BBN's Comments on NWG/RFC #33

BBN has given us the attached comments on NWG/RFC 33, but wouldn't
publish them being relectant to embarrass us. Embarrassment notwith-
standing, we found the comments particularly useful and decided to share
them with our friends. Bill Crowther is the author.

I found two substantial errors in the Host Protocol Paper, which was
otherwise an excellent paper. Both concern a misunderstanding of the
nature of the IMP as a communications device, and in particular the
nature of buffering an IMP must do. The authors consider the network as
a device into which one pushes a message which travels around some,
waits in buffers for substantial lengths of times, and then emerges at
the destination. In fact a better model would be that the message pops
out again an instant after it is inserted. While it is true there is a
delay, it is imposed by phone line hardware for the most part. The IMP
buffering is minimal, and devoted to error control and momentary traffic
surges.

Since we cannot force a Host to take a message, we have built an elab-
orate RFNM mechanism to suspend new input until he does. This mech-
anism is an imperfect attempt to solve a very hard communications
problem. The desire is to regulate traffic in such a way that as the
Host takes its message from the IMP the next message is arriving on the
phone line, and no buffering occurs at all.

In fact we cannot achieve this, and therefore have included buffering to
handle traffic surges. These buffers are useless for their intended
purpose unless they are empty. Only empty buffers are available to soak
up a traffic surge.

The two specific errors occur on pages 5 and 23. On page 5 the authors
say "Implicit in this purpose is the assumption that a user does not use
multiple links to achieve a wide band." In fact one of the primary
purposes of links is to achieve a wider band.

We wish to allow as much band width as possible. Our troubles occur not
with wide band but with an imbalance of input and output. The authors
have rightly noticed that multiple links subvert the RFNM mechanism,
making our job harder, but have wrongly labeled the nature of the
problem.

Again on page 5 "An even more basic assumption, of course, is that the
network's load comes from some users transmitting sequences of messages
rather than many users transmitting single messages coincidentally." We
are in great shape against single message users when their messages are
randomly related. The statistics are all in our favor and we have
special procedures for the (rare) coincedences. Our problems come with
the non-random coincidences, and we have taken special precautions
against users transmitting bursts (sequences) of messages. We assume
all kinds of users, and protect ourselves accordingly.

On pages 23 and 24 there are 4 critical sentences which imply that the
system design could have been improved by allowing the Host to specify
which of several waiting inputs he might wish to accept. We grant that
the Host needs to buffer these messages for its users, but violently
disagree that the IMP has the capability to do this buffering.

If we are operating in ideal mode, we would have at most one message for
the Host at any time. If we have more than one we urgently need the
Host to accept these messages, because our ability to handle traffic
surges is now below standard. At present we allow three full

length messages in an IMP for its Host before we start backing traffic
up in the network. "Three" is not enough to help the Host in addition
to keeping a reserve for the traffic surges.

But if buffering is needed why not get more memory and do it in the IMP?
Because buffering is a Host function, is different in each time share
system, is hard to control over a busy serial channel, might not be
needed at all in some places, and is better done where the extra memory
can be efficiently shared by the Host operating system.

I repeat: the IMP's buffers must be empty or they are not serving their
communication purpose.

The offending sentences are:

        Paragraph 2 sentence 3
             "   3 all
             "   4 sentences 1 and 2 (80ms is hardware screw adjustable)
             "   4 sentence last

          [This RFC was put into machine readable form for entry]
         [into the online RFC archives by Jeff & Christy McClellan 2/98]