Pintos project 0 보고서

컴퓨터공학부

2013-11431 정현진

1. System environment and execution problems and their solutions

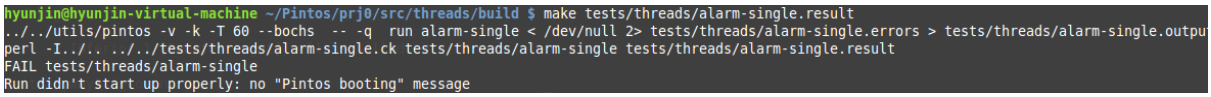
시스템 환경은 다음과 같다.

CPU: Intel® Core™ i7-4720HQ CPU @ 2.60GHz (8 CPUs), ~2.6GHz

RAM: 8192MB RAM

구동 환경: VMware player 12 가상머신을 이용해 Linux Mint 17.2 32-bit 운영체제를 사용.

처음 bochs와 pintos를 설치한 뒤 'make tests/threads/alarm-single.result'를 실행하는 과정에서 다음과 같이 "Run didn't start up properly: no "Pintos booting" message" 이라는 메세지가 출력되며 에러가 발생하였다.



이 문제는 PPT에 있는 해결방식을 이용해 bochs가 설치되어 있는 폴더의 main.cc 파일에서 'bx_print_header()' 라는 함수를 주석처리 해주어 문제를 해결하였다.

2. Execution results of 'alarm-multiple'

'alarm-multiple'의 실행 결과는 다음과 같다.

```
hyunjin@hyunjin-virtual-machine ~/Pintos/prj0/src/threads/build $ ../../utils/pintos -- -q
run alarm-multiple
Prototype mismatch: sub main::SIGVTALRM () vs none at ../../utils/pintos line 940.
Constant subroutine SIGVTALRM redefined at ../../utils/pintos line 932.
warning: can't find squish-pty, so terminal input will fail
bochs -q
00000000000i[      ] BXSHARE not set. using compile time default '/usr/local/share/bochs'
00000000000i[      ] reading configuration from bochsrc.txt
00000000000e[      ] bochsrc.txt:8: 'user_shortcut' will be replaced by new 'keyboard'
option.
00000000000i[      ] installing nogui module as the Bochs GUI
00000000000i[      ] using log file bochsout.txt
```

```
PiLo hda1
Loading.....
Kernel command line: -q run alarm-multiple
Pintos booting with 4,096 kB RAM...
383 pages available in kernel pool.
383 pages available in user pool.
Calibrating timer...  204,600 loops/s.
Boot complete.
Executing 'alarm-multiple':
(alarm-multiple) begin
(alarm-multiple) Creating 5 threads to sleep 7 times each.
(alarm-multiple) Thread 0 sleeps 10 ticks each time,
(alarm-multiple) thread 1 sleeps 20 ticks each time, and so on.
(alarm-multiple) If successful, product of iteration count and
(alarm-multiple) sleep duration will appear in nondescending order.
(alarm-multiple) thread 0: duration=10, iteration=1, product=10
(alarm-multiple) thread 0: duration=10, iteration=2, product=20
(alarm-multiple) thread 1: duration=20, iteration=1, product=20
(alarm-multiple) thread 2: duration=30, iteration=1, product=30
(alarm-multiple) thread 0: duration=10, iteration=3, product=30
(alarm-multiple) thread 3: duration=40, iteration=1, product=40
(alarm-multiple) thread 0: duration=10, iteration=4, product=40
(alarm-multiple) thread 1: duration=20, iteration=2, product=40
(alarm-multiple) thread 4: duration=50, iteration=1, product=50
(alarm-multiple) thread 0: duration=10, iteration=5, product=50
(alarm-multiple) thread 0: duration=10, iteration=6, product=60
(alarm-multiple) thread 1: duration=20, iteration=3, product=60
(alarm-multiple) thread 2: duration=30, iteration=2, product=60
(alarm-multiple) thread 0: duration=10, iteration=7, product=70
(alarm-multiple) thread 3: duration=40, iteration=2, product=80
(alarm-multiple) thread 1: duration=20, iteration=4, product=80
(alarm-multiple) thread 2: duration=30, iteration=3, product=90
(alarm-multiple) thread 4: duration=50, iteration=2, product=100
(alarm-multiple) thread 1: duration=20, iteration=5, product=100
(alarm-multiple) thread 2: duration=30, iteration=4, product=120
(alarm-multiple) thread 3: duration=40, iteration=3, product=120
(alarm-multiple) thread 1: duration=20, iteration=6, product=120
(alarm-multiple) thread 1: duration=20, iteration=7, product=140
(alarm-multiple) thread 2: duration=30, iteration=5, product=150
```

(alarm-multiple) thread 4: duration=50, iteration=3, product=150
(alarm-multiple) thread 3: duration=40, iteration=4, product=160
(alarm-multiple) thread 2: duration=30, iteration=6, product=180
(alarm-multiple) thread 3: duration=40, iteration=5, product=200
(alarm-multiple) thread 4: duration=50, iteration=4, product=200
(alarm-multiple) thread 2: duration=30, iteration=7, product=210
(alarm-multiple) thread 3: duration=40, iteration=6, product=240
(alarm-multiple) thread 4: duration=50, iteration=5, product=250
(alarm-multiple) thread 3: duration=40, iteration=7, product=280
(alarm-multiple) thread 4: duration=50, iteration=6, product=300
(alarm-multiple) thread 4: duration=50, iteration=7, product=350
(alarm-multiple) end
Execution of 'alarm-multiple' complete.
Timer: 889 ticks
Thread: 55 idle ticks, 837 kernel ticks, 0 user ticks
Console: 2951 characters output
Keyboard: 0 keys pressed
Powering
off..==========
==========
Bochs is exiting with the following message:
[UNMAP] Shutdown port: shutdown requested
==========
==========

3. Testing results of ‘alarm-multiple’

make tests/threads/alarm-multiple.result를 수행한 결과는 다음과 같다.

```
hyunjin@hyunjin-virtual-machine ~/Pintos/prj0/src/threads/build $ make tests/threads/alarm-multiple.result
perl -I../.. ../../tests/threads/alarm-multiple.ck tests/threads/alarm-multiple tests/threads/alarm-multiple.result
pass tests/threads/alarm-multiple
```

그리고 tests/threads 폴더에 ‘alarm-multiple.result’라는 파일이 생성되었는데 내용은 다음과 같다.

```
hyunjin@hyunjin-virtual-machine ~/Pintos/prj0/src/threads/build $ cat tests/threads/alarm-multiple.result
PASS
```

테스트를 통과한 것을 볼 수 있었다.

4. Execution results of the series of following commands during debugging

gdb를 실행했더니 다음과 같이 1234번 포트와의 연결을 기다린다는 메시지가 출력되었다.

```
hyunjin@hyunjin-virtual-machine ~/Pintos/prj0/src/threads/build $ ../../utils/pintos --gdb -- run alarm-multiple
Prototype mismatch: sub main::SIGVTALRM () vs none at ../../utils/pintos line 940.
Constant subroutine SIGVTALRM redefined at ../../utils/pintos line 932.
warning: can't find squish-pty, so terminal input will fail
bochs -q
000000000000i[      ] BXSHARE not set. using compile time default '/usr/local/share/bochs'
000000000000i[      ] reading configuration from bochsrc.txt
000000000000e[      ] bochsrc.txt:8: 'user_shortcut' will be replaced by new 'keyboard' option.
000000000000i[      ] Enabled gdbstub
000000000000i[      ] installing nogui module as the Bochs GUI
000000000000i[      ] using log file bochsout.txt
Waiting for gdb connection on port 1234
```

그 뒤 새로운 terminal을 열어 ‘pintos-gdb kernel.o’를 실행시키고 ‘target remote localhost:1234’ 명령어를 입력하니 기존의 터미널에서 1234 포트에 연결되었다는 메시지가 출력되었다.

```
hyunjin@hyunjin-virtual-machine ~/Pintos/prj0/src/threads/build $ ../../utils/pintos --gdb -- run alarm-multiple
Prototype mismatch: sub main::SIGVTALRM () vs none at ../../utils/pintos line 940.
Constant subroutine SIGVTALRM redefined at ../../utils/pintos line 932.
warning: can't find squish-pty, so terminal input will fail
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000000000000e[      ] bochsrc.txt:8: 'user_shortcut' will be replaced by new 'keyboard' option.
000000000000i[      ] Enabled gdbstub
000000000000i[      ] installing nogui module as the Bochs GUI
000000000000i[      ] using log file bochsout.txt
Waiting for gdb connection on port 1234
Connected to 127.0.0.1
```

그 뒤 새로운 터미널의 gdb에서 지정된 명령어를 순서대로 입력한 결과는 다음과 같다.

```
hyunjin@hyunjin-virtual-machine ~/Pintos/prj0/src/threads/build $ ../../utils/pintos-gdb kernel.o
GNU gdb (Ubuntu 7.7.1-0ubuntu5~14.04.2) 7.7.1
Copyright (C) 2014 Free Software Foundation, Inc.
License GPLv3+: GNU GPL version 3 or later <http://gnu.org/licenses/gpl.html>
This is free software: you are free to change and redistribute it.
There is NO WARRANTY, to the extent permitted by law.  Type "show copying"
and "show warranty" for details.
This GDB was configured as "i686-linux-gnu".
Type "show configuration" for configuration details.
For bug reporting instructions, please see:
<http://www.gnu.org/software/gdb/bugs/>.
Find the GDB manual and other documentation resources online at:
<http://www.gnu.org/software/gdb/documentation/>.
For help, type "help".
Type "apropos word" to search for commands related to "word"...
Reading symbols from kernel.o...done.
(gdb) target remote localhost:1234
Remote debugging using localhost:1234
0x0000fff0 in ?? ()
(gdb) b test_alarm_multiple
Breakpoint 1 at 0xc002a236: file ../../tests/threads/alarm-wait.c, line 23.
(gdb) c
Continuing.

Breakpoint 1, test_alarm_multiple () at ../../tests/threads/alarm-wait.c:23
23      {
(gdb) n
24          test_sleep (5, 7);
(gdb) s
test_sleep (thread_cnt=thread_cnt@entry=5, iterations=iterations@entry=7) at ../../tests/threads/alarm-wait.c:52
52      {
(gdb) bt
#0  test_sleep (thread_cnt=thread_cnt@entry=5, iterations=iterations@entry=7) at ../../tests/threads/alarm-wait.c:52
#1  0xc002a248 in test_alarm_multiple () at ../../tests/threads/alarm-wait.c:24
#2  0xc0029dbe in run_test (name=name@entry=0xc0007d42 "alarm-multiple") at ../../tests/threads/tests.c:56
#3  0xc00201b3 in run_task (argv=0xc00347a0 <argv>) at ../../threads/init.c:290
#4  0xc0020745 in run_actions (argv=0xc00347a0 <argv>) at ../../threads/init.c:340
#5  main () at ../../threads/init.c:133
(gdb) f 2
#2  0xc0029dbe in run_test (name=name@entry=0xc0007d42 "alarm-multiple") at ../../tests/threads/tests.c:56
56          t->function ();
(gdb) p name
$1 = 0xc0007d42 "alarm-multiple"
```

그 뒤 gdb를 종료하자 기존 terminal에 있던 bochs도 다음과 같은 메시지를 출력하며 종료되었다.

```
hyunjin@hyunjin-virtual-machine ~/Pintos/prj0/src/threads/build $ ../../utils/pintos --gdb -- run alarm-multiple
Prototype mismatch: sub main::SIGVTALRM () vs none at ../../utils/pintos line 940.
Constant subroutine SIGVTALRM redefined at ../../utils/pintos line 932.
warning: can't find squish-pty, so terminal input will fail
bochs -q
000000000000i[      ] BXSHARE not set. using compile time default '/usr/local/share/bochs'
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000000000000i[      ] Enabled gdbstub
000000000000i[      ] installing nogui module as the Bochs GUI
000000000000i[      ] using log file bochsout.txt
Waiting for gdb connection on port 1234
Connected to 127.0.0.1
PiLo hda1
Loading..........
Kernel command line: run alarm-multiple
Pintos booting with 4,096 kB RAM...
383 pages available in kernel pool.
383 pages available in user pool.
Calibrating timer...  204,600 loops/s.
Boot complete.
Executing 'alarm-multiple':================================================================================
Bochs is exiting with the following message:
[GDBST ] Debugger asked us to quit
================================================================================
```