Life at a Networking Hardware Vendor
[Keeping up with the Joneses]

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Defined: **Keeping up with the Joneses**

- Comparing yourself with your neighbors (surname ‘Jones’ is used to reference a generic neighbor) as a benchmark for social class or achievement.
- In this context it would reference make sure networking hardware or software support for hardware matches or beats that of other vendors.
Broadcom makes lots of different networking hardware
This talk is not about wireless hardware
This talk is not about switching hardware
This talk is about NIC hardware
Broadcom’s goal is to sell as many NICs as possible
${VENDOR}’s goal is to sell as many NICs as possible
To sell the most hardware you *might* need to build the *best* hardware.
Define best...
Highest Packets Per Second?
Lowest Power Consumption?
Lowest Price?
Most Offloads?
Least Offloads?
Most ARM/RISC-V cores?
Most programmable FPGA or NPU?
You also might need to make the best firmware and drivers?
Best is different for almost every [potential] customer
With 1500 byte packets, most NICs can send and receive at line-rate (10/25/40/50/100Gbps)
Some can handle line-rate traffic at smaller packet sizes
If you need line rate with 64 byte packets then you need to find a NIC that can handle it
Individual component costs are important
NICs that can offload work from server cores can justify a higher price
Spending more money on a NIC might save money other places
Look closely at the prices for processors as you scale the core density
Checksum Offload and TSO...
...GSO, LRO, Hardware GRO, UFO, RSS, XPS, RPS...
...Tunnel Encap/Decap...
...Flow Offload via Ntuple Filters or CLS Flower...
...TLS Offload...
...XDP/BPF Offload...
...Control Plane Offload
Seems unlikely that all offloads are being used at the same time.
But vendors need to make sure they can support as many of those as possible
Unless users do not want to offload anything
Some just want the hardware to get out of the way.
Smart or *Dumb Nics*?
Snabb Switch creator would like to see a low-cost *Dumb NIC* with no offload features
General purpose processors on NICs
Gives users the chance to have a “server inside there server”
Turtles Linux all the way down
Offload of control plane and dataplane to Smart NIC instead of using server cores
FRR on the NIC
Open vSwitch on the NIC
XDP/BPF maps and forwarding on the NIC
FRR + XDP for routing on the NIC
Speaking of programmable dataplanes...
FPGAs and NPUs fill the gap left by fixed-function devices
NPUs that allow offload of P4/XDP/BPF dataplane
FPGAs can do anything
Small Matter of Programming
Tough to justify FPGA development cost
Unless you can get your hardware or OS vendor to do it for you...
Best Firmware
Some hardware features are enabled by firmware
Firmware version impacts user experience
Firmware feels like a ‘black box’ even if open source
What makes a driver the best?
Upstream is all that matters
Inbox is all that matters
Out of tree drivers are not going away
Does your driver support...
...all that your hardware supports
Checksum Offload, TSO, GSO, LRO, Hardware GRO, UFO, RSS, XPS, RFS, Tunnel Encap/Decap, Flow Offload, TLS Offload, XDP Offload...
Let’s not forget software dataplane support
DIM
DPDK poll mode driver
DPDK PMD vector support
DPDK rte_flow support
Kernel by-pass generally not preferred
DPDK poll mode driver
AF_XDP
AF_XDP is the new black
Seems simple to make the *best* NIC, right?
What should vendors set as their goal?
Minimize the number of instructions needed to process a packet
Offloading to hardware saves instructions
Optimizing drivers saves instructions
XDP saves instructions
AF_XDP saves instructions
DPDK saves instructions
No single hardware/firmware/driver combination works for everyone
Focus on everything?
Not realistic
What can we do to help users today?
What can we do to enable future users?
Obrigado!