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ANALYSIS OF A SERVER FACILITY WITH PERIODIC CHECKPOINT

François BACCELLI

Equipe de Recherche Associée au CNRS : n° 452 AL KHOWARIZMI

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UNIVERSITE DE PARIS-SUD
Centre d'Orsay
LABORATOIRE DE RECHERCHE EN INFORMATIQUE
Bât. 490
91405 ORSAY (FRANCE)

Résumé

On établit dans ce papier un modèle mathématique précis de la méthode des points de reprise dans les systèmes informatiques. La résolution de ce modèle se fonde sur les méthodes analytiques usuelles dans les problèmes de files d'attente et sur une caractérisation des processus aléatoires utiles. On obtient des formules exactes pour la disponibilité asymptotique du système et pour le temps moyen de traitement des taches. Des procédures numériques sont proposées pour optimiser un système de ce type pour ces deux critères.

Abstract

A mathematical model of systems operating with checkpointing and rollback/recovery methods is established. It's resolution is based on the analytical methods usual in queueing problems and on the caracterisation of some useful stochastic processes. Exact formulas are then derived for system's availability and average customer's system-time at steady state. Numerical procedures are proposed to optimize such a system for these two criteria.

INTRODUCTION

The model we analyze in this paper arises in the context of reliability and queueing theory. The main practical motivation for our work consists in being able to obtain efficient numerical procedures leading to the optimization of systems operating with checkpointing and rollback/recovery methods. There is an abundant litterature on this subject (ref. [1], [4] and [6] to [8]). Our main contribution consists in determining the policy which minimizes the average time spent by customers in the system, when general assumptions are made concerning this one. This optimization is based on the analysis of the sample paths of stochastic processes defined in queueing systems. In the first section, we describe the model to be analyzed. In the second one, we define useful stochastic processes and give ergodicity conditions. In section 3, the local properties of our processes are studied. In section 4, these different properties and conditions provide global results concerning our model. In section 5, these results are used to develop the numerical procedures mentioned above. We also compare our method with the results given by a simulation.