LPIC-1 101-500 – Lesson 7

103.7 Search text files using regular expressions

Regular Expressions

- Regular expressions is a versatile method to match strings and text patterns
- Regular expressions are part of the POSIX standard for UNIX systems
- There are two flavors, the ”Basic Regular Extensions” and the ”Extended Regular Expressions”

Regular Expressions Special Characters

Basic Regular Expressions	Extended Regular Expressions	Description
.	**.**	Matches any single character e.g. **a.c** matches with **a1c**, **aac**, **abc**, **a)c** etc
[ ]	**[ ]**	Matches any single character enclosed in the square brackets e.g. **[agk]**, **[1-9a-kL-Z]**. Here a "**.**" and other special characters are interpreted literally
[^]	**[^]**	Matches any character NOT included in square brackets e.g. **[^agk]**
^	**^**	Matches the beginning of string or line e.g. **^hat**, **^[jtr]**
\< \>	**\< \>**	Matches words
$	**$**	Matches the end of string or line e.g. **hat$**, **[jtr]$**
*****	*****	Matches 0 or more of the preceding characters e.g. **a***, **[jtr]***, **.***
\?	**?**	Matches 0 or 1 of the preceding characters e.g. **a?**, **[jtr]??**
\+	**+**	Matches 1 or more of the preceding characters e.g. **a+**, **[jtr]+**
|	**|**	Matches the expression before or after the vertical bar e.g. **this|that**
\{m,n\}	**{m,n}**	Matches m times the preceding characters but no more that m (n>m) e.g. **a{2,4}**, **[jtr]{2,4}**
\(\)	**( )**	Grouping of the expression in parentheses so it can be called later. **\1** refers to the first set of parentheses, **\2** to the second, and goes up to **\9**

Character Classes in Regular Expressions

Character Classes	Equivalent Expression	Description
[:alnum:]	[a-zA-Z0-9]	Alphanumeric characters
[:alpha:]	[a-zA-Z]	Alphabetic characters
[:blank:]	[\t]	Space and Tab
[:cntrl:]	[\x00-\x1F\x7F]	Control characters
[:digit:]	[0-9]	Numbers
[:graph:]	[\x21-\x7E]	Optical characters
[:lower:]	[a-z]	Lower case letters
[:print:]	[\x20-\x7E]	All optical characters plus space
[:punct:]	[\]\[!"#$%&'()*+,./:;<=>?@\^_`{|}~-]	Punctuation characters
[:space:]	[\t\r\n\v\f]	All Whitespace
[:upper:]	[A-Z]	Upper case letters
[:xdigit:]	[A-Fa-f0-9]	Hexadecimal digits

Match Expressions with `grep`

- **grep** is one of the most powerful and popular commands for text filtering, in Linux
- It prints lines that match a certain pattern,from text files
- Support Basic Regular Expressions
- Supports extended regular expressions when the **-E** option is set (**grep -E = egrep**)
- It can even search for patterns in binary files and report the matching ones

Match Expressions with `grep`

Options:

- **-c** # just show the number of matches in the text
- **-i** # ignores upper case or lower case in the match
- **-n** # show the number of line of the match, in the text
- **-o** # show only the match,not the complete line
- **-r** # recursively search the directory hierarchy
- **-v** # show the lines NOT matching a match
- **-E** # support Extended Regular Expressions. Identical to **egrep**)
- **-F** # literal interpretation of the special characters in the pattern. Identical to **fgrep**
- **--color=auto** # color the matched pattern (default in Ubuntu)

Match Expressions with `grep`

- **$ grep uuid /etc/fstab** # regular expressions are case sensitive
- **$ grep UUID /etc/fstab** # does it work now?
- **$ grep -i uuid /etc/fstab** # case insensitive search
- **$ grep -v -i uuid /etc/fstab** # show lines that do not include **uuid**
- **$ grep -i "[linux]\{3,5\}" -r /etc/** # recursively search **/etc** for patterns of the enclosed characters, which are equal or greater than 3 up to equal or less than 5
- **$ grep -i "[linux]\{5\}" -r /etc/** # search for patterns with exactly 5 characters from those enclosed in the brackets

Match Expressions with `grep`

- **$ grep "^[[:alpha:]]" -r /etc**# print lines beginning with letters.
- **$ grep "\<[[:alnum:]]*\>" -r /etc** # print lines beginning with letters or numbers
- **$ grep "[[:punct:]]" -r /etc** # print lines containing punctuation
- **$ grep "[[:space:]]$" -r /etc** # print lines that end in whitespace
- **$ grep "[[:xdigit:]]\{3,\}" -r /etc** # print lines that contain 3 or more hexadecimal digits

Variations of `grep`. `egrep` and `fgrep`

- **egrep** is identical to **grep -E** and uses Extended Regular Expressions by default
- `$ egrep -i "[linux]{3,5}" -r /etc # identical to grep -i "[linux]\{3,5\}" and also with grep -E -i "[linux]{3,5}"`
- **fgrep** is identical to **grep -F** and matches the pattern literally irrespective of special characters
- `$ fgrep '[[:alpha:]]' regex.examples # Will search for the the string [[:alpha:]] instead of the alpha class. Identical to grep -F '[[:alpha]]'`
- `$ fgrep "[linux]{3,5}" regex.examples # will search for the string [linux]{3,5} instead of the enclosed characters`

”You can't grep dead trees”
~ Ancient UNIX proverb ~

Filter and process text with `sed`

- **sed** is a powerful command for filtering and processing text
- Uses Basic Regular Expressions by default
- Uses Extended Regular Expressions when called with the **-r** option
- It has its own subcommands

Filter and process text with `sed`

- **$ sed -e 's/UUID/uuid/' /etc/fstab** # replace the first occurrence of **UUID**, in a line, with **uuid**.
- **$ sed -e 's/UUID/uuid/g' /etc/fstab** # replace all occurrences of **UUID** in a line, with **uuid**.
- **$ sed '1,4d' /etc/fstab > ~fstab.cribbled** # remove lines 1 to 4 from **fstab**
- **$ sed '/^$/d'** # delete all empty lines
- **$ sed 'y/leti/1371/' matches.txt** # Replace characters **l,e,t** or **i** with **1371** respectively
- **$ sed -f rot13.sed matches.txt** # run sed commands from the **rot13.sed** file

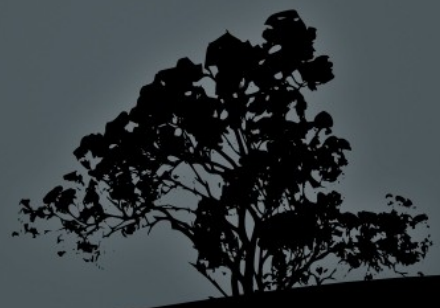
Filter and process text with `sed`

Options:

- **-e** # defines a following command. It is optional when there is only one command
- **-f file**# reads command from **file** instead from the CLI
- **-r** # allows Extended Regular Expressions
- **-i**, **--inplace** # changes the file in place. Use with caution!

More info about regular expressions

- $ man 7 regex
- http://en.wikipedia.org/wiki/Regular_expression#Syntax
- http://en.wikibooks.org/wiki/Regex
- http://tldp.org/LDP/Bash-Beginners-Guide/html/chap_04.html



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