RISE OF THE SOFTWARE-EMPPOWERED VIDEO OPERATOR
Life on the competitive frontier of video services today requires agility, technical prowess and extreme leverage of available technical and commercial resources. Operators today are less constrained by previous generations of technical standards and operating conventions, and more able to reach out beyond their franchise or geographic boundaries in search of new customers.

To keep up with consumer demand in a cost-efficient way, and to prepare itself for the next generation of UHD/4K services, the video services industry is experiencing a steady technological, and more importantly cultural, shift.

At its heart, this is a shift towards networks and other infrastructure components that will be fundamentally based on IP technologies — and this also implies a movement away from a hardware-defined value proposition to one that is more software-centric and adaptable.

This shift goes way beyond just a lower cost version of the services that have traditionally been a cash cow for operators, while opening up a realm of possibilities for more dynamic presentation, discovery and real-time usage feedback.

Seen through the eyes of Verimatrix, and the eyes of other key innovators in our ecosystem, we believe these are changes that help enable what we term the "software-empowered video operator." In this model, pay-TV operators of all types intensively capitalize on some already mature and some still-maturing software-based technologies and standards in order to populate, power and manage a flexible suite of resources that exist in data centers and across the network infrastructure.

We believe that operators embarking on the journey to a software-centric video service delivery system will gain an advantage that propels them beyond the current limitations of their physical resources and enable them to better respond to new standards, new opportunities and the changing market dynamics.

"I believe television will change more in the next five years than in the last 50.

- Brian L. Roberts, CEO, Comcast"
Where can we see evidence of the kind of drivers that will shape our industry most clearly? There are certainly several key inter-related movements taking place currently:

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| Initiatives in the network infrastructure industry include the concepts of software-defined networks (SDNs) and network functions virtualization (NFV) that when applied to the most generalized model of cloud-based hybrid delivery systems, for example, would represent significant steps towards a totally open, automated, and purely software-powered network infrastructure. Deutsche Telekom (DT), in particular, has been very vocal about its transition towards becoming a software-defined operator via SDNs and NFV to greatly simplify its network infrastructure. One of DT’s major objectives is to more heavily rely on software to manage the network. Axel Clauberg, VP of aggregation, transport, IP, and fixed access networks, has said that they have to invest in their networks and become more software-oriented in order to survive. He continues, “The OTT players can move very fast because they are software-oriented. We need drastically simplified IP networks, IP/optical integration and an infrastructure cloud model that hosts all manner of functions, applications and content.”

Head-end systems of video operators have also long been dominated by specialized hardware (encoders, muxes, modulators, etc.) threaded together with video specific interface technologies (ASI, SDI, etc.). Now head-ends are at least partially supported by IP interconnect using standard switches and routers. They feature generic servers as building blocks for all but the most specialized functions. This approach is accelerated in many ways by the ability to deploy a mix of physical and cloud resources that assist in scalability, OPEX and power management. Hybrid physical and cloud-based deployments help manage the increasing demand for high-bandwidth services, like UHD/4K video.

For example Stofa, a Danish broadband and cable operator, has taken a significant step towards an all-IP service architecture with its deployment of the Cisco Converged Cable Access Platform (CCAP) solution. The service provider can now simultaneously manage video-on-demand (VOD) and high speed broadband traffic within the same access platform and claims to be the first European cable operator to combine digital video and data on a common infrastructure.

The pace setters of this video operator transition have already started to emerge, perhaps somewhat in the background, via the path to hybrid network convergence, which has laid the groundwork for proving the value of IP-based technologies. The managed network IP infrastructure of leading TelcoTV operators has put them in a good position to expand the range of their service delivery, but global cable operators are also now more fully exploiting their two-way enabled networks to deliver superior service offerings.

Many successful hybrid network deployments, such as Brazil’s GVT, Taiwan’s Chunchwa and Sweden’s Com Hem have been lauded for combining complementary network types to offer a more compelling experience for their subscribers. In the United States, evidence of a software-centric shift is happening on various levels. For example, Joe Jensen, CTO of Buckeye CableSystem, a Tier 2 operator based in Ohio, has said that the shift to an all-IP framework is vital and well within reach.

Cardless security solutions are increasingly popular. State-of-the-art, secure system-on-a-chip (SOC) implementations offer at least equivalent security to smart cards, but at a lower cost. They also have the ability to bridge the gap between unconnected and connected screens. In contrast to hardware conditional access (CA) systems, cardless CA and DRM clients are largely implemented in software that take advantage of secure chip technology, when available, ensuring flexibility, a secure upgrade path over time and a way to track technology and business models changes to provide a future-proof investment.

Indian and Latin American video operators are showing a clear preference for cardless, software-centric security solutions for newly deployed digital video services. They recognize the shifts in industry dynamic and threat profile and are moving beyond the legacy approaches, in the process saving huge sums on hardware and distribution logistics.

In the more connected North American and Western European markets, the use of cardless security offers a way forward for operators transitioning to all-IP delivery infrastructures and integrating hybrid and multi-screen services.
Yet the true realization of the software-empowered video operator may go even beyond these movements, as it represents a significant shift in mindset for all types of service providers that traditionally built their entire business around the concept of vertically integrated and closed systems. The culture of the video industry is based on network configurations developed by engineers who intimately understand the closed environment, and therefore have a deep rooted sense of physical as well as logical control over the network.

**REVISITING SOFTWARE PARADIGM SHIFTS**

It can be argued that a shift towards a software-oriented value proposition is the natural progression of today’s technology environment. Many technological shifts to software have restructured the communications industry as a whole and opened up a new era of lower cost services and more comprehensive applications to satisfy the consumer.

An example of how dramatic the shift to a software-empowered ecosystem can be to an industry is illustrated by the transition of the world of fixed line telephony (often called POTS — plain old telephone service, long dominated by the national Telcos) to the current more dynamic world of IP telephony and mobile services.

Initially catalyzed by a few upstart, low-cost long distance operators who cherry-picked a premium market, the old universal standards and specialized switching equipment that supported TDMA (time division multiplexed access) has almost universally been replaced by a core of IP switching systems and trunks. And IP-based technologies are increasingly extending towards the network edge as consumers replace their old landline telephone systems by those based on broadband connections or mobile networks. In the process, the regulatory framework of universal service that seemed so critical to industry health at one time has effectively been left in the rear view mirror by the new industry structure.

Another tangible example of a shift in the balance from a largely hardware to a software value proposition is in the typical video customer premises equipment (CPE), which has historically been the set-top box (STB).

In contrast to analog cable converters of a decade or two ago, the digital video STB was in fact the first significant piece of CPE where the development cycle was dominated by a large-scale software application. The software architecture revolved around a fairly extensive graphical user interface, backed up with software managed subsystems for video and audio management running on a real-time networked operating system.

A couple of generations later and with improved connectivity, the STB software environment has started to enable virtualization of the television functions themselves by moving both intelligence and resources out of the STB and into the network. A dramatic illustration of this is the trend towards video recording support for start-over and catch-up TV functions shifting to the network (or cloud) rather than using large amounts of STB hard disk storage.

These examples reinforce that open, IP-based technologies have the power to drive both minor network improvements and major paradigm shifts within network infrastructure deployments, which can affect how subscribers interact with an operator’s brand.
The promise represented by the shift in the infrastructure of a video services head-end to a software applications world underpinned by IP is dramatic. Furthermore, the downstream link of video delivery systems are less and less fundamentally based on RF transmission technologies, which amplifies the magnitude of the potential impact.

Alongside the many Telco operators that have pioneered the use of IP standards for all aspects of video services delivery, some of the world largest cable operators are also now vocal about shifting to an all IP infrastructure — from capture, grooming and core distribution all the way to last-mile delivery to the consumer premises.

Important implications of the shift to a software-empowered video operator model include:

1. A transition from a static approach to resource usage and presentation to one that is responsive to market dynamics and the real-time behavior of the consumers using the service.
   As a comparison, today’s best web sites are able to be reconfigured in real time in response to events and business opportunities, and are personalized to reflect the individual tastes and whims of their users while seeking to encourage incremental business transactions by lowering the barriers to impulse activity. All of this and more can apply to the competitive video service of the future.

2. A better way to meet evolving consumer expectations of multi-screen interactions and content discovery paradigms.
   Service providers will be able to provide a more granular and personalized experience for subscribers to provision content when and how they want it — in a seamless fashion.

3. Holistic capture of “big data” across the full range of network performance and subscriber usage patterns for a more rapid response to real-time operational and customer feedback.

4. Seamless integration of head-end deployment approach and delivery systems.
   An all IP architecture used for video processing and asset management lends itself to integration with a delivery system that is also IP centric. Additionally, the integration of third-party services — such as CDNs — alongside an operator’s own delivery network is easier to contemplate.

5. Ability to better address a rapidly changing world of format and delivery protocol standards.
   Some of the most recent profound innovations have come from compression technologies and adaptive rate delivery profiles.

6. Leverage of an unprecedented economy of scale and vendor choice in IT solutions that could never be matched by an industry based on specialized video hardware standards alone.

The timeline for these benefits to come to full fruition might be five years or longer. However, operators are making aggressive moves towards this inevitable software-centric path because of the short-term efficiency gains as well as the longer-term strategy for maximizing the value of their physical networks. A software-based strategy is also essential for operators wishing to cast a wider net with their offerings, seeking new subscribers and revenue from beyond their managed networks.
Security, in all its forms, is a continuing concern for video operators as they move towards a software-empowered model, particularly when the physical boundaries of a head-end become less well defined. An even greater concern is that the introduction of higher resolution, more valuable content services, such as UHD/4K, are matched by enhanced security approaches that must employ as much next-generation techniques as commercially reasonable.

Moving forward with the software-empowered video operator model definitely requires a new vision of revenue security that is a substantial leap forward from most of the current offerings. Legacy smartcard based CA systems have no place in this new vision.

The hardware-based, client centric, connectionless operational approach that dictated prior generations of security offerings is gradually becoming irrelevant. The new generation of software-based, IP-centric security solutions, where control and integrity can be managed at the point of service origin, are especially well aligned with the vision of a more dynamic, flexible and extensible value proposition that will drive the new marketplace.

The key security elements of this new vision should include:

- **Cloud-based security functionality as a core capability of the video head-end.** In a more connected paradigm, secure server resources will handle rights and key management through a distributed implementation approach that is pushed out to each screen as needed, rather than relying on native local security subsystems at each and every device where the tendency is to attack the weakest link.

- **Support for a highly dynamic approach to content management and usage rights windows.** A more intuitive presentation of content is the lesson of the online world. When combined with an aggressive approach to “freemium” promotion and a real-time response to audience behavior that is a design feature of the security solution, an operator has the tools to maximize commercial potential.

- **Standards-based encryption algorithms and content identification formatting practices to ensure economies of scale in consumer device implementations.** Additionally, standards can enable a seamless workflow between security regimes that includes post-production all the way through distribution without intermediate “security holes”.

- **Enhanced approaches to rights revocation and client renewability in anticipation of recent Movielabs UHD/4K specification guidance.** The recent Movielabs publications were written with an eye to the failures of past, hardware-centric solutions that did not sufficiently anticipate, and even less respond to, the trajectory of future revenue threats.

- **A holistic security system that can apply the right security techniques to a specific service model.** Moving forward with premium and UHD/4K content, this will definitely include key management security integrated with forensic video watermarking and other defensive measures.

Security that is component architected with the rest of the ecosystem touch points very much in mind. The end is in sight for the single-vendor monolithic video solutions that we have seen in the past. The landscape is much brighter for specialist vendors that have proven component integration points — often standards centric — with other members of a deployment ecosystem. The result is less vendor lock in and significant reduction in deployment risk.
By highlighting the seminal technological and commercial pressure points that are shaping the next generation video operator landscape, it becomes clear how the broader use of software-centric infrastructure and components can empower service providers to create a more compelling value proposition for their subscribers.

Verimatrix has established itself as a leader in the field of disruptive video security systems, starting with the Verimatrix Video Content Authority System (VCAS™) platform that was designed from the ground up as an IP-based connected security solution. The company has since been independently ranked as the global leader in IPTV content protection, aka software-based security, for seven years running. This strong technology heritage ideally positions Verimatrix to implement the revenue security that progressive operators will want to incorporate into their software-defined networks of the future. Verimatrix has already made significant strides to develop or integrate with the technology that will bridge this software transition.

Furthermore, our unparalleled partner ecosystem is being extended to accommodate integration with more virtualized components within the deployment environment network – creating teams that see this path as the future.

Service providers adopting a software-empowered model will be able to better contain network costs while increasing security, operational efficiencies, and enable flexible business models that can address the expanding range of consumer viewing experiences — anytime, anywhere. Simply put, operators will be able to create significant differentiation from its competitors to achieve market longevity.
Verimatrix specializes in securing and enhancing revenue for multi-screen digital TV services around the globe. The award-winning and independently audited Verimatrix Video Content Authority System (VCAS™) and ViewRight® solutions offer an innovative approach for cable, satellite, terrestrial and IPTV operators to cost-effectively extend their networks and enable new business models. As the recognized leader in software-based security solutions for premier service providers, Verimatrix has pioneered the 3-Dimensional Security approach that offers flexible layers of protection techniques to address evolving business needs and revenue threats. Maintaining close relationships with major studios, broadcasters, industry organizations and its unmatched partner ecosystem enables Verimatrix to provide a unique perspective on digital TV business issues beyond content security as operators seek to deliver compelling new services.

To discuss your vision of revenue security, please contact Verimatrix either via email info@verimatrix.com or phone +1 858-677-7800.