A Linear Daisy Chain with Two Divisible Load Sources

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Abstract —

A finite linear daisy chain with divisible load originating from the two boundary stations is considered. Such multiple source models have received a limited amount of attention in the literature. Using a hard boundary between the sources, solution time as a function of the boundary position is found.

I. Introduction

Divisible computational loads have received a good deal of attention [2,3] since research on the topic began in 1988 [1]. However most of the literature assumes that load originates from a single node in a network. To accurately represent grids or supercomputer fabrics such as that used in the IBM Bluegene machine, it is necessary to model load originating from multiple sources. In this short paper a well structured problem consisting of a linear daisy chain of N nodes with load originating from each of the two stations at either end of the chain is considered.

II. Main Result

We consider N nodes in a linear daisy chain with divisible load originating at either end of the chain. For each instance of the problem a boundary node m is established such that load from the left source is processed by nodes 1,2...m and load from the right source is processed by nodes m+1,m+2...N. In effect there are two single source problems (with load originating at a boundary) with the overall solution time given by the maximum of the two single source solution times. The store and forward scheduling strategy of [1] is used for each single source problem.

The figure is a plot of overall network solution time versus the boundary location in a 19 node network for various values of inverse (homogeneous) link speed, z. Each source node supplies an equal amount of load here so that the solution time optimal boundary is at m=10. Note that since the single source solution time versus the number of processors curve is monotonically decreasing, for equal load amounts at each source the overall (dual source) solution time curve is equal to the single source solution time curve for the smaller number of processors.

III. Conclusion

An open and challenging problem is optimal load allocation from multiple sources in more general topologies.

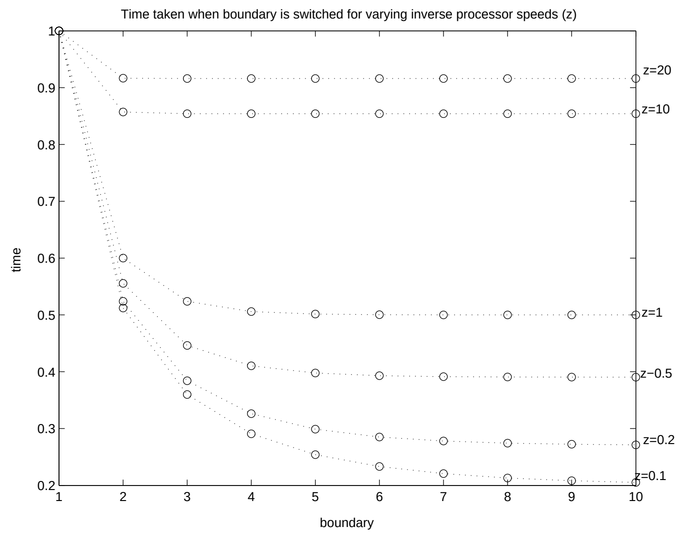

Figure 1: Single level tree network.

References

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[2] V. Bharadwaj, D, Ghose and T.G. Robertazzi, "Divisible Load Theory: A New Paradigm for Load Scheduling in Distributed Systems," *Cluster Computing*, vol. 6, no. 1, pp. 7–18, 2003.

[3] T.G. Robertazzi, "Ten Reasons to Use Divisible Load Theory," *Computer*, vol. 36, no. 5, pp. 63–68, 2003.

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