

3/7/69

TO: Multics Performance Log
 FROM: J. H. Saltzer, R. J. Feiertag
 SUBJECT: Page faults during Segment and Linkage Fault handling

A special run of the Multics_Test_D Certifier (using the Feiertag "typical user" script) on system 2.2B was performed with page fault metering turned off. The time spent in page faults was therefore charged to the procedure which got the fault rather than the page fault handling procedure. By comparing this run with the standard certification run of system 2.2B the following interesting statistics can be gleaned:

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|----|-------------------------------|--------|-----------------------|
| 1. | Overall overage running time | | |
| | between missing-page faults, | 454 | total running time |
| | excluding time spent handling | - 162 | page fault time |
| | the page fault and time spent | 292 | |
| | handling interrupts. | - 14 | interrupt time |
| | | 278 | net running time |
| | | +10880 | number of page faults |
| | | 26 | ms. |
2. Time between page faults experienced by segment fault handler. 27 ms.
 3. Time between page faults experienced by linkage fault handler. 27 ms.
 4. Time between page faults experienced by the "user"; that is during non-fault time. 24 ms.

Average number of page faults

to handle a segment fault	3.7
to handle a linkage fault	1.7
to handle a wall-crossing	0.1

{ (excludes nested segment faults, if any)

Observations:

1. The amount of headway between missing page faults is neither exceptionally high nor exceptionally low in the segment and linkage fault handlers. Thus projections of the effect of the new file system which include "accelerator" effects from nested page faults have a higher confidence level than before.
2. Wall crossings apparently do not have a large hidden penalty from paging. (This may be because they happen so often that needed pages are "pinned" instead. We do not have a way to measure the number of pages "pinned" by high usage.)
3. Conditions of the certification run (only 4 processes using a system segment table with space for 10 or 12) cause segment faults to be rare; about one every 1500 ms. Thus it is likely that the segment fault handler gets close to its maximum possible number of page faults.
4. With a 26 ms. headway between page faults, the maximum time it will take for a scan around a page-removal condition list of 128 pages is about 3300 ms. Since many pages will be used, it is actually likely that a complete circuit will take considerably less than 3 seconds; perhaps 1 to 2 seconds. We thus have an estimate of the expected lifetime of a page once it falls into disuse.