Introduction au projet Minix

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Get and start Minix

- Connect to an INGI-machine. (from the outside, pass via sirius.info.ucl.ac.be)

```
christoph@cpaasch-mac:~$ ssh cpaasch@intel01.info.ucl.ac.be
Last login: Thu Apr  7 10:24:07 2011 from 130.104.228.14
-bash-3.2$
```

- Create a dedicated directory and move into it.

```
-bash-3.2$ mkdir INGI1113
-bash-3.2$ cd INGI1113
-bash-3.2$ pwd
/etinfo/users2/cpaasch/INGI1113
```

Get and start Minix

- Get the Makefile

```
-bash-3.2$ curl -L http://goo.gl/rnRFC -o Makefile
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100  2856  100  2856    0     0  39805      0 --:--:-- --:--:-- --:--:-- 39805
-bash-3.2$ ls
Makefile
```

- What options does `make` supports ?

```
-bash-3.2$ make
Utilisez 'make <target>' ou <target> est :
  init          pour initialiser le repertoire du projet
  run           pour executer la machine virtuelle (en console)
  run_x11       pour executer la machine virtuelle (en fenetre)
  patch         pour generer le patch
  dist          pour generer une archive comprenant le patch, le
                rapport et le dossier test.
  clean         supprime l'archive et le patch
  mrproper      supprime les disques virtuels
-bash-3.2$
```

Get and start Minix

- Initialize Minix - downloads part of the minix source-code (the rest is linked with symbolic links).

```
-bash -3.2$ make init
 Creation du disque virtuel: minix_local.cow... done.
 Creation du disque virtuel: additional_disk.img... done.
 Creation du dossier: src... done.
 Creation du lien symbolique: src_orig... done.
 Creation du dossier: test... done.
```

- Launch Minix and select the kernel to boot on.

```
-bash -3.2$ make run
....
SeaBIOS (version 0.6.1.2-20110201_165504-titi)

gPXE (http://etherboot.org) - 00:03.0 C900 PCI2.10 PnP BBS PMM0FE0@10 C900

 Booting from Hard Disk...

-- Welcome to MINIX 3. This is the boot monitor. --

By default, MINIX 3 will automatically load in 3 seconds.

 Press ESC to enter the monitor for special configuration.

 Hit a key as follows:

    1  Start MINIX 3
    3  Start Custom MINIX 3
```

Get and start Minix

- Login to minix with "root"

```
Starting services: random e1000 inete1000#0: Intel PRO/1000 MT Desktop Adapter (
8086/100e/00) at 0.3.0
 printer ipc.

Starting daemons: update cron syslogd.
Starting networking: dhcpd nonamed.
Local packages (start): sshd Starting sshd.
 done.

Minix  Release 3 Version 1.8  (console)

10.0.2.15 login: root
```

- You logged in to minix!!! :)

```
10.0.2.15 login: root

To install additional packages, run 'pkgin'. First do a 'pkgin update'
to update the list of available packages, and then do a 'pkgin' to get
a list of commands. For example, 'pkgin install vim' installs the
'vim' package, and 'pkgin available' will list all available packages.

MINIX 3 supports multiple virtual terminals. Just use ALT+F1, F2, F3
and F4 to navigate among them.

For more information on how to use MINIX 3, see the wiki:
http://wiki.minix3.org.

# ls
.ashrc   .lesshst   .profile   update_minix
```

Get and start Minix

- Configure your minix machine correctly (needs to be done only once). — replace cpaasch by your login, and INGI1113 by the directory where the project lies on.

```
# echo "export HOST_USERNAME=cpaasch" >> .profile
# echo "export HOST_MINIXPATH=INGI1113" >> .profile
# . .profile
```

- Update everything - The password is your INGI-password.

```
# ./update_minix
The authenticity of host '10.0.2.2 (10.0.2.2)' can't be established.
RSA key fingerprint is 0d:02:0f:8a:27:d7:5d:13:f5:44:9a:bd:db:cb:4c:73.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '10.0.2.2' (RSA) to the list of known hosts.
cpaasch@10.0.2.2's password:
```

Get and start Minix

- If you change the intel* machine, you will get the following warning :

```
# ./update_minix
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
@    WARNING: REMOTE HOST IDENTIFICATION HAS CHANGED!     @
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
IT IS POSSIBLE THAT SOMEONE IS DOING SOMETHING NASTY!
Someone could be eavesdropping on you right now (man-in-the-middle attack)!
It is also possible that the RSA host key has just been changed.
The fingerprint for the RSA key sent by the remote host is
35:f4:47:ba:10:b4:5c:ce:63:d6:9e:3a:2e:46:a7:09.
Please contact your system administrator.
Add correct host key in /root/.ssh/known_hosts to get rid of this message.
Offending key in /root/.ssh/known_hosts:1
RSA host key for 10.0.2.2 has changed and you have
requested strict checking.
Host key verification failed.
```

- Exit it with Ctrl-C and remove `.ssh/known_hosts` :

```
# rm .ssh/known_hosts
# ./update_minix
The authenticity of host '10.0.2.2 (10.0.2.2)' can't be established.
RSA key fingerprint is 35:f4:47:ba:10:b4:5c:ce:63:d6:9e:3a:2e:46:a7:09.
Are you sure you want to continue connecting (yes/no)?
```

Get and start Minix

- Shutdown Minix and exit everything.

```
# halt
Local packages (down): sshd  done.
Sending SIGTERM to all processes ...
MINIX will now be shut down ...
d0p0s0> off
```

Add a system-call to Minix

What should you do now ?

Implement a small system call who prints out the pid of the calling process.

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lib/libc/syscall/*.S

Assembler code, to be sure that the function call is forwarded correctly to the system call (added underscore by the compiler).

Add a system-call to Minix

servers/pm/table.c and servers/vfs/table.c

Has the mapping between the number defined in `include/linux/minix/callnr.h` and the function-pointer that will be called inside the kernel.

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include/your_sys_call.h and server/*/your_sys_call.c

The .h-file contains the prototype of the function-pointer. The .c file has the code of the function.

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What else ?

Of course, you have to modify the Makefile's of the directory where you added a file.

Add a system-call to Minix

Where is the PID of the calling process ?

- `servers/pm/mproc.h` - contains the structure (`struct mproc`), that represents a process.
- Global pointer `mp` points to the `struct mproc` of the calling process. Use this global pointer (e.g., `do_exit()` in `servers/pm/forkexit.c`)

Compile the kernel

- Boot into Minix, and update the sources with `./update_minix`
  The sources are now in `/usr/src/`
- `cd /usr/src/tools`
- Compile minix with `make libraries hdboot`
  This will take quite some time. Thus, if you have not done any changes to the libraries, you can compile just with `make hdboot`
- And boot into the new kernel by selecting the *Custom Minix 3* after `make run`

More in detail..

- `lib/libc/other/_printpid.c`

```
#include <lib.h>
#include <unistd.h>
#include <printpid.h>

PUBLIC void printpid()
{
    message m;

    _syscall(PM_PROC_NR, PRINTPID, &m);
}
```

- `lib/libc/syscall/printpid.S`

```
#include <machine/asm.h>

IMPORT(_printpid)
ENTRY(printpid)
        jmp     _C_LABEL(_printpid)
```

- `include/printpid.h`

```
#ifndef _PRINTPID_H_
#define _PRINTPID_H_

#include <stdlib.h>

_PROTOTYPE( void printpid, (void));

#endif
```