Universität Stuttgart

INSTITUT FÜR
KOMMUNIKATIONSNETZE
UND RECHNERSYSTEME
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Master thesis No. 958

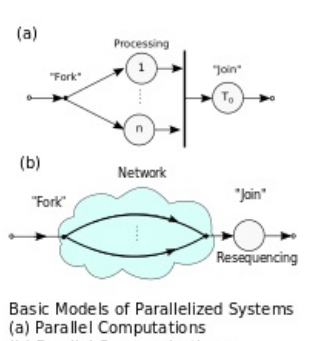
Performance Analysis of Job-Splitting in Parallelized Systems

Methods
Performance Evaluation
Simulation

Topics
Parallel Computions
Parallel Communications

Background

Computation processes with parallel execution paths can be greatly enhanced by parallel processing as, e.g. in "Big Data" processing (MapReduce, Hadoop), executed on massively parallel computers or on multi-core processors. The operating system splits up the execution path ("Fork"), but the continuation after parallel processing requires a resynchronization ("Join") which causes either server blockings or subprocess resequencing (Model a). Parallel communications in the Internet allows a performance increase by reducing repeated transmissions in case of packet errors or packet losses (Model b).



Basic Models of Parallelized Systems
(a) Parallel Computations
(b) Parallel Communications

Problem Definition

The performance analysis of parallelized systems is difficult and is approached mostly by the method of "Network Calculus". In this project an alternative method will be applied based on successive task graph reduction techniques and queueing theory. The thesis project is part of a joint cooperation of IRK with the DFG Collaborative Research Center "MAKI" at TU Darmstadt by which both methods will be applied by Queueing Theory and Network Calculus methods, respectively. The queueing method is based on stochastic task graph reductions. Both methods will be validated by computer simulations.

Aquired Knowledge and Capabilities

The student will become familiar with a highley actual problem in computing and communications requirements and advanced methods of performance analysis and simulation techniques. Basic knowledge on probabilities and stochastic processes and Java programming are helpful, and will be enforced during project work.

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