

## **Pathways of Data Center (PDC)**

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In the early days of computing, data storage was a physical affair, with Punch cards and magnet tapes, holding precious bits of information. And for many years after the days of room-filled computers, data storage remained a physical process, with hard drives and external devices being the primary means of storing and accessing data. Next generation data centers rely on software-defined technologies as their logical layer, allowing for better control of physical and virtual resources.

### **Automation**

One of the biggest priorities of a next generation data center is automation—streamlining workflows and reducing the burden of manual upkeep. Predicting the future is tricky business – but one thing is for sure: data centers are not going anywhere. One of the most secure industries out there at the moment, projecting a CAGR of 8% between 2023 and 2030, they are at the centre of the digital revolution. It's no secret that businesses are currently replacing traditional data centers with the cloud. Gartner predicts that by 2025, more than 50% of global enterprises will have moved to a serverless platform. If you have delayed migration for your own business, you may be asking if it will be worth the investment. Data center needs vary depending on their structure, physical limitations, density requirements and more. Here are four common data center types including onsite, colocation facilities, hyperscale, and edge data centers, as well as their use cases and industry trends. These include Advanced Robotics, Artificial Intelligence (AI), Internet of Things (IoT), Robotic Process Automation (RPA), Quantum Computing, 3-D printing, 5G wireless networks, virtual reality & augmented reality and blockchain.

### **Robotic Process Automation**

The first half of 2023 witnessed robust growth in the data center market; however, most major and secondary markets are struggling with a supply and demand imbalance, leading to a shortage of colocation space and rising pricing, The trend is shifting towards building self-owned data centres for reasons such as vendor reduction, customization and access to renewable energy resources. The use of prefabricated, modular designs is becoming the norm for increased speed and efficiencies through standardization.

### **What is the biggest problem for data centers?**

While data centers are one of the most sophisticated infrastructures, they also suffer from inefficiency, low equipment utilization rates, etc. One of the major problems is security. Overall, Uptime has observed a steady decline in the outage rate per site, as tracked through four of its own surveys of data-center managers and operators conducted from 2020 to 2022. In 2022, 60% of survey respondents said they had an outage in the past three years, down from 69% in 2021 and 78% in 2020. Many organizations want to simplify or scale down their data centers -- but they won't disappear. Admins can examine as-a-service options and cloud to offload some applications. Gartner has predicted that, by 2025, 85% of enterprises will shut down their traditional data centers. In 2021, the data centre industry is valued at US\$1.2 billion, which shows 216% growth from \$385 million from 2014. As of March 2022, the number of data centres in India is 138 and globally India ranks 13<sup>th</sup> in terms of highest number of data centres.

Next generation IoT architectures should be focus on user-aware, self-aware and semi-autonomous IoT systems to address the new real-time capable solutions, which solve performance challenges such as streaming and filtering at the edge, latency and network constraints. In the next 20 years, this new generation Alpha (born between 2010-2025) will emerge in the public space. It is estimated that among others, this generation will live longer, stay in education longer and be more technologically skilled compared to the previous ones. The rapid growth of artificial intelligence—along with other modern technologies, such as streaming, gaming and self-driving cars—is expected to drive continued strong data center demand.

### **What Are the Major Differences Between Data Center Tiers?**

Let us develop a basic understanding of all the four tiers which has recently emerged, featuring more stringent requirements and improved reliability and redundancy.

#### **Tier 1 Data Center (Basic capacity)**

A Tier 1 data center is the simplest and the lowest level of all. The uptime level is around 99.671%, but compared to other tiers, it is a bit on the lower side because the data center features no or little redundancy. Thus, this means that power and cooling equipment has access to only a single path, implying a downtime of 28 to 29 hours every year. For small businesses with no complex requirements, a Tier 1 data center is a good choice, serving their needs pretty well. Most small businesses require data centers for record-keeping, and corporate correspondence tasks, so complete and unfailing reliability is not always a top priority. Essentially, the stakes are relatively low; therefore, the cost incentive of maintaining only a Tier 1 data center outweighs the advantages of higher-tier data centers. Due to its lack of intrinsic reliability, tier-one data centers are limited in their capacity to provide service to businesses that cannot sustain the kind of hampered reliability that is to be expected from this level of the data center. Due to their lack of extensive redundancy, and other key omissions from their design, they are not suitable for companies that require unflinching reliability and failproof service.

#### **Tier 2 Data Center (Redundant capacity components)**

A Tier 2 data center has an uptime of 99.741%, meaning that the total downtime hours in a year are not more than 22. As a Tier 1 data center, the path for power and cooling is still one, but such a data center does comprise some redundant components, including a backup generator or cooling equipment, increasing their perceived reliability. While they may not seem distinctly different from their lower-ranking counterpart, tier two data centers are markedly more reliable than the former. This reliability is capitalized upon by many mid-sized businesses who require reliability superior to that provided by tier-one data centers but cannot afford the prohibitive cost of a higher tier data center. While tier two data centers offer improved reliability compared to tier-one data centers, their inability to function while under maintenance prevents them from being utilized by clients with more demanding requirements. The area in which tier two data centers stand out relative to their operating costs is their improved performance. Unlike tier-one data centers, tier two data centers benefit from redundant hardware and software that substantially improve their up and down speeds without raising operational costs to an unreasonably high level.

#### **Tier 3 Data Center (Comprehensive redundancy)**

A Tier 3 data center is the choice of larger companies, featuring an uptime of around 99.982%. This means that the data center won't go down for more than 1.6 hours in a year. Uptimes improve considerably for a Tier 2 data center because it features a sophisticated infrastructure and a high redundancy level, along with multiple paths for power and cooling. All the components are also connected to multiple power sources. If any of these fails, others can be utilized instead, so performance isn't affected. If maintenance and repairs are required, they can be done without

shutting off the system itself. Also, certain measures are taken to protect the entire data center from a power outage. As compared to tier one and two data centers, tier three data centers offer a level of reliability that is far superior. Naturally, this makes tier three data centers a clear choice for businesses or institutions which by nature, prioritize reliability. Due to their vastly superior reliability and security, tier three data centers are often the choice of law enforcement departments, fire departments, healthcare facilities, and any company that wishes to gain a reputation for reliable and dependable service. Additionally, due to its performance superiority as compared to tier two data centers, it's often chosen as a compromise between performance and affordability.

**Tier 4 Data Center (Fault-tolerant)**

Mega enterprises often select a Tier 4 data center, which exceeds the performance of all three tiers described above. The uptime percentages are as high as 99.995%, meaning that the data center will only suffer downtime of 0.5 hours in a year. A Tier 4 data center also features 96-hour protection from the power outage and multiple redundancies to ensure that the system can maintain consistent performance despite extensive equipment failure. While the redundancy level necessary to operate a tier 4 data center is often prohibitively expensive to operate and maintain, companies with the resources to take advantage of the improved performance and reliability do so without hesitation. Government agencies also often operate their own data centers that meet tier four data center requirements.

<b>Tier</b>	<b>Efficiency</b>	<b>Uptime Per Year</b>
Tier I Basic Capacity	99.671%	< 28.8 hours
Tier II Redundant Capacity Components	99.741%	< 22 hours
Tier III Concurrently Maintainable	99.982%	< 1.6 hours
Tier IV Fault Tolerant	99.995%	< 26.3 minutes

**Tier 5 Data Center**

A Tier 5 data center is a relatively newer trend, meeting all the Tier 4 data center requirements, along with additional ones. These include performing without water, air pollutant detectors, securable server racks, and energy system monitors. A Tier 5 data center is usually preferred for local and renewable power projects. Tier five data centers offer a unique set of benefits compared to the lower tiers, creating a unique niche in the market. Whereas the lower tiers are distinguished from one another by their increasingly unquestionable reliability and performance, tier five data centers have a much more complex and nuanced appeal. To put it simply, they offer a unique set of benefits in addition to their exceptional performance and reliability. This tier of data center appeals primarily to businesses, institutions, or organizations that are concerned with public perception regarding their environmental policy. As a part of an “eco-friendly” public image, tier 5 data centers offer a level of perceived environmental concern that is often overlooked in discussions surrounding the lesser data center tiers. In a few words, tier five data centers are worth the exorbitant amounts that they cost to construct and operate.

Today, most of us (even if we are not always fully aware of it), are storing data in the 'cloud', a term that feels as ethereal as the data it holds. The cloud refers to a network of remote servers that store and manage data, allowing users to access and share information from any device with an internet connection. These remote servers we know best by their more popular moniker, data centers, and they have become an essential part of our digital lives. This transformation didn't happen overnight, and it's far from over.

As we stand on the precipice of a new era in cloud storage, it's worth reflecting on Amara law "We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run." We tend to be overly optimistic about the immediate effects of new technologies but fail to anticipate the long-term consequences.

For example, when cloud storage first emerged, many people saw it as a convenient way to store and access their files from anywhere. But as the technology has grown and changed, it has had effects that go far beyond making people's lives easier. Companies now rely heavily on cloud storage to manage their data, which has made a big difference in how businesses work. This change has also raised concerns about data security and privacy, showing how using new technologies can have long-term effects. No one wants their information to be stolen or viewed by people who aren't supposed to. And with the rise of AI, there is growing concern on how this data will be used. The solution lies in not just a new approach, but the right approach. This is where hiveDisk comes in.

### **Embrace the future with hiveDisk**

Cloud storage has become an integral part of our digital lives, providing a convenient way to store, access, and share data. However, traditional cloud storage services often face challenges such as high costs, limited storage capacity, and concerns over data security and privacy. These challenges have opened the door for innovative solutions that can redefine the way we store and access our digital data. In the evolution of cloud storage, one name rings out—hive disk. This isn't a byproduct of some technological era; hiveDisk is a timely solution that addresses our collective concerns about security and privacy. When we choose hiveDisk, we're choosing the right way to store our files, a future where cloud storage is accessible, secure, and controlled by the user. And this isn't about data stored in some distant data center; the cloud is still the cloud even when we decide to scrap the data centers for a better alternative. hiveDisk operates on a new kind of cloud: a disturbed network called hivenet\_ which spread our data across a hive of computers.

hiveNet utilizes the unused computing capacities of devices worldwide. In simpler terms, instead of the computational tasks being done in a single centralized location, like traditional data centers, hiveNet distributes these tasks across numerous devices connected to its network globally. This makes the process more efficient, reliable, and sustainable.

The idea is that many computers (personal computers, servers, etc.) around the world remain idle a significant amount of the time. During this idle time, these devices have unused computing capacities, which hiveNet aims to leverage. By doing so, hiveNet can provide cloud computing services at a much lower cost, while also reducing the amount of energy wasted on idle devices.

This ensures our data's security, as it is encrypted and divided across numerous devices, enhancing data availability and redundancy. Even if one device fails, our data is retrievable from other devices in the network.

### **The hiveNet solution and the role of hiveDisk**

When we choose hiveDisk, we're not just adopting a service; we're joining a movement—a hive that values the security and sovereignty of data. Here, every contribution matters, helping to create a secure, robust, and user-controlled digital world. hiveDisk isn't just the future of cloud storage; it's about community. And quite frankly, we believe it to be the right way to store our files. It aligns with the global push towards more sustainable digital ecosystems by utilizing the unused capacities of existing devices. This is an environmentally conscious move that reduces the need for additional data centers and the associated carbon emissions.

**Security, accessibility, affordability, and sustainability**—these are the pillars that hiveDisk stands upon. By providing a cost-effective solution, hiveDisk makes cloud storage accessible to a wider audience. This democratization of storage has the potential to spur innovation and growth, further emphasizing the significance of hiveDisk.

### **The impact of hiveNet and hiveDisk on the cloud storage market**

The introduction of hiveNet and hiveDisk into the cloud storage market is set to disrupt the status quo. By offering a distributed, secure, and cost-effective solution, we are poised to challenge traditional cloud storage providers. The unique approach of utilizing unused storage capacities not only reduces costs but also promotes a more sustainable and efficient use of digital resources.

### **The sustainability aspect of hiveNet and hiveDisk**

In today's digital age, sustainability is a growing concern. The energy consumption of data centers, which are the backbone of traditional cloud storage services, is a significant contributor to global carbon emissions. HiveNet and hiveDisk address this issue by utilizing the unused capacities of existing devices, thereby reducing the need for additional data centers. This approach not only makes cloud storage more sustainable but also aligns with the global push towards a more environmentally friendly digital ecosystem.

### **The security and accessibility of hiveDisk**

Security and accessibility are two critical aspects of cloud storage. HiveDisk addresses these concerns through its unique data storage approach. By encrypting and distributing data across multiple devices, hiveDisk ensures that our data is secure and always accessible. Even in the event of a device failure, the distributed nature of hiveDisk's storage system ensures that our data can be retrieved from other devices in the network. This level of security and accessibility is a significant advancement in the realm of cloud storage.

### **The economic impact of hiveNet and hiveDisk**

By providing a cost-effective cloud storage solution, our platform is making digital storage more accessible to a broader range of users. Small businesses, startups, and individuals who may have found traditional cloud storage services prohibitively expensive can now leverage the power of our distributed cloud at a fraction of the cost. They can also use the distributed nature of the platform to contribute idle storage from their devices and use that contribution to offset their monthly plans. This democratization of cloud storage has the potential to spur innovation and economic growth.



\*S Decoret is the author of this picture





<https://depositphotos.com/photo/white-social-network-server-room-data-center-interior-rendering-201963208.html>

### **The future of cloud storage**

As we continue to generate and store more digital data, the importance of efficient and secure cloud storage solutions will only grow. In this evolving landscape, Hive is leading the way, shaping the future of cloud storage and redefining our digital experiences.

Reflecting on Roy Amara's quote, it's clear that the impact of technologies like hiveNet and hiveDisk on cloud storage may be underestimated now, but their long-term effects will likely be profound. As we continue to push the boundaries of what's possible with cloud storage, we're not just storing data; we're shaping the future.

### **About the Author**



**Mr. Raj Pareek**, Management Executive, Crescon Project, Chennai, India. He worked as Head, - Strategic Alliance, Vice President and Business Head in Telecom Industry with more than 21 years' experience. His specific focus in Customer Service Delivery, Program Management, PMO, Order Management, Life cycle management, Alliances, Strategic Partnership, Channel Management and Business Development. Ability to think out-of-the-box and contribute ideas towards achieving business excellence. Pivotal in contributing in all the Govt. Projects for alliances, partnership and technology.