嵌入式 u盘Linux——在U盘上建立根文件系统

2023年3月20日　　9:04

按教程操作到这里：

```
Device     Boot Start      End  Sectors  Size Id Type
/dev/sdb1          32 60088319 60088288 28.7G  c W95 FAT32 (LBA)
root@ubuntu:/home/scott930# mkfs.ext2 /dev/sdb1
mke2fs 1.44.1 (24-Mar-2018)
/dev/sdb1 contains a vfat file system
Proceed anyway? (y,N) y
/dev/sdb1 is mounted; will not make a filesystem here!
root@ubuntu:/home/scott930#
```

百度，说是现在u盘已经挂载了，要先卸载

umount /dev/sdb1

卸载，接着操作，建立目录和设备节点文件

```
root@ubuntu:/mnt/usb# mkdir boot etc etc/rc.d proc tmp var dev mnt lib initrd
root@ubuntu:/mnt/usb# chmod 755 etc etc/rc.d proc tmp var dev mnt lib initrd
root@ubuntu:/mnt/usb# chmod 755 boot
root@ubuntu:/mnt/usb# cd dev
root@ubuntu:/mnt/usb/dev# mknod tty c 5 0
root@ubuntu:/mnt/usb/dev# mknod console c 5 1
root@ubuntu:/mnt/usb/dev# chmod 666 tty consol
chmod: cannot access 'consol': No such file or directory
root@ubuntu:/mnt/usb/dev# chmod 666 tty console
root@ubuntu:/mnt/usb/dev# mknod tty0 c 4 0
root@ubuntu:/mnt/usb/dev# chmod 666 tty0
root@ubuntu:/mnt/usb/dev# mknod ram0 b 1 0
root@ubuntu:/mnt/usb/dev# chmod 600 ram0
root@ubuntu:/mnt/usb/dev# mknod null c 1 3
root@ubuntu:/mnt/usb/dev# chmod 666 null
root@ubuntu:/mnt/usb/dev# cp -a -R -f /home/scott930/busybox-1.36.0/_install/* /mnt/usb/
```

复制busybox工具，复制sh工具

```
root@ubuntu:/tmp/busybox-1.36.0# cp -a -R -f /tmp/busybox-1.36.0/_install/* /mnt/usb/
root@ubuntu:/tmp/busybox-1.36.0# cd /bin
root@ubuntu:/bin# ls-l sh
ls-l: command not found
root@ubuntu:/bin# ls -l sh
lrwxrwxrwx 1 root root 4 Nov 26 18:16 sh -> dash
root@ubuntu:/bin# ldd dash
        linux-vdso.so.1 (0x00007ffd55ffc000)
        libc.so.6 => /lib/x86_64-linux-gnu/libc.so.6 (0x00007f339ca96000)
        /lib64/ld-linux-x86-64.so.2 (0x00007f339d0a7000)
```

对于虚拟机的系统，用户操作的shell是bash，但是系统默认的shell是dash。据说bash功能强一点所以还是用bash吧

```
root@ubuntu:/mnt/usb/bin# cd /bin
root@ubuntu:/bin# ldd bash
        linux-vdso.so.1 (0x00007ffe7eb7f000)
        libtinfo.so.5 => /lib/x86_64-linux-gnu/libtinfo.so.5 (0x00007f1a67349000)
        libdl.so.2 => /lib/x86_64-linux-gnu/libdl.so.2 (0x00007f1a67145000)
        libc.so.6 => /lib/x86_64-linux-gnu/libc.so.6 (0x00007f1a66d54000)
        /lib64/ld-linux-x86-64.so.2 (0x00007f1a6788d000)
root@ubuntu:/bin# cp /bin/bash /mnt/usb/bin
root@ubuntu:/bin# cp /lib/x86_64-linux-gnu/libtinfo.so.5 /mnt/usb/lib
root@ubuntu:/bin# cp  /lib/x86_64-linux-gnu/libdl.so.2 /mnt/usb/lib
root@ubuntu:/bin# cp /lib/x86_64-linux-gnu/libc.so.6 /mnt/usb/lib
root@ubuntu:/bin# cp /lib64/ld-linux-x86-64.so.2 /mnt/usb/lib
root@ubuntu:/bin# cd /mnt/usb/bin
root@ubuntu:/mnt/usb/bin# ln -s bash sh
root@ubuntu:/mnt/usb/bin#
```

发现这一步不需要，busybox自带sh了

```
root@ubuntu:/mnt/usb/bin# ls -l sh
lrwxrwxrwx 1 root root 7 Mar 29 01:11 sh -> busybox
```

在 BusyBox 工具中，还缺少 sh 命令，可以把 Linux 操作系统的 sh 命令复制过来，首先进入系统的/bin 目录，通过 ls-l 命令来查看 sh 命令，操作如下：

```
$ cd /bin
$ ls-l sh
```

发现 sh 命令实际上是 bash 命令的一个链接，再用 ldd 命令来查看 bash 的关联性：

```
$ ldd bash
```

发现 bash 需要/lib/libtermcap. so. 2、/lib/libdl. so. 2、/lib/tls/libc. so. 6 和/lib/ld-Linux. so. 2 库的支持，可以把这些库和 bash 复制到 U 盘中。具体操作如下：


```
$ cp /bin/bash /mnt/usb/bin
$ cp /lib/libtermcap. so. 2 /mnt/usb/lib
$ cp /lib/libdl. so. 2 /mnt/usb/lib
$ cp /lib/tls/libc. so. 6 /mnt/usb/lib
$ cp /lib/ld-Linux. so. 2 /mnt/usb/lib
$ cd /mnt/usb/bin
$ ln-s bash sh     //通过链接命令建立 sh 命令
```

至此，我们需要的命令已经建立完毕。

然后到了grub，发现没有安

参照17级武辛婕的报告进行安装

```
root@ubuntu:/# grub-install --boot-directory=/mnt/usb /dev/sdb
Installing for i386-pc platform.
Installation finished. No error reported.
root@ubuntu:/#
```

```
root@ubuntu:/# update-grub
Sourcing file `/etc/default/grub'
Generating grub configuration file ...
Warning: Setting GRUB_TIMEOUT to a non-zero value when GRUB_HIDDEN_TIMEOUT is set is no longer supported.
Found linux image: /boot/vmlinuz-4.15.0-208-generic
Found initrd image: /boot/initrd.img-4.15.0-208-generic
Found linux image: /boot/vmlinuz-4.15.0-201-generic
Found initrd image: /boot/initrd.img-4.15.0-201-generic
Found linux image: /boot/vmlinuz-4.15.0-197-generic
Found initrd image: /boot/initrd.img-4.15.0-197-generic
Found memtest86+ image: /boot/memtest86+.elf
Found memtest86+ image: /boot/memtest86+.bin
done
```

```
root@ubuntu:/# grub-mkconfig -o /mnt/usb/grub/grub.cfg
Sourcing file `/etc/default/grub'
Generating grub configuration file ...
Warning: Setting GRUB_TIMEOUT to a non-zero value when GRUB_HIDDEN_TIMEOUT is set is no longer supported.
Found linux image: /boot/vmlinuz-4.15.0-208-generic
Found initrd image: /boot/initrd.img-4.15.0-208-generic
Found linux image: /boot/vmlinuz-4.15.0-201-generic
Found initrd image: /boot/initrd.img-4.15.0-201-generic
Found linux image: /boot/vmlinuz-4.15.0-197-generic
Found initrd image: /boot/initrd.img-4.15.0-197-generic
Found memtest86+ image: /boot/memtest86+.elf
Found memtest86+ image: /boot/memtest86+.bin
done
```

```
root@ubuntu:/# cp /boot/initrd.img-4.15.0-201-generic /mnt/usb/boot/
root@ubuntu:/# cp -r /etc/grub.d /mnt/usb/etc
```

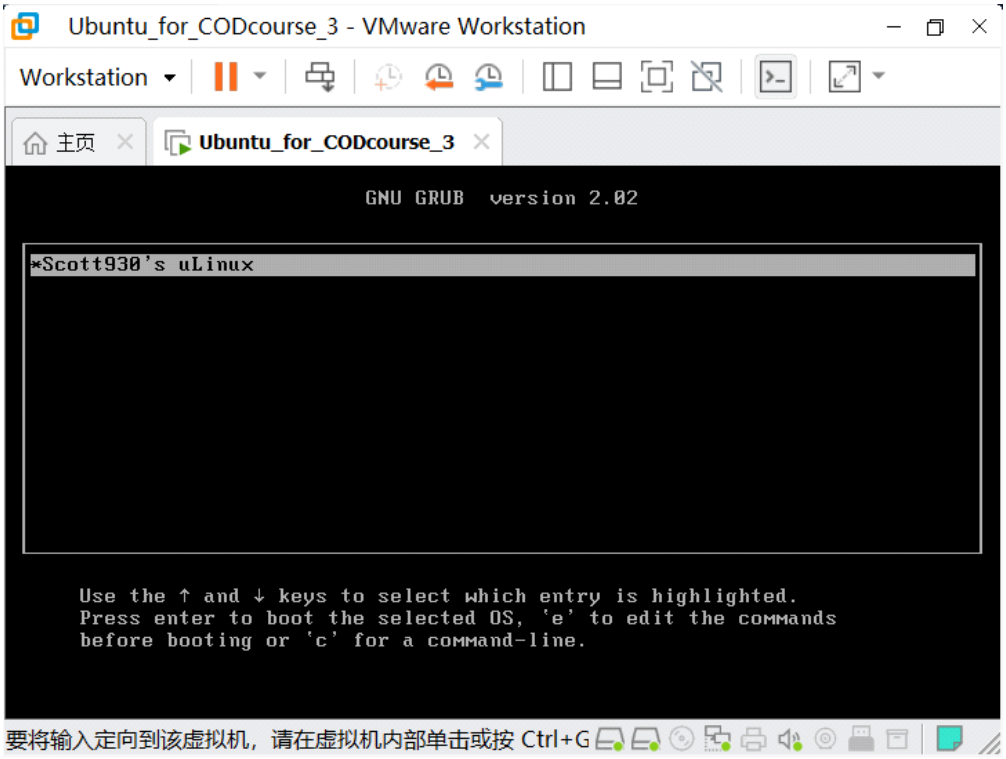
```
root@ubuntu:/# cd /mnt/usb/grub
root@ubuntu:/mnt/usb/grub# blkid
/dev/loop0: TYPE="squashfs"
/dev/loop1: TYPE="squashfs"
/dev/loop2: TYPE="squashfs"
/dev/loop3: TYPE="squashfs"
/dev/loop4: TYPE="squashfs"
/dev/loop5: TYPE="squashfs"
/dev/loop6: TYPE="squashfs"
/dev/loop7: TYPE="squashfs"
/dev/sda1: UUID="19dbb4e7-4c4f-48a6-aad8-9ab3950abbb2" TYPE="ext4" PARTUUID="75db4ae9-01"
/dev/loop8: TYPE="squashfs"
/dev/loop9: TYPE="squashfs"
/dev/loop10: TYPE="squashfs"
/dev/loop11: TYPE="squashfs"
/dev/loop12: TYPE="squashfs"
/dev/loop13: TYPE="squashfs"
/dev/loop14: TYPE="squashfs"
/dev/loop15: TYPE="squashfs"
/dev/loop16: TYPE="squashfs"
/dev/sdb1: UUID="2b882d0d-3314-47d5-aaaf-20709a5b0b4a" TYPE="ext2" PARTUUID="9e3584ed-01"
```

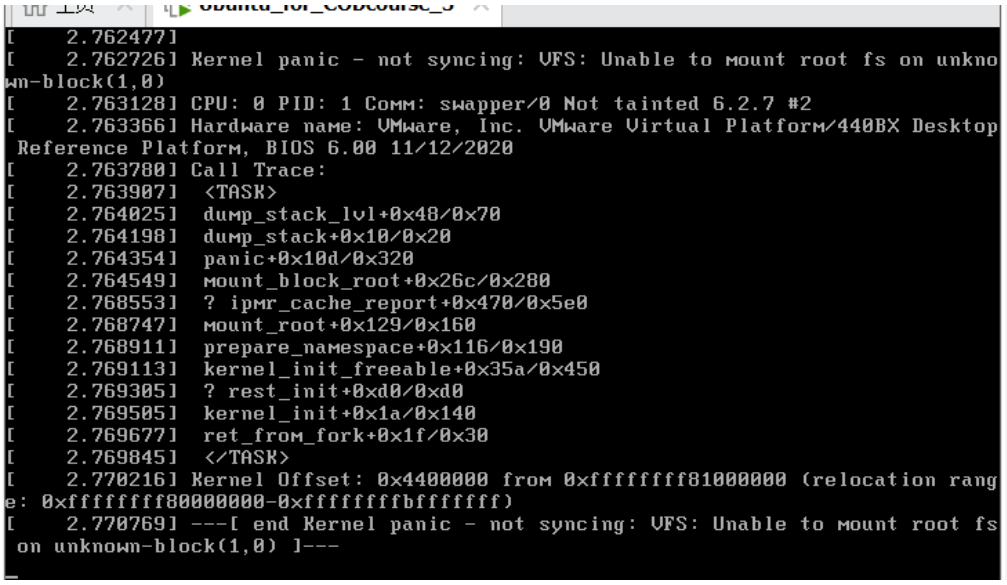
按照学姐报告，无法成功启动。。。。。。

参照这个教程[Linux删除分区提示：No partition is defined yet! 解决办法_11969904的技术博客_51CTO博客]

```
root@ubuntu:/home/scott930# cd uLinux.bak/
root@ubuntu:/home/scott930/uLinux.bak# find . | cpio -H newc -o > ../uLinux.img
27831 blocks
root@ubuntu:/home/scott930/uLinux.bak# cd ..
root@ubuntu:/home/scott930# ls
busybox-1.36.0          Documents    Music     project2             Templates   Videos
busybox-1.36.0.tar.bz2  Downloads    Pictures  Public               uLinux.bak
Desktop                 linuxKernel  project1  riscv-gnu-toolchain  uLinux.img
root@ubuntu:/home/scott930# gzip uLinux.img -f
```

```
root@ubuntu:/home/scott930# mount /dev/sdb1 /mnt/usb
mount: /mnt/usb: /dev/sdb1 already mounted on /mnt/usb.
root@ubuntu:/home/scott930# grub-install --root-directory=/mnt/usb /dev/sdb
Installing for i386-pc platform.
Installation finished. No error reported.
```





考虑是内核的问题

又去看了下教程：

无盘构建根文件系统

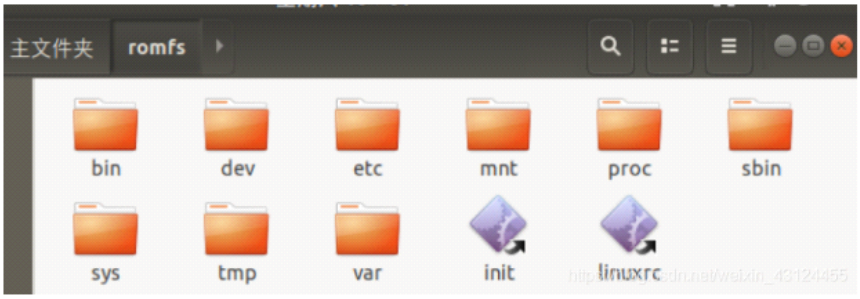
这里没有直接在U盘中构建根目录，而是在虚拟机中构建一个根文件系统的镜像压缩，之后复制到U盘中。如果直接在U盘中构建，之后有什么错误需要格式化U盘，就没必要重新构建根文件系统，把压缩文件复制过去即可。

（1）在用户目录下新建rootfs，把_install目录中的内容复制进去，现在rootfs下已经有了bin、sbin目录

（2）一个完整linux系统还需要添加其他必要文件夹，进入/rootfs，输入：

```
mkdir usr proc mnt var tmp dev sys etc
```

（下图 和我的描述有两个不同，一是文件夹名字 rootfs 无所谓吧这个名字... 而是下图没有usr 这个文件夹也不是必须的 可能要做用户登录系统需要涉及这个吧）



（3）同时在rootfs下还必须要有一个init文件，这个init文件可以是一个可执行的二进制文件，也可以是一个shell脚本，或者是指向前面两者的链接。init文件会在linux内核初始化就绪后被执行。方便起见，我们就把init做成一个指向bin/sh的软连接，在rootfs下输入：

```
ln -s bin/sh init
```

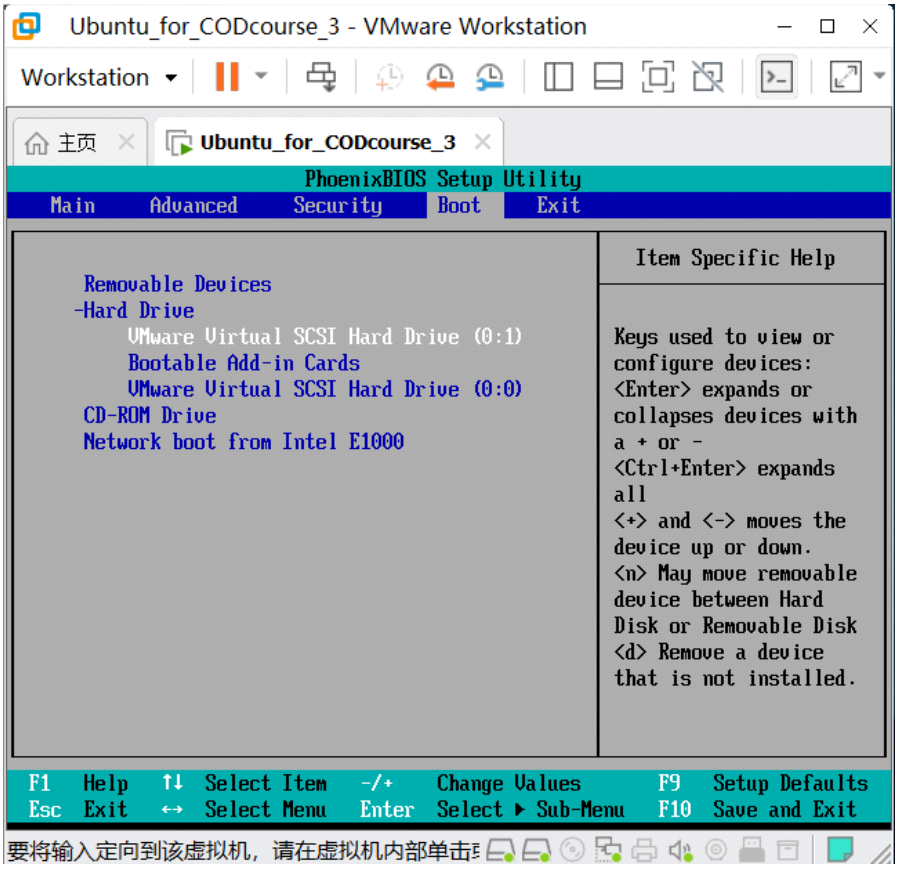
（4）dev目录下还必须有几个必要的设备console,null,ram,tty,tty1,tty2，这些tty就是和用户交互的终端：

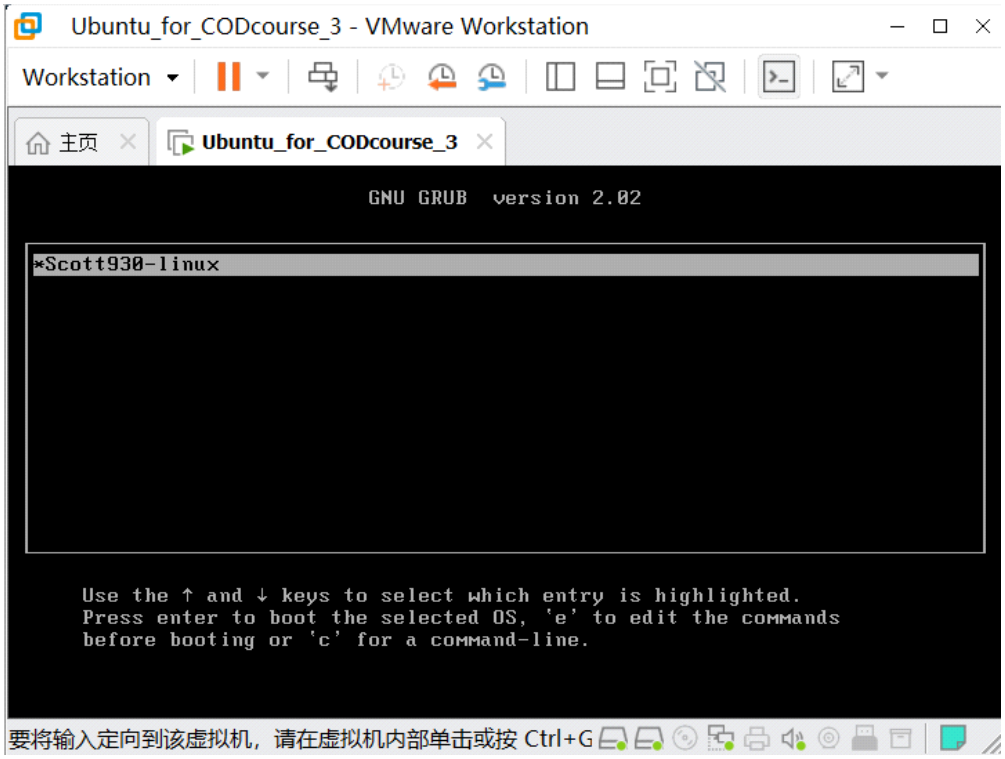
cd 进入/rootfs/dev，建立必须的设备节点文件，并授权，输入：

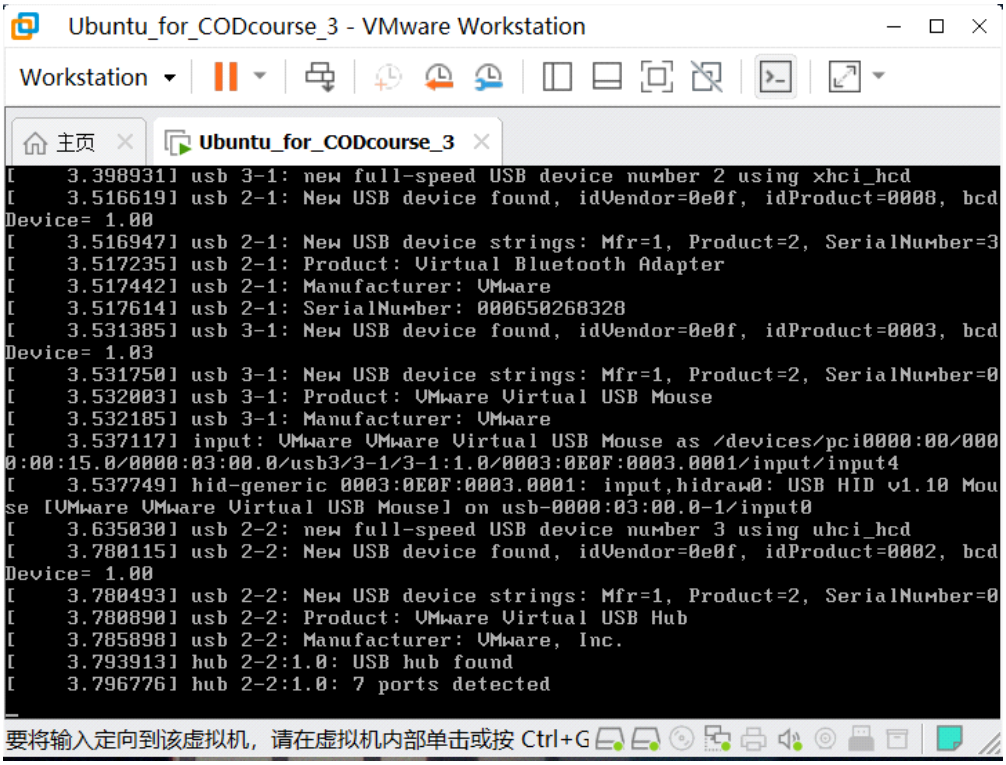
```
mknod tty c 5 0
mknod console c 5 1
mknod null c 1 3
```

发现比书上的教程多了这个init文件

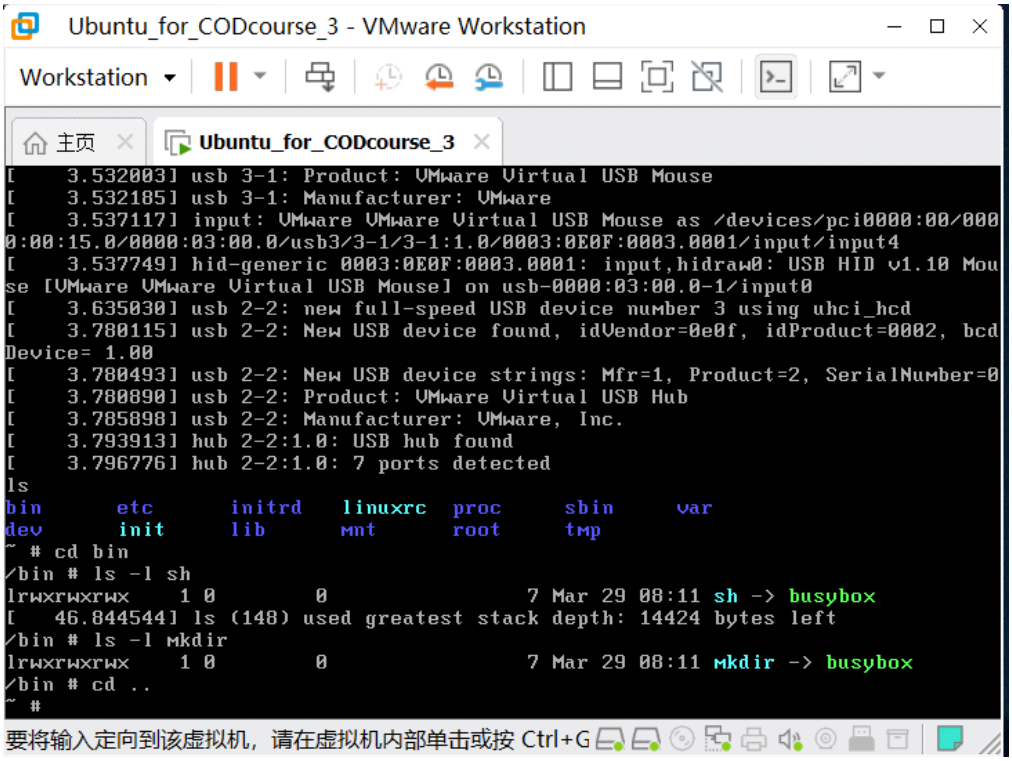
重新做了一遍

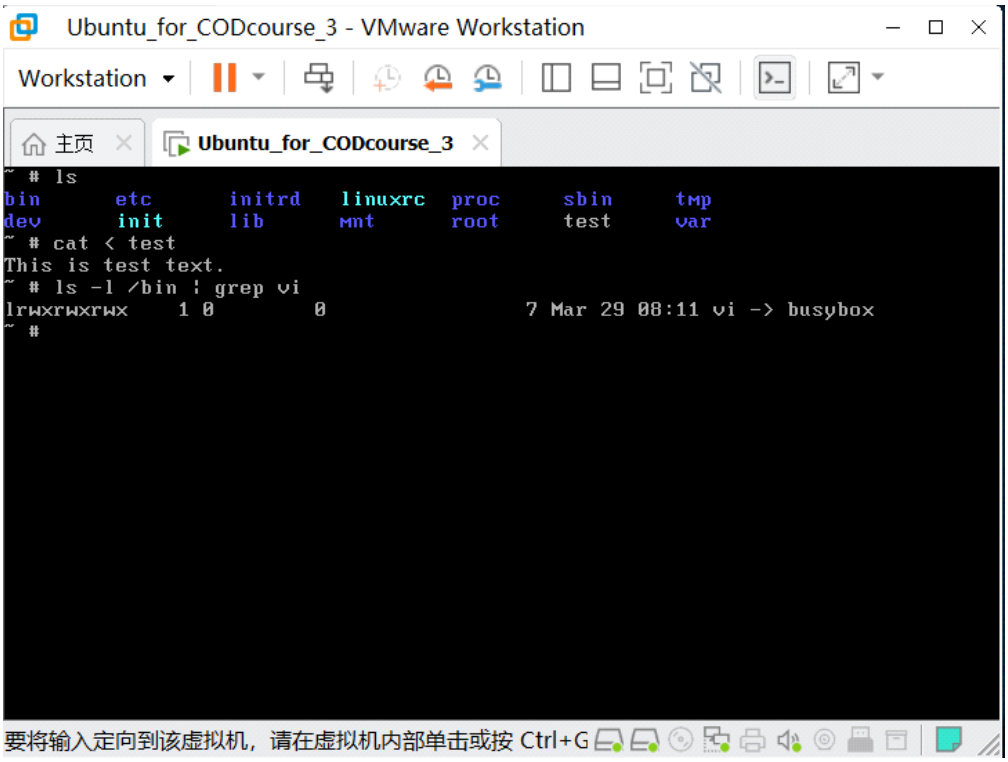



Ubuntu_for_CODcourse_3 - VMware Workstation
Workstation
主页
Ubuntu_for_CODcourse_3
GNU GRUB version 2.02
*Scott930-linux
Use the ↑ and ↓ keys to select which entry is highlighted.
Press enter to boot the selected OS, 'e' to edit the commands
before booting or 'c' for a command-line.
要将输入定向到该虚拟机，请在虚拟机内部单击或按 Ctrl+G


Ubuntu_for_CODcourse_3 - VMware Workstation
Workstation
主页
Ubuntu_for_CODcourse_3
[3.398931] usb 3-1: new full-speed USB device number 2 using xhci_hcd
[3.516619] usb 2-1: New USB device found, idVendor=0e0f, idProduct=0008, bcd
Device= 1.00
[3.516947] usb 2-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[3.517235] usb 2-1: Product: Virtual Bluetooth Adapter
[3.517442] usb 2-1: Manufacturer: VMware
[3.517614] usb 2-1: SerialNumber: 000650268328
[3.531385] usb 3-1: New USB device found, idVendor=0e0f, idProduct=0003, bcd
Device= 1.03
[3.531750] usb 3-1: New USB device strings: Mfr=1, Product=2, SerialNumber=0
[3.532003] usb 3-1: Product: VMware Virtual USB Mouse
[3.532185] usb 3-1: Manufacturer: VMware
[3.537117] input: VMware VMware Virtual USB Mouse as /devices/pci0000:00/000
0:00:15.0/0000:03:00.0/usb3/3-1/3-1:1.0/0003:0E0F:0003.0001/input/input4
[3.537749] hid-generic 0003:0E0F:0003.0001: input,hidraw0: USB HID v1.10 Mou
se [VMware VMware Virtual USB Mouse] on usb-0000:03:00.0-1/input0
[3.635030] usb 2-2: new full-speed USB device number 3 using uhci_hcd
[3.780115] usb 2-2: New USB device found, idVendor=0e0f, idProduct=0002, bcd
Device= 1.00
[3.780493] usb 2-2: New USB device strings: Mfr=1, Product=2, SerialNumber=0
[3.780890] usb 2-2: Product: VMware Virtual USB Hub
[3.785898] usb 2-2: Manufacturer: VMware, Inc.
[3.793913] hub 2-2:1.0: USB hub found
[3.796776] hub 2-2:1.0: 7 ports detected
要将输入定向到该虚拟机，请在虚拟机内部单击或按 Ctrl+G

可以了





测试命令：cd ls grep cat vi

输入exit，退出√