Multimedia Standards and Formats

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- **Sammendrag**/Abstract:

In this paper we discuss the standards for streaming on handheld devices and examine the leading products in this area. We also point out some potentially interesting application areas, and discuss some trends in this area.

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1. Introduction

This report is written as a result of Study Cs 2001 of the Channel S project.

The Channel S project has a superior objective of developing knowledge, methods and technological building blocks for net-based, multi-platform information and service solutions which enable information and services to be tailored and channelled to variegated target groups in different work and life situations. The overall effort is characterised by work aimed to delineate, develop and evaluate how multi-platform services and information can and should be:

· channelled to specific target groups through multiple technology platforms and end-user technologies;

· channelled through heterogeneous kinds of network infrastructures; and,

· organised as a service architecture enabling flexible use and updating.

The Study C2 is described in the plans as:

"Study C2: Multimedia Standards and Formats

Objectives

- To examine the relevant multimedia standards and their potential application areas.
- To examine the relevant multimedia standards' current presence in the different market segments.
- To analyse the current trends for the relevant multimedia standards.
- The scope of this study will be based on the results of an EU-project investigating the same standards and formats.

Results / Deliverables

- Technical note with possibility for academic paper
- Presentation within Programme Seminar "

In this paper we will consider audio and video related standards. Other standards for multimedia will only be commented on when relevant relative to streaming media.

2. Relevant Standards for Streaming Media

The need for distributing audio and video through telecommunication started with video-conferencing system. The ITU H-standards are covering most aspects of this area. The most relevant H-series standards for this paper are H.261 and H.263 regarding media compression and the H.32x series for transmitting data through various public or private telecommunication networks. The H-series protocols are still used, and today they are important in voice-over-IP (se eg.).

The Moving Picture Experts Group (MPEG) is a working group of ISO/IEC in charge of the development of standards for coded representation of digital audio and video. The group has produced MPEG-1, used for distributing digital video and audio. MPEG-1 is the standard on which MP3 is based. MPEG-2 is the standard used by DVD. It is compatible with MPEG-1, ie a MPEG-2 player will generally be able to play MPEG-1 media. MPEG-4 is intended to be "the standard for multimedia for the web and mobility". It is anticipated that MPEG-4 will replace H.261/3, working with communication speeds as low as 5 kbit/sec. The MPEG standards MPEG-1, MPEG-2, MPEG-4 and MPEG-7 each have several subsets. As we are investigating the use of streaming media for a series of devices, including PDAs and cellular phones, we will concentrate or MPEG attention on MPEG-4 in this paper.

In addition to the international standards in video and audio distribution, several proprietary / "industry standard"s have emerged. In this paper we will consider three of these, QuickTime from Apple Computer, Real system IQ from RealNetworks and Windows Media Technology by Microsoft. These three technologies are, in addition to MPEG, dominant on the web today. We will examine their differences in the next chapter.

For PDAs and cellular phones another set of proprietary solutions exists, and we will examine some of them.

3. Architectures cowered in the paper

This part of the study will give a short summary of the main features of and technical differences between the four “web-standards”. We will give references to easily accessible reports and papers going into more details on each of the standards.

The word streaming is used for (at least) two purposes. We will generally also use the word streaming in a broad sense. In some cases, however, we will differentiate between “true streaming” and “progressive download”. True streaming is real-time (live) broadcast. Progressive download is streaming stored video- or audio clips. The biggest difference is that true streaming requires enough recourse to run real time, whereas progressive download pre-transfer and buffer part of the media clip before starting to play.

3.1 QuickTime

QuickTime is the oldest of the four digital video architectures. It's been doing video on the Web as progressive download, for many years. QuickTime has supported true streaming since v4.0 (1999).

QuickTime streaming server is part of Mac OS X Server. It streams live audio and/or video with protocols RTP/RTSP. It guarantees 3000 simultaneous streams on a Macintosh G4.

A public domain version of QuickTime streaming server, named Darwin, exists for Red Hat 6.2 Linux (Intel), Solaris 7, FreeBSD 3.5 (Intel) and Windows 2000.

QuickTime 5 (current version) has client sw for Macintosh and Microsoft platforms. No player is available for hand-held devices.

3.2 Real System IQ

RealVideo from RealNetworks, is another pioneering Web streaming format. RealAudio was introduced in 1994; RealVideo was included with Version 4.0 in 1997.

The following codecs are supported in version 8.

- Single-rate RealAudio and RealAudio
- RealVideo and RealVideo SureStream
- Apple QuickTime Live
- MP3

RealPlayer 8 clients are available for Windows, Macintosh and seveal Unix platforms.

Mobile RealPlayer exists for Symbian OS, and runs on the Nokia 9120 Communicator.

3.3 MPEG 4

Two excellent short introductions to MPEG-4 have been given in the press, “The many Faces of MPEG-4” by Ben Waggoner in DV May 2001 and “Will MPEG-4 Fly?” by Jan Ozer, PC Magazine March 19, 2001 . Leonardo Chiariglione and Rob Koenen have responded to the second article. On the MPEG home page, an extensive description of the MPEG-4 standard can be found.

The basic building block of the MPEG-4 architecture is a media object. The architecture

describes the composition of these objects to form audiovisual scenes, how to multiplex and synchronise scenes to transport over network channels and how to interact with these audiovisual scenes on the receiving side.

The standard includes all types of media, not only streaming types.

3.4 Windows Media Technologies

At the time of writing Microsofts web site gives a good overview of both concepts and details of audio and video production for network distribution.

According to the web site the main Windows Media tools and components are:

- Windows Media Encoder. Converts source audio and video to digital media that can be downloaded or streamed.
- Windows Media Services. Distributes streaming media over a computer network.
- Windows Media Player. Converts digital media back to analog audio and video.
- Windows Media Rights Manager. A DRM system for the secure distribution of digital media files.
- Windows Media Software Development Kit (SDK). Detailed information for creating custom programs and Web pages that use Windows Media Technologies.

The following codecs are supported by WMT:

Microsoft Windows Media Audio version 7.0	This latest Windows Media Audio codec supports content encoded with Windows Media Audio version 2.0.
Sipro Labs ACELP	Encoding low-bit-rate voice content. This codec comes with several audio formats depending on the network bandwidth you choose.
Microsoft Windows Media Video version 7.0	It supports a wide variety of network bandwidths and enhances video quality for broadband Internet users. It supports multiple-bit-rate profiles and delivers TV-quality compression at 700 Kbps.
Microsoft MPEG-4 version 3.0	Encoding video with Windows Media Encoder version 4.0.
ISO MPEG-4 video codec version 1.0	Based on the International Standards Organization (ISO) MPEG-4 standard.
Microsoft Windows Media Screen version 7.0	Encoding screen capture video. This codec enables lossless streaming of computer screen images at data rates as low as 15 kbps. It is included with Windows Media Player 7.

The current version has support for Windows, Macintosh and Windows CE /PocketPC.

4. Players for Hanheld devices

4.1 Players for PocketPC

The market for players for hand-held dvices

4.1.1 PocketTV

PockeTV is a MPEG-1 player for hand held devices. Requirements are a colour screen PDA. According to the manufacturer you will need about 500K of storage memory to install PocketTV, plus at least 2MB of available Program Memory.

More info can be found on: http://www.mpegtv.com/wince/pockettv/

4.1.2 Media Player 7.1

Microsoft Media Player has been discussed previously. Of the four major web-technologies discussed above MMP is the only one supporting handheld devices.

4.1.3 Packet Video PVPlayer

Pocket video follows the MPEG-4 standard, according to their Whitepapers. In addition they use the RTP/RTSP/RTCP communication protocols.

More info on: http://www.pv.com/

4.1.4 ActiveSky Player

ActiveSky uses a proprietary format. They do not provide an encoder or an API to the general public. To encode your movies you need to buy services from one of their partners. A list of companies that do encoding can be found on their web-site.

http://www.activesky.com/

4.1.5 Casio MobileVideoPlayer

The Casio Mobile Video Player uses a proprietary format, based on MPEG video compression and a special sound format that is Casio specific. Movies can be converted on a PC into CMF format and then copied to the PDA for playback. The player and converter is shipped with Casiopeia. The player can be downloaded from http://www.cewindows.net/casio/index.htm

4.1.6 Pocketmultimedia

Pocketmultimedia is using a proprietary, wavelet-based technology. They offer a library and an API for developers to encode video into the Pocketmultimedia format.

http://www.pocketmultimedia.com/

4.2 Players for PalmOS and Symbian OS

The to other major operating systems for handheld devices are PalmOS and Symbian OS (formerly EPOC).

4.2.1 Palm

4.2.1.1 ActiveSky Player

An ActiveSky (see above) player exists for Palm, and can be downloaded from (http://www.activesky.com/).

4.2.1.2 MovPlayer from Micro Technologi, Inc.

Plays QuickTime movies.

http://www.mti-mimir.com/pilot.html

4.2.1.3 TealMovie from Tealpoint

TealMovie is a Palm multimedia system which enables any model Palm handheld to become a player of sound files or high-quality video and animation. It supports features previously unavailable, including smooth playback up to 25 frames per second, high-quality full screen color or grayscale imagery, and synchronized sound playback capability. In addition to providing entertainment, TealMovie greatly extends the usefulness of Palm handhelds for sales, marketing, training, service, and maintenance operations for a wide range of industries. Sound playback is available on all Palm handheld models above a Palm III.

http://www.tealpoint.com/softmovi.htm

4.2.1.4 PhotoSuite Mobile Edition.

MGI PhotoSuiteMobile Edition for Palm Os let you view and share media files on colour and grayscale devices. This product is bundled with the Palm 500 series.

4.2.1.5 FireProducer

FireProducer enables video streaming to a PalmOS handheld device connected to the Internet. It is the only server application for streaming media to PalmOS devices. Both live and stored video on the Internet or a corporate Intranet - movie trailers, production dailies, animations and webcams - can now be streamed to a handheld device. FireProducer can be used for surveillance purposes, corporate news and training broadcasts, media and entertainment companies and more. FireProducer brings unexpected video functionality to the Palm, opening up new markets and taking video data beyond desktops and laptops.

Firepad provides both consumer desktop and enterprise grade servers for streaming media. The trial version supports one input stream and one output stream. The full version supports one input stream and multiple output streams.

4.2.2 Symbian

Symbian recently announced an alliance with Real Networks to provide Real clients for the Symbion OS, the Mobile RealPlayer. The player is released on the Nokia 9210 Communicator.

5. The Standards current presence in different market segments

A market segmentation will be done for the mayor applications area, and an attempt to document the presence of the

The best recent numbers come from a Jan. '00 Nielsen/NetRatings report. They don't measure installed base (which would give a huge lead to Windows Media because it's pre- installed on all Windows machines), but rather, they tell you which players were actually used in the month of November. Note that these numbers aren't exclusive; people who view a lot of Web video are likely to use two or three different players.

Market Penetration

Player	Unique Audience	Reach
RealPlayer	8,973,331	12.1 percent
QuickTime	5,461,303	7.4 percent
Windows Media	2,376,191	3.2 percent

6. Potensial application areas for the different standards.

Sound and moving pictures are commonly used today, mostly in the learning and entertainment industry. These industries are the most likely ones to take these techniques into new devices.

The music industry is likely to be using multi-media networks to distribute their product. Music has a fairly small footprint, both in bandwidth and storage. An MP3 player much smaller than a traditional walk-man can store hours of music. The possibility to by-pass the traditional distribution network (music stores) is tempting, and distribution of music via the net will be one way of doing business in the future. The problem to be solved is the Intellectual Properties Rights (IPR).

The movie industry is less likely to distribute films in the same way. First of all watching Star-Wars on a 320*240 screen with the sound coming from your head-set is not a killer application. People are likely to want screens at least the size of a TV set to view films. It might be cool to se a 3-minute trailer on your PDA, but it is not likely to be a mass market for feature length movies. Secondly the footprint of video is enormous compared to sound. To download movies at DVD quality over mobile networks will not be feasible in the entertainment market in the near future. We assume that video-on-demand to set-top-boxes will be the first step in digital movies to consumers. This is an interesting market, but a bit outside the scope of this paper.

If videophones had been a good idea, we would have had them. The technology has been there for decades, but never taken off in the mass market. We have seen conference system utilizing video for some time, and they are used in the business market. It has not been an overwhelming success. New and more efficient video compressing standards are not going to change this.

Digital television will probably take off, but it is hard to se application that will give qualitatively different television. You can have more channels on the same bandwidth, but so far this has been “more of the same”. On-demand services are appealing when it comes to movies, but a lot of TV is based on live coverage, and having a digital video recording service might not be such a good idea. With continuous news coverage on multiple channels, the idea of watching the 9-o’clock news at any time you want is a bit outdated. And “yesterday’s paper is today’s fish-wrap” so the market for yesterday’s 9 o’clock news seems marginal.

Animated “talking head” news on PDAs is another area in which we have little confidence. Most newscasts are radio with pictures anyhow, so why not just send the sound?

So to the areas where we believe net-based video will be used. The main areas are Learning, simulations and games. We do foresee web-TV and digital broadcasting, but mainly on PC /TV, not on handheld devices.

Learning already is a large market on the Internet, and we anticipate that net-based learning will increase its market. Handheld devices will play a part in learning, and more so in the privet market than in schools. PDAs and mobile phones will be used in just-in-time learning for sales-reps and engineers on the road. Video will play a part in these learning processes.

Games will benefit from live video. This will be used both in adventure games and in betting. For betting you will be able to se parts (the finish) of a horse-race or the penalty kick from a football mach while betting on the outcome.

These two areas are discussed further in the next section of the document.

7. Trends in multimedia standards

Although there are some methods for the extrapolation of facts into trends, prediction of the future always has aspects of guessing. Through analysis, interviews, observation, discussions aso one can build a basis where the guessing can be called qualified, but it is still guessing. The trend analysis in this paper is based on literature studies, web search and discussion. It is done based on some years of experience in the area of multi-media.

7.1 Bandwidth is Increasing

Bandwidth is increasing in all areas, in office, at home and on mobile devices. In the near future the servers might have problems filling up the communication pipelines.

Until now, the cost of entry has been low on the Internet. A fairly cheap PC, a

MP3 is and will continue to be the leading audio streaming format

For streaming audio MPEG-1 audio layer-3, MP3 for short, is the dominating format, and it will continue to be so for the next couple of years. The number of devices and sw-packages supporting this format will keep the momentum going. There is still a great controversy over the intellectual properties rights of MP3 music files, but this will not stop MP3 from being the preferred audio format in the near future.

Two factors could change this trend:

· The introduction of a new IPR system supported by the music industry that makes it simple to legally download music

· The introduction of a mass-market system that make downloading music simpler than today

We do not expect this to happen for the next two years.

7.2 Video on PDA will not make it into Business-Critical Systems

Video on PDAs is not a major business area. Although video clips in different formats are available for download, it is not a big hit. PDAs are generally used as a business tool. We know no business critical application based on PDA video. At the present, we do not see any such application appearing.

We do however se one business related market where useful applications are likely to emerge: Learning. The use of Learning-on-demand and Just-in-time-learning systems will increase. More and more people will work out-of-office. They will need support and learning systems. The use of multimedia in mobile QA-, Security- and learning system will increase.

7.3 Learning Systems will be the Dominant Business Application for Multimedia

In addition to Learning we foresee applications in entertainment and gaming. This will emerge when mobile phones and PDAs merge further, when communication speeds increase and when the price point reaches a consumer accepted level. Like SMS messages and call-tones took of, a simple camera/encoder communicating (eg via BlueThooth) to a mobile phone might take off.

7.4 Gaming Applications will use Multimedia

We believe that Games will benefit from video streaming. We anticipate that the gaming market will continue to grow, and that PDA / Mobile phones will be a major platform for gaming. The gaming industry has been driving the use of advanced graphics in sw applications. We assume that this will continue, and that the use of streaming multimedia will be used extensively by the gaming industry.

One Dominant Player is Emerging in Video Streaming for PDAs

So far, no dominant player has existed in the field. This is about to change. With Windows Media Player 7.1, Microsoft is about to capture the market. As discussed above, Microsoft uses a proprietary format, based on the MPEG-4. With an encoder free of charge on their website, the encoding of video into this format will take of. The only real challenge might come from a free for all real MPEG-4 encoder. This is not likely to happen.

7.5 New MPEG Standards will Emerge

MPEG-7, Multimedia Content Description Interface standardises several aspects of organising meta-data for multimedia. It is not final by the time of writing, but will probably be by the time this is read. The official date is “July 01”.

MPEG-21 will standardise the framework for multimedia production, distribution and consumption. Handeling intellectual properties rights will be part of this standard.

[1] Holmes, P., Aarhus, L., Maus, E., "An Investigation into the Effects of GEO Satellite Environments upon H.323-based Voice over IP", NR Report 973, May 2001, ISBN 82-539-0479-7

[2] MPEG Group can be found at http://www.cselt.it/mpeg/

[3] Web version at http://www.zdnet.com/filters/printerfriendly/0,6061,2692072-50,00.html

[4] http://www.m4if.org/MPEGFlyresponse2.html

[5] http://www.m4if.org/MPEGFlyresponse.html

[6] MPEG-4 Overview (V.18 – Singapore Version), www.cselt.it/mpeg/standards/mpeg-4/mpeg-4.htm

[7] msdn.microsoft.com/windowsmedia/default.asp