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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

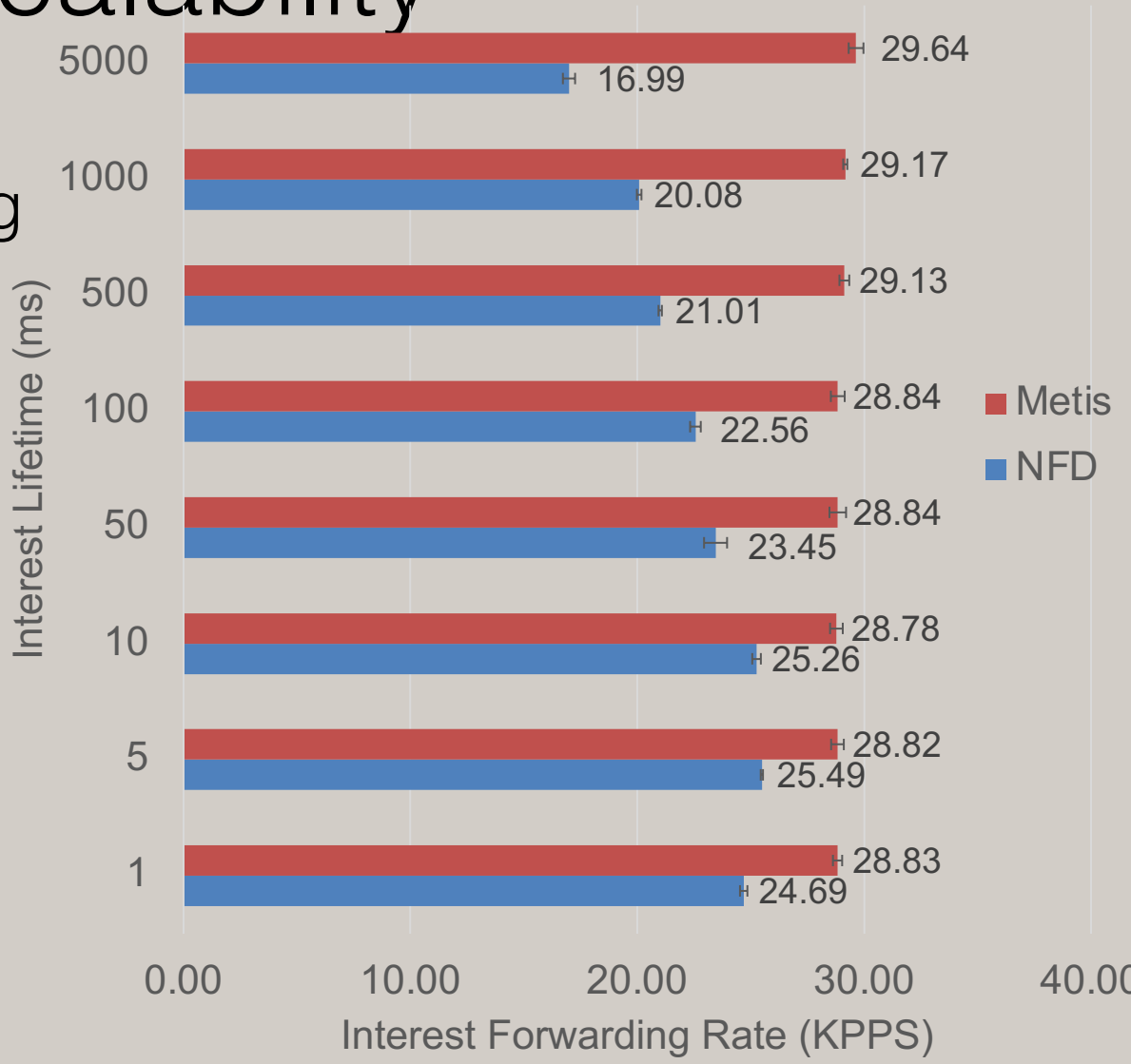
`prod.ftl.netflix.com`

`/com/netflix/ftl/prod`

`/com/netflix/ftl/prod/<padding>`

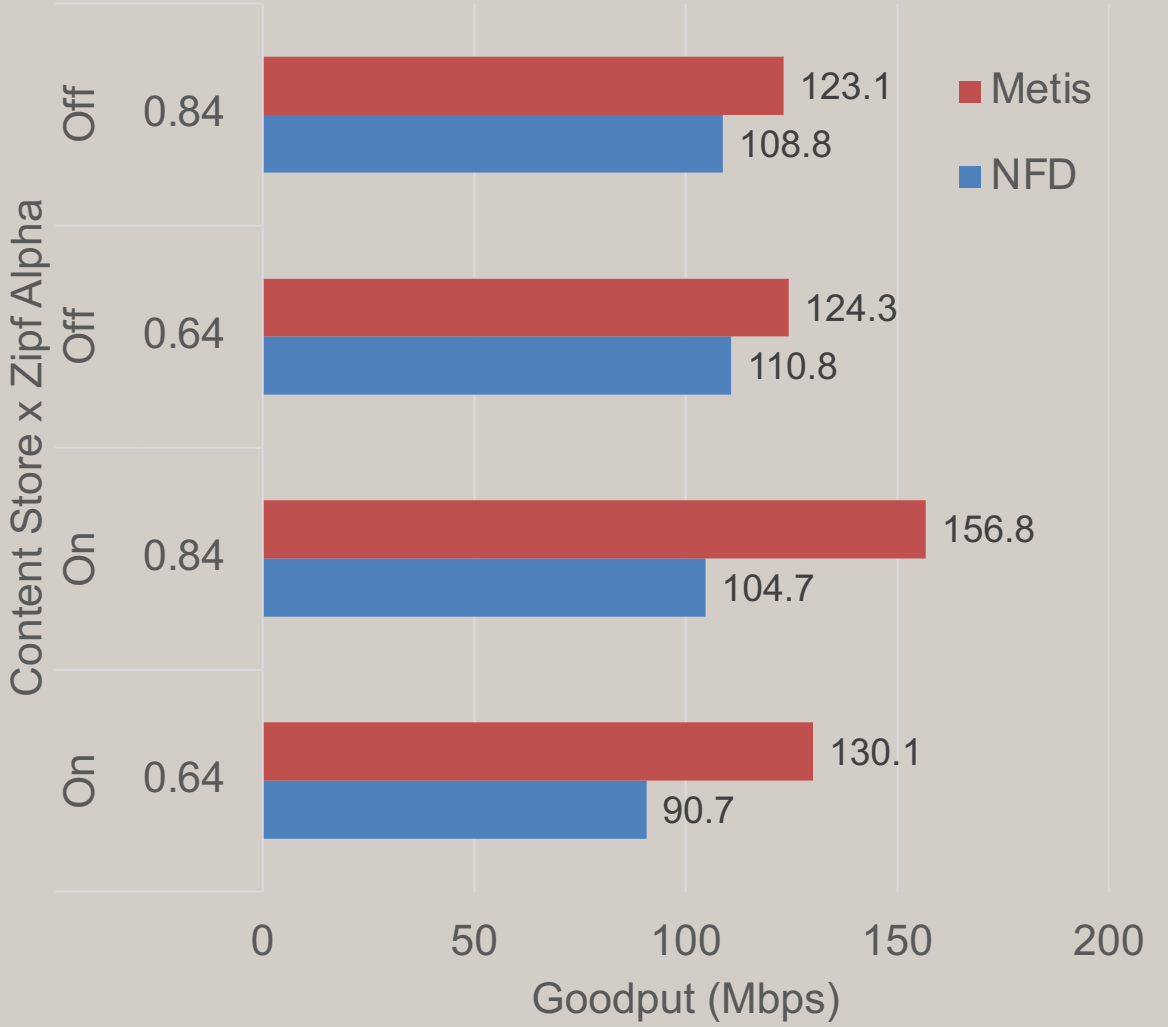
Probing PIT scalability

- 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?