EGC442
Class Notes
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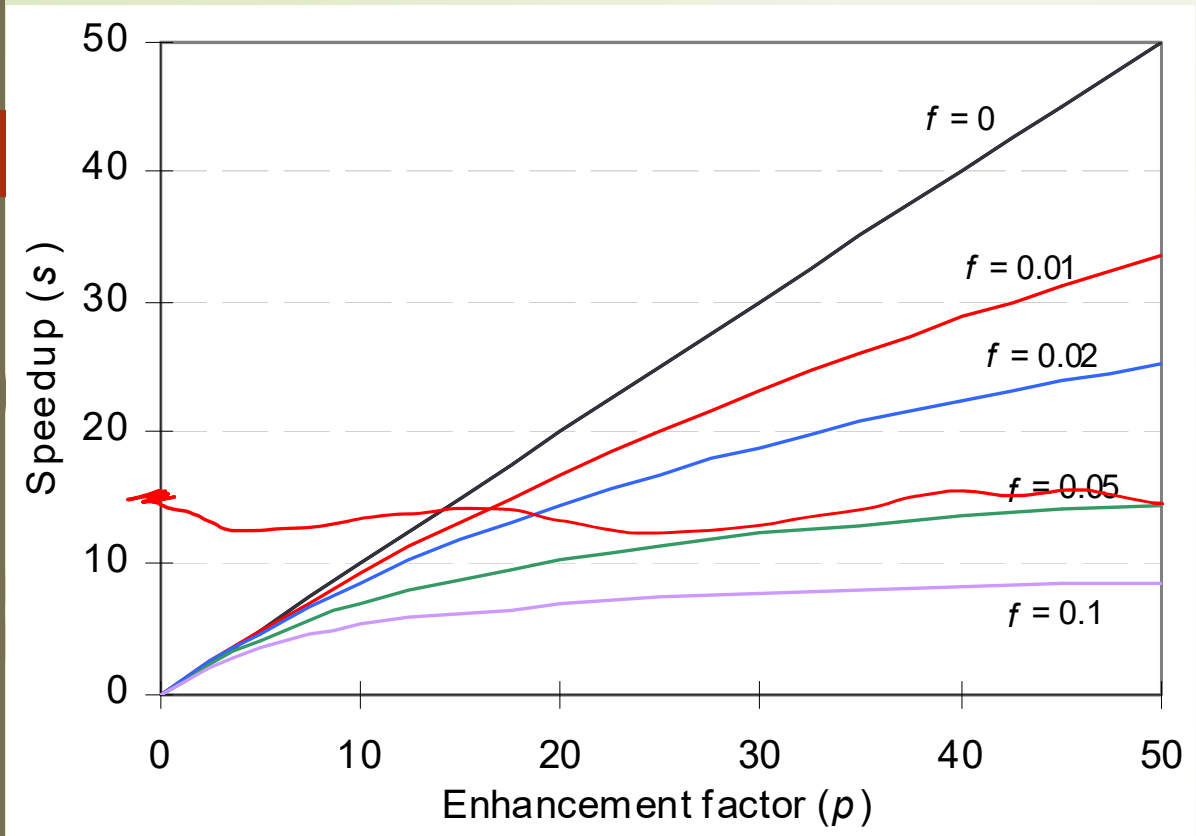
Baback Izadi
Division of Engineering Programs
bai@engr.newpaltz.edu



$$s = \frac{\text{Exec Time 1 Processor}}{\text{Exec Time P Processors}} \qquad s = \frac{1}{f + (1-f)/p}$$

$$\leq min(p, 1/f)$$

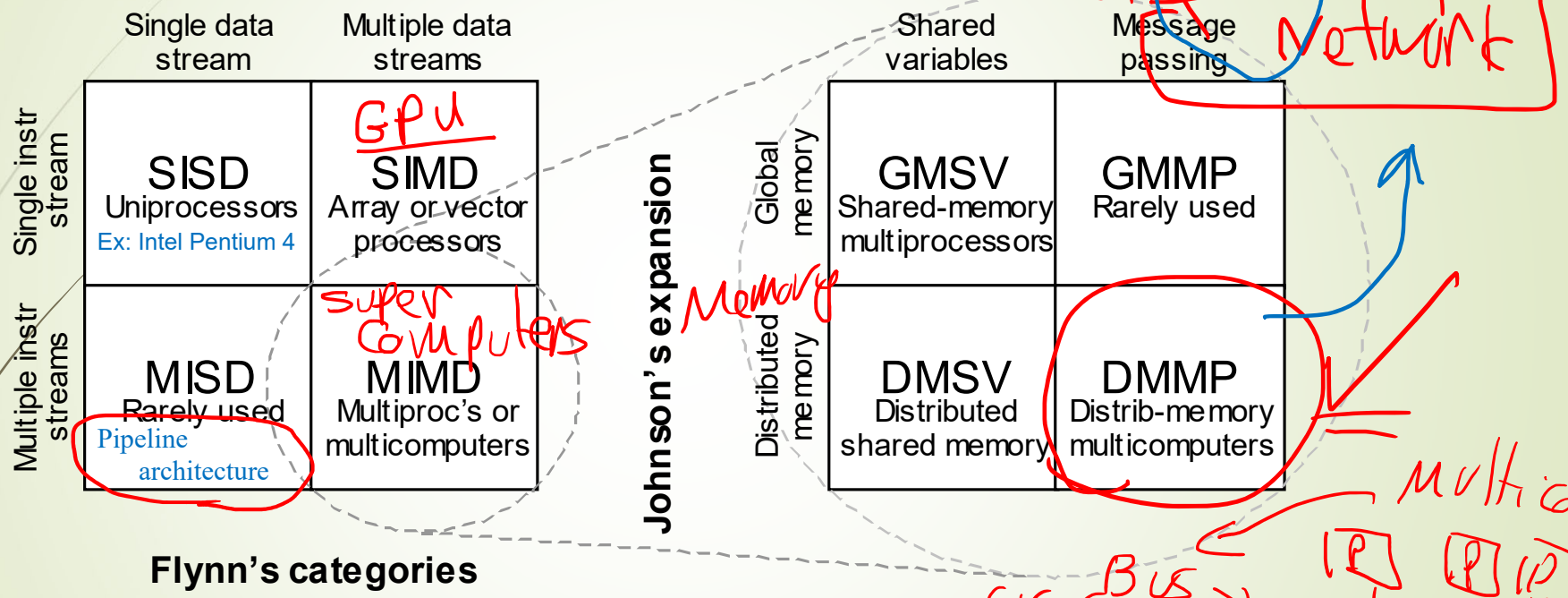
1) What is the maximum speedup of a parallel processing environment with 50 processors given than 5% of code is sequential?

$$s = \frac{1}{.05 + (.95)/50} = 14.49$$

2. infinite # of processor

$$s = \frac{1}{.05 + 0} = 20$$

Types of Parallelism: A Taxonomy



- SPMD: Single Program Multiple Data A parallel program on a MIMD computer Conditional code for different processors

) Devise a program which would result in sum of array X[] with 5,000 elements using 1 processor.

```
sum = 0;
 for (i = 0;      i < 5000; i = i + 1)
   sum = sum + X[i];
```

5000 steps

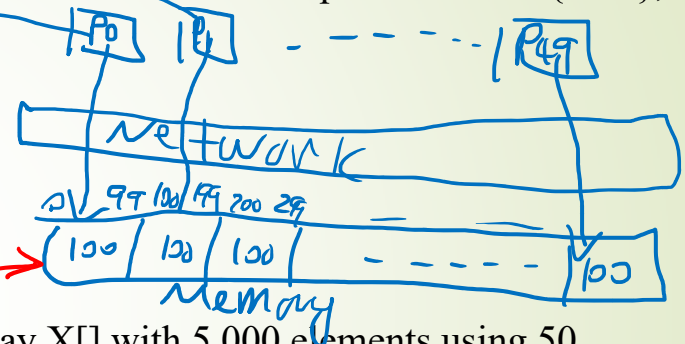
Shared Memory

2) Devise a GMSV program which would result in sum of array X[] with 5,000 elements using 50 processor.

Each processor will get data from shared memory space. 5000 / 50 = 100 data points. i.e. P0 {0:99}, p1{ 100: 199}, etc.

```
sum[Pn] = 0;
 for (i = 100*Pn;
    i < 100*(Pn+1); i = i + 1)
   sum[Pn] = sum[Pn] + X[i];
```

100 steps

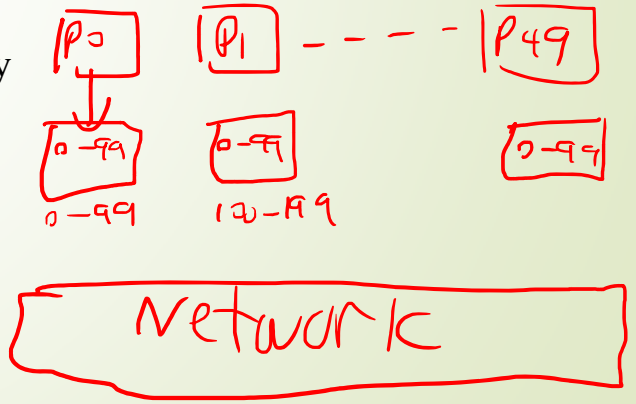


3) Devise a DMMP program which would result in sum of array X[] with 5,000 elements using 50 processor.

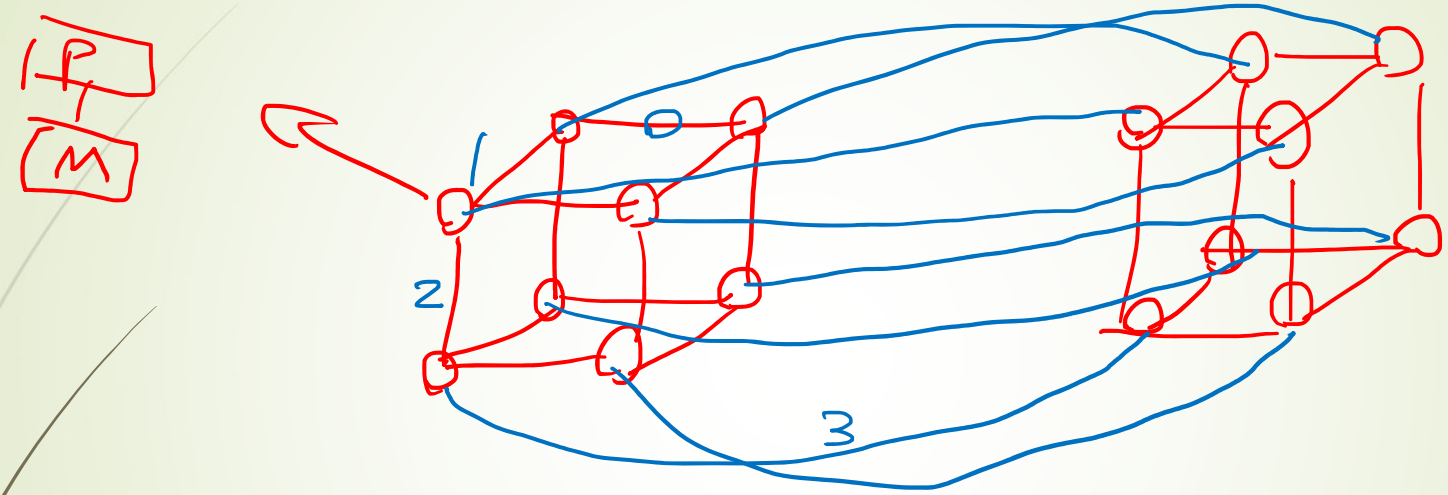
Each processor gets its 5000/50 = 100 data points in its local memory

```
   sum = 0;
for (i = 0; i<100; i = i + 1)
  sum = sum + X[i];
```

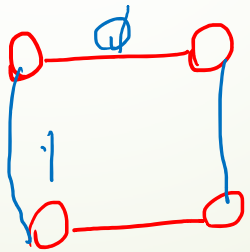
100 steps



4) Design a DMMP such that the network is organized as a 4-cube. Determine the number of processors in such an architecture.

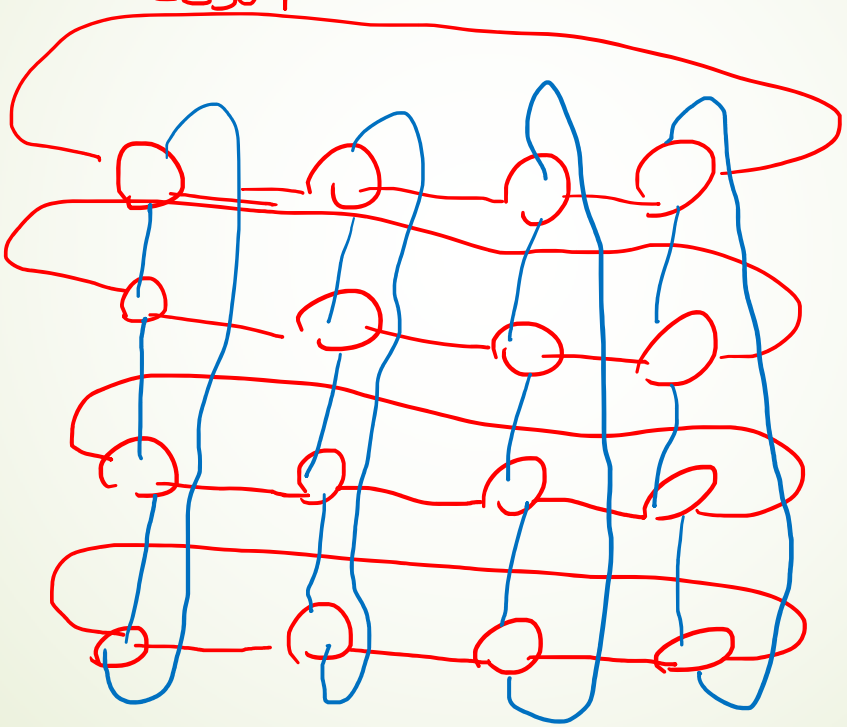


Hypercube

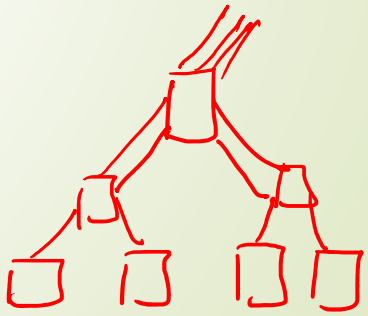


5) Design a DMMP such that the network is organized as a two dimensional torus with the same number of processors as problem 4.

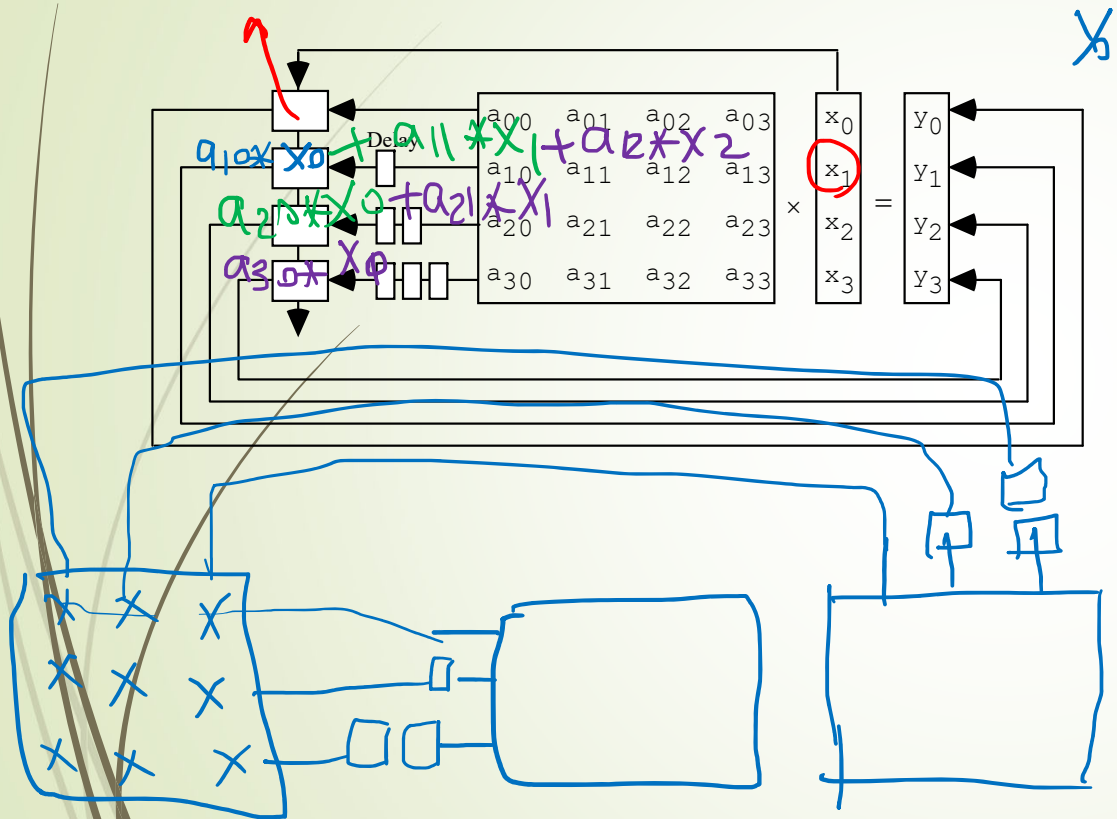
16 Processor



Most super computers today Fat Tree



6) The following diagram depicts a vector processor for matrix – vector multiplier. Devise a vector processor for a matrix – matrix multiplication.



Final:

Comprehensive

- Performance problems
- ALU design
- Data Path and control
- Pipelining design and issue
- Cache memory
- Virtual memory
- Parallel Computing