

525.712 Advanced Computer Architecture

Chapter 8

Superscalar Processor Overview: Group Discussion
Questions

1. Which was the first superscalar microprocessor?

2. How does the PowerPC architecture differ from the POWER architecture?

3. Prepare a table with the processors mentioned in Chapter 8 on the side and room at the top for various categories of information.

- (a) Place function unit types at the top and show how many of each type are in the various kinds of processors.

- (b) For each processor, indicate whether out-of-order execution is supported.

- (c) For each processor, indicate the caches available on chip (e.g., L1I, L1D, L2), their size in bytes, and their organization (e.g., direct-mapped, associative, set-associative).

- (d) For each processor, show which ones have static branch prediction, which ones have dynamic branch prediction, which ones have both. Also indicate the scheme used in each case, e.g., two-level adaptive, gshare.

- (e) For each processor, show whether it supports integer register renaming, floating-point register renaming, or both. In each case, show how many renaming registers it has.

- (f) Show which processors decompose instructions into a collection of simpler instructions.

- (g) Show which processors group instructions together and process the group together.

- (h) Show how many instructions can be fetched, issued, executed, and completed in one cycle for each processor.

- (i) Show which processors support load bypassing and which ones support load forwarding.

- (j) Show which processors do speculative fetching and which ones do speculative execution. In the first case, show how many instructions can be fetched speculatively. In the second case, show how many speculative instruction groups can be in flight at once.

- (k) Show which processors use reservation stations. Distinguish between centralized and decentralized reservation stations.

(1) Show which processors can do:

- integer multiplication
- integer division
- floating-point multiplication
- floating-point division
- floating-point square root.

Indicate the processors that do integer operations using floating-point hardware.

(m) Which processors are speed demons and which are brainiacs?

(n) Which processors support graphics or multimedia instructions?

(o) Which processors consume low power?