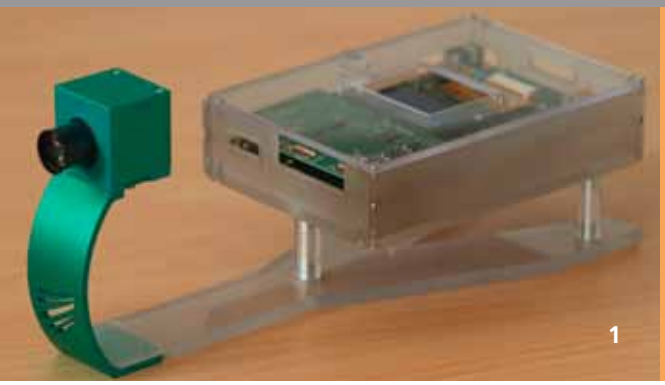
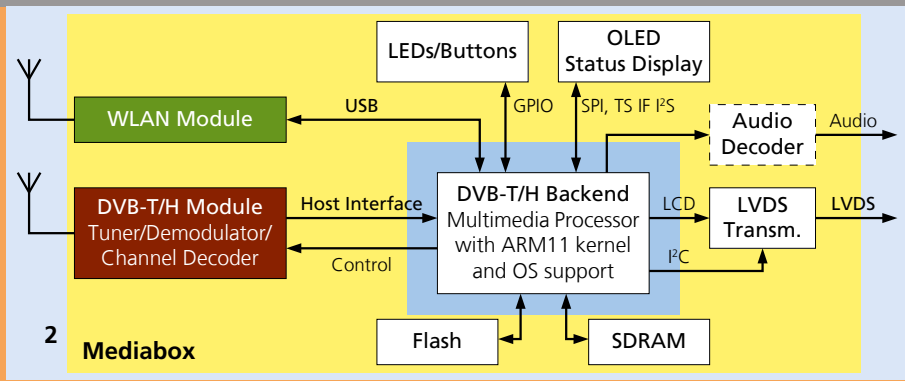
Fraunhofer
IPMS

FRAUNHOFER INSTITUTE FOR PHOTONIC MICROSYSTEMS IPMS





1 *Photograph of Mediabox with OLED projector (photo courtesy by Fraunhofer IOF).*

2 *Architecture of Mediabox.*

MEDIABOX FOR HEAD-MOUNTED DISPLAYS

Fraunhofer Institute for Photonic Microsystems IPMS

Maria-Reiche-Str. 2
01109 Dresden

Contact

Ines Schedwill
Phone +49 351 8823-238
ines.schedwill@ipms.fraunhofer.de

Dr. Michael Scholles
Phone +49 351 8823-201
michael.scholles@ipms.fraunhofer.de

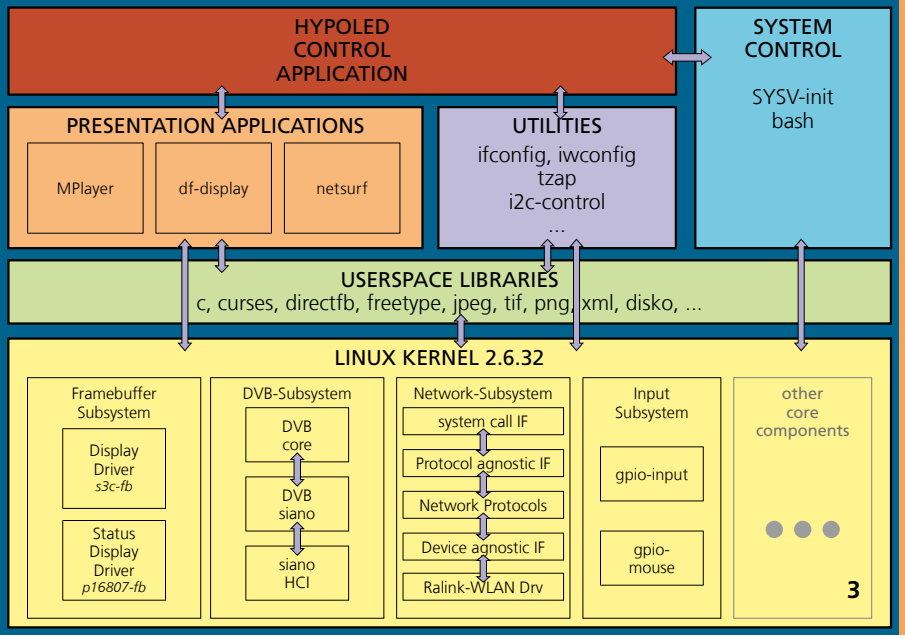
www.ipms.fraunhofer.de

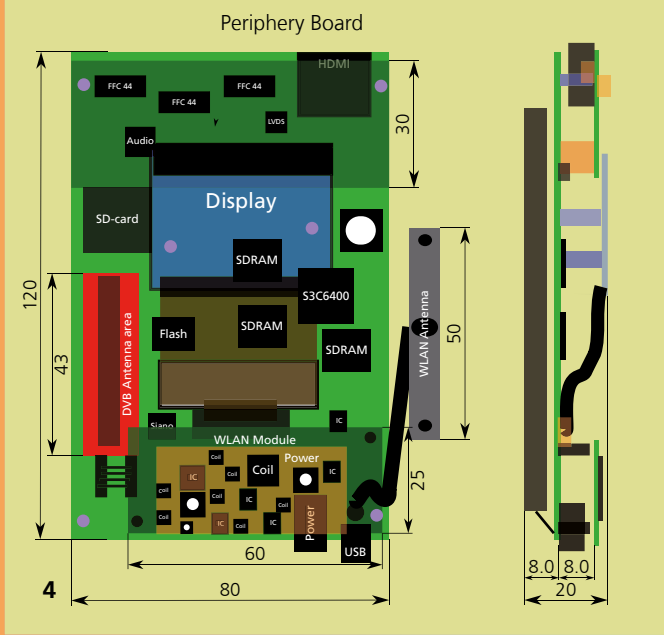
ISO 9001:2008 DEKRA Certification DEKRA Certified
Quality Management
We are certified
Voluntary participation in regular monitoring according to ISO 9001:2008

Introduction

One of the major advantages of multimedia systems using Head-Mounted Displays (HMDs) if compared to devices with full size video screens is that they allow to watch multimedia content in a lot of mobile applications. However, that can only be achieved if also the necessary electronics that enable access to the content and that perform all signal and data processing for converting the content into a format suited for HMD is also lightweight and portable. Hence, the HYPOLED project for development of High-Performance OLED-Microdisplays for Mobile Multimedia HMD and Projection Applications also includes the development of a so called Mediabox that will connect the mobile OLED device to the multimedia world..

Based on power efficient chip and software solutions, naturally targeted at mobile devices like mobile phones, a corresponding embedded system has been designed and necessary software components implemented. The Mediabox provides both access to DVB-H and DVB-T video streams as well as a fast wireless connection to a PC via WLAN. Since these technologies use compressed audio /video streams, real-time decompression methods for MPEG-2 and MPEG-4, either fully by hardware or by mixed hardware / software approach have to be included as well. All mentioned technologies have been developed as an integral part of a common platform of reconfigurable hardware and software components. Hence, the solution has high power efficiency as well as a small overall form factor.





Target objective for a demonstration is the visualization of digitally broadcasted video programs and the transmission of streaming video from a media player via the Mediabox to the OLED device.

System realization

Instead of developing a dedicated hardware solution for video decoding, decompression and scaling, a processor-based design with DVB-T/-H and WLAN front ends and an appropriate multimedia processor has been chosen. One very important requirement concerning the processor is integrated MPEG-4 hardware support. Among other arguments, this was the main reason why the Samsung S3C6400 Multimedia Processor has been chosen for the Mediabox. For clarification, its overall architecture is shown in figure 2.

Development of required hardware module for DVB-T/H reception as well as related software modules for separating DVB-T and DVB-H, channel tuning and decoding of support information (Electronic Program Guide, etc.) is available. Same is true for reception of streaming videos via a WLAN module. The Samsung multimedia processor has built-in hardware support for decompression of MPEG-4 encoded data. This compression scheme is used for DVB-H and also for most video streams delivered via internet today. Decompression of MPEG-2 has to be done in software. The Mediabox runs Linux as operating system (see figure 3), video processing functionality including MPEG-2 decompression has been implemented using open source software widely used within the Linux community.

Figure 4 shows the current mechanical design of the Mediabox. With an overall size of 120 x 80 x 20 mm it fulfils the requirements for a portable and easy to carry system that will be connected to the HMD via a special, very flexible HDMI cable. The Mediabox also provides native support for the OLED projector application targeted within the HYPOLED project. The mainboard carries the processor module with attached memory, power supply, as well as auxiliary circuitry which includes an audio chip, SD card slot for booting and USB interface for remote access. In order to minimize the volume of the Mediabox it was decided to integrate the electronics of the DVB reception module with the Siano SMS1130-Chip and the DVB chip antenna directly on the mainboard. Further reduction concerning DVB was achieved by omitting parts required for reception of VHF and UHF L-Band channels, since there is currently no public DVB service using this frequency range. The WLAN module is connected to the processor via an USB connection. The user interface is realized on one hand by using a commercial full color, full graphics OLED display with resolution of 160 x 128 pixels connected via SPI and on the other hand by a 4+1 way navigation button. This combination allows both to switch certain internal settings of the systems and to navigate through DVB information like channel guide and Electronic Program Guide.

The battery for the Mediabox will be placed underneath the mainboard, which results in a total thickness of 20 mm.

SEVENTH FRAMEWORK PROGRAMME
European Commission Information Society and Media

3 *Mediabox software stack.*

4 *Mechanical design of Mediabox.*