

Reading:

PP, Chp 8.1-8.3.3 (device registers, memory-mapped I/O, keyboard and display I/O),

PP, Chp 8.5 (interrupt overview).

PP, Chp 9.1-9.2.2 (TRAP/JSR subroutine calls, register saving).

PP, Chp 10.1-10.2 (stacks, push/pop, stack under/overflow, interrupt I/O, saving/restoring program state).

PP LC3 Reference (Also in docs/):

ASCII table: inside back cover
Instruction Formats: inside back cover
Instruction Descriptions: App. A.3
Notation for Descriptions: App. A.2
Memory Map: App. A.1
TRAP routines: App. A.3, Table A.2
I/O Device Registers: App. A.3, Table A.3
Interrupt and Exception execution: App. A.4 and App. C.6
Control FSM state diagram: App. C, Fig. C.2 and Fig. C.7
Complete Datapath: App. C, Fig. C.8
Memory-IO Bus: lib/system.jelib:top

Also see other helpful references in docs/

Problems:

PP, Chp 8:

- 8.5 (what is KBSR[15]?)
- 8.11 (polling vs. intr. efficiency)
- 8.14 (I/O addr. decode)
- 8.15 (KBSR[14] and intr. handling)

PP, Chp 9:

- 9.2 (TRAP execution)
- 9.13 (debugging JSR and RET)
- 9.19 (complete the intr. priority service call)

PP, Chp 10:

- 10.10 (cc pushed in intr.)
- 10.11 (device registers and IVT)
- 10.15 (keyboard interrupt handler w/ circular buffer)
- 10.24 (intr. vector and pointer handler)

Question.

Find the trap service routine for TRAP x21 (aka "OUT"). Explain how that trap service routine works. You can find the code for that in several places:

(a) look at the lc3os.asm operating system source code (or any of the other LC3 OS sources in projects/trunk/src/)

(b) start PennSim.jar, look at the TVT slot for x21, find the routine's address there, then look at that memory location and see the code.