Programmable **Solutions** for
Test and Measurement Applications

Incorporate emerging technology standards and protocols into existing test platforms at the lowest possible cost

Design flexible, scalable, high-performance test equipment in a shortened development cycle

Test and Measurement (T&M) equipment is used throughout every electronic equipment industry — from consumer, automotive, defense and semiconductor manufacturing to professional video broadcast and communications. In fact, T&M is a critical step in every phase of the design, development, installation and maintenance of products.

There are several components that are driving the need for new test and measurement solutions, especially in the networking market:

• The emergence of new technologies, continually drives the need for upgrades, updates, and replacement of current testers
• Designers require solutions that accelerate product time-to-market, resulting in enhanced revenues and a competitive advantage
• The ability to adapt to changes in technology determines which T&M vendors will be successful in the market
• Product scalability is critical with the emergence of new technologies and standards
• Designers require high-performance, easily upgradeable, low-cost solutions
• It is critical for designers to quickly incorporate emerging technology standards and protocols into existing test platforms

Xilinx offers an extensive line of programmable logic devices that enables designers to build high-performance, flexible and cost-effective T&M equipment, while at the same time accelerating time-to-market. Whatever the test and measurement design requirements, Xilinx provides a comprehensive suite of solutions — from programmable logic to IP cores and reference designs — to meet every challenge.

Virtex-**II Pro**™ **FPGAs** are ideal when designing high-end, chassis-based communications or video broadcast test equipment. This platform device provides the power to implement custom traffic generators and analyzers, framers/MACs, high-speed parallel chip-to-chip, chip-to-memory, or chip-to-backplane interfaces, and even multi-gigabit serial interfaces — all on one Xilinx chip.

Spartan™-**3 FPGAs** enable designers of bench-top test equipment with low-cost/high-volume requirements to interface to various ADCs and memory, perform 32-bit microprocessing with the MicroBlaze™ soft processor, and interface to various peripherals such as CD ROM drives, displays and more. Spartan-3 FPGA features are ideal for applications including network analyzers, protocol analyzers and test equipment.

CoolRunner™-**II CPLDs** deliver the industry's best solution for portable/handheld designs requiring low cost and low power.

Xilinx in Test & Measurement CD
This CD provides a complete solution for designing various T&M applications, including:

• Detailed system block diagrams and presentations
• Technology tutorials
• Application notes, white papers, IP cores and reference designs

Network Test & Measurement

The Challenge

There are a host of challenges facing the networking market that necessitate more powerful, flexible T&M solutions:

- Multiple new and complex protocols for networking are constantly being introduced
- Long development cycles make ASICs impractical
- Low-to-medium size volumes usually do not justify ASIC NRE or risk
- Time-to-market and competitive pressures require off-the shelf solutions, but off-the-shelf ASSPs may not address the designer's needs
- Basic functions and customization options are needed, but ASSPs offer limited flexibility
- Paying extra for unnecessary functions is unacceptable
- High-speed logic and I/O (parallel and serial) need optimization
- Integration and optimization of complex embedded systems can be extremely difficult
- There is constant pressure to future-proof, or at least extend the life of critical equipment

The Xilinx Solution

- PHY/framer/MAC
- RocketPHY™ 10Gbps physical layer transceivers
- PRBS generation & BERT
- Interfaces
- System I/F, memory I/F, backplane
- Microprocessor IP and tools
- Data acquisition
- Display control
- Field upgradeability

Traffic Generator/Performance Analyzer
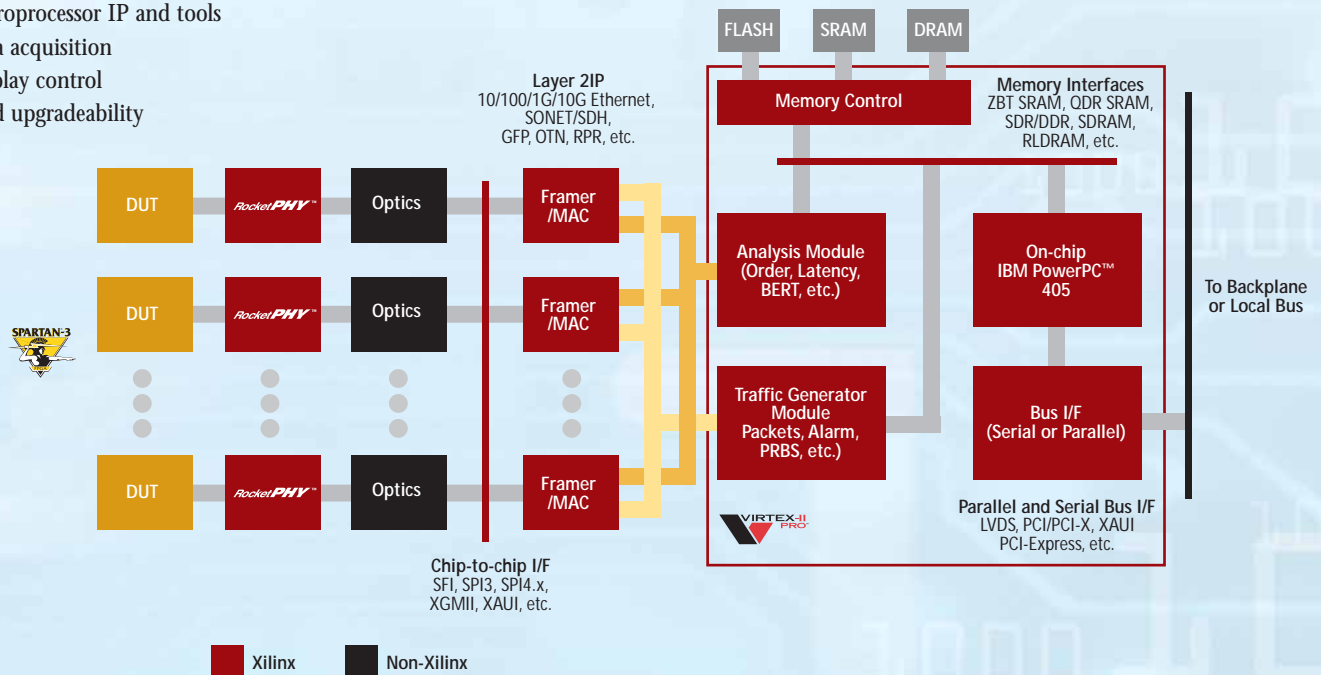
Benefits of the Xilinx Solution

Xilinx FPGA features make them ideal for the low-volume, customized nature of network T&M equipment:

- Highest logic density and advanced features
- Wealth of resources for creation of custom, system-level functions such as framers, traffic generators and traffic analyzers
- Ultimate connectivity — signaling standards
- Support for single-ended, differential and multi-gigabit serial
- Large library of customizable, system-level IP
- Networking, system interfaces and memory interfaces for rapid time-to-market
- Embedded design tools and IP, along with powerful debug tools, to ease the pain of SoC design
- Reprogrammability and Internet reconfigurability
- Improved total cost management
- High-performance Embedded Processor core — PowerPC in Virtex-II Pro

Center
622.1000000 MHz

RocketPHY

VIRTEX-II

VIRTEX-II PRO

SPARTAN-3

CoolRunner-II

XILINX®
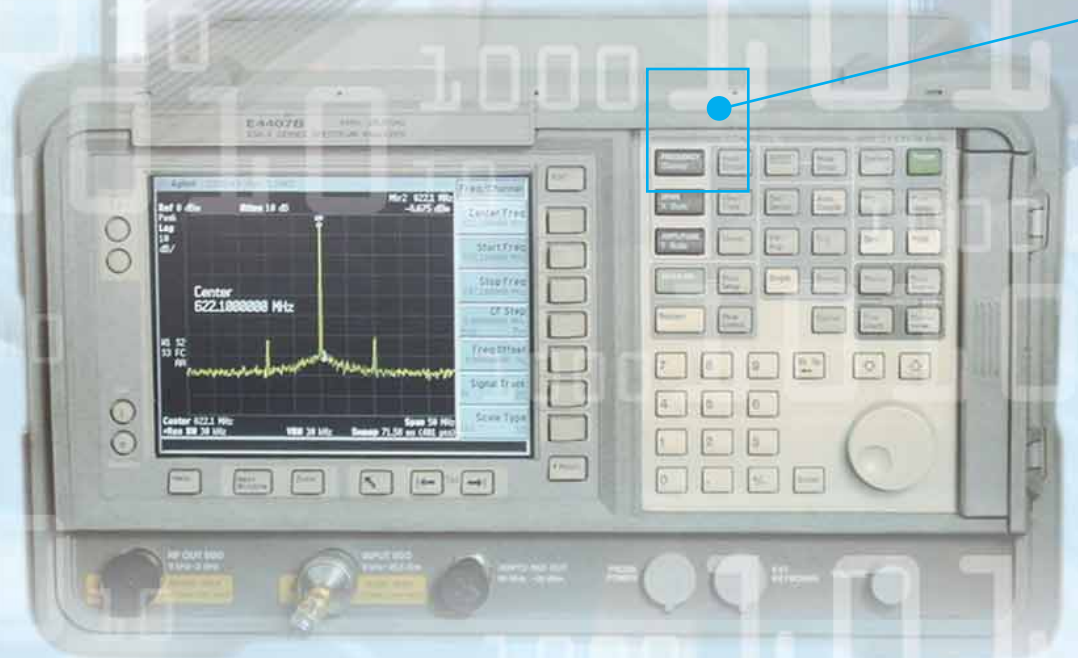
Broadcast Test & Measurement

The Challenge

Broadcast applications offer a unique set of challenges that require not only superior performance, but also the flexibility to adapt existing solutions to evolving standards:

- The need to monitor all areas of the broadcast chain
- Compliance to industry standards
- Ensuring video signal levels fall between legal min/max values
- Quality of compressed images
- Adequate trade-off between bandwidth and picture quality
- Objective and subjective measurement
- Ensuring correct operation of MPEG devices
- Signal reception levels
- Broadcast reception levels exceeding specified minimum strength
- Timing stability
- Measuring and correcting jitter and drift to ensure proper synchronization

Picture Quality Monitoring
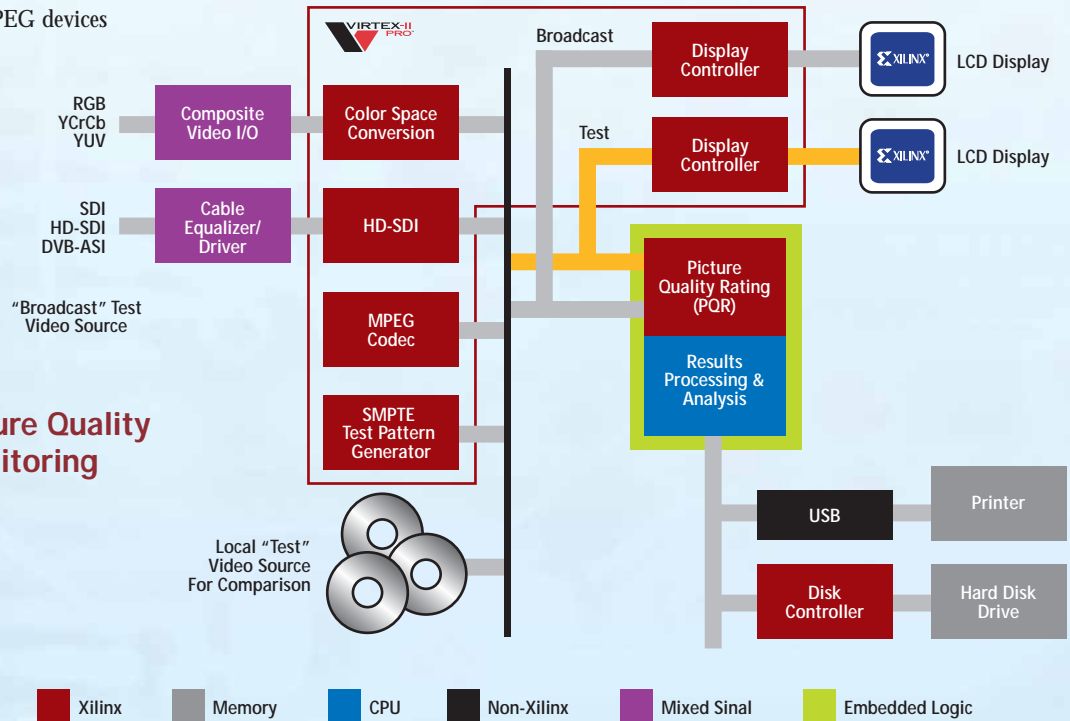
The Xilinx Solution

- FPGAs and CPLDs with superior flexibility and performance
- The capability to analyze data/pictures on virtually any network
- IP to support a range of color spaces, video interfaces, network protocols, etc.
- High speed capture, analysis and processing for on-line measurements
- Use of parallel processing for the industry's fastest DSP performance
- Embedded PowerPC processors for analysis and hardware acceleration in logic
- Provision of programmable trigger levels for error capture
- High value for off-line analysis requirements
- Simple glue logic and state machines in handheld testers addressed with low-power Xilinx CoolRunner-II CPLDs
- FPGA hardware/logic typically used for real-time triggering and analysis
- Triggers that can alternatively store a section of data/video for processing later on a PC if performance limits are exceeded
- Easy hardware/software partitioning for algorithms and analysis all in one fully reprogrammable device

Benefits of the Xilinx Solution

- Allows manufacturers to easily change test signals
- Enables easy adaptability to new or altered standards
- Provides the performance required to handle high-bandwidth data/signals
- Low-power devices available for handheld testers
- Remotely upgradeable
- More time-in-market for increased revenue

Xilinx and Partner IP, Reference Designs and Application Notes

There are a variety of soft IP cores, reference designs and application notes available in partnership with a wide range of third-party core developers covering everything from networking standards to video broadcast solutions, including:

▶ Networking

- **SONET/SDH, ATM, PDH** — Framing and OH processing (OC-192/STS-192/STM-64, OC-48/OC-48c, OC-3/-12 framers and path processors), E3 framer (G.832), DS3 framer, T1/E1 framer/deframer, ATM processor (OC-48), Packet over SONET/SDH (PPP8, HDLC controllers)
- **G.709** — G.709 framers with and without FEC for STS-192/STS-48, G.709 FEC (G.709 compliant FEC core based on G.975)
- **1/10GbE** — MGT support for 1 / 10 Gb Ethernet; PHY, 1-GE MAC with GMII Interface, 10-GE MAC with XGMII and XAUI interface, LogiCORE™ IP for 10/100 Mbps Ethernet, and application note: XAPP 606 - XGMII Using the DDR Registers, DCM, and SelectIO™ Features in Virtex-II Devices
- **EOS/GFP** — GFP framer, multi-channel LAPS
- **RPR** — RPR protocol stack reference design from Novilit, which supports all processor implementation (PowerPC or MicroBlaze™), all FPGA fabric, or a combination of both (OC-12 to OC-192 line rate depending on implementation)

▶ Video Broadcast

- **Compression** — DCT/iDCT, motion compensation/estimation, JPEG2000 CODEC, MPEG-2
- **Color Space Conversion** — RGB2YCrCb, YCrCb2RGB, RGB2YUV, YUV2RGB, etc.
- **Forward Error Correction** — Reed-Solomon, Viterbi, Convolutional
- **Design Tools** — Xilinx ISE Logic Design tools, Xilinx Embedded Development Kit (EDK), and commercial RTOS support for MicroBlaze such as Nucleus, uC-OS, Micrium, and ExpressLogic
- **SDI and SDV** — SDV demo board and SDI application notes
- **Application notes** — video test patterns, 3/3-matrix multiplier, color space converters, video compression, FIR filters

▶ Microprocessor
— MicroBlaze (32-bit RISC soft processor core for Spartan-IIE and Spartan-3 FPGAs), 8051, Z80, 68000, PIC, 80186

▶ Peripherals
— UART, SPI, timers, DMAs, IIC, WDT, and GPIO

▶ Memory Controllers
— SRAM (ZBT/QDR), SDRAM (SDRAM/DDR), Flash (CompactFlash, MMC, SD card, MemoryStick, IDE)

▶ System Interfaces
— PCI, PCI-X, RapidIO, PCI Express

▶ DSP Functions
— FIR filters, DA FIR, FFTs, MAC, sine, cosine, etc

▶ Memory Functions
— Asynchronous FIFOs, synchronous FIFOs, block memory modules, frame buffers, CAMs, shift registers, flip-flops

▶ Basic Logic Functions
— Gate modules, multiplexers, decoders, accumulators, comparators, counters

Take the Next Step

Visit the eSP website for application notes, information on reference boards, and to download tutorials on using Xilinx IP cores to implement various functional blocks for test and measurement applications inside CoolRunner-II CPLDs, Spartan-3 and Virtex-II Pro FPGAs. Contact Xilinx at **espteam@xilinx.com**

www.xilinx.com/esp/test_meas/

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