Introduction to Linux with Advanced Hands-on Practice

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Course Outline

1:30 -1:45 Introduction, Accessing the system, Basic Shell Scripting
1:45 -2:10 Hands-on Session 1

2:10-2:25 Basic Bash Scripting Constructs
2:25-2:55 Hands-on session 2

2:55-3:05 Break

3:05-3:20 Sed, Awk, pipes, redirects
3:20-4:00 Hands-on session 3

Directives used in this Lecture

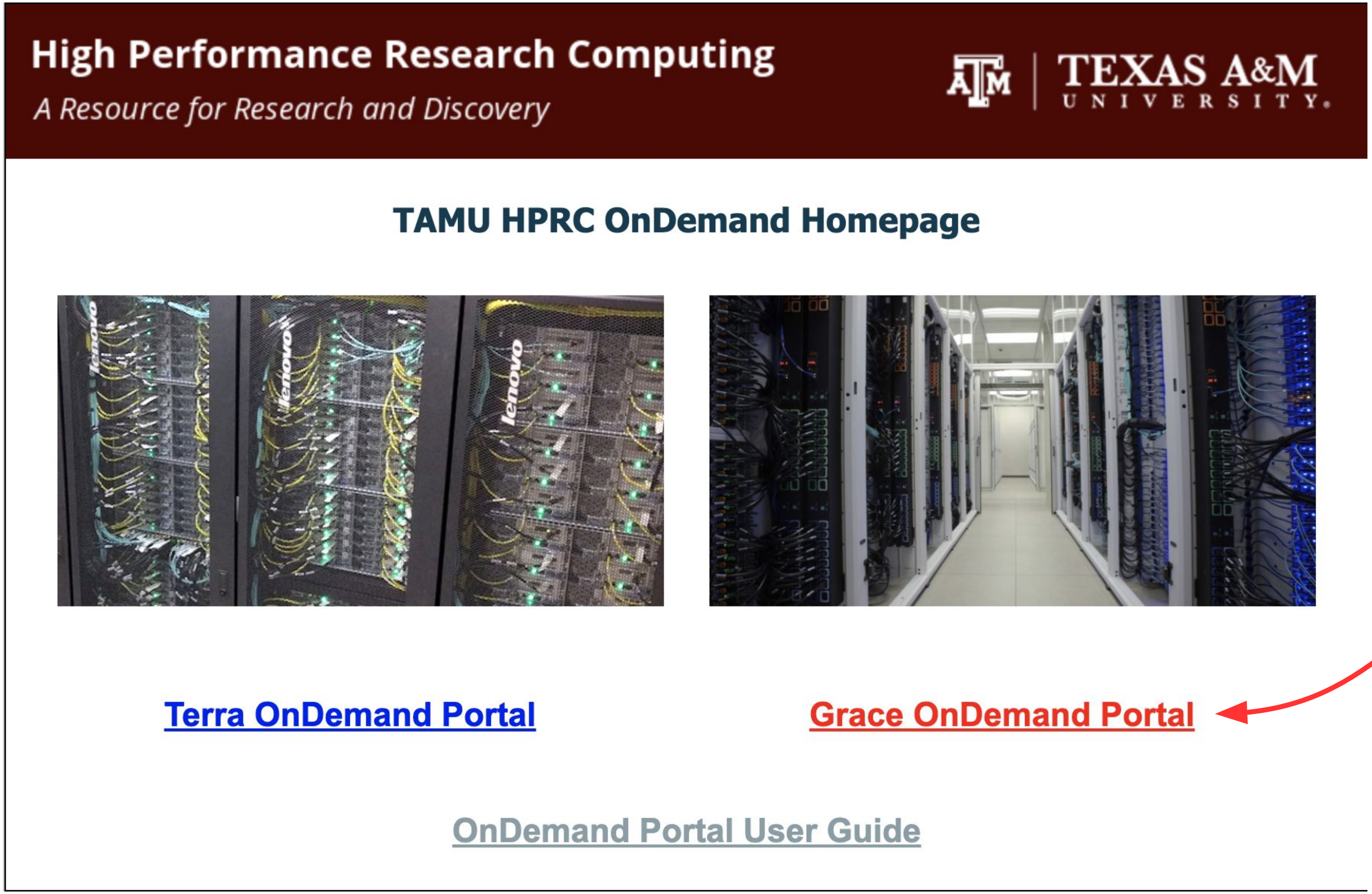
Commands to type in will use the following:

- **Bold** words should be entered explicitly
- *Italicized* words are variable depending on the information that the utility needs
- commands for you to type in 🟩
- command output in 🟦

Accessing the system

- HPRC Portal:
    - https://portal.hprc.tamu.edu/
    - login with your HPRC account
- SSH (secure shell):
    - Encrypted communication
    - Windows:
        - https://hprc.tamu.edu/wiki/HPRC:MobaXterm
    - MacOS:
        - https://hprc.tamu.edu/wiki/HPRC:Access:MacOSX

portal.hprc.tamu.edu



High Performance Research Computing

A Resource for Research and Discovery

TEXAS A&M UNIVERSITY

TAMU HPRC OnDemand Homepage

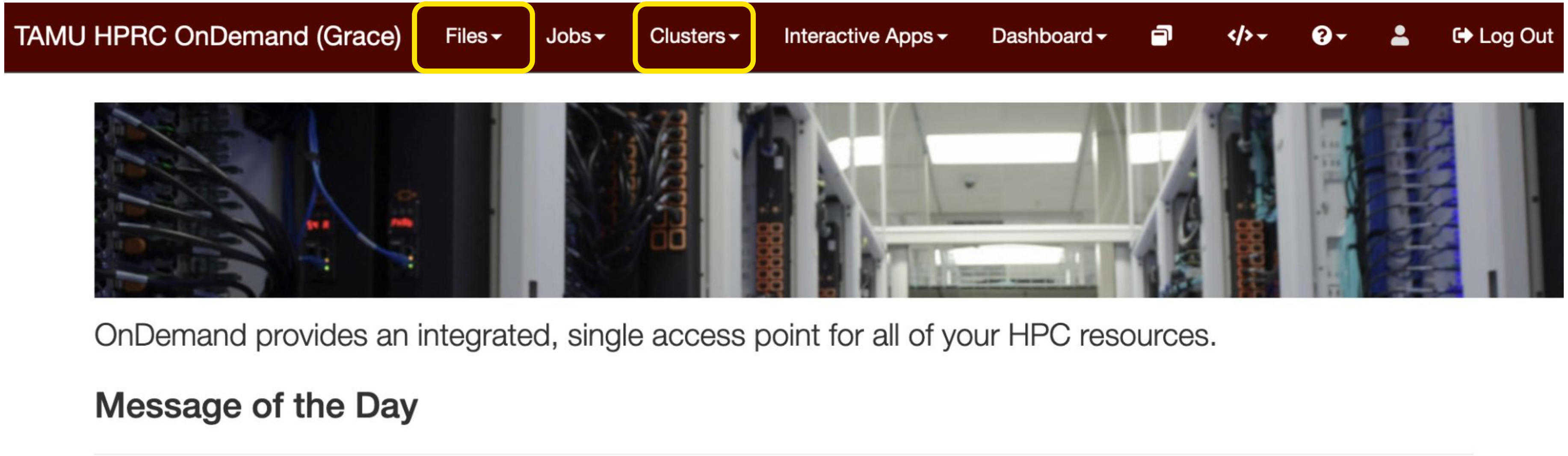
Terra OnDemand Portal

Grace OnDemand Portal

OnDemand Portal User Guide

Select “Grace OnDemand Portal”

Using the Portal



OnDemand provides an integrated, single access point for all of your HPC resources.

Message of the Day

- **Files** > copy and edit files on the cluster’s filesystems
- Jobs > submit and monitor cluster jobs
- **Clusters** > open a shell terminal (command line) on a login node
- Interactive Apps > start graphical software on a compute node
- Dashboard > view file quotas and computing account allocations

Basic Shell Scripting

A shell script is a text file that contains one or more linux commands that can be run as a single batch of commands.

Ideal for automating tasks.

It is good practice to name shell scripts with: **.sh**

Hands-on Session 1

- logon to the portal
- navigate to the file menu
- turn on hidden files
- open a terminal

Hands-on Session 1

Create a bash script using the portal text editor or your favorite text editor.

Name it my_script.sh →

```
#!/bin/bash
# HPRC shell script exercise

my_name=$1

input="

You have written a simple shell script.

"

echo "Howdy $my_name" > output.txt
echo "$input" >> output.txt

mkdir script_output

mv output.txt script_output

cat script_output/output.txt
```

make your bash script executable

```
chmod u+x my_script.sh
```

run your bash script

```
./my_script.sh name
```

Basic Constructs for Bash Scripting

Conditionals: If something is true do something and if it is false, do something else

```
if [ <some test> ] ; then
  <commands>
  fi

if [ <some test> ]; then
  <commands>
    else
  <other commands>
  fi
```

```
#!/bin/bash
#

i=1
if [ $i -eq 1 ] ; then
   echo i is equal to 1
  else
   echo i does not equal 1
   echo i equals $i
  fi
```

Basic Constructs for Bash Scripting

Case Constructs

```
case var in
  case1)
    <commands>
    ;;
  case2)
    <commands>
    ;;
esac
```

```
#!/bin/bash
#
month='June'
case $month in
  Jan)
    mnum='01'
    ;;
  Feb)
    mnum='02'
    ;;
  ….
  Dec)
    mnum = '12'
    ;;
esac
```

Basic Constructs for Bash Scripting

Loops: Do something over and over until a specific condition changes and then stop

```
while [ <some test> ] ; do
  <commands>
  done

for var in <list> ; do
  <commands>
  done
```

```
#!/bin/bash

#

i=1

while [ $i -le 100 ] ; do

   echo i equals $i

   ((i++))

   done
```

```
for file in *.log ; do

    head -n1 $file

    done
```

Hands-on Session 2

1. Create a shell script that checks if a variable is set to 1. Print to stdout if it is 1. If is not 1, print that it is not 1 and it's actual value. (hint: if then construct, echo)
2. Create a shell script that checks a variable named **colors** for the values red, green, and blue and echoes its color or ‘not primary’ if it is not red, green, or blue (hint: case, echo)
3. Create a shell script with a loop that echoes the value of a variable i from 1 to 10 (hint: while loop)

GNU sed - Stream editor

- Useful one-liner scripts for sed
- common uses:
  - `sed 's/pattern1/pattern2/g' filename`
    - output is set to stdout
  - `sed 's/pattern1/pattern2/g' filename > filename2`
    - output is set to *filename2*
  - `sed -i 's/pattern1/pattern2/g' filename`
    - Modifies the file in-place. Changes the original file.
- **man sed**
  - Manual page for sed on linux systems

GNU Awk

awk is used to search files for lines (or other units of text) that contain certain patterns and then do something (print, manipulate, etc).

- Delimiters
  - Default is white space
- Search patterns
  - `awk '/pattern/' filename`
- Variables
  - fields are stored in variables based on the delimiter
  - $0 the entire line
  - $1 1st field
  - $2 2nd field
- Print statement
  - `awk '/pattern/ {print $0}' filename`
  - `awk '/pattern/ {print $1","$2}' filename>outputfilename.txt`
- `prinf Statement for more control over the print format`
- BEGIN/END
  - perform a task at the beginning or end
  - BEGIN {print '============='' }
  - END {print '--------------------'}

Pipes

- Pipes **|**
  - takes the output of one command and sends it to another
  - `ls|more`
  - `ls|less`
    - List the files one page at a time
  - `grep Energy run1.out|grep HF`
  - `grep Energy run1.out|grep HF>HF_output.txt`
    - Searches a file named run1.out for the word Energy and then searches for the word HF in the lines that have the word Energy. The resulting information is then sent to a file named HF_output.txt

Redirecting Output

- **>** Redirects output
  - *`command>outputfilename`*
  - **`ls -al>list-of-files.txt`**
  - `>>` symbol appends to the end of the file instead of overwriting it.
  - **`ls -al>>list-of-files.txt`**

Exercise 3

1. Using the portal text editor or your favorite editor, create a file that contains the sample data from a mail-list: https://www.gnu.org/software/gawk/manual/gawk.html#Sample-Data-Files
2. Use awk to print column 3 only: email addresses
3. Use awk to print the email addresses on one line separated by commas
4. Use sed to replace the @ with a space and send the result to awk using a pipe (|) and print the name and username of the email address only. (ie Amilia amelia.zodiacusque)
5. Bonus: send the results to a file instead of stdout (hint: >)

Need Help? Contact the HPRC Helpdesk

Website:	hprc.tamu.edu
Email:	help@hprc.tamu.edu
Phone:	(979) 845-0219

Help us, help you -- we need more info

- Which Cluster (Terra, Grace)
- NetID (NOT your UIN)
- Job id(s) if any
- Location of your jobfile, input/output files
- Application used if any
- Module(s) loaded if any
- Error messages
- Steps you have taken, so we can reproduce the problem