MASSACHUSETTS INSTITUTE OF TECHNOLOGY
INFORMATION PROCESSING SERVICES
CAMBRIDGE, MASSACHUSETTS 02139

August 3, 1970

Professor Jerome H. Saltzer
M. I. T.
545 Technology Square, Room 536

Dear Jerry:

Subject: Reply to your "General Strategy for Equiping GIOC's with Typewriter Channels"

Since receiving your memo of July tenth, I have been compiling information from a number of different people relating to the various problems of going to a two GIOC strategy as you have suggested. The following memo attempts to outline these various problems.

GIOC Hardware Configuration

In Appendix I, I have indicated the adapter configuration of the two GIOC's: according to the MIT-GE contract, the current configuration, your telecommunications planning memo of April sixth, your memo of July tenth, and my predictions of load on various types of adapters as indicated from talking to various users. As you can see, the biggest difference is between what is stated in the contract and what is actually on site. This is partially because after signing the contract IPC decided that it would not be cost-effective to maintain two completely equipped GIOC's but rather, since the GIOC is the most reliable piece of hardware we have on site, to keep one in a service configuration and one in a very stripped down development configuration. The costs for these various configurations are indicated in Appendix II.

According to John Ammons, the amount of time necessary to go from the current configuration to the one proposed in your memo of July tenth would be about 12 man hours. This, however, is contingent upon the arrival on site of enough additional hardware to meet the adapter requirements.

Multics Software

According to Bob Daley, Multics is, of course, designed for use with multiple GIOC's. He estimates that about one man month of Stan Dunten's programming time would be required to make the current software run with two GIOC's. This again is contingent upon machine availability and all the problems of making Multics software work (as you well realize, most estimates of software completion time have been well below actuality). Since there are several other projects vying for Stan's time, it is

felt that he could not begin work on this problem until after the 2314 DIM has been completed (some time in late October).

Telecommunications Support

Your memo of July tenth states that "it would be appropriate to prepare for forty users on one CPU, one GIOC, and 256K". We have already found that this number is below our current needs and feel that by September we will probably need more than that number of lines. According to your memo of April sixth, we will need 78 ports for 133 baud and varying numbers of ports for other terminals by December, 1970. We would then immediately need a third adapter for 133 baud terminals. The probability of getting this adapter working before December, 1970, is, in my opinion, very small and this in itself presents another problem (it would be necessary to power up another wing on the GIOC's). Telecommunications support for this number of users is, of course, contingent upon delays within the telephone company. Currently, we have 48 lines attached to 133 baud ports. There are a number of spare lines in the 103E cabinet and, if necessary, we could use 103A datasets for additional lines. I think that a much more significant problem is that of "regrading" of Level 8 phone lines. Problems with grading are still evident (although much less so than they used to be) and I would assume that it would take a similar amount of time and effort to achieve a grading scheme which permitted reasonable service when only one GIOC was in use by Multics.

Reconfiguration

Discussions with Bob Daley have yielded the following information about dynamic reconfiguration of a GIOC: Assuming that the software for running two GIOC's was designed properly, dynamic reconfiguration of GIOC's could be achieved in software. However, since a number of users would be dialed up on the second GIOC, it would be impossible to dynamically reconfigure that GIOC out of the system unless all those users were disconnected. It is felt by IPC that this is an unacceptable solution to the reconfiguration problem. Further discussion yielded no other way of performing dynamic reconfiguration and, therefore, it was Daley's feeling that if we were to go to a two GIOC Multics service, this would essentially spell the end of the Development Machine during first and second shift hours.

On the basis of the above information, it is my feeling that at the very minimum we could not proceed to a two GIOC plan until:

1) The reconfiguration problem is solved.

2) Hardware availability is determined.

3) Telecommunications and grading problems are investigated.

In addition, I feel that we should not proceed with such a plan until

1) All other hardware problems have settled down (the GIOC's are still very reliable -- let's leave them that way)

2) The GE-645 is moved to Building 39.

I will recommend to Wes Burner that IPC review the situation when these conditions have been fulfilled. If you have any other comments, could you please let me know.

Sincerely,

Jerrold M. Grochow

JMG/p

cc: Messrs. Scott
Burner
Corbató
Daley
Clingen
Gintell
Ammons
Garman
Berlan
Van Vleck

APPENDIX I

GIOC Configuration

Adapters	Contract[1] S	Contract[1] D	8/1/70[2] S	8/1/70[2] D	Predicted 12/70 S	Predicted 12/70 D	Predicted 12/71 S	Predicted 12/71 D	Saltzer[5] Proposal S	Saltzer[5] Proposal D
HPC - for tapes	1	1	1	1	1	1	1	0	1	1
HPC - for DS-270's	1	1	1	1	1	(1	1[6]	0	1	1
HPC - for 2314	0	0	1	1	1	(1	2[6]	0	1	1
TTA - for 110 baud	1	1	0	0	1[3]	0	1[7]	0	1	~~1~~ 0
Channels	24	24	0	0	16[4]	0	32[4]	0	~~12~~ 16	~~12~~ 0
TTA - for 133 baud	2	2	2	2	3[4]	1	3[4]	0	2	2
Channels	64	64	48	16	78[4]	8	96[4]	0	48	48
TTA - for 150 baud	1	1	1	1	1[4]	1	1[4]	0	1	1
Channels	24	24	24	8	24	8	32[7]	0	24	24
TT ? - for 300 baud	0	0	0	0	0	0	1[7]	0	~~1~~ 0	1
Channels	0	0	0	0	0	0	16	0	~~8~~ 0	8
CAA - for 1200 baud	2	2	1	1	2[4]	1	3[4]	0	1	1
Channels	6	6	3	3	6	2	9[7]	0	3	3
CSA - for 2400 baud	1	1	1	1	1	1	2[7]	0	1	1
Channels	3	3	3	3	3	2	6	0	3	3
DDA - for DS-10	0	0	1	1	0	0				

1. MIT-GE Agreement, 1970-1973: All additional equipment to be added at full rental.
2. By inspection and help of John Ammons.
3. Outstanding order.
4. Telecommunications Planning Memo, April 6, 1970, J. Saltzer. This memo only deals with 133, 150 and 1200 baud adapters.
5. GIOC Typewriter Strategy, July 10, 1970, J. Saltzer. This memo only deals with 133 baud, 150 baud and 1200 baud adapters, although 110 and 300 baud are mentioned. Other numbers are my extrapolation of Saltzer's remarks.
6. This allows for the installation of a second 2314 or other secondary storage device.
7. My estimates of user demand.
8. It is expected that Development time will be allocated on the service machine.

APPENDIX II

Multics GIOC Monthly Rental Prices and Costs

	Service (Actual Price)	Service* (Actual Cost with MIT Discount)	Development (Actual Price)	Development* (Actual Cost with MIT Discount)	Total Cost to MIT
MIT-GE Contract	14,841	3,710	14,841	3,710	7,420
8/1/70**	13,781	3,985	12,413	3,641	7,626
Predicted 12/70	16,064	9,169	10,830	5,422	14,591
Predicted 12/71	20,230	16,688	-		16,688
Saltzer Proposal	15,355	12,046	15,355	12,046	24,092

A basic GIOC (no adapters) is priced at $7294/month in the MIT Configuration.

*Actual cost is determined as follows: all equipment itemized in the contract: 8/1/70 - 25%; 12/70 - 50%; 12/71 - 75%; any equipment not on the contract: 100%. Saltzer Proposal calculated as in 12/71.

**This does not include price or cost of the DDA DS-10 Adapter.