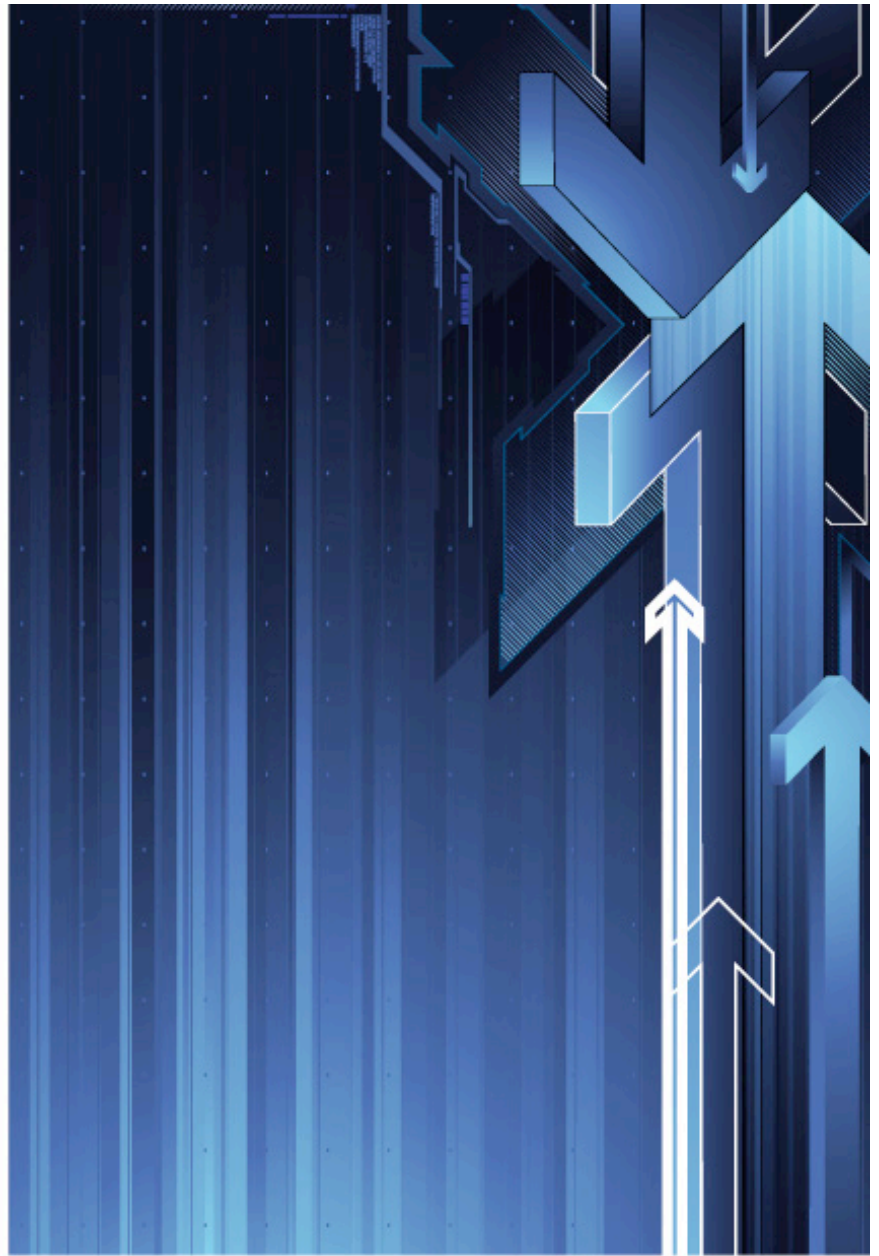# Best Practices Guide

Promise® VTrak Ex30 and Ex10 Series External Disk Array Subsystems Best Practice Guide

April 2011 Version 1.2

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About This Guide

This Best Practices Guide describes the recommended VTrak Ex10, Vtrak Ex30 configurations, settings and tips for achieving the best performance and stability. Reliable operation of Promise storage devices is dependent upon correct assembly, cabling, and configuration. Incorrect assembly, cabling or configuration can result in less the optimal performance and or stability problems. It is also important that only fully qualified hardware is used. A list of fully qualified hard drives can be found on the promise web-page www.promise.com. This guide It is intended for system administrators, storage architects, system integrators, and resellers who are planning to install or qualify VTrak Ex10, Vtrak Ex30 series products

Terminology

- Active - Active
- Physical Drive (PD)
- Disk Array (DA)
- Logical Drive (LD)
- Active – Active
- LUN Affinity (LA)
- Predictive Data Migration (PDM)
- Bad Block Manager (BBM)
- Background Activity (BGA)
- Asynchronous LUN Unit Access (ALUA)
- Operating System (OS)

Assembly

Assure that the following are correctly seated and locked in place:

- Controllers
- Power Supplies
- Fan Trays

Assure that all cables are fully seated and locked in place.

- SAS cables to HBA snapped into place
- SAS cables between JBODs or JBODs, and the raidhead, Network connectors snapped into place
- Power cables fully seated with wire lock in place
- Drive Trays should be fully seated and locked
- For adjacent drive trays one tray needs to be seated and locked before the other drive tray is inserted (applicable to Ex10 not Ex30)

Assure that all AAMUX adapters and drives are installed using the 4 screws provided by the manufacturer. Do not over-tighten screws (applicable if you integrate drives, new SKU comes with drives pre-integrated

- Hard Drives installed with 4 screws
- AAMUX adapters installed with 4 screws
- Drive Firmware must be Promise qualified firmware

Code Set

Controller RAID Head + JBOD expander firmware should have the latest qualified specified builds

- Firmware/Software
- Expander on JBODs known as SEP version should be running respective version (check from JBOD IO Module RS232 connection using "enclosure –v" command or via CLI using "enclosure –v")

Configuring the VTrak

This section lists best practices for configuring your VTrak Ex10 and Ex30 series products Disk Arrays, Logical Disks, Controller settings and configuring Error Notification, followed by additional recommendations, and depth explanations on various functions and features.

DA/LD configuration is set by the user according to their performance, and capacity requirement needs. The following are strongly recommended:

- A full synchronization or initialization should be run on every LD established
- Use of LUN Affinity with ALUA or No ALUA (depending if the host OS is ALUA aware)
- LD Preferred Controller IDs set to balance the load in 1DA:1LD configurations
- More than 1 Sub LD with in a DA, avoid accessing SubLDs across both controllers
- Number of recommended drives per DA/LD: For Raid6 10 PDs (8+2), for RAID 5 (8+1), from here you can change the configuration in terms of drive count, you should use the above as a base line. Our hardware XOR engine has been optimized to use 8 source disk to compute parity. To compute parity for more drives, we need to do multiple times, by adding more disks it will increase the time it takes to compute parity, thus the above optimal configuration.
- Global Revertible Spares strongly recommended, and should always be used
- Error handling thresholds are set automatically how ever the user may choose to change these if applicable (every application is different), see KB (applicable to Ex10 and Ex30): http://kb.promise.com/KnowledgebaseArticle10255.aspx?Keywords=SR2.6
- Controller Settings, Forced Read Ahead: Enable or Disable (aggressive pre-fetch)
  - o Controller Forced Read Ahead should be enabled for large block sequential access such as rich media type applications
  - o Controller Forced Read Ahead should be disabled for Random IO type applications
- Disable Physical Disk Cache for mission critical database type applications, this will insure data is written to disk in the event of a power outage occurs (LD cache is protected by the Vtrak battery)

Make sure one of the provided error notification methods is used.

- Email Notification
- SNMP

Single/Dual Controller Module

Depending on your application availability and performance requirements, you may choose either the single or dual controller module configuration. To achieve high availability and optimal performance, Promise recommends using the dual controller module configuration.

Memory and Battery Options

For high performance Promise recommends using two gigabytes of memory, on the controller, and four-cell battery for ample cache memory backup retention. For Ex30 series you can upgrade up to 4 gigabytes per controller, Battery is included.

- If a RAID Head is shelved for more than 3 months its possible the battery may not be fully charged therefore reconditioning is recommended
- The unit will recondition the battery on the default schedule of 1 time every 2 months on the 1st of the month (customizable)
- Battery warranty is 1 year
- The batteries can last longer than 3+ years if properly maintained

For more information, please see these Knowledge Base articles:

http://kb.promise.com/KnowledgebaseArticle10140.aspx?Keywords=battery
http://kb.promise.com/KnowledgebaseArticle10038.aspx?Keywords=battery
http://kb.promise.com/KnowledgebaseArticle10202.aspx?Keywords=battery

Hard Drive

Promise recommends using high capacity, low cost enterprise-capable SATA drives or Native SAS drives. Please refer to the Promise VTrak Ex10 and Ex30 series compatibility matrix on the Promise website, under Support > Compatibility Matrix, for compatible hard drive models.

Recommended Settings

The following table lists the recommended settings for the VTrak Ex10 and Ex30 series:

Table 1. Recommended settings

Setting	Value	Rationale
Subsystem		
Redundancy Type	Active-Active	Supports high availability and load balancing with VTL/SIR. The default setting is Active-Active.
Controller		
LUN Affinity	Enabled	Ensures stability increased write performance
ALUA	Enabled or Disabled	Asynchronous LUN Unit Access (depends if OS supports it or not)
Force Read Ahead	Enabled or Disabled	Achieves the optimal performance for large block sequential reads such a rich media type applications. Should be disabled for random type IO applications
Adaptive Write Back Cache	Enabled	Protects the data integrity in case of Battery Backup Unit (BBU) failure or a low battery condition. The default setting is Enabled.
Auto Rebuild	Enabled	Enable Automatic Rebuild to replace bad drive or Predictive Drive Migration (PDM) to replace a drive that is going to fail. These actions improve data reliability by reducing or eliminating periods of lost redundancy. The default setting is Enabled.
SATA Physical Drive Settings		
ReadAheadCache	Enabled	Helps to achieve the optimal performance for multiple stream backup/restore and deduplication. The default setting is Enabled.
Write Cache	Enabled	Helps to achieve the optimal write performance The default setting is Enabled.
Medium Error Threshold	64	This value is the number of bad blocks tolerated before the controller marks a physical drive as Dead. By enabling this setting, you can identify problem drives before they fail, thereby improving system performance and reliability. The default setting is 0, meaning disabled. Please refer the Knowledge Base on how to set Medium Error Threshold: http://www.promise.com/support/support_eng1.asp Search for keyword "Medium Error Threshold."
PDM Error Block Threshold	128	Error Block Threshold will trigger Predictive Data Migration (PDM) when the physical drive error counters are exceeded on respective physical drive

Alert Notification

It is important to set up the alert notification on the Promise VTrak external disk array subsystem, as this feature notifies the system administrator and allows him to act accordingly in the event of any status change or failure condition. The administrator should set up event notification either through Email or Simple Network Management Protocol (SNMP) during the initial setup phase.

Usually, Email is a preferred notification method. In certain user environments, there may be an existing alert notification infrastructure that is based on a standard network management protocol such as SNMP. In this case, SNMP notification can be configured to integrate with the existing infrastructure.

For detailed instructions on how to configure event notification through Email and SNMP, please refer to the VTrak Product Manual. You can find all of the Product Manuals on the Promise website under the Downloads section (Support > Downloads).

Configuring the RAID

Promise VTrak E-Class external disk array subsystems support RAID levels of 0, 1, 1E, 10, 5, 6, 50 and 60. It also supports the mixing of different RAID level volumes in the same disk group to meet the requirements of different application performance profiles. This section provides the proven sample configurations scripts so you can build your own.

Global Revertible Hot Spare

To achieve the best reliability and manageability, Promise recommends configuring all of the spares as global revertible hot spares. The advantage of global revertible hot spares is that each of the hot spares can be used for rebuilding the same logical drive or different logical drives, in the same enclosure or in different enclosures. Therefore, when there are unevenly distributed drive issues, there are still enough hot spares to provide coverage and to allow RAID redundancy to be restored in the shortest time frame. As revertible spares, when the rebuild completes and the failed drive is replaced with a new drive, the used spare will automatically be freed up and become a revertible spare again after the reversion process, called Transition, initiates and completes in the background. Due to reliability considerations, Promise does not recommend mixing drives from different enclosures in the same disk array. Therefore, when a rebuild completes through using a hot spare from a different enclosure, Promise recommends replacing the failed drive as soon as possible. When the new drive is inserted, Transition will start automatically in the background. Eventually, the disk array will consist of drives in the same enclosure again. The follow diagram illustrates how global revertible hot spares work.

Sample Configuration Script with 1DA:LD with LA + ALUA Disabled and other recommended settings:

```
#Begin Copy
#
# Promise VTrak E-Class configuration script
#
ctrl -a mod -i 1 –s
"lunaffinity=enable,alua=disable,cacheflushinterval=12,adaptivewbcache=disable,hostcacheflushing=disa
ble,forcedreadahead=disable
"ctrl -a mod -i 2 –s
"lunaffinity=enable,alua=disable,cacheflushinterval=12,adaptivewbcache=disable,hostcacheflushing=disa
ble,forcedreadahead=disable"
# SMART setting = disabled
ctrl -a mod -s "smart=disable"
# Delete any existing arrays
# Delete array 0 thru 2
#
#
# Build DATA LUN
# RAID level: 6
# Configuration options: Capacity all (default), 64k stripe size (default),
# 512K sector (default), Read Ahead, Write Back
#Qty 1 Logical Disks Per Disk Array
#
array -a add -p 1~10 -s "alias=DA0" -c 1 –l
"alias=LD0,raid=6,stripe=64kb,readpolicy=readahead,writepolicy=writeback,preferredctrlid=1"
#
# Build DATA LUN
# RAID level: 6
# Configuration options: Capacity all (default), 64k stripe size (default),
# 512K sector (default), Read Ahead, Write Back
#Qty 1 Logical Disks Per Disk Array
#
array -a add -p 11~20 -s "alias=DA1" -c 1 -l
"alias=LD1,raid=6,stripe=64kb,readpolicy=readahead,writepolicy=writeback,preferredctrlid=2"
# Set up global spares
# Physical Drives: 21~24
# Type: Global spares, Revertible
#
spare -a add -p 21 -t g -r y
spare -a add -p 22 -t g -r y
spare -a add -p 23 -t g -r y
spare -a add -p 24 -t g -r y
#
#BGA error handling thresholds
bga -a mod -s "BBMThreshold=1024"
bga -a mod -s "ErrorBlock=128"
#
#Additional PD (Physical Drive) settings for improved error handling
phydrv -a mod -s "MediumErrorThreshold=64"
#Quick Init
```

```
init -a start -l 0 -q 1024
init -a start -l 1 -q 1024
#init -a start -l 2 -q 1024
#init -a start -l 3 -q 1024
# END
#
#
#End Copy
```

Sample Configuration Script highlighting LA + ALUA Enabled with Forced Read Ahead Disabled

```
# Promise VTrak E-Class configuration script
#
ctrl -a mod -i 1 –s
"lunaffinity=enable,alua=enable,cacheflushinterval=12,adaptivewbcache=disable,hostcacheflushing=di
sable,forcedreadahead=disable
"ctrl -a mod -i 2 –s
"lunaffinity=enable,alua=enable,cacheflushinterval=12,adaptivewbcache=disable,hostcacheflushing=di
sable,forcedreadahead=disable"
```

Sample Configuration Script highlighting Multiple Sub LDs per Disk Array with Preferred Controller ID's Optimally Set to the same Controller

```
# Build DATA LUN
# RAID level: 6
# Configuration options: Capacity all (default), 64K stripe size (default),
# 512K sector (default), Read Ahead, Write Back
#Qty 2 LDs Per DA
#Preferred controller ID set to 1
array -a add -p 1~10 -s "alias=DA0,mediapatrol=enable"
array -a addld -d 0 -c 2 -l "raid=6,stripe=64kb,readpolicy=readahead,writepolicy=writeback,preferredctrlid=1"
logdrv -a mod -l0 -s "alias=LD0"
logdrv -a mod -l1 -s "alias=LD1"
#
# Build DATA LUN
# RAID level: 6
# Configuration options: Capacity all (default), 64K stripe size (default),
# 512K sector (default), Read Ahead, Write Back
#Qty 2 LDs Per DA
#Preferred controller ID set to 2
array -a add -p 11~20 -s "alias=DA0,mediapatrol=enable"
array -a addld -d 0 -c 2 -l "raid=6,stripe=64kb,readpolicy=readahead,writepolicy=writeback,preferredctrlid=1"
logdrv -a mod -l0 -s "alias=LD2"
logdrv -a mod -l1 -s "alias=LD3"
```

Summary

This Best Practice Guide will play a significant role in the reliability, stability, and performance with the Promise Vtrak E-Class. Promise VTrak E-Class external disk array subsystem is a versatile storage solution that can support many different application requirements. In order to achieve the best performance when planning installation with Promise VTrak E-Class external disk array subsystem, please follow the guidelines in this Best Practices Guide and refer to the additional resources specified in this paper.

About Promise

With a long history of innovation, Promise Technology develops and manufactures sophisticated RAID solutions recognized worldwide, ranging from a complete line of RAID controller cards to SAS/SATA RAID subsystems. Meeting enterprise, mid-range, and entry-level data protection needs, Promise products are distinguished by their common RAID code, unified management interface, and unparalleled support. Known as the originator of SATA/ATA RAID products, Promise's comprehensive product base includes High Availability (HA) standalone RAID subsystems with standards-based management interfaces, host-based (internal) RAID controllers, NAS appliances for SOHO, and SATA ASICs integrated into an extensive list of industry-leading motherboards. Headquartered in Milpitas, California, Promise has operations throughout Asia and Europe.

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Before Contacting Promise for Technical Assistance

- Save subsystem report:
  http://kb.promise.com/KnowledgebaseArticle10095.aspx?Keywords=subsystem+report
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