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An Efficient Deterministic Edge Traffic Distribution Network-on-chip Routing Algorithm Design

1. Introduction

In previous decades, computer systems have advanced from relatively simple single-core CISC and RISC architectures to much more complex multi-core system-on-chip designs with higher communication requirements. Network-on-chip (NOC) architectures emerged as promising solutions. To address the deficiencies of the existing routing algorithms, a new deterministic Edge Traffic Distribution (ETD) routing is proposed.

2. The Proposed ETD Routing

The traffic which involves the edge routers will be directed to move along the edges first instead of entering into the center of the network. Four possible traffic patterns must be taken into consideration: 1. Edge router to edge router; 2. Edge router to internal router; 3. Internal router to edge router; 4. Internal router to internal router. The primary goal is to distribute the traffic from center to the outer edges of the network in order to alleviate the problems of centric congestion and deadlocks.

3. Simulation and Results

The proposed ETD Routing, along with the most popular routing algorithms, XY, OE and DyAD routings are implemented and simulated on a 2D 6X6 mesh topology in Nirgam 2.1 network-on-chip simulator. Compared to the existing XY, OE and DyAD routings, at low network loads, the proposed ETD routing consumes 5.46%, 32.40%, and 4.96% less power while reducing latency by 2.27%, 29.75% and 2.69% respectively. At medium loads, power savings are 3.10%, 13.28%, and 11.79% while reducing latency by 1.86%, 106.49%, and 67.94%, respectively. At high network loads power consumption is reduced by 3.62%, 12.62%, and 11.01% and latency is reduced by 4.81%, 156.73%, and 154.74%, respectively.

4. Conclusion

The proposed ETD routing focuses on the problems current NOC architectures are facing. Simulation results show the proposed algorithm performs better in power consumption and communication latency compared to the existing routings. An IEEE journal paper is prepared based on the simulation results.