



5 Key Decisions in Data Center Design

The design and deployment of data centers is as much an art as it is a science. Myriad decisions must be made throughout the process, whether you're tackling a new build or a tech refresh.

Here are five infrastructure-related choices that can have a big impact on your project's labor requirements, deployment time, and manageability:



1. Termination Method

Choosing whether to deploy pre-terminated cabling or perform field terminations is the first step in data center design. Both options have distinct advantages. The method selected will be influenced by the amount of planning you want to do, how quickly you want new equipment deployed, and how much labor you can invest in the project.

Pre-Terminated Cabling

Advantages:

- Offers rapid deployment by reducing installation time and requiring fewer installers
- Factory-tested terminations eliminate the need for transmission performance testing in the field
- Minimizes material waste, jobsite cleanup, and purchase of proprietary tools or equipment
- Eliminates variation due to differing skill-levels of field technicians
- A cleaner factory termination environment provides better overall transmission and lower loss budgets

Field-Terminated Cabling

Advantages:

- Offers more control during installation and more flexibility should the infrastructure change
- Requires less upfront planning of cabling and termination routes and lengths
- Reduces purchase lead-time when ordering cable



2. Network Standardization

Industry standards are an important tool for data center design. The standards created by ISO, IEEE, and TIA ensure the interoperability of equipment regardless of the geographic location, field of industry, or size of the network. However, forgoing established standards can sometimes be vital to furthering a specific organization technique, business need, or data center design.

Industry Standardization

Advantages:

- Helps stabilize manufacturing costs and market prices
- Provides consistency among organizations within an industry, and personnel or departments within a business
- Lowers staff education time and hiring costs
- Minimizes human error and network downtime
- Creates consistent installations for organizations with multiple data centers

Network Customization

Advantages:

- Custom color connectors, adapters, patch panels, and cable routing systems may be the most efficient and cost-effective option for extremely large networks that have significant purchasing power and specific needs that standard products cannot meet
- New standards, such as those that ushered in Cat 6A, are often outgrowths of application customizations by manufacturers and end-users who drive innovation to accommodate performance or capability requirements not addressed by existing standards



3. Expenditure Planning

Whether planning a data center upgrade, expansion, or greenfield design and construction, data center managers face the competing requirements of reducing immediate capital expenditures (CapEx) while minimizing ongoing operating expenditures (OpEx).

Greater Capital Expenditure

Advantages:

- Larger CapEx investments can help reduce on-going OpEx expenditures
- Blending and owning complete facilities offers total control and responsibility
- CapEx investments, such as cabling migration strategy, climate control, and solar power, can be designed to minimize OpEx over time
- Long-term amortization and deduction of CapEx may be beneficial from an accounting perspective, depending on the financial situation of the organization

Greater Operating Expenditure

Advantages:

- Sustaining ongoing and even rising OpEx expenses can help defer larger CapEx outlays
- OpEx expenditures tend to be stable and easier to budget for over the long-term
- OpEx costs will be incurred regardless of system upgrades; by allocating funds primarily for OpEx, the organization can moderate its overall IT budget
- Using colocation facilities can increase OpEx, while keeping CapEx down
- Colocation offers more options for edge data centers and fog computing applications



4. Cable Management

Cable management is one of the most visible elements of data center design. The decision to deploy a free-standing floor-based cable management system that places the cabling backbone above the racks, or a building-based infrastructure organization that routes cable under the floor or in the ceiling, has many ramifications to both the overall data center design, the engineering of the building, and the function of the network itself.

Free-Standing Cable Management

Advantages:

- Can be installed in any network application
- Typically offers the greatest design versatility and space-saving options
- Places no weight burden on the building's existing structure
- Allows the preparation and deployment of an entire rack in many POD-type rack-and-roll methodologies
- Minimizes network downtime, speeds deployment, and reduces the likelihood of human error
- Provides numerous options for zero-RU patching
- Increases airflow and heat dissipation

Building-Based Infrastructure

Advantages:

- Installation in the flooring removes the cabling backbone from view and may offer protection from accidental damage (a subfloor is required to support the racks)
- An overhead cable run allows the installation of ladder racking or cable trays supported from the ceiling via threaded rods (the ceiling must be engineered to support the cable load)



5. Density

Port density requirements vary from data center to data center. Whether standard density or high-density is deployed within a network will impact an organization's budget resiliency, system downtime, and network manageability, both during the data center design phase and throughout the lifetime of the system.

Standard Density

Advantages:

- May fully meet the needs of smaller data centers and enterprise applications
- Facilitates field terminations and fiber splicing
- Allows network administrators to make frequent moves, adds, and changes
- Provides an easy means of tracing patch cords and trunk cables
- Offers more space to accommodate splice trays and port ID labeling

High-Density

Advantages:

- Offers significant space savings
- Reduces costs by minimizing the amount of expensive data center floor space required for patching
- For large data center and enterprise applications, a higher density of ports per RU will pose no inconvenience as changes are made at the rack level more often than at the port level
- Network manageability can be facilitated with the addition of cable managers, pre-terminated cabling, and meticulous port identification

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