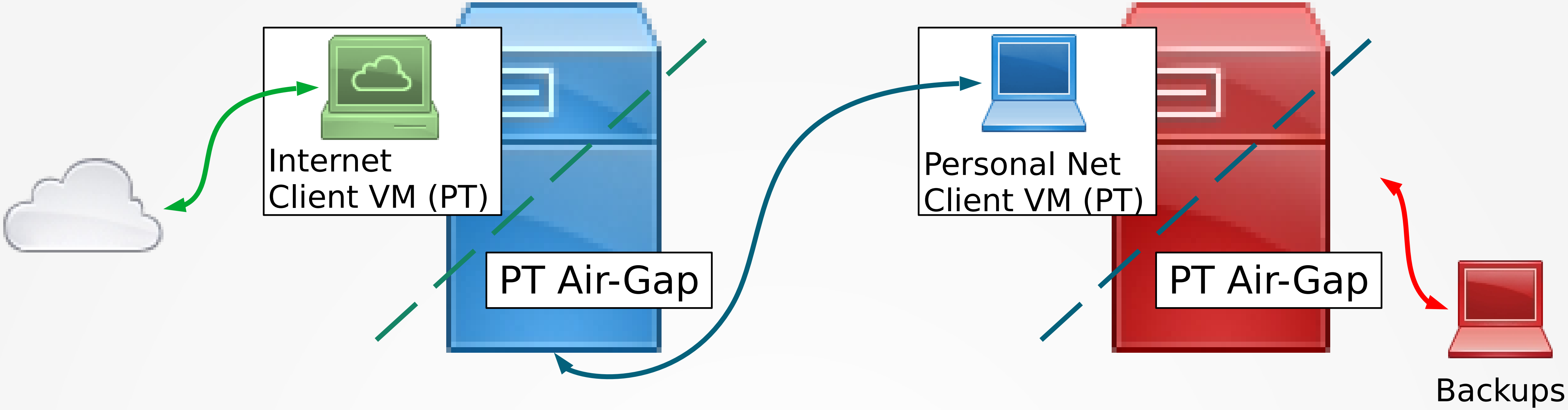


Good Fences = Good Nets

Home Air-Gap Networks via NIC Pass-Thru

Morey Hubin: SoftwareInTheWild@gmail.com

ICONS from Cisco: iconlibrary-production-oct2016.pptx

Overview

• **Network/Data Threats**	Danger Everywhere
• **NIC (to VM) Passthru**	Cheap Net Isolation
• **Hardening Simplified**	Trap Apps and Attacks
• **Use and Maintenance**	Segmented Living

Threat: Most Dangerous

Threat: Most Dangerous

- **You, Yourself & You** Self-Destruct in 3, 2, …

Threat: Most Dangerous

- **You, Yourself & You** Self-Destruct in 3, 2, …
- **Family, Friends, Guests** From Inside The House!

Threat: Most Dangerous

• **You, Yourself & You**	Self-Destruct in 3, 2, ...
• **Family, Friends, Guests**	From Inside The House!
• **Biz, Workers, Neighbors**	Wifi/OS B-Day Passwd?

Threat: Most Dangerous

• **You, Yourself & You**	Self-Destruct in 3, 2, ...
• **Family, Friends, Guests**	From Inside The House!
• **Biz, Workers, Neighbors**	Wifi/OS B-Day Passwd?
• Scams, Russians, Aliens	External Containment.
• Burglary? - Add Crypto-FS	

Threat: Separate Nets

🟩 • **Public:** ☠ Internet, Gaming, Phone-Home Apps

Covered Today

🟦 •

🟥 •

🟥 •

(Army Color Codes: G = Careful, B = Know The Hazards, R = Danger)

Threat: Separate Nets

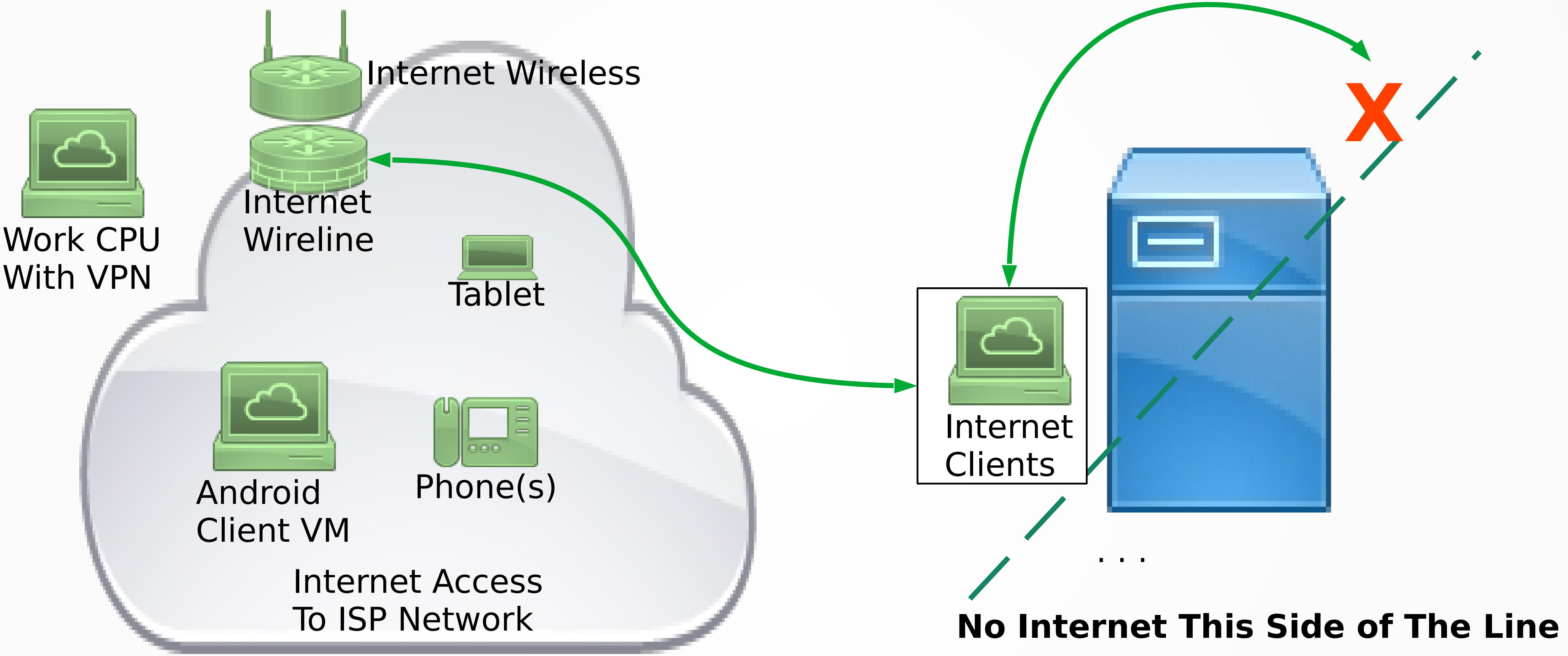
- 🟩 **Public:** ☠ Internet, Gaming, Phone-Home Apps

Covered Today

- 🟦 **Personal:** Code Work, Media Library, Offline-Apps
- 🟥 **Private:** Gov’t Docs, Bank Info, ID Scans, e-Will
- 🟥 **Archive:** RAID Backups and **PXE-dd-Reinstalls**

(Army Color Codes: G = Careful, B = Know The Hazards, R = Danger)

Internet-Facing Subnet



Threat: Air-Gap Net? SCIF

- **Secure Compartment**
  - **TCP** 100% Bi-Directional
  - Firewalls are of NO Help
  - SSL Crypto is of NO Help

- If **YOU** connect to others, THEY OWN YOUR CPU!!
  - **Especially if You Use Their Client or Phone-Home App**

SCIF Images: **https://scifglobal.com/scif-definition-what-is-a-scif/**

Threat: $0 Budget SCIF

Physical Security on A Budget

Detailed Technical Discussion

Pass-Thru: Knowlege Key

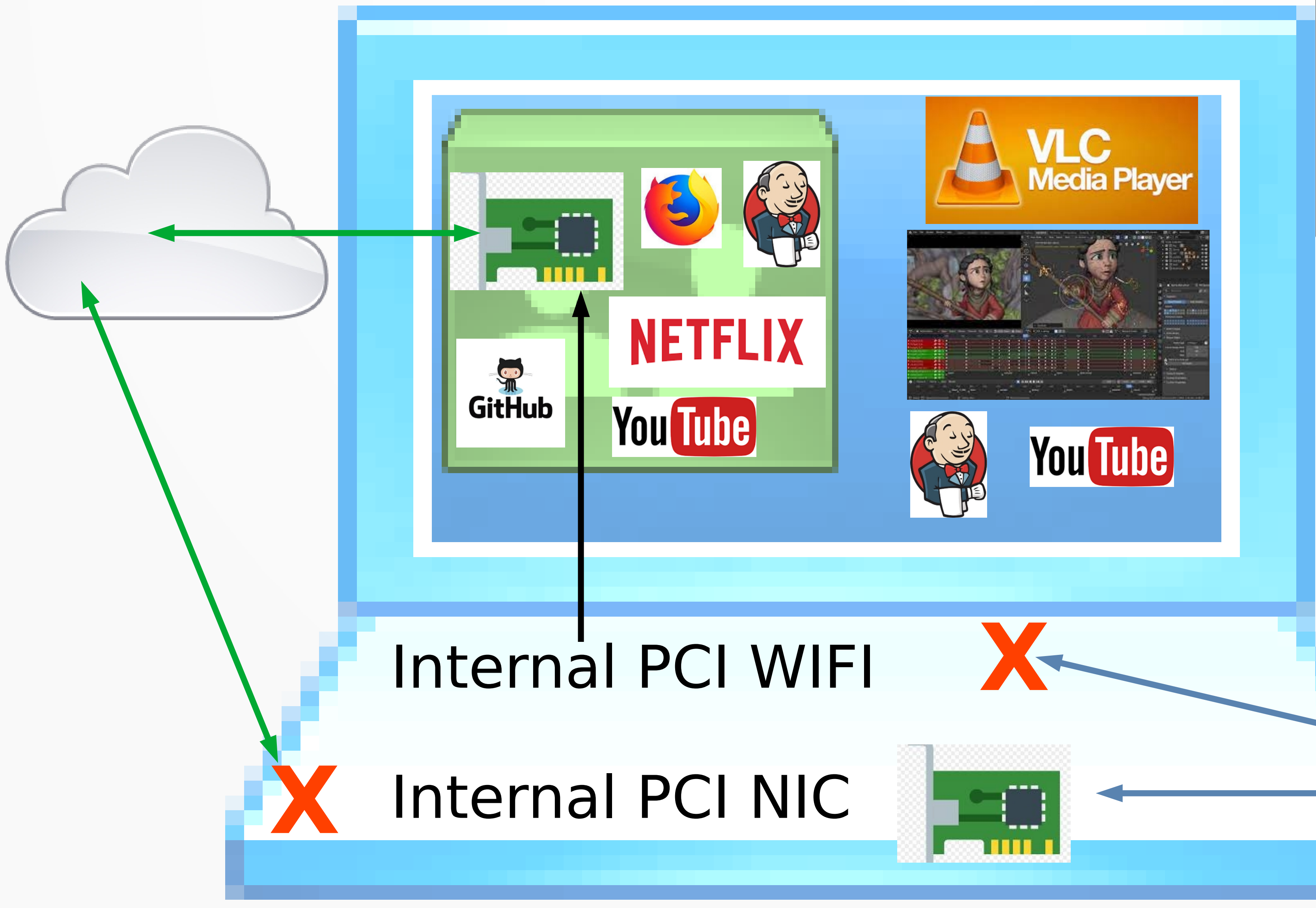
Sir Lancelot: Vetted

Sir Robbin: Unvetted

Pass-Thru: Pick Battles

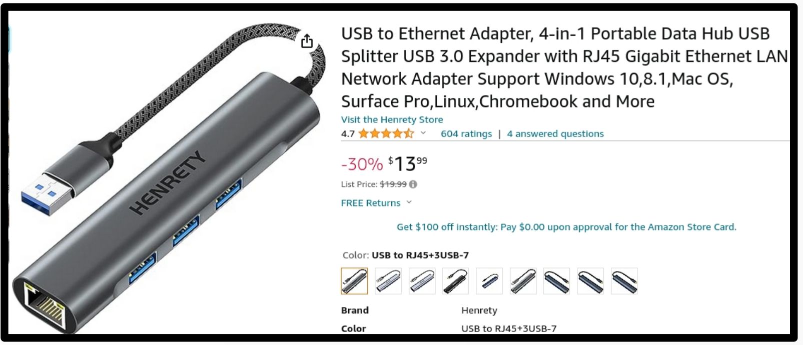
- Group/Org vs You on SW Talent: YOU LOSE
- Group/Org vs You on Phys Access: YOU WIN

Pass-Thru: NIC Device



(BT Split Works)

Personal Net



USB to Ethernet Adapter, 4-in-1 Portable Data Hub USB Splitter USB 3.0 Expander with RJ45 Gigabit Ethernet LAN Network Adapter Support Windows 10,8.1,Mac OS, Surface Pro,Linux,Chromebook and More

Visit the Henrety Store

4.7 ★★★★☆ 604 ratings | 4 answered questions

-30% $13.99

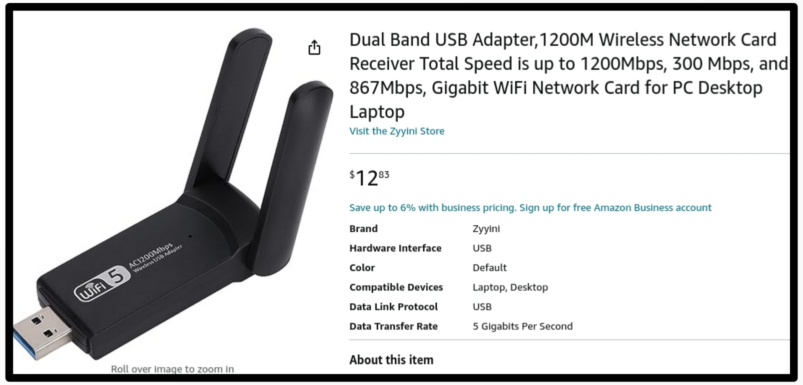
List Price: ~~$19.99~~

FREE Returns

Get $100 off instantly: Pay $0.00 upon approval for the Amazon Store Card.

Color: **USB to RJ45+3USB-7**

Brand	Henrety
Color	USB to RJ45+3USB-7



Dual Band USB Adapter,1200M Wireless Network Card Receiver Total Speed is up to 1200Mbps, 300 Mbps, and 867Mbps, Gigabit WiFi Network Card for PC Desktop Laptop

Visit the Zyyini Store

$12.83

Save up to 6% with business pricing. Sign up for free Amazon Business account

Brand	Zyyini
Hardware Interface	USB
Color	Default
Compatible Devices	Laptop, Desktop
Data Link Protocol	USB
Data Transfer Rate	5 Gigabits Per Second

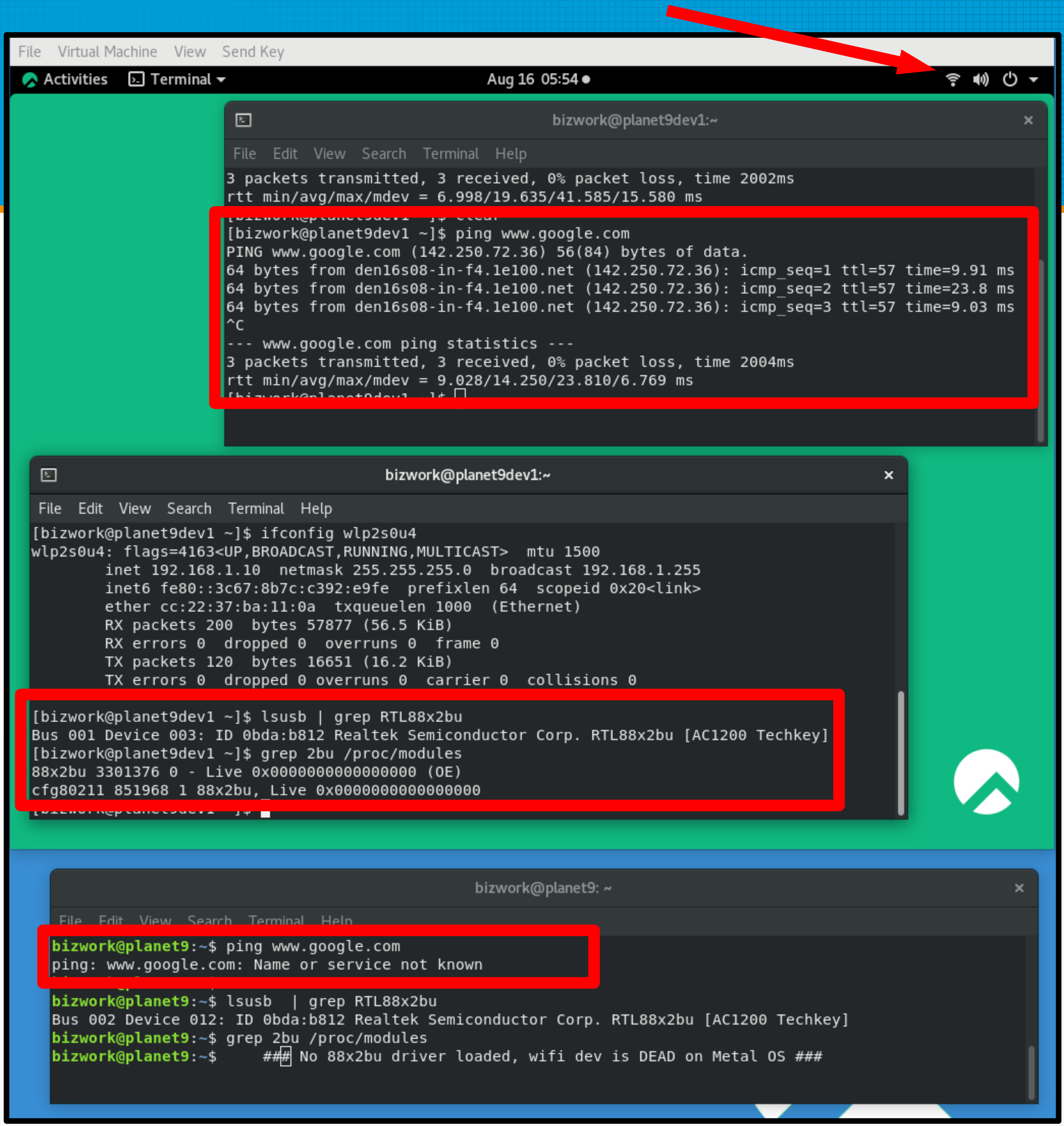
About this item

Roll over image to zoom in

Pass-Thru:

- Qemu OS (VM)
  - Wifi Dev is Live
  - Wifi Full Control
  - **No Host Conn**

- Host OS (Metal)
  - Wifi Dev Blacklisted
  - Wifi NIC is DEAD!!!


File Virtual Machine View Send Key
Activities
Terminal
Aug 16 05:54
bizwork@planet9dev1:~
File Edit View Search Terminal Help
bizwork@planet9dev1:~
File Edit View Search Terminal Help
bizwork@planet9: ~
File Edit View Search Terminal Help

```
3 packets transmitted, 3 received, 0% packet loss, time 2002ms
rtt min/avg/max/mdev = 6.998/19.635/41.585/15.580 ms
[bizwork@planet9dev1 ~]$ ping www.google.com
PING www.google.com (142.250.72.36) 56(84) bytes of data.
64 bytes from den16s08-in-f4.1e100.net (142.250.72.36): icmp_seq=1 ttl=57 time=9.91 ms
64 bytes from den16s08-in-f4.1e100.net (142.250.72.36): icmp_seq=2 ttl=57 time=23.8 ms
64 bytes from den16s08-in-f4.1e100.net (142.250.72.36): icmp_seq=3 ttl=57 time=9.03 ms
^C
--- www.google.com ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2004ms
rtt min/avg/max/mdev = 9.028/14.250/23.810/6.769 ms
```

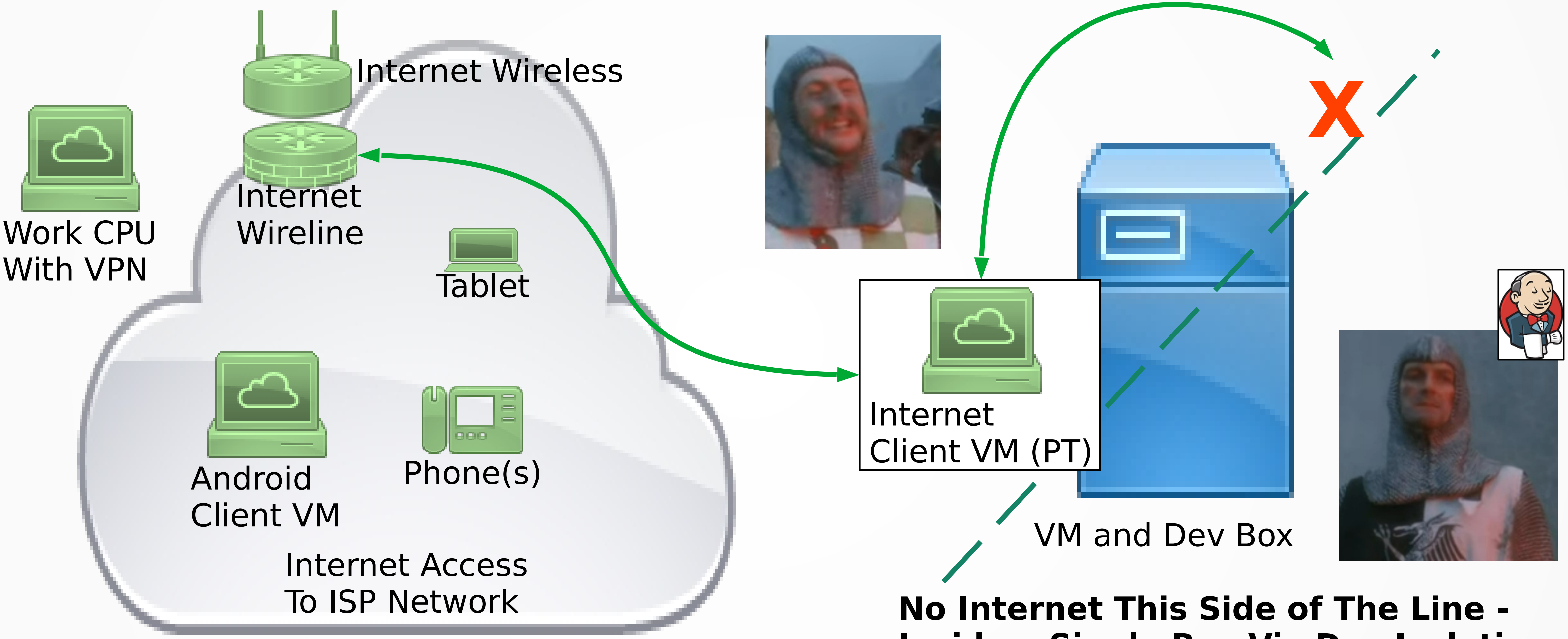
```
[bizwork@planet9dev1 ~]$ ifconfig wlp2s0u4
wlp2s0u4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.1.10  netmask 255.255.255.0  broadcast 192.168.1.255
        inet6 fe80::3c67:8b7c:c392:e9fe  prefixlen 64  scopeid 0x20<link>
        ether cc:22:37:ba:11:0a  txqueuelen 1000  (Ethernet)
        RX packets 200  bytes 57877 (56.5 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 120  bytes 16651 (16.2 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

[bizwork@planet9dev1 ~]$ lsusb | grep RTL88x2bu
Bus 001 Device 003: ID 0bda:b812 Realtek Semiconductor Corp. RTL88x2bu [AC1200 Techkey]
[bizwork@planet9dev1 ~]$ grep 2bu /proc/modules
88x2bu 3301376 0 - Live 0x0000000000000000 (OE)
cfg80211 851968 1 88x2bu, Live 0x0000000000000000
```

```
bizwork@planet9:~$ ping www.google.com
ping: www.google.com: Name or service not known
bizwork@planet9:~$ lsusb  | grep RTL88x2bu
Bus 002 Device 012: ID 0bda:b812 Realtek Semiconductor Corp. RTL88x2bu [AC1200 Techkey]
bizwork@planet9:~$ grep 2bu /proc/modules
bizwork@planet9:~$     ### No 88x2bu driver loaded, wifi dev is DEAD on Metal OS ###
```

Air-Gap On The Cheap

Internet-Facing Subnet



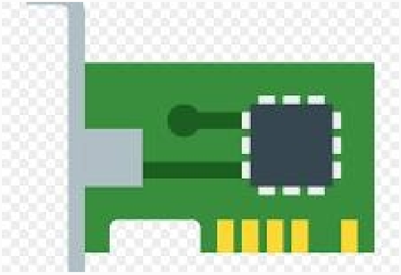
No Internet This Side of The Line -
Inside a Single Box Via Dev Isolation

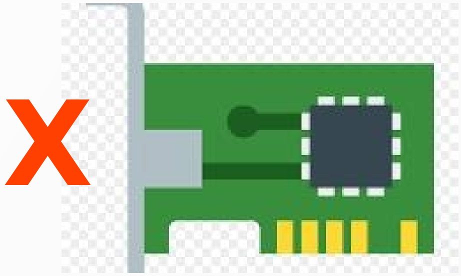
- **Jenkins**: Pin-Hole File Movement, Highly Regulated

DEMO

Pass-Thru: General Use

- Give PCI/USB HW to Guest OS



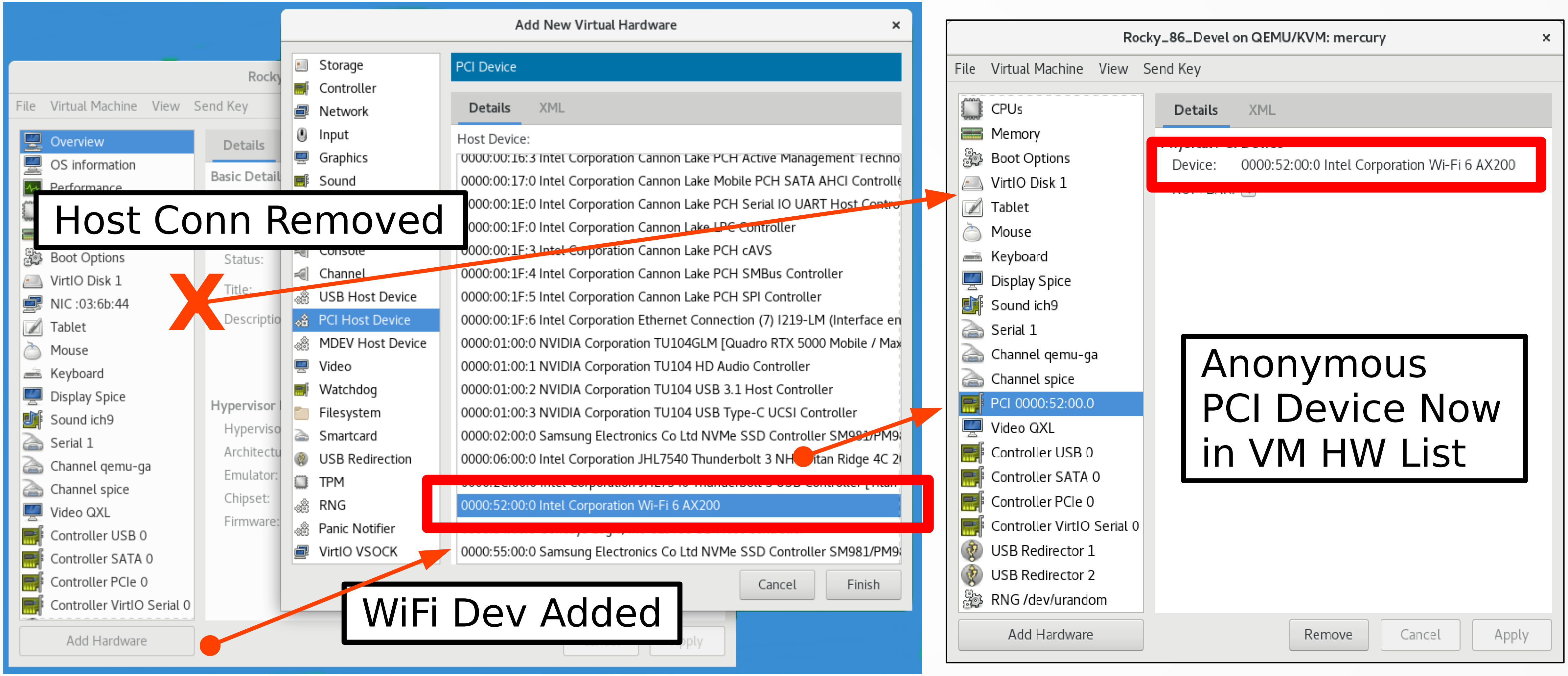


- Device is **Dead** to Host OS!!!!!!

- GPU’s, USB Disks, Audio Mixers, CAD Tools, etc…

- Infinite Life To CPU-Locked Licenses
  - Run old OS in VM, Licensed HW controlled via Pass-Thru

Qemu VM Pass-Through NIC Device



Host Device:

```
0000:00:16:3 Intel Corporation Cannon Lake PCH Active Management Techno
0000:00:17:0 Intel Corporation Cannon Lake Mobile PCH SATA AHCI Controlle
0000:00:1E:0 Intel Corporation Cannon Lake PCH Serial IO UART Host Contro
0000:00:1F:0 Intel Corporation Cannon Lake LPC Controller
0000:00:1F:3 Intel Corporation Cannon Lake PCH cAVS
0000:00:1F:4 Intel Corporation Cannon Lake PCH SMBus Controller
0000:00:1F:5 Intel Corporation Cannon Lake PCH SPI Controller
0000:00:1F:6 Intel Corporation Ethernet Connection (7) I219-LM (Interface en
0000:01:00:0 NVIDIA Corporation TU104GLM [Quadro RTX 5000 Mobile / Max
0000:01:00:1 NVIDIA Corporation TU104 HD Audio Controller
0000:01:00:2 NVIDIA Corporation TU104 USB 3.1 Host Controller
0000:01:00:3 NVIDIA Corporation TU104 USB Type-C UCSI Controller
0000:02:00:0 Samsung Electronics Co Ltd NVMe SSD Controller SM981/PM9
0000:06:00:0 Intel Corporation JHL7540 Thunderbolt 3 NH  itan Ridge 4C 2
0000:52:00:0 Intel Corporation Wi-Fi 6 AX200
0000:55:00:0 Samsung Electronics Co Ltd NVMe SSD Controller SM981/PM9
```

Device: 0000:52:00:0 Intel Corporation Wi-Fi 6 AX200

Host Conn Removed

WiFi Dev Added

Anonymous PCI Device Now in VM HW List

– iwlwifi Driver: Wifi Device is usable in VM OS only

Harden: Selinux (Public)

- RHEL 2018 Summit “**Mere Mortals**” on Youtube
- Block **TCP/IP** Out-Ports
- RedHat Core Sec Policies
- **Booleans** for Micro Adjustments
- **Jail** & Track Successful Attacks

Harden: Selinux (Public)

- ls -ladZ path {path ...}

```
# ls -ladZ /etc /etc/libvirt/libvirt.conf /etc/libvirt/virtlogd.conf /etc/libvirt/nwfilter ~
drwxr-xr-x. 175 root    root  ...:etc_t:...          12288 Jul 31 22:47 /etc
-rw-r--r--.   1 root    root  ...:virt_etc_t:...       547 Jan 14  2022 /etc/libvirt/libvirt.conf
drwx------.   2 root    root  ...:virt_etc_rw_t:...   4096 May 10  2022 /etc/libvirt/nwfilter
-rw-r--r--.   1 root    root  ...:virtlogd_etc_t:...  3537 Jan 14  2022 /etc/libvirt/virtlogd.conf
dr-xr-x---.   9 bizwork users ...:admin_home_t:...    4096 Aug  7 19:15 /root
```

- ps -efZ

```
# ps -efZ | egrep '(firefox$|sssd_nss|NetworkManager)' | grep -v grep
...:sssd_t:…             root      1400    1271  0 ... /usr/libexec/sssd/sssd_nss --uid 0 ...
...:NetworkManager_t:…   root      1484       1  0 ... /usr/sbin/NetworkManager --no-daemon
...:unconfined_t:…       bizwork   100647 82517  9 ... /usr/lib64/firefox/...
```

- netstat -anZ

```
# netstat -anZ | head -n 5
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Addr  Foreign Addr State     PID/Program name     Security Context
tcp   0      0 127.0.0.1:44321 0.0.0.0:*    LISTEN    1935/pmcd            system_u:system_r:pcp_pmcd_t:...
tcp   0      0 127.0.0.1:4330  0.0.0.0:*    LISTEN    3280/pmlogger        system_u:system_r:pcp_pmlogger_t:..
tcp   0      0 127.0.0.1:5900  0.0.0.0:*    LISTEN    83311/qemu-kvm       system_u:system_r:svirt_t:...
```

Harden: FirewallD

- “**Linux firewalld config examples**” on Youtube
- Block **Inbound Connections** Traffic
- Open **Ports** for Critical Services (Httpd, SSH)
- “**Rich Rule**” Logging and Blocking

Use: Public to Personal

- X11 Copy+Paste Works (Copilot, Images)
  - CTRL+Insert (Copy) SHIFT+Insert (Paste)
- **9p Mount Host** or USB Stick (Drop Box Style)
  - PT for USB Stick OR **qemu-nbd** mount offline VM disk
- Jenkins, **Youtube-DL**, Wget, Reposync, Rsync
  - **Intelligently filter content during movement**

Use: Public to Personal

- “QEMU/KVM - Virt-Manager | Folder sharing and USB Redirection”
  - Simple **YouTube** Training Video

- RHEL Disabled 9P Mounts
  - Use **USB Stick** on RHEL, CentOS, Rocky
- Fedora, Debian/Ubuntu, Others
  - 9P Mount Give **VM-To-Jailed-Host-Dir** Sharing

Use: Jenkins Tasks

Jenkins

- **Youtube**: Jenkins Complete Course Masterclass
  - Step by Step for Beginners with Interview Questions & Quiz
  - Best “Simplest Case” video I’ve seen, others target Enterprise use.
- “**Filesystem Trigger**” move mount files on arrival
- Pin-Hole File Movement (Filtering) As Set by Admin
- Avoid “Blue Ocean” training, Not needed for home.

Use: Jenkins Tasks

Jenkins

- **Jobs**: Schedule or Event Driven Tasks
- **Nodes**: Optional SSH Connections
- **Plugins**: Deep Linux/Win OS & App Know-how
- Boot WoL, Distribute Procs, Monitor DBs, Backups
- Run Builds, Up/Download over Time, Everything!!!

Youtube-DL (+ Reddit...)

- pip3 install youtube-dl

- youtube-dl \

  -o "%(playlist_index)s-%(title)s.%(ext)s" \

  -f bestvideo+bestaudio --sub-format srt "$1"

- youtube-dl **-F** "$1"   ;   youtube-dl **-f <code>** "$1"
  - Identify Choice of Audio+Video Formats (uses FFMpeg)
  - Works with **Reddit** and other video/meme sites

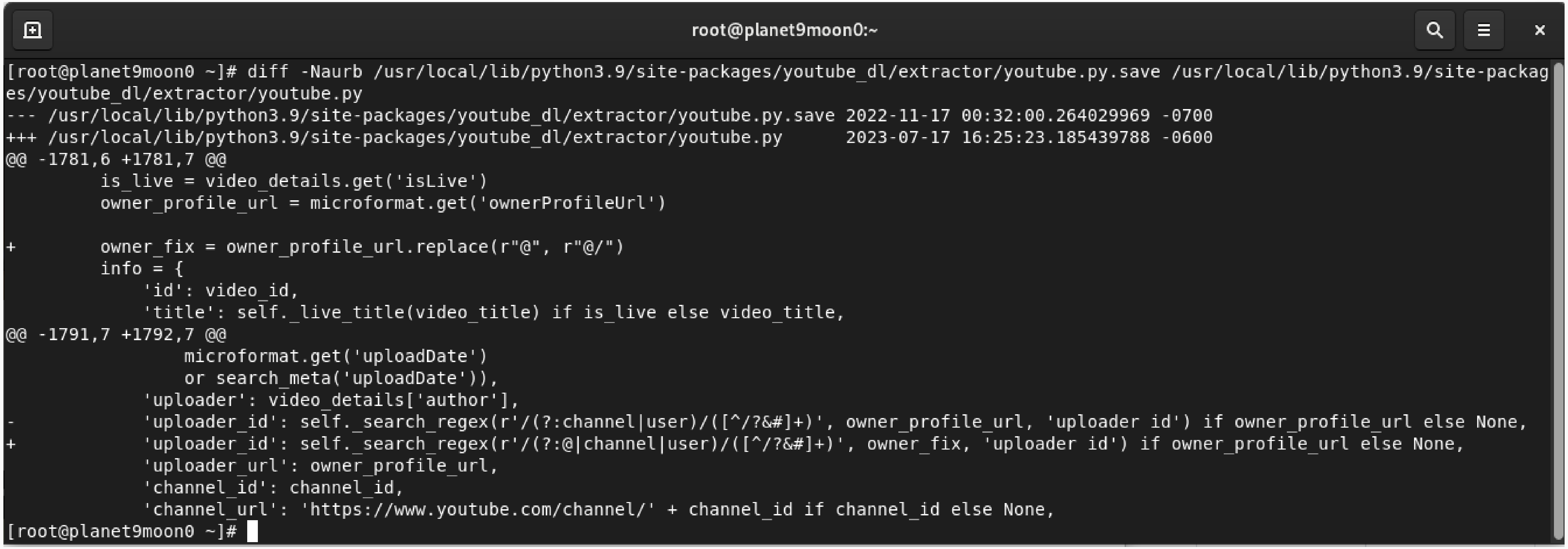
Youtube-DL (+ Reddit…)

- **VLC** Video/DVD Player: Watch all Y-dl Formats
  - EPEL Repo for RHEL's
- FFMpeg / ffplay Edit Audio or Video
- FORBIDDEN: Youtube SSL Certs & Round Robin
  - Round Robin YT Download Servers confuse SSL Certs
  - Simple Retry will Fix Issue

Youtube-DL (+ Reddit...)

- Youtube-DL Bug: New Accounts Containing @’s

- /usr/local/lib/py*/site-packages/youtube_dl/extractor/youtube.py



```
[root@planet9moon0 ~]# diff -Naurb /usr/local/lib/python3.9/site-packages/youtube_dl/extractor/youtube.py.save /usr/local/lib/python3.9/site-packag
es/youtube_dl/extractor/youtube.py
--- /usr/local/lib/python3.9/site-packages/youtube_dl/extractor/youtube.py.save 2022-11-17 00:32:00.264029969 -0700
+++ /usr/local/lib/python3.9/site-packages/youtube_dl/extractor/youtube.py      2023-07-17 16:25:23.185439788 -0600
@@ -1781,6 +1781,7 @@
         is_live = video_details.get('isLive')
         owner_profile_url = microformat.get('ownerProfileUrl')

+        owner_fix = owner_profile_url.replace(r"@", r"@/")
         info = {
             'id': video_id,
             'title': self._live_title(video_title) if is_live else video_title,
@@ -1791,7 +1792,7 @@
                 microformat.get('uploadDate')
                 or search_meta('uploadDate')),
             'uploader': video_details['author'],
-            'uploader_id': self._search_regex(r'/(?:channel|user)/([^/?&#]+)', owner_profile_url, 'uploader id') if owner_profile_url else None,
+            'uploader_id': self._search_regex(r'/(?:@|channel|user)/([^/?&#]+)', owner_fix, 'uploader id') if owner_profile_url else None,
             'uploader_url': owner_profile_url,
             'channel_id': channel_id,
             'channel_url': 'https://www.youtube.com/channel/' + channel_id if channel_id else None,
[root@planet9moon0 ~]# 
```

Maint: Binaries

- **wget** -r -np -nc -k -e robots=off $SITE_URL
- **axel** -n 6 $DVD_URL   # Split+Parallel Download
- **rsync** -av --progress ssh-style::path/from path/into
- **reposync** -g -l –repoid=epel -p=/opt/repos/epel-8
  - Or --urls then **yum install --downloadonly <pkglist>**

Maint: Python Packages

- **pip_search**: Python like “apt/yum search”
- **pip3 download**: Download packages no install
- **pip3 download -r requirements.txt** # github
- Package-sets preserved for re-installation
  - VM and Host OS Same Version and PY Binaries!!!!

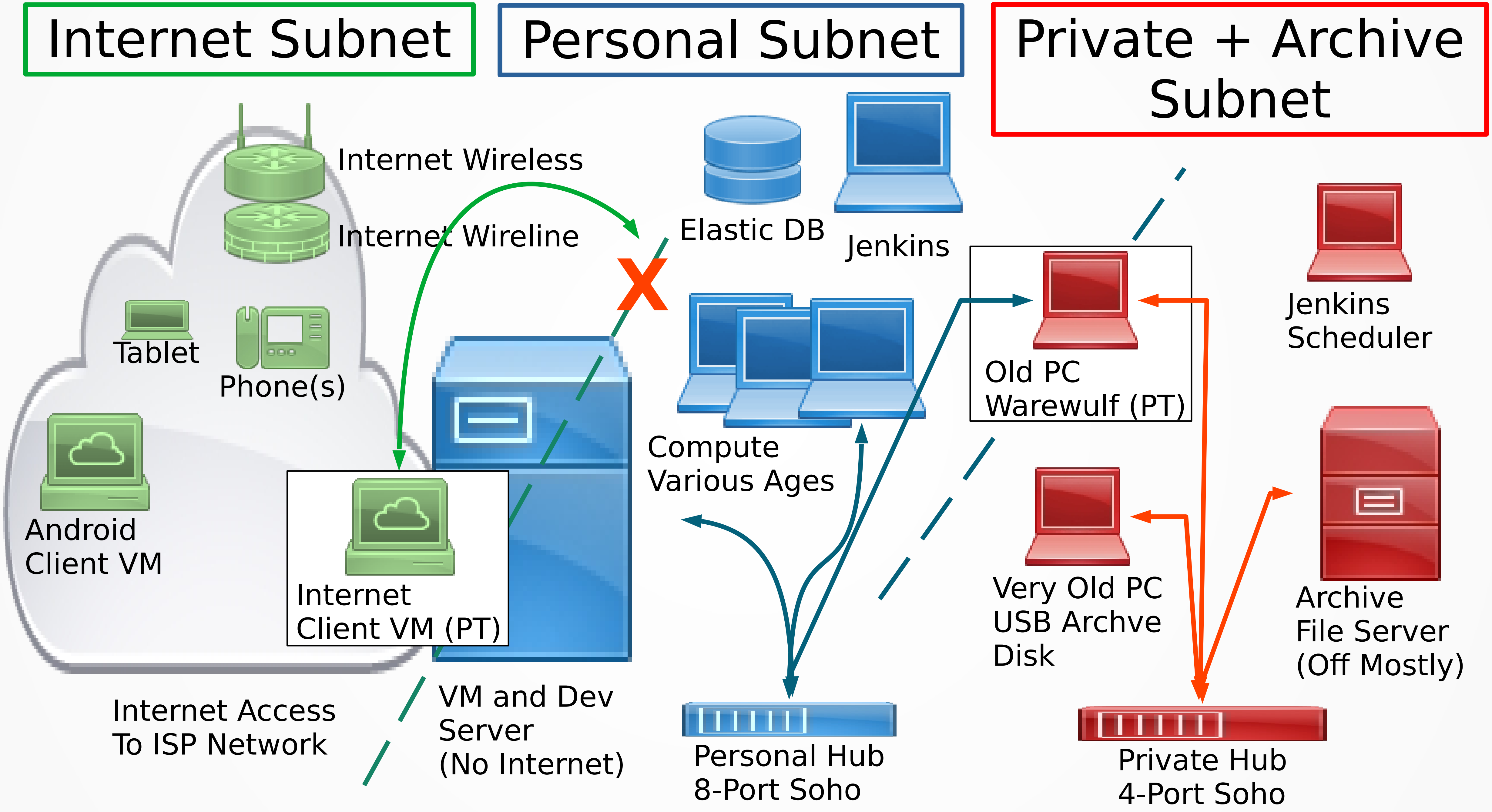
Maint: Warewulf & DD

- **PXE Boot Machines**
  - Boot RAM-OS to Remote Host (Think Live-DVD)

- **Linux DD Duplicate OS**

- **Linux DD Copy New OS**

- **Reboot Into New/Clean OS**



Internet Subnet

Personal Subnet

Private + Archive Subnet

Internet Wireless

Internet Wireline

Tablet

Phone(s)

Android Client VM

Internet Client VM (PT)

Internet Access To ISP Network

VM and Dev Server (No Internet)

Elastic DB

Jenkins

Compute Various Ages

Personal Hub 8-Port Soho

Old PC Warewulf (PT)

Jenkins Scheduler

Very Old PC USB Archve Disk

Archive File Server (Off Mostly)

Private Hub 4-Port Soho

Separate Activity & Data

- **Public:** Pass-Thru, Selinux, FirewallD, Copilot
- **Personal:** Apptainer, VLC, IDEs, Jenkins, Slurm
- **Private:** Warewulf, DD, Http Drop, USB Cache
- **Archive:** RAID/CryptFS, dd images, ISOs, Installs
  - Off most of the time. Jenkins+WoL power-up when needed

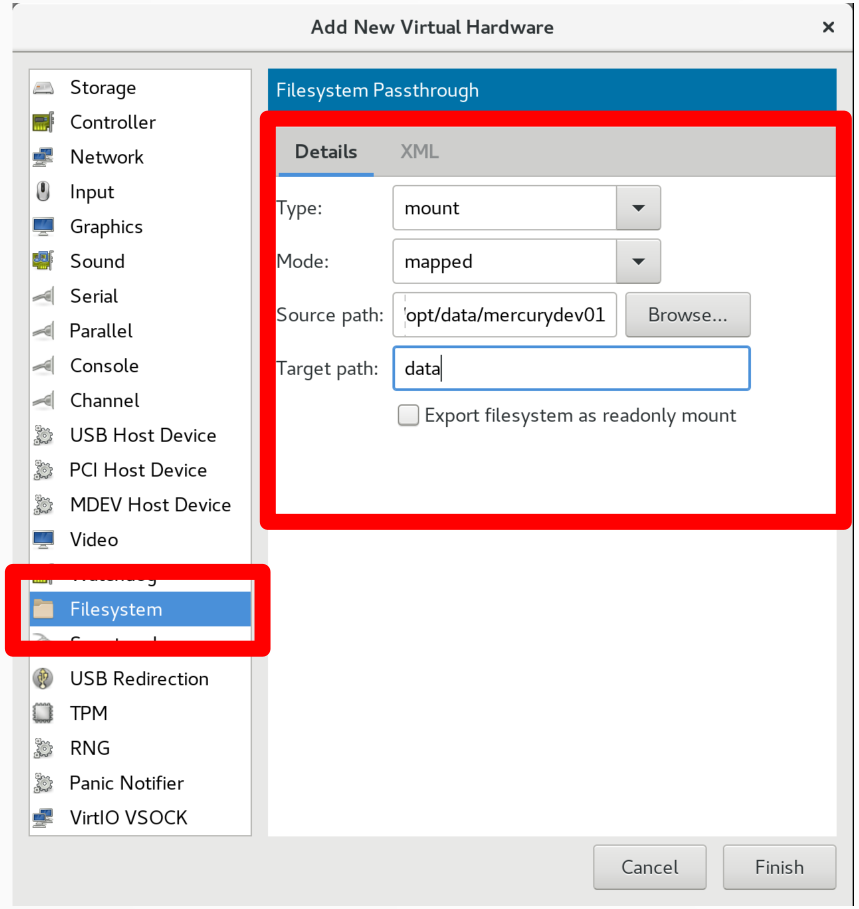
The End
(Part 1)

Appendix

Maint: Mount Issue

- **Linux KVM/Qemu:**
  - Debian Distros: Everything Works out of the Box
  - Fedora Distro: Everything Works out of the Box
  - Mixed Linux: Ubuntu Host w/RHEL Guest Works
  - RHEL Distros: PT Works, Host Mounts Disabled
- **Win Hyper-V:** Win Pro or Ent, Add To Home
- **VMWare, ProxMox:** Common and Easy

RHEL Filesystem Mount to Host



Type: mount

Mode: mapped

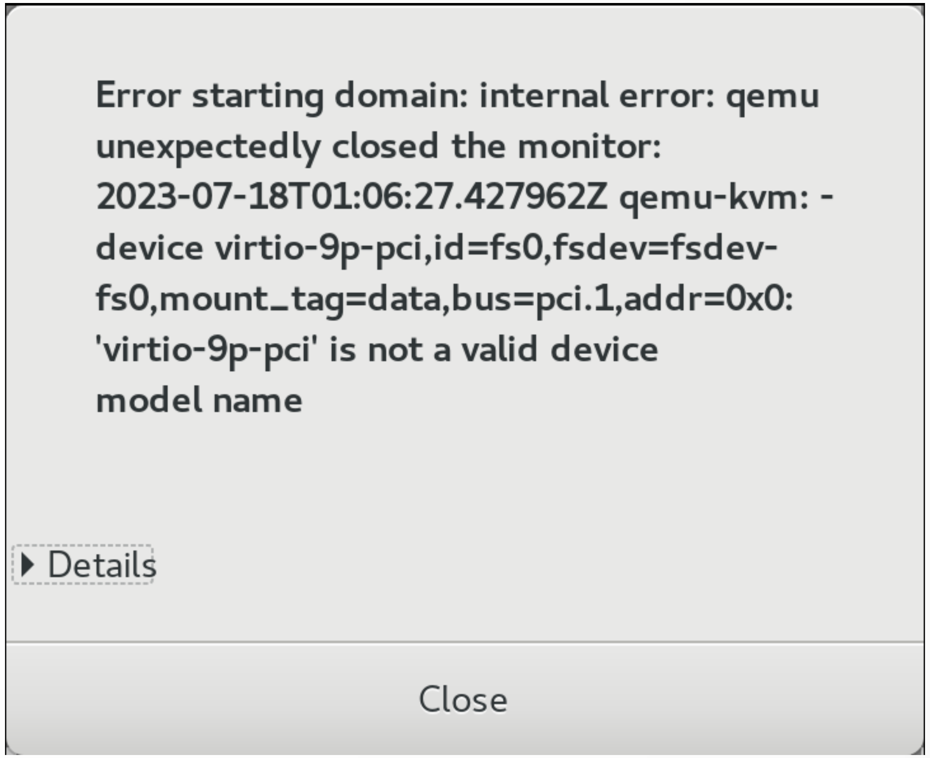
Source path: 'opt/data/mercurydev01

Target path: data

☐ Export filesystem as readonly mount

- VM Filesystem:

Issue in RedHat Only, Debian OK

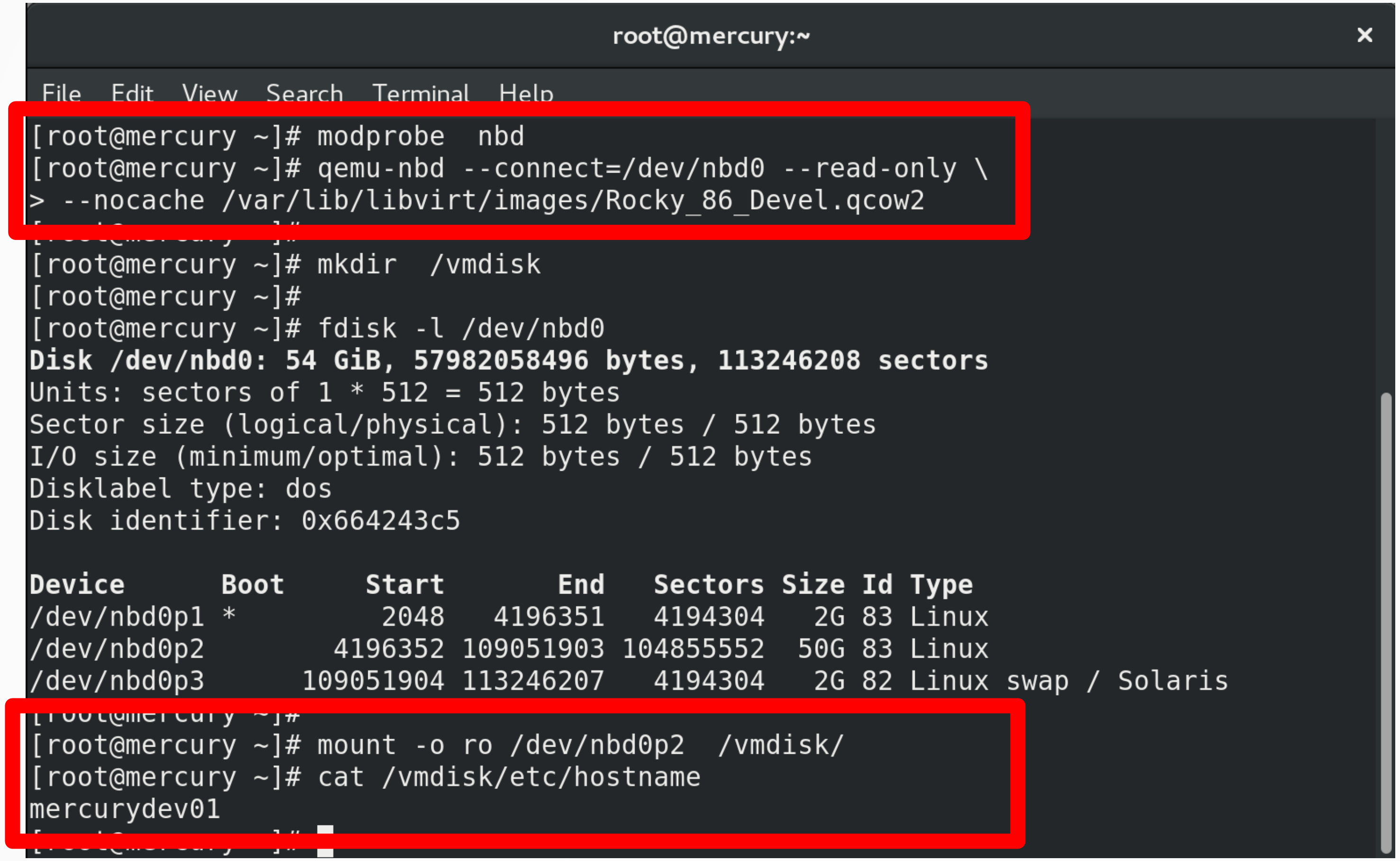


Error starting domain: internal error: qemu unexpectedly closed the monitor: 2023-07-18T01:06:27.427962Z qemu-kvm: -device virtio-9p-pci,id=fs0,fsdev=fsdev-fs0,mount_tag=data,bus=pci.1,addr=0x0: 'virtio-9p-pci' is not a valid device model name

RHEL Removed Mounts for Sec

Debian/UB, Others Work Fine

Qemu-nbd Mount To Host (Backup)

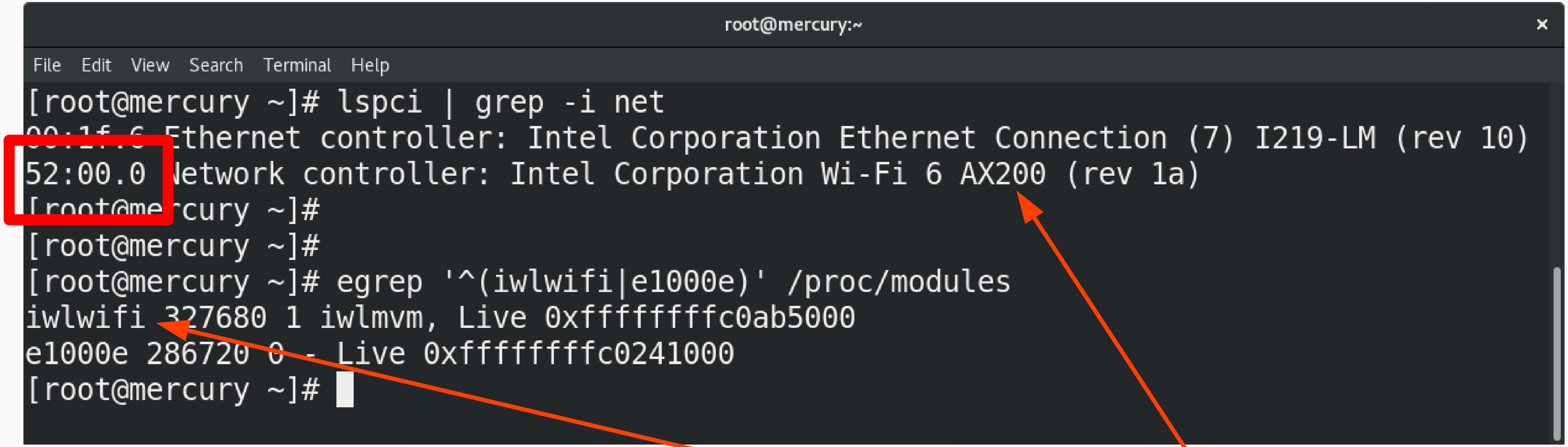


```
[root@mercury ~]# modprobe  nbd
[root@mercury ~]# qemu-nbd --connect=/dev/nbd0 --read-only \
> --nocache /var/lib/libvirt/images/Rocky_86_Devel.qcow2
[root@mercury ~]#
[root@mercury ~]# mkdir  /vmdisk
[root@mercury ~]#
[root@mercury ~]# fdisk -l /dev/nbd0
Disk /dev/nbd0: 54 GiB, 57982058496 bytes, 113246208 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x664243c5

Device      Boot     Start       End   Sectors Size Id Type
/dev/nbd0p1 *         2048   4196351   4194304   2G 83 Linux
/dev/nbd0p2        4196352 109051903 104855552  50G 83 Linux
/dev/nbd0p3      109051904 113246207   4194304   2G 82 Linux swap / Solaris
[root@mercury ~]#
[root@mercury ~]# mount -o ro /dev/nbd0p2  /vmdisk/
[root@mercury ~]# cat /vmdisk/etc/hostname
mercurydev01
[root@mercury ~]#
```

- PT USB Stick: Use Real USB Stick with PT
- VM Filesystem: NBD Mount to Extract Large Data

Qemu VM Pass-Through NIC Device



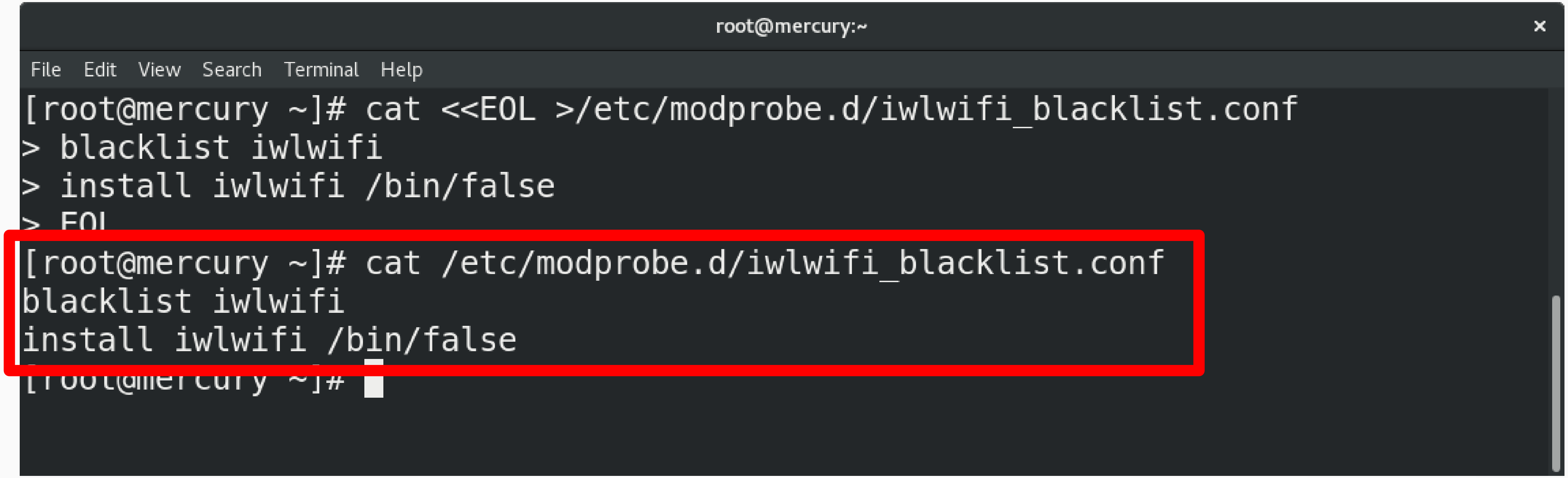
```
[root@mercury ~]# lspci | grep -i net
00:1f.6 Ethernet controller: Intel Corporation Ethernet Connection (7) I219-LM (rev 10)
52:00.0 Network controller: Intel Corporation Wi-Fi 6 AX200 (rev 1a)
[root@mercury ~]#
[root@mercury ~]#
[root@mercury ~]# egrep '^(iwlwifi|e1000e)' /proc/modules
iwlwifi 327680 1 iwlmvm, Live 0xffffffffc0ab5000
e1000e 286720 0 - Live 0xffffffffc0241000
[root@mercury ~]#
```

- **Intel AX200 Wifi:**
  - iwlwifi Driver:

Blacklist iwlwifi from Host Linux

PCI Bus Address 52:00.0

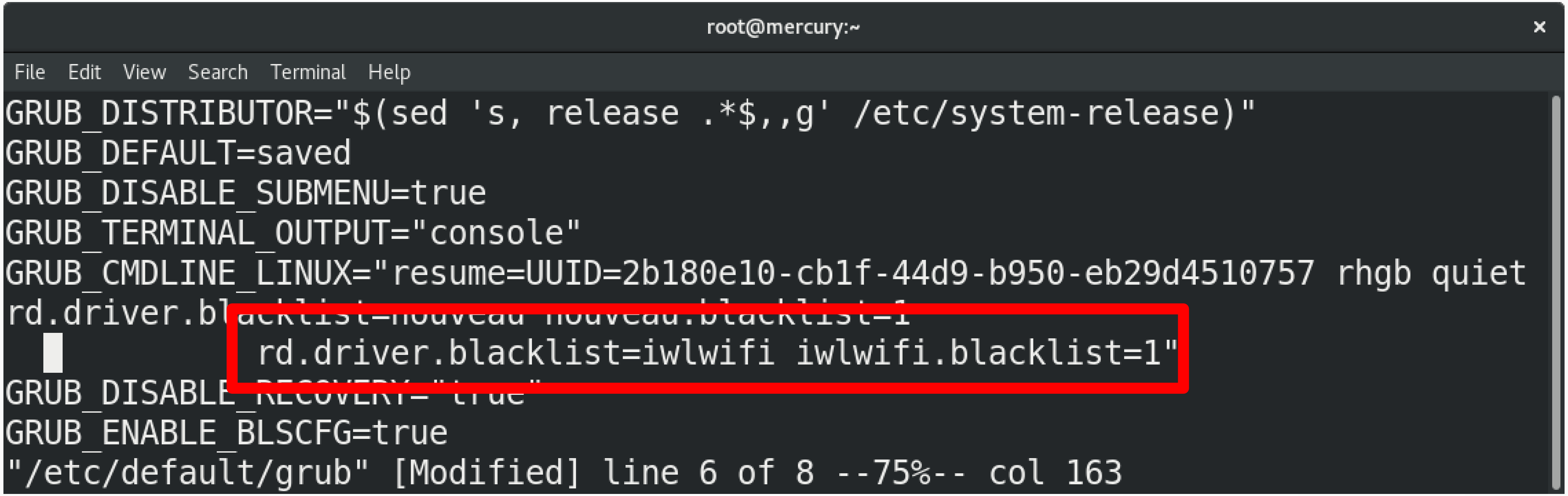
Qemu VM Pass-Through NIC Device



```
[root@mercury ~]# cat <<EOL >/etc/modprobe.d/iwlwifi_blacklist.conf
> blacklist iwlwifi
> install iwlwifi /bin/false
> EOL
[root@mercury ~]# cat /etc/modprobe.d/iwlwifi_blacklist.conf
blacklist iwlwifi
install iwlwifi /bin/false
[root@mercury ~]# 
```

- **Intel AX200 Wifi:**
  - iwlwifi Driver: Kernel Will Refuse Wifi Driver

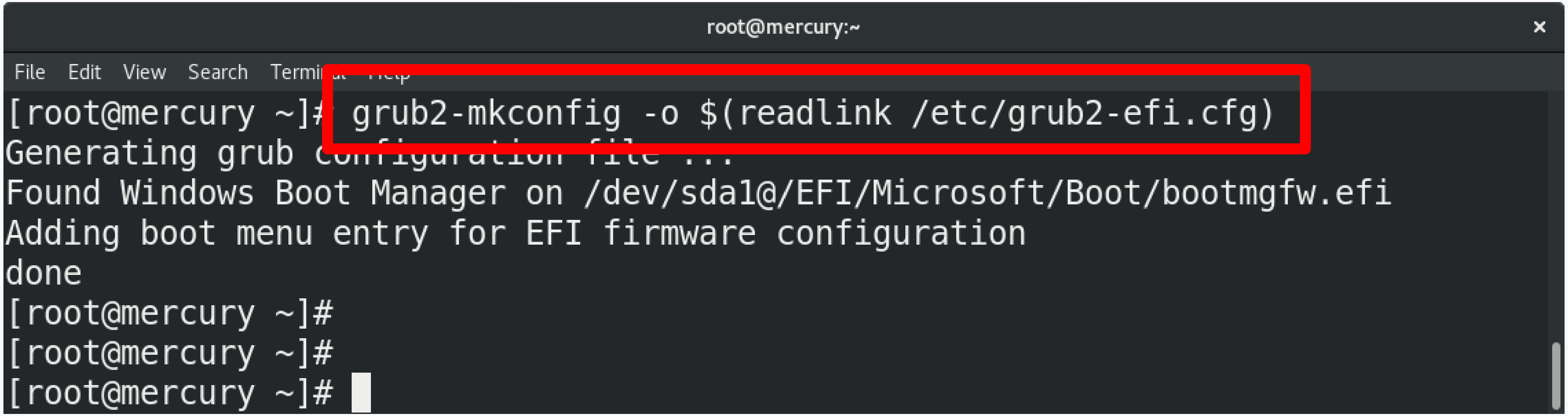
Qemu VM Pass-Through NIC Device



```
GRUB_DISTRIBUTOR="$(sed 's, release .*$,,g' /etc/system-release)"
GRUB_DEFAULT=saved
GRUB_DISABLE_SUBMENU=true
GRUB_TERMINAL_OUTPUT="console"
GRUB_CMDLINE_LINUX="resume=UUID=2b180e10-cb1f-44d9-b950-eb29d4510757 rhgb quiet
rd.driver.blacklist=nouveau nouveau.blacklist=1
  █          rd.driver.blacklist=iwlwifi iwlwifi.blacklist=1"
GRUB_DISABLE_RECOVERY="true"
GRUB_ENABLE_BLSCFG=true
"/etc/default/grub" [Modified] line 6 of 8 --75%-- col 163
```

- **Intel AX200 Wifi:**
  - iwlwifi Driver: Boot Up Also Rejects Driver
  - GRUB_CMDLINE_LINUX I Wrapped Text for Clarity in Pic

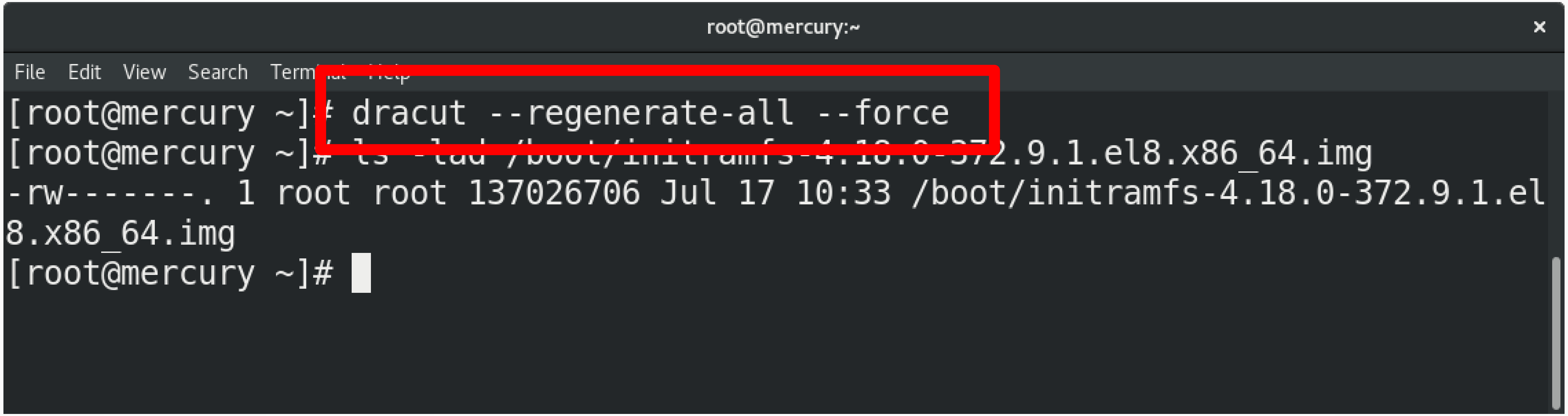
Qemu VM Pass-Through NIC Device



```
[root@mercury ~]# grub2-mkconfig -o $(readlink /etc/grub2-efi.cfg)
Generating grub configuration file ...
Found Windows Boot Manager on /dev/sda1@/EFI/Microsoft/Boot/bootmgfw.efi
Adding boot menu entry for EFI firmware configuration
done
[root@mercury ~]#
[root@mercury ~]#
[root@mercury ~]#
```

- **Intel AX200 Wifi:**
  - iwlwifi Driver: Update GRUB Boot Configs

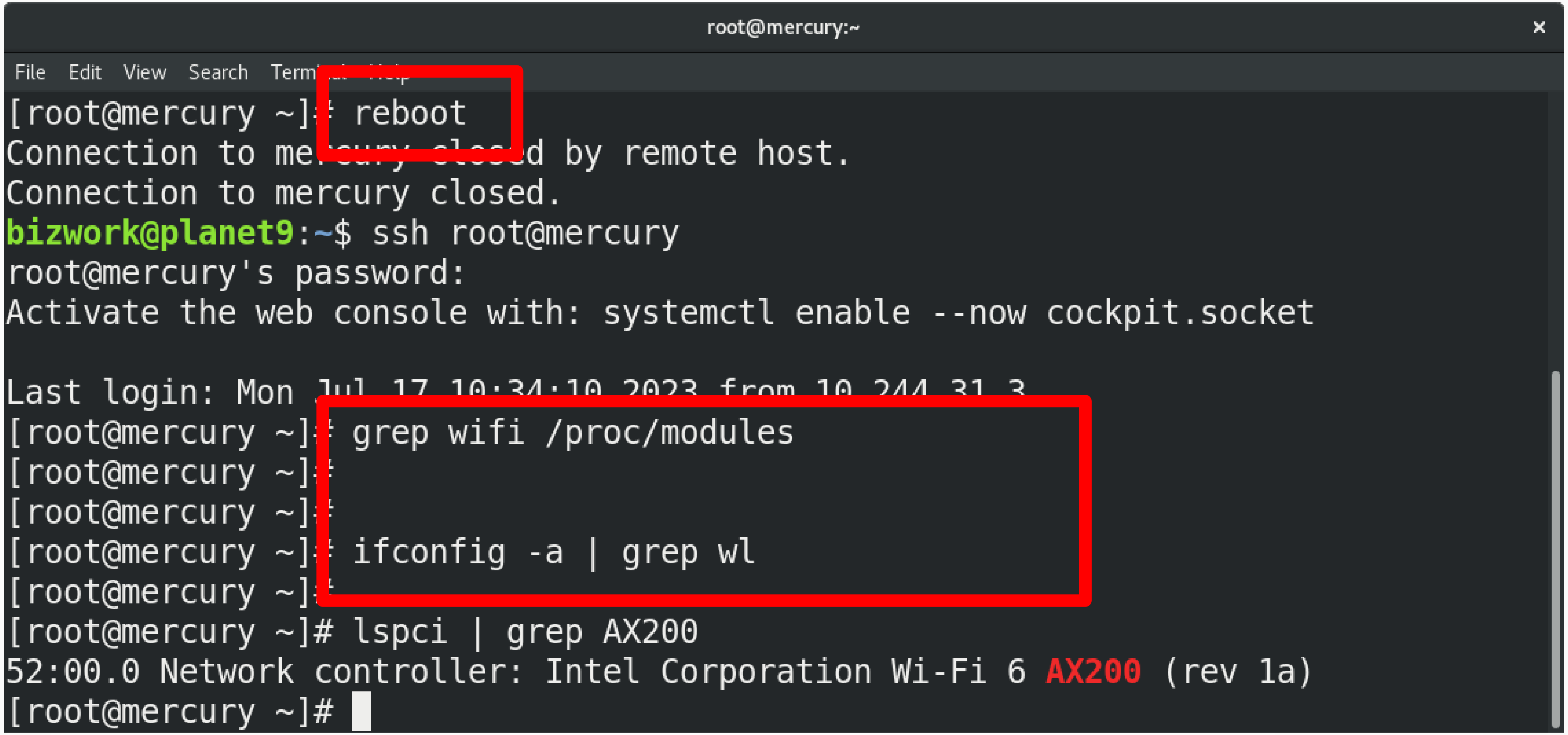
Qemu VM Pass-Through NIC Device



```
[root@mercury ~]# dracut --regenerate-all --force
[root@mercury ~]# ls -lad /boot/initramfs-4.18.0-372.9.1.el8.x86_64.img
-rw-------. 1 root root 137026706 Jul 17 10:33 /boot/initramfs-4.18.0-372.9.1.el
8.x86_64.img
[root@mercury ~]# 
```

- **Intel AX200 Wifi:**
  - iwlwifi Driver: Remove Driver from Initrd

Qemu VM Pass-Through NIC Device

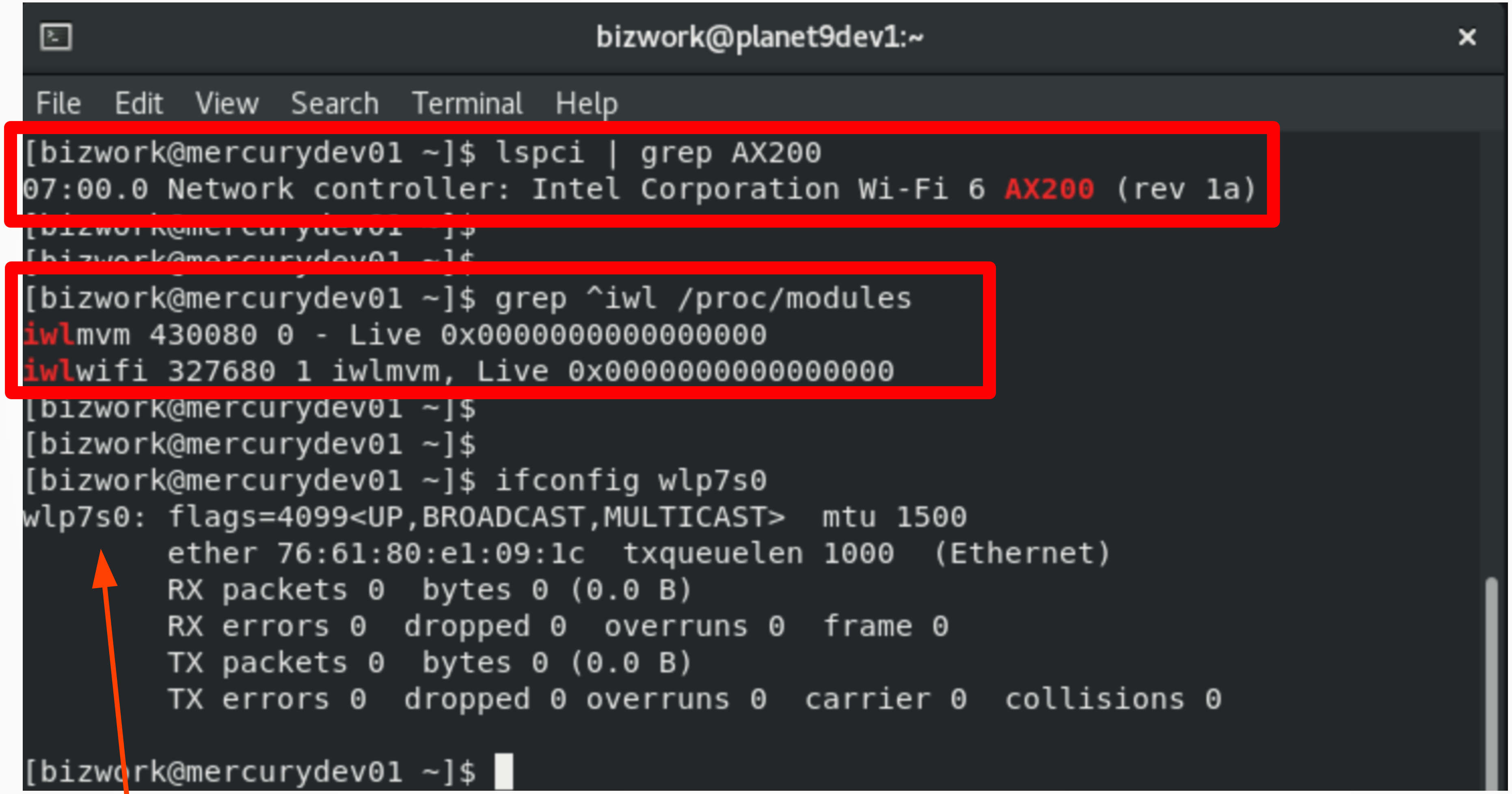


```
[root@mercury ~]# reboot
Connection to mercury closed by remote host.
Connection to mercury closed.
bizwork@planet9:~$ ssh root@mercury
root@mercury's password:
Activate the web console with: systemctl enable --now cockpit.socket

Last login: Mon Jul 17 10:34:10 2023 from 10.244.31.3
[root@mercury ~]# grep wifi /proc/modules
[root@mercury ~]#
[root@mercury ~]#
[root@mercury ~]# ifconfig -a | grep wl
[root@mercury ~]#
[root@mercury ~]# lspci | grep AX200
52:00.0 Network controller: Intel Corporation Wi-Fi 6 AX200 (rev 1a)
[root@mercury ~]#
```

- iwlwifi Driver: Driver is Gone from Host OS

Qemu VM Pass-Through NIC Device



```
[bizwork@mercurydev01 ~]$ lspci | grep AX200
07:00.0 Network controller: Intel Corporation Wi-Fi 6 AX200 (rev 1a)
[bizwork@mercurydev01 ~]$
[bizwork@mercurydev01 ~]$
[bizwork@mercurydev01 ~]$ grep ^iwl /proc/modules
iwlmvm 430080 0 - Live 0x0000000000000000
iwlwifi 327680 1 iwlmvm, Live 0x0000000000000000
[bizwork@mercurydev01 ~]$
[bizwork@mercurydev01 ~]$
[bizwork@mercurydev01 ~]$ ifconfig wlp7s0
wlp7s0: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        ether 76:61:80:e1:09:1c  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

[bizwork@mercurydev01 ~]$ 
```

- iwlwifi Driver: Internet is **inside VM Only**