

Cloud Computing Module 1

Subject : Cloud Computing for the Students of IEM

Challenges of using a cloud service provider

While there are many advantages to working with a cloud provider, there are some considerations to keep in mind.

The key things for organizations to consider:

Complex contracts: You will need to negotiate contracts and SLAs with each cloud provider you use. Multiple providers and vendors can lead to complex SLA relationships with different parameters and guaranteed service expectations.

Vendor lock-in: Some cloud providers do not integrate well with competitor products and services. Becoming too dependent on a single provider can make it difficult to migrate data and workloads to another technology stack without incurring high costs, incompatibilities, or even legal constraints.

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Challenges of using a cloud service provider

Security responsibility: Generally a shared responsibility model is followed.

It means cloud security is implemented by both the cloud provider and the customer.

Poor understanding of a provider's responsibilities and consumer's own can lead to substantial security risks or security breaches.

Along with these specific concerns when working with cloud service providers, your organization will also need to have a solid cloud migration strategy in place and be ready to tackle new complexity when it comes to monitoring and managing cloud environments.

Composability

- ✓ Composability is the art of building systems in a modular and flexible way. It emphasizes creating components that are not only reusable but can seamlessly fit together, forming a cohesive and adaptable architecture.
- ✓ Composability is a systems design approach made to increase agility and accelerate application development by reusing existing assets and reassembling them in unique ways to satisfy specific user requirements.

Composability

Composable systems break down larger projects into smaller, more modular “components.”

Each component addresses a specific problem or use case.

Individual components can then be selected and assembled in various combinations to create new experiences without building from scratch.

In the context of application development, modular composability refers to the rapid assembly of new digital experiences by drawing from a library of pre-existing components that can be arranged—or “composed”—to address a specific use case.

Composability

The key elements are:

Modularity

Autonomy

Discoverability

Composability

Modularity

To put it simply, modularity is about doing one thing well. It involves bundling a specific set of services into a single component that is dedicated to achieving a specific purpose.

Autonomy

To qualify as a truly composable system, the individual components must be autonomous—meaning, they are entirely self-contained, and are not dependent on other parts of the system. Also, it should be possible to update one part of the system without affecting any other parts of the system.

Composability

Discoverability

An important element in a composable system approach is that individual components can be reused over and over again to assemble new experiences.

For that to occur, the individual components must be easily discoverable by other teams.

Building a reusable component that lacks discoverability negates the value of composable systems design.

Virtual Appliance (VA)

- ✓ A software equivalent of a hardware device.
- ✓ It contains an operating system (OS) and a customized application to perform a fixed set of functions.
- ✓ When a software appliance is installed on a virtual machine (VM), it creates a virtual appliance, which is nothing but a VM image file.

Virtual Appliance (VA)

VAs usually come in the Open Virtualization Format (OVF).

It is vendor-independent, the appliance can be easily packaged and distributed in a single-file format.

OVF is also beneficial for customers because it allows them to deploy, manage and update complex solutions easily.

Virtual Appliance (VA)

Virtual appliances play a major role in SaaS service model.
The delivery of software remotely through a user's web browser.

VAs are also useful for quickly provisioning OSES and applications in the platform as a service (PaaS) model.

Virtual Appliance (VA)

Two types of virtual appliances:

Closed virtual appliance, which is always packaged, distributed, maintained, updated and managed as a unit

Open virtual appliance, which allows to customers to make modifications.

Virtual Appliance (VA)

How a virtual appliance is deployed

- ✓ A VA can be deployed as a VM or a subset of a VM running atop virtualization technology.
- ✓ It is possible to package, maintain and manage multiple VMs as a single unit.
- ✓ Deploying an application as a VA can eliminate problems with installation and configuration, such as software or driver compatibility issues.
- ✓ Users can simply download a single file and run the application.
- ✓ Resources required for maintenance are also reduced.

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Virtual Appliance (VA)

Virtual appliance Use Cases

- ✓ Virtual Appliance have proved useful for deploying network applications.
- ✓ It is helpful in grid computing too.
- ✓ In SaaS delivery model.

Virtual Appliance (VA)

Benefits of virtual appliances

Reduced costs for developers, vendors and customers. For developers and appliance vendors, virtual appliances help lower development and distribution costs.

It is achieved by reducing the need for hardware testing and decreasing the number of platforms that need to be supported.

VAs are a cheaper alternative to hardware appliances because they don't have to manage inventory or support hardware components.

It can be distribute online.

VA reduces the cost of owning, operating and managing the software.

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Virtual Appliance (VA)

Benefits of virtual appliances

Easier IT management

- ✓ In VA, users have to manage a single solution instead of multiple applications, OS and server hardware.
- ✓ Moreover, they can get support from a single vendor for all components in the VA.
- ✓ So, simplifies IT management, administration and maintenance.

Virtual Appliance (VA)

Benefits of virtual appliances

Accelerated time-to-market and time-to-value

- ✓ A VA reduces the time required for product evaluation, configuration, packaging and deployment, accelerating time-to-value for customers.
- ✓ It also shortens the sales cycles for vendors, accelerating their time-to-market.
- ✓ Further, vendors can expand customer reach by targeting potential customers they would not be able to target with hardware appliances.

Virtual Appliance (VA)

Benefits of virtual appliances

Enhanced security with isolation.

- ✓ Virtual appliances run in an isolated environment, with different appliances shielded from each other.
- ✓ With such an arrangement, if the security of any VA is compromised, other VAs will not be affected and can continue functioning.

Communication Protocols in Cloud Computing

A **Gossip protocol** or epidemic protocol is a procedure or process of computer peer-to-peer communication that is based on the way epidemics spread. Some distributed systems use peer-to-peer gossip to ensure that data is disseminated to all members of a group.

MTP (Media Transfer Protocol) - The Media Transfer Protocol, introduced by Microsoft, is a protocol designed for intelligent storage devices like phones and digital audio players.

It is based on, and fully compatible with, the Picture Transfer Protocol (PTP). MTP allows the synchronization of files between portable devices and a personal computer (PC).

Communication Protocols in Cloud Computing

- ✓ CEE (Coverage Enhanced Ethernet Protocol) - Converged enhanced Ethernet is a term used to refer to the IEEE 802.1 standard version
- ✓ Next generation Ethernet
- ✓ A standardized packet lossless technology in input/output consolidation fiber channel over Ethernet networks.

Communication Protocols in Cloud Computing

SRP (State Routing Protocol) - In link-state routing protocols, each router possesses information about the complete network topology.

Each router then independently calculates the best next hop from it for every possible destination in the network using local information of the topology. The collection of best-next-hops forms the routing table.

This contrasts with distance-vector routing protocols, which work by having each node share its routing table with its neighbours.

In a link-state protocol, the only information passed between the nodes is the information used to construct the connectivity maps.

Examples of link-state routing protocols:

- Open Shortest Path First (OSPF)
- Intermediate System to Intermediate System (IS-IS)

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Communication Protocols in Cloud Computing

SSHP (Secure Shell Protocol) - SSH transport layer protocol

The Secure Shell (SSH) is a protocol for secure remote login and other secure network services over an insecure network.

SSH transport layer protocol, which typically runs on top of TCP/IP.

IGMP (Internet Group Management Protocol) - IGMP is a communication protocol used by hosts and adjacent routers for multicasting communication with IP networks and uses the resources efficiently to transmit the message/data packets.

Multicast communication can have single or multiple senders and receivers and thus, IGMP can be used in streaming videos, gaming or web conferencing tools.

Communication Protocols in Cloud Computing

Connecting to the Cloud by Clients

1. Direct Connect:

- ✓ Direct Connect services enable dedicated network connections with cloud service providers like AWS and Azure.
- ✓ Compared to VPNs, direct connections offer significantly higher bandwidth.
- ✓ Setting up direct connect requires router installations at each colocation, and many service providers support international locations, making it a viable option for enterprises operating globally.

Communication Protocols in Cloud Computing

Connecting to the Cloud by Clients

2. VPN (Virtual Private Network):

- ✓ VPN is a simple and affordable way to connect with cloud applications.
- ✓ Cloud service providers offer native VPN or VPN appliances through their network service control panels.
- ✓ VPN supports various devices, including OS-powered VPN services and solutions, VPN concentrators, and more.
- ✓ Notably, VPN often doesn't have minimum commitment requirements for data transfers, making it cost-effective.

Communication Protocols in Cloud Computing

Connecting to the Cloud by Clients

3. VPN Gateway or Software VPN:

- ✓ Software VPN gateways provide another popular method to connect with cloud applications.
- ✓ These gateways typically offer resizable cloud computing capacity for easy scalability.
- ✓ Additionally, you can leverage marketplace or software solutions on these connections.
- ✓ VPN gateways ensure consistent connections to co-locations, establishing a backbone for global operations and connecting to virtual private clouds in multiple locations.

Communication Protocols in Cloud Computing

Connecting to the Cloud by Clients

4. MPLS VPN (Multiprotocol Label Switching)

- ✓ MPLS VPN utilizes a mechanism that directs and carries data between network nodes.
- ✓ It enables enterprises to build virtual links across vast distances and supports multiple network protocols.
- ✓ MPLS VPN is protocol-independent, highly scalable, and eliminates the need for specific data link layer technologies like frame relay, ATM, Ethernet, or SONET.
- ✓ It is particularly suitable for organizations utilizing various network protocols.

Communication Protocols in Cloud Computing

Connecting to the Cloud by Clients

5. Telco Managed Services

Telecommunication companies now offer managed services based on direct connect.

These services bundle network connectivity to your cloud provider's network.

The advantage of telco-managed services is the flexibility to choose connectivity options, such as MPLS VPN and Internet VPN, for your preferred cloud service provider.