

CODECS

Compression[®] to the Highest Power

Technology White Paper

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CodecSys is Future-Proof

Another key advantage of the CodecSys approach is that its software architecture is completely open, enabling it to readily accommodate new specialized codecs as they come on the market. This is in sharp contrast to all other competitive solutions which rely on single codecs and embedded hardware/software architectures that are rendered obsolete as soon as a new codec or standard emerges. For example, there are literally billions of dollars in video compression infrastructure on the market that will become useless when the new generation of H.264 standard codecs are widely adopted. And following closely on the heels of that standard is JPEG 2000. With CodecSys, upgrading to a new codec standard is as simple as downloading a new software upgrade. Only the patented open architecture of CodecSys can readily incorporate new standards and technologies, providing an “ever-green,” future-proof solution to customers.

CodecSys: How it Works

Broadcast International’s video compression engine, CodecSys, is ideally suited to solving the problems posed by video delivery over any platform, whether IPTV, cable, wireless or Internet. A key feature of the system is its utilization of a library of video and audio compression codecs in a “just-in-time” fashion in order to dynamically leverage the strength of each codec rather than trying to use a “one-size-fits-all” approach to the compression and transmission of video and audio. This produces a multi-codec video stream that exhibits superior compression, quality, security and adaptability over the traditional uni-codec encoded multimedia stream.

Key technology features of CodecSys include its ability to adapt to any transmission medium without re-engineering; support for third party development through open, published APIs; support of advanced security technology including encryption, watermarking, and content expiration; support of feature extraction for future applications such as motion tracking and facial recognition; and automatic self updating to client sites as new formats and protocols are added.

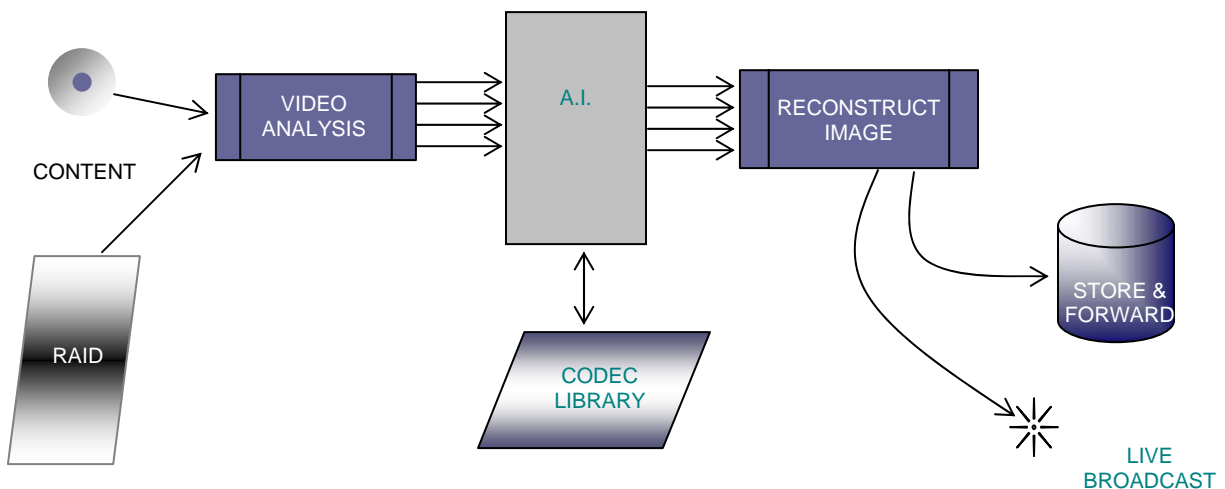


FIGURE 1: VIDEO COMPRESSION USING CODECSYS BASED SYSTEM

CodecSys and IBM

The open CodecSys software architecture is particularly well-suited to exploit the power of the new generation of multi-core, parallel processors, such as the IBM's Cell Broadband Engine™ (Cell/B.E.) multi-core processor. The new processor, incorporated on the IBM BladeCenter® QS21 server, "supercharges" compute-intensive applications such as video compression. In addition to increasing processing power, the IBM QS21 server is highly scalable and programmable, enabling users to customize and upgrade in a way that has never before been possible. For example, adding an additional processing "blade" requires only the removal of two screws on the chassis. BI and IBM have a license agreement and a joint development project to integrate and optimize the entire software/hardware solution, providing a synergistic combination of technologies that will bring video compression to unprecedented levels.

According to broadband industry analyst Peter White in his newsletter Faultline, new video encoders based on Broadcast International's CodecSys video compression software running on IBM's Cell/BE multi-core processor hardware promise to "change the video world" by making it possible to deliver HDTV at 3 Mbps. This represents a reduction in bandwidth of more than 80%, compared to the MPEG2 standard of 19.4 Mbps currently used to deliver most HD video. White also points out that "flatter video streams will push HD towards the web."

The IBM hardware with its multi-processor approach and the CodecSys software, with its multi-codec approach, are ideally suited to solving the problem of delivering HD quality at low bandwidths. According to the Faultline report, the joint product helps tackle the looming bandwidth problem, particularly among IPTV suppliers. "There is quite simply too much data to get across the network in order to provide sufficient HDTV against the cable operators," said White.

In the future, Broadcast International will be able to deliver HD at 1.5 Mbps. According to White, "if it can be genuinely delivered, it changes all the cost calculations for IPTV, satellite, cable, mobile TV and TV over the web – overnight."

Applied CodecSys

Live or On-Demand Applications

The CodecSys software can be applied in any live or on-demand video environment over virtually any delivery platform – whether cable, telco, satellite, wireless, IPTV or Internet streaming.

In on-demand applications, content can be pre-recorded and made available as needed. Examples of this type of application include movies and entertainment, marketing and corporate videos, digital signage, archival events originally broadcast live, surveillance archival, webinars, distance learning, on-line conferences and events and many others.

Live applications include broadcast television, live video streaming over the Internet and to mobile devices, live sportscasts and special events, telemedicine, as well as corporate events such as product launches and quarterly shareholder meetings.

The Challenge of Internet Video Delivery

Video compression technology is becoming an increasingly critical requirement for video sent over the Internet. Last year, according to a report from Nemertes Research cited in a recent New York Times story, video uploading and downloading from sites like You Tube, “consumed as much bandwidth as the entire Internet did in 2000.” Most experts agree that a bandwidth crisis looms if new technologies are not developed and implemented to alleviate the congestion.

The bandwidth crisis will be particularly severe in the U.S., which has dropped from fourth to 15th place on the broadband ranking kept by the Organization for Economic Cooperation and Development. Michael Kleeman, a senior fellow at the Annenberg Center for Communication at USC, has cited video compression as a technology critical to the resolution of the bandwidth crisis.

There is no question that better video compression technology would take the pressure off the Internet -- especially as more and more users want to upload video to sites like You-Tube and MySpace, in order to share experiences. At present many content providers are forced to settle for inflexible and suboptimal proprietary streaming solutions such as Windows Media¹, Flash² and Real³. These products do not solve the fundamental problems associated with Internet video and thus have unsatisfactory quality. IP networks impose packet loss on data, which can severely impede the quality of a compressed video and audio stream with interdependencies and can impair sound synchronization.

Most current solutions offer only a 25% reduction in bandwidth at best, with compromised picture quality. Even new fiber initiatives such as those from Verizon and AT&T will be challenged to deliver the quantity and quality users are going to demand. CodecSys promises a much more effective and longer range solution, offering bandwidth reductions up to 80%, an open software platform for upgrading compression technology, and scalable hardware to accommodate inevitable volume increases.

IPTV and Wireless: The Wave of the Future

IPTV is a rapidly growing application area for the CodecSys software. The entry of telcos into the pay-TV market has generated enormous interest over the last few years. Large telecom operators like AT&T, Verizon, France Telecom and PCCW now offer TV services. As the telcos begin offering

¹ Windows Media is a Trademark of Microsoft Corporation

² Flash is a Trademark of Adobe

³ Real is a Trademark of RealNetworks

broadcast TV packages, cable and satellite providers have boosted their offerings to include additional services like Video-On-Demand, HDTV, and Digital Video Recording.

Telcos will need to offer these services as well in order to be competitive. Additionally, telcos want to take advantage of their two-way networks to add more services and applications that will differentiate themselves from their cable and satellite competitors. As more of these services come on-line, bandwidth will be stretched to its limit. CodecSys provides the only viable, future-proof solution for the IPTV bandwidth crunch.

Likewise, the wireless market provides exceptionally fertile ground for CodecSys, due to its ability to deliver high-quality video over unrivaled low-bandwidths to cell phones and PDAs. The latest trend in video is called “placeshifting” – the ability to watch video content anywhere from any device including cell phones and PDAs -- and it’s a driving factor in the market for wireless video. Mobile video is projected to have more than 25 million users by 2011 and \$1 billion in revenue, according to IDC.

In a 2007 report by Multimedia Research Group titled “Mobile TV: Global Standards Review & Forecast for Infrastructure and Handsets” it was reported that 60-85% of participants in a study were keen to purchase a video-enabled handset when they were shown the high-quality video service possible on the devices. A press release on the same report predicted that over 240 million TV-enabled hand-sets would be sold by 2011. Cell phone makers and operators are anxious to tap into this enormous market; but the infrastructure needs to be able to deliver the quantity and quality required. This is especially true in the U.S. where much of the wireless infrastructure is still analog. It simply won’t support the pricing models, the image quality nor the raw quantity of video required.

Video is an extremely bandwidth-intensive application and right now, the chokepoint in the infrastructure is video compression technology. Currently, video viewing over wireless devices requires at least 300 Kbps in bandwidth. That number needs to come down by close to 80% in order to make video delivery to cell phones practical and cost-effective for large numbers of viewers.

Broadcast International’s CodecSys video compression technology can reduce bandwidth needs for video from 300 Kbps to as low as 60 Kbps over the current wireless infrastructure in the U.S. That will go a long way toward alleviating the near-term bandwidth crisis in the wireless video market. It will also make the pricing models work much better for consumers and providers.

The Cable Industry: Staying Competitive

Broadcast television and HD video have long been the stronghold of cable companies, but that may well change as IPTV initiatives promise new alternatives to consumers, delivering HD-quality video over newly tooled IP infrastructures. In order to stay competitive, cable providers need to fight back with new and improved services such as more HD programming, Internet gaming, pay-per-view, even social networking, but the cable infrastructure is not up to the task because of inadequate video compression technology.

A recent press release announcing a new report by CMP market research group, Heavy Reading, states that “surging demand for high definition TV, video on demand, time-shifting video services such as digital video recorders, and Internet video is rapidly depleting bandwidth reserves on cable networks and will force cable MSOs to upgrade their networks with new technologies aimed at conserving bandwidth.”

Solutions such as switched digital video (SDV) are currently being explored by cable providers to address the bandwidth crisis. But SDV is an extremely expensive solution involving change-out of end-user devices, and will not address the critical upstream bandwidth issues. SDV will likely be used in conjunction with more efficient encoding technologies as well as plant upgrades in order to provide a longer-term solution.

Next-generation video compression technology such as CodecSys offers a much more effective and economical solution. Currently, the vast majority of video is delivered at the MPEG 2 standard of 19.4 Mbps. But that number needs to come down by close to 80% for both live and pre-recorded video in order to make a real impact on the bandwidth crisis in the cable industry. Because CodecSys delivers live HD video at 3Mbps, it provides a critical solution to the bandwidth crisis in the cable industry.

CodecSys VOS (Video Operating System): A platform for next-generation video

In April, 2008 Broadcast International announced its roadmap for the industry’s first video operating system (VOS.) The new operating system, specifically designed for handling a wide range of video capabilities will be an extension of the company’s patented CodecSys video compression engine.

The key capabilities of the new VOS will be real-time transcoding, taking video in one format and translating it to another; support for multiple outputs so that the same video can be re-purposed for delivery over mobile devices, cable or the Internet; and media management functions that enable, for example, streamlined search of archival video for playback. These functions will be developed by Broadcast International or third-party developers through open APIs published by the company.

These capabilities are critical for the exploding inventory of new and archived video content -- including user-generated video -- to reach consumers across a vast range of devices, networks, and distribution channels. Transcoding is necessary to deal with the complexity caused by the scores of file formats, bit rates, screen resolutions, and audio and video codecs involved in the video distribution process. A single piece of video, for example, may need to be transcoded up to 100 times for the mobile and Internet distribution channels alone. Capabilities such as real-time transcoding are critical if video content is to become ubiquitous across all media delivery platforms.

Broadcast International’s new VOS will provide the industry’s only comprehensive, open, software-based solution for delivering these critical video capabilities to markets including broadcast, Internet video, IPTV, mobile, satellite, and cable. With the VOS, the company is taking the core principles behind CodecSys – an open software design, upgradeability and scalability – and applying them to the enormous new markets for transcoding, video re-purposing and media management.

Industry veteran Ron Bell will head up the new VOS initiative for Broadcast International. Bell is a well-known international figure in the definition, design, development and application of a wide range of technologies including microprocessors, operating systems, and networking. Most notably, Bell was one of the key contributors to the UNIX operating system while serving as the General Manager of the UNIX Systems Group at Unisys and later as its Chief Technology Officer. Most recently Bell served as Chief Technology Officer at Micro Linear in San Jose, CA.

User-generated video and mobile markets drive transcoding need

Much of the demand for video transcoding – which involves decoding and recoding digital content from one format to another – is being driven by the enormous user-generated video (UGV) market, led by YouTube which uploads more than 75,000 new videos per day and streams over 100 million videos daily back to users. According to comScore, 70% of the U.S. Internet audience views streaming video each month.

Broadcasters, such as Fox Interactive™ and CNN™, also transcode and re-purpose high volumes of videos in dozens of different formats. The highest volume video operators have to support thousands of transcode servers each to process the backlog of videos waiting to be transcoded and re-purposed.

VOS advanced functionality: Meta data tagging, event-based search, mezzanine applications

Advanced functionality such as media management capabilities are on the VOS roadmap. These capabilities include meta-data tagging, and event-based search that enable the automatic retrieval of archival video based on a particular event. In sports coverage of the Olympics, for example, broadcasters would be able to automatically retrieve appropriate archived footage when a particular country wins a medal. Even more advanced functions such as feature recognition could be added as an application running on the VOS.

For broadcast and media production facilities, media management capabilities developed specifically for high-volume, internal production environments will be supported by the VOS. Mezzanine level applications, for example, will allow broadcasters to move production quality video around their editing facilities at low bandwidths.