End-to-end Data Protection and Tapes (07-373r4)

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• Customers are looking for solutions using standards based end-to-end data protection
• End-to-end data protection in the standards
• Disk based solutions are getting chosen over tape based solutions.
• Tape standards (i.e., SSC-3) need to add end-to-end data protection
• IBM has an end-to-end data protection solution for tapes
• Tape will be seen as having a complete solution for protecting data
Potential for data corruption
(same on tape as disk)

• Between the application and the HBA
• Interfaces to the data delivery subsystem on both ends of the wire
• Internal to the device
• As block is transferred between intermediate devices (e.g., protocol bridges)
### Disk data vs. Tape data

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<th>User Data</th>
<th>LBA</th>
<th>CKSM</th>
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LBA is not known "a priori" — can’t be used effectively
Existing vendor-specific methods

• IBM has a proven solution in its enterprise tape drives.
  – Used for more than 12 years
• Began with 3480 Tape drives
• Continued in 3590 and 3592
• 4-byte CRC placed on logical block and transferred with the block
  – Validated at multiple points along the path
Benefits to IBM and the customer with this solution

• Prior to solution
  – Data Integrity Issues
  – Difficult to find where the problem occurred

• After solution
  – Quickly find where problems occur
  – Data Integrity issues disappeared (Integrity was assured)
  – H/W issues discovered before host believes the data is on the medium
Diagram of IBM Solution
(logical representation)

4-byte CRC calculated and placed as last 4-bytes of logical block – LBA size = LBA size + 4 and transferred with block (or validated and stripped if Read)
Diagram of IBM Solution
(logical representation)

- zSeries (Mainframe)
  - HBA (FICON)
  - HBA (ESCON)

- Controller
  - HBA (FICON)
  - HBA (ESCON)
  - HBA (FC)
  - HBA (pSCSI)

- Enterprise Tape Drive
  - Format Stuff
  - Data written to / read from medium
  - Format Stuff

- Buffer
  - Transferred Logical Block
  - Port (FC)
  - Port (pSCSI)

4-byte CRC calculated and placed as last 4-bytes of logical block – LBA size = LBA size + 4 and transferred with block (or validated and stripped if Read)

4-byte CRC validated at multiple points between source and destination (exact points not necessarily shown)
Likelihood of quick adoption

• Tape drives today protect data blocks.
  – ECC
  – CRC
• E2E protection fits into media format schemes in use today
• Does not require change in Transport Layer Protocols
Proposal – Implement end-to-end logical block protection on tape

• There is a proven method that has been in use for more than twelve years
• Leverage this proven solution
• Make sure that options are available to meet all vendors needs
• For proposal against SSC-3 see (http://www.t10.org/ftp/t10/document.07/07-374r3.pdf)