

On Permuting Capability of A Binary Hypercube and Its Prospects as A Noc In The Architecture Of Peta- Scale Supercomputers

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Abstract

In this paper necessary and sufficient conditions of blocking occurrence in a synchronous binary hypercube under order-dimension routing, which is also known as e-cube routing, are expressed mathematically with the use of congruence notion from number theory. If a permutation does not cause blockings it is said to be admissible under chosen routing algorithm. Examples of applying the approach for checking some regular permutations admissibility to a hypercube under e-cube routing are given. A heuristic approach for blocking avoidance, when routing those regular permutations which are not admissible to a hypercube under classical e-cube routing, is proposed. A method for increasing the fraction of admissible permutations with asynchronous mode of packet switching in a low-dimensional hypercube is given. The results of analysis of a hypercube permuting capability carried out with using our methods is an added reason for choosing hypercube as a NoC (network-on-chip) topology in future supercomputers.

Keywords: Binary hypercube, Order-dimension routing, Congruence, permuting capability, NoC Topolog.