

January 30, 2003

Some people missed the ARM tornado

In a recent thread about ARM some doubt is expressed about their business model, about their ability to become a RISC core gorilla.

Paul said:

It is not ARM that is disruptive. It is the increase in chip complexity that is disruptive. ARM has a technology that solves a core problem caused by the increase in chip complexity.

I would rephrase that: **ARM cores, the solution to chip design complexity, is a disruptive technology.**

Until now, Intel was a one trick pony. They designed and built the **microprocessor for the desktop computer**. Because the desktop world was quite content to use a single design, Intel could capture the leadership position with the x86 design. As the world moves away from the desktop it also moves away from massive microprocessors such as the Pentium. The mobile world needs smaller, more versatile and less power-hungry microprocessors. This market cannot be supplied by a single design and there is a trend to bring design back in-house as a way to create the requisite diversity of microprocessors. But it is not cost-efficient to design every new microprocessor from the ground up. The solution is to go to with Lego style design, semi-custom design. The major chip makers such as Intel, Motorola and Texas Instrument did not have a pony in their stables capable of filling this need. By historical accident, as often happens, ARM, or its predecessor, was the supplier of RISC cores to the original PDA, the Apple Newton. That happened about 15 years ago. The processor supplied by ARM was in no way perceived as a threat by the desktop chip suppliers, after all, it had relatively very little processing power and it ran none of the current Operating Systems. This is a classical disruptive scenario, an under featured product that does not meet your client's needs and hence represents no threat to you.

The world moves on, in this case from the desktop to the mobile thin client. Massive size is not acceptable. Massive power consumption is not acceptable.

Massive one-fits-all computing power is not feasible. The entrenched microprocessor suppliers don't have a product to fill this niche while ARM does. Intel continues moving up-market with a 64 bit processor for servers and with more powerful versions of the Pentium but it also wants a slice of the lower end mobile, thin-client market. By this time ARM is so far ahead that Intel opts for basing their entry on ARM cores. Likewise does Motorola, Texas, and the twenty odd microprocessor market leaders. The thick-client microprocessor has been disrupted.

The next question is, "Will thin-client makers adopt ARM cores or will they prefer to use in-house design?" The answer lies in the whole product price/performance equation. Is it more profitable to design in-house or is it more profitable to use an off-the-shelf core? This is not a question of disruption but one of economics 101. In-house design has one mayor drawback, the uncertainty of time to market. The law of increasing returns as expressed in *The Gorilla Game* says that if you are not first to market you will have a very hard time selling well in the market. The alternative available to reduce this uncertainty is the use of proven ARM RISC cores.

The days of custom logic are numbered. The evolution and history of microprocessors point the way to the future.

The very first microprocessors were created in the 1970s to replace hard-wired logic (in other words, they were embedded processors). In the 1980s and 1990s custom-designed gate arrays and ASICs took off as people discovered how to design their own chips. Now the pendulum is swinging back as engineers, investors, and managers rediscover the joy of programming.

Jim Turley, Embedded Systems Programming

Although chief executive Bourgoin [MIPS] deftly managed to compare areal density with pricing-like apples to orangutans-he does have a point. Microprocessors are becoming more capable without becoming more expensive. On the other hand, custom chips are already more expensive to design than just a few years ago, and those costs are vectoring skyward. ASICs have their place, but it looks like they'll

increasingly be a luxury of the well-heeled embedded developer.

[The Death of ASICs](#)

The use of ARM cores implies two types of payments to ARM, an upfront payment by way of a license fee and the purchase of development gear and software; and an ongoing royalty payment. ARM has been smart enough to charge enough by way of license fees to be a profitable company in stark contrast with competitors such as MIPS and ARC

MIPS... For the six months ended 12/31/02, revenues fell 19% to \$19.8 million. Net loss also reflects the additional resources for R&D projects and acquired in-process R&D charges. [MIPS Yahoo profile](#)

ARC International... Pre-exceptional net loss decreased 22% to £5.3 million (Q3 2001: £6.8m) [ARC International Investor Relations](#)

The next question is whether ARM will be able to collect sufficient royalties to become a cash cow gorilla. Royalties are the product of a rate time the number of units shipped. ARM management has downplayed royalties as a revenue stream and I believe this was a smart move. No sense in scaring your customers away even before they buy from you. Quite clearly the royalty rate has to be low enough to make it an attractive proposition for ARM customers. The real question is what sort of volume can and will ARM customers generate. I firmly believe that the number of cores sold will easily be two orders of magnitude greater than Pentium sales. At least 100 ARM cores sold for every Pentium sold. It is highly likely that this is a pessimistic view of ARM's market potential.

The complexity of the cores will increase as well as the cost of in-house hardware design allowing ARM to charge higher royalties for more complex products. Keep an eye on the growth of royalties as the best indicator of ARM's future worth. This last quarter royalties grew by 26% sequentially q/q. Don't expect this rate of growth to be sustained but rest assured that ARM's management has greatly understated the impact of royalties much to the delight and profit of current shareholders.

The last remaining question is the one about the tornado. Some people are waiting for the tornado. In my opinion a two year long tornado ended a year ago with the

happy result that ARM garnered 80% of the RISC core market:

Quarter	Revenue	Growth q/q
6/30/98	16,568	
9/30/98	19,022	
12/31/98	20,753	
3/31/99	21,110	
6/30/99	22,787	37.54
9/30/99	25,850	35.90
12/31/99	30,482	46.88
3/31/00	30,115	42.66
6/30/00	34,995	53.57
9/30/00	39,028	50.98
12/31/00	44,560	46.18
3/31/01	46,211	53.45
6/30/01	50,619	44.65
9/30/01	59,074	51.36
12/31/01	56,925	27.75
3/31/02	60,006	29.85
6/30/02	65,794	29.98

ARM's tornado is not a run-of-the-mill tornado that you measure by end user uptake of product. You could measure the Intel and Microsoft tornados by the sale of PCs. Not so with ARM because there is an additional manufacturing step involved. ARM customers don't stick ARM cores in their products the way DELL sticks a Pentium and Windoze in a PC. ARM customers use ARM IP to build a processor that goes into their product creating a long delay between the time ARM receives license fees and the time the ARMed product hits the street. You might argue that the royalty tornado is more meaningful than the license tornado. It is certainly safer to invest after the royalty tornado but I don't think you need to wait that long. With the PC the end user decides if he wants an x86 or a 680x0 machine. With mobile thin clients the choice is mostly between flavor A and flavor B ARM cores. You have your choice of StrongARM, xScale, DragonBall and the OMAP Texas processor.

Some people are willing to assign gorilla status to Qualcomm without Qualcomm controlling 80% of the cellular market. ARM already has 75 or 80% of the RISC core market. What more do you want?

I believe that we need to review the significance of the tornado. The Gorilla Game advises buying all the hardware gorilla candidates as you spot the tornado and to drop the ones that don't make it. The reasoning behind this advice is that

there is no way to tell beforehand who the winner will be but, if you wait too long you'll lose the opportunity to buy the stock at bargain basement prices. Spotting market tornados while they blow is not easy and a 100% y/y sustained surge in sales is considered a safe tornado signal. Clearly ARMs tornado never blew that hard but the objective of the tornado was achieved nonetheless, 75 or 80% mind and market share. The pragmatists have opted for ARM cores.

When Moore and company wrote The Gorilla Game they did not have stock market bubbles on their mind. On September 30, 1999, at the start of the tornado, ARMHY closed at \$9.40 split adjusted. Under normal, non-bubble conditions, the share price would shoot up from there never to see \$9.40 again. Shoot up it did reaching \$48.60 on March 3, 2000 better that a home run in less than six months. [ARMHY price chart](#)

By October 1, 2001, ARMHY had fallen back to \$9.90 losing all the gains made in two years. Right now ARMHY is down to the \$2.27 which goes to prove that during bubble and bust conditions stronger forces than gorilla gaming apply

If you believe as I do that ARM had its tornado in 1999-2000 then these are most certainly attractive prices to buy ARMHY at. If you are still waiting for the tornado then you have no other choice but to wait. In that case, I would like you to point out the basket of gorilla candidates that you are planning on buying. If you can't find team mates for ARM they you are conceding that ARM is the gorilla and your doubt is centered on the gorilla's ability to make money which is a different game altogether.

Denny Schlesinger
Caracas - Venezuela
denny@softwaretimes.com