Additional Information for QIM 2.2.1, methods and tools for identification of slow and advanced learners such as Classroom and Formal Assessments and Formative and Summative Assessments.

Sample evidence for following methodologies-

Classroom and Formal Assessments-

- Class Tests
- Pop Quiz
- Open Book Test
- Take Home Test

Formative and Summative Assessments-

- Students Seminars
- Poster Presentations
- Group Discussions

1) Given the CIDR representation 20.10.30.35 / 27. Find the range of IP Addresses in the CIDR block.
2) Given the CIDR representation 100.1.2.35 / 20. Find the range of IP Addresses in the CIDR block.
3) Consider a block of IP Addresses ranging from 100.1.2.32 to 100.1.2.47.
    a. Is it a CIDR block?
    b. If yes, give the CIDR representation
4) Suppose a network with IP Address 192.16.0.0. is divided into 2 subnets, find number of hosts per subnet. Also, for the first subnet, find-
    a. Subnet Address
    b. First Host ID
    c. Last Host ID
    d. Broadcast Address
5) What is **not true** about subnetting?
    a. It is applied for a single network
    b. It is used to improve security
    c. Bits are borrowed from network portion
    d. Bits are borrowed from Host portion
6) In a class B, network on the internet has a subnet mask of 255.255.240.0. What is the maximum number of hosts per subnet?
    a. 4096
    b. 4094
    c. 4092
    d. 4090
7) If the subnet mask 255.255.255.128 belongs to class C, find-
    a. Number of subnets
    b. Number of hosts in each subnet
8) If a class B network has a subnet mask of 255.255.248.0, what is the maximum number of hosts per subnet?
    a. 1022
    b. 1023
    c. 2046
    d. 2047
9) Consider the following subnet masks-

1. 255.0.0.0
2. 255.128.0.0
3. 255.192.0.0
4. 255.240.0.0
5. 255.255.0.0
6. 255.255.254.0
7. 255.255.255.0
8. 255.255.255.224
9. 225.255.255.240

For each subnet mask, find-

a. Number of hosts per subnet
b. Number of subnets if subnet mask belongs to class A
c. Number of subnets if subnet mask belongs to class B
d. Number of subnets if subnet mask belongs to class C

Assignments and BSA

Poster/Infographics	Group Activity	Network Devices/OSI-ISO Model/TCP/IP Model
Take Home Test with quiz certificate	Individual Activity	IP Addressing https://www.proprofs.com/quiz-school/quizreport.php?title=njuxmzmwe6au&sid=281612318
Online certificate course	Individual Activity	Any topic related to networking; links are given below- 1. https://learn.saylor.org/course/view.php?id=84 2. https://www.netacad.com/courses/networking/networking-essentials 3. https://www.udemy.com/course/introduction-to-networking-for-complete-beginners/ (Rs.499/-) 4. https://enterprise.edx.org/vidyalankar-institute-tech/course/LinuxFoundationX+LFS165x (free up to 1st July) 5. https://www.netacad.com/courses/networking/networking-essentials (badge achieved)
Technical Research Paper Review with PPT	Group Activity	Sample papers given below- 1) Analysis of TCP/IP Header Attack and How to Prevent Hirushan Sajindra- 15 July 2021 Sri Lanka Institute of Information Technology | 2) TCP/IP Protocol Security Problems and Defenses Zhi Kanmai 10 May 2021 School of Engineering and Technology, Xi'an Fanyi University, Xi'an, China 3) Connectivity Based Positioning System for Underground Vehicular Ad Hoc Networks International Journal of Computer Networks and Applications (IJCNA) Published By EverScience Publications ISSN : 2395-0455 4 April 2021 4) Research and Development on Cloud Computing Aliasghar Azma, Dalian University of Technology Nima Kianfar Khaje Nasir, Toosi University of Technology March 2021 5) Packet Reordering Metrics to Enable Performance Comparison in IP-Networks Pedro Rodrigues Torres, Eduardo Parente Ribeiro, ederal University of Paraná, Centro Politécnico, Curitiba, PR 81531-890, Brazil May 2020
Proproofs Quizzes	Individual Activity	3 certificates
Crossword	Individual Activity	OSI-ISO Model
Kahoot, join my quiz	Individual Activity	Based on each module
Youtube Videos	Individual Activity	Based on each module

Guest Lecture	Individual Activity	Recent Trends in networking
Google Quiz with certificate	Individual Activity	Based on each experiment
Youtube video links	CCN	1. https://www.techtarget.com/searchnetworking/definition/OSI 2. https://www.youtube.com/watch?v=dEemt7m0GVQ 3. https://www.bmc.com/blogs/osi-model-7-layers/
	NGN	1. https://www.accenture.com/in-en/insights/5g-index 2. https://www.youtube.com/watch?v=DrH-1505-Mg

NAME _____

Roll Number: _____

10 Multiple choice questions

1. Hybrid
    a. What are the 2 variants of Community Cloud7
    b. What are the 3 primary Cloud Service Models7
    c. What are the 2 types of Private cloud*
    d. What type of cloud is composed of two or more individual clouds, each of which can be private, community, or public clouds?

2. Public, Private, Hybrid, Community
    a. What are the 2 types of Private cloud7
    b. What are the 3 primary Cloud Service Models7
    c. What are the 2 variants of Community Cloud*
    d. What are the 4 primary cloud deployment models?

3. IaaS, PaaS, SaaS
    a. What are the 4 primary cloud deployment models?
    b. What are the 3 primary Cloud Service Models7
    c. What are the 2 types of Private cloud7
    d. What are the 2 variants of Community Cloud*

4. On—Premise, Externally—Hosted
    a. What are the 3 primary Cloud Service Models7
    b. What are the 4 primary cloud deployment models?
    c. What are the 2 types of Private cloud*
    d. What are the 2 variants of Community Cloud*

5. Externally-Hosted
    a. What are the 2 types of Private cloud*
    b. The organization's IT infrastructure connects to the_____—_____private cloud over a secure network.
    c. What are the 2 variants of Community Cloud*
    d. A_____cloud is a cloud infrastructure deployed by a provider to offer cloud services to the general public and/or organizations over the Internet.

6. Public
    a. What are the 2 types of Private cloud*
    b. A_____cloud is a cloud infrastructure deployed by a provider to offer cloud services to the general public and/or organizations over the Internet.
    c. What type of cloud is composed of two or more individual clouds, each of which can be private, community, or public clouds?
    d. What are the 3 primary Cloud Service Models7

7. Yes
    a. What are the 2 variants of Community Cloud7
    b. What are the 4 primary cloud deployment models?
    c. What are the 3 primary Cloud Service Models7
    d. Can any of the 4 deployment models be used to support the 3 Service models?

8. On—Premise, Externally Hosted
    a. What are the 3 primary Cloud Service Models7
    b. What are the 2 types of Private cloud7
    c. What are the 2 variants of Community Cloud*
    d. What are the 4 primary cloud deployment models?

9. Private
    a. What are the 4 primary cloud deployment models?
    b. What are the 2 types of Private cloud7
    c. What are the 3 primary Cloud Service Models*
    d. The cloud services implemented on the_____cloud are dedicated to consumers, such as the departments and business units within the organization.

10. On-Premise
    a. What are the 4 primary cloud deployment models?
    b. What are the 3 primary Cloud Service Models7
    c. What type of cloud is composed of two or more individual clouds, each of which can be private, community, or public clouds?
    d. The___—_____private cloud, also known as an internal cloud, is hosted by anorganization on its data centers within its own premises.

CERTIFICATE

OF ACHIEVEMENT

THIS CERTIFICATE IS PROUDLY PRESENTED TO

Omkar Nipanikar

got a score of

100/100

on

Cloud Computing Practice Exam quiz

Date

Aug 20, 2023

ProProfs
Quiz Maker

Network Topology

Network topology is the way in which all network components are connected together.

Ring Network

Bus Network

Star Network

Full

Mesh Network

All nodes (devices) are connected, which allows it to work fully, so there is no need for a central switch or server.

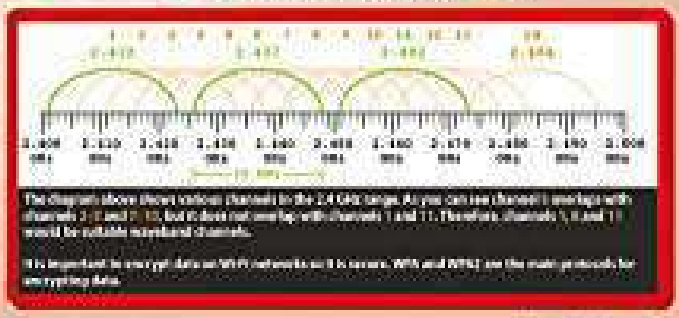
Data is sent along the fastest route.

If one route fails, algorithms reroute the data along a different route, in a process called 'self-healing'.

It can be expensive, as all nodes need to be physically connected to each other.

Partial

Wireless Network



The diagram above shows various channels in the 2.4 GHz range. As you can see channel 1 overlaps with channels 2, 3 and 4, but it does not overlap with channels 5 and 11. Therefore, channels 1, 6 and 11 would be suitable non-band channels.

It is important to encrypt data on Wi-Fi networks as it is secure. WPA and WPA2 are the main protocols for encrypting data.

Certificate of Achievement

Soham Chavan

Got a Score Of

90/100

On

Cloud security protects quiz

ProProfs
Quiz Maker

Nov 2, 2022

Quiz Links for all experiments

Sr. No.	Experiment Name	Quiz Link
1	All networking devices and operating software	https://docs.google.com/forms/d/e/1FAIpQLSfMvRNYNiKR5rV2tSJcb1gA6N_K8y6I-fK8j6uGcLkpp7bPUg/viewform?usp=sf_link
2	Command Line Tools-Networking commands ping, tracert, netstat, arp, route etc.	https://docs.google.com/forms/d/e/1FAIpQLSd5_nO3ytB18X77PhxVn5i8r0REv4y2JLilVskJVHGklGYJDA/viewform?usp=sf_link
3	Topologies in a packet tracer	https://docs.google.com/forms/d/e/1FAIpQLSfuu0hHn2EfZkLlh405jsWG4ta7ruMR-ehOBMLJ-s3G-pF00w/viewform?usp=sf_link
4	MAC Table and Routing Table in packet tracer	https://docs.google.com/forms/d/e/1FAIpQLSfaFVm9i6jNaHznf0lVubcwoJNSw_za7qge2cNfm3aK_uaF5w/viewform?usp=sf_link
5	Implementation of DHCP Server, Web server and DNS server	https://docs.google.com/forms/d/e/1FAIpQLSc1Cv05CDTDd0JrpUCbGMYnP4zV1jVwF8EhSzTPNDS3sdfkrQ/viewform?usp=sf_link
6	Implementation of static routing	https://docs.google.com/forms/d/e/1FAIpQLSdxDpvBLueFE-iXWqLTM-C0N2FXl0gG3xBz3jD3_xztiCuuZg/viewform?usp=sf_link
7	Introduction to NS2 and GNS3	
8	Simulate the different agents and their applications like TCP, FTP over TCP, UDP, CBR over UDP in NS2	
9	PBL-Using NS2 or GNS3	
10	PBL-Using another simulator	

ISA Activities for cloud computing (ETRX and EXTC)

1. Quizzes (Average of all) **(Individual Activity)**
2. Certification/ Technical Research Paper Review (Latest trends in cloud computing) **(Individual Activity)**
3. Technical Survey (Must include hands-on)/ Micro-Project **(Group Activity)**

Rules: -

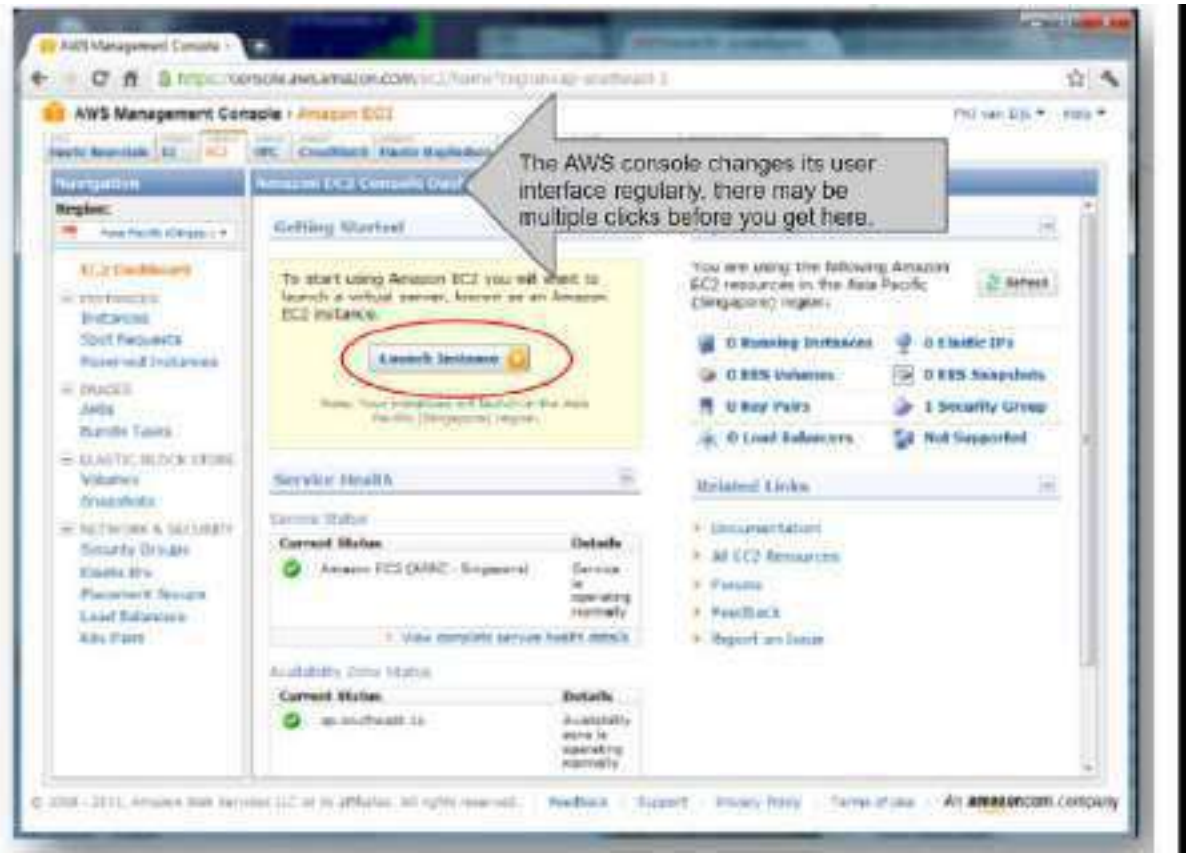
a) All 3 activities are mandatory.
b) In Group activity- 3 to 4 students per group
c) Technical Research Paper Review-Latest paper expected (from the year 2020 onwards)
d) Submission: -

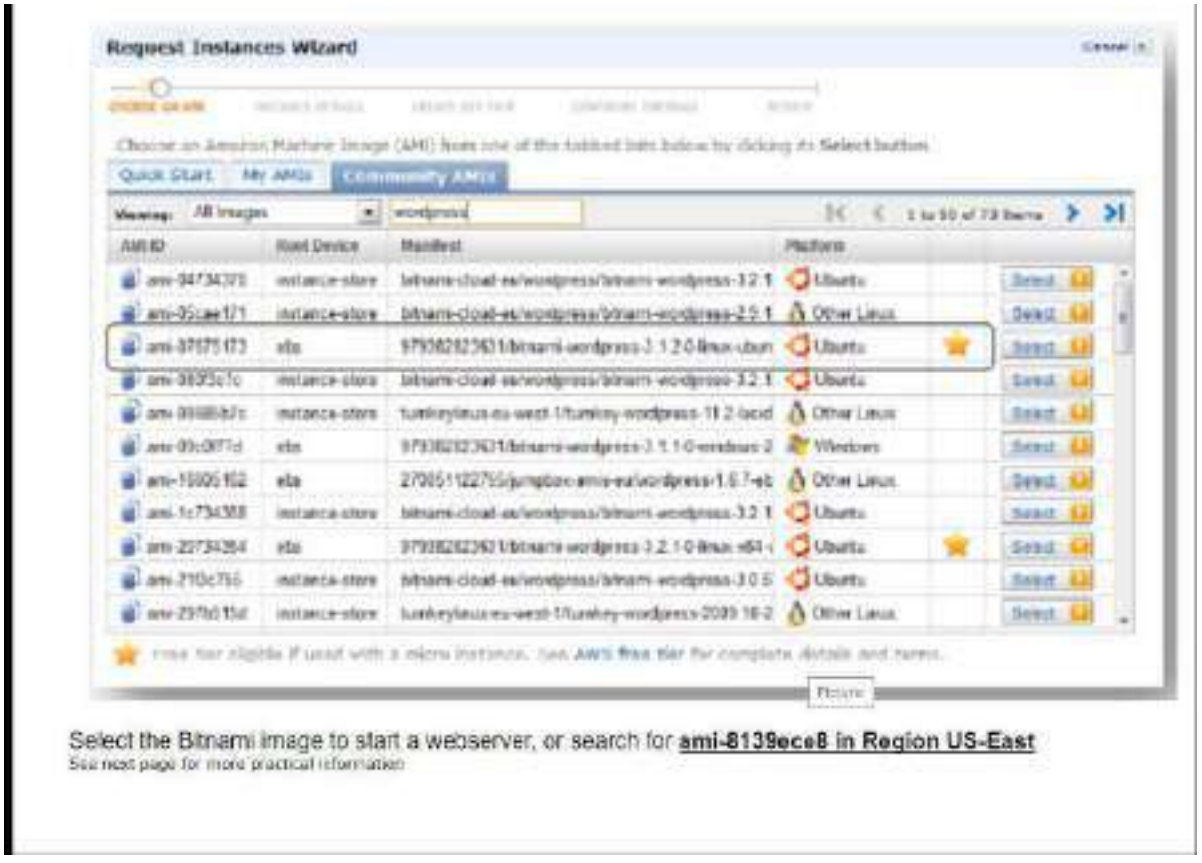
For Individual activity- Certificate and 4-to-5-page report **or** Technical Paper, presentation and 3-page document

For Group activity- Presentation (In the class) and 4-to-5-page report

Topics for Group Activity : -

1. Generate your own public/private key pairs -See following instruction https://docs.google.com/presentation/d/1bcfwGvpvA9CAygHq0H8AekZpJqu0a7XwTEuhKNV7jU4/edit?usp=sharing
2. IaaS- If you have an Amazon AWS account? http://aws.amazon.com Getting such an account verified takes hours-days and a phone call. Do try this at home. Otherwise use: https://pvedemo.signin.aws.amazon.com/console usernames are handed out on site. Use Amazon EC2 -The next step is to start up a webserver. We will be using bitnami provided server images.





Select the Bitnami image to start a webserver, or search for **ami-8139ece8 in Region US-East**

See next page for more practical information

Tips:

Bitnami WordPress on EC2:

Start it in US-East: image name 'ami-8139ece8'

Tip: when launching the image, give it a name and a tag so you won't confuse it with others.

Tip: you don't have to create a keypair, but you won't be able to login to the Linux command line.

Tip: you can enable cloudwatch in the screen 'instance details'

Tip: you can use security group: webserver.

You can start the Bitnami application through the public domain name (DNS) that the EC2 dashboard gives you.

This has a button that says 'launch my application' which will bring you to the wordpress site.

Using WordPress:-

In order to create a page on the wordpress site, you will have to login.

Default WordPress login information (follow the link that says Meta -> log in).

username: user password: bitnami

Please change this to avoid unauthorized access. In the administrator page you can select 'new-> post' to create a new post.

Study questions: think about what you have to do if you run a thousand of these? Manage security groups, users, images, instances, performance?

Feel free to explore other features of the EC2 interface panel, or other cloud services such as S3.

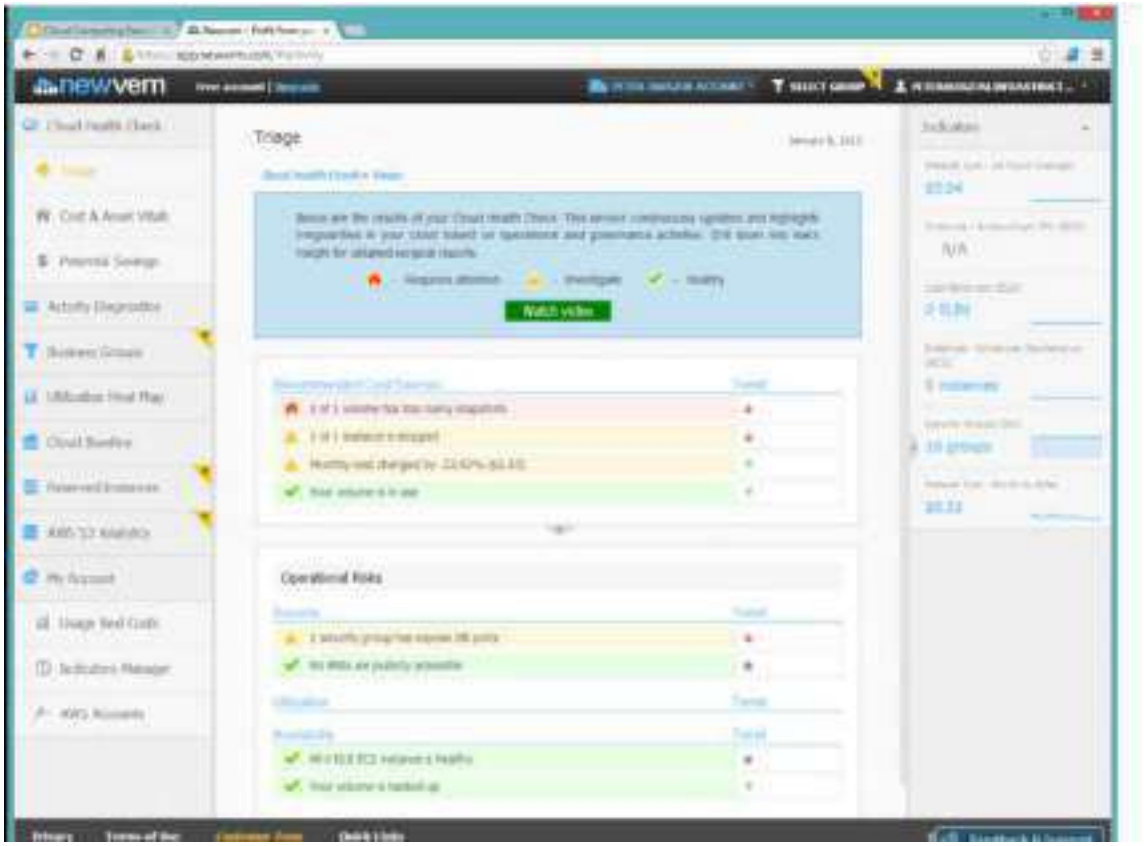
3. IaaS: Cost control and other management with Newvem
   High Level the steps are as follows: 1. get a free account at www.newvem.com
   2. create an amazon sub account with read-only access, through the IAM service. (https://newvem.uservoice.com/knowledgebase/articles/33997)
   3. give these account details to newvem
   ALTERNATIVE: www.cloudcheckr.com

Create Newvem account
independent of Amazon

Create a new user in Amazon Web Services,
with limited access
(only one step shown here..)

Then give these to ~~NewVem~~ Newvem was
acquired by DataPipe in 2013

Full details in: https://newvem.uservoice.com/knowledgebase/articles/33897



4. OpenStack: - Free account to try
   https://x86.trystack.org/dashboard/auth/login/
   Small demo video:
   https://www.youtube.com/watch?v=EPZPzXSypl4&feature=youtu.be

5.

http://goo.gl/S1UXL

Business simulation game

http://www.cloudchallenge.com

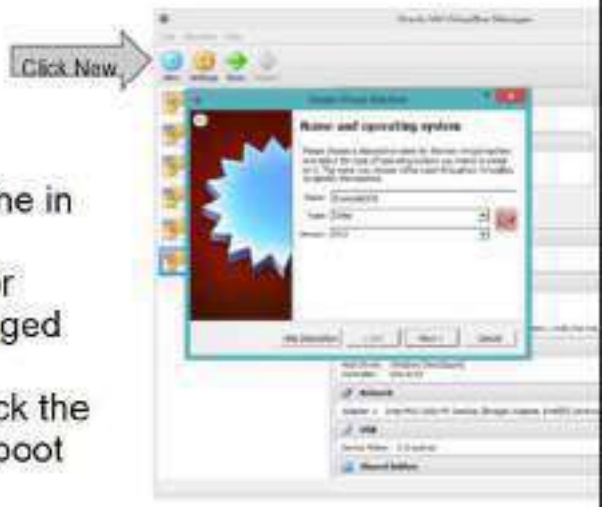
As homework, read the document at
https://docs.google.com/open?id=0B_ilbs_TLVWQQ2hoQVgweXlLb2s

When in the lab, it is probably a good idea to do this in pairs: one person reading the instructions, the other person playing the game.

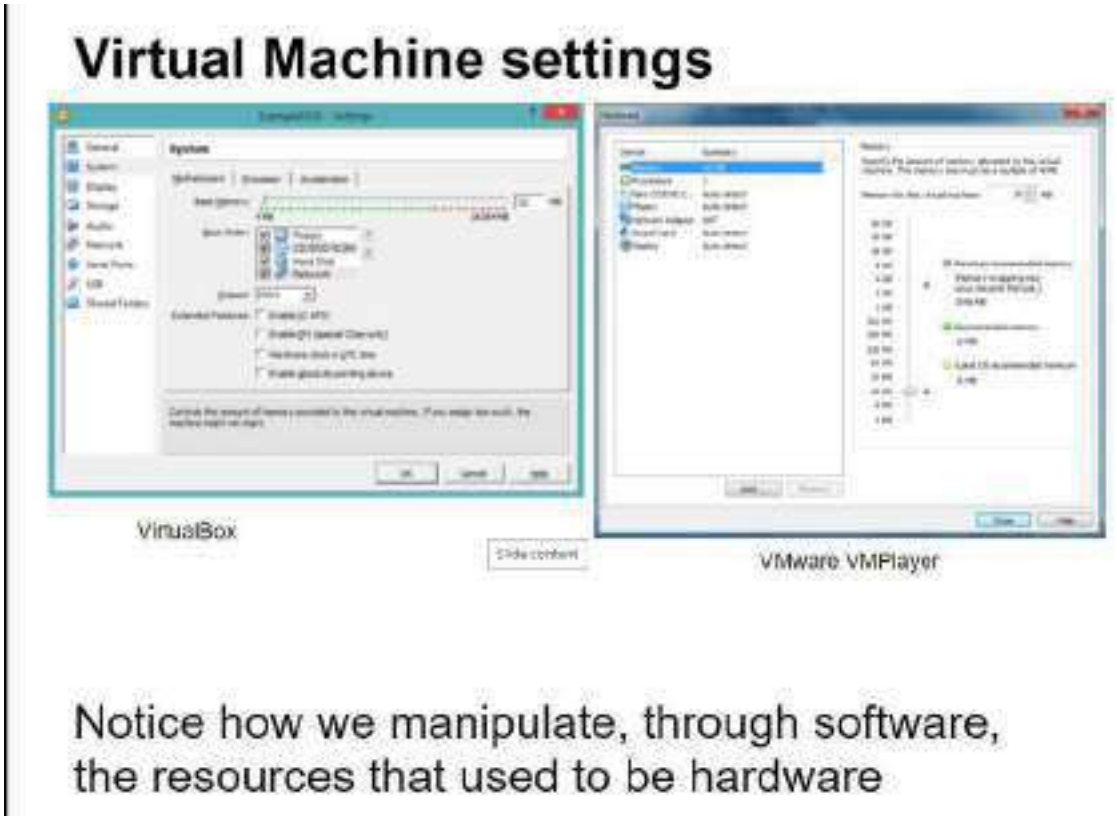
If your registration fails, try:
User ID : democloud1
Password : democloud2012

6. **Virtualization:**

Virtualization Exercise



Create a new virtual machine in VirtualBox.
Click next, next, etcetera for defaults (most can be changed later).
When it is created, right-click the icon for settings, including boot device. Notice the various hardware settings.
You can try to boot it, but without a bootable device it will fail.



Run more Virtual machines Copy the virtual machine images from the course USB drive to a local directory.
Find the files called *.vmx or *.ova and start them by double clicking.
Notice the servers booting up.
There is a web server, which you can browse to if you note the address.
There is a desktop (DSlinux), which you can click on to interact with it. Press Ctrl-alt to leave that window. Connect to Windows server
Use MSTSC from a Windows command line. (may not work with all firewalls).

7. Running a private cloud: http://devstack.org/ is a documented script to run OpenStack. Requires Github.
8. OpenStack
9. CloudStack
10. Apache Mesos
11. Eucalyptus
12. OpenNebula
13. AppScale
14. Tsuru
15. OpenShift Origin/OKD

16.

PaaS

Platform as a Service examples are also accessible for experimentation. Arguable the simplest example can be made with **Google maps**. By sending the appropriate URL to Google Maps, you can embed a map in your website. Try the next example:

http://maps.google.com/maps/api/staticmap?center=Eiffel+Tower&zoom=12&size=512x512&sensor=false

You may have to use Notepad or so to fold this to a single line. Then you can play around with the parameters. For example, change the location to 'Brooklyn+Bridge,New+York,NY'. Or change the maptype by adding '&maptype=terrain' add the end. You can also at a marker to the map with '&markers=color:green%7Clabel:E%7C48.8583,2.2945'. The example now becomes:

http://maps.google.com/maps/api/staticmap?center=Eiffel+Tower&zoom=12&size=512x512&sensor=false&maptype=terrain&markers=color:green%7Clabel:E%7C48.8583,2.2945

https://developers.google.com/maps/documentation/staticmaps/ has more documentation on the parameters you can change.
http://ws.geonames.org/postalCodeSearch?postalcode=90210&country=us

17.

Paas: the internet of things

Xively.com storing data streams from sensors.
Zapier.com to implement workflows over them

Example:
http://www.clubcloudcomputing.com/2014/02/cloud-things/

DEPARTMENT OF ELECTRONICS ENGINEERING
SUBJECT: CLOUD COMPUTING
PROF: PRANITA PADHYE

TOPIC: ENHANCING SECURITY OF HEALTH INFORMATION USING MODULAR ENCRYPTION STANDARD IN MOBILE CLOUD COMPUTING

GROUP MEMBERS

OMKAR POL:19103A0066
GANESH KUMBHAR:19103A0063
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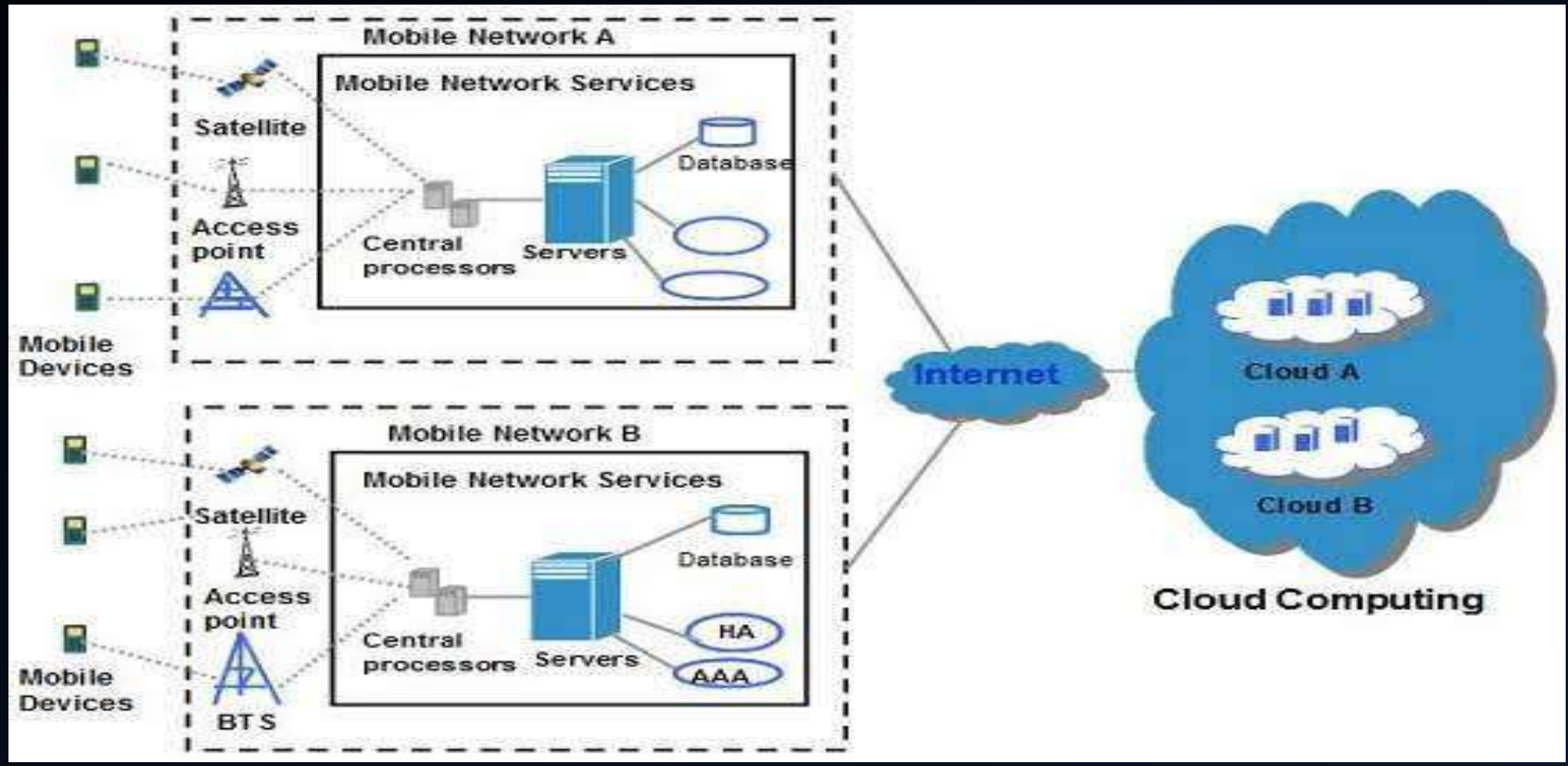
AKSHAY SALUNKHE:19103A0048

INTRODUCTION

- As computing technologies have rapidly growth , cloud computing has earned a lot of popularity in recent years through applications, services, storage, and computing over the Internet.
- It is commonly utilized in many domains like Medical Science, Agriculture, Business, Information Technology, and many others. Additionally, it encourages resource provisioning flexibility and cost-effective decoupling administrations.
- Smart devices like smartphones and tablets are progressively turning into a fundamental constituent of human life as a convenient and effective tool for communication that is not limited by place and time.
- Smart device users assemble rich experience of different administrations from mobile apps such as Google Applications and iPhone applications which run on the remote servers using wireless connectivity to the network. The integration of cloud computing with mobile phones is known as Mobile Cloud Computing (MCC) .

MOBILE CLOUD COMPUTING



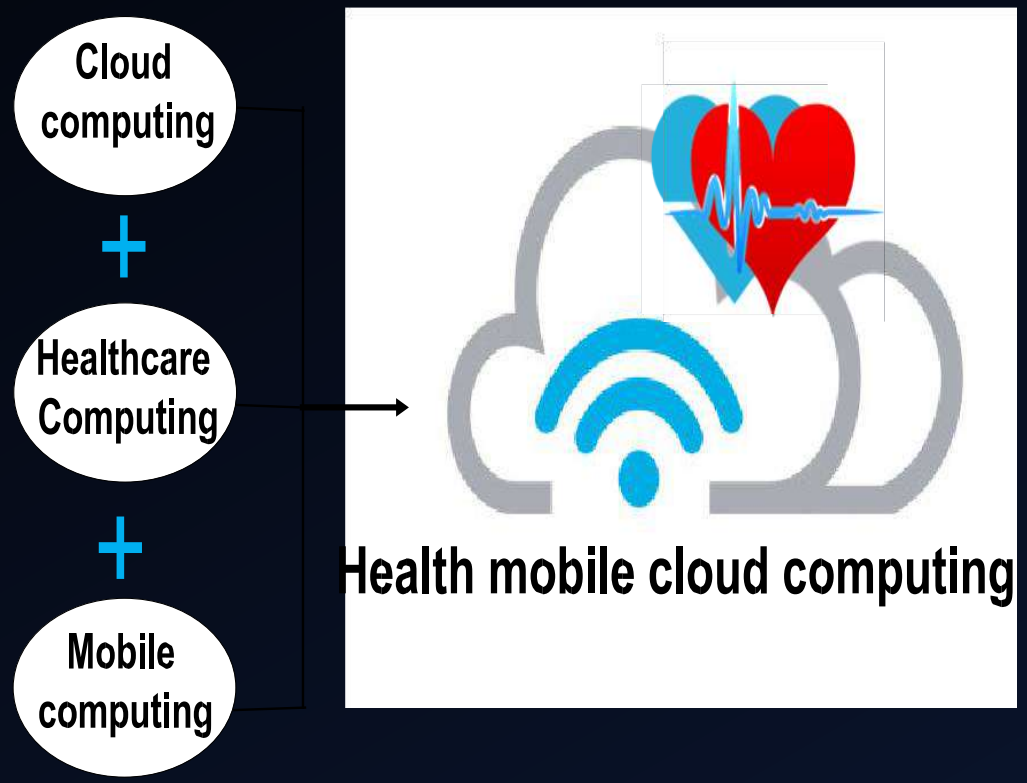
Security of Health Information (HI)

Security of Health Information (HI) is an iterative procedure (with the technological improvements) along with the changes to the healthcare environs. By the adaptation of new schemes to upgrade the quality and effectiveness of HI in practice, it is additionally imperative to reconsider the security policies and practices of HI . Recognizing the threats and securing the HI is challenging and demanding for small health-centers.

This research is intended to enable the practice to get ready for those demands and challenges, for effective risk assessment, and provide suitable security approaches to ensure HI security. In the healthcare domain, MCC offers several favors as:

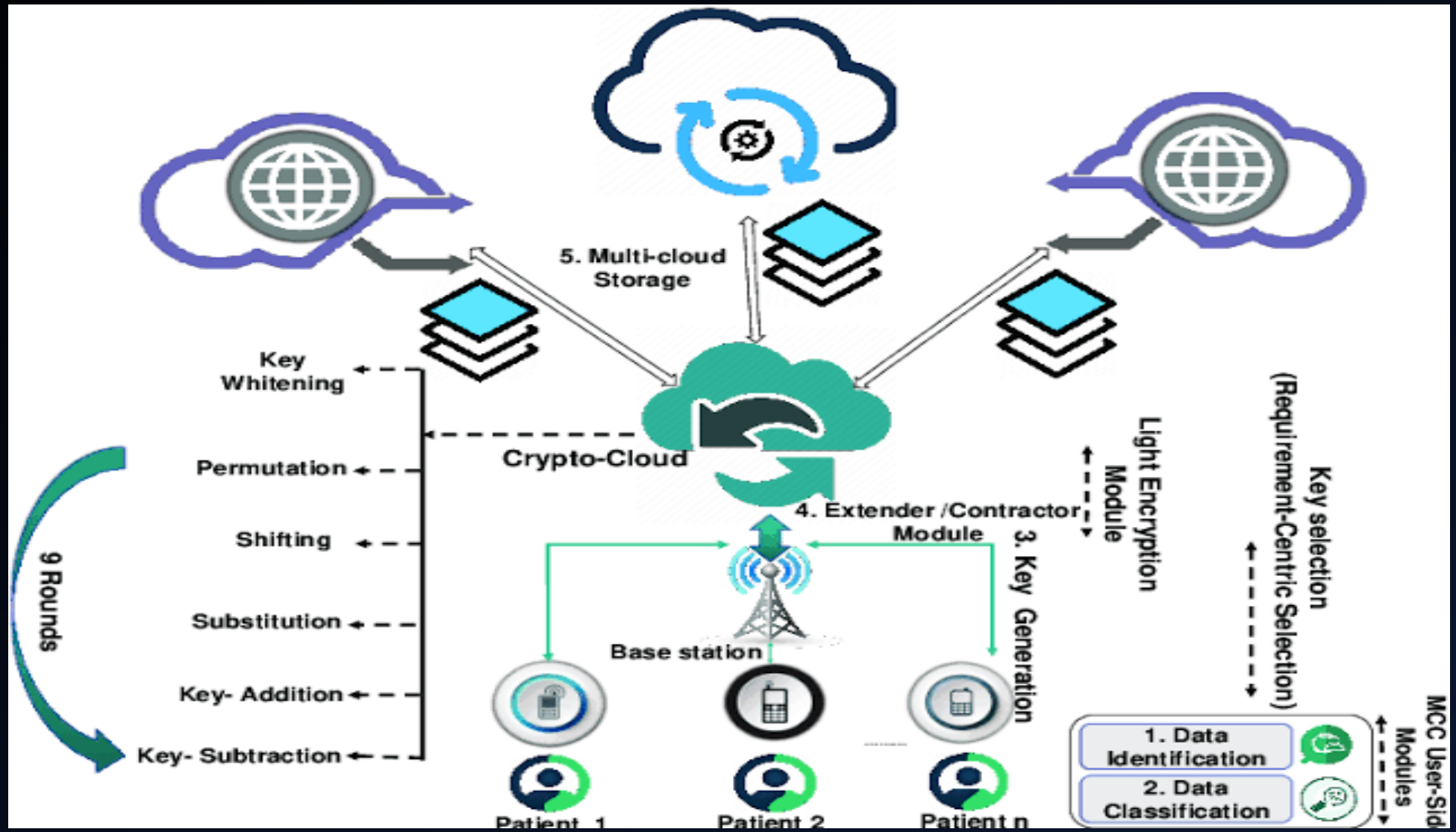
1) Portability: The facilitation of remote access monitoring of health information in a ubiquitous and distributed manner.
2) Scalability: The facilitation of remote access to patient information.
3) Modernization: MCC lessens the barriers to the modernization of healthcare applications.
4) Performance: A quick access to computing, big data storage can be done by MCC. It provides easy information sharing and cost reduction as well.
5) Collaboration: It provides team-care facilitation and maintained collaboration

- The integration and federation requirements from distinct domains like health insurance, hospitals, and medical laboratories, have evolved the domain of Health Information Security (HIS). HIS can be regarded as the utilization of e-commerce policies and practices and the infrastructure of Information Technology (IT) for the manipulation, sharing, and processing of Health Information (HI).
- It is one of the rising fields of public health and medical informatics. HI requires organized and coordinated tactics, which comprises the collection of HI monitoring and securing approaches at cloud . Among other solutions, MCC can be the leading HI monitoring approach.
- The integration of Cloud Computing, Healthcare Computing, and Mobile Computing are known as Healthcare Mobile Cloud Computing (HMCC) .



Healthcare monitoring using MES.

- MES includes three significant measures. These measures are ‘‘Identification (IDN)’’, ‘‘Classification (CLF)’’, and ‘‘Securing (SC)’’. IDN and CLF are performed at the MCC user side. While the SC step is performed at the Crypto-cloud. Crypto-cloud is the intermediary cloud that is dedicated to performing cryptography measures.
- A. IDENTIFICATION : The requirement for securing HI is directed by IDN and CLF characterization (as per the level of confidentiality of HI). Here, the identification (to distinguish the criticality and sensitivity of HI) would be performed. The IDN of Health records depends on the MCC client’s highlighted prerequisites.
- B. CLASSIFICATION :
- 1) NON-SENSITIVE DATA • Public Data e.g., Doctor’s/specialist’s availability hours and clinics etc.
- 2) SENSITIVE DATA • Less-Sensitive Data e.g., patient name, gender, etc. • Moderately-Sensitive Data e.g., Doctors/specialists or the medical centers to which the patient is referring, patient-doctor appointment date, timings, etc. • Highly-Sensitive Data e.g., Patient’s diagnostic reports, etc. • Extremely-High Sensitive Data e.g., Genetic Information, etc.


5. Multi-cloud Storage
Key Whitening
Permutation
Shifting
Substitution
Key- Addition
Key- Subtraction
9 Rounds
Crypto-Cloud
4. Extender /Contractor Module
3. Key Generation
Base station
Patient 1
Patient 2
Patient n
Light Encryption Module
Key selection (Requirement-Centric Selection)
1. Data Identification
2. Data Classification
MCC User-Side Modules

CONCLUSION

- Despite the prospective solutions offered by MCC in Health record monitoring, numerous impediments restrain the key potentials of MCC. Among these obstacles, security and privacy are the key hindrances in the utilization of MCC in healthcare.
- This is one of the considerable research gaps. Accordingly, this research utilizes a layered, modular, data nature-centric cryptography approach, for example, MES, that utilizes secure HI sharing, and storage mechanisms. The Comparative results show that this scheme outperforms other commonly used techniques (from different performance factors) in the MCC environment.
- Currently, this approach is intended for the enciphering and deciphering of textual data and there is no consideration of the image-oriented data-set yet. However, in future work, this issue would be considered.

Prospective solutions offered by MCC in Health record monitoring, numerous impediments restrain the key potentials of MCC. Among these obstacles, security and privacy are the key hindrances in the utilization of MCC in healthcare. This is one of the considerable research gaps. Accordingly, this research utilizes a layered, modular, data nature-centric cryptography approach, for example, MES, that utilizes secure HI sharing, and storage mechanisms. The Comparative results show that this scheme outperforms other commonly used techniques (from different performance factors) in the MCC environment. espi the prospective solutions offered by MCC in Health record monitoring, numerous impediments restrain the key potentials of MCC. Among these obstacles, security and privacy are the key hindrances in the utilization of MCC in healthcare. This is one of the considerable research gaps. Accordingly, this research utilizes a layered, modular, data nature-centric cryptography approach, for example, MES, that utilizes secure HI sharing, and storage mechanisms. The Comparative results show that this scheme outperforms other commonly used techniques (from different performance factors) in the MCC environment.

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[2] H. Qi and A. Gani, ‘‘Research on mobile cloud computing: Review, trend and perspectives,’’ in Proc. 2nd Int. Conf. Digit. Inf. Commun. Technol. Appl. (DICTAP), May 2012, pp. 195–202.

A Comparative study on RIP and OSPF protocols
Analysis of RIP and OSPF protocols using GNS-3

BE (Electronics Engineering)

by

Anusha Sarla

Sanmesh Shintre

Divya Jain

Introduction

A routing protocol shows the communication between various routers.

- It is used to determine the routes. Each router contains details of its neighboring networks only.
- A routing protocol shares this information first among immediate neighbors, and then throughout the network. This way, routers gain knowledge of the topology of the network.
- The classification of Routing are basically into two types namely static routing and dynamic routing. Static routing is done manually whereas dynamic routing uses certain protocols. RIP, OSPF, IGRP, EIGRP and IS-IS are some of the routing protocols.
- All these are interior gateway routing protocols. RIP is a distance vector routing protocol, OSPF is a link state routing protocol and EIGRP is a hybrid protocol.
- The performance of RIP and OSPF can be analyzed by using GNS-3.

Routing Information protocol

- RIP is a distance vector routing algorithm and it makes use of hop count as the metric.
- Hop count can be defined as the number of intermediate devices through which data is transferred from the source to the destination. The maximum number of hops is 15, which means that the data can be transferred through a maximum of 16 nodes.
- This is one of the major limitation of RIP. It cannot exceed the hop count limit of 15. A hop count of 16 is also considered as unreachable.It implements split horizon, route poisoning and hold-down mechanisms to prevent wrong routing information from being sent.
- RIP transfers in every 30s. RIPv1, RIPv2, RIPng are different versions of the RIP. After enabling the RIP in the network the RIP protocols advertise its broadcast messages to all the RIP interfaces and receives the response.
- The router table gets updated once in every 30 secs. The routing protocol priority is set by using the administrative distance value which is 120 by default.

Versions of rip:

- A. RIPv1:

RIPv1 is based on local broadcasting. The updates occur in every 30s. There is a hop count limit to prevent the packets from going around the loop forever. Any packet that is on the 16th hop is discarded. It is a classfull protocol. There is also no support for router authentication, making RIP prone to various attacks.

- B. RIPv2:

RIPv2 is a distance vector routing protocol which is an enhancement of RIPv1. It is also called as hybrid routing protocol. RIPv2 uses multicasts whereas RIPv1 uses broadcasts. RIPv2 supports triggered updates. It notifies any changes that RIPv2 is a classless protocol and it supports variable-length subnet masking (VLSM). Both RIPv1 and RIPv2 uses hop count as the metric.

- C. RIPng:

RIPng stands for RIP next generation. It is an extension of RIPv2 which supports IPv6.

OPEN SHORTEST PATH FIRST (OSPF):

- OSPF is a router protocol which is used for larger networks other than using RIP. OSPF immediately multicasts any changes that is made in the network to all the other hosts. RIP advertises the entire routing table, whereas OSPF sends only the part that has changed. RIP sends the routing table to the neighbors in every 30 seconds. OSPF multicasts the updated information only when a change has taken place. It also sends hello packets in every 10s.
- **Significant features of OSPF:**

i) Fast convergence: OSPF updates any changes in the network topology to the neighboring routers.

ii) Support for large networks: the network diameter is virtually limitless.

iii) Fully classless routing protocol

iv) Efficient and reliable transport of routing updates.

v) It provides scalability.

Different Versions of OSPF:

1) OSPFv1
2) OSPFv2
3) OSPFv3

COMPARITIVE ANALYSIS

METRICS	RIP	OSPF
No of nodes	Maximum of 16 nodes only can be used	N number of nodes can be used
Shares	Shares the whole database	Shares the link alone
Data known	Contains details only about its neighbors	Contains details of the entire database
Advertising time	The advertisements are sent in every 30s	The advertisements are sent in every 10s
Advertising data	The whole database is advertised each time which results in overhead	Only the updated data is advertised which minimizes overhead
Algorithm used	Distance vector algorithm	Link state algorithm
Error detection	It cannot detect errors or failures	It can detect errors or failures
Metric used	It uses hop count	It uses cost metrics
Summarization	Auto-summarization	Manual summarization
Implementation	RIP is easy to implement	OSPF consists of complex processes
Network	Efficient for small networks	Efficient for large networks
Packet loss	More when there is a failure	Comparatively less than RIP

.

Conclusion

- RIP sends the whole routing information through periodic updates which overloads the network and results in unnecessary waste of bandwidth.
- RIP has a high latency value than OSPF. RIP has higher convergence time than OSPF and hence it is suitable only for smaller networks.
- OSPF on the other hand has fast convergence and efficiently uses the bandwidth. Since OSPF has fast convergence, packet loss is less.
- The throughput rate is higher for OSPF than RIP. Hence reliability and efficiency of OSPF is more than RIP. OSPF has the least cost of transmission compared to RIP.
- When OSPF and RIP are implemented together in a network, OSPF is chosen over RIP as it has a lower administrative distance value than RIP.
- OSPF is the best choice for larger networks and RIP can be limited to simple and small networks.

References

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- Shah.A, Waqs J. Rana ,"Performance analysis of RIP and OSPF protocols in Network using OPNET", International Journal of Computer Science Issues, Vol.10, Iss.6, pp. 2-5,November 2013.
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1. SSH Implementation:

Take any topology in packet tracer and implement SSH

```
ssh UserName@SSHserver.example.com
```

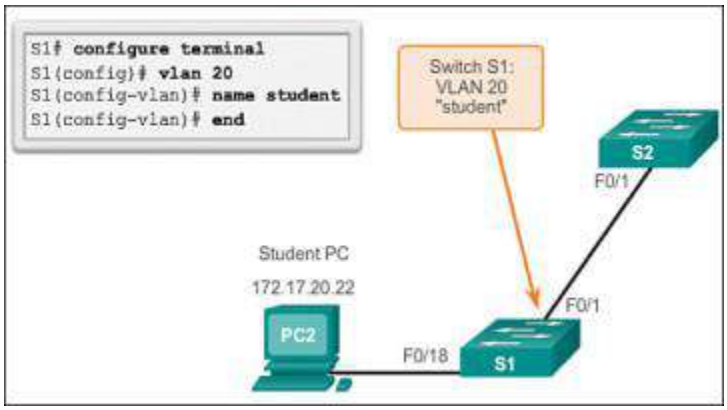
This command will cause the client to attempt to connect to the server named *server.example.com*, using the user ID *User Name*. If this is the first time negotiating a connection between the local host and the server, the user will be prompted with the remote host's public key fingerprint and prompted to connect, despite there, having been no prior connection:

The output should be

```
The authenticity of host 'sample.ssh.com' cannot be established.
 DSA key fingerprint is 01:23:45:67:89:
ab:cd:ef:ff:fe:dc:ba:98:76:54:32:10.
 Are you sure you want to continue connecting (yes/no)?
```

2. Implementation of VLAN

Create VLAN for following topology or you can use your own topology



CCS MICRO PROJECT

How to use VMWare to setup virtual machines

TEAM MEMBERS

Yash Gajare
Aniket Babar
Aditya Dhage

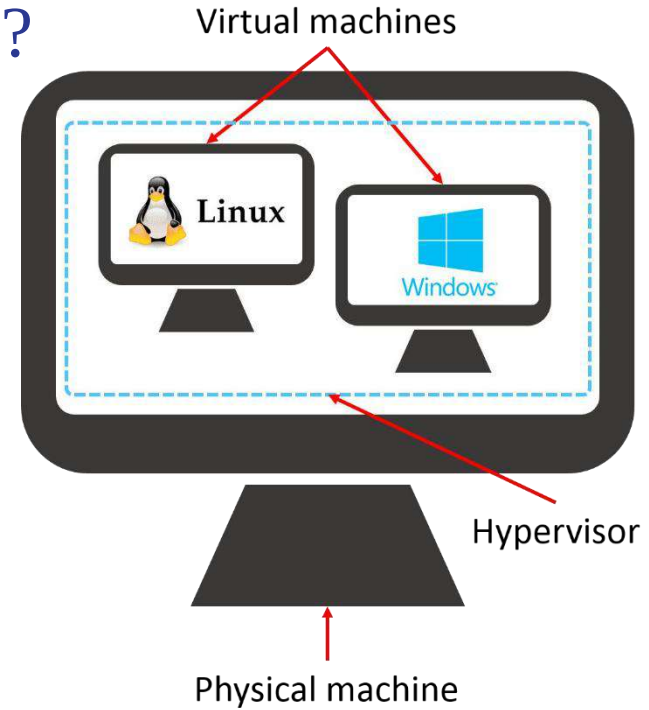
Manish Borse

WHAT IS VMWARE WORKSTATION ?

VMware Workstation is a line of Desktop **Hypervisor** products which lets users run virtual machines, containers and Kubernetes clusters.

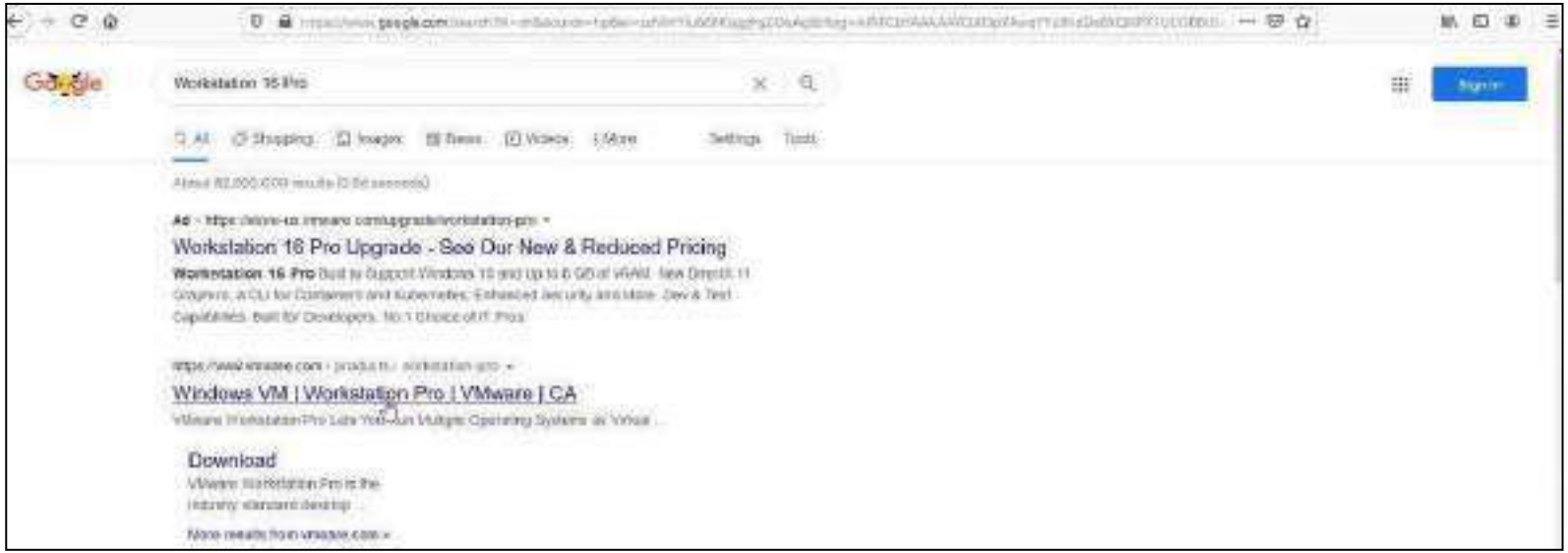
VMware Workstation is a type 2 hypervisors. It means that the application must be installed on theunderlying host operating system running on a physical computer.

In simple words , one can use it to run multipleoperating systems over a single hardware.

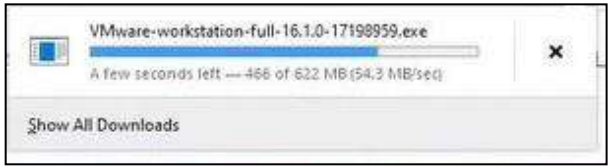


Steps to install VMWare

Step 1: Download VmWare workstation pro

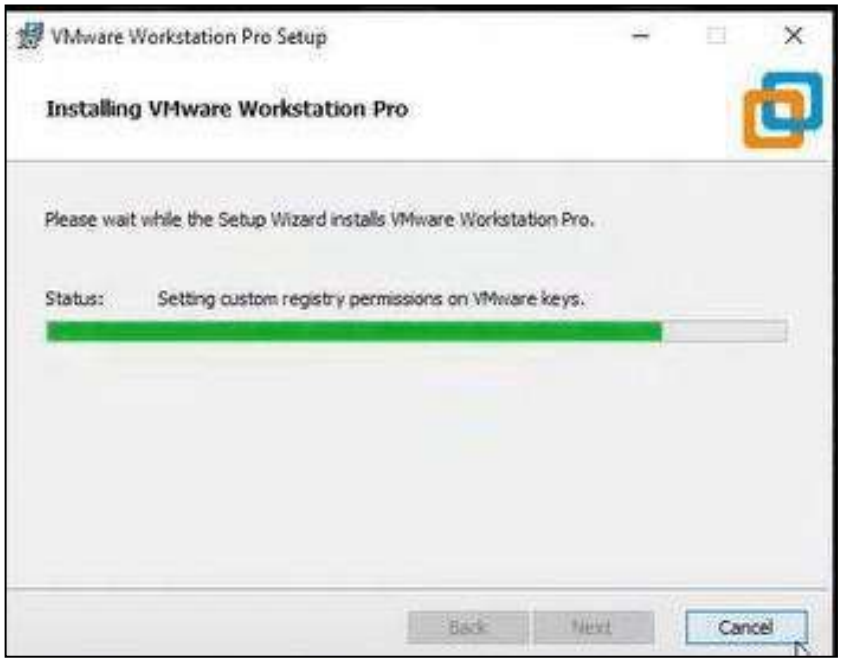

Workstation 16 Pro
Workstation 16 Pro Upgrade - See Our New & Reduced Pricing
Windows VM | Workstation Pro | VMware | CA
Download

Step 2: Click on download now



A dialogue box will appear read all the rights reserved and click on next

Click on finish when everything is downloaded.



In this box we have two options:

1.) License key
2.) 16 to 30 days Free trail.

We have clicked on free trail. Some free license key are available on google we can test andtry them.

How to Create a Virtual Machine Using VMware Workstation

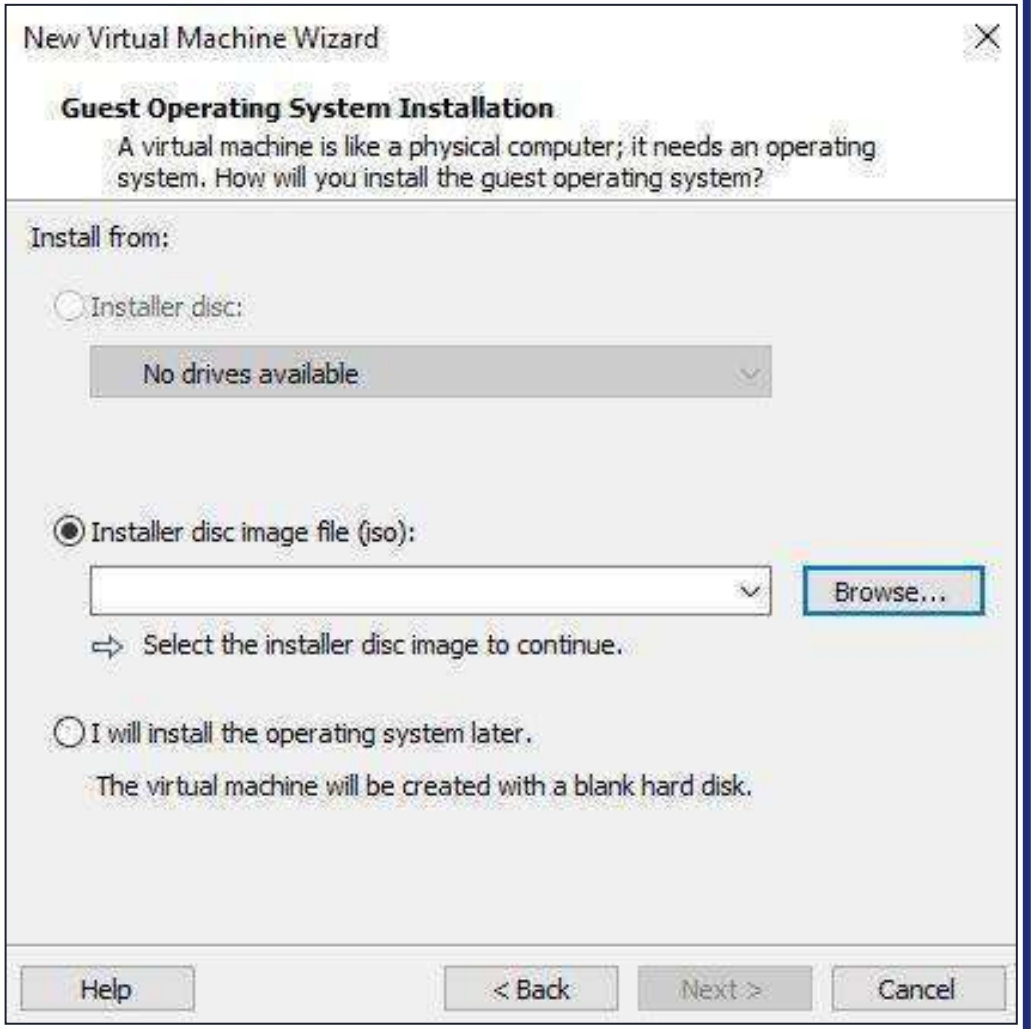
Step 1 : Launch the VMware workstation app on your desktop and click the Create a New Virtual Machine button.

Step 2 :

Once clicked, a new pop-up window will appear. Select Typical (recommended) and click on the Next button to perform the recommended configuration.

Step 3 :

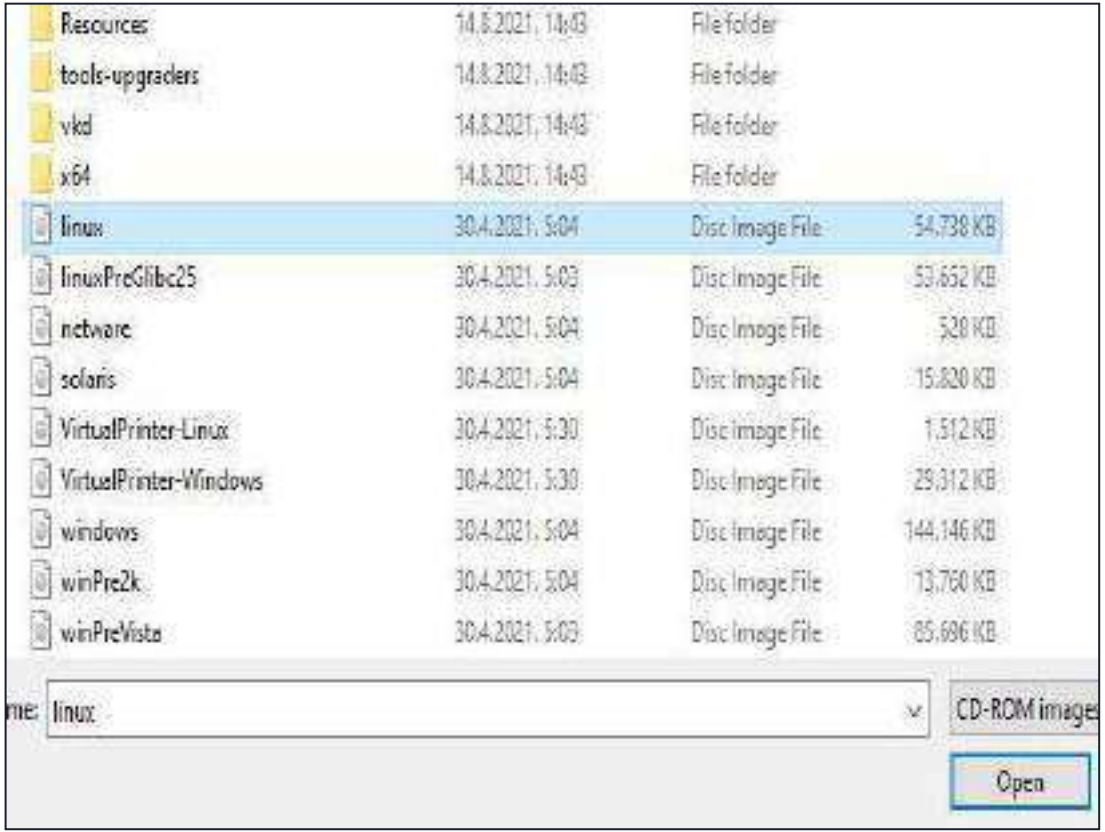
Next, choose the operating system on which your virtual machine will run. A new window for the installation of the guest operating system will appear. Choose Installer disc image file (iso): and click the Browse… button.



Step 4 :

VMware workstation will automatically open a directory where disc images of operating systems are stored.

We chose the linux disc image file for this tutorial, but you can choose whatever you prefer. After selecting your file, click theOpen button.

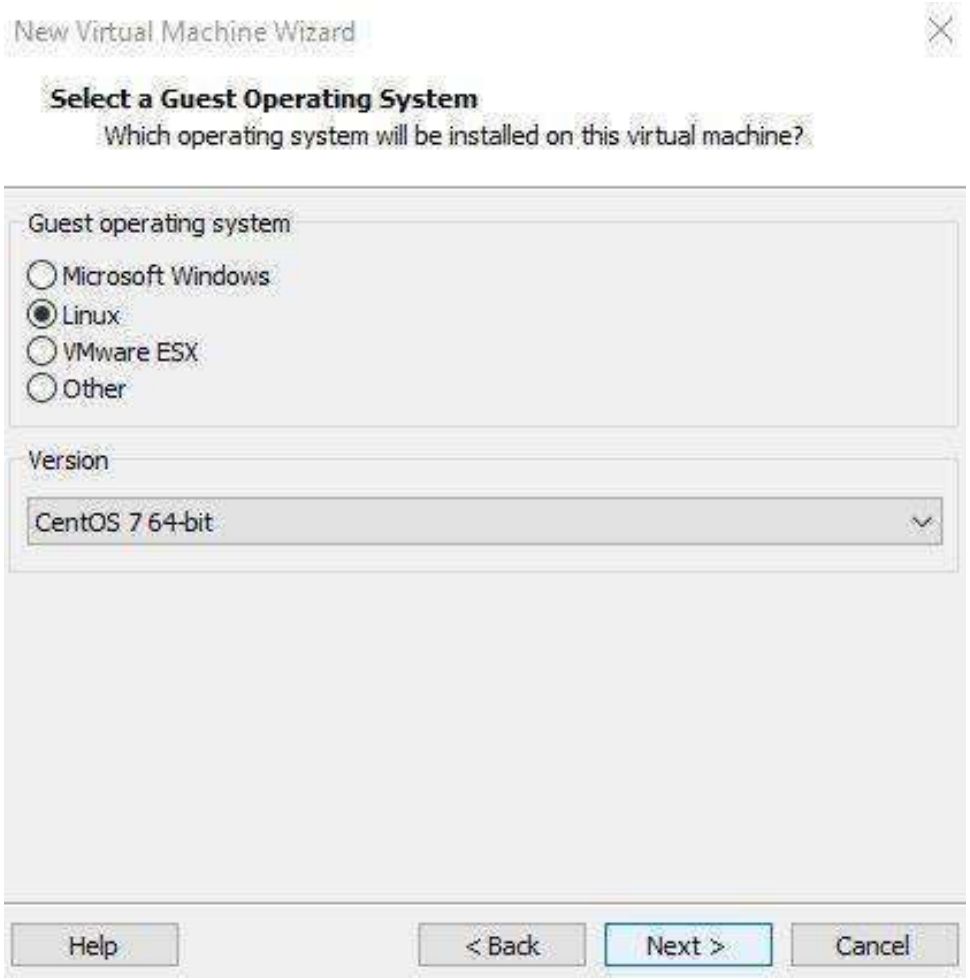


Step 5 : click the Next button.

Now we will choose an operating system from the long list of available options. For this tutorial, we selected:

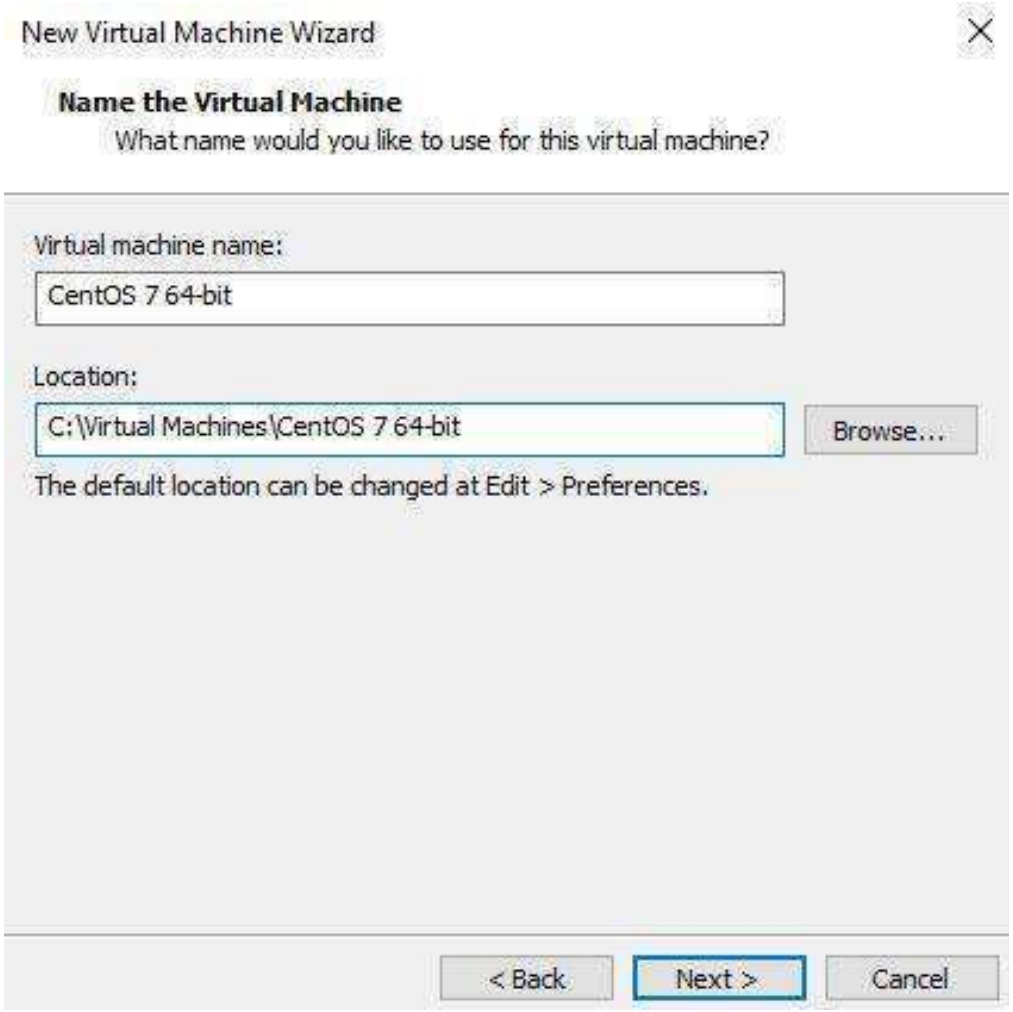
Guest operating system: Linux
Version: CentOS 7 64-bit

Click next button



Step 6 :

Now we will name our VM and choose its location. Choose whatever name you want for your virtual machine. The default location is your Documents folder. We saved our VM to a folder called Virtual Machines. Click the Next button.

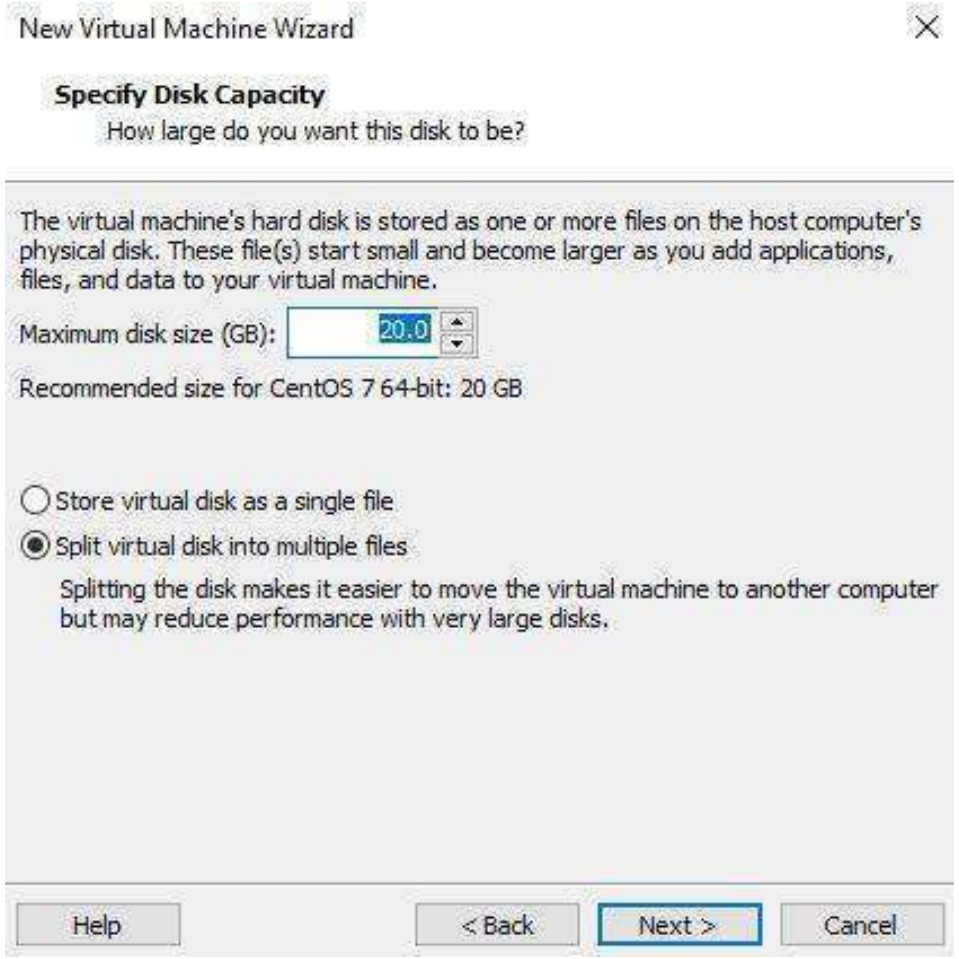


Step 7 :

Next, specify the disk space capacity for your virtual machine. The space you allocate for your VMis up to you. We went with the recommended 20GB as we are using CentOS 7.

Select whether you want to store your virtual disk as a single file or split into multiple files. One file will have everything in one place, but multiple files will make it easier to move if necessary.

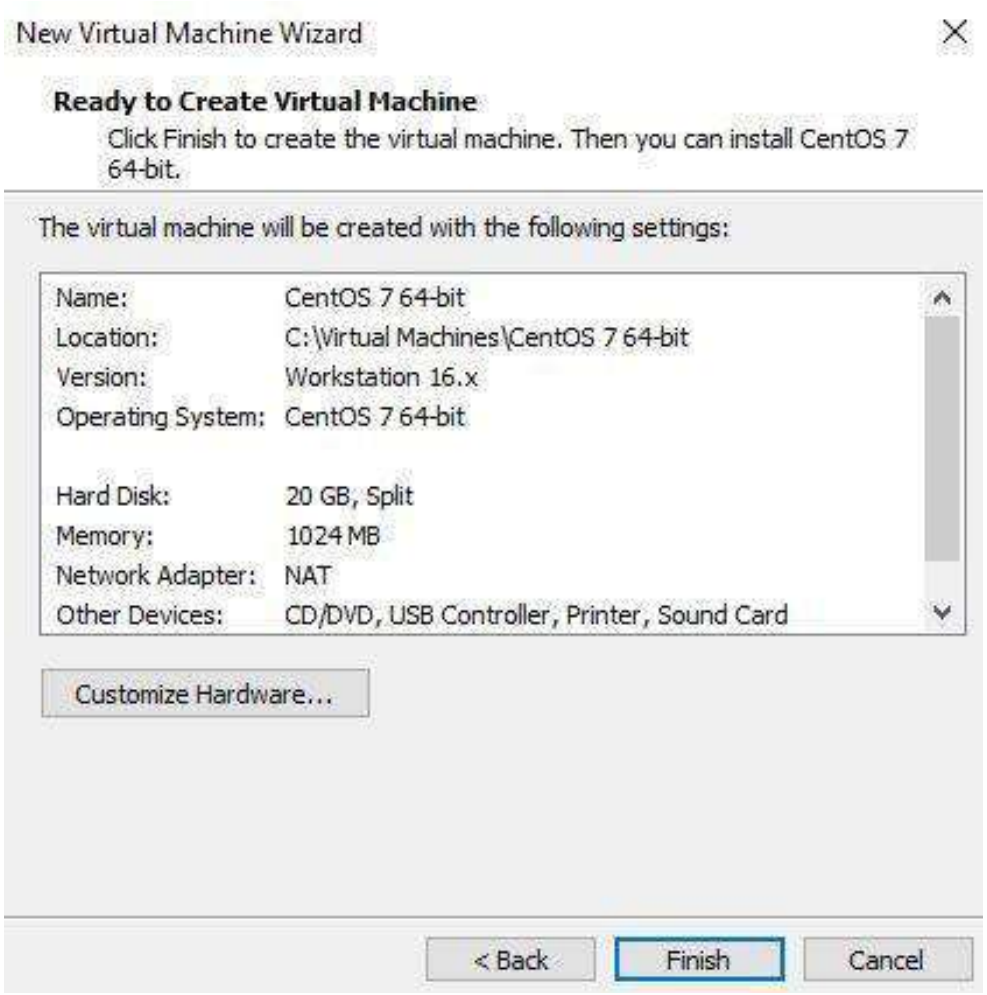
Click Next once you have made your selections.



Step 8 :

A final pop-up window indicates your virtual machine is ready to be created. It provides a breakdown of your chosen settings but make sure to double-check everything is correct.

If everything is correct, click Finish.



IP Address Assignment

1) Given the CIDR representation 20.10.30.35 / 27. Find the range of IP Addresses in the CIDR block.
2) Given the CIDR representation 100.1.2.35 / 20. Find the range of IP Addresses in the CIDR block.
3) Consider a block of IP Addresses ranging from 100.1.2.32 to 100.1.2.47.
    a. Is it a CIDR block?
    b. If yes, give the CIDR representation
4) Suppose a network with IP Address 192.16.0.0. is divided into 2 subnets, find number of hosts per subnet. Also, for the first subnet, find-
    a. Subnet Address
    b. First Host ID
    c. Last Host ID
    d. Broadcast Address
5) What is **not true** about subnetting?
    a. It is applied for a single network
    b. It is used to improve security
    c. Bits are borrowed from network portion
    d. Bits are borrowed from Host portion
6) In a class B, network on the internet has a subnet mask of 255.255.240.0. What is the maximum number of hosts per subnet?
    a. 4096
    b. 4094
    c. 4092
    d. 4090
7) If the subnet mask 255.255.255.128 belongs to class C, find-
    a. Number of subnets
    b. Number of hosts in each subnet
8) If a class B network has a subnet mask of 255.255.248.0, what is the maximum number of hosts per subnet?
    a. 1022
    b. 1023
    c. 2046
    d. 2047
9) Consider the following subnet masks-

1. 255.0.0.0

2. 255.128.0.0
3. 255.192.0.0
4. 255.240.0.0
5. 255.255.0.0
6. 255.255.254.0
7. 255.255.255.0
8. 255.255.255.224
9. 225.255.255.240

For each subnet mask, find-

a. Number of hosts per subnet
b. Number of subnets if subnet mask belongs to class A
c. Number of subnets if subnet mask belongs to class B
d. Number of subnets if subnet mask belongs to class C
e. Number of subnets if total 10 bits are used for the global network ID

Name of the Student	**Navdeep patil** **Shritej Magare**
Roll Number	**20103B0049** **20103B0018**
Division	A
Semester	SEM 6
Branch	ETRX
Subject	CCN
Subject Teacher	Prof. Pranita Padhye
Lab No	M-512

Experiment Number	**8/PBL**
Experiment Title	1. Dynamic NAT Implementation.

Faculty	**Signature**	**Marks**

Theory:

Network Address Translation (NAT): It is a process in which one or more local IP addresses are translated into one or more Global IP addresses and vice versa to provide Internet access to the local hosts. To access the Internet, one public IP address is needed, but we can use a private IP address in our private network. The idea of NAT is to allow multiple devices to access the Internet through a single public address.

Static NAT: In this, a single private IP address is mapped with a single Public IP address, i.e., a private IP address is translated to a public IP address. It is used in Web hosting. These are not used in organizations as there are many devices that will need Internet access and to provide Internet access, a public IP address is needed.

Dynamic NAT: In this type of NAT, multiple private IP addresses are mapped to a pool of public IP addresses. It is used when we know the number of fixed users who want to access the Internet at a given point in time.

PAT (Port Address Translation): This is also known as NAT overload. In this, many local (private) IP addresses can be translated to a single public IP address. Port numbers are used to distinguish the traffic, i.e., which traffic belongs to which IP address. This is most frequently used as it is cost-effective as thousands of users can be connected to the Internet by using only one real global (public) IP address.

Term	Description
Inside Local IP Address (Private IP)	Before translation source IP address is located inside the local network.
Inside Global IP Address (Public IP)	After translation source IP address is located outside the local network.
Outside Global IP Address (Public IP)	Before translation destination IP address is located outside the remote network.
Outside Local IP Address (Private IP)	After translation destination IP address is located inside the remote network.

These addresses are different from public IP addresses in that they do not have to be unique, other devices can use the same address provided they aren't on the same network. This is because devices on the private network cannot communicate with outside devices, which eliminates the risk of an address conflict.

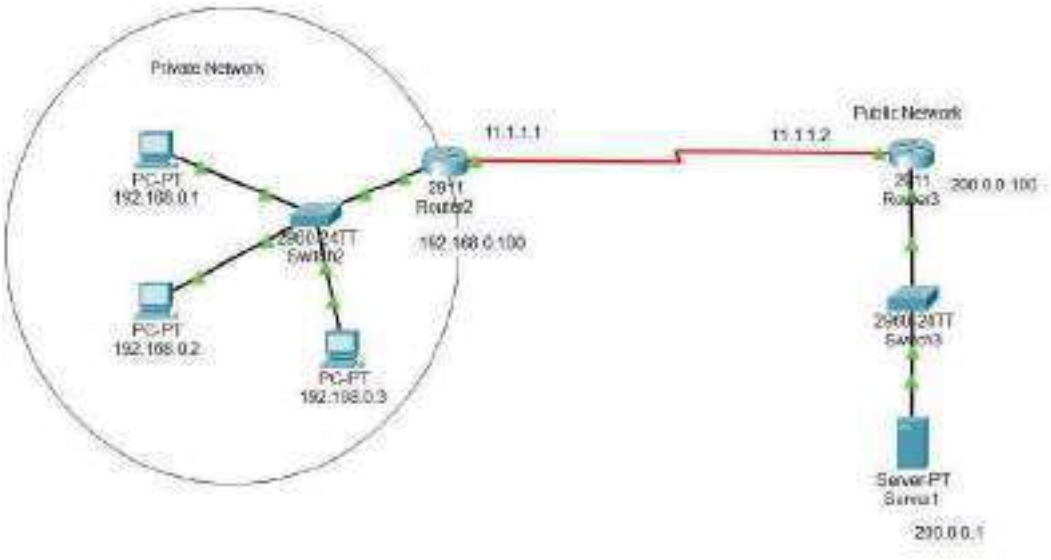
Class A: 10.0.0.0 — 10.255.255.255

Class B: 172.16.0.0 — 172.31.255.255

Class C: 192.168.0.0 — 192.168.255.255

Private IP address exists within specific private IP address ranges reserved by the Internet Assigned Numbers Authority (IANA) and should never appear on the Internet.

Topology: -



IP address assignment-

Device	Port	Private IP Address
Router 2	Gbit0/0	192.168.0.100
	Se2/0	11.1.1.1
Router 3	Gbit0/0	200.0.0.100
	Se2/0	11.1.1.2
Server	Fa0/0	200.0.0.1
PC0	Fa0	192.168.0.1
PC1	Fa0	192.168.0.1
PC2	Fa0	192.168.0.1

Commands-

For Dynamic Routing- Configure

dynamic routing in R2.

R2(config)#ip route 0.0.0.0 0.0.0.0 11.1.1.2

Dynamic NAT implementation on router 2

R2(config)#int g0/0

R2(config-if) #ip nat inside

R2(config-if) #exit

R2(config)#int se0/2/0

R2(config)#ip nat outside

R2(config)#exit

R2(config)# access-list 50 permit 192.168.0.0 0.0.0.255

R2(config-if) #ip nat pool publicip 50.0.0.1 50.0.0.255 netmask 255.255.255.0

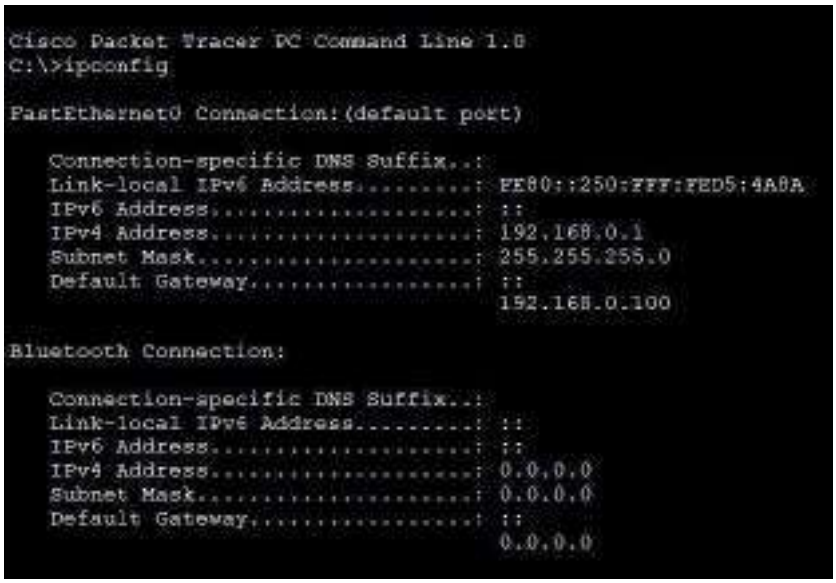
R2(config)#ip nat inside source list 50 pool publicip

R2(config-if) #exit

AT the End test the communication between two PC to test whether your Routing is properly configured or not.

First Check the IP Address of PC:

PC>ipconfig



Then Ping with server:

PC>ping 200.0.0.1

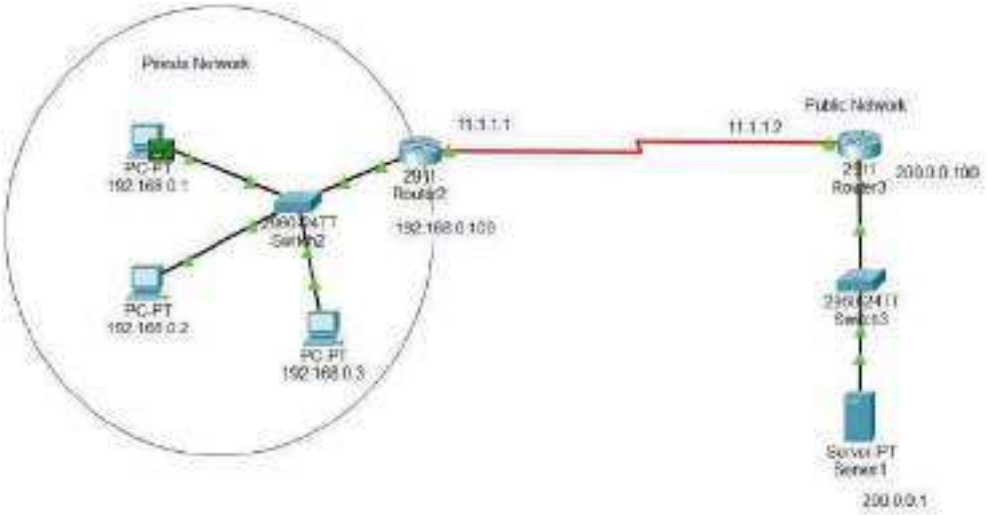
```
C:\>ping 200.0.0.1

Pinging 200.0.0.1 with 32 bytes of data:

Request timed out.
Request timed out.
Reply from 200.0.0.1: bytes=32 time=14ms TTL=126
Reply from 200.0.0.1: bytes=32 time=10ms TTL=126

Ping statistics for 200.0.0.1:
    Packets: Sent = 4, Received = 2, Lost = 2 (50% loss),
Approximate round trip times in milli-seconds:
    Minimum = 10ms, Maximum = 14ms, Average = 12ms
```

You can see another PC is Receiving the Packets. It means It's working fine.



Conclusion: Dynamic NAT Implementation was successfully done.

DEPARTMENT OF ELECTRONICS ENGINEERING

REPORT ON TECHNICAL ACTIVITY

SUBJECT: ADVANCED NETWORKING TECHNOLOGY

"Optical Networking Technologies That Will Create Future Bandwidth-Abundant Networks"

PRESENTED BY

HEMANT BHOIR - 19103B0024

DEPARTMENT OF ELECTRONICS ENGINEERING

INTRODUCTION :

Broadband access including ADSL and FTTH is being rapidly adopted throughout the world and, as a result, traffic is continually increasing by around 50% every year in North America and Japan. The number of FTTH subscribers exceeded thirteen million in Japan and three million in the USA in 2008. In order to cope with the traffic increase, optical transmission and node technologies are being extensively developed. The maximum number of WDM wavelengths per fibre exceeds one hundred, and WDM transmission systems with a channel speed of 40G bits/s are now being introduced in some countries.

OBJECTIVE :

The transport network paradigm is moving toward next-generation networks that aim at IP convergence, while architectures and technologies are diversifying. Video technologies including ultrahigh-definition TV (more than 33M pixels) continue to advance, and future communication networks will become video-centric. The inefficiencies of current IP technologies the energy consumption and throughput limitations of IP routers, will become pressing problems.

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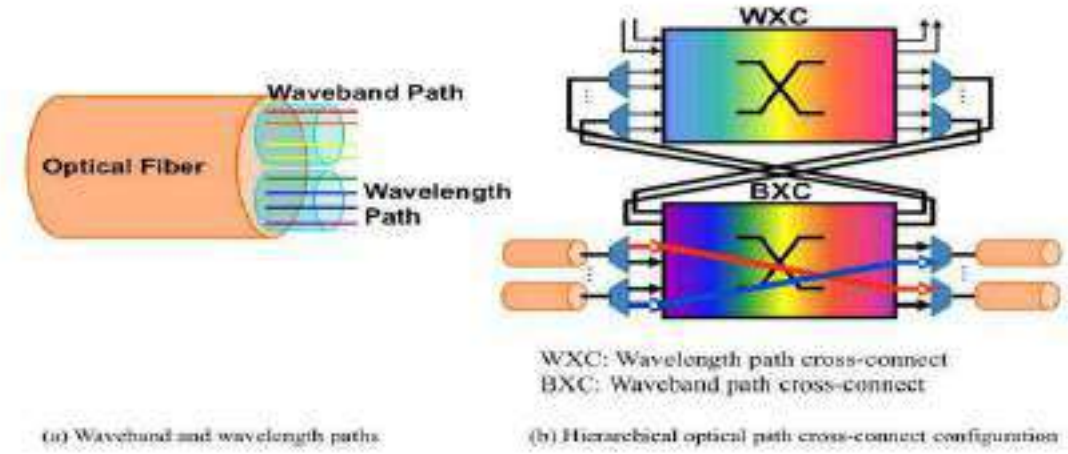
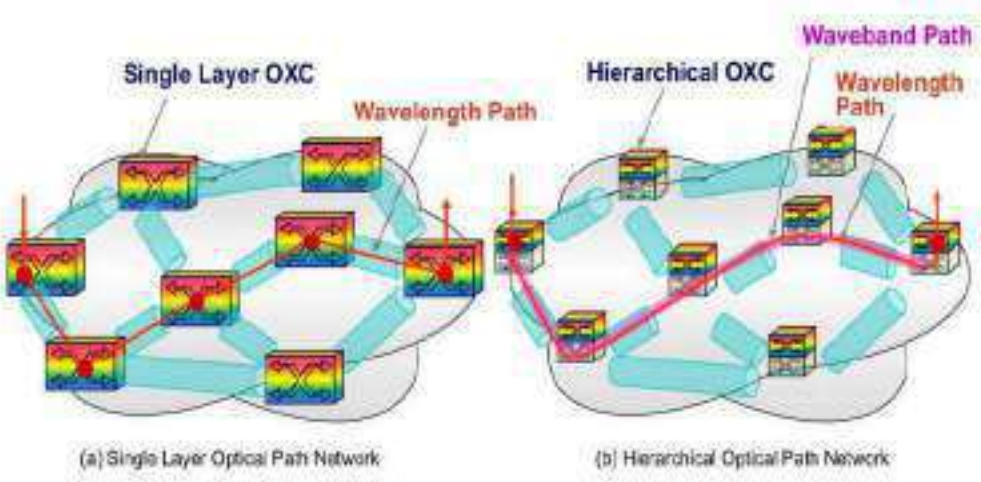
BLOCK DIAGRAM :





DEPARTMENT OF ELECTRONICS ENGINEERING

CONCLUSION :

To create future networks, the hierarchical optical path network and node technologies and network architectures that fully harness the power of optical transmission are of great importance. Fast optical circuit/path switching will play a key role in creating cost-effective and bandwidth-abundant future networks. Those technologies need to be fully developed soon, and some of the recent advances have been demonstrated.

Alison

Certificate

CPD CERTIFIED
The CPD Certification Service

This is to certify that

Prathamesh Gothankar

Successfully obtained certificate in

Computer Networking - Digital Network Security

1447-3852240

Director of Certification

Date of Award

VIT Vidyalankar Institute of Technology
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Cloud Computing & Security

Micro Project

Group Members: Shefali Bala, Karzan Kumana, Malhar Shenolikar and Balaji Durai Masanam

About the Project

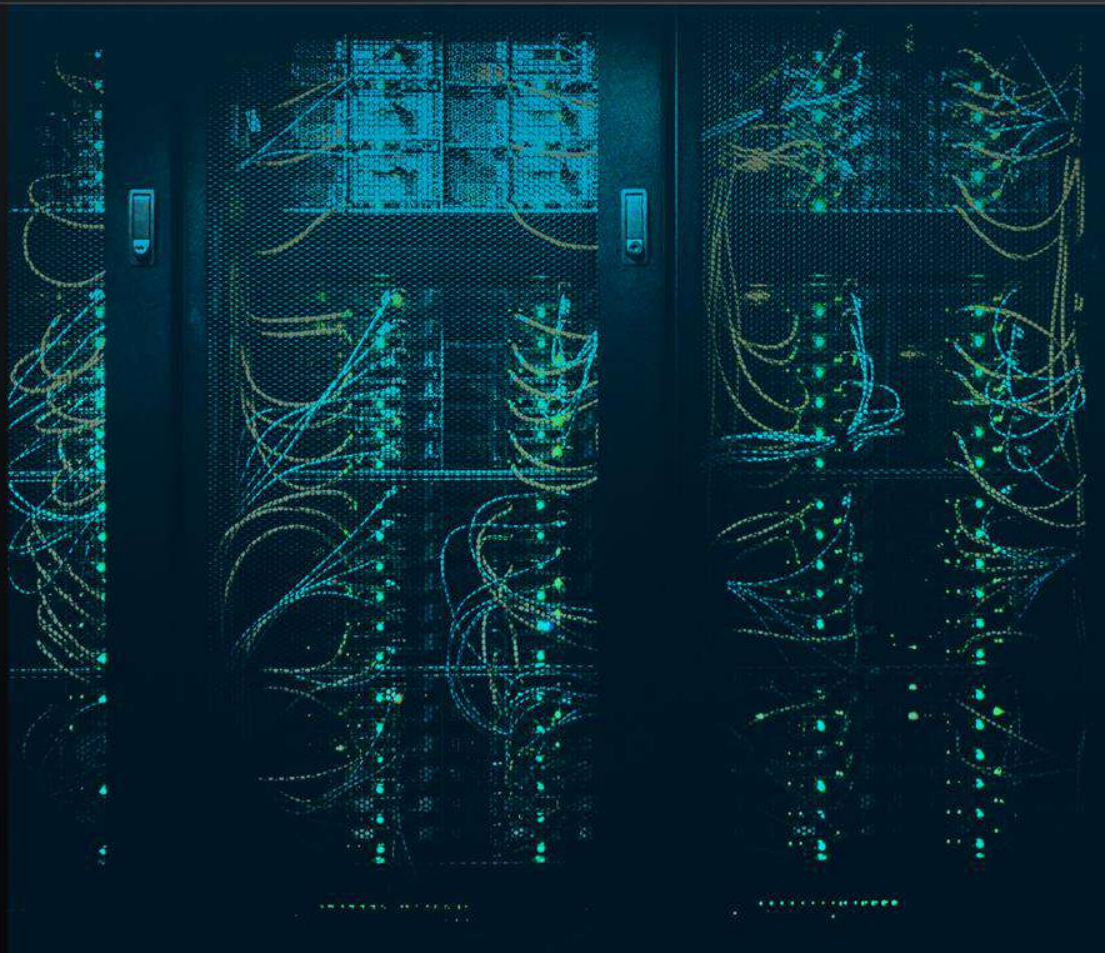
How did we do it?

The Code

Get Started →

About the Project

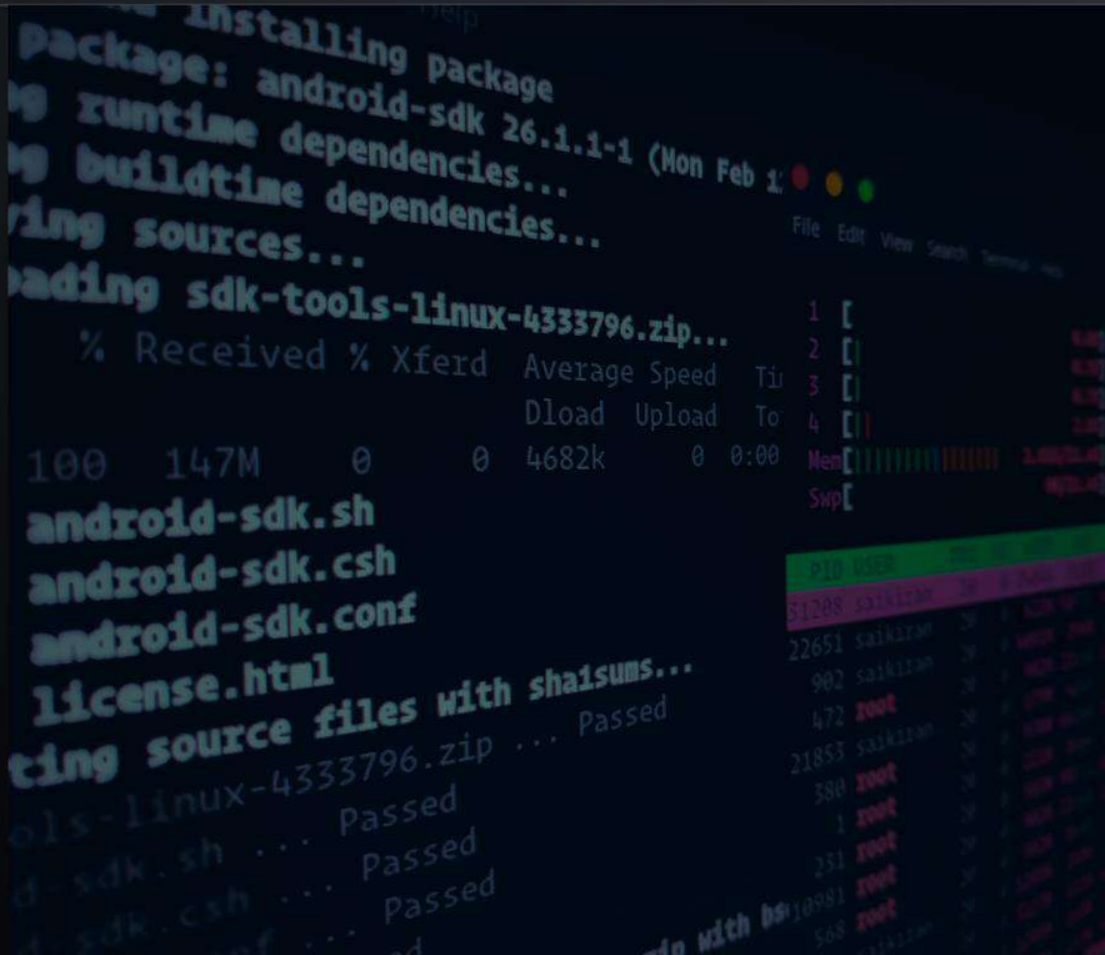
We focus on the creation of a Virtual Machine, hosting a web server and ultimately our own website.



How did we do it?

- On MS Azure, create a virtual machine.
- Download PuTTY and FileZilla. Keep it ready for use.
- Type in the code on PuTTY to activate Apache Web Server.
- Download a website template and add it to FileZilla.

You can now see your website on the VM!



The Code

Disclaimer: This is for the setting up of Apache Web Server on PuTTY. Type this on the CMD of PuTTY.

Step 1

Downloading Apache

- yum update
- yes
- yum install httpd
- yes

Step 2

To check the status

- systemctl status httpd

Step 3

To activate httpd

- systemctl status httpd
- systemctl enable httpd

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Cloud Computing & Security

Micro Project

Thank you

Student Roll. Nos : 19104A0004, 19104A0010	Faculty In charge: Prof. Pranita Padhye

An enhanced encryption-based security framework in the CPS Cloud.

Cyber-physical Systems (CPS) are large-scale collections of cyber- and physical components. These are used as it enhances interoperability i.e., its ability to exchange and make use of information on Cloud. It is a system environment which can be build, modify composed set of cloud computing-based sensor, processing, control, and data services.

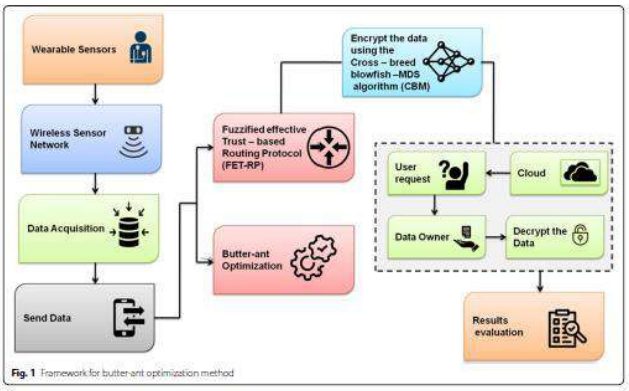
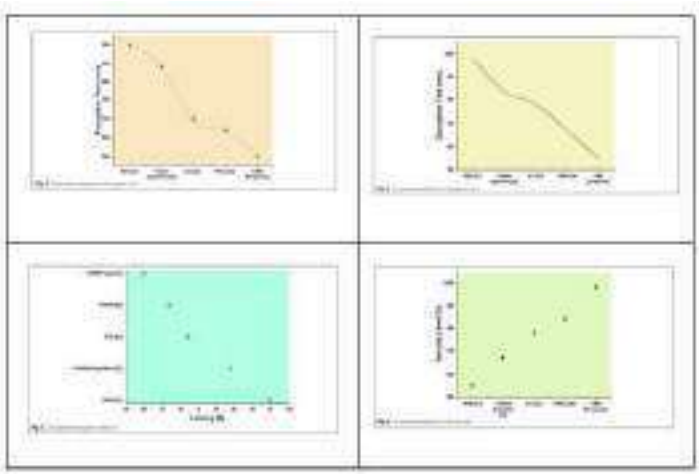
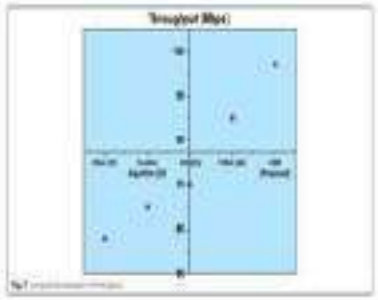
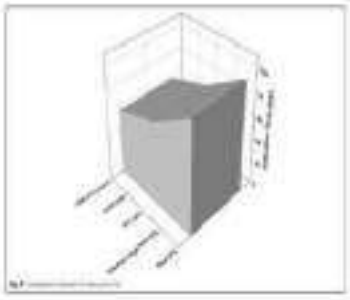


Fig. 1 Framework for butter-ant optimization method

A multi-step fuzzy component is used in this model to determine trust. Fuzzy logic is used to calculate greatest level of confidence. This implements a FETM-IoT, a multi-level fuzzy model where IoT devices can be trusted. Three dimensions are used to assess the reliability. These are Contextual data, QoS (Quality of Service) & P2P communication quality.







The CPS Cloud protects the data's integrity and privacy while security is enhanced. This system improves security of health data in CPS Cloud. The Wireless sensor network (WSN) collects health care data. A fuzzified effective trust-based routing protocol selects the data route, transmission of data efficiently. For optimal path, Butter-And Optimization (BAO) approach is used. The novelty of this system is data is in decoded format to transmit data during encryption and decryption.

References : https://journalofcloudcomputing.springeropen.com/articles/10.1186/s13677-022-00336-z

Shubham Mainkatte- 19104A0010 Shubham Soman- 19104A0004 BE EXTC A

Review Paper Presentation

An enhanced encryption-based security framework in the CPS Cloud.

It is particularly used in the field of health care. We can automatically update patient data digitally, monitor patients passively using sensors. It uses the Internet of Medical Things (IoMT), to continuously monitor various parameters such as body temperature, heart rate, etc. This gives patients a reliable health care experience & security concern. Due to physical connectivity restrictions, networks are more susceptible to security threats. The fact that data is stored in the cloud, it is necessary to provide security regardless of device security and network security.

It uses wireless sensor network in which data acquired is transmitted via the node. Using some set of protocol like FET-RP, BAO, the most efficient path is selected. The proposed model & method conveys data through encryption and decryption. It is stored in the cloud database for security reasons. There are some application specific methods, where CPS, cloud computing & wireless sensor networks are combined with more emphasis than security & privacy concerns as mentioned. For this reason, CPCCS, is proposed.

Using the FET-RP, the most efficient path for data transmission is determined. BAO is used to find the optimal path. CBM is used to convey the data throughout Encryption & Decryption in a decoded format. Several methods have been proposed for integrating service-oriented architecture (cloud computing) with CPS as it is seen as Platform as a Service (PaaS) and Infrastructure as a Service(IaaS).

All these computation technique and cloud computing has led to substantial advancements of CPS.

Cyber-physical Systems (CPS) are large-scale collections of cyber- and physical components. These are used as it enhances interoperability i.e. its ability to exchange and make use of information on Cloud. It is a system environment which can be build, modify composed set of cloud computing-based sensor, processing, control, and data services. Some functions performed by CPS are :

1. Smart Health: It includes medical devices and system composed of a set of cloud computing.
2. Smart Power Grid: It includes electrical power grid as well as navigation application.
3. Social Networking

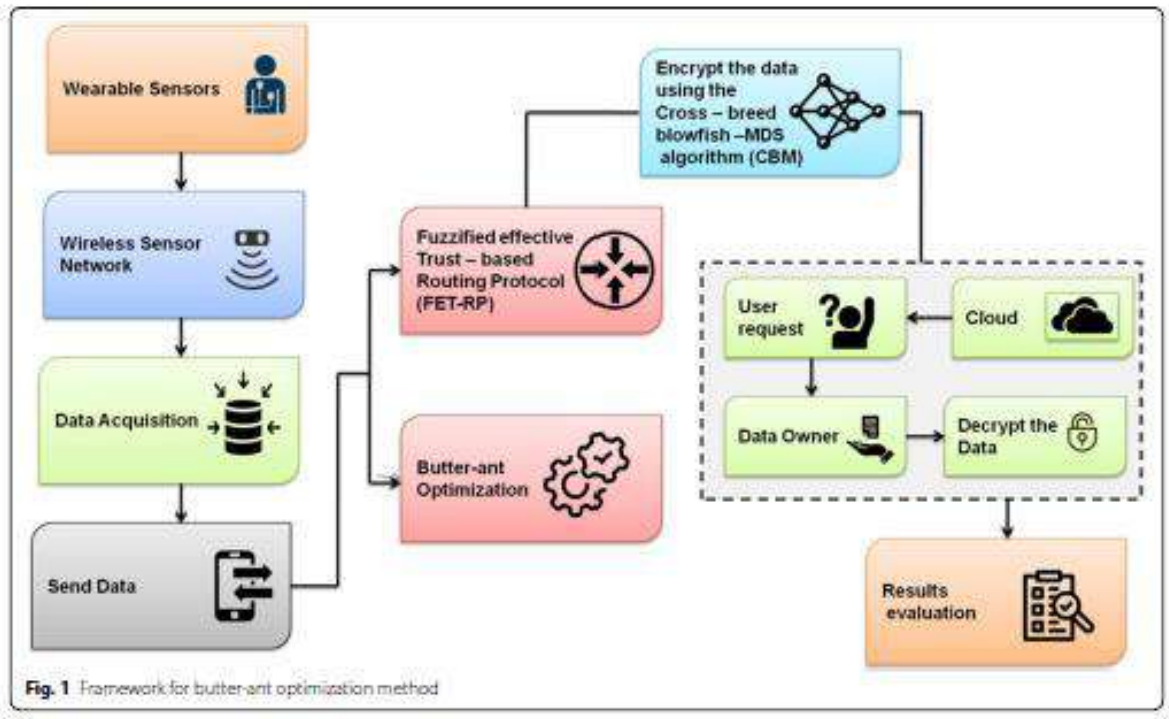


Fig. 1 Framework for butter-ant optimization method

IoT effective fuzzy trust model:

A multi-step fuzzy component is used in this model to determine trust. Fuzzy logic is used to calculate greatest level of confidence. This implements a FETM-IoT, a multi-level fuzzy model where IoT devices can be trusted. Three dimensions are used to assess the reliability. These are Contextual data, QoS (Quality of Service) & P2P communication quality. Because of this, the model is dynamic and comprehensive. Systems for Fuzzy Inference (FI) system is supplied into the final fuzzy system in all dimensions. This inference technique enables the determination of a final degree of confidence. All these dimensions i.e., QoS, P2P communication quality and contextual data are significant.

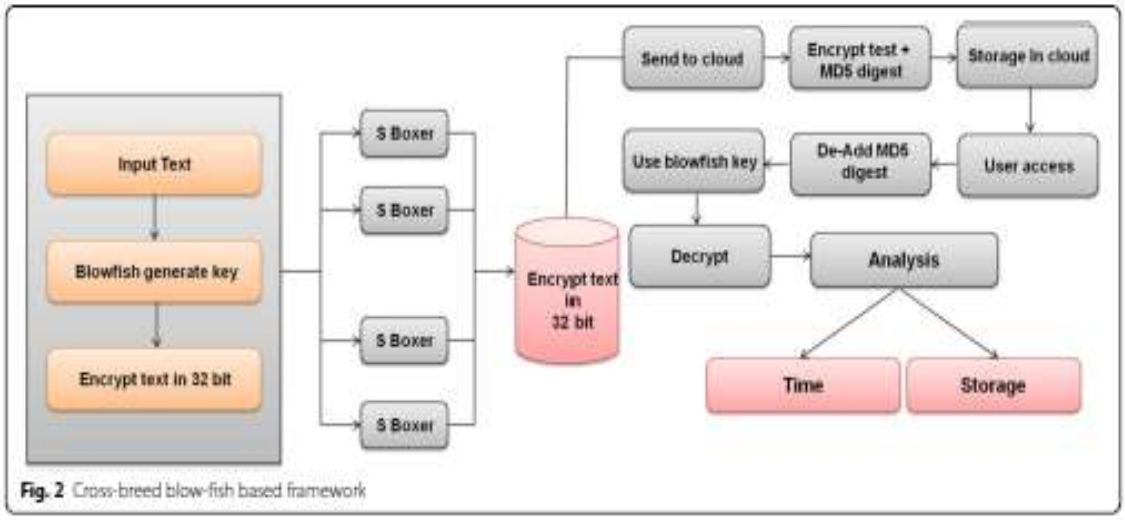


Fig. 2 Cross-breed blow-fish based framework

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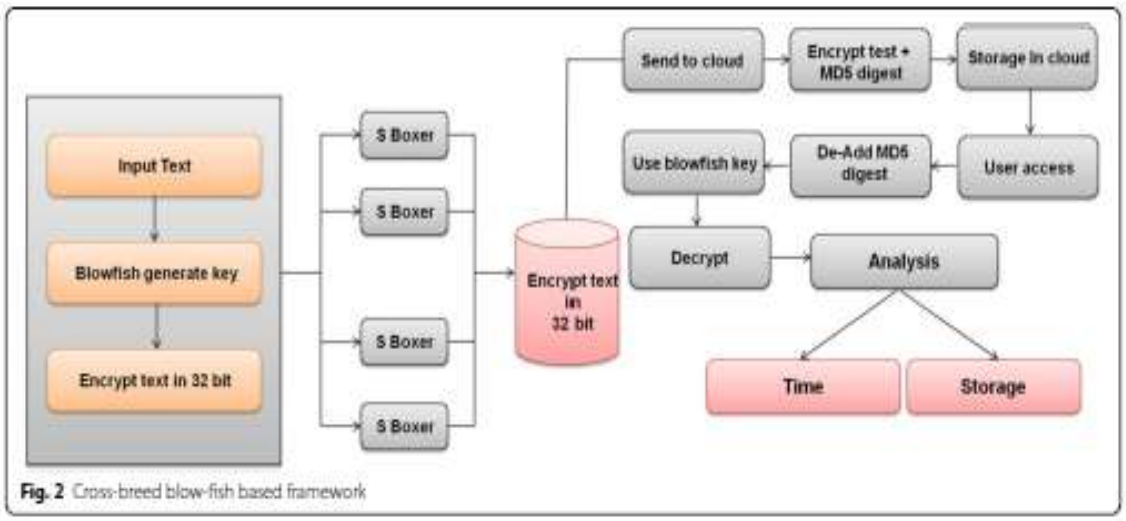


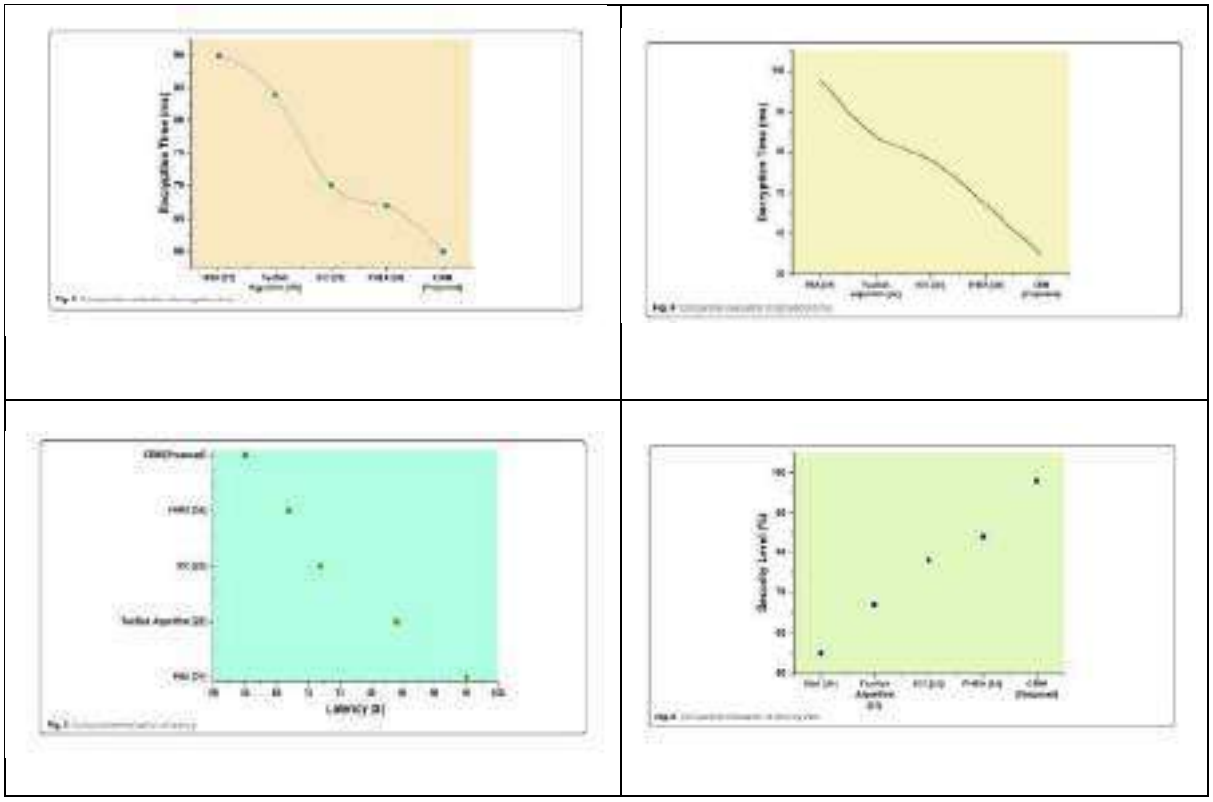
Fig. 2 Cross-breed blow-fish based framework

MD5 Algorithm:

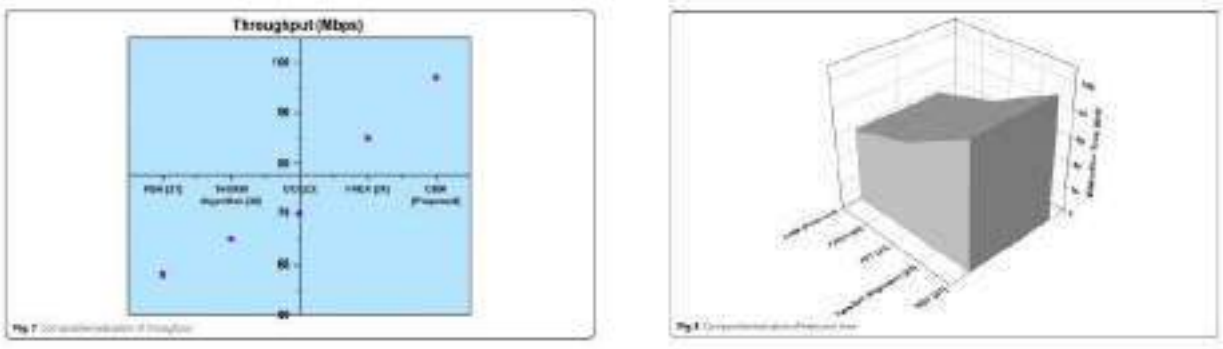
An MD5 message is composed of sixteen 32-bit sub-blocks that are separated by 512 bits each (Message Digest Algorithm). The 128-bit message processing of MD5 uses four linked 32-bit barriers to demonstrate CPS.

Decryption:

After extracting an authentication code or frame value, completing the whole technique for constructing an authentication code, we need decryption. The patient's data consists of group of sensors & control unit. It is kept in an encrypted form. If data consumers possess the set of decryption characteristics specified by the signature access structure, they may verify the authenticity of the cypher text and decode the data.



In this, the security framework in CPS cloud and performance of this techniques is compared with the existing methods. Those methods are RSA, Twofish algorithm, improved chacha20 algorithm & Fully Homomorphic encryption algorithm. All these graphs analysis and illustrates the average amount of time required to encrypt media content files as input. Some graphs show the comparative evaluation of encryption time. This technique enhances security compared to other methods. Other figures show latency. This technique has low latency as compared to other methods.



The CPS Cloud protects the data's integrity and privacy while security is enhanced. This system improves security of health data in CPS Cloud. The Wireless sensor network (WSN) collects health care data. A fuzzified effective trust-based routing protocol selects the data route, transmission of data efficiently. For optimal path, Butter-And Optimization (BAO) approach is used. The novelty of this system is data is in decoded format to transmit data during encryption and decryption.

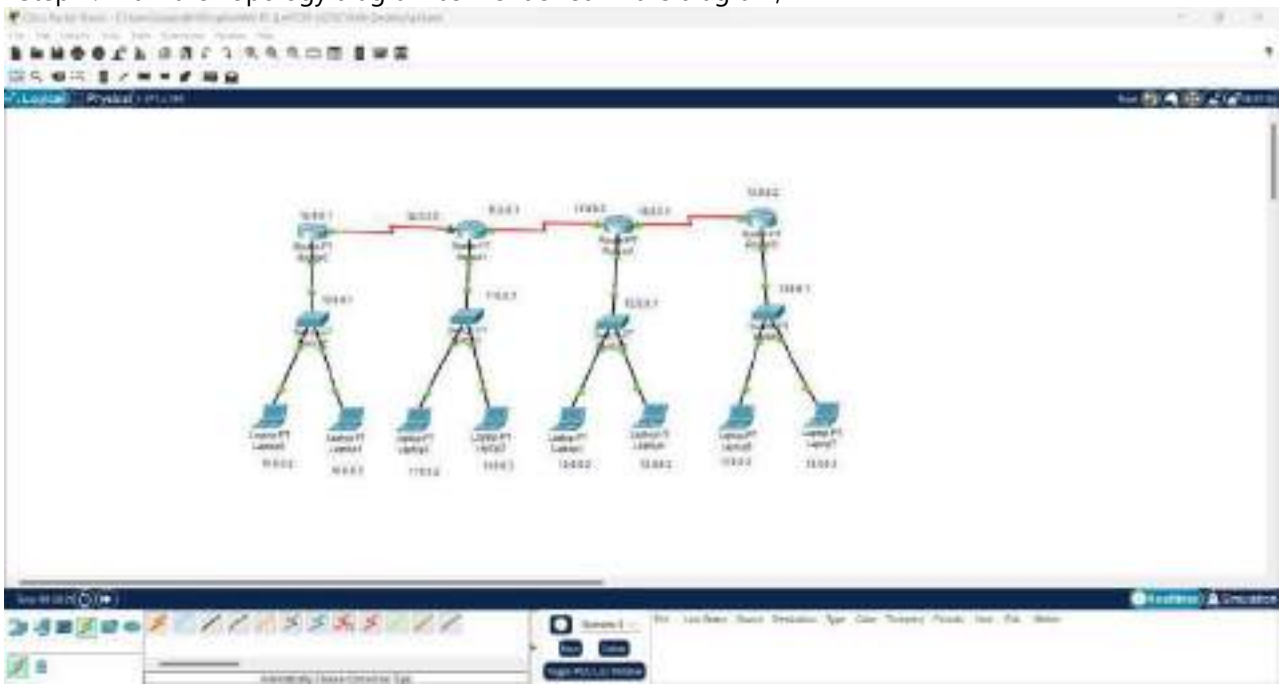
Title:- static routing with 4 routers

Group Members:-

Sr no.	Name	Roll No
1	PRITISH PAUL	20103B0005
2	SACHIN YADUVANDU	20103B0022

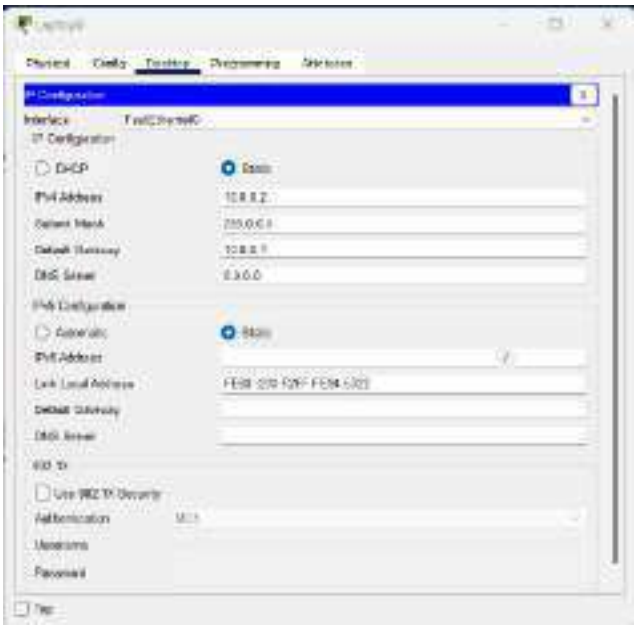
Implementation of Static Routing

Step 1: Draw the Topology diagram as mentioned in the diagram,



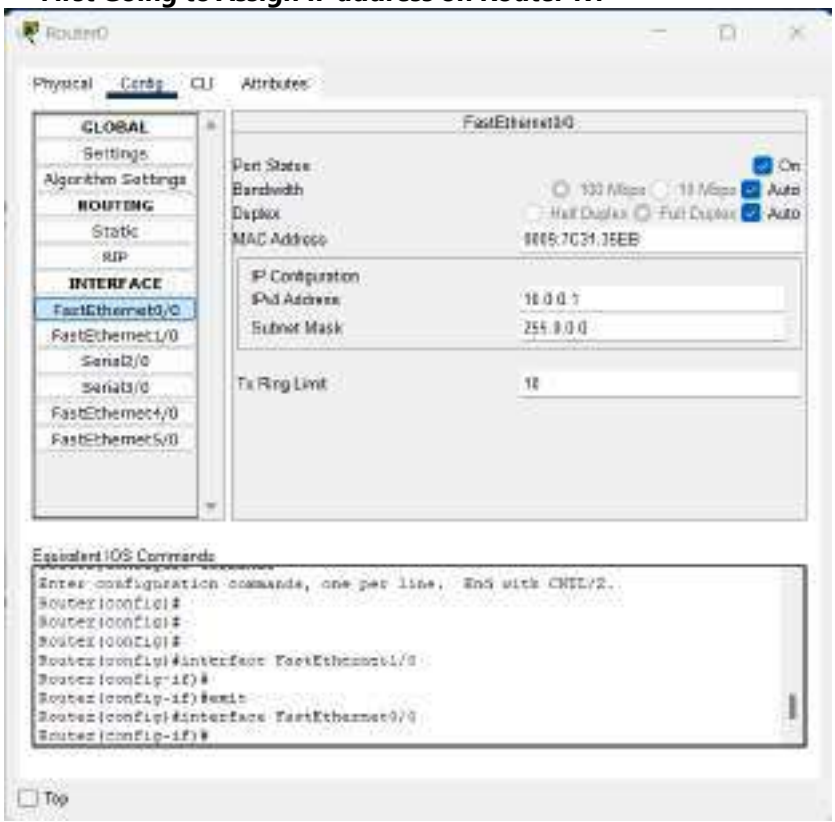
Step 2: Assigned IP address on Each PC with gateway IP.

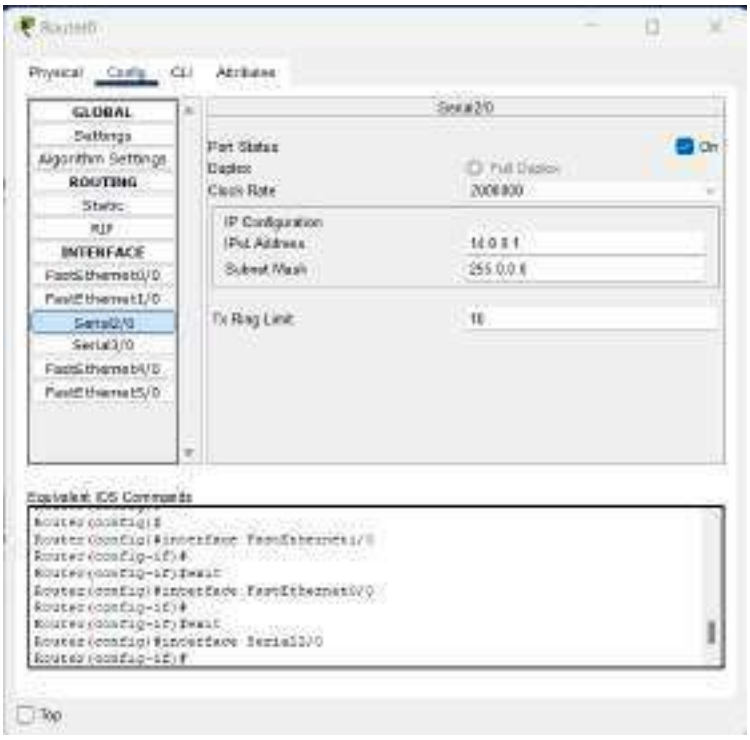
For Example i Have mentioned one image below.



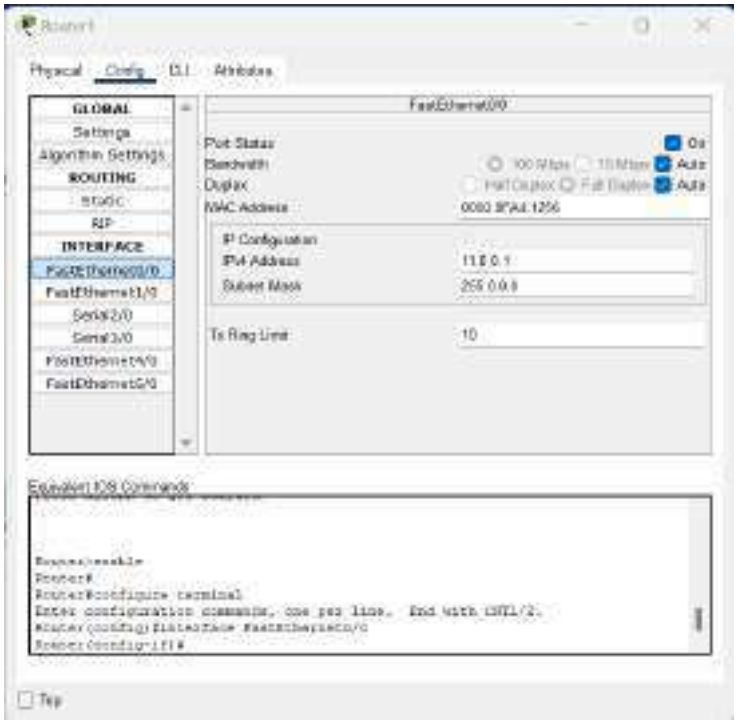
Step 3: Assign Ip Address on each Router One by One:

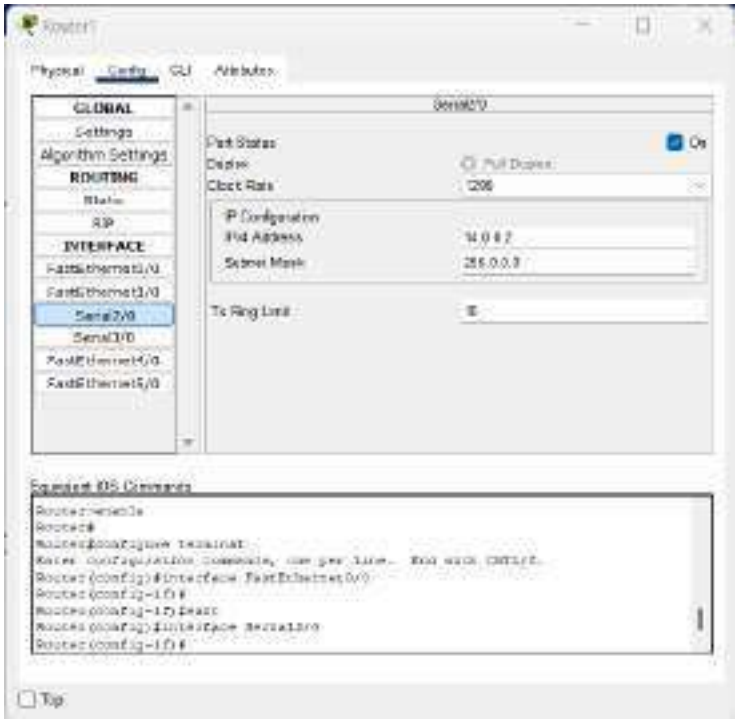
First Going to Assign IP address on Router R1

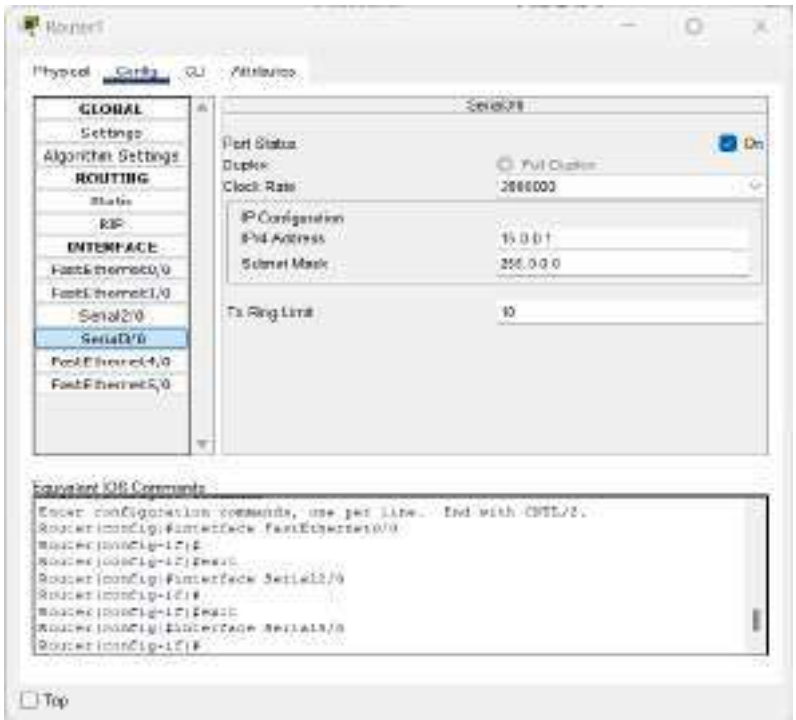




Now Going To Assign IP Address on Router R2




Physical
Config
GUI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
FastEthernet1/0
FastEthernet3/0
Serial2/0
Serial3/0
FastEthernet4/0
FastEthernet5/0
Port Status
On
Duplex
Full Duplex
Clock Rate
1200
IP Configuration
IPv4 Address
14.0.0.2
Subnet Mask
255.0.0.0
Tx Ring Limit
10
Equivalent IOS Commands
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet3/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#
Top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FastEthernet4/0
FastEthernet5/0
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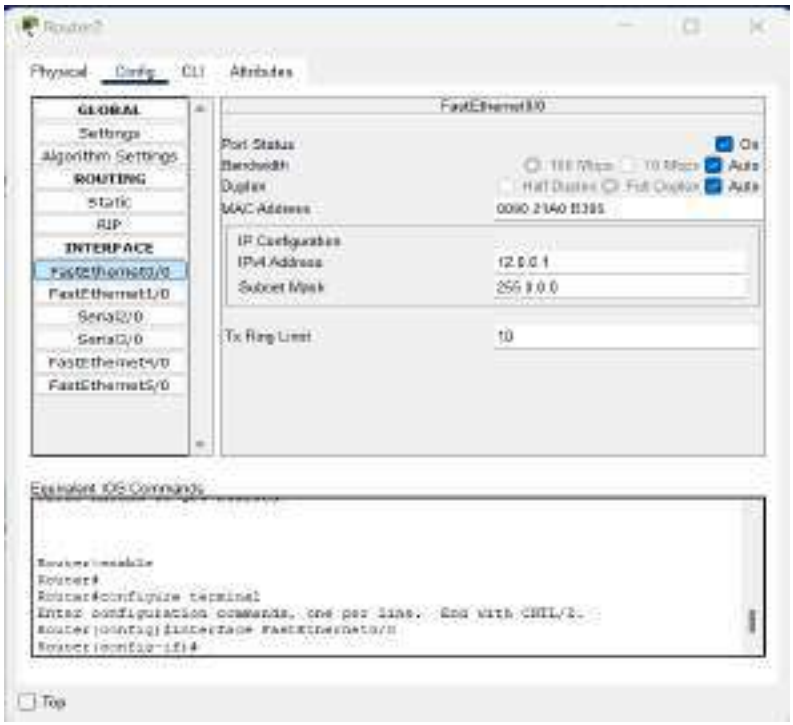
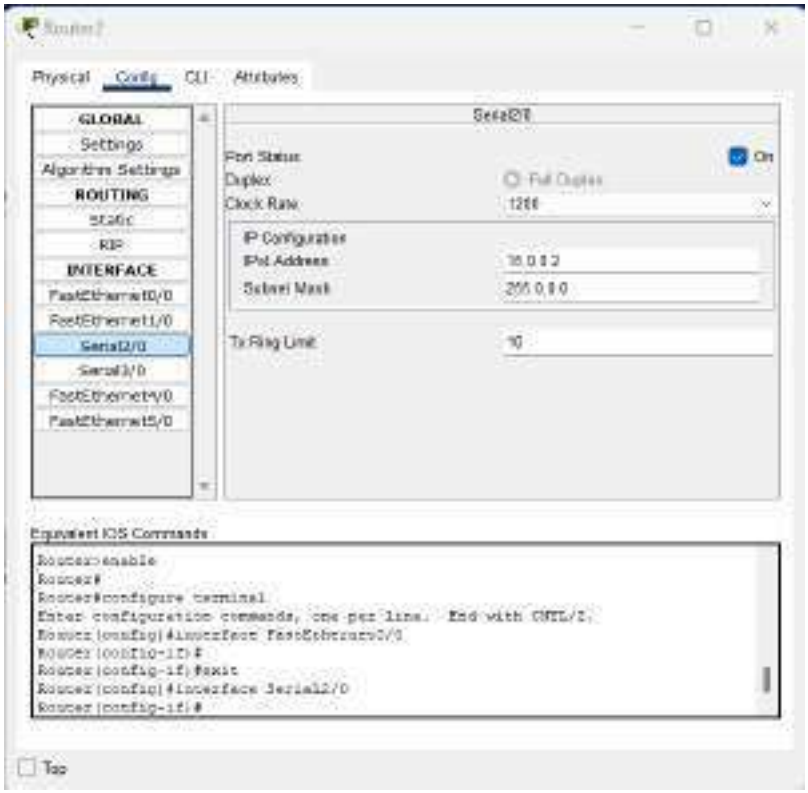
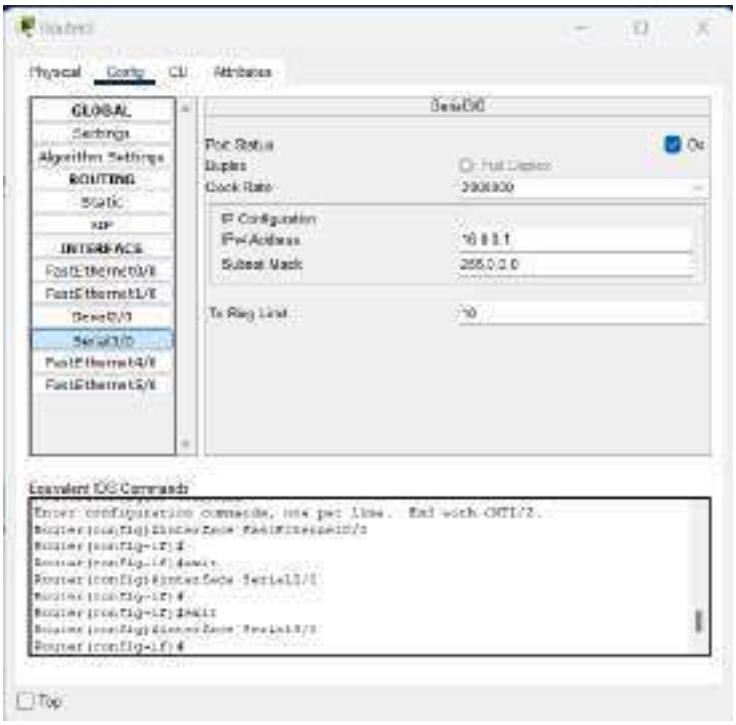
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial3/0
Router(config-if)#
Top

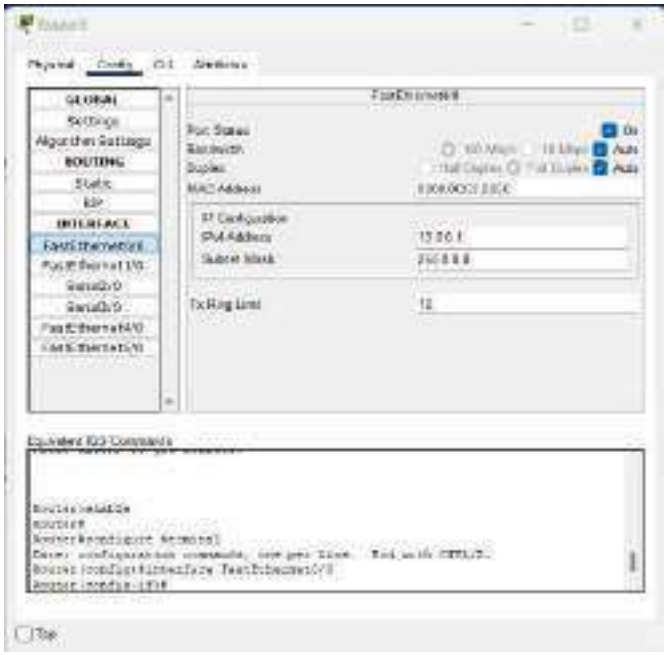
Now Assign IP Address on Router R3:

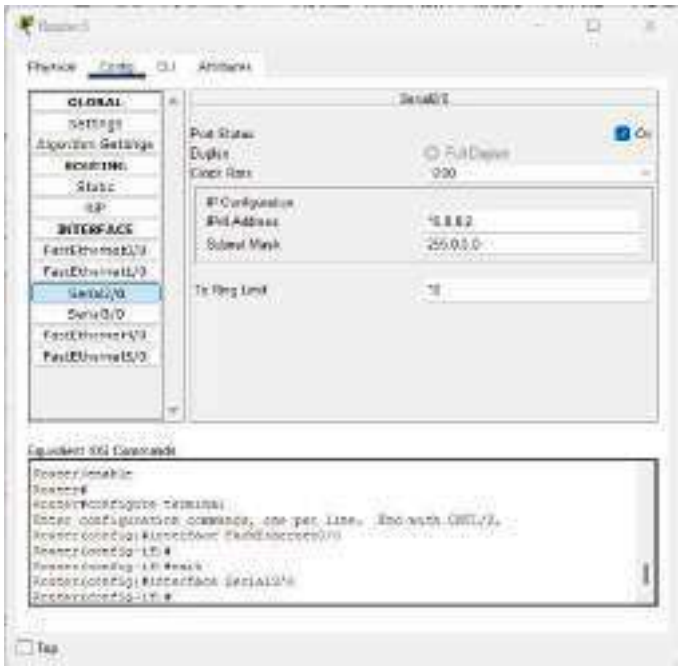






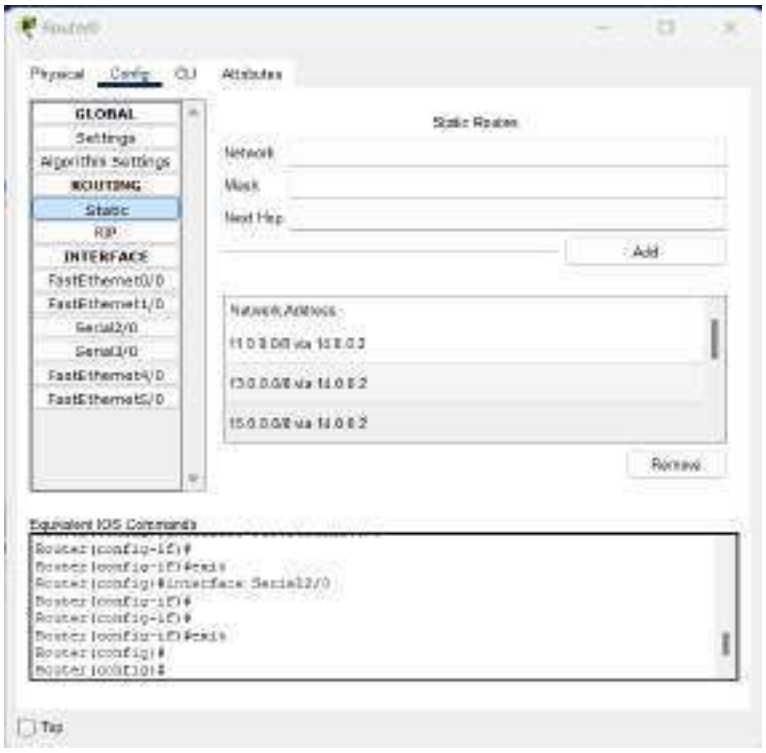
Now Assign IP Address on Router R4:



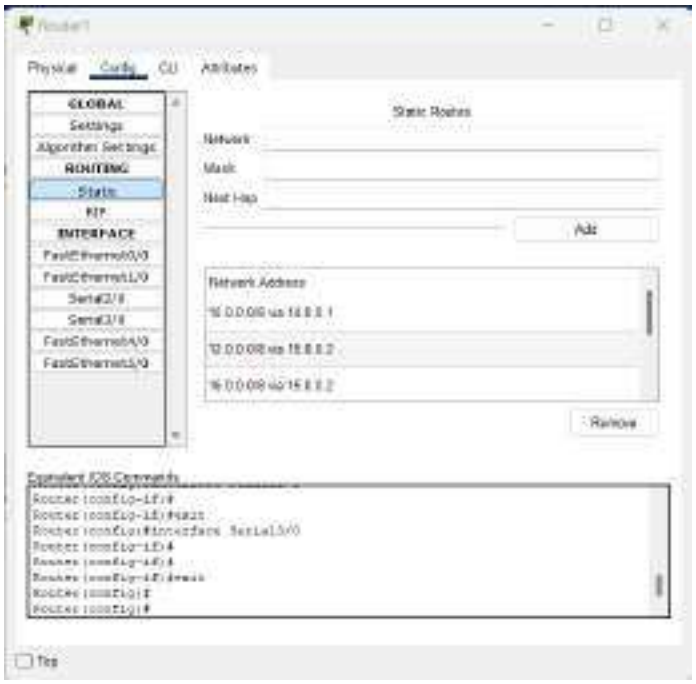


Step 4: Now it's Time to configure Static Route over all those Four Routers R1,R2,R3 and R4

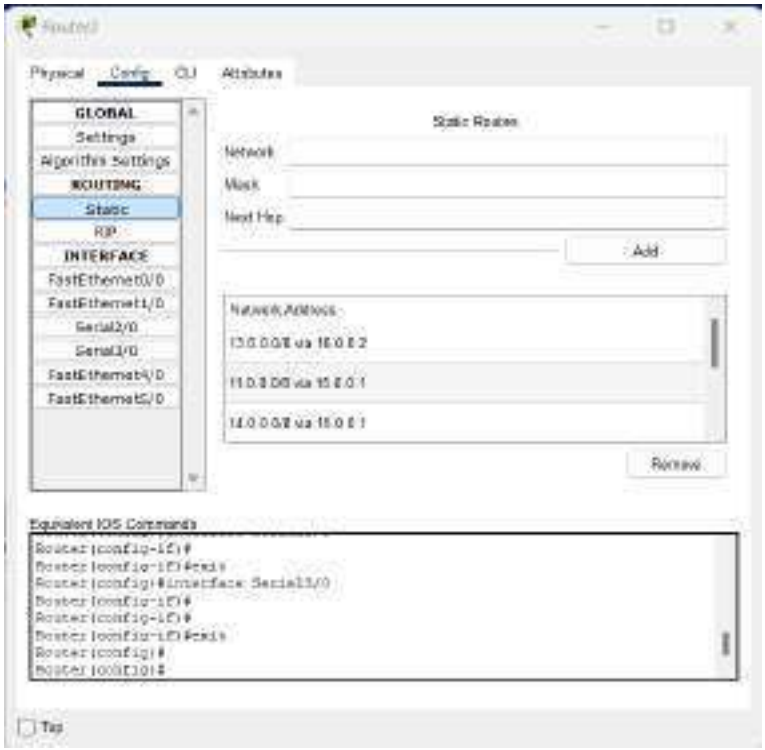
Static Routing Configuration on Router R1:



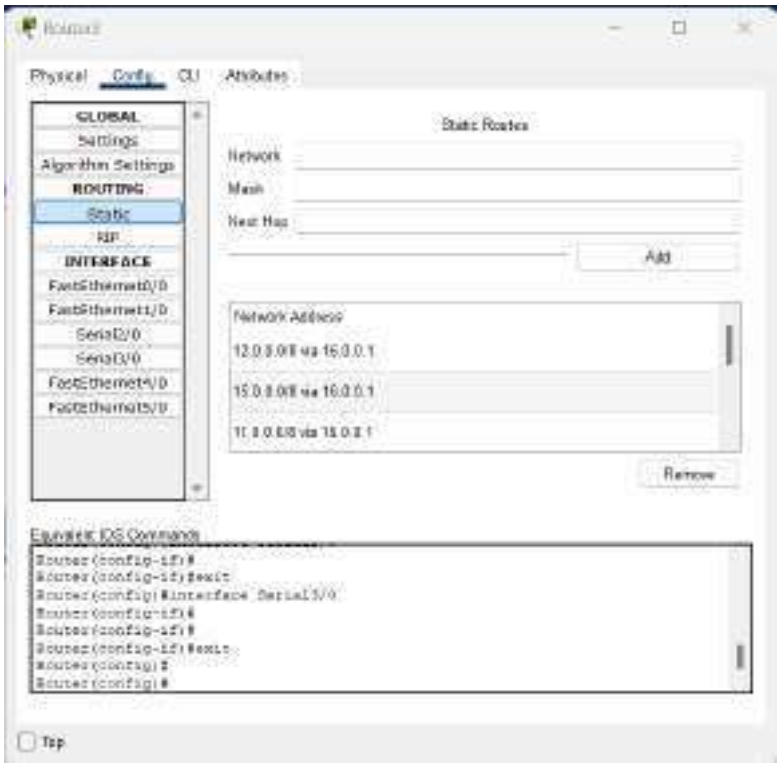
Static Routing Configuration on Router R2:



Static Routing Configuration on Router R3:

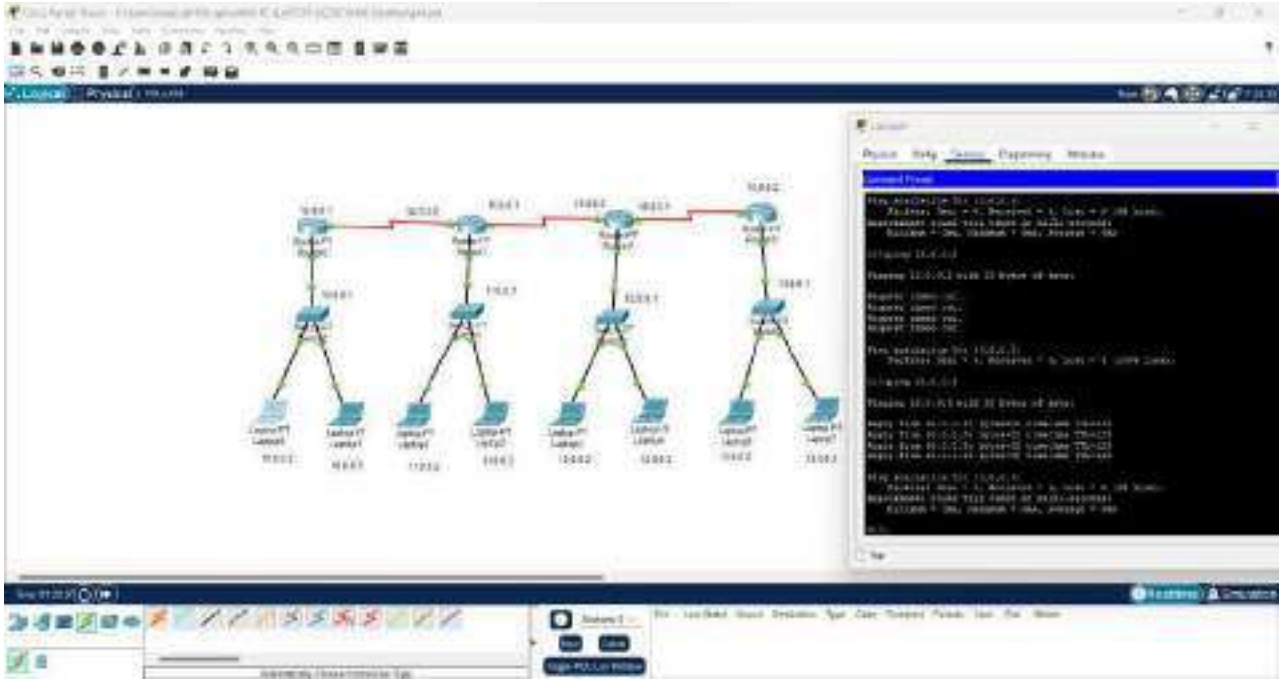


Static Routing Configuration on Router R4:

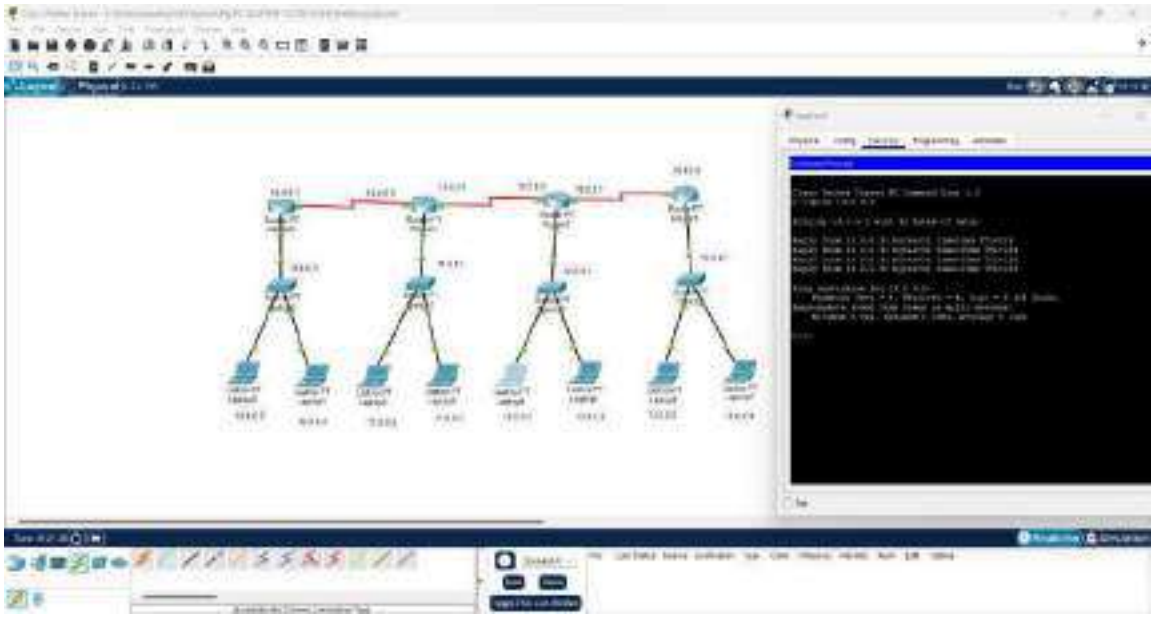


AT the End test the communication between two PC to test whether your Routing is properly configured or not.

Output:-

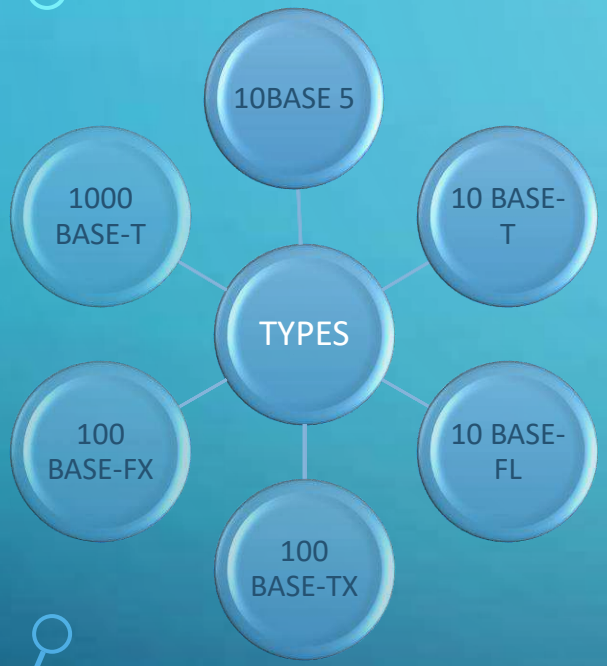


You can see another PC is Receiving the Packets. It means It's working fine.



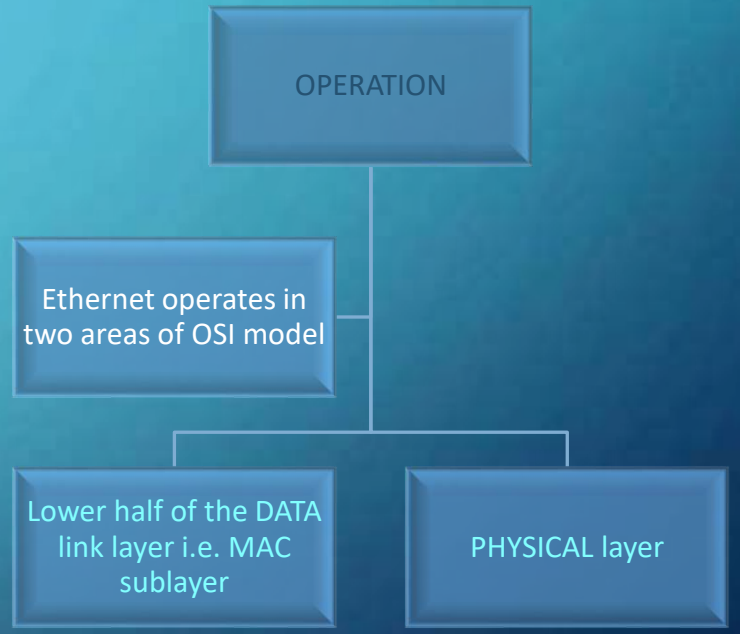
Vidyalankar Institute of Technology

ETHERNET



Ethernet Fundamentals

- Gigabit Ethernet Started as a LAN technology
  - Now extends out to distances that make Ethernet a metropolitan-area network (MAN) and wide- area network (WAN) standard.
- Ethernet is not one networking technology, but a family of networking technologies that includes Legacy, Fast Ethernet, and Gigabit Ethernet. Ethernet speeds can be 10, 100, 1000, or 10,000 Mbps.



- Ethernet is a traditional technology used to connect devices in a wired local area network (LAN) or wide area network (WAN), enabling them to communicate with each other through a protocol

Presented By:

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MAYUR KAKADE 21103B2006

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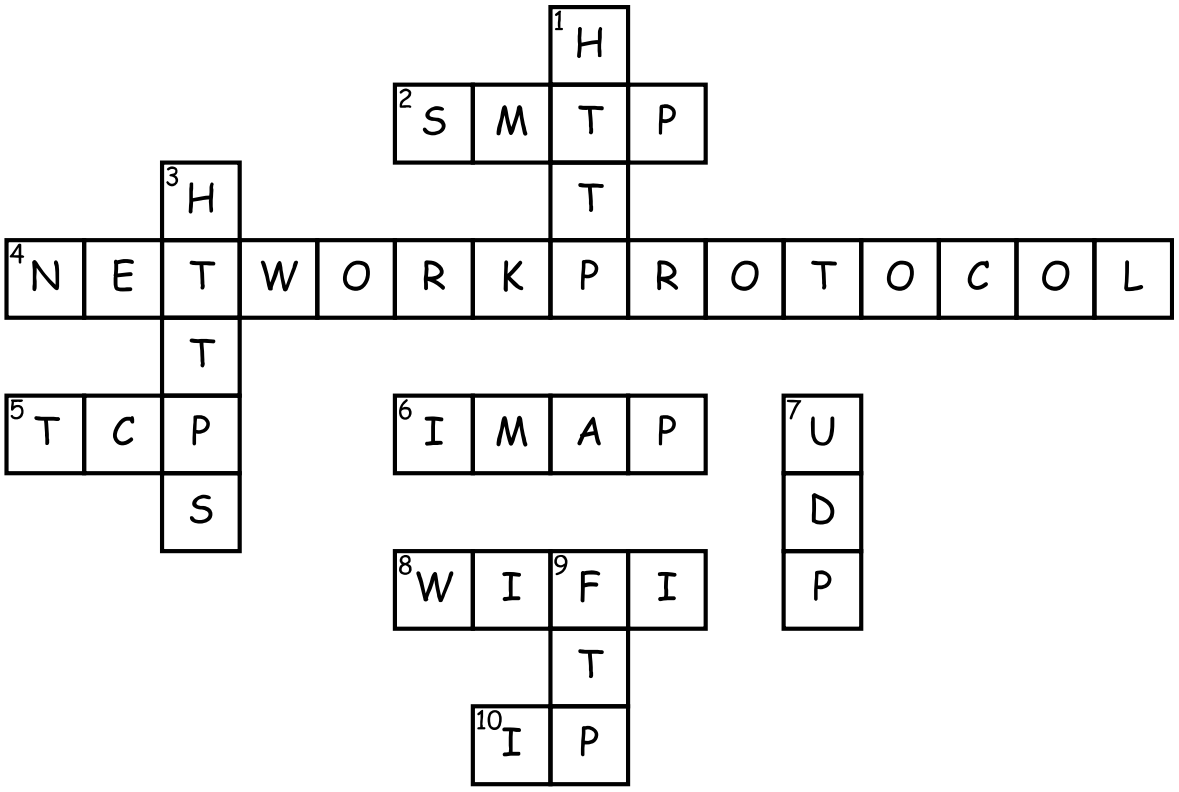
Network Potocols



Across

2. Used to send email, also to transfer emails between servers

4. A rule that determines how 2 devices communicate over a network

5. Establishes a connection between a sending and receiving device, splits packets into numbered parts

6. Used to retrieve emails from a server

8. Standard set of protocols for WLANs

10. Establishes connections between routers

Down

1. Used by web browsers to access websites and communicate with web servers

3. A more secure version of another protocol

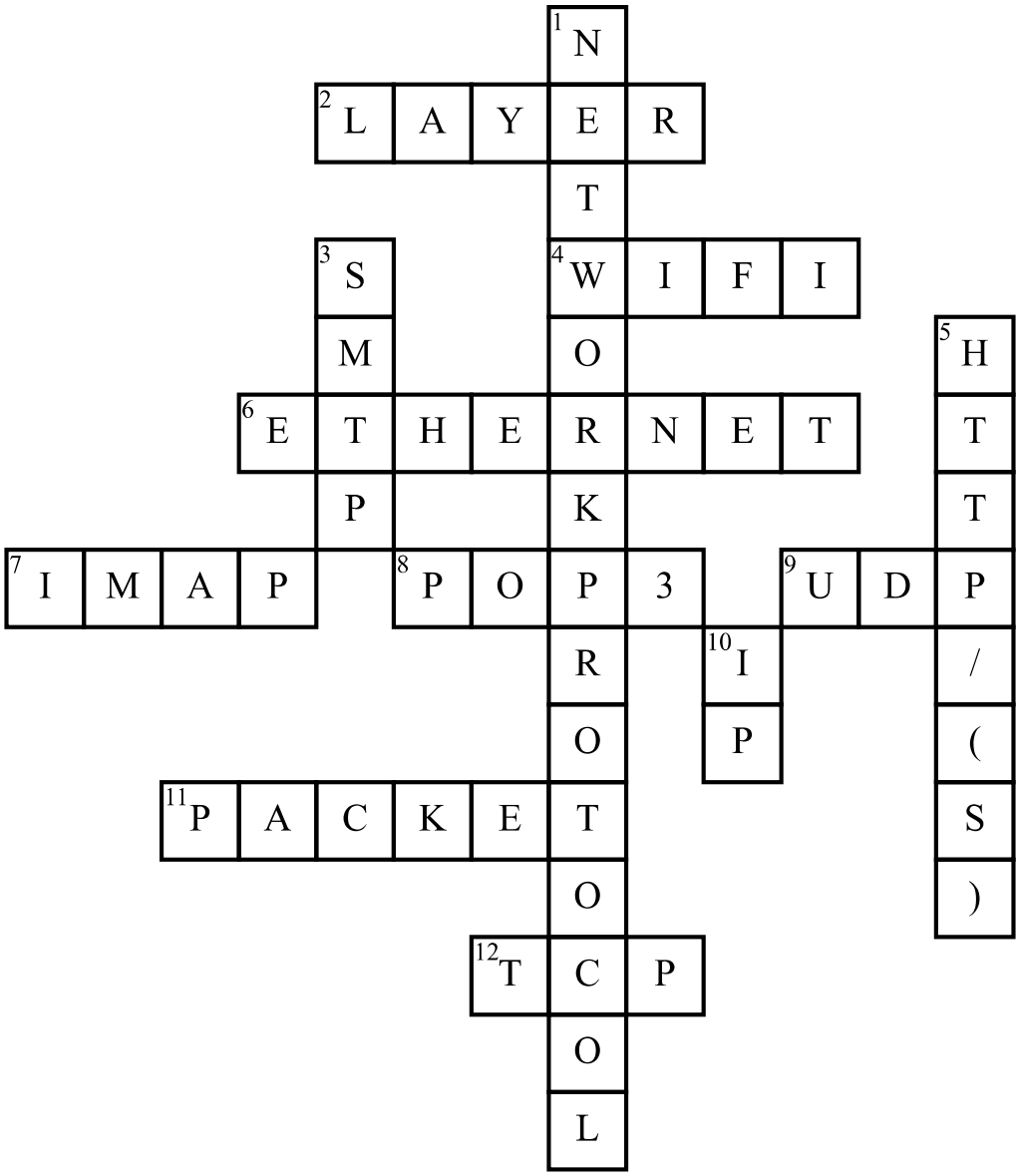
7. breaks down packets without numbering them.

9. Used to access, edit and move files between devices on a network

Take Home test Network Design

1. What is the function of distribution layer in network design?
2. What are the access and core layers?
3. What is the access layer in a three-layer network design?
4. What is the purpose of the core layer in the Cisco network design model?
5. What features of a multilayer switch could be used in the access layer?
6. Which layer in the hierarchical model provides media translation?
7. What is a benefit of using multilayer switching in the core network layer?
8. What are the six major functional areas in the Cisco Enterprise Architecture?
9. What are the modules and layers within the Enterprise Campus functional area?
10. What is an advantage of using the Cisco Enterprise Architecture?
11. What is the difference between Hierarchical model and Ubiquitous model in network design?
12. What role does the Building Access layer play in voice transportation?

Network Protocols Crossword



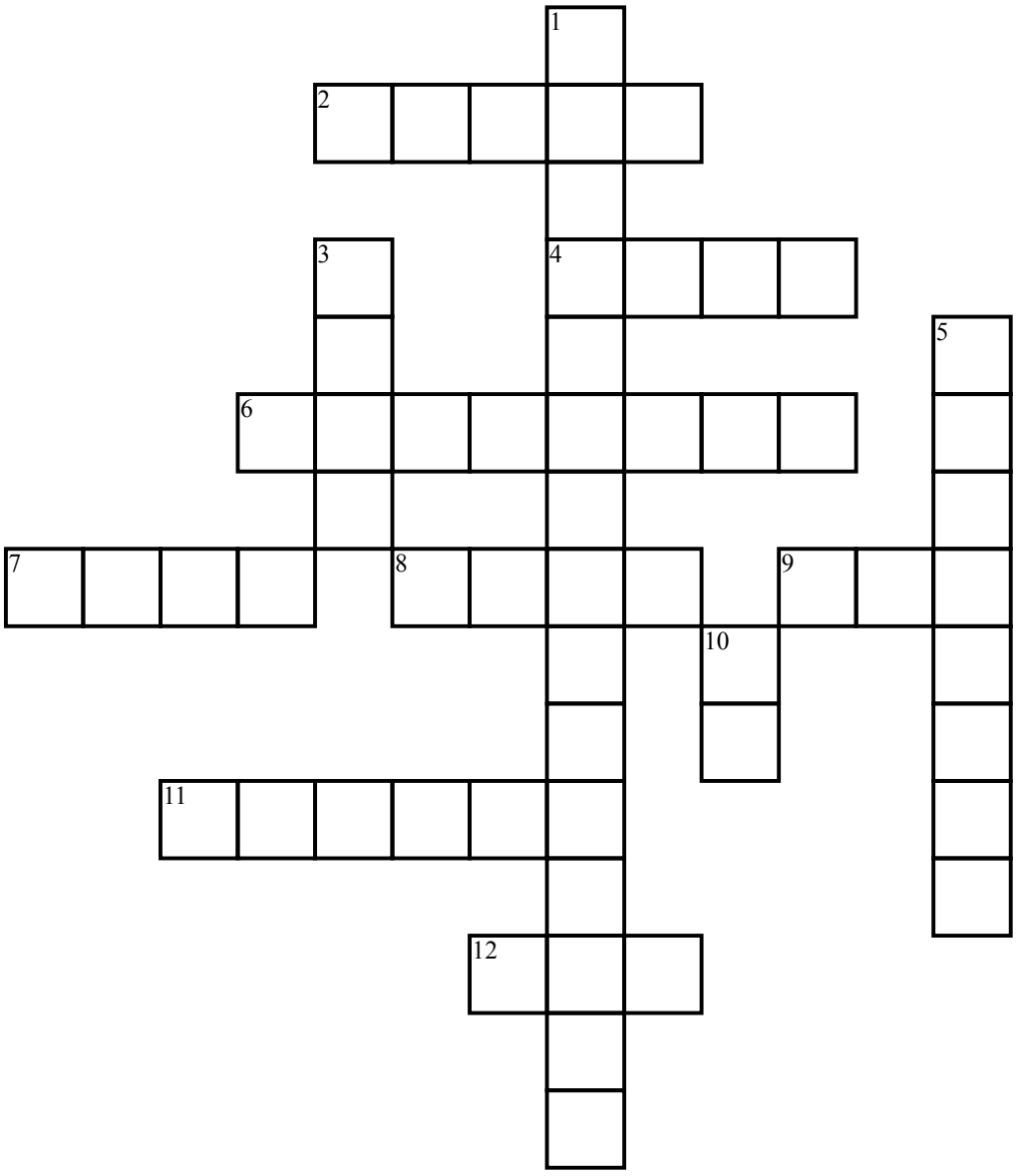
Across

2. The TCP/IP model is split into --
4. Dictates how information is sent using waves
6. Manages how information is sent across a wire
7. Used to access emails from server
8. Outdated protocol that is used to retrieve emails from servers
9. used to send packets over the internet with no error checking
11. A fragmented piece of information sent over the interent
12. Protocol used to send packets over the interent with error checking

Down

1. Protocols used to communicate over a network
3. Used to send emails to the main server
5. Used to create a website from data
10. Adds addresses to packets

Network Protocols Crossword



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