Tutorial 6 - SS2016
Communication Systems and Protocols

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Task 1: Networks

Task 1.1: General Questions

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

B) Your task is to decide on which type of connection 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.

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

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

Task 1.2: Routing

Figure 1.1 shows a 4x4 meshed network with bidirectional links for wormhole packet-switching communication.

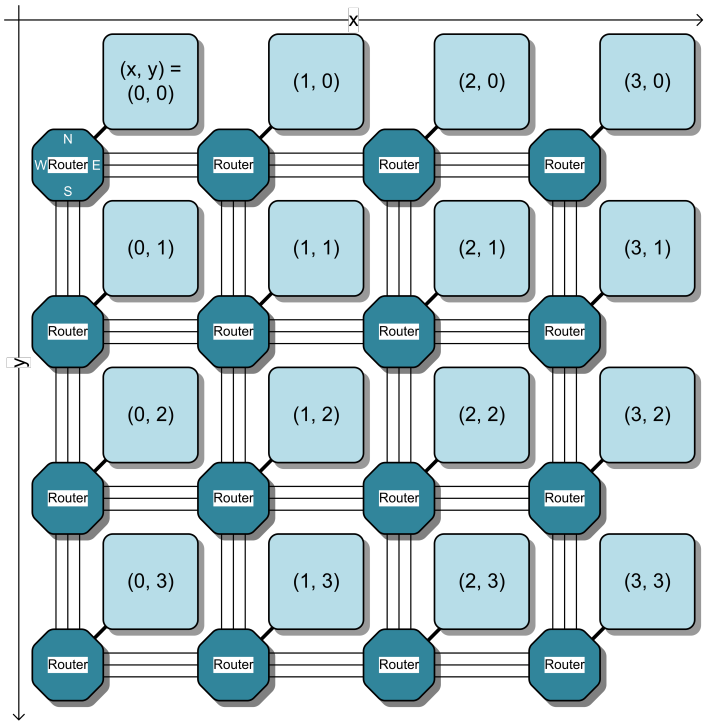

Figure 1.1: 4x4 meshed network

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.

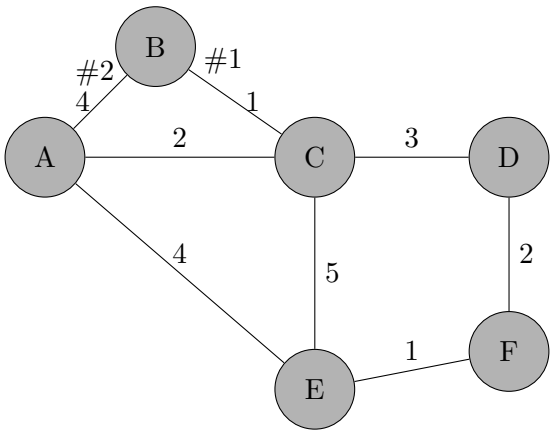

Figure 2.1: Given network topology

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 2.1 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