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Moore or less?

Do we need to repeal Moore's Law? As the cost drivers in the data center change, it will be those managers who can understand the data center's physical infrastructure who will meet the challenge.

1965: Bill Gates was ten years old and had yet to see a computer; the Russians made the first space walk; Bob Dylan caused outrage by going electric at the Newport Folk Festival; and Intel co-founder Gordon Moore predicted the economics of the next four decades of computer power.

His theory was tucked away in a modest essay in the April issue of Electronics magazine. So far-reaching was the article's impact that Intel paid US\$10,000 to acquire an original copy of the magazine in 2005.

Moore said that the transistor density on integrated circuits at minimum cost would double roughly every 18 months. Today, what has become known as "Moore's Law" is commonly taken to mean that the cost of computing power halves every year and a half.

The law's been extended to other technologies as well: trends in hard disk capacity over the last few decades have followed a similar trajectory to processor power. And there is a formulation that RAM storage mirrors the growth rate in processing power.

Until recently, Moore's Law has been proven true. Indeed, so convincing was the observation that many companies started to set it as a target. Developers had faith that if they didn't double their power in 18 months, they would be dead in the water because their competitors would.

But now the law is starting to break down because the cost of the infrastructure supporting processors is starting to exceed the cost of the devices themselves. The Uptime Institute says that the cost per processor is falling by 29% per year and that in three years, your IT budget will buy 2.7 times more processors and 12 times more processing power.

Those processors will fit into the same floor space that they would today. The density of processing power is increasing dramatically, which has a knock-on effect on the cost of the power and cooling infrastructure. While the manufacturing costs of devices might be falling in line with Moore's Law, the total cost of ownership is rising in line with power consumption.

The Uptime Institute estimates that UPS power consumption will increase by 2.7 times if power consumption per chip remains constant, and that it will increase by 2.3 times even if power consumption falls by 5%. Don't forget that today's data centers require as much power for supporting devices as they do for the devices themselves. Most of this power is used by cooling equipment. The Uptime Institute estimates that site power will increase by at least twice the rate that UPS power consumption is increasing.

The budget driver in the data center has changed from the price of hardware to the cost of running it. For data center managers, the fundamental difference is that while they can't do much about how quickly

new devices are invented, they can do a lot to cut their usage costs if they optimise the data center layout. Managers can plan hot and cool racks, for example, to make the most of ambient cooling opportunities.

Many data centers don't have the data they need – ironically – to do a good job of this. As a result, they're unable to understand the capacity of the data center now. If available network subnet ports cannot be found in spaces where there is sufficient cooling, space or power nearby, then the data center is already operating at full capacity and it's possible the managers don't even know it yet. Provisioning a new server will involve a massive step-change in costs as the data center is extended, replaced or fundamentally upgraded. In a recent survey by the Aperture Research Institute, as many as 37% of those surveyed admitted they had run out of space, power or cooling capacity without sufficient notice in the last two years. Only 6% of 100 data centers surveyed thought they were 'excellent' at predicting when additional space or power infrastructure will be needed, with 10% describing their abilities as 'poor' and 27% as merely 'fair'.

This will have to change. Data center managers can no longer rely on the industry's natural momentum to cost-effectively deliver the processing power they need as the business expands. As operating costs increase disproportionately, managers will need to proactively manage the data center to ensure cost-effectiveness. They will, however, be in control of their biggest cost driver, perhaps for the first time.

While Moore's Law is breaking down, there's another law that's held true in the IT industry and that promises to do so forever: Murphy's Law – if nothing can go wrong, something will. Data centers are designed to eliminate a single point of technical failure but there remains a weakness: people. The Aperture Research Institute found that 57% of data centers had experienced an outage attributable to human error. This is the result either of a good plan poorly executed or a poor plan. It's no surprise that organisations that do not have the information to understand their current data center are unable to plan a smooth transition when changes need to be made.

IT budgets are often squeezed from two sides: the board wants to slash them, while the demands of a growing business and rising operating costs are bleeding them dry. As the cost basis in the data center shifts, it will be those managers who have true insight into the physical aspects of their data center who will meet the challenge. Only they will be able to control their usage costs, provision equipment effectively and satisfy their budget targets and service level agreements.

About the author

William T. Clifford joined Aperture in 2005 after serving as a member of Aperture's Board of Directors since 2003. He was Chairman of the Strategy Committee and a member of the HR/Compensation committee of the Board during that time. Prior to working at Aperture Mr. Clifford was President and CEO of Gartner Group, Inc., the world's leading authority on the information technology industry, user and vendor technology strategies and market research.