Optimized Packet Distribution Library

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Agenda

• **Problem** – How to distribute workload across cores

• **Solution** – OPDL high level design

• **Characteristics of OPDL** – low latency, in order, asynchronous

• **Simple Example** - IPSEC in-bound processing

• **Next Steps** – Future Work
Problem and Challenge

- Stringent latency and high throughput
- Minimizing cross core costs
- Re-Order, Asynchronous
- Centralized distributor
- Scalability, Flexibility
Flow Distribution Type

• Parallel
  • Packets from same flow can be distributed to multiple cores
  • Without Ordering

• Ordered
  • Packets from same flow can be distributed to multiple cores
  • With Ordering

• Atomic
  • Only one packet from same flow is processed at a time
DPDK Packet Distributor

- Very efficient for high volume small packets with synchronous work load
- Centralized distributor, Dedicated Core
- Round Robin to worker cores
- Atomic, and Parallel (un-ordered)
- Buffer Pointer will be send back to Distributor
- Asynchronous operation can be very complex
Optimized Packet Distributor

- No multiple queue cost, decentralized distributor
- Stage topology is configurable and extremely flexible.
- All packets are maintained in order
- Using meta-data to synchronize stages within an application
- Support ATOMIC/ORDERED method
- Stage instance and Core mapping is flexible.
- Support asynchronous device seamless. (E.g. Crypto Dev)
OPDL APIs

- **OPDL_init()**
  - Invocate stage initialization handler call back function

- **OPDL_claim()**
  - Claim available slot from OPDL Ring

- **OPDL_Processing()**
  - Invocate stage packet processing handler call back function

- **OPDL_disclaim_n()**
  - Can do partial disclaim to handler asynchronies device
Example: Simple IPSEC In-bound Processing

- RX is atomic stage. RX will poll packet from port/queue and put packet into the OPDL Ring slot.

- Pre Processing stage is atomic. SA look-up, esn processing, put sequence number into meta data.

- Decryption Stage is Ordered, there are 2 instances, processing the packet based on modulo.

- Post Processing will do de capsule first then apply Acl rules against the decrypted packet.
Example: Single large SA & Multiple unevenly distributed SA’s

RTC
• Single SA - Load is distributed according to SA throughput (not evenly distributed across cores)
• External Load Balancer required

OPDL
• Multiple SA - Can scale to max capacity (function of #cores)
• Load is distributed evenly across all available cores
Future Work

- Looking for opportunity of up-streaming OPDL to DPDK mainstream repository
- Optimization research for multiple workload
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Q&A

Thanks!!

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