Welcome to:

# Unit 5: Cloud implementation, deployment and delivery models

# Unit objectives



**After completing this unit, you should be able to:**

- Understand cloud deployment models
- Explain cloud deployment decision factors
- Identify advantages and disadvantages of various models
- Identify cloud delivery models

- This unit provides the overview of cloud deployment models and cloud deployment decision. Gain knowledge on factors, identify advantages and disadvantages of various models and identify cloud delivery models are presented here.

# Cloud deployment models



- A cloud system (IaaS, PaaS, and SaaS) can be deployed using the following three main models.
- A hybrid cloud is needed when the capacity of private clouds is exhausted. It is a composition of two or more clouds that remain unique entities but are connected to each other.
- A private cloud is a proprietary network or data center that provides hosted services to a limited number of people.
- A public cloud sells services to everyone on the Internet. (For example, Amazon Web Services is currently the largest provider of public clouds.)

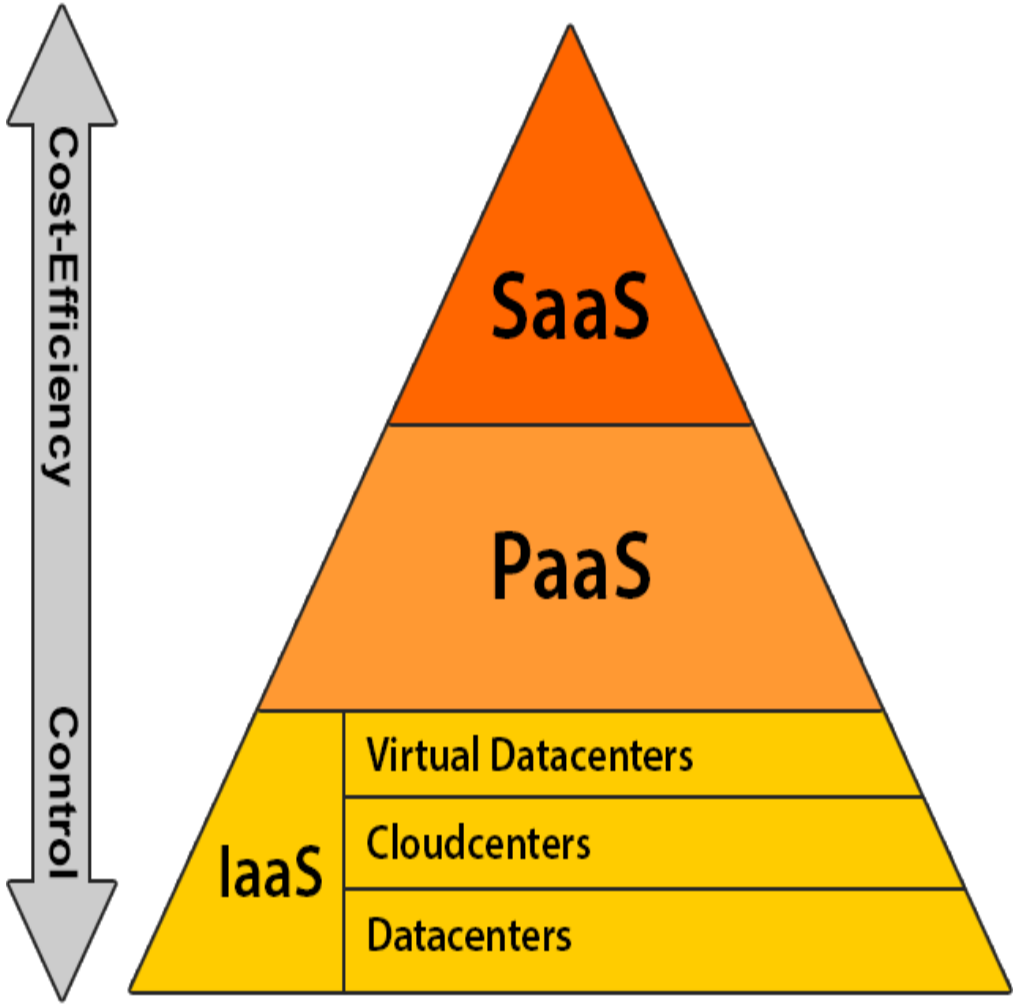



Figure: Cloud deployment models

# Business IT control



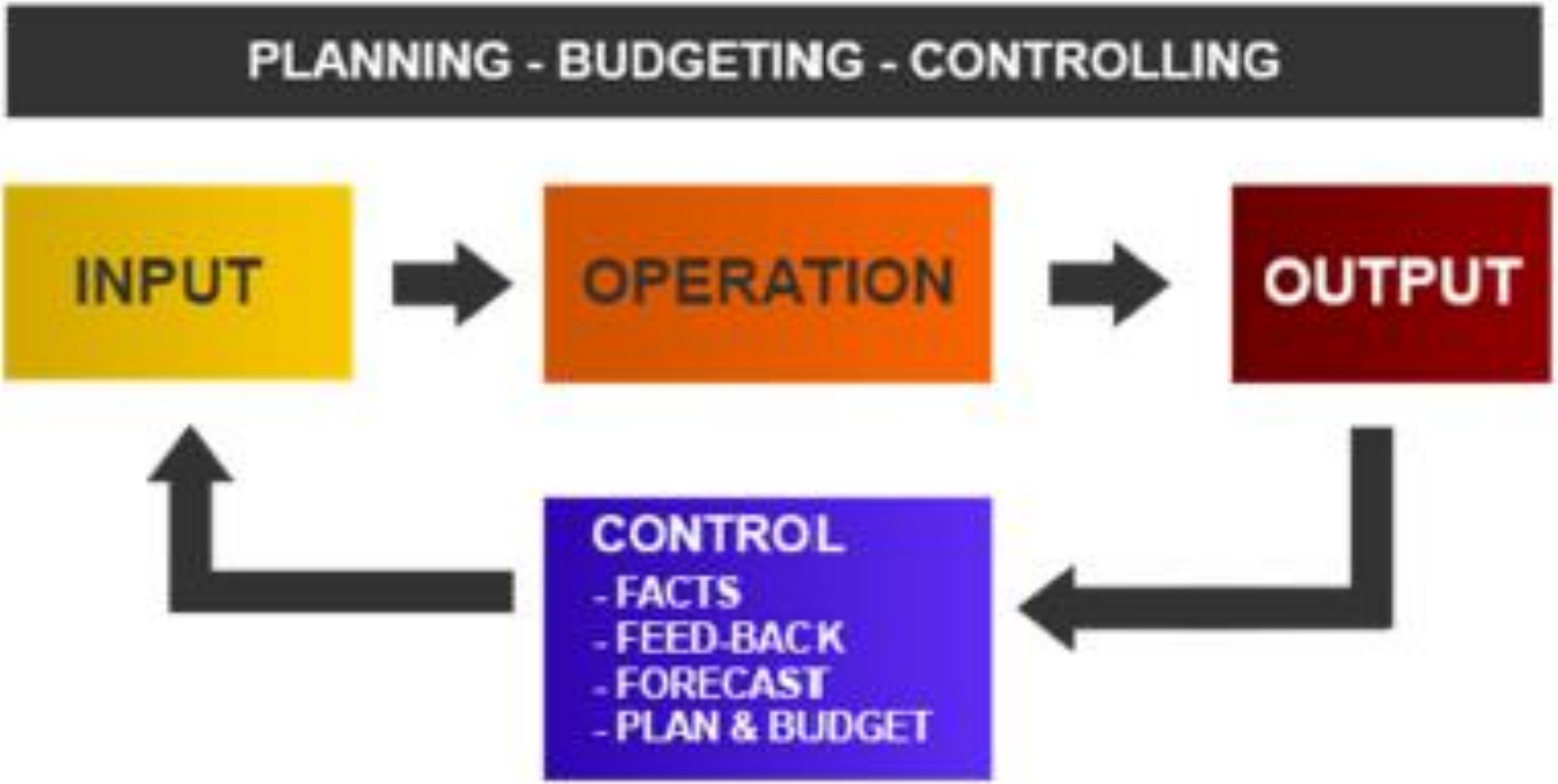



Figure: Business IT control

# Workload characteristics



Figure: Workload characteristics

# Workload lifespan preferences



Figure: Workload lifespan preferences

# Data freedom




Figure: Data freedom

# Time to deploy



Figure: Time to deploy

- A public cloud can be easily deployed in a matter of seconds or hours.
- However, setting a private cloud requires time to purchase the hardware and software to set up the cloud.
- If time is the only factor, then public cloud are the easiest to deploy.

# Public cloud



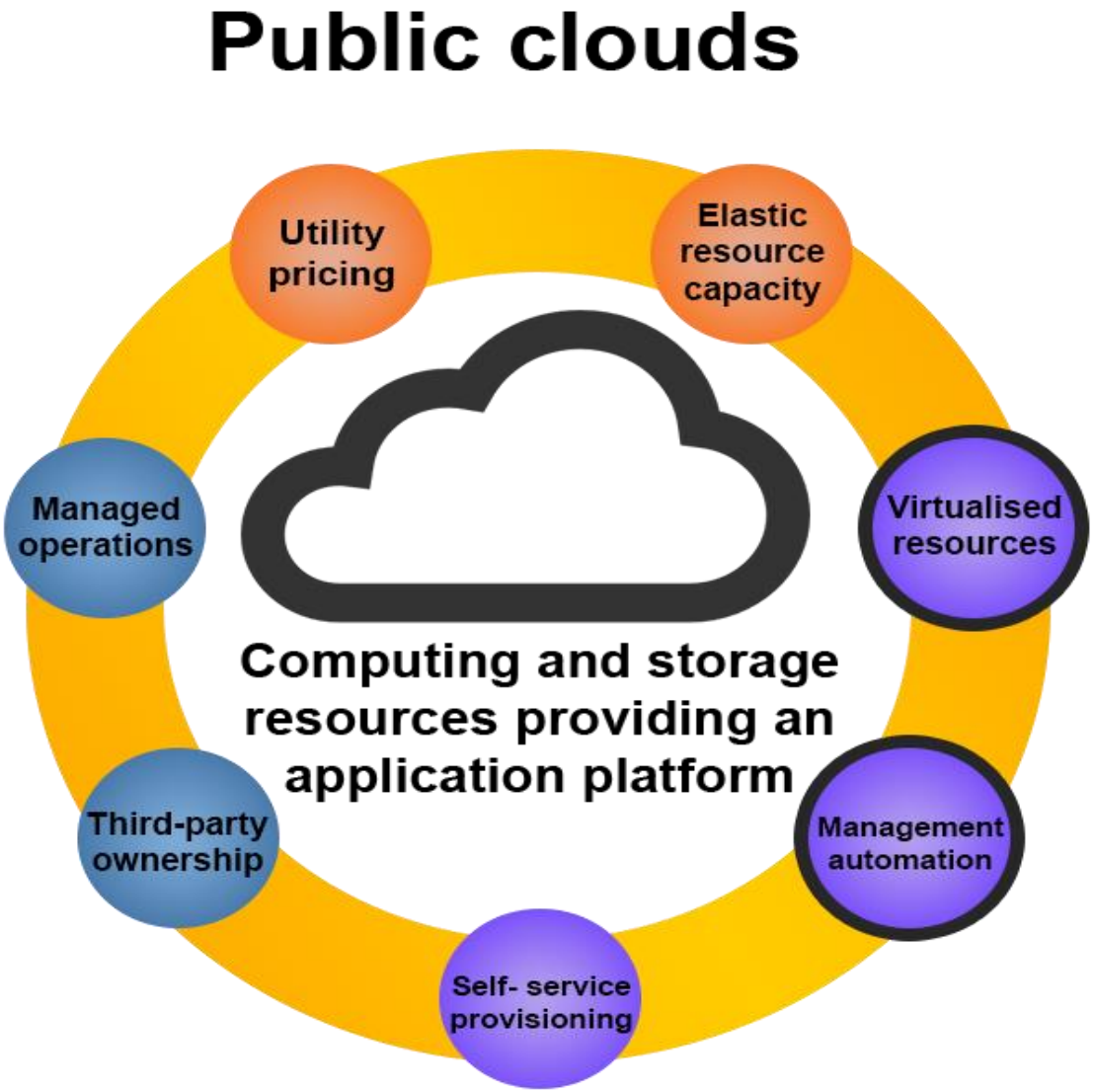



Figure: Public cloud

# Important points about public cloud



- The public cloud service is available through the public internet through a self- service portal.
- The public cloud service provider provides a Service Catalog, listing the cloud services on the portal and the associated cost of each.
- Creating and deleting a cloud server or a cloud storage instance is just a matter of few mouse clicks.
- The customer does not have to make an initial investment.
- The cloud service provider provides a minimum SLA (service level agreement) for the cloud server instance.

# Factor matrix



| Parameter | Public Cloud |
|---|---|
| Business IT Control | Limited control over the IT infrastructure. The cloud service provider maintains absolute control over the provisioning, metering, optimization, chargeback and other administrative activities on cloud. |
| Business Criticality | Public cloud is built using open-industry standards and off-the-shelf components. Applications that rely on proprietary stacks to achieve higher availability and disaster tolerance are not suitable for public clouds. Typically applications that do not have strict response requirements are suitable for public cloud. |
| Data and Transaction security | An organization going for public cloud services have to rely on the cloud service providers for implementation of security mechanisms to secure data and transactions. These security mechanisms if not implemented properly are prone to compromise. The number of areas where the compromise may take place are more as compared to other cloud models. |

Figure: Factor matrix

# Public cloud advantages



- No cost on hardware. Zero CapEx ensures fast deployments.
- The customer only pays for a subscription cost (OPEX) based on the usage.
- The customer can make use of readymade OS images with up-to-date patches from the cloud service provider to set up test and development environments – saving a lot of time.
- Competition among public cloud service providers ensures the subscriber of the lowest cost for the services rendered.
- The subscription cost can be tailor-made based on SLA agreement.
- The entire IT administration for the cloud is handled by the cloud service provider thus relieving the end-user.

# Hybrid Cloud



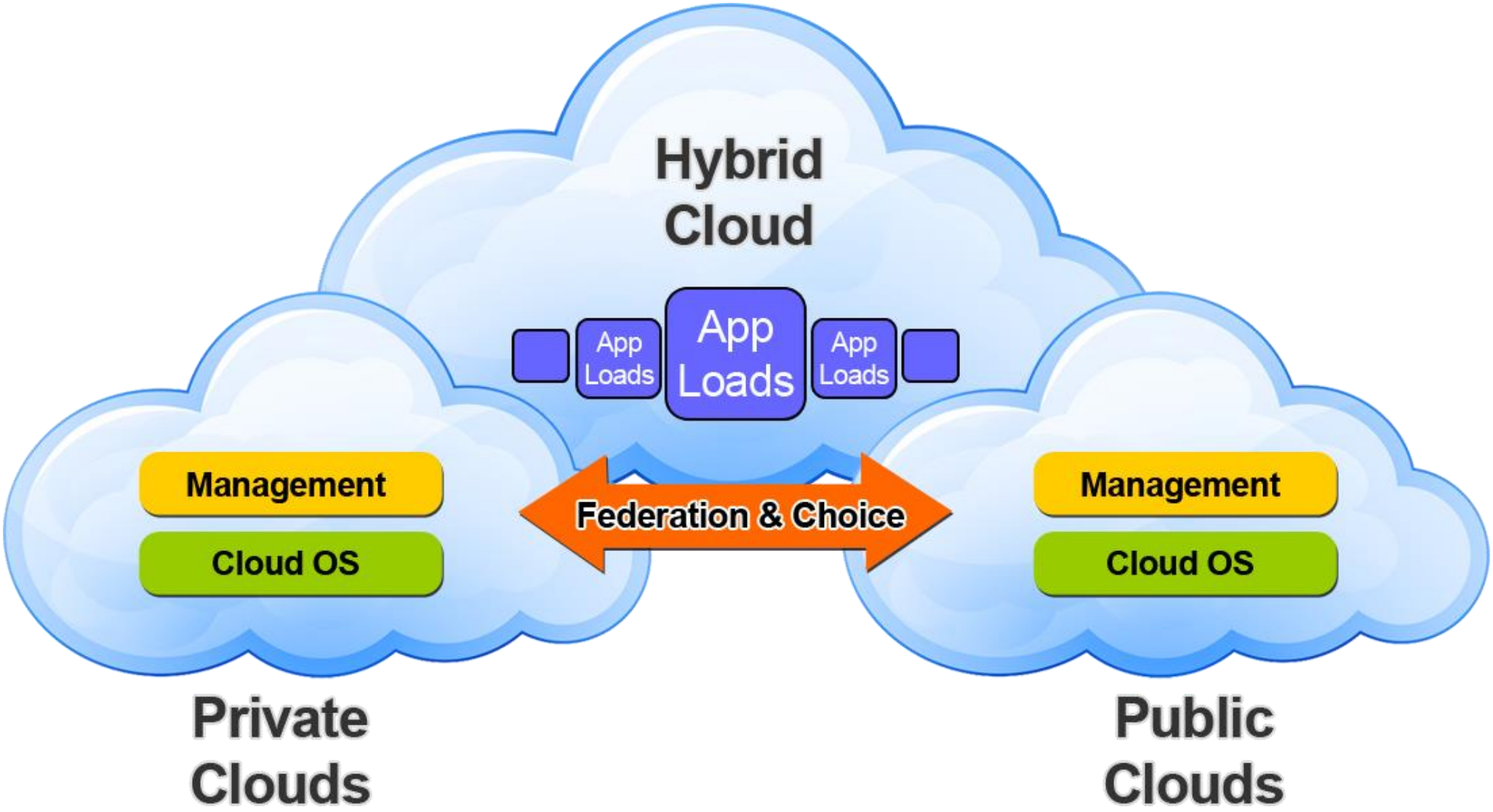



Figure: Hybrid Cloud

# Factor matrix



| Parameter | Hybrid Cloud |
|---|---|
| Business IT Control | Higher control over the IT infrastructure. The cloud service provider maintains absolute control over the provisioning, metering, optimization, chargeback and other administrative activities on the private cloud, but the control over the public cloud is limited. Workload can be moved between public and private cloud to accommodate control requirements. |
| Business Criticality | Applications that rely on proprietary stacks to achieve higher availability and disaster tolerance can be run on the private section. Other applications that do not have strict response requirements can be run on the public cloud section. Any change in criticality can be adjusted by moving workload between public and private clouds. |
| Data and Transaction security | Private Cloud being internal to an organization enables custom implementation of security mechanisms to secure data and transactions. Workloads can be moved between public and private cloud to map it to the right security environment. |

Figure: Factor matrix

# Overview of cloud delivery models



- A Cloud Service Layer determines the nature and particulars of service are delivered by a Cloud.
- The nature of services delivered by Cloud is also known as Cloud delivery model.
- A cloud delivery model is different from a deployment model(discussed in the last chapter).
- A deployment model determines to show a cloud is implemented but not the kind of service it provides.
- A cloud service layer determines the types of services delivered by a particular cloud solution.

# Cloud delivery infrastructure



- A typical IT infrastructure is composed of our major IT layers–Infrastructure, Platforms(middleware), Software(Applications), Business Process Solutions(Specialized business applications and services).

- Each of these layers can be delivered as a service to the end customer.

- The infrastructure layer can be provided as a service to the end-customer, in the form of VMs, Storage pools, Network bandwidth etc.

# IT Layers



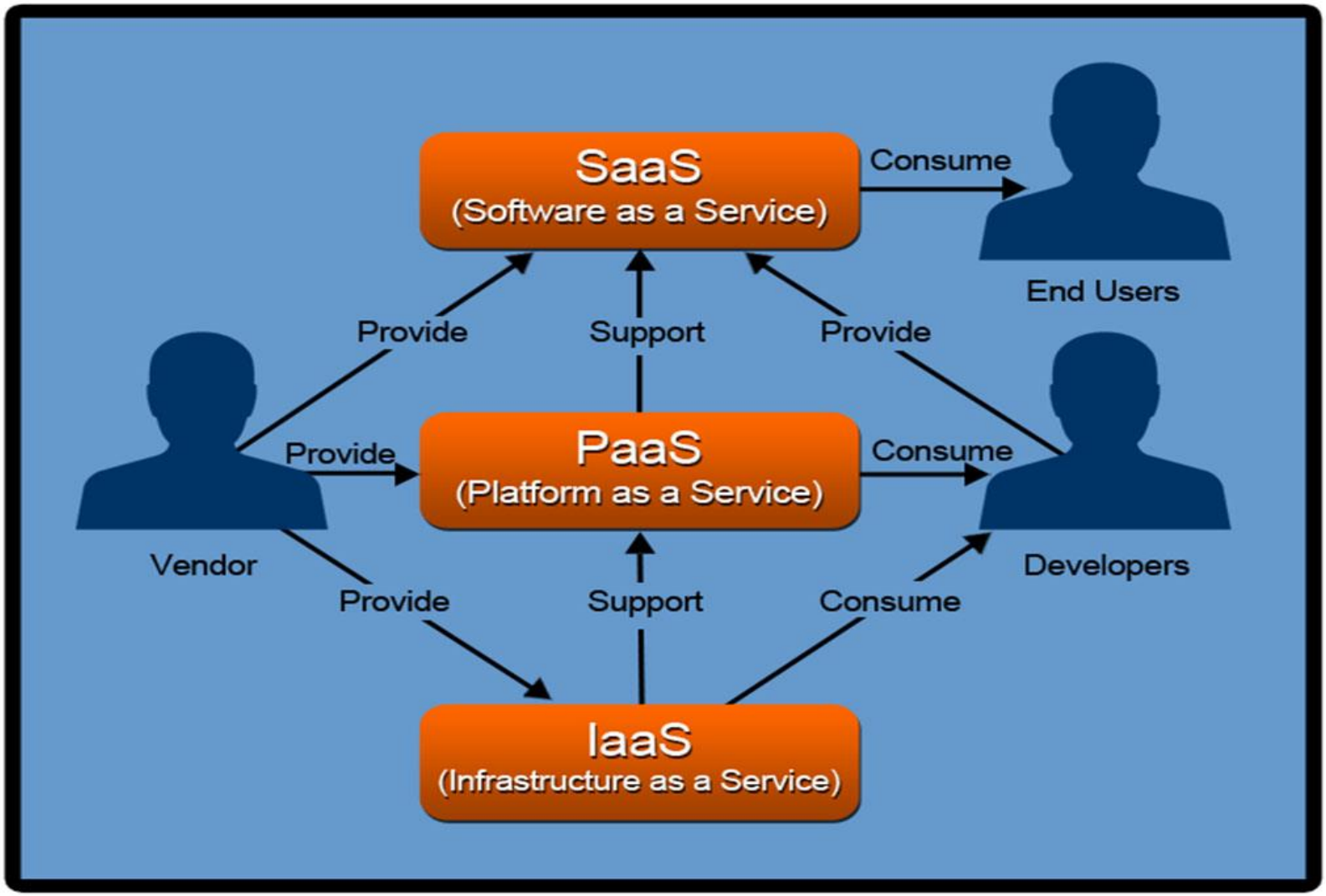



Figure: IT Layers

# IaaS overview



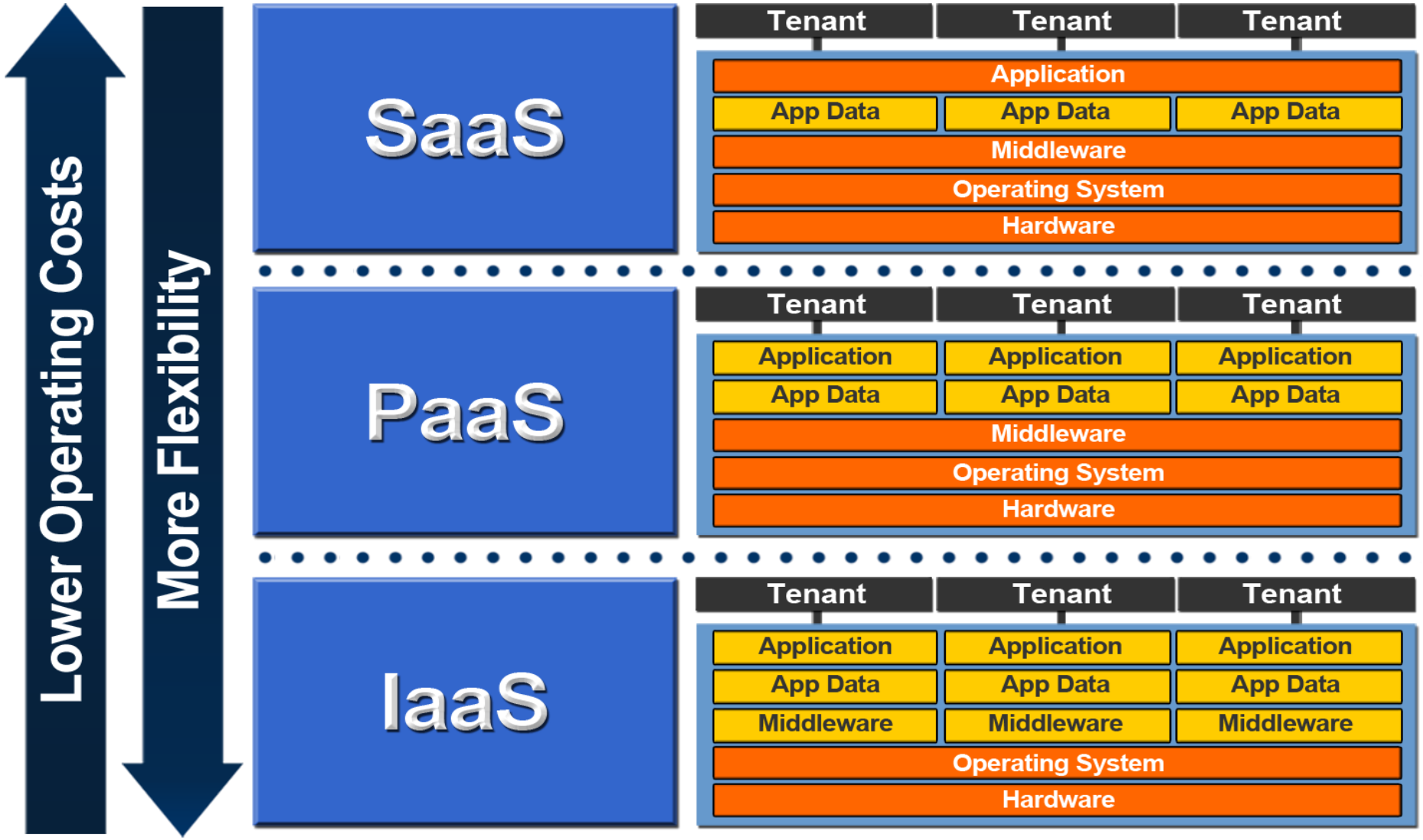



Figure: IaaS overview

# Cloudbursting



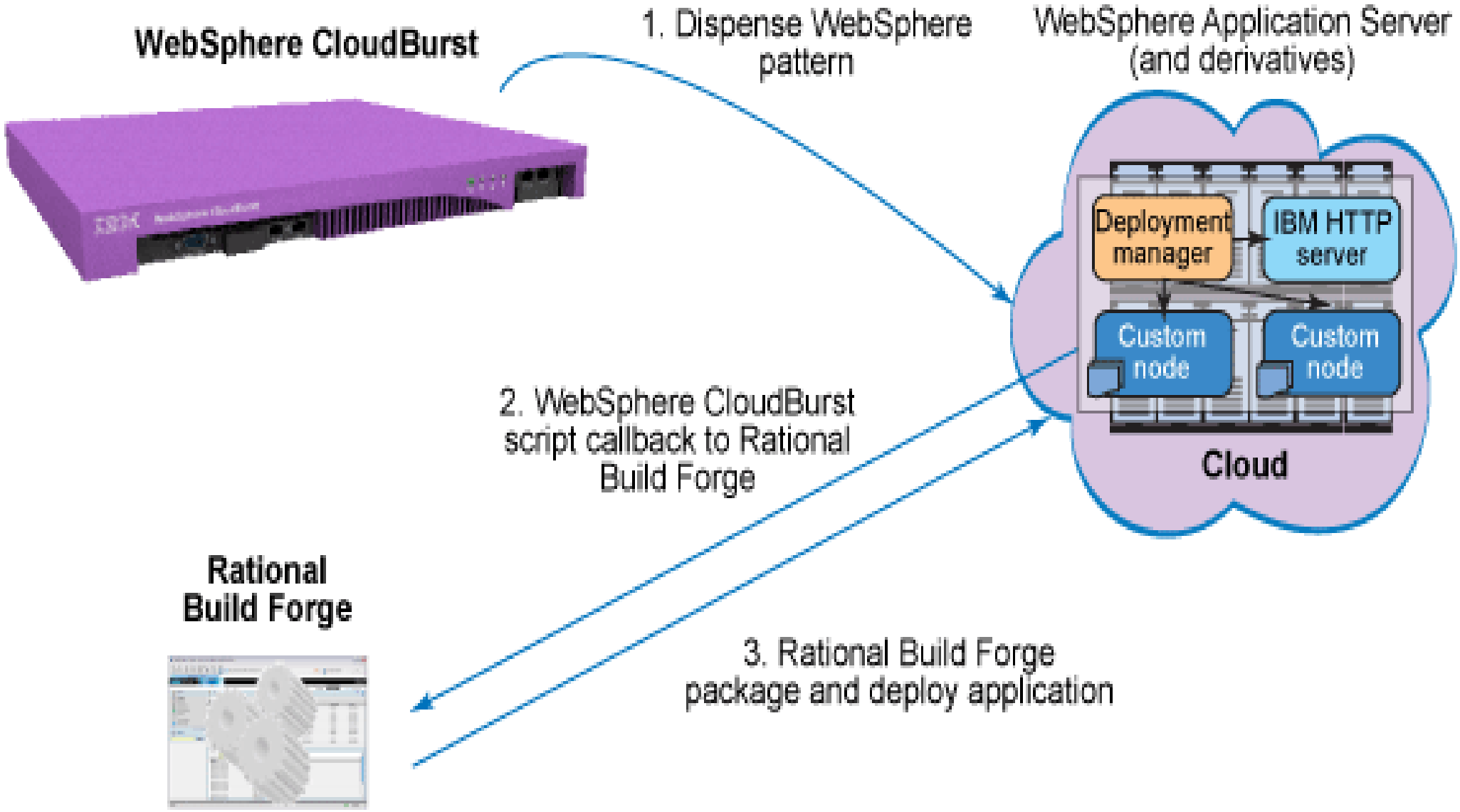



Figure: Cloudbursting

# Multi Tenancy

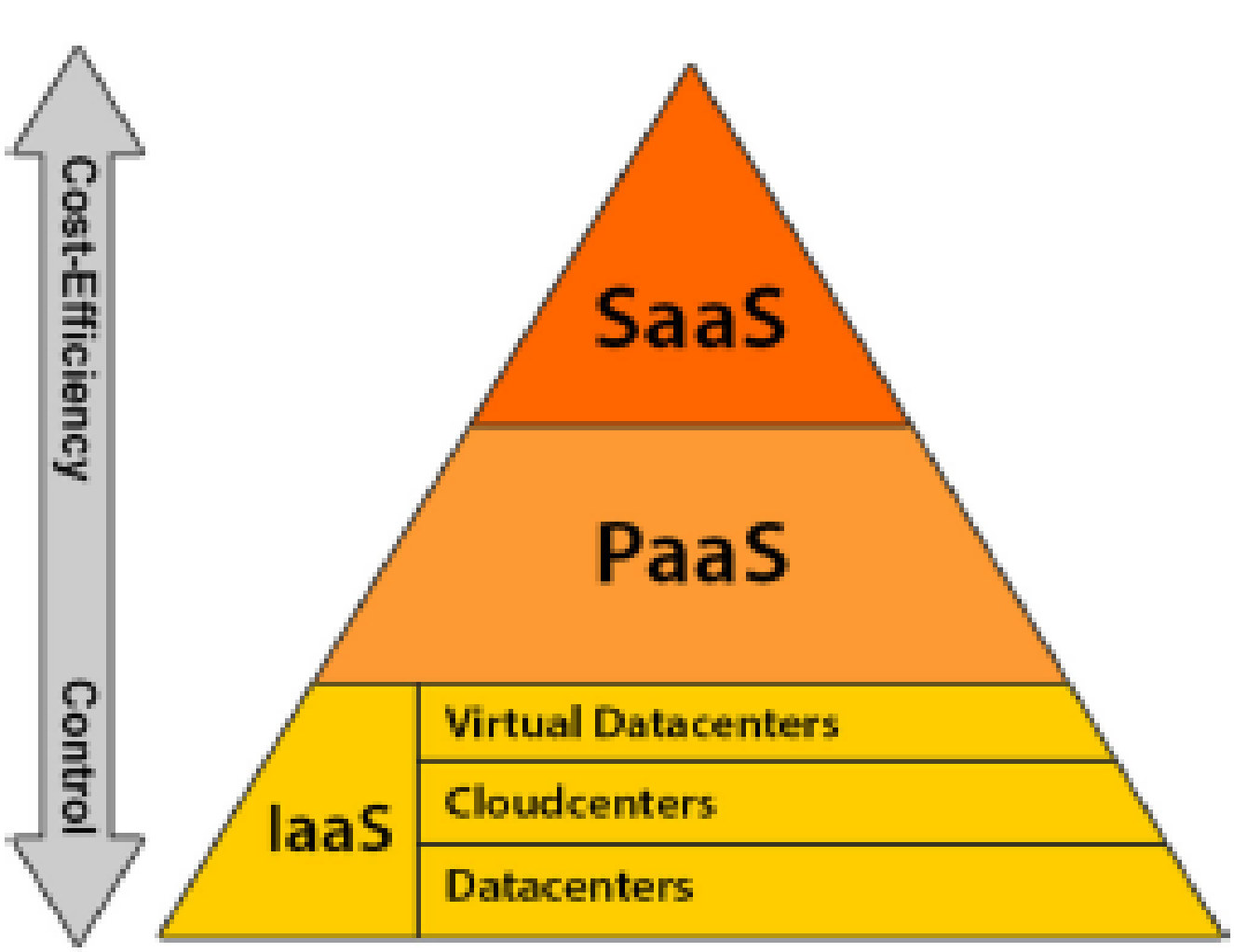


- **What's Multi-Tenancy?**
  - "In multi-tenancy, the cloud provider has one instance of the application, one instance of the database, and has all his clients/customers a.k.a. Tenants, using the single instance of the application and sharing the database. The data for each client is segregated simply by designing the database and application for this."

- **In other words, Multi-tenancy is**
  - A central feature of Cloud is that it allows multiple users make use of common infrastructure on a transparent sharing basis. This feature is called multi-tenant computing and it has become widespread with cloud computing. Multi-tenancy allows for efficient use of spare capacity on the cloud that would otherwise remain unutilized in single tenant systems.

# PaaS Overview





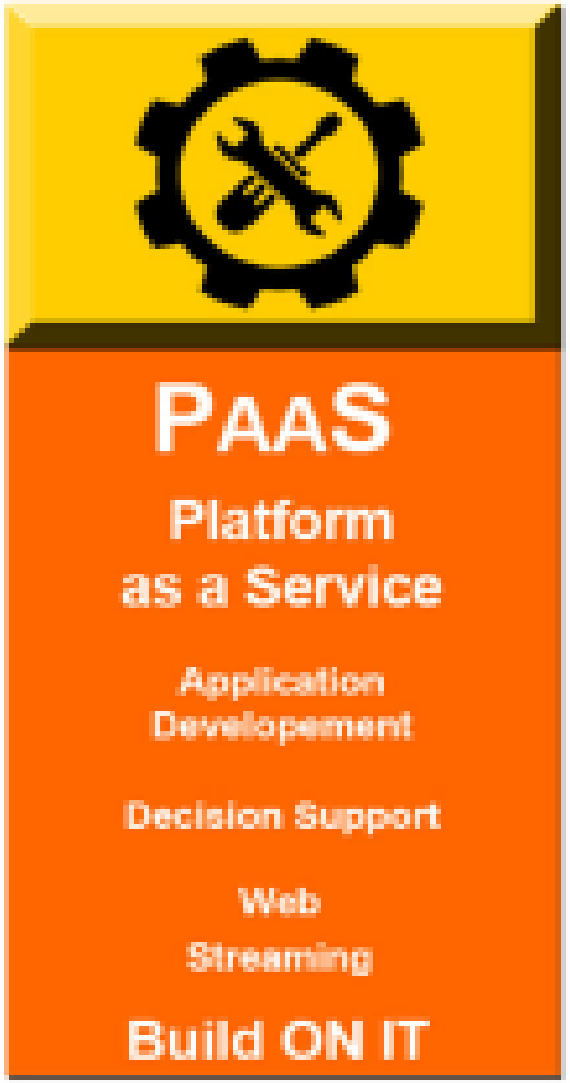




Figure: PaaS Overview

# Pass stack



Common technologies and solution provided by a web hosting PaaS stack are as follows:

- A web server (Apache, Microsoft IIS etc.).
- A servlet container or web server script container/server (PHP, CGI-Perl, Ruby etc).
- Database (A database that interacts with web-based API for data exchange).
- Web Management Panel (C Panel, Parallels etc).
- Console based access for advanced administration (SSH, FTP accounts).
- Analytics (Web analytics tools to determine the number of visitors to the website, geographic distribution etc.).
- SEO (Search engine optimization) tools to optimize your web application for search engines.
- The features provided by a platform vendor may vary based on cost and other factors. Also, the SLA may vary for each feature. A user must do a thorough due-diligence before choosing a PaaS solution.

# What is SaaS



- A SaaS is an implementation of a business application or process that is developed on a cloud platform and hosted in a cloud infrastructure.
- SaaS providers deliver domain-specific applications or services over the Internet and charge end users on a pay-per-usage basis.

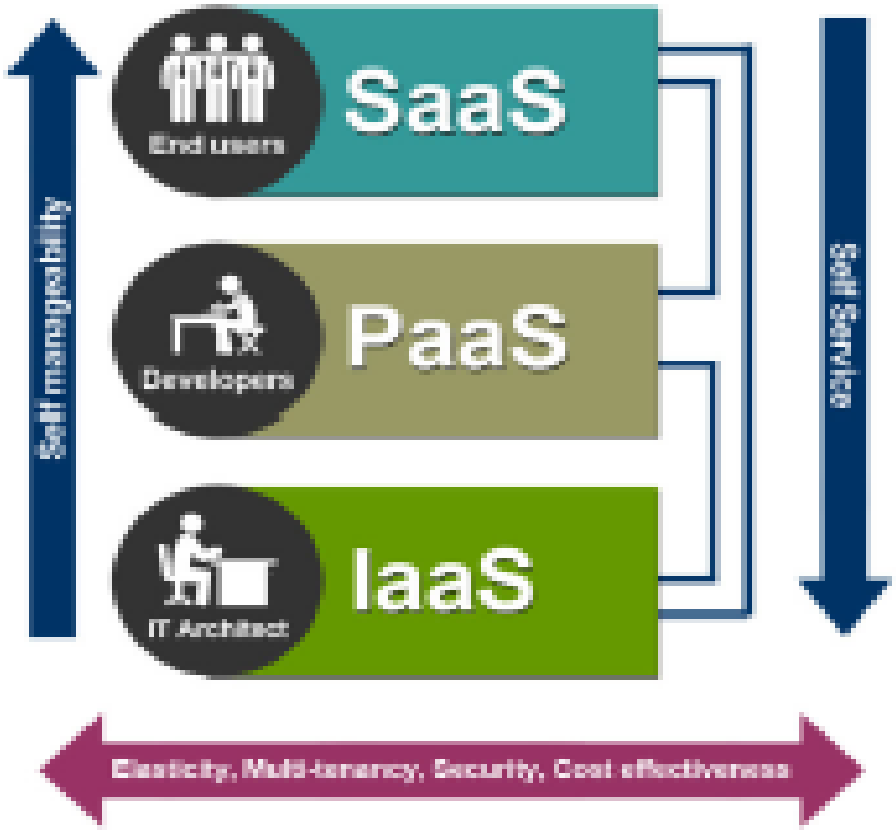




Figure: What is SaaS

# Checkpoint (1 of 2)



**Multiple choice questions:**

1. What feature does not belong in a private cloud?
   a) Metered billing
   b) Self-service portal
   c) Dial-home support
   d) Rapid elasticity

2. Which of these services is not Platform as a Service?
   a) Force.com
   b) Microsoft Azure
   c) Amazon EC2
   d) Joyent

3. Which is not a major cloud computing platform?
   a) Rackspace's Mosso
   b) IBM BigData
   c) Microsoft Azure
   d) Amazon EC2

# Checkpoint Solution (1 of 2)



**Multiple choice questions:**

1. What feature does not belong in a private cloud?
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# Checkpoint (2 of 2)



**Fill in the blanks:**

1. A cloud architecture maintained within an enterprise data center is _____ cloud.
2. Amazon Web Services is _____ type of cloud computing distribution model.
3. _____ is the name of the Rackspace cloud service.
4. _____ deployment model do not necessarily require an internet connection.

**True/False:**

1. An Internet connection is necessary for public cloud computing interaction. True/False.
2. A Platform as a Service (PaaS) cloud not lies directly upon an IaaS layer. True/False.
3. Resource pooling involves pooling up of physical server resources and sharing of these resources among multiple users. True/False.

# Checkpoint Solution (2 of 2)



**Fill in the blanks:**

1. A cloud architecture maintained within an enterprise data center is **Private** cloud.
2. Amazon Web Services is **Platform as a Service** type of cloud computing distribution model.
3. **Cloud Servers** is the name of the Rackspace cloud service.
4. **Private Cloud** deployment model do not necessarily require an internet connection.

**True/False:**

1. An Internet connection is necessary for public cloud computing interaction. True.
2. A Platform as a Service (PaaS) cloud not lies directly upon an IaaS layer. False.
3. Resource pooling involves pooling up of physical server resources and sharing of these resources among multiple users. True.

# Question bank



**Two-mark questions:**

1. Define Private cloud.
2. Mention any 4 cloud deployment decision factors.
3. Define Software as a Service (SaaS).
4. Define Platform as a Service (PaaS)

**Four-mark questions:**

1. Explain in brief Software as a Service (SaaS).
2. Explain in brief Cloud bursting.
3. Explain in brief IT layers.
4. Explain in brief Business IT control.

**Eight-mark questions:**

1. Explain in detail Hybrid Cloud.
2. Explain in detail Platform as a Service (PaaS).

# Unit summary



**Having completed this unit, you should be able to:**

- Understand cloud deployment models
- Explain cloud deployment decision factors
- Identify advantages and disadvantages of various models
- Identify cloud delivery models