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CS333 Project 4

3/7/2021

Test name: With CS333 PROJECT set to 0 in the MakeFile

Test Description: Compiles correctly with the CS333 P4 macro turned off, when CS333 PROJECT is set to 0 in the Makefile.

Expected results: Expected results is for this to pass.

Test Output / Actual Results:

```
cervan4@babbage:~/CS333/xv6-pdx$ grep "CS333_PROJECT ?=" Makefile
CS333_PROJECT ?= 0
cervan4@babbage:~/CS333/xv6-pdx$ !m
make clean run
rm -f *.o *.d *.asm *.sym vectors.S bootblock entryother \
initcode initcode.out kernel xv6.img fs.img kernelmemfs \
xv6memfs.img mkfs .gdbinit \
_cat _echo _forktest _grep _init _kill _ln _ls _mkdir _rm _sh _stressfs _usertests _wc _zombie  _halt _uptime
rm -rf dist dist-test
make -s clean
make -s qemu-nox
nmeta 59 (boot, super, log blocks 30 inode blocks 26, bitmap blocks 1) blocks 1941 total 2000
balloc: first 717 blocks have been allocated
balloc: write bitmap block at sector 58
boot block is 467 bytes (max 510)
10000+0 records in
10000+0 records out
5120000 bytes (5.1 MB, 4.9 MiB) copied, 0.102708 s, 49.9 MB/s
1+0 records in
1+0 records out
512 bytes copied, 0.00307116 s, 167 kB/s
377+1 records in
377+1 records out
193504 bytes (194 kB, 189 KiB) copied, 0.00838721 s, 23.1 MB/s
SeaBIOS (version 1.13.0-1ubuntu1)


iPXE (http://ipxe.org) 00:03.0 CA00 PCI2.10 PnP PMM+1FF8CA10+1FECCA10 CA00


Booting from Hard Disk..xv6...
cpu1: starting 1
cpu0: starting 0
sb: size 2000 nblocks 1941 ninodes 200 nlog 30 logstart 2 inodestart 32 bmap start 58
init: starting sh
$
```

Discussion: The results were as expected everything compiled and worked properly

Indication of Pass/Fail: This test Passed

Test name: For MAXPRIO = 0

Test Description:

- Show that the scheduler operates as a single round robin queue, as it did in project 3,
- Show that setpriority() for any value other than 0 fails.
- Code should not attempt promotion or demotion when MAXPRIO == 0.

Expected results: I expect for all of the results to pass and for it to do everything correct when MAXPRIO is set to 0

Test Output / Actual Results:

```
$ Ready List Processes:
Prio 0: 20 -> 19 -> 22 -> 63 -> 18 -> 16 -> 3 -> 17 -> 29 -> 8 -> 31 -> 33 -> 30 -> 32 -> 34 -> 28 -> 36 -> 37 -> 38 -> 23 -> 41 -> 50 -> 35 -> 51 -> 52 -> 55 -> 59 -> 61 -> 60 -> 62 -> 54 -> 42 -> 14 -> 39 -> 57 -> 53 -> 46 -> 58 -> 44 ->
21
$ Now verify that your system is working by pressing C-p and then C-r.

PID     Name        UID     GID     PPID    Prio    Elapsed CPU     State   Size     PCs
1       init        0       0       1       0       60.16843009     53.16843009     sleep   12288    80104183 801043ac 801060bc 801054b7 8010652c 80106419
2       sh          0       0       1       0       4070.16843009   32.16843009     sleep   16384    80104183 801043ac 801060bc 801054b7 8010652c 80106419
3       p4-test     0       0       2       0       39530.16843009  481.16843009    runble  12288
4       p4-test     0       0       3       0       39500.16843009  2593.16843009   runble  12288
5       p4-test     0       0       3       0       39430.16843009  2584.16843009   runble  12288
6       p4-test     0       0       3       0       39490.16843009  2567.16843009   runble  12288
7       p4-test     0       0       3       0       39480.16843009  8.16843009      runble  12288
8       p4-test     0       0       3       0       39530.16843009  2563.16843009   runble  12288
9       p4-test     0       0       3       0       39470.16843009  2039.16843009   runble  12288
10      p4-test     0       0       3       0       39480.16843009  2040.16843009   runble  12288
11      p4-test     0       0       3       0       39480.16843009  2028.16843009   runble  12288
12      p4-test     0       0       3       0       39470.16843009  2010.16843009   runble  12288
13      p4-test     0       0       3       0       39460.16843009  2020.16843009   runble  12288
14      p4-test     0       0       3       0       39640.16843009  0.16843009      runble  12288
15      p4-test     0       0       3       0       39440.16843009  1782.16843009   runble  12288
16      p4-test     0       0       3       0       39520.16843009  1779.16843009   runble  12288
17      p4-test     0       0       3       0       39520.16843009  1779.16843009   runble  12288
18      p4-test     0       0       3       0       39510.16843009  1766.16843009   runble  12288
19      p4-test     0       0       3       0       39500.16843009  1599.16843009   runble  12288
20      p4-test     0       0       3       0       39490.16843009  1598.16843009   runble  12288
21      p4-test     0       0       3       0       39500.16843009  0.16843009      runble  12288
22      p4-test     0       0       3       0       39510.16843009  1580.16843009   runble  12288
23      p4-test     0       0       3       0       39580.16843009  1590.16843009   runble  12288
24      p4-test     0       0       3       0       39450.16843009  1439.16843009   runble  12288
25      p4-test     0       0       3       0       39450.16843009  1419.16843009   runble  12288
26      p4-test     0       0       3       0       39460.16843009  1420.16843009   runble  12288
27      p4-test     0       0       3       0       39440.16843009  1420.16843009   runble  12288
28      p4-test     0       0       3       0       39570.16843009  0.16843009      runble  12288
29      p4-test     0       0       3       0       39530.16843009  1320.16843009   runble  12288
30      p4-test     0       0       3       0       39550.16843009  1320.16843009   runble  12288
31      p4-test     0       0       3       0       39540.16843009  1310.16843009   runble  12288
32      p4-test     0       0       3       0       39550.16843009  1290.16843009   runble  12288
33      p4-test     0       0       3       0       39540.16843009  1310.16843009   runble  12288
34      p4-test     0       0       3       0       39560.16843009  1200.16843009   runble  12288
35      p4-test     0       0       3       0       39600.16843009  0.16843009      runble  12288
36      p4-test     0       0       3       0       39560.16843009  1200.16843009   runble  12288
```

Code should not attempt promotion or demotion when MAXPRIO == 0:

```
$ p4-priority
MAXPRIO is 0. Change MAXPRIO and try again
$
```

Discussion: All of the tests passed as expected and would not promote or demotion when maxprio was set to 0.

Indication of Pass/Fail: This test Passed

Test name: For MAXPRIO = 2

Test Description:

- Show that the scheduler always selects the first process on the highest priority non-empty list
- Show that promotion correctly moves processes on the ready lists to the next higher priority list (if one exists) and maintains correct ordering
- Show that demotion correctly moves a process to the next lower priority list (if one exists) when the processes budget is used up

Expected results: I expect for all of the results to pass and for it to do everything correct when MAXPRIO is set to 2

Test Output / Actual Results:

```
$ Now verify that your system is working by pressing C-p and then C-r.
Ready List Processes:
Prio 2: 3 -> 7 -> 14 -> 21 -> 28 -> 43 -> 49 -> 35 -> 41 -> 56 -> 63 -> 42 -> 59 ->
44
Prio 1: 53 -> 61 -> 50 -> 57 -> 46 -> 55 -> 27 -> 58 -> 60 -> 34 -> 13 -> 54 -> 51 ->
29
Prio 0: 33 -> 12 -> 20 -> 47 -> 32 -> 23 -> 8 -> 31 -> 30 -> 48 -> 9 -> 15 -> 17 -> 36 -> 22 -> 26 -> 40 -> 11 -> 45 -> 38 -> 18 -> 16 -> 6 -> 24 -> 39 -> 4 -> 37 -> 10 -> 25 -> 5 ->
19
$
PID     Name         UID        GID     PPID    Prio    Elapsed CPU     State   Size     PCs
1       init         0          0       1       2       60.16843009     54.16843009     sleep   12288    80104319 80104543 801062ee 801056e9 80106761 8010664e
2       sh           0          0       1       2       21850.16843009  31.16843009     sleep   16384    80104319 80104543 801062ee 801056e9 80106761 8010664e
3       p4-test      0          0       2       2       56340.16843009  465.16843009    runble  12288
4       p4-test      0          0       3       0       56140.16843009  4158.16843009   runble  12288
5       p4-test      0          0       3       0       56170.16843009  3728.16843009   runble  12288
6       p4-test      0          0       3       0       56110.16843009  3665.16843009   runble  12288
7       p4-test      0          0       3       2       56350.16843009  0.16843009      runble  12288
8       p4-test      0          0       3       0       56240.16843009  3109.16843009   runble  12288
9       p4-test      0          0       3       0       56300.16843009  2480.16843009   runble  12288
10      p4-test      0          0       3       0       56150.16843009  1880.16843009   runble  12288
11      p4-test      0          0       3       0       56370.16843009  2230.16843009   run     12288
12      p4-test      0          0       3       0       56210.16843009  2219.16843009   runble  12288
13      p4-test      0          0       3       0       56310.16843009  1550.16843009   runble  12288
14      p4-test      0          0       3       2       56350.16843009  0.16843009      runble  12288
15      p4-test      0          0       3       0       56310.16843009  1790.16843009   runble  12288
16      p4-test      0          0       3       0       56100.16843009  1780.16843009   runble  12288
17      p4-test      0          0       3       0       56320.16843009  1360.16843009   runble  12288
18      p4-test      0          0       3       0       56100.16843009  1658.16843009   runble  12288
19      p4-test      0          0       3       0       56180.16843009  1440.16843009   runble  12288
20      p4-test      0          0       3       0       56230.16843009  1300.16843009   runble  12288
21      p4-test      0          0       3       2       56360.16843009  0.16843009      runble  12288
22      p4-test      0          0       3       0       56340.16843009  1440.16843009   runble  12288
23      p4-test      0          0       3       0       56260.16843009  1450.16843009   runble  12288
24      p4-test      0          0       3       0       56120.16843009  1310.16843009   runble  12288
25      p4-test      0          0       3       0       56170.16843009  1250.16843009   runble  12288
26      p4-test      0          0       3       0       56350.16843009  1241.16843009   runble  12288
27      p4-test      0          0       3       0       56270.16843009  1400.16843009   runble  12288


$ p4-priority
Testing that process starts at MAXPRIO
Priority after program start is 2
**** TEST PASSED ****


Testing that a priority cannot be set to an out of range value.
  Testing setting priority to a negative number.
  setPriority(66, -1) returned -1.
  **** TEST PASSED ****


  Testing that a priority cannot be set on a non-existent PID.
  **** TEST PASSED ****


Priority for pid 1 is 2
Press C-p to verify.

PID     Name         UID        GID     PPID    Prio    Elapsed CPU     State   Size     PCs
1       init         0          0       1       2       60.-2146370576  54.-2146370576  sleep   12288    80104319 80104543 801062ee 801056e9 80106761 8010664e
2       sh           0          0       1       2       279320.-2146370576      60.-2146370576  sleep   16384    80104319 80104543 801062ee 801056e9 80106761 8010664e
66      p4-priority  0          0       2       2       282887.-2146370576      151.-2146370576 sleep   16384    80104319 801063cc 801056e9 80106761 8010664e
$

Testing promotion...
Promotion has occurred.
**** TEST PASSES ****
```

Discussion: All of the tests passed as expected and promote and demotion worked properly and all of the tests passes with the correct values

Indication of Pass/Fail: This test Passed

Test name: For MAXPRIO = 6

Test Description:

- Show that the scheduler always selects the first process on the highest priority non-empty list
- Show that promotion correctly moves processes on the ready lists to the next higher priority list (if one exists) and maintains correct ordering
- Show that demotion correctly moves a process to the next lower priority list (if one exists) when the processes budget is used up

Expected results: I expect for all of the results to pass and for it to do everything correct when MAXPRIO is set to 2

Test Output / Actual Results:

```
Ready List Processes:
Prio 6: 21 -> 3 -> 60 -> 28 -> 42 -> 35 -> 14 -> 56 -> 49 -> 63 ->
7
Prio 5: (NULL)
Prio 4: (NULL)
Prio 3: 62
Prio 2: 55
Prio 1: 59
Prio 0: 58 ->
61
$
PID     Name         UID        GID     PPID    Prio    Elapsed CPU     State   Size     PCs
1       init         0          0       1       6       60.16843009     53.16843009     sleep   12288    80104319 8010454c 801062f8 801056f3 8010676b 80106658
2       sh           0          0       1       6       55250.16843009  25.16843009     sleep   16384    80104319 8010454c 801062f8 801056f3 8010676b 80106658
3       p4-test      0          0       2       6       137800.16843009 558.16843009    runble  12288
4       p4-test      0          0       3       0       116330.16843009 9272.16843009   zombie  0
5       p4-test      0          0       3       0       117150.16843009 8651.16843009   zombie  0
6       p4-test      0          0       3       0       116870.16843009 6649.16843009   zombie  0
7       p4-test      0          0       3       6       137780.16843009 2.16843009      runble  12288
8       p4-test      0          0       3       5       117810.16843009 1979.16843009   zombie  0
9       p4-test      0          0       3       0       117820.16843009 5498.16843009   zombie  0
10      p4-test      0          0       3       0       117190.16843009 5871.16843009   zombie  0
11      p4-test      0          0       3       4       116620.16843009 1317.16843009   zombie  0
12      p4-test      0          0       3       0       116990.16843009 3989.16843009   zombie  0
13      p4-test      0          0       3       0       117580.16843009 5094.16843009   zombie  0
14      p4-test      0          0       3       6       137850.16843009 0.16843009      runble  12288
15      p4-test      0          0       3       0       118620.16843009 4518.16843009   zombie  0
16      p4-test      0          0       3       0       118400.16843009 5211.16843009   zombie  0
17      p4-test      0          0       3       5       119200.16843009 1277.16843009   zombie  0
18      p4-test      0          0       3       0       118210.16843009 4416.16843009   zombie  0
19      p4-test      0          0       3       5       119380.16843009 2819.16843009   zombie  0
20      p4-test      0          0       3       5       119820.16843009 1871.16843009   zombie  0
21      p4-test      0          0       3       6       137790.16843009 0.16843009      runble  12288
22      p4-test      0          0       3       6       121390.16843009 1050.16843009   zombie  0
23      p4-test      0          0       3       0       120600.16843009 2955.16843009   zombie  0
24      p4-test      0          0       3       2       121400.16843009 5924.16843009   zombie  0
25      p4-test      0          0       3       0       121710.16843009 3655.16843009   zombie  0
26      p4-test      0          0       3       6       123740.16843009 1114.16843009   zombie  0
27      p4-test      0          0       3       5       121850.16843009 895.16843009    zombie  0
28      p4-test      0          0       3       6       137810.16843009 1.16843009      runble  12288

$ p4-priority
Testing that process starts at MAXPRIO
Priority after program start is 6
**** TEST PASSED ****


Testing that a priority cannot be set to an out of range value.
  Testing setting priority to a negative number.
  setPriority(64, -1) returned -1.
  **** TEST PASSED ****


  Testing that a priority cannot be set on a non-existent PID.
  **** TEST PASSED ****


Priority for pid 1 is 6
Press C-p to verify.

PID     Name         UID        GID     PPID    Prio    Elapsed CPU     State   Size     PCs
1       init         0          0       1       6       60.-2146370544  53.-2146370544  sleep   12288    80104319 8010454c 801062f8 801056f3 8010676b 80106658
2       sh           0          0       1       6       288102.-2146370544      36.-2146370544  sleep   16384    80104319 8010454c 801062f8 801056f3 8010676b 80106658
64      p4-priority          0          0       2       6       291133.-2146370544      159.-2146370544 sleep   16384    80104319 801063d6 801056f3 8010676b 80106658
$

Testing promotion...
Promotion has occurred.
**** TEST PASSES ****
```

Discussion: All of the tests passed as expected and promote and demotion worked properly and all of the tests passes with the correct values

Indication of Pass/Fail: This test Passed

Test name: setpriority(), getpriority()

Test Description:

- Show that the priority is changed and budget reset when given a valid PID and priority
- Show that changing the priority of a process on a ready list correctly moves the process to the list corresponding to the new priority
- Show that setting the priority of a process on a ready list to the same priority it already has does not change the position in the list for that process
- Show that calling setpriority() with an invalid PID and/or priority returns a rele-vant error code and leaves the process priority and budget unmodified.
- Returns -1 if PID is not found or process is in the UNUSED state.
- Shows the correct priority for any process other than the current process

Expected results: Expect it to pass all of the results and for it to be able to get and set properly and for the priority to be correct.

Test Output / Actual Results:

```
$ p4-priority
Testing that process starts at MAXPRIO
Priority after program start is 6
**** TEST PASSED ****


Testing that a priority cannot be set to an out of range value.
  Testing setting priority to a negative number.
  setPriority(3, -1) returned -1.
  **** TEST PASSED ****


  Testing that a priority cannot be set on a non-existent PID.
  **** TEST PASSED ****


Priority for pid 1 is 6
Press C-p to verify.

PID     Name         UID        GID     PPID    Prio    Elapsed CPU     State   Size     PCs
1       init         0          0       1       6       60.-2146370544  51.-2146370544  sleep   12288    80104319 8010454c 801062f8 801056f3 8010676b 80106658
2       sh           0          0       1       6       66290.-2146370544       33.-2146370544  sleep   16384    80104319 8010454c 801062f8 801056f3 8010676b 80106658
3       p4-priority          0          0       2       6       68284.-2146370544       161.-2146370544 sleep   16384    80104319 801063d6 801056f3 8010676b 80106658
$

Testing promotion...
Promotion has occurred.
**** TEST PASSES ****

$
```

Discussion: All of the tests passed as expected the set and get worked as they were supposed to which shows that everything was working properly.

Indication of Pass/Fail: This test Passed

Test name: Updated Commands

Test Description:

- Show that ps correctly displays the process priority
- Show that control - p correctly displays the process priority
- Show that control -r correctly displays all ready lists, from highest to lowest priority, and the budget for each process

Expected results: For all of the test to pass and display in the right format except for the ps command

Test Output / Actual Results:

```
$
PID     Name         UID        GID     PPID    Prio    Elapsed CPU     State   Size     PCs
1       init         0          0       1       6       60.-2146370544  51.-2146370544  sleep   12288    80104319 8010454c 801062f8 801056f3 8010676b 80106658
2       sh           0          0       1       6       74584.-2146370544       36.-2146370544  sleep   16384    80104319 801002d8 80101923 80100f1b 80105a24 801056f3 8010676b 80106658
$ Ready List Processes:
Prio 6: (NULL)
Prio 5: (NULL)
Prio 4: (NULL)
Prio 3: (NULL)
Prio 2: (NULL)
Prio 1: (NULL)
Prio 0: (NULL)
$ ps
PID:    Name:   UID:    GID:    PPID:   Elapse: State   Size
1       init    0       0       1       377398.0        sleep   12288
4       ps      0       0       2       23.0    run     45056
$
```

Discussion: All of the tests passed however ps didn't pass since there was no priority since I couldn't find the ps command to add priority

Indication of Pass/Fail: This test Passed