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CompTIA IT Fundamentals+
(Exam FC0-U61)

Module 4 / Unit 2 / Connecting to a Network

Objectives

- Identify the roles of different network devices in providing local and Internet network connectivity

- Distinguish the advantages and disadvantages of Internet connection types

- Connect a computer to a wired or wireless network

- Configure a wireless access point to use secure network settings
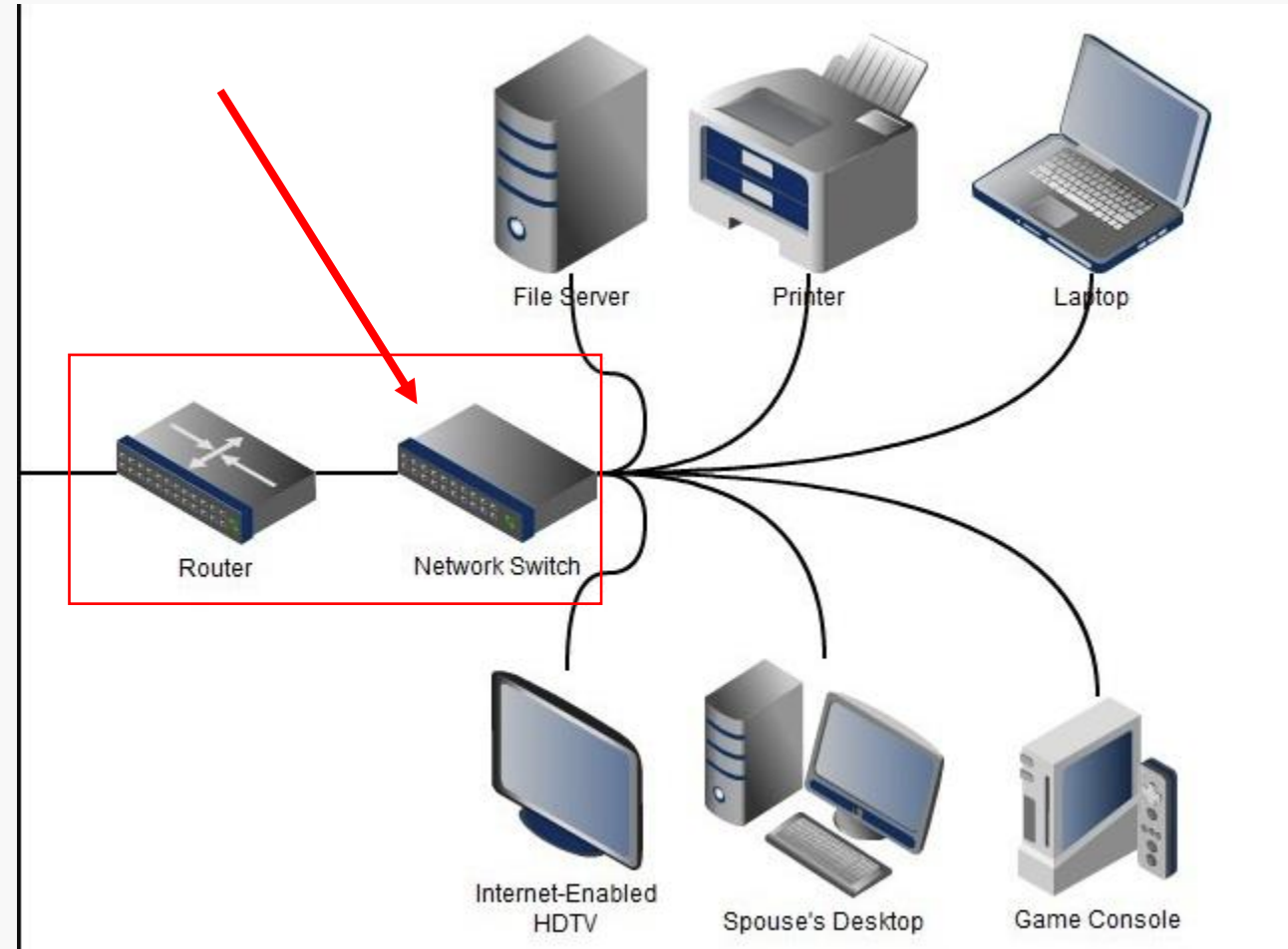
Internet Service Types (1)

- SOHO Internet router/modems

- Multifunction appliances combining several networking devices

  - Switch—connects four or eight computers together in an Ethernet LAN using RJ-45 network ports and twisted-pair cabling

  - Access Point (AP)—creates a Wi-Fi wireless network (WLAN) between computers and mobile devices equipped with suitable adapters and also switches communications between the wired and wireless networks

  - Internet router/modem—connects the wired and wireless network clients to the Internet via a WAN link

What device is used to connect computers together in an Ethernet network?

A switch.

Internet Service Types (2)

- Digital Subscriber Line (DSL)

  - Broadband over copper telephone cabling

  - Router/modem interfaces with telephone network via RJ-11 port

  - Asymmetric DSL (ADSL)—24 Mbps download and 1.4 Mbps upload

- Fiber optic

  - Fiber to the Home (FTTH)

  - Fiber to the Curb (FTTC) and Very High Bit Rate DSL (VDSL)
    - 52 Mbps download (100 Mbps with VDSL2 at up to 100m) and 16 Mbps uplink

- Cable

  - Cable Access TV (CATV)/Hybrid Fiber Coax (HFC) networks

  - Cable router/modem interface with network via coax F-connector

  - Data Over Cable Service Interface Specification (DOCSIS)
    - Up to 1.2 Gbps, though 100 Mbps is more typical of commercial packages

Can you list at least four Internet access methods?

Digital Subscriber Line (DSL), cable/Hybrid Fiber Coax, Fiber to the Curb (FTTC), satellite, and cellular radio.

What is the difference between a modem and a router?

A modem creates a serial link between two computers over some sort of long-distance media. It operates at the data link layer. A router makes forwarding decisions between logical networks. It does not need to take account of the framing and transmission details—those are the responsibility of the modem (or of an Ethernet switch or wireless access point). It just needs to know that a particular logical network can be reached over one of its interfaces. Most SOHO devices pack all these functions into a single appliance, but it is important to appreciate the differences between the functions.

Verifying a Connection

- Network status icon

- IP address configuration and Dynamic Host Configuration Protocol (DHCP)

- Perform a simple test by browsing a website
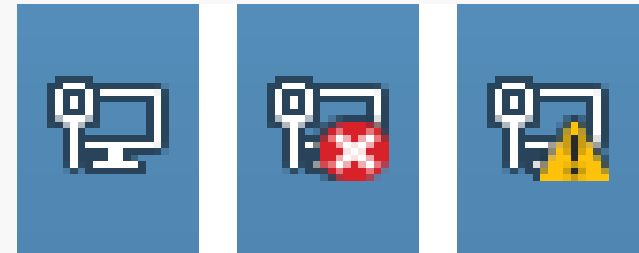
Microwave Satellite

- Reception dish aligned with orbital satellite

- Usually available, even in rural areas

- High latency (packet delay)

- DVB-S (Digital Video Broadcast Satellite) modem

Cellular Radio

- Transmitters or base stations service "cells" at up to about 5 miles (8 km)

  - GSM (Global System for Mobile Communication)
  - TIA/EIA IS-95 (cdmaOne)

- Can provide data services as well as voice

  - GPRS/EDGE (General Packet Radio Services/Enhanced Data Rates for GSM Evolution)
  - Evolved High Speed Packet Access (HSPA+)
  - CDMA2000/Evolution Data Optimized (EV-DO)
  - Long Term Evolution (LTE)
  - LTE Advanced (LTE-A)

Radio Frequency

- Wi-Fi networking

- Open/public access points

Wireless Standards and Compatibility

Standard	Maximum Transfer Rate	Band
802.11a (1999)	54 Mbps	5 GHz
802.11b (1999)	11 Mbps	2.4 GHz
802.11g (2003)	54 Mbps	2.4 GHz
802.11n (2009)	72.2 Mbps/stream (Single Channel) 150 Mbps/stream (Bonded Channels)	2.4/5 GHz
802.11ac (2013)	1.7 Gbps (at time of writing)	5 GHz

- Wireless LAN (WLAN) Wi-Fi standard

- IEEE 802.11a/b/g – legacy standards

- 802.11n and 802.11ac –current standards

- Access points can support a mix of clients with adapters for different standards (e.g. 802.11ac AP might support 802.11g and 802.11n clients)

- Compatibility modes can reduce performance though

What is the latest Wi-Fi standard and which frequency band(s) does it use?

IEEE 802.11ac works in the 5 GHz band. Most 802.11ac access points do have 2.4 GHz radios but they use them to support legacy standards.

Configuring an Access Point

- Connect to admin interface via IP address

- Log in using admin credentials – change the password!

- Configuration settings
  - Service Set ID (SSID)
  - Wireless mode / compatibility mode
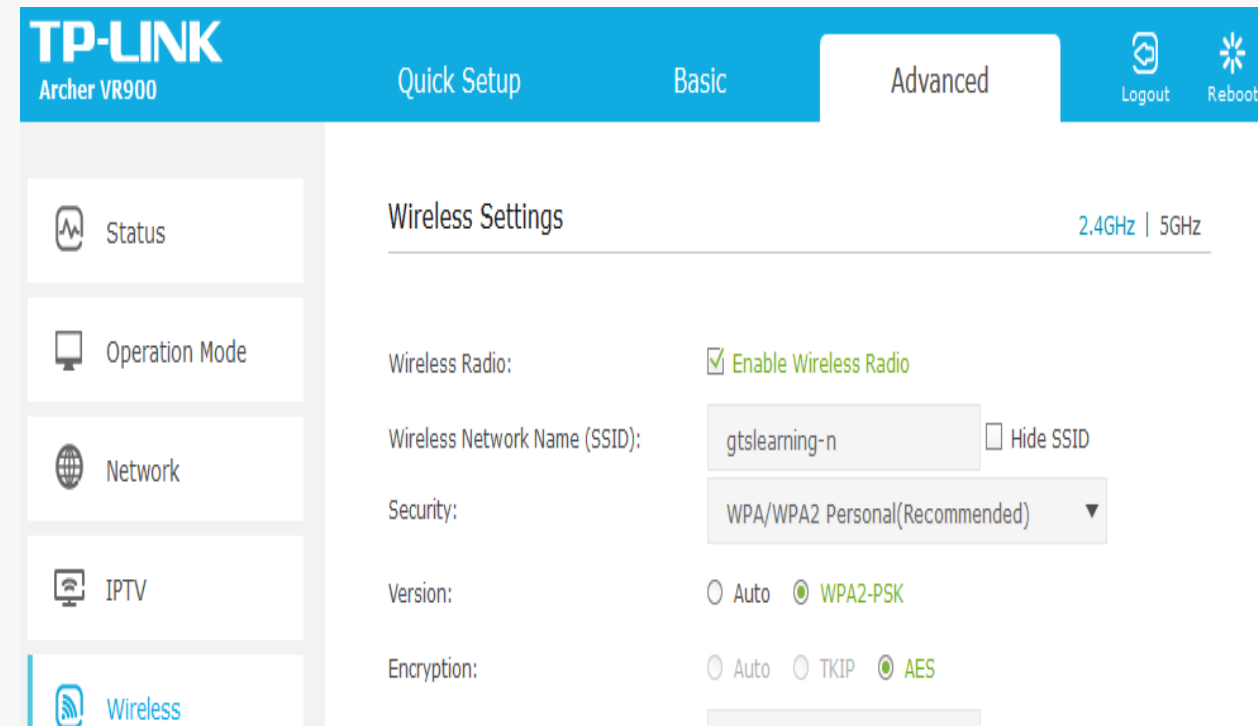
What information do you need to configure a wireless connection manually?

Service Set ID (SSID)/network name, encryption type, and authentication information (a preshared key if not using enterprise authentication).

Configuring Wireless Security

- Encryption

  o Cipher scrambles message

  o Key allows receiver to reverse cipher and unscramble message

- Wireless security standards

  o WEP (Wired Equivalent Privacy)

  o Wi-Fi Protected Access (WPA)

  o WPA2

- Pre-shared key authentication (passphrase)

Open Authentication and Captive Portals

- Open authentication disables encryption

- Used by public access points (hotspots)

- May be secondary authentication via a captive portal

Configuring a Wireless Client
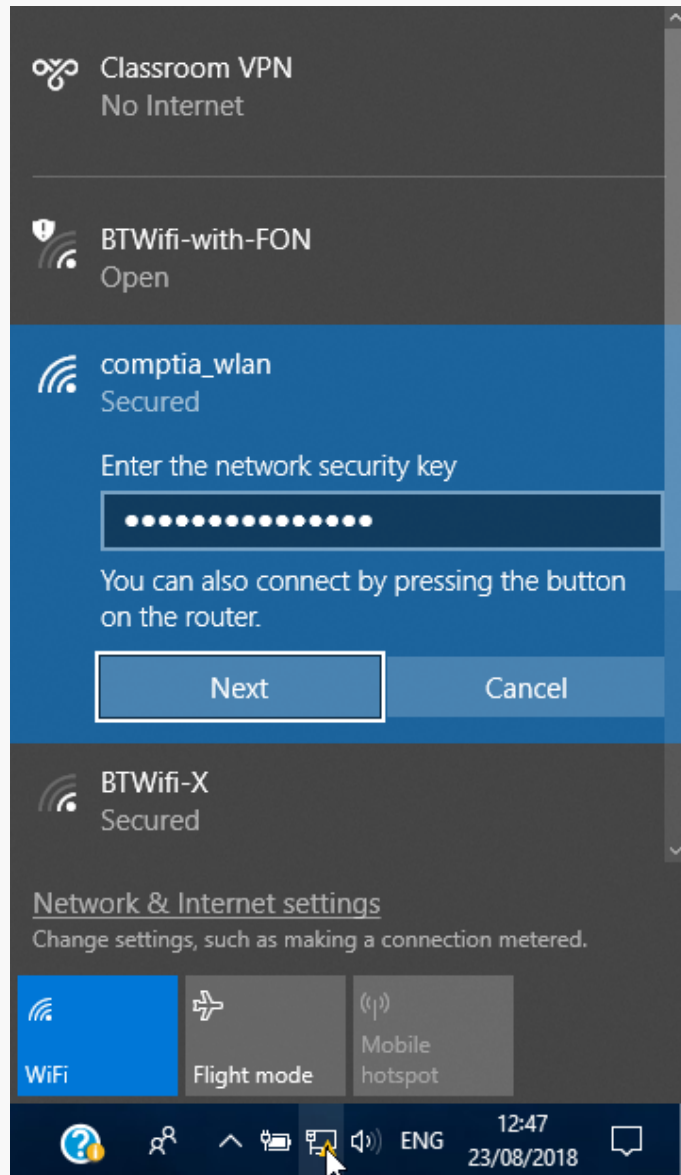
- Network status icon menu

- Network location (private versus public)

What is the risk of using a free Wi-Fi network to make an order from an online shop?

Data on an open network may be intercepted by the person running the network or by other computers connected to the network. You need to ensure that the online store uses a secure (HTTPS) connection.

Speed Limitations (Attenuation and Interference)

- Wi-Fi indoor range is nominally up to about 30m (100ft)

- Signal attenuates at longer range

- Dynamic Rate Switching/Selection (DRS) reduces data rate at range to preserve a reliable connection

- Radio waves are weakened/blocked by dense material (concrete and metal)

- Interference from other networks and radio sources

What does attenuation mean?

Attenuation describes the loss of strength of a signal the farther it has to travel. Attenuation sets the distance limitations on different network media types.
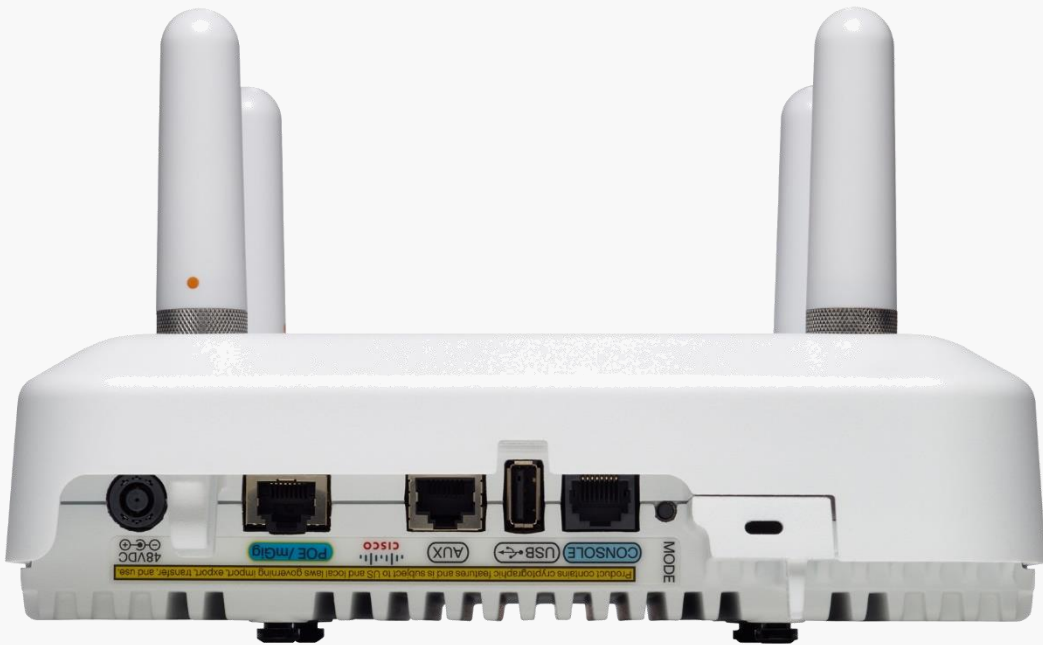
Cabled Enterprise Network Access

- Flood wired cabling and network wall ports

- Enterprise-grade switches

- Multiple switches and interconnections can provide thousands of ports

- Same Wi-Fi standards

- Enterprise-grade access points

Enterprise Network Routers

- Switch ports are placed in logical groups using Virtual LANs (VLANs)

- Each VLAN is assigned to an IP subnet

- Communications between subnets go via a router

- Routers also required for Internet access and WAN links
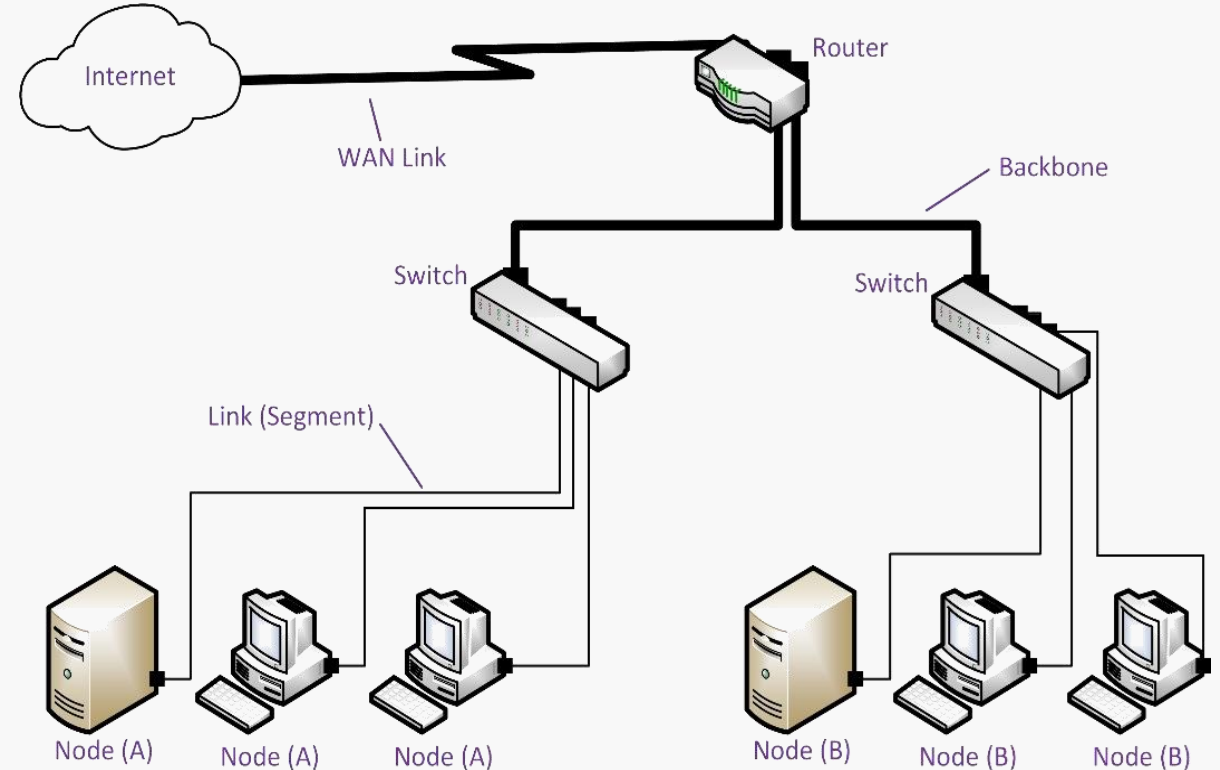
Review

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