MPL-17

TO: Multics Performance Log

FROM: R. J. Feiertag

SUBJECT: Certification of system 3.0.5

DATE: June 3, 1969

Included here are the first certifications of the new file system. The certifier has been modified to yield greater information about the runs. Also certifications are now done on the user hierarchy as opposed to the empty system used previously. The two runs included here are a 4 user typewriter run and a 12 user FSIM run.

Due to the increased amount of information available from this certifier a new, more accurate calculation technique has been employed. In order to compare the results using the new calculation method with results from the previous method a constant compensating time is used. The compensating time is illustrated in the graph as the dotted line in the bar for system 3.0.5. This is where the base of the bar would be if the old calculation technique were used.

The following observations can be made when comparing system 2.3 to system 3.0.5:

1) The drop in page fault time is due to a drop in both page fault handling time and a drop in the number of page faults.
2) The drop in the segment fault time is due primarily to a drop in the time necessary to handle segment faults. Note that even though the size of the SST was increased from 11k to 30k, this does not have a great effect on the number of segment faults in this four user certifier run.

3) The drop in linkage fault time is due to a drop in the amount of time necessary to handle linkage faults as would be expected.

4) The drop in non-fault time is not as great as was predicted indicating that not as much of this time is spent in the file system as was previously thought.

5) The time spent in the File System Daemon is definitely significant.

Process creation and initialization breaks down in the following manner:

Linking	33%
Paging	18%
Other faults	18%
Non-fault	31%

The average process creation and initialization time per process is 18.1 sec. (including loading and the File System Daemon) of which 5.6 is non-fault time. The latter number calculated from the 12 user FSIM run is 3.9 sec. Since the only difference between the two is in attach calls to the I/O system it would seem it costs 1.7 sec. to attach a typewriter. This cost is not seen during process initialization during console sessions because the typewriters are previously attached by user control.

Another point of comparison is in script running. The per-process non-fault time on the 4 user typewriter run is 49.6 sec. and on the 12 user FSIM run is 49.4 indicating that during script running the FSIM and typewriter DIM cost approximately the same amount of computation.

The decrease in CPU time necessary to perform the certification script is not matched by a proportional drop in real time. This is due primarily to an increase in eligibility idle time. This is the first system in which idle times have been accurately measured. They can only be approximated in previous systems.

MPL-17

TO: Multics Performance Log DATE: 6/2/69

FROM: R.J. Feiertag

SUBJECT: Multics System Performance Certification Record

I Variable settings: operating system

System being certified: 3.0.5

Certifier used: Multics_test_f Script used: Cert 1

Number of processes used: 4

Typewriter output: Yes [X] No [ ] Number of lines output:

System Segment Table Size: 30k

Number of permanently wired pages:

Maximum number of processes eligible for multiprogramming: 2

Maximum number of processes which may be loaded: 2

Scheduling Quanta, starting with highest-priority queue:

1. 4 2. 4 3. 8 4. 16 5. ____ 6. ____

II Hardware configuration

Amount of Core Memory: 256k

Number of processors: 1

Firehose Drum: Yes [X] No [ ]

Disk Yes [X] No [ ]

Installation used: MAC

Date of Certification run: 5/31/69

Time of Certification run: 1030 EDT

III Other factors expected to influence measurements:

Certification of System: 3.0.5

IV Measurements

a. CPU time breakdown	during process creation	during command sequence	total
1. Time used by subject processes	68.6 sec.	265.9	334.5
2. Time spent loading processes	0.6	3.1	3.7
3. Time spent in file system daemon	3.2	25.4	18.6
4. Idle time due to eligibility control	16.0	123.3	139.3
5. Idle time during page waits	24.8	11.5	36.3
6. True idle time	35.6	25.2	60.8
Total CPU time charged	148.8	444.4	593.2

b. Breakdown of CPU times used by subject processes

1. Missing-page fault time	13.3 sec.	47.1	60.4
2. Missing-segment fault time	3.7	2.3	6.0
3. Linkage fault time	23.6	16.7	40.3
4. Wall crossing fault time	6.0	6.3	12.3
5. Interrupt handling time	3.3	13.8	17.1
6. Non-fault time	22.5	198.2	214.3
Total	72.4	284.4	350.4

Certification of System: 3.0.5

c. Fault times and number

Process Creation	missing page	missing segment	Linkage	wall crossing	Interrupt
average fault time	6.8 ms.	11.2	31.3	1.4	1.0
number of faults	1956	332	755	4324	3289
command sequence					
average fault time	7.0	15.7	23.0	1.4	1.3
number of faults	6700	144	729	4432	10192

d. Average times seen by a process

1. Average real time for completion of a process: 391.8 sec.
2. Average process creation time: 17.2 sec.
3. Average time for execution of command sequence: 66.5 sec.
4. Time for CTSS to execute same command sequence. .85 sec. approx CTSS average
5. Performance relative to CTSS (#4/#3) .68

V Output of original run may be found in file labeled:

VI Comments:

P - page faults
S - segment faults
L - linkage faults
W - wall crossing
I - interrupts
N - non fault time
E - elegibility idle time

Certification of 4 users
using script "cert 1"
and certifiers:

multics_test_c : 1.9, 1.12

multics_test_d: 2.1, 2.2, 2.3

multics_test_f: 3.0.5