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The TCP RESET Mechanism

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1. History

The TCP Version 1 specification included a variety of error codes. Of these only three would ever cross the network (i.e., "catenet") in packets. Using the original terminology these were:

EFP+6: "I just received a SYN which is not a duplicate of the one which established the current sequence. This SYN must be a duplicate from a previous incarnation (or from the most recent DSN-SYN)".

EFP+7: "No such TCB exists at this site".

EFP+12: Generated by an intermediate gateway to indicate that the destination cannot be reached.

At the TCP meeting which was held at UCLA on September 21, 1976 a new mechanism was designed which replaced all three errors with the RST mechanism. Basically, instead of emitting EFP+6, a TCP now sends a normal, ACK-only packet which contains enough information for the receiver of that ACK-only packet to send a RST (see below) which will be acceptable and will kill the connection.

EFP+7 became RST. An acceptable RST packet causes the connection to be deleted. EFP+12 was judged to be useless since there are multiple paths through the catenet and the fact that some intermediate gateway cannot reach the destination does not mean that there is not some other path.

2. The Algorithm

A. If a strange SYN is received, reply with a null (ACK-only) packet which contains the normal Sequence and Acknowledge fields. A strange SYN is one which is not a duplicate of the SYN packet which established the current incarnation of this connection. This is determined by saving the Sequence number of the initial SYN in the TCB.

B. If an out of window, non-SYN packet is received while in the SYN-SENT state, reply with an RST packet which will be acceptable to the TCP that sent the offending packet. Thus the Sequence number for the RST packet is taken from the Acknowledge field of the offending packet and the Acknowledge field is taken from the Sequence number of the offending packet.

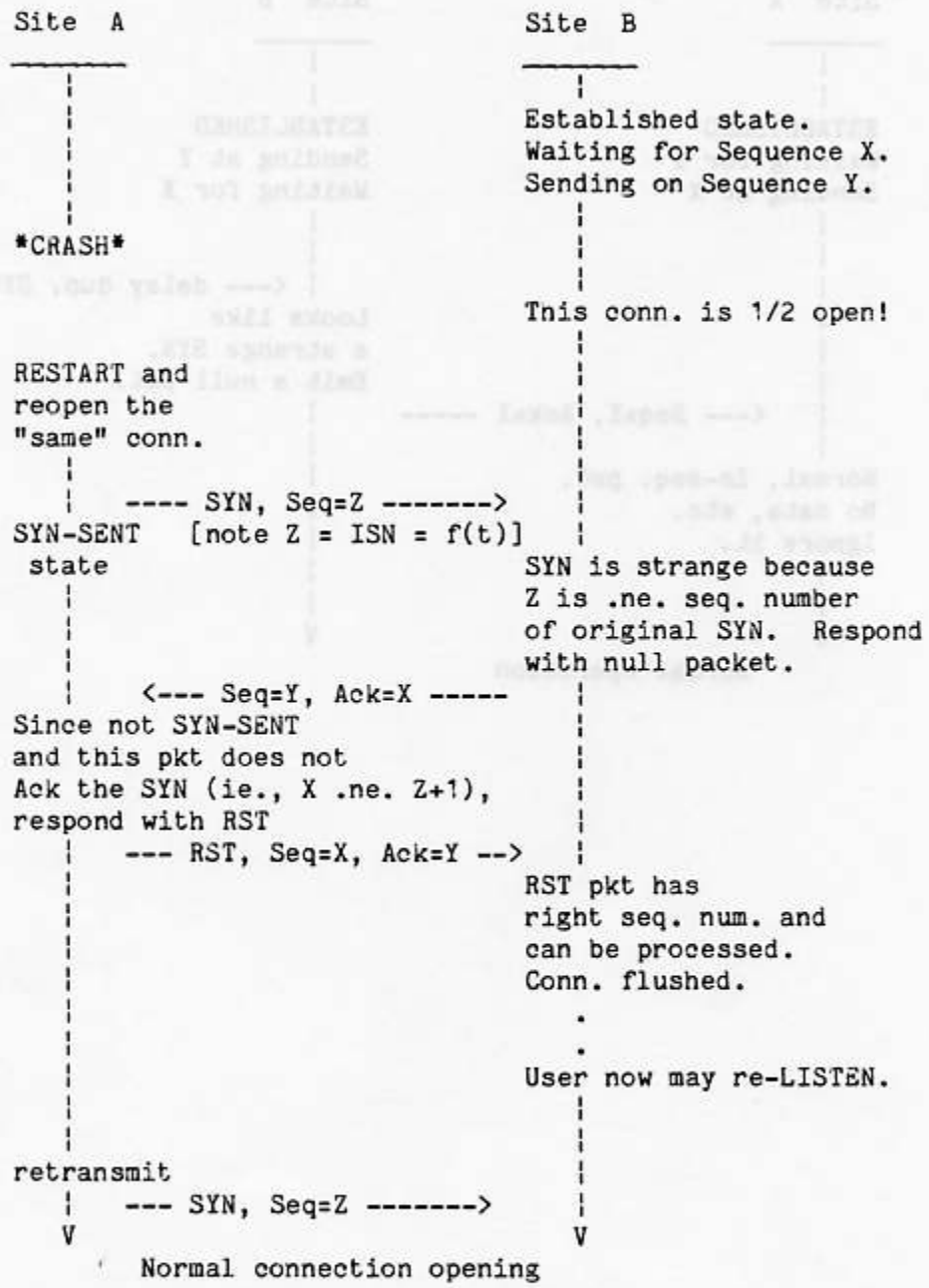
C. If an acceptable RST packet is received, delete the TCB it addresses and say no more.

D. A connection can be abandoned at any time including while it is in the SYN-RECEIVED state. As a courtesy to speed up things an RST may be sent. Again, this RST packet must be constructed so that it will be acceptable at the receiving end.

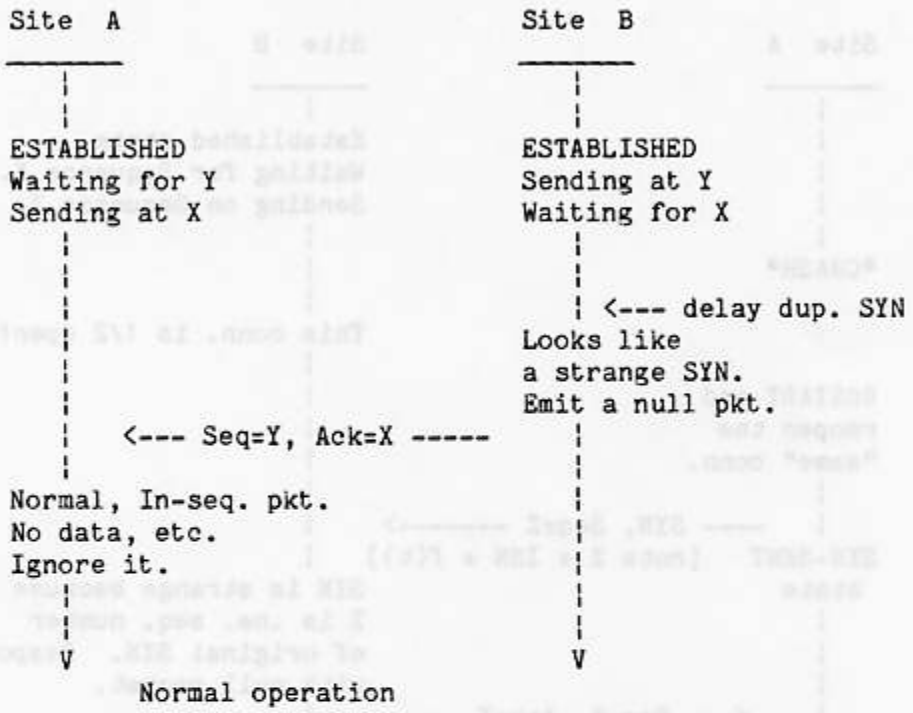
E. An RST received while in the SYN-SENT state may be interpreted as "Connection Refused". It may be that the refusal is due to the fact that the remote end was not listening.

Several pages of illustrations follow which will hopefully make it clear how this RST mechanism works.

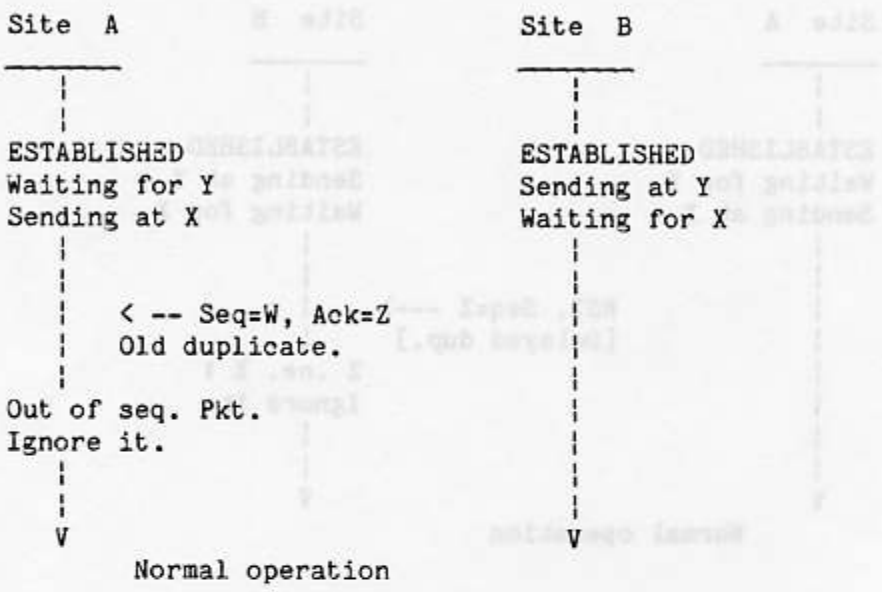
3. Half-open Connection Recovery



4. Delayed SYN From Previous Incarnation

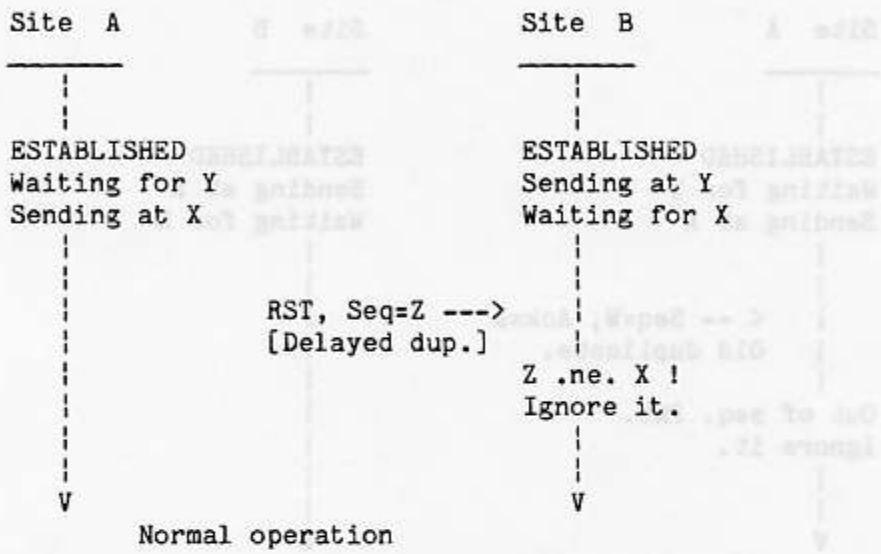


5. Delayed Null Packet

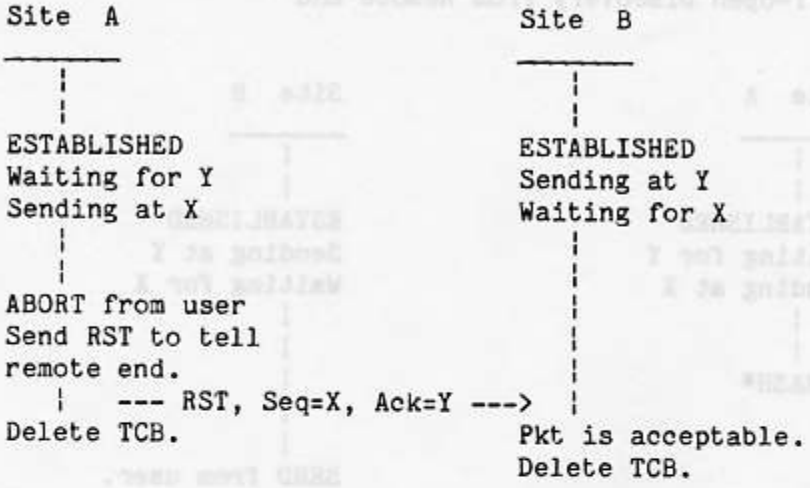


Normal operation

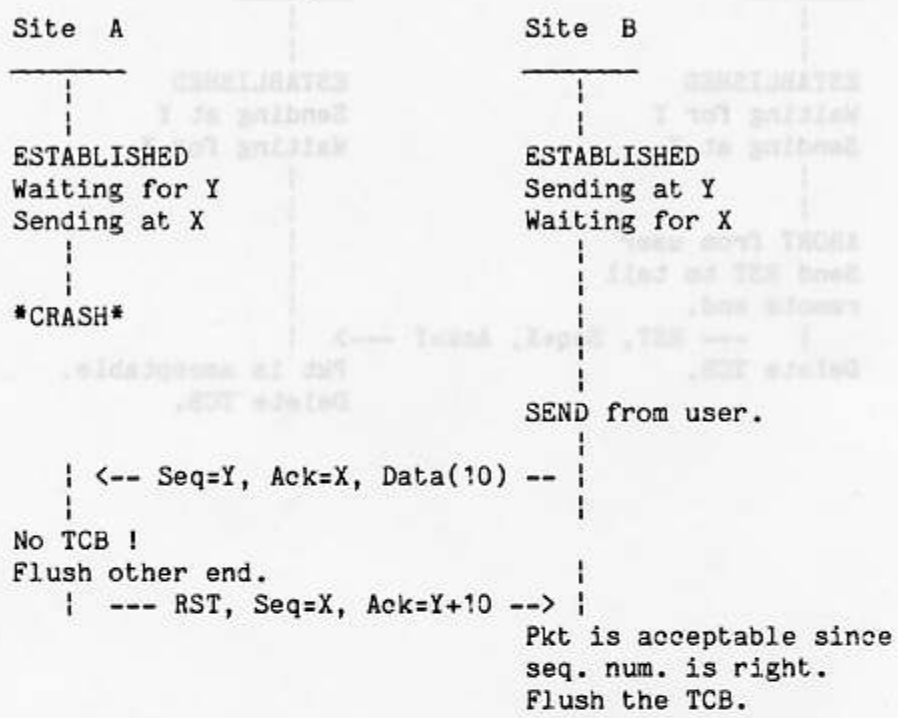
6. Delayed RST Packet



7. Use of "Courtesy RST"



8. Half-open Discovery From Remote End



N.B. This is what happens if the "courtesy RST" is not sent when an ABORT happens. The only difference is in the timing at B.