Project Documentation: Hardware Management System

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Introduction

The Libre Minimalistic Private Server (LibMPS) project aims to create a free server based on the RISC-V architecture for deploying AI and cloud services. The project aims to provide energy efficiency and scalability, as well as a high level of freedom and openness for users. This will allow users to have full control over their data and applications, as well as enable the development of new applications and services.

Project components

1. Processor: SpacemiT K1, a RISC-V architecture, provides a high level of performance and energy efficiency. This will allow the server to work efficiently and save energy.

2. Power supply: 5 batteries of 30,000mAh each, provide long-term operation of the server without connection to the network. This will allow the server to work autonomously for a long time.

3. Operating system: Devuan Linux, ensures the stability and security of the system. This will allow the server to work stably and securely.

4. Service deployment programme: LibMPS Runner, written in Qt6 and Bash, provides a simplified service deployment and management process. This will allow users to easily deploy and manage their applications.

5. Services: Llama, Sharkey (Misskey), XMPP, IRC, provide support for various protocols and services. This will allow users to access different applications and services.

Project functionality

- Deployment of AI and cloud services: on a free platform, providing a high degree of freedom and openness. This will allow users to deploy their applications and services on a free platform.

- Energy efficiency: thanks to the use of the SpacemiT K1 processor and optimised power supply, it provides long-term operation of the server without a network connection. This allows the server to operate autonomously for a long time.

- Scalability: due to the possibility of expanding the number of batteries and processors, it provides the ability to increase server performance. This will allow the server to work efficiently and scale according to the user's needs.

- Support for various services: including Llama, Sharkey (Misskey), XMPP and IRC, provides a high degree of versatility. This allows users to access different applications and services.

- Own service deployment programme: LibMPS Runner, simplifies the process of deploying and managing services. This allows users to easily deploy and manage their applications.

- Fingerprint reader connected to arduino nano checks identity of user to power up the device.

Use cases

- Educational institutions: for learning and research. This will allow students and teachers to have access to a free platform for learning and research.

- Small businesses: to optimise processes and reduce costs. This will allow small businesses to access a free platform to optimise processes and reduce costs.

- Personal use: for experimentation and development. This will allow users to have access to a free platform for experimentation and development.

Benefits of the project

- Free and open platform: provides a high degree of freedom and openness. This will allow users to have full control over their data and applications.

- Energy efficiency and scalability: provides long-term operation of the server without a network connection and the ability to increase productivity. This will allow the server to work efficiently and scale according to user needs.

- Ability to expand and modify the project: provides the ability to develop new applications and services. This will allow users to develop new applications and services based on the project.

- Support for various services and protocols: provides a high degree of versatility. This will allow users to access different applications and services.

Project outlook

- Expanding the functionality of the project: by adding new services and protocols. This will allow the project to develop and improve its functionality.

- Development of new applications: based on the LibMPS Runner project. This will allow developers to create new applications based on the project.

- Improving the energy efficiency and scalability of the project: provides the ability to increase server performance. This will allow the server to work efficiently and scale according to user needs.

- Dissemination of the project: among the community of developers and users of free software, provides an opportunity to develop the project and implement it in various industries. This will allow the project to develop and spread among the community of developers and users.

Future plans

- Improve main cons of the current design
- Make the design more user friendly
- Make an industry-grade version
- Find an “angel” (or crowdfund the future steps)
- Start mass production
- Create own Devuan-based OS with all the needed tools

Conclusion

The Libre Minimalistic Private Server (LibMPS) project has great potential for development and implementation in various industries. Its free and open architecture, energy efficiency, and scalability provide a high degree of freedom and openness for users. Expanding the functionality of the project and developing new applications will contribute to its further development and distribution.

Parts and price

• Arduino Nano: 125 UAH

• Toggle Switch: 83 UAH

• Batteries (5 x 30mAh): 1660 UAH

• RISC-V Board: 3735 UAH

• Printing Plastic: 500 UAH

• Tag ID Sensor: 400 UAH

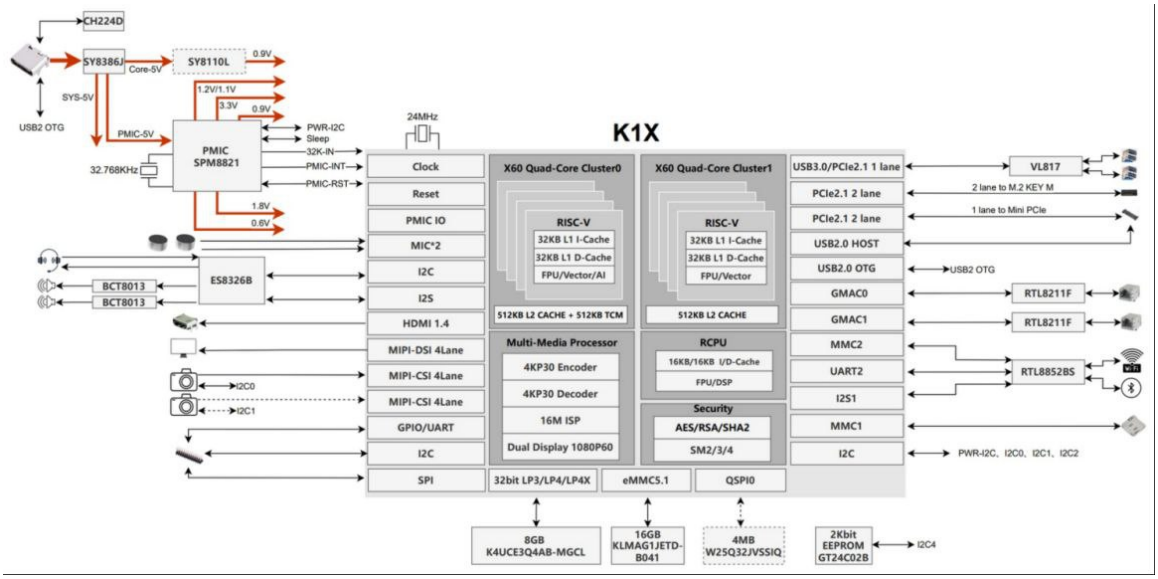
• Magnetic Strip: 100 UAH

• Thermal Pads: 55 UAH

• Copper Metal: 300 UAH

- LED: 157 UAH
- Thermal Glue: 110 UAH
- Cooling System: 166 UAH
- Acrylic Glass: 400 UAH
- Type-C (not a cable): 400 UAH
- Type-C to SATA Adapter (3 pcs.): 1869 UAH

Schematics and Drawings



Software Description

The system operates on Devuan Linux with a software interface LibMPS Runner, developed in Qt6 and Bash.

Conclusions

The developed system demonstrates high energy efficiency, autonomous operation, and the ability to deploy various services.

LibMPS Technical Specifications

"LibMPS" Specifications Document

LibMPS is a powerful server and SBC designed for developers, hobbyists, and enthusiasts who seek a versatile platform for various applications. It is part of a series known for its high-performance hardware and flexibility. Below is a comprehensive listing of the LibMPS specifications, based on publicly available information and sources.

Overview

The LibMPS is built around an advanced RISC-V architecture, making it one of the first SBCs to adopt this cutting-edge processor design. It is designed to handle complex tasks, support multiple applications, and cater to a wide range of applications, from embedded systems to desktop computing. The board is compact, yet packed with features, making it an excellent choice for both beginners and experienced users.

Specifications

Processor (CPU)

- Architecture: 8-core RISC-V processor
- Performance: Designed for high-speed computing, ideal for multitasking and resource-intensive applications.

Memory

Onboard RAM: Equipped with 4GB of DDR4 memory, providing sufficient resources for running multiple applications simultaneously. Extendable to 8GB or 12GB

Storage

eMMC: 32GB eMMC storage for onboard data storage.

Expandable Storage: Supports microSD cards for additional storage capacity, allowing users to expand storage as needed.

Connectivity

Ethernet: 2 x Gigabit Ethernet ports for high-speed wired internet connectivity.

Wi-Fi and Bluetooth: Built-in Wi-Fi and Bluetooth for wireless connectivity (exact specifications not provided).

USB Ports: 4 x USB 3.0 Type-A ports for connecting peripherals such as external drives, keyboards, and other devices.

HDMI: 1 x HDMI port for connecting to displays or monitors.

Audio: 1 x 3.5mm audio jack for sound output.

SIM Card Slot: 1 x SIM card slot, supporting cellular connectivity for IoT applications.

Power Supply

DC Input: 1 x DC power input (12V/3A), allowing users to power the board using an external power supply.

Power Management: Efficient power management ensures optimal performance and energy consumption.

5 x On-board batteries, 30,000 mAH each.

Expansion Interfaces

GPIO: A set of GPIO pins for interfacing with external hardware, sensors, and actuators.

MIPI CSI Camera: Supports MIPI CSI camera modules, enabling users to connect high-resolution cameras for computer vision projects.

MIPI DSI Display: Equipped with a MIPI DSI interface for connecting MIPI DSI displays, offering flexibility in display solutions.

PCIe Expansion: 1 x PCIe x4 slot, allowing users to add expansion cards for advanced functionality (e.g., additional storage, networking, or graphics).

Camera and Display Interfaces

The LibMPS features a camera module interface, enabling users to connect high-quality cameras for applications such as surveillance, robotics, and computer vision. The interface supports MIPI CSI camera modules and provides pins for camera control, power management, and I/O communication.

The board is also equipped with a MIPI DSI interface, which supports a wide range of displays, including high-resolution screens. The interface provides pins for display power management, reset, and I/O communication, making it easy to integrate different display solutions.

Peripheral Interfaces

The LibMPS offers a rich set of peripheral interfaces, including:

- I2C: Multiple I2C buses for connecting sensors and other I2C-compatible devices.
- SPI: SPI interface for communicating with SPI-compatible devices.
- PWM: PWM pins for controlling motor speeds, LED brightness, and other analog applications.
- ADC: Analog-to-Digital Converter pins for reading analog signals from sensors.

Software and Operating Systems

The LibMPS is supported by a robust Linux BSP (Board Support Package), which includes:

- OpenSBI: A secure boot initialization environment.
- U-Boot: A powerful boot loader for custom boot configurations.

Linux Kernel: A customized Linux kernel optimized for the RISC-V architecture.