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Thought leadership from Atos

***white
paper***

**Video: The power
of moving pictures;
from glass to glass**

As humans, some of our strongest emotional responses come from visual input. For most, it is the primary sensory input and accounts for more than 50 percent of our brain's activity.

This white paper outlines the importance of video, the major technical and business challenges that industries face, and describes the opportunities opening up for system integrators, like Atos. Atos is continually enhancing the delivery of video and video-related services from the camera lens to the viewer's screen; from glass to glass.

Video: The power of moving pictures; from glass to glass

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About the Atos Scientific Community

The Atos Scientific Community is a network of some 100 top scientists, representing a mix of all skills and backgrounds, and coming from all geographies where Atos operates. Publicly launched by Thierry Breton, Chairman and CEO of Atos, the establishment of this community highlights the importance of innovation in the dynamic IT services market and the need for a proactive approach to identify and anticipate game changing technologies.

Introduction

Visual images offer a high-density, high-impact means of absorbing information. Images, and increasingly moving images, are all around us, in our homes, businesses, and throughout the environment, and they undoubtedly shape the way we think, learn, behave, and interact.

Video is more and more influencing the way we go about our everyday lives. Video conferences, video business cards, smart phones with video features, images projected onto a car windscreen, facial recognition, augmented reality, and movies with holographic effects are just a few examples that illustrate how video services have or will become an even more integral part of our lives. Video will become so omnipresent and embedded that it will be the normal medium of communication. Video of tomorrow is the paper of today.

Video is also driving technological innovations, including solutions that address the vast growth of data and the need for storage and increased bandwidth; these needs are relevant to other areas of IT too. There are many new opportunities emerging in the delivery of video-related solutions; from integrating the infrastructure required to capture, store, and deliver video stream, to the provision of end-user services, advanced indexing and search capabilities, and the enrichment of content with metadata.

Video will become so omnipresent and embedded that it will be the normal medium of communication.

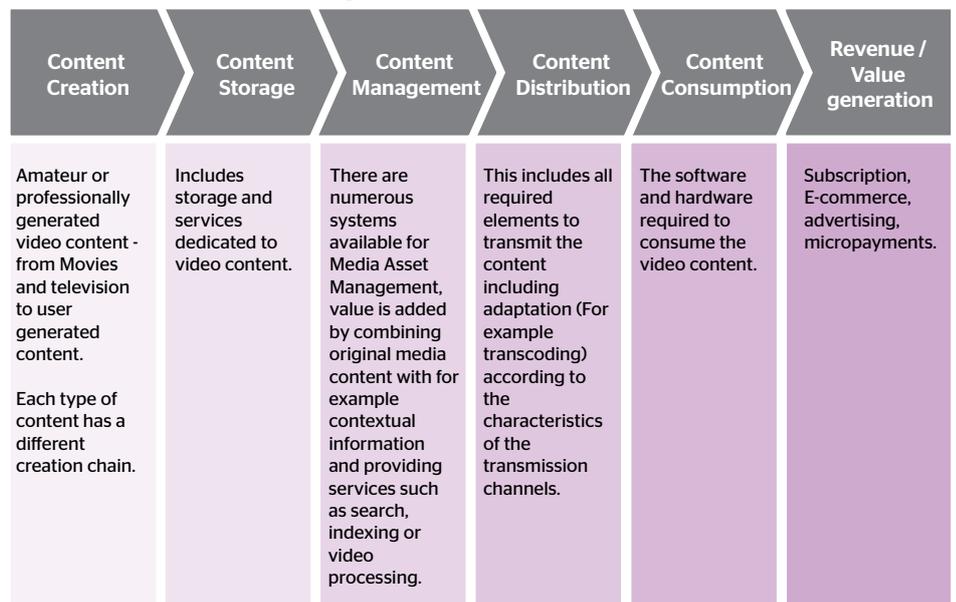
Business context for video

Video in this white paper refers to the IT-based solutions that include digital video content capture, processing, and transmission as their core components. The paper also considers video content management and delivery, including video data archiving and video streaming, whether the content is professionally or privately created. There are many other aspects to video and there is a vast array of uses of video technology, however these are not the main focus of this Atos Scientific Community white paper.

Video Content Management and Delivery

New video-based service offerings are emerging. Of particular interest is online video as it is driving a significant change in the consumption of video content. The importance of online video grows daily, and the audience for online video and online video consumption is exploding. The value chain for video content management is explained below.

Value chain for video content management



The explosion of video

Today

- ▶ Video-sharing site usage increased from 33% in 2006 to 71% in 2011.
- ▶ Internet video to TV tripled bandwidth in 2010 = 40% percent of consumer Internet traffic in 2010.
- ▶ 4 billion views a day on YouTube. 8 hours of video were uploaded every minute in 2007, 60 hours in 2011.
- ▶ 85.6% of the US Internet audience viewed online video in June 2011.

Tomorrow

- ▶ Every second, 1 million minutes of video content will cross the network in 2015.
- ▶ Internet video will reach 62% of Internet traffic by the end of 2015.
- ▶ Internet video TV will represent over 16% of consumer Internet video traffic in 2015, compared to 7% in 2010.
- ▶ Video-on-demand traffic will triple by 2015 (equivalent to 3 billion DVDs per month).
- ▶ 36 million TVs with built-in Internet capability will be in UK homes by the end of 2016.

References¹⁻²⁻³⁻⁴

¹<http://www.pewinternet.org/Reports/2011/Video-sharing-sites/Report.aspx> (July 2011)

²http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-481360.pdf

³<http://youtube-global.blogspot.com/2011/05/thanks-youtube-community-for-two-big.html> (May 2011)

⁴http://www.comscore.com/Press_Events/Press_Releases/2011/7/comScore_Releases_June_2011_US_Online_Video_Rankings (June 2011)

Composing and Video Sharing

Since YouTube launched its video-sharing service in 2005, it has become the largest Internet video storage and sharing site. Vimeo and DailyMotion also offer similar services. It is expected that Asia will surpass North America (the current leader) in the consumption and monetization of online video; YouTube will fall behind Youku and Tudou as US video viewership peaks and Asia continues to soar⁵. Whilst we expect the content and consumption across these geographies to remain separate markets (due to, for instance, language differences - audio and image translation services within video could offer new opportunities), there is no reason why the underlying technology cannot be common.

Interactive capabilities and integration with social networks, such as Facebook, provide a large potential market that has not yet been completely monetized. Only premium-user services and advertising messages provide revenue returns to Google (YouTube was acquired by Google in 2006). For other video-sharing providers, most services are advertising-based. Google does not split YouTube earnings from global results, but it is estimated that it doubled its revenue during 2010 and reached \$1 Billion revenue in 2011⁶. There are some other trends, including the emergence of specialized sites offering different types of content, like TED which offers conference videos from all kinds of speakers and on all kinds of topics.

Interactive & Multimedia-based Content Services

Traditional video-on-demand (VoD) services have evolved into advanced interactive services based on new platforms and channels. IPTV and mobile services allow new service providers, such as Apple (iTunes, Apple TV), Hulu, and Netflix to offer huge content catalogues via these new channels; most generating revenues through subscription fees or advertising.

Although the use of interactive services is not as prevalent as video sharing, it has already attracted widespread support and is steadily increasing.

ITCasting

Broadcasting, the traditional distribution of audio/video signals is transforming into ITCasting; the delivery of content over IT networks. ITCasting focuses on managing the individual experience of select content on computers or mobile devices, and takes advantage of the associated metadata to enrich the end-user experience. Live interactive video and VoD features are typically associated with ITCasting solutions.

With Over The Top (OTT) technologies, the video is distributed through a television set which is connected to the Internet as well as to a content distributor, like a cable or satellite provider. New industry standards are growing, such as the mainly EU-based Hybrid Broadcast Broadband TV (HbbTV) which is defined and supported by a large consortium of broadcasting, Internet, and TV manufacturers. Television sets connected to the Internet are expected to number around 550 million in 2016, which will represent 20 percent of all televisions around the world⁹.

Traditional broadcasters (such as BBC, TF1, RTVE, RAI and NBC) with large content production capabilities and holding rights for the transmission of popular content, such as sports and movies are taking the lead in the ITCasting market. Their commercial models are typically based on advertising and/or public financing, and they use the Internet as a new distribution channel. Subscriptions to premium services are also becoming a viable option.

New players, such as large Internet services providers (ISPs) and telecom operators, like Terra and Everything Everywhere, are also providing premium services to subscribers, merging traditional broadcast components with new Internet-based services.

Interactive capabilities and integration with social networks provide a large potential market that has not yet been completely monetized.

Google broadcast all matches of the 2011 'Copa America' football tournament live on a dedicated channel. Fans across 50 countries without traditional TV coverage were able to watch live matches and highlight clips of the entire competition on-demand. Google also agreed with NBC to deliver video services for the London 2012 Olympics

References¹⁰⁻¹¹

145 million unique viewers of online video services in the US (Jan 2011): 110 million accessed YouTube; 32 million were on Facebook; 12 million on Hulu and 7 million on Netflix.

Netflix revenues from online-only subscribers in the US will grow from \$172 million this year to \$578 million in 2013. Adding Hulu Plus, the combined streaming revenues from both companies will reach an estimated \$800 million in two years⁷⁻⁸.

⁵<http://blog.vidcompare.com/>

⁶<http://allthingsd.com/20100305/another-youtube-revenue-guess-1-billion-in-2011/>

⁷http://blog.nielsen.com/nielsenwire/online_mobile/january-2011-online-video-usage-up-45/ (February 2011)

⁸<http://techcrunch.com/2011/04/05/streaming-tv-800-million-netflix-hulu/> (April 2011)

⁹Source: Digital TV Research

Video Publishing and Management Platforms

Video publishing and management platforms are frequently used for storing, controlling, versioning, publishing, and distributing all types of video assets. Managed digital content may include videos, pictures, ads, metadata, and web content. A variety of solutions exists, delivered in several models. Among the providers, a large number of (traditional) niche players compete with large software vendors (such as Microsoft, Adobe, and Oracle) who are providing digital content management suites.

The professional need for video content management and delivery goes beyond broadcasters and extends to large enterprise sectors. Applications such as training, externally-generated news feeds, and marketing materials are becoming more and more popular. Communication based on multimedia is becoming the standard for many companies¹².

- ▶ By 2013, 25% of business communication content that workers see will be images, audio, or video.
- ▶ Video usage within the enterprise is expected to grow at an annual rate of nearly 50% over the next five years.
- ▶ Annual corporate spending on online multimedia will grow from \$350 million in 2007 to over \$1 billion in 2011.

Video Archiving & Indexing

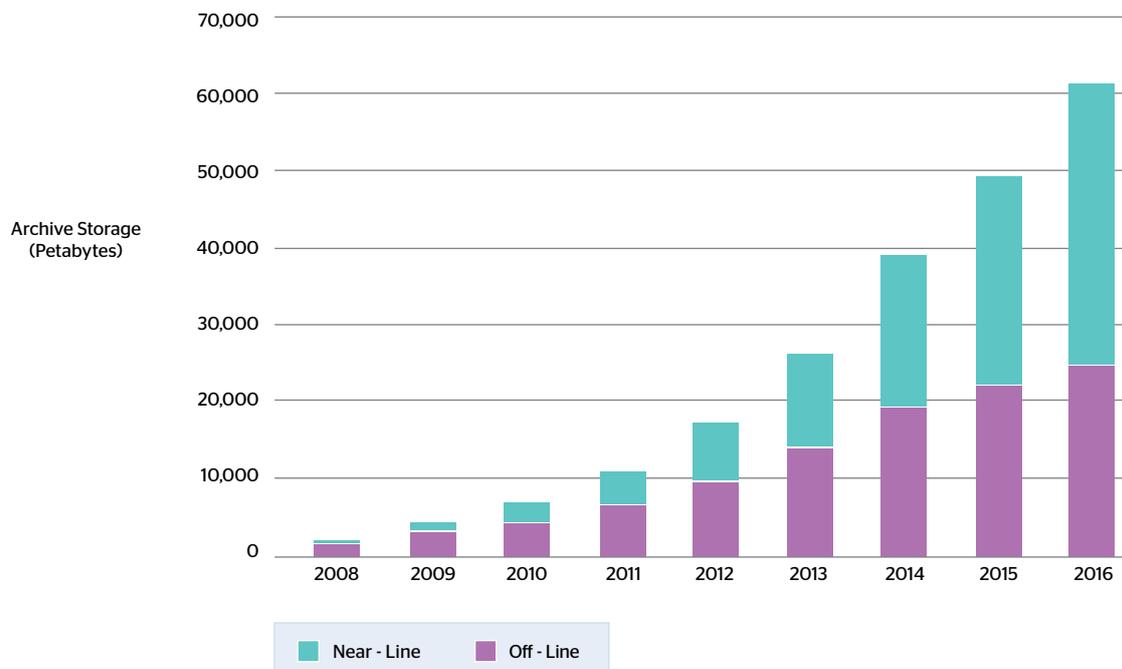
According to Gartner¹³, the data storage market has significantly increased in terms of revenue in the last couple of years, growing 18.1 percent in 2010 and 9.8 percent in 2011, and achieving \$21.2 billion in 2011.

The main players (EMC, IBM, NetApp, HP, Hitachi, Dell or Oracle) in the ECB (External

Controller-Based Disk Storage) market have realized that one of the key drivers for this growth is video and media storage¹⁴. It is estimated that total revenue for media and entertainment storage will increase by 280 percent from 2008 to 2014 (\$3.5 billion to \$9.9 billion)¹⁵.

The value chain for video and media storage includes processes for recording, encoding, image processing, archiving, and indexing. Many niche companies, like BlueARC, Isilon, Omneon, DataDirect Networks, Aspera and EVS, provide these additional services; thereby augmenting the pure storage layer. The main players in data storage have defined their own strategies via alliances with specific software providers (for example Aspera) or acquisitions (Isilon was bought by EMC for \$2.25 billion and Omneon by Harmonic for \$274 million). Apple has announced an agreement to buy 12 petabytes of Isilon storage technology for its iTunes services.

Growth in Near-Line and Off-Line Digital Storage for Content Archiving



¹⁰ <http://www.youtube.com/copaamerica>

¹¹ <http://thenextweb.com/google/2012/03/07/nbc-partners-with-youtube-to-deliver-video-services-for-the-london-2012-olympics/>

¹² <http://vimeo.com/26774751> (July 2011)

¹³ <http://www.gartner.com/it/page.jsp?id=1577214>; <http://www.gartner.com/it/page.jsp?id=1946115>

¹⁴ <http://www.activearchive.com/content/active-archives-enable-media-and-entertainment-monetization>

¹⁵ http://www.org.id.tue.nl/FIP-TC14/documents/Coughlin_Digital_Storage_Professional_Media2.pdf

Video Indexing, a key part of storage and processing services that helps classify and identify information about video content, is a challenge that has not yet been completely solved by the industry (see section 2.1 Challenges Related to Technology). Google and Exalead, amongst others, are working on their natural language processing technologies and LSI (Latent Semantic Indexing) to provide more relevant search results from video content. However, as James Turner said, "Images are subject to more than one interpretation; text is not. Text can stand alone; images rarely do."¹⁶

Online Video Platforms

Software-as-a-Service (SaaS) is taking the form of online video platforms (OVPs), providing end-to-end tools to manage, publish, and measure online video content for both on-demand and live delivery, including hosting, encoding, syndication, analytics, and advertising through third parties. Providers such as Brightcove, Ooyala and open-source Kaltura are offering these services to medium-sized and large organizations that require a professional platform and are not willing to invest in large in-house infrastructure deployments. Vimeo is also trying to leverage the infrastructure it has already built for casual or semi-professional video producers, extending it to small- and medium-sized businesses that require video hosting¹⁷.

Content Delivery Networks

Content delivery networks (CDNs) have been a key enabler of the video content revolution over the Internet with major players like Akamai, Limelight, and Level3 basing their core business charging model on bandwidth consumption. On top of traditional caching and streaming, their services are evolving to facilitate video archiving, management, and distribution over multiple channels.

Telecom providers such as AT&T are building CDN offerings on top of their large points of presence and are now competing with traditional CDNs. In addition, Cloud providers like Amazon with CloudFront¹⁸ are launching services that enable multimedia content delivery. However, service levels, reliability, and reach are still behind those of a pure-play CDN.

Other Applications

Traditional video calls and new voice IP-based services have evolved into reliable enterprise unified communication systems (UCSs).

Video conferencing: Focusing on business needs, advanced (and managed) services to provide video conference and 'telepresence' (one step beyond video conferencing, which provides a more real sense of presence and proximity) already exist. The current economic environment is accelerating the adoption of these solutions that, amongst other benefits, help reduce travelling costs.

Video will also become an essential part of enterprise collaboration, adding instant communication or enhanced VoD features (such as advanced searches).

Videoconferencing and telepresence in the enterprise, traditionally a market for hardware and appliance vendors such as Tandberg and Polycom, are now part of compelling 'unified communications' solutions that can include other collaboration features, such as web communications and desktop sharing. As a consequence, major IT players such as CISCO (that acquired Tandberg in a clear move to enlarge its reach in the collaboration arena) and Microsoft with Lync and OCS are becoming serious competitors.

Video Indexing is a challenge that has not yet been completely solved by the industry.

- ▶ It is predicted that the video conferencing and telepresence market will more than double by 2015, hitting \$5.0 billion.
- ▶ Video conferencing is currently used by 67% of large corporations, while web conferencing use is above 70%.
- ▶ The global team collaboration and web conferencing market is expected to reach \$19.97 billion by the year 2015.

References¹⁹⁻²⁰

¹⁶ <http://www.slideshare.net/misscybrarian/video-indexing-and-retrieval>

¹⁷ <http://gigaom.com/video/vimeo-to-take-on-brightcove-ooyala-for-video-hosting/>

¹⁸ <http://aws.amazon.com/cloudfront/>

¹⁹ <http://www.infonetics.com/pr/2011/4Q10-Enterprise-Telepresence-Video-Conferencing-Market-Highlights.asp>

²⁰ <http://www.salisonline.org/market-research/globalteam-collaboration-software-audio-video-web-conferencing-solutions-market-2009-2015/> (May 2011)

In addition to the UCS uses described above, video data is used in a large number of applications for a variety of industries, ranging from medical to industry to advertising. For example, the placement of video cameras within the human body during complex surgery or on a remote oil drilling platform facilitates the intervention of specialists; minimizing risks, providing access to wider pools of knowledge and expertise, and reducing overall costs.

CCTV (close-circuit television) services are also widely used for security and industrial purposes. Current CCTV systems are typically based on IP-based protocols similar to the ones used for video communications. A high-definition security system using a Wi-Fi mesh network with Cloud storage and facial recognition, accessed and controlled using iPad and iPhone devices, was recently implemented at Fulham Football club in the UK by EMC²¹.

Many other typical uses of video include public advertising, traffic control, and a large range of research fields.

New content consumption trends

New multimedia consumption trends take advantage of video, but not in isolation. Viewers are now becoming active and expect enriched content to complete their viewing experience.

- ▶ Viewers expect to receive additional information from different sources: user-generated content, social networks, sensors, and mobile contextual information all add value to edited video contents. Information from social networks will become richer and will be exploited automatically (for instance, immediate feedback on how much a particular moment of a match was relevant for users through the analysis of social networks). The emerging concept of the 'second screen' will allow viewers to enhance their experience with contextual information via a mobile device while enjoying a broadcast on a large screen (or indeed by actually being at the event in person).
- ▶ Personalized and proactive view of events: viewers have their own preferences and context-aware multimedia presentations

can utilize 'memorized' user preferences to automatically present the most relevant information to that user in their preferred format. Complex and structured content (video and metadata from different sources) enable self-direction (as in a movie director) of the core video content and additional related data streams.

- ▶ Permanent and ubiquitous access to information: media consumers expect to have immediate, permanent, and easy access to information anytime and anywhere. Users will have access to their 'personalized virtual desktops' across devices (smart phone, connected TV, holograms, etc.) and will access the content through completely personalized views (akin to the concept of 'three screens and a Cloud': phone, computer, and TV set that access value-added services delivered from a Cloud).
- ▶ Educational support: some initiatives based on video are providing advanced services for educational purposes. Khan Academy²² with more than 3,000 videos and lessons provides a wide content offering for topics, from basic arithmetic to advanced math. Udacity²³, based on a popular AI Stanford course, has joined and provides advanced research educational contents, showing how video can spread knowledge.

Demystifying 3D

3D multiview is a complete environment for gaming, simulators, virtual reality, etc. in which the user can interact and move freely. 3D video is a more elaborate form of video with a third spatial dimension (or more accurately, the illusion of a third spatial dimension).

3D technology is fashionable at the moment, but it is still not clear whether it will ultimately be a commercial success outside cinemas, gaming, and virtual reality. One of the more promising areas in 3D is the improvements being made in the areas of conversion of 2D to 3D, and especially the

Regulatory Context and Exploitation Rights

When dealing with video content management and distribution, the major regulation concern relates to the right of exploitation that rights holders acquire from rights owners. These rights are typically based on geographies (where content can be distributed), time, and distribution channels (such as Internet, broadcasting TV, and DVD).

Rights holding and its exploitation has become a business in itself for large media groups. Some groups produce content and exploit their rights (examples include Sony and Time Warner), others simply acquire, redistribute, and resell exploitation rights (for instance, sport broadcasting rights holders). There are initiatives to include digital rights in video streaming technology, for instance in HTML5 video contents, as Google, Microsoft and Netflix have proposed to W3C²⁴.

²¹ <http://www.bbc.co.uk/news/technology-14899893> (September 2011)

²² <http://www.khanacademy.org/>

²³ <http://www.udacity.com>

²⁴ <http://dvcs.w3.org/hg/html-media/raw-file/tip/encrypted-media/encrypted-media.html>

The challenges

The rapid evolution of technologies around video raises a series of challenges related, not only to technology, but also to the business generated around them. These challenges are explored below.

Challenges Related to Technology

Impact on underlying technologies

Probably the biggest challenge facing the Internet in the coming years is the exponential growth in traffic. Much of this will be attributable to video and increasing 3D traffic.

- ▶ Bandwidth capacity is one of the main challenges faced by video services providers. Companies need to assess network infrastructure readiness prior to adopting video-based technologies.
- ▶ Video has large storage requirements that grow exponentially with the requirement for multiple encoding technologies. Video storage also requires supporting technologies to index data and enable searching.
- ▶ Reducing CDN cost will be also a key factor for video delivery services.
- ▶ For both videoconferencing and video calls, communications infrastructure will become the key price factor, and telecom operators will benefit from a significant increase in bandwidth demand and utilization.

The vast majority of Internet traffic consists of content being disseminated from a source to a number of users - content-centric networking (CCN) architecture aims to ensure that the source for the data is situated as close as possible to the user, taking advantage of intelligent nodes and caching.

Guarantee Quality of Service (QoS) and Quality of Experience (QoE)

Immediacy is now an expectation in the Internet era and speed of access is a challenge for online video. Content capture, post production and publishing must fit the schedule of the rights holders who provided the content, and that content and related data have to be available to the multimedia user as soon as possible.

The digitization and encoding required to publish video content are currently considered too slow, and multiple encoding and delivery formats extend the publishing process.

Users want online video to be delivered with good quality. Buffering delays or bad audio quality may dissuade a user from watching a video, ultimately impacting revenue for businesses. Due to the huge number of online video offerings, a high quality of service may actually be a key differentiator for a provider.

Other efficiencies for video distribution are improved coding techniques, such as scalable video coding (SVC) or multiple description coding (MDC), or the use of peer-to-peer (P2P) technologies for streaming. The current use of the BitTorrent P2P protocol may be one of the causes of Internet bandwidth saturation; P2P for streaming could also be a solution.

Storage - Video and Big Data

Growth of data in the world today is phenomenal: 90% of the world's digital data was produced within the past two years. Most of it is unstructured and a large proportion is related to video. There are many new technologies and techniques that have been developed to handle these vast sets of data. Hardware infrastructures need to 'scale out' to accommodate the physical housing and processing of information. High-performance storage networks (such as Infiniband), scale-out and distribute file systems, clustering technologies, and massive parallel processing now need to underpin these large systems.

The storage challenges faced for video are similar to those addressed by the Big Data problem. But it's not just the storage of the data that is required, it needs to be analyzed and indexed, there has to be an understanding of who's watching it and which parts, and it needs to be made searchable - securely whilst managing privacy aspects accordingly.

Indexing and Search Solutions

Other important areas for the evolution of video include video analysis, annotation, indexing, search, and recommendation. A clear example is offered by the difficulties users experience finding the right video in a video-sharing platform like YouTube or Vimeo. This refers more precisely to:

- ▶ Image and audio recognition within a video.
- ▶ Complexity of the information provided by images.
- ▶ Automated metadata generation: video analysis consumes huge amounts of CPU - how can billions of videos be annotated?
- ▶ Without good annotations, search and recommendation are unfeasible at this time.

But gradually, technologies such as audio to text, facial recognition, pattern recognition, and image comparisons are improving both in quality and throughput. Atos expects that video annotation on an Internet-wide scale will emerge shortly. GPU programming (orders of magnitude faster in terms of analysis of graphical content) and crowd sourcing will also play an important role. Once properly annotated video is available then the whole process of indexing, searching, and recommending video becomes much simpler.

Semantic search technologies that seek to improve accuracy by understanding the intent of the searcher and the contextual meaning of terms²⁵ are being touted as a solution, but have not as yet lived up to their initial promise.

Long-term Digital Preservation

Access to digital information needs to be guaranteed over time, as does the elimination of the risk of data being lost due to an obsolete format or a discontinued technology. This is especially complicated when taking into account the databases and metadata associated with the content.

In the future, true end-to-end solutions for multimedia asset management will have to consider these issues as more and more of our cultural heritage (not to mention legal, medical, and financial requirements) are associated with digital video.

Tablets of information produced many thousands of years ago can still be read, but few people can still access precious and relatively recent Super-8, Philips V2000, Betamax, VHS and even HD-DVD format media.

Challenges Related to Business

Content protection

Perhaps one of the more challenging aspects of this developing communications paradigm is not so much the technology itself, but how it can be delivered within a relevant and workable business model. The simple fact is that once data becomes more accessible and easier to share, it is potentially easier for ownership to be abused.

Bona fide video distributors have made multiple attempts to 'lock down' content through encryption and cooperation with electronic device manufacturers, in order to prevent illegal copying. However, in some ways such approaches are at odds with the content owners desire to maximize the legitimate distribution of their material. Over recent years, the emphasis has shifted much more towards the control of distribution of content rather than control over the ability to view it.

Besides concerns relating to ownership, privacy protection (personal data, medical images, annotation and tagging of videos with personal data, etc.) must also be considered. Helping to secure the privacy of personal data with mechanisms built into solutions could create additional value for end users and content processors alike.

²⁵http://en.wikipedia.org/wiki/Semantic_search

Piracy

There is an ongoing debate in the market over the application of different digital rights management (DRM) technologies and whether there should be greater control over content production and the distribution of video. On one hand, most producers are still fighting for the strong legal and technical protection of their assets; on the other, technology is allowing easy and fast content copy, download, and distribution. There is no one magic solution; the market has seen similar situations in the past. As an example, when video cassette recorders (VCRs) were first introduced in the 70s, the movie industry was convinced that they would destroy their business. After a long legal battle, VCRs were accepted as legal and not considered to violate copyright. VCR and tape prices went down, and within five years the movie industry was getting 50 percent of its revenue from video rentals²⁶.

Funding

How to monetize the distribution and use of video content and how to identify copyright ownership are two key questions that need to be addressed.

Facilitating access to content, simplifying the subscription process and the payment of the fees, or offering bundles of content may help the monetization of services. Detection of the transmission of copyrighted material and automated micropayments, perhaps through ISP or mobile phone account charges, could well form part of a viable business model for protecting revenues from copyright material in the future. Similar technologies and approaches to those used for improving indexing and searching of content could be applied to monetizing the use of content.

A close eye should be kept on the growing role of CDN providers, particularly their place at the heart of the content distribution chain which puts them in an ideal position to support their role as both 'network police' and 'content tax collector'. Atos also foresees the appearance of business models where content or services are provided for free and the content provider can monetize viewer data and viewing habits.

Atos also foresees the appearance of business models where content or services are provided for free and the content provider can monetize viewer data and viewing habits.

²⁶http://www.ficodtves/index.php?seccion=ver_video&id=92 (James Boyle: Intellectual Property Rights in the new digital society)

The role of the IT service provider in the delivery of video services

How are IT service providers (Atos in particular) contributing to this video revolution? IT is at the heart or can provide solutions to address most of the challenges described above.

Infrastructure Solutions

One of the most obvious ways in which IT services providers can contribute to the delivery of large-scale video services is in the provision of infrastructure; from simple hosting services, complete data center operation with high-end service level agreements (SLAs), and burst processing in the Cloud, to the management of broadcast infrastructure. As an example, Atos manages the live delivery of broadcast video to an entire country for a major European broadcaster.

IT services providers also already offer, or are working on, various video-related topics; exploiting their wider experience in data and security services. Some examples include:

- ▶ Live and on-demand data encoding, transcoding, and streaming services.
- ▶ Storage and archiving of content, including meta-tagging and indexing.
- ▶ Security services such as rights management-as-a-service.
- ▶ CDN services, partnering with CDN providers and ISPs; combining their offerings and including provider management and expense management services.

Media Asset Management-based Solutions

In addition to traditional integration solutions with video content management and delivery, the correlation of video content with further information from other sources opens a large number of opportunities for the industry. Examples include speech analysis, speaker and image recognition, behavioral tracking, and correlation with social network data.

These types of information also facilitate services based on the data analysis of archived content. Transaction-based business models can be built on servicing requests for specific information. New technologies, based on Big Data, could support the provision of complex data analysis that correlates content from different sources, including social networks.

Atos predicts that broadcasters will use such services, obtaining information regarding audiences, user profiles, and particular interests. With proper data protection, this information could also be valuable for other parties, such as media analysts. Rights management could also be provided as a service for broadcasters or even end users.

Long-Term Storage and Access

A huge issue for the industry is the long-term storage and preservation of video archives. This requires a combination of infrastructure and media asset management and involves ensuring that archives are both accessible and safe over the long term in the context of evolving hardware and software environments. All content producers need to start facing this problem, in particular traditional broadcasters who have millions of hours of content, much of which is already in danger of being lost forever. The IT services industry must proactively help to address the issue of digital preservation.

Other Opportunities

Other fields such as unified communications, training, security, and remote assistance offer integrators a large area for the development of offerings, including.

- ▶ Managed videoconferencing services on top of unified communication solutions or the combination of videoconferencing with features described as 'media asset management-based solutions' (e.g. information about speakers being made visible to (selected) conferencing participants, or object recognition; editing by participants of a document shown in a video).
- ▶ Social video: video and content recommendations with the potential for generating advertisements based on contents and user/customer profile.
- ▶ Training support and audit via interactive video training, including simulations and virtual or remote assistants (e.g. doctors or remote diagnosis of equipment).

Systems Integration

Finally, IT services providers are required to consolidate all components described above in order to deliver services for end users. The video market relies strongly on third-party components, which are evolving rapidly. Integrators will play a key role in guaranteeing that services are packaged and delivered under strict service levels. Only structured integration practices, such as application management and testing, can ensure faultless delivery of these IT-based services.

Example of Services provided by Atos

Atos already provisions and manages infrastructure-based solutions as part of the services it offers a number of major broadcasters. Many of these are in partnership with other providers, CDNs, and integrators that provide storage, encoding services, and distribution within a high-performance environment to meet stringent SLAs.



Archiving and preservation solutions provide end-to-end hosted or on-premise services for digital archiving, long-term preservation, and access, including collaboration and search. These solutions will be further developed to include video content management and syndication.

There is a particular focus on solutions targeted at new media, delivering rich-media content over fixed and mobile devices with full monetization built in.

Research work is underway looking at video pattern recognition to enable the generation of personalized coverage of large events by gathering information about what is happening at the event and combining it with individual viewer preferences.

The ability for viewers to manage their own sports action is already available through the My eDirector project led by Atos²⁷.

²⁷<http://www.myedirector2012.eu/>

Conclusions

IT services providers now play a major role in the provision of integration and managed services for video. Cloud infrastructure services complement these offerings by addressing issues related to processing and storage, but there are a number of key trends that integrators will need to embrace and incorporate into future thinking and delivery models:

- ▶ Video content hosting is at the heart of many Big Data concerns and will inevitably rely on Cloud computing to address the impact on core infrastructure, and to build key scalable services on.
- ▶ Smart Mobility (context-aware computing) incorporates video as an essential component in many applications.
- ▶ There will be a seamless integration of collaboration and social networking solutions with video, applications, and data.
- ▶ Nano-payments are key to monetize video content consumption.

IT services providers should also address new viewers' habits. Control of the viewing experience is shifting from content owners and multichannel providers toward viewers themselves. Today's users are in control and are more and more interested in watching content via a smartphone or computer²⁸.

In a world where everyone can easily produce and broadcast content, increasing audience engagement and monetizing consumption will become a challenge for media companies. IT services providers can bring their expertise to offer IT services that enrich content with complex metadata in order to enable new services, adapted to consumers' new expectations (i.e. automatically personalized views, recommendations, etc.).

When it comes to monetization, IT services providers are in a position to offer services that can help customers increase revenues, either through advertising or via subscriptions, or by linking nano-payments with media content consumption through a transactional revenue-based model. Monetization will not come exclusively from consumption, but also from the information around how the content is used (for instance, how many users are watching, where they are, and what they are doing in parallel).

Video and metadata provide the means to offer enriched and proactive services to viewers. Companies need to be ready, with the right partners and best IT services providers, to obtain maximum value from content.

Atos already plays a part in every aspect of video delivery; from glass to glass.

Monetization will not come exclusively from consumption, but also from the information around how the content is used.

²⁸<http://www.digitalsmiths.com/parks>

About Atos

Atos is an international information technology services company with annual 2010 pro forma revenues of EUR 8.6 billion and 74,000 employees in 42 countries at the end of September 2011. Serving a global client base, it delivers hi-tech transactional services, consulting and technology services, systems integration and managed services. With its deep technology expertise and industry knowledge, it works with clients across the following market sectors: Manufacturing, Retail, Services; Public, Health & Transport; Financial Services; Telecoms, Media & Technology; Energy & Utilities.

Atos is focused on business technology that powers progress and helps organizations to create their firm of the future. It is the Worldwide Information Technology Partner for the Olympic Games and is quoted on the Paris Eurolist Market. Atos operates under the brands Atos, Atos Consulting and Technology Services, Atos Worldline and Atos Worldgrid.

