Cloud Computing & Virtualization

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Overview

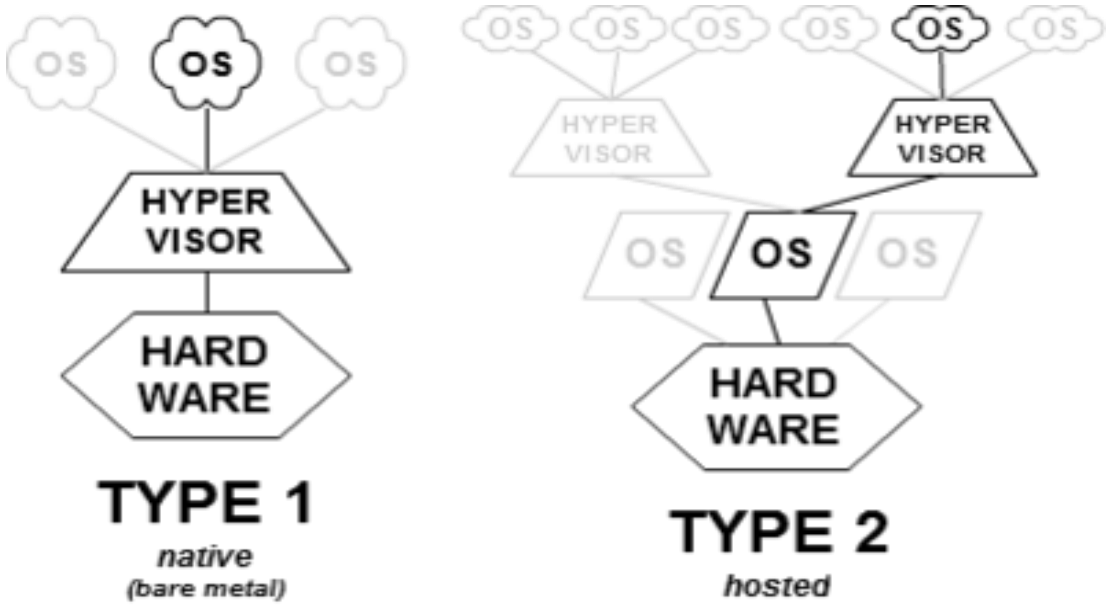
- **Introduction about Virtualization.**
- **What is the Hypervisor software.**
- **Software layer of Hypervisor.**
- **Advantages of a Hypervisor.**
- **Virtual Machine Hypervisor Examples.**
- **Virtual Appliances.**
- **Autonomic Computing**

Introduction

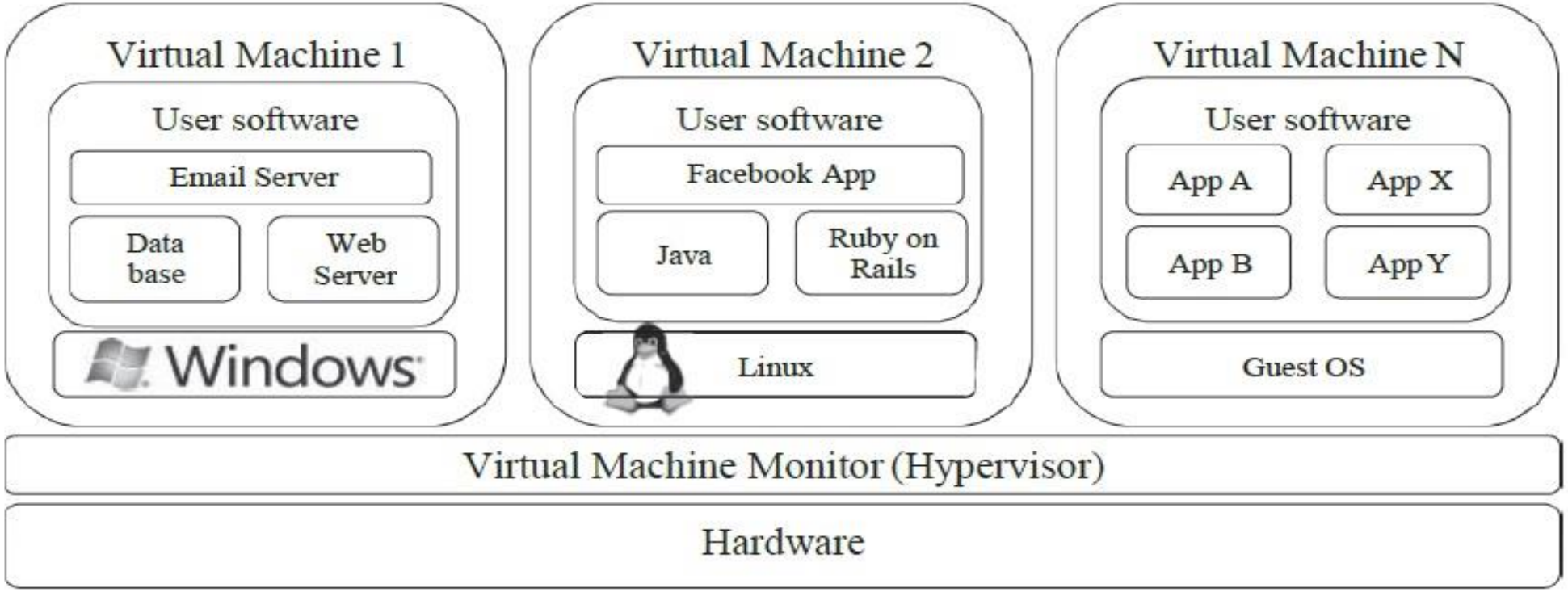
- The idea of virtualizing a computer system's resources, including processors, memory, and I/O devices, has been well established for decades, aiming at improving sharing and utilization of computer systems.
- Hardware virtualization allows running multiple operating systems and software stacks on a single physical platform.
- The virtual machine manage (VMM), also called a **hypervisor**, mediates access to the physical hardware presenting to each **guest operating system** a virtual machine (VM), which is a set of virtual platform interfaces.

A Hypervisor

- A **Hypervisor** : is a hardware virtualization technique that allows multiple guest OS to run on a single host system at the same time.
- The guest OS shares the hardware of the host computer, such that each OS appears to have its own processor, memory and other hardware resources



Software layer of VMM



- In above figure, a hardware virtualized server hosting three virtual machines, each one running distinct operating system and user level software stack.

Advantages of a Hypervisor

- Workload isolation is achieved since all program instructions are fully confined inside a VM, which leads to **improvements in security**.
- **Better reliability** is also achieved because software failures inside one VM do not affect others.
- Moreover, **better performance control** is attained since execution of one VM should not affect the performance of another VM.

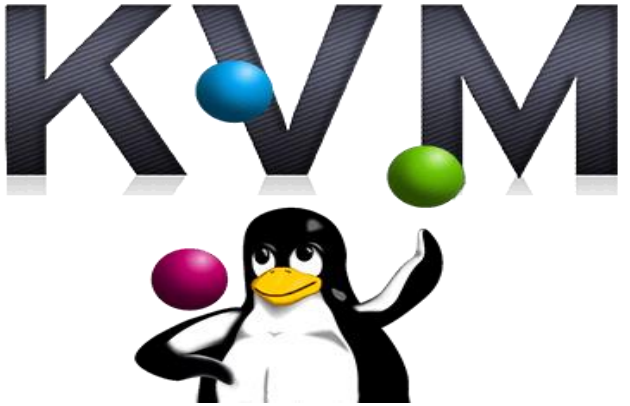
Virtual Machine Examples -1

- VMware is a pioneer in the virtualization market.
- Its ecosystem of tools ranges from server and desktop virtualization to high-level management tools
- **ESXi** : is a VMM from VMWare.
- It is a bare-metal hypervisor, meaning that it installs directly on the physical server, whereas others may require a host operating system.

Virtual Machine Examples -2

- The **Xen** hypervisor started as an open-source project and has served as a base to other virtualization products, both commercial and open-source.
- In addition to an open-source distribution , Xen currently forms the base of commercial hypervisors of a number of vendors.
- Such as, Citrix Xen Server and Oracle VM.

Virtual Machine Examples -3



- **KVM.** The kernel-based virtual machine (KVM) is a Linux virtualization subsystem.
- Is has been part of the mainline Linux kernel since version 2.6.20, thus being natively supported by several distributions.
- **In addition**, activities such as memory management and scheduling are carried out by existing kernel features, thus making KVM simpler and smaller than hypervisors that take control of the entire machine.
- KVM allows it to support unmodified guest operating systems ; currently, it supports several versions of Windows, Linux, and UNIX .

Virtual Appliances (الاجهزة الافتراضية)

- An application combined with the environment needed to run it (operating system, libraries, compilers, databases, application containers, and so forth) is referred to as a "**virtual appliance**."
- Packaging application environments in the shape of virtual appliances eases software customization, configuration, and patching and improves portability.
- Most commonly, an appliance is shaped as a VM disk image associated with hardware requirements, and it can be readily deployed in a hypervisor.

Autonomic Computing

- The increasing complexity of computing systems has motivated research on autonomic computing, which seeks to improve systems by decreasing human involvement in their operation.
- In other words, systems should manage themselves, with high-level guidance from humans .
- So, **Autonomic computing** (also known as AC) refers to the self-managing characteristics of distributed **computing** resources, adapting to unpredictable changes while hiding intrinsic complexity to operators and users.

Autonomic Computing

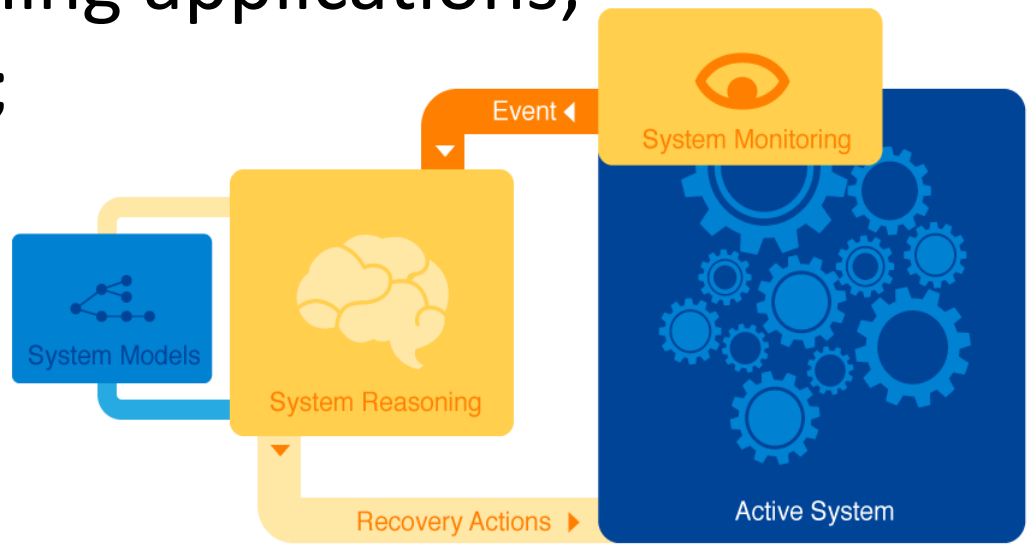
In this sense, the concepts of autonomic computing inspire (تحفيز) software technologies for data center automation, which may perform tasks such as :

1- management of service levels of running applications;

2- management of data center capacity;

3- proactive disaster recovery;

4- automation of VM provisioning .



References

- Book,Realtime Publishers 2010,“The Definitive Guide to Cloud Computing”, Dan Sullivan.(http://nexus.realtimepublishers.com)