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Resilience Analysis on Lifetime based Node Failure for Peer-to-Peer Networks

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Abstract
In the last few years, P2P networks have rapidly evolved and emerged as a promising platform to deploy new applications and services in the Internet. This paper investigates the resilience of random graphs to lifetime-based node failure and derives the expected delay before a user is forcefully isolated from the graph and the probability that this occurs within his/her lifetime. Using these metrics, we show that systems with heavy-tailed lifetime distributions are more resilient than those with light-tailed (e.g., exponential) distributions and that for a given average degree, k-regular graphs exhibit the highest level of fault tolerance. We finish the paper by observing that many P2P networks are almost surely connected if they have no isolated nodes and derive a simple model for the probability that a P2P system partitions under churn.

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