1. **Discuss 5 points you will consider while choosing between private cloud and public cloud. Explain the reasons behind your selection criteria.  Provide examples.**

Ans1 These are key factors to consider before deciding whether private cloud or public cloud is the better fit for your company.

## Budget

If you run a small business that has a tight budget, you should consider a public cloud provider, because you only pay for what you need. Plus, you probably lack the funds to invest in hardware, software, and staff necessary to set up a private cloud.

If you're at a large organization with a bigger budget, it might be cheaper to invest in a private cloud than rent a lot of public cloud resources in order to run long-term projects. You will have complete control over security, compliance, hardware, virtual servers, failover algorithms, and Service Level Agreements (SLAs).

## Security and compliance

If your organization has Sarbanes-Oxley Act ([SOX](http://en.wikipedia.org/wiki/Sarbanes%D0Oxley_Act" \t "https://www.techrepublic.com/article/public-or-private-cloud-5-criteria-to-help-you-choose/_blank)), Health Insurance Portability and Accountability Act ([HIPAA](http://en.wikipedia.org/wiki/Health_Insurance_Portability_and_Accountability_Act" \t "https://www.techrepublic.com/article/public-or-private-cloud-5-criteria-to-help-you-choose/_blank)), and/or Payment Card Industry Data Security Standard ([PCI DSS](http://en.wikipedia.org/wiki/Payment_Card_Industry_Data_Security_Standard" \t "https://www.techrepublic.com/article/public-or-private-cloud-5-criteria-to-help-you-choose/_blank)) compliance requirements to meet, you should choose a private cloud to process or store sensitive documents. You know where in the private cloud the documents are when you want them. Also, your organization has certain security controls that a public cloud provider doesn't have.

The public cloud is more suitable for processing and storing non-sensitive data (you don't care where they are in the cloud). You will likely be satisfied with a public cloud provider's security controls.

## Hardware and virtual server control

Software as a Service (SaaS) users and Platform as a Service (PaaS) developers have no control over hardware and virtual servers; the only control a SaaS user has is to access an SaaS application. PaaS developers have control over the SaaS application life cycle; they decide what stress testing methodology to use and what operating system to run on the platform. Only the provider has the control over hardware and virtual servers.

If your organization wants complete control over hardware and virtual servers, you should consider a private cloud. If your budget is limited, I recommend looking for a public cloud provider. You can rent a SaaS application or develop simple applications on the PaaS of your choice.

## Failover control

If you choose to set up a private cloud, you will have complete control over a failover plan to ensure the cloud service will be available to users. You specify which healthy servers can automatically take over when a server's connection fails, or when the server experiences sudden loading spikes. You can test your failover algorithms in different scenarios to make sure they will work properly when a server begins to fail.

A public cloud provider has complete control over a failover plan -- the provider doesn't share its proprietary failover algorithms with you. The public cloud is the right choice if you don't care about the location of any server or which healthy servers would take over.

## SLA management

A private cloud helps an organization have complete control over SLA management. Your business can see how direct and indirect SLAs are related and what metrics are used in each SLA to measure service availability at given points of time.

A public cloud provider has control over SLAs with all tenants. As a public cloud subscriber, your organization should be allowed limited negotiation on the terms in a SLA, including an exit clause. The provider will not let you view SLAs it has with other tenants and vendors.

## Summary

If you have sufficient funds, have compliance requirements to meet, and want complete control over security, hardware, failover, and SLA management, a private cloud is your best bet. Otherwise, I advise you to opt for a public cloud provider.

1. **Explain how Hybrid clouds can help an Enterprise. Provide examples.**

## Ans2 **1. Maintain easily-accessible private infrastructure as well as have a plan for Disaster Recovery**

Disaster recovery is one of the major benefits that the hybrid cloud offers enterprises, especially those new to the cloud. Without the cloud, disaster recovery is often expensive and resource-heavy, including backup sites or applications owned or rented by the organization. While a prime need for maintaining on-prem data centers is to be ready in case disaster strikes, a hybrid cloud model can make a big difference in terms of cost-savings and flexibility.

A public cloud can be used for less critical resources, including backup database storage and compute and would still allow you to maintain control over sensitive data in your data center. Cloud-based storage and computing resources are elastic, meaning you only pay for what you use, allowing organizations to duplicate applications and infrastructure and store recovery data for a fraction of the cost of on-prem disaster recovery solutions.

Disaster recovery is a must-have for any enterprise, and the benefits afforded by a hybrid cloud disaster recovery model are attainable for anyone, with a best of both worlds scenario: Storage and compute costs remain low while availability always remains high.

## 2. Streamline day-to-day functionality

Agility is a growing business need. Being able to respond to customer and business demands is a constant concern for enterprises, and is a big driver for [DevOps](https://www.stratoscale.com/blog/datacenter/5-software-defined-data-center-capabilities-that-enable-devops/) and other agile development methodologies. Cloud adoption is essential for DevOps, and it’s increasingly important for all enterprises. As more and more organizations become agile, competition has grown, pushing enterprises to innovate faster and faster.

The hybrid cloud allows enterprises to both keep up with responding to customer needs by innovating faster, while not shaking up the whole organization by moving to a full cloud environment. With the right hybrid cloud provider, [migrating](https://www.stratoscale.com/blog/datacenter/tips-successful-cloud-migration/) to and from environments, whether virtual machines or containers, can be as simple as the push of a button, allowing teams to work and collaborate quickly and efficiently, no matter where they are.

## 3. Reap the Benefits of  Cloud Bursting

Organizations often deal with workloads that fluctuate in use, and keeping high resource levels available at all times in your own infrastructure is costly and ineffective. The cloud offers the major benefit of unlimited resources on demand, and the hybrid cloud offers the additional benefit of close monitoring of all resources being used to best balance your organization’s demand with supply.

One way enterprises benefit from the hybrid cloud is a process called [cloud bursting](http://www.gartner.com/it-glossary/cloudbursting). Cloud bursting expands workloads to a public cloud on demand during spikes, and then scales back to the original servers once the peak is over. The additional storage and compute resources are essentially ‘rented’ only for the time needed.

Cloud bursting, especially for high-performance applications, eliminates many of the issues, both cost and performance-wise, that resource spikes can create. In a full cloud model, you receive a monthly bill which details your resource usage, and have separate costs for any on-prem infrastructure.  A hybrid cloud model, monitored in an all-encompassing dashboard, offers total insight and cost-control over your entire environment. With better oversight over which resources are misallocated or over-provisioned, the hybrid cloud offers a prime method of cost cutting. A [recent IDG survey](https://www.emc.com/collateral/brochure/dellemc-analyst-report-digital-business-demands-hc.pdf" \t "https://www.stratoscale.com/blog/cloud/7-reasons-hybrid-cloud-ideal-enterprises-new-cloud/_blank) proved this, reporting that organizations with a hybrid cloud model cut IT costs by an average of 24 percent across the board.

The oft-discussed use case for cloud bursting is for eCommerce and similar applications that use a steady amount of resources most of the time but have peaks – such as end of year sales in November and December – that require many more resources than normal. In these cases, a hybrid cloud model with cloud-bursting can be a terrific solution to the problem.

## 4. Sharing what needs to be shared, keeping private what needs to be kept private

Many organizations have been hesitant to move to the cloud out of worry for security and privacy, as well as compliance regulations. It’s a fair enough concern, and one that the hybrid cloud can help solve. Because while privacy and security should be of utmost concern, businesses still need to innovate at a high rate  – something that fully private infrastructure cannot maintain. An additional offering for enterprises that deal with confidential data is the ability to create a [multi-tenant cloud](https://www.stratoscale.com/blog/cloud/cloud-101-multi-tenant-cloud/) within the hybrid model, which segregates applications and resources from each other and can be further isolated with VLANs and additional encryption methods.

Highly sensitive businesses such as hospitals and other medical organizations have found success using hybrid cloud models that allow them to keep full control over sensitive data, such as patient records and communications between staff, by keeping it stored on-premises and readily accessible, while relegating less-sensitive data and workloads in the cloud. Using a multi-tenant model, access to applications can be restricted to only to those with privileged access. A hybrid cloud model enables these organizations to maintain HIPAA and HITECH guidelines with the right service provider and enjoying the scalability, flexibility, and efficiency that the cloud has to offer.

## 5. Better Control/Manage Big Data Analytics

For Big Data organizations, [migrating](https://www.stratoscale.com/blog/cloud/cloud-migration-savings/) to a hybrid cloud model offers an ideal solution which enables them to better serve their customers and their own employees by providing the most up-to-date and relevant data. For example, employing a hybrid cloud for big data analytics can help eCommerce, news, and social media platforms tailor messages and promotions custom to their unique behaviors.

The cloud was made for big data, with its scalability, compute power and elastic resources, and if your enterprise is involved in big data analytics, you should be utilizing the cloud. The added benefit of maintaining a hybrid solution with an on-prem data center is for disaster recovery and keeping private data out of the public pool.

## 6. Scalable as You Grow

By integrating with your existing infrastructure, a hybrid cloud solution offers an easy way to cost-effectively extend your capabilities into the cloud. Whether your organization is growing already or has plans for major growth, scaling on-premises infrastructure can be cost-prohibitive, to say the least.

A hybrid cloud model is an excellent way to continue managing current business requirements while being able to support current and future growth. [Stratoscale’s private cloud platform](https://www.stratoscale.com/solutions/private-cloud-platform/) eases your way into a hybrid cloud model by providing all the benefits of the cloud on your on-prem environment while streamlining operations with public cloud APIs. The ability to use the same scripts and DevOps infrastructure to manage both the on-prem and public cloud components of your hybrid cloud enables  innovation while keeping costs down.

## 7. Improve Customer Experience

Last but not least is the hybrid cloud’s ability to improve the customer experience. The cloud enables faster time to market, allowing enterprises to more quickly respond to customer needs and requests while rapidly developing new products and services. For example, with a hybrid cloud model, healthcare organizations can interact with patients in real-time and financial institutions have better oversight over a customer’s full financial overview.

## Conclusion:

The hybrid cloud is the ideal use of public and private resources that maximize cost-savings and productivity and minimize latency, privacy and security issues.

**3. Read the case study and suggest which deployment model they should go and why**

**- A group of organizations having similar computing concerns and have shared interest in business ventures, and research. Their customers may also want to share their experiences in a common portal.**

Ans3 They should go for a community cloud because the systems and services need to be accessed by a group of organizations and also by the group of their customers who want to share their experiences in a common potal. A community cloud has restricted access like a private cloud and at the same time, the cloud resources are shared by a number of independent organizations like a public cloud.

**4.Which SaaS you are using currently or have used in the recent past? Please explain how you have enjoyed the service and what was the payment mode ?**

Ans4 <https://getnerdio.com/academy/10-popular-software-service-examples/>

<https://fastpayltd.co.uk/blog/saas-payments-what-is-the-best-option/#:~:text=SaaS%20pricing%20models%20are%20subscription,for%20both%20customer%20and%20company>

<https://blog.paylane.com/33-payment-forms-of-the-most-popular-saas-in-the-world/>

1. **How can IaaS help Startup organizations ?**

Ans5 Having the ability to offer a commoditized, scalable, and virtual Operating System with infinite capacity and with OPEX (Operational Excellence) based cost model, IaaS can:

* Allow new organizations investing in hardware with no upfront capital
* Create the foundation for successful business continuation
* Provides the tight security to protect computing environments from breaches
* Allows for quick implementation making it easier moving to the cloud since they already have an infrastructure in place
* IaaS provides both the servers and networking components.

**6. How PaaS can help higher-level programming?**

Ans6 A cloud-based PaaS solution provides developers with a stable groundwork and less overhead, so they can focus on building the code that adds value. PaaS solutions allow for higher-level programming with significantly reduced complexity. This means faster development and quicker delivery of new applications, an important competitive edge.

**\*Long Questions:\***

1. **Discuss with examples about the importance of cloud over traditional datacenters.**

Ans1 Cloud computing is far more abstract as a virtual hosting solution. Instead of being accessible via physical hardware, all servers, software and networks are hosted in the cloud, off premises. It’s a real-time virtual environment hosted between several different servers at the same time. So rather than investing money into purchasing physical servers in-house, you can rent the data storage space from cloud computing providers on a more cost effective pay-per-use basis.

The main differences between cloud hosting and traditional web hosting are:

**Resilience and Elasticity**

The information and applications hosted in the cloud are evenly distributed across all the servers, which are connected to work as one. Therefore, if one server fails, no data is lost and downtime is avoided. The cloud also offers more storage space and server resources, including better computing power. This means your software and applications will perform faster.

Traditional IT systems are not so resilient and cannot guarantee a consistently high level of server performance. They have limited capacity and are susceptible to downtime, which can greatly hinder workplace productivity.

**Flexibility and Scalability**

Cloud hosting offers an enhanced level of flexibility and scalability in comparison to traditional data centres. The on-demand virtual space of cloud computing has unlimited storage space and more server resources. Cloud servers can scale up or down depending on the level of traffic your website receives, and you will have full control to install any software as and when you need to. This provides more flexibility for your business to grow.

With traditional IT infrastructure, you can only use the resources that are already available to you. If you run out of storage space, the only solution is to purchase or rent another server.If you hire more employees, you will need to pay for additional software licences and have these manually uploaded on your office hardware. This can be a costly venture, especially if your business is growing quite rapidly.

**Automation**

A key difference between cloud computing and traditional IT infrastructure is how they are managed. Cloud hosting is managed by the storage provider who takes care of all the necessary hardware, ensures security measures are in place, and keeps it running smoothly. Traditional data centres require heavy administration in-house, which can be costly and time consuming for your business. Fully trained IT personnel may be needed to ensure regular monitoring and maintenance of your servers – such as upgrades, configuration problems, threat protection and installations.

**Running Costs**

Cloud computing is more cost effective than traditional IT infrastructure due to methods of payment for the data storage services. With cloud based services, you only pay for what is used – similarly to how you pay for utilities such as electricity. Furthermore, the decreased likelihood of downtime means improved workplace performance and increased profits in the long run.

With traditional IT infrastructure, you will need to purchase equipment and additional server space upfront to adapt to business growth. If this slows, you will end up paying for resources you don’t use. Furthermore, the value of physical servers decreases year on year, so the return on investment of investing money in traditional IT infrastructure is quite low.

1. **Differentiate between professional cloud and personal cloud with examples.**

Ans2

|  |  |
| --- | --- |
| **Professional Cloud** | **Personal Cloud** |
| This type of cloud is used for professional ventures and is thus used by an organization or a group of organizations. | This type of cloud is used for personal usage and is thus used either by an individual or relatively by a small number of individuals like a family or a group of friends. |
| Storage capacity is more | Storage capacity is less |
| More difficult maintenance | Easier maintenance |
| Less economical | More economical |
| Requires more security | Requires lesser security |
| Higher automation makes the work easier | Not much automation isrequired generally. |
| Requires more resilience | Lesser but not zero resilience is required |
| Larger network access | Smaller network access |
| One can pay for professional cloud | One cannot pay for personal cloud |
| Example- Google Drive, Amazon Simple Storage Service (S3) | Example- WD My Cloud |

1. **Explain the benefits of B2B services in cloud environment.**

Ans3 Benefits of a B2B Cloud Services Solution:

1. Improve and streamline onboarding and management of your trading partners
2. Enhance visibility and control over business processes shared with outside companies
3. Increase the reliability and performance of your B2B operations
4. Reduce the Total Cost of Ownership (TCO) of your B2B operations
5. **Explain storage management in cloud.**

Ans4 The cloud storage management portal mechanism allows cloud consumers and cloud service consumers access to interact with and control data stored in a cloud environment. This mechanism can be implemented to store data in the cloud in different formats, including structured and unstructured datasets, and to store data in different types of cloud storage devices. It also allows cloud consumers to access data regardless of its type and underlying cloud storage device type. The cloud storage management portal mechanism provides a feature for data owners to publish and share data with other cloud consumers inside or outside of the cloud environment. Data owners are given control to govern who can access their data using an API. An integration point is provided via an API for required applications to interact with datasets stored on a cloud storage device. Cloud consumers can publish datasets or grant access to other external users via the use of integration APIs and by further integration of the mechanism to other cloud service consumers and identity sources. Different types of cloud storage devices can be used to store different types of datasets that cloud consumers can access and interact with from a single point via a cloud storage management portal mechanism, as shown in Figure 1.

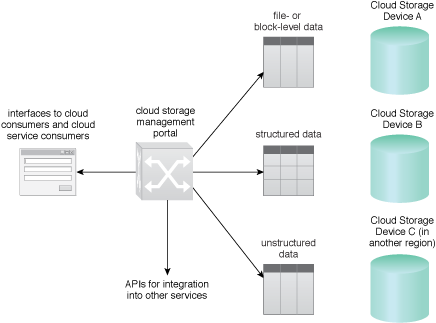


Figure 1 – A cloud storage management portal mechanism acts as a single point of access between the cloud consumer and different types of datasets stored on cloud storage devices.

1. **Explain multi-cloud strategy. Is it advisable to adopt this strategy? Justify your answers with examples.**

Ans5 Multi-cloud is the use of two or more cloud computing services from any number of different cloud vendors. A multi-cloud environment could be all-private, all-public or a combination of both. Companies use multi-cloud environments to distribute computing resources and minimize the risk of downtime and data loss. They can also increase the computing power and storage available to a business. It is absolutely advisable to adopt the multi-cloud strategy. A multi-cloud strategy allows companies to select different cloud services from different providers because some are better for certain tasks than others. For example, some cloud platforms specialize in large data transfers or have integrated machine learning capabilities. Organizations implement a multi-cloud environment for the following reasons:

**• Choice:** The additional choice of multiple cloud environments gives you flexibility and the ability to avoid vendor lock-in.

**• Disaster Avoidance:** Outages happen; sometimes it is due to a disaster; other times it is due to human error. Having multiple cloud environments ensures that you always have compute resources and data storage available so you can avoid downtime.

**• Compliance:** Many multi-cloud environments can help enterprises achieve their goals for governance, risk management and compliance regulations.

A multi-cloud platform combines the best services that each platform offers. This allows companies to customize an infrastructure that is specific to their business goals. A multi-cloud architecture also provides lower risk. If one web service host fails, a business can continue to operate with other platforms in a multi-cloud environment versus storing all data in one place.

Stats can tell the story -- and a growing number of organizations are adopting a multi-cloud strategy. Specifically, IDC predicted in its [IDC FutureScape: Worldwide Cloud 2017 Predictions](https://www.idc.com/research/viewtoc.jsp?containerId=US41863916) that more than 85% of enterprise IT organizations will commit to multi-cloud architectures by 2018. And, the drivers behind the trend are crystal clear. Benefits, such as avoiding vendor lock-in, cost savings, performance optimization, a lowered risk of DDoS attacks, as well as improved reliability, are all critical as businesses jockey for position in today’s new digital economy.

Perhaps the most attractive benefit for some organizations is the ability to avoid vendor lock-in. When IT adopts a multi-cloud strategy it provides the organization with the leverage rather than the cloud provider. When it’s clear upfront that the workloads may end up transferring between providers, development teams can build apps that work across providers. This approach makes it easier to transfer between cloud service providers when pricing or differing capabilities make a different route more appealing.

At the same time, competing in today’s increasingly digital economy heavily depends on the organization’s ability to run workloads within the most appropriate environments – whether the goal is to take advantage of cost savings or capitalize on performance optimization opportunities.

It is important since every provider has strengths and weaknesses and it’s not uncommon to leverage multiple providers to complete one customer transaction. A properly managed multi-cloud architecture gives IT the freedom to seamlessly shift the transaction as needed.

As cloud deployments have grown, so too has the likelihood of DDoS attacks not only taking a site down, but ultimately keeping it down.  However, a well-crafted multi-cloud architecture helps lessen the effectiveness of DDoS attacks by providing a level of resiliency not available with a single provider. If a cloud provider suffers an attack, this strategy lets IT instantly shift the load or only the impacted services to other cloud environments.

A multi-cloud strategy can also improve reliability. Specifically, with multi-cloud an otherwise passive cloud can seamlessly serve as the failover solution when the primary cloud has issues processing a requested service such as an e-commerce transaction. And, once the primary cloud is back to its normal function, the operations can automatically revert.

Each benefit associated with a multi-cloud approach can prove instrumental in establishing or maintaining a competitive advantage in today digital economy. Of course, realizing these benefits requires a solid strategy to map out opportunities as well as access to a well-crafted management tool. A solid tool should help simulate migrations, as well as provide the visibility needed to ensure seamless inventory, security, migration, and change management. The best tools also offer multi-cloud cost forecasting – a necessity when establishing a realistic budget.

1. **Is elasticity and scalability same in cloud? Support your answer with examples.**

Ans6 Cloud Elasticity is a tactical resource allocation operation. It provides the necessary resources and capacity required for the current task and handles varying loads for short periods. For example, running a sentiment analysis algorithm, doing database backups, or just taking on user traffic surges on a website.

Cloud Scalability is a strategic resource allocation operation. Scalability handles the scaling of resources according to the system's workload demands. Chatbots are an example of cloud scalability in action. Advanced chatbots with Natural language processing that leverage model training and optimization, which demand increasing capacity. The system starts on a particular scale, and its resources and needs require room for gradual improvement as it is being used. The database expands, and the operating inventory becomes much more intricate.

1. **Assume that your business wants to migrate to cloud computing from traditional computing. What are the essential things you will be considering before moving to cloud platform?**

## Ans8 5 factors to consider when migrating from traditional computing to cloud platform:

### 1. Cloud assessment

When moving towards the cloud, firstly analyze your current IT environment and build strategic goals. There are three types of cloud: private, public or hybrid.

Private cloud provides a dedicated IT infrastructure, using your own hardware and private network, managed by your team or third-party providers.

Public cloud uses an off-site network that is accessible to other customers. It usually offers a pay-per-usage billing model that can save significant amount of money for your business.

Hybrid cloud is a combination of private and public solutions. It is commonly used to manage IT infrastructure to meet requirements for seasonal businesses, or to process applications in a public cloud, while storing the sensitive information in a private environment.

When choosing between these cloud types, ensure that you have a thorough understanding of their features, extensions, bandwidth and storage to find the best fit for your business needs.

### 2. Cost

Considering the implementation of any system, it is important to estimate your resources and the total cost of ownership (TCO). Not all cloud computing platforms follow a transparent pay-as-you-use costing model. Companies should be aware that for some cloud-based platforms costs of implementation and integration into the IT infrastructure might be higher than expected. Thus, when planning, the budget should include the declared price per user and the price per usage.

### 3. Reliable provider

The next important factor is to choose a reliable cloud solution provider (CSP) before investing time and money in integration to the cloud. Analyze the compatibility of technical, governance and language standards of the potential provider to your company internal standards. Ensure your provider is a certified partner with deep experience and is aware not only how an application works, but also how various components integrate with each other. The right provider has to guarantee software support to quickly eliminate issues and assure the safety of data 24/7.

### 4. Time

The next important factor is to assess the time required for data migration. Evaluate time investment for testing before and after migration. As you are preparing your organization for the transition, consider the availability of resources, governance, efficiency, application design etc. These things do tend to get delayed, due to compliance issues, low productivity and security problems, that an enterprise experiences. It’s important to have appropriate estimates so you are able to mitigate unexpected increases in budgets.

### 5. Security

One of the biggest concerns enterprises have about adopting a new cloud-based system is the fear of data loss and leakage. According to Forbes, [66%](http://www.forbes.com/sites/louiscolumbus/2018/01/07/83-of-enterprise-workloads-will-be-in-the-cloud-by-2020/" \l "770384d66261) of IT professionals say security is their most significant concern in adopting an enterprise cloud computing strategy. It’s important to find the right partner to ensure that your security concerns are addressed and that your data is safe in the cloud.

1. **\*Case study 1:\***

**Compare the top 3 cloud service providers on the basis of their services, uptime,  pricing model, reliability, security features and interoperability.**

Ans8 Compare Google Cloud, Amazon Web Services (AWS) and Microsoft Azure on the basis of the given criteria.

1. **\*Case Study 2:\***

**Are the VPS and Cloud hosting same? Discuss and Justify your answers with a comparison chart on the basis of cost,  service benefits,  performance,  uptime, security and reliability.**

Ans9 No, VPS and Cloud Hosting are not the same.

VPS (Virtual Private Server) system users will have root level access to their operating system instance. In many terms VPS servers are equivalent to dedicated servers and have prize lower than dedicated servers. The perfomance of a VPS server may be lower compared to dedicated server since they share the physical hardware. Perfomance may be affected by workload and perfomance of other executing virtual machines. If you want root level access but cannot afford the high cost of dedicated servers, then VPS servers are the best option for you.

In cloud hosting hundreds of individual servers work together so that it looks like one giant server. The idea is that as the need grows, the hosting company can just add more commodity hardware to make an ever larger grid or cloud. If you're website is growing and you're driving more traffic to your website, this is probably the first point you would upgrade too from a shared hosting plan.

|  |  |  |
| --- | --- | --- |
| ***Criteria*** | **VPS (Virtual Private Server)** | **Cloud Hosting** |
| *Cost* | Less expensive | More expensive |
| *Service benefits* | Powerful but has lesser server power and flexibility | Greater server power and ultimate flexibility |
| *Performance* | Less efficient and limited in its level of resources | Faster, extensible, scalable and better performance due to multiple servers |
| *Uptime* | Lower than cloud hosting because a guranteed level of system resources is dedicated to the virtual server. | Higher uptime due to high availability of servers |
| *Security* | Better | More vulnerable to malicious attacks |
| *Reliability* | Less | More |

1. **\*Case study 3:\***

**Compare and contrast on the IAAS services provided by AWS and Microsoft Azure. Present a comapartive analysis to Suggest which service provider is useful for novice users.**

Ans10 <https://www.parallels.com/blogs/ras/aws-vs-azure-vs-google/>

For both novice users and a novice enterprise, AWS is better service provider when it comes to IaaS services (or diverse set of tools).

1. **Discuss the different types of datacenters.**

## Ans11 Hyperscale Data Center

* A Hyperscale (or Enterprise Hyperscale) data center is a facility owned and operated by the company it supports. This includes companies such as AWS, Microsoft, Google, and Apple.
* They offer robust, scalable applications and storage portfolio of services to individuals or businesses.
* Hyperscale computing is necessary for cloud and big data storage.
* Has anywhere from 500 Cabinets upwards, and at least 10,000sq ft. in size.
* Usually have a minimum of 5,000 servers linked with an ultra-high speed, high fiber count network.
* May use external companies on initial fit outs before maintaining internally.
* Noticeable difference from Enterprise to Hyperscale is the High Fiber Count utilized across the network.

## Colocation Data Center

* Colocation Data Centers consist of one data center owner selling space, power and cooling to multiple enterprise and hyperscale customers in a specific location.
* Interconnection is a large driver for businesses. Colocation data centers offer interconnection to Software as a Service (SaaS) such as Salesforce, or Platform as a service (PaaS) like Azure. This enables businesses to scale and grow their business with minimum complexity at a low cost.
* Colocation companies offer technical guidance for companies that don’t know what they require, or want the hassle to source and deliver it.
* Other Colocation facilities have a slightly different model where chosen integrators provide the technical design, guidance and specification for migrating customers.
* Depending on the size of your network requirement, you can rent 1 Cabinet to 100 Cabinets, in some cases ¼ or ½ a cabinet is available.
* A colocation data center can house 100s if not 1000s of individual customers.

## Wholesale Colocation Data Center

* Wholesale colocation data centers consist of one owner selling space, power and cooling to enterprise and hyperscale like standard colocation.
* In these instances Interconnection is not really a requirement. These facilities are used by hyperscale or large companies to hold their IT infrastructure.
* In most cases wholesale colocation provide the space, power and cooling.
* A number of wholesale colocation companies are adding standard colocation into their portfolio on the same sites where possible.
* Wholesale colocation tend to support less customers, depending on the data center size, this can be typically under 100 tenants.
* Typically the cabinet numbers range from 100 cabinets to 1000+ Cabinets.

## Enterprise Data Center

* An enterprise data center is a facility owned and operated by the company it supports and is often built on site but can be off site in certain cases also.
* May have certain sections of the data center caged off to separate different sections of the business.
* Commonly outsources maintenance for the M&E but runs the white space themselves via the IT team.
* May use external companies on initial fit-outs and network installation before being maintained internally.
* Has anywhere from 10 Cabinets upwards and can be as large as 40MW+.

## Telecom Data Center

* A telecom data center is a facility owned and operated by a Telecommunications or Service Provider company such as BT, AT&T or Verizon.
* These types of data centers require very high connectivity and are mainly responsible for driving content delivery, mobile services, and cloud services.
* Typically the telecom data center uses 2 post or 4 post racks, to house IT infrastructure, however cabinets are becoming more prevalent.
* Use their own staff to install and manage the sites, initial install and continual routine. A lot become lights out sites.
* Some Telco companies run the data center within a Data Centre, for example a Colocation data center.
* Telco Data Centres are now utilising space within their facilities to add additional services such as Colocation

Soon there will be another classification of data center. The Edge data center. Early indications show Edge data centers will support IoT, autonomous vehicles and move content closer to users, with 5G networks supporting much higher data transport requirements. It is expected Hyperscale and Telecom companies will largely push or compete for the emerging business. It is too early to predict the detailed shape and scale of Edge computing but we do know that some form of Edge computing will evolve and that there will be lots of fiber involved.

With different data centers come very different needs and network architecture types. The varying network architectures are all united in the want for higher speed, performance, efficiency and scalability. What is certain is that our want for greater technologies, whether it be IOT, automation, or AI, alongside our consumption of social media, and streaming services, will continually put pressure on data centers to innovate and grow as we continue to move into a more connected world.

1. **List the various elements involve in setting up a datacenter.**

## Ans12 1. Environmental controls

A standardized and predictable environment is the cornerstone of any quality data center.  It’s not just about keeping things cool and maintaining appropriate humidity levels ([according to Wikipedia](http://en.wikipedia.org/wiki/Data_center" \l "Environmental_control" \t "https://www.techrepublic.com/blog/10-things/10-critical-elements-of-an-efficient-data-center/_blank), the recommended temperature range is 61-75 degrees Fahrenheit/16-24 degrees Celsius and 40-55% humidity). You also have to factor in [fire suppression](https://www.techrepublic.com/blog/it-security/the-mystical-world-of-data-center-fire-suppression/), [air flow](http://hightech.lbl.gov/dctraining/strategies/mam.html" \t "https://www.techrepublic.com/blog/10-things/10-critical-elements-of-an-efficient-data-center/_blank) and [power distribution](http://www.datacenterknowledge.com/archives/2013/05/15/gaining-more-efficiency-from-power-distribution-within-data-centers/" \t "https://www.techrepublic.com/blog/10-things/10-critical-elements-of-an-efficient-data-center/_blank).

## 2. Security

It goes without saying (but I’m going to say it anyhow) that physical security is a foundation of a reliable data center. Keeping your systems under lock and key and providing entry only to authorized personnel goes hand and hand with permitting only the necessary access to servers, applications and data over the network. It’s safe to say that the most valuable assets of any company (other than people, of course) reside in the data center. Small-time thieves will go after laptops or personal cell phones. Professionals will target the data center. Door locks can be overcome, so I recommend alarms as well. Of course, alarms can also be fallible so think about your next measure: locking the server racks? Backup power for your security system? Hiring security guards? It depends on your security needs, but keep in mind that “security is a journey, not a destination.”

## 3. Accountability

Speaking as a system administrator, I can attest that most IT people are professional and trustworthy.  However, that doesn’t negate the need for accountability in the data center to track the interactions people have with it. Data centers should log entry details via badge access (and I recommend that these logs are held by someone outside of IT such as the Security department, or that copies of the information are kept in multiple hands such as the IT Director and VP). Visitors should sign in and sign out and remain under supervision at all times. Auditing of network/application/file resources should be turned on. Last but not least, every system should have an identified owner, whether it is a server, a router, a data center chiller, or an alarm system.

## 4. Policies

Every process involved with the data center should have a policy behind it to help keep the environment maintained and managed. You need policies for system access and usage (for instance, only database administrators have full control to the SQL server). You should have policies for data retention – how long do you store backups? Do you keep them off-site and if so when do these expire? The same concept applies to installing new systems, checking for obsolete devices/services, and removal of old equipment – for instance, wiping server hard drives and donating or recycling the hardware.

## 5. Redundancy

Credit: Wikimedia Commons

The first car I ever owned was a blue Ford Pinto. My parents paid $400 for it and at the time, gas was a buck a gallon, so I drove everywhere. It had a spare tire which came in handy quite often. I’m telling you this not to wax nostalgic but to make a point: even my old breakdown-prone car had redundancy. Your data center is probably much shinier, more expensive, and highly critical, so you need more than a spare tire to ensure it stays healthy. You need at least two of everything that your business requires to stay afloat, whether this applies to mail servers, ISPs, data fiber links, or voice over IP (VOIP) phone system VMs. Three or more wouldn’t hurt on many scenarios either!

It’s not just redundant components that are important but also the process to test and make sure they work reliably – such as scheduled failover drills and research into new methodologies.

## 6. Monitoring

Monitoring of all systems for uptime and health will bring tremendous proactive value but that’s just the beginning. You also need to monitor how much bandwidth is in use, as well as energy, storage, physical rack space, and anything else which is a “commodity” provided by your data center.

There are free tools such as [Nagios](http://www.nagios.org/" \t "https://www.techrepublic.com/blog/10-things/10-critical-elements-of-an-efficient-data-center/_blank) for the nuts and bolts monitoring and more elaborate solutions such as [Dranetz](http://dranetz.com/infotech" \t "https://www.techrepublic.com/blog/10-things/10-critical-elements-of-an-efficient-data-center/_blank) for power measurement. Alerts when outages or low thresholds occur is part of the process – and make sure to arrange a failsafe for your alerts so they are independent of the data center (for instance, if your email server is on a VMWare ESX host which is dead, another system should monitor for this and have the ability to send out notifications).

## 7. Scalability

So your company needs 25 servers today for an array of tasks including virtualization, redundancy, file services, email, databases, and analytics? What might you need next month, next year, or in the next decade? Make sure you have the appropriate sized data center with sufficient expansion capacity to increase power, network, physical space, and storage.  If your data center needs are going to grow – and if your company is profitable I can guarantee this is the case - today is the day to start planning.

Planning for scalability isn’t something you stop, either; it’s an ongoing process. Smart companies actively track and report on this concept. I’ve seen references in these reports to “the next rivet to pop” which identifies a gap in a critical area of scalability that must be met (e.g., lack of physical rack space) as soon as possible.

## 8. Change management

You might argue that Change Management falls under the “Policies” section, a consideration which has some bearing. However, I would respond that it is both a policy and a philosophy. [Proper guidelines for change management](https://www.techrepublic.com/blog/data-center/best-practices-for-change-management-in-the-data-center/) ensure that nothing occurs in your data center which hasn’t been planned, scheduled, discussed and agreed upon along with providing backout steps or a Plan “B.” Whether it’s bringing new systems to life or burying old ones, the lifecycle of all elements of your data center must fall in accordance with your change management outlook.

## 9. Organization

I’ve never known an IT pro who wasn’t pressed for time. Rollout of new systems can result in some corners being cut due to panic over missed deadlines – and these corners invariably seem to include making the environment nice and neat.

A successful system implementation doesn’t just mean plugging it in and turning it on; it also includes integrating devices into the data center via standardized and supportable methods. Your server racks should be clean and laid out in a logical fashion (production systems in one rack, test systems in another). Your cables should be the appropriate length and run through cabling guides rather than haphazardly draped. Which do you think is easier to troubleshoot and support; a data center that looks like this:

## 10. Documentation

The final piece of the puzzle is appropriate, helpful, and timely documentation – another ball which can easily be dropped during an implementation if you don’t follow strict procedures. It’s not enough to just throw together a diagram of your switch layout and which server is plugged in where; your change management guidelines should mandate that documentation is kept relevant and available to all appropriate personnel as the details evolve – which they always do.

1. **Discuss the cloud backup and recovery method in dataecnters.**

Ans13 <https://www.datto.com/blog/data-backup-and-recovery-methods-the-basics-you-need-to-know>

1. **What is object based storage technology.**

Ans13 Object storage, often referred to as object-based storage, is a data storage architecture for handling large amounts of unstructured data. This is data that does not conform to, or cannot be organized easily into, a traditional relational database with rows and columns. Today’s Internet communications data is largely unstructured. This includes email, videos, photos, web pages, audio files, sensor data, and other types of media and web content (textual or non-textual). This content streams continuously from social media, search engines, mobile, and “smart” devices. Market research firm IDC estimates that unstructured data is likely to represent as much as 80% of all data worldwide by the year 2025. Enterprises are finding it challenging to efficiently (and affordably) store and manage this unprecedented volume of data. Object-based storage has emerged as the preferred method for data archiving and backup. It offers a level of scalability not possible with traditional file- or block-based storage. With object-based storage, you can store and manage data volumes on the order of terabytes (TBs), petabytes (PBs), and even greater.

1. **Explain the Information lifecycle management policy in cloud.**

Ans15 Information lifecycle management (ILM) is the effort to oversee data, from creation through retirement, in order to optimize its utility, lower costs, as well as minimize the legal and compliance risks that may be introduced through that data. ILM involves storage optimization as well as strategies to improve data quality and security. Finally, a strong information lifecycle management practice will proactively control data retention and disposal in accordance with business policy. Due to the incredible volume of data that the typical organization creates, data management techniques are vital to prevent storage costs from spiraling out of control. ILM controls data growth and minimizes costs while supporting greater application performance. ILM also prevents out-of-compliance conditions and reduces legal liability by ensuring that data is stored securely and is not retained for longer than is needed. Data that is kept too long costs the organization unnecessarily and creates liability. It also enforces compliances policy, thereby preventing audit fines. The main activities are database archiving, test data management, data privacy/data masking, and data/application retirement. However, any systemic application of rules to business data or attempts to minimize, simplify, or increase the security of data can fall under the general procedures of ILM.

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