

School of Computing and Information Systems

COMP90025: Parallel and Multicore Computing

Tutorial

Implementation topics

1. Why is the number of ports in a switch often a power of two (or a small multiple of a power of two, like 6, 12, 24).
2. A Benes network is often used as a switching fabric. In this context, why is it acceptable to be rearrangeably non-blocking instead of strictly non-blocking?
3. Neglecting the constraint that n , m and r be integers, what is the optimal value of r for a strictly non-blocking Clos network with N inputs?

Why do openMP parallel blocks have (implicit) barriers at the end? Why do they not have them at the beginning?

4. Imagine you were asked to implement openMP on a system using pthreads. name three challenges you would face, and describe each in one sentence. Choose an openMP primitive and explain how you would implement it.
5. MPI allows the user to define new data types. Write pseudocode using the functions

```
int MPI_Type_vector (int count, int blocklength, int stride,  
                    MPI_Datatype oldtype, MPI_Datatype *newtype)
```

and

```
int MPI_Type_commit (MPI_Datatype *datatype)
```

to send elements

```
(5,5)  (5,6)  ...  (5,12)  
  ⋮      ⋮      ⋮  
(12,5) (12,6) ... 12,12)
```

from a 1000 x 1000 matrix MAT from the current rank to rank 52.

6. : Although OpenMP is suited to parallel algorithms in which each thread does similar tasks, it can be used to implement general multi-thread algorithms of the sort that pthreads is used for. Explain how the flexibility of pthreads can be obtained under openMP. (Hint: You may find the “omp section” pragma useful.)
7. What is lower-order memory interleaving, why is it used, and why is it not done at the level of bytes?