

Simulator for Network Reliability Estimation

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Abstract

Network reliability is an important measure of the ability of a communication or computer network to provide continuous and dependable services under normal operating conditions and in the presence of component failures. Accurate estimation of network reliability is essential for designing robust networks, identifying critical components, improving fault tolerance, and minimizing service interruptions. This study presents a simulator for network reliability estimation that provides a systematic environment for modelling network structures, simulating component failures, and evaluating network performance. The proposed simulator can represent different network topologies and assign reliability parameters to nodes, links, and other network components. Failure events can be generated using predefined probability distributions or user-specified failure rates, allowing the behaviour of a network under different operating conditions to be examined. The simulator estimates reliability by analysing the connectivity and operational status of the network after repeated failure simulations. A Monte Carlo simulation approach can be incorporated to perform multiple independent trials and obtain reliable estimates of network availability and failure probability. The system can also help identify vulnerable components and compare the reliability of alternative network configurations. By providing a flexible and cost-effective simulation environment, the proposed approach reduces the need for extensive physical testing and enables researchers and network designers to study complex reliability scenarios efficiently. The simulator can therefore serve as a useful tool for network planning, performance evaluation, reliability analysis, and fault-tolerant system design.

Keywords: Network reliability, reliability estimation, network simulator, Monte Carlo simulation, fault tolerance, network topology, component failure, network availability, reliability analysis.