The Network Stack (2)

Lecture 6, Part 3: Wrapping Up

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Architectural → micro-architectural + I/O optimisation

- Hardware, software, protocol co-design causes change to optimisation approach over time:
  - Counting instructions → counting cache misses
  - Reducing lock contention → cache-line contention
  - Adding locking → identifying new parallelism
  - Work ordering, classification, and placement
  - Vertically integrated distribution and affinity
  - NIC offload of further protocol layers, crypto
  - DMA/cache interactions
- Convergence of networking and storage technologies?

Labs 3: TCP

- From abstract to concrete understanding of TCP
  - Use tools such as `tcpdump` and DUMMYNET
  - Explore effects of latency on TCP performance
  - Be sure to consider probe and simulation effects
- Part 1: TCP state machine and latency
  - Measure the TCP state machine in practice
  - Experiment with artificially induced latency (DUMMYNET)
- Part 2: TCP congestion control
  - Explore OS buffering strategies
  - Explore slow-start vs. steady state as latency changes
  - Explore OS and microarchitectural performance interactions

Advanced Operating Systems: wrap-up

- Goal: Deeper understanding of OS design and implementation
  - Evolving architectural and microarchitectural foundations
  - Evolving OS design principles
  - Evolving tradeoffs in OS design
  - Case study: The process model
  - Case study: Network-stack abstractions
  - Quick explorations of past and current research
- Goal: Gain practical experience analysing OS behaviour
- Goal: Develop scientific analysis + writing skills (**L41 only**)
- Feel free to get in touch to learn more!