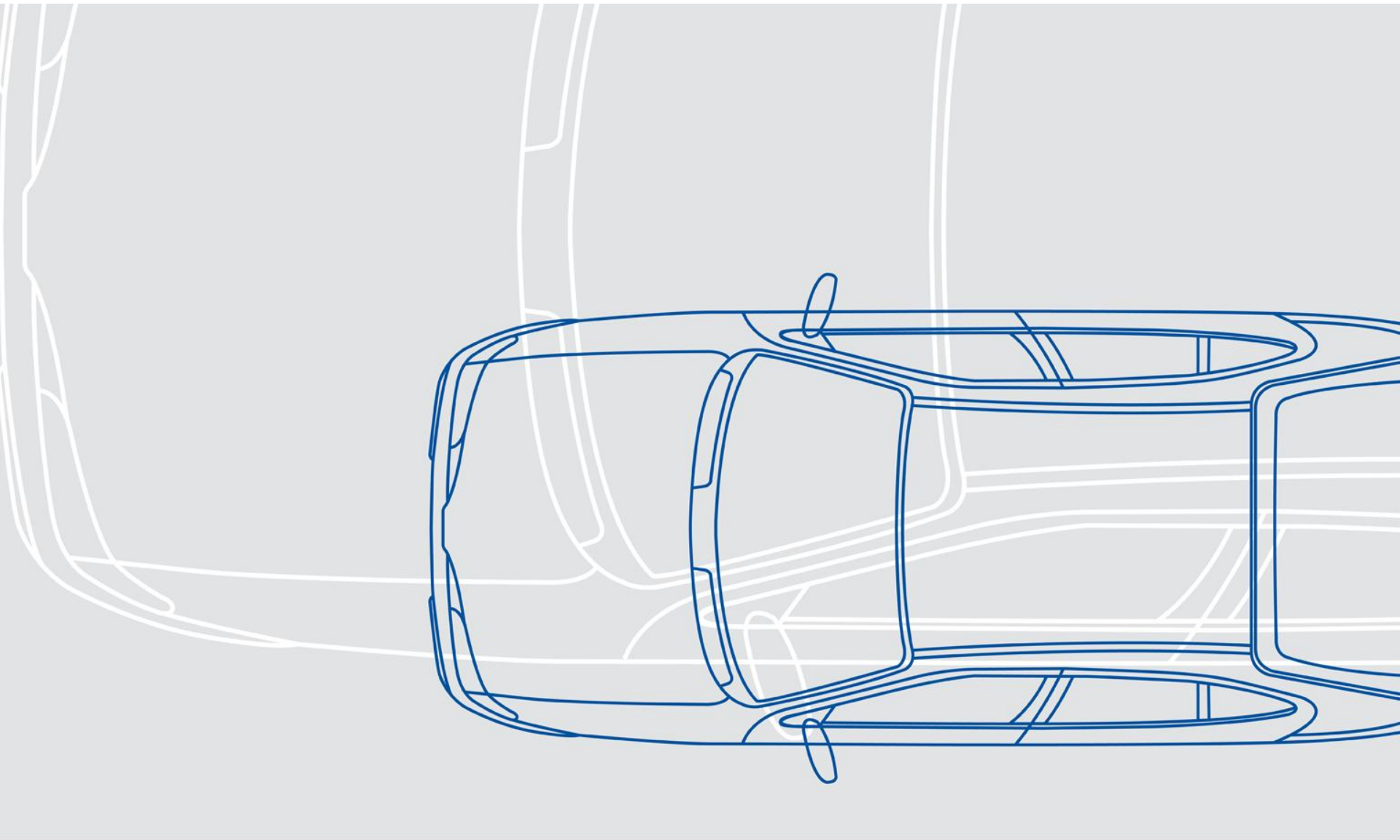
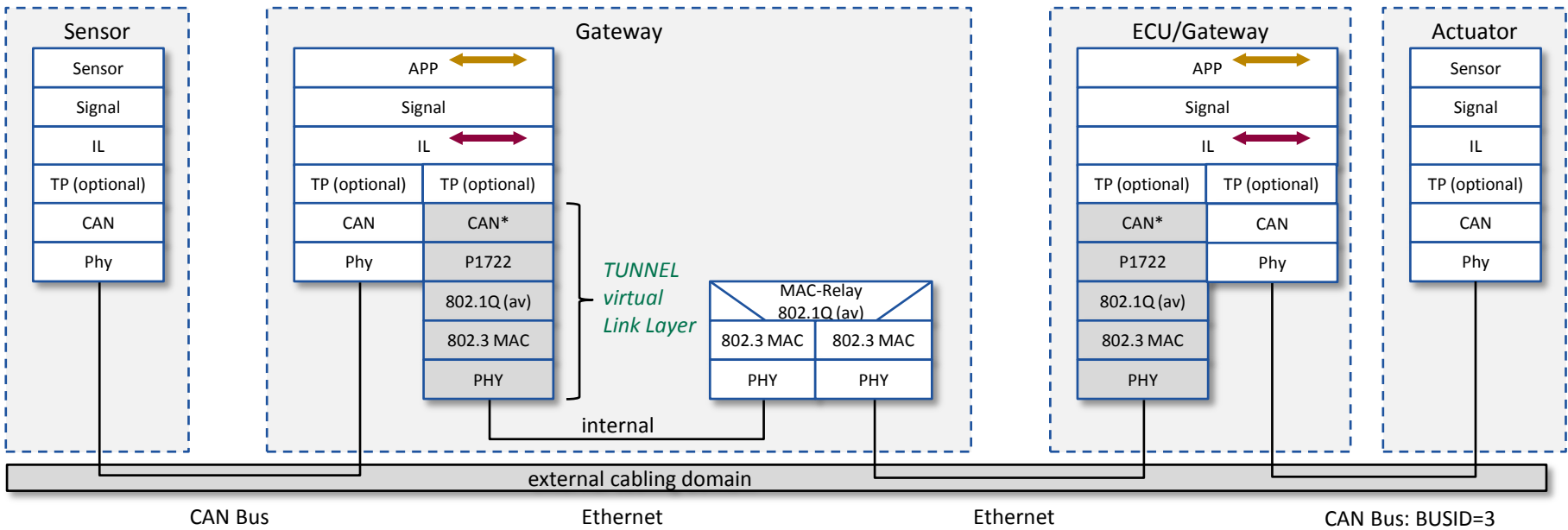


Control Frame Transport Proposal Version 3

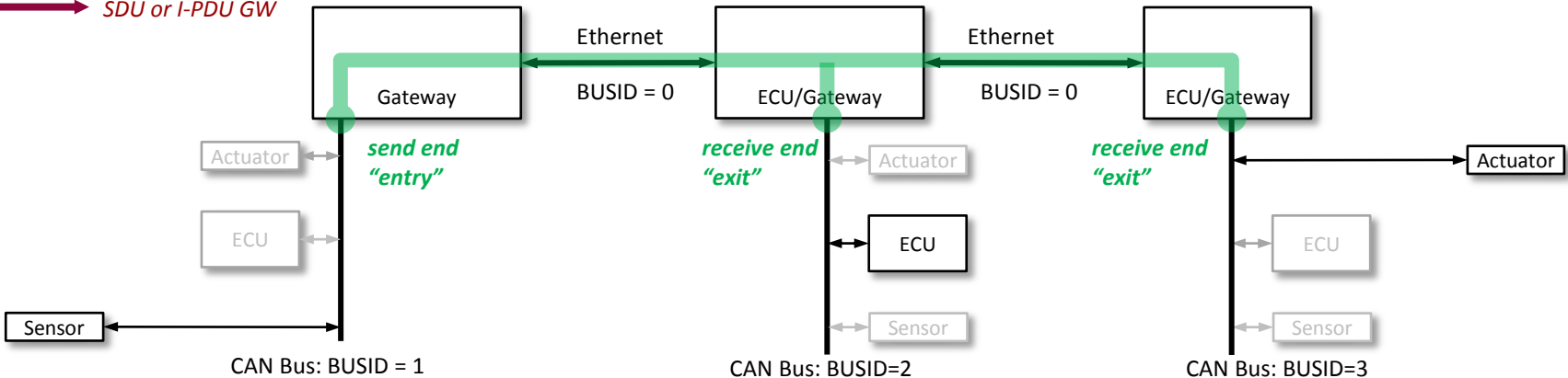


- AVTP control streams extend automotive busses CAN, FlexRay and LIN using “virtual busses”
- Tunneling of automotive control frames via AVTP can viewed from an ECU perspective as a “virtual automotive bus link layer”
- The “virtual link layer” emulates the “standard” or “physical link layer” behavior:
 1. native multicast medium rules
 - 1.1 Sender presents it’s data based on a frame ID to every node on the bus.
 - map incoming automotive bus frame ID to AVTP stream (Ethernet multicast group address + stream ID).
 - 1.2 Receiver decides by frame ID filters which frames to process.
 - subscribe to AVTP stream (Listener, Ethernet multicast group address + stream ID)
 - filter desired automotive bus frame IDs
 2. bus specific media access control rules
 - 2.1 Must be handled in the physical link layer at the wire’s receive end (tunnel exit)
 - CAN: priority based medium access (CSMA)
 - FLX: flexible time division multiplex + dynamic time slots (FTDMA)
 - LIN: single master, delegated sender token
 - 2.2 Ensure that the congestion occurs only at the receive end of the “virtual bus”. Priority inversion is a congestion phenomena and is handled at the receive side of the “virtual bus”.
 - Provide sufficient Ethernet stream bandwidth
 - Provide sufficient media specific buffers at the receive side of the “virtual bus” to avoid priority inversion.



↔ SIGNAL GW
↔ SDU or I-PDU GW

Virtual Bus:= Virtual CAN Link Layer



– Message Passing Gateway (section 10.3.1)

- The current address mapping defines direct station addressing and a default gateway approach similar to IP for routing automotive control frames. This contradicts to automotive bus paradigms where a message is principally exposed to multiple potential receivers (also gateways).
- **Proposed Change:** Remove mapping parameter *Dest Bus Id*. Replace mapping parameter *Dest MAC* by traffic descriptor, where the traffic descriptor describes the Ethernet transport mechanism, e.g. the multicast AVTP stream, a unicast destination MAC address or even IP based transport mechanisms.

– Data Encapsulation Gateway (section 10.3.2)

- The current standard version states that no message map is required. However, the automotive bus paradigms require to distribute a single bus towards multiple destination busses.
- **Proposed Change:** Provide the possibility to map the source bus to a traffic descriptor similar to the message passing gateway, e.g. the multicast AVTP stream, a unicast destination MAC address of a peer gateway or even IP based transport mechanisms.

– **Minimize Assembly Latency**

- Collecting multiple automotive control frames into a single AVTP transport frame produces latency (need to wait for serialized frames)
- Allow to collect automotive control frames from MULTIPLE busses of the SAME type into a SINGLE AVTP transport frame. This is already covered by current P1722a.
- **Proposed Change:** Include field protocol type into EACH single control frame message TLV.
 - Extend P1722a to collect control frames from MULTIPLE busses of ANY type into a SINGLE AVTP transport frame. This is not yet covered by current P1722a.

– **Field Message Time Stamp**

- P1722a-D2 defined a single message time stamp for all control frame message TLVs. This is not meaningful.
- This has already be included in newest P1722a proposal (2012-07-30).

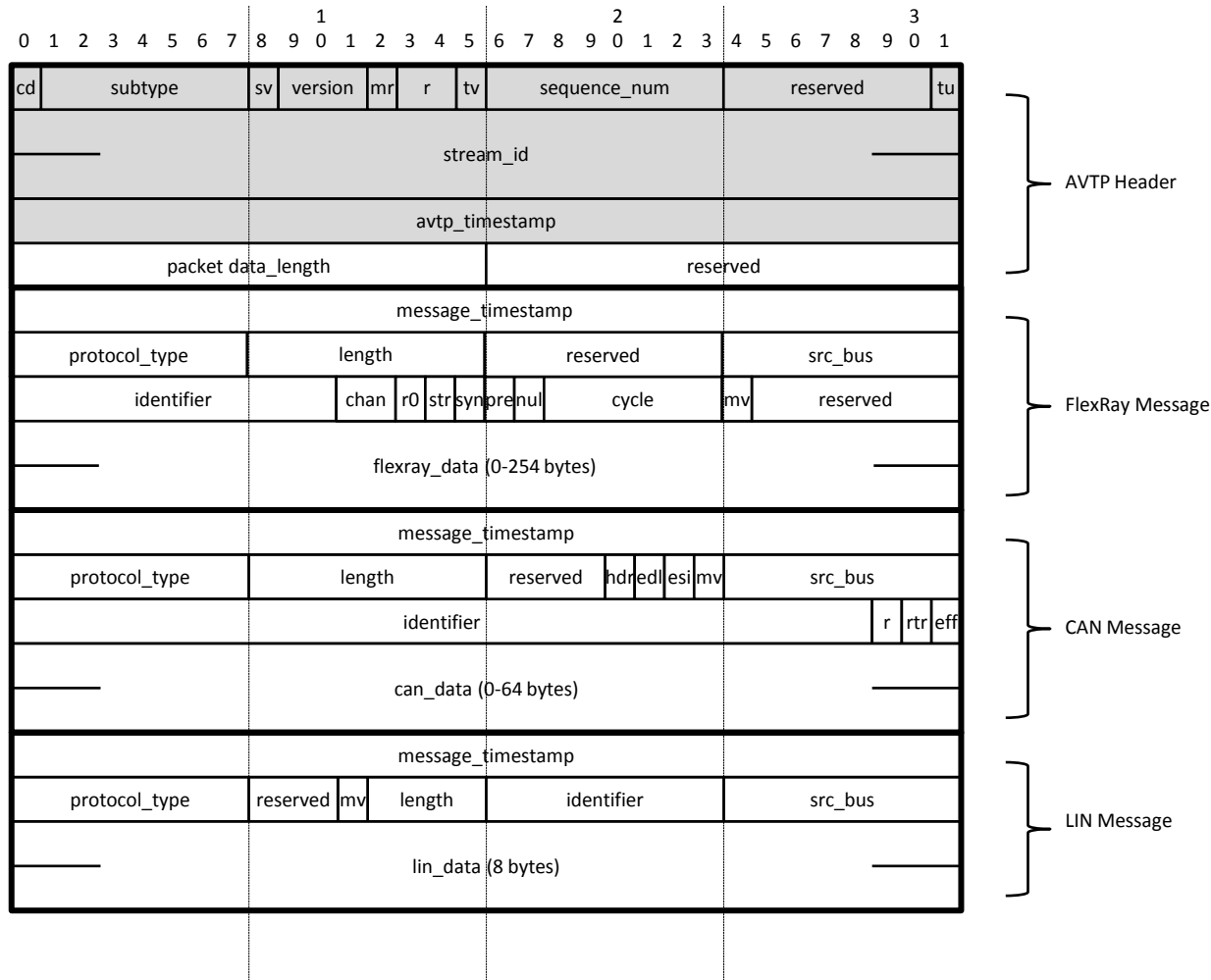
– Field *num_messages*

- This field opens a new store and forward context in the AVTP client layer (need to count automotive control frames and hand over to service layer).
- It cannot avoid the necessity to iterate over variable length control frame message TLVs.
- **Proposed Change:** Remove field *num_messages* from specification. Alternative: define *num_messages* as optional (*num_messages* := 0 means field not set)

– Field *dst_bus* (Destination Bus ID)

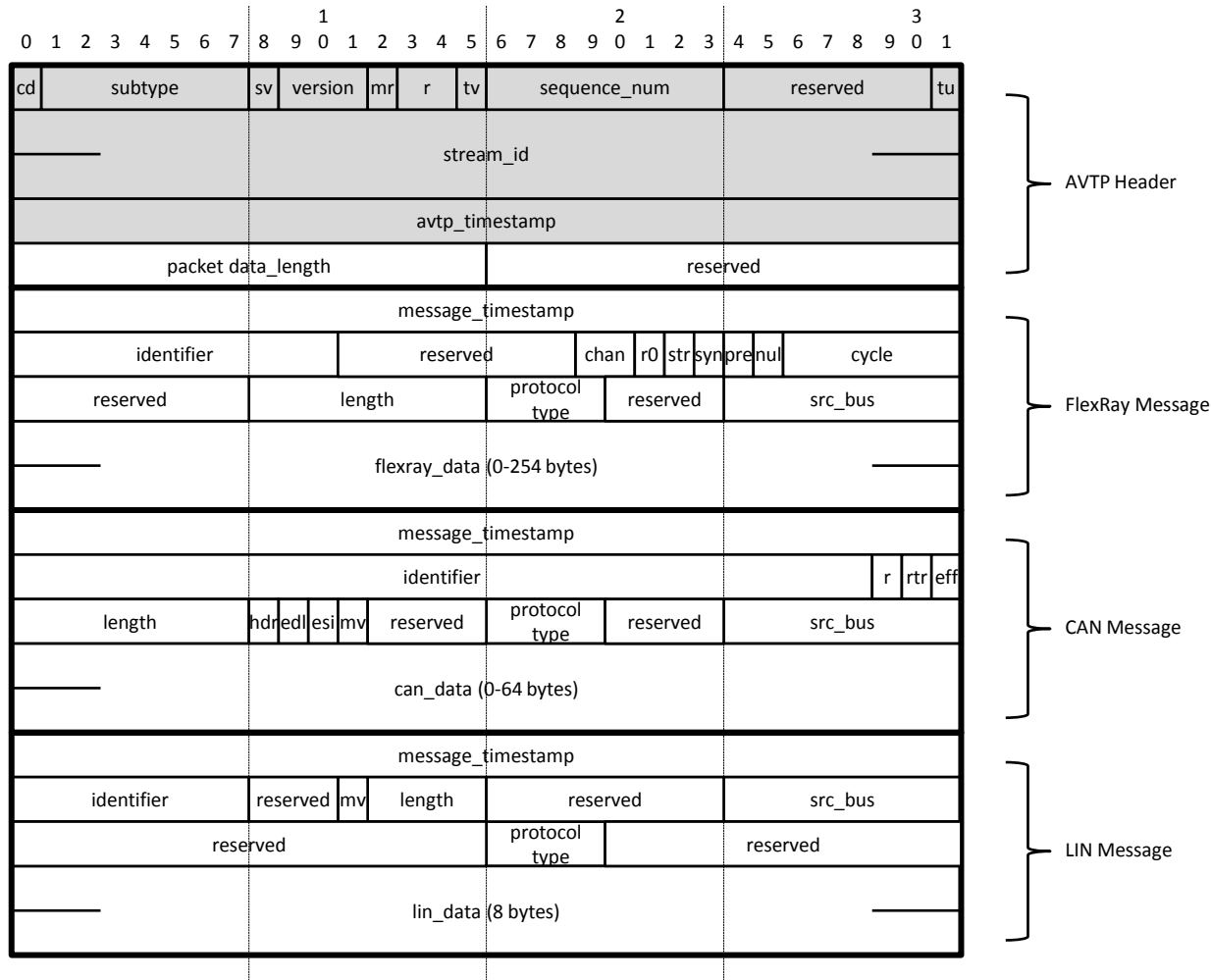
- The field *dst_bus* breaks automotive bus paradigms, which define automotive busses as native multicast media and defines receive side filter mechanisms. For instance, the field does not allow to multicast a control frame to multiple destination busses. It also contradicts to Ethernet's native multicast properties.
- **Proposed Change:** Remove field *dst_bus* from specification. Note, that *src_bus* is meaningful. Introduce an appropriate sender configuration mapping which allows to map frame IDs to transport descriptors. Introduce an appropriate receiver configuration which introduces subscription to a transport descriptor. A transport descriptor is basically the description of AVTP Ethernet stream. Does it make sense to communicate the sender mapping in a new field replacing *dst_bus*?

Proposed control frame messages – Option A



- Important Rule: *protocol_type* must have the same offset for all messages
- Option A: *protocol_type* and *length* at fixed positions for efficient parsing

Proposed control frame messages – Option B



- Important Rule: *protocol_type* must have the same offset for all messages
- Option B: minimum change of current frame format