Implementation Experiments of TCP proxy Mechanism

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Outline
- Background
  - TCP Overlay Network
  - TCP proxy Mechanism
  - Experimental Environment
  - Experiments using the Public Network
    - Effect of TCP proxy
    - Effect of High-Speed TCP
  - Conclusion and Future Work

Background
- Development of the access/backbone network technologies
- Rapid growth of the Internet population
  → User demands diversified and sophisticated services
  → But can't be assured in the current Internet because of its best-effort basis

TCP Overlay Network
- Control data transmission quality at the transport layer
- Absorb differences between network environments

TCP proxy Mechanism
- TCP proxy
  - Relay and transfer the TCP session
  - Send back pseudo ACK packet
  - Buffer the received packet
    - Can retransmit packets from TCP proxy when packet dropped
  - Improve the data transfer throughput of connections by shortening the round-trip time
  - Other TCP protocol can be used between TCP proxies

Objectives
- Implementation Evaluation of the TCP proxy mechanism in the public network
  - Use the public Internet network between Osaka and Tokyo
  - Evaluate the performance using High-Speed TCP between TCP proxies
- Evaluation of the performance using High-Speed TCP between TCP proxies
  - HiSTCP (High-Speed TCP)
  - giHiSTCP (gentle HiSTCP)

We have logically confirmed the effect of the TCP proxy mechanism [4], but not reveal yet in the actual network.

Experimental Environment

- 4 - receiver and sender hosts
- 2 - TCP proxies
- Network emulator
  - Osaka-Tokyo case: not used
  - Okinawa-Tokyo case: add 25-msec delay

Effect of TCP proxy

Can obtain high throughput even with a small TCP buffer
- Because of the large TCP buffer at the TCP proxies
- No need special settings at end-hosts
- Cannot utilize the link bandwidth in the long-delay network
- Use High-Speed TCP between the TCP proxies to improve the performance

Effect of High-Speed TCP

- Enhance the data transfer throughput by using HSTCP or gHSTCP
- No need special setting at the end-hosts

Research Background: High-Speed TCP

<table>
<thead>
<tr>
<th>Control</th>
<th>At (ms/RTT)</th>
<th>MD</th>
<th>Feature/Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCP Reno</td>
<td>0.5</td>
<td>1</td>
<td>Can be common in the current Internet</td>
</tr>
<tr>
<td>HSTCP (High-Speed TCP)</td>
<td>0.5</td>
<td>1</td>
<td>Enhance high throughput</td>
</tr>
<tr>
<td>gHSTCP (gentle High-Speed TCP)</td>
<td>1</td>
<td>1</td>
<td>Occupies the link bandwidth</td>
</tr>
</tbody>
</table>

Fairness between TCP Reno and High-Speed TCP

- HSTCP
  - Make co-existing (TCP Reno) connections throughput decrease
  - gHSTCP
    - Enhance high throughput while not affecting the performance of co-existing connections
Conclusion

- TCP proxy mechanism is verified making the data transfer throughput increase in the actual network
- Equivalent to the results by simulation
- No need the special settings of the end hosts
- Enhance the performance by using High-Speed TCP between the TCP proxies
- Future work:
  - Evaluation in a larger experimental network using more than three networks
  - Evaluation in a high-speed network