

Multicore Computer Architecture - Storage and Interconnects

Tutorial 5

Concepts in Network on Chip



NPTEL Online Course : Multi-Core Computer Architecture - Storage and Interconnects, Dr. John Jose, IIT Guwahati

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Tutorial Problem-1

- ❖ An input buffered NoC router R that uses age based switch allocation scheme (higher age-higher priority) and XY routing receives 3 packets at a given clock cycle. The details (packet number, age, source, destination) of the packets are $\langle P1, 3, 1, 13 \rangle$, $\langle P2, 2, 4, 3 \rangle$ and $\langle P3, 5, 5, 10 \rangle$. What are the input ports through which these three packets entered R and what is the output port allocated to each of these packets at R, if R is router 5 in a 4x4 mesh NoC?

12	13	14	15
8	9	10	11
4	5	6	7
0	1	2	3

Tutorial Problem-2

- ❖ A packet injected from router 4 with a destination address 16 in a 5x5 mesh interconnect system uses minimal east last routing algorithm. Show a possible path (sequence of node numbers) that this packet could travel.

20	21	22	23	24
15	16	17	18	19
10	11	12	13	14
5	6	7	8	9
0	1	2	3	4

Tutorial Problem-3

- ❖ Consider a 25 core machine in which cores are organized as regular square mesh topology. A packet P1 is generated from core number 18 destined to core 6. The system follows minimal north last routing. How many unique minimal paths are there from 18 to 6?

20	21	22	23	24
15	16	17	18	19
10	11	12	13	14
5	6	7	8	9
0	1	2	3	4

Tutorial Problem-4

- ❖ A packet injected from router 4 with a destination address 16 in a 5x5 mesh interconnect system reaches router 8 through its east input port. What are the possible output port(s) for this packet at router 8 if it uses minimal odd-even routing algorithm?

20	21	22	23	24
15	16	17	18	19
10	11	12	13	14
5	6	7	8	9
0	1	2	3	4

Tutorial Problem-5

- ❖ Consider an 8x8 mesh NoC that uses a single flit packet scheme that can accommodate a full cache block. Consider a 3 cycle router and 1cycle link for the NoC that uses XY routing. 3 packets P1, P2 and P3 were generated from routers 6, 24, and 32 respectively. The packets follow transpose traffic pattern. If packet injection and ejection takes 2 cycles each, find the latency of P1, P2 and P3.

56	57	58	59	60	61	62	63
48	49	50	51	52	53	54	55
40	41	42	43	44	45	46	47
32	33	34	35	36	37	38	39
24	25	26	27	28	29	30	31
16	17	18	19	20	21	22	23
8	9	10	11	12	13	14	15
0	1	2	3	4	5	6	7

Tutorial Problem-6

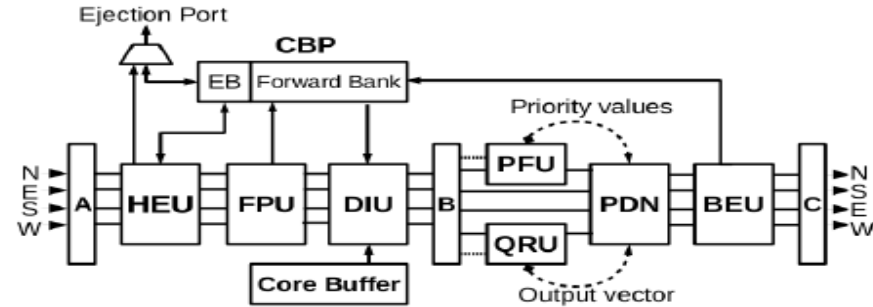
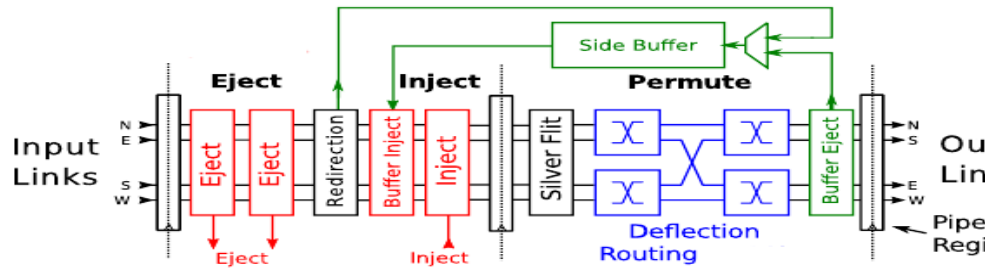
- ❖ A cache miss request packet P1 with a destination address 1 is injected into router 14 in a 4x4 mesh NoC that uses XY routing. State whether each of the following statement is True/False.
- P1 while moving through the NoC takes a 90 degree turn at router 2.
- P1 moves through router 9.
- P1 takes 5 hops to reach its destination.
- P1 moves through router 10.
- P1 while moving through the network takes a 90 degree turn at router 13.
-

12	13	14	15
8	9	10	11
4	5	6	7
0	1	2	3

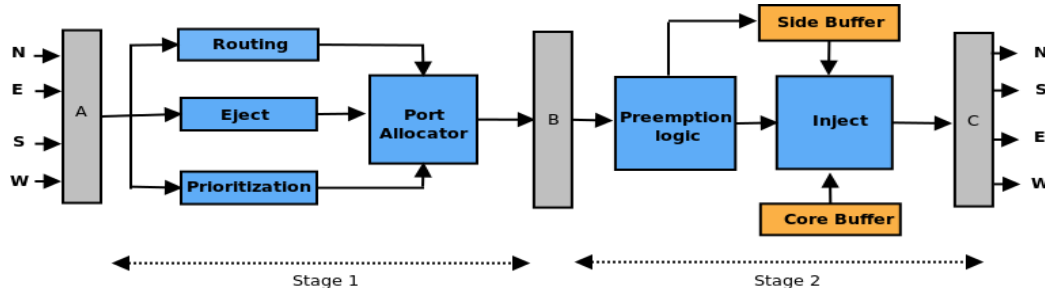
Tutorial Problem-7

- ❖ State whether each of the following statement is True /False.
- BLESS router uses parallel port allocation logic.
- BLESS router uses golden packet scheme for flit prioritization
- CHIPPER uses silver flit scheme for flit prioritization.
- MinBD uses late injection to reduce channel wastage.
- DeBAR uses hops to destination scheme for flit prioritization.
- SLIDER uses silver flit scheme for flit prioritization.

Tutorial Problem-7



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**THANK
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FOR

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