Agenda for Today

- Reminders
- Introduction to network stacks
- IX discussion
- XDP discussion
Announcements and Reminders

• Sign up to lead a discussion
  • Spreadsheet is linked from Canvas
  • Some papers have multiple co-leads
  • Due Monday 10/9 at 11:59 pm

• Warm-up assignment
  • Posted on Canvas
  • Due Monday 10/16 at 11:59 pm
Prep for Tuesday

- FaRM discussion
  - Read FaRM and submit review as usual
- Where do research ideas come from? To prepare, consider:
  - What is a systems paper you have really liked?
  - Why did you like it?
  - How do you think the authors came up with the idea?
  - (no need to submit anything)
Network Stacks
Linux’s Network Stack

- A simplified version
- Kernel data structure for packets: sk_buff
- Overheads:
  - Copying data
  - Context switches
  - Interrupts
  - Lots of queueing
- For more details, see “Understanding Host Network Stack Overheads” [SIGCOMM ‘21]
Data Plane Development Kit (DPDK)

- One example of kernel bypass
- DPDK data structure for packets: rte_mbuf
- Differences from Linux:
  - Much less functionality
  - No copying
  - Polling instead of interrupts
  - Network stack runs in userspace

![Diagram of DPDK architecture](diagram.png)
Handling Multicore

• One NIC queue per core
• Transmit path: each core sends to its own queue
• Receive path:
  • Flow-consistent hashing using receive-side scaling (RSS)

Transmit (TX)

Receive (RX)

Hash packets based on header fields (e.g., IPs)
IX Discussion
XDP Discussion