Network+ 2009

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Introduction
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 structure your lessons. 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:** The student 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 your students 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 your students the opportunity to research an applicable real-world situation whose answer will require using their understanding of the training as well as outside resources to generate a response.

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

**Quiz:** The quizzes will help you gauge your students’ progress. They also provide your students additional preparation for the training Pre-Tests and Post-Tests.
These workbook exercises, used in conjunction with the LearnKey training, give your students the best learning experience possible.

**Shoot File Links:** The links to shoot files contain any of the actual files (Excel spreadsheets, Flash FLA files, etc.) that are used and demonstrated during the training. The files will typically have a starting file containing all data necessary to begin the demonstrated skill, as well as a completed file that shows the final result.

**Keyboard Shortcuts & Tips:** The keyboard shortcuts and tips provide a reference of product-specific keyboard shortcuts and helpful hints to make working more efficient.

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

**Best Practices Guide:** The best practices guide gives you as the instructor the help you will need to effectively incorporate the workbook and training into your classroom experience. This guide comes from teachers like yourself and has been proven time and time again.

**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 Introduction

Network+ is an ebecome Network+ certified. Students will gain the knowledge and skills necessary to manage, maintain, troubleshoot, install, operate and configure basic network infrastructure, describe networking technologies, and basic design principles. This course will provide lite training program that completely and adequately prepares students to students with the ability to effectively learn real-world concepts and skills to help launch or enhance a networking career. This course will prepare you to pass the CompTIA® Network+ certification exam N10-004.

Benefits:

- Certification is ranked as one of the most in-demand networking skills in the IT department
- Achieve industry recognition and respect among colleagues and professionals
- Provides a full library of knowledge that can be referenced time and time again
# 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

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

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

---

## 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.

## 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

---

## 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:
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

2.2 Identify common connector types, RJ-11, RJ-45, BNC,
SC, ST, LC2.2 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.

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

2.8 Install components of wiring distribution: Vertical and horizontal cross connects, path panels, 66 block, MDFs, IDF, 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

4.7 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, Prt 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.
### Introducing TCP/IP
- Protocoll Suite
- Broadcasting
- NetBIOS/NetBEUI
- Logical Network Addressing
- Routing
- IP Naming Importance
- 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

### 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:
  - Broadcasting.

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

### 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

## 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
- Configuring DNS
- Reverse Lookup Zones
- Root Hints
- Forwarder Servers
- Nslookup
- Dig

## Windows Name Resolution

- WINS
- SMB/CIFS
- NetBIOS Commands

---

### 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.

### 1.1 Explain the function of common networking protocols:

- DHCP

### 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 functionally: `ipconfig`.

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

- 5.1 Given a scenario, select the appropriate command line interface tool and interpret the output to verify functionality: `Hostname`, `Nbtstat`. 
Introducing TCP/IP Ports

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

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:

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
Dynamic Routing

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)

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.

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.
5.2 Explain the purpose of network scanners: Intrusion detection software, intrusion prevention software.

5.0 Network Tools
5.5 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.

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.

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
5.5 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.
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, SNMPv2/3.


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.
Introduction

Wireless

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

Implementing Wireless

Configuration Considerations
Wireless Access Points
Access Point Antennas
Wireless Issues

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

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.

0 Network Devices

3.4 Implement a basic wireless network: Configure appropriate encryptions, Configure channels and frequencies, Set ESSID and beacon, Verify installation.

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.

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 sharper, Proxy server.

4.0 Network Management


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.
### Session 5

#### IPv6
- IPv6 Defined
- IPv6 Addresses
- Link Local Address
- Getting a IPv6 Address

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

#### The Last Mile
- POTS
- Central Office
- Digital to Analog to Digital
- ISDN
- DSL
- DLS Types
- PPPoE
- Cable Modem
- Satellite
- Wireless

#### Remote Access
- Overview
- Bonding
- Traffic Shaping
- QoS

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

#### 2.0 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.

#### 4.0 Network Management
- 4.5 Explain different methods and rationales for network performances optimization;
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

The Art of Network Support

Nine Step 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

Lab 2: WAN Issues
Switching Loops
Routing Loops
Broadcast Storms
Proxy arp
Signature Identification

Lab 3: Wireless Issues
Interference
ESSID Mismatch
Incorrect Encryption
Incorrect Channel
Incorrect Frequency

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.

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.

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.

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

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
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# Sample Lesson Plans

## 5 Week Plan

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<tr>
<th>Week 1</th>
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<td><strong>Session 1 Pre-Test</strong></td>
<td><strong>Introduction Packets</strong></td>
<td><strong>Glossary Word Search</strong></td>
<td><strong>Matching Crossword Topologies</strong></td>
<td><strong>Building a Network with OSI</strong></td>
<td><strong>Research Topic</strong></td>
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<td><strong>Short Answer</strong></td>
<td><strong>Individual Project</strong></td>
<td><strong>Labs</strong></td>
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<td><strong>Session 2 Pre-Test</strong></td>
<td><strong>Read Article: CompTIA Gets Technical Glossary Crossword</strong></td>
<td><strong>Word Search Matching</strong></td>
<td><strong>Modern Ethernet Structured Cabling Tools</strong></td>
<td><strong>Group Project</strong></td>
<td><strong>Introducing TCP/IP</strong></td>
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<td><strong>Labs</strong></td>
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<td><strong>Glossary Word Search Subnetting DHCP</strong></td>
<td><strong>Matching Crossword</strong></td>
<td><strong>Network Naming Windows Name Resolution Research Topic</strong></td>
<td><strong>Introducing TCP/IP Ports</strong></td>
<td><strong>Static Routing Firewalls</strong></td>
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<td><strong>Individual Project</strong></td>
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<td><strong>Session 4 Pre-Test</strong></td>
<td><strong>Glossary Crossword Internet Applications Part I</strong></td>
<td><strong>Word Search Matching</strong></td>
<td><strong>Group Project</strong></td>
<td><strong>Internet Applications Part II Encryption</strong></td>
<td><strong>Authentication Wireless Implementing Wireless Individual Project</strong></td>
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<td><strong>Individual Project</strong></td>
<td><strong>Labs</strong></td>
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<td><strong>Session 5 Pre-Test</strong></td>
<td><strong>Glossary Word Search IPv6 Remote Connections</strong></td>
<td><strong>Matching Crossword</strong></td>
<td><strong>Group Project</strong></td>
<td><strong>The Last Mile Remote Access</strong></td>
<td><strong>Individual Project Network Optimization Physical Network Protection Maintaining Network Integrity The Art of Network Support</strong></td>
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<td><strong>Lab1</strong></td>
<td><strong>Labs</strong></td>
<td><strong>Short Answers</strong></td>
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*Complete the corresponding section of the Listing Fill in the Blank Exercise.*

LearnKey training segments are underlined. Activities are italicized. Tests are bolded.
# 6 Week Plan

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| 1    | Session 1 Pre-Test  
Introduction  
Packets | Glossary  
Word Search  
Matching  
Crossword  
Topologies | Building a Network  
with OSI  
Research Topic  
Network Cabling | Ethernet Basics  
10/100Base  
Ethernet  
Group Project | Short Answer  
Individual Project  
Labs |
| 2    | Session 1 Post Test | Session 2 Pre-Test  
Read Article:  
CompTIA Gets Technical  
Glossary  
Word Search  
Matching  
Modern Ethernet | Crossword  
Word Search  
Matching  
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Structured Cabling  
Tools  
Group Project | Introducing TCP/IP  
Basic IP Addressing  
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dressing  
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| 3    | Week 1  
5 Post Test | Session 2 Post Test | Session 3 Pre-Test  
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Word Search  
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Matching  
Network Naming  
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| 4    | Static Routing  
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Part I | Word Search  
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Group Project | Internet Applications  
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Wireless |
| 5    | Individual Project  
Implementing Wire- 
less | Advanced Networking  
Devices  
Labs  
Short Answers | Session 4 Post Test | Session 5 Pre-Test  
Glossary  
Word Search | IPv6  
Remote Connections  
Matching  
Crossword  
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| 6    | The Last Mile  
Remote Access  
Individual Project  
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tion | Physical Network  
Protection  
Maintaining Network  
Integrity  
The Art of Network  
Support | Lab1: LAN Issues  
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Lab 3: Wireless Is- 
issues | Lab  | Session 5 Post Test |

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<td><strong>Week 1</strong></td>
<td><strong>Session 1 Pre-Test</strong>&lt;br&gt;Introduction&lt;br&gt;Packets&lt;br&gt;Glossary&lt;br&gt;Word Search</td>
<td><strong>Tuesday</strong>&lt;br&gt;Matching Crossword&lt;br&gt;Topologies&lt;br&gt;Building a Network with OSI&lt;br&gt;Research Topic</td>
<td><strong>Wednesday</strong>&lt;br&gt;Network Cabling&lt;br&gt;Ethernet Basics&lt;br&gt;10/100Base Ethernet&lt;br&gt;Group Project&lt;br&gt;Individual Project</td>
<td>Thursday</td>
<td>Friday</td>
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<td><strong>Week 2</strong></td>
<td><strong>Session 1 Post Test</strong>&lt;br&gt;Session 2 Pre-Test</td>
<td><strong>Tuesday</strong>&lt;br&gt;Session 2 Pre-Test&lt;br&gt;Read Article: CompTIA Gets Technical&lt;br&gt;Glossary&lt;br&gt;Crossword&lt;br&gt;Matching</td>
<td><strong>Thursday</strong>&lt;br&gt;Word Search&lt;br&gt;Modern Ethernet&lt;br&gt;Group Project</td>
<td><strong>Friday</strong>&lt;br&gt;Session 3 Pre-Test&lt;br&gt;Subnetting&lt;br&gt;DHCP&lt;br&gt;Session 2 Post Test</td>
<td><strong>Monday</strong>&lt;br&gt;Session 3 Post Test</td>
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<tr>
<td><strong>Week 3</strong></td>
<td><strong>Structured Cabling</strong>&lt;br&gt;Structured Cabling Tools&lt;br&gt;Individual Project</td>
<td><strong>Tuesday</strong>&lt;br&gt;Introducing TCP/IP&lt;br&gt;Basic IP Addressing&lt;br&gt;Advanced IP Addressing&lt;br&gt;Research Topic&lt;br&gt;Short Answer Labs&lt;br&gt;Session 2 Post Test</td>
<td><strong>Wednesday</strong>&lt;br&gt;Introducing TCP/IP&lt;br&gt;Prints&lt;br&gt;Static Routing&lt;br&gt;Firewalls&lt;br&gt;Group Project&lt;br&gt;Individual Project</td>
<td><strong>Thursday</strong>&lt;br&gt;Short Answers&lt;br&gt;Session 3 Post Test</td>
<td><strong>Friday</strong>&lt;br&gt;Labs&lt;br&gt;Authentication&lt;br&gt;Wireless&lt;br&gt;Individual Project</td>
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<td><strong>Week 4</strong></td>
<td><strong>Glossary</strong>&lt;br&gt;Word Search&lt;br&gt;Matching Crossword</td>
<td><strong>Tuesday</strong>&lt;br&gt;Network Naming&lt;br&gt;Windows Name Resolution&lt;br&gt;Research Topic&lt;br&gt;Group Project&lt;br&gt;Internet Applications Part II&lt;br&gt;Encryption</td>
<td><strong>Wednesday</strong>&lt;br&gt;Introducing TCP/IP&lt;br&gt;Packets&lt;br&gt;Static Routing&lt;br&gt;Firewalls&lt;br&gt;Group Project&lt;br&gt;Individual Project</td>
<td><strong>Thursday</strong>&lt;br&gt;Session 5 Pre-Test&lt;br&gt;Glossary&lt;br&gt;Word Search&lt;br&gt;IPv6&lt;br&gt;Remote Connections&lt;br&gt;Matching Crossword&lt;br&gt;Group Project&lt;br&gt;The Last Mile&lt;br&gt;Remote Access&lt;br&gt;Session 4 Post Test</td>
<td><strong>Friday</strong>&lt;br&gt;Short Answers&lt;br&gt;Session 5 Post Test</td>
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<td><strong>Week 5</strong></td>
<td><strong>Session 4 Pre-Test</strong>&lt;br&gt;Internet Applications Part I&lt;br&gt;Implementing Wireless&lt;br&gt;Advanced Networking Devices&lt;br&gt;Labs&lt;br&gt;Short Answers</td>
<td><strong>Tuesday</strong>&lt;br&gt;Glossary Crossword&lt;br&gt;Word Search&lt;br&gt;Matching&lt;br&gt;Labs</td>
<td><strong>Wednesday</strong>&lt;br&gt;Session 5 Pre-Test&lt;br&gt;Glossary&lt;br&gt;Word Search&lt;br&gt;IPv6&lt;br&gt;Remote Connections&lt;br&gt;Matching Crossword&lt;br&gt;Group Project&lt;br&gt;The Last Mile&lt;br&gt;Remote Access&lt;br&gt;Session 4 Post Test</td>
<td><strong>Thursday</strong>&lt;br&gt;Session 5 Post Test</td>
<td><strong>Friday</strong>&lt;br&gt;Short Answers</td>
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<tr>
<td><strong>Week 6</strong></td>
<td><strong>Individual Project</strong>&lt;br&gt;Network Optimization</td>
<td><strong>Tuesday</strong>&lt;br&gt;Physical Network Protection&lt;br&gt;Maintaining Network Integrity&lt;br&gt;The Art of Network Support&lt;br&gt;Lab 1: LAN Issues&lt;br&gt;Lab 2: WAN Issues&lt;br&gt;Lab 3: Wireless Issues</td>
<td><strong>Wednesday</strong>&lt;br&gt;Lab 1: LAN Issues&lt;br&gt;Lab 2: WAN Issues&lt;br&gt;Lab 3: Wireless Issues</td>
<td><strong>Thursday</strong>&lt;br&gt;Lab 1: LAN Issues&lt;br&gt;Lab 2: WAN Issues&lt;br&gt;Lab 3: Wireless Issues</td>
<td><strong>Friday</strong>&lt;br&gt;Session 5 Post Test</td>
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<td>Session 1 Pre-Test&lt;br&gt;Introduction&lt;br&gt;Packets&lt;br&gt;Glossary&lt;br&gt;Word Search</td>
<td>Matching Crossword&lt;br&gt;Topologies&lt;br&gt;Building a Network with OSI&lt;br&gt;Research Topic</td>
<td>Network Cabling&lt;br&gt;Ethernet Basics&lt;br&gt;10/100Base Ethernet</td>
<td>Group Project</td>
<td>Individual Project&lt;br&gt;Short Answer&lt;br&gt;Labs</td>
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<tr>
<td>Week 2</td>
<td>Session 1 Post Test</td>
<td>Session 2 Pre-Test&lt;br&gt;Read Article:&lt;br&gt;CompTIA Gets Technical&lt;br&gt;Glossary&lt;br&gt;Crossword</td>
<td>Word Search&lt;br&gt;Matching&lt;br&gt;Modern Ethernet</td>
<td>Structured Cabling&lt;br&gt;Structured Cabling Tools</td>
<td>Group Project</td>
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<tr>
<td>Week 3</td>
<td>Introducing TCP/IP&lt;br&gt;Basic IP Addressing&lt;br&gt;Advanced IP Addressing</td>
<td>Individual Project Short Answer Labs</td>
<td>Research Topic</td>
<td>Session 2 Post Test</td>
<td>Session 3 Pre-Test&lt;br&gt;Glossary&lt;br&gt;Subnetting&lt;br&gt;DHCP</td>
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<td>Week 4</td>
<td>Word Search&lt;br&gt;Matching Crossword</td>
<td>Network Naming&lt;br&gt;Windows Name Resolution&lt;br&gt;Research Topic</td>
<td>Introducing TCP/IP Ports&lt;br&gt;Static Routing&lt;br&gt;Firewalls</td>
<td>Short Answers&lt;br&gt;Group Project</td>
<td>Individual Project Labs</td>
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<td>Session 4 Pre-Test</td>
<td>Glossary&lt;br&gt;Internet Applications Part I</td>
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<td>Internet Applications Part II&lt;br&gt;Encryption</td>
<td>Authentication&lt;br&gt;Wireless Implementing Wireless</td>
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<td>Session 5 Pre-Test&lt;br&gt;Glossary</td>
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<td>Group Project&lt;br&gt;The Last Mile&lt;br&gt;Remote Access</td>
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<td>Individual Project&lt;br&gt;Network Optimization&lt;br&gt;Physical Network Protection</td>
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<td>Labs&lt;br&gt;Short Answers</td>
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## Introduction

### Skills Assessment

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

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<thead>
<tr>
<th>Skills</th>
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<td>Point-to-Multipoint</td>
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<td>RJ Connectors</td>
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<td>Duplex LC Connector</td>
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<td>Services</td>
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LearnKey offers video-based training solutions which are flexible enough to accommodate the private student, as well as educational facilities and organizations.

Our course content is presented by top experts in their respective fields, and provides clear and comprehensive information. The full line of LearnKey products have been extensively reviewed to meet superior standards of quality. The content in our courses has also been endorsed by organizations such as Certiport, CompTIA®, Cisco, and Microsoft. However, it is the testimonials given by countless satisfied customers that truly set us apart as leaders in the information training world.

LearnKey experts are highly qualified professionals who offer years of job and project experience in their subjects. Each expert has been certified in the highest level available for their field of expertise. This provides the student with the knowledge necessary to also obtain top level certifications in the field of their choice.

Our accomplished instructors have a rich understanding of the content they present. Effective teaching encompasses not only presenting the basic principles of a subject, but understanding and appreciating organization, real-world application, and links to other related disciplines. Each instructor represents the collective wisdom of their field and within our industry.

Our Instructional Technology

Each course is independently created, based on standard objectives provided by the manufacturer for which the course was developed.

We ensure that the subject matter is up-to-date and relevant. We examine the needs of each student and create training that is both interesting and effective. LearnKey training provides auditory, visual, and Kinesthetic learning materials to fit diverse learning styles. The following are three levels of implementation:

Standard Training Model

The standard training model allows students to proceed through basic training, building upon primary knowledge and concepts to more advanced application and implementation. In this method students will use the following toolset:

- **Pre-assessment**: The pre-assessment is used to determine the student’s prior knowledge of the subject matter. It will also identify a student’s strengths and weaknesses, allowing the student to focus on the specific subject matter he/she needs to improve most. Students should not necessarily expect a passing score on the pre-assessment as it is a test of prior knowledge.
• *Video training session:* Each course of training is divided into sessions that are approximately two hours in length. Each session is divided into topics and subtopics.

• *Post test:* The post test is used to determine the student’s knowledge gained from interacting with the training. In taking the post test, students should not consult the training or any other materials. A passing score is 80 percent or higher. If the individual does not pass the post test the first time it is taken LearnKey would recommend the incorporation of external resources such as the workbook and additional customized instructional material.

**Intermediate Training Model**

The intermediate training model offers students additional training materials and activities which allows for better retention, review, and interaction. This model includes not only the standard model material, but also includes the following toolset:

• *Study guides:* Study guides are a list of questions missed which can help students recognize areas of weakness and necessary focus. They can be accessed from either the pre-assessment or post test.

• *Labs:* Labs are interactive activities that simulate situations presented in the training. Step-by-step instructions and live demonstrations are provided.

• *Workbooks:* Workbooks have a variety of activities, such as glossary puzzles, short answer questions, practice exams, research topics, and group and individual projects, which allow the student to study and apply concepts presented in the training.

**Master Training Model**

The master training model offers the student an additional opportunity to prepare for certification by further examining his/her knowledge. This model includes the materials used in the standard and intermediate models, as well as the MasterExam.

• *Master Exam:* The MasterExam draws from a large pool of questions to provide a unique testing experience each time it is taken. LearnKey recommends a student take and pass the exam, with a score of 80 percent or higher, four times in order to prepare for certification testing. Study guides can also be accessed for the MasterExam.
Session 1
## Session 1 Time Tables

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### Session 1

| **Introduction**              | 00:10:57       |
| **Packets**                   | 00:23:04       |
| **Topologies**                | 00:14:37       |
| **Building a Network with OSI** | 00:22:30      |
| **Network Cabling**           | 00:25:33       |
| **Ethernet Basics**           | 00:30:52       |
| **10Base/100Base Ethernet**   | 00:17:21       |
| **Training Time**             | 02:24:54       |
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. **Network devices** 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 **Ah**. \[Binary to Hex\]
2. The **MAC address** is burned into the Network Card at the factory which it was made. \[IPconfig\]
3. The **OUI** is represented in the first 24 bits of a MAC Address. \[IPconfig\]
4. The last 24 bits of the MAC address are called the **host identifier** or unique identifier. \[IPconfig\]

Topologies

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

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

2. A **broadcast 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. [Frames]

3. Layer two of the OSI model is called the data link layer. [Data-link layer]

4. A **router** works on the network layer to interconnect multiple local area networks using logical addresses. [Network Layer]

5. The terms **assemble** and **disassemble** are associated with the transport layer of the OSI model. [Transport Layer]

6. **PDF files** and PostScript are examples of the presentation layer. [Presentation Layer]

7. The application layer is layer seven of the OSI model. [Application Layer]

Network Cabling

1. A **Coaxial Cable** has two wires with a **shared** axis. [Coaxial]

2. **UTP**, or Unshielded Twisted Pair is a very common cable consisting of **twisted pairs** of cable wrapped in a plastic sheath. [Unshielded Twisted Pair]

3. **Bandwidth** is defined by Cat levels. [Cat levels]

4. Cat 4 has a capacity of **20** BPS. [Cat levels]

5. **RJ-45** cable connectors are the most common type of 4 pair connectors. [RJ Connectors]

6. RJ-11 connectors are designed to handle **two** pairs of wire. [RJ Connectors]

7. **PVC** rated cable has a very low fire rating and is not readily used as a network cable. [Cable Fire Ratings]

8. **Single Mode** fiber optic cable uses lasers instead of regular light. [Fiber optic]

9. There is one **glass** fiber in a fiber optic cable used for sending and receiving information. [Fiber optic]

10. **ST connectors** are commonly used with fiber optic cable. [Fiber Connectors]
**Ethernet Basics**

1. **Full-duplex** allow two parties to communicate simultaneously. [Fiber Connectors]

2. **CRC**, data, **type**, Source MAC, and Destination MAC are all elements included in the Ethernet. [Ethernet Frame]

3. Data which is less than 46 bytes requires a pad. [Ethernet Frame]

4. A **repeater** is another name for a hub. [Conceptualizing Ethernet/Sending Ethernet Frames]

5. Promiscuous mode allows a user to keep a copy of every packet sent including ones intended for a different MAC address. [Promiscuous Mode]

6. The **source** MAC address from a frame is stored after the frame is received. [Receiving Ethernet Frames]

7. The **CSMA/CD** 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 **EIA/TIA 568 B** are cabling methodologies used on RJ-45 connectors. [Connecting Hubs]

**10Base/100Base Ethernet**

1. The **RJ-45** is the type of connector is used by 10Base-T Ethernet. [10Base Ethernet]

2. **Multimode fiber optic** cabling is used by 10Base-FL Ethernet. [10Base Ethernet]

3. The maximum length of cabling for 100Base-FX Ethernet is 400 meters. [100Base Ethernet]

4. **Speed**, **activity**, and **connection** 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  start topology
topology  coaxial cable  MAC address  transport layer
cable  CSMA/CD  mesh topology  unshielded twisted pair
daisy chain  frame  point-to-point topology
data link layer  MAC address  presentation layer
application layer  ethernet  network layer  ring topology
binary  fiberoptic cables  OSI model  RJ connector
bus topology  frame  OUI  session layer
cat levels  hexadecimal  packet  start topology
topology  coaxial cable  MAC address  transport layer
cable  CSMA/CD  mesh topology  unshielded twisted pair
daisy chain  frame  point-to-point topology
data link layer  MAC address  presentation layer

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
3. A connector used to connect pairs of optical fibers
4. A unidirectional circular physical network configuration
5. A cable rating system which defines the speed of bandwidth
6. Type of network for local area network
7. A data packet encoded at the data link layer
8. A network protocol used to send data over a segment of an Ethernet network
9. Type of physical network configuration where all nodes connect to a common pathway
10. Type of physical network configuration where each node is directly connected
11. An electrical transmission medium with a single copper conductor and a plastic insulation layer
12. Second layer of OSI model
13. First layer of the OSI model
14. Third Layer of OSI model
15. A wiring scheme used in linking two or more HGs in a local area network
16. Seventh layer of the OSI model
17. A network card configuration that allows Ethernet interface to read all information on the network card
18. Fifth layer of OSI model
19. 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
topology
cat levels
coaxial cable
CSMA/CD
daisy chain
data link layer
Ethernet
fiber optic cables
frame
hexadecimal
MAC address
mesh topology
MTRJ connector
network card
network layer
OSI model

class
application

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?
   Network Tools; Network Devices; Network Security; Network Technologies; Network Management; Network Media and Topologies.

2. Define Point-to-Multipoint topology.
   A type of network configuration in which only two nodes are directly connected.

3. Define the OSI model.
   OSI, or Open Systems Interconnection, model is a seven-layer model used to define the various operation levels of network connections.

4. List (in order) the seven layers of the OSI model.
   Physical; Data-link; Network; Transport; Session; Presentation; Application

5. What is a UTP, and how is it recognized?
   UTP, or Unshielded Twisted Pair is a type of common cable that is consisting of twisted pairs of cable wrapped in a plastic sheath.

6. Define the function of Cat Levels.
   Cat Levels are a rating system for cabling systems which defines the speed of bandwidth.

7. If a cable has a PVC rating, what does that mean?
   A PVC rated cable has a very low fire rating and is not readily used as a network cable.

8. Define Ethernet.
   A type of network technology for local area networks in which cables carry radio frequency signals between computers at a rate of either 10 or 100 megabits per second.

9. Describe the elements found in an Ethernet frame.
   CRC, Data, Type, Source MAC, and Destination MAC are all elements included in an Ethernet frame.

10. What is the Promiscuous mode?
    The Promiscuous mode allows a user to keep a copy of every packet sent, including ones intended for a different MAC address.
11. Describe the function of a CSMA/CD.
   The CSMA/CD, or Carrier Sense Multiple Access with Collision Detection, is a network protocol for computers to send data over a segment of an Ethernet network.

12. Describe the function of an MT-RJ connector.
   An MT-RJ, or mechanical transfer registered jack, connector is used to connect pairs of optical fibers.

13. What is the function of Fiberoptic Cables?
   Fiberoptic Cables are a glass or plastic fiber which transmits information in one direction through light or sometimes laser pulses.

14. What is the purpose of a Daisy Chain?
   A Daisy Chain is a wiring scheme used in linking two or more hubs together in a local area network.

15. List the types of link lights that are used by network cards and hubs.
   Speed, Activity, and Connection are types of link lights used by network cards and hubs.
Glossary Matching

Instructions: Match the glossary term described in Session 1 to it’s 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. **p** A type of protocol for local area networks.
2. **m** A network card configuration that allows an Ethernet interface to read all information on the network card.
3. **k** Primary language of computers consisting of only two digits.
4. **u** A type of physical network configuration connected through a central hub.
5. **s** A type of physical network configuration where each node is directly connected.
6. **c** A small bundle of information sent over a network.
7. **aa** A data packet encoded at the data link layer.
8. **a** A unique 48-bit hexadecimal number burned into a network card.
9. **g** A 16-digit notation system used to convert 4-digit segments of binary.
10. **x** The first 3 bits of a MAC address in the OSI model.
11. **l** The second layer of the OSI model.
12. **e** The third layer of the OSI model.
13. **cc** The sixth layer of the OSI model.
14. **i** The seventh layer of the OSI model.
15. **q**  An electrical transmission medium with a single copper conductor and a plastic insulation layer.

16. **dd**  A type of cable with one or more twisted copper wires in a plastic sheath.

17. **d**  A type of physical network configuration where all nodes connect to a common pathway.

18. **w**  The fourth layer of the OSI model.

19. **bb**  The fifth layer of the OSI model.

20. **b**  A unidirectional circular physical network configuration.

21. **o**  A type of physical network configuration where only two nodes are directly connected.

22. **t**  A seven-layer model used to define various operation levels.

23. **y**  The first layer of the OSI model.

24. **h**  A cable rating system which defines the speed of bandwidth.

25. **v**  A standard interface connector for phone and internet.

26. **r**  Provides communication between a computer and a network.

27. **z**  A connector used to connect pairs of optical fibers.

28. **f**  Glass or plastic fiber which transmits info through light or laser pulses.

29. **j**  A network protocol used to send data over a segment of an Ethernet network.

30. **n**  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. \( \frac{n(n-1)}{2} \)  
   B. \( \frac{n}{5-4} \)  
   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
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%

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

OSI History
OSI Seven Layer Model
Defined seven functions that all networks needed to do in order to act as a network

Notes: