

TCP/IP 通訊協定及應用

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<http://wmlab.csie.ncu.edu.tw/course/tcp>

We provide
無線網路多媒體實驗室
Wireless
Wireless Network & Multimedia Laboratory
Solution

Chapter 17

TCP: Transmission Control Protocol

Introduction

- ◆ The original specification for TCP is RFC 793, although some errors in that RFC are corrected in the Host Requirements RFC.

TCP Service

- ◆ TCP provides:
 - Connection-oriented: establish a TCP connection with each other before they can exchange data.
 - Reliability:
 - ◆ the application data is broken into what TCP considers the best sized chunks to send.
 - ◆ Acknowledge and retransmit: a timer for each TCP segment.
 - ◆ This acknowledgment is not sent immediately, but normally delayed a fraction of a second.
 - ◆ TCP maintains an end-to-end checksum on its header and data.
 - ◆ Re-sequencing: TCP segments can arrive out of order.
 - ◆ A receiver must discard duplicate data.
 - ◆ TCP also provides flow control.

- Byte stream service
 - ♦ There are no record markers automatically inserted by TCP.
 - ♦ TCP does not interpret the contents of the bytes at all.

TCP Header

- ◆ TCP data is encapsulated in an IP datagram

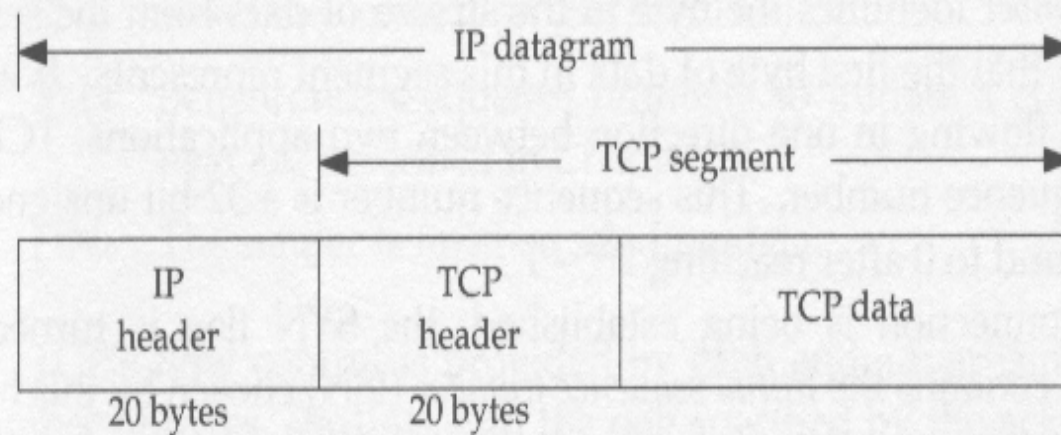
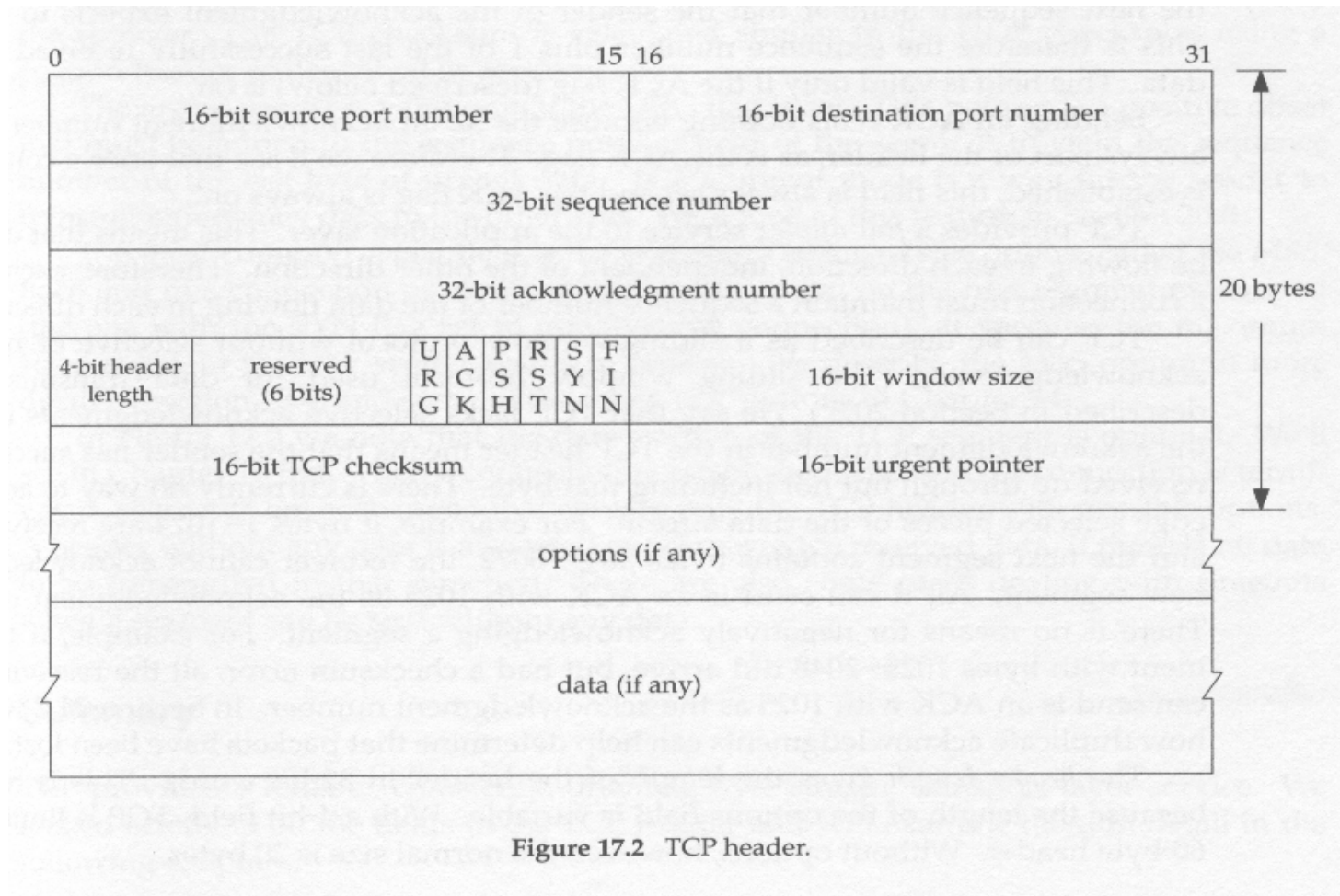


Figure 17.1 Encapsulation of TCP data in an IP datagram.

TCP Header (Cont.)

- ◆ The format of TCP header



TCP Header (Cont.)

- *port number*: to identify the sending and receiving application.
- *Socket*: the combination of an IP address and a port number.
- *Socket pair*: the 4-tuple consisting of the client IP address, client port number, server IP address, and server port number.
- *sequence number*: identifies the byte in the stream of data from the sending TCP to the receiving TCP that the first byte of data in this segment represents.
 - ♦ TCP numbers each byte with a sequence number.
- *ISN*: initial sequence number (seq# of the 1st data byte = ISN+1)
- *acknowledgment number*: contains the next sequence number that the sender of the acknowledgment expects to receive.
- *header length*: this is required because the length of the option field is variable.

TCP Header (Cont.)

- The six flag in the TCP header:
 - ♦ URG The urgent pointer is valid.
 - ♦ ACK The acknowledgment number is valid.
 - ♦ PSH The server should pass this data to the application as soon as possible.
 - ♦ RST Reset the connection.
 - ♦ SYN Synchronize sequence numbers to initiate a connection.
 - ♦ FIN The sender is finished sending data.
- *window size*: TCP flow control (up to 65535 bytes)
- *checksum*: calculated and stored by the sender and then verified by the receiver
- *urgent pointer*: valid only if the URG flag is set. This pointer is a positive offset. TCP's urgent mode is a way for the sender to transmit emergency data to the other end.
- *option*: MSS (maximum segment size)

Summary

- ◆ TCP provides a reliable, connection-oriented, byte stream, full-duplex, transport layer service.
- ◆ TCP packetizes the user data into segments, sets a timeout any time it sends data, acknowledges data received by the other end, records out-of-order data, discards duplicate data, provides end-to-end flow control, and calculates and verifies a mandatory end-to-end checksum.
- ◆ TCP is used by many of the popular applications, such as Telnet, Rlogin, FTP, and electronic mail (SMTP).