Sun City Summerlin Computer Club Seminar

Home Networking Basics
Wired and Wireless
What's New?

Tom Burt
tomburt89134@cox.net
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Where to Find the Seminar Materials

- **Sun City Summer Computer Club Website:**
  - http://www.scscc.club/smnr

- **Acrobat file of these slides and notes**
  - http://www.scscc.club/smnr/HomeNetworkingBasics-2025.pdf

Seminar Agenda

- Basic Concepts and Terminology
- Wireless Networking Concepts and Hardware
- Las Vegas Internet Services
- Helpful Web Site Links
- Demo - Setting Up a Wireless Network
- Key Network Protocols and Services
- Shared Files and Printers
- Connecting to Network Printers
- WiFi Direct Networking
- Open Q and A

Basic Concepts

- **Networks allow computers and devices to communicate.**

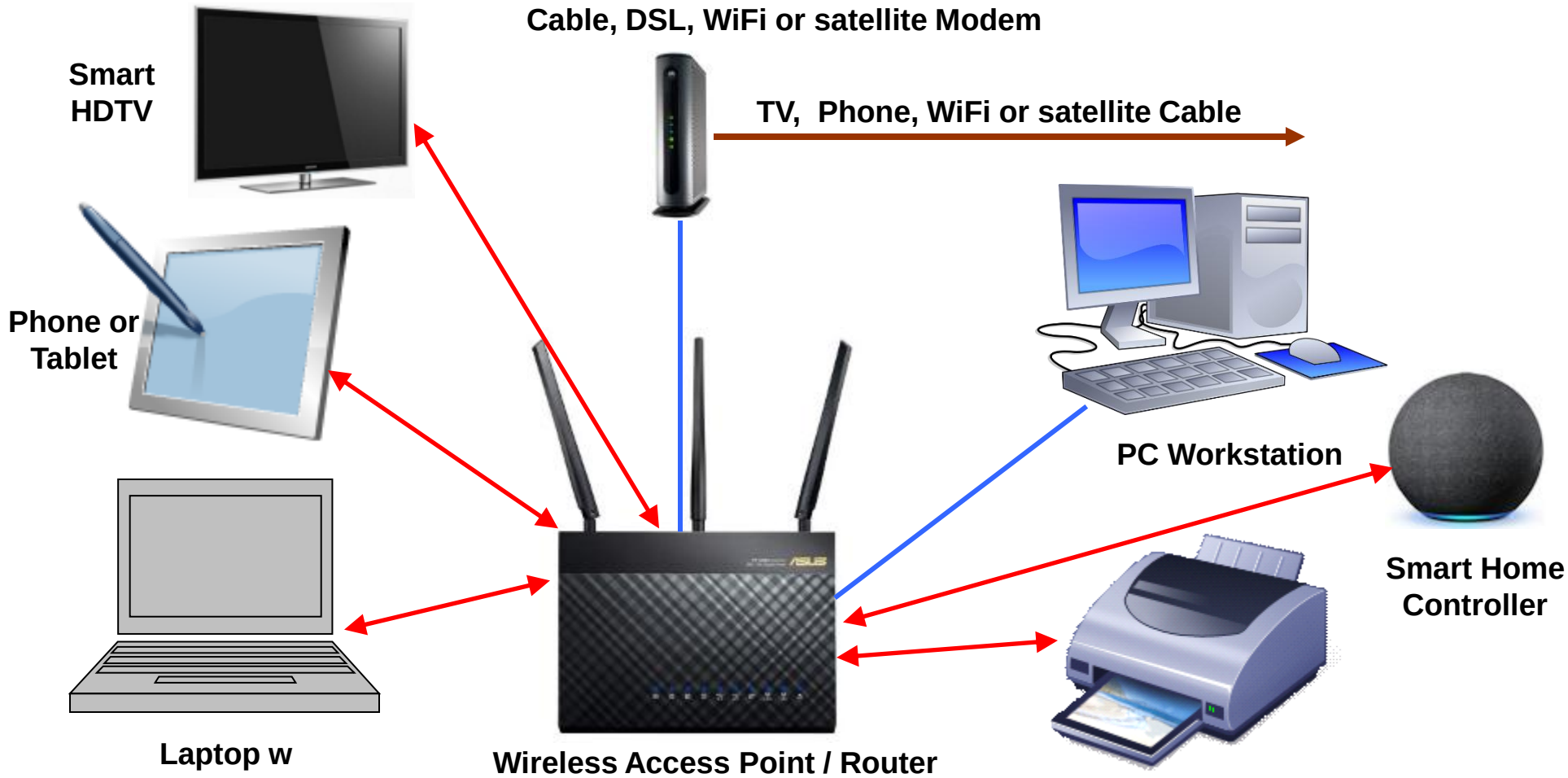
- **Why Have a Home Network?**
  - **PCs & devices can share: files, printers, Internet connection.**
  - **PCs and devices can *back up* each other's data.**

- **Simple Home Networks are easy to set up.**
  - **Network cables, router or switch.**
  - **Enable client / server software configuration.**

- **Home wireless networking uses 2.4, 5 and 6 GHz radio spectrum.**

- **Speeds have steadily improved …**
  - **(up to) 54 Mbits per second (802.11g – rare these days)**
    (up to) 150, 300, 450, 600 & 900 Mbits per second (802.11n),
    (up to) 1.3 Gbits per second (802.11ac)
  - **(up to) 11 Gbits per second (802.11ax) (2.4, 5 and 6 GHz bands)**
  - **(up to) 45 Gbits per second (802.11ay) (60 GHz spectrum – NOT FOR HOME)**

Classic Small Mixed Network



Wired Networking Hardware (1)

- **Ethernet Network Interface Card / Chip (NIC)**
  - Usually on motherboard of a device (PC, laptop, tablet, TV, …)
  - Every NIC has a unique 6 byte (48 bit) physical address.
  - In Windows, try IPCONFIG /ALL in Command prompt to see yours.

- **Ethernet Cable - Category 5e (up to 1 Gbit) or 6 (up to 10 Gbits)**
  - Costs about $1 per foot retail for short cables.
  - 8 wires inside (4 twisted pairs) with shielding in cable.
  - Use RJ45 multi-line telephone jacks as connectors.

- **Ethernet Switch**
  - Usually 4 Ethernet ports + a WAN port or Uplink port.
  - Also comes in 8, 16 or 24 ports.
  - Newer switches are auto-sensing – any port can be the “uplink”.
  - One switch can connect to another switch.
  - Often a switch is built into a Router or Wireless Access Point (WAP).

Wired Networking Hardware (2)

- **Ethernet Router / Wireless Access Point**
  - Provides basic switch functionality.
  - Provides dynamic IP address (DHCP) services.
  - Provides Network Address Translation (Isolates internal LAN network from Internet).
  - May also provide wireless network support Handles 802.11b,g,n,ac,ax,ay wireless protocols.

- **Cable, DSL or Satellite Modem**
  - Ethernet to Cable, Phone or satellite converter.
  - Has to be activated with your Internet Service Provider (provide the MAC address)

Wireless Networking Hardware

PC Card Wireless Network Adapter

- Remote wireless connection.
- Wireless now built into most cell phones, laptops & tablets. Try to get ac support

USB Wireless Network Adapter

- Remote wireless connection.
- Newest “n”, “ac” and “ax” models are very small
- USB “ax” (WiFi 6) adapters now widely available

Powerline Networking Hardware

- Uses your household wiring.
- Speeds from 80 M-bits to 2000 M-bits. (1000 M-bits per port)
- Plug in one near your router and connect an Ethernet cable to it.
- Plug in the second in a remote room (say by your TV) and connect an Ethernet cable from it to your TV, Blu-ray player or cable / satellite receiver.
- Great for streaming audio/video, extending wireless network.

- See the following web page:
  - https://www.amazon.com/AV2000-Powerline-Pass-Thru-Gigabit-PLA5456BBKIT/dp/B01MTNKNPZ/

Messaging Over Coax (MOCA) Adapters

- Uses your household coaxial cable TV wiring to carry Ethernet traffic.
- Speeds up to 2500 M-bits (MOCA 2.5)
- Plug in one adapter near your router, connect an Ethernet cable to it. Then connect it using a coax cable to a coax jack in the wall (may need a MOCA-compatible splitter).
- Plug in the second adapter in a remote room (say by your TV) and connect an Ethernet cable from it to your TV, Blu-ray player or cable / satellite receiver or to Ethernet a switch. Then connect it using a coax cable to a coax jack in the wall (may need a MOCA-compatible splitter).
- May also need a MOCA filter at the cable entry to the house.
- Great for streaming audio/video, extending wireless network.

- See the following web page:
  - https://www.amazon.com/Hitron-Ethernet-existing-Backbone-Streaming/dp/B08MQG6T61/ref=sr_1_5?th=1

High Speed Internet Service in LV

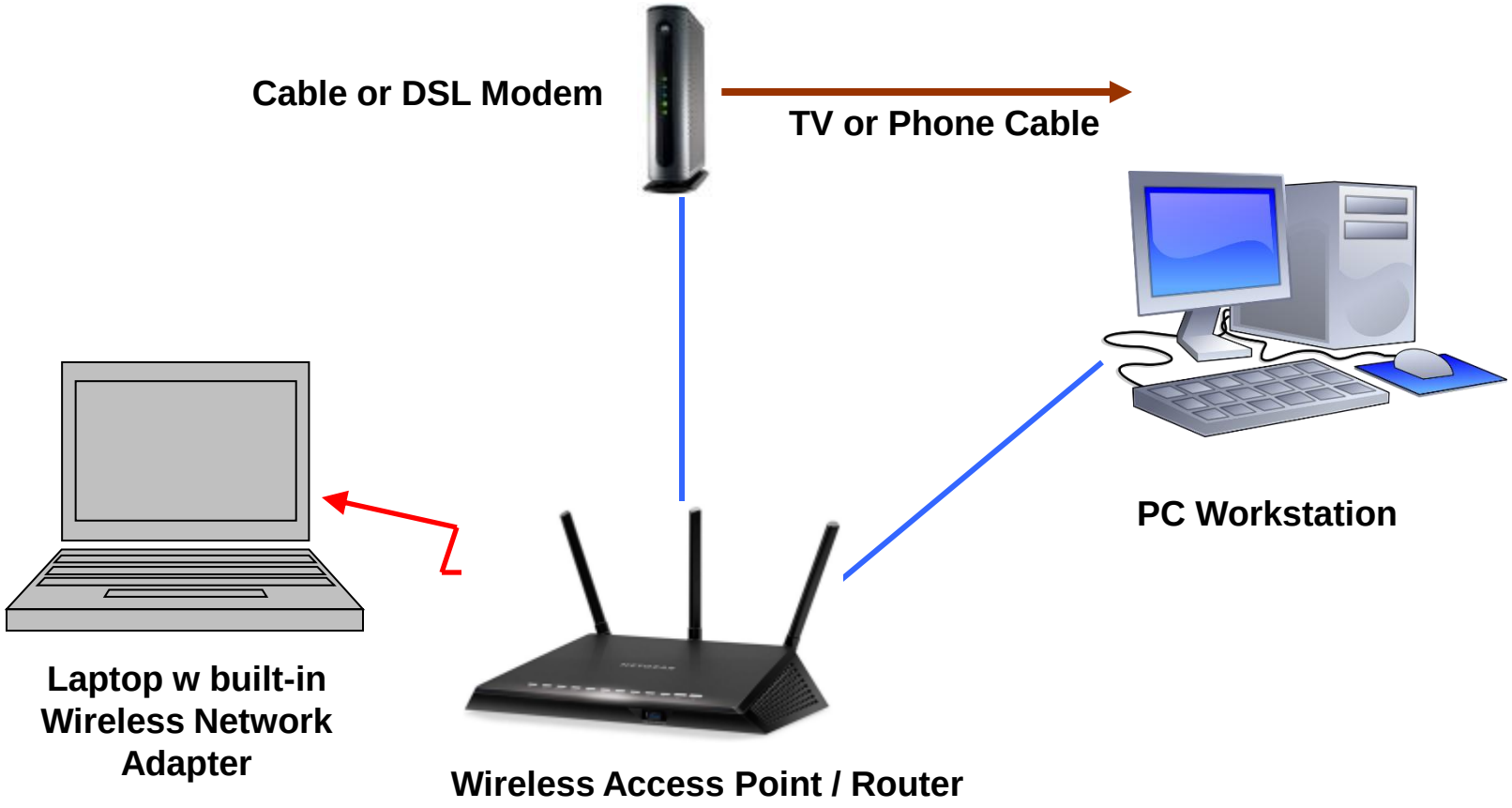
- Cox Cable (fiber-coaxial cable hybrid) Speeds - 10 to 940 Mbps
  - https://www.cox.com/residential/internet.html
- CenturyLink DSL (fiber-DSL hybrid) Speeds - 10 to 40 Mbps (SCS); 940 Mbps (fiber)
  - https://www.centurylink.com/
- Cellular Data Hot Spots - uses your 4g or 5G cellular data plan
- 5G Home Internet
  - Verizon: https://www.verizonwireless.com/5g/home/
  - T-Mobile: https://www.t-mobile.com/home-internet/plans

- Hughes Net (satellite) – subsidiary of Echostar
  - http://www.hughesnet.com/
  - 25 Mbps - various data limits: 10, 20, 30 or 50 Gbytes/mo
  - Target market is rural communities
- LEO Satellite Internet Service
  - Starlink (https://www.starlink.com/us)
  - Viasat (https://www.viasat.com/)

Networking Web Links

- http://www.linksys.com
- http://www.netgear.com/
- http://www.dlink.com/
- http://www.belkin.com/
- https://www.asus.com/us/
- Windows Help and Support (Networking and the Web)

Demo – Two PC Wired / Wireless Network



Demo – Setting Up a Two-PC LAN (1)

- **Read the vendor instructions – *TWICE*!**
- **On newer PCs and laptops, Ethernet NICs are already installed or built in. Most laptops also have built in 802.11n, ac or ax.**
- **Plug in an Ethernet cable from a PC to your WAP/Router.**
- **Plug in an Ethernet cable from Cable/DSL modem to WAP/Router's WAN port. (if needed) Often today, the modem and WAP/Router are integrated into a single box, so there's no separate cabling between them.**
- **Power cycle both the Cable/DSL/WiFi modem and the WAP/Router.**

Demo – Setting Up a Wireless Router

- **Configure the Wireless Access Point using the setup program provided by the vendor. The setup may be a series of web pages built into the router. If so, use your web browser to connect.**
  - **SSID (change it from the default – e.g. "SCSCC300N").**
  - **Administrator access password (change it from the default).**
  - **Strongly Recommended - configure WPA3, WPA2, (or WEP) security on the router (see notes). WPA3 is best security. WEP very weak.**
- **Using your browser, connect to the WAP / Router to re-check its configuration.**
- **Install any required network adapter drivers on the wireless PC(s).**
- **As needed, plug in the Wireless PC card or USB adapter or turn on your laptop's wireless network subsystem.**
- **Windows should automatically discover the wireless access point and run a wizard to let you join the wireless LAN.**

Demo – Setting Up a Two-PC LAN (3)

- **Set up the LAN Connection on each PC (use Wizard)**
  - In Windows 10/11, go to This PC > Properties
  - Specify a Workgroup name and PC name.
    Don't use defaults: "MSHOME" or "WORKGROUP"!
  - On Windows 8 / 10, avoid "HomeGroups" if other PCs are not also Windows 8 / 10.
  - As of Win 10 V1903, HomeGroups are no longer supported.

- **Check and adjust LAN Connection's Settings.**
  - Use Control Panel's Network Connections applet.
  - Go back to check and refine Wizard's settings.
  - If needed, enable the Windows Firewall.

Demo – Setting Up a Two-PC LAN (4)

- **Reboot both PCs to ensure all software & settings are clean.**
- **Check PCs can “see” each other (Use “My Network Places”).**
- **Try your Internet connection from both PCs.**

TCP/IP Name / Address Services

- **Domain Name Services (DNS)**
  - Resolves Internet host names like AOL.COM to IP addresses (e.g. 172.20.148.50)
  - Experiment with PING command.
  - Cox.Net DNS servers at: 68.111.16.30 and 68.111.16.25.
  - OpenDNS servers at: 208.67.222.222 and 208.67.220.220.

- **Dynamic Host Configuration Protocol (DHCP)**
  - Your router's built-in IP address server automatically assigns a dynamic IP address to requesting PCs.
  - IP address is "leased" to a PC or device for a set length of time (e.g. 4, 8, 12 or 24 hours).
  - A PC or device can "renew" the lease.
  - Commonly, your *router* will assign IP addresses (192.168.x.y) to PCs on your internal network.
  - Your router will use Network Address Translation (NAT) to manage external Internet traffic to/from the various devices connected to the router.

Key Windows Local Networking Services

- **Client For Microsoft Networks**
  - Allows a PC to connect to shared files and printers on another networked PC in the same Work Group.
  - Required to connect to network printers and shared folders on other network devices.

- **File and Printer Sharing for Microsoft Networks**
  - Allows a PC to share its own printers and files with other networked PCs and devices in the same Workgroup.
  - Required to allow other PCs and devices to connect to this PCs network printers and shared folders.

Shared Files Demo

- **Create some file folder and local printer “shares”.**
  - **Windows Explorer folder “Sharing” menu (Properties > Sharing)**
  - **Make them accessible by “Everyone” or by specific users or groups.**
- **Connect to those “shares” from the other PC.**
  - **Windows Explorer Right-click “This PC” and choose :Map network drive”**
  - **Specify a drive letter and network path to the shared folder (\\pcname\sharename).**
  - **Creates a logical drive letter that points to a remote folder.**
- **Disconnecting from a “shared folder”**
  - **In “This PC”, right click on the logical drive.**
  - **Choose “Disconnect”.**

Installing Network Printers Demo

- **Network printers may be wired or wireless.**
  - **A network printer has built-in network print server software.**
  - **Good practice to configure the network printer with a "static" IP address so it won't change if router or printer is reset.**
  - **Newer printers advertise themselves via "Bon Jour" or UP&P service (uses connection by *name*, rather than IP address).**
  - **Important! You may need to install a printer driver if your Windows system doesn't already have it.**
- **Start in Windows Control Panel's Devices and Printers applet**
  - **In Settings > Bluetooth & Devices > Printers & scanners, click "Add Device" and follow the prompts.**
  - **In the dialog that appears, click "Network printer".**
  - **Windows will search the network for network printers and display a list.**
  - **Select the network printer you wish to connect to and Windows will complete the installation.**
- **Deleting a network printer.**
  - **In Settings > Bluetooth & Devices > Printers & scanners, select the printer and then click the Remove button.**

WiFi Direct Networking

- **New standard for connecting two or more "certified" devices *without* a wireless access point / router. Standard is managed by the WiFi Alliance.**
  - http://www.wi-fi.org/discover-wi-fi/wi-fi-direct
  - http://en.wikipedia.org/wiki/Wi-Fi_Direct

- **Devices form an ad-hoc "peer to peer" network.**
  - **Secure connections automated (WPS, NFC or Bluetooth).**
  - **Useful for synchronizing contacts & calendars.**
  - **Devices can print directly to a Wifi Direct printer.**
  - **Can be used to facilitate streaming (e.g. Chromecast).**
- **Look for the "WiFi CERTIFIED" logo:**
  - **Cell phones**
  - **Tablets**
  - **Laptops**
- **Caution – WiFi of any kind uses lots of battery power**

Open Workshop / Q and A

Your Networking Problems and Questions