OPERATING SYSTEMS

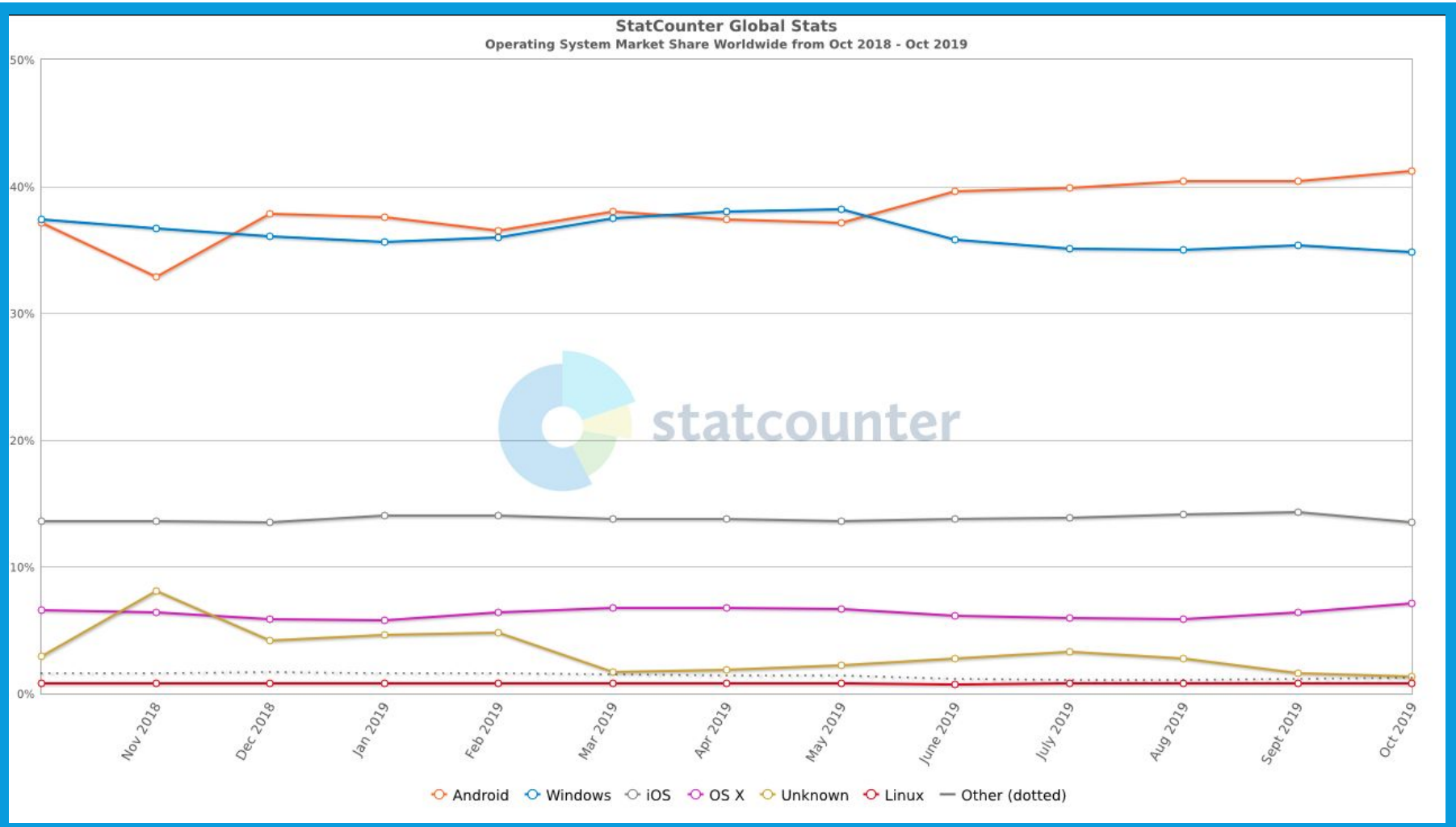
AGENDA

- OS
- Linux
- Kernel
- 32 and 64bit OS
- Drivers
- User interfaces (CLI / GUI)
- Tasks (processes)
- Basic commands

WHAT IS OS

- The operating system (OS) is the most important program that runs on a computer – software that manages computer hardware and software resources, provide common services for computer programs.
- OS provide a software platform on top of which other programs, called application programs, can run.
- Computer operating systems perform basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the storage drives, and controlling peripheral devices, such as printers.

Operating system market share



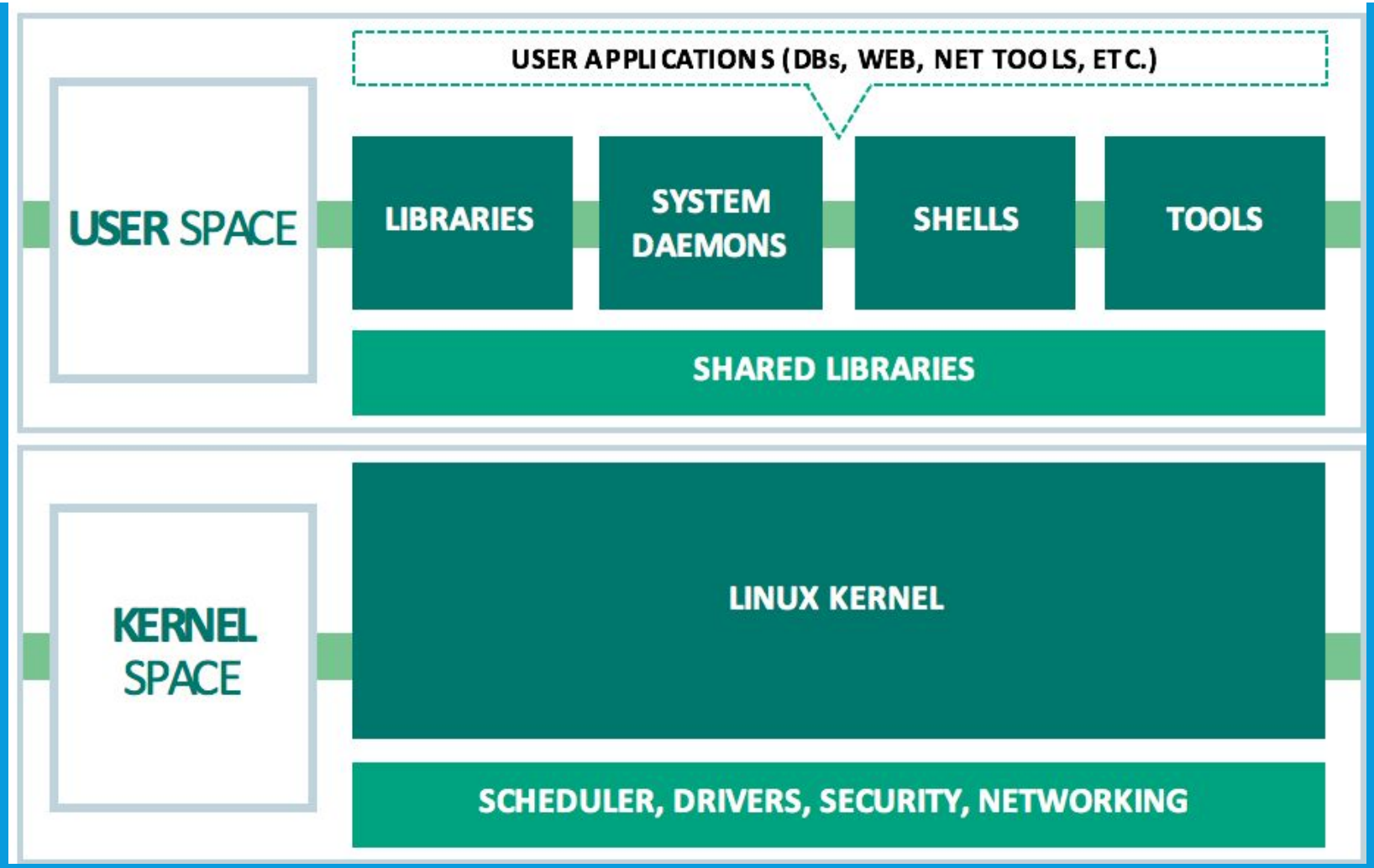
Linux

- From smartphones to cars, supercomputers and home appliances, home desktops to enterprise servers, the Linux operating system is everywhere.
- Open source operating system (free)
- Linux systems are extremely stable
- No/very few viruses/malware

Linux distribution

- We are using Lubuntu Linux distribution for this training
- A Linux distribution (often abbreviated as distro) is an operating system made from a software collection, which is based upon the Linux kernel and, often, a package management system.
- There are many distributinos (distros) - Ubuntu, Debian, Mint and others.
- Kernel – This is the one piece of the whole that is actually called Linux. The kernel is the core of the system and manages the CPU, memory, and peripheral devices. The kernel is the lowest level of the OS.

Structure of OS

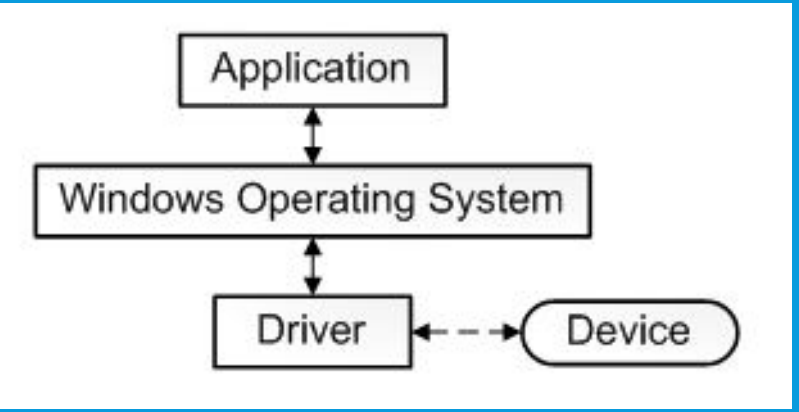


KERNELS

- The kernel is the core of an operating system. It is the software responsible for running programs and providing secure access to the machine's hardware.
- Since there are many programs, and resources are limited, the kernel also decides when and how long a program should run. This is called scheduling. Accessing the hardware directly can be very complex, since there are many different hardware designs for the same type of component.
- The Linux kernel was conceived in 1991 by Linus Torvalds. To this day, Torvalds continues to be the lead developer on the Linux kernel, while developers from all over the world contribute to the Linux kernel. In fact, it's estimated that nearly 10,000 developers, from more than 1,000 companies, have contributed to the Linux kernel since tracking began in 2005.

ABOUT DRIVERS

- It is challenging to give a single precise definition for the term *driver*. In the most fundamental sense, a driver is a software component that lets the operating system and a device communicate with each other.
- For example, suppose an application needs to read some data from a device.
  1. The application calls a function implemented by the OS
  2. The OS calls a function implemented by the driver.
  3. After the driver gets the data from the device
  4. Driver returns the data to the OS
  5. OS returns data to the application.
- It looks like that:



32bit and 64bit

- Most of today's processors are 64-bit.
- 32-bit is shorthand for a 32-bit number. This number contains 32 bits (binary digits) which are either 0 or 1. And example could be 10101010101010101010101010101010.
- A 32-bit processor is - by definition - capable of dealing with instructions and referencing memory locations of 32-bits.
- Also referred to as x86 (32bit) and x64 (64 bit)
- more detailels: https://www.techadvisor.co.uk/feature/pc-components/32-bit-vs-64-bit-3584953/

USER INTERACTION WITH THE OS

- Lubuntu uses the minimal desktop LXDE/LXQT
- As users, we normally interact with the operating system through graphical user interface (GUI)
- You can also interact with operating system via command line interface (CLI)
- Try opening command line - CTRL + ALT + T
- Type “pwd” and hit ENTER to print your working directory (the folder in which you currently are)
- command -[OPTION] (ls -a) or command --[OPTION] (ls --all)

CHECK YOUR OS?

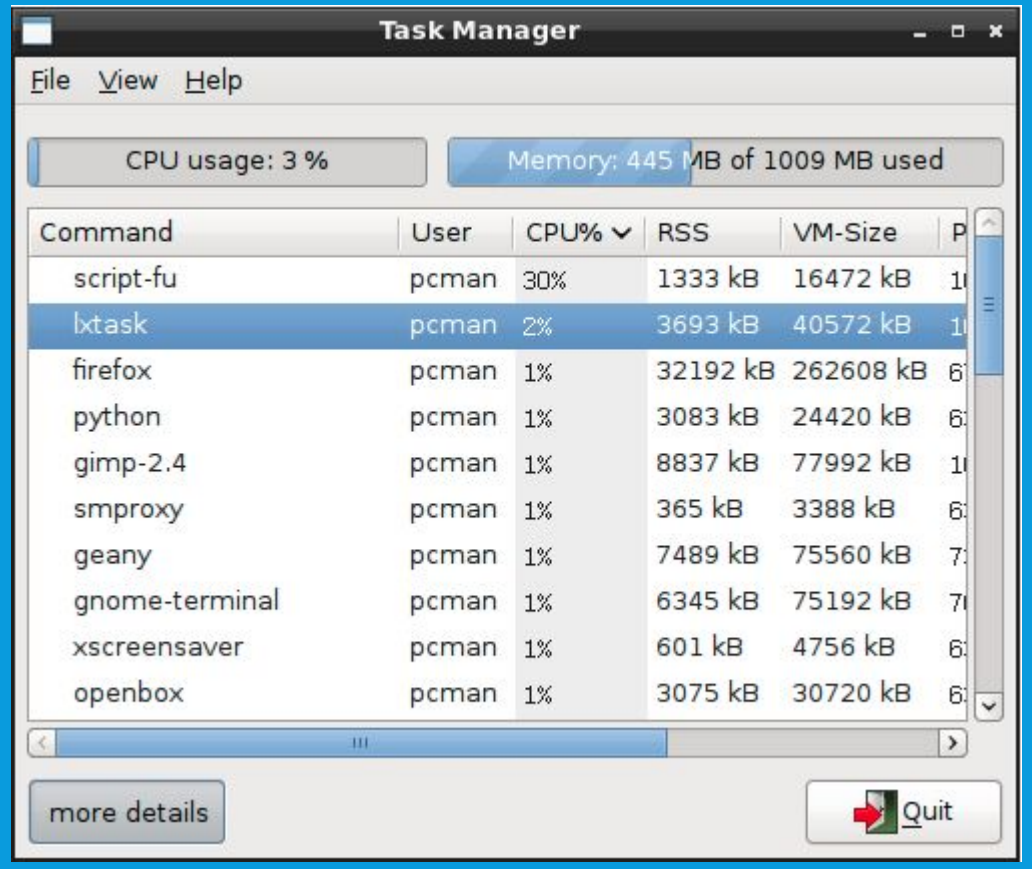
- You can open Command-Line and type: uname -a (or uname -i)

```
ritvars@ritvars-HP-ZBook-14-G2:~$ uname -a
Linux ritvars-HP-ZBook-14-G2 4.15.0-70-generic #79-Ubuntu SMP Tue Nov 12 10:36:11 UTC 2019 x86_64 x86_64 x86_64 GNU/Linux
```

- Try it! :)

TASKS

- In every OS there are many tasks (processes) running on background.
- To look at them, check memory usage or just kill You can use Task Manager:
- CTRL+ALT+DEL -> Task Manager



TASKS (processes)

- Task manager is not the only way to deal with tasks. You can do it via Command Line.
- To display processes use *top* command
- To kill the process find it's PID (proces id) and perform command:
  kill 10167

```
Tasks: 336 total,   1 running, 282 sleeping,   0 stopped,   0 zombie
%Cpu(s):  3,6 us,  2,5 sy,  0,0 ni, 93,7 id,  0,1 wa,  0,0 hi,  0,1 si,  0,0 st
KiB Mem : 16297884 total,  4493164 free,  5108676 used,  6696044 buff/cache
KiB Swap:  2097148 total,  2097148 free,        0 used. 10140236 avail Mem

  PID USER      PR  NI    VIRT    RES    SHR S  %CPU %MEM     TIME+ COMMAND
 2665 root      20   0 1614484  60452  17728 S   6,3  0,4  22:15.82 cadvisor
 3165 ritvars   20   0 1193268 196892 141276 S   4,0  1,2  12:09.56 Xorg
 3486 ritvars   20   0 3768692 306224  77816 S   3,0  1,9  13:49.72 gnome-shell
 8151 ritvars   20   0  813292  45832  28856 S   2,6  0,3   0:07.65 gnome-terminal-
13586 ritvars   20   0  656156  48736  34908 S   2,0  0,3   6:12.97 gnome-system-mo
10167 ritvars   20   0 1838156 306132 141124 S   1,0  1,9   0:42.82 atom
    8 root      20   0       0      0      0 I   0,7  0,0   1:43.86 rcu_sched
 1011 root      20   0  269804   6080   5228 D   0,7  0,0   2:35.05 iio-sensor-prox
 1082 mongodb   20   0  959388  66616  27968 S   0,7  0,4   2:40.93 mongod
 1089 rabbitmq  20   0 3254560  80512   6928 S   0,7  0,5   1:38.89 beam.smp
 1341 mysql     20   0 1997812 384848  28988 S   0,7  2,4   2:10.78 mysqld
 5175 ritvars   20   0 1748596 408500 180620 S   0,7  2,5  24:32.21 chrome
27325 ritvars   20   0   52696   4184   3432 R   0,7  0,0   0:00.16 top
   26 root      rt   0       0      0      0 S   0,3  0,0   0:00.10 watchdog/3
 1244 redis     20   0   59772   3548   2476 S   0,3  0,0   0:31.14 redis-server
 2158 root      20   0 2082216  92680  46312 S   0,3  0,6   0:38.24 dockerd
 3434 ritvars   20   0  220784   6824   6104 S   0,3  0,0   0:04.76 at-spi2-registr
 5573 ritvars   20   0  743024 108480  63992 S   0,3  0,7   1:19.16 chrome
 5606 ritvars   20   0  689668  76360  58108 S   0,3  0,5   0:01.33 chrome
```

Commonly used commands

- pwd - print working directory
- cd - change directory
- ls - list files and folders of directory
- mkdir - create directory
- rm - delete file or folder
- uname - get information about your computer/OS
- kill - close program
- man - check manual for certain command

RECAP

- For a now we are aware about:
  - OS
  - Kernel
  - Drivers
  - Linux
  - GUI and CLI
  - Basic commands

- Following topics for today – Introduction to programming and Java