Korea University

Computer Networks
컴퓨터네트워크

(Berkeley Socket Programming)

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Chapter 2
Application Layer

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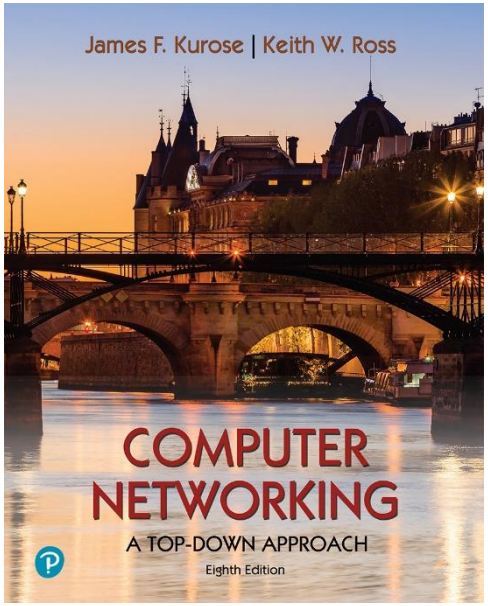
Thanks and enjoy! JFK/KWR



Computer Networking: A Top-Down Approach
8th edition n
Jim Kurose, Keith Ross
Pearson, 2020

Application Layer: Overview

- Principles of network applications
- Web and HTTP
- E-mail, SMTP, IMAP
- The Domain Name System DNS
- P2P applications
- video streaming and content distribution networks
- socket programming with UDP and TCP

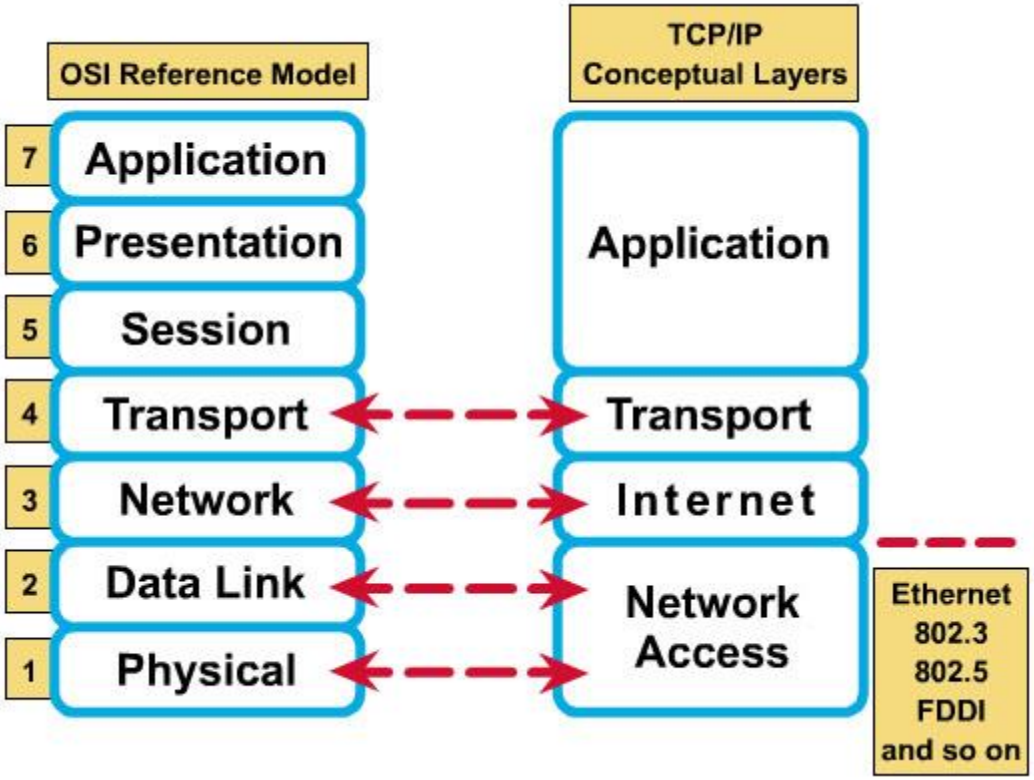
The Socket Interface

- Funded by ARPA (Advanced Research Projects Agency) in 1980.
- Developed at UC Berkeley
- Objective: to transport TCP/IP software to UNIX
- The socket interface has become a standard.

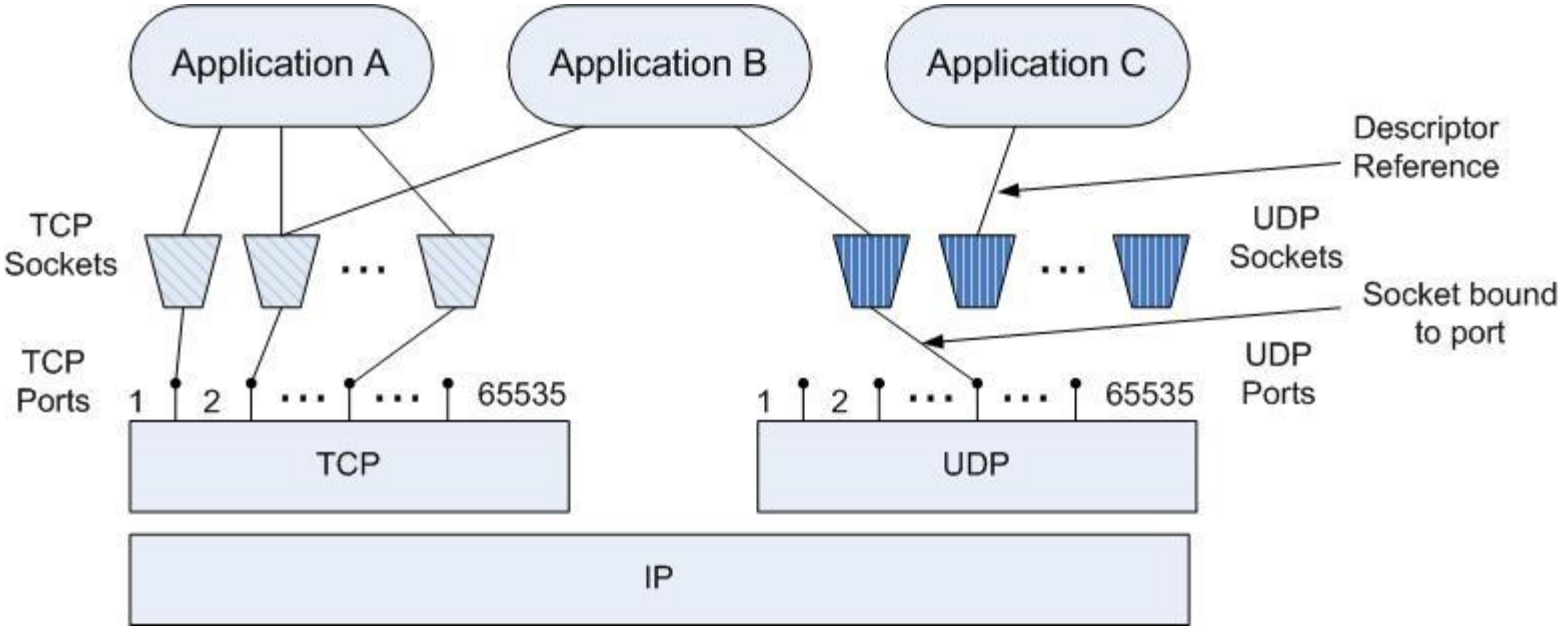
History of Sockets

- Sockets were introduced in 1981 as the Unix BSD 4.2 generic interface for Unix to Unix communications over networks (IPC between machines).
- In 1985, SunOS introduced NFS and RPC over sockets.
- In 1986, AT&T introduced the Transport Layer Interface (TLI) with socket-like functionality but more network independent.
- Another popular socket Interface Winsock

OSI Reference vs. TCP/IP



- What is a socket?
  - An interface that can "plug into" each other over a network
  - Generic interface for many protocols



Implementing network S/W

- Knowing how to implement network S/W
  - Essential part of understanding computer networks
- Application programming interface (API)

UCB Socket Programming Fundamentals

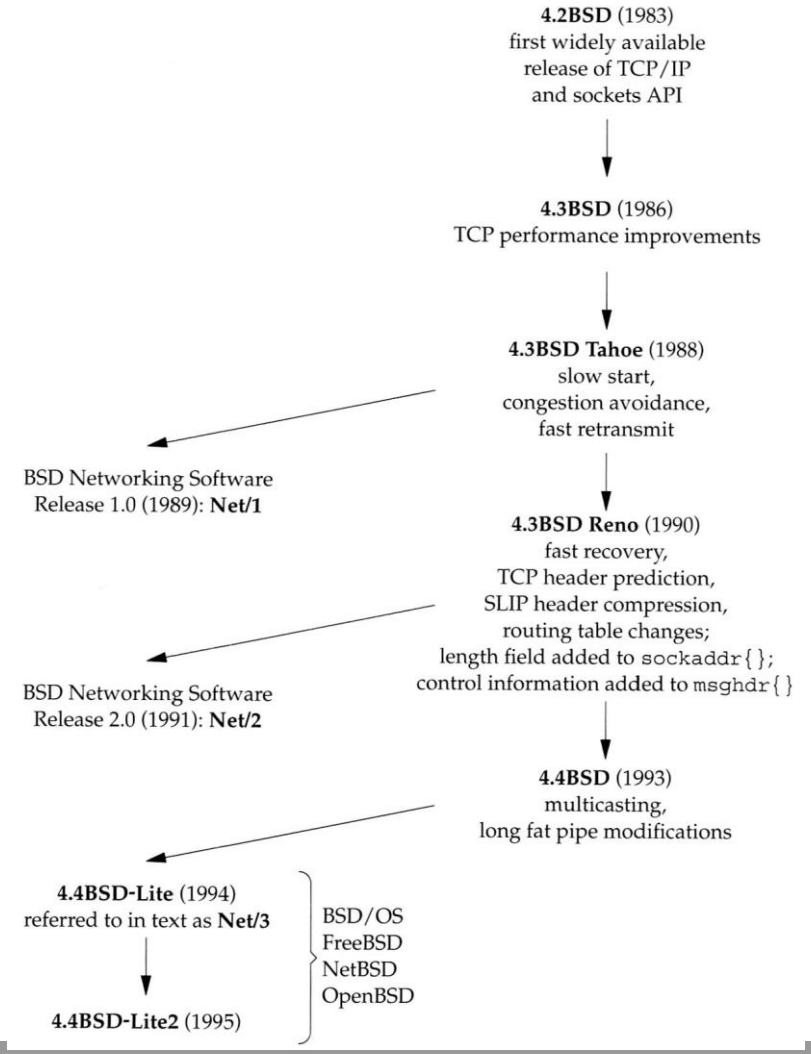
- Socket Programming Overview
- BSD Unix C Socket Programming API

Remember this legend as a Computer Scientist!!

Dennis Ritchie
1941-2011

BSD Networking History

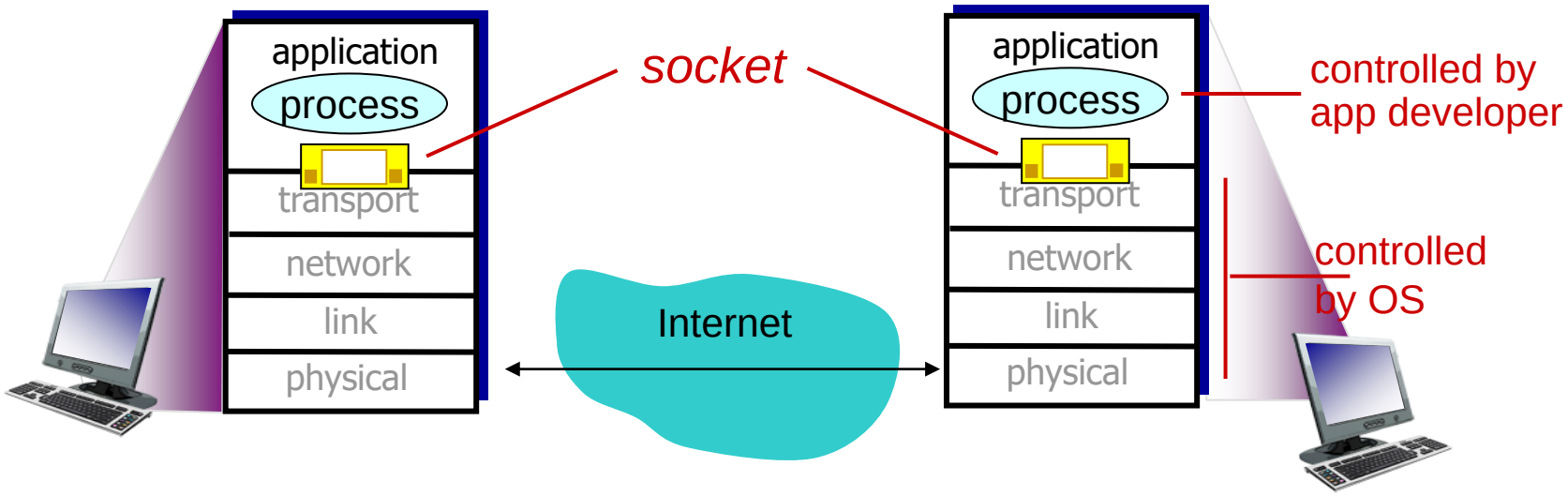
- Berkeley Socket API does not come from AT&T's UNIX
  - Dennis Ritchie, one of the fathers of UNIX, invents Streams in 1982, but



Socket programming

goal: learn how to build client/server applications that communicate using sockets

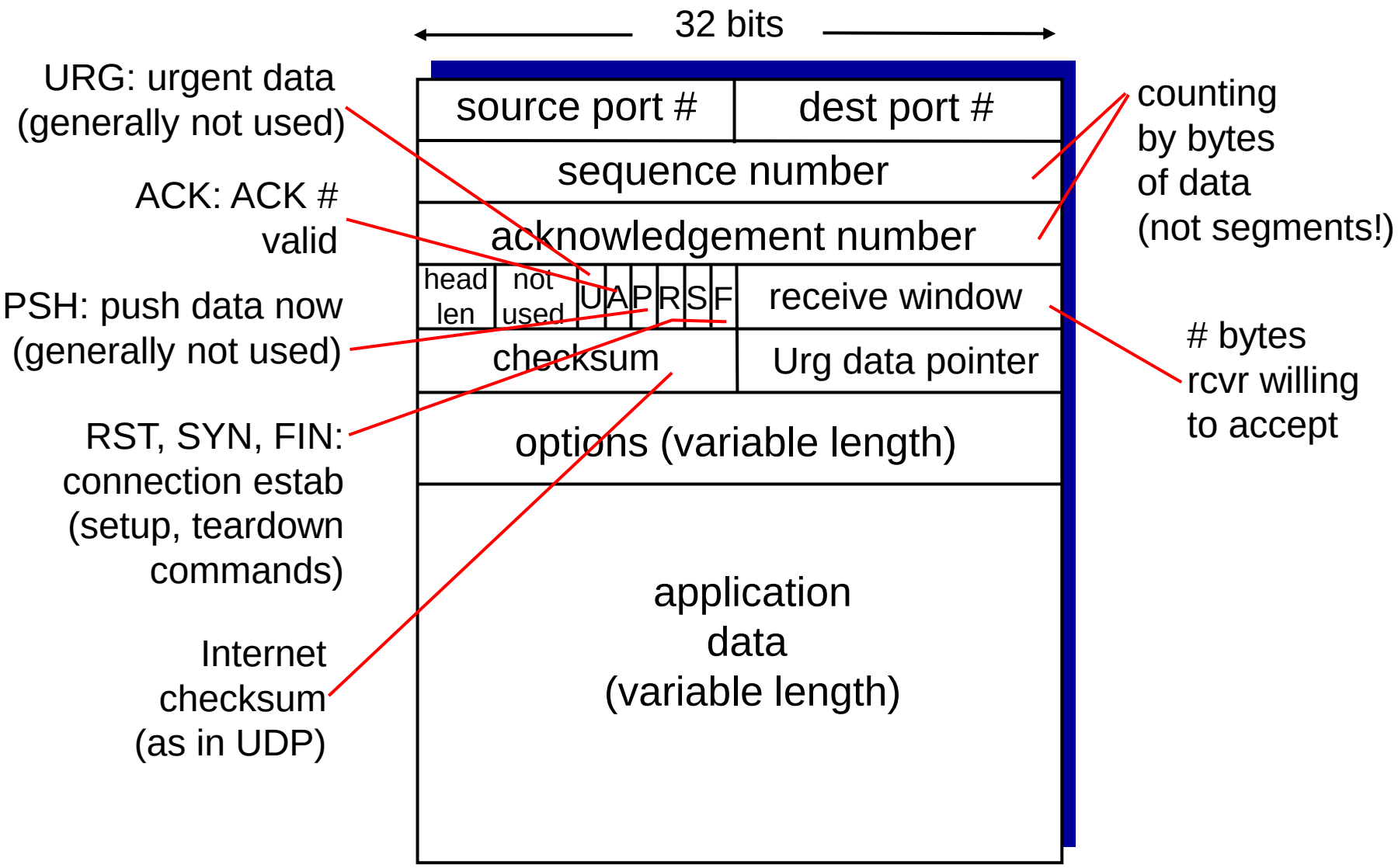
socket: door between application process and end-end-transport protocol



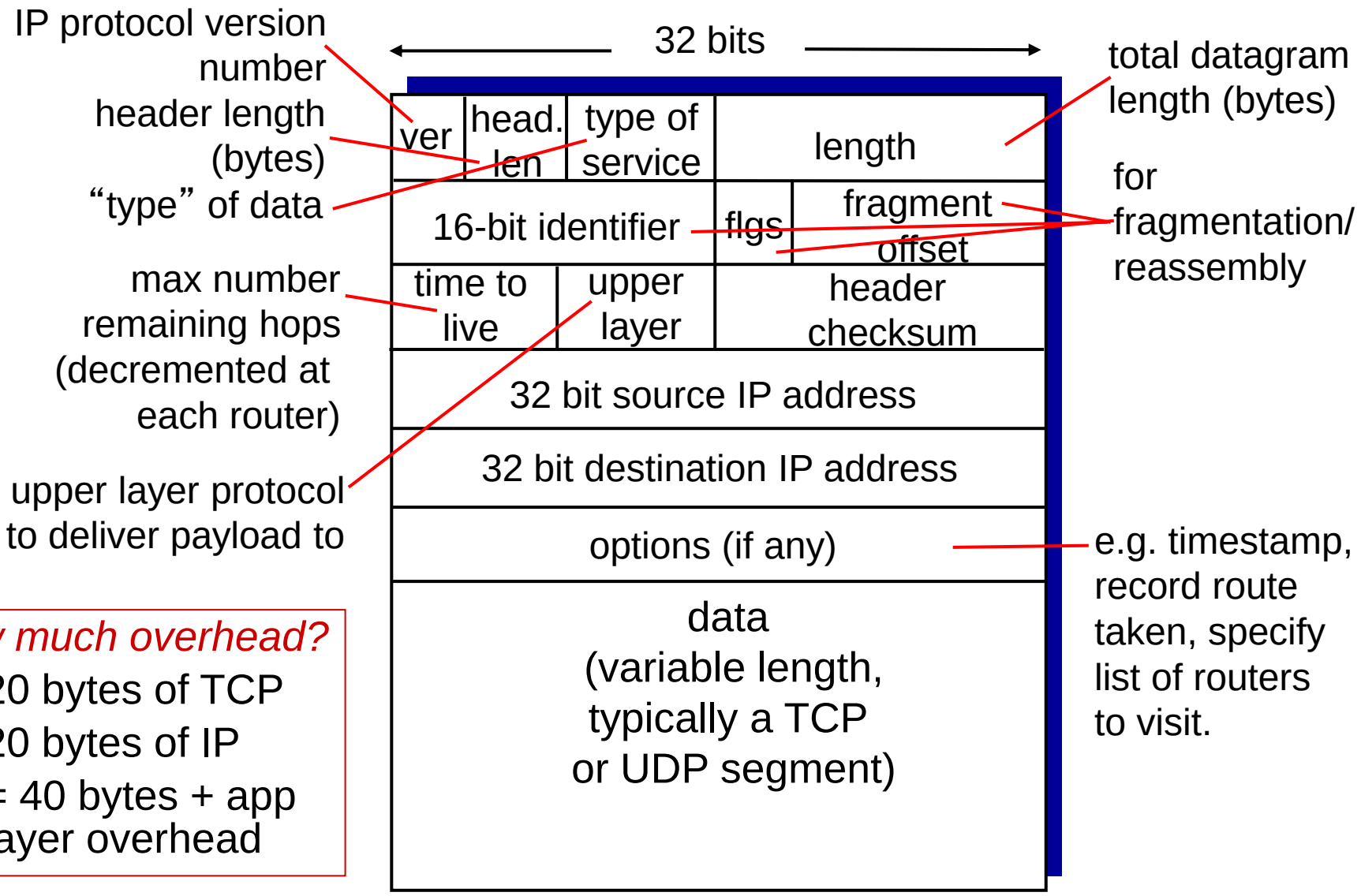
Introduction

- IP Address
  - 32-bit binary number
  - Dotted-quad: 163.152.38.163
  - Identifies a host interface
- Ports
  - Identifying ultimate destination
  - IP addresses identify host
  - Host has many applications
  - 16-bit identifier

TCP segment structure



IP datagram format



how much overhead?

- 20 bytes of TCP
- 20 bytes of IP
- = 40 bytes + app layer overhead