



bwHPC – C5

# Linux: Basic Concepts and Command Line Usage

## Unit 2

### Process Monitoring, Redirection



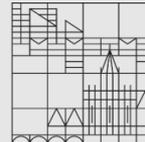
UNIVERSITÄT  
HEIDELBERG  
ZUKUNFT  
SEIT 1386

Hochschule  
für Technik  
Stuttgart



**Hochschule Esslingen**  
University of Applied Sciences

Universität  
Konstanz



UNIVERSITÄT  
MANNHEIM



Universität Stuttgart

EBERHARD KARLS  
UNIVERSITÄT  
TÜBINGEN



**KIT**  
Karlsruher Institut für Technologie



ulm university universität  
**uulm**



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# Outline

- Redirection
- Process Management
- Debugging Tools

# Redirection and pipes

## ■ Redirect output

- `program` prints everything to the terminal
- `program > out.txt` stdout → file
- `program 2> out.txt` stderr → file
- `program &> out.txt` stdout AND stderr → file
  
- `program | otherprogram` stdout becomes the input of otherprogram



# Redirection and pipes

## ■ Pipes

- `ls -l | less` This command takes the output of the long format directory list command "ls -l" and pipes it through the "less" command
- `du -sch * | sort -n | tail`  
"du -sch \*" lists the sizes of all files and directories, "sort -h" orders the output from smallest to largest size, "tail" displays last few

## ■ Example output:

```
146M    Programming
403M    sage-6.3.tar.gz
1.4G    Downloads
4.6G    sage-6.3
7.2G    total
```

# Process management

- Show running processes

- top

List of run processes

- htop

Extended version of “top”

- Shortcuts (examples):

- F1 help screen

- u show only processes which belong to a certain user

- F9 kill a process  
SIGTERM signal or SIGKILL

# Process management

```
1 [|||||] 8.9% Tasks: 147, 445 thr; 1 running
2 [|||||] 7.6% Load average: 0.18 0.16 0.14
3 [|||||] 10.7% Uptime: 16:01:04
4 [|||||] 9.0%
Mem [|||||] 2227/7948MB
Swp [|||||] 0/9535MB

PID USER PRI NI VIRT RES SHR S CPU% MEM% TIME+ Command
1161 root 20 0 318M 148M 60720 S 11.3 1.9 6:12.88 /usr/bin/X :0 vt7 -br -nolisten tcp -auth /var/run/xauth/A:0-om4E9b
6936 matze 20 0 303M 40896 34724 S 7.5 0.5 0:00.30 /usr/bin/ksnapshot -caption KSnapshot
2100 matze 20 0 3098M 138M 96204 S 2.3 1.7 3:30.03 kwin -session 10134f713914d000135650842600000031790000_1421957184_419758
2109 matze 20 0 3938M 191M 91524 S 1.4 2.4 5:46.47 /usr/bin/plasma-desktop
2592 matze 20 0 451M 50540 35832 S 0.5 0.6 1:27.18 /usr/bin/konsole
6917 matze 20 0 25240 4492 2964 R 0.5 0.1 0:00.14 htop
822 root 20 0 4248 1672 1528 S 0.5 0.0 0:18.73 /usr/sbin/acpid
11339 matze 20 0 1788M 261M 134M S 0.5 3.3 10:26.25 /usr/lib/libreoffice/program/soffice.bin --impress /media/share/Windows-Dokumente/bwhpc_intro/linux_basics
2138 matze 20 0 1733M 40444 9964 S 0.5 0.5 0:14.91 /usr/sbin/mysqld --defaults-file=/home/matze/.local/share/akonadi/mysql.conf --datadir=/home/matze/.local/
3819 matze 20 0 1405M 195M 78828 S 0.5 2.5 0:06.50 /usr/lib/chromium/chromium --type=renderer --enable-deferred-image-decoding --lang=en-US --force-fieldtria
32263 matze 20 0 3938M 191M 91524 S 0.0 2.4 0:00.03 /usr/bin/plasma-desktop
1984 matze 20 0 43152 3472 2044 S 0.0 0.0 0:00.73 /usr/bin/dbus-daemon --fork --print-pid 5 --print-address 7 --session
2021 matze 20 0 1290M 65064 39728 S 0.0 0.8 0:02.10 kdeinit4: kded4 [kdeinit]
2337 matze 20 0 318M 35896 31508 S 0.0 0.4 0:00.22 /usr/bin/akonadi_agent_launcher akonadi_contacts_resource akonadi_contacts_resource 0
6028 matze 20 0 3364M 192M 99848 S 0.0 2.4 1:34.03 /usr/lib/chromium/chromium --ppapi-flash-path=/usr/lib/pepperflashplugin-nonfree/libpepflashplayer.so --pp
6069 matze 20 0 847M 238M 120M S 0.0 3.0 2:51.43 /usr/lib/chromium/chromium --type=gpu-process --channel=6028.0.1020725055 --supports-dual-gpus=false --gpu
6935 matze 20 0 3938M 191M 91524 S 0.0 2.4 0:00.02 /usr/bin/plasma-desktop
2116 matze 20 0 9788 2320 1884 S 0.0 0.0 0:18.94 ksysguardd
2155 matze 20 0 1733M 40444 9964 S 0.0 0.5 0:02.97 /usr/sbin/mysqld --defaults-file=/home/matze/.local/share/akonadi/mysql.conf --datadir=/home/matze/.local/
1152 root 20 0 24100 5700 2976 S 0.0 0.1 0:18.60 /bin/bash /usr/sbin/fancontrol
2213 matze 20 0 449M 76688 55220 S 0.0 0.9 0:00.73 python /usr/bin/printer-applet
2422 matze 20 0 881M 218M 79256 S 0.0 2.8 1:13.79 /usr/bin/icedove
2427 matze 20 0 881M 218M 79256 S 0.0 2.8 0:00.85 /usr/bin/icedove
1 root 20 0 173M 5948 3244 S 0.0 0.1 0:01.05 /sbin/init
213 root 20 0 33088 4652 4260 S 0.0 0.1 0:00.31 /lib/systemd/systemd-journald
227 root 20 0 41892 4024 2792 S 0.0 0.0 0:00.10 /lib/systemd/systemd-udev
540 root 20 0 11348 2876 1924 S 0.0 0.0 0:02.35 /sbin/mount.ntfs-3g /dev/sdb1 /media/share -n -o rw,noexec
624 root 20 0 37068 2680 2260 S 0.0 0.0 0:00.03 /sbin/rpcbind -w
649 statd 20 0 37268 2972 2380 S 0.0 0.0 0:00.00 /sbin/rpc.statd
687 root 20 0 23348 200 4 S 0.0 0.0 0:00.00 /usr/sbin/rpc.idmapd
775 root 20 0 252M 3600 2764 S 0.0 0.0 0:00.02 /usr/sbin/rsyslogd -n
776 root 20 0 252M 3600 2764 S 0.0 0.0 0:00.00 /usr/sbin/rsyslogd -n
778 root 20 0 252M 3600 2764 S 0.0 0.0 0:00.03 /usr/sbin/rsyslogd -n
741 root 20 0 252M 3600 2764 S 0.0 0.0 0:00.07 /usr/sbin/rsyslogd -n
743 daemon 20 0 19012 1828 1668 S 0.0 0.0 0:00.00 /usr/sbin/atd -f
748 root 20 0 55160 5348 4680 S 0.0 0.1 0:00.01 /usr/sbin/sshd -D
802 root 20 0 348M 13244 11140 S 0.0 0.2 0:00.00 /usr/sbin/NetworkManager --no-daemon
809 root 20 0 348M 13244 11140 S 0.0 0.2 0:00.00 /usr/sbin/NetworkManager --no-daemon
```

F1 Help F2 Setup F3 Search F4 Filter F5 Tree F6 SortBy F7 Nice - F8 Nice + F9 Kill F10 Quit



# Debugging Tools

... when ps, top etc are not enough...

- strace: prints all system calls a process does  
usual usage: `strace -e open someprogram`
- lsof: shows all open files
- gdb: the gnu debugger

# shell scripts

- Shell script: list of shell commands in a file

- Example: `script1.sh`

```
cd $HOME
```

```
echo "Biggest files in my home directory:"
```

```
du -sch * | sort -n | tail
```

- Make this file executable:

```
chmod u+x script1.sh
```

- Start the script:

```
./script1.sh
```

# shell scripts

- **Very bad** example script (**do not execute** this script):

```
cd $HOME
```

```
...
```

```
cd $HOME/oldtmp
```

```
rm -rf *
```

- Why is this bad?

# shell scripts

■ Better:

```
■ if [ -d $HOME/oldtmp ]  
  then  
    cd $HOME/oldtmp  
    rm -rf *  
  else  
    echo "directory does not exist"  
  fi
```