SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

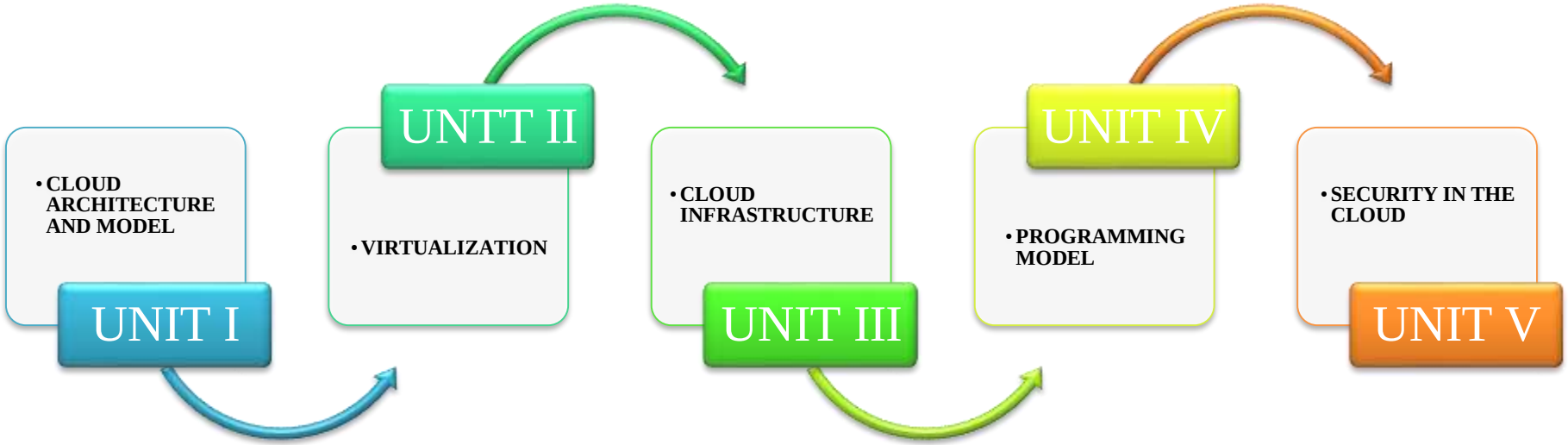
Re-accredited by NAAC with A+ grade, Accredited by NBA(CSE, IT, ECE, EEE & Mechanical)

Approvedy by AICTE, New Delhi, Recognized by UGC, Affiliated to Anna University, Chennai

DEPARTMENT OF COMPUTER APPLICATIONS

COURSE	UNIT I	TOPIC	Semester
23CAE717 Cloud Computing	Cloud Architecture and Model	Technologies for Network based Systems	II Semester / I MCA

COURSE FLOW


UNIT I
• CLOUD ARCHITECTURE AND MODEL
UNTT II
• VIRTUALIZATION
UNIT III
• CLOUD INFRASTRUCTURE
UNIT IV
• PROGRAMMING MODEL
UNIT V
• SECURITY IN THE CLOUD

TECHNOLOGIES FOR NETWORK BASED SYSTEMS

UNIT I NETWORK TECHNOLOGIES

- Technologies for Network-Based System
- System Models for Distributed and Cloud Computing
- NIST Cloud Computing Reference Architecture
- Cloud Models:- Characteristics – Cloud Services Cloud models (IaaS, PaaS, SaaS)
- Public vs Private Cloud –Cloud Solutions
- Cloud ecosystem
- Service management
- Computing on demand

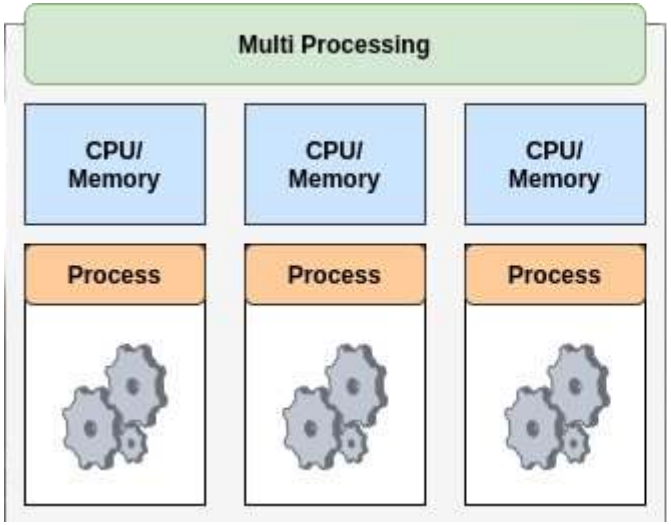
Technologies for Network-Based System

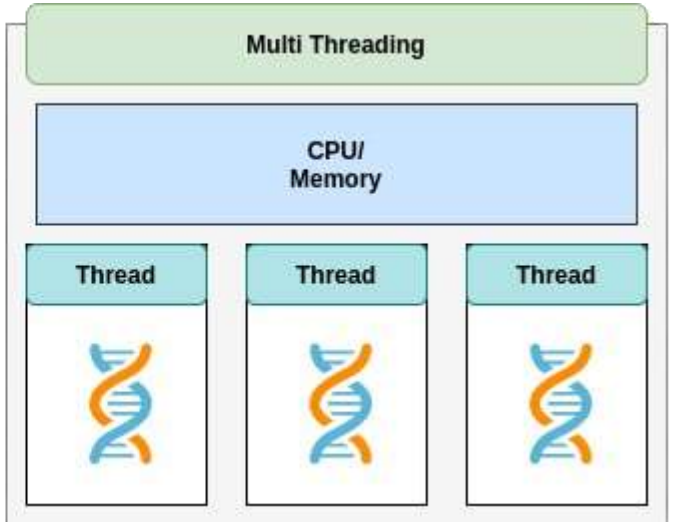
- Multicore CPU and Multithreading Technologies
- GPU Computing
- Memory, Storage and Wide-Area Networking
- Virtual Machine and Virtualization Middleware
- Data Center Virtualization for Cloud Computing

Multicore CPU and Multithreading Technologies

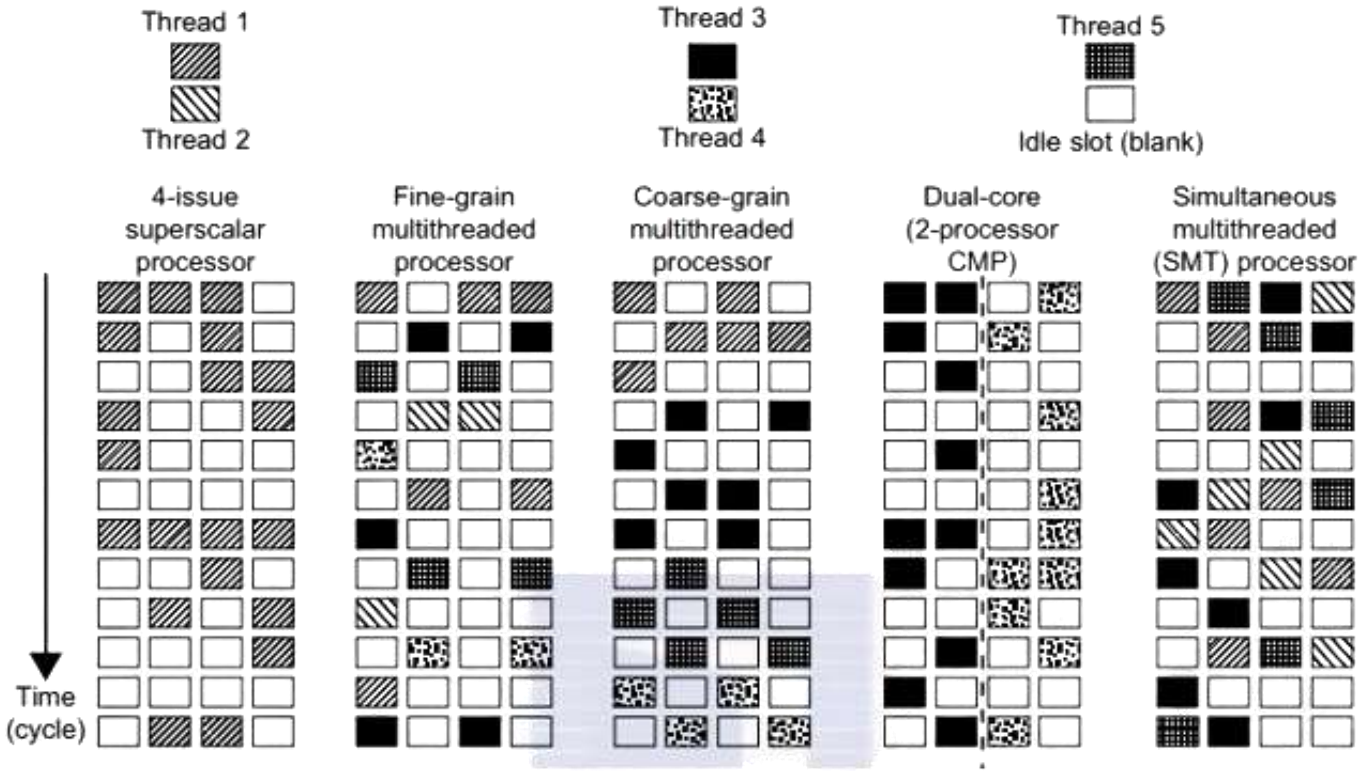
1. **Multicore:** Computer that has more than one logical CPU and physically execute multiple instructions at same time

2. **MultiThreading:** Program that can running more than one core at the same time.





Multicore CPU and Multithreading Technologies in Cloud Computing



Multicore CPU and Multithreading Technologies in Cloud Computing

- Four-issue superscalar
  - Implements instruction level parallelism (ILP) within a single processor.
  - Executes more than one instruction during a clock cycle
- Fine-grain multithreaded processor
  - Switch threads after each cycle
  - Interleave instruction execution
  - If one thread stalls, others are executed
- Coarse-grain multithreaded processor
  - Executes a single thread until it reaches certain situations
- Simultaneous multithread processor (SMT)
  - Instructions from more than one thread can execute in any given pipeline stage at a time.

Processor used by the service provider

AWS: Graviton processor

Azure: Intel® Xeon® Platinum 8180M 2.5GHz

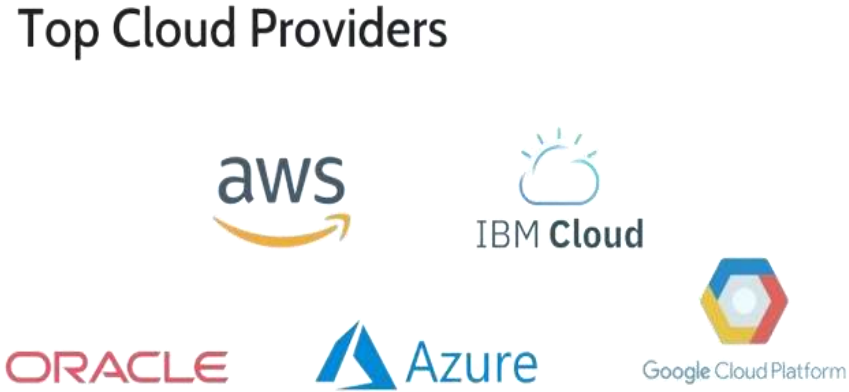
Google Cloud Platform : AMD EPYC™ processors

IBM: Intel Xeon

Oracle: Ampere Altra processor.

Alibaba Cloud: AMD EPYC 7T83 64-Core Processor

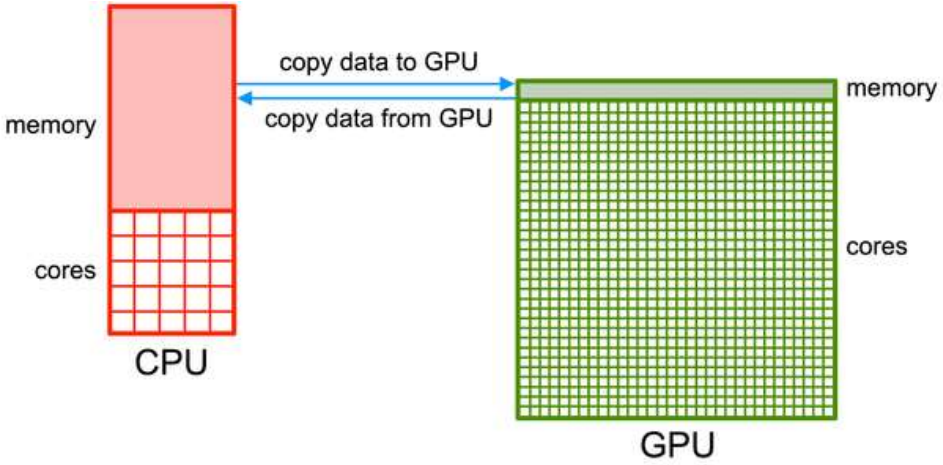
Wipro: dual-core ARM® Cortex™-A9



Graphical Processor Unit Computing (GPU)

- Marketed by NVIDIA
- Graphics co-processor or accelerator mounded on the computer graphics card or video card
- Have throughput architecture that exploits massive parallelism by executing may concurrent threads slowly, instead of executing a single long thread in conventional microprocessor very quickly.
- For example, the Xeon X5670 CPU has six cores. However a modern GPU chip can built with hundreds of processing cores

Graphical Processor Unit Computing (GPU)



Four Challenges:

- Energy and Power
- Memory and Storage
- Concurrency and locality
- System Elasticity

Processing Units

CPU
- Small models
- Small datasets
- Useful for design space exploration

GPU
- Medium-to-large models, datasets
- Image, video processing
- Application on CUDA or OpenCL

TPU
- Matrix computations
- Dense vector processing
- No custom TensorFlow operations

FPGA
- Large datasets, models
- Compute intensive applications
- High performance, high perf./cost ratio


CPU


GPU

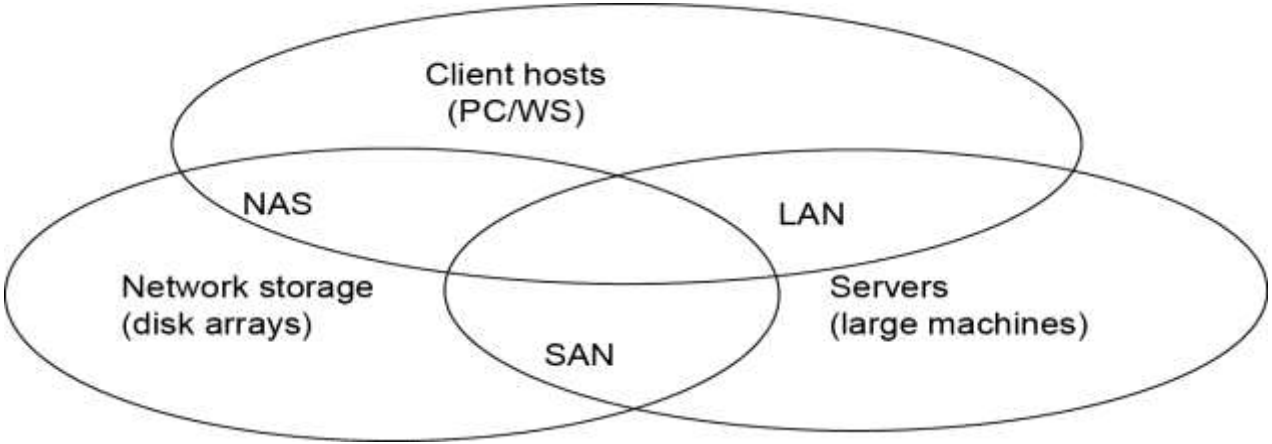

TPU

intel, SAMSUNG, AMD, Qualcomm, NVIDIA, IBM, Atmel

NVIDIA, AMD, BROADCOM, Imagination

Google, Coral, HAILO

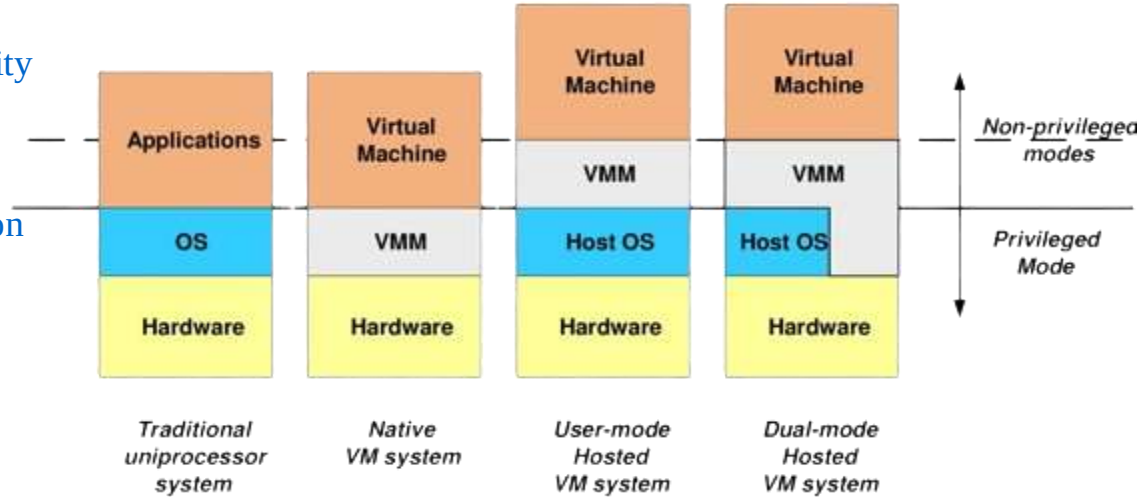
Memory, Storage and Wide-Area Networking



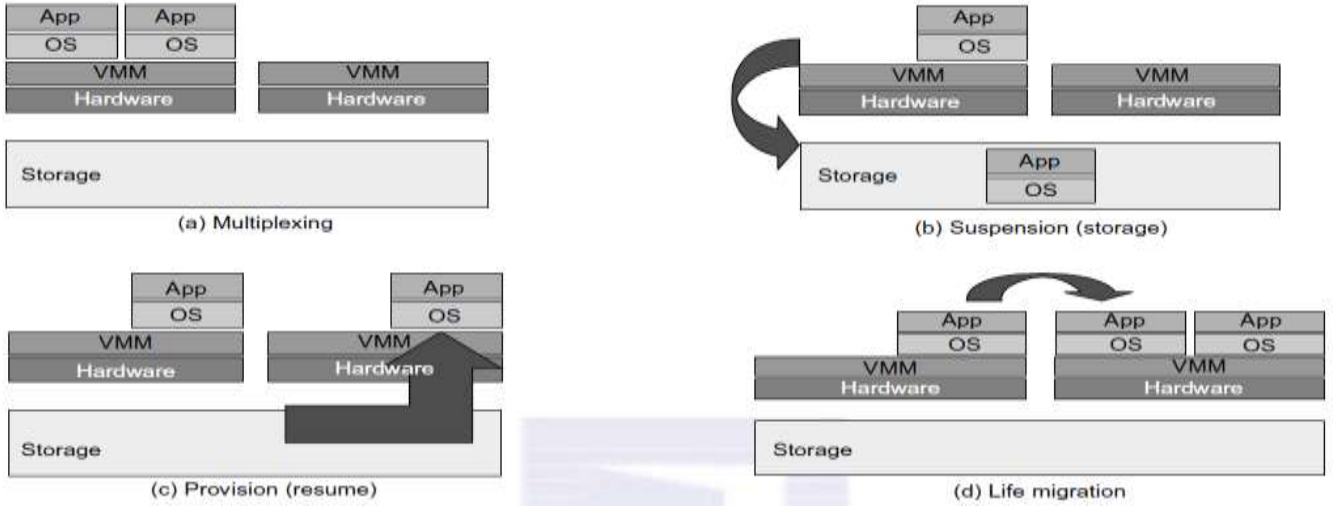
- SAN (storage area network) - connects servers to network storage - disk arrays
- LAN (local area network) - connects clients, hosts, and servers
- NAS (network attached storage) - connects clients with large storage systems

Virtual Machine and Virtualization Middleware

- To built large large cluster, cloud and grid we need to access large amount of computing, storage and networking resources in virtual manner - Hypervisor
- Virtual machine adds software to a physical machine to give it the appearance of a different platform or multiple platforms.
- Advantages
  - Cross platform compatibility
  - Increase Security
  - Enhance Performance
  - Simplify software migration

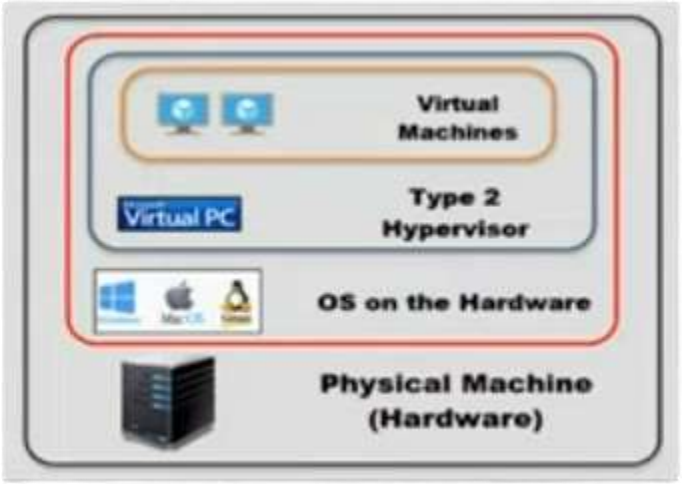


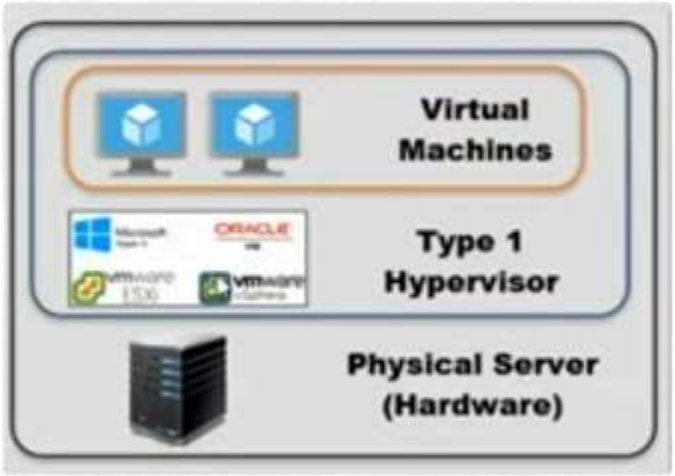
VM PRIMITIVE OPERATIONS



- First, the VMs can be multiplexed between hardware machines
- Second, a VM can be suspended and stored in stable storage
- Third, a suspended VM can be resumed or provisioned to a new hardware platform
- Finally, a VM can be migrated from one hardware platform to another

Virtualization Middleware





- A Native VM installed with the use of a VMM called a Hypervisor in privileged mode. The guest OS could be a Linux system and hypervisor is the server system

Data Center Virtualization for Cloud Computing

- A large data center may be built with thousands of servers.
- Smaller data centers are typically built with hundreds of servers.
- High-end switches or routers may be too cost-prohibitive for building data centers
- Currently, nearly all cloud computing data centers use Ethernet as their fundamental network technology
  - 30% of Data Center cost: IT Equipment Servers/Disks
  - 33% of Data Center cost: Chillers
  - 18% of Data Center cost: UPS
  - 9% of Data Center cost: AC
  - 7% of Data Center cost: Lighting in room

Data Center Virtualization for Cloud Computing

- Key benefits of Data Center Virtualization
  - Reduced Hardware Vendor Lock-in
  - Improved Disaster Recovery
  - Smooth Migration to Cloud
  - Reduced Data Center Footprint
  - Faster Server Provisioning

ANY
QUERIES ?