LLC Type 3 as VDP Transport
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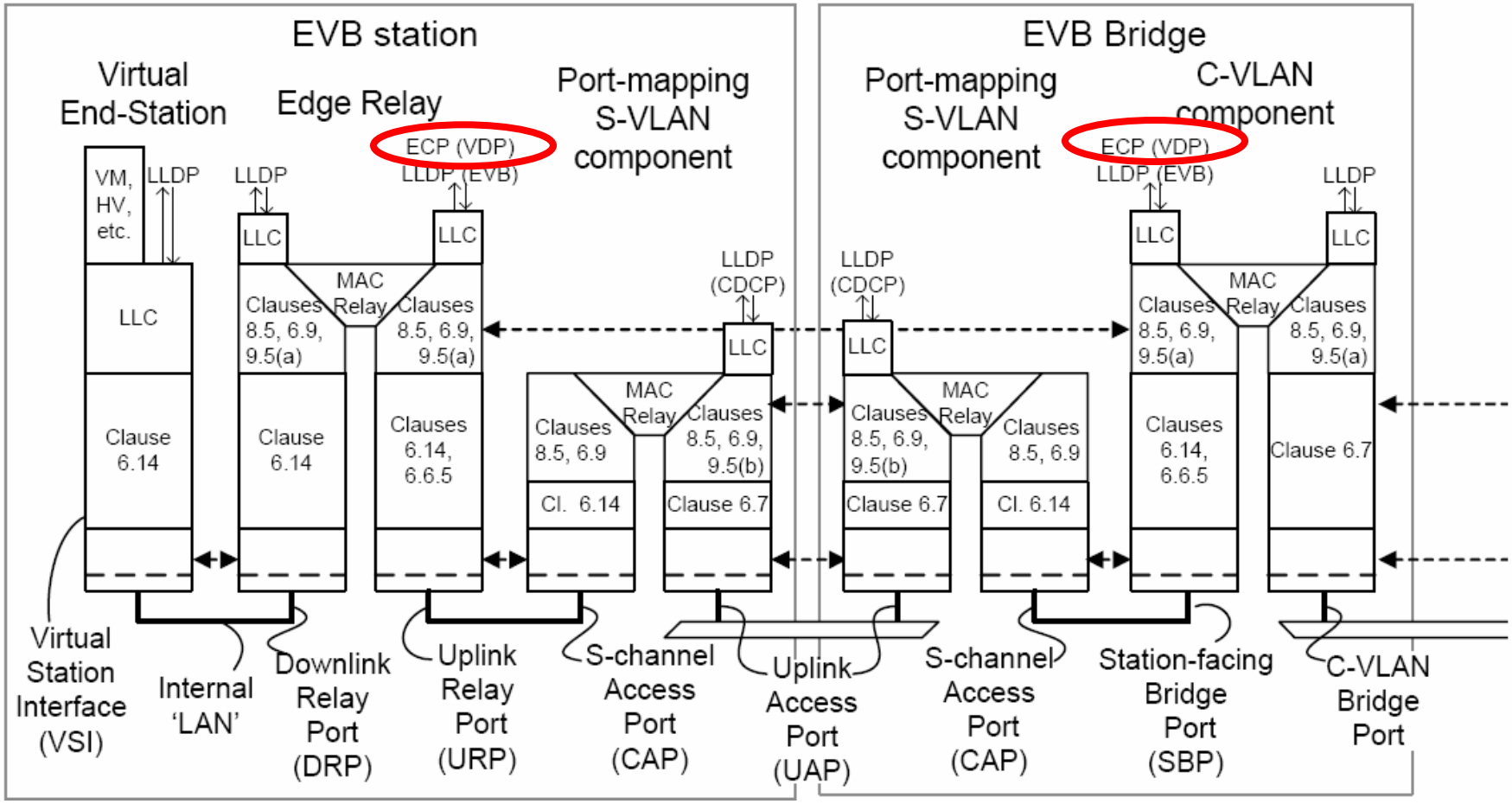
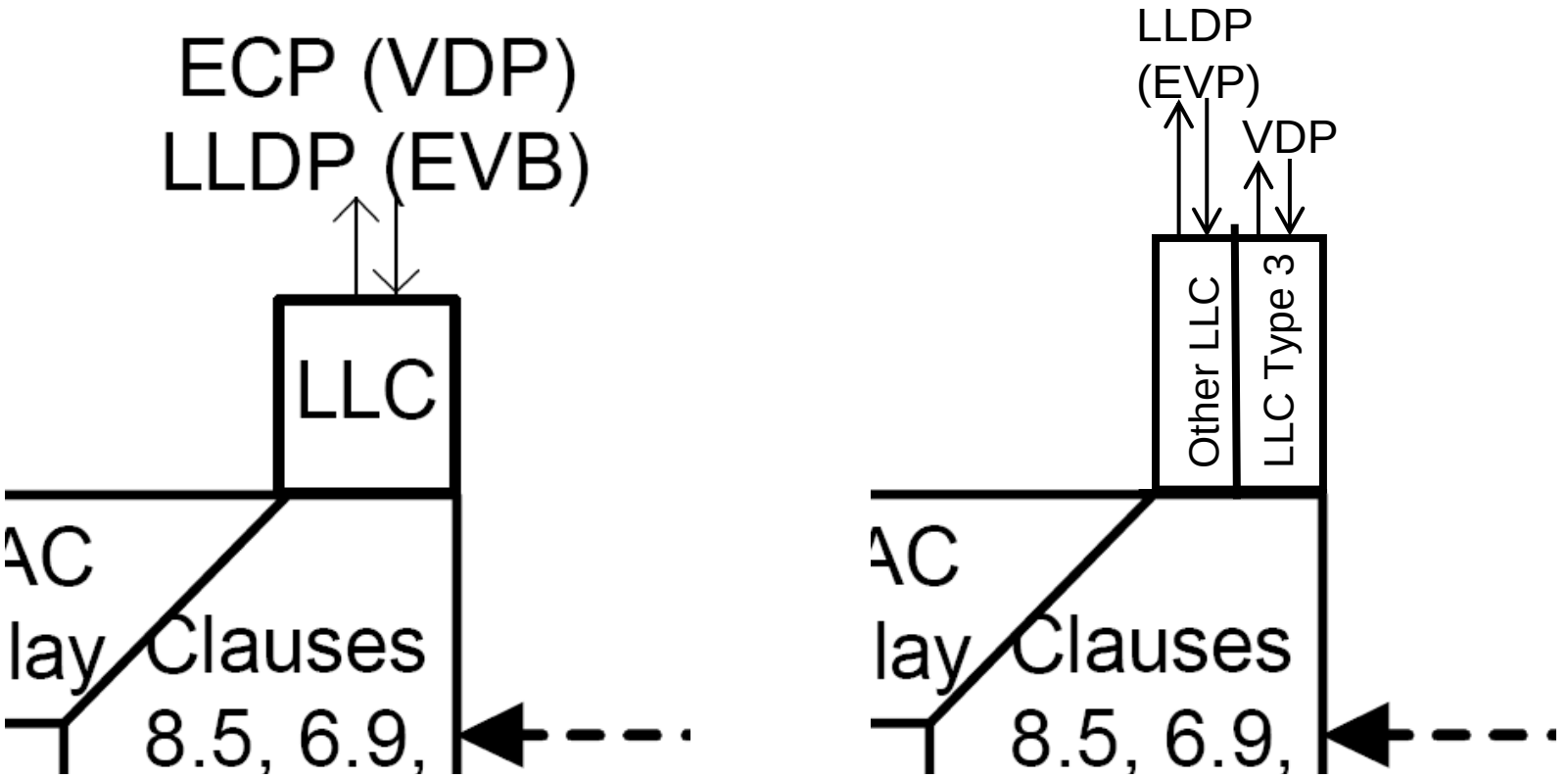
Current Baggy Pants



- Qbg baggy-pants shows VDP transport over ECP;
- VDP 'in the right place' to use LLC (Type 3) directly;

Using LLC Type 3



- LLC Type 1 Unacknowledged Datagram Service generally assumed;
- But LLC Type 3 Acknowledged Datagram Service is also defined by .2;
- Hypothesis: LLC Type 3 provides *all* functions needed by VDP and supported by ECP;
  - Easy to disprove with one appropriate counterexample
  - Can someone supply the counterexample (at or before San Francisco)?

Acknowledged connectionless-mode services

- The acknowledged connectionless-mode data unit exchange services provide the means by which network layer entities can exchange link service data units (LSDUs) that are acknowledged at the LLC sublayer, without the establishment of a data link connection. The services provide a means by which a network layer entity at one station can send a data unit to another station, request a previously prepared data unit from another station, or exchange data units with another station. The data unit transfer is point-to-point.

ECP Operation

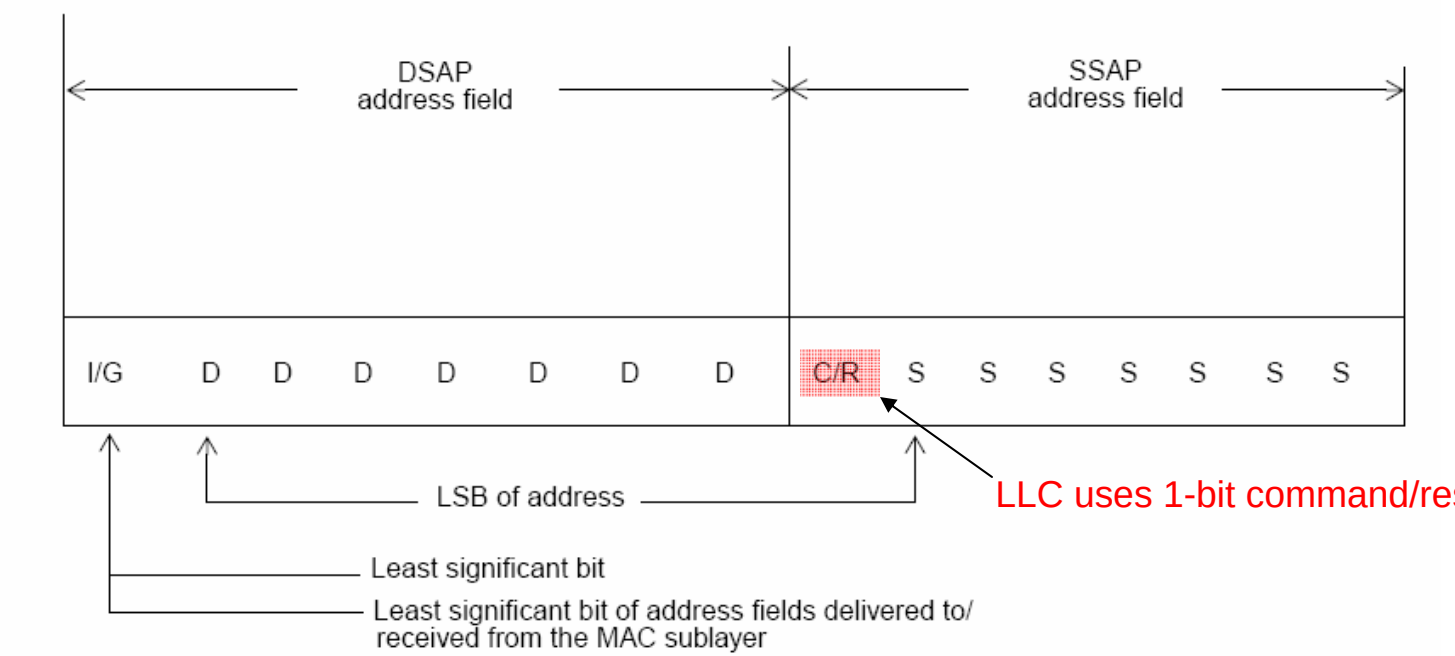
- The ECP is intended to operate between two peers over an IEEE 802 LAN. ECP delivers the following service characteristics:
- a) Reliable delivery of ULP PDUs, resilient against frame loss. The value of the *maxRetries* parameter determines the number of sequential lost frames that the protocol can sustain.
- b) Delivery of ULP PDUs to the recipient ULP in the order that they were transmitted by the sending ULP.
- c) Delivery of a single copy of each ULP PDU to the recipient.
- d) Flow control that provides protection against buffer overrun on the receive side.

LLC Type 3 PDU Format

DSAP address	SSAP address	Control	Information
8 bits	8 bits	8 ~~or 16 bits~~	M*8 bits

DSAP address	=	Destination service access point address field
SSAP address	=	Source service access point address field
Control	=	Control field [16 bits for formats that include sequence numbering, and 8 bits for formats that do not (see 5.2)]
Information	=	Information field
*	=	Multiplication
M	=	An integer value equal to or greater than 0. (Upper bound of M is a function of the medium access control methodology used.)

Comparing request/response



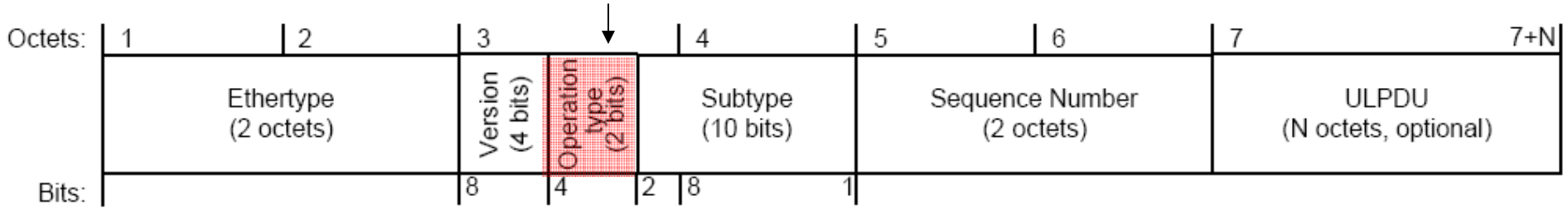
I/G = 0 Individual DSAP
I/G = 1 Group DSAP
C/R = 0 Command
C/R = 1 Response

43.3.3.3 Operation type

A 2-bit field that identifies the operation type:

a) ECP request (0x0).
b) ECP acknowledgement (0x1).

ECP defines 2 bits but only one bit actually used



Subtypes

43.3.3.4 Sub-type

A 10-bit field that defines the ULP type included in the PDU. For ACKs the sub-type is ignored at the station. The sub-type used by VDP is as shown in Table 43-1.

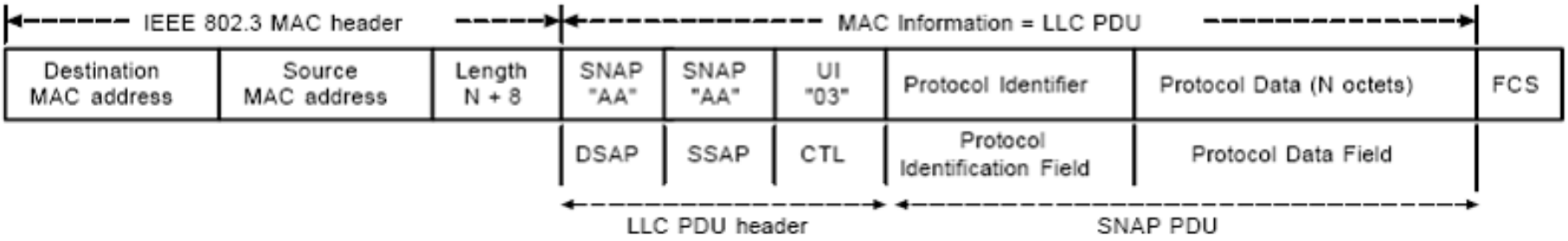
Table 43-1—ECP sub-types

Use	Sub-type
VDP	0x0001
Reserved for future standardization	All other values

ECP provides 10-bit 'subtype' to allow transport to be shared by multiple protocols (e.g. VDP and Qbh protocol). LLC uses DSAP/SSAP to distinguish.

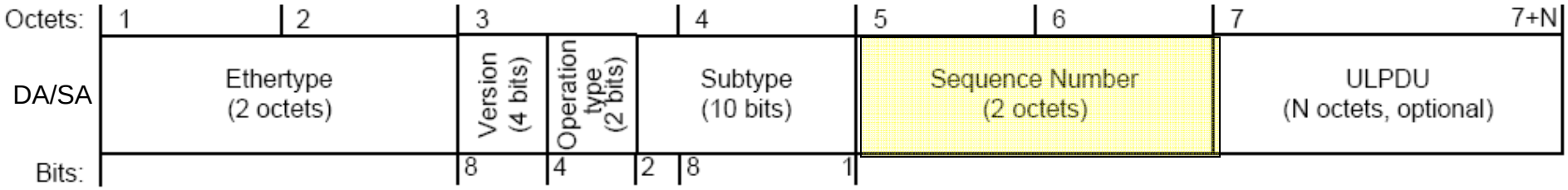
DSAP address	SSAP address	Control	Information
8 bits	8 bits	8 or 16 bits	M*8 bits

Or use a SNAP Header



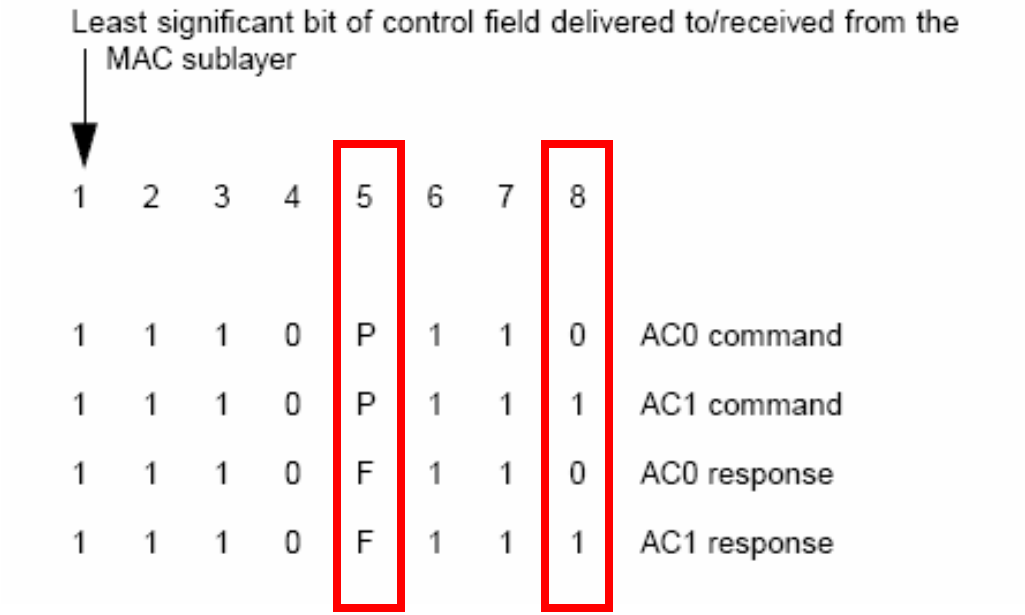
- But maybe we don’t want to assign scarce SAPs for this purpose;
- So we use a SNAP header and assign an Ethertype to each user (e.g. VDP)
  - Or, I suppose, multiple users of LLC Type 3 could share an Ethertype by providing a subtype, but it’s not clear to me that this is worth the trouble;

2-octet vs 1-bit sequence number



- A mechanism of alternating code-points in successive PDUs in Type 3 operation provides a one-bit sequence number functionality that allows the LLC receiving a command PDU to differentiate between a new PDU and a second copy of a previously received PDU.
- Further, the LLC receiving an acknowledgment PDU can ensure that the acknowledgment refers to the last sent information PDU.
- A previous acknowledgment that incurred excessive delay is thus ignored.

The LLC Type 3 1-bit sequence number



1	2	3	4	5	6	7	8	
1	1	1	0	P	1	1	0	AC0 command
1	1	1	0	P	1	1	1	AC1 command
1	1	1	0	F	1	1	0	AC0 response
1	1	1	0	F	1	1	1	AC1 response

- **5.3.3.1.1 Transmit sequence state variable V(SI)**
- The LLC shall be able to maintain one transmit sequence state variable V(SI) for each unique combination of DA portion of the remote address, SSAP portion of the local address, and MAC priority used for sending Type 3 command PDUs.
- This variable shall only take on the values of zero and one **and shall be set equal to bit eight of the code-point used for the last Type 3 response PDU received with the associated address pair and priority**.

The LLC Type 3 1-bit sequence number

Operation	Command	Response	Format	Control Field Hex. Value
Type 1 (CL)	Unnumbered Information (UI)		Unnumbered (U)	03
	Exchange Identification (XI)	Exchange Identification (XI)	Unnumbered (U)	AF, BF
	Test (TEST)	Test (TEST)	Unnumbered (U)	E, F3
Type 2 (CO)	Information (I)	Information (I)	Information (I)	00 00 to FE FF
	Receiver Ready (RR)	Receiver Ready (RR)	Supervisory (S)	01 00 to 01 FF
	Receiver Not Ready (RNR)	Receiver Not Ready (RNR)	Supervisory (S)	05 00 to 05 FF
	Reject (REJ)	Reject (REJ)	Supervisory (S)	09 00 to 09 FF
	Set Asynchronous Balance Mode Extended (SABME)	Unnumbered Acknowledgement (UA)	Unnumbered (U)	6F, 7F (SABME) and 63, 73 (UA)
	Disconnect (DISC)	Disconnected Mode (DM)	Unnumbered (U)	43, 53 (DISC) and 0F, 1F (DM)
		Frame Reject (FRMR)	Unnumbered (U)	87, 97
Type 3 (AC)	Ack Connectionless, seq 0 (AC0)	Ack Connectionless, seq 0 (AC0)	Unnumbered (U)	67, F7
	Ack Connectionless, seq 0 (AC1)	Ack Connectionless, seq 0 (AC1)	Unnumbered (U)	E7, F7

Proposal

- VDP provides the means to manage the association between a VSI and an SBP. Each uplink relay port and each Station-facing Bridge Port has an instance of Edge Control Protocol (ECP, Clause 43) used to support the VDP. These instances of ECP use the Nearest Customer Bridge address as the destination for frames exchanged between the URP and SBP. A VDP entity packs and unpacks VDP TLVs into PDUs that are handed to ECP for delivery. ECP provides reliable delivery of VDP SDUs.
- VDP provides the means to manage the association between a VSI and an SBP. VDP PDUs are exchanged via LLC Type 3. A VDP entity packs and unpacks VDP TLVs into PDUs that are handed to ECP for delivery. LLC Type 3 provides reliable delivery of VDP SDUs.
- Delete clause 43