UNIT-3

Virtual Machines Provisioning and Migration Services:

Analogy for Virtual Machine Provisiong:

→ Historically, when there is a need to install a new server for a certain workload to provide a particular service for a client, lots of effort was exerted by the IT administrator, and much time was spent to install and provision a new server.

1) Check the inventory for a new machine
2) get one
3) format, install OS required
4) and install services.

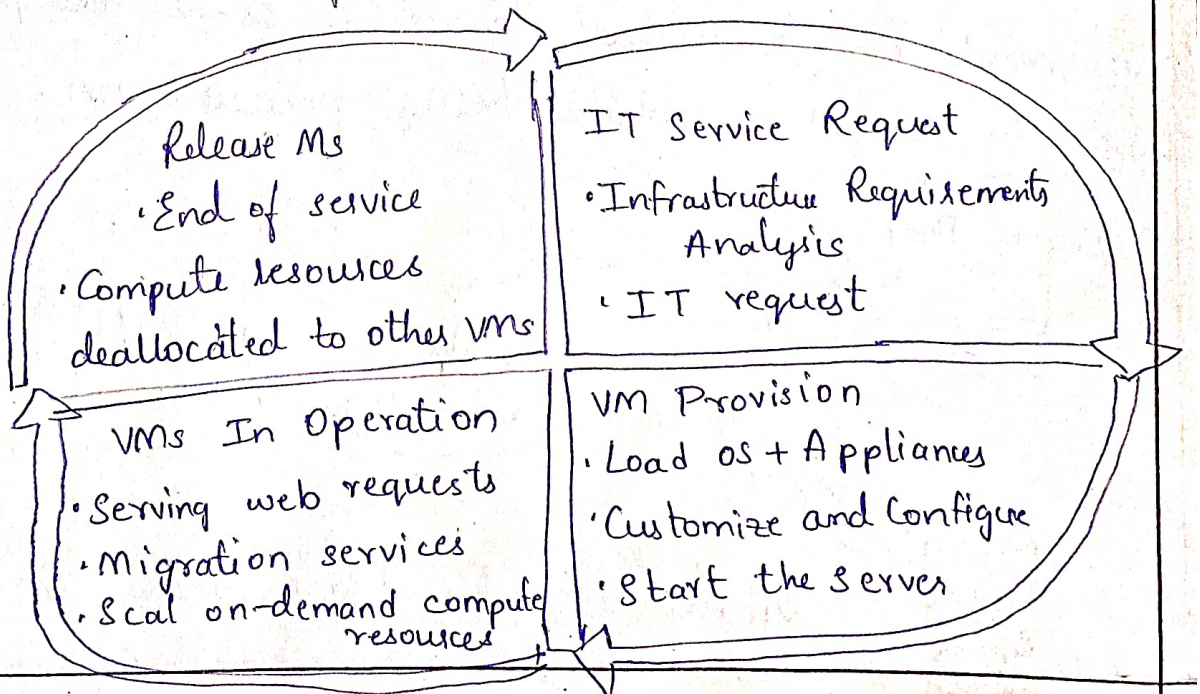
Analogy for Migration Services:

→ Whenever there was a need for performing a server upgrade or performing maintenance tasks, you would exert a lot of time and effort, because it is an expensive operation to maintain or upgrade a main server that has lots of applications and users.

→ Now, with the advance of the revolutionized virtualization technology and migration services associated with hypervisors' capabilities, these tasks are very easy and need no time to accomplish.

Virtual Machine Life Cycle:

- The cycle starts by a request delivered to the IT department, stating the requirement for creating a new server for a particular service.
- This request is being procesed by the IT administration to start seeing the servers resource pool, matching these resources with requirements.
- Starting the provision of the needed virtual machine.
- Once it provisioned and started, it is ready to provide the required service according to an SLA
- Virtual is being released, and free resources.



VM Provisioning Process:

→ The common and normal steps of provisioning a virtual server as follows:

→ Firstly, you need to select a server from a pool of available servers along with the appropriate OS template you need to provision the virtual machine.

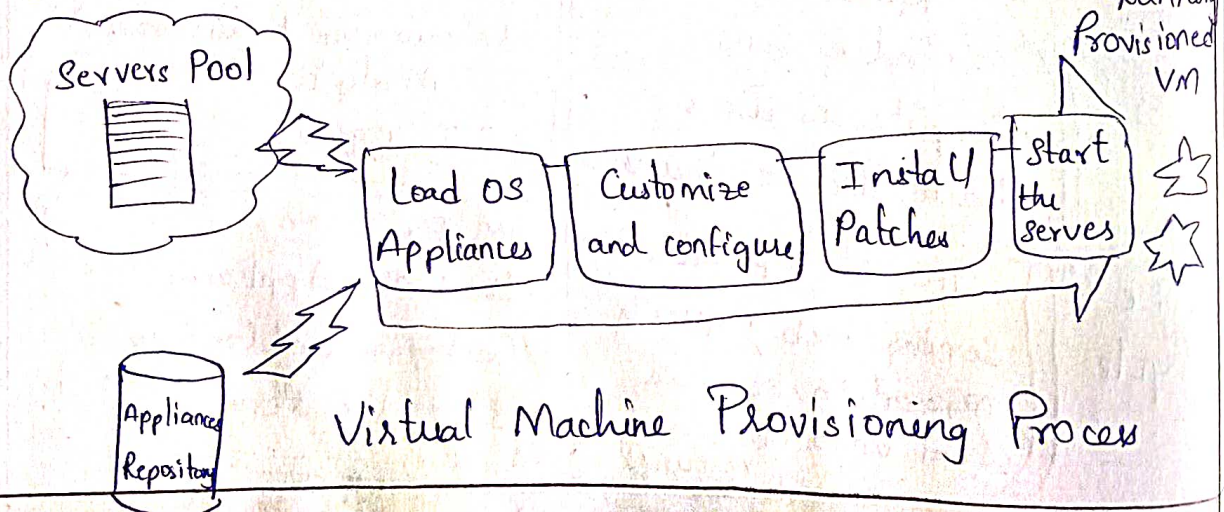
→ Secondly, you need to load the appropriate software.

→ Thirdly, you need to customize and configure the machine to configure an associated network and storage resources.

→ Finally, the virtual server is ready to start with its newly loaded software.

Live Migration and High Availability:

→ Live Migration (which is also called hot or real-time migration) can be defined as the movement of a virtual machine from one physical host to another while being powered on.



Virtual Machine Provisioning Process

Topic-2

On the Management of Virtual Machines for Cloud Infrastructures:

The Anatomy of cloud Infrastructures:

→ Here we focuses on the subject of IaaS clouds and more specifically, on the efficient management of virtual machines in this type of cloud. There are many commercial IaaS cloud providers in the market, such as those cited earlier, and of them share five characteristics:

i) They provide on-demand provisioning of computational resources

ii) They use virtualization technologies to lease these resources;

iii) They provide public and simple remote interfaces to manage those resources;

iv) They use a pay-as-you-go cost model, typically charging by the hour

v) They operate data centers large enough to provide a seemingly unlimited amount of resources to their clients

Distributed Management of Virtual Infrastructures:

→ VM Model and Life Cycle in OpenNebula. The life cycle of a VM within OpenNebula follows several stages:

→ Resource selection: Once a VM is requested to OpenNebula, a feasible placement plan for the VM must be made. OpenNebula's default scheduler provides an implementation of a rank scheduling policy allowing site administrators to configure the scheduler to prioritize the resources that are more suitable for the VM, using information from the VMs and the physical hosts.

→ Resource Preparation: The disk images of the VM are transferred to the target physical resource. During the boot process, the VM is contextualized, a process where the disk images are specialized to work in a given environment.

→ VM Termination: When the VM is going to shut down, OpenNebula can transfer back its disk image to a known location. This way, changes in the VM can be kept for a future use.

Topic -3

Enhancing Cloud Computing Environments Using a Cluster as a Service:

RVWS Design Dynamic Attribute Exposure:

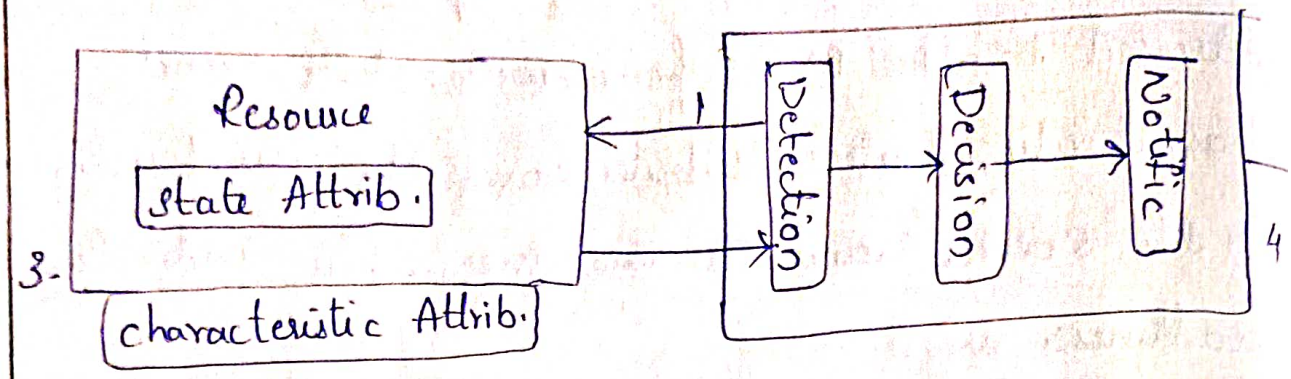
→ There are two categories of dynamic attributes addressed in the RVWS framework: state and characteristic. State attributes cover the current activity of the service and its resources, thus indicating readiness.

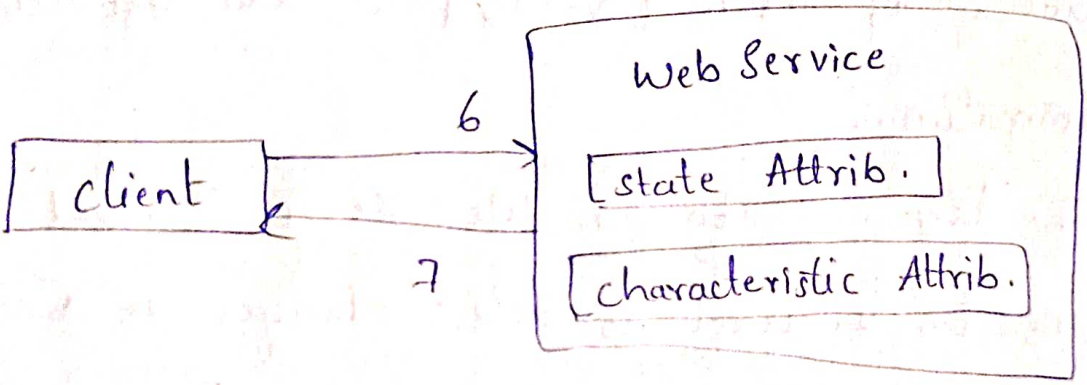
→ Characteristic attributes cover the operational features of the service, the resources behind it, the quality of service (QoS), price and provider information.

→ To keep the stateful Web service current, a Connector[2] is used to detect changes in resources and then inform the Web service. The connector has three logical modules: Detection, Decision and Notification. Any changes in the attributes are passed to the decision module (3) that decides if the attribute change is large enough to warrant a notification.

(4) Which is Updated attributes are passed ~~on~~ to the notification module, which informs the stateful Web Service.

(5) that updates its internal state. When clients requests the stateful WSDL document
(6) the web service returns the WSDL document with the values of all attributes
(7) at the request time.





Exposing resource attributes

Cluster as a service: The logical design:

Simplification of the use of clusters could only achieved through highes layer abstraction that proposed here to be implemented using the serivice-based cluster as a Servic (CaaS) Technology.

CaaS Overview:

→ The exposure of a cluster via a Web service is intricate and comprises several services running on top of a physical cluster.

→ A typical cluster is comprised of three elements: nodes, data storage, and middleware.

→ The middleware virtualizes the cluster into a single system image; thus resources such as the CPU can be used without knowing the organization of the cluster.

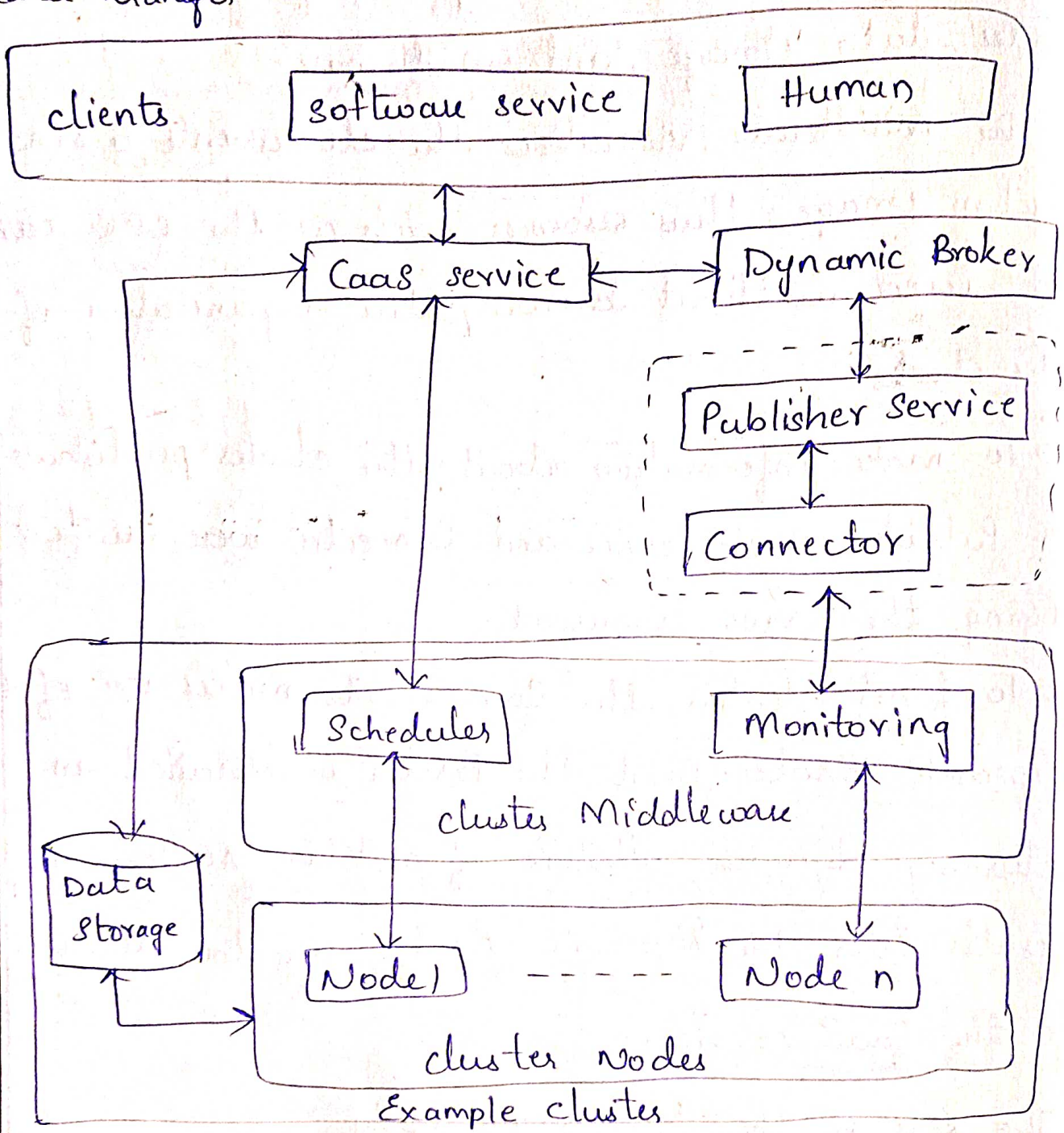
→ To make information about the cluster publishable, a Publisher Web service and Connector were created using the RVWS framework.

→ To find clusters, the CaaS service makes use of the Dynamic Broker. While the Broker is detailed in returning dynamic attributes of matching services, the results from the Dynamic Broker are too detailed for the CaaS service.

The role of the CaaS service is to

i) Provide easy and intuitive file transfer tools so clients can upload jobs and download results and

ii) Offer an easy to use interface for clients to monitor their jobs. The CaaS service does this by allowing clients to upload files as they would any Web page while carrying out the required data transfers to the cluster transparently.



Complete CaaS System

→ It allowing clients to upload files as they would any Web page while carrying out the required data transfer to the cluster transparently.

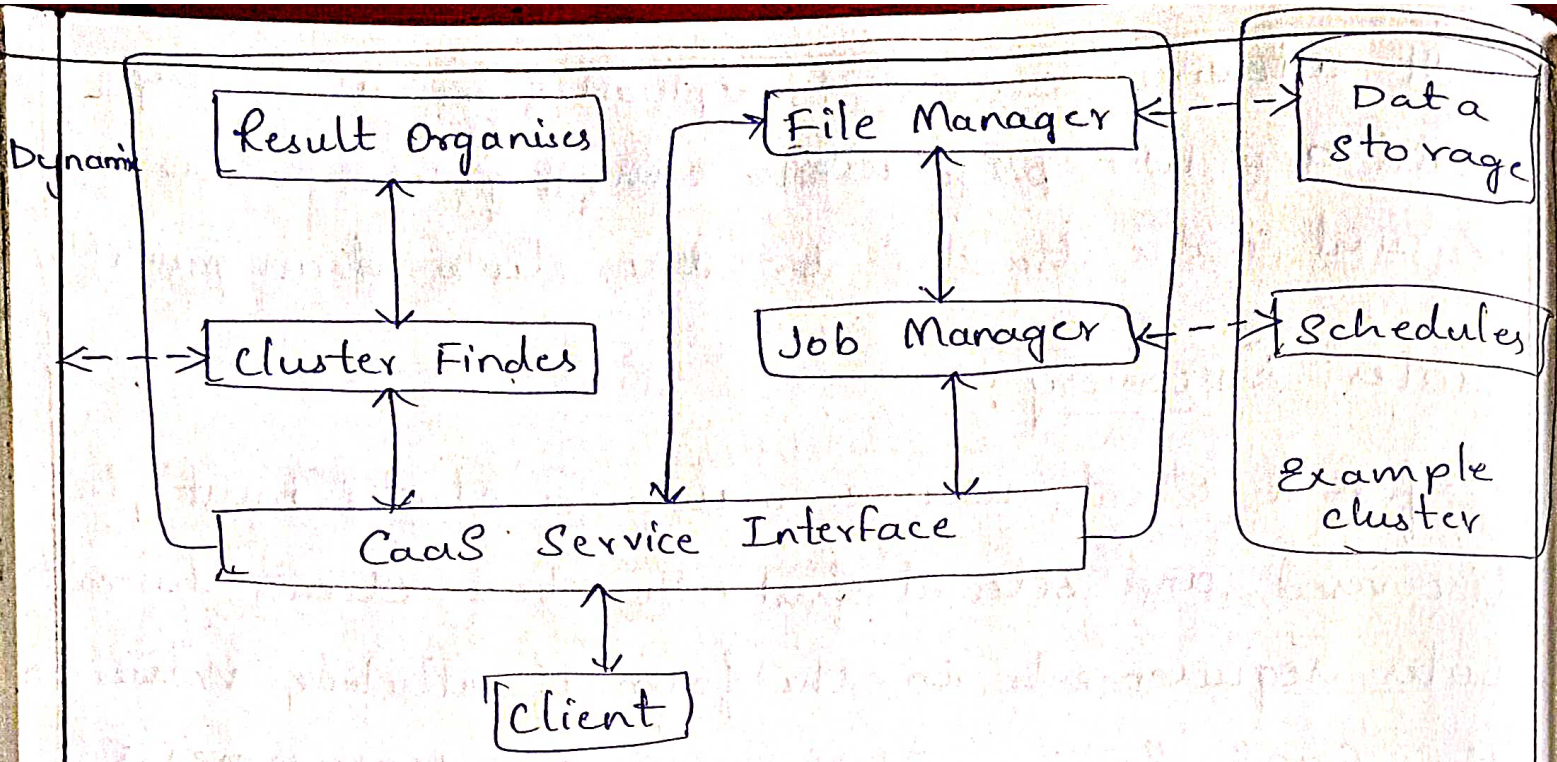
Cluster Discovery:

→ Before a client uses a cluster, a cluster must be discovered and selected first. To start, clients submit cluster requirements in the form of attribute values to the CaaS Service Interface (1). The requirements range from the number of nodes in the cluster to the installed software. The CaaS Service Interface invokes the Cluster Finder module (2) that communicates with the Dynamic Broker

(3) and returns service matches (if any).

To address the detailed results from the Broker, the cluster finder module invokes the Results Organizer module

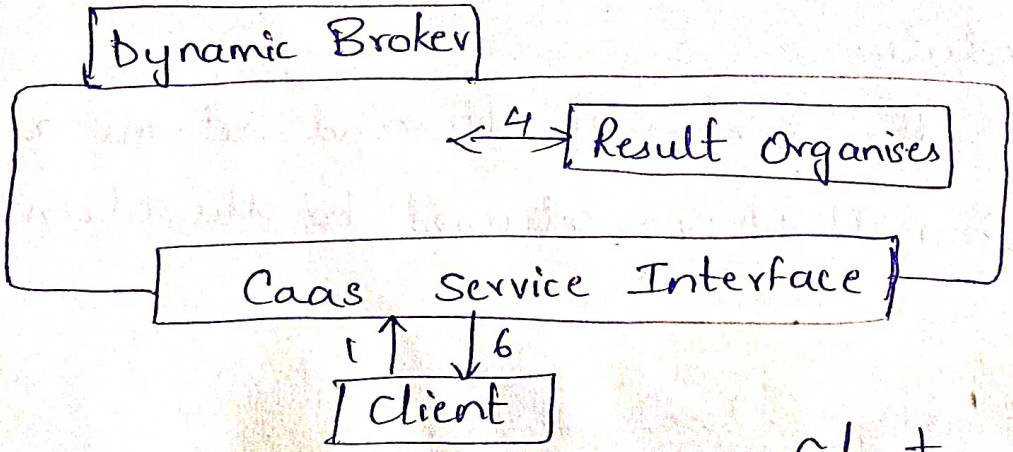
(4) that takes the broker results and returns an organised version that is returned to the client(5-6)



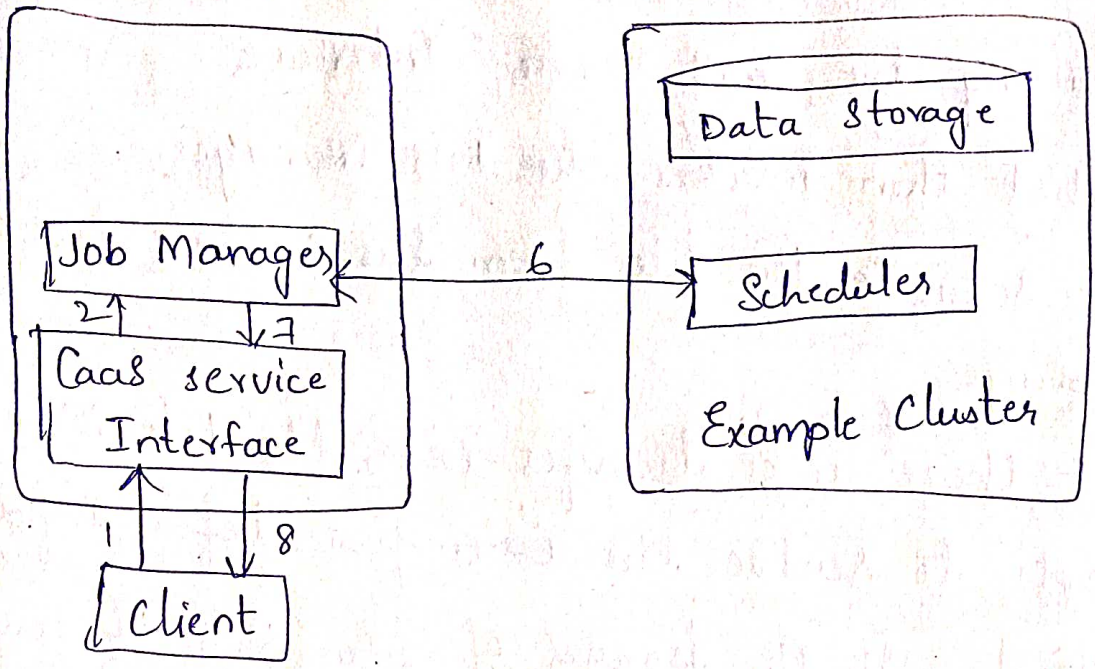
CaaS Service design

After reviewing the results, the client chooses a cluster.

Job Submission : After selecting a required cluster, all executable and data files have to be transferred to the cluster and the job submitted to the scheduler for execution.



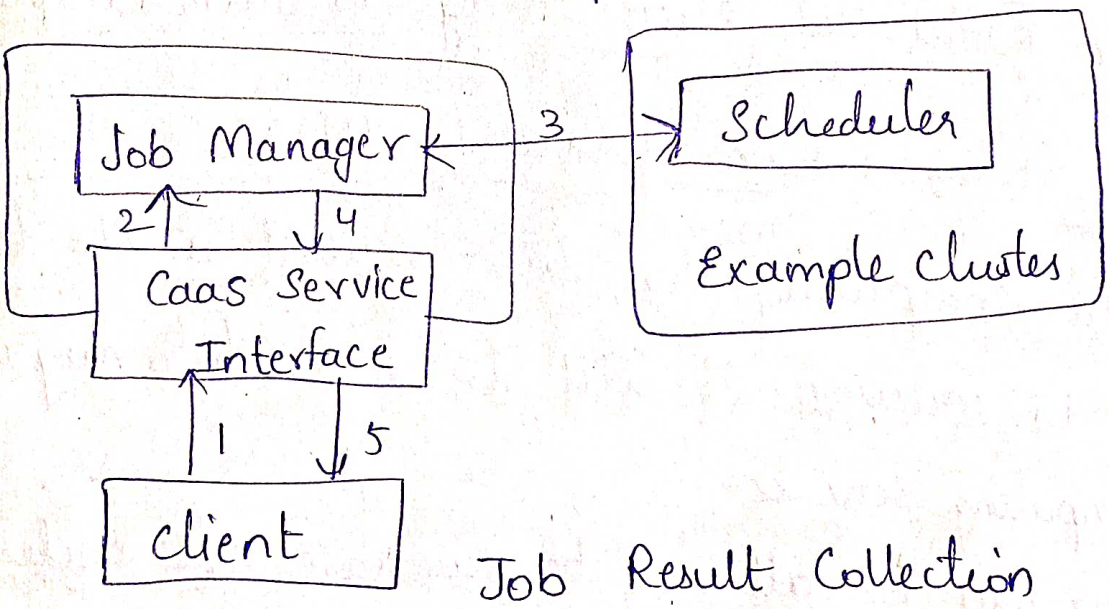
Cluster discovery



Job Submission

Job Monitoring : During execution, clients should be able to view the execution progress of their jobs.

Result Collection : The final role of the CaaS service is addressing jobs that have terminated or completed their execution succesfully.



Job Result Collection

→ client start the user or result file transfer by contacting the CaaS Service Interface

(1) that then invokes the File Manager

(2) to retrieve the files from the cluster's data storage

(3) If there is a transfer error, the File Manager attempts to resolve the issue first before informing the client. If the transfer of files (3) is successful, the files are returned to the CaaS Service Interface

(4) then the client

(5) when returning the files, URL link or a FTP address is provided so the client can retrieve the files.

Topic-4:

Secure Distributed Data Storage in Cloud Computing

Cloud Storage: From LANs to WANs

→ Cloud computing has been viewed as the future of the IT industry. It will be a revolutionary change in computing services.

→ Users will be allowed to purchase CPU cycles, memory utilities, and information storage services

conveniently just like how we pay our monthly water and electricity bills.

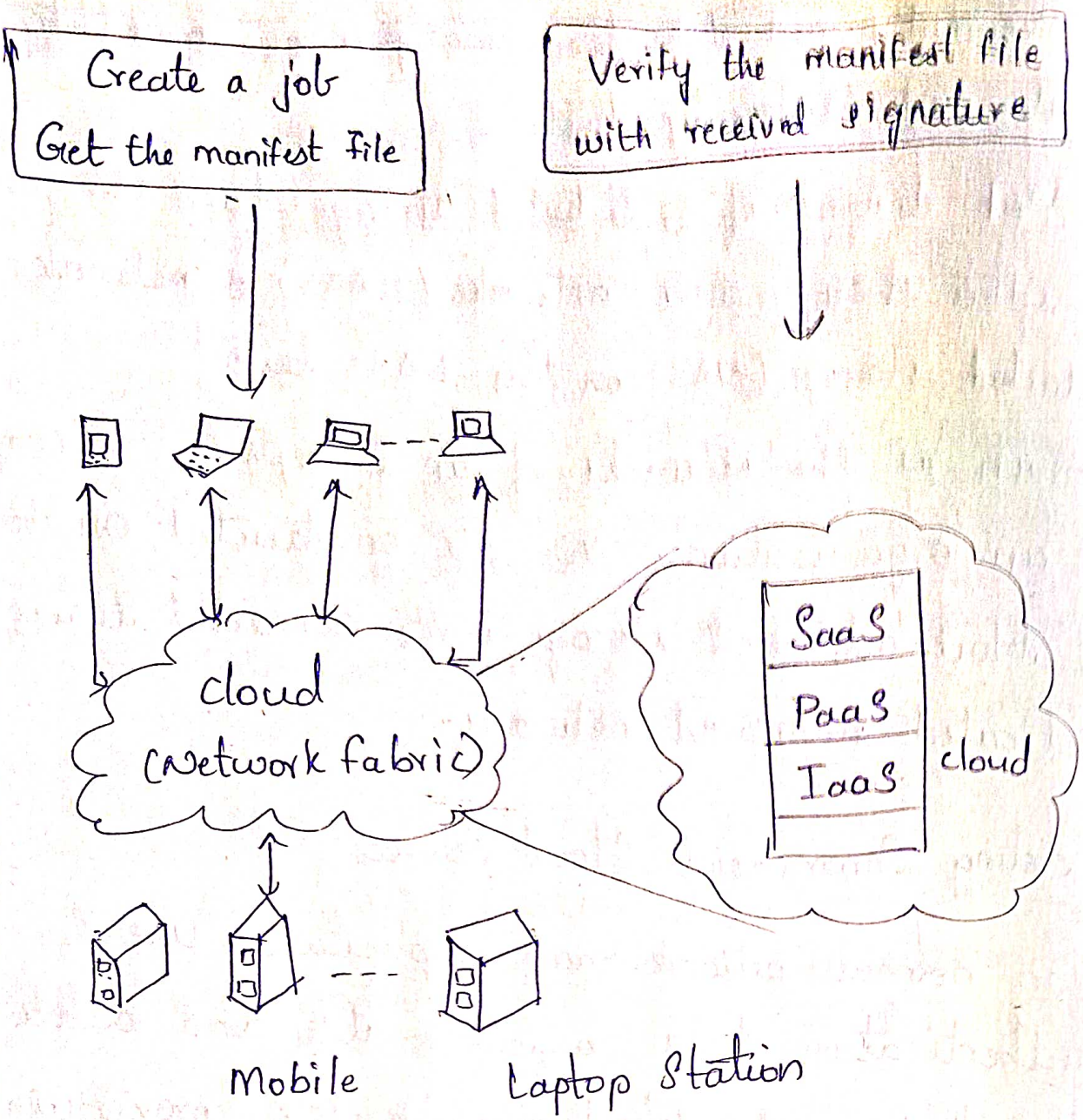
→ Most designs of distributed storage take the form of either storage area networks (SANs) & network-attached storage (NAS) on the LAN level

→ Such as the networks of an enterprise, a campus or an organisation. SANs are constructed on top of block addressed storage units connected through dedicated highspeed networks.

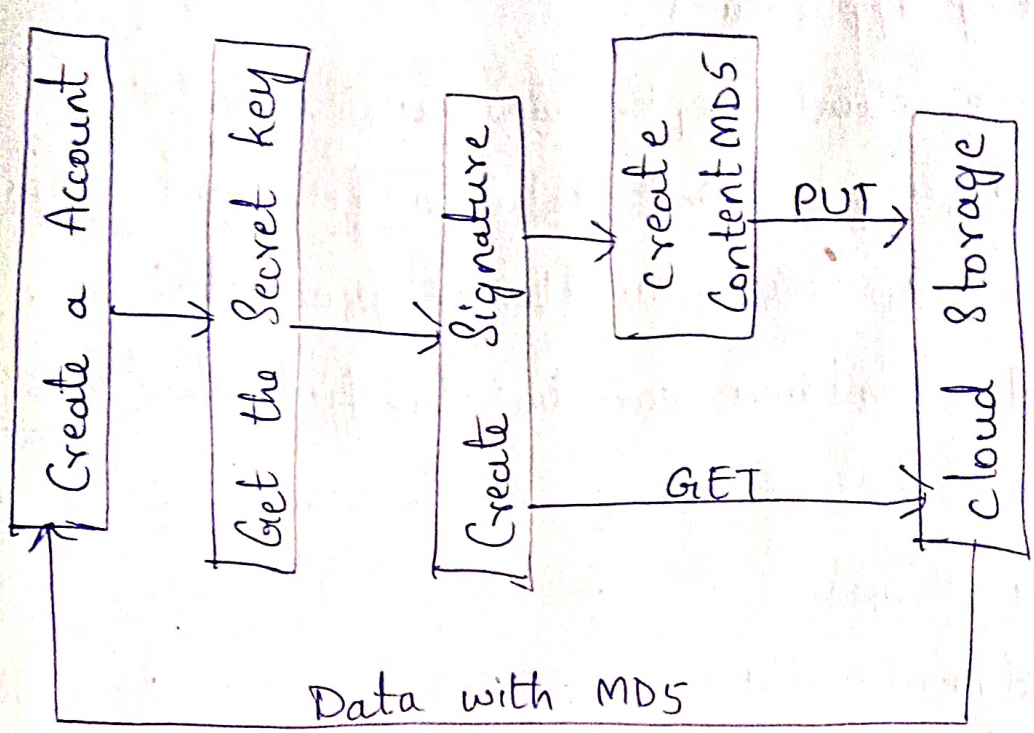
Existing Commercial Cloud Services:

→ In normal network-based applications, users authentication, data confident-ality and data integrity can be solved through IPSec proxy using encryption and digital signature. The key exchanging issues can be solved by SSL proxy.

→ Amazon Web Service: Amazon provides infras-tructure as a Service (IaaS) with different terms, such as Elastic Compute Cloud (EC2), Simple DB, Simple Storage Service (S3) and so on. They are supposed to ensure the confidentiality, integrity and availability of the customer's applications and data.



Microsoft Windows Azure: The Windows Azure platform is an Internet-scale cloud services platform hosted in Microsoft data centers, which provides an operating system and a set of developer services that can be used individually or together.



Security data access procedure

Topic-5:

Aneka

→ Aneka includes an extensible set of APIs associated with programming models like MapReduce.

→ These APIs support different cloud models like a private, public, hybrid cloud.

→ Manjrasoft focuses on creating innovative software technologies to simplify the dof development and deployment of private or public cloud applications. Our product plays the role of an application platform as a service for multiple cloud computing.

· Multiple structures;

· Aneka is a software platform for developing cloud

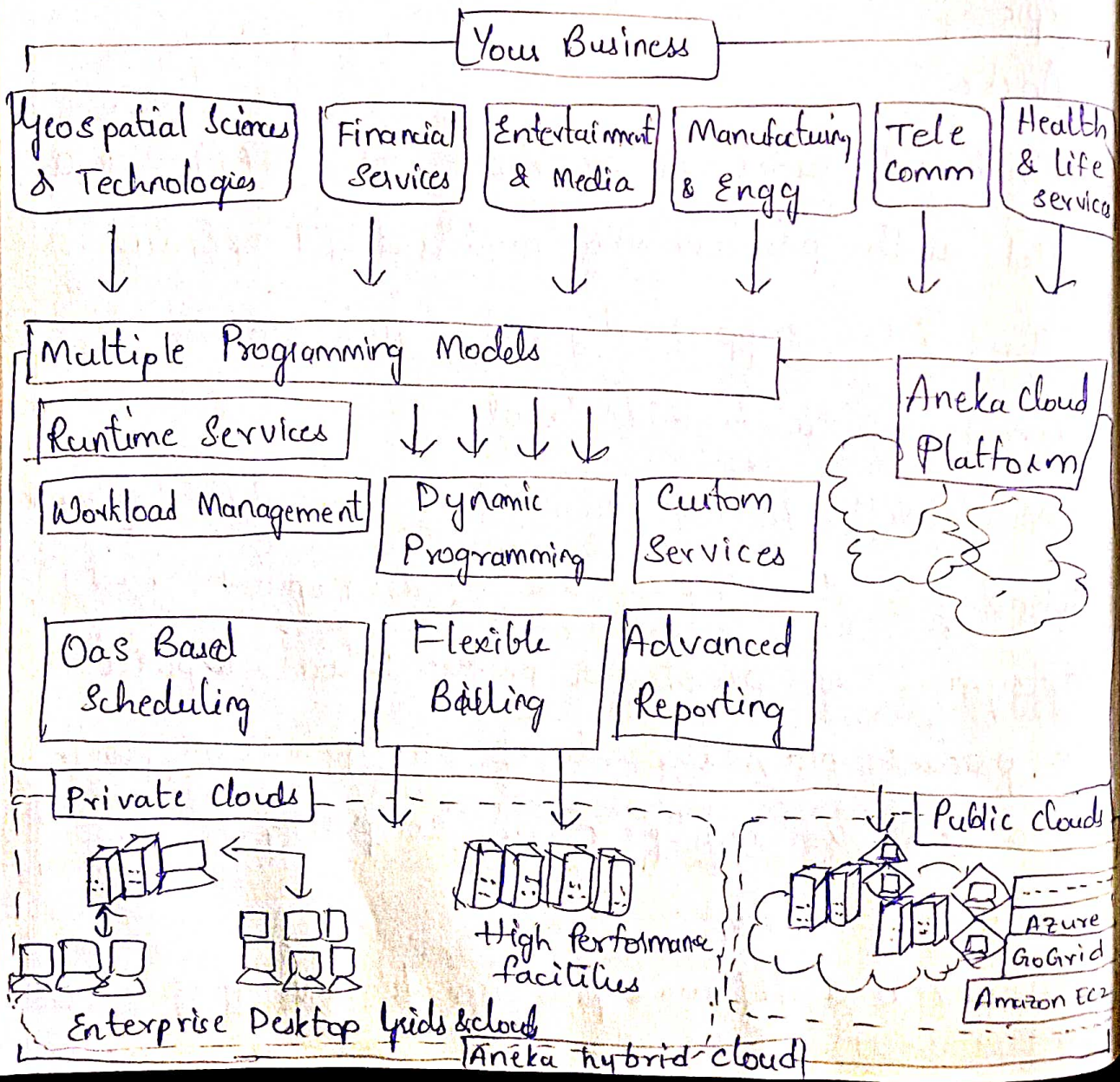
Computing applications.

- In Aneka, cloud applications are executed.
- Aneka is a pure PaaS solution for cloud computing.
- Aneka is a cloud middleware product.

Multiple containes can be classified into three major categories:

1) Textile services
2) Foundation services
3) Application services

Architecture of Aneka:



Topic-6:

Comet cloud:

→ Comet cloud is an autonomic computing engine for cloud and grid environments. It is based on the Comet decentralized coordination substrate and supports highly heterogeneous and dynamic cloud/grid infrastructures, integration of public/private clouds.

→ Support core programming paradigms for real-world data and compute intensive applications.

→ Enables autonomic cloudbursts and cloud-bridging and on-demand scale-out and scale-in, driven by dynamic policies, economic models, QoS Constraints etc.

Topic-7:

T-Systems:

→ T-Systems is strategically repositioning itself with cloud services. With "Cloud First", the company will focus on cloud computing in the future - from private cloud to public cloud to hybrid cloud.

→ To this end, T-Systems has deepened its partnerships with Amazon Web Services AWS and Microsoft.

→ Telekom subsidiary is increasingly training cloud experts and expanding its Open Telekom cloud.

Topic-8 :

Workflow Engine for clouds:

→ A workflow models a process as consisting of a series of steps that simplifies the complexity of execution and management of applications.

→ Scientific workflows in domains such as high-energy physics and life sciences utilize distributed resources in order to access, manage and process a large amount of data from a higher level.

→ Processing and managing such large amounts of data require the use of a distributed collection of computation and storage facilities.

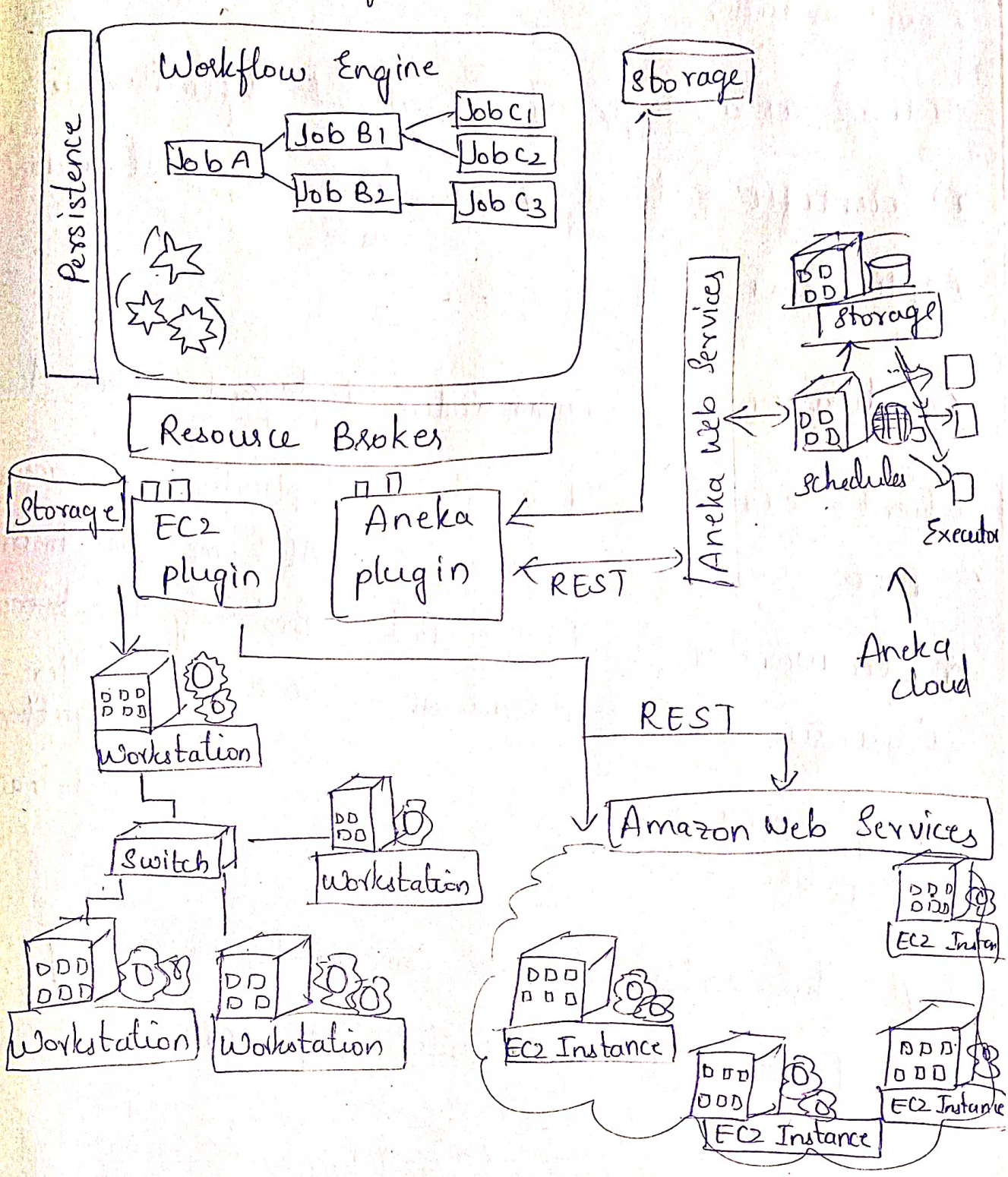
→ These resources are often limited in supply and are shared among many competing users.

Workflow Management Systems and Clouds:

Elasticity: This enables workflow management systems to readily meet quality-of-service (QoS) requirements of applications.

SLA: This allows workflow management systems to provide better end-to-end guarantees when meeting the service requirements of users by mapping them to service providers.

Vistualization: Direct access to the physical machine, is the reduced need for securing the physical resource from malicious code.



Topic-9:

Understanding Scientific applications for cloud Environments:

1) Cloud as a Type of Distributed Infrastructure

2) Scientific cloud Applications as Distributed Applications

Coordination	Communication	Deployment	Data Ac
Client-server	Pub-sub	Replication	Co-ocu
P2P	Stream	At-home	One-to-o
Master-worker	Point-to-Point	Brokering	One-to-m
Consensus	Broadcast	Co-allocation	Scatter-gathe
Data processing pipelin			All-to

A classification of some commonly occuring Patterns in Distributed Computing

3) Software as a Service (SaaS) Layer

4) Platform as a Service (PaaS) Layer

5) Infrastructure as a Service (IaaS) layer

6) Discussion of cloud models