

How Old is Too Old?

A Look at Today's Data Center

By Steven Harris, Forsythe

First: Power

Older data centers were designed around a mainframe processing architecture. Generally, they have a lower watts-per-square-foot electrical design standard. It is not uncommon to see power capacity in the 30 to 50 watts-per-square-foot range for an older data center. Mainframes, although power hungry, were enormous in size as compared to today's IT equipment. The electrical requirements of a mainframe were spread over a large expanse of floorspace, yielding a low overall watts-per-square-foot power requirement. Today, depending upon size, reliability level, and business requirements, data centers can demand electrical power from 75 to 150 watts-per-square-foot or more.

Second: Cooling

The quantity of cooling, measured in tons, is to a great degree determined by the power capacity of the data center and cooling demands of the IT equipment in the room. Here again, an older data center outfitted with mainframe technology required a lower quantity of cooling. The heat output, measured in BTU's, relative to floor space occupied was small. Additionally, many mainframes in use during the late 1980s and early 1990s were water cooled, further reducing the ambient cooling demand within the data center. In 2007, with cooling capacity being driven by electrical requirements and IT heat output, the ambient cooling required even five years ago, let alone 15 to 20 years ago, is insufficient.

Third: Floor Space

Not everyone views this category as a constraint, but appearances can be deceiving. As older and larger IT equipment is replaced with the newer and smaller, a data center can become oversized. This perceived overabundance of floor space leads people to believe that the data center has years of growth capacity ahead of it. The reality is that floor space utilization is constrained by both power and cooling. Furthermore, as smaller, more heat-generating and power-consumptive IT hardware is added to the data center, additional floor space needs to be devoted to the increased amount of electrical and mechanical equipment required to power and cool the new IT hardware.

Fourth: Maintenance

Remember when the norm was annual, if not semi-annual, or even quarterly occurrences referred to as "maintenance windows"? These pre-planned periods of time, when the data center could be shut down to perform maintenance on both the IT and the building systems infrastructure, have long since disappeared in most production data centers. In today's 24x365, always-up, always-on world, maintenance is a four-letter word. Nothing runs forever. And in older data centers where 24x 365 was never a design consideration, redundancy was not built-in. Therefore, shut-downs are still required in order to perform maintenance or repairs to the building systems infrastructure.

Fifth: Redundancy

The Uptime Institute categorizes data centers into four Tier Levels from I to IV—with a Tier Level I data center having significantly less building systems infrastructure and redundancy than a Tier Level IV data center. Data centers designed nearly 20 years ago, not having the business drivers which require today's uninterrupted uptime, were not designed with the infrastructure and/or redundancy that most businesses require of their data centers now.

Finally: Solutions

So, how do you solve the constraint problem that an older data center presents? Several opportunities exist. None are easy, risk free, or inexpensive, but one or more will, at some point, be necessary to extend the useful life of an older data center.

As long as the building that houses the data center has available power—or additional street power can be brought in—and floor space is available to house the added electrical components (panel boards, switchgear, generators, UPS and PDU's, etc.) within the data center, the buildings electrical room, and possibly outside, a power upgrade usually is possible. This improvement however is fraught with risk, time-consuming, and expensive. It likely will require a lengthy outage in the data center when tying-in new electrical components to the existing infrastructure. Effective planning as well as a realistic project timeline and capital budget are essential.

Mechanical improvements, like electrical upgrades, also are risky, can be difficult to implement, and can carry a hefty price tag. Depending upon the data center in question and its location within the overall building, additional cooling may be more easily accomplished. If the rooftop or other acceptable exterior location is within approximately 150 feet of where the new CRAC unit is to be placed within the data center, DX-type air-conditioning can be an easy upgrade alternative. If DX is not a possibility, then cooling constraint issue can get more complicated and expensive, including considerations such as cooling tower/chiller capacity, quantity and capacity of water loops, etc. needing to be taken into consideration. Again, planning timeline and budget need to be well thought-out.

The floor space in an older data center can be made more functional, while improving the mechanical systems ability to effectively cool the data center, by simply implementing a hot/cold aisle IT configuration. A well-implemented floor plan with proper aisle spacing, cabinet utilization, and attention paid to where growth is likely to occur (in what IT systems, so the data centers floor space can be master planned), will provide for longer, more structured growth.

Nothing lasts forever, and sooner-or-later your building systems infrastructure components will require maintenance. The question becomes: Will I have to shut-down all or part of my processing environment in order to provide the ability to perform maintenance? The answer to that question may lie in the answer to this one: How redundant is your building systems infrastructure? Data centers designed and constructed more than 17 years ago may not have the redundancies in their building systems components that recently-designed data centers likely have. 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 a full, or partial IT processing shutdown.

Most of today's IT processing equipment is manufactured with dual power supply technology—so the IT manufacturers are providing you with the ability to perform maintenance. You just need complimentary up-stream electrical and cooling capabilities in order to achieve the maintenance goal. The further up The Uptime Institute's Tier Level matrix your data center is, the better your data center's redundancy, the better your data center's availability. If your business' goals for continuity and IT uptime are 24x365, a data center designed and constructed much below a Tier Level III will fall short.

You don't have to keep up with the Jones', but in the IT world, you do need to keep up with the times. Having a 1990 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 will be a rough ride!

Published in Continuity Insights, May 30, 2007.

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.

