

# CSE 291: Operating Systems in Datacenters

Amy Ousterhout

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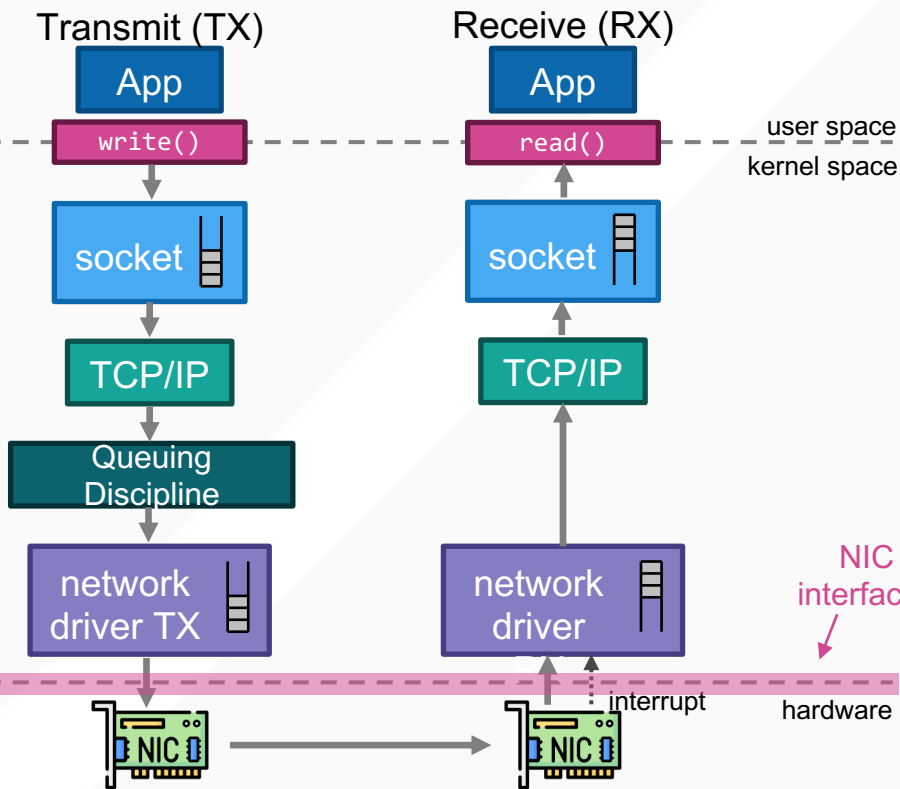
## Agenda for Today

- Introduction to NIC interfaces
- Enso discussion

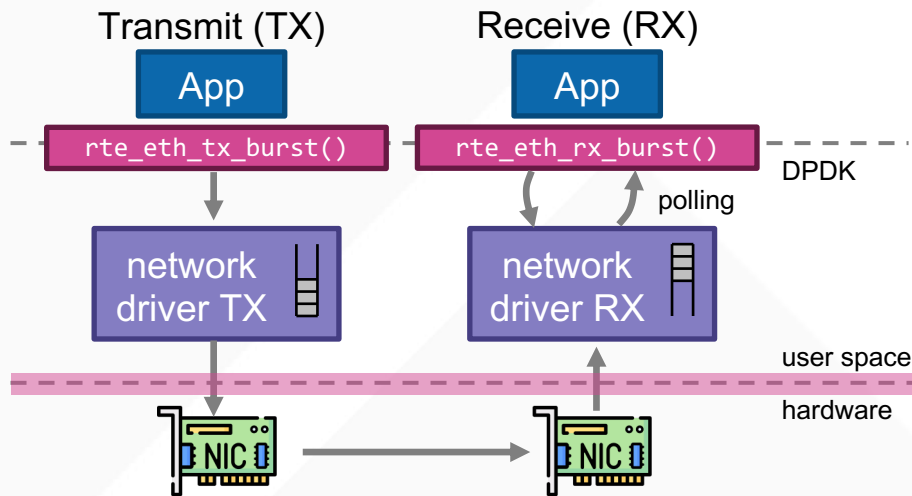
# NIC Interfaces

# Network Stacks

## Linux's Network Stack

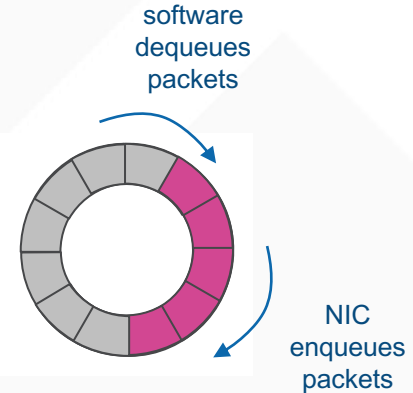
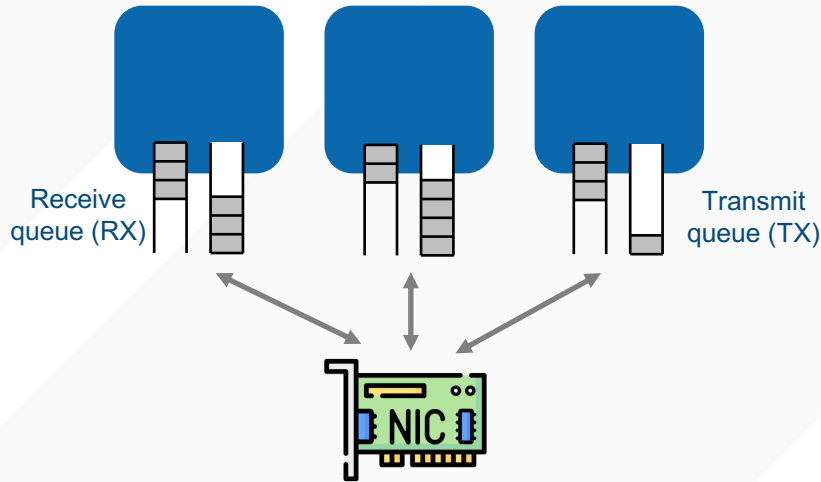


## Kernel-Bypass Network Stack (DPDK)



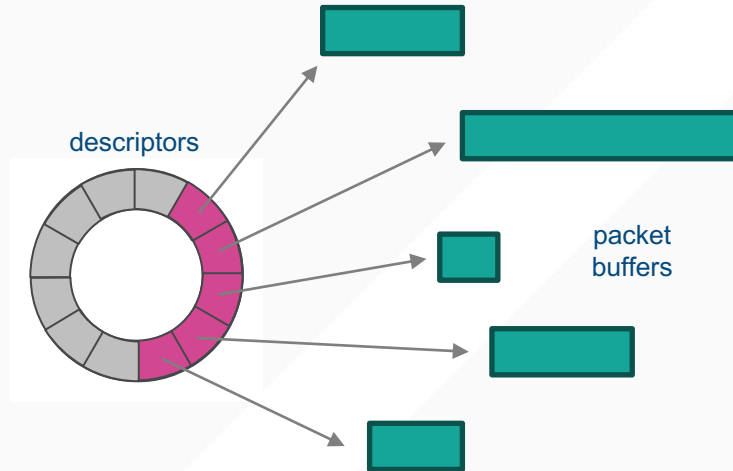
# NIC Interface: Queues

- Logically organized as pairs of queues
  - Receive queues (RX)
  - Transmit queues (TX)
- Often one pair of queues per core
- Each queue is implemented as a ring buffer



# Packetized NIC Interface

- Each entry in the ring is a descriptor
- Descriptors contain pointers to packet buffers
  - Packet buffers are scattered in memory
- Descriptors also contain a flag indicating if the buffer has data



# NIC Offloads

- NICs today support various offloads
  - Simpler offloads:
    - Checksum computation
    - TCP segmentation offload (TSO)
    - Large receive offload (LRO)
  - More complex offloads:
    - Entire transport protocols (e.g., TCP)
    - Data serialization
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- Commonly supported in NICs
- Active research area

# Enso Discussion