

8/04/2019

CSC 310

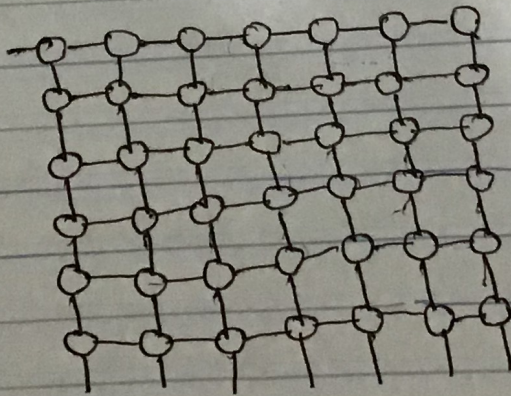
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18/SCI 01/019

Computer Science

1. What is a crossbar network?

Crossbar networks allow any processor in the system to connect to any other processor or memory unit so that many processors can communicate simultaneously without contention. A new connection can be established at any time as long as the requested input and output ports are free. Crossbar networks are used in the design of high-performance small-scale multiprocessors, in the design of large scale interconnect networks. A crossbar can be defined as a switching network with N inputs and M outputs, which allows a minimum of $\binom{N, M}$ one-to-one interconnections without contention. The figure below shows an $N \times M$ crossbar network.



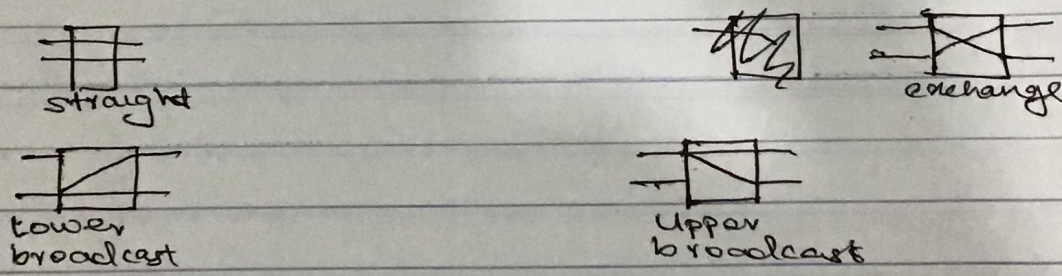
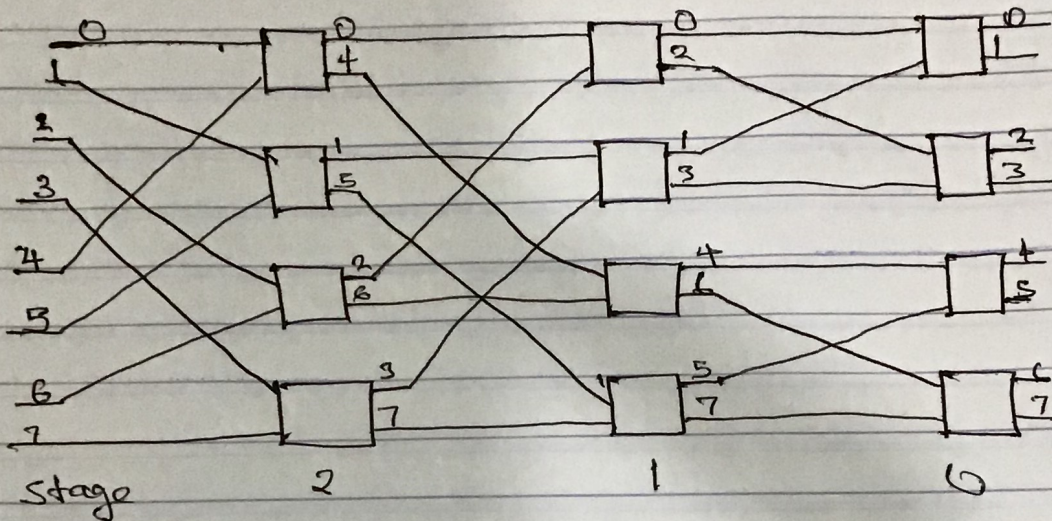
2. What is a cube interconnection network?

A cube interconnection network is a multistaged cube-type network topology that was introduced as a standard for comparing network topologies. Assume

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The network has N inputs and N outputs in the figure below $N = 8$. The generalized cube topology has $m = \log_2 N$ stages, where each stage consists of a set of N lines connected to $N/2$ interchange boxes. Each interchange ~~network~~ ^{box is} a two-input, two-output device.



3 A fat tree network is a universal network for provably efficient communication. In a tree data structure, every branch has the same thickness, regardless of how place in hierarchy—they are all skinny (skinny in the context means low bandwidth). In a fat tree, branches nearer the top of the hierarchy are "fatter" (thicker) than branches further down the hierarchy. In a telecommunications network, the branches are data lines; the varied thickness (bandwidth) of the mesh and hypercube topologies have communication requirements data lines allows for more efficient and technology specific use