

Introduction to UNIX

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The Minnesota Supercomputing
Institute for Advanced Computational
Research

www.msi.umn.edu/tutorial/

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UNIX

- UNIX is the operating system of choice for engineering and scientific workstations.
- The variant of UNIX found at MSI and most widely in use around the world is GNU/Linux.
- MSI currently uses **CentOS** Linux. There are many other distributions (RedHat, Ubuntu, Debian)
- MSI has largely standardized on x86/x86_64 hardware (Intel/AMD microprocessors)

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UNIX

- Originally developed in the late 1960s.
- Unix is flexible, secure and based on open standards.
- Programs are often designed ‘to do one simple thing right’ .
- Unix provides ways for interconnecting these simple programs to work together and perform more complex tasks.
- Most MSI systems are actually “Unix-Like”, or “*nix” systems – includes UNIX, IRIX, Linux, etc.

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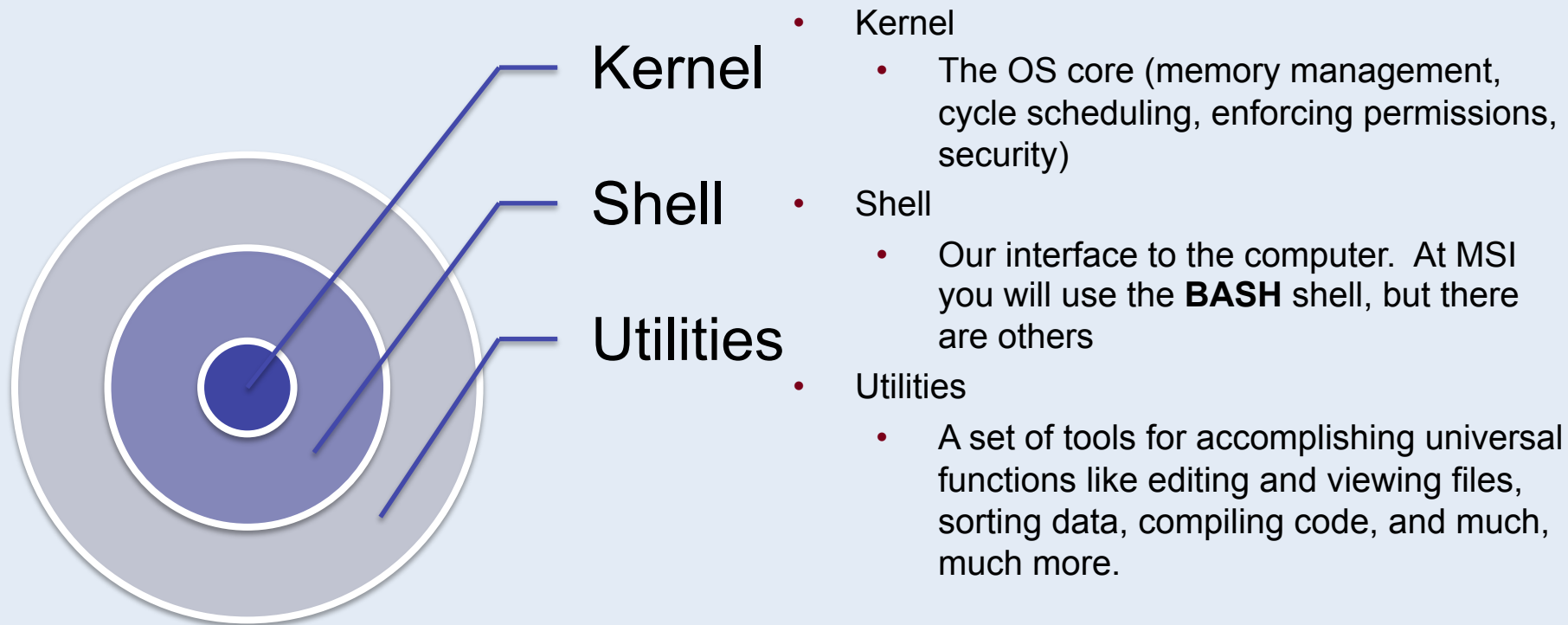
What's the difference between Linux and UNIX?

- Linux is a UNIX clone
- Linux is an operating system kernel
- UNIX is a certification for operating systems
- UNIX is a trademark
- The terms are often used interchangeably

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UNIX



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UNIX

- UNIX is a development environment.
 - compilers (GNU, Intel, Pathscale, PGI)
 - interpreters (Python, Perl, Ruby)
 - text editors (VI, emacs, nedit, gedit)
 - batch capabilities (PBS, scripts)
 - multiuser capabilities
 - command line driven

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Getting Started

- MSI account.
- Open a terminal while sitting at the machine.
- A shell provides an interface for the user to interact with the operating system.
- BASH is the default shell at MSI.
- Alternatively, see the following links for information concerning remote access from your machine.

www.msi.umn.edu/labs/remote.html

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FAQ

Most of the commonly asked questions can be answered through our FAQ located at

www.msi.umn.edu/support/faq

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Accessing machines while at MSI

- **ssh [options] machine**
- **[options]**
 - **-X set up environment to port graphics**
 - **-Y for Macs**
- **machine**
 - **itasca, koronis, calhoun, etc.**
- **User**
- **Examples:**
ssh -Y rowe@itasca.msi.umn.edu
- **Encrypted login to remote machines**
- **\$> man ssh**
- **See the MSI home page for a full listing of lab and core machines**

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Remote Login from outside MSI

Login to the bastion host

login.msi.umn.edu

Use *isub* or *ssh* to connect to other machines

- *isub* is an MSI specific command
- Expects bash shell
- Syntax:

`ssh [-X][-Y] [user@]host1`

- Examples:

`ssh -Y rowe@login.msi.umn.edu`

`isub`

or

`isub -nopfile`

Use NX

- Remote graphical connection
- Expects bash shell
- Download client

<https://www.msi.umn.edu/support/nx/3.5>

***Users cannot launch software directly on login.msi.umn.edu**

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isub

The command `isub` is a wrapper to `ssh` and `qsub`, designed specifically for interactive use. `isub` is unique to MSI.

Example:

```
isub -n nodes=1:ppn=4 -m 16GB -w 24:00:00
```

Check <https://www.msi.umn.edu/isub> for more details

Whether you are connecting through `nx.msi` or `login.msi`, you cannot run any software directly on that node.

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qsub

```
#!/bin/bash -l
#PBS -l nodes=1:ppn=1,mem=1gb,walltime=01:00:00
#PBS -m abe
cd /home/msi/username/Testpbs
module load intel
./test < input.dat > output.dat
```

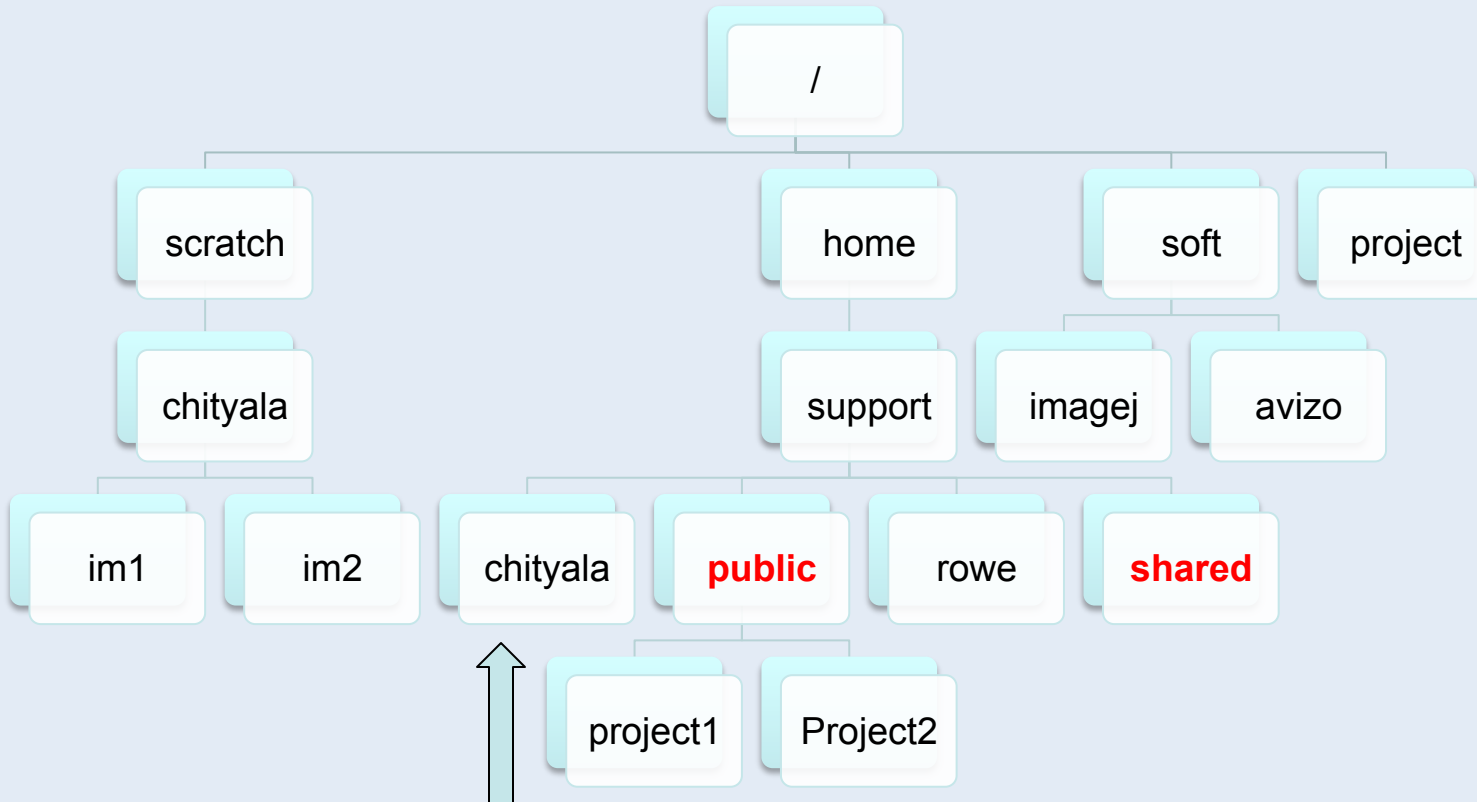
Submit job: qsub script.pbs

Check status: showq -u username

More details can be found at <https://www.msi.umn.edu/labs/pbs>

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MSI File System



Full path is **/home/support/chityala**

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The Anatomy of a Command

% ls -alrth /scratch



ls (command or utility name)

-alrth (options – modify behavior of the command)

/scratch (argument – what is being operated on)

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Basic Commands

ls (-l, -rt, -h)

mkdir

cd

man

info

cp (-r)

mv

ssh (-X, -Y)

scp (-r)

w, uptime

rmdir

rm (-r,-f)

Note that “**rm -rf ***” is one of the most dangerous commands in the universe.

list contents of the directory

make a new **directory**

change into a **directory**

open the **manual**

open the documentation

copy a file

move or rename a file

login remotely

copy files to/from a remote machine

find **who** else is logged in

remove a directory

remove a file

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Text editing

- vi
- emacs
- nedit, gedit – graphical, work similar to Notepad or TextEdit

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Get help on a command

- man ls
 - CTRL+F pages forward
 - CTRL+B pages back
- The ‘up’ and ‘down’ arrows allow finer grain control
- “:q” quits the help file
- apropos

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Command Completion

- **TAB**
- Finishes the current command, filename, directory **or** shows any of the above that match the current string.
- Learn to use **TAB** often!

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Running software

- Modules
 - module load *software*
 - module avail *software*

 - *Example of running software:*
module load avizo
avizo

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Stay Organized

- Keep your files arranged
 - System studied
 - File Type
 - Date
 - Program used
- Make directories, subdirectories, subsubdirectories, subsubsubdirectories and so on.
- Name your files carefully. **Avoid use of spaces in file names** – it's usually allowed but requires extra work to use, in practice.

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Caveats

- If you delete a file, it's GONE! There is no "Recycle Bin" step. The file **may** be able to be recovered from a backup by contacting help@msi.umn.edu.
- If you overwrite a file it has been changed forever.
- Home directories are backed up nightly.
- The scratch spaces are not backed up.

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Physical access to labs

- Every lab needs card access
- Contact help@msi.umn.edu for more information

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File transfer

- Files can be transferred to MSI Linux storage using SCP or SFTP or RSYNC

```
scp [[user@]host1:]filename1[[user@]host2:]filename2
```

```
scp temp.ps login.msi.umn.edu:/scratch/temp.ps
```

- Files can be transferred to MSI Windows machines using options in remote desktop connection

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Data storage

- Home directories in labs and HPC systems
- Scratch directories in labs and HPC systems
- Lustre file system in Itasca
- **shared** space for group collaboration
- **public** space for world access

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Wrap up Questions

- Your feedback is extremely important to us. Is there a topic you would like to see covered in this or another workshop?

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For help

- By email

help@msi.umn.edu

- Web

www.msi.umn.edu

- Phone

612-626-0802

- By appointment



END

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Make Directory

```
mkdir sandbox
```

```
mkdir sandbox/scratch
```

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Copy

cp [options] *existing_file new_file*

cp *file1 file2*

cp sandbox sandbox2 (does not work)

cp -r sandbox sandbox2

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Change Directory

```
cd project2
```

```
cd ..
```

```
cd project2/quantum
```

```
cd ../..
```

```
cd ~
```

```
cd
```

```
cd .
```

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Permissions

- - - - -
- Each of the 10 bits are either 'True' or 'False'
- **directory**
- **owner Read, Write, eXecute**
- **group Read, Write eXecute**
- **others Read, Write eXecute**
- Read = 4, Write = 2, eXecute = 1

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chmod

`chmod [options] mode file1 ...`

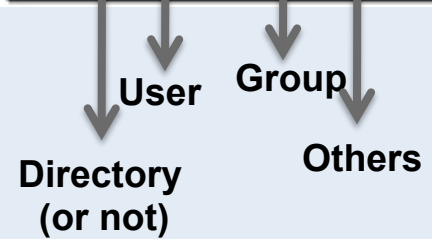
- `rwX` – read, write, execute
- `ugo` – user, group, others
- `ls -l` to see `rwX` permissions for the user, group, and others
- `chmod +x, -x, +r, -r, +w, -w`
- `chmod 777, 755, 700, 500`

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Permissions (rwx)

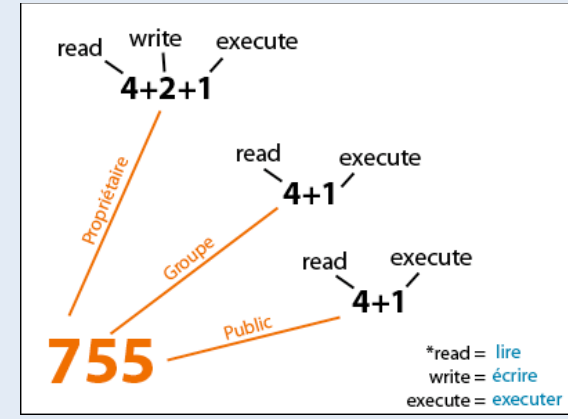
- `ls -l` to see rwx permissions for the user, group and others.

```
% -rw-r--r-- 1 pratik staff 342016 Jan 24 14:30 TC1.xls
```



```
% chmod [options] mode filename
```

u g o a 755
+ - =
r w x



http://catcode.com/teachmod/try_1.html

<http://catcode.com/teachmod/numeric2.html>

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Questions?

- Basic commands, options, arguments, permissions, chmod

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Configuration Files

.bashrc is sourced each time you login

```
module load schrodinger
```

```
alias ll "ls -lrth"
```

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Regular Expressions

- Character or set of characters that define a pattern.

?	single character wild card
*	wild card, any number of characters
~	home directory of current user
~name	home directory of user <i>name</i>
.	current directory
..	parent directory (one up)
[0-9]	any single digit

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tar, gzip, bzip

- tar: creating one file from many, does not automatically suggest compressed
- zip: compressing files
- bzip, gzip: compression algorithms

```
tar -czvf new.tar.gz file1 file2 directory1
```

```
tar -xzvf new.tar.gz
```

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grep

- Search for a string
- Can be used on files, or have input piped.

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Redirects and Pipes

- > Output re-direction, overwrite.
- >> Output re-direction, append.
- < Input re-direction.
- | Pipe output to a new command.

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Open Office

- At the command line, type
 - *oowriter* (word processor)*
 - *oocalc* (spreadsheet)*
 - *gimp* (image manipulation program)
 - *acroread* – (read PDF files)

* part of ooffice

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