



EINLADUNG

zum

ZIH-Kolloquium

Titel: Multistage Switches are not Crossbars: Effects of Static Routing in High-Performance Networks

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Kurzfassung:

Many large-scale networks have to support different dense or sparse communication patterns in order to achieve high scalability. Particular examples of such patterns are nearest neighbor communication, many-to-many, one-to-many and many-to one. Collective operations map those abstract definitions to network-specific implementations such as multicast. While sparse communication patterns are often easy to map to current network architectures such as fat-trees, dense collective operations like all-to-all are likely to cause congestion and head-of-line blocking in most network designs. The performance of the most general endpoint-congestion free communication patterns can be modelled with a metric that we call effective bisection bandwidth. We analyze the influence of static routing on the effective bisection bandwidth and different communication patterns for fat trees. Furthermore, we discuss possible approaches to reduce head-of-line blocking with adaptive routing strategies. Another approach to mitigate communication costs results from more intelligent network interfaces. In this approach, we analyze the applicability of a new programming paradigm that encourages overlapping of computation and communication at the application level. We discuss tradeoffs for asynchronous message progression and different paths to solve this problem. We show practical benchmarks and simulations with large-scale InfiniBand networks using the Message Passing Interface (MPI) middleware for collective and point-to-point network operations. MPI is the most commonly-used programming interface in High-Performance Computing.

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gez. Prof. Dr. Wolfgang E. Nagel