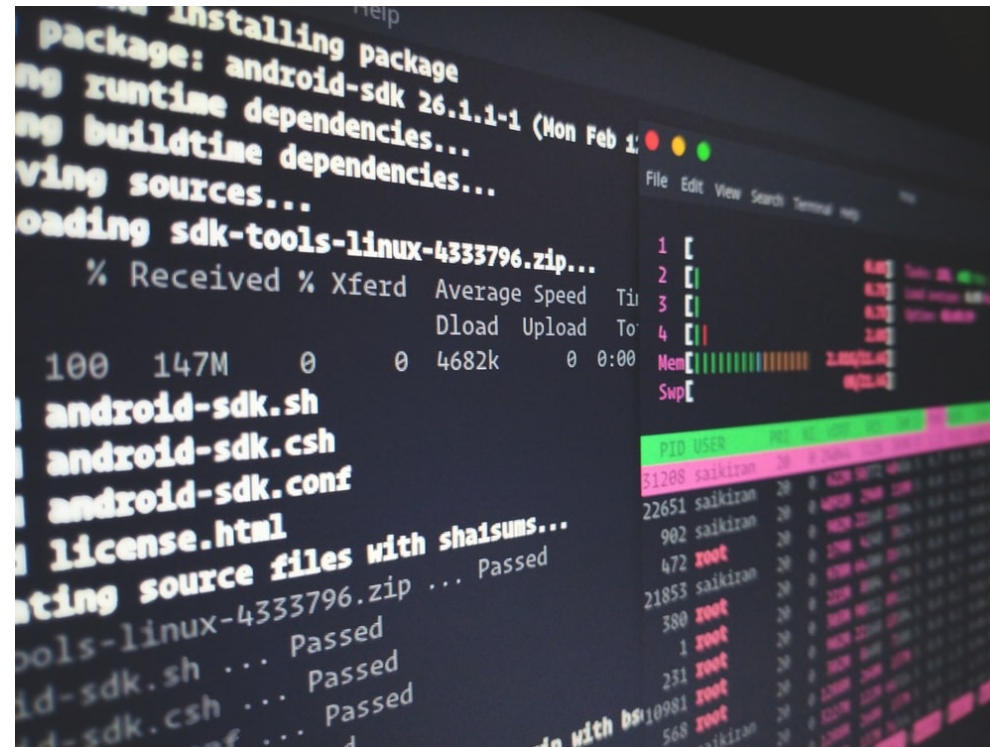


COS 217: Introduction to Programming Systems

Intro to Linux and the Shell



Sai Kiran Anagani



PRINCETON UNIVERSITY



ssh! While I bash this shell...

A quick COS217 \leftrightarrow English dictionary so that we're on the same page





What's an Operating System?

Narrow definition:

A piece of software that controls the interaction between programs and hardware (CPU, memory, storage, peripherals).

Also called a “kernel”.

Modern Kernel Examples

- Unix lineage: Linux, XNU
- VMS lineage: Windows NT

Looser definition:

The kernel plus a variety of libraries and tools built upon it, that provide a specific experience to users (e.g., GUI).

Modern “OS” Examples

- Linux kernel: “Linux”/GNU, Android
- XNU kernel: MacOS, iOS
- Windows NT kernel: Windows



What's a Command Line?

Graphical User Interface (GUI):

Graphical “point and click” or “swipe and tap” paradigm for interacting with programs.

Programs usually designed to respond to “events”, and display output via “widgets”.

Often more user-friendly.

Command Line Interface (CLI):

Text-based paradigm for interacting with programs.

Programs usually designed to accept typed (text-based) input and produce text-based output.

Easier to code, more flexible, and *easier to execute remotely*.



What's a Terminal and a Shell?

Terminal Emulator:

GUI program that relays typed input to a CLI program and displays its output on the screen.



Shell:

CLI or GUI program for managing files and running other programs.

GUI examples: Mac finder / dock, Windows file mgr / start menu

CLI example: bash



What's ssh?

ssh:

Stands for “secure shell” but it’s not a shell!

CLI program that connects to `sshd` on another computer and relays text back/forth securely.

sshd:

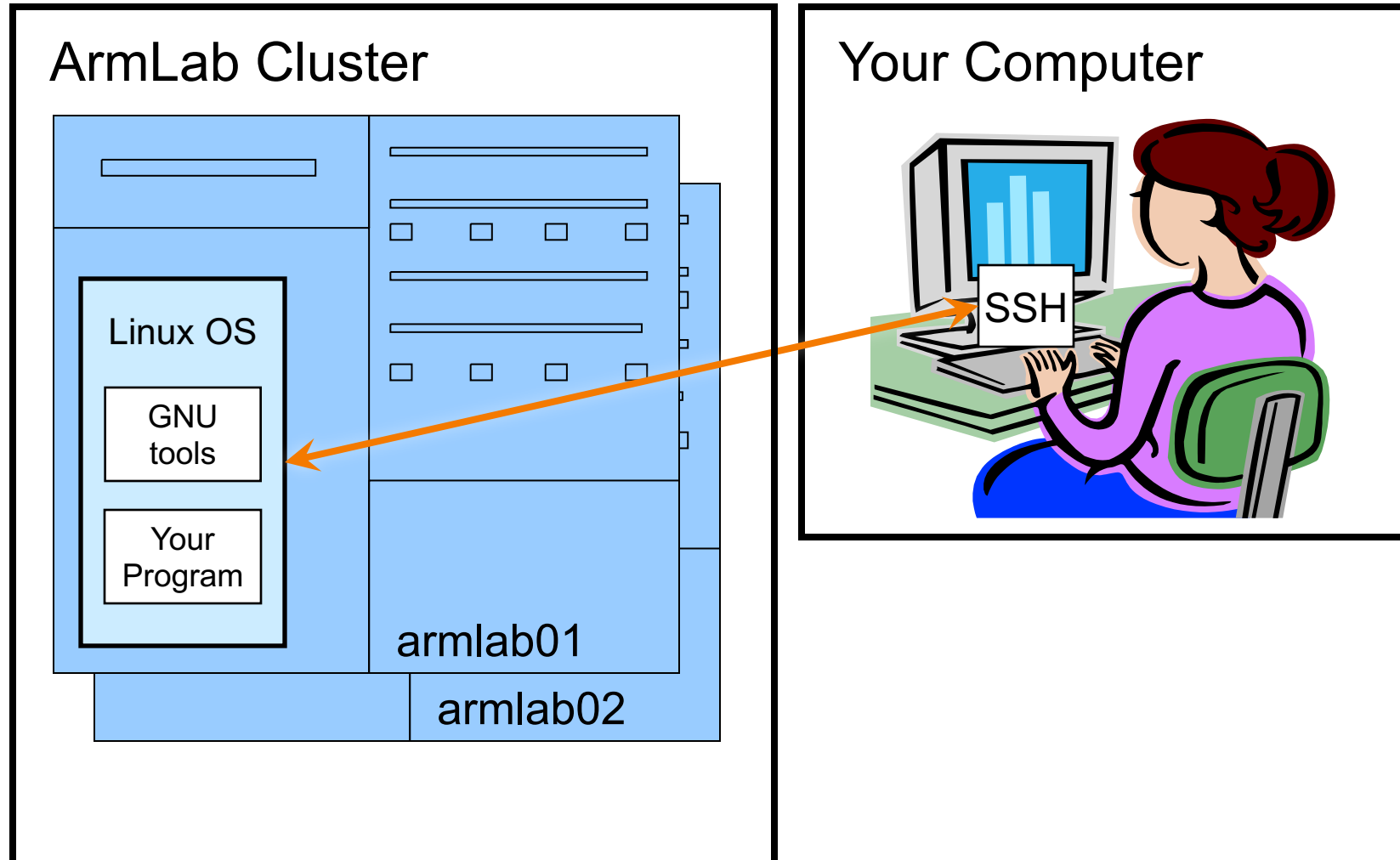
Program that runs continuously on a server, accepts network connections from ssh clients, and relays text back/forth to a local shell (e.g., `bash`).



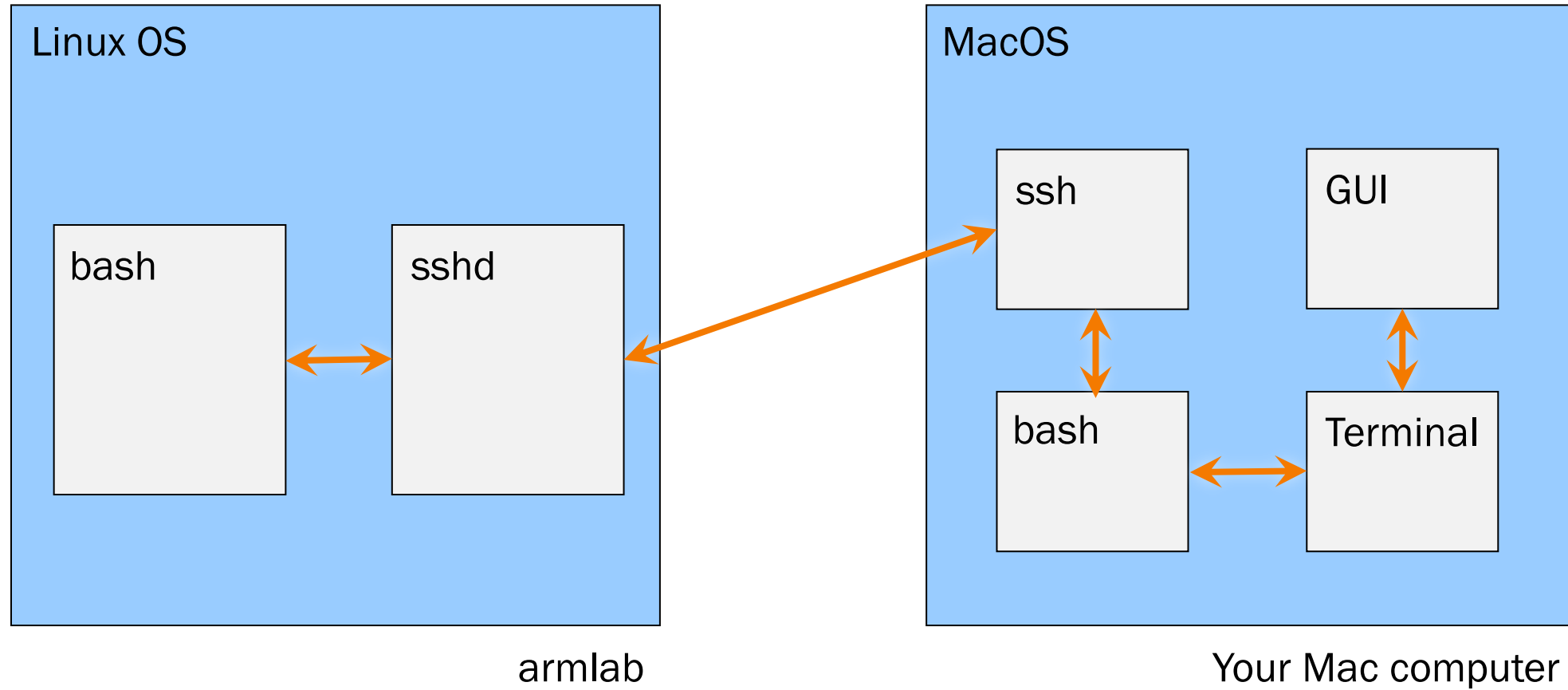
Programming Environment – The Illusion

Server

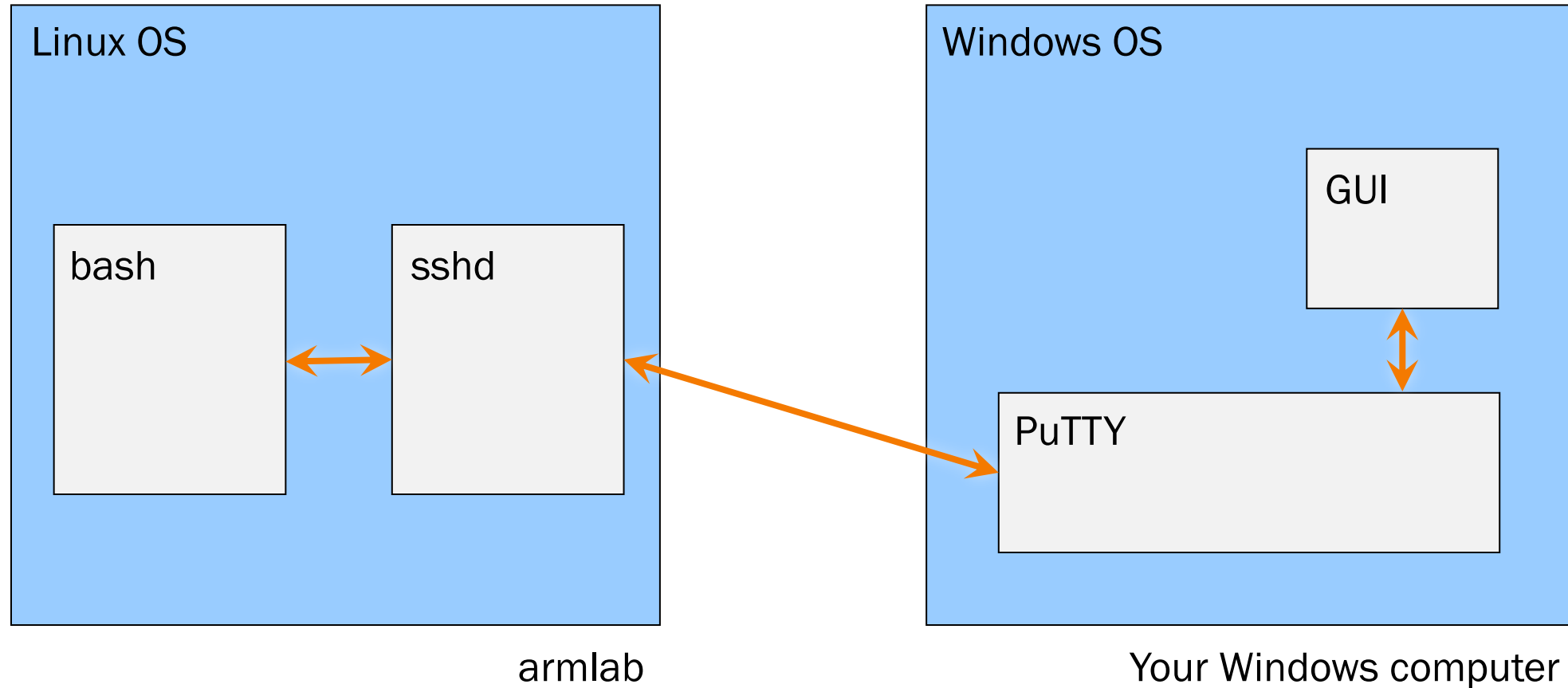
Client



Programming Environment – The Reality (Mac)



Programming Environment – The Reality (Windows)





What's a Text Editor?

Text Editor:

Allows editing *plain text*:
just a sequence of characters.

Examples: TextEdit, Notepad,
emacs

Word Processor:

Allows editing text with formatting
(various fonts, paragraphs, etc.)

Does *not* output plain-text.

Examples: Word, Pages

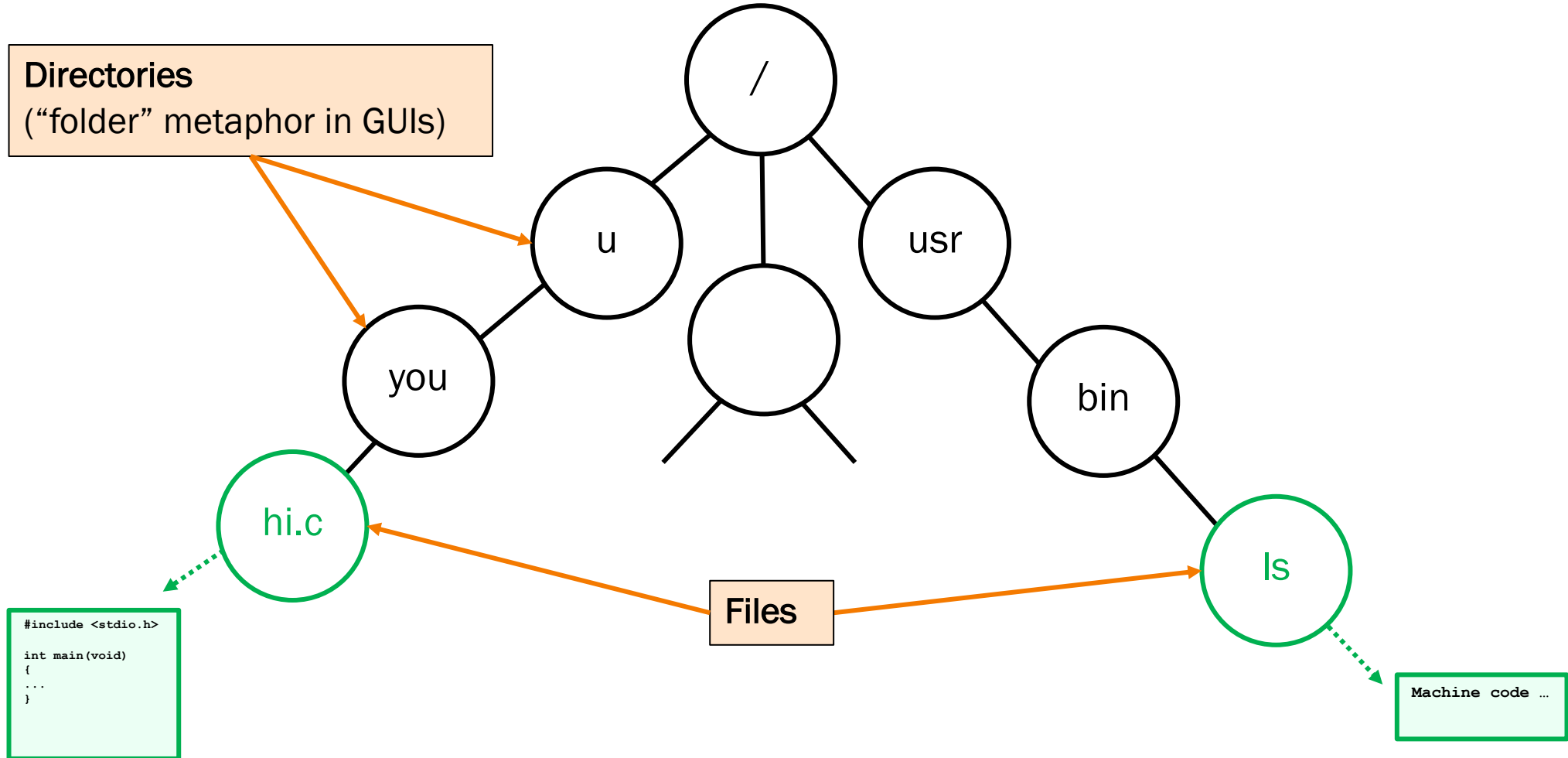
Integrated Development Environment (IDE):

Text editor optimized for code –
usually integrates syntax coloring,
compiling, searching for errors,
sometimes suggesting variable
names or code snippets.

Examples: IntelliJ, Visual Studio,
emacs *with the appropriate
configuration*



Filesystems



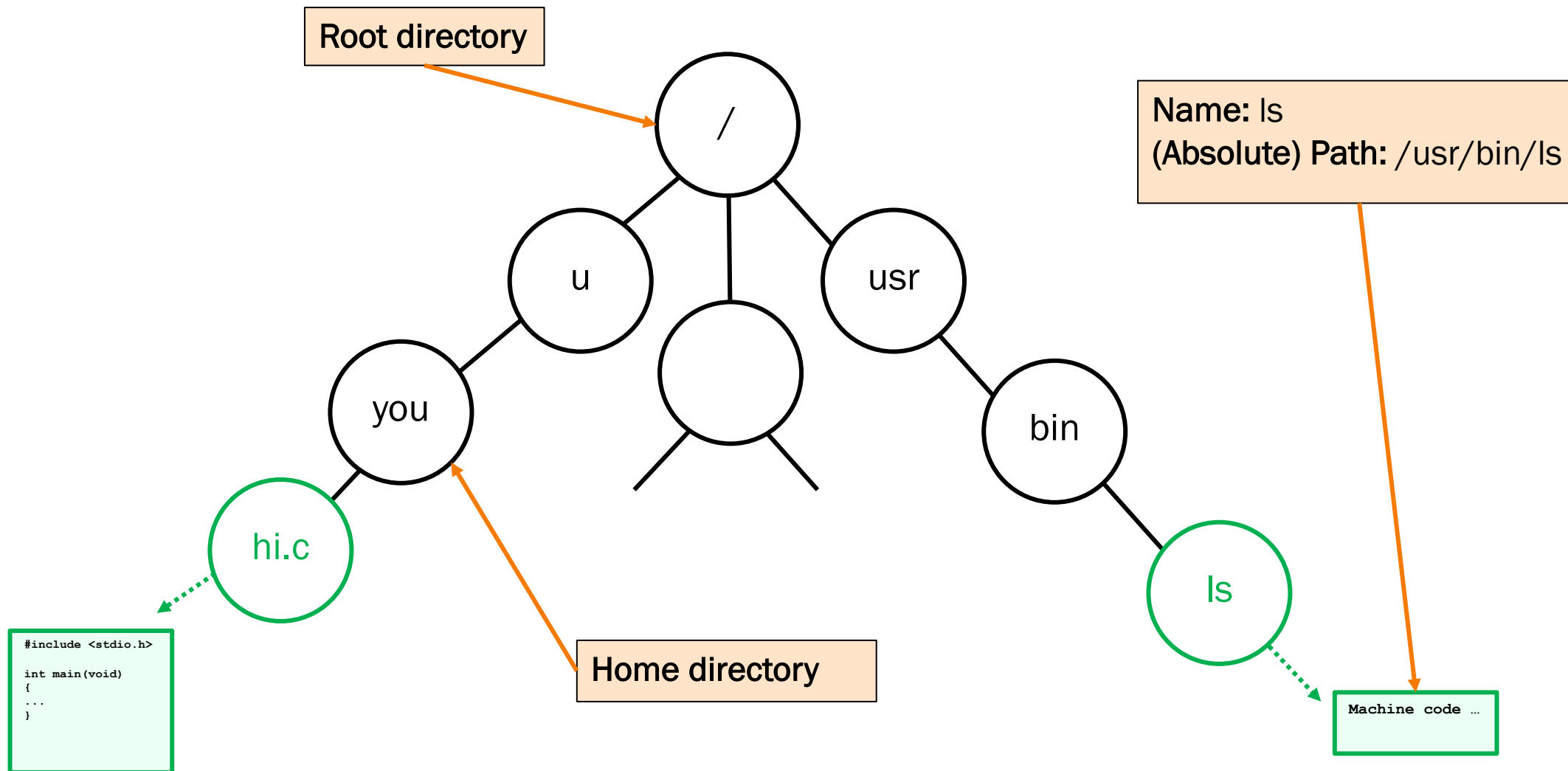
Directories
("folder" metaphor in GUIs)

Files

```
#include <stdio.h>
int main(void)
{
  ...
}
```

Machine code ...

Filesystems

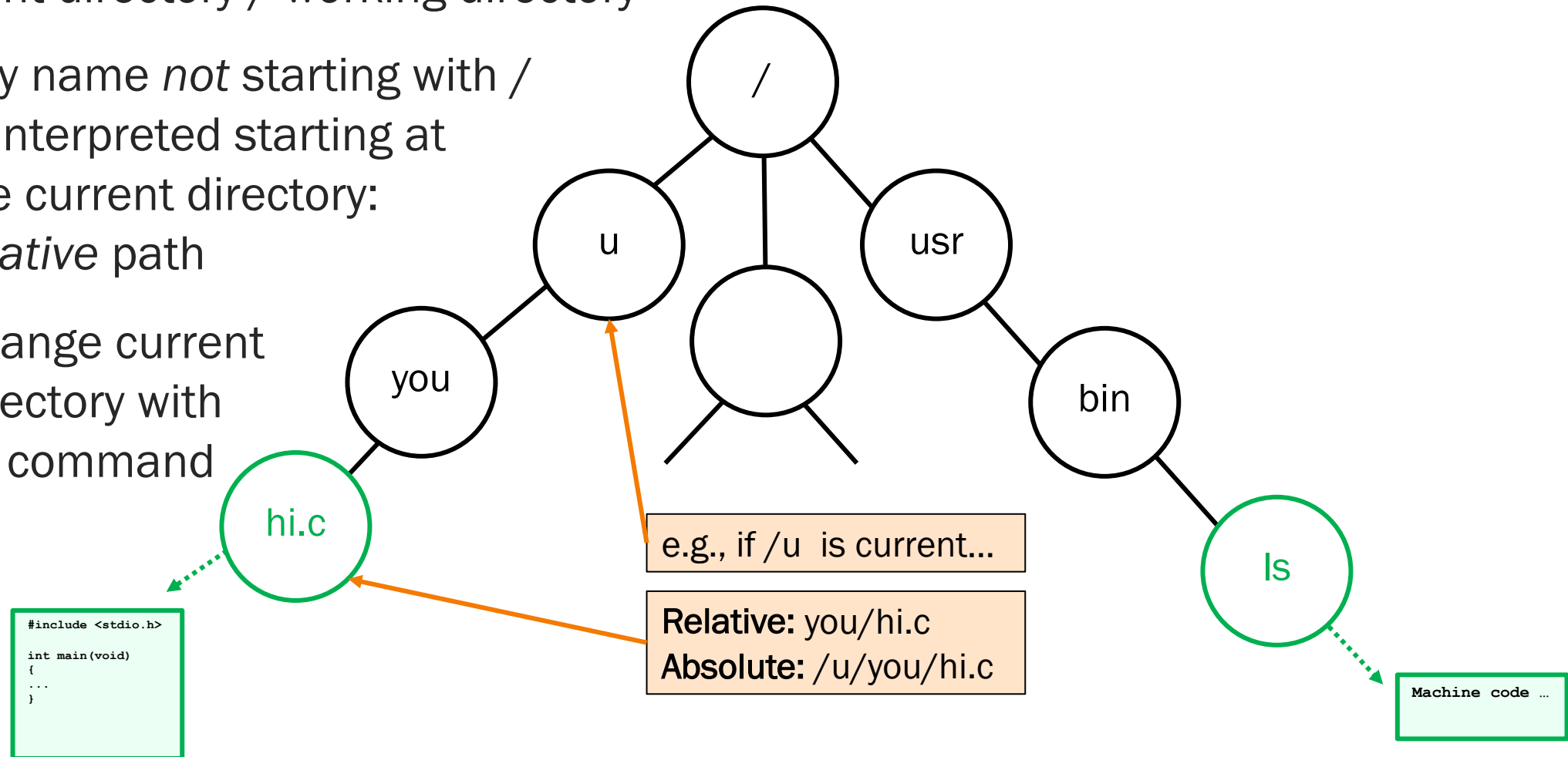




Filesystems

Current directory / working directory

- Any name *not* starting with / is interpreted starting at the current directory: *relative* path
- Change current directory with *cd* command

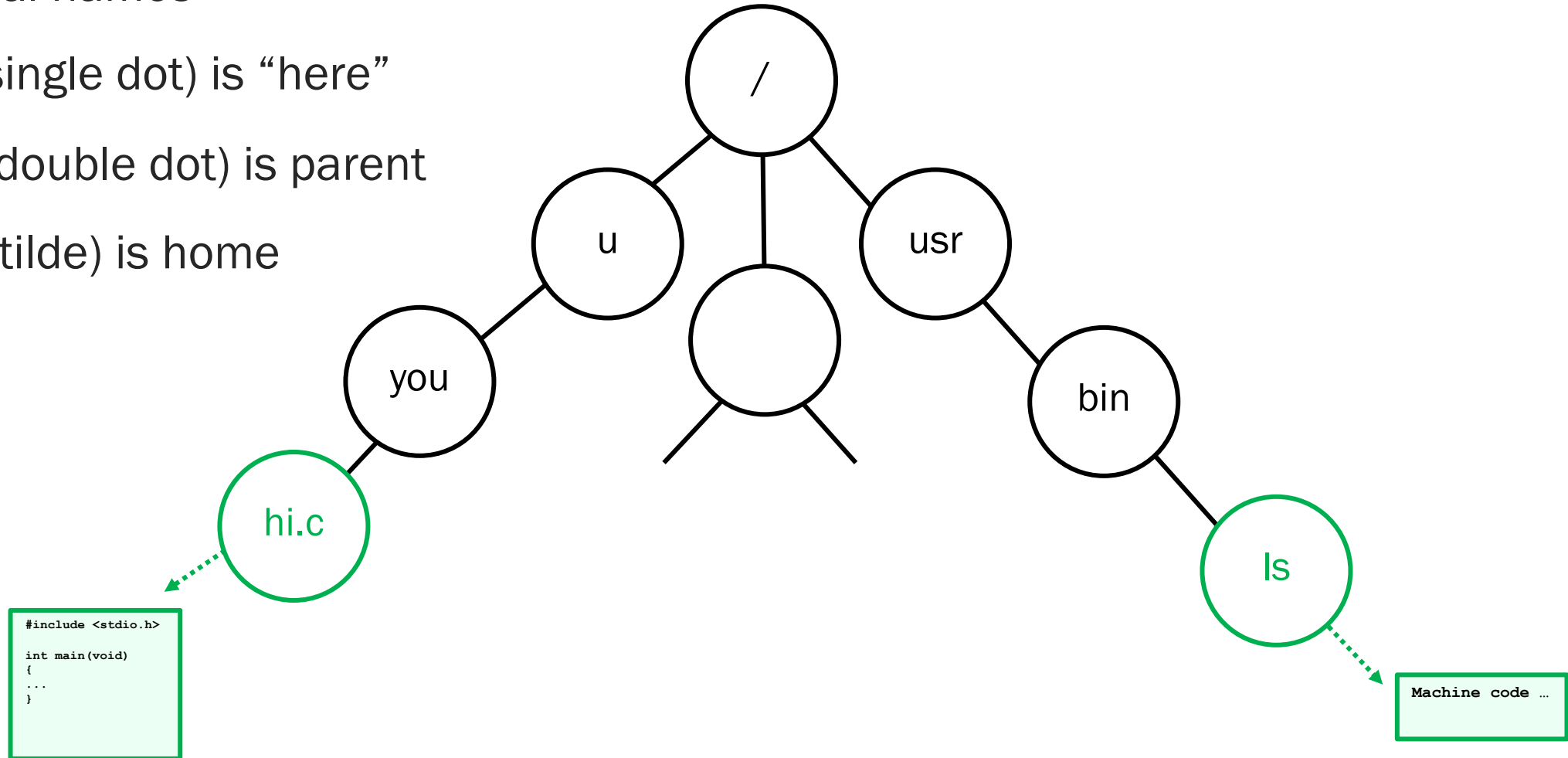




Filesystems

Special names

- . (single dot) is “here”
- .. (double dot) is parent
- ~ (tilde) is home





AND NOW THE DEMO...