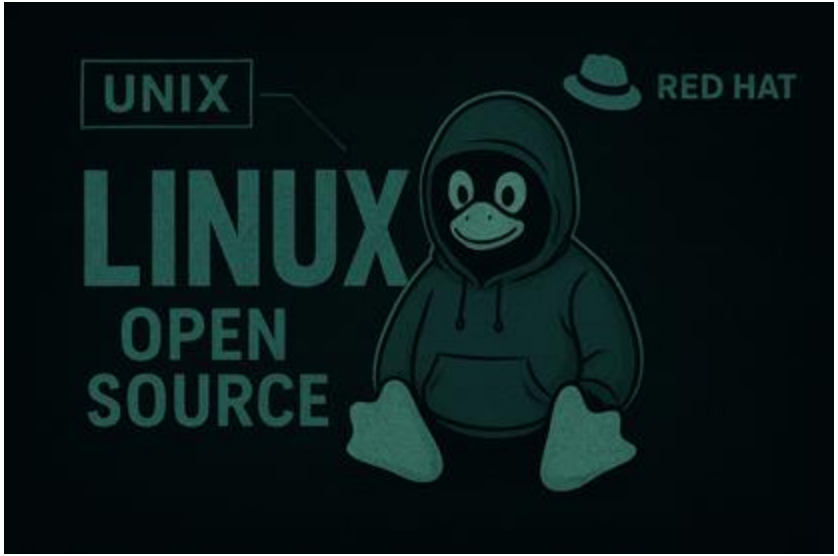
Introduction to Linux



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Course text

chapter 1: Introduction to Linux and Basic Networking

- 1.1 Introduction to Linux
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  - Linux
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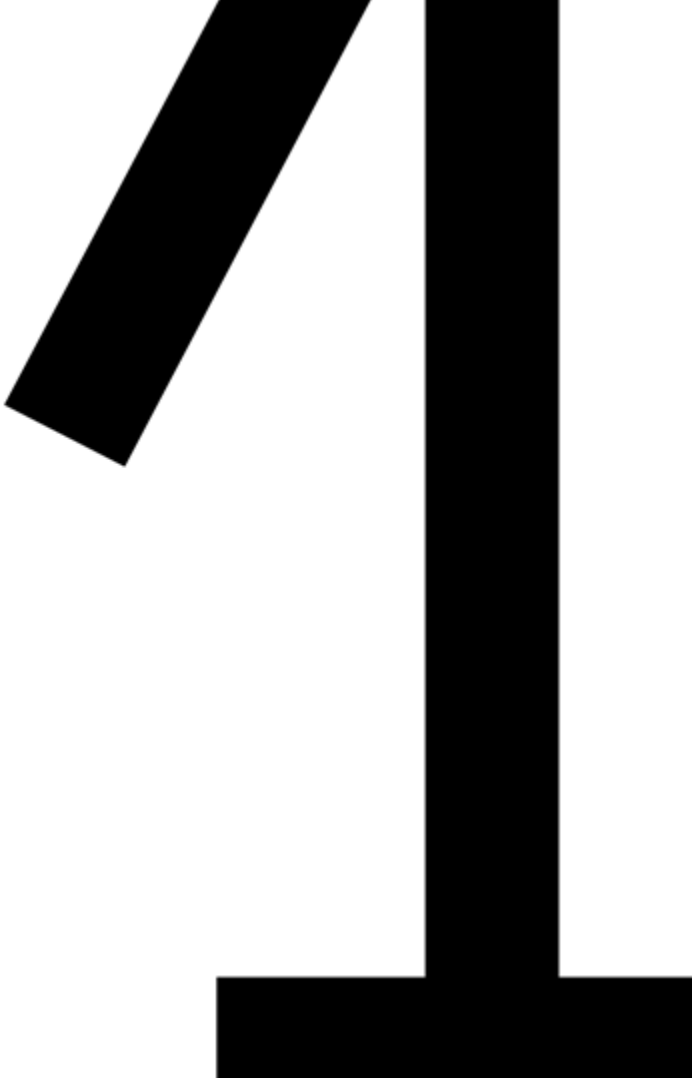
- 1.2 Basic Networking
  - Why Networking Matters in Linux
  - The Basics of Network Communication
  - IP Addresses
  - Finding Your Own IP Address
  - Hostnames and DNS
  - Ports and Services

What is Linux?



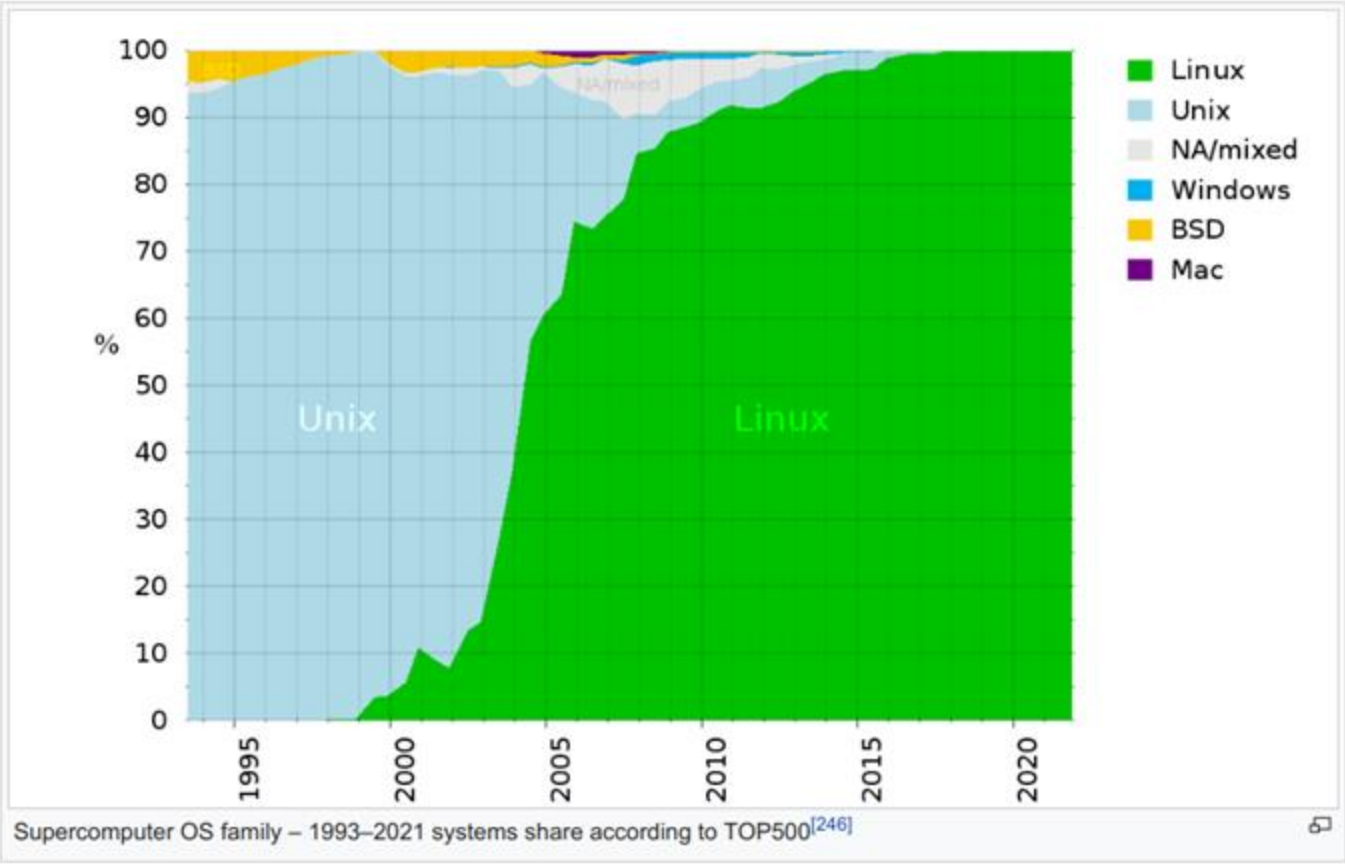
What is …?

What is Linux?
What is an Operating System (OS)?
Which ones do you know?
On which devices do you use Linux?
What is UNIX?

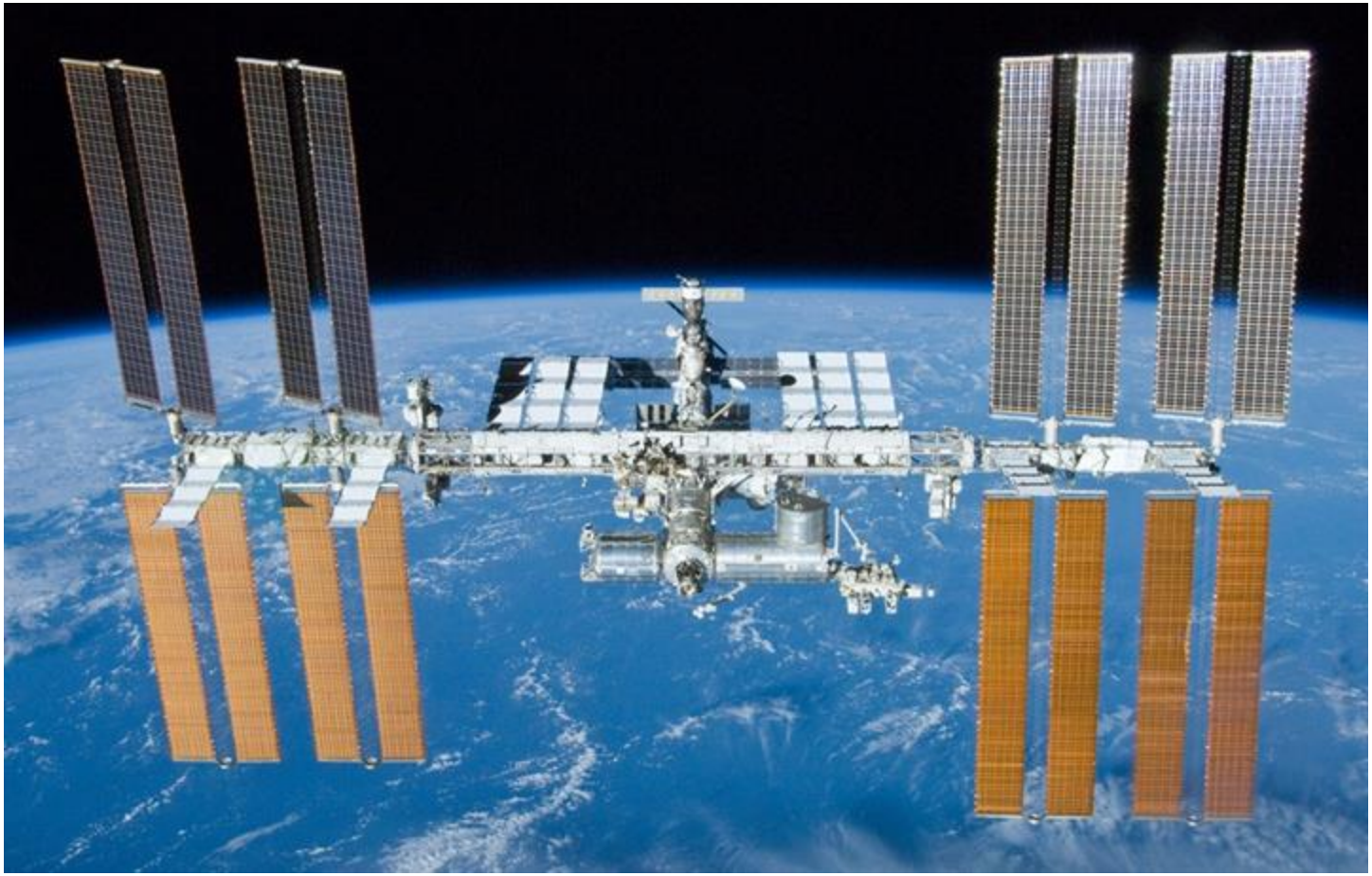
Linux is everywhere

- televisions
- phones
- networking equipment, routers, firewalls
- tv recorders
- digital pianos
- gps systems
- satellites
- ….

Why linux ?



Supercomputer OS family – 1993–2021 systems share according to TOP500[246]




RECARO


nest
68
IN 20 MIN
70

Microsoft developer reveals Linux is now more used on Azure than Windows Server

Linux rules all the clouds now, including Microsoft's own Azure.

Written by **Steven Vaughan-Nichols,** Senior Contributing Editor

June 30, 2019 at 5:19 p.m. PT

History

1969: UNIX, C: Ken Thompson, Dennis Ritchie
1985-1989: Open source, GNU: Richard Stallman
1987: Minix: Andrew S. Tanenbaum
1991: Linux kernel: Linus Torvalds

Ken Thompson (sitting) and Dennis Ritchie working together at a PDP-11

Richard Stallman

Andrew S. Tanenbaum

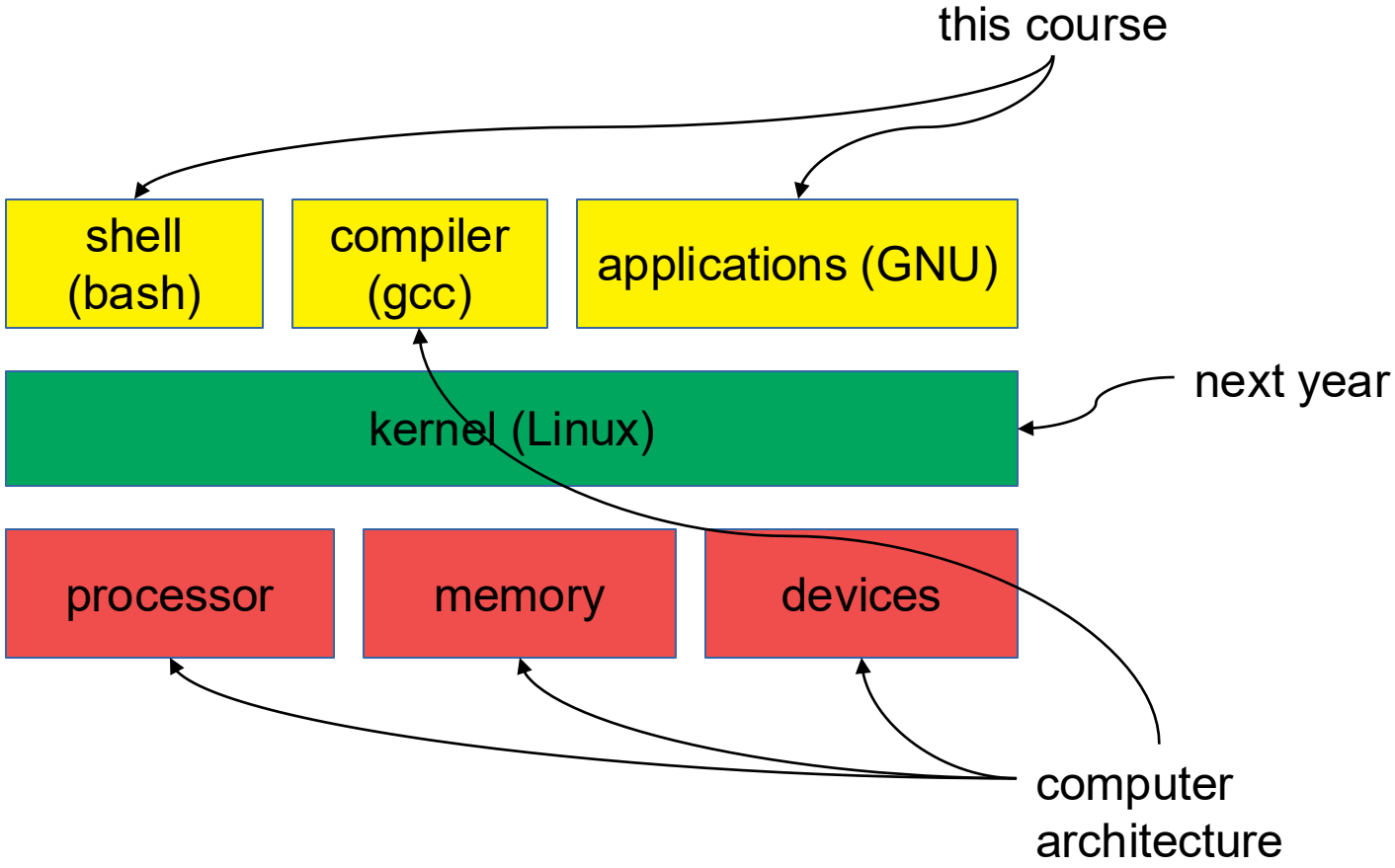
Linus Torvalds

Linux “birth announcement”

From: torvalds@klaava.Helsinki.FI (Linus Benedict Torvalds)
Newsgroups: comp.os.minix
Subject: What would you like to see most in minix?
Summary: small poll for my new operating system
Message-ID: <1991Aug25.205708.9541@klaava.Helsinki.FI>
Date: 25 Aug 91 20:57:08 GMT
Organization: University of Helsinki

Hello everybody out there using minix -
I'm doing a (free) operating system (just a hobby, won't be big and
professional like gnu) for 386(486) AT clones. This has been brewing
since april, and is starting to get ready. I'd like any feedback on
things people like/dislike in minix, as my OS resembles it somewhat
(same physical layout of the file-system (due to practical reasons)
among other things).
I've currently ported bash(1.08) and gcc(1.40), and things seem to work.
This implies that I'll get something practical within a few months, and
I'd like to know what features most people would want. Any suggestions
are welcome, but I won't promise I'll implement them :-)
Linus (torvalds@kruuna.helsinki.fi)
PS. Yes - it's free of any minix code, and it has a multi-threaded fs.
It is NOT protable (uses 386 task switching etc), and it probably never
will support anything other than AT-harddisks, as that's all I have :-(.

Schematic


this course
shell (bash)
compiler (gcc)
applications (GNU)
kernel (Linux)
next year
processor
memory
devices
computer architecture

UNIX kernel

- Tasks
  - booting (loading, getting started)
  - control hardware
    - mouse, keyboard, screen, disk, network, …
    - only the kernel can access the hardware
  - process management
  - memory management
  - file management
  - …
- Without a kernel all applications should handle this on their own

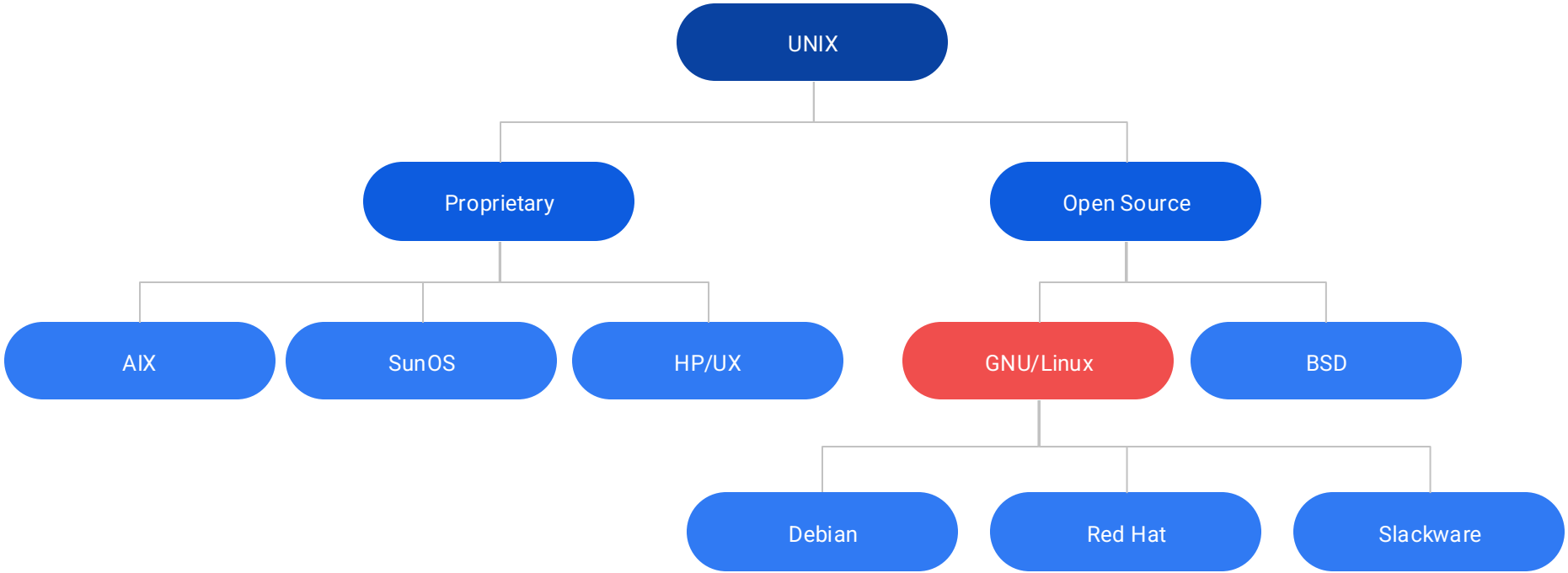
Philosophy UNIX

- there are many flavours of UNIX:
  - HP-UX, AIX, SunOS, Solaris, IRIX, GNU/Linux, BSD, ...
- small programs that can be combined
  - less probability for bugs
- programs work with text files (ASCII or unicode) as input-output

UNIX

- multi user: many users can access the system at the same time
- interaction with user using a terminal (text) or X-terminal (graphical user interface)
- multitasking
- "processor independent": mostly written in C

UNIX flavours



GNU Public Licence (GPL)
FOSS (Free Open Source Software)

"Free" as in "Free speech", not as in "Free beer"

- The freedom to run the program, for any purpose (freedom 0).
- The freedom to study how the program works, and adapt it to your needs (freedom 1). Access to the source code is a precondition for this.
- The freedom to redistribute copies so you can help your neighbour (freedom 2).
- The freedom to improve the program, and release your improvements to the public, so that the whole community benefits (freedom 3). Access to the source code is a precondition for this.

Youtube: Revolution OS

Who develops FOSS

- Mostly professionals
- A large group of volunteers
- Very often academic & research institutes

Linux = open => many versions

- there are many versions (“distributions”) of GNU/Linux
  - https://nl.wikipedia.org/wiki/Lijst_van_Linuxdistributies
- Debian based (like Ubuntu)
- Redhat based (like Alma Linux)
- Own version (http://www.linuxfromscratch.org)
- …

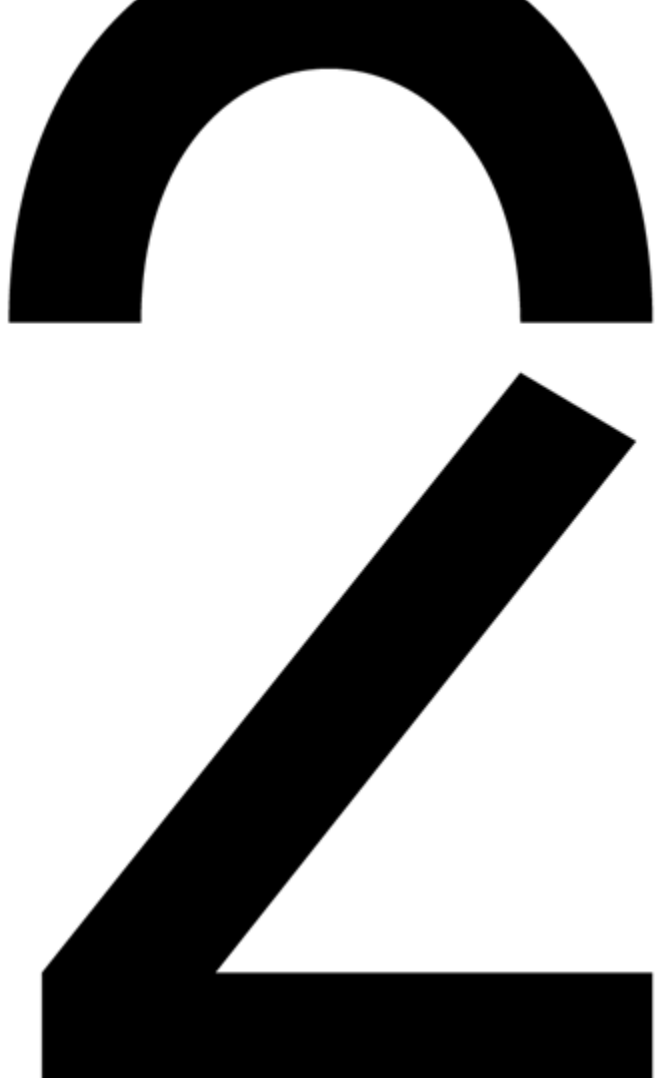
But they all share the same kernel

http://en.wikipedia.org/wiki/Linux_distribution
http://upload.wikimedia.org/wikipedia/commons/1/1b/Linux_Distribution_Timeline.svg

Red Hat Enterprise Linux

Red Hat Enterprise Linux (RHEL) is Red Hat's **production-ready**, **commercially supported** Linux distribution. In the computing industry, RHEL is acknowledged as the leading platform for open source computing. RHEL is **extensively tested** and has a worldwide ecosystem of **support** partners **for hardware and software certifications,** consulting services, training, and **multi-year support** and maintenance guarantees.

How to run?



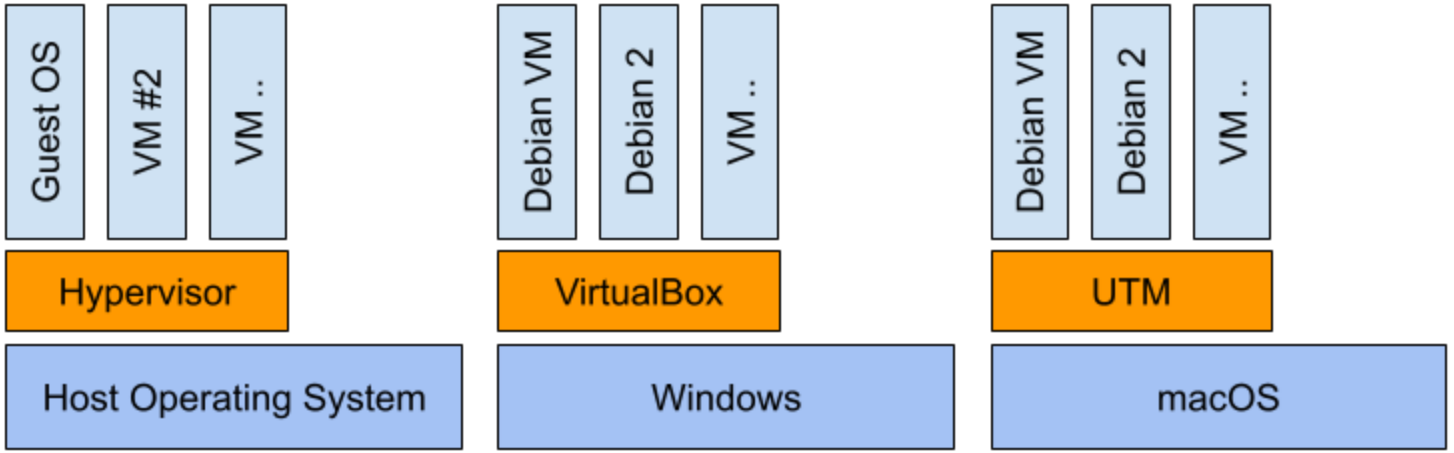
Different possibilities

- On your own laptop
  - Native: replace Windows
  - Dual boot: Windows and Linux next to each other
  - Live CD/USB
  - Windows Subsystem for Linux (WSL2)
  - Virtual machine
- On a server
  - Native
  - Virtual machine

In this course

- on KdG servers: Alma Linux
- via Red Hat online cursus: Red Hat Enterprise Linux
- on a virtual machine on your laptop
  - Virtual Box
  - Alma Linux
  - from week 4-5

Virtualisation



Practical: Red Hat

Red Hat System Administration I Course

Red Hat System Administration I (RH124) is designed for IT professionals without previous Linux system administration experience. The course provides students with Linux administration competence by focusing on core administration tasks.

Red Hat

- see document on Canvas: “Setup RedHat account”
- go to https://sso.redhat.com
  - create login using your KdG email address
  - use “firstname.lastname.kdg” as username
    - no spaces
    - no special characters (this is an American system)
  - put your loginname in this sheet:

    …
- wait until your teacher has added you to the course (till next class)
- try to login into the RH academy and the “System Administration 1” course https://rha.ole.redhat.com/rha/

My Courses

Course | Learning Path | Assignment

Red Hat System Administration I 9.3

RH124 - September 9, 2024 - September 30, 2025

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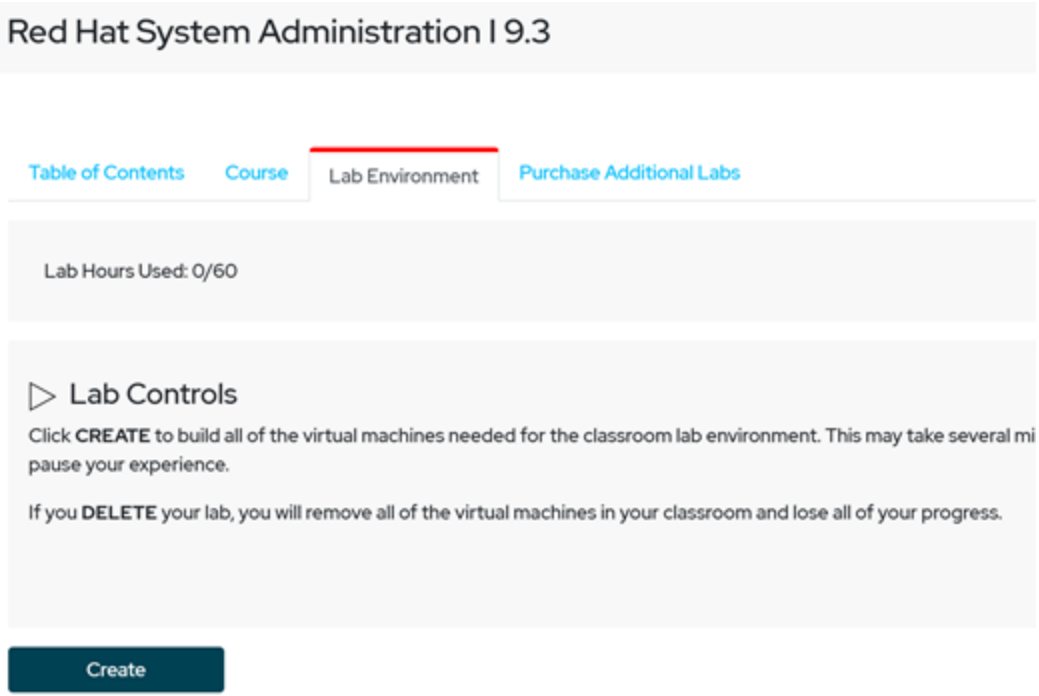
Your online course material (textbook, labs)

Your online lab environment. (max 80 hours)

Create - Start - Stop your lab environment



You need to create your virtual lab environment before you can use it, this takes a while

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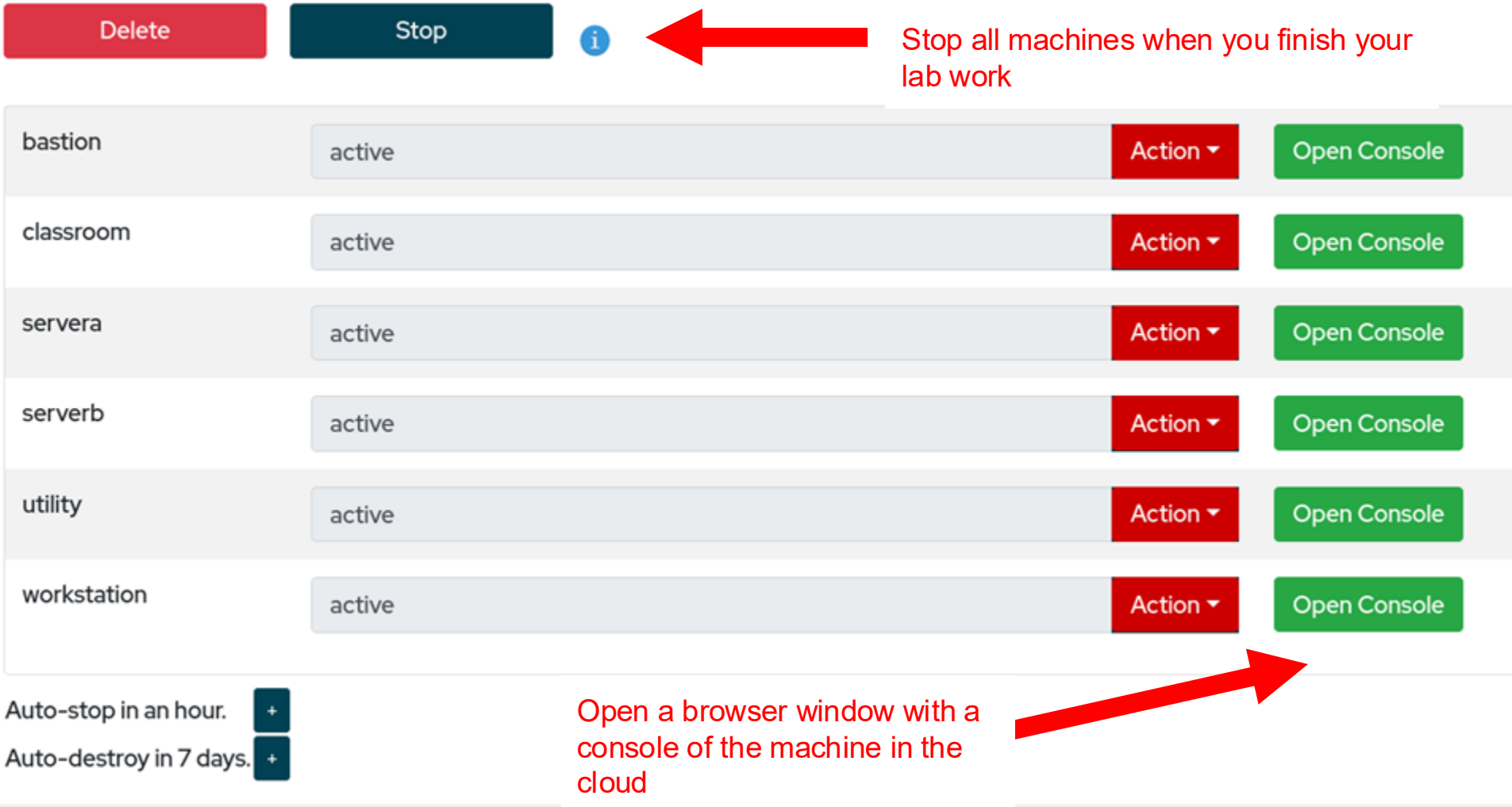
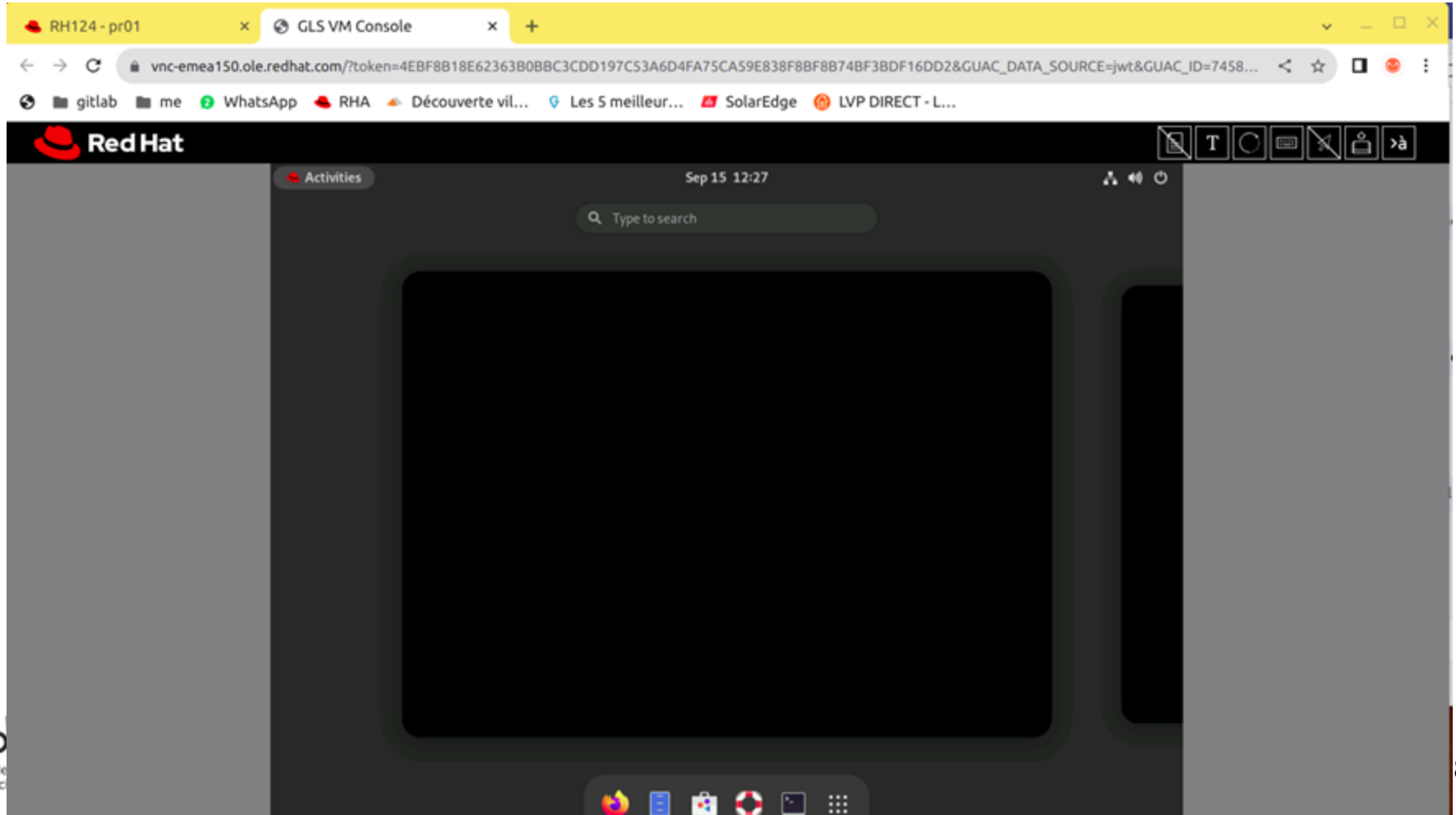

Delete
Stop
Stop all machines when you finish your lab work
bastion
active
Action
Open Console
classroom
active
Action
Open Console
servera
active
Action
Open Console
serverb
active
Action
Open Console
utility
active
Action
Open Console
workstation
active
Action
Open Console
Auto-stop in an hour.
Auto-destroy in 7 days.
Open a browser window with a console of the machine in the cloud

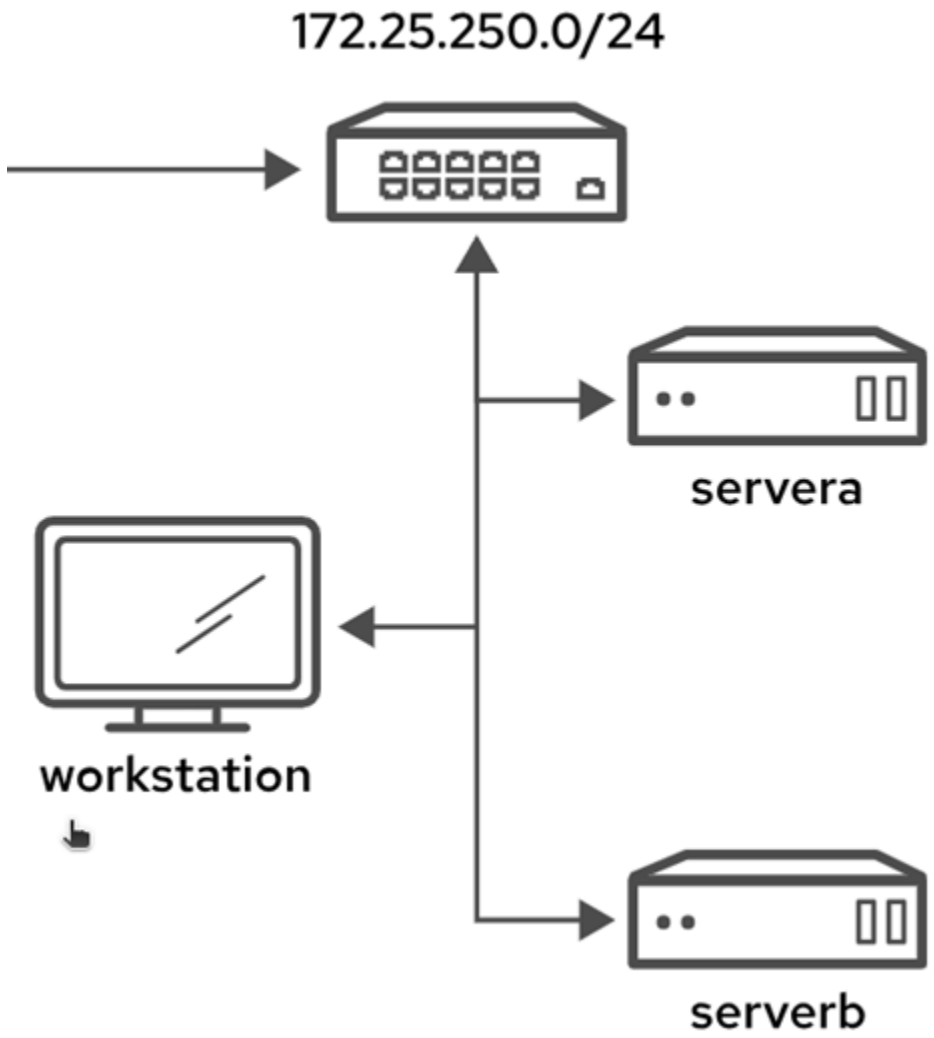
Login password: student



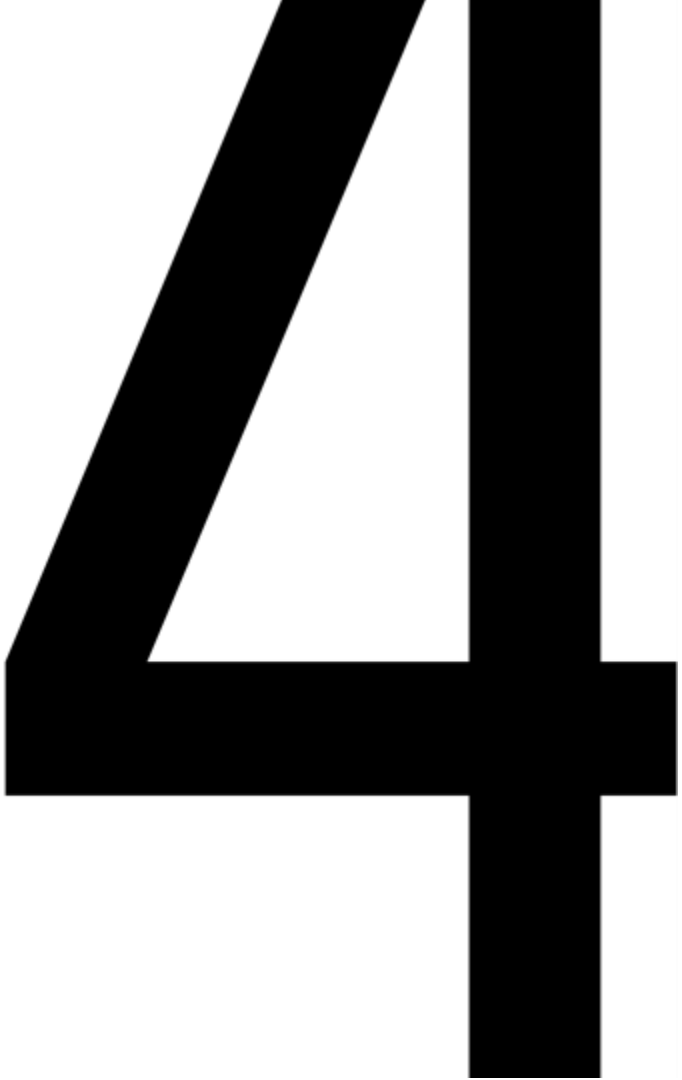
Cloud lab environment

- We will be connecting to "workstation"

  And from there ssh into (get a terminal on) "servera" or "serverb"



Basic Networking



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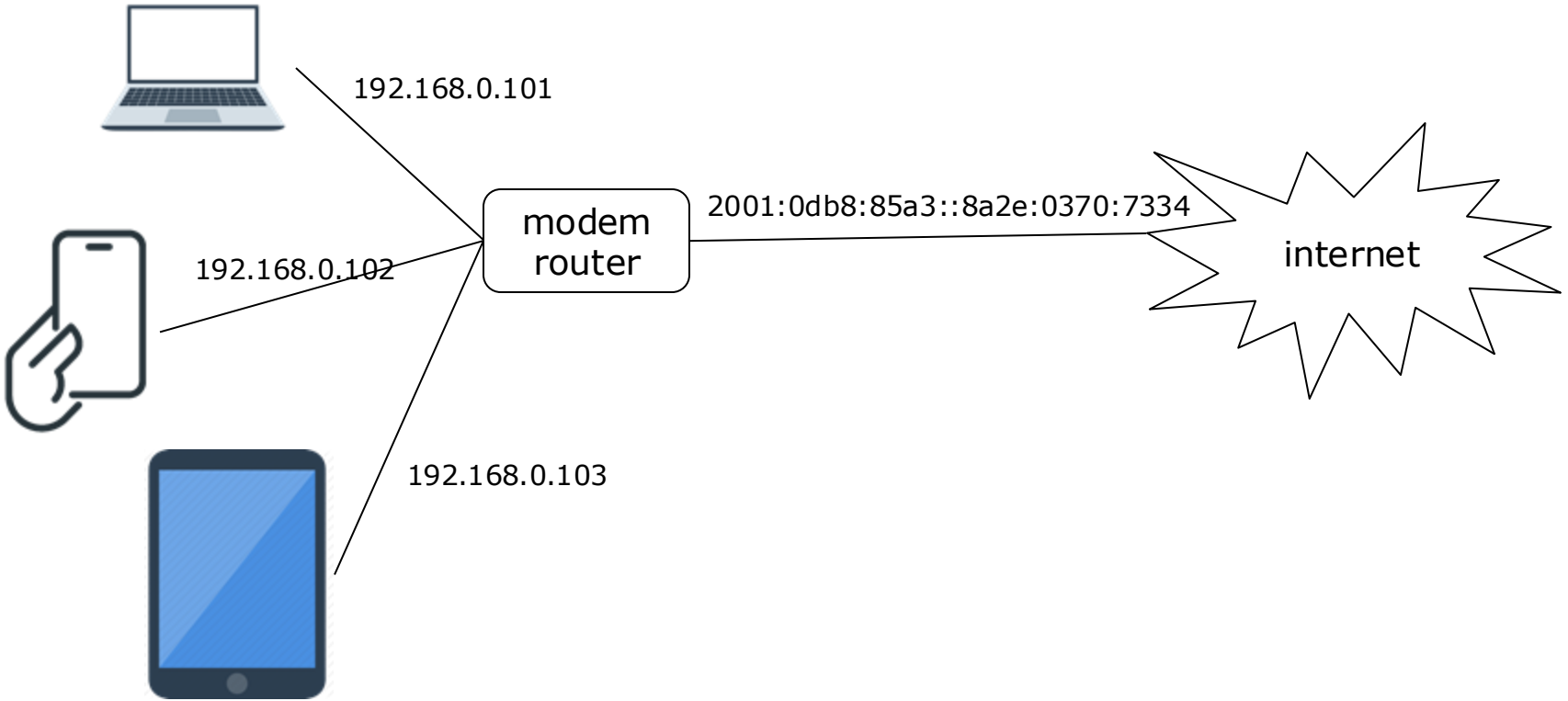
IP addresses

- Computers are connected to each other using a network
- Every network adapter in a computer gets an "IP address"?
- There are 2 versions of IP addresses:
  - IPv4: four numbers separated by dots (e.g. 192.168.1.10)
    - every number is decimal between 0 and 255 (why?)
    - most common
  - IPv6: eight groups of hexadecimal numbers (e.g. 2001:0db8:85a3::8a2e:0370:7334)
    - every number is hexadecimal (what does that mean?)
    - every digit is between 0 and F

IP addresses

- There are some very common IP addresses
  - 127.0.0.1: “loopback”: connects to the same computer
  - 192.168.x.x: is the IP address that the computer got from a local network. This only works on the local network
  - 10.x.x.x: can also be a local network address or an address to connect to a local service like a virtual machine

Local networks



Finding your IP address

- on Windows
  - open a terminal using “cmd”
  - use the command “ipconfig”
- on Mac
  - open a terminal window
  - use the command “ifconfig”
- on Linux
  - open a terminal window
  - use the command “ip a”
- Look for “inet”
- surf to ifconfig.me to find the public IP address

Domain Name Servers

- You don’t have to know the IP number of every computer
- A Domain Name Server (DNS) has a dictionary translating names into IP numbers
- e.g. “www.kdg.be” translates to:
  - IPv4: 185.135.13.159
  - IPv6: 2a06:efc0:0:102::94
- A name server also has an IP address
  - needs to be configured in your network configuration
  - e.g. 8.8.8.8 is a DNS from google

Ports

- Every computer has “ports”
- There are “services” listening to certain ports
  - http web server listens to port 80
  - https web server listens to port 443
  - …
- client connects to a certain port of a certain server (creating a “socket”)

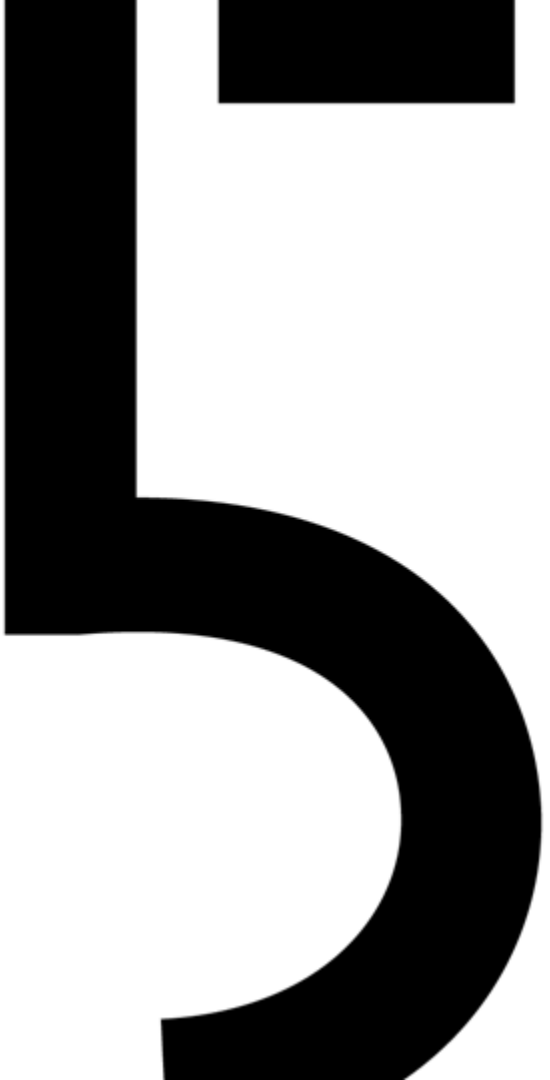
Example: surfing the internet

- you enter an URL in the top bar e.g. http://www.kdg.be
- the computer looks up the IP address of www.kdg.be using a DNS server, yielding 2a06:efc0:0:102::94
- the computer connects to port 80 of the server 2a06:efc0:0:102::94
- the computer sends a request
- the server replies with a web page
- the browser displays the web page

SSH

- SSH is an acronym for “secure shell”
- it lets you make a connection to a remote server and to interact with it
- the remote server must have an ssh service running and listening to port 22
- interaction happens through text commands
- there is no graphical interface!
- start a terminal and use the command
  ssh <login@address>

Practical: KdG Servers



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KdG Linux servers

- there is a Linux server per group:
  - acs101: 10.134.176.101
  - acs102: 10.134.176.102
  - acs103: 10.134.176.103
  - acs104: 10.134.176.104
  - acs105: 10.134.176.105

- these are “headless” servers: only network connection
- only available at KdG!
- accounts have been made (see canvas for details)

Exercices

Exercise

- create a connection with the server
- log in
- change your password
- type: “who”
- type: “last”
- type: “hostname”
- type: “id”
- type: “exit” (or ctrl-d)

Exercises

- Course (PDF)
  - Course exercises of chapter 1
    - 1.1, 1.2, 1.3
    - 2.1, 2.2, 2.3, 2.4, 2.5
    - 3.1, 3.2
    - Exercise 1, 2, 3, 4, 5

- RedHat
  - ch01s02: Quiz at the end of chapter 1

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