Analyzing the Performance of ICN Forwarders on the Wire

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Motivation

• Many ICN papers focus on forwarding performance
  – Few focus explicitly on evaluation methodology

• Existing materials do not take a detailed, practical approach
Contribution

• Provide a series of **behavioral microbenchmarks** to evaluate ICN forwarders in a rigorous way

• Analyze two well-known ICN forwarders to show efficacy of microbenchmarks

• Detail **synthetic workload generation** and other practical concerns for experimentation
Key Focuses

• Probe the forwarding behavior of the core ICN forwarding data structures (PIT, FIB, CS)

• Minimize the effect of other data structures not being interrogated

• Reveal subtle interactions in forwarding behavior without instrumenting forwarder
Synthetic Workflow

- Cisco Umbrella top 1 million domain names
- Convert to hierarchical ICN name
- Add padding to achieve average URL length
- Sample names with Zipf distribution
  alpha = 0.64, 0.84 [RFC 7945]
Synthetic Workflow Example

prod.ftl.netflix.com

/com/netflix/ftl/prod

/com/netflix/ftl/prod/<padding>
Probing PIT scalability

- Microbenchmark:
  - Interest forwarding only; no data
  - Small packets, measuring packet forwarding rate
  - Minimize affect of FIB and CS

- PIT performance drops as interest lifetimes increase (NFD)
Probing the Content Store

- Microbenchmark:
  - Interest/data exchange
  - Large packets, measuring goodput

- 50% hit rate isn’t enough
  - Can’t break even with cost of enabling content store for NFD
Future Work & Conclusion

• Future work:
  – Improve name distribution of the synthetic workload
  – Add/refine microbenchmarks

• Specified the steps for synthetic workload generation

• Provided microbenchmarks to illustrate forwarding behavior for key ICN data structures
Thank you

• Questions?