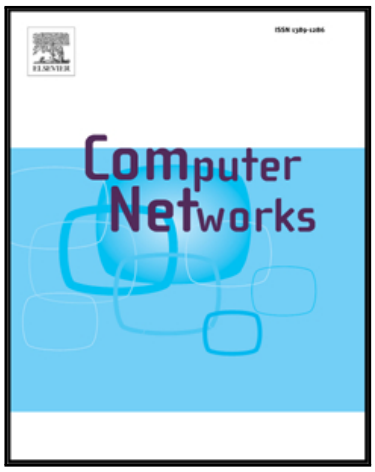

Survivability Analysis of a Two-Tier Infrastructure-Based Wireless Network

Lang Xie, Poul E Heegaard, Yuming Jiang

PII: S1389-1286(17)30122-6
DOI: 10.1016/j.comnet.2017.03.023
Reference: COMPNW 6138

To appear in: *Computer Networks*

Received date: 30 June 2016
Revised date: 31 December 2016
Accepted date: 29 March 2017

Please cite this article as: Lang Xie, Poul E Heegaard, Yuming Jiang, Survivability Analysis of a Two-Tier Infrastructure-Based Wireless Network, *Computer Networks* (2017), doi: 10.1016/j.comnet.2017.03.023

Survivability Analysis of a Two-Tier Infrastructure-Based Wireless Network

Lang Xie[1], Poul E Heegaard, Yuming Jiang

Department of Telematics, Norwegian University of Science and Technology (NTNU)

[a]NO-7491, Trondheim, Norway

Abstract

Network design and operation of a mobile network infrastructure, especially its base stations, need to consider survivability as a fundamental requirement. Quantifiable approaches to survivability analysis of such infrastructures are crucial. The objective of this paper is to propose a model for quantification of the survivability of a two-tier infrastructure-based wireless network subject to massive failures, caused by e.g. natural disasters, common mode hardware and software failures, and security attacks. We use a Markov modelling approach to analyze the transient behavior of the recovery phases of a two-tier infrastructure-based wireless network. In order to take location information of base stations into consideration, the spatial average network performance is estimated by means of a stochastic geometry based approach. In order to avoid state space explosion while addressing large networks, an approximate product-form analysis approach is also presented, where the two base stations tiers are decoupled such that their survivability analysis can be studied independently. The assumptions used in the proposed models, including Poisson point process and product-form decomposition, are validated on real data. Numerical experiments are also performed to investigate the approximation accuracy and computational efficiency of the product-form analysis approach, as well as to examine the effects of different parameters on the network's survivability. The results show that the approximate product-form approach has reasonably good

[1]Lang Xie is the corresponding author with email address langxie_77@163.com.