

The Green Side of BlueArc

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Abstract: Using a custom-built NAS server and hardware-accelerated file system, BlueArc is able to deliver both high performance and industry leading energy efficiency.

The Greening of Blue

With so many manufacturers—across all industries—frantically ‘greenwashing’ their existing products in order to claim environmental friendliness, it is encouraging to uncover the few that have actually done something different to justify their ‘green’ credentials. Simply ‘painting’ an existing product does not constitute a ‘green’ approach! BlueArc stands as an excellent example of planned and executed differentiation.

Though we at ESG have a healthy skepticism towards the enthusiasm demonstrated by the storage industry’s marketing departments for all things ‘green,’ we *are* very positive about the potential for significant improvements in some of the basic measurable things that really matter to many data center managers—specifically, the usage of power, cooling and space (which we refer to as PCSE: Power, Cooling and Space Efficiency. See the sidebar ‘ESG’s position on Green’). From its beginnings, BlueArc clearly understood that there was room for improvement in these areas, while refusing to give up one iota on its main goal of delivering exceptional performance.

Bucking the Architectural Trend

Let’s start with a review of how things (in this case, storage ‘controllers’ or ‘gateways’—depending on whether you’re on the block or file side of the house) have typically been developed. Since the underlying platform architectures are still often pursued within the industry (interestingly, the same general track has applied to IP router development), a brief reminder is merited.

The accepted historical approach has been that you have a ‘data traffic director’—a hardware/software combination—in front of a number of hard disk drives. More specifically, over the years this ‘controller’ or ‘gateway’ functionality has initially been placed on what was basically an off-the-shelf CPU (plus memory and an I/O bus) repurposed to run the data control, flow and placement inherent to a storage system. Over time, purpose-built servers were leveraged with operating systems that were more specific to the needs of storage. It was better, but it was still a server approach. Like much that has developed in IT, it was a quick and practical route at the time and—even though it was probably not optimum in hindsight—it became “just the way it is”... the rule, if you like. And it was this rule (among others that are outside the scope of this paper) that BlueArc set out to change.

Rather than starting with what had gone before, BlueArc considered what was actually needed to provide the necessary gateway (in this case, a NAS implementation) functionality—and thus, the next step in its evolution was to embed NAS services in a hardware accelerated architecture built on FPGA (Field Programmable Gate Array) technology to optimize both performance and efficiency gains.

In very simple terms, this approach can be regarded as having stripped out what you don’t need so that all that is left is a set of dedicated, purpose-built ASICs to manage the storage system. While the engineering design criteria focused on bandwidth and throughput, the environmental benefits of this approach were also important and impressive—for example, using just 66MHz to power the control function, rather than the GHz required in traditional CPU-based controllers. This makes the BlueArc’s Titan very efficient in terms of PCSE.

ESG's Position on 'Green' – Focus on 'PCSE'

There is a lot of messaging around 'green' these days. Indeed, with global-warming as a top item on public and private agendas everywhere, it is hard to avoid. Everything from aircraft to zoos claims some green aspect or endeavor. And, like everyone, we applaud these efforts—if things can be done with a reduced negative impact on our planet, then that's clearly a good thing. Every small step counts. 'Green is good'. And the IT infrastructure suppliers know it too.

Consequently, with electricity prices and consumption heading upwards, almost all storage vendors are chasing the 'green' mantle. However, while this may be right and good in general, the implied altruism is also somewhat misleading. There are no real green storage products; although certainly some are significantly less bad than others. And, as yet, there are few end-users making buying decisions purely on 'green-ness.' At ESG, we assert that most IT departments are realistically not currently highly focused on being 'green,' but rather *are*—and if not they should be—highly focused on reducing the consumption of power, cooling and floor-space that their operations require. While many IT vendors are enamored by this 'green' image, at ESG we concentrate on PCSE: Power, Cooling and Space Efficiency. This is where huge, immediate, practical improvements are possible in the data center. Driven by technology advances in collaboration with better processes, the power, cooling and space necessary to deliver a certain level of capacity, IO and service level can be dramatically reduced. PCSE focus and improvement is where the rubber (of 'green' expectations) meets the road (of IT and business deliverables). It's an area of massive potential.

This is not to say that there are no genuine initiatives by IT infrastructure vendors to directly minimize environmental impact (such as reducing their use of hazardous materials, improving manufacturing, or offering decommissioning and recycling programs). Where these exist and have merit we of course applaud and indeed highlight them too. They are an added bonus. But PCSE improvement is where the major opportunity lies today, offering significant operational advances and huge financial savings.

FPGA Advantages

Because it is an interesting implementation, and the basis of BlueArc's PCSE advantages, it is worth expanding a little on the value of using the FPGA:

- a) Although the fact that they run at MHz rather than GHz speeds might intuitively (and 100% wrongly as it turns out) suggest some lack of performance, the massively parallel and application specific architecture can boast quite astounding abilities—way beyond that of traditional 'standard' repurposed CPUs, which it beats by a factor of thousands. While today's best generic CPU chips can perform some billions of tasks per second, the FPGA approach yields the ability to perform 50 *trillion*. Thus, for a given amount of processing, you would need fewer gateways—or, more likely, you are now availed of the opportunity to do even more operations.
- b) In a traditional architecture, trillions of tasks would generate massive power consumption and heat production. However, from a PCSE perspective, the lower running speed of the FPGAs means far better energy efficiency without sacrificing performance. The Titan system requires noticeably less power to operate, and that means less heat is produced (which, of course, means reduced cooling requirements). The energy efficiency improvements range from an impressive 30-60% (better than many other NAS solutions) to a staggering 90-99% (better than off-the-shelf 'white box' filers). An additional and useful side benefit is that the FPGA approach also offers higher component reliability and life.

The Bottom Line

The drivers in IT to be more energy-efficient remain strong and are likely to be come more pressing. In reality, these pressures can be generalized into two categories:

- some organizations are at, or close to, the point of running out of available power, space or cooling, which can usually only be remedied via expensive and awkward rebuilding or movement of their data center(s).

- the increasing performance and power density of today's IT equipment is putting additional strain, especially the cost of power, on virtually all data centers.

Additionally, of course, there are also increasing societal and corporate pressures to do things more efficiently if it's possible. But no one can afford to trade-off performance, throughput or delivered business value in their desire to address these challenges.

The Titan hardware-based file server offered by BlueArc delivers an enticing mix of attributes—including the excellent performance that is generated from the point-to-point FPGA architecture (removing the high volume of arbitration in traditional systems)—which have a direct impact on the PCSE advantages of the product and allows BlueArc to claim industry leading 'IOPS per BTU.'

In a world where exaggerated 'green' claims are all-too-often out of synch with the likely realistic impact that IT alone can have, it is refreshing to see a company that has genuinely done something innovative to address the PCSE challenges that face many data centers—and to do it in a way that does not compromise on throughput or performance. BlueArc now offers a model¹ that allows users to calculate potential PCSE savings as well as other business benefits. Of course, it's not the only company offering such a tool, but it is part of a small group of infrastructure suppliers whose improvements are based on more than just the gradual march of generic technology. Our only criticism is, if anything, a back-handed compliment: While we like the fact that BlueArc has not over-claimed its 'green-ness' (while waiting to produce verified—and even 'guaranteable'—savings), it does have a tremendous PCSE story—one that should be made known in today's ecologically-aware environment as a story that motivated IT users would do well to consider.

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¹ *As this paper was being prepared (Feb '08) BlueArc was preparing for an online model to be offered as well as the consultative tool.*