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AIX: Logical Volume Manager Overview (5/96)

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TOPIC --

This article contains an overview of the Logical Volume Manager in AIX.

DISCUSSION ---

Logical Volume Manager Overview

In a traditional UNIX environment, a hard drive is configured and formatted into
distinct sections, called partitions or slices. A disk may be formatted to
contain one or more of these partitions, each of which is empty and unassigned
until used for a particular purpose. Most partitions later have some kind of
file system created with them. These file systems can later be mounted somewhere
under the root file system and accessed. Other partitions are deliberately left
empty and used for system purposes, such as paging or swapping, or for specific
applications such as Oracle, which use the empty space in an application
specific way. Under this arrangement, a file can only be as large as the file
system that contains it, which in turn can only be as large as the partition
that contains it. The partition can never be larger than the single physical
disk that contains it.

AIX has a way around these limitations. A traditional disk partition or slice in
UNIX is replaced by something called a logical volume. The disk space that makes
up a logical volume can span multiple disks, and be made up of blocks of
non-contiguous space. Since a logical volume is not hard wired to a fixed amount
of physical disk space, it can be dynamically enlarged without affecting the
file system contained within it. That file system can then be enlarged later on
to take advantage of the additional space added to the volume. Volumes can also
be mirrored or striped for reliability or high speed access.

In AIX, an actual hard drive is known as a physical volume. Hard disks are
grouped together to form volume groups. A volume group can contain one or more
hard drives, and a hard drive can belong to only one volume group. The one thing
all hard disks in a volume group have in common is, they all use the same size
unit of disk allocation space, which is called a physical partition. A physical
partition can be anywhere from 1 to 256 MB in size. Physical partitions are the
smallest units of space allocation on a physical disk. AIX comes with one
default volume group, known as rootvg. All of the logical volumes necessary to
boot and run the system are a part of rootvg. These volumes (and the file
systems within them are):

Begin_Table

- /dev/hd4   '/' (root)
- /dev/hd2   /usr
- /dev/hd1   /home
- /dev/hd3   /tmp
- /dev/hd6   Paging space (not a file system)
- /dev/hd8   Journal File System log space (also not a file system)
- /dev/hd5   The boot logical volume (contains kernel, file system and
                other structures required to boot the system)
- /dev/hd9var   /var

End_Table

A system can have many volume groups; all except for the rootvg are user defined
and configured.

A logical partition is the same size as a physical partition; each one maps to
an actual physical partition somewhere in the volume group. A logical volume
consists of one or more logical partitions from within a volume group. Since
logical volumes can be increased, it stands to reason that they can be expanded
(the size of) one logical partition at a time. The default size of a logical
partition in the rootvg (under Apple's version of AIX) is 16 MB. This logical
storage method allows for a tremendous amount of storage capacity per system.
The system limits are:

Begin_Table

- Volume groups   255
- Physical volumes   32 per volume group
- Physical partitions 1016 per physical volume, up to 256 MB each in size
- Logical volumes   256 per volume group
- Logical partitions   32,512 per logical volume

End_Table

Striping and Mirroring

One of the advantages to a logical storage management system is, striping and
mirroring can be easily set up. Striping allows the data blocks that make up a
file to be spread over two or more disks. The data blocks used in AIX striping
are called stripe units; they can be 4K to 128K bytes in size. These stripe
units (contained within logical partitions on different disks) allow parallel
access to the data blocks of a file. This can greatly reduce file I/O access
time.

Mirroring is when a logical partition maps to more than one physical partition
with the same volume group (usually physical partitions on different physical
volumes). All the logical partitions with a mirrored logical volume will be
mapped to two, or possibly 3 different physical partitions. Mirroring can slow
the performance of the logical volume, but it is very useful in cases where data
redundancy and availability are critical.

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