**Assignment 1**

# Name: Naif Ali Alghamdi

# ID Number: 438000519

# Question 1:

Briefly define the following basic techniques and technologies that represent recent related advances in computer architecture, parallel processing, distributed computing, Internet technology, and information services:

1. **High-performance computing system**

"Supercomputer sites and big data centers It should provide high-performance computing services to a large number of Internet users at the same time. Because of this high demand, Linpack Benchmark for High Performance Computing (HPC) The applications are no longer ideal for measuring system performance." [1]

1. **High-throughput computing system**

"The development of market-oriented advanced computing systems is undergoing a strategic change From HPC model to HTC model. This HTC model pays more attention to high streaming Computing. The main application for high-flow computing is internet search and web services With millions or more users at the same time."[1]

1. **Peer-to-peer network**

"Client devices (computers and workstations) connected to a central computing and email server, Access to files and database applications. P2P architecture introduces a distributed network model Systems. First, the P2P network is client oriented rather than server oriented."[1]

1. **Computer cluster versus computational grid**

* **"Cluster computing**: A computer group is a local area network made up of two or more homogeneous computers.
* **Grid computing**: Grid computing can be defined as a network of homogeneous or heterogeneous computers that work together over a long distance to perform a task that may be difficult on a single machine."[2]

1. **Service-oriented architecture (SOA)**

"SOA is the evolution of distributed computing based on A synchronization request/response design form Asynchronous applications"[3]

1. **Pervasive computing versus Internet computing**

* **"Pervasive computing** : Diffuse computing, Diffuse computing, which is also called ubiquitous computing, is the increasing trend to include computational power (generally in the form of microprocessors)
* **Internet computing** : Ubiquitous computing is often considered the successor to mobile computing, and generally includes communication technologies, wireless networks, mobile devices, embedded systems, wearable computers,"[4]

1. **Virtual machine versus virtual infrastructure**

* **"Virtual machine**: Virtualization technology was primarily designed for the sharing of expensive hardware resources ,by multiplexing virtual machines (VM) on the same set of hardware hosts.
* **Virtual infrastructure**: is what connects resources to distributed applications."[1]

1. **Public cloud versus private cloud**

**"A public cloud** : is built over the Internet and can be accessed by any user who has paid for the service.

**A private cloud** : is built within the domain of an intranet owned by a single organization"[1]

# Question 2:

Characterize the following three cloud computing models:

1. **What is an IaaS cloud? Give one example system.**

* "IaaS: (Infra as a Service) cloud-based services, pay-as-you-go for services such as storage, networking, and virtualization. for examples: AWS EC2, Rackspace, Google Compute Engine (GCE) "[5]

1. **What is a PaaS cloud? Give one example system.**

* "PaaS: (Platform as a Service) hardware and software tools are available over the internet. for examples: AWS Elastic Beanstalk, Heroku "[5]

1. **What is a SaaS cloud? Give one example system**

* SaaS:(Software as a Service) software that’s available via a third-party over the internet. For examples: BigCommerce, Google Apps

# Question 3:

Briefly explain the following terms associated with network threats or security defense in a distributed computing system:

1. **Denial of service (DoS)**

* **"A Denial-of-Service (DoS)** : is an attack meant to shut down a machine or network Distributed denial of service (DDoS) attacks are caused by flooding attacks on a target node ,A denial of service (DoS) results in a loss of system operation and Internet connections."[1]

1. **Trojan horse**

* "A **Trojan horse :** is a type of malicious code or software that looks legitimate but can take control of your computer. in general, inflict some other harmful action on your data or network, A Trojan act as a bona fide application or file to trick you."[6]

1. **Network worm**

* "A **net-worm** : is a type of worm that finds new host machines to infect by using network shares -a media (such as a hard drive or server) that can be accessed by multiple computers on a local area network (LAN),"[7]

1. **Service spoofing**

* "**Spoofing** : is a fraudulent act in which communication from an unknown source is disguised as being from a source that is known to and trusted by the recipient. As a type of impersonation carried out via technological means for example Email Spoofing, IPSpoofing ... "[8]

1. **Authorization**

* "**Authorization :** is a security mechanism to determine access levels or user/client privileges related to system resources including files, services, computer programs, data, and application features."[9]

1. **Authentication**

* "**Authentication** :is the process of recognizing a user’s identity. It is the mechanism of associating an incoming request with a set of identifying credentials. The credentials provided are compared to those on a file in a database of the authorized user’s information on a local operating system or within an authentication server."[9]

1. **Data integrity**

* "Data integrity refers to the accuracy and consistency (validity) of data over its lifecycle. Data integrity can be compromised in several ways. Each time data is replicated or transferred, it should remain intact and unaltered between updates."[10]

1. **Confidentiality**

* "Confidentiality refers to protecting information from being accessed by unauthorized parties. In other words, only the people who are authorized to do so can gain access to sensitive data. So, in summary, a breach of confidentiality means that someone gains access to information who shouldn't have access to it."[11]

# Question 4:

**What is Speed-up?**

**"speedup** : is defined by the fraction of code (P) that can be parallelized."[3]

# Question 5:

**What is the maximum time speed-up possible according to Amdahl's law?**

* "If 50% of the code can be parallelized, the maximum speed up. = 2, meaning the code will run twice"[3]

# Question 6:

What is the maximum speed-up which can be achieved on 5, 10, and 20 processors if 90% of a calculation can be parallelized?

**P+S/N**

(0.1+0.90)=1/5=0.2

(0.1+0.90)=1/10=0.1

(0.1+0.90)=1/20=0.5

Question 7:

What is the system efficiency which can be achieved on 100, 250, and 400 processors if 25% of a calculation can be serial and the workload is fixed?

E =1/(SN + P)

E = 1/[0.25 × 100 + 0.75] = 38%

E = 1/[0.25 × 250 + 0.75] =15%

E = 1/[0.25 × 400 + 0.75] =9.9

# Question 8:

Assume that a large cluster is used, what is the scaled-workload speed-up and system efficiency which can be achieved on 100, 250, and 400 processors if 25% of a calculation can be sequential?

E′ = scaled-workload speedup / N = S/N + P

E′ = 0.25/100 + 0.75 = 0.752

E′ = 0.25/250 + 0.75 = 0.751

E′ = 0.25/400 + 0.75 = 0.750

**Refence**

1. From bock
2. Difference between Grid computing and Cluster computing, [**omkarchalke**](https://auth.geeksforgeeks.org/user/omkarchalke/articles)

<@omkarchalke>, from <https://www.geeksforgeeks.org/difference-between-grid-computing-and-cluster-computing/>

1. From chapter 1
2. Pervasive computing (ubiquitous computing), **BySharon** **Shea**, from <https://internetofthingsagenda.techtarget.com/definition/pervasive-computing-ubiquitous-computing>
3. IaaS vs PaaS vs SaaS Enter the Ecommerce Vernacular: What You Need to Know, Examples & More,  [Tony Hou](https://www.bigcommerce.com/blog/author/tony-hou/), Copyright 2003 - 2021 BigCommerce Pty. Ltd. E-commerce platform, from <https://www.bigcommerce.com/blog/saas-vs-paas-vs-iaas/#executive-summary-summing-up-saas-vs-paas-vs-iaas>
4. What is a Trojan? Is it a virus or is it malware? Written by Alison Grace Johansen for NortonLifeLock, July 24, 2020 from <https://us.norton.com/internetsecurity-malware-what-is-a-trojan.html>
5. Net-Worm, © F-Secure 2021, from <https://www.f-secure.com/v-descs/networm.shtml>
6. What is Spoofing? SoftwareLab.org is part of Momento Ventures Inc. © 2014-2021., from <https://softwarelab.org/what-is-spoofing/>
7. Definition of 'Authorization', 06 February, 2021, 12:26 AM IST,Copyright © 2020 Bennett, Coleman & Co. Ltd. For reprint rights: Times Syndication Service, from <https://economictimes.indiatimes.com/definition/authorization>
8. A DEFINITION OF DATA INTEGRITY, by Chris Brook on Tuesday, December 1, 2020 from <https://digitalguardian.com/blog/what-data-integrity-data-protection-101>
9. Confidentiality, Integrity, and Availability, Last modified: Apr 20, 2020, by MDN contributors, 2005-2021 Mozilla and individual contributors. Content is available under these licenses. From <https://developer.mozilla.org/en-US/docs/Archive/Security/Confidentiality,_Integrity,_and_Availability>