White Paper

Headend Video Monitoring in a Virtualized Infrastructure

A compelling alternative to dedicated hardware-defined video monitoring for service providers

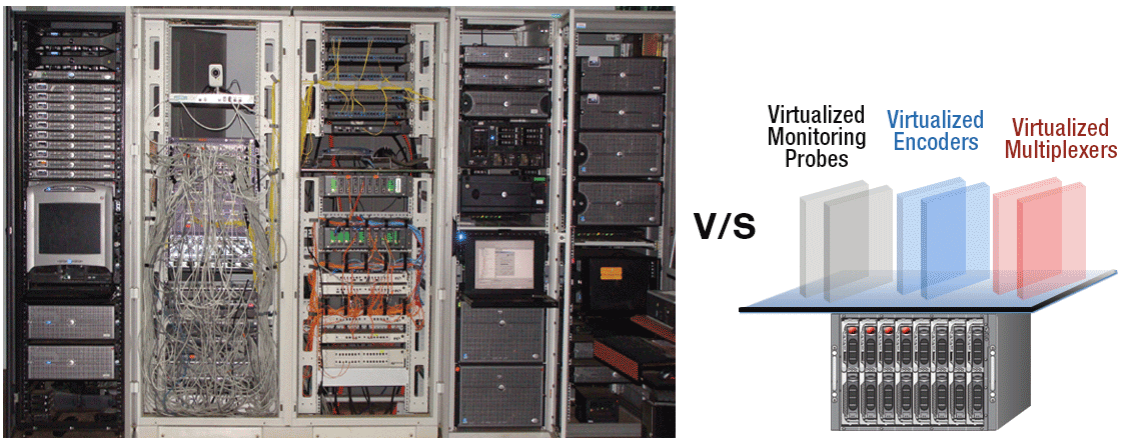
1. INTRODUCTION

Real time content monitoring has been deemed mission critical in the video delivery chain for service providers such as broadcasters, video headends and telecom/satellite companies. The monitoring probes are placed strategically within the headend where video processing takes place and at network edges. They enable service providers to detect and troubleshoot video/audio impairments that can adversely affect Quality of Service (QoS) and Quality of Experience (QoE).

Traditionally, these monitoring products have comprised specialized hardware with a dedicated, fixed interface designed to monitor a specific number of video feeds. They require a substantial amount of manpower for racking, cabling and configuring including connectivity to the surrounding ecosystem, all of which have associated overheads – maintenance of the hardware, energy, training, rack footprints, downtime in case of failure, and most importantly, underutilization of hardware. Scalability and flexibility, to accommodate growing monitoring needs, are known issues with this type of deployment. They have a higher cost of ownership and run the risk of having a limited shelf life. Over the last few years, the broadcast industry has been shifting from dedicated hardware-based solutions to software-based solutions running on readily-available dedicated IT equipment. The next step in this evolution is for the software-based solutions to work on virtualized standard IT equipment. In this white paper we discuss why a software-based, virtualized monitoring solution can be a much better alternative to the currently deployed dedicated hardware-defined video monitoring solutions.

2. VIRTUALIZATION

Virtualization is a technology that separates the hardware resources of a computer from the operating system and the applications that run on that computer. A software instance of an operating system, called a Virtual Machine (VM) is created. Multiple VMs can run on a single computer. Virtualization software allows VMs to access the physical hardware resources of the computer on which they reside. This ability to run multiple VMs on one physical computer enables resource optimization. For a video headend, this means running a video monitoring software probe or encoder software or transcoder software on a general-purpose IT platform such as a Dell or HP blade server, instead of running it on its own dedicated hardware. Furthermore, a software-based solution allows a service provider to take advantage of virtualization.

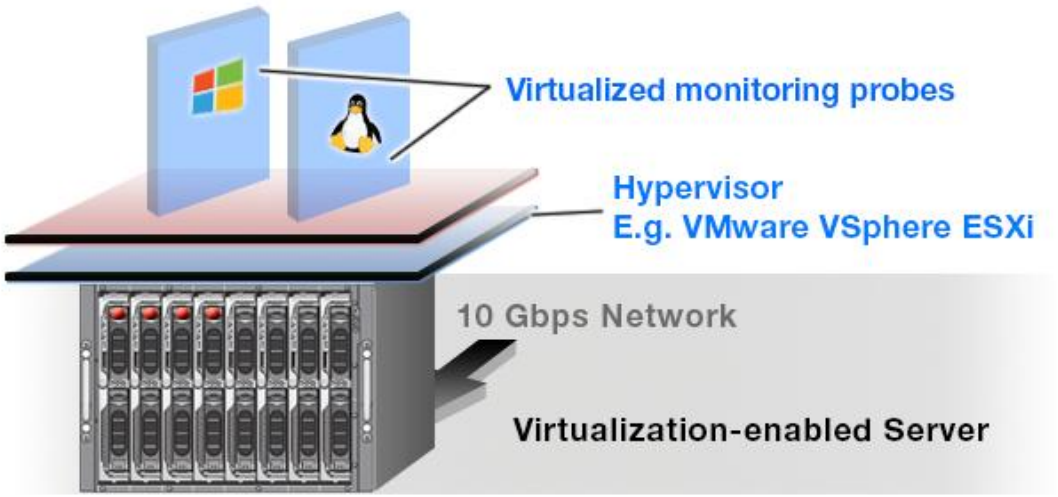


Hardware based Solution v/s Virtualized Solution

3. THE NEED FOR VIRTUALIZATION

Video headends of today are full of hardware that runs dedicated applications with fixed bandwidth and network interfaces. IRDs, encoders, decoders, multiplexers, and video monitoring probes are a few examples of these hardware products. In the case of monitoring probes running on specialized hardware, if the probe were to break down, a user would have to spend a significant amount of time and money ordering a replacement, setting up the new system, and dealing with other problems caused due to the downtime. It is also worth considering the scenario wherein the infrastructure needs to be expanded to include more monitoring probes, encoders, etc. This would again entail acquiring more hardware, added setup costs, and more time. Of course, moving all equipment to a virtualized environment is not feasible or even desirable; however, tasks such as content transcoding, multiplexing and monitoring can be moved to virtualized platforms.

In general, a virtualized monitoring probe is a software probe that can be deployed on a virtual machine with virtual NICs and virtual network switches. Typically this requires a virtualization-enabled hardware server, such as a blade server, with a hypervisor, such as VMWare vSphere ESXi, installed on it. The monitoring probe can then be installed on the virtual machine created on top of the hypervisor.



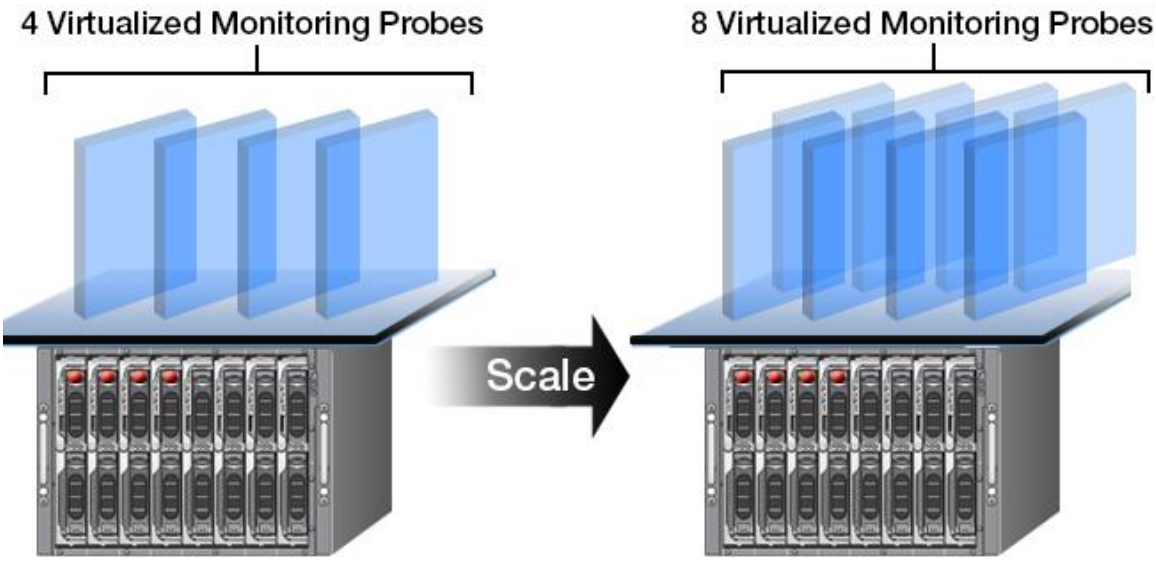
A virtualized monitoring probe has the following advantages:

- **Independence from Custom Hardware**
  A virtualized monitoring probe decouples the monitoring application from any underlining physical hardware. This allows the user to exploit the increase in processing power and falling costs of IT server hardware.

- **Lower Energy and Space Footprint**
  Multiple virtualized monitoring probes can be installed on blade server machines. A blade server is a stripped down server machine with a modular design optimized to minimize the use of physical space and energy. There are many options for blade servers such as HP Proliant blades, Dell PowerEdge blade series and Cisco UCS blade servers, among others. Moreover, since existing hardware can also be used for this purpose, no additional energy or rack space is required.

- **Fast, Easy and Scalable Deployment**
  Using well-defined virtual machine templates, setting up a virtualized monitoring probe on hardware that supports virtualization is fast and easy. The template takes care of the complete software environment required for running a monitoring probe including the operating system. For an operator, this reduces the installation time and simplifies the installation process.

  One of the bigger advantages of virtualization is that scaling monitoring capacity becomes easy compared to hardware-based monitoring solutions where hardware and space are concerns. For virtualized monitoring probes, this requires only deploying additional probes on the already existing hardware.



Scalability with minimal cost

- **Remote Probe Management**
  All hypervisors provide APIs for automation of all virtual machine management-related tasks. This means that the virtualized monitoring probes can be managed remotely. Apart from this, monitoring probe APIs, if available, can provide a means to control all monitoring-related functions and access all real-time and historical monitoring information for video service debugging and analysis.

- **High Availability**
  Built-in support for high availability and fault tolerance in the hypervisors ensure that the virtualized monitoring probes will run 24x7 with zero downtime. In the case of hardware failures, the monitoring probes are automatically restarted or set to run on a different physical server with minimal data loss and downtime.

- **Dynamic Scaling and Resource Pooling**
  Virtualization enables optimum utilization and sharing of time/resources of a physical machine. The hypervisors dynamically allocate resources to the virtual machines so that the available hardware (computing) capacity is used efficiently. When a virtualized monitoring probe is running at its full capacity, it will command maximum resources, but when it's idle, the same resources can be used by other virtual applications.

  Moreover, a user can deploy a farm of virtualized monitoring probes and scale their use as and when needed. For example, during normal times an operator may use fewer probes, however, during times of peak viewership and in order to ensure high quality broadcast, the operator can use all the monitoring probes. While this scaling occurs on the fly, dynamic resource

pooling ensures that the physical machines are always optimally used either for monitoring or for other tasks.

4. CHALLENGES

The transition to virtualization has to be well thought through as it affects multiple groups in an organization and involves decision making at the corporate level. Virtualization can also present some challenges. Selecting the right hardware infrastructure to run different applications that are part of a workflow or certifying products from different vendors to work on an IT-approved VM and operating system can be a time consuming process.

A real time monitoring application performs many network I/O operations. In the case of virtual machines, all network traffic must pass through the physical network adapters, the virtual switch and the virtual network adapters before it reaches the application running on the VM. When processing services with high packet rates, this additional layer of virtual devices can be considered a performance overhead. Real-time content monitoring solutions, being network I/O intensive and latency sensitive, have to be tuned and configured to take care of this overhead. If an existing hardware platform is used for virtualization, the monitoring software must have the right software plugins to communicate with the user interface software. Apart from this, software applications that are intended to run in a virtual environment must be rid of any dependency on custom hardware devices. These are not insurmountable issues, however, all of these factors must be carefully considered for virtualization to work as intended. Furthermore, current custom hardware-based monitoring solutions will have to be completely re-architected, and doing so may be a very difficult proposition.

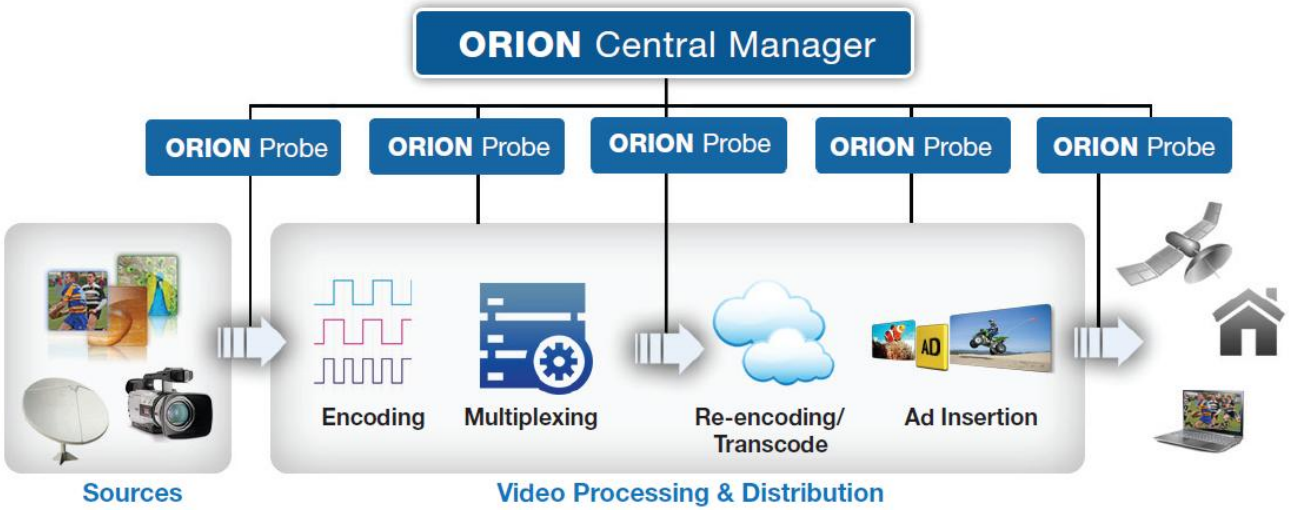
5. VIRTUALIZED MONITORING WITH INTERRA'S ORION CONTENT MONITOR

Designed for video service providers, **Orion** is a powerful, scalable video content monitor that helps ensure superior Quality of Service and Quality of Experience. It is a software-based solution that performs all critical monitoring functions in a single, integrated platform. Its centralized monitoring and web-based architecture allow remote monitoring through any browser-enabled device, providing extreme flexibility and on-the-go decision-making.

Orion highlights include:

- Virtualization-ready monitoring platform
- Scalable architecture for efficiency, flexibility and maximum ROI
- Comprehensive HEVC 4K video quality monitoring
- Centralized view and control of all monitoring points
- Long term historic data for regulatory compliance

- In-depth audio/video quality checks
- Closed caption and ad-insertion (SCTE-35) verification



6. CONCLUSION

With massive improvements in computer processing power made in recent years, there has been a significant shift in the industry towards adopting software-based solutions. There is a general consensus among the players in this ecosystem that virtualization is the way to go. Virtualization has already made major in-roads in enterprise-level applications such as accounting, HR, sales management and others. Video service providers are under tremendous pressure to keep costs down as they expand video service offerings and pursue growth opportunities.

A virtualized monitoring platform can offer the following advantages:

- Decouple monitoring software purchase from server hardware purchase
- Hardware and software cost savings
- Flexibility to run monitoring on corporate IT-approved hardware
- Ability to scale monitoring as needs grow

To learn more about Interra's content monitoring solution, visit:
http://www.interrasystems.com/content-monitoring.php

For Orion product sales inquiry, please write to:
sales@interrasystems.com

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http://www.interrasystems.com

Interra Systems, Inc.
1601 S. De Anza Boulevard, Suite 212
Cupertino, CA 95014
USA