Evolution of the Data Center:

How to Modernize Your IT Infrastructure

Rakesh Parameshwara and Björn Kahsnitz

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INTRODUCTION

As companies have grown more and more dependent on technology and data to connect with and serve their customers, demand on IT has skyrocketed. Technology organizations have responded to rising client demands and showcased huge innovations and solutions to cater to customer needs and challenges. With the growth of technology solutions and increasing reliance on technology, the need for next-generation data centers has also grown. ISG believes roughly 2% to 3% of the world's energy utilization comes from data centers alone, and that this number will only grow with the increased reliance on technology and data.

The evolution of data centers from traditional brick-and-mortar facilities to the next generation is fostered by technological, financial and social drivers.

Of course, data centers today are no longer constrained by brick walls. Let's take cloud as an example. Cloud should be thought as an overlay service with a physical data center underlay that resides somewhere or might even be spread across the globe. This means the interpretation of what constitutes a data center is evolving rapidly and can now be seen as a dynamic collection of cloud and traditional server resources that reside in disparate physical locations and have a smart service wrapper that brings them together. This is where the next-generation data center begins.

In a holistic sense, data centers face a number of issues. These include:

- High cost of maintenance and management with major focus on fixed costs
- High cost of energy consumption (and increase of tariffs)
- High dependency on local human labor
- Latency issues giving rise to relatively poor client experience
- High initial capital investment with long depreciation periods
- Slow pace of and limited potential for scalability

How is the next-generation data center solving these important issues?

One of the biggest challenges with the traditional data center is the pain of managing a large infrastructure estate with high dependency on human involvement. Historically, management of IT infrastructure has been a tedious and labor-intensive manual process, which caused errors and inefficiencies that then required even more human intervention. Labor and estate costs could not be easily adapted to volatile demand or business development needs and incurred a consistently high expense.

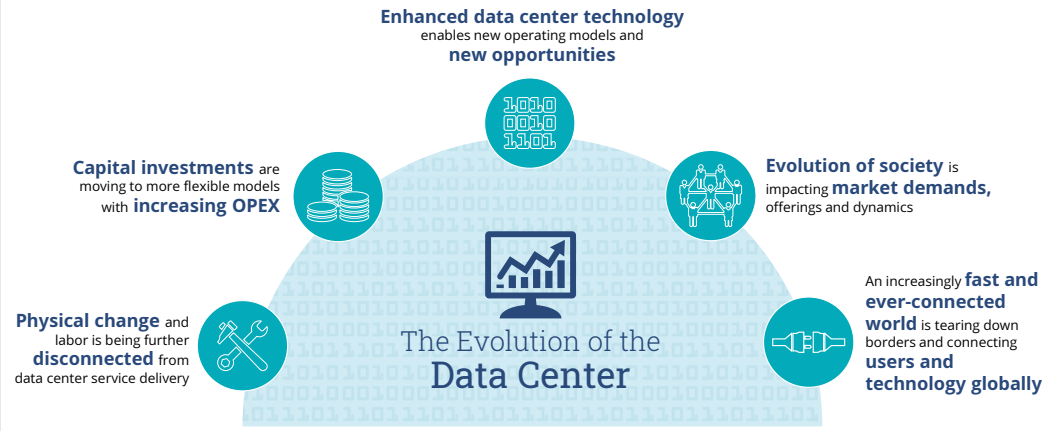

Figure 1: The Evolution of the Data Center

Infrastructure Talent Shortage

With the changing IT job market and the growing desire for more exciting careers that include cloud computing and advanced technologies, solving the need for constant data center maintenance has become a focus for many companies. The field of IT infrastructure is facing a real labor shortage. While increased adoption of automation in the last couple of decades has helped reduce costs, hardware and maintenance issues in self-managed infrastructure environments have continued to be a major problem that require human intervention.

Using Advanced Tools that Reduce Human Involvement

In the last decade, a lot of work has gone into automating infrastructure to enable "zero touch" provisioning and configuration of devices. This was further enhanced through the integration of advanced data center infrastructure management (DCIM) tools, which – in combination with existing enterprise IT systems – provide monitoring, asset management and capacity planning on a centralized platform.

Optimal infrastructure performance and high-uptime is achieved by leveraging data-driven intelligent monitoring systems in large-scale data centers. There is a number of aggregator solutions in the market that give companies the ability to manage large hybrid estates. The advancement in DCIM is decreasing the dependence on human support and intervention – and revolutionizing how data centers are being managed.

Infrastructure as Code and the Software-defined Data Center

Let's now focus on some of the key technology enhancements enabling next-generation data centers of today. Today, companies are employing infrastructure-as-code to eliminate hardware dependencies and allow for automated centralized deployment. This, along with the advent of software-defined data centers, is helping reduce overall operating costs and making server management much more flexible, scalable and efficient.

Software-based architectures are decoupling servers and storage from underlying hardware.

Infrastructure-as-code and software-defined data centers are helping overcome the limitations of the traditional data centers by making data center management easy while reducing the economic burden on companies. A software-based architecture provides additional resiliency that lowers the net unit management costs and allows companies to manage and maintain large infrastructure estates with a relatively thin human service wrapper that is fully decoupled from geographical or distances. Modern technologies and standardized procedures can be reliably and quickly implemented across large environments to foster innovation in fast evolving IT- and IT-supported businesses.

Any conversation about the evolution of the data center requires a clear understanding of the following terms:

What is infrastructure as code?

Infrastructure as code (IaC) is the management and provisioning of computer data centers through machine-readable definition files, rather than physical hardware configuration or interactive configuration tools. It allows organizations to quickly and consistently generate the same environment every time on demand.

What is hyperconverged infrastructure?

Hyperconverged infrastructure (HCI) adds a software layer between physical hardware and instance provisioning. This software-based automation and intelligence allows a company to provision elastic and fully scalable building blocks of storage and compute in a virtual and hardware-independent environment.

What is a software-defined data center?

A software-defined data center (SDDC) is an IT-as-a-Service platform that services an organization's infrastructure, platform or software needs by applying concepts such as abstraction, pooling and automation.

Colocation or Fully Managed Service Data Centers

IT organizations continue to partner with service providers that help them manage both their facilities and IT operations simultaneously. The classic fully managed data center offering is a colocation offering, which provides a number of advantages to companies without the need for capital investment up front. Colocation providers are really the pioneers of the modern data centers of today as they brought about specialist focus and investment that ultimately gave rise to technology advancements. Colocation providers are now acting as a bridge between organizations and hyperscalers by providing embedded connectivity services, which enable organizations to connect with multiple platforms and cloud providers. This is driving increased interest in colocation. Adoption of hybrid IT strategies, in which enterprises have at least one off-site data center along with their existing on-site data center, is also driving the colocation market. In EMEA, 70% are using colocation as the bridge between their own legacy data center and cloud hyperscalers.

Edge technology is bringing compute and storage provisioning closer to consumers and eliminating the barrier of distance.

Edge Computing and Edge Data Centers

Edge computing is built on a distributed computing model that brings computation and data storage closer to the sources of data. Edge computing will bring about another advancement in the data center space by bringing computing closer to the data through decentralized setups, which are commonly referred to as edge data centers. This will make processing more efficient and diminish latency associated with processing large volumes of data in the traditional centralized setup. Edge data centers make use of the synergies between the processing of data and the location of data. Already existing local hardware and facilities are being integrated into global delivery.

Edge computing is not without its challenges, as it requires advanced DCIM that is capable of monitoring and managing complex estates. Edge computing will benefit greatly from HCI, which is the next-generation DCIM. HCI products come with analytics software to monitor workloads and identify resource constraints. The monitoring software is consolidated into a single dashboard view of system performance, including negatively impacted performance. This will act as a catalyst to propel the adoption of edge computing by bringing computing closer to the data and the user. Industrial companies, for example, are using edge computing when they build local branches that delivery globally. In this case, edge technology eliminates the burden posed by geography by tapping into local edge sites that dramatically improve response time and availability.

Sustainability in Data Centers

An increase in data center usage and power consumption increases the need for sustainable solutions. Law makers in support of a sustainability agenda are continuing to toy with the idea of enforcing regulations and a green tax as they see data centers as one the biggest energy consumers given their sheer scale of operations. The rise in big data, AI, ML and IoT technology further drives global energy consumption of data centers. The green data center market is expected to grow over 20% to 30% in the next few years. Data center leaders are pivoting to green energy and renewable sources, like water-efficient and free cooling technologies and reclaimed water supplies to minimize use of potable water. A sustainability agenda is already being adopted by leading colocation providers that are continuing to invest heavily in green technologies to ensure their power usage effectiveness (PUE) is low. Microsoft, for example, has deployed its data center under water. The idea with a submerged infrastructure is that a sealed container on the ocean floor could improve the reliability of the data center. Following this exercise, it was established that underwater data centers can be very practical, highly reliable and exceedingly energy-efficient and sustainable.

Infrastructure design, offerings and technology are driven by increasingly complex functional and financial client demand.

Evolution of Infrastructure Architecture Design and Thinking

With the rise of IaC and customer centricity, companies are more and more interested in service-oriented architectures. Data centers are now employing serverless architecture models enabled through API-led microservices and working in a DevOps style that is prominent in the software development world. DevSecOps is another delivery style that integrates security within the underlying infrastructure to make it regulatory-ready from inception. All in all, infrastructure design and implementation is shifting toward a customer-centric, serverless paradigm.

Eliminating the Need for Capital Investments

More and more companies are moving away from traditional capital investments (CAPEX) in physical data centers and moving toward an OPEX spending model. This stems from the adoption of a product-as-a-service mindset that is driving providers to co-create and deliver tangible value through the relationship rather than going through the traditional slow transformation approach.

Summary

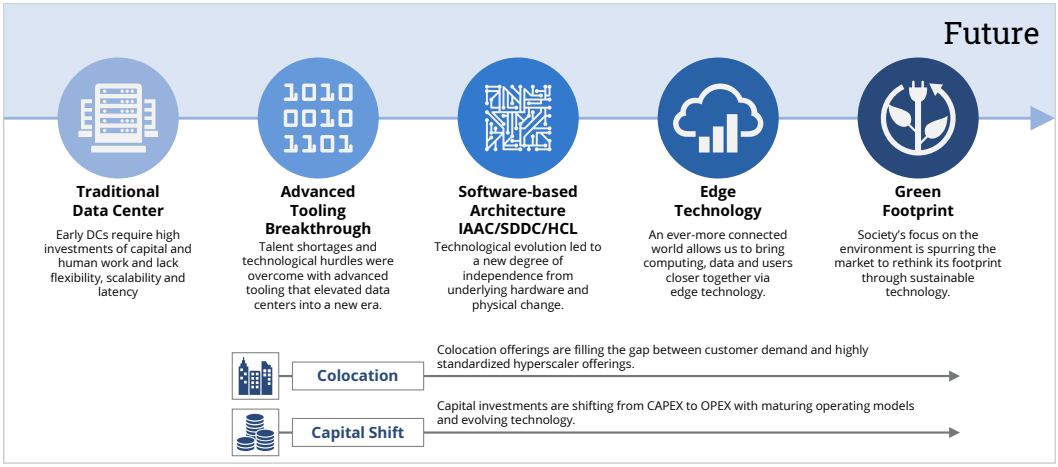

Figure 2: Data Centers are Evolving Rapidly

It is in this context that data centers are evolving. Physical hardware is losing its direct connection to dedicated systems, the pace of provisioning is increasing rapidly and companies are shifting to consumption-based models (making costs variable). The next generation of data centers will be API-led software architecture-based with the server, storage and network resources fully abstracted from the hardware underlay. The green agenda will increasingly drive design of the modern data center, so that infrastructure environments become more sustainable. ISG believes green regulations will drive increased investment in data center modernization projects, with at least 50% of the projects after 2025 directly influenced by it. As customer centricity and product centricity become important areas of focus, IaC-based development is set to become the standard framework. Enterprises will see data centers of the future as hardware-agnostic, scalable and resilient. The data-driven economy will drive edge computing and security will move closer to the data.

Overall, we predict that the next decade will truly lead the way in terms of data center technology and innovations with the increased focus on the green agenda. Companies will need to plan ahead to ensure they don't get left behind both in terms of technology and in terms of green regulations.

ABOUT THE AUTHOR

Evolution of the Data Center: How to Modernize your IT Infrastructure

RAKESH PARAMESHWARA B
Principal Consultant

Rakesh Parameshwara leads the Infrastructure Strategy team at ISG EMEA. He helps clients across all market segments focussing on the holistic technology value chain leading IT strategy, sourcing and transformation engagements. He helps global clients address complex business and technology challenges by leveraging his deep industry and consulting experience. He has led and delivered across the end-to-end deal lifecycle and has built a strong portfolio of clients across the Retail, FMCG, Financial, Transport and Logistics and Travel Sectors.

ABOUT THE AUTHOR

Evolution of the Data Center: How to Modernize your IT Infrastructure

BJÖRN KAHSNITZ
Senior Consultant

Bjoern Kahsnitz is leading the Infrastructure Transformation solution at ISG EMEA. Leveraging 10 years of experience in IT and driving innovation for customers, he is advising leaders in international client organizations in digital transformation journeys and their sourcing program and project lifecycles. As a reliable and trusted partner for decision makers, he helps enterprises shape and achieve their goals by translating customer business and technological demand into delivered artifacts.

ABOUT ISG

ISG (Information Services Group) (Nasdaq: III) is a leading global technology research and advisory firm. A trusted business partner to more than 800 clients, including more than 75 of the top 100 enterprises in the world, ISG is committed to helping corporations, public sector organizations, and service and technology providers achieve operational excellence and faster growth. The firm specializes in digital transformation services, including automation, cloud and data analytics; sourcing advisory; managed governance and risk services; network carrier services; strategy and operations design; change management; market intelligence and technology research and analysis. Founded in 2006, and based in Stamford, Conn., ISG employs more than 1,300 digital-ready professionals operating in more than 20 countries—a global team known for its innovative thinking, market influence, deep industry and technology expertise, and world-class research and analytical capabilities based on the industry's most comprehensive marketplace data. For more information, www.isg-one.com.

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