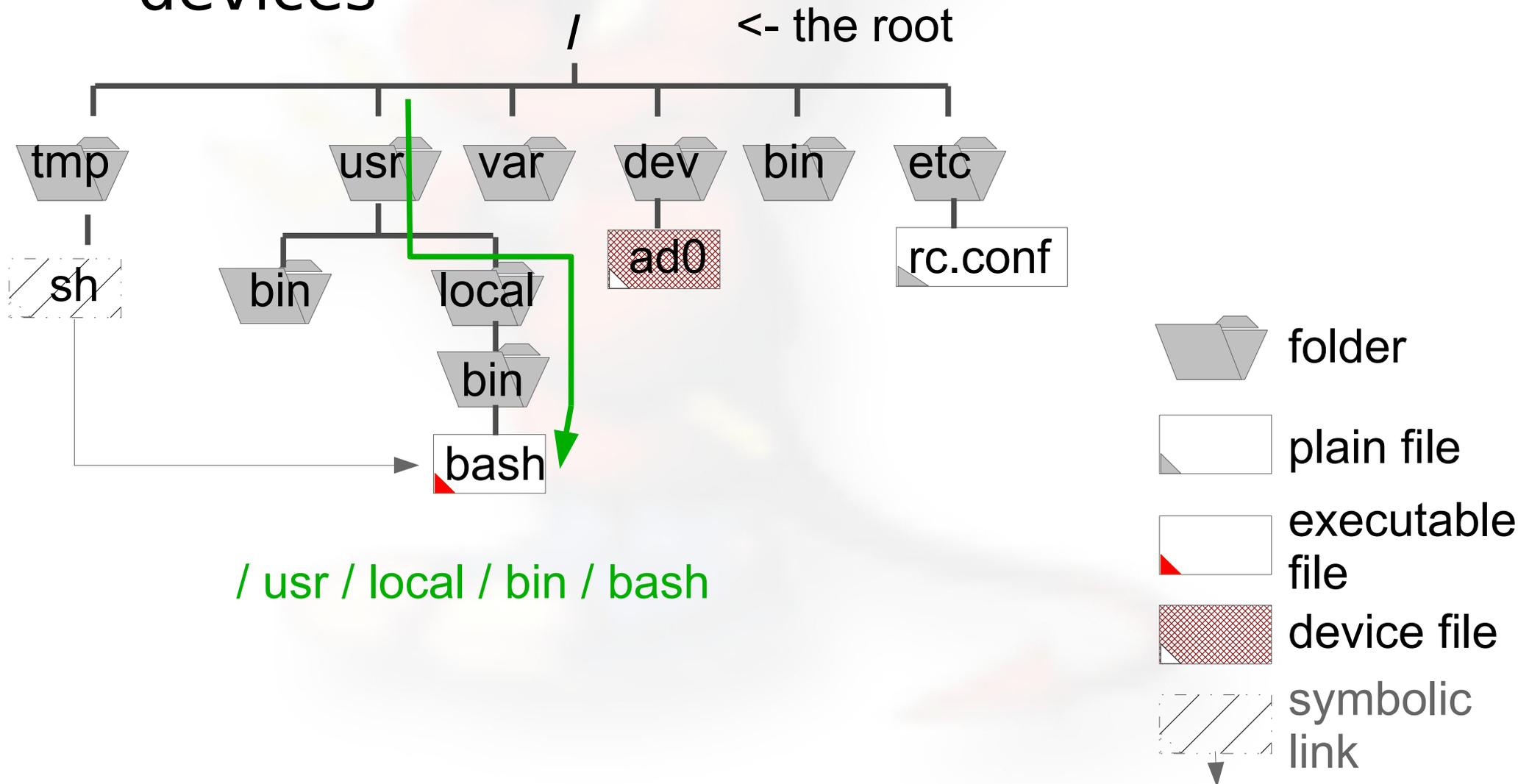# UNIX Filesystem and Hierarchy

AfNOG 2009 Workshop
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The UNIX filesystem

- The file system is a tree. Objects include files, directories (folders), links, devices

/   <- the root

tmp   usr   var   dev   bin   etc

sh   bin   local   ad0   rc.conf

bin

bash

/ usr / local / bin / bash

folder

plain file

executable file

device file

symbolic link

The UNIX filesystem

- In UNIX, *Everything Is A File!* (well, almost): disks, terminals, ...

- Files can be accessed via an explicit path, from the root, to the file:
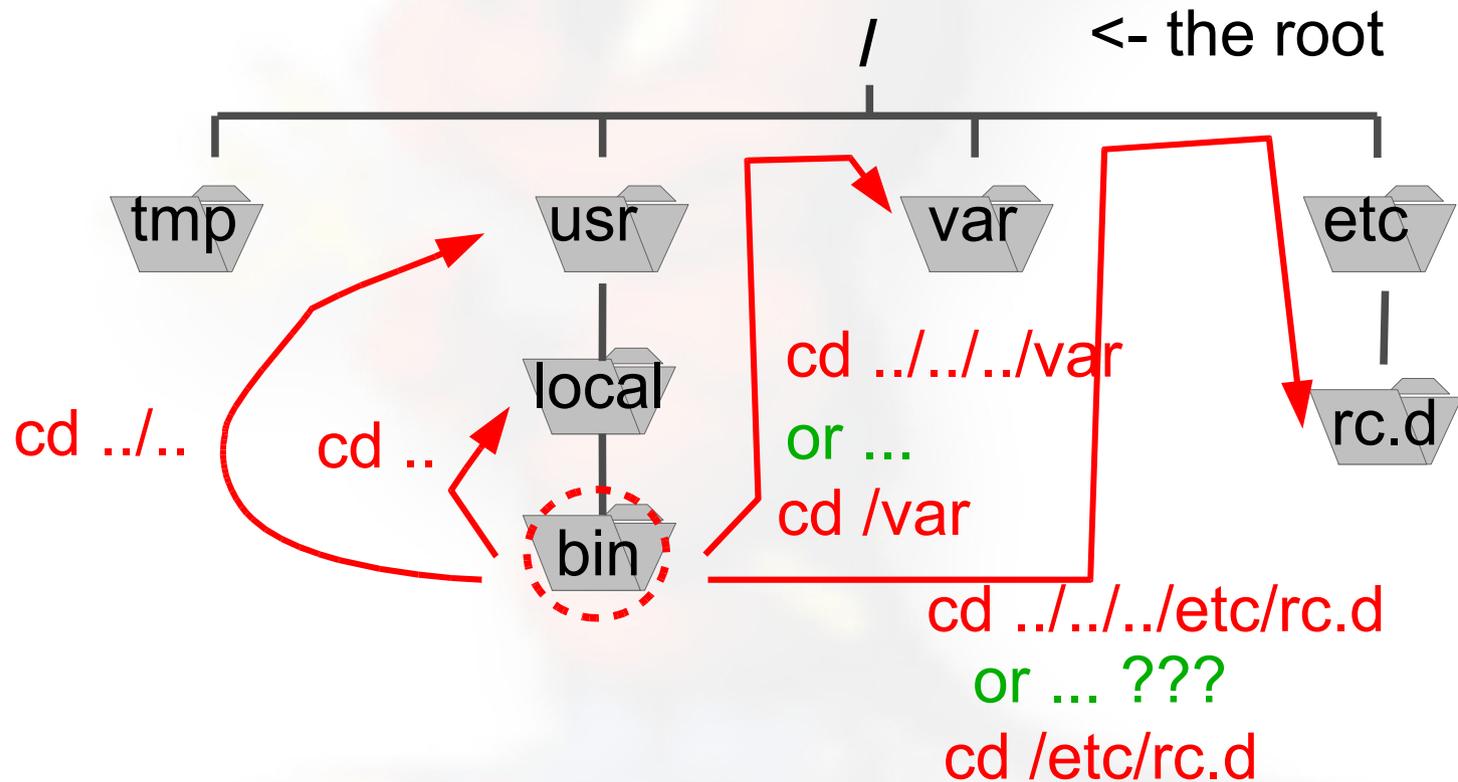
  `/usr/local/bin/bash`
  -> this is an ABSOLUTE path

- ... or in relation to where one is located:
  `../../etc/passwd`
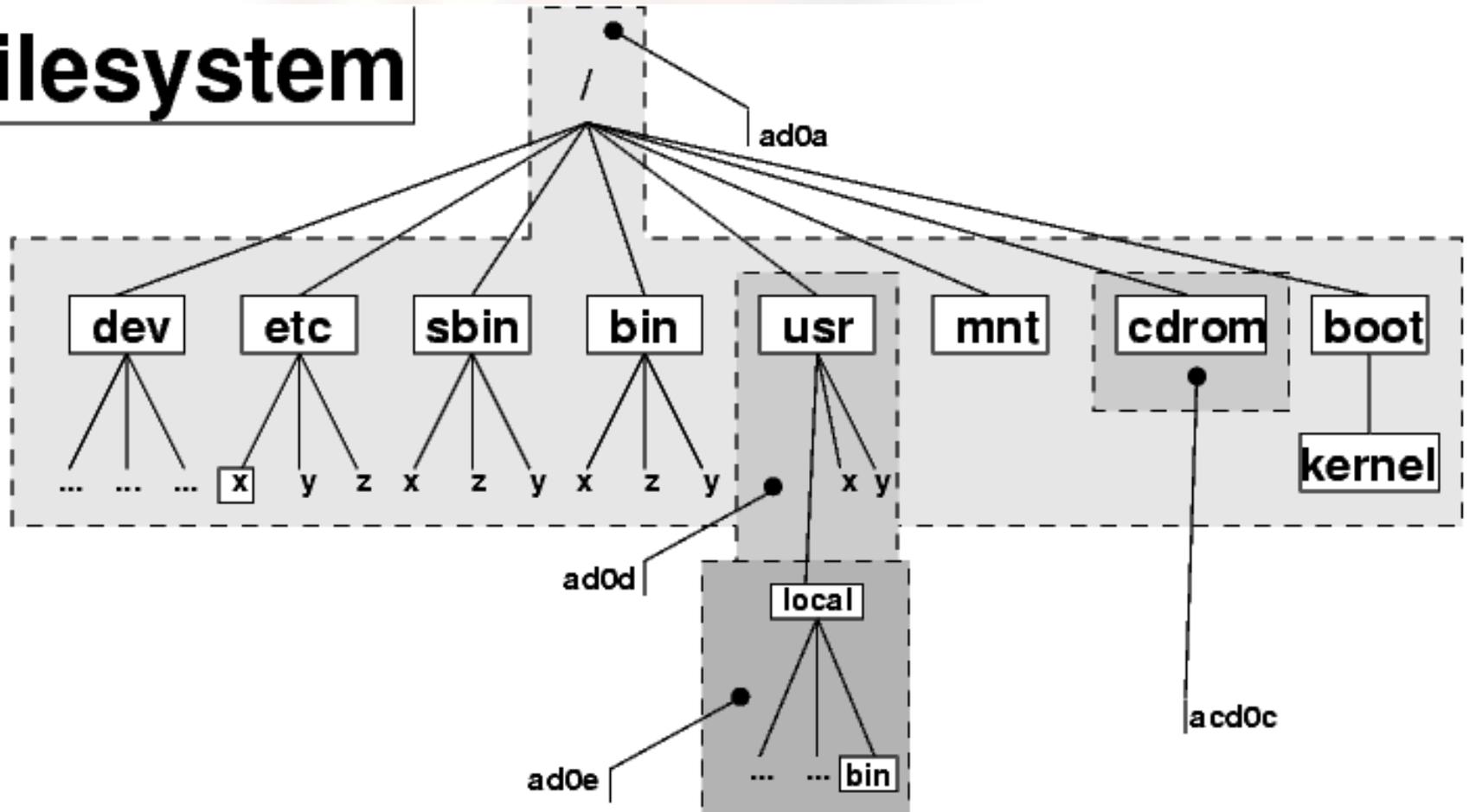 -> this is a RELATIVE path

Relative vs. Absolute

If the 'pwd' command says you are in /usr/local/bin ...

/   <- the root

tmp

usr

var

etc

local

cd ../..

cd ..

cd ../../../var

or ...

cd /var

bin

rc.d

cd ../../../etc/rc.d

or ... ???

cd /etc/rc.d

Mount points

Filesystem Hierarchy

FreeBSD Directory Structure

Repeat after me:
  "The command 'man hier' is your friend."

So, why is your FreeBSD disk slice split in to "partitions"? Largely to separate important file systems from each other. These file systems are usually represented by specific directories.

Why not just run with everything in one partition? That is, everything under '/'?

A Few FreeBSD Directories

- Structure of partitions/directories:
  - /   ("root")
  - /usr
  - /var
  - swap

- Two important directories:
  - /tmp
  - /usr/home

"/" Root

The root partition is where critical system files live, including the programs necessary to boot the system in to "single user" mode.

The idea is that this part of the system does not grow or change, but rather stays isolated from the rest of the operating system.

If you give enough room to /usr and /var, then "/" can be quite small (around 512MB should be safe for now).

One directory that may grow is /tmp, particularly if you run Linux binaries that use /tmp.

/usr

Is used for system software like user tools, compilers, XWindows, and local repositories under the /usr/local hierarchy.

If one has to expand* this partition for additional software, then having it separate makes this possible.

FreeBSD maps user directories to /usr/home.

*We'll discuss this. We don't always install FreeBSD with a separate /usr partition.

/var

This is where files and directories that consistently change are kept. For example, webserver logs, email directories, print spools, temporary files, etc.

On a server it is a good idea to have /var in a separate partition to avoid having it fill your other filesystems by accident.

swap

Swap is where virtual memory lives. Swap has its own partition.

You can run without swap, but this is dangerous if you run out of memory (programs will stop working)

There are several opinions about what is the optimal swap size. This can depend on what type of OS, services you run. The general rule of thumb is that swap size should be somewhere between your RAM and twice your server's RAM.
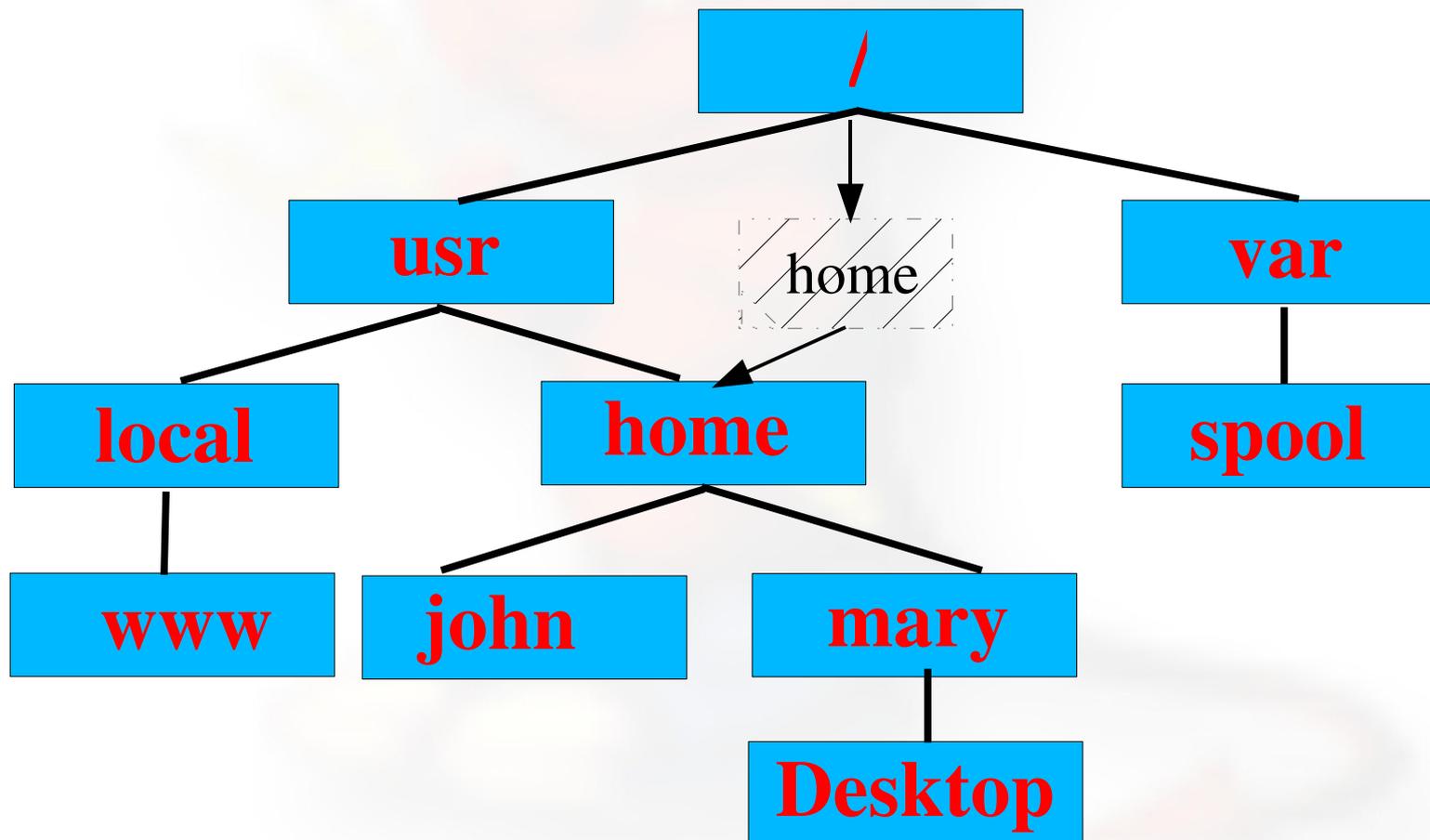
Q. How do we move around in such a tree?
Q. "/" to /usr/home/mary?
Q. /var/spool to /usr/home/john?
Q. /usr/home to /usr/local/www?
Q. Etc.

Questions ?