7 Ways to Reduce Complexity by Improving Data Center Simplicity

WHITE PAPER

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Introduction

Along with the new technology and applications emerging over the past several years—IoT, IT/OT convergence, virtualization, increased security requirements, edge computing and the cloud, for example—comes more data center complexity.

As technology and its usage become more complicated, it's not unusual for any complex project, let alone data center infrastructure, to become more complex and convoluted as well.

Complexity arises when products, tools and resources not designed to work together are used to support a network. This mix-and-match approach can occur for a variety of reasons, but it often happens because today's technology demands require data center managers to move quickly. There often appears not enough time to be practical, do things the "right way" or think through long-term ramifications.

The result? IT systems that are difficult to design, install, maintain and manage, ultimately causing higher capital and operating costs, slower deployment, increased potential for human error, escalating risk profiles, potentially more downtime and scalability problems.

Why Does Data Center Complexity Matter?

Business and technology developments are headed our way at an alarmingly fast pace, putting strong, non-negotiable demands on data center infrastructure in all markets. Existing IT systems and components become quickly outdated as requirements increase—whether they're from hardware, software or users themselves.

These issues are compounded by the increasingly high rate of change in global marketplaces due to a variety of factors, including changing traffic patterns, global events (like COVID-19 or climate change) and evolving business models.

Consider these statistics that highlight how technology is driving these increasingly complex challenges:

- 125 billion devices will connect to our networks by 2030 (IHS Markit)
- 127 new devices connect to the internet every second (Cisco)
- There will be 1.9 billion 5G cellular subscriptions by 2024 (Ericsson)
- The IoT healthcare market is expected to reach $140 billion by 2024 (Zion Market Research)
- 80% of industrial manufacturers are using or planning to use IoT devices (Tech Pro)
- 60+% of U.S. cities are investing in smart cities/IoT technology (TechRepublic)
- 90% of retailers plan to use IoT to customize store visits (PwC Research)
- 90% of technology, media and telecom companies say IoT growth is critical to business (McKinsey)

The pandemic also changed data center expectations. Data centers have always provided critical infrastructure for business and life, but COVID-19 showed us just how important their role really is.

Instead of usual pockets of peak demand, remote work increased data center demand throughout every day. Online/video meetings have become the norm, placing even more pressure on data centers. As our scope of work becomes more diverse, so do the places where we expect reliable connectivity.

We're not just having online video meetings from well-equipped offices—they could be in our homes, on the road, in a restaurant or on vacation.

Despite this increase in usage and our insatiable appetite for 24/7 technology, data centers are also being called on to operate as efficiently as possible by keeping energy costs low and maximizing space utilization.

All these demands translate to pressure on data center operators, which not only impacts complexity but also increases the possibility of human error.

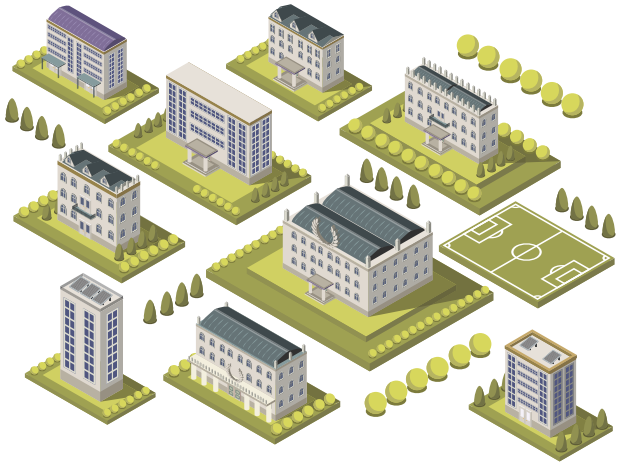
According to a recent Uptime Institute survey, human error accounts for approximately 70% of data center problems. These mistakes could be caused by being overworked or in a hurry, lack of understanding of the equipment or failing to follow standard procedures (or not updating procedures), such as labeling or misconfiguration.

The more complex a data center is, the more difficult it can be to ensure efficiency for systems, equipment and IT staff. It can be hard to implement new technology and strategic initiatives to move your business and data center forward when you're stuck in reactive mode, dealing with problems traced back to data center complexity.

Here are seven ways to reduce complexity by improving data center simplicity.

1. Emphasize Standardization

While we have industry standards that offer guidelines, it's important to pick the right standards for you and your application. From there, it's essential to use, adapt and change industry standards, even sometimes creating your own standards to make sure the foundation you build is driven by purpose and intent.



Let's consider a university campus as an example. That environment could use off-the-shelf products standardized by TIA, BICSI and others, but those products may not address the needs of the entire university (or the nuances of a particular institution). Your own standards could complement the industry standards you use and address things like working in historical buildings or greenfield vs. brownfield projects, for example. Embrace the good work of others but modify it to make it unique to your purposes.

It's also important to watch emerging standards that may change how your data center operates in the future. For example, the Open Compute Project (OCP) may move hyperscale standards out to the edge.

Beyond published industry standards, the idea of standardization applies to the products you deploy as well. As active equipment needs to be replaced, standardization is something to keep in mind—as well as the infrastructure that supports this equipment. Utilizing a standardized approach to data center hardware lets you work with common parts, technology and upgrade approaches that make maintenance smoother and faster to save time, resources and money.

A standardized operating environment can simplify IT infrastructure, allowing operations to become more efficient at a lower overall cost. Even something as simple as racks and cabinets that assemble using a similar process will save time.

It's important to note that developing your own standard isn't a "one-and-done" task. It needs to be a living document. As technology and needs changes, and as successes and missteps occur, the standard needs to evolve to recognize what happened in the past and accommodate what's to come.

2. Streamline Vendors

If your data center is made up of services and solutions from several vendors, you already know how difficult it is to manage patches, upgrades and maintenance.

Even though using several providers can lead to increased complexity, many data center managers struggle to overcome this problem. A recent IDC survey found that nearly 50% of IT professionals rely on 10 or more software support services; more than one-quarter of the survey respondents had 20 or more vendors delivering hardware and data center support. Keeping all that information straight could be a full-time job!

Integrating equipment from various vendors introduces unnecessary complexity. Are products interoperable? Does combining two pieces of equipment pose a potential downtime problem? The more types of products that are deployed, the more opportunity for problems that pull valuable staff resources away from strategic initiatives to fight fires caused by product deployment and compatibility.

Work with a data center partner that offers, understands and appreciates all components of a data center—from the rack space to the parking space—including fiber, copper, steel, cybersecurity

and electronics, such as software, applications and connectivity. Also make sure your provider understands your industry: The needs of a hospital vary greatly compared to the needs of a large fulfillment warehouse. Select partners that span the states, countries and continents where you do business, as well as partners that offer consistent support across all product lines. Select partners that are based on solutions, not widgets, so they're invested in your success and not focused on placing products.

By involving fewer parties and people, you'll know exactly who to call when there's a problem—and fewer opportunities exist for incompatibility. There are also fewer contracts to sign and manage, and fewer warranties to track.

3. Select Products Engineered to Work Together

Investing in products engineered to work together goes hand in hand with streamlining vendors. You'll experience faster, less complex installation when fiber, copper and steel products are designed and manufactured to fit together and follow consistent installation processes. These solutions are designed to run at peak efficiency all the time. Where you are planning for the worst-case scenario, these solutions avoid pitfalls and keep "gotchas," such as insertion loss, at bay.

It's important to realize that, sometimes, an off-the-shelf product won't work to meet your goals. For example: Maybe you need certain airflow requirements for a tall seismic rack. In this case, you need a tailored or completely custom solution. You need to look at the solution holistically and not just at individual needs in isolation. Each data center's requirements are different, so don't be afraid to ask for what you need. If your current vendor can't support it, then find one that can.

When products are engineered to work together, you'll experience the flexibility of making product switch-outs and changes without compatibility or footprint issues. This reduces complexity, which also reduces the opportunity for human error and unplanned downtime due to product incompatibility or installing components that don't work together.

4. Easy Installation and Maintenance Requirements

A complex data center environment makes it more difficult to identify the root cause of errors and misconfigurations. When there's a complex problem, a complex fix is likely the solution.

Selecting products with improved installation and maintenance features means shorter lead times, less training time for staff and lower maintenance costs—whether you're talking racks and cabinets that come together quickly with adjustable rails and taller heights or pre-terminated solutions that allow for quick installation, easy MACs (moves, adds and changes) and simple migration to new technology.

There are many examples of products that make installation and maintenance simple by fitting more equipment into less space, reinforcing proper cable management, supporting multiple generations of equipment, reusing assets when it's time to upgrade and making MACs straightforward:

- Fiber connectors that can be terminated reliably in a short amount of time
- Category 6A cables with small diameters that improve space utilization while combining the best mechanical and electrical characteristics available to support mission-critical applications
- Connectors that rely on a single termination method, using a universal termination method for all shielded and unshielded Category 5e, 6 and 6A RJ45 connections
- Patch cords with built-in LEDs, making it easy to find patch cord connections in dense patching areas for critical connections

- High-density patch cords that are easy to remove through the use of a flexible pull-tab
- Modular and customizable building blocks that can adapt to changing needs

By reducing installation and maintenance complexity, you can save money, time and frustration. Trimming a few seconds or dollars here and there may not seem like much—but saving just a few minutes (or dollars) a day can add up to hours and days of savings (or thousands of dollars) over time.

5. Responding to Complexity "Seepage"

Just because you've made a concerted effort to remove complexity from your data center doesn't mean it won't come creeping back in. And even if you haven't made great strides in reducing data center complexity so far, it's not too late to implement practices that will prevent things from getting worse.

When new products, systems or components are proposed, identify potential issues and commonalities right away. This may also allow you the opportunity to leverage an existing system or application for multiple uses to avoid investing in something new or unknown.

Look for a vendor like Belden that owns its R&D process and is based in infrastructure: a vendor that understands your connectivity (fiber and copper), infrastructure (enclosures, power and cooling) and networking and software needs. This level of control can help you embrace our increasingly complex world by creating solutions that can move forward to become standardized offerings.

Need to design a data center for a mixed-use building that supports fiber to the home for condos plus fiber-enabled connectivity for retail and commercial tenants? Creating this complex environment is only possible when you have control over the solutions you deploy.

We formed our Customer Innovation Centers (CICs) for this very reason: to help you embrace our increasingly complex world through tailor-made solutions.

Many conversations with customers about enhanced solution delivery start here, virtually or in person. This collaborative environment lets you co-innovate with expert advisors—sales, technologists, application experts and product engineers—to develop, test, document and deploy solutions to make your efficiency, security and innovation goals attainable. You get to see how the solutions we design will work in your environment before they go live.

Recently, we worked with an ISP/technology firm that had its own ideas about how to support fiber optic infrastructure. The only problem? The infrastructure to bring this fiber-management concept to life didn't exist.

The team had an open conversation with Belden about needs and expectations. We met to discuss possible solutions, listening to ideas and feedback based on how installers would work with and deploy components in the field. The partnership resulted in a solution to help them manage data center fiber without compromising on ease of use.

6. Find Products that Serve More than One Purpose

Complexity tends to grow over time. Systems are often built to do one specific task; as needs change, they're modified or converted to do things they were never originally intended to do.

Open bridge racks are a good example: They offer an Open Compute solution and a standard solution without having to purchase and store double inventory. They can be used as standard IT enclosures until your data center decides to migrate. When that decision is made, the racks will be ready—you won't need to purchase new ones. They convert quickly (in less than 40 minutes) from EIA-310 rails to Open Compute rails in the field.

Mixed-media options make it easier to transition from copper to fiber (or vice versa) without having to make space for additional components. For example, copper frames can easily be swapped out for fiber frames within the same patch panel when they share the same form factor.

Modular cabinet designs support your power and cooling requirements today but also allow you to manage changes in density, power and cooling in the future without having to invest in new cabinets.

Whatever the situation, find a partner that will work alongside your team and become part of the project management process. This ensures that you have the right material at the right time.

7. Aim for Seamless Scaling and Migration

Your data center should be equipped to handle current needs while offering a clear path for future technology requirements—whether you're starting fresh or integrating with legacy equipment.

Planning for migration is a key to keeping complexity under control. As you prepare for future technologies, a migration plan can help protect your assets. It also provides a valuable roadmap to follow as you make decisions transition from things like hot-aisle/cold-aisle configuration to liquid cooling, for example.

In the last two decades, we've helped one data center through at least five major technology migrations. Throughout each of these upgrades, they've been able to reuse most of their infrastructure to protect capital investments. By reducing the amount of forklift upgrades required, you'll make the most of the dollars you spend.

Data center complexity can be reduced when components are used that allow you to grow and migrate to new systems and support higher-density form factors and higher-speed applications in the future without compromising performance or reliability.

This reduces the need for lots of redesign and reconfiguration work. It also allows data center staff to upgrade systems faster while avoiding complete teardowns and replacement.

Learn More

When data center processes and components are simplified, installation and maintenance become easier and less costly, staff resources are available for strategic tasks, troubleshooting becomes less cumbersome and migration is easily achieved.

Belden empowers people and organizations to support in-building and across-campus data centers through industry-leading copper and fiber infrastructure. We can help you design, upgrade and maintain a data center that decreases complexity by emphasizing simplicity.

To be successful, your data center must be reliable; you need consistency, certainty and trust in your partners to deliver that level of comfort.

Our solutions include:

- A strong partnership with you, your integrators and the rest of the project team
- Collaborative solution development, including R&D, product development and project management
- Data center products that avoid cumbersome installation
- Products that eliminate compatibility issues and large product-replacement requirements
- Solutions designed and engineered to work together for easier, quicker installation and better system performance
- Cable and connectivity solutions developed in-house to seamlessly work together
- Scalable components that allow for fast upgrades and backward compatibility without full teardowns
- Stringent testing requirements that help you exceed standards

To learn more about Belden data centers, visit **www.belden.com/markets/data-centers**.