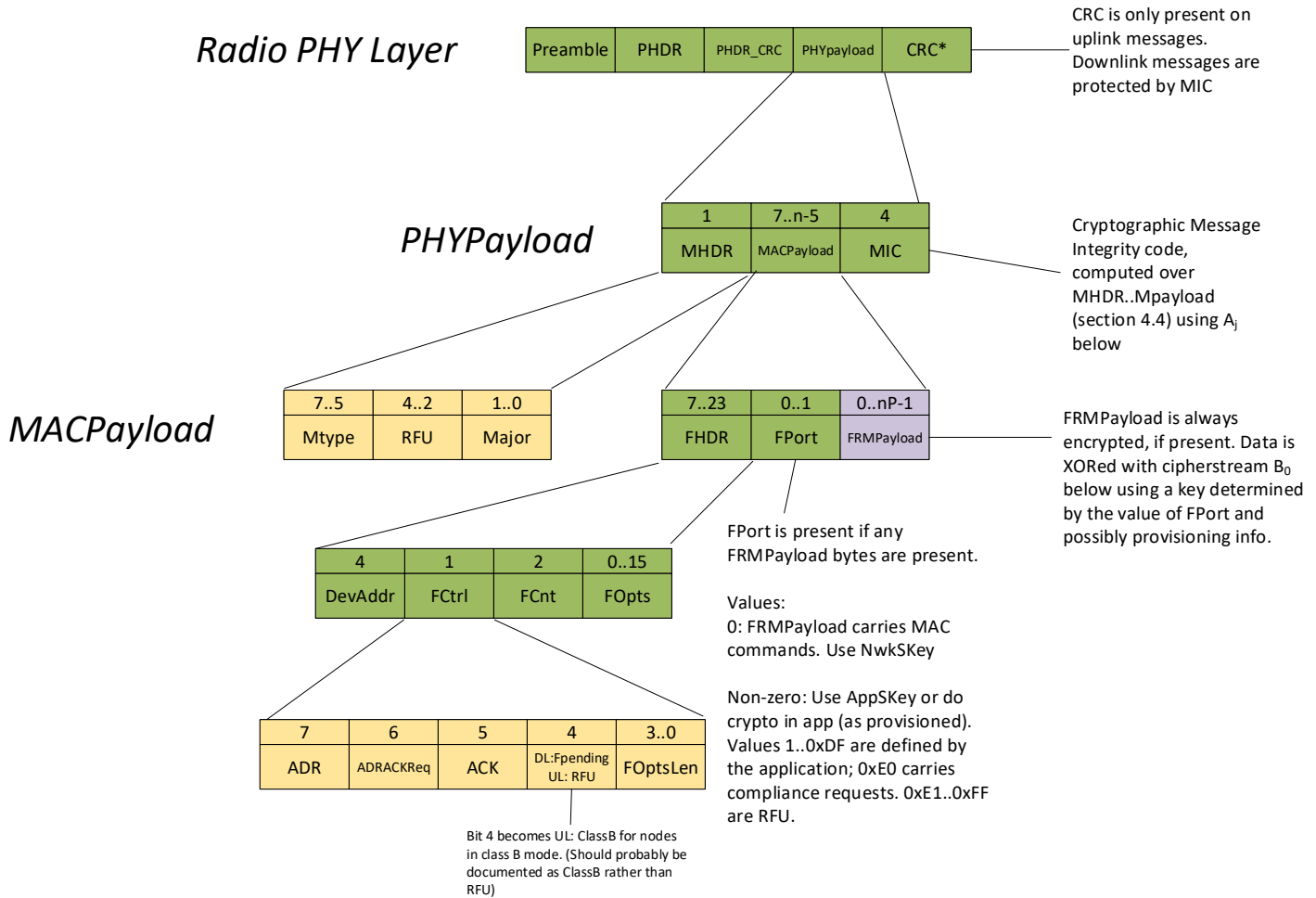


LoraWAN® At A Glance

Application Messages



Cipher Keystreams

A_i

1	4	1	4	4	1	1
0x01	0x00	Dir (dl: 1)	DevAddr	FCntUp / FCntDown	0x00	i

Compute $\text{aes128_encrypt}(K, A_i)$ using $K = \text{NwkSKey}$ or AppSKey , as needed to get 16-byte ciphertext, then xor with corresponding payload bytes; j is the block index for 16-byte blocks.

B_0

1	4	1	4	4	1	1
0x49	0x00	Dir (dl: 1)	DevAddr	FCntUp / FCntDown	0x00	len(msg)

Compute $\text{aes128_cmac}(\text{NwkSKey}, B_0 \parallel \text{msg})$, then MIC is $\text{cmac}[0..3]$.

msg is MHDR|MPayload

Class A MAC Commands (1.03): 02..08

General Format

1	0..n
CID	payload

Length of payload is implied by CID and originator of message. All messages are in pairs; ...Rq from one side begins a sequence and ...Ans from the other side concludes that sequence. Most sequences are initiated by the Gateway, but LinkCheck* is initiated by a Node

CID values 0x00 and 0x01 are reserved

From Gateway

From Node

LinkCheckAns [5.1]

1	1	1
0x02	Margin	GwCnt

LinkCheckReq [5.1]

1
0x02

LinkADRReq [5.2]

1	1	2	1
0x03	DataRate TxPower	ChMask	Redundancy

7..4	3..0
DataRate	TxPower

7	6..4	3..0
RFU	ChMaskCntl	NbRep

LinkADRAAns [5.2]

1	1
0x03	Status

7..3	2	1	0
RFU	Power ACK	Data Rate ACK	Channel Mask ACK

DutyCycleReq [5.3]

1	1
0x04	MaxDCycle

DutyCycleAns [5.3]

1
0x04

RxParamSetupReq[5.4]

1	1	3
0x05	DLSettings	Frequency

7	6..4	3..0
RFU	RX1DROffset	RX2DataRate

RxParamSetupAns [5.4]

1	1
0x05	Status

7..3	2	1	0
RFU	RX1DROffset ACK	RX2DataRate ACK	Channel ACK

DeviceStatusReq [5.5]

1
0x06

DeviceStatusAns [5.5]

1	1	1
0x06	Battery	Margin

7..6	5..0
RFU	Margin

NewChannelRq [5.6]

DIChannelReq [5.6]

1	1	3	1
0x07	ChIndex	Freq	DrRange

7..4	3..0
MaxDR	MinDR

NewChannelAns [5.6]

DIChannelAns [5.6]

1	1
0x07	Status

7..2	1	0
RFU	Data Rate Range OK	Channel Frequency OK

RxTimingSetupRq [5.7]

1	1
0x08	Settings

7..4	3..0
RFU	Delay

RxTimingSetupAns [5.7]

1
0x08

Class A MAC Commands (1.03): 09..0D

General Format

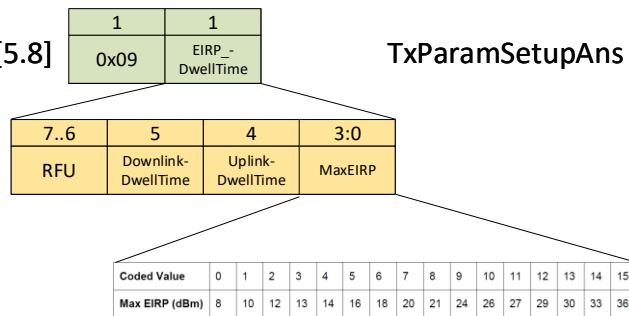
1	0..n
CID	payload

Length of payload is implied by CID and originator of message. All messages are in pairs; ...Rq from one side begins a sequence and ...Ans from the other side concludes that sequence. Most sequences are initiated by the Gateway, but LinkCheck* is initiated by a Node

From Gateway

From Node

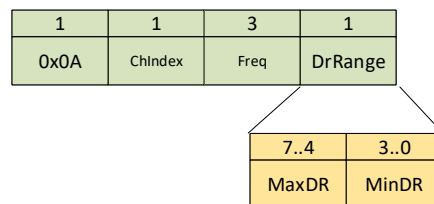
TxParamSetupReq [5.8]



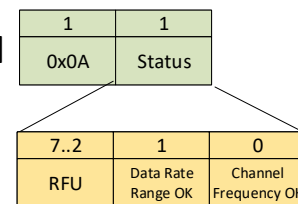
TxParamSetupAns [5.8]

1
0x09

DIChannelReq [5.6]



DIChannelAns [5.6]



CID values 0x0B and 0x0C are reserved

DeviceTimeReq [5.9]

1
0x0D

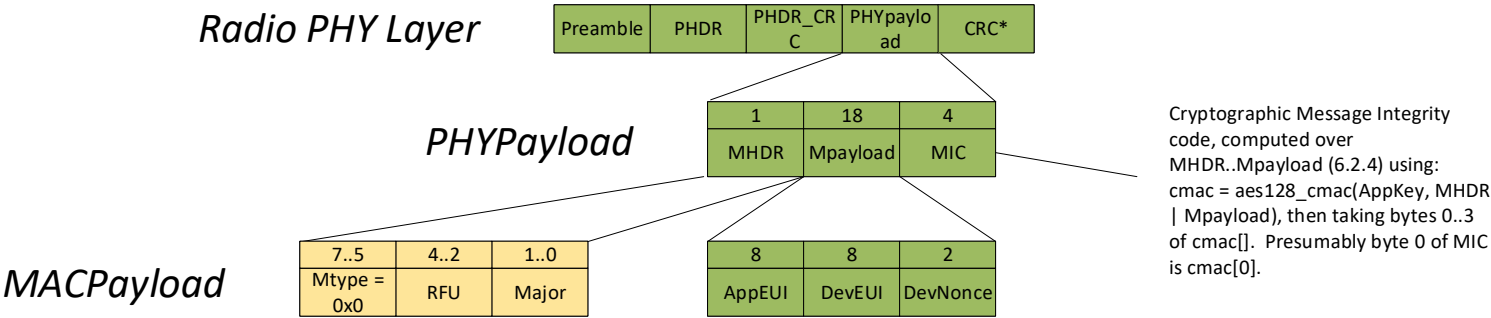
DeviceTimeAns [5.9]

1	4	1
0x0D	GPS time	Fractional second

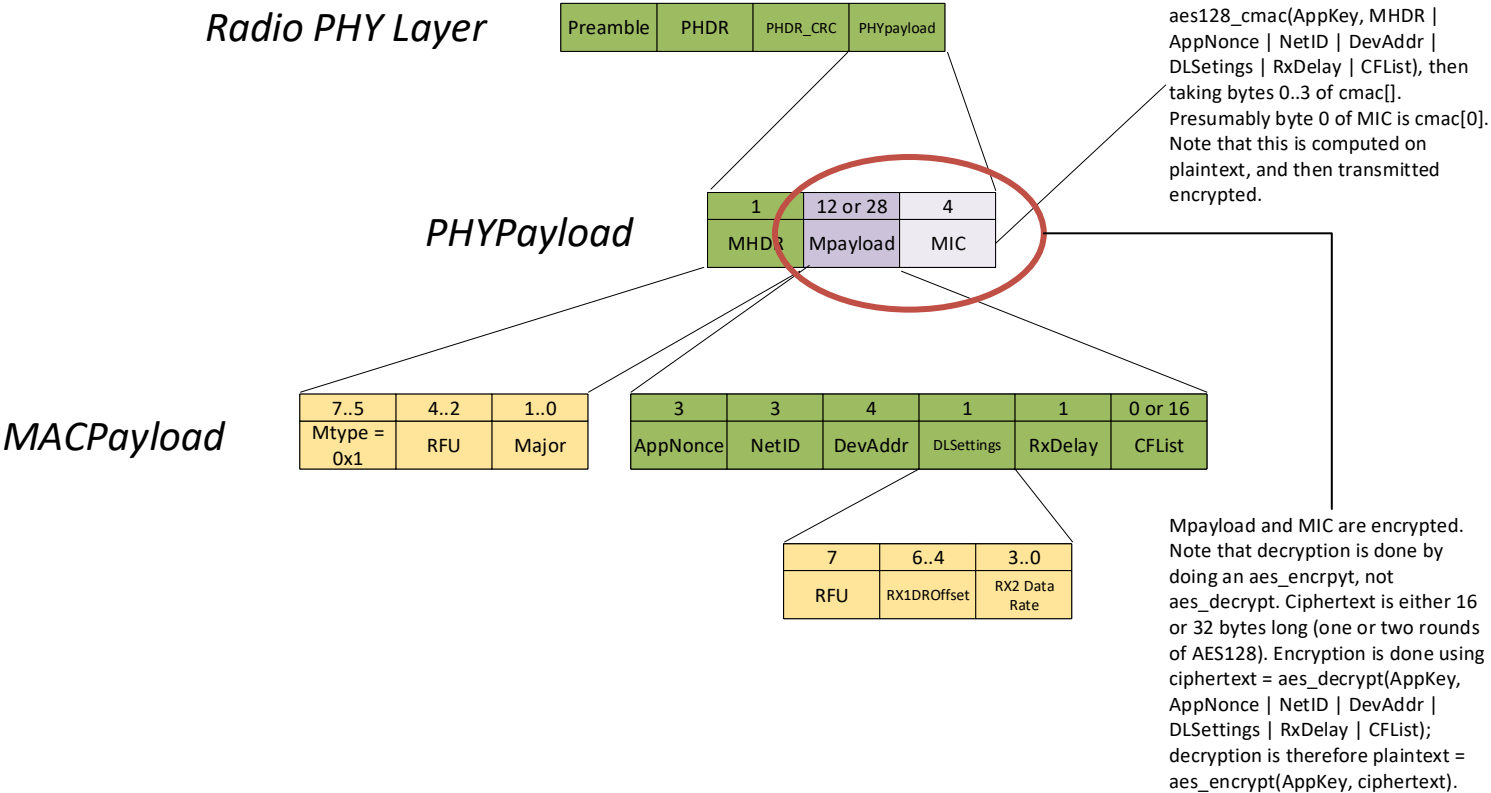
Fraction of section in 1/256-th second steps

Join Messages

Join Request



Join Accept



Message Types

MType (binary)	1.0.3	1.1
000	Join-Request	Join-request
001	Join-Accept	Join-Accept
010	Unconfirmed Data Up	Unconfirmed Data Up
011	Unconfirmed Data Down	Unconfirmed Data Down
100	Confirmed Data Up	Confirmed Data Up
101	Confirmed Data Down	Confirmed Data Down
110	RFU	Rejoin-request
111	Proprietarry	Proprietary