

System programming homework #6

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1. 執行 `readelf -d /usr/bin/ls` , `readelf -d ~/busybox/_install/bin/busybox` 。

```
busybox : bash — Konsole
File Edit View Bookmarks Settings Help
xingyan@kubuntu:~/busybox$ readelf -d /usr/bin/ls

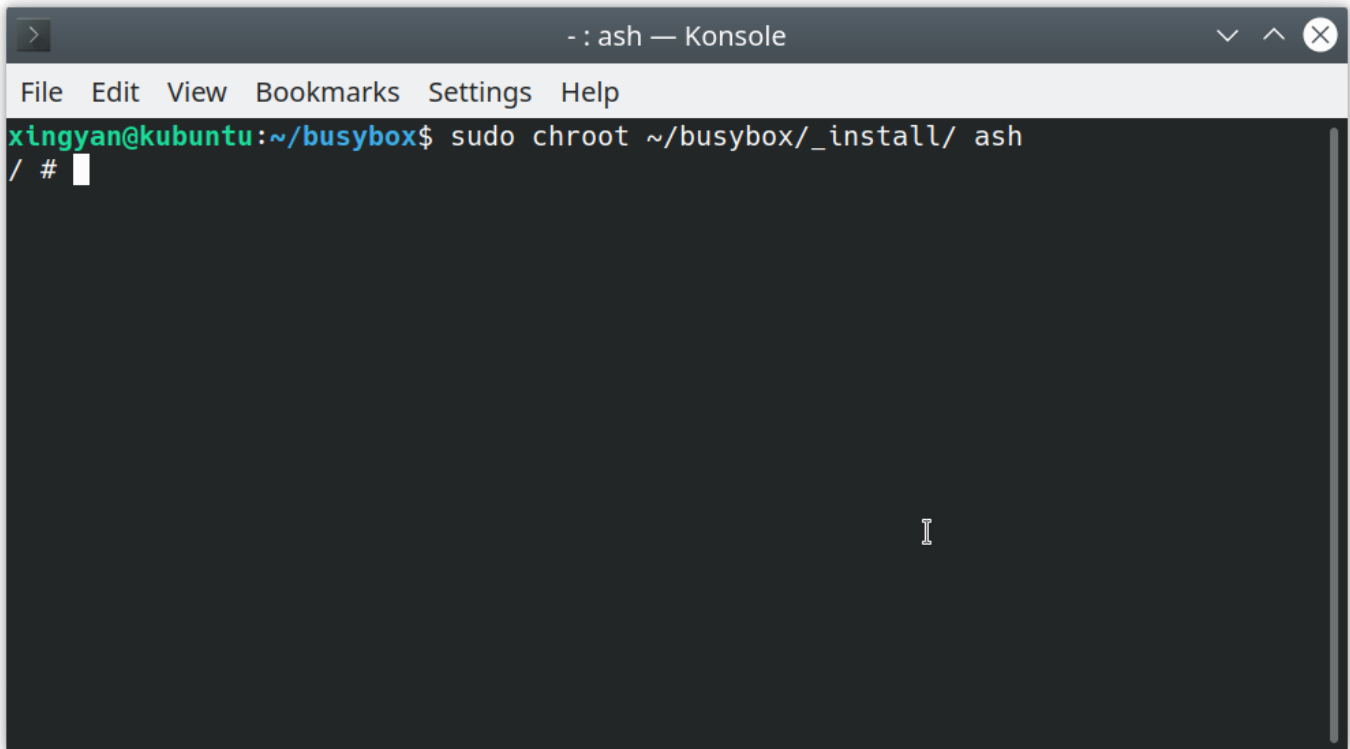
Dynamic section at offset 0x21a58 contains 28 entries:
  Tag                Type                               Name/Value
0x0000000000000001 (NEEDED)           Shared library: [libselinux.so.1]
0x0000000000000001 (NEEDED)           Shared library: [libc.so.6]
0x000000000000000c (INIT)             0x4000
0x000000000000000d (FINI)             0x17574
0x0000000000000019 (INIT_ARRAY)          0x22010
0x000000000000001b (INIT_ARRAYSZ)       8 (bytes)
0x000000000000001a (FINI_ARRAY)         0x22018
0x000000000000001c (FINI_ARRAYSZ)      8 (bytes)
0x0000000006ffffef5 (GNU_HASH)          0x3a0
0x0000000000000005 (STRTAB)             0x1190
0x0000000000000006 (SYMTAB)             0x488
0x000000000000000a (STRSZ)              1612 (bytes)
0x000000000000000b (SYMENT)             24 (bytes)
0x0000000000000015 (DEBUG)              0x0
0x0000000000000003 (PLTGOT)             0x22c58
0x0000000000000002 (PLTRELSZ)          2544 (bytes)
0x0000000000000014 (PLTREL)             RELA
0x0000000000000017 (JMPREL)            0x2cb8
0x0000000000000007 (RELA)              0x1968
0x0000000000000008 (RELASZ)            4944 (bytes)
0x0000000000000009 (RELAENT)           24 (bytes)
0x000000000000001e (FLAGS)             BIND_NOW
0x0000000006fffffb (FLAGS_1)           Flags: NOW PIE
0x0000000006fffffe (VERNEED)           0x18f8
0x0000000006ffffff (VERNEEDNUM)        1
0x0000000006fffff0 (VERSYM)            0x17dc
0x0000000006fffff9 (RELACOUNT)         193
0x0000000000000000 (NULL)              0x0
xingyan@kubuntu:~/busybox$
```

```
busybox : bash — Konsole
File Edit View Bookmarks Settings Help
xingyan@kubuntu:~/busybox$ readelf -d ~/busybox/_install/bin/busybox

There is no dynamic section in this file.
xingyan@kubuntu:~/busybox$
```

這邊可以發現執行 `readelf -d ~/busybox/_install/bin/busybox` ,
會顯示 `There is no dynamic section in this file.`
是因為 `busybox` 設定成 `Build static binary` 的原因。

2. `sudo chroot ~/busybox/_install/ ash` 的執行結果



The screenshot shows a terminal window titled "- : ash — Konsole". The window has a menu bar with "File", "Edit", "View", "Bookmarks", "Settings", and "Help". The terminal content shows the command `xingyan@kubuntu:~/busybox$ sudo chroot ~/busybox/_install/ ash` being executed. The prompt changes to `/ #`, indicating a successful chroot operation. A cursor is visible on the line following the prompt.

3. BusyBox 將許多具有共性的小版本的 UNIX 工具結合到一個單一的可執行文件。可執行於多款 POSIX 環境的作業系統，BusyBox 提供了一個比較完善的環境，且 BusyBox 執行檔較小，可以適用於任何小的嵌入式系統。