MPL-5

3/7/69

TO: Multics Performance Log

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SUBJECT: Predicted effect of New File System on Multics overall Performance

Based on the prediction of an across-the-board reduction of size and running time by a factor of three for the revised file system, it is possible to project the effect on Multics performance as a whole. Since the file system (including the paging machinery) is the most heavily used part of Multics, the effect is significant. In summary, when the "typical user" certification script is run against Multics, about 3/4 of the charged CPU time is spent in file system subroutines. Thus a factor of three improvement in the file system will produce about a factor of two in the overall time required to run the certification script.

Two assumptions are made in the projection:

1. File system subroutines which run faster will also produce proportionally fewer missing-page faults. Thus missing-page fault time currently caused by the file system itself will be reduced by a factor of 9 rather than 3.

2. Of the running time not spent in handling faults and interrupts, some percentage is spent in direct calls to the file system to create and manipulate files and directories, etc. Page fault time produced during these calls will also exhibit the effect of assumption 1. We presume, for each measurement, that 50% of the user's time is currently spent in such direct calls to the file system. A review of the script suggests that this estimate is not unreasonable.

The projections do not attempt to take into account the additional core memory available because of reduction in size of both wired-down and paged components of the file system. One would expect that the number of page faults would be reduced, however.

The details: (all times in seconds consumed while running a 4 user certification run driven from a "typical user" script.)

	System 2.2B		Projected System	
		page fault time		
Segment Fault Time	16 +	10	5 +	1
Linkage Fault Time	34 +	19	12 +	2
Wall crossing Time	13 +	6	13 +	2
Interrupt Handling	14 +	0	14 +	0
User in File System	106 +	64	35 +	7
User outside File System	106 +	64	106 +	21
	289 +	163	185 +	33
		= 452		= 218

$\frac{452}{218}$ = 2.1 Relative performance improvement

If assumption (2) is replaced by its opposite extreme (the user spends zero time in direct calls to the file system) then one obtains a projected running time of 303 seconds, giving a relative improvement of 1.5.