Exercise
for Lecture “P2P Systems”

Prof. Dr. David Hausheer
Dipl.-Wirtsch.-Inform. Matthias Wichtlhuber, Leonhard Nobach, M. Sc., Dipl.-Ing. Fabian Kaup, Christian Koch, M. Sc., Dipl.-Wirtsch.-Inform. Jeremias Blendin

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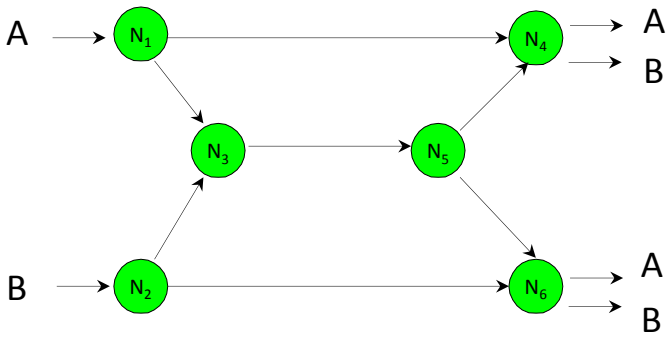
Submission only via the Moodle platform in PDF, plain text, or JPG/PNG.
Contact: [mwichtlh|lnobach|fkaup|ckoch|jblendin]@ps.tu-darmstadt.de
Web: http://www.ps.tu-darmstadt.de/teaching/p2p/

Surname (Nachname):	
First name (Vorname):	
ID# (Matrikelnummer):	

Problem 11.1 - Network Coding

In the lecture you learned about Network Coding. In the following, the network nodes are named N and the chunk (e.g. packet) are noted by the letters A and B.



a) Consider the given topology and assume that no network coding is used. Further assume that one node can only pass one chunk each 10ms. How long would it take to deliver the chunks A and B to the nodes N4 and N6? Next, state the number of messages which have to be exchanged between the nodes.

b) Now assume that network coding is used. How long does it take to deliver A and B and how many messages are send between the nodes?

c) Consider the network coding example given in the lecture slides 24-26. What would change if Node 1 uses a) the coefficient vector (4, 6, 2) and b) the coefficient vector (4,6,3) instead of the vector (1, 3, 2)? Explain in both cases if Node 3 is able to compute M1, M2, and M3.

d) Assume the given network topology used for network coding. The messages M1, M2, M3 contain the following information: M1=6, M2=2, M3=7. Now assume that the encoding vectors used by Node 1 to be: (2,1,5), (1,2,3), and (3,1,1). Node 2 used the vectors (7,3) and (1,2) for the encoding. Show how the nodes compute the encoded representation of the messages named X. Which information is exchanged by which nodes?