

FLEXIBILITY TO MEET EVOLVING STANDARDS

The arrival of 3G, or third generation, networks brings data services as well as voice and there is great pressure to realise the large sums spent on the 3G licences and to deliver these data services before the licences expire.

According to programmable logic company Xilinx (www.xilinx.com), the way for basestations to meet the emerging industry standards, and to adapt to consumer demand for services and features is to leave behind the ASIC and ASSPs, application specific solutions and to overlook the DSP option, in favour of field programmable gate arrays. The former is too restrictive, the company argues and the latter, in the form of DSP farms cannot meet the performance requirements.

The company has announced the Xilinx Wireless Initiative with the Virtex-4 multi-platform devices, reference designs, validation platforms, IP and software tools specifically designed for wireless basestation architects and designers.

The Virtex-4 FPGAs are enabled by the ASMBL (Advanced Silicon Modular Block) architecture, based on 90nm triple-oxide technology to deliver performance at low power for use in wireless basestations. The FPGA family has up to 256 billion MAC (multiply and accumulate) operations/sec for programmable parallel DSP processing

Following the launch of 3G services, mobile phone companies are under pressure to recoup the money invested in the spectrum licence, writes CAROLINE HAYES



Basestations : adaptable

capabilities for the key elements of the baseband and radio module designs in wireless basestations.

It has a micropower architecture, which reduces power consumption to just

23µW/MHz (typical) per XtremeDSP slice. The programmable parallel DSP processing, increased by a factor of 10 above that of previous-generation FPGAs, is capable of addressing the baseband and radio module designs in today's basestations.

Accompanying development kits include the SystemGenerator for DSP, an integrated environment to develop and debug high-performance DSP systems. There is also the Embedded Development Kit (EDK) for embedded processor debug. This accelerates embedded development by automating steps that were previously done manually. It also automates the hardware/software debug process making bugs faster to find and to correct.

Deployment

Hundreds of thousands of basestations are expected to be deployed each year as markets like Africa, China and parts of south east Asia, eastern Europe, Latin America and India increase their mobile phone service coverage. The semiconductor market for wireless

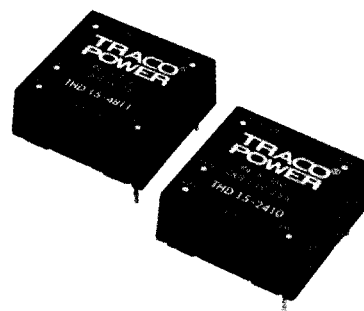
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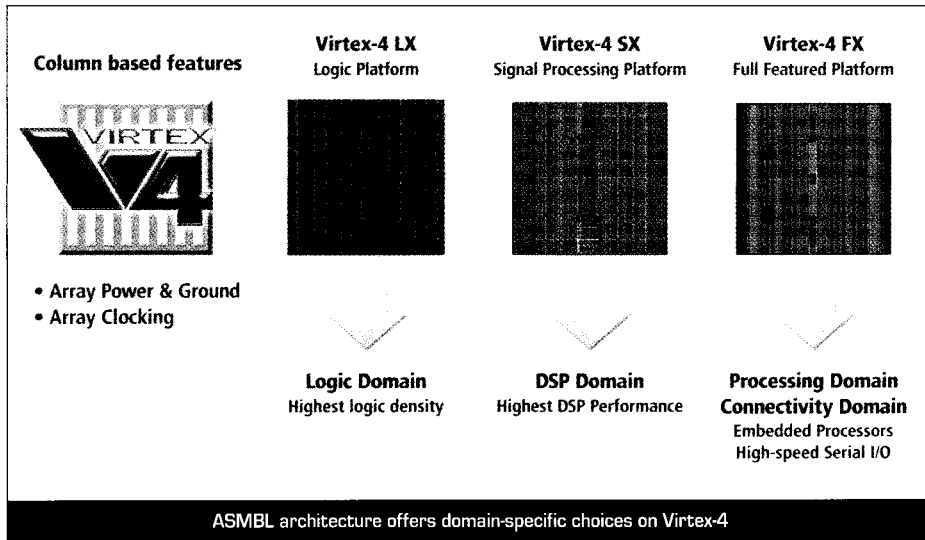
basestations is expected to double from 2003's figure of \$2.7billion to more than double to \$5.6billion in 2008. Xilinx reports that the FPGA/CPLD portion of this revenue is forecast to increase by over 50 per cent from \$222million to \$382million in that five year period.

Although many of the basestations installed for the 3G infrastructure used ASIC and ASSPs, as standards have evolved since 3G's inception, the move now is towards programmable devices that can be upgraded or adapted to meet the change in standard requirements.

Programmable solutions have been used in wireless networks before. Service providers use it to achieve remote upgrades, which save time and money in terms of reduced downtime and also as personnel do not have to travel to make the upgrade. Programmable solutions have also been used to achieve extensions on the lifecycle of a basestation, with the benefits it brings of eliminating hardware development costs. Similarly bug fixes and deploying new services as well as system performance tuning have been demonstrated to save time and cost with remote software downloads to reprogram the devices. Estimates for this type of operating expenditure savings can be \$10million per basestation network upgrade.

Emerging standards

However, standards such as EDGE, HSDPA, W-CDMA and WiMAX have emerged for data traffic relatively recently. The 3G licences were bought at considerable cost and face an expiry date. This has condensed the timeline for companies to make commercial returns through data traffic services. As a result, wireless networks and basestations are being



designed with programmable logic to sustain a place in a highly competitive market.

Basestation designs have to consider emerging serial I/O technology and support flexible design and features specific to geographic location. For instance, programmable solutions allow a basestation to be tuned for clarity and reliable communications and to deliver the continuous, extended coverage in different regions and climates. Manufacturers must also supply semiconductor content that supports a range of wireless data services which are constantly changing.

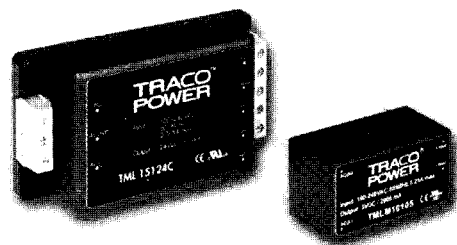
One of the warnings given by analysts at the UK's launch of 3G was that the return on investment was going to pose an economic problem. The billions invested in new video and entertainment capabilities may be difficult to recoup, as 99 per cent of network traffic is voice calls. The few video calls made are far less profitable than text messaging for the

operator. New business models and ways to increase revenue per user are called for. It may be that the kind of video content that people will be prepared to pay for is the 'adult' kind, which would shift the emphasis away from voice and increase the 15 per cent of revenue presently accounted for by video and data services for the operator.

Revenue resources

As well as providing the new services, these services must be reliable. To minimise the impact of the decrease in average selling price and the support costs, companies like Xilinx believe that a common platform is the best option to deploy across geographic locations and the broad set of requirements. Features and function such as radio, baseband processing, transport network interfacing and control are shifting from ASIC and DSP to programmable logic. The ability to support new standards, support field upgrades and

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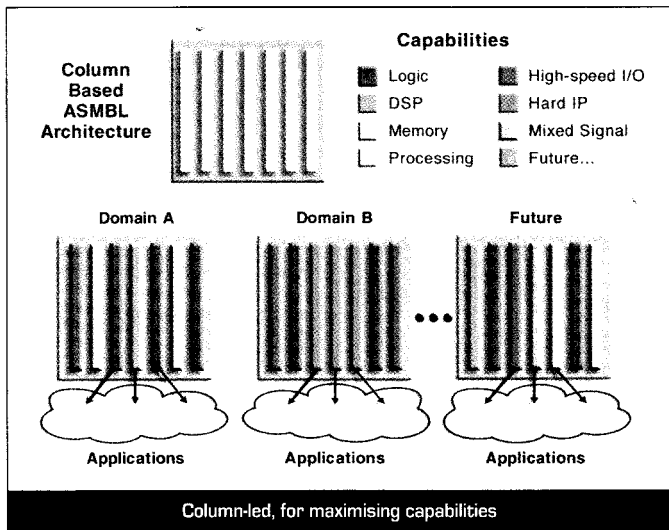
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minimise, if not negate, non-recurring engineering costs has opened up the market to programmable technology.

As well as programmable logic realising a faster time-to-market and a return on investment for application-specific technology, it is the ability to support both changing user requirements and emerging standards and technologies which have eclipsed ASIC use. ASICs used in current basestations are not able to support HSDPA to 3GPP, Release 5, for example. A programmable solution allows providers to implement HSDPA without board repair or new hardware costs.

Converting design

As well as inspiring the programmable logic community, the growth in basestations is also creating a need for lower power, multi-channel ADCs. The lower power concerns, which directly affect the basestation's overall system costs, are coupled with efficiency and cooling requirements for use in basestations. The principles also apply to satellite receivers and portable electronics of course. ADCs are being revised as a result of these new markets. One example is Linear Technology's (www.linear.com) LTC2255, a 125Msample/sec, 14bit ADC that consumes 49 per cent less power at only 395nW. Its high sampling rate and low current with 14bit resolution make it equally suitable for use in battery-powered, high-performance test and instrumentation equipment.

It is an example of integration techniques, having integrated bypass capacitors, reducing the number of external components needed in a 32pin, 5 x 5mm QFN package. The device, according to the company, eliminates the need for large and expensive decoupling capacitors. The company claims that four times the number fit into the space required by a competing solution.

The ADC market is also looking at the plethora of emerging wireless standards. This device can meet the needs of wideband technologies, such as WiMAX and handle the increasing network traffic. The high linearity results in a strong low-level input signal performance. At the 125Msample/sec rate the AC performance is 72.1dB SNR [signal to noise ratio] and 85dB SFDR (spurious free dynamic range) at 70MHz.

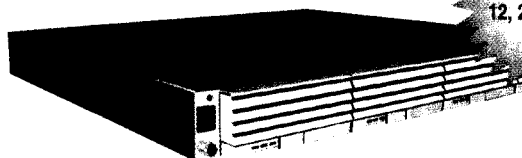
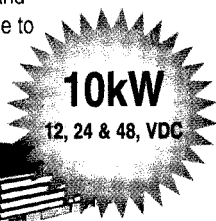
The device is pin-compatible with other devices from the company and expands the Linear portfolio to an increased sampling rate of 105 to 125Msample/sec in 10, 12 and 14bit parts. Commercial and industrial temperature grades are available.



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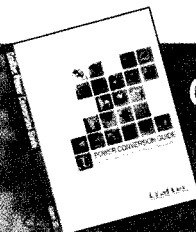
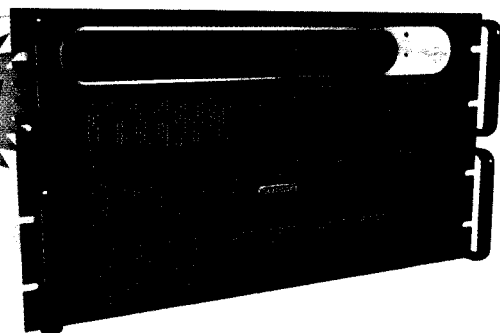
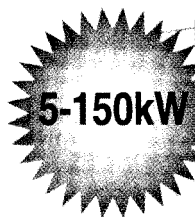
8000W from a 1U power supply

Valere Power's Mini DC Power System offers an up to now unseen efficiency for its small size, only 1U high and EIA standard width. The compact size makes it possible to save space in the rack mounting and it is especially suitable in telecommunications.



Programmable DC supplies

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