Fundamentals of Cloud Computing and Big Data

Dr. Preeti Mishra (Ph. D (MNIT Jaipur)), Associate Professor
Dept. of Computer Science & Engineering
Graphic Era Deemed to be University Dehradun

https://scholar.google.com/citations?user=qRKv67AAAAAJ&hl=en

Cloud Definitions

- Definition from ***NIST*** ***(National Institute of Standards and Technology)***
  - Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.
  - This cloud model promotes availability and is composed of five essential characteristics, three service models, and four deployment models.

Different Perspectives on Cloud Computing

- From an **engineering perspective** the cloud is a computing architecture characterized by a large number of interconnected identical computing devices that can scale on demand and that communicate via an IP network.
- From a **business perspective** it is computing services that are scalable and billed on a usage basis.
- Allows customers to shift traditional Capital Expenditures (CapEx) into their Operating Expenditure (OpEx) budgets

Different Perspectives on Cloud Computing

- **Perspective from user** :
  - Users do not care about how the works are done
    - Instead, they only concern about what they can get
  - Users do not care about what the provider actually did
    - Instead, they only concern about their quality of service
  - Users do not want to own the physical infrastructure
    - Instead, they only want to pay as many as they used

- What dose user really care ?
  - They only care about their "Service"

Some Advantages

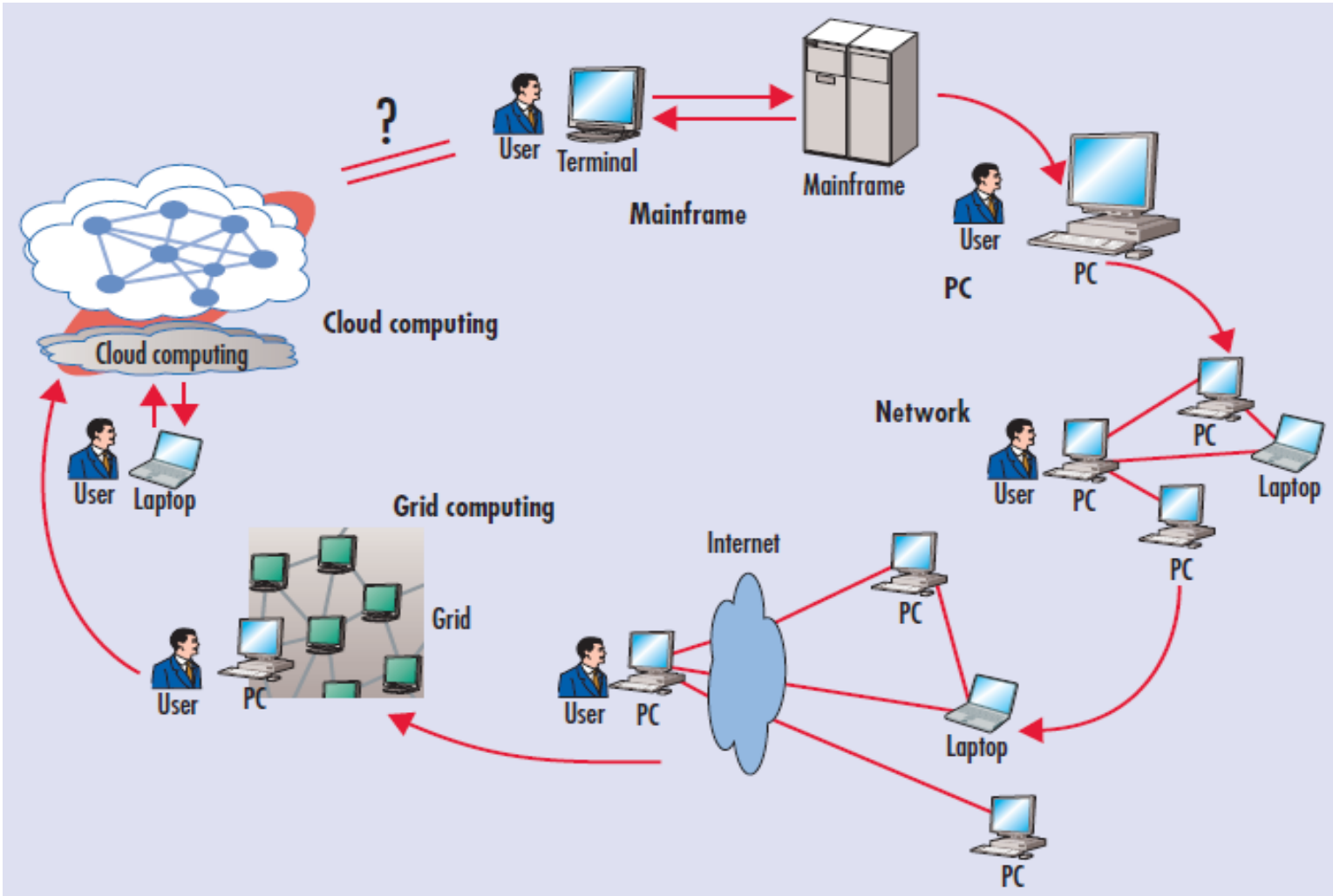
- No up-front investment
- Lowering operating cost
- Highly scalable
- Easy access
- **Reducing** business risks and **maintenance expenses**

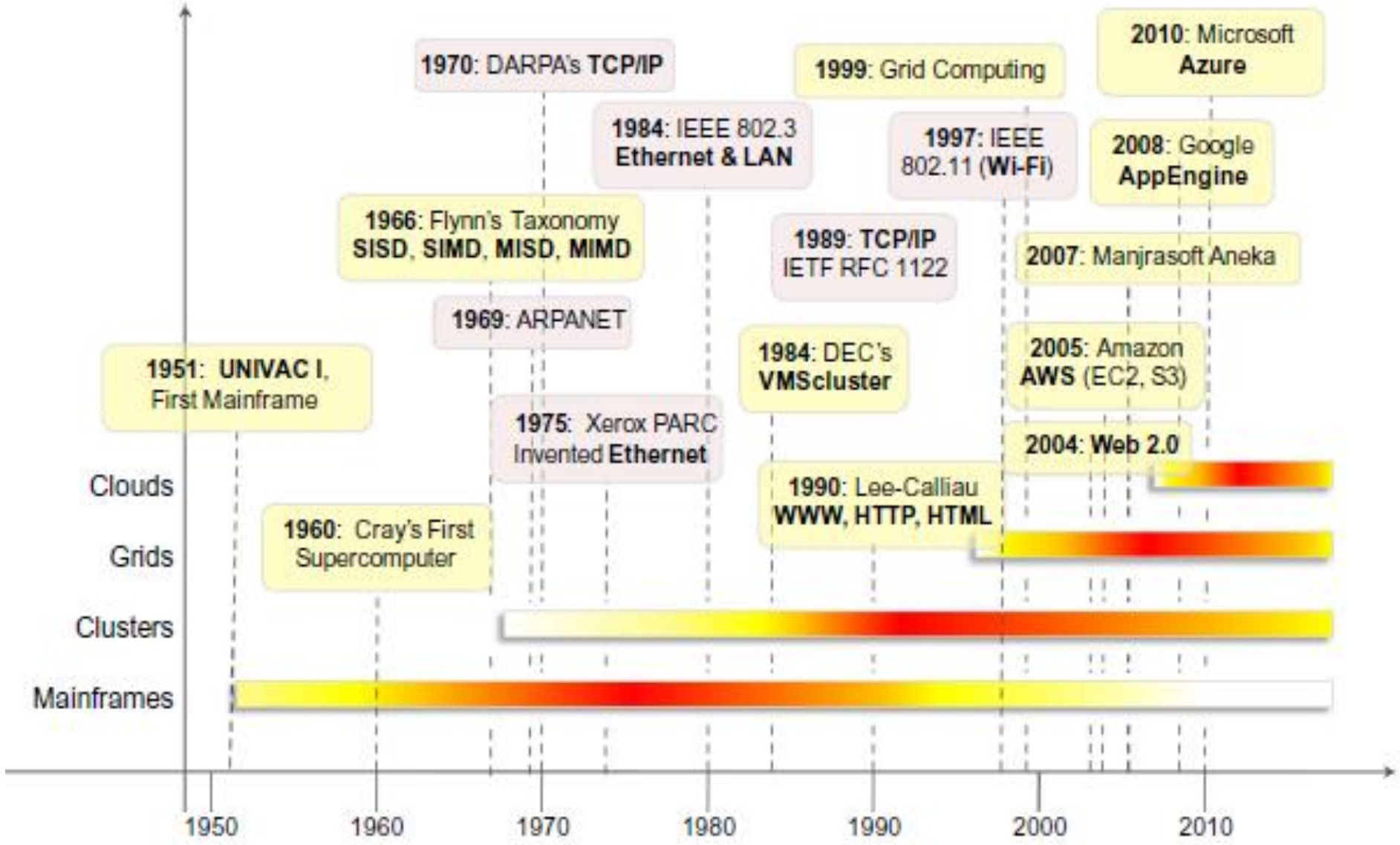
Some disadvantages

- No Physical Control on data
- Security threats
- Technical Issue
- May be not all features are supported
- Support Problem
- Network Connectivity required etc


I need to grow my infrastructure, but I do not know for how long…
I have a lot of infrastructure that I want to rent …
I have a surplus of infrastructure that I want to make use of
I cannot invest in infrastructure, I just started my business….
I have infrastructure and middleware and I can host applications
Global Cloud Marketplace
I want to focus on application logic and not maintenance and scalability issues
I have infrastructure and provide application services
I want to access and edit my documents and photos from everywhere..

Foundations




1970: DARPA's TCP/IP
1999: Grid Computing
2010: Microsoft Azure
1984: IEEE 802.3 Ethernet & LAN
1997: IEEE 802.11 (Wi-Fi)
2008: Google AppEngine
1966: Flynn's Taxonomy SISD, SIMD, MISD, MIMD
1989: TCP/IP IETF RFC 1122
2007: Manjrasoft Aneka
1969: ARPANET
1984: DEC's VMScluster
2005: Amazon AWS (EC2, S3)
1951: UNIVAC I, First Mainframe
1975: Xerox PARC Invented Ethernet
2004: Web 2.0
Clouds
1990: Lee-Calliau WWW, HTTP, HTML
1960: Cray's First Supercomputer
Grids
Clusters
Mainframes
1950
1960
1970
1980
1990
2000
2010

Foundations

Technologies	Description
Grid Computing	• Form of distributed computing which applies the resources of numerous computers in a network to work on a single complex task at the same time
Utility Computing	• Service provisioning model that offers computing resources as a metered service
Virtualization	• Provides improved utilization of resources • Enables optimization of resources by over subscription
Service Oriented Architecture (SOA)	• An architectural approach in which applications make use of services available in the network • Each service provides a specific function

A. Distributed Systems

- Cloud computing uses the concept of distributed computing.

- "A distributed system is a collection of independent computers that appears to its users as a single coherent system."

- The major milestones that led to cloud computing:

(i) Mainframe (ii) Clusters (iii) Grids

Mainframes

- Mainframes are very powerful, highly reliable computers, specialized for large data movement and massive IO operations.
- Used by organization for bulk data processing.
- Based on batch-processing

Clusters

- Low cost alternative to the use of mainframes and supercomputers
- Cheap commodity machines can be connected by high-bandwidth networks.
- Controlled by specific software tools that manage them a single system.

- By 1980s, Standard technology for parallel and high performance computing.

Grids

- Early 90s, as a evaluation of cluster computing.
- An aggregation of geographically dispersed clusters by means of internet connections.
- Clusters belongs to different organizations and arrangements are made between them to share computational power.
- Scale is nation wide or world wide.

- Cloud is a successor of it.

Virtualization

1. Transforms from "one server- one application" to multiple virtual machines on each physical machine
2. Run Multiple OS on a single machine
3. A thin layer is introduced over either the hardware or on top of the OS

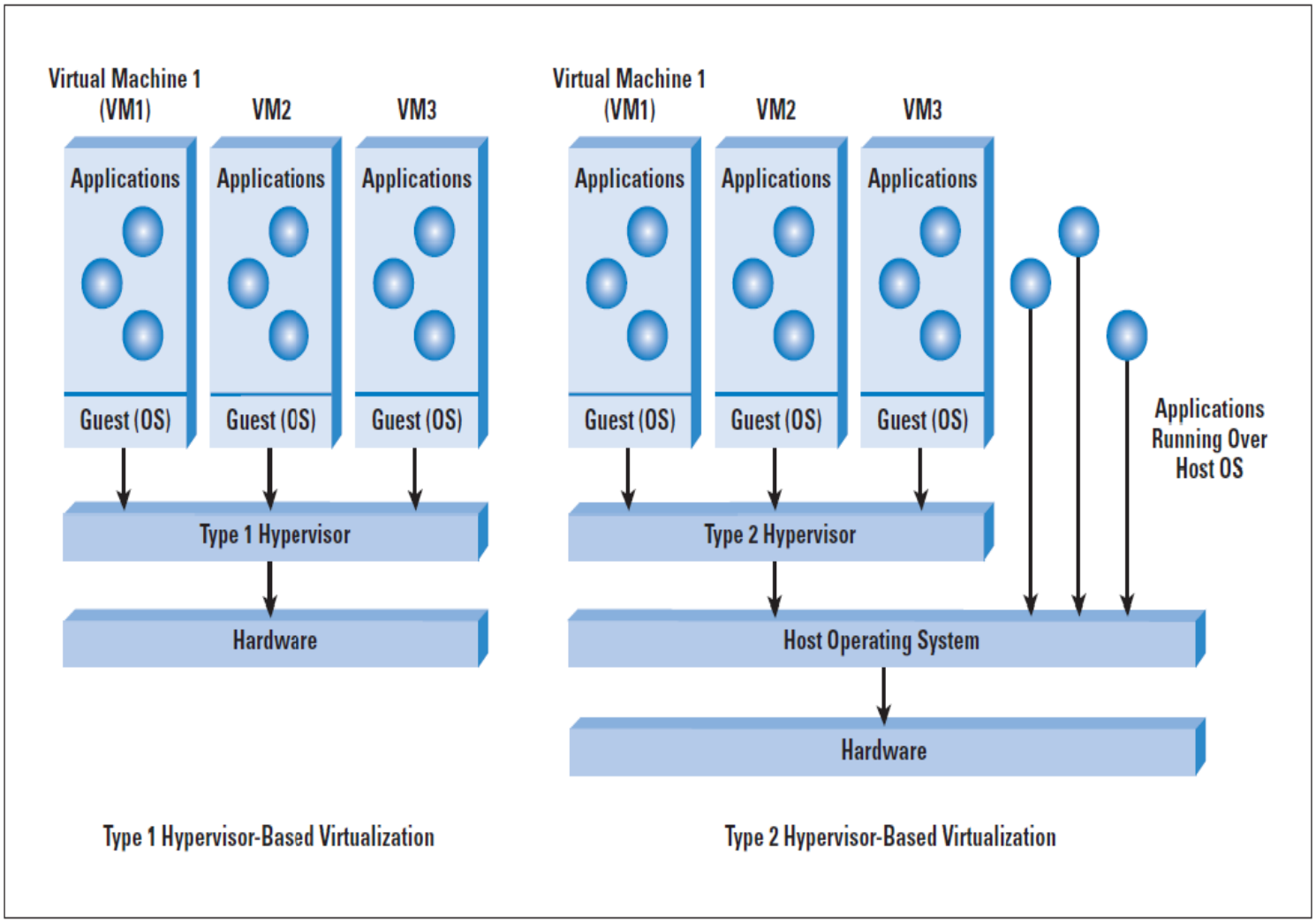
- Leaders in Virtualization – VMware, Citrix Xen

Hypervisor

- Hypervisor or Virtual Machine Monitor (VMM) is a software that creates and runs VMs. It can access any of the VM spawned by it. It emulates the physical hardware and prevents direct access to physical hardware.

- Multiple instances of a variety of OS'es can share a virtualized resource.

Two types of Hypervisors



Hypervisor

Hardware

Standard Computer
Hardware + OS

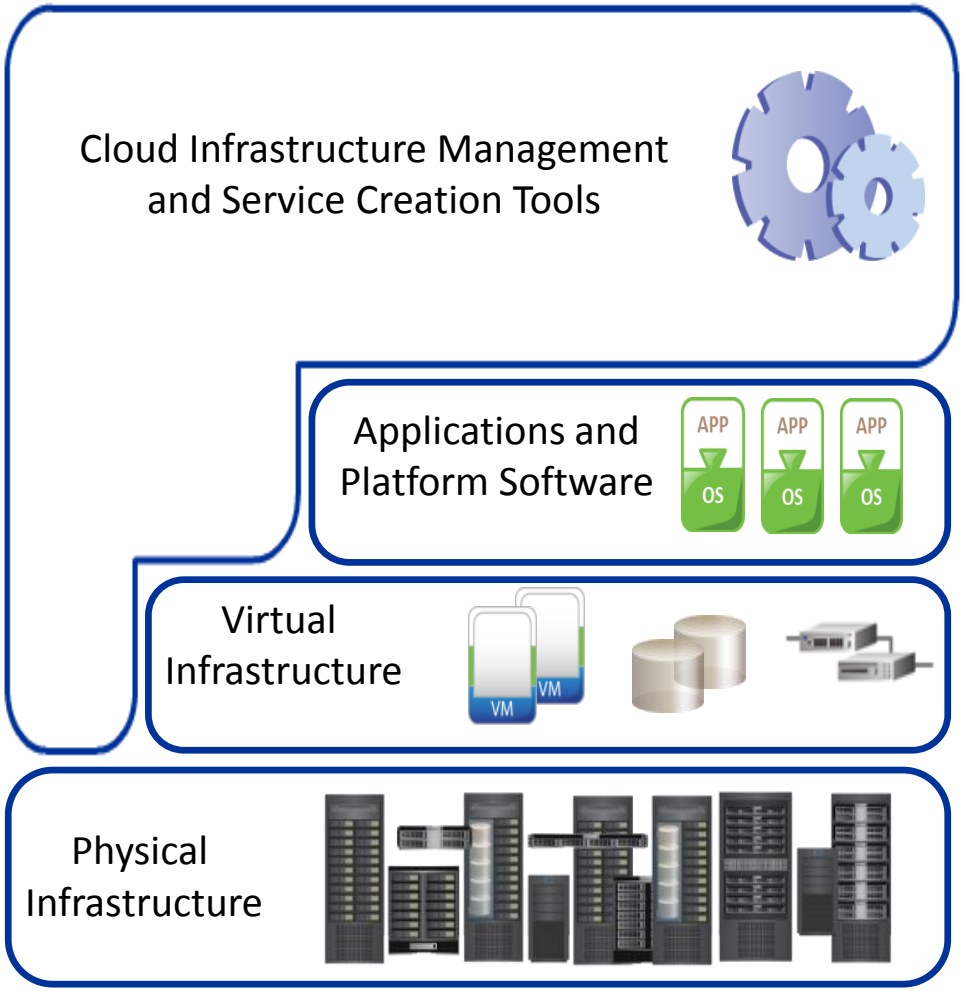
Hardware

Virt. Computer
Hardware + Xen

Benefits of Hypervisor

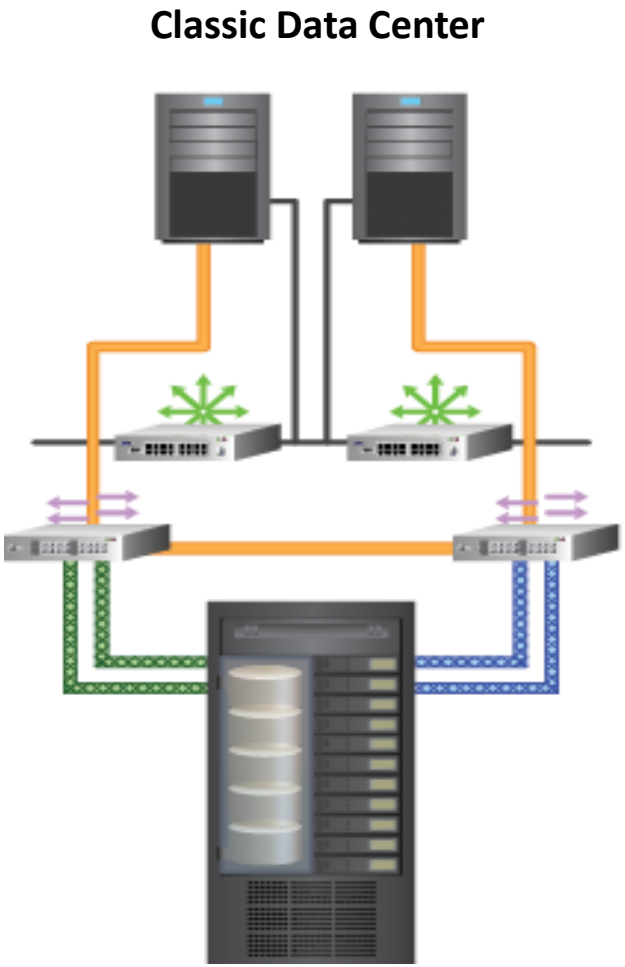
- Increase server utilization
- Consolidate server farms
- Decrease complexity
- Decrease Total Cost of Ownership (TCO)
  - Server consolidation refers to the use of a physical server to accommodate one or more server applications or user instances.
  - Sharing a server's compute resources among multiple applications and services simultaneously.
  - It is mainly used to reduce the number of server required in an organization.

Cloud Infrastructure



Classic Data Center

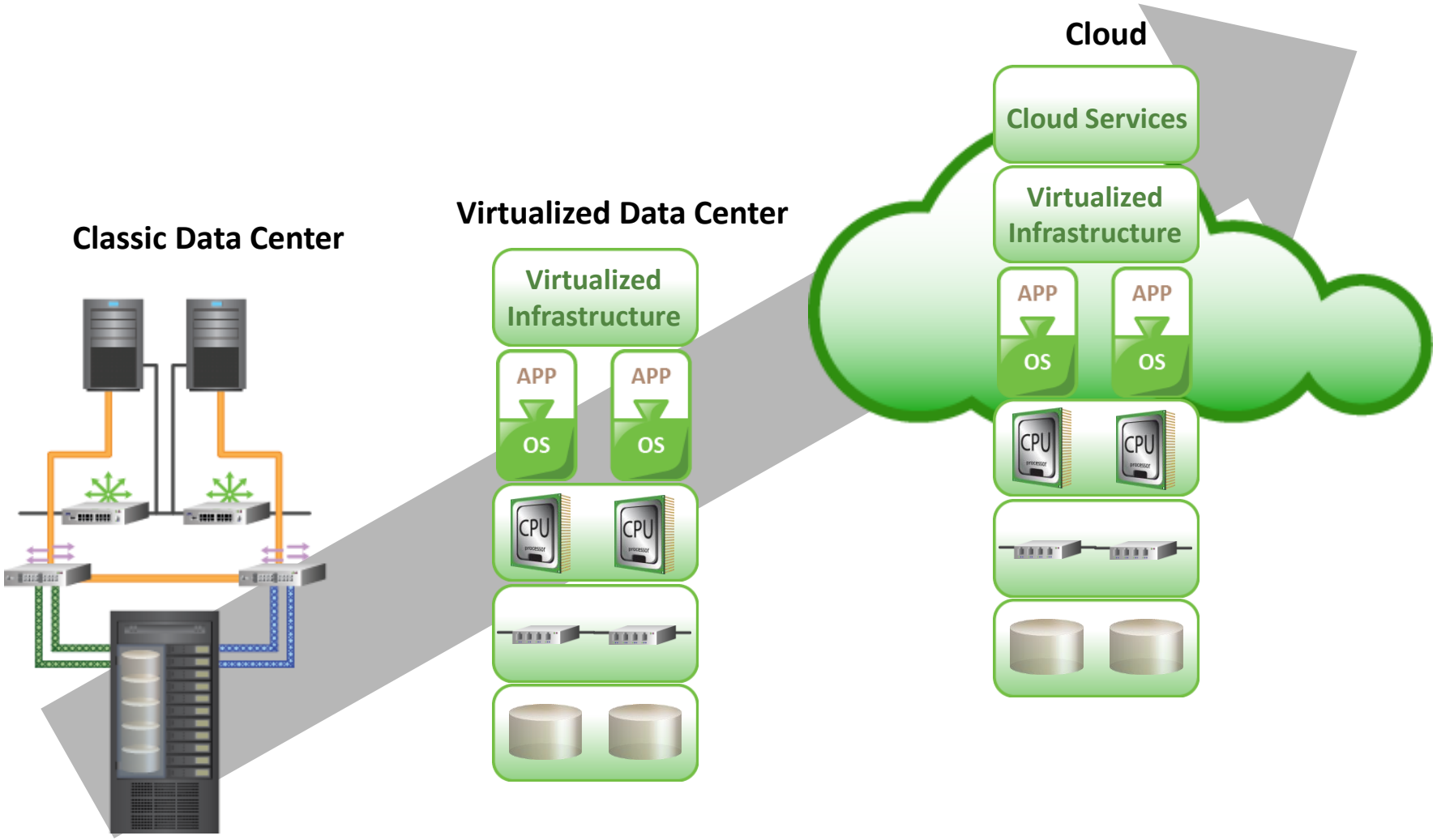
- Core elements of classic data center are:
  - Compute
  - Storage
  - Network
  - Operating System
  - DBMS
  - Application



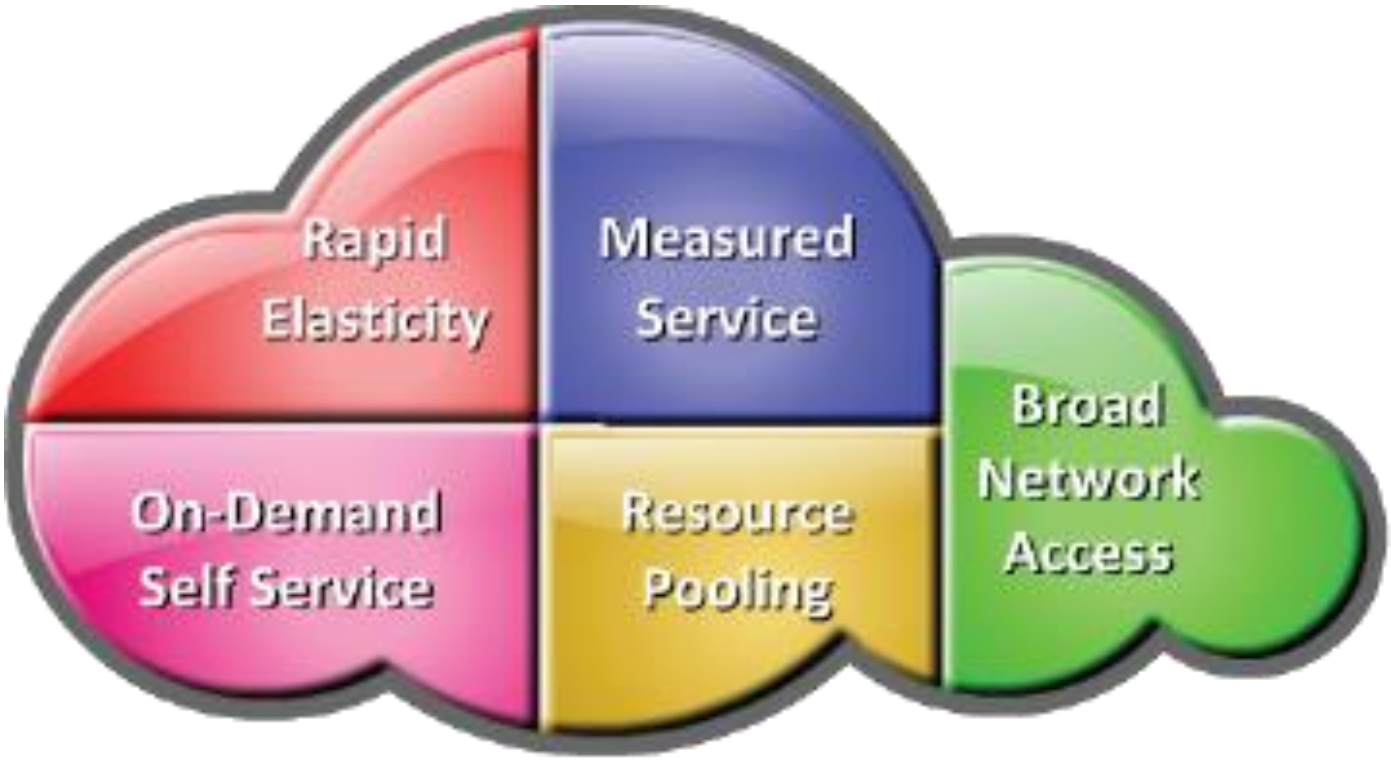
Virtualized Data Center

- Virtualization may be implemented at compute, storage, network, and/or application layers
- Virtualization Benefits:
  - Optimizes utilization of IT infrastructure
  - Reduces cost and management complexity
  - Reduces deployment time
  - Increases flexibility

Journey to the Cloud

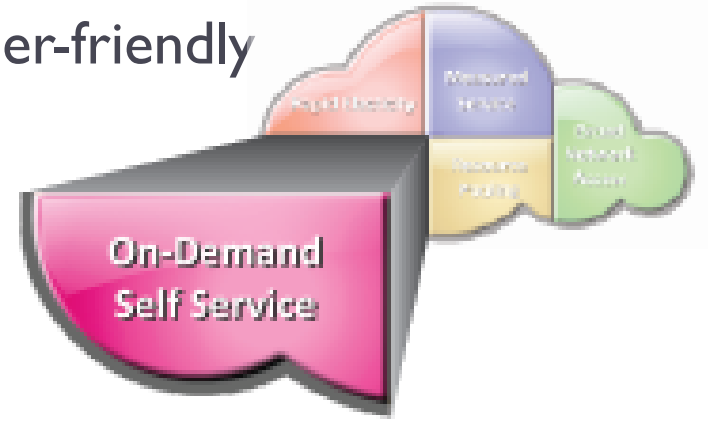


Essential Characteristics as per NIST



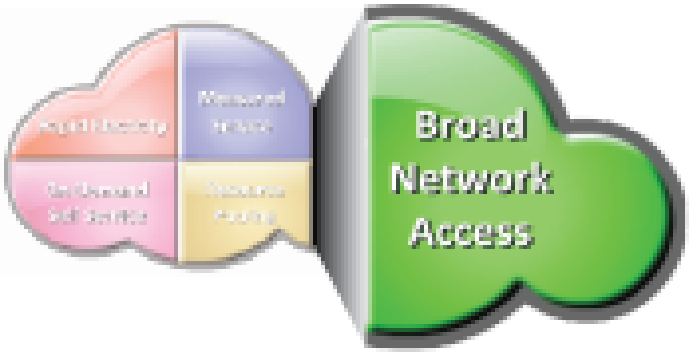
On-Demand Self-Service

- Enables consumers to get computing resources as and when required, without any human intervention
- Facilitates consumer to leverage "ready to use" services or, enables to choose required services from the service catalog
- Allows provisioning of resources using self-service interface
  - Self-service interface should be user-friendly



Broad Network Access

- Cloud services are accessed via the network, usually the internet, from a broad range of client platforms such as:
  - Desktop computer
  - Laptop
  - Mobile phone
  - Thin Client



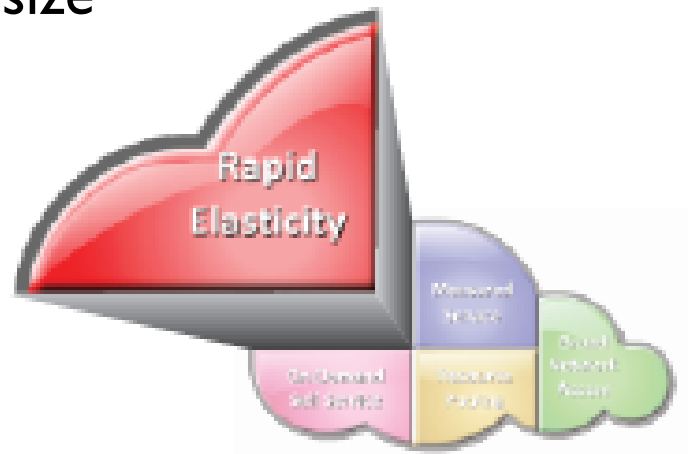
- Eliminates the need for accessing a particular client platform to access the services
- Enables accessing the services from anywhere across the globe

Resource Pooling

- IT resources (compute, storage, network) are pooled to serve multiple consumers
  - Based on **multi-tenant** model
- Consumer has no knowledge about the exact location of the resources provided
- Resources are dynamically assigned and reassigned based on the consumer demand

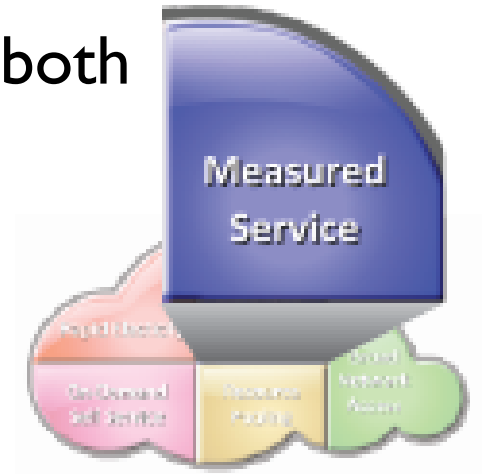
Rapid Elasticity

- Ability to scale IT resources rapidly, as required, to fulfill the changing needs without interruption of service
  - Resources can be both scaled up and scaled down dynamically
- To the consumer, the Cloud appears to be infinite
  - Consumers can start with minimal computing power and can expand their environment to any size



Metered Service

- Consumers are billed based on the metered usage of Cloud resources
  - Cost incurred on a pay-per-use basis
  - Pricing/billing model is tied up with the required service levels
- Resource usage is monitored and reported
- Provides transparency for chargeback to both
  - Cloud service provider
  - Consumer about the utilized service



Why the Cloud

- Cloud Architectures address key difficulties surrounding **large-scale data processing**.
- In traditional data processing it is difficult to get as many machines as an application needs.
- Second, it is difficult to get the machines when one needs them.
- Third, it is **difficult to distribute and coordinate a large-scale job** on different machines, **run** processes on them, and **provision another machine** to **recover if one machine fails**.

Why the Cloud

- Fourth, it is **difficult to auto scale up and down based on dynamic workloads.**
- Fifth, it is difficult **to get rid of all those machines** when the job is done.

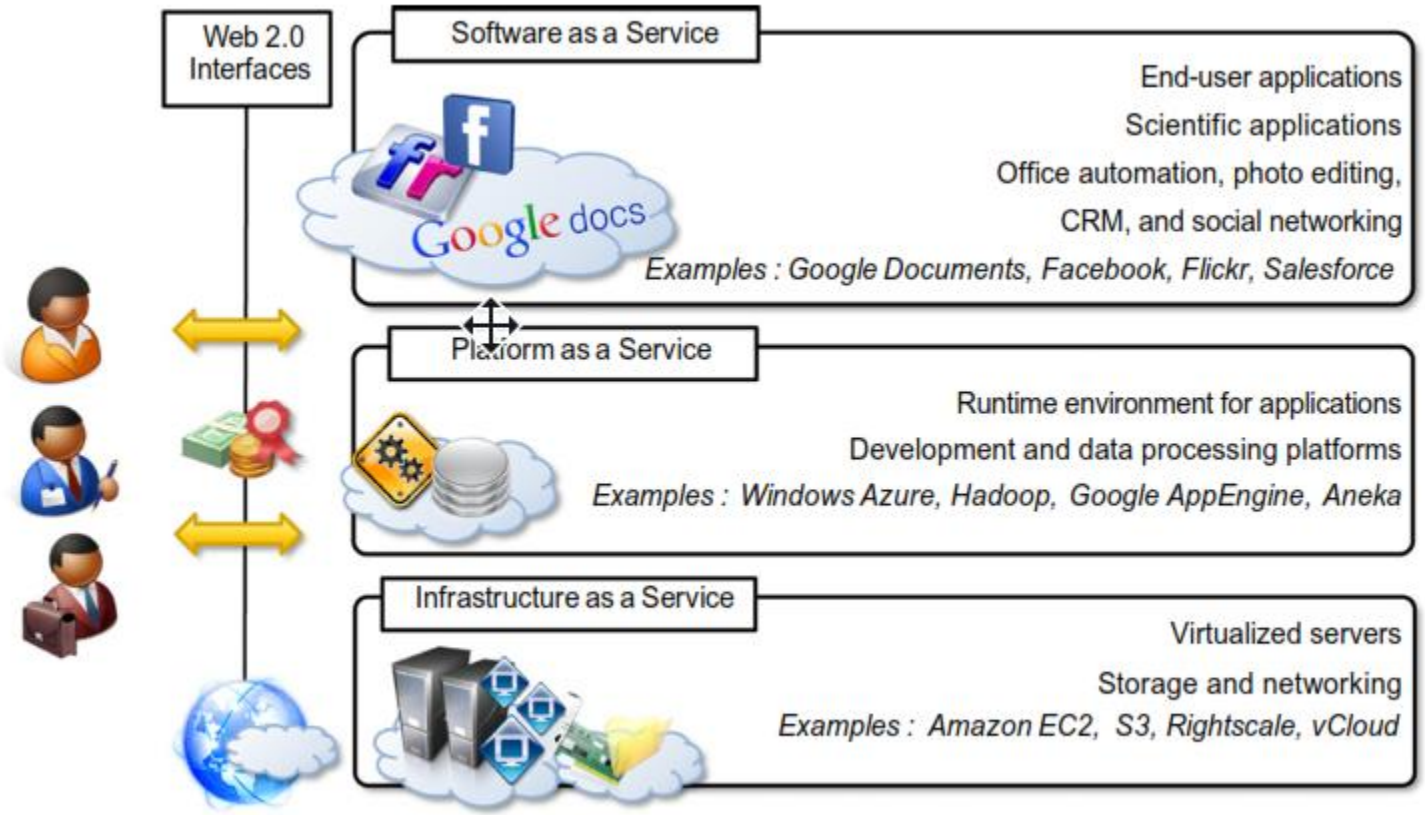
etc….

Cloud Architectures solve such difficulties!!!

Cloud Reference Architecture

SaaS, PaaS, IaaS

Cloud Reference Architecture*



*Mastering Cloud Computing

Cloud Service Delivery Models

SaaS, PaaS, IaaS

Cloud Service Models

Cloud Service can be classified into three categories:

- Infrastructure-as-a-Service (IaaS)
- Platform-as-a-Service (PaaS)
- Software-as-a-Service (SaaS)

Infrastructure as a service

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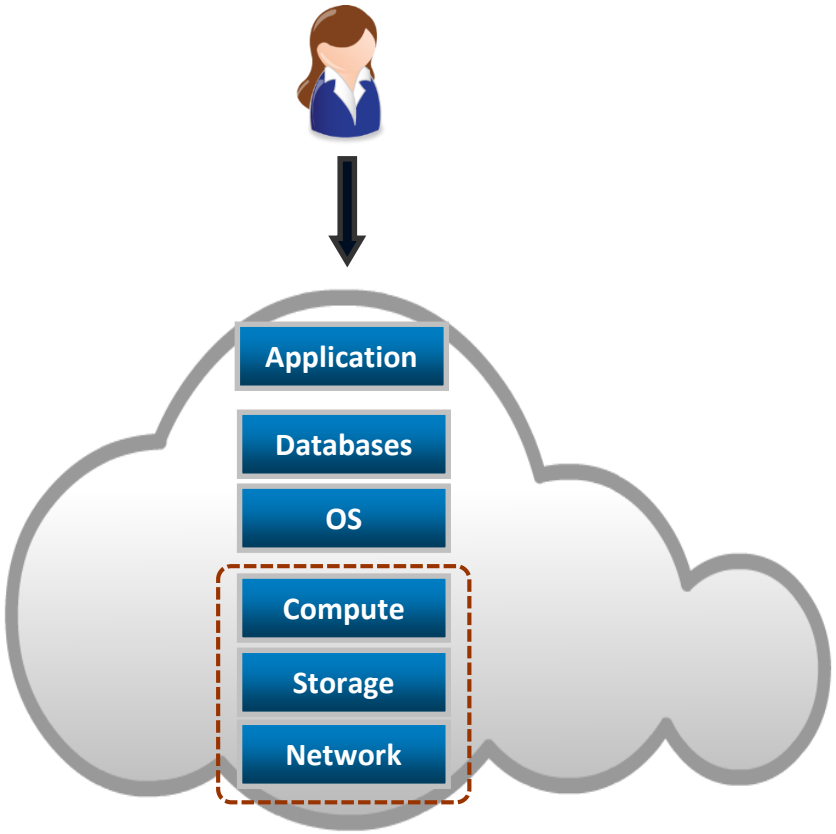
Infrastructure-as-a-Service

- Provides capability to the consumer to hire infrastructure components such as servers, storage, and network
- Enables consumers to deploy and run software, including OS and applications
- Pays for infrastructure components usage, for example, Storage capacity, CPU usage, etc.



IaaS Examples

- Amazon Elastic Compute Cloud (EC2) is an IaaS model that provides resizable compute capacity on a pay-per-use basis
  - Allows consumers to hire virtual compute on which they run their own applications
- EMC Atmos Online provides Storage as a service
  - Internet accessible, on demand storage
- Common Examplë: DigitalOcean, Linode, Rackspace, Amazon Web Services (AWS), Cisco Metapod, Microsoft Azure, Google Compute Engine (GCE)

Platform as a service

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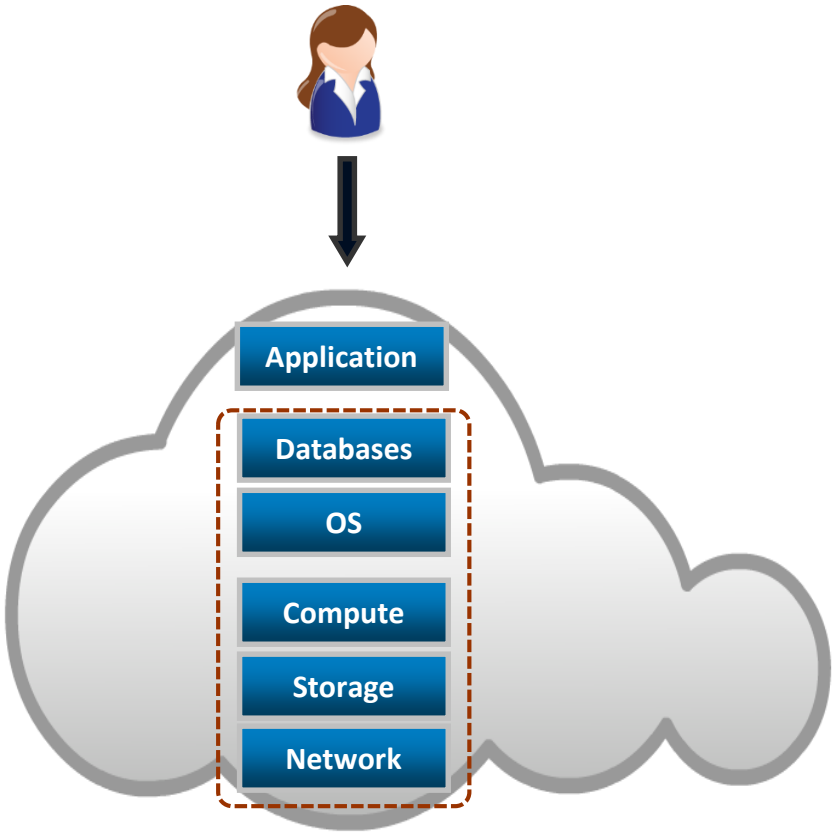
Platform-as-a-Service

- It provides a platform allowing customers to develop, run, and manage applications without the complexity of building and maintaining the infrastructure typically associated with developing and launching an app
- Consumer has control over
  - Deployed applications
  - Possible application hosting environment configurations
- Consumer is billed for platform software components
  - OS, Database, Middleware ((e.g. Java runtime, .NET runtime, integration, etc.))



PaaS Examples

- Google App Engine provides platform for consumers to deploy or create their own applications
  - Allows dynamic allocation of system resources for an application based on the actual demand
  - Provides Java and Python environment to create and deploy application
- Microsoft Azure Platform provides diverse functionalities to build applications
  - Uses existing skills with Visual Studio and .Net to build applications
  - Builds applications also in Java and PHP using Eclipse and other tools

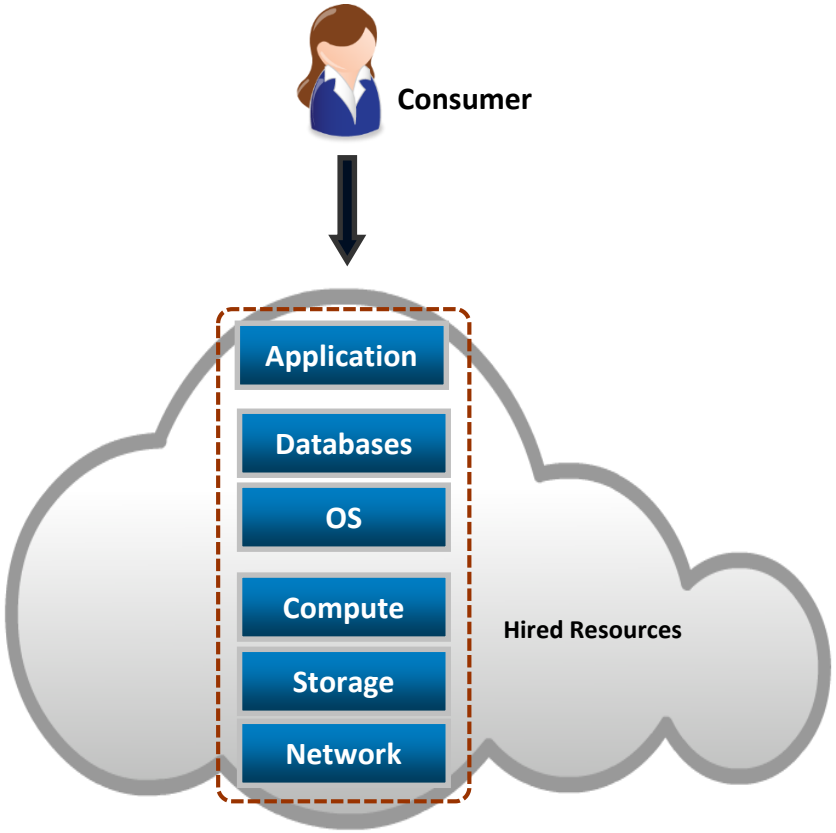
Common Examples: AWS Elastic Beanstalk, Windows Azure, Heroku, Force.com, Google App Engine, Apache Stratos

Cloud Service Delivery Models

Software as a Service (SaaS)

Software-as-a-Service

- Capability provided to the consumer to use provider's applications running in a Cloud infrastructure
- Complete stack including application is provided as a service
- Application is accessible from various client devices, for example, via a thin client interface such as a Web browser
- Billing is based on the application usage



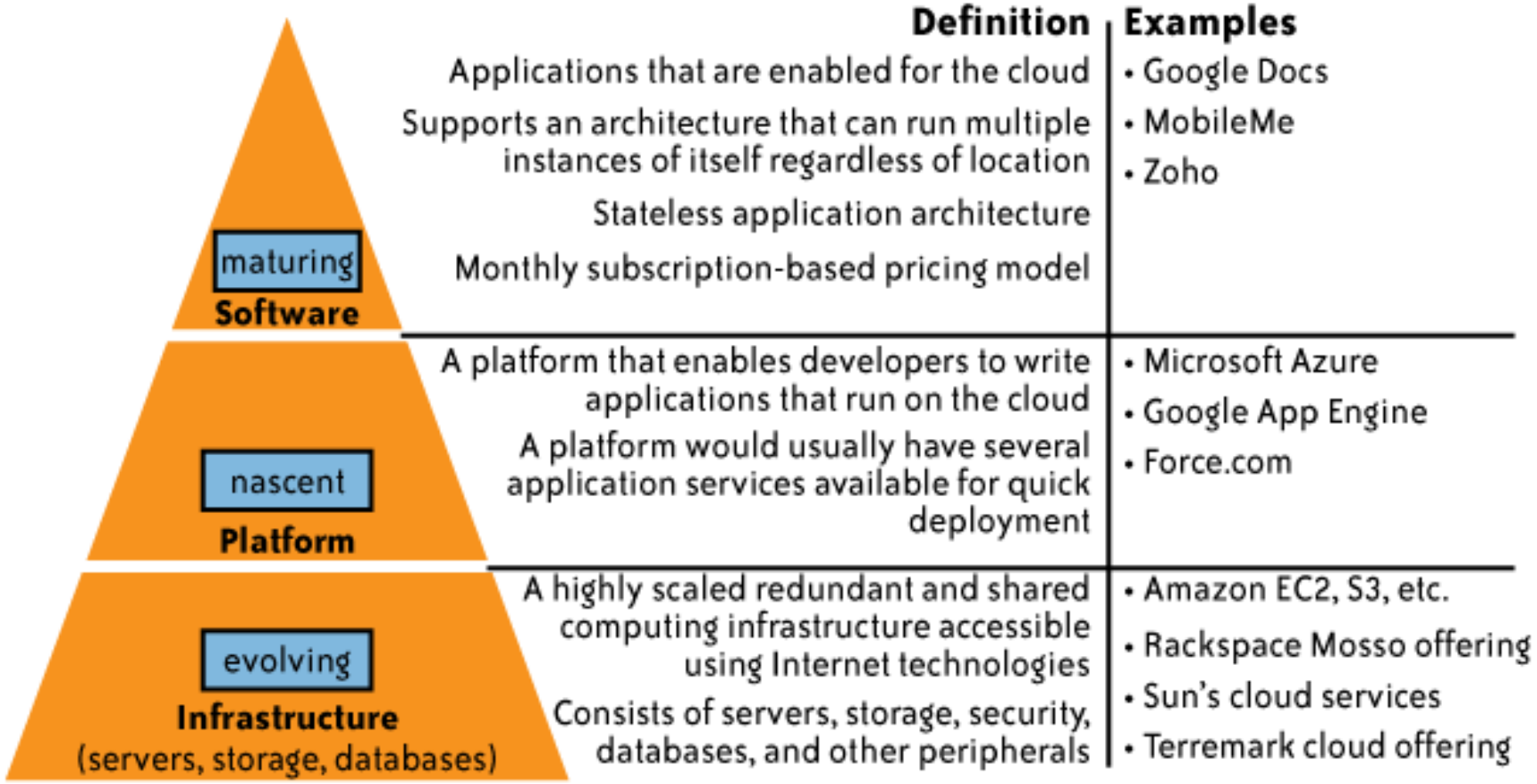
SaaS Examples

- EMC Mozy is a Software-as-a-Service solution for on-line backup
  - Consumers can leverage the Mozy console to perform automatic, secured, online backup and recovery of their data with ease
- Salesforce.com is a Software-as-a-Service solution for CRM application
  - Consumers can access CRM applications from anywhere, any time
- Common Examples: Google Apps, Microsoft office365, Google docs, Gmail

Everthing-As-A-Service (XaaS)

- Storage-as-a-service
- Database-as-a-service
- Information-as-a-service
- Process-as-a-service
- Application-as-a-service
- Platform-as-a-service
- Integration-as-a-service
- Security-as-a-service
- Management/Governance-as-a-service
- Testing-as-a-service
- Infrastructure-as-a-service

Taxonomy of Cloud Service Models



Amazon Web Services (AWS)

- AWS stands for Amazon Web Service which is a collection of remote computing services also known as cloud computing. This technology of cloud computing is also known as IaaS or Infrastructure as a Service.

Key Components of AWS

- The key components of AWS are as follows:
- **Route 53:** A DNS (Domain Name SERVER) web based service platform.
- **Simple E-mail Service:** Sending of E-mail is done by using RESTFUL API call or via regular SMTP (Simple Mail Transfer Protocol).
- **Identity and Access Management:** Improvised security and Identity management is provided for AWS account.
- **Simple Storage Device or (S3):** It is a huge storage medium, widely used for AWS services.

Key Components of AWS

- **Elastic Compute Cloud (EC2):** Allows on-demand computing resources for hosting applications and essentially useful for unpredictable workloads
- **Elastic Block Store (EBS):** Storage volumes which is being attached to EC2 and allows the data lifespan of a single EC2
- **Cloud Watch:** It is used to monitor AWS resources and it allows administrators to view and collect keys required. Access is provided so that one can set a notification alarm in case of trouble.

Hands-on: Demo of AWS

- *AWS EC2 service to launch and access VM from client machine using ssh.*

AWS services

Find a service by name or feature (for example, EC2, S3 or VM, storage).

Recently visited services

EC2 Billing

All services

Build a solution

Get started with simple wizards and automated workflows.

Launch a virtual machine
With EC2 or Lightsail
~1-2 minutes

Build a web app
With Elastic Beanstalk
~6 minutes

Host a static website
With S3, CloudFront, Route 53
~5 minutes

Connect an IoT device
With AWS IoT
~5 minutes

Start a development project
With CodeStar
~5 minutes

Register a domain
With Route 53
~3 minutes

See more

Learn to build

See all

Helpful tips

Manage your costs

Get real-time billing alerts based on your cost and usage budgets. Start now

Create an organization

Use AWS Organizations for policy-based management of multiple AWS accounts. Start now

Explore AWS

Amazon Relational Database Service (RDS)

RDS manages and scales your database for you. RDS supports Aurora, MySQL, PostgreSQL, MariaDB, Oracle, and SQL Server. Learn more.

Real-Time Analytics with Amazon Kinesis

Stream and analyze real-time data, so you can get timely insights and react quickly. Learn more.

EC2 Dashboard
Events
Tags
Reports
Limits
INSTANCES
Instances
Spot Requests
Reserved Instances
Dedicated Hosts
IMAGES
AMIs
Bundle Tasks
ELASTIC BLOCK STORE
Volumes
Snapshots
NETWORK & SECURITY
Security Groups
Elastic IPs
Placement Groups
Key Pairs

Resources

You are using the following Amazon EC2 resources in the Asia Pacific (Mumbai) region:

- 0 Running Instances
- 0 Dedicated Hosts
- 0 Volumes
- 0 Key Pairs
- 0 Placement Groups
- 0 Elastic IPs
- 0 Snapshots
- 0 Load Balancers
- 1 Security Groups

Create Instance

To start using Amazon EC2 you will want to launch a virtual server, known as an Amazon EC2 instance.

Launch Instance

Note: Your instances will launch in the Asia Pacific (Mumbai) region

Service Health

Service Status:

Asia Pacific (Mumbai):
This service is operating normally

Availability Zone Status:

ap-south-1a:
Availability zone is operating normally

Scheduled Events

Asia Pacific (Mumbai):

No events

Account Attributes

Supported Platforms

VPC

Default VPC

vpc-414aa429

Resource ID length management

Additional Information

Getting Started Guide
Documentation
All EC2 Resources
Forums
Pricing
Contact Us

AWS Marketplace

Find free software trial products in the AWS Marketplace from the EC2 Launch Wizard. Or try these popular AMIs:

Barracuda NextGen Firewall F-Series - PAYG

Step 1: Choose an Amazon Machine Image (AMI)

Cancel and Exit

An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. You can select an AMI provided by AWS, our user community, or the AWS Marketplace; or you can select one of your own AMIs.

Quick Start

1 to 29 of 29 AMIs

My AMIs

AWS Marketplace

Community AMIs

Free tier only

Amazon Linux AMI 2017.09.1 (HVM), SSD Volume Type - ami-2ed19c41

Amazon Linux

Free tier eligible

The Amazon Linux AMI is an EBS-backed, AWS-supported image. The default image includes AWS command line tools, Python, Ruby, Perl, and Java. The repositories include Docker, PHP, MySQL, PostgreSQL, and other packages.

Root device type: ebs Virtualization type: hvm

Select

64-bit

Red Hat Enterprise Linux 7.4 (HVM), SSD Volume Type - ami-e41b618b

Red Hat

Free tier eligible

Red Hat Enterprise Linux version 7.4 (HVM), EBS General Purpose (SSD) Volume Type

Root device type: ebs Virtualization type: hvm

Select

64-bit

SUSE Linux Enterprise Server 12 SP3 (HVM), SSD Volume Type - ami-3d4b0752

SUSE Linux

Free tier eligible

SUSE Linux Enterprise Server 12 Service Pack 3 (HVM), EBS General Purpose (SSD) Volume Type. Public Cloud, Advanced Systems Management, Web and Scripting, and Legacy modules enabled.

Root device type: ebs Virtualization type: hvm

Select

64-bit

1. Choose AMI | 2. Choose Instance Type | 3. Configure Instance | 4. Add Storage | 5. Add Tags | 6. Configure Security Group | 7. Review

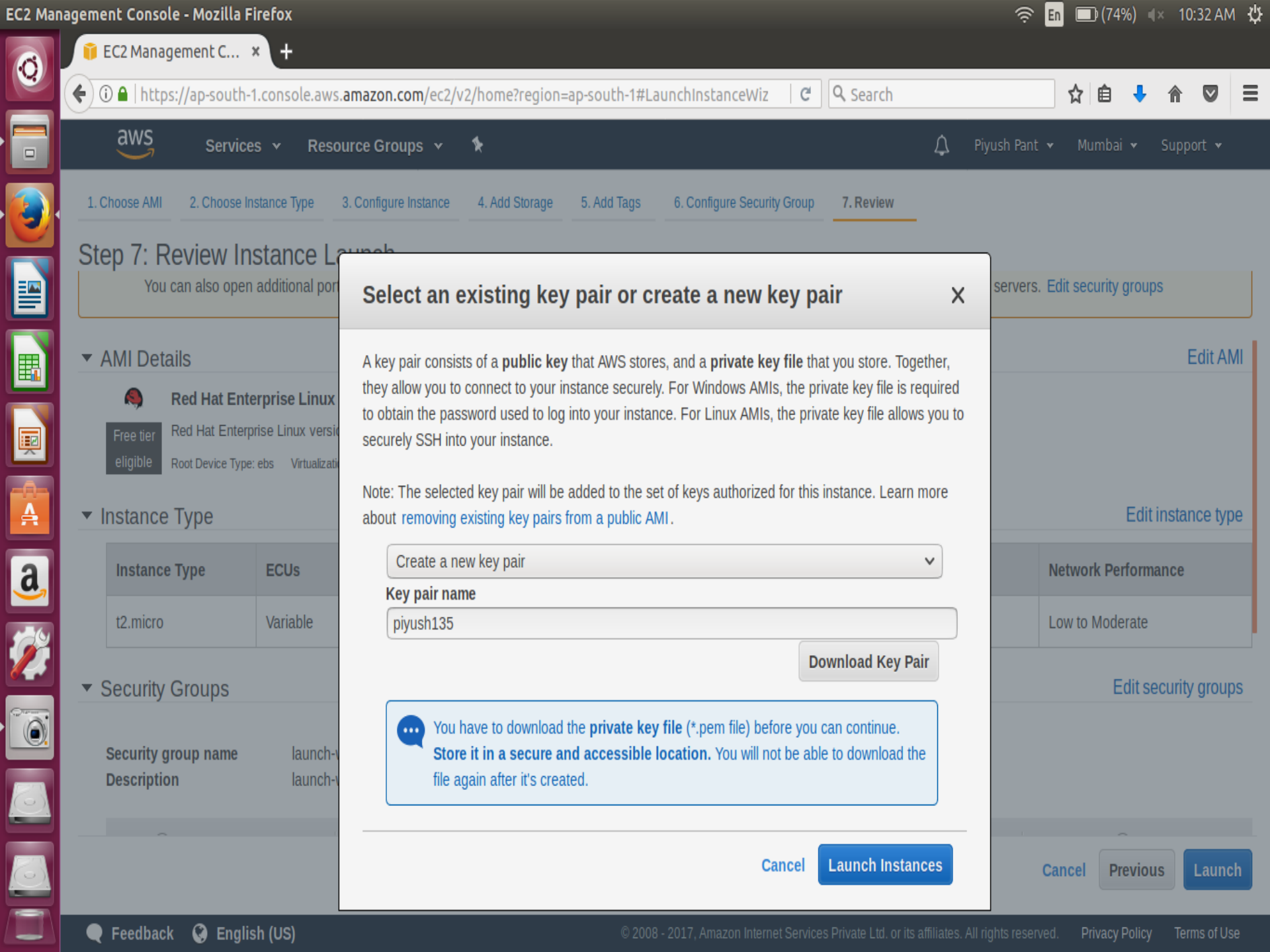
Step 2: Choose an Instance Type

Filter by: All instance types | Current generation | Show/Hide Columns

Currently selected: t2.micro (Variable ECUs, 1 vCPUs, 2.5 GHz, Intel Xeon Family, 1 GiB memory, EBS only)

	Family	Type	vCPUs	Memory (GiB)	Instance Storage (GB)	EBS-Optimized Available	Network Performance	IPv6 Support
☐	General purpose	t2.nano	1	0.5	EBS only	-	Low to Moderate	Yes
☑	General purpose	t2.micro Free tier eligible	1	1	EBS only	-	Low to Moderate	Yes
☐	General purpose	t2.small	1	2	EBS only	-	Low to Moderate	Yes
☐	General purpose	t2.medium	2	4	EBS only	-	Low to Moderate	Yes
☐	General purpose	t2.large	2	8	EBS only	-	Low to Moderate	Yes
☐	General purpose	t2.xlarge	4	16	EBS only	-	Moderate	Yes
☐	General purpose	t2.2xlarge	8	32	EBS only	-	Moderate	Yes

Cancel | Previous | Review and Launch | Next: Configure Instance Details


EC2 Management Console - Mozilla Firefox
10:32 AM
EC2 Management C...
https://ap-south-1.console.aws.amazon.com/ec2/v2/home?region=ap-south-1#LaunchInstanceWiz
Search
aws
Services
Resource Groups
Piyush Pant
Mumbai
Support
1. Choose AMI
2. Choose Instance Type
3. Configure Instance
4. Add Storage
5. Add Tags
6. Configure Security Group
7. Review
Step 7: Review Instance Launch
You can also open additional port
servers. Edit security groups
AMI Details
Edit AMI
Red Hat Enterprise Linux
Free tier eligible
Red Hat Enterprise Linux versi
Root Device Type: ebs
Virtualizati
Instance Type
Edit instance type
Instance Type
ECUs
Network Performance
t2.micro
Variable
Low to Moderate
Security Groups
Edit security groups
Security group name
launch-
Description
launch-
Select an existing key pair or create a new key pair
A key pair consists of a public key that AWS stores, and a private key file that you store. Together, they allow you to connect to your instance securely. For Windows AMIs, the private key file is required to obtain the password used to log into your instance. For Linux AMIs, the private key file allows you to securely SSH into your instance.
Note: The selected key pair will be added to the set of keys authorized for this instance. Learn more about removing existing key pairs from a public AMI.
Create a new key pair
Key pair name
piyush135
Download Key Pair
You have to download the private key file (*.pem file) before you can continue. Store it in a secure and accessible location. You will not be able to download the file again after it's created.
Cancel
Launch Instances
Cancel
Previous
Launch
Feedback
English (US)
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Privacy Policy
Terms of Use

Launch Status

Your instances are now launching

The following instance launches have been initiated: i-063bfe9b41dbe0866 View launch log

Get notified of estimated charges

Create billing alerts to get an email notification when estimated charges on your AWS bill exceed an amount you define (for example, if you exceed the free usage tier).

How to connect to your instances

Your instances are launching, and it may take a few minutes until they are in the **running** state, when they will be ready for you to use. Usage hours on your new instances will start immediately and continue to accrue until you stop or terminate your instances.

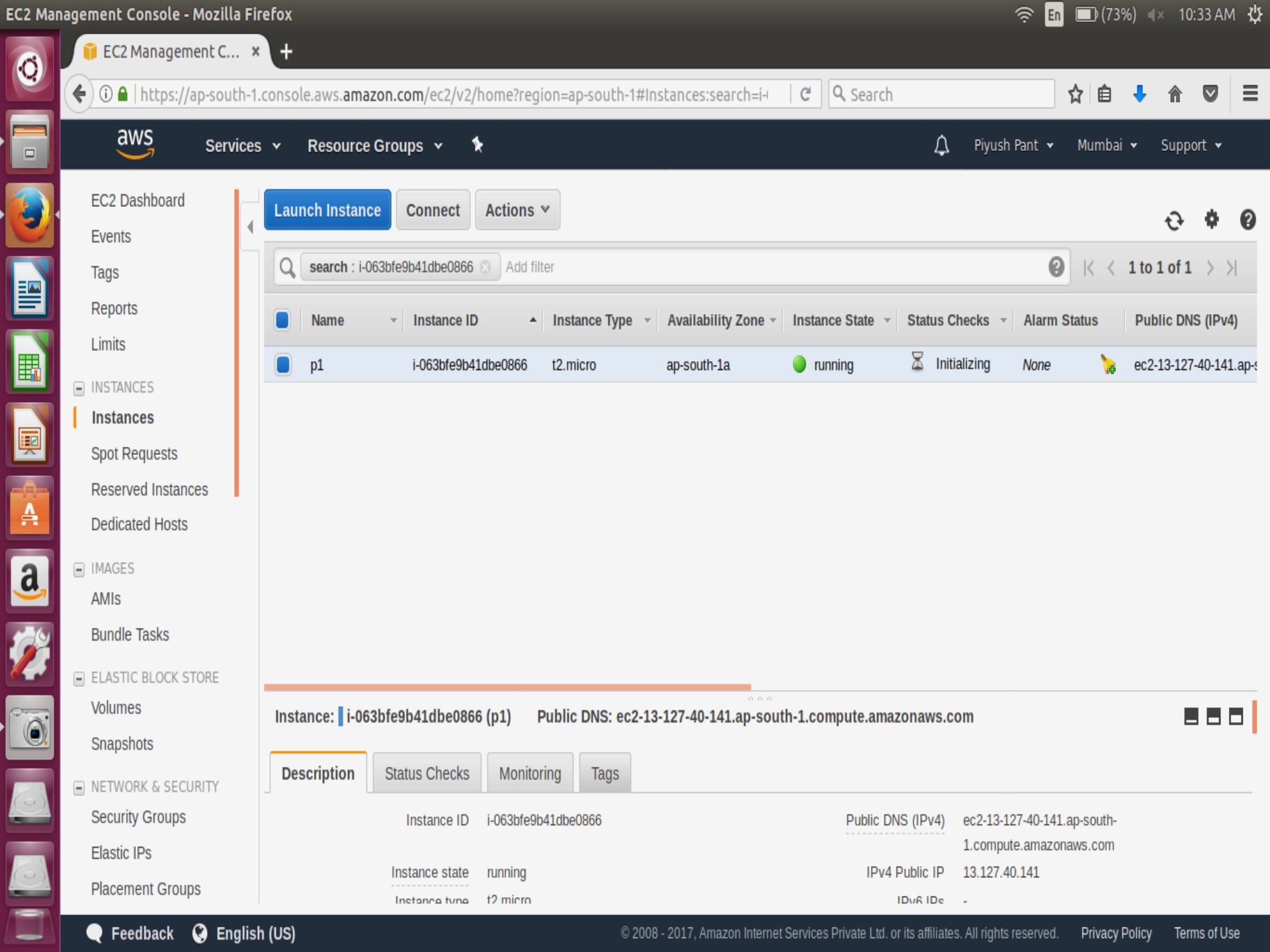
Click **View Instances** to monitor your instances' status. Once your instances are in the **running** state, you can **connect** to them from the Instances screen. Find out how to connect to your instances.

Here are some helpful resources to get you started

- How to connect to your Linux instance
- Learn about AWS Free Usage Tier
- Amazon EC2: User Guide
- Amazon EC2: Discussion Forum

While your instances are launching you can also

Create status check alarms to be notified when these instances fail status checks. (Additional charges may apply)


EC2 Management Console - Mozilla Firefox
10:33 AM
EC2 Management C...
https://ap-south-1.console.aws.amazon.com/ec2/v2/home?region=ap-south-1#Instances:search=i-
Search
aws
Services
Resource Groups
Piyush Pant
Mumbai
Support
EC2 Dashboard
Events
Tags
Reports
Limits
INSTANCES
Instances
Spot Requests
Reserved Instances
Dedicated Hosts
IMAGES
AMIs
Bundle Tasks
ELASTIC BLOCK STORE
Volumes
Snapshots
NETWORK & SECURITY
Security Groups
Elastic IPs
Placement Groups
Launch Instance
Connect
Actions
search : i-063bfe9b41dbe0866
Add filter
1 to 1 of 1
Name
Instance ID
Instance Type
Availability Zone
Instance State
Status Checks
Alarm Status
Public DNS (IPv4)
p1
i-063bfe9b41dbe0866
t2.micro
ap-south-1a
running
Initializing
None
ec2-13-127-40-141.ap-s
Instance: i-063bfe9b41dbe0866 (p1)
Public DNS: ec2-13-127-40-141.ap-south-1.compute.amazonaws.com
Description
Status Checks
Monitoring
Tags
Instance ID
i-063bfe9b41dbe0866
Instance state
running
Instance type
t2.micro
Public DNS (IPv4)
ec2-13-127-40-141.ap-south-1.compute.amazonaws.com
IPv4 Public IP
13.127.40.141
IPv6 IPs
-
Feedback
English (US)
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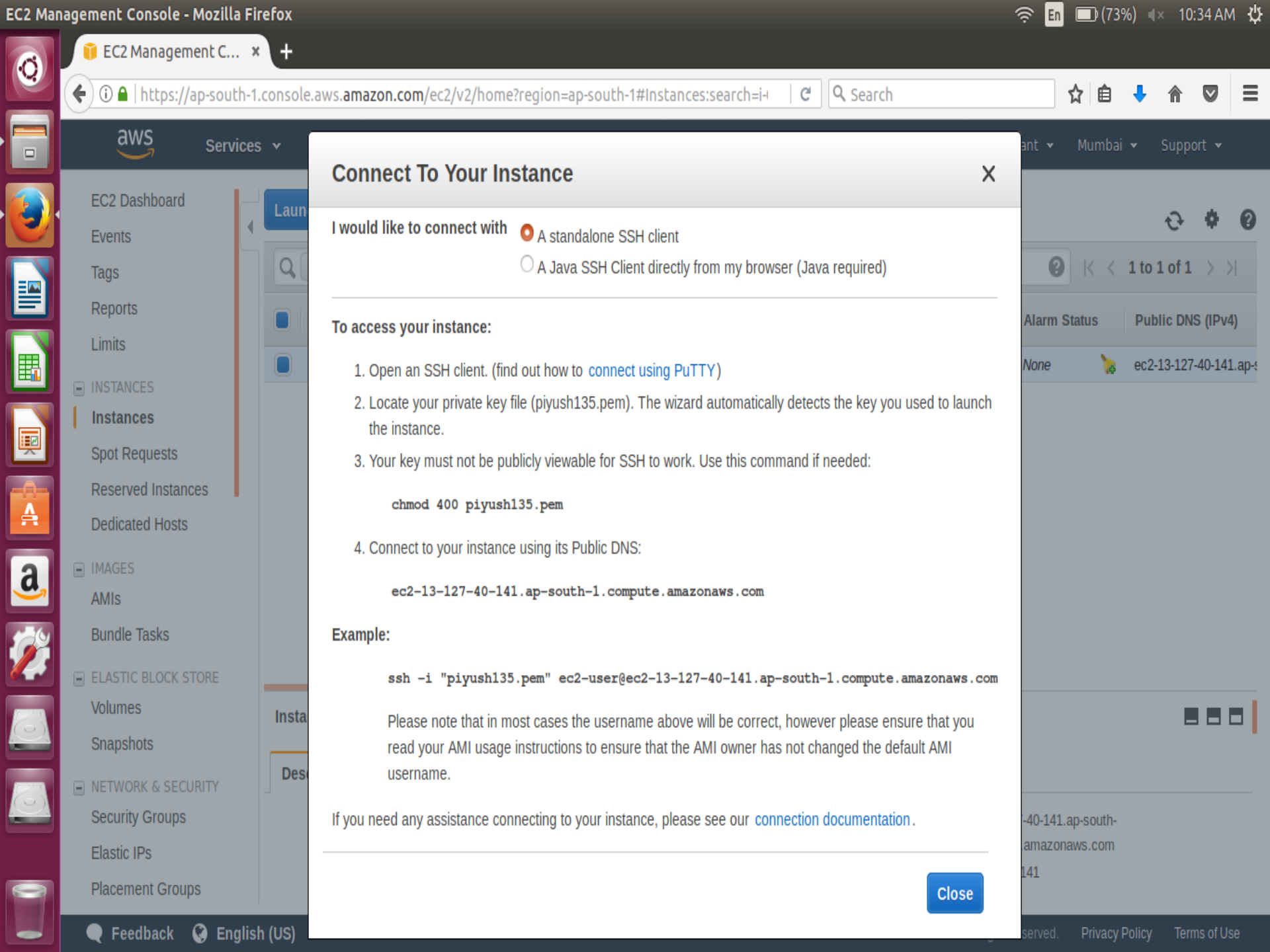
EC2 Management Console - Mozilla Firefox
10:34 AM
EC2 Management C...
https://ap-south-1.console.aws.amazon.com/ec2/v2/home?region=ap-south-1#Instances:search=i-
Search
aws
Services
Mumbai
Support
EC2 Dashboard
Events
Tags
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Connect To Your Instance
I would like to connect with
A standalone SSH client
A Java SSH Client directly from my browser (Java required)
To access your instance:
1. Open an SSH client. (find out how to connect using PuTTY)
2. Locate your private key file (piyush135.pem). The wizard automatically detects the key you used to launch the instance.
3. Your key must not be publicly viewable for SSH to work. Use this command if needed:
chmod 400 piyush135.pem
4. Connect to your instance using its Public DNS:
ec2-13-127-40-141.ap-south-1.compute.amazonaws.com
Example:
ssh -i "piyush135.pem" ec2-user@ec2-13-127-40-141.ap-south-1.compute.amazonaws.com
Please note that in most cases the username above will be correct, however please ensure that you read your AMI usage instructions to ensure that the AMI owner has not changed the default AMI username.
If you need any assistance connecting to your instance, please see our connection documentation.
Close
1 to 1 of 1
Alarm Status
Public DNS (IPv4)
None
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English (US)
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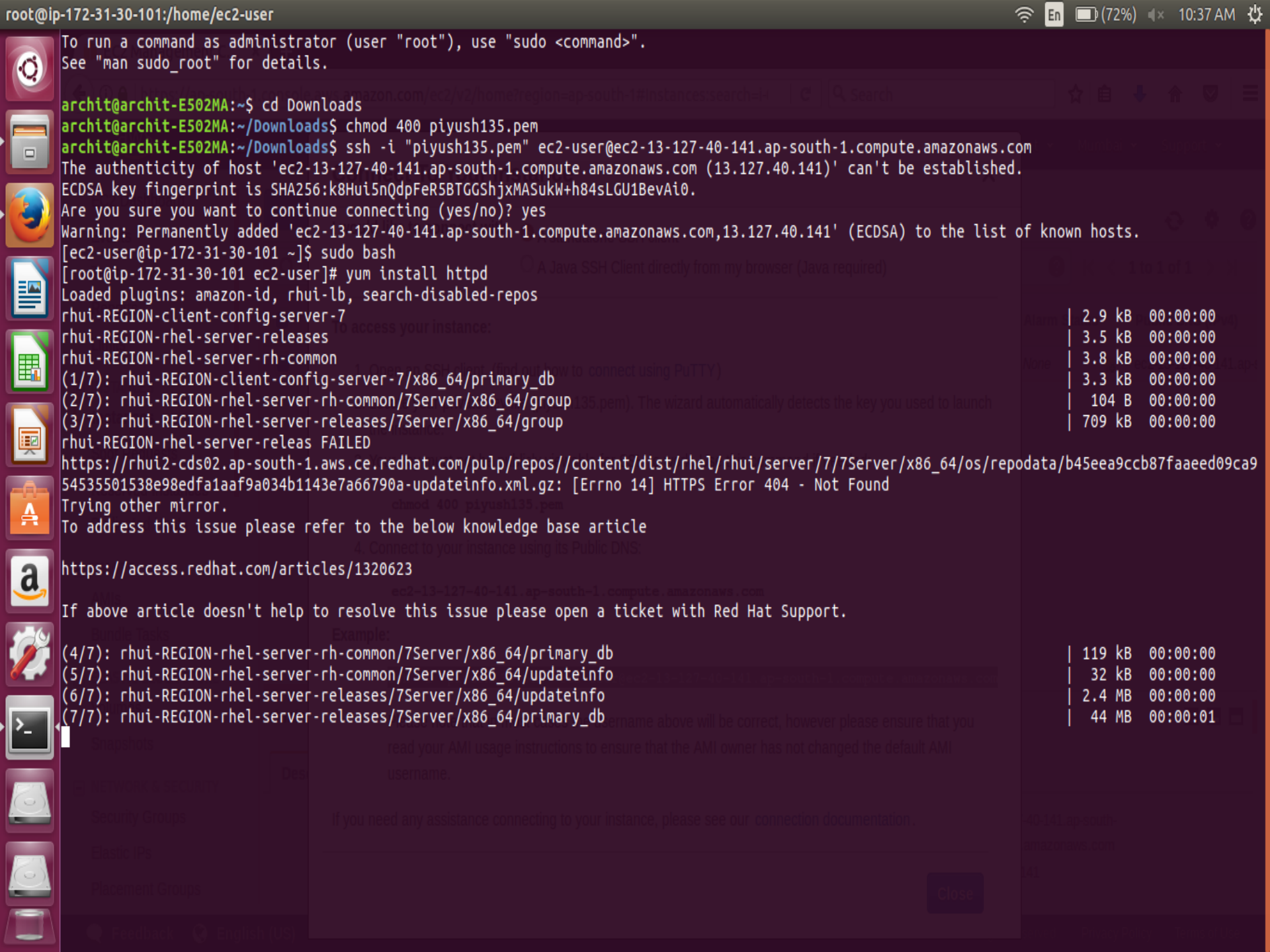
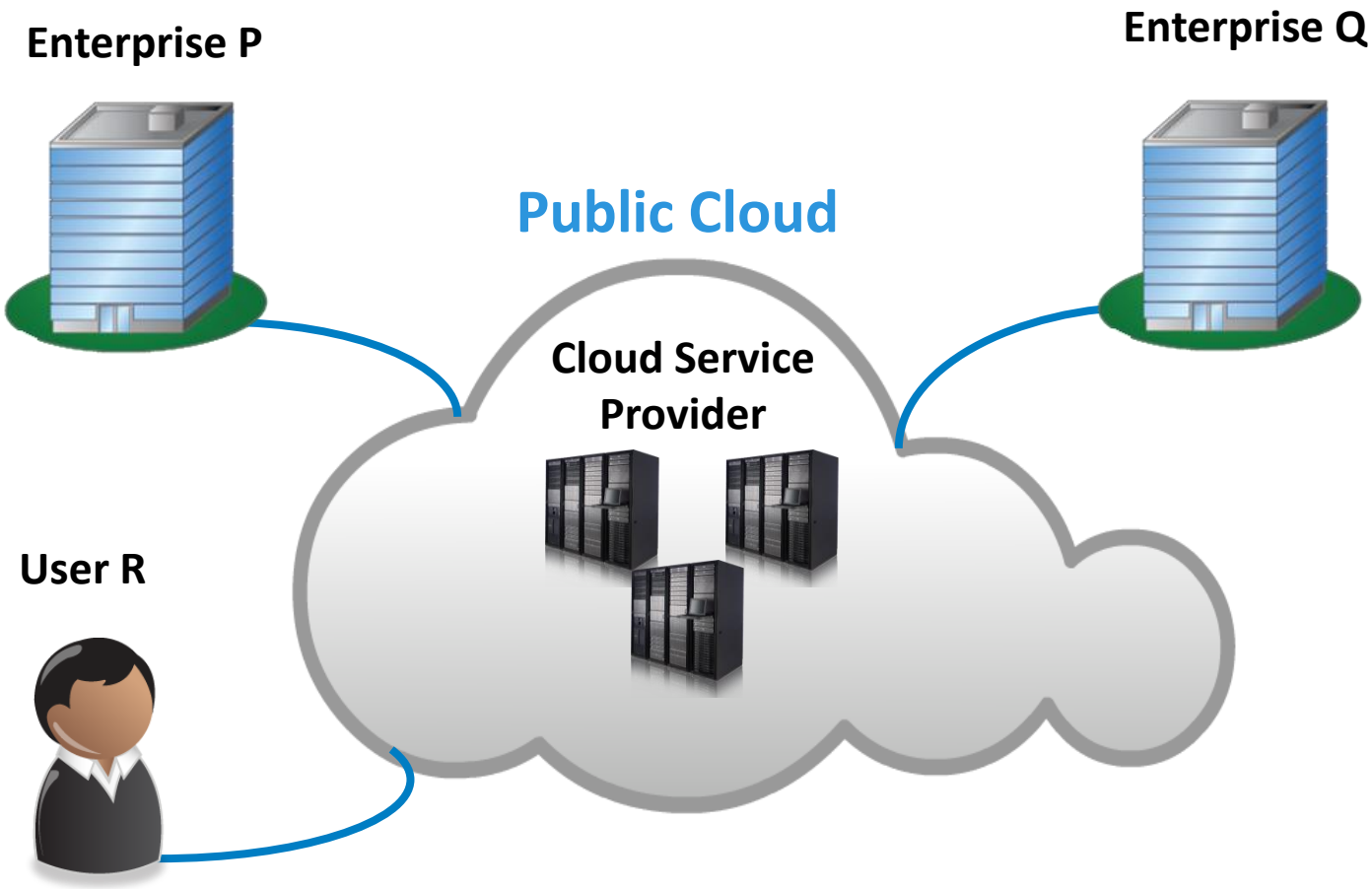

root@ip-172-31-30-101:/home/ec2-user
10:37 AM
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.
archit@archit-E502MA:~$ cd Downloads
archit@archit-E502MA:~/Downloads$ chmod 400 piyush135.pem
archit@archit-E502MA:~/Downloads$ ssh -i "piyush135.pem" ec2-user@ec2-13-127-40-141.ap-south-1.compute.amazonaws.com
The authenticity of host 'ec2-13-127-40-141.ap-south-1.compute.amazonaws.com (13.127.40.141)' can't be established.
ECDSA key fingerprint is SHA256:k8Hui5nQdpFeR5BTGGShjxMASukW+h84sLGU1BevAi0.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'ec2-13-127-40-141.ap-south-1.compute.amazonaws.com,13.127.40.141' (ECDSA) to the list of known hosts.
[ec2-user@ip-172-31-30-101 ~]$ sudo bash
[root@ip-172-31-30-101 ec2-user]# yum install httpd
Loaded plugins: amazon-id, rhui-lb, search-disabled-repos
rhui-REGION-client-config-server-7 | 2.9 kB 00:00:00
rhui-REGION-rhel-server-releases | 3.5 kB 00:00:00
rhui-REGION-rhel-server-rh-common | 3.8 kB 00:00:00
(1/7): rhui-REGION-client-config-server-7/x86_64/primary_db | 3.3 kB 00:00:00
(2/7): rhui-REGION-rhel-server-rh-common/7Server/x86_64/group | 104 B 00:00:00
(3/7): rhui-REGION-rhel-server-releases/7Server/x86_64/group | 709 kB 00:00:00
rhui-REGION-rhel-server-releas FAILED
https://rhui2-cds02.ap-south-1.aws.ce.redhat.com/pulp/repos//content/dist/rhel/rhui/server/7/7Server/x86_64/os/repodata/b45eea9ccb87faaeed09ca954535501538e98edfa1aaf9a034b1143e7a66790a-updateinfo.xml.gz: [Errno 14] HTTPS Error 404 - Not Found
Trying other mirror.
To address this issue please refer to the below knowledge base article
https://access.redhat.com/articles/1320623
If above article doesn't help to resolve this issue please open a ticket with Red Hat Support.
(4/7): rhui-REGION-rhel-server-rh-common/7Server/x86_64/primary_db | 119 kB 00:00:00
(5/7): rhui-REGION-rhel-server-rh-common/7Server/x86_64/updateinfo | 32 kB 00:00:00
(6/7): rhui-REGION-rhel-server-releases/7Server/x86_64/updateinfo | 2.4 MB 00:00:00
(7/7): rhui-REGION-rhel-server-releases/7Server/x86_64/primary_db | 44 MB 00:00:01

Assignment

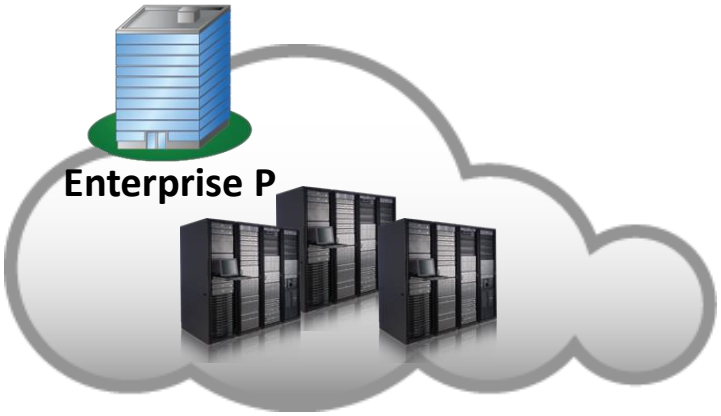
- Install VMWare Workstation in your machine.
  - - Create a VM (any Unix flavor)
    - Install a Apache WS on the VM
      - Create a webpage
        - host the webpage on the Apache WS

Taxonomy of Deployment Model – Public Cloud

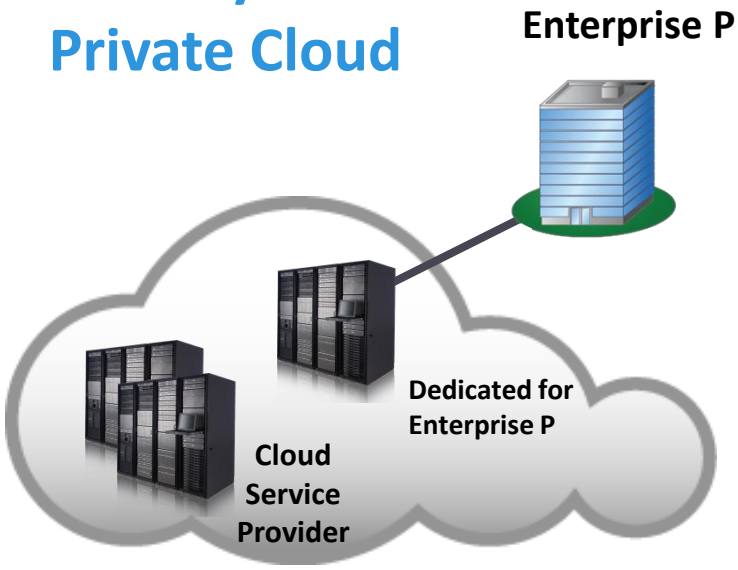


Deployment Model – Private Cloud

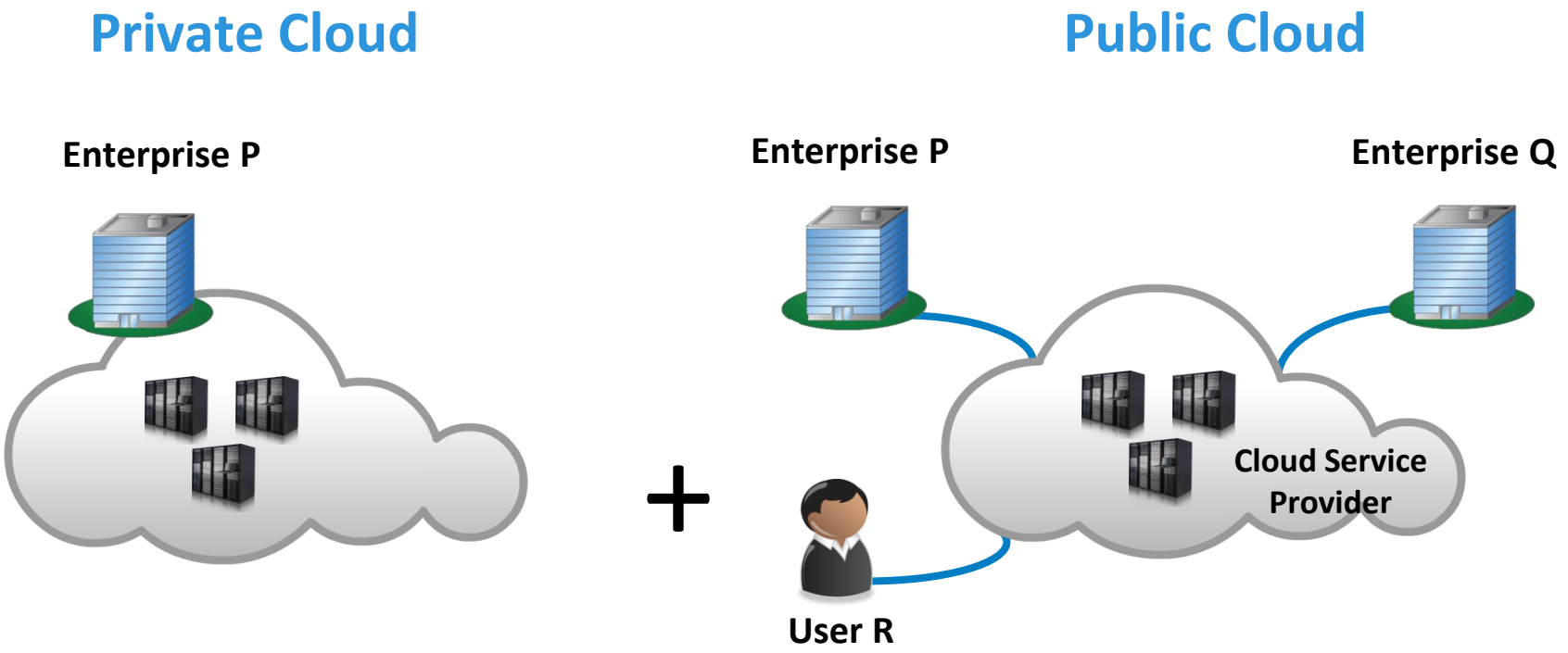
On-premise Private Cloud



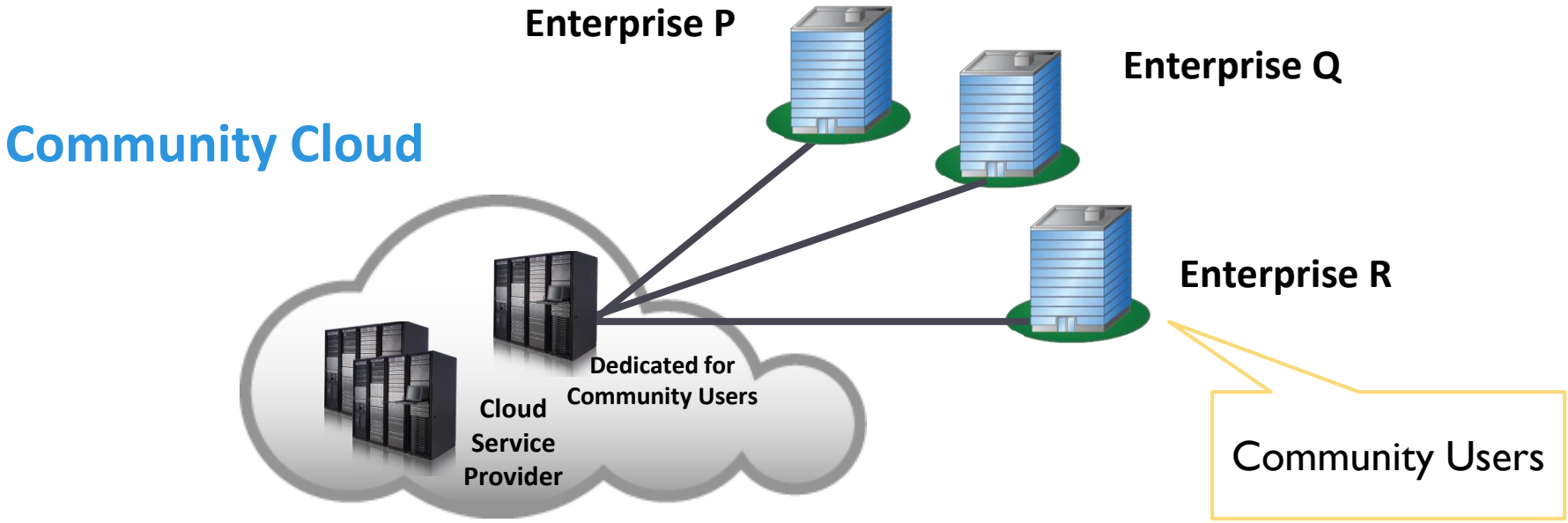
Externally hosted Private Cloud



Deployment Model – Hybrid Cloud



Deployment Model – Community Cloud



- Cloud infrastructure is shared by several organizations and supports a specific community that has shared concerns
- Managed by the organizations or by a third party

Vendors


Azure Services Platform
BUNGEEconnect
salesforce.com
Microsoft
3tera
Sun microsystems
force.com
YAHOO! DEVELOPER NETWORK
Google App Engine
Google
ORACLE
vmware
ACROBAT.COM
IBM
Google
EMC²
Sun Grid Compute Utility
MOSSO
amazon web services
intel
NETSUITE
Joyent Accelerators
OpenID
hp invent
DELL

Cloud Service Provider

- Cloud service providers: A cloud service provider, or CSP, is a company/Organization that offers some component of cloud computing -- typically infrastructure as a service (IaaS), software as a service (SaaS) or platform as a service (PaaS) -- to other businesses or individuals.
- Google
- Microsoft
- Citrix
- Joyent. San Francisco infrastructure-as-a-service provider,
- CenturyLink.

Cloud Service Provider

- Amazon.
- IBM.
- Salesforce
- Rackspace
- Verizon Terremark

Cloud Software

- Give the best example for open source Cloud Computing Management Software: **OpenStack**
- OpenStack software controls large pools of compute, storage, and networking resources throughout a datacenter, managed through a dashboard or via the OpenStack API.
- **Explain what is the full form and usage of "EUCALYPTUS" in cloud computing.**
- EUCALYPTUS" full form stands for Elastic Utility Computing Architecture for Linking Your Programs to Useful Systems".

Cloud Software

- Both are open source software infrastructure in cloud computing, which enable us to implement clusters in cloud computing platform. It is mainly used to build public, hybrid and private clouds.

- List the platforms which are used for large scale cloud computing: The platforms that are used for large scale cloud computing are:
  - **Apache Hadoop**
  - **MapReduce**

Large Cloud Databases

- Mention the name of some large cloud providers and databases.
- Google Big table
- Amazon Simple Database
- Cloud based SQL(Sequential Query Language)

Cloud Vs Traditional

- The expenditure of the traditional data center is expensive due to heating and hardware/software issues.

- Cloud being scaled when there is an increase in demand. Mostly the expenditure is on the maintenance of the data centers, while this issues are not faced in cloud computing.

- Etc….

API's

- What are the uses of API's in cloud services?
- API's (Application Programming Interface are used to eliminate the necessity to write the complete programs.
- The instructions are provided to make communication between one or more applications.
- Creation of applications is made easy and access for the link of cloud services with other systems.

Benefits of Cloud

- Cost & management
- Economies of scale, "out-sourced" resource management
- Reduced Time to deployment
- Ease of assembly, works "out of the box"
- Scaling
- On demand provisioning, co-locate data and compute
- Reliability
- Massive, redundant, shared resources
- Sustainability

Benefits of Cloud

- Hardware not owned
- What are the benefits of cloud computing?
- Data backup and storage of data.
- Powerful server capabilities.
- Incremented productivity.
- Cost effective and time saving.