

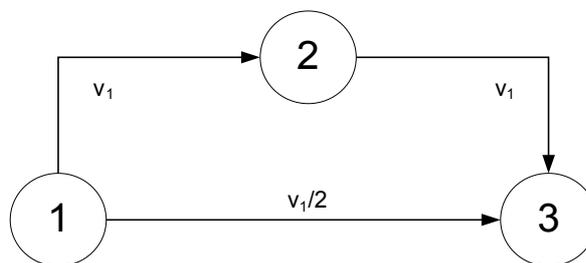
## Multimedia Systems

# Exercise No. 4

### Packet Switching

In a packet switching network, packets are buffered in each node they pass between their source and destination node, before they are transmitted to the next node (store-and-forward). A message (total length:  $L = n * k$ ) consists of  $n$  packets with a length of  $k$  bit. The transfer rate of the connection is  $v$  bit. There are  $z$  sections between source and destination node.

1. How long is the transmission time  $t$  for the complete message? (The transmission delay, the time needed to process the packets and the access delay can be ignored.)
2. Given is the following network topology, which allows two paths for a transmission from node 1 to node 3. The direct path has a transfer rate of  $v_2 = v_1/2$ . Another path exists over an intermediate node 2, whereas both sections have a transfer rate of  $v_1$ .



- a) Compare the time needed for a transmission of a message between nodes 1 and 3
    - i. over intermediate node ( $t_1$ )
    - ii. on the direct path ( $t_2$ )
  - b) What is more convenient for a given path: The transfer of a message in form of a few big packets, or in form of plenty small packets? (Suppose there is no overhead for packet headers and the entire message is available for sending.)
3. Each packet (length  $k$ ) has  $K$  bit usage data and  $O$  bits overhead for header and trailer. The smaller the packets are, the larger the ratio of the overhead will be.
    - a) What information is placed in headers, what information in trailers?
    - b) Calculate the optimal packet length to minimize the transmission time of the entire message considering the overhead  $O$ , the transfer rate  $v$  and the number of sections  $z$ .