



CONFIGURABLE EMBEDDED SYSTEM
DESIGN WITH XILINX FPGAS

EMBEDDED PLATFORMS FOR VIRTEX-6 / SPARTAN-6 FPGAS

» Embedded Design Challenges

- Rapidly changing product requirements and creating differentiated products
- Reducing total system cost and size
- Reducing hardware and software development time

» Xilinx Embedded Platforms

- Enable creation of customizable system-on-chip (SoC) designs
- Jumpstart your hardware and software development
- Reduce cost and deliver higher performance with pre-built IP blocks

Simplifying Embedded Design with FPGAs

Embedded processing using FPGAs has become an integral part of a growing number of applications such as industrial networking and video applications, as well as closed-loop control systems in the industrial and aerospace and defense (A&D) markets. Embedded design creates deeper levels of integration and value of parallel processing performance, design reuse, the mitigation of design risk and obsolescence, and reduces cost, weight, area, and power.

Comprehensive Design Platforms

Embedded Design Platforms enable rapid software application development as well as easy customization of the processor subsystem. Key elements of Embedded Platforms are:

- Spartan®-6/Virtex®-6 Embedded Kits
 - Flexible Boards: Xilinx and Partner Boards with FMC-based expansion
 - Integrated Tools: ISE® Design Suite–Embedded Edition
 - ISE, Platform Studio, SDK and ChipScope™ tools
 - Industry standard AXI4™-based IP: ISE and EDK IP
 - Robust Targeted Reference Designs: Base Processor Reference Designs
- Partner Software Tools, RTOSes and Middleware

The platforms are extensible to vertical market-specific design platforms by adding market-specific IP, software, and FPGA Mezzanine Card (FMC) connectors.

Supports Broad Range of Markets and Applications

Xilinx Embedded platforms enable a broad range of applications in multiple market segments including:

- Industrial networking, automation and machine vision
- Medical imaging, instrumentation and control
- Military communications and processing
- Automotive driver assistance and infotainment

Silicon

The Spartan-6 and Virtex-6 FPGA families are the programmable silicon foundation for Xilinx Embedded Design Platforms. Compared to previous generations, the two new FPGA families:

- Deliver as much as 50% higher performance through hard memory controller, six-input LUT architecture and enhanced DSP slides in Spartan-6 FPGAs
- Deliver as much as 50% lower cost and power due to advanced process technologies and integration of multiple dedicated IP blocks
- Deliver breakthrough I/O performance with the integration of high speed serial transceivers in both Spartan-6 and Virtex-6 FPGAs

Tools

Xilinx ISE Design Suite Embedded Edition saves time and reduces learning curves with intuitive graphical tools optimized for hardware and/or software engineering personas.

Hardware Design Tools

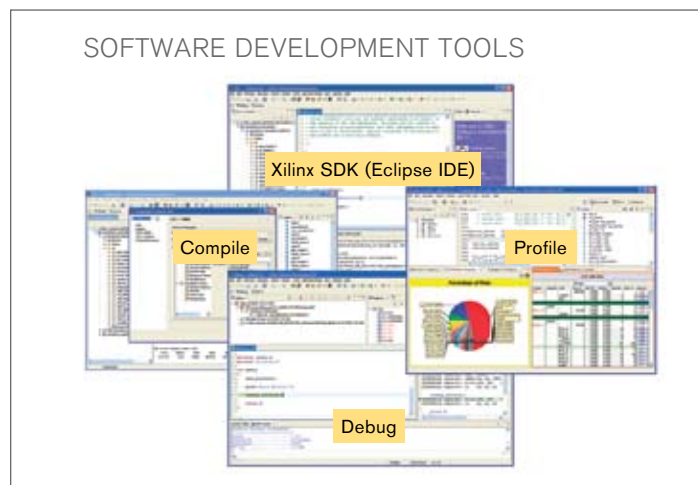
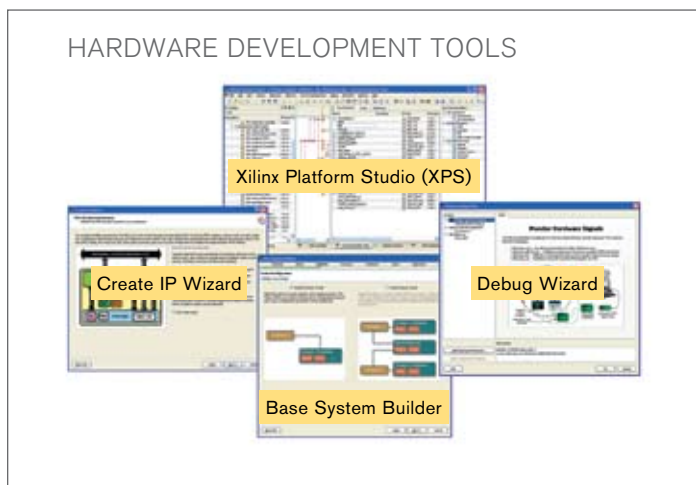
Build your Hardware Platform using Xilinx Platform Studio (XPS)

- Targeted Reference Designs or create new design using a Base System Builder (BSB) wizard
- Catalog of over 100 parameterizable IP cores
- Create custom IP using Create IP wizard
- Connect industry standard AXI4-based IP together graphically
- Insert ChipScope debug logic using Debug Configuration wizard
- Generate netlist and bitstream
- Export to Software Development Kit

Software Development Tools

Program in 'C' using Eclipse-based Software Development Kit (SDK)

- Code Development Perspective
 - Edit, compile, link, and build
 - Automatic OS/RTOS BSP creation
- Debug Perspective
 - Download and Debug code – run, step, break
 - Examine watchpoints, registers, memory
 - Program Flash memory
- Profiler Perspective
 - Examine critical code sections



IP

Xilinx ISE Design Suite Embedded Edition includes a comprehensive set of embedded processing IP including the following commonly used IP cores:

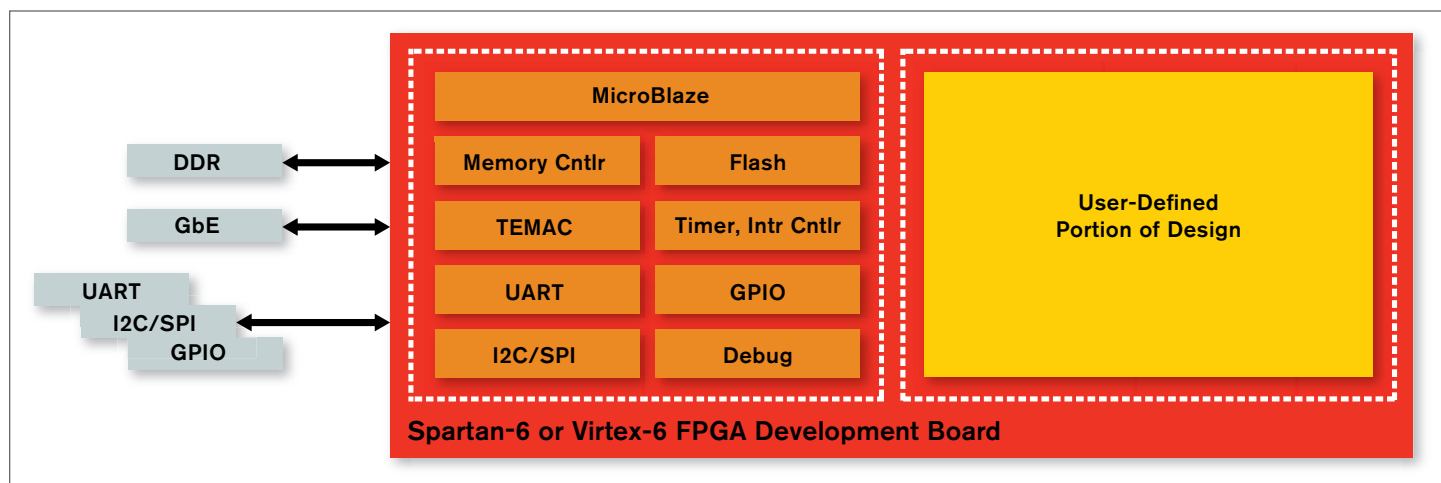
- MicroBlaze 32-bit processor
 - Highly configurable soft processor with key features including Memory Management Unit (MMU), Floating Point Unit (FPU), Caches and Barrel shifter
- AXI4-based Memory Controller Fully parameterizable high performance external memory controller with support for DDR, DDR2, DDR3 and LPDDR memories
- Tri-mode Ethernet MAC (TEMAC)
 - High performance Gigabit Ethernet MAC IP that can be used with MicroBlaze soft processor and TCP/IP stacks
- Other industry standard AXI4-based IP including PCIe, UART 16550, I2C, SPI, CAN, PWM, Timers and Interrupt Controller

Targeted Reference Design

MicroBlaze Processor Sub-System (PSS) is the Targeted Reference Design provided with Spartan-6 and Virtex-6 Embedded Platforms that jumpstarts both hardware and software development. The MicroBlaze PSS includes the most commonly used AXI4-based IP including:

- 32-bit MicroBlaze Soft Processor with Memory Management Unit
- Tri-Mode Ethernet MAC (TEMAC)
- AXI4-based Memory Controller
- On-Chip Block RAM, Parallel and Serial (SPI) NOR Flash memory controllers
- Serial Interface IP – UART16550, I2C, SPI
- Basic Embedded IP – Interrupt Controller, Timers, GPIO
- Infrastructure IP – Bus infrastructure, Clock and Reset management IP
- JTAG Debug IP – MicroBlaze Debug Module (MDM), ChipScope Logic and Bus Analyzers

MICROBLAZE PROCESSOR SUBSYSTEM (PSS)



The key advantages of the MicroBlaze Processor Sub-System are:

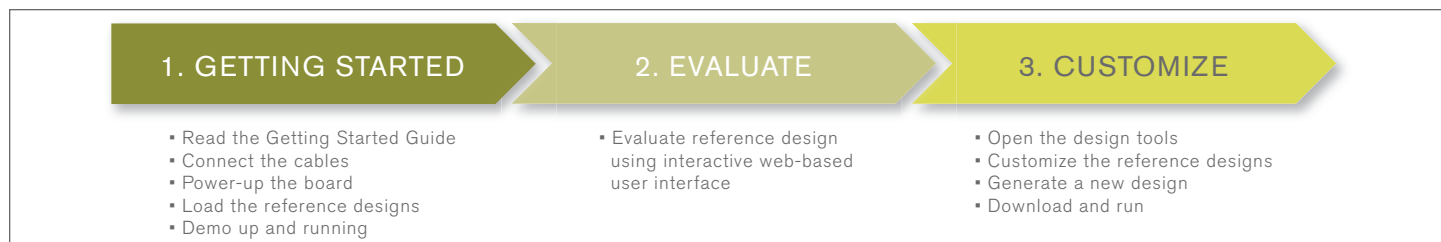
- Out-of-box software programmability using industry-standard operating systems
- Common embedded processing IP blocks integrated and verified to shorten design cycle
- Scalable reference design
- Starting point for multiple Xilinx market-specific platforms

Ecosystem Support

Xilinx Embedded Platforms are supported by a strong ecosystem of embedded vendors providing the following solutions:

- Embedded Linux
 - PetaLogix provides a cutting-edge PetaLinux SDK optimized for the MicroBlaze processor
- RTOS and Middleware
 - Micrium provides industry leading uC/OS-II/III and related middleware suite for MicroBlaze processor. Other vendors including ExpressLogix also support
 - Treck provides a high performance TCP/IP stack for MicroBlaze processor and TEMAC IP
- IP and Design Services
 - Large ecosystem of ARM AMBA IP providers as well as Xilinx Alliance Program members

EMBEDDED KIT DESIGN FLOW



Embedded Kits

There are two Embedded kits, each featuring either a Virtex-6 or Spartan-6 device. These kits enable software application development with the MicroBlaze soft processor, as well as customization of the hardware processor system.

VIRTEX-6 FPGA EMBEDDED KIT



Each Virtex-6 FPGA Embedded Kit for high-bandwidth and high-performance applications includes:

- Xilinx ML605 Development Board including Virtex-6 LX240T FPGA
- ISE Design Suite Embedded Edition (device-locked to Virtex-6 LX240T FPGA)

Each kit also includes:

- ISE software, Platform Studio, SDK (Eclipse IDE)
- MicroBlaze Processor Sub-System (PSS) Targeted Reference Design
- Cables, power supply, and compact flash
- Third-party OS/RTOS Support
 - PetaLogix Linux, Micrium uC/OS-II, Treck
- Download/debug cables and power supply
- Getting Started Demo
- Documentation: Hardware Setup Guide, Getting Started Guide, and Tutorials
- Reference designs, demos, documentation, and applications delivered on USB flash drive to get started quickly

SPARTAN-6 FPGA EMBEDDED KIT



Each Spartan-6 FPGA Embedded Kit easy-to-use applications includes:

- Xilinx SP605 Development Board including Spartan-6 LX45T FPGA
- ISE Design Suite Embedded Edition (device-locked to Spartan-6 LX45T FPGA)

Take the NEXT STEP

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