**What is a Smartphone?**

* A mobile phone running a mobile OS, with advanced computing capability & connectivity.
* More advanced than a ‘feature phone’ (retronym, eg old Nokia phones with MMS, Snake, limited WAP web browser)
* First ones initially just introduced functions of PDAs. Now we have cameras, GPS, multimedia, high-res touchscreens, web browsers, app stores etc.
* Speech by accessing cellular networks *(2G, 3G, 4G)*
* Data from the same networks *(GPRS, EDGE -2G, HSPA, LTE - 3G,4G)*
* As well as Wi-fi, bluetooth, GPS, NFC.

**Mobile OSs:**

* Android - founded 2003, first phone 2008, Google-owned. Mostly free and open source
* iOS - 2007, Apple owned. Closed source & proprietary
* Windows Phone - 2010, closed source & proprietary.
* Blackberry - 1999, owned by RIM. Closed source & proprietary
* Others: Bada, Symbian, Palm OS, Ubuntu for phones, Sailfish

**Two aspects of OS -**

1. User-facing software platform- interface including display, buttons and using RISC type instructions
2. Real-time operating system- operating sound I/O, radio comms, error control.

**Smartphone Anatomy:**

* Memory
* Hardware - touch screen (mostly capacitive nowadays), buttons, mic, speakers, camera, sensors
* Antenna
* Battery
* Essential components such as
  + Speech I/O
  + Speech and music storage
  + Image capture and storage
  + Data network & internet access
  + Comms by Wi-fi, cellular network, BT, NFC
  + Comms needed for GPS

**Breakdown:**

* **Mobile Systems**
  + Features of mobile systems including smartphones.
* **Representing signals in smartphones**
  + Analogue & digital signals, time & freq domain representations, sampling,
  + aliasing, quantisation, compression, real time computation.
* **Coding, decoding & compression**
  + GSM, MP3, JPEG & MPEG coding & decoding, error correcting codes, comms coding schemes,
* **Android applications**
  + Principles, tools & some techniques
* **Mobile Comms**
  + Transmitting real time info over wireless networks; cellular & ad-hoc coding of multimedia to increase capacity of radio channels & to minimise effect of transmission errors
* **Maximising battery life**
  + Addressed at many levels: chip design, signal coding & processing, medium access control (MAC), power & error control

**Summary**

Smartphones have evolved because of:

* Moore’s Law allowing low cost, power and weight
* The development of mobile OSs & apps
* Digital media processing & *compression (*speech, music, image, video)
* Error correction, resolving mobile-specific (non-tethered systems) issues
* Improvements in batteries (slow) and their usage.