N3630 Virtual Tape Device

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Abstract

The authors have commercialized the "N3630 Virtual Tape Device for use as a magnetic tape module for the ACOS4 system. It can emulate the cartridge library function by storing a virtual tape in a disc array, which can be run by making use of the software assets of previous systems. This product functions to provide data output to the latest LTO devices and also provides ACOS systems with a function for the backup and archiving of compact, large-capacity tapes.

Keywords

ACOS-4, virtual tape, tape library, magnetic tape, LTO tape, virtualization, backup, archiving

1. Introduction

The large amount of data handled by the ACOS system has in the past been backed up using cartridge library devices. Magnetic tape technology has recently made rapid progress and compact, large-capacity magnetic devices are mainly marketed for use in open systems. However, the introduction of these devices to ACOS systems has been hindered by problems such as the necessity for significant changes in the operational methods and the inheritance of traditional software assets. To deal with these problems, we have commercialized the N3630 Virtual Tape Device that can emulate the functions of cartridge libraries by saving the virtualized tape volumes in a disc array and offer a function for data output (ejection) to the LTO tapes. This paper is intended to introduce details of this product.

2. Product Features

Features of the product are shown as bellow (**Table**).

(1) Functions

- The N3630 Virtual Tape Device is designed to be connected to an ACOS system and to be capable of emulating the existing N3645/N3646 Cartridge Library. It can be operated in the same manner as traditional library devices.
- It saves data in the form of magnetic tape images in the highly reliable RAID-6 disc array.
- It can store 528 to 6,132 virtual tapes and up to 8 virtual drives by this method
- It does not involve the physical movement of cartridges, so that it offers a considerable saving on the time previously required for magnetic tape loading/unloading and file searching, thereby enabling high-speed data access.
- When an LTO library device is connected to it, it can unload the virtual tape data to LTO tapes for external storage of data.

(2) Space Saving and Weight Reduction

- The components are mounted in a dedicated 19" rack with a space-saving/lightweight design that enables a 94% reduction in footprint and a 93% reduction in weight compared to the N3645 Cartridge Library Device in a typical configuration (8-drive, 5,806-volume model). Such a significant reduction in the installation space makes possible a more effective use of the workspace floor area.

(3) High Reliability and Availability

- The main hardware components are provided in dual re-

Table Specifications and performance.

Item		N3630
Storage capacity	(TB)	0.42～4.9
Number of tapes	(volume)	528～6,132*
Tape capacity	(GB/vol)	0.8, 2.4, 10, 30
Drive type		36/128-track drive
Connectable channels		High-speed optical loop channels A/B
Channel data transfer time	(MB/s)	100**
Mounting/dismounting time		≤ 3 sec.
Loading/unloading time		≤ 3 sec.
Number of storage directors		2
Number of I/O ports		2 (per storage director)
Number of drives		2～8
Access mechanisms		2

* Number assuming that each tape has a capacity of 0.8GB.
** Maximum momentary value that is dependent on the system configuration and operating conditions.

dundant configurations in order to improve both their performance and availability.

3. Operation

3.1 Logic Configuration of Virtual Tape Device

Fig. 1 shows the logic configuration of the tape library device emulated by the N3630 Virtual Tape Device. The emulated device is composed of the controllers and the 2 to 8 tape drives and the 2 accessors that are connected to them. On receiving an instruction from the host, one of the accessors carries a tape in a cell to a drive and mounts it in the drive to read or write data to it.

The Entry/Exit cells used in the loading and unloading of the tapes are accessible only when the LTO library device is connected.

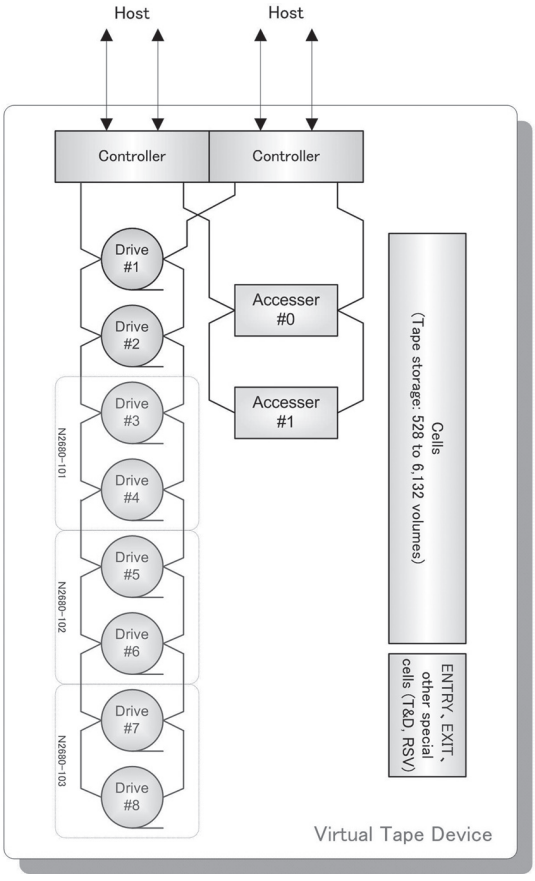

Fig. 1 Logic configuration of the N3630 Virtual Tape Device.

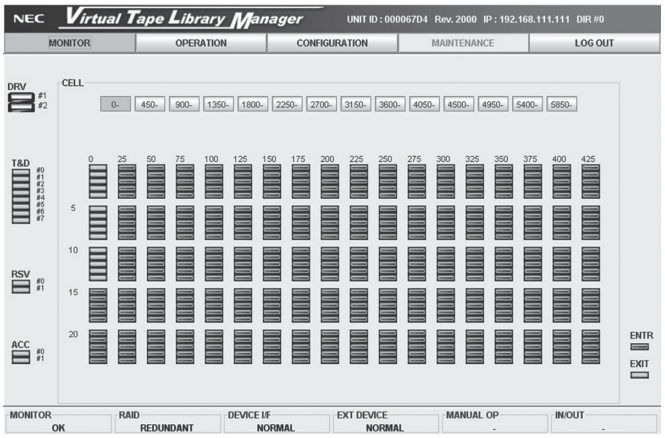

Fig. 2 Tape Library Manager (Monitor screen).

3.2 Tape Library Manager

The virtual tapes handled by the virtual tape device are sets of logical data managed on the disc array, and the Tape Library Manager is provided for handling the virtual tapes (**Fig. 2**).

The Tape Library Manager is implemented with a Java Applet that runs on a PC/server connected to the N3630 Virtual Tape Device via Ethernet, and assumes the following main functions.

- Visualization of the library image such as the virtual tape storage map display.
- Operation status display.
- Virtual tape handling including movements between cells and cell initialization.
- Configuration set up
  (Network setting, host's connection port ID setting, etc.)
- Maintenance including diagnostics, log display and fault display

3.3 Initialization and Registration in the VACF File

Since the virtual tape device emulates the N3645/3646 Cartridge Library, it can execute jobs from the OS that are intended to be executed on these devices without modification.

The virtual tape device makes it unnecessary to perform the recording medium handling operations such as tape entry initialization before the start of an operation and subsequent tape additions manually, because these operations are implemented with the Tape Library Manager. For example, the effect of tape entry initialization before the start of an operation can be achieved by clicking on the cell for entering the virtual tape in

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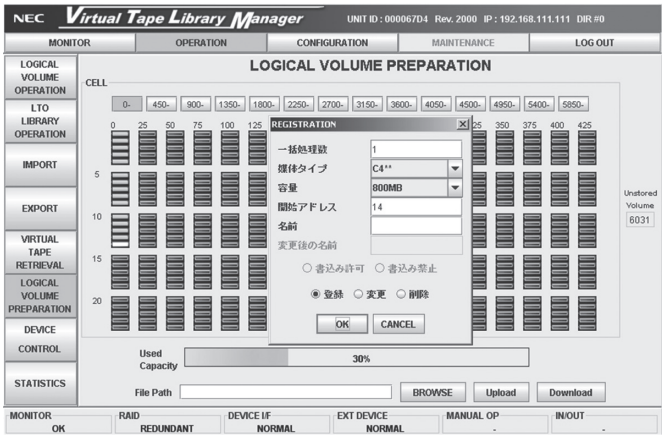

Fig. 3 Virtual tape entry window.

Fig. 4 Initial entry procedure of virtual tape.

the Tape Library Manager. The required tape information such as the volume name and the defined capacity are displayed in the window after clicking (**Fig. 3**). The virtual tape entry operation can also be performed by the input of a previously created CSV file as well as the above GUI operation.

After each virtual tape is generated in the virtual tape device, it should be registered in the Volume Access Control File (VACF), which is managed by the OS, using an OS utility. It may then be initialized by writing the volume label according to the VACF in the virtual tape (**Fig. 4**). When these operations are completed, the OS can handle the virtual tape in the same way as a traditional cartridge library.

3.4 Outline of the Import/Export Functions

The N3630 Virtual Tape Device provides the functions for the unloading to the LTO tapes and the loading from the LTO tapes for the external storage of the virtual tapes. This makes it possible to replace the traditional external storage method of the ACOS systems using the cartridge magnetic tapes with a method that uses large-capacity LTO tapes (**Fig. 5**).

Unloading the virtual tapes to the outside can be executed in the same way as before, i.e. using the EJECT command in the $CARTKEEPER service program provided by the OS.

The exporting of a virtual tape moved from the Exit cell to an LTO tape is instructed by the Tape Library Manager. With regard to unattended operation outside of normal working hours, the output to the LTO tapes is designed to be executable at such times by making a start time reservation.

4. Conclusion

In the above, we have outlined the features and operational methods of the N3630 Virtual Tape Device.

Magnetic tapes have long been positioned as the medium for backing up or storing computer systems data and the need for them is still increasing.

Technologies associated with the magnetic tape are making rapid progress and capacities have been increasing every year. However, the introduction of new developments often necessitates changes in the administration method or JCL (Job Control Language).

In order to use new, large-capacity magnetic tapes effectively

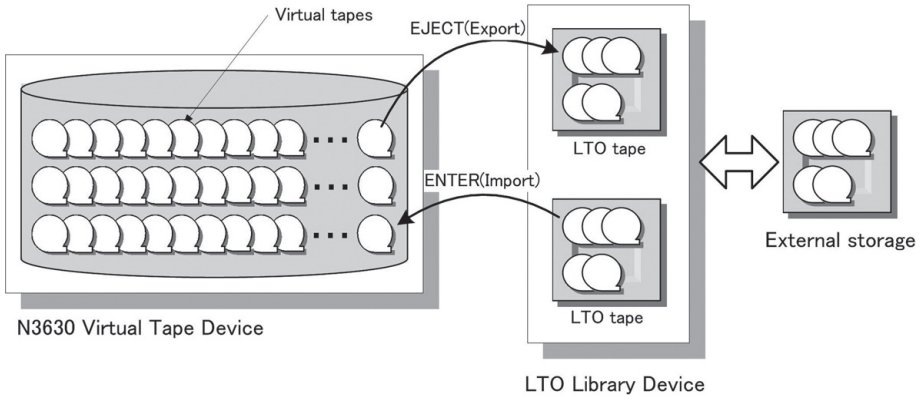

Fig. 5 Image of external storage method.

without modifying the existing applications or the JCL, it is now indispensable to virtualize the magnetic tapes. We will continue our development of virtualization technology by focusing on the virtualization of devices other than library devices, such as cartridge magnetic tape devices, and their linkages to open systems.

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