The Innovation of Chinese Microprocessor and Computer Technology

Introduction

The Microprocessor Research & Development Center of Peking University (MPRC) was established in 1997. Beijing PKUnity Microsystems Technology Co., Ltd. (PKUnity) was derived from MPRC and founded in 2002. Over the past decade, MPRC (includes PKUnity) has been a pioneer innovating the microprocessor (CPU) and computer technology of China. The computer designed by MPRC has been certified by the Chinese government as one of the national independently innovated and developed products in its information technology industry.

As a representing progress of Chinese computer technology, the computer systems using MPRC created CPU (named UniCore) have been widely used all over the nation.

Technology Innovation

At present, with their strengths in economic and human resources, a few developed countries and multinational companies have tight control over the core technology. Moreover, they have become standard manufacturers in the information industry. This hegemony of information technology has led to price barriers on computer products, and has resulted in the widening of the digital gap between developed and developing countries. In order to bridge the digital gap, MPRC is committed to the development of low-cost, secure, and competitive computer products with independently developed microprocessors and software technology to enable the greater popular computer access.

Typically, the motherboard of a personal computer (PC) or laptop consists of 4 chips: the CPU, the Northbridge chipset, the Southbridge chipset and the Graphic Processing Unit (GPU). Based on the UniCore microprocessor family and the highly integrated SoC platform, MPRC is able to integrate microprocessors, the Northbridge/Southbridge chipset, and the GPU onto a single chip by utilizing the latest semiconductor process. The single-chip PC solution has a number of advantages, such as low-cost, low-power, and adequate performance with an affordable price.

In February 2009, MPRC released the first-generation System-on-Chip of the "Super-K Project". The future price target of

PKUNITY® System-on-Chip

Latest Generation of Computer Products

Mini Workstation

Low-Cost Laptop (Net Book)

Consumer Electronics Products

MPRC, Dedicated to Bridging the Digital Gap
the computer system will be at a very low cost of ¥1000 (US$150) for each. It is one of the very few System-on-Chips in the world that can provide a single-chip solution for personal Computers. The main frequencies of the PKUnity SoC series range from 600 MHz to 1.5GHz according to the performance requirements of application Scenarios.

Sharing the same dream with the OLPC organization, the computer designed by MPRC has a similar form factor and performance. As the hardware and software architecture of OLPC is derived from commercial laptop products, ideal cost control is difficult to realize. MPRC has its overall control of the entire technology chain. Very low cost and performance balance can be enabled with children friendly features.

MPRC also provides x86 CPU and computer products for the MS-Windows compatible market. The CPU technology was transferred from AMD in 2005, and represented the significant technology overseas transfer from the US. With a fully legal architectural license, MPRC has already released its first x86 SoC product with high integration of peripherals and graphics. In 2010, MPRC will bring their commercial x86 compatible computer product to the market as an entry level student laptop with a very low price and adequate performance.

In 2010-2011, MPRC is planning to release a higher integration System-on-Chip of the "Super-K Project", including PKUnity-4 (multi CPU cores) which will be manufactured using the advanced 40nm semiconductor process. The incoming computer using those chips will provide gigahertz clock frequency and a full HD resolution multimedia experience while still having a very low cost and low power features.

Product & Market

According to different demands on performance, functionality and power consumption, MPRC will provide PKUnity-3 and PKUnity-4 and other series of SoC based computer products. With these technologies, MPRC is able to embody a more comprehensive solution for different applications, including rural area information technology construction, e-education, e-government, enterprise applications, IPC, home entertainment, and so on. According to the different market applications, MPRC focuses on two general product lines:

Low-Cost Laptops: This series of products can effectively support the Internet browser, e-mail client, and instant messaging software. It also enables the smooth playback of multiple standards of video such as MPEG-1/2/4, H.264 encoding, etc. Its built-in H.264 codec can support video conferencing through Internet/Intranet. The hardware-accelerated 2D/3D engine provides 2D/3D animation, gaming, 3D desktop, and other amazing user experiences for courseware. For the important office applications, the computer is compatible with all main-stream document formats such as Word, Excel, Power Point, and PDF. Meanwhile, a multi-language electronic dictionary for English, French, Japanese and German has been provided for children as their learning assistant. To expand the dictionary support, users can further download preferred language packs from an official website.
The computer also works with top publishers to offer a free electronic library service of books and magazines. Specifically designed for the educational requirements of different ages of readers, thousands of multimedia textbooks and story books can be found for daily reading extensions of primary and secondary school students.

**Mini Workstations:** The Mini Workstation is a novel low-cost desktop computer product, supporting a seamless integration of three popular computing models including local computing, Client/Server & Browser/Server, and remote computing. By using a real-time network switch, the machine guarantees effective multi-network physical isolation among up to three computer networks. This technology is not only fast and efficient, but also highly secure for enterprise operations. Users will gain several benefits from the following features:

- All the data is concentrated and stored on the server, to facilitate a centralized security management;
- On the client side, user-authentication is done through an individual USB-KEY;
- After being logged on to the system, all the data transfer on the networks is encrypted to prevent network monitoring;
- The client machine can be powered off at any time, and all the user states will be recovered after a swift boot-up and re-login;
- The client machine supports multiple Ethernet ports, easily isolating the confidential network from the public network. This series of workstation products aims at the market segments of government and enterprise information security. It is also applicable for banking and stock market applications, and provides a safe, low-cost and free maintenance solution. It offers a local Linux operating environment on the basis of the existing infrastructure and customer usage habits. Meanwhile, it provides a low-cost MS-Windows environment through a remote desktop protocol as an e-classroom solution for primary and secondary education, and for rural low-income groups.

**Achievement & Progress**

MPRC adheres to the philosophy of bringing computers to the people who have been unable to access information technology due to poverty or price barriers. The MPRC’s innovated technologies on CPU and System-on-Chips are the keys to bridge the digital gap between developed and under-developed regions. After 10 years of significant efforts, MPRC has compiled a high-level independent research. It has also achieved industrial level development and outstanding technology innovation on a deep and broad coverage of computer architecture. The computers using MPRC’s UniCore CPU have been successfully applied to many markets, such as education, government, business, hotel, health care and other areas. Users are found over all the
provinces of China. In year 2004, 2006 and 2007, the Chinese Ministry of Education officially adopted the MPRC computer for the qualification certification of national “Modern Distance Education Project of Middle and Primary Schools in Rural Areas”. This project is dedicated to empowering under-developed regions to access computer technology. As a fact, it proved definitely that MPRC’s technology innovation could serve the developing countries better than the expensive computer technologies.

From 2007 to 2009, MPRC worked with Qualcomm in a joint “Wireless Reach” program of donating advanced CDMA communication technology to computer classrooms in the rural areas of China. This program successfully realized computerized education in about forty primary schools, mainly located in the most under-developed regions in China, and therefore created a very good example of using high technology cooperation to help the children learn about the outside world.

During the reconstruction after the “512 Wenchuan Earthquake” in 2008, PKUnity computers have been adopted in the first batch of recovered schools, including Beichuan middle school, Mianyang science and technology middle school, and other totally destructed education institutes. For the children who had lost their families, those computers became precious windows for receiving care and encouragement through the Internet. In March 2009, after comprehensive market research, the government procurement center of Mianyang city signed an agreement with MPRC to use MPRC’s computer products in all the post-disaster reconstruction of network multimedia classrooms and electronic reading rooms in the middle and primary schools. To date, thousands of MPRC’s computers have entered the daily life of Chinese people and offered them a new avenue to access computers.

Following this remarkable example of providing indigenously-innovated technology to support the education of a developing country, Minister of Science and Technology of Cuba and government officials from India have paid attention to MPRC’s technology. Cuba has already adopted MPRC’s low cost computers in their middle schools. More and more countries, such as Tajikistan and Zimbabwe, have been working with MPRC to improve their educational environment with MPRC’s low cost computers.

MPRC is dedicated to bridging the digital gap between developed and developing countries, bring more educational opportunities by providing people with low-cost, low-power and reliable computer technology with rich content and software designed to lower the barrier of accessing computer technology, and create a brighter future for the generations to come.