

hmu

Multics 14.6b, load 51.0/51.0; 50 users

r 1509 .320 7+10

fsm -all

Total metering time 0:23:59

Deactivations	4991
Ast grace	0:00:19 ←
Used ASTs	411
Free ASTs	0
Held ASTs	225
Seg; Faults	6268

	#	ATB
Needc	124694	23.085 msec.
Steps	388206	7.415 msec.
Ceiling	2434	.020 min.
Laps	1084	2.655 sec.
Skip wired	4151	693.452 msec.
Skip used	220158	13.075 msec.
Skip mod	26082	110.364 msec.
Skip os	13121	219.383 msec.

.292 pages, 34 wired.

Average steps 3.113

← 384 K core system

	DRUM	DSU270	DSU170
Left	753	12483	12634
Reads	106384	15250	422
ATB	27.058	188.755	6821.135
Writes	69626	7717	29
ATB	41.343	373.010	99259.276
ATB I/O	16.354	125.333	6382.526
% Cpcty	25	83	3
Ave Latency	23.109	116.649	66.827 ←
N Errors	0	0	0
F Errors	0	0	0

← DS270 is getting saturated.
DS170 is rarely used.

r 1510 1.677 13+29

ttn -all

Total metering time 0:25:15

	%	AVE
Page Faults	12.14	4040.703
Drum interrupts	6.20	2475.936
Getwork	9.67	1425.169
Seg Faults	3.35	15003.249
Interrupts	5.21	4280.719
Gate faults	2.73	3670.000
MP Idle	15.23 ←	increased very much.
Loading idle	2.02	
NMP Idle	0.00	
Zero idle	0.00	
Other	43.45 ←	decreased accordingly.

MPM118
 2/19/71
 # users = 47
 MFTN3
 K. 6 b

***** MULTICS PERFORMANCE ANALYSIS *****

USER NO	COMMAND	TIME	CPU TIME	NO OF P.F.
0	login	1433	3.458	0 + 101
	edm	1442	7.596	147 + 276
	fortran	1443	5.479	50 + 230
	edm	1448	3.616	46 + 207
	fortran	1450	8.032	19 + 348
	rename	1450	.964	2 + 52
	print	1451	1.155	4 + 32
	a_prime\$prime	1452	3.751	38 + 122
	list	1453	.768	2 + 40
	df	1454	1.465	3 + 48
	edm	1503	5.928	122 + 289
	fortran	1504	3.970	3 + 215
	edm	1509	3.625	54 + 174
	fortran	1510	4.069	3 + 225
	rename	1510	.696	3 + 31
	print	1511	.827	2 + 34
	b_prime\$prime	1512	2.272	5 + 92
	list	1513	.654	2 + 45
	df	1514	1.438	2 + 48
	logout			+

384 K core
 2 CPUs
 w.s. factor = .50

***** SUMMARY *****

USER NO	TOTAL CPU TIME	TOTAL REAL TIME	TOTAL NO OF P.F.	NO OF INTER-ACTIONS	AVERAGE CPU TIME	AVERAGE RESPONSE TIME	AVERAGE NO OF P.F.
USER 0	56.305	2390	507 + 2508	66	.853	8.2 (4.7)	7+ 38

***** #users

(	32.826	1196	311 + 1355	33	.996	9.3 (4.7)	9 + 41	46 first half
	23.479	1161	196 + 1153	33	.712	7.1 (4.6)	5 + 34	49 second half

↑
average except "fortran"

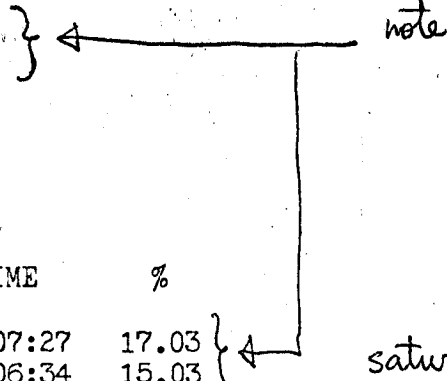
- (1) Time between page faults became shorter, increasing the multiprogramming idle time.
- (2) The total CPU time required by the script increased by about 10 seconds (See MPM117).

tcm -all

MPM118

Total metering time 0:21:52

Ave queue length 17.76
 Ave eligible 5.77
 Working-set factor .50
 Working-set addend 0
 Te first (seconds) 2
 Te last (seconds) 2
 Ti max (seconds) 8



IDLE TYPE	TIME	%
Total idle	0:07:27	17.03
Multi-prog idle	0:06:34	15.03
Non-multi-prog idle	0:00:00	0.00
Zero idle	0:00:00	0.00

saturated!

COUNTER	TOTAL	ATB	#/INT
Interactions	387	3.392 sec	
Loadings	2624	.500 sec	6.780
Blocks	1888	.695 sec	
Wakeups	1871	.702 sec	
Waits	81341	16.140 msec	210.183
Notifies	230470	5.696 msec	
Schedulings	2401	.547 sec	6.204
Pre-empts	91026	14.423 msec	235.209

Time	%Int	%Cum	Ave	%T	%CumT
0.0	63	63	.255	30	30
.5	17	80	.751	24	54
1.0	7	87	1.265	17	71
1.5	6	94	1.894	22	94
2.0	2	95	2.400	7	101
2.5	1	97	2.822	7	108
3.0	1	97	3.468	6	114
3.5	1	98	3.846	5	118
4.0	0	98	4.489	2	120
4.5	0	99	5.023	4	125
5.0	0	99	5.627	2	126
5.5	0	99	5.956	5	131
6.0	0	100	6.544	1	132
6.5	0	100	6.823	1	133
7.0	0	100	7.531	3	135
7.5	0	100	8.117	3	100

-38

DEPTH	%PF	TBPF	%GTW	TBS	%CPU
1	19.5	28.1	17.2	19.4	20.6
2	19.3	32.6	17.4	21.9	23.4
3	18.9	29.2	19.5	17.0	20.6
4	17.9	22.8	18.8	13.1	15.3
5	15.0	22.0	16.7	11.9	12.4
6	12.2	23.2	13.3	12.8	10.7
7	.5	0.0	.5	0.0	.5

MTBPF is getting shorter.

r 1509 3.160 26+62

hmu

Multics 14.6b, load 51.5/51.0; 50 users

r 1511 .395 10+19

>udd>m>w>o>ppmt -all

Total metering time 0:25:35

Working-set factor	.50	
Working-set addend	0	
Min-eligible	2	
Max-eligible	6	
% bad pre-paging	37.31	← increased.
Drum faults/pre-paging	1.04	
% drum priority moves	14.97	
% misses	12.42	
Ave post size	61.02	
Ave purge size	19.65	
% purged	32.20	
Ave pre size	27.33	
Ave pre-pagings	12.06	
% pre-paged	44.14	
Thrashing percentage	7.02	
Ave post in core	43.39	
Ave working-set size	22.53	
Ave used in quantum	50.82	
Pre-page time	27.10	
Post-purge time	41.20	
Calls	2762	

r 1512 1.165 2+30

>udd>m>jhs>cf

```

cpu b 5      } 2 CPUs
cpu a 4
gluc a 2 0 7 11 13
mem d 200 on } 384 k core
mem c 200 on
mem e 200 on
clock a 0 25 est 5
drum 0 7700 1 4 5 6
d270 0 104270 a 37 16 103040506 71213141516 210
d170 0 64050 a 27 6 102030405
part mult 0 7700 0 103270 0 64050 0 0
part salv 0 0 103270 1000 0 0 0 0
int 27 30 31 32 37
sst 50
schd 400000 20 20 100
pods 11 1000
ttyb 4 144
tty a 300 40 150.
tty a 100 40 133.
tty a 200 40 133.
tty a 60 3 1200.
intk 77 mult

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r 1513 2.310 13+69

hmu

Multics 14.6b, load 48.5/51.0; 47 users

r 1513 .301 7+10

>uid>m>w>o>q

avg = 22, elapsed time = 0 sec, 23 active last 15 sec.

flags	tu	dtu	te	ts	ti	tssc	event	d	ws	process
NLERI	46	47	1741	0	0	.001	0 0		7	Sekino
WNLRI	748	749	1631	4040	2185	-.001	0 0		52	Retriever
WLEI	7	8	1701	2145	4090	.032	54700	2	54	Voydock
WLEI	7	8	1409	2005	4126	.008	37001	1	26	Webber
LEI	225	225	631	0	0	.001	0 0		6	Willis
LEI	137	138	206	0	0	.272	0 0		23	Stone
W	28	28	0	0	0	2.983	0 0		12	Quinones
W	58	58	0	0	0	2.896	0 0		6	PDP8
W	181	182	0	0	0	2.251	0 0		13	Veza
W	1336	1337	0	0	0	2.067	0 0		14	IO
W	177	177	0	0	0	1.472	0 0		17	Bruck
W	15	16	0	0	0	1.264	0 0		49	Somers
W	1296	1297	0	0	0	.678	0 0		16	initializer
W	56	57	0	0	0	.314	0 0		13	Hill
	219	219	42	0	6002	273.273	0 0		26	Grochow
W	140	141	72	0	6039	33.837	0 0		67	Haber
W	469	469	47	0	6078	65.187	0 0		84	Fateman
	53	53	229	0	6082	35.381	0 0		30	Chang
W	146	147	51	0	6138	32.455	0 0		45	Thurber
	20	20	71	0	6323	179.557	0 0		47	Taylor
W	527	527	53	6020	8000	328.405	0 0		26	Translator
W	14	15	0	0	0	330.252	0 0		11	KHuber
	134	134	96	4011	8000	352.445	0 0		63	Backup
	49	50	43	0	8000	525.617	0 0		25	RHart
	60	61	43	0	8000	417.863	0 0		18	Spier

r 1515 5.108 38+218

rzl scs 200

200 600000000000

r 1516 1.547 3+64

ppn -all

Pre-paging mode is ON.

r 1516 .527 7+22

hmu

Multics 14.6b, load 47.5/51.0; 46 users

r 1516 .284 7+13

MPM119
 2/23/71
 # users = 50
 MFTN3
 14.6 b
 384 K core
 2 CPUs

***** MULTICS PERFORMANCE ANALYSIS *****

USER NO	COMMAND	TIME	CPU TIME	NO OF P.F.
0	login	1444	3.528	0 + 101
	edm	1453	7.352	137 + 283
	fortran	1454	5.854	19 + 260
	edm	1459	3.595	52 + 170
	fortran	1501	7.305	45 + 296
	rename	1501	.913	3 + 34
	print	1502	1.575	3 + 36
	a_prime\$prime	1503	3.205	24 + 84
	list	1504	1.418	4 + 51
	df	1505	1.716	2 + 62
	edm	1514	7.384	116 + 327
	fortran	1515	3.659	5 + 225
	edm	1520	3.208	45 + 176
	fortran	1521	3.461	8 + 225
	rename	1521	.696	3 + 44
	print	1522	.832	2 + 35
	b_prime\$prime	1524	2.036	8 + 92
	list	1524	.637	5 + 32
	df	1525	1.244	2 + 66
	logout			+

***** SUMMARY *****

USER NO	TOTAL CPU TIME	TOTAL REAL TIME	TOTAL NO OF P.F.	NO OF INTER-ACTIONS	AVERAGE CPU TIME	AVERAGE RESPONSE TIME	AVERAGE NO OF P.F.
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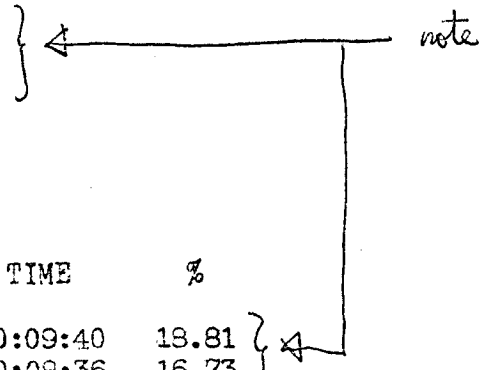
USER 0 56.090 2425 483 + 2498 66 .849 9.2 (5.5) 7+ 37

***** #users							
(32.933	1217	289 + 1276	33	.998	10.5 (5.2)	8 + 38 49 first half
	23.157	1175	194 + 1222	33	.701	8.0 (5.8)	5 + 37 51 second half
						↑ average except "fortran"	

* The result is very similar to that of MPM118.

Total metering time 0:25:43

Ave queue length 20.24
 Ave eligible 5.79
 Working-set factor .50
 Working-set addend 0
 Te first (seconds) 2
 Te last (seconds) 2
 Ti max (seconds) 8



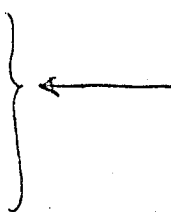
IDLE TYPE	TIME	%
Total idle	0:09:40	18.81
Multi-prog idle	0:08:36	16.73
Non-multi-prog idle	0:00:00	0.00
Zero idle	0:00:00	0.00



COUNTER	TOTAL	ATB	#/INT
Interactions	529	2.917 sec	
Loadings	3206	.481 sec	6.060
Blocks	2305	.669 sec	
Wakeups	2304	.670 sec	
Waits	88426	17.450 msec	167.157
Notifies	263527	5.855 msec	
Schedulings	2899	.532 sec	5.480
Pre-empts	102645	15.033 msec	194.036

Time	%Int	%Cum	Ave	%T	%CumT
0.0	66	66	.253	35	35
.5	17	83	.738	27	62
1.0	6	88	1.271	15	77
1.5	5	93	1.869	19	96
2.0	2	95	2.380	9	106
2.5	2	97	2.861	10	115
3.0	1	97	3.376	5	121
3.5	1	98	3.853	4	125
4.0	0	98	4.332	1	126
4.5	0	98	5.093	2	129
5.0	0	99	5.427	3	131
5.5	0	99	5.903	4	135
6.0	0	99	6.524	3	138
6.5	0	99	7.175	2	140
7.0	0	99	7.651	1	141
7.5	1	100	8.137	-52	100

DEPTH	%PF	TBPF	%GTW	TBS	%CPU
1	19.5	28.3	17.1	19.3	19.5
2	20.0	32.3	18.1	21.5	22.8
3	19.0	29.5	18.9	17.8	19.8
4	17.2	26.7	18.7	14.7	16.2
5	14.8	25.3	16.6	13.5	13.3
6	12.4	26.0	13.7	14.1	11.4
7	.5	0.0	.5	0.0	.5



r 1512 3.451 17+75

M) [MM 14.5b, load 50.5/54.0; 50 users

r 1513 .535 5+27

fsm -all

Total metering time 0:28:04

Deactivations	6357	
Ast grace	0:00:17	← shorter
Used ASTs	408	
Free ASTs	0	
Held ASTs	233	
Seg Faults	7996	

	#	ATB
Needc	133292	24.713 msec.
Steps	424351	7.937 msec.
Ceiling	5086	.011 min.
Laps	1175	2.867 sec.
Skip wired	4692	717.265 msec.
Skip used	235219	14.320 msec.
Skip mod	30690	109.750 msec.
Skip os	17453	192.933 msec.

292 pages, 33 wired.
Average steps 3.114

	DRUM	DSU270	DSU170
Left	692	13886	10834
Reads	115007	17891	252
ATB	29.287	188.263	13365.961
Writes	78897	10351	84
ATB	42.691	325.401	40097.832
ATB I/O	p17.371	119.263	10024.470
% Cpcy	23	88	2
Ave Latency	22.837	118.361	68.506
N Errors	0	0	0
F Errors	0	0	0

← DS270 is almost saturated
DS170 is rarely used.

r 1513 1.822 16+42

ttn -all

Total metering time 0:29:18

	%	AVE
Page Faults	14.12	4987.746
Drum interrupts	6.56	2800.232
Getwork	9.35	1423.808
Seg Faults	3.64	15238.542
Interrupts	4.82	4078.594
Gate faults	2.41	3670.000
MP Idle	16.81	
Loading idle	2.06	
NMP Idle	0.00	
Zero idle	0.00	
Other	40.22	← note

r 1514 1.361 2+60

lmu

Multics 14.5b, load 50.5/54.0; 50 users

r 1515 .437 2+25

>uld>m>w>o>psmt -all

Total metering time 0:29:35

Working-set factor	.50
Working-set addend	0
Min-eligible	2
Max-eligible	6
% bad pre-paging	39.01
Drum faults/pre-paging	.99
% drum priority moves	15.49
% misses	12.79
Ave post size	58.35
Ave purge size	19.22
% purged	32.94
Ave pre size	26.67
Ave pre-pagines	11.38
% pre-paged	42.68
Thrashing percentage	6.12
Ave post in core	42.16
Ave working-set size	21.44
Ave used in quantum	47.95
Pre-page time	29.07
Post-purge time	38.54
Calls	3209

r 1516 2.401 14+59

>uld>m>jhs>cf

```

cpu b 5
cpu a 4
gloc a 2 0 7 11 13
mem c 200 on
mem e 200 on
mem d 200 on
clock b 1 25 est 5
drum 0 7700 1 4 5 6
d170 0 104270 a 37 16 103040505 71213141516 210
d170 0 64050 a 27 6 102030405
part mult 0 7700 0 103270 0 64050 0 0
part salv 0 0 103270 1000 0 0 0 0
ist 27 30 31 32 37
sst 50
schd 400000 20 20 100
wods 11 1000
ttyb 4 144
tty a 300 40 150.
tty a 100 40 133.
tty a 200 40 133.
tty a 60 3 1200.
lntk 77 mult

```

} 2 CPUs
 } 384 k core

r 1516 1.559 8+26

hmu

Multics 14.6b, load 51.5/54.0; 51 users

r 1517 .609 11+40

>add>mw3>###>w>o>q

avg = 20, elapsed time = 0 sec, 29 active last 15 sec.

flags	tu	dtu	te	ts	ti	tssc	event	d	ws	process
NLEI	75	75	1766	0	0	-.001	0 0	9	Sekino	
LEI	276	276	607	0	0	.393	0 0	22	Schell	
LEI	273	274	633	0	0	.001	0 0	23	Abramson	
LEI	120	121	507	0	0	.005	0 0	14	Lees	
LEI	73	73	229	0	0	.003	0 0	39	Bos	
NLEI	129	129	134	0	0	.006	0 0	30	Testa	
W	131	132	0	0	0	7.323	0 0	7	Veza	
W	247	248	0	0	0	6.770	0 0	14	Carey	
W	23	23	0	0	0	6.312	0 0	15	Hatvany	
W	49	49	0	0	0	4.904	0 0	20	PDP8	
W	18	18	0	0	0	4.373	0 0	28	Reine	
W	98	98	0	0	0	3.953	0 0	8	Tilden	
W	321	321	0	0	0	3.499	0 0	8	EFranklin	
W	21	21	0	0	0	2.907	0 0	10	MSmith	
W	38	38	0	0	0	5.257	0 0	64	Snyder	
W	30	31	0	0	0	1.074	0 0	6	Haber	
W	57	58	73	0	2000	.883	0 0	68	Misunas	
	112	112	45	0	2000	7.587	0 0	37	Boothby	
	308	308	23	0	2104	6.673	0 0	10	Sward	
W	1069	1070	96	4023	6001	11.511	0 0	79	Translator	
W	306	306	79	6055	6014	5.529	0 0	69	Somers	
W	47	48	70	2001	6015	13.384	0 0	49	DChang	
	36	37	47	2088	6096	11.997	0 0	44	DClark	
W	1576	1577	75	0	6337	73.294	0 0	38	IO	
	656	656	28	6002	8000	277.518	0 0	22	Scherer	
W	169	169	73	1901	8000	675.922	0 0	35	Gearing	
W	969	969	55	0	8000	625.029	0 0	55	Backup	
W	519	519	54	0	8000	278.253	0 0	50	Jordan	
W	10	10	80	0	8000	19.518	0 0	48	Guldberg	
r 1520	6.766	59+324								

rzd scs 200

200 8000000000000

r 1520 1.363 8+59

ppm -all

Pre-paging mode is ON.

r 1520 .685 10+26

hmu

Multics 14.6b, load 51.5/54.0; 51 users

r 1521 .339 8+16

resp

no. of processors = 2

no. of users = 50

percentile throughput in percent = 40.22

average CPU time per interaction = 0.40

average user think time = 20

*The model prediction of
system response time*

exact response time = 5.43419969e+00 → 5.4 sec. response time
apprtd response time = 4.86325234e+00
average queue length = 1.06828593e+01
total of probabilities = 9.99999993e-01

1 eligible	.....	pb =	9.89992678e-01
2 eligible	.....	pb =	9.65111233e-01
3 eligible	.....	pb =	9.34798181e-01
4 eligible	.....	pb =	8.98621500e-01
5 eligible	.....	pb =	8.56346406e-01
6 eligible	.....	pb =	8.07995975e-01
7 eligible	.....	pb =	7.53899269e-01
8 eligible	.....	pb =	6.94718391e-01
9 eligible	.....	pb =	6.31446943e-01
10 eligible	.....	pb =	5.65375313e-01

r 1544 8.110 131+264