SESSION 7

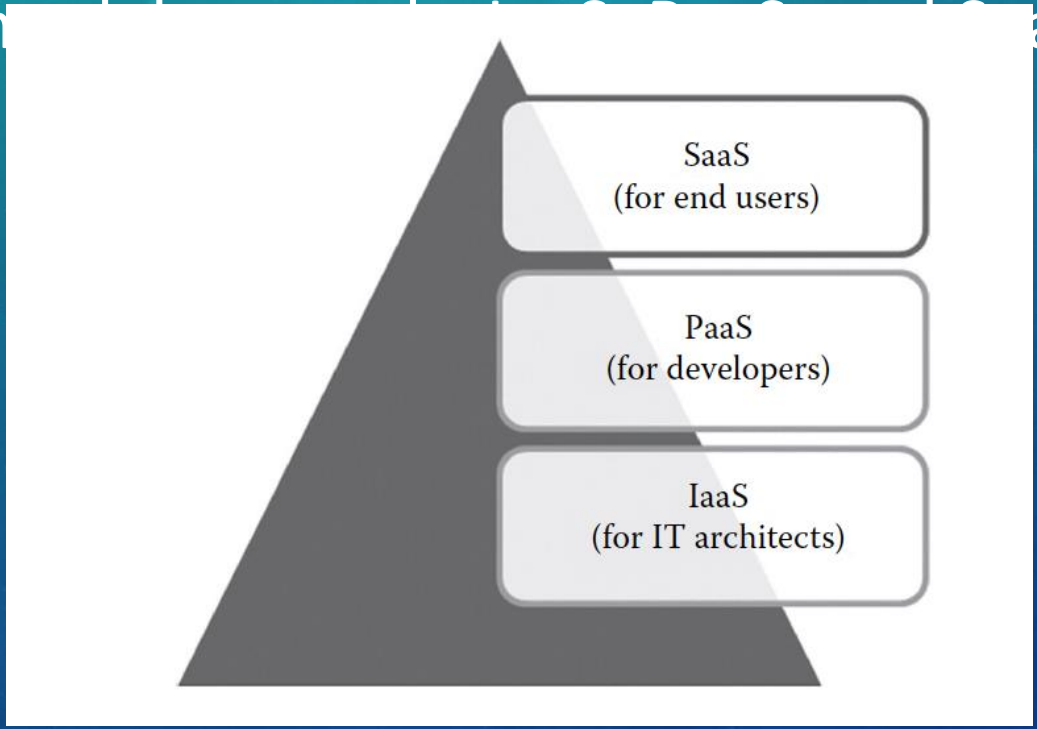
CLOUD SERVICE MODELS

OBJECTIVES

- Definition and characteristic of
  - IAAS
  - PAAS
  - SAAS

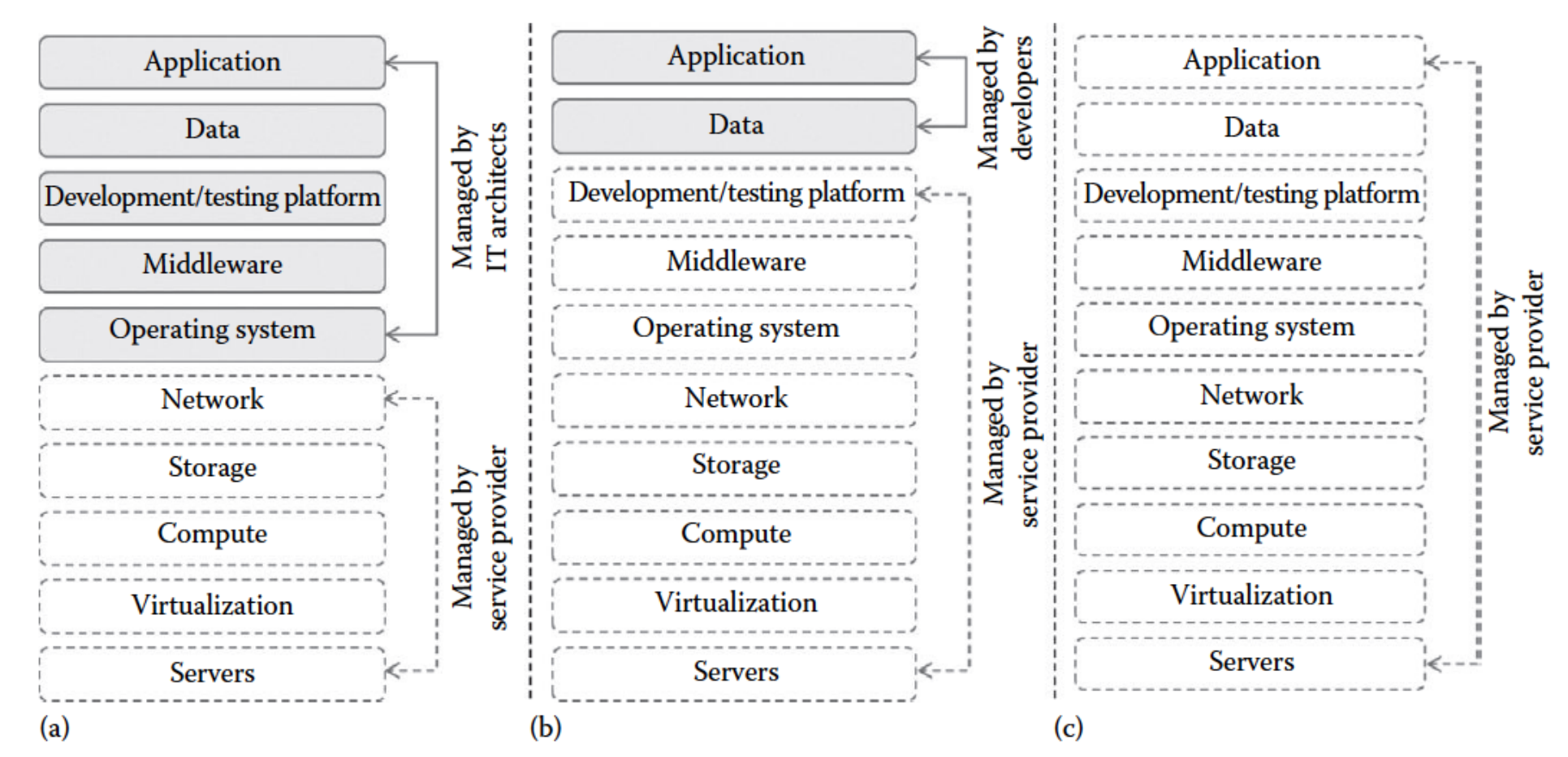
INTRODUCTION

- The National Institute of Standards and Technology (NIST) defines three basic service m aS

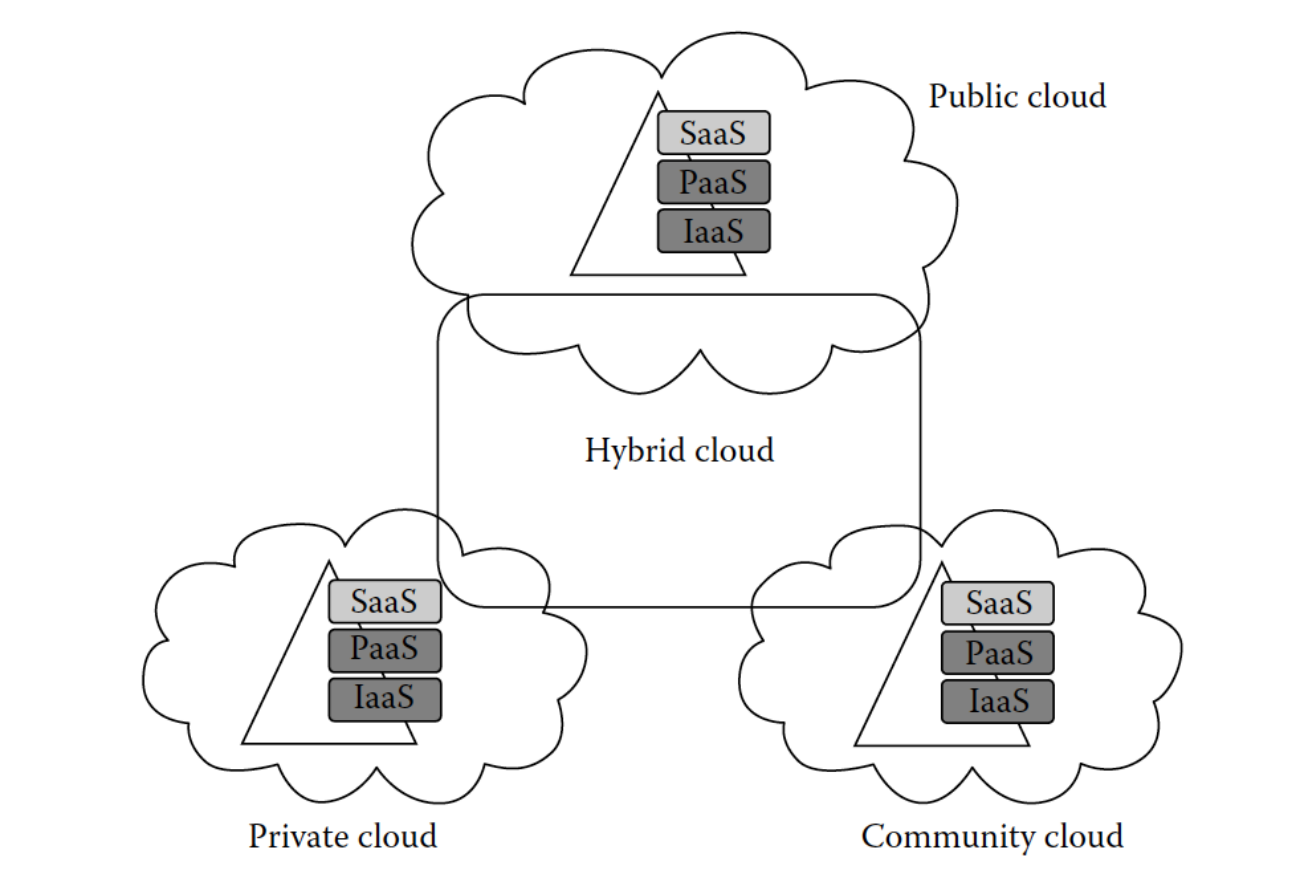


USER AND SERVICE PROVIDER RESPONS
CLOUD SERVICE MODELS

Which one is IaaS, PaaS, or SaaS?

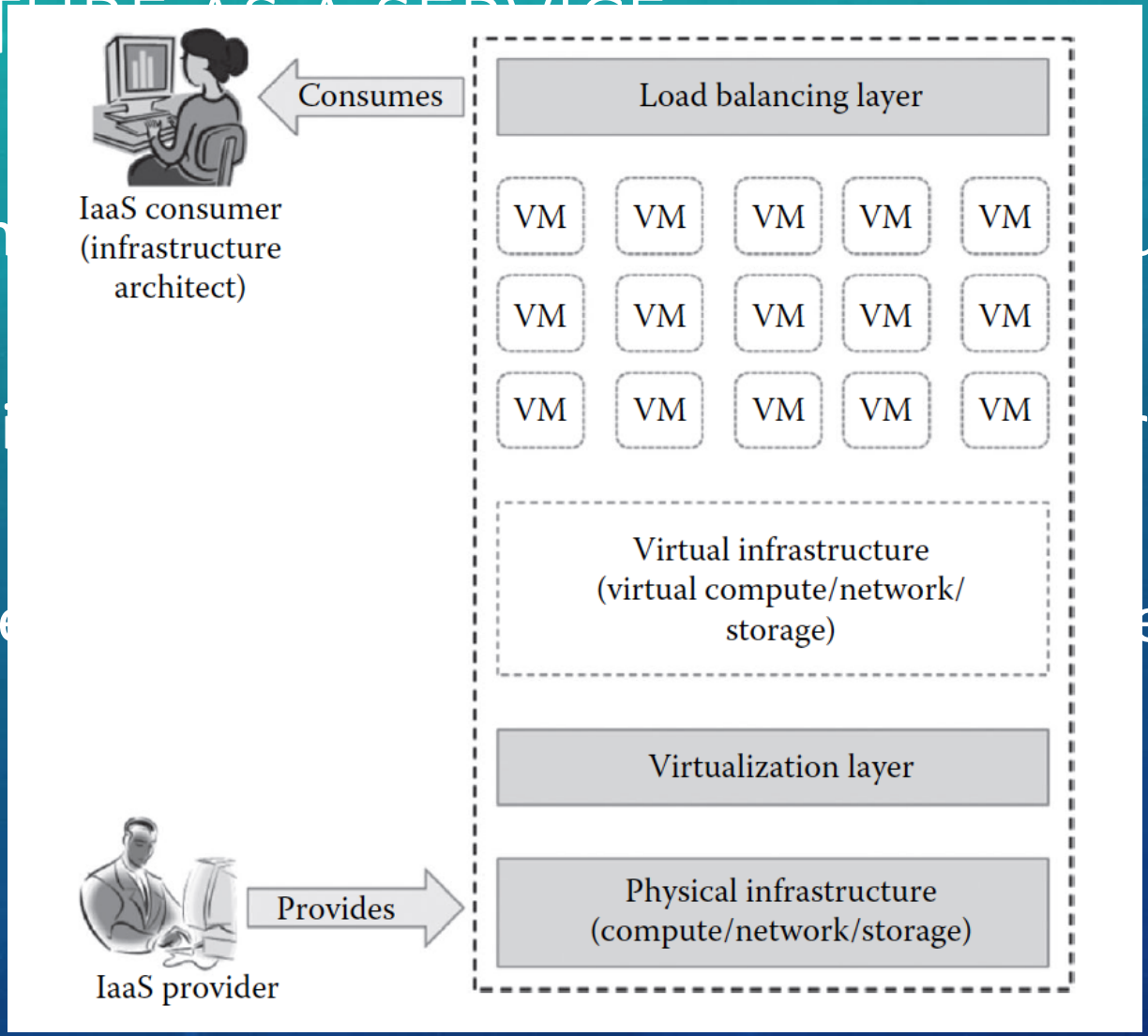


DEPLOYMENT AND DELIVERY OF DIFFERENT CLOUD SERVICE DELIVERY MODELS



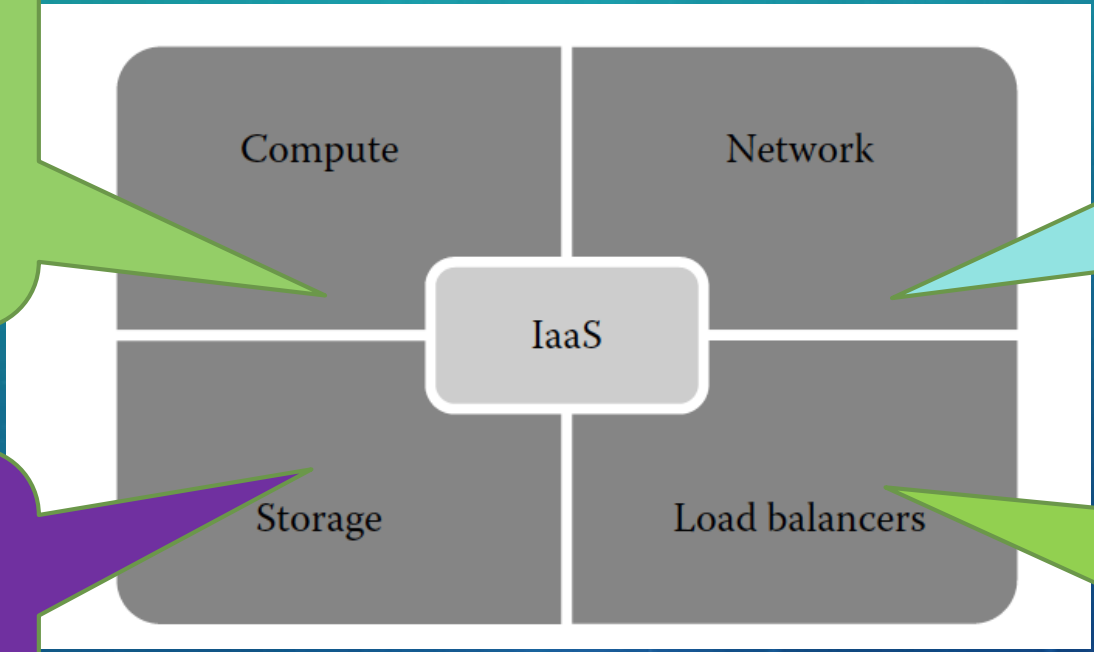
INFRASTRUCT

- IaaS changes th ure to a virtual infrastructure
- IaaS provides vi esources by abstracting the
- All the virtual re es (VMs) that are configured



SERVICES PROVIDED BY IAAS PROVIDERS

central processing units (CPUs) and virtual main memory for the VMs that are provisioned to the end users



provides virtual networking components such as virtual router, switch, and bridge for the VMs

Some of the IaaS providers also provide the back end for storing files.

provides load balancing capability at the infrastructure layer

CHARACTERISTICS OF IAAS

- *Web access to the resources:*Through any web browsers or management console, the users can access the required infrastructure
- *Centralized management*: Even though the physical resources are distributed, the management will be from a single place.
- *Elasticity and dynamic scaling:* The usage of resources can be increased or decreased according to the requirements
- *Shared infrastructure*: Allows multiple IT users to share the same physical infrastructure. IaaS ensures high resource utilization.

CHARACTERISTICS OF IAAS

- *Preconfigured VMs*: The IT users can select any kind of VMs of their choice. The users can directly start using the VMs as soon as they subscribed to the services
- *Metered services*: The services consumed by the IT user will be measured, and the users will be charged by the IaaS providers based on the amount of usage.

SUITABILITY OF IAAS

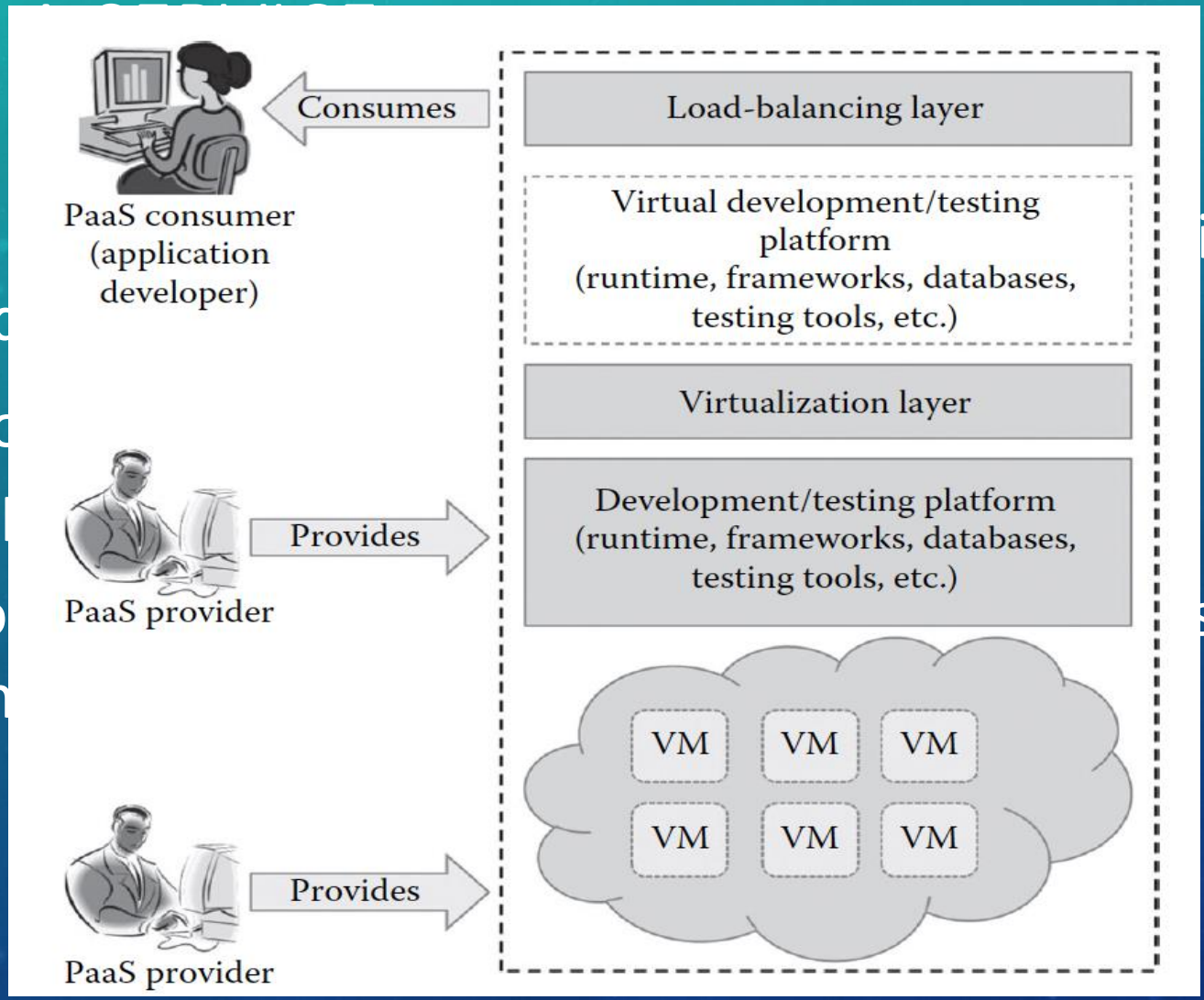
- IaaS reduces the total cost of ownership (TCO) and increases the return on investment (ROI) for start-up companies that cannot invest more in buying infrastructure.
- IaaS can be used in the following situations
  - *Unpredictable spikes in usage*
  - *Limited capital investment*
  - *Infrastructure on demand*

DRAWBACKS OF IAAS

- *Security issues:* Since IaaS uses virtualization as the enabling technology, hypervisors play an important role. There are many attacks that target the hypervisors to compromise it
- *Interoperability issues*: It is very difficult to migrate any VM from one IaaS provider to the other. Sometimes, the customers might face the vendor lock-in problem
- *Performance issues:* Latency of the network plays an important role in deciding the performance. Because of latency issues, sometimes the VM contains issues with its performance

PLATFORM AS

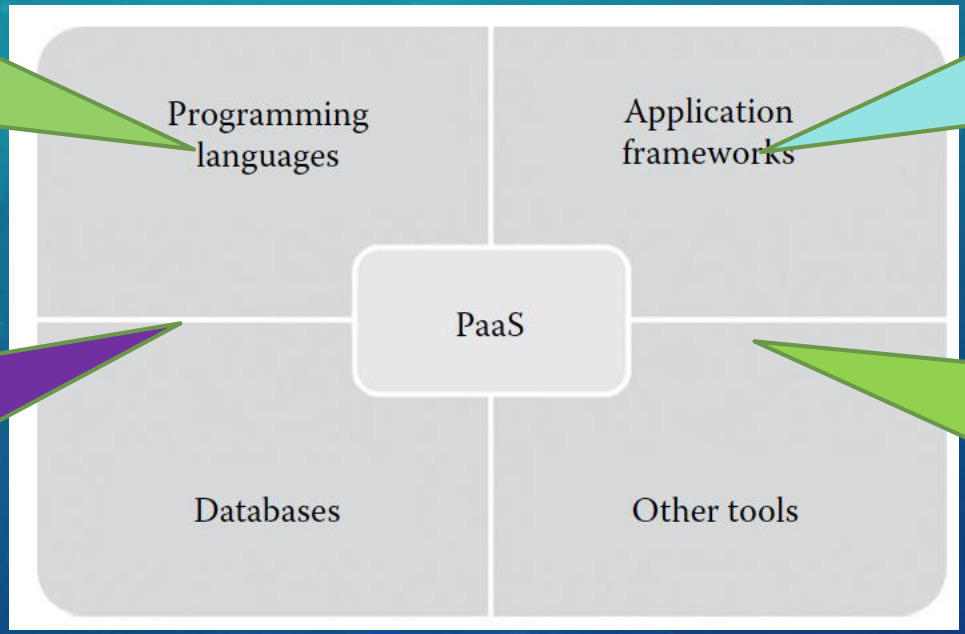
- PaaS allows the ... ine and also allows them to ...
- It reduces the co... nt tools for developing an ap...
- Typical PaaS pro... s, application fram...



SERVICES PROVIDED BY PAAS PROVIDER

PaaS providers provide a wide variety of programming languages for the developers

Some of the popular application development frameworks provided by a PaaS provider include Node.js, Rails, Drupal, Joomla, WordPress



The popular databases provided by the popular PaaS vendors are ClearDB, PostgreSQL, Cloudant,, MongoDB

PaaS providers provide all the tools that are required to develop, test, and deploy an application

CHARACTERISTICS OF PAAS

- *All in one*: Most of the PaaS providers offer services to develop, test, deploy, host, and maintain applications in the same IDE
- Using web UI, any developer can get access to the development platform. The web-based UI helps the developers create, modify, test, and deploy different applications on the same platform.
- *Offline access*: Some of the PaaS providers allow the developer to synchronize their local IDE with the PaaS services
- *Built-in scalability*: This ensures that the application is capable of handling varying loads efficiently

CHARACTERISTICS OF PAAS

- *Collaborative platform:* Developers can collaboratively work together on the same project from different workplaces.
- *Diverse client tools*: To make the development easier, PaaS providers provide a wide variety of client tools to help the developer

SUITABILITY OF PAAS

- *Collaborative development*: A common place where the development team and other stakeholders of the application can collaborate with each other
- *Automated testing and deployment:* The development team needs to concentrate more on development rather than testing and deployment.
- *Time to market*: The PaaS services follow the iterative and incremental development methodologies. The PaaS services are the best option for application development that uses agile development methodologies

DRAWBACKS OF PAAS

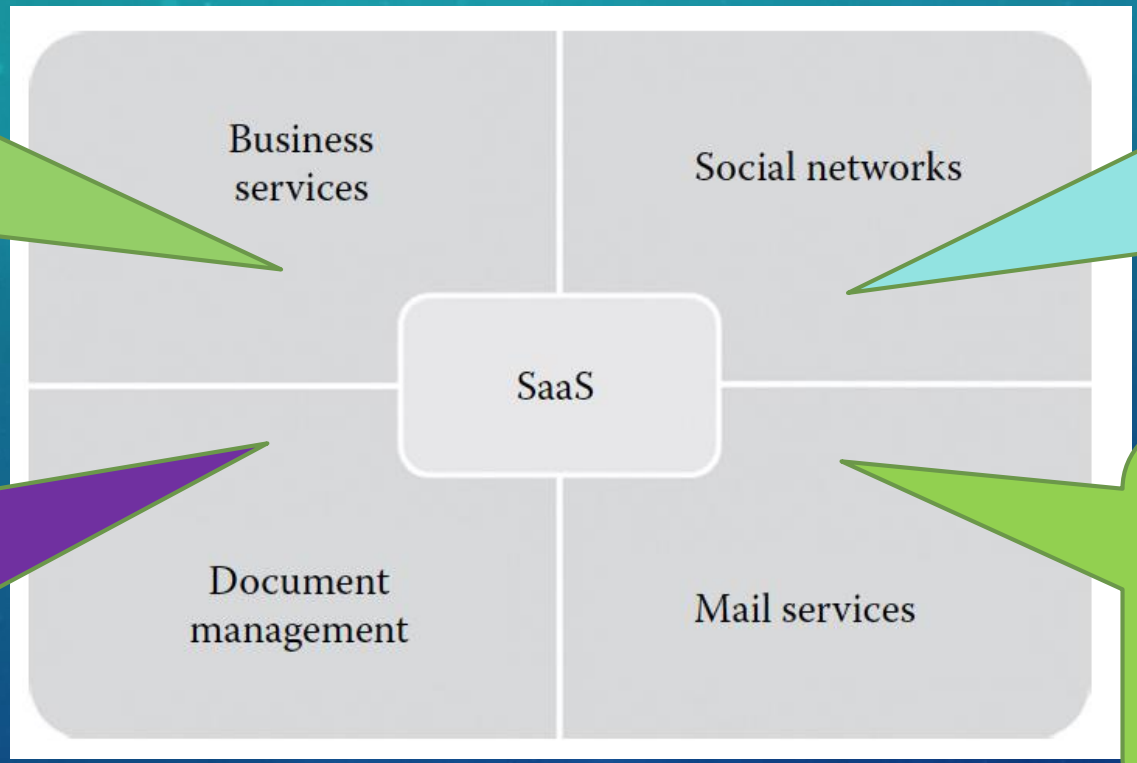
- *Vendor lock-in*: Because proprietary technologies used by PaaS providers so that the applications to be migrated from one PaaS provider to the other.
- *Security issues:* Since data are stored in off-premise third-party servers, developers are afraid to go for PaaS
- *Less flexibility*: PaaS providers do not give much freedom for the developers to define their own application stack
- *Depends on Internet connection*: With slow Internet connection, the usability and efficiency of the PaaS platform do not satisfy the developer requirements

SOFTWARE AS A SERVICE

- There is no need to install the software to the end user's devices.
- SaaS services can be accessed or disconnected at any time based on the end user's needs
- SaaS services can be accessed from any lightweight web browsers on any devices such as laptops, tablets, and smartphones.
- The important benefits of using thin clients for accessing the SaaS application are as follows: it is less vulnerable to attack, has a longer life cycle, consumes less power, and is less expensive

PROVIDED BY SAAS PROVIDERS.

The business SaaS services include ERP, CRM, billing, sales, and human resources



Since the number of users of the social networking sites is increasing exponentially, cloud computing is the perfect match for handling the variable load

services that are used to create, manage, and track electronic documents

most of the e-mail providers started offering their services as SaaS services

CHARACTERISTICS OF SAAS

- *One to many*: application can be shared by multiple tenants or customers
- *Web access:* It allows the end user to access the application from any location with internet connection
- *Centralized management*: the SaaS providers will perform the automatic updates that ensure that each tenant is accessing the most recent version of the application without any user-side updates
- *Multidevice support*: can be accessed from any end user devices such as desktops, laptops, tablets, smartphones

CHARACTERISTICS OF SAAS

- *Better scalability*: The dynamic scaling of underlying cloud resources makes SaaS applications work efficiently even with varying loads.
- *High availability:* ensure the 99.99% availability of user data as proper backup and recovery mechanisms are implemented at the back end
- *API integration*: the capability of integrating with other software or service through standard APIs

SUITABILITY OF SAAS

- *On-demand software*: The licensing-based software model increases the spending on buying software.
- *Software for start-up companies*: Can reduce the initial expenditure on buying high-end hardware
- *Software compatible with multiple devices*: The SaaS applications are adaptable with almost all the devices.
- *Software with varying loads*: Applications can handle varying loads efficiently without disrupting the normal behavior of the a

DRAWBACKS OF SAAS

- *Real-time applications*: Since SaaS applications depend on Internet connectivity, it may not work better with low Internet speed
- *Applications with confidential data:* Since data are stored with third-party service providers, there is no surety that our data will be safe.
- *Better on-premise application*: In such situations, migrating to the SaaS model may not be the best option.

PROS OF SAAS

- *No client-side installation*
- *Cost savings*
- *Less maintenance*
- *Ease of access*
- *Dynamic scaling*
- *Disaster recovery*
- *Multitenancy*:

CONS OF SAAS

- *Security*: Security is the major concern in migrating to SaaS application. Since the SaaS application is shared between many end users, there is a possibility of data leakage
- *Connectivity requirements*: Sometimes, the end user's Internet connectivity might be very slow.
- *Loss of control*: Since the data are stored in a third-party and off-premise location, the end user does not have any control over the data.

Summary of Popular SaaS Providers

Provider	Services Provided
Salseforce.com	On-demand CRM solutions
Google Apps	Gmail, Google Calendar, Talk, Docs, and Sites
Microsoft Office 356	Online office suite, software, plus services
NetSuite	ERP, accounting, order management, inventory, CRM, professional services automation (PSA), and e-commerce applications
Concur	Integrated travel and expense management solutions
GoToMeeting	Online meeting, desktop sharing, and video-conferencing software
Constant Contact	E-mail marketing, social-media marketing, online survey, event marketing, digital storefronts, and local deals tools
Workday, Inc.	Human capital management, payroll, and financial management
Oracle CRM	CRM applications
Intacct	Financial management and accounting software solutions

SUMMARY

- IAAS
- PAAS
- SAAS

REFERENCES