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Powerful Unix-Tools - sed & awk

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String Substitution with sed

- sed - Stream Editor
- non interactiv, controlled by command line options or a script
- line oriented text processing
- short scripts are typically given as parameter (-e option),
  longer scripts as files (-f option)
- Possible operations: Insert, **S**ubstitude, **D**elete, **A**ppend, **C**hange, **P**rint, **D**elete
- Commands in script can take an optional *address*, specifying the line(s) to be performed.
- *Address* can be a as ingle line number or a regular expression
- *Address* can be an interval (start, stop)
- A loop executes script commands on each input line
- Default behavior: printing each processed line to stdout (suppress with: -n)

sed commands

- **s**: substitude
  - Replace all occurences of D with GER

    ```
    sed 's/\bD\b/GER/g' city.csv > city2.csv
    ```
  - Replace „Stuttgart“ with „Stuttgart am Neckar“ (extended regexp)

    ```
    sed -r '/Stuttgart/ s/^([A-Za-z]+)/\1 am Neckar/' city.csv
    ```
  - Replace all occurences of NULL in a line with \N (Inplace Substitution)

    ```
    sed -i 's/\bNULL\b/\\N/g' city.csv
    ```

- **p**: print (typically used with default printing behaviour off (-n option))
  - print from line 10 to 20 (resp.: 5-10, 23, 56-71)

    ```
    sed -n 10,20p city.csv
    sed -n '5,10p;23p;56,71p' city.csv
    ```
  - print lines starting from dataset about ’Sapporo’ inclusive dataset about ’Seattle’

    ```
    sed -n '/^Sapporo/,/^Seattle/p' city.csv
    ```

- **i**: insert
  - Insert dataset about Karlsruhe at line 2

    ```
    sed '2i Karlsruhe,D,"Baden Wuerttemberg",301452,49.0,6.8' city.csv
    ```
- **d**: delete
  - delete Aachen (inplace)

    ```
    sed -i '/Aachen/ d' city.csv
    ```
  - delete all empty lines

    ```
    sed '/^ *$/d' The-Adventures-of-Tom-Sawyer.txt
    ```
  - delete lines 2-10

    ```
    sed '2,10d' city.csv
    ```
  - delete all <script>..</script> sections in a file

    ```
    sed -Ei '/<script>/,/<\/script>/d' jaccard.html
    ```
  - delete from `<h2>Navigation menu</h2>` to end of file

    ```
    sed -i '/<h2>Navigation menu<\/h2>/,$d' jaccard.html
    ```

sed Examples

- **c**: change
  - Replace entry of Biel

```
sed '/^Biel\b/ c Biel,CH,BE,53308,47.8,7.14' city.csv
```

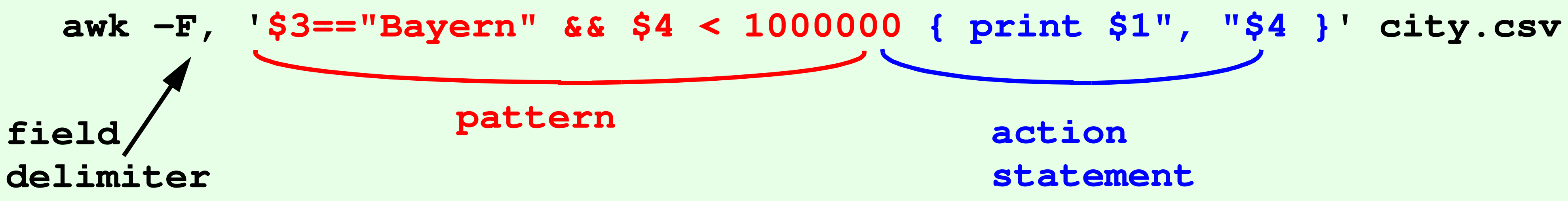
- **a**: append
  - Underline each CHAPTER

```
sed '/^CHAPTER/ a ------------' The-Adventures-of-Tom-Sawyer.txt
```

- ...

awk

- like sed, but with powerful programming language
- filter and report writer
- ideal for processing rows and columns
- suport for associative arrays
- structure: pattern { action statements }
- special BEGIN, END pattern match **before** the first line is read and **after** the last line is read
- Access to column values via $1, $2, ... variables ($0: whole line)
- Examples:



```
awk -F, '$3=="Bayern" && $4 < 1000000 { print $1", "$4 }' city.csv
```

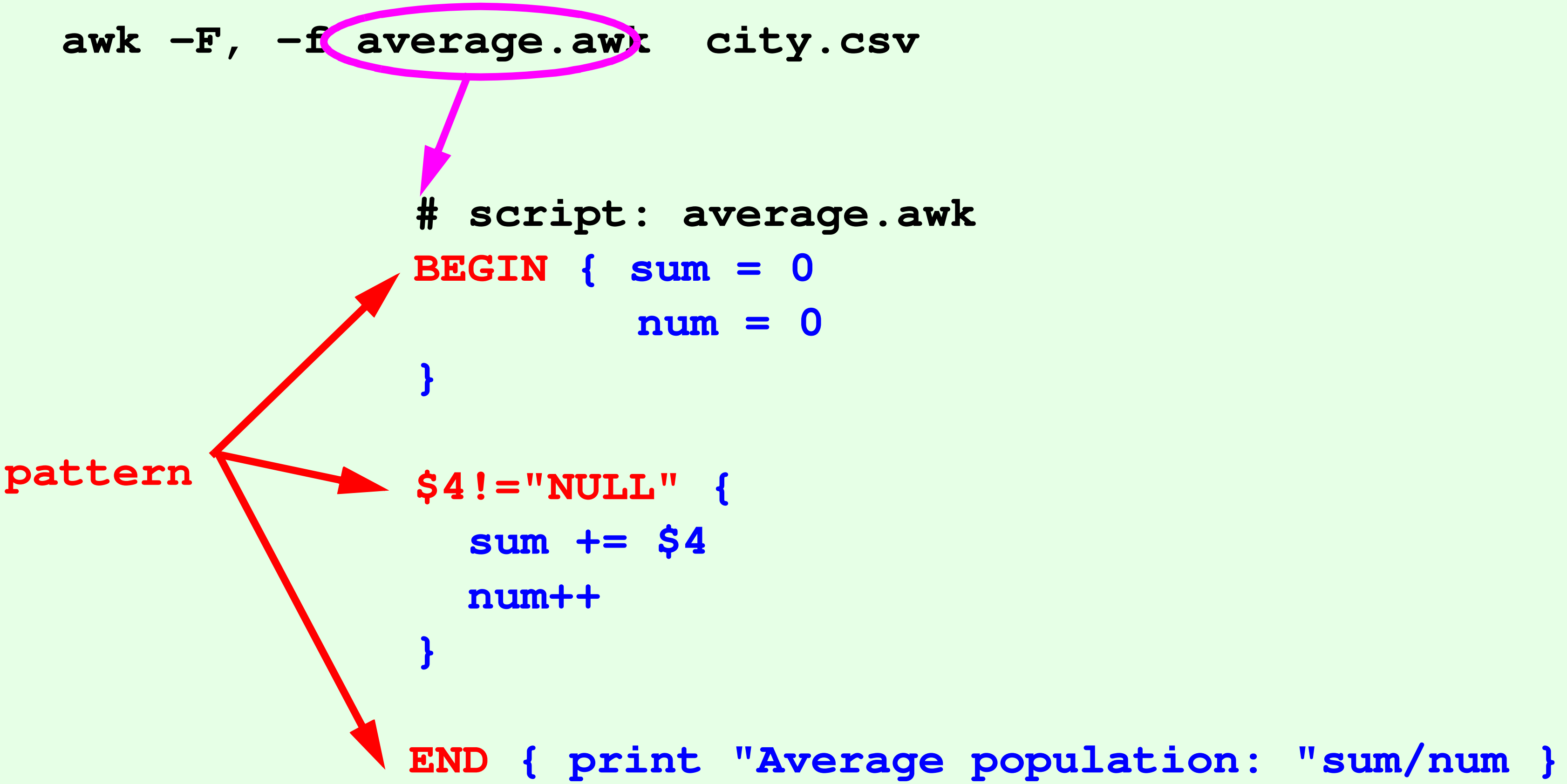
field delimiter

pattern

action statement

awk

- Calculating average population



```
awk -F, -f average.awk  city.csv
```

```
# script: average.awk
BEGIN { sum = 0
        num = 0
}

$4!="NULL" {
   sum += $4
   num++
}

END { print "Average population: "sum/num }
```

- Distribute entries in multiple files (all entries with same value in the first column, should go to the same file)

- awk-file:

append semantic

```
{
     printf "%06d\n", $2 >> "terms/"$1".dat"
}
```

output file

- Call:

```
awk -F':' -f file-redirection-example.awk data.txt’
```

- input format (file data.txt):

```
<string>:<integer>
```

- predefined variables
  - NF: number of fields
  - NR: number of records
  - FS: field separator (default: " ", same as -F from command line)
  - RS: record separator (default: \n)
  - ORS: output record separator
  - FPAT: Field pattern (alternative way to specify a field instead of use of FS)
  - FILENAME

awk example: multi-line input

- Input-file:

```
Andreas Schmidt
KIT
Germany

Petre Dini
IARIA
USA

Fritz Laux
University Reutlingen
Germany
```

- Output (STDOUT):

```
Andreas Schmidt,KIT,Germany
Petre Dini,IARIA,USA
Fritz Laux,University Reutlingen,Germany
```

```
awk -f demo2.awk address.txt
```

```
BEGIN {
    FS="\n"
    RS="\n\n"
    ORS=""
}
{
    for (i=1; i<NF; i++) {
      print $i","
    }
    print $NF"\n"
}
```

becomes $3

awk

- FPAT: Split a line by pattern, rather then by delimiter

- Example:
  - File:

```
12,45,Test, 123.56
13,21,"Test without comma", 345.2
14,71,"Test, with comma", 0.7
```

  - Command:

```
awk -F, '{print $1" : "$3}' fpat-demo.txt
```

  - Output:

```
12 : Test
13 : "Test without comma"
14 : "Test
```

WRONG!!!!!

- Example with FPAT:
  - command:

strings, containing
no comma

matches "..."
(more specific rule)

```
awk 'BEGIN{FPAT = "([^,]*)|(\"[^\"]*\")"}  \
     {print $1" : "$3}' fpat-demo.txt
```

  - Output:

```
12 : Test
13 : "Test without comma"
14 : "Test, with comma"
```

Example file: city.csv

```
Aachen,D,"Nordrhein Westfalen",247113,NULL,NULL
Aalborg,DK,Denmark,113865,10,57
Aarau,CH,AG,NULL,NULL,NULL
Aarhus,DK,Denmark,194345,10.1,56.1
Aarri,WAN,Nigeria,111000,NULL,NULL
Aba,WAN,Nigeria,264000,NULL,NULL
Abakan,R,"Rep. of Khakassiya",161000,NULL,NULL
Abancay,PE,Apurimac,NULL,NULL,NULL
Abeokuta,WAN,Nigeria,377000,NULL,NULL
Aberdeen,GB,Grampian,219100,NULL,NULL
Aberystwyth,GB,Ceredigion,NULL,NULL,NULL
Abidjan,CI,"Cote dIvoire",NULL,-3.6,5.3
```