International Journal Of Computer Science And Applications Vol. 1, No. 3, December 2008
ISSN 0974-1003

Intelligent Agent For Improving The Performance Of TCP/IP

B.Sasikumar
Research scholar, Anna university Chennai-600025, 9884939294
thilsasi@yahoo.com

Dr.V.Vasudevan
Professor and Head, Department of Information Technology, Arulmigu Kalasalingam College Of Engineering Krishnankoil

ABSTRACT

In the modern days the satellite communication system is playing an important role in sending and receiving data. The low channel utilization and reduced throughput for TCP traffic are caused due to the higher bit error rate and bandwidth delay product.

This paper present some result to the land mobile satellite channel using the digital model presented by Lutz and Cygan. Here we can analyses the random bit errors under the assumption of Rayleigh or Rieian signal statistics. The model parameters include environment type, velocity, bit rate and signal to noise ratio. The results of the TCP behavior under selected parameters are given. The test result indicates that fading losses contribute to degradation of the performance for TCP.

1 INTRODUCTION

Here we discus about the various parameters

Latency:

There are various definitions for latency. They are

1. The time it takes for a packet to cross a network connection, from sender to receiver.

2. The period of time that a frame is held by a network device before it is forwarded. Two of the most important parameters of a communication channel are its latency, which should be low, and its bandwidth, which should be high. Latency is particularly important for a synchronous protocol where each packet must be acknowledged before the next can be transmitted. The satellite communication paths have very high latency

Bit error ratio

The number of erroneous bits divided by the total number of bits transmitted, received, or processed over some stipulated period. Low channel utilization is due to high average bit error rates. In the mobile wireless channel the bit error rates are in the range of 10^{-2} to 0^{-6} where as in satellite line it will be in the range of 10^{-5} to 10^{-8}. Apart from this due to shadowing the average bit error rate may be increase.

Asymmetry:

System constrained by low uplink data rates must allocate limited network resources effectively and with fairness to all the users. TCP acknowledgement schemes are often more bandwidth-intensive than alternatives, especially on noisy, high-BDP links.

2 WIRELESS NETWORKING TESTED

The wireless networking testbed as a platform to support the testing and evaluation of network protocol in various conditions are established by Lincoln laboratory.

This network includes four computer configured as a client, a server and three routers are shown in figure 1.

The software channel simulator, delay memory and error generation features are equipped in the routers/gateways. Assymetric links can be tested by different delays and rate limits for each routers/gateways. The server provided by the software HTTP and FTP transfer services to the client system. The latency is emulated by delaying the transmission of each packet by the required amount.

3 FADING CHANNEL MODEL

For the land Mobil satellite channel, we characterized the received signals into coherent and incoherent, including direct signals, ground reflection and other multipart.

State transforms are determined probabilistically based on the average duration of each shadowing period. The expected bit error rate in each state is then calculated for a given set of channel conditions.

SNR, the data rate and velocity of the mobile satellite are the some factors which influence the bit error rates. The two-state markov model provides a good approximation of time-varying channel behavior at 64kbps and 128 kbps.

The list of parameters is shown in table1 along with values for scenario 6 which is subsequencntly used for performance testing.

Satellite Elevation	Environment	Antenna
22^0	Highway	D4

A	10 log c	μ	σ
0.031	16.642dB	-7.09	5.49dB

D_g	D_b	ε_g	ε_b
523m	14m	$1.07.10^{-4}$	0.193

Table 1.Channel parameter of test scenario 6

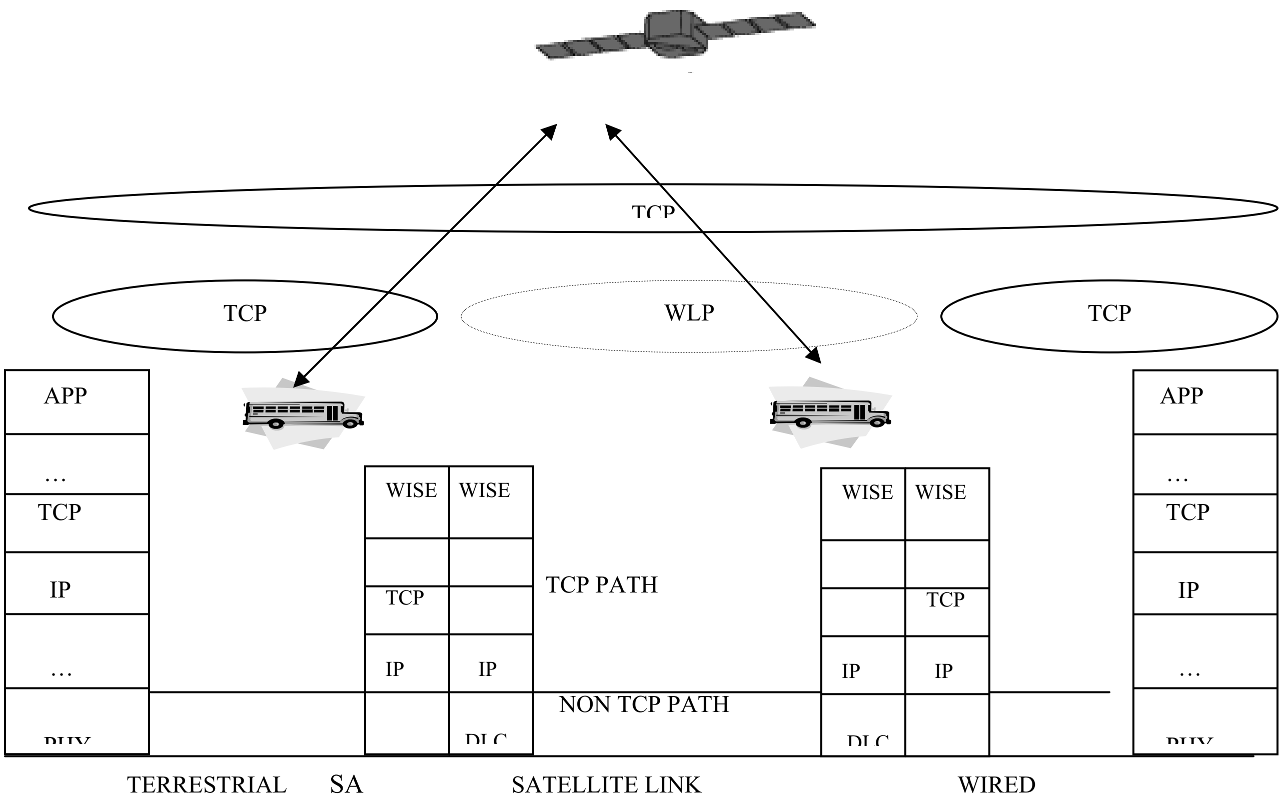

Figure 1.Wireless Networking Testbed: Architecture and protocol Stack

Where A is the time–share of shadowing, c is the direct- to- multipath signal power ratio, which describe the fading behavior during non-shadowing periods,

μ - shadowing effects, σ^2 variance of the power level, Dg reflect the mean duration in meter of good channel state, D_b reflect the mean duration in meter of bad channel state

ε_g is the bit error rate in the good state for DPSK modulation with SNR 10 db, ε_b is the bit error rate in the good state for DPSK modulation with SNR 10 db

The data rate and velocity are supplied as testbed input parameters, while D_g and D_b are obtained from the Lutz model

4 PERFORMANCE RESULTS

The performance of the landline channel is evaluated under a variety of channel conditions. An initial comparison with the random noise channel provides a baseline for further study of fading effects. Performance of TCP and SACK is examined as channel condition including round trip time and signal to noise ratio vary over a selected range.

An average bit error rate of 10^{-5} is used for the AWGN channel. For the fading channel a value of 13 for the Markov model SNR parameter result in an average bit error rate in the Rician state of approximately 10^{-5} .As a result TCP performance degradation in the fading channel can be attributed primarily to the error bursts that occur while in the Rayleigh state.20 iterations of a 1MB HTTP transfer are measured for each of the eight test cases.

TCP performance in the AWGN and fading channels is further analysis and given in the table 2.

Protocol	**Transfer Time(seconds)**		
	AWGN	**Fading**	**Increase**
TCP	**μ=306.65**	**μ=518.11**	**Δ=211.40**
	σ=22.89	**σ=55.32**	**(68%)**
SACK	**μ=195.67**	**μ=254.13**	**Δ=58.45**
	σ=14.82	**σ=14.39**	**(30%)**
WISE	**μ=130.61**	**μ=135.34**	**Δ=4.71**
	σ=0.90	**σ=1.86**	**(3.5%)**
LLLL	**μ=202.74**	**μ=283.34**	**Δ=80.57**
	σ=10.64	**σ=19.00**	**(39,72)**

Protocol	Transfer Time(seconds) as Percentage of Mean for TCP	
	AWGN	Fading
SACK	63.4%	48.8%
WISE	42.4%	26.0%
LLLL	59.9%	54.5%

Table 2.Transfer time by protocol and channel Model

Although SACK improves performance in both channels, it is more effective at recovering from error bursts than from random bit errors.

The table 3 given below summarizes the channel efficiency of the four protocols for a variety of signal to noise ratios. This value expresses the quantity of data delivered to the application as a percentage of total channel utilization. It is calculated as

$$\text{Efficiency} = \frac{\text{File Size}}{\sum_{t=1}^{t=TT} \text{CU}(t) * \text{Data Rate}}$$

Where

TT is the transfer time in second, Data rate is the data rate of the channel in byte per second and file size is the size of the test file in byres.

protocol	Signal to noise ratio(SNR)			
	10	13	17	21
TCP	79.85%	84.89%	85.93%	85.90%
WISE	91.97%	92.94%	93.02%	93.01%
SACK	77.98%	93.94%	95.98%	96.93%
LLLL	81.98%	79.99%	84.98%	85.91%

Table 3 Channel Efficiency by protocol and SNR

5 CONCLUSION AND FUTURE WORK

There is some improve in the performance of TCP in land line mobile satellite channel. Based upon the result it is understood that the limit of the selective acknowledgment (SACK)option for fading channels and show that SACK performance depends strongly on the average bit error rate in good channel state. The performance TCP degrade due to channel fading but the overall WISE performance is relatively unaffected by error burst and variation in SNR. Further work will focus on improving the scalability of the gateways.

6 REFERENCES

[1] Ivancic, W.D., Brooks, D., Frantz, B., Hoder, D., Shell,D., Beering, D., NASA's Broadband Satellite Jacobson, V., R. Braden, D. Borman, TCP Extensions for High Performance, IETF, RFC 1323, May 1992.

[2] Jacobson, V., R. Braden, TCP Extensions for Long-Delay Paths, IETF, RFC 1072, October 1988.

[3] Lutz, E., D. Cygan, M. Dippold, F. Dolainsky, W.Papke, The Land Mobile Satellite communication Channel – Recording, Statistics, and Channel Model, IEEE Transactions on Vehicular Technology, Vol. 40,No. 2, May 1991, pp. 375-386.

[4] Mathis, M., J. Mahdavi, S. Floyd, A. Romanow, TCP Selective Acknowledgment Options, IETF, RFC 2018,October 1996.Networking Research, IEEE Communications Magazine, July 1999, pp. 40-47.

[5] Partridge, C., Shepard, T.J., TCP/IP Performance over Satellite Links, IEEE Network Magazine, September / October 1997, pp. 44-49.

[6] Stadler, J.S., A Link Layer Protocol for Efficient Transmission of TCP/IP via Satellite, IEEE MILCOM 1997, November 1997, vol. 2, pp. 723-727.

[7] Stadler, J.S., J. Gelman, J. Howard, performance Enhancement for TCP/IP on Wireless Links, 9th Virginia Tech/MPRG Symposium on Wireless Personal Communications, June 1999.

[8] Stadler, J.S., J. Gelman, Performance Enhancement for TCP/IP on a Satellite Channel, IEEE MILCOM 1998,November 1998, vol. 1, pp. 270-276.

[9] Stevens, W., TCP Slow Start, Congestion Avoidance, Fast Retransmit, and Fast Recovery Algorithms, IETF,RFC 2001, January 1997

[10] Turin, W., van Nobelen, R., Hidden Markov Modeling of Flat Fading Channels, IEEE Journal on Selected Areas in Communications, vol. 16, no. 9, December 1998, pp. 1809-1817.

[11] Zorzi, M., Rao, R., Milstein, L., Error Statistics in Data Transmission over Fading Channels, IEEE Transactions on Communications, vol. 46, no. 11, November 1998, pp. 1468-1477