

## SAS Storage Tips

A white paper series  
prepared by IBM ^  
pSeries Solutions Enablement  
in cooperation with the IBM Storage Group

### Managing SAS Storage on IBM Enterprise Storage Servers

IBM Enterprise Storage Servers can contain multiple terabytes of disk. Managing that storage can be a daunting task. This paper suggests a management strategy that will make the task less formidable.

#### 1. Subdivide each ESS RAID 5 array into as few logical volumes as possible

There are three factors that should influence how many logical volumes you create from a single RAID 5 array:

- How many hosts are connecting to your system, and will they be given exclusive access to some subset of the storage? Obviously, you will need enough logical volumes to support your multiple host needs.
- Do you do imports, exports, backups, or other operations at the AIX volume group level? AIX volume groups cannot share hdisks. If you want your volume group to contain as many physical spindles as possible (and you do), then extremely large ESS logical disks will result in extremely large and unwieldy AIX volume groups.
- Do you use FlashCopy? FlashCopies must be created within ESS logical subsystems. Logical subsystem boundaries change as the capacity of the ESS increases; but in general it is safest to plan as if a logical subsystem were identical to an SSA loop. This means that if you are planning to use FlashCopy, each loop must contain at least two logical volumes.

Unless you have very strong reasons from the start, do not fall prey to the assumption that breaking your storage up into a large number of logical volumes will make the system more flexible. Usually, it will make it less manageable. Every logical volume will translate into one or more AIX hdisks ( $\# \text{ of hdisks} = \# \text{ of paths} * \# \text{ of logical volumes}$ ). You can always subdivide larger hdisks from within the AIX logical volume manager.

We recommend that you create between two and fourteen logical volumes per RAID 5 array.

#### 2. Make all your logical volumes the same size

Managing many volumes of many different sizes can be tedious, and it promotes uneven distributions of data. As was mentioned above, you can always subdivide logical volumes from within the AIX logical volume manager. Making all your logical volumes the same size makes it easier to distribute data evenly.

### 3. Distribute (stripe) evenly across the entire ESS

By distributing data evenly, you'll avoid hotspots, and it will be much easier to add storage to applications. Suppose you have distributed your SAS data as follows (each AIX filesystem is placed on an AIX logical volume striped across logical disks from every ESS RAID 5 array):

SAS input
SAS work
SAS output
Unused
Unused
Unused
Unused
Unused

You can increase the size of any SAS filesystem with complete assurance that performance will remain constant simply by continuing with your management strategy of distributing evenly across the entire ESS using equally sized logical volumes:

SAS input
SAS work
SAS output
Additional SAS work
Additional SAS work
Additional SAS input
Unused
Unused

### 4. Use the Subsystem Device Driver software

Even if you have chosen to keep the number of logical volumes on your ESS to a minimum, you'll still have a large number of AIX hdisks as a result of multipathing. This unnecessary complexity can be taken care of easily simply by using the Subsystem Device Driver software that comes with your Enterprise Storage Server. This software represents every set of physical paths to the same logical volume by a single virtual path.

**For more information, refer to the following IBM redbooks at**  
<http://www.redbooks.ibm.com>:

*Working Together: IBM ESS with DB2 UDB,*  
SG24-6262

*Implementing the Enterprise Storage Server in Your Environment,*  
SG24-5420

*IBM Enterprise Storage Server Performance Monitoring and Tuning Guide,*  
SG24-5656

**Other resources:**

*ESS Introduction and Planning Guide*

<http://www.storage.ibm.com/hardsoft/products/ess/refinfo.htm>

*ESS User's Guide*

<http://www.storage.ibm.com/hardsoft/products/ess/refinfo.htm>

IBM Enterprise Storage Server web site

<http://www.ibm.com/storage/ess>

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