FINAL

IOT:

→ Networked Intercommunication of everyday objects, tools, devices or computers.

→ IOT is a wireless network or sensors that interconnect all things in our daily life.

Three Communication Patterns:

① H2H [Human to Human]

② H2T [Human to things]

③ T2T [Things to Things] [Machines, PCs, devices]

Cyber-Physical System: (CPS)

→ Result of interaction b/w computational processes & physical world.

→ cyber (hetrogeneous, asynchronous) with physical concurrent and information-dense objects.

→ CPS merges 3C technologies:

① computation

② Communication

③ Control

→ exploration of Virtual Reality.

Multicore CPUs & Multithreading Technologies:

→ 1 Gbps Ethernet bandwith

→ Advances in CPU Processors:

Multicore architecture with dual, quad & six or more processing cores.

These processors exploit parallelism at ILP & TLP levels.

MIPS = Million Instructions per second

Higher the processing power higher the heat generation with high frequency or high voltages.

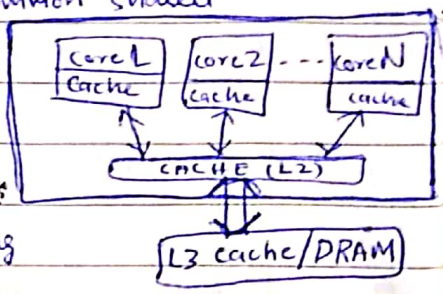
DLP: Data level Parallelism. [Single operation]
ILP: Instruction level Parallelism.
TLP: Task level Parallelism. [Multiple operation]

ILP includes:

① Multiple-issue superscalar architecture.
② Dynamic branch predition.
③ Speculative execution [Discrete system events]

DLP & TLP are available used in GPUs

* Each Processor has its own cache + one common shared cache + one software level cache.

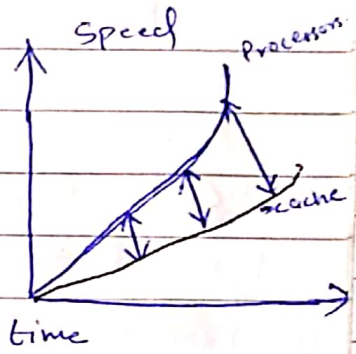


Multicore CPU & Many-Core GPU Architecture:

CPU has reached its limit in terms exploiting massive DLPs due to aforementioned memory wall problem.

Memory Wall Problem:

Instructions/sec => 2x every 2 year
Memory Capacity => 2x every 2 year
Memory Latency => 1.1x every 2 year



Multithreading Technology:

4-issue Superscalar processor
Fine-grain multithreaded Processor
Coarse-grain multithreaded Processor
Dual Core (2 processor CMP)
Simultaneous multithreaded (SMT) Processor.

GPU: Working: & Model:

→ Each core in GPU can handle eight threads of instruction
→ 2^{12} threads executed concurrently.
→ Optimized for latency caches, deliver higher HTC
→ Also used in HPC/super computer. [CPU instruct GPU to perform massive data processing]

26/11/2020

CUDA = Compute Unified Device Architecture

Warps =

(X) No. of threads ~~schedule~~ in group schedule parall. for execution.

Challenges identified for exascale computing:

① Power Efficiency of the GPU:

Dally has estimated that CPU chip consumes 10 times more power per instruction as compared to GPU.

CPU : 2nJ/instruction : optimized for latency in cache & memory

GPU : 200 pJ/instruction : optimized for HTC.

* Tesla K40 GPU has 12GB RAM of GPU

② Memory Storage & Wide-Area Networking:

Memory Access time did not improve much in the past in fact memory wall problem is getting worse as the processor gets faster.

SAN: Storage Area Network

Disk Arrays in network, if one disk fails, it continues running if two or more disk fails, it may stop. And Disk array is broken up & data is lost.

NAS: Network Attached Storage:

One storage device that is connected through network. No arrays.

LAN: Local Area Network

Used to connect client hosts to big servers.

3) Virtual Machines & Virtualization Middleware:

VMs are novel solutions to underutilized resources, application inflexibility, software manageability, and security concerns in existing physical machines.

Used mostly in cloud computing. In cloud every tent (client) has given different VM environment so that he/she should securely do his work.

Virtualizes processors, memory & I/O

xavw-tuzg-ezs (2020-12-03 at 21_49 GMT-8).mp4

GPU = Multicore → limited Parallelism

GPU = Many-core → hundreds of cores processing

↳ MPPs

Massively Parallel Processors

↳ HPC

Convergence of Technologies:

Technology depends upon:

① Hardware virtualization and multi-core chips.
② Utility and grid computing.
③ SOA, Web 2.0 and WS mashups
④ Atonomic computing and data center automation.

Grid = Cluster of nodes for computation.
Parallel of workflow, algorithms and virtualization issues.
Map reduce - big data / search anything.
Data mining / scientific applications
Algorithms.
Cloud is cluster of internet VMs where big data is stored - Parallel Databases. (SQL, NoSQL)
Each ~~thread~~ cluster node has multithreading & manycore GPUs.
Local area network, wide area network.
are used to connect clusters.
~~Cluster = P2P of networks.~~

Massive Systems are classified into four groups.

clusters.	highly scalable, web-scale connectivity
P2P networks.	huge data centers.
Computing grids.	involve 100s, 1000s, 100000s of nodes
Internet clouds.	* Book Figure *

Grid Computing Infrastructure:

Telnet k through, teamviewer k through, VNC k through Local computer ~~ko~~ ko remotely access kar sakte hain.
Remotly accessing an application from different computers with ease of access.
eg: Using Facebook, WA, Amazon e.t.c
Table 1.3 Critical Cluster Design Issues & Feasible implementations.

⇒ Peer-to-Peer Network Families:

→ Client-server architecture.
→ client machines (PCs & workstation) are connected to a central server for compute, email, file access & DB applications.
→ e.g: Bit Torrent.
→ Offer distributed model of networked systems.
→ Routing Efficiency should be good.
↳ kam se kam time me data source se destination tk pohunch jaye.
→ Load balancing, failure management are imp issues.

Cloud Computing Over Internet:

Cloud is pool of virtualized computer resources.
Cloud can host a varity of different workloads cluding batch-style backend jobs and interactive and ser-facing applications.
Quick, Scalable → EK k bad dusra, dusre k bad 3sra virtual machine mil jayega, physical b mil jayega depending on jitne services ap use karte hain utne apko pay karne parti hai.

Cloud Landscape:

① Infrastructure as a Service (IaaS):

This model puts together infrastructures demanded by users - namely servers, storage, networks and data center fabric.

User can deploy and run on multiple VMs running guest OSes on specific aplications.

e.g: executing C code online compiler. / Amazon

② Platform as a Service (PaaS):

Allow users to deploy user-built applications onto a virtualized cloud platform. PaaS includes middleware, databases, development tools & some runtime support such as Web2.0 and Java. This platform includes both hardware and software integrated with specific programming interfaces. The provider supplies the API & software tools e.g CJava, python, Web 2.0, .NET). The user is freed from managing the cloud infrastructure.

e.g: Google

③ Software as a Serive (SaaS):

This refers to browser-initiated application software over thousands of paid cloud customers.

Applies to Bussiness processes, Industry applications

HR (Human Resources).

CRM = Consumer relationship management.

ERP = Enterprise resources planning.

e.g: Google Docs.