Decision-support system to maximize the robustness of computer network topologies

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Computer networks are supposed to meet predefined security levels. Both the definition and the measurement of such security levels are usually based on subjective methods [3]. Currently, there are no such methods based on objective parameters, which can be used to algorithmically calculate the reliability of computer networks. Reliability is often determined by the experience of IT engineers.
In this paper we propose a new method that is independent of subjective criteria. Administrators and architects can measure or improve the security level of their computer networks based on objective parameters. A decision support system has been developed by us to design computer networks not only to maximize reliability based on the current architecture, but also to satisfy financial constraints.
This paper describes the proposed methodology from the aspects of robustness. This method is based on the theory of P-graphs [1]. Former examinations show that the P-graph approach to process-network synthesis (PNS) originally conceived for conceptual design of chemical processes and supply-chain optimization provides appropriate tools for generating and analyzing structural alternatives for product supply problem. Computer network topologies are often represented by standard diagrams which do not support the robustness analysis. In order to examine the robustness of a network, a topology diagram – P-graph transformation was determined to generate the alternative structures and reliability values. Thereby, the topology given by the operator or architect can be modelled by P-graphs, and by performing optimization on this P-graph robustness can be measured [2]. The result will be reflected in the original topology, therefore we can make recommendations on the enhancement of the network's robustness. The algorithm in this paper is compared to an already published case study.

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