



Pipelining Design Techniques

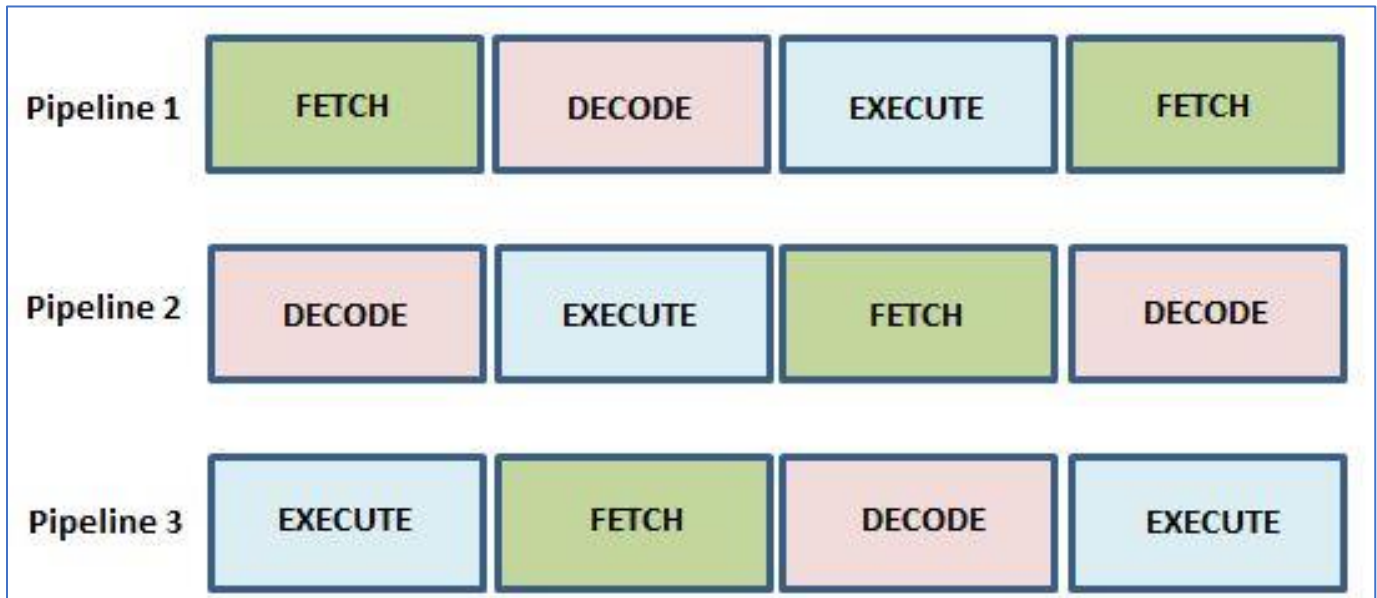
Lecture 6

MSc. Riyam K. Marjan
2022-2023



1. Introduction to Pipelining

Pipelining is a technique where multiple instructions are overlapped during execution. Pipeline is divided into stages and these stages are connected with one another to form a pipe like structure. Instructions enter from one end and exit from another end. **Pipelining increases the overall instruction throughput.**

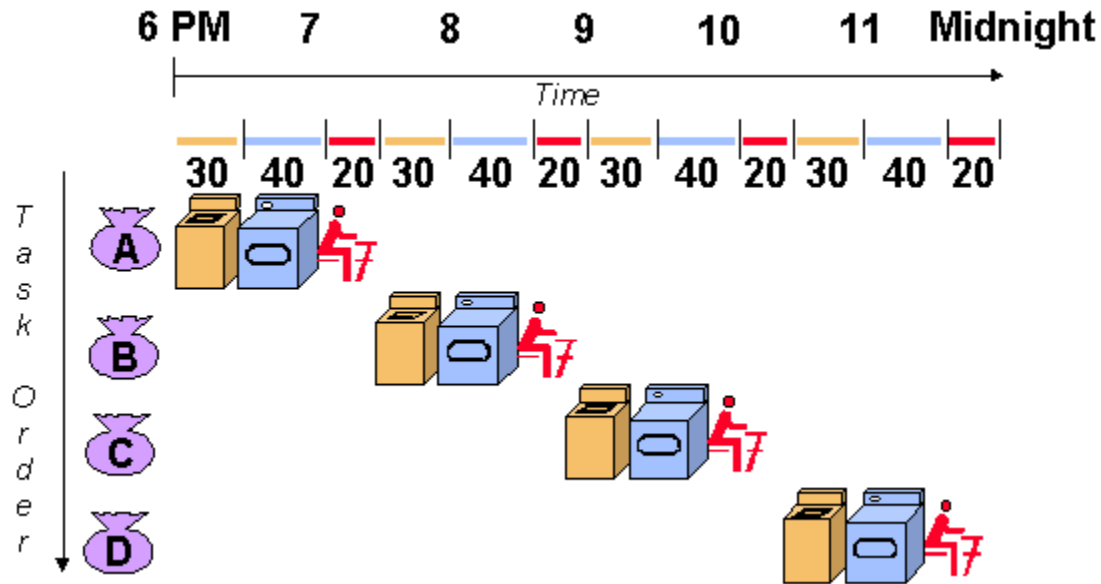


2. Instruction Pipeline

In this a stream of instructions can be executed by overlapping *fetch*, *decode* and *execute* phases of an instruction cycle. This type of technique is used to increase the throughput of the computer system. An instruction pipeline reads instruction from the memory while previous instructions are being executed in other segments of the pipeline. Thus we can execute multiple instructions simultaneously. The pipeline will be more efficient if the instruction cycle is divided into segments of equal duration.

Example

A useful method of demonstrating this is the laundry analogy. Let's say that there are four loads of dirty laundry that need to be washed, dried, and folded. We could put the the first load in the washer for 30 minutes, dry it for 40 minutes, and then take 20 minutes to fold the clothes. Then pick up the second load and wash, dry, and fold, and repeat for the third and fourth loads. Supposing we started at 6 PM and worked as efficiently as possible, we would still be doing laundry until midnight.



However, a smarter approach to the problem would be to put the second load of dirty laundry into the washer after the first was already clean and whirling happily in the dryer. Then, while the first load was being folded, the second load would dry, and a third load could be added to the pipeline of laundry. Using this method, the laundry would be finished by 9:30.

