Performance of New Variants of TCP
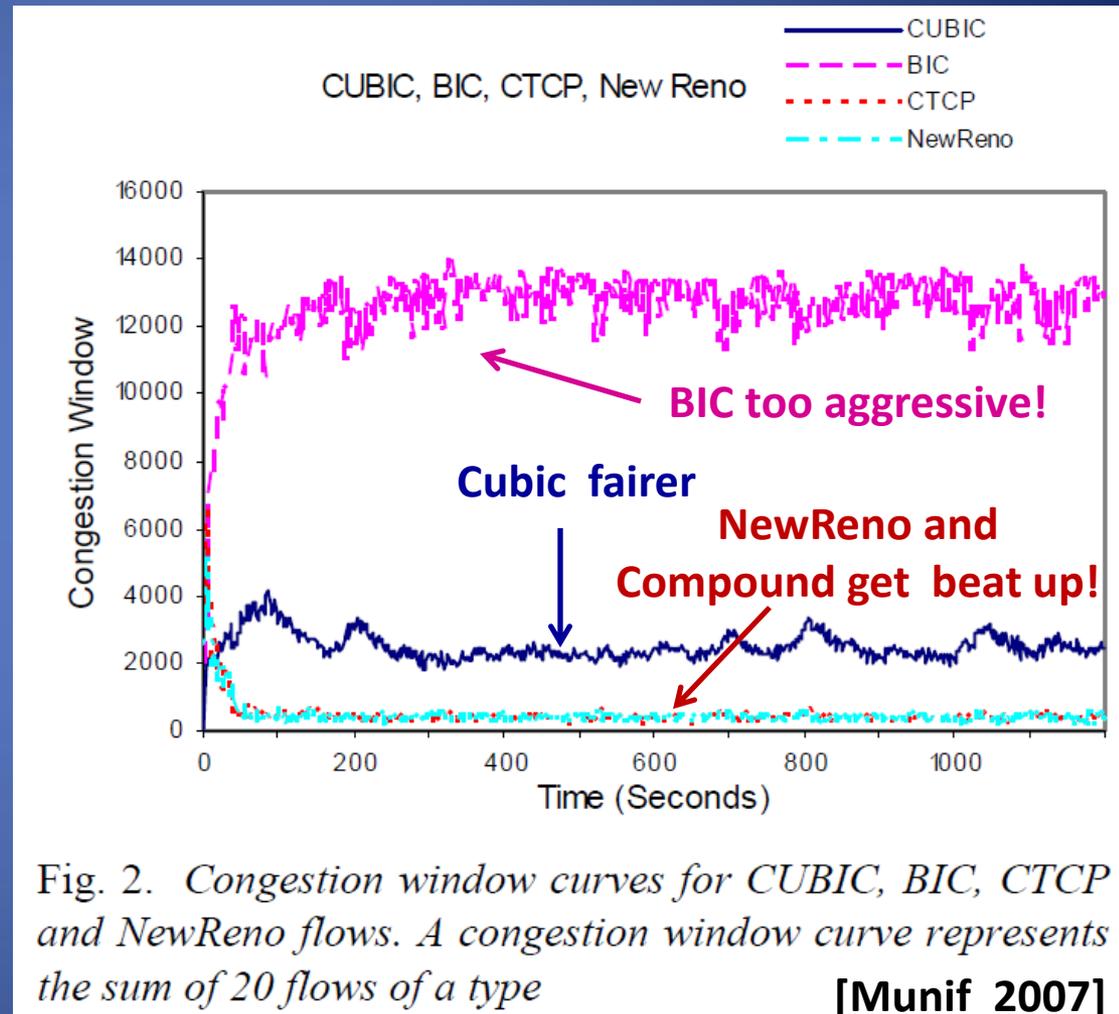
Presenter – Bob Kinicki

Fairness in TCP Variants

ns-2 dumbbell simulations

- C = 1 Gbps
- Min RTT = 104 ms.
- Drop tail routers
- 1500 byte packets
- Buffer size = BDP
- 20 flows of each TCP variant
- 1200 sec. simulated

CUBIC, BIC, CTCP, New Reno

BIC too aggressive!

Cubic fairer

NewReno and Compound get beat up!

Fig. 2. *Congestion window curves for CUBIC, BIC, CTCP and NewReno flows. A congestion window curve represents the sum of 20 flows of a type*

[Munif 2007]

Fairness in TCP Variants

Table 1: Average transfer rates and average link utilization

Mechanism	Average Transfer Rate (Mbs)	Average Link Utilization (%)
CUBIC	151.11	15.11
BIC	764.42	76.42
CTCP	27.80	2.78
NewReno	26.59	2.66

Too Aggressive
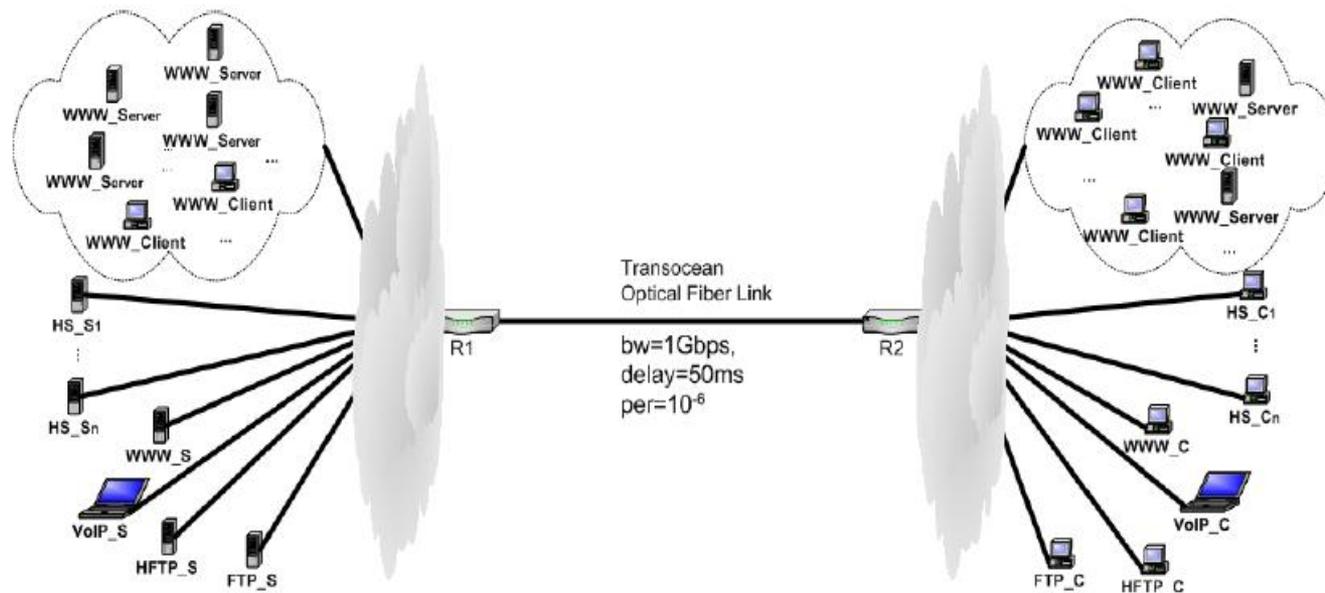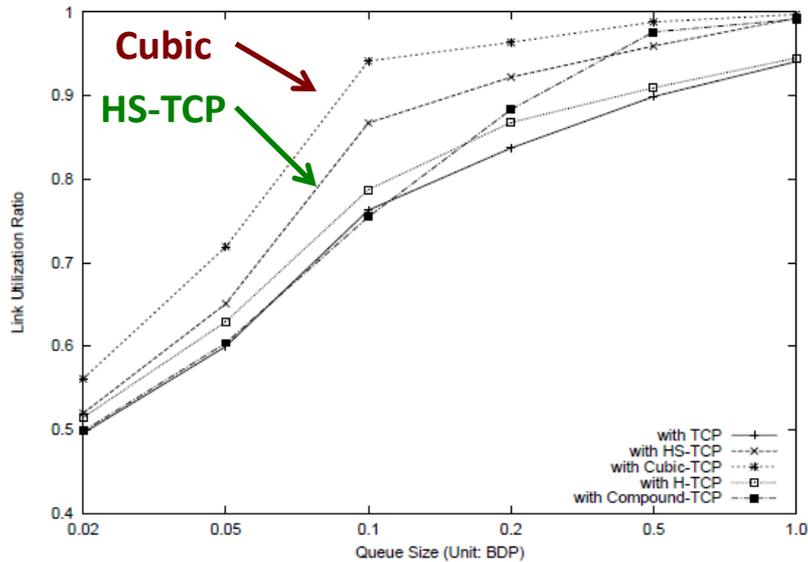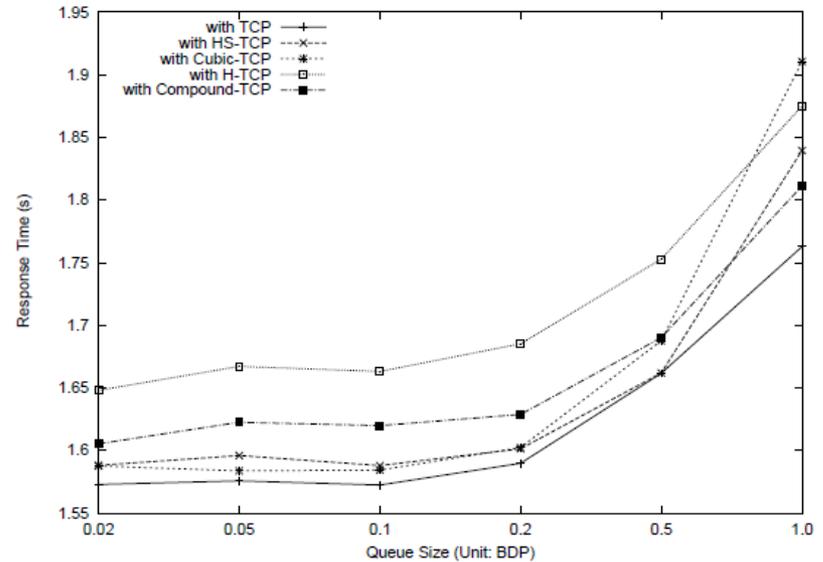
[Munif 2007]

High Speed Simulations

Figure 1: Wide Area Network Scenario: High Speed Congestion Control Algorithms on a Transocean Optical Fiber Link

[Wu 2008a]

Utilization and Response Time

(a) Link Utilization Ratio

(b) WWW (Response Data Size=64KB)

Figure 7: Twenty High Speed Flows on the Simulated Transocean Optical Fibre Link
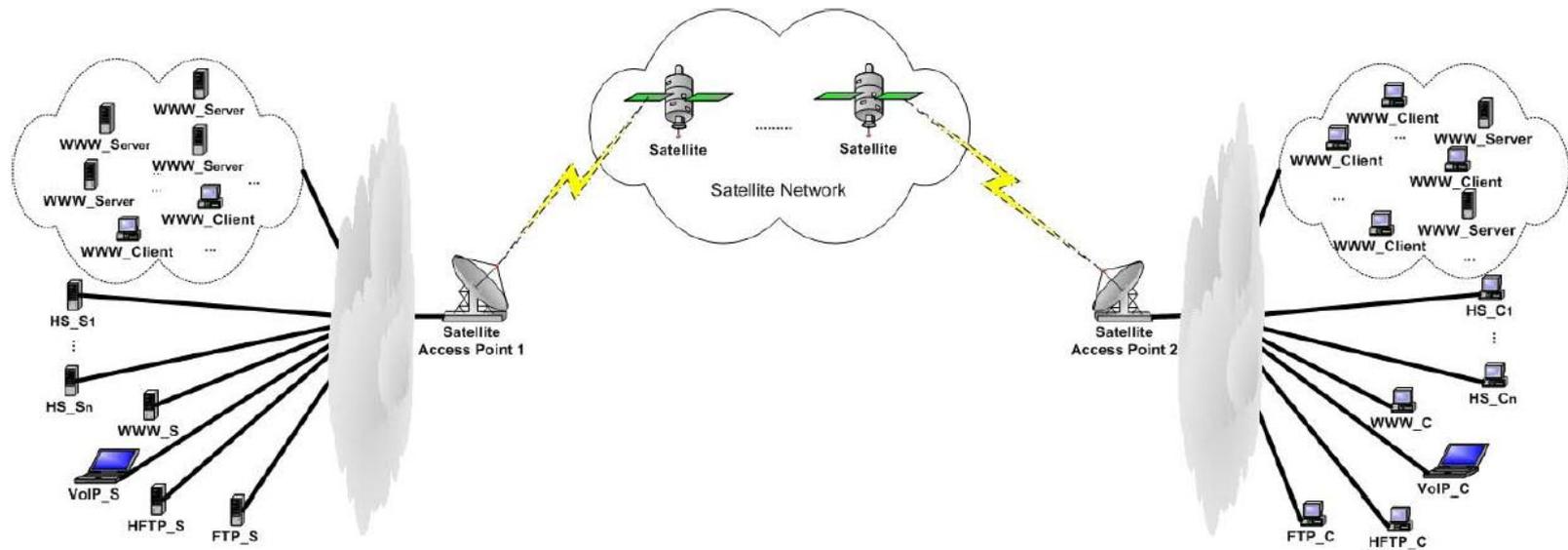
Simulated Satellite Network

Fig. 1. Network Topology: Two High Speed Networks Connected Through Satellite Network

[Wu 2008b]

Satellite Simulations

Nodes	Delay of Side Link	Traffic Type	Traffic Load
WWW_Server and WWW_Client nodes	Random Number [5ms-15ms]	Background Web Traffic	800 Sessions / s (forward path) 200 Sessions / s (backward path)
$HSCC\_S_i$ $HSCC\_C_i$	Random Number [5ms-15ms]	Long-Lived FTP Flows	4 Flows (forward path)
WWW_S WWW_C	10ms	HTTP Sessions	10 Sessions / s (forward path)
VoIP_S VoIP_C	10ms	ITU G.711 PCM Traffic	1 Connection (forward path)
HFTP_S HFTP_C	10ms	Long-Lived FTP Flow	1 Flow (forward path)
FTP_S FTP_C	10ms	FTP Flow (small buffer)	1 Flow (forward path)

TABLE I
PARAMETERS OF GENERATED TRAFFIC

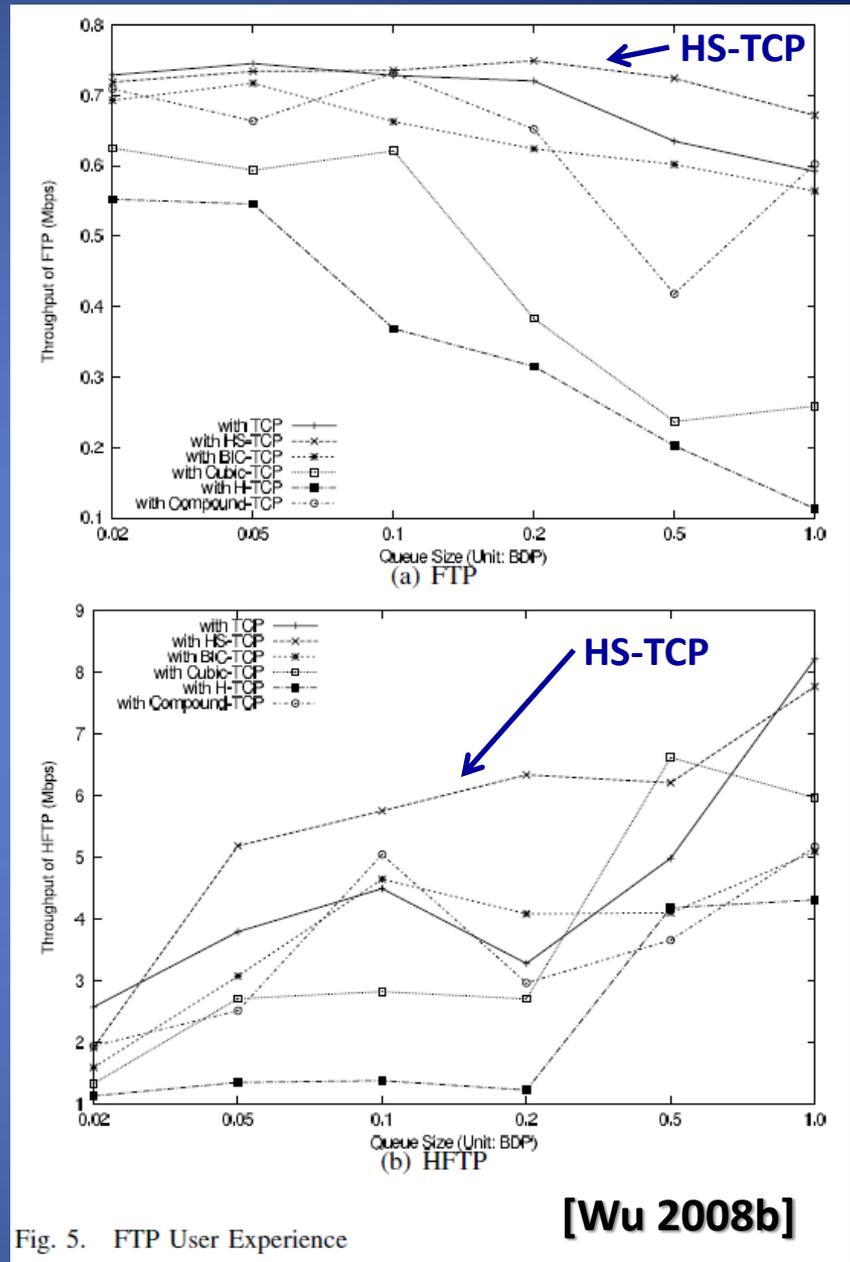HFTP flows: 100000 packet window
FTP flows: 64 packet window

HS-TCP

with TCP
with HS-TCP
with BIC-TCP
with Cubic-TCP
with H-TCP
with Compound-TCP

(a) FTP

HS-TCP

(b) HFTP

Fig. 5.   FTP User Experience

[Wu 2008b]

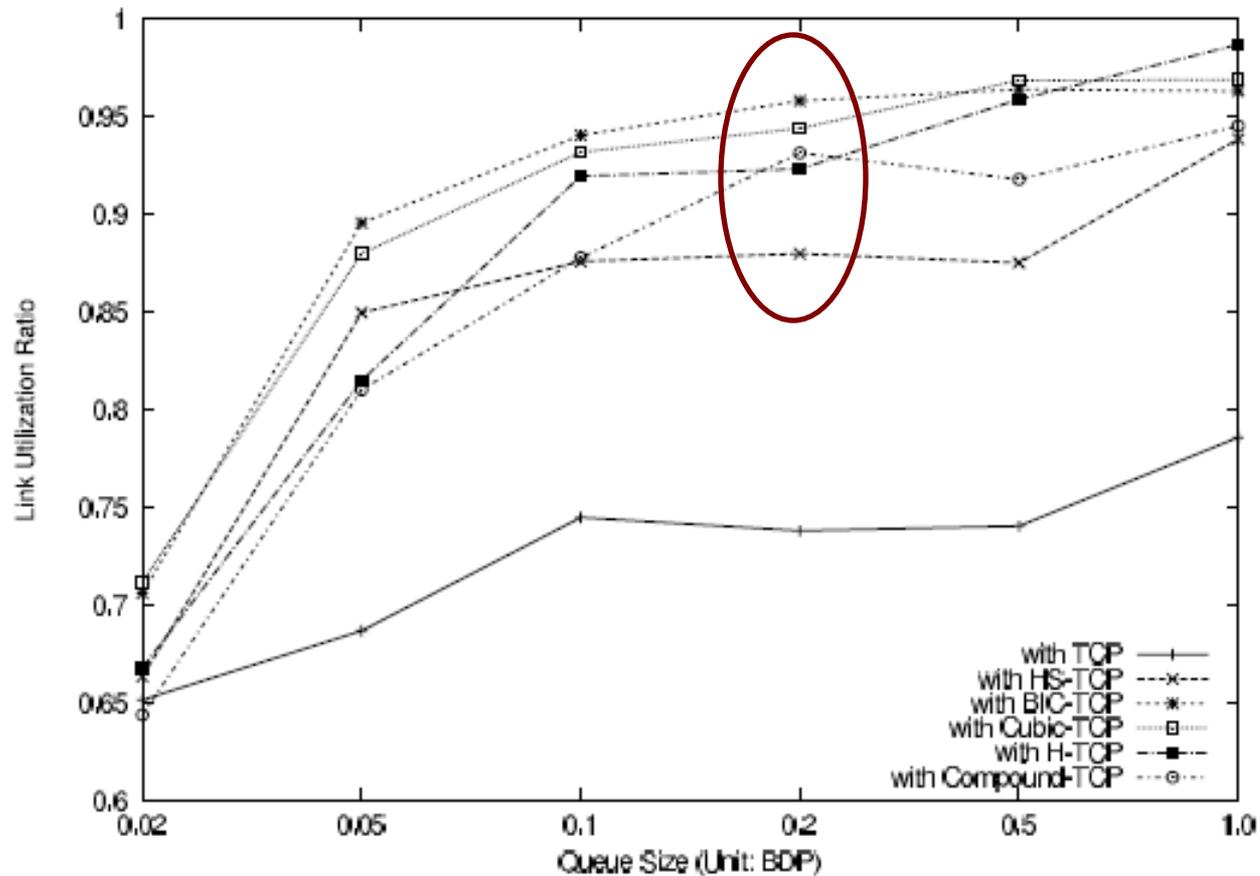# TCP Variant Utilization

Fig. 6.   Satellite Network Utilization Ratio

[Wu 2008b]

References

[Munif 2007] K. Munir, M. Welzl, D. Damianovic, "Linux beats Windows! – or the Worrying Evolution of TCP in Common Operating Systems" Fifth International Workshop on Protocols for FAST Long-Distance Networks (PFLDnet-07), February 2007, pp. 43-48.

[Wu 2008a] X. Wu, "Effects of Applying High Speed Congestion Control Algorithms in the Internet", National University of Singapore Tech Report 2008.

[Wu 2008b] Xiuchao Wu, M. C. Chan and A. L. Ananda, "Effects of Applying High-Speed Congestion Control Algorithms in Satellite Network", IEEE International Conference on Communcations, Beijing, May 2008, pp. 1925-1929 .