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COPENHAGEN BUSINESS ACADEMY

2 semester spring 2016

Welcome

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- Who are we?
  - Me, you, newcomers since last semester
- Where is info for the semster
  - Schedule at timeedit
  - Moodle rooms (cphbusiness.mroom.net)
  - **Github**
    - **github.com/cphdat2sem2017-Cos**

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Semester overview

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Weekly topics

Week no	Topic
01	OS-Linux
02	Database
03	Frontend development part 1
04	Frontend part 2
05	Algorithms
06	Requirements spec.
07	SCRUM
08	Tech infrastructure incl. GIT
09	Project

This week

- Day 1: Github and Linux on digital ocean
- Day 2: SSH & bash scripting
- Day 3: MySQL in the cloud
- Day 4: Tomcat
- Day 5: Studypoint exercise

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Operating System Linux – Day 1.

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Agenda

- What does an operating system do

Practical stuff

- Connect with Linux
- Create users
- Log in
- Copy files up / down
- Move files around (mv and cp)
- Create catalogs
- Rights (root, admin, user - rwx - sudo)
- Standard in and out, piping, grep

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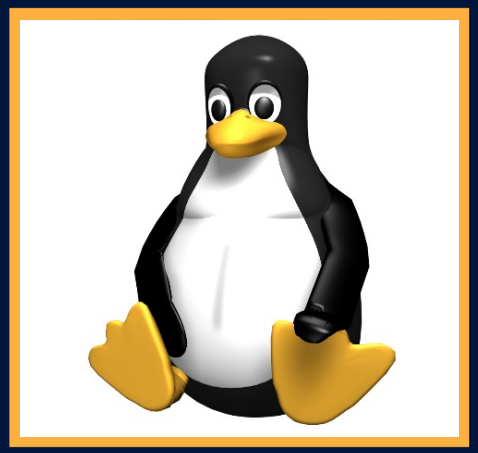


What is an operating system

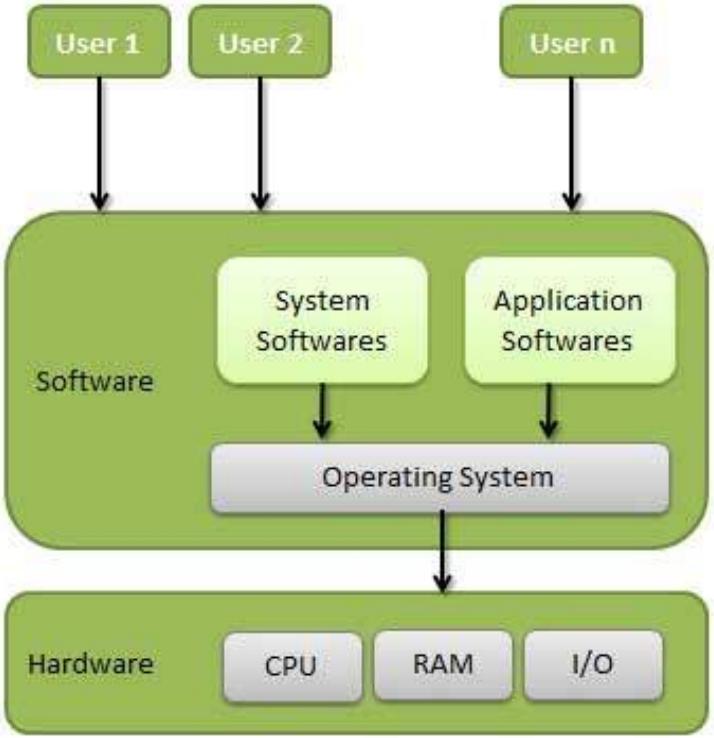
What is an Operating System?

- A program that acts as an intermediary between a user of a computer and the computer hardware.
- Operating system goals:
  - Execute user programs and make solving user problems easier.
  - Make the computer system convenient to use.
- Use the computer hardware in an efficient manner.

Computer System Structure

Computer system can be divided into four components

- **Hardware** – provides basic computing resources
  - CPU, memory, I/O devices
- **Operating system**
  - Controls and coordinates use of hardware among various applications and users
- **Application programs** – define the ways in which the system resources are used to solve the computing problems of the users
  - Word processors, compilers, web browsers, database systems, video games
- **Users**
  - People, machines, other computers



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Types of operating systems

As computers have progressed and developed, so have the operating systems.

GUI - Short for Graphical User Interface, a GUI operating system contains graphics and icons and is commonly navigated by using a computer mouse.

- Windows – OSX – Linux Ubuntu

Multi-user - A multi-user operating system allows for multiple users to use the same computer at the same time and different times.

- Linux – Unix – Windows Server

Multiprocessing - An operating system capable of supporting and utilizing more than one computer processor

- Linux – Unix – Windows 8 – 10

Multithreading - Operating systems that allow different parts of a software program to run concurrently.

- Linux – Unix – Windows XP

Embedded - Operating systems designed to be compact, efficient at resource usage, and reliable, forsaking many functions that non-embedded computer operating systems provide.

- Linux embedded version - OpenWrt

Memory Management

Memory management refers to management of Primary Memory or Main Memory. Main memory is a large array of words or bytes where each word or byte has its own address.

Main memory provides a fast storage that can be access directly by the CPU. So for a program to be executed, it must in the main memory. Operating System does the following activities for memory management.

- Keeps tracks of primary memory i.e. what part of it are in use by whom, what part are not in use.
- In multiprogramming, OS decides which process will get memory when and how much.
- Allocates the memory when the process requests it to do so.
- De-allocates the memory when the process no longer needs it or has been terminated.

Processor Management

In multiprogramming environment, OS decides which process gets the processor when and how much time.

This function is called process scheduling. Operating System does the following activities for processor management.

- Keeps tracks of processor and status of process. Program responsible for this task is known as traffic controller.
- Allocates the processor(CPU) to a process.
- De-allocates processor when processor is no longer required.

Device Management

OS manages device communication via their respective drivers. Operating System does the following activities for device management.

- Keeps tracks of all devices. Program responsible for this task is known as the I/O controller.
- Decides which process gets the device when and for how much time.
- Allocates the device in the efficient way.
- De-allocates devices.

File Management

A file system is normally organized into directories for easy navigation and usage.

These directories may contain files and other directions. Operating System does the following activities for file management.

- Keeps track of information, location, uses, status etc. The collective facilities are often known as file system.
- Decides who gets the resources.
- Allocates the resources.
- De-allocates the resources.

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Other Important Activities

- **Security**
  By means of password and similar other techniques, preventing unauthorized access to programs and data.
- **Control over system performance**
  Recording delays between request for a service and response from the system.
- **Job accounting**
  Keeping track of time and resources used by various jobs and users.
- **Error detecting aids**
  Production of dumps, traces, error messages and other debugging and error detecting aids.
- **Coordination between other softwares and users**
  Coordination and assignment of compilers, interpreters, assemblers and other software to the various users of the computer systems.

Operating System Services

One set of operating-system services provides functions that are helpful to the user:

- **User interface** - Almost all operating systems have a user interface (UI)
  - Varies between Command-Line (CLI), Graphics User Interface (GUI), Batch
- **Program execution** - The system must be able to load a program into memory and to run that program, end execution, either normally or abnormally (indicating error)
- **I/O operations** - A running program may require I/O, which may involve a file or an I/O device.
- **File-system manipulation** - The file system is of particular interest. Obviously, programs need to read and write files and directories, create and delete them, search them, list file Information, permission management.

Operating System Services (Cont.)

- One set of operating-system services provides functions that are helpful to the user (Cont):
  - **Communications** – Processes may exchange information, on the same computer or between computers over a network
    - Communications may be via shared memory or through message passing (packets moved by the OS)
  - **Error detection** – OS needs to be constantly aware of possible errors
    - May occur in the CPU and memory hardware, in I/O devices, in user program
    - For each type of error, OS should take the appropriate action to ensure correct and consistent computing
    - Debugging facilities can greatly enhance the user's and programmer's abilities to efficiently use the system

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Operating System Services (Cont.)

Another set of OS functions exists for ensuring the efficient operation of the system itself via resource sharing

- **Resource allocation -** When multiple users or multiple jobs running concurrently, resources must be allocated to each of them
  - Many types of resources - Some (such as CPU cycles,mainmemory, and file storage) may have special allocation code, others (such as I/O devices) may have general request and release code.
- **Accounting -** To keep track of which users use how much and what kinds of computer resources
- **Protection and security -** The owners of information stored in a multiuser or networked computer system may want to control use of that information, concurrent processes should not interfere with each other
  - **Protection** involves ensuring that all access to system resources is controlled
  - **Security** of the system from outsiders requires user authentication, extends to defending external I/O devices from invalid access attempts
  - If a system is to be protected and secure, precautions must be instituted throughout it. A chain is only as strong as its weakest link.

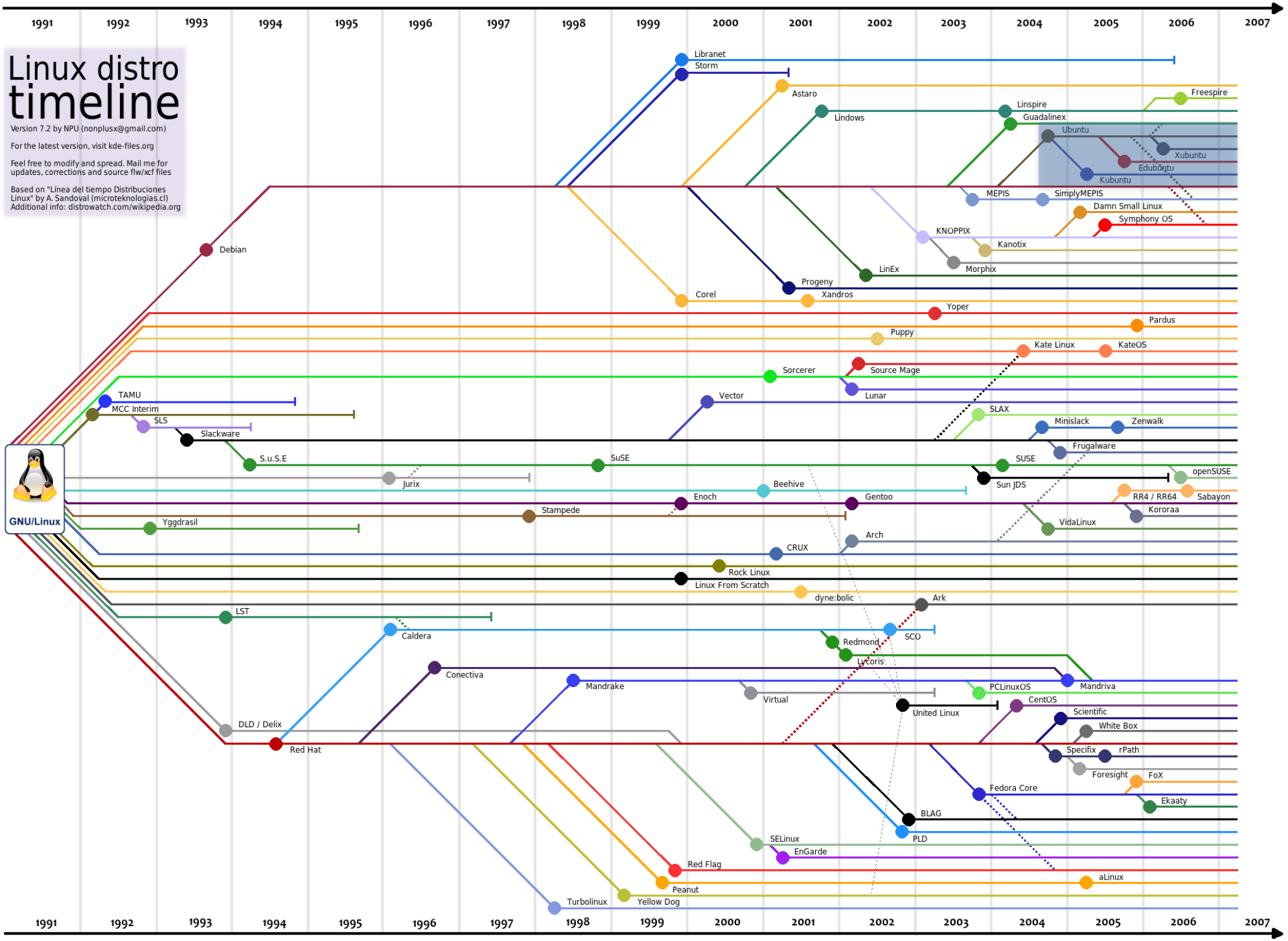
Linux - History

Linux was originally developed as a **free operating system for personal computers** based on the Intel x86 architecture, but has since been ported to more computer hardware platforms than any other operating system.

Thanks to its dominance on smartphones, Android, which is built on top of the Linux kernel, has the largest installed base of all general-purpose operating systems.

Linux, in its original form, is also the **leading operating system on servers** and other big iron systems such as mainframe computers and supercomputers, but is used on only around **1.5% of desktop computers** with Linux-based Chrome OS taking about 5% of the overall and nearly 20% of the sub-$300 notebook sales.

Linux also runs on **embedded systems**, which are devices whose operating system is typically built into the firmware and is highly tailored to the system; this includes smartphones and tablet computers running Android and other Linux derivatives, TiVo and similar DVR devices, network routers, facility automation controls, televisions, video game consoles, and smartwatches.


Linux distro timeline
Version 7.2 by NPU (nonplusx@gmail.com)
For the latest version, visit kde-files.org
Feel free to modify and spread. Mail me for updates, corrections and source flw/xcf files
Based on "Línea del tiempo Distribuciones Linux" by A. Sandoval (microteknologias.cl)
Additional info: distrowatch.com/wikipedia.org
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Edubuntu
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SimplyMEPIS
Damn Small Linux
Symphony OS
KNOPPIX
Kanotix
Morphix
LinEx
Progeny
Xandros
Corel
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Pardus
Puppy
Kate Linux
KateOS
Sorcerer
Source Mage
Lunar
Vector
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CentOS
Scientific
White Box
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Red Hat
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Red Flag
aLinux
Peanut
Yellow Dog
Turbolinux

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Digital Ocean

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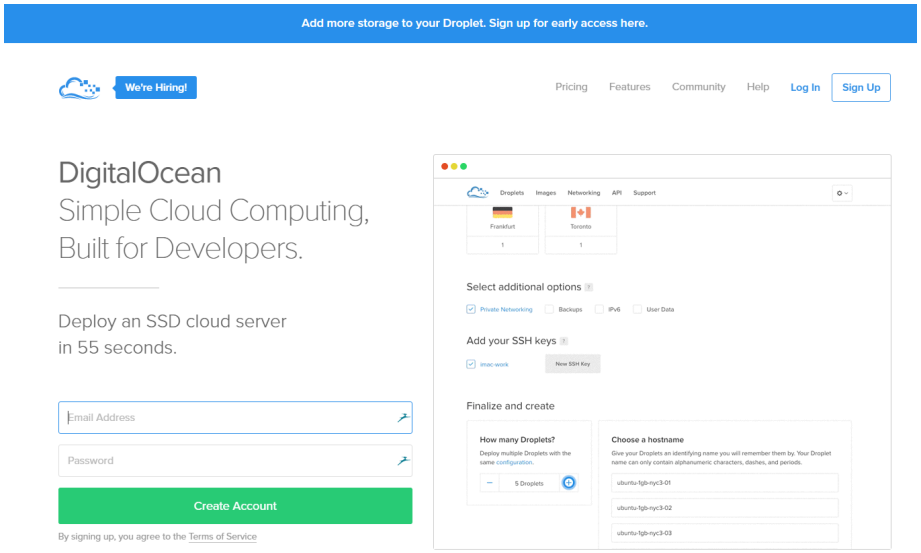
Digital Ocean



There are many provides which offer a Linux machine in the cloud.

For this set of exercises we recommend you as a group buy a 5$ (42 dkk incl moms) month access to an Ubuntu Linux machine at digital ocean.

You will only need to work which what is called a Unix shell, and we will set up a server as part of the next three days.

One machine can have several users logged in at the same time, and the cheapest version should do just fine.

Connecting to a linux server

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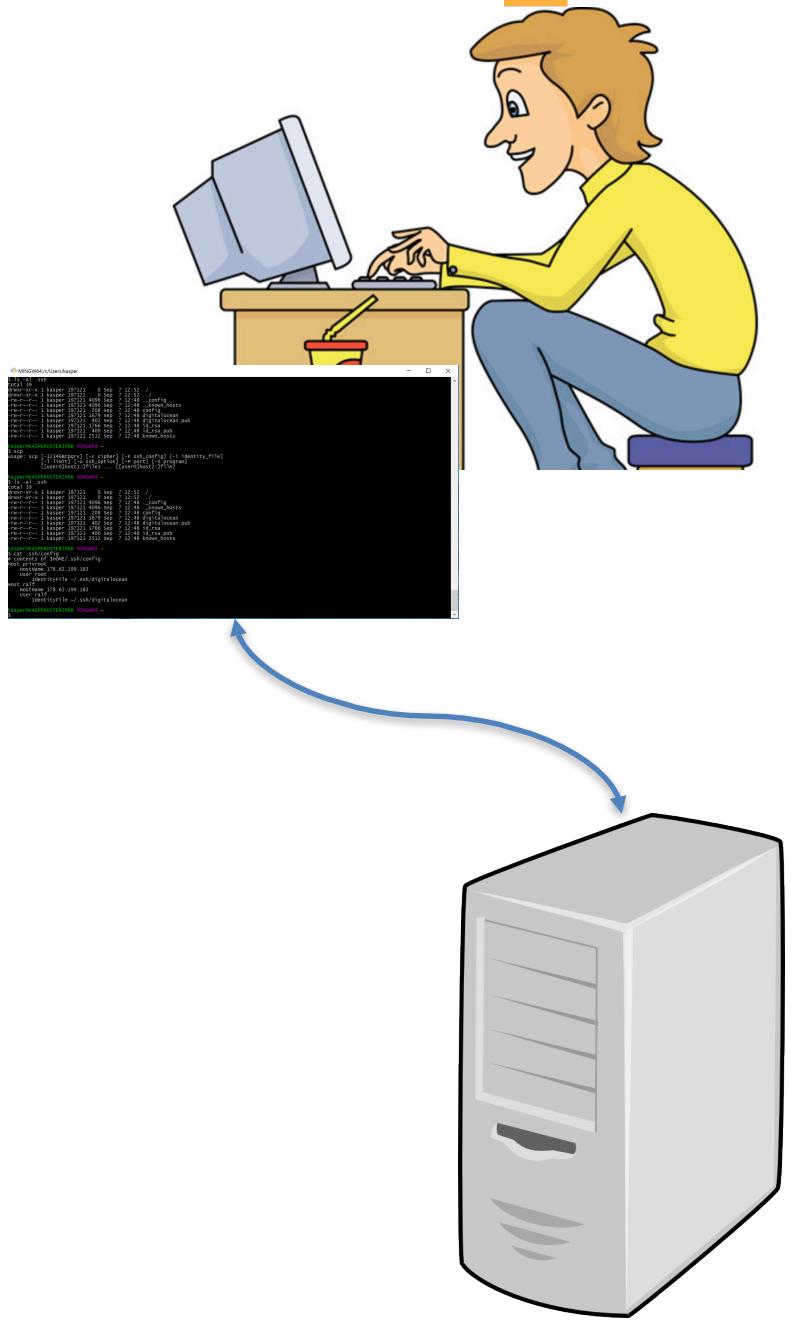
Connecting to a server using ssh is a two step procedure.

First you run the git-bash program to allow you to have a “shell” program to work on your own computer using a text-only interface

Second, you use the shell to connect to the digitalocean server – the command to do this is called ssh (secure shell).

Warning – it can be hard to tell at a glance if you are working on the server or on your own computer.



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Git bash

We are going to use git from the prompt later on anyways, so we will use this tool to connect to our digitalocean linux from **windows**.

Mac users can connect using the build-in command prompt (named "Terminal"). Mac is a unix machine from the beginning.

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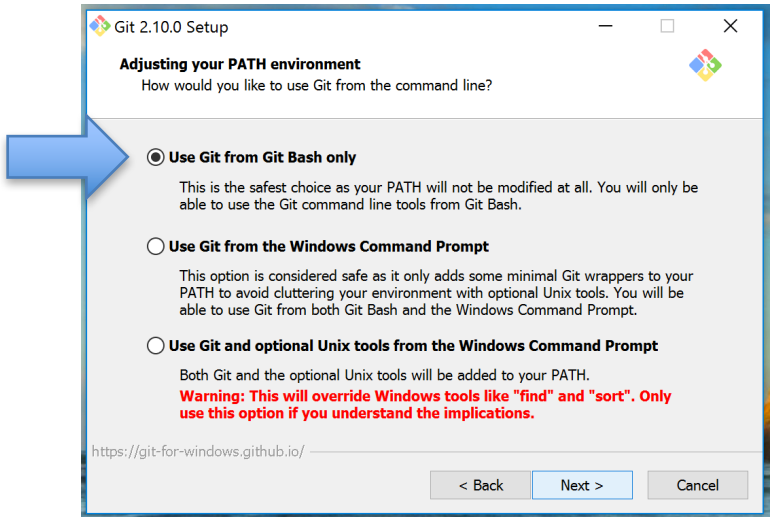
Installing GIT bash- Windows

Git (and in particular git-bash) can be installed from:
https://git-scm.com/download

The installer will at one point ask:

I believe the rest of the options can left as they are.



Note: Mac has the necessary programs build in as the mac is a unix machine

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Linux Commands

File Management

In Linux are three basic types of files

- **Ordinary Files** – An ordinary file is a file on the system that contains data, text, or program instructions. In this tutorial, you look at working with ordinary files.
- **Directories** – Directories store both special and ordinary files. For users familiar with Windows or Mac OS, UNIX directories are equivalent to folders.
- **Special Files** – Some special files provide access to hardware such as hard drives, CD-ROM drives, modems, and Ethernet adapters. Other special files are similar to aliases or shortcuts and enable you to access a single file using different names.

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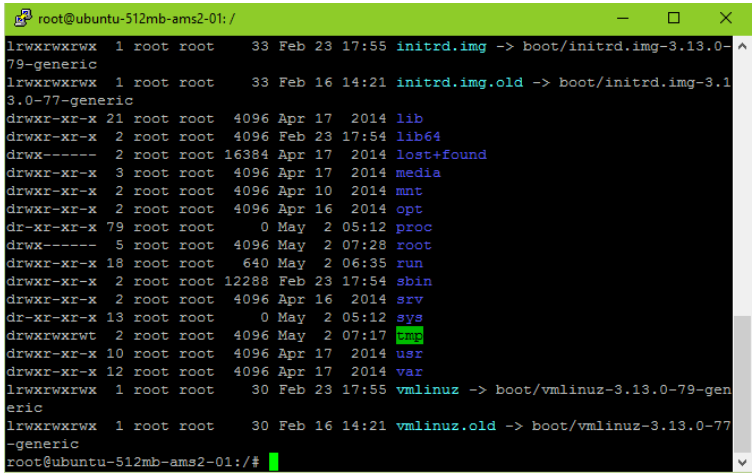
File Management – Listing files

To list the files and directories stored in the current directory. Use the following command: **ls – l**

Here is the information about all the listed columns

- **First Column**: represents file type and permission given on the file. Below is the description of all type of files.
- **Second Column**: represents the number of memory blocks taken by the file or directory.
- **Third Column**: represents owner of the file. This is the Unix user who created this file.
- **Fourth Column**: represents group of the owner. Every Unix user would have an associated group.
- **Fifth Column**: represents file size in bytes.
- **Sixth Column**: represents date and time when this file was created or modified last time.
- Seventh Column: represents file or directory name.



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Display content of a file

You can use **cat** command to see the content of a file.

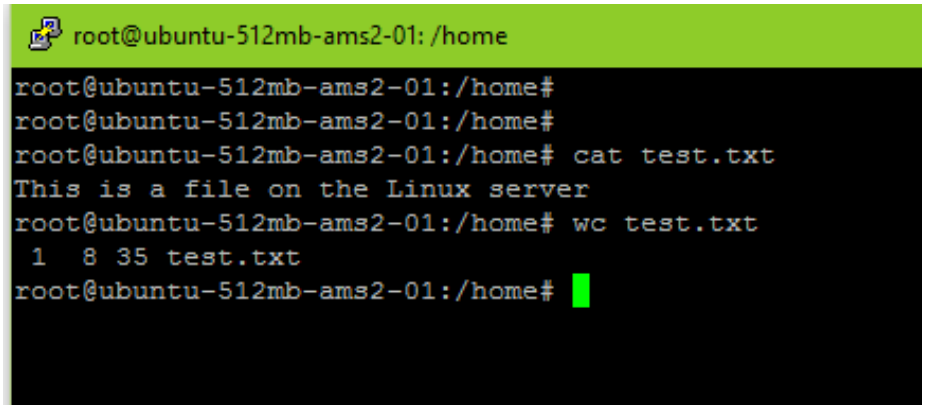
cat test.txt

Count the numbers of words in a file is very easy just use

wc test.txt

The command “less test.txt” shows the file one screen-full at a time.

head test.txt
show the first lines of the file



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Directory Related Commands

- **cp** – Copy of file - cp source_file destination_file
- **mv** – Renaming - mv old_file new_file
- **rm** – Delete – rm filename
- **cd** – Change dir – cd~ (home dir) – cd- (last dir)
- **mkdir** – Create directory - mkdir dirname
- **rmdir** – Remove directory – rmdir dirname
- **pwd** – print working directory - pwd

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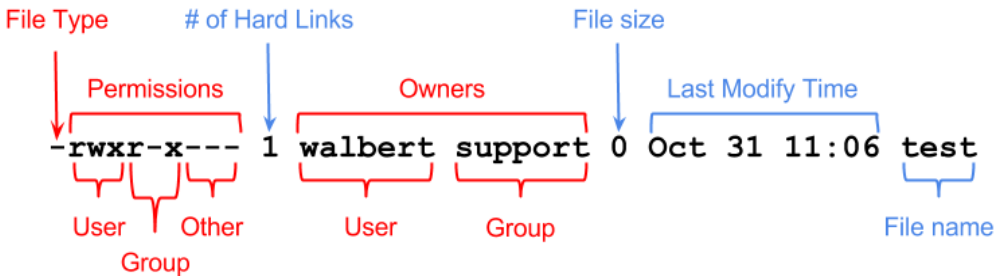
Process Related Commands

- **ss**
  Obtain a listing of processes and their id's. Including the option aux will show all processes.
- **top**
  provides an ongoing look at processor activity in real time. It displays a listing of the most CPU-intensive tasks on the system, and can provide an interactive interface for manipulating processes.
- **netstat**
  Print network connections, routing tables, interface statistics, masquerade connections, and multicast memberships
- **pstree**
  shows running processes as a tree
- **kill**
  send signal to a process
- **whoami**
  Display information about the user

File permissions

If the command ls -l is given, a long list of file names is displayed. The first column in this list details the permissions applying to the file.



The **chmod** command changes the permission on a given file or directory.

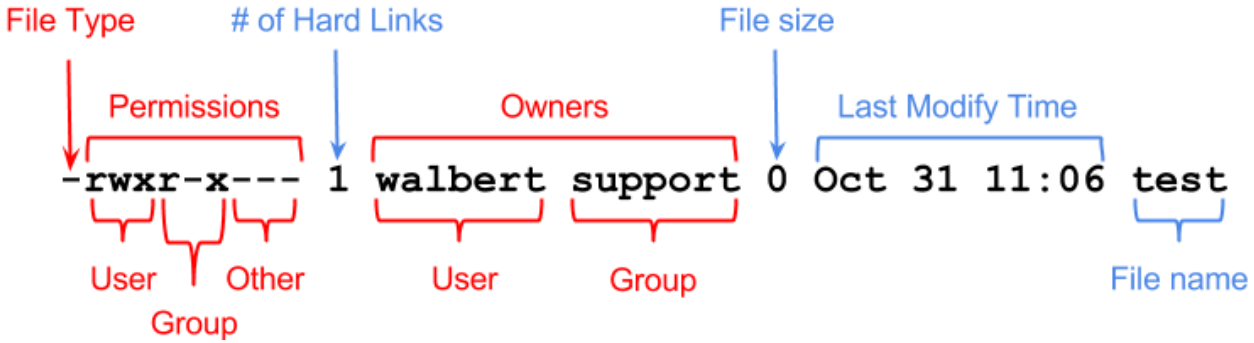
chmod sets permissions in two ways.

- Using symbols
- Using octal values

Octal	Symbol	Permission
0	---	No Permissions
1	--x	Execute
2	-w-	Write
3	-wx	Write and Execute
4	r--	Read
5	r-x	Read and Execute
6	rw-	Read and Write
7	rwx	Read, Write, and Execute

File ownership

If the command ls -l is given, a long list of file names is displayed. The first column in this list details the permissions applying to the file.



Octal	Symbol	Permission
0	---	No Permissions
1	--x	Execute
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4	r--	Read
5	r-x	Read and Execute
6	rw-	Read and Write
7	rwx	Read, Write, and Execute

The **chown** command changes the owners of a file on a given file or directory.

For security reasons, the ownership of a file may only be altered by a **super-user**.

Similarly, only a member of a group can change a file's group ID to that group.

Subdirectories of the root directory

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Directory	Content
/bin	Common programs, shared by the system, the system administrator and the users.
/boot	The startup files and the kernel, vmlinuz. In some recent distributions also grub data. Grub is the GRand Unified Boot loader and is an attempt to get rid of the many different boot-loaders we know today.
/dev	Contains references to all the CPU peripheral hardware, which are represented as files with special properties.
/etc	Most important system configuration files are in /etc, this directory contains data similar to those in the Control Panel in Windows
/home	**Home directories of the common users.**
/initrd	(on some distributions) Information for booting. Do not remove!
/lib	Library files, includes files for all kinds of programs needed by the system and the users.
/lost+found	Every partition has a lost+found in its upper directory. Files that were saved during failures are here.
/misc	For miscellaneous purposes.
/mnt	Standard mount point for external file systems, e.g. a CD-ROM or a digital camera.
/net	Standard mount point for entire remote file systems
/opt	**Typically contains extra and third party software.**
/proc	A virtual file system containing information about system resources. More information about the meaning of the files in proc is obtained by entering the command man proc in a terminal window. The file proc.txt discusses the virtual file system in detail.
/root	**The administrative user's home directory**. Mind the difference between **/**, the root directory and **/root**, the home directory of the root user.
/sbin	Programs for use by the system and the system administrator.
/tmp	Temporary space for use by the system, cleaned upon reboot, so don't use this for saving any work!
/usr	Programs, libraries, documentation etc. for all user-related programs.
/var	Storage for all variable files and temporary files created by users, such as log files, the mail queue, the print spooler area, space for temporary storage of files downloaded from the Internet, or to keep an image of a CD before burning it.

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Nano Editor

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Nano Editor

nano is a text editor for Unix-like computing systems or operating environments using a command line interface.

It emulates the Pico text editor, part of the Pine email client, and also provides additional functionality.

In contrast to Pico, nano is licensed under the GNU General Public License (GPL).

Released as free software by Chris Allegretta in 1999, nano became part of the GNU Project in 2001.

www.nano-editor.org