



## Reliability

The system handles errors as transparently as possible while maintaining data integrity and providing sufficient information to diagnose the errors. The system limits the effects of an error by first attempting to recover from the error, then if recovery fails, by reporting the error to the current process for action, and finally (if the error cannot be clearly bounded), shutting down and restarting the system. VAX/VMS will shut itself down rather than continue operating with a condition that could propagate undetected bad data. The types of errors possible are as follows:

- \* **Processor errors (machine checks)** - The system retries the instruction on which the processor failed, as long as no internal state has been modified. If no retry is possible or the retry fails, the system reports the error to the current process as an exception. However, if the executive is currently executing, the system shuts down and performs a cold restart by bootstrapping a fresh copy of VAX/VMS from the system disk.
- \* **Operating system errors (system errors or undetected hardware failures)** - The system checks its internal data structures for consistency to provide early detection of a system error. If the error effects only a single process, the system reports the error of the process. If the error effects more than one process, the system shuts down and performs a cold restart by bootstrapping a fresh copy of VAX/VMS from the system disk.
- \* **User errors (user bugs)** - The system uses hardware and software protection mechanisms to prevent processes from damaging the system. As with a system error, the system detects a user error through internal consistency checks and reports the error to the single affected process.
- \* **Memory errors** - The system examines memory at start-up time and does not use any pages found to be bad. During system operation, the hardware transparently corrects all single-bit memory errors. An unrecoverable error causes the memory page on which the error occurred to be added to the bad page list; if the page has not been modified, system operation continues with a new copy of the page. (Unrecoverable memory errors that occur during a read by an I/O device are reported to the device so that the I/O operation can be reported as failed.)