

# MODULE-II

## CLOUD COMPUTING ARCHITECTURE

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Dept . Of ISE

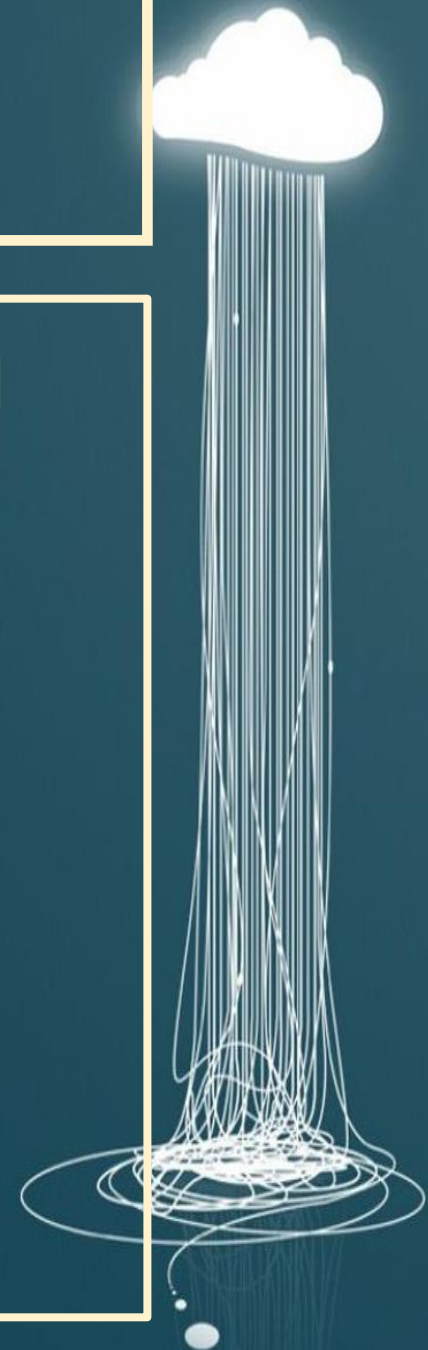


## ❖ Introduction

❖ Cloud Service---Depends on ---Distributed Infrastructure.

❖ Cloud can be created using

- ❖ A data center
- ❖ Collection of Cluster
- ❖ Heterogeneous Distributed System

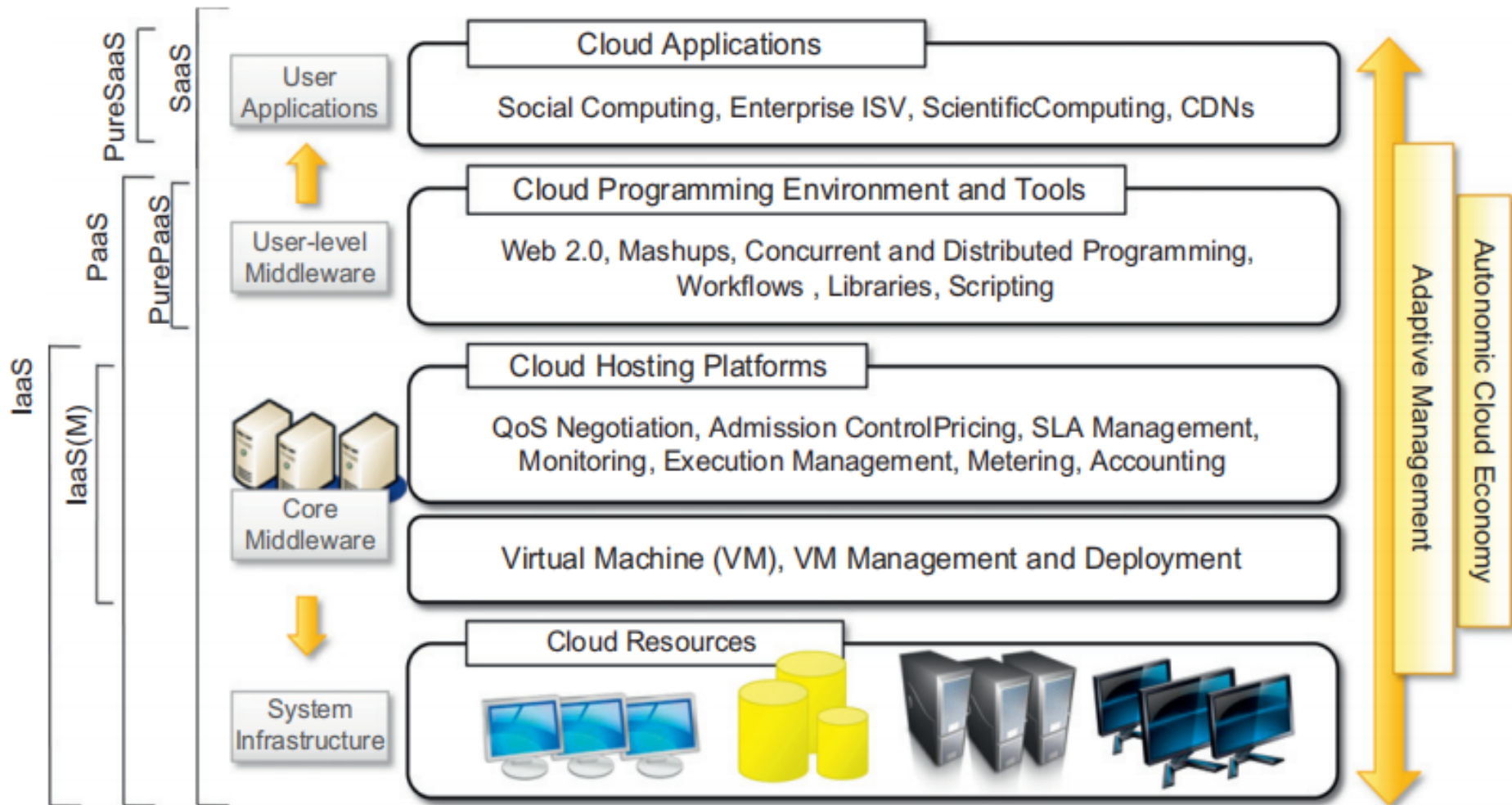


## ❖ Introduction

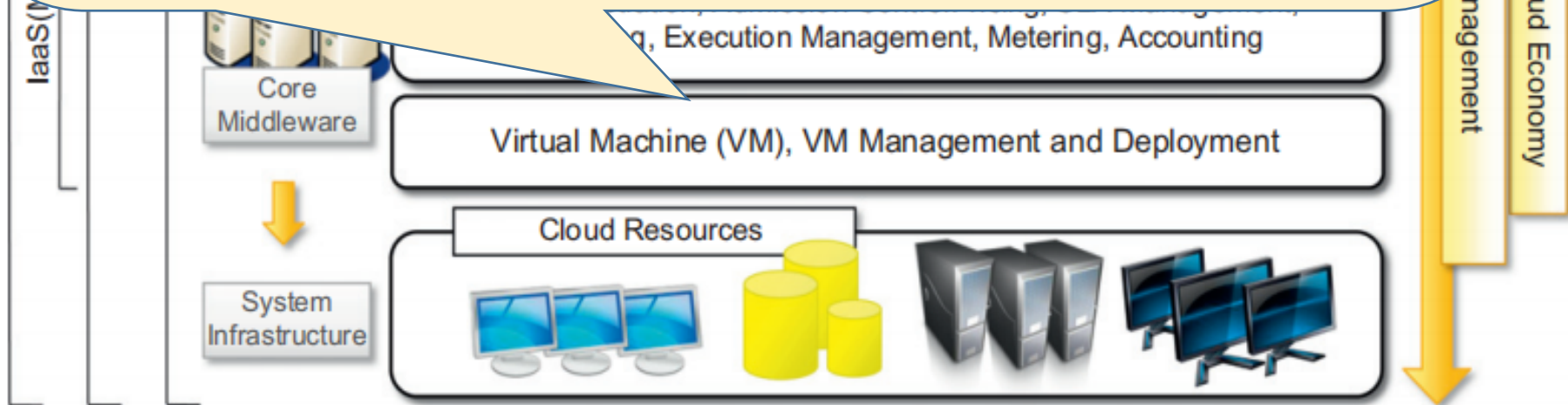
Cloud computing is a utility-oriented and Internet-centric way of delivering IT services on demand. These services cover the entire computing stack: from the hardware infrastructure packaged as a set of virtual machines to software services such as development platforms and distributed applications.



# ❖ The Cloud Reference Model Architecture



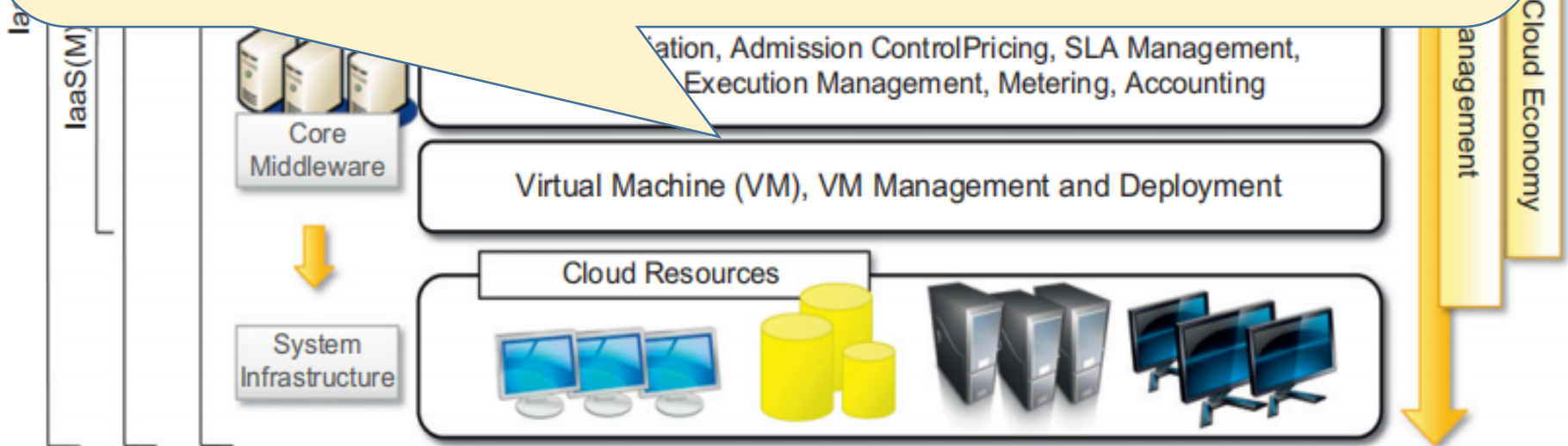
- ❖ Run time Environemtn Customization.
- ❖ Isolation
- ❖ Sandboxing
- ❖ Manage pool os resources
- ❖ hardware Virtualization---- Provided
- ❖ Storage Virtualization -- Provided
- ❖ Network Virtualization -- Provided



# ❖ The Cloud Reference Model Architecture



- ❖ other Virtualization Techniques---on This Platform----
- Programming Language level / Application level



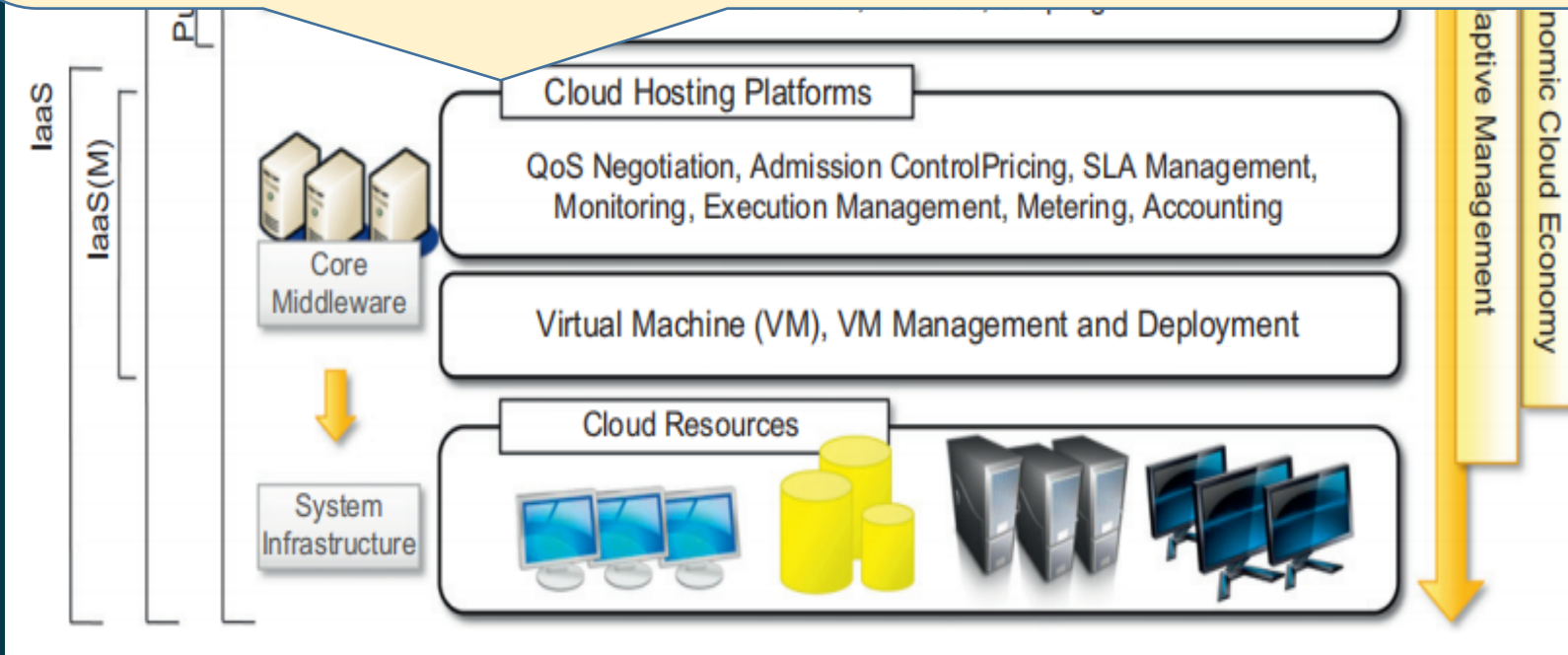


# ❖ The Cloud Reference Model

## Architecture



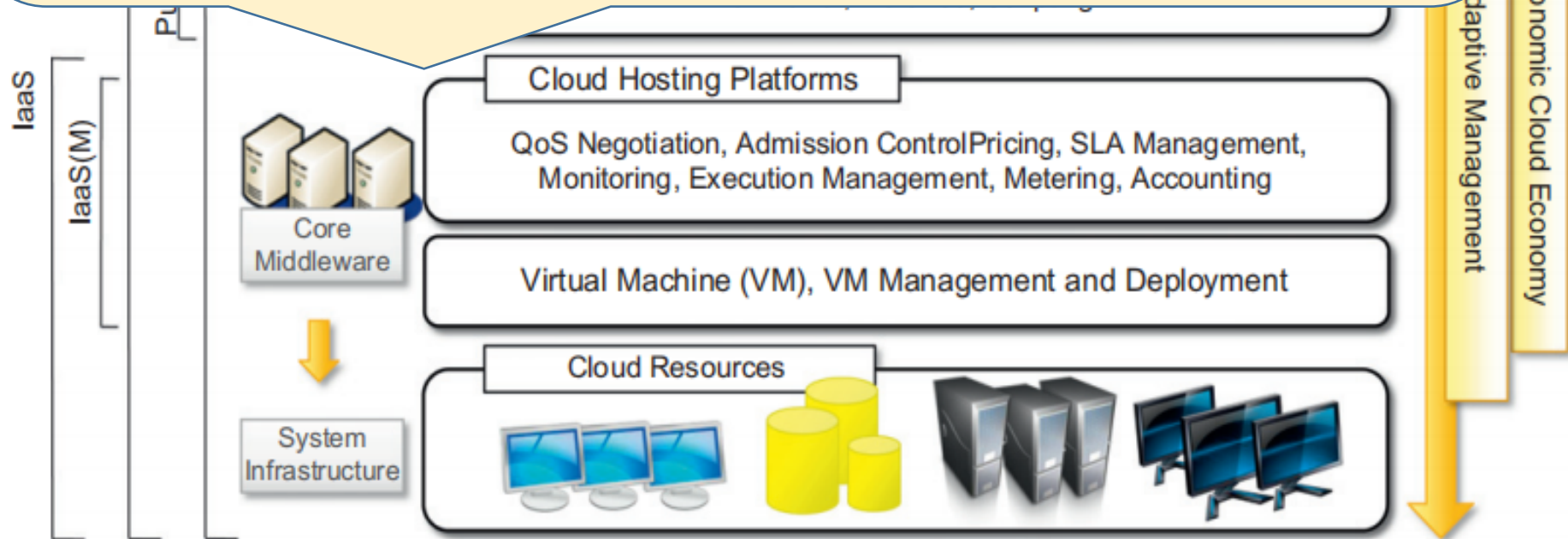
- ❖ IaaS = Virtualization + Cloud Hosting Platform
- ❖ IaaS (M) --> IaaS Management --> Only Management is provided by vendor  
--> Physical resources are rented by somewhere else



# ❖ The Cloud Reference Model

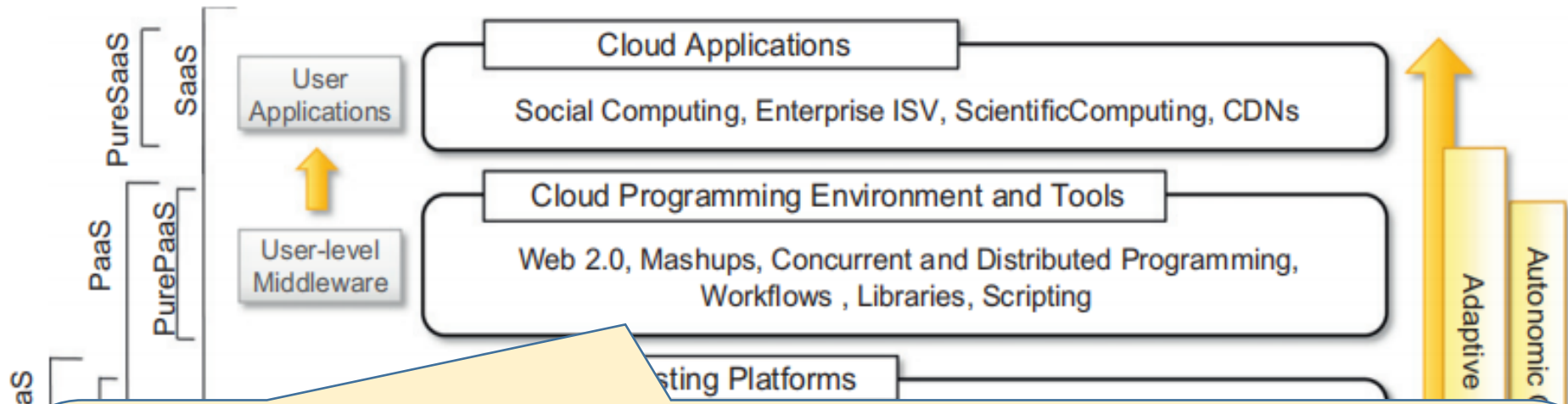
## ❖ IaaS

- ❖ Just Provides Infrastructure
- ❖ If you want to develop app --- You have to-----Install s/w on provided infrastructure





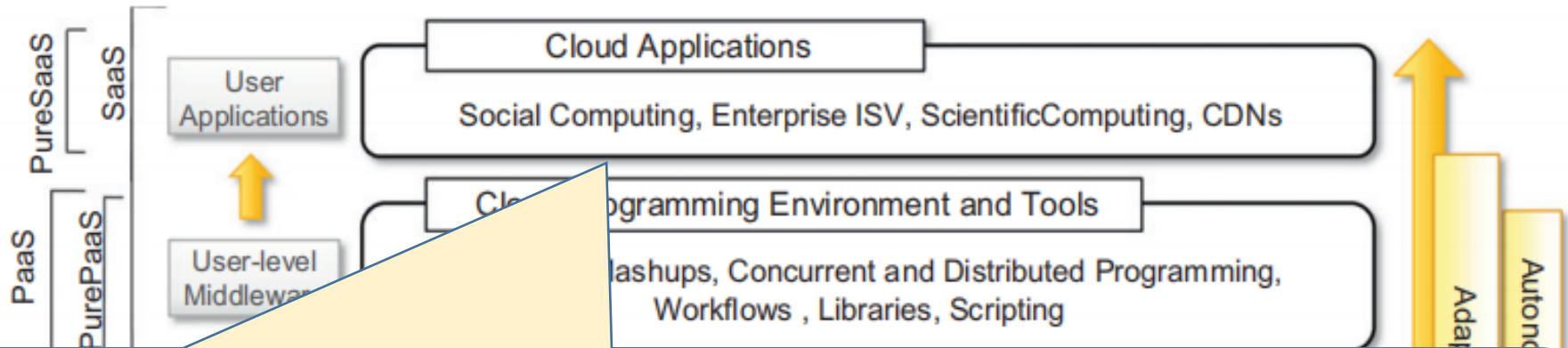
# ❖ The Cloud Reference Model Architecture



## ❖ PaaS

- ❖ Infrastructure is provided----as part of----- Middleware Software Provided
- ❖ Pure PaaS -->  
Only Middleware is Provided-----> Run it in your machine or  
-----> Ask some other vendor to give  
infrastructure

# ❖ The Cloud Reference Model Architecture



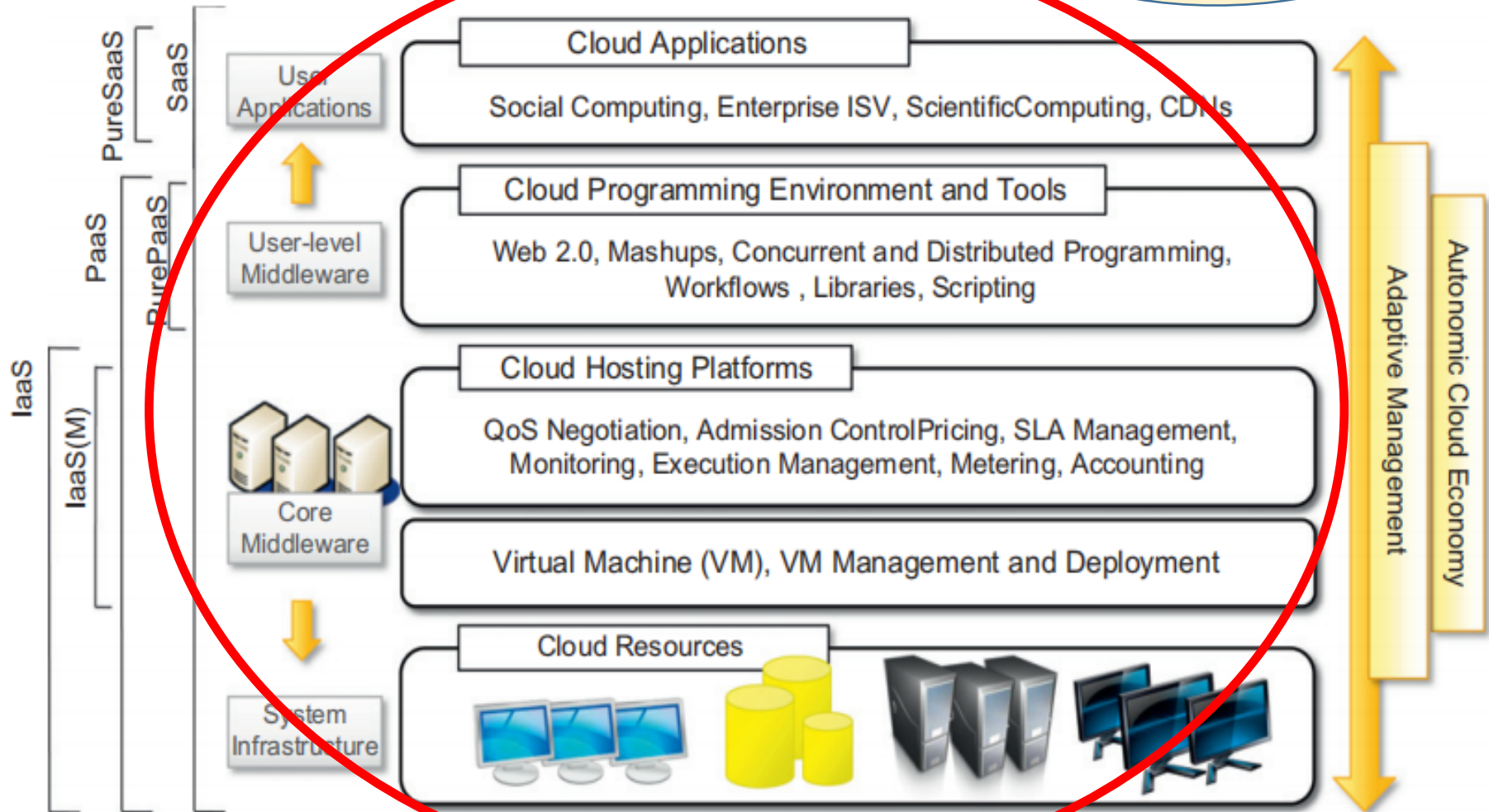
## ❖ SaaS

- ❖ Web Based Applications---- Hosted On ---- Cloud
- ❖ S/W provided through Internet --- Cloud makes them SCALABLE



# ❖ The Cloud Reference Model Architecture

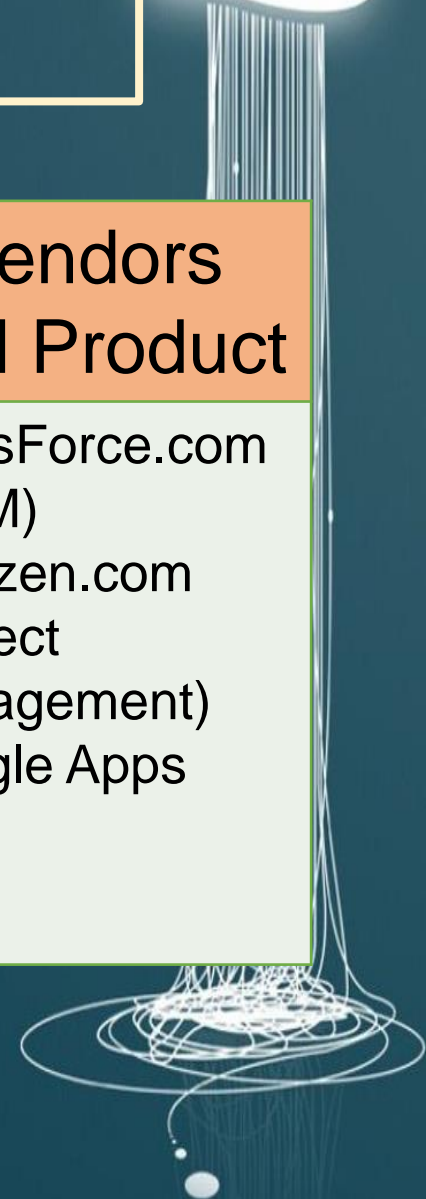
XaaS:  
Everything  
as a Service



# ❖ The Cloud Reference Model Architecture



Category	Characteristics	Product Type	Vendors and Product
SaaS	Customers are provided with applications that are accessible anytime and from anywhere.	Web applications and services (Web 2.0)	SalesForce.com (CRM) Clarizen.com (project management) Google Apps



# ❖ The Cloud Reference Model Architecture



Category	Characteristics	Product Type	Vendors and Product
PaaS	Customers are provided with a platform for developing applications hosted in the cloud.	Programming APIs and frameworks Deployment systems	Google AppEngine Microsoft Azure Manjrasoft Aneka Data Synapse



# ❖ The Cloud Reference Model Architecture



Category	Characteristics	Product Type	Vendors and Product
IaaS/HaaS	Customers are provided with virtualized hardware and storage on top of which they can build their infrastructure.	Virtual machine management infrastructure Storage management Network management	Amazon EC2 and S3 GoGrid Nirvanix



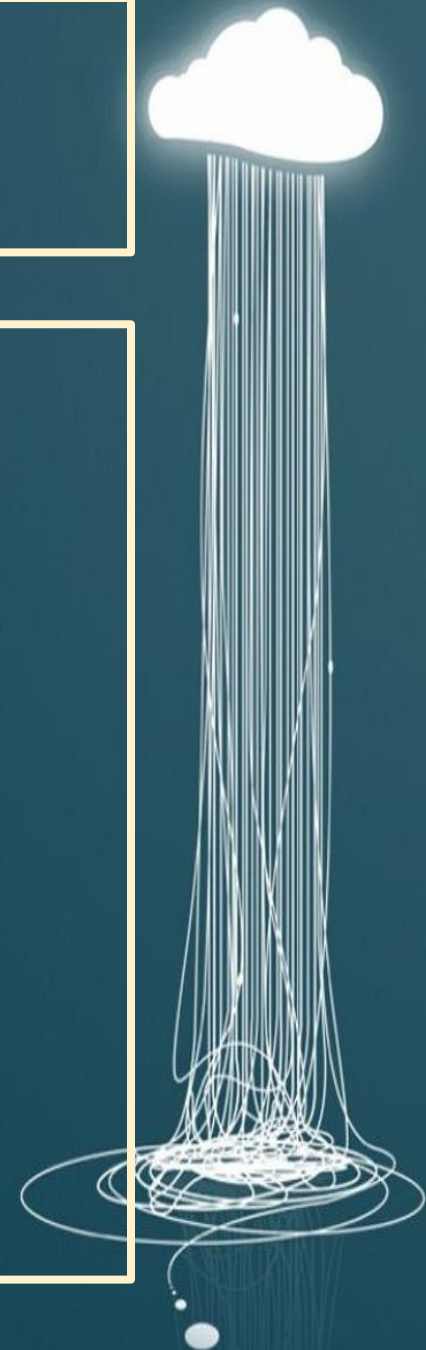


# ❖ The Cloud Reference Model

Infrastructure and Hardware as a Service(IaaS/HaaS)

## ❖ Services Provided are

- Single Server
- Cluster
- Network
- Storage
- Web Servers
- Load Balancers

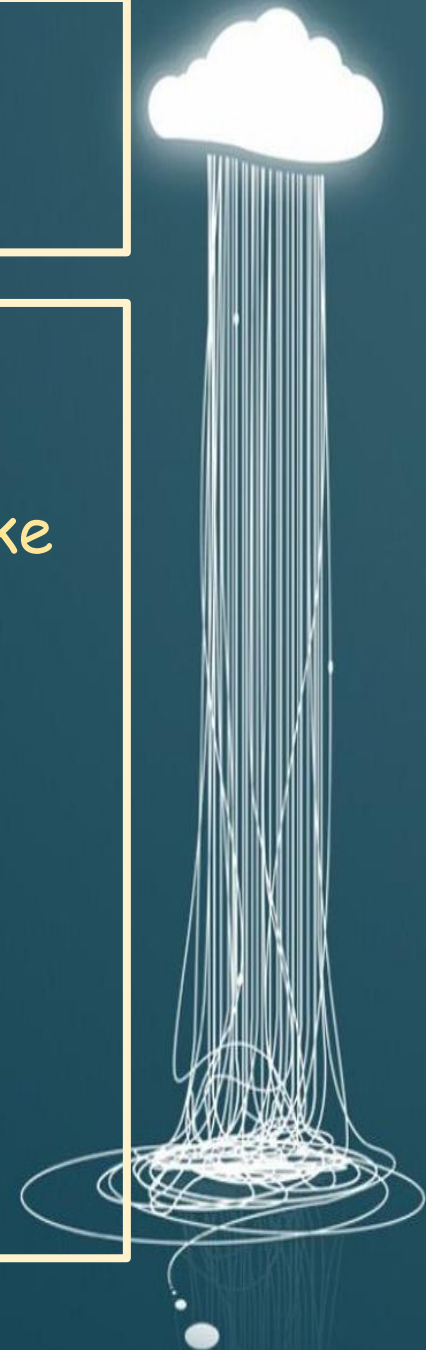


## ❖ The Cloud Reference Model

Infrastructure and Hardware as a Service(IaaS/HaaS)

❖ Virtual machine---set of Atomic components like

- Memory
- Processor
- Disk
- etc.



# ❖ The Cloud Reference Model

Infrastructure and Hardware as a Service(IaaS/HaaS)

## ❖ Advantages of technology

- Workload Partitioning
- Application Isolation
- Sandboxing
- Hardware Tuning

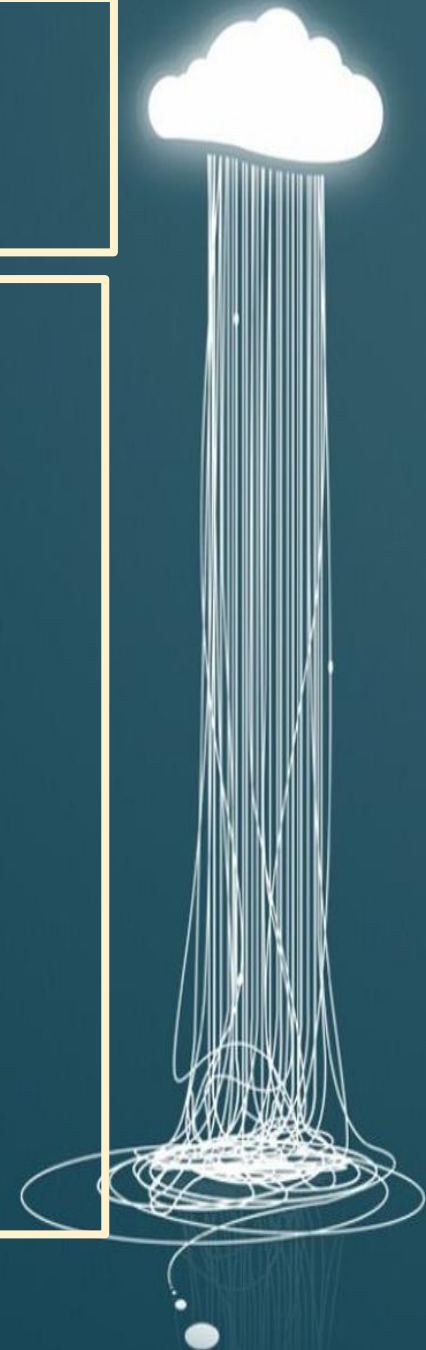


# ❖ The Cloud Reference Model

Infrastructure and Hardware as a Service(IaaS/HaaS)

## ❖ Advantages for Provideer

- Better exploiting IT infrastructure
- Secure environment

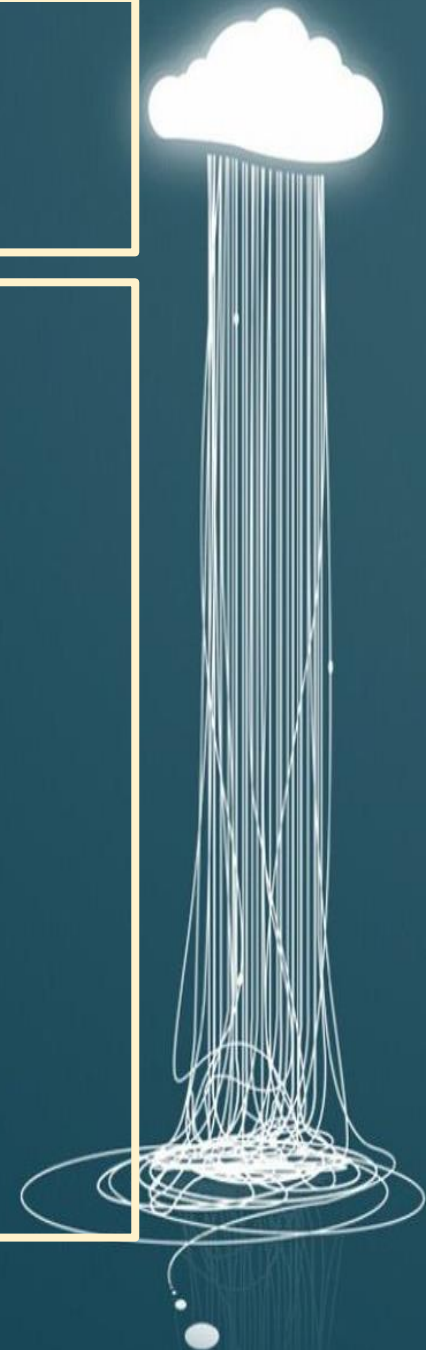


## ❖ The Cloud Reference Model

Infrastructure and Hardware as a Service(IaaS/HaaS)

## ❖ Advantages for End User

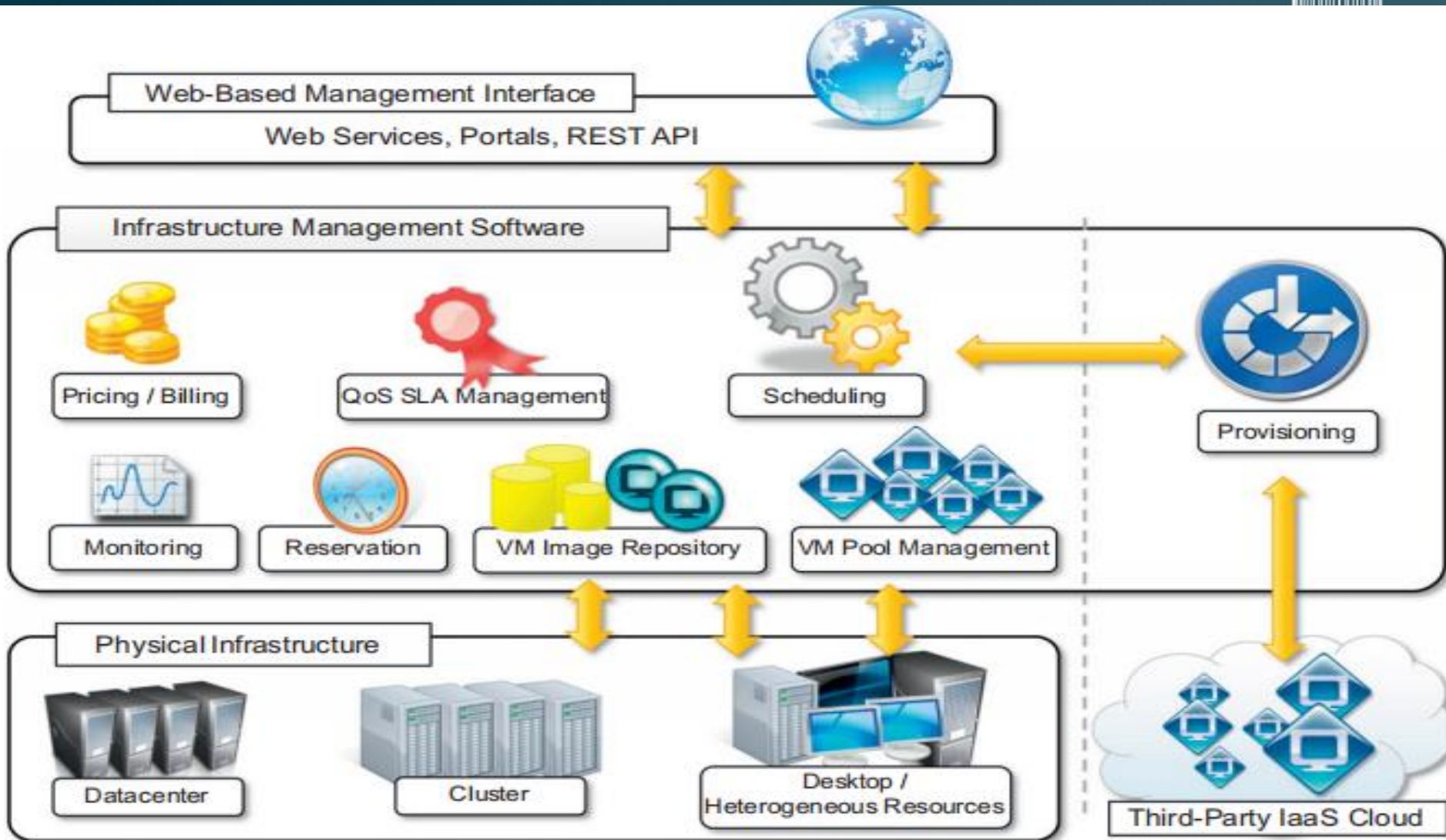
- Reduces Administrative ,Maintenance and Capital Cost
- Full Customization
- Prepackaged System Images - Ex: Web Servers----With HttpD running....
- SLA based resource allocation etc.





# ❖ The Cloud Reference Model

## Infrastructure and Hardware as a Service(IaaS/HaaS)

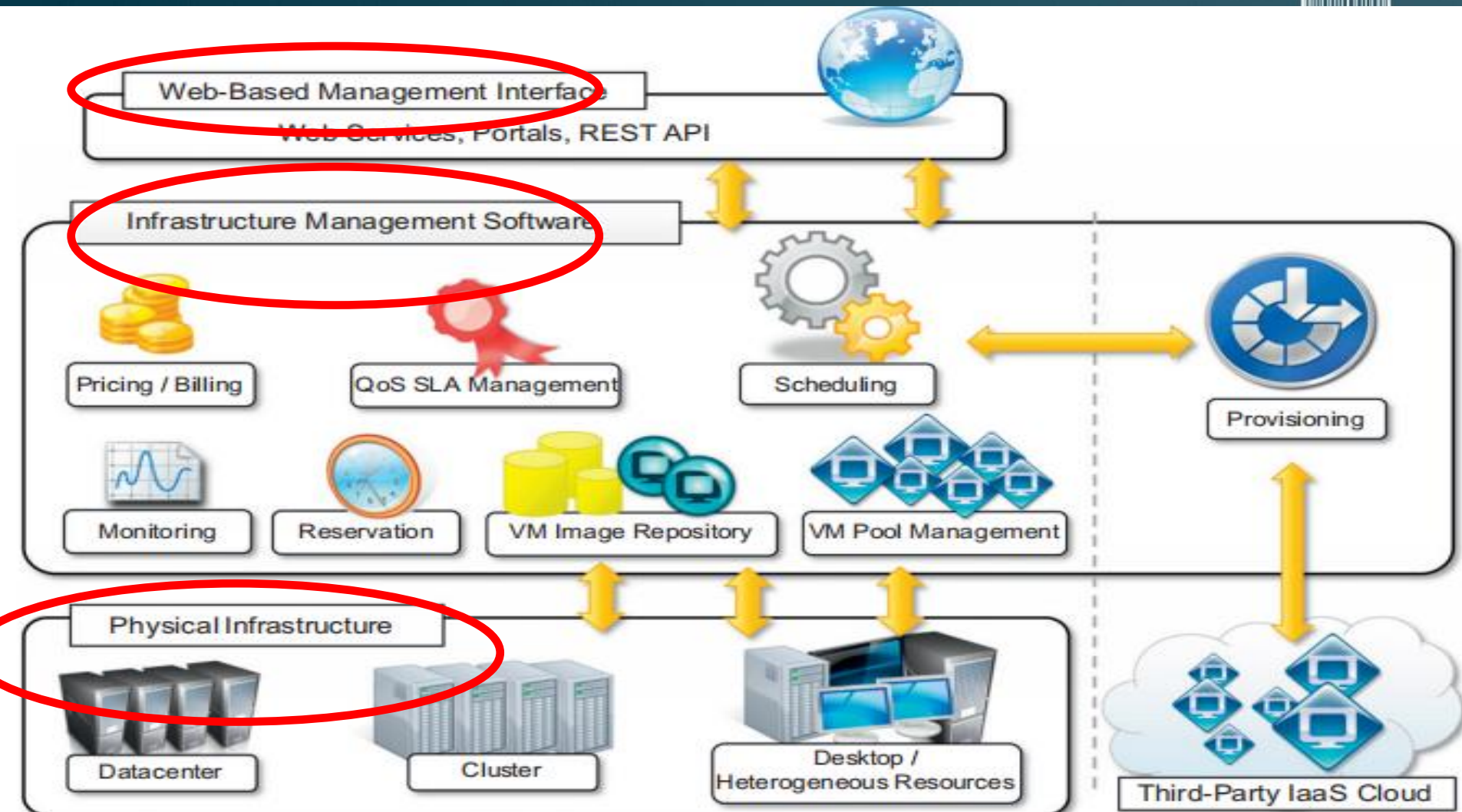






# ❖ The Cloud Reference Model

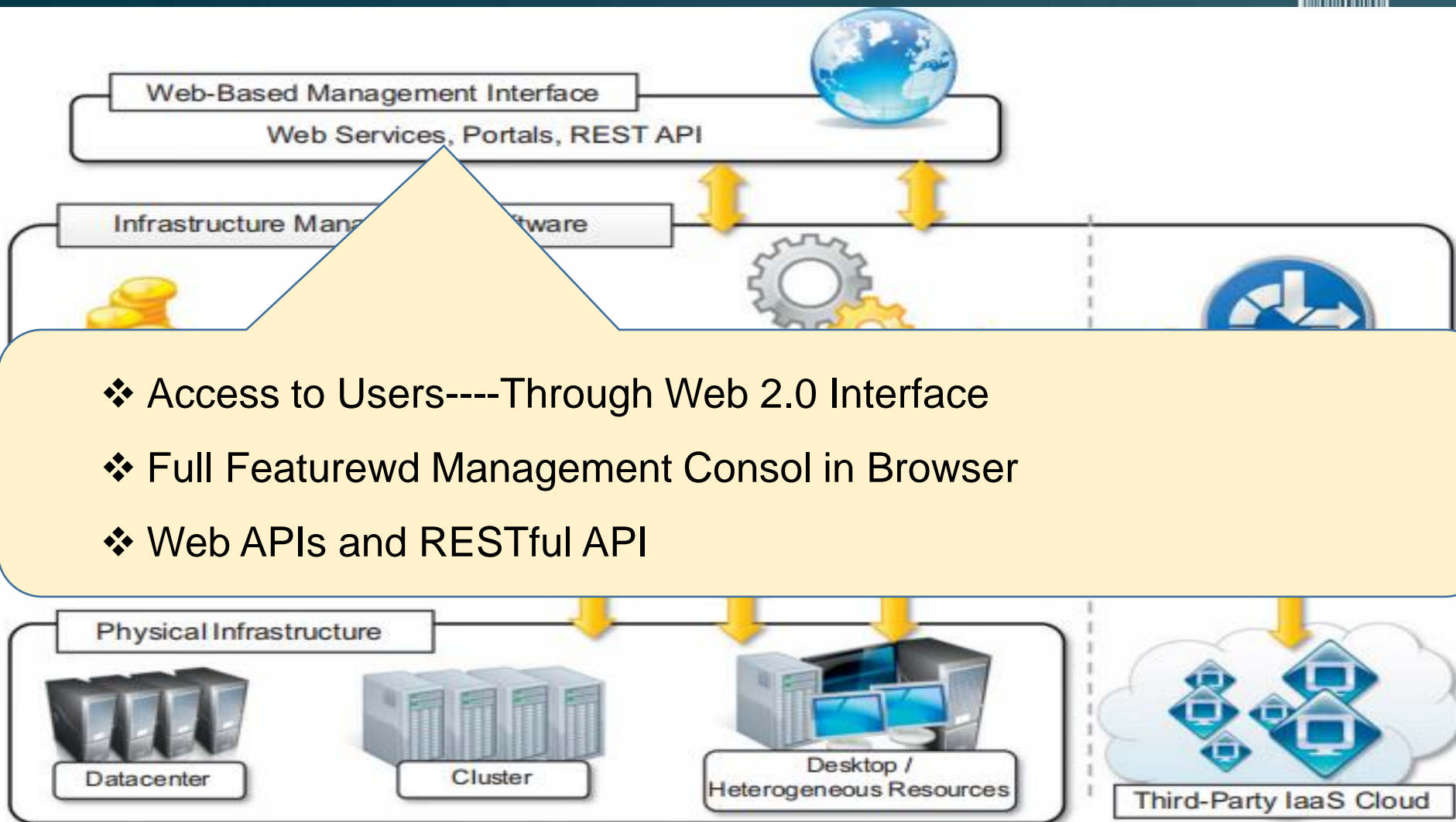
## Infrastructure and Hardware as a Service(IaaS/HaaS)





# ❖ The Cloud Reference Model

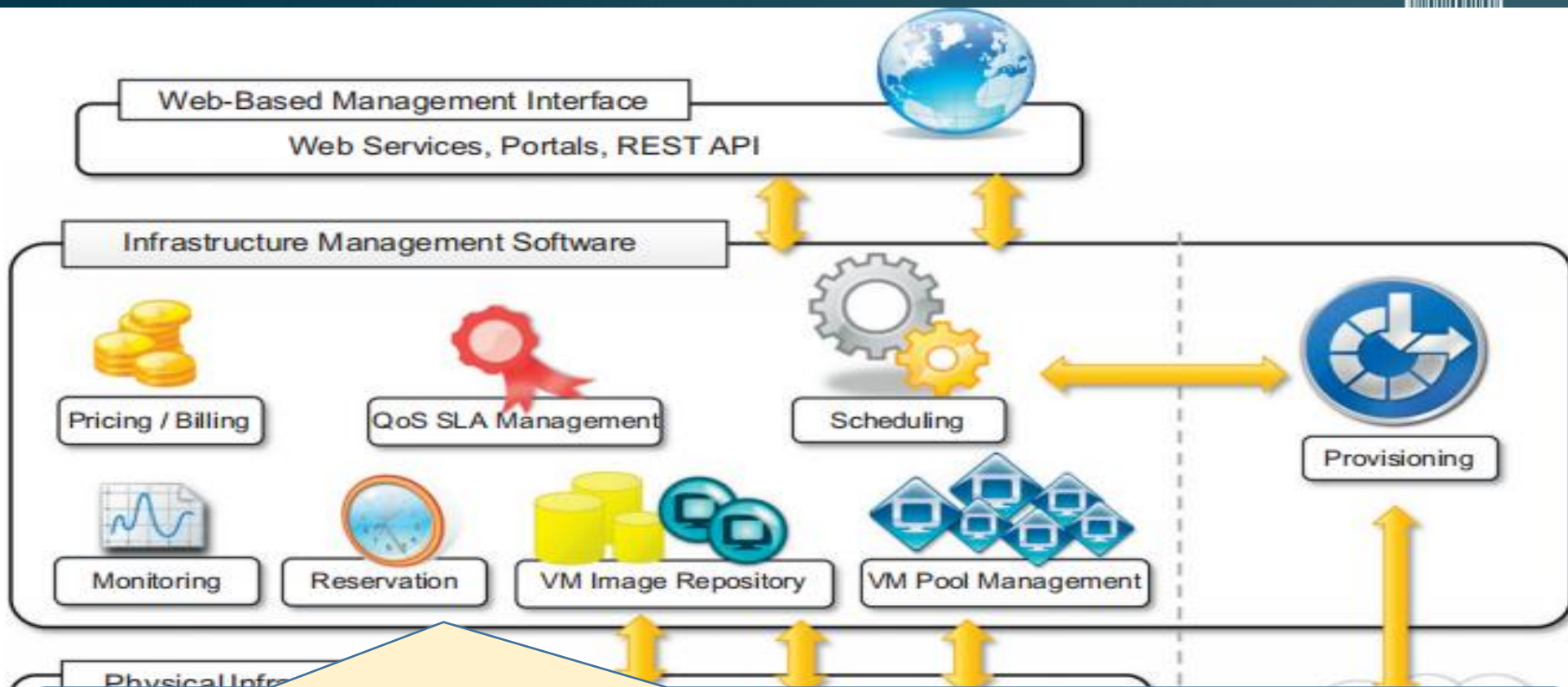
## Infrastructure and Hardware as a Service(IaaS/HaaS)





# ❖ The Cloud Reference Model

## Infrastructure and Hardware as a Service(IaaS/HaaS)



❖ Core Features of IaaS

❖ VMs Management

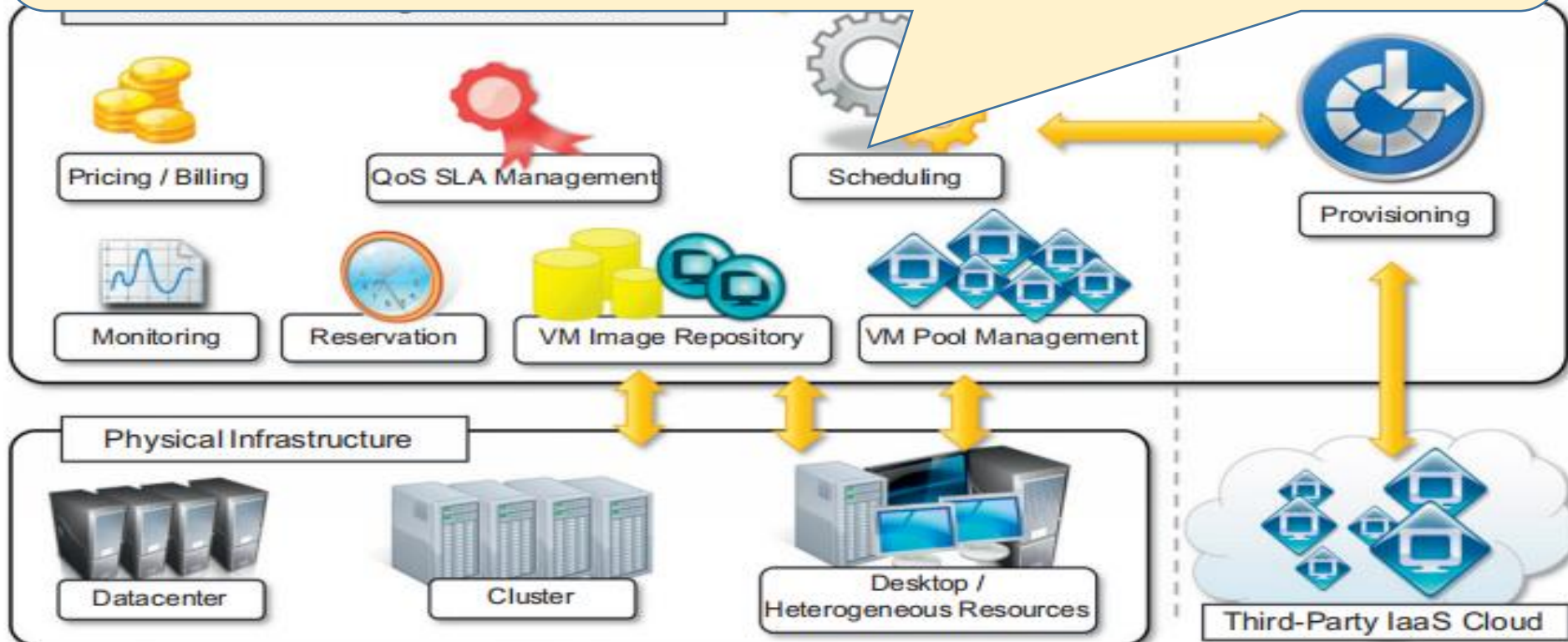




## ❖ The Cloud Reference Model

### Infrastructure and Hardware as a Service(IaaS/HaaS)

- ❖ Central Role
- ❖ Allocating the execution of VM
- ❖ Interacts with other modules

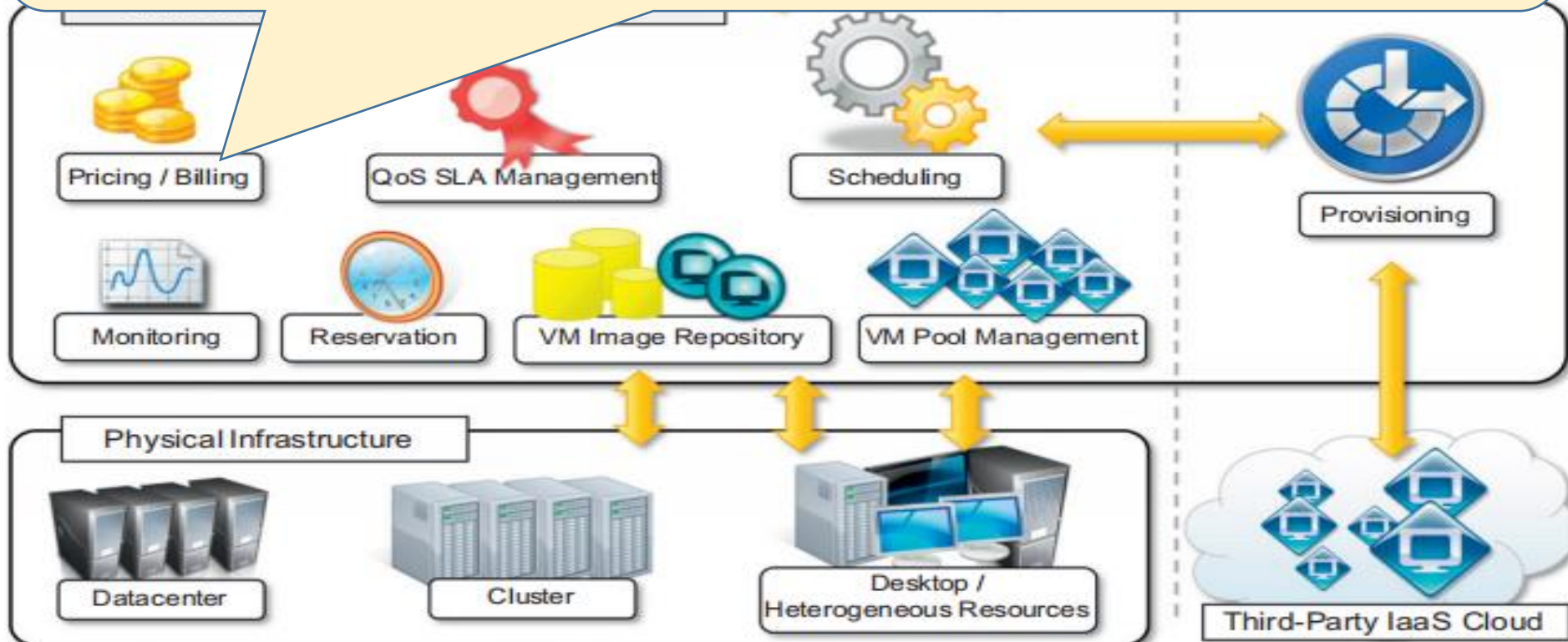


# ❖ The Cloud Reference Model

## Infrastructure and Hardware as a Service(IaaS/HaaS)



- ❖ Calculates the cost of executing each VM instance.
- ❖ Maintaining data related to charging



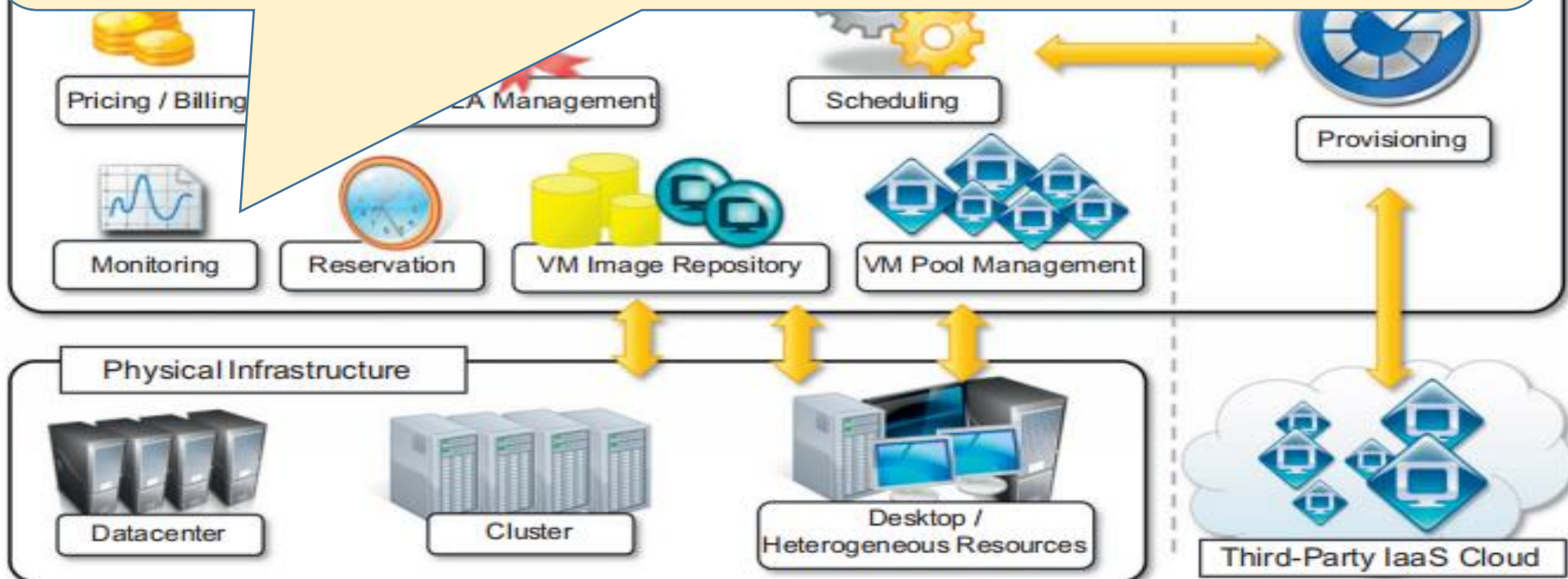


## ❖ The Cloud Reference Model

### Infrastructure and Hardware as a Service(IaaS/HaaS)



- ❖ Tracks each VM and maintain data---to----Analyze---- Performance of VM.



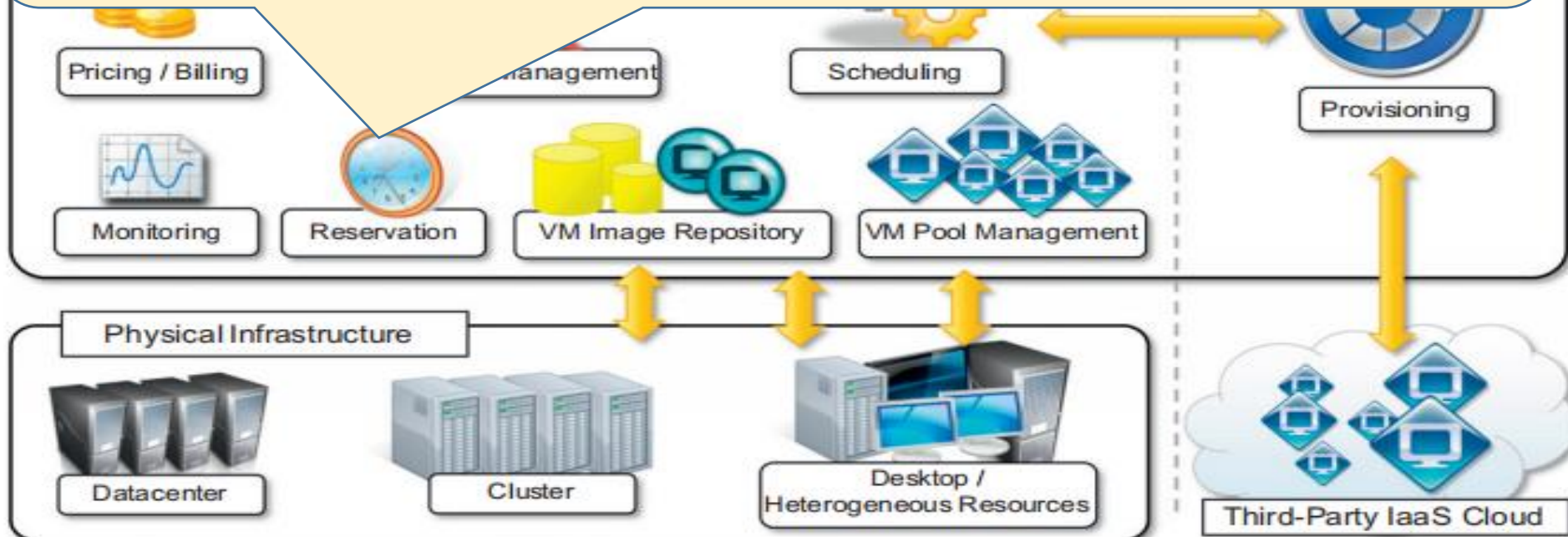


# ❖ The Cloud Reference Model

## Infrastructure and Hardware as a Service(IaaS/HaaS)



- ❖ Information about all VM instances. (Already Executing and will be executed in future)

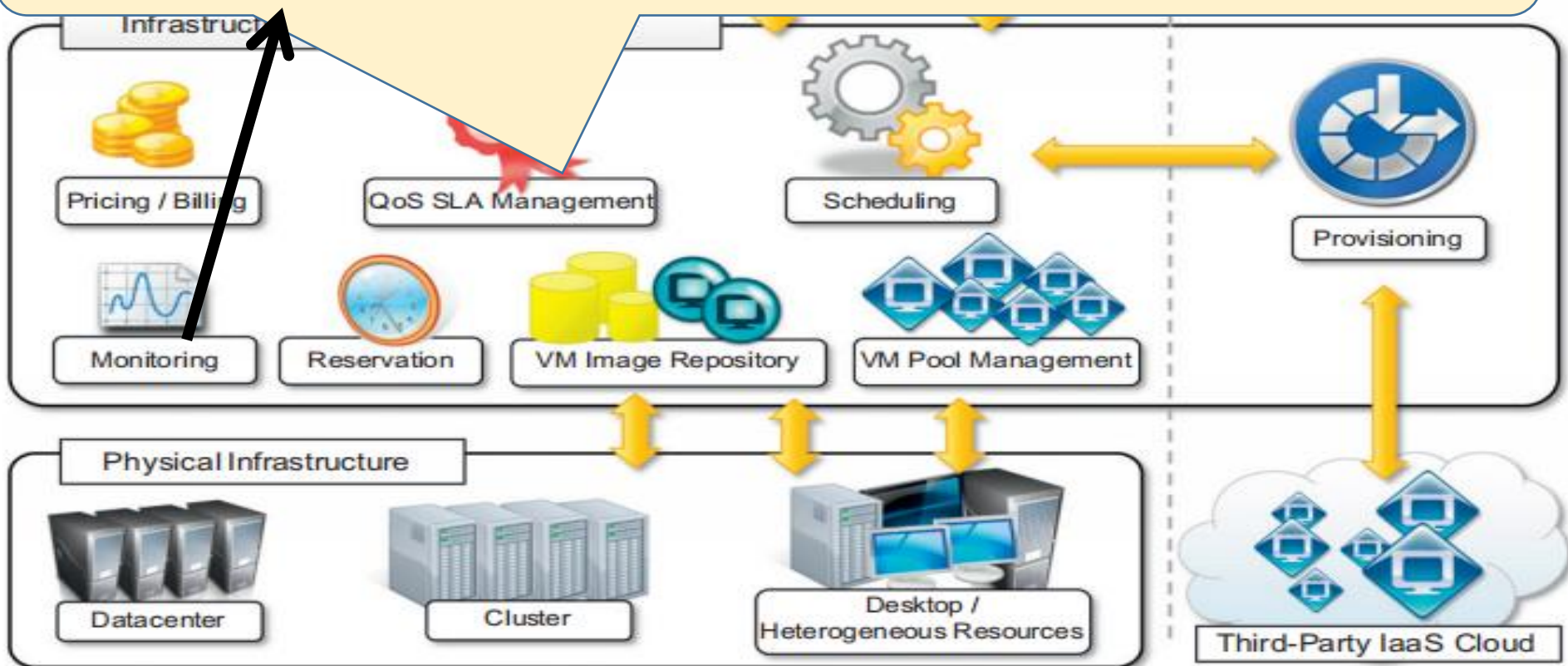




# ❖ The Cloud Reference Model

## Infrastructure and Hardware as a Service(IaaS/HaaS)

- ❖ Maintains Service-Level-Agreement Documents.
- ❖ QoS+Monitoring --> Make Sure---> VM has been given QoS

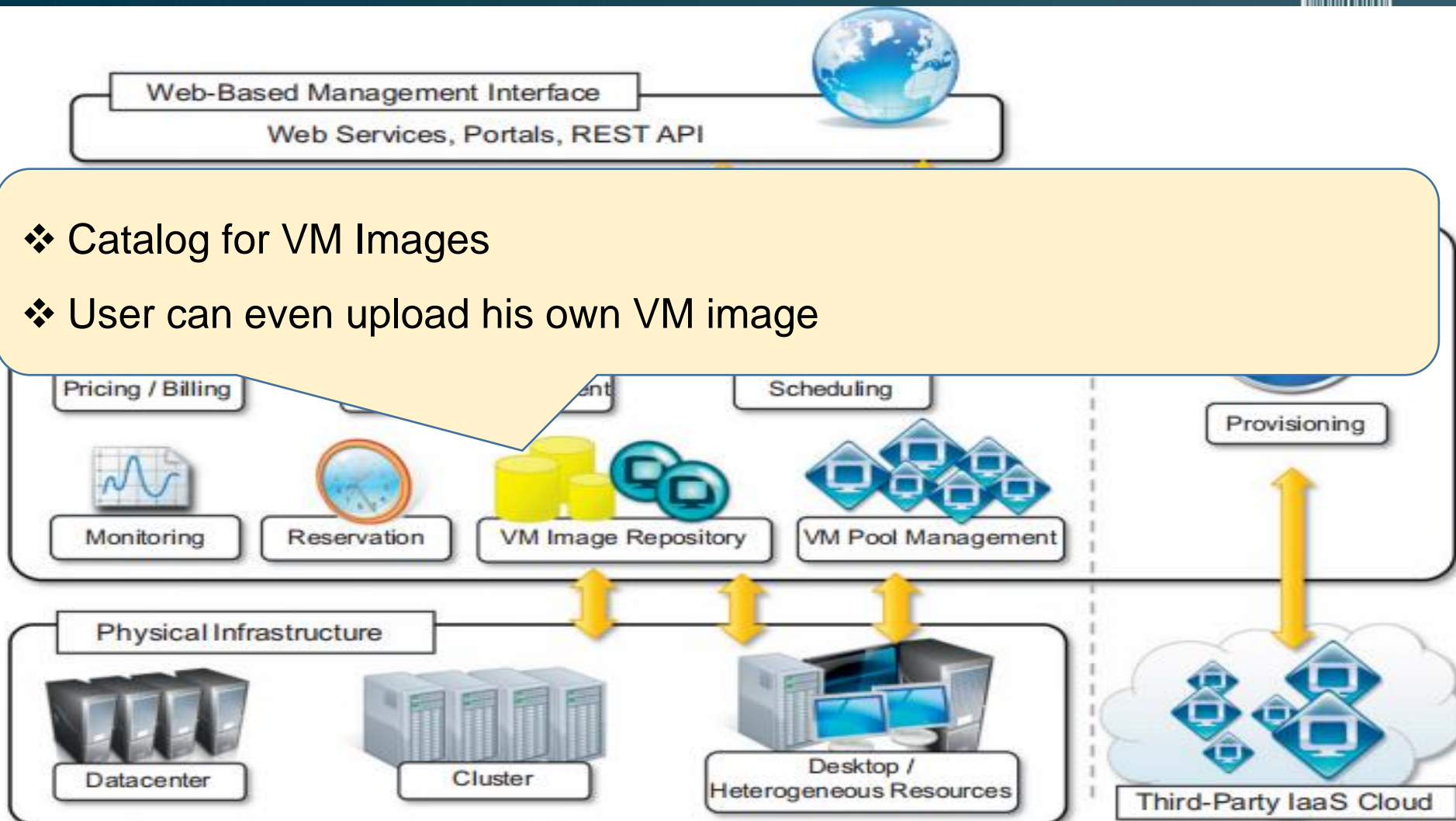




# ❖ The Cloud Reference Model

## Infrastructure and Hardware as a Service(IaaS/HaaS)

- ❖ Catalog for VM Images
- ❖ User can even upload his own VM image





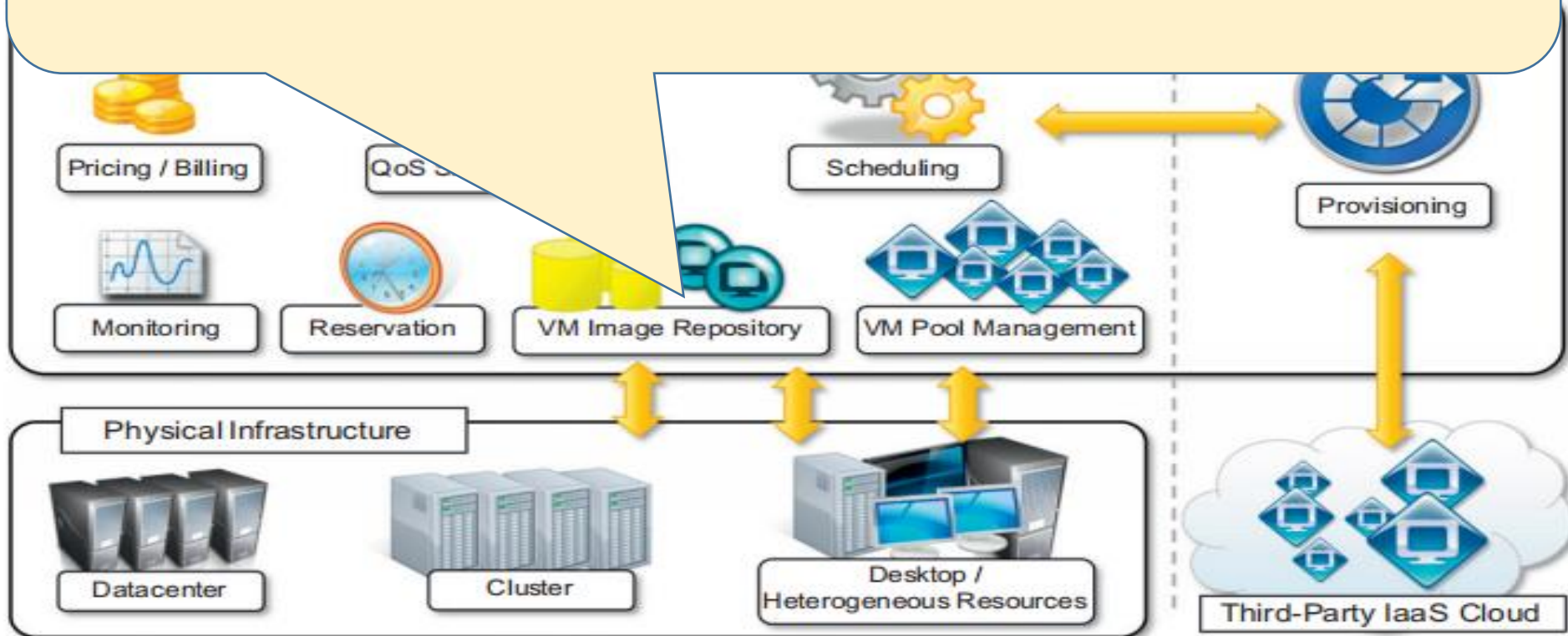


## ❖ The Cloud Reference Model

### Infrastructure and Hardware as a Service(IaaS/HaaS)

❖ Catalog for VM Images

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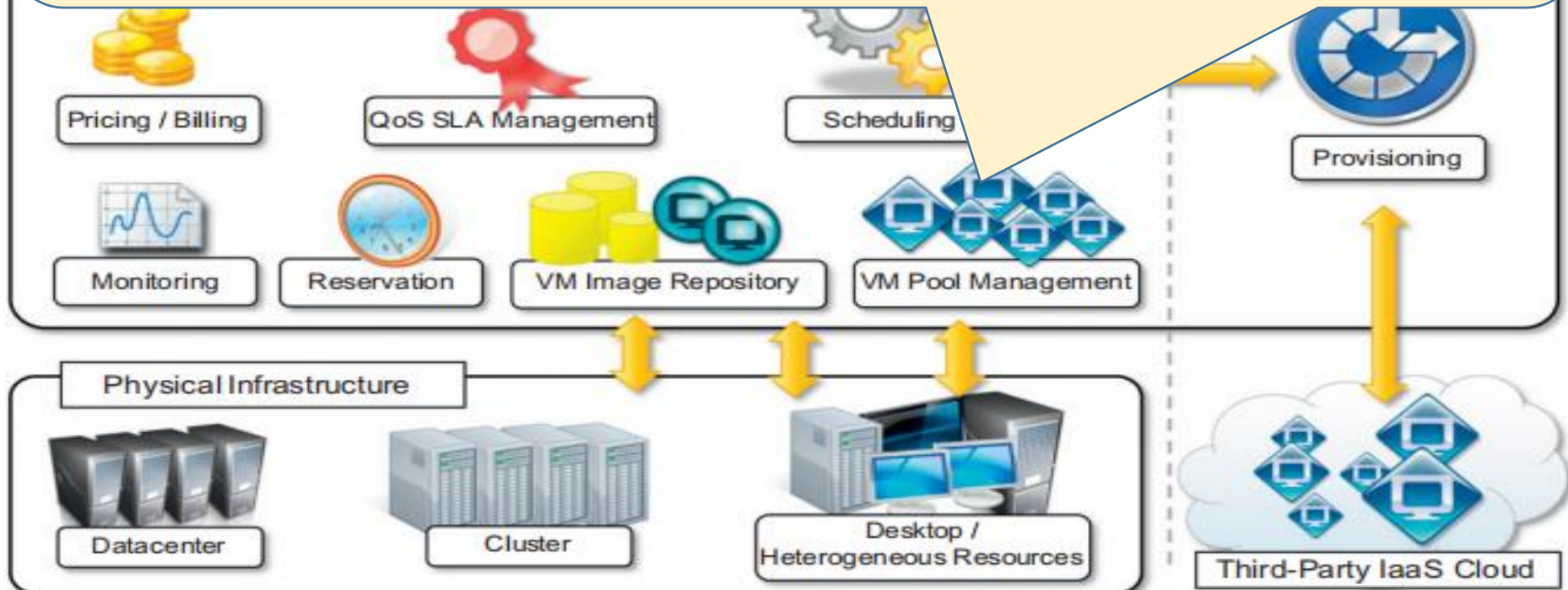




# ❖ The Cloud Reference Model

Infrastructure and Hardware as a Service(IaaS/HaaS)

## ❖ Keeping Track of Live Instances

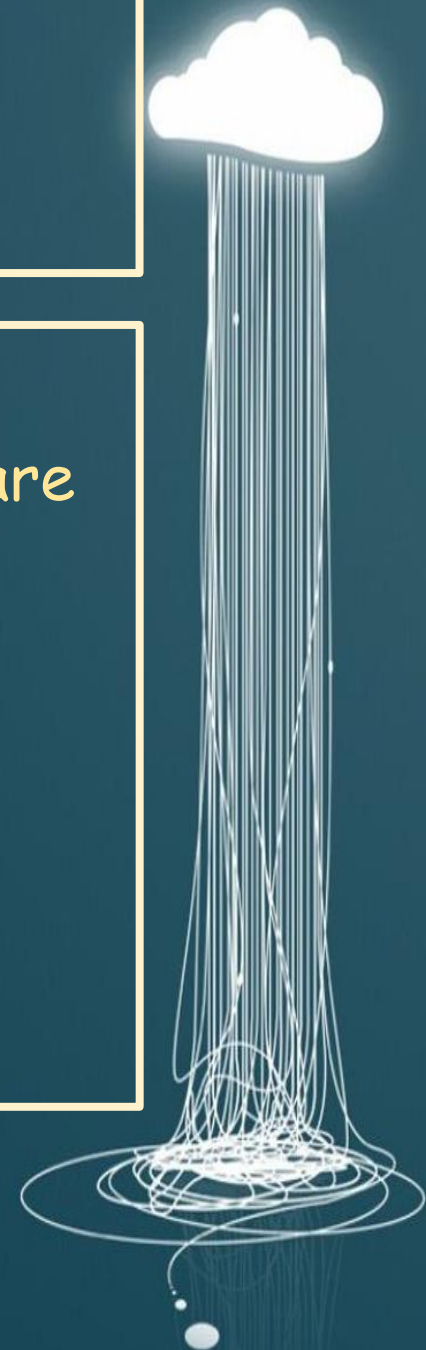


## ❖ The Cloud Reference Model

Infrastructure and Hardware as a Service(IaaS/HaaS)

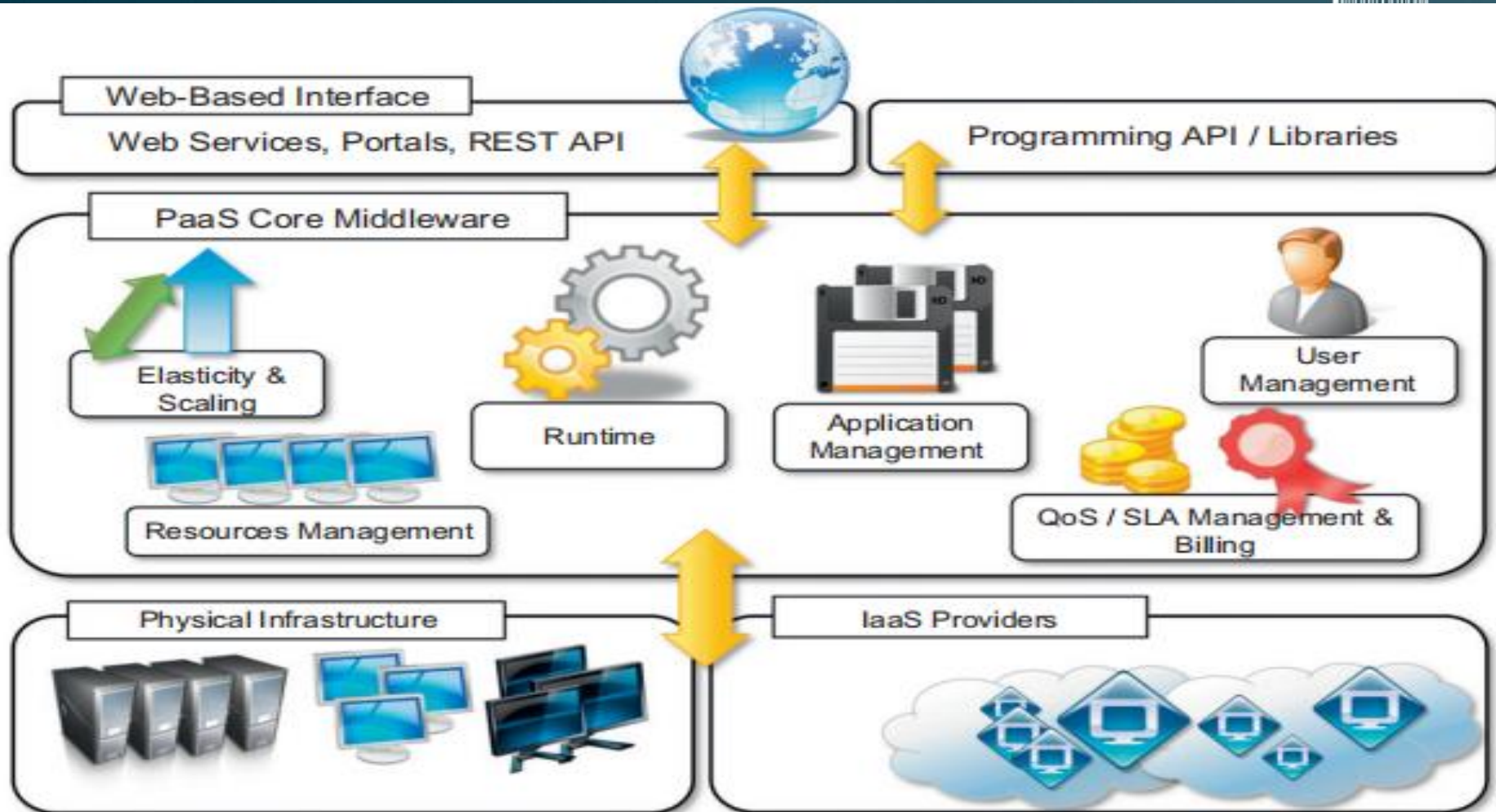
Some Examples of IaaS Management Software are

- ❖ Eucalyptus
- ❖ OpenNebula
- ❖ Elastra
- ❖ Enomaly etc.



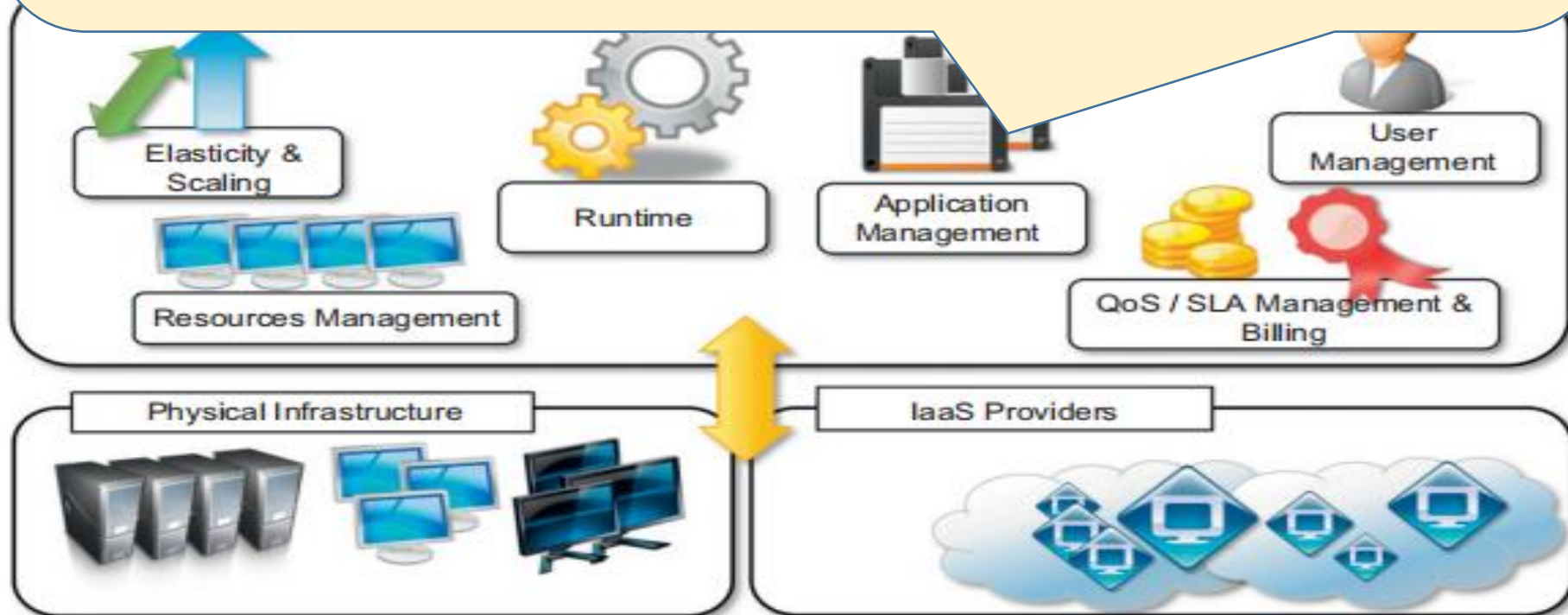


# ❖ The Cloud Reference Model Platform as a Service(PaaS)



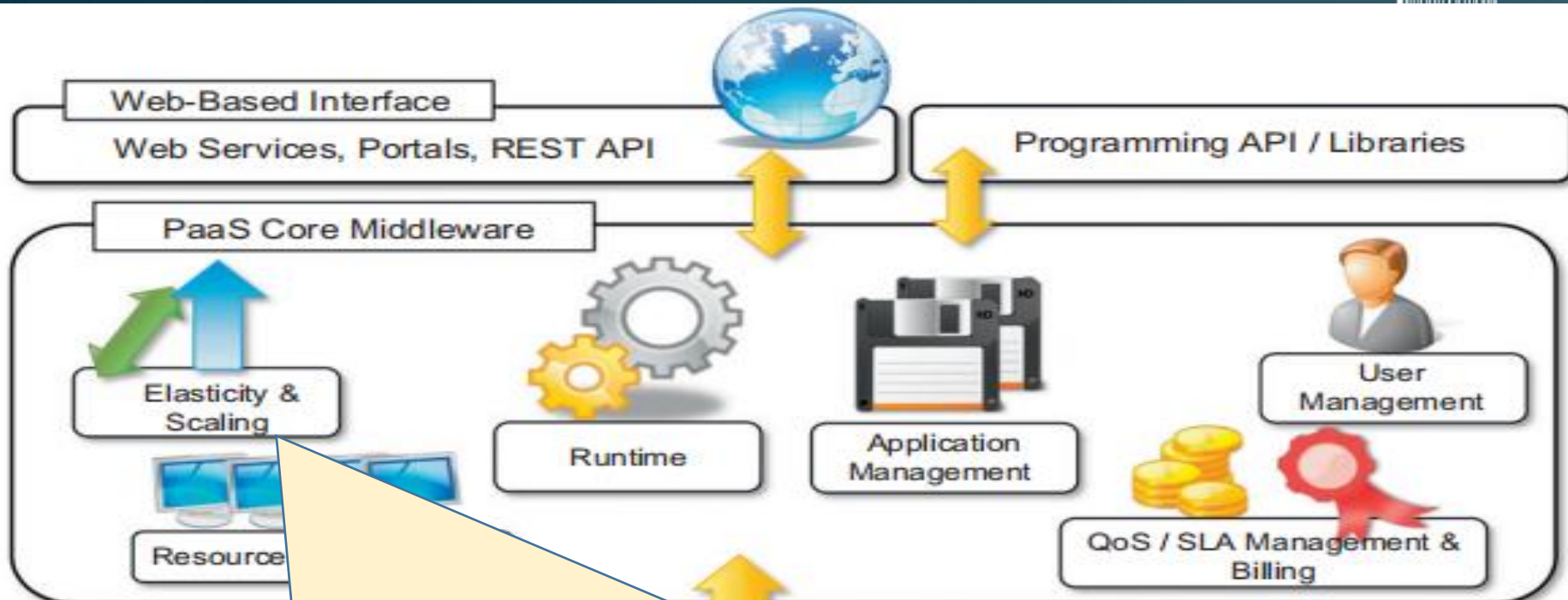
PaaS Reference Model

- ❖ Core functionality of PaaS.
- ❖ Automate---Deploying application-----
  - ❖ On any Infrastructure
  - ❖ Configuring Application Components
  - ❖ Provisioning---Supporting Technologies (Ex: Databases)



PaaS Reference Model

# ❖ The Cloud Reference Model Platform as a Service(PaaS)



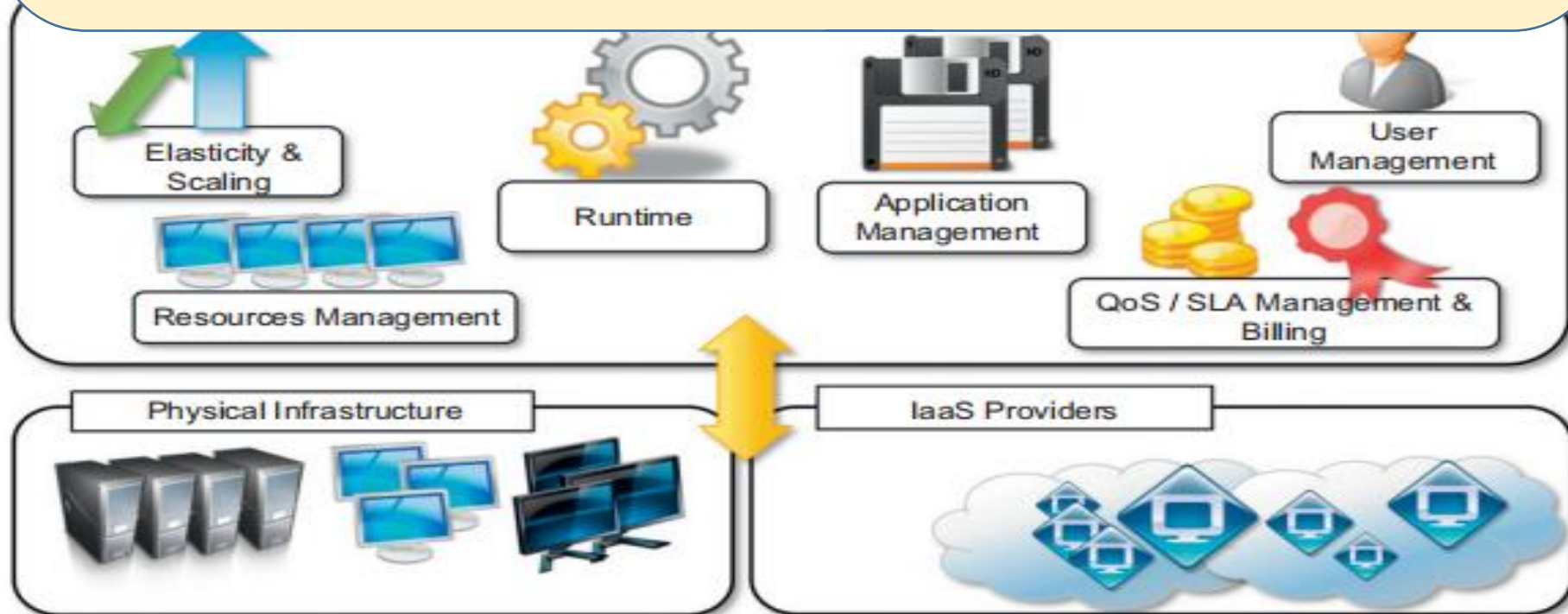
❖ Middleware is responsible for it.

## ❖ Core Middleware

❖ Responsible for scaling

❖ For user-----A platform ----to develop Application

❖ Platform is provided----- Web Based---or--- APIs and Library

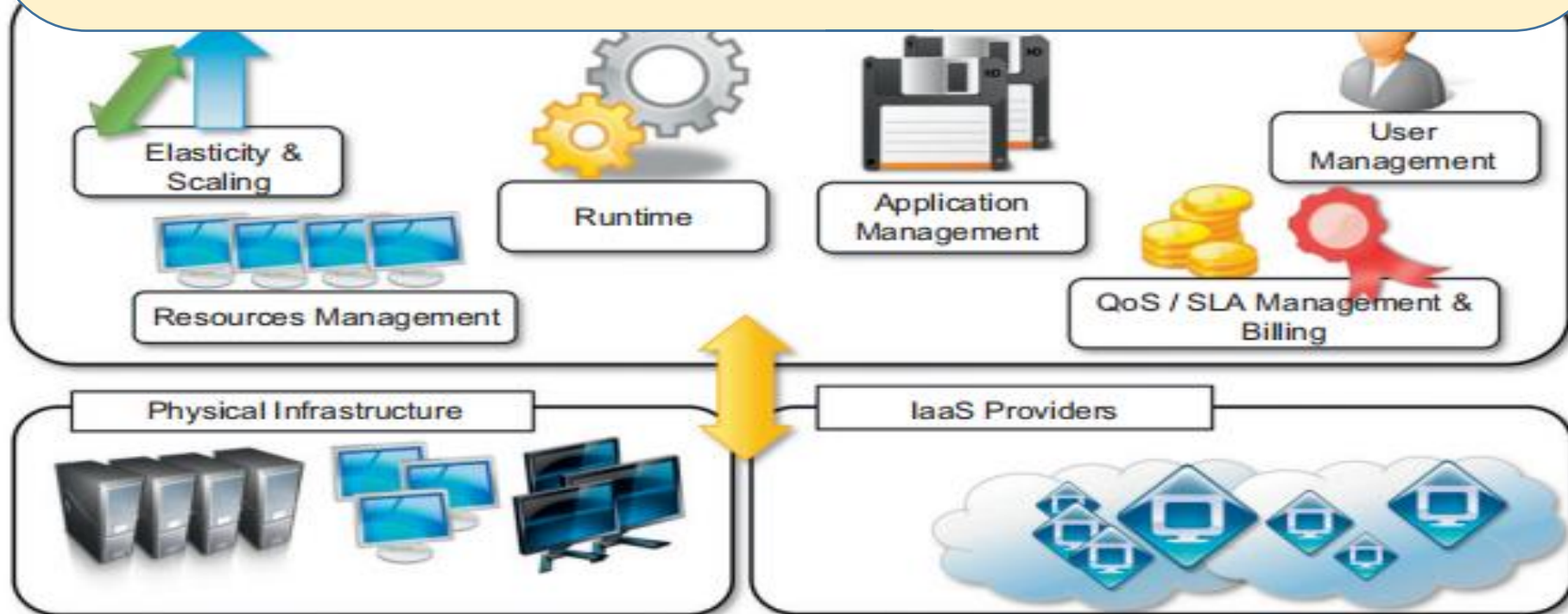


PaaS Reference Model



## ❖ Core Middleware

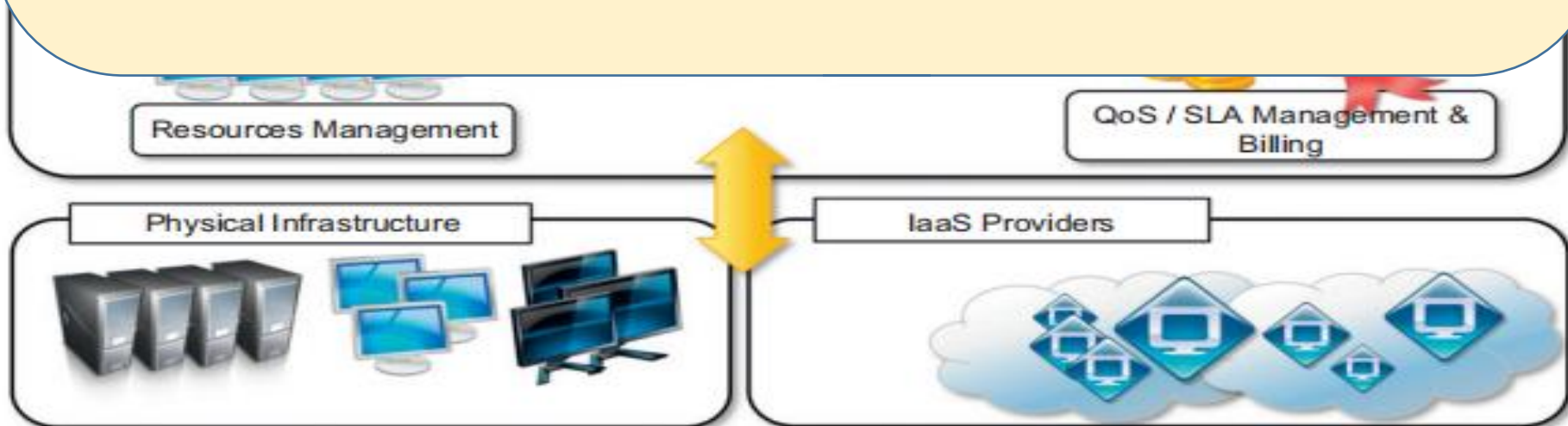
- ❖ Responsible for scaling
- ❖ For user-----A platform ----to develop Application
- ❖ Platform is provided----- Web Based---or--- APIs and Library



PaaS Reference Model

## ❖ Core Middleware Provided

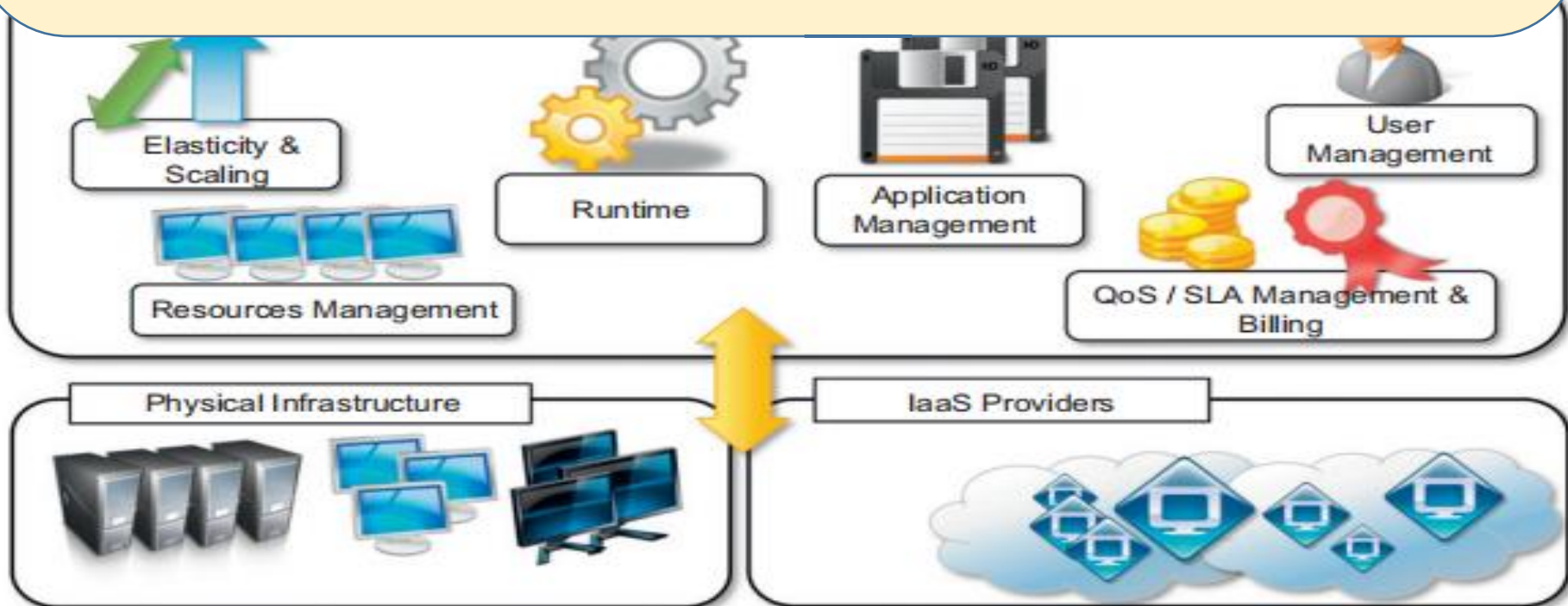
- ❖ 4GL--or-- Visual Programming Concept--or-- Rapid Prototyping
- ❖ Object Based--or--Programming language based---take more time
- ❖ Use complete feature ---- of languages like JAVA, Python, Ruby etc.-----Few restriction ----SECURITY



## PaaS Reference Model



- ❖ Pure PaaS- Only Middleware ---User can run-----on his infrastructure
- ❖ PaaS--- Middleware+ Infrastructure.



PaaS Reference Model



# ❖ The Cloud Reference Model

## Platform as a Service(PaaS)

PaaS-I	<ul style="list-style-type: none"><li>❖ Run-Time Environemnt</li><li>❖ Web Hosted App Development</li><li>❖ Rapid App Prototyping</li></ul>	Middleware+ Infrastructure	Force.com
		Middleware+ Infrastructure	LongJump
PaaS-II	<ul style="list-style-type: none"><li>❖ Run-Time Environement for scaling web apps</li></ul>	Middleware+ Infrastructure	Google App Eng.
		Middleware	AppScale
		Middleware+ Infrastructure	Heroku
		Middleware+ Infrastructure	Engine Yard
		Middleware+ Infrastructure	Joyent Smart PPlatform
		Middleware	Gigaspace XAP

# ❖ The Cloud Reference Model



## Platform as a Service(PaaS)

PaaS-I	❖ Run-Time Environemnt	Middleware+ Infrastructure	Force.com
	❖ Web Hosted App Development	Middleware+ Infrastructure	LongJump
PaaS-II	❖ Mobile App Platforming		
	❖ Run-time Environment	Middleware+ Infrastructure	Google App Eng.
	❖ scaling	Middleware	AppScale
		Middleware+	Heroku
			Yard
			Smart Platform
		Middleware	Gigaspaces XAP

Pure Cloud Implementation: Web based Interface



# ❖ The Cloud Reference Model

## Platform as a Service(PaaS)

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PaaS-II	❖ Run-Time Environement for scaling web apps	Middleware+ Infrastructure	Google App Eng.
			AppScale
			aku
		❖ Scalable ❖ JAVA and Python Programming Lnaguages	
		Infrastructure	Joyent Smart PPlatform
	Middleware	Gigaspace XAP	



# ❖ The Cloud Reference Model

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		Middleware	AppScale
			Heroku
	<ul style="list-style-type: none"> <li>❖ Open-Source Implementation---Google App Eng.</li> <li>❖ To be installed in your machine.</li> </ul>		
			art Platform
		Middleware	Gigaspace XAP





# ❖ The Cloud Reference Model

## Platform as a Service(PaaS)

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		Middleware	Gigaspace XAP

❖ Ruby and Ruby on scale





# ❖ The Cloud Reference Model

## Platform as a Service(PaaS)

PaaS-III	❖ To develop Distributed Apps	Middleware+ Infrastructure	Microsoft Azure
		Middleare	DatSynapse
		Middleware	Cloud IQ
		Middleware	Manjrasoft Aneka
		Middleware	Apprenda SaaSGrid
		Middleware	GigaSpace DataGrid



# ❖ The Cloud Reference Model

## Platform as a Service(PaaS)



PaaS-III	❖ To develop Distributed Apps	Middleware+ Infrastructure	Microsoft Azure
		Middleare	DatSynapse
		Middleware	Cloud IQ
		Middle	Manjrasoft Aneka
		Mi are	Apprenda SaaSGrid
		ware	GigaSpace DataGrid

❖ Provides .NET

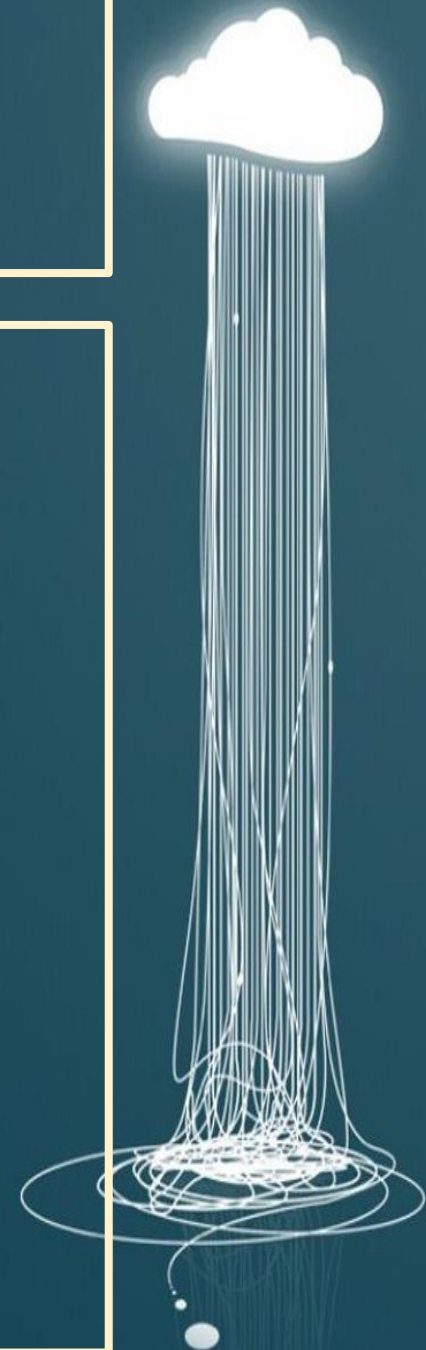


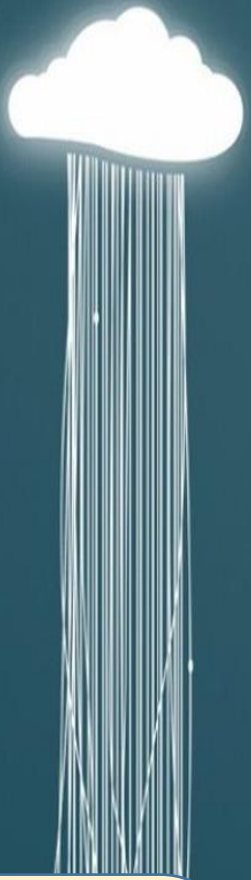
# ❖ The Cloud Reference Model

## Platform as a Service(PaaS)

Essential Characteristics which Identify PaaS  
(According to Sam Charington of Appistry.com)

- ❖ Run Time Framework
- ❖ Abstraction
- ❖ Automation
- ❖ Cloud Services





## ❖ The Cloud Reference Model

### Platform as a Service(PaaS)

#### ❖ Essential Characteristics which Identify PaaS

❖ (According to Sam Charington of Appistry.com)

❖ Run Time Framework

❖ Abstraction

❖ Executes User Code---- According to Policies----By user  
and Vendor



# ❖ The Cloud Reference Model

## Platform as a Service(PaaS)

### ❖ Essential Characteristics which Identify PaaS

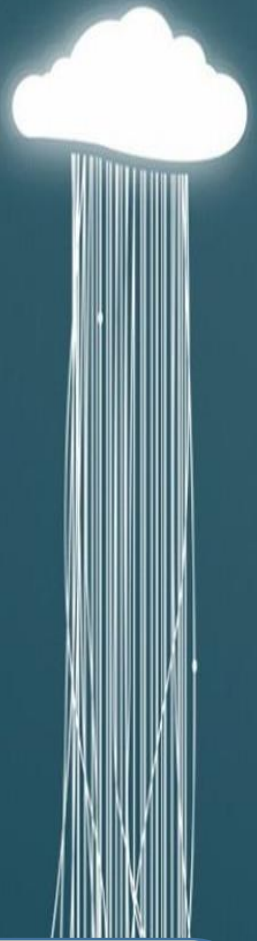
❖ (According to Sam Charington of Appistry.com)

❖ Run Time Framework

❖ Abstraction

❖ Automation

❖ Deploy a way----To Manage Apps -----on Cloud----Rather than on VM



❖ Automate

❖ Application Deployment

❖ Scaling

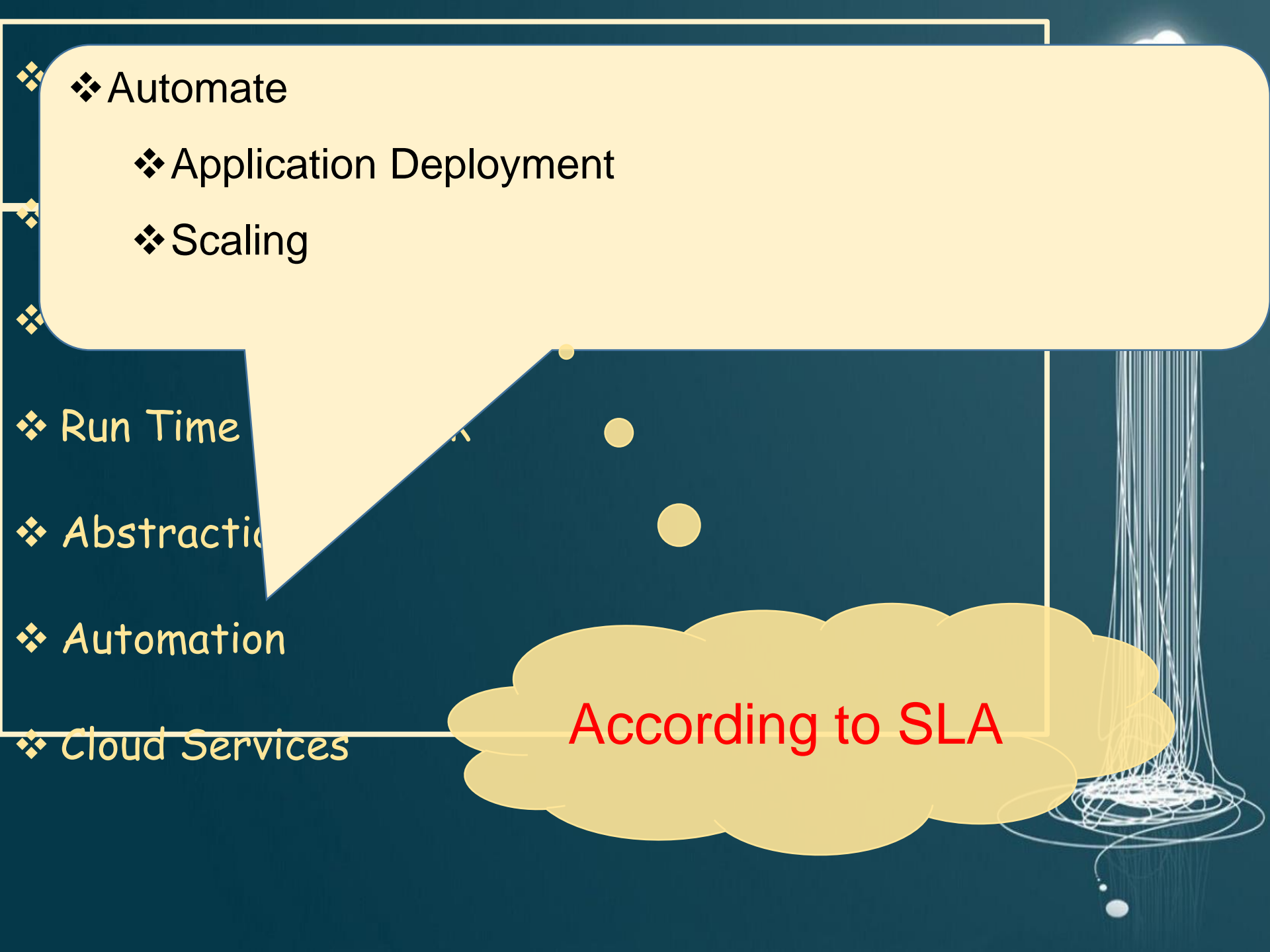
❖ Run Time

❖ Abstraction

❖ Automation

❖ Cloud Services





- ❖ Automate

- ❖ Application Deployment

- ❖ Scaling

- ❖ Run Time

- ❖ Abstraction

- ❖ Automation

- ❖ Cloud Services

According to SLA

❖ Creation and Delivery ----- Elastic and highly available-----

Cloud Applications

❖ Services include

❖ App development Component

❖ Application Monitoring

❖ Management

❖ Reporting

❖ Automation

❖ Cloud Services



# ❖ The Cloud Reference Model

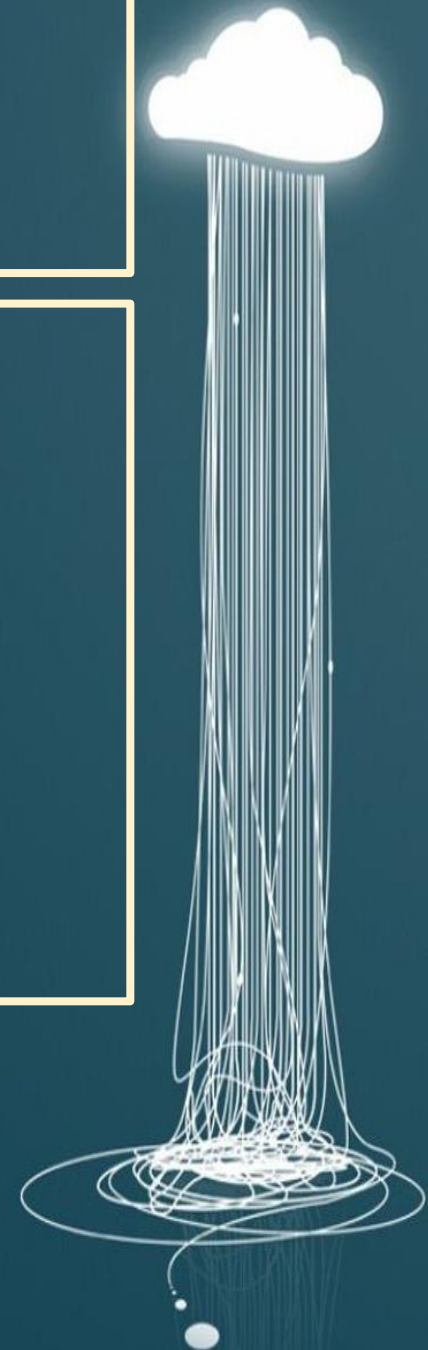
## Platform as a Service(PaaS)

### ❖ Advantage

❖ Apps are developed in SoA (Service -Oriented Architecture)

❖ More Agile

❖ Better evolvement





## ❖ The Cloud Reference Model

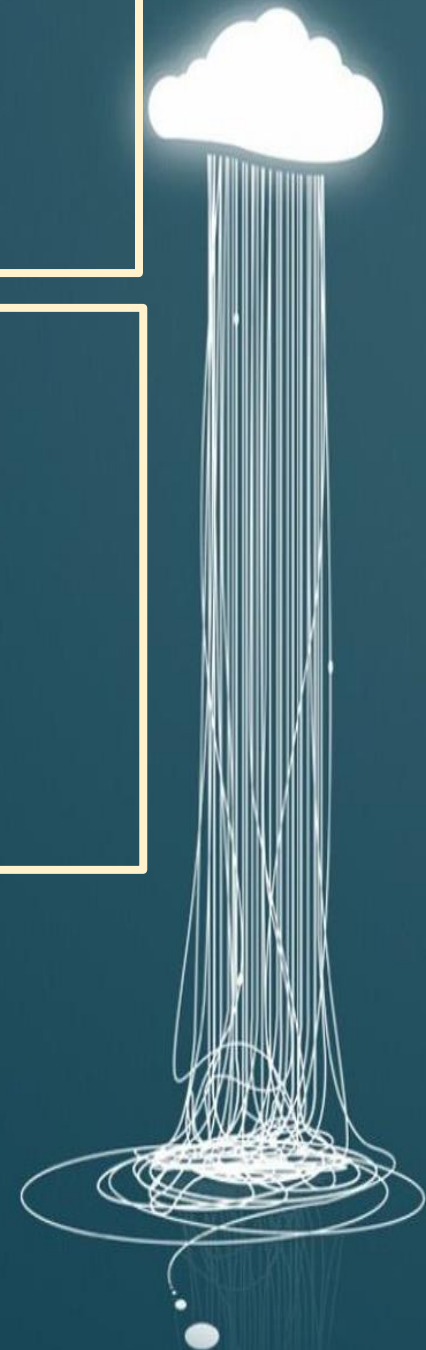
### Platform as a Service(PaaS)

#### ❖ CONCERN

#### ❖ Vendor Lock In

❖ may Bind App---- To specific--- Run time

❖ Apps are dependent on ---- Same Provider

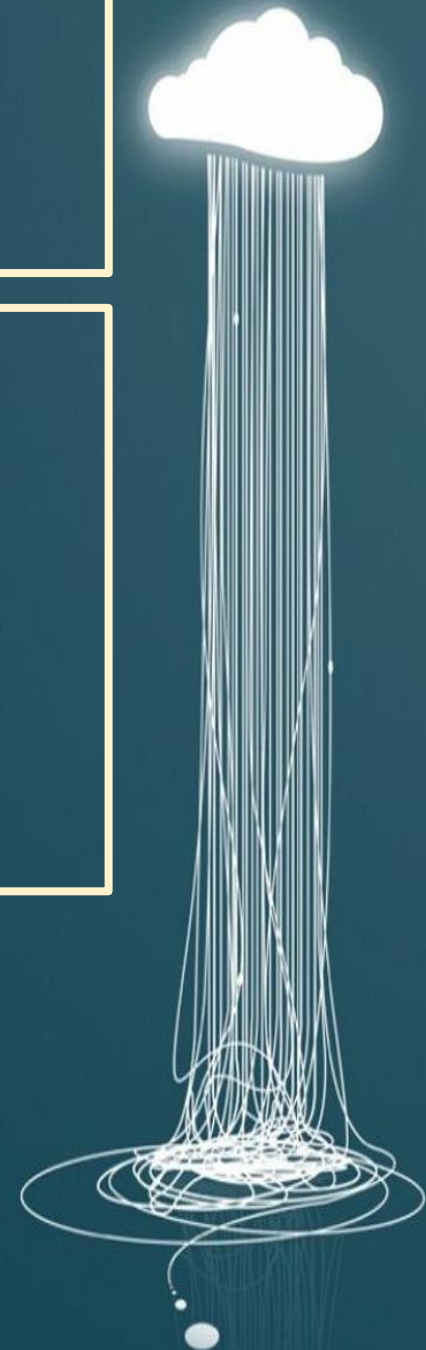


## ❖ The Cloud Reference Model

### Platform as a Service(PaaS)

#### Cost:

- ❖ IaaS: Remove Capital Cost
- ❖ PaaS: Removes Application Development, Deployment and Management Cost.



# The Cloud Reference Model

## Software-as-a-Service (SaaS)

Access to Application-----Through----Internet

Applications accessible--- through-----BROWSER.

Ex: Lumen5



15 Common Software as a Service (SaaS) Examples to Inspire You  
joshfechter.com



# supercharge your content strategy

Easily make  
videos for  
**content  
marketing,  
thought  
leadership, and**





My Workspace ▾

SAVED

PREVIEW

PUBLISH



Library

GIFs

Uploads

Recent



Search your uploaded media

Most relevant ▾

Bring images and videos from your phone into Lumen5 with our mobile app. [Click here](#) and we'll email you a download link.

Upload images and videos



Preview

Layouts

5s

More options



Preview

Layouts

5s

More options

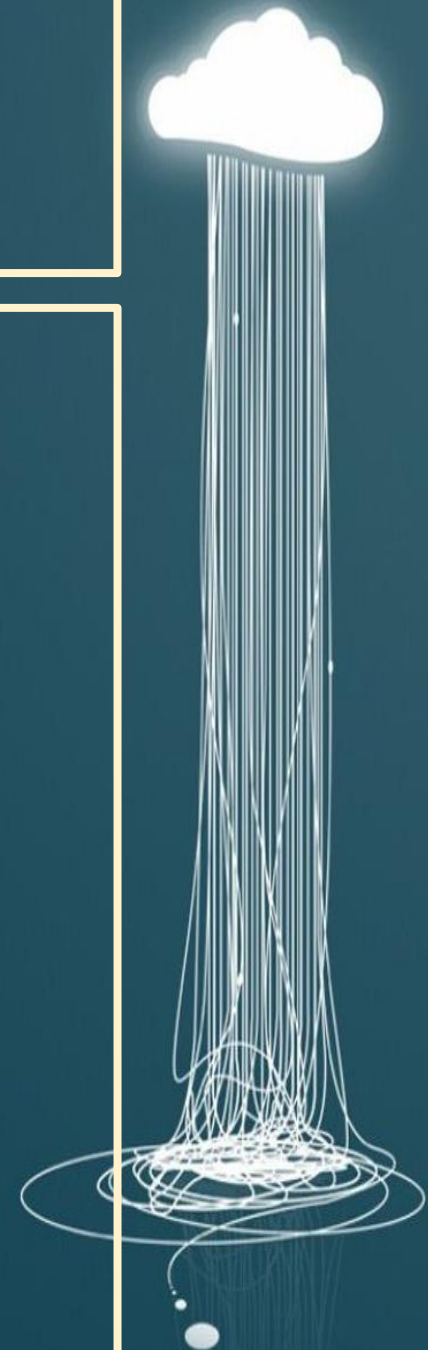




# The Cloud Reference Model

## Software-as-a-Service (SaaS)

- ❖ One-to-Many Software Delivery Model.
- ❖ most suitable ---- applications like CRM and ERP----Used in all the enterprises.
- ❖ Little bit customization.



# The Cloud Reference Model

## Software-as-a-Service (SaaS)

Software should have following feature

- ❖ General set of----basic features
- ❖ Special feature --- Able to Add or Remove----Customization'
- ❖ Ease Integration-----New Component

