



**ACIT 2620**

# **Principles of Enterprise Networking**

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# Ethernet

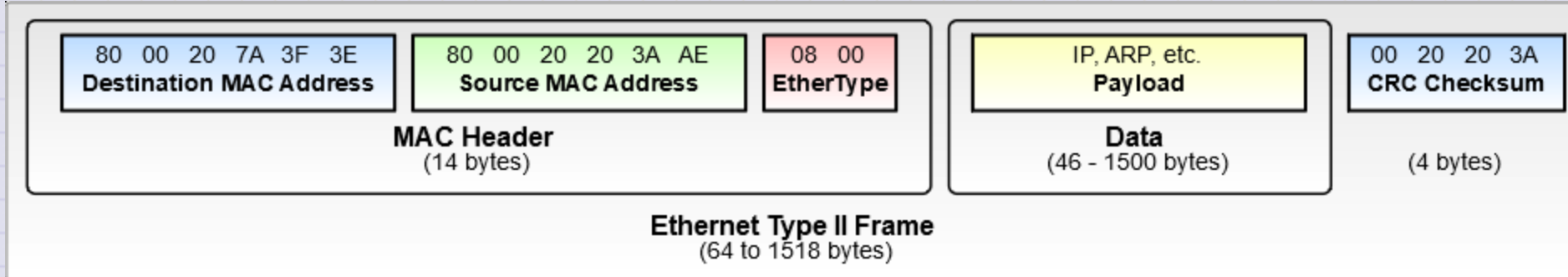
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## Data Link Layer Sublayers

<dl> <dt>Logical Link Control (LLC)</dt> <dd>Used to facilitate multiple upper layer (i.e. network ) protocols</dd> <dd>Provides common interface to upper layers</dd> <dd>Supplies multiplexing and flow control services</dd> <dd>Provides error checking</dd> </dl>

<dl> <dt>Media Access Control (MAC)</dt> <dd>Provides addressing and channel access control mechanisms (i.e. CSMA CD, CSMA CA)</dd> <dd>Appends physical address of destination computer onto the frame</dd> </dl>

# Frames



- Preamble
  - Marks beginning of entire frame
- Start of Frame Delimiter (SFD)
  - Indicates beginning of addressing fields
- Destination Address
  - Contains destination node address



- Source Address
  - contains address of sender node
- Length (LEN)
  - indicates length of data/payload
- Data (payload)
  - contains data, or segmented part of data, transmitted from originating node

- Pad
  - Used to increase size of the frame to its minimum size requirement of 46 bytes
- Frame Check Sequence
  - provides algorithm to determine whether data were correctly received
  - most commonly used algorithm is Cyclic Redundancy Check (CRC)



# Ethernet Addressing

- MAC address: Media Access Control (MAC) sub-layer
- 48 Bits
- Number uniquely defining a network node
- Generally rendered as Hex: **00:1e:33:ba:87:c1**
- Doesn't contain any data regarding network location –just an ID

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- first three bytes
  - Either Manufacturer hard coded
  - Or Reserved Addresses (common ones)
    - Broadcast Address **FF:FF:FF:FF:FF:FF**
    - Spanning Tree Multicast: **01:80:C2:00:00:00**
    - IANA reserves all address starting with **00:00:5E** see Ethernet Numbers(this includes IPv4 multicast -and inserts the low 23 Bits of the multicast IPv4 Address into the Ethernet Address)
    - **33:33:XX** is reserved for IPv6 Multicast

# Switching

- Making Forwarding decisions
  - Transparent bridging

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## Broadcast Loop and STP

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## Spanning Tree Protocol

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# VLANs

- Virtual Local Area Networks
- A logical network within a physical network
- Achieved by grouping some of the switch ethernet ports into a logical broadcast domain
- Can span multiple switches



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## VLAN port types

- Access ports
  - assigned VLAN ID
  - for connecting end hosts/nodes
  - nodes connected to ports with same VLAN ID are in the same broadcast domain

- Trunk ports
  - typically for switch to switch or switch to router connection
  - carry "tagged" frames, i.e modified ethernet frames with VLAN markers

## Tagged frames

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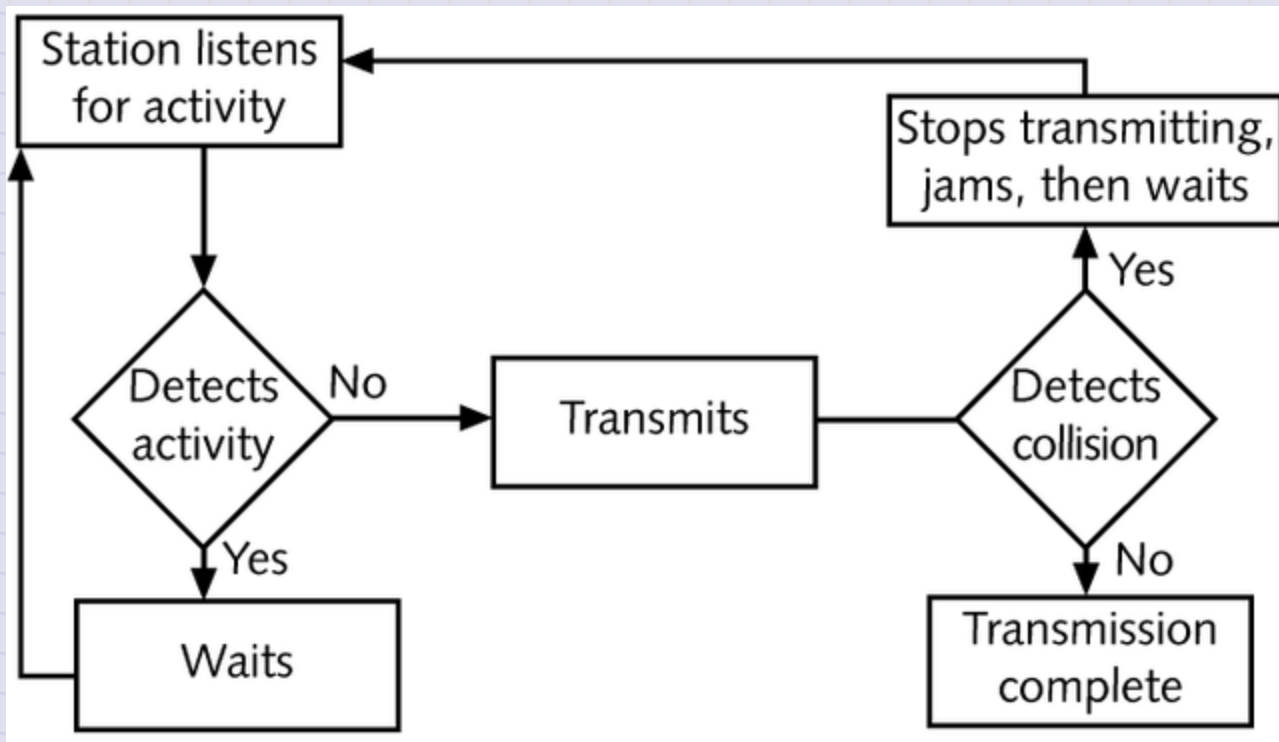
- 4-byte tag header inserted between Source MAC and EtherType fields
  - 2-byte tag protocol identifier (TPID)
    - a fixed value of 0x8100 that indicates the frame carries tag information.

- 2-byte tag control information (TCI)
  - Three-bit user priority (used to prioritize traffic)
  - Drop Eligible Indicator (DEI) (in congestion is frame “dropable”)
  - Twelve-bit VLAN identifier (VID)-Uniquely identifies the VLAN to which the frame belongs

# Link Access Methods

- Manage shared medium access contention (collision)
- Two methods:
  - CSMA/CD: for wired Ethernet
  - CSMA/CA: for wireless Ethernet

## CSMA/CD





## CSMA/CA

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# Reading List

- [IPv4 Addressing \(video\)](#)
- [Internet Protocol Version 4](#)