The Network Stack (2)

Lecture 6, Part 3: Wrapping Up
Prof. Robert N. M. Watson
2023-2024
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 especially 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 (ACS/Part III only)
  • 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
  • The pandemic has not been kind to practical teaching
  • We have adapted the material and delivered as best we can
  • Your feedback on what worked, and what didn’t, 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.!
  • A large number of 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