

보고서 / 품의서 / 제안서

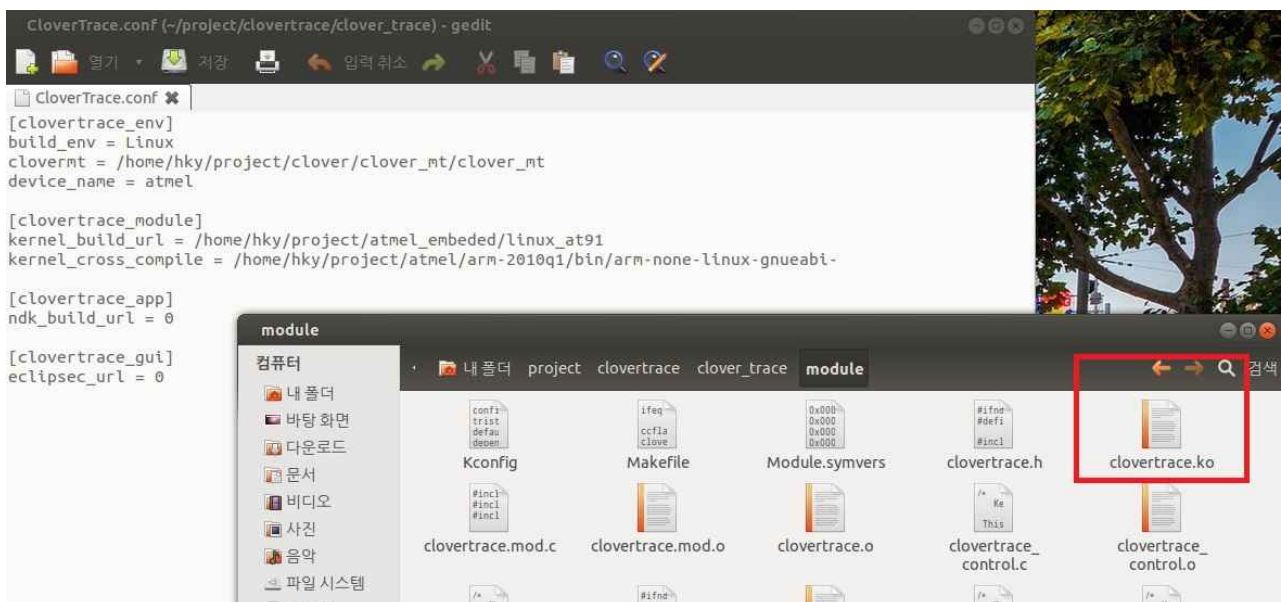
작성자	하권용
작성 일자	2014. 04. 28 (V 1.0)
분 류	<input checked="" type="checkbox"/> 기술 <input type="checkbox"/> 제안서 <input type="checkbox"/> 의견제출 <input type="checkbox"/> 구매요청 <input type="checkbox"/> 기타 <input checked="" type="checkbox"/>
제 목	How to use CloverTrace in vanilla linux

Summary

SKT Heart – FPGA용 바닐라 리눅스에서 clovertrace를 사용하기 위하여 작업한 내용들을 설명한 기술문서이다. 즉, 안드로이드가 없는 환경에서 clovertrace를 수행하기 위한 방법을 기술하였다.

1. CloverTrace 관련 파일 준비

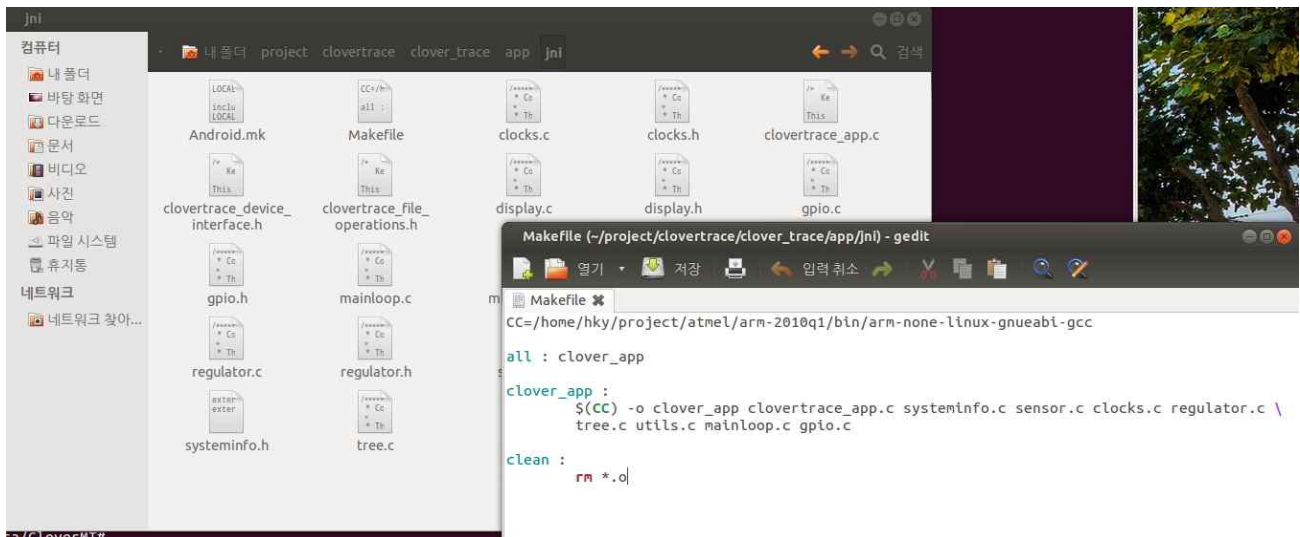
1-1. 해당 리눅스 커널로 빌드된 clovertrace.ko 모듈파일



1-2. Cross Compile된 clovertrace app

- Clovertrace App은 결과파일들(kernel.txt, thread.txt ...)을 생성(dump)하는 역할을 한다.
- 기존엔 NDK를 이용하여 컴파일하고 adb를 통해 동작하였으나
이전 방식을 사용할 수 없으므로 포팅한다.

■ <clovertrace>/app/jni 폴더에 Maefile 작성



CC=/home/hky/project/atmel/arm-2010q1/bin/arm-none-linux-gnueabi-gcc

all : clover_app

clover_app :

\$(CC) -o clover_app clovertrace_app.c systeminfo.c sensor.c clocks.c regulator.c \ tree.c utils.c mainloop.c gpio.c

clean :

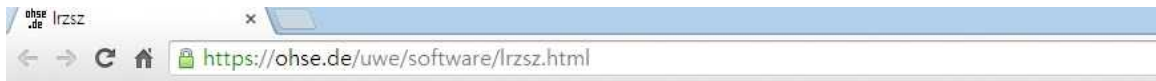
rm *.o

■ make 수행하면 clover_app 바이너리 파일이 생성된다.



1-3. Lrzs

- Lrzs는 터미널을 통한 파일전송을 가능하게 해 주는 통신 프로토콜 패키지이다.
- <https://ohse.de/uwe/software/lrzs.html>
- 위 사이트에서 lrzs를 다운받은 후 압축을 해제한다.



Uwe Ohse

available software

lrzs: free x/y/zmodem implementation

lrzs is a unix communication package providing the [XMODEM](#), [YMODEM](#), [ZMODEM](#) file transfer protocols. lrzs is a he now [free software](#) and released under the [GNU General Public Licence](#).

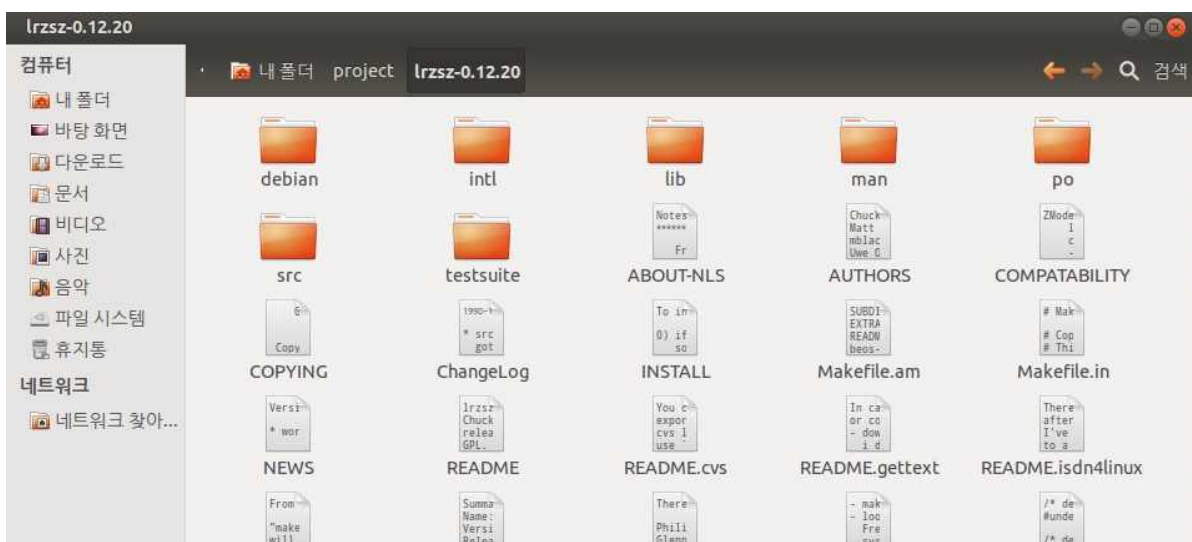
Features of lrzs

- very portable, automagically configured with GNU *autoconf*.
- crash recovery.
- up to 8KB block sizes (ZMODEM8K).
- internationalized (using GNU *gettext*). German translation of the programs output exists.
- far more secure than the original sources.
- high performance. say 'make vcheck-z' and have a look at the BPS rate - i recently saw *1.4 MB per second* tran
- good blocksize calculation (tries to compute an optimal blocksize based on the number of errors occured).
- It's [free software](#).

Downloading lrzs

The latest release is [lrzs-0.12.20.tar.gz](#) (*about 270KB*).

Recent changes



- CC=<툴체인path> ./configure --host=arm-none-linux-gnueabi-gcc
 - CC=/home/hky/project/atmel/arm-2010q1/bin/arm-none-linux-gnueabi-gcc ./configure --host=arm-none-linux-gnueabi-gcc

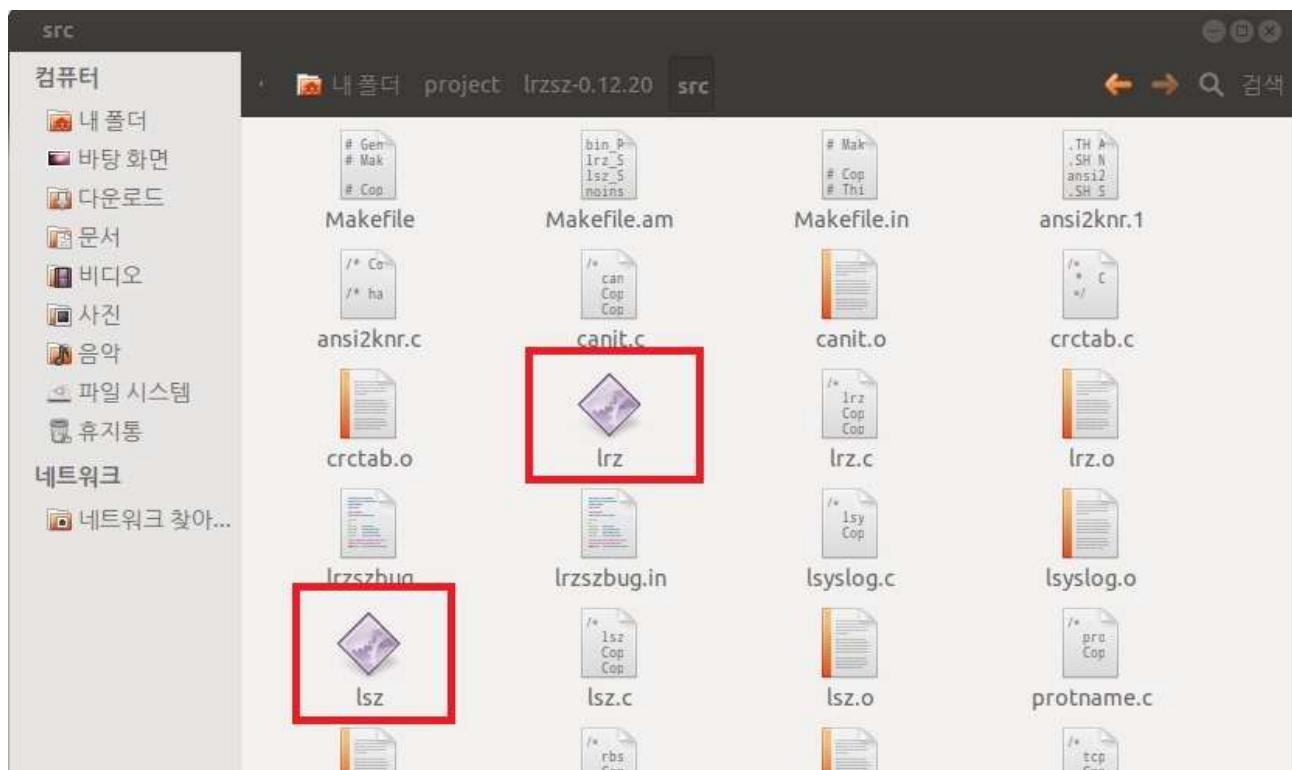
```
checking whether NLS is requested... yes
checking whether included gettext is requested... no
checking for libintl.h... yes
checking for gettext in libc... yes
checking for msgfmt... no
checking whether catgets can be used... no
checking for msgfmt... (cached) no
checking for gmsgfmt... no
checking for xgettext... :
checking for catalogs to be installed... de
updating cache ./config.cache
creating ./config.status
creating Makefile
creating intl/Makefile
creating lib/Makefile
creating testsuite/Makefile
creating man/Makefile
creating po/Makefile.in
creating src/Makefile
creating debian/rules
creating Specfile
creating systype
creating src/lrzszyug
creating config.h
linking ./intl/libgettext.h to intl/libintl.h
hky@hky-All-Series:~/project/lrzszy-0.12.20$
```

- make

```
hky@hky-All-Series: ~/project/lrzszy-0.12.20
usr/local/share/locale/" -I.. -I.. -I../src -I../intl -I../lib -g -O2 -c zm.c
/home/hky/project/atmel/arm-2010q1/bin/arm-none-linux-gnueabi-gcc -DNFGVMIN -DHAVE_CONFIG_H -DLOCALEDIR
usr/local/share/locale/" -I.. -I.. -I../src -I../intl -I../lib -g -O2 -c protname.c
/home/hky/project/atmel/arm-2010q1/bin/arm-none-linux-gnueabi-gcc -DNFGVMIN -DHAVE_CONFIG_H -DLOCALEDIR
usr/local/share/locale/" -I.. -I.. -I../src -I../intl -I../lib -g -O2 -c tcp.c
/home/hky/project/atmel/arm-2010q1/bin/arm-none-linux-gnueabi-gcc -DNFGVMIN -DHAVE_CONFIG_H -DLOCALEDIR
usr/local/share/locale/" -I.. -I.. -I../src -I../intl -I../lib -g -O2 -c lsyslog.c
lsyslog.c: In function 'lsyslog':
lsyslog.c:67: warning: incompatible implicit declaration of built-in function 'sprintf'
/home/hky/project/atmel/arm-2010q1/bin/arm-none-linux-gnueabi-gcc -DNFGVMIN -DHAVE_CONFIG_H -DLOCALEDIR
usr/local/share/locale/" -I.. -I.. -I../src -I../intl -I../lib -g -O2 -c canit.c
/home/hky/project/atmel/arm-2010q1/bin/arm-none-linux-gnueabi-gcc -g -O2 -o lrz lrz.o timing.o zperr
deadline.o crctab.o rbsb.o zm.o protname.o tcp.o lsyslog.o canit.o ../lib/libzmodem.a ../intl/libintl.a
l
/home/hky/project/atmel/arm-2010q1/bin/arm-none-linux-gnueabi-gcc -DNFGVMIN -DHAVE_CONFIG_H -DLOCALEDIR
usr/local/share/locale/" -I.. -I.. -I../src -I../intl -I../lib -g -O2 -c lsz.c
/home/hky/project/atmel/arm-2010q1/bin/arm-none-linux-gnueabi-gcc -g -O2 -o lsz lsz.o timing.o zperr
deadline.o crctab.o rbsb.o zm.o protname.o tcp.o lsyslog.o canit.o ../lib/libzmodem.a ../intl/libintl.a
l
make[2]: Leaving directory `/home/hky/project/lrzszy-0.12.20/src'
Making all in po
make[2]: Entering directory `/home/hky/project/lrzszy-0.12.20/po'
make[2]: Leaving directory `/home/hky/project/lrzszy-0.12.20/po'
Making all in man
make[2]: Entering directory `/home/hky/project/lrzszy-0.12.20/man'
make[2]: `all'를 위해 할 일이 없습니다
make[2]: Leaving directory `/home/hky/project/lrzszy-0.12.20/man'
Making all in testsuite
make[2]: Entering directory `/home/hky/project/lrzszy-0.12.20/testsuite'
make[2]: `all'를 위해 할 일이 없습니다
make[2]: Leaving directory `/home/hky/project/lrzszy-0.12.20/testsuite'
make[1]: Leaving directory `/home/hky/project/lrzszy-0.12.20'
hky@hky-All-Series:~/project/lrzszy-0.12.20$
```


- 빌드가 완료되면 /src 폴더에 lsz, lrz 두 바이너리 파일이 생성된다.

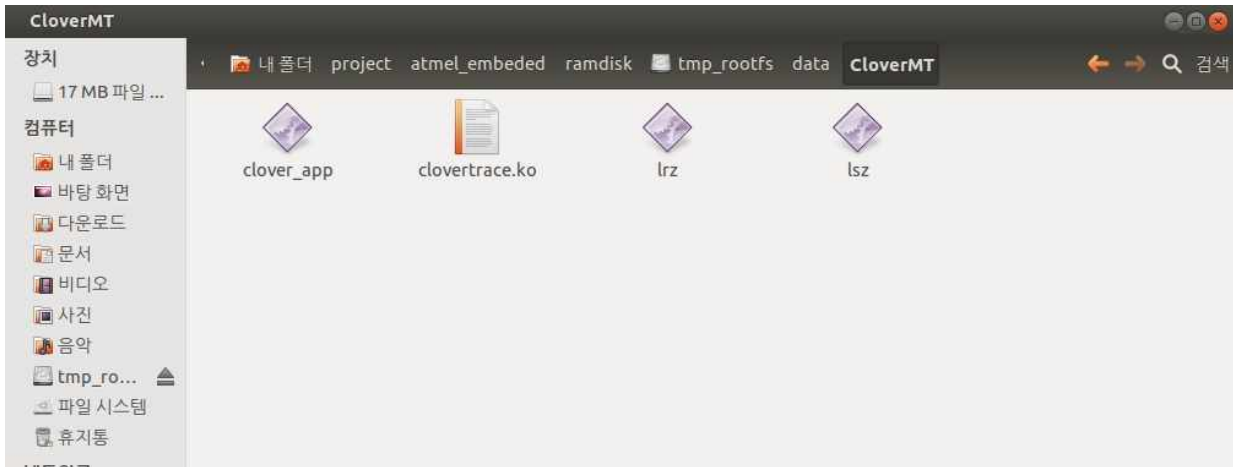
```
hky@hky-All-Series:~/project/lrzzsz-0.12.20$ cd src
hky@hky-All-Series:~/project/lrzzsz-0.12.20/src$ ls
Makefile      ansi2knr.c  crctab.o  lrzzszbug  lsz          protname.o  tcp.o      zglobal.h  zperr.c
Makefile.am   canit.c     lrz        lrzzszbug.in  lsz.c        rbsb.c      timing.c   zm.c        zperr.o
Makefile.in   canit.o     lrz.c      lsyslog.c  lsz.o        rbsb.o      timing.h   zm.o        zreadline.c
ansi2knr.1    crctab.c    lrz.o      lsyslog.o  protname.c   tcp.c        timing.o   zmodem.h   zreadline.o
hky@hky-All-Series:~/project/lrzzsz-0.12.20/src$ file ls
ls: ELF 32-bit LSB executable, ARM, version 1 (SYSV), dynamically linked (uses shared libs), for GNU/Linux 2.6.16, not stripped
hky@hky-All-Series:~/project/lrzzsz-0.12.20/src$ file lr
lr: ELF 32-bit LSB executable, ARM, version 1 (SYSV), dynamically linked (uses shared libs), for GNU/Linux 2.6.16, not stripped
hky@hky-All-Series:~/project/lrzzsz-0.12.20/src$
```



2. Clovertrace 관련 파일 삽입

1-1. rootfs ramdisk 이미지를 마운트하여 위에서 준비한 파일들을 copy한다.

- /data/CloverMT 폴더에서 작업함.



1-2. Ramdisk 이미지 언마운트 후 보드로 다운로드.

3. CloverTrace 수행하기

여기서부터는 minicom 화면입니다.

1-1. 모듈 인스톨

```
hky@hky-All-Series: ~/project/clovertrace/clover_trace
hky@hky-All-Series: ~/project/clo... ✕ hky@hky-All-Series: ~/project/at... ✕ root@hky-A
root@SKT_FPGA:/# cd data/CloverMT
root@SKT_FPGA:/data/CloverMT# ls
clover_app      clovertrace.ko  lrz             lsx
root@SKT_FPGA:/data/CloverMT# insmod clovertrace.ko
clovertrace profiling size : 11468800
clovertrace : finished initialization
root@SKT_FPGA:/data/CloverMT#
root@SKT_FPGA:/data/CloverMT# lsmod
clovertrace 14405 0 - Live 0xbf000000 (0)
root@SKT_FPGA:/data/CloverMT#
```

1-2. Clovertrace 타이머에 수행시간(15초) 전달

- echo 15 > /sys/clover/clover_time

1-3. Clovertrace 수행시작 신호 전달

- echo 1 > /sys/clover/clover

1-4. 원하는 작업 수행

```
hky@hky-All-Series: ~/project/clovertrace/clover_trace
hky@hky-All-Series: ~/project/clo... ✕ hky@hky-All-Series: ~/project/at... ✕ root@hky-All-Series
root@SKT_FPGA:/data/CloverMT# echo 15 > /sys/clover/clover_time
root@SKT_FPGA:/data/CloverMT# echo 1 > /sys/clover/clover
@clovertrace start
clover record time : 15
clovertrace_start 0
root@SKT_FPGA:/data/CloverMT# clovertrace_stop 85
total : 15.039749137
core : 0
      idle 15.033481253
      off 0.000000000
      on 0.006265944

root@SKT_FPGA:/data/CloverMT# echo 0 > /sys/clover/clover
root@SKT_FPGA:/data/CloverMT#
root@SKT_FPGA:/data/CloverMT#
root@SKT_FPGA:/data/CloverMT#
```

1-5. 15초 후 trace가 완료되면 CPU 수행데이터가 출력되고, 수행완료 신호를 입력해준다.

- echo 0 > /sys/clover/clover

4. CloverTrece 결과 확인

1-1. 결과파일 추출

- clover_app 실행

```
root@SKT_FPGA:/data/CloverMT#
root@SKT_FPGA:/data/CloverMT# cd ..
root@SKT_FPGA:/data# ls
CloverMT
root@SKT_FPGA:/data# cd CloverMT
root@SKT_FPGA:/data/CloverMT#
root@SKT_FPGA:/data/CloverMT# clover_app
not enough memory to allocate systems info
failed to initialize clock details (check debugfs)
failed to initialize sensor details (check debugfs)
failed to initialize gpio details (check debugfs)

Device:
Kernel: Linux version 3.6.9 (root@hky-All-Series) (gcc version 4.4.1 (Sourcery G++
Backlight information

Clock Tree :
*****

Sensor Information:
*****

Gpio Tree :
*****
/

Regulator Information:
*****

clovertrace dump done...
root@SKT_FPGA:/data/CloverMT#
root@SKT_FPGA:/data/CloverMT# cd ..
root@SKT_FPGA:/data# ls
CloverMT          gpioinfo.json      regulatorinfo.json  systeminfo.csv
clockinfo.json    kernel.txt          sensorinfo.json     thread.txt
root@SKT_FPGA:/data#
```

- /data/폴더에 trace 결과파일들이 생성됨.

1-2. 결과파일을 Host로 가져오기 위해 minicom에서 path 설정

- Ctrl+A, O

```
hky@hky-All-Series: ~/project/clovertrace/clover_trace
hky@hky-All-Series: ~/project/clo... ✕ hky@hky-All-Series: ~/project/at...
CloverMT
root@SKT_FPGA:/data# cd CloverMT
root@SKT_FPGA:/data/CloverMT#
root@SKT_FPGA:/data/CloverMT# clover_app
not enough memory to allocate systems info
failed to initialize clock details (check debugfs)
failed to initialize sensor details (check debugfs)
failed to initialize gpio details (check debugfs)

Device:      +-----[configuration]-----+
Kernel: Linu| Filenames and paths |l-Series) (gcc vers
Backlight in| File transfer protocols |
              | Serial port setup       |
Clock Tree :| Modem and dialing       |
*****      | Screen and keyboard     |
              | Save setup as dfl       |
              | Save setup as..        |
              | Exit                    |
Sensor Infor+-----+
*****
```

- Download/Upload directory 설정

```
hky@hky-All-Series: ~/project/clovertrace/clover_trace
hky@hky-All-Series: ~/project/clo... ✕ hky@hky-All-Series: ~/project/at... ✕ root@hky-All-Series: /home/hky/
CloverMT
root@SKT_FPGA:/data# cd CloverMT
root@SKT_FPGA:/data/CloverMT#
root@SKT_FPGA:/data/CloverMT# clover_app
not +-----+
fail| A - Download directory : /home/hky/project |
fail| B - Upload directory  : /home/hky/project |
fail| C - Script directory  :                   |
      | D - Script program    : runscript        |
Devi| E - Kermit program    :                   |
Kern| F - Logging options   :                   |
Back|                       |
      | Change which setting? |
Cloc+-----+
***** | Screen and keyboard |
      | Save setup as dfl   |
      | Save setup as..    |
```

1-3. lsz <filename>을 입력하면 해당 파일이 직전에 설정한 폴더로 다운로드 된다.

```
+-----[zmodem download - Press CTRL-C to quit]-----+
Device: |
Kernel: L|Receiving: kernel.txt                               |urcery
Backlight|Bytes received: 2984/ 2984 BPS:11107
Clock Tre|Transfer complete
*****
| READY: press any key to continue...|
+-----+

Sensor Information:
*****

Gpio Tree :
*****
/

Regulator Information:
*****

clovertrace dump done...
root@SKT_FPGA:/data/CloverMT#
root@SKT_FPGA:/data/CloverMT# cd ..
root@SKT_FPGA:/data# ls
CloverMT          gpioinfo.json      regulatorinfo.json  systeminfo.csv
clockinfo.json    kernel.txt          sensorinfo.json     thread.txt
root@SKT_FPGA:/data# cd CloverMT
root@SKT_FPGA:/data/CloverMT# ls
clover_app        clovertrace.ko     lrz                 lsz
root@SKT_FPGA:/data/CloverMT#
root@SKT_FPGA:/data/CloverMT# lsz /data/kernel.txt
**B00
```

1-4. 결과파일을 열어 내용 확인.

kernel.txt (~/.project) - gedit

```
1500 0 0 1170959846 534954521 0 0
1504 377 0 1170959846 534956339 2 0
1507 377 0 1170959846 534957309 8 0
1500 3 0 1170959846 535681309 0 0
1500 0 0 1170959846 535711855 0 0
1500 236 0 1170959846 598619861 0 0
1500 0 0 1170959846 598710649 0 0
1500 236 0 1170959846 658670897 0 0
1500 0 0 1170959846 658726533 0 0
1500 236 0 1170959846 858861220 0 0
1500 0 0 1170959846 858902190 0 0
1500 236 0 1170959847 59049240 0 0
1500 0 0 1170959847 59087422 0 0
1500 236 0 1170959847 259242109 0 0
1500 0 0 1170959847 259278715 0 0
1500 236 0 1170959847 459434614 0 0
1500 0 0 1170959847 459468917 0 0
1500 236 0 1170959847 659622997 0 0
1500 0 0 1170959847 659660573 0 0
1500 236 0 1170959847 859816472 0 0
1500 0 0 1170959847 859852593 0 0
1500 236 0 1170959848 60006067 0 0
1500 0 0 1170959848 60013533 0 0
```

thread.txt (~/.project) - gedit

```
*version
1
data-file-overflow=false
clock=thread-cpu
elapsed-time-usec=269540
num-method-calls=4164
clock-call-overhead-nsec=26001
vm=dalvik
*cpus
1
*freqs
*threads
1 1 ini
2 2 kthread
3 3 ksoftirqd/
4 4 kworker/0:
5 5 kworker/0:0
6 6 kworker/u:
7 7 kworker/u:0
8 8 khelpe
9 9 kdevtmpf
10 10 kworker/u:
```

1-5. 결과 증명

■ 테스트 파일

```
#include <unistd.h>
#include <errno.h>
#include <fcntl.h>
#include <sys/ioctl.h>
#include <sys/socket.h>
#include <sys/types.h>
#include <sys/stat.h>
#include <stdio.h>

#define FRAME_PATH "/sys/clover/clover_framework2"

void main()
{
    int id = 500;
    long value1;
    long value2;
    int ret = -1;
    int nwr = -1;
    int fd = -1;
    char buf[20];

    fd = open(FRAME_PATH, O_RDWR);
    nwr = sprintf(buf, "%ld Wn", id);
    ret = write(fd, buf, nwr);
    close(fd);
}
```

■ 실행 시 (500, 0, 0)값을 찍음.

```
hky@hky-All-Series: ~/project/clovertrace/clover_trace
hky@hky-All-Series: ~/project/clo... hky@hky-All-Series: ~/project/at... root@hky-All-Serie
root@SKT_FPGA:/data/CloverMT# echo 15 > /sys/clover/clover_time
root@SKT_FPGA:/data/CloverMT# echo 1 > /sys/clover/clover
@clovertrace start
clover record time : 15
clovertrace_start 0
root@SKT_FPGA:/data/CloverMT# a.out
root@SKT_FPGA:/data/CloverMT#
root@SKT_FPGA:/data/CloverMT# a.out
root@SKT_FPGA:/data/CloverMT# a.out
root@SKT_FPGA:/data/CloverMT# a.out
root@SKT_FPGA:/data/CloverMT# a.out
root@SKT_FPGA:/data/CloverMT# a.out
root@SKT_FPGA:/data/CloverMT# a.out
root@SKT_FPGA:/data/CloverMT# a.out
root@SKT_FPGA:/data/CloverMT# a.out
root@SKT_FPGA:/data/CloverMT#
root@SKT_FPGA:/data/CloverMT# a.out
root@SKT_FPGA:/data/CloverMT# a.out
root@SKT_FPGA:/data/CloverMT# a.out
root@SKT_FPGA:/data/CloverMT# a.out
root@SKT_FPGA:/data/CloverMT#
root@SKT_FPGA:/data/CloverMT# a.out
root@SKT_FPGA:/data/CloverMT#
root@SKT_FPGA:/data/CloverMT# clovertrace_stop 104
total : 15.049773864
core : 0
      idle 14.924192527
      off 0.000000000
      on 0.125579277

root@SKT_FPGA:/data/CloverMT# echo 0 > /sys/clover/clover
root@SKT_FPGA:/data/CloverMT#
```

```
l-Series: ~/project/clovertrace/clover_trace
Series: ~/project/clo... hky@hky-All-Series: ~/project/at... root@hky-All-Series: /home/hky/... root@hky-All-Series: /home/hky/... hky@hky-All-Series: ~/project
GA:/data/CloverMT# a.out
GA:/data/CloverMT# clovertrace_stop 104
049773864

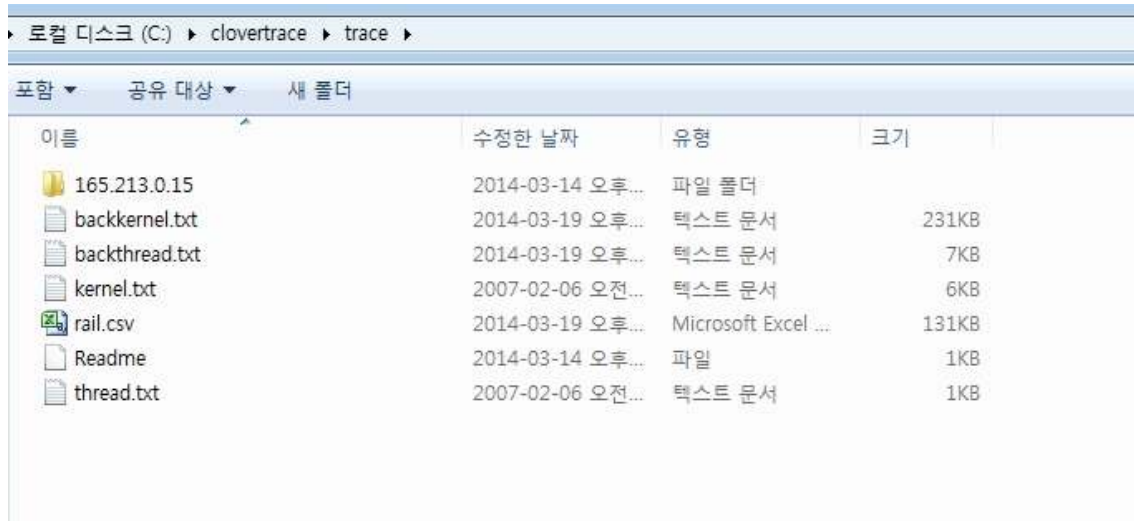
e 14.924192527
-----[zmodem download - Press CTRL-C to quit]-----+
ceiving: kernel.txt
ytes received: 3685/ 3685 BPS:11161
ransfer complete
READY: press any key to continue...[ ]
-----+
ux version 3.6.9 (root@hky-All-Series) (gcc version 4.4.1 (Source
nformation
:
mation:
*****

kernel.txt (~/.project) - gedit
500 454 0 1170962140 244279350 0 0
1500 377 0 1170962140 244684320 0 0
1500 3 0 1170962140 245557168 0 0
1500 0 0 1170962140 245604926 0 0
1500 236 0 1170962140 397735366 0 0
1500 377 0 1170962140 397779002 0 0
1500 0 0 1170962140 398014517 0 0
1500 236 0 1170962140 517846044 0 0
1500 377 0 1170962140 517883984 0 0
1500 455 0 1170962140 518825075 0 0
500 455 0 1170962140 524579378 0 0
1500 377 0 1170962140 524991984 0 0
1500 3 0 1170962140 525861196 0 0
1500 0 0 1170962140 525906529 0 0
1500 236 0 1170962140 637963632 0 0
1500 377 0 1170962140 638007874 0 0
1500 0 0 1170962140 638244723 0 0
1500 394 0 1170962140 708013094 0 0
1500 0 0 1170962140 708053457 0 0
1500 236 0 1170962140 748063158 0 0
1500 377 0 1170962140 748178431 0 0
1500 456 0 1170962140 749107522 0 0
500 456 0 1170962140 754852371 0 0
1500 377 0 1170962140 754852371 0 0
```

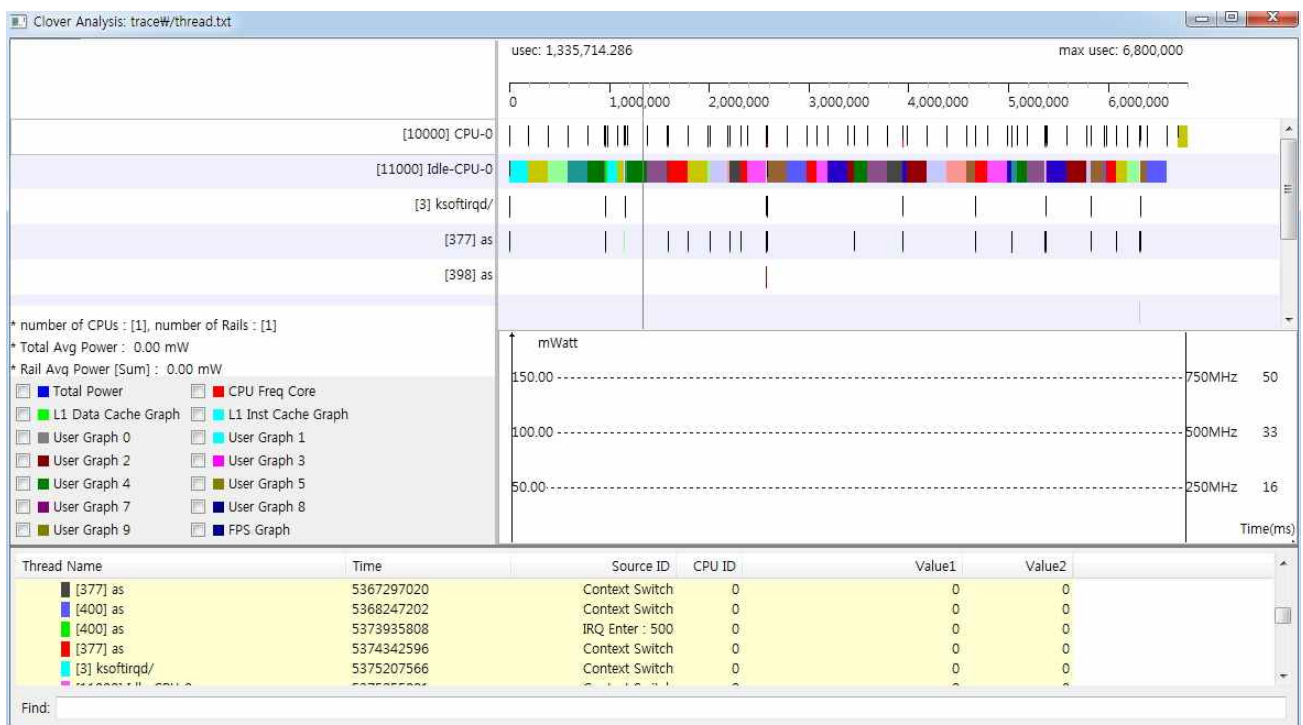
- Kernel.txt 파일에서 id - 500으로 찍혀나옴.

1-6. GUI로 보기

- (MS 윈도우) kernel.txt, thread.txt 파일을 Clovertrace/trace 폴더로 옮긴다.

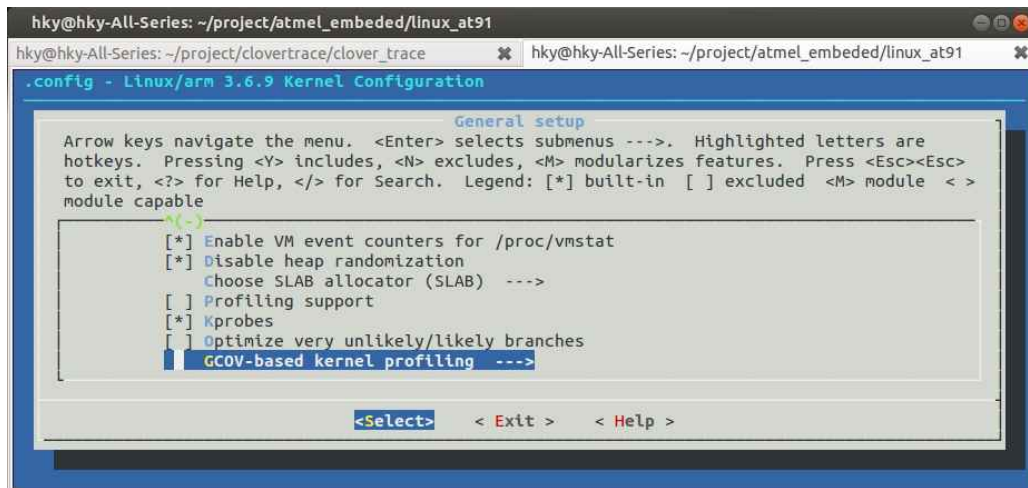


- cmd창에서 run_gui.bat



5. Clovertrace 모듈 관련 기타사항

1-1. 모듈이 동작하기 위해선 커널에서 kprobe 옵션 체크해야함.



1-2. 커널의 version masic string 불일치시 모듈 로딩불가 - svn부분 주석처리



1-3. Wake_up_new_task, finish_task_switch 심볼 확인

