

SmartNIC: Extensible NIC Design for Hybrid Data Center Networks



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Recent Trends:

- Centralized network control plane with SDNs
 - Offer network management flexibility
- Optical Interconnects
 - Offer reconfigurable topology

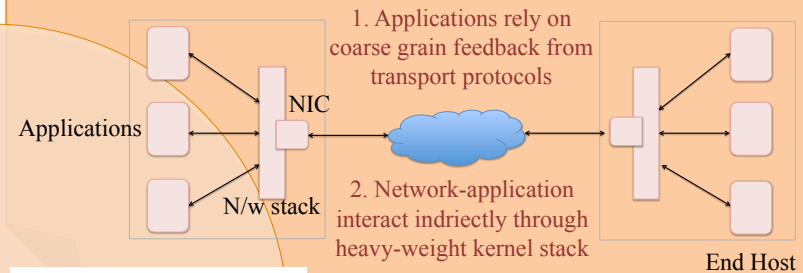
While networks have evolved, the NICs have not!
Cannot efficiently leverage the flexibility of the network.

Need for an extensible NIC design (**Software Defined DataPlane**) that offers fine-grain synchronization between end-host and the network

What is the problem?

Lack of synchronization between applications and network:

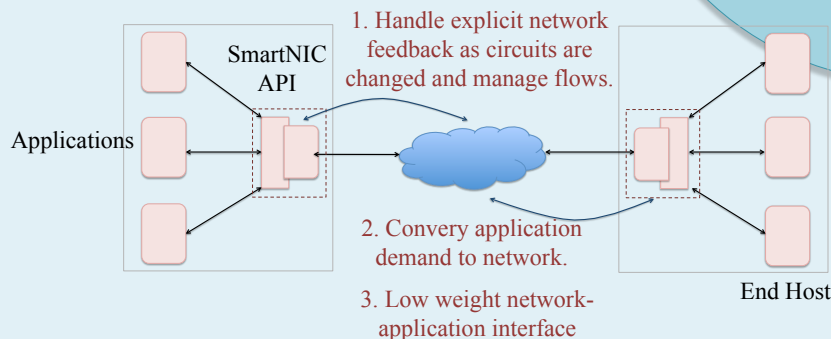
- Poor understanding of application/network interaction
- Hard to compose multiple existing functionality
- Low throughput, high latency → Low Performance/Higher costs!



Why is it a problem?

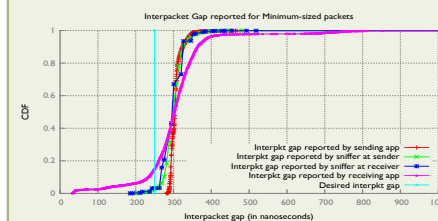
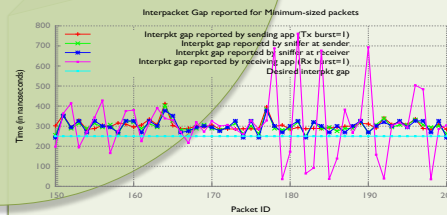
SmartNIC Design:

- Based on user-space Intel DPDK Library
- Direct access to application buffers through shared memory
- Multi-threaded to leverage multiple cores in modern servers



What is it the solution?

How good is the solution?



Throughput:

- Achieve line rate for MTU sized packets with single core.
- Leverage multiple cores to achieve line rate minimum sized packets.

Latency:

- Minimum RTT latency of ~16 usec

Synchronization:

- Can offer sub-microsecond synchronization for sending packets.