Wormhole Routing for Hierarchical Interconnection Networks

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January 10, 2002

Abstract

Three dimensional(3D) computers has been proposed. Hierarchical interconnection network TESH(Tori connected mESHes) and H3D torus(Hierarchical 3-D torus) has been proposed for interconnection network of large scale 3D multicomputer.

It have been showed that TESH and H3D torus are superior for network diameter and they are suitable for 3-D VLSI implementation by some works. However, dynamic network performance by sending packets in the network have not been evaluated. When many packets run in the wormhole routed interconnection network, deadlocks occur in the network. To avoid deadlocks, some virtual channels are added. Thus, to calculate the number of virtual channels and to propose routing algorithms are necessary. To propose adaptive routing algorithms and data mapping method are effective to improve network throughput. In this thesis, some fixed and adaptive routing algorithms are proposedand dynamic network performance are evaluated.

First, *in-a-line* allocation for link allocation method of TESH network and a routing algorithm for TESH are proposed , and the number of necessary virtual channels is calculated. As the result, it is shown that the number of necessary virtual channels is 2 or 4. Then the network performance of fixed routing for TESH network are evaluated by simulation. It is showen that 3 level TESH network show higher performance than other networks. Second, some adaptive routing algorithms are proposed to improve network performance. Then the network performance are evaluated. It is shown that adaptive routing algorithms for TESH network have higher performance than fixed routing. Third, new mapping policy of FFT for TESH network are proposed and the execution time are evaluated. By the simulation, it is showen that execution time of FFT in TESH is less than mesh. It is also showen that new mapping policy for TESH can reduce execution time. Finally, a routing algorithm for H3D torus network are proposed and the number of necessary virtual channels iscalculated. As the result, it is shown that the number of necessary virtual channels is 2. The dynamic network performance of H3D torus which have 4096 PEs are evaluated by simulation. It is showen that the routing algorithm for H3D has a few lower latency and higher throughput than TESH.

Key Words: **Hierarchical interconnection network, TESH, H3D torus, Wormhole routing**