实验环境配置

`VirtualBox` 虚拟机为载体，安装Ubuntu

```
$ uname -a
Linux eliot-VirtualBox 5.11.0-36-generic #40~20.04.1-Ubuntu SMP Sat Sep 18
02:14:19 UTC 2021 x86_64 x86_64 x86_64 GNU/Linux
```

下载实验框架

```
$ git clone https://pdos.csail.mit.edu/6.828/2018/jos.git mit6.828
```

安装 `toolchain`

先检查本机安装

```
$ gcc -m32 -print-libgcc-file-name
/usr/lib/gcc/x86_64-linux-gnu/9/libgcc.a
```

不然则安装相关工具

```
sudo apt-get install -y build-essential gdb
```

安装32位支持

```
sudo apt-get install gcc-multilib
```

或者直接一站式解决

```
sudo apt-get install -y build-essential libtool libglib2.0-dev libpixman-1-dev
zlib1g-dev git libfdt-dev gcc-multilib gdb
```

对于 `qemu` 虚拟机，安装课程推荐的定制版本为佳：

```
git clone git@github.com:mit-pdos/6.828-qemu.git
```

开始进行配置

先安装配置需要的 `python2.7`

```
sudo apt-get install python2.7
```

```
./configure --disable-kvm --target-list="i386-softmmu x86_64-softmmu" --
python=python2.7
```

开始编译安装

先进入root用户

```
su root
```

开始安装

```
make && make install
```

可能遇到的错误:

- 错误1

```
qga/main.c: In function 'ga_log':
qga/main.c:268:5: error: 'GTimeVal' is deprecated: Use 'GDateTime' instead [-Werror=deprecated-declarations]
  268 |     GTimeVal time;
      |     ^~~~~~~~
In file included from /usr/include/glib-2.0/glib/galloca.h:32,
                 from /usr/include/glib-2.0/glib.h:30,
                 from qga/main.c:16:
/usr/include/glib-2.0/glib/gtypes.h:547:8: note: declared here
  547 | struct _GTimeVal
      |        ^~~~~~~~~
qga/main.c:283:9: error: 'g_get_current_time' is deprecated: Use 'g_get_real_time' instead [-Werror=deprecated-declarations]
  283 |         g_get_current_time(&time);
      |         ^~~~~~~~~~~~~~~~~~
In file included from /usr/include/glib-2.0/glib/giochannel.h:33,
                 from /usr/include/glib-2.0/glib.h:54,
                 from qga/main.c:16:
/usr/include/glib-2.0/glib/gmain.h:679:8: note: declared here
  679 | void     g_get_current_time                 (GTimeVal       *result);
      |          ^~~~~~~~~~~~~~~~~~
cc1: all warnings being treated as errors
make: *** [/home/eliot/Desktop/SoftwarePackages/6.828-qemu/rules.mak:57: qga/main.o] Error 1
```

解决方法

```
.../6.828-qemu$ vim Makefile
```

更改 `Makefile`，在最后一行添加

```
QEMU_CFLAGS+=-w
```

- 错误2

```
  LINK   qemu-ga
/usr/bin/ld: qga/commands-posix.o: in function `dev_major_minor':
/home/eliot/Desktop/SoftwarePackages/6.828-qemu/qga/commands-posix.c:633: undefined reference to `major'
/usr/bin/ld: /home/eliot/Desktop/SoftwarePackages/6.828-qemu/qga/commands-posix.c:634: undefined reference to `minor'
collect2: error: ld returned 1 exit status
make: *** [Makefile:288: qemu-ga] Error 1
```

解决方法

```
.../6.828-qemu$ cd qga/
.../6.828-qemu/qga$ vim commands-posix.c
```

在头文件中添加

```
#include <sys/sysmacros.h>
```

- 错误3

```
In file included from /usr/include/string.h:495,
                 from /home/eliot/Desktop/SoftwarePackages/6.828-qemu/include/qemu-common.h:30,
                 from /home/eliot/Desktop/SoftwarePackages/6.828-qemu/dump.c:14:
In function 'strncpy',
    inlined from 'create_header64' at /home/eliot/Desktop/SoftwarePackages/6.828-qemu/dump.c:837:5,
    inlined from 'write_dump_header' at /home/eliot/Desktop/SoftwarePackages/6.828-qemu/dump.c:928:9,
    inlined from 'create_kdump_vmcore' at /home/eliot/Desktop/SoftwarePackages/6.828-qemu/dump.c:1372:5,
    inlined from 'qmp_dump_guest_memory' at /home/eliot/Desktop/SoftwarePackages/6.828-qemu/dump.c:1674:9:
/usr/include/x86_64-linux-gnu/bits/string_fortified.h:106:10: error: '__builtin_strncpy' output truncated before terminating nul copying 8 bytes from a string of the same length [-Werror=stringop-truncation]
  106 |   return __builtin___strncpy_chk (__dest, __src, __len, __bos (__dest));
      |          ^~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
In function 'strncpy',
    inlined from 'create_header32' at /home/eliot/Desktop/SoftwarePackages/6.828-qemu/dump.c:737:5,
    inlined from 'write_dump_header' at /home/eliot/Desktop/SoftwarePackages/6.828-qemu/dump.c:926:9,
    inlined from 'create_kdump_vmcore' at /home/eliot/Desktop/SoftwarePackages/6.828-qemu/dump.c:1372:5,
    inlined from 'qmp_dump_guest_memory' at /home/eliot/Desktop/SoftwarePackages/6.828-qemu/dump.c:1674:9:
/usr/include/x86_64-linux-gnu/bits/string_fortified.h:106:10: error: '__builtin_strncpy' output truncated before terminating nul copying 8 bytes from a string of the same length [-Werror=stringop-truncation]
  106 |   return __builtin___strncpy_chk (__dest, __src, __len, __bos (__dest));
      |          ^~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
cc1: all warnings being treated as errors
make[1]: *** [/home/eliot/Desktop/SoftwarePackages/6.828-qemu/rules.mak:57: dump.o] Error 1
make: *** [Makefile:173: subdir-i386-softmmu] Error 2
```

解决方法

```
.../6.828-qemu$ vim config-host.mak
```

删除其中的 `-Werror`

- 错误4

```
install -d -m 0755 "/usr/local/share/qemu"
install: cannot change permissions of '/usr/local/share/qemu': No such file or directory
make: *** [Makefile:382: install-datadir] Error 1
```

解决方法

进入root用户模式

```
su root
make && make install
```

还有其他错误的，可以自行Google解决.

进入实验的文件夹下：

```
make
```

不出意外会出现如下显示

```
eliot@eliot-VirtualBox:~/Desktop/mit6.828$ make
+ as kern/entry.S
+ cc kern/entrypgdir.c
+ cc kern/init.c
+ cc kern/console.c
+ cc kern/monitor.c
+ cc kern/printf.c
+ cc kern/kdebug.c
+ cc lib/printfmt.c
+ cc lib/readline.c
+ cc lib/string.c
+ ld obj/kern/kernel
ld: warning: section `.bss' type changed to PROGBITS
+ as boot/boot.S
+ cc -Os boot/main.c
+ ld boot/boot
boot block is 412 bytes (max 510)
+ mk obj/kern/kernel.img
```

之后运行虚拟机

```
make qemu
```

```
eliot@eliot-VirtualBox:~/Desktop/mit6.828$ make qemu
sed "s/localhost:1234/localhost:26000/" < .gdbinit.tmpl > .gdbinit
qemu-system-i386 -drive file=obj/kern/kernel.img,index=0,media=disk,format=raw
-serial mon:stdio -gdb tcp::26000 -D qemu.log
VNC server running on `127.0.0.1:5900'
6828 decimal is XXX octal!
entering test_backtrace 5
entering test_backtrace 4
entering test_backtrace 3
entering test_backtrace 2
entering test_backtrace 1
entering test_backtrace 0
leaving test_backtrace 0
leaving test_backtrace 1
leaving test_backtrace 2
leaving test_backtrace 3
leaving test_backtrace 4
leaving test_backtrace 5
Welcome to the JOS kernel monitor!
Type 'help' for a list of commands.
K>
```

这样 `MIT6.828` 的实验环境便配置成功了。

参考资料

https://pdos.csail.mit.edu/6.828/2018/labguide.html

https://pdos.csail.mit.edu/6.828/2018/labs/lab1/

https://www.cnblogs.com/gatsby123/p/9746193.html

https://github.com/woai3c/MIT6.828/blob/master/docs/install.md