## CN MW4 貴工三 603902125 林映连

a. Note, wrap around if overflow

01000000

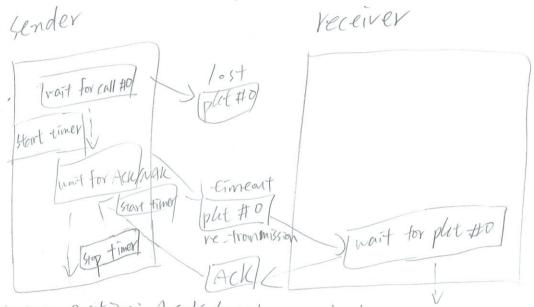
10/1/1001 0/1/01/01 100/01/01

A:10000010

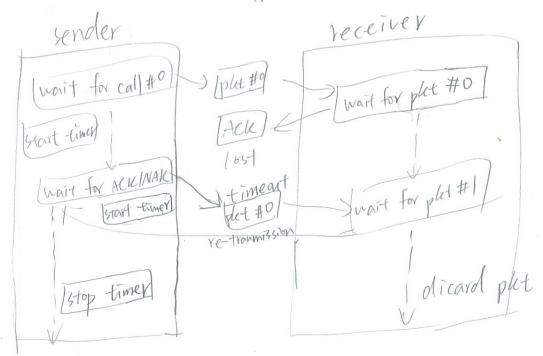
To detect errors, the receiver adds the four words (
the three Original words and the checksum). If the
sum contains a zero, the receiver knows there has been an
error. All one-bit errors will be detected, but two-bit
errors can be undetected (e.g., if the last digit of the
first word is converted to a O and the lost digit of
the second word is converted to a 1).

volt-send(data) 2. sender: snotplet = make-plet(0, data, checksum) ndt-send(sndplet) rdt\_vcV(vcvplet) Wait for ACKON (corrupt (respect)) isNAK( verplet)) Timeout/ udt\_send(sndplet) nott\_send(snotplet) Start timer volt\_rev/revplet) Stop timer Start timer & notcorrupt (revplet) rolt-rev(revput). ll is ACK (very let) Timeout &2 notcorrupt (resplit) nudt\_send(sndplet) 88 is ACK (revplet) Stop timer Start timer Nort ACK Stop timer Wait for NAK call I from valt\_vcv(vcvpbt)&& volt\_send(data) (corrupt (verplet) ! 4 ndplit = make\_plit (1, dota, checlesum) TSNAK (YCVpht) udt-send(sndpkt) udt-send (sndplet) Starf timer Stop timer Start timer receiver: No changes are needed rdt\_rev(revplet)&&notcorrupt (revplet) & has\_sego (revplet) xdt\_rcv(ruplet)&&corrupt(rcvplet, extract ("cripht, data) detiver dorfa (dorta) rdt\_rcv(vcvpkt) stroplet = make plut (NAK, checksum, Wait for svolphet = make\_plet (ACK, checksum) Wout for volt\_send (snotplet) I from the own Nott-send(sndplet) & corrupt (verplet) 0 from snolphet=make phet (NAX, checksum) below Afterer(revplet) 88 not corrupt ndt-sendlindpht) (rcvplet) 22 has sego (rcvplet) sndplet=make\_plet(ACK, ehecksum, udt\_send(sndplet) volt\_rev(revplet) & anoteorrapt rot-revereplet) & hotcomptercoplet) (resplet) & has\_seq ((resplet) &8 has segl (verplut) snotplet=make\_plet(ACK, Checksum) extract (verplet, data) udt\_send(snolpkt) deliver-data (data) snot plut = make\_plet (ACK, checksum) nolt\_send(sudplet)

\* Suppose the timeout is caused by a lost data packet, i.e. a packet on the sender-to-receiver channel. The receiver never received the previous fransmission and, if the timeout retransmission is received, it look exactly the same as if the original transmission is being received \* Suppose an ACK is lost. The sender will eventually retromsmit the packet on a timeout. But a retransmission is exactly the same action that is take if an ACK is garbled. Thus, the sender's reaction is the same with a loss, as with a garbled ACK. I timer in action: data packet is lost.



\* timer in action: ACK/NAK is lost



has received packets let, and has Acked that and all other preceding packets. If all of these ACK's have been received by sender, then senders window is [k, k+N-1]. Suppose next that none of the ACKs have been received at the sender. In this second case, the sender's window contains let and the N packets up to and including let. The sender, window is thus [k-N, k-1]. By these arguments, the senders window is of size 4 and begins somewhere in the range [k-N, k].

The receiver is woriting for packet k, then it has received (and ACKed) packet k-1 and the N-1 packets before that. If none of those N ACKs have been yet received by the sender, then ACK messages with values of [k-N, k-1] may still be propagating back. Because the sender has sent packets [k-N, k-1], it must be the case that the sender has already received an ACK for k-N-1. Once the receiver has sent an ACK for k-N-1, it will never send an ACK that is less that k-N-1, Thus, the range of in-flight ACK values can range from k-N-1 to k-1.

(4) In the second segment from Host A to B, the sequence number is 20%; source port number is 302 and destination por number is 80.

4. (b) If the first segment arrives before the second, in the orchnowledgement of the first arriving segment, the orchnowledgement number is 207, the source part number is 80, and the destination port number is 302.

4. (C) If the second segment arrives before the first segment, in the acknowledgement of the first arriving segment, the acknowledge number is 127, indicating that it is still variting for bytes 127 and onwords.

4. (d)
Host A

Seq = 127, 80 bytes

Timeout

Timeout

Leq = 127, 80 bytes

Ack = 247

Timeout

Timeout

Acl = 247

5. (01) TCP slow start is operating in the intervals [1,6] and [23, 26]

5. (b) TCP congestion avoidance is operating in the intervals [6,16] and [17,22]

5. (c) After the 16th transmission round, packet loss is recognized by a triple duplicate ACK. If there was a timeout, the congestion window size would have dropped to 1.

5.(d) After the 22<sup>nd</sup> transmission round, segment loss is detected due to timeout, and hence the congestion window size is set to 1.

5.(e) The threshold is initially 32, since it is at this window size that slow start stops and congestion avoidance begins,

5. (f) The threshold is set to half the value of the congestion window when packet loss is detected. When loss is detected during 22nd transmission round, the congestion window size is 26. Hence, the threshold is 13 during the 24th transmission round.

t. GIThe threshold is set to half the value of the congestion vindow when packet loss is detected. When loss is detected during 22 nd transmission round, the congestion windows size is 26. Hence the threshold is 13 during the 24th transmission round.

5.(h) puring the 1st transmission round, packet 1 is sent; packet 2-3 are sent in the 2nd transmission round; packets 4-7 are sent in the 3rd transmission round; packets 6-15 are sent in the 4th transmission round; packets 16-31 are sent in the 5th transmission round; packets 32-63 are sent in the 6th transmission round; packets 32-63 are sent in the 6th transmission round; packets 64-96 are sent in the 7th transmission

round. Thus packet 70 is sent in the 7th transmission round 5(i). The congestion undow and threshold will be sent to halo the current value of the congestion window(8) when the 1035 occurred. Thus, the new value of the threshold and vindon mill be 4. 5(j). Threshold is 21. The congestion window size is first

set to 1, and then grows to 4 in 19th round.