Eng 67 / 115: Laboratory 5

Background: OpenMPI - Message Passing Interface (MPI) Standard

The goal of this assignment is to familiarize you with the 6 fundamental MPI functions for process communication and synchronization. During the assignment you will experiment with how to use these functions to build basic forms of process synchronization. This assignment will cover the basics of compiling and running a program for execution on a network of workstations with MPI. Manual pages for using OpenMPI and the functions listed below are available on the Blackboard.

MPI Routines to use in this Assignment:

- MPI_Comm_rank()
- MPI_Comm_size()
- MPI_Finalize()
- MPI_Init()
- MPI_Recv()
- MPI_Send()

TASKS:

1. Write a program that prints the message: **"hello: N processes, process P"** from each process in an N process MPI computation. The value N should be the number of processes in the computation, and the value P should be the identifier of the printing process. Save this project as a "starter project" that can be used in all future experiments.

2. Copy and generalize your project from Part 1 by adding command line options to your program that allow you to select from among the following options for process synchronization. Make sure you run your program on a large number of processors and watch the output carefully! *You must guarantee that the output of all processes is seen on the screen* ***in order.***

Manager/Worker

One process (by convention, the one with rank zero) is the "manager". Every other process waits for a message from the manager before printing its hello message, then after doing so (and before terminating), it replies to the manager to report that it has finished.

Token Passing

Instead of having one central process managing the rest, in this paradigm each process "hands off" to the next using a token. The token should be passed in order of increasing process number.

Reverse Order

The above token passing scheme in reverse order.

RESEARCH

Take a look at the lecture video associated with Lab 6 and make sure you understand:

- What are functional, domain, and irregular decompositions?
- What is the distinguishing characteristic of an irregular decomposition?
- What is the manager-worker scheme?