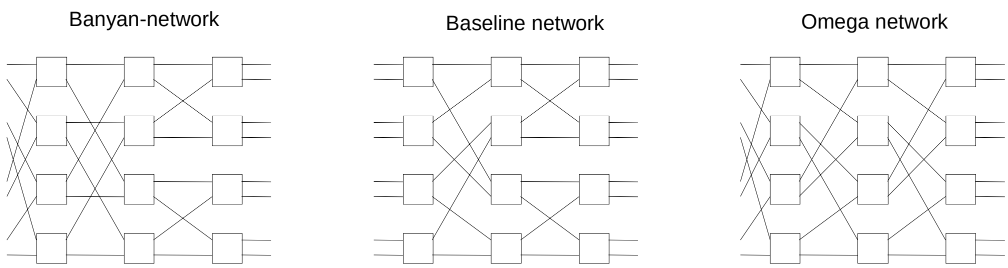
TEKNILLINEN KORKEAKOULU **Exercise 3**
Tietoverkkolaboratorio 26.2.2002
S-38.164 Laajakaistainen välitystekniikka, K-02 Virtamo/Penttinen

1. A shared memory ATM switch is built by using RAM memory chips. The memory access time is 1 μs. Assume that the memory is organized into 16 bit words and only the payload (48 bytes) is stored into the memory. What is the switch throughput? What is the maximum port speed, if the switch is 4×4 ATM-LAN-switch?

2. Consider a 16×16 knockout-switch. To reduce the number of buffers in the output ports, a 16:8 concentration is performed. What is the cell loss probability when each input line has load 0.7 and the destination addresses are evenly distributed over all output ports?

3. Convince yourself that the Banyan -, baseline - and omega networks (depicted in the picture below) have the self-routing property: A cell can determine the right destination port at the n^{th} stage by selecting the output port (0 or 1) by looking at the n^{th} binary digit of the destination port's address' binary representation (starting with the least significant bit). How do the Omega - and Banyan networks differ ?



4. Show that the omega network in internally non-blocking if the cells arrive to subsequent input ports sorted according to their output port addresses.

   Tip: If the input port addressses of two cells are a and a' and the output ports are b and b´, respectively, then it follows that b´-b $\geq$ a´-a. Show that the opposite claim, the two paths have a common link, is in conflict with this inequality. Try to use the information on how the number of the link on the path is obtained from the input port and the output port addresses, i.e. the link number consists of the switching element's number from which the link is leading out among the current stage switching elements, and appended to this is the output port number from the current switching element.