Seneca | SCHOOL OF INFORMATION AND COMMUNICATIONS TECHNOLOGY

Unix Scripting

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What we have learned…

- Introduction to Shell Scripting
  - Categories of variables
  - Conditional Statements
  - Loops

Agenda

- stdin, stdout, stderr Redirection and piping
- Simple filter commands: head, tail, cut, sort, wc
- grep utility

stdin, stdout, stderr

- The three input/output (I/O) connections are called
  - standard input (stdin),
  - standard output (stdout)
  - and standard error (stderr).
- Originally I/O happened via a physically connected system console (input via keyboard, output via monitor), but standard streams abstract this.

Standard Input and Standard Output

- Standard input (stdin) is a term which describes from where a command receives input
- Standard output (stdout) describes where a command sends it's output
- For most commands the default standard input and output are your terminal's keyboard and screen
- Standard input can be redirected from a file or piped from another command
- Most commands also accept a filename argument, which is internally redirected to standard input
- Standard output can be redirected to a file or piped to another command

Standard Input Redirection

```
command < filename
```

- Example:
  ```
  cat < cars
  ```
- Used for commands which do not accept a filename as an argument

Standard Output Redirection

`command > filename`

- Redirects a command's standard output to a file
- Stdout redirection is represented by the **`>`** symbol

  Example:

  `ls > ls.txt` - will save output from the ls command into a file called ls.txt
- If the file exists already its content will be replaced
- To append (add) to a file, the **`>>`** symbol can be used

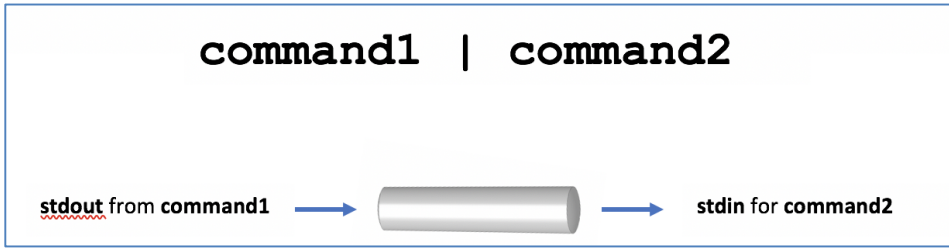
Inter-process communication

- Commands can send their standard output directly to standard input of other commands
- A few simple commands can be combined to form a more powerful command line
- No temporary files are necessary
- This is achieved by using pipes and tees

Pipes

- Pipes are represented by **|**
- Many commands can be "piped" together, filter commands are especially useful
  - Each filter processes the initial input based on it's design
  - Filters must be chained in a specific order, depending on what you wish to accomplish
- Example piping use:

```
ls -al | more
```



"Here" documents

- The << symbol indicates a "here" document

Example:

```
sort << EOF
word
name
car
EOF
```

- Anything between EOF…EOF is sent to the standard input of a utility
- You can use some other string instead of "EOF"
- This is especially useful for embedding a small file within a shell script

Let’s learn StdErro

- What does the following command do?
  - `cat nofile`
- How to redirect the error output to a file?

Standard Error

- In addition to standard input and standard output UNIX commands have standard error, where error messages are sent
- By default error messages are sent to the terminal
- Standard error can be redirected by using the **2>** or **2>>** redirection operators
- To redirect both standard output and the standard error to the same destination, use **>&**
  - `wc nofile file1 >& wordcount`

Example

- `cat nofile 2> file1`
  - the standard error from the above example could be redirected from appearing on the display screen to being written to a file named *file1* .

What does the following command do?

- `cat nofile1 2> /dev/null`
  - Error messages can be discarded so that they neither appear on the screen nor are written to any file by redirecting them to a special file called ***/dev/null***

/dev/null file

- The /dev/null file (sometimes called the bit bucket or black hole) is a special system file that discards all data written into it
  - Useful to discard unwanted command output, for example:
    `find / -name "tempfile" 2> /dev/null`
- Also, /dev/null can provide null data (EOF only) to processes reading from it
  - Useful to purge (empty) files etc, for example: **`cat /dev/null > ~/.bashrc`**

Challenge

- Create a file using vi and add 10 friends name, their phone no and their email as follow
  - John, 6471112222,joan@abc.com
- List the file content sorted by phone no
- List the first 3 person in the file
- List the last two persons in the file
- List the person 3,4 only

Using exec to assign a file descriptor (fd) to file

- In the Bash shell environment, every process has three files opened by default.
  - These are standard input, display, and error. The file descriptors associated with them are 0, 1, and 2 respectively.
- In the Bash shell, we can assign the file descriptor to any input or output file. These are called file descriptors.

File Descriptor…

- The syntax for declaring output.txt as output is as follows:
  - **exec fd > output.txt**
  - **exec 4 > output.txt**
- The syntax for closing the file is as follows:
  - **exec fd<&-**
  - Example: exec 5<&-

Activity: Try the following and explain how it works

Step 1

- exec 4> myFiles
  echo "Here are my current files" >&4
  ls -l >&4
  exec 4>&-

Step2

- exec 4< myFiles
  read line1 <&4
  read line2 <&4
  exec 4<&-
  echo $line1
  echo $line2

Review

- Here is a quick review about the filtering commands in Unix:
  - Cut
  - Head and Tail
  - Grep
  - Sort
  - Wc

head and tail commands

- These commands display the beginning or the end of a file respectively
- By default, 10 lines are displayed
  - The entire file will be displayed if it is less than 10 lines in length
- Example usage:

  `head [-line_count] file`

  for example: **`head –3 users.log`**

cut

- Selects which fields or columns to display from files or standard input
- Range can be specified in multiple ways:
  - 1–10 – first 10
  - 3–8 – 3rd to 8th
  - –10 – up to 10th
  - 2– – from 2nd until the end of line
  - 1–3,4,10– – combination of above
- Important options:
  - -c – cut **c**haracters
    Example: `cut -c1-2` – will cut first 2 characters
  - -f – cut **f**ields
    Example: `cut -f2,5` – will cut 2nd and 5th field

cut fields

- Default field delimiter is the tab
- Other field delimiter can be specified using the –d option
  For example:
  `cut-d,-f1-2` – will cut first 2 fields delimited with a comma
- Field delimiter must be a single character, only one character delimiters are supported
- If special characters are used for delimiters they must be quoted
  For example:
  `cut -d" " -f1` – space is the field delimiter

sort command

- Sorts files or standard input
- Is able to sort by fields
- Popular options:
  - -f – fold (ignore case in comparisons)
  - -n – numeric sort (default is ascii)
  - -u – display unique entries only
  - (do not display duplicate lines)
  - -r – reverse sort (default is lowest to highest value)

wc

- Counts the number of lines, words and/or characters in files or standard input
- Usage:

  wc option [filename]
- Options:
  - -l – count lines
  - -w – count words (delimited by whitespace)
  - -c – count bytes
  - -m – count characters
  - If no option is specified, line, word, and byte counts are displayed
  - Note than one extended ascii character is one byte

grep utility

- Searches for literal text and text patterns
  - Pattern-based searches will be covered in detail later in this course
- Example usage: `grep ford cars`
- Works with files or standard input
- Acts like a filter – outputs only lines which are successfully matched to a given regular expression
  - A successful match can be an entire line or any part of it, but the entire line will be displayed

Useful grep options

- -i – ignores case
- -n – numbers lines in the output
- -v – reverse match
- -c – displays count of matched lines

What does the following commands do?

- **ls -al | more**
  ls | sort -r
  ls | sort | more
- **head -7 filename | tail -2**
- **ls -l | cut -d" " -f2**

What does the following command do?

- `wc -l feb6.txt | tee  out1.txt`