SATELLITE DATA COMMUNICATIONS (TCP/IP OVER SATELLITE): PERFORMANCE ISSUES

Projek Ilmiah is presented in partial fulfillment for the award of the
Bachelor of Electrical Engineering (Honours)
UNIVERSITI TEKNOLOGI MARA

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ACKNOWLEDGEMENT

All praises to the Mighty Allah, the Merciful and the Beneficent for the strength and blessing in the completion of the thesis.

Thanks to my family and my friends: your support over the past year is greatly appreciated. Also thanks to Dr. Mohd. Dani Baba for his invaluable guidance, ideas, comments, encouragement, and for introducing me to the wide world of networking. May Allah be upon all of you.

ABSTRACT

This paper focuses on understanding the principles of Satellite Data Communication, study the concepts and the implementation of Transmission Control Protocol/Internet Protocol (TCP/IP) Protocol Suite over satellite links. The performance over satellite links especially the throughput is investigated by simulation using the commercial communication software design tool.

The main objective of the study is to evaluate the throughput performance of TCP/IP over satellite links. The throughput of TCP/IP over satellite have been investigated in four conditions:

1. Without congestion control and in error free condition.
2. Without congestion control and in error condition.
3. With congestion control and in error free condition.
4. With congestion control and in error condition.

From the investigation, the first condition proved that in error free and without employing the congestion control algorithms, 5 data connections can fully utilize the available bandwidth. However, when congestion control algorithm was employed, only 2 data connections are needed to improve to the same bandwidth utilization. The present of errors for both situations with and without congestion control algorithms reduce the number of multiple data connection used.

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CHAPTER 1

SATELLITE DATA COMMUNICATION

1.1 Satellite Data Communication – An Overview

A communication satellite functions as an overhead wireless repeater station that provides a microwave communication link between two geographically remote sites. Due to its high altitude, satellite transmission can cover a wide area over the surface of the earth. Each satellite is equipped with various "transponders" consisting of a transceiver and an antenna tuned to a certain part of the allocated spectrum. The incoming signal is amplified and then rebroadcast on a different frequency. Most satellites simply broadcast whatever they receive, and are often referred to as "bent pipes". These were traditionally used to support application such as TV broadcasts and voice telephony. In recent times, the use of satellites in packet data transmission has been on the rise. They are typically used in WAN networks where they provide backbone links to geographically dispensed LAN's and MAN's [1].

Satellite communication channels are characterized by wide area coverage of the earth's surface, long transmission delays, broadcast transmission, large channels bandwidth and transmission costs independent of distance.

Satellite links can operate in different frequency bands and use separate carrier frequencies for the up-link and downlink. Table 1.1 shows the most common frequency bands. The use of C bands was most common in first generation Satellite systems. However this band is already crowded as terrestrial microwave links also use these frequencies. The current trend is towards the higher frequencies of Ku and Ka bands. Attenuation due to rain is a major problem in both these bands. Also due to the higher frequencies, microwave equipment is still very expensive, especially in the Ka band.