

## csH redirection

- Redirection of the stdout and stderr (>, >! )

```
% date > filea
% cat < filea
Fri Feb 19 17:59:46 EET 2010
% ls -la > filea
filea: File exists.
% echo A test line > filea
filea: File exists.
% echo This is a test >! filea
% more filea
This is a test
%
```

- You get the above results when the noclobber variable is set
- in csH ‘set noclobber=on’

## Append type redirection

```
% cat a_file
Fri Feb 19 17:38:24 EET 2010
% cat b_file
cat: b_file: No such file or directory
% date >> c_file
% cat c_file
Fri Feb 19 20:54:59 EET 2010
% cat c_file >> a_file
% cat a_file
Fri Feb 19 17:38:24 EET 2010
Fri Feb 19 20:54:59 EET 2010
%
```

## Redirecting inout-redirect

```
#include <stdio.h>
#include <unistd.h>

main(){
int i=0;
while(1) {
    for( i=0; i<3; i++){
        fprintf(stdout,"Guillermo ");    // high-level I/O interface
        write(1,"Guillermo ",10);       // I/O with file descriptor
        fflush(stdout);                  // I/O with file pointer
    }
    fprintf(stdout,"!\n");
    write(2,"U r a smart fella\n",20);   // low-level I/O with fd
    sleep(1);
}
}
```

The *stdout/stderr* of the execution appear as:

```
antoulas@sazerac:~/set001/src$ ./inout-redirect
Guillermo Guillermo Guillermo Guillermo Guillermo Guillermo !
U r a smart fella
Guillermo Guillermo Guillermo Guillermo Guillermo Guillermo !
U r a smart fella
Guillermo Guillermo Guillermo Guillermo Guillermo Guillermo !
U r a smart fella
.....
```

## Directing stdout and stderr to specific files

- send stdout to file out.log

```
antoulas@sazerac:~/set001/src$ ./inout-redir 1> out.log
U r a smart fella
U r a smart fella
U r a smart fella
^C
antoulas@sazerac:~/set001/src$ cat out.log
Guillermo Guillermo Guillermo Guillermo Guillermo Guillermo Guillermo !
Guillermo Guillermo Guillermo Guillermo Guillermo Guillermo !
Guillermo Guillermo Guillermo Guillermo Guillermo
antoulas@sazerac:~/set001/src$
```

- send stdout to out.log and stderr to err.log

```
antoulas@sazerac:~/set001/src$ ./inout-redir 1> out.log 2> err.log
^C
antoulas@sazerac:~/set001/src$ cat out.log
Guillermo Guillermo Guillermo Guillermo Guillermo Guillermo !
Guillermo Guillermo Guillermo Guillermo Guillermo Guillermo !
Guillermo Guillermo Guillermo Guillermo Guillermo
antoulas@sazerac:~/set001/src$ cat err.log
U r a smart fella
U r a smart fella
U r a smart fella
antoulas@sazerac:~/set001/src$
```

## Some More Redirection

- Ways to send output/error to a single file:

```
antoulas@sazerac:~/set001/src$ ./inout-redir >& allout
^C
antoulas@sazerac:~/set001/src$ cat allout
Guillermo Guillermo Guillermo Guillermo Guillermo U r a smart fella
Guillermo !
Guillermo Guillermo Guillermo Guillermo Guillermo U r a smart fella
antoulas@sazerac:~/set001/src$ ./inout-redir &> allout
^C
antoulas@sazerac:~/set001/src$ cat allout
Guillermo Guillermo Guillermo Guillermo Guillermo U r a smart fella
Guillermo !
Guillermo Guillermo Guillermo Guillermo Guillermo U r a smart fella
Guillermo !
Guillermo Guillermo Guillermo Guillermo Guillermo U r a smart fella
antoulas@sazerac:~/set001/src$
```

- And another command flavor...

```
antoulas@sazerac:~/set001/src$ ./inout-redir > allout 2>&1
^C
antoulas@sazerac:~/set001/src$ cat allout
Guillermo Guillermo Guillermo Guillermo Guillermo Guillermo U r a smart fella
Guillermo !
Guillermo Guillermo Guillermo Guillermo Guillermo U r a smart fella
Guillermo !
Guillermo Guillermo Guillermo Guillermo Guillermo U r a smart fella
antoulas@sazerac:~/set001/src$
```

## Filters and Pipes

```
antoulas@sazerac:~/set001/Samples$ !! | grep 6
ls -las | grep 6
total 10436
  4 drwxr-xr-x  3 antoulas _developer    4096 2010-02-19 20:58 .
  4 drwxr-xr-x  6 antoulas _developer    4096 2010-02-19 21:09 ..
  4 drwx-----  2 antoulas _developer    4096 2010-02-19 12:41 Alexdir
  4 -rw-r--r--  1 antoulas _developer      38 2010-02-19 20:56 c_file
  4 -rw-r--r--  1 antoulas _developer     21 2010-02-19 16:45 mytest
10336 -rw-----  1 antoulas _developer 10583040 2010-02-19 12:41 Set-01.ppt
antoulas@sazerac:~/set001/Samples$
antoulas@sazerac:~/set001/Samples$
antoulas@sazerac:~/set001/Samples$ grep 3 lista
john    32  london
filip   23  telaviv
louis   31  heraclion
dimi    34  heraclion
hyseyin 33  izmir
antoulas@sazerac:~/set001/Samples$ grep 3 lista | tail -4 | sort -n +1 -2
filip   23  telaviv
louis   31  heraclion
hyseyin 33  izmir
dimi    34  heraclion
antoulas@sazerac:~/set001/Samples$ grep 3 lista | tail -4 | sort -n +1 -2 | lpr
-Pmypr
antoulas@sazerac:~/set001/Samples$
```

## Sequences and Groups of Commands

```
antoulas@sazerac:~/set001/Samples$ mkdir konnos; cd konnos; ls -las
total 8
4 drwxr-xr-x 2 antoulas _developer 4096 2010-02-19 21:27 .
4 drwxr-xr-x 4 antoulas _developer 4096 2010-02-19 21:27 ..
antoulas@sazerac:~/set001/Samples/konnos$ pwd
/home/antoulas/set001/Samples/konnos
antoulas@sazerac:~/set001/Samples/konnos$
antoulas@sazerac:~/set001/Samples$ mkdir mydir; cd mydir; ls -al;
mkdir: cannot create directory 'mydir': File exists
total 8
drwxr-xr-x 2 antoulas _developer 4096 2010-02-19 21:29 .
drwxr-xr-x 4 antoulas _developer 4096 2010-02-19 21:32 ..
antoulas@sazerac:~/set001/Samples/mydir$ cd ..; rm -rf mydir
antoulas@sazerac:~/set001/Samples$ (mkdir mydir; cd mydir; ls -al;)
total 8
drwxr-xr-x 2 antoulas _developer 4096 2010-02-19 21:34 .
drwxr-xr-x 4 antoulas _developer 4096 2010-02-19 21:34 ..
antoulas@sazerac:~/set001/Samples$
antoulas@sazerac:~/set001/Samples$
```

- ▶ With “grouping” of commands, the shell remains in the original directory.

## Command umask

- ▶ The number of umask indicates which access rights should NOT be given to files to be created.
- ▶ chmod starts off where umask left at.

```

antoulas@sazerac:~/set001/Samples/UMASK$ umask
0022
antoulas@sazerac:~/set001/Samples/UMASK$ touch file1
antoulas@sazerac:~/set001/Samples/UMASK$ mkdir alex
antoulas@sazerac:~/set001/Samples/UMASK$ ls -l -sa
total 12
4 drwxr-xr-x 3 antoulas _developer 4096 2010-02-19 22:53 .
4 drwxr-xr-x 5 antoulas _developer 4096 2010-02-19 22:53 ..
4 drwxr-xr-x 2 antoulas _developer 4096 2010-02-19 22:53 alex
0 -rw-r--r-- 1 antoulas _developer 0 2010-02-19 22:53 file1
antoulas@sazerac:~/set001/Samples/UMASK$ umask 077
antoulas@sazerac:~/set001/Samples/UMASK$ touch file2
antoulas@sazerac:~/set001/Samples/UMASK$ mkdir alex2
antoulas@sazerac:~/set001/Samples/UMASK$ ls -las
total 16
4 drwxr-xr-x 4 antoulas _developer 4096 2010-02-19 22:54 .
4 drwxr-xr-x 5 antoulas _developer 4096 2010-02-19 22:53 ..
4 drwxr-xr-x 2 antoulas _developer 4096 2010-02-19 22:53 alex
4 drwx----- 2 antoulas _developer 4096 2010-02-19 22:54 alex2
0 -rw-r--r-- 1 antoulas _developer 0 2010-02-19 22:53 file1
0 -rw----- 1 antoulas _developer 0 2010-02-19 22:54 file2
antoulas@sazerac:~/set001/Samples/UMASK$ umask 022
antoulas@sazerac:~/set001/Samples/UMASK$ rm file1 file2 ; rmdir alex alex2
antoulas@sazerac:~/set001/Samples/UMASK$

```



# Metacharacters

- \* : matches any number (zero or more) of characters
- ? : matches one exactly character
- $[c_1c_2c_3\dots c_n]$ : matches exactly one character from set:  
 $\{c_1c_2c_3\dots c_n\}$
- $[c_1-c_n]$ : matches exactly one character from those in the range  $c_1-c_n$

# Metacharacter-Examples with ls

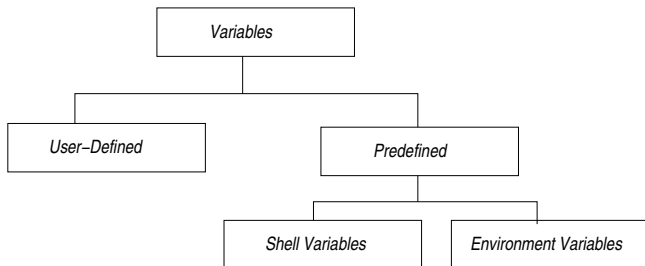
```
antoulas@sazerac:~/set001/Samples$ ls -dF ???
aaa sss/ sts/ usr/ uuu/ zzz
antoulas@sazerac:~/set001/Samples$ ls *z*
all-lists.zip mylists.zip mylist.tar.gz mylist.zip zzz
antoulas@sazerac:~/set001/Samples$ ls -l *[uz]*
-rw-r--r-- 1 antoulas _developer 1123 2010-03-02 00:56 all-lists.zip
-rw-r--r-- 1 antoulas _developer 0 2010-03-02 00:56 mylout
-rw-r--r-- 1 antoulas _developer 1123 2010-03-02 00:56 mylists.zip
-rw-r--r-- 1 antoulas _developer 443 2010-03-02 00:56 mylist.tar.gz
-rw-r--r-- 1 antoulas _developer 1123 2010-03-02 00:56 mylist.zip
-rw-r--r-- 1 antoulas _developer 20 2010-03-02 00:56 out1
-rw-r--r-- 1 antoulas _developer 72 2010-03-02 00:56 zzz

usr:
total 0

uuu:
total 0
antoulas@sazerac:~/set001/Samples$ ls *[a-z][uz][b-z]*
mylout out1 zzz

uuu:
antoulas@sazerac:~/set001/Samples$ ls [Mm]ylists*
mylists.tar mylists.zip
antoulas@sazerac:~/set001/Samples$
```

# Variables



- ▶ **Predefined Variables:**
  - ▶ *Shell Variables*: used to configure shell (ie, setting the internal field separator which is often a space or tab).
  - ▶ *Environment Variables*: used to configure the environment (ie, a system variable determines which editor to edit the history file).
- ▶ *User defined Variables*: created by the users for storing values; may start with an alphabetic or `_` character.

## setting & unsetting environment variables with csh

```
perth:/home/users/antoulas>printenv | head -6
USER=antoulas
HOME=/home/users/antoulas
PATH=/usr/bin/X11:/bin:/usr/bin:/usr/ucb:/usr/etc:/usr/local/bin
SHELL=/usr/local/bin/csh
TZ=EET
SSH_TTY=/dev/pts/2
perth:/home/users/antoulas>setenv ALEX antoulas
perth:/home/users/antoulas>printenv | tail -3
TEXINPUTS=:/home/users/antoulas/tex
ICAROOT=/home/appl/ICAClient
ALEX=antoulas
perth:/home/users/antoulas>echo $ALEX
antoulas
perth:/home/users/antoulas>unsetenv ALEX
perth:/home/users/antoulas>printenv | tail -2
TEXINPUTS=:/home/users/antoulas/tex
ICAROOT=/home/appl/ICAClient
perth:/home/users/antoulas>
```

## setting/unsetting local & shell variables (bash)

```
antoulas@sazerac:~$ set | head -4
BASH=/bin/bash
BASH_ALIASES=()
BASH_ARGC=()
BASH_ARGV=()
antoulas@sazerac:~$ MYVAR="alexis"
antoulas@sazerac:~$ echo MYVAR
MYVAR
antoulas@sazerac:~$ echo $MYVAR
alexis
antoulas@sazerac:~$ set | grep MYVAR
MYVAR=alexis
antoulas@sazerac:~$ unset MYVAR
antoulas@sazerac:~$ echo $MYVAR

antoulas@sazerac:~$
antoulas@sazerac:~$ set | grep MYVAR
antoulas@sazerac:~$
```

# History in bash

```
antoulas@sazerac:~/set001$ ls -la *tex
-rw-r--r-- 1 antoulas _developer 48821 2010-02-20 11:17 set001.tex
antoulas@sazerac:~/set001$ pwd
/home/antoulas/set001
antoulas@sazerac:~/set001$ ls *set*
set001.aux  set001.log  set001.out  set001.snm  set001.tex.bak
set001.dvi  set001.nav  set001.ps   set001.tex  set001.toc
antoulas@sazerac:~/set001$ echo this is work in progress
this is work in progress
antoulas@sazerac:~/set001$ history | tail -5
 511  ls -la *tex
 512  pwd
 513  ls *set*
 514  echo this is work in progress
 515  history | tail -5
antoulas@sazerac:~/set001$ !511
ls -la *tex
-rw-r--r-- 1 antoulas _developer 48821 2010-02-20 11:17 set001.tex
antoulas@sazerac:~/set001$ !pw
pwd
/home/antoulas/set001
antoulas@sazerac:~/set001$ date
Sat Feb 20 11:35:08 EET 2010
antoulas@sazerac:~/set001$ history | tail -3
 517  pwd
 518  date
 519  history | tail -3
antoulas@sazerac:~/set001$ !da
date
Sat Feb 20 11:35:24 EET 2010
antoulas@sazerac:~/set001$
```

## history in csh

```
perth:/home/users/antoulas>set history=5
perth:/home/users/antoulas>history
 39 11:48 history
 40 11:48 ls x2del.*
 41 11:48 ls x2del.* TP
 42 11:48 set history=5
 43 11:48 history
perth:/home/users/antoulas>!ls
ls x2del.* TP
TP: No such file or directory
x2del.pdf      x2del.qxp.pdf
perth:/home/users/antoulas>ls TPD*
TPDS-0026-0206.pdf  TPDS-0026-0206.ps
perth:/home/users/antoulas>!!
ls TPD*
TPDS-0026-0206.pdf  TPDS-0026-0206.ps
perth:/home/users/antoulas>!41
ls x2del.* TP
TP: No such file or directory
x2del.pdf      x2del.qxp.pdf
perth:/home/users/antoulas>
```

## alias-ing within the shell

```

antoulas@sazerac:~/set001$ alias
alias egrep='egrep --color=auto'
alias grep='grep --color=auto'
alias ls='ls --color=auto'
antoulas@sazerac:~/set001$ cd Samples/
antoulas@sazerac:~/set001/Samples$ ls
!      Alexdir  b_file  antoulas  lista    lista3  out1      UMASK
aaa    bb         c_file  d_file    lista1   mydir    Set-01.ppt zzz
a_file bbbb      dddd    eeee      lista2   mytest   sfile
antoulas@sazerac:~/set001/Samples$ alias
alias egrep='egrep --color=auto'
alias grep='grep --color=auto'
alias ls='ls --color=auto'
antoulas@sazerac:~/set001/Samples$ alias dir='ls -sa'
antoulas@sazerac:~/set001/Samples$ dir *bb
4 bb 4 bbbb
antoulas@sazerac:~/set001/Samples$ alias lls='ls -las'
antoulas@sazerac:~/set001/Samples$ alias mydir='ls;pwd'
antoulas@sazerac:~/set001/Samples$ mydir
!      Alexdir  b_file  antoulas  lista    lista3  out1      UMASK
aaa    bb         c_file  d_file    lista1   mydir    Set-01.ppt zzz
a_file bbbb      dddd    eeee      lista2   mytest   sfile
/home/antoulas/set001/Samples
antoulas@sazerac:~/set001/Samples$ unalias lls mydir
antoulas@sazerac:~/set001/Samples$ alias
alias dir='ls -sa'
alias egrep='egrep --color=auto'
alias grep='grep --color=auto'
alias ls='ls --color=auto'
antoulas@sazerac:~/set001/Samples$

```



# Process Management

ps	display status of the processes
jobs	display interrupted processes
kill	kill a specific process
bg	set a process in "background" processing
fg	set a process in "foreground" processing
top	show status of processor(s), memory, running programs

## Working with bg, and fg

```
antoulas@sazerac:~/set001$ ./a.out
^Z
[3]+  Stopped                  ./a.out
antoulas@sazerac:~/set001$ jobs
[1]  Running                    make &
[2]-  Running                    gv set001.ps &
[3]+  Stopped                  ./a.out
antoulas@sazerac:~/set001$ bg
[3]+ ./a.out &
antoulas@sazerac:~/set001$ jobs
[1]  Running                    make &
[2]-  Running                    gv set001.ps &
[3]+  Running                   ./a.out &
antoulas@sazerac:~/set001$ fg %3
./a.out
^Z
[3]+  Stopped                  ./a.out
antoulas@sazerac:~/set001$ kill %3
[3]+  Terminated             ./a.out
antoulas@sazerac:~/set001$ ps
  PID TTY          TIME CMD
 2659 pts/0    00:00:00 bash
 2695 pts/0    00:00:00 gv
 2739 pts/0    00:03:17 soffice.bin
 3406 pts/0    00:00:00 gs
 3448 pts/0    00:00:00 ps
antoulas@sazerac:~/set001$
```

# Command top

```
top - 13:18:11 up 3:20, 5 users, load average: 0.00, 0.00, 0.00
Tasks: 181 total, 3 running, 178 sleeping, 0 stopped, 0 zombie
Cpu(s): 1.2%us, 1.0%sy, 0.0%ni, 97.9%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0%st
Mem: 2061416k total, 1311888k used, 749528k free, 157420k buffers
Swap: 4883720k total, 0k used, 4883720k free, 642324k cached
```

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
1807	antoulas	20	0	156m	4896	3672	R	2	0.2	1:48.90	pulseaudio
1946	antoulas	20	0	422m	117m	33m	S	1	5.8	7:41.66	firefox
1248	root	20	0	305m	38m	11m	S	1	1.9	4:32.62	Xorg
3515	antoulas	20	0	2472	1204	884	R	1	0.1	0:00.18	top
1851	antoulas	20	0	104m	14m	10m	S	0	0.7	0:07.31	metacity
2933	antoulas	20	0	149m	80m	25m	S	0	4.0	0:24.08	acoread
1	root	20	0	2664	1552	1128	S	0	0.1	0:00.85	init
2	root	15	-5	0	0	0	S	0	0.0	0:00.00	kthreadd
3	root	RT	-5	0	0	0	S	0	0.0	0:00.00	migration/0
4	root	15	-5	0	0	0	S	0	0.0	0:00.36	ksoftirqd/0
5	root	RT	-5	0	0	0	S	0	0.0	0:00.00	watchdog/0
6	root	RT	-5	0	0	0	S	0	0.0	0:00.00	migration/1
7	root	15	-5	0	0	0	S	0	0.0	0:00.60	ksoftirqd/1
8	root	RT	-5	0	0	0	S	0	0.0	0:00.00	watchdog/1
.....											

## Dealing with Multiple Jobs in the Background..

```
antoulas@sazerac:~/set001/src$ sleep 100 & sleep 200 & sleep 300 & sleep 400 &
[1] 7238
[2] 7239
[3] 7240
[4] 7241
antoulas@sazerac:~/set001/src$ jobs
[1]  Running                sleep 100 &
[2]  Running                sleep 200 &
[3]- Running                sleep 300 &
[4]+ Running                sleep 400 &
antoulas@sazerac:~/Dropbox/k24/Transparencies/set001/src$
```

→ What are these pluses/minuses?

```
antoulas@sazerac:~/Dropbox/k24/Transparencies/set001/src$ fg
sleep 400
^C
antoulas@sazerac:~/Dropbox/k24/Transparencies/set001/src$ jobs
[1]  Running                sleep 100 &
[2]- Running                sleep 200 &
[3]+ Running                sleep 300 &
antoulas@sazerac:~/Dropbox/k24/Transparencies/set001/src$ fg
sleep 300
^C
antoulas@sazerac:~/Dropbox/k24/Transparencies/set001/src$ jobs
[1]- Running                sleep 100 &
[2]+ Running                sleep 200 &
antoulas@sazerac:~/Dropbox/k24/Transparencies/set001/src$ fg
sleep 200
^C
antoulas@sazerac:~/Dropbox/k24/Transparencies/set001/src$ jobs
[1]+ Running                sleep 100 &
antoulas@sazerac:~/Dropbox/k24/Transparencies/set001/src$ fg
```

## Compression of files

- ▶ create flat version of files and directories with *tar* or *zip*
- ▶ compress their size with *gzip*

```
antoulas@sazerac:~/set001/Samples$ tar cvf mylist.tar lista*
lista
lista1
lista2
lista3
antoulas@sazerac:~/set001/Samples$ zip mylist.zip lista*
  adding: lista (deflated 26%)
  adding: lista1 (deflated 26%)
  adding: lista2 (deflated 26%)
  adding: lista3 (deflated 26%)
antoulas@sazerac:~/set001/Samples$ ls -l mylist.*
-rw-r--r-- 1 antoulas _developer 10240 2010-02-20 16:54 mylist.tar
-rw-r--r-- 1 antoulas _developer  1123 2010-02-20 16:54 mylist.zip
antoulas@sazerac:~/set001/Samples$ gzip mylist.tar
antoulas@sazerac:~/set001/Samples$ !ls
ls -l mylist.*
-rw-r--r-- 1 antoulas _developer  443 2010-02-20 16:54 mylist.tar.gz
-rw-r--r-- 1 antoulas _developer 1123 2010-02-20 16:54 mylist.zip
antoulas@sazerac:~/set001/Samples$
```

## Decompression of .gz .zip files

- ▶ zcat: does not alter the structure of the compressed file.
- ▶ decompression: gunzip or unzip

```
antoulas@sazerac:~/set001/Samples$ zcat mylists.tar.gz | tar xv
lista
lista1
lista2
lista3
antoulas@sazerac:~/set001/Samples$ gunzip mylists.tar.gz
antoulas@sazerac:~/set001/Samples$ ls -l mylists.*
-rw-r--r-- 1 antoulas _developer 10240 2010-02-20 16:42 mylists.tar
-rw-r--r-- 1 antoulas _developer 1123 2010-02-20 16:42 mylists.zip
antoulas@sazerac:~/set001/Samples$ unzip mylists.zip
Archive:  mylists.zip
replace lista? [y]es, [n]o, [A]ll, [N]one, [r]ename: A
  inflating: lista
  inflating: lista1
  inflating: lista2
  inflating: lista3
antoulas@sazerac:~/set001/Samples$
```

## Other commands

<code>tr</code>	translate or delete characters in files
<code>colrm</code>	delete columns from file
<code>find</code>	locate file/catalogs in an FS
<code>script</code>	record the interaction with the shell
<code>sleep</code>	wait for a number of seconds
<code>last</code>	last appearances of user(s)
<code>clear</code>	clear tty

## Using tr

```
antoulas@sazerac:~/set001/Samples$ cat test1
This is a test - test FILE
of manuscript that is to be
served as a subpoena
to the jurors of the court
antoulas@sazerac:~/set001/Samples$ tr acbdef ijklm < test1
This is i tmst - tmst FILE
om minusjript thit is to km
smrvml is i sukpomni
to thm jurors om thm jourt
antoulas@sazerac:~/set001/Samples$ tr -d '[i-l]s' <test1
Th a tet - tet FILE
of manucrpt that to be
erved a a ubpoena
to the uror of the court
antoulas@sazerac:~/set001/Samples$
```



## Using colrm

```
antoulas@sazerac:~/set001/Samples$ colrm 8 15 < lista1
123:jimn:2103456789:reading
345:petel:4567891234:london
673:pet:9602345612:sydney
133:time:3452678967:moscow
231:kitilata:2138905674:athens
antoulas@sazerac:~/set001/Samples$ colrm 10 < lista1
123:jim:m
345:peter
673:pete:
133:time:
231:kitri
antoulas@sazerac:~/set001/Samples$ ls -ald mydir
drwxr-xr-x 2 antoulas _developer 4096 2010-02-19 21:34 mydir
antoulas@sazerac:~/set001/Samples$ ls -ald mydir | colrm 11 55
drwxr-xr-x
antoulas@sazerac:~/set001/Samples$ ls -ald mydir | colrm 11 44
drwxr-xr-x mydir
antoulas@sazerac:~/set001/Samples$ ls -ald * | colrm 11 44 | grep zip
-rw-r--r-- all-lists.zip
-rw-r--r-- mylists.zip
-rw-r--r-- mylist.zip
antoulas@sazerac:~/set001/Samples$
```

## Command find

```

antoulas@sazerac:~$ find SysProMaterial -name '*dvi*' -print
syspro_sockets_presentation/syspro_sockets_presentation/sockIPC.dvi
syspro_sockets_presentation/sockIPC.dvi
set001/set001.dvi
PERNASVIP-kickoff/myprese.dvi
antoulas@sazerac:~$ find . -name set001.ps -print
./set001/set001.ps
antoulas@sazerac:~/$ find .. -type d -name '*Set*' -exec file '{} ' \;
../set001: directory
../K24/Set-3-Code: directory
../K24/Set-4-Code: directory
antoulas@sazerac:~/$
antoulas@sazerac:~/$ find . -type f -name '*tex' -exec ls -l '{} ' \;
-rw-r--r-- 1 antoulas _developer 6317 2010-02-15 21:22 ./Admin/k24-syllabus10.
tex
-rwx----- 1 antoulas _developer 1103 2010-02-15 21:22 ./Admin/Bebaiwsi.tex
-rwxr-xr-x 1 antoulas _developer 25200 2010-02-15 21:22 ./
syspro_sockets_presentation/sockIPC.tex
-rwxr-xr-x 1 antoulas _developer 25200 2010-02-15 21:22 ./
syspro_sockets_presentation/syspro_sockets_presentation/sockIPC.tex
-rw-r--r-- 1 antoulas _developer 59746 2010-02-20 18:10 ./set001/set001.tex
-rw-r--r-- 1 antoulas _developer 58694 2010-02-19 12:41 ./set001/_sockIPC.tex
-rwxr-xr-x 1 antoulas _developer 26056 2010-02-15 21:22 ./PERNASVIP-kickoff/
myprese.tex
antoulas@sazerac:~/$
antoulas@sazerac:~/$ find /usr/ -perm 664 -print
/usr/local/share/texmf/ls-R
antoulas@sazerac:~/$ find /usr/ -perm 664
/usr/local/share/texmf/ls-R
antoulas@sazerac:~/$

```

## Commands: last, script, sleep, clear

```
antoulas@sazerac:~/set001$ last -n 5
antoulas pts/4          :0.0          Sat Feb 20 20:11    still logged in
antoulas pts/3          :0.0          Sat Feb 20 18:19    still logged in
antoulas pts/3          :0.0          Sat Feb 20 11:31 - 18:19    (06:47)
antoulas pts/3          :0.0          Sat Feb 20 11:28 - 11:31    (00:02)
antoulas pts/2          :0.0          Sat Feb 20 11:00    still logged in

wtmp begins Wed Feb  3 20:05:09 2010
antoulas@sazerac:~/set001$ script mysession
Script started, file is mysession
antoulas@sazerac:~/set001$ ls *tex
set001.tex
antoulas@sazerac:~/set001$ pwd
/home/antoulas/set001
antoulas@sazerac:~/set001$ exit
Script done, file is mysession
antoulas@sazerac:~/set001$ cat mysession
Script started on Sat 20 Feb 2010 08:29:09 PM EET
antoulas@sazerac:~/set001$ ls *tex
set001.tex
antoulas@sazerac:~/set001$ pwd
/home/antoulas/set001
antoulas@sazerac:~/set001$ exit

Script done on Sat 20 Feb 2010 08:29:17 PM EET
antoulas@sazerac:~/set001$ rm mysession
antoulas@sazerac:~/set001$ date; sleep 10; date
Sat Feb 20 20:31:25 EET 2010
Sat Feb 20 20:31:35 EET 2010
antoulas@sazerac:~/set001$ clear;
```

## Compiling with `gcc`

- ▶ (Separate) compilation of C/C++ programs: `gcc/g++`

```
antoulas@sazerac:~/set001/Sample-C/SampleGCC$ ls
InputFile      LinkedList.c  main.c       MyHeader.h    OrderedLinkedList.h
InputFile.out  LinkedList.h  Makefile     OrderedLinkedList.c
antoulas@sazerac:~/set001/Sample-C/SampleGCC$
antoulas@sazerac:~/set001/Sample-C/SampleGCC$ gcc -c main.c
antoulas@sazerac:~/set001/Sample-C/SampleGCC$ gcc -c LinkedList.c
antoulas@sazerac:~/set001/Sample-C/SampleGCC$ gcc -c OrderedLinkedList.c
antoulas@sazerac:~/set001/Sample-C/SampleGCC$ gcc main.o LinkedList.o
OrderedLinkedList.o -o myexe
antoulas@sazerac:~/set001/Sample-C/SampleGCC$ ./myexe
expected syntax: myexe inputfile
```

## Using Makefile

- ▶ An easy way to organize separate compilation of programs and activities
- ▶ The basic format of Makefile command is:  
*target: required-files*  
*TAB* → *command*
- ▶ The existence of TAB before the command above is **imperative**; otherwise, makefile does not work! (strange but that is the way it goes).
- ▶ The *required-files* have to be “done” before the *target* is realized.
- ▶ If *required-files* have not “changed” then the command of the Makefile does not get executed (things are up to date).
- ▶ Often, the final target of a Makefile is termed *all*.
- ▶ There is also a target named *clean* that purges all \*.o and executable files.

# Makefile

```
# In order to execute this "Makefile" just type "make" -A. Ntoulas (antoulas@di.uoa.gr)
OBJS      = main.o LinkedList.o OrderedLinkedList.o
SOURCE    = main.c LinkedList.c OrderedLinkedList.c
HEADER    = MyHeader.h LinkedList.h OrderedLinkedList.h
OUT       = myexe
CC        = gcc
FLAGS     = -g -c
# -g for debugging mode ; -c for objects file creation

$(OUT): $(OBJS)
        $(CC) -g $(OBJS) -o $@

# create/compile the individual files >>separately<<
main.o: main.c
        $(CC) $(FLAGS) main.c

LinkedList.o: LinkedList.c
        $(CC) $(FLAGS) LinkedList.c

OrderedLinkedList.o: OrderedLinkedList.c
        $(CC) $(FLAGS) OrderedLinkedList.c

# clean house
clean:
        rm -f $(OBJS) $(OUT)

# do a bit of accounting
count:
        wc $(SOURCE) $(HEADER)
```

```
OBJS = main.o iodat.o dorun.o
LIB = /usr/lib/crtn.o
CC = /usr/bin/gcc

program: ${OBJ} ${LIB} mylibops.a
        ${CC} -o $@ ${OBJS} ${LIB} mylibops.a

main.o: main.c
        ${CC} -c $?

iodat.o: iodat.c
        ${CC} -c $?

dorun.o: dorun.c
        ${CC} -c $?

mylibops.a: interact.o sched.o gen.o
        ar r $@ $?

interact.o: interact.c
        ${CC} -c $?

gen.o: gen.c
        ${CC} -c $?

sched.o: sched.c
        ${CC} -c $?
```

- ▶  `$?`  : current list of prerequisites
- ▶  `$@`  : current target