AIM: To design and implement cluster virtualization

**Tools used: libvirt** is an open source API, daemon and management tool for managing platform virtualization. It is used to manage QEMU, a generic and open source machine emulator.

**Implementation**

**Netwoking:** In our network file, default.xml, we have defined mac and IP address mapping. Names of Virtual Machines are dynamically assigned based on how many Vms have already been defined. For example, if say 10 VM are already created, and user wants to create a new cluster of 2 nodes, then two new VM with domain name vm110 and vm120 would be created. So here, each VM is statically assigned an IP. For running applications, every VM has open-ssh client and server installed in them, which is passwordless. Port forwarding is used, which is done using accepting vm bridges in ip tables.

**Scheduling**

1. **Round Robin Scheduling:** Variable quantum is defined. So given 'p' physical nodes, and 'n' nodes are demanded by user, then n=p\*(quantum)\*i+l\*(quantum)+x, where 0<x<quantum. We find number of virtual machines allotted to each physical machine using this formula and create VM's on each machine accordingly.
2. **Customized Scheduling:** We find 'k' least loaded CPUs and allocate n/k VM's to each, alongwith n%k Vm's to least loaded CPU.

**Checkpointing** is done based on user discretion.

**Migration** is done whenever a physical CPU usage exceeds a threshold, or a physical CPU usage is below a threshold for a particular interval of time. In former, we find virtual CPU usage of each Virtual Machine and shift the most heavily loaded to the physical CPU with least CPU usage. This is done automatically. In latter, we find physical CPU with highest CPU usage, proceed te similar way.

Configuration of given physical infrastructure is done in file- “physicalInfrastructure”

**To run:**

2 executable files are given- roundRobinScheduling and CustomizeScheduling

Choose 1 of them and give a cluster configuration file. This file, clusterX.txt here, contains user-defined parameters separated by new line character. For now, we take two parameters only- Number of Nodes, RAM size.

To run, for example- ./roundRobinScheduling < clusterX.txt, will create VM's in round robin fashion.