Assignment 1

Due date: Monday, February 24, 2025

1. A multipleprocessor consists of 100 processors, each capable of a peak execution rate of 2Gflops. What is the performance of the system as measured in Gflops when 10% of the code is sequential and 90% is parallelizable?

2. Is it possible to have a system efficiency (*E*) of greater than 100%? Discuss.

3. Parallelize the program of finding the sum of *n* numbers (*a*1+*a*2+...+*an*) using different numbers of processes (Algorithm 1: *n*/2 processors; Algorithm 2: *n*/log2*n* processors).

(1) Draw the diagrams for the implementations of Algorithm 1 and Algorithm 2 respectively.

(2) Find the numbers of operations for the implementations of the sequential algorithm, Algorithm 1, and Algorithm 2 respectively.

(3) Calculate the speedups of Algorithm 1 and Algorithm 2 respectively.

(4) Compute the efficiencies of Algorithm 1 and Algorithm 2 respectively.

(5) Are Algorithm 1 and Algorithm 2 cost optimal respectively? Justify your answer.

4. Find the following parameters for 2-D mesh, hypercube, binary tree, and omega interconnection networks respectively.

(1) Direct or indirect topology?

(2) Diameter

(3) Bisection width

(4) Edges per node (degree)

(5) Constant edge length (Yes or No?)