

All-Hazards Communications Technician (COMT)

Training Course

Unit 8: Computer Awareness Technology



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Unit 8: Objectives

- Explain the operational capabilities of the various types of computer systems the COMT may encounter
- Understand the appropriate applications of the various technology resources
- Understand the technical and physical principles behind the appropriate technologies



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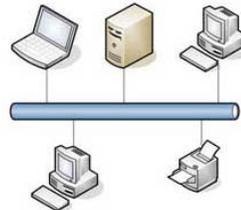
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COMT UNIT 8 – COMPUTER TECHNOLOGY AWARENESS

Introduction

Why network our computers?

- File sharing
 - Information exchange
- Device sharing
 - Printers
 - Scanners
- WAN/LAN connectivity sharing
 - Internet
 - Intranet



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Types of Networks

- LAN
 - Local Area Network - using category 5 or 6 Ethernet cabling and wired devices
- WLAN
 - Wireless Local Area Network - using 802.11 devices to connect the computers and equipment with RF (Radio Frequency) signals
- Combination – both wire and wireless are used together
- VPN
 - Virtual Private Network – software overlay on an existing large area network to provide secure private communications over public networks



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Types of Networks

Comparison

Wired

- Less Interference
- More Secure
- Controlled Access/Bandwidth
- Takes Time to set up

Wireless

- More Interference potential
- Less Secure
- Less Time to set up



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LAN Components

- Network interface card – NIC
- Hub
- Switch
- Router
- Cat 5 Ethernet cables



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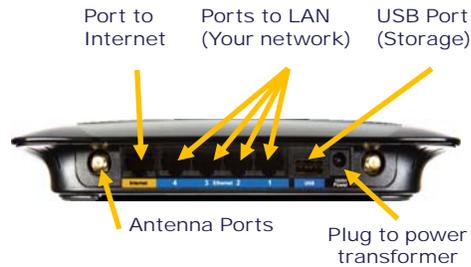
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Wired LAN Components

- Router
- Smart device (Assigns LAN addresses)
- Usually has an integrated switch
- Provides gateway to WAN (Wide Area Network) but can be used without WAN



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Wired LAN Components

- Switch
- Connected to the router switch ports
- Allows multiple users
- Various sizes
- Smart device (knows what devices are connected)



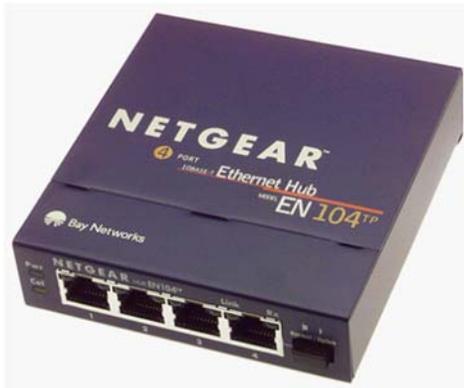
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Wired LAN Components

- Hub
- Allows multiple users
- Dumb device
- Slows network speed due to data collisions



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Wired LAN Components

- Network Print Server
- Allows connection of non-network capable printers to a LAN
- Installation of print drivers is still required on all computers in the network



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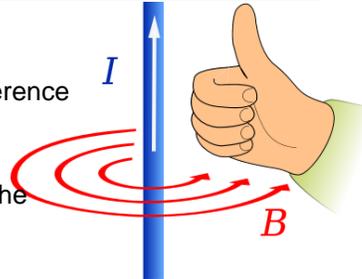
Wired Networks

Cat 5 Cable

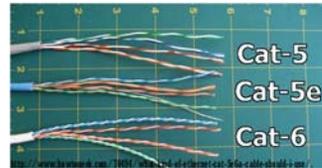
- Category 5
 - Twists minimize crosstalk & interference
- 8 Conductors, 24 AWG
 - 4 are used (Tx +, Tx-, Rx+, Rx-)
 - Other conductors are not used in the current standard.
- Data Rate 100 Mbit/sec

Cat 6 Cable

- 8 Conductors, 22 AWG
- Uses all pairs
- Data Rate 1 Gbit/sec



Right Hand Rule
Diagram from Wikimedia



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Wired Networks

RJ45 Plugs

- Also referred to as 8P8C (8 pin, 8 conductor)

RJ45 Jack

- Two wiring standards
 - 568A
 - 568B



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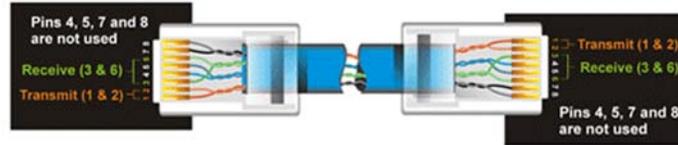
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Wired Networks

RJ-45 Pinout



Pin number	Wire Color	Straight-Through		Pin number	Wire Color
		Wire	Becomes		
Pin 1 ==>	Orange/White	1	→ 1	Pin 1 ==>	Orange/White
Pin 2 ==>	Orange	2	→ 2	Pin 2 ==>	Orange
Pin 3 ==>	Green/White	3	→ 3	Pin 3 ==>	Green/White
Pin 4 ==>	Blue	6	→ 3	Pin 4 ==>	Blue
Pin 5 ==>	Blue/White			Pin 5 ==>	Blue/White
Pin 6 ==>	Green			Pin 6 ==>	Green
Pin 7 ==>	Brown/White			Pin 7 ==>	Brown/White
Pin 8 ==>	Brown			Pin 8 ==>	Brown



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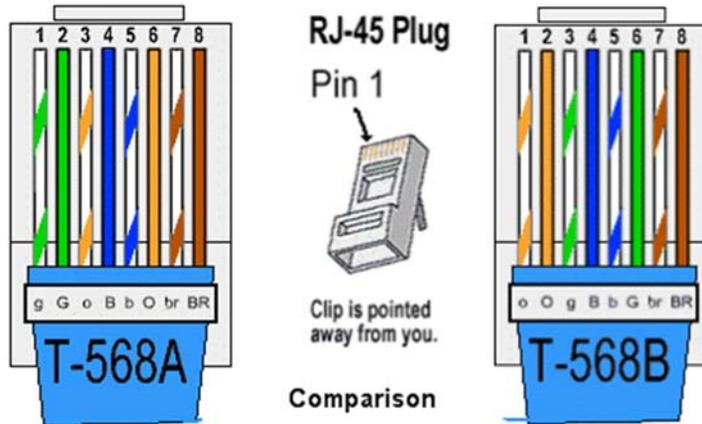
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Wired Networks

568A & 568B Comparison



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Wired Networks

- 568 A or 568 B
 - Use the same standard on both ends
 - The difference in standards only comes into play in combined phone/ethernet systems.
 - Cross-Over cable- Use 568A on one end 568B on the other.



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Wired Networks

- LAN Architecture Factors
 - Network Components
 - Routers, switches, hubs, Wireless
 - Peripheral equipment
 - Building layout
 - Walls
 - Number of floors
 - Work Spaces
 - Number of personnel
 - Services required



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Wired Networks (Cont)

- Building Systems
 - Electrical
 - Plumbing
 - Hvac



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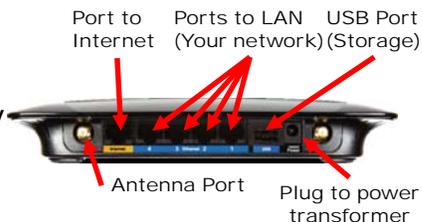
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WLAN Components

- Wireless LAN (WLAN)
- Wireless router
- Wireless access points
- Wireless network interface cards
- Wireless repeaters
- Accessory antennas
- Wired network connectivity
- Wireless 802.11 a,b,g,n



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802.11 Wireless Network Standards

Protocol	Date	Frequency	Throughput	Data Rate	Typical Range	Meters
802.11a	1999	5 GHz	23 Mb/s	54 Mb/s	30 m to 100 m	
802.11b	1999	2.4 GHz	4 Mb/s	11 Mb/s	35 m to 110 m	
802.11g	2003	2.4 GHz	19 Mb/s	54 Mb/s	35 m to 110 m	
802.11n	2006	2.4 and 5GHz	74 Mb/s	248 Mb/s	70 m to 160 m	

4.9 GHz Public Safety

Not a standard, but a frequency band reserved for close area broadband wireless networking for public safety.



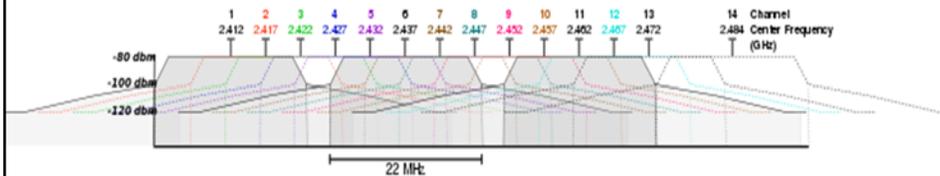
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Operating Frequencies 802.11b,g



Operating Frequencies 802.11b,g

802.11b and g Channels Overlap

802.11a No Channels Overlap

Ch	Freq	GHz	EIRP
1	2.412	4W indoors	
2	2.417	4W indoors	
3	2.422	4W indoors	
4	2.427	4W indoors	
5	2.432	4W indoors	
6	2.437	4W indoors	
7	2.442	4W indoors	
8	2.447	4W indoors	
9	2.452	4W outside	
10	2.457	4W outside	
11	2.462	4W outside	

Ch	Freq	GHz	EIRP
36	5.180	160 mW indoors	
40	5.200	160 mW indoors	
44	5.220	160 mW indoors	
48	5.240	160 mW indoors	
52	5.260	800 mW outside	
56	5.280	800 mW outside	
60	5.300	800 mW outside	
64	5.320	800 mW outside	

2.4 GHz 802.11b and g only
Channels 1, 6, and 11
do not overlap

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Wireless Modes

- Ad-Hoc mode
 - Each wireless device communicates with others freely without any access point or router
- Infrastructure mode
 - Each wireless device communicates through an access point or wireless router



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Wireless SSID

- SSID – Service Set Identifier
- Wireless router may be set to broadcast the SSID or hide it
- Identifies a particular [802.11 wireless LAN](#). Client device receives broadcast messages from all [access points](#) within range advertising their SSIDs, unless disabled



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Wireless Encryption

- None
 - Anyone can connect and use the network and WAN connection
- WEP (Wired Equivalent Privacy)
 - For low-level security, choose 40/64bit, 128 bit, or 152 bit mode; key is static and does not change
- WPA (Wi-Fi Protected Access) TKIP (Temporal Key Integrity Protocol)
 - Changing key constantly
- WPA 2 AES (Advanced Encryption Standard) 802.11i
 - Changing key constantly; highest level readily available encryption



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Wireless LAN may not be used for access behind Federal Emergency Management Agency (FEMA) firewall

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Wireless Router Authentication

- Open system
 - No WEP key to authenticate
- Shared Key
 - The Sender and Recipient use a WEP key for authentication
 - Provides only unintentional use level of security



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Wireless Router Configuration

- Configuration Sequence
- Access to router
 - Address
 - IP or URL
 - User Name
 - Password
- Dynamic Host Configuration Protocol (DHCP)
- Wireless
- Attached Devices table



Note: All routers are not the same but have similar capabilities.

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Router Configuration

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Router Configuration

Block Sites

Keyword Blocking
 Never
 Per Schedule
 Always

Type keyword or domain name here.

Block sites containing these keywords or domain names:
 azbasszone
 credit union

Allow trusted IP address to visit blocked sites
 Trusted IP Address

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Router Configuration

Block Services

Services Blocking
 Never
 Per Schedule
 Always

Service Table

#	Service Type	Port	IP

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Router Configuration

Service Type: SMTP
Protocol: Any(UDP)
Starting Port: 465
Ending Port: 465
Service Type/User Defined:
Filter Services For :
 Only This IP Address :
 IP Address Range:
 All IP Addresses

Services List:
SMTP
Any(UDP)
AIM
Age of Empire
BGP
BOOTP CLIENT
BOOTP SERVER
CU-SEEME(7048)
CU-SEEME(24032)
DNS
FINGER
FTP
HTTP
HTTPS
ICUII
IDENT
IP Phone
IRC
NetMeeting/H.323
NFS
News
Quake II & III
RCMD
Real Audio
REXEC
RLOGIN
RTELNET
RTSP
SFTP
SMTP
SNMP

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Router Configuration

Days to Block:
 Every Day
 Sunday
 Monday
 Tuesday
 Wednesday
 Thursday
 Friday
 Saturday

Time of day to block:(use 24-hour clock)
 All Day
Start Blocking: 0 Hour 0 Minute
End Blocking: 24 Hour 0 Minute

Time Zone:
(GMT-08:00) Pacific Time (US & Canada): Tijuana
 Automatically adjust for daylight savings time

Current Time: Tuesday, 24 Apr 2012 07:39:43

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Router Configuration

The screenshot shows a router configuration interface. On the left is a navigation menu with options like 'Add WPS Client', 'Setup', 'Basic Settings', 'Wireless Settings', 'Guest Network', 'USB Storage', 'Advanced Settings', 'Content Filtering', 'Logs', 'Block Sites', 'Block Services', 'Schedule', and 'E-mail'. The main content area is titled 'Attached Devices' and contains two tables. The first table, 'Wired Devices', lists two devices: 'MIKE-PC' with IP 192.168.1.2 and MAC 48:5B:39:D6:BF:18, and an unnamed device with IP 192.168.1.4 and MAC 00:19:9D:8E:75:99. The second table, 'Wireless Devices (Wireless intruders also show up here)', lists four devices: 'android_b0ad2cd8' (IP 192.168.1.6, MAC 58:67:1A:54:CF:DE), 'android_4dcfd5280553843' (IP 192.168.1.5, MAC C8:AA:21:35:89:D9), 'Mike-PC' (IP 192.168.1.3, MAC 1C:4B:D6:94:74:8E), and an unnamed device (IP --, MAC 00:24:1E:D0:D8:92). A 'Refresh' button is located below the second table. At the bottom left is the 'Homeland Security OEC/ICTAP' logo and text, and at the bottom right is the page number '31' and the text 'COMT UNIT 8 - COMPUTER TECHNOLOGY AWARENESS'.

Router Configuration

The screenshot shows a router configuration page for 'Wireless Settings'. The left navigation menu includes 'Setup Wizard', 'Add WPS Client', 'Setup', 'Basic Settings', 'Wireless Settings', 'Guest Network', 'USB Storage', 'Basic Settings', 'Advanced Settings', 'Content Filtering', 'Logs', 'Block Sites', 'Block Services', 'Schedule', 'E-mail', 'Maintenance', 'Router Status', 'Attached Devices', 'Backup Settings', 'Set Password', 'Router Upgrade', 'Advanced', 'Wireless Settings', 'Wireless Repeating Function', 'Port Forwarding / Port Triggering', 'WAN Setup', 'LAN Setup', 'QoS Setup', 'Dynamic DNS', 'Static Routes', 'Remote Management', 'UPnP', and 'IPv6'. The main content area is titled 'Wireless Settings' and contains several sections. 'Wireless Advanced Settings (2.4GHz b/g/n)' includes checkboxes for 'Enable Wireless Router Radio', 'Turn off wireless signal by schedule', and a table for scheduling. 'Wireless Advanced Settings (5GHz a/n)' has similar options. 'WPS Settings' shows the Router's PIN as '12135011' and checkboxes for 'Disable Router's PIN', 'Keep Existing Wireless Settings (2.4GHz b/g/n)', and 'Keep Existing Wireless Settings (5GHz a/n)'. 'Wireless Card Access List' has a 'Set Up Access List' button. 'Apply' and 'Cancel' buttons are at the bottom. At the bottom right is the page number '32' and the text 'COMT UNIT 8 - COMPUTER TECHNOLOGY AWARENESS'.

Router Configuration

Wireless Card Access List

Available Wireless Cards		
	Device Name	MAC Address
<input type="checkbox"/>	android_4dcfd5280553843	c8:aa:21:35:89:d9
<input type="checkbox"/>	Mike-PC	1c:4b:d8:94:74:8e
<input type="checkbox"/>	UNKNOWN	00:24:1e:d0:d8:92
<input type="checkbox"/>	android_b0ad2cd8	58:07:1a:54:cf:de

Wireless Card Entry

Device Name:

MAC Address:

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Router Configuration

LAN Setup

Device Name:

LAN TCP/IP Setup

IP Address: . . .

IP Subnet Mask: . . .

RIP Direction:

RIP Version:

Use Router as DHCP Server

Starting IP Address: . . .

Ending IP Address: . . .

Address Reservation

#	IP Address	Device Name	MAC Address
<input type="button" value="Add"/>	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>	

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Broadband Wireless

- Commercial services
 - Wireless network interface cards (Aircards)
 - 1 MHz and greater bandwidth with data rates greater than about 1.5 Mbit/s
 - Typical carriers
 - Sprint, Verizon, and AT&T Mobility



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Broadband Wireless (Cont)

- Applications vary by agency
- Accessibility varies by location
- Inexpensive routers support broadband wireless
- MiFi now available from some vendors, allowing a small number of users to share a single connection



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Wireless Router Configuration Review

- Wireless router considerations
- In order to have a reasonable chance of success in an urban environment, evaluate and change the following:
 - Change name of router from default
 - Turn off SSID broadcast
 - Change IP address range
 - Change default channel
 - Add an encryption security key
 - Document the above changes



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Unit 8 Questions



QUIZ



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