MultiMedia in Linux

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April 19, 2001

Lecture Plan

- Introduction
- Audio
  - Sound file formats
  - Waveform files (wav,au, etc.)
  - Compressed audio (mp3)
  - Midi files
  - MOD files
  - CD Audio
  - xmms GUI-based player.
  - esd - Enlightened Sound Deamon

- Video
  - Video file formats
  - Video players
    * MPEG (xmovie, xtheater, plaympeg, xmps)
    * AVI (xanim, aktion)
    * AVI/ASF (aviplay)

Introduction

Many people believe that Linux is great for servers and networking stuff, but doesn't do multimedia. In this lecture I will demonstrate that there is a multimedia software base in Linux.

This lecture will talk about working with sound and video under Linux.

This lecture will *not* cover the following topics: 3D graphics/games, image manipulation, video capture and generation, sound editing and other topics that might have a relation to multimedia.

Installing sound modules

Before you can use any sound option, you must compile sound card support for your sound card into the kernel (or a module) and make sure that the module is loaded.

As most modern distributions take care of this for you, I will not elaborate on how to do this.

For more information see the Sound-HOWTO and Kerenel-HOWTO.

Audio files

When we talk about audio files, we should pay attention to the actual *format* that the sound file is encoded in.

We can distinguish between the following categories of audio formats:

- **Waveform** - This is the simplest format, in which the audio data is directly encoded sample-by-sample in the audio file. Waveform file formats include: wav (usually), au, aiff, voc, and raw.
- **Compressed Waveform** - This format means that the sampled data is compressed in a data-losing compression, that however should not be noticed by humans. Compressed waveform files include mp3 and ogg vorbis.

- **MIDI** files encode only musical notes, and instrument identifiers. The file itself includes no samples, it's simply a notesheet with instrument IDs. Consequently, MIDI files cannot be used to store songs with lyrics. The main advantage of MIDI files, is that they are very small in size, and most soundcards can play them internally.
- **MOD** files are a hybrid approach. A typical MOD file contains both samples and a table of when to play each sample at a given frequency. The MOD tracker is in charge of modifying the frequency of the samples in playback time. MOD files can be used for audio files with little or no lyrics. They tend to be larger than MIDI files, but still much smaller than mp3 files.

Waveform files

The main package that deals with waveform files is the `sox` package. This package allows you to convert from *almost any* waveform format to another. The package also includes `play` and `rec` that allow you to play and record any given waveform format supported by sox.

`sox` also allows you to add *effects* to any supported sound file or stream (if using standard IO).

mp3 files

In order to play mp3 files in a command-line environment, use `mpg123`.

If you wish to decode an mp3 file, pipe the output of `mpg123` to `sox` as follows:

```
mpg123 -s input.mp3 |
sox -s -t raw -w -r 44100 -c 2 - output.wav
```

The output format may be any format supported by `sox`.

To encode (create) mp3 files, use `bladeenc` - a free mp3 encoder.

MIDI files

MIDI files may either be played *directly* on the sound card hardware supporting FM synthesis, or *indirectly* via conversion to waveform.

To play MIDI files directly, use `playmidi`. The actual device used to access the FM synthesizer is `/dev/sequencer`. You can also play MIDI files to *external* MIDI devices (such as various musical instruments), using `/dev/midi*` devices, or `-e` flag for `playmidi`.

Usually, however, you would like to do the synthesis in software, and send the waveform data to the sound card. To do this, we can use `timidity`. `timidity` can also convert MIDI files to WAV files.

If you would like to compose MIDI files, use a MIDI composition software such as KeyKit (`http://www.nosuch.com/keykit/`).

MOD Files

A program to play MOD files is called a MOD tracker. A popular console-based mod tracker is `MikMod`.

To edit or create MOD files, you should use a MOD editor such as FunkTrackerGold (`http://jsno.downunder.net.au/proj_linux/funk.html`).

Shlomi Fish has supplied some of his favorite MOD files at `http://www.iglu.org.il/shlomif/mods/`. More MOD files can be found at `http://www.modarchive.com/`.

CD Audio

CDs can include audio tracks in addition to data tracks. These audio tracks can be played using a CD player software such as `cdplay` (command line) or `cdp` (console).

In addition, audio data from CDs can be extracted (ripped) to create waveform files. A popular CD-Ripping tool for Linux is `cdparanoia`, which supercedes the older `cdda2wav`.

However, in contrast to data CDs, audio CD data *cannot* be extracted in a way that the original audio file is recovered. This is due to physical properties of the CD media. These errors do not interfere with hearing the audio data, but make the process irreversible. While writing data CDs these problems are overcome by special codings. This is the reason why audio CDs can include more minutes than data CDs with WAV files.

In order to create audio CDs, please refer to my previous lecture.

xmms

`xmms` is a generic a-la-winamp GUI-based audio player that can play many types of media files using plug-ins to support various audio formats. It also supports output plugins, effect plugins, visuallization plugins and general plugins.

In addition to plugins, `xmms` supports generic skins to fully customize it's general appearance.

`xmms` plugins exist to support all audio formats previously discussed in this lecture.

esd - The enlightened sound daemon

`esd` is a tool that enables many applications to play sounds at once, and have all sounds mixed together. `esd` also supports forwarding sound on a network. To use `esd` all sound-related programs should send their output to the `esd` socket.

Many programs (such as `xmms` and Gnome) natively support `esd`. However, many more programs do not. That's why there are two utility programs supplied with `esd`. Those programs are `esddsp` which does `/dev/dsp` emulation, and works for most programs; and `esdcat` which can be piped raw sound data instead of the `dsp` device.

To use `esd`, you'll need to start the daemon by issuing `esd&` and then configure all your client programs to use `esd`.

To use `esddsp` simply run: `esddsp` *`program`*

Sound-Related Links

- Linux Sound- `http://www.bright.net/~dlphilp/linuxsound/`
- Sound HOWTO- `http://www.linuxdoc.org/HOWTO/Sound-HOWTO.html`
- Sound playing HOWTO- `http://www.linuxdoc.org/HOWTO/Sound-Playing-HOWTO.html`
- xmms - `http://www.xmms.org/`

Video file formats

- MPEG/MPG - general lossy-comperssion for audio/video, ISO standard. More information at `http://www.cselt.it/mpeg/`.
- RM/RA - Proprietary format by `http://www.real.com/`. Zero-cost player available for Linux. Encoding software commercially available. Designed mostly for streaming.
- FLI/FLC - Autodesk `http://www.autodesk.com/` specification for animation files. Specification is available on the web.
- AVI/ASF - Microsoft proprietary generic video/streaming format, which can use various audio/video *codecs*, few of which available for Linux.
- QT (Quicktime) - Apple proprietary format - `http://www.apple.com/quicktime/`. No official player for linux.

MPEG

MPEG (Moving Picture Experts Group), is the name of family of standards used for coding audio-visual information (e.g., movies, video, music) in a digital compressed format.

MPEG Video standards contain: MPEG-1, MPEG-2, and MPEG-4. Various MPEG playing programs support different MPEG standards, and not all programs fully comply to the standard.

For Linux, the following MPEG players are recommended:

- `smpeg` (`http://www.lokigames.com/development/smpeg.php3`) - Library for MPEG I/II playback
  - `Xtheaer` (`http://Xtheater.sourceforge.net/`) - Simple MPEG player
  - `xmps` (`http://xmps.sourceforge.net/`) - Pluginable, skinnable media player. Video version of `xmms`.
- `xmovie` (`http://heroine.linuxave.net/xmovie.html`) - Standalone MPEG I/II player

RealPlayer

RealPlayer is available as a closed binary from `http://www.real.com/`. The binary works exactly the same as under windows, and supports playing local files as well as web streams.

xanim and aktion

`xanim` is a generic library+player for playing various video formats including AVI, FLI/FLC, QuickTime, and more. The formats are only partially supported (not all AVI codecs, etc.).

The library behind `xanim` is used by the KDE media player known as `aktion`.

avifile

And now, for the reason I decided to give this lecture in the first place... The movie playing software that can play almost any AVI or ASF file, including DivX ;) encoded material. I am proud to present `avifile`!

`avifile` is a library based on the `wine` code for playing AVI/ASF streams using the original windows codecs DLLs

`avifile` is available from `http://divx.euro.ru`.

Summary

- Multimedia under Linux is a fact, not a myth!
- Most sound and movie formats can be played well under Linux.
- Streaming video is partially supported (only RealPlayer for now).