PROMISE® TECHNOLOGY, INC.
It's All About Your Data

Surveillance Storage Guide

INTRODUCTION TO VIDEO SURVEILLANCE

It's all about your security. Whether property, assets, or even people's lives, we at PROMISE understand that you sell security – and in video surveillance security means 100% reliability. This can only be achieved by finding the right solution for the right customer. So, how do you ensure that you deliver the best packages? It's a big question when dealing with a bewildering array of surveillance packages that include host recording systems like DVR or NVR, cameras, storage arrays and operating software with technical support. There are so many choices that finding an answer can seem impossible. What kind of camera is good for home use? And how many cameras do we need in the office? Is H.264 or MPEG4 compressed video evidence recognized by law? And which protocol best fits video recording? SCSI? Gigabit Ethernet? eSATA? Or USB?

READY TO GO IP?

It's a hot topic right now. IP based cameras are blushing under the attention. Currently, on seminars, forums, webinars and blogs, the question rings out on whether it's worth the initial investment for businesses to go IP. But they're the future and they know it. Frost & Sullivan, a leading business research and consulting firm, estimated the IP surveillance market at $1.4 billion in 2008 and $6.5 billion in 2012 with a compound annual growth rate of 47 percent for 2005-12, and this trend shows no signs of abating. As in all technological walks of life, digital is rapidly taking over analogue in the surveillance industry. IP-based cameras are gaining popularity. H.264/AVC has already become the mainstream data compression technology. And network infrastructure is set to be king. Choosing an IP based solution means finding a better way in the beginning.

VIDEO RECORDING

Whether choosing standalone or PC-based video recorders, PROMISE's RAID products can promise you all-in-one flexible storage with failsafe protection that can handle continuous streaming input without video frame drop under live playback conditions.

YOUR RELIABLE STORAGE FOR SURVEILLANCE

Video surveillance's goal is to help people safeguard their properties, assets, and life safety. The common challenge in all video surveillance deployments, either large or small, is not only to decide proper interconnecting components required for recording but also find appropriate data storages where all surveillance video can be kept in a secured database for later retrieval and review. Once an incident strikes, a well-preserved video archive can provide enough analytical visibility to the viewers to profile and detail all possible security threats that had occurred in widespread surveillance check points. It is therefore important to realize that storage is not simply a space provided to store video stream, but a safe data center in which reliability and capability greatly matters when it comes to surveillance video protection.

HOW MUCH STORAGE?

A number of factors drive video frame size change.

But when it comes to the calculation of how much capacity required for recording, there are several factors to be taken into account. These are:

(**Resolution**   x   **FPS**   x   **Retention Period**)   ÷   **CODEC**   =   **Drive Size**

How high a resolution?

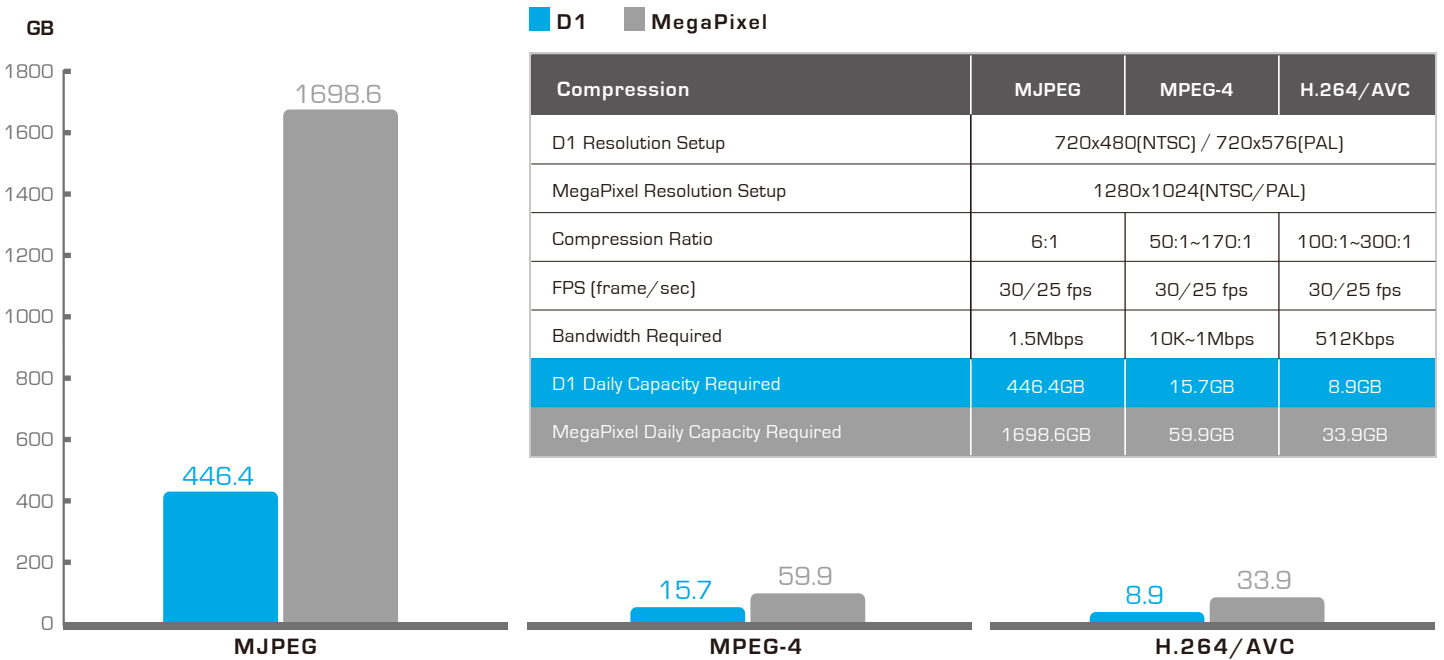(Which affects the picture quality)

How many frames per second?

(Which affects the playback quality)

What's your retention period?

(How long are you recording and keeping the data?)

What CODEC best shrinks data without compromise?

Drive size needed

(Which affects cost)

Daily Capacity Required in Video Recording

D1   **MegaPixel**

Compression	MJPEG	MPEG-4	H.264/AVC
D1 Resolution Setup	720x480(NTSC) / 720x576(PAL)		
MegaPixel Resolution Setup	1280x1024(NTSC/PAL)		
Compression Ratio	6:1	50:1~170:1	100:1~300:1
FPS (frame/sec)	30/25 fps	30/25 fps	30/25 fps
Bandwidth Required	1.5Mbps	10K~1Mbps	512Kbps
D1 Daily Capacity Required	446.4GB	15.7GB	8.9GB
MegaPixel Daily Capacity Required	1698.6GB	59.9GB	33.9GB

The number of daily capacity required was based on the calculation of 24/7 continuous recording with 30/25 video frames stored in a second to hard disk drives. Any change on resolution, code selection, FPS setup for various record conditions will result in a different storage need.

Allowing users to transfer high quality images using a lower bit rate bandwidth, modern compression technology offers more quality for less cost. And it's sophistication is advancing daily. MJPEG has the lowest compression ratio, but is the only submittal compression standard accepted by courts of law worldwide as standalone prosecuting evidence, and is therefore a must for any recording done where possible litigation is required. MPEG-4 is the market leader in analogue recording technologies. But H.264, an advanced video compression standard known as MPEG-4 part10, is expected to dominate future codec implementation.
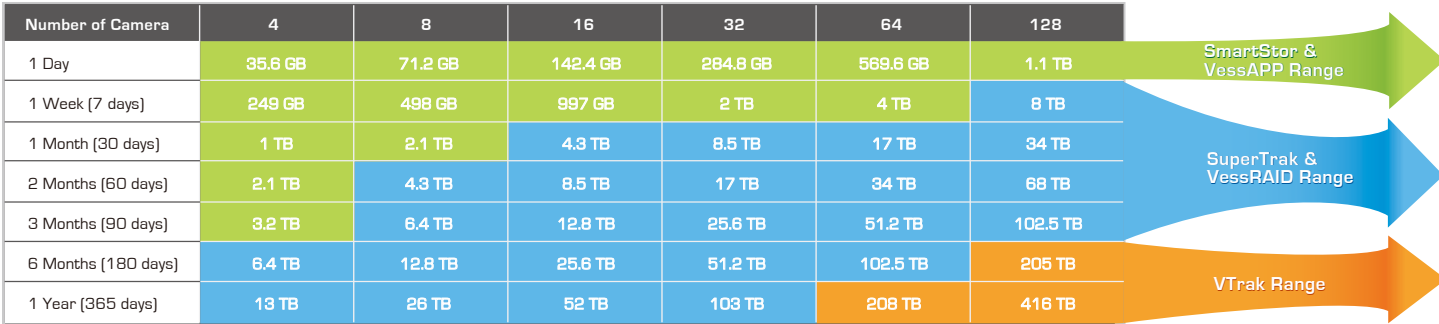
Of course some less obvious factors such as day or night recording, lighting level, quality setting, the motion detection algorithm, and the types of scene will also impact the size of the archive. These, nevertheless, are minor factors. So, let's move on and look at how to examine your video surveillance deployment scale and pick right storage arrays.
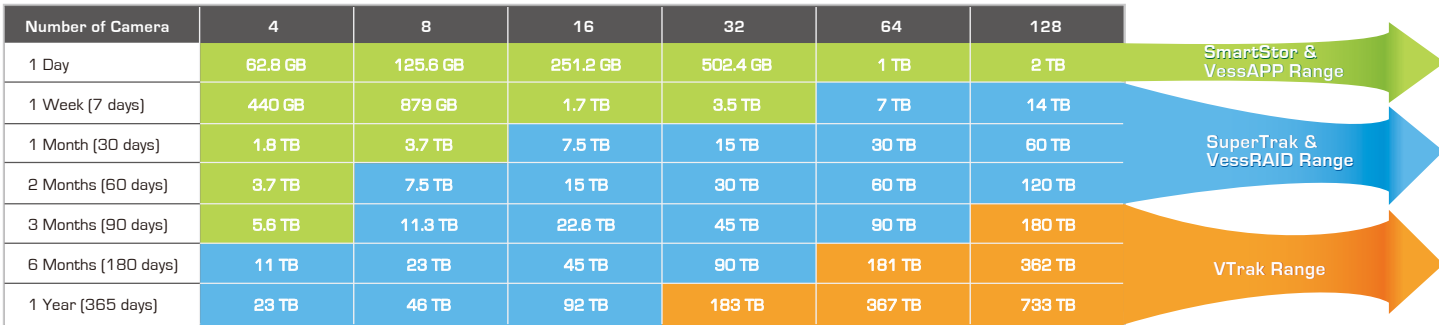
DEPLOYMENT SCALE

In video surveillance deployment, there are two basic factors that determine the size of system needed. There are the number of cameras needed and the amount of recording time needed. System sizes come in three basic entirely scalable ranges: small, midrange and large. Since most DVRs are typically embedded with one to two hard drives by default, the need of using external storage arrays is reliant on the two factors mentioned above. Using a 720 x 480p resolution with 30 frame-per-second rate recording produces around 31MBs of data per second, meaning that from one camera we can obtain a whopping 2.6 TBs of uncompressed capacity in a straight 24-hour non-stop operation. And thanks to modern CODECs, we can reduce the size significantly to either accommodate more cameras or keep a longer retention period. The Compression Range chart illustrates the correlation between the number of cameras installed and the resultant retention period while using the H.264 and MPEG-4 compression format.

The Compression Range

• D1 (NTSC/PAL), 30/25 fps, H.264   Daily Capacity Required=8.9GB

Number of Camera	4	8	16	32	64	128
1 Day	35.6 GB	71.2 GB	142.4 GB	284.8 GB	569.6 GB	1.1 TB
1 Week (7 days)	249 GB	498 GB	997 GB	2 TB	4 TB	8 TB
1 Month (30 days)	1 TB	2.1 TB	4.3 TB	8.5 TB	17 TB	34 TB
2 Months (60 days)	2.1 TB	4.3 TB	8.5 TB	17 TB	34 TB	68 TB
3 Months (90 days)	3.2 TB	6.4 TB	12.8 TB	25.6 TB	51.2 TB	102.5 TB
6 Months (180 days)	6.4 TB	12.8 TB	25.6 TB	51.2 TB	102.5 TB	205 TB
1 Year (365 days)	13 TB	26 TB	52 TB	103 TB	208 TB	416 TB

SmartStor & VessAPP Range

SuperTrak & VessRAID Range

VTrak Range

• DI (NTSC/PAL), 30/25 fps, MPEG4 Daily Capacity Required=15.7GB

Number of Camera	4	8	16	32	64	128
1 Day	62.8 GB	125.6 GB	251.2 GB	502.4 GB	1 TB	2 TB
1 Week (7 days)	440 GB	879 GB	1.7 TB	3.5 TB	7 TB	14 TB
1 Month (30 days)	1.8 TB	3.7 TB	7.5 TB	15 TB	30 TB	60 TB
2 Months (60 days)	3.7 TB	7.5 TB	15 TB	30 TB	60 TB	120 TB
3 Months (90 days)	5.6 TB	11.3 TB	22.6 TB	45 TB	90 TB	180 TB
6 Months (180 days)	11 TB	23 TB	45 TB	90 TB	181 TB	362 TB
1 Year (365 days)	23 TB	46 TB	92 TB	183 TB	367 TB	733 TB

SmartStor & VessAPP Range

SuperTrak & VessRAID Range

VTrak Range

■ SmartStor & VessAPP Range

■ SuperTrak & VessRAID Range

■ VTrak Range

The total amount of information per second and capacity required is the same in both NTSC and PAL standards.

From The Compression Range chart without taking into account retention period, if you want to record continuously for more than thirty days on a 16-camera setup using a DVR or NVR, even with two default drives installed giving a maximum of 4TB available space for archiving, after that period you're going to need external storage. If a four-camera setup has to keep six months data safe for security requirements, we still can't categorize it as a small, midsize or large range. Although usually video data preservation periods vary depending on different locations and security levels, in our notes we'll take one month to be the leading indicator to identify the deployment scale because a thirty days storage seems to be video surveillance standard practice.

Therefore, for entry video surveillance applications we can define one to sixteen cameras to be the typical number needed depending on budget and the required recording characteristics. This package fits homes, retail shops, laundry stores, family clinics and restaurants requiring entry level video surveillance installation. In the midrange set-ups with 16 to 256 cameras tend to be performance driven from a storage perspective. A decent storage bandwidth allows concurrent video input from various locations and enables users to gain a better stability during live and playback controls. Large scale installations of over 256 cameras usually require performance features such as real-time multi-thread recording and rate scalability that can extend capacity on an ad hoc basis. Also, here cameras are generating data in volume so quickly that the ability and flexibility to provide immediate capacity expansion is also vital.
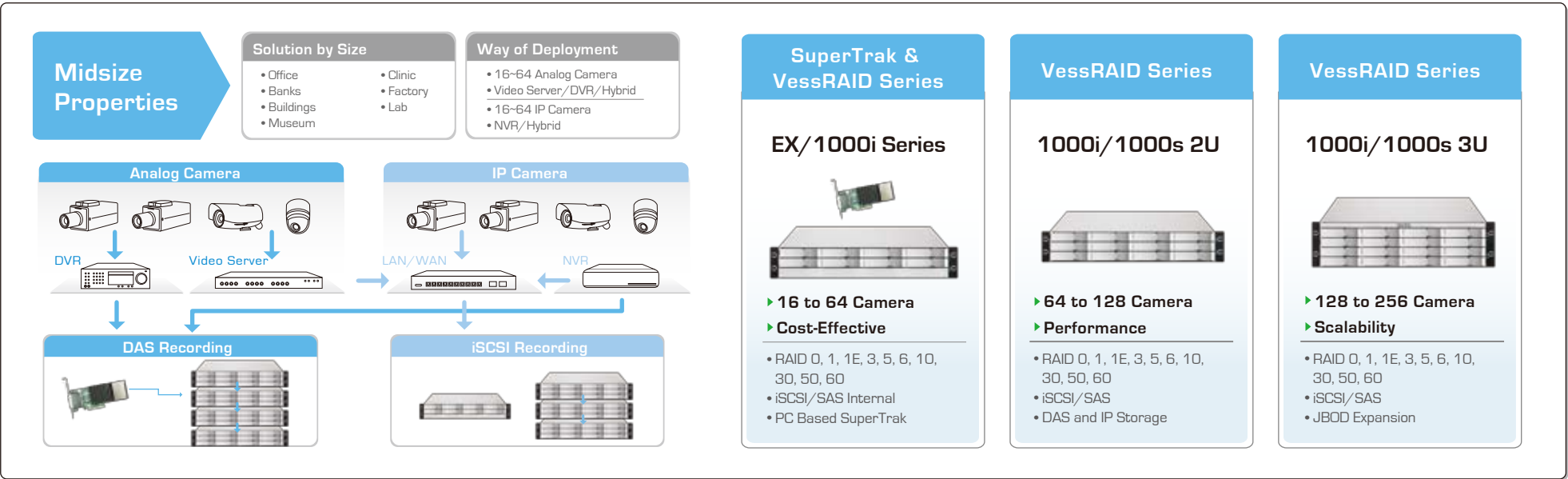
DAS, NAS, OR SAN?

Small Range Solutions

How do you pick the right storage architecture at the entry level? You need a layout that requires instant or remote access to the archive, and plug and play convenience. A direct or network attached storage system ranging from two to four bays is the ideal choice. These utilize USB, eSATA, and Gigabit Ethernet connectivity, are simple to install and require a minimum of support. See our SmartStor & VessAPP range for more details.
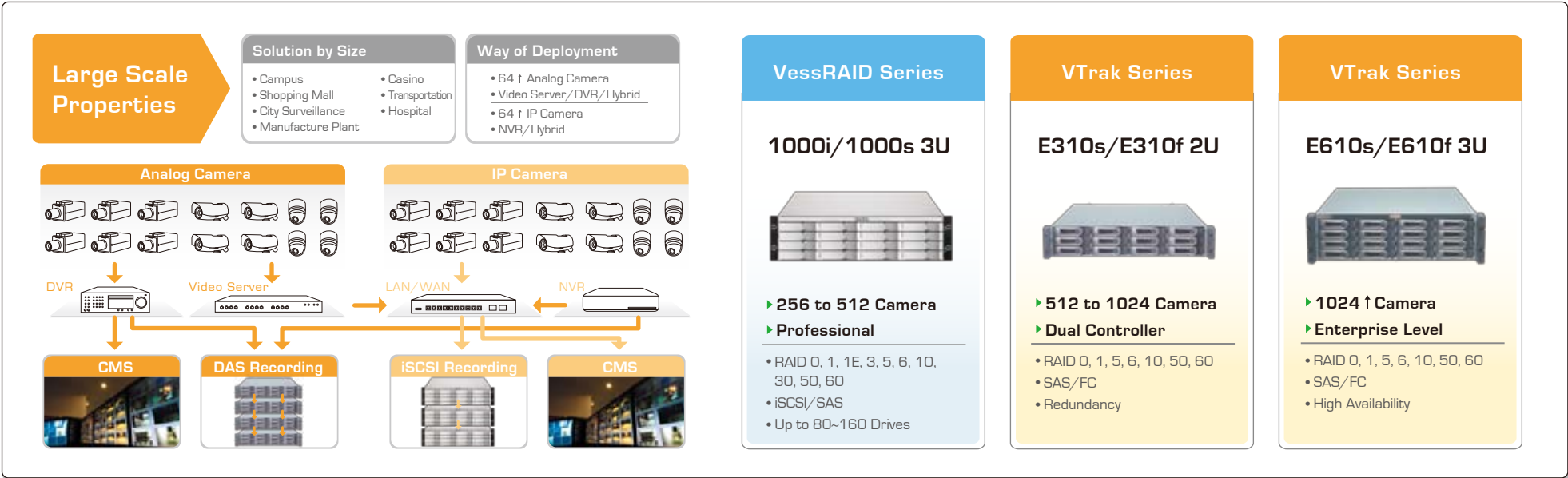
Small Properties

Solution by Size	Way of Deployment
• Home • Retail Shops • Laundry Store • Family Clinic	• 1~16 Analog Camera • Video Server/DVR/Hybrid • 1~16 IP Camera • NVR/Hybrid

Analog Camera

DVR   Video Server

DAS Recording

IP Camera

LAN/WAN

NVR Recording

SmartStor Series	SmartStor Series	SmartStor & VessAPP Series
NS2600	**NS4600/DS4600**	**VessAPP 1x10i & SmartStor NS6700/4700**
▸ 1 to 4 Camera ▸ Basic	▸ 1 to 16 Camera ▸ Live Playback	▸ 16 to 32 Camera ▸ Popular
• RAID 0, 1 • Gigabit Ethernet • Software Based NVR	• RAID 0, 1, 5, 10 • iSCSI/GbE/eSATA/USB • Software Based NVR	• RAID 0, 1, 5, 10 • Gigabit Ethernet • Rackmount or Desktop

Midsize Range Solutions

Midsized arrangements with 16 to 256 camerashave to cope with a number of concurrent video streams in seconds. This means that sufficient connecting bandwidth is the first priority when choosing storage. Speed is essential to avoid hitting a live playback bottleneck. So whatever choice is finally made, performance is the key and a SCSI or SAS interfaced DAS storage, or an iSCSI SAN lock-up will provide a better throughput guarantee for all types of applications at this level. Please see our SuperTrak, VessRAID and VTrak ranges for more details.

Midsize Properties

Solution by Size		Way of Deployment
• Office • Banks • Buildings • Museum	• Clinic • Factory • Lab	• 16~64 Analog Camera • Video Server/DVR/Hybrid • 16~64 IP Camera • NVR/Hybrid

Analog Camera

DVR   Video Server

DAS Recording

IP Camera

LAN/WAN   NVR

iSCSI Recording

SuperTrak & VessRAID Series	VessRAID Series	VessRAID Series
EX/1000i Series	**1000i/1000s 2U**	**1000i/1000s 3U**
▸ 16 to 64 Camera ▸ Cost-Effective	▸ 64 to 128 Camera ▸ Performance	▸ 128 to 256 Camera ▸ Scalability
• RAID 0, 1, 1E, 3, 5, 6, 10, 30, 50, 60 • iSCSI/SAS Internal • PC Based SuperTrak	• RAID 0, 1, 1E, 3, 5, 6, 10, 30, 50, 60 • iSCSI/SAS • DAS and IP Storage	• RAID 0, 1, 1E, 3, 5, 6, 10, 30, 50, 60 • iSCSI/SAS • JBOD Expansion

Large Range Solutions

Large-scale installations, such as public transportation sites, city surveillance, and worldwide organizations, require expansion flexibility, trustworthy reliability, cost-effectiveness, centralized storage management and onsite vendor support. Our VessRAID and VTrak ranges can handle data from hundreds or even thousands of cameras. Storage here means being able to provide a lot of drive spaces for recording, support on-demand expansion while extending the retention period, offer reliable and high throughput for immediate read and write access, and solve any unexpected technical glitches in real time, because video downtime is unacceptable in high-level security environments. Under such circumstances, DAS storage, either SCSI or SAS, and a trunked iSCSI or FC SAN architecture with huge expansion capabilities, is the only solution.

Large Scale Properties

Solution by Size		Way of Deployment
• Campus • Shopping Mall • City Surveillance • Manufacture Plant	• Casino • Transportation • Hospital	• 64 ↑ Analog Camera • Video Server/DVR/Hybrid • 64 ↑ IP Camera • NVR/Hybrid

Analog Camera

DVR   Video Server

CMS   **DAS Recording**

IP Camera

LAN/WAN   NVR

iSCSI Recording   **CMS**

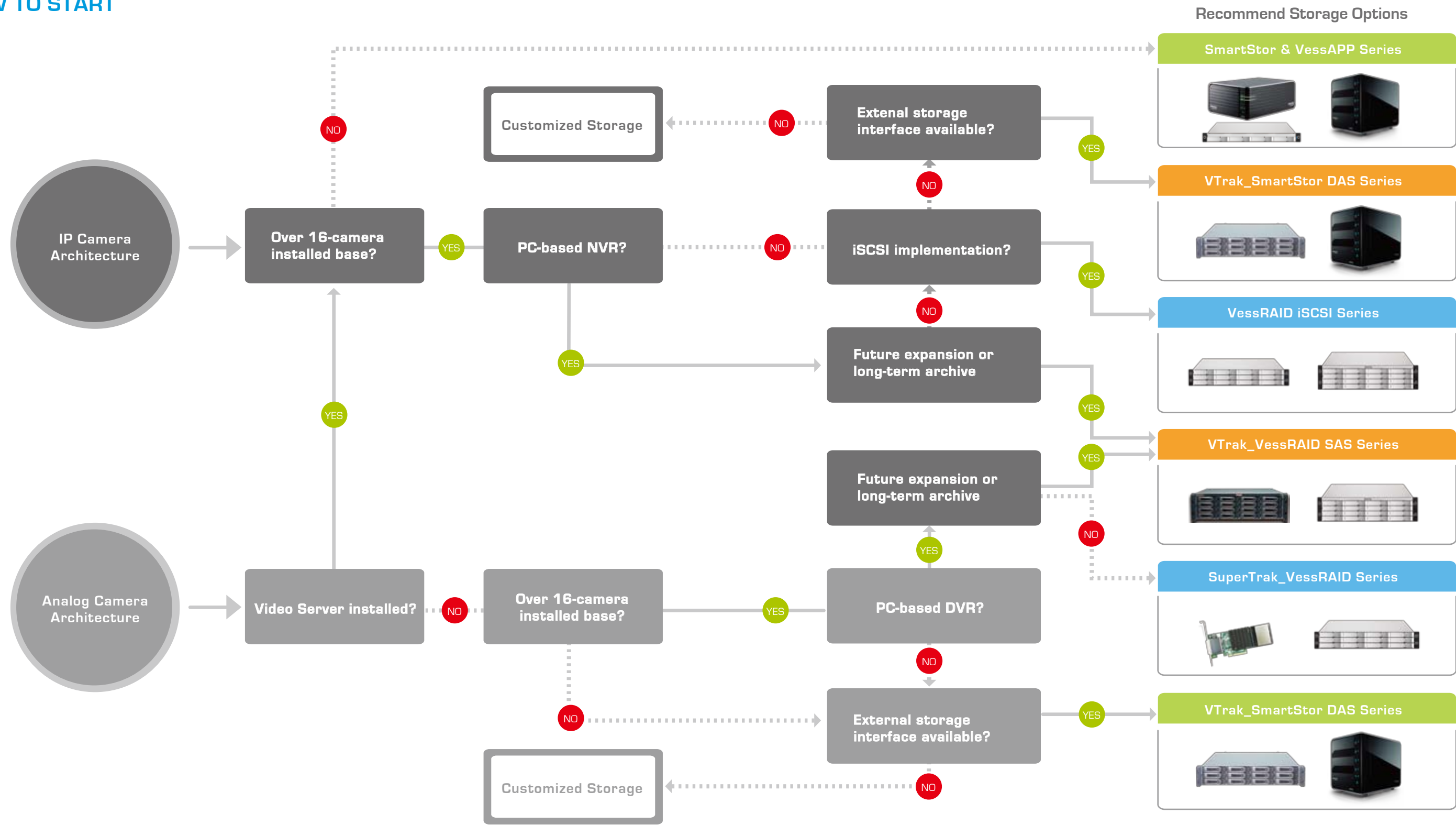| VessRAID Series	VTrak Series	VTrak Series
1000i/1000s 3U	**E310s/E310f 2U**	**E610s/E610f 3U**
▸ 256 to 512 Camera ▸ Professional	▸ 512 to 1024 Camera ▸ Dual Controller	▸ 1024 ↑ Camera ▸ Enterprise Level
• RAID 0, 1, 1E, 3, 5, 6, 10, 30, 50, 60 • iSCSI/SAS • Up to 80~160 Drives	• RAID 0, 1, 5, 6, 10, 50, 60 • SAS/FC • Redundancy	• RAID 0, 1, 5, 6, 10, 50, 60 • SAS/FC • High Availability

MAPPING PROMISE SOLUTIONS

Increased video data means a growing demand for storage. With the right storage you can safeguard days or months of video surveillance records operating on optimal drive utilization that combines maximum cost efficiency and security effectiveness. With our distinguished technical expertise in the storage industry and extensive experience in video surveillance, PROMISE promises to help you find the perfect surveillance storage solution for your customers. To build the perfect storage solution for various video surveillance environments, please follow the "How to Start" chart to quickly find the most suitable products for your deployment.

There are so many storage products available in the market that it can be confusing. The Q&A Flow Chart aims at giving installers a convenient guide to quickly and easily select the best storage solution from PROMISE. For example, if you're a regional integrator looking for a new video surveillance portfolio that includes storage capable of fitting in a retail shop needing eight IP-based cameras, you'll find that the SmartStor NAS series immediately pops up as the best choice. Or if you have a midsized installation using purely analog cameras that requires a simple extension of the retention period in response to local governing laws, you'll see that the VTrak and VessRAID SAS series are the options.

HOW TO START

Recommend Storage Options

SmartStor & VessAPP Series

VTrak_SmartStor DAS Series

VessRAID iSCSI Series

VTrak_VessRAID SAS Series

SuperTrak_VessRAID Series

VTrak_SmartStor DAS Series

Flow chart elements:

- **IP Camera Architecture** → **Over 16-camera installed base?**
  - NO → SmartStor & VessAPP Series
  - YES → **PC-based NVR?**
    - YES → **Future expansion or long-term archive**
      - YES → VessRAID iSCSI Series
      - NO → VTrak_VessRAID SAS Series
    - NO → **iSCSI implementation?**
      - YES → VessRAID iSCSI Series
      - NO → **Extenal storage interface available?**
        - YES → VTrak_SmartStor DAS Series
        - NO → **Customized Storage**

- **Analog Camera Architecture** → **Video Server installed?**
  - NO → **Over 16-camera installed base?**
    - YES → **PC-based DVR?**
      - YES → **Future expansion or long-term archive**
        - YES → VTrak_VessRAID SAS Series
        - NO → SuperTrak_VessRAID Series
      - NO → **External storage interface available?**
        - YES → VTrak_SmartStor DAS Series
        - NO → **Customized Storage**
    - NO → External storage interface available?

PROMISE STORAGE FOR SURVEILLANCE LINEUP

	SMALL RANGE SOLUTIONS							MIDSIZE RANGE SOLUTIONS									LARGE RANGE SOLUTIONS	
Product Family	SmartStor Series					VessAPP Series	FastTrak Series	SuperTrak Series			VTrak Series		VessRAID Series				VTrak Series	
	NS2600	NS4600	DS4600	NS4700	NS6700	1x10i	TX4660/8660	EX4650/8650	EX8654/8658	EX16650	M210P/310P	M610P	1x20i/1x30i	1x30s	1x40i	1x40s	E310s	E610s
Product Models																		
Camera Range	1 to 4	1 to 16	1 to 16	16 to 32	16 to 32	16 to 32	1 to 16	16 to 64	16 to 64	16 to 64	64 to 128	64 to 128	64 to 128	64 to 128	128 to 256	256 to 512	512 to 1024	1024 above
Form Factor	Desktop	Desktop	Desktop	Desktop	Desktop	1U Rackmount	Host Bus Adapter	Host Bus Adapter	Host Bus Adapter	Host Bus Adapter	2U rackmount	3U rackmount	2U rackmount	2U rackmount	3U rackmount	3U rackmount	2U rackmount	3U rackmount
Number of Drives	2	4	4	4	6	4	4 or 8 internal	4 or 8 internal	4 or 8 external	16 internal	8 or 12	16	8 or 12	12	16	16	12	16
Drive Interface	SATA 3.0Gb/s	SATA 3.0Gb/s	SATA 3.0Gb/s	SATA 3.0Gb/s	SATA 3.0Gb/s	SATA 3.0Gb/s	SAS/SATA 3.0Gb/s	SAS/SATA 3.0Gb/s	SAS/SATA 3.0Gb/s	SAS/SATA 3.0Gb/s	SATA 3.0Gb/s	SATA 3.0Gb/s	SAS/SATA 3.0Gb/s	SAS/SATA 3.0Gb/s	SAS/SATA 3.0Gb/s	SAS/SATA 3.0Gb/s	SAS/SATA 3.0Gb/s	SAS/SATA 3.0Gb/s
Max. Drives Supported	2	8	12	84	86	84	4 or 8	128 or 256	256	256	8 or 12	16	8 or 60	60	80	80	240	320
Host Interface	1x Gigabit Ethernet	1x Gigabit Ethernet	1x eSATA 1x Firewire400 2x Firewire800 1x USB 2.0	2x Gigabit Ethernet	2x Gigabit Ethernet	2x Gigabit Ethernet	PCI-Express x4	PCI-Express x8	PCI-Express x8	PCI-Express x8	Ultra 320 SCSI	Ultra 320 SCSI	4x 1Gb iSCSI	2x 3Gb SAS (x4)	4x 1Gb iSCSI	2x 3Gb/s SAS (x4)	4x 3Gb SAS (x4)	4x 3Gb SAS (x4)
Expansion Links	USB 2.0	eSATA 3Gb USB 2.0	FireWire 800	2 x eSATA 5 x USB 2.0 PCIe x 4	2 x eSATA 5 x USB 2.0 PCIe x 4	2 x eSATA 5 x USB 2.0 PCIe x 4	N/A	mini-SAS (SFF-8087)	mini-SAS (SFF-8087) mini-SAS (SFF-8088)	mini-SAS (SFF-8087)	N/A	N/A	mini-SAS (SFF-8088)	mini-SAS (SFF-8088)	mini-SAS (SFF-8088)	mini-SAS (SFF-8088)	mini-SAS (SFF-8088)	mini-SAS (SFF-8088)
RAID Levels	0, 1	0, 1, 5, 10	0, 1, 5, 10	0, 1, 5, 10	0, 1, 5, 6, 10	0, 1, 5, 10	0, 1, 5, 10 , JBOD	0, 1, 1E, 5, 6, 10, 50, 60	0, 1, 1E, 5, 6, 10, 50, 60	0, 1, 1E, 5, 6, 10, 50, 60	0, 1, 1E, 5, 6, 10, 50	0, 1, 1E, 5, 6, 10, 50	0, 1, 1E, 3, 5, 6, 10, 30, 50, 60	0, 1, 1E, 3, 5, 6, 10, 30, 50, 60	0, 1, 1E, 3, 5, 6, 10, 30, 50, 60	0, 1, 1E, 3, 5, 6, 10, 30, 50, 60	0, 1, 1E, 5, 6, 10, 50, 60	0, 1, 1E, 5, 6, 10, 50, 60
UPS Monitor	○	○		○	○	○							○	○	○	○	○	○
Online Capacity Expansion	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
RAID Level Migration	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Predictive Data Migration (PDM)							○	○	○	○	○	○	○	○	○	○	○	○
Disk Roaming			○ (SmartStor DS series)	○ (SmartStor NSx700 & VessAPP series)	○ (SmartStor NSx700 & VessAPP series)	○ (SmartStor NSx700 & VessAPP series)	○ (FastTrak TX series)	○ (SuperTrak EX series)	○ (SuperTrak EX series)	○ (SuperTrak EX series)	○ (VTrak series)	○ (VTrak series)	○ (VessRAID series)	○ (VessRAID series)	○ (VessRAID series)	○ (VessRAID series)	○ (VTrak series)	○ (VTrak series)
Auto Restart	○	○	○	○	○	○					○	○	○	○	○	○	○	○
Smart FAN Control	○	○	○	○	○	○					○	○	○	○	○	○	○	○
Power Redundancy						1810 i					○	○	1820i or 1830i	1830s	1840i	1840s	○	○
LCD Module				○ (Built-in LCD Panel)	○ (Built-in LCD Panel)									Optional	Optional	Optional	Optional	
Battery Backup Unit						Optional		Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	○	○
Warranty	2 years	2 years	2 years	2 years	2 years	2 years	3 years	3 years	3 years	3 years	3 years and optional Extended Warranty Plan	3 years and optional Extended Warranty Plan	3 years and optional Extended Warranty Plan	3 years and optional Extended Warranty Plan	3 years and optional Extended Warranty Plan	3 years and optional Extended Warranty Plan	3 years and optional Extended Warranty Plan	3 years and optional Extended Warranty Plan

The camera range indicates a reference camera number supported to each Promise product based on the capacity required in The Compression Range chart.   There are still many factors driving the supporting number changes such as system upgrade, video streaming variable, recording conditions, or configuration parameter, etc.
• SmartStor NS4700/6700 and VessAPP 1x10i available in early Q3 2010.
• Specifications may change without notice.

Comprehensive Product Coverage for Video Surveillance

PROMISE Technology has designed and manufactured sophisticated RAID solutions for more than 20 years. Catering to small, midsize, and large scale video surveillance requirements, our profound knowledge and dedication means that we can produce storage requirements for all levels of need. For entry level users we can provide comprehensive storage solutions, including NAS and DAS appliances for 1 to 16 camera installation bases. For SMBs, we offer host-based RAID controllers for internal and external disk drive connections from 16 to 64 cameras. And for large scale enterprises we can deploy high available standalone RAID subsystems for more than thousands of networked cameras. As such surveillance integrators and installers who want to have a single umbrella storage solution able to streamline a control of video data management, PROMISE can promise to meet all your needs.

One Stop Shop for All Your Needs

SmartStor & VessAPP
- 1~32 IP / Analog Camera
- NVR / Hybrid
- GbE / iSCSI / eSATA
- 2/4/6 bays w/ DAS expansion

VessRAID
- 16~512 IP / Analog Camera
- NVR / Hybrid / DVR
- GbE / SAS / iSCSI
- JBOD expansion

VTrak
- 64~512 ↑ IP / Analog Camera
- NVR / Hybrid / DVR
- SAS / Fiber
- High Availability
- JBOD expansion

FastTrak
- 1~16 IP / Analog Camera
- PC-based NVR / Hybrid / DVR
- 4/8 Internal Drives

SuperTrak
- 16~64 IP / Analog Camera
- PC-based NVR / Hybrid / DVR
- 4/8/16 Internal / External Drives
- JBOD expansion

SMALL PROPERTIES **MIDSIZE PROPERTIES** **LARGE SCALE PROPERTIES**

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