

## Experiment No : 3

Aim : To study and implement Bare-metal Virtualization with Xen.

Theory :

- Functions performed by Bare-metal hypervisors  
⇒ Bare-metal hypervisor, also known as Type-2 hypervisors, operate directly on the hardware without the need for an underlying operating system.

- Their main functions include:

### 1) Resource Management

- ⇒ Bare-metal hypervisors allocate hardware resources such as CPU, memory, and storage to multiple virtual machines running on the same physical host.

### 2) Isolation

- ⇒ They ensure strong isolation between VMs, preventing interference and providing security by separating the execution environments.

### 3) Performance Optimization

- ⇒ Bare-metal hypervisors optimize performance by directly interacting with hardware, reducing the overhead associated with a host operating system.

#### 4) Hardware Virtualization

→ They enable multiple operating systems to run on a single physical machine by creating virtual instances of the hardware components.

#### • Compare Hosted and Bare-metal hypervisors:

| Hosted Hypervisors  | Bare-Metal Hypervisors   |
|---|--|
| 1) Operates on the conventional operating system.         | 1) Runs directly on the system where VMs function.             |
| 2) OS virtualization.                                     | 2) Hardware virtualization.                                    |
| 3) Functions as the application on the host.              | 3) Guest OS and applications runs on the hypervisor.           |
| 4) It is less scalable than the bare-metal hypervisor.    | 4) It is more scalable than the hosted hypervisor.             |
| 5) Easier than a type 1 setup because of the existing OS. | 5) Simpler, if your hardware supports the application.         |
| 6) Speed is slower than bare-metal.                       | 6) Speed is faster than hosted hypervisors.                    |
| 7) For e.g., VMware ESXi, Microsoft Hyper V               | 7) For e.g., VMware ESXi, Microsoft Hyper V, Citrix XenServer. |
| Player Microsoft Virtual PC                               |  |
| Sun's VirtualBox  |  |

- Horizontal and Vertical Scaling:

- In horizontal scaling, increasing the number of instances of an application or services across multiple machines or nodes.
- For e.g., Adding more servers to a web application to handle increased user traffic.
- Vertical scaling can be defined as increasing the capacity of a single machine by adding more resources. (CPU, RAM)
- For e.g., Upgrading a server's RAM or CPU to handle a growing database.

- Auto Scaling

- Automatically adjusting the number of compute resources based on the demand, ensuring optimal performance and cost efficiency.
- For e.g., scaling up instances during peak hours and scaling down during low traffic.

- Load Balancing

- Distributing incoming network traffic across multiple servers to ensure no single server is overwhelmed, optimizing resource utilization and improve reliability.
- For e.g., Distributing web traffic among multiple servers to prevent overloading any single server.

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