Process management in UNIX/Linux system

Krzysztof Kluza

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Redirecting work results to files

1. Redirect the results of various commands (`ps, ls, finger, who`) to files and view the resulting files, e.g.:
   `ls > file_list`
   Compare `>` and `>>`.

2. View the result of the redirection of the standard error output:

   ```
   kill 1
   kill 1 1>a 2>b
   ```

3. Check and explain the result of the command:
   `sort some_file > some_file`

4. What is a source of data if we do not provide the file name for the following commands: `cat`, `grep`, `tail`?

5. A pipeline is a mechanism for inter-process communication using message passing. Execute and observe the results of the following simple pipelines:

   ```
   ls | wc
   ps | sort
   ps -A | grep bash
   ps | head -n 1
   who | wc
   who | sort | grep "vi"
   ```

6. How to count the number of users' home directories on the server?

7. How to create a list of logged in users sorted alphabetically?
   How to display only the last 10 users from the list?

8. Create a file with numbers:
   `(seq 10; seq 10; seq 10) > numbers`
   Using `sort` or `uniq` commands display only unique numbers from the file.

9. Using `tr`:
   - Write a command that displays the content of a file in the terminal in one line.
   - Count the number of occurrences of the letter 'k' in that file.

`find` and `grep` commands

`find` is used to search for files in the file system. The basic usage is:
`find path -name filename`.
Using `find` look for the following files in the system:

1. in `/usr/bin`, find all files with the names starting with `au`,
2. in `/tmp` find all files owned by `root`,
3. in `/tmp` find all files modified in last 24h,
4. in `/tmp` find all regular files with permissions `700`.

Among the results found using some commands, we can choose the ones we are interested in using: `grep [options] pattern [file]`
Some useful options:

`-A x`	– shows x lines after the line with the pattern,
`-B x`	– shows x lines before the line with the pattern,
`-v`	– reverses the result (shows lines that do not match the pattern).

Using `grep` or other commands:

1. In file `/etc/passwd` find a line about your account with the context lines (a line before and after your line).
2. Count the number of files in `/usr/bin` containing `ubuntu` in their file names.
3. From last 6 lines in the `/etc/passwd` file, select these containing letter `W` and count total number of characters in these selected lines.
4. Show the first 7 files ending with the letter `p` from `/usr/bin` (sorted alphabetically).
5. From ~~`~wojnicki/lab/zdjecia`~~ copy files ending `.JPG` to your home directory `~/lab/`. Then using `file`, display the names of the files which truly are JPEG pictures.
6. Create two files using the following command:
   ```
   seq 1 2 13 > odd; seq 1 12 > all
   ```
   Check and explain the behavior of the following commands:
   - `grep -xFf odd all`
   - `comm -12 <(sort odd) <(sort all)`
   - `diff -c <(sort odd) <(sort all)`

Complex pipelines

Test and check what the following commands do (do not copy the commands, just rewrite it, because some quotes may not copy correctly):

- `cat /etc/passwd | cut -d:  -f1 | sort | uniq | grep ’^g’`
- `tr ’[a-z]’ ’[A-Z]’ < /etc/passwd`
- `cat /etc/passwd | tr ’:’  ’\n’ | sort | uniq -ic | sort -n`
- `find /tmp -perm -o=r -size +500k 2>/dev/null`
- `du -Sh | sort -h | tail -5`
- `find ~/lab1 -type f -exec cp {} ~/copy/ \;`

Complex pipelines may serve as a tool for analyzing content from webpages:

1. Analyze and explain what is the result of the following pipeline:

   ```
   curl "https://en.wikipedia.org/wiki/Bash_(Unix_shell)" | \
   sed "s/[^a-zA-Z ]/ /g" | \
   tr "A-Z " "a-z\n" | \
   grep "[a-z]" | \
   sort -u | \
   comm -23 - /tmp/american-english
   ```

2. Using only `grep, cut, tr, head, tail` from the website: `https://www.nbp.pl/homen.aspx?f=/kursy/ratesa.html` create a filter (pipeline) which generates a textual table of exchange rates which can look as follows:

   ```
   Australian Dollar 1 AUD 2.7565
   Baht 1 THB 0.1260
   Brazilian Real 1 BRL 0.6965
   ...
   ```