CS2043 - Unix Tools & Scripting
Lecture 7
Working with Streams

Spring 2015 [1]

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[1] based on slides by Hussam Abu-Libdeh, Bruno Abrahao and David Slater over the years

Announcements

- Course drop deadline today
- A2 is out (due Saturday 02/07)
- CSUGLab accounts will be activated sometime this week

Today

- Regular expressions (`grep` recap)
- More Unix tools: `cut`, `paste`, `split`, `join`
- Stream Editor: `sed`
- `vim`

Regular Expression Recap (grep)

see Lecture 6

XKCD

WHENEVER I LEARN A NEW SKILL I CONCOCT ELABORATE FANTASY SCENARIOS WHERE IT LETS ME SAVE THE DAY.
OH NO! THE KILLER MUST HAVE FOLLOWED HER ON VACATION!
BUT TO FIND THEM WE'D HAVE TO SEARCH THROUGH 200 MB OF EMAILS LOOKING FOR SOMETHING FORMATTED LIKE AN ADDRESS!
IT'S HOPELESS!
EVERYBODY STAND BACK.
I KNOW REGULAR EXPRESSIONS.
PERL!
TAP TAP

xkcd.com/208

Cut and paste without mouses and windows

cut

cut extract sections from each line of the input.

cut

```
cut [-b] [-c] [-d delim] [-f list] [-s] [file]
```

- `delim` is a delimiter that separates fields
- `list` consists of one of N, N-M, N-

Options

- `-b`: extracts using range of bytes
- `-c`: extracts using range of characters
- `-d`: specifies a delimiter (tab by default)
- `-f`: specifies a range of fields separated by a delimiter
- `-s`: supressses line if delimiter is not found

Cut examples

employee.txt

```
Alice:607-233-2464:15 Sunny Place, Ithaca, NY:14850:female
Bob:607-257-2884:504 Brown St, Ithaca, NY:14850:male
Charlie:605-987-7886:99 Berry Lane, Palo Alto, CA:94304:male
This line doesn't have a demiliter
```

Examples

- `cut -d : -f 1 -s employee.txt`: Prints the names
- `cut -d : -f 3,4 -s employee.txt`: Prints the address and the zip code
- `cut -d : -f 2 employee.txt`: Prints phone numbers plus the last line
- `cut -c 1 employee.txt`: Prints their first initial plus the first character of the last line

Cut and paste without mouses and windows

paste

paste concatenate files side-by-side.

cut

```
paste [options] [file1 ...]
```

Options

- -d: specify a delimiter to separates fields (instead of tab)
- -s: concatenates serially instead of side-by-side

Paste examples 1/3

names.txt

```
Alice
Bob
Charlie
```

phones.txt

```
607-233-2464
607-257-2884
605-987-7886
```

Examples

- `paste names.txt phones.txt`

```
Alice 607-233-2464
Bob 607-257-2884
Charlie 605-987-7886
```

Paste examples 2/3

names.txt

Alice
Bob
Charlie

phones.txt

607-233-2464
607-257-2884
605-987-7886

Examples

- `paste -d :  names.txt phones.txt`

```
Alice:607-233-2464
Bob:607-257-2884
Charlie:605-987-7886
```

Paste examples 3/3

names.txt

```
Alice
Bob
Charlie
```

phones.txt

```
607-233-2464
607-257-2884
605-987-7886
```

Examples

- `paste -s names.txt phones.txt`

```
Alice Bob Charlie
607-233-2464 607-257-2884 605-987-7886
```

Splitting files

`split`

Splits a files into pieces, i.e., files named `xaa`, `xab`, `...`

cut

```
split [options][file1] [prefix]
```

Options

- `-l`: how many lines in each file
- `-b`: how many bytes in each file
- `prefix`: name prefix of each file produced

Joining files

`join`

Join lines that contain the same keys between two different files

cut

```
join [options] file1 file2
```

Options

- `-1 field`: join by the n-th field of file 1
- `-2 field`: join by the n-th field of file 2
- `-a file_number`: displays unpaired lines of file file_number

Join examples 1/2

age.txt

```
Alice 12
Bob 30
Charlie 23
```

salaries.txt

```
Bob 129,000
Charlie 75,000
```

Examples

- `join age.txt salaries.txt`

```
Bob 30 129,000
Charlie 23 75,000
```

Join examples 2/2

age.txt

```
Alice 12
Bob 30
Charlie 23
```

salaries.txt

```
Bob 129,000
Charlie 75,000
```

Examples

- `join -a1 age.txt salaries.txt`

  ```
  Bob 30 129,000
  Charlie 23 75,000
  Alice 12
  ```

Basic Calculator

bc

Performs arithmetic and logical calculations

Options

- `-l field`: increase the precision to 20 decimal places (default 0)

Examples

-
  ```
  echo "1/3" | bc
  0
  ```

-
  ```
  echo "1/3" | bc -l
  0.33333333333333333333
  ```

-
  ```
  echo "1>3" | bc -l
  0
  ```

-
  ```
  echo "1<3" | bc -l
  1
  ```

sed

sed is a *stream editor*. We will only cover the basics, as it is a completely programming language!

Stream Editor

`sed [options] [script] [file]`

- Stream editor for filtering and transforming text
- We will focus on `sed 's/<regexp>/<text>' [file]`
- This form replaces anything that matches `<regexp>` with `<text>`.
- `sed` goes line by line searching for the regular expression.

What is the difference between `sed` and `tr`?

- `sed` can match regular expressions!
- `sed` also does lots of other stuff

Basic Example:

Example:

```
sed 's/not guilty/guilty/g' filename
```

Replaces not guilty with guilty everywhere in the file

What happens if we don't have the g?

Without the g, it will only do one substitution per line.

sed deletion

Just like with `tr` we can do deletion with `sed`

sed deletion

- `sed '/regexp/d'` - deletes all lines that contain regexp

Example

```
sed '/[Dd]avid/d' filename > filename2
```

- deletes all **lines** that contain either David or david and saves the file as `filename2`.

sed understands regular expressions!

The power of sed is that it treats everything between the first pair of /'s as a regular expression. So we could do

```
sed 's/[[:alpha:]]\{1,3\}[[:digit:]]*@cornell\.edu/cornell email
removed/g' file
```

to print a file with all cornell email addresses removed.

use -r on Linux (-E on OS X) to use extended regular expressions.

sed can save the string

Another Example:

```
sed 's/^\([A-Z][A-Za-z]*\), \([A-Z][A-Za-z]*\)/\2 \1/' filename
```

- Searches for an expression at the beginning of the line of the form `e1, e2` where `e1` and `e2` are "words" starting with capital letters.
- Placing an expression inside ( ) tells the editor to save whatever string matches the expression
- Since ( ) are special characters we escape them; i.e. by using \(\)
- We access the saved strings as `\1, \2`.
- This script for example could convert a database file from

`Lastname, Firstname` to `Firstname Lastname`

More sed

You can specify which lines to check by numbers or with regular expressions:

`sed '1,20s/john/John/g' filename` - checks lines 1 to 20

`sed '/^The/s/john/John/g' filename` - checks lines that start with The

& corresponds to the pattern found:

```
sed  's/[a-z]\+/"&"/g' filename
```

replaces words with words in quotes For more on sed check out

http://www.grymoire.com/Unix/Sed.html

Even more sed

How could we use sed to remove a specific regular expression? `sed 's/regexp/ /g' file`

Example:

```
sed 's/[[:alnum:]]/ /g' Frankenstein.txt
```

Examples:

Let's strip the directory prefix from our pathnames (i.e. convert `/usr/local/src` to `src`

Example:

```
pwd | sed 's/.*//'
```

- Translates anything preceeding (and including) a frontslash to nothing
- Note the backslash-escaped frontslash

sed scripting

sed is a complete programming language and we can write sed scripts.

- Any file that begins with #! is a script file (we will talk more about this next week).

Example

- Create a new text file named trim.sed

```
#! /usr/bin/sed -f
s/^ *//
s/ *$//
```

You can run this script from the shell like any other program:

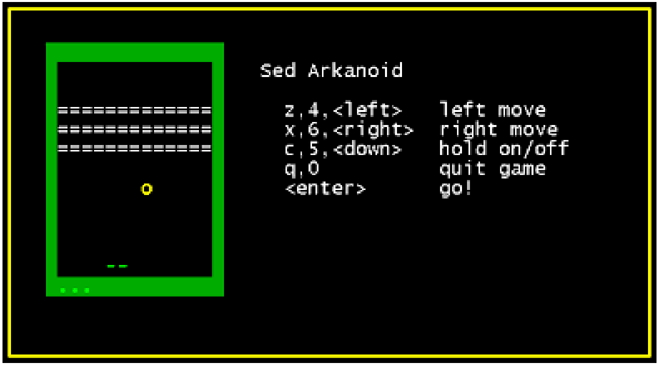
- `echo " this is a test " | ./trim.sed`

```
this is a test
```

We now have a script that trims leading and trailing whitespace!

Sed Arkanoid

Sed is a complete programming language. In fact people have written entire games as sed scripts.



```
Sed Arkanoid

   z,4,<left>    left move
   x,6,<right>   right move
   c,5,<down>    hold on/off
   q,0           quit game
   <enter>       go!
```

http://aurelio.net/soft/sedarkanoid/

Next Time