Low-Cost, Low-Fuss Ways to Extend a Data Center’s Life

When a data center is running at its limits, an organization has some big decisions to make. To buy time to plan for whatever's coming next, consider some modest and inexpensive upgrades and adjustments.
Editors Note

Improving Without Overhauling

Few organizations are enthusiastic about committing the money and time necessary for a significant upgrade to their data centers. A business needs to carefully consider how—or even if—a major data center initiative should be undertaken. But what’s an IT team to do in the meantime? Big decisions take time, but the infrastructure needs to keep running. The business depends on it.

This puts IT decision makers in the position of needing to extend the life of what may be an old and struggling data center while the larger issues are sorted out.

It’s possible to take action, data center expert Robert McFarlane writes in this guide, without incurring significant costs. Specifically, McFarlane suggests organizations target underutilized resources. Are those servers being used to full effect? And with power, IT staffers should look at battery balance. Also, the strategic use of in-row coolers, in certain situations, can alleviate a facility’s cooling problems.

Also in this guide, TechTarget’s Stephen Bigelow identifies ways an IT team can boost data center performance without devoting a lot of time and money to the effort. Adding solid-state drives to a server’s local storage, as an example, can clear bottlenecks and stop errors. Sensors, meanwhile, can be installed at little cost and without a lot of effort.

These actions won’t resolve the bigger issues of what to do about a data center that’s approaching the end of its usefulness, but they will afford a business more time to plan its future IT infrastructure.

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Simple Fixes and Upgrades for an Aging Data Center

When your data center runs out of space, power or cooling—or all three—you have some difficult decisions to make. Those deliberations become more challenging if your business is likely to move within the next several years or if there are discussions about eventually transferring some computing to the cloud or to a hosting site. These decisions are important, and not ones you want to be rushed into making. The choices an organization makes, after all, could be costly—in both capital outlay and operational effectiveness.

But while these long-term decisions are being pondered, an IT team still bears short-term burdens: it needs to keep that data center running, and must reliably support users.

So which steps are realistic? Which will provide real benefit for minimal investment? And, just as importantly, which ones will be least disruptive? In short, how can you navigate the short term in the most economic, effective and efficient way possible?

A sound strategy here will be to look at your data center to first find what you can clean up, then what you can fix up, and, lastly, what you can phase up.

Remove what shouldn’t be there

If a data center is already running at the limits of its capacity, the IT staff will likely have shut down and removed most of those comatose servers.

The next step is to challenge the importance of anything that shows low utilization, say, maybe 10%. See if it can be virtualized. Or maybe it can be done away with. If it’s supporting a single application that one user thinks is “nice to have,” it may be time to have a serious conversation. A data center that’s at its limit, after all, isn’t in a position to accommodate unnecessary equipment. Plus, those kinds of
changes provide the added benefit of reducing power consumption.

While you’re looking at hardware, clean the equipment air filters and make sure cables aren’t blocking exhaust airflow. These simple steps cost nothing and can improve cooling effectiveness and extend equipment life. If you have cardboard boxes and other unnecessary items stored in your data center, get rid of them. They create more dirt that will re-block filters and degrade cooling.

If you supply air from a raised access floor, remove that unused cable. It’s not easy, but you don’t need a capital budget authorization to do it. You may be surprised by the difference it makes in cooling performance.

It might be worthwhile to employ a professional data center cleaning service. It’s amazing what a clean facility can do for equipment operation and power usage.

**FIX UP WHAT REMAINS**

When you’re running close to your limits, nothing is more important than good preventive maintenance. Consider this even if it means a special call beyond the terms of a service contract. Being sure everything is running at maximum performance may well justify the extra charge.

*When a data center is running close to its limits, nothing is more important than conducting thorough preventive maintenance.*

Change air conditioner filters. Have all belts and bearings checked. Verify that everything is clean. Your vendor should have a thorough maintenance checklist, just like a mechanic has for a car. Make sure it’s followed completely. And if you’re running so close to the edge that you can’t afford to shut down an air conditioner for service, rent portable coolers to get you through.

Uninterruptible power supply (UPS) batteries are probably the most failure-prone item in the data center, and they’ll fail just when they are needed most. Valve regulated lead acid (VRLA) “sealed cells” are only good for a few
years anyway, so if they’re more than three to five years old, it’s a good idea to replace them.

Before calling for preventive maintenance on your UPS, and certainly before replacing a UPS or adding capacity, check the phase balance. You may have more power available than you think.

Large UPS systems (generally 20 kW and above) are three-phased. This means there are three “hot” wires, but nearly all cabinets and equipment connect to only one or two of those phase wires. In the United States, 208-volt circuits draw power from any two of the three phase wires. A 120-volt circuit in the U.S., as well as a 230-volt circuit in Europe, draws power from any one of the phase wires plus a neutral wire. As a result, it’s easy to load one or two of the phases to near capacity, leaving little load connected to the remaining phase or phases.

The front-panel display can tell you the load on each phase, but the general display will show only the percentage load based on the worst-case phase. Therefore, if phases are way out of balance, your display could show 98% utilization—even though 20% to 30% of your capacity remains available and unused.

Rebalancing phases as closely as possible (the goal is within 5%) can unchain significant extra power from an existing UPS, solving potential overload concerns at little to no cost.

Install blanking panels in any unused rack and cabinet spaces to stop the waste of expensive cooling air. Snap-in panels can make a huge difference in cooling effectiveness. Likewise, expandable panels are available to close gaps between cabinets, and products are now available to seal the space between the bottom of a cabinet and the floor.

MAKE STRATEGIC ADDITIONS

Only after all this has been done should major equipment additions be considered.

If you need more UPS capacity, consider the use of smaller, in-rack UPS units. These will be helpful, but only if a minimal amount of additional UPS capacity is needed. Even though this is meant to be a short-term solution, use commercial-grade units. Check the batteries in these small units every few months, and heed their alarms.
If you need more cooling capacity, in-row coolers (IRCs) may be a better option than large computer room air conditioners or air handlers (CRACs or CRAHs), particularly if the existing cooling is via under-floor air delivery. Adding CRACs may force more air under the floor than the plenum space can accommodate, and may exacerbate pressure variations due to under-floor obstacles. Further, the air streams can interfere with each other, actually reducing cooling in some areas of the floor instead of improving it.

IRCs are placed between cabinets, and deliver cool air directly in front of the cabinets where the highest heat loads exist. Further improvements can be made by relocating equipment with high heat outputs to cabinets configured for higher density, thereby reducing the load in other parts of the data center. Another option would be rear door heat exchangers (RDHxs), which neutralize the heat before it leaves the cabinets. Either of these options requires chilled water or refrigerant piping out to the floor, which is certainly a significant, potentially disruptive installation. The advantage of these approaches is that they can be sized and located to address the specific need. This restricts major work to a small section of the floor, and minimizes the amount of new equipment that needs to be purchased.

Moving equipment with high heat outputs to cabinets configured for higher density reduces the load in other parts of the data center.

If cooling remains a problem, consider adding containment. Cold-aisle containment is generally the better choice for existing facility retrofits, although it can be difficult to control the air balance. Hot-aisle containment avoids the balancing problem, but it requires a return air path back to the air conditioners. That’s inherent with an IRC design, but could be difficult if you don’t already have a return air plenum ceiling back to your CRACs.

Plastic curtains are easier to implement in an existing space than solid air barrier doors and panels, and they allow air leakage, which
can solve the air balance challenge of cold-aisle containment. However, the plastic may not comply with flame-spread and smoke-emission requirements.

Solid containment, using end-of-row doors and above-cabinet panels, may be more difficult to implement in an existing space, but will provide more complete containment than curtains. Air balance in cold-aisle containment installations will be challenging, usually meaning the design will need to allow some leakage to avoid problems.

Also, there are important fire-protection considerations related to containment. If sprinklers or gas discharge heads are not located in each aisle, the containment may isolate an aisle from the fire suppressant, which is illegal. U.S. fire-prevention standards require that the containment barriers drop automatically upon smoke detection (not with fusible links that melt with actual fire) and that the dropped barriers do not impede emergency egress by falling into the aisle. The best way to address these issues is to re-configure the fire protection, but this can be expensive and disruptive, and is probably not realistic for a short-term facility plan.

When faced with the need to extend the life of an existing data center for a few years, the first steps likely will be those you should have been taking all along, but weren’t forced to until now.

Large budget approvals to fix an end-of-life facility will be hard to come by, and should rarely be necessary. When they are, the solutions need to be modular in nature, providing only what is necessary, at the lowest cost and with the least possible disruption.

Don’t add major equipment unless absolutely necessary. That kind of work is expensive, dangerous to existing systems, and may create new problems rather than solving the existing ones.

—Robert E. McFarlane
Put Cabling, Sensor, Disk Upgrades on Your To-Do List

**Not every IT** infrastructure project needs to be a time-consuming, capital-intensive, paradigm-shifting corporate initiative. Let’s look at some uncomplicated, inexpensive tasks that can shore up a data center.

**Upgrade existing hardware**
Strategic memory and local disk upgrades boost a server’s performance capacity. Memory is a limiting resource in virtualization, and servers rarely come with a full complement onboard. Inventory your unused slots and add memory to assist existing VMs or accommodate future server consolidation.

Solid-state drives (SSDs) are a local disk storage upgrade for strategic servers. SSDs improve I/O and lower latency, ideal for workloads sensitive to storage bandwidth. SSDs can accelerate performance if a server’s workloads rely on disk caching. Rather than rip and replace all the disk drives, add an SSD to a server’s local storage to clear bottlenecks and stop errors.

Upgrades to server firmware are fast and free, but also disruptive. Perform them only to fix specific problems like hardware or OS support. Check your asset inventory and get a list of the current server models and firmware versions; then check the server vendors’ download sites for updates. Ascertain via the details or release notes whether the update actually solves a problem. Peripheral interface and adapter devices also have firmware that may need updates.

Memory and disk upgrades mean downtime (unless hot plugging) and re-racking. “RAM upgrades are cheap and effective, but ... it’s not exactly an in-place upgrade,” said Pete Sclafani, COO and co-founder of 6connect, which develops network-automation technologies. Perform memory and SSD upgrades during scheduled
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Server Downtime

Disk capacity is expensive, and you can forestall major capacity additions by removing unnecessary content or migrating data to lower storage tiers. For example, temporary directories flood with unneeded data, so clear out /tmp and c:/temp directories in servers and storage subsystems.

Try a zero byte reclaim for thin storage deployments. “Write zeros to all allocated but unused space,” said Tim Noble, director of IT operations at ReachIPS, a cloud platform provider in Anaheim Hills, Calif. A zero byte reclaim of the server’s allocated, never-needed storage frees up space on the array.

Redo That Cabling

As network bandwidth reaches 10 Gigabit Ethernet (GigE), 25 GigE and faster, it has meant aging Category (Cat) 5 and 5e copper cabling infrastructure for 1 GigE can’t cope with the new data center requirements.

Even if the right hardware is in place for higher bandwidth networks, the cabling might be lacking. “People tend to forget that when the physical network gear is upgraded, your cabling may not be taking full advantage,” Sclafani said.

Don’t rip out aging cabling all at once; Ethernet cabling is fully backward-compatible. Make relatively small, incremental investments in faster cables as time and budget allow.

Servers will remain on 10 GigE, so focus on network backbones, especially Ethernet-based iSCSI and Fibre Channel over Ethernet storage arrays. For example, Cat 6 cables can support 10 GigE to 55 meters while Cat 6a and Cat 7 cables can handle 10 GigE to 100 meters, without requiring new network adapters, switches or other components.

Add Sensors

If you can’t measure it, you can’t manage it. Data center infrastructure management (DCIM)
tools monitor the electrical and environmental behaviors of complex facilities.

DCIM requires a proliferation of sensors placed strategically around the data center. These tools may trigger automated responses to situational events, such as migrating workloads when a server becomes too hot, or sounding an alert when moisture suggests a leak in the cooling loop. Missing or inadequate sensors can leave input gaps.

What are you missing?

- Temperature sensors locate hot spots within racks and rows.
- Humidity sensors warn of excessively dry air or damaging condensation levels.
- Moisture (liquid) sensors are essential when chilled water circulates in heat exchangers or rack doors.
- Power monitors track energy use in real time.
- Air-flow sensors ensure that fans are running and filters are unclogged.
- Motion detectors spot intruders and trigger security alerts and cameras.
- Smoke/fire sensors protect valuable assets and lives.
- RFID tags help automate hardware inventory control.

New sensors are easy to install. Plus, they can be added incrementally, which spreads out the costs. —Stephen Bigelow
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