سامية محمد مصطفى

شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم

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شبكة المعلومات الجامعية

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التوثيق الالكتروني والميكروفيلم

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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

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شبكة المعلومات الجامعية

بعض الوثائق الأصلية تالفة

سامية محمد مصطفى

بالرسالة صفحات لم ترد بالأصل

Menoufiya University

Faculty of Electronic Engineering

Dept. of Computer Sciences & Engineering

DESIGN AND PERFORMANCE EVALUATION OF OPTICAL COMPUTER NETWORKS

Thesis submitted in accordance with requirements of the University of Menoufiya for the degree of M.Sc. in

(Computer Sciences and Engineering)

By

Eng. Emad EL-Deen Hassan Atia Masameer

Demonstrator at Mathematics Department,

Faculty of Science, Al-Azhar University

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2002

بسم الله الرحمن الرحيم

"قالوا سبحانك لا علم لنا إلا ما علمتنا

إنك أنت العليم الحكيم"

صدق الله العظيم

سورة البقرة–آية ٣٢

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ABSTRACT

Existing networks are becoming increasingly congested as a growing number of users seek access to the vast amount of information available on the Internet. At the same time, emerging multimedia applications, such as video conferencing, interactive television, and video-on-demand are expected to further test the limits of current network infrastructures. There is an immediate need for the development of new, evolutionary high-capacity networks, which are capable of supporting these growing bandwidth requirements. Wavelength-division multiplexing (WDM) is a promising solution for satisfying this bandwidth bottleneck. As WDM deployment becomes widespread, new network architectures and protocols, which take advantage of WDM's capabilities, will need to be developed. This dissertation investigates network architectures and protocols for WDM network, with the goals of measuring the performance of existing approaches and developing new architectures and protocols, which provide improved performance.

This work provides an in-depth case study of a single-hop protocol used in WDM local lightwave network that has been built, viz., the IBM Rainbow network. Specifically, the study focused on a quantitative analysis of the performance characteristics of Rainbow's in-band polling protocol.

The Rainbow system is difficult to be analyzed directly, because each station can be in any large number of states. The size of the state space therefore growth exponentially with the number of stations in the system. A framework for analyzing the Rainbow protocol was provided using the equilibrium point analysis (EPA) technique. By assuming that the system remains at its equilibrium point, we can reduce the complexity of the

problem and obtain analytical results for an otherwise intractable system. Our analysis investigates the effect of system parameters, such as message arrival rate and timeout duration, on the performance of the system.

The EPA technique was found to provide good results when the arrival rates are high, but it was not very accurate for lower arrival rates. This is because the model doesn't properly capture the deadlock phenomenon for low arrival rates. It was also found that, for a given set of system parameters, there exists an optimal timeout duration which will maximize the throughput of the system.

The Rainbow protocol was modified such that if a source node, upon tuning its receiver to the destination node's channel, finds that the destination node is requesting a connection with the source node, and then, instead of sending a request, it sends an acknowledgement to the destination node's request. It was found that for a same given set of system parameters, this modification will improve the throughput of the system.

In general, this optimal timeout duration seems to be independent of the message length and the number of stations, but depends on the arrival rate of messages.