

Design and Modeling of a Dependable Network

Abstract

As networks become a part of our lives, we are becoming dependent on them, and thus we need them to be highly dependable.

Dependability is an important requirement in network's design and operation. This thesis introduces and investigates the topic of dependability modeling for networks. It concentrates on dependability attributes models, which should be set for the network. The results of dependability modeling and analysis, if properly considered, will directly improve the network performance, and guide the future design decisions. This fact requires that dependability modeling and analysis should form an integral part of the network design, operation, and development stages.

Since all required information for dependability modeling and planning has to be gathered, the conversion of network system information into dependability models can be set. This thesis shows how this can be done. A different modeling techniques are used to describe the models of the main dependability attributes, reliability, availability and maintainability, which should be done in order to achieve high dependability network (HDN).

Dependable network design and modeling is too demanding today since, however a general assumption has been conducted that the network being constructed is free of failures and will run as intended, but without dependability modeling it is just a hope.

The major goal of the thesis is to ensure the importance of network dependability modeling as an integral part of the network design, operation, and modifications and to provide hints for network system improvement by applying these introduced models to reach which is called nowadays the five nines, or 99,999% for reliability and availability of a network.

The three main attributes of dependability (reliability, availability, and maintainability) are modeled for the network to achieve the acceptable level of dependability.

The Sudan university network (SUST WAN) was taken as a case study in which the dependability main models were set and the network reliability and availability were measured together with the recommendations to increase the reliability and availability values for this network.

Since the PSTN forms an essential part in SUST network, methods to find the reliability and availability for the PSTN are described.

For any operational networks the three models (reliability, availability, and maintainability) are the more appropriate models for the network performance evaluation, and they provide useful guides for network's redesign and also to make the required modifications to the current network design to increase its dependability.