

MANIFEST

the best practices for data center planning.

Critical Facilities Implementation

Business white paper





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Executive summary

The data center landscape is undergoing dramatic changes, driven by economic factors and technology evolution. Capital costs and construction time versus availability and complexity trade-offs can impact decisions to create a greenfield facility or retrofit your existing data center. Meanwhile, factors such as adaptability, reliability, energy efficiency, and operating costs are undergoing significant changes. This paper discusses these dynamics and explains how to go about data center planning—to be able to comfortably meet your current uptime performance goals as well as future business needs.

What do you do when you have maximized your existing IT facilities—and still need more?

Years of both organic and inorganic growth can result in undersized, uneconomical systems. It can also lead to rigid architecture, redundant applications and platforms, and inefficient silos of poorly utilized computing capacity. With resources often allocated to maintain infrastructure and applications rather than

modernize them, the growing need for IT availability and reliability are seldom met with agility.

Aging data centers can be a barrier to business growth, as they are costly to maintain and manage. In addition, they face constant demand for more—more space for more servers, more cooling, and more power. Optimizing existing resources can help; although “band-aid” approaches—such as partitioning hot aisles and cold aisles, using water and air cooling on racks, and using floor fans—simply do not resolve major data center power and cooling issues.

For many organizations, the way forward is to build or retrofit a data center to accommodate advanced technology and business needs well into the future. Typically, the time gap between building one data center and the next is about two decades; by which time, you are likely find the considerations and expertise for building a new data center have changed immensely. The significant increase in power requirements is a case in point. A few years ago, anything up to 5MW was considered large. But today, HP Critical Facilities Services has designed 150MW data centers.

Figure 1: Factors affecting data center operations

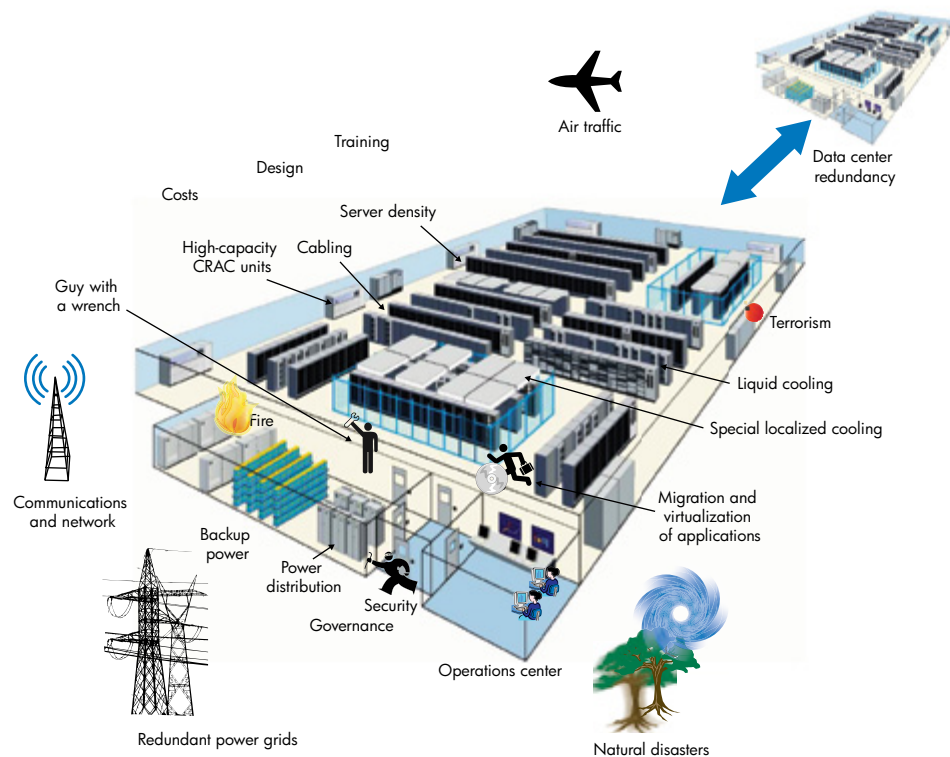


Figure 2: Critical Facilities Services



Making the decision—to build or retrofit

The decision to build or retrofit is a complex choice that may have major financial and operational repercussions. Much of the conventional thinking that has driven this decision process in the past is being challenged today. Clearly, the dramatic cost escalation of greenfield and brownfield data centers is not sustainable anymore, despite improvements in the economic environment.

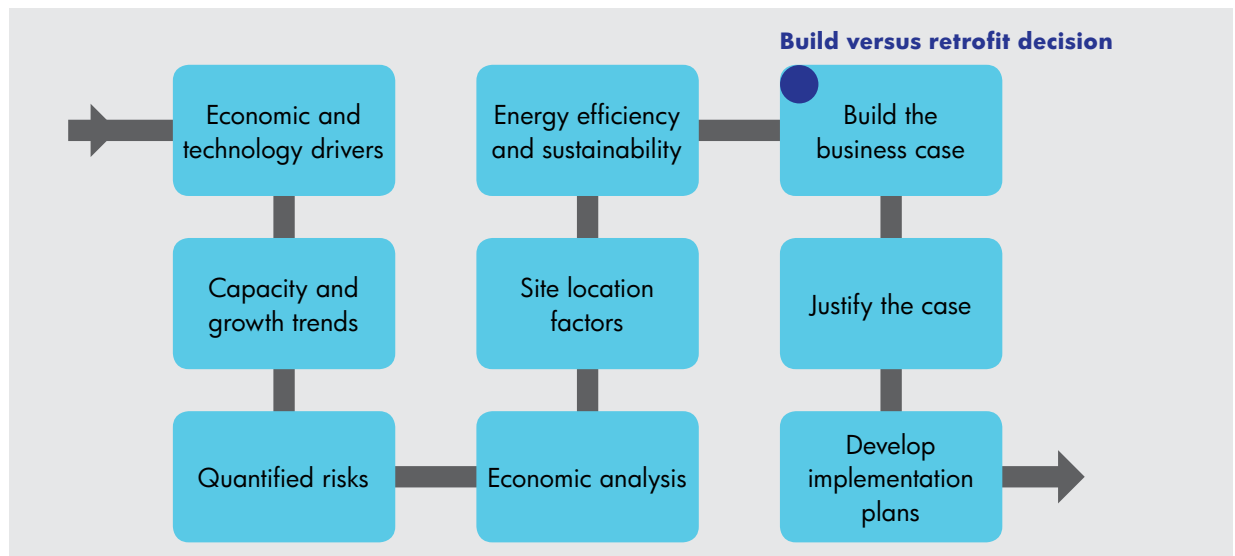
The data center industry is undergoing a rapid and significant transformation that will address the need for facilities that are faster and more energy-efficient, cost-effective, scalable, and reliable. Moreover,

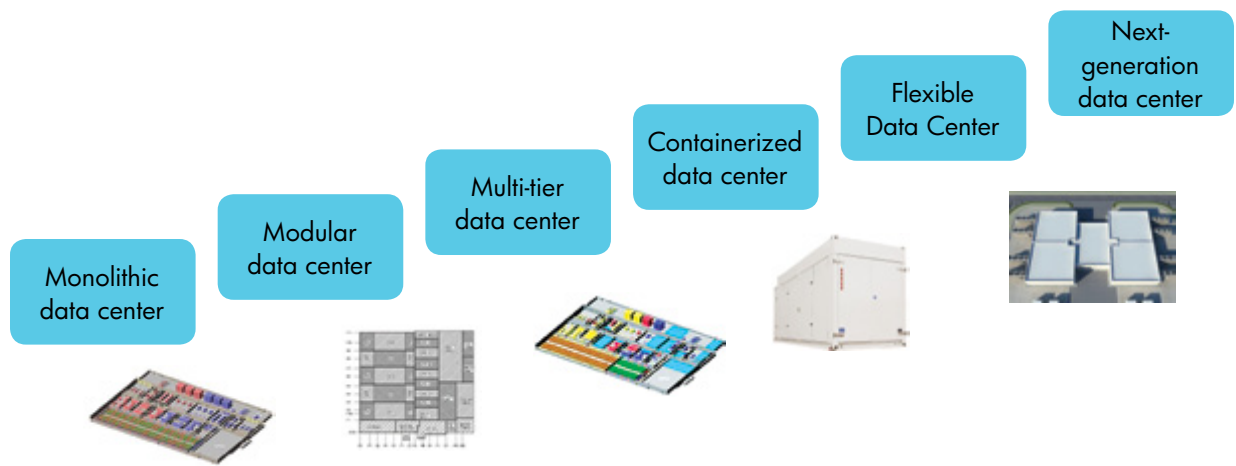
Converged Infrastructure and the growth of the cloud as a means to deliver IT services can also have a major impact.

HP can help you arrive at your “build or retrofit” decision with thorough economic analysis and a roadmap that takes you through various business and IT drivers, future trends, operating requirements, and the total cost of ownership (TCO). We can assist in building the business case, justify our recommendations, and support you with the resources required to implement a total solution that is right for you.

Within this process, we use modeling techniques and analytical tools to quantify risks and help forecast energy consumption and operating costs to accurately project the TCO. This can set your entire project on the right foot.

Figure 3: Arriving at the decision to “build or retrofit” a data center





Choosing a data center design that makes sense for your business

After making the decision to build or retrofit, organizations mostly base their data center plans on parameters like watts per square foot, cost to build per square foot, and tier levels. All too often however, these criteria are not aligned with their respective business goals and risk profiles. This sort of poor planning leads to poor use of valuable capital, which can increase operational expenses. Before settling on a certain approach, it is imperative to understand what each methodology has to offer.

Evolution of data center design

Historically data centers have been, and continue to be, monolithically designed. But more recently, we've seen the emergence of three broad types of designs—each supporting a distinct business model:

- Enterprise data centers—which require high reliability, customization flexibility, and the ability to support tomorrow's workload densities—typically have tier-3 or tier-4 ratings.
- Data centers of Internet-based companies—which don't need high reliability and tend to be homogenous for standardized expansion—typically have tier-1 or tier-2 ratings.
- Heterogeneous data centers of colocation companies—whose requirements are lower than those of enterprise organizations—typically have higher tier ratings than the data centers of Internet companies.

An experienced partner can help you suitably evaluate your current and future business needs, and zero in on the data center design that best serves your organization's purpose.

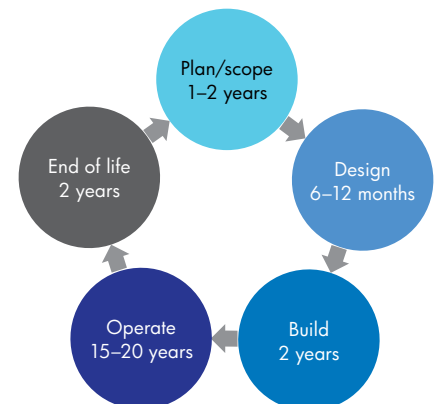
Getting what you need when you need it

One of the most difficult problems in the data center business is the dichotomy between the long life expectation for the facility and the need for frequent technology refreshes. There is typically a 2–4 year interval from the start of the planning phase until the data center is fully operational. If you add the normal operating period and the end-of-life period, we are approaching something close to 20 years. How then would one account for the rapid changes in technology, business climates, and an organization's fortunes, as well as mergers and acquisitions? The answer lies in modularity and accurate provisioning.

Data center lifecycle

HP has led the adoption of modularity with the introduction of multi-tiered hybrid designs over a year ago. Continuing the trend is the recent introduction of [HP Flexible Data Center](#)—enabling greater modularity, standardization, availability, and agility, as well as lower TCO.

Figure 5: Data center lifecycle



Key best practices for data center planning

Costs, energy efficiency, sustainability, time to value, and redundancy to meet future needs are some of the many factors that go into the decision-making process. The overwhelming number of details can overshadow the big picture. While there are several specialized consultants in the field to help you find your way, assimilating and assessing ideas and inputs can sometimes add to the confusion. It helps to have a consultant like HP that possesses a keen, end-to-end perspective. Having implemented turnkey design-build solutions successfully for organizations across the globe, we've developed a set of key best practices that can help you steer clear of pitfalls:

- 1. Include facilities and IT in the design team**
 - Integrate facility and IT needs, as this leads to reduced operating costs and improved efficiency
 - Begin Converged Infrastructure planning right at the building design stage
- 2. Plan with accurate data**
 - Take into account the entire TCO—including CapEx (cost to build), OpEx (operations and maintenance), and energy efficiency (PUE¹ and LEED²)
 - Arrive at a realistic estimate of what it will cost to build the data center
- 3. Drop preconceptions, include open minds**
 - Don't assume that you need a tier-3 or tier-4 data center design
 - Verify if the design criteria reflects your business needs and risk profile correctly
- 4. Right-size the data center**
 - Select a site only after you've finalized the design criteria
 - Plan the space only after you've finalized the design criteria
- 5. Enable modular flexibility even for [power and cooling](#)**
 - Don't underestimate future power and cooling needs and costs
 - Assess the TCO and ROI for realizing your PUE goal
- 6. Be green while improving energy management**
 - Plan ahead for LEED certification
 - Gain a good understanding of the qualifying criteria
- 7. Keep the design simple and include external design experts early**

One-stop accountability for the entire design-build process

HP Critical Facilities Implementation (CFI) Services can provide you a complete turnkey design-build solution, bringing together the design and build program of the facility. Experienced HP data center project managers oversee third-party services from approved general contractors to perform the actual construction.

We start with a meeting in a workshop setting to gather the information needed from your team to define the scope of work for designing and building the data center. Our CFI team then documents your requirements to develop a conceptual design for a data center that:

- Is right-sized for your environment
- Allows for flexibility and growth as the business grows
- Accounts for your current and future business and IT needs, as well as growth projections

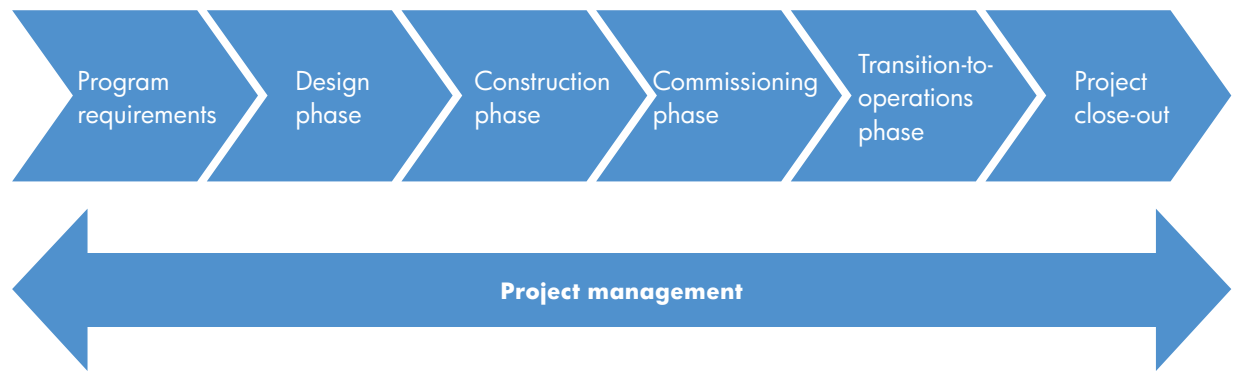
Incorporating the best practices of our existing proven solutions in designing and commissioning of data centers—with HP Critical Facilities Design (CFD) and HP Critical Facilities Assurance (CFA)—CFI offers you a solution with end-to-end project management. Our lifecycle approach to project management comprises the following phases:

- **Program requirements:** Here, we define your data center needs by developing a basis of design (BOD). The BOD outlines the architectural, mechanical, electrical, and plumbing requirements, as well as the redundancy level to support future IT availability demands. This data is collected through a series of interviews and site visits.
- **Design phase:** In the design phase, we take the BOD input and develop conceptual, schematic drawings. Then, we finalize the construction documents required to obtain permits and plan the construction. During this phase, we also start the commissioning planning for Integrated System Test (IST), which will take place after the construction is completed.
- **Construction phase:** This is where the actual "build" takes place. Here, one of our preferred partners takes the construction documents and starts the "build out". We obtain all the required permits and licensing needed to complete the project.

¹ Power Usage Effectiveness

² Leadership in Energy and Environmental Design

Figure 6: Project management lifecycle



- **Commissioning phase:** Here is where we test the data center to verify its functioning as indicated in the design. The installed facility equipment is put through a functional test by the manufacturer to see that it powers up and operates well. We then conduct IST, where we test the capability of the data center as a whole—under fully-loaded design conditions—to verify proper functioning of the equipment.
- **Transition-to-operations phase:** Here, we do a complete “walk through” with your staff and document any areas that need addressing. We then define and schedule the work that needs to be done. Additionally, we provide systems training by a factory representative to your designated personnel. Finally, we compile and provide a collection of all owners’ manuals and warranty information.
- **Project close-out:** Here, we review all aspects of the project to enable completion and sign off.

If you are planning a larger data center, CFI can bring in additional collaboration. Based on your technology strategy and needs, CFI can also include elements of HP Critical Facilities Consulting (CFC) to help build an overall data center roadmap that defines:

- How many data centers need to be built
- Where to place them
- What the space/power/cooling requirements will be

CFI also includes data center optimization as part of the design-build solution. There are many issues that can be addressed as part of this process. Depending on your specific needs, this can include:

- Improved cost-performance ratio
- TCO that can offset the capital costs
- Better reliability
- Capacity that can support demand growth
- Enhanced energy efficiency and sustainability
- Higher load densities

- Faster refresh rates
- Greater flexibility and scalability

Ultimately, CFI can help increase the returns from a data center investment, using a holistic approach to systems, physical infrastructure, and data center design. We can integrate the technologies and strategies required to help improve your data center economics and drive innovation—so that you stay competitive.

Top four reasons to partner with HP

HP has the in-house capability to address data center planning—from engineering consulting and design through to proactive support of the data center environment. No other vendor can offer this without partnering. We bring together:

1. **End-to-end critical facility expertise:** HP has the depth of service expertise that few can match locally and globally. We have the vision to combine both facility and IT strategies to deliver a complete solution.
2. **Ability to align multiple interests:** We can align IT, facilities/real estate, and CxO organizations into a single package. In doing so, we provide a future-state data center roadmap that is right-sized, scalable, and flexible—within controlled building costs.
3. **Leadership and innovation:** HP is a global design leader in the “mission-critical facilities” space, with a proven track record in delivering successful customer projects around data center planning, designing, and building. Many of our engineers and design experts are advisors to industry bodies and governments.
4. **Valuable experience:** HP has designed more than 50 million square feet of raised floor data center space. This includes more than 60 greenfield sites—a number of which are 40-megawatt facilities. In addition, HP has designed the world’s first LEED-certified data center and the first LEED GOLD-certified data center.

HP Critical Facilities Services

Innovation in data center design



Realize a data center that's just right for your business. Visit www.hp.com/services/CFI



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