



Computer System Architecture

Second week's Report

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Commercial in-order & out-of-order execution processors

- In-order execution processors

MIPS R4000 Alpha 21064

- Out-of-order execution processors

Intel Pentium 4 HT Intel Xeon X5660

Intel Core i5-8350 Intel Core i7-8700

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Out-of-order vs in-order execution

- Out-of-order execution
- Advantages:
 - Fast execution speed
 - Easy to achieve high performance
 - Dynamically execute orders can reduce stall time

Out-of-order vs in-order execution

- Out-of-order execution
- Disadvantages:
 - Require additional hardware resources
 - Bigger chip area
 - May encounter hazard
 - Can consume more power

Out-of-order vs in-order execution

- In-order execution
- Advantages:
 - Easy to design
 - Smaller chip area
 - Suitable for MCUs

Out-of-order vs in-order execution

- In-order execution
- Disadvantages:
 - Hard to achieve high performance
 - Slow in execution
 - Instructions afterwards have to wait for previous instruction to complete

Processor design principles

- High performance processors:
 - For applications like server or PC, power consumption and chip area isn't primary constrain. Therefore, architecture like IBM Power or x86 processors, I'm going to use out-of-order execution method to achieve maximum performance possible.
- Low power processors:
 - For applications like micro controller or embedded systems, power consumption even cooling is critical while performance is not primary concern, which in this case my choice is in-order execution method.