Dual-Channel IP-to-NDN Gateway

1. Background

- Information-Centric Networking (ICN) changes the data communication paradigm by naming the data object in the network instead of host address.
- The ICN communication primitive operates in a pull driven scheme differing from the IP that operates alternatively in push-based or pull-based.

Co-exist of IP and NDN during the transition period

2. Principles

To preserve privacy of users, the proposed dualchannel translation gateway separates the channel into two types of packets that bring NDN semantics into IP protocol, namely interest and data channel.



4. Translation procedure when IP as consumer and NDN as producer



- IP consumer sends the IP interest packet using 10.10.10.17:1002 as a source IP address and 10.10.10.1:1002 as a destination IP address.(1)
- GW checks the source IP address into the REG consumer table. (when receives IP interest packet). GW checks the corresponding prefix name to CS (β). If available, create an IP packet with destination address 10.10.10.17:1002 through IP 10.10.10.2 as the IP data channel. If unavailable (1- β), GW generates an NDN interest packet with /eee as prefix name.

- NDN consumer send interest packet with prefix name /abc. (1)
- GW checks content availability in CS with β hit ratio, and if it is hit, the content is sent directly to NDN consumers. If it is miss,1- β, GW checks the REG producer table for corresponding prefix name, /abc, translated to 10.10.10.17:1001. (when receives NDN interest packet)
 IP interest packet with 10.10.10.17:1001 as the destination address is sent through 10.10.10.1 as the IP interest channel. (2)

- NDN producer receives interest packet with /eee as a prefix name. (2)
- NDN producer reply by an emitting data packet with /eee as a prefix name. (3)
- Gateway receives the NDN data packet and checks the destination of IP address in the REG consumer table.
- IP consumer receives IP data packet with 10.10.10.17:1002 as a destination IP address and 10.10.10.2:9000 as a source IP address.(4)



- Throughput increases
 as α increases for
 both scenarios.
- Increase of CS size about ten times has increased throughput about 50% in average for both scenarios.

 Throughput estimation model can

- IP producer sends the reply packet with sending through IP 10.10.10.2 as the IP data channel. (3)
- Gateway receives the packet and knows directly that this is a data packet. It is stored in CS. Afterward, GW generates an NDN data packet with prefix name /abc.
- NDN consumer receives NDN data packet with prefix name /abc. (4)

accurately predict about 90% in average for Scenario 1 where Scenario 2 has 5% more accurate than Scenario 1.

6. Conclusion

- The IP-to-NDN translation gateway is enabling semantic protocol translation.
- The throughput performance is affected by the CS hit ratio and processing time for each process in the gateway.
- Our finding shows that the memory capacity and the content popularity affect the overall throughput dominantly.