Listen To Me!
Creating Audio for PowerPoint and the Web

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<u>**Abstract**</u>**:**

This report proposes a methodology accessible to instructors at Mt. Hood Community College for manipulating digital audio sound clips using a personal computer (PC) and related peripherals. Sound files enhance academic presentations and offer a procedure to address audio learning styles more efficiently. Audio files can consist of spoken words, music, clips from TV or radio broadcasts, etc. Details for creating the audio will be suggested along with tips to construct the required sound.

Two novel applications of audio to enhance student learning and teaching effectiveness are proposed. The first involves the addition of customized audio clips to Microsoft PowerPoint presentations. Using a "second voice", a dialog can be created for classroom lectures that will keep the students' attention focused on the learning material. Audio learning styles will be addressed more effectively using audio clips than by using text and pictures only.

A second application will be the incorporation of audio into World Wide Web applications. Using recent advances in the QuickTime architecture, instructors can enhance their web sites with a variety of tools and techniques previously unavailable. Audio can be broadcast effectively over the Web even when download speeds of 56K are the norm (as they are in the MHCC District). Virtual lectures, training simulations, audio messages - all of these and more are possible using the power of audio.

Note that this document may be viewed on the World Wide Web: http://www.gst-d2l.com/TLC

<u>**Contents**</u>**:**

If I can answer any additional questions you might have, please contact me. Thank you for your time,

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I. <u>Introduction</u>

The Importance of Sound

I cannot imagine being unable to hear any sounds. Many of life's sounds are pleasurable: soothing music, the babble of a noisy brook, the sound of a loved one's voice. Many of life's sounds are certainly unpleasant as well - namely, screeching horns, the annoying roar of airplanes, the screams of a person in distress - but even these sounds imply information to the listener. A screeching car horn can save your life, and a scream of a person in distress can trigger an alarm, a call for action. Sound is an integral part of our life, and I personally cannot imagine living without it.

As an instructor, the delivery of sound remains the most indispensable basic tool for disseminating information. Talking to the students, telling them information verbally - these are the primary tools of my trade, imparting information to eager minds ready to learn the concepts. Yet how often I take this aspect of my teaching for granted; talking is as "normal" to human society as the desire to eat.

But when I consider the situation of the deaf, my perspective changes. Now all of my audible tools fail to impart information to the learning audience. To impart information to deaf and hard of hearing individuals, I must rely on the written word (and maybe a video on occasion) to get my message across. Reading lips can be of some assistance here, but the idea remains: the loss of audio implies an education barrier worth examining.

I will allow others more qualified than myself to address the implications of teaching lecture material to the deaf and hard of hearing. But what I discovered in my discourse was also of value to instructors, including the instructors at Mt. Hood Community College: the impact and power of audible sound. We can use sound to maximize our presentations and enhance student learning, accessing different learning modalities and enhancing the student learning process.

But sound - and music - is so much more. Music has a way of speaking to the individual's psyche because it is completely individually interpretive - when two people listen to the same song or sound bite, they will create their own mental images and impressions for themselves. The interpretation of each individuals' artistic experience will be unique and, frustratingly at times, incomprehensible to the outside world.

When music is combined with the appropriate visual (either animated or still), the result is incredibly dynamic - your senses are being probed on several levels, and the experience becomes much richer for the audience. This should be the goal of not just artists, but educators as well… we wish to expand our students' perspectives through examples, and music can help deepen the magnitude of the event.

Remember that before Hollywood could encompass the human voice and video simultaneously, music projected the characters' feelings and the movie's themes effectively. Movies devoid of music or audio fail to reach the inner recesses of the human psyche; music must accompany the experience for credible impact. This fact bolstered the fledgling movie industry into the multi-billion dollar megalith it is today.

So if you wish to reach your students, or any audience for that matter, a soundtrack of music or music and audio talking is critical to success.

Auditory Learning Styles

Theories concerning the differentiation of learning styles differ, but the primary four learning modalities are auditory, visual, tactual and kinesthetic. (www.about.com) Students who have an auditory strength or preference like the teacher to provide verbal instructions. They find it easy to learn by listening. They enjoy dialogues, discussions, and plays. (http://www.geocities.com/~educationplace/aud.html)

No one exhibits one learning style exclusively. Instead, our learning style preference changes as we progress into adulthood. Children start with a primarily kinesthetic modality, but by the first grade they become more tactual. The auditory learning style begins usually by the second grade, and the visual learning style begins by the third grade. It is important to realize that no learning modality is ever discarded; rather, we develop a learning preference for one or two modalities as we progress into adulthood.

The item of importance to this report, then, is that all of our students - and indeed, all of the people in the world providing they do not possess a hearing loss - will have a certain amount of information processed into their cerebral cortex through the auditory modality. The percentage of material processed depends on the individual, but all individuals - from students to faculty to staff and administrators - will process at least some of their information through auditory channels.

Using audio for lecture presentations should be of paramount importance to the instructor. The focus of a lecture should encompass the visual and audible components to the furthest extent possible. Music can help students focus in on a particular subject; they can also energize and highlight important concepts.

It should be noted that music will never be a replacement for effective teaching content, nor is it the only resource available when considering teaching applications. But music is one tool that effective teachers should have at their disposal. Music does not necessarily draw attention to itself, but it can instill comfort and openness to learning. Instructors that harness the teaching power of music often discover that the teaching can indeed have a beat unto itself!

The Incorporation of PCs in Audio Creation

At no time in our collective human history have the potentialities of music creation been so vivid. Our computers can do so much more than simple word processing or email gathering; indeed, we have a powerhouse of audio tools available on even the most inexpensive modern computers.

The soundtrack for the movie *U-571*, a major motion picture release from the year 2000 which generated more than $77 million dollars in the United States alone (www.imdb.com), heralded a new age of music production. *U-571* incorporated traditional orchestral symphonic scores with digital audio incorporated into the sound track at appropriate junctures. The composer for this movie, Rick Marvin, used the program Digital Performer to add the appropriate music intensities to the correct moment, which highlighted certain scenes in the movie. This technology has been available to home users for only a few years, and its presence is beginning to be felt across the globe.

Acoustic sounds (i.e. played *au naturale* on a "real" instrument) can be *sampled* (converted to a digital file) and modulated as needed. For example, if you need to change pitch, the computer alters the waveform to match the desired pitch. If you wish to add effects (such as reverb or echo), the computer can add the necessary information to the sound file. Sounds can be stretched and compressed, augmented or limited: the possibilities are endless. In addition, entire synthesizers, drum machines, sound effects, and more have been

digitally recreated on the computer. No longer must the aspiring digital musician have rows and racks of keyboards and drum machines; now he or she needs only a single computer. Some experts predict that acoustic instruments will be replicated digitally within the next decade… the computer can be a powerful ally indeed to the musician.

An Overview of this Report

The "Listen To Me!" grant will provide an introductory overview of digital audio technology available to PC owners as it exists today. The emphasis will be directed toward individuals new to the field, and references to additional information will be provided. Pertinent teaching examples will be discussed and provided regarding the effective use of audio in PowerPoint presentations and on the web. The examples will attempt to demonstrate novel utilizations of audio for lectures and web applications not used regularly by many instructors.

II. Uses of Sound in the Classroom

Digital audio can be used in a variety of methodologies within the classroom setting. Examples include:

Communicate Ideas through informative dialogue, narration, and voice over content

When learning a new subject, students need as much positive input as possible. Instructors can access a variety of learning styles by going beyond "chalk talk" lectures and incorporating videos, still images, demonstrations, role-playing, and other techniques to the new material. Adding pre-recorded digital audio clips helps address the audio learning styles inherent to the students. Pre-recorded audio helps emphasize key points in the lecture and allows for instructor "highlighted" comments. A website exemplifying these concepts can be found at the "What is Asthma?" site at http://www.whatsasthma.org/flash/hasthmav.html.

Improve site navigation with interface-oriented sound effects (audio buttons, rollover cues and related tools)

The World Wide Web (or simply "Web") can be very static, and static often implies a level of boredom. Watching still images can be mundane to the casual onlooker. Instructors wishing to spice up their web sites can add simple audio feedback mechanisms to enliven their websites.

For example, if the website has a series of navigation buttons, adding a simple "click" sound can provide dynamic feedback to the web surfer. Although largely supplanted by animated gif files, sound bites used for navigation can be found on the Web at many locales. Elaborate sites offer user feedback through graphic interfaces; for example, notes can be played by pressing the keys of a "Web piano" etc.

One of the best examples of site navigation comes from the Web pages devoted to the German band Kraftwerk. Always a leader in multimedia, Kraftwerk continues its tradition of stimulating the audience to be participatory instead of voyeuristic by engaging in live Web music. See: http://www.kraftwerk.com

Enliven videos with audio and/or narration

One of the newest areas in Web development has been the addition of video clips to Internet Web pages. The limiting factor in Web video remains the slow bandwidth afforded by 56K modems. Slow modem speeds cannot offer video on demand… if we all only had Ethernet connections at our house! Oh well…

However, it is a foregone conclusion by all in the industry that the faster delivery access of webpages is inevitable to people of the 21st century. Even now DSL and Cable modem transfer rates are creeping into the Mt. Hood Community College District, replacing the limited 56K analog phone line transfer rates to interested people. The advent and coming of the so-called Internet2 will also bring further enhancements to the delivery of Web audio.

Videos with moving pictures can be quite entertaining, but the addition of audio should be deemed essential for all quality work. Sound adds so much more to moving video than the video can do alone. An excellent (and quite advanced) example of the method audio can add to videos can be found at the website for Totally

Hip software, developers of LiveStage Pro (a wonderful tool for developing QuickTime videos) - http://www.totallyhip.com.

Provide "second voice" narration to focus students' attention

A common problem when classes are taught by a single instructor is that the students get used to his or her voice and mannerisms, tuning out when other exams, work schedules, or any of the other hundred and one things occupies their mind. One method underutilized to help students' attention stay on track is the occasional "second voice" in lectures, and accomplishing this goal is simple using digital audio.

If you use PowerPoint or the Web, consider constructing a short audio clip with a relevant fact or factoid recorded. At the appropriate juncture in your lecture, play the audio clip. The difference in your "live" voice and the recorded "digital" voice will surprise your students and bring their attention back to the lecture topic at hand. Incorporating audio clips into PowerPoint and the Web is a relatively straightforward process, and since the file sizes are considerably smaller than the corresponding files for movies, application of sound-only media applies itself easily to Web applications. Comments will be made concerning this methodology later in this report.

Add Background Music to Webpages and PowerPoint Presentations

Finally, one need not be a Mozart or Beethoven to develop decent sounding music. The easiest method to add original music is through a MIDI file or looped sample, and several programs exist to create your own music from very little amounts of equipment. Indeed, the days when musicians required racks upon racks of sound gear have all but disappeared, for the computer has allowed for unprecedented creativity for any home musician. Many web sites include background music that is soothing and not distracting, including the following web address: http://members.aol.com/dstevens/tcmidi/index.htm

…and many more!

This is just the tip of the iceberg when dealing with digital audio utilization. As the MP3 and Napster controversy fades from memory, we will be seeing a new dawn of digital audio entertainment. Faster network download (and upload) times will result in a greater dependence on video and audio files. Shared networks (such as Gnutella) and music construction programs will prevail, inducing a new era in shared media. The future looks bright for not just music applications, but for ALL of the arts… we live in exciting times.

To know the powers and limitations of this technology, we need to discus some of the basic principles when dealing with digital audio… and this will be the focus of Section III.

III. An Overview of Digital Audio

Before we can utilize digital audio technology in our classrooms and presentations, we need to understand something of the tools needed to take a sound and prepare it for the computer and Web. The path to achieve digital audio status will depend on such components as the source material, the amount of effects processing necessary to achieve the final sound, and the intended audience.

With any new technology, a plethora of definitions and tools must be applied to fully grasp the context of the medium. My goal in this section is not to provide a detailed description of each technology necessary to create digital audio. Instead, my aim strives to introduce the reader to the various tools and sound palettes available to PC owners. A brief description of digital music creation will be provided, followed by a description of the major audio architectures available to computer users.

How does digital sound differ from analog sound

Analog sound refers to music created without using a computer. Analog sound is sometimes thought of as "normal" sounding, although this is misleading. Digital sound - sound created with a computer - can be recreated with a quality equal to that of analog sound, and "normal" sounds may be analog or digital.

Sounds can be created either through analog means (such as the playing of a piano or an acoustic guitar) or through digital methods (such as through a synthesizer keyboard or computer.) To convert an analog sound to a digital sound, a variety of factors must be considered.

First, the digital sound will be quite large and require copious amounts of hard disk space. A large hard disk is a prerequisite for digital audio.

The quality of the digital audio must also be considered. Analog sounds come to our senses as sinusoidal waves (or waveforms) along a certain frequency, and the amplitude and harmonics of the resulting waves make up the rich assortment of tones we experience naturally through our ears.

For digital audio to recreate the quality of analog sound, a process known as ***sampling*** must occur. Sampling is, in its simplest, a computer's attempt to measure the amplitude, the frequency and general waveguide of the sampled sound. The more samples applied to an analog waveform, the better the quality of the digital sound. Each sample will have so much memory associated with it, and this will correspond to the amplitude of the sound (often measured in decibels (dB)).

Sampling digital sound can be performed at different frequencies, and the higher the frequency, the better the recreation of the analog sound. Frequencies are measured in units of the Hertz (Hz), and 1 Hz implies that one waveform has passed by in one second. Just like a kilometer is 1000 meters, a kilohertz (kHz) refers to 1000 Hertz, or 1000 cycles per second. Most AM broadcasts are about 8 kHz - relatively low quality, and the 8 kHz implies that 8000 waveforms are being sampled per second. Compact Disc (CD) recordings have a digital sampling frequency of 44.1 kHz, digital video (DV) tapes usually record sound at 48 kHz, and hi-end audio work (used in DVD recordings, etc.) can be sampled at 96 kHz.

It is important to realize that as the sound quality increases, the amount of hard disk space also increases. On VCRs, recording at the higher quality SP rating will consume more tape per minute than the lower quality SLP rating. Higher quality digital audio requires more disk space than lower quality digital audio, but this

can work to the producers' advantage if disk space is at a premium. The higher the quality of the digital sound, the more memory the sound requires on the hard disk.

Converting between the digital sample rates can be disastrous if not treated carefully. If we played a classical music symphony sampled at 96 kHz on an old scratchy stereo system, the results would be appalling - all of the nicely recorded and sampled sound would be lost to the listener as we play the music through poor quality sound equipment. This example personifies the sampling transformation process: converting between one rate and another has to be done with care to avoid quality losses.

What is an audio architecture and what is a codec?

An **audio architecture** contains the software and drivers necessary to deliver the sounds to your PowerPoint and Web applications. A plethora of audio architectures exist, but the three primary audio architectures are **QuickTime, Windows Media** and **RealSystem**. All three architectures require client-side software to play audio files; therefore, each user of these systems will have to have the appropriate browser plug-in (for Web development) or sound files (for PowerPoint) installed on their computer to play the audio.

QuickTime started as a Macintosh-only architecture but now has complete cross-platform accessibility. QuickTime is generally believed to deliver the highest quality sound using the lowest amount of bandwidth (i.e. the file sizes are generally smaller), but this dubious distinction could change in the future.

Windows Media is the dominant platform on all PCs operating with Microsoft Windows' variants, so this is an architecture that should be around for a long time. The quality of delivered sound is often poor, but the file sizes are small, making it a viable contender for speech-only sound applications. New codecs (see below) should continue to bolster the Windows Media architecture.

RealSystem is the most popular audio (and video) architecture on the Web. The necessary software is included upon installation of most browsers, and the software is generally cross-platform. Of the three sound architectures, RealSystem offers the lowest quality generally, but for streaming audio RealSystem is hard to beat. Future codecs will improve the sound quality problem.

A **codec** refers to a compression / decompression protocol which is useful in playing digital audio on PCs. Similar to how a modem (modulate / demodulate) operates with analog phone signals, a codec encodes (or *compresses*) a transmitted audio signal and then decodes (or *decompresses*) the signal once it arrives at the computer.

Remember that sound files can be quite large. If Jack wishes to send Andy his latest song creation over a 56 K modem, this process could take a long time. First Jack would send his song to the Web; later, Andy would download the song from the Web to his machine. A codec will minimize the time it takes to both upload and download the song. Note that Andy must have the decompression program on his computer to view the file; else the downloaded file will be worthless to him.

There are a variety of popular codecs used on the Web and for PC audio, and most of them can be utilized for video as well as audio sources. They include **Sorenson** (which is great for Web movies), **Cinepak** (used often in CD-ROM movie delivery), **Animation**, **MPEG** (used for DVD movies but very expensive; there are also different versions, including MPEG-1, MPEG-2, MPEG-3 (also known as MP3), etc.), **RealSystem G2** (used often for Internet streaming of Web movies), and many others. **QuickTime** uses many different

codecs within its architecture, which is nice for developers wishing to reach a variety of audiences on many different computer systems.

Hardware Requirements

To access digital sound, the computer must possess a sound card capable of translating digital sounds into analog tones which can be played back on a speaker system. A sound designer must also have access to a sound input and sound output ports on the sound card, allowing for music to be played on an external audio system and for music to be transferred to the computer from outside sources (CDs, acoustic instruments, etc.) Most Macintosh computers have built in sound cards with sound outputs, and many have sound input connections as well. Most PCs have sound options available, and it is recommended that new PC purchases include a sound card.

Some sound cards have a MIDI port. MIDI (which stands for the Musician Instrument Digital Interface) ports can connect music synthesizers with the computer, allowing for special types of musical information to be played. MIDI files do not contain sampled music information per se, but rather they are helpful in telling an external sound card or synthesizer what notes to play and what instrument to use while playing them. MIDI is essential to musicians wishing to record and play music using digital techniques, and this option can be very helpful.

If the computer does not have built in sound capabilities, all is not lost. External sound modules or sound cards can be purchased at relatively inexpensive prices to turn your PC into a sound machine. These sound modules can connect to your computer using a variety of data transfer protocols including SCSI, USB, Firewire, PCI, and many more. Mark of the Unicorn makes some wonderful sound input devices, and major sound dealers will have many models to choose from.

Storing Digital Audio

Digital audio can command huge quantities of disk space depending on the level of compression and sampling. Sooner or later aspiring musicians will require a method to store their music and music files.

One of the most accessible digital audio storage formats is the compact disc. Capable of storing up to 800 MB of information, this corresponds to approximately 80 minutes of "traditional" CD quality sound. Many computers have built in CD-burners, and since the price of blank CDs has fallen to less than $1 per CD, this medium may be the best answer.

If a digital audio project (with a plethora of samples, drum tracks, notes, etc.) needs to be saved, the recordable CD may be the perfect medium to do so. Larger projects may need additional hard disk space, however, forcing the artist to look for other options. Options include external hard disks (which have multiple GB ranges and are cross-platform), Orb drives (2 GB tape methods), DVD data storage (almost 5 GB of space), and related methods. These methods range from the relatively inexpensive to the financially demanding, so shop around for best prices, reliability, features, etc.

For this project I utilized a recordable CD drive for everything, and most musicians seem content with this medium *unless* they are composing movie soundtracks or other highly memory intensive projects.

IV. Using Audio in PowerPoint

How to utilize audio in PowerPoint 2000/2001

Inserting audio files into PowerPoint presentations is very straightforward. Below are instructions on how to include audio clips into PowerPoint 2000 (Windows) and PowerPoint 2001 (Macintosh). Note that including audio into PowerPoint 97 (Windows) and PowerPoint 98 (Macintosh) follows similar procedures… contact the author for more information.

The instructions below assume you have a sound file and that you are ready to place it in a PowerPoint presentation. To play the music, you will need a sound card and speakers. PowerPoint can utilize a variety of audio architectures (and codecs), but generally QuickTime and Windows Media are the preferred platforms.

Adding Sound to a PowerPoint 2000 (Windows) Presentation

- Open a PowerPoint 2000 Presentation, and move to the slide where you want to insert a sound.

- From the **Insert Menu**, choose **Movie and Sounds** then choose **Sound from File**

- Point to *C:\Multimedia Files\Music* (or wherever the sound bite is saved) Click on the sound clip name, then press the **<Enter>** key.

- Double click on the speaker icon to play with and test the sound. You can move and re-size the speaker icon as desired. NOTE: During a presentation, a single mouse click will play the sound file.

That's all there is to it! Alternatively, you can add the sound clip as a "Clip Art" sound to re-use in many presentations. To do so:

- From the **Insert Menu**, choose **Movie and Sounds** then choose **Sound from Gallery**

- In the lower right hand corner of the screen, click on **Import Clips**

- Point to *C:\Multimedia Files\Music* (or wherever the sound bite is saved) Click on the sound clip name, then press the **<Enter>** key.

- Add the keyword description (example: if the sound clip contains a dog barking, the description might be "dog bark") to the Clip Properties dialog box then press the **<Enter>** key

- Finally, Click on the **Insert button** in the upper left hand corner. The sound file is now a permanent part of your clip art gallery!

Adding Sound to a PowerPoint 2001 (Macintosh) Presentation

- Open a PowerPoint 2001 Presentation, and move to the slide where you want to insert a sound.

- From the **Insert Menu**, choose **Movie and Sounds** then choose **Sound from File**

- Change the folder to the location of your sound file. Click on the sound clip name, then press the **<Insert>** key.

- Double click on the speaker icon to play with and test the sound. You can move and re-size the speaker icon as desired. NOTE: During a presentation, a single mouse click will play the sound file.

That's all there is to it! Alternatively, you can add the sound clip as a "Clip Art" sound to re-use in many presentations. To do so:

- From the **Insert Menu**, choose **Movie and Sounds** then choose **Sound from Gallery**

- In the lower left hand corner of the screen, click on **Import**

- Move the folder to the location of the sound bite. Click on the sound clip name, then press the **<Insert>** key.

- Add the keyword description (example: if the sound clip contains a dog barking, the description might be "dog bark") to the Clip Properties dialog box then press the **<Insert>** key

- Finally, Click on the **Insert** in the lower right hand corner. The sound file is now a permanent part of your clip art gallery!

The examples demonstrated here add a single sound clip (or sound byte) into the PowerPoint presentation. Sound bytes can be short or long, depending on the nature of the clip, and they can contain narration, background music, and much more as desired. PowerPoint excels in kiosk-style presentations which run continuously until interrupted along pre-defined time limits… these are useful for trade shows, poster sessions, etc. A plethora of tools exist to time your PowerPoint presentation for a kiosk display should this be of interest to the reader.

Advantages over Web delivery

PowerPoint files utilizing audio clips have many advantages over Web-based delivery. First and foremost, installing a clip in a PowerPoint presentation involves no more than the instructions above; it's quite easy to add sound to PowerPoint. In addition, PowerPoint presentations will be limited only by the power of the CPU in the computer. Sample-rich, large audio files can be played from PowerPoint with no concerns about bandwidth delivery, compression, and any of the other headaches associated with Web sound. Finally, Web delivery has to be provided "kiosk" style, for only individuals will be viewing the presentation from the Web. A PowerPoint presentation can be controlled by the presenter, allowing for questions, variable time allotments between slides, and more.

The last paragraph does not imply that Web delivery has no place in the academician's world; instead, the focus of the Web designer must be broader and more focused than the PowerPoint designer. Adding a background soundtrack in PowerPoint involves nothing more than a few clicks of the mouse; but to add the soundtrack on the Web, the music's size, sampling rate, compression, codec, and audio architecture must all be considered for adequate delivery.

Example of Audio Utilization in PowerPoint

A sample PowerPoint file utilizing a variety of sound clips can be found on the website (http://www.gst-d2l.com/TLC). The file should be compatible with PowerPoint versions 97, 98, 2000 and 2001.

V. <u>Using Audio on the Web</u>

Considerations for Audio Utilization on the World Wide Web

In the earliest days of the World Wide Web, all pages were considered "silent" - there was no (or at least very little) sound provided. Most pages contained static (i.e. non-moving) images devoid of audible content.

The Web has changed dramatically since the earliest times, and now sound sources flourish on thousands of web pages. Sound can be found on the Web primarily in these forms:

- ambient-style loops and bytes (via Flash, Shockwave, Beatnik, etc.)
- radio-style music broadcasting (via RealAudio, Windows Media, QuickTime, etc.)
- distribution via downloadable formats (MP3 files, Liquid Audio, AIFF, WAV, etc.)
- MIDI sequences (for utilization with hardware or software synthesizers)

Ambient loops are short (less than 30 seconds long) sound clips which can be downloaded quickly and played in succession without the listener going crazy (try playing the "Grease" soundtrack ten times straight! Ack!)   Initial offerings were quite basic and irritating, but newer applications (such as at www.kraftwerk.com) can be quite engaging.

The next generation of radio might be occurring on the Internet. Using the audio architectures described above, users are able to download and play continuous radio broadcasts from anywhere in the world, 24 hours a day. I've enjoyed listening to a classical radio station from Bosnia using Real Audio's Real Player - the music quality remains high throughout the day, although I cannot understand the radio commentators when they talk! Mt. Hood Community College's KDOX and KMHD can be listened to on the Internet with better quality than traditional reception will allow for on the MHCC campus, and I can listen to my alma matter's WDCR (Dartmouth College Radio from Hanover, New Hampshire) whenever I desire it on the Web. Internet radio has become an important medium for home radio enthusiasts also: all they need is a valid IP address (a relatively simple acquisition) and they can bypass the FCC's rigorous protocols for "traditional" radio.

It should be noted that these radio broadcasts involve **streaming audio** that provides constant audio signals to the listening computer. Streaming audio requires a dedicated server (or access to one), but many of the bandwidth limitations can be lifted using streaming audio since small packets of information are provided continuously instead of large "downloadable" data chunks.

Downloadable audio formats are very important for PowerPoint presentations and certain web pages. Using a variety of codecs (MP3, AIFF, WAV, etc.) they can be played and sometimes downloaded from Web pages directly. The disadvantage of these formats usually revolves around their size, and since most Internet connections are slow, size equates to time. For example, a stereo 16-bit 44,100 Hz audio file (used in commercial CD music) requires the computing of 1.4 million bits per second (1.4 Mbits) and requires 10 MB of storage space for every minute of recorded audio. Even fast Internet connections can bog down if required to download 10 MB of material, and how many listeners are patient enough to wait that long for one minute's worth of music?

Internet audio requires explicit detail to sound quality, compression settings, and file size. Compression algorithms use mathematical equations to shrink audio file sizes… but the cost can be sound quality. Audio engineers and artists must decide what the optimum audio size and quality should be for the project at hand.

Programs such as Cleaner Pro (http://www.discreet.com/) help the user to pick compression settings appropriate for the job at hand.

How to incorporate audio in web pages

Adding sound files to web pages can be extremely easy or extremely difficult. To add a background sound to a webpage, you will need to view the HTML (HyperText Markup Language) for the document and add the following code:

```
<BGSOUND SRC="yoursound.wav">
<EMBED SRC="yoursound.wav" HIDDEN="TRUE" AUTOSTART="TRUE"></EMBED>
```

where `yoursound.wav` is the name of the sound file you wish to add to your page. Please note that file will begin playing immediately upon loading and will not stop, so use it judiciously.

To add a looping music soundtrack, add this code to the `BODY` tag of your HTML document:

```
<BODY BGSOUND="yoursound.au">
```

where `yoursound.au` is the sound file you wish to add to the page. Later, use this code in the body of the HTML:

```
<CENTER>
<EMBED SRC="yoursound.au" AUTOSTART="TRUE" WIDTH="144" HEIGHT="56" LOOP="5">
</EMBED>
</CENTER>
```

Notice in the first example a WAV file was inserted in the webpage, and in the second example, an AU file was utilized. Both formats can be used in most web browsers, along with MID (i.e. MIDI) files, and many now support MP3 files.

Netscape and Internet Explorer differ in their utilization of sound files, so subtle variations in the code might exist in the previous examples. As always, thorough testing of your pages in as many browsers and platforms as possible makes for the best web pages.

Example of Audio Utilization on the World Wide Web

Examples of sound utilization in Web pages can be found on the accompanying website (http://www.gst-d2l.com/TLC),

VI. Final Thoughts Regarding Digital Audio

Digital audio will continue to play a major role in media development throughout the next decade. Hollywood began its rise to fame through silent movies with music soundtracks. Internet video will follow suit by adding better quality and extensive audio samples to videos. In addition, home enthusiasts will continue to create unique music pieces to be shared on the Internet, especially as the many racks of synthesizing equipment can be replaced by a computer. The difference between a sampled (i.e. recorded) sound and a "live" sound will continue to fade as digital quality improves and sound files get smaller.

Educators and many home audio enthusiasts will desire to participate in the audio creation process. A variety of programs exist on many different platforms to encourage hobbyist music, but a few general ideas to remember while constructing include:

- **save often** - it is easy to make mistakes! Save many versions and save often within each version.
- **hard disk size** - every one minute of CD quality music will require roughly 10 MB of disk space, or 5 minutes of music will require 50 MB of hard disk memory. If you have many songs, your hard disk might fill up quickly. Make sure you have enough space on your hard disk!
- **"Garbage in equals garbage out"** - no matter how many audio filters applied, your final audio will sound like garbage if it was originally recorded using low quality equipment and/or surroundings. Spending the time and/or money initially will keep the overall quality of the project high from start to finish.

Very creative individuals can try to post their songs to the music market, but hopefully the joy of music creation will overshadow any financial shortfalls incurred through music creation.

Above all, remember to enjoy yourself! Music creation in the early part of the 21st century might seem more technological than creative, but the heart of the music process revolves around a person's ability to synthesize music from the sounds of chaos around us. Computer aided music creation is no exception, so try to enjoy your abilities in this area to the fullest!

VII. <u>Acknowledgements</u>

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I would also like to thank you, the reader, for taking the time to read this report. Thanks!

All of the materials in this report can be found on the Web at http://www.gst-d2l.com/TLC

Feel free to contact me if you have any questions. Peace, and I look forward to hearing your digital audio creations!

VIII. <u>Resources For More Information</u>

Printed Material:

- Beggs, Josh and Thede, Dylan "Designing Web Audio", O'Reilly (Sebastopol, CA), 2001.
- Frederikse, Tom and Cook, Adrien "Future Sounds: An Insider's Guide to Making and Selling Music in the Digital Age", Carlton Books (London, UK), 2001.
- White, Paul "Basic MIDI", MPG Books (London, UK), 1999.
- White, Paul "Basic Multitracking", MPG Books (London, UK), 1999.
- White, Paul "Basic Digital Recording", MPG Books (London, UK), 2000.
- Millbower, Linn "Training With A Beat: The Teaching Power of Music", Stylus Publishing (Sterling, VA), 1999.
- Deutsch, Herbert A. "Synthesis: An Introduction to the History, Theory and Practice of Electronic Music", Alfred Publishing Company (Sherman Oaks, CA), 1985
- Brenneis, Lisa "Final Cut Pro For Macintosh", Peachpit Press (Berkeley, CA), 2000.
- Stern, Judith and Lettieri, Robert "QuickTime 5 For Macintosh & Windows", Peachpit Press (Berkeley, CA), 2001.
- Apple Computer, "Final Cut Pro User's Manual", Apple Computer (Cupertino, CA), 1999.
- Terran Interactive, Inc. "Media Cleaner Pro 4 User Manual for MacOS and Windows", Terran Interactive, Inc. (Los Gatos, CA), 1999.
- Sorenson Vision, Inc. "Sorenson Video 2 QuickTime codec User Guide", Sorenson Vision, Inc. (Logan, UT), 1999.
- Terran Interactive, Inc. "How to Produce High-Quality QuickTime", Terran Interactive, Inc. (Los Gatos, CA), 1999.
- DVcreators.net, "DV Revolution Workshop" (handout) dvcreators.net (www.dvcreators.net), 2000.
- Tokuda, Andrew "How To Get Great Sound" article in *MacAddict*, November 2001, pg. 66 - 69.

Web Addresses:

Digital Audio Architectures and Codecs:

- www.apple.com/quicktime - QuickTime site
- www.real.com - Real Networks site
- www.microsoft.com/windows/windowsmedia/en/default.asp - Windows Media site
- www.s-vision.com - Sorenson, creators of the Sorenson video codec used extensively in audio applications
- http://www.liquidaudio.com - Liquid Audio, a powerful but not as widely utilized audio architecture

Digital Audio Software and Hardware:

- www.motu.com - Mark of the Unicorn site, creator of Digital Performer, Unisyn, and a host of ADC PCI digital audio cards for computers
- www.digidesign.com - creators of Pro Tools, a powerful sound editing suite for Macintosh and Windows PCs
- www.sonicfoundry.com - Sonic Foundry website, home of Sonic Foundry, ACID Pro, and other great PC software music titles.
- www.sonic.com - Sonic, home of the high-end SonicStudio HD audio program and other DVD related materials
- www.bias-inc.com - Bias site, creators of PeakDV, Deck and other sound creation tools.
- http://www.discreet.com/- Discreet, distributor of Cleaner Pro and other quality A/V products
- www.apple.com/finalcutpro - Final Cut Pro site
- www.apple.com/iTunes - iTunes site, a great MP3 encoder
- www.roxio.com - Toast creators, a useful CD burning software package for the Macintosh
- www.fcp411.net - the Final Cut Pro 411 "answer site" - excellent and highly recommended!
- www.adobe.com - Adobe site, creators of Photoshop, After Effects, and much more
- www.macromedia.com - Macromedia site, creators of Flash, Director, and much more
- www.apple.com/firewire - Apple Computer's Firewire page
- www.sonicdesktop.com - Sonic Desktop, developer of SmartSound
- www.yamaha.com - Yamaha music site, developers of fine instruments and recording systems
- www.korg.com - Korg music, producers of fine musical instruments and recording systems
- www.propellerheads.se - Propellerhead software, home of the great Reason, Rebirth, Recycle and other music programs

Other Resources:

- Local Resource: The friendly staff at PowerMac Pack (Portland, Oregon), (503) 256-5210 (http://www.macpac.com/)
- Local Resource: Multnomah County Television (MCTV), (503) 491-7636 (www.mctv.org)