

What Role Will FPGAs Play in the Pico-cell Base Station Market?

Airports outfitted with a comprehensive set of pico-cell base stations could give their customers much better experiences while traveling.



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As we enter the second half of 2008, a sad fact of life is that airline travel is becoming harder and more uncomfortable with each passing week. This is due in large part to increased fuel costs for airlines and the cutbacks in service enacted to help offset these costs. Plus, some airlines are instituting additional fees for checked baggage and are also taking planes out of service, making the number of seats available fewer at any given time.

Undeniably, the life of the casual airline traveler is becoming more complicated. This is doubly true for the business traveler.

What does the FPGA have to do with all this? Please bear with me while I explain.

Traveler's Tension

Picture a large airport anywhere in the world, with many gates. Numerous planes are taking off and landing. Large masses of people are coming and going; the corridors are packed. Everyone is either trying to make a connecting flight, heading toward baggage claim, or looking for a place to rest weary bones.

Let's say that your flight has just arrived. You could be traveling by yourself, with other colleagues, or even with your family. This airport is unfamiliar to you and the people in it may be speaking a foreign language. The signs may also be in an unfamiliar language. Your flight has landed late (of course) and you need to make decisions about several things simultaneously:

- Where is the gate for my next flight?
- How far away is the gate from where I'm at now? Do I have enough time to get there without running?
- Do I have enough time to get something to eat (preferably at a reasonably good restaurant) along the way?
- What types of food are available along the way? Do any of them interest me, my colleagues, or my other family members?
- My colleagues were sitting in seats somewhere behind me on the plane. If I obtain the necessary information about shops, restaurants, gates, and flight times, how do I easily communicate this to them without losing any time?
- I need to connect to my office to send/download a file necessary for my next customer visit. Will my cell phone reception provide a data rate sufficient to accomplish this in a reasonable amount of time so I still have time to eat? (Don't forget, you're still hungry.)
- What other shops are along the way? Will I need to pick up a birthday present, which I didn't have time to do at my point of departure. Am I limited to just the shops I can see along the way? Does more information exist somewhere that I can access easily?
- Finally, where is the closest restroom?

I'm sure the list of questions above pretty much outlines the experiences of most airline travelers today. It is a set of decision points that we travelers review each time we fly – especially if our arrival airport is new or unfamiliar to us.

But given the press of humanity on all sides, all trying to do essentially the same thing at the same time, how will you collect all of this data in the short amount of time you have? This can be a daunting and stressful situation for most people. It definitely takes most of the fun out of flying today.

Smooth Skies

I'd like to lay out the following scenario of what I think is a possible solution to solving some of these issues for airline travelers.

As the cell phone market continues to evolve, new types of technologies are becoming available. This includes commu-

nication interface solutions such as WiMAX and WiFi for broader, faster coverage. A new technology has also come along: the picocell base station.

A picocell base station is similar to a cellular base station, except that it is intended to function in large municipal buildings and large commercial spaces such as airports and sports stadiums. Unlike its larger cousin, the cellular base station, each picocell base station is intended to service a far smaller number of users – possibly only several hundred to 1,000 users at one time, as the range of a picocell base station is only 100 to 200 feet.

Because of these restrictions, it would take still many picocell base stations to fully cover one facility (think O'Hare Airport or any large sports stadium). The main idea for this type of solution is to make very fast data rates available to users and to increase the quality of services offered to them.

One possible scenario, given the increase in capabilities, is to offer good quality mobile TV, for example. Another is some form of video conferencing, which business travelers would surely pay for, as it would give them the opportunity to be more productive while traveling.

I must point out that at the time of this writing, many details for picocell base sta-

tions have yet to be worked out. Areas like which communications protocol to use – WiMAX or WiFi – are as yet undetermined. How many users each base station will support is still undetermined. In addition, who will pay for these stations and how much access to these services will cost are also as yet undecided.

Changes will also have to occur on the cell phone handset side for these types of services to be accessed. In fact, several vendors (Intel being one of them) are planning to create semiconductor solutions that incorporate several air interfaces – all simultaneously active.

Airline travelers might start to see some of the fun come back into flying, with services enabled by picocell base stations.

These solutions will begin entering the market toward the end of 2008 and into 2009. Much work still needs to be done to arrive at the right mix of features and capabilities. However, it would seem that there is definitely some value to this type of solution.

Airports outfitted with a comprehensive set of picocell base stations could give their customers much better experiences while traveling. Vendors could offer a wider set of products and sell these products to a broader set of customers. Most airport vendors today do not really do much advertising, depending instead on foot traffic.

Imagine a situation where vendors allow access to their products and services over the Internet through picocell base stations. Potential customers could access airport restaurant menus remotely, order meals, and reserve table space if necessary. They could pay for their meal and have it ready as they move toward their connecting gate.

The same solutions could apply for the other basic questions I outlined previously: where is the next gate, how much time does it take to get there, what shops and restaurants are along the way, and how do I communicate this information to my colleagues. All of these questions can be answered by putting such a system in place.

To make such a scenario real, additional middleware must be written with the appropriate level of security for financial transactions. This presents opportunities for both software companies and facility owners to jointly participate in improving the level of service available to the traveling public.

FPGAs in Picocell Base Stations

Back to the FPGA. For the type of system outlined in this article, the number of picocell base stations would need to be substantial, since the range of each system will be fairly limited. This increases the number of systems needed to offer full coverage.

Given the range of capabilities inherent in such systems, the types of services offered must change very fast to meet changing consumer preferences. Programmable logic is a perfect fit given these parameters.

Picocell base stations will be fitted in relatively small enclosures, probably high up toward the ceiling in any given large commercial space. In this situation, there will be little opportunity to do an extensive installation of new fixtures, since the space around these installations will most likely remain in service during the installation process. Although the systems will have access to building power, they won't have extensive cooling systems, which means operating in ambient conditions. This lends itself well to the direction programmable logic is heading in today;

namely, lower power silicon that still delivers relatively high performance.

Finally, because the number of systems in any of these environments will be large, the ability to swap out circuit boards for upgrades will be limited. This is another area where programmable logic can shine, given its ability to be reprogrammed as needs dictate.

Semico Research Corp. has looked at this market and has concluded that a real potential exists both for the picocell base station concept and for the role programmable logic can play within it.

The forecast shown in Figure 1 is for the semiconductor content in the entire picocell base station market, including programmable logic. It is reasonable to expect that programmable logic will represent at least 15% of these revenues. It is also likely that each system will include at least one programmable logic device and that larger systems will include more than one programmable logic device.

If, as Semico believes, this market does in fact come to fruition, it can represent a significant growth potential and revenue stream to the programmable logic industry in the coming years.

The future is indeed bright for programmable logic. Airline travelers might start to see some of the fun come back into flying, with services enabled by picocell base stations.

Now if airports could do something to make their seats more comfortable ...

Source: Semico Research Corp.

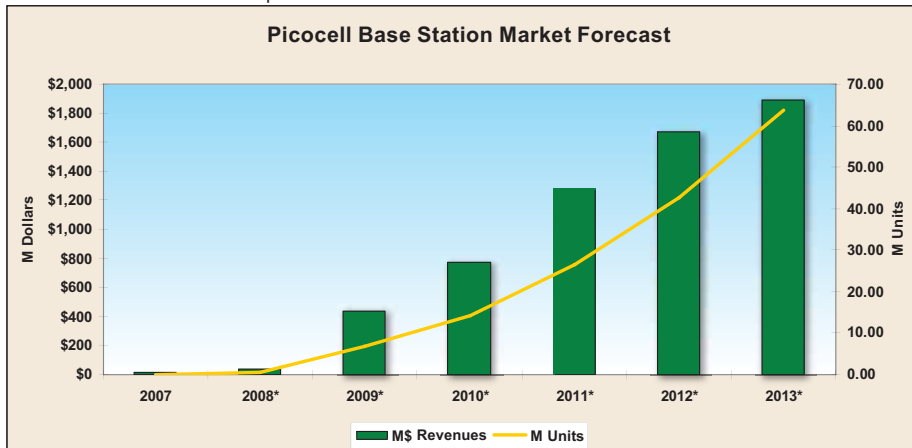



Figure 1 – Picocell base station market forecast



FPGA Powered –
That's it!

FPGA-Module:
TQM hydraXC –


*smallest, most universal
Hardware Platform for
Reconfigurable Computing*

- Based on XILINX Spartan 3, Virtex 4 and Virtex 5 technology
- Ethernet 10/100, USB 2.0, RTC
- SPI-, NAND-Flash, DDR2 / SDRAM
- Size 2.13 Inch x 1.73 Inch (54 mm x 44 mm)
- Programmable VCC IOs

*Embedded solution with
TQM hydraXC for*

- Fast time to market
- Economical series production
- Highest flexibility
- Hardware reduction

:: Starter kits available ::



Starter kit with module



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