Pragmatic Recommendations to Monetize the Video Experience™
EXECUTIVE SUMMARY
Operators and content providers face many business and technical challenges in providing video entertainment services to today’s consumers. The methods for video delivery are becoming more complicated every month, with rapid industry innovation such as UltraHD TV, associated new encoding standards, the use of content delivery networks, and the move to using virtualized data center architectures in both private and public clouds. Serious competitive pressures to provide the best quality of experience, debates around regulation due to industry consolidation and net neutrality, the challenges of how to leverage the influx of data produced, and how to cope with the vast amount of video that will be flowing into the mobile infrastructure over the next 5 years are also compounding the complexities of offering superior video services.

This paper examines these complexities and suggests processes and methods to leverage advanced video analytics to provide the best video services and generate the best return on investment. The analytics discussed provide a framework to enable content providers and operators to truly Monetize The Video Experience™.

THE MONETIZATION CYCLE
For video service providers with access to good content that consumers are prepared to pay for, there are three main phases to monetizing video services: assuring the delivery, optimizing the delivery, and personalizing the delivery.

ASSURE
Delivering Video is Difficult
Assure the Video Experience

OPTIMIZE
Delivering Video is Expensive
Profile the infrastructure & Content Delivery

PERSONALIZE
Deliver Video Services and
Advertising that is Relevant
ASSURING DELIVERY

The first phase is assuring video delivery and quality. Quality is extremely important, as consumers will not pay for services if the quality is bad. Additionally, they will tend to look for another supplier of the content, which immediately creates a churn issue. There are numerous statistics that show how likely people are to leave when they have a bad quality experience, as well as how hard it is and how long it can take to bring those people back once they have decided to move on. Thus, making sure the subscribers have a good experience is paramount.

If there are no alternative suppliers of the same content in that region, then customers will typically use word of mouth or social media to complain about the provider to others and create brand-damage, which has been the case recently with high profile content delivery failures. The danger is that the content provider may be adversely impacted when it may be the local service provider at fault, or in some cases, the other way around. Either way, all brands associated with the delivery of the content are affected.

Video delivery has always been a challenge, due to the time-sensitive nature of video, and it pinpoints faults in networks like no other type of data, whether head-end issues, switch or router buffering challenges, or problems with the infrastructure edge, last mile or customer premise equipment. Video is affected far more by heavy jitter or poor connections than any other type of traffic, as the viewing experience can be greatly impacted by relatively minor issues. This is a lesson learned in IPTV or cable video deployments, where packet loss can cause numerous effects, from basic pixelization (blocks) to much greater viewing impact (black screen, freeze frame, audio loss) depending on the data that was in the lost packet. The greater the compression and the larger the screen size, the more noticeable the impact can be on the viewing experience.

In adaptive networks, packet loss should be accounted for by packet retransmissions as Transmission Control Protocol (TCP) is used as the underlying delivery mechanism for HTTP adaptive video, but every retransmission on the network uses up valuable bandwidth leading to more congestion and network delay. This congestion, in turn, can lead to video packet delivery delay, with the eventual impact being video buffer depletion on the end device creating the well-known circular buffering symbols.

These customer-impacting scenarios are key factors in the current innovations to move video caching further towards the edge of operator networks, as well as removing video loading from the core networks as video consumption increases. This will ultimately reduce network congestion and result in a better customer experience, assuming the many other factors that can affect video delivery are monitored and dealt with in a timely manner

OPTIMIZE DELIVERY

The second phase of monetization is optimizing the network infrastructure and the amount of individual content being delivered, as networks are very expensive to build and operate. Anything that can be done to optimize and “tune” the video delivery to get the maximum return on the network infrastructure capital expenditure, and to make sure that the highest-value services get to the people that are prepared to pay for them, is critical.
A key factor of optimizing video delivery that can often be overlooked is choosing what “not” to do. Service providers need accurate data to be able to decide which services to terminate, as they may not be delivering a substantial return on investment, and, in-turn, are lowering the company profit margins. In many cases, companies may continue to run services because they have always been there, or because many people have a historical connection to the service. However, unless public services are involved, private companies can little afford to run video services that are not profitable (via the content fees, advertising, associated merchandise or otherwise).

For companies that may be providing premium carriage services for content providers, it is also important to be able to prove service level agreement (SLA) compliance. A service provider may under-provision and impact viewing quality, or may also over-provision for the video carriage, and could possibly reallocate some of the bandwidth to other services. Optimization through the use of quality and behavioral analytics will provide intelligence for these scenarios. The analytics will also be critical for mobile operators looking to have more intelligence around the video being delivered across their networks, especially with the amount of video forecast to hit the mobile infrastructure over the next 5 years as Long-Term Evolution (LTE) becomes more common. For mobile operators having a vested interest in premium content being delivered, they will need the analytics for their own services. For mobile operators acting as a pipe for third party content, the analytics will be important to tune the networks for other competitive reasons, e.g. the best operator in a region for video streaming. Either way, video analytics will need to be a key part of a mobile operator's strategy in future.

The use of third party content delivery networks (CDN) is also a key factor in the cost of video delivery today. Many operators turn to the third party CDN providers when they don’t own their network infrastructure and need to de-risk or supplement the launch of a multiscreen service, or simply need the fastest time-to-market for the launch of a multiscreen service. Content providers may also de-risk video delivery by using multiple CDN providers and attempt to work out which providers offer the best services at different times of the day to optimize provisioning. In any of these scenarios, it is important to have the analytics on hand to decide on the optimal use of the CDN providers by balancing quality and cost, and, as the number of subscribers increases, whether to make the switch to building out a CDN capability of their own.

Optimization without quality is possibly good for efficiency but will ultimately drive customers away. Conversely, quality without optimization will retain customers but reduce potential profit margins or expansion capabilities due to delivery inefficiencies. By having quality and optimization, video service providers can really start to look at driving maximum monetization through the third phase – personalization.

PERSONALIZED RECOMMENDATIONS, ADVERTISING AND CHARGING

Personalization is appropriate targeting of existing paid-for content, new associated services, and more focused advertising to consumers based on their viewing habits, location and preferences. Depending on demographics and the age of the subscribers, targeting of content and advertising may be viewed as perfectly acceptable, or a “big brother” tactic. However, statistics are increasingly showing that content recommendations and targeted advertising are becoming more and more acceptable, with increasing amounts of consumers watching longer pre-roll ads before content, or actively engaging with
recommendation menus in video service portals. Provided that video and advertising content become more relevant, people will be more accepting. It’s the feeling of being “spammed” that people really don’t like.

To enable personalization of content and advertising, video providers need to be able to understand the what, when, where, how and “on what” of video consumption. If the data is available that allows the provider to better tune the services to the needs of the subscriber, then the subscriber will feel looked after and be more open to spending more money on additional services.

The key to doing this is to have access to the right data in a time period when it can really make a difference. Many forms of data analysis can be done on a medium to long-term basis to identify longer-term trending patterns, but with the rapid pace of change in viewing habits, and the ease with which people can access video-capable devices, the need for real-time analytics is increasing dramatically.

This need for real-time data also ties nicely into the industry’s “Big Data” themes for “high-velocity data” or “data streaming” where critical data can be analyzed and cross-referenced to OSS/BSS systems in real-time to provide better service response time and enable greater monetization (see later).

**INDUSTRY COMPLEXITY**

The Monetization Cycle provides a guidance path for monetizing video, but coping with the rapidly changing landscape of video is a huge challenge for content providers and operators alike. The diagram below illustrates some of the complexity facing the industry today, with many of these trends being interlinked in ways unimaginable in the past. These trends provide an incredible challenge today for video service providers with employee skillsets that fall into distinct silos (assuming they even have the skills in-house), but finding people with skills across multiple silos is becoming a lot more challenging.
One example is UltraHD and the use of the new HEVC encoding/decoding methods. Moving to a higher resolution of video is nothing new to the video industry for cable and IPTV, but moving to a higher resolution while moving to virtualized head-ends in the cloud, delivering HEVC-encoded DASH-based adaptive streams across operator-based, third party, or virtualized CDN infrastructures, is something completely different. Add in the complexity of digital rights management across an exponentially growing number of consumer platforms, and the world looks very different to when the industry moved from standard definition (SD) to high-definition (HD) across walled-garden networks using controlled set-top boxes (STBs) for video consumption. The traditional wire-line broadband operators certainly have a rapid educational task ahead, and the cable operators also have additional complexity on their hands with the migration to the Converged Cable Access Platform (CCAP).

Additionally, mobile operators who have never had to deal with the nuances of video delivery in the past, will have a mountain to climb as 4G LTE starts to provide another valuable broadband pipe to consumers. It is well known that video will utilize any bandwidth available, and as soon as consumers realize they can continue to consume video in high quality as they go mobile, they will inevitably want to do it more often.

When this ongoing complexity is coupled with the monetization cycle, it becomes apparent that the two are intimately linked, and video service providers will need to form a unified iterative approach to be able to deliver the best quality and returns.

**THE ITERATIVE MONETIZATION CYCLE**

Looking at the typical model of a video service provider with a goal to increase multiscreen subscribers over time and factoring in the complexity of industry innovation over the next 3-5 years, it becomes very apparent that going through the monetization cycle once and hoping for the best is not a valid strategy for success. Even if there are no fundamental changes to the delivery infrastructure or addition of new codecs, the simple act of attracting more subscribers and adding more video loading to the core network or CDN infrastructure is enough by itself to warrant a re-run of the monetization cycle. This is key to ensure that quality and efficiency remain paramount as a foundation for attracting and growing the subscriber base further. To cater for the additional changes in video delivery and innovation highlighted in the below chart, it is absolutely necessary to make the monetization cycle an iterative, continuous process.
In order to do this, the data will need to be continuous, meaningful and scalable, or the resulting information will lay wasted and stagnate, reducing the value of the data and leaving valuable monetization potential on the table. It is therefore essential that analytics collected for the multiscreen service can be processed quickly into meaningful, actionable analytics that can interface rapidly with other big data systems for customer support, business profiling, marketing and ad-insertion targeting. If the video analytics application-level processing can be offloaded from the big data analytics teams, then the valuable resources in that team can focus on leveraging the data for monetization rather than trying to understand it in the first place.

Video service providers are beginning to understand this model as they move into phase 2 of their multiscreen video deployments, and are learning from their phase 1 assumptions. Many are also realizing that pre-launch testing of a multiscreen video service (especially if premium paid-for content is involved) is not only wise, but also essential. In some cases it is possible to disrupt new CDN infrastructures designed for many tens of gigabits of traffic with only a few gigabits of loading due to configuration issues in the CDN.

With all this in mind, the need for unified analytics that handle operational quality assurance, as well as providing real-time and historical behavioral analytics, is a path many video service providers will need to follow. The following sections describe the different deployment scenarios and the analytics possible today and in the near future.

**ADVANCED OPERATIONAL AND BEHAVIORAL ANALYTICS**

Looking at IPTV and cable video deployments, much of the data collected from the delivery infrastructure is operational analytics – video service assurance data that provides the ability for the operations teams to be able to identify issues in the delivery infrastructure, and hone in on the root cause of those issues by locating the origin of the problem. The green arrows on the diagram below highlight operational probe points, with the uppermost section being representative of traditional cable and IPTV deployments delivering to STBs in the home.
In contrast, the purple arrows represent behavioral or viewershhip analytics, providing much more intelligence about what is actually being consumed from which location, on which kind of device and for how long. For the traditional IPTV and cable markets, the behavioral analytics would be representative of the kind of data that can be extracted from monitoring video on demand (VoD) or switched digital video (SDV) control-plane traffic between the STBs and the servers. It is also possible to extract behavioral analytics in this environment by monitoring RTP packet refill traffic in the network for systems with refill servers that attempt to fill missing packets reported by the STBs in the home.

A similar view of operational and behavioral traffic can be seen when moving into the adaptive streaming, or over-the-top (OTT) world of video delivery, represented by the multiscreen and OTT path. The original video streams are transcoded into multiple bit rates, and then segmented and packaged ready for transmission across the relevant CDN infrastructure, whether operator-owned or provided by a third party CDN carrier. The operational probe points occur at every major change-point in the network, whereas the behavioral data can only be obtained after the last caching point in the infrastructure. Due to the nature of caching, the full unicast video streams can only be seen after the caching nodes. This means that independent behavioral data can be harvested post caching if the service provider owns the CDN and can access the caching nodes (point “A”) or an aggregation node further downstream. When using a third party CDN for the video delivery, the independent behavioral data can only be obtained by harvesting data from the end point devices themselves (points “B” – see later).

If the operator CDN or the third party CDN is feeding video to a mobile operator, and the mobile operator is not performing caching on the video, then it is also possible to see the operational and behavioral data at the ingress to the mobile gateway, before the video enters the mobile core (points “C”).

Network Functions Virtualization (NFV) will play a major part in the future of video delivery and analytics for both wire-line and mobile operators, and areas where this will be important will be at the caching nodes (point “D”) and across the mobile core and radio access networks (RAN). As caching technology evolves to run on virtualized data center architectures, independent analytics can run virtualized in parallel with the caching software, and monitor the adaptive streams via the virtual switch fabrics. This allows the use of independent analytics for a variety of caching server technologies, even in a virtualized environment, and also provides a method for mobile equipment manufacturers and mobile operators to instrument the mobile core and RAN with industry-proven video analytics as video becomes more prevalent for mobile.

The other area where virtualized analytics plays a part is monitoring the output of a third party CDN. The active test capability built into the analytics engine can behave like an end point device and request streams from the network. By virtualizing the analytics engine on a cloud server, it is possible to request streams from a CDN in any geographic location, and validate the operation of the video streams, as well as profile the CDN’s ability to deliver the streams in a timely fashion at that location. This allows the active testing capability to provide an operational demarcation point at the edge of the third party or operator CDN, and isolate whether consumer issues are due to the last mile infrastructure or the CDN delivering the video stream. By validating at this point, it also provides assurance that the streams were correctly segmented and packaged at the video head-end. This cloud-monitoring capability is shown at point “E” on the diagram.
The last elements are the end point devices themselves, and this is where it is important to understand the difference between a service-centric view versus a network-centric view of the video. By placing analytics capabilities in the end device player, it is possible to provide a view of how well the video service is being delivered to, and played out by, that particular player. This perspective can then be aggregated across many devices to provide a good view of how well the video is playing out, and how well the network infrastructure, or multiple network infrastructures (if using multiple content delivery networks), are delivering that particular video service at different times.

However, as with the early days of IPTV and set top box agents, an end point device agent will tell you “when” the service is bad, but not necessarily “why” it is bad. For example, the end point device can report that a premium sports channel is bad, but it won’t know that it is bad because the serving CDN is suddenly consumed by a mass of viral video content going elsewhere, a huge operating system update is consuming the valuable capacity needed for time-sensitive video delivery, or a there has been a head-end failure in the video transcoding or packaging for a particular adaptive protocol or asset. Some triangulation can be done from the end points given advanced centralized analytics, but the real answer is to combine core and device-level monitoring through a unified analytics system.

In summary, operational analytics will point out where the video service is breaking down, and allow the operations team to pinpoint the starting location for the problem. Behavioral analytics will provide the viewership intelligence to know what is happening with the video from a consumption basis.

The real power, however, happens when the two are overlaid, and the video service providers start to understand the reasons “why” subscribers are abandoning assets or advertisements. This then enables much more proactive churn management so subscribers with issues can be targeted “before” they leave the service, and advertising can be targeted on a finer-grained, more intelligence-led basis.

Another valuable use for combining quality and behavioral analytics is to profile a network infrastructure’s ability to deliver video. Consider being able to track the quality of video as a subscriber drives across a city, or takes a rail journey between major cities. For example, in a controlled profiling exercise, several hundred users could use the same type of device, and stream the same video asset to benchmark the infrastructure’s capability to carry HLS traffic across a city. This kind of testing could then be done for different protocols, and then a mix of different devices and protocols. It may sound complex, but this is the nature of adaptive video streaming, and understanding an infrastructure’s capability to deliver video, whether over a Wi-Fi cloud, broadband network, or mobile infrastructure is paramount to the successful monetization of video. It can also be applied whether the carrier provides the content, or just carries it as a premium service.
Video consumers are fickle, and even if the content is free, mobile consumers are likely to switch carriers if they can get a better service from another provider; so mapping the infrastructure’s capability for delivering video is becoming more essential. This can also provide valuable insight into peak loadings if the mapping can be executed in real-time and time-sliced to profile network behavior at different times of the day or week.

INTEGRATION WITH OSS/BSS SYSTEMS

The analytics discussed so far produce a lot of data, and it is essential that the data is processed in real-time rather than being dropped into a big data farm where only 3% of the data will probably ever be used again. As a result, video analytics systems need to be able to dynamically process the data at multiple levels, and enable data streaming capabilities for rapid integration into operation support systems (OSS) and business support systems (BSS) for customer support, business intelligence, or advertising management.

By processing the operational and behavioral data in real-time, and providing meaningful, actionable data, the valuable human resources that Chief Information Officers and Chief Data Officers have for analyzing data can be applied to correlating the video analytics with other systems. Thus allowing them to really focus on the monetization aspects rather than trying to make sense of terabytes of video data. Provided that the analytics system has rich web services access and enables access to additional data if required, the video analytics subsystem can take a huge workload off the big data team and solve a big resourcing problem facing the industry today – application-level knowledge of video.

Video data has always been, and will continue to be very useful for historical pattern and trend analysis. However, one trend that the industry is starting to embrace is the dynamic provisioning of services and
resources through the use of Software Defined Networking (SDN). SDN by its nature relies on real-time feedback to be able to do the dynamic provisioning, and real-time video analytics will be a key enabling factor.

The marketing industry is also starting to wake up to the potential of accurate advertising analytics rather than estimated impressions based on sampling. This is driving some new thinking in the advertising world where advertising rates can be more accurately profiled and time-sliced, if it is known what and when people are watching with a great deal more accuracy. This also fuels the move towards real-time bidding (RTB), where advertisers can bid on an advertising slot in 15 minutes time (for example), based on knowing how many people watched the advertising slot 15 minutes previously. RTB is increasing in popularity, and it will only take a few advertising and operator pioneers to realize the potential for real-time analytics and remove much of the ambiguity in advertising imprint counting and value today.

**CONCLUSION**

In summary, there are a number of factors to consider when realizing the potential for monetizing video:

- Customer time-to-resolution expectations have changed, so high-velocity fault identification and proactive churn management is becoming essential to customer retention.
- Anything that can be done to reduce capex and squeeze more from existing networks is extremely valuable.
- Video delivery is consuming the current telecommunications networks, and will have an enormous impact on the mobile infrastructure.
- Change will be continuous for many years to come and needs to be managed on an iterative basis.
- Content is expensive, so leveraging behavioral data dynamically and historically is essential to maximizing the revenue.
- Customers are becoming more accepting of analytics collection when it leads to better recommendations and relevant advertising.
- There is significant potential to monetize video by targeting and tracking relevant advertising and impressions in real-time.
- Better quality = more subscribers = more advertising views

This paper has discussed the challenges faced by video content and service providers, and the possibilities to deal with those challenges through the use of advanced operational and behavioral analytics. Not all analytics will fit every scenario, so it is important to fully understand the options available based on who controls the parts of the video delivery chain, and the visibility that is feasible based on those constraints.

The next several years are going to be very interesting and challenging for operators, content providers and the advertising industry, with some very powerful catalysts for change. It’s going to be an exciting time for analytics innovation that enable operators to tune content services and advertising to truly Monetize the Video Experience™.
ABOUT INEOQUEST TECHNOLOGIES

With over 600 global customers, IneoQuest is the global leader in video analytics and service assurance solutions that enable video providers to monetize the video experience. IneoQuest’s solutions monitor, analyze and optimize video – independent of the screen or network – with end-to-end visibility into every subscriber, viewing experience, and channel. IneoQuest gives customers the ability to monetize the video experience through verifying and assuring the quality of every viewing experience, understanding and expanding their subscriber base, and growing their returns on capital investments and digital assets. Clients include service providers, broadcasters, content providers, government, equipment manufacturers and enterprises.