

Roll No:- 41258

HPC Unit Test.

1) Scope of parallel Computing:-

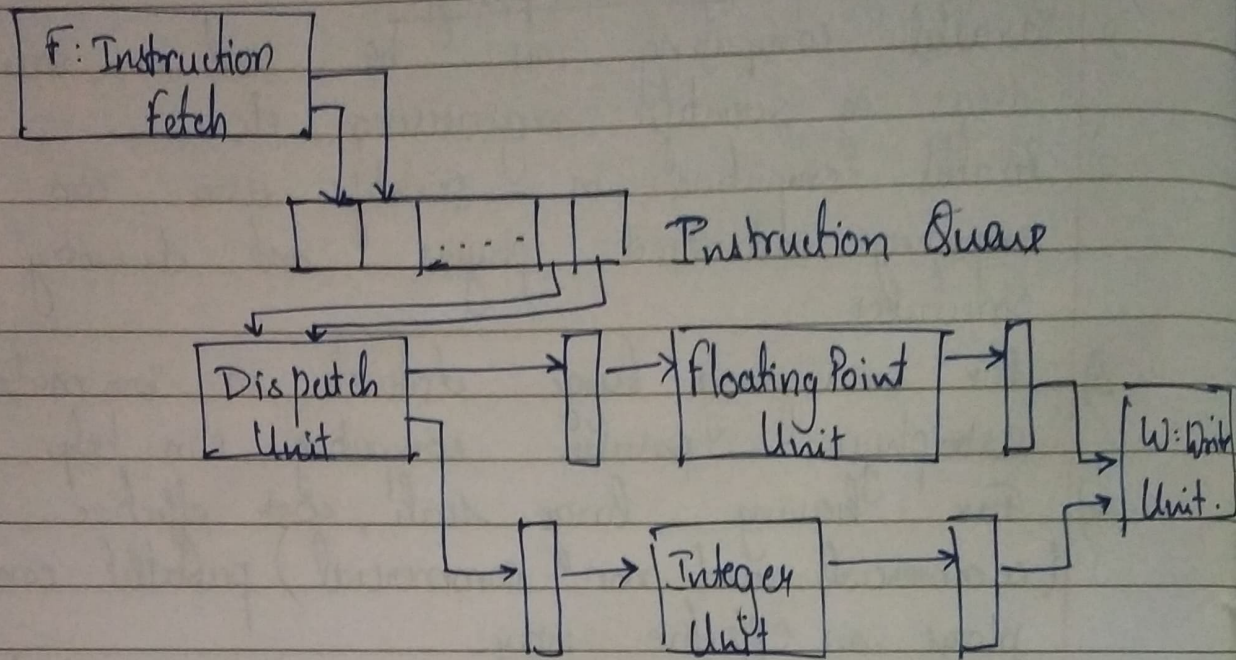
- 2) Parallel computing can be used in variety of areas eg scientific, engineering etc.
- 3) Parallel computing in scientific area can be used in computing advanced physics and chemistry formulae & structures
- 4) For analysing large datasets in bio medicals and astrophysics parallel computing can help.
- 5) For having large scale, cost effective website & (commercial and non commercial) parallel computing plays an effective way.
- 6) For security measures like intrusion detection, password cracking etc parallel computing can be used.
- 7) Parallel computing is very effectively used where we need to do multiple task simultaneously with efficient time and resource utilization.

2) Applications of parallel computing:-

- 1) Data mining and analysis.
- 2) Simulation of system (Real time)
- 3) Advanced graphic games
- 4) Augmented and virtual reality.
- 5) Study of astronomical data
- 6) Business model analysis and development
- 7) Medical imaging, pattern recognition and analysis.
- 8) Solving complex mathematical problems.

2) Superscalar architecture:-

- 1) In this, the CPU manages multiple instructions pipelines to execute several instructions concurrently during a clock cycle.



Advantages :-

- 1) Avoids hazards through judicious selection & ordering.
- 2) high performance due to maximum utilization of hardware units.

Disadvantages:-

- 1) Scheduling problems may occur.

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3) Decomposition Techniques:-

- The different decomposition techniques are
- 1) Data Decomposition
 - 2) Recursive Decomposition
 - 3) Exploratory Decomposition
 - 4) Speculative Decomposition.

Data Decomposition :-

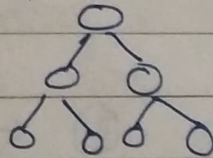
- 1) Problems having large volumes of data can be executed using this technique.

2) Steps:-

- a) data is divided into sub parts
 - b) sub parts are executed by different processors concurrently.
- 3) Here data is partitioned in various task.

Recursive decomposition :-

- 1) a problem can be solved with divide & conquer thus giving it a concurrency approach.
- 2) Divide large problem in sub problems and then solve those sub problems recursively.



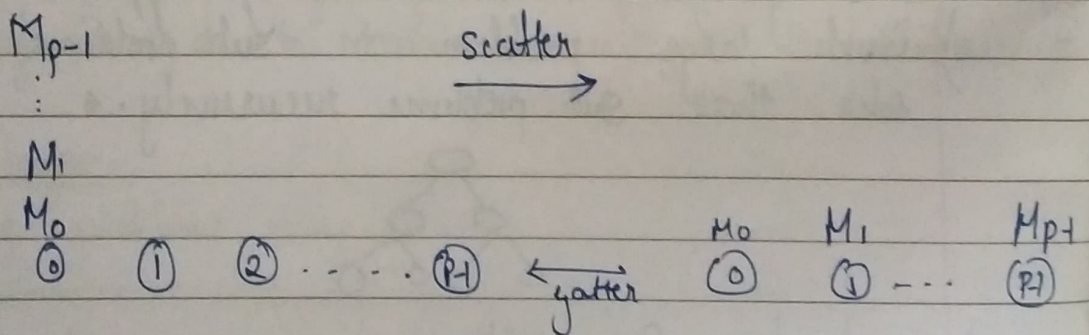
3) Exploratory Decomposition:-

- 1) Here problems involves exploration i.e. search of a state space of solutions.
- 2) The problem is decomposed in running state.

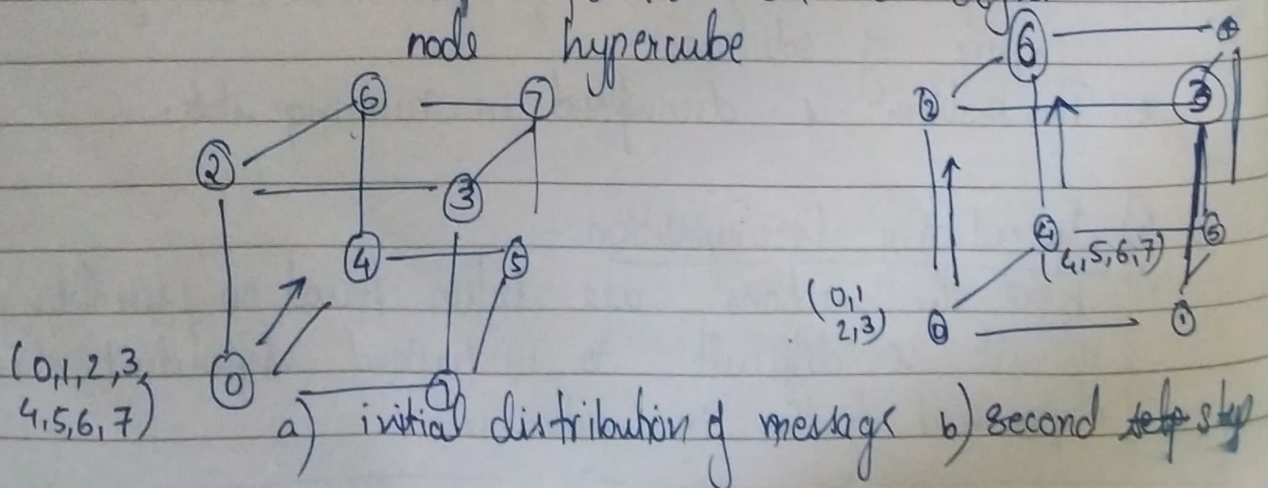
4) Speculative Decomposition:-

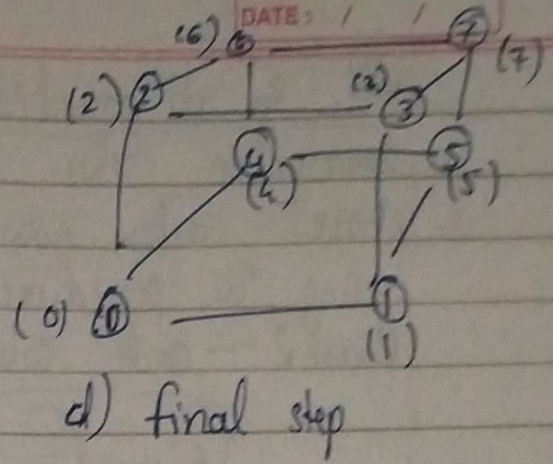
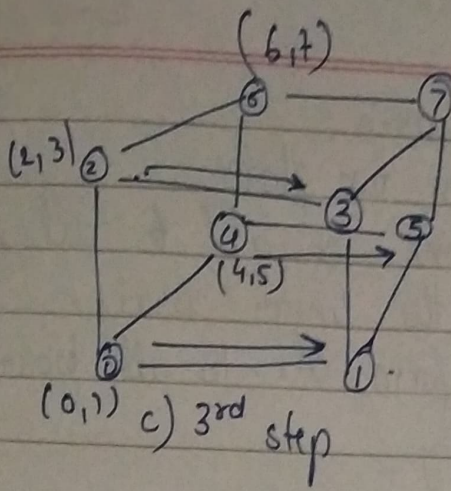
- 1) Here the actions are taken based on preceding output as it is difficult to understand independent task & dependent task in advance.

- 6) Scatter & Gather Communication Pattern of Hypercube.
1. In Scatter operation a single node sends a unique message of size m to every other node.
 2. This operation is also known as one-to-all personalized communication is different from one-to-all different broadcast. In that the source node ~~not~~ starts with p unique messages, one distinct for each node.
 3. Unlike one-to-all broadcast, one-to-all personalized communication does not involve duplication of data.
 4. The dual of one-to-all personalized communication of the scatter operation is the gather operation all concatenation, in which a single node collects a unique message from each node.
 5. A gather operation is different from an all-to-one reduce operation. In that it does ~~not~~ involve any combination or reduction of data.



Scatter operation on a eight node hypercube





4) Mapping Technique of Load Balancing

a) Static Mapping b) Dynamic Mapping.

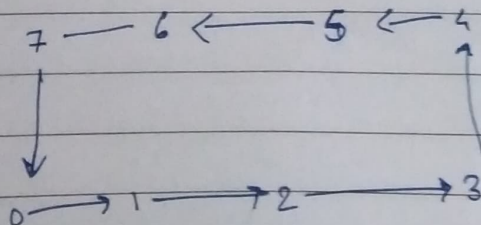
1) Static Mapping :- Static mapping techniques distribute the task to processes prior to the execution of the algorithm.

Algorithms that use static mapping are easier to design and program.

2) Dynamic Mapping :- Dynamic mapping techniques distribute the task at the time of execution of algorithm. Algorithms are more complicated and difficult to design.

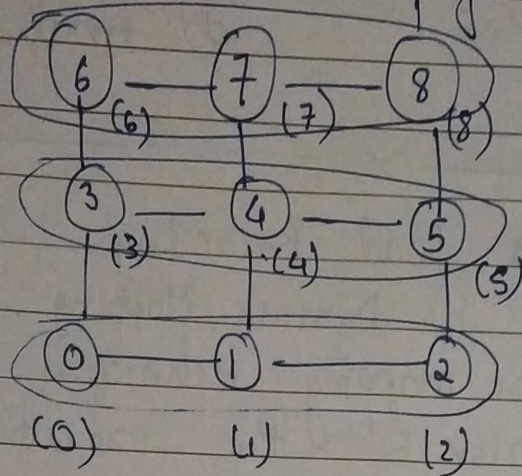
5) All to All Broadcast on Ring:-

1. all communication links are kept busy simultaneously until the operation is complete because each node always has some information that it can pass along to its neighbour.
2. Each Node sends, forwards data to its neighbour

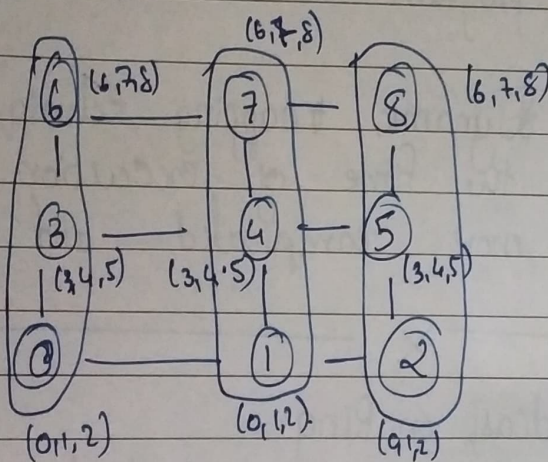


All to all broadcast in mesh.

1. Communication takes place in two phases.
2. phase 1:- each row performs a all to all broadcast using the procedure for the linear array.
- phase 2:- each column perform all to all broadcast.



phase 1



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