【分享】linux设备驱动程序该添加哪些头文件 [复制链接]

linux设备驱动程序该添加哪些头文件

在编写linux设备驱动程序的时候，如果在不参考已有驱动程序的情况下，我们该如何不多不少地用#include包含所需的头文件呢？

下面，通过一个实验来介绍。

运行环境：Source Insight @ Windows xp

内核代码：Linux 2.6.32

实验: 内存模拟磁盘ramblock

代码如下:

#define DEV\_MAJOR 251

static struct gendisk \*my\_rmbk;

static struct request\_queue \*my\_rq;

DEFINE\_SPINLOCK(rmbk\_lock);

#define RAMBLOCK\_SIZE (1024\*1024)

const struct block\_device\_operations rmbk\_fops = {

.owner = THIS\_MODULE,

};

static void do\_rmbk\_request(struct request\_queue \*q)

{

printk(Do\_ramdisk\_request\n);

}

static int ramdisk\_init(void)

{

/\* 注册块设备 \*/

register\_blkdev(DEV\_MAJOR, ramdisk);

/\* 分配gendisk结构体\*/

my\_rmbk = alloc\_disk(16);

/\* 为块设备准备一个请求队列 \*/

my\_rq = blk\_init\_queue(do\_rmbk\_request, rmbk\_lock);

sprintf(my\_rmbk, ramdisk);

my\_rmbk->major = DEV\_MAJOR;

my\_rmbk->first\_minor = 0;

my\_rmbk->fops = rmbk\_fops;

my\_rmbk->gt = my\_rq;

set\_capacity(my\_rmbk, RAMBLOCK\_SIZE / 512);

/\* 添加分区信息到内核列表 \*/

add\_disk(my\_rmbk);

return 0;

}

static void ramdisk\_exit(void)

{

del\_gendisk(my\_rmbk);

blk\_cleanup\_queue(my\_rq);

put\_disk(my\_rmbk);

unregister\_blkdev(DEV\_MAJOR, ramdisk);

return;

}

module\_init(ramdisk\_init);

module\_exit(ramdisk\_exit);

MODULE\_LICENSE(GPL);

上面是没有写#include语句的源代码，直接编译程序，看会报告那些函数未知的错误

编译错误如下:

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:6: warning: data definition has no type or storage class

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:6: warning: type defaults to 'int' in declaration of 'DEFINE\_SPINLOCK'

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:6: warning: parameter names (without types) in function declaration

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:10: error: variable 'rmbk\_fops' has initializer but incomplete type

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:11: error: unknown field 'owner' specified in initializer

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:11: error: 'THIS\_MODULE' undeclared here (not in a function)

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:11: warning: excess elements in struct initializer

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:11: warning: (near initialization for 'rmbk\_fops')

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c: In function 'do\_rmbk\_request':

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:16: error: implicit declaration of function 'printk'

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c: In function 'ramdisk\_init':

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:22: error: implicit declaration of function 'register\_blkdev'

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:25: error: implicit declaration of function 'alloc\_disk'

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:25: warning: assignment makes pointer from integer without a cast

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:28: error: implicit declaration of function 'blk\_init\_queue'

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:28: error: 'rmbk\_lock' undeclared (first use in this function)

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:28: error: (Each undeclared identifier is reported only once

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:28: error: for each function it appears in.)

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:32: error: implicit declaration of function 'sprintf'

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:32: warning: incompatible implicit declaration of built-in function 'sprintf'

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:32: error: dereferencing pointer to incomplete type

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:33: error: dereferencing pointer to incomplete type

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:34: error: dereferencing pointer to incomplete type

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:35: error: dereferencing pointer to incomplete type

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:36: error: dereferencing pointer to incomplete type

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:38: error: implicit declaration of function 'set\_capacity'

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:41: error: implicit declaration of function 'add\_disk'

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c: In function 'ramdisk\_exit':

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:50: error: implicit declaration of function 'del\_gendisk'

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:51: error: implicit declaration of function 'blk\_cleanup\_queue'

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:52: error: implicit declaration of function 'put\_disk'

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:53: error: implicit declaration of function 'unregister\_blkdev'

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c: At top level:

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:58: warning: data definition has no type or storage class

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:58: warning: type defaults to 'int' in declaration of 'module\_init'

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:58: warning: parameter names (without types) in function declaration

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:59: warning: data definition has no type or storage class

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:59: warning: type defaults to 'int' in declaration of 'module\_exit'

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:59: warning: parameter names (without types) in function declaration

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:61: error: expected declaration specifiers or '...' before string constant

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:61: warning: data definition has no type or storage class

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:61: warning: type defaults to 'int' in declaration of 'MODULE\_LICENSE'

/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.c:61: warning: function declaration isn't a prototype

make[2]: \*\*\* [/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk/ramblock.o] Error 1

make[1]: \*\*\* [\_module\_/home/profiles/2440/rootfs/exps\_wqkfsc/ramdisk] Error 2

make[1]: Leaving directory `/home/profiles/2440/linux-2.6.32.2'

make: \*\*\* [all] Error 2

提取重要错误信息如下:

第6行 warning DECLARE\_SPINLOCK

第10行 error rmbk\_fops 为struct block\_device\_operations

第11行 error .owner = THIS\_MODULE

第16行 error printk

第22行 error register\_blkdev

第25行 error alloc\_disk

第28行 error blk\_init\_queue、rmbk\_lock

第32行 error sprintf

第32-36行 error 都是上面引起的连带错误

第38行 error set\_capacity

第41行 error add\_disk

第50行 error del\_gendisk

第51行 error blk\_cleanup\_queue

第52行 error put\_disk

第53行 error unregister\_blkdev

第58-59行 warning module\_init,module\_exit的警告

第61行 error&amp;warning MODULE\_LICENSE发出的

先说明一下source insight里面经常用到的两个快捷键

Jump to difinition（跳至定义处）: CTRL+=或者CTRL+左键单击关键词

Lookup reference（查找引用）：CTRL+\ 搜索关键词

对错误信息分析如下：

第6行

DECLARE\_SPINLOCK是一个宏，Lookup reference（查找引用）：#define DECLARE\_SPINLOCK

结果：

Spinlock\_types.h (e:\friendly2.6.32.2\include\linux):

#define DEFINE\_SPINLOCK(x) spinlock\_t x = \_\_SPIN\_LOCK\_UNLOCKED(x)

所以要包含：#define linux/spinlock\_types.h

第10行

block\_device\_operations, Jump to difinition跳到它定义处

怎么使用source insight查看文件的路径呢？

Project->Add and Remove Project Files...右击被选中的文件Copy List-Copy selected item(s)

找到路径e:\friendly2.6.32.2\include\linux\Blkdev.h

包含：#include linux/blkdev.h

第11行

THIS\_MODULE, 同样的，按住鼠标左键，单击这个词

找到路径：e:\friendly2.6.32.2\include\linux\Module.h

包含：#include linux/module.h

第16行

Jump to difinition: printk

找到路径: e:\friendly2.6.32.2\include\linux\Kernel.h

所以要包含：#include linux/kernel.h

第22行

Jump to difinition: register\_blkdev

路径: e:\friendly2.6.32.2\block\Genhd.c

包含：？？？

出现问题了，文件并不在include目录或者子目录中，包含这个文件也没用，而我们用Jump to difinition也只能跳转到Genhd.c

出现int register\_blkdev(unsigned int major, const char \*name)

这个时候就需要命令Lookup reference（查找引用）。并且搜索的词也是关键，我们需要搜索这个函数的声明，就需要尽量包含整个函数声明的语句。

如果搜索int register\_blkdev(unsigned int major, const char \*name)这整段话的话，很可能不成功，因为包含了变量的名字major, name，不一定能匹配。

我们应该搜索如register\_blkdev(unsigned int;或者register\_blkdev(这样的关键字，那么就试一试吧。

找到:

Fs.h (e:\friendly2.6.32.2\include\linux):

extern int register\_blkdev(unsigned int, const char \*);

Genhd.c (e:\friendly2.6.32.2\block):int register\_blkdev(unsigned int major, const char \*name)

找到了e:\friendly2.6.32.2\include\linux\Fs.h

那我们就包含#include linux/fs.h

第25行

Jump to difinition: alloc\_disk

路径: e:\friendly2.6.32.2\block\Genhd.c

找到：struct gendisk \*alloc\_disk(int minors)

Lookup reference关键字：alloc\_disk(int

结果找到：

Genhd.c (e:\friendly2.6.32.2\block):struct gendisk \*alloc\_disk(int minors)

Genhd.h (e:\friendly2.6.32.2\include\linux):extern struct gendisk \*alloc\_disk(int minors);

包含：#include linux/genhd.h

我们可以在这个文件里看看，应该和一般的硬盘操作有关的函数都在里面，可以找到:

set\_capacity、add\_disk、del\_gendisk、put\_disk

第28行

Jump to difinition: blk\_init\_queue

路径: e:\friendly2.6.32.2\block\Blk-core.c

找到：struct request\_queue \*blk\_init\_queue(request\_fn\_proc \*rfn, spinlock\_t \*lock)

Lookup reference关键字：blk\_init\_queue(request\_fn\_proc

结果：

Blk-core.c (e:\friendly2.6.32.2\block):struct request\_queue \*blk\_init\_queue(request\_fn\_proc \*rfn, spinlock\_t \*lock)

Blkdev.h (e:\friendly2.6.32.2\include\linux):extern struct request\_queue \*blk\_init\_queue(request\_fn\_proc \*, spinlock\_t \*);

包含：#include linux/blkdev.h

这里还可以找到blk\_cleanup\_queue

rmbk\_lock，第6行已解决

第32行

Jump to difinition: sprintf

路径: e:\friendly2.6.32.2\lib\Vsprintf.c

找到：int sprintf(char \* buf, const char \*fmt, ...)

Lookup reference关键字：sprintf(char \* buf

结果：

Kernel.h (e:\friendly2.6.32.2\include\linux):extern int sprintf(char \* buf, const char \* fmt, ...)

Vsprintf.c (e:\friendly2.6.32.2\lib):int sprintf(char \* buf, const char \*fmt, ...)

包含：#include &lt;linux/kernel.h，其实和printk在一个文件里面

第32-36行

上面已解决

第38行

set\_capacity，第25行已解决

第41行

add\_disk，第25行已解决

第50行

del\_gendisk，第25行已解决

第51行 error blk\_cleanup\_queue

第52行

put\_disk，第25行已解决

第53行

unregister\_blkdev，第28行已解决

第58-59行

Jump to difinition: module\_init是找不到的，我们知道它是一个宏

所以只能Lookup reference关键字：#define module\_init

结果：

Init.h (e:\friendly2.6.32.2\include\linux):#define module\_init(x) \_\_initcall(x);

Init.h (e:\friendly2.6.32.2\include\linux):#define module\_init(initfn)

包含：#include linux/init.h, module\_exit也包含在里面

第61行

同样的只能Lookup reference关键字：MODULE\_LICENSE

结果：

Module.h (e:\friendly2.6.32.2\include\linux):#define MODULE\_LICENSE(\_license) MODULE\_INFO(license, \_license)

Nand\_ecc.c (e:\friendly2.6.32.2\drivers\mtd\nand):#define MODULE\_LICENSE(x) /\* x \*/

Pq.h (e:\friendly2.6.32.2\include\linux\raid):#define MODULE\_LICENSE(licence)

包含：#include linux/module.h

添加上头文件

#include linux/spinlock\_types.h

#include linux/blkdev.h

#include linux/module.h

#include linux/kernel.h

#include linux/fs.h

#include linux/genhd.h

#include linux/init.h

再次编译，Finished！