

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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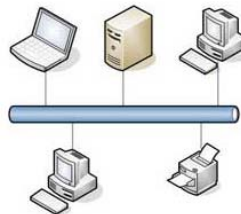
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COMT UNIT 8 – COMPUTER TECHNOLOGY AWARENESS

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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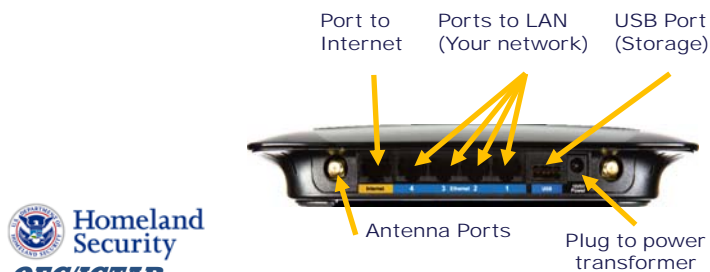
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Wired LAN Components

- 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

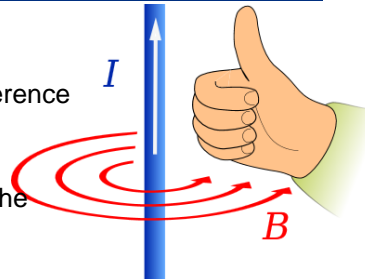
- 8 Conductors, 22 AWG
- Uses all pairs
- Data Rate 1 Gbit/sec



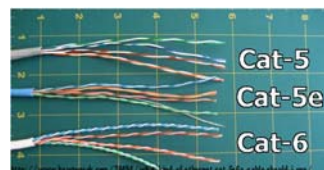
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Right Hand Rule
Diagram from Wikimedia



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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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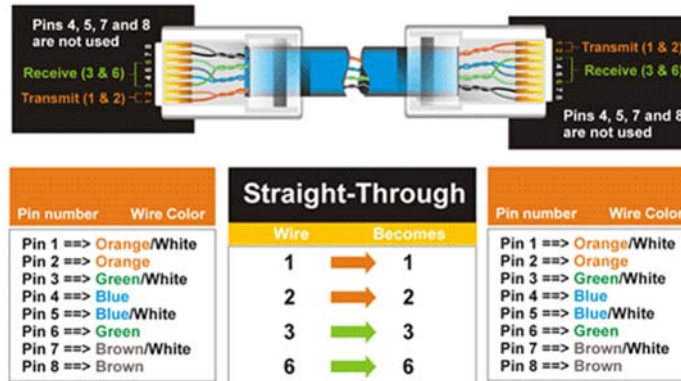
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Wired Networks

RJ-45 Pinout



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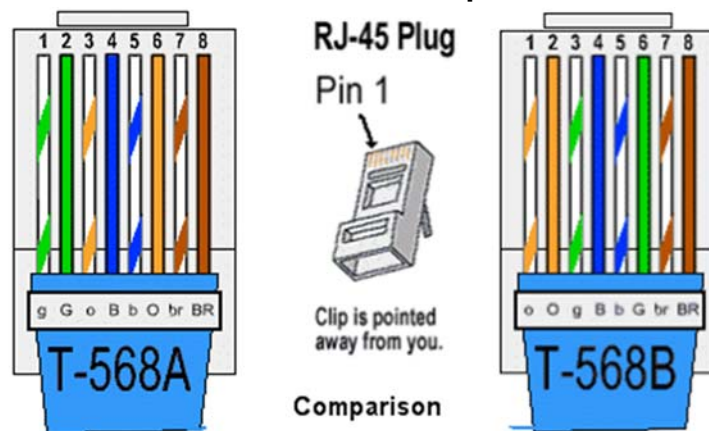
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Wired Networks

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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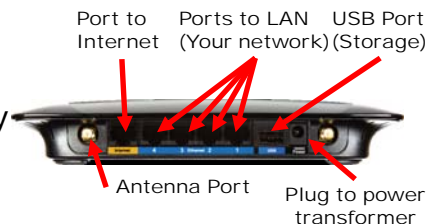
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WLAN Components

- 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.



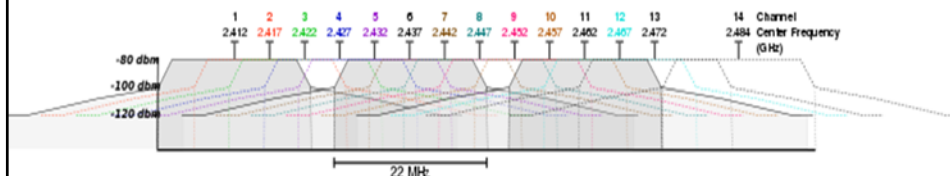
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Operating Frequencies 802.11b,g



Operating Frequencies 802.11b,g

802.11b and g Channels Overlap

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	

802.11a No Channels Overlap

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:

adasszone
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



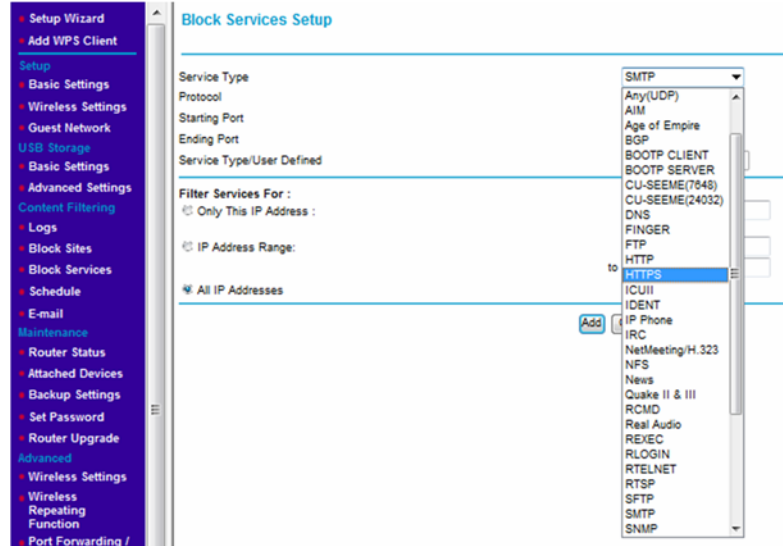
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Router Configuration

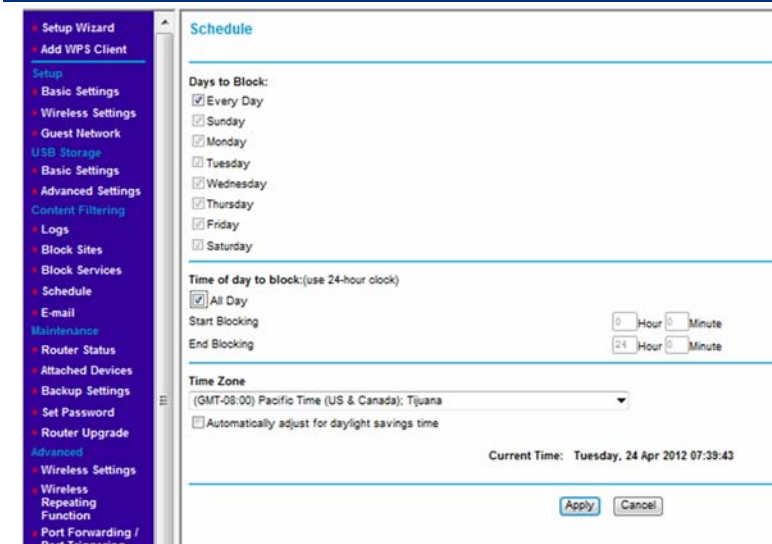


The screenshot shows the 'Block Services Setup' configuration page. On the left is a navigation menu with categories: Setup Wizard, Add WPS Client, Setup, Basic Settings, Wireless Settings, Guest Network, USB Storage, Basic Settings, Advanced Settings, Content Filtering, Logs, Block Sites, Block Services, Schedule, E-mail, Maintenance, Router Status, Attached Devices, Backup Settings, Set Password, Router Upgrade, Advanced, Wireless Settings, Wireless Repeating Function, and Port Forwarding / Port Triggering. The 'Block Services' option is selected. The main area is titled 'Block Services Setup' and contains fields for 'Service Type' (set to SMTP), 'Protocol' (Any(UDP)), 'Starting Port', 'Ending Port', and 'Service Type/User Defined'. Below these are checkboxes for 'Filter Services For:' with options 'Only This IP Address' and 'All IP Addresses'. A list of services is shown on the right, including SMTP, Any(UDP), AIM, Age of Empire, BGP, BOOTP CLIENT, BOOTP SERVER, CU-SEEME(7048), CU-SEEME(24032), DNS, FINGER, FTP, HTTP, HTTPS (highlighted), ICUII, IDENT, IP Phone, IRC, NetMeeting/H.323, NFS, News, Quake II & III, RCMD, Real Audio, REXEC, RLOGIN, RTELNET, RTSP, SFTP, SMTP, and SNMP. An 'Add' button is located between the 'Filter Services For:' section and the service list.

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Router Configuration



The screenshot shows the 'Schedule' configuration page. The navigation menu is the same as in the previous screenshot, with 'Schedule' selected. The main area is titled 'Schedule' and contains a 'Days to Block:' section with checkboxes for 'Every Day' (checked), Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday. Below this is a 'Time of day to block:(use 24-hour clock)' section with a checked 'All Day' option and input fields for 'Start Blocking' (0 Hour 0 Minute) and 'End Blocking' (24 Hour 0 Minute). A 'Time Zone' dropdown menu is set to '(GMT-08:00) Pacific Time (US & Canada): Tijuana', with an unchecked option for 'Automatically adjust for daylight savings time'. The 'Current Time' is displayed as 'Tuesday, 24 Apr 2012 07:39:43'. At the bottom are 'Apply' and 'Cancel' buttons.

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Router Configuration

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

Attached Devices

Wired Devices			
#	IP Address	Device Name	MAC Address
1	192.168.1.2	MIKE-PC	48:5B:39:6D:BF:18
2	192.168.1.4	--	00:19:9D:6E:75:99

Wireless Devices (Wireless intruders also show up here)			
#	IP Address	Device Name	MAC Address
1	192.168.1.6	android_b0ad2cd8	58:67:1A:54:CF:DE
2	192.168.1.5	android_4dcfd5280553843	C8:AA:21:35:89:D9
3	192.168.1.3	Mike-PC	1C:4B:D6:94:74:8E
4	--	--	00:24:1E:D0:D8:92

[Refresh](#)



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Router Configuration

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
- Router Status
- Attached Devices
- Backup Settings
- Set Password
- Router Upgrade
- Advanced
- Wireless Settings
- Wireless
- Repeating Function
- Port Forwarding / Port Triggering
- VPN Setup
- QoS Setup
- Dynamic DNS
- Static Routes
- Remote Management
- UPnP
- IPv6

Wireless Settings

Wireless Advanced Settings (2.4GHz b/g/n)

☒ Enable Wireless Router Radio

Fragmentation Length (256-2346):

CTS/RTS Threshold (1-2347):

Preamble Mode: Long Preamble

☐ Turn off wireless signal by schedule

The wireless signal is scheduled to turn off during the following time period:

Period	Start	End	Recurrence Pattern
Add a new period Edit Delete			

Wireless Advanced Settings (5GHz a/n)

☒ Enable Wireless Router Radio

Fragmentation Length (256-2346):

CTS/RTS Threshold (1-2347):

Preamble Mode: Long Preamble

☐ Turn off wireless signal by schedule

The wireless signal is scheduled to turn off during the following time period:

Period	Start	End	Recurrence Pattern
Add a new period Edit Delete			

WPS Settings

Router's PIN: **12135011**

☐ Disable Router's PIN

☒ Keep Existing Wireless Settings (2.4GHz b/g/n)

☒ Keep Existing Wireless Settings (5GHz a/n)

Wireless Card Access List [Set Up Access List](#)

[Apply](#) [Cancel](#)

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Router Configuration

Wireless Card Access List

Available Wireless Cards

	Device Name	MAC Address
	android_4dcf65280553843	c8:aa:21:35:b9:d9
	Mike-PC	1c:4b:d8:94:74:8e
	UNKNOWN	00:24:1e:d0:d8:92
	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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