CSCI2400 Final Practice Problems Solutions

December 15, 2013

1 Textbook Problems

7.6) This problem builds on Problem 7.1 by adding some functions and variables that are declared with the static attribute. The main idea for the students to understand is that static symbols are local to the module that defines them, and are not visible to other modules.

Symbol	swap.o .symtab entry?	Symbol Type	Module where defined	Section
`buf`	yes	extern	main.o	.data
`bufp0`	yes	global	swap.o	.data
`bufp1`	yes	local	swap.o	.bss
`swap`	yes	global	swap.o	.text
`temp`	no	-	-	-
`incr`	yes	local	swap.o	.text
`count`	yes	local	swap.o	.data

7.12) This problem tests whether the students have grasped the concepts of relocation records and relocation. The solution approach is to mimic the behavior of the linker: use the relocation records to identify the locations of the references, and then either compute the relocated absolute addresses using the algorithm in Figure 7.9, or simply extract them from the relocated instructions in Figure 7.10. There are a couple of things to notice about the relocatable object file in Figure 7.19:

- The movl instruction in line 8 contains two references that need to be relocated.
- The instructions in lines 5 and 8 contain references to buf[1] with an initial value of 0x4. The relocated addresses are computed as ADDR(buf) + 4.

Line # in Fig. 7.10	Address	Value
15	`0x80483cb`	`0x004945c`
16	`0x80483d0`	`0x0049458`
18	`0x80483d8`	`0x0049548`
18	`0x804983dc`	`0x0049458`
23	`0x804983e7`	`0x0049548`

8.18) For each process, the kernel preserves the ordering of its printf statements, but otherwise can interleave the statements arbitrarily. Thus, any topological sort of the following DAG represents a possible output:

$$1 \qquad 1 \to 2 \qquad 0 \to 2 \qquad 0$$

a) 112002 (possible)

b) 211020 (not possible)

c) 102120 (possible)

d) 122001 (not possible)

e) 100212 (possible)

8.23) Signals cannot be used to count events in other processes because signals are not queued. Solving this problem requires inter-process communication (IPC) mechanisms (not discussed in the text), or threads, which are discussed in Chapter 12.

2 TLB and Virtual Memory

a) VPN: 9-6, VPO: 5-0
TLBT: 9-8, TLBI 7-7

b) PPN: 11-6, PPO: 5-0

c) VA: 1010001110
VPN: 0xa
TLBI: 0x2, TLBT: 0x2
TLB Hit?: yes
Page Fault?: no
PPN: 16

PA: 10110001110
BO: 0x2, CI: 0x3, CT: 0x16
Cache Hit?: yes
Value: 0x37

3 Signals

```
counter = 1 // from handler1
counter = 3 // from handler2
counter = 3 // from main
```