Embedded Systems Labs – Homework 1

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1. thread-ex

We can find that program thread-ex creates three threads with same PID(Process ID) and PPID(Parent Process ID), but different LWP/Thread ID.

```
bentsai@bentsai-HP ~/Desktop/EmbeddedSystem/hw1 $ ps -eLf | egrep "thread-ex|PID"
UID        PID  PPID   LWP  C NLWP STIME TTY          TIME CMD
bentsai   4419  3445  4419  0    3 23:18 pts/0    00:00:00 ./thread-ex
bentsai   4419  3445  4420  0    3 23:18 pts/0    00:00:00 ./thread-ex
bentsai   4419  3445  4421  0    3 23:18 pts/0    00:00:00 ./thread-ex
```

2. socket

I create a socket server that continuously runs and sends the time and date when a client connects to it. Then as soon as a socket client is created through a call to socket() function, the client will receive the time and date sent from the server.

```
bentsai@bentsai-HP ~/Desktop/EmbeddedSystem/hw1/socket $ ./time_serv &
[1] 5480

bentsai@bentsai-HP ~/Desktop/EmbeddedSystem/hw1/socket $ ./time_client 127.0.0.1
Tue Sep 26 23:47:39 2017
```

3. Raspberry Pi 3 Setup

First I need to prepare a boot SD card for Rpi. After writing Raspberry Jessie Image into SD card, we can use command to verify that two partitions are on SD card:

```
ntuee@ntuee-HP-406-G1-MT / $ df
Filesystem     1K-blocks     Used Available Use% Mounted on
udev             8145752        0   8145752   0% /dev
tmpfs            1633672     9440   1624232   1% /run
/dev/sdb2      944368052 5635352 890738540   1% /
tmpfs            8168344      856   8167488   1% /dev/shm
tmpfs               5120        4      5116   1% /run/lock
tmpfs            8168344        0   8168344   0% /sys/fs/cgroup
/dev/sda1          98304    21912     76392  23% /boot/efi
cgmfs                100        0       100   0% /run/cgmanager/fs
tmpfs            1633672       48   1633624   1% /run/user/1000
/dev/sde2        7583656  1068332   6174736  15% /media/ntuee/9a7608bd-5bff-4dfc-
ac1d-63a956744162
/dev/sde1          42136    21474     20663  51% /media/ntuee/boot
```

```
ntuee@ntuee-HP-406-G1-MT / $ sudo fdisk -l /dev/sde
Disk /dev/sde: 7.4 GiB, 7969177600 bytes, 15564800 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x7b0723d2

Device     Boot Start      End  Sectors  Size Id Type
/dev/sde1        8192    93813    85622 41.8M  c W95 FAT32 (LBA)
/dev/sde2       94208 15564799 15470592  7.4G 83 Linux
```

We can check what is in /boot of SD card:

```
ntuee@ntuee-HP-406-G1-MT / $ ls /media/ntuee/boot/
bcm2708-rpi-0-w.dtb     config.txt     LICENCE.broadcom
bcm2708-rpi-b.dtb       COPYING.linux  LICENSE.oracle
bcm2708-rpi-b-plus.dtb  fixup_cd.dat   overlays
bcm2708-rpi-cm.dtb      fixup.dat      start_cd.elf
bcm2709-rpi-2-b.dtb     fixup_db.dat   start_db.elf
bcm2710-rpi-3-b.dtb     fixup_x.dat    start.elf
bcm2710-rpi-cm3.dtb     issue.txt      start_x.elf
bootcode.bin            kernel7.img    System Volume Information
cmdline.txt             kernel.img
```

After revising /boot/config.txt, now a boot SD card is prepared.

We can use minicom to connect USB-TTL serial console to Rpi to see boot and console messages:

```
[  OK  ] Started Daily apt download activities.
[  OK  ] Started Daily apt upgrade and clean activities.
[  OK  ] Reached target Timers.
         Starting Permit User Sessions...
         Starting /etc/rc.local Compatibility...
[  OK  ] Started /etc/rc.local Compatibility.
[  OK  ] Started Permit User Sessions.
         Starting Terminate Plymouth Boot Screen...
         Starting Hold until boot process finishes up...

Raspbian GNU/Linux 9 raspberrypi ttyS0
raspberrypi login: pi
Password:
Last login: Thu Sep  7 16:18:08 UTC 2017 on ttyS0
Linux raspberrypi 4.9.41-v7+ #1023 SMP Tue Aug 8 16:00:15 BST 2017 armv7l

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
pi@raspberrypi:~$
```