1. Frame Format

The format of the MAC frames is specified in this clause. All stations shall be able to properly construct frames for transmission and decode frames upon reception, as specified in this clause.

1.1 MAC frame formats

Each frame consists of the following basic components:

a) A *MAC header*, which comprises frame control, duration, address, and sequence control information;

b) A variable length *frame body*, which contains information specific to the frame *type*;

c) A *frame check sequence* (FCS), which contains an IEEE 32-bit cyclic redundancy code (CRC).

1.1.1 Conventions

The MAC protocol data units (MPDUs) or frames in the MAC sublayer are described as a sequence of fields in specific order. Each figure in Clause 7 depicts the fields/subfields as they appear in the MAC frame and in the order in which they are passed to the physical layer convergence protocol (PLCP), from left to right.

In figures, all bits within fields are numbered, from 0 to k, where the length of the field is $k + 1$ bit. The octet boundaries within a field can be obtained by taking the bit numbers of the field modulo 8. Octets within numeric fields that are longer than a single octet are depicted in increasing order of significance, from lowest numbered bit to highest numbered bit. The octets in fields longer than a single octet are sent to the PLCP in order from the octet containing the lowest numbered bits to the octet containing the highest numbered bits.

Any field containing a CRC is an exception to this convention and is transmitted commencing with the coefficient of the highest-order term. MAC addresses are assigned as ordered sequences of bits. The Individual/Group bit is always transferred first and is bit 0 of the first octet. Values specified in decimal are coded in natural binary unless otherwise stated. The values in Table 1 are in binary, with the bit assignments shown in the table. Values in other tables are shown in decimal notation.

Reserved fields and subfields are set to 0 upon transmission and are ignored upon reception.

1.1.2 General frame format

The MAC frame format comprises a set of fields that occur in a fixed order in all frames. Figure 1.1 depicts the general MAC frame format. Each field is defined in Section 1.2.

Octets	2	6	6	6	2	4	2	0-9196	4

Len	Rcvd	DA	SA	PT	RPR Header	HEC	Payload	FCS

Figure 1.1—MAC frame format

1.2 Elements of the MAC frame

1.2.1 Length field

The length field specifies the length of the MAC frame in bytes, including all headers, the body, and the FCS elements. The length is computed from the Type field within the RPR header to the FCS, inclusive.

1.2.2 Payload Type field

The PT field is used to specify the type of MAC frame and the content of the data within the body. It is logically similar to the Ethernet Type (ET) field and will overlay the address space of the Ethernet Types (ETs). The following table shows the reserved types allocated:

PT	Description
TBD	Control RPR Header
TBD	Reserved

1.2.3 Destination Address (DA) field

The DA field contains an IEEE MAC individual or group address that identifies the MAC entity or entities intended as the final recipient(s) of the MSDU contained in the frame body field.

1.2.4 Source Address (SA) field

The SA field contains an IEEE MAC individual address that identifies the MAC entity from which the transfer of the MSDU contained in the frame body field was initiated. The individual/group bit is always transmitted as a zero in the source address.

1.2.5 RPR Header field

The RPR Header consists of the following subfields: ring time-to-live (TTL), class of service (CoS), ClientID, and Reserved.

The format of the RPR Control field is illustrated in Figure 1.2.

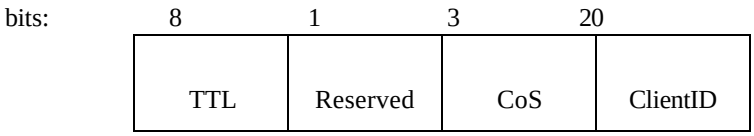

Figure 1.2 —RPR Control field format

1.2.5.2 Time-to-live (TTL)

The TTL field is 8 bits in length. The TTL value can range from 0 to 255 supporting a ring size of up to 255 stations. As stated in section xx, the TTL value is decremented by 1 when the packet transiting through each station, and is discarded when equal to zero.

1.2.5.3 Class-of-service (CoS)

The CoS field is 3 bits in length indicating the class of service, in which the frame should be handled accordingly.

1.2.5.4 Reserved

The reserved fields are 1 bit and 4 bits in length, respectively. They are reserved for future use.

1.2.6 Client Identifier

To be completed.

1.2.7 Header Error Check (HEC)

The HEC field is a 16 bit field containing a CRC-16 computed over all header fields from Length to RPR Control, inclusive. The HEC is calculated using the following standard generator polynomial of degree 16:

$G(x) = x^{16} + x^{12} + x^5 + 1$

1.2.8 Frame Body field

The Frame Body is a variable length field that contains information specific to individual frame types and subtypes. The minimum frame body is 0 octets. The maximum length frame body is 9196 octets.

1.2.9 FCS field

The FCS field is a 32-bit field containing a 32-bit CRC. The FCS is calculated over all the fields of the MAC header and the Frame Body field. These are referred to as the *calculation field*s.

The FCS is calculated using the following standard generator polynomial of degree 32:

$G(x) = x^{32} + x^{26} + x^{23} + x^{22} + x^{16} + x^{12} + x^{11} + x^{10} + x^8 + x^7 + x^5 + x^4 + x^2 + x + 1$

The FCS is the 1's complement of the sum (modulo 2) of the following:

a) The remainder of $x^k \times (x^{31} + x^{30} + x^{29} + \ldots + x^2 + x + 1)$ divided (modulo 2) by G(x), where k is the number of bits in the calculation fields, and

b) The remainder after multiplication of the contents (treated as a polynomial) of the calculation fields by x^{32} and then division by G(x).

The FCS field is transmitted commencing with the coefficient of the highest-order term.

As a typical implementation, at the transmitter, the initial remainder of the division is preset to all 1's and is then modified by division of the calculation fields by the generator polynomial G(x). The 1's complement of this remainder is transmitted, with the highest-order bit first, as the FCS field.

At the receiver, the initial remainder is preset to all 1's and the serial incoming bits of the calculation fields and FCS, when divided by G(x), results in the absence of transmission errors, in a unique nonzero remainder value. The unique remainder value is the polynomial:

$x^{31} + x^{30} + x^{26} + x^{25} + x^{24} + x^{18} + x^{15} + x^{14} + x^{12} + x^{11} + x^{10} + x^8 + x^6 + x^5 + x^4 + x^3 + x + 1$

1.3 Format of individual frame types

1.3.1 Control frames

The RPR Control frames will have a common frame structure. The details of this frame structure will be provided.

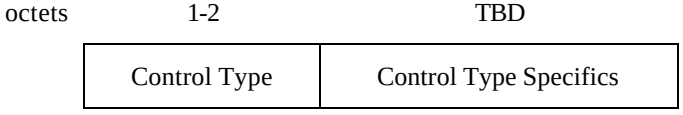

Figure 1.3 RPR Control Frame Structure

The following table shows the Control Types allocated:

Control Type	Description
Hello	
Keep Alive	
RCM	
OAM	
Status Change	

1.3.2 Management frames