my ♡ favourite ♡ command line arguments

I use these 3 arguments the most:

-i is for interface

Which network interface to capture packets on. I often use `-i any`. The default interface tcpdump picks isn't always what you want.

Example: sudo tcpdump -i lo
shows you packets on the local "loopback" interface.

-w is for write

Instead of printing out packets, write them to a file! This is VERY USEFUL for analyzing the packets later. I use it all the time

Example: sudo tcpdump host 8.8.8.8
-w my_packets.pcap

Saves packets to/from 8.8.8.8 to a file

-c is for count

When writing to a file, be careful! You don't want to accidentally fill up your hard drive. `-c 10000` will only capture 10,000 packets.

Example: sudo tcpdump -c 1000
-w my_packets.pcap
dest port 8080

and here are a few more good ones:

-A

This prints out the packet's contents! For example, suppose I have a webserver on port 7777.

$ sudo tcpdump -A dest port 7777

will show me all the HTTP requests being sent to that server. Only works for HTTP, not HTTPS.

(I like ngrep more than tcpdump -A for looking at HTTP request bodies though ☺)

-n

By default, tcpdump will translate IP addresses to hostnames. `-n` forces it to just always print out the IP address

-e is for ethernet

Includes Ethernet information! This shows you the MAC address that the packet came from

Example: sudo tcpdump -e -i any
port 443

-p

makes sure you only get packets that are to or from your computer

like this?
there are more
zines at:
http://jvns.ca/zines

Julia Evans, wizard industries 2017

network administration tools

Finally, there are a lot more tools than tcpdump ! We won't explain them here but here's a list !

ping
"are these computers even connected?"

dig / nslookup
"does that domain exist?"

netstat / ss
"am I using that port?"

ifconfig
"what's my IP address?"

ip
configures interfaces, routes, and more. Successor to ifconfig.

arp
see your ARP table!

ngrep
grep for your network

traceroute / mtr
What servers are on the way to that server?

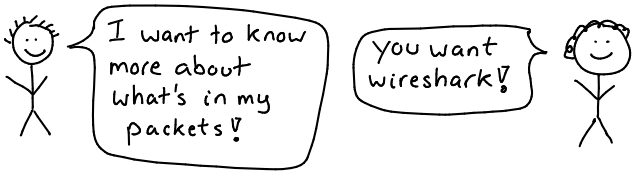
nc
netcat! Make TCP connections manually!

nftables / iptables
set up firewalls and NAT !

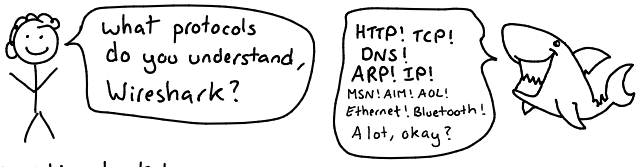
sysctl
configure socket buffer sizes, and more!

ethtool
understand your ethernet connections

♡ Wireshark ♡



Wireshark is an incredibly powerful packet analysis tool !



Things Wireshark has:

- ★ nice graphical interface !
- ★ it can connect TCP packets from the same connection !
- ★ search through your packets easily !

If you want to analyze packets from tcpdump with Wireshark, you can either:

① save a .pcap file and open it with Wireshark

② use this incantation to pipe tcpdump output into Wireshark !

```
ssh some.remote.host tcpdump -pni any -w - -s0 -U port 8888
  | wireshark -k -i -
```

what's this?

The man page for tcpdump starts like this:

```
NAME
       tcpdump - dump traffic on a network

SYNOPSIS
       tcpdump [ -AbdDefhHIJKlLnNOpqStuUvxX# ] [ -B buffer_size ]
               [ -c count ]
               [ -C file_size ] [ -G rotate_seconds ] [ -F file ]
               [ -i interface ] [ -j tstamp_type ] [ -m module ] [ -M secret ]
               [ --number ] [ -Q in|out|inout ]
               [ -r file ] [ -V file ] [ -s snaplen ] [ -T type ] [ -w file ]
               [ -W filecount ]
               [ -E spi@ipaddr algo:secret,... ]
               [ -y datalinktype ] [ -z postrotate-command ] [ -Z user ]
               [ --time-stamp-precision=tstamp_precision ]
               [ --immediate-mode ] [ --version ]
               [ expression ]
```

Julia Evans
@b0rk
http://jvns.ca
my blog!

BPF filters!

tcpdump uses a small language called BPF to let you filter packets.

When you run `$ sudo tcpdump port 53`, "port 53" is a BPF filter. Here's a quick guide!

→ port 53

checks if the source port OR the dest port is 53. Matches TCP port 53 and UDP port 53.

→ host 192.168.3.2

checks if the source or dest IP is 192.168.3.2

→ host 11.22.33.44 and port 80

you can use 'and', 'or', and 'not'

→ src port 80
→ dest port 80
→ tcp port 80

are what they look like ☺ so are
src host 1.2.3.4
dest host 1.2.3.4

→ udp[11] & 0xf == 3

you can do bit math like this on packet contents. This checks for the DNS response code "NXDOMAIN"!

(I googled to find this and it works! ☺)

nmap

in ur network scanning ur ports

whois

look up a domain

lsof

what ports are being used?

telnet

see if a port on nother server a is open

ssh

can't forget this one ☺

sysctl

configure socket buffer sizes, and more!

network manager

GUI tool to configure the network on your laptop

nethogs / ab / nload
iptraf / netperf / iperf
iftop / netsniff-ng

lots of performance / benchmarking tools (they all do different things)

paping

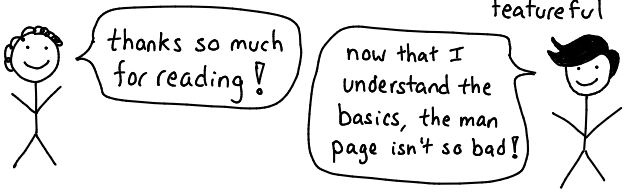
ping, but it uses TCP

OpenVpn

set up a VPN!

socat

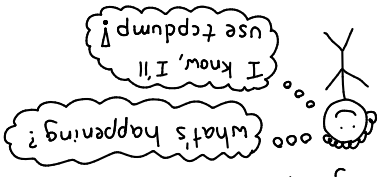
like netcat, but more featureful



What is tcpdump for?

tcpdump captures network traffic and prints it out for you.

For example! Yesterday DNS lookups on my laptop were slow




```
$ sudo tcpdump -n -i any port 53
```

DNS queries

```
10:52:03.992138 IP 192.168.1.241.63019 > 192.168.1.1.53: 44000+ A? ask.metafilter.com. (36)
10:52:08.972719 IP 192.168.1.241.63019 > 192.168.1.1.53: 44000+ A? ask.metafilter.com. (36)
10:52:13.919782 IP 192.168.1.241.63019 > 192.168.1.1.53: 44000+ A? ask.metafilter.com. (36)
10:52:13.928894 IP 192.168.1.1.53 > 192.168.1.241.63019: 44000 2/0/0 CNAME metafilter.com.,
A 54.186.13.33 (80)
```

DNS response

This means that there were 3 DNS queries (at 10:52:03, 10:52:08, 10:52:13), but only the 3rd one got a response!

I figured my router was probably the problem, I restarted it, and my internet was fast again!

Let's learn how to debug problems with tcpdump!

Questions you can answer with tcpdump

→ what DNS queries is my laptop sending?

"tcpdump -i any port 53"

→ I have a server running on port 1337. Are any packets arriving at that port at ALL???

"tcpdump -i any port 1337"

→ what packets are coming into my server from IP 1.2.3.4?

"tcpdump port 1337 and host 1.2.3.4"

→ show me all DNS queries that fail

"tcpdump udp[11] &0xf==3"

(complicated but it works!)

→ how long are the TCP connections on this box lasting right now?

"tcpdump -w packets.pcap"

and analyze packets.pcap in Wireshark

What tcpdump output means

Every line of tcpdump output represents a packet.

The parts I usually pay attention to are:

* source + dest IP address and port
* timestamp
* which TCP flags (good for spotting the beginning of a TCP connection)
* the DNS query, for DNS packets
* that's it!

UDP packet:

```
10:52:03.992138 IP 192.168.1.241.63019 > 192.168.1.1.53: 44000+
A? ask.metafilter.com. (36)
```

timestamp · source IP · port · dest IP (my router) · port · DNS query ID · DNS query

TCP packet:

```
11:36:26.353797 IP 192.168.1.241.45296 > 192.241.182.146.443: Flags [.],
ack 2291349910, win 319, options [nop,nop,TS val 1096755 2 ecr 580196754],
length 0
```

TCP flags · "." means ACK

Ever seen a "Connection refused" error? Here's what that looks like in tcpdump!

```
12:16:38.944390 IP6 localhost.48680 > localhost.8999: Flags [S]
12:16:38.944458 IP6 localhost.8999 > localhost.48680: Flags [R.]
```

SYN · RST ACK

We sent a SYN to open the connection but the server replied with a "RST" packet. That gets translated to "connection refused".