The Network Stack (2)

Lecture 6, Part 3: Wrapping Up

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Advanced Operating Systems: wrap-up

- Deeper understanding of OS design + implementation
  - Evolving architectural and microarchitectural foundations
  - Evolving OS design principles
  - Evolving tradeoffs in OS design
  - Case study: The process model
  - Case study: The network stack
  - Shallow explorations of past and current research
- Practical experience analysing OS behaviour
  - Tracing-centric approaches are essential because no OS developer can have a complete understanding of a system
  - Hardware and network behaviours are expecially opaque
  - For any non-trivial system, even a good local understanding doesn't get you far for the full composed system
- Scientific analysis + writing skills
  - Writing is an essential part of not just communicating, but also developing, ideas during evaluation

OS development as co-design

- Co-evolution of the OS with NIC hardware, TCP protocol design is typical of many OS co-design cycles:
  - Multiprocessor systems, non-uniform memory access, etc.
  - From minicomputers to mobile devices
  - Security features {sandboxing, integrity, confidentiality, …}
  - Widely deployed multipath networking
  - Latency reduction from NVM storage
  - …
- Challenging because of development timescale and methodology mismatches, not just technical concerns
  - E.g., NIC or processor hardware vs OS vs application code
- … But also exciting for the same reason: The OS is an intersection point between, and integral to, many new developing computer technologies

Please stay in touch!

- Do give us feedback on the unit/module
  - Your feedback on what worked, and what didn't, especially relating to the labs, is very much appreciated
  - Feel free to reach out directly by email with your thoughts and ideas
- Let us know if you do further work in this area – research, development, etc.!
  - Many of our past students have gone on to systems research and development at companies such as Microsoft, Google, Arm, and elsewhere, as well as PhDs in the area