Linux y HPC para big data

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Linux

Working with text files line by line

- Viewing and Creating Files: ***cat, tac, more, less, echo, touch***
- Editing Files: ***nano, vi, vim***
- File Content Manipulation:
    - ***grep:*** Searches for patterns within files; can be used to find specific text.
    - ***sed:*** Stream editor for filtering and transforming text in a file or input from a pipeline.
    - ***awk:*** A programming language designed for text processing and manipulation.
    - ***paste:*** Merges lines of files horizontally.
    - ***cut, sort, uniq, tr, wc, head, tail.***

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Working with text files line by line

- Comparing Files:
  - **diff :** Compares files line by line.
- Regular Expressions and Pattern Matching: ***grep, egrep, fgrep, sed, awk***
- Text Processing:
  - ***join:*** Joins lines of two files on a common field.
  - ***split:*** Splits a file into fixed-size pieces.
  - ***nl*** (add line numbers), ***expand*** (tab to spaces)***, unexpand*** (spaces to tab)***, fold y fmt*** (text format).
- File Encoding and Character Conversion: ***dos2unix, unix2dos***

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Working with text files line by line

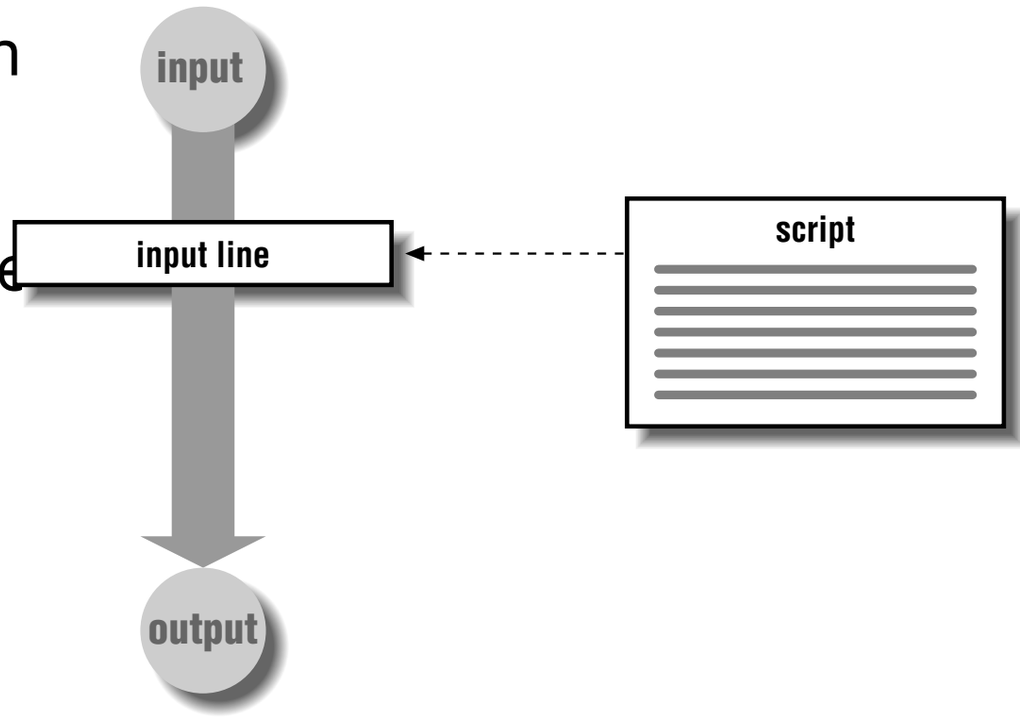
```
Country,City,AccentCity,Region,Population,Latitude,Longitude
ad,aixas,Aixàs,06,,42.4833333,1.4666667
ad,aixirivali,Aixirivali,06,,42.4666667,1.5
ad,aixirivall,Aixirivall,06,,42.4666667,1.5
ad,aixirvall,Aixirvall,06,,42.4666667,1.5
ad,aixovall,Aixovall,06,,42.4666667,1.4833333
ad,andorra,Andorra,07,,42.5,1.5166667
ad,andorra la vella,Andorra la Vella,07,20430,42.5,1.5166667
ad,andorra-vieille,Andorra-Vieille,07,,42.5,1.5166667
ad,andorre,Andorre,07,,42.5,1.5166667
```

- head worldcitiespop.csv
- wc -l worldcitiespop.csv
- head -100 worldcitiespop.csv > sample_worldcitiespop.csv
- cut -d',' -f1,5 worldcitiespop.csv > country_population.csv
- tail -n +2 worldcitiespop.csv | sort -t',' -k5 -nr | head -10
- cut -d',' -f1 worldcitiespop.csv | sort | uniq | tail -n +2
- awk -F',' ‘NR>1 && $5 > 1000000' worldcitiespop.csv
- awk -F',' 'NF > 1 {pop[$1]+=$5} END{ for(c in pop){print c" "pop[c]}}' worldcitiespop.csv | sort -rn -k2,2 | head
- Add country name using join..

Linux

Sed and Awk —- Power tools for editing files

- The basic function of awk is to search files for lines (or other units of text) that contain certain patterns.
  - A Pattern-Matching Programming Language
  - awk 'program' input-file1 input-file2 ...
  - View a text file as a textual database made up of records and fields.
  - Use variables to manipulate the database.
  - Use arithmetic and string operators.
  - Use common programming constructs such as loops and conditionals.
  - Generate formatted reports.



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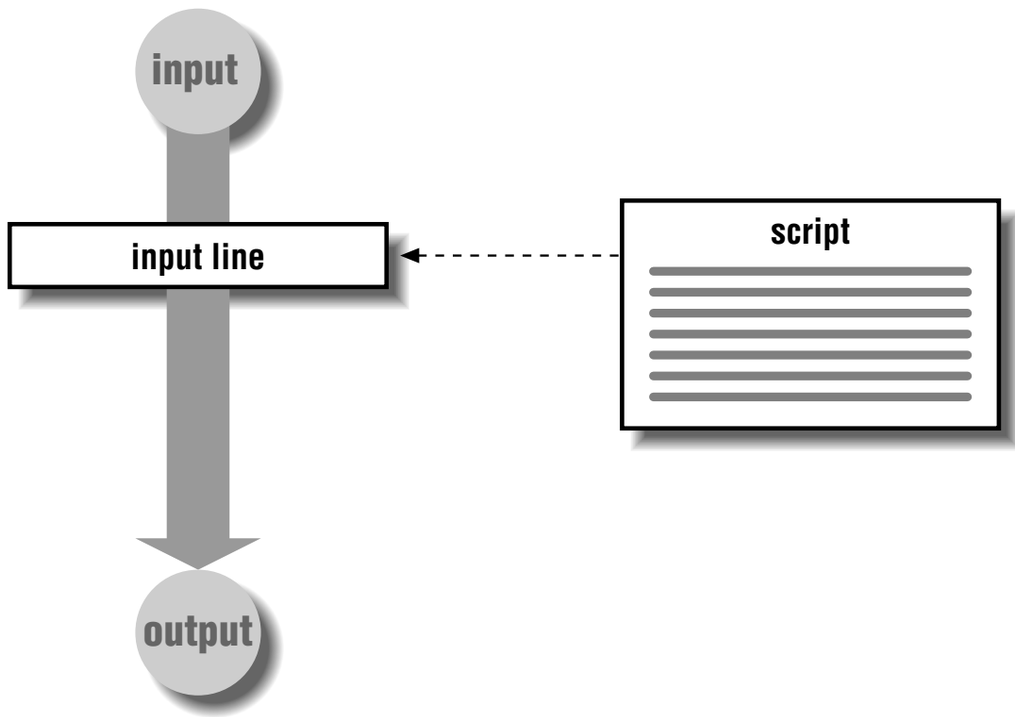
Sed and Awk —- Power tools for editing files

- Sed
  - Sed is a “non-interactive” stream-oriented editor.
  - To automate editing actions to be performed on one or more files.
  - To simplify the task of performing the same edits on multiple files.
  - To write conversion programs.




```
sed ’s/2022/2024/g’ file.txt
sed ’s/2022/2024/g ; s/casa/home/g’ file.txt

awk ‘{print $1}’ file.txt
awk ‘{print $1}’ *.txt
awk ‘/perro/ {print $0}’ *.txt
```

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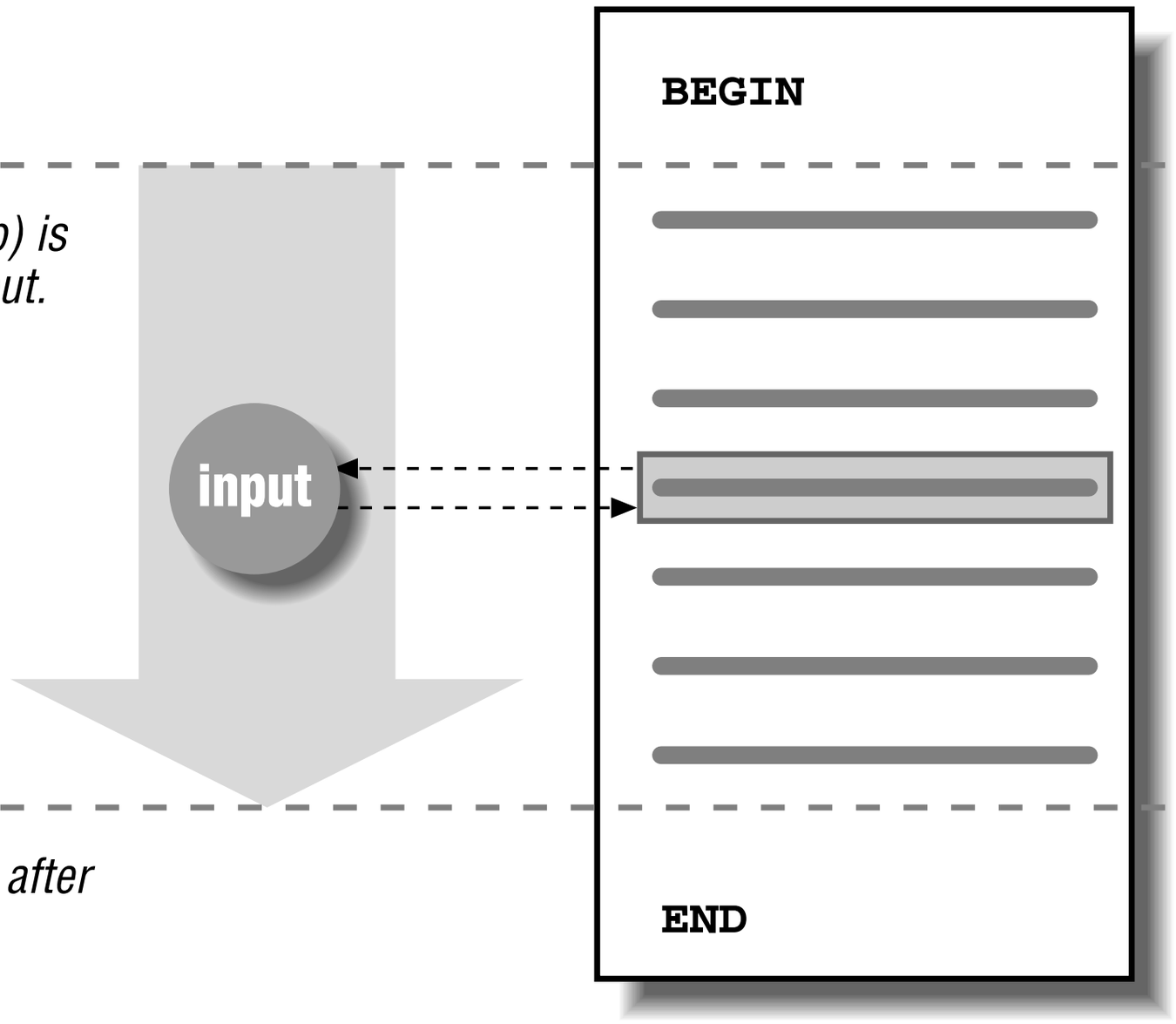
Awk

1 *1st routine is executed once before any input is read.*

2 *2nd routine (main input loop) is executed for each line of input.*



3 *3rd routine is executed once after all input is read.*

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Awk

- if (*expression*) *action1*; [else *action2*]

expr ? *action1* : *action2*

grade = (avg >= 65) ? "Pass" : "Fail"

while (*condition*)

action

for (*set_counter* ; *test_counter* ; *increment_counter*)

action

array[*subscript*] = *value*

for (*variable* in *array*)

do something with array[*variable*

Awk Function	Description
cos(*x*)	Returns cosine of *x* (*x* is in radians).
exp(*x*)	Returns *e* to the power *x*.
int(*x*)	Returns truncated value of *x*.
log(*x*)	Returns natural logarithm (base-*e*) of *x*.
sin(*x*)	Returns sine of *x* (*x* is in radians).
sqrt(*x*)	Returns square root of *x*.
atan2(*y*,*x*)	Returns arctangent of *y*/*x* in the range -π to π.
rand( )	Returns pseudo-random number *r*, where 0 <= *r* < 1.
srand(*x*)	Establishes new seed for **rand( )**. If no seed is specified, uses time of day. Returns the old seed.

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Awk

Awk Function	Description
gsub(*r*,*s*,*t*)	Globally substitutes *s* for each match of the regular expression *r* in the string *t*. Returns the number of substitutions. If *t* is not supplied, defaults to **$0**.
index(*s*, *t*)	Returns position of substring *t* in string *s* or zero if not present.
length(*s*)	Returns length of string *s* or length of **$0** if no string is supplied.
match(*s*,*r*)	Returns either the position in *s* where the regular expression *r* begins, or 0 if no occurrences are found. Sets the values of **RSTART** and **RLENGTH**.
split(*s*, *a*, *sep*)	Parses string *s* into elements of array *a* using field separator *sep*; returns number of elements. If *sep* is not supplied, **FS** is used. Array splitting works the same way as field splitting.
sprintf("*fmt*", *expr*)	Uses **printf** format specification for **expr**.
sub(*r*,*s*,*t*)	Substitutes *s* for first match of the regular expression *r* in the string *t*. Returns 1 if successful; 0 otherwise. If *t* is not supplied, defaults to **$0**.
substr(*s*,*p*, *n*)	Returns substring of string *s* at beginning position *p* up to a maximum length of *n*. If *n* is not supplied, the rest of the string from *p* is used.
tolower(*s*)	Translates all uppercase characters in string *s* to lowercase and returns the new string.
toupper(*s*)	Translates all lowercase characters in string *s* to uppercase and returns the new string.

Awk

Examples

```
$ cat table.txt
brown bread mat hair 42
blue cake mug shirt -7
yellow banana window shoes 3.14

# print the second field of each input line
$ awk '{print $2}' table.txt
bread
cake
banana

# print lines only if the last field is a negative number
# recall that the default action is to print the contents of $0
$ awk '$NF<0' table.txt
blue cake mug shirt -7

# change 'b' to 'B' only for the first field
$ awk '{gsub(/b/, "B", $1)} 1' table.txt
Brown bread mat hair 42
Blue cake mug shirt -7
yellow banana window shoes 3.14
```

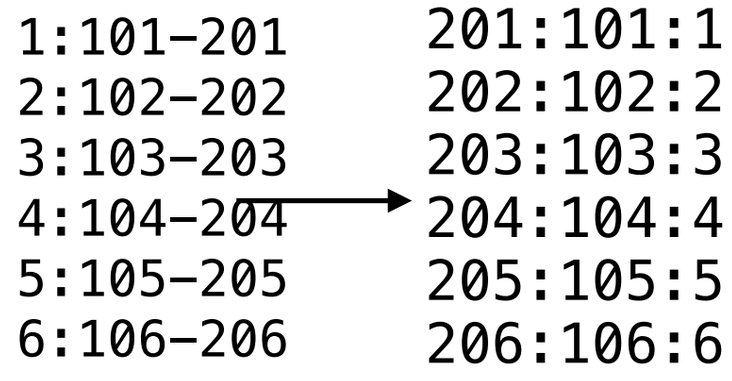
```
awk 'cond1{action1} cond2{action2} ... condN{actionN}'
```

https://learnbyexample.github.io/learn_gnuawk/

Linux

Sed

- Substitutions
  - /Pattern/replacement/flags
    - Flags : n <replace the n-matchin pattern>,g<global>,I <insensitive case>,p <print pattern>
- Transform
  - s/abc/xyz/
  - y/abcdefghijklmnopqrstuvwxyz/ABCDEFGHIJKLMNOPQRSTUVWXYZ/
- Regular expressions with Sed
  - sed 's/\(.*\):\(.*\)-\(.*\)/\3:\2:\1/' test.txt



Linux

Regular expressions

Basic Syntax

- /.../: Start and end
- |: Alternation
- (): Grouping

Groups and Ranges

- .: Any character except newline (\n)
- (a|b): a or b
- (…): Group
- (?:…): Passive (non-capturing) group
- [abc]: a, b or c
- [^abc]: Not a, b or c
- [a-z]: Letters from a to z
- [A-Z]: Uppercase letters fro
- [0-9]: Digits from 0 to 9

Quantifiers

- *: 0 or more
- +: 1 or more
- ?: 0 or 1
- {3}: Exactly 3
- {3,}: 3 or more
- {3,5}: 3, 4 or 5

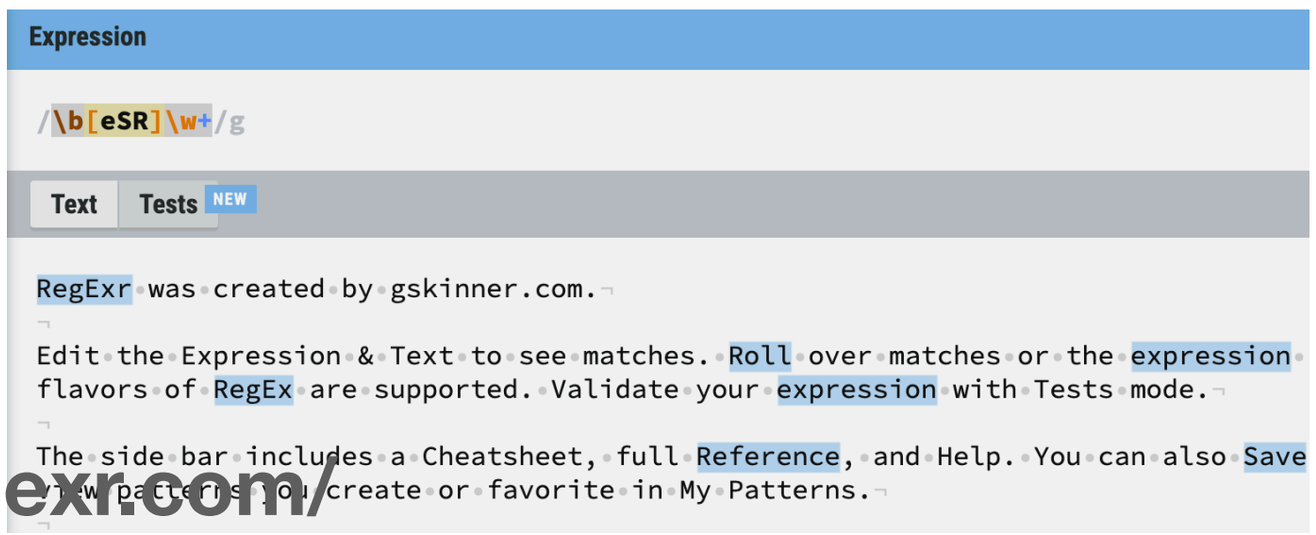
Position Matching

- ^: Start of string or start
- $: End of string or end o
- \b: Word boundary
- \B: Not word boundary

Character Classes

- \s: Whitespace
- \S: Not whitespace
- \w: Word
- \W: Not word
- \d: Digit
- \D: Not digit
- \x: Hexadecimal digit
- \O: Octal digit

https://regexr.com/



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Sed & regex examples

```
$ cat anchors.txt
sub par
spar
apparent effort
two spare computers
cart part tart mart

# words starting with 'par'
$ sed -n '/\bpar/p' anchors.txt
sub par
cart part tart mart

# words ending with 'par'
$ sed -n '/par\b/p' anchors.txt
sub par
spar


$ sed -nE '/two|sub/p' anchors.txt
sub par
two spare computers

# match 'cat' or 'dog' or 'fox'
# note the use of 'g' flag for mul
$ echo 'cats dog bee parrot foxed' | sed -E 's/cat|dog|fox/--/g'
--s -- bee parrot --ed
```

```
$ echo 'ac abc abbc abbbc abbbbbbbbc' | sed -E 's/ab{1,4}c/X/g'
ac X X X abbbbbbbbc

$ echo 'ac abc abbc abbbc abbbbbbbbc' | sed -E 's/ab{3,}c/X/g'
ac abc abbc X X

$ echo 'ac abc abbc abbbc abbbbbbbbc' | sed -E 's/ab{,2}c/X/g'
X X X abbbc abbbbbbbbc

$ echo 'ac abc abbc abbbc abbbbbbbbc' | sed -E 's/ab{3}c/X/g'
ac abc abbc X abbbbbbbbc

$ echo 'fd fed fod fe:d feeeeder' | sed 's/fe*d/X/g'
X X fod fe:d Xer

# zero or more of '1' followed by '2'
$ echo '31111111111125111142' | sed 's/1*2/-/g'
3-511114-

# from the first 'b' to the last 't' in the line
$ echo 'car bat cod map scat dot abacus' | sed 's/b.*t/-/'
car - abacus

# from the first 'b' to the last 'at' in the line
$ echo 'car bat cod map scat dot abacus' | sed 's/b.*at/-/'
car - dot abacus
```

https://learnbyexample.github.io/learn_gnused/cover.html