Multicore Processor For Next Generation Computer

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Overview

Aim and Objective
The aim of this project is to evaluate the performance of multicore processor system with different network topologies for a specific ultrasound medical imaging algorithm and to design an ASIP, using an FPGA for the same application.

Multicore Processor Network Topology
Three well-known multicore multicore processor network topologies are chosen for study the performance targeting the application.

(a) Fat tree
(b) 4x4 Mesh
(c) 16x16 Torus

Implementation

Target application: Ultrasound Speckle Tracking Algorithm
Ultrasound speckle tracking is usually applied along with the medical image system to examine the human body. After capturing two images, the tissue motion parameter is revealed. The parameter can be used for deeper diagnosis.

Task Communication Graph
TCG model list shows the communication between tasks and execution sequence.

FPGA Design Structure Diagram
Multiple basic units are implemented to provide better parallelism.

Simulation Result

Average Execution Time Per Iteration
The execution time per iteration shows how long the application is executed under the specified multi-core topology.

Ideal case: Higher number of cores => Lower average execution time

Network Throughput
Throughput is measured by the number of bits transmitted per cycle.

Ideal case: Higher number of cores => Higher throughput