

# A Distributed Partial Order Reduction Algorithm

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A distributed version of the PV model checker [5] is being developed at the University of Utah [7]. Other distributed model checkers have also been implemented [1, 2, 6], however these have limited, or do not use partial order reduction.

The distributed version of PV uses a variant on the original Twophase partial order reduction algorithm [4] and a simple heuristic that may reduce the number of states saved in a distributed verification. The graph search has been changed to make the distributed version of PV perform a breadth first based search.

The distributed Twophase algorithm uses an alternation between a reduction step and a classical breadth first search step. The reduction step executes every commuting [3, 4] enabled transition of each process in the model as in the sequential version. The resultant search frontier consists of non-commuting states.

Distributed breadth first search requires sending and receiving of states. The owner of a state is determined when a new state has been returned by Phase-1. States received from other processes are enqueued as though they were generated by the classical breadth first search. States are passed as messages along with information to reconstruct an error trail. A process is assigned a section of the search space using a uniform hash function. Communication only takes place after Phase-1.

The distributed version of PV uses a variant on the “Twophase” algorithm that may reduce the amount of unnecessary communication in a distributed verification.

## References

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