H3ABioNet

Pan African Bioinformatics Network for H3Africa

Introduction to Bioinformatics online course: IBT

Linux

Introduction to Linux and Unix and the command line

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Learning Objectives

① Understand the Unix file structure

② Understand full vs relative paths: when and how to use them

③ Learn how to create directories and navigate through the file structure

④ Learn some useful shortcuts

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Learning Outcomes

① Be able to create a file structure

② Be able to navigate through the file structure

③ Be able to create text files and view their content

④ Be able to use simple shortcuts

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Part 1

Introduction to Linux and UNIX

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What is Linux?

- UNIX is an Operating System (OS) initially developed in the 1960.
- There are many different versions of UNIX, that share common similarities.
- The most popular varieties of UNIX are Solaris, Linux and MacOS.
- UNIX systems have a graphical user interface (GUI) making them easier to use.

Linux vs Unix

- Linux is a “clone” of the original Unix but doesn’t contain its code
- Linux is free and open source, the original Unix is not (but some of its derivatives are)
- All command lines work the same on both

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Why Linux?

- Linux is free and the most popular distributions are Ubuntu, Fedora/Red Hat, Mandriva, etc.
- Low cost and very stable system
- Most secure OS
- Best multi-user and multi tasking OS
- The world's fastest super computers run Linux
- Fast developing OS (many developers)

➡ **Very popular as servers OS**

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Linux distributions

- Different Linux distributions are available http://distrowatch.com/
- Ubuntu distribution is easy and convenient to use for beginners
- A simple guide to install Ubuntu in your machine: http://www.ubuntu.com/download/desktop/install-ubuntu-desktop

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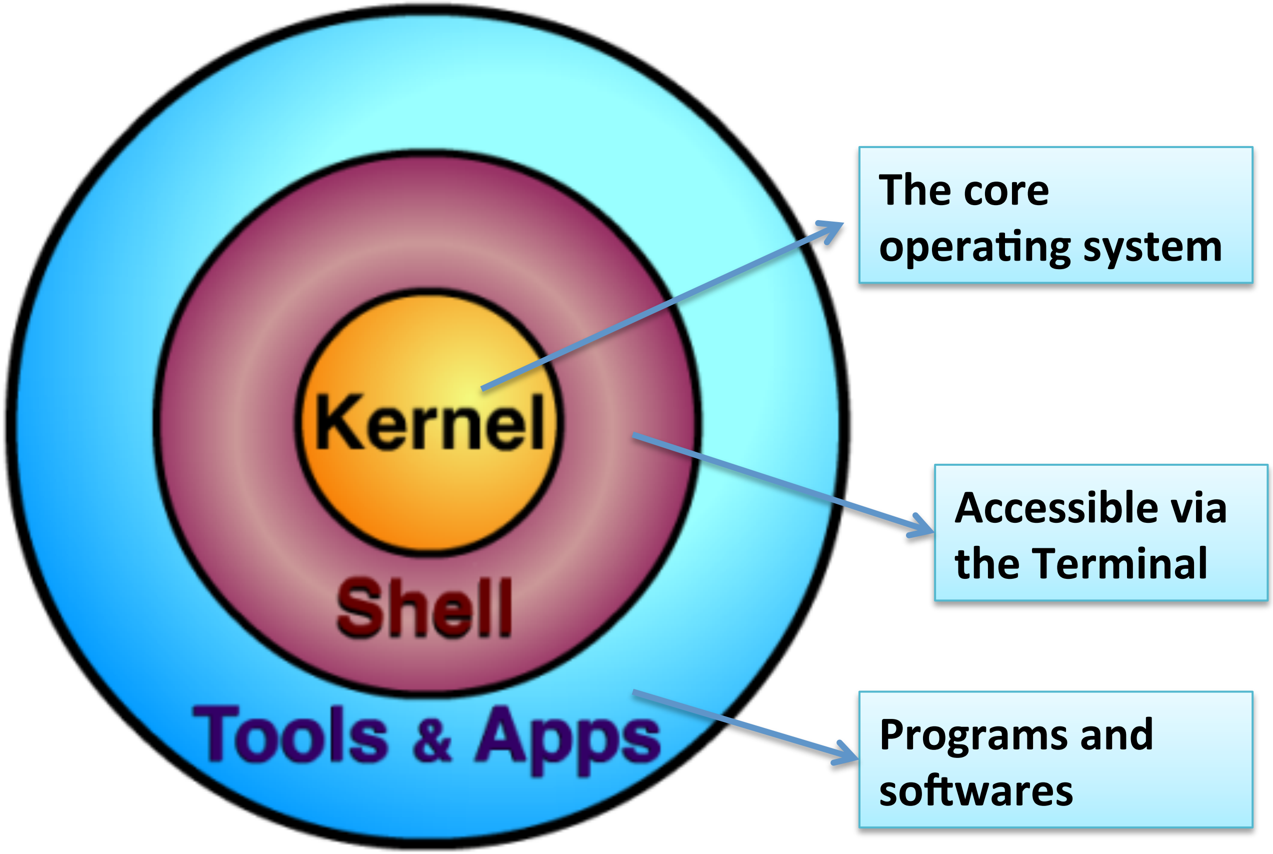
Parts of the UNIX System



The core operating system

Accessible via the Terminal

Programs and softwares

Adapted from: www.usna.edu

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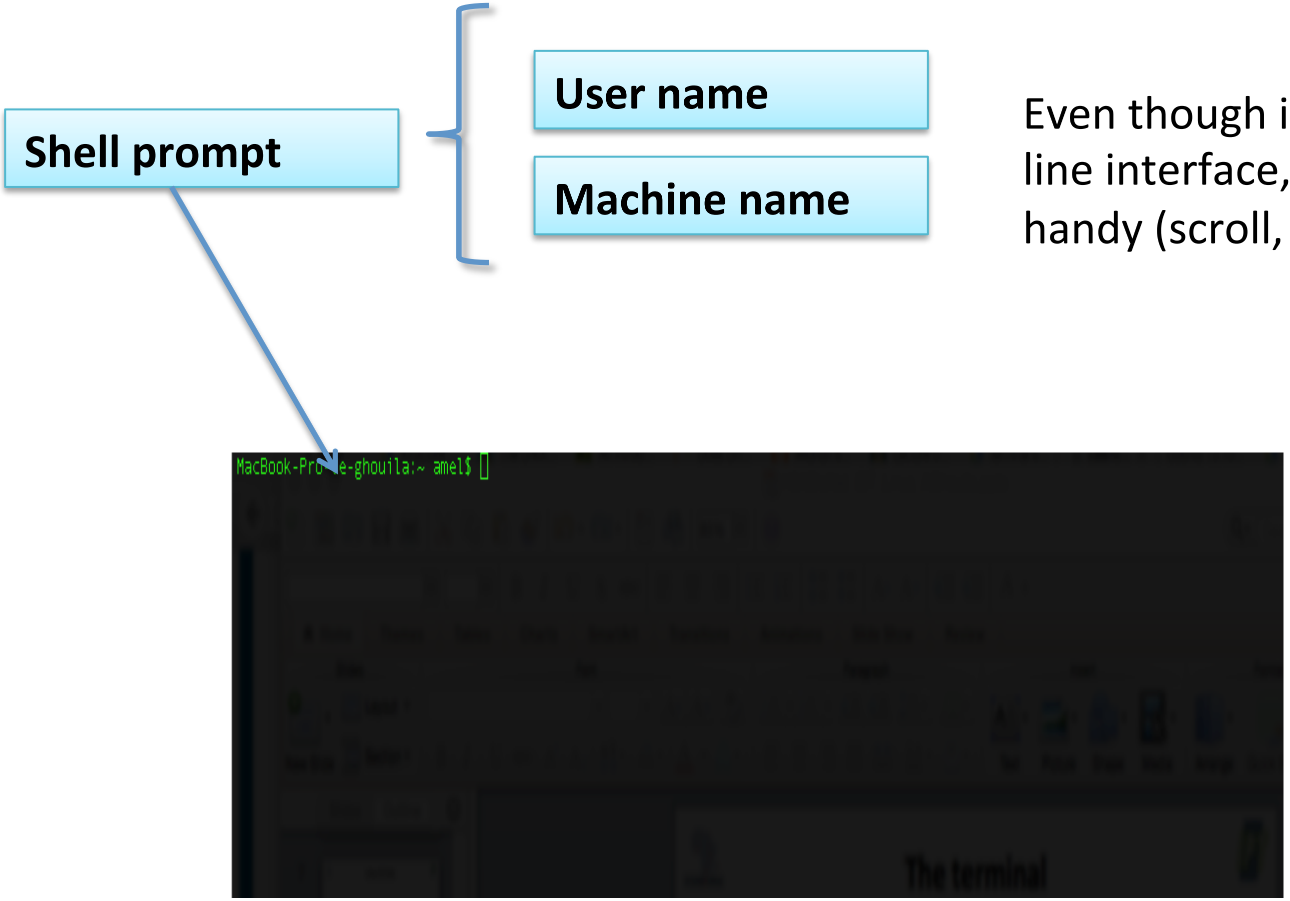
The Terminal

- A **terminal** refers to a wrapper program which runs a shell

- There are many different Unix shells, the most popular shell for interactive use include Bash: the default on most Linux installations

The Terminal



Shell prompt

User name

Machine name

```
MacBook-Pro-de-ghouila:~ amel$
```

Even though it is a command line interface, the mouse is still handy (scroll, copy, paste, etc.)

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Part 2

File-system under UNIX

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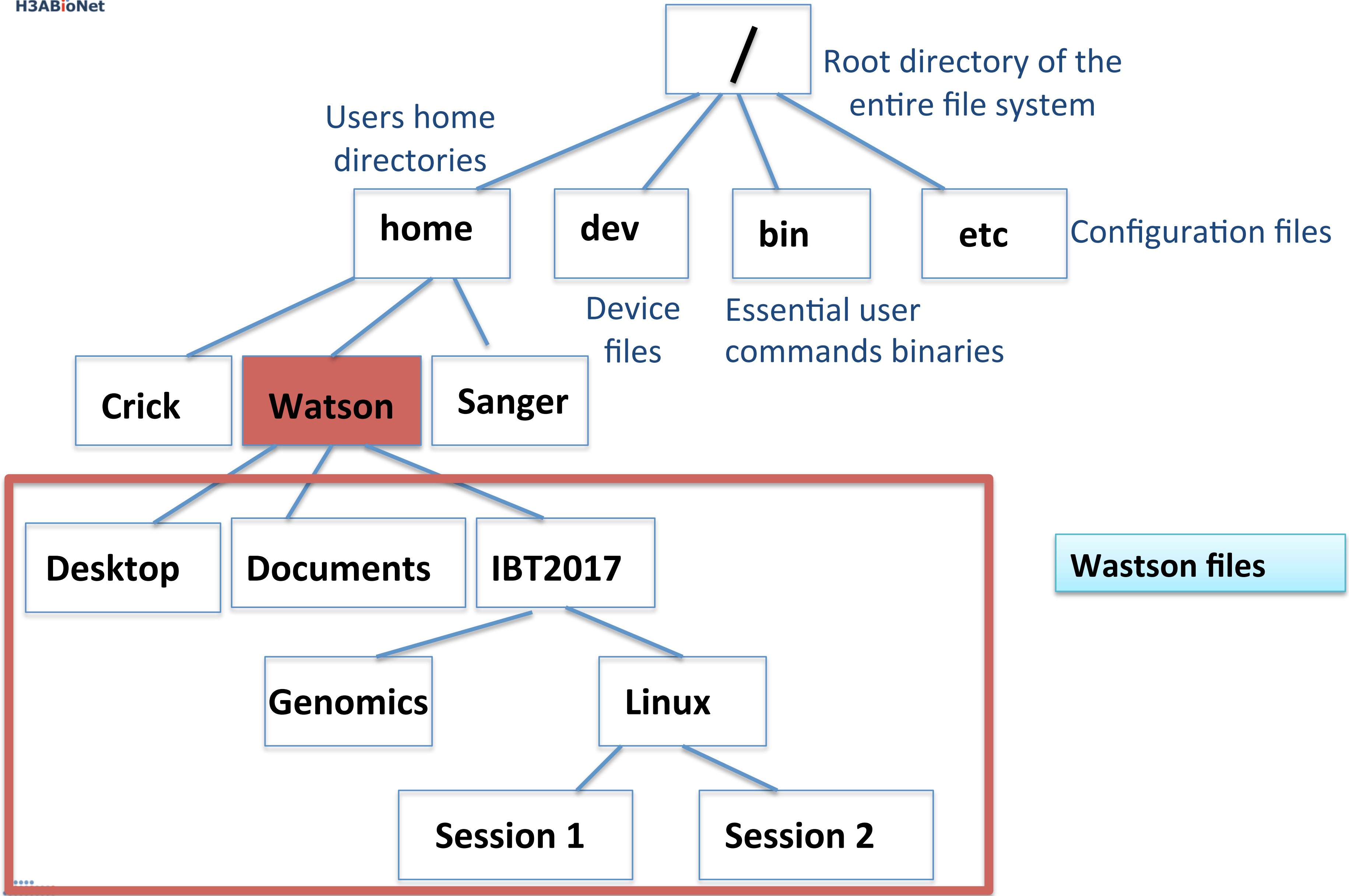
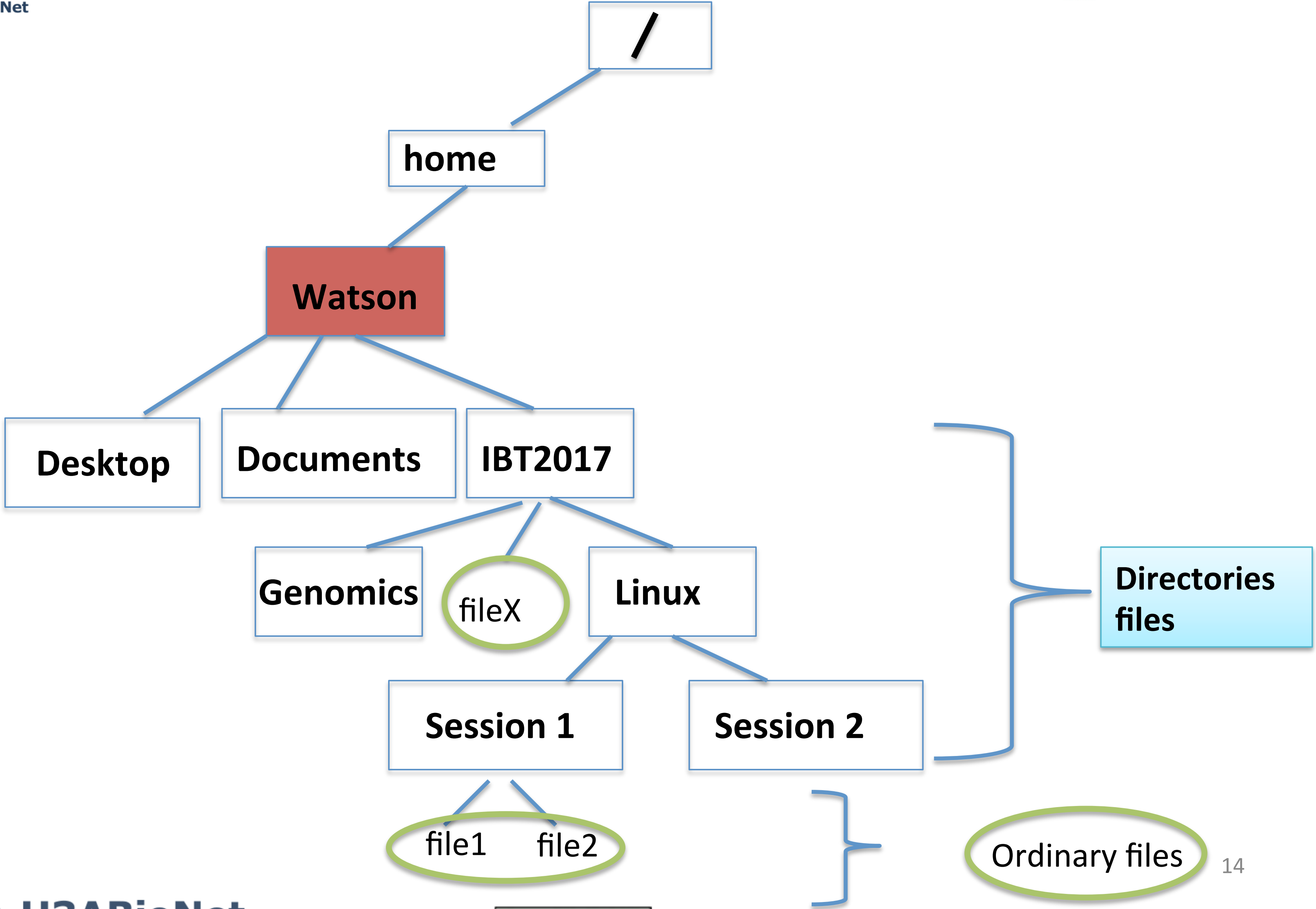
Linux files structure




/
home
Watson
Desktop
Documents
IBT2017
Genomics
fileX
Linux
Session 1
Session 2
file1
file2
Directories files
Ordinary files

Home directory and working directory

- When you first log in on a UNIX system, the working directory is your home directory.

- While working you will be associated to one directory called the working directory or the current directory

- An abbreviation of the working directory is displayed as part of the prompt on your terminal

- The command pwd gives the absolute path of the working directory

What is a path or a pathname?

- A path locates a given file in the system hierarchy
- An absolute path in the file system hierarchy for a given file or folder describes the parents all the way up to the root
- A relative path describes the path to the file starting from the current working directory

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~ (your home directory)

- ~ refers to the home directory in a given file system
- The tilde ~ character can be used to specify paths starting at your home directory

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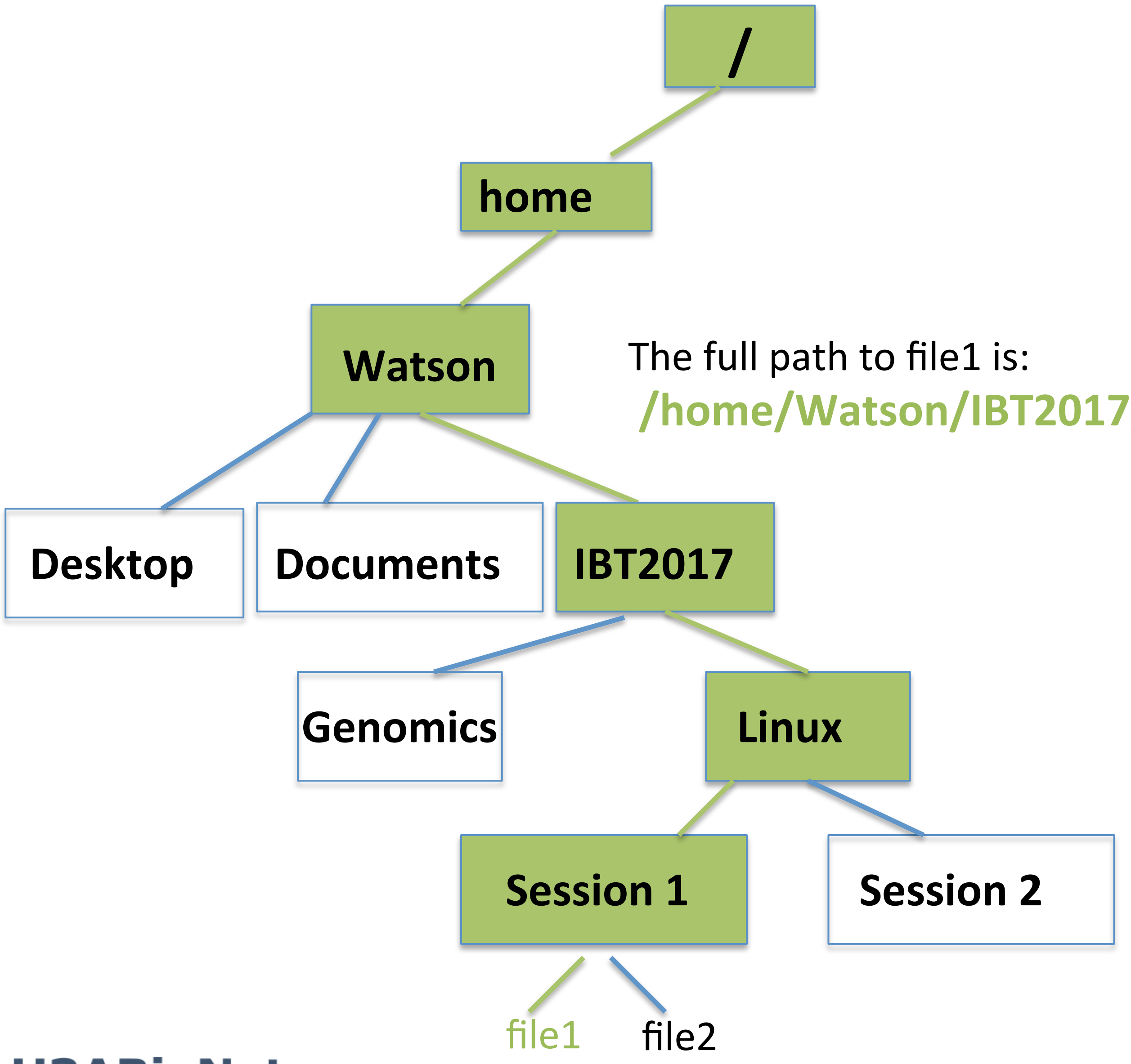
Absoulte path?



The full path to file1 is:

/home/Watson/IBT2017/Linux/Session1/file1

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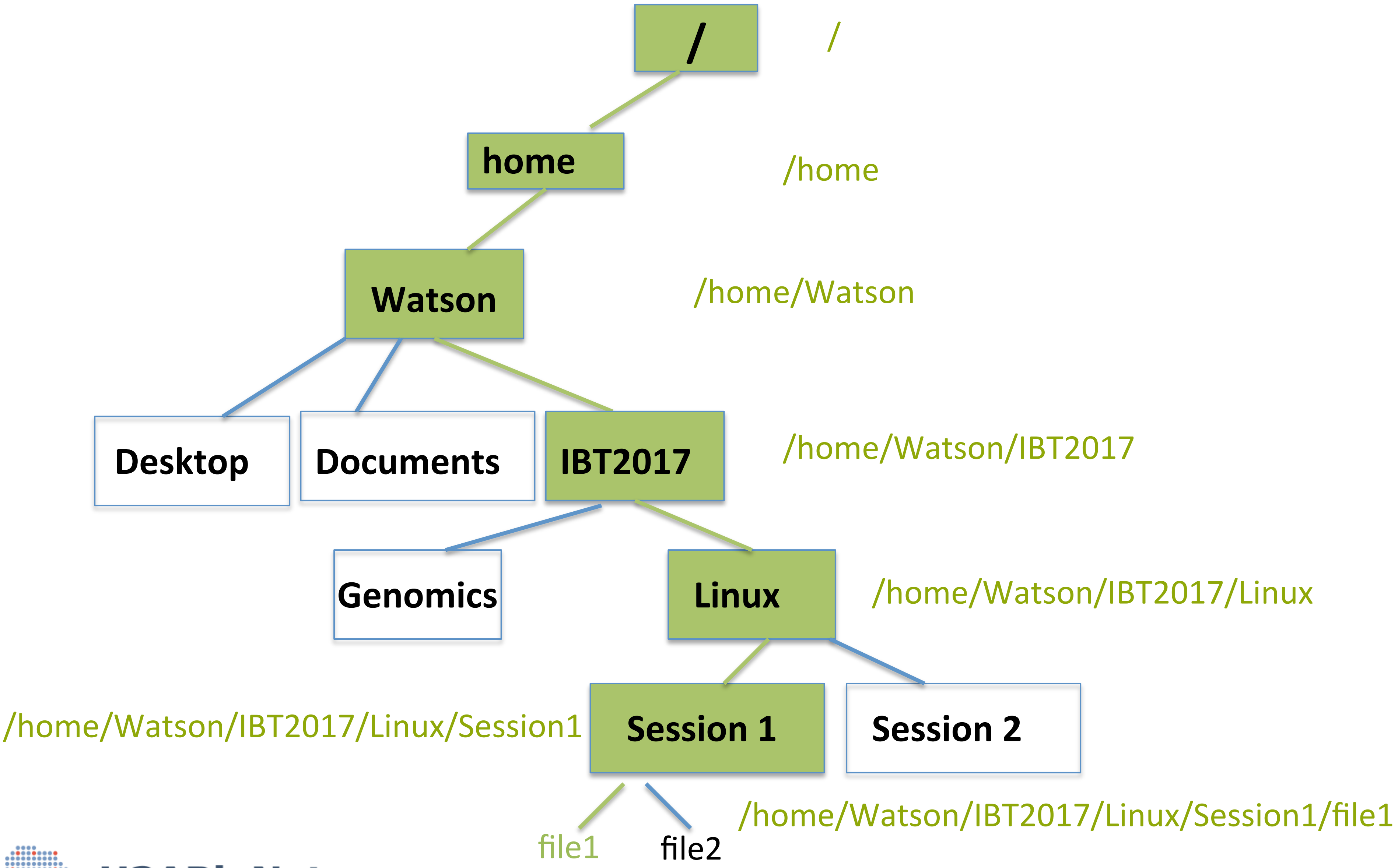
Absoulte path?



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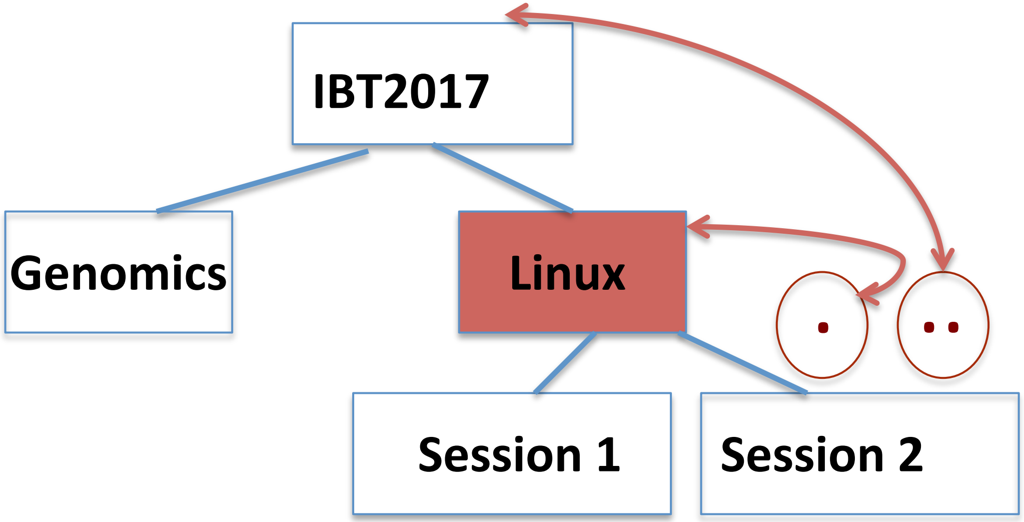
Refer to the parent and current directories

Every directory has two special sub-directories:

- . (dot): the current directory
- .. (dot-dot): the parent directory



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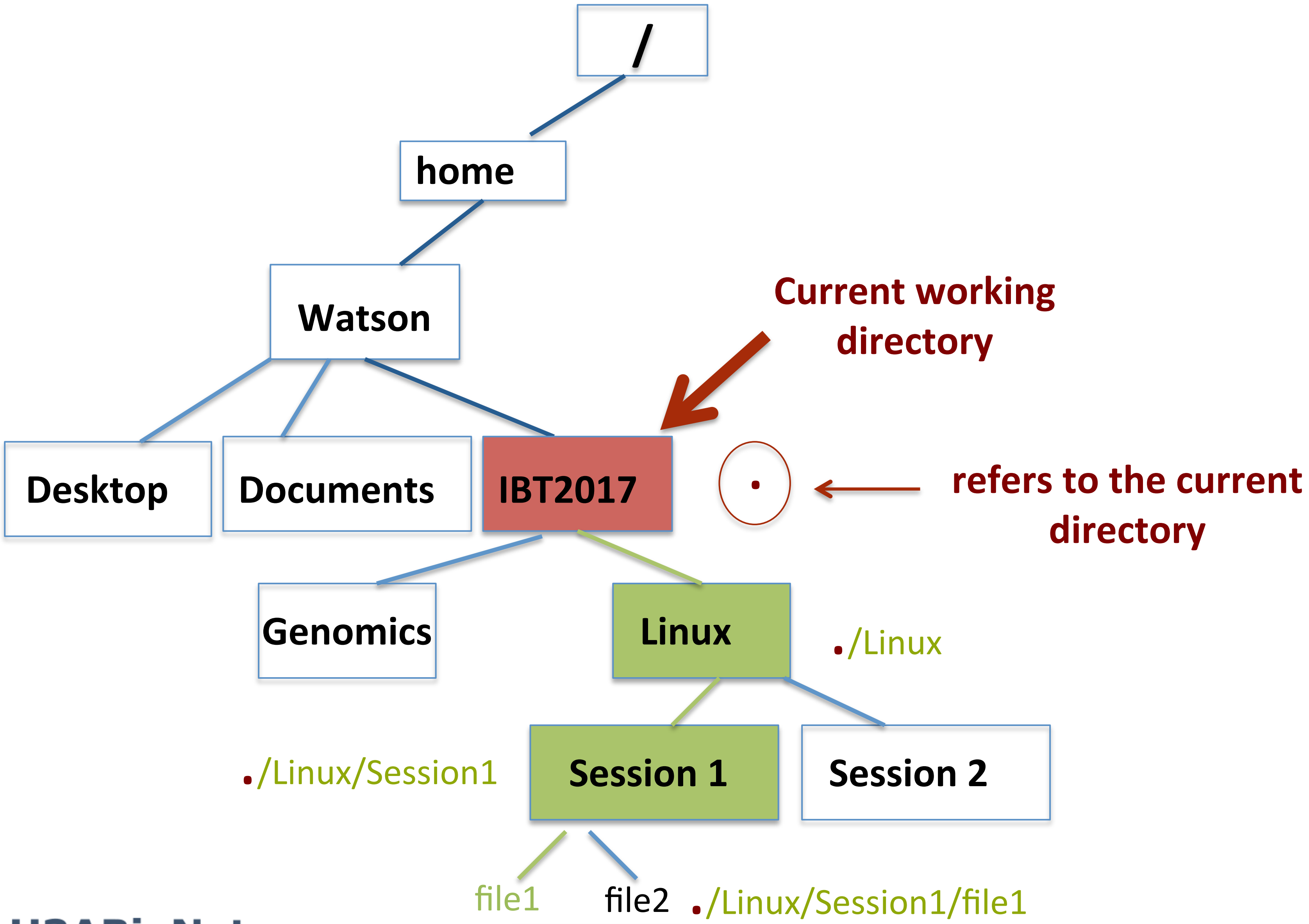
Relative path?



Current working directory

. refers to the current directory

./Linux

./Linux/Session1

./Linux/Session1/file1

First test of the terminal

- Open the Terminal on your system
- The shell prompt will appear

Ok, let’s try some typing !

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Part 3

Creating directories and navigating through the file structure

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Commands for manipulating directories

mkdir	Make directory: creates a new directory
rmdir	Removes a directory
pwd	Displays the absolute path of the current working directory
cd	Change directory: allows moving from one directory to another
ls	Lists a directory content

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pwd command

- pwd: print working directory
- Displays the absolute path of your current location in the file system
- Try pwd on your terminal
- You should see: /home/YourUsername

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ls command

- ls lists the content of the current directory by default
- Command structure ls [OPTION] [dirname]
- Some useful options:
  - -l: shows sizes, modified date and time, file or folder name and owner of file and permissions
  - - a: List all files including hidden file starting with '.'
  - -lh: shows sizes in easier readable format
  - -R: recursively lists sub-directories
  - -lS: sorting by file sizes

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Create a directory

- mkdir: makes a directory
- Command structure: mkdir dirname [path]

- mkdir dirname: would create a directory with the specified dirname
- The new created directory will be created in your current working directory
- If you want to create it elsewhere, you have to specify the path: mkdir dirname path

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Commands basic structure

```
command [–options]  [arguments]
```

Example:

```
ls –lh /home/Watson/IBT2016
pwd
mkdir Test1
```

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What you should know about file names in Linux

- No real distinction between the names of ordinary files and the names of directory files.
- No two files in the same directory can have the same name.
- Files in different directories can have the same name.
- Linux is case-sensitive: Sanger, sanger and SANGER are different and would represent three distinct files.
- In most cases, file extensions are optional (.txt, .exe, etc.)

Move in the files system

- cd: change the working directory
- Command structure: cd <path>

- The path name of the directory you want to move to should be specified
- You can specify either the absolute path or the relative path

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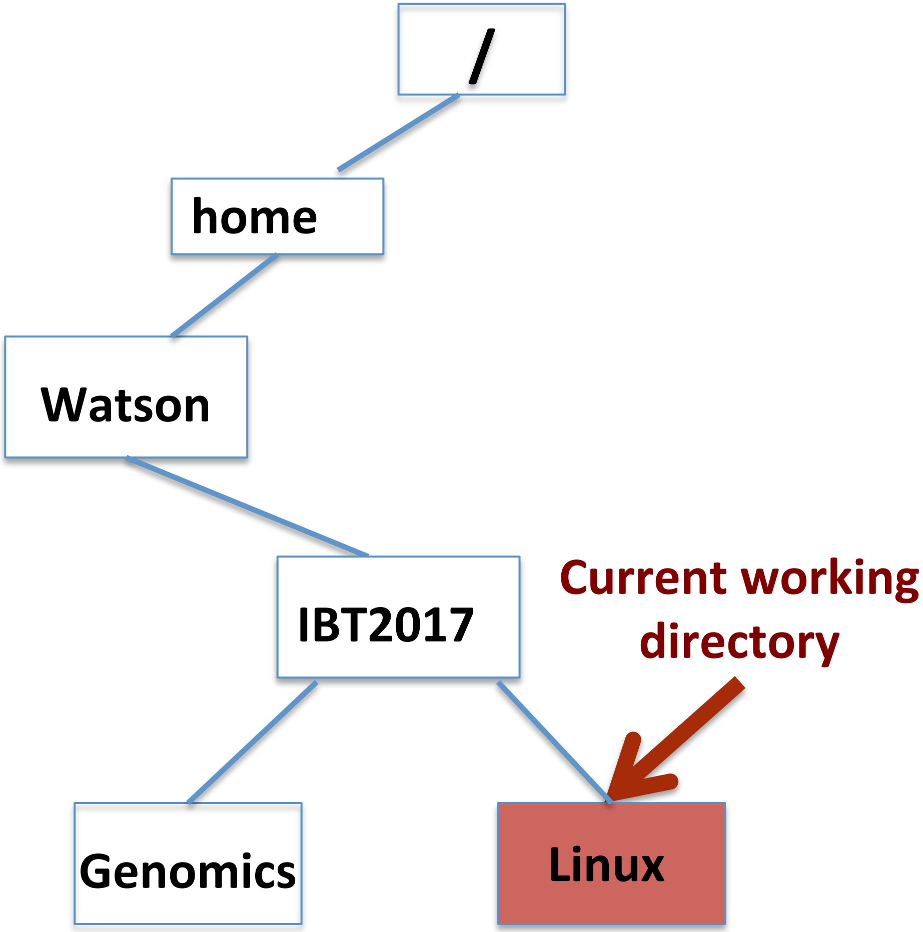
Move in the files system: example



- Move to Watson directory

1. cd /home/Watson
2. cd ../..
3. cd .. + cd ..

- Move to Genomics directory

1. cd /home/Watson/IBT2017/Genomics
2. cd ../Genomics
3. cd .. + cd Genomics

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Remove a directory

- rmdir: removes a directory
- Command structure: rmdir dirname [path]
- It would remove the dirname directory
- The directory should be in your current working directory
- If you want to remove it from elsewhere, you have to specify the path: rmdir dirname path to the directory
- rmdir works if there is no contents in the directory

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Remove a directory

- rmdir works if there is no contents in the directory
- If the directory contains files or sub-directories, an error message will appear: “Directory not empty”
- There is an option to remove -r, which stands for recursive, that will recursively remove a directory and its contents

How to get help for a command from the terminal?

- man commandname displays

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Part 4

Some useful shortcuts and Links

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Useful Links

- cd: cd followed by nothing will change the working directory to your home directory
- cd ~user_name: moves to the specified user home directory

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Linux, some useful CLI key combinations

- Ctrl+A: move the cursor to the beginning of the command line
- Ctrl+C: end a running program and return to the prompt
- Ctrl+D: logout from the current shell session: equivalent to exit
- Tab: autocomplete a file name
- Tab Tab: displays command completion possiblities
- Ctrl+L: clear the terminal

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Thanks

- Shaun Aron & Sumir Panji

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