

Saltze
revised

GENERAL  ELECTRIC

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IPC -

DEPT. • CISL/LSD

ADDRESS • 575 Technology Square, Cambridge, Mass.

SUBJECT • Reliability Issues

TO: R. C. Daley

FROM: J. W. Gintell

It is perhaps significant that the date and subject of this memo are what they are! It is clear to me that the most pressing issue that we face during the next several months is that of reliability and that appropriate attention and priority should be immediately given to this area. With a few minor exceptions at this moment we have the performance and the functions needed to make the service offering; we do not have, however, a reasonable level of reliability. Fortunately, there are a number of activities which yield what I believe will be a large improvement; none have a large cost. These activities fall into the following general categories:

- improvement of the equipment environment and intrinsic hardware reliability
- addition to Multics, BOS and their documentation information that will allow the proper detection and consequent repair of hardware problems
- decrease of the sensitivity of Multics to hardware malfunctions
- replacement of DS-10's
- speedup of recovery after a crash

Improvement of Equipment Environment

This general area requires a number of administrative and operational decisions to be made and followed. A number of recommendations have been made by Paul Lea, Manager of Field Service, which he feels will significantly improve reliability. These range from having Operations staff perform regular maintenance procedures to no longer allowing eating, drinking and smoking in the machine room. I suggest that each of his recommendations be followed and that implementation of these recommendations be followed as soon as possible. A copy of Paul's letter outlining his recommendations is attached.

Hardware Problem Reporting by Multics and BOS

The current situation is that only a small number of hardware errors are reported in such a way that Field Engineering can react or even know that a problem exists! Changes must be made to Multics so that each and every hardware error and any required supporting information is reported on the online console. A similar change must be made to BOS so that errors detected by it are reported. That area of Multics which has no timeout capability (Bootstrap1) must have all of its error stops and error situations extremely well documented. There are currently various mysterious messages which are typed on the operator's console that give no interpretable explanation of the true problem. An orderly, concentrated attack on this area must be made.

Decrease of Multics (and BOS) Sensitivity to Hardware Malfunctions

? — The two obvious areas for improvement are reaction to disk or drum errors and reaction to memory parity errors. A memory parity handler can be written which attempts to retry the failing instruction. Disk I/O for the DS 10 can be modified to employ a verify after write technique. The BOS SAVE/RESTORE package can be modified to "get past" bad sections of tape. The Disk and Drum I/O packages can be modified so that the salvager can get by fatal disk or drum errors. The lock recording technique can be modified so that it is possible to detect the difference between a ? — locked data base and one whose values are unstable. By this means the system will only crash when it needs to.

Replacement of DS-10s

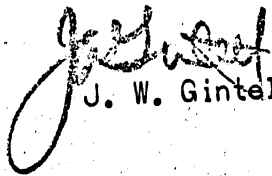
Need I say more?

Speedup of Recovery After a Crash

In the Dartmouth system when the Datanet-30 notices that the system is malfunctioning, it merely reloads it. This is accomplished with no loss of users logged in and with perhaps only a single user noticing that something has happened. In Multics, however; all users lose their processes and current work: 10 minutes; if emergency shutdown detects a lock set the salvager must be run: 10 minutes; if the salvager fails, a RESTORE and incremental reload must be done: at least 1 hour; the system must be loaded and properly initialized: 10 minutes; a dump is sometimes taken: 10 minutes. The result of all of this is a net loss of service of from 25 minutes up to several hours. Of course if the hardware has gone bad but no printed indication of the problem has been given even more time gets lost in abortive attempts to bring up the system. Although there are few major changes which can be easily made, solutions to three previously mentioned problems

will aid this situation:

- change the lock recording strategy to make emergency shutdown succeed
- change the disk error procedure to make the Salvager succeed
- change the RESTORE facility to make it succeed.


J. W. Gintell

JWG/jk

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FIELD
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cc: C. Wise
E. Kleinow

September 30, 1969

Mr. C. T. Clingen, Manager
C.I.S.L.
575 Technology Square
Cambridge, Massachusetts

Subject: Suggested Improvements to 645 Computer Room

1. Present method of cleaning the room is inadequate. The method of dusting and sweeping does more harm than good. At present, we have dirty grills, subfloor which tends to distribute the dust.

Suggested Solutions:

- A. Clean up all grills.
 - B. Clean up (vacuum) the subfloor.
 - C. Use a vacuum to clean equipment and the floor.
2. The room once cleaned up has a tendency to get dirty much too fast.

Suggested Solutions:

- A. No smoking in the room.
- B. No eating or drinking in the room.
- C. Install mats or rugs at room entrance to clean shoes off.
- D. Printers are the largest source for dirt within the Computer Room. Make sure the skins are buttoned up when running this unit.

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3. The appearance of the equipment is very bad. Both F.E.D. and Operations should clean up the skins and maintenance panels and should keep them clean.

Suggested Solutions:

- A. F.E.D. should clean and keep clean all maintenance panels.
- B. Operations should clean all the equipment skins.
- C. Operations should clean and keep clean all operation panels, etc. tape controller operation panels, remote console, etc. The remote console is a daily reminder of just how bad things have gotten. This console and the telephones on it are disgustingly filthy.

The keep clean aspect needs emphasizing. Equipment on site and their skins are not chairs, foot stools, or foot rests. They should not be leaned over, etc. Personal observations find operations, programming staff, C.I.S.L. personnel and F.E.D. personnel all guilty of abusing the equipment and its skins.

4. Tape operation. The tape system could operate much more efficiently if the following steps are followed.
 - A. Clean heads each shift. Operators are doing a good job now.
 - B. Run the handlers with the plexiglass window closed.
 - C. Periodically clean and certify all tapes.
5. Security of the Room. Anybody and Everybody can enter the room. I know steps are being taken in this area.
6. I suggest that no tab equipment be allowed in the computer room. The reasons are:
 - A. Source for card dust and dirt.
 - B. Source for electrical noise.

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7. Clean up the grounding problems on site. This will always be a problem source until we can isolate the grounding loops.



Paul A. Lea, Service Manager
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