Exercise 1.2

[5] <§1.2> The eight great ideas in computer architecture are similar to ideas from other fields. Match the eight ideas from computer architecture, "Design for Moore's Law", "Use Abstraction to Simplify Design", "Make the Common Case Fast", "Performance via Parallelism", "Performance via Pipelining", "Performance via Prediction", "Hierarchy of Memories", and "Dependability via Redundancy" to the following ideas from other fields:

a. Assembly lines in automobile manufacturing
b. Suspension bridge cables
c. Aircraft and marine navigation systems that incorporate wind information
d. Express elevators in buildings
e. Library reserve desk
f. Increasing the gate area on a CMOS transistor to decrease its switching time
g. Adding electromagnetic aircraft catapults (which are electrically-powered as opposed to current steam-powered models), allowed by the increased power generation off ered by the new reactor technology
h. Building self-driving cars whose control systems partially rely on existing sensor systems already installed into the base vehicle, such as lane departure systems and smart cruise control systems

Solutions 1.2

a. Assembly lines in automobile manufacturing (*Performance via Pipeline*)

b. Suspension bridge cables (*Dependability*)

c. Aircraft and marine navigation systems that incorporate wind information (*Performance via Prediction*)

d. Express elevators in buildings (*Performance via Parallelism*)

e. Library reserve desk (*Hierachy of Memory*)

f. Increasing the gate area on a CMOS transistor to decrease its switching time (*Design for Moore's Law*)

g. Adding electromagnetic aircraft catapults (which are electrically-powered as opposed to current steam-powered models), allowed by the increased power generation offered by the new reactor technology (*Make the Common Case Fast*)

h. Building self-driving cars whose control systems partially rely on existing sensor systems already installed into the base vehicle, such as lane departure systems and smart cruise control systems (*Use Abstraction to Simplify*)

Exercise 1.3

[2] <§1.3> Describe the steps that transform a program written in a high-level language such as C into a representation that is directly executed by a computer processor.

Solutions 1.3

[2] <§1.3> Describe the steps that transform a program written in a high-level language such as C into a representation that is directly executed by a computer processor.

Step 1: Translate from C-language Program (in text format) into assambly language Program (still in text format, but in corresponding architecture of the computer where the program will be run). The software tool used for this step is Compiler

Step 2: Translate from assamly language program (text format) into Machine Code Program (in binary format). The software tool used for this step is Assembler

Exercise 1.4

[2] <§1.4> Assume a color display using 8 bits for each of the primary colors (red, green, blue) per pixel and a frame size of 1280 × 1024.

a. What is the minimum size in bytes of the frame buff er to store a frame?

b. How long would it take, at a minimum, for the frame to be sent over a 100 Mbit/s network?

Solutions 1.4

[2] <§1.4> Assume a color display using 8 bits for each of the primary colors (red, green, blue) per pixel and a frame size of 1280 × 1024.

a. What is the minimum size in bytes of the frame buffer to store a frame?

1280 x 1024 points of the color screen and 3 bytes (one for red, one for green and one for blue) so the size of the buffer to store a frame is: 1280 * 1024 *3 Bytes = 3 932 160 Bytes

b. How long would it take, at a minimum, for the frame to be sent over a 100 Mbit/s network?

100 Mbits = 100 x 1024 Kbit = 100 x 1024 x 1024 bit.

Time for transmit.=(3 932 160 x 8 bits)/(100 x 1024 x1024 b/s)

= 0.3 seconds