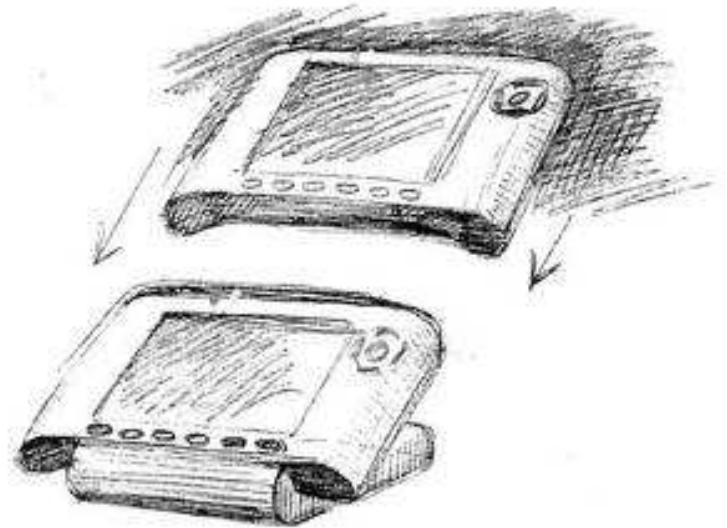


Customer

Swiss company engaged in "Smart Home" automation solutions.

Objective

To develop design, prototype and software for multi-purpose control panel with large LCD color display and vast list supported interfaces. The device should be portable, low-consume and easy-to-use.



Basic requirements to the design:

- Comfortably placed in a hand (hand use);
- User-friendly interface;
- Ethernet connected and ability to be inserted in a charging dock station.

Basic requirements to the equipment:

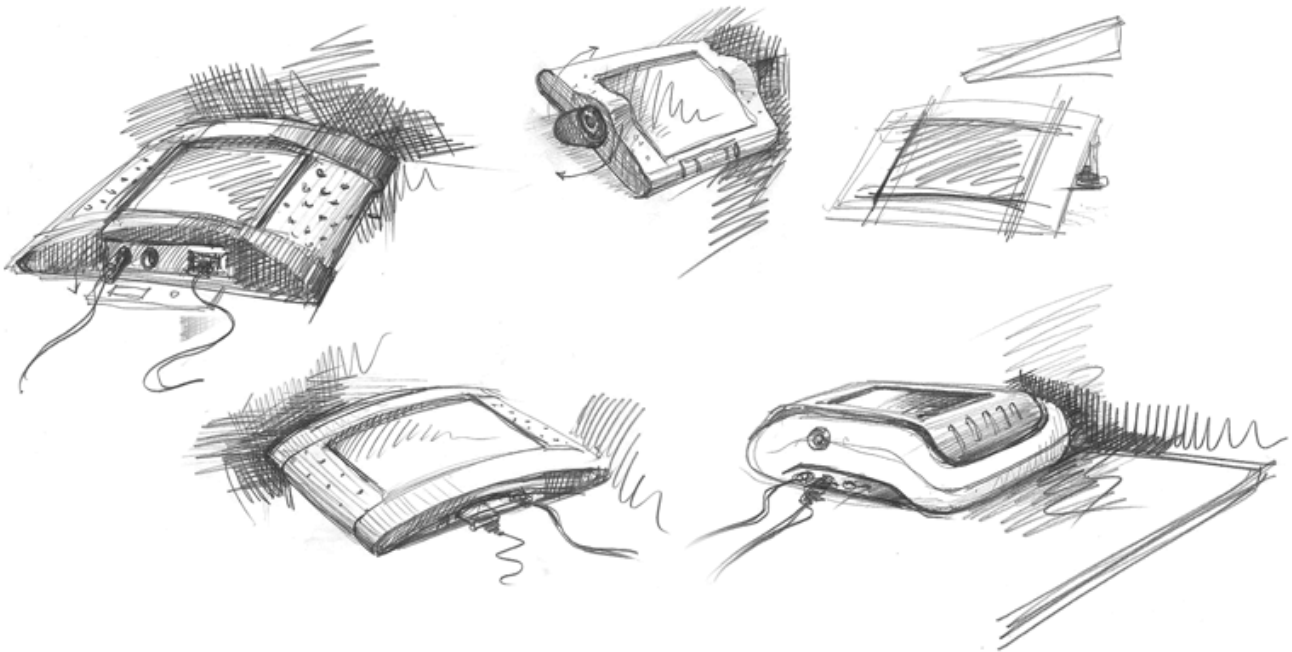
- Ethernet 10/100Mbit;
- USB host;
- Wi-Fi 802.11b/g standard;
- LCD resolution 800x480;
- Touch screen;
- Luminance sensor;
- Presence detector;
- IR port;
- Loudspeaker audio output;
- Microphone input;
- Keyboard and LED display;
- Circuit power supply should be realized either from an independent supply source 12V or POE (Power-Over-Ethernet technology), or lithium-ion batteries;
- Lithium-ion batteries charging integrated in the circuit.



Solution

Device design

Our designers developed device sketches, in which, according to requirements, they thought over device's design and ergonomics features, its architecture and placement of principal elements.

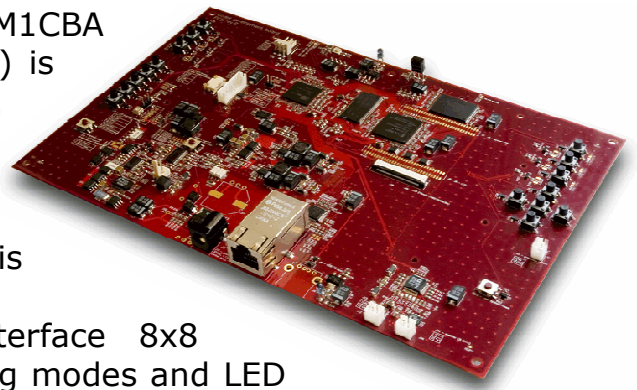


Hardware platform

The board for a multimedia "Smart Home" control panel is developed on the basis of SoC Cirrus Logic EP9307. It is provided with SDRAM elements of 32M x 16bit and Flash 8M x 16bit. PHY Ethernet interface is realized on DP83848 chip. Unex RM5 of the standard 802.11b/g based on Marvell M8385 chip is used to implement Wi-Fi module functions. The USB host interface is implemented into the board to connect USB drives and other USB-slave devices.

A color graphic TFT LCD Hitachi TX18D16VM1CBA with touch screen (LCD resolution 800x480) is intended to display visual information. Microphone audio signals, outgoing messages or music are digitized and transmitted to loudspeakers by the use of audio codec AD1981BJSTZ, which is connected to the AC`97 processor interface.

The keyboard (using the processor interface 8x8 Keypad Scanner), LED indication of operating modes and LED

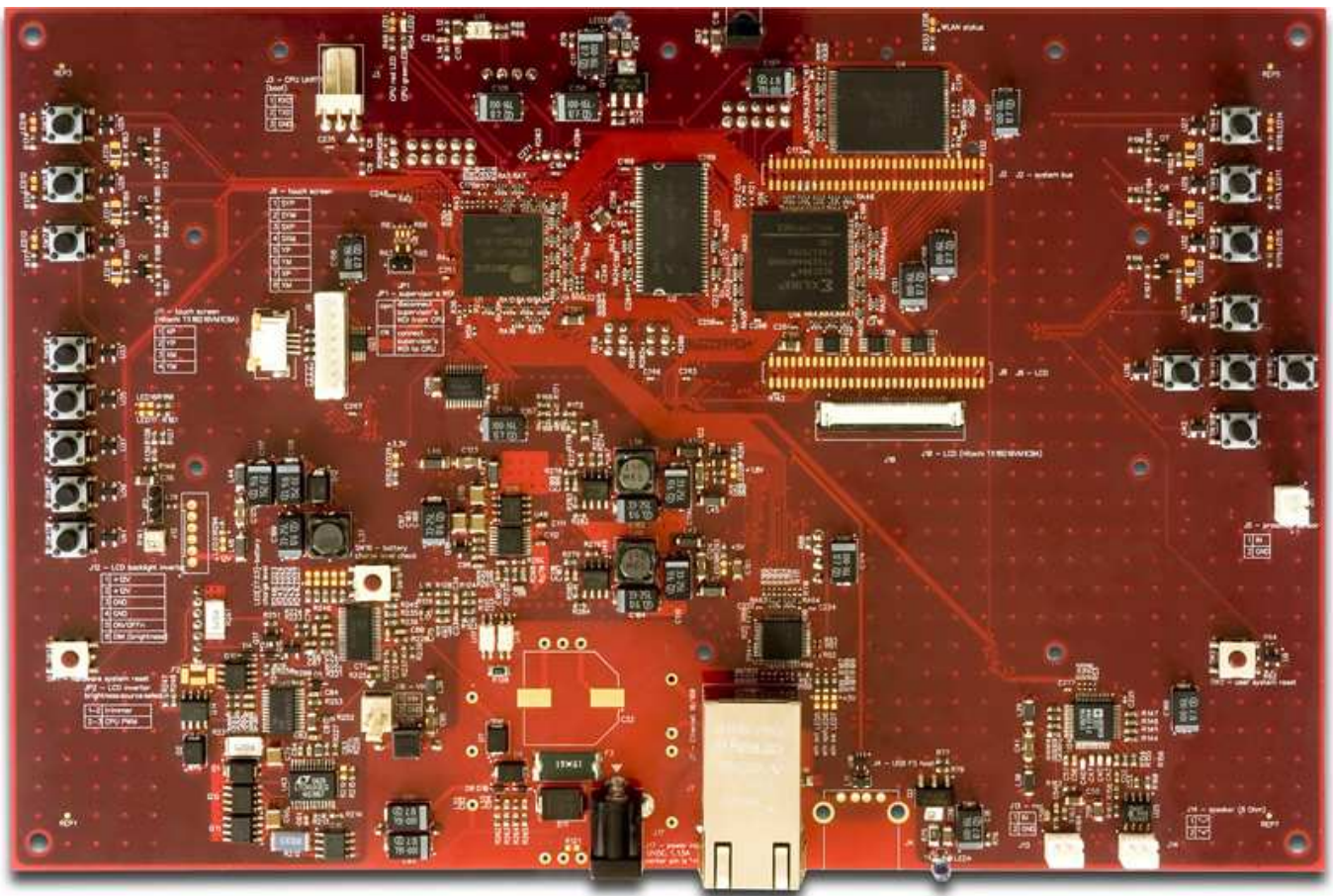




keyboard illumination are implemented to the circuit board. DBGU serial port is intended for device debugging.

The circuit board includes:

- Luminance sensor on the basis of TSL2550T chip;
- Presence detector on the basis of T113-ISG Qprox chip;
- Infrared receiver and transmitter.



The board power supply could be carried out in three ways: either through the Wall adapter 12V, or through the PoE (Power-over-Ethernet), or through Li-ion batteries. The integral charging for Li-ion batteries from the Wall adapter 12V or by the Power-over-Ethernet is also provided.

Design of this printed circuit board is specific. It takes into account certain features of power supply pathways and Li-ion charging. Analog circuits' power supply is implemented in separated filtered polygons.

Software

The board support package (BSP) is developed on the basis of the initial loader U-Boot and the Poky Linux operating system for ARM processor, that is based on GNU libc full-function system library. The standard stable version of the kernel OS Linux



2.6.20 with modifications, delivered by Cirrus Logic company, is used as a kernel of the operating system.

The initial loader U-Boot with SDRAM, NOR Flash, Ethernet MAC support is adapted for device successful loading.

As a result of the developing process the drivers for the power management that are used by different functional modules of the device and the driver for the presence sensor are developed. The changes to the keyboard driver of a kernel are made during the adaptation stage. The graphic server X is changed in order to support the touch screen device and LCD display. The frame buffer support driver is adapted for working with Hitachi company LCD display.



The worked up demonstration distributive software is composed of:

- Command shell bash;
- Wireless-tools packet utilities (iwlist, iwconfig etc.) for connection to wireless network by Wi-Fi interface;
- Packet ALSA utilities (arecord, aplay) for sound replaying and recording;
- Graphic server Xorg to checkout a touch screen device availability and run X-applications.



Features and benefits

- SoC Cirrus Logic EP9307, used in the project, possesses rich periphery that allows avoiding an additional chips' usage for interfaces realization.
- Power-over-Ethernet technology allows an easy device supply without any extra outfits.
- Implemented Li-ion battery charging scheme allows changing flexible charging parameters and controlling its state and charging degree by the processor.
- Applied LCD Hitachi TX18D16VM1CBA allows displaying image data with a high level of detail. It is a very important issue for the "Smart House" control panel.
- Used luminance sensor and presence detectors allow a considerable charge saving.

Development tools	GNU Toolchain (gcc, gdb), P-CAD, ISE Foundation
Interfaces & Technologies	USB2.0 (Host), Wi-Fi, PoE, CF II+, AC`97, RS-232
Programming languages	C, C++, VHDL, Verilog
Project management tools	dotProject, MSPProject, SVN
Efforts	210 man-days
Duration	8 months