



SNS COLLEGE OF TECHNOLOGY



(An Autonomous Institution)

Re-accredited by NAAC with A+ grade, Accredited by NBA(CSE, IT, ECE, EEE & Mechanical)
Approved by AICTE, New Delhi, Recognized by UGC, Affiliated to Anna University, Chennai

DEPARTMENT OF COMPUTER APPLICATIONS

COURSE

23CAE717
Cloud Computing

UNIT II

Virtualization

TOPIC

Virtualization Cloud

Semester

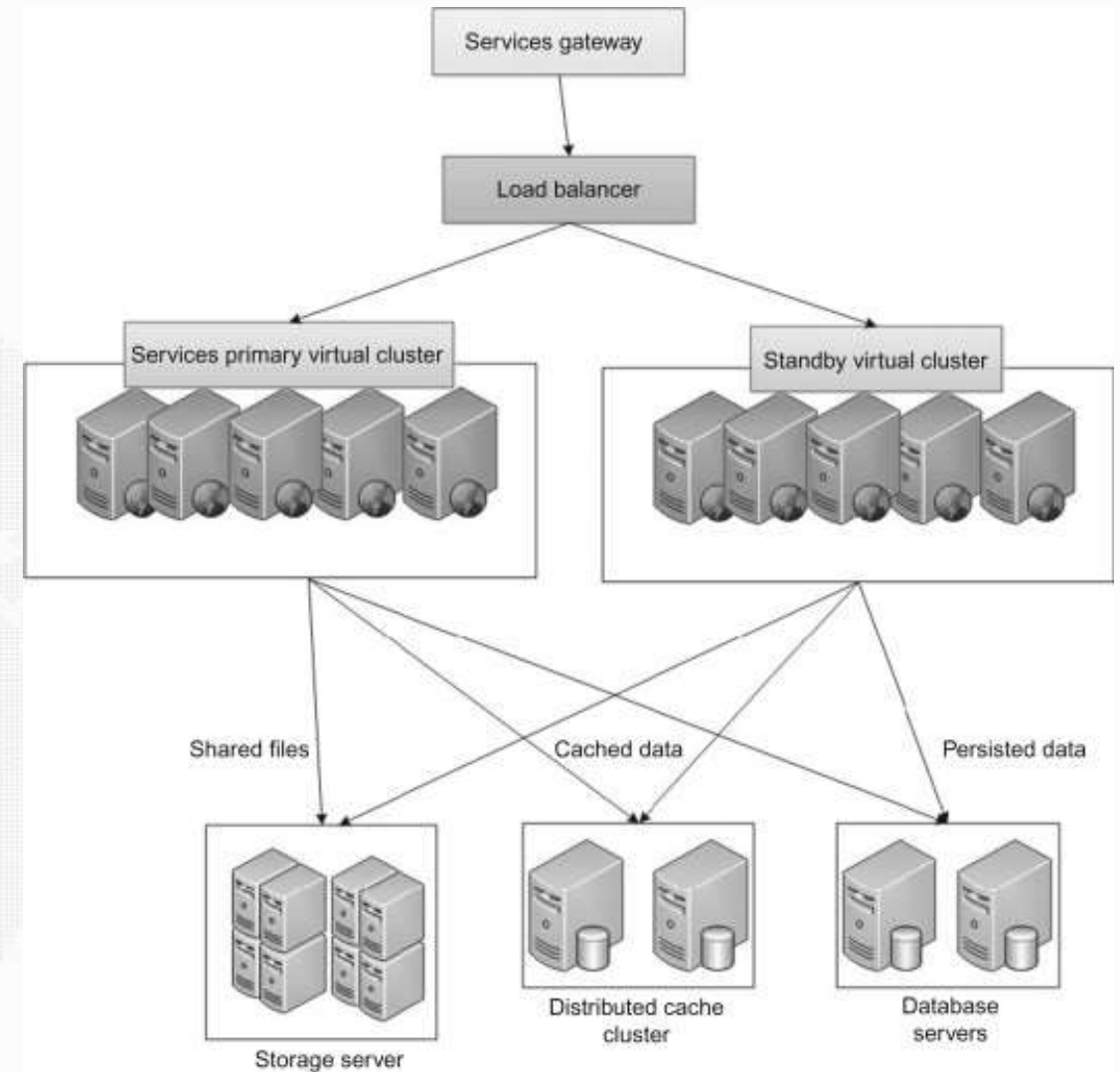
II Semester /
I MCA



Virtual Cluster

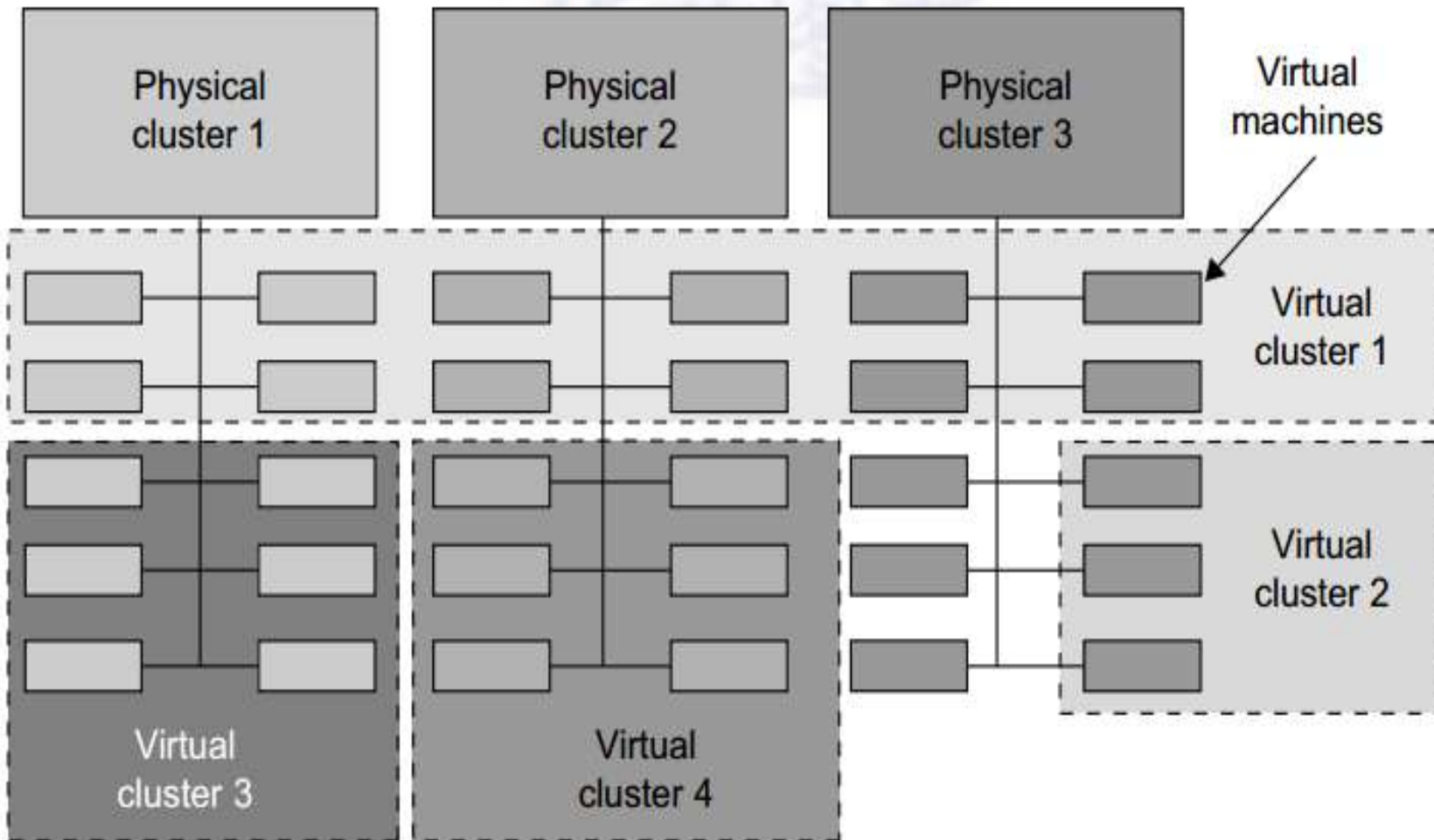


- ❑ Physical cluster is a collection of servers interconnected by a physical network
- ❑ Virtual clusters have VMs that are interconnected logically by a virtual network across several physical networks
- ❑ Three critical design issues :
 - ❖ Live migration of VMs
 - ❖ Memory and file migrations
 - ❖ Dynamic deployment of virtual clusters



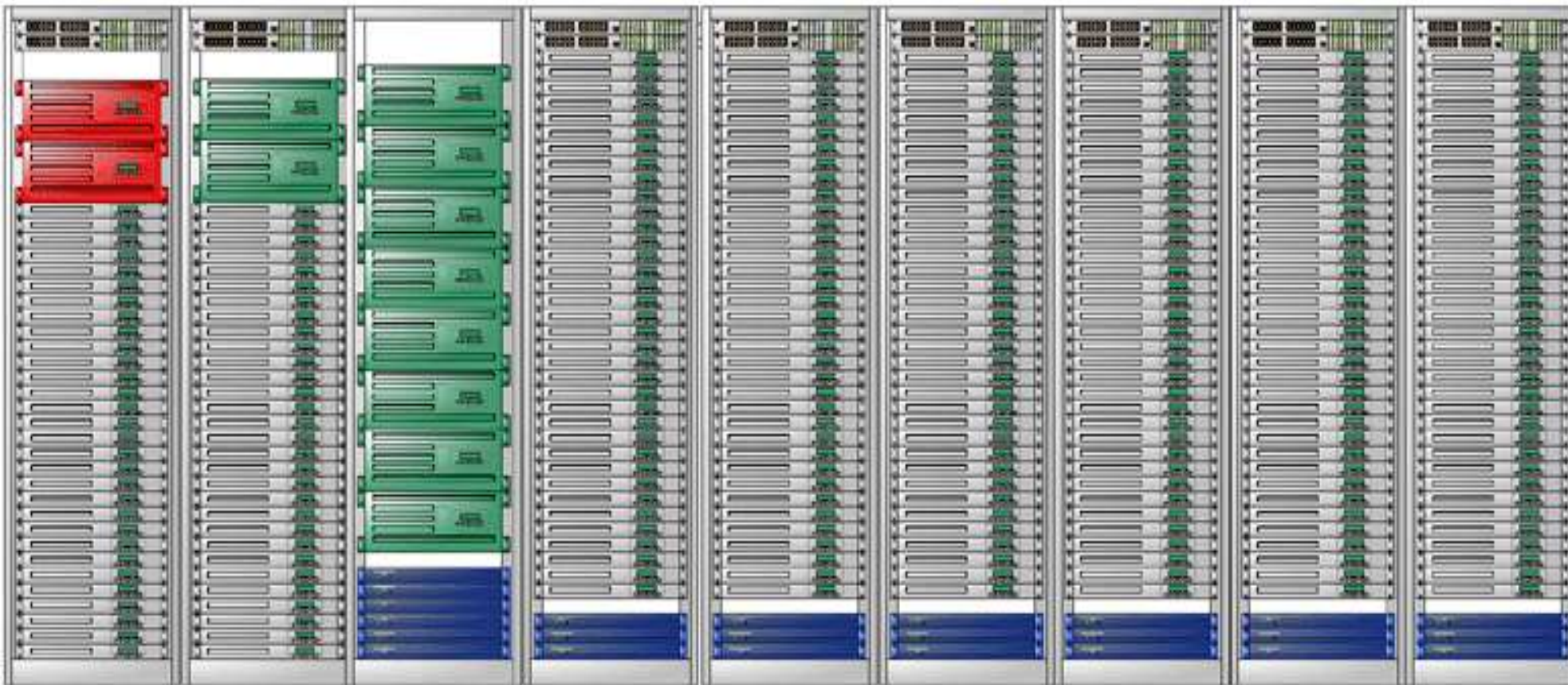


Virtual Cluster





Scalable Unit Cluster (Linux Cluster)



compute node



login / remote partition server node



infiniband switch



gateway node



management hardware

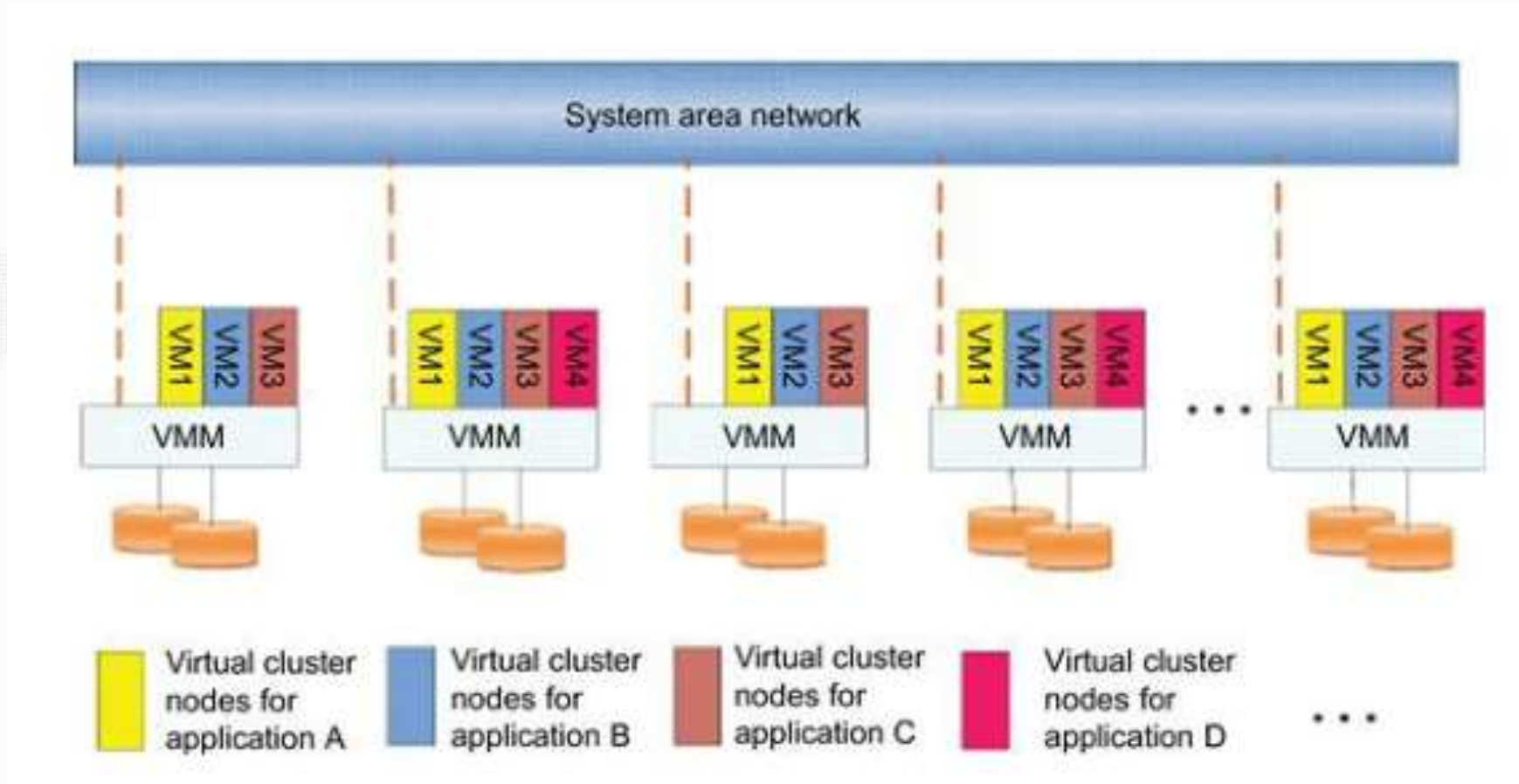


□ Properties of VM in Virtual Clusters

- Nodes can be either physical or virtual machines
- VMs is to consolidate multiple functionalities on the same server
- VMs can be replicated in multiple servers
- size (number of nodes) of a virtual cluster can grow or shrink dynamically
- failure of any physical nodes may disable some VMs installed on the failing nodes



Virtual cluster based on Application partitioning





Virtual Cluster: benefit

- ❑ Deployment: construct and distribute software stacks like OS, libraries, **applications to a physical node inside clusters quickly**
- ❑ **Switch runtime environments** from one user's virtual cluster to another user's virtual cluster quickly
- ❑ To deploy a group VM in cluster, we follow
 - Preparing the disk image
 - Configuring the VMs
 - Choosing the destination nodes
 - Executing the VM deployment command on every host
- ❑ Use templates to simplify
 - A template is a disk image that includes a preinstalled OS with/ without certain applications.



Virtual Cluster

- ❑ Four ways to manage a virtual cluster:
 - Guest-based manager
 - Host-based manager
 - Independent cluster manager on both the host and guest systems
 - Integrated cluster on the guest and host systems

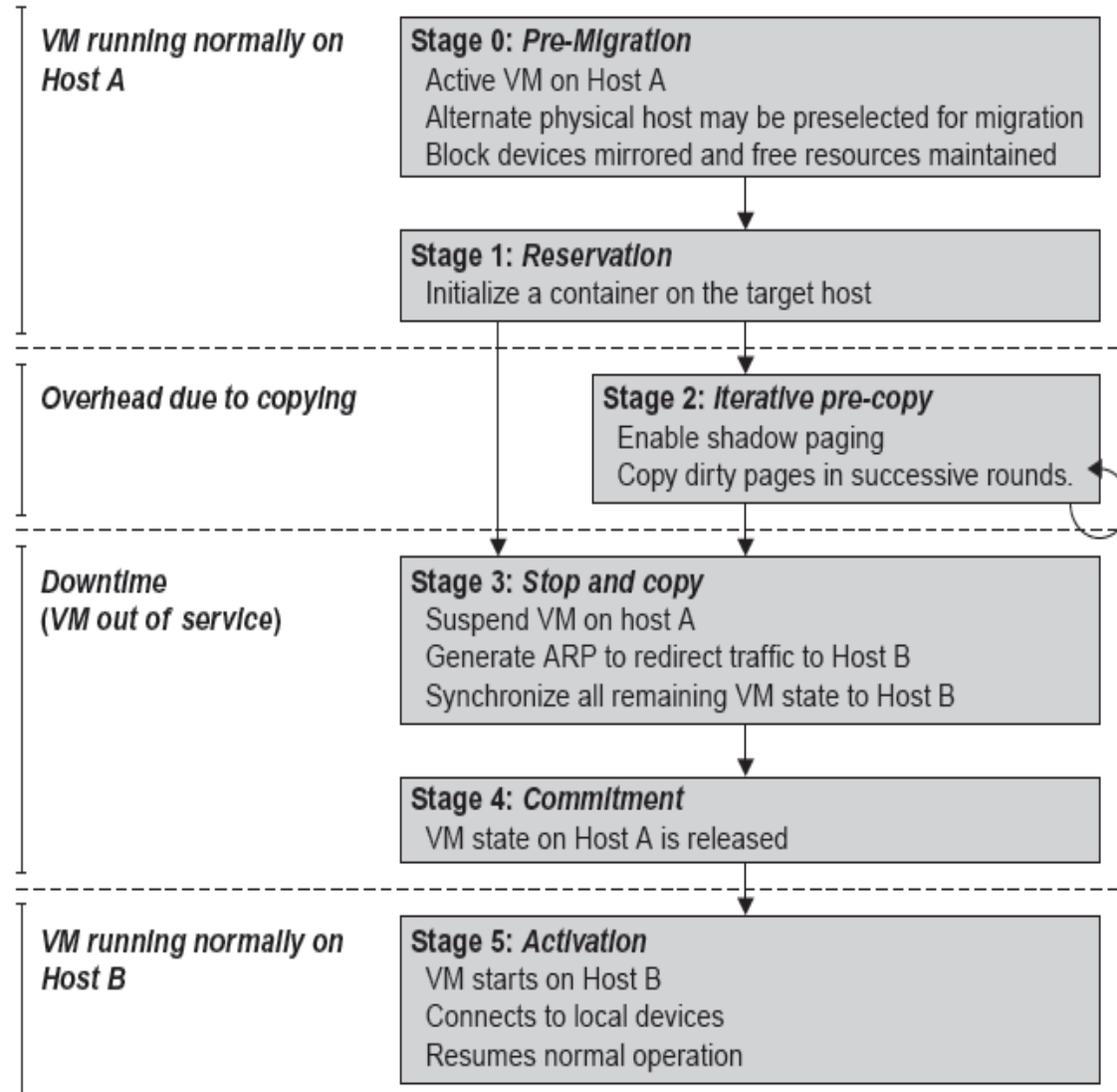


- ❑ When a VM fails, its role could be replaced by another VM on a different node
- ❑ VM can be in one of the following state:
 - Inactive state (VM is not enabled)
 - Active state (VM has been instantiated to perform task)
 - Paused state (VM has been instantiated, but disabled to process)
 - Suspended state (resources are stored back to the disk)





Live VM Migration

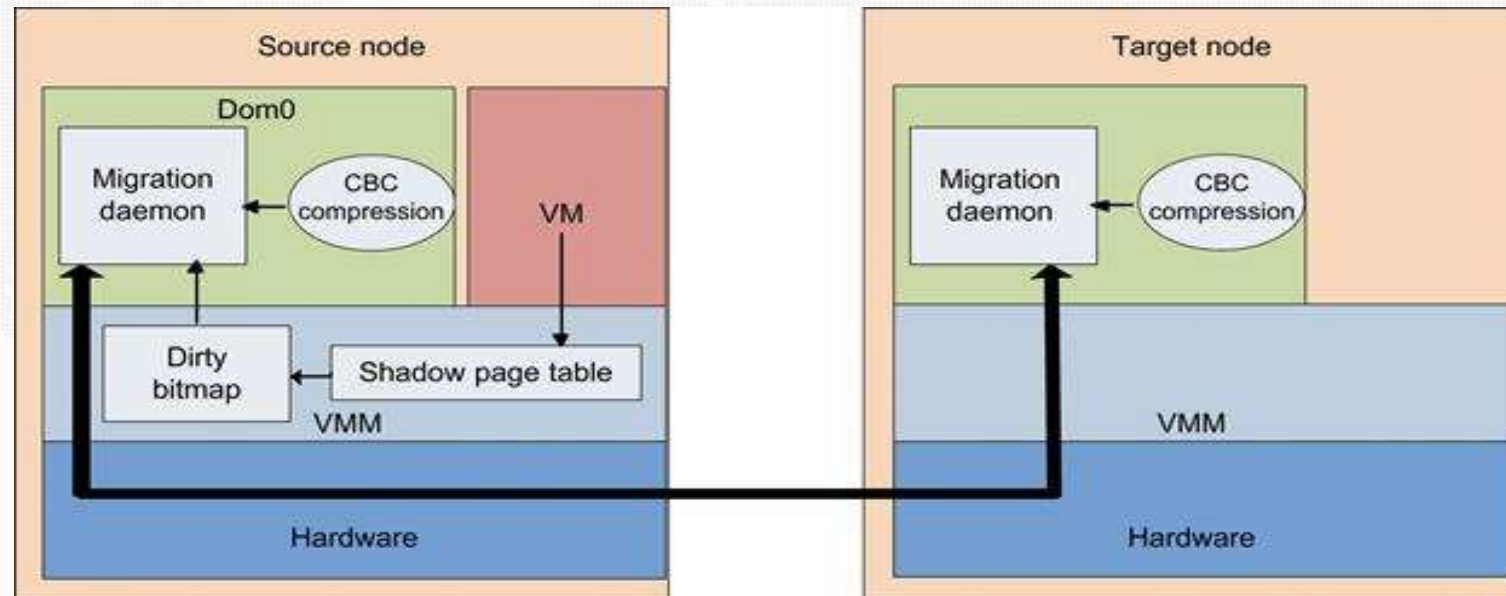




Live VM Migration



Live Migration of VMs between Two Xen-Enabled Hosts using Remote Direct Memory Access (RDMA)





Migration of Memory, Files, and Network Resources

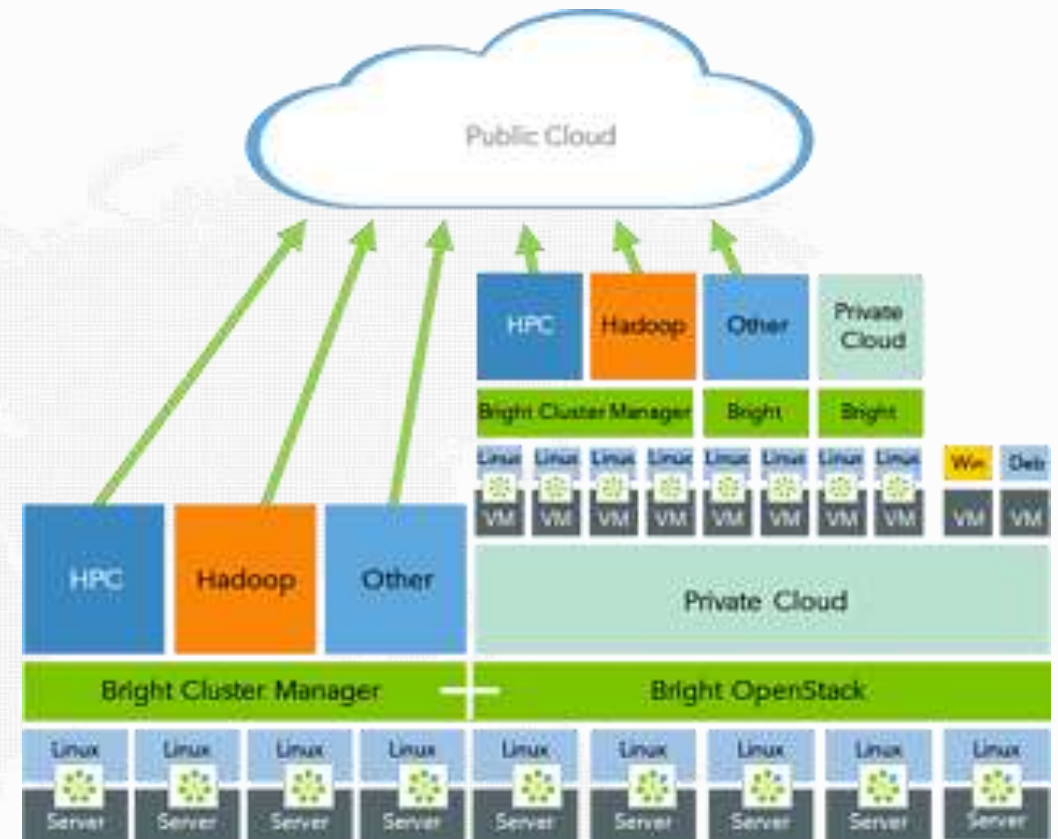


- Internet Suspend-Resume (ISR) technique exploits temporal locality as memory states are likely to have considerable overlap in the suspended and the resumed instances of a VM
- Each file is represented as a tree of small subfiles, copy of this tree exists in both the suspended and resumed VM
- File migration: provide each VM with its own virtual disk which the file system is mapped to and transport the contents of this virtual disk along with the other states of the VM
- Network Resources: VM has a virtual IP address and its own distinct virtual MAC address
- VMM maintains a mapping of the virtual IP and MAC addresses to their corresponding VMs



Cluster on Demand (CoD)

- ❑ The COD partitions a physical cluster into multiple virtual clusters (vClusters)
- ❑ vCluster owners specify the operating systems and software for their clusters through an XML-RPC interface.
- ❑ The vClusters run a batch schedule from Sun's GridEngine on a web server cluster





VIOLIN Project: Real case example



- ❑ Its purpose is to achieve better resource utilization in executing multiple cluster jobs on multiple cluster domains.





References



- ❑ Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012
- ❑ James E. Smith, Ravi Nair, “Virtual Machines: Versatile Platforms for Systems and Processes”, Elsevier/Morgan Kaufmann, 2005.
- ❑ Kumar Saurabh, “Cloud Computing – insights into New-Era Infrastructure”, Wiley India,2011.
- ❑ Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing, A Practical Approach”, TMH, 2009.
- ❑ John W.Rittinghouse and James F.Ransome, “Cloud Computing: Implementation, Management, and Security”, CRC Press, 201



Thanks !