

Thesis Overview

Software Network Analyzer for Computer Network Performance Measurement Planning over Heterogeneous Services in Higher Educational Institutes

PhD Thesis

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Abstract

In 21st century, convergences of technologies and services in heterogeneous environment have contributed multi-traffic. This scenario will affect computer network on learning system in higher educational Institutes. Implementation of various services can produce different types of content and quality. Higher educational institutes should have a good computer network infrastructure to support usage of various services. The ability of computer network should consist of i) higher bandwidth; ii) proper network design; and iii) higher performance of communication devices/servers. Thus, presently there is no software to plan and help network administrator in determine ability of network services during introduce a new service. Current approach using by network administrators are planning computer network performance via prediction and measure ability of real network performance using hardware/software network analyzer. This approach can influence several problems such as prediction without software always inaccurate and most of the software/hardware network analyzer in real network is limited by network interfaces. Therefore, to encounter these problems, network administrators need software that can plan and measure additional network resources. Thus, this study presents a novel approach for measurement and planning network performance management in heterogeneous environment. The main objectives of this research is to i) identify which approach and problem occurs in Malaysia higher educational institutes; ii) create simulation model that able to plan and measure network performance for various services; iii) software network analyzer development based on simulation model design; and iv) conduct an evaluation of simulation model and software development with real network. These objectives can achieve as follows: i) conduct a survey; ii) select appropriate mathematical formula to create simulation model; iii) select appropriate modeling application for software development; and iv) conduct verification and validation technique for simulation modeling and evaluation of software network analyzer. The results from survey show that most of the network administrators are using hardware/software network analyzer to measure network performance during operational phase. The minimum size of bandwidth capacity has contributed higher network utilization usage. It can generate network congestion and network service failure in higher educational institutes. We create suitable models to evaluate the network performance using Little Law and Queuing theory that can represent similar to hardware/software network analyzer. In order to get accuracy results on the performance of simulation model, we measure (verify and validate) data from lab experiment and real network environment. Development of software network analyzer is based on simulation

model architecture. This software will undergo evaluation process using qualitative technique. As a result, this software prototyping can provide a good approximation of real functionality observed in the real network environment. In addition the software is capable of approximating the performance within a minimum error rate. This software network analyzer can significantly enhance to analyze and propose solution on computer network performance. Future work is to develop software network analyzer for planning, suggestion and analyzing computer network performance on wireless transmission (WLAN, WWAN and WiMax) and Ipv6 protocol. We investigate how preparation and planning phases can be applied to heterogeneous environment in order to better utilize network resources. Our software network analyzer prototyping development is based on Fluke Optiview Network Analyzer. Before we develop any software prototype, it should define the following criteria: i) establish prototype objectives; ii) define prototype functionality; iii) develop prototype; and iv) evaluate prototype. Software network analyzer prototype consists of two phases: analyzing computer network performance under optimum condition and without optimum condition. Software network analyzer prototype was developed to measure and predict network activities based on offline condition. We use qualitative technique to measure our software network analyzer prototype to identify this software is able to plan, propose and analyze computer network performance. Evaluation of software network analyzer prototype is based on focus groups in University of Kuala Lumpur (UniKL). Six evaluators are experienced in education and industrial sector will select to complete the survey and interview task. Three evaluators will select who are experienced in industrial sector only, while, another three evaluators experienced in academic and industrial sector. All evaluators have experienced more than 6 to 13 years in network management field. All evaluators need to complete the following task such as: acceptance test, performance test, loading test, network responsive test and repetition test. A common strategy is to design, test, evaluate and then modify the design based on analysis of the prototype.