

# Unix-like Operating Systems

Regular expressions, command grep.

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# Grep – options

- What is the default behaviour of the command `grep`?

- Print lines matching a pattern.

```
ls /home/* 2>/dev/null | grep novak
```

- What is the meaning of the following options?

- `-v ...` invert the sense of matching, to select non-matching lines,

```
echo $PATH | tr ':' '\n' | grep -v bin
```

- `-c ...` print a count of matching lines for each input file,

```
grep -c root /etc/passwd
```

- `-i ...` ignore case distinctions,

```
man ls | grep -i command
```

- What is the meaning of the following options?

- -l ... suppress normal output, instead print the name of each input file from which output would normally have been printed,

```
grep -l start /etc/* 2>/dev/null
```

- -n ... prefix each line of output with the 1-based line number within its input file

```
grep -n bash /usr/bin/* 2>/dev/null
```

# grep – extended regular expressions (ERE)

- What is the meaning of the following symbols in ERE?
    - `^` (caret/hat) ... begin of line,
    - `$` ... end of line,
    - `\<` ... begin of word,
    - `\>` ... end of word,
  - `.` ... any single character
  - `[a-d]`, `[abcd]`, `[[:lower:]]` ... single character from interval/list,
  - `[^a-d]`, `[^abcd]`, `[^[:lower:]]` ... single character not from interval/list,
- 
- `?` ... the preceding item will be matched zero or one times,
  - `+` ... the preceding item will be matched one or more times,
  - `*` ... the preceding item will be matched zero or more times,
  - `{n}` ... the preceding item is matched exactly `n` times,
  - `{n,}` ... the preceding item is matched `n` or more times,
  - `{,n}` ... the preceding item is matched at most `n` times (GNU extension),
  - `{m,n}` ... the preceding item is matched at least `m` times,  
but not more than `n` times.

- What is the meaning of the following symbols in ERE?
  - `|` ... the choice, that matches any string matching either alternate expression.
  - `( )` ... defines a marked subexpression. The string matched within the parentheses can be recalled later.
  - `\n` ... matches the same string of characters as was matched by an expression enclosed between `(` and `)` earlier in the same ERE.

For example, the expression `^(.*)\1$` matches a line consisting of two repeated appearances of the same string.

# grep – extended regular expressions (ERE)

- Copy file /usr/dict/words from fray1.fit.cvut.cz to local system.

```
scp fray1.fit.cvut.cz:/usr/dict/words .
```

- Try the following commands and explain the output.

```
grep -E 'o' words
```

```
grep -E 'oo' words
```

```
grep -E 'oo$' words
```

```
grep -E '^oo' words
```

```
grep -E 'o.o' words
```

```
grep -E 'o.*o' words
```

```
grep -E '^o.*o$' words
```

# grep – extended regular expressions (ERE)

- What is the difference between the following commands?

```
grep -E 'o*' words
```

```
grep -E 'oo*' words
```

- What is the difference between the following commands?

```
grep -E '[^o]' words
```

```
grep -E -v 'o' words
```

- What is the difference between the following commands?

```
grep -E '^a.*a$' words
```

```
grep -E '^ (a) .* \1$' words
```

```
grep -E '^ (.) .* \1$' words
```



# grep – extended regular expressions (ERE)

- Use the output of the command `ps -ef`. How to print the number of processes running under the identity of the user `root`?  
Hint: try to find the correct solution for both Linux and Solaris.

```
ps -ef | grep -Ec '^root '      # Linux
```

```
ps -ef | grep -Ec '^ *root '    # Solaris
```

- Use the output of the command `ps -eo pid,user,comm` on the server `fray1.fit.cvut.cz`. How to determine how many times the program `sshd` is running on this server?

```
ps -eo user,pid,comm | grep -Ec '/sshd$'
```

- Use the output of the command `ps -eo pid,user,comm` on the server `fray1.fit.cvut.cz`. How to determine how many times the program `sshd` is running under the identity of the user `root` on this server?

```
ps -eo pid,user,comm | grep -Ec ' root *[^ ]*/sshd$'
```

- Use the output of the command `getent passwd` on the server `fray1.fit.cvut.cz`. How to determine how many students have the account on this server?  
Hint: student's account has the flag `student` at the end of the fifth column.

```
getent passwd | grep -Ec ' student:[^:]*:[^:]*$'
```

- Assume that the variable `file` is defined as follows

```
file=/home/courses/BIPS1/public/07/NAMES.TXT
```

Use the output of the command `getent passwd` on the server `fray1.fit.cvut.cz`. How to find account info about users whose names are in the file `NAMES.TXT`?

```
getent passwd | grep -Ef "$file"
```

# grep – extended regular expressions (ERE)

- How to print names of the days of the week from file /usr/dict/words on the server fray1.fit.cvut.cz?

```
M o n      day
T u e s    day
W e d nes  day
T h u rs   day
F r i      day
S a t ur   day
S u n      day
```

```
grep -E '[MTWFS][ouehra][neduit][esnru]*day' words
```

```
grep -E '(Mon|Tues|Wednes|Thurs|Fri|Saturn|Sun)day' words
```

# Homework

- How to print lines containing the same character at the beginning and at the end of line.

```
grep '^(.).*\1$' /usr/dict/words
```

- How to print all palindromes of length 2, 3, 4 and 5 characters from the file /usr/dict/words on server fray1.fit.cvut.cz.

```
grep '^(.)\1$' /usr/dict/words
```

```
grep '^(.).\1$' /usr/dict/words
```

```
grep '^(.)(.)\2\1$' /usr/dict/words
```

```
grep '^(.)(.)).\2\1$' /usr/dict/words
```