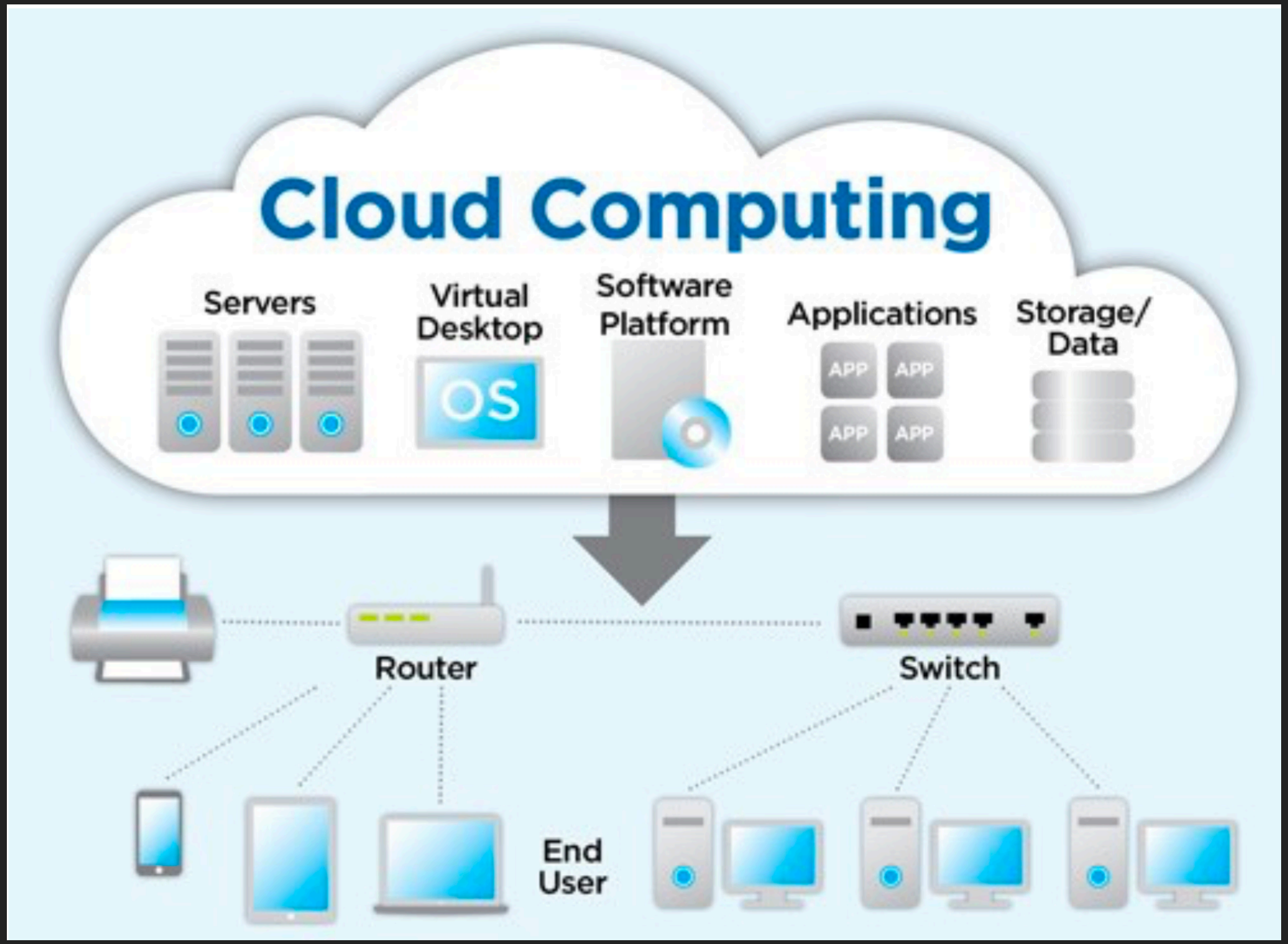
BY SASHWAT

TECHNIQUES TO SECURE DATA ON CLOUD: DOCKER SWARM OR KUBERNETES?

WHAT IS CLOUD COMPUTING?

- A Cloud Computing model is a model which enables convenient, on demand network access to a shared pool of configurable computing resources and services.
- The resources includes:-
  - Network
  - Storage
  - CPU cores
  - RAM

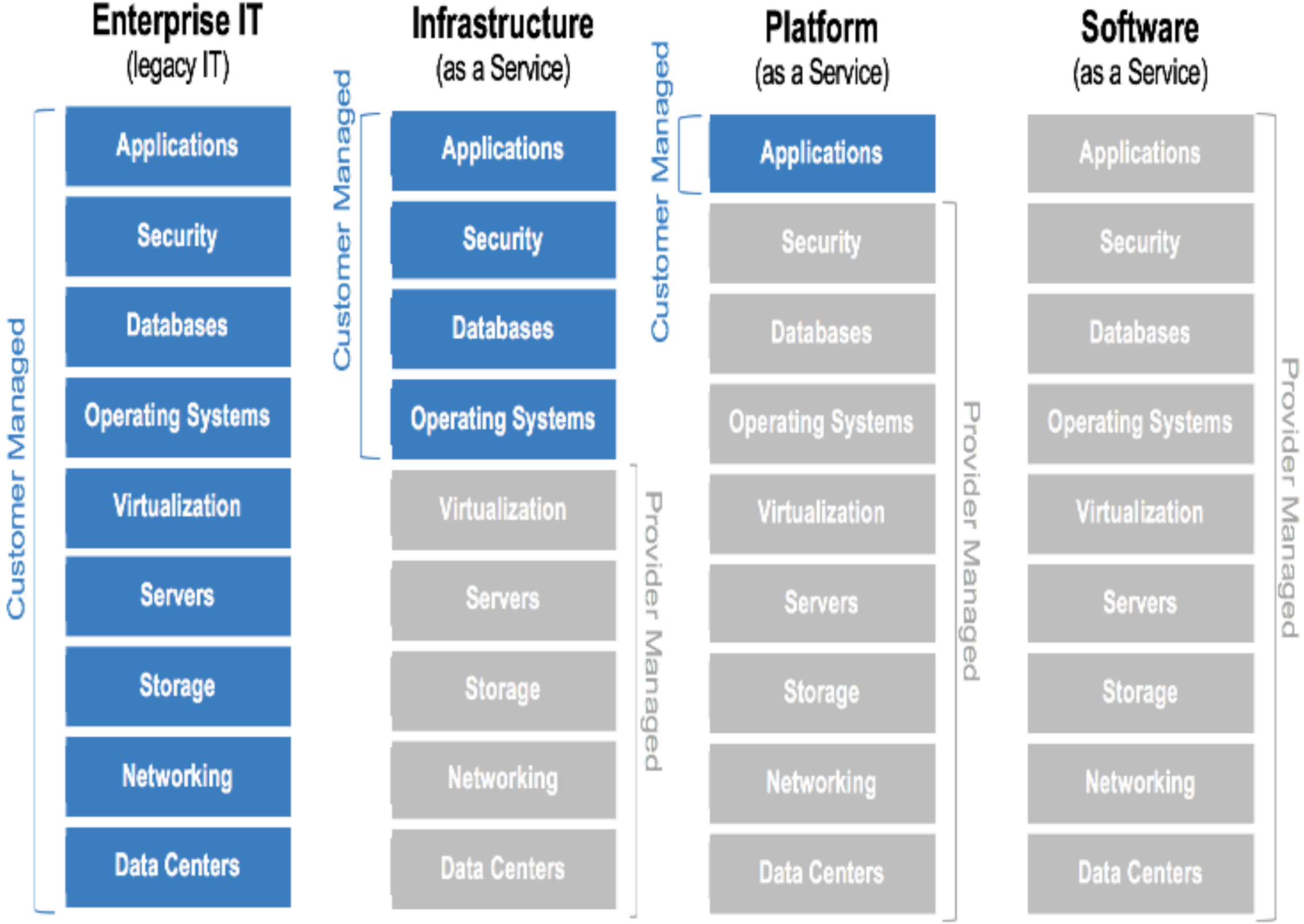

Cloud Computing
Servers
Virtual Desktop
OS
Software Platform
Applications
APP
APP
APP
APP
Storage/ Data
Router
Switch
End User

CLOUD COMPUTING CHARACTERISTICS

- On-Demand self service.
- Broad network access.
- Resource pooling.
- Rapid elasticity.
- Measured service.

CLOUD COMPUTING SERVICE MODEL

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


Enterprise IT
(legacy IT)
Infrastructure
(as a Service)
Platform
(as a Service)
Software
(as a Service)
Customer Managed
Provider Managed
Applications
Security
Databases
Operating Systems
Virtualization
Servers
Storage
Networking
Data Centers

CLOUD COMPUTING DEPLOYMENT MODEL

- Public cloud
- Private cloud
- Community cloud
- Hybrid cloud

Public Cloud

- Elasticity
- Utility Pricing
- Leverage Expertise

Private Cloud

- Total Control
- Regulation
- Flexibility

Community Cloud

- Meets shared concerns

CLOUD COMPUTING – ADVANTAGES

- Minimised cost
- Higher resource sharing
- Consumption based cost
- Efficient power saving
- Faster time to deploy new services
- Management moves to the cloud provider

CLOUD COMPUTING – DISADVANTAGES

- Reliability
- Availability
- Security
- Privacy
- Latency
- Regulatory laws

SECURITY

- Three principles of cloud security:-
  - Availability
  - Confidentiality
  - Integrity
- Best security method - Cryptography, RSA algorithm and Container clustering
- Kubernetes and Docker swarm are technologies that use container clustering

WHAT IS CONTAINER?

- A container image is a lightweight, stand-alone, executable package of a piece of software that includes everything needed to run it: code, runtime, system tools, system libraries, settings.
- It is platform independent.

WHAT IS DOCKER?

- Docker is a set of platform-as-a-service products that use OS-level virtualisation to deliver software in packages called containers.
- Core DevOps tool.
- Docker is the next step from virtualisation. Before virtualisation, all the features where deployed in one server.

ADVANTAGES OF DOCKER?

- Continuous deployment and testing.
- Multi-Cloud platform (Available in AWS, DigitalOcean etc).
- Environment standardisation and version control.
- Isolation (Kernel Level).
- Security.

RELATIONSHIP BETWEEN CLOUD COMPUTING AND DOCKER?

- Docker with PaaS.
  - Fundamental unit / Feature by cloud providers.
    - Eg: AWS, DigitalOcean etc.
- Docker with IaaS.
  - Docker deployed on Virtual Machine.
  - Eg: Docker on a VM.

WHY USE DOCKER SWARM OR KUBERNETES OVER DOCKER?

- Coordination
- Scheduling
- Orchestration
- Best use for large scale environment.

DOCKER SWARM VS KUBERNETES

- Networking:-
  - Docker swarm: Node model. Creates a overlay network for the containers and a host only bridge for communication.
  - Kubernetes: Flat network. Allows interaction with each other.

CONTINUE..

- High Availability:-
  - Docker swarm: Load balancing detects unhealthy pods and removes it.
  - Kubernetes: Controls entire cluster and handles worker node’s resources.

CONTINUE..

- Container setup:-
  - Docker swarm: Native tools support for docker
  - Kubernetes: YAML, APIs and client definitions. Cannot use Docker compose.

CONTAINER CLUSTERING AND GLUSTERFS

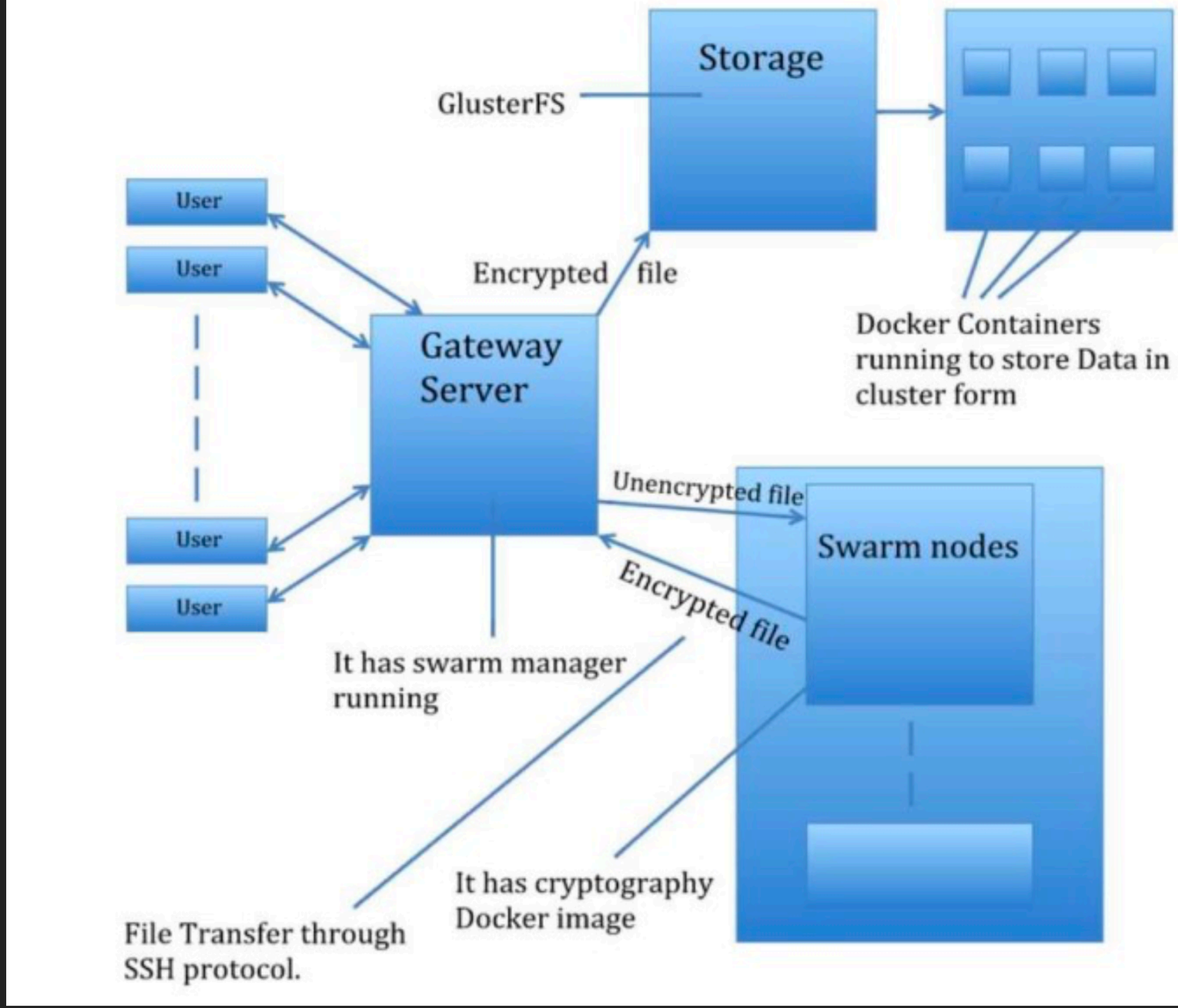
- Network file system developed by RedHat.
- Used for storing data in clusters.
- Process: Stripping or replicating or both.

ENCRYPTION OVER CLOUD MODEL AND ITS PROCESS USING CONTAINER

- Swarm manager
  - Send plain text (Unencrypted) to a container running Docker Cryptography Container.
- Gateway Server
  - Uses SSH for communication.
- Gateway Manager
  - Data stored to make highly available.

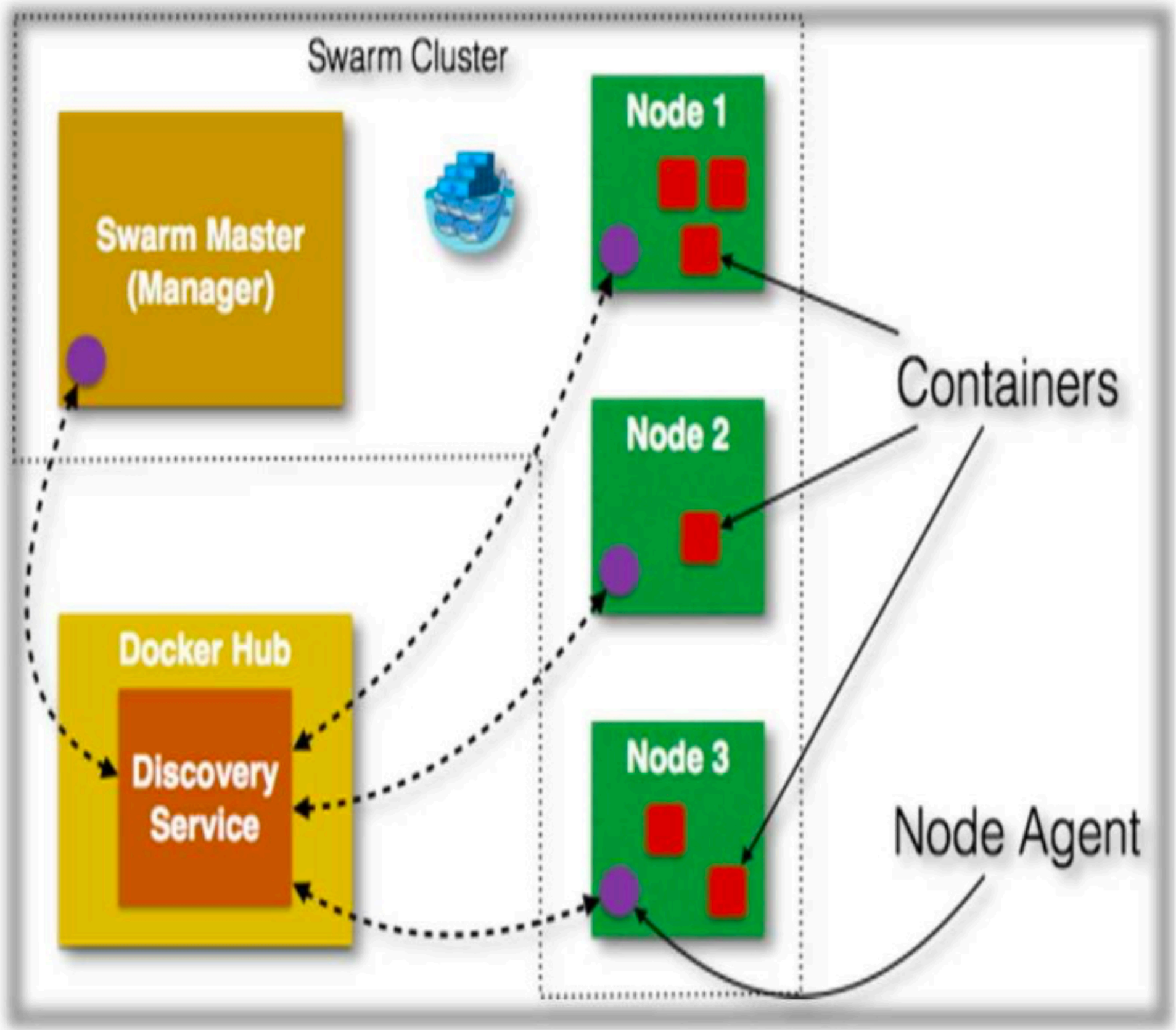
CONTINUE..

- GlusterFS:-
  - Stores data to multiple docker containers.


Storage
GlusterFS
User
User
Encrypted file
Gateway Server
Docker Containers running to store Data in cluster form
Unencrypted file
Swarm nodes
User
User
Encrypted file
It has swarm manager running
It has cryptography Docker image
File Transfer through SSH protocol.

DOCKER

SWARM MODEL


Swarm Cluster
Swarm Master
(Manager)
Node 1
Node 2
Node 3
Containers
Docker Hub
Discovery
Service
Node Agent

USING KUBERNETES INSTEAD OF DOCKER SWARM

- More efficiency.
- Better power, performance and flexibility in container management.
- Better optimisation for the existing model.

CONCLUSION

- Cloud computing is very popular and cyber threats have also increased.
- So securing the cloud is a necessity.
- The technology of containers is used to secure data that is being uploaded to the cloud.
- For each user a container can be used to manage encryption / decryption of user data.
- Kubernetes is better for this model due to its shear strength.

THANK YOU