portalplayer

PortalPlayer Firmware: The Key to Market Leadership

PortalPlayer Firmware Leadership

In four years, PortalPlayer's personal media player platforms have had a significant impact on the portable digital audio player market.

Many factors contributed to this success. Among them was PortalPlayer's system-on-chip (SoC), based on dual ARM7TDMI cores, which provided twice the performance of alternative approaches. This performance advantage enabled support for complex encoders and watermarking algorithms, audio post-processing effects, and network connectivity. The SoC was also designed to access storage media, including CD-R/W drives and hard drives. It included on-chip SRAM and cache, LCD controller and bridge interface, and direct memory interfaces to all major removable media types including Memory Stick, MultiMedia Card, Smart Media Card, Compact Flash, DataPlay, and Iomega PocketZip (previously Clic!).

Today, PortalPlayer SoCs continue to be based on the Dual ARM7TDMI® micro-processors with a unique crossbar architecture and zero wait state memory, delivering 160 MHz performance with future roadmap support up to 200 MHz. Our current architecture offers USB 2.0 Device, Host and On-The-Go (OTG), Firewire, and SPDIF, as well ATA/66 IDE controllers and dedicated DMA engines for up to four hard disk drives. Display support is included for YUV out to an external TV encoder, color TFT VGA graphics controller, 4-bit gray scale controller or bridge interface to smart panels.

But as important as the hardware is, the element that differentiates PortalPlayer from other companies serving this segment is the firmware and software that allows manufacturers to easily customize their products with unique proprietary features to distinguish their brands, while enabling shorter development cycles and lower development costs.

Ease of Development, Ease of Use

When PortalPlayer began in 1999, most compressed audio devices on the market were Flash-based digital music players that included PC applications to provide jukebox functionality and simple transfer functions. There were no applications that provided content management for audio devices supporting small form factor hard drives. Typically, consumers had to deal with several separate applications to download music files over the Internet, transfer content from CDs, translate content from vinyl records and tapes into a digital format, and transfer content from PCs to their portable players.

OEMs built their own firmware stacks from scratch to provide support for various CODEC formats, file systems, digital rights management (DRM) schemes, and protocols for different music providers. Separate hardware components had to be used to provide the necessary capabilities to download, transfer, and play audio files. PortalPlayer's business model is built on offering customers complete solutions to these design challenges. The complete platform is architected to enable an end user to create or acquire content from a range of sources, move the content between the player and a PC, and enjoy it anywhere.

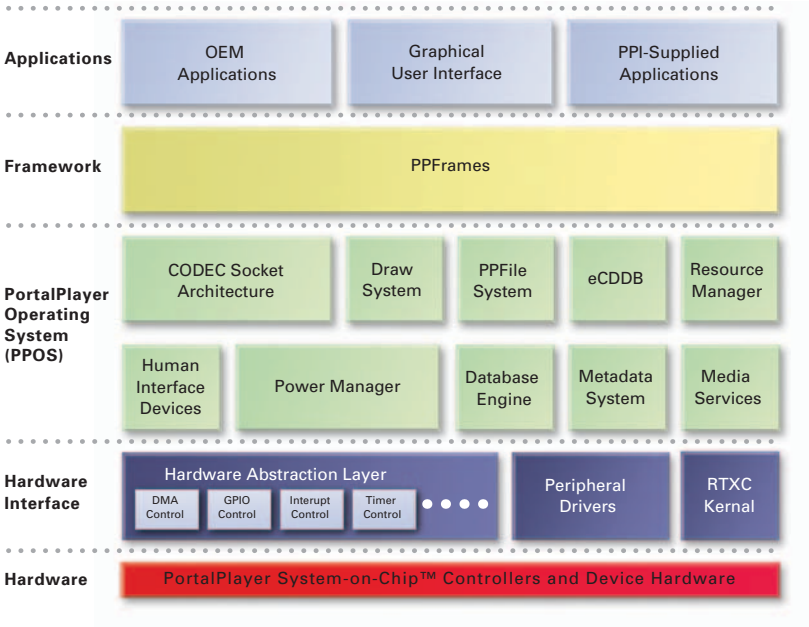
Integration Provides Usability Performance

PortalPlayer saw the need to provide an integrated, end-to-end solution with a range of customer support options. First they started by building a Firmware Development Kit (FDK) to allow ODMs to embed features of their choice in their devices. With the ability to customize the user interface and then access functions such as PC-to-device content synchronization through Application Program Interfaces (APIs), OEMs can offer a unique product that provides an easy, convenient and seamless experience for the consumer. The FDK provides the basic building blocks so the ODM can focus its budget and development time on value-added features to distinguish their products from their competitors.

We also developed a Software Development Kit (SDK) that enables custom PC application development, including database and content synchronizing, firmware upgrading, content protection, hard drive recovery, editing metadata information, play list creation, and for digital photos, creating slideshows with a music soundtrack. PortalPlayer's SDK is continually reviewed and upgraded to include new features or functions that will add value for the consumer.

The result is a platform that provides manufacturers with exceptional capabilities to design products that offer an immersive media experience for the consumer, intelligent library indexing, digital rights management, and adaptive power management.

PortalPlayer Extensible Firmware Suite



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Immersive Media Experience

Optimized CODEC Suite and CODEC Socket Architecture

PortalPlayer paid close attention to the variety of content formats from both the user's and the OEM's point of view. Music, voice, graphics, and video all require different formats, and there are multiple formats within each category.

PortalPlayer developed the PPI CODEC Suite and CODEC Socket Architecture to provide extremely high quality sound over the entire audio frequency spectrum, achieving a full-spectrum audible range response with very, very low distortion.This level of quality is the reason major high-quality brands such as Alpine, Bang & Olufsen, and Yamaha Japan have chosen PortalPlayer as the system for their compressed audio products.

The CODEC Socket Architecture enables elements such as decoders and DRMs to be downloaded seamlessly from the PC application to the device. This critical capability enables OEMs to offer after-sale upgrades to the consumer.

Intelligent Library Indexing

PPI File System, Database Engine, and Metadata Engine

The small form factor hard drives used on portable media players can store thousands of files in many different formats, and these files must be organized, stored, indexed and retrieved quickly and efficiently. PortalPlayer's flexible firmware and software architectures, which include the proprietary PPI File System, Database Engine, and Metadata Engine, are designed to handle all digital media metadata types including music, photos, and digital video.

PortalPlayer's optimized file system and extensible database optimize system performance as an increased number of files are processed. OEMs can utilize these features to enable library management tasks to run very quickly in both background and foreground modes, as well as to allow the user to easily generate playlists and metadata that can be synchronized between the portable device and a host PC.

Digital Rights Management

PPI Crypto Services and Media Service Framework

PortalPlayer was the first solution that could create content on the device directly, and in the early days of the company, they worked closely with the SDMI (Secure Digital Music Initiative) Association to incorporate Serial Copy Management Standards (SCMS) into the platform firmware. These standards protect against illegal distribution of copyrighted music. The flexible Digital Rights Management (DRM) Media Service Framework that enables PortalPlayer customers to use their choice of any DRM scheme, including the Microsoft® Windows® digital rights management, Audible® Books, and PortalPlayer's own Crypto Services™, which is based on well-established PGP standards.

Unique to PortalPlayer, PPI Crypto Services secures MP3 files with an encryption wrapper that allows non-Crypto Services clients to preview the files but not play them. Crypto Services was developed to accommodate the fact that the new DRM schemes being deployed for music services address new music yet do not address the non-secured music already in the customer's collection.

With its Media Service Framework, PortalPlayer supports the top five music and audiobook download services as well as proprietary security protocols for many major customer brands. We are working with partners to develop next-generation DRMs that will enable metering, time-outs and other advanced DRM functionality.

PortalPlayer's highly developed expertise in Digital Rights Management enables our partners to provide extremely efficient, yet unobtrusive rights compliance for the end user. We called this "transparent DRM", the goal is for any device to work with any media download service seamlessly.

Adaptive Power Management

HDD Micro-Pulse Power Control™ and Buffer Play Caching

Needs for battery operation of portable media players vary greatly among consumers. They may use their player for a few minutes to an hour or more while working out, commuting to work, or driving to the mall; they may carry it on a plane trip of several hours; backpackers on a weekend outing may need two or three days of battery reserve. Not only do today's consumers require many hours of reliable play, they want their devices to display video or photo content along with audio output – which creates extreme demands on the battery due to the processing power required.

Media storage is another factor in power consumption. Memory storage schemes such as Flash memory allow for extremely limited storage, so small form factor hard drives are used to provide optimum storage capacity. But of course the additional power requirements of rotating media storage devices increase demands on the battery, particularly on spin up.

PortalPlayer has met these challenges by developing multiple strategies to maximize battery life. For example, Buffer Play (which caches content in SDRAM memory) and HDD Micro-Pulse Power Control minimize hard-drive "duty cycle"access time to less than 2 percent of actual play time. That is, to play music for one hour, the hard drive needs to run only 1.2 minutes. The PPI solution allows the usage of different amounts of buffer – similar to the shock buffer in portable CD players – ranging from 8 minutes to a few hours, depending upon the OEM's requirements. In addition, a standby feature allows the device to go into system sleep after a preset period of inactivity. The standby feature extends battery life while allowing near instant-on convenience for the user.

The result is battery performance dramatically better than any other high performance system on the market.

In addition, the technology has further extended battery life with MIPS optimized decoders and encoders; enhanced memory management that uses extremely efficient overlay techniques for code and data; distributed computing between two embedded processors in the PPI ASIC; on-demand control of the system and peripheral clocks; and turning off hardware islands not in use for specific functionality. We have also provided device drivers that have very low power requirements.

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PortalPlayer Thriving on Chaos

Protocols and technology for digitized media constantly change. PortalPlayer continually adapts our platform to meet the challenges of evolving form factors, standards, protocols, and media types. The fact that the PortalPlayer platform is an integrated, end-to-end solution that includes both silicon and software means that not only are OEMs freed from the time-consuming search for compatible components for their systems, they do not have to invest in building firmware stacks nor do they have to worry about complying with the latest standards and protocols – PortalPlayer does it for them. The results are products that are the evolution of personal media players.

PortalPlayer, Inc. is personalizing digital entertainment by providing complete platforms for computer and consumer electronics manufacturers to design innovative personal media players that integrate audio and photo capabilities. The company's award-winning, flexible silicon and software platform has been adopted by the majority of leading audio jukebox manufacturers worldwide by providing superior features and unmatched flexibility, and enabling rapid time to market. Founded in 1999, PortalPlayer is a privately-held company with offices in Santa Clara, California; Charlotte, North Carolina; Seattle, Washington; and Hyderabad, India. For more information, visit www.portalplayer.com.

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