Case Study

Computer-On-Modules

Evolution of the ETX Standard

Design, Development Ease and Reliability – Now and For the Future

ETX 3.0 Standard

ETX-LX

ETX-CD

kontron

Executive Summary

With the continuing evolution of processors and new and faster buses, embedded system developers are confronted with the problem of how to implement these new capabilities into their designs while also developing unique capabilities to gain a competitive edge. Engineering, debugging and supporting a new single-board computer for each new generation of processor and faster bus is an extremely expensive and time-consuming undertaking.

Computer-on-Modules methodology has become a well-accepted technique to enable designers to overcome this obstacle. COMs can be simply defined as a module that contains all the components needed for a bootable host computer, packaged as an off-the-shelf component. System expansion and customization for each solution is implemented on an application-specific carrier board. Together, the COM and carrier board deliver the functionality of a single-board computer.

More specifically, the COMs approach puts an entire computer host-complex power on a small form factor module that can be mounted on larger carrier boards containing the application specific I/O and power circuitry. All generic PC functions, such as such as graphics, Ethernet, sound, IDE, FDD, keyboard/mouse, parallel, serial, USB ports and PCI and ISA system buses are readily available on an off-the-shelf compact module. A custom designed carrier board complements the COM with additional functionality that is required for the specific application. The carrier boards provide all the interface connectors to attach the system to peripherals such as hard disk, mouse, and display.

This enables OEMs and system integrators to standardize their system core while offering the ability to customize functions to meet specific application requirements. It also allows flexibility in standard form factor boards that require upgradeable host functionality. As a result, system developers are able to focus on their core competencies and the unique functions of their systems. The end result is a compact, high-performance system designed in a shortened development time.

ETX 3.0 Standard

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COMs Standardization

As the COMs approach gained popularity, the embedded industry recognized the need for an open COMs standard to provide the advantages of modular, off-the-shelf building blocks.

The benefits of standardization include:

- Reduced cost.
- Improved quality.
- Standard architectures..
- Scalable and flexible.

This paper will cover the Embedded Technology eXtended (more commonly referred to as ETX®) standard including its latest version ETX 3.0. The original ETX standard was introduced in the January of 2000 by Kontron to provide an open standard to meet the needs of embedded industrial applications.

The ETX standard provides a number of advantages:

- Full PC functionality
- Minimal engineering and adoption resources
- Low cost
- Reliable connectors
- Extremely slim design
- Simple upgradeability and scalability

Because ETX provides a highly flexible mechanical design with performance scalability, a number of board manufacturers supported the standard and it is considered the de facto standard for customizable designs. According to market research studies conducted by the Venture Development Corporation, the ETX standard is the clear leader in the Computer-On-Modules market.

ETX modules are very compact (95 mm x 114 mm), highly integrated computers. All ETX modules conform to a standardized form factor and a standardized connector layout that carry a specific set of signals. This standardization allows designers to create a single-system baseboard that can accept present and future ETX modules.

ETX modules offer a variety of common personal computer (PC) peripheral functions including graphics, parallel, serial and USB ports, keyboard/mouse, Ethernet, sound or IDE. Baseboard designers have the ability to optimize exactly how each of these functions implements physically. Designers can place connectors precisely where they are needed on a baseboard to optimally fit a system's packaging.

Peripheral PCI or ISA buses can be implemented directly on the baseboard rather than on mechanically unwieldy expansion cards. The ability to build a system on a single baseboard using the computer as one plug-in component simplifies packaging, eliminating cabling, and significantly reduces system-level cost.

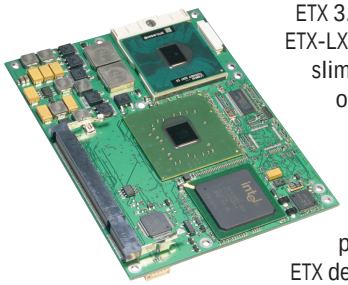
A single baseboard design can use a range of ETX modules. This flexibility can differentiate products at various price/performance points, or to design future-proof systems that have a built-in upgrade path. A custom designed carrier board complements the ETX core module with additional functionality that is required for a specific application. The carrier board provides the interface to connect the module to peripherals such as hard disk, mouse, and display. Connectors on the carrier board can be placed exactly where they are needed to optimize the final package and minimize cabling. This results in a more reliable product and simplifies system integration. A single carrier board can be used with different ETX modules when the same functionality is required at different performance levels, allowing great ease in end product diversification.

This modularity also ensures against obsolescence. A properly designed ETX baseboard can work with several successive generations of ETX modules.

Evolution of the ETX Standard

As technology evolves, the ETX standard has undergone further development in scalability and performance. In April 2006, Kontron and the members of the ETX Industrial Group released the latest generation of the ETX specification, ETX 3.0. The ETX Industrial Group (www.etx-ig.org) is an independent association of companies and individuals that work to exchange knowledge about ETX, communicate with users of the ETX world, monitor trends and ensure the ETX standard fulfills the market's needs. Membership is open to companies all over the world who develop and produce ETX modules. Members of the ETX Industrial Group include Kontron Embedded Modules GmbH, Advantech, MSC Vertriebs GmbH, ADLINK Technology, Evalue Technology Inc., SECO Srl, Arbor Technology Corp., Axiomtek Co., Blue Chip Technology, AAEON Technology Inc., AEWIN Technologies Co., Honeywell – CMSS and American Portwell Technology.

The new ETX 3.0 specification offers all of the benefits of the original ETX standard while adding in 2x Serial ATA without changing any of the ETX pins, making new modules 100 percent pin-to-pin compatible with previous versions. This ensures long-term support for the vast number of embedded application solutions based on these already highly integrated COMs including medical, gaming and entertainment, military and aerospace.



ETX 3.0 modules, such as the Kontron's ETX-LX, integrate 2x Serial ATA via two slim line connectors that are designed onto the top-side of the CPU module itself rather than requiring the ETX-connectors of the module and carrier board to be redefined, making new modules 100 percent pin-to-pin compatible with previous ETX designs. As a result, existing carrier board designs can remain unmodified in order for the solution to take advantage of faster Serial ATA hard drives. ETX 3.0 also defines USB 2.0 to be used via the existing ETX connectors.