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UMBC LINUX USERS GROUP

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Club Updates:

- Sysadmins have been onboarded, new progress on the mirror and infrastructure expected
  - Applications are still open at sh.lug.umbc.edu/sysadmin
- Upcoming Presentations:
  - Next Week: FOSS
- We still are open for presentation signups
  - sh.lug.umbc.edu/present-sp26

Who are we?

President
Alex (blahaj)

Vice President
dani (puppy)

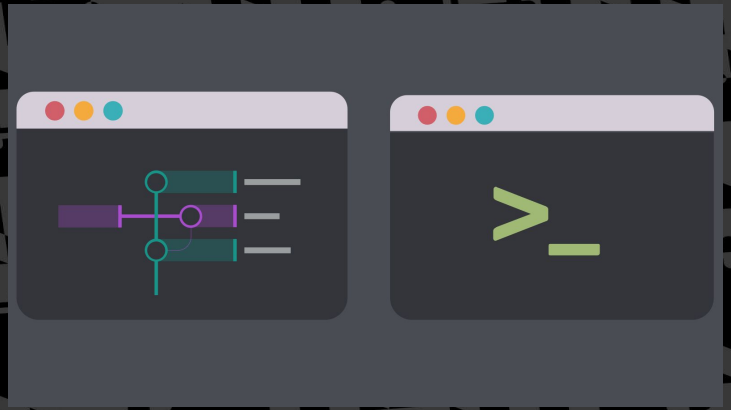
Treasurer
Will (pptx.)

Secretary
Milk (🥛)

Today’s Presentation: Command Line Basics: Getting Started with Linux

Why the command Line?

- Lightweight, powerful, and flexible
- Automates repetitive tasks
- Works on any Linux system (even servers without GUI)



The Terminal Environment

- Open the terminal (Ctrl + Alt + T) - Most systems
- Shell types (bash, zsh, fish)
- Prompt Structure
  - alex@kallax:~$

Navigating

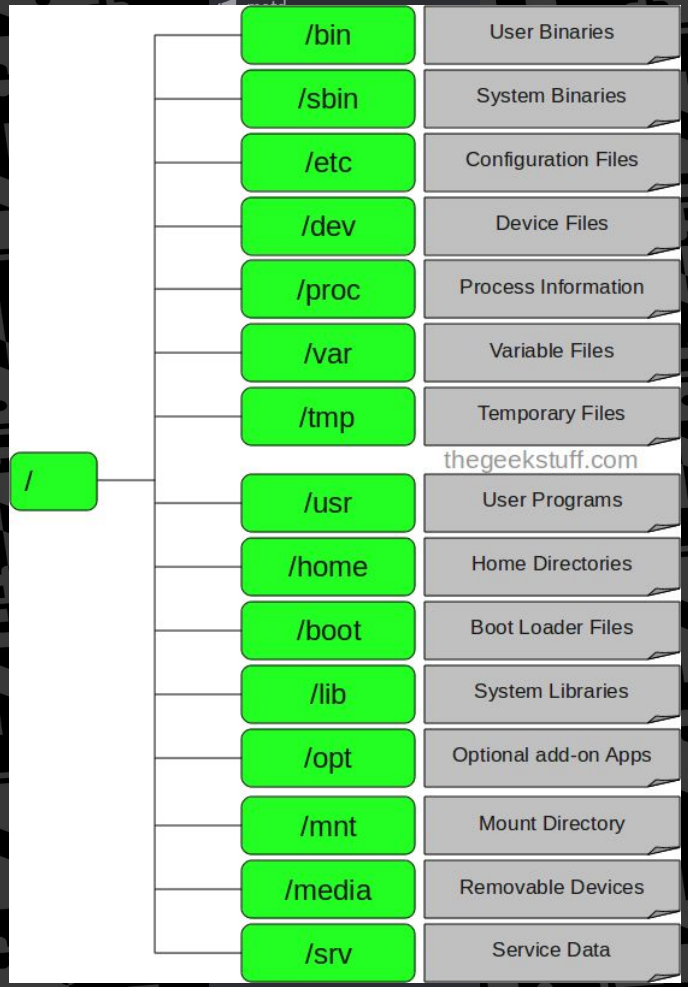
- pwd - print working directory
- ls - list files
- cd - change directory

Options & arguments

- ls -la (uses the options -l & -a)
  - Shows all files (hidden files)
  - List format
- After the options are the actuals arguments

Linux File Structure

- Files & Directories
- Hierarchical file structure
  - Root Directory ‘/’
  - Subsequent directories within
  - Path: ‘/home/alex/LUG/umbx.txt’
    - Absolute path
    - Relative path
      - LUG/umbc.txt
- Standard Linux directory structure

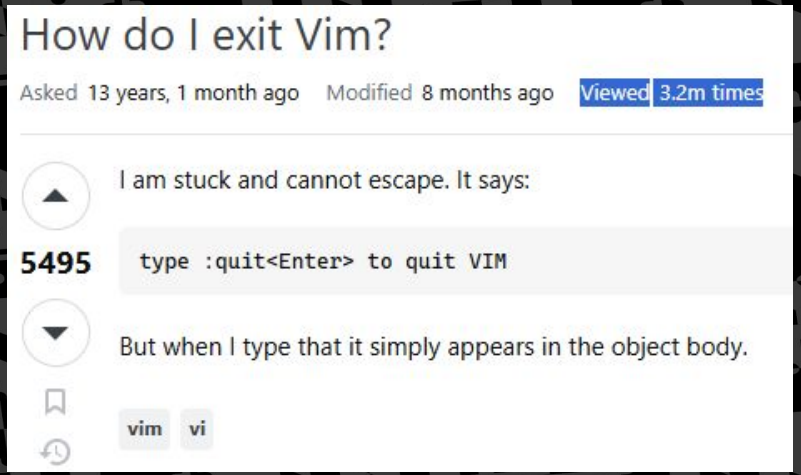


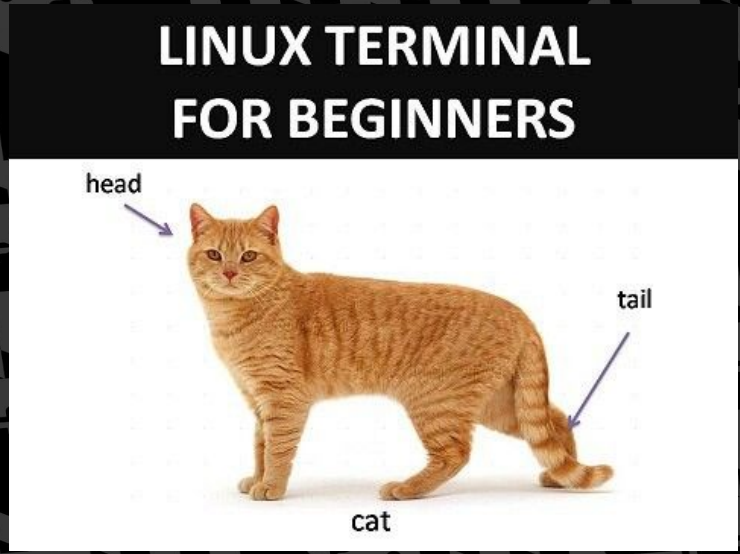
File operations

- touch - create empty file
- cp - copy files
- mv - move/rename files
- rm - remove files
- mkdir /rmdir - create/remove directories

Viewing and Editing Files

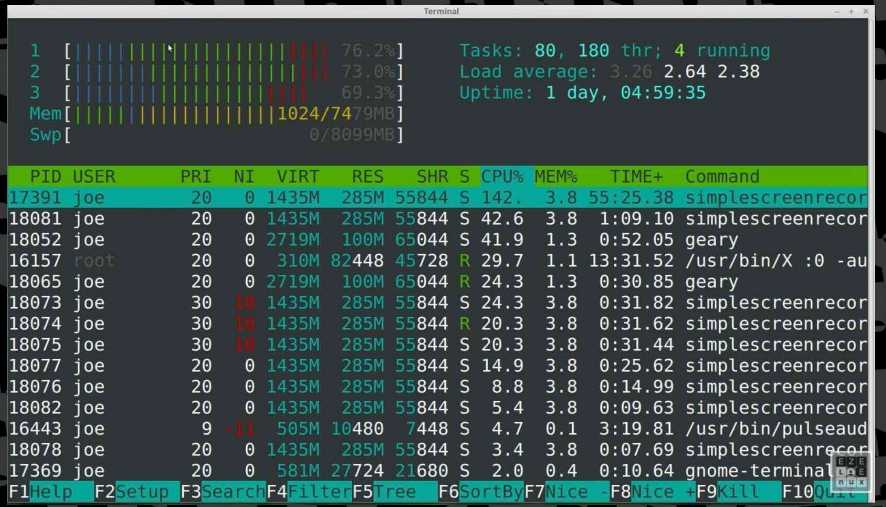
- cat, less, head, tail - view contents
- nano - beginner friendly text editor
- vim - powerful text editor





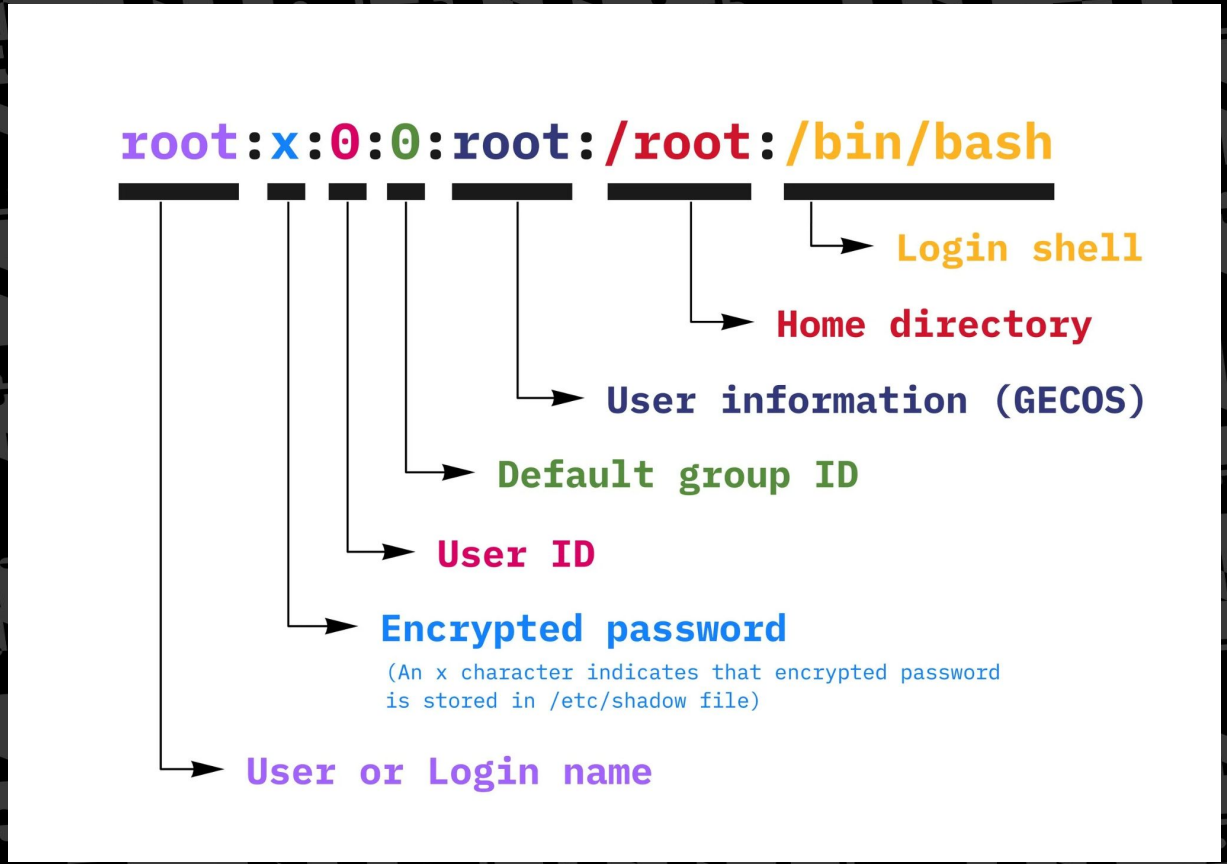
System Info & Management

- Whoami - current user
- Uname -a - kernel/system info
- Df -h - disk usage
- top/htop - monitor processes
- Free -h - memory usage
- ps - list processes
- kill - terminate process



Users and Permissions

/etc/passwd



- UID of zero always means root (carries those perms)

File Permissions

```
drwxr-xr-x  5 alex alex 4096 Aug 12 21:37 .vscode-server
-rw-r--r--  1 alex alex  183 Aug 12 21:36 .wget-hsts
drwxr-xr-x  5 alex alex 4096 Sep 18 21:53 SamsungHealth
-rw-r--r--  1 alex alex 3541 Sep 21 22:27 jeopardy.py
drwxr-xr-x  3 alex alex 4096 Aug 12 21:39 shelf
```

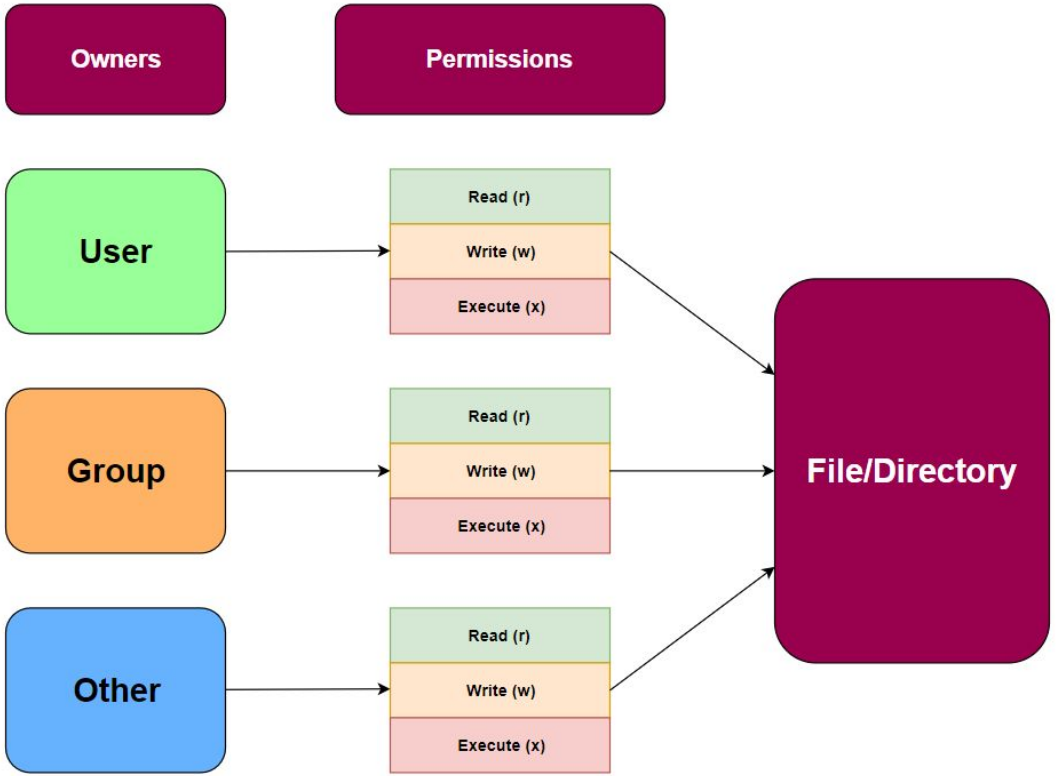
User Group

-rwxrwxrwx

USER (U) GROUP (G) OTHERS (O)

- = file
d = directory
l = Symbolic Link

r = read (4)
w = write (2)
X = execution (1)



Changing file permissions

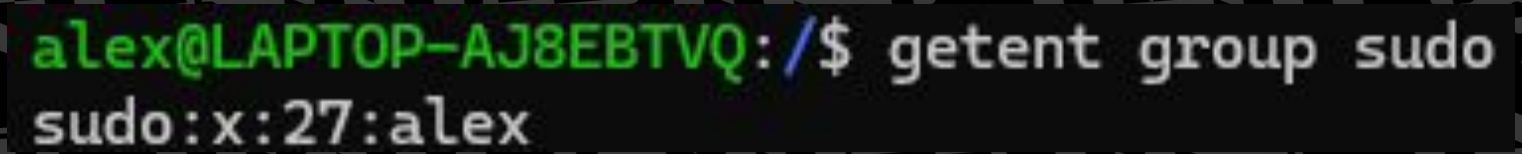
- chmod
  - sudo chmod -R 755 /home/alex/Documents
  - sudo chmod 777 /etc/passwd
  - chmod u=rw,go=r document.odt
  - chmod u+x script.sh
- chown
  - sudo chown dev script.sh
  - sudo chown docker:docker script.sh

Sudo

Sudo is an application that handles having multiple admins.

Allows users root access with their own credentials

Membership defined in /etc/sudoers



Demo

(This could theoretically mess with things so be careful)

- Create a new user ‘$ adduser dev’
- Modify the UID bit of the user to be zero
- Switch to the test account

SUID/SGID bit

```
chmod u+s <file>
```

```
- rws r-- r-- 1 user admin
```

SUID bit set! This will run as user

```
chmod g+s <file>
```

```
- rwx r-s r-- 1 user admin
```

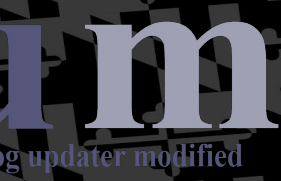
SGID bit set! This will run with the admin group

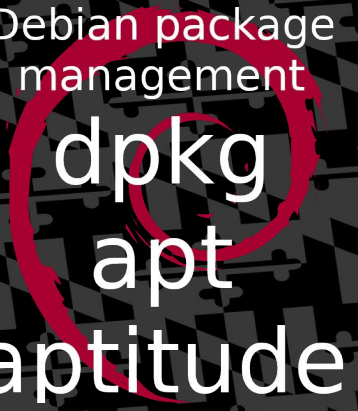
Changing SUID Bits

- Remove the SUID bit from passwd
  - chmod u-s /bin/passwd
- Add SUID bit to /bin/bash
  - chmod u+s /bin/bash
- Remove the SUID bit from sudo
  - ?

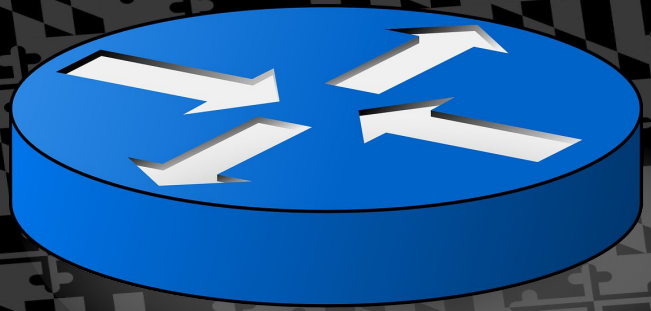
Package Management

- Responsible for installing, updating, and managing packages
- Debian/Ubunutu - apt install
- Fedora/RHEL - dnf install
- Arch: pacman -S





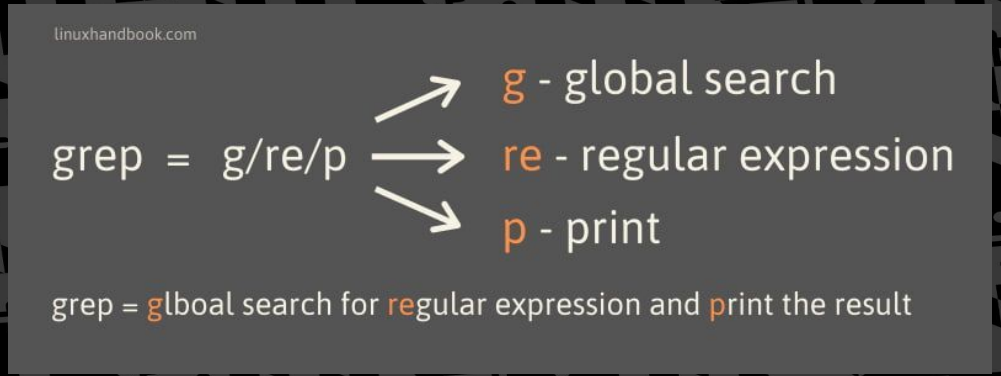
Networking



- ping - test connectivity
- ifconfig / ip addr - network info
- ip route - show routing table
- nslookup - DNS record lookup
- Traceroute - trace path to destination
- netstat -tuln - show open connections
- curl /wget - download files
- ssh - connect to remote systems

Essential Applications

- Grep - search files in text
- Find - locate files
- Tar / zip / unzip - archive/compression
- History - see command history
- Man - read manual pages

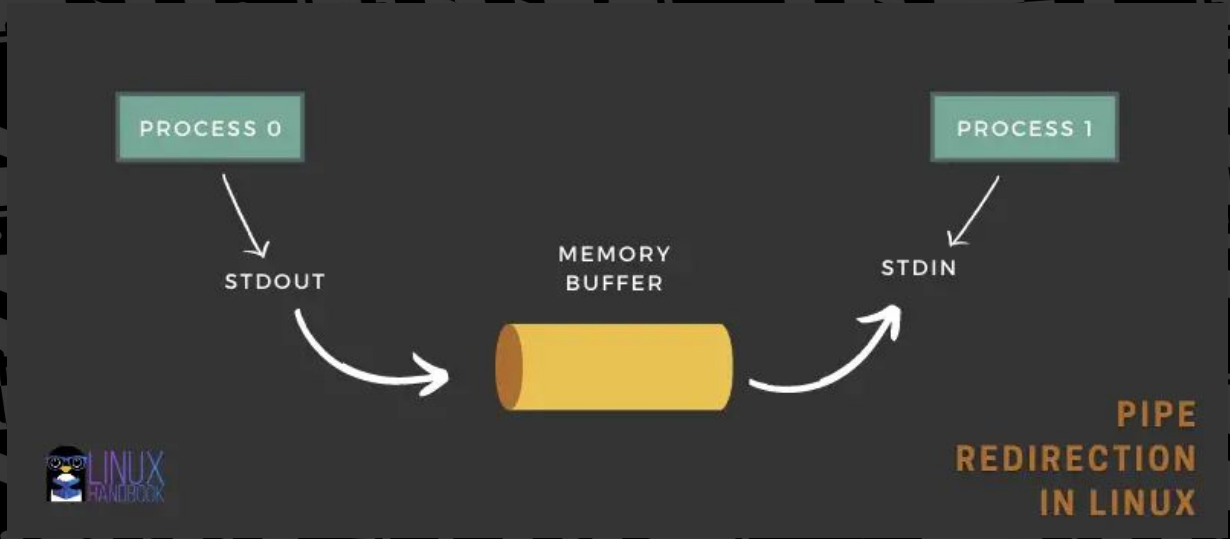



```
SED(1)                User Commands                SED(1)

NAME
   sed - stream editor for filtering and
   transforming text

SYNOPSIS
   sed [OPTION]... {script-only-if-no-other-
   script} [input-file]...

DESCRIPTION
   Sed is a stream editor.  A stream editor is
   used to perform basic text transformations
   on an input stream (a file or input from a
   pipeline).  While in some ways similar to an
   editor which permits scripted edits (such as
   ed), sed works by making only one pass over
   the input(s), and is consequently more
   efficient.  But it is sed's ability to
   filter text in a pipeline which particularly
   distinguishes it from other types of
   editors.

   -n, --quiet, --silent

      suppress automatic printing of pattern
      space

   --debug

      annotate program execution

   -e script, --expression=script

      add the script to the commands to be
      executed
:
```

ESC ↹ CTRL ALT — ↓ ↑

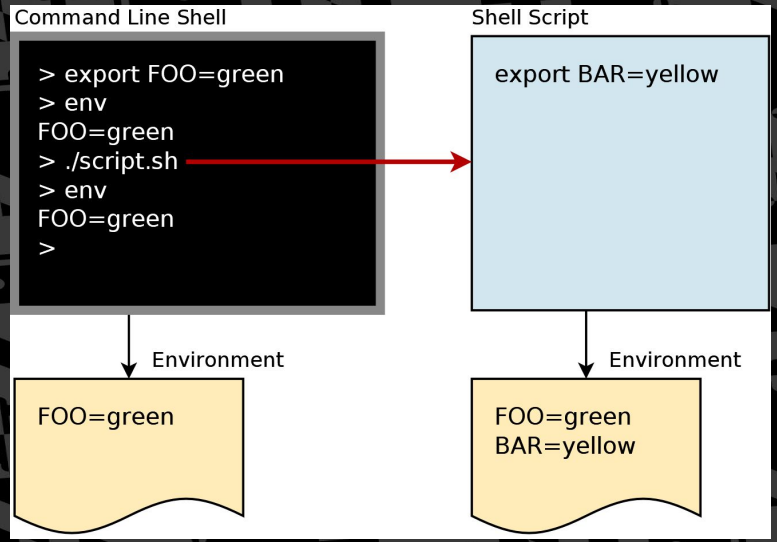
Redirection & Pipes

- STDIN & STDOUT
- > redirect to file
- >> append
- | pipe



High Level concepts

- Variables
  - Local Variables
  - Global (Environment) Variables
  - PATH, HOME, SHELL, USER, PWD
  - Viewing
    - printenv
    - echo $VARIABLE
    - export $VAR=123
    - unset $VAR
- Commands are Programs



Processes

- What about processes?
- How do applications run?
- How are they managed?
- Daemons? What's a daemon

Much more to learn

- Process management (systemd)
- Security practices
- Customizing the environment
- Advanced Networking (network manager, resolved)
- Shell Scripting
- Any Questions?