

System Administration

Week 03, Segment 4
Files go hier(?)

**Department of Computer Science
Stevens Institute of Technology**

Jan Schaumann
jschauma@stevens.edu
<https://stevens.netmeister.org/615/>



[1] + Done

cat ?\$F??\$F?

\$ ln /var/run/log 📋

\$ ln /dev/xbd0a 💾

\$ ln /dev/tty 🖱

\$ file *

↳: fifo (named pipe)

⌨️: character special (1/0)

💾: block special (142/0)

📁: directory

🐱: UTF-8 Unicode text

😍: UTF-8 Unicode text

🦁: symbolic link to 😍

🔗: socket

\$ ls -li

total 12

659796 prw-r--r-- 1 jschauma users 0 Feb 14 22:28 ↳

3846 crw-rw-rw- 2 root wheel 1, 0 Feb 7 17:12 🖱

2518 brw-r----- 2 root operator 142, 0 Jan 22 00:44 💾

659792 drwxr-xr-x 2 jschauma users 512 Feb 14 22:26 📁

659743 -rw-r--r-- 2 jschauma users 5 Feb 14 22:26 😺

659743 -rw-r--r-- 2 jschauma users 5 Feb 14 22:26 😍

659794 lrwxr-xr-x 1 jschauma users 4 Feb 14 22:27 🐾 -> 😍

38027 srw-rw-rw- 2 root wheel 0 Feb 7 16:25 📲

\$



```
[laptop$ ssh freebsd
Last login: Mon Feb 15 17:32:09 2021 from 207-172-174-21.s8181.c3-0.avec-cbr2.ny
r-avec.ny.cable.rcncustomer.com
FreeBSD 12.2-RELEASE-p3 GENERIC
```

Welcome to FreeBSD!

```
[ec2-user@freebsd:~ $ uname -a
FreeBSD freebsd 12.2-RELEASE-p3 FreeBSD 12.2-RELEASE-p3 GENERIC amd64
[ec2-user@freebsd:~ $ df
Filesystem      1K-blocks    Used   Avail Capacity Mounted on
/dev/gpt/rootfs 10142620 4104104 5227108    44%     /
devfs                  1        1        0   100%     /dev
[ec2-user@freebsd:~ $ mount
/dev/gpt/rootfs on / (ufs, local, soft-updates)
devfs on /dev (devfs, local, multilabel)
[ec2-user@freebsd:~ $ exit
Connection to ec2-3-93-57-140.compute-1.amazonaws.com closed.
laptop$
```

```
rpool  /HVMamirpool  zfs      rw,devices,setuid,nonbmand,exec,xattr,atime,dev=4490003 1613409533
-hosts  /net    autoofs  nosuid,indirect,ignore,nobrowse,dev=8ac0001      16134095
36
auto_home        /home    autoofs  indirect,ignore,nobrowse,dev=8ac0002      16134095
36
[root@ip-10-10-0-51:~# man vfstab
[root@ip-10-10-0-51:~# more /etc/vfstab
#device          device       mount      FS      fsck   mount     mount
#to mount        to fsck     point      type    pass   at boot  options
#
/devices          -           /devices   devfs   -      no        -
/proc             -           /proc      proc    -      no        -
ctfs              -           /system/contract ctfs   -      no        -
objfs            -           /system/object  objfs  -      no        -
sharefs          -           /etc/dfs/sharetab sharefs -      -         no
-
fd                -           /dev/fd    fd      -      no        -
swap              -           /tmp      tmpfs   -      yes       -
```

[root@ip-10-10-0-51:~# exit
logout
Connection to ec2-54-159-118-250.compute-1.amazonaws.com closed.
laptop\$]

Terminal – 80x24

```
rpool  /HVMamirpool  zfs      rw,devices,setuid,nonbmand,exec,xattr,atime,dev=4490003 1613409533
-hosts /net    autoofs  nosuid,indirect,ignore,nobrowse,dev=8ac0001      16134095
36
auto_home       /home   autoofs  indirect,ignore,nobrowse,dev=8ac0002      16134095
36
[root@ip-10-10-0-51:~# man vfstab
[root@ip-10-10-0-51:~# more /etc/vfstab
#device          device        mount          FS      fsck      mount      mount
#to mount        to fsck      point         type     pass      at boot    options
#
/devices          -           /devices       devfs    -         no         -
/proc             -           /proc         proc     -         no         -
ctfs              -           /system/contract ctfs    -         no         -
objfs            -           /system/object  objfs   -         no         -
sharefs          -           /etc/dfs/sharetab sharefs -         no         -
-
fd                -           /dev/fd        fd      -         no         -
swap              -           /tmp          tmpfs   -         yes        -



[root@ip-10-10-0-51:~# exit
logout
Connection to ec2-54-159-118-250.compute-1.amazonaws.com closed.
laptop$
```

Terminal — 82x24

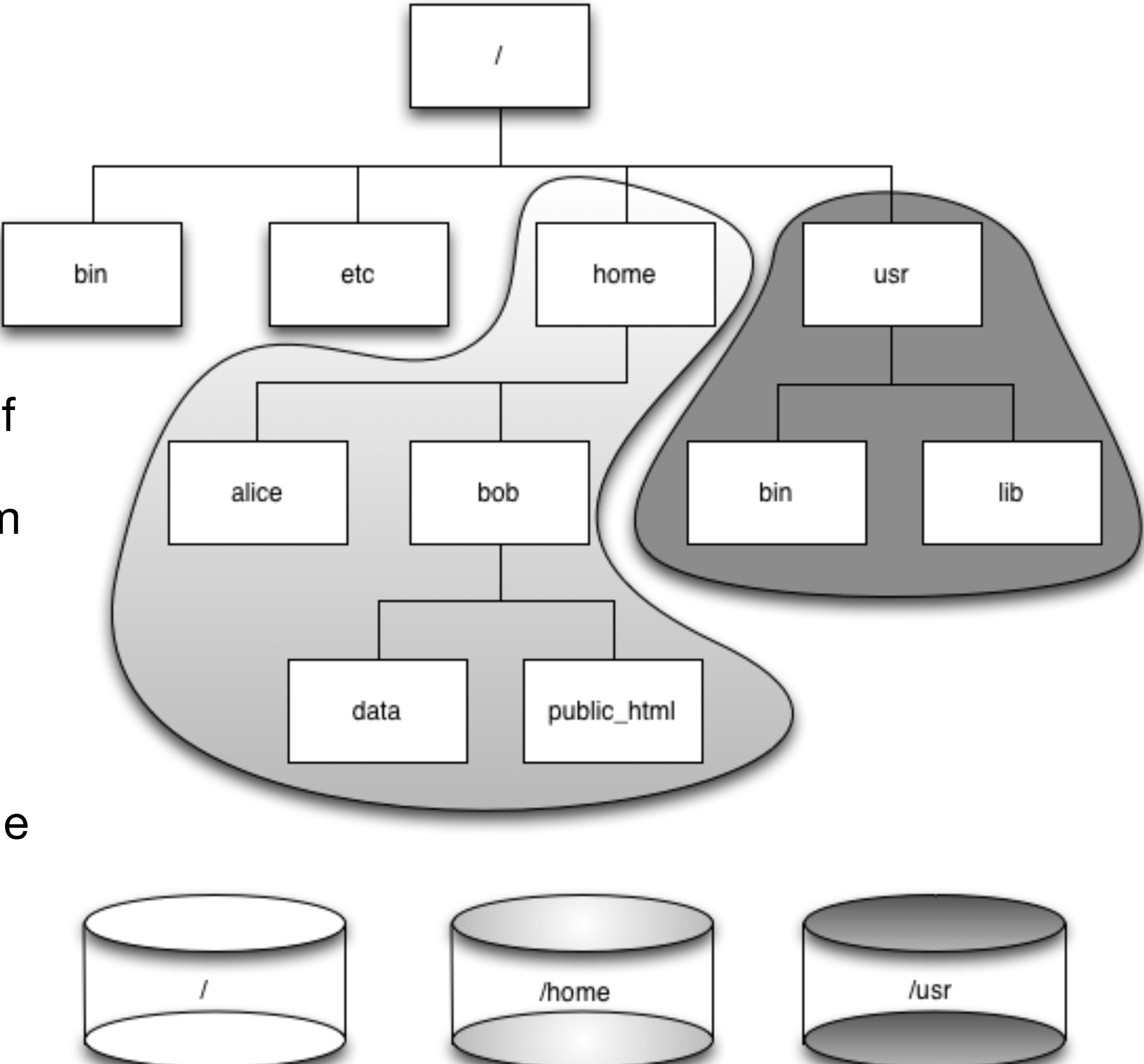
```
$ df
Filesystem
/dev/xbd0a
kernfs
ptyfs
/dev/xbd3a
/dev/xbd4a
tmpfs
$
```

Filesystem	512-blocks	Used	Avail	%Cap	Mounted on
/dev/xbd0a	10163644	4634164	5021300	47%	/
kernfs	2	2	0	100%	/kern
ptyfs	2	2	0	100%	/dev/pts
/dev/xbd3a	49544824	20119564	26948020	42%	/home
/dev/xbd4a	67091640	12415728	51321332	19%	/misc
tmpfs	3145728	8	3145720	0%	/var/shm

File System Hierarchy

All partitions – with the exception of the *root* (or `/`) partition – can be mounted anywhere in the filesystem hierarchy.

Many pseudo-filesystems can be “mounted” to present system information or properties as if via file I/O.



**NAME**

hier — layout of file systems

DESCRIPTION

An outline of the file system hierarchy.

Naming is very important. The UNIX System relies on filename conventions for much of its power as a system. The following file system layout describes generally where things are and what they are, with references to other man pages for more detailed documentation.

Not all files will be in every system.

/ Root directory of the system.

/COPYRIGHT

System copyright notice, most often put on CD-ROM distributions.

/[a-z]/ User file systems.

Exercises

- Mount options:
 - Review the different default filesystems as mounted on different OS/instances. How do they differ, what do they have in common? What filesystem types do you find?
 - Review the different mount options for each of the filesystems — what do they mean?
 - Why or when would the list of filesystems mounted not match what is found in e.g., /etc/fstab?

Exercises

- Consider the limitations of the filesystem:
 - How many files can you create? How many entries can a single directory have?
 - How large can a single file be?
 - What characters can a file name contain?
 - How long is the longest file name?
 - How deep can a pathname be?
 - How many links can a file have?
 - Why can't you have a hard link across mount points?

Next up: Software types and installation

Links

File Systems and Storage Models:

<https://www.netmeister.org/book/04-file-systems.pdf>

Mounting and Unmounting File Systems:

<https://docs.freebsd.org/en/books/handbook/mount-unmount.html>

An introduction to the Linux /etc/fstab file:

<https://www.redhat.com/sysadmin/etc-fstab>

systemd: The Discoverable Partitions Specification:

https://systemd.io/DISCOVERABLE_PARTITIONS/

Manual pages:

fstab(5), hier(7), mount(8)