Flow and HQoS Acceleration Over DPDK Using Intel Programmable Acceleration Card N3000

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Agenda

- Key Hardware Features
- DPDK and OPAE
- A Typical Flow and HQoS Acceleration Reference Design
- HQoS Acceleration
- Flow and HQoS Acceleration in DPDK
- Future work
Key Hardware Features

► Intel® Arria® 10 GT1150
  ▪ 8x10GbE, 4x25GbE Network Interfaces
  ▪ Local DDR4 and QDR Memory

► Dual Intel® Ethernet Controller XL710
  ▪ Extensive OS support and Easier system integration
  ▪ XL710 enable and XL710 bypass

► PCIe Interface
  ▪ 2 x PCIe Gen3x8 host interface
  ▪ 2xPCIe Gen3x8 towards the FPGA
  ▪ PCIe Gen3x8 towards each of the XL710
  ▪ PCIe SMBus connected MAX10 and all XL710

► Intel® MAX® 10 CPLD
  ▪ Board power, clocks and reset control
  ▪ Board security and management
DPDK and OPAE

► AFU devices are handled by PMDs
  ▪ AFUs provide acceleration functions
  ▪ AFUs are scanned and probed on the IFPGA bus
► RawDev is a special kind of Drivers to manage FPGA device
  ▪ AFU PCIe MMIO address map
  ▪ OPAE UMD(User Mode Driver) integration
► FPGA management ops are handled by OPAE user space driver
  ▪ Enumerate/identify AFUs on the IFPGA bus
  ▪ FPGA thermal/power management
  ▪ FPGA performance reporting
  ▪ AFU PR (when HW support is available)
A Typical Flow and HQoS Acc. Reference Design

- **Ingress Flow Partial Offload**
  - Flow search data in metadata
  - DPDK parse metadata

- **Egress Flow Based HQoS**
  - Flow is identified by Queue ID
  - DPDK Pipeline Handle other Packet Processing
HQoS Acceleration

► Capacity
  ▪ Policing
  ▪ Congestion Control
  ▪ Scheduling and Shaping

► Queuing
  ▪ Flow match for Queue ID
  ▪ Queue ID in Metadata
  ▪ Thousands of Queue Number

► Configuration
  ▪ Follow Rte_tm API
  ▪ Testpmd and Example APP
Flow and HQoS Acc. in DPDK

- I40e PMD handles Packet TX/RX in XL710 enable mode
  - New PF Device ID
  - Reuse current code
  - Binding I40e PF to FPGA Port
- AFU PMDs provide data plane control path
  - Binding FPGA Port to I40e PF
  - Implement HQoS and Flow Acceleration
  - Follow librte_ethdev API
- DPDK Test APP
  - Simple Test APP for HQoS, Flow and Packet TX/RX
Future work

► Enable more workload
  ▪ vBNG/vBRAS
  ▪ 5G FlexRan
  ▪ vRouter

► PAC N3000 Power Management
Thanks