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TO: X3T10 Committee (SCSI)

SUBJECT: New Mode of Operation for Sequential Devices with access to Medium Changer Functions

In the present tape devices which are attached either directly attached to medium changers or installed in a subsystem with a medium changer, an alternative mode of operation is appearing that has only vendor unique means of control. We propose to make that function reportable in a standard way in SSC.

We propose that, possibly in the Device Configuration page for a tape device with an attached medium changer only, that the following function and behavior be added:

- A device reports in INQUIRY response data and MODE SENSE data whether it has an attached medium changer function through the INQUIRY MCHGR field and a new MODE SENSE AutoSeq field. The MChgr field, when set to one, indicates that READ ELEMENT STATUS and MOVE MEDIUM commands may be issued to the logical unit reporting this bit set to 1b, as well as normal tape commands. When set to 0b, the field means that there is no attached medium changer function sharing the same logical unit. When 0b, the logical unit may still be in a subsystem with a medium changer in a different logical unit, possibly in a different target.

- For some types of unattended dump/restore software, the initiator needs to have the next volume in a set mounted sequentially and automatically (two different terms in use in the industry, but both are better used together as here), unattended by an operator, when the previous volume is unloaded. This behavior continues until each cartridge in a cassette has been loaded and unloaded once. At this point the device stops the automatic mounting cycle so it will not overwrite just written cartridges. The method for changing from random/medium changer mode or sequential device with external medium changer mode to automatic/sequential mode is normally an operator panel event or a vendor unique command or mode page update. We propose to keep the operator panel function and standardize the interface control function and reporting to eliminate the need for vendor unique functions for SCSI-3 SSC.

  In some cases, devices allow cartridges to be removed from a mounted cassette or exported from a medium changer and new ones inserted or imported while others are being processed or waiting to be processed in a cycle. This permits unattended operation for a minimum set of volumes, or, with occasional operator attention to the cassette, continuous operation for many volumes. The capability for a dynamic volume changing capability is a function of the implementation and does not need standardization, but it is important for understanding the concept. The initiator does not need to know how the cartridges get there or how many, as long as it knows the state of the operation.

  As long as there is a fresh unmounted cartridge, the medium changer function keeps mounting cartridges. The software needs to know that this mode is in effect and to monitor whether it is working with the last available cartridge or not. If the software has an operator console interface, it

may send a message to the operator during processing of the last volume to either remove and insert more volumes or to prepare the operator for a cassette change at the end of a cycle. The software can also predict whether it has sufficient recording capacity to carry out an assigned task. It may choose to not start processing a request that would require more than the remaining estimated capacity of the currently mounted volume if no additional volume is available.

We propose that two fields be added to the Device Configuration mode page with the behavior indicated:

- AutoSeq - The AutoSeq field when 0b indicates that this mode, as described, is not in effect. This does not indicate that the device or subsystem is incapable of this mode, just that it is not active at the moment.

    - When this bit is set, the MOVE MEDIUM command of an attached medium changer returns CHECK CONDITION status with an appropriate ASC/ASCQ (possibly new). The READ ELEMENT STATUS command of an attached medium changer device may or may not be accepted (i.e., implementation specific).

    - This field only indicates, when 0b, that the sequential device is in true random/medium changer mode or that there is no attached medium changer. This bit an only be set to 1b if the device supports medium changer functions that support automatic/sequential operation.

    - If the AutoSeq bit is set to 1b by a MODE SELECT command and the MChgr bit is set to 1b, it is set to 0b in INQUIRY response data. A Unit Attention is reported for INQUIRY Data Changed and another for Mode Parameters Changed when the state of these two fields reverses. When this bit is set to 0b, from 1b, the same two Unit Attention reports occur again per initiator.

    - If the AutoSeq bit is set to 1b by a MODE SELECT command and the MChgr bit is set to 0b, there is no change to the INQUIRY response data. A Unit Attention is not reported, but a Unit Attention condition is set for Mode Parameters Changed. When this bit is set to 0b, from 1b, the Unit Attention report occur again per initiator.

    This field is always available for monitoring by an initiator using a MODE SENSE command.

- ASVolAv - This field is only valid when the AutoSeq field is set to 1b.

    - When zero, this field indicates that there is no volume available to automatically mount, or that a cycle has finished with no volume available to mount after the last available volume at the time was unloaded. The later case does not indicate that a fresh volume is available; operator action is required to start a new cycle and the

drive makes no attempt to report that a volume is available once a cycle ends. For example, the door covering the cartridges could have been opened and closed, so the drive takes no overt action in this case. When this field changes from 1b to 0b, a Unit Attention, Mode Parameters Changed, is reported to each initiator (possibly all initiators since this is an asynchronous event).

- When one, the ASVolAv field indicates that there is at least one more volume available for automatic/sequential mounting.

This field is always available for monitoring by an initiator using a MODE SENSE command.

An initiator should check both the MCHGR field in INQUIRY response data and the Auto Seq field in the mode page to determine the presence of an attached medium changer function for this logical unit since the MChgr bit is reset when the AutoSeq bit is set. If either bit is set on, a medium changer function is present for this logical unit. This gives a positive indication to a peripheral driver of the capability of a device and the current mode of operation of that device. AutoSeq set to one indicates that the MOVE MEDIUM function has temporarily been overridden.

When MChgr is 0b and AutoSeq is 0b, the device is in a SCSI-2-type mode with manual operator intervention required for each volume mount.

By this extended reporting, all currently known modes of operation for volume mounting are detectable by an initiator.

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