MEMORANDUM

To.     Frank Heart

From.   Ralph Alter

Subject: NCC, ARPA Network Usage Accounting, ARPA Network System
         Programming, PDP-1D, etc.

Date:   27 July 1971

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Our present posture on a set of interesting issues is sum-
marized as follows:

1)  ARPA Network System Programming development, etc. presently
    uses the PDP-1D, but experiences large delays in getting at
    the TENEX line printer due to the manual mode of access thru
    magtape transfer.

2)  The NCC has long been constrained by the unavailability to
    it of file storage, magtapes, and generally the fact that
    is a small, unpowerful machine.  As a long-standing advocate
    of powerful control facilities for large computer systems
    (i.e. the ARPA Network), I see this as a massive and
    growing limitation.

3)  We are considering inclusion in the next ARPA contract of
    $24,000 to facilitate adding two magtape drives, a magtape
    controller, and the related necessary 4K of core to the NCC
    in order to facilitate recording of the accounting data in
    a reliable manner.

4)  Division 6 is assuming that it will receive back operational
    control of the PDP-1D at some time in the near future.


    I believe that there is a convenient alternate approach to
all of the above issues which has many additional interesting
payoffs also.  That solution includes adding the PDP-1D as a Host
to the ARPA Network.  The advantages are as follows:

1)  Programmers and their PDP-1D programs would then have easy
    access to TENEX, the TENEX line printer, the ODEC or Gould
    line printer, and any other facilities that are on the
    network.

2)  Consider the PDP-1D to be the new NCC: it would then be a
    reasonably powerful machine with a large file storage device
    (the Fastrand), two magtape drives, etc.

3)  We then avoid adding any hardware to the present NCC, although
    we should keep that hardware intact, I believe.

4)  From BBN's and Division 6's points of view, the ARPA contract
    can now support some of the PDP-1D operational expenses,
    removing the spectre of having those costs appear on the
    Division 6 overhead.

5)  The PDP-1D is currently a highly reliable device; its
    Fastrand storage provides extra protection even for the case
    when the 1D itself fails—an all-important characteristic
    for our NCC.

Other relevant considerations are the following:

1) A special Host interface for a PDP-1 has been built at least once before by people who work here (Ben Barker, at Harvard). Initial estimate for parts cost is very conservatively $4,000.

2) Although implementation of full Host protocol on the PDP-1D might (or might not) be impractical, (a) we probably do not need full protocol (although it might be nice), and (b) we are in an excellent position to be able to modify the 1D exec, having Bernie Cosell, and possibly soon also Jon Cole, on our staff and therefore potentially available for that work.

3) There are at least three possible access ports to PDP-1D memory which we can consider. One of them probably will turn out to be easy. These three are (a) directly to the memory port, (b) connect to the still existing but untrustworthy 2400-baud serial interface, or (c) make the SHI to the IMP appear to the PDP-1D to be a PDP-7; the existing interface box provides for a quantity of 4 PDP-7's, of which we have 2 (Telcomp's) and probably do not even need those 2.

4) Note also that for specific hardware experience on our own PDP-1D, Phil Rulon, who used to be with Telcomp, has expressed a willingness to be available if we happen to need him.

5) We currently do take the PDP-1D down for about an hour each night for a Fastrand dump. Maybe we can reconsider the need for this procedure, but the simplest approach is probably for the present NCC to stay up, and to receive and buffer any NCC data which comes in while the PDP-1D is down, giving it all to the PDP-1D if we wish when the 1D comes back up. It could run mostly any present NCC program we now have to cover that short interval.

6) We do have a slot problem in the IMP #5. Three modems + two Distant Hosts + one Local Host + one new Distant Host requires 20 slots. I insist this is a solvable problem when we care enough. We do not have a DMC channel or an interrupt problem, I think, although we will use all of each that exist.

7) We would obtain real experience in trying to use our own ARPA network, for real work - to get at the line printer, to sample IMP status, etc.

In summary, I think the approach I have suggested has substantial technical advantages for Division 6 and for the ARPA contract; I believe it offers a significant financial advantage for both Division 6 and the ARPA contract, and I believe the PDP-1D will provide both low cost and the more powerful NCC facility which I think we will badly need as we try to reduce the failure rate while expanding the network and its usage. I recommend immediate adoption of this approach and immediate planning for its implementation.

cc: PC, WRC, SMO, HKR, DJS