Performance of New Variants of TCP

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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

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

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>Average Transfer Rate (Mbs)</th>
<th>Average Link Utilization (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CUBIC</td>
<td>151.11</td>
<td>15.11</td>
</tr>
<tr>
<td><strong>BIC</strong></td>
<td><strong>764.42</strong></td>
<td><strong>76.42</strong></td>
</tr>
<tr>
<td>CTCP</td>
<td>27.80</td>
<td>2.78</td>
</tr>
<tr>
<td>NewReno</td>
<td>26.59</td>
<td>2.66</td>
</tr>
</tbody>
</table>

[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]
Figure 7: Twenty High Speed Flows on the Simulated Transocean Optical Fibre Link

(a) Link Utilization Ratio

(b) WWW (Response Data Size=64KB)
Simulated Satellite Network

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

[Wu 2008b]
# Satellite Simulations

<table>
<thead>
<tr>
<th>Nodes</th>
<th>Delay of Side Link</th>
<th>Traffic Type</th>
<th>Traffic Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>WWW_Server and WWW_Client</td>
<td>Random Number [5ms-15ms]</td>
<td>Background</td>
<td>800 Sessions / s (forward path)</td>
</tr>
<tr>
<td>nodes</td>
<td></td>
<td>Web Traffic</td>
<td>200 Sessions / s (backward path)</td>
</tr>
<tr>
<td>HSCC_S_i and HSCC_C_i</td>
<td>Random Number [5ms-15ms]</td>
<td>Long-Lived FTP Flows</td>
<td>4 Flows (forward path)</td>
</tr>
<tr>
<td>WWW_S and WWW_C</td>
<td>10ms</td>
<td>HTTP Sessions</td>
<td>10 Sessions / s (forward path)</td>
</tr>
<tr>
<td>VolP_S and VolP_C</td>
<td>10ms</td>
<td>ITU G.711 PCM Traffic</td>
<td>1 Connection (forward path)</td>
</tr>
<tr>
<td>HFTP_S and HFTP_C</td>
<td>10ms</td>
<td>Long-Lived FTP Flow</td>
<td>1 Flow (forward path)</td>
</tr>
<tr>
<td>FTP_S and FTP_C</td>
<td>10ms</td>
<td>FTP Flow (small buffer)</td>
<td>1 Flow (forward path)</td>
</tr>
</tbody>
</table>

**TABLE I**
PARAMETERS OF GENERATED TRAFFIC

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

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Fig. 5. FTP User Experience

[Wu 2008b]
TCP Variant Utilization

Fig. 6. Satellite Network Utilization Ratio

[Wu 2008b]
References

