

Background

The ASIC core industry has been developing for over a decade. Today there exists a wealth of intellectual property (IP) that is readily available from numerous sources. During this time, however, programmable logic did not have the density or the performance needed to accommodate large IP cores.

Today, things have changed considerably. Xilinx is shipping FPGAs like the XL family that have usable densities up to 1,00,000 gate Virtex. Now, not only is the use of pre-defined logic functions in programmable logic a possibility, it is becoming a requirement to meet ever-shrinking product development cycles.

As a result, many ASIC core vendors and system designers are beginning to look at using cores for their programmable logic designs. It is for this reason that Xilinx created the CORE Solutions portfolio of products.

CORE Solutions Products

CORE Solutions products support four application areas. The application areas are as follows:

- **Standard Bus Interfaces** - such as PCI, PCMCIA, USB and Plug-and-Play ISA.
- **DSP Functions** - These range from small building blocks such adders, registers and multipliers, to larger system-level functions such as FIR filters and Reed-Solomon coders.
- **Telecom and Networking** - building blocks for popular communications standards.
- **Base-Level Functions** - a broad category of functions used across many application segments. These include the every small parameterizable LogiBLOX macros up through larger functions such as UARTs and DMA controllers.

CORE Solutions Data Book

The goal of the CORE Solutions portfolio of products is to provide cores with the shortest time-to-market and best possible device utilization the programmable logic industry has to offer. Xilinx has published a brand new data book focused entirely on programmable logic cores and related products. Now there is one definitive sourcebook with detailed descriptions of all Xilinx CORE Solutions.

When you receive your copy of the CORE Solutions Data Book, become familiar with the *Product Listing by Application Segment Table*, (reproduced at the end of this over-

view) which lists all of the functions available today. This table will be your best guide to locating a specific product. If you don't see what you need, check the *AllianceCORE Partner Profiles*, Areas of Expertise section, for each of our AllianceCORE partners. Our partners will be more than willing to discuss the possibility of producing a core specifically for your needs.

Data Book Contents

The contents of the data book are as follows:

- Introduction
 - Program Overview
 - Product Listing by Application Segment
- LogiCORE Products, sold and supported by Xilinx
 - Product Overview
 - PCI
 - DSP
 - CORE Generator products
- AllianceCORE Products, sold and supported by Xilinx' Partners
 - Program Overview
 - Products
 - AllianceCORE Partner Profiles
- LogiBLOX, GUI-based small function generator
- Reference Designs
- Sales Offices, Representatives and Distributors

Ordering Information

To order a copy, request the CORE Solutions Data Book from the Xilinx Literature Department. In the US call 1-800-231-3386. For international locations call 1-408-879-5017 or you can send an E-mail request to:

literature@xilinx.com.

An electronic version of the CORE Solutions Data Book (1.2M Adobe Acrobat.pdf format) can also be downloaded from:

www.xilinx.com/products/logicore/core_sol.pdf

LogiCORE Products

LogiCORE products are sold, licensed and supported by Xilinx. They are developed internally by Xilinx or jointly with a partner.

Typically, LogiCORE designs use Smart-IP technology to achieve a highly predictable functionality and performance of the core. For example, the performance of the core will

not be affected by the adjacent custom logic, the user's choice of EDA development tools, or coding style. As a result, you can save several months in design and verification time.

The cores that Xilinx provides as LogiCORE products typically fall into one of two categories. The first are high-performance cores that require a thorough understanding and control of the FPGA technology and implementation software in order to achieve the desired performance and complexity. An example of a core in this category is the LogiCORE PCI interface.

The second category are cores that benefit from a very specialized implementation in the FPGA. An example is the LogiCORE DSP modules that are implemented using unique algorithms. Those algorithms fit the lookup-table-based architecture of the FPGA. The result is outstanding performance and device utilization, often more than 10 times better than generic HDL descriptions.

Smart-IP

Cores made with Smart-IP technology provide flexibility while maintaining their performance and predictability regardless of device size and the number of cores used in the device. Smart-IP technology combines the power of the Xilinx implementation software with the unique features of the Xilinx FPGA architectures to give your cores with consistent performance, no matter where you place them.

Xilinx CORE Generator System

In addition to actual cores, Xilinx is committed to develop enabling design tools and methodologies to facilitate "Design Reuse" with FPGAs. The first products available in this category are the CORE Generator System (available on CD) and the web-based PCI Configuration tool. This innovative methodology for acquiring and using cores combines the benefits of:

- A firm core with parameterizable and predictable performance
- Flexibility of system level design, facilitated by behavioral languages such as VHDL and Verilog.

Additionally Xilinx, using the web as a distribution mechanism, gives the user access to the latest versions and enhancements of cores at:

www.xilinx.com/products/logicore/coregen/corelinx.htm

LogiCORE products are customized to fit your specific application using an intuitive graphical user interface. Based on your inputs, the CORE Generator System generates a proven core with highly predictable timing which can be integrated into any VHDL-, Verilog- or schematic-based design flow. As a result, you can integrate several individually proven cores with given performance into one system on a single FPGA. Because each core is already verified,

the time-to-market benefits are maintained for high-complexity FPGAs.

Xilinx PCI Solutions

Xilinx' PCI solution includes devices, tools and cores needed to build a cost-effective single-chip PCI system in record time.

- LogiCORE PCI Designs - With over 400 licensed cores, Xilinx LogiCORE PCI have become the industry's most used PCI solution. The product line includes both 32- and 64-bit, 33 to 66MHz fully compliant PCI interface designs with 0 wait-state performance and up to 528MB/s sustained bandwidth. The critical PCI min and max timing is guaranteed by use of Smart-IP, which will save the user significant development time and enable 100% PCI compliance.
- Virtex - The industry's fastest FPGAs allow you to integrate all standard PCI interface variations including the high-performance, 64-bit 66MHz core.
- Spartan XL - offers the lowest cost 32-bit, 33MHz PCI solution. Integrate a 0 wait-state PCI interface with your own design, at a price below standard PCI chips.
- XC4000XLA - allows you to integrate a high performance 32-bit, 33MHz PCI interface with up to 60K gates of user designed logic.
- Web-based configuration - provides you with an easy way to configure the PCI core according to your needs, and gives you instant access to the latest design files and documentation.
- XPERTS Design Services - gives you a worldwide network of specially trained consultants providing design services for Xilinx PCI.

PCI is an extremely high-performance and complex specification that is challenging to meet in any technology. To meet the stringent PCI specification the core is carefully hand-tuned for the targeted architecture. Placement and routing for the critical parts of the core is locked down to ensure that timing can be met every time the core is used.

To achieve our goals, the LogiCORE development team is working closely with both the IC and Software teams. As an example of this teamwork, new methodologies for characterizing and modeling our FPGAs have been developed. The result is access to state of the art technology and expertise, that allows you to complete your PCI application in record time.

Since the introduction of the first core in early 1996, Xilinx has built up solid knowledge about PCI. We are committed, and will continuously develop our PCI products to remain state of the art.

Xilinx DSP Solutions

Using an FPGA to implement high performance DSP functions often allows a radical performance advantage over fixed processors while maintaining maximum flexibility and

the shortest time-to-market. Until now, tools to automate the design process have been lacking and most designs have been completed manually by experienced FPGA designers.

With the introduction of Xilinx' CORE Generator System for DSP, complex parameterized DSP building blocks can be implemented automatically with the performance and density of a hand-tuned implementation. LogiCORE DSP modules can be used with VHDL-, Verilog- or schematic based design methodologies.

Higher level DSP cores and DSP prototyping boards are available from our AllianceCORE partners.

DSP system level modeling tools are available to mathematically model LogiCORE based FPGA designs and aid in determining optimal core parameters. systemView by Elnix supports the Xilinx DSP LogiCORE libraries with bit-true modeling and is integrated with Xilinx CORE Generator System software.

The Xilinx DSP Solution consists of:

- Standard Xilinx FPGA components - XC4000, Spartan, Virtex
- DSP parameterizable LogiCORE FPGA cores
- AllianceCORE DSP cores and prototyping boards
- DSP system level tools integration
- DSP starter kit
- Regional dedicated DSP Field Applications Engineers
- DSP Ph.D. level support

Acquiring LogiCORE Products

LogiCORE products are available from your local Xilinx sales representative similar to other Xilinx software products. Xilinx and your local sales representative will also be your primary source for support of the core, the devices and the design tools.

You can also send email questions to:

logicore@xilinx.com.

AllianceCORE Overview

The AllianceCORE program is a cooperative effort between Xilinx and independent third-party core developers. It is designed to produce a broad selection of industry-standard solutions dedicated for use in Xilinx programmable logic.

Xilinx takes an active role with its partners in the process of productizing AllianceCOREs. This is unique to the AllianceCORE program. Because the process is so involved, we work closely with our partners to select the right cores first. This naturally limits the number of partners we can work with at any one time and subsequently the number of available cores. At the same time it raises the quality and usability of the cores that are offered.

AllianceCORE Criteria

A core must meet a minimum set of criteria before it can receive the AllianceCORE label.

Core Selection

The AllianceCORE program looks at cores from a practical point of view. A programmable logic version of a core must have value over an ASIC or standard product version of the same function. It must be cost effective and make sense for use in a programmable device in a production system. If a candidate core does not pass these simple test, then it does not make sense to invest the effort to convert it to an AllianceCORE module.

Core Qualification

Generic, synthesizable cores offer maximum flexibility for users with unique requirements. This is typically the format for cores provided to the ASIC market. With programmable logic, however, this flexibility can come at the expense of efficiency and performance. It can take a considerable amount of effort to get a specific core to synthesize in a way that meets density and timing requirements. Time spent trying to accomplish this can quickly reduce the time-to-market advantage of using programmable logic and cores in the first place.

Xilinx is not interested in promoting generic, synthesizable functions as AllianceCOREs. Instead, AllianceCOREs are generally provided as parameterizable black-boxes that allow customization in critical areas. This guarantees that the implementation is optimized for density while still meeting performance, preserving the time-to-market value of programmable logic. Flexibility is provided by allowing you to quickly implement your unique logic on the same device. Source code versions of the cores are also available from the partners at additional cost for those who need ultimate flexibility.

Announced AllianceCOREs have been implemented and verified in a Xilinx device. They are available immediately for purchase in a Xilinx-specific format. Timing-critical cores designed to adhere to an industry standard also come with appropriate constraints files in order to guarantee functionality and compliance. AllianceCOREs originated from either schematic or HDL entry tools.

Core Integration

AllianceCOREs are not just cores, they are complete solutions for system designs. While cores by themselves have value, in many cases it is often not enough to just supply a generic core. You may need additional tools such as system software and prototyping equipment to help you rapidly integrate the core into your design, perform system debug in a real-world environment, and then quickly convert the prototype to a production unit. This is particularly true of complex functions.

Many AllianceCORE functions are supported by Xilinx-based demonstration or prototyping boards. Some also have system simulation models or debug software. All of this allows you to evaluate and work with the function before you have to layout your board. These tools are provided by the AllianceCORE partner, usually at additional cost. Descriptions of the support tools available for each core are included in the CORE Solutions Data Book.

Complete solutions like these help preserve the value of using programmable logic while minimizing the support burden for the core provider.

Acquiring AllianceCORE Products

AllianceCORE products are sold and serviced directly by the AllianceCORE partners since they are the experts for their particular products. They are responsible for pricing, licensing terms, delivery and technical support. Contact information for each partner is included in the AllianceCORE Partner Profiles section of the CORE Solutions Data Book.

If you want additional information about the AllianceCORE program or are interested in becoming a partner, contact Xilinx directly.

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Table 1: AllianceCORE Products

Check www.xilinx.com/products/logicore/tblcores.htm for the latest listing of available Cores	
Function Name	Provider
Standard Bus Interface Products	
CAN Bus Interface	SICAN Microelectronics
FireWire Demo Board	I2P
FireWire Link Layer Core	I2P
IIC Interface	Memec Design Services
PCMCIA Card Interfaces	Mobile Media Research
PCMCIA Development Tools	Mobile Media Research
USB 3-Port Hub Controller	Mentor
USB Development Tools	Mentor
USB Function Controller Cores	Mentor
Digital Signal Processing	
YCrCb2RGB Color Space Converter	Perigee, LLC
Communications & Networking Products	
<i>Networking</i>	
Cell Assembler	CoreEI MicroSystems
Cell Delineation	CoreEI MicroSystems
CRC10/32 Cores	CoreEI MicroSystems
10/100 Ethernet MACCores	CoreEI MicroSystems
UTOPIA Master & Slave Cores	CoreEI MicroSystems
<i>Forward Error Correction</i>	
Reed-Solomon Codecs	Integrated Silicon Systems
Reed-Solomon Encoder	Memec Design Services
Viterbi Decoder	CAST, Inc.
<i>Telecommunications</i>	
Data Encryption Standard Engine	Memec Design Services
HDLC Protocol Core	Integrated Silicon Systems
PPP8 HDLC	CoreEI MicroSystems

Table 1: AllianceCORE Products

Check www.xilinx.com/products/logiccore/tblcores.htm for the latest listing of available Cores	
Function Name	Provider
MT1F T1 Framer	Virtual IP Group
Base-Level Products	
<i>Processor Products</i>	
C2901 Microprocessor Slice	CAST, Inc.
C2910a Microprogram Controller	CAST, Inc.
RISC CPU Cores	T7L Technology Inc.
RISC Development Tools	T7L Technology Inc.
V8 uRISC 8-bit RISC Microprocessor	VAutomation
Intellicore™ Prototyping System	VAutomation
<i>Process Peripherals</i>	
M8237 DMA Controller	Virtual IP Group
M8254 Programmable Timer	Virtual IP Group
M8255A Peripheral Interface	CAST, Inc.
M8255 Peripheral Interface	Virtual IP Group
XF8255 Peripheral Interface	Memec Design Services
XF8256 Multifunction Controller	Memec Design Services
M8259 Interrupt Controller	CAST, Inc.
M8259 Interrupt Controller	Virtual IP Group
XF8279 Keyboard Display Interface	Memec Design Services
XF9128 Video Terminal Logic Controller	Memec Design Services
SDRAM Controller	NMI Electronics
DRAM Controller	NMI Electronics
<i>UARTs</i>	
Compact UART	CAST, Inc.
C6850 ACIA	CAST, Inc.
XF8250 UART	Memec Design Services
C8251 UART	CAST, Inc.
C16450 UART	CAST, Inc.
M16450 UART	Virtual IP Group
C16550 UART with RAM	CAST, Inc.
M16550A UART with RAM	Virtual IP Group
<i>Generic Core Development Tools</i>	
DSP Prototyping Boards	GV & Associates
FPGA Development Module	Memec Design Services
Core Evaluation Card	NMI Electronics

Table 2: LogiCORE Products

Function Name
Standard Bus Interface Products
<i>PCI</i>
PCI32 4000 (V2.0)
PCI32 Spartan
PCI64/66 Virtex
PCI32 Virtex
PCI32 Bridge Design
PCI64 Bridge Design
PCI32 Power Management
HotPCI Spartan Prototyping Board
Vireo Device Driver Kits
Digital Signal Processing
<i>Correlators</i>
1D RAM/ROM Based Correlators
<i>Filters</i>
Comb Filter
SDA FIR Filter
Dual Channel SDA FIR Filter
PDA FIR Filter
<i>Transforms</i>
Fast Fourier Transforms
<i>DSP Building Blocks</i>
SDA FIR Control Logic
Sine/Cosine
Time Skew Buffers (3 types)
Base-Level Products
<i>Basic Elements</i>
Constant
2/3/4-Input Multiplexers
Register
<i>Math Functions</i>
1's and 2's Complement
Scaled by 1/2 Accumulator
Adders (4 types)
Integrator
Multipliers (4 types)
Square Root
Subtractors (2 types)
<i>Memories</i>
Delay Element
Synchronous FIFO
Look-up Tables (2)
RAM and ROM
<i>Generic Core Development Tools</i>
Xilinx CORE Generator System

Table 3: Reference Designs

Function Name
Standard Bus Interface Products
Synthesizable PCI Bridge Design Example
ISA Plug and Play Interface
Digital Signal Processing
16-Tap, 8-Bit FIR Filter
Base-Level Products
4Mb Virtual SPROM
Adders, Subtractors, Accumulators
Configuring FPGAs over a Processor Bus
Counters (3 types)
Dynamic Microcontroller
FIFOs (2 types)
Frequency/Phase Comparator for PLL
Harmonic Frequency Synthesizer and FSK Modulator
Multiplexers, Barrel Shifters
Pulse-Width Modulation
Serial Code Conversion between BCD and Binary

Table 4: LogiBLOX Products

Function Name
Base-Level Products
<i>Basic Elements</i>
Clock Divider
Comparator
Constant
Counter
Data Register
Decoder
Simple Gates
Input/Output
Multiplexer
Shift Register
Tristate
<i>Math Functions</i>
Accumulator
Adder/Subtractors
<i>Memories</i>
ROM, RAM, Synch-RAM, Dual Port RAM