程式講解

Date2time:

- 先讀取輸入值
- Init 內先判斷輸入是否合理(ex: y=0 or d=32 or m=13 不合理)
- 分大小月個別算生日當年的日期已過多久(ex: 3/10 = 31+28 天 + 10 天)
- 算出總日子 x86400(sec)

```c
# include <linux/module.h>
# include <linux/time.h>

int d,m,y;

module_param(d, int, 0);
MODULE_PARM_DESC(d, "date of time");
module_param(m, int, 0);
MODULE_PARM_DESC(m, "month of time");
module_param(y, int, 0);
MODULE_PARM_DESC(y, "year of time");

int year,month,day,month_d=0;
unsigned long long ts;
```

```c
int init_module(void) {

        if (y > 0 && m < 13 && m > 0 && d > 0 && d < 32){
                year = y - 1970;
                if (m == 2) {month_d = 31;}
                else if(m == 3) {month_d = 31+28;}
                else if(m == 4) {month_d = 31+28+31;}
                else if(m == 5) {month_d = 31+28+31+30;}
                else if(m == 6) {month_d = 31+28+31+30+31;}
                else if(m == 7) {month_d = 31+28+31+30+31+30;}
                else if(m == 8) {month_d = 31+28+31+30+31+30+31;}
                else if(m == 9) {month_d = 31+28+31+30+31+30+31+31;}
                else if(m == 10) {month_d = 31+28+31+30+31+30+31+31+30;}
                else if(m == 11) {month_d = 31+28+31+30+31+30+31+31+30+31;}
                else if(m == 12) {month_d = 31+28+31+30+31+30+31+31+30+31+30;}
                else {
                        month_d = 0;
                }
                day = d;
                ts = (year*365 + month_d + day)*86400;
                printk(KERN_INFO "data2timestamp inserted successfully! ts=%llu\n",ts);
                return 0;
        }

        else{
                printk(KERN_ERR "Invalid argument(s).\n");
                return -EINVAL;
        }
}
```

```c
void cleanup_module(void) {
        printk(KERN_INFO "data2timestamp remove successfully\n");
}

EXPORT_SYMBOL(ts);

MODULE_LICENSE("GPL");
MODULE_AUTHOR("s4110056030");
MODULE_DESCRIPTION("Lab5");
```

程式講解

Myage:

- 用 ktime_get_real_seconds()取得目前時間戳記並轉換 type
- 程式先 extern 剛剛 Date2time 得到的生日 ts
- now – ts = 我目前 total 活幾秒

```c
int init_module(void) {

    unsigned long long now;
    now = (unsigned long long)ktime_get_real_seconds();

    if (now < ts){
        printk(KERN_INFO "myage insert successfully\n");
        printk(KERN_INFO "Are U kidding me :)\n");
    }
    else{

        unsigned long long life_t = now - ts;
        unsigned long long total_date,my_d,my_y;
        total_date = life_t/86400;
        my_d = total_date % 365;
        my_y = total_date / 365;
        printk(KERN_INFO "myage insert successfully\n");
        printk(KERN_INFO "Wow you have survived on this world %llu years and %llu days!\n",total_date/365,total_date%365);

    }
    return 0;

}
```

```c
#include <linux/module.h>
#include <linux/time.h>

extern unsigned long long ts;
```

```c
void cleanup_module(void) {
    printk(KERN_INFO "myage remove successfully\n");
}

MODULE_LICENSE("GPL");
MODULE_AUTHOR("s4110056030");
MODULE_DESCRIPTION("Lab5");
```

遇到的困難+解決方法

時間戳記

尋找如何取得時間戳記找了很久
一開始是用 time_t(), make 後 ERROR 建議用 ktime_t(), make 後還是失敗 QQ
最後改成 ktime_get_real_seconds()終於 make 通過!!!

來源參考:

https://docs.kernel.org/core-api/timekeeping.html

```c
time64_t ktime_get_seconds(void)
time64_t ktime_get_boottime_seconds(void)
time64_t ktime_get_real_seconds(void)
time64_t ktime_get_clocktai_seconds(void)
time64_t ktime_get_raw_seconds(void)
```
Return a coarse-grained version of the time as a scalar time64_t. This avoids accessing the clock hardware and rounds down the seconds to the full seconds of the last timer tick using the respective reference.

執行結果

檢查 module

```
s4110056030@s4110056030-VirtualBox:~/lab5$ lsmod
Module                  Size  Used by
myage                  16384  0
date2timestamp         16384  1 myage
vboxvideo              57344  0
binfmt_misc            24576  1
nls_iso8859_1          16384  1
snd_intel8x0           53248  2
snd_ac97_codec        200704  1 snd_intel8x0
ac97_bus               16384  1 snd_ac97_codec
snd_pcm               192512  2 snd_intel8x0,snd_ac97_codec
intel_rapl_msr         20480  0
intel_rapl_common      40960  1 intel_rapl_msr
snd_seq_midi           20480  0
snd_seq_midi_event     16384  1 snd_seq_midi
crct10dif_pclmul       16384  1
```

Remove 有先後

```
s4110056030@s4110056030-VirtualBox:~/lab5$ sudo rmmod myage
s4110056030@s4110056030-VirtualBox:~/lab5$ sudo rmmod date2timestamp
s4110056030@s4110056030-VirtualBox:~/lab5$ sudo dmesg | tail -2
[ 6515.016906] myage remove successfully
[ 6518.249359] data2timestamp remove successfully
```

Result:

1. 輸入詭異的日期 + 正常計算

```
s4110056030@s4110056030-VirtualBox:~/lab5$ sudo insmod date2timestamp.ko d=0 m=1 y=1970
insmod: ERROR: could not insert module date2timestamp.ko: Invalid parameters
s4110056030@s4110056030-VirtualBox:~/lab5$ sudo insmod date2timestamp.ko d=20 m=11 y=2001
s4110056030@s4110056030-VirtualBox:~/lab5$ sudo dmesg | tail -2
[ 2264.283122] Invalid argument(s).
[ 2271.097847] data2timestamp inserted successfully! ts=1005609600
s4110056030@s4110056030-VirtualBox:~/lab5$ sudo insmod myage.ko
s4110056030@s4110056030-VirtualBox:~/lab5$ sudo dmesg | tail -4
[ 2264.283122] Invalid argument(s).
[ 2271.097847] data2timestamp inserted successfully! ts=1005609600
[ 2289.622393] myage insert successfully
[ 2289.622411] Wow you have survived on this world 21 years and 331 days!
```

2. 穿越未來

```
s4110056030@s4110056030-VirtualBox:~/lab5$ sudo insmod date2timestamp.ko d=1 m=1 y=2024
s4110056030@s4110056030-VirtualBox:~/lab5$ sudo insmod myage.ko
s4110056030@s4110056030-VirtualBox:~/lab5$ sudo dmesg | tail -3
[ 2224.338301] data2timestamp inserted successfully! ts=1703030400
[ 2228.883410] myage insert successfully
[ 2228.883414] Are U kidding me :)
```