

Abstract 8 – Paper ID: 120**An Improved Modified Mesh-Based Topology For NoC**

Abhijit Biswas¹, Sourish Dhar¹, Yagnyasenee Sen Gupta², Arnab Paul¹

¹Computer Science and Engineering, Assam University, Silchar, India

²Faculty of Science and Technology, ICAI University, Agartala, India

Email: abhi.021983@gmail.com

Abstract

Over the years, many 2D topologies have been proposed by the researchers, such as MIN FAT Tree, Cubes, mesh, torus etc. Among those Mesh and Torus are used most prominently in commercial deployments. This is due to the simple design, regular grid of routers and links and straightforward physical implementation in VLSI. In a typical 2-D mesh each router connects to up to four neighbours and to a local processing element, producing a tiled “city-grid” layout that maps well to floor planning and clock-tree design. This regularity simplifies router design, supports systematic scaling to large core counts, and enables many well-studied routing and mapping methods.

However, Mesh topology suffers from large network diameter and have tight edge bandwidth. This problem was tackled by torus topology by adding wrap around links from every edge node vertically and horizontally. The tori successfully decreased the network diameter and reduced the end-to-end delays of the packet travelling from corner node to corner node of a mesh topology, however, the long extra wrap around links introduced long wire delays. Over the years, many attempts were made to reduce the diameter of a mesh topology by introducing extra links, but, either, they have used too many short links or very long links which increased the total wire length of the resulting topology.

Here, we propose an improved modified $N \times N$ mesh topology ($N \geq 4$) with four extra links, with an aim of restricting the hop count strictly to $N - 1$, which in regular mesh goes up to $N - (N - 1)$. The proposed topology is simulated using Dijkstra’s algorithm based shortest path Routing algorithm and result shows the maximum hop count of $N - 1$. An approximate reduction of around 73% in the total wire length is achieved by our proposed topology, as compared to torus. The proposed topology incurred an average latency of 20×10^{-6} Seconds for a 5×5 network size.

Keywords: Network-on-Chip, System-on-Chip, Latency, Hop count, Topology