### (Approx. 1768 words)

### Shopping for a New Smartphone

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I’ve been looking at new smartphones for a few months, and now, with “Black Friday” and “Cyber Monday” sales in full force, it seemed like an interesting topic for a monthly column. As with most technology, the purchase process has become very complex. Smartphones have evolved to where you’re buying a mobile computer that can also make calls on the cellular phone network.

At Casa de Burt, both Mrs. and I have been using fairly simple, low-end LG Android phones with 5-inch screens, modest cameras, and minimal storage. Originally, we had these mainly for emergency use when out and about. However, inevitably, they become more integral to one’s daily existence in the modern technical world. Also, LG is exiting the smartphone business, and our phones’ versions of Android are well out of support, so compatibility with future apps is a growing concern.

## Carrier Technology (4G / 5G)

The cellular phone/data network has evolved over the years through successive generations: 2G, 3G, 4G, 4G LTE, and now 5G. A 6G standard is already in the works. If you’re interested in a deep dig, here’s an extensive article describing the history and current state of signaling technology: <https://en.wikipedia.org/wiki/Cellular_network>.

Older generations of the 3G GSM and CDMA standards are being phased out. As a result, older cell phones that can only access GSM or CDMA cell networks may no longer work after mid-April 2022. If buying a new phone, check to see if it’s compatible with T-Mobile/Sprint, Verizon, or AT&T. Most new unlocked phones are compatible with all three.

All newer phones support 4G and 4G LTE; many support 5G. The main difference between 4G and 5G is that 5G offers higher data speeds. If you’re not getting reliable 5G service from your carrier, there’s little benefit in having a 5G phone.

## Phone Brand and Hardware Specs

The major makers of cell phones include Apple, Samsung, LG, Motorola, and Google. Apple and Samsung are the major players in the US, with a combined 78% market share. LG announced its exit from the mobile phone business as of July 31, 2021.

Key hardware features to pay attention to are:

#### Processor cores and speed

New Apple iPhones use custom Apple-designed 6-core processor chips (A14, A15) that support the ARM (Advanced RISC Machines) instruction set with Apple extensions. New Android phones use ARM architecture processors primarily from Qualcomm (Snapdragon series), Samsung (Exynos series), MediaTek (Dimensity series), HiSilicon (Kirin series), and Google (Tensor series). In addition, the latest Android phones are coming with 8-core 64-bit processors running at up to 2.8 GHz clock speeds, so they compare well to mid-range desktop processors.

As you might expect, a higher-end processor yields better performance for running apps on our phone.

#### RAM memory

New smartphones come with 1G-byte to 4 G-bytes of internal RAM (memory for running active programs). More RAM is better but will increase the price of the phone. I’d recommend at least 2 G-bytes of RAM for running newer versions of Android (10 or 11).

#### Onboard solid-state storage

Newer phones now offer anywhere from 16 G-bytes to 512 G-bytes of onboard solid-state data storage. The data stored includes the operating system, all apps, and end-user data. If you use your phone to store videos, pictures, or music, you’ll want a phone with at least 32 G-bytes of storage. Most phones allow you to add a SD flash card for additional storage.

#### Screen size and pixel resolution

Most new phones have a physical screen size close to 6.5 inches by 3 inches. Resolutions (pixels per inch) vary, with higher resolutions costing more. A typical mid-range screen (Moto G) is 1600 x 720 – about 267 pixels per inch. Some Apple 13 iPhones with Retina displays have 460 pixels per inch resolution.

#### Wi-Fi connectivity

Virtually all smartphones can connect to a Wi-Fi router and connect to the Internet for web surfing, email, and many “connected” apps. Most phones now support connecting via either the 2.4 GHz or 5 GHz bands using the 802.11AC standard. Some newer phones now also support the Wi-Fi 6 (802.11AX) standard. When shopping, look for 802.11AX or Wi-Fi 6 to “future proof” your phone. However, 802.11AC (Wi-Fi 5) is still OK.

#### Bluetooth connectivity

Bluetooth is a short-range radio connection alternative to Wi-Fi. It’s handy for connecting to your car’s in-dash entertainment console for hands-free phone operation or for connecting your phone to a Bluetooth headset (again for hands-free calling). With appropriate apps, you can also use Bluetooth to connect to other users’ phones when there’s no Wi-Fi router nearby.

#### Motion sensing / Accelerometer

Many newer phones have a built-in accelerometer. These are often used by gaming and virtual reality apps so that your phone’s motion can be tracked, allowing it to function as a game controller or a game weapon. Or it might be used to sense activity while you’re working out.

#### Headphone Jack

A headphone jack is important if you want to plug in wired headphones so you can listen to music or videos on your phone without disturbing others. However, there are also inexpensive rechargeable wireless Bluetooth earbuds that allow you to listen, even if the phone lacks a headphone jack.

#### USB connector

Newer Android phones come with a USB-C (small, symmetric) connector that can be used to charge and pass data between the phone and another device. Older phones used a “micro-USB” d-shaped connector. The charging cable for your phone should have the correct connector on one end and a USB-A (rectangular) connector on the other.

#### Battery Life

Most new smartphones have batteries rated 4000 to 5000 milliamp hours, translating to 36 to 40 hours of talk time. Generally, a higher capacity battery gives more talk time, but this will also depend on the processor speed, the amount of RAM and storage, the apps you use, and how much data is transferred over the Wi-Fi connection.

## Phone Software Features

Apple iPhones run Apple’s proprietary iOS (12, 13, or 14) operating system. Phones from other makers primarily run Google’s Android operating system; newer phones typically run Android 10 or 11. In addition, some inexpensive Chinese phones may be running Linux-based operating systems that can also run Android apps. For example, Huawei, which is now banned in the U.S., uses HarmonyOS in its Chinese smartphones.

Out of the box, the features of a smartphone are determined by its operating system and the built-in apps. For example, for the Apple iPhone, the Apple app store offers an extensive catalog of additional free and paid iOS-compatible applications. Similarly, the Google Play store offers an extensive catalog of free and paid Android-compatible applications for Android phones.

Baseline bundled apps for all phones include a phone app (includes contacts), a text messaging app, the settings app, a file manager app, a camera app, and an app to interface to either the Apple app store or the Google Play store. You will also find a photo viewer, a music player, a video player, a web browser, and an email app. Your phone carrier may also add vendor-specific apps.

Many new phones offer facial or fingerprint recognition to secure your phone while not requiring a PIN or password to unlock the screen.

## Shopping Options

You can buy a new phone at many retail stores or at online retailers. Many of these are packaged with a prepaid plan from one of the carriers. You can also buy phones directly from the various carriers at the retail or online stores. Often, the carriers have the best pricing, but the phones will be “locked” to that carrier’s network. “Unlocked” phones (compatible with many or all carriers) can be bought, but prices tend to be higher. Be careful buying phones on eBay – especially “used” phones.

Many carriers offer phones at large discounts but require an expensive phone plan to get reasonable pricing.

After you buy the phone, you may need to get a SIM (Subscriber Identity Module) card for it from your preferred carrier and then activate the phone on that carrier’s network.

## Buying a New Phone from a Carrier’s Phone Store – Experiences

As noted above, you can often find some really good deals by shopping your current carrier’s online or brick-and-mortar store. Of course, phones you buy from your carrier will be “locked” to that carrier’s network, but if you like your current plan, that should not be a problem.

Mrs. Burt has a low-cost prepaid phone plan with Boost Mobile (a subsidiary of T-Mobile / Sprint). As a result, we could buy her a very nice Motorola Moto G Pure phone for $59.99 (pre-Black Friday special). In the Boost Mobile website screenshot, the price had dropped to $49.99 on Black Friday). The Moto G Pure has 3GB of RAM and 32GB of onboard storage and A screenshot of a cell phone

Description automatically generated with medium confidenceis powered by a MediaTek 8-core CPU and runs Android 11. So for Mrs. Burt, it’s a perfect fit for her needs. Once the new phone arrived, it was easy to activate her new Moto G on the Boost Mobile website, keeping her current phone number.

My experience with the AT&T website was less successful. All their phones for regular plans are offered on a 36-month time contract. You pay a certain amount per month ($5 to $20, depending on the phone) and, after 36 months, you own the phone. However, you have to buy a plan that costs at least $75 a month to get those good prices! After 36 months, you can trade the old phone in and get a new one, starting another 36-month time contract. Effectively, the customer is renting the phone.

The AT&T prepaid plans offer a small selection of phones for flat purchase prices. However, all these phones are locked to the AT&T network.

I looked at Verizon, and their plans, phone prices, and terms are about the same as AT&T’s.

I finally decided to switch from AT&T to Boost Mobile and get a Moto G Power phone ($67 on Cyber Monday) for myself.

## Final Thoughts

Your choice of smartphone depends a lot on your connectivity needs and how you use the phone as a mobile computer. Phones eventually wear out, but most succumb to mishaps like getting dropped, dunked, or lost. With care, a phone should last five years or more – long enough to where it will become obsolete before it wears out.

Lastly, in buying a smartphone, don’t forget its phone functionality. You won’t be happy if your phone drops calls or has poor reception. Read the online reviews before buying and look for comments about phone reception.

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