Chapter 5

Real Time Control: Interrupts

Lesson 4

Interrupt Latency

Definition

Execution Time - Time taken in executing instructions from start to finish in an uninterrupted running.

Definition

Latency- Time interval taken between a need for starting an interrupt service and actual starting of the service routine.

Definition

Worst case latency- means maximum time interval that could be taken between a need for starting an interrupt service and actual starting of the service routine.

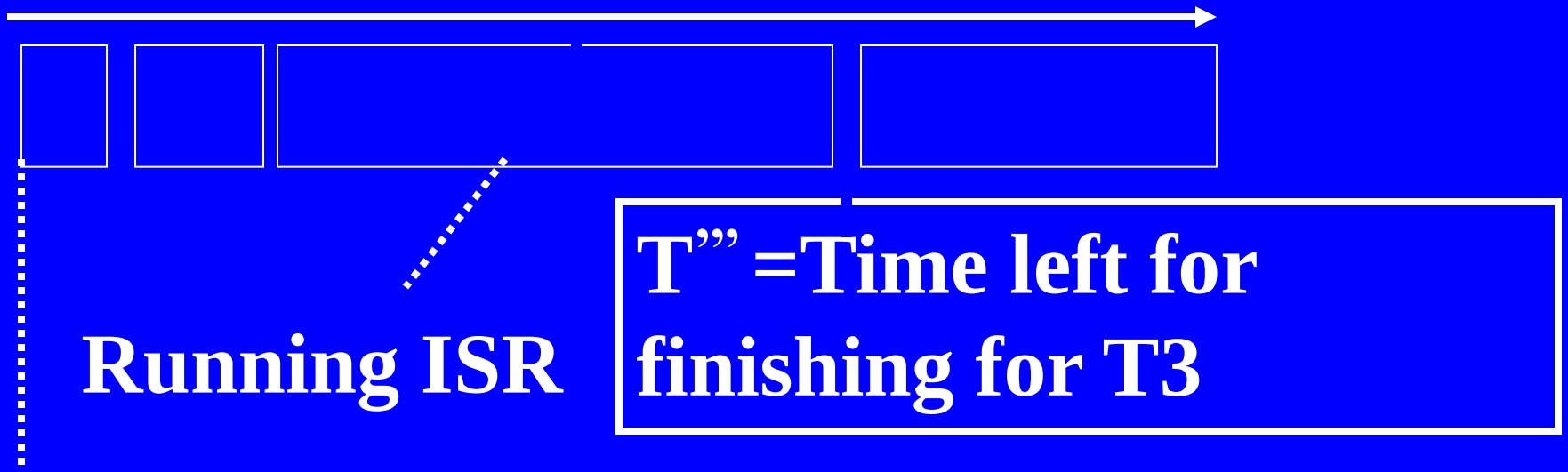
Definition

Context Switching Time: Time taken in saving the context of current routine and retrieving the new ISR or program context. Context includes the program counter.

Highest priority interrupt latency

Case of Poll only at the end of each ISR on return

Four ISRs- Execution times = T1 ms,T2 ms,T3 ms and T4 ms for running without interruption



Latency = T”’ + context switching time

Maximum Latency = T3 + context switching time

Highest priority interrupt latency

Case when Poll at the end of each ISR instruction

When Preemption of a running routine permitted

Four ISRs- Execution times = T1 ms,T2 ms,T3 ms and T4 ms for running without interruption

Running ISR

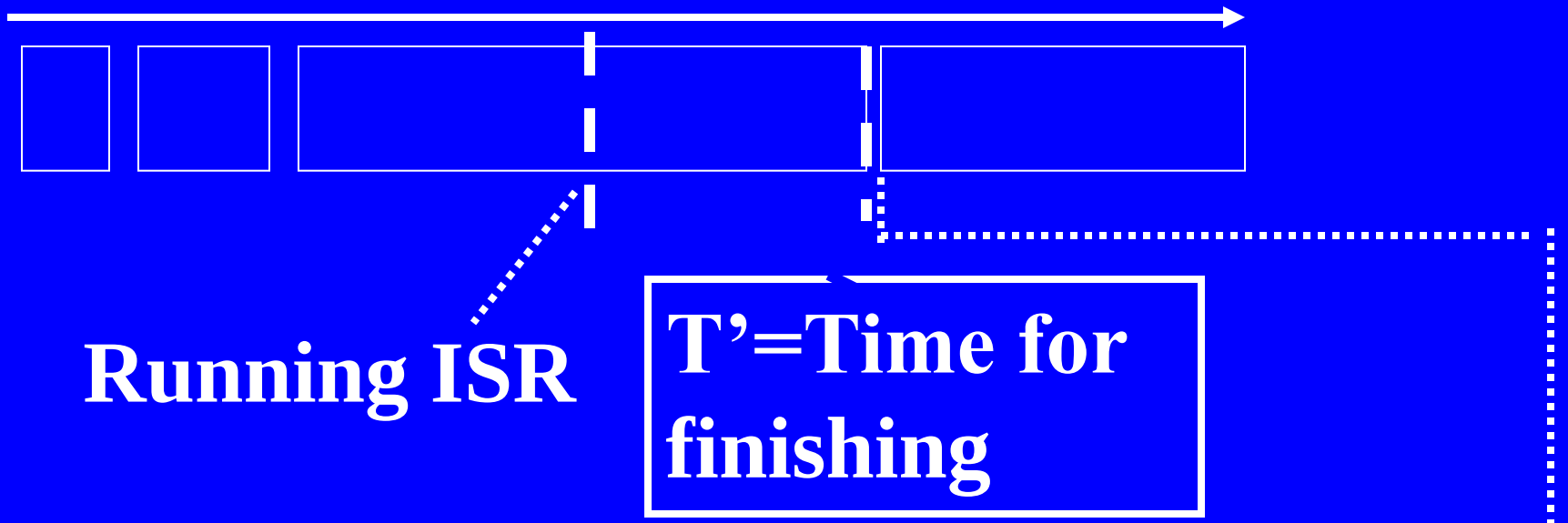
T'_i =Maximum Time for finishing one instruction

Latency = Maximum Latency = T'_i + context switching time

Lowest priority interrupt latency

Case when Poll only at the end of each ISR on return preemption of a running routine not permitted

Four ISRs- Execution times of T1 ms,T2 ms,T3 ms and T4 ms for running without interruption.



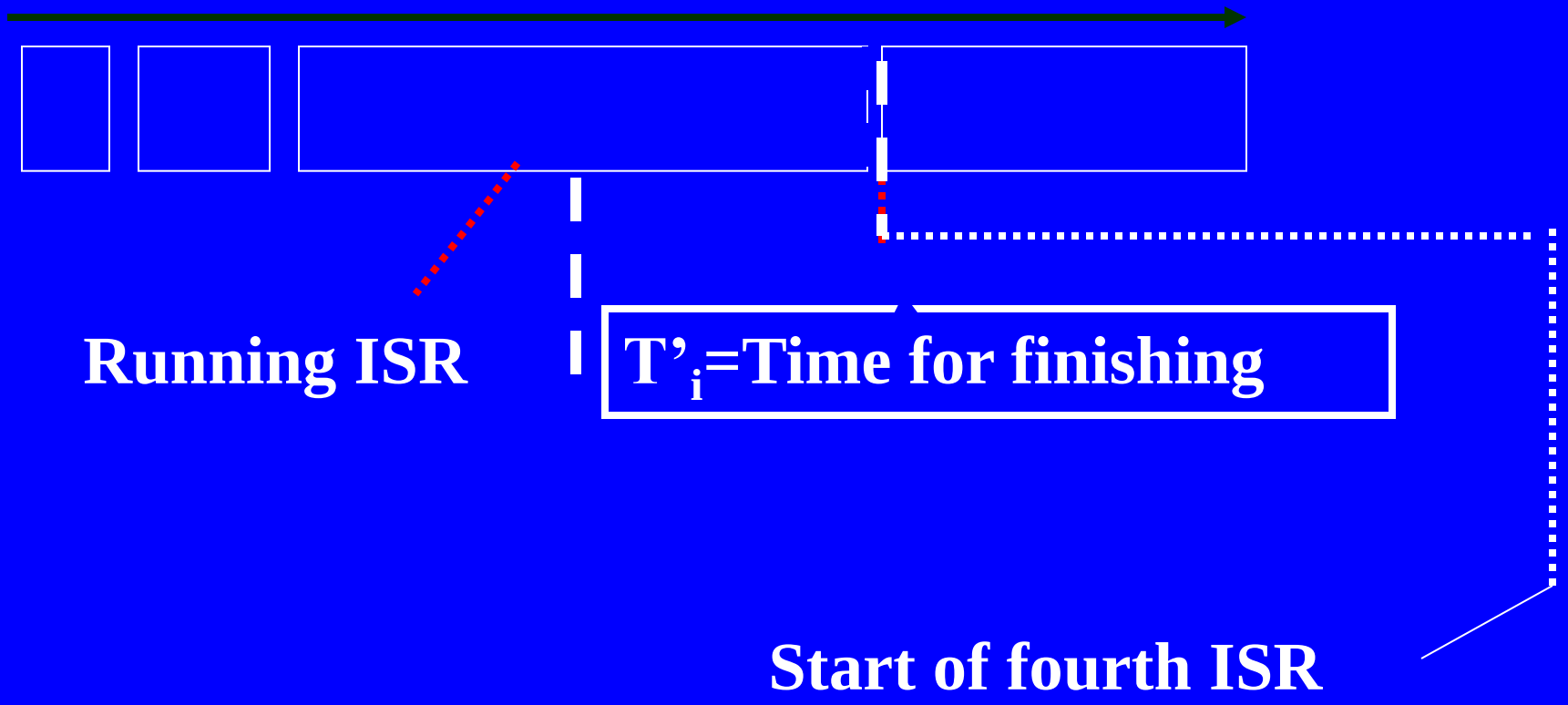
Case when Poll only at the end of each ISR on return

Latency = T' + context switching time
if none of high priority routine pending service
Worst case latency: When all high priority routines pending service = T1+ T2 + T3 + 3× context switching time

Lowest priority interrupt latency

Case when Poll at the end of each ISR instruction preemption of a running routine permitted

Four ISRs- Execution times of T1 ms,T2 ms,T3 ms and T4 ms for running without interruption



Case when Poll at the end of each ISR instruction

Latency = T' + context switching time if none of high priority routine pending service

Worst case latency: When all high priority routines pending service = T1+ T2 + T3 + 3× context switching time

Summary

We learnt

- Interrupt Latency- Time taken in starting an ISR for an event after interrupting the presently running routine
- Depends on priorities and whether in-between preemption of a running routine permitted or not