A Partial Order Reduction Algorithm
without the Proviso

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Abstract

This paper presents a partial order reduction algorithm, called Two phase, that preserves stutter free
LTL properties. Two phase dramatically reduces the number of states visited compared to previous
partial order reduction algorithms on most practical protocols. The reason can be traced to a step
of the previous algorithms, called the *proviso* step, that specifies a condition on how a state that
closes a loop is expanded. Two phase avoids this step, and uses a new execution approach to obtain
the reductions. Two phase can be easily combined with an on-the-fly model-checking algorithm
to reduce the memory requirements further. Furthermore a simple but powerful selective-caching
scheme can also be added to Two phase. Two phase has been implemented in a model-checker
called PV (Protocol Verifier) and is in routine use on large problems.

Keywords: Partial order reductions, explicit enumeration, temporal logic, on-the-fly model-checking,
concurrent protocol verification