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Systems and Internet  
Infrastructure Security Laboratory

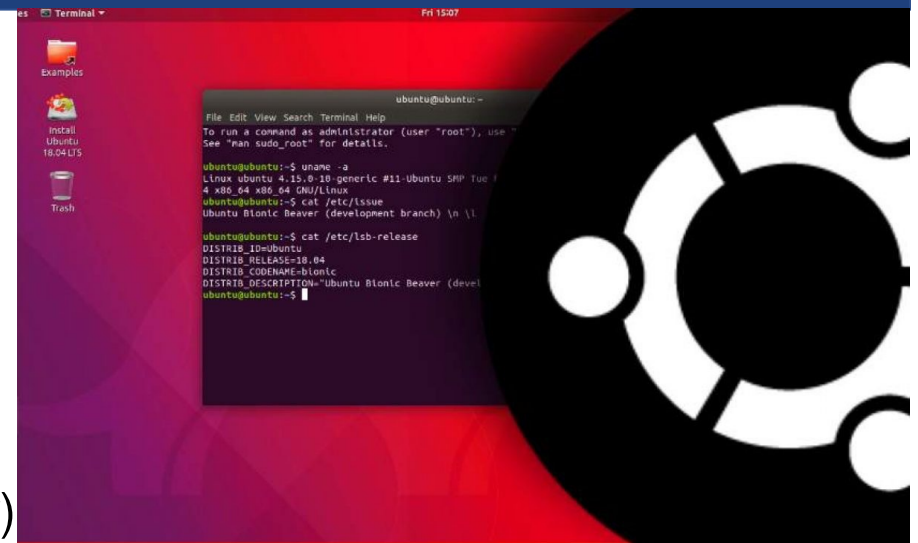
# CMPSC 311 - Introduction to Systems Programming

## UNIX Essentials

Professors:

Suman Saha

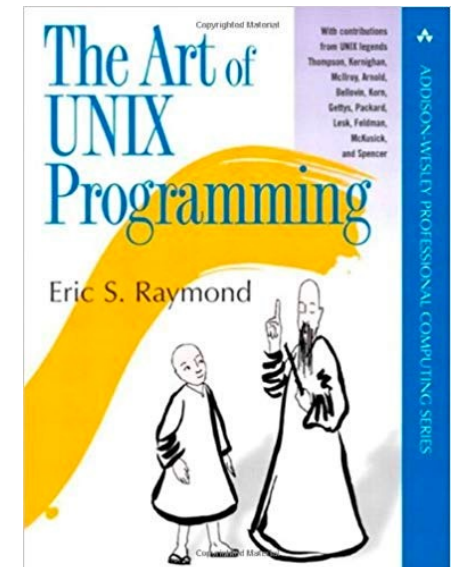
(Slides are mostly by *Professor Patrick McDaniel* and *Professor Abutalib Aghayev*)



# The Unix Philosophy



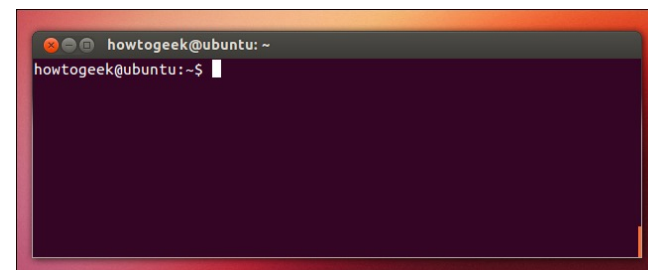
- Write programs that do one thing and do it well.
- Write programs to work together.
- Write programs to handle text streams, because that is a universal interface.
  - Doug McIlroy, Unix patriarch
- More general programming principles:
  - KISS – “Keep it simple, stupid”
  - Modularity – thinking in terms of components
  - Composability – thinking in terms of interacting components
  - Transparency – making inspection and debugging easier
  - etc...



# Command line interface



- Command line? Why?
  - Efficient and powerful
  - Scriptable
  - Simple and reliable
    - Always works... even if everything else is b0rked!
- What is it?
  - Shell program (“bash” on Linux)
  - Interprets built-in commands
  - Runs other programs
  - Runs shell scripts



# Standard filesystem layout



- **Grouped by type**
- `/` root directory of the entire filesystem
- `/usr` installed software
  - `/usr/bin`, `/usr/lib`, ...
- `/etc` configuration
- `/home` users' own files
- `/dev` devices
- `/tmp` temporary files



# Root (administrator)

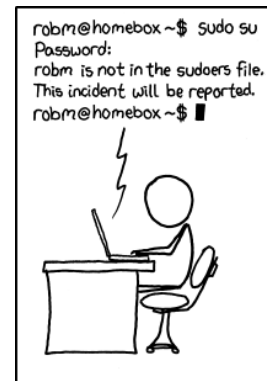
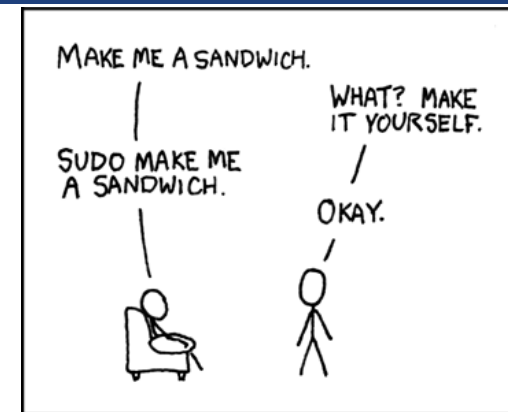


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- Files in Unix have owners
  - Users can (usually) only touch their files
- Root (Super User) can do anything
- "Becoming root"
  - Administrative privileges: *su*
  - Temporary privileges (per command): *sudo* (su "do")

We trust you have received the usual lecture from the local System Administrator. It usually boils down to these three things:

- #1) Respect the privacy of others.
- #2) Think before you type.
- #3) With great power comes great responsibility.



<https://xkcd.com/149/> <https://xkcd.com/838>