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# IEEE 802.3as – Ethernet Frame Expansion

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**NORTEL**

# Agenda

- > Requirements for larger Ethernet frames
- > IEEE 802.3as Basics
- > IEEE 802.3as Examples
- > Conclusions





# Motivation for project

- > Standard activities requiring larger frame:
  - IEEE 802.1ad Provider Bridges
  - IEEE 802.1ah Provider Backbone Bridges
  - IEEE 802.1AE MAC Security
  - ITU-T SG15 Ethernet Transport (G.8010, G.8110)
  - IETF MPLS
- > Liaisons/work requests
  - IEEE 802.1
  - ITU-T SG15
- > Desire to increase size only once...
- > This is **not** standardization of jumbo (~9600 octet) frames



# Excerpts from IEEE 802.1 request

- > *802.1 is requesting 802.3 to start a project to define a larger 802.3 maximum frame size with the new size being in the range of 1650 to 2048 octets.*
- > *802.1 further requests 802.3 to investigate and define what the largest feasible maximum frame size increase should be with minimal impact to existing networks and standards.*
- > *The size of the MAC Client data portion of the frame (46-1500 octets) is not to be changed.*
- > *Current work in 802.1 requires a larger frame size. The [rationale] of increasing the size to beyond what is currently needed is to prevent the need for 802.1 from asking for another frame size increase in the near future.*



# 802.3as PAR

## > Title

- Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements Part 3: Carrier sense multiple access with collision detection (CSMA/CD) **frame format extensions**

## > Scope

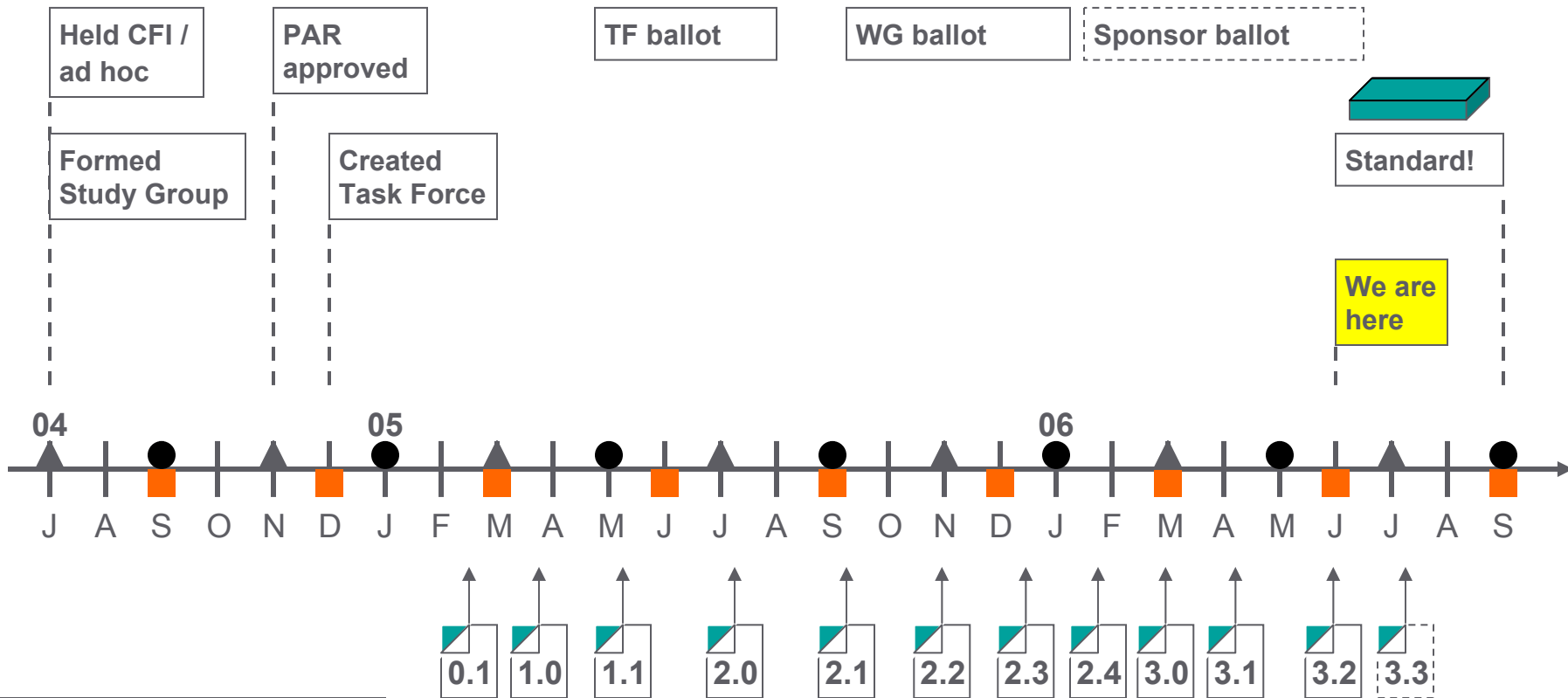
- a) Specify the IEEE 802.3 frame format when optional envelope information is present while preserving the original MAC service data unit
- b) Also, specify related adjustments to IEEE 802.3 Media Access Control (MAC) parameters and management attribute definitions

## Purpose

- The purpose of this project is to extend the size of the IEEE 802.3 frame format to accommodate IEEE 802.1ad Provider Bridging, IEEE 802.1AE MACSec and other applications requiring envelope information



# Current timeline



**Legend**

- ▲ IEEE 802 Plenary
- IEEE 802.3 Interim
- IEEE-SA Standards Board



# Agenda

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## Other change #1

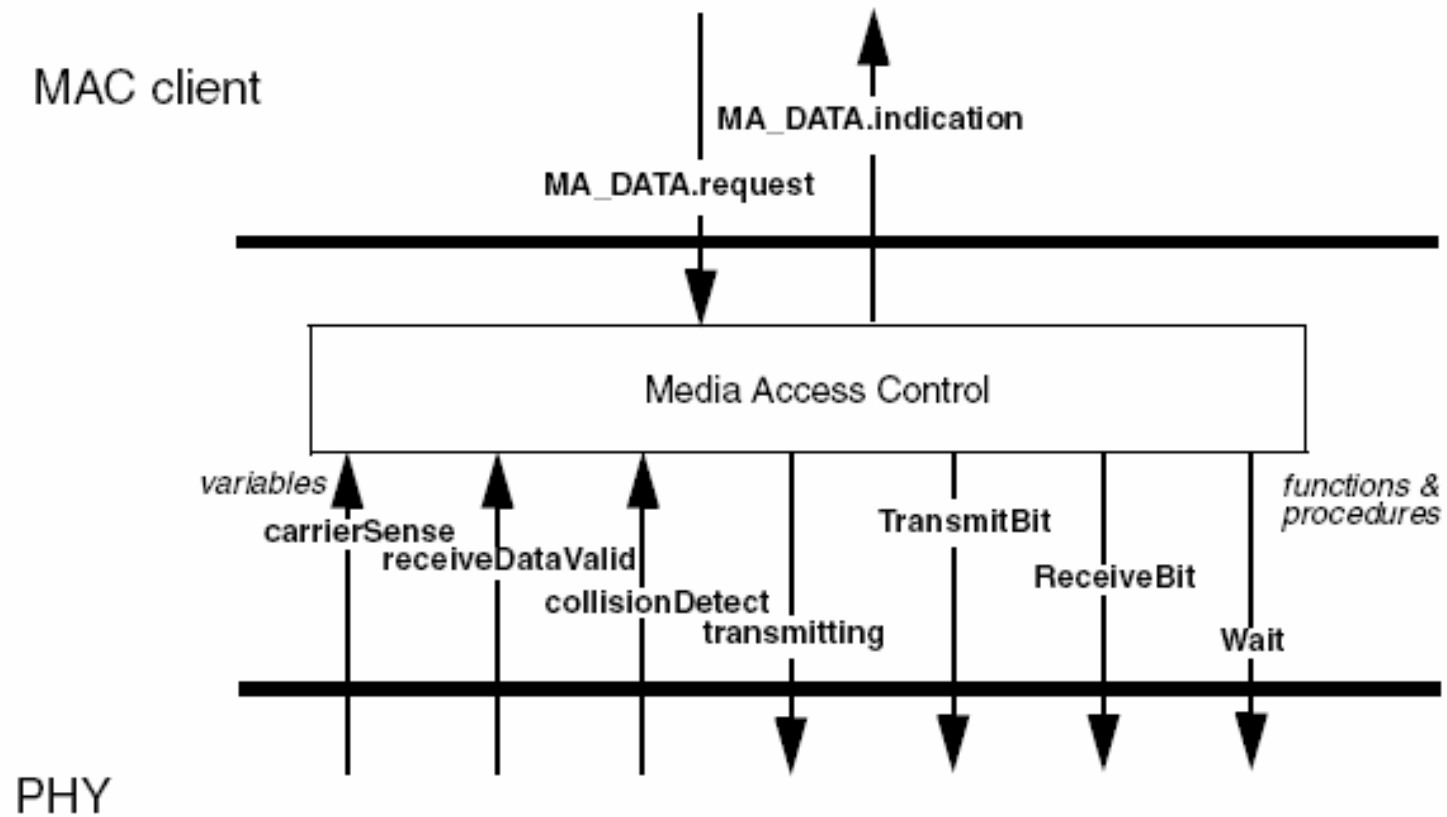
### > Realign MAC client service primitives

- **MA\_DATA.request and MA\_DATA.indication**
- **Separate**
  - **MAC Client**
  - **MAC Control Sublayer**
  - **MAC**
- **Delete TransmitFrame, ReceiveFrame**
  - **Replace with consistent state machine**



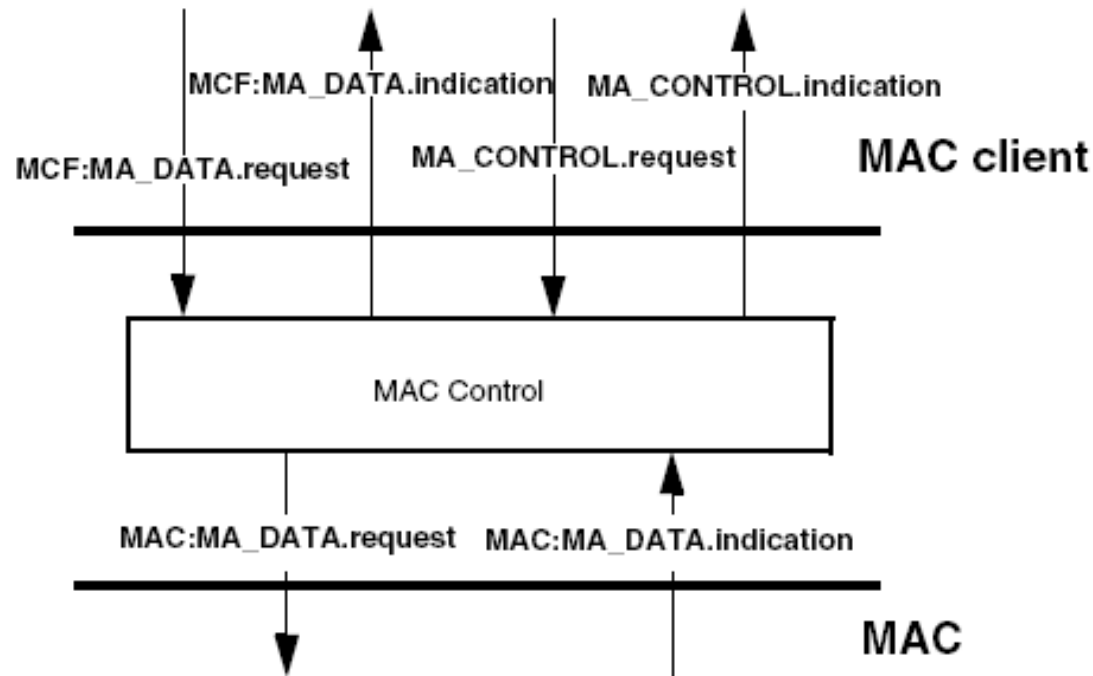
# Other change #1

## Revised MAC service primitives



## Other change #1

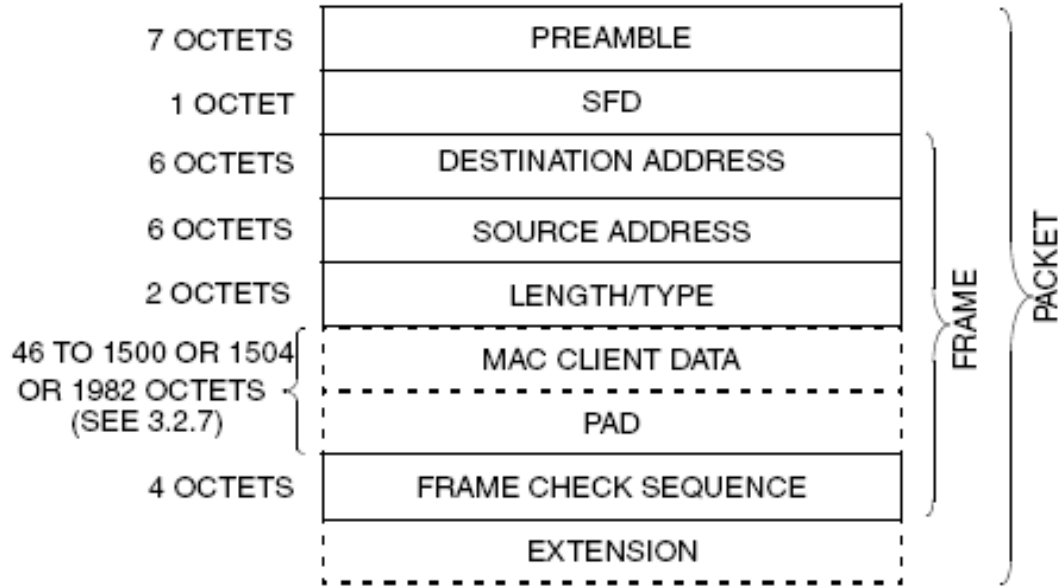
### Revised MAC Control service primitives



Instances of MAC data service interface:  
MAC=interface to subordinate sublayer  
MCF=interface to MAC client

## Other change #2

### Ethernet MAC Frame & Ethernet MAC Packet



#### > Traditional 802.3 usage of the term **frame**

- ‘start-of-**frame** delimiter’ denotes start of the frame on next octet
- ‘**frame** check sequence’ covers all the fields of the frame

#### > Alignment of frame and packet terms throughout the clauses

- Reworking of all related terms to ‘Interpacket Gap’



# Main change – frame expansion

- > Landmark direction – January 2005
- > 802.3 proposes envelope frame
  - Prefix and suffix around original data
  - Constructs described in Pascal
- > 802.1 disagrees and prevails
  - No prefix or suffix
  - No constructs to ‘artificially’ bound the original frame contents
  - Only note a bigger size
    - Use an enumerated list
  - 2000 is a non-offensive number
    - Provides 482 octets of encapsulation overhead



# The new frame size choice

## > Options considered

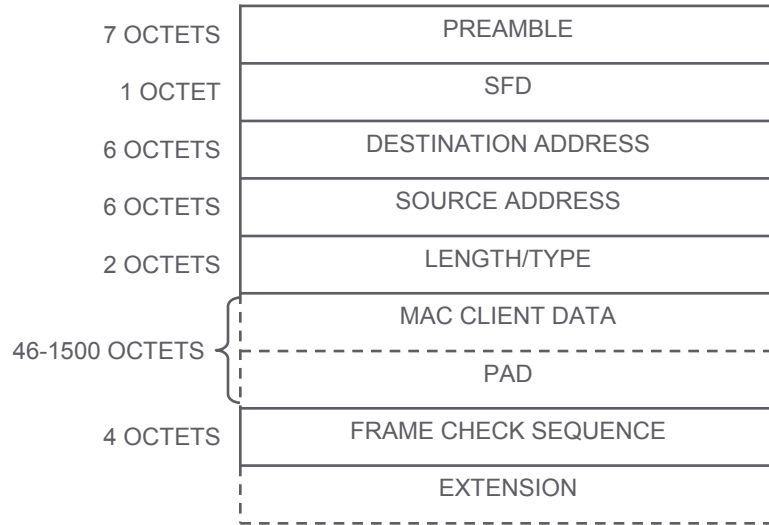
- 1875
  - Maximum for 10 Mb/s repeaters with 3 bit elasticity buffers
- 2000
  - 2KB minus arbitrary space for internal registers
- 2048
  - The maximum suggested size from 802.1

## > Issues considered in evaluation

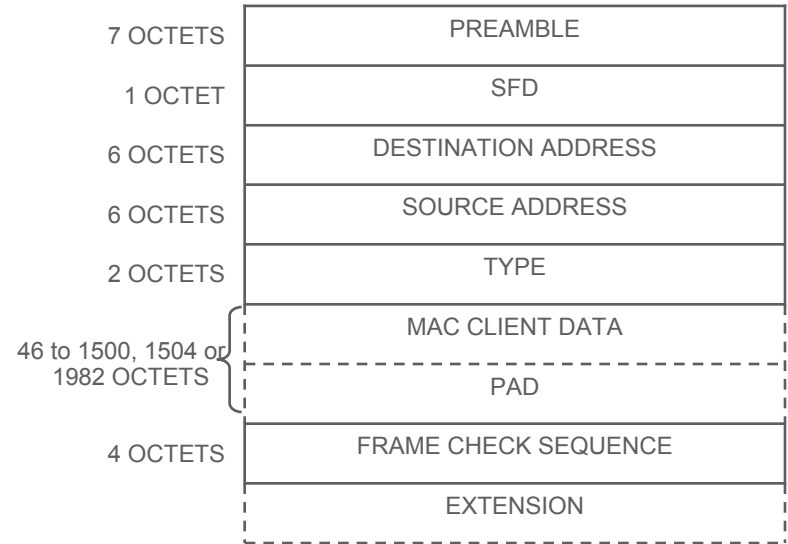
- Existing implementations
- Technical limitations
- Sufficient size for current projects
- Future proof for future encapsulations
- FCS coverage

**'Beauty contest' winner was 2000**

# Frame format



IEEE 802.3-2002/Figure 3-1  
Basic MAC frame format



IEEE 802.3as/Figure 3-1  
MAC packet format

**Remove clause 3.5 – Tagged Frame**



# Frame sizes

Frame Sizes	802.3-2005	802.3as
Minimum <b>basic</b> (untagged) MAC frame size	64 octets	64 octets
Maximum <b>basic</b> (untagged) MAC frame size	1518 octets	1518 octets
Minimum Q-Tagged MAC frame size	64 octets	64 octets
Maximum Q-Tagged MAC frame size	1522 octets	1522 octets
Minimum Envelope MAC frame size	N/A	<b>64 octets</b>
Maximum Envelope MAC frame size	N/A	<b>2000 octets</b>

**Maximum size = Basic, Q-Tagged or Envelope**



## Clause 4.2.7.1 - constants

802.3-2005	802.3as
frameSize = address + L/T + data + CRC	No change
minFrameSize = 64 octets	No change (Qtagged frame grandfathered)
maxUntaggedFrameSize = 1518 octets	maxBasicFrameSize = 1518 octets maxEnvelopeFrameSize = 2000 octets
qTagPrefixSize = 4 octets	No change (grandfathered)
maxValidFrame = maxUntaggedFrameSize – (2 x addressSize + lengthOrTypeSize + crcSize) / 8	maxBasicDataSize = 1500  maxFrameSizeLimit = maxBasicFrameSize or (maxBasicFrameSize + qTagPrefixSize) or maxEnvelopeFrameSize
DataValue = includes VLAN tag	DataValue = includes envelope

**Maximum original data payload size = 1500**



# Agenda

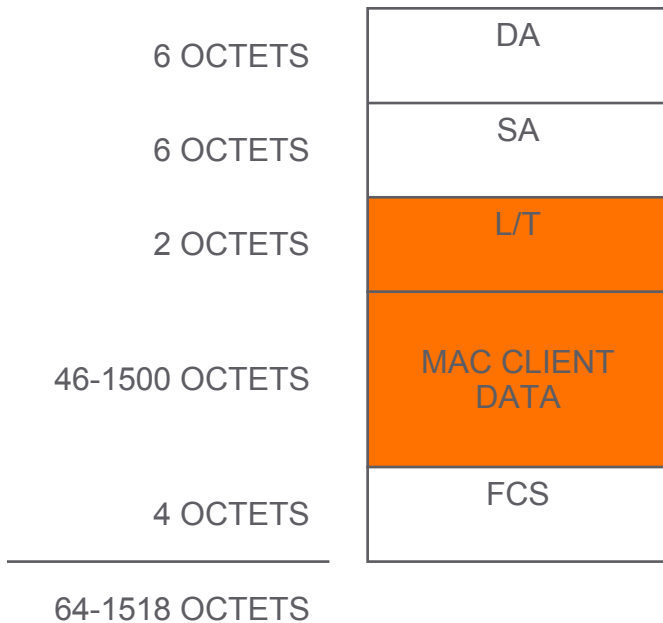
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# Sample frames (1/3)

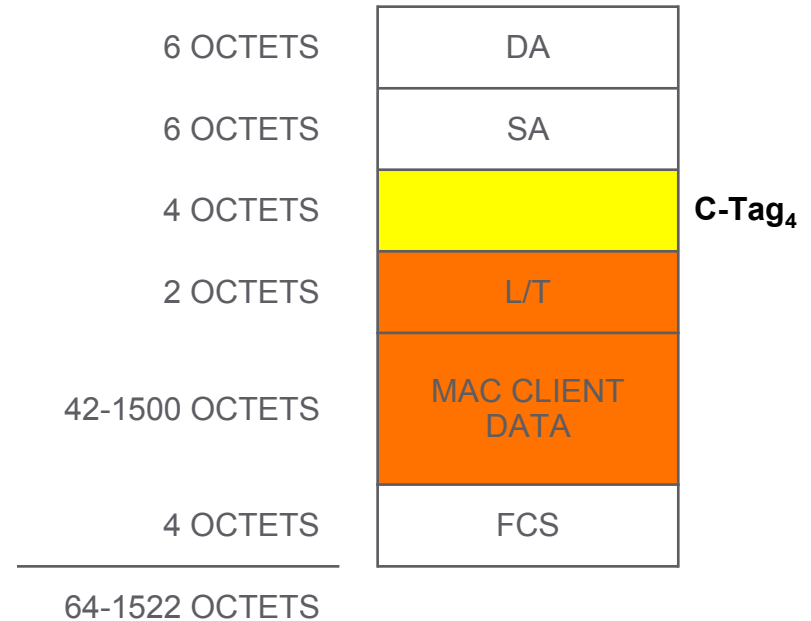


*Basic MAC frame*



## 802.1Q Tagged Frame

*Envelope MAC frame*



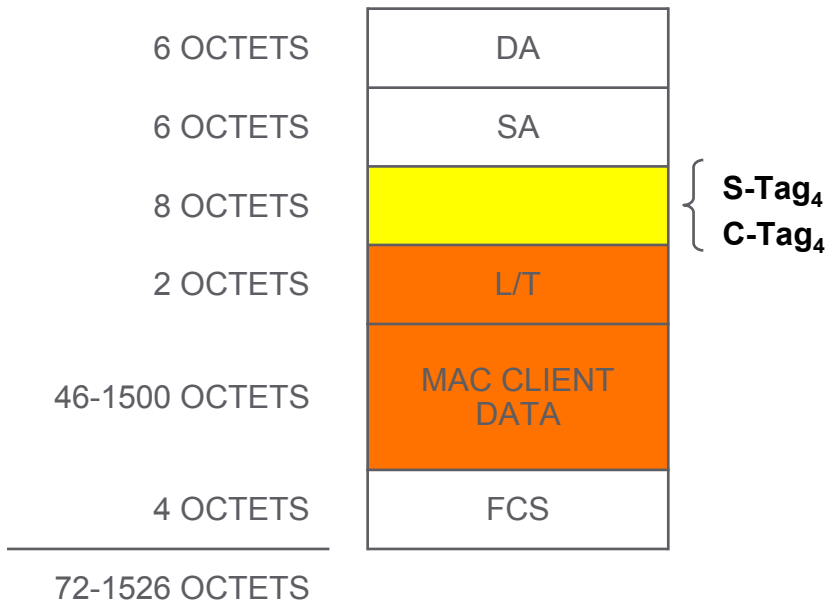
Encapsulation = 4

**Note:** minimum size is grandfathered at 64 octets for C-Tag frame, though it should be 68 octets

# Sample frames (2/3)

## 802.1ad QiQ Frame

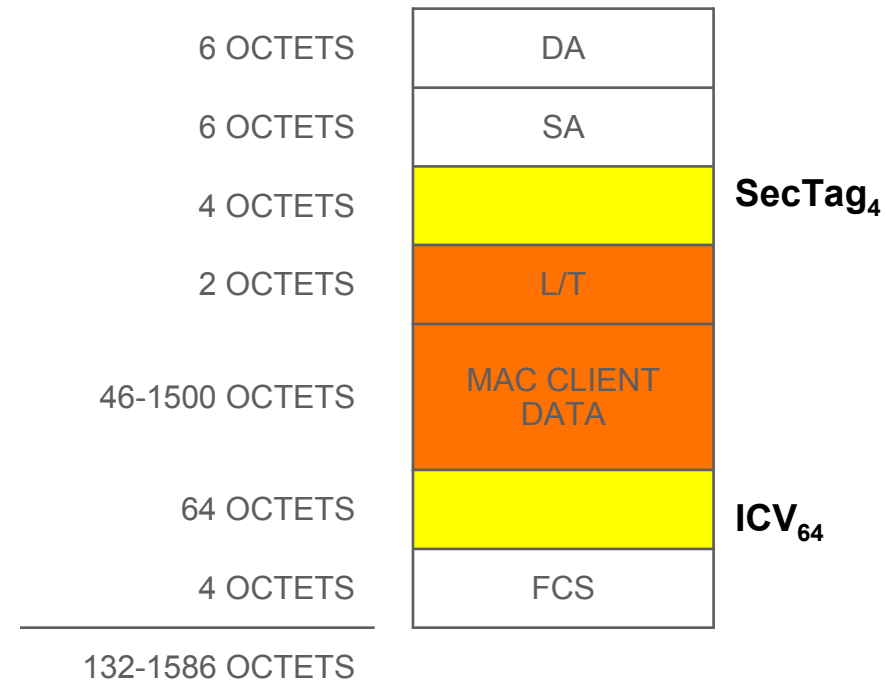
*Envelope MAC frame*



Encapsulation = 8

## 802.1AE MACSec Frame

*Envelope MAC frame*



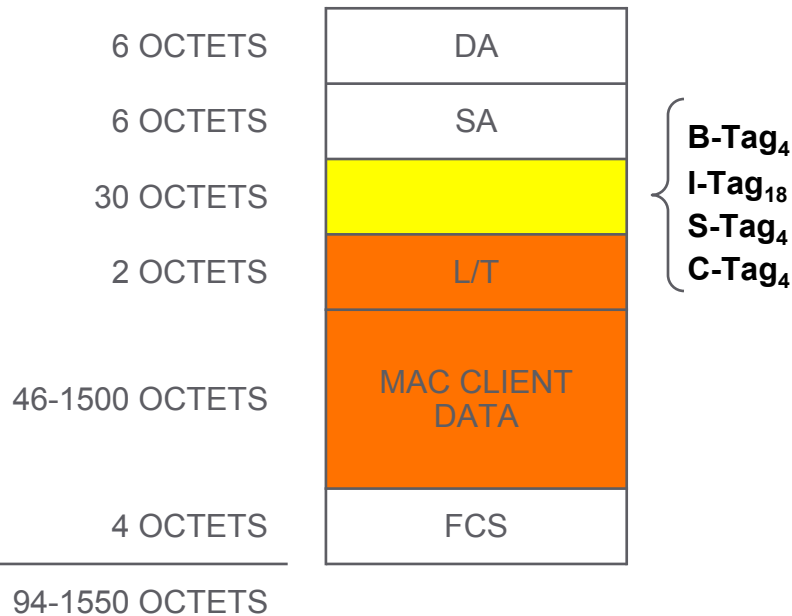
Encapsulation = 68



# Sample frames (3/3)

## 802.1ah MiM Frame

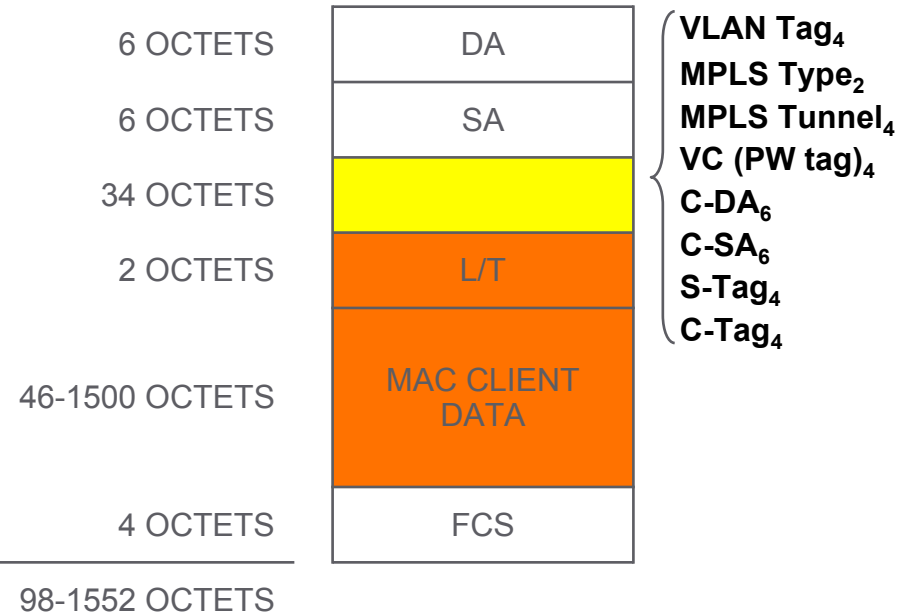
*Envelope MAC frame*



Encapsulation = 30

## MPLS frame

*Envelope MAC frame*



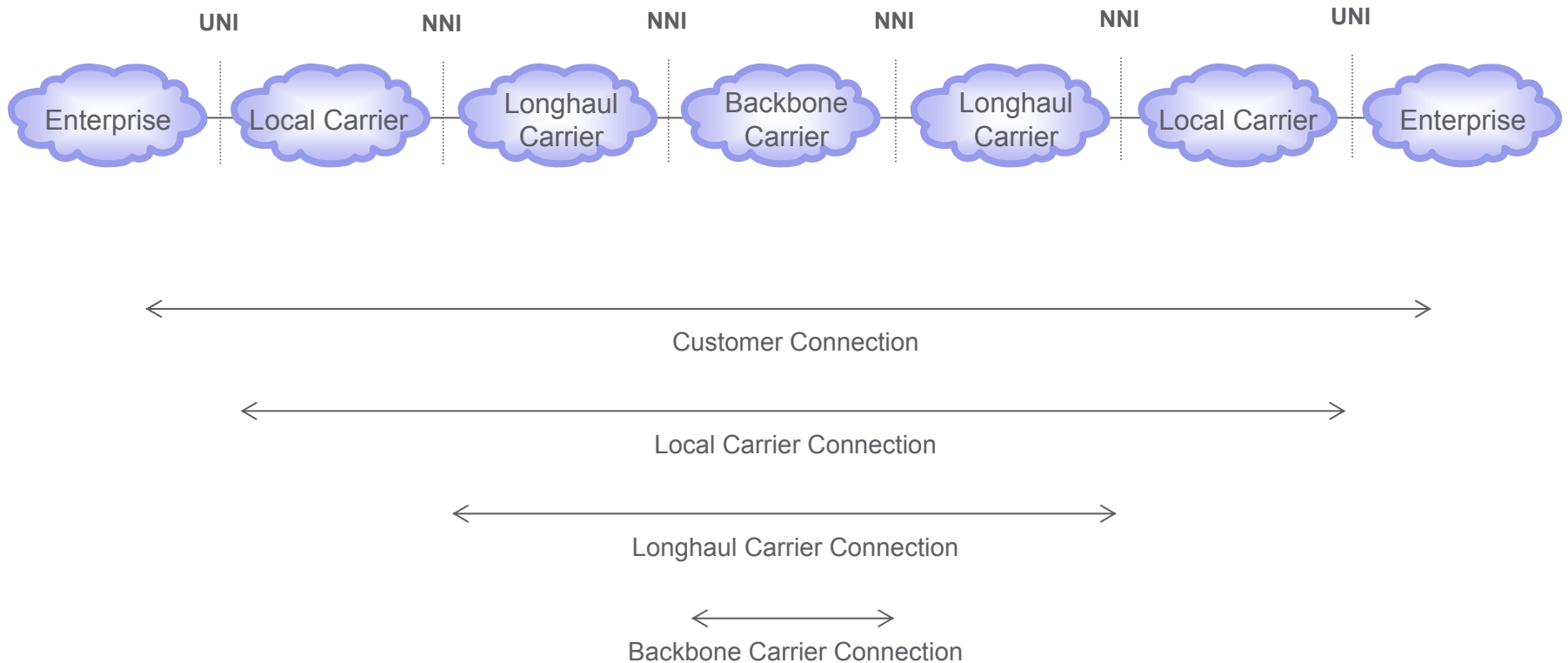
Encapsulation = 34

# Network Scenario



- > In network deployments, recursive encapsulation of the payload size will result in larger frame sizes. Consider the following:

All handoffs shown between networks are Ethernet links





# Conclusion

- > Envelope Ethernet frame size will support encapsulation requirements of the foreseeable future
- > This will not adversely affect any network function
- > This is expected to be supported very soon