Voicemailbox

An Open-Source Development Platform for Audio Systems

Students

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Introduction: Modern-day communication predominantly depends on smartphones. This can pose challenges in situations where their use is impractical or inaccessible. This reliance may marginalize individuals with difficulties in writing, vision, or technology use. An audio-based system could provide a solution. Since developing new electronic devices is often too complicated for those without the relevant technical background, this project aims to build a development platform that lowers the barrier to creating interconnected audio-based systems. The highest priorities of the project were given to audio input and output, user differentiation and management, file storage, and wireless transfer of files.

Approach: It was decided that semi-custom hardware would be best. This means that we combine a solution using one of two existing development boards with a custom extension HW board (refer to Fig. 1). As the connections between parts are fixed that way, the chances of incorrect or faulty connections are significantly reduced. This also makes the entire project way more portable and comfortable, since there are no loose or dangling connections (see Fig. 3). For the software, we prepared multiple starter projects and example applications in C++ to demonstrate the platform's capabilities. Those projects are based on a HAL and a BSP for the selected development boards (as depicted in Fig. 2). The entire project is also built with a strong focus on open-source, featuring interactive online documentation that explains how to use the demonstrated parts and components: https://github.com/KROIA/Voicemail-Box.

Result: Using this development platform, it becomes easy to set up an audio messaging system like a voicemailbox with the following features: audio data with 48 kBit/s sampling rate at 16 Bit resolution, with conversion to mp3 and storage using an external FAT32-formatted micro SD card. The files can be easily uploaded to and downloaded from a server. To identify who can access which files, the NFC reader is used in combination with a tag, for example, with the OST campus card.

Fig. 1: Hardware blocks: shows implemented HW-elements and their placement on the PCB.
Own presentment

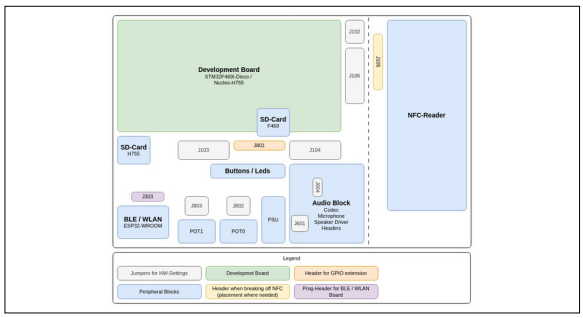


Fig. 2: Software interconnections: shows the different SW-layers of the platform.
Own presentment

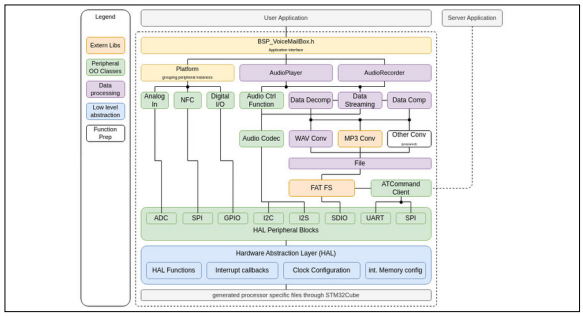
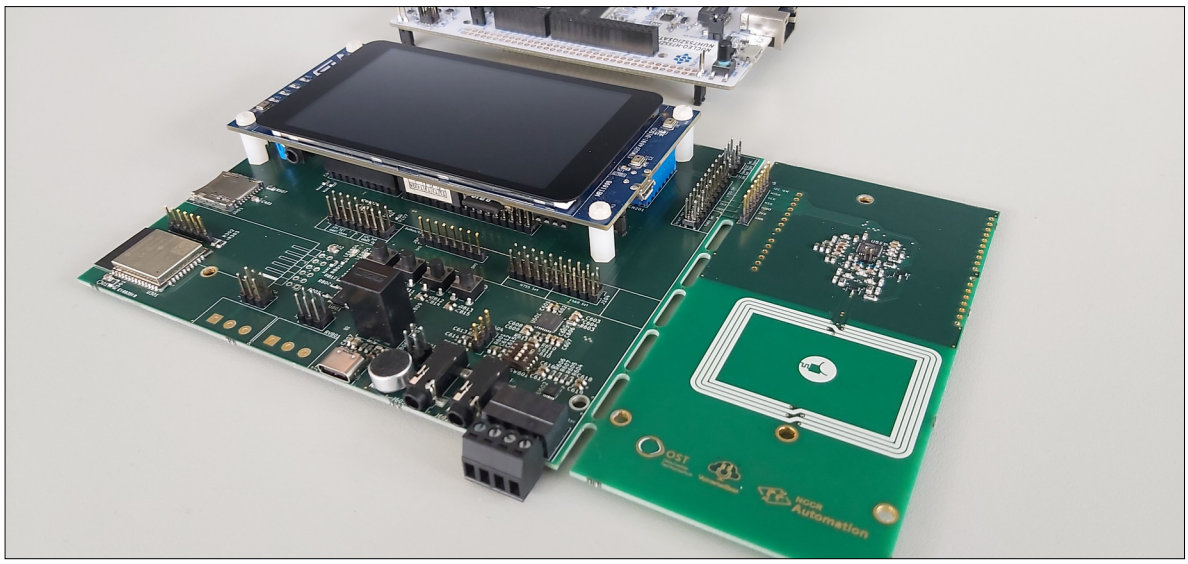


Fig. 3: Platform setup: green baseboard for all custom extensions, dev board on top: STM32F469I-Disco (or Nucleo-H755).
Own presentment



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Embedded Systems

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