

# gCORE™ Home Multimedia Application Brief

## Boston Circuits, Inc.

### Introduction

Home multimedia devices are becoming increasingly complex and diverse as digital TV, high definition, video on demand, integration of voice and Internet, interactive gaming and other new market needs pave the way to the connected multimedia home. Industries are converging as set top boxes, recording devices, television sets, internet gateways, game consoles, and PC's try to address the market in different ways. At the same time, technology standards continue to evolve as do regulatory standards and infrastructure.

It is widely believed that the next 5 years will see a fast paced transformation of the market, driven by new products and services that do not exist today.

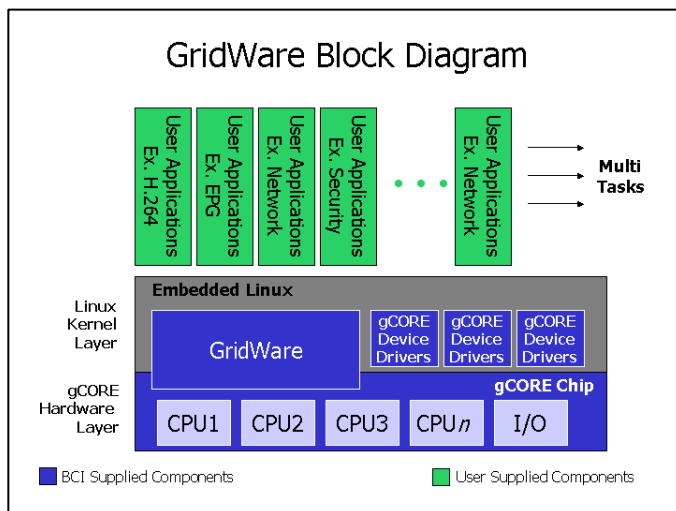
BCI's gCORE™ processors address the needs of next-generation home multimedia devices. Compared with dedicated system on chip (SoC) or general-purpose processors, gCORE is uniquely positioned to provide the power, flexibility, and cost efficiency to enable these multimedia devices of the future.

### gCORE – The Multi-Core Multimedia Processor

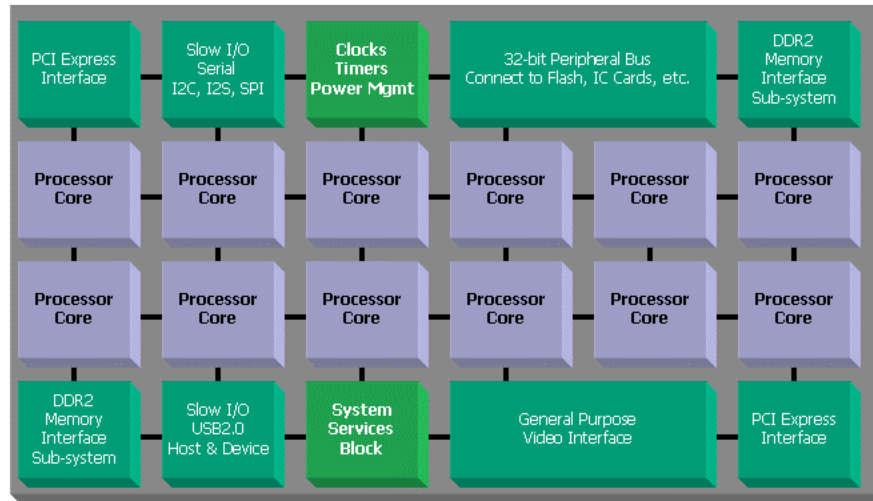
The gCORE processor represents the next generation in embedded processor design. Employing a revolutionary Grid on Chip® architecture, BCI has integrated up to sixteen processor cores along with system and I/O peripherals on a single chip.

The chip is supported by BCI's GridWare™ operating environment, which allows seamless migration of existing software applications onto the gCORE platform. This patent pending system greatly reduces the effort required to develop devices using gCORE.

The combination of this powerful new chip architecture, high level of system integration, and a robust and transparent operating environment provides a level of performance, flexibility, and low cost that is not available anywhere else.



## gCORE Conceptual Block Diagram



### gCORE Benefits

**Powerful:** gCORE features up to 16 multimedia optimized 32-bit RISC processor cores, on a unique Grid on Chip® architecture running at over a gigahertz. This processing power allows functions traditionally implemented in hardware such as video encode/decode, encryption/decryption, wired and wireless network processing, and image processing (filters, scaling, transformations, rendering) to be implemented in software. The gCORE16 is specified to decompress multiple HD H.264 streams, while compressing another channel, and transferring data over a wired or wireless network.

Multimedia devices require concurrent processing of many tasks. For example, multiple input data streams must be decompressed and displayed, while another may have to be compressed for recording. At the same time, an Internet session may be in progress, requiring networking applications such as a browser to run. Finally, multiple layers of security can add significant overhead to the aforementioned tasks. Multi-core processors excel at multi-tasking, making them ideal for this type of usage scenario. On the other side of the coin, when the device is not busy, processor cores can be shut down to reduce power consumption.

**Flexible:** By allowing device manufacturers to implement advanced features in software rather than hardware, the gCORE gives manufacturers flexibility in adapting to the latest standards, different OEM and geographical markets, and feature sets. This flexibility results in faster time to market, lower development costs, and the ability to meet market requirements spot on.

For example, if a particular decompression scheme is required for a particular market, or if a new WiFi standard must be supported, all that is needed is an update to the software modules affected. Many SoC-based systems would require a redesign of the SoC, which could take anywhere from 12 to 24 months. This is in addition to whatever software changes would also be needed.

Software implementations can also enable new business models where new features can be downloaded or “unlocked” over the Internet, or using some form of security device.

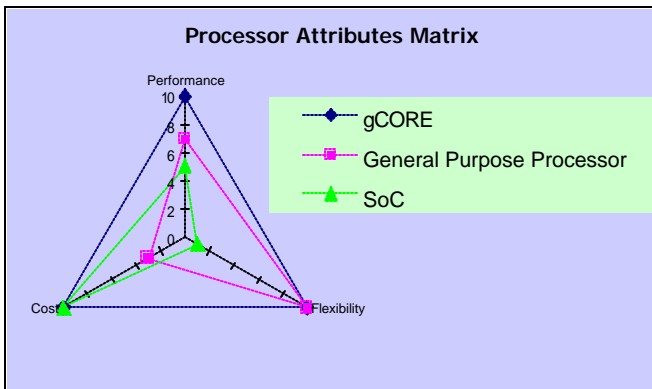
**Low Cost:** The ability to implement functions in software rather than hardware allows manufacturers to reduce the total system cost of a product significantly by replacing hardware components such as CODEC’s with

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a software module. Additionally, gCORE integrates many of the standard I/O and systems peripherals on-chip for reduced system cost. PCI-Express is provided for high speed transfers with devices such as GPU's (graphics accelerators), hard drives, DVD-RW, 100M and 1G Ethernet, IEEE 1394, and wireless networks. Dual integrated USB 2.0 high speed ports can connect digital cameras, USB drives, PC's, joy sticks, keyboards, and other common peripherals. A 64-channel synchronous video FIFO interface allows for glueless and flexible connection of DAC's and other digital or analog devices. As a result, manufacturers can develop systems with a lower total bill of materials when all the system components are considered.

### Balancing the Benefits

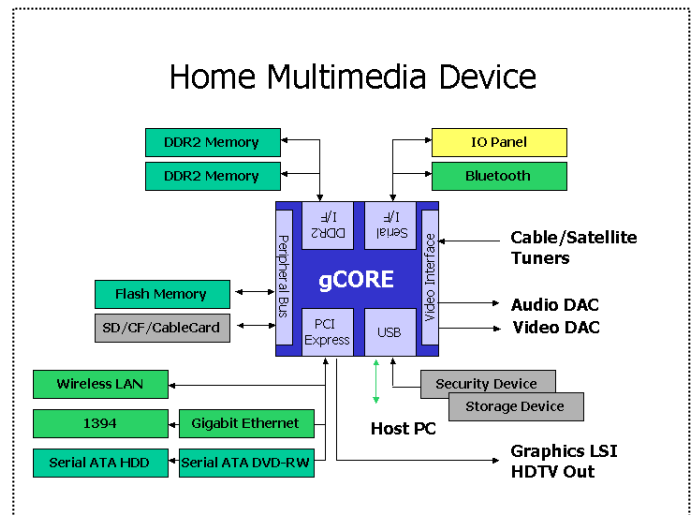
As shown below, BCI's gCORE platform offers the best balance of performance, flexibility, and low cost when compared to dedicated SoC's and general purpose processors like those used in PC's. SoC's can achieve highly optimized costs by integrating all of the necessary system components onto one chip. However, this results in a lack of flexibility, as many of the functions would have to be hardwired. As the size and complexity of SoC's increases, so does the development time and cost. It is not unusual for a custom SoC to take 2 years to develop, and over \$10 million in development expense. This is a process that would then have to be repeated every time there is a new generation, or market need. General purpose processors like those used on PC's or the recently



announced Cell processor, usually have a high level of performance, and since most functions are implemented in either software or on external chips, flexibility is high. However, general purpose processors require additional chips outside, such as North/South bridge IO devices, or in some cases CODEC's if the processor core's performance is not enough. gCORE balances performance, flexibility, and cost making it ideal for the fast moving and competitive home multimedia market.

### Application Example

The diagram below shows some of the options that can be connected to a gCORE to comprise a home multimedia device.



A set top box would have memory, security devices, USB and 1394, and tuners. A recorder can be added to that using Serial ATA for a hard disk or DVD-RW devices. Networking can be added over both 802.11g or Ethernet (10/100/1000BaseT). For Internet enabled gaming and other applications that require graphics capabilities, a graphics accelerator can be connected using the x16 PCI Express.

Manufacturers and developers can easily develop multi-function devices that incorporate TV, networking, storage. BCI believes that the market is moving from triple play (TV, Internet, VoIP) to ultimately a 5-play (TV, Internet, VoIP, personal imaging, interactive entertainment) world. The gCORE architecture

provides the core logic necessary to support a wide range of home multimedia devices.

## Looking Forward

The current generation of gCORE processors are in development, and will be introduced over the next two years. As we all know, however, the market never sits still, so BCI's architecture is designed to scale, and thought is already being given to supporting even higher density cores in the future. On the software side, support for the Linux operating system will be provided initially, with other popular OS platforms to follow. Run time programmable environments are also in the works,

which truly represent the next generation in software advances. Most importantly, BCI is here to listen; to customers, industry experts, and market makers. We believe in participating in shaping the future with our partners, and will continue to invest our energies in driving the embedded multi-core revolution.

Contact for more information or comments:

info@bostoncircuits.com  
[www.bostoncircuits.com](http://www.bostoncircuits.com)

**67 South Bedford St., Suite 400W  
Burlington, MA 01803  
781-229-5830**

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