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# Exercise No. 7

## Communication Networks I

### Summer Term 2015



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### General Remarks

Welcome to the exercise for Communication Networks I. Please adhere to the following general remarks regarding the organization of the exercise during this summer term.

- One week before the tutorial, a new exercise will be published at the Exercise area of the KN1 Moodle (<https://moodle.tu-darmstadt.de/course/view.php?id=5268>)
- The exercise serves as your hands-on experience in addition to the lecture and as a preparation for the exam
- The questions in the exercise can be discussed at the tutorial date
- The sample solution for the exercise is available at the Exercise area of KN1 Moodle in addition to the corresponding tutorial. Nevertheless, we encourage students to try to solve the exercise themselves before the tutorial date without looking into the solution as a good practice to understand the subject of the lecture

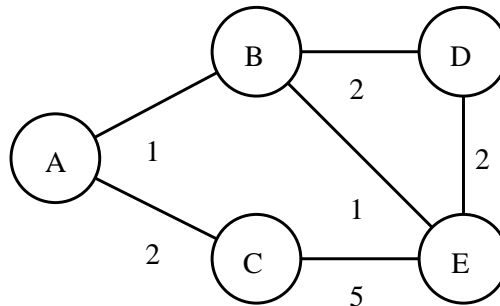
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**Problem 1 - Distance Vector Routing**

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- a) Compare Distance-Vector and Link-State Routing, which information is collected, which information is send to whom and what do the nodes calculate themselves?
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In the following network the numbers indicate a metric for the distance of 2 nodes.



At the moment, however, the routing tables of the nodes A, B, C and E look as follows:

Node A			Node B		
Target	Egress	Costs	Target	Egress	Costs
A	-	0	A	A	1
B	B	1	B	-	0
C	C	2	C	E	6
D	B	3	D	D	2
E	B	2	E	E	1

Node C			Node E		
Target	Egress	Costs	Target	Egress	Costs
A	A	2	A	B	2
B	A	3	B	B	1
C	-	0	C	E	5
D	E	7	D	D	2
E	E	5	E	-	0

- b) What are the vectors, that B and E send to their neighbours? Use the following format:  
Sender : Vector
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- c) D receives the vectors from B and E. Complete D's routing table:
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Node D		
Target	Egress	Costs
A		
B		
C		
D		
E		

- d) Now the line between A and B is cut. Describe, how the nodes react. For this purpose, specify the first 5 vectors interchanged by the nodes after the cut. Use the following format:  
Sender : Vector  
A node sends the vector when its routing table has changed.
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e) After some steps, all the nodes have updated their routing tables and the network works without the line between A and B. The routing tables of A and C look like this:

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Node A			Node C		
Target	Egress	Costs	Target	Egress	Costs
A	-	0	A	A	2
B	C	8	B	E	6
C	C	2	C	-	0
D	C	9	D	E	7
E	C	7	E	E	5

Now also the line between C and E is cut.

Describe which problem occurs, if node A sends its routing information (the vector) to node C (e.g. because of a timer), before node C was able to send its new routing information (containing the cut between C and E) to A.

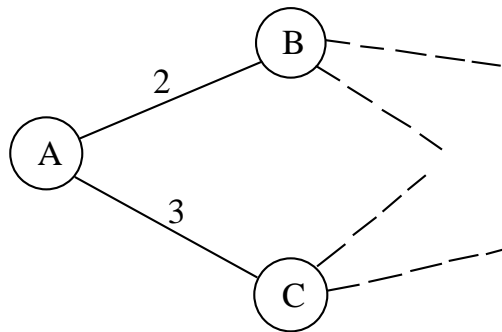
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f) How can this problem be solved?

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## Problem 2 - Link State Routing

Look at the following cut-out of a network:



In this network, Link-State Routing is used. System A knows its neighbours (found out via HELLO messages over each L2 channel)

B, distance 2

C, distance 3

and has sent its Link State Packet.

a) Who will receive this packet? Which sending mechanism is used?

b) What does this Link State Packet contain? Why?

c) Station A receives the following Link State Packets:

B		C		D		E		F		G	
Seq.#		Seq.#		Seq.#		Seq.#		Seq.#		Seq.#	
Age		Age		Age		Age		Age		Age	
A	2	A	3	B	1	B	6	E	2	C	4
D	1	D	5	C	5	D	3				
E	6	G	4	E	3	F	2				

Compute the routing table of A. For every station in the network, the table must have a row of the form (target, egress, distance), e.g. the entry for station B in the routing table of A looks like this:

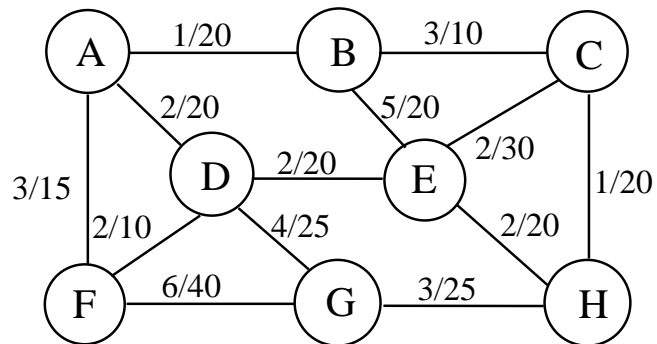
Target	Egress	Distance
B	B	2

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### Problem 3 - Multipath Routing

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The following network topology is given:



The first number indicates a metric for the distance of 2 nodes. The second number denotes the data rate in Kbits/sec.

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State according to the Multipath-Routing Algorithm based on the distance the routing table for node E. Do this by indicating the weight of the two best egress lines. Pick any one in case of several possibilities for the second alternative. The weight should be reciprocally proportional to the total distance over each path. Note that the sum of the weights for every target node must be 1.

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Target	Egress	Distance	Weight	Egress	Distance	Weight
A						
B						
C						
D						
F						
G						
H						