

TV Unlimited: How Cloud DVR Will Transform Video Services

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The consumer market for video services is more challenging than ever for operators.

In this environment, a well-known part of the pay-TV offering may hold the key to improved profitability and competitiveness in video services – **the DVR**.

The movement of DVR functionality from TV-connected devices into the operator's network represents a potential transformation of pay TV, providing the flexibility to offer a variety of new service options, features, consumer experiences, and revenue opportunities.

A Challenging Environment for Operators

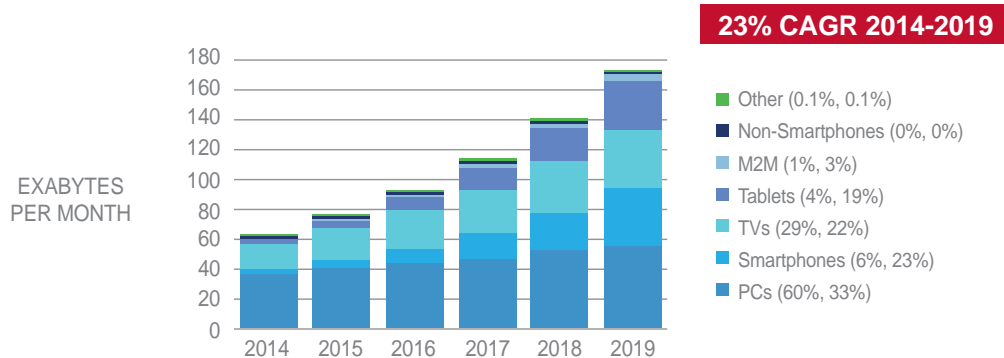
IN A CERTAIN SENSE, THERE HAS NEVER BEEN A BETTER TIME TO BE IN THE VIDEO BUSINESS.

Demand is high and increasing across the globe. Consumers are watching record amounts of video, filling available time with their favorite TV programs and movies. The total number of screens within homes continues to rise, including TVs, computers, tablets, and smartphones. To meet this demand, operator networks are offering greater capacity and performance than has been available in the past, delivering broadband speeds of a gigabit per second or faster.

According to **Cisco's Visual Networking Index (VNI) Global IP Traffic Forecast**, consumption of video across all screens will continue to grow, with video-enabled mobile devices driving most of the growth in IP traffic.

GLOBAL IP TRAFFIC BY DEVICE TYPE

BY 2019, NON-PC DEVICES WILL DRIVE 67% OF GLOBAL IP TRAFFIC



Device Percentages (x, y) refer to 2014, 2019 device share

Source: Cisco VNI Global IP Traffic Forecast, 2014-2019

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While pay TV's strength and primary source of revenues is in linear, broadcast TV, a substantial and quickly growing portion of consumption is on-demand.

ALMOST ONE-HALF OF ALL VIDEO VIEWING ON THE TV BY U.S. BROADBAND HOUSEHOLDS TODAY IS ON-DEMAND, INCLUDING OTT, PHYSICAL MEDIA, OPERATOR VOD, AND RECORDED CONTENT.

While operators offer free and paid VOD to satisfy users' appetite for on-demand viewing, many consumers are turning to OTT video services to meet their content needs, in part due to the easier discoverability of and multiscreen access to interesting content.

FRAGMENTATION OF THE CONSUMER EXPERIENCE IS ALSO A CHALLENGE.

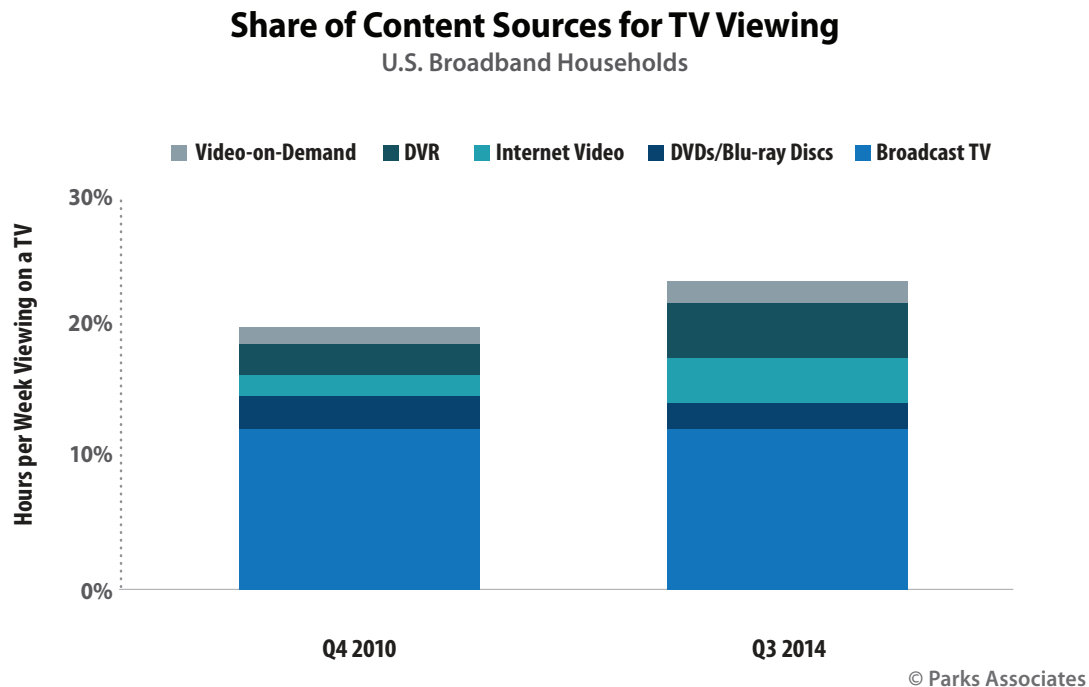
Operators have countered the OTT onslaught with their own multiscreen experiences, but pay-TV content from the television is often inconsistently available to consumers on other connected devices. Again, the desire to access preferred content on preferred devices is driving consumers into the arms of OTT video services.

The widespread and growing availability of content options for consumers exacerbates another challenge for operators – ARPUs. In an environment of cord shaving (consumers reducing their pay-TV spend in favor of OTT or other alternatives), operators need features that can both satisfy consumers' changing preferences and drive incremental revenues.

The Good and Bad of the Traditional DVR

Despite initial fears that the DVR would ultimately hurt the television industry, this TV-connected device has proven to be a godsend. The DVR allows consumers to avoid missing their favorite programming and also lets them consume greater volumes of content by shifting consumption to more convenient times. Viewers can more easily follow serialized content, which keeps them engaged and helps maintain or build audiences throughout a programming season.

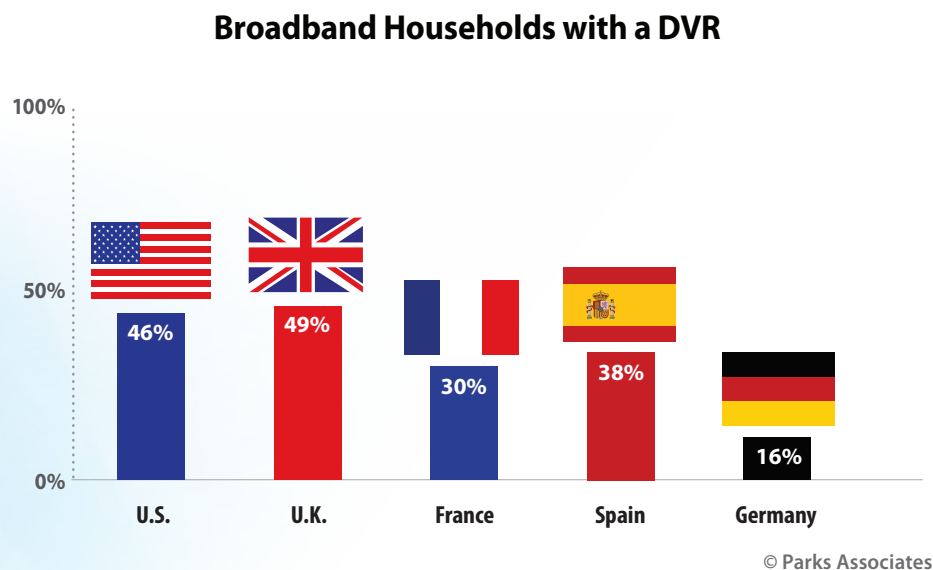
DVR-based video consumption has continued to rise over the past few years, with the average hours of DVR-recorded content watched per month almost doubling since 2010.



DVR viewing is one of the few pay-TV features that has kept pace with the increasing use of OTT video services on the television.

While the U.S. market has the highest penetration of operator-provided DVRs (78% of all DVRs are provided as part of a pay-TV service), figures in Europe are notable as well.

The DVR is highly popular among consumers and provides incremental revenues for operators.



Some aspects of the DVR are frustrating to consumers.

Managing storage – Consumers must regularly review their DVR recordings in order to have adequate space for more programs. HD-quality recordings exacerbate this challenge. In households of many viewers, users must gather consensus or risk deleting programs wanted by others.

Recording conflicts – Consumers must occasionally choose which desired programs to record and which ones to miss. Though some operators and set-top box makers have addressed this problem by adding more tuners, this solution results in a more expensive device and/or service tier for the consumer, and raises costs for the operator.

Content stuck in the box – Older or less expensive DVRs may not have connectivity to allow other devices to access recorded content. While more expensive DVRs include multiroom capabilities, allowing other set-top boxes in the home to access content recorded on the DVR, only a small percentage of DVRs currently allow multiscreen access to recorded content.

Box-based features – Over time, consumers are left with older DVRs lacking the compelling features of new consumer products entering the market. Even DVRs that have Internet connectivity and that can have the software and firmware dynamically updated are still constrained by the processor, on-board memory, and physical hardware features of the device.

Device failure – The availability of a user's DVR recordings is only as good as the reliability of the device. Consumers who have purchased their own DVR face a repair bill or a replacement purchase as well as loss of their recorded content. Where consumers receive a DVR as part of their pay-TV service, the operator foots the replacement bill and also receives the wrath of their subscriber if the device fails.

Likewise, operators are faced with their own challenges related to the DVR.

CPE cost – Adding recording functionality and storage to the set-top box increases the cost of the device. Operators must also increase the number of tuners in the set-top box to allow users to watch an alternative program while recording or to support multiple concurrent recordings. CPE-related costs are a particular challenge in low ARPU markets.

Reliability – A common point of failure for DVR-enabled set-top boxes is the hard drive used for storing recorded content. Problems with the device's storage result in additional support costs and returned set-top boxes.

Lagging feature sets – Most classic DVRs cannot stack up against the latest connected CE devices entering the market today. Many new devices offer integration with social media, personalized features, and portable viewing.

Lack of upsell path beyond the core service – While many operator-delivered services have options for upgrades and premium features, the traditional DVR has only a limited upgrade potential beyond the monthly fee for the set-top box. Since the core functionality is tied to the CPE device, upgrades to greater storage capacity, tuners, or additional features must also carry the cost of set-top box replacement.

As a result of these challenges and the growing popularity and use of the DVR, many operators are now considering changes to the traditional TV-connected DVR.

A Look into Cloud DVR

Many of the challenges for the traditional DVR are related to limitations of the physical device itself. Virtualizing components of the DVR eliminates these physical constraints and offers several unique benefits. However, operators quickly realize that the simple idea of moving the scheduling, recording and storage functionality from the device into the network is a surprisingly complex task that affects multiple systems, especially as they consider adding multiscreen access to recording and playback functionality.

THE DVR SERVES AS A BRIDGE BETWEEN THE LINEAR BROADCAST WORLD AND THE ON-DEMAND WORLD SOUGHT BY CONSUMERS. THE FUNCTIONS OF A CLOUD DVR TOUCH UPON BOTH OF THESE AREAS.

Storage of a video file seems straightforward. Yet, where the content is stored impacts the performance of video playback and the volume of traffic across the operator's network, especially for multiscreen delivery. Content rights also complicate storage, particularly in markets where regulation, law, and license agreements determine whether operators must store a copy for each household or maintain a single copy that can be accessed by many subscribers. These content rights can significantly impact the cost for storing and delivering cloud-recorded content.

A **scheduler** allows users to specify the content that they wish to record and activates the recording from the live, linear stream. Unlike the traditional scheduler operating within the DVR device, a cloud-based scheduler interacts with several network-based components of the cloud DVR. The scheduler is commonly integrated into the EPG in order to provide a familiar user interface for viewers. Since the EPG may run on the set-top box, be tied into the operator's middleware, or run entirely in the operator's network, the integration of the EPG, scheduler, and recording function is a complex effort.

A **policy control and rights management system** is necessary to ensure that the pay-TV operator is meeting its licensing and content protection obligations and that users have the right to schedule, record, and play back the selected content on their devices. The cloud-based policy control must interact with multiple business and rights management systems to authorize and entitle multiple users and devices, as well as to resolve conflicts that can arise as the number of users and devices per account increase.

Cloud DVR implementations may include **ad insertion** systems that provide revenue opportunities in ways that most CPE-based DVRs cannot. Operators can replace ads in recorded content with ones that are better targeted to the viewer. Since advertisers only pay for ads that are played from the DVR within three (or at most seven) days after broadcast, pay-TV operators can generate ad revenues by inserting new and more relevant ads into content played after this period.

Though the transition from CPE-based DVR to cloud-based DVR is complex, the move to the cloud adds improved flexibility and features that can unlock new potential revenue and service opportunities.

Playout of the recorded file involves many components common to OTT and on-demand delivery systems. **Multiscreen** content packaging functions prepare the video files into various bit rates and profiles to ensure quality playback across consumer screens such as smartphones, tablets, and other Internet-connected devices. A **content management system** draws out the selected content to be played for users as it is requested.

The Impact of Cloud DVR

CLOUD DVR CAN HAVE A SUBSTANTIAL IMPACT ON THE WAYS IN WHICH VIDEO IS DELIVERED, MONETIZED, AND CONSUMED.

One of the most striking areas of impact is in the potential elevation of the user experience, including the following areas:

Improved insight

Device-based DVRs offer pay-TV providers little, if any, data on the viewing and recording habits of their subscribers. In contrast, cloud DVR allows operators to see nuanced usage details on content recording, viewing, and storage for individual users, households, or in aggregate. These details help operators understand the evolving habits of consumers, refine content offerings, and position those offerings to maximize revenues. This insight also allows operators to tune their infrastructure and improve the operational performance of the cloud DVR system.

Greater personalization

With a wealth of new usage data, pay-TV providers can provide a deeper level of personalization to subscribers. The EPG and discovery tools can be optimized to the preferences of the particular user or household, allowing consumers to find desired content more quickly across linear, on-demand, and recorded content. Leveraging viewing history and preferences, the cloud DVR can offer a more seamless experience by predictively recording content that consumers may have forgotten to select for recording.

Reduced consumer frustration

Many of the DVR-related consumer frustrations involve restrictions in the device itself. No longer will consumers face loss of their recorded content if the hard drive fails. In addition, the number of recordings is no longer gated by the number of tuners on the set-top box or the size of a local hard drive. Not only will these factors reduce frustration, but they will also reduce the number of DVR-related support calls and device replacement costs faced by operators.

New experiences

With greater control over the content and features, the cloud DVR introduces new user-experience possibilities. For example, the cloud DVR can ensure that programs are recorded in full, rather than being cut off, as can occur when programs run beyond their scheduled length or when changes in the actual broadcast are not reflected in the schedule. Alternatively, the service may allow users to download recorded content to authenticated devices for offline playback.

Business Value of Cloud DVR Cisco Perspective

Unlimited flexibility by combining intelligence and control with cloud recording and storage



- Manage storage with content lifecycle policies to control retention and use metadata to ensure recording requests capture the complete event
- Remove duplicate recordings and advertising—as defined by policy—to optimize common and unique copy recordings
- Intelligently cache recorded content in the network or the STB based on booking popularity or network load
- Personalize recording management, bookmarks, favorites and discovery to individual user profiles

Virtualizing the DVR introduces a variety of new features that can differentiate a pay-TV service and provide options that consumers cannot receive with traditional TV-connected DVRs.

Unlimited storage

Of the feature benefits produced by cloud DVR, unlimited storage is the one that most resonates with consumers. Since this feature is unique to cloud DVR, consumers will only be able to receive it from participating pay-TV providers. Operators can scale the amount of storage per customer, transforming unlimited storage into both a differentiating feature and a premium upgrade.

OVER 50% of U.S. pay-TV subscribers state that unlimited storage is very appealing.

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Multiscreen access

While OTT video services and aspects of the pay-TV service are accessible on Internet-connected devices, the DVR remains one of the few holdouts in the multiscreen trend. The ability to access recorded content on multiple connected screens is a feature desired by consumers. However, multiscreen access to recorded content is largely unavailable in most markets and for most DVRs.

OVER 33% of U.S. pay-TV households find it very appealing to access recorded content on multiple connected screens.

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Blending live, catch-up, and on-demand viewing

In the end, consumers simply want to watch programming when it is convenient to their schedule. Cloud DVR can make this viewing seamless and allows pay-TV providers to implement user interfaces that blur the lines between live, catch-up, and recorded or on-demand programming across all consumer screens.

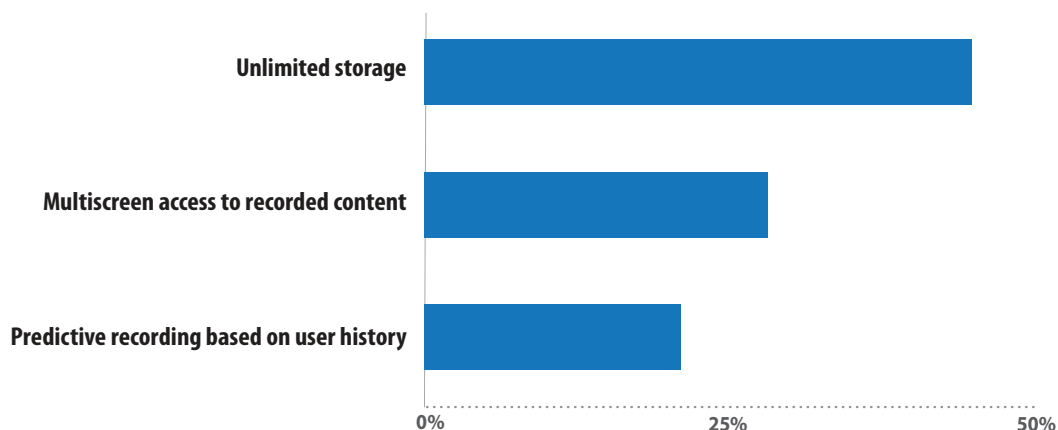
Virtualization provides operators with a level of flexibility that is simply not possible with CPE-based DVRs.

In an era of quickly changing user habits and competitive forces, greater flexibility can be an important competitive advantage.

- **Greater control of content** – With CPE-based DVRs, pay-TV providers have virtually no control over the content recorded to the set-top box. With cloud DVR, pay-TV providers have greater control over the content and the user's interaction with that content. In addition to scaling the total volume that can be recorded, pay-TV providers can set parameters such as limits on how long recordings are archived or the devices that can play back recorded content. This level of control is particularly attractive to content partners, and pay-TV providers can use it to help secure and monetize the content rights needed for cloud DVR.
- **Ability to dynamically replace ads** – In markets such as North America, where operators actively participate in ad sales, cloud DVR ad insertion provides new ad inventory that can be sold alongside broadcast advertising. For operators in other markets, cloud DVR advertising represents an entirely new source of revenue. With greater control over the content, operators can also set policies on the viewer's ability to skip ads during playback of recorded content.
- **Flexibility in business models and new experiences** – Because the cloud DVR operates within the managed network, operators are able to modify the system software at the network level rather than on each set-top box. So, new business models, features, and service capabilities can be deployed as a software upgrade to all subscribers. As a result, operators can better respond to changing market dynamics and introduce innovative services at the Internet speeds consumers increasingly expect.
- **Ability to leverage legacy hardware** – Since new innovations can be implemented in the network, operators are able to offer new capabilities without wholesale replacement of set-top boxes. This flexibility can extend the life of existing CPE devices and also minimize the hassles faced by subscribers in exchanging equipment.
- **Potential for increased penetration** – With a cloud-based approach to the DVR, operators can promote DVR services in ways that are not feasible with CPE-based DVRs. For example, operators can offer limited trials to introduce consumers to cloud DVR or to new premium cloud DVR features.

Demand for Cloud DVR Features

U.S. Broadband Households



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Unlocking the Potential

With an increasingly competitive market for video services, operators need new, unique services that can provide differentiation, delight users, and produce incremental revenues. Improvements to the DVR represent an enhancement of one of the operator's core businesses. It is an offering that is well understood and accepted by consumers, providing a reliable base for adoption.

Although content restrictions remain in some markets, content producers and rights holders are now more open to discussions about the benefits of cloud DVR, including greater control over content and participation in advertising revenues. As this obstacle is overcome, cloud DVR is likely to see increased interest among pay-TV providers.

Cloud DVR opens up new video service options that the pay-TV operator can uniquely provide.

With an ability to record a near-infinite amount of content and to play it back on any device, pay-TV operators have an opportunity to capture a greater share of video consumption, including viewing that may be going to OTT video services.

Combined with greater flexibility and enhanced service features, this new area of innovation represents a potential transformation of video services and the way that content is consumed.

Evolving to the Infinite Possibilities of Cloud DVR



This paper examines how the transformation of today's DVR services from TV-connected devices to a cloud-based infrastructure opens up vast new opportunities across the entire media value chain – from the content provider and pay-TV service provider through to the subscriber.

Navigating the business and technical challenges of this transformation requires a platform that reaches broadly across the ecosystem of linear, on demand, and multiscreen content preparation, distribution and experience delivery.

The platform should be grounded in an architecture that combines:

- The elasticity to scale resources to meet changing requirements
- The flexibility to manage and modify control systems to accommodate dynamic business policies
- The agility to rapidly and seamlessly provision new experiences that satisfy evolving consumer desires.

The first stage of this transformation has provided cloud-based and elastic recording and storage capabilities which are unavailable in the set-top box. But it is the combination of an intelligent and dynamic policy control system with an elastic video processing infrastructure that can enable service and content providers to approach the infinite possibilities available with cloud DVR.

The solution is founded on Cisco's experience delivering DVR hardware and software to pay-TV providers worldwide, alongside the policy controls for managing and evolving scheduling and recording functions to connected devices and the cloud, and established performance powering demanding video recording and playback systems.

Cisco provides a pre-integrated solution for cloud DVR which combines the management and control of content scheduling, recording, user preferences and business policies with elastic video processing functions for transcoding, recording, storing and packaging content. It enables the complete transformation of DVR functionality from an in-home architecture to a cloud-based and multiscreen architecture.

Built on a foundation of open, modular and cloud-based components, the **Cisco cloud DVR solution** enables you to elastically support multiple video services such as Live, VOD and Time Shift TV. It provisions cloud resources as requests for recordings, storage and multiscreen playback sessions increase and releases them as requests are completed. Control plane integration provides the essential policy controls, account management and personalization capabilities you need to authorize multiscreen scheduling, recording and playback, upsell service tiers to subscribers, create personalized offers, and enable new functionality.

For more information, please visit: [Cisco Cloud DVR Solution](#)



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As a director of research at Parks Associates, Brett Sappington leads Parks Associates services research team, including access and entertainment services, digital media, OTT, cloud media, video gaming, and technical support services. Brett is an expert in worldwide television and broadband services. His personal research focuses on the activities and trends among operators and the market forces affecting their businesses.

Brett has spent over eighteen years in the industry as an analyst, executive manager, and entrepreneur. Brett holds an MBA from the University of Texas at Austin with a concentration in high-tech marketing and a BA in physics from Baylor University.

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