

How To Select A RAID Disk Array

A PRIMER FOR VARs TO SHOW CLIENTS

BY JOEL LEIDER

Like any of today's high technology products, where the technology has evolved rapidly, it is easy to find the new topic confusing. However, selecting a RAID disk array is much like choosing any other product. You just need to ask the right questions so you can sort out, from the plethora of products, those few that best suit your needs.

Determine Your Needs

Shopping for a RAID disk array can be simple once you know what you really need and understand what the technology actually can offer you. Simply, RAID disk arrays provide data storage, but with a higher degree of operational availability and performance depending upon the feature set available from various vendors. All RAID disk arrays will provide you with some level of storage, reliability, performance, and service for different prices. Your job is to determine which is the best fit for you.

Storage

All RAID disk arrays provide storage, but so does "just a bunch of disks." Clearly, anyone can pile boxes on boxes to meet your total storage requirements. However, how well does the storage scale from single units to racks of storage? Do all the disks use a limited number of host interfaces? Do all the disks use a very small number of controllers? These are sources of potential data bottlenecks. Does the vendor offer a rack cabinet? Who provides uninterruptible power supplies and are they adequate? Does the system require software drivers that must be updated constantly or is the product a truly plug-and-play "open system"? Is the product scalable as your needs grow? Can it be moved to another platform and operating system easily and without added expense?

RAID Reliability

Most vendors will provide you with an implementation of RAID where one

extra disk is used for parity information to recreate lost data in the event of a single disk failure. You should avoid any vendor that does not meet even this minimum criterion. Given that most vendors will offer similar capabilities on this most basic issue, you should ask more detailed questions: How long does the controller take to rebuild the data? Does the controller permit an automatic "hot-spare" replacement? How easy is it to monitor and control the status of the array? Do you need to be at the system to monitor and control it or can you operate remotely? How?

RAID Levels

Much has been written on the various RAID "levels" and, in short, the word levels is a misnomer and should be understood as merely RAID "modes." Each RAID mode is just a different, yet not necessarily better, means of operation.

RAID 1 offers complete duplication of data and this 100% data redundancy pro-



Pedestal Model with 8 or 12 drives provides up to 584 GB of storage.

vides the best protection, but it is much too expensive for most applications. RAID 3 and RAID 5 each use one extra disk to store parity information needed to recreate data in the event of a single disk failure. RAID 3 uses a dedicated parity disk and is typically faster for throughput-oriented applications such as file transfer and other sequential applications. RAID 5 distributes the parity information across all disks in the array and is typically faster for transaction processing and other random access applications. These results are relevant mostly in arrays that have little or no controller cache memory. In products with significant cache memory (64MB or more) on-board the controller, performance will be higher in all cases due to the distinctly higher abilities of the controller and will perform in a vastly superior manner regardless of RAID mode.

You should insist that your RAID vendor support standard RAID levels, including 1, 3, and 5, as defined in the original University of California Berkeley RAID project. Only RAID 0–6 appear in that definition and RAID 2, 4, and 6 are rarely seen in commercial products. RAID 0 is merely disk striping, which has some performance advantages, but stores no parity information and, thus, does not offer true RAID data protection. If the vendor has created additional RAID levels that are non-standard, e.g., outside the range of RAID 0–6, be

wary that you are not buying into a proprietary architecture. However, certain RAID levels are merely combinations of two other RAID levels such as RAID 1+0 (also called RAID 10) where multiple RAID 1 pairs are striped for faster access or RAID 15 where two RAID 5 arrays are mirrored for added reliability. These combinations offer advantages over single RAID modes and are perfectly acceptable.

Hardware Fault Tolerance

While all RAID vendors provide RAID in some form, vendors vary greatly in the degree of fault tolerance they provide. To maximize system availability, you need redundancy in other system components that are most likely to fail, including power supplies and fans. Disk controllers, unlike all the other mechanical components, are completely electronic and, thus, are the most reliable components. You can optionally look for redundancy here too. These components, to the extent possible, should be “hot-swap” so that they can be replaced while the system is running, further increasing total system availability. You should also make sure that each individual enclosure has two AC power cords. You should install one into a dedicated uninterruptible power supply and one into a room outlet, preferably a protected outlet or second uninterruptible power supply. Any RAID disk array with cache memory on the RAID controller should also have a battery backup module for added protection.

Quality Construction

This is an often-overlooked parameter in today’s world of sleek-looking enclosure design. Don’t be fooled by smooth rounded corners of plastic disk enclosures. Only all-metal disk carriers offer the thermal conductivity needed for proper heat dissipation for today’s high speed, higher capacity disk drives that often run hot and require proper operating environments. Proper cooling is critical to achieve long and reliable disk drive life and metal carriers simply do this

better. Metal carriers also shield the disk drives’ high-speed signals from stray RFI (Radio Frequency Interference) that may occur in an office or computer room environment. For 18GB drives and high-speed 10,000 rpm drives, it is also important to minimize drive vibration to avoid excessive disk errors and time-consuming retries. A quality vendor will have a new drive mounting scheme to ensure reliable operation of 18GB and 10,000 rpm disk drives and not just put these more sensitive drives into the same old plastic disk carriers that handled their 1GB, 2GB, 4GB, and 9GB drives.

Performance

This is a critical parameter for every server. After you spend all your money on a RAID disk array, is it going to give you the performance you need? Today, at competitive prices, you can get over 9,000 disk read/write operations per second for transaction-oriented applications and up to 35MB/sec actual sustained throughput for data transfer operations. If a vendor is not providing anything near these specs, all your applications will run needlessly slow. Today, computers process data in near zero time, thus the speed of all server applications run in proportion to the speed of the slowest device, which is the mechanical disk drive. Ask vendors for the performance specs of their RAID disk arrays and compare. Do not accept generalizations. If they are clueless or do not publish their specs you can be assured that they do not measure up.

Service

Can your people service the unit or must you rely only on outside service providers? How easy is it to replace disk drives, power supplies, fans, and controllers? Can any moderately skilled technician perform these component replacements? How quickly can the components be replaced? Are they “hot-swap” replacements—can they be done while the system is still delivering data to users who are unaware of the problem? Does the

vendor have on-site service available? Do they have an 800 hotline staffed by people who actually know the equipment? Is the service available on a 24x7 hour basis? Can you or a highly trained factory engineer dial in to your system from a remote site? Can your system automatically alert you via pager in the event of a warning or error condition?

Company

The company you select is as important as the product. Is the company merely a distributor of the product who may not know much about it or is it factory direct from the people who know the equipment? Are you considering buying the storage from the server manufacturer because it is most convenient or are you truly looking at your needs and choosing the right RAID disk array? Is the vendor completely committed to RAID disk array technology or do they have many other products or even thousands of other products that dilute their interest and expertise? Is it important to you to have the comfort that comes with a name brand ("no one ever got fired for buying IBM") or do you just want the best product for your needs from a company that can stand behind the product? How long has the company been in the business? Do they enable you to be self-sufficient in a crisis or completely dependent? Do they use industry standard components? Do they offer systems designed to "open systems" standards or have they managed to include proprietary components that lock you in to their architecture? Do they use the industry's best disk drives or less expensive models with correspondingly lower quality and reliability? Is the price fair, compared to other vendor's offerings, or is it too high or too low? Do the company's representatives in sales, sales support, and technical support seem to have the expertise needed to support the product? Do they exhibit genuine interest in providing solutions to your needs? Are they enthusiastic about their products and committed to showing you how much

they can be of service or is their zeal devoted to separating you from your budget as quickly and efficiently as possible?

References

You should ask the company for references from other happy customers. Ask their customers how well they were treated before the sale and after the sale. Did the company meet its promises? Did the product live up to its claims? Did the performance, reliability, and service get delivered? How smoothly did the installation process go? You can be sure that a company will treat you much the same as it treated others. Ask the people if they are happy with their purchase and if they would buy from the company again.

Guarantees

When comparing systems, vendors who are willing to guarantee performance in writing are more credible. If a vendor claims to offer a high performance system that runs fast, see if they will back up their claim. A vendor that believes their claim will gladly guarantee you the results that you are looking for because they have the confidence, based upon prior experience with other customers, that you will get the performance you are paying for or they will let you return the system. Try to be as specific as possible with respect to your most important application.

Challenge the vendor to cut your month-end report times by 33% or serve twice as many web pages from your server or cut lengthy database inquiries from five seconds to two seconds. That way, you can test the RAID disk array immediately upon receipt and know right away if you received the advertised benefit. It also builds a case to justify the investment to management in the first place and communicates clearly to the vendor what you expect in return for your hard-earned cash. It also filters out vendors who know they can't really do it. All these are positive results that come from being specific and getting a guarantee. You simplify the purchasing



Rackmount Model supports up to 584 GB of storage and 4 simultaneous host servers on dedicated SCSI ports.

process, the management justification process, and increase your odds of success while minimizing risk and conserving your valuable time.

Checklist For Installing RAID Without Any Worry: Prepare For Success

Successful installation is no accident. It happens by choosing the best equipment for the job and by preparing for successful installation, operation, and maintenance. "Plug and play" sometimes means plug it in and it immediately plays and sometimes means plug it in and play and play until it works. The truth is, as always, somewhere in between. By reviewing the following checklist, you can be assured that you have done as much as you can to ensure the success of your server storage installation.

Pre-Installation Checklist

- **Configuration.** Choose the configuration that meets your performance, storage, availability, and serviceability needs by consulting with your sales engineer. Stick with standard configurations for best price/performance and ease of serviceability unless your requirements dictate otherwise. Ask the difficult questions before buying anything. The higher the availability requirements, the more redundancy and component removability you require. Consider redundancy for disk channels, host buses, interface cards, and even servers, in addition to the disk drives and internal disk array components.
- **Backup.** Ensure that your backup device and procedure are adequate to handle the increased storage in the time available.
- **Power.** Ensure clean power and UPS protection. Add cache battery backup

option for added data protection.

- Interference. Check for sources of electromagnetic interference such as banks of modems on web servers.
- Load. Is the system totally loaded already? Will the addition of one more device, especially a high performance RAID array, push the load limit over the edge?
- SCSI Interface. Is the interface fast enough to avoid bottlenecking the new high performance equipment?
- Service. Decide who is going to perform remedial service. Do you need 24x7 service availability? On-site third party service? Will you train your people?
- Key phone numbers. Post 800 Hotline numbers in conspicuous places. Post beeper number and, perhaps, home phone numbers of key internal personnel. Prepare pocket summaries with this information for key people to keep handy.
- Spare parts. Are advance replacement parts supplied overnight sufficient or do you need on-site spare parts?
- Remote alarms. Would you benefit if your system were programmed to "cry for help" by automatically dialing designated pagers with an optional alarm?
- Remote diagnostics. With an optional modem, you can enable your system to receive remote diagnostic calls. Temporary system passwords can be provided for use only when the Service is needed.
- Performance benchmark. Naturally, you will be curious to test how much faster everything runs with new high performance storage. Time your longest batch jobs and measure client response to lengthy transactions before and after installation. Call us with the benchmark information to see if you are getting the performance you paid for—or simply to share the excitement of any productivity increase you receive.
- Capacity assessment. Based upon performance benchmarks, you can make a reasonable estimate of how many users you can support on the ex-

isting server before you need to add another one.

During Installation

- Schedule downtime. Make sure that there will be time enough to properly install the system. Allow plenty of time and anticipate that it will take longer than expected—Murphy is ever present.
- Test period. The more critical the application, the longer the shake out period should be. Several days to several weeks of running diagnostics, exercisers, and representative applications is a reasonable precaution to take before committing your entire enterprise to a new piece of equipment—including RAID arrays.
- Training. Make sure one or, preferably, two or more people are trained on the system. Training includes setting up RAID arrays, swapping components, rebuilding arrays, simulating failures, and, most importantly, practicing what to do in the event of actual failures.

After Installation

- Data protection. RAID is not different than any other storage device when it comes to protection from viruses and accidental or deliberate deletions. Implement the same file protection and record locking strategies you would use on a non-RAID system.
- Data recovery. Database and transaction processing systems are often implemented on RAID systems. If yesterday's backup is too old to be a useful data recovery system, make sure you have the ability to roll the database forward in time with journal files or similar capabilities. Store journal files on a separate physical device from your primary database. No system is perfect, not even RAID systems. You still need to protect your data as you would with any storage device.
- Data backup. Typically, RAID systems significantly increase your total storage capacity. Make sure you do a complete backup frequently and incre-

mental backups at least daily. Test data restoration periodically to ensure that you remember how to do it and to ensure proper operation of the tape system.

- Data security. Make extra backups and keep copies off site.
- Upgrades. Certainly, there are other improvements on your agenda. You should implement one major change at a time so that problems are easy to identify and correct if you are upgrading an existing server. You wouldn't want to upgrade the operating system and the application while also installing new storage and backup. If you need to make all these changes and want to avoid sequential disruptions, build an entire new server and then test it intensively before deploying. Keep the old server as a backup until the new one is proven.
- Communication. Stay in touch with your service provider. The person will be familiar with your installation and your capabilities when you need help and will be better prepared when the time comes.

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