

**ADVANCE STUDY OF
COMPUTER NETWORK
AND
PRACTICAL
IMPLEMENTATION**

MR. MOHIT MALIK

Assistant Professor

Department of Computer Science and Engineering
Lovely Professional University,
Phagwara, Punjab, INDIA

ADVANCE STUDY OF COMPUTER NETWORK AND PRACTICAL IMPLEMENTATION

Copyright© : Mr. Mohit Malik
Publishing Rights© : VSRD Academic Publishing
A Division of Visual Soft India Pvt. Ltd.

ISBN-13: 978-81-972449-6-4
FIRST EDITION, JUNE 2024, INDIA

Printed & Published by:
VSRD Academic Publishing
(A Division of Visual Soft India Pvt. Ltd.)

Disclaimer: The author(s) / Editor(s) are solely responsible for the contents compiled in this book. The publishers or its staff do not take any responsibility for the same in any manner. Errors, if any, are purely unintentional and readers are requested to communicate such errors to the Author(s) or Editor(s) or Publishers to avoid discrepancies in future.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the Publishers & Author.

Printed & Bound in India

VSRD ACADEMIC PUBLISHING
A Division of Visual Soft India Pvt. Ltd.

REGISTERED OFFICE

154, Tezab mill Campus, Anwarganj, KANPUR–208003 (UP) (IN)
Mb:9899936803, Web: www.vsrdpublishing.com, Email: vsrdpublishing@gmail.com

MARKETING OFFICE

340, FF, Adarsh Nagar, Oshiwara, Andheri(W), MUMBAI–400053 (MH) (IN)
Mb:9956127040, Web: www.vsrdpublishing.com, Email: vsrdpublishing@gmail.com

PREFACE

In this preface, I wish to convey my heartfelt appreciation to the individuals and resources that have played a pivotal role in bringing this book to fruition. Foremost, I am profoundly grateful to the academic institutions that have provided the essential groundwork and support for embarking on this odyssey of knowledge dissemination. Furthermore, I extend my sincere gratitude to the numerous authors, researchers, and educators whose scholarly works have served as a wellspring of inspiration and insight, shaping the content of this book. Their invaluable contributions have profoundly influenced my understanding and approach to the subject matter. I am also indebted to the countless mentors, colleagues, and friends whose unwavering guidance, constructive feedback, and encouragement have been indispensable throughout the writing process. Their wisdom and support have been instrumental in navigating the intricate terrain of this topic and instilling a commitment to excellence in every facet of this endeavor. Lastly, I dedicate this book to the students and readers who will benefit from its contents. It is my fervent aspiration that this book will serve as a catalyst for curiosity, learning, and innovation in the realm of computer networks. May it inspire and embolden individuals to embark on their own transformative journeys of exploration and advancement.

 *Author*

ACKNOWLEDGEMENT

I extend my heartfelt gratitude to the divine for granting me the resilience to finalize my book titled "*Advanced Study of Computer Networks and Practical Implementation*." Additionally, I am profoundly thankful to my friends and family whose unwavering support propelled me to accomplish my research within a tight timeframe. Through this book, I have had the privilege of disseminating my expertise in the realm of computer networks, guided by the invaluable insights of my companions. Every facet of my understanding and viewpoints in the field finds expression within these pages, a testament to collaborative effort and dedication. In composing this book, I've aimed to simplify intricate concepts into understandable insights, enabling readers to explore the complexities of computer networks with clarity and depth. This endeavor has been a journey of mutual learning and sharing, enriched by the collective wisdom and encouragement of those in my circle. Furthermore, I owe a debt of gratitude to the extensive hours of research and study invested in crafting this work. Each chapter embodies a dedicated effort, driven by a fervent desire to enhance comprehension of computer networks and their practical uses. My aspiration is for this book to serve as a valuable asset for students, professionals, and enthusiasts, offering perspectives that ignite further inquiry and innovation in the dynamic realm of computer networking.


 *Author*

TABLE OF CONTENTS

CHAPTER ONE: AN OVERVIEW OF COMPUTER NETWORKS.....	1
1.1. INTRODUCTION.....	1
1.2. WHAT IS THE OSI MODEL?.....	3
1.3. WORKING OF OSI MODEL.....	4
1.4. WHAT IS TCP/IP?	4
1.5. DISTINCTIONS BETWEEN TCP/IP AND OSI.....	5
1.6. INTERFACE AND EXPLANATION OF CISCO PACKET TRACER.....	6
1.7. HOW TO INSTALL CISCO PACKET TRACER ON WINDOWS?.....	7
CHAPTER TWO: EXPLORING THE PHYSICAL LAYER.....	10
2.1. INTRODUCTION.....	10
2.2. IMPLEMENTION OF HUB IN CISCO PACKET TRACER.....	13
2.3. IMPLEMENTION OF CABLES AND CONNECTORS IN CISCO PACKET TRACER.....	13
2.4. IMPLEMENTION OF REPEATER IN CISCO PACKET TRACER.....	14
2.5. IMPLEMENTION OF MODEM IN CISCO PACKET TRACER	14
2.6. DEFINITION OF TRANSMISSION MEDIA AND TRANSMISSION IMPAIRMENTS AND PERFORMANCE	14
2.7. WHAT IS ATTENUATION?	16
2.8. TYPES OF TRANSMISSION MEDIA	17
2.9. DIFFERENCE BETWEEN SHIELDED AND UNSHIELDED TWISTED PAIR CABLE.....	18
2.10. ADVANTAGES OF COAXIAL CABLE	20
2.11. OPTICAL FIBER CABLE	20

2.12.	WHAT IS UNGUIDED MEDIA?	21
2.13.	MICROWAVE	21
2.14.	RADIO WAVES.....	22
2.15.	INFRARED TRANSMISSION	23
2.16.	CABLING STANDARDS.....	24
2.17.	IMPLEMENTATION OF CABLES IN CISCO PACKET TRACER.....	24

CHAPTER THREE: EXAMINING THE DATA LINK LAYER..... 25

3.1.	INTRODUCTION.....	25
3.2.	TYPES OF NETWORKS INTERFACE CARDS.....	28
3.3.	IMAGES OF NETWORK INTERFACE CARDS	28
3.4.	IMPLEMENTATION OF SWITCH IN CISCO PACKET TRACER	29

CHAPTER FOUR: INVESTIGATION OF NETWORK LAYER..... 30

4.1.	INTRODUCTION.....	30
4.2.	ROUTING ALGORITHMS.....	32
4.3.	CONGESTION CONTROL.....	34
4.4.	ALOGRITHMS	35
4.5.	NETWORK LAYER PROTOCOLS.....	37
4.6.	IMPLEMENTATION OF IPV4 IN CISCO PACKET TRACER.....	40
4.7.	IMPLEMENTATION OF IPV6 IN CISCO PACKET TRACER.....	42
4.8.	EXAMPLE HOW TO GIVE IPV6 ADDRESS	43
4.9.	TYPES OF UNICASTING PROTOCOLS	45
4.10.	EXPLANATION OF DISTANCE VECTOR ROUTER ALGORITHM	45

CHAPTER FIVE: INSPECTING OF TRANSPORT LAYER..... 50

5.1. INTRODUCTION..... 50

5.2. IMPORTANT FUNCTIONS OF THE TRANSPORT LAYER 51

5.3. SOME DESIGN ISSUES OR CHALLENGES IN THE TRANSPORT LAYER..... 52

5.4. ESSENTIAL ELEMENTS OF THE TRANSPORT LAYER..... 52

5.5. TYPES OF TRANSPORT LAYER PROTOCOLS 54

5.6. DISTINGUISHING BETWEEN TCP AND UDP 57

5.7. SERVICES OF TRANSPORT LAYER 57

5.8. IANA RANGES..... 58

5.9. DIAGRAM OF NETWORK PORTS 58

CHAPTER SIX: ASSESSING THE SESSION LAYER..... 59

6.1. INTRODUCTION..... 59

6.2. REMOTE PROCEDURE CALL (RPC) – SESSION LAYER PROTOCOL..... 60

6.3. DIAGRAM REMOTE PROCEDURE CALL (RPC)..... 60

6.4. WORKING HAPPEN RPC BY CLIENT AND SERVER MODEL..... 61

6.5. MERITS OF RPC..... 62

6.6. DEMERITS OF REMOTE PROCEDURE CALL 62

CHAPTER SEVEN: REVIEWING OF PRESENTATION LAYER..... 63

7.1. INTRODUCTION..... 63

7.2. DESIGN CHALLENGES OF THE PRESENTATION LAYER..... 64

7.3. CHALLENGES IN PRESENTATION LAYER DESIGN..... 64

7.4. UNDERSTANDING DATA COMPRESSION..... 65

7.5. UNDERSTANDING LOSSY DATA COMPRESSION 65

7.6.	DEFINITION OF LOSSLESS DATA COMPRESSION.....	66
7.7.	LOSSY DATA COMPRESSION	66

CHAPTER EIGHT: SCRUTINIZING THE APPLICATION LAYER 68

8.1.	INTRODUCTION.....	68
8.2.	FUNCTIONS OF THE APPLICATION LAYER.....	68
8.3.	CLIENT SERVER NETWORK.....	69
8.4.	PEER – TO – PEER NETWORK	70
8.5.	WORLD WIDE WEB (WWW)	70
8.6.	DOMAIN NAME SERVER (DNS)	71
8.7.	EMAIL.....	71
8.8.	IMPLEMENTATION OF PROTOCOLS USED IN APPLICATION LAYER IN CISCO PACKET TRACER	72
8.9.	HTTP MESSAGES.....	79
8.10.	IMPLEMENTATION OF MAIL SERVER IN CISCO PACKET TRACER.....	80
8.11.	EMAIL - ACTIVE SERVICES OF SMTP	80

CHAPTER NINE: REVIEWING OF NETWORK TOPOLOGIES..... 81

9.1.	COMPUTER NETWORK TOPOLOGIES	81
9.2.	WORKING DIAGRAM OF DIFFERENT TOPOLOGIES.....	86
9.3.	IMPLEMENTATION OF TOPOLOGIES IN CISCO PACKET TRACER.....	86

CHAPTER TEN: DESCRIPTION OF SUBNETTING AND SUPERNETTING..... 90

10.1.	INTRODUCTION.....	90
-------	-------------------	----

10.2.	ADVANTAGES OF SUBNETTING	91
10.3.	DISADVANTAGES OF SUBNETTING	91
10.4.	ADVANTAGES OF SUPERNETTING.....	91
10.5.	DIAGRAM SHOWS ABOUT THE DIFFERENT ID.....	94
10.6.	DIFFERENCE BETWEEN CLASSFUL AND CLASSLESS ADDRESSING	95
10.7.	ADDRESSING PERFORM IN THE NETWORK LAYER BOTH CLASSFUL AND CLASSLESS	95

