TO: Multics Performance Log

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SUBJECT: Results of Daily Multics Performance Measurements
             (Period: September 30 through October 6) and
             Response Time Measurements

DATE: October 8, 1969

   The results of daily Multics performance measurements of the
period, September 30 through October 6, are given below. Since the PDP-8
computer sporadically suffered from the troubles in this period, three
manual experiments were also exercised by typing the script lines manually
on the console, with 30 second think times, and measuring the response times.
There seems to be considerable performance improvement in the 4.1 system.

   (a)   PDP-8 Measurements

time unit: second
average: per interaction

Date	Run No.	No. of users	system	Total CPU time	Total No. of P. F.	Total real time	Average CPU time	Average No. of P. F.
9/30	MPM51	24	4.1	47.918	2449	2610	.726	37
10/3	MPM52	18	4.1	----	--	--	--	--

Note: In MPM52, only the first half of the script was run on account of the
system crash encountered during the measurement.

   (b)   Manual Experiments

   1.   CPU time and No. of page faults

Date	Time	No. of users	system	Total CPU time	Total No. of P. F.	Average CPU time	Average No. of P. F.
10/3	14:38	24	4.1	47.763	2501	.724	37
10/5	16:22	7	4.1	30.495	1306	.463	19
10/6	12:27	19	4.1	45.341	2560	.687	38

   2.   System Response Time

   The system response time, corresponding to each interaction
which involves waiting, measured in the above three experiments is tabulated

in Table 1, with the CTSS data measured in last August. It is also shown
in Figure 1 as a function of the number of users.

Generally speaking, the system response time has become considerably
shorter than before (For the 3.1.1 system response time, for example, see
MPL-30 issued on August 11, 1969), but it is still a little longer than the
CTSS system response time. Specifically, it should be noted that the
improvement in system response time is very drastic especially for the heavy
commands, such as "fortran", but not very drastic for the light commands.
This is considered to be due to a pretty large quantum size, namely 4
seconds for each quantum.

Table 1 System Response Time

interaction number	MULTICS 4.1 system			CTSS	interaction number
	system response time (sec)			system response time	
	number of users			# of users	
	7	19	24	15	
edm 1	2.0	7.0	14.0	2.0	1 edl
2	2.0	10.5	4.0	4.5	2
3	2.0	3.5	9.8	9.0	3
fortran 4	9.0	25.5	28.7	6.5	4 mad
edm 5	2.5	11.0	25.6	4.5	5 edl
6	1.5	5.0	5.1	3.5	6
7	1.5	5.0	9.0	2.0	7
8	3.0	11.5	3.4	2.0	8
9	1.5	15.5	9.3	13.0	9
10	1.5	3.0	5.4	2.5	10
fortran 11	8.5	22.5	60.8	6.0	11 mad
rename 12	3.5	4.5	11.2	3.5	12 rename
print 13	2.5	13.0	12.0	2.5	13 print
a_prime & prime 14	2.0	15.0	18.9	9.5	14 loadgo
list 15	3.0	7.5	7.9	3.0	15
df 16	4.0	14.0	13.0	2.0	16 listf
				16.0	17 delete

first half of the script

edm	17	2.5	7.5	8.5	2.0 *	18 edl
	18	1.5	8.0	4.0	4.5	19
	19	1.5	3.0	9.4	9.0	20
fortran	20	5.5	21.5	21.0	6.5	21 mad
edm	21	5.0	5.5	14.5	4.5	22 edl
	22	2.0	9.0	4.8	3.5	23
	23	2.0	2.0	5.4	2.0	24
	24	2.0	3.0	10.1	2.0	25
	25	2.5	6.5	10.2	13.0	26
	26	2.0	10.5	6.5	2.5	27
fortran	27	7.0	16.5	15.2	6.0	28 mad
rename	28	2.5	8.0	7.0	3.5	29 rename
print	29	1.5	3.5	10.5	2.5	30 print
b.prime$prime	30	2.0	6.0	6.5	9.5	31 loadgo
list	31	1.5	6.5	10.8	3.0	32
df	32	1.5	5.0	6.5	2.0	33 listf
					16.0	34 delete
Sum						**Sum**
1st half		50.0	174.0	238.1	92.0	1st half
2nd half		42.5	122.0	150.9	(92.0)	2nd half
total		92.5	296.0	389.0	(184.0)	total
Average response time						**Average response time**
1st half		3.1	10.9	14.9	5.4	1st half
2nd half		2.7	7.6	9.4	(5.4)	2nd half
total (all)		2.9	9.2	12.1	(5.4)	total (all)
total (except "fortran")		2.2	7.5	9.4		

* Because the measurement of the CTSS response time was done only for the first half of the script, the data of the second half is not available. But, for convenience, the data of the first half is repeated here.
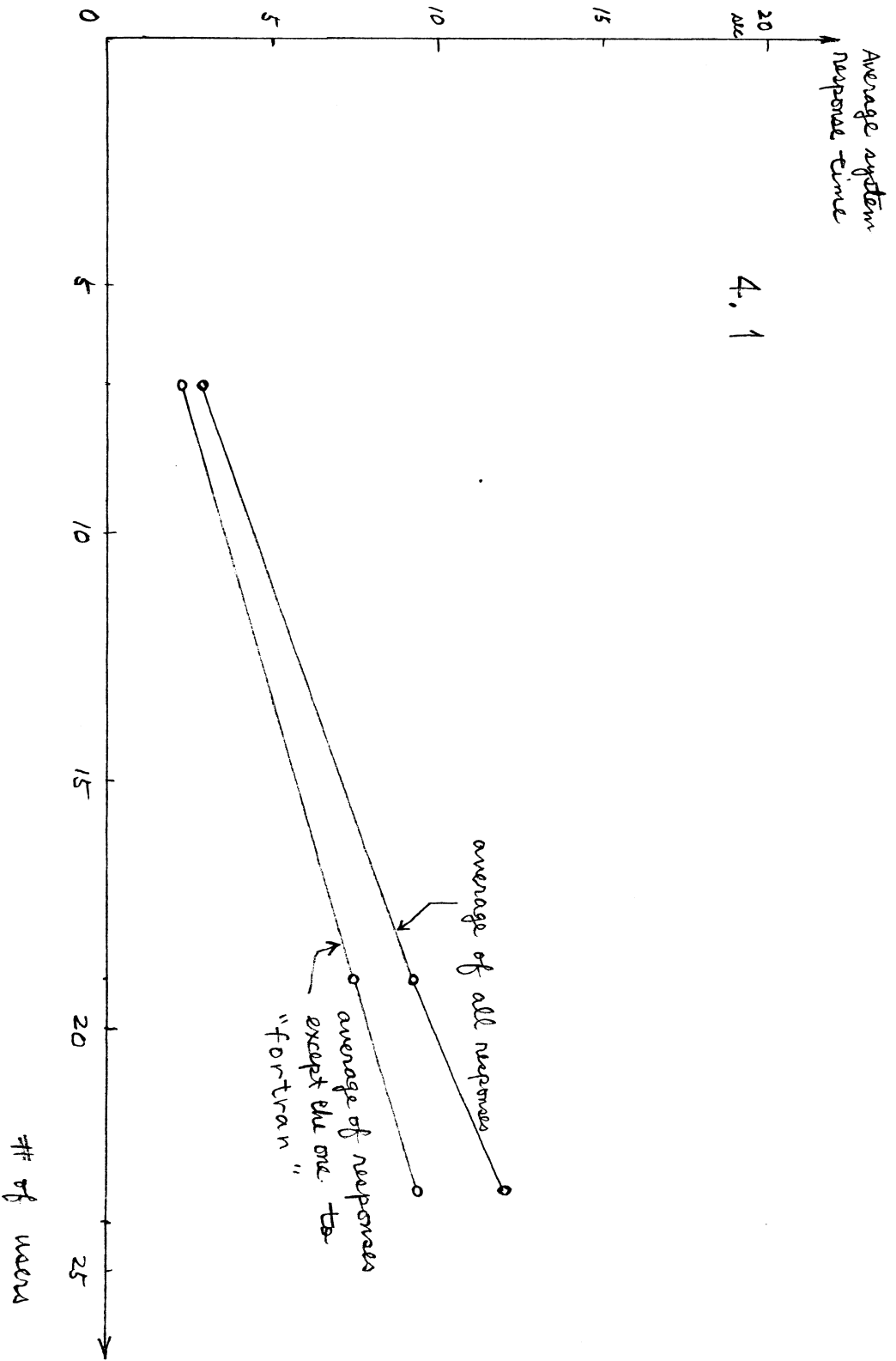
Figure 1. Effect of the number of users on the system response time