**Synchronization of audio over LAN network**

We are interested in developing a solution for synchronized audio in different PC. This system can produce synchronized audio playback on multiple devices located on different locations for instance playing the same audio in synchronization on different devices at the same time. Meanwhile, the audio playback units in the system is connected to a Local Area Network (LAN). Real Time transport Protocol (RTP) multicast is used for distributing audio streams across a network. The RTP multicast module provides the functionality of transmitting an audio stream from one source device to multiple receiving devices connected on the network, the receiving devices will preform synchronized playback of the audio stream which is the requested functionality of the synchronization of system. The RTP is a network transport protocol suited for transmitting real-time data, such as audio and video over a network. The RTP can both be used over the commonly used transport protocols, Transmission Control Protocol (TCP) and User Datagram Protocol (UDP), and can be used in unicast and multicast fashion. The RTP does not provide any guarantees for synchronized delivering of packages or delivering packages in sequence. The idea of using RTP is to let the receiver deal with out-of-order delivery and losses of packages, with the provided information from the RTP package. IP multicast is a technique used for sending data packages to multiple receivers without having to send the data packages specific to each receivers. IP multicast will only transmit data to nodes connected to a specific multicast group. A multicast group is identified by its IP address. In IPv4 there is a reserved span of IP addresses reaching from 224.0.0.0 to 239.255.255.255.

ALSA is an open source software framework and a part of the Linux kernel, ALSA provides an API for creation of sound card device drivers and a user space library. The main functionality of the ALSA user space library is to provide the functionality of playback and capture of audio. Playback offers the functionality of playing sound on specific sound device. While captures offers the functionality of capturing sound from the sound cards input.

**Overview of the synchronized multi-PC system**

The synchronized multi-PC playback system consists of two different types of devices:

• The source device transmits the audio

• The sink device receives the audio

The source device is responsible for capturing audio from a program (some media player or generated audio) and distribute the it across the network to each connected sink device. The sink device are responsible for receiving the audio and preform playback in synchronization with the other sink devices.

In figure below the basic idea of the synchronized multi-PC playback system is shown with one source device and multiple sink devices. The source device captures the audio from an audio program and distributes it to the connected sink devices over the network, the sink devices preforms synchronized playback of the audio delivered by the source device.

Diagram

Description automatically generated

Basic Idea of the synchronous multi PC system