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PALO ALTO RESEARCH CENTER

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To: All ALTO Users

From: Ted Stollo and Bob Sproull

Subject: ALTO Main Memory Parity Errors

The improper use of the two switches which affect memory parity error handling in the long INSTALL dialogues is dangerous. If you are a novice ALTO user and/or don't wish to take the time to read this memo, answer NO to both questions about handling memory parity errors. If you answer yes, you run the risk of clobbering your disk files and masking problems which may exist in your machine which will make it even harder for the maintainers to fix.

This memo is to clarify for ALTO users some possible confusion which may exist about the ALTO operating system's handling of memory parity errors. In particular, several months ago, two switches were added to the INSTALL dialogue for installing a new operating system. These switches enable the user to ignore parity errors and not have them reported over the Ethernet. We want to emphasize that if the user invokes these ignore operations, he does so *at his own risk*. In particular, the setting of the first switch to disable parity error detection does just exactly that. Parity errors which occur are ignored. This attempts to get the machine to limp along. The user could invoke the same action without setting this switch by typing control P to SWAT to attempt a proceed whenever an error occurs. Of course this requires much patience. The setting of this switch makes for some convenience, but the consequence is that the user has absolutely no idea that a parity error has occurred, and no information about parity errors from that machine gets sent to MAXC for analysis by the maintainers. A likely consequence is that with that switch left on, the machine will get sicker and finally display very anomalous behavior (such as crashing to SWAT, smashing disk files...) which finally alerts the user that his machine is seriously ill.

The switches are there in recognition of the fact that we cannot repair an ALTO memory problem in zero time, and in recognition of a particular problem within the ALTO II parity error detection logic which is described below. They are therefore expedient to use when a machine has a known memory problem which has been isolated but has not yet been fixed. We want to emphasize again that other uses of these switches are dangerous and are not endorsed by us.

Types of ALTO Parity Errors

ALTOs make basically three types of parity errors. These are:

- A) Regular parity errors where the location is found and reported.
- B) Phantom parity errors. These are errors reported to the hardware, but a sweep of memory does not find a location with bad parity. This is a problem with some ALTO I's which are believed to have electrical problems associated with the parity error computation circuitry itself. The second switch in the INSTALL dialogue about parity error detection/reporting allows you to select whether you want such errors reported over the Ethernet to MAXC. If you have an ALTO I with a chronic case of this problem, it may be reasonable for you to set this second switch since apparently little can be done to fix this problem.
- C) Garbled parity error information - this is a problem unique to the ALTO II and which is being fixed by an ECO to the machine which is in process. In this case a real parity error occurs and a sweep of memory finds the error, but the information about the location of the error is garbled and erroneously reported to the hardware due to a timing problem in the hardware.

ALTO II's are different from ALTO I's in that single bit errors can be corrected but double bit errors are detected without correction. You should be aware that the operating system sets up the error correction hardware for ALTO II's such that single bit errors are corrected with no attempt to report them. It is only when a double bit error interrupt occurs that error information is reported. There is currently no ALTO operating system switch to cause a single bit error interrupt to make a report to MAXC. You should therefore be aware that when you are using an ALTO II and SWAT reports a parity error, it is from a double bit error interrupt and it is just as risky to proceed from these error interrupts as when SWAT reports a parity error on an ALTO I. One other point of clarification about ALTO II's. When DMT is running on an ALTO II it reports all parity errors - single bit or otherwise.

It was the discovery of the garbled parity error information type that triggered the events which led to the addition of these two new switches to INSTALL. This type of error is particularly frustrating to maintainers of the machine because it is a real error but the maintainer does not get any information about where the error is occurring.

We hope this memo explains what is going on with ALTO parity errors and those INSTALL switches, but should you have additional questions please submit them to us.