DSPLinux

DSPLinux™ from RidgeRun

The leading software platform
for DSPs with embedded Linux®

R I D G E R U N

DSPs And Embedded Linux: A Natural Evolution

Consumers Increase Demands On Embedded Devices

In the high-tech industry, the widespread adoption of new enabling technologies is largely driven by consumer demand for expanded features and additional services. Today's consumers, well accustomed to the robust functionality found on their desktop systems, have come to expect this same functionality from their handheld devices. The challenge for developers and OEMs lies in finding a solution that allows them to incorporate such functionality into these devices in the most competitive, cost-effective and timely manner possible.

Some manufacturers of embedded devices are addressing this challenge by simply running their processors at higher and higher clock speeds. The drawback here, of course, is that battery life is significantly compromised.

Consumer demand for greater functionality, coupled with the needs of OEMs to stay competitive, has forced manufacturers to rethink the technology behind their embedded devices. Many are turning to embedded Linux as the solution.

DSP+ARM+Linux

Digital Signal Processors (DSPs) already form the core of multimedia, wireless networking and broadband devices that require significant real-time processing. DSPs are particularly well suited for multimedia, voice processing, wireless communications, compression and encryption tasks. As the demand for Internet-enabled mobile devices continues to grow, many of these new appliances based on DSP technology will be running embedded Linux to take advantage of the operating system's exceptional flexibility, high reliability and ease of Internet connectivity.

DSPs are ideally suited for compute-intensive tasks, and system designers often add them to a system to handle the "hot-spot" processing demands of multimedia. Recognizing this trend, DSP market leader Texas Instruments has introduced the TMS320DSC processor family that combines a DSP core with an ARM processor on a single chip. The DSP+ARM architecture offers developers the best of both worlds: a General Purpose Processor (GPP) that runs Linux and its large base of software well, with a DSP core that executes real-time tasks in parallel. The result is a high-performance processor with lower power requirements and easy programmability.

What It Means For Developers And OEMs

TI's DSP+ARM architecture and Linux's flexibility enable developers to leverage the strengths of each to dramatically improve the battery life, reliability, memory management and performance of the devices they are designing. Linux has a large base of Open Source software that can dramatically reduce time-to-market. New advances in Internet and multimedia standards are often implemented on Linux first. Software that bridges between the DSP and ARM processors makes it easy for developers to use the power of DSPs without requiring expertise in DSP algorithm development. Even generic media-handling capabilities will become easy to add to devices using open multimedia interfaces that reduce development cycles from weeks or even months to a matter of days.

Introducing DSPLinux™

DSPLinux from RidgeRun is the industry's first embedded Linux distribution targeted exclusively toward wireless networking, broadband and multimedia devices built on DSPs. With the new DSP+ARM processors from Texas Instruments, DSPLinux is truly defining embedded Linux solutions for DSP technology. DSPLinux allows Internet appliance developers to balance the feature-hungry demands of consumers with more practical, device-specific considerations such as power management, performance, memory management and product schedule. With DSPLinux, the proven Linux kernel runs on the ARM processor while the DSPLinux Bridge provides a robust interface to code running on the DSP. The result is a shorter design cycle, longer product life, and a rapid time-to-market no other platform can match.

The screenshots on this page show the Appliance Simulator in action, simulating a web tablet, smart phone and digital camera.

Start Developing Immediately With The Appliance Simulator

The Powerful DSPLinux Software Development Kit

The DSPLinux SDK from RidgeRun provides Internet appliance developers with a powerful, robust platform for configuring, customizing and deploying embedded Linux software solutions that use DSP chips. The DSPLinux SDK offers an expansive set of Open Source and advanced proprietary components designed specifically for the TI DSP+ARM architecture, allowing developers to rapidly design and bring to market a broad spectrum of feature-rich devices.

Platforms Supported:

- TI TMS320DSC Processor Family
- TI TMS320C5000™/ TMS320C6000™ + ARM or MIPS RISC Processor

Open Source Components Include:

- Pre-configured Linux Kernel
- Development Tools for the ARM Processor
- Bluetooth™ and 802.11 wireless technology, USB and Ethernet Connectivity
- GStreamer Open Multimedia Interface

Advanced Proprietary Components Include:

- Appliance Simulator
- Multimedia Acceleration
- Code Compression Technology
- Power Management

During the development of an embedded device, developers usually need to test and debug their code before hardware is available. The Appliance Simulator solves this problem by providing an application development environment that simulates the embedded DSPLinux on a desktop Linux PC, enabling the software team to immediately begin developing algorithms and applications well before hardware is available. The Appliance Simulator displays an on-screen simulation of the embedded device (including LCD, hardware buttons and industrial design) while offering a configurable kernel that simulates constrained memory conditions. When hardware becomes available, developers can use DSPLinux cross-compile tools to easily build their applications for the embedded processor target. RidgeRun includes the Appliance Simulator as part of the DSPLinux SDK to allow OEMs to begin developing software as soon as possible, significantly accelerating the time-to-market.

Performance And Flexibility For A Broad Spectrum Of Connected Devices

DSPLinux™ from RidgeRun leverages the power of Texas Instruments industry-leading DSP architectures to deliver the highest performing software platform for wireless networking, broadband and multimedia appliances.

DSPLinux In Photography

The processing demands for image-intensive devices are an ideal fit for DSPs. Texas Instruments DSPs can already be found in most of the leading digital still cameras today. Next-generation digital photography products will offer more connectivity options and capabilities, greater resolution and compression, and increasing interface complexity. Consumers will expect digital photo appliances to communicate wirelessly with other appliances, connect to web sites and send e-mail—all while remaining easy to use. The memory compression, power management and connectivity features of DSPLinux are essential to appliances in this market.

- Digital Still Cameras
- Digital Video Cameras
- Electronic Picture Frames
- Photo Printers

DSPLinux is the natural choice for networking devices since networking protocols and standards are usually implemented on Linux first. Over 80 percent of e-mail servers and 60 percent of web servers are running Open Source software on Linux or related operating systems. Features such as firewalling, port forwarding, IP masquerading and routing are all standard with Linux networking. DSPs power many of today's wireless devices and are well-suited for the demands of voice processing and encryption.

• Wireless Access Points
• VoIP Phones
• Set-top Boxes
• Home Gateways

"RidgeRun leverages the fast growing popularity of Linux, yet addresses the unique demands placed on Linux when used in DSP-based embedded applications."

—Leon Adams
   Worldwide Manager,
   DSP Strategic Marketing
   Texas Instruments

DSPLinux In Multimedia

Streaming audio and video are rapidly becoming part of handheld devices. Single-function devices, such as personal video and audio players, need to meet the challenge of supporting the expanding set of video and audio formats while remaining price-competitive and easy to use. Manufacturers of multifunction devices such as PDAs and web tablets want to add multimedia features to their products without requiring major changes to the core functionality of the device. DSPLinux enables developers to bring multimedia-enabled products to market quickly. GStreamer, the open multimedia interface for Linux, provides an API that lets developers easily add video and audio functionality to their products.

• Web Tablets
• eBooks
• Personal Video and Audio Players
• PDAs

GStreamer Open
Multimedia Framework

GStreamer is the Linux community's leading Open Source streaming media framework, providing developers with a base infrastructure from which any media player can be built. Unlike other Open Source libraries, many of which are tied to specific applications, GStreamer handles all types of media data similarly. Interpretation of media types is handled entirely by the large selection of plug-ins packaged with GStreamer, or by plug-ins which developers can create using the comprehensive set of tools GStreamer provides.

RidgeRun sponsors the Open Source GStreamer project to help create more multimedia applications for all versions of Linux. DSPLinux is designed to integrate with GStreamer in order to execute multimedia processing tasks on the DSP. GStreamer and DSPLinux together represent a significant opportunity for enabling generic media handling in a wide variety of next-generation Internet appliances. As an Open Source framework, GStreamer allows developers to easily integrate multimedia capabilities into their designs. Consumers want more multimedia functionality in their handheld devices. OEMs using GStreamer running on DSPLinux can bring that functionality to market quickly and efficiently.

GStreamer Offers The Following Features:

- Small core library of less than 150KB
- Transparently executes code on the DSP when running on DSPLinux
- Clean and simple API for both plug-in and application developers
- Large selection of plugins, test programs and example code
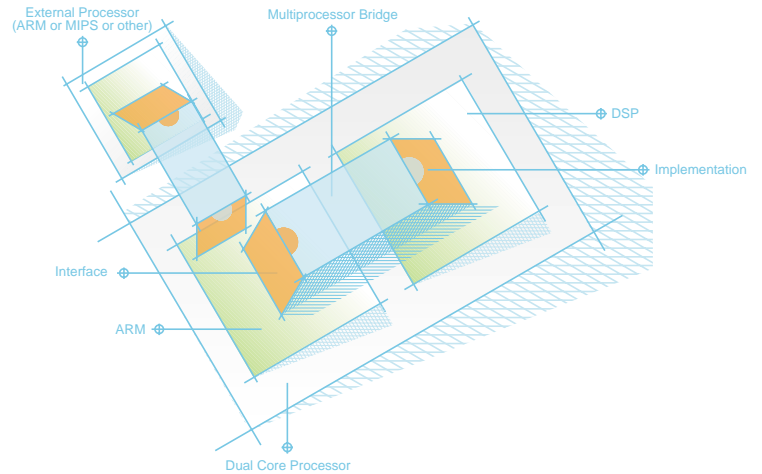
Intelligent Power Management

Today's Internet appliance developers are perpetually challenged to balance the feature-hungry demands of consumers with more practical technology and design considerations. Tradeoffs must be made regarding size, cost, display technology, performance and battery life. DSPLinux simplifies the tradeoffs by adding intelligent and sophisticated power management to the power efficiency of DSPs. DSPLinux conserves power and significantly extends battery life through a variety of means such as powering down external I/O interfaces, displays and unused memory whenever possible— without impacting performance. With additional analog circuitry, the clock speeds of the GPP and DSP can be adjusted based on current system loads. DSPLinux also supports the addition of more advanced power management that can be implemented based on the specific characteristics of the device.
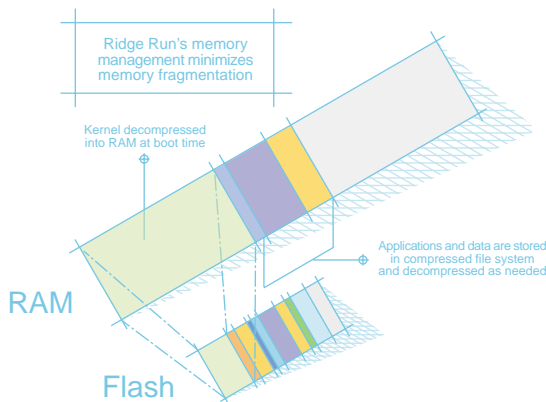
DSPLinux Bridge

The TMS320DSC processors from Texas Instruments provide a new level of performance, and when coupled with an industry standard programming framework (CORBA) in the DSPLinux Bridge, developers can easily take advantage of asymmetric multiprocessing. Developers can use well-documented APIs, or create their own custom APIs, to run tasks on DSPs or other processors. Many DSP algorithms are already written to TI's TMS320™ DSP Algorithm Standard, and all of those are automatically supported by the DSPLinux Bridge. When GStreamer runs on DSPLinux, it uses the DSPLinux Bridge to execute multimedia algorithms on the DSP.

The DSPLinux Bridge allows the implementation of an interface run on a different processor, even using a different machine architecture. Software calls are made to a well-defined interface, then the DSPLinux Bridge crosses processor boundaries and calls into the code that provides the implementation. This is all done transparently to the programmer using the interface.

External Processor
(ARM or MIPS or other)

Multiprocessor Bridge

DSP

Implementation

Interface

ARM

Dual Core Processor

DSPLinux Reduces Your Development Time And Component Costs

Memory Management and Code Compression Technology™

Ridge Run's memory management minimizes memory fragmentation

Kernel decompressed into RAM at boot time

Applications and data are stored in compressed file system and decompressed as needed

RAM

Flash

Effective management of RAM and ROM controls costs, extends battery life and in many instances, can reduce board size requirements. DSPLinux offers advanced Code Compression Technology with greater than 2:1 compression without requiring developers to change their software. DSPLinux reduces memory requirements and minimizes the load on the ARM processor by storing data and applications in a compressed file system and decompressing them as needed via the DSP. DSPLinux also monitors memory and actively reduces fragmentation to conserve system resources and optimize embedded system performance.

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About DSPLinux.net

DSPLinux.net is a development community established by RidgeRun to foster communication among OEMs and Open Source community members. The site serves as a place to host the Open Source components of DSPLinux as well as applications and drivers for DSPLinux, and provides OEMs with a forum to support developers extending their products.

About RidgeRun

RidgeRun is exclusively focused on bringing the reliability and flexibility of Linux to embedded Internet appliances based on DSP+RISC architectures. Systems employing Texas Instruments DSPs from the TMS320 family and any ARM or MIPS RISC processor are supported by RidgeRun's DSPLinux™ operating system. DSPLinux leverages the power of Texas Instruments DSP architectures to deliver the performance and power efficiency leading platform for wireless networking, broadband and multimedia appliances. DSPLinux is optimized for high-performance OEM devices including digital cameras, audio and video players, web tablets, automotive systems, set-top boxes, home networking gateways and PDAs. The RidgeRun team has extensive experience in developing world-class embedded systems, fault-tolerant software and high-performance Linux solutions. The company is headquartered in Boise, Idaho, with additional offices in: San Jose, California • Austin, Texas • Osaka, Japan • Dublin, Ireland.

Pricing And Availability

RidgeRun offers a flexible licensing program for the DSPLinux SDK development tools, and the proprietary components of DSPLinux. The DSPLinux SDK license includes 30 days free installation and configuration support, special access to DSPLinux.net, and one year of free updates. RidgeRun's team has years of experience and expertise in embedded system design and development, and is available for professional services or consulting. Contact one of our offices listed below, or email info@ridgerun.com for more details.