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**Parallel Sweeping Algorithms in SN Transport**

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A potential bottleneck when solving Boltzmann transport equations in parallel is the inversion of the streaming operator. The discretized form of this operator is a lower triangular matrix or block lower triangular matrix with small blocks. The solution of these triangular systems by direct methods is inherently sequential. Although various overloading techniques have been used to amortize the costs of these lower triangular solves or “sweeps”, the practicality of scaling to massively parallel machines with tens of thousands of processors is unclear.

In this talk, we will present new theoretical scaling models for sweeping algorithms and compare with experiment. In theory, these algorithms have the potential to scale like  $O(dP^{1/d} + M)$ , where  $d$  is the spatial dimension of the problem,  $M$  is the number of directions, and  $P$  is the number of processors. When  $M$  is fairly large, it masks the effect of the  $P$  term, whereby delaying the poor asymptotic scaling behavior. This delay may be adequate in some cases to get practical performance, even up to tens of thousands of processors. However, some popular parallel sweep algorithms may scale worse than this best-case theoretical model. This will also be discussed in the talk.