ANEVIA

White Paper

OTT Streaming

Lionel Bringuier, CTO, Anevia

This White Paper presents an overview of over the top (OTT) streaming and how it fits into the IPTV and VOD markets. It explains the principles of OTT, considers the differences between OTT and IPTV, looks at the challenges facing this new approach to service delivery and presents the 3 major contenders aiming to become the industry's technical standard.

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Contents

Keywords: Over The Top TV (OTT), streaming over IP, IPTV, Internet TV, Connected TV, mobile TV, HTTP Live Streaming (HLS), Silverlight Smooth Streaming, WebM, 3Screens convergence.

What is Over The Top streaming?

OTT streaming, where OTT stands for “over the top”, is the delivery of video and audio media streams to connected devices via the Internet. Unlike traditional IPTV, there is no need for a dedicated network or infrastructure provided by the operator, as OTT is transported through regular Internet data protocols and uses the open Internet, on unmanaged networks.

What is the difference between OTT and IPTV?

By IPTV, we mean traditional IPTV which has been widely deployed by numerous operators, namely those that propose a triple-play ADSL offer to their customers.

This traditional IPTV is delivered over a dedicated, operator-managed network that is used only for broadcasting TV. The operator has full control over the network and can configure certain parameters, such as bandwidth consumption and regularity of packet transportation, to ensure a high level of service quality. Traditional IPTV uses TS (transport stream) transmission technology which is based on satellite TV broadcasting and delivers content over UDP in datagram mode.

OTT TV uses HTTP, the protocol which has been used for decades to transport web pages over the Internet. HTTP is based on TCP, a connected transport protocol with more practical features than UDP. It is easier to track a TCP connection, for example. As a result, a TCP connection is easily managed through firewalls, NAT (network address translation), home and office networks. It also enables anyone that has sufficient web hosting capacity to broadcast any audio and video media to a worldwide audience over the open Internet.

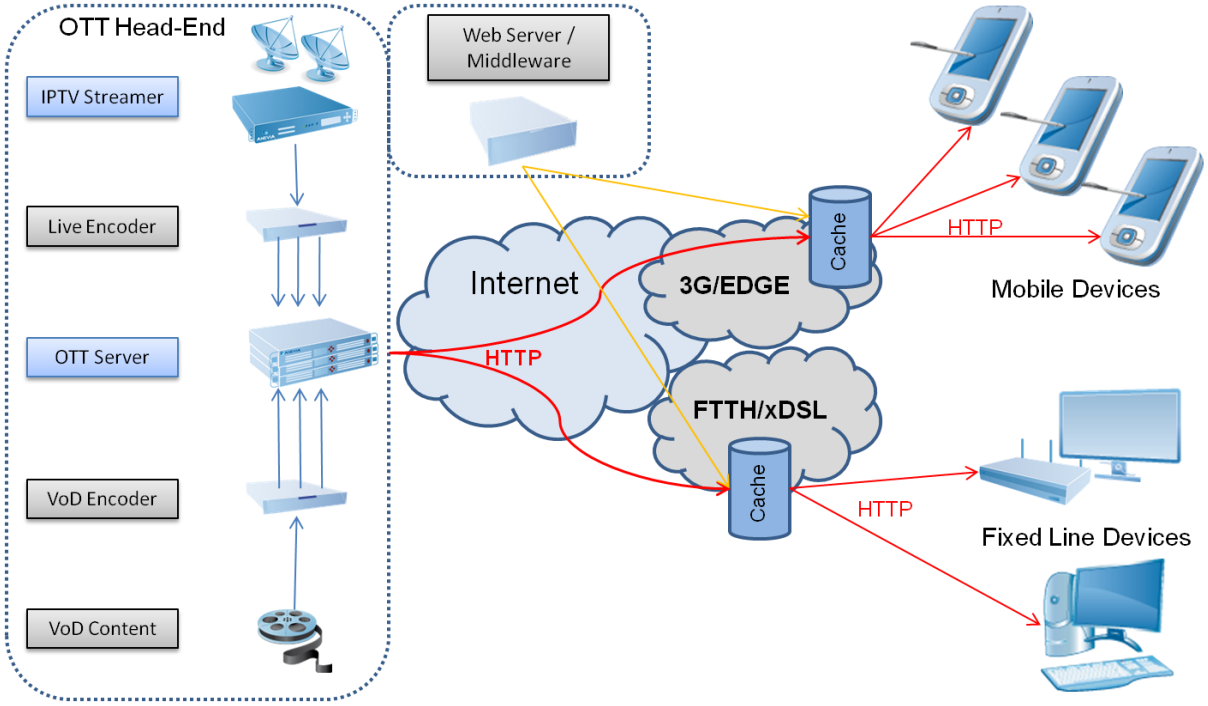
HTTP has already been used as a transport solution for video on demand (VOD) media embedded into web pages, especially on Flash-based sites, such as YouTube or Dailymotion. However this solution does not use real time streaming, but progressive downloading of one media file, where the browser downloads the file from the HTTP web server and when it has a sufficient amount of data, starts to play the content while downloading the rest of the file. The main drawback to this approach is the length of time it takes to fill the initial buffer. Another issue associated with http is streaming quality, which depends on the IP connection. Content streaming may be subject to stalling if there are fluctuations in bandwidth, leading to frame freezing. As a consequence, it is nearly impossible to use the solution to broadcast live channels.

Until recently, live broadcasting was therefore restricted to operator-managed IPTV networks using the UDP multicast protocol. The arrival of OTT streaming, however, has brought a new approach and it is now possible to achieve levels of streaming quality over HTTP that allow live content to also be broadcast over the Internet.

What are the challenges in streaming content OTT?

If we take into account the principles described above, we can sum up the challenges faced by OTT service providers as follows:

- Video and audio content should be available wherever the Internet is accessible. HTTP must therefore be used as the transport protocol for these types of content;
- It should be used for live TV broadcasting as well as for VOD content;
- As the open Internet is by definition an "unmanaged" network, the end-user bandwidth cannot be controlled. This can lead to low streaming quality and negatively impact the user experience when watching TV. This issue is of particular importance for mobile networks;
- The proposed technology must be adapted for use on a full range of end-user devices (PC web browsers, STB/TV, mobile handsets, digital tablets, etc). This means it must be light on system resources and easy to install;
- It should also be easy to integrate into current digital TV workflows and ecosystems, because most content is now distributed using these formats and protocols (codecs, DRM, etc.).



Which candidates are willing to take on these challenges?

Currently, there are three big players who propose their own solutions to the challenges of OTT. Unsurprisingly, these companies are also the three giants that are building the connected world in which we live:

- Apple®, promoting its HLS standard;
- Google™, pushing its own WebM technology;
- Microsoft®, with Silverlight Smooth Streaming.

They have already achieved significant success in different areas of telecommunications and the Internet. However, at the time of writing (end of summer 2010), none of them has emerged as a leader in the media and broadcasting industry.

The war between them is a long one. Apple®, Google™ and Microsoft® used to fight to gain your PC and Internet screen, then they battled over your mobile handset, and now they are struggling for your living room.

Why is everyone in the industry talking about OTT?

While Over The Top is key to the future business success of the aforementioned three big players, it also creates a disruption in the video delivery value chain, enabling many new players to also enter the game.

OTT for Telecom Companies

Up to now, high quality video delivery was the monopoly of managed network players, i.e. telecom operators (telcos) and Internet Service Providers (ISPs). The revolution came in 2002 when Fastweb (Italy) was among the first to propose a wide scale video over IP offer. France was also active with France Telecom and Free launching IPTV and VOD services as early as 2003.

As previously stated, the arrival of OTT, means that it is no longer necessary to have a managed network to ensure quality of service in video delivery. This is a threat for telcos who fear “disintermediation” (the removal of intermediaries in the video supply chain – in this case the managed operator networks) and are relegated to simple Internet bandwidth providers, a position they have been fighting for many years.

There is, nonetheless, an opportunity for telcos in OTT. Most of them are currently building new offers that enable them to reach new customers, and even to extend their video offers to subscribers of other ISPs.

Moreover, OTT can be also seen as a short-term enabler for 3-screens convergence (delivering video content to different user devices) because HTTP is used on PCs, Set-Top Boxes, connected TVs and mobile devices. Over the last few years, telecom infrastructure convergence has been built around the IMS (IP-Multimedia Subsystem) vision. However, OTT may be a smoother and faster path to 3-screens video convergence, allowing offers to arrive before IMS is spread widely enough.

OTT for Content Providers

OTT enables new players to enter the game by creating a direct connection between the content providers (TV channels, content aggregators, satellite and cable broadcasters) and the end users. It enables the content providers to promote their video services directly to the viewer.

Most content providers have suffered from the telco/broadcast war for end user management, and telcos have gained a significant advantage through IPTV and VOD offers that are included in triple-play packages. With OTT, content providers will be able to get their revenge by marketing and delivering their content directly to TV and mobile device viewers.

OTT for Consumer Electronics Manufacturers

Before the arrival of OTT technologies, video delivery was mainly limited to PCs and some high-end mobiles phones. We now see the emergence of Connected TVs, and they are also entering the OTT arena. Connected TV enables consumer electronics manufacturers to bring value to TV delivery because it allows direct contact between the viewers and the content providers. Partnerships are created between the TV set manufacturers and the content providers to enhance both offerings. Another new market which has emerged from OTT content availability is the tablet market. The tablet war, initiated by Apple®'s iPad™, is set to rage in the coming 2010 decade, with fierce competition from both hardware and software manufacturers.

OTT for Electronic & General Retailers

Other examples of new emerging players able to take advantage of the opportunity in OTT are the electronic retailers who already have partnerships on the fixed and mobile telco markets, and MVNOs (mobile virtual network operators). They both have a strong customer base with a local presence. Their core business is to deliver devices to consumers such as TV sets, tablets and other connected video equipment. OTT can enable them to leverage their CRM (customer relationship management) with a complementary video offer, linked to the electronic devices they are distributing.

Apple HLS

History

Apple introduced HTTP Live Streaming (HLS) in June 2009 with their iPhone® OS 3.0 (which has since been renamed iOS). That makes HLS the oldest of the three technologies described in this white paper.

Nowadays, HLS streaming is without any doubt the most widespread protocol used for OTT, as it is available on all Apple devices (iPhone, iPad, iPod®...) as well as on some software players and a number of set top boxes.

The keynote delivered by Steve Jobs on September 1st, 2010 was one of the major events broadcasted live over HLS. It was also the day Jobs announced the second version of Apple TV®, a set-top-box natively turned towards HLS streaming.

Principle

The operating principle of HLS is to work with segmented TS-based video streams or files. The chosen container for HLS is thus an MPEG transport stream (TS), also used for satellite broadcasting and IPTV on managed networks. The chosen codec is MPEG H.264 for video and AAC for audio, which have also been widely used in the broadcast industry for many years.

The approach taken by Apple is very interesting. It is based on using proven industry standards and modifying them slightly in order to fit with the requirements of an OTT solution. The less the modifications impact existing standards and technologies, the faster HLS will integrate into existing ecosystems.

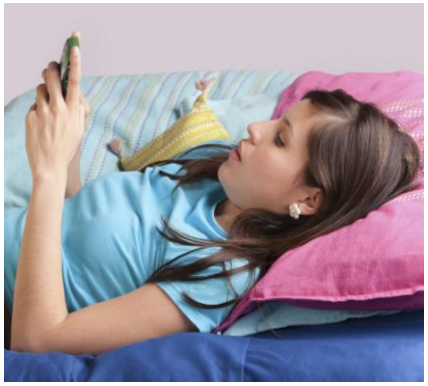
The way to achieve HLS streaming is to:

- Encode video in H.264/TS format (taken from live feed or from a file), in different bitrates;
- Use a stream segmenter to generate short “chunks” of content – typically 10 seconds each - and generate a playlist file (m3u or m3u8) indicating where to download the chunks;
- Distribute through a HTTP server, and provide appropriate caching.

Another strength of HLS is its ability to implement adaptive bitrate intelligently. Contrary to the techniques that are used in mobile RTP streaming, it is the end user device that decides the stream quality, according to the available bandwidth (and not the video server). This approach aims to ensure unbroken video streaming, thus creating a positive user experience on an unmanaged network:

- Index file is generated indicating different profiles (streaming qualities) available for one channel/content file;
- The receiving device (PC, mobile, STB) looks for the most suitable bitrate based on how long it takes to receive a chunk file;
- Each chunk file lasts 10 seconds, so the receiving device can automatically adapt the streaming with flexibility – in this case, every 10 seconds.

Ecosystem



HLS is natively supported by Apple devices that use iOS 3.0 and above: iPhone, iPad and iPod, as well as Macintosh computers running MacOS® X Snow Leopard. The video client used is QuickTime® X player, developed by Apple for their products. Here’s the catch: even if Apple decided to port some of their software to a Windows-based PC platform, iTunes or Safari for example, they haven’t ported QuickTime X Player to a Windows-based PC platform yet. As a result, there is no "official" client for the HLS streaming system, except on devices manufactured by Apple.

However, since the principle behind HLS is fairly simple, designing a client software for HLS streaming is quite straightforward. Verimatrix, Widevine, NDS, Latens and SecureMedia are a few examples of DRM companies that provide a solution for Windows-based PC platforms so they can play media streamed from an HLS server – as a point of interest, they also integrated their own DRM in the system.

But HLS clients aren’t limited to the Apple, PC and mobile markets: they are gaining more and more traction from set-top-box (STB) manufactures. Airties, Netgem and Amino, for example, already provide STBs capable of playing media streamed from an HLS server. At the IBC 2010 event in Amsterdam, demonstrations were given using the HLS protocol running on the ViaMotion video server from Anevia and an HLS compliant STB. Many other devices are expected to appear on the market - Apple wants HLS to become a standard and has submitted a draft to the IETF in order for it to become a RFC, called 'HTTP Live Streaming'.

Advantages

- As of today (end of summer 2010), Apple has sold over 60 million iPhones, 45 million iPod Touch®, and more than 3 million iPads, even though the product was only released earlier this year. The potential audience for HLS streaming is therefore huge, particularly for portable devices.
- It provides a simple and efficient adaptive bitrate solution to cope with the fact that bandwidth is not managed on open networks.
- It is easy to integrate at the reception device level and can therefore be deployed on a wide range of set-top-boxes and devices. The fact that the H.264 codec was chosen implies that many chip manufacturers can provide H.264 hardware decoders as of today: demand on CPU power and on mobile battery power is low.

- It is based on Transport Stream transmission technology, making it easy to integrate into the existing digital TV world. A lot of IPTV DRM providers have already adopted this standard.

Limitations

- The adaptive bitrate solution is located solely in the device client. This "democratic" approach could hinder some uses in the professional / corporate world where administrators may wish to fine-tune the available video quality for certain specific content.
- Why didn't Apple propose its own client software for Windows PC? There is no native support in the major web browsers, and the lack of plugins to simplify integration makes it difficult to use as a web TV standard.
- Being limited to the MPEG standards means that the providers of HLS-compatible equipment may be liable to pay a license fee to MPEG LA. While it is no problem for Apple to pay an additional few cents in licensing fees when they sell iPhones, iPods or iPads that cost several hundreds of dollars, it may be a significant barrier for players in the "free and open-source" culture – namely the web browser providers who do not sell their products. Mozilla Foundation or Opera Software would not be very pleased to pay royalties to MPEG LA every time their browser software is downloaded. Recently, MPEG LA chose to soften their politics regarding free content over the Internet, but their global position remains unclear.
- DRM encryption is done through the encryption of the entire chunks. The transport layer is thus also encrypted, which is a barrier for some features, such as dynamic trick modes.

Viewpoint!

Jean-Baptiste Kempf, VideoLAN / VLC

Jean-Baptiste Kempf is Chairman of the VideoLAN project. He joined VLC as a developer in 2006, when he was a student at the Ecole Centrale de Paris.

What is the status of HLS support in VLC?

As there were no free HLS players for PC platforms, Anevia decided to sponsor and participate in developing HLS support for the VLC media player. The development project was led by Jean-Paul Saman, one of VLC's main contributors. Nonius Software, a middleware solution provider and an Anevia partner, also sponsored the project.

Does VLC intend to support other OTT streaming standards in addition to HLS?

VLC is a free and open-source multimedia player and toolbox. As such, it is designed to play the most common multimedia streams on a network (as well as local files, disks, etc.). The more we support, therefore, the better. So, once we have finished the project to support HLS, we intend to begin support of WebM. The VLC team is also closely monitoring Smooth Streaming, but as the industry is not currently showing much interest, there is less urgency to support it.

How do you see the development of streaming on PCs in the coming years?

The PC as a platform for watching TV and movies is doomed! Most recent industry innovations have focused on the mobile and tablet platforms. These platforms are significantly changing the way we create multimedia software because the decoding must be done on the DSP and GPU for performance reasons. This also makes it more expensive to develop and harder to debug.

VLC is already ported on Windows CE, Maemo and iOS (iPad and iPhone). We aim to be able to port it on Android and MeeGo very soon.

Google WebM

History

WebM was announced in May 2010, during Google I/O 2010. Promotion of the technology made it clear that WebM aimed to provide an OTT solution that would be royalty-free and usable on an open basis by all Internet companies and communities. In order to achieve this, Google decided to provide its VP8 video codec under a BSD license.

The chosen audio codec is Vorbis, and the container is based on a profile from Matroska. Although Vorbis and Matroska (.mkv) are already known and used in some products in the digital media industry, VP8 is a brand new codec, originally developed by On2 Technologies, before it was acquired by Google in early 2010.

A few days after its announcement, the WebM format was already supported by more than forty software publishers and hardware vendors, including ARM, Intel, Mozilla Foundation and Opera Software.

Principle

The philosophy of WebM is different from the other OTT techniques. It does not require segmentation of the media into chunks, because with WebM, one media stream is seen as one file.

To stream WebM from a live or VOD file:

- Encode the video and audio content in VP8 and Vorbis respectively, in different bitrates;
- Mux them into a WebM file, which must be automatically refreshed in real time if you plan to do live streaming;
- Use a HTTP server to deliver the WebM file.

Note that there is an added complexity to live TV streaming, where the muxing must be done constantly, and the resulting file will never be the same over time. As a result, caching on WebM is much more difficult than with chunks of video files. This makes it difficult to integrate added-value features such as trick play, playlist or circular buffer. However, it's not impossible – Anevia has succeeded in developing a full-featured OTT solution based on WebM that can stream both live TV content as well as video on demand. In its favor, WebM has the advantage that it can be used directly as a storage format.

The adaptive bitrate process is also very different from the other OTT solutions because it is the server that chooses the audio/video streaming bitrate before muxing. The server has an output buffer in which it pushes all the packets ready to be sent. As it sends the content of the buffer to the network, it detects if there is enough bandwidth to reach the client. If not, it scales down to a lower bitrate.

Ecosystem

WebM appears to be chosen and driven by the Internet-centered community. It is supported by almost any web browser that can run on Windows, MacOS X or Linux OS. Either WebM is natively supported in modern browsers, such as Mozilla Firefox 4, Opera 10.60, Chrome / Chromium in their latest versions, or it can be embedded in other web browsers through plugins. Thus, Microsoft Internet Explorer 9, Apple Safari (desktop version) and any Linux browser connected to GStreamer multimedia framework can play WebM streamed media.

Moreover, WebM has a tight link to the new HTML5 <video> tag, because the VP8 and H.264 codecs are both supported by HTML5 standards. VP8 is free, and as you know, Internet communities love anything that is free. So, in the future, we may well have VP8 and H.264 coexisting in the <video> tag, as nowadays we have JPEG and PNG coexisting in the <img> tag.

On the set-top-box side, we cannot overlook the buzz generated by the highly anticipated Google TV. In an approach which aims to be much more than a simple, direct response to Apple TV, Google has been experimenting new partnership proposals in order to push their TV ecosystem. As a result, Sony has already announced its first HD TV incorporating the Google TV platform. It is rumored that other TV set or set-top-box vendors will quickly follow this move.

Last but not least, regarding mobile streaming, Android 3.0, codenamed Gingerbread and scheduled to be released before the end of 2010, should also support WebM and VP8. The fact that Android has been embraced by many handset manufacturers, such as Motorola, HTC, Samsung and Sony-Ericsson among others, could form the path to the success of WebM in the mobile world.

Advantages

- The choice of Matroska for the container profile is interesting: Matroska uses EBML, a binary format derivative of XML. It allows the capabilities of the container to be extended without breaking the compatibility with older parsers. For example, it already includes a menu system (similar to the “chapters” of a DVD) and supports multiple audio and video tracks with labels attached to them, clean 3D handling, closed captions and subtitles, etc. Moreover, Matroska uses less bandwidth than TS encapsulation – this is an important point, especially for mobile devices.
- Native playback for three of the main web browsers is also an advantage. If you have ever tried to watch a Flash-based video clip using LinuxOS, you should know that plugins are not necessarily very stable.
- The adaptive bitrate is managed by the server, but there are tricks that can enable the client software to ask the server to switch to higher or lower bitrate.

Limitations

- The lack of chips currently available for VP8 hardware decoding is a major drawback for WebM. When compared to the support of H.264, which has become very common on medium to high-range mobile devices, it is a good illustration of the difficulty in imposing a new codec to the industry.
- In addition to the codec issue, and contrary to HLS, there is also the fact that the STBs have to support the Matroska container. While it’s not a significant issue for players from the web environment, it may become one for those who come from the satellite receiver domain, which more traditionally supports TS. However, this could be balanced by the fact that some STBs are powered by an Opera browser, which promotes the WebM standard (even though Opera on STBs only currently supports the H.264 codec).
- There is also an issue with WebM caching, which can be tricky. It can only be done using dedicated IP streaming servers. It can’t be done using web caches.
- At the time of writing, the specifications of WebM are still at the “developer preview” stage, implying that things may change in the future. Hopefully there will be no dramatic changes, but even the slightest change can have drastic consequences when you depend on hardware manufacturers.
- Officially, WebM does not mention DRM systems. However Matroska can support encryption very easily, even if DRM-enabled .mkv files are not very common yet.

Viewpoint!

Steve Lhomme, Matroska

Steve Lhomme is the creator of the Matroska container, and Chairman of the Matroska Foundation. Prior to that, for three years, he was one of the main developers for the mobile and desktop CorePlayer.

What impact has Google's adoption of WebM had on Matroska?

It took us by surprise at first, but it was very exciting. Matroska has always been thought of as a one size fits all container for local storage, file streaming and even live streaming. But it is hard to advertise a format when you are a tiny group of people against companies like Apple, Microsoft, Real Networks and DivX. We already converted DivX to the quality levels of Matroska. Google could have gone with other containers or even created their own, but they were really convinced by the technical quality of our format.

What is the technical challenge for a container?

Unfortunately audio/video containers are usually the less considered element of the multimedia toolbox. They are usually built with the goal of making a new custom codec work. But they are not meant to be used with all codecs in all possible configurations. They are only extensible to a certain point and usually carry heavy legacy from the time they were designed. Matroska was designed to look forward 10 years to make sure it would still be relevant, and still allow all the existing systems to work in Matroska. It is not perfect, but it certainly fits the bill.

What about the choice of the VP8 codec?

VP8 really resulted from the necessity for Mozilla and Opera to provide video in their browsers, but they could not afford to pay the MPEG LA license fees. Google mostly uses H264, but it also realizes there has to be another choice. In the long term it makes as much sense and maybe even more to use VP8 because it's cheaper and just as good as H.264. In the end more creative use and customization may appear from this freedom. And it will surely be favored by any startup that wants their product to be cost competitive. H.264 currently has overwhelming momentum, but I think little by little VP8 will make significant ground on the web. A key factor will be when hardware decoders appear.

Microsoft Silverlight Smooth Streaming

History

Smooth Streaming is part of Silverlight 3.0, and its specifications were published by Microsoft in September 2009. Video streaming was a major advance in Silverlight's capabilities, and the team in charge of designing Smooth Streaming was formed from engineers who had already worked on the software side of Zune.

Concerning HD content delivery for the masses, Microsoft created a stir in September 2010 when Stephen McGill, head of the British Xbox division, was reported as saying: "People have moved through from DVDs to digital streaming, so we can offer full HD 1080p Blu-ray quality streaming instantly, no download, no delay. So, who needs Blu-ray?"

Microsoft chose to support the H.264 and AAC codecs. This choice was driven by the objective to propose easy hardware decoding in order to achieve HD (720p/1080p) streaming on web applications. However, Smooth Streaming also supports VC-1 and WMA, which are Microsoft proprietary codecs, for those who wish to remain in a complete Microsoft ecosystem, or any other codec supported by the 3GP container format.

Pre-versions of Smooth Streaming were tested on a large scale before its official release. It was used, for example, for the web broadcasting of Michael Jackson's funeral and for the Roland Garros tennis tournament in HD.

Principle

Smooth Streaming is based on fragmented files, with a PIFF (Protected Interoperable File Format) container, which is extended from 3gp format, and an underlying SSTP (Smooth Streaming Transport Protocol) layer.

The general principle is quite similar to HLS streaming:

- Encode video in H264 and audio in AAC (or VC-1/WMA), in different bitrates;
- Use a stream segmenter to generate fragments and mux them into a PIFF container;
- Distribute through a HTTP web server, and provide appropriate caching.

The client software starts by requesting a manifest from the server. The manifest response from the server lists the available media, tracks and bitrates. The client then asks for one or more fragments corresponding to the requirements on the list to be sent by the streaming server over HTTP. Like HLS, when using Smooth Streaming it is the client that manages the choice of adaptive bitrate.

Finally, it should also be noted that DRM are particularly well integrated into Smooth Streaming, with the possibility to use several DRM layers in the same file.

Ecosystem

The Smooth Streaming ecosystem is managed by Microsoft through their partnership and certification programs. Microsoft seems willing to certify any encoder or client able to integrate into their Smooth Streaming ecosystem. However, for the streaming server, it seems that Microsoft has only authorized certification of its own IIS 7.0 server.

This appears to be quite a strange move from Microsoft, because the specifications for the Smooth Streaming protocols are open and publicly available. Some streaming server providers, such as Anevia, can provide streaming servers that are fully compliant with the published specifications from Microsoft. All in all, the integration process should be no more trouble than for any other interoperability and inter-working project.

On the mobile side, there is a lot at stake for Microsoft with the release of Windows Phone 7. It's clearly their last hope to get back into the mobile and smartphone industry and take market share from the well established Apple iOS and Google Android platforms. It was no surprise when Microsoft announced that their new mobile OS will support Silverlight Smooth Streaming. However, it was much less clear if they plan to support any other OTT streaming systems.

Advantages

- The general design principles for Smooth Streaming are quite similar to those of HLS and so, like the Apple solution, it provides easy adaptive bitrate management from the client side.
- Contrary to the other two OTT systems, DRM is already well integrated in Smooth Streaming.
- In the web streaming field, Microsoft Smooth Streaming has acquired a strong image gained from successful live HD (720p/1080p) streaming of major events. The video quality of the live broadcasting was praised, compared to that provided by Flash-based sites at the same time.
- Something that could be considered an advantage as well as a limitation is the fact that Microsoft specifications are very detailed, and illustrated with many examples. It makes it much easier to fully understand the way Smooth Streaming is meant to be working, but is also longer to implement (see below).

Limitations

- As mentioned in the previous point, Microsoft specifications are very detailed, so solution support takes much more time to implement. The result is that Smooth Streaming may not be adopted as fast as HLS, which was designed as an easy derivation from the TS standard.
- Although Smooth Streaming was clearly designed for web streaming, the player is always managed through the Silverlight plugin. Even Microsoft's Internet Explorer requires the external plugin. Also, although Silverlight is officially supported on Microsoft Windows and Apple MacOS X, it is not the case for Linux workstations, or mobile devices. So Smooth Streaming cannot be used on any of the highly popular iOS devices (Apple iPhones, iPads, iPods...) or on Android platforms. For Linux OS, the solution is to use Moonlight, an open-source implementation compatible with Silverlight, based on the Mono framework.
- Like HLS, Smooth Streaming is also limited by the fact that it is impossible to manage bandwidth from a centralized point on the network: everything is decided solely by the device clients.
- Finally, Smooth Streaming is based on patented audio and video codecs, so its use may be subject to license fees, payable to MPEG LA or Microsoft.

In a nutshell, which OTT solution is the best?

Obviously, there is no clear cut and no definitive answer to that question; all three approaches have their advantages and drawbacks. The real question is: **What are you going to use OTT for?**

Do you plan to launch an iPhone app? Or a corporate web site? Or a mobile service?... And do you want to include connected TVs? Or are you planning a new service with a dedicated set top box, created from scratch?… This will give you a starting point for your choice of a possible solution or solutions.

Then, you have to consider the need for DRM, which may depend on the content provider. How much caching capabilities will be required? Do you have to integrate any specific encoders, or a specific head-end? I would sum all this up in one question: **Into which ecosystem do you want to integrate your service?**

Of course, we all want to know which solution will become the leader in the mid-term future (whether it's the best or not is another matter!). However, it's very difficult to predict a winner because each of the OTT solutions presented in this paper is promoted by a major player of the computer and telecommunications industry, and each has a tremendous striking force. At the time of writing, HLS seemed to be the current leader, driven in particular by the amazing commercial success of Apple devices. But things could change rapidly: in Q2 2010, the sales of Google Android-powered devices superseded those from Apple, for the first time…

The quality and quantity of a TV service proved to be a competitive advantage in network operator offers when they launched multi-play services on their managed IPTV networks. Today, OTT streaming represents an important opportunity for many new actors, enabling them to promote innovative services without having to deploy heavy infrastructures. But the two questions above remain, and must be tackled before diving into the definitive choice of the OTT solution.

About the Author

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Lionel Bringuier has over 10 years software engineering experience in the Telecommunications industry managing real time and mission critical services. Prior to joining Anevia he held senior positions at Matra Nortel Communications (now EADS Telecom), Netcentrex/Comverse and SFR where he was director of IMS-based triple play deployments. As CTO at Anevia, he is responsible for guiding the company in its technical direction, for managing cross-product architecture, standards initiatives and R&D resources. He is a graduate in engineering from the Ecole Centrale de Nantes.

About Anevia

Anevia provides video solutions and service infrastructure for the delivery of live TV and video on demand (VOD) services to TV, PC, Internet-connected and mobile devices.

With over 1,000 deployments in 70 countries, representing several millions of users and over 10,000 live channels, Anevia is a reference in solution delivery to telecom operators, broadcast service providers and the hospitality market.

Anevia's solution portfolio includes DVB to IP gateways, content distribution, network management, time-shifting applications and video servers. The 3Screens™ platform delivers services across mobile phone, TV and PC including VOD, network personal video recorder, Catch-up TV, Start Over, and Pause TV.

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