

Running your own Webserver ***Theory and Practice***

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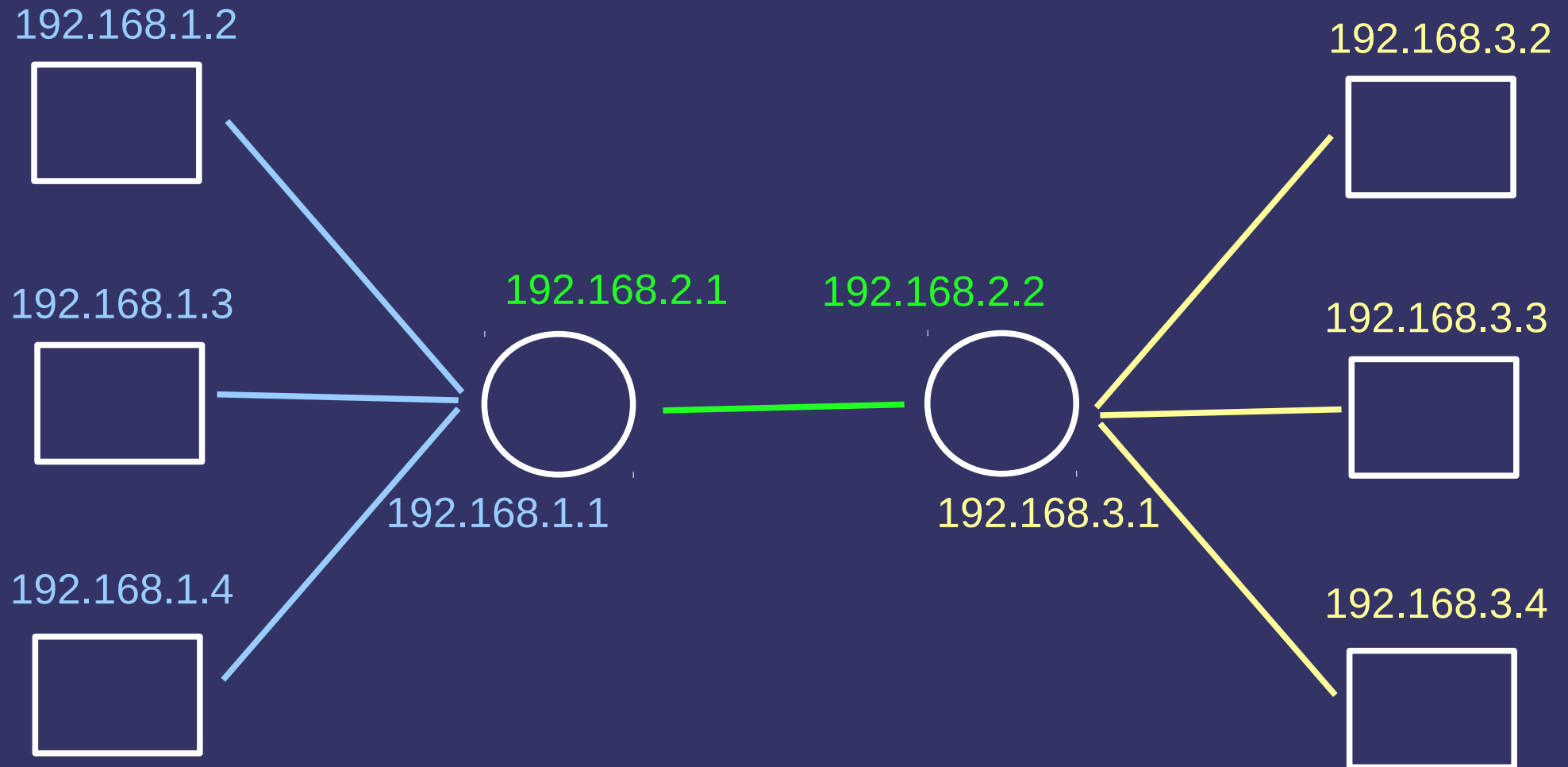
Event Overview

- Presentation:
 - background Internet technology (TCP/IP)
 - background UNIX, Linux and Raspberry Pi
 - practical things
- Workshop: *try it yourself*

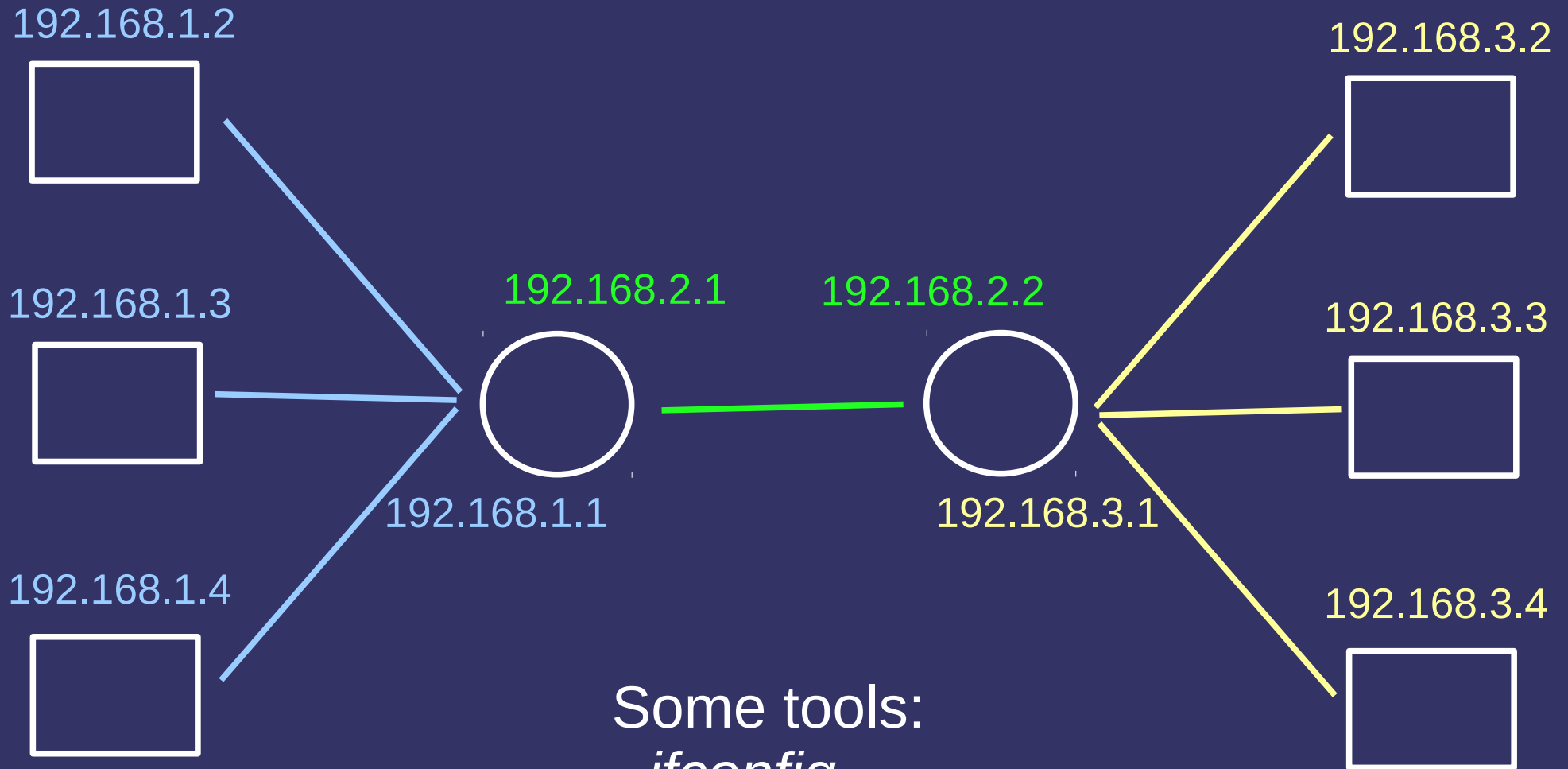
TCP/IP history



TCP/IP principles



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Some tools:
- *ifconfig*
- *traceroute*

Domain Name System

How to resolve *www.cs.vu.nl* ?

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- (2) ask *.nl* DNS server for *vu.nl*
- (3) ask *vu.nl* for *cs.vu.nl*
- (4) ask *cs.vu.nl* for *www.cs.vu.nl*

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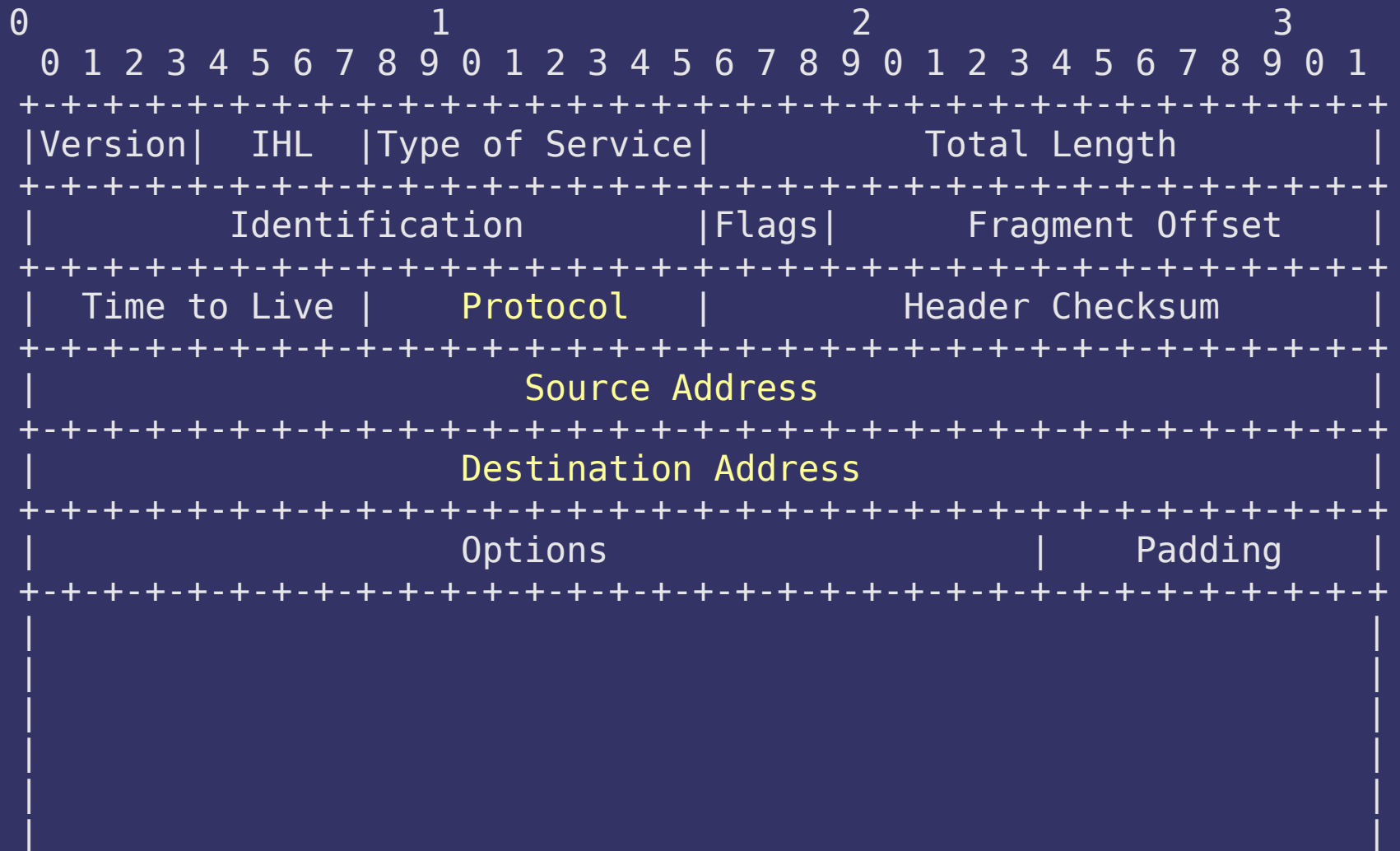
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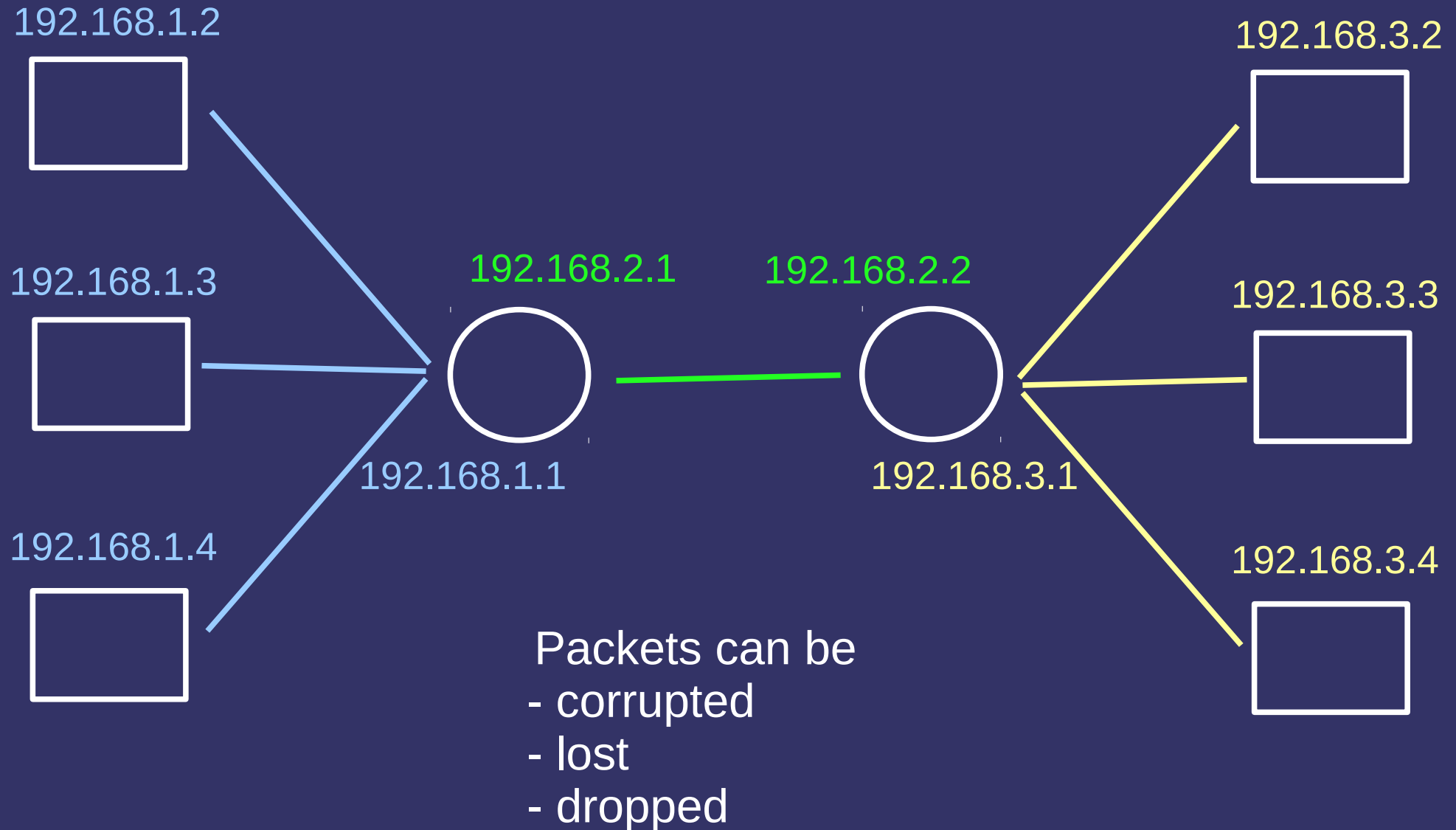
Some tools:

- *nslookup*
- *dig*
- *host*

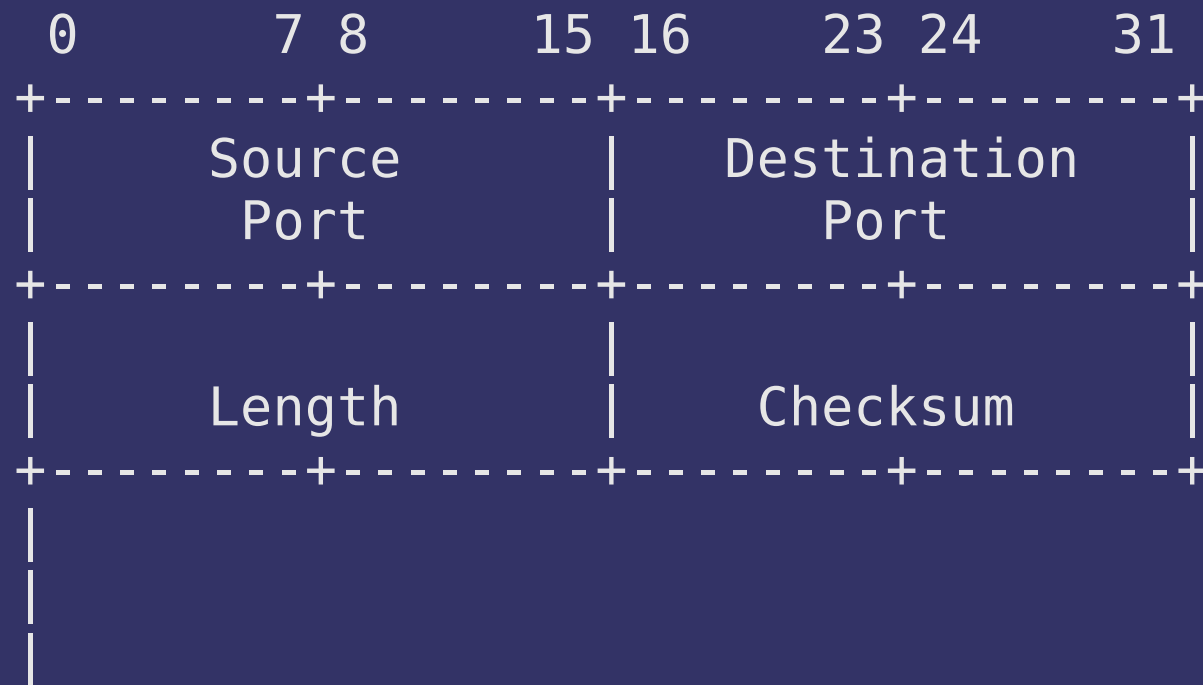
What IP packets look like



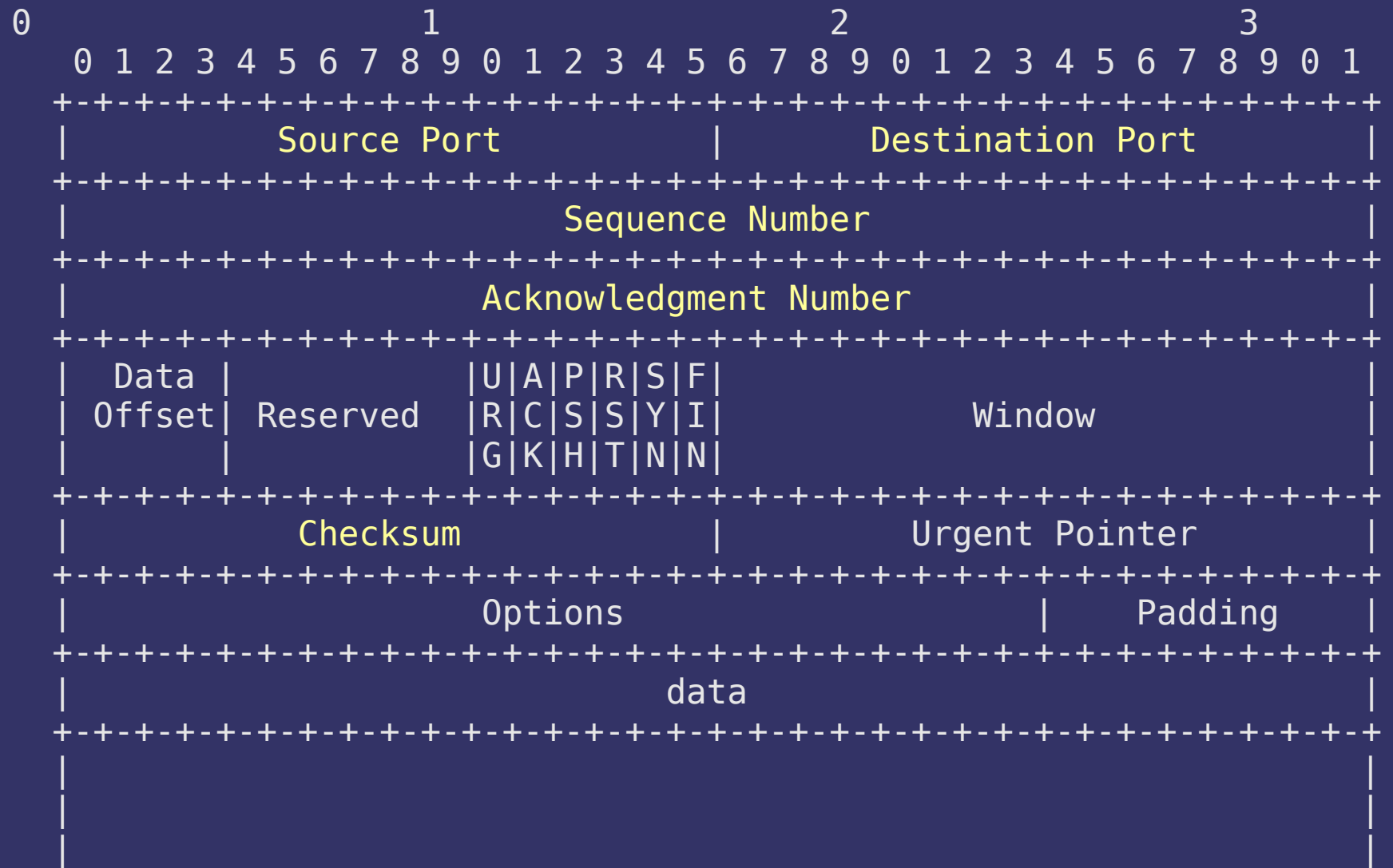
Problem: IP is unreliable



On top of IP: UDP



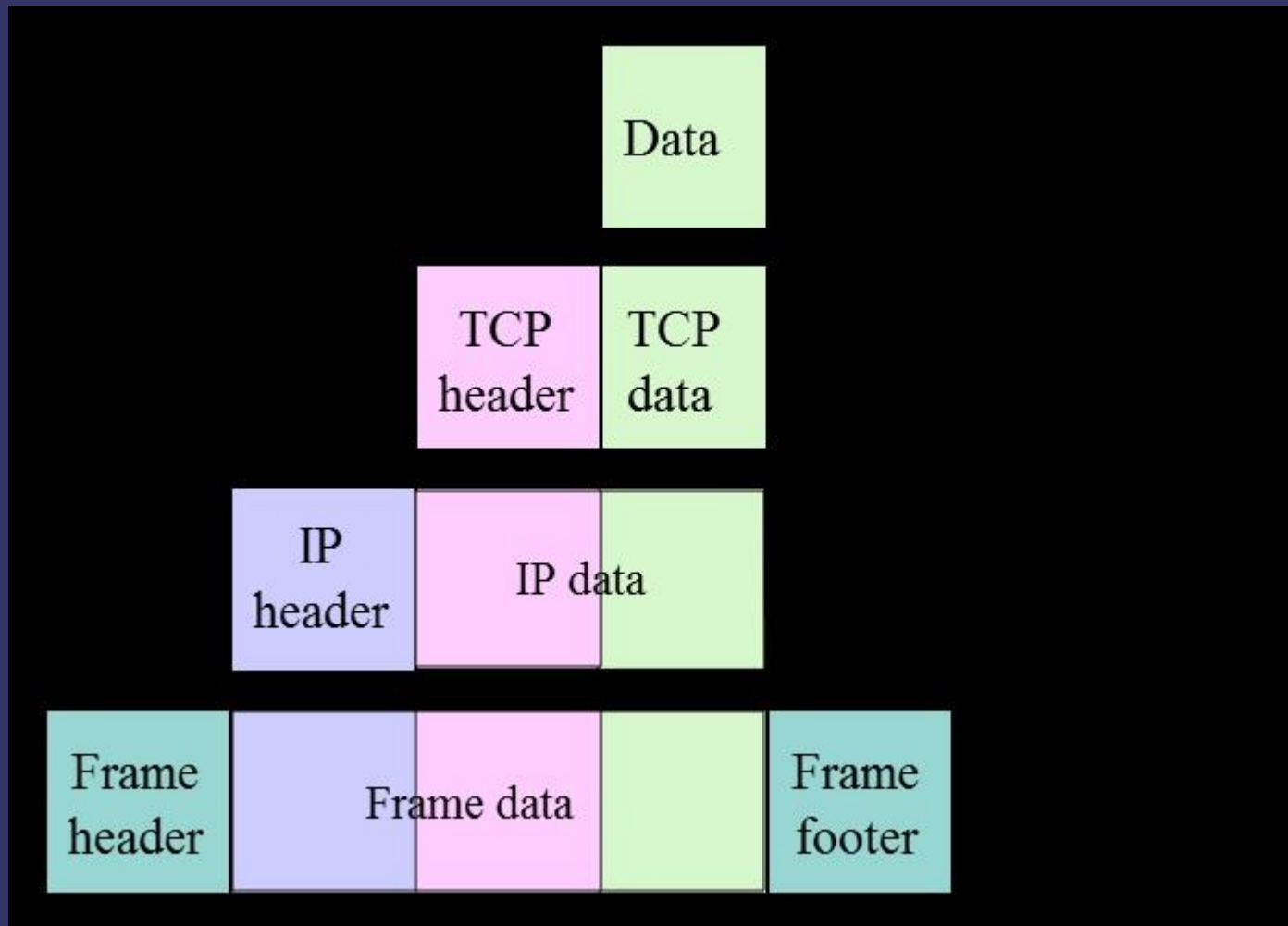
On top of IP: TCP



Important TCP port numbers

- TELNET: 23 (old school remote login)
- HTTP: 80 (Web)
- SMTP: 25 (sending email)
- SSH: 22 (secure remote login)

TCP/IP protocol stack



More info: *TCP/IP Illustrated, vol 1 (Fall & Stevens)*
or *Computer Networks (Tanenbaum)*

Next Topic: UNIX



UNIX history

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- Start of Open Source Movement
 - Free Software Foundation (GNU)
 - Minix (Andy Tanenbaum)
 - Linux (Linus Torvalds)

Some practical UNIX commands

<i>ls</i>	list contents of directory
<i>cd</i>	change direccory
<i>cp</i>	copy file
<i>mv</i>	move file
<i>ln</i>	link to file
<i>rm</i>	remove file
<i>cat</i>	concatenate file contents
<i>man</i>	manual page (RTFM!)

Example redirected I/O:

```
ls -al | tail -n +1 | sort
```

Where to find what

/bin	essential programs
/usr	more system resources (read-only)
/etc	configuration files
/dev	devices (everything is a file)
/home	user files
/var	logfiles and other system stuff (r/w)

Useful commands: **mount**, **free**, **du**, **du | xdu**

Processes

- process: program that is running
- each process has a PID (and a parent)
- some processes are *daemons* (*inet, cron, getty, ...*)
- useful commands: *ps, top*

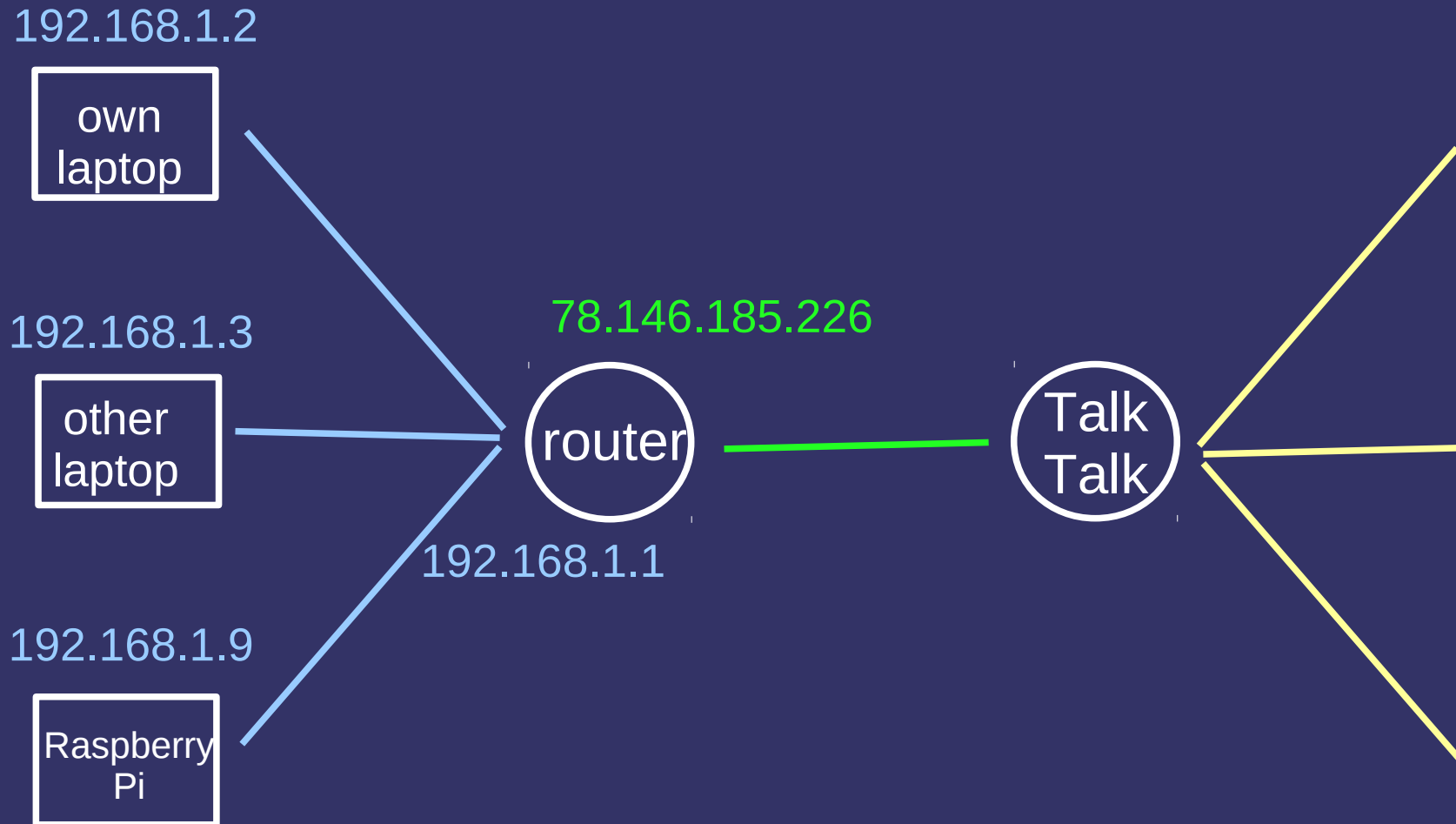
More Info

- UNIX power tools (Powers & Peek)
- The Linux Documentation Project Guides + HOWTOs (www.tldp.org)
- Raspberry Pi documentation
- Books from O'Reilly (usually OK)

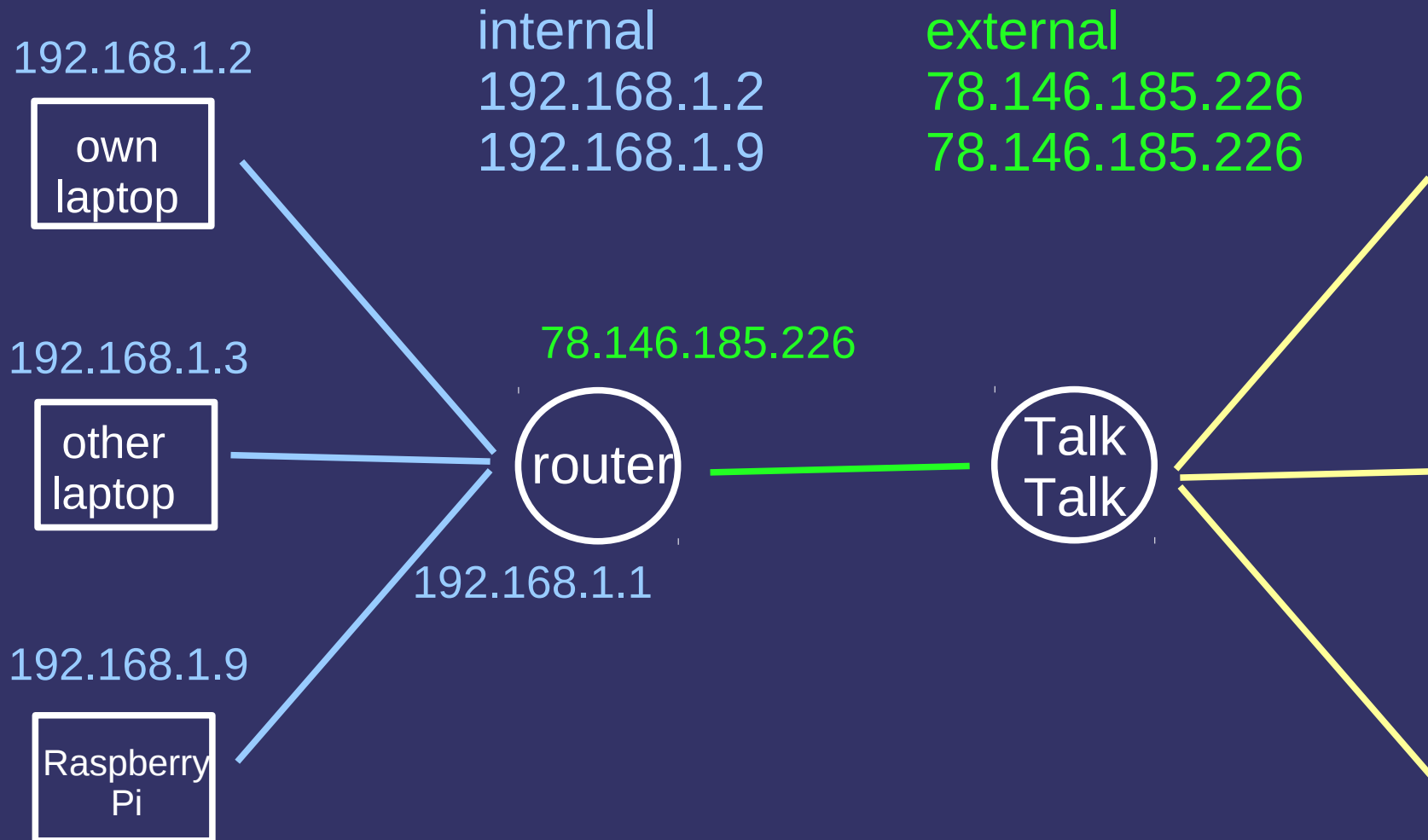
Getting Practical

- (1) If necessary, flash the SD card
- (2) Plug in your Raspberry Pi (incl. KB + TV)
- (3) Install an SSH server (if not already there) and get an SSH client (PUTTY) so you can use remote access (unplug KB+TV)
- (4) Refresh your package list
sudo apt-get update
- (5) Install Apache webserver
sudo apt-get install apache
- (6) Reconfigure your home broadband router:
NAT, Port Forwarding, assigning fixed IP to Pi
- (7) Get yourself a Domain Name (NameCheap?)

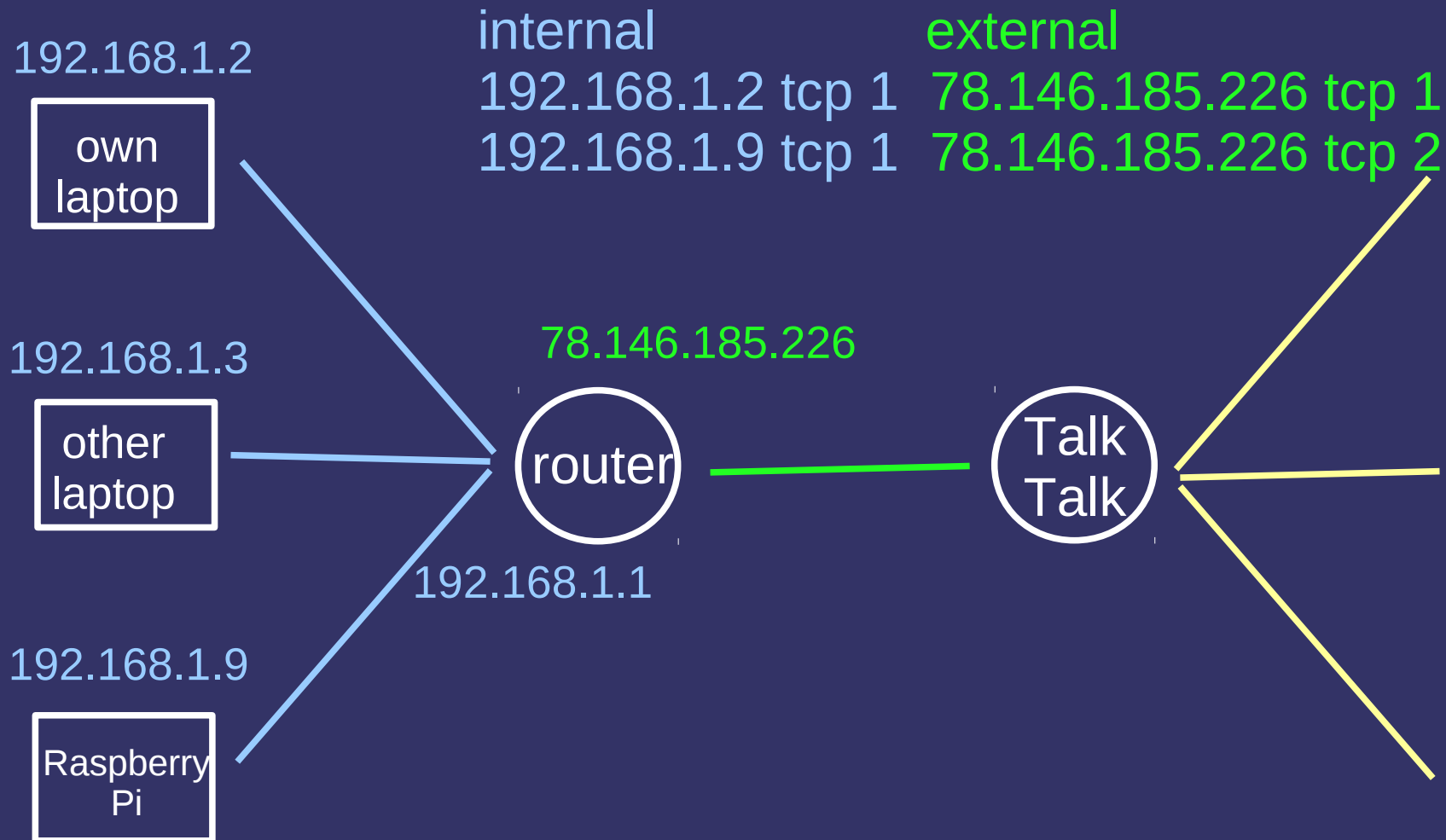
The Ugly Details (part 1): Network Address Translation



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The Ugly Details (part 2): Dynamic IP addresses and DDNS

- each time you restart the ADSL connection and each time you restart the router, you'll get a different IP address
- You need to have your DNS provider (like NameCheap) automatically informed whenever this happens (DDNS)
- Ideally, this should be configured on the router, if not, make it a cron job on the Pi

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cpc.farnell.com

get yourself a Starter Kit for £41.99
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avoid Maplin (expensive!)