Frequency-aware Reconstruction of Forwarding Tables in Name-based Routing

Hae sung Hwang, Shingo Ata, and Masayuki Murata
1Graduate School of Information Science and Technology, Osaka University
2Graduate School of Engineering, Osaka City University

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Top level domain

System Architecture

FQDN - variable length, usually longer than IP address
→ distribute routing information to multiple routers

Distribution Algorithms
- Hierarchical Longest Alphabet Match (HLAM)
- Takes full advantage of TCAM
- Hybrid Distribution (HD)
- Grouping by TLD + hashing function
- Balanced distribution

Goal

Feasibility Evaluation of name-based routing

- Hardware
  - Is storing routing information of `names` to currently deployed routers possible?
- Network
  - How does the network topology change when the database is updated?
  - Is reconstructing the forwarding tables effective when objects have different access frequency?

Sketch of Proposal

Name-based Routing

- FQDN (Fully Qualified Domain Name)
  - Hierarchical
  - Generalize to resource-based routing

Distribution Routing Info.

- Location-aware virtual topology
  - Considers number of physical hops between routers
- Access frequency-aware virtual topology
- Reconstruction of routing tables
**Hybrid distribution (HD)**

Add shortcut path entries:
- In routers with a high request frequency
- Toward routers with the actual object
- Soft-state & robustness

**Simulation settings**
- Add shortcut entries → Entry migration
- 1,000 communication/1 unit time (calculate number of hops between src-dst pair)
- FQDN: Acquired from ISC* (July 2009 database, approx. 700 million entries)
- Access frequency: Zipfian distribution
- Most popular element occurs with a frequency of 1/n compared to that of the most popular element


**Simulation result**
- Average number of hops decreased (4.1 → 3.4 hops) after routing table reconstruction
- Shows potential in developing a mapping algorithm to reach the destination with the shortest possible path
Simulation result (2)

- Src/dst pairs of round 1 are reused in round 2, using the forwarding tables of round 1
- Shortcut entries increase and are eventually migrated

Conclusion & Future Work

- Conclusion
  - A Post-IP routing technology expected in future Internet
  - A feasibility evaluation of name-based routing, as a first step of content-based routing
  - Evaluated the effect of reconstructing routing tables, reflecting the access frequency of search objects

- Future work
  - Mobile end nodes
  - Generalize name-based routing to resource-based routing (resource: name, category, type of a content...)

Thank you!

Haesung Hwang
h-hwang@ist.osaka-u.ac.jp