Embedding eVideo in Mobile terminals

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As broadband networks expand with speeds and capacities continuing to increase, Internet Protocol (IP) networks are used not merely for the transmission of data, but voice communications have also been achieved, triggering expectations for eventual communications using video images, which are considered to involve an amount of data a hundred times more than voice data.

Research and development of video transmissions has been advancing with OKI implementing practical systems, primarily video distribution and remote monitoring, even before IP networks began to emerge. OKI has been consistently researching and developing video transmitting over networks, providing network solutions for a global society. The culminated technology has been called “eVideo”, a software engine product for loading video transmission technologies onto information appliances and mobile terminals.

eVideo represents the video transmission technologies of OKI, resulting in the transmission of high quality video images at high speeds, primarily MPEG4-AVC/H.264, which is an advanced IP video transmission standard. OKI has been creating such high compression and high quality video transmission technologies using software that has been developed based on our proprietary architecture.

This paper describes the current status of video images in terms of technologies catering to communications. Furthermore, descriptions of the high quality video transmission technology, eVideo, will also be provided with an introduction of a case example at the end involving the embedding of the eVideo on a mobile terminal.

Ubiquitous ... communications for connecting individuals

It has been some time since the word “ubiquitous” emerged to represent communications for connecting individuals. The mobile network environment for realizing “any time, anywhere and with any entity”, one may recall from the past, was for a pager, which reached its peak merely ten years or so ago. Pagers used numbers to communicate and they were responsible for establishing a communication of “characters”, so to speak.

A rise in mobile terminals occurred later on, resulting in the popularization of communications using “voice”. In other words, a technology for establishing a means of communication to connect individuals was “voice”. Mobile terminals were initially merely a means for conveying voice messages and they were competing against each other for miniaturization. Rapid progress took over, however, when they began to convert into multimedia terminals offering email, internet connection services and the incorporation of digital cameras capable of taking pictures with a resolution of a few megapixels.

Video services started in the last few years and since last year mobile terminals have been capable of viewing one segment broadcasts.

Technological innovations in the current mobile terminals give an increased chip performance, a higher capacity, faster processing speeds and are, therefore, capable of better image processing.

Communications with video images are expected next. It is commonly believed that as much as one hundred times the information enters through our eyes rather than our ears. A similar thing could be said about the amount of data required for video images, which is an extremely large amount in comparison with voice. A stream of voice data for example, would require approximately 256 kbit/s, whereas video data stored on a DVD would stream at about 5 Mbit/s. This means that there is a gap of about 20 fold. Even though expectations were high for its use as a means of communication, a practical implementation did not take place due to the fact that in reality, there were too many technical obstacles that needed to be resolved with video data requiring real-time processing. Due to the aforementioned technological innovations in recent years, however, the time can finally be considered right for communications using video images.

Video transmission technologies at OKI up until now

Video data requires a large amount of information as previously mentioned, therefore, the high technological hurdle to overcome to enable the processing video images involves large capacities and real-time processing.

In such an environment, OKI has for some time been making the transmission of video data accessible through the available networks of a given time by developing teleconferencing systems since 1980, while actively involved in the product commercialization of MPEG2 video transmission equipment as well as through other endeavors.

Furthermore, IP networks became popular, as the OKI MediaServer, which distributes video images using MPEG1, was developed in 1995, followed by sequential successful support for the Asynchronous Transfer Mode (ATM), Integrated Services Digital Network (ISDN) and others. The OKI MediaServer is currently fulfilling a central role at Plala Networks, providing entertainment as part of the 4th MEDIA service.

In a similar manner a product for monitoring video images using technologies for transmitting video data

over networks, has been commercialized as VisualCast®*1) and is being offered as a social infrastructure. VisualCast is used as a monitoring device for remotely monitoring large scale events, monitoring cross sections, as well as monitoring large scale public facilities, such as Haneda International Airport in Tokyo, in an active role as an infrastructure for protecting the security of our daily lives in society.

OKI has been proactively participating in international standardization efforts relating to data compression coding technologies and the technology proposed has been adopted as a standard for MPEG4. OKI launched "excrea for V-Live®*2)" in 2006, in so doing commercializing an encoding software product for the preparation of video files that can be played back on mobile terminals.

Particular about the transmission of video over networks, in the aforementioned manner, OKI has been developing data compression coding technologies, transmission technologies and real-time processing technologies. As we enter the era of full-scale broadband services, with household appliances connecting to networks to become information appliances, the application of video transmission technologies appears to be expanding in a variety of fields. Serious changes are taking place with communications on mobile terminals, as they shift from communications using voice to video images. Amidst all this, OKI's fastidious research, development and practical implementation regarding video transmissions, named the high quality video transmission technology for high quality images eVideo, presenting it as a software engine that can be loaded on information appliances, cameras and mobile terminals. eVideo is expected to be a major move towards the use of video communications in society, as it can be loaded onto information appliances that are representative mobile terminals catering to communications with video images in the future.

What is eVideo?

Not only does eVideo comply with video compression coding methods, such as MPEG4 and H. 264, stipulated by international standardization organizations, such as ISO and ITU, but it also incorporates proprietary technologies for increasing process speeds and improving image quality, as well as IP network transmission technologies nurtured by OKI over the years. Furthermore, it is a library group comprised of components with codec at the core for effectively and efficiently transmitting multimedia information, such as audio and video, over IP networks (**Fig. 1**). Even though the technology delivers a high image quality, it also provides high speeds, small data sizes, as well as a short incidence of delays, while supporting low grade images to high definition images, making it compatible to be incorporated onto various platforms ranging from mobile terminals to personal computers.

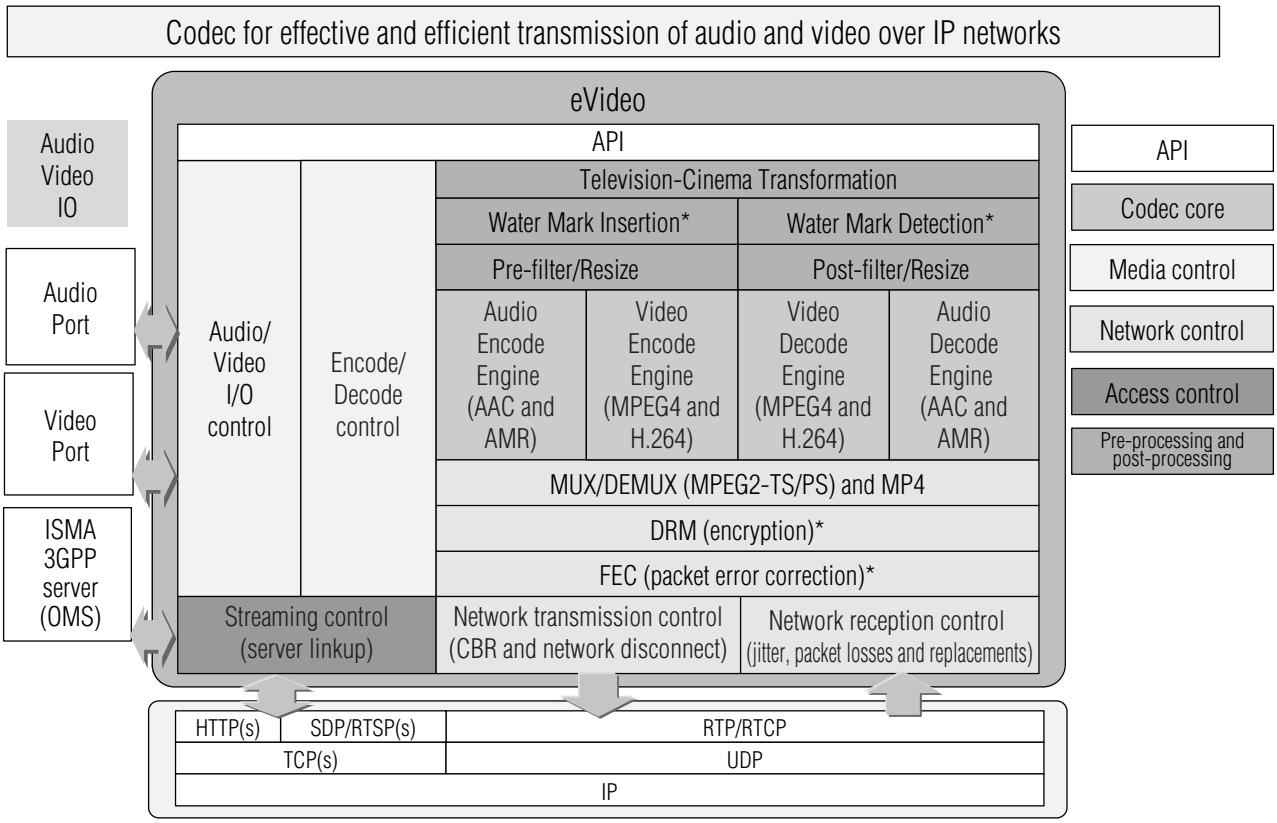

Fig. 1 Framework of "eVideo"

*1) VisualCast is a registered trademark of Oki Electric Industry Co., Ltd.
*2) V-Live is a registered trademark of NTT DoCoMo, Inc.

Video images better than conventional images (a) are available with the use of eVideo as shown in **Fig. 2**.

(a) Conventional image (b) eVideo

Fig. 2 Image of eVideo (1 Mbit/s)

The main library modules are shown below:

- **Codec core engine**

  This engine module incorporates a codec algorithm for accelerated speeds and high image quality while maintaining compliance with international standards. The module provides a speedy and high quality image movement search, forward and backward feeding rate control, minimum bit search algorithm, high-speed calculation process algorithm, as well as minimal delay rate control.

- **Media control**

  This control module provides application control, linkup and multi-functional support for video image input and output control, as well as encoding, play back and interactive communications to smoothly load and play back video images.

- **Network control**

  This module incorporates an optimized control technology for the real-time transmission of audio and video data over IP networks, with a minimal delay rate control, robust network error preventative strategies (against packet losses and congestion) and a stable network transmission control method (CBR transmission). Furthermore, it also incorporates encryption and encryption key exchange technologies, as well as a high resistance watermark technology, OKI's proprietary highly reliable encryption technology, known as Digital Right Management (DRM).

- **Access control (data streaming control)**

  This data streaming control module facilitates live and video on demand (VOD), unicast and multicast transmissions, as well as IPv4 and IPv6.

- **Pre- processing and post-processing**

  This pre-processing and post-processing module is used for the codec core engine and incorporates features for the conversion of formats, such as YUV and RGB24, as well as OKI's proprietary noise reduction technology, which retains image contours.

The eVideo library can be used in a wide range of devices from mobile terminals to personal computers. The CPU is compatible with Intel Pentium*3), Intel Xscale*3), TI C6xxx, TI OMAP™*4), SH4, SH-Mobile and ARM®*5), etc. Operating systems, such as Windows*6), Windows CE*6), Windows M*6), Linux*7), mLinux, BREW®*8) and Symbian*9) can be used for its operation. We intend to expand its compatibility in response to the market trends and demands of the future.

OKI's video transmission technologies for mobile terminals

Competition in the mobile terminal market is intensifying, with pressure on the manufacturing businesses to incorporate new functions, to shorten development periods and to deal with increasing development costs. It is for this reason that a reduction in costs is sought through such means as creating common platforms or joining hands with rivaling businesses to establish development companies.

eVideo on mobile terminals provides a common video related library for multiple mobile terminal manufacturing businesses. Mobile service businesses are able to determine whether or not to offer a new video service quite easily, for example, since it provides a common library. The benefits for adopting eVideo are quite substantial for mobile terminal manufacturers because they are able to reduce their development costs. Furthermore, using eVideo will also make it possible to play back video images at accelerated speeds and with a high image quality.

The eVideo framework on mobile terminals is shown in **Fig. 3**. The functions provided can be broadly divided into two groups, one is comprised of a decoding library for video as well as audio and the other is a player engine that connects with the server, to control the decoder.

- **Decoding library**

  The eVideo library complies with the codec core engine. It is capable of decoding video images in MPEG4, H. 264 as well as H. 263 formats and it is also compatible with AAC, AMR and MP3 audio formats. By using the specified CODEC API, a player engine can be utilized at a higher level to call for programs. This decoding software is compliant with international standards, yet it delivers speedy and high quality images using the proprietary technologies of OKI. Furthermore, they are also able to accommodate Windows media.

- **Player engine**

  This library complies with the access control of eVideo. It is a streaming control module that enables live broadcasting, video on demand, unicast and multicast broadcasting, as well as IPv4 and IPv6, while

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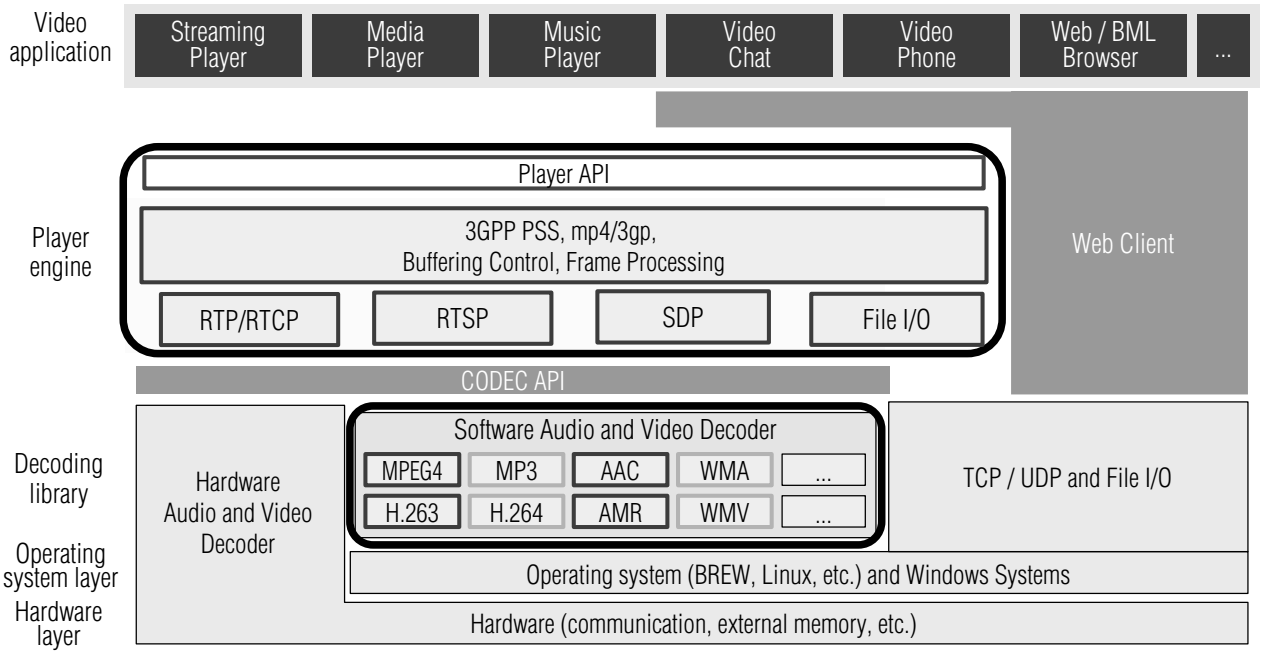

Fig. 3 Application of eVideo for mobile terminals

also complying with the 3GPP and MP4 standards for mobile terminals. Since Player API is specified the API of the upper level web clients and applications, such as video players, are all used to call for programs.

Although only a video decoding library is provided at the moment, we believe that eVideo library modules will be available for encoding in the future, as mobile terminals will be equipped with increasingly sophisticated functions.

eVideo technology and its future prospects with mobile terminals

Oki Access Technologies Co., Ltd., a joint venture between ACCESS and OKI created to provide software platforms on mobile phones, was established around the same time eVideo was launched. The implementation of platforms using eVideo on mobile phones was put into practice with the establishment of the aforementioned company.

Mobile phones will evolve from Generation 3.5 to Generation 4 in the future. It is fair to say that communication technologies using video images will be key technologies for this era. Communications with video images will be utilized as an infrastructure of society in the very near future. At OKI, we intend to contribute to the new era with video, using the eVideo technology we have nurtured over the years.

Authors

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TIPS Abstract

Broadband networks are spreading and data transmission rates are reaching accelerated speeds as capacities expand. IP networks are no longer considered merely for transmitting data and voice, since practical implementation of communications with video images is expected of IP networks.

OKI proceeded with the research and development of video transmissions even before IP networks emerged. The practical implementation of systems, primarily for video distribution and remote monitoring, has been successful. These video transmission technologies have been called eVideo and are available on the market as a software engine product for loading onto information appliances and mobile terminals.

eVideo is a general term used for video transmission technologies from OKI, primarily MPEG4-AVC/H. 264, which is an advanced IP video transmission standard that enables the transmission of high quality video images over low bandwidths. Such a video transmission technology with a high compression and high image quality has been achieved using software that utilizes architecture, which is a proprietary development of OKI.

This paper described eVideo, a set of high quality video transmission technologies and introduced implementation examples regarding the incorporation of eVideo in mobile terminals.

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