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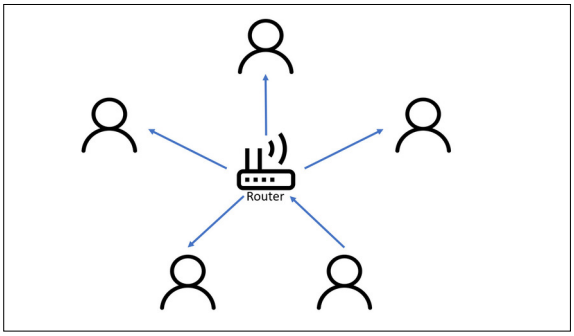
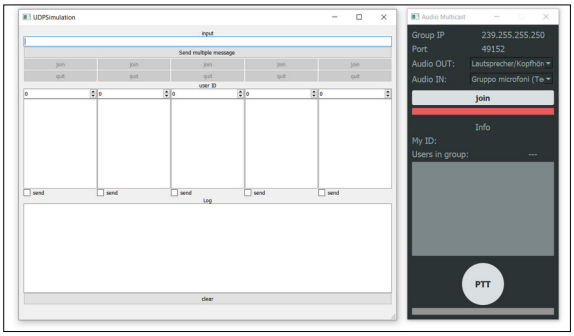
Subject Area	Embedded Software Engineering
Project Partner	ErvoCom AG, Feusisberg, SZ

Multicast Audio Streaming

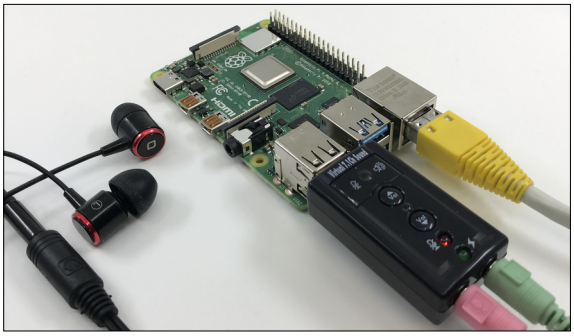
Multipoint Audio communication between participants



Network group
Own presentment



Simulator GUI (left) and multicast audio sender GUI (right)
Own image



Raspberry Pi 4 setup
Own image

Introduction: ErvoCom is a Swiss company specializing in communications systems for the industrial and transportation sectors. Their line of products ranges from railway radio communication to person locators and safety monitoring systems.
The goal of our project was to develop and test a method for handling a real-time audio communication between up to 200 participants. The focus was on realizing a reliable communication without using a central server which creates a single point of failure that could lead to a complete shutdown of the communication system. Multiple solutions had to be evaluated with the following implementation of the best one, creating a final demonstration of a scenario with 5 users.

Approach / Technology: The transmission method chosen to better solve this problem is multicast, an internet protocol for sending data: a message sent to a specific IP address is broadcasted by the network nodes (switches or routers) to all the clients connected to the same group. This moves the forwarding of data from the main server to the network node.
The chosen method to replace the centralized server is a shared consensus network where the decisions are discussed among all the users.
To test our method and improve it we created a program to simulate a communication between up to 5 users. This was fundamental for testing the handling of all the different events.
Thanks to an object-oriented structure, we were able to reuse most of the simulation program in the final version with the real communication over the internet using multicast.

Conclusion: The result is a program capable of sending audio acquired from a peripheral over the local network (LAN) using multicast.
The program was implemented using the Qt toolkit and C++. Qt cross compatibility permitted us to obtain a program able to run on computers and also embedded systems, in our case we have chosen a Raspberry Pi 4 running Raspbian, an operating system based on Debian GNU/Linux.
The tests in a 5 users' scenario have proven the correct working of our decisional method and program structure.
The same algorithms could easily be used with a different transmission medium, such as radio waves therefore obtaining other characteristics.