Heymac link layer frame format
draft 4.1   2021/05/08

Heymac Frame

PID 1 B	Fctl 1 B	NetId 0/2 B	DstAddr 0/2/8 B	IEs 0+ B	SrcAddr 0/2/8 B	Payld N	MIC 0+ B	Hops 0/1 B	TxAddr 0/2/8 B

Authentication range (PID … MIC start)
Encryption range (IEs … Payld)
Multihop mutable (Hops, TxAddr)

Sign then encrypt

PID: Protocol ID (1B). See below for details
Fctl: Frame Control. See below for details.
NetId: Network **Id**entifier. Exists if Fctl's N bit is set.
DstAddr: **Des**tination **Addr**ess. 0, 2 or 8B address. Exists of Fctl's D bit is set.
IEs: Header and Body Information Elements. Exists if Fctl's I bit is set.
SrcAddr: **S**ou**rc**e **Addr**ess. 0, 2 or 8B address. Exists of Fctl's S bit is set.
Payld: Payload (0 .. 253 octets; entire frame must not exceed 255 octets).
MIC: Message Integrity Code (size depends on algorithm which is specified in IE).
Hops: wireless subnet hops remaining (0 or 1B). Exists if Fctl's M bit is set.
TxAddr: Re-transmitter's address. Exists if Fctl's M bit is set.

PID field:

PID: Protocol ID: an 8-bit pattern to identify the frame's protocol.
HeyMac claims the range 8b111XXXXX to distinguish from LoRaWAN and
802.15.4-2015 MAC header (MHR).

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Bit pattern       Protocol
1110 00vv         HeyMac TDMA, major (vv)ersion
1110 01vv         HeyMac CSMA, major (vv)ersion
1110 1xxx         HeyMac (RFU)
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Fctl field:

X 1 b	L 1 b	N 1 b	D 1 b	I 1 b	S 1 b	M 1 b	P 1 b

X: Extended:
    0: Fctl bits and HeyMac fields as described here.
    1: Remaining Fctl bits are Extended Frame ID (rest of frame is unique).
L: Long Addressing: all present address fields are:
    0: 2 octets (16b).
    1: 8 octets (64b).
N: Net ID present
D: Dst Addr present
I: IE(s) present
S: Src Addr present
M: Multihop: Hops and TxAddr fields are present.
P: Pending frame: 1: another frame immediately follows this one.

Command:

Prefix 2b10	Command ID 6 b	Command Data N

Heymac commands are sent in the Payld field. The first byte contains the two-bit prefix and the six-bit command ID. The command determines if there are any bytes that follow. Data may be fixed or variable length.