Implementation of Distributed Randomized Algorithms for Resilient Peer-to-Peer Networks

Authors : Richard Tanaka, Ying Zhu

Abstract : This paper studies a few randomized algorithms in application-layer peer-to-peer networks. The significant gain in scalability and resilience that peer-to-peer networks provide has made them widely used and adopted in many real-world distributed systems and applications. The unique properties of peer-to-peer networks make them particularly suitable for randomized algorithms such as random walks and gossip algorithms. Instead of simulations of peer-to-peer networks, we leverage the Docker virtual container technology to develop implementations of the peer-to-peer networks and these distributed randomized algorithms running on top of them. We can thus analyze their behaviour and performance in realistic settings. We further consider the problem of identifying high-risk bottleneck links in the network with the objective of improving the resilience and reliability of peer-to-peer networks. We propose a randomized algorithm to solve this problem and evaluate its performance by simulations.

Keywords : distributed randomized algorithms, peer-to-peer networks, virtual container technology, resilient networks
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