

**HYBRID CLOUD INFRASTRUCTURE VS. ON-PREMISES: SECURITY,
PERFORMANCE, AND COST PERSPECTIVES**

Bahronov Shahzodjon Vahobjonovich

Istamov Mirjahon Mominjonovich

Oybek Eshonqulov Shuhratovich

Abstract. *This article analyzes the differences and features of hybrid cloud infrastructure and on-premises deployment models in terms of security, performance, and cost. The advantages and disadvantages of both models are considered, and recommendations are made on which infrastructure model is more effective for organizations. The article highlights the main factors that are important in choosing a modern IT infrastructure.*

Keywords: *Hybrid cloud infrastructure, security, performance, cost, cloud services.*

In the field of information technology, organizations face many choices when forming their infrastructure. On-premises deployments are based on the traditional method of managing all resources on-site. Cloud deployments, on the other hand, store and manage data and applications with the help of external service providers. Hybrid cloud infrastructure combines these two models, providing maximum flexibility and security. This article compares these infrastructure types in terms of security, performance, and cost.

Cloud technologies are widely used today in various fields, including personal and professional purposes. Due to their efficiency and convenience, they are fundamentally changing the work processes in many industries. Below are examples of the use of cloud technologies in some of the main areas.

In the field of education: Cloud services make the educational process more interactive and free. Students and teachers can easily communicate remotely. With the help of cloud platforms, online courses and lectures have become much more convenient. At the same time, education is available 24 hours a day, and students can



continue their studies at any time and place. This helps to improve the quality of education and improve the level of knowledge of students.

In the field of healthcare: Currently, about 35% of healthcare organizations prefer to store their data in the cloud. This helps to further optimize medical processes. For example, it becomes easier to provide an individual approach to patients, and doctors can quickly monitor the condition of patients. Health information stored in the cloud is always available to specialists, which helps to provide quick consultations and improve collaboration between doctors. This results in reduced waiting times for patients and increased quality of treatment.

In trade: Cloud technologies are also widely used in the trade and retail sectors. They help businesses expand their activities, quickly access large databases, analyze the market, and create online trading platforms. At the same time, cloud technologies make trade relations between sellers and customers more efficient and convenient, which simplifies trading processes and allows you to meet customer needs faster.

In business processes: Cloud architecture offers a wide range of opportunities for optimizing corporate operations. The ability to quickly expand and manage computing power allows companies to quickly grow their business and maintain a flexible pricing policy. In addition, cloud technologies allow employees to serve customers from anywhere in the world, which supports global operations. And data is available 24 hours a day, 7 days a week, and business processes continue uninterrupted.

In today's competitive business environment, organizations are under intense pressure to effectively manage their information technology (IT) resources, regardless of their position in the market. Operating entirely on traditional, local (on-premises) infrastructure is becoming less efficient due to its rigidity and limited flexibility in the rapidly changing conditions of the digital era. At the same time, moving to the full cloud is also a difficult task for many organizations. Data confidentiality, legal restrictions, and large investments already made in on-premises systems make this process difficult.

The hybrid cloud model, on the other hand, combines the best of both worlds and is seen as a perfect solution. This approach allows organizations to keep their



critical systems and data under local control, while at the same time opening the way to take advantage of the flexibility, cost savings, and efficiency benefits of cloud computing. Hybrid cloud technology has been widely discussed recently, as many organizations realize that this approach can meet many of the needs of their IT departments.

Combining local and cloud resources allows organizations to maximize the use of their IT assets and quickly adapt their operations to market conditions. However, the hybrid cloud model is not without its own challenges. Therefore, the decision to implement it should be carefully studied in order to maximize the benefits for each organization.

This article will provide the reader with detailed information about the concept of hybrid cloud computing, its advantages and disadvantages, as well as the application of this model in modern business. It also discusses integration issues between on-premises and cloud environments, industry examples, and the future of hybrid cloud technology. The article also discusses how hybrid cloud will shape the future of IT infrastructure management.

A hybrid cloud is a solution that combines private and public cloud services. A private cloud is specific to an organization, is managed by it, and is intended only for that organization. A public cloud is managed by an external cloud service provider and serves multiple customers. The hybrid cloud model allows organizations to store their confidential and critical data in a private cloud, while storing less sensitive data in a public cloud. This approach allows for data security and efficient use of resources.

In addition, a multi-cloud strategy involves the use of multiple public cloud providers. This approach reduces dependency on a single provider, increases system resilience, and provides a wide range of cloud services. The main advantages of hybrid and multi-cloud solutions include increased flexibility, enhanced data privacy, resource scalability, and optimal management.

The growth trend of hybrid and multi-cloud solutions in 2024 is clearly visible. This is due to the following factors:



Edge Computing: This technology allows for faster and more efficient data processing and reduces network traffic. Critical data is processed locally, without leaving the device, which increases security and speed.

Artificial Intelligence (AI) and Machine Learning (ML): The demand for high computing power in hybrid and multi-cloud infrastructures is increasing, as AI and ML technologies require powerful resources to analyze and automate large amounts of data.

Containerization: Containers, which allow applications to be deployed in a single package, provide efficient use of cloud resources. This makes it easier to quickly and easily migrate applications to different cloud environments.

The world's leading cloud providers — Amazon AWS, Microsoft Azure, Google Cloud — offer a wide range of services for hybrid and multi-cloud solutions.

The use of AI and ML in the cloud technology industry is becoming increasingly widespread. Artificial intelligence plays an important role in automating tasks, efficiently using resources, and predicting needs. Machine learning, on the other hand, allows for distributed computing and keeping data closer to users.

Cloud service providers are constantly working on security measures to protect their users' sensitive data. These processes include the following areas:

Authorization, identification, and authentication: Implementing strong passwords, eliminating outdated passwords, using multi-factor authentication, and biometric systems prevent unauthorized access to confidential data.

System segmentation and regular security audits: IT infrastructure vulnerabilities are regularly scanned and DDoS measures are taken, which strengthens the system's defenses.

Phishing protection: Training employees to identify the security of links sent via email and other messages is an important part of combating fraud attacks.

Advantages of hybrid cloud solutions:

Flexibility and scalability: One of the most important advantages of the hybrid cloud is the ability to dynamically allocate and expand resources based on demand. Organizations can keep their critical systems on-premises and maintain control, while moving less critical or occasionally required tasks to the cloud. This flexibility allows



companies to avoid over-purchasing on-premises infrastructure and quickly adapt to market demands.

Cost optimization: The hybrid cloud model offers a financially efficient solution by dividing IT costs between capital expenditures (CAPEX) and operating expenses (OPEX). Companies are not forced to purchase permanent equipment for all their needs; The pay-as-you-go model of cloud services makes it much easier to manage costs.

Improved security and compliance: Storing sensitive data and critical applications in on-premises data centers gives organizations complete control over security processes. This approach is especially important for industries facing stringent regulatory requirements. At the same time, less sensitive data and applications can be moved to the cloud, as cloud service providers offer advanced security technologies.

Disaster Preparedness and Business Resilience: A hybrid cloud architecture allows organizations to avoid service disruptions during disasters by backing up data on-premises and in the cloud. Cloud backup and recovery solutions provide geographic redundancy, ensuring that applications continue to operate even in the event of a local disaster.

Accelerate innovation: With hybrid cloud, organizations can leverage new cloud services and technologies while leveraging existing IT infrastructure investments. This enables faster adoption of advanced technologies such as artificial intelligence, machine learning, and IoT, and drives innovation.

Workload optimization: Each workload can be placed in the most optimal location for its performance, security, or cost—on-premises or cloud infrastructure. This strategy improves overall system efficiency and resource utilization.

Legacy support: Every company has legacy applications that are impractical or risky to migrate to the cloud. The hybrid cloud model allows these legacy systems to be kept on-premises while integrating with next-generation cloud applications and services.



Enhanced collaboration capabilities: The cloud components of a hybrid cloud give every employee access to the resources and applications they need from anywhere over the internet. This is especially important for remote work and distributed teams.

Limitations of Hybrid Cloud Solutions:

Management Complexity: Managing a hybrid cloud can be more complex than managing an on-premises or fully cloud-only infrastructure. IT teams need new skills, tools, and careful planning to ensure that the two environments work together effectively.

Disadvantages:

- High initial investment.
- Ongoing maintenance and support costs.
- Difficulty in scaling and changing.¹

In conclusion, organizations should make their infrastructure choices based on their security, performance, and financial needs. If privacy and control are a priority, on-premises is preferable. At the same time, hybrid cloud solutions are helping businesses run more efficiently. These solutions give organizations a competitive advantage by modernizing data centers, accelerating digital transformation, strengthening information security, and expanding the ability to operate on a global scale. In the future, hybrid cloud technologies are expected to evolve further to include features that support edge computing, quantum technologies, artificial intelligence-based management systems, and environmental sustainability. This will be an important factor in adapting to constantly changing technological and business requirements. If flexibility and cost-effectiveness are required, a hybrid cloud infrastructure may be a better solution.

REFERENCES

1. Mell, P., & Grance, T. (2011). The NIST Definition of Cloud Computing. National Institute of Standards and Technology.

¹ Sultan, N. (2014). Making use of cloud computing for healthcare provision: Opportunities and challenges. International Journal of Information Management, 34(2), 177-184.



2. Rittinghouse, J. W., & Ransome, J. F. (2017). Cloud Computing: Implementation, Management, and Security. CRC Press.
3. Sultan, N. (2014). Making use of cloud computing for healthcare provision: Opportunities and challenges. International Journal of Information Management, 34(2), 177-184.