

# Dramatically Reduce the Cost and Complexity of Video Surveillance Storage

Achieve Previously Unattainable Data Retention Periods  
at a Fraction of the Cost

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## Introduction



In the past, storing video surveillance tapes required racks of VCR tapes next to the VCR camera, and the tapes were rotated three times a day. Retention time was based on how many VCR tapes an organization could afford. Video surveillance has come a long time since those days. This paper focuses on a scalable, flexible, and yet cost-effective tiered storage solution that allows video surveillance solutions to store and easily access high-end video images at a cost that enables longer retention times. Many disk storage companies promote the ability to deliver multipetabyte solutions; however, the cost to store and access this content is prohibitive, and organizations are again determining retention based on how much money is in the budget to spend on storage. How nice it would be for video surveillance managers to select a retention period based on requirements and find that it is affordable.

Video surveillance crosses all industries, not just the local police force, as can be seen on the news and TV shows. Cameras are in hospitals, on the highway, in schools, in malls, and even on ships. The recorded data is being used not only for analysis of a past event but also for trend analysis and event prediction, and to help organizations be proactive and prepared for an event. IP networks and video surveillance management software, as well as cameras, have become advanced over the past five years with technology changes every few months. However, the content must be available, even if it is months or even years old, or all of that specialized technology is worthless.

Three critical conclusions emerge from this white paper:

- Oracle Optimized Solution for Tiered Storage Infrastructure's total cost of ownership is 12 times lower when users store video surveillance content from 1,000 cameras on tiered storage for two years compared to storing the same content on an all-disk solution.
- Oracle offers a solution that provides massive capacity and scalability that makes the required video content available no matter how old it is.
- A side advantage of using Oracle's tiered storage is the data is protected from accidental, natural, or intentional disasters. This ensures access to any content at any time.

Video surveillance requirements are driving most organizations that are responsible for video surveillance management into a tailspin while they attempt to provide enough storage to support the number of cameras they are responsible for while keeping the videos for the required number of months or years. Companies have been setting retention periods based on the cost of storage, not

based on requirements. With Oracle's tiered storage, those responsible for storage now can look at the required retention period and be pleasantly surprised that the requirement also fits the budget.

## Massive Capacity and Scalability for Video Surveillance

Capacity requirements for video surveillance storage are different than for other types of data in that they are predictable. When cameras are installed and begin downloading content, the data is the same every day. There is no growth in daily capacity until new cameras with higher resolution replace existing cameras or additional cameras are added.

After the retention period is reached for the first files, there is a plateau of capacity as original files are deleted. For example, if the retention period is one year, at the end of one year, users can delete the first video stored as new video is added for the current day. The amount of deleted capacity matches the added capacity, thus no capacity growth occurs after the retention period is reached. Figure 1 shows this capacity growth for 1,000 cameras with a 12-month retention period. Table 1 provides camera assumptions.

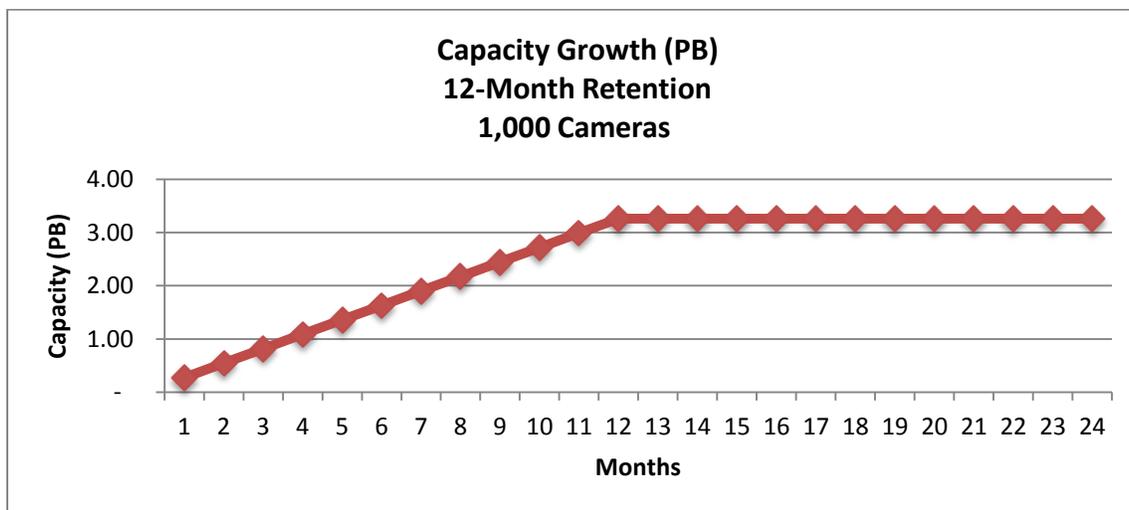


Figure 1. Capacity growth for 1,000 cameras with a retention period of 12 months. From months 13 to 24, the capacity remains the same because the same number of videos is deleted and added.

This example shows predictable growth, unlike other content, such as research data or MRIs, for which the capacity growth is dependent on the business growth—peaks and valleys are typical. Until the cameras are upgraded to higher resolution or more frames per second, or more cameras are added, the capacity after the one-year retention does not change. The initial capacity of 270 terabytes the first month grows to more than 3 petabytes at month 12 and then remains at 3 petabytes.

The following Figure 2 shows another example of capacity for 1,000 cameras with a retention period of five years, with capacity growth over five years. Table 1 provides camera assumptions. The figure shows how capacity planning is predictable each year starting at more than 3 petabytes the first year and growing to over 16 petabytes by year five.

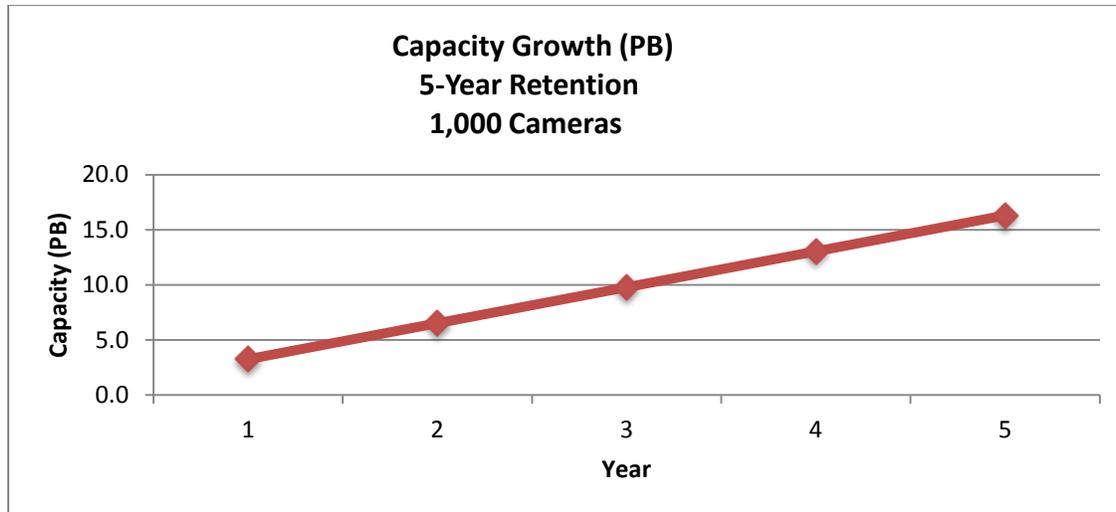


Figure 2. Capacity growth for 1,000 cameras with a five-year retention period is predictable, allowing for clear budget planning.

**TABLE 1. CAPACITY REQUIREMENT CALCULATION ASSUMPTIONS FOR FIGURES 1 AND 2**

- » *Cameras run 24 hours per day.*
  - » *Cameras record at 30 frames per second.*
  - » *Video format is VGA (640 x 480).*
  - » *Video compression type is H264-10 (high).*
- Each camera records approximately 8.94 GB/day compressed.

### Total Cost of Storing Video Surveillance Content

The cost of storing content is calculated by taking several items into consideration.

- » Capital costs (CapEx) including the hardware and software initial cost of acquisition and installation
- » Operating costs (OpEx) including the cost of facilities including power, footprint, and cooling
- » Management costs to support all components
- » Yearly maintenance for hardware and software

A TCO or total cost of ownership analysis takes all of the above into the formula to calculate this value. For video surveillance, the required storage capacity, because it is predictable growth, is fairly easy to calculate.

#### All-Disk Solution

An all-disk storage solution includes all components necessary to manage and store content on storage that is based on all HDD disk storage. The disk capacity may be tiered, using performance disk in conjunction with capacity disks and auto-tiering software to move the data to appropriate storage. However, there is always only one copy of the data, leaving the data unprotected. There may be features such as deduplication or compression to help reduce the actual required capacity; however, video does not compress well and often comes from the camera already compressed. Also, a file that has been modified by compression or deduplication or contains a reduction in frames per second may not be accepted during litigation or in a court of law because it is viewed as having been modified.

## Oracle Solution

Oracle's tiered storage solution includes all components necessary to manage and store content on the most efficient storage based on predetermined, easy-to-set, flexible policies. These characteristics include things such as the last access of a file; the file name, owner, or group; and file type or size. The storage includes every tier of storage starting with very high-performance SSD for metadata, continuing with high-performance HDD disks and ending with the most cost-effective storage, which is digital tape. The content can be on multiple tiers at one time. Active content, such as video under review, is stored on performance disks while at the same time, up to four copies can be stored at local and/or remote sites. These copies also represent the data protection copies. The policy then determines when to release the data from performance disk, keeping metadata that knows where the data is located on archive tape. Users do not know where the data is located; they simply access the required files, and the storage system automatically makes those files available immediately.

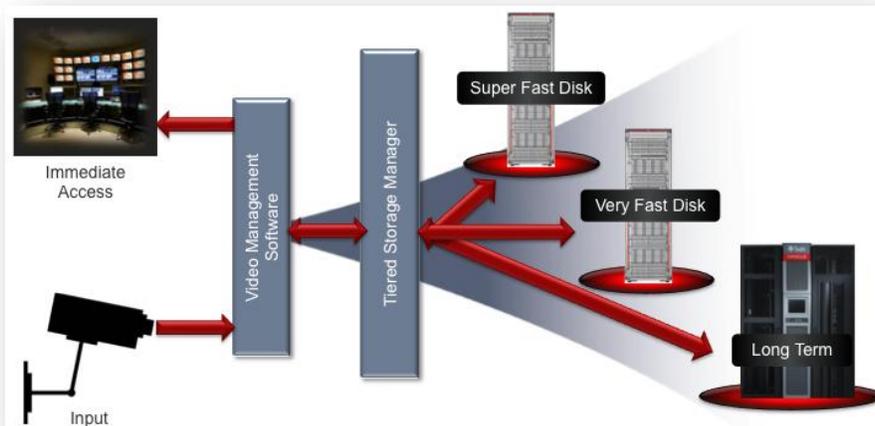


Figure 3. Data flow from camera to storage is automatic, abstracting the tiered storage from the video management software, which has no knowledge of the storage behind the scenes. The information is quickly and easily stored in the appropriate tier of storage, and just as easily accessed from the appropriate tier of storage.

## TCO Comparison: Tiered Storage with All-Disk Storage

The configurations for the all-disk solution in this TCO comparison use list pricing of a major storage vendor and Oracle list pricing. The configurations for Oracle's tiered storage use Oracle list pricing for all components, including the storage archive management software that manages the content based on policy and the server required to run the software to make this an apples-to-apples comparison. This also includes the cost to store two copies on the archive tier of the Oracle solution; therefore, for some level of protection in the all-disk solution, snapshot is included to protect against intentional data corruption; however, this does not protect against accidental or intentional data deletion. Table 2 provides a list of assumptions of the configurations being compared.

Using the 1,000-camera example and calculating TCO for a retention period of one to five years, the following Figure 3 shows the difference in storing video surveillance content on an Oracle tiered storage solution compared to an all-disk solution from a major storage vendor<sup>1</sup>.

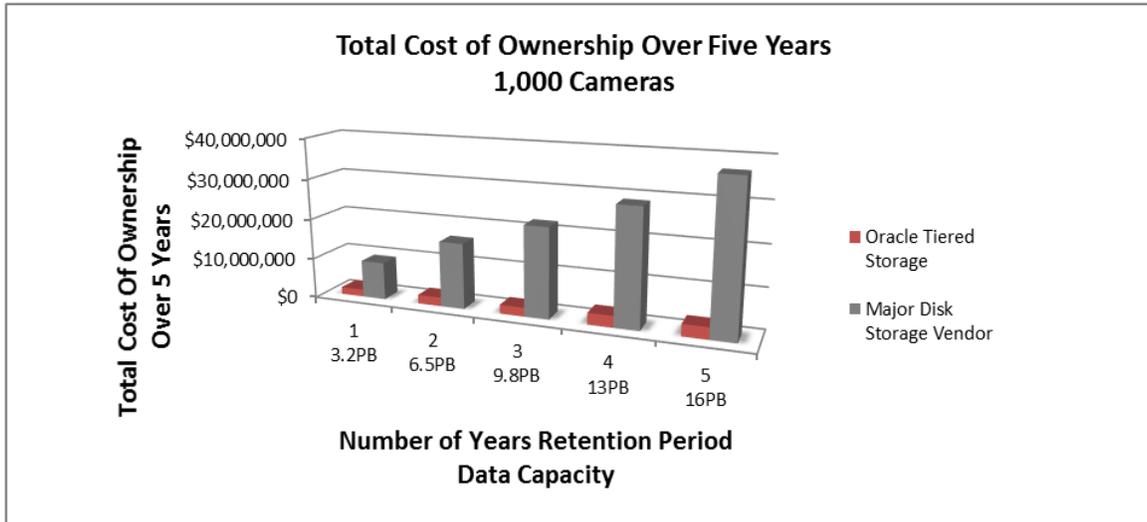


Figure 4. Comparison of a five-year total cost of ownership between Oracle's tiered storage and a major storage vendor's disk solution covering retention periods of one to five years.

It is clear from the above graph that storing video surveillance data on Oracle's tiered storage is significantly less costly than on an all-disk solution, with a savings of more than \$7 million for a one-year retention and up to more than \$33 million saved for a five-year retention. This is a 92 percent savings.

Instead of deleting video much sooner than required because of the cost of storage, users now can keep video for much longer periods of time and still be within budget. Even with a five-year retention and capacity requirement of 32 petabytes, the total cost of ownership for Oracle's tiered storage solution is less than \$3 million while the all-disk solution is well over \$36 million.

### Highest TCO Contributors

Although power, cooling, and floor space are big contributors to the very large difference in TCO between an all-disk solution and a tiered storage solution, the biggest contributor is hardware maintenance. The maintenance cost of the largest capacity tier of storage, the tape tier, in a tiered storage architecture is very low. At rest, there are no moving parts in the media. Compared to the maintenance cost of spinning disks, where the devices are in constant motion even if never accessed, a savings of 94 percent can be realized just in maintenance, saving more than \$11 million. Further savings are realized because there is no maintenance on the tape media due to a lifetime warranty from Oracle on that media. The same lifetime warranty is not available on disk media, requiring a maintenance contract to cover disk failure.

<sup>1</sup> TCO analysis is calculated using industry-accepted formulas. Power consumption and floor space requirements are sourced from the major storage vendor's publically available power calculators and product specification sheets.

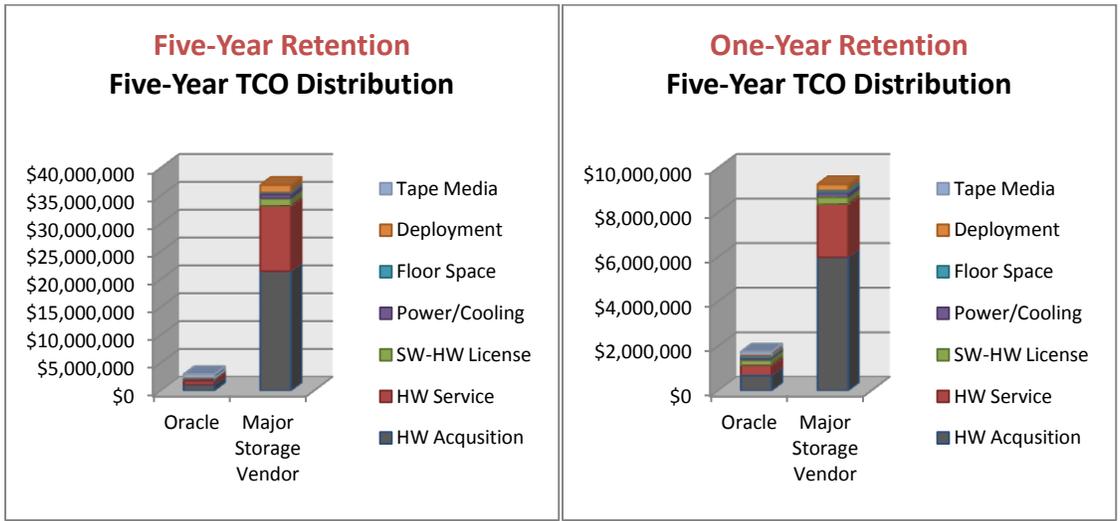


Figure 5. These charts indicate the distribution of costs included in the five-year TCO for one-year and five-year retentions. Acquisition is the highest cost followed by the hardware service of the all-disk solution.

**TABLE 2. KEY ASSUMPTIONS FOR FIVE-YEAR TCO ANALYSIS**

- » Tiered storage solution analysis includes cost of servers, storage, SAN infrastructure, hardware maintenance, storage software license, floor space, and power and cooling costs.
- » All-disk solution includes disk systems and required software license, floor space, and power and cooling costs.
- » Data capacity use rate is set at 2.388 terabytes per day for 1,000 cameras.
- » Tiered storage solution is sized to keep 30 percent on disk and two copies on tape, providing protection from data corruption and accidental or on-purpose data deletion.
- » The all-disk solution is sized to take a snapshot, allocating 20 percent more capacity to protect from data corruption; however, this does not protect from accidental or on-purpose data deletion.
- » Oracle Solaris partitioning and virtualization capabilities are included in the base operating system.

**Additional Benefits of Oracle's Tiered Storage**

- » Data Protection: Users can keep two copies on digital tape; or keep a third copy on digital tape; or a fourth in an offsite underground vault. Organizations can choose their best practices.
- » Data Integrity Checking: Data integrity checks are automated and verify that video is accessible throughout its lifecycle.
- » Scalability: Storage and archive media can be added nondisruptively.
- » Technology Changes: Easily upgrade to new storage technologies while keeping the storage system online.
- » Migration: Easily migrate data to new storage devices in the background.
- » Environment: Use of power and cooling is environmentally friendly.



## Conclusion

A total cost of ownership comparison of the cost of storing video surveillance content on Oracle's tiered storage versus an all-disk solution clearly shows that content can be kept for longer retention times than previously thought possible. Disk storage TCO dictates the retention period, instead of the retention requirements dictating the retention. With a tiered storage solution, organizations can specify the retention period and find that not only can they afford to keep and access the video content for the required retention period, but also it is protected from disasters. Organizations can contribute to the bottom line by saving more than \$34 million dollars when they have video surveillance content with a five-year retention over five-year TCO.

There is, perhaps, a new, cost-effective way to look at storage for video surveillance.



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