CS 2340 Assignment 1

Diego Rodrigues Rodriguez

January 31, 2024

Question 1

Aside from the smart cell phones used by a billion people, list and describe four other types of computers.

a) Personal computers (PCs): these are meant to be used by a single person at a time. Designed to be easy to use and affordable.

b) Supercomputers: these are the most powerful computers in the world. They are used for complex scientific and engineering problems, such as weather forecasting, climate research, and nuclear simulations.

c) Servers: these are normally stored in data centers for running software applications that serve many users. They are designed to be reliable and scalable.

d) Embedded computers: these are small, lightweight computers that are built into other products and are dedicated to a specific task. They are used in cars, airplanes, and consumer electronics.

Question 2

Match the seven great ideas in computer architecture to ideas from other fields.

a) Assembly lines in automobile manufacturing - **Performance via pipelining**

b) Suspension bridge cables - **Dependability via redundancy**

c) Aircraft and marine navigation systems that incorporate wind information - **Performance via prediction**

d) Express elevators in buildings - **Common case fast**

e) Library reserve desk - **Hierarchy of memories**

f) A weather simulation model that runs on a supercomputer - **Performance via parallelism**

g) Building self-driving cars - **Use abstraction to simplify design**

Question 3

Assume a color display using 8 bits for each of the primary colors (red, green, blue) per pixel and a frame size of 1280 x 1024

a) **What is the size of the frame buffer in bytes?** We have $1280 \times 1024 = 1,310,720$ pixels. Each pixel uses 24 bits, so the frame buffer size is $1,310,720 \times 24/8 = 3,932,160$ bytes.

b) **How long does it take to transmit the frame buffer over a 100 Mbit/s network?** it takes $3,932,160$ bytes $\times$ 8 bits$/100,000,000 = 315$ seconds.

Question 4

Assume a 15cm diameter wafer has a cost of 12, contains 84 dies, and has 0.020 defects/cm^2.
Assume a 20 cm diameter wafer has a cost of 15, contains 100 dies, and has 0.031 defects/cm^2.

First wafer Area: $A = \pi \times (15/2)^2 = 176.71cm^2$
Second wafer Area $B = \pi \times (20/2)^2 = 314.16cm^2$

a) **Find the yield for both wafers** The yield is given by $Y = \frac{1}{(1+(\text{Defects per area} \times \text{Die area}/2))}$. Then:

$$Die\ area\ A = \frac{A}{84} = 2.10cm^2 Die\ area\ B = \frac{B}{100} = 3.14cm^2$$