3/2/66

TO: F. J. Corbató

FROM: J. H. Saltzer

SUBJ: Continuous operation of MAC 7094 CTSS

Although it now appears to be technicall possible to run CTSS continuously for long periods (e.g., 1 week) no effort is being made presently to push into continuous operation for more than a few hours. Since CTSS is available and running it does not seem necessary to wait until Multics is on the air to "discover" all the potential problems of continuous operation.

The following potentially interesting questions are examples which may be answered by attempting to run for long periods:

1. What is the effect of gradual deterioration of supervisor data bases? Is an on-line supervisor salvager a useful concept, or does reloading the supervisor make more sense? (For example, it is suspected that the 7094 supervisor occasionally loses track of a 32-word 7750 buffer. After two days of heavy use, it could conceivably lose enough buffer space to hamper operations. There may be other similar, but unexpected surprises.)
2. What is the mean time between supervisor failures? hardwarefailures? when in continuous operation. These answers could be quite different than when the system is brought up and downtwo or three times a day.
3. What is the effect of a crash following a long period of operation? (For example, it is known that logged-in users are not charged for the time they used when the system crashes.

If, under continuous operation, a supervisor crash is the usual mode of bringing the system down, what effect on allocations and allotments does repeated loss of accounting information have? Can a user effectively avoid charging by not logging out, but waiting for a system crash? Bringing problems such as these into the open is more likely to suggest solutions for Multics.)

4. What, if any, are the operations and administrative requirements brought up by continuous operation?

It would seem worthwhile to explore possibilites of continuous operation as far as possible within the framework of the 7094 computer, so that as much experience as possible can be brought to bear on the Multics design. In particular, the following two (independent) administrative steps are suggested for the MAC computer:

1. Make every effort to utilize the period from 9:00 a.m. Friday to 7:00 a.m. Monday as a continuous period. In particular, schedule no test sessions during this time. Similarly, at least one day during the week should be scheduled for 22 hours with no breaks. Since CTSS is virtually frozen, test schedule restrictions should present no particular hardship to the programming staff.
2. Continue efforts begun by M. Solomita to negotiate rearrangement of Preventative Maintenance and Engineering work to provide long operating periods while maintaining adequate PM and not falling behind on engineering changes. For example, 4 or 5 hours of

maintenance on Monday and Friday mornings might replace the 2 hours every weekday presently used. Further adjustments to test session schedules should probably be made if such PM rearrangements are feasible.

It is not anticipated that any particular extra staff effort, either programming, operations, or administration, is needed to explore continuous operation, beyond the usual alert observations normally contributed in the course of operation. If particular problems are encountered, it may be necessary to back off and, say, reload the supervisor once every 24 hours, rather than organize programming effort to fix some discovered problem. Even if such a measure is required, it potentially represents information gained on the subject of continuous operation.

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