Tutorial 7 - SS2017
Communication Systems and Protocols

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Task 1: Networks

Task 1.1: General Questions

A) Name the three components of a network on chip node in the basic setup and their respective task.

B) How do networks and busses differ from each other?

C) Your task is to decide on which type of switching to be used in a network consisting of components in need of predictable latencies. Justify your decision.

D) Your task is to decide on which type of switching to be used in a network consisting of components that mainly communicate by streaming data, thus in need of high and guaranteed throughput. Justify your decision.

Task 1.2: Routing

Figure 1.1 shows a 4x4 meshed network with packet-switching communication.

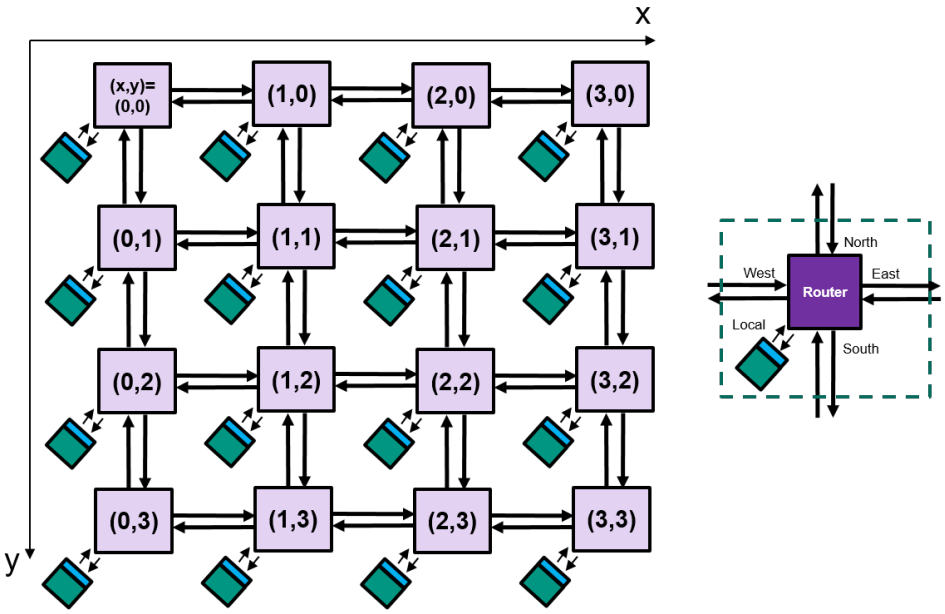

Figure 1.1: 4x4 meshed network

A) Which routers are passed by a packet sent from $(x, y) = (1, 0)$ to $(3, 3)$ using XY-Routing. Please provide the coordinates of the passed router in the order given by the transmission process.

B) The routers $(1, 0)$ and $(2, 1)$ are experiencing heavy traffic towards their east port, such that packets have to wait before being forwarded. As an alternative "hot potato XY-Routing" is used. If a port is occupied the opposite dimension is used, so in case of X towards Y and in case of Y towards X. If no heavy traffic is present common XY Routing is used. Which routers are passed by a packet sent from $(x, y) = (1, 0)$ to $(3, 3)$ for that routing?

C) Which classes of routing algorithms is hot potato XY-Routing associated with?

D) Describe two scenarios: one in which common XY Routing is preferable and one in which "hot potato XY Routing".

E) Instead of XY-Routing, Flooding is considered for the given network. How many times is a packet forwarded when flooding is used, with router $(1, 0)$ being the origin and router $(2, 2)$ the destination?

F) How many times is a packet forwarded by routers, using Flooding with a time to live of 2, when router $(1, 0)$ is the origin and router $(2, 2)$ the destination?

G) What is the minimal time to live for a packet sent by router $(1, 0)$ to reach router $(2, 2)$?

Task 2: Dijkstra

In Figure 2.1 you can see a network of six nodes (A..F). The nodes each have a different number of ports, numbered from #1 to #4. Each connection between the tiles is annotated with the communication cost. Your task is to generate the routing tables for the individual nodes.

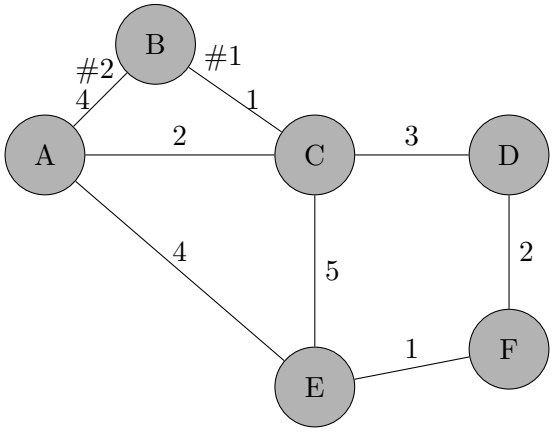

Figure 2.1: Given network topology

A) Determine the shortest path from node B to all other nodes using the Dijkstra-Algorithm. Make use of the tables 2.2 and 2.3.

B) Use the results from the previous task to generate the routing table of node B.

Destination	Port #
A	
B	
C	
D	
E	
F	

Table 2.1: routing table of node B

node	step 1 **B**		step 2		step 3		step 4		step 5	
vertex	dist.	pred.	dist.	pred.	dist.	pred.	dist.	pred.	dist.	pred.
A										
B										
C										
D										
E										
F										

Table 2.2: Dijkstra algorithm

node	step 6		step 7	
vertex	dist.	pred.	dist.	pred.
A				
B				
C				
D				
E				
F				

Table 2.3: Dijkstra algorithm