**Introduction to Computer Science – Networking** 

# Computer Networks

Introduction to the Internet Protocol (IP)



#### **Lecture Contents**

- ARPANet
- Internet Development Documentation
- Internet Protocol Origins
- Internet Protocol Basics
- IPv4 Header

#### **ARPANet**

- United States *Department of Defense* started a research agency called the *Defense Advanced Research Projects Agency* (**DARPA**) on 7 February 1958.
  - Has contributed to: Internet, GPS, drones; even Moderna COVID-19 vaccine
- DARPA funded the *Advanced Research Projects Agency Network* (**ARPAnet**), 1966, the precursor to the Internet
  - First computers connected 1969
  - Declared operational 1971
  - Decommissioned 1990

#### Internet Development Documentation

- RFC Request For Comment
  - Originally for ARPAnet
  - RFC 1 (7 April 1969, Steve Crocker of UCLA); still publishing
  - Currently managed by the Internet Engineering Task Force (IETF), 1986
  - https://www.rfc-editor.org
- **IEN** *Internet Experimental Note* 
  - Sequentially numbered documents for development of the internet
  - IEN 1 (29 July 1977) to IEN 212 (September 1982)
  - IEN are no longer published; now all published as RFC
  - https://www.rfc-editor.org/ien/ien-index.html

- The Transmission Control Program, 1974; modularized, 1977, into
  - Transport Layer (OSI Model layer 4)
    - Connection oriented Transmission Control Protocol (TCP)
    - Connectionless User Datagram Protocol (UDP)
  - Network Layer (OSI Model layer 3)
    - Internet Protocol (IP)

Internet Protocol Suite (Informally TCP/IP)



OSI Model

TCP/IP Stack

Application

**Presentation** 

**Application** 

Session

**Transport** 

Transport

**Network** 

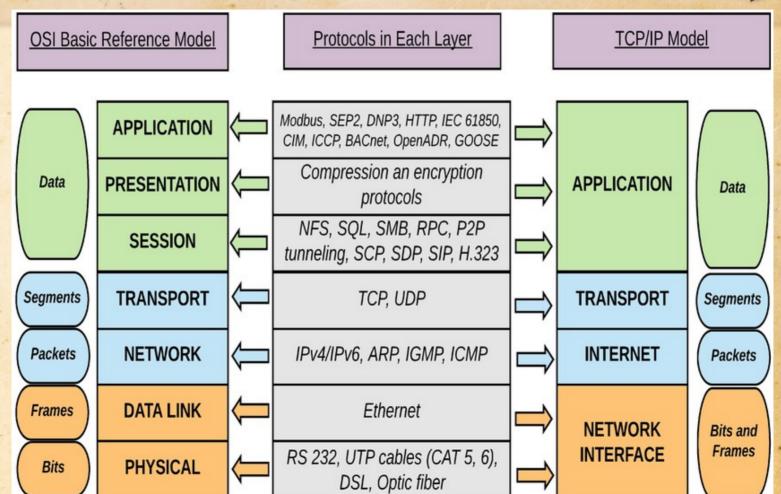
**Internet** 

**Data Link** 

**Physical** 

**Network Access** 





- IPv1 through IPv3 experimental
  - 1977 August: IEN 2 proposes first version of IP header IPv1
  - 1978 February: IEN 28 IPv2

#### • IPv4

- 1978 June: IEN 41, 44 first drafts of IPv4 header
- 1978 September: IEN 54 IPv4 header
- 1980 January: **RFC 760** standardized IPv4 header version in IEN 54

#### **Internet Protocol Basics**

- Network Layer (Layer 3)
- Packet delivery from source to destination
- Defines
  - Packet structures to encapsulate data
  - Addressing methods

#### Internet Protocol version 4 (IPv4)

• Header given in *IEN 54* (and *RFC 760*)

```
01234567890123456789012345678901
!Version! IHL !Tupe of Service!
                Total Length
Identification
             !Flags! Fragment Offset
Time to Live!
              Header Checksum
       Protocol
Source Address
      Destination Address
        Options
                      Padding
```

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