
Reverse mode, remote host 192.168.50.159 is sending
[  5] local 172.17.1.10 port 42964 connected to 192.168.50.159 port 5201
[ ID] Interval           Transfer     Bitrate
[  5]   0.00-1.00   sec  34.2 MBytes   287 Mbits/sec
[  5]   1.00-2.00   sec  33.1 MBytes   278 Mbits/sec
[  5]   2.00-3.00   sec  35.1 MBytes   295 Mbits/sec
[  5]   3.00-4.00   sec  35.0 MBytes   294 Mbits/sec
^C[  5]   4.00-4.17   sec  5.75 MBytes   289 Mbits/sec
- - - - - - - - - - - - - - - - - - - - - - - - -
```

```
[ ID] Interval           Transfer     Bitrate
[  5]   0.00-4.17   sec  0.00 Bytes  0.00 bits/sec                  sender
[  5]   0.00-4.17   sec   143 MBytes   288 Mbits/sec                  receiver
iperf3: interrupt - the client has terminated
hxd@morgana /tmp [1]> iperf3 -c 192.168.50.159 -t 9999
Connecting to host 192.168.50.159, port 5201
[  5] local 172.17.1.10 port 34608 connected to 192.168.50.159 port 5201
[ ID] Interval           Transfer     Bitrate         Retr  Cwnd
[  5]   0.00-1.00   sec  48.1 MBytes   403 Mbits/sec   35    508 KBytes
[  5]   1.00-2.00   sec  51.8 MBytes   434 Mbits/sec    0    577 KBytes
[  5]   2.00-3.00   sec  55.4 MBytes   465 Mbits/sec    0    643 KBytes
^C[  5]   3.00-3.69   sec  38.0 MBytes   462 Mbits/sec    0    684 KBytes
- - - - - - - - - - - - - - - - - - - - - - - - -
[ ID] Interval           Transfer     Bitrate         Retr
[  5]   0.00-3.69   sec   193 MBytes   439 Mbits/sec   35             sender
[  5]   0.00-3.69   sec  0.00 Bytes  0.00 bits/sec                  receiver
iperf3: interrupt - the client has terminated
```

```
root@www ~# iperf3 -s
-----------------------------------------------------------
Server listening on 5201 (test #1)
-----------------------------------------------------------
^[[1;5CAccepted connection from 192.168.0.2, port 42948
[  5] local 192.168.50.159 port 5201 connected to 192.168.0.2 port 42964
[ ID] Interval           Transfer     Bitrate         Retr  Cwnd
[  5]   0.00-1.00   sec  36.2 MBytes   304 Mbits/sec   99    514 KBytes
[  5]   1.00-2.00   sec  33.4 MBytes   280 Mbits/sec   64    419 KBytes
[  5]   2.00-3.00   sec  34.5 MBytes   289 Mbits/sec    0    477 KBytes
[  5]   3.00-4.00   sec  35.0 MBytes   294 Mbits/sec    0    528 KBytes
[  5]   3.00-4.00   sec  35.0 MBytes   294 Mbits/sec    0    528 KBytes
- - - - - - - - - - - - - - - - - - - - - - - - -
[ ID] Interval           Transfer     Bitrate         Retr
[  5]   0.00-4.00   sec   145 MBytes   304 Mbits/sec  163             sender
iperf3: the client has terminated
-----------------------------------------------------------
Server listening on 5201 (test #2)
-----------------------------------------------------------
Accepted connection from 192.168.0.2, port 34604
[  5] local 192.168.50.159 port 5201 connected to 192.168.0.2 port 34608
[ ID] Interval           Transfer     Bitrate
```

```
[  5]   0.00-1.00   sec  44.8 MBytes   375 Mbits/sec
[  5]   1.00-2.00   sec  52.2 MBytes   438 Mbits/sec
[  5]   2.00-3.00   sec  54.5 MBytes   457 Mbits/sec
[  5]   2.00-3.00   sec  54.5 MBytes   457 Mbits/sec
- - - - - - - - - - - - - - - - - - - - - - - - -
[ ID] Interval           Transfer     Bitrate
[  5]   0.00-3.00   sec   191 MBytes   533 Mbits/sec                  receiver
iperf3: the client has terminated
-----------------------------------------------------------
Server listening on 5201 (test #3)
-----------------------------------------------------------
```

Some requests from Morgana to WWW are very slow, like 45KB/s while most are fast 3MB/s:

```
 146.70.189.27:36190   192.168.50.159:443    ESTABLISHED  0s     82 KB/s

hxd@morgana /tmp> time curl -o /dev/null https://wiki.hexadust.net/attachments/15
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100 3460k  100 3460k    0     0  53464      0  0:01:06  0:01:06 --:--:-- 78502


_____________________________________________________
Executed in   66.28 secs      fish           external
   usr time  100.61 millis   56.00 micros  100.55 millis
   sys time   60.88 millis  705.00 micros   60.17 millis

hxd@morgana /tmp> time curl -o /dev/null https://wiki.hexadust.net/attachments/15
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100 3460k  100 3460k    0     0  2588k      0  0:00:01  0:00:01 --:--:-- 2590k


_____________________________________________________
Executed in    1.35 secs      fish           external
   usr time   52.86 millis    0.00 micros   52.86 millis
   sys time   29.61 millis  748.00 micros   28.86 millis

hxd@morgana /tmp> time curl -o /dev/null https://wiki.hexadust.net/attachments/15
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
 75 3460k   75 2598k    0     0  55139      0  0:01:04  0:00:48  0:00:16 28232^C
```

```
_____________________________________________________
Executed in   48.58 secs      fish           external
   usr time   71.12 millis  567.00 micros   70.56 millis
   sys time   54.87 millis  196.00 micros   54.67 millis
```

Requests to kernel.org are fine.

Requests from sanbox-gw are also slow - they go via Mullvad that is deployed on sandbox-gw (not via justine):

```
 146.70.189.27:35562   192.168.50.159:443    ESTABLISHED  0s     48 KB/s
> time curl -o /dev/null https://wiki.hexadust.net/attachments/15
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
 73 3460k   73 2544k    0     0  59686      0  0:00:59  0:00:43  0:00:16 62609^C
_____________________________________________________
Executed in   44.33 secs      fish           external
   usr time   67.40 millis  676.00 micros   66.72 millis
   sys time   37.12 millis    0.00 micros   37.12 millis
```

Using local route to go directly to caroline does fix the issue, so going through the internet is where the slowdown happens.

```
ip route add 46.7.126.16 dev wlp52s0 via 192.168.0.1
```

Things to try:

1. Change VPN exit node
2. Try access from non-VPN connection

Fast.com (over VPN) shows 300Mbit down and 1.2 Mbit up - this explains slow download from the server (as it is upload to the internet). Without VPN I get 300Mbit / 48Mbit - so the slow down is due to VPN.

Ping with max MTU:

```
ping -4 -M do -c 20 -s 1392 jpastuszek.net
```

Detailed connection info:

```
ss -ntpi
```

Update 2024-10-11:

- MTU looks good and is 1420 with MSS 1368.
- Ping packet loss is 30-40%
- When connections is slow we get 16% bytes re-transmitted; good connection has 0.2%
- Bad ping packet loss is on both IE endpoints

FIX: Changing VPN server did the trick.

Slow Jitsi Meet transmission

Sending out 170KB/s and receiving stream of 64KB/s (512kbit/s).

- Ann is set up to statically route to video.hexadust.net (public IP) to caroline (default G/W is justine)
- I have noticed that UDP 10000 traffic goes directly to SERV VLAN (yunohost/192.168.50.137) so it bypasses the static route and ends up going to justine
  - Added additional static route to forward directly to caroline and confirmed with tcpdump (ether host) that it works
  - This did not improve traffic/quality
  - It would have been going to justine and there to caroline I suppose, so only extra hop; it would be NAT'ed on justine though: `iptables -t nat -A POSTROUTING ! -d 192.168.0.0/24 -o enp1s0 -j MASQUERADE`
  - How did Chrome know about local SERV IP? WebRTC shares the IP?

For morgana UDP video traffic goes:

1. To VPN connection to Justine
2. On exits on justine and is NAT'ed through HOME VLAN with destination IP of younohost
3. It should go to caroline
4. Caroline routes it over SERV VLAN to younohost

With static route I can bypass VPN tunnel to justine and go directly to caroline to be VLAN routed to younohost

No 5GHz WiFi

```
phy0-ap0: DFS-RADAR-DETECTED freq=5520
```

I got radar detection triggered and after 30 minutes it tried to turn it back off but was failing; manually restarting the interface fixed the issue:

```
Mon Nov 11 20:31:03 2024 daemon.notice hostapd: phy0-ap0: DFS-NOP-FINISHED freq=5500
ht_enabled=0 chan_offset=0 chan_width=0 cf1=5500 cf2=0
```

```
Mon Nov 11 20:31:03 2024 daemon.err hostapd: could not get valid channel
Mon Nov 11 20:31:03 2024 daemon.notice hostapd: phy0-ap0: interface state DFS->DFS
Mon Nov 11 20:31:03 2024 daemon.notice hostapd: phy0-ap0: DFS-NOP-FINISHED freq=5520
ht_enabled=0 chan_offset=0 chan_width=0 cf1=5520 cf2=0
Mon Nov 11 20:31:03 2024 daemon.notice hostapd: phy0-ap0: interface state DFS->DFS
Mon Nov 11 20:31:03 2024 daemon.notice hostapd: phy0-ap0: DFS-CAC-START freq=5520 chan=104
sec_chan=-1, width=0, seg0=114, seg1=0, cac_time=60s
Mon Nov 11 20:31:03 2024 daemon.err hostapd: 20/40 MHz: center segment 0 (=114) and center
freq 1 (=5510) not in sync
Mon Nov 11 20:31:03 2024 daemon.err hostapd: Can't set freq params
Mon Nov 11 20:31:03 2024 daemon.err hostapd: DFS start_dfs_cac() failed, -1
Mon Nov 11 20:31:03 2024 daemon.notice hostapd: phy0-ap0: DFS-NOP-FINISHED freq=5540
ht_enabled=0 chan_offset=0 chan_width=0 cf1=5540 cf2=0
Mon Nov 11 20:31:03 2024 daemon.notice hostapd: phy0-ap0: interface state DFS->DFS
Mon Nov 11 20:31:03 2024 daemon.notice hostapd: phy0-ap0: DFS-CAC-START freq=5520 chan=104
sec_chan=-1, width=0, seg0=114, seg1=0, cac_time=60s
Mon Nov 11 20:31:03 2024 daemon.err hostapd: 20/40 MHz: center segment 0 (=114) and center
freq 1 (=5510) not in sync
Mon Nov 11 20:31:03 2024 daemon.err hostapd: Can't set freq params
Mon Nov 11 20:31:03 2024 daemon.err hostapd: DFS start_dfs_cac() failed, -1
```

This is a reported issue:

- https://forum.openwrt.org/t/5ghz-vht160-on-channel-100-breaks-on-radar-dfs-event-and-never-comes-back/165274
- https://forum.openwrt.org/t/center-segment-0-106-and-center-freq-1-5510-not-in-sync/164185

I have changed from channel `104` to `100` which is the start of 160MHz wide channel that I use: https://en.wikipedia.org/wiki/List_of_WLAN_channels. Not sure if this will help, the Wikipedia table suggest the center frequency for 160MHz wide channel is 114 but it cannot be selected. Looks like channel list is made for 20MHz wide channels. So selection 100 puts it as the first 20MHz channel for the 160MHz channel. *Channel Analysis* shows that my radio uses channels 100 through to 128 which matches the table on Wikipedia.

Monitoring

iperf3

Server running on:

- justine.lan (192.168.1.2)
  - running as a service
- umma.lan (192.168.1.8)
  - this is set up as docker container `networkstatic-iperf31`

Clients installed on:

- igor.lan/void VM
- morgana
- futaba

Can be installed on OpenWRT via opkg.

Void Linux service (`void/iperf`):

```
#!/usr/bin/fish

mascot-config "iperf3 server" |
mascot-config-xbps-package iperf3 installed |
mascot-config-dir "/etc/sv/iperf" present |
mascot-config-file "/etc/sv/iperf/supervise" symlink "/run/runit/supervise.iperf" |
mascot-config-file "/etc/sv/iperf/run" present --mode "u=rwx,go=rx" read (begin
	echo '#!/bin/sh'
	echo 'exec chpst -u nobody:nogroup iperf3 -s'
end | psub) |
mascot-config-runit-service \
	--require 'Delegated("XBPS package \"iperf3\"")' \
	--require 'FileContent(path:"/etc/sv/iperf/run")' \
	iperf running
```

SNMP

Host	Version	Username / Community	Protocol	Passwords	Walk example
umma.lan	v3	`snmp`	SHA/AES	`Inne/network-snmp-v3`	`snmpwalk -v3 -l authPriv -u snmp -a SHA -x AES -A (pass Inne/network-snmp-v3 | head -n 1) -X (pass Inne/network-snmp-v3 | head -n 1) 192.168.1.8`

Getting Hardware

Linux/OpenWRT router/small devices

Small devices suitable for running Linux or OpenWRT.

- https://www.friendlyelec.com - ARM devices with dual Ethernet ports - FriendlyEelec NanoPC & NanoPi
  - they ship for Singapore? so it takes few weeks
  - I used R2S and R4S with VoidLinux and OpenWRT
- https://wiki.radxa.com/Home - ARM and Atom SBCs
- https://pine64.com/product/rockpro64-4gb-single-board-computer/ - ARM SBCs, PinePhone and other stuff
  - Some stuff delivered from EU
- https://www.gl-inet.com/products/
  - OpenWRT preinstalled by default
  - EU local delivery
- https://mikrotik.com/products - network oriented devices using RouterOS but some can also run OpenWRT
- https://hackerboards.com/ - SBC directory

Passive cooled PC

NUC or similar, Atom or Celeron based PC that use only passive cooling.

- Slimbook Zero
- https://www.apu-board.de/ - PC Engines APU Boards
- https://shop.nitrokey.com/shop/product/nitropc-1-132

Thin clients

Small form factor PCs used in business and POS. Can often by bought used for cheep.

- https://www.parkytowers.me.uk/thin/hware/hardware.shtml - List of thin client PCs, specs, power usage

Shops and distributors

- https://www.okdo.com/ - UK based?