

SOME FLUID MODELS IN PERFORMANCE AND DEPENDABILITY ANALYSIS

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Many probabilistic models, designed for evaluating systems' performance or dependability, lead to complex and "large" mathematical objects that can only be analyzed using simulation. The bad side of this situation is the lack of qualitative insight that is often associated with analytical methods. Fluid limits and mean field theory, are possible approaches that can be tried in some cases (typically, when we deal with the so-called population models), allowing to transform the original stochastic process into a very "small" deterministic one.

We will discuss technical details of two on-going studies where we analyze performance aspects of communication networks and dependability properties of basic models of repairing services. Specifically, we explore the relations between the stochastic and the related deterministic models, in two cases: Bit-Torrent-like P2P networks with some variants in the way the network is structured, and the basic Machine Repairman Model. We will focus on the convergence of the stochastic model towards the deterministic one as the size of the former goes to infinity, and the relations between the stationary distributions of the stochastic models (when their sizes vary) and the fixed points of the deterministic related models.