NICE

White Paper

Is Your Video Surveillance System Meeting The TCO Challenge?

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Important Notice

Introduction

While requirements for security systems are constantly increasing, security managers and IT directors are forced to deal with shrinking budgets, posing a real challenge for an organization looking to deploy surveillance systems.

For the most part and until now, those responsible for acquiring surveillance systems were allotted a specific budget and generally made their selection based on the offering that complied with the predefined specifications at the lowest acquisition cost. Longer-term cost factors such as power consumption, footprint, ease of maintenance and others were usually not considered at the time of purchase, since the budget for these expenses would only be secured in later years.

As a part of the on-going evolution of both security systems and customer requirements, the real cost of security systems is now being examined and measured not only at the time of purchase, but equally important for the lifespan of the system. As a result, the Total Cost of Ownership (TCO) can be analyzed, and used as a basis of comparison between different solutions.

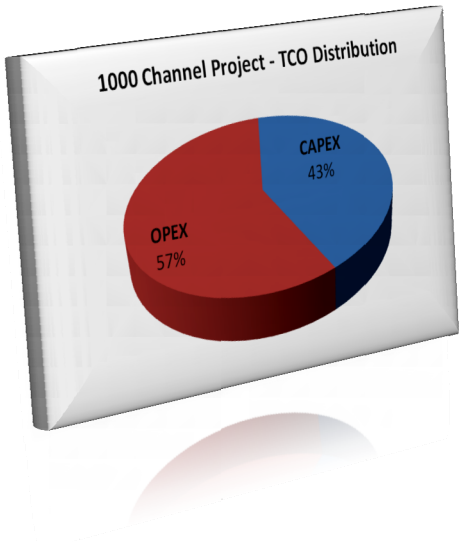
What is TCO and its relationship to ROI?

The definition of TCO is a calculation of all direct and indirect costs associated with an asset or acquisition over a defined lifecycle. In information systems it can be measured as the total of direct capital investment in hardware and software plus indirect costs of installation, commissioning, training, repairs, service downtime, technical support and upgrading.

In other words, TCO is the arithmetic sum of all costs associated with the system, both capital expenses (CAPEX) and operational expenses (OPEX). So what makes TCO more relevant than a system's purchase price? The true power of TCO takes into account the operational costs, which in many cases are higher when compared to capital expenditure.

Here's an example. A mid-range video surveillance server costs $3K to acquire. But that only takes into consideration one cost aspect. To calculate the TCO over a 5-year period, let's assume the estimated OPEX per server footprint is around $1K annually, which includes all associated expenses such as installation, maintenance, power and ventilation and more[1]. In this case, over a 5 year period the TCO is $3K + $5K (5 X $1K) = $8K.

Figure 1 – TCO Distribution



[1] Some companies take higher numbers such as 2,000$ per year but we took the conservative approach

The insight here is that the OPEX component is substantially higher than the CAPEX, comprising more than 60% out of the overall TCO, so thus we can clearly see the relevance of TCO over CAPEX. In many cases, the viability and validity of an information system is examined by its Return Of Investment (ROI) factor, which in simple terms is how much profit or cost savings are realized on a project investment over a period of time. For example, if a new ERP system costs $100K, and saves the organization $20K annually, its ROI factor is 5 (100 ÷ 20 = 5). The lower the factor, the sooner the investment will pay for itself, making it a worthier investment. With a clear connection between ROI and TCO, systems providing similar value but with a lower TCO will result in a faster (or smaller factor) ROI.

The challenge of optimizing TCO in surveillance systems

So now that we've established the importance of TCO to the organization, how can we accurately measure it?

One approach is to consider each and every cost associated with the system, but this is a daunting task and it is quite difficult to accurately estimate the cost of upgrading and commissioning. To simplify matters, we propose a model that estimates OPEX according to the solution's footprint. The reason behind using the footprint as a benchmark is because it represents the solution's *real estate*, regardless if the real estate is within the organization or hosted in a 3rd party datacenter. This OPEX estimate includes power consumption, ventilation costs, and the amount of equipment requiring maintenance efforts by IT personnel.

Based on reliable information from leading storage and server vendors, companies offering hosting services, we've estimated that 1 Rack Unit (RU) of equipment costs approximately $1K annually. And so it follows that a server or a storage array of 2RU will cost $2K per year on top of its initial purchase price.

The figure above provides a typical TCO distribution between CAPEX and OPEX over the course of 5 years for a 1,000 channel project. One can see that the OPEX component is higher compared to the initial purchase price (or CAPEX). Furthermore, it shows that OPEX comprises more than half of the on-going costs of the system[2].

Minimizing TCO in surveillance systems is a significant challenge as video surveillance is a resource hungry application, which requires significant processing power and storage allocation. Unlike traditional IT systems such as ERP, organizational email and others, the sheer amount of equipment required to manage a 1,000 camera system is huge due to the amount of servers and storage devices required for recording and storage. Reducing TCO in small-scale deployments, bank branches or mass transit stations, is also difficult. In those cases, the amount of cameras per location is relatively low, generally four to 16, but the number of branches or locations managed by a larger organization can be in the hundreds and thousands, making TCO a critical component in the ROI equation.

Steps to optimize your organization's TCO

As you understand the value of TCO and the challenges in minimizing it, now how do you address it?

Minimizing CAPEX

You can start by minimizing the CAPEX component. Other than having skilled purchasing people to negotiate better prices, you should consider the following.

[2] In this white paper we focus mainly on the recording system and consider the cameras as a fixed component in the equation.

Extreme performance

With H.264, a camera's required bit rate has been significantly reduced, and now with a 2Mbps stream, a security operator can view high-quality 4CIF@30fps images. Still, when taking into account hundreds, even thousands of cameras used in enterprise deployments, the amount of servers required to handle this traffic is large and results in significant cost. A typical server can manage around 150Mbps of recorded streams and each server can support 75 streams of 4CIF@30fps. But what if an organization decides to use the latest Megapixel cameras with 6Mpbs streams? The standard server would only be able to support 25 cameras. And in an installation of 1000 channels this adds up to 40 servers (assuming that each server has internal storage), costing an exorbitant $80K annually.

Therefore it is very important to define performance figures with the surveillance vendor and verify that servers can support up to 512Mpbs of recording performance. And do not forget to make sure this figure is allocated to recording only, and does not include the live streaming and playback. By doing this, you will decrease the number of servers to 12, **saving 70% of the CAPEX associated with the servers**.

Optimized solution for branches

While extreme performance mainly influences CAPEX for centralized architectures, the main need in distributed solutions, for environments such as mass transit stations and bank branches, is cost effective recording. The applicable solution should have hybrid capabilities to support both existing analog cameras and next-gen IP and megapixel cameras and support a comprehensive list of value added services to ensure highest video quality and integrity.

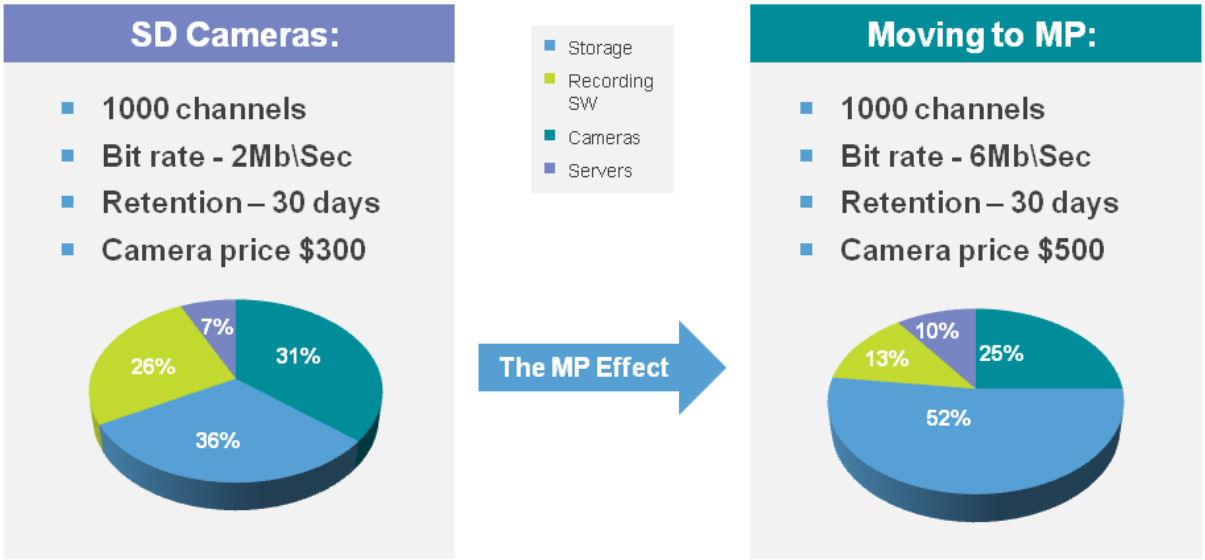
Enhanced compression

With the introduction of new and powerful megapixel cameras, benefits such as enhanced image quality, smart zooming capabilities, and a wider field of view are now available. However, the main drawback of megapixel cameras is the massive amount of required storage.

In the figure below the budget allocation for a project using standard definition cameras stored for 30 days is shown. This is a common practice for financial institutions, mass transit organizations, and other critical facilities. Clearly, the largest budget allocation is for storage.

In the second part of the figure, you can see the budget allocation for a project utilizing megapixel cameras. Here, the storage portion is more than 50% of the overall budget, while cameras prices have increased by more than 60%.

Figure 2 – Budget allocation with Standard and megapixel cameras



This scenario requires a more efficient method to store video images in megapixel-based environments, such as advanced compression schemes that do not compromise video quality or motion flow, unlike some traditional storage dilution solutions. Using enhanced compression solutions can reduce overall storage utilization by 10% to 20% for megapixel cameras, without compromising the video quality required for proper security operations. By using this type of solution, up to 10% of the overall budget for video storage can be saved.

Value Added Services enabled hybrid

The introduction of IP cameras into the surveillance arena has significantly changed the way organizations manage and treat their security systems. Once discrete, stand-alone, analog, proprietary solutions, security systems have been transformed to integrated, open, and IT friendly; providing the security integrators with much more flexibility. With the advent of megapixel cameras, video quality has been dramatically improved, however, this comes with a higher cost of network bandwidth and storage as mentioned above.

Many organizations with existing analog cameras, have been struggling to find the necessary budget to replace their install base and upgrade to the latest and greatest, an IP camera security system. However, in many cases, analog cameras still provide good video quality and the cost of replacing them in large-scale deployments is extremely high. The finance market is an excellent example where many banks have existing security systems in place for four or five years, and prefer not to upgrade the existing analog cameras and cabling as they add new video management systems.

To address this situation for these types of organizations, a hybrid Recorder has been developed. We are not referring to an entry level “VCR like” hybrid DVRs, but to a high-end, enterprise-class, hybrid Smart Video Recorder (SVR), that can support several dozen analog cameras while providing all the related IP benefits to standard analog, IP and megapixel cameras simultaneously. The hybrid SVR is coupled with an Analog Expansion Board, which encodes the analog images and sends them over a low-cost connection such as PCIe, to the Recorder. With this solution it is possible to maintain the install base, and does not require installation, or provisioning new IP network access for edge devices.

While DVRs have become outdated in the last five years, and replaced by much more advanced video recording and storage technology, it is now possible to cost-effectively migrate a legacy analog solution with the significant benefits of hybrid Smart Video Recorders. This type of Recorder offers a wide range of video value-added services aimed at improving video quality and operations efficacy, while providing state-of-the-art management and IT-friendly capabilities.

Below is a brief description of some of the video value added services SVR’s provide.

- **Visual Parameter Optimizer** (VPO) enhances video quality and saves on maintenance fees (OPEX). It utilizes a repetitious algorithm cycle to analyze the image quality coming from the video camera, adjusts the camera’s visual parameters (balance, contrast) according to the analysis, thus enabling continuous high-quality viewing and recording. There is no need to check video quality and adjust video parameters on a routine basis as the system does that automatically.
- **Camera tampering detection (CT)** guaranties the integrity of the video source. Managing many cameras installed at various locations is a very big challenge for any operator. Without automatic alerting that video image integrity has been compromised, the operator may lose valuable information that they assumed was being captured properly (for instance the camera is not in focus thus recorded video becomes useless). The camera tampering detection mechanism triggers an alert whenever video image integrity is compromised. The algorithm will detect events such as camera redirection, significant sudden change in scene brightness or focus change.
- **Advanced Video Motion Detection (AVMD)** is a mechanism to detect movement in a specific scene. It allows selecting areas of interest and setting sensitivity levels for alarms to optimize them. The central management of a unified configuration for all types of cameras simplifies the work for the installer because there is no need to edit the different UIs of each camera. In most practices, the motion detector is used to trigger a recording start and stop. This reliable mechanism of motion detection reduces unnecessary recording, immediately reducing the amount of storage used – directly affecting CAPEX.

- **Video Analytics** algorithms support security and operational insight that can be gleaned from video. When implemented centrally, it allows scaling the wisdom to all edge devices, IP or analog, with or without integrated video analytics mechanisms. This significantly improves the value of older equipment and improves overall insight extraction capabilities.

Reducing OPEX

While reducing CAPEX is a big step towards reducing the TCO, we know that the OPEX portion is a key component in the TCO equation. We will now examine methods for reducing OPEX.

Reduced footprint

Above, we have seen that reducing the number of servers and storage devices by using extreme performance and enhanced compression, reduces the budget required to purchase a new surveillance system. As demonstrated, OPEX can be directly linked to surveillance equipment's footprint. If we can reduce up to 70% of the number of servers purchased, we can reduce 70% of the solution's footprint, which translates to a 70% OPEX reduction annually.

Maintenance costs

Maintenance is a significant portion of an organization's expenses. A high-maintenance solution costs more money for the organization, but also creates dissatisfaction.

Therefore, a surveillance solution with low maintenance overhead is always preferable. This would include an easy manner to deploy software, both on workstations and servers, using automated software distribution tools to reduce the maintenance load when performing version updates and upgrades.

In addition, an option to use a simple web client, without additional client installation should be provided. This enables security personnel and law enforcement agencies to gain access to the video surveillance system from any smartphone or PC using web access.

Lastly, one of maintenance administrator's biggest challenges is determining actual resource consumption such as CPU and storage, for their surveillance solution. This is extremely important for on-going maintenance and future expansion, and can result in many wasted hours spent logging and describing the system's status. Thus, a simple-to-use dashboard, with all of the install base's information should be provided.

High reliability

One of security manager's main objectives is assuring a 24x7x365 operable and accessible video surveillance service.

To truly achieve reliable security service, both the security officer and IT manager should pay special attention to the design of the system's reliability and resiliency, including all video surveillance components, applications and services, as well as the IP network infrastructure. As the video surveillance arena is rapidly moving towards IP-based video surveillance systems, the resilience of video surveillance systems is strongly dependent on the IP network.

A proper design will take into account the customer's availability requirement (manifested in number of 9's. e.g. 4 x 9's or 99.99%), together with the system integrator's service availability (manifested by Mean Time to Repair (MTTR)) and provide the proper technical redundancy and resilience mechanisms to ensure this level of reliability. Such mechanisms include encoders, SVRs, management redundancy, Disaster Recovery Protection capabilities and others.

Maintenance and Support offering

To ensure that your OPEX is as low as possible, you must consider the vendors maintenance options. Just as you would insure your home and car, you must make sure that your latest generation video surveillance solution is fully covered with a maintenance offering.

You should select a relevant Service Level Agreement (SLA) best suited to your needs, making sure you will get support whenever it's needed. You should also make sure you will be getting software upgrades and updates as a part of the maintenance offering, otherwise, your system will quickly become obsolete, or you will have to pay a hefty amount to get the latest innovations.

Main TCO Influencers:

- CAPEX
  - Extreme performance
  - Enhanced compression
  - Hybrid solution
  - VAS enable video recorder
- OPEX
  - Minimal footprint
  - Automated software tools
  - High reliability
  - Maintenance offering

A common scenario where this is prevalent is with expansions and up-scales. You start with a system including 100 or 200 cameras. But over the years, you find it necessary to increase your install base to cover more facilities and provide security service to additional users. In some cases, you will see that your software is not up to the task and will require an up-scale. As a result, you must ensure that the vendor providing your solution will be able to up-scale you to the most comprehensive offering without having to scrap your existing system, or alternatively reinstall every component.

The green factor

Other than costing much more money, legacy systems consume more electricity and contribute higher CO_2 emissions. Moving to a new generation of solutions, which are both space and electrical efficient, will save significant amount of power and result in a greener environment.

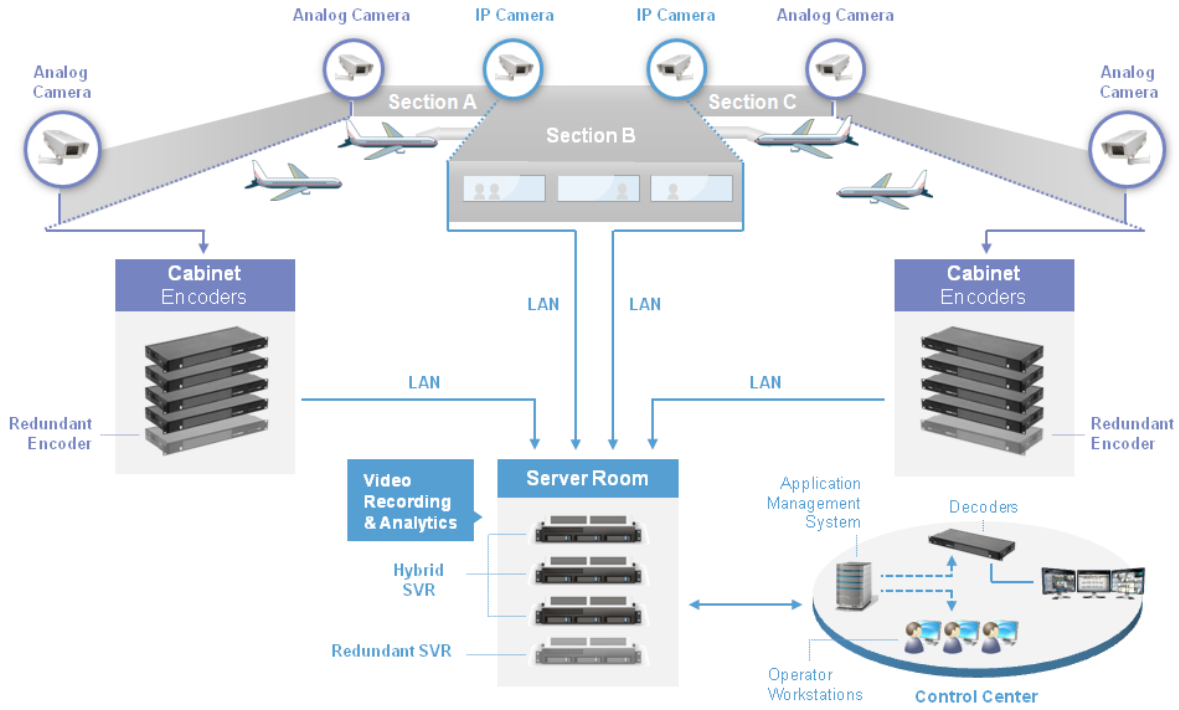
Market Use Cases

Let's examine several use cases and see how we can optimize a system's TCO.

Large airport using megapixel and IP cameras

In this deployment we've used a centralized architecture, where all cameras are recorded at the same location. This is enabled using a high-bandwidth LAN, carrying all the IP streams to the server room, both for standard IP cameras, as well as for megapixel cameras.

Figure 3 – Airport Deployment

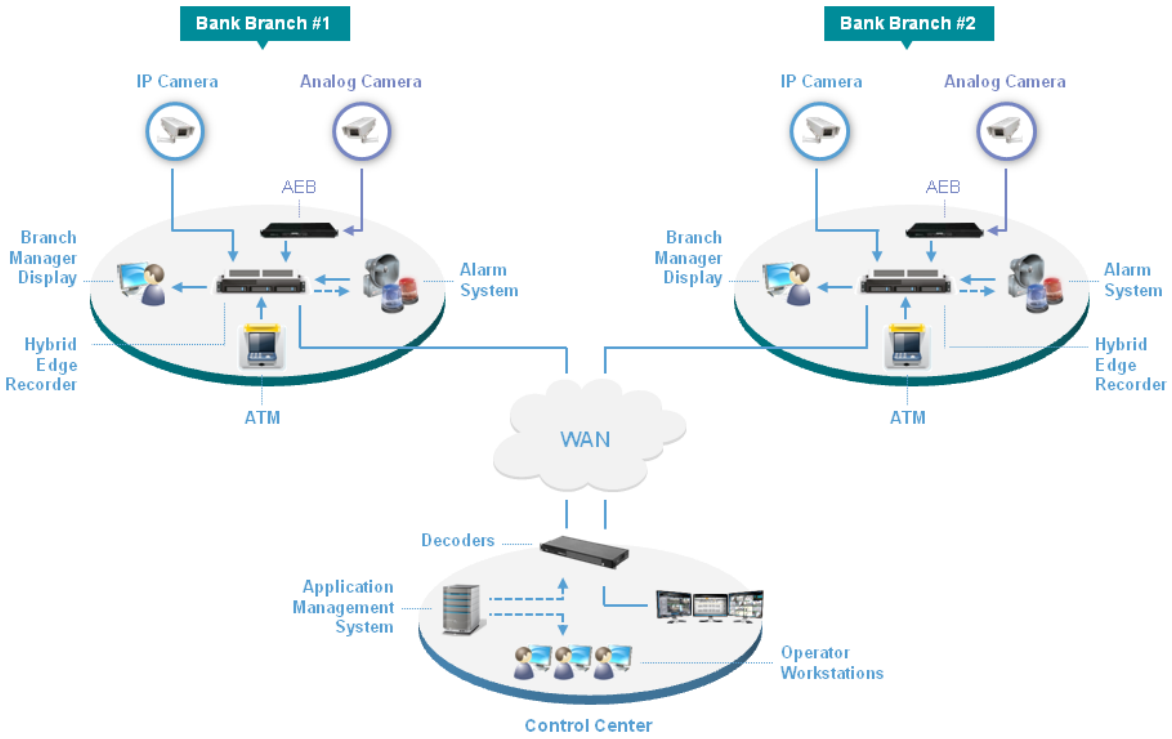


By using extreme performance servers, the amount of required servers necessary has been reduced while solution redundancy is maintained using high-availability solutions, providing a high level of service.

Distributed bank using analog and IP cameras

In this deployment we've used a highly distributed architecture, where the recording is done at every branch location, due to the WAN's bandwidth limitations.

Figure 4 – Bank Deployment



The hybrid edge Recorder is connected to an AEB, supporting both IP cameras and analog cameras with a small footprint and attractive price, while at the same time providing high video quality and different VAS features such as VPO, Camera Tampering and Video Analytics. The complete operation is supervised and monitored via a central control room.

Summary

Despite the budget crunch and new, stricter security procedures and requirements there is light at the end of the tunnel. Advanced systems, with an overall reduced TCO are now available.

Purchasing a surveillance system is not strictly a matter of acquisition costs. IT managers and security directors should consider ongoing operational expenses and system costs. In order to achieve a low TCO for surveillance systems, an efficient design and implementation process is necessary, one that considers extreme performance, enhanced compression schemes, high-reliability solutions and a comprehensive maintenance offering.

About NICE Systems

NICE Systems (NASDAQ: NICE), is the worldwide leader of intent-based solutions that capture and analyze interactions and transactions, realize intent, and extract and leverage insights to deliver impact in real time. Driven by cross-channel and multi-sensor analytics, NICE solutions enable organizations to improve business performance, increase operational efficiency, prevent financial crime, ensure compliance, and enhance safety and security. NICE serves over 25,000 organizations in the enterprise and security sectors, representing a variety of sizes and industries in more than 150 countries, and including over 80 of the Fortune 100 companies.