Performance Measurement of Congestion Control in CCN

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Motivation

• Content-centric networking (CCN) is recently emerged to provide efficient content retrieval and distribution.

• In practice, deploying CCN over the Internet should be in incremental fashion.

There is a time that we need to consider the impact of coexistence with TCP/IP flows.
Testbed

- Both flows are sharing 100Mbps bottleneck link.
- TCP flows by ‘iperf’ application
- At gateway, queue-size is set to 500KB.
- CCNx can choose both TCP and UDP.
Performance of a single CCNx flow

CCNx(TCP)

From PIPE 128, CCNx works very poor!
CCNx vs TCP(iperf)

From PIPE 128, CCNx works very poor!
Performance of CCNx (with delay variation)

PIPELINE_SIZE is fixed to 64.
4-CCNx vs 4-TCP(iperf)

4-CCNx(TCP) flows are included in 1-TCP flow!

CCNx(UDP) flows works poor in congested link
## Summary

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<th>CCNx over TCP</th>
<th>CCNx over UDP</th>
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| Single flow | It works well when;  
• the performance of CPU is sufficient.  
• PIPELINE size is proper. | • CCNx over UDP performs poor with large pipeline size.                       |
| Multiple flows | • Aggregate performance of multiple CCNx flows is limited by a single TCP flow. | • It can support multiple CCNx flows without a limitation, if it overcomes the poor performance |
| PIPELINE size | • It is difficult to know the optimal pipeline size in advance.  
• CCNx with fixed pipeline size cannot be adjusted to network condition changes. |
Conclusions

• Since a congestion control of CCNx is designed for a direct connection between CCNx nodes,

To deploy CCNx incrementally, we need to design a new congestion control of CCNx to compete with regular TCP flows.
Future works

• To avoid “the limitation by a single TCP throughput in CCNx(TCP)”, we’ve chosen CCNx(UDP) to proceed.

• We consider a receiver-driven congestion control which is similar to the CUBIC algorithm.