

The Network Stack (2)

Lecture 6, Part 3: Wrapping Up

Prof. Robert N. M. Watson

2022-2023

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 (**L41**)
 - 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