From Gray *to* GREAT! Rejuvenating Your Aging Data Center

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Recent industry estimates have placed the average age of a data center in the United States at eighteen years old. That's right, built in the early 1990s, when the first George Bush was president, the mainframe was still king and the server/laptop phenomenon had yet to catch fire. The reality is that many data centers in operation today are based on the design standards and innovations of the late 1980s. In other words, aside from increasing interest in “green” data centers, most organizations are concerned about their “graying” data centers.

Typically, 15 to 20 year-old data centers face the following constraints:

Power

Older data centers were designed around mainframe processing architecture. Mainframes, although power hungry, were enormous in size as compared to today's IT equipment, so the overall watts-per-square-foot power capacity is much lower—often in the 30 to 50 watts per square foot range. In contrast, today's IT environments can demand electrical power from 75 to 150 watts per square foot or more—depending upon size, reliability and business requirements.

Cooling

Here again, an older data center outfitted with mainframe technology required a lower quantity of cooling because the heat output, measured in BTUs, was small relative to the occupied floor space. Also, many mainframes in use during the late 1980s and early 1990s were water cooled, further reducing the ambient cooling demand within the data center. The electrical requirements and heat output of today's IT have significantly outpaced the ambient cooling required even five years ago, let alone 15 to 20 years ago.

Floor Space

As older and larger IT equipment is replaced with newer and smaller units, a data center can become oversized. Perceived overabundance of floor space can create the impression that the data center has years of growth capacity ahead of it. However, as smaller, more heat-generating and power-consumptive IT hardware is added to the data center, additional floor space is needed for the increased amount of electrical and mechanical equipment required to power and cool new IT hardware.

Maintenance

I still remember when the norm was quarterly, or maybe semi-annual, or possibly even annual occurrences referred to as "maintenance windows." Today's expectation is a 24 x 365, always-up, always-on data center. But in older data centers, where 24 x 365 was never a design consideration, redundancy was not built in and therefore shutdowns are still required in order to perform maintenance or repairs to the building systems infrastructure.

Redundancy

The Uptime Institute categorizes data centers into Tier Levels from I to IV, with a Tier Level I data center having significantly fewer building systems infrastructure and redundancy than a Tier Level IV data center. Most older data centers lack the infrastructure and/or redundancy needed to ensure uninterrupted uptime, which was not a common requirement 18 years ago.

In each of these areas, however, there are steps you can take to extend your data center's useful life. Even if you are contemplating a major overhaul or a brand-new data center, there may be interim solutions to help you maintain successful performance and operations for a few more years, until you are ready to plan, design, budget and build a new data center. Furthermore, as long as IT continues to evolve at a faster pace than facilities technology—which it always has—data center facilities issues need to be addressed on something of a rotating basis.

Upgrading Power

A power upgrade is usually possible if the building that houses the data center has available power, or

additional street power can be brought in—and if floor space is available to house the added electrical components (panel boards, switchgear, generators, UPS and PDUs, etc.), either within the data center itself, in the building's electrical room or possibly outside. This improvement, however, is time consuming, expensive and fraught with risk, and will likely require a lengthy planned outage in the data center while tying in the new electrical components to the existing building infrastructure.

Alternatively, adding new electrical equipment, or swapping out old for new, can produce a significant increase in operating efficiencies. Effective planning and a realistic project timeline and capital budget are essential.

Cooling Options

If the rooftop or another acceptable exterior location is within approximately 150 feet of where the data center's new computer room air conditioner (CRAC) unit is to be placed, direct exchange (DX) type air-conditioning can be an easy upgrade. New DX air-conditioning units operate more efficiently than units manufactured just five years ago.

If DX is not a possibility, water cooling is a viable option. Water cools even more efficiently than DX air-conditioning, but it can be more complicated and expensive. Water-cooling elements such as the cooling tower, chiller capacity, and quantity and capacity of water loops should be considered, as well as the appropriate budget and timeline.

The use of common platforms and infrastructure standards enables organizational agility, allows optimization of capacity, and can shorten recovery time in the event of a technology failure. Plus, you will shorten the development cycle and make it easier to maintain cost-effective IT services.

Floor Space Solutions

Implementing a hot/cold aisle IT configuration can make the floor space in an older data center more functional and, at the same time, improve the mechanical systems' ability to effectively cool the data center. A well-implemented floor space master plan with proper aisleway spacing, cabinet utilization and attention paid to where growth is likely to occur, will provide for more structured, long-term capacity.

Trackling Maintenance

The more redundancy you have in your electrical and mechanical systems, the more likely it is that you will be able to perform required maintenance without needing a full or partial IT processing shutdown. Even if your data center is 18 or more years old, much or part of it may have been upgraded more recently. Much of today's IT processing equipment is manufactured with dual power supply technology. The IT manufacturers are providing you with the ability to perform maintenance (among other dual power supply advantages), as long as you have the complementary up-stream electrical and cooling capabilities to achieve the maintenance goal.

If you need to perform a partial or full shutdown, you will create a business interruption, so be sure to work closely with the business to assess all potential impacts, and make sure your disaster recovery plan is fully intact—because that is what you will be doing: recovering your business. This process may well lead to the decision to establish redundancies prior to performing necessary maintenance on existing facilities equipment.

The Green Data Center

Everyone seems to be talking about green data centers these days. On the West coast of the U.S., where power constraints and conscience run high, green data centers have become more of a reality. However, in the rest of the country, we're only at the beginning stages of discussion and consideration. Since a data center is a substantial undertaking, major “green” initiatives are expected to be adopted primarily as standards for new construction. In the context of new construction, many “green” initiatives are a win-win, as their primary environmental benefit is dramatically reduced energy usage, which pays for itself in the long-run.

For organizations not yet ready to build a new data center, the easiest, least risky way to introduce green efficiencies into an operating data center is to do so via the IT side of the house as opposed to the building systems infrastructure. Eliminating old and un-needed IT equipment, enabling power management software, purchasing new IT hardware and implementing virtualization can all provide significant gains in power efficiency.

On the building systems infrastructure side of the house, introducing small changes can increase operational efficiencies without too much risk or added cost. Hot/cold aisles positioned correctly in relation to the air-conditioning units, or the directional flow of cold air, appropriate quantities of perforated floor tiles and blanking panels in IT

cabinets all increase operational efficiencies at low cost and risk. It is worth keeping in mind that when you reduce the IT power consumption, the heat output is reduced, resulting in the need for less air conditioning. In today's data center, typically, every $0.01 reduction in IT power consumption yields a $0.02 reduction in total power consumption.

Keeping Your Data Center Up and Running Smoothly

Finally, keep in mind that every data center is different, just as every business is different. It's not about the latest fashion, but rather about the latest—and anticipated—demands the business places upon it. You don't have to keep up with the Joneses, but in the IT world, you do need to keep up with the times. Having a 1990s data center and expecting it to perform to meet today's business and IT expectations is a little like having the best new car and driving it over highways that haven't been updated in almost two decades … It'll be a rough ride!

As director of data center planning for Forsythe, Steven Harris helps clients with data center planning and design issues, including facility assessment and optimization, floor plan design, site selection, disaster recovery planning, and project management.