
NetBench: A Benchmarking Suite for Network Processors

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Applications

- Different “levels” of applications:
- Micro-level:
 - “Close” to link, components of higher levels
 - Apps: CRC checksum, RTR table lookup
- IP-level:
 - IP packet processing
 - Apps: IPv4 Routing, DRR scheduling, NAT, firewall
- Application-level:
 - More complex processing
 - Apps: URL-based switching, Diffie-Hellman, MD5

NetBench Characteristics

- Instruction-level parallelism:
 - IPC of 1.38 to 1.97
- Instruction mix:
 - Add ~40-50%
 - Load ~20-30%
 - Arithmetic ~10%
 - Others < 10%
- Cache miss rates:
 - Only one measurement: 4kB i-cache, 4kB d-cache, 128kB L2
 - i-cache miss rate < 0.3%
 - d-cache miss rate < 2.3%

IXP1200 Implementation

- Implementation on IXP1200:
 - IPv4 routing, MD5, CRC checksum
- Throughput:
 - IPv4: 2.2 Gbps on IXP, 1.2 on Pentium
 - MD5: 0.3 Gbps on IXP, 0.2 on Pentium
 - CRC: 0.3 Gbps on IXP, 0.2 on Pentium
- What conclusions can be drawn from this result?

Other NP Benchmarks

- NP Forum
 - Consortium of NP vendors
 - Has recently standardized IP forwarding
 - MPLS etc. next
- EEMBC
 - Embedded processor consortium
 - Has a few networking-related micro-benchmarks
- Question:
 - What are good benchmarking metrics?
 - How to incorporate networking and processing aspects?

NP Benchmark Summary

- Difficult to define good benchmark
 - Many levels to processing
 - Many application domains
 - Has to be general enough to be “standard”
- Many measurements
 - What do they mean?
 - How can those numbers be used for NP design?

Topics for Remaining Classes

- Performance modeling for design space exploration
- Simulation of network processors
- Scheduling of processing tasks
- Look at more commercial products
- What should we focus on?