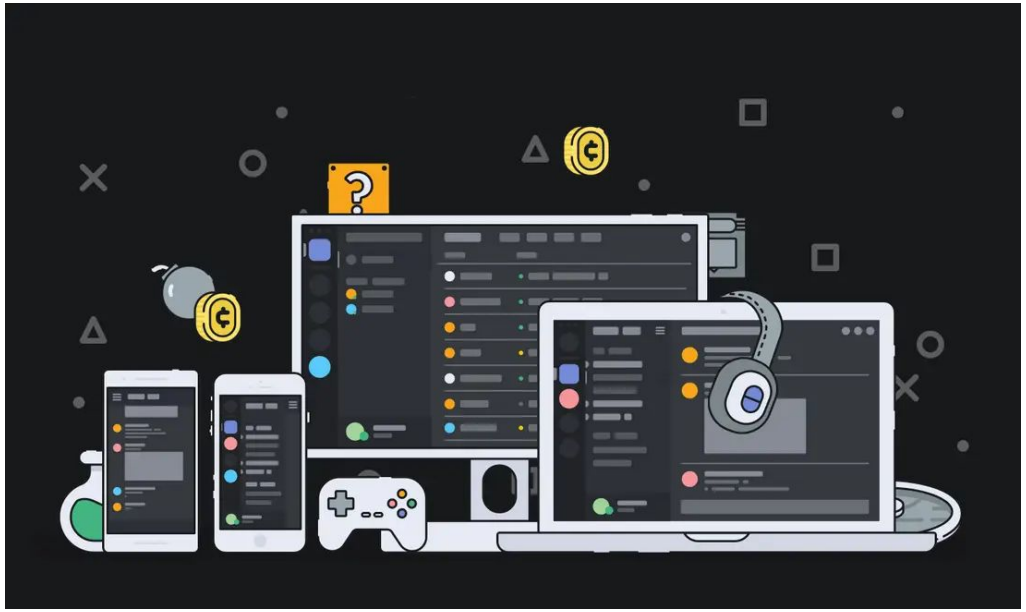
ACTIVE | COUNTERMEASURES

Building a Home Lab

Active Countermeasures and BHIS
Bill Stearns and John Strand

Welcome!

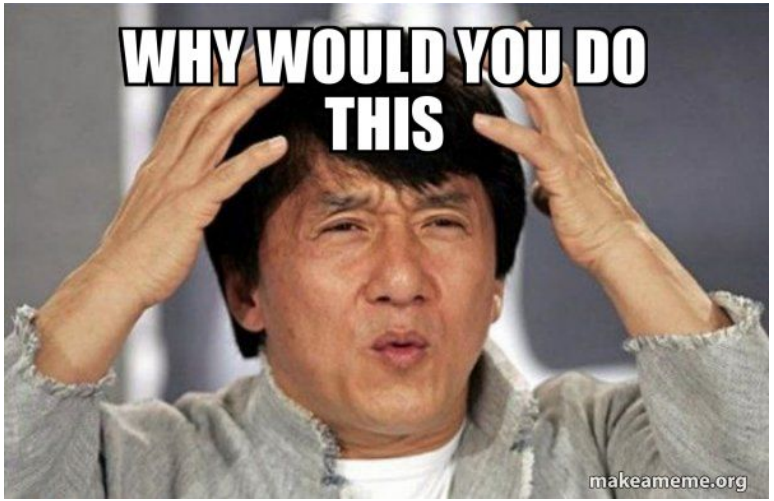
- Discord servers
  - Discussion during and after webcast
  - Threat Hunting community: https://discord.gg/w23C3rd
    - Live discussion in #acm-webcast-chat
    - Slides and materials in #acm-webcast-content
    - Report problems in #feedback
  - Black Hills Information Security: https://discord.gg/aHHh3u5
- Private questions window in GTW
  - We'll answer as many as we can



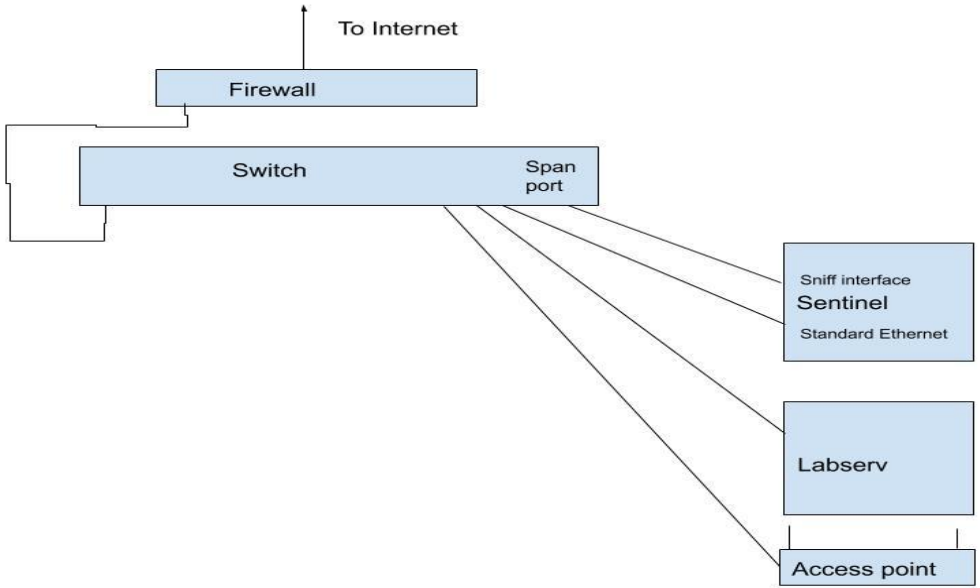
Chaos… Total. Chaos

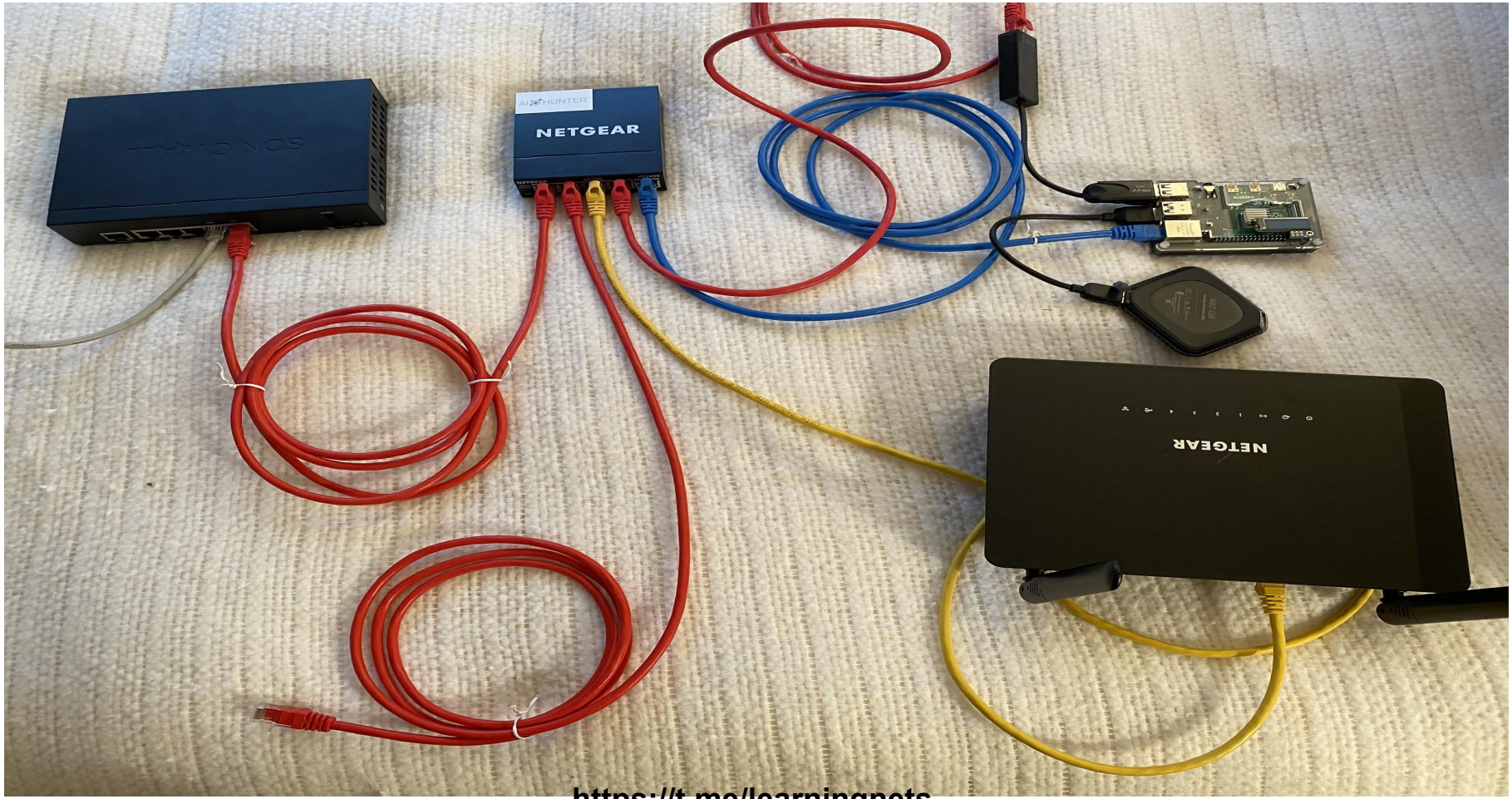
Why?

- Protection
  - Testing software in a controlled environment
- Rules
  - Packet capture and some cracking tools may be prohibited at work
- Learning
  - You can try out applications without risk
  - Document install procedure on a test network
  - Reverse engineering
- Patch testing
  - Apply to these non-production machines first
- Troubleshooting
  - Place to test/repair potentially infected systems
  - Disconnect other systems for this use

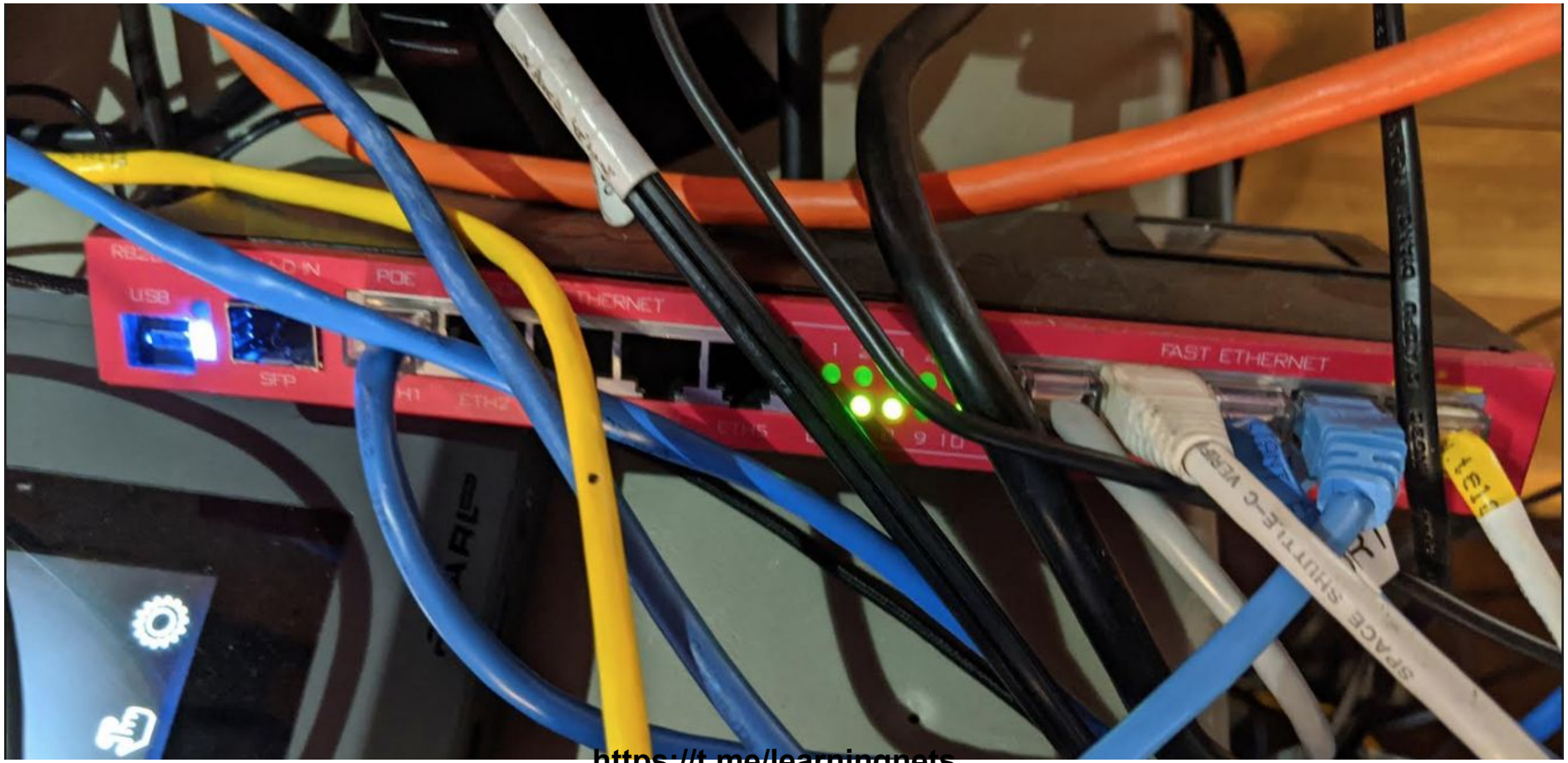


Network layout





John’s Lab Network



John’s Lab Network

‹ Back to results

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Mikrotik Routerboard RB2011UiAS-2HnD-IN Sfp Port plus 10 Port Ethernet

by MikroTik

279 ratings | 120 answered questions

Price: $140.69 ✓prime

Get $125 off: Pay $15.69 upon approval for the **Amazon Business Prime Card**. Terms apply.

- RouterBOARD 2011UiAS-2HnD has most features and interfaces from all our Wireless routers
- It's powered by the new Atheros 600MHz 74K MIPS network processor, has 128MB RAM, five Gigabit LAN ports, five Fast Ethernet LAN ports and SFP cage
- Also, it features powerful dual chain 2.4Ghz (2312-2732MHz depending on country regulations) 802.11bgn wireless AP, RJ45 serial port, USB port and RouterOS L5 license, as well as desktop case with power supply and two 4dBi Omni antennas
- RouterBOARD 2011UAS-2HnD-IN comes with desktop enclosure, LCD panel and power supply
- The RB2011Ui also has passive PoE output capability on the last port (ETH10), this means you can power another device just by connecting it over regular Ethernet cable

New & Used (6) from $100.00 + $5.49 Shipping

Report incorrect product information.

Port Mirroring

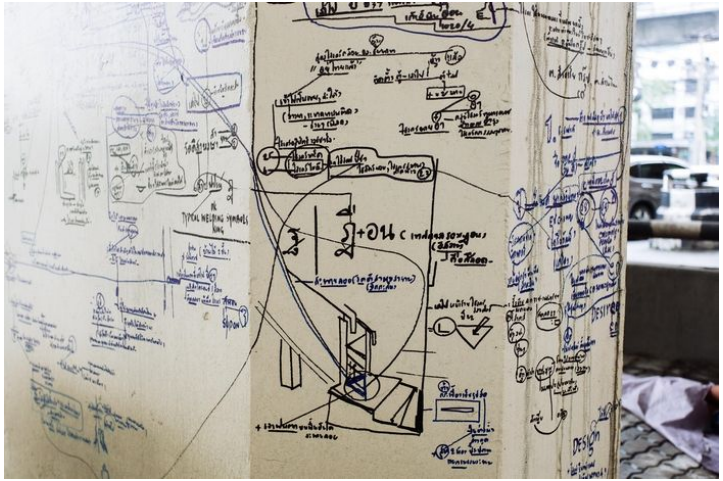
Port mirroring lets switch 'sniff' all traffic that is going in and out of one port (mirror-source) and send a copy of those packets out of some other port (mirror-target). This feature can be used to easily set up a 'tap' device that receives all traffic that goes in/out of some specific port. Note that mirror-source and mirror-target ports have to belong to same switch. (See which port belong to which switch in `/interface ethernet` menu). Also mirror-target can have a special 'cpu' value, which means that 'sniffed' packets should be sent out of switch chips cpu port. Port mirroring happens independently of switching groups that have or have not been set up.

- Port mirroring configuration example:

```
/interface ethernet switch
set switch1 mirror-source=ether2 mirror-target=ether3
```

John’s Lab Network

Network layout



- From the outside in:
- Ethernet from firewall to internet gateway
- Lab Firewall
  - Choke point, good for isolation and capture
- Switch with span port
  - Dedicated Sentinel capture system
  - Dedicated Labserv service system
- Wireless AP
  - By connecting this to the lab switch, Sentinel can capture all wired and wireless clients

Hardware for the project

- Firewall
- Switch with span port
- Wireless AP
  - wired ethernet outbound
- KVM switcher, monitor, KB, mouse
  - 4x PC -> KB/Mouse/HDMI: https://www.amazon.com/Switch-HDMI-1080P-Supported-Cables/dp/B083VWW9N9/
- Used hardware - excellent!
  - All that stuff you have in your basement already. :-)
- Gigabit ethernet
  - Needed for imaging
- Extra sata drives, flash drives, and microSDs
  - One for each project

Firewall or IPS

- Severely limit all traffic
  - Both directions
  - Do **not** open up for all outbound traffic
  - Open up ports as needed (coming up in this talk)
- IDS/IPS
  - Look for signatures of malicious traffic and beacons
- Bro/Zeek
  - Feed output to Rita (https://github.com/activecm/rita/)
  - Feed output to devprof (https://github.com/activecm/devprof)

Which firewall?

- Anything!
- Requirements
  - At least 2 network interfaces - inside and outside
  - Fast enough for needed data
  - Per-port firewall rules (ideally, per-port and per-client)
  - IPv4 and IPv6 support
- For this example, Sonicwall TZ300
  - Left over from a previous project
  - Serves the above needs

Switch

- Span port for capture leading to Sentinel
  - Second normal port for Sentinel incoming/outgoing access
- One port leading up to the firewall
- One port leading down to the wireless AP
- One port leading down to labserv
- Remaining N-5 ports for client systems
- Netgear GS116E (managed, 16 port)
  - Has span port capability (1 monitor port only)
  - https://www.amazon.com/gp/product/B00GG1AC7I/
  - $130, $108 with discount
- Mikrotik
  - https://www.amazon.com/Mikrotik-Routerboard-RB2011UiAS-2HnD-Port-Ethernet/dp/B00BGIXOHQ

Wireless AP

- Wired Ethernet going out to switch
- Optional additional Ethernet ports for lab machines
  - Though prefer main switch so all traffic captured
- Wireless Ethernet for wireless devices
  - Needs to support 2.4 ghz and 5 ghz
- Use management interface to monitor new systems
- Disable NAT here so you see the wireless IPs at your firewall

Free Wifi!!

Sentinel

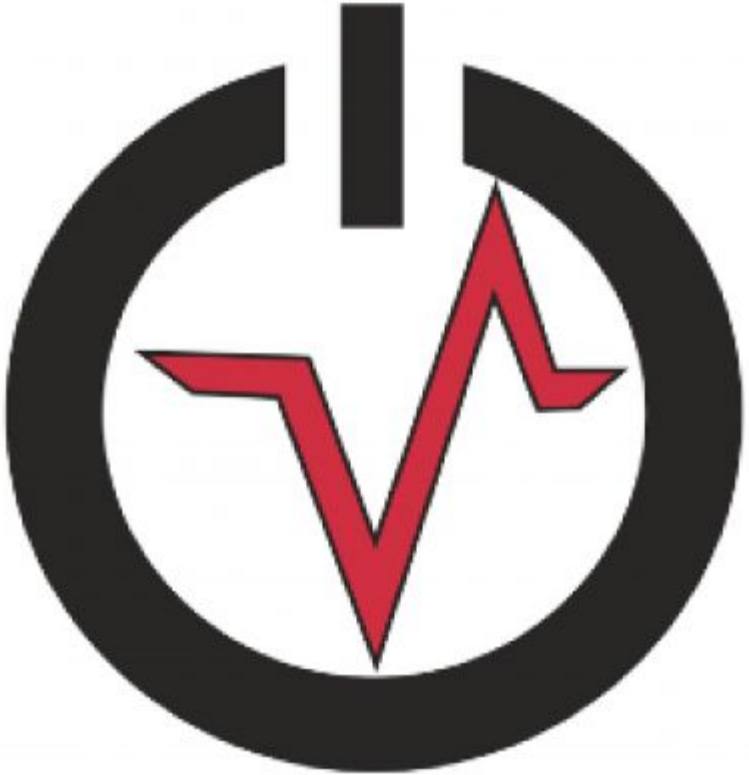
- SSH accessible from home machines
  - Allows for port forwarding in and out as needed
  - Jump to other hosts from here
- Has network tools for testing
  - Kali Linux or Security Onion
- VPN gateway software if needed
  - Discouraged - can be a way around the firewall
- Block all listening ports from lab IPs
- Extra drive space
  - Forensic images
  - Pristine images for rebuilding
- Second ethernet interface connected to span port
  - Need to capture inside packets with internal IP addresses

File and drive image transfer

- Make sure Sentinel system and devices support at least USB 3.0
- Flash drives
  - For manual file transfer
  - Pay attention to infection
    - Read-only before inserting into infected system
- USB 3 SATA cable or bay
  - https://www.amazon.com/s?k=USB+3+sata
- USB 3 memory card reader
  - https://www.amazon.com/s?k=USB+3+card+reader
  - https://www.amazon.com/SmartQ-C368-Multi-Card-Compatible-Supports/dp/B06Y1G18KS/
- Make image before starting forensics
- Create pristine images for all lab systems

Memory Analysis

- Volatility
  - https://www.volatilityfoundation.org/
- FTK Imager
  - http://vcodispot.com/ram-acquisition-ftk-imager-volatility/



Labserv

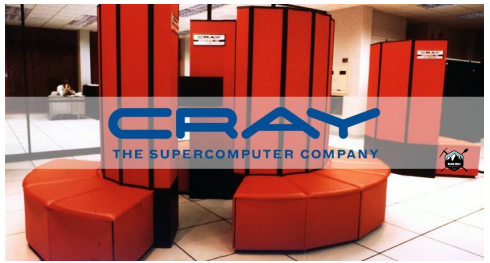
- SSH accessible from home machines
- System that provides services to lab systems
  - DNS
  - SMTP
  - Syslog
  - Squid web proxy
  - Hides the requestor IP
- Enable logging of all requests
  - DNS and squid request logging, /var/log/maillog
- Turn on file sharing with SMB/NFS/SSH if needed
  - If you need to share files with lab machines, do it from here
- Connections: Labserv -> lab systems

Do Firewall, Sentinel, and Labserv have to be separate?

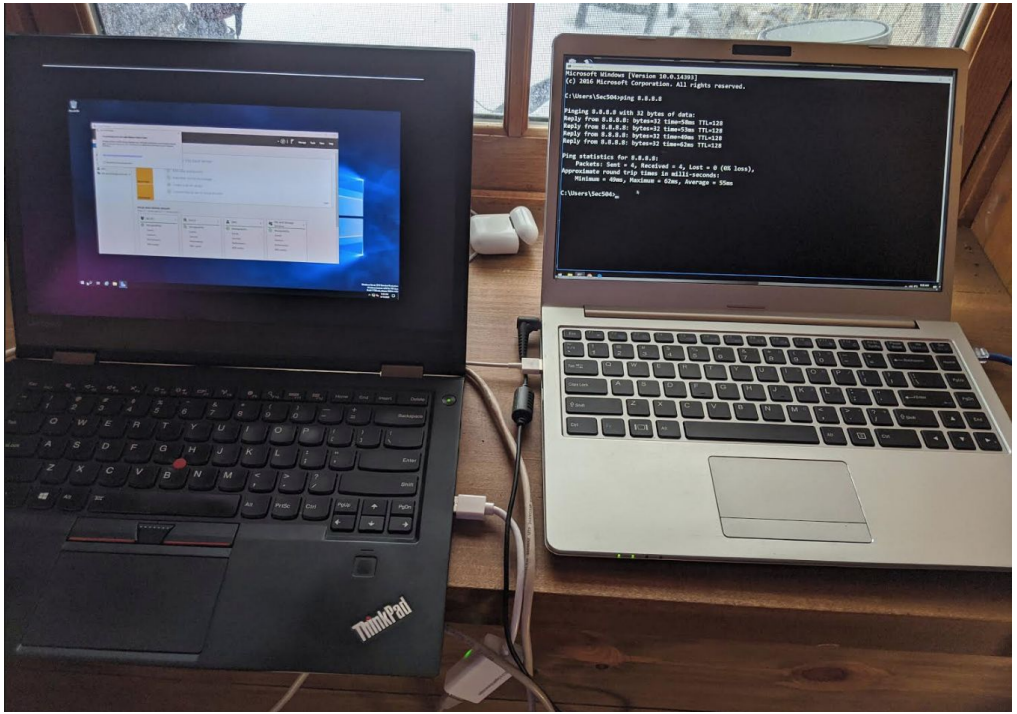
- 3 systems available
  - Keep all three separate
- 2 systems available
  - sentinel and firewall together
  - Labserv separate
  - **OR**
  - sentinel and labserv together
  - firewall separate
- 1 system available
  - discouraged, but can place all three on 1

Guinea Pigs

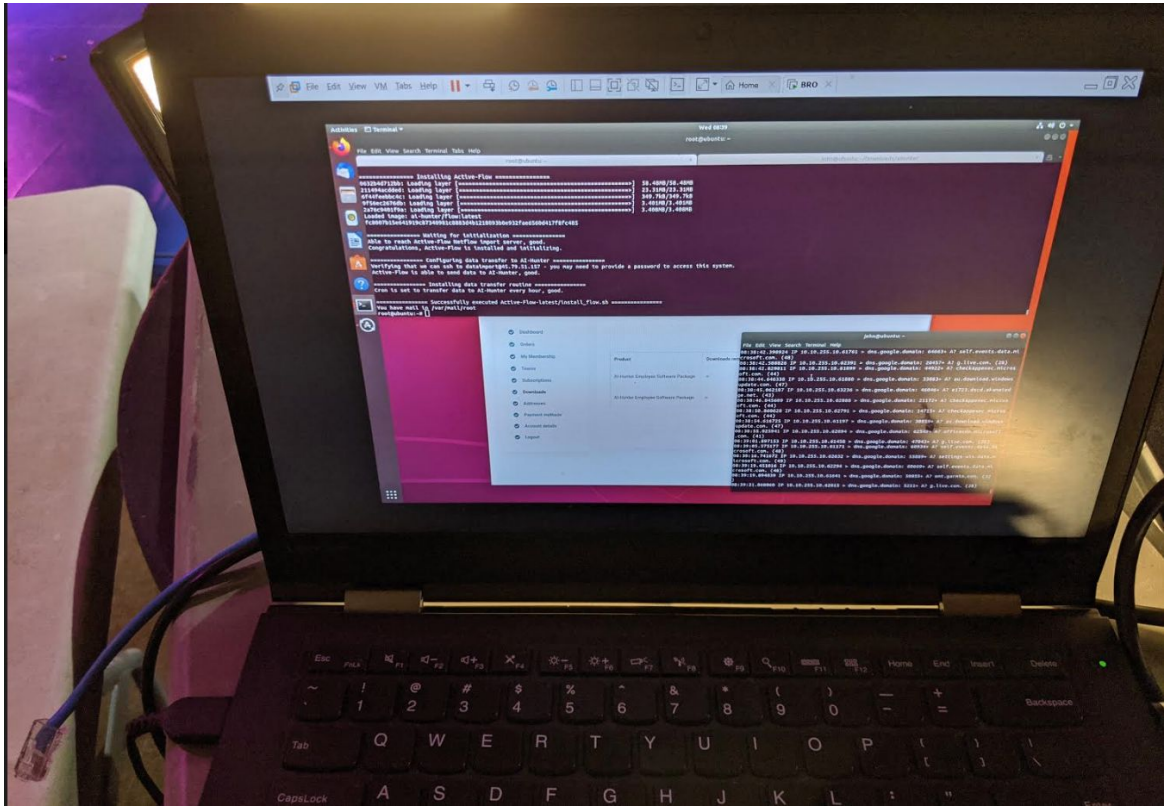
- Different platforms
  - Windows, Mac, Linux
  - IOT devices
  - Software you're testing or don't trust
  - Devices you're testing or don't trust
  - Android phone
  - Raspberry Pi
    - Multiple microsd cards for different Linux distributions
  - Potentially infected systems for forensics and imaging
- Virtual machines
  - Much easier to snapshot and restore
- They can *only* get internet access through this lab network



John’s Systems

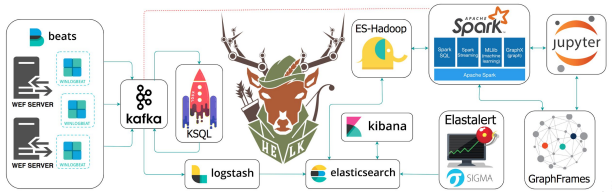


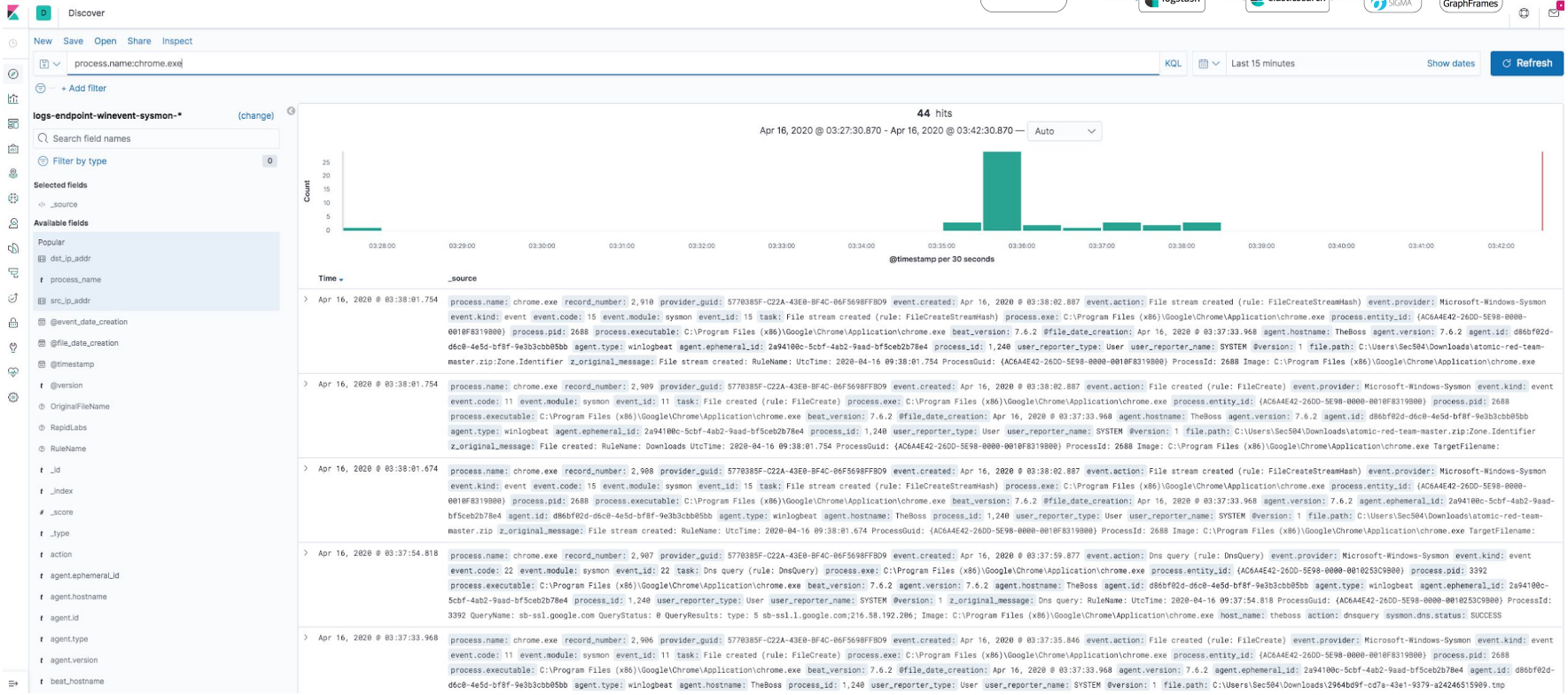
Zeek System



AI-Hunter for home

HELK



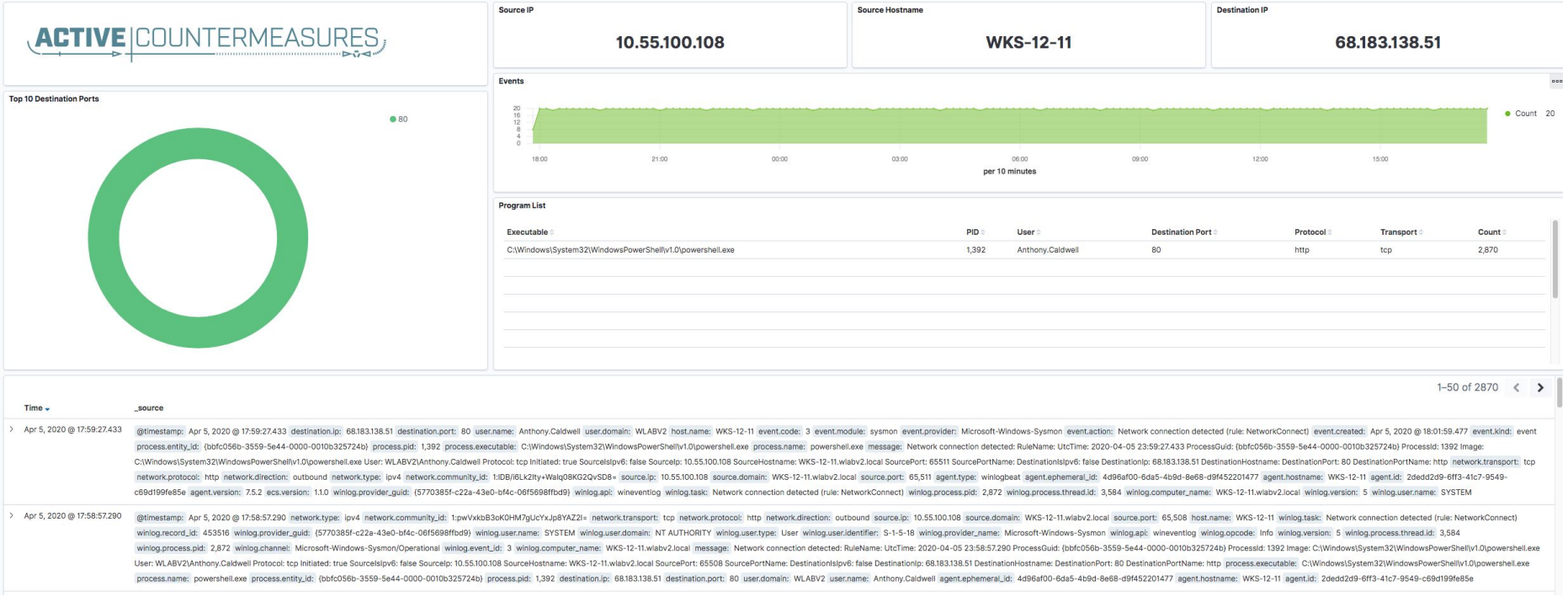


ACTIVE COUNTERMEASURES

https://t.me/learningnets

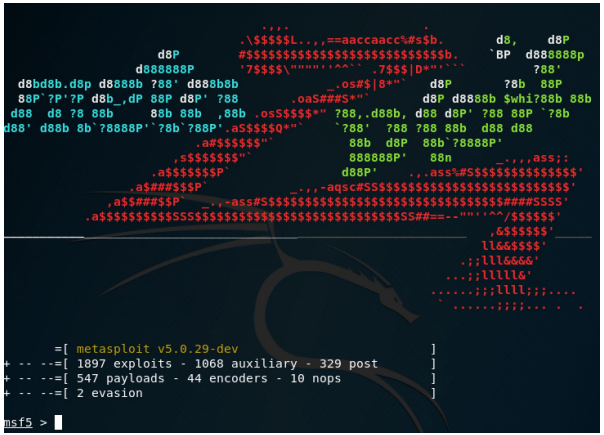
BLACK HILLS Information Security

Beaker



Creating Evil

- Atomic Red Team
- Metasploit
- Scythe
- Cobalt Strike



Recording

Incrementally opening up the Firewall

- Top of the list
  - Allow from Home network to Sentinel, Firewall and Labserv on ssh (22/tcp)
    - And responses
  - Block all traffic from lab network to Home network subnets
    - And responses
- End of firewall rules, add a "Block and Log everything not yet allowed" rule
- Wait for a new entry in the firewall log
- Create a rule for it above "Block and Log everything" rule
  - Make it an "Allow" rule if you agree with it, a "Block/Drop" rule otherwise
- Repeat
- Mason!

Software

AUTOPSY
DIGITAL FORENSICS

- IDS/IPS
- Forensics tools for your OS's
  - Statically linked binaries if possible: write protected drive
- Packet capture
- Port and network scanners
- Disk imaging

osquery

WAZUH

REAL INTELLIGENCE
THREAT ANALYTICS

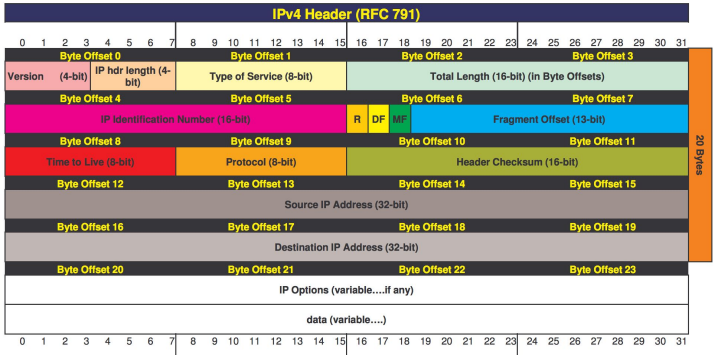
RITA is an open source framework for network traffic analysis.

ACTIVE COUNTERMEASURES

IDS/IPS

- Snort
  - https://www.snort.org/
  - https://github.com/snort3/snort3
- Suricata
  - https://suricata-ids.org/
- Security Onion
  - https://securityonion.net/
- Rock NSM
  - https://rocknsm.io/

Packet capture



- tcpdump
- Zeek/RITA
- tshark/wireshark
  - "ssh -x sentinel" if you want to run wireshark on sentinel and display on your laptop
- All will read live from an interface or read from pcaps
- Continuous capture, use BPF to drop local-local traffic

```
mkdir -p /opt/pcaps
```

```
screen -S capture -t capture -d -m bash -c "nice -n 15 tcpdump -i eth0 -G 3600 -w '/opt/pcaps/'`hostname -s`'.%Y%m%d%H%M%S.pcap' -z bzip2 'not (src net 172.27.0.0/16 and dst net 172.27.0.0/16)'"
```

```
screen -S capture -t capture -d -m bash -c "nice -n 15 tcpdump -i eth0 -G 3600 -w '/opt/pcaps/'`hostname -s`'.%Y%m%d%H%M%S.pcap' -z bzip2 '( (tcp[13] & 0x17 != 0x10) or not tcp) and not (src net 172.27.0.0/16 and dst net 172.27.0.0/16)'"
```

Network monitoring

- Nagios/Icinga/Shinken
  - https://www.nagios.org/
  - https://icinga.com/
  - http://www.shinken-monitoring.org/
- Bandwidth monitoring tools
  - https://www.dnsstuff.com/linux-network-monitoring-tools
  - https://www.binarytides.com/linux-commands-monitor-network/

Scanning

- nmap
  - https://nmap.org/
- Kali Linux
  - https://www.kali.org/
- Passer
  - https://github.com/activecm/passer

Disk imaging

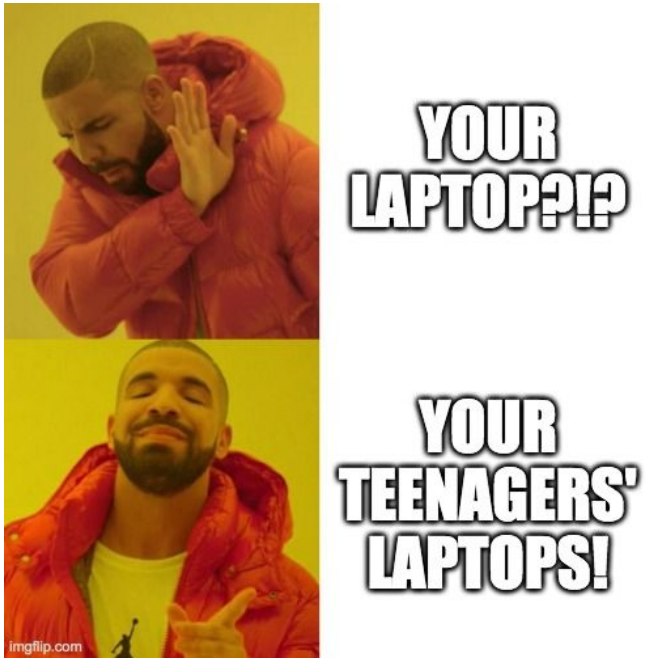
- Clonezilla
  - https://clonezilla.org/
  - Specifically Clonezilla Live: https://clonezilla.org/clonezilla-live.php
- Pi
  - https://github.com/billw2/rpi-clone
  - https://github.com/johntcw/Forensic-Imager
- FOG
  - https://fogproject.org/

On a budget - what's critical?

- **>>> Network Isolation <<<**
  - Severely limit what gets in and out
- Packet capture
  - Usually needs a span/mirror port
- Storage for pcaps, system images, and forensics
- Network and forensic tools
- Rest is negotiable
  - Network speed, type, and number of ports
  - Number and performance of support systems
  - Wireless vs wired

Closing notes

- Do **not** connect other systems to this network!
  - Come in over ssh to Sentinel
- Keep infected systems isolated
  - Disconnect the rest while working with one
  - Don't open up ports on the firewall until you know why they're needed.
- Play!
- Restore pristine image after trying new code



Credits

- John Strand
- Chris Brenton
- Bill Stearns
- Ethan Robish - thanks for the ideas!
  - https://www.blackhillsinfosec.com/home-network-design-part-1/
  - https://www.blackhillsinfosec.com/home-network-design-part-2/
- Shelby and Jason for pulling this all together
- Thanks to KC, Deb, Keith, Rick, David, Joff, Beau, Derek, Kent, James, Darin, and CJ for answering questions.
- Ongoing discussion: Discord servers

But Wait!!!!

https://www.activecountermeasures.com/documents