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OVS DPDK MTU configuration

- OVS DPDK Uses DPDK 17.11 LTS.
- 3 stages to setting the MTU of a device.

Validate Frame Length
Create Mempool
Configure & Initialize DPDK Device
OVS DPDK MTU configuration

- OVS DPDK Uses DPDK 17.11 LTS.
- 3 stages to setting the MTU of a device.

**Validate Frame Length**
- Requested MTU represents layer 3 MTU.
- Must account for layer 2 header and CRC.
- Ensure overall frame length of the requested MTU does not surpass the NETDEV_DPDK_MAX_PKT_LEN (9728 B).
OVS DPDK MTU configuration

- OVS DPDK Uses DPDK 17.11 LTS.
- 3 stages to setting the MTU of a device.

Create Mempool
- Requested MTU directly affects mbuf size.
- Mbuf size calculated as ‘Requested mtu + L2 headers + CRC + RTE_PKTMBUF_HEADROOM’
- Round final value to be multiple of 1024.
OVS DPDK MTU configuration

- Note: OVS DPDK Uses DPDK 17.11 LTS.
- 3 stages to setting the MTU of a device.

- Configure & Initialize DPDK Device
  - **Device stopped** as part of configuration,
  - MTU is configured with `rte_eth_dev_set_mtu(port_id, mtu)`;
  - Various other configurations (TXQs, RXQs etc.).
  - **Device started** when configuration completes.
Case Study 1: Device specific overhead

IXGBE

- MTU REQUEST 9710

- Frame length Validated. ✓

- Mempool created. ✓

- Device configured & initialized. ✓
Case Study 1: Device specific overhead cont.

IXGBE

- MTU REQUEST 9710
- Frame length Validated. ✓
- Mempool created. ✓
- Device configured & initialized. ✓

i40e

- MTU REQUEST 9710
- Frame length Validated. ✓
- Mempool created. ✓
- Device configured & initialized. X

- Interface dpdk0 MTU (9710) setup error: Invalid argument (-EINVAL)
- Why?
Case Study 1: Device specific overhead cont.

**IXGBE**

- Frame length Validated.
- Mempool created.
- MTU + ETHER_HDR_LEN + ETHER_CRC_LEN

**i40e**

- Frame length Validated.
- Mempool created.
- MTU + ETHER_HDR_LEN + ETHER_CRC_LEN + (VLAN_TAG_SIZE * 2)

*Note: RTE_ETH_DEV_SET_MTU() function.*
## Case Study 1: PMD & Associated Overhead

<table>
<thead>
<tr>
<th>PMD</th>
<th>Overhead</th>
<th>Total Bytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>qede</td>
<td>$\text{ETHER_HDR_LEN} + \text{ETHER_CRC_LEN}$</td>
<td>18</td>
</tr>
<tr>
<td>cxgbe</td>
<td>$\text{ETHER_HDR_LEN} + \text{ETHER_CRC_LEN}$</td>
<td>18</td>
</tr>
<tr>
<td>dpaa2</td>
<td>$\text{ETHER_HDR_LEN} + \text{ETHER_CRC_LEN}$</td>
<td>18</td>
</tr>
<tr>
<td>ixgbe</td>
<td>$\text{ETHER_HDR_LEN} + \text{ETHER_CRC_LEN}$</td>
<td>18</td>
</tr>
<tr>
<td>luiquidio</td>
<td>$\text{ETHER_HDR_LEN} + \text{ETHER_CRC_LEN}$</td>
<td>18</td>
</tr>
<tr>
<td>thunderx</td>
<td>$\text{ETHER_HDR_LEN} + \text{ETHER_CRC_LEN}$</td>
<td>18</td>
</tr>
<tr>
<td>em1000</td>
<td>$\text{ETHER_HDR_LEN} + \text{ETHER_CRC_LEN} + \text{VLAN_TAG_SIZE}$</td>
<td>22</td>
</tr>
<tr>
<td>igb</td>
<td>$\text{ETHER_HDR_LEN} + \text{ETHER_CRC_LEN} + \text{VLAN_TAG_SIZE}$</td>
<td>22</td>
</tr>
<tr>
<td>bnxt</td>
<td>$\text{ETHER_HDR_LEN} + \text{ETHER_CRC_LEN} + (\text{VLAN_TAG_SIZE} * 2)$</td>
<td>26</td>
</tr>
<tr>
<td>i40e</td>
<td>$\text{ETHER_HDR_LEN} + \text{ETHER_CRC_LEN} + (\text{VLAN_TAG_SIZE} * 2)$</td>
<td>26</td>
</tr>
<tr>
<td>mrvl</td>
<td>$\text{MV_MH_SIZE} + \text{ETHER_HDR_LEN} + \text{ETHER_CRC_LEN}$</td>
<td>?</td>
</tr>
</tbody>
</table>
Case Study 1: OVS Solution

OVS Solution

• Must account for vlan * 2 when
  • MTU + ETHER_HDR_LEN + ETHER_CRC_LEN + (VLAN_TAG_SIZE * 2) > NETDEV_DPDK_MAX_PKT_LEN
Case Study 1: OVS Solution cont.

OVS Solution

- Must account for \( \text{vlan} \times 2 \) when
  - \( \text{MTU} + \text{ETHER_HDR_LEN} + \text{ETHER_CRC_LEN} + (\text{VLAN_TAG_SIZE} \times 2) > \text{NETDEV_DPDK_MAX_PKT_LEN} \)

Problem:
- MTU upper limit will be reduced by 4 or 8 bytes for devices that do not have to account for \( 2 \times \text{VLAN} \) headers in overhead.
Case Study 1: OVS Solution cont.

**OVS Solution**
- Must account for vlan * 2 when
  - \( \text{MTU} + \text{ETHER_HDR_LEN} + \text{ETHER_CRC_LEN} + (\text{VLAN_TAG_SIZE} \times 2) > \text{NETDEV_DPDK_MAX_PKT_LEN} \)

**Problem:**
- MTU upper limit will be reduced by 4 or 8 bytes for devices that do not have to account for 2 * VLAN headers in overhead.

**DPDK Solution**
- Expose device specific overhead for PMDs.
  - **Extend the existing ETH DEV API?**
    - `rte_eth_dev_get_max_mtu(port_id)`
  - **Make info available in rte_eth_dev_info struct?**
Case Study 2: Scatter requirements

• PMDs can require **scatter** explicitly set for jumbo rx.
Case Study 2: Scatter requirements cont.

- PMDs can require `scatter` explicitly set for jumbo rx.

  **i40e**

  - i40e: Not required, handled in `i40e_set_mtu()`.
Case Study 2: Scatter requirements cont.

- PMDs can require **scatter** explicitly set for jumbo rx.

**i40e/ixgbe**

- **i40e**: Not required, handled in `i40e_set_mtu()`.
- **ixgbe**: Required pre DPDK 17.11.
Case Study 2: Scatter requirements cont.

- PMDs can require `scatter` explicitly set for jumbo rx.

i40e/ixgbe/igb

- i40e: Not required, handled in i40e_set_mtu().
- ixgbe: Required pre DPDK 17.11.
- igb: Required.
Case Study 2: Scatter requirements cont.

- PMDs can require `scatter` explicitly set for jumbo rx.

- **i40e/ixgbe/igb/nfp**
  - i40e: Not required, handled in `i40e_set_mtu()`.
  - ixgbe: Required pre DPDK 17.11.
  - igb: Required.
  - nfp: **Not supported**
Case Study 2: OVS Solution

- Check for nfp driver explicitly before enabling scatter.
  - if (strncmp(info.driver_name, "net_nfp", 7))
Case Study 2: OVS Solution cont.

**OVS Solution**

- Check for nfp driver explicitly before enabling scatter.
  - `if (strncmp(info.driver_name, "net_nfp", 7))`

**Problem:**

- Device specific checks introduced to OVS DPDK code base.
- Only resolves issue for nfp PMD.
Case Study 2: OVS Solution cont.

**OVS Solution**
- Check for nfp driver explicitly before enabling scatter.
  - `if (strncmp(info.driver_name, "net_nfp", 7))`

**Problem:**
- Device specific checks introduced to OVS code base.
- Only resolves issue for nfp PMD.

**DPDK Solution**
- Upcoming rx offload capability API.
  - Implemented for nfp in 17.11, missing for ixgbe/i40e/igb.
  - Handle scatter configuration in class specific mtu_set functions.
Case Study 3: Device configuration state requirements

- Device stopped
- MTU configured with `rte_eth_dev_set_mtu();`
- Device started
Configure & Initialize DPDK Device

- Device stopped
- MTU configured with `rte_eth_dev_set_mtu();`
- Device started

**i40e/ixgbe/qede**

- i40e: Device must be stopped.
- ixgbe: Stopped if scatter required.
- qede: **Must be active** (pre 17.11.)
  - Explicit stop/start device within `set_mtu()`
Case Study 3: OVS Solution

- No work around, change required in DPDK.
- Change implemented in qede set_mtu logic in DPDK 17.11, backported to 16.11.
Case Study 3: OVS Solution cont.

OVS Solution

- No work around, change required in DPDK.
- Change implemented in qede set_mtu logic in DPDK 17.11, backported to 16.11.

Problem:

- QEDE pmd not supported for OVS 2.8, uses DPDK 17.05 (Non LTS).
Case Study 3: OVS Solution cont.

**OVS Solution**
- No work around, change required in DPDK.
- Change implemented in qede set_mtu logic in DPDK 17.11, backported to 16.11.

**Problem:**
- QEDE pmd not supported for OVS 2.8, uses DPDK 17.05 (Non LTS).

**DPDK Solution**
- Solution already in place.
- Underlying behaviour should be uniform across PMDs.
Conclusion/Discussion

• Ethdev API helps OVS DPDK be hardware agnostic.

• Corner cases can exist e.g. behavior regarding `rte_eth_dev_set_mtu()`.

• Solutions to avoid such cases
  • Expose device specific overhead via API extension or device info.
  • Expose device capabilities.
  • Follow uniform behavior in underlying API implementations.
Questions?

Email: ian.stokes@intel.com
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