FPGA based Advanced Mezzanine Cards for MicroTCA applications

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Abstract: *Commercial off the shelf solutions has been typically leading the telecom equipment market in the recent years. Custom solutions already in place are fast getting replaced by standard architectures like ATCA, MicroTCA etc. Out of these architectures MicroTCA with Advanced Mezzanine Cards (AMC) has been evolving as low cost solutions in comparison to the "big brother" ATCA. Earlier days AMC solutions were purely based on network processors and switches. The evolution of AMC cards based on programmable devices (FPGAs) has made lots of changes in the Telecom COTs ecosystem.*

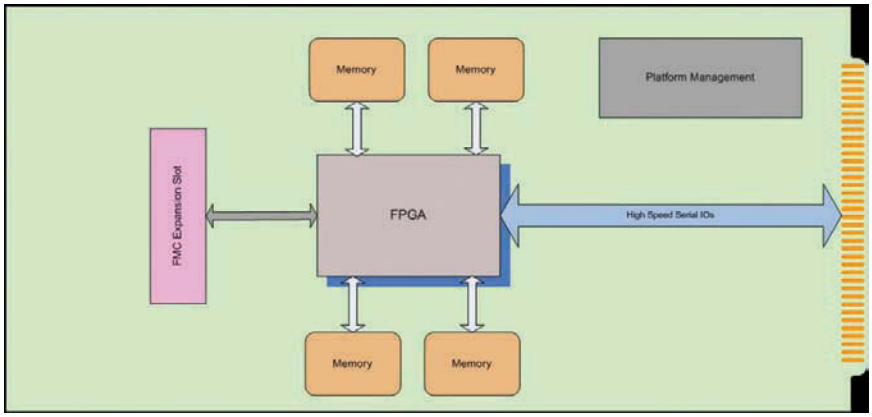

Figure 1: Typical FPGA AMC architecture

FPGAs since its introduction into the industry have undergone lots of changes. The logic capacity and performance has been increasing steadily with reduction in static & dynamic power. Modern FPGAs come with "super high speed" IOs that are capable of handling data with signaling speeds of tens of GHz. Along with this more and more processing elements like embedded processors and DSP slices added to the FPGA has made it a perfect replacement for custom processing solutions. FPGA based solutions have been in place for various telecom functions such as encryption, RF backend signal processing, packet inspection, packet processing and so on. When this capability of FPGA gets added to a standard architecture such an AMC, it brings out an ideal configurable and scalable COTs solution for the industry.

The FPGA used will typically be a medium to large logic capacity device from a high performance FPGA family. This FPGA will house the main application logic along with the basic support logic. A typical design will feature one or more embedded processor cores with external high speed memories like DDR3, QDR-II and RLDRAM. These high speed memories are very much essential for buffering high throughput data packets, storing lookup tables etc.

The high speed serial IOs will be mainly used for the external world data connectivity. The high speed IOs can be configured to operate as various standard interfaces like PCI Express, Rapid IO, XAUI, Gigabit Ethernet etc. The interface standard can be chosen based on the MicroTCA chassis in which it is going to operate.

The FPGA Mezzanine Card (FMC) standard offers flexibility in the front panel connections also. Most of the FPGA based AMCs are now coming with FMC expansion slots. These expansion slots utilize the configurability of FPGA IOs so that any required IO interface like Copper Gigabit Ethernet, Fiber Channel etc can be provided by using a suitable FMC add-on module.

The advantages offered by an FPGA based AMC architecture to solution providers and the end users are many.

One of the biggest advantages of an FPGA based architecture is that the solution will be greatly adaptive. The card behaves in a system based on the logic we incorporate in it. As an example, the same AMC hardware can be used as a control processor card, a packet processing card or as an encryption-decryption card in a MicroTCA system. Thus a COTs solution provider can market different functional variants of AMC cards with the same hardware. This will reduce the effort, time and cost that go into the design, development and validation of the hardware itself. It will also make the architecting of the solutions easier for them, since all of them are based on the same platform.

For a long time FPGAs has been used in the defense market segment which required rugged and secure solutions. To implement the proprietary algorithms and crypto standards used by the defense, FPGA based AMCs is the right choice. It is ideal for suchusers to have a free-space or user logic area to add the proprietary logic on their own.

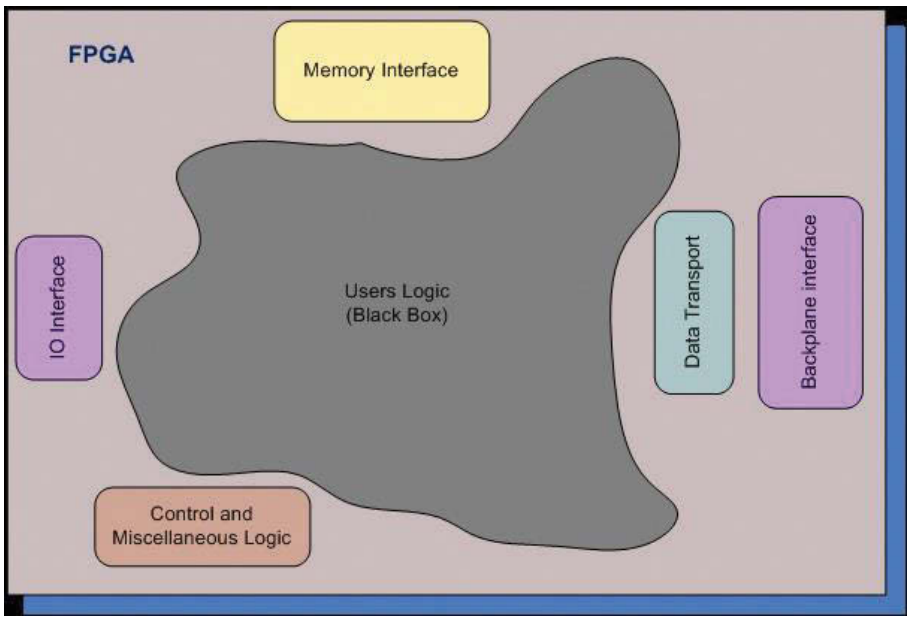

Figure 1: User Area in FPGA

In this case, The COTs solution will be provided with the necessary memory, peripheral and connectivity related FPGA logic.

The hardware acceleration options available in network processors and crypto processors are limited and vary from device to device. As compared to a processor based system, almost any function can be hardware accelerated in the FPGAs. This gives the flexibility to the user to decide which of the functions needs to be hardware accelerated based on his application.

Overall system complexity in an FPGA AMC card is less since the peripherals can be integrated into the FPGA. The lesser the number of chips, the PCB design becomes simpler, power dissipation lowers and cooling becomes easier. FPGAs themselves come with hardened and therefore better performing peripherals such as Gigabit Ethernet and PCI Express. Apart from this, the vast FPGA ecosystem provides the options for many ready to go IPs which makes the life of the solution provider and integrator easier.

In essence, the FPGA based Advanced Mezzanine Cards has been emerging as the ideal COTs solution for MicroTCA based telecom systems. Lot of opportunities will be coming out from this for the FPGA design houses and IP vendors.

Mobile broadband – The backhaul story

By Dr Kumar N. Sivarajan, CTO, Tejas Networks

Mobile broadband is fast emerging as the mainstay of telecom service provider business around the world. The availability of affordable smartphones, popularity of OTT (Over The Top) application such as Google, Facebook, Skype etc., and high speed 3G/4G connections are driving this trend. As per Ovum, by 2015, the number of mobile subscribers will exceed 7.5 billion, and more than 40% of those will use broadband connections based on 3G and 4G technology. As a result of this astronomical growth in mobile broadband, the spending on wireless backhaul equipment (including fiber, copper, and microwave based) will exceed $7.5bn in a span of three years. The 3G/BWA spectrum auctions in 2010 saw India joining the global mobile broadband community. Thanks to the steady growth in 3G subscriber base, India is already the fifth largest in terms of smartphone ownership and over half of total internet traffic in the country today is being generated on mobile phones.

Mobile Backhaul is that part of the mobile network that connects the base stations at cell towers to the central mobile switching site. It is typically divided into multiple transport layers –access, aggregation or core – with increasing capacity.