Global program state monitoring in execution control of distributed applications - PEGASUS DA framework

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***Abstract*—** There are many distributed applications in which execution control of a distributed algorithm requires precise knowledge if in an examined global relation concerning states of a distributed algorithm components the states occurred in precisely the same time. Global application states for which such property holds are called Strongly Consistent Global States (SCGSs). Detection of such states is valuable in the control of many types of distributed applications such as for example dynamic program run-time optimization, parallel event-driven simulation, industrial process control, scientific distributed computing based on divide and conquer or branch and bound methods. Existing commercial distributed systems have no support for automated monitoring of application strongly consistent global states which makes the paradigm of program control based on such global application states troublesome for programmers.

The lecture will present a first runnable distributed program design and execution framework in which system support for automated handling of application global states has been included. Its name is PEGASUS DA from **P**rogram **E**xecution **G**overned by **A**synchronous **SU**pervision of **S**tates in **D**istributed **A**pplications. The framework provides a programmer with a graphical and textual interface which enables defining the global applications states to be monitored based on distributed local state components, sending reports on local states to global state detectors, automatic detection of required SCGs, evaluation of control predicates on SCGs and sending control signals to program components to stimulate necessary reactions. A user-defined global state-based program control flow graph filled with C++ code is generated which is next compiled into a distributed application modular program.

***Keywords*— distributed programs control paradigms, distributed application global state monitoring, distributed application design based on global states monitoring.**