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Virtual machines in the world of Video Management Systems

By Guy Arazi
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The solutions offered today in the field of server virtualisation seem to be a natural fit for the evolution of security systems from analogue to IP

The video surveillance industry has been transitioning from analogue to IP-based systems over the last several years, and it is clear that this trend will continue. In light of this, it is apparent that taking advantage of the advancements in the IT world for use in security system design is the next logical step. In this article, Guy Arazi, Director of Product Management, Vicon Industris, looks at the new technology of virtualisation, or "virtual machines" (VMs), in consideration for use with Video Management Systems (VMS).

Running VMS software, specifically the Network Video Recorder (referred to as NVR, video server, archiver, logger, etc. depending on the manufacturer) on these virtual machines is an alternative that saves space, energy and potentially money. Using this new innovation, however, brings new challenges that must be taken into account during the design of the security system.

To better understand these challenges, an explanation of virtual machines is helpful. The virtualisation solution provides a way to use one powerful physical computer (or more likely server) and run multiple operating systems (Windows®, Linux®, etc) on it. Each OS mimics the behaviour and capabilities of a physical standalone computer, with its own computer identity, computer name, IP address, etc. Even though there is only one underlying physical server, from the computer network side, there are multiple computers with individual operating systems, applications and capabilities, each working as a separate computer running different tasks. The total power of the physical server is carved up and shared among all these virtual machines.

As an analogy, think of a parking spot in the city (expensive real estate) where only one car can park. Now a parking lift is installed that allows stacking cars, creating

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virtual parking spaces using the same physical one. The physical spot is similar to the physical server, the parking system is the virtualisation solution and the added spaces on top are the virtual machines. The total weight that the bottom parking spot can hold is similar to the total power of the physical server, and once the maximum is reached, nothing more can be loaded on or it will collapse.

Considerations

Video surveillance systems (NVRs in particular) receive, process and transmit massive amounts of data in the form of video files. These files are not only fairly large in comparison to web pages or standard database transactions, but keep streaming to the NVR almost non-stop, unlike many other information exchanges that come in bursts. This requires that the machine running the NVR software has a high level of resources to allow it to always be available to receive and send video and store it on the drive, as well as read it back for playback at the minimal latency.

Because of this requirement for highly available, high level of resources, the process of carving a physical server into many virtual ones needs to ensure that the physical resource does not get too thinly sliced. The result would be underpowered virtual machines with slow response, delay in video caused by network overload, gaps in recordings when the data comes in too fast for the drive to handle, or memory issues.

Once all these variables have been taken into account for smooth operation on each machine, a calculation can be made to determine if the total number of VMs on the physical server justifies the price of that single server vs. using a physical machine per NVR with much lower specifications and cost.

The fact is that the virtualisation solution is an amazing tool and solid concept that is offered in many flavours; the flexibility it brings, allowing for the creation of any virtual hardware sharing the available resources of the physical one, provides, essentially, an unlimited set of configurations.

For software manufacturers who are aware of how demanding the NVRs are, it is a very delicate situation to manage. Instead of publishing a clear specification that says *"This hardware can perform these tasks,"* most manufacturers make a professional decision to avoid publishing a specification that states "support for VMs," as it is too general.

Recommendations
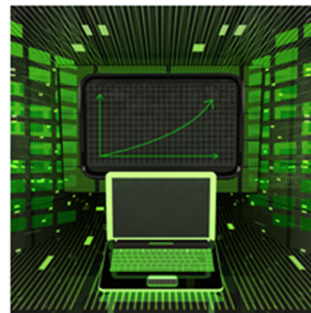
Virtualisation solution is an amazing tool and solid concept that is offered in many flavours

For those who want to use a virtualisation solution with their video systems, follow these Best Practice rules in their system design:

- Make sure that each virtual machine meets the minimum requirements specified by the manufacturer for the application (CPU, RAM, O.S., etc.).
- Allocate a dedicated physical network card per virtual machine. Do not create virtual NICs based off one physical NIC; this might slow down video traffic handling.
- Allocate a dedicated set of hard drives for recording. Do not create virtual hard drives based off the same physical ones; this can slow down the read and write response.
- Remember that at the bottom of the virtual tower there is a physical base, and other VMs that are on the physical server might suffer from sharing resources with a process intensive NVR. It is highly recommended to build the NVR virtual machines with no other services sharing the physical resources (for example, do not put NVR virtual machines on the same server that has a virtual machine running the company mail server).
- Once designed, evaluate if the actual cost savings in individual computer hardware is truly worthwhile, considering the number of VMs per physical server.

Summary

The solutions offered today in the field of server virtualisation seem to be a natural fit for the evolution of security systems from analogue to highly available networked solutions with IP-based cameras and recorders. However, careful consideration of the advantages and disadvantages of these solutions must be taken into account when applying them to the security industry. In particular, the processing load required by the NVRs, which is not always similar to standard IT, transaction-based servers, must be weighed heavily in the decision.

Due to the variety of options in creating virtual machines, most VMS software manufacturers find it difficult to provide a general specification for their system. By using the previously outlined recommendations, it will be easier to design virtual machines will perform as expected as well as allow for estimating the required hardware for the physical servers, and the number of VMs that can safely be created on them.

Ultimately, it is still essential to look at the final design and decide if the savings involved in virtualising the NVRs are truly significant.

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