Scalable, High Performance Ethernet Forwarding Lookup on Commodity x86 Platform
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Goal
- Single-node software switch, with
  - One billion entries in the forwarding table
  - 10Gbps line speed
  - 4-8 ports support
- Motivation
  - Content-based networking
  - Ever-larger layer-2 networks enabled by recent research efforts
  - Pushing the limit of the scalability of forwarding table

Why Current Technologies Won’t Do
- High-speed memories (e.g. TCAM)
  - Small size severely limits scalability
  - Memory efficient but approximate solutions
    - Induce path stretch
  - Prior hashing schemes
    - Either memory inefficient and/or have unacceptable lookup performance to handle collisions

Solution: Intel DPDK + Optimized Concurrent Cuckoo Hashing
- Intel DPDK: high-throughput packet I/O to user-space
- NUMA-aware memory management
- Polling mode user-space driver
- Batching for efficiency
- Optimized Concurrent Cuckoo Hashing
  - Fast lookups: two parallel cacheline-sized reads
  - Highly Compact
  - Concurrent reads with in-place writes

Evaluation

Minimum (64B) Packet

Throughput vs. Update Rate

Throughput (Mpps)

Throughput (Mpps)

Number of FIB Entries

Number of Updates Per Second (K)