Learning-based DyAD Routing for Network-on-Chip

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**ABSTRACT**

In this paper, we propose an improved DyAD routing scheme based on machine learning. DyAD routing scheme combines the advantages of deterministic routing algorithms and adaptive routing ones effectively because of switching between them intelligently according to congestion conditions of communication channels. But, when should we switch, what congestion condition should we use deterministic routing and what congestion condition should we use adaptive one DyAD routing scheme do not make it clear. The detail mentioned above is what we will discuss in this paper.

**Keywords**

Network-on-Chip, machine learning, router algorithms, System-on-Chip

1. **INTRODUCTION**

In the last few decades, Moore Law dominates the performance of System-on-Chip. Manufacturers in the world make their best effort to improve the frequency of Central Processing Unit. But the frequency of one single core can not be improved when it hit the ceil of contemporary physical conditions. Therefore, the road has been converted from single core to multi core so as to achieve better performance.

Multi core brings up the requirement of communication on chip. Traditionally, design-specific global wiring is an acceptable approach. However, the complexity of expandability is a huge disadvantage. we invent Internet and various protocols to connect computers all over the world. Network-on-Chip is a new technique in communication of multi-core System-on-Chip referring to computer network.

Routers can be generally classified into deterministic and adaptive[1]. In deterministic routing the path from source to destination is fixed. In adaptive routing message are divided into several packets and every packet choose next road when arriving a router node according to router algorithms. Thus, the performance of NoC plays a critical role in the System-on-Chip.

Deterministic routing is simple and behaves better when the channel is free, but when the channel is busy, deterministic routing is unacceptable. Adaptive routing has better performance when channel is busy comparing to deterministic routing but it is more complex and spends more time to transfer packet when channel is free. DyAD routing combines the advantages of deterministic routing and adaptive one. It switches the routing scheme dynamically according to congestion conditions.

Learning-based DyAD routing is an improved routing scheme presenting the details for timing to switch between deterministic and adaptive. A machine leaning training model is established after watching the congestion conditions in the NoCs and guide DyAD router to switch from one to another back and forth to improve the performance(latency and throughput) of NoCs.

1. **METHOD**

To be continued.

1. **RESULT**

To be continued.

1. **DISCUSSION**

To be continued.

1. **CONCLUSION AND FUTURE WORK**

To be continued.

**References**

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