

# Network+ 2009

## LearnKey®

This workbook is designed to go hand in hand with LearnKey online courseware. All material is copyrighted. It is illegal to duplicate this material without permission from the publisher.

To order additional copies  
contact:

### LearnKey®

35 North Main  
St. George, UT 84770  
1.435.674.9733  
[www.learnkey.com](http://www.learnkey.com)

Belongs to: \_\_\_\_\_

School: \_\_\_\_\_

Instructor: \_\_\_\_\_

# Network+ 2009

**First Edition**

**LearnKey®**

LearnKey, Inc. provides self-paced training courses and online learning solutions to education, government, business and individuals world-wide. With dynamic video based courseware, and effective learning management systems, LearnKey solutions provide expert instruction for popular computer software, technical certifications and application development. LearnKey delivers content on the Web, by enterprise network, and on interactive CD-ROM. For a complete list of courses visit:

<http://www.learnkey.com>

**Trademarks:** All brand names and product names used in this book are trade names, service marks, trademarks or registered trademarks of their respective owners.

All rights reserved. No part of this book may be reproduced or transmitted in any form or by any means now known or to be invented, electronic or mechanical, including photocopying, recording, or by any information storage or retrieval system without written permission from the author or publisher, except for the brief inclusion of quotations in a review.

© 2009 LearnKey, Inc. [www.learnkey.com](http://www.learnkey.com)

**Network+ 2009  
Student Manual**

# Table of Contents

|                     |       |                    |    |
|---------------------|-------|--------------------|----|
| <b>Introduction</b> |       | <b>Session 2</b>   |    |
| Using this Workbook | vii   | Time Tables        | 53 |
| Course Map          | ix    | Fill-in-the-Blanks | 54 |
| Session Objectives  | Xx    | Crossword          | 57 |
| Course Outline      | xxi   | Word Search        | 59 |
| Skills Assessment   | xxvii | Short Answer       | 60 |
|                     |       | Matching           | 63 |
|                     |       | Research Topic     | 64 |
|                     |       | Individual Project | 65 |
|                     |       | Groups Project     | 66 |
|                     |       | Quiz               | 68 |
|                     |       | Slides & Notes     | 71 |
| <b>Session 1</b>    |       | <b>Session 3</b>   |    |
| Time Tables         | 31    | Time Tables        | 75 |
| Fill-in-the-Blanks  | 32    | Fill-in-the-Blanks | 76 |
| Crossword           | 35    | Crossword          | 80 |
| Word Search         | 38    | Word Search        | 82 |
| Short Answer        | 39    | Short Answer       | 83 |
| Matching            | 42    | Matching           | 86 |
| Research Topic      | 44    | Research Topic     | 87 |
| Individual Project  | 45    | Individual Project | 88 |
| Group Project       | 46    | Groups Project     | 89 |
| Quiz                | 47    | Quiz               | 90 |
| Slides & Notes      | 49    | Slides & Notes     | 93 |

**Session 4**

|                    |     |
|--------------------|-----|
| Time Tables        | 97  |
| Fill-in-the-Blanks | 98  |
| Crossword          | 101 |
| Word Search        | 103 |
| Short Answer       | 104 |
| Matching           | 107 |
| Research Topic     | 108 |
| Individual Project | 109 |
| Groups Projects    | 110 |
| Quiz               | 112 |
| Slides & Notes     | 114 |

**Session 5**

|                    |     |
|--------------------|-----|
| Time Tables        | 117 |
| Fill-in-the-Blanks | 118 |
| Crossword          | 121 |
| Word Search        | 124 |
| Short Answer       | 125 |
| Matching           | 128 |
| Research Topic     | 130 |
| Individual Project | 131 |
| Group Projects     | 132 |
| Quiz               | 134 |
| Slides & Notes     | 137 |

# Introduction



Sample

## Using this Workbook

In the *Introduction* section, you will find an outline for each session of training and sample lesson plans. These are included to give you an overview of the training content and to help you in achieving your learning goals. The content, delivered by industry professionals, is the most up-to-date, comprehensive content available.

The exercises included in this workbook are meant to serve as supplementary material for the OnlineExpert courses. The following types of exercises are included for each session of training:

**Fill-in-the-Blanks:** Completes a comprehensive fill-in-the-blank exercise while watching each session of the training. Each exercise follows the instructor's lecture and can be used as a review for the Quiz, the Pre-Tests, and the Post-Tests.

**Glossary Crossword and Word Search Puzzles:** These puzzles, taken directly from the courses' glossary, are intended to help you become more familiar with the terms found in each session.

**Short Answer:** The short answer questions facilitate recall of the basic training concepts to further aid in retention of the course topics and information in preparation for the training's Pre-Assessments and Post-Tests.

**Matching:** The matching exercise provides additional learning reinforcement of terms and concepts found throughout the training in the courses' glossary.

**Research Topic:** The research topic gives you the opportunity to research an applicable real-world situation whose answer will require using your understanding of the training as well as outside resources to generate a response.

**Projects:** The individual and group projects require you to apply the knowledge gained during the training to complete the assigned task. By using both individual and group projects you will receive the added benefit of applying the knowledge you have gained in a situation that mimics life in the workforce.

**Quiz:** The quizzes will help you gauge your progress. They also provide you additional preparation for the training Pre-Tests and Post-Tests.

## LearnKey

These workbook exercises, used in conjunction with the LearnKey training, give you the best learning experience possible.

**Objective Mapping:** The objective mapping provides a quick reference as to where in the training a specific certification exam objective is covered.

**Running & Training Time Table:** The running and training time tables will help you to better plan your lessons based on the time you have available. The running time is the actual time required to simply watch the training. The training time is an estimated average time that it will take to watch and discuss the concepts presented as well as do any applicable exercises.

**Skills Assessment:** The skills assessment will help you and your students to gauge their understanding of course topics prior to beginning any coursework. Understanding where your students as a group feel less confident will aid you in planning and getting the most from the training.



# Course Map

## Session 1

### Introduction

Understanding The Network+  
Network+ Domains

### Packets

Network Card  
Everything Is Binary  
Conceptualizing Packets  
Conceptualizing MAC Address  
Binary to Hex  
IPCONFIG  
IFCONFIG

1.0 Network Technologies

1.3 Identify the following address formats; MAC Address

5.0 Network Tools

5.1 Given a scenario, select the appropriate command line interface tool and interpret the output to verify functionally: Ipconfig, Ifconfig.

### Topologies

Bus Topology  
Ring Topology  
Star Topology  
Mesh Topology  
Point-to-Point  
Point-to-Multipoint  
Hybrid Topologies

2.0 Network Media and Topologies

2.3 Identify common physical network topologies: Star, Mesh, Bus, Ring, Point to point, Point to multipoint, Hybrid.  
2.7 Explain common logical network topologies and their characteristics, Peer to peer, Client/server, VPN, VLAN

### Building a Network

OSI History  
Physical Layer  
Frames  
Data Link Layer  
Network Layer  
Transport Layer  
Session Layer  
Presentation Layer  
Application Layer

3.0 Network Devices

3.1 Install, configure and differentiate between common network devices: Hub, Repeater.

4.0 Network Management

4.1 Explain the function of each layer of the OSI model:  
Layer 1 – physical, Layer 2 – data link, Layer 3 – network, Layer 4 – transport, Layer 5 – session, Layer 6 – presentation, Layer 7 – application.

## LearnKey

### Network Cabling

Overview  
Coaxial  
Unshielded Twisted Pair  
CAT Levels  
RJ Connectors  
Cable Fire Ratings  
Shielded Twisted Pair  
Fiber Optic  
Fiber Connectors  
Understanding Fiber

#### 2.0 Network and Media Topologies

2.1 Categorize standard cable types and their properties  
Type: CAT3, CAT5, CAT5e, CAT6, STP, UTP, Multimode fiber, single-mode fiber, Coaxial o RG-59 o RG-6, Serial, Plenum vs. Non-plenum Properties: Transmission Speeds, Distance, Duplex, Frequency

.2 Identify common connector types, RJ-11, RJ-45, BNC, SC, ST, LC.2.2 Identify common connector types: RJ-11, RJ-45, BNC, SC, ST, LC. 3.1 Install, configure and differentiate between common network devices: Hub, Repeater, NIC.

### Ethernet Basics

Understanding Ethernet  
Ethernet Frame  
Conceptualizing Ethernet  
Sending Ethernet Frames  
Promiscuous Mode  
Receiving Ethernet Frames  
CSMA/CD  
Connecting Hubs  
Crossover Cable  
Daisy Chaining Hubs

#### 2.0 Network Media and Topologies

2.4 Given a scenario, differentiate and implement appropriate wiring standards: 568A, 568B, Straight vs. cross-over.

2.6 Categorize LAN technology types and properties  
Types: Ethernet, 10BaseT. Properties: CSMA/CD, Broadcast, Collision. 3.1 Install, configure and differentiate between common network devices: Hub, Repeater, NIC, Media converters, Basic switch, Bridge, Wireless access point, Basic router, Basic firewall, Basic DHCP server.

#### 4.0 Network Management

4.7 Given a scenario, troubleshoot common connectivity issues and select an appropriate solution: Collisions.

### 10Base/100Base Ethernet

10BaseT  
10BaseFL  
10Base Ethernet  
100BaseT  
100Base Ethernet  
Media Converter  
Link Lights

#### 2.0 Network Media and Topologies

2.4 Given a scenario, differentiate and implement appropriate wiring standards: 568A, 568B, Straight vs. cross-over.

2.6 Categorize LAN technology types and properties  
Types: Ethernet, 10BaseT. Properties: CSMA/CD, Broadcast, Collision. 3.1 Install, configure and differentiate between common network devices: Hub, Repeater, NIC, Media converters, Basic switch, Bridge, Wireless access point, Basic router, Basic firewall, Basic DHCP server.

#### 4.0 Network Management

4.7 Given a scenario, troubleshoot common connectivity issues and select an appropriate solution: Collisions.

## Session 2

### Modern Ethernet

Ethernet Switches  
Switching  
Spanning Tree Protocol  
Gigabit Ethernet  
Backbone  
10GbE  
10GBaseT

2.0 Network Media and Topologies

2.6 Categorize LAN technology types and properties; Types: 1000BaseT, 1000BaseX, 10GBaseSR, 10GBaseLR, 10GBaseER, 10GBaseSW, 10GBaseLW, 10GBaseEW, 10GBaseT. Properties: Speed, Distance.

3.0 Network Devices

3.1 Install, configure and differentiate between common network devices: Basic switch, Bridge.

3.3 Explain the advanced features of a switch: Spanning tree.

### Structured Cabling

Structured Cabling Defined  
Structured Cabling Terminology  
Rack Units  
Wiring Distribution  
Main Distribution Frame  
Patch Panel  
Patch Cables  
Horizontal Run Demonstration  
66 Block  
Wiring Schematic  
Physical Network Diagram

2.0 Network Media and Topologies

2.8 Install components of wiring distribution: Vertical and horizontal cross connects, path panels, 66 block, MDFs, IDFs, 25 pair, 100 pair, 110 block, Demarc, Demarc extension, Smart jack, Verify wiring installation, Verify wiring termination.

4.0 Network Management

4.2 Identify types of configuration management documentation: Wiring schematics, Physical and logical network diagrams.

4.3 Given a scenario, evaluate the network based on configuration management documentation: Compare wiring schematics, physical and logical network diagrams, baselines, policies and procedures and configurations to network devices and infrastructure. Update wiring schematics, physical and logical network diagrams, configurations and job logs as needed.

### Structured Cabling Tools

Cable Making Tools  
Punch Down Tool  
Continuity  
Continuity Tester  
Micro Scanner  
TDRs  
Attenuation  
Crosstalk  
Shorts and Interference  
Certifiers  
Toner Probe

4.0 Network Management

4.7 Given a scenario, troubleshoot common connectivity issues and select an appropriate solution; Physical issues: Cross talk, Nearing crosstalk, Near End crosstalk, Attenuation, Shorts, Interference. Logical issues: Port speed, Port duplex mismatch, Incorrect VLAN, Incorrect IP address, Wrong gateway, Wrong DNS, Wrong subnet mask.

5.0 Network Tools

5.3 Given a scenario, utilize the appropriate hardware tools: Cable testers, Certifiers, TDR, OTDR, Multimeter, Toner probe, Punch down tool, Cable stripper, Snips.

## LearnKey

### Introducing TCP/IP

Protocoll Suite  
 Broadcasting  
 NetBIOS/NetBEUI  
 Logical Network Addressing  
 Routing  
 IP Naming Importance  
 TCP/UDP/ICMP

1.0 Network Technologies

1.1 Explain the function of networking protocols: TCP, FTP UDP, TCP/IP suite, ICMP.

1.4 Given a scenario, evaluate the proper use of the following addressing technologies and addressing schemes: Broadcast.

### Basic IP Addressing

IP Addressing Defined  
 Unique Addresses  
 Subnet Mask  
 Network ID  
 Binary vs. Decimal  
 Converting Binary to Decimal  
 Dotted-Decimal  
 Converting Decimal to Binary

1.0 Network Technologies

1.4 Given a scenario, evaluate, the proper use of the following addressing technologies and addressing schemes; Addressing Technologies: Subnetting.

### Advanced IP Addressing

Class Licenses  
 CIDR  
 Configuring IP  
 Ping  
 Arp  
 MAC IP Tools  
 Linux IP Tools

1.0 Network Technologies

1.1 Explain the function of common networking protocols: ARP, ICMP.

1.4 Given a scenario, evaluate the proper use of the following addressing technologies and addressing schemes; Addressing schemes: classful vs. classless (e.g. CIDR, Supernetting).

5.0 Network Tools

5.1 Given a scenario, select the appropriate command line interface tool and interpret the output to verify functionality: Ping, Arp Ping, Arp

## Session 3

### Subnetting

Understanding Subnetting  
Subnet Setup  
Extending the Subnet  
Calculating Hosts  
Determining IP Addresses  
Defining Network IDs  
Applying Subnetting  
Example Subnetting Scenario

1.0 Network Technologies

1.3 Identify the following address formats: IPv6, IPv4, MAC addressing.

1.4 Given a scenario, evaluate the proper use of the following addressing technologies and addressing schemes. Addressing Technologies; Subnetting.

### DHCP

Understanding DHCP  
DHCP Client Side  
DHCP Server  
Administering DHCP Server  
Renewing DHCP lease  
APIPA  
Windows DHCP Server  
Rogue DHCP Server

1.0 Network Technologies

1.1 Explain the function of common networking protocol: DHCP.

1.4 Given a scenario, evaluate the proper use of the following addressing technologies and addressing schemes; Addressing Technologies: DHCP (static, dynamic APIPA).

3.0 Network Devices

3.1 Install, configure and differentiate between common network devices: Basic DHCP server.

5.0 Network Tools

5.1 Given a scenario, select the appropriate command line interface tool and interpret the output to verify functionality: Ipconfig.

### Network Naming

Name Resolution  
Host File  
DNS  
DNS Server  
DNS in Action  
Configuring DNS  
Reverse Lookup Zones  
Root Hints  
Forwarder Servers  
Nslookup  
Dig

1.0 Network Technologies

1.1 Explain the function of common networking protocols: DNS

3.0 Network Devices

3.2 Identify the functions of specialized network devices: DNS server.

5.0 Network Tools

5.1 Given a scenario, select the appropriate command line interface tool and interpret the output to verify functionality: Nslookup, Dig.

### Windows Name Resolution

WINS  
SMB/CIFS  
NetBIOS Commands

5.0 Network Tools

5.1 Given a scenario, select the appropriate command line interface tool and interpret the output to verify functionality: Hostname, Nbtstat.

## LearnKey

### Introducing TCP/IP Ports

Ports Defined  
Netstat  
TCPView  
Wireshark  
Packet Filtering

### Static Routing

Routers  
Router Console Cables  
Routing Table  
Route Print  
Broadcast/Unicast/Multicast  
Netstat -r

### 4.0 Network Management

4.4 Conduct network monitoring to identify performance and connectivity issues using the following: Network monitoring utilities (e.g. packet sniffers, connectivity software, load testing, throughput testers). System logs, history logs, event logs.

### 5.0 Network Tools

5.1 Given a scenario, select the appropriate command line interface tool and interpret the output to verify functionality: Netstat.

5.2 Explain the purpose of network scanners: Packet sniffers, Port scanners.

5.3 Given a scenario, utilize the appropriate hardware tools: Protocol analyzer.

### 1.0 Network Technologies

1.4 Given a scenario, evaluate the proper use of the following addressing technologies and addressing schemes: Addressing schemes: Unicast, Multicast, Broadcast.

1.6 Explain the purpose and properties of routing: Understanding routing tables and how they pertain to path selection.

### 2.0 Network Media and Topologies

2.1 Categorize standard cable types and their properties; Types: Serial.

2.2 Identify common connector types: RS-232 2.4 Given a scenario, differentiate and implement appropriate wiring standards: Rollover, Loopback.

### 3.0 Network Devices

3.1 Install, configure and differentiate between common network devices: Basic router.

### 5.0 Network Tools

5.1 Given a scenario, select the appropriate command line interface tool and interpret the output to verify functionality: Route.

Dynamic Routing

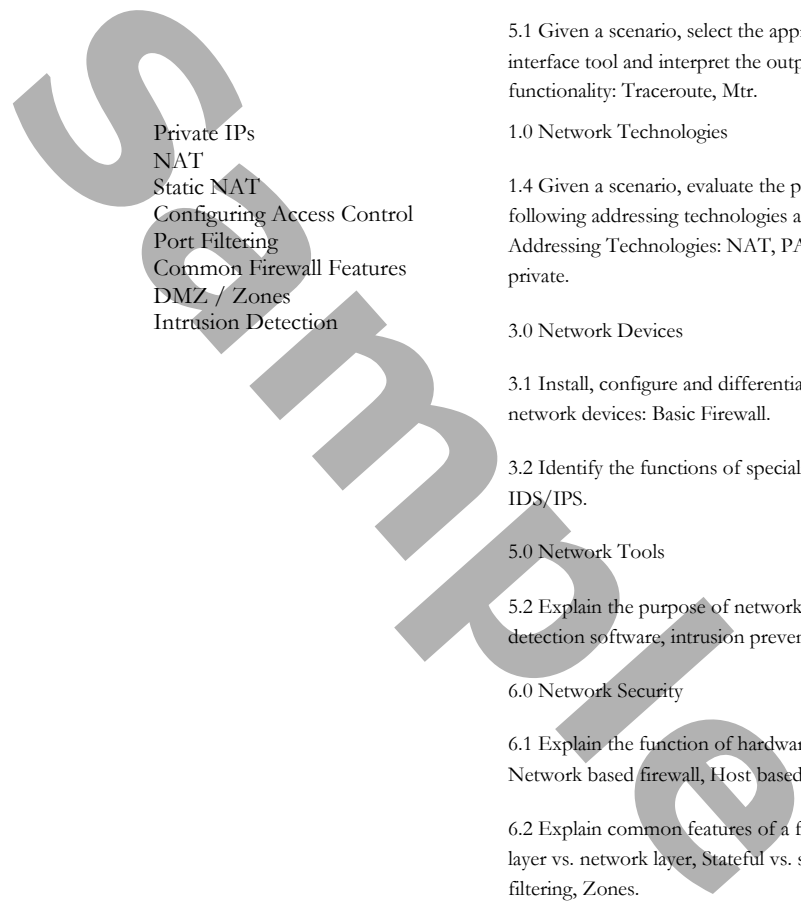
Why Dynamic Routing  
Dynamic Routing Types  
Distance Vector  
RIP  
Autonomous System  
BGP  
OSPF / IS-IS  
Link State in Action  
Hybrid  
Traceroute  
Mtr

1.0 Network Technologies  
  
1.5 Identify common IPv4 and IPv6 routing protocols; Link state: OSPF, IS-IS. Distance vector: RIP, RIPv2, BGP. Hybrid: EIGRP.  
  
1.6 Explain the purpose and properties of routing: IGP vs. EGP, Static vs. dynamic, Next hop, Explain convergence (steady state)  
  
5.0 Network Tools  
  
5.1 Given a scenario, select the appropriate command line interface tool and interpret the output to verify functionality: Traceroute, Mtr.

Firewalls

Private IPs  
NAT  
Static NAT  
Configuring Access Control  
Port Filtering  
Common Firewall Features  
DMZ / Zones  
Intrusion Detection

1.0 Network Technologies  
  
1.4 Given a scenario, evaluate the proper use of the following addressing technologies and addressing schemes; Addressing Technologies: NAT, PAT, SNAT, Public vs. private.  
  
3.0 Network Devices  
  
3.1 Install, configure and differentiate between common network devices: Basic Firewall.  
  
3.2 Identify the functions of specialized network devices: IDS/IPS.  
  
5.0 Network Tools  
  
5.2 Explain the purpose of network scanners: Intrusion detection software, intrusion prevention software.  
  
6.0 Network Security  
  
6.1 Explain the function of hardware and software devices: Network based firewall, Host based firewall, IDS, IPS.  
  
6.2 Explain common features of a firewall: Application layer vs. network layer, Stateful vs. stateless, Content filtering, Zones.  
  
6.3 Explain the methods of network access security; Filtering: ACL-Mac filtering, IP filtering.



# LearnKey

## Session 4

### Internet Applications Part 1

Identifying DHCP Port  
Identifying DNS Port  
SNMP  
Querying SNMP  
HTTP / HTTPS  
Web Server Admin  
Telnet  
SSH

1.0 Network Technologies

1.1 Explain the function of common networking protocols: HTTP (S), SSH, Telnet, SNMP2/3.

1.2 Identify commonly used TCP and UDP ports; TCP ports: SSH-33, TELNET-23, DNS-53, HTTP-80, HTTPS-443. UDP ports: DNS-53, BOOTPS/DHCP-67, SNMP-161.

6.0 Network Security

6.5 Explain issues that affect device security; Secure methods vs. unsecure methods: SSH, HTTPS,SNMPv3,SFTP,SCP. TELENET, HTTP, FTP,

### Internet Applications Part 2

FTP  
FTP Client  
Secure FTP  
TFTP  
E-Mail  
SMTP Server Settings  
Network Time Protocol

1.0 Network Technologies

1.1 Explain the function of common networking protocols: TFTP, SIP (VoIP), RTP (VoIP), POP3, NTP, IMAP4, SMTP, IGMP.

1.2 Identify commonly used TCP and UDP default ports; TCP ports: FTP- 20.21, SMTP-25, POP3-110, NTP-123, IMAP4-143. UDP ports: TFTP-69.

6.0 Network Security

6.5 Explain issues that affect device security; Secure methods vs. unsecure methods: SSH, HTTPS,SNMPv3,SFTP,SCP. TELENET, HTTP, FTP, RSH, RCP, SNMPv1/2.

### Encryption

Authentication Standards  
Point-to-Point Protocol  
Kerberos  
AAA Tools  
EAP  
802.1x

6.0 Network Security

6.3 Explain the methods of network access security; Remote access: PPP.

6.4 Explain methods of user authentication: PKI.

### Authentication

WINS  
SMB/CIFS  
NetBIOS Commands

1.0 Network Technologies

1.7 Compare the characteristics of wireless communication standards; Authentication and encryption: RADIUS.

6.0 Network Security

6.4 Explain methods of user authentication; Kerberos, AAA: RADIUS, TACAS+. Network access control: 802.1x. CHAP, MS-CHAP, EAP.



Wireless

- Understanding 802.11
- 802.11 Standards
- Wireless Settings
- ESSID
- SSID Broadcast
- Joining a Wireless Network

- 1.0 Network Technologies
- 1.7 Compare the characteristics of wireless communication standards; Authentication and encryption: RADIUS.
- 6.0 Network Security
- 6.4 Explain methods of user authentication; Kerberos, AAA: RADIUS, TACAS+. Network access control: 802.1x. CHAP, MS-CHAP, EAP.

Implementing Wireless

- Configuration Considerations
- Wireless Access Points
- Access Point Antennas
- Wireless Issues

- .0 Network Devices
- 3.4 Implement a basic wireless network: Configure appropriate encryptions, Configure channels and frequencies, Set ESSID and beacon, Verify installation.
- 1.6 Explain the purpose and properties of routing: Understanding routing tables and how they pertain to path selection.
- 4.0 Network Management
- 4.7 Given a scenario, troubleshoot common connectivity issues and select an appropriate solution; Wireless Issues: Interference (bleed, environment factors), Standard mismatch (802.11 a/b/g/n), Distance, Bounce, Incorrect antenna placement.

Advanced Networking Devices

- Peer-to-Peer
- Client Server
- Multi-Layer Switch
- Content Switch
- Bandwidth Shaper
- Proxy Server
- VLANs
- Creating a VLAN
- Assigning VLAN Ports
- InterVLAN Routing
- Trunking
- Dynamic VLAN
- VPN
- Tunneling
- Tunneling Protocols
- Connecting VPNs

- 2.0 Network and Media Topologies
- 2.7 Explain common logical network topologies and their characteristics: Peer to peer, Client/server, VPN, VLAN.
- 3.0 Network Devices
- 3.2 Identify the functions of specialized network devices: Multilayer switch, Content switch, Load balancer, Multifunction network devices, Bandwidth shaper, Proxy server.
- 3.3 Explain the advanced features of a switch: PoE, VLAN, Port authentication.
- 4.0 Network Management
- 4.5 Explain different methods and rationales for network performances optimization; Methods: QoS, Traffic shaping, Load balancing, High availability, Caching engines, Fault tolerance. Reasons: latency sensitivity, High bandwidth applications-VoIP-Video Applications, Uptime.
- 6.0 Network Security
- 6.1 Explain the function of hardware and software security devices: VPN concentrator.
- 6.3 Explain the methods of network access security; Tunneling and encryption: SSL VPN, VPN, L2TP, PPTP, IPSEC.

# LearnKey

## Session 5

### IPv6

IPv6 Defined  
 IPv6 Addresses  
 Link Local Address  
 Getting a IPv6 Address

### 6.0 Network Security

6.3 Explain the methods of network access security; Tunneling and encryption: SSL VPN, VPN, L2TP, PPTP, IPSEC.

### Remote Connections

Connectivity History  
 Analog to Digital  
 DSO  
 Digital Cabling  
 Testing T1s  
 T-Carriers  
 SONET  
 Packet Switching  
 MPLS

### .0 Network Media and Topologies

2.5 Categorize WAN technology types and properties; Type: Frame relay, E1/T1, E3/T3, OC-x, ATM, SONET, MPLS. Properties: Circuit switch, Packet switch, Speed, Transmission media, Distance.

### 3.0 Network Devices

3.2 Identify the functions of specialized network devices: CSU/ DSU.

### 5.0 Network Tools

5.3 Given a scenario, utilize the appropriate hardware tools: Butt set.

### The Last Mile

POTS  
 Central Office  
 Digital to Analog to Digital  
 ISDN  
 DSL  
 DLS Types  
 PPPoE  
 Cable Modem  
 Satellite  
 Wireless

### 2.0 Network Media and Topologies

2.5 Categorize WAN technology types and properties; Type: ADSL, SDSL, VDSL, Cable Modem, Satellite, Wireless, ISDN BRI, ISDN PRI, POTS, PSTN. Properties: Circuit switch, Packet switch, Speed, Transmission media, Distance.

### 3.0 Network Devices

3.1 Install, configure and differentiate between common network devices: Modem.

### 6.0 Network Security

6.3 Explain the methods of network access security; Remote access: PPPoE.

### Remote Access

Overview  
 Bonding  
 Traffic Shapping  
 QoS

### 4.0 Network Management

4.5 Explain different methods and rationales for network performances optimization; Methods: QoS, Traffic shaping, Load balancing, High availability, Caching engines, Fault tolerance. Reasons: latency sensitivity, High bandwidth applications-VoIP-Video Applications, Uptime.

**Protecting Your Network**

Physical Security  
Theft  
Power  
HVAC  
Fire  
Hardware Failure  
Antivirus / Malware  
DoS  
Man in the Middle  
Rogue Access Points  
Social Engineering  
Protection Checklist  
Baselines  
Patches / Updates  
Configurations  
Regulations

4.0 Network Management

4.2 Identify types of configuration management documentation: Baselines, Policies, procedures and configurations, Regulations.

6.0 Network Security

6.5 Explain issues that affect device security: Physical security, Restricting local remote access.

6.6 Identify common security threats and mitigation techniques; Security threats: DoS, Viruses, Worms, Attackers, Man in the Middle, Smurf, Rogue access points, Social engineering (phishing). Mitigation techniques: Policies and procedures User training, Paths and updates.

**The Art of Network Support**

Nine Step Process

4.0 Network Management

4.6 Given a scenario, implement the following network troubleshooting methodology: Information gathering-identify symptoms and problems, Identify the affected areas of the network, Determine if anything has changed, Establish the most probable cause, Determine if escalation is necessary, Create an action plan and solution identifying potential effects, Implement and test the solution, Identify the results and effects of the solution, Document the solution and the entire process.

**Lab 1: LAN Issues**

NIC Configuration  
Speed / Duplex Issues  
Wrong IP Address  
Dynamic vs. Static IP / DNS  
VLAN Issues  
Angry IP Scanner  
Port Mirroring  
Impedence Mismatch  
Logs

4.0 Network Management

4.4 Conduct network monitoring to identify performance and connectivity issues using the following: System logs, history logs, event logs.

4.7 Given a scenario, troubleshoot common connectivity issues and select an appropriate solution; Physical issues: Open impedance mismatch (echo). Logical issues: Port Speed, Port duplex mismatch, Incorrect VLAN, Incorrect IP address, Wrong gateway, Wrong DNS, Wrong subnet mask.

**Lab2: WAN Issues**

Switching Loops  
Routing Loops  
Broadcast Storms  
Proxy arp  
Signature Identification

4.0 Network Management

4.7 Given a scenario, troubleshoot common connectivity issues and select an appropriate solution; Issues that should be identified but escalated: Switching loop, Routing loop, Route problems, Proxy arp, Broadcast storms

**Lab3: Wireless Issues**

Interference  
ESSID Mismatch  
Incorrect Encryption  
Incorrect Channel  
Incorrect Frequency

4.0 Network Management

4.7 Given a scenario, troubleshoot common connectivity issues and select an appropriate solution; Wireless issues: Interference (bleed, environment factors), Incorrect encryption, Incorrect channel, Incorrect frequency, ESSID mismatch.

# Session Objectives

## Course Objectives: Session 1

1. Understand physical and logical network topology
2. Describe and define the OSI seven layer model
3. Be able to explain what a packet is and how it's built

## Course Objectives: Session 2

1. Describe and categorize LAN technology types
2. Given a scenario troubleshoot common connectivity issues
3. Explain the functions of different network protocols and their proper use

## Course Objectives: Session 3

1. Describe and implement IP addressing schemes; DHCP, Subnetting, and WINS
2. Gain an understanding of TCP/IP ports
3. Identify the differences between static and dynamic routing

## Course Objectives: Session 4

1. Explain the differences among the many encryption protocols
2. Explain the methods of user authentication
3. Implement and troubleshoot a basic wireless network

## Course Objectives: Session 5

1. Describe the benefits of IPv6
2. Implement and configure remote access and troubleshoot remote connections
3. Identify common security threats and the steps needed to protect your network

# Course Outline

## Session 1

### Introduction

Understanding the Network+  
Network+ Domains

### Packets

What is a Network?  
Network Card  
Everything is Binary  
Conceptualizing Packets  
Conceptualizing MAC Addresses  
Binary to Hex  
IPCONFIG  
IFCONFIG

### Topologies

Bus Topology  
Ring Topology  
Star Topology  
Mesh Topology  
Point-to-Point  
Point-to-Multipoint  
Hybrid Topologies

### Building a Network with OSI

OSI History  
Physical Layer  
Frames  
Data-Link Layer  
Network Layer  
Transport Layer  
Session Layer  
Presentation Layer  
Application Layer

### Network Cabling

Network Cabling Overview  
Coaxial  
Unshielded Twisted Pair  
Cat Levels  
RJ Connectors  
Cable Fire Ratings  
Shielded Twisted Pair  
Fiber optic  
Fiber Connectors  
Understanding Fiber

### Ethernet Basics

Understanding Ethernet  
Ethernet Frame  
Conceptualizing Ethernet  
Sending Ethernet Frames  
Promiscuous Mode  
Receiving Ethernet Frames  
CSMA/CD  
Connecting Hubs  
Crossover Cable  
Daisy Chaining Hubs

### 10Base/100Base Ethernet

10Base-T  
10Base-FL  
10Base Ethernet  
100Base-T  
100Base Ethernet  
Media Converter  
Link Lights

## Session 2

### Modern Ethernet

- Ethernet Switches
- Switching
- Spanning Tree Protocol
- Gigabit Ethernet
- Backbone
- 10GbE
- 10GBase-T

### Structured Cabling

- Structured Cabling Defined
- Structured Cabling Terminology
- Rack Units
- Wiring Distribution
- Patch Panel
- Patch Cables
- Horizontal Run Demonstration
- 66 Block
- Wiring Schematic
- Physical Network Diagram

### Structured Cabling Tools

- Cable Making Tools
- Crimping
- Punch Tools
- Testing Tools
- Continuity
- Continuity Tester
- MicroScanner
- TDRs
- Multimeter
- Attenuation
- Crosstalk
- Shorts
- Interference
- Certifiers
- Toner Probes

### Introducing TCP/IP

- Protocol Suite
- Broadcasting
- NetBIOS/NetBEUI
- Logical Network Addressing
- Routing
- IP Naming Importance
- TCP/IP
- TCP/UDP/ICMP

### Basic IP Addressing

- IP Addressing Defined
- Unique Addresses
- Subnet Mask
- Network ID
- Binary vs. Decimal
- Converting Binary to Decimal
- Dotted Decimal
- Converting Decimal to Binary

### Advanced IP Addressing

- Class Licenses
- CIDR
- Configuring IP
- Ping
- ARP
- Mac IP Tools
- Linux IP Tools

# Session 3

## Subnetting

- Understanding Subnetting
- Subnet Setup
- Extending the Subnet
- Calculating Hosts
- Determining IP Addresses
- Determining Network IDs
- Applying Subnetting
- Example Subnetting Scenarios

## DHCP

- Understanding DHCP
- DHCP Client Side
- DHCP Server
- Administering DHCP Server
- Renewing DHCP Lease
- APIPA
- Windows DHCP Server
- Rogue DHCP Server

## Network Naming

- Name Resolution
- Host File
- DNS
- DNS Server
- DNS in Action
- Reverse Lookup Zones
- Root Hints
- Forwarder Servers
- Nslookup
- Dig

## Windows Name Resolution

- WINS
- SMB/CIFS
- NetBIOS Commands

## Introducing TCP/IP Ports

- Ports Defined
- Netstat
- TCPView
- Wireshark
- Packet Filtering

## Static Routing

- Routers
- Router Console Cables
- Routing Tables
- Static Routes
- Route Print
- Broadcast/Unicast/Multicast
- Origin of Routing Tables
- netstat-r

## Dynamic Routing

- Why Dynamic Routing
- Dynamic Routing Types
- Distance Vector
- RIP
- Autonomous System
- BGP
- OSPF
- IS-IS
- Link State
- Hybrid
- Trace Route
- MTR

## Firewalls

- Private IPs
- NAT
- Overloaded NAT (PAT)
- Static NAT
- Configuring Access Control
- Port Filtering
- Intrusion Detection
- Common Firewall Features

# Session 4

## Internet Applications Part I

- Identifying DHCP Port
- Identifying DNS Port
- SNMP
- Three Types of SNMP
- Cacti and SNMP
- HTTP and HTTPS
- Web Server Administration
- Telnet
- SSH

## Internet Applications Part II

- FTP
- FTP Client
- Secure FTP
- TFTP
- E-mail and SMTP
- Network Time Protocol
- What to Know

## Encryption

- Understanding Encryption
- Symmetric Encryption
- Asymmetric Keys
- Certificates/PKI

## Authentication

- Authentication Standards
- Point-to-Point Protocol
- PAP and CHAP
- Kerberos
- AAA Tools
- EAP
- 802.1x

## Wireless

- Understanding 802.11
- 802.11 Standards
- Wireless Settings
- ESSID
- Joining a Wireless Network
- Wireless Security
- WEP
- 802.11i
- AES Encryption
- WPA
- Recommended Wireless Security

## Implementing Wireless

- Wireless Access Points
- Access Point Antennas
- Wireless Issues

## Advanced Networking Devices

- Introduction
- Peer-to-Peer
- Multilayer Switch
- Content Switch
- Bandwidth Shaper
- Proxy Server
- VLANs
- Creating a VLAN
- Assigning VLAN Ports
- Route and Trunking
- Dynamic VLAN
- VPNs and Tunnels
- VPN Tunnel Standards
- Connecting VPNs



# Session 5

## IPv6

- IPv6 Defined
- IPv6 Addresses
- Link Local Address
- Getting an IPv6 Address
- Configuring IPv6
- IPv6 Tunneling
- Using IPv6

## Remote Connections

- Connectivity History
- Circuit Switching
- Analog to Digital
- DSO
- Digital Cabling
- Testing T1s
- T-Carriers
- SONET
- Packet Switching
- MPLS

## The Last Mile

- The Last Mile
- POTS/PSTN
- Central Office
- Digital to Analog to Digital
- ISDN
- DSL
- DSL Types
- PPPoE
- Cable Modem
- DOCSIS
- Satellite
- Wireless

## Remote Access

- Taking Control
- Remote Access Options
- RRAS
- VNC
- Remote Desktop
- Best Practices

## Network Optimization

- Network Optimization Overview
- Bonding
- Traffic Shaping
- QoS

## Physical Network Protection

- Security Considerations
- Physical Security
- Theft
- Power
- HVAC
- Fire
- Hardware Failure

## Maintaining Network Integrity

- Antivirus/Malware
- DoS Attacks
- Man-in-the-Middle
- Rogue Access Points
- Phishing
- Protection Checklist
- Baselines
- Patches/Updates
- Configurations
- Regulations

## The Art of Network Support

- Nine Step Process

# Session 5

## Lab 1: LAN Issues

Misconfigurations  
NIC Configurations  
Speed/Duplex Issues  
IP Address Issues  
Dynamic vs. Static IP/DNS  
VLAN Issues  
Angry IP Scanner  
Port Monitoring  
Impedance Mismatch  
Logs

## Lab 2: WAN Issues

Escalatory Problems  
Switching Loops  
Routing Loops  
Broadcast Storms  
Proxy ARP  
IDS Signature Identification

## Lab 3: Wireless Issues

Interface  
ESSID Mismatch  
Incorrect Encryption  
Incorrect Channel  
Incorrect Frequency

# Skills Assessment



**Instructions:** Rate your skills with the following tasks on a level from 1-5.

| Skills                              | Poor |   | Excellent |   |   |
|-------------------------------------|------|---|-----------|---|---|
|                                     | 1    | 2 | 3         | 4 | 5 |
| Finding the MAC Address             |      |   |           |   |   |
| Finding the MAC on a Windows system |      |   |           |   |   |
| Point-to-Multipoint                 |      |   |           |   |   |
| RJ Connectors                       |      |   |           |   |   |
| Duplex LC Connector                 |      |   |           |   |   |
| Configuring IP Settings             |      |   |           |   |   |
| Ping Command                        |      |   |           |   |   |
| Using MAC Command Programs          |      |   |           |   |   |
| Accessing Root Hints List           |      |   |           |   |   |
| Services                            |      |   |           |   |   |
| View DHCP Port                      |      |   |           |   |   |
| Filtering Wireshark Results         |      |   |           |   |   |
| Starting SNMP                       |      |   |           |   |   |

| Skills                          | Poor |   |   | Excellent |   |
|---------------------------------|------|---|---|-----------|---|
|                                 | 1    | 2 | 3 | 4         | 5 |
| Accessing Telnet via TTY        |      |   |   |           |   |
| Using SSH on PuTTY              |      |   |   |           |   |
| Connecting to FTP               |      |   |   |           |   |
| Connecting to Wireless Networks |      |   |   |           |   |
| Creating a VLAN                 |      |   |   |           |   |
| Modify VLAN Ports               |      |   |   |           |   |
| Quality of Service              |      |   |   |           |   |
| Configuring IPv4                |      |   |   |           |   |
| IP Address Scan                 |      |   |   |           |   |

# Session **1**



Sample

# Session 1 Time Tables

| <b>Session 1</b>            |                 |
|-----------------------------|-----------------|
| Introduction                | 00:07:18        |
| Packets                     | 00:15:23        |
| Topologies                  | 00:09:45        |
| Building a Network with OSI | 00:15:01        |
| Network Cabling             | 00:17:02        |
| Ethernet Basics             | 00:20:35        |
| 10Base/100Base Ethernet     | 00:11:34        |
| <b>Training Time</b>        | <b>01:36:38</b> |

| <b>Session 1</b>            |                 |
|-----------------------------|-----------------|
| Introduction                | 00:07:18        |
| Packets                     | 00:23:04        |
| Topologies                  | 00:15:23        |
| Building a Network with OSI | 00:22:30        |
| Network Cabling             | 00:25:33        |
| Ethernet Basics             | 00:30:52        |
| 10Base/100Base Ethernet     | 00:17:21        |
| <b>Training Time</b>        | <b>02:24:54</b> |

# Fill-in-the-Blanks



**Instructions:** While watching Session 1, fill in the missing words according to the information presented by the instructor.

[References where answers are found are in brackets.]

## Introduction

1. \_\_\_\_\_ is the objective which covers topics such as switches, routers and wireless access points. **[Network+ Domains]**

## Packets

1. The hexadecimal equivalent to the binary group 1010 is \_\_\_\_\_. **[Binary to Hex]**
2. The \_\_\_\_\_ is burned into the Network Card at the factory which it was made. **[IPconfig]**
3. The \_\_\_\_\_ is represented in the first 24 bits of a MAC Address. **[IPconfig]**
4. The last 24 bits of the MAC address are called the \_\_\_\_\_ or unique identifier. **[IPconfig]**

## Topologies

1. \_\_\_\_\_ is the term used to describe methods of physically wiring computers together. **[Bus Topology]**
2. Ring topologies move packets in \_\_\_\_\_ direction. **[Ring Topology]**
3. Mesh topology physically connects \_\_\_\_\_ to every other computer.  
**[Mesh Topology]**
4. The formula \_\_\_\_\_ is used to determine the number of connections needed to create a fully meshed network. **[Mesh Topology]**

## Building a Network with OSI

1. \_\_\_\_\_, hubs, creating, and repeating copies of a frame are elements of the physical layer of the OSI model. **[Physical Layer]**



2. A \_\_\_\_\_ is a term used to describe an array of computers linked by a hub, in which one computer sends a piece of information and every other computer receives it. **[Frames]**
3. Layer \_\_\_\_\_ of the OSI model is called the data link layer. **[Data-link layer]**
4. A \_\_\_\_\_ works on the network layer to interconnect multiple local area networks using logical addresses. **[Network Layer]**
5. The terms \_\_\_\_\_ and \_\_\_\_\_ are associated with the transport layer of the OSI model. **[Transport Layer]**
6. \_\_\_\_\_ and PostScript are examples of the presentation layer. **[Presentation Layer]**
7. The application layer is layer \_\_\_\_\_ of the OSI model. **[Application Layer]**

### Network Cabling

1. A Coaxial Cable has two wires with a \_\_\_\_\_ axis. **[Coaxial]**
2. UTP, or Unshielded Twisted Pair is a very common cable consisting of \_\_\_\_\_ of cable wrapped in a plastic sheath. **[Unshielded Twisted Pair]**
3. \_\_\_\_\_ is defined by Cat levels. **[Cat levels]**
4. Cat 4 has a capacity of \_\_\_\_\_ BPS. **[Cat levels]**
5. \_\_\_\_\_ cable connectors are the most common type of 4 pair connectors. **[RJ Connectors]**
6. RJ-11 connectors are designed to handle \_\_\_\_\_ pairs of wire. **[RJ Connectors]**
7. \_\_\_\_\_ rated cable has a very low fire rating and is not readily used as a network cable. **[Cable Fire Ratings]**
8. \_\_\_\_\_ fiber optic cable uses lasers instead of regular light. **[Fiber optic]**
9. There is one \_\_\_\_\_ fiber in a fiber optic cable used for sending and receiving information. **[Fiber optic]**
10. \_\_\_\_\_ are commonly used with fiber optic cable. **[Fiber Connectors]**

### Ethernet Basics

1. \_\_\_\_\_ allow two parties to communicate simultaneously. **[Fiber Connectors]**

## LearnKey

2. \_\_\_\_\_, data, \_\_\_\_\_, Source MAC, and Destination MAC are all elements included in the Ethernet. **[Ethernet Frame]**
3. Data which is less than \_\_\_\_\_ requires a pad. **[Ethernet Frame]**
4. A \_\_\_\_\_ is another name for a hub.  
**[Conceptualizing Ethernet/Sending Ethernet Frames]**
5. Promiscuous mode allows a user to keep a \_\_\_\_\_ of every packet sent including ones intended for a different MAC address. **[Promiscuous Mode]**
6. The \_\_\_\_\_ MAC address from a frame is stored after the frame is received.  
**[Receiving Ethernet Frames]**
7. The \_\_\_\_\_ is the process that allows multiple Ethernet devices to share the same line. **[CSMA/CD]**
8. Star bus topology is a hybrid topology used in a **10Base-T** standard Ethernet.  
**[Connecting Hubs]**
9. EIA/TIA 568 A and \_\_\_\_\_ are cabling methodologies used on RJ-45 connectors. **[Connecting Hubs]**

### 10Base/100Base Ethernet

1. The \_\_\_\_\_ is the type of connector is used by 10Base-T Ethernet.  
**[10Base Ethernet]**
2. \_\_\_\_\_ cabling is used by 10Base-FL Ethernet.  
**[10Base Ethernet]**
3. The maximum length of cabling for 100Base-FX Ethernet is \_\_\_\_\_.  
**[100Base Ethernet]**
4. \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_ are types of link lights used by network cards and hubs. **[Link Lights]**

# Glossary Crossword

**Instructions:** Use the terms and clues below to complete the crossword puzzle.

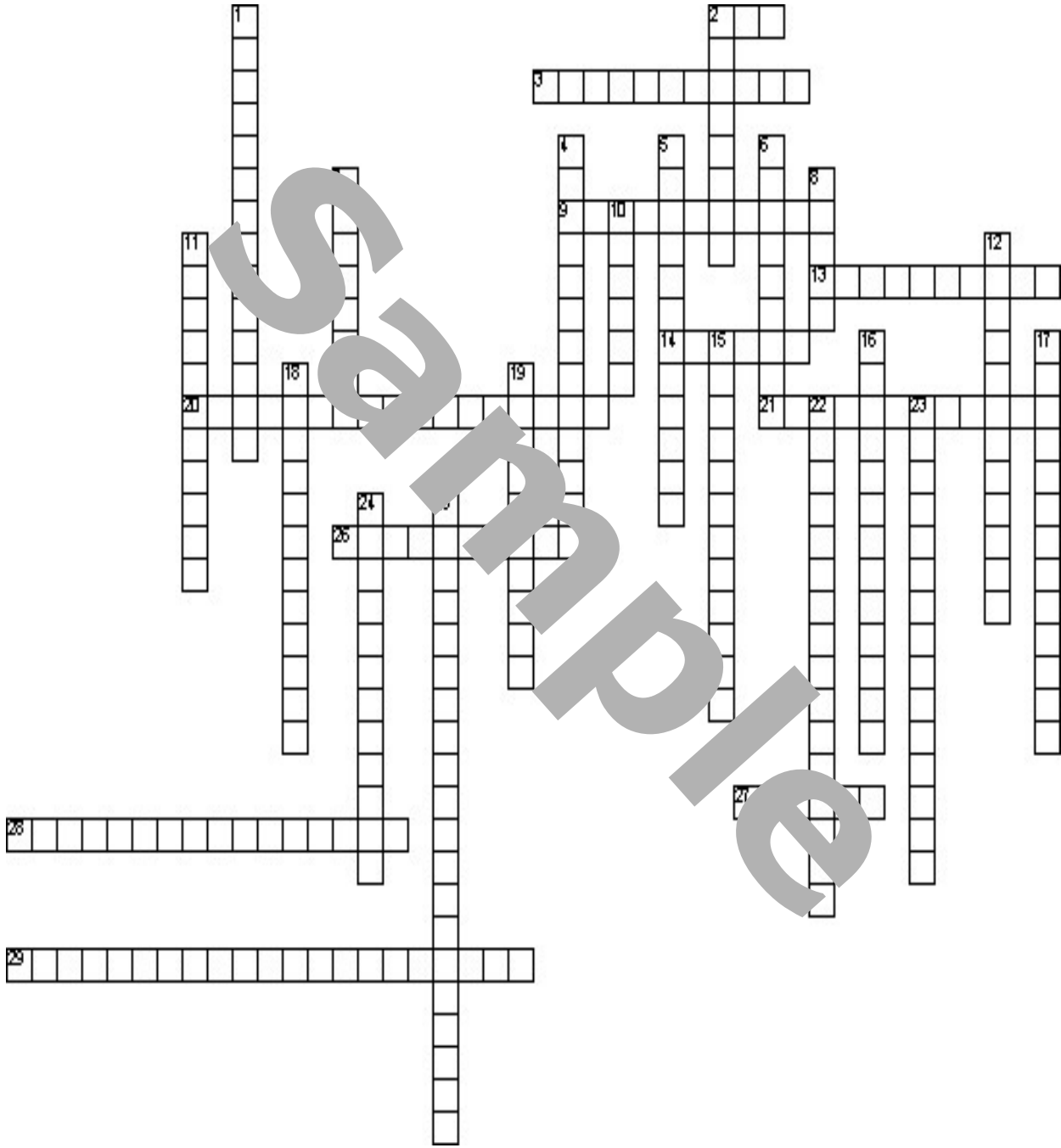
|                   |                   |                         |                         |
|-------------------|-------------------|-------------------------|-------------------------|
| application layer | ethernet          | network layer           | ring topology           |
| binary            | fiberoptic cables | OSI model               | RJ connector            |
| bus topology      | frame             | OUI                     | session layer           |
| cat levels        | hexadecimal       | packet                  | star topology           |
| coaxial cable     | MAC address       | physical layer          | transport layer         |
| CSMA/CD           | mesh topology     | point-to-point topology | unshielded twisted pair |
| daisy chain       | MTRJ connector    | presentation layer      |                         |
| data link layer   | network card      | promiscuous mode        |                         |

## Across

2. The first bits of a MAC address
3. 16-digit notation system used to convert 4-digit segments of binary
9. A standard interface connector for phone and internet
13. Unique 48-bit hexadecimal number burned into a network card connected
14. Small bundle of information sent over the network
20. Sixth layer of the OSI model
21. A type of physical network configurations connected through a central hub
26. Provides communication between computer and network
27. Primary language of computers consisting of only two digits
28. Glass or plastic fiber which transmits information through light or laser pulses
29. Type of cable with one or more twisted copper wires in a plastic sheath

### Down

1. Fourth layer of the OSI model
2. A seven layer model used to define various operation levels
4. A connector used to connect pairs of optical fibers
5. A unidirectional circular physical network configuration
6. A cable rating system which defines the speed of bandwidth
7. Type of network for local area network
8. A data packet encoded at the data link layer
10. A network protocol used to send data over a segment of an Ethernet network
11. Type of physical network configuration where all nodes connect to a common pathway
12. Type of physical network configuration where each node is directly connected
15. An electrical transmission medium with a single copper conductor and a plastic insulation layer
16. Second layer of OSI model
17. First layer of the OSI model
18. Third Layer of OSI model
19. A wiring scheme used in linking two or more HGs in a local area network
22. Seventh layer of the OSI model
23. A network card configuration that allows Ethernet interface to read all information on the network card
24. Fifth layer of OSI model
25. Type of physical network configuration where only two nodes directly connect



# Glossary Word Search

**Instructions:** Use the clues below to complete the word search.

- layer
- binary
- bus
- application
- topology
- cat levels
- coaxial cable
- CSMA/CD
- daisy chain
- data link layer
- ethernet
- fiberoptic cables
- frame
- hexadecimal
- MAC address
- mesh topology
- MTRJ connector
- network card
- network layer
- OSI model

R M E Z O I J K K I M M U E V D K N E S I U T H D D D Y  
 U I T E F L J T L H I G D H K L H P M S J N W C A M N G  
 Y G O L O P O T S U E K O S Z C Z O O A E F S P A T X E O  
 X W N B E I J B T E J K M P J I W N R R U H C Z A K U L  
 R U H O G S D U O C Y S E C N N H V F D M I A Q L Z R O  
 B E J Y U X I Q O F U J V M T X T B R J D E E Z E I E J P  
 D U Y I A B X N J O F T X B T D R N I A Y L H B N E Q O  
 Z D R A I X N Z U Y G O L O P G M I R C X D G W K B Y T  
 O Z Z N L E T C Q I J N P G K M V I G A L E S I L K X H  
 D B A Q C N S H R N I O G V G I M Q N M E D P Y A D G S  
 M R Z T C I O L W A I H D R K T N P O T L A Y E R E  
 Y C O R M M E I H N N L K C E P U N L X S W V B E I N M  
 M R I O Y F Y C T Q B S V F Z G H M I S I M I U E R E E G  
 N C R I E G Y T O A R E Y A L N O I T A I N E R P S T W  
 W P T Z F S O T Q A C S E S S I O N L A Y E T Q U E W V  
 T R R L I P G L H U X I J Y C X O S U D T X E L I X L O G  
 H L S A L N Q E O N S I L O C V M F P I I C E D X U B B R X  
 P S D O T I S V F P Q Z A P L K M N H A F O H P B F L A K Q  
 L H L H S S R J W L O G I L P P S E D N R R E A X V A C C Y  
 B G Y S T I Q O M G V T Q F C A X B R N E I R I J X P C A W  
 Y S E S E S M A T C C X R Q Z A D U G Y V E N R B W O I R E  
 S N K O I U O O T C Q S P A D E B C A U F J E G P R N T D N  
 X S A P D C Y S D Q E B F E T X D L A P V P T T A D O P Q F  
 G A T N L H A S N E C N C V R S K B E M O P M V U I F O Z O  
 P V X S R E K L U U L I N C F R V Q A L S L E N Q C T R J U  
 W C R V Z E L F L F M O C O O T E K C A P C V Z X P B E Z T  
 Q K C L X V I P B A U I G W C N L S D P X F F F A K H B H D  
 H F Y G V I Z O L O Y R T M H J C A T L E V E L S X H I A U  
 S K J A U G I G R W B E N L S F R H V Q H Q C G M B I F M G  
 V C Z O M Z B F Z E N U R M V X G L G E B N V D E C R H Y J

# Short Answer

**Instructions:** Use the information learned while watching Session 1 to answer the questions.

1. What are some of the objectives covered in the Network+ 2009 Certification exam?

---

---

---

2. Define Point-to-Multipoint topology.

---

---

---

3. Define the OSI model.

---

---

---

4. List (in order) the seven layers of the OSI model.

---

---

---

5. What is a UTP, and how is it recognized?

---

---

---

6. Define the function of Cat Levels.

---

---

---

---

7. If a cable has a PVC rating, what does that mean?

---

---

---

---

8. Define Ethernet.

---

---

---

---

9. Describe the elements found in an Ethernet frame.

---

---

---

---

10. What is the Promiscuous mode?

---

---

---

---



11. Describe the function of a CSMA/CD.

---

---

---

---

12. Describe the function of an MT-RJ connector.

---

---

---

---

13. What is the function of Fiberoptic Cables?

---

---

---

---

14. What is the purpose of a Daisy Chain?

---

---

---

---

15. List the types of link lights that are used by network cards and hubs.

---

---

---

---

# Glossary Matching

**Instructions:** Match the glossary term described in Session 1 to its definition.

- |                      |                            |                             |
|----------------------|----------------------------|-----------------------------|
| a. MAC address       | k. binary                  | u. star topology            |
| b. ring topology     | l. data link layer         | v. RJ connector             |
| c. packet            | m. promiscuous mode        | w. transport layer          |
| d. bus topology      | n. daisy chain             | x. OUI                      |
| e. network layer     | o. point-to-point topology | y. physical layer           |
| f. fiberoptic cables | p. ethernet                | z. MTRJ connector           |
| g. hexadecimal       | q. coaxial cable           | aa. frame                   |
| h. cat levels        | r. network card            | bb. session layer           |
| i. application layer | s. mesh topology           | cc. presentation layer      |
| j. CSMA/CD           | t. OSI model               | dd. unshielded twisted pair |

1. \_\_\_ A type of protocol for local area networks.
2. \_\_\_ A network card configuration that allows an Ethernet interface to read all information on the network card.
3. \_\_\_ Primary language of computers consisting of only two digits.
4. \_\_\_ A type of physical network configuration connected through a central hub.
5. \_\_\_ A type of physical network configuration where each node is directly connected.
6. \_\_\_ A small bundle of information sent over a network.
7. \_\_\_ A data packet encoded at the data link layer.
8. \_\_\_ A unique 48-bit hexadecimal number burned into a network card.
9. \_\_\_ A 16-digit notation system used to convert 4-digit segments of binary.
10. \_\_\_ The first 3 bits of a MAC address in the OSI model.
11. \_\_\_ The second layer of the OSI model.
12. \_\_\_ The third layer of the OSI model.
13. \_\_\_ The sixth layer of the OSI model.
14. \_\_\_ The seventh layer of the OSI model.

15. \_\_\_ An electrical transmission medium with a single copper conductor and a plastic insulation layer.
16. \_\_\_ A type of cable with one or more twisted copper wires in a plastic sheath.
17. \_\_\_ A type of physical network configuration where all nodes connect to a common pathway.
18. \_\_\_ The fourth layer of the OSI model.
19. \_\_\_ The fifth layer of the OSI model.
20. \_\_\_ A unidirectional circular physical network configuration.
21. \_\_\_ A type of physical network configuration where only two nodes are directly connected.
22. \_\_\_ A seven-layer model used to define various operation levels.
23. \_\_\_ The first layer of the OSI model.
24. \_\_\_ A cable rating system which defines the speed of bandwidth.
25. \_\_\_ A standard interface connector for phone and internet.
26. \_\_\_ Provides communication between a computer and a network.
27. \_\_\_ A connector used to connect pairs of optical fibers.
28. \_\_\_ Glass or plastic fiber which transmits info through light or laser pulses.
29. \_\_\_ A network protocol used to send data over a segment of an Ethernet network.
30. \_\_\_ A wiring scheme used in linking two or more components together.

# Research Topic



**Instructions:** Research the topic below using the Internet and then write a few paragraphs reporting your findings. Be sure to research thoroughly and site your resources. This page may be used to take notes.

Research the different types of topologies. Write a short essay describing each of the seven types, bus topology, ring topology, star topology, mesh topology, Point-to-Point, Point-to-Multipoint, and hybrid topology. Be sure to include the advantages and disadvantages of each type, as well as the environments that each would be best utilized.

# Individual Project



**Instructions:** Assign each student the following subjects to research. Each student should prepare a short 5-10 minute class presentation of the information researched.

Everything that comes in and out of the network card is binary data. In order for this data to be received properly, the binary code must be converted to a hexadecimal value known as a MAC address. This is an identification number burned into every network card at the factory where it was manufactured. On the Network+ Exam, you will be asked to convert not only binary to hexadecimal, but hexadecimal to binary.

Using the formula in Session 1, convert the following hexadecimal MAC address back into binary code:

12-34-46-78-9A-BC

# Group Projects



**Instructions:** Divide into groups and assign each group one of the following subjects to research. Each group should prepare a short 5-10 minute class presentation of the information researched.

1. Within a network there are a number of different methods used to connect individual systems. These methods are called Topologies. These topologies are crucial to the proper delivery of data, effective communication, and security measures within a company/organization.

As a group determine what kind of organization is using the network, what the network will be used for, and whether all systems involved are in the same location.

Divide the class into four groups and assign each group a computer. Each group must:

1. Identify the Physical (MAC) address
  2. Identify the OUI and its manufacturer
  3. Find the Host Identifier
  4. Decide which Topography best serves the organization and its needs.
2. The OSI Seven Layer Model defines seven functions that all networks need in order to act as a network and provide for interoperability. The Network+ Exam fixates on this model, knowing each layer and its function is crucial.

Divide the class into seven groups and assign each group/student one of the seven layers.

Each group/student will then gather specific data and document the uses of the layer and its relation to the other layers of the model. These must be specific and thorough using illustrations, diagrams, definitions, and descriptions of processes and functions.

Allow each group to share their finding with the other groups.

Discuss as a group the importance of each layer and the role it plays within the network.

# Session 1 Quiz



**Instructions:** Circle the letter of the option that BEST answers the question.

1. \_\_\_\_ topology physically connects every computer to every other computer.
  - A. Ring
  - B. Layer
  - C. Joint
  - D. Mesh
  - E. Link
2. The terms "assemble" and "disassemble" are associated with the Presentation layer of the OSI.
  - A. True
  - B. False
3. What formula is used to determine the number of connections needed to create a fully meshed network?
  - A.  $[n(n-1)/2]$
  - B.  $[n/5-4]$
  - C.  $[3(n-3)n]$
4. A \_\_\_\_\_ Domain is a term used to describe an array of computers linked by a hub, in which one computer sends a piece of information and every other computer receives it.
  - A. Cabling
  - B. Broadcast
  - C. Network
  - D. Identifier
  - E. Transport
5. The last 24 bits of the MAC Address are called the Host Identifier.
  - A. True
  - B. False
6. The RJ-45 is the type of connector used by 10Base-T Internet.
  - A. True
  - B. False
7. Which types of link lights are used by the network cards and hubs?
  - A. Speed
  - B. Connection
  - C. Activity

8. Bandwidth is defined by \_\_\_\_\_ levels.
  - A. Sky
  - B. Wide
  - C. Set
  - D. Cat
  - E. Sound
9. What is the name of layer seven of the OSI model?
  - A. Physical layer
  - B. Presentation layer
  - C. Application layer
  - D. Data Link layer
10. Binary is a 16-digit-based numeric notation system.
  - A. True
  - B. False
11. The OSI model is a seven-layer model used to define the various operation levels of network connections.
  - A. True
  - B. False
12. The fourth layer of the OSI model, which is responsible for routing data across one or more networks:
  - A. Network
  - B. Presentation
  - C. Transport
  - D. Data-link
  - E. Application
13. Which are found on the presentation layer of the OSI model.
  - A. SMTP
  - B. PDF files
  - C. PostScript
  - D. TCP
14. CRC, Data, Type, Source MAC, and Destination MAC are all elements included in the Internet.
  - A. True
  - B. False
15. What is another name for a Hub?
  - A. Gopher
  - B. RILO
  - C. Router
  - D. Repeater



# Slides

# & Notes

**Network+ Domains**

- 1.0 Network Technologies - 20%
- 2.0 Network Media and Topologies - 20%
- 3.0 Network Devices - 17%
- 4.0 Network Management - 20%
- 5.0 Network Tools - 12%
- 6.0 Network Security - 11%

**Notes:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_


\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Conceptualizing MAC Address**

- MAC (Media Access Control)
- A number burned into every network card, no exceptions



**Notes:** \_\_\_\_\_

\_\_\_\_\_


\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**OSI History**



**OSI  
Seven  
Layer Model**

Defined seven functions that all networks needed to do in order to act as a network

**Notes:** \_\_\_\_\_