

Computer Performance

DUE: Thursday, January 9, Start of class

Objective

Gain an understanding of the issues involved in measuring computer performance.

To Do

Note: Make reasonable assumptions where necessary and clearly state them. Each of the problems is worth an equal number of points. Feel free to discuss problems with classmates, but the only written material that you may consult while writing your solutions are the textbook and lecture slides.

1. A processor running at 3 GHz consumes 100 W of dynamic power. How much dynamic power does the processor consume at 4 GHz?
2. A program executes 10 billion instructions. It executes on an Intel processor that has an average CPI of 1.5 and a clock frequency of 2 GHz. How many seconds does the program take to execute? What is the cycle time of this Intel processor? Assume that an AMD processor takes 6 seconds to execute the program. What is the speedup provided by the Intel processor, relative to the AMD processor?
3. Doug builds a 1 GHz processor where two important programs, A and B, take one second each to execute. Each program has a CPI of 1. Renee is tasked with designing the company's next-generation processor. She comes up with an idea that improves the CPI of A to 0.8 and the CPI of B to 0.6. But the idea is so complex that she is struggling to support the same clock speed as before. What is the minimum clock speed she needs to support so that the new processor performs better than the old processor?
4. In a server, the processor accounts for 40% of total server power, the memory system accounts for 30%, the disk accounts for 10%, and miscellaneous components account for the remaining 20%. What is the reduction in server power if we design a new memory system that consumes half the power?
5. Do problem 1.6 from chapter 1 of your textbook.

To Turn In

- **This page** stapled to your solutions, which are to be done in accordance with the School of Engineering homework guidelines found on the course web page. Use minimal, but sufficient, problem statements.