Advanced Computer Networking (ACN)

IN2097

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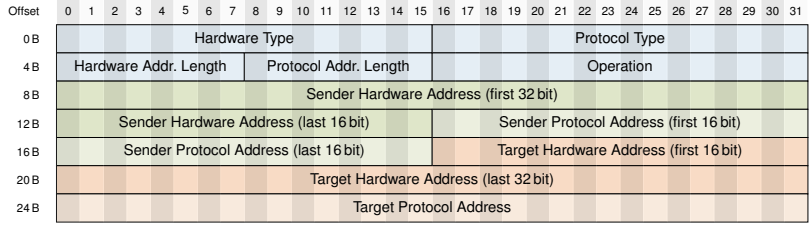
Project—Problem 2: Common Mistakes

Memory Management

- Buffers must be freed to be able to recycle them
- Freeing buffers:
  - `rte_eth_tx_burst()`, automatically frees
  - if a packet is dropped, buffer must be freed manually (`rte_pktmbuf_free()`)

- Common mistakes:
  - Packets were not freed in case of malformed ARP
  - Packets were not freed in case of unknown protocol, e.g. IPv6
  - All packets were freed:
    - Packets were freed twice (after sending and with the additional free)
    - Trying to send already freed packets

Project—Problem 2: Common Mistakes
ARP



ARP header

- All of you recycled the ARP request to create the ARP reply
- Basic operations to perform:
  - Check Ethertype (0x0806) of Ethernet frame
  - Check if the ARP request addresses one of the router's own IP addresses
  - Check ARP Operation code (0x0001)
  - Other address types/address lengths remain (everyone got that right)
  - Change sender addresses (MAC addr and IP addr of the router)
  - Change target addresses (MAC addr and IP addr of the client)
- ARP request, typically Ethernet broadcast (destination MAC `ff:ff:ff:ff:ff:ff`)
- ARP reply, unicast

Project—Problem 2: Common Mistakes
IPv4

1. Check packet length of link layer (min. 20 bytes).
2. The IP checksum must be correct (software or hardware, but check if it is enabled)
3. The IP version number must be 4
4. The IP header length field must be large enough (min. 20 bytes = 5 words).
5. The IP total length field must be large enough to hold the IP datagram header, whose length is specified in the IP header length field.

Project—Problem 2: Common Mistakes
IPv4 TTL

```
ttl -= 1;

if (ttl == 0) free_buffer();
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- Packet with ttl = 0 arrives (should not happen but some routers are designed badly)
- Decrementing 0 -> wrap around -> packet is sent out
- Packets do not expire and could be routed indefinitely

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Correct solution check before decrementing

```
if (ttl <= 1) free_buffer();
ttl -= 1;
```

Project—Problem 2: Common Mistakes
MAC address handling

- Router needs to update the dest MAC addr with the one returned by the routing table
- Router should also update the src MAC addr of the sent frames
- Common mistakes:
  - Only dst MAC addr was set, src MAC addr was not changed
  - Src MAC addr was set to the MAC addr of the network port the frame was received (but it should be set to the MAC addr of the egress port)
  - You can use the src MAC addr of the router's egress port