D-Star radio packet structure for the Digital Data (DD) mode

by Dick Rucker, KM4ML
date: 07-Sep-06 version: 1

source: JARL protocol for D-Star; downloaded from here:
http://www.arrl.org/FandES/field/regulations/techchar/D-STAR.pdf

Structure of a D-Star Digital Data (DD mode) packet:

sync	64 bit	Bit sync	1 0 1 0 … for GMSK; 1 0 0 1 … for QPSK
pulses	14 bit	Frame sync	
flags	1 octet	Flag 1	see below
	1 octet	Flag 2	see below
	1 octet	Flag 3	see below
r o u t i n g	8 octets	RPT2	Destination repeater ≤ 8 ASCII chars; fill blanks with space characters
	8 octets	RPT1	Departure repeater ≤ 8 ASCII chars; fill blanks with space characters
	8 octets	UR	Companion's call sign ≤ 8 ASCII chars; fill blanks with space characters
	8 octets	MY call 1	Own station's call sign ≤ 8 ASCII chars; fill blanks with space characters
	4 octets	MY call 2	Own station's call suffix ≤ 4 ASCII chars; fill blanks with space characters
	2 octets	Packet Forward Check Sum (FCS)* = CRC-CCITT checksum: G(x) = x^16 + x^12 + x^5 + 1	
E t h e r n e t	2 octets	Length =	*not found in standard Ethernet*
	6 octets	Source Address =	*same as standard Ethernet, but follows the Destination Adress*
	6 octets	Destination Address =	*same as standard Ethernet, but precedes the Source Address*
	2 octets	Type =	*same as standard Ethernet*
payload	46-1500 octets	Data =	*smaller than standard Ethernet -- see Ethernet packet structure below*
	4 octets	Ethernet's FCS*, a CRC-32 checksum defined in ISO-3309: G(x) = x^32 + x^26 + ...	

octet = 8 bits without regard to word & byte boundaries

*An FCS is used as the basis for Forward Error Correction (FEC)

where flag 1 is defined as:

	bit number	
MSB	7	1 = Digital Data follows; 0 = Digital Voice follows
	6	1 = Repeater address(es) follow; 0 = this is a direct station-to-station contact
	5	1 = an interruption exists; 0 = no interruption exists
	4	1 = a control signal follows; 0 = a voice or data signal follows
	3	1 = this comes with urgent (EMR) priority >> receiver opens squelch; 0 = with normal priori

bits 2,1,0 are read as an octal value

111	= payload contains control data for the receiving repeater
110	= Auto-reply
101	= <unused>
100	= Resend request
011	= ACKnowledgement
010	= No response is available
001	= Relay is unavailable
000	= NULL

Flag 2 = format descriptor

1 octet for future expansion

Flag 3 = to be used to match control functions in future versions of the protocol

1 octet for future expansion

D-Star radio packet structure for the Digital Data (DD) mode

Structure of an Ethernet frame:

Ethernet	8 octets	Preamble	*provides bit and frame synchronization in standard Ethernet*
	6 octets	Destination Address	
	6 octets	Source Address	
	2 octets	Type	
payload	368-12000 oct	Data	
	4 octets	Ethernet FCS, a CRC-32 checksum defined in ISO-3309: G(x) = x^32 + x^26 + ...	

source = Douglas Comer, "Internetworking with TCP/IP", Prentice-Hall, 1988

Since that source was published, Ethernet has been standardized as IEEE 802.3.