IDC Vendor Spotlight

Sponsored by: **Red Hat**

Author:

Melissa Fremeijer

February 18

The Rising Need for Media Function Virtualization

Introduction

Today's pay TV market is as competitive as ever, and providers face a number of challenges in order to stay ahead of the competition. It is clear that over-the-top (OTT) is the digital turning point for the TV industry, affecting business models and success factors in all the steps of the video workflow and value chain, from content creation to distribution. All players in the TV industry need to formulate a strategy to deal with this transformation. This applies not only to content makers, broadcasters, and aggregators, but also to traditional pay TV operators.

The growing pressure on costs forces pay TV operators to seek ways to increase operational efficiency and strengthen their position in the (non-traditional) online/OTT video market as they need to keep up to speed to offer higher quality video services, increase time to market, and reach a broader range of consumer devices.

This paper explores the benefits of media function virtualization (MFV) and how Red Hat has successfully enabled carriers to leverage its MFV solutions to reduce costs, scale efficiently, and increase time to market with new channels and personalized services while ensuring high quality of performance and service. Red Hat's aggregation of open source, cloud, virtualization, and container technology is crucial, differentiating elements of an optimized video workflow. In addition, function virtualization is at the core of mobile edge computing, fundamental for the increasing level of mobile video traffic and the 5G use case rollouts in the region.

Red Hat is well on its way to demonstrating its thought leadership, provisioning a virtualized architecture that will ultimately remove barriers between content creation and delivery functions which clearly aligns with the increasing horizontal consolidation trends in the broadcasting value chain today.

Situation Overview

The digitalization of TV coupled with the proliferation of broadband and the growing importance of IP technology for delivery as well as content creation are among the main disruptors of the traditional pay TV landscape. The popularity of OTT TV, in particularly premium subscription-video-on-demand (or SVOD) services, coupled with the rise of streaming set-top devices and increasing sophistication of smart TV capabilities, have paved the way for the liftoff of OTT in Europe. The OTT TV market in Europe is forecast to grow at a CAGR of 16.1% to reach around $15 billion in 2021, with SVOD (there is also transactional VOD and advertising VOD) to grow at a CAGR of 28% during the forecast period.

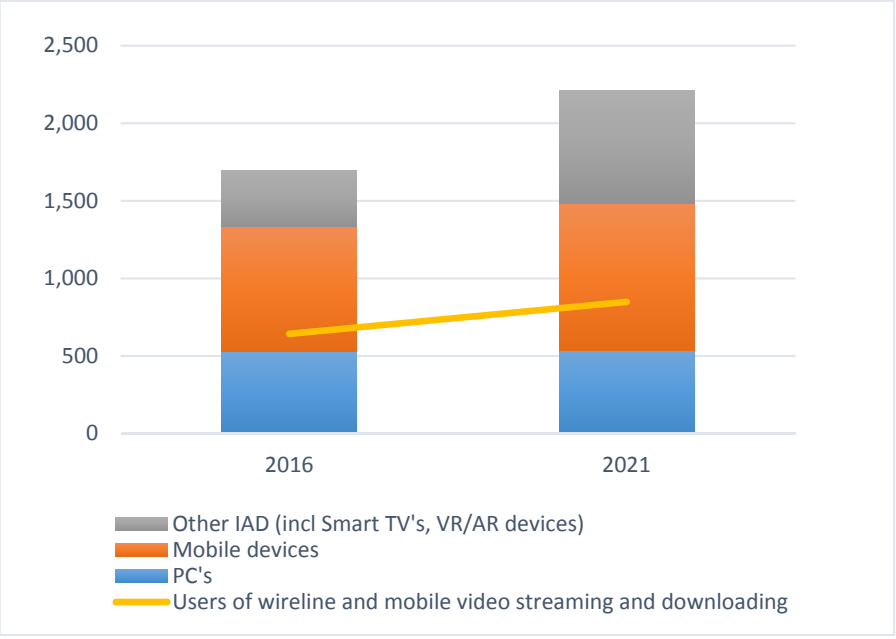
Being able to offer mobile video is a key requirement in this evolving value chain of TV and most probably the new growth path for pay TV globally.

While most OTT video users will continue to subscribe to traditional pay TV, IDC believes that competition from OTT services will contribute to an ongoing erosion of pay TV's subscriber base and negatively impact traditional pay TV revenues going forward. The penetration rate of OTT TV is set to grow from 10% in 2016 to 32% in 2021, whereas penetration of pay TV is expected to modestly grow from 62% to 65% in 2021, primarily due to the rise of IPTV subscribers.

The ability to watch TV from the TV set but also from the PC, tablet, and smartphone is crucial for today's viewing audience. This particularly applies to millennials, who are an important and growing segment of the user base. Being able to offer mobile video is a key requirement in this evolving value chain of TV and most probably the new growth path for pay TV globally. It has become a "must have" to meet consumers' need to watch TV anytime, anywhere, and on any device; not having a "multiscreen TV everywhere" strategy will force consumers to opt for alternate content sources.

The mainstream adoption of PCs and smart mobile devices and the rapid growth of smart internet access devices (IADs) such as smart TVs and AR/VR devices will further drive the growth in online video users and online video traffic. The number of internet (wireline and mobile) users to stream or download video on their PCs and mobile devices is expected to grow from 665 million in 2016 to around 850 million in 2021. IP video traffic will grow threefold from 2016 to 2021, with a CAGR of 27%.

Figure 1
Connected Devices and Internet Video Users in Europe (M)



Source: IDC, 2018

The rapid growth of video consumption is leading to equally rapid growth in video advertising. We forecast that global expenditure on online (wireline and mobile) video advertising will grow to $19.5 billion in Europe in 2021, with a CAGR

of 28%. Mobile online video advertising is expected to grow at a CAGR of 34% in the forecast period.

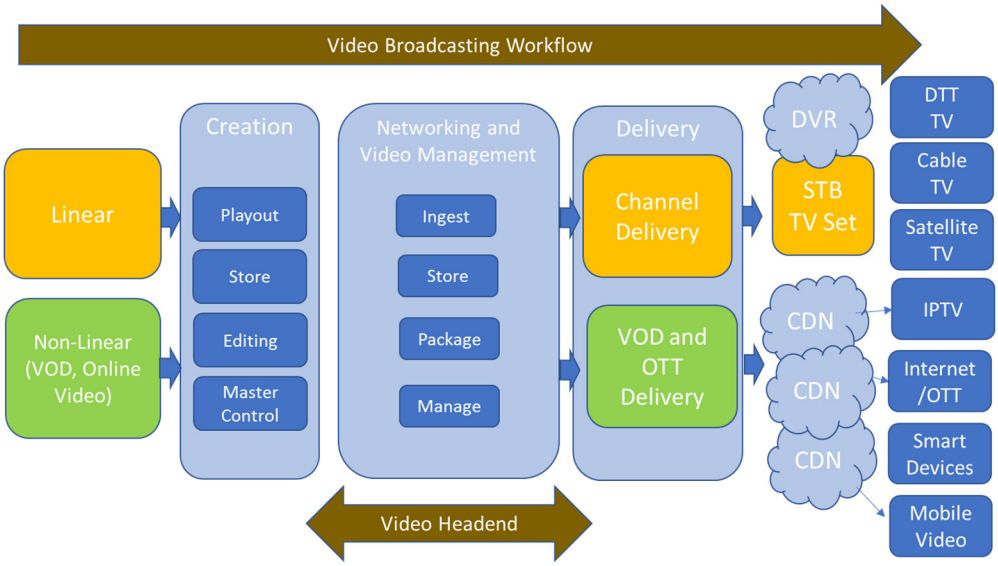
It is clear that IP and digitalization have opened up new business opportunities and introduced a multitude of new players into the ecosystem. For traditional pay TV providers (telco carriers and satellite and cable operators), however, it has become increasingly challenging to grow the "traditional" pay TV ARPUs. The growing pressure on costs forces pay TV operators to seek ways to increase operational efficiency. To strengthen their position in the (non-traditional) online/OTT video market, they need to keep up to speed in offering higher quality video services, increase time to market, and reach a broader range of consumer devices. In addition, these traditional pay TV operators need to upgrade their network infrastructure to deliver the new and personalized services on time and meet today's high-quality standards while limiting capex and lowering opex costs.

In other words, operators need to radically rethink their delivery strategy and how to enhance their video workflow infrastructures. In this Spotlight we take a closer look at the areas in the video workflow that will play a key role in a successful transformation toward optimization and innovation.

Optimization of the Video Workflow

The video workflow is an extensive process which starts with video creation and ends with the reception of video content by the end user. In this chain, one of the key areas service providers will want to optimize is in the video headend. The video headend is the center of technical functions for video management and controls the ingestion, storage, management, and packaging of functionalities. The video headend ecosystem consists of hardware that manages diverse classes of services (linear, VOD, and multiscreen), handling different types of video signals and processing them into the expected delivery platform.

Figure 2
The Video Broadcasting Workflow



Source: IDC, 2018

Traditional pay TV headend systems, however, are not well designed to serve modern video consumption habits. Legacy headends are siloed and still ingest serial digital interface (SDI) video streams; they use single-purpose appliances and hardware. Legacy infrastructure limits fast and efficient adoption of new capabilities which increases the risk of bypassing OTT services. In addition, the complexity of video headends has increased due to the need to adapt to new compression technologies (i.e., HEVC, VP9) and multiple video standards such as standard definition (SD), high definition (HD), 4K, and soon 8K.

Migration to IP Headend

The shift to IP-based transport as a substitute for SDI leads to additional architectural changes in the headend which creates further complexity in the transport formats that need to be supported. Coupled with the broadcasting architectures (e.g., switched digital video), as well as the use of encoding techniques — constant bit rate (CBR), variable bit rate (VBR), and adaptive bit rate (ABR) — this has created a complex mix of scenarios and delivery options.

Slowly, however, we see operators' move toward hybrid headends where IP video can run off software to enable VOD and OTT. The benefits of a hybrid/IP headend are the reduced capex and partial move to opex due to the increasing software functions. However, vendors' video systems have traditionally been fairly non-interoperable, resulting in a separate video headend needed to manage each vendor's equipment. Although conversion to a hybrid/IP video headend system is the first step in the right direction, the complicated architecture and management of proprietary siloed hardware will continue to increase cost and time to market for delivery and monetization of new video services.

CDN Investments

The increasing growth of OTT video users and internet traffic from streaming and downloading videos will continue to impact networks. To bridge the gap between the congested core and the last mile it is crucial to provide content delivery (servers) at the edge to relieve the burden — moving video content and applications in closer proximity to the end users. TV operators will continue to increase spend on content delivery networks (CDNs) to diminish jitter and latency impacts and continue to deliver quality of experience to mobile and fixed video viewers, especially for live video streaming.

In this highly competitive ecosystem TV operators need to invest in technology solutions to get ahead of the curve. This is where virtualization technology comes into play.

Cloud Video Recording (DVR)

Although the majority of TV operators have launched TV Everywhere services, the ability to view TV content on a device of preference is not enough for today's viewers. It is essential that user experiences across set-top-box and TVE environments are fully integrated and offer a consistent experience across all video consumption devices. Deployment of cloud DVR solutions will improve this integration as saved content can be made available beyond the set-top box. Cloud DVR is a great opportunity for pay TV, cable, and telecom operators in their quest to attract new subscribers, reduce churn, and increase the average revenue per user.

Value Proposition of Media Function Virtualization

Migration to hybrid and IP headend systems and investing in CDN (services) and cloud-enabled DVRs are imperative for broadcasters to remain competitive. But in this highly competitive ecosystem TV operators need to invest in technology solutions to get ahead of the curve. This is where virtualization technology comes into play. The main goal of virtualization is to manage workloads by radically transforming traditional computing to make it more scalable. Virtualization has been part of the IT landscape for decades now, and today it can be applied to a wide range of system layers, including networking.

Network function virtualization (NFV) aims to address the problems of current telecom networks that comprise an increasing variety of proprietary hardware appliances. By evolving standard IT virtualization technology diverse network equipment types can be consolidated onto industry-standard high-volume servers, switches, and storage. NFV involves implementing network functions in software that can run on a range of industry-standard server hardware and can be moved to or instantiated in various locations in the network as required, without the need to install new equipment.

In 2012 the European Telecommunications Standards Institute (ETSI) formed an Industry Specification Group (ISG) to develop the standards to virtualize classical telco functions and applications. Since then, the ETSI model has become a blueprint for managed virtual infrastructures and the orchestration and management of virtual functions. Due to the carrier-grade and real-time requirements of the network, it made sense to apply the same model to the virtualization and management infrastructure of media functions within the virtual headend.

By changing the equipment functions to software functions, the virtual headend can manage video processing operations across all available deployment platforms. This way each platform can be leveraged for its unique advantages to deliver optimum processing performance in terms of quality, cost, and efficiency. This approach generates a flexible, scalable pool of resources for all video processing operations. The introduction of an orchestrator managing the virtual functions can be deployed as a single interface decreasing the efforts of managing and monitoring multiple systems for diverse services.

When using a virtualized video processing environment, the capital expenses (capex) can be increasingly reduced by shifting from traditional equipment toward software-based solutions. Functional upgrades or changes in standards and codecs can be achieved without the need for new hardware. On top of that, virtualization and orchestration enable workflow rationalization. Reducing the management of service silos simplifies the operational structure and improves operations, which leads to lower opex for all video processing environments. The virtual headend manager can be enriched with analytics to assure the management of service-level agreements and control predefined key performance indicators (KPIs). A virtualized video workflow enhances capabilities to offer content in new ways, faster. A virtual headend can add new services and channels faster, enabling updates or portfolio adjustments, which ultimately raises the service level.

Successful MFV Use Cases

Red Hat is a prominent provider of open source solutions, using a community-powered approach to provide cloud, virtualization, storage, Linux, and middleware technologies. Its Red Hat OpenStack Platform combines the capabilities of Red Hat Enterprise Linux with Red Hat OpenStack technology to deliver a scalable and secure foundation to build and manage an open private or public cloud. OpenStack depends on Linux as the operating environment for its services, access to hardware resources, and third-party integration with existing or new systems. Red Hat has entered various strategic alliances to extend its provisioning of open technology and solutions to enterprises in a broad range of verticals. In the video broadcasting ecosystem, the vendor works with key partners such as HPE, Cisco, Ericsson, Intel, Nokia/Velocix, Ateme, Harmonic, and Akamai.

Virtualized Headend Ecosystem

Red Hat and HPE jointly enabled Swisscom, the Swiss incumbent telco that also provides pay TV services, to transition from legacy broadcasting appliances to software-based IT infrastructure running on off-the-shelf IT hardware. The MFV deployment is part of HPE's Virtual Headend Manager and Red Hat's multicast-enabled OpenStack cloud platform running on standard x86 hardware. The agnostic virtual headend manager developed for the service provider's live TV headend eliminates the complexity of managing different vendor applications.

Management of the integrated components includes configuration, management, and monitoring of different transcoding, centralizing the processing chain for the IPTV or OTT linear (live) TV channels, as well as monitoring the quality of generated streams. Furthermore, due to the NFV technology in the HPE Virtual Headend Manager, it also provides both GUI and API modes of operation. It leverages the benefits of open standards to enable faster development of functionalities and make use of innovative capabilities.

The new virtualized headend manager has enabled Swisscom to lower costs, optimize its network, and become more agile as it can introduce new channels and services more quickly. MFV has enabled the service provider to shift from a traditional model where appliances had to be purchased at project outset and amortized over multiple years to a model where resources are consumed on demand. The scalable pool of resources enables Swisscom to spin up new TV channels in minutes, when it previously took weeks. It can also repurpose available resources for disaster recovery, if for example a processing node is down, without disruption for the operator's customers, improving the quality of experience (QoE).

Virtualized VOD Solution

For Sky Italia Red Hat deployed its OpenShift Container Platform and Red Hat Gluster Storage service to help virtualize and thus optimize the satellite broadcaster's VOD repository. Sky Italia operates on different broadcasting platforms and with different business models. Its pay TV channels are available via satellite and IPTV. Its online multiscreen offering "NOW TV" includes a smart TV box and TV streaming stick to access live TV channels and VOD.

Sky Italia was strongly expanding its online streaming and on-demand services, and already had more than 2 million connected customers using the on-demand service via its DTH set-top boxes. One of the main challenges was to transcode linear and on-demand content to different devices while maintaining high availability and performance, even in peak hours.

It chose Red Hat's OpenShift Container Platform and Red Hat Gluster Storage to virtualize its on-premise VOD solution to optimize the encoding/transcoding workflow. Initially, as part of a VOD hybrid solution, the TV operator had decided to offload the encoding/transcoding workflow to its cloud platforms. But since transcoding is the most time-consuming part of the workflow and often includes large files (of 20–50GB) this often caused issues such as peering saturation and resulted in high transcoding costs (as costs of transcoding in the cloud increase per byte). Red Hat's virtualization solution enabled Sky Italia to virtualize the encoding/transcoding on-premise (keeping that part of the workflow on-premise) and only offloading exceeding workflow to its cloud platform during peak hours.

The benefits of the virtualized encoding/transcoding workflow include a reduction in editing time from an average of 6 hours to 2.5 to 3 hours. Orchestration of the virtualized workflow enables prioritization of editorial tasks, which contributes to optimization and faster delivery. Building on Red Hat's MFV virtualization solutions has given Sky Italia the same scalability benefits of cloud but at lower price points while maintaining high signal quality and performance.

Virtual CDN

Red Hat has teamed up with Akamai to jointly support a tier 1 European carrier to virtualize its CDNs. A virtual CDN (vCDN) is basically designed to allow TV broadcasters to address scalability challenges experienced during peak demands (when new videos are released or during live streaming events, for example). Instead of relying on dedicated CDN hardware, the virtual CDN runs on virtualized platforms to (virtually) configure network resources, allowing easy and fast caching capacity and enabling efficient use of resources.

Red Hat's MFV solutions leverage container technology which allows CSPs to implement the media functions in a leaner environment, enabling greater agility and flexibility.

One of the key use cases of CDN in the broadcasting industry is to offload origin servers. CDNs are an essential instrument for broadcasters to enable multiscreen offerings (i.e., live TV and VOD services) onto foreign networks. As broadcasters are not able to use multicast routing in foreign networks, CDNs can be leveraged to help offload unicast traffic from the origin servers. Another main use case is to move caching of video content closer to the user to reduce latency and improve performance. As internet traffic surges on the back of increased demand from online VOD delivery, more capacity is needed for caching which leads to bottlenecks in the aggregation of networks, especially during peak usage times or large delivery events.

vCDN helps to optimally provision and turn up new caches and move caching closer to subscribers without dramatically increasing capital and operational costs. In addition, vCDN also tackles another problem in the increasing number of physical CDNs. In a similar way, vCDN removes the need to stack up (CDN) hardware closer to the viewers to address scalability challenges during peak capacity needs. To address similar overcapacity issues from a mobile video

perspective, virtualization of mobile network functions, or mobile edge computing, will become increasingly important to optimize 5G networks.

Applying MFV technology to the video broadcasting workflow seems very promising for the many benefits it brings to TV operators. However, there are a number of things that need to be taken into consideration when transforming to a virtualized headend ecosystem. For one, it takes initial investment and ongoing costs for new software and orchestration systems. In addition, without a well-defined adoption strategy, transformation may take longer than anticipated and this can impact the overall return on investment. From an operational perspective the CSPs/TV operators need to realize they need to work on readiness of the network, from a security angle and in terms of staff readiness. Consulting services are needed to guide service providers on the virtualization journey to avoid the hurdles already mentioned.

Conclusion

In conclusion, Red Hat has shown how NFV technology can be applied to the same model for the virtualization and management infrastructure of media functions within the virtual headend. Together with its strategic partners, Red Hat demonstrates it has leveraged its OpenShift Container Platform, OpenStack technology, and Red Hat Gluster Storage solutions and services to help telco operators achieve cost reduction by moving away from proprietary, hardware-based infrastructures, and leverage the agility and optimization of virtual headend management.

Successful use cases demonstrate how MFV has helped TV operators to not only lower costs but also ensure high quality of performance and quality of service. Virtualization of the video workflow has enabled these TV service providers to expand in an optimized way and offer content and services in a new, faster way, enabling updates or portfolio adjustments, which ultimately raises the service level and QoE.

Red Hat's MFV solutions leverage container technology which allows CSPs to implement the media functions in a leaner environment, enabling greater agility and flexibility. This is a clear differentiator of Red Hat's MFV solutions and services, providing a future virtual headend that will eventually remove barriers between content creation and delivery functions. It proves Red Hat is clearly a thought leader in the MFV arena as it leverages its open source, cloud, virtualization, and container technology expertise to help accommodate the increasing online video traffic on trillions of (mobile) devices in the years ahead.

IDC UK

5th Floor, Ealing Cross,
85 Uxbridge Road
London
W5 5TH, United Kingdom
44.208.987.7100
Twitter: @IDC
idc-community.com
www.idc.com

About IDC

International Data Corporation (IDC) is the premier global provider of market intelligence, advisory services, and events for the information technology, telecommunications and consumer technology markets. IDC helps IT professionals, business executives, and the investment community make fact-based decisions on technology purchases and business strategy. More than 1,100 IDC analysts provide global, regional, and local expertise on technology and industry opportunities and trends in over 110 countries worldwide. For 50 years, IDC has provided strategic insights to help our clients achieve their key business objectives. IDC is a subsidiary of IDG, the world's leading technology media, research, and events company.