LOST MESSAGE DETECTION

I have three suggestions for detecting the loss of messages by the
communications subsystem. The first of these is perhaps the more
powerful and simpler to implement since it uses no new concepts and has
the power to retransmit the message detected as lost.

The first scheme:

    If upon sending a message the host saved a copy of that message and
    waited until either:

        a RFNM was returned, in which case everything is ok and the next
        message is processed.

        a INCOMPLETE TRANSMISSION is returned, in which case the copy of
        the message is retransmitted (this could be a loop so put a
        finite upper bound on the number of times to retransmit the same
        message).

        a DESTINATION DEAD is returned, in which case mark the
        destination down and require the exchange of reset commands
        before further communication is allowed.

        something else is received indicating an error in the network or
        local IMP, in which case at least log the error, and probably
        close the conversation.

    Following the above procedures either on a per host basis or a per
    link basis should prevent a lost message problem from
    developing.

The second scheme:

    If on a per host basis, message numbers are included in the host to
    host header of messages,, and messages are delivered in order (this
    is currently the case in the network, except for priority messages
    so this proposal requires that each host either send everything as
    priority or nothing as priority) then each receiving host can detect
    a missing message by comparing the message number of the received
    message with the previously received message.

        On exchanging resets the sequence numbers between that pair of

hosts is set to zero.

Each time a message is sent the current send message number is
entered into a field in the message header, and the current send
message number is incremented (modulo N, say N=256)

Each time a message is received the message number from the
message is compared to the current receive message number and:

if the received message is the expected one then the message
is acceptable and current receive message number is
incremented (modulo N);

if the received message is not the expected one then a
message has been lost.

What to do when a missing message is detected, not clear, but at
least can be logged and reported to the network control center. A
missing message may not be fatal to an interactive conversation, but
it is critical in a file transfer, thus I suggest that missing
messages which are not recovered be cause to close the conversation.

The third scheme:

Host to host acknowledgements could be required. Such an
acknowledgement scheme could be implemented similarly to the IMP to
IMP scheme. This is a serious change to the current protocols so I
will not elaborate on it here, feeling that deeper study will be
necessary to fully specify a reasonable host to host acknowledgement
strategy.

Of these three suggestions the first is the most immediately practical
and implementable; in fact several hosts all ready do this. These
schemes also are non-conflicting, they could be implemented and used
simultaneously.