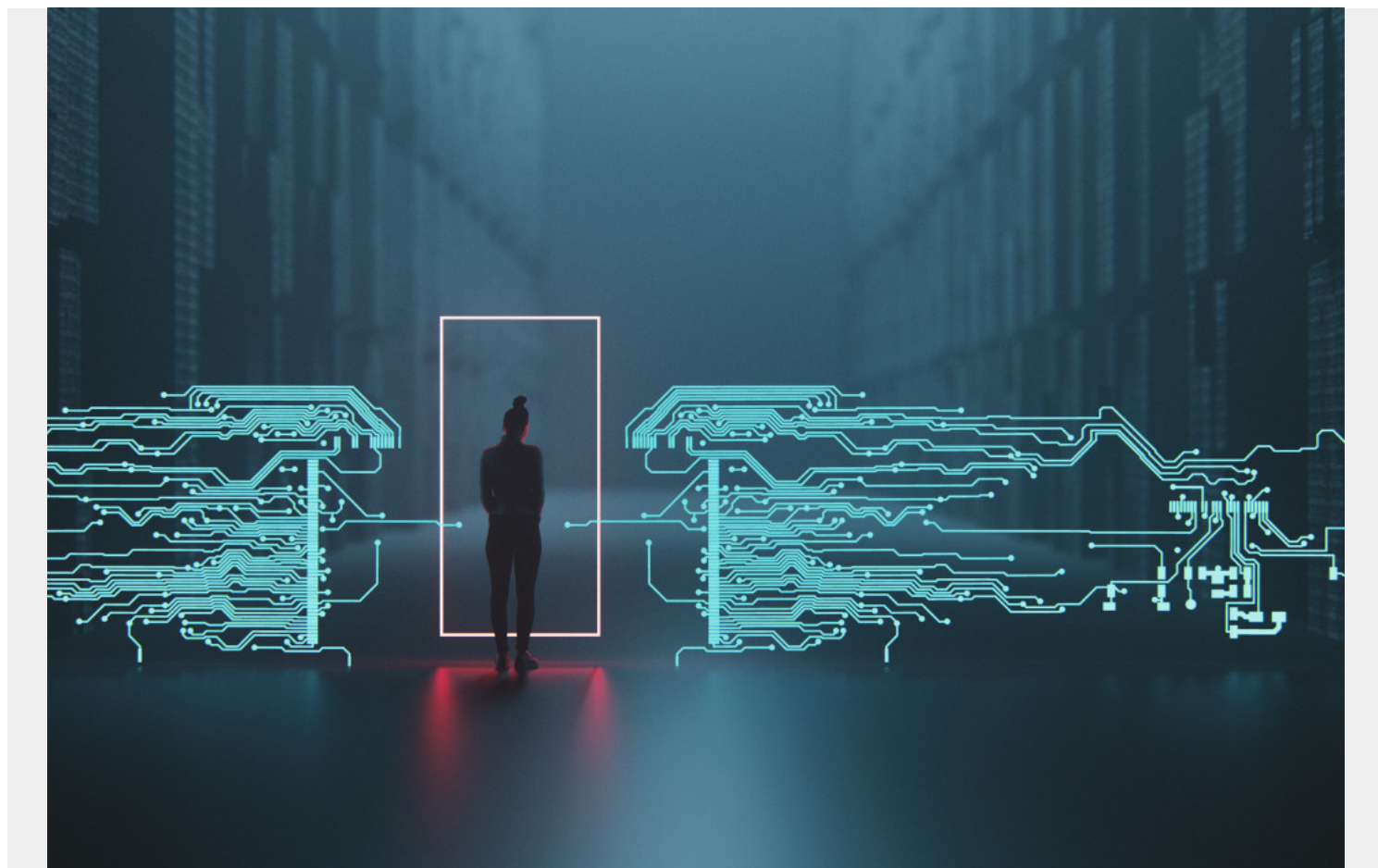# INTRODUCTION TO DATA CENTER OPERATIONS

Data Center Operations refer to the systems, processes, and workflows used to operate a data center facility. These operations include several areas:

- The construction, maintenance, and procurement of data center infrastructure
- The IT systems architecture design and security
- Ongoing data center management, including compliance, audits, and and accounting of the data center organization

In this article, let's look at data center operations, including the core components of running and supporting a data center.

(This article is part of our [Data Center Operations Guide](#). Use the right-hand menu to navigate.)

How data centers work

Large cloud vendors including [AWS, Google, and Microsoft](#) operate a global footprint of data center facilities that serve [cloud-based computing services](#) to millions of business organizations and Internet consumers.

Global IT data center spending has reached [$196 billion in 2021](#). Over 700 [hyperscale data centers](#)

are operational around the world.

As the global Internet traffic has increased by [40% in 2020](#), the number of Internet users has doubled, increasing Internet traffic at 30% per year. The prevalence of work-from-home business practices and video streaming services has significantly contributed toward increasing demands on [highly available](#) data center operations. Other contributions to high data center energy consumption include:

- Machine learning training and inference
- Bitcoin and other cryptocurrency mining

These services are delivered to end-users at specific performance and dependency levels specified in the [Service Level Agreements](#) (SLAs). Additionally, these data center facilities operate [in compliance](#) with stringent global regulations such as ISO/IEC 27001, GDPR, HIPAA, and SOC 2, among others.

Components of data center operations

In order to meet these various objectives, the modern data center operations cover the following key pillars:

- Physical components
- IoT, connect systems & data-driven control
- Standards and process workflows

Let's take a look at each pillar.

Physical data center components

The physical design aspects are critical to managing highly dependent data center operations. Some of the most efficient data centers are located at low-temperature geographic regions, safe and secure from natural and man-made disaster incidents, with ready access to utility and emergency services.

The common physical elements of a data center include:

- **The facility.** The building space with efficient access to utility and emergency services. Since data centers are some of the [most energy-consuming building facilities](#), the architecture is optimized for space and environmental control. Natural cooling in specific humidity and low-temperature regions are chosen to offset energy consumption necessary for [data center component cooling](#). Data centers account for around 1% of global electricity demand, which comes to about 250 TWh.
- **Core components.** This includes the standard IT equipment and software necessary to deliver computing services to a large customer base. These include servers, [networking devices](#), infrastructure such as racks, HVAC and electrical systems, and other [computing infrastructure resources](#).
- **Support Infrastructure.** This includes the [physical security](#) of the space, HVAC cooling, Uninterruptible Power Sources (UPS) such as generators and battery banks, utility services infrastructure. and access to emergency services is critical to maintain data center operations.
- **Operational staff.** The workforce that supports the datacenter, which can include employees

available on-premises as well as off-site teams that work toward managing and maintaining the data center operations to meet the defined performance, security, and compliance standards.

(Learn how the cloud is [changing data center jobs](#).)

IoT, connected systems & data-driven control

The modern data center is highly dependent on a network of connected devices that relay information on several key attributes of the data center operations. These are not limited solely to computing performance and network security, but also include the overall performance of the facility in terms of:

- Cooling
- Energy consumption
- Airflows
- Reliability
- Costs

A Data Center Infrastructure Management (DCIM) solution integrates the network of [IoT sensors](#) to capture relevant information logs from across the facility and data center components. These technologies use sophisticated algorithms and analytics capabilities to:

- Report on data center performance
- Guide on decisions to optimize various aspects of data center operations
- Manage workflow changes at the physical layer of the IT network with respect to the network traffic and software applications running on the servers

Therefore, the supply of computing resources is optimized against changing demands and network traffic flows.

In order to achieve these goals, the DCIM also physically tracks every component of the IT environment tagged by an RFID chip. As a result, the DCIM presents a holistic dashboard view of the current status of all components and helps engineers manage process workflows accordingly.

(Read all about [DCIMs](#) & [data center management](#).)
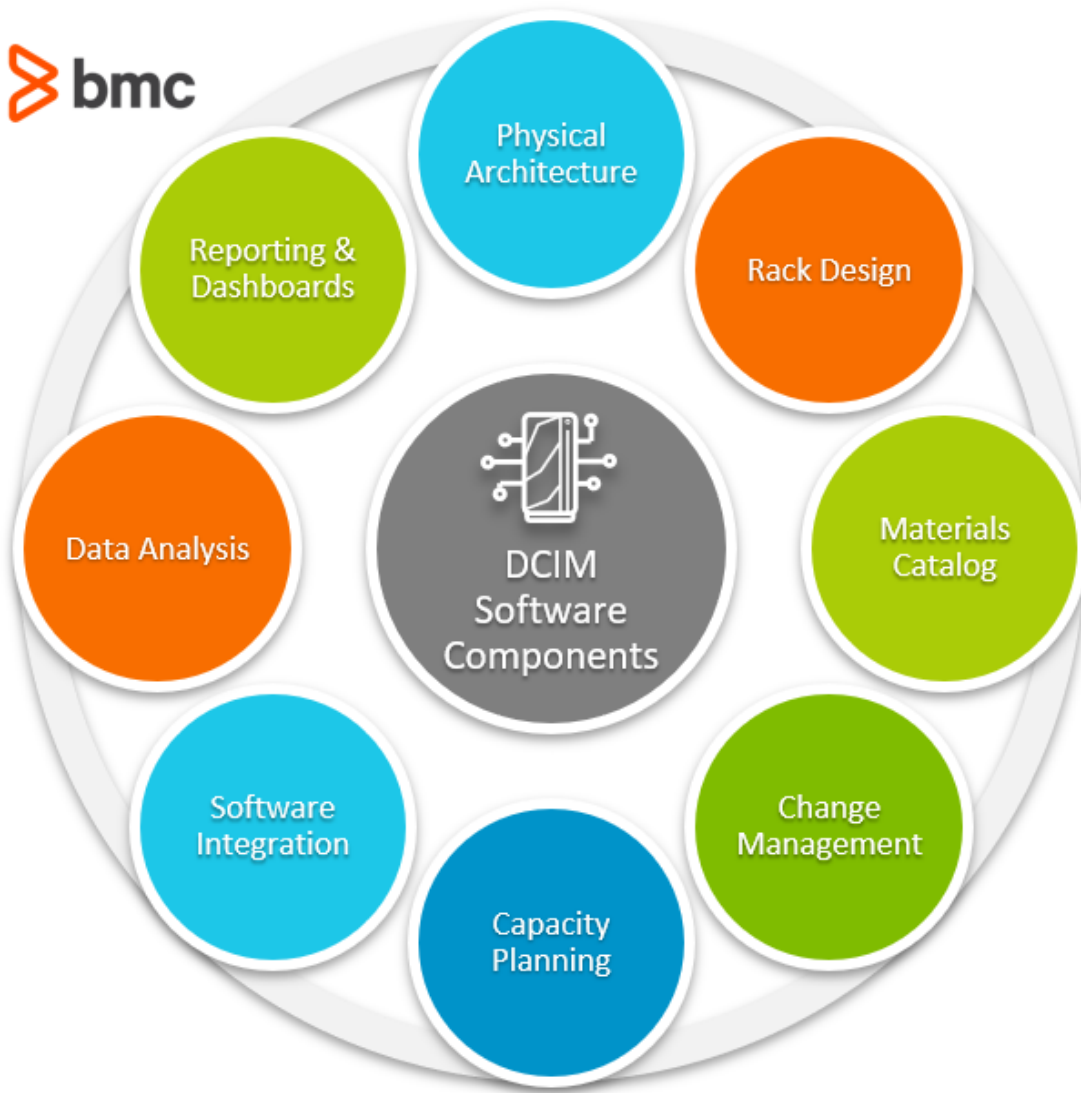
Standards & process workflows

A significant proportion of data center optimization takes place at the logical level. Operational workflows that govern the information flow, system design, engineering and business practices, and the end-to-end data center lifecycle procedures govern the effectiveness of the data center facility.

Industry standards and organizations—including Lawrence Berkeley National Laboratory, The Green Grid, Open Compute Project, ITI and the TBM Council—provide guidelines on managing data center operations. These guidelines encompass the end-to-end lifecycle of data center operations, including:

- Design and deployment
- Management and troubleshooting
- Decommissioning of data center components

Organizations such as the National Institute of Standards and Technology (NIST) provide guidelines on information systems and design architecture of the IT environment.

Optimizing data center operations for customer value

The final element of cloud-based data center operations corresponds to the [IT services delivered to end-users](#). Data center organizations can adopt tools such as [ITIL 4](#) to integrate multiple service management operating models that can help organizations optimize IT operations for maximum business value.

Related reading

- [BMC IT Operations Blog](#)
- [Data Center Tiers: What Are They & Why Are They Important?](#)
- [Data Center Migration: Creating a DC Inventory](#)
- [What is "Data Center Colocation"? Data Center Colocation Explained](#)
- [What Is a Software-Defined Data Center? SDDCs Explained](#)
- [Power Outages at Public Cloud Data Centers: How To Mitigate Risks](#)