



Reduce Time to Market and Development Costs Using .NET Micro Framework on Blackfin Processors

By Analog Devices, Inc. and AxiomFount

Introduction

In contrast to application development for desktop systems, embedded software development has been a resource intensive and time-consuming process. Embedded developers work very close to the underlying hardware. Embedded developers also often work in a severely resource-constrained environment without the niceties of the desktop world—working in a small memory footprint, and controlling and communicating with peripherals and devices directly. Applications are often coded using low level languages to optimize the use of the system resources. Signal processing applications have been especially challenging because of the need for performance in the critical inner-loop execution. Tools for embedded developers tend to be specialized, reflecting the concerns of the developers. This is especially true for DSP software development due to the need for expertise with a specific DSP. By contrast, the desktop developer generally works with a high level language and an environment that manages and abstracts resources including memory and peripheral devices. This difference in development models is what defines the embedded developer today.

Microsoft .NET Micro Framework

The .NET Micro Framework is a Microsoft technology that enables faster development of more capable embedded systems that are smart, securely connected, and easier to manage. By supporting modern development tools and paradigms, .NET Micro Framework allows embedded project managers to improve productivity by bringing innovative products to market faster and at lower cost.

Through its fully integrated Visual Studio experience, the .NET Micro Framework brings a reliable and productive development system to the world of embedded development. Complex applications can be developed faster by leveraging the powerful emulation and debugging capabilities. The familiar development environment allows .NET desktop programmers to work easily on embedded projects.

Microsoft .NET Micro Framework combines the efficiency and reliability offered by a .NET enabled managed code foundation, the strength of the C# programming language, and the optimization required for use in small intelligent devices.

With its small memory footprint, specific focus on critical generic features, and AxiDotNet's Blackfin® processor-specific optimized solutions, the .NET Micro Framework is the paramount choice for products that require embedded processing in a variety of markets and applications, especially where Blackfin processors' unique capabilities and processing power are required.



Blackfin processors and .NET Micro Framework enable rapid development in a variety of markets for connected media-rich applications:

- Home automation
- Office automation
- Medical imaging
- Medical diagnostics
- Patient monitoring
- Metering
- PC peripherals
- Internet appliances
- Navigation/tracking
- Test and measurement
- Defense and government
- Messaging
- POS systems
- Retail kiosk
- Gaming and toys
- Automotive infotainment
- Remote control
- Mobile handsets
- Transportation
- Portable media devices

Expanding Resource Pool Eases Development

By enabling Microsoft .NET Micro Framework on Analog Devices Blackfin processors, AxiomFount's AxiDotNet solution empowers rapid product development in a multitude of markets and applications through the combination of seamless integration with the Visual Studio tools and the Blackfin processor technology convergent DSP/microcontroller architecture. The availability of .NET Micro Framework on Blackfin processor technology eases the development of embedded products by providing abstractions that allow applications to be decoupled from the hardware and enables easier migration from one platform to another.

The ability to use Visual Studio tools with Blackfin processor technology instantly allows access to the larger community of software designers that are already familiar with .NET Framework and .NET Compact Framework. This also reduces, and in some instances eliminates, the need for specialized embedded developers.

Drastically Reduce Development Time and Cost

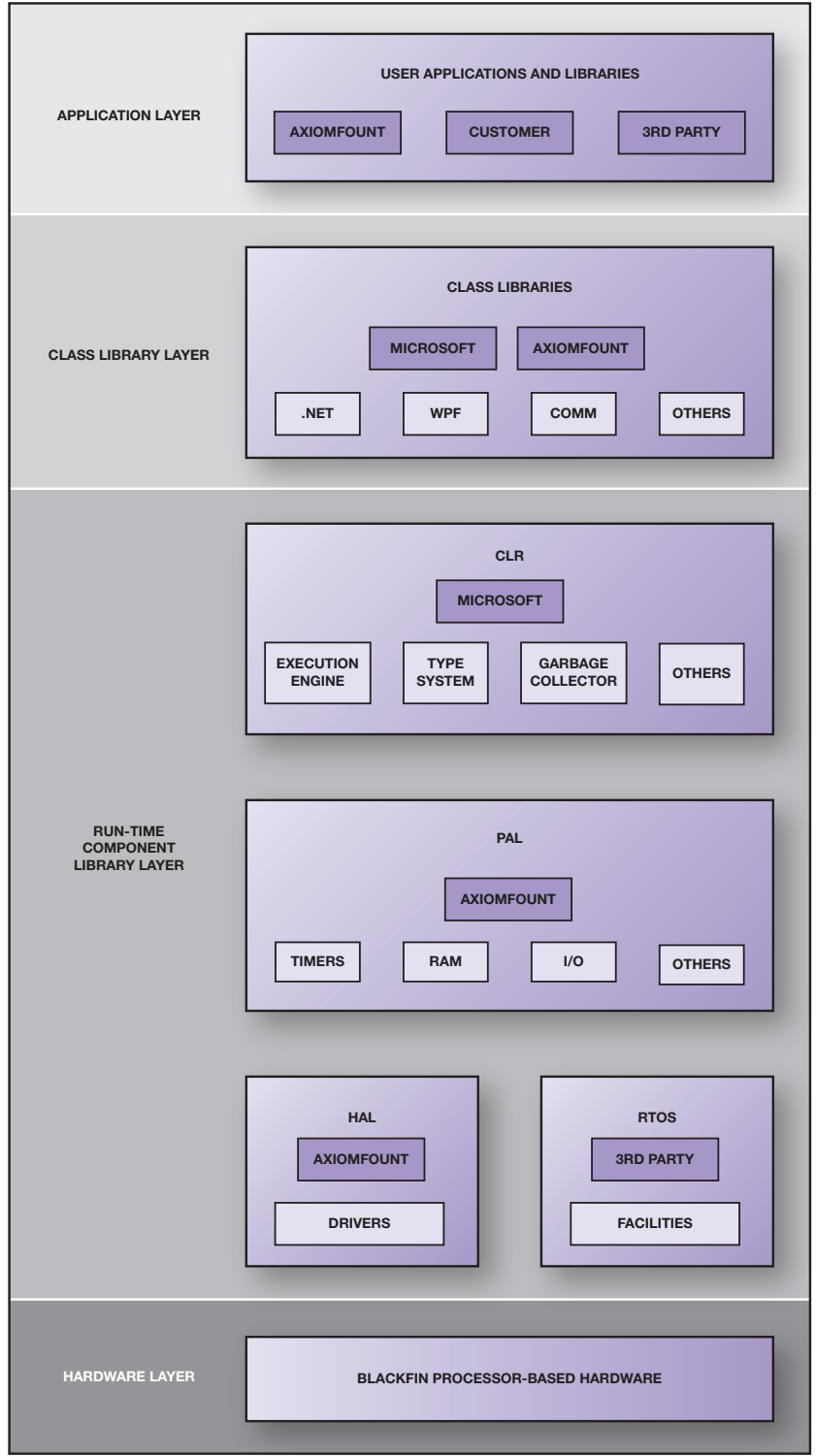
Reduction of development time and cost are very important factors in capturing the window of opportunity and making a product successful. Using .NET Micro Framework along with AxiDotNet on Blackfin processor technology facilitates this by lowering the development time and cost through

- Utilization of more cost-effective application level developers compared to more expensive embedded developers.
- Elimination or reduction of need for costly tools.
- Reduction of development time for any single product by developing majority of software in application layer using C# and managed drivers and libraries in Visual Studio environment versus development in C, C++, or assembly.
- Managed layer application additions without the need for any changes at the PAL/HAL layer.
- Develop new applications at managed and native layers with minimal effort at the PAL/HAL layer.
- Optionally, integrate existing applications available through various .NET developer communities.

Sharing existing .NET code across multiple product lines and platforms results in an even more shortened development cycle and significantly improved productivity. A certain portion of this may be accomplished by minimizing or eliminating application layer changes when

- Expanding to higher end or lower end products within the same product family.
- Adding new features/functions for the same product using a single Blackfin device (ADSP-BF527), a device from the same family (ADSP-BF52x) or a different device family (ADSP-BF5xx).

The application layer is the value-added software contributed by the end product developer. Because of the programming ease offered by the .NET Micro Framework, the end product developer is empowered to focus nearly all efforts on the application layer, secure in the knowledge that .NET Micro Framework, through its layered architecture, provides an efficient, robust, and trustworthy foundation.



Solution layers for .NET Micro Framework application on Blackfin processor technology host.



Market Leaders Start Here

AxiomFount in partnership with Analog Devices and Microsoft provides Blackfin processor-based .NET Micro Framework solutions. AxiDotNet solutions are seamless solutions that take advantage of the unique Blackfin architecture and capabilities, as well as the robust .NET programming model, managed code environment, and state-of-the-art software development tools to empower companies to stay ahead of the competition by providing flexibility, short design/development cycles, and lower development costs.

	Traditional Embedded Development	.NET Micro Framework
<i>Time to Market</i>	Long	Very short
<i>Development Cost</i>	High to very high	Very low to low
<i>NRE</i>	Varies	Very low
<i>Flexibility</i>	Low	Very high
<i>BOM Cost</i>	Good	Very good

Software evaluation kits and complete Blackfin processor-based AxiDotNet solutions can be obtained by contacting AxiomFount through their website www.axiomfount.com.

.NET Micro Framework Features

- Runs directly on hardware or alongside an RTOS
- Small footprint of about 300 kB
- Automatic memory management
- No MMU required
- Multitude of standard embedded interfaces and peripherals: NV memory, GPIO, RS-232, SPI, TWI, etc.
- .NET Object Model
- Windows Presentation Foundation enabled GUI
- Native and managed device driver models
- Managed execution environment with automatic garbage collection
- Time-sliced thread management
- Fully supported Microsoft Platform: Visual Studio development with C#
- Middleware: TCP/IP, WLAN, DPWS, file system, touch-screen LCD, USB device, SSL, sockets, security, etc.
- Optional: Extendible with RTOS and C-level/assembly development with VisualDSP++[®] software

Blackfin Processor Specific Features

- PPI, SPORT, USB OTG, etc.
- Media (video/audio/image) codecs
- Lockbox™ Secure Technology
- Signal processing libraries

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