CYBER SECURITY AND NETWORKING

Virtualization

What is Virtualization ?

Virtualization is a technology that helps us to install different Operating Systems on a hardware. They are completely separated and independent from each other. In Wikipedia, you can find the definition as – “In computing, virtualization is a broad term that refers to the abstraction of computer resources.

Types of Virtualization

- Server Virtualization
- Client & Desktop Virtualization
- Services and Applications Virtualization
- Network Virtualization
- Storage Virtualization

Client & Desktop Virtualization

This is similar to server virtualization, but this time is on the user’s site where you virtualize their desktops. We change their desktops with thin clients and by utilizing the datacenter resources

Server Virtualization

It is virtualizing your server infrastructure where you do not have to use any more physical servers for different purposes

Services and Applications Virtualization

The virtualization technology isolates applications from the underlying operating system and from other applications, in order to increase compatibility and manageability. For example – Docker can be used for that purpose

Network Virtualization

It is a part of virtualization infrastructure, which is used especially if you are going to visualize your servers. It helps you in creating multiple switching, Vlans, NAT-ing, etc

Storage Virtualization

This is widely used in datacenters where you have a big storage and it helps you to create, delete, allocated storage to different hardware. This allocation is done through network connection

Different Types of Hypervisors

Hypervisors are two types −

- ✓ Native of Bare Metal Hypervisor and
- ✓ Hosted Hypervisor

Native or Bare Metal Hypervisor

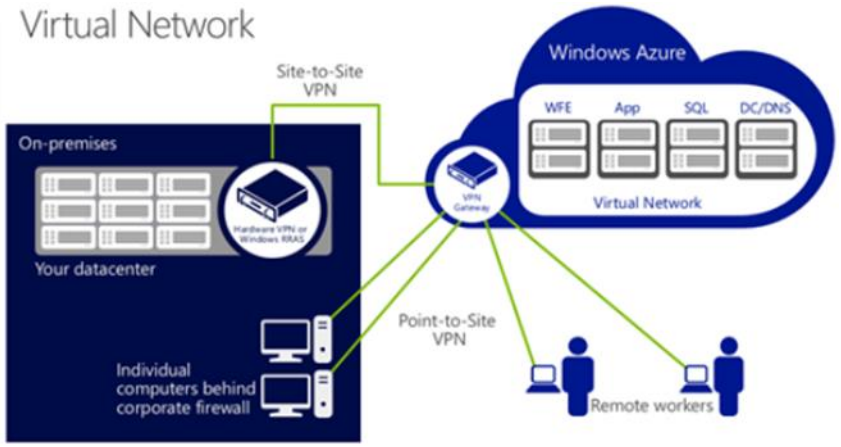
Native hypervisors are software systems that run directly on the host's hardware to control the hardware and to monitor the Guest Operating Systems. The guest operating system runs on a separate level above the hypervisor. All of them have a Virtual Machine Manage

Examples of this virtual machine architecture are Oracle VM, Microsoft Hyper-V, VMWare ESX and Xen

Hosted Hypervisor

Hosted hypervisors are designed to run within a traditional operating system. In other words, a hosted hypervisor adds a distinct software layer on top of the host operating system. While the guest operating system becomes a third software level above the hardware.

A well-known example of a hosted hypervisor is Oracle VM VirtualBox. Others include VMWare Server and Workstation, Microsoft Virtual PC, KVM, QEMU and Parallels



Local Virtualization and Cloud

Virtualization is one of the fundamental technologies that makes cloud-computing work. However, virtualization is not cloud computing. Cloud computing is a service that different providers offer to you based on some costs.

In enterprise networks, virtualization and cloud computing are often used together to build a public or private cloud infrastructure. In small businesses, each technology will be deployed separately to gain measurable benefits. In different ways, virtualization and cloud computing can help you keep your equipment spending to a minimum and get the best possible use from the equipment you already have.

Advantages of Virtualization

Using Virtualization for Efficient Hardware Utilization

Virtualization decreases costs by reducing the need for physical hardware systems. Virtual machines use efficient hardware, which lowers the quantities of hardware, associated maintenance costs and reduces the power along with cooling the demand. You can allocate memory, space and CPU in just a second, making you more self-independent from hardware vendors

Using Virtualization to Increase Availability

Virtualization platforms offer a number of advanced features that are not found on physical servers, which increase uptime and availability. Although the vendor feature names may be different, they usually offer capabilities such as live migration, storage migration, fault tolerance, high availability and distributed resource scheduling. These technologies keep virtual machines chugging along or give them the ability to recover from unplanned outages

Disaster Recovery

Disaster recovery is very easy when your servers are virtualized. With up-to-date snapshots of your virtual machines, you can quickly get back up and running. An organization can more easily create an affordable replication site. If a disaster strikes in the data center or server room itself, you can always move those virtual machines elsewhere into a cloud provider. Having that level of flexibility means your disaster recovery plan will be easier to enact and will have a 99% success rate.

Disadvantages of Virtualization

- ✓ **Extra Costs**
- ✓ **Software Licensing**
- ✓ **Learn the new Infrastructure**
- ✓ **Deploying Servers too fast**
- ✓ **Save Space in your Server Room or Datacenter**
- ✓ **Testing and setting up Lab Environment**
- ✓ **Shifting all your Local Infrastructure to Cloud in a day**

Save Energy

Moving physical servers to virtual machines and consolidating them onto far fewer physical servers' means lowering monthly power and cooling costs in the data center. It reduces carbon footprint and helps to clean up the air we breathe. Consumers want to see companies reducing their output of pollution and taking responsibility

Cloud computing is the delivery of on-demand computing resources over the internet. These resources can include servers, storage, databases, software, and networking, all of which are accessed remotely via the internet.

There are three main types of cloud computing services:

1.Infrastructure as a Service (IaaS) - This is a basic building block of cloud computing that provides virtualized computing resources such as virtual machines, storage, and networks.

2.Platform as a Service (PaaS) - This type of service provides a complete platform for developers to build and deploy applications without worrying about the underlying infrastructure.

3.Software as a Service (SaaS) - This is a complete software solution that is delivered over the internet and can be accessed through a web browser.

main cloud computing scenarios

1.Public Cloud: A public cloud is a cloud computing service that is provided by a third-party cloud service provider and is available to the general public over the internet. These cloud services are typically provided on a subscription or pay-per-use basis, and users can access the resources they need through a web browser or a cloud service provider's API.

2.Private Cloud: A private cloud is a cloud computing environment that is dedicated to a single organization or entity. It can be hosted on-premises or by a third-party cloud service provider, and it provides the organization with greater control over their computing resources and security. Private clouds are typically used by large enterprises, government agencies, and other organizations that require high levels of security and customization.

3.Hybrid Cloud: A hybrid cloud is a cloud computing environment that combines both public and private cloud services. This allows organizations to take advantage of the benefits of both types of clouds, such as the scalability and cost-effectiveness of public clouds and the control and security of private clouds. Hybrid clouds are particularly useful for organizations with varying workloads and data requirements.

operational benefits of the cloud

1.Scalability: Cloud computing allows organizations to quickly and easily scale their computing resources up or down based on their current needs. This means that they can avoid the costs and complexities of purchasing and maintaining hardware and software infrastructure that may not be used to its full capacity.

2.Cost-effectiveness: Cloud computing can help organizations save money by eliminating the need for large upfront investments in hardware and software. Instead, they can pay for what they need on a subscription or pay-per-use basis. Cloud computing can also help reduce ongoing maintenance and support costs, as these are typically handled by the cloud service provider.

3.Flexibility: Cloud computing allows organizations to access their computing resources from anywhere with an internet connection. This means that employees can work remotely and collaborate on projects in real-time, which can help improve productivity and reduce costs associated with commuting and office space.

4.Disaster Recovery: Cloud computing provides organizations with a reliable and cost-effective way to backup and recover their data in the event of a disaster. Cloud service providers typically offer robust backup and recovery solutions that can be easily customized to meet the organization's specific needs.

5.Security: Cloud service providers typically have robust security measures in place to protect their customers' data. This can help reduce the risk of data breaches and other security incidents that can be costly and damaging to an organization's reputation.

The economic benefits of the cloud

1.Reduced Capital Expenditure: Cloud computing can help organizations reduce their capital expenditure (CAPEX) by eliminating the need to invest in and maintain their own hardware and software infrastructure. Instead, they can pay for what they need on a subscription or pay-per-use basis, which can help reduce upfront costs and improve cash flow.

2.Reduced Operational Costs: Cloud computing can help organizations reduce their operational costs by eliminating the need for expensive hardware and software maintenance and support. This is typically handled by the cloud service provider, which can help reduce the organization's labor costs.

3.Improved Agility and Scalability: Cloud computing allows organizations to quickly and easily scale their computing resources up or down based on their current needs. This means that they can avoid the costs and complexities of purchasing and maintaining hardware and software infrastructure that may not be used to its full capacity.

4.Access to Innovation: Cloud computing allows organizations to access the latest technology and innovation without having to invest in expensive hardware and software infrastructure. Cloud service providers are typically on the cutting edge of technology and can provide their customers with access to the latest tools and applications.

5.Improved Productivity: Cloud computing can help organizations improve their productivity by providing employees with access to computing resources from anywhere with an internet connection. This means that they can work remotely and collaborate on projects in real-time, which can help improve productivity and reduce costs associated with commuting and office space.

security benefits of the cloud

1.Robust Security Measures: Cloud service providers typically have robust security measures in place to protect their customers' data. These can include firewalls, encryption, access controls, and intrusion detection and prevention systems.

2.Disaster Recovery and Business Continuity: Cloud computing provides organizations with a reliable and cost-effective way to backup and recover their data in the event of a disaster. Cloud service providers typically offer robust backup and recovery solutions that can be easily customized to meet the organization's specific needs.

3.Compliance: Cloud service providers often have the expertise and resources to help organizations comply with industry-specific regulations and standards, such as HIPAA, PCI DSS, and GDPR.

1.Reduced Risk of Data Loss: Cloud computing can help reduce the risk of data loss by providing organizations with secure and redundant storage options. This means that data is typically stored in multiple locations, which can help ensure that it is not lost in the event of a hardware failure or other issue.

2.Access Controls: Cloud computing allows organizations to easily manage user access to their computing resources. This means that they can control who has access to what data and applications, which can help reduce the risk of unauthorized access and data breaches.

cloud tools and services

1.Infrastructure-as-a-Service (IaaS): IaaS providers offer users the ability to rent computing resources, such as virtual machines, storage, and networking, on a pay-as-you-go basis. Some examples of IaaS providers include Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform.

2.Platform-as-a-Service (PaaS): PaaS providers offer users a platform on which they can develop, run, and manage their applications without having to worry about the underlying infrastructure. Examples of PaaS providers include Heroku, Google App Engine, and Microsoft Azure App Service.

3.Software-as-a-Service (SaaS): SaaS providers offer users access to software applications over the internet, without the need for users to install or maintain the software themselves. Examples of SaaS providers include Dropbox, Salesforce, and Microsoft Office 365.

4.Containers: Containers are a lightweight way to package and deploy applications in a consistent and reproducible way. Some examples of container platforms include Docker, Kubernetes, and Amazon Elastic Container Service (ECS).

5.Serverless Computing: Serverless computing allows developers to write and run code without having to manage servers or infrastructure. Examples of serverless platforms include AWS Lambda, Google Cloud Functions, and Microsoft Azure Functions.

6.Cloud Storage: Cloud storage providers offer users the ability to store and access their data over the internet, without the need for local storage infrastructure. Examples of cloud storage providers include Amazon S3, Microsoft Azure Blob Storage, and Google Cloud Storage.

7.Cloud Security: Cloud security tools and services help users protect their cloud infrastructure and applications from security threats. Examples of cloud security tools include Amazon Web Services (AWS) Security Hub, Google Cloud Security Command Center, and Microsoft Azure Security Center.