

## WORLD WIDE WEB AUDIO: ENSURING ADEQUATE HARDWARE AND SOFTWARE CONFIGURATIONS

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### ABSTRACT

*As Client machines need to be properly configured with the correct hardware and software to playback the many different audio file formats available, a discussion of how to configure client machines is given.*

**Keywords:** *Helper applications; Internet audio; Internet multimedia; MIDI; Malaysian WWW users; Real Audio; WWW audio; WWW browser configuration*

### 1.0 INTRODUCTION

The WWW is undoubtedly the fastest growing segment of the Internet [1], with its friendly graphical user interface (GUI) and powerful hypermedia capabilities rapidly making the dream of a truly global village a reality [2]. Nielsen's description of the present trend of integrating hypertext and multimedia into hypermedia presentations suitable for dissemination over the WWW [3] is certainly the norm in today's Internet society. Every organisation, commercial or non-commercial, is eager to establish and maintain an effective WWW presence. In Malaysia, more and more organisations and individuals are going online, in line with the nation's IT development policy [4, 5, 6].

The network protocol for the WWW, the HyperText Transfer Protocol (HTTP), is a generic stateless object-oriented protocol, built to facilitate browsing of many sources of related networked information available over the Internet in a manner transparent to the user [7]. Present WWW browsers connect to many different Internet services utilising many different protocols all at the single click of a mouse. File transfer protocol (FTP), gopher, Usenet News (NNTP), telnet, finger, wide area information search (WAIS), electronic mail and many other

Internet services are easily accessible through WWW browser software. Formatted text and graphics are displayed as hypertext documents while audio, video and certain other graphics formats are displayed using *helper applications*, programs on the user's computer that are used to display files that cannot be displayed by the browser itself [8].

The WWW is thus synonymous with cross platform communications by way of the Internet. However, a brief look around at the various audio file formats available will quickly indicate that there is a lack of cross platform standards in this area. The *Interactive Multimedia Association* (IMA) has recognised this problem of interchange between PC, Macintosh and workstation computers different native audio data types and different sampling rates and has recommended practices for developing and processing interchangeable digital audio data formats to promote cross platform compatibility [9].

The present study was carried out to determine the use of WWW audio among Malaysian WWW users. With so many Malaysian organisations publishing sophisticated multimedia WWW pages, it was thought useful to identify whether or not the average Malaysian user is able to actually playback the various audio files available. The paper concludes with a discussion of how to properly configure client machines with the correct hardware and software to playback the many different audio file formats available.

### 2.0 MALAYSIAN WWW AUDIO SURVEY

#### 2.1 Methodology

A survey was carried out to discover how Malaysian WWW users were using the audio available over the Internet. The survey questionnaire was posted to all

newsgroups relating to Malaysia and responses were received via electronic mail. This method of distribution was chosen as the one which could potentially reach the largest number of users as the option to email the survey to all Jaring (an Internet provider in Malaysian) members was not available. Feedback via a Web page using the forms element was not thought to be a viable option as there would be no way to ensure the form would be read by a sufficient number of users.

## 2.2 Findings

In all, 103 responses were received. This number was small in comparison to the Jaring membership which stood at about 10,000 at the time the survey was conducted (1%). Several reasons may be put forward to account for the poor response:

- Although the newsgroups to which the questionnaire was posted have a high volume of traffic, many of the same users make frequent postings. This means that the questionnaire may not have reached the majority of Jaring members.
- Many of the users who may have seen the questionnaire may not have responded due to natural apathy.
- This may also indicate that many of them do not know how to properly configure their clients for audio. Some may not have even understood the questions.

Of the respondents, 71% used multimedia computers to browse the WWW, while 24% did not and 5% had Internet access but no WWW access. Of those that had WWW access, Netscape Navigator proved to be the most popular browser, used by 91% of the respondents. 3% of users could not identify their browsers, while the remaining 6% of users used other applications such as NCSA Mosaic, Internet in a Box and Microsoft's Internet Assistant.

53% of these claimed they knew how to properly configure their browser to playback any type audio file, while 14% said they were able to configure their browsers to playback some audio file formats but not others. 33% said they did not know how to configure their browsers at all. 43% were not able to playback MIDI file formats, 36% were not able to playback .au digital audio file formats and 32% were not able to playback .wav digital audio file formats, 3 of the most common audio and music file formats available over the Internet. 36% were able to playback all 3 file formats.

36% of those unable to playback any one or more of the above file formats could not do so as they did not have a sound card installed in their machine. This amounted to 22% of the total number of respondents. 30% of the total number of respondents had earlier declared they used a non-multimedia computer. This 8% discrepancy occurs because some of those who used non-multimedia computers chose not to answer the above section of questions while others did answer them. It is an interesting point to note that some of these individuals were confident that they knew how to properly configure their browsers although they lacked the appropriate hardware. Another point to note is that of these users, 4% were yet able to playback files in .wav format, through their internal PC speaker with the appropriate software installed.

40% of those unable to playback any one or more of the above file formats said that they did not know how to properly configure their WWW browser. This figure is somewhat lower than the 47% (33% + 14%) who said they were either not able to configure their browsers to playback audio files at all or only for certain formats. This result possibly indicates that among those 47% of users, 7% may have had other people configure their browsers for them. Of the remaining number of those unable to playback any one or more of the above file formats (24%), 9% had soundcards that were not MIDI compatible, hence not meeting the Multimedia Personal Computer (MPC) specifications standards set by the MPC Marketing Council in 1991 [10]. 7% said they lacked the software or helper applications needed to playback these file types. 4% felt that it was too troublesome and not worth the effort to configure their browsers for audio due to insufficient communication bandwidth. Other reasons cited for not playing back some of these file types included dissatisfaction with the quality of audio playback on cheap soundcards and denial of permission to configure browser software used in the case of students using school computers.

Besides .au, .wav and MIDI file formats, it was found that 44% were also used to browsing several other native audio formats over the WWW. Of these, Progressive Networks *Real Audio*, a new mime type which allows users to listen to audio in real time while downloading [11], has proved most popular with 34% of all WWW browser equipped respondents able to playback this file format. Fig. 1 and Table 1 summarize the other audio file formats respondents said they were able to playback.

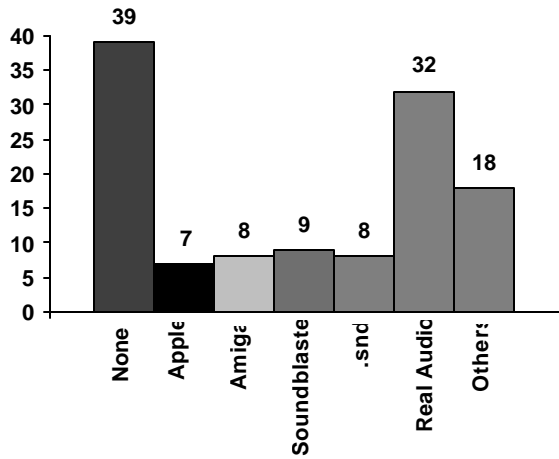


Fig. 1: Other audio file types playable from browser

20% of the respondents were also able to playback several other application specific file formats (see Fig. 1), not usually found over the Internet.

Respondents used a variety of helper applications (see Fig. 2), including freeware, shareware and commercial products.

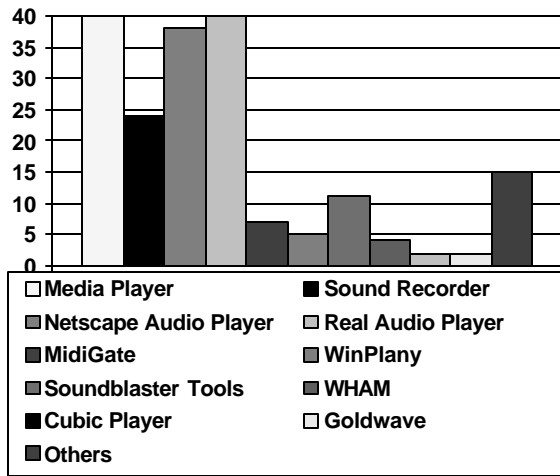


Fig. 2: Audio helper applications used

It should be noted that of the above, Media Player and Sound Recorder are applications provided with Microsoft Windows; Netscape Audio Player comes preconfigured with the Netscape Navigator browser software; Real Audio player is available over the Internet, as is Cubic Player, Goldwave, MidiGate, WinPlany and WHAM; and Soundblaster tools include various audio and music software provided with the purchase of the Soundblaster sound card. Various other software was also cited, in use singly by various respondents.

A brief profile of the respondents was also obtained. It was found that 54% confined their WWW browsing to the home while 29% only browsed the WWW at their workplace or school. 17% spent time on the WWW both at home and at work or school. (Note: *school* as used in this paper includes all educational institutions, including schools, colleges and universities). 70% of those surveyed were working people, 29% were students while 1% was retired. 91% used an IBM PC or compatible to connect to the Internet, with only 5% connected via an Apple Macintosh and 4% via a non-WWW VT-100 terminal emulation connection. Several users were connected to the Internet via more than one type of computer. These include 7% on Sun Sparc workstations and an extra 3% on VT-100 terminal emulation connections.

### 2.3 Discussion

The survey findings indicate that possibly a majority of Malaysian Internet users browse the WWW using a multimedia IBM compatible personal computer equipped with the Netscape Navigator WWW browser. This would seem to indicate that users are potentially able to access the often sophisticated multimedia WWW pages published by various Malaysian organisations easily. However, the findings also indicate that a significant number of users are not fully utilising the capabilities of their multimedia PC's or their WWW browsers due to a lack of know how in terms of both adequate hardware and software configurations.

Table 1: Various audio file types extensions and origins

Extension	Origins
.au	NeXT, Sun
.aif, .aiff, AIFF, AIFC	Apple
.iff, IFF, .mod, .nst	Amiga
.mpg, .mpeg	Mpeg Audio
.voc	Soundblaster
.wav, WAVE	Microsoft
.ra, .ram	Real Audio
.snd	this extension is used for different formats of various origins

### 3.0 ENSURING ADEQUATE CLIENT HARD-WARE CONFIGURATIONS

Our discussion will be limited to the IBM PC and PC compatible machines as our research findings have shown that the vast majority of Malaysian's use such machines to browse the WWW.

In order to take full advantage of the hypermedia capabilities of the WWW, client machines need to be equipped at least with a 16-bit sound card capable of digital audio, video and MIDI playback. The MPC Level 2 Specification [10] further requires that the PC be a 486-based system (no speed specification) with at least 4 MB RAM. In addition to these requirements, a modem with a minimum speed of 14.4 kbps is recommended for home users in Malaysia logging in to the Internet via a dialup connection. 28.8 kbps modems are currently in the market, but existing Telekom Malaysia phone lines are presently stable only at 14.4 kbps. Users would also need a pair of speakers or headphones.

This is merely the minimum configuration required. Naturally, a Pentium machine with 8 MB RAM and a 32-bit sound card would produce superior performance. A leased line connection running ATM or ISDN, as opposed to a dialup connection would naturally mean that hypertext documents are loaded much faster on to the client machine.

### 4.0 ENSURING ADEQUATE CLIENT SOFT-WARE CONFIGURATIONS

#### 4.1 Helper Applications

A helper application is a program that is launched by a WWW browser to process files that the browser cannot handle internally. When a user clicks on a hypertext link, the client machine sends a request to the server for the file referenced in that link. The server then processes the request and sends the requested file back to the client. A special message header which is part of the HTTP protocol is sent to the client just before the actual data, explicitly informing the browser as to the type of data to be transmitted. This message is the *Multipurpose Internet Mail Extensions* (MIME) content-type header, in the format

*Content-Type: filetype/subtype*

Upon receiving this message, the browser if properly configured, searches its own database of helper applications to find the program that is associated with

that particular MIME type. If the helper application specified is present, the data will then be passed to the program for processing. If the data comes from an FTP server, the browser will guess at the data content from the filename extension. In the case of audio, 3 MIME types are preconfigured into most WWW browsers (see Table 2):

Table 2: MIME Types and their extensions

MIME Type/subtype	extensions
audio/basic	au, snd
audio/x-aiff	aiff, aiff, aifc
audio/x-wav	wav

This means that if the hypertext link requested of by the client references to a file of any of these MIME types, the browser will recognise this and launch the appropriate helper application. In Netscape Navigator, the browser automatically launches the Netscape Audio player (naplayer.exe) for the audio/basic MIME type. This is because the Netscape Audio player is automatically installed and configured when the user installs Netscape Navigator on to the client machine.

The other MIME types, audio/x-wav and audio/x-aiff, still need to be associated with appropriate helper applications. The procedure described in the following section for audio/x-wav is valid for all other MIME types, only different helper applications need to be used for different MIME types.

#### 4.2 Configuring Netscape Navigator for Audio

Netscape Navigator is described due to the indications from the survey findings that most Malaysian WWW users use this WWW browser.

Setting up Netscape to play audio files is actually a straightforward task. From the Netscape **Options** menu item, select **Preferences** (see Fig. 3).

- From the choice of items presented there, select **Helper Applications** (see Fig. 4). This reveals the menu in Fig. 5.
- Select the File type *audio/x-wav* and the **Launch Application** radio button under the **Action** menu. Type in the path or select **Browse** to specify which helper application is to be used for this MIME type. Press the **OK** button when done.

The steps outlined above are the same for all MIME types and helper applications.

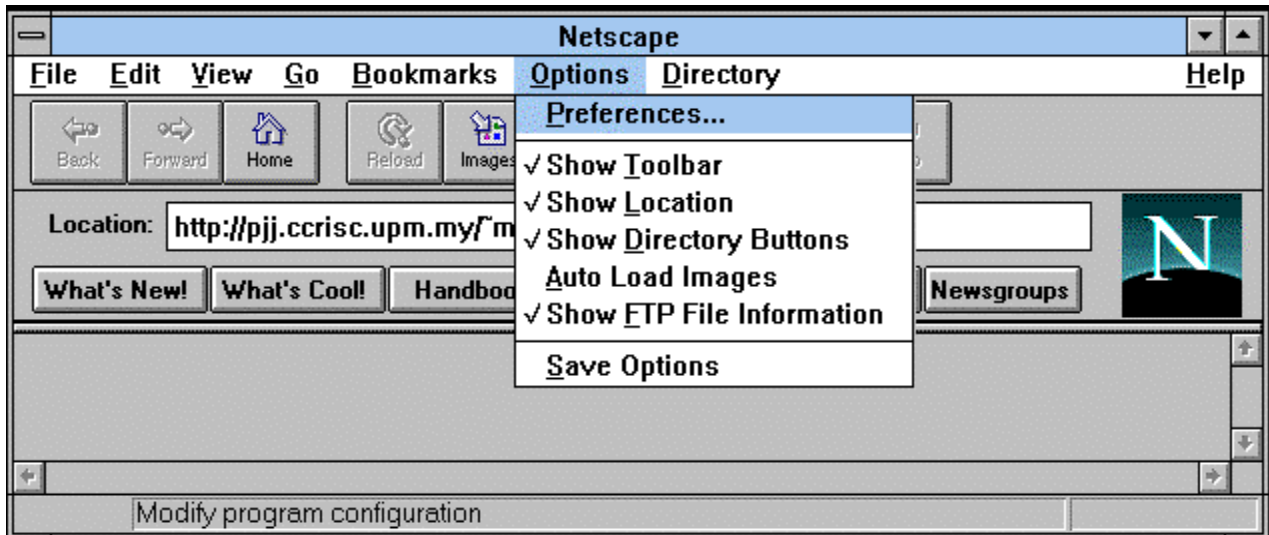


Fig. 3: Netscape Menu Bar

#### 4.2.1 Configuring Netscape for new MIME types

This is important for the user to know as there are many audio file formats found on the WWW other than the 3 standard ones predefined in most WWW browsers. Table 3 lists out the most commonly found of these, along with their filename extensions.

Table 3: Other audio MIME types

extension	filetype / subtype
.mid	audio/midi
.mp2	audio/x-mpeg
.ra, .ram	audio/x-pn-realaudio

The procedure in configuring these MIME types is identical to that which was described in the previous section, except that instead of merely selecting the MIME type from the scrolling menu, the user now has to select the **New Type** button and type in the new filetype and subtype. Suitable helper applications for each MIME type are discussed in the following section.

#### 4.3 Installing suitable Helper Applications

A suitable helper application is not merely one which can playback the particular MIME type required but also one which is quick to launch and able to run as a background process, allowing the user to continue browsing. An additional useful feature is spontaneous playback - some applications require the user to press the **Play** button while others playback spontaneously upon completion of downloading. A helper application should be merely a *player* as opposed to an *editor* as large editor applications

take significantly longer to launch than smaller player applications due to their many extra features unnecessary to someone merely interested in listening to audio/music online.

A point to note here is that most audio MIME types are not played back in real time. The relevant helper application is activated immediately once all the audio data has been received by the client machine. Real time WWW audio is a relatively new development, having been introduced by Progressive Networks within the past 6 months. The real audio MIME type plays back spontaneously from the continuous incoming data stream, utilising a buffer mechanism to overcome interrupted packet delivery hiccups [11]. *StreamWorks* is another new real time audio MIME type recently released by Xing Technology Corporation, utilising a similar technique [12]. In the case of real time audio, the connection with the server is lost once the user activates a subsequent hypertext link.

A final criterion in selecting a suitable helper application is the application's availability and cost (see Table 4). Many are available over the Internet as freeware or shareware. These applications have often been developed with the WWW in mind and thus often proven to be more suitable than commercial applications which are usually designed as editors rather than players anyway.

Having considered all the above, Table 4 lists out helper applications recommended for the more commonly found MIME types on the WWW.

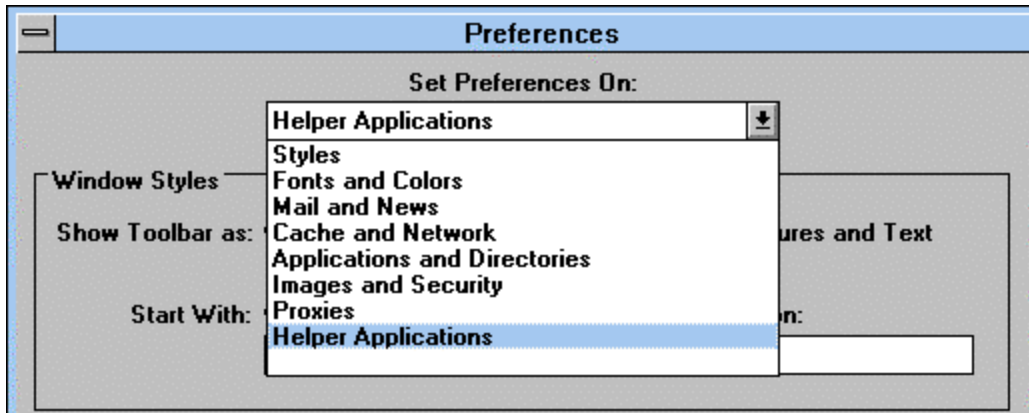


Fig. 4: Select **Helper Applications** from pull-down menu

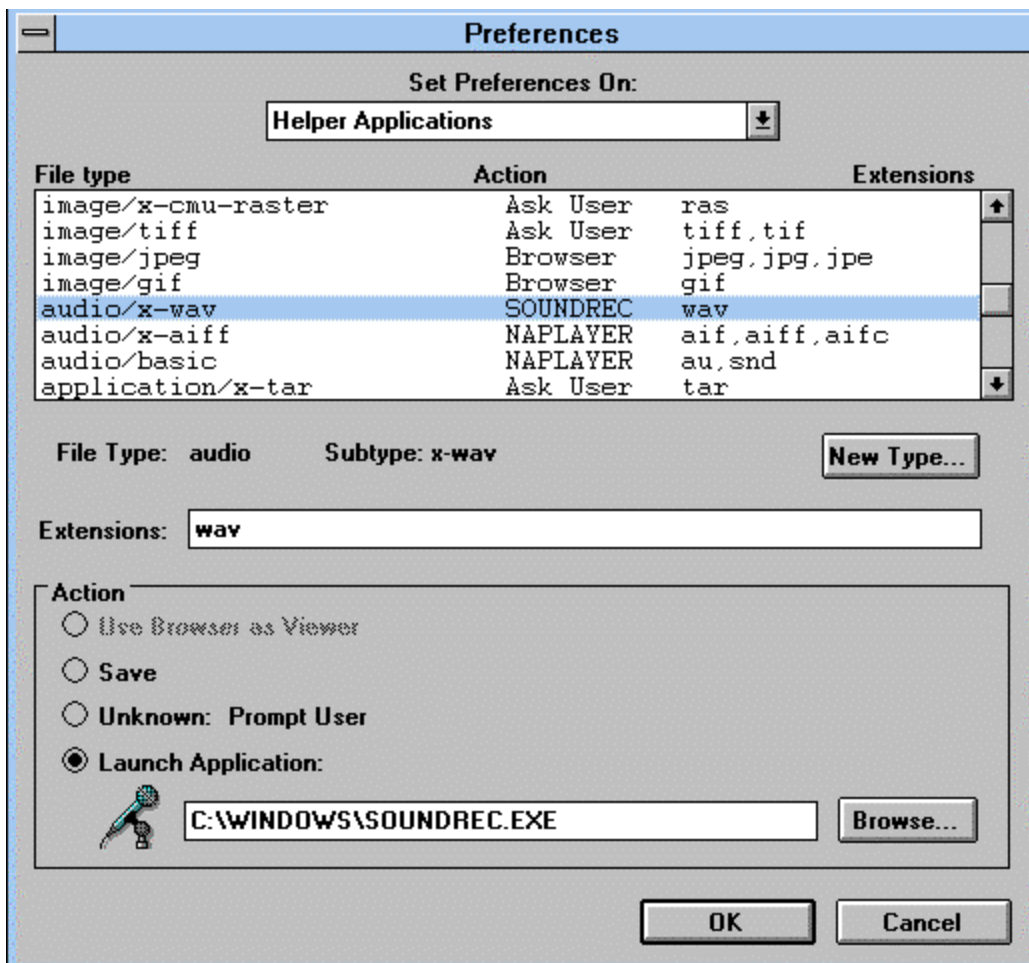


Fig. 5: Setting preferences on Helper Applications

## 5.0 CONCLUSION

A majority of Malaysian Internet users browse the WWW using a multimedia IBM compatible personal computer equipped with the Netscape Navigator WWW browser. A significant number of users are not fully utilising the

capabilities of their multimedia PC's or their WWW browsers due to a lack of know-how in terms of both adequate hardware and software configurations. Client computers need to meet certain minimum hardware specifications and be equipped with certain software in order to utilise the audio on the WWW.

Table 4: Recommended Helper Applications

MIME Type	Helper application recommended	Obtainable from
audio/basic	Netscape Audio Player	<a href="http://www.netscape.com/">http://www.netscape.com/</a>
audio/x-aiff	WinPlany	<a href="http://www.cdrom.com/pub/cica/win3/sounds/">http://www.cdrom.com/pub/cica/win3/sounds/</a>
audio/x-wav	Windows Sound Recorder or Windows Media Player	Microsoft Windows
audio/midi	MidiGate	<a href="http://198.68.188.62/midigate.html">http://198.68.188.62/midigate.html</a>
audio/x-mpeg	MPEG Audio Player	<a href="ftp://ftp.iuma.com/audio_utils/mpeg_players">ftp://ftp.iuma.com/audio_utils/mpeg_players</a>
audio/x-pn-realaudio	Real Audio Player	<a href="http://www.realaudio.com/">http://www.realaudio.com/</a>

## REFERENCES

- [1] D. M. Chandler, *Running a Perfect WEB Site*. Indianapolis: Que Corporation, 1995, pp. 10-13.
- [2] Z. Razak, "The Internet Global Villages and its Challenges", in *Using IT to Build a Better Future Conference, Kuala Lumpur, 3 October 1995*.
- [3] J. Nielsen, *Multimedia and Hypertext: the Internet and Beyond*. California: AP Professional, 1995, pp. 338-361.
- [4] M. Awang-lah, "Publishing Information on the Internet: Technical, Management and Policy Issues", in *Using IT to Build a Better Future Conference, Kuala Lumpur, 3 October 1995*.
- [5] K. Kramer, "Competing in Computers: Business and Government Strategies in East Asia", in *Persidangan Infotech Malaysia '95, Kuala Lumpur, 1 November 1995*.
- [6] K. Ohme, "Formulating Multimedia Policy for Malaysia", in *Persidangan Infotech Malaysia '95, Kuala Lumpur, 1 November 1995*.
- [7] E. Tittel, M. Gaither, S. Hassinger & M. Erwin, *Foundations of World Wide Web Programming with HTML & CGI*. California: IDG Books Worldwide Inc., 1995, pp. 4-7.
- [8] I. S. Graham, *HTML Sourcebook*. New York: John Wiley and Sons, 1995, pp. 60-61.
- [9] IMA, *IMA Recommended Practices for Enhancing Digital Audio Portability*. <http://www.ima.org:80/forums/imf/audio>, 1995.
- [10] P. Perry, *Multimedia Developer's Guide*. Indianapolis: SAMS Publishing, 1994, pp. 16-18.
- [11] Progressive Networks Incorporated, *Delivering time-based information over the Internet*. <http://www.realaudio.com/products/http-vs-ra.html>, 1995.
- [12] Xing Technology Corporation, <http://www.xingtech.com/streams/>, 1995.

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