Process VM & System VM

- **Process VM**
  - A *process* VM is a virtual platform that executes an individual process.
  - Java VM, FVM Sandbox, etc.
- **System VM**
  - a *system* VM provides a complete, persistent system environment that supports an operating system along with its many user processes.
  - VMware, Qemu, etc.
- **Basic concepts**
  - guest, host, runtime, VMM

FULL VIRTUALIZATION	PARAVIRTUALIZATION
A common and cost effective type of virtualization in which computer service requests are separated from the physical hardware that facilitates them	An enhancement of virtualization technology in which a guest OS is recompiled prior to installation inside a virtual machine
Allows the guest operating systems to execute independently	Allows guest operating systems to communicate with the hypervisor
Guest operating system issues hardware calls to access hardware	Guest operating system directly communicate with the hypervisor using drivers
Lower Performance	Higher Performance

Kernel-based Virtual Machine (KVM) is **an open source virtualization technology built into Linux®**. Specifically, KVM lets you turn Linux into a hypervisor that allows a host machine to run multiple, isolated virtual environments called guests or virtual machines (VMs). KVM is part of Linux. 11-May-2022

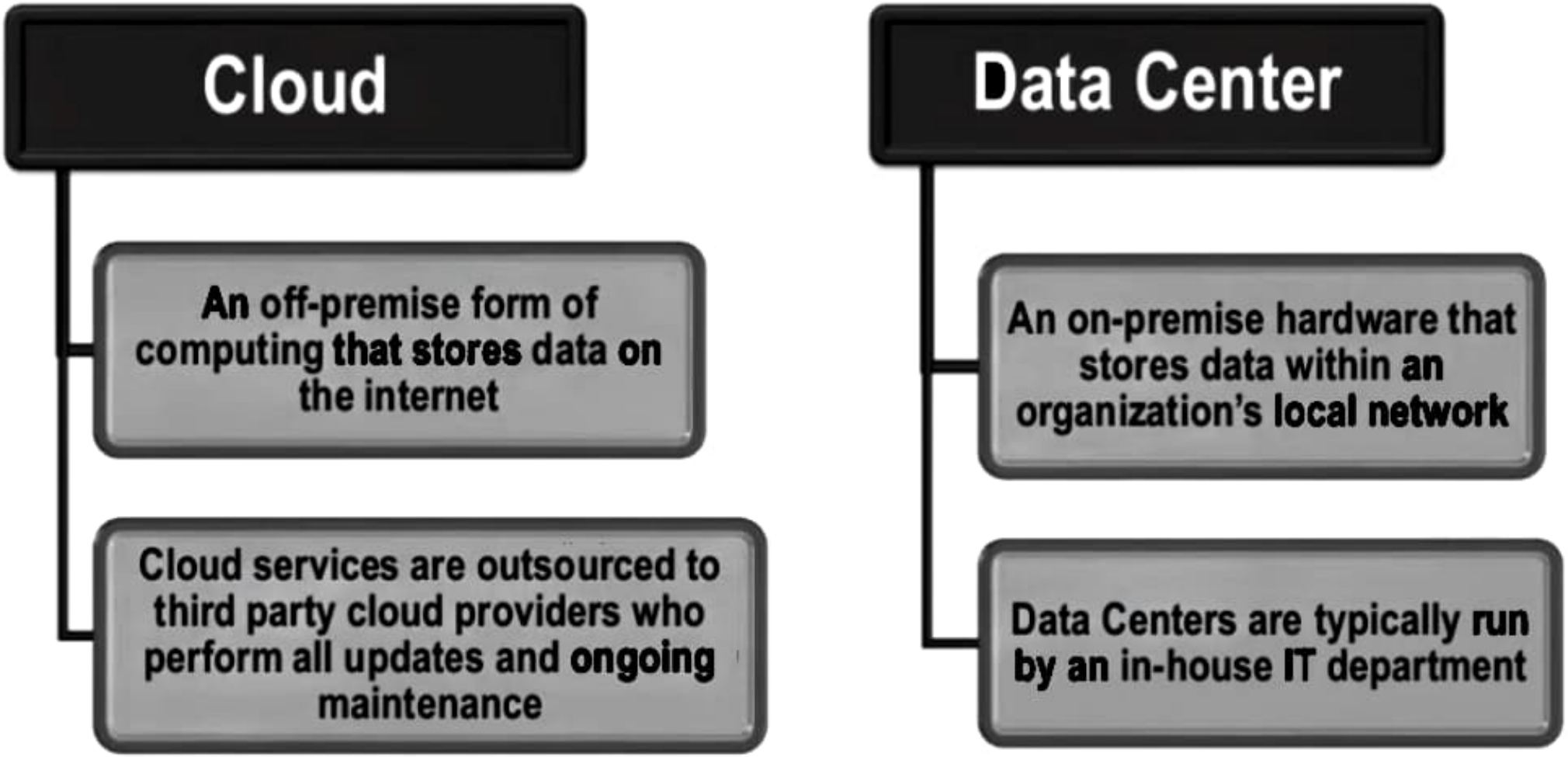
Xen is a hypervisor that **enables the simultaneous creation, execution and management of multiple virtual machines on one physical computer**. Xen was developed by XenSource, which was purchased by Citrix Systems in 2007.

Oracle VM VirtualBox is defined as **a tool for virtualizing x86 and AMD64/Intel64 computing architecture, enabling users to deploy desktops, servers, and operating systems as virtual machines**. One can use this solution to deploy as many virtual machines as the host architecture has the resources for.

Definition:
Virtualization is the process of creating a virtual environment of something which may include hardware platforms, storage devices, OS, network resources, etc.
Example:
Virtual memory is a memory-management technique that enables an operating system to see and use non-contiguous segments of memory as a single, contiguous memory space.

Features	Virtualization	Cloud
What it is	Technology	Methodology
Why it is	Create multiple simulated environments from one physical hardware resource	Provide a pool of shared resources requested and released on demand via self-service
Used for	Delivery of packaged resources to specific users for specific purposes	Deliver variable resources to groups of users for many purposes
Configuration	Image-based	Template-based
Cost	High CapEx, high OpEx	Private: Variable CapEx, ??? OpEx Public: Low CapEx, low OpEx
Scaleability	Scale Up	Scale Out
Workload	Stateful	Stateless
Servers	Consolidated	On-Demand
Tenancy	Single-Tenant	Multiple Tenant

MAIN DIFFERENCE BETWEEN CLOUD AND DATA CENTER



Virtual Machines

- Disadvantages
  - Physical server prices are very high
  - VMs tend to be under powered if too many share the physical server
  - Setup and resource allocation need to be done with attention to system needs

Cloud security **ensures your data and applications are readily available to authorized users**. You'll always have a reliable method to access your cloud applications and information, helping you quickly take action on any potential security issues.

Sensor-Cloud is **a new paradigm for cloud computing that uses the physical sensors to accumulate its data and transmit all sensor data into a cloud computing infrastructure**. Sensor-Cloud handles sensor data efficiently, which is used for many monitoring applications.

Hypervisors manage independent virtual machines by distributing resources like memory, network bandwidth, etc. among them. Maintaining a healthy balance of virtual machine resources will optimize individual VM capabilities, thereby improving your overall network performance.

Open-source software is computer software with its source code made available by the developer to everybody to study, change, modify, enhance and distribute. On the other hand, commercial software has source code that only the person, team, or organization that created it can edit, inspect, change and enhance it.