Written Assignment #1
EECS497.32
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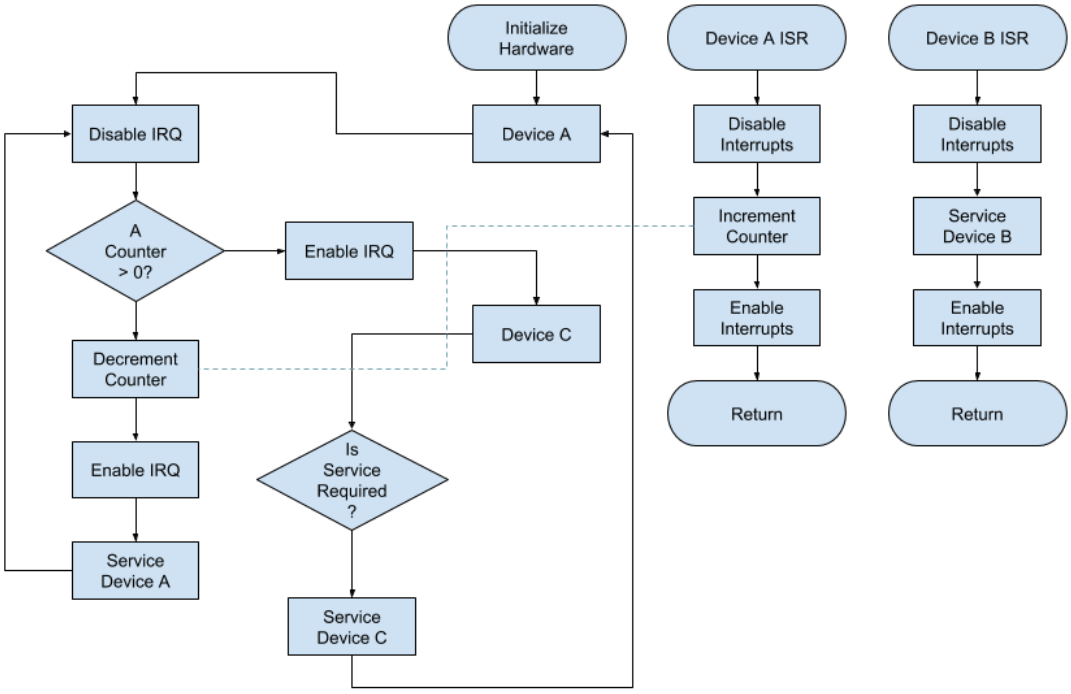
1. What are the main reasons of using "volatile" keyword? (10pt)

Answer:

The volatile keyword is used for memory locations so that can change without the compiler knowing about it so that it won't remove instructions that do the same operation on the sa7gme address.

2. Show a code flow diagram using " Round Robin with Interrupt" method that handles 3 I/O devices. Device B needs the fastest response time than A and C. C has the slowest response time requirement of all. Make sure you take care of the shared data problem. (20pt)

Answer:



Explanation:

1. Device B's servicing is handled directly in the ISR, with interrupts disabled. This ensures that no shared data is accessed, and that Device B is handled immediately on interrupt with no other distractions.
2. Device A's ISR essentially notifies the main loop to run the Device A handler as many times as are required. The Device A handler disables interrupts only while checking the counter updated by the ISR to see if there are still pending requests, and to essentially acknowledge one by decrementing the counter. Then, with interrupts enabled again, it handles Device A's request. This allows Device B's request to interrupt it and service Device B, while still allowing Device A to handle requests as needed when Device B doesn't require attention. Since all of Device A's requests are handled before running the Device C handler, Device A will still be serviced first.
3. Device C's handler now is only run by the main loop when Device A's requests are all complete, and when Device B isn't being serviced. The handler checks the hardware registers of Device C and will only handle requests when required.

3. What are the Data bus and Address bus sizes of ATmega2560? (10pt)

Answer: data bus is 8 bits and address bus is 16 bits.

4. Name one use for the "Watchdog Timer"? (10pt)

Answer:

The watchdog timer is used to trigger a system reset if the software fails to respond to it so if there is a bug that causes the infinite loop for example, the watchdog timer will make sure the system recovers.

5. What are some ways to reduce "Interrupt Latency" ? (10pt)

Answer:

1) Schedule jobs that are outside of the interrupt context for complex computation
2) Enable interrupts and interrupt handlers so that other interrupts can be handled as well, so that you have nested interrupts
3) Do fewer memory accesses in the interrupt handler

6. What are the minimum tasks an Interrupt Service Routine(ISR) has to do to service an interrupt? (10pt)

Answer:

It has to save the processor status, and it has to do the acknowledge interrupt, and then it has to restore the system status, and then return from the interrupt.