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G.3.6.1 Example of Data Link Layer PDU. The Data Link Layer PDU consists of the Transmission Header, Data Link Frame Header, Followed by the information field and Data Link Frame Trailer as shown in Figure G-21. The information field consists of the Network PDU described previously (VMF message, Application Header, Transport Header, IP Header and Intranet Header).

Table G-8 illustrates the Data Link Frame Header, and Table G-9 illustrates the Data Link Frame Trailer. The first four columns of the tables provide a description of each field in the example, the field length in bits, and the value of the field in both decimal and binary representations. The last three columns show the *bit serial* physical ~~encoding~~ *Transmission order* of the Data Link Frame *as a sequence of octets with the bits of each octet transmitted LSB first*. In the fifth column, Field Fragments, the bits of each field are placed in octets*, in accordance with* paragraph *5.3.4.3.1*. The bit(s) of each field*, other than the FCS field,* are positioned in an octet such that the LSB of the field is positioned in the least significant unencoded bit of the octet, the next LSB of the field is placed in the next least significant unencoded bit of the octet, and repeated until all of the bits of the field have been encoded. *The bit(s) of FCS fields are positioned in an octet such that the MSB of the field is positioned in the least significant unencoded bit of the octet, the next MSB of the FCS field is placed in the next least significant unencoded bit of the octet, and repeated until all of the bits of the FCS field have been encoded.* When an octet is filled before all the bits of a field are encoded, the process is continued encoding the next octet with the remaining bits of the field. This field/octet encoding procedure is performed starting with the first field and octet, and repeated for each successive field and individual octet, in order, until the encoding is completed. The sixth column, Octet Value - Binary, assembles the bits contributed by successive fields into complete octets, represented in binary *and transmitted LSB first*. The last column, Octet Number, numbers the octets *in the order in which they will be transmitted,* from first to last starting with 0.

Table G-10 illustrates the octets comprising the Data Link Frame showing the actual bit ~~patterns~~ *serial physical transmission order of fields* from the previous examples for each layer, the octet number based on each individual layer, and the octet number based on entire Data Link Frame. *The first column, labeled Octet Value - Binary, shows the bits contributed by successive fields as completed octets represented in binary and transmitted LSB first. The last column, Octet Number (Entire Transaction), numbers the octets in the order in which they will be transmitted, from first to last octet starting with 0.* This data is shown in serial representation as it would be transmitted in Figure G-22.

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TABLE G-8. Example construction of data link frame header.

Field Name	Length	Value (Dec)	Value (Binary) 2^n … 2^0	Field Fragments 2^7 … 2^0	Octet Value (Binary) ~~2^n~~ 2^7 … 2^0	Octet Number
Flag	8	126	*0*1111110	*0*1111110	*0*1111110	0
Command/Response Bit	1	0	0	xxxxxxxx0		
Source Address	7	7	*0*000111	*0*000111x	*0*0001110	1
Extension Bit	1	1	1	xxxxxxx1		
Destination Address	7	4	*0*000100	*0*000100x	*0*0001001	2
Control Field	8	19	*0*0010011	*0*0010011	*0*0010011	3

TABLE G-9. Example construction of data link frame trailer.

Field Name	*Length*	*Value (Dec)*	*Value (Binary)* 2^n … 2^0	*Field Fragments* 2^7 … 2^0	*Octet Value (Binary)* 2^7 … 2^0	*Octet Number*
Frame Check Sequence (transmitted MSB first)	32	162159487	*0*00010011010101001011101011111111	*0*0001001	~~*0*0001001~~ *1*0010000	0
				10101010	~~10101010~~ *0*1010101	1
				01011101	~~01011101~~ *1*0111010	2
				01111111	~~01111111~~ *1*1111110	3
Flag	8	126	*0*1111110	*0*1111110	*0*1111110	4

TABLE G-10. Octets comprising data link frame.

Octet Value (Binary) 2^7 2^0	***Nomenclature***	***Octet Number*** **(Individual Layer)**	***Octet Number*** **(Entire Transaction)**
*0*1111110	**Flag**	0	0
*0*0001110	**Source Address**	1	1
*0*0001001	**Destination Address**	2	2
*0*0010011	**Control Field**	3	3
*0*100*0*000		0	4
*0*0000011	***INTRANET HEADER***	1	5
*0*0000000		2	6
*0*100*0*101		0	7
*0*0000000		1	8
*0*0000000		2	9
00110010		3	10
*0*0000000		4	11
00000001		5	12
*000*0000		6	13
•	***IP HEADER***	•	•
•		•	•
01111100		18	25
00111101		19	26
*0*0000110		0	27
00101101		1	28
*0*0000110		2	29
•	***UDP HEADER***	•	•
•		•	•
10100011		7	34

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TABLE G-10. Octets comprising data link frame.

Octet Value (Binary) 2^7 2^0	***Nomenclature***	***Octet Number*** **(Individual Layer)**	***Octet Number*** **(Entire Transaction)**
11100001		0	35
00001011		1	36
•		•	•
•		•	•
01110000		10	45
00000100		11	46
01011111	***APPLICATION HEADER***	12	47
01000000		13	48
•		•	•
•		•	•
00000100		15	50
00000000		16	51
11001000		0	52
10100000		1	53
11110000		2	54
11000000		3	55
•	***CHECKFIRE MESSAGE***	•	•
•		•	•
00000000		4	56
~~00001001~~	**Note: FCS transmitted MSB**	0	57
10010000	**First**		
~~10101010~~	**FCS**	1	58
01010101			
~~01011101~~		2	59
10111010			
~~01111111~~		3	60
11111110			
01111110	**Flag**	0	61

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DATA LINK FRAME HEADER				INTRANET HEADER				IP								
0	1	2	3	4		5	6	7		8	9	10	11	12	13	14
2^0 2^7	2^0 2^7	2^0 2^7	2^0 2^7	2^0 2^7		2^0 2^7	2^0 2^7	2^0 2^7		2^0 2^7	2^0 2^7	2^0 2^7	2^0 2^7	2^0 2^7	2^0 2^7	2^0 2^7
FLAG	SRC	DST	CNTL	V	T	LEN	TOS	L	V	TOS	Total Length		Identification		Offset	flag	Offset
01111110	01110000	10010000	11001000	0000	0010	11000000	00000000	1010	0010	00000000	00000000	01001100	00000000	10000000	00000	000	00000000

IP		UDP			
25	26	27	28	29	30
2^0 2^7	2^0 2^7	2^0 2^7	2^0 2^7	2^0 2^7	2^0 2^7
DESTINATION		SOURCE		DESTINATION	
00111110 10111100		01100000	10110100	01100000	10110100

APP. HEADER		
34	35	36
2^0 2^7	2^0 2^7	2^0 2^7
CHKSM	GPI-FPI-ORIG	
11000101	10000111	11010000

APP. HEADER			
45	46	47	48
2^0 2^7	2^0 2^7	2^0 2^7	2^0 2^7
Message Size- etc.			GPI-YR
00001110	00100000	11111010	00000010

APP. HEADER		VMF MESSAGE			
50	51	52	53	54	55
2^0 2^7	2^0 2^7	2^0 2^7	2^0 2^7	2^0 2^7	2^0 2^7
Min/Sec-etc.		CF-etc.	GROUP-etc		
00100000	00000000	00010011	00000101	00001111	00000011

LINK FRAME TRAILER					
56	57	58	59	60	61
2^0 2^7	2^0 2^7 $\cancel{2^7}$ $\cancel{2^0}$	2^0 2^7 $\cancel{2^7}$ $\cancel{2^0}$	2^0 2^7 $\cancel{2^7}$ $\cancel{2^0}$	2^0 2^7 $\cancel{2^7}$ $\cancel{2^0}$	2^0 2^7
Pad	FCS				FLAG
00000000	00001001	10101010	01011101	01111111	01111110

FIGURE G-22. Serial representation of data link layer PDU.

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TABLE G-11. Example construction of data link transmission header.

Field Name	Length	Value (Dec)	Value (Binary) 2^n … 2^0	Field Fragments 2^7 … 2^0	Octet Value (Binary) ~~2^n~~ 2^7 … 2^0	Octet Number
Flag	8	126	*0*1111110	*0*1111110	*0*1111110	0
FEC	1	0	1	xxxxxxx1		
TDC	1	0	1	xxxxxx1x		
Scramble	1	0	1	xxxxx1xx		
Topology Update Id	3	0	*0*00	xx*0*00xxx		
Transmit Queue	10	0	*0*000000000	00xxxxxx *0*0000000	00*0*0000111 *0*0000000	1 2
FCS	32	471931248	*0*00111000010000100011001011100 00	*0*0011100 00100001 00011001 01110000	~~*0*0011100~~ *00111000* ~~00100001~~ *10000100* ~~00011001~~ *10011000* ~~01110000~~ *00001110*	3 4 5 6
Flag	8	126	*0*1111110	*0*1111110	*0*1111110	7