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Mr. B. L. Sarahan

November 28, 1956

Subject: Tape or Memory Coupled Systems

In recent discussions, the question has arisen whether it would not be advantageous to have the SIGMA computer physically independent from the DELTA computer. A number of observations have been made in the past and can be summarized as follows:

1) The high speed of the SIGMA arithmetic element depends, to a large extent, on keeping the operations to be performed as simple and as few in number as possible. By simple I do not mean elementary. Rather the rules have to be rigid with few or no variations. Anything which does not contribute in a major way to high arithmetic performance should be kept out. This helps to reduce the amount of switching to be done.

2) If SIGMA were to be a separate machine, it should be coupled to DELTA by the high-speed tapes. As a corollary of 1, there should be no other input-output equipment on the SIGMA computer.

3) In a tape-coupled system, the tape units should be switched electronically under program control between the memory buses of the DELTA and the SIGMA computers. Manual switching or reel changing would seriously detract from the system performance.

4) Because of the high speeds involved, the tape units to be switched between DELTA and SIGMA would have to be in close physical proximity to both machines.

5) In a memory-coupled system, it is necessary to connect the memory buses of DELTA and SIGMA electronically. In a tape-coupled system, a single tape unit must be switched to either the DELTA or the SIGMA memory bus. While we are not yet at the point where we can study the engineering of memory buses, I believe that the difference will turn out to be a small one technically.

6) A memory-coupled system is obviously superior in its flexibility to a tape-coupled system, assuming that interruptions in SIGMA arithmetic due to the common memories can be kept at a low level. It seems to me that we will be able to arrive at a satisfactory method of coupling memory buses when the time comes to design them.

7) • Even closer coupling may turn out to be desirable. An example would be to have DELTA handle break-ins for the SIGMA program.

8) The LARC has already copied our technique, after a fashion. Can we do less?

To my mind, all this adds up to the conclusion that direct coupling is both beneficial and necessary to the success of the program.

I would appreciate comments.

W Buchholz

WB:gmp

W. Buchholz

cc: Dr. F. P. Brooks
Mr. S. W. Dunwell
Mr. J. E. Griffith
Mr. D. W. Pendery
Mr. J. H. Pomerene
Mr. D. W. Sweeney
Mr. H. K. Wild
Mr. W. Wolensky