BASH

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What is a shell?

- A program that interprets your requests to run other programs
- A shell is a high-level programming language
- Most common Unix shells:
  - Bourne shell (sh)
  - C shell (csh - tcsh)
  - Korn shell (ksh)
  - Bourne-again shell (bash)

Common commands

- cat, more, less, head, tail
- mkdir, rmdir, cp, mv, rm, touch
- grep, awk, sort, cut
- ls, ls –a, ls –l, cd, pwd, man, echo
- chown, chgrp, chmod

What is a bash script?

- A sequence of bash commands
- A bash script is a program
  - Stored as a text file
  - Interpreted by the bash shell
  - Made up of
    - Variables
    - Control structures
    - Conditions/tests

Write a script:

- Scripts must be executable

```
chmod 744 scriptName
```

- The first line is always identifying the interpreter (the shell) that will execute the script

```
#!/bin/bash (sha-bang)
```

or

```
#!/bin/sh
```

Ex:

```
#!/bin/bash
echo ‘Hello World!’
```

Variable:

- To use a variable: $varname
- Name=value
  - No space around the equal sign
  - Do not start with number
  - Avoid existing commands and shell/environment variables

Control structures

- Branching: if, if-else, if-elif-else
- Loops: while, until, for, select

if

- **if** tests

then

        cmds;

fi

- Also:
  - **if** tests; **then** cmds; **fi**

if-elif-else

```
if tests
then
      cmds;
elif tests
      cmds;
…
else
      cmds
fi
```

while loops

```
while condition
do
        command(s)
done
```

until loops

```
until condition
do
        command(s)
done
```

for loops

```
for variable in list
do
    command(s)
done
```

select

```
select name [in list]; do
        cmds;
done
```

Conditions/Tests

- Test a condition using
  - [ ]
  - [[ ]]
  - (( ))
- Example:
  - If test $name = “John”

```
then
      echo ‘Hello John!’
fi
```

Numeric tests

Bash condition	Java Condition	Python Condition
n1 –eq n2	n1 == n2	n1 == n2
n1 –lt n2	n1 < n2	n1 < n2
n1 –gt n2	n1 > n2	n1 > n2
n1 –ne n2	n1 != n2	n1 != n2
n1 –le n2	n1 <= n2	n1 <= n2
n1 –ge n2	n1 >= n2	n1 >= n2

Spaces are important

- These are ok:
  - [$a = $b]
  - [$a=$b]
- These are not ok:
  - [$a = $b] this is the most common mistake
  - [$a = $b]
  - [$a=$b]
  - [$a = $b]
  - [$a= $b]
  - [$a =$b]

Permissions

3 basic file permissions or modes:

- read (r)
- write (w)
- execute (x)

Each can be applied to:

- user (u)
- group (g)
- other (o)

Permissions

- Permission numbers are:
  - **0 = ---**
  - **1 = --x**
  - **2 = -w-**
  - **3 = -wx**
  - **4 = r-**
  - **5 = r-x**
  - **6 = rw-**
  - **7 = rwx**

Change permissions

- chmod [references] [operator] [modes] filename

Ex: to add the execute permission for the user to file1

```
chmod u+x file1
```

- NFS4 ACLs
    - nfs4_setfacl [OPTIONS] COMMAND file
    - nfs4_editfacl [OPTIONS] file
    - https://proteusmaster.urcf.drexel.edu/urcfwiki/index.php?title=NFS4_ACLs&action=edit&redlink=1

Pipelining: awk

- Reads input file one record at a time
- Searches an input file for lines that match a pattern
- For every matching line, a corresponding action is performed
- Awk split the input line into fields automatically

Examples

- The file data.txt (name, payrate, hours) contains data for a week:
  - $1 name
  - $2 payrate
  - $3 hours
- Print to the screen the name and salary of people who worked last week
  - awk ‘$3 > 0 {print $1, $2 * $3}’ data.txt

grep

- Output all lines in the input that match given pattern
  - grep [options] pattern [file]
- Options:
  - -i case-insensitive search
  - -v invert search
  - -l output only the name of files with matching lines
  - -c output only the number of lines that match

cut

- Cutting out the sections from each line of files and writing the result to standard output
- Syntax:
  - Cut OPTION… [FILE]…
- Options:

-f or - -fields	Field-based selection
-c or - -characters	Character-based selection, delimiter ignored or error
-d or - -delimiter	Delimiter for field-based selection

sed

- Stream editor
  - Search
  - Find and replace
  - Insert or delete
- Syntax
  - Sed OPTIONS … [SCRIPT] [INPUTFILE]
- Options:
  - -e
  - -f
  - -h

Let’s Practice!

Question?

Thank you!

References

- https://kb.iu.edu/d/abdb
- https://linuxcommand.org/lc3_lts0090.php
- https://www.gnu.org/software/sed/manual/sed.html