

M3W

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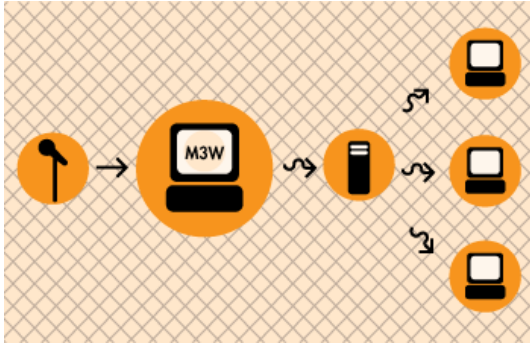
License : None

INTRODUCTION

1. M3W

2. What is streaming?

1. M3W



Streaming is the name given to the realtime delivery of audio and video over the internet. It is typically used for sending live audio for online radio stations, or perhaps sending live video from events. If you have ever listened to an online radio station you have done this via streaming audio.

M3W is a software that allows you to send live audio over the internet. You can use it for creating 'online radio', broadcasting live events, or just having some fun.

M3W is possibly the simplest software available for streaming **MP3** with **Microsoft Windows**.

2. WHAT IS STREAMING?

Streaming Media is the term used to describe the *real-time delivery* of audio and video over the internet. Streaming Media allows for *live transmission* of audio or video over the internet, transforming the internet into a broadcasting medium. Content can also be archived in streaming file formats[?], allowing internet users to experience recordings of events after they happen.

VARIETIES OF STREAMING

There are three types of delivery of audio and video data over the internet: Download and Play, Progressive Download, and True Streaming.

Download and play

To experience Download and Play media you must first download the entire media file to your hard disk before you can play it. For this reason Download and Play media cannot be used for live broadcasts, however it is often a good way to deliver high quality media content over any bandwidth. A high quality movie, for example, can be downloaded over any internet connection. However because you cannot play the movie until you have downloaded the entire file, download time becomes a factor. To download a DVD movie (usually about 4.6 GB in size) over a dial-up modem (56kbps) it would take over 8 days! Most people would find this quite tedious!

Download and Play media is *not* streaming media (more on this later) but it is a lot more popular than streaming. File sharing networks are Download and Play mechanisms, and this is an extremely popular activity on the internet. As many countries make high bandwidth connections more accessible there is an increasing popularity of trading Download and Play movies on these networks.

Progressive download

This enables you to experience media as it downloads to your harddrive. Progressive Download is useful but is less efficient than True Streaming and cannot provide some functionality such as multiple bitrate encoding. However this method has an advantage over Download and Play as you do not have to wait for the file to finish downloading before you can start playing it. There are some constraints - for example, if the file does not download as fast as you are playing it, then you will find that playback will stop while you wait for more of the file to download. This can be annoying and it is often the reason why some choose True Streaming as a preferred method of delivery.

Quicktime (Apple's suite of streaming technologies) calls Progressive Download "Fast Start". This highlights one of the difficulties of learning streaming - in the effort to differentiate technologies, each technology provider has made up their own jargon. However throughout this manual I will stick to the more generic terminologies wherever possible.

True streaming

This enables the user to view or listen to the media as it is delivered over the internet in real-time. True Streaming is the only variety of streaming that allows for live broadcasting, and it also supports more advanced functionality than Progressive Download, enabling the user to control the media experience by pausing, skipping forward, or rewinding. Although different terms have been used to describe True

Streaming, including webcasting, livecasting, web tv, or net.radio, the term that has prevailed is "streaming media" (more often it is just referred to as "streaming").

The difference between Progressive Download and True Streaming is not always obvious. If, for example, a user has a very fast connection to the internet then Progressive Download may appear to behave in exactly the same way as True Streaming.

Within Download and Play, Progressive Download, and True Streaming there are two distinct varieties : static file streaming and live streaming.

Static file streaming

The delivery of pre-recorded media files over the internet in real time. Typically when we refer to archives of online media we are discussing static file streaming. A large archive of video art encoded into streaming files is an example of a collection of static file streaming files. This content is also known as on-demand or archived content. This content can be delivered by Download and Play, Progressive Download, or True Streaming processes.

Live streaming

The delivery of live audio and/or video over the internet. This allows the user to experience an event as it occurs in realtime. There are many examples of this such as online radio or viewing live performances. Only True Streaming supports live streaming.

This manual will mainly deal with True Streaming of both live and archived content.

ENCODING

To stream static files over the internet the files must be compressed and encoded into a 'streaming format'. Ripping CDs into MP3 is doing just this and is done using encoding softwares. In this process a CD audio recording is converted by the encoding software from a CD (Compact Disc) audio format into a 'streaming audio format' (MP3). This will involve compressing the data, which reduces its quality and file size, and converting the data into a 'streaming format' (for example MP3).

Compression

There are two forms of compression - lossy, and lossless compression.

When the encoding process compresses the source file so that it can be delivered over internet connections in real-time this process degrades the quality of the audio and video. The more a file is compressed, the lower bandwidth required to be able to play the file, but the more the quality is reduced. A compromise has to be achieved whereby the level of compression achieves an acceptable audio and video experience, while reducing the amount of data enough to enable delivery over the internet.

Live encoding is similar except that an audio or video (or both) input is encoded instead of a file. With this process the encoding software delivers the encoded data in a continuous stream to the streaming server.

Lossless compression

This is the process of compressing data information into a smaller size without removing data. To visualise this process imagine a paper bag with an object in it.

When you remove the air in the bag by creating a vacuum the object in the bag is not affected even though the total size of the bag is reduced

Lossy compression

Sometimes called 'Perceptual Encoding', this is the process of 'throwing away' data to reduce the file size. The compression algorithms used are complex and try to preserve the qualitative perceptual experience as much as possible while discarding as much data as necessary.

Lossy compression is a very fine art. The algorithms that enable this take into account how the brain perceives sounds and images and then discards information from the audio or video file while maintaining an aural and visual experience resembling the original source material. To do this the process follows Psychoacoustic and Psychovisual modelling principles.

Codecs

The algorithms used to compress and encode audio and video and create the file format are known as "codecs". The word is made from two common terms compress and decompress. The encoding software uses a codec to 'compress' the streaming content for delivery over the net, and the player softwares use a codec to 'decompress' the content for replay.

The codec is mathematical wizardry and is the heart and soul of streaming. It is on this ground that we have the various technology providers battling it out for dominance. Each codec has its own unique way of doing things depending on what the developer believes is best, and some come with their own minefield of licencing issues too.

Bitrate

Compression is the process of reducing the amount of data

Multiple bitrate encoding allows the server and player to negotiate the best quality (highest bandwidth) stream to be delivered from a single static file or live stream. Hence the player is delivered the best quality stream possible over the user's internet connection. Multiple bitrate? encoding produces only one encoded stream.

Choosing the bitrate(s) will require the consideration of several factors, including: The target audience's connectivity; The desirable frame size of the video (if including video); The amount of movement in the frame (if including video); The level of video contrast (if including video); The type of audio encoded (e.g. ambient noise/voice/stereo music); The amount of camera movement (if including video); The quality of the camera and camera lens (if including video).

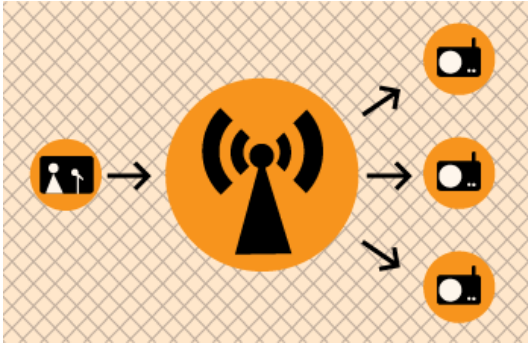
DELIVERY

Streaming static ("archived") files can be achieved using a normal web server. This is often the cheapest way to deliver content on a small scale. This method cannot be used for live streaming and does not allow for the advanced features of True Streaming such as multiple bitrate encoding. This method will also enhance the likelihood for time-outs ('buffering') and cannot deliver the same amount of simultaneous player connections as True Streaming.

To enable live streaming and to gain full functionality and efficiency a streaming media server is required. This server is usually standard server hardware but with the necessary streaming server softwares installed. It is quite normal to install a streaming server on the same machine as an existing web server.

Streaming servers

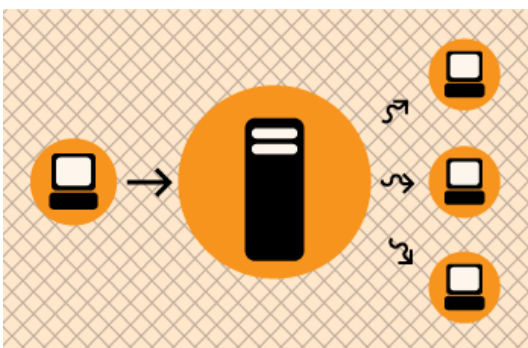
Perhaps a good way to understand what a streaming server does is to imagine a radio station. A radio station comprises of three components - a *studio*, a *transmitter*, and the *receivers* that your audience has.



Above is a basic diagram showing how a transmitting radio station works. The radio studio is the source of the audio. In this space there are usually mixing desks, cd-players, minidisc players, turntables etc. Then from the studio an audio signal is sent to the transmitter. This can be sent from the studio to the transmitter by either a cable (sometimes called a "landline") or by a microwave link. Then the transmitter sends the audio via FM so that radio receivers (tuners) can pick it up and play it.

Radio works this way because it is trying to distribute the studio audio to as many people as possible. If you imagine the radio studio without the transmitter then the station would have a fairly reduced audience! Essentially only people that could fit into the studio would be able to listen. So the transmitter works as a distributor, allowing more people to connect via their radio receivers and hence the potential audience is enlarged.

This is a close analogy to why streaming exists and how it works. If you were just playing audio on a computer in your room then the audience isn't going to be so big.. so, we utilise streaming to distribute this audio to more people.



The analogy is obvious....the computer replaces the radio studio, the streaming server replaces the transmitter, and your listeners connect by computers to the server rather than with radio receivers to the broadcast signal. The analog can be taken quite a long way. Having a bigger radio transmitter is like having more bandwidth available at the streaming server - both allow more people to connect.

INSTALLING

3. Installing M3W

3. INSTALLING M3W

Software name : M3W

Homepage : <http://www.informatik.fh-muenchen.de/~ruckert/m3w/>

Software version used for this installation : 2.1

Operating System use for this installation : Microsoft Windows (2000)

Recommended Hardware : 200MHz processor, internet connection

REQUIREMENTS

M3W will run on any Windows system since Windows 95.

M3W does not need any prerequisites installed. It installs the **lame dll**, which is the library that applications need to stream **MP3**. Many Windows streaming encoders require you to install **lame** separately, which can be a pain. Thankfully **M3W** takes care of this for you.

You will need however:

- Windows running
- A working soundcard
- access to a streaming server
- the **host address** of the streaming server
- the **password** of the streaming server
- a **mountpoint** for the streaming server
- the **port** of the streaming server

INSTALLING

First, download the latest installer from here:

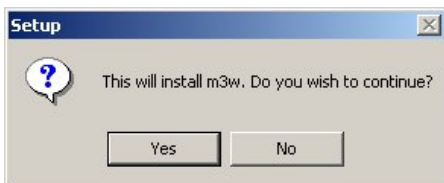
<http://www.informatik.fh-muenchen.de/~ruckert/m3w/download.cgi>

The installer is about 500KB which is very small. The installer at the time of writing is for version 2.1 of **M3W**.

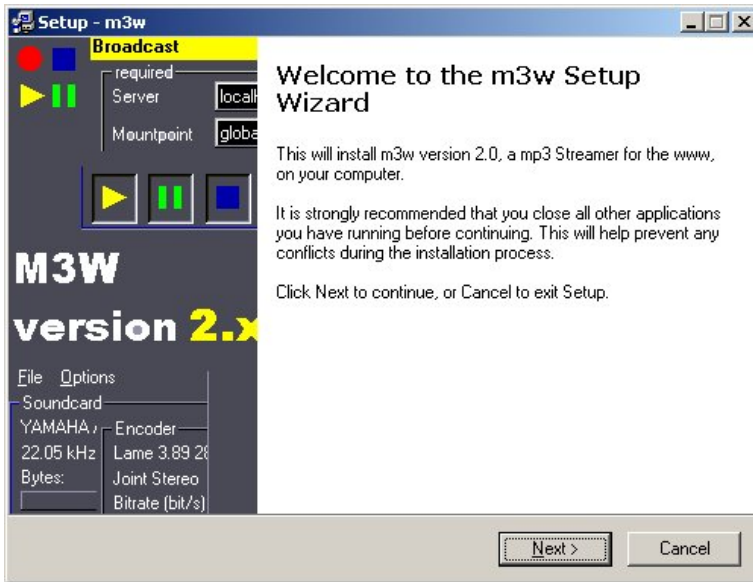
Now, once the installer has downloaded, you need to double click on the installer icon.



Now you should see a small window asking you if you want to proceed with the install. Just click **yes**

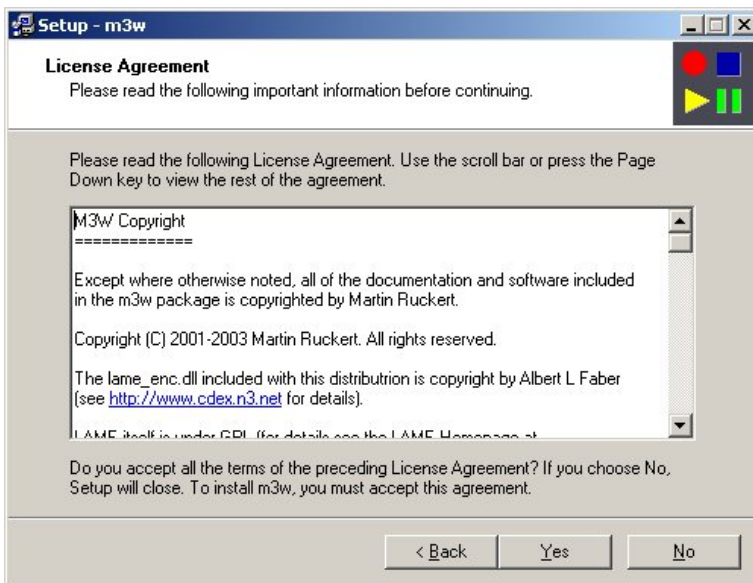


Now you will be presented by the following window:

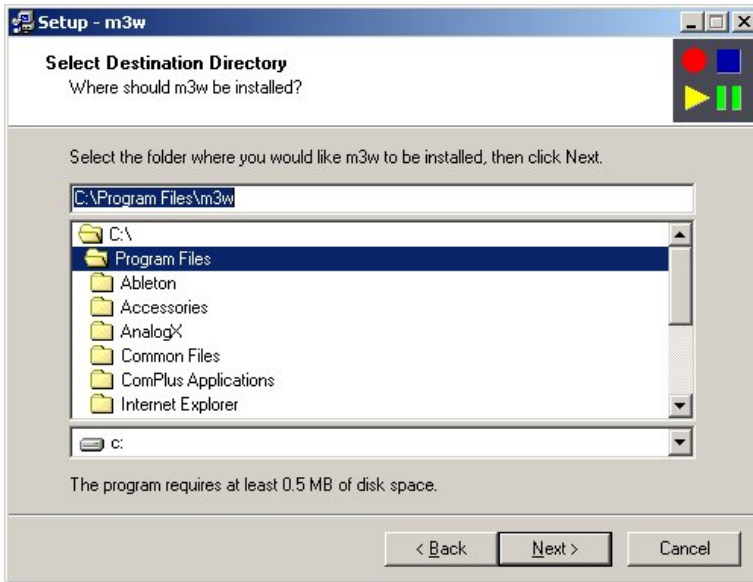


This is just the intro page for the installer wizard, press **next** and keep going.

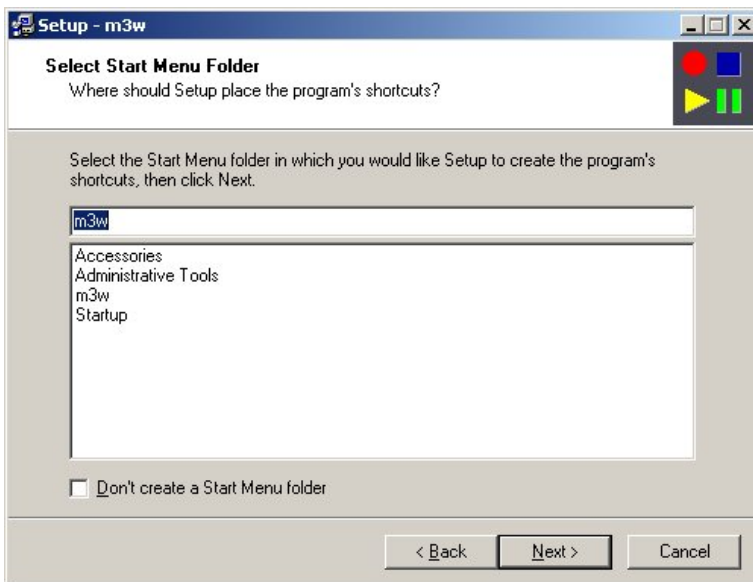
With the next screen press **YES** (read the licence if you wish).



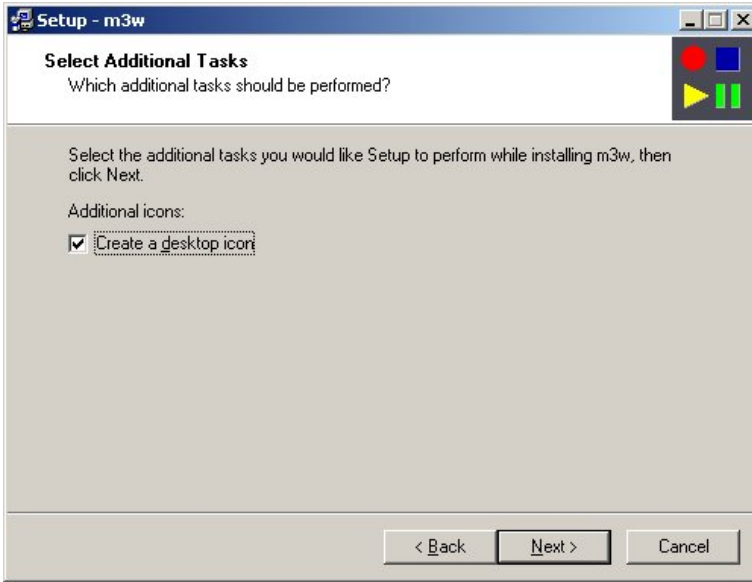
Now with the next screen, you are asked what folder you wish the software to be installed in. I usually just use the default which means I will press **next** at this screen.



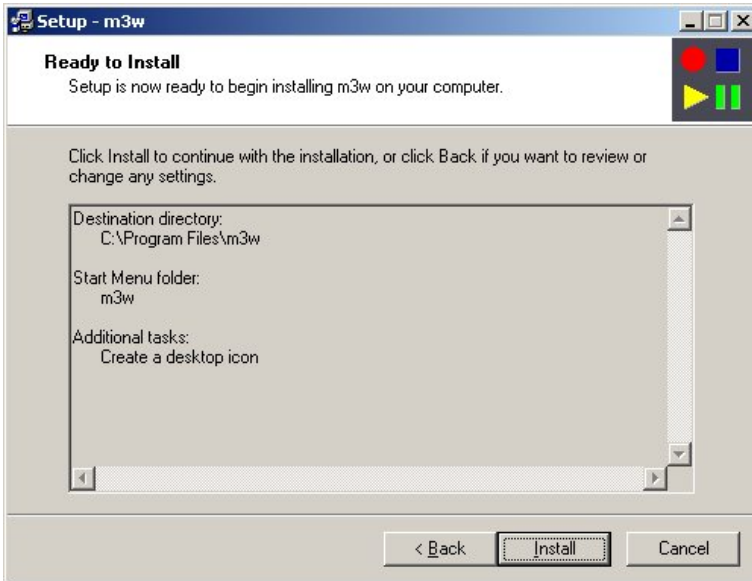
The next screen asks you what category of software you wish **M3W** to be listed under in the start menu. I always use the default, so I press **next** :



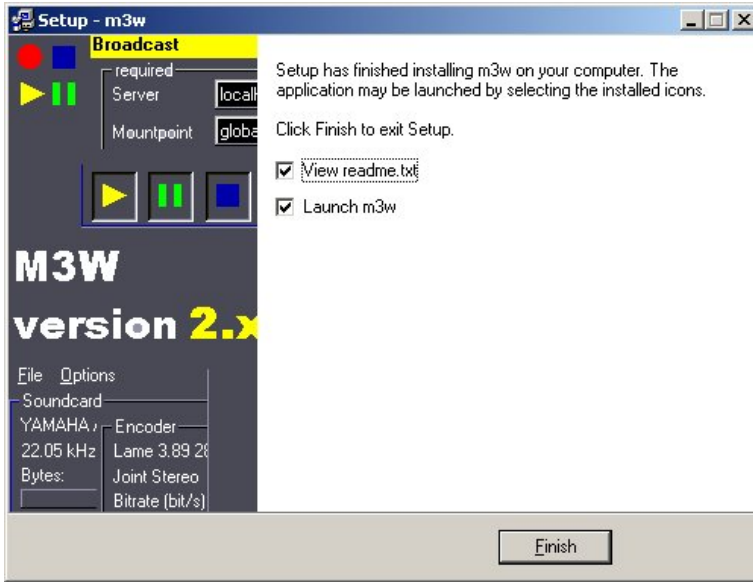
Now, its good to create a **desktop icon** for ease of opening the application, so just keep the check box checked (the default) and press **next**:



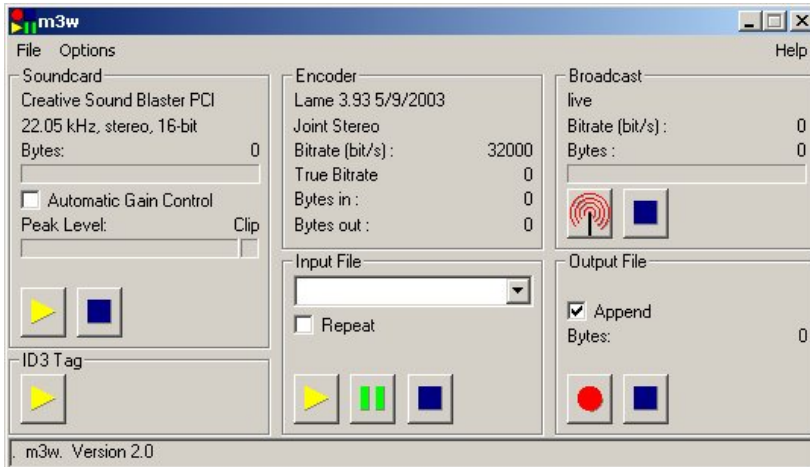
Now, everything should be good. So in the next screen press **install**:



Now you should be presented with one last install window, click **finish**:



And you should now see the main window of M3W.



GETTING STARTED

4. M3W Interface

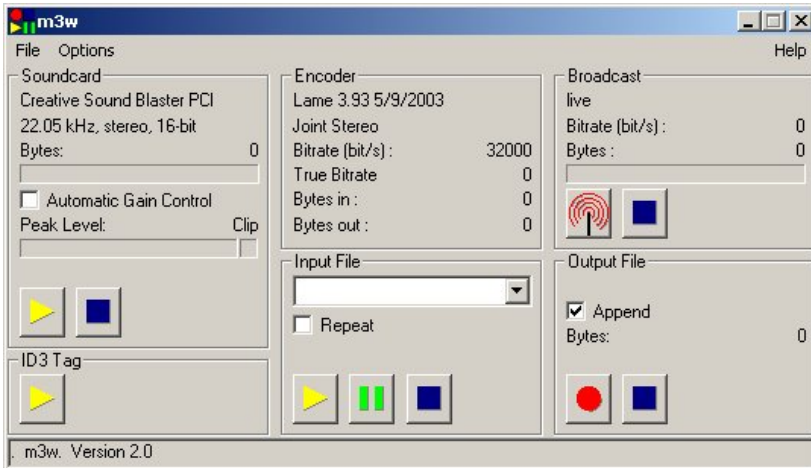
5. Configuring M3W

4. M3W INTERFACE

Software name : M3W

Software version : 2.1

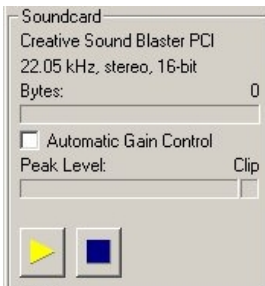
The user interface for **M3W** is very simple:



It is divided into the following sections:

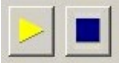
SOUNDCARD

This section is used for giving you feedback about the soundcard and for setting a few options:



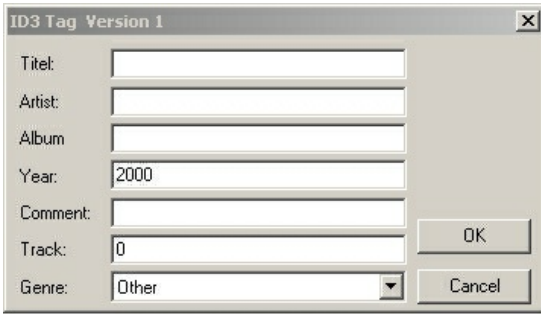
If everything is running properly you should see information about your soundcard displayed in the window. In the above example, you can see that **M3W** has identified the computer has a **Creative Sound Blaster PCI** soundcard. Additionally, you can see the volume level (loudness) of the soundcard displayed as the **Peak Level**, and the Bytes of audio received from the soundcard. The Peak Level is interesting because it tells you if your audio is likely to distort. You can't control the input level from **M3W**. You should do it using your **Microsoft Windows Sound Controls**. You can open the Windows Sound Controls, by a doubleclick on the loudspeaker symbol in the taskbar or in the Windows Control Panel. Once the Windows Sound Controls are open, select the the recording controls through the Options menu. Moving the sliders up and down changes the volume of the input to m3w. If you see the levels peak into the **clip** segment then you should turn down the sound input levels.

The yellow and blue buttons at the bottom turn the soundcard input on and off. You use these buttons to stream from the soundcard **mic-in** or **line-in** inputs (eg. for live streaming events etc):



ID3 TAG

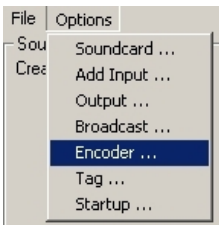
The **ID3 Tag** section is where you set the information to be displayed in the clients player when they play your stream. This information is embedded in the stream in a format know as **ID3**. If you click on the yellow button in this section you will see the kind of information that you can enter:



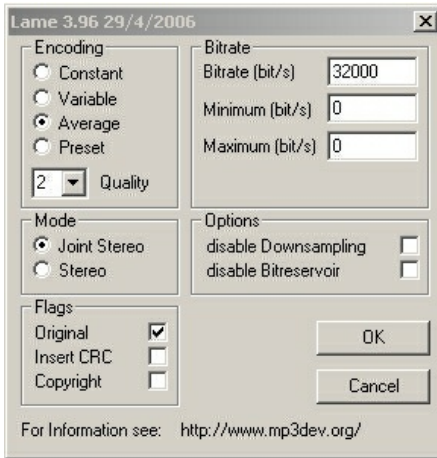
This information does not effect how you connect to the streaming server or any part of the delivery of the audio. The information in this form only will effect the text data displayed in a player (like **Winamp**, **xmms**, **iTunes**) when you stream is played. In fact, you don't even have to follow the categories of information here, you could put anything you wanted into these fields for display in the player, for example you could put a message for your users, a phone number, chat room details, whatever you like.

ENCODER

The encoder section displays the information about the outgoing audio stream. This information can not be changed directly form the main interface window. Instead, you have to choose **Encoder** from the **Options** menu:



This will then open a window where you can edit the details of the outgoing (encoded) audio stream.



These details refer to the type of **MP3** stream you will send. **M3W** uses the **lame** encoding libraries, which output a **MP3** stream. The label at the top of this window reads **lame 3.96**. It gives you the version of the lame library currently in use. The **lame** library is installed by **M3W** so you don't have to do this yourself. This window in itself offers a variety of variables that you can change. They include :

Bitrate

An outgoing **MP3** stream has a certain **bitrate**. The **bitrate** is the amount of data used to deliver one second of audio. The higher the **bitrate** the higher the quality of the audio. However the higher the **bitrate** the more **bandwidth** (speed of your internet connection) you will need. The default is set at **32000** meaning you will need an internet connection of **56kbps** or higher to deliver the audio stream to the server and users will need to have the same (or higher) speed internet connection to listen to the stream. The needed bitrate is higher than the streams raw bitrate, because every stream contains some overhead (headers, addresses, confirmation packets etc...).

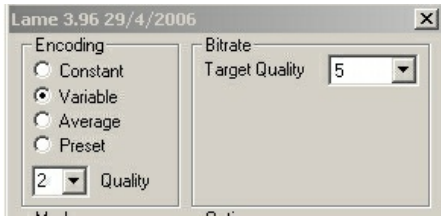
You can choose whatever value you like here but be careful that your **bitrate** settings do not exceed the available **bandwidth** of your internet connection or your listeners internet connections.

As stated, the **bitrate** also effects the quality of your audio stream. It is difficult to recommend a bitrate but in general 32000 would be sufficient to deliver voice very clearly. If, however, you require stereo audio or music, then try 56000 or higher.

Encoding

The **encoding** setting also refer to the outgoing **bitrate**. If a stream or audio file is encoded at a **constant bitrate (CBR)** it means every part of the file is encoded at constant (exact) amount of data per second - the **bitrate** does not vary at any point in the stream.

A **variable bitrate (VBR)** is slightly different. With **VBR** the bitrate is adjusted according to how complex the audio source is. For example, if you encoded a stream or audio file with **VBR** then the **bitrate** would fluctuate often. The **bitrate** used at any given point is worked out by the encoder. Essentially the encoder analyses the audio to be encoded and works out how much data is required to accurately describe it. When you choose **VBR** you forgo the choice of a **bitrate** setting in **M3W**, and instead you get a drop down box from which you choose the 'quality' of the outgoing encoding.



The setting on the right (**bitrate**) is now a choice between **0** and **9**, with **0** being the highest quality. **VBR** is not the best choice for encoding live streams because the actual bitrate used is unpredictable.

The default setting for **M3W** is the **average bitrate (ABR)**. This method is halfway between **VBR** and **CBR**. With this method you do not have a constant bitrate, instead it is variable but it is variable between a fixed high and a fixed low point. You can choose the maximum and minimum **bitrates** in the **Bitrate** area if you choose to encode with **ABR**. While the actual bitrate varies between the high and low bitrate according to the complexity of the audio signal, the average bitrate will match the given target bitrate. Typically the receiving player uses some buffering of the stream to cope with this kind of variable bitrate. If it can not receive bits fast enough, it will play from the buffer, which gets refilled later, when the bitrate is again lower than the available bandwidth.



It is recommended that you use either **CBR** or **ABR** when streaming live audio.

Mode

The **mode** refers to how much data and processing goes into producing a stereo output. **Stereo** encoding preserves the channel separation between the left and right channels whereas **Joint Stereo** encoding calculates what is in the *middle* and *side* of the stereo input. For lower bitrates the **Joint Stereo** is better and for higher bitrates full **Stereo** encoding is generally recommended, but this is an argument that haunts many mailing lists and forums. Some argue that **Joint Stereo** creates odd stereo artifacts (unwanted distortions). The answer is - experiment. The mode setting is used only if the input from the soundcard is in stereo.

Flags

These three options are unrelated and generally speaking, you don't need to use them. **CRC** (cyclic redundancy check) is a number that is used to check for errors when streaming the audio. It uses 2 byte of extra data per frame, which is about a 1 percent overhead. Often however the receiving player do not use this extra information. If you are extremely short on bandwidth go without it. The **Copyright** option just marks the outgoing stream as **copyrighted**, presumably so all good law abiding citizens won't then attempt to copy it (Creative Commons blew that assumption up). The **Original** flag is actually associated to the **copyright** flag, and marks the stream as an original (not a copy). These all seem pretty useless to me especially as they make no difference to the listener.

Options

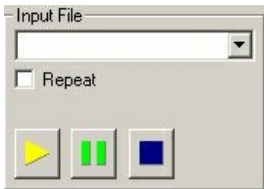
The **Options** can generally be ignored.



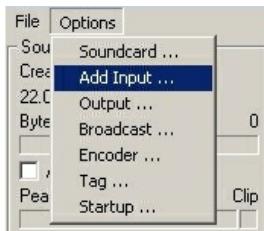
disable Downsampling means that if you select this the **sample rate** will be preserved. If you are learning about streaming, then ignore this for now. **disable Bitreservoir** means that certain quality negotiations undertaken by the **lame MP3** encoder will not take place, potentially reducing the quality of your outgoing stream.

INPUT FILE

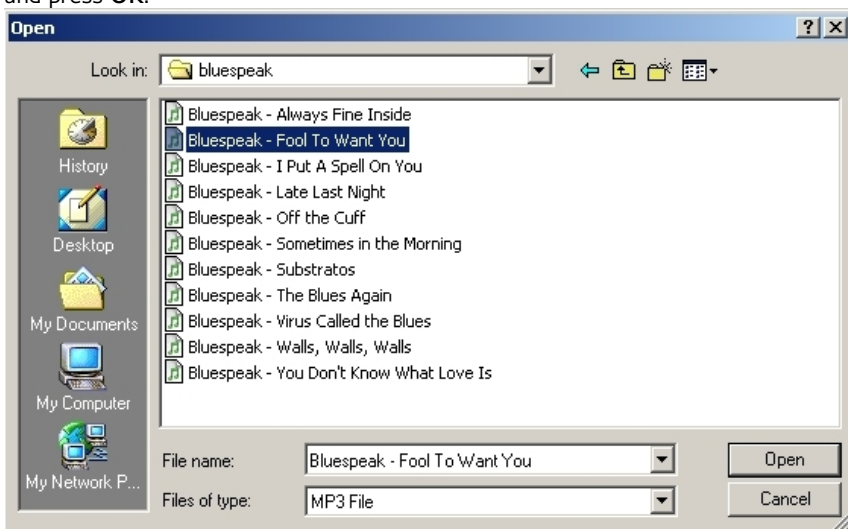
If you wish to stream a **file** instead of a live input then you will need to use this section of the interface.



To add a file to the drop down box displayed you have to choose **Add Input...** from the **Options** file menu:



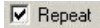
This will open a file browser and you can browse to the file you wish to load, highlight (select) it and press **OK**:



The file will then be loaded in the main interface, in the drop down box of the **Input Area**:



To play, pause or stop playing the file you can use the buttons at the bottom. To loop the playback check the **Repeat** box. This feature can be used to send a prerecorded announcement just before or after you start your live broadcast, and repeat the announcement over and over.



BROADCAST



This section gives you feedback on the status of the outgoing stream. It will tell you how many **bytes** have been sent and the true measured bitrate of the outgoing stream. The true bitrate can be lower than the encoders bitrate, if your connection is bad, or too slow. In this case the progress bar below it will show you how the output buffer slowly fills up. If the congestion of your connection is only temporary, the output buffer should become empty again later. If not, the true bitrate gives you a clear indication of the maximum bitrate you should use for the encoder. The two buttons at the bottom are for starting and stopping the broadcast (stream).

OUTPUT FILE

This section allows you to start and stop archiving the outgoing stream to your harddisk. The big red button is record and the blue square will stop the archiving process. If you choose the **append** option then each time you start and stop the archiving, the archived files will be joined together in order. If you choose the **autoname** option then each archived file will be named automatically by **M3W**. This section also gives you feedback on the amount of **bytes** archived (archive file size).

5. CONFIGURING M3W

Software name : M3W

Software version : 2.1

The interface is pretty easy to understand, if you have done any streaming before. If not, you will need to understand a little about how it all fits together, but its not so difficult.

SERVER DETAILS

As stated in the section on **requirements**, you will need to know some information about the server you will stream to. You will need the following details:

- password
- host name or IP number
- port number
- mount point
- login type

First of all, you will need to open the broadcast configuration panel which holds the details for the server. You can find this configuration panel under the **options** menu item.



The broadcast configuration panel looks like this:

Broadcast

required

Server: localhost

Mountpoint: live

Port: 8000

Password: topsecret

User: source

Login Type

X-Audio

HTTP

Icy

optional

Name:

Genre:

URL:

Description:

Dumpfile:

Buffer (s): 20 Private

Automatic reconnect

Enable Initial Delay: 60

Number of Retries: 3 Delay: 60

Cancel OK

Now, let's enter the details of the server into the appropriate fields. The first thing you need to know is what kind of server you are streaming to. If you use the icecast1 server, you should use the x-audio login. The new version of the icecast server, icecast 2, understands the http login. Both servers, as well as the shoutcast server, speak also the icy protokol. Which, however, is somewhat outdated and should be avoided if possible. If you are streaming to an **Icecast** server you will not need to enter the **User** field (just leave it with the default 'source').

When entering this data make sure that you don't have anyone looking over your shoulder as **M3W** password field does not hide the password so anyone looking at the screen will be able to read it. Some notes on the fields:

mount point

This is the name of the stream so it can be identified by player softwares. **Mountpoint** is a bad name, I think, it would be more helpful in streaming jargon to call it **stream name** or something similar. The **mount point** is the unique identifier by which players can identify your stream which is helpful if there are more than streams on the server.

Generally the **mount point** will be given to you by whoever is managing the streaming server, if they haven't given you one then make one up just don't use special characters in the name. In some streaming encoders the **mount point** should be preceded with a forward slash (/). In **M3W** this is not necessary.

password

The streaming server requires a password to authenticate you as someone that is allowed to send a stream.

port

The port number should be given to you by the person who is managing the streaming server. It is usually port **8000**.

Server

This is the **IP number** or the **hostname** of the streaming server. Don't put a <http://> in front of the **hostname** or **IP**.

An example config my look like this:

Broadcast [X]

required

Server: 12.56.4.2

Mountpoint: mystream

Port: 8000

Password: hackme

User: source

Login Type

X-Audio

HTTP

Icy

optional

Name: []

Genre: []

URL: []

Description: []

Dumpfile: []

Buffer (s): 20 Private

Automatic reconnect

Enable Initial Delay: 60

Number of Retries: 3 Delay: 60

Cancel OK

When you are ready press **ok**.

USING

6. Using M3W

6. USING M3W

Software name : M3W
Software version : 2.1

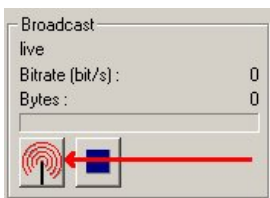
START LIVE INPUT

Next we need to start the input from the soundcard so you can stream audio from a microphone or CD player or whatever you have plugged into your computer. To do this press the **play** button on the main interface that is in the **soundcard** section. If all is ok, the Peak Level meter should start moving, and the Bytes counter should start running. If this does not happen, m3w is not receiving data from the soundcard, or the data received is plain silence. If that happens, check your m3w soundcard settings using the options menu and the settings of the windows sound mixer. You can open the windows sound mixer by a doubleclick on the loudspeaker symbol in the task bar or in the windows control panel. Once the sound mixer is open select the recording controls through the options menu, and adjust the sliders.



START THE STREAM

Now press the **antenna** button on the main interface. If all goes well, you see a transcript of the talk between m3w and the streaming server in the status line at the bottom of the window, just before the byte counter starts running. If the connection to the server can not be established, the status line will show the error message received from the server.



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