Lecture 24 (Route Computation)

1   Routing Table

1. Each node maintains a routing table and specifies the possible next hops based on final destination
2. Make a choice out of possibilities depending on congestion information
3. Take into account the delay incurred in sending flits the last time the channel was used

2   Allocate Switch Ports

Can design a $m \times n$ switch for input vs output

2.1   Combine Smaller Switches

1. For a $m \times n$ switch, latency is $m + n$ and area is $m \times n$
2. For 10×5, we can combine as:
    i. 5 switches of 2×1 followed by 5×5 switch - better
    ii. 2 switches of 5×2 follows by 4×5 switch

2.2   Dimension Sliced Switch

Used for X-Y routing, saves on area

Startup in switch industry will work really well. They are very expensive. SIT ke liye planning was done by faculties

3   Allocation and Arbitration

1. Arbiter chooses one out of N requests for resource allocation
2. Allocator creates one to one mapping between N requests and M resources - bipartite matching

3.1   Round Robin Arbiter

Combinational logic that performs round robin

3.2   Matrix Arbiter

1. If given agent is not interested, it sets entries in its row to 0 and in column to 1
2. In every cycle, request is granted to the agent who has 1 in all entries of its row
3. Once agent i is done servicing, it sets all entries in its row to 0 and all in column to 1

3.3   Separable Allocator

1. First column selects resource
2. Second column selects agent
3. Does not give maximal matching

3.4   Wavefront Allocator

1. Start by giving each diagonal element a row and column token
2. Each round, row token moves 1 step to left, column moves 1 step down (with wraparound)
3. If agent i is interested in resource j, it grabs both row and column token when it receives them
4. If some i, j is chosen, then
     i. no other agent can request for resource j
    ii. agent i cannot request for any other resource
5. This ensures maximal matching

4   Router Pipeline

1. Buffer Write
2. Route Computation
3. VC Allocation
4. Switch Allocation
5. Switch Allocation

5   Lookahead Routing

1. Compute route for next hop
2. Send routing decision along with packet
3. Removes route computation from critical path