Reliability and Availability Analysis of a Triplex Sensor Node System with Shared Repair

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Abstract

Wireless sensor nodes are prone to failures due to severe resource constraints and usually harsh operational environments. Many wireless sensor network applications are mission-critical, requiring continuous operation. Thus, in order to meet application requirements reliably, it is imperative to design fault-tolerance into wireless sensor networks (WSNs). In this study, we deal with the reliability and availability analysis of a triplex repairable wireless sensor node system under a shared repair facility. The repair facility is turned on when a sensor node fails, providing repair under a first-fail-first-repair policy. We analyze system mean time to failure (MTTF) and steady-state availability (SSA) as a function of the component failure and repair rates. Our primary objective is to provide explicit expressions for these performance measures and highlight the significance of fault-tolerance into WSNs.

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