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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 slices 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

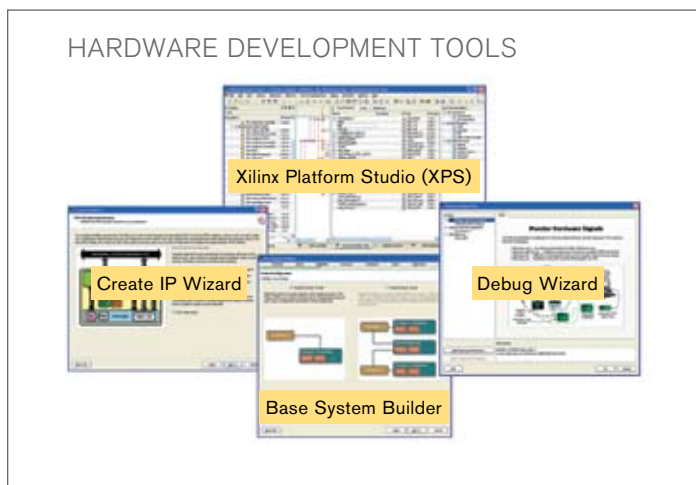
## Tools

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)

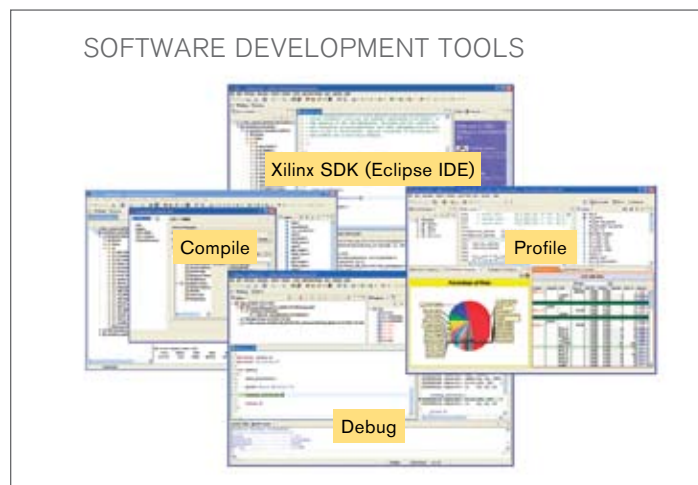
- Targeted Reference Designs or create new design using a Base System Builder (BSB) wizard
- Catalog of over 100 parameterizable IP cores
- Create custom IP using Create IP wizard
- Connect industry standard AXI4-based IP together graphically
- Insert ChipScope debug logic using Debug Configuration wizard
- 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:

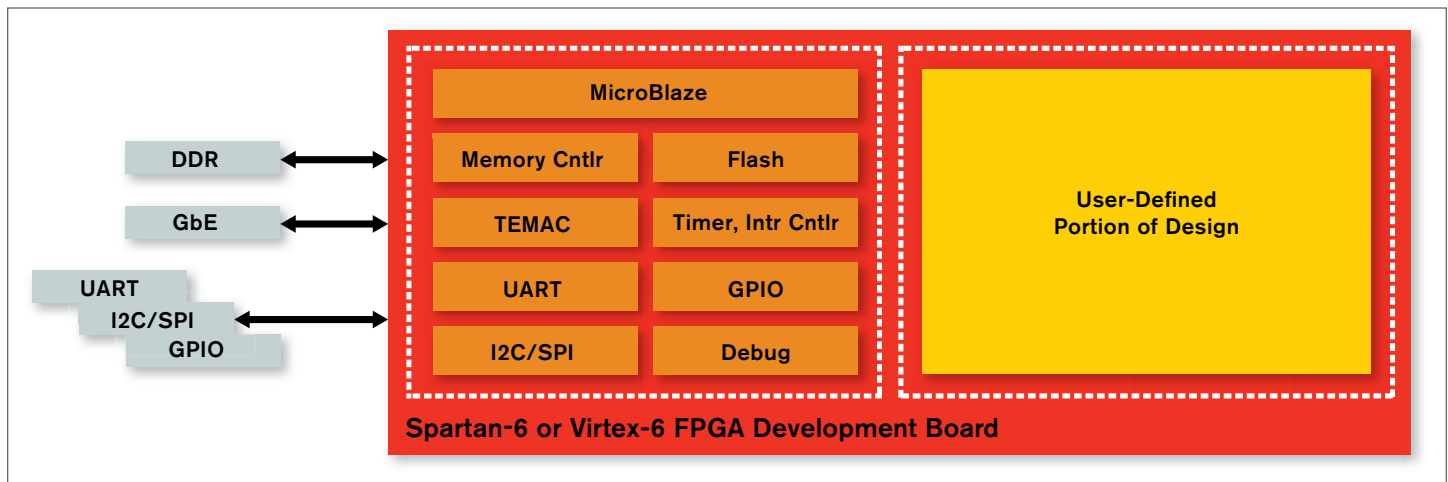
- MicroBlaze 32-bit processor
  - Highly configurable soft processor with key features including Memory Management Unit (MMU), Floating Point Unit (FPU), Caches and Barrel shifter
- AXI4-based Memory Controller Fully parameterizable high performance external memory controller with support for DDR, DDR2, 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:

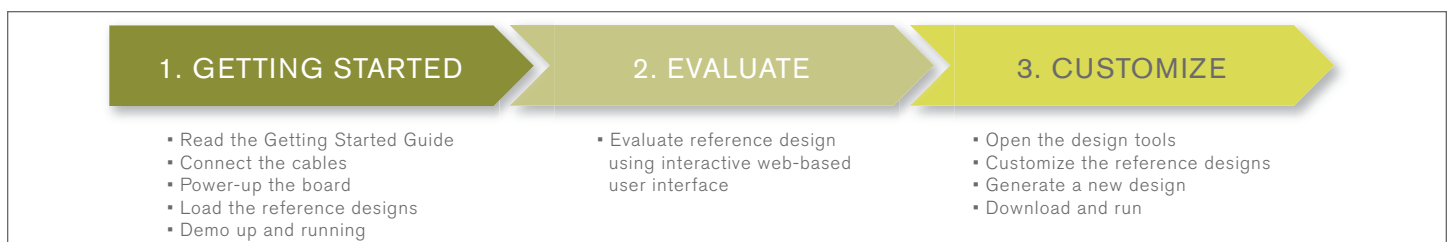
- Out-of-box software programmability using industry-standard operating systems
- Common embedded processing IP blocks integrated and verified to shorten design cycle
- Scalable reference design
- Starting point for multiple Xilinx market-specific platforms

## 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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