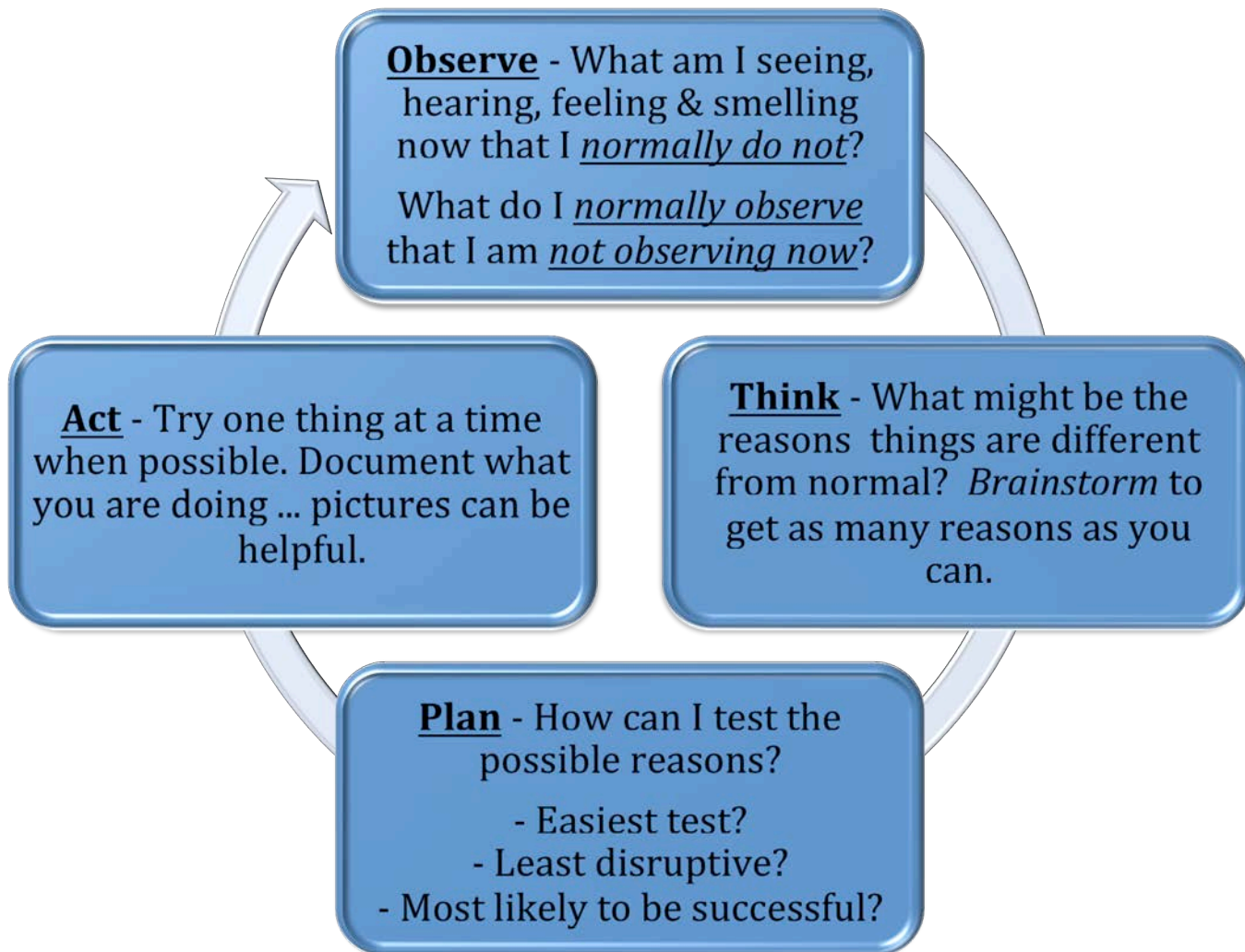


## Troubleshooting basics

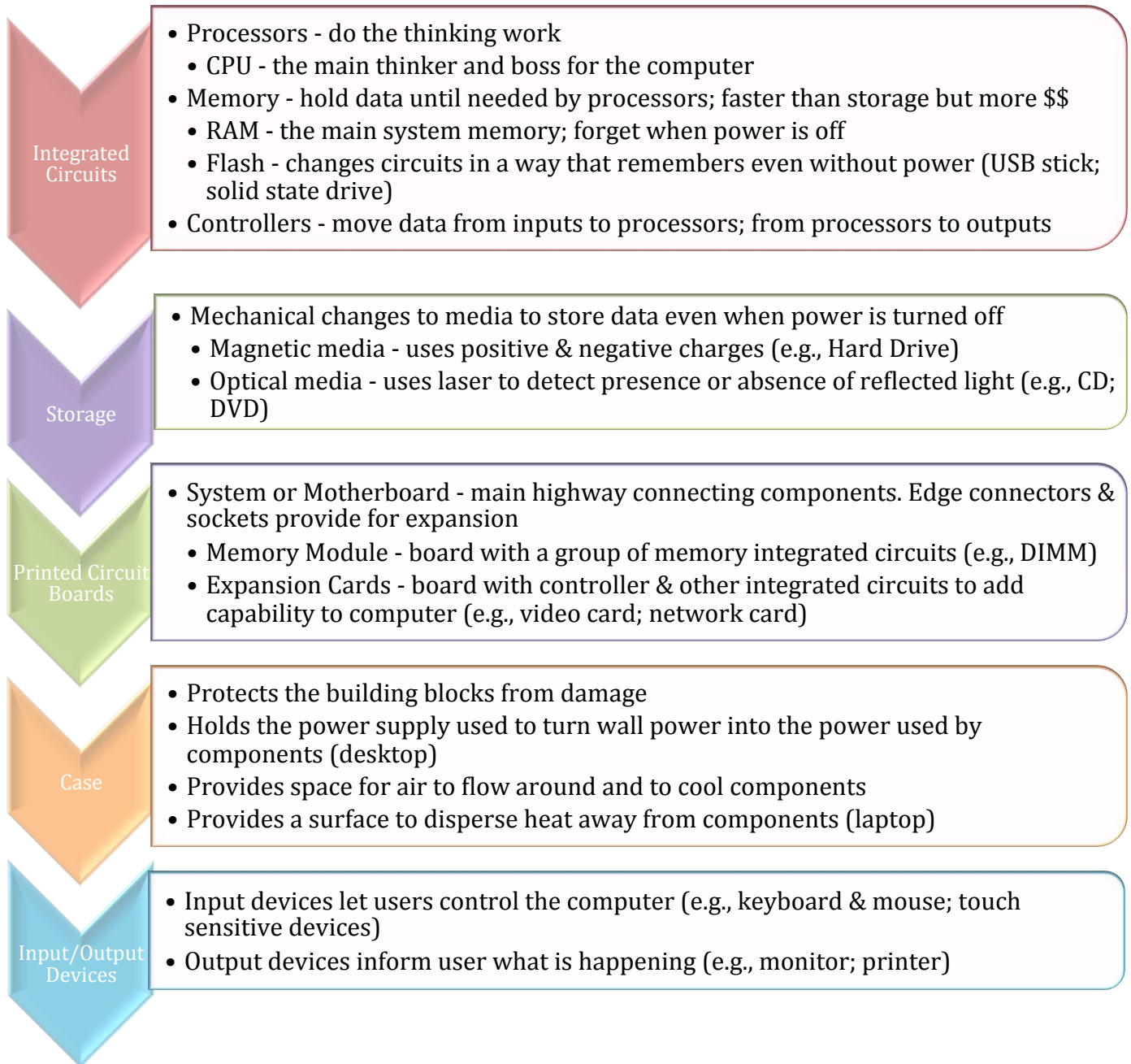


### **Knowing normal:**

1. Try to observe and document normal operations before a problem occurs.
2. Compare your system or network to others that are similar.
3. Use your manual when available on hand or online to determine normal.
4. Experience helps. Each activity is a learning opportunity.

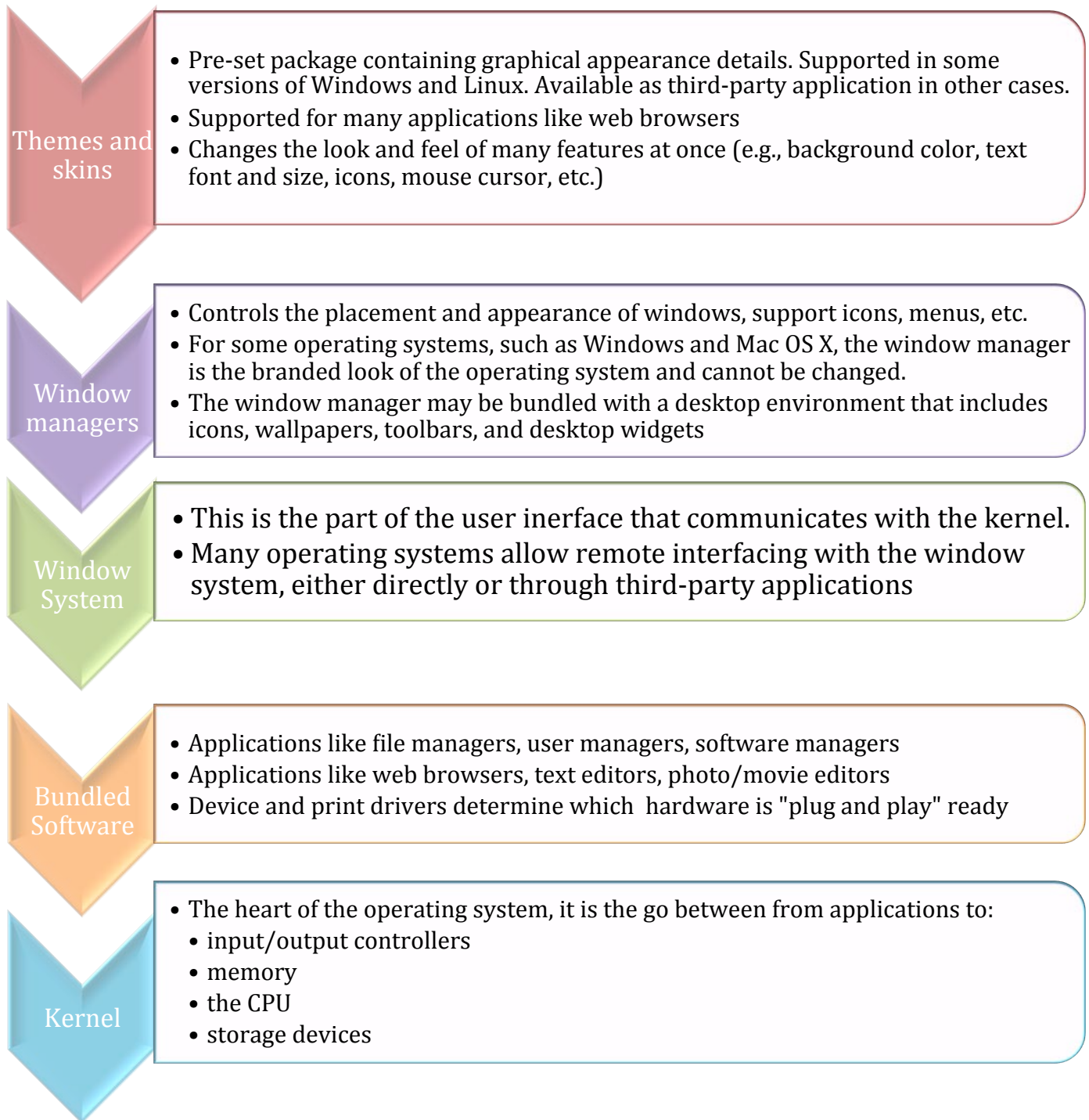
## Hardware Building Blocks

- ✚ All computers are made up of the following basic building blocks.
- ✚ The basic building blocks can be assembled in many different ways
  - How innovators, producers, marketers, etc. see the world influences design
  - Economic, social & political contexts influence how designs are turned into products
- ✚ Different products (different designs & contexts) have different social consequences
- ✚ We influence the social consequences through our choices and our [re]invention of products



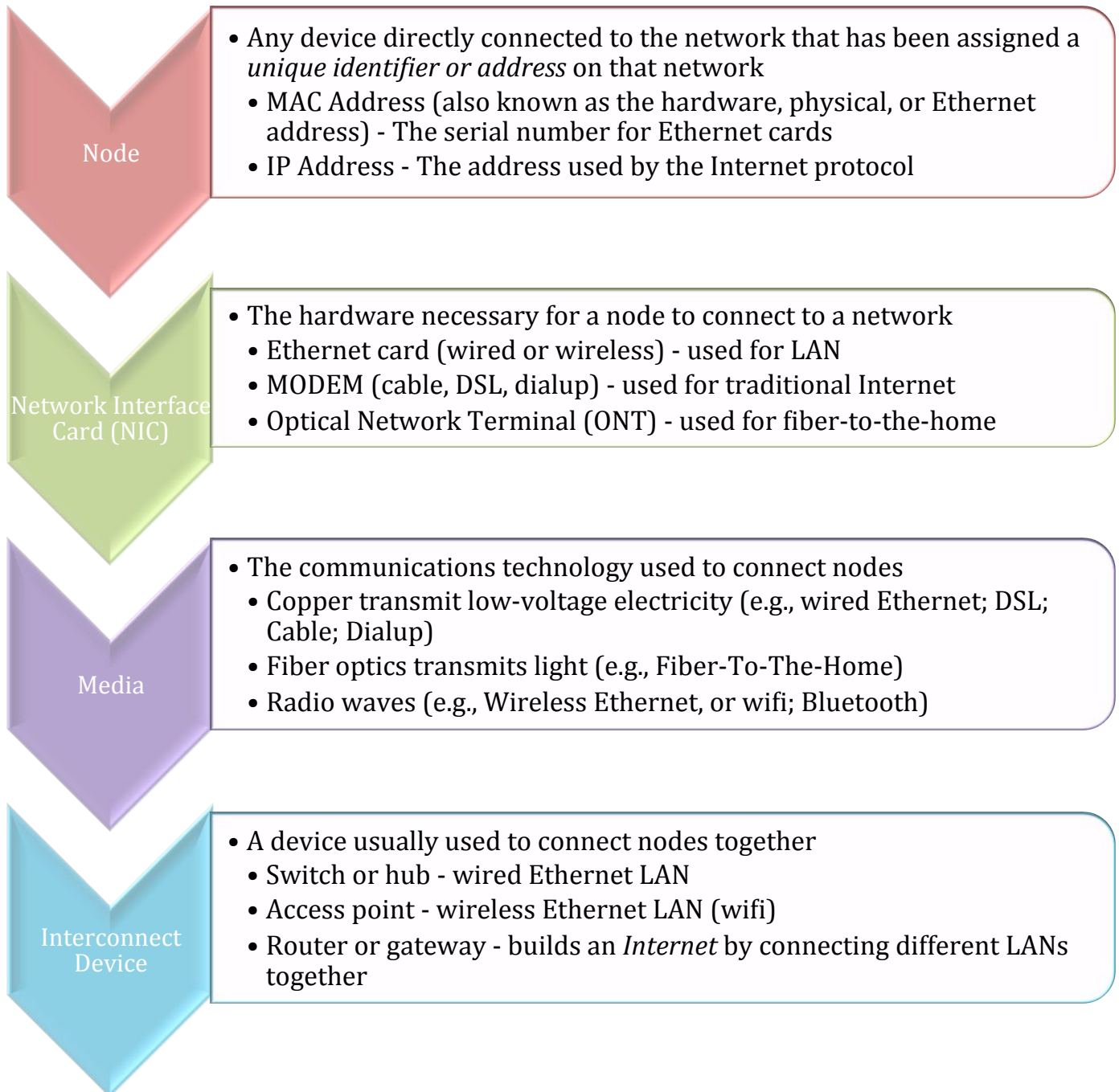
## Operating System Building Blocks

- ✚ Operating systems are comprised of the following basic building blocks
- ✚ The same OS can work on many different hardware platforms (e.g., desktop/laptop and smartphone/tablet) by using the same kernel but different window managers
- ✚ Different editions (e.g., Windows 8, Windows 8 Pro) or distributions (Ubuntu, Edubuntu, Linux Mint) add/remove bundled applications and/or administration features



## Network Building Blocks

- ✚ All computer networks are made up of the same following basic building blocks
- ✚ Networks differ on how far they reach geographically, how many people are meant to use them, and who primarily owns/control them.
  - Local Area Network (LAN) – owned, managed, and used by people in a building
  - Wide Area Network (WAN) – owned and managed by Internet Service Provider
  - Metropolitan Area Network (MAN) – community owned and/or managed WAN



## Essential Network Troubleshooting Tools

### Link Lights

- LED light found on wired Ethernet cards & switches
- When lit, indicates card & switch are on and working properly, and that Ethernet cable is plugged in and working properly

### Network Manager

- Operating system utility that shows network configuration
- An IP address of 0.0.0.0 or one that starts with 169.254 indicates you are connected to the media but aren't getting a proper IP address from the address server (usually the gateway router)

### Ping

- Run from from the command line or terminal application to test if you can communicate with another node
- ping *IP\_ADDR* or ping *IP\_NAME* (e.g., ping google.com)
- Times of 1ms or less are good on a local network; 10-50ms or less are good on the Internet
- HINT: ping different nodes to track down faulty component



### Traceroute

- Run from from the command line or terminal application to test the performance of each router between nodes
- Windows: tracert *IP\_NAME*; Linux: tracepath *IP\_NAME*; Mac OS X: traceroute *IP\_NAME*; Smartphone apps available
- Astericks (i.e., \*) indicate failure or firewall
- HINT: usually hop 1 is your router; hop 2 is your ISP's

### Speed Test

- Web-based Internet connection speed test
  - <http://www.speedtest.net>
  - <http://www.speakeasy.net/speedtest/>

NOTE: To access the command line:

- **Windows** – click on the Start button, choose run, type in *cmd* in the open bar & hit the enter key
- **Mac OS X** – click on the spotlight  , type in *terminal* & choose Terminal under Applications
- **Linux** – click on the Start button  , choose Terminal under Accessories



## Broadband Choices

### Key differences

- ✚ Do others in your neighborhood split the bandwidth on the media with you (*bus topology*), or do you get a dedicated line to your house (*hub and spoke topology*)?
- ✚ Can the media send a packet of data at the same time it is receiving one (*full duplex*), or can it only do one thing at a time (*half duplex*)?
- ✚ Is the upload speed the same as the download speed (*synchronous*), or is it slower (*asynchronous*)?
- ✚ Are there limits in what you can do with your connection, such as a limited amount of bandwidth each month (*data caps* – cell data plans, *fair use* – satellite data plans), limits based on file size (e.g., Comcast *TurboBoost* only transfers the first part of a large file at the advertised speed), or limits based on contracts with the ISP (for instance, a streaming video company could have a contract to pay Comcast more so that their videos are on a “fast lane” to Comcast homes but not to AT&T homes, contradicting the historic policy of *net neutrality*)

### Digital Subscriber Line (DSL)

- Adds 2 channels to standard phone line for Internet
- Hub and spoke (dedicated line) topology; full duplex
- In the US DSL prioritizes download speeds

### Cable Internet

- Redirects a cable channel to be used for Internet
- Neighborhood shares bus topology; full duplex
- In the US, Cable Internet prioritizes download speeds

### Cell-based Internet

- 3G adds the EV-DO (Verizon, Sprint/Nextel) or HSDPA (AT&T, T-Mobile) protocol to cell's voice protocol
- 4G adds the WiMax (Sprint) or LTE (Verizon, AT&T) standard to cell's voice protocol
- Equivalent to bus (shared) topology; half duplex
- Prioritizes download speeds

### Community Wireless

- Uses standard wireless Ethernet (wifi) outdoors; anyone can use off-the-shelf equipment to create
- Equivalent to bus (shared) topology; typically half duplex
- Synchronous upload and download speeds

### Fiber Optics

- Ultra high speed communications technology with one or more channels for Internet
- Hub and spoke (dedicated) topology; full duplex
- Synchronous upload and download speeds

# Basic System Maintenance

The following maintenance schedule will help you keep your computer up-to-date, and keep your files backed up.

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## Regularly: Empty the Trash

Items placed in the trash are still on your computer and can be taken out, just like documents in your actual kitchen trash can, for example, can be taken out and recovered. Emptying the trash (by right-clicking on it and selecting “Empty Trash”) is like taking the trash out to the curb – any documents can still be recovered before the garbage truck comes, but this is a dirtier job and you might not be able to recover the whole document.

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## Every Week: Check for updates using the terminal

Go to “Accessories” to open the “Terminal” application. This will open a terminal window where you can enter commands. The command `sudo` is short for “super do,” which means the command is a “super-command.” The following terminal commands will ask you for your password.

**Terminal command:** `sudo app-get update`

*Checks for updates of available applications. You have to do this before using the `app-get dist-upgrade` command, otherwise the computer won't know what's new.*

**Terminal command:** `sudo app-get dist-upgrade`

*Updates all applications and system files to the newest version. LINUX takes the list of new updates it got from `app-get update` and then upgrades all of the software on your computer.*

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## Every Month: Check that backups are working properly

It's important to back up your files, because hard drives can fail. This is like copying important documents and putting them in a second file box, in case the first one is lost, stolen, or damaged for any reason. Use the “Backups” application under “Accessories” menu to make sure your settings are still what you want them to be.

*Check “Folders to save” and “Storage location” to make sure the files you want to back up are being backed up at the correct place. Schedule automatic backups under “Scheduling,” if desired. Make sure the “switch” at top right is set to “On.”*

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## As Needed: Basic physical maintenance

Check cable connections to make sure they are tight, and that cords are intact.

*Tighten any loose connections, replace any damaged cables.*

Unplug all cables from the computer. Use compressed air designed for cleaning computers to blow out dust from the keyboard. Use a cloth dabbed in rubbing alcohol to clean the tops of keys. Clean the monitor with a dry microfiber cloth (paper towels and many household cloths are abrasive). If the computer is located in an especially dusty area, open the case and use the compressed air to blow dust from the inside of desktop computer.

Never spray liquids directly on computer parts. Never use furniture cleaners or strong solvents. Reconnect everything once dry.

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## Yearly: Account and Software Management

Change passwords on local computer and remote systems. Consider using groups of passwords (one for online banking, one for online credit cards, one for email services, one for social media sites, etc. (do not share passwords unless you trust someone with every thing you have and are)

Delete unused applications, consider updating to the newest versions of remaining applications and your operating system, especially if updates are no longer available for existing version.

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## Security Building Blocks

### Firewall

- Software that chooses which types of services to allow through (for instance, allow web access but not remote login access)
  - On router to stop outsiders from getting in
  - On each computer to stop attacks from a compromised computer

### Encryption

- A big time improvement on the old-fashioned decoder ring
  - On the wireless access point, enable **WPA2** encryption
  - In your web browser, never enter private data unless you see **https**
  - Make sure other applications transferring private data use **SSL** or another encryption
  - Consider encrypting a folder on your storage devices

### Software

- Always run software updates
- Always run antivirus software in Windows
- Create and regularly use a non-administrative account
- Enable second-level access codes when applications store or access in the cloud private data (for instance, a pin to start the dropbox app on a mobile device)

### Passwords

- Use secure passwords that include non-letters; HINT: use phrases
- Use different passwords, or at least different groups of passwords, with different devices and servers
- Never share your password unless you trust that person with all you have & all you are
- Consider using a password manager to keep track of passwords securely

### Physical

- Don't leave your computer (laptop, smartphone, tablet) laying around
- Logoff or lock your screen when leaving your computer or people can easily become you
- Don't leave your external storage devices laying around, including your backup device
- Consider installing/enabling tracking and remote lock/erase software if you store highly private data
- Be careful of over-the-shoulder data snatchers

### Weakest Links

- Social Engineering
  - Using seemingly harmless information to get more private information
  - "Phishing" to trick you into believing you are on a legitimate site
- Server security - only provide/store private data on the most trusted servers
- An insecure computer or user on your local network increases the risk to all other computers and devices