To:     Membership of X3T10
From:  Ralph O. Weber
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Subject: Attached Medium Changer Operation Codes

During the past few weeks, the SCSI Reflector has hosted a
discussion about conflicting operation codes for CD-ROM devices
with attached medium changers. This proposal, if approved, will
resolve those conflicts.

I believe that approved document X3T9.2/92-006r1 (Enhancement of
Command Sets for Removable Media Devices with Medium Changers)
tended that CD-ROM device be capable of having attached medium
changers. However, even in SCSI-2 R10C the MOVE MEDIUM command
shared operation code A5h with the PLAY AUDIO(12) command.
During preparation of the SCSI-3 Multi-Media Commands, we
compounded this by making the READ ELEMENT STATUS command share
operation code B8h with the SET CD-ROM SPEED command.

As a result, CD-ROM devices cannot have attached medium changers.
In particular, the MOVE MEDIUM and READ ELEMENT STATUS read
element status commands cannot be directed to a LUN with per-
ipheral device type code 05h. The setting of the MChngr bit in
the INQUIRY data is irrelevant. The LUN will not be able to
distinguish MOVE MEDIUM from PLAY AUDIO(12) or READ ELEMENT
STATUS from SET CD-ROM SPEED.

N.B. CD-ROM devices may still implement a medium changer as a
separate LUN. However, the requirement to do this is absolutely
counter to the intent of approved document X3T9.2/92-006r1. I
believe that X3T10 must either fix this conflict or reverse its
prior approval of 92-006r1.

I propose that the conflict be fixed by assigning different
operation codes to the MOVE MEDIUM and READ ELEMENT STATUS
commands for their attached medium changer usage. I propose that
Table B.2 of the SCSI-3 Primary Commands be updated as follows:

<table>
<thead>
<tr>
<th>OP</th>
<th>DTL</th>
<th>POW</th>
<th>RSM</th>
<th>OCA</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>BBh</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>MOVE MEDIUM (attached)</td>
</tr>
<tr>
<td></td>
<td>BBh</td>
<td></td>
<td></td>
<td>O</td>
<td>REDUNDANCY GROUP (OUT)</td>
</tr>
<tr>
<td>+</td>
<td>BFh</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>READ ELEMENT STATUS (attached)</td>
</tr>
<tr>
<td></td>
<td>BFh</td>
<td></td>
<td></td>
<td>O</td>
<td>VOLUME SET (OUT)</td>
</tr>
</tbody>
</table>

In this proposal, operation codes BBh and BFh are shared between
attached medium changer devices and storage array devices. I
doubt that there will be any problems with this sharing. Storage
array devices should embed any medium changers that they support.
as LUNs. Any other mechanism conflicts with the basic concepts of a storage array. However, if this operation code sharing is a problem, a few completely unused operation codes are available in group 5.

If approved, this proposal also requires equivalent changes in the Table 5 of the SCSI-3 Primary Commands, changes in all the SCSI-3 command documents that list the attached medium changer commands, and changes in the SCSI-3 Medium Changer Commands document.