PROMISE TECHNOLOGY

Challenges

- Lack of self healing RAID Technology
- SATA drives lack the sophisticated error recovery commands of SAS drives
- Today's demanding applications have little tolerance for downtime nor data loss
- RAID 5 and 6 although great technologies for balancing performance, cost and capacity are negatively affected by drive failures
- Drive failures always seem to happen at the worst times

Solution

- Predictive Data Migration (PDM) is a Promise unique technology that automatically and intelligently migrates data off of sick drives BEFORE the drive fails.
- Instead of using XOR to rebuild the failed drive and thereby incurring a large performance penalty on the entire solution PDM is done in the background and only affects the source and destination drives.

Results

- Drive migration using PDM is up to 5 times faster than a XOR rebuild
- Performance of the entire storage solution is barely affected
- Original drive ID sequence is maintained with use of global revertible spare, drives transition to original slot placement

Predictive Data Migration
Delivers Advanced Data Protection

Overview

Predictive Data Migration (PDM) is Promise's unique self healing technology that proactively detects possible drive failures before they could occur and migrates data to a new healthy drive. Predictive Data Migration dramatically reduces the potential for data loss as well as the likelihood of a logical drive (array) going critical and impacting performance as is typical during a traditional rebuild process.

The VTrak system monitors its hard drives for Grown Defect List (Glist) on SAS drives, SMART events, as well as hard drive reliability indicators and back end SAS expanders. If a physical drive reaches a predetermined error threshold (becomes 'sick'), the data on the sick drive is copied directly to the global revertible hot-spare drive before the 'sick' drive fails. Since the drive is replaced in the background before it fails, the chance of data loss is dramatically reduced. Once the data is copied to the new drive, the sick drive is set down and the new drive is automatically integrated into the affected logical drive with zero downtime. Predictive Data Migration prevents the logical drive from reaching a critical unprotected state and impacting data access. Promise's Web-based storage management software (WebPAM PRO and WebPAM PROe) enables the administrator to manage the entire process simply and efficiently from anywhere.

Today's massive terabyte capacity hard drives and stringent data availability requirements are driving the need for more robust data protection and failure resiliency. With hard drives exceeding 10TB in capacity and even larger drives on the horizon, the impact of a single drive failing and the resulting intensive XOR rebuild can put a toll on performance. During the rebuild the likelihood of a second drive having an error or failing

PDM dramatically reduces the impact of drive failures. The time to migrate data off of a 'sick' drive to a healthy one is up to 5 times faster than a traditional RAID 5 rebuild. Average of 32 hours/TB logical drive to rebuild, and only less than 7 hours for PDM to migrate the same drive.

Waiting for a hard drive to fail and then beginning the RAID engine intensive task of rebuilding a drive using XOR is no longer an option for today's organizations.

completely increases exponentially with both the size of the hard drives and the total capacity of the logical drive. PDM dramatically reduces the impact of the drive failures. The time to migrate data off a 'sick' drive to a healthy one is up to 5 times faster than a traditional RAID 5 or RAID 6 rebuild (days rather than hours). The longer the rebuild takes the higher the risk to your data. In RAID 5, if you lose a second hard drive while the first one is still rebuilding, you lose 100% of your data. In RAID 6 although more resilient, allows a total of two drives to fail before losing all data in the RAID set.

The Solution

The solution is to remove the need for a complicated and time intensive RAID XOR drive rebuild altogether. That is the purpose of Predictive Data Migration. Because it proactively monitors the health of all hard drives in the system, it reacts before a drive fails and migrates data to a known healthy drive. This migration is a straight disk to disk copy that is many times faster and far less RAID engine intensive than a full XOR rebuild. As a result, not only is it much faster to copy data from one drive to the next, but it has less impact on the performance of the RAID engine and the affected logical drive.

PDM works by monitoring the following critical health indicators on every hard drive in the system:

1. BBM (Bad block Manager): Grown defects polled from Glist. The threshold is user configurable and the default is set to 1024
2. SMART errors: Physical drive SMART condition. Default setting is disabled although can be enabled. Can serve as a PDM trigger
3. Other indicators: Error Block Threshold via Media Patrol facility. The threshold is user configurable and the default is set to 128. Medium Error Threshold: Global physical drive setting. Value is the number of bad blocks tolerated before the controller sets a drive down. The threshold is user configurable and the default is set to 64.

When any of these reaches the predetermined threshold, the PDM process is automatically launched and the data is copied from the 'sick' drive to the healthy drive in the background (if a hot spare is present). These thresholds are preset at manufacturing and can be adjusted for proactive failure analysis in Promise's storage management software (WebPAM PRO).

Predictive Data Migration is part of Promise's unique PerfectRAID technology. PerfectRAID is Promise's unique RAID data protection technology, a suite of data protection and redundancy features built into every Promise RAID product. PerfectRAID incorporates robust data handling and error management features including write hole prevention, read check tables, SMART support and multi-dead drive prevention. PerfectRAID features are also carefully matched with Promise's resilient RAID Engine Core to deliver substantial data protection.

On top of the core protection techniques, the VTrak system takes advantage of advanced PerfectRAID features including Bad Block Remapping and Media Patrol. These features scan the system's drives to ensure that even bad media does not impact data availability.

For more information visit: https://kb.promise.com/thread/e5000-drive-error-reporting/