MEMORANDUM

To: T.Rulon, R.Alter, S.Ornstein, J.McQuillan, W.Crowther, B.Barker, J.Cole

From: B.Cosell

Subject: PDP-1 Interface to the Network

Date: 2 November 1971

It appears to be the case that the easiest way to connect the PDP-1 to the network is to take advantage of the already existing PDP-1 to PDP-7 interfaces currently being used by Telcomp to effect their file storage. There are three interfaces; each interface is a half-duplex word at a time interface (via the I-O) and is burdened by a lot of nonsense concerned with setting up a memory address on the PDP-7 end (for it looks like a memory access channel to the PDP-7). If we were to use the interfaces we would probably strip away almost all of them, retaining only the portions which interface directly into the CPU and I-O structure on the PDP-1, thereby providing us with a collection of pre-selected IOTs and interrupt lines and whatnot.

At our meeting on the morning of 3 November, we will consider the difficulty of making one of these PDP-7 interfaces be a Host interface. I've been thinking about a slightly different question, which is whether or not a word at a time interface can run fast enough to be able to function as a Host interface on the network.

I think that the interfaces should be connected up as simplex connections to the network. We should use two interfaces, one dedicated to pushing information into the network, and one dedicated to taking information from the network. The scheme I propose for implementing the user calls to talk to and listed to the network would be that the program would do a single IOT which would be

the GIVE ME (send you) a block of stuff from (to) the network. Considering only receiving from the network, which is the real problem, the system would hang the user until he got an interrupt from the network saying HERE'S SOME STUFF and then the user would be waked up, called into core, and locked in core as the word at a time transfer was pulled in from the network and jammed down into his core and then when the network said this was the last word, or you just got the last word, whichever way, he would then be released. The program would then write the entire message out on the drum. In later versions he may do some processing of it and do somewhat more clever things, but for the first cut he will just write it out on the drum and then go back and listen for another network message. So, to find out what the bandwidth of this is, we have to consider what the time will be from when the network says I HAVE A MESSAGE FOR YOU until that program can possibly get back to being ready to receive the next message from the network.

When the interrupt comes in it will take approximately 100 microseconds to process the interrupt and initiate waking the user up. At that point it will take approximately 40 milliseconds for the user to be brought into core and set up and prepared to run, at which point he will re-execute his GIVE ME SOME STUFF from the network IOT and then, on channel 16, will sit in a loop, pulling the information in from the network until it's done. The loop will run at approximately 50 microseconds per word, plus approximately 2 or 3 milliseconds of overhead in actually getting the whole affair started and then ended. The program would then be set running again and would do a single I-O processor IOT to write out the message that was just received. This can take a half second as an absolute upper bound. Then there would be 1 millisecond, which would be the processor time for the program getting

re-initialized and coming back up through the monitor to make his request again. This gives us a total of approximately 550 milliseconds, plus 50 microseconds per word. There are three datapoints of interest: the first is for a one word "interactive" message, which works out to about 30 bits per second. For an 8-packet message, however, the rate moves up to approximately 14 kilobits. At this rate, the third interesting datapoint is how long it will take the PDP-1 to suck up a full core load from the network. A full core load is 48 8-packet messages, which would take 27.6 seconds. Although this sounds like an excessively large number, I believe that it is acceptable and totally within the constraints that an IMP imposes upon a Host, and one also must remember that the 14 kilobits, which is the rate at which the PDP-1 would be sucking up a core load, was computed using an absolute upper bound for the response time of the PDP-1 and I believe that it is probably a factor of 2 or perhaps 4 faster than that.

BC/jm