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High Performance MPUs for a Variety of AIoT Applications

X2000 & X1600/X1600E

This article introduces Lumissil's family of high performance and yet low power MPUs – X2000 and X1600/X1600E for a variety of AIoT (Artificial Intelligent of Things) applications, such as - smart home HMI panels, advanced QR code readers, network thermal/ laser printers, portable printers and deep-learning edge applications.

Each MPU chip is optimized for connectivity, video coding and decoding functions. The MPUs consist of multi-core CPUs based on MIPS with ISA, SIMD, MMU and other resources. The multi-core CPU technology permits both computing and real-time control with a single MPU. Its LPDDR enables these chips to run full OS based applications. Some of these MPUs incorporate video processors, image signal processors and audio codecs – all in a single chip. These MPUs facilitate designers to design systems in power-saving modes for various low-power and low-cost applications.

Each MPU is peripheral-rich and supports I/O functions such as MIPI-CSI, MIPI-DSI, UART, SSI, Ethernet, USB2.0 OTG, I^2C, and I^2S.

Design-friendly development packages are available with both hardware and software tools and development boards along with video LCD display panel.

X2000: MULTI-CORE CPU HETEROGENEOUS MULTI-APP MICROPROCESSOR

X2000 is a multi-core CPU heterogeneous multi-app microprocessor. It includes 2 CPU cores - an XBurst2 (a MIPS based CPU core, which can be configured to work as two logic CPUs) and an XBurst0 - yet another MIPS based CPU core. Those 2 CPU cores combine the computing power of application processors with the real-time control and outstanding power efficiency. As a system-on-a-chip, X2000 has 128Mbytes LPDDR3 on-chip, so that a Linux based application can run on it.

The X2000 is equipped with the interfaces to connect up to 3 cameras simultaneously, and 2 of them can be hardware synchronized. Integrated video processor and two image signal processors allow H.264 coding/encoding and image manipulations at the developer's disposal. Multiple interfaces are also available, including USB, RGMII, GPIO, SSI, UART and others. The X2000 is packaged in a BGA-270 package. It operates over industrial grade temperature range of -40°C to +85°C. X2000's development kit, called Halley5, includes an evaluation board and comprehensive software package and documentation.

X2000 APPLICATION/SOLUTIONS

- Edge Deep Learning: Detection solutions - human body detection, vehicle detection, human face detection
- Multi-app Solutions: cloud printers
- Recognition Solutions - plate recognition, speech recognition, facial recognition
- Baseline Algorithms: QR code readers, facial recognition, finger print recognition
- Human Machine Interfaces: smart panels, smart air conditioners, smart refrigerators, smart small appliances

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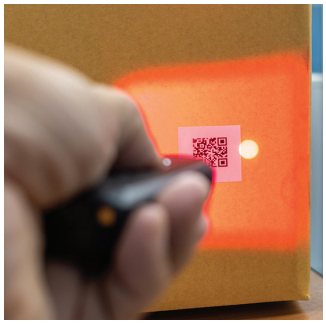
X2000 APPLICATIONS



CLOUD THERMAL PRINTER

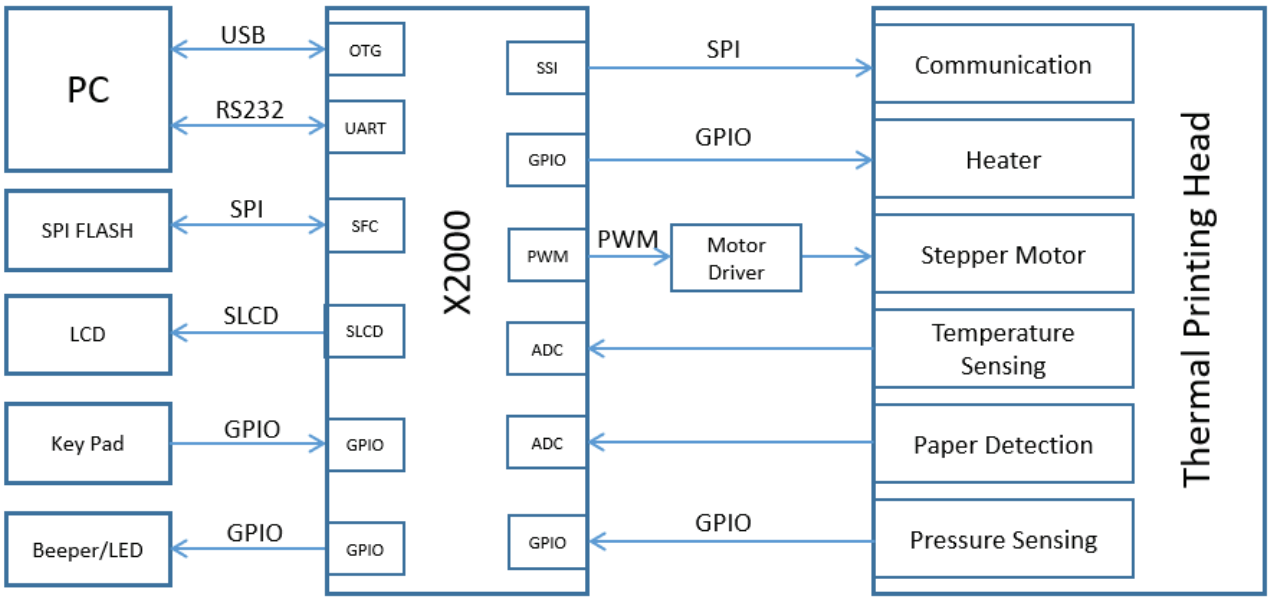
An application example of a typical printer design with X2000 – widely used Cloud Thermal Printer

Cloud thermal printer design using the X2000 MPU need to consider the following important aspects during the design process:

- The control of the thermal printing head: the control of motor, heating control, overheat detection and prevention, paper and paper jam monitoring process, and printing speed up to certain number of pages/min, etc.
- Operating system and software: open source Linux4.4, SDK for multi-app applications and other driver software
- Connectivity: Wi-Fi, Bluetooth, Ethernet, USB, UART; Configuration over Wi-Fi; upgrading over the air
- Input: keypad, touch screen, camera
- Output: LCD display, voice
- Standards supported: Internet Printing Protocol, Common UNIX Printing System
- An optional QR code reading: QR code reading & producing which can be included to build QR reading and thermal printing in one device
- Decoding: PDF and JPG, thus less demanding for network capacity

HARDWARE SOLUTION OF THE CLOUD THERMAL PRINTER:

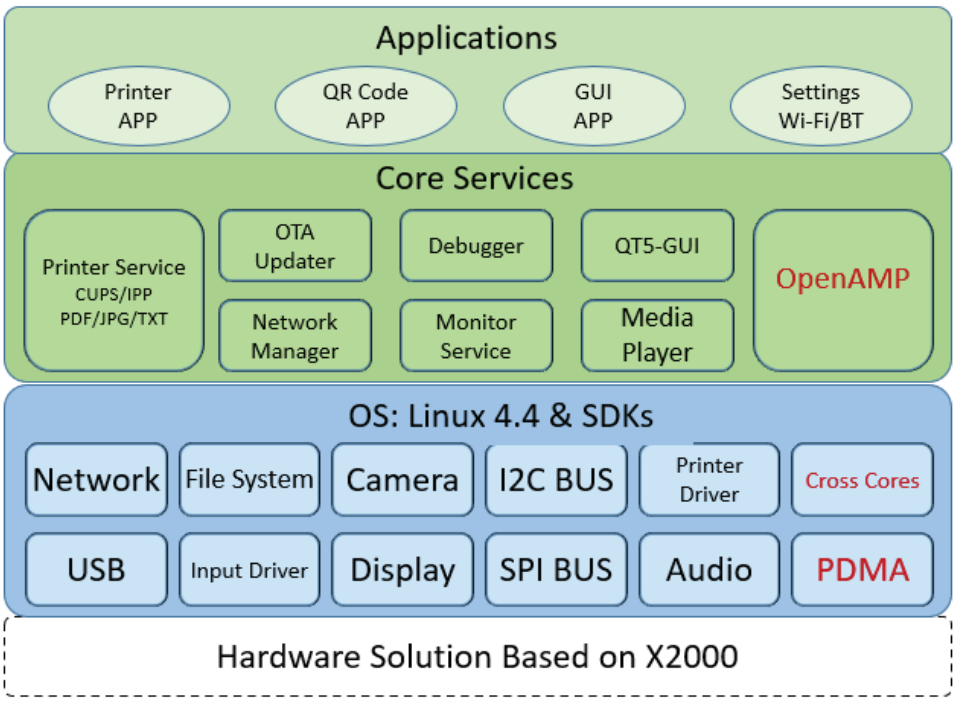
The hardware solution of the Cloud Thermal Printer is illustrated in the following figure. Thanks to the highly integrated architecture of X2000, the solution is perfectly optimized for these kind of applications!



THE SOFTWARE SOLUTION OF THE CLOUD THERMAL PRINTER:

The software solution of the Cloud Thermal Printer is illustrated in the following figure.

The software solution consists of an Operating System, software development kit - SDK package, service software package for application development and specific printer modules. The Cross Cores and DMA in the SDK package facilitate the coordination between the main and secondary cores, while the OpenAMP module provides the API for developers to develop applications.



Tasks performed by main and secondary cores:

Tasks of the main cores

- Managing all the resources in the SoC
- Running the Linux O/S
- Receiving the printing and QR reading tasks
- Data Processing and computing
- Allocating printing tasks to the secondary core through DMA

Tasks of the secondary core

- Monitoring the status of the printing head
- Coordinating the printing and data preparing tasks
- Communicating with the printing head and feeding the data to it

The heterogeneous multi-core architecture of X2000 is a solid base for its working as a processor in a cloud-printer. It has found its way into thermal printers, laser printers, and scanner-printer-all-in-one devices.

X2000 MPU DEVELOPMENT BOARD ORDERING PART NUMBERS:

- HALEY5-EB: X2000 development Board

Additional information and other application notes using the X2000 can be obtained at: MPU for AIoT applications | Lumissil Microsystems

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High Performance MPUs for a Variety of AIoT Applications - X2000 and X1600/X1600E

X1600/X1600E: LOW POWER AIoT MICROPROCESSOR

X1600 / X1600E are low power, high performance, and highly integrated application processors for AIoT applications. These MPUs are designed to meet the requirements of many general purpose embedded processors. Microprocessor with a structure of xburst®1 + xburst®0, X1600 / X1600E boast a powerful compute engine as well as a real-time control agent. These MPUs incorporate abundant peripheral interfaces and can support a variety of applications, where lower power consumption and a small package foot-print are needed.

The X1600 accommodates 32MB LPDDR2 vs X1600E with 64MB LPDDR2.

X1600 and X1600E are pin-to-pin compatible!

These MPUs also feature DVP and MIPI-CSI interfaces, SPI flash. SLDC display interface with resolution up to 640x480 @60Hz, 24BPP. They support RGB display interface with resolution up to 1280x720 @60Hz, 24BPP. In addition, these MPUs support CAN2.0B x2 and media access controller – RMII. Further more, the security subsystem features true random number generator and AES-256/MD5/SHA/SHA2 engines. X1600/X1600E are packaged in BGA159 package. X1600/X1600E development kit - called Halley6, includes an evaluation board and comprehensive software package and documentation.

APPLICATIONS/SOLUTIONS:

- Algorithms: QR code readers, fingerprint recognition
- Human Machine Interfaces: Smart air-conditioners, smart refrigerators, smart small appliances
- Real Time Control: Portable printers, robot vacuums

APPLICATIONS:

X1600E MPU EVALUATION BOARD ORDERING PART NUMBERS:

- HALLEY6-EB: X1600/X1600E Development board

Additional information on X1600/X1600E can be obtained at: MPU for AIoT applications | Lumissil Microsystems

CONTACT:

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