CCE60220

Perangkat Bergerak (TKOM)

Fakultas Ilmu Komputer Universitas Brawijaya

MATAKULIAH	: **Perangkat Bergerak (TKOM)**
KODE/ STATUS	: CCE60220
SKS	: 2
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Email	: dahnial87@ub.ac.id
Ruang	:

Agenda Perkuliahan

1. Intro dan overview perkuliahan
2. Sejarah dan perkembangan teknologi perangkat bergerak
3. Komponen perangkat keras dan perangkat lunak
4. Pengenalan dan instalasi android studio serta aplikasi sederhana
5. Intent dan passing data pada Android Studio
6. Android Studio: Sensor reading
7. Android Studio: Storage & shared preference
8. **==========UTS**
9. Pengenalan dan aplikasi sederhana dengan MIT AppInventor
10. Appinventor: variable, looping, conditional, tinyDB, file
11. appInventor: sensor reading & persiapan project
12. Appinventor: Akuisisi gambar dan suara
13. Appinventor: komunikasi bluetooth
14. Appinventor: basic animation
15. Presentasi kelompok
16. **==========UAS**

Requirements of Smart phone & Tablet

Games, music, video
- Intense graphics and sound
- Powerful processing

Internet/email
- Wifi, connectivity

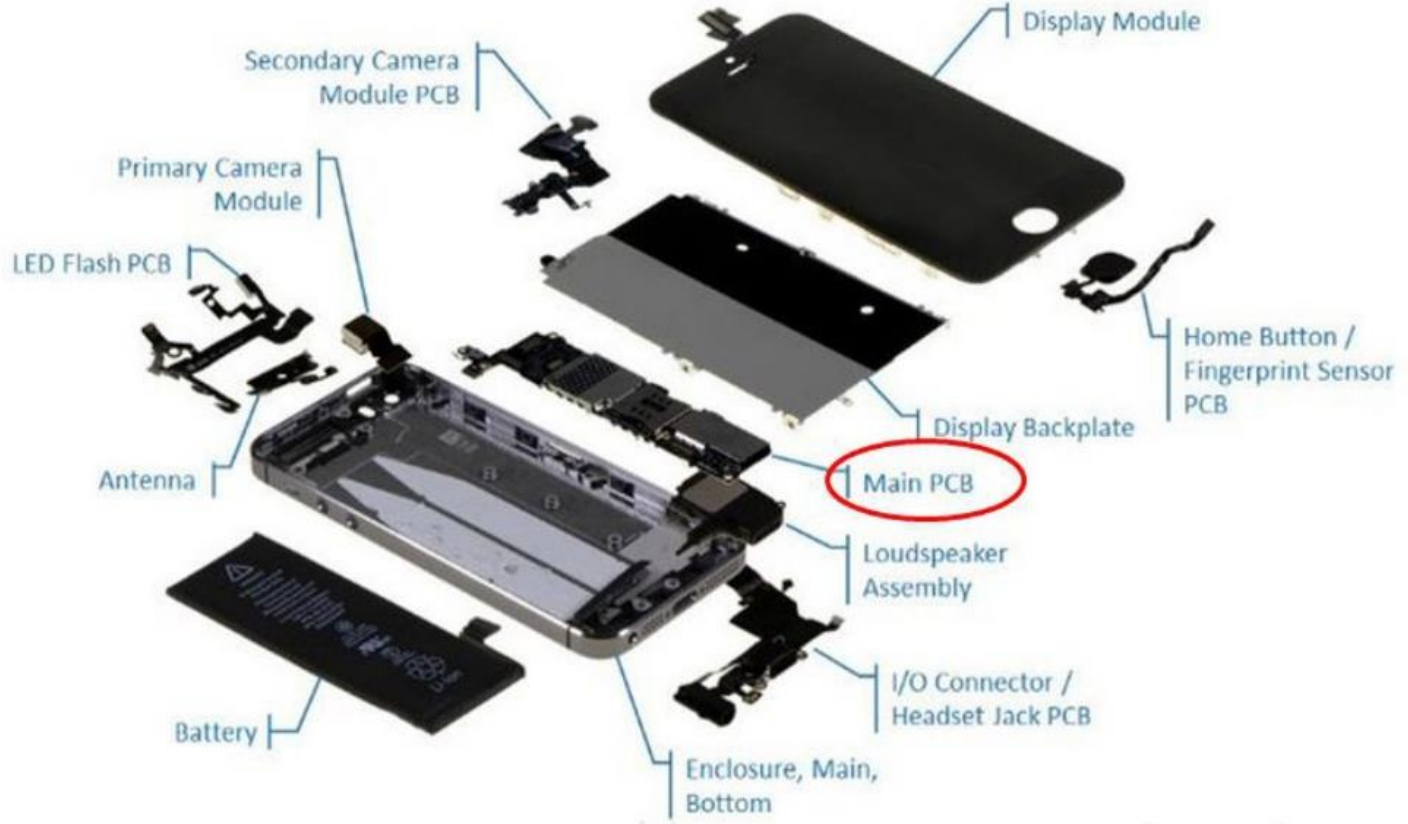
GPS
- GPS chip, compass

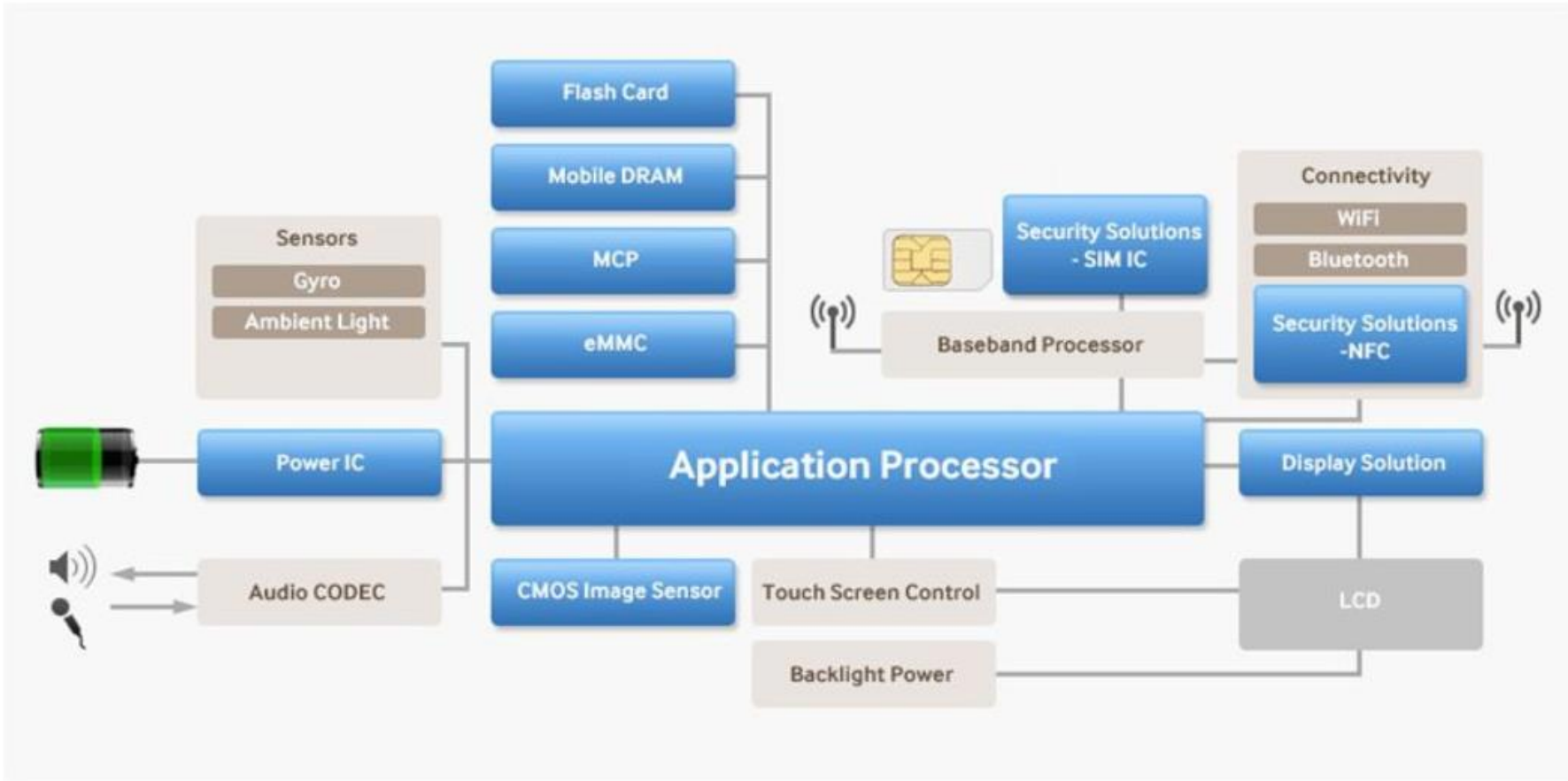
Camera and Video
- Image processing module

General
- Antenna
- Power control

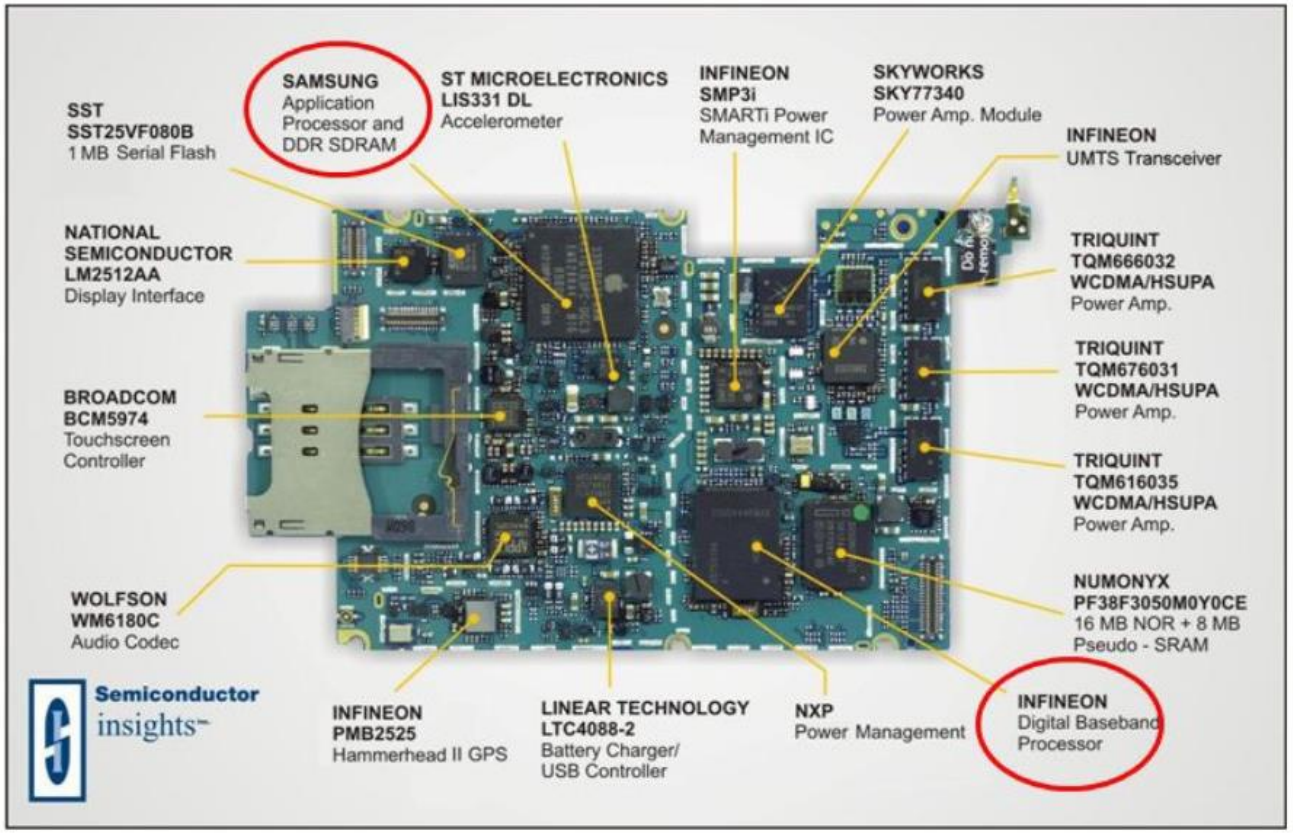
Smartphone:

- Communication capabilities of cellphone
- Functionality like computer
- Multiple sensors

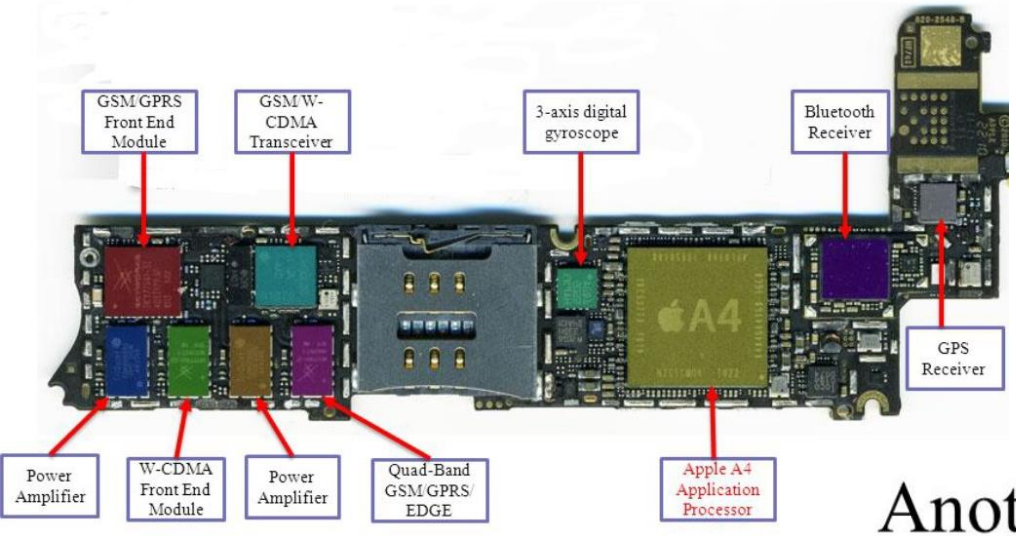



Flash Card
Mobile DRAM
MCP
eMMC
Sensors
Gyro
Ambient Light
Security Solutions
- SIM IC
Connectivity
WiFi
Bluetooth
Security Solutions
-NFC
Baseband Processor
Power IC
Application Processor
Display Solution
Audio CODEC
CMOS Image Sensor
Touch Screen Control
LCD
Backlight Power

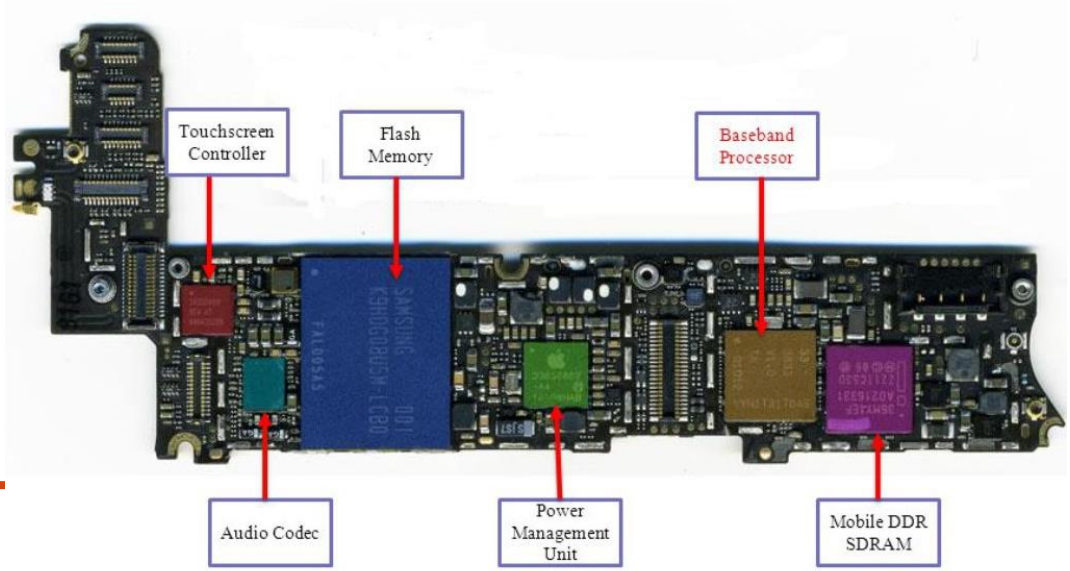
An Example – iPhone 3G Main PCB Front



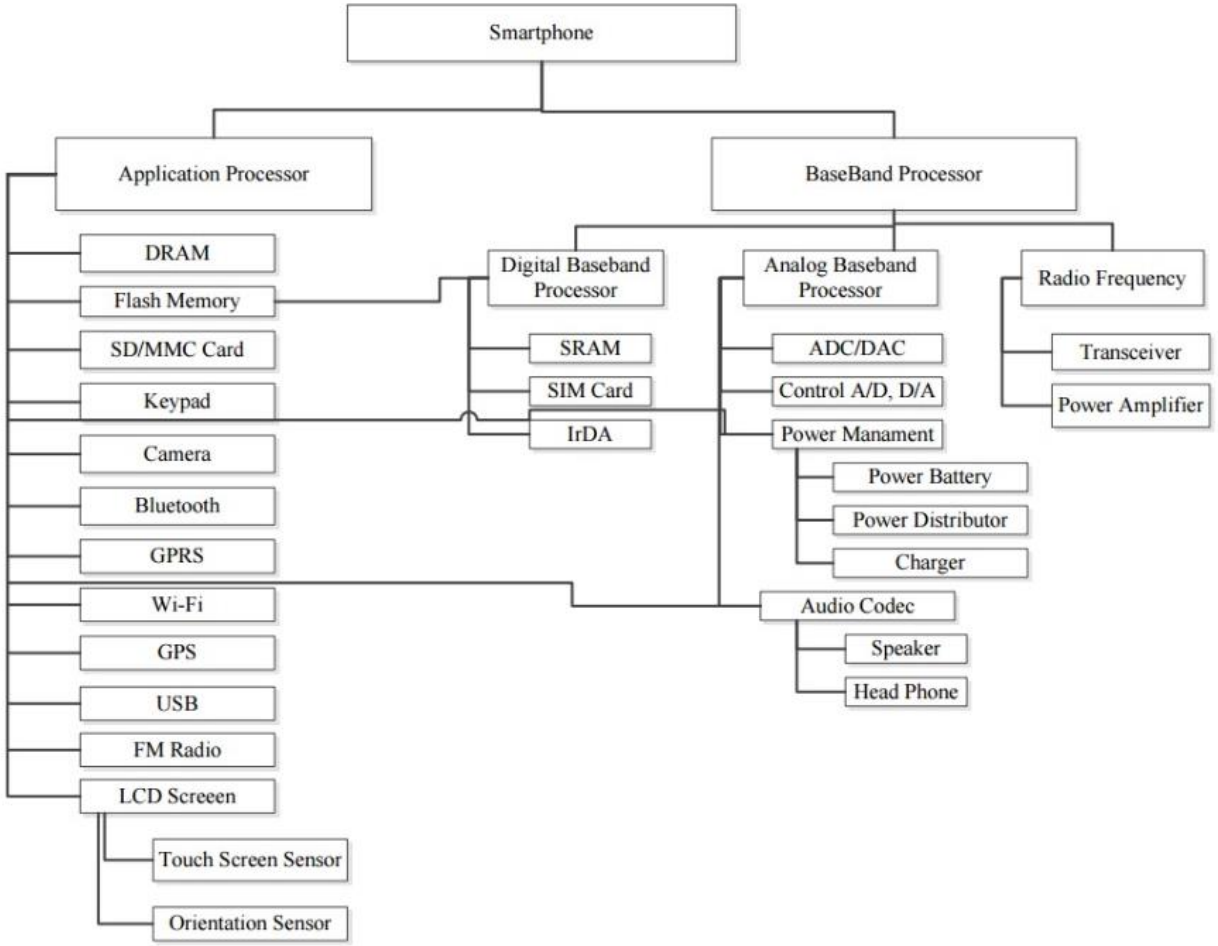
Another Example – iPhone 4 Main PCB Front



Another Example – iPhone 4 Main PCB Back



Anatomy of a smartphone



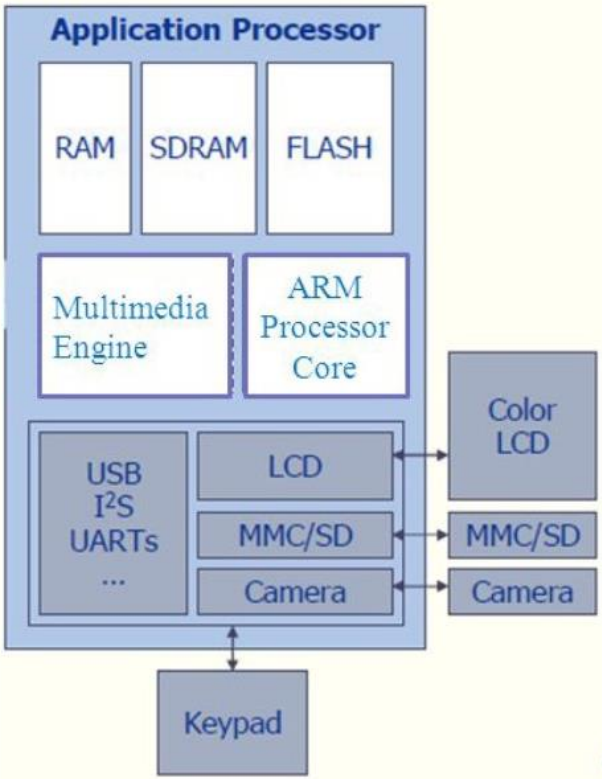
Application Processor: Overview

- A dedicated processor which enables smartphone to run mainstream OS such as Android, iOS and Windows Mobile etc.
- Optimized to run a number of user applications
- Emphasize multimedia processing (audio/video/still image/2D/3D)

Application Processor: Components

- Processor core (e.g. ARM based processor) which is specifically optimized for minimal power consumption
- Multimedia engine which is hardware implementation of one or more multimedia standards (e.g. JPEG module, MPEG module, Audio module)
- Device interfaces which are used to communicate with peripheral device (e.g. USB, camera, display)

Application Processor: Structure

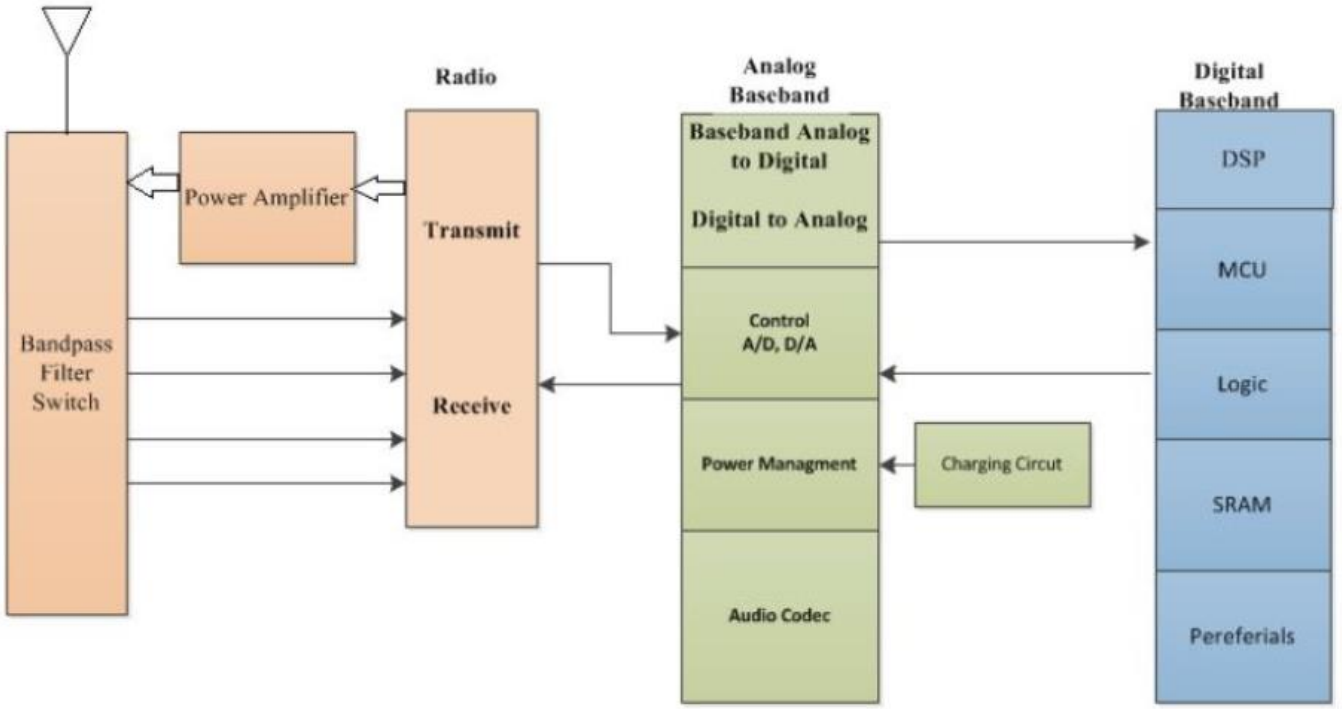


Baseband Processors

Secondary processors functioning as modems

- Originally used in cellphone networks
  - Have since evolved to handle Digital, 3G, LTE, etc .
- Most employ an ARM design for very low power usage
- Processors contain their own micro OS and memory
  - Allows the processor to function on its own
  - Increases reliability by isolating functions from main system
- Handles device functions when device is idle

Baseband Processor: Structure

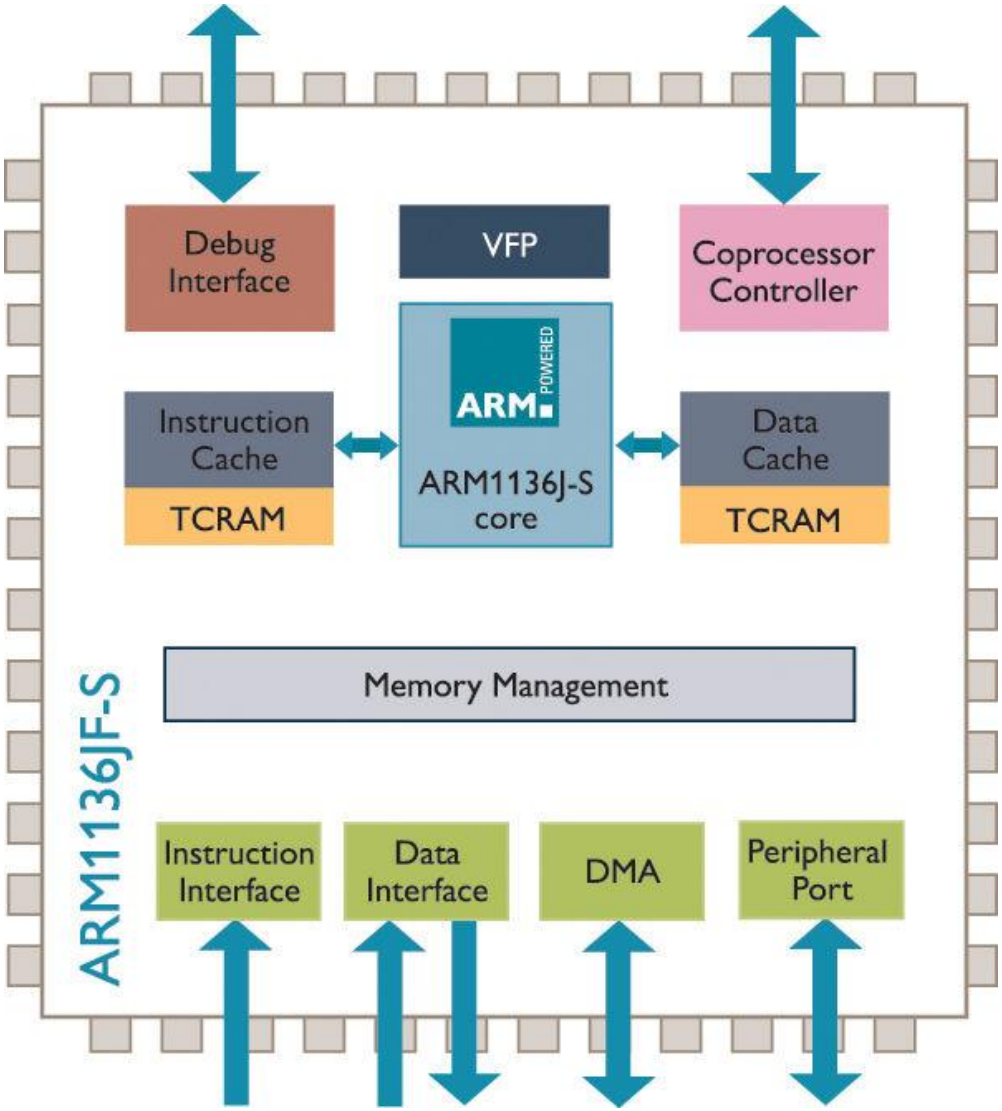


Processor Vendors

Vendor	Notes
ARM	Family of GPP cores used in most application processors
AMD	Family of MIPS-based application processors
Intel	PXA family of application, application/baseband processors
MIPS	Family of GPP cores used in some application processors
MediaQ	Katana family of application processors
Motorola	Several families of application, application/baseband processors
NeoMagic	MiMagic family of application processors
Qualcomm	MSM7xxx family of application/baseband processors
Renesas	Family of SH-based application processors
Samsung	S3Cxxxx family of application processors
STMicro	OMAPI-compatible Nomadik application processors
TI	OMAP families of application, application/baseband processors

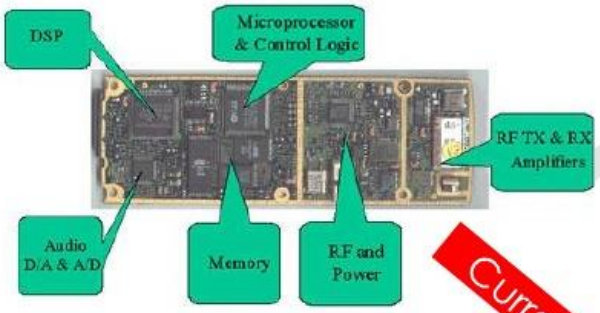
- The processors used in a smartphone are quite different from those used in a PC or laptop because they have different design constraints.
- Using an Intel Core i7 will drain the battery in a few minutes flat while using something like an 8-bit microprocessor will not pack enough power to run your browser and YouTube.
- The market is rules by Advances RISC Machines (ARM), a British fabless company which sells its smartphone processor designs to all major semiconductor manufacturers. ARM has won the game because its designs are optimized for battery life Vs performance and have a low area and transistor count. This is important to provide a small form factor and lower drain on the battery.
- A modern smartphone is likely to have multiple application processor cores (2, 4, or even 8)

A Typical ARM processor in a Modern Smartphone



- ARM based processors are the most widely used in modern Smart phones. ARM is a32-bit instruction set architecture based on RISC architecture.
- ARM processors are particularly used in Smart phones because of its low power consumption and great performance.
- ARM holdings provide chip design and instruction set customization licenses to third party vendors like Apple, Qualcomm etc. who design their own products based on the provided architecture.
- ARM architecture is the main hardware architecture for most of the operating systems of mobile devices such as iOS, Android, Windows Phone, Windows RT, Bada, Blackberry OS/Blackberry10, MeeGo, Firefox OS, Tizen, Ubuntu Touch

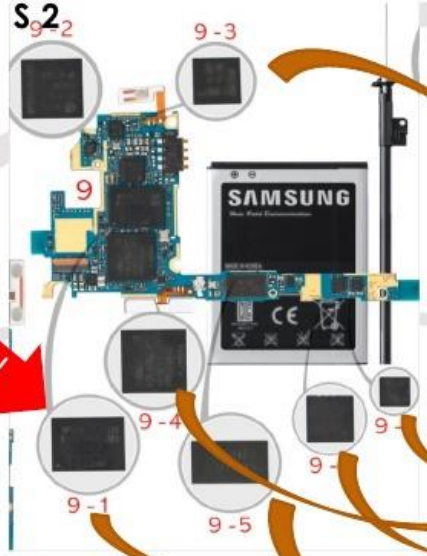
But how do we integrate all requirements?



Early mobile phones - Ericsson

Current!!!

Smartphone - Galaxy S 2



Future!!!

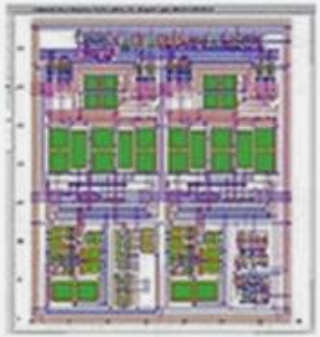
SoC

DSP, Microprocessor and Memory are all integrated into a single SoC!

All In One!

- Technological Advances
  - today's chip can contains billions of transistors .
  - transistor gate lengths are now in term of nano meters .
  - approximately every 18 months the number of transistors on a chip doubles – Moore's law .
- The Consequences
  - components connected on a Printed Circuit Board can now be integrated onto single chip .
  - hence the development of System-On-Chip design .

From PCB to SoC

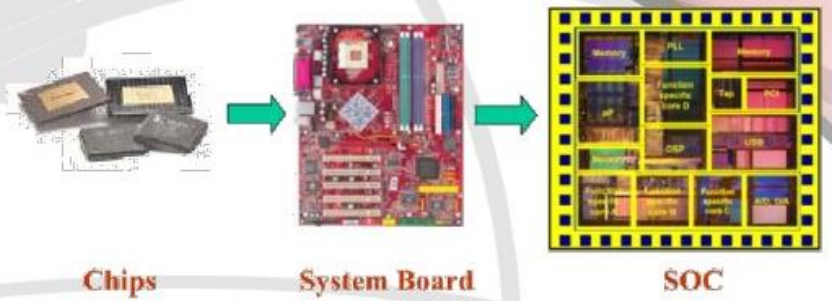


- SoC: System-on-a-Chip or System-on-Chip
- System:
  - A collection of all kinds of components and/or subsystems that are appropriately interconnected to perform the specified functions for end user
- SoC refers to integrating all components into a single integrated circuit (chip)

What is System on Chip (SoC)?

- A complex IC that integrates the major functional elements into a single chip or chipset.
  - programmable processor
  - on-chip memory
  - accelerating function hardware
  - both hardware and software
  - analog components
  - opto/microelectronic mechanical system

- Benefits of SoC
  - Reduce overall system cost
  - Increase performance
  - Lower power consumption
  - Reduce size



System on Chip (SOC)

- Single chip solution for application processor
  - Processors (CPUs and GPUs)
  - On-chip memory
  - Accelerating function hardware
  - All analog components

Coordinated software and hardware

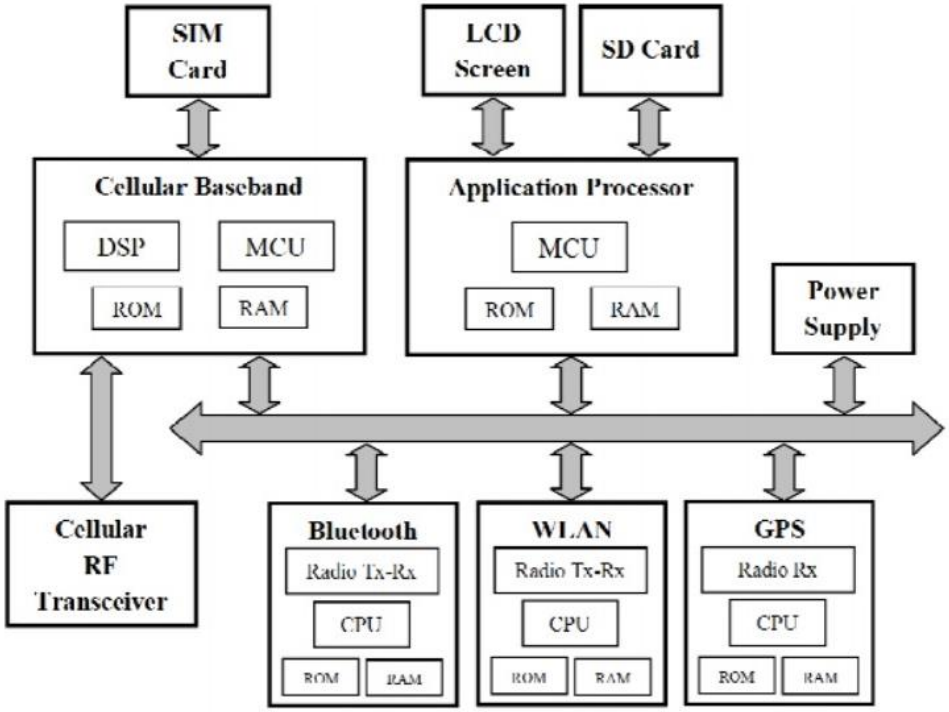
Smartphones use SoC instead of connecting separate chips on a PCB because:

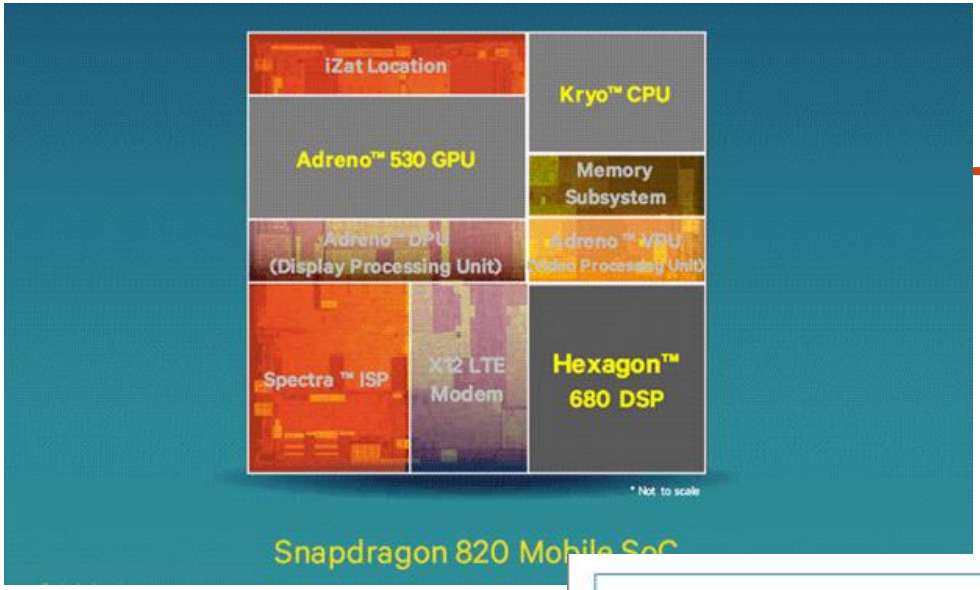
- Reduces cost, power, and size
- Increases performance

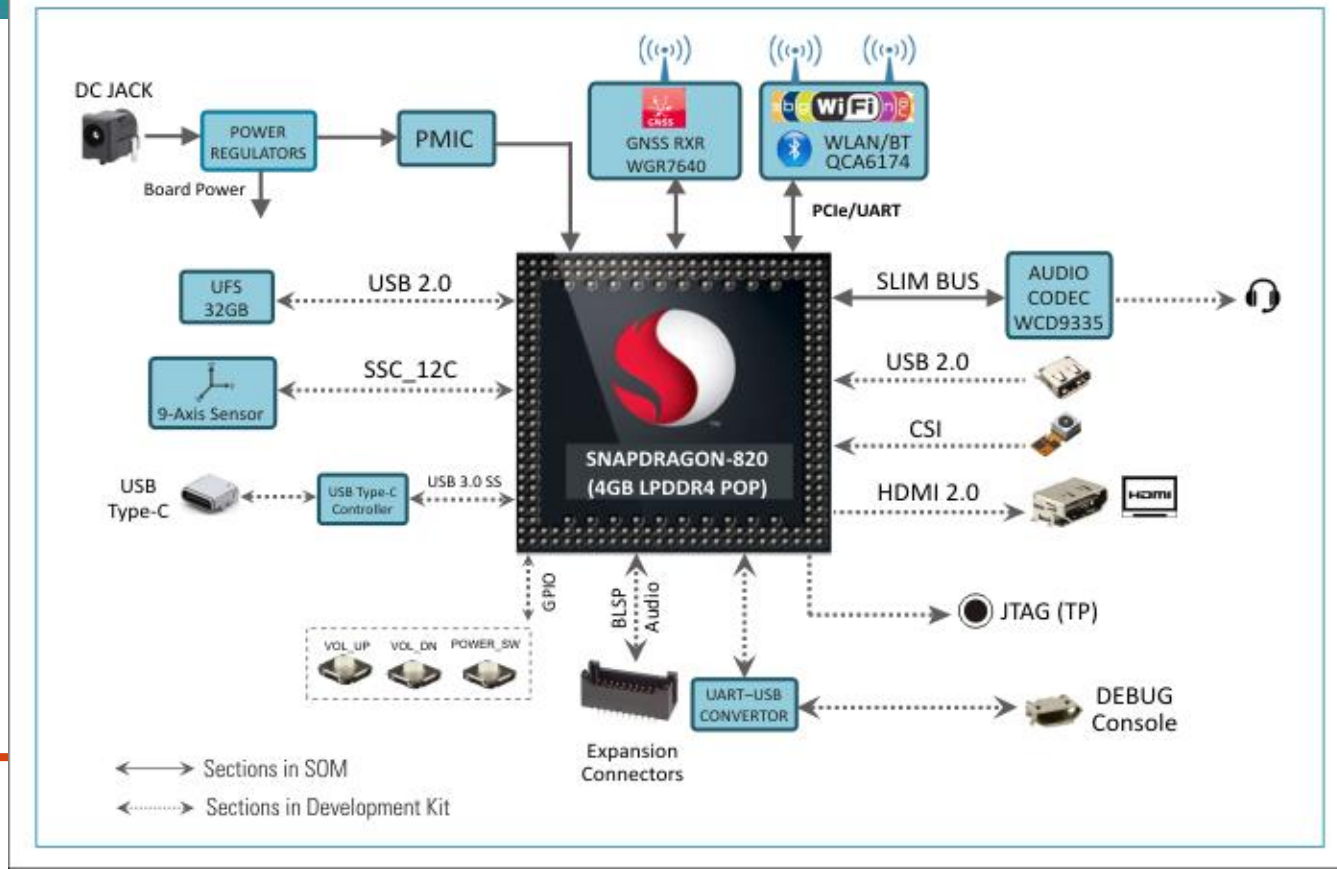
- A system on a chip (SoC) is an integrated circuit (also known as a "chip") that integrates all or most components of a computer or other electronic system.
- These components almost always include a central processing unit (CPU), memory, input/output ports and secondary storage, often alongside other components such as radio modems and a graphics processing unit (GPU) – all on a single substrate or microchip.[1] It may contain digital, analog, mixed-signal, and often radio frequency signal processing functions (otherwise it is considered only an application processor).
- SoCs are in contrast to the common traditional motherboard-based PC architecture, which separates components based on function and connects them through a central interfacing circuit board. Whereas a motherboard houses and connects detachable or replaceable components, SoCs integrate all of these components into a single integrated circuit.

Every modern smartphone today uses a System on a Chip (SoC) Architecture with the following 3 primary components:

- Application processor executing the user's application software with instructions from the middleware and the operating system (OS)
- A baseband (or modem) processor with its own OS components performing baseband radio transmission and reception of audio, video and data
- Various peripheral devices for the user interface




iZat Location
Kryo™ CPU
Adreno™ 530 GPU
Memory Subsystem
Adreno™ DPU (Display Processing Unit)
Adreno™ VPU
Spectra™ ISP
X12 LTE Modem
Hexagon™ 680 DSP
* Not to scale
Snapdragon 820 Mobile SoC


DC JACK
POWER REGULATORS
Board Power
PMIC
GNSS RXR WGR7640
WLAN/BT QCA6174
PCIe/UART
UFS 32GB
USB 2.0
SLIM BUS
AUDIO CODEC WCD9335
9-Axis Sensor
SSC_12C
USB 2.0
CSI
SNAPDRAGON-820 (4GB LPDDR4 POP)
USB Type-C
USB Type-C Controller
USB 3.0 SS
HDMI 2.0
GPIO
BLSP Audio
JTAG (TP)
VOL_UP
VOL_DN
POWER_SW
UART–USB CONVERTOR
DEBUG Console
Expansion Connectors
Sections in SOM
Sections in Development Kit

MediaTek Helio P30 SoC

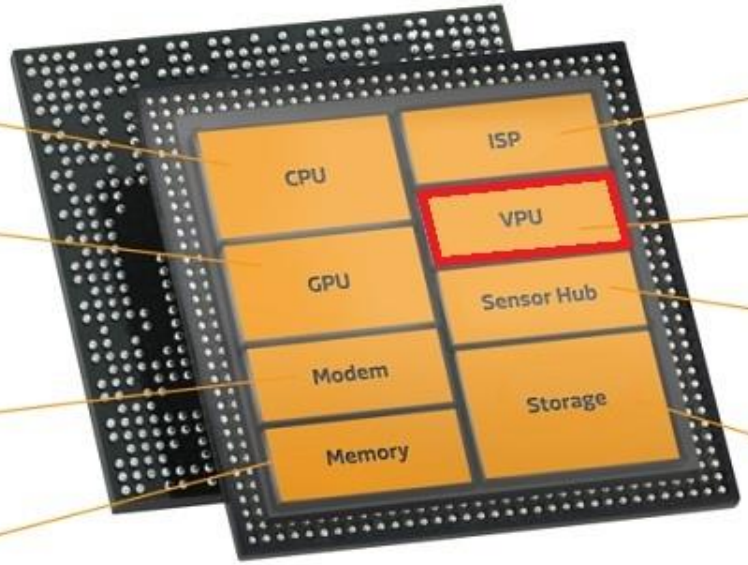
MediaTek CorePilot 4.0
Intelligent Task Scheduling

Octa-core Cortex-A53
Up to 2.5GHz

Mali-G71 MP2
950MHz

4G LTE Cat-7(DL) / Cat-13(UL)
Dual SIM, Dual 4G LTE
Dual VoLTE, ViLTE

2x16-bit LPDDR4X 1866MHz
Max6 GB



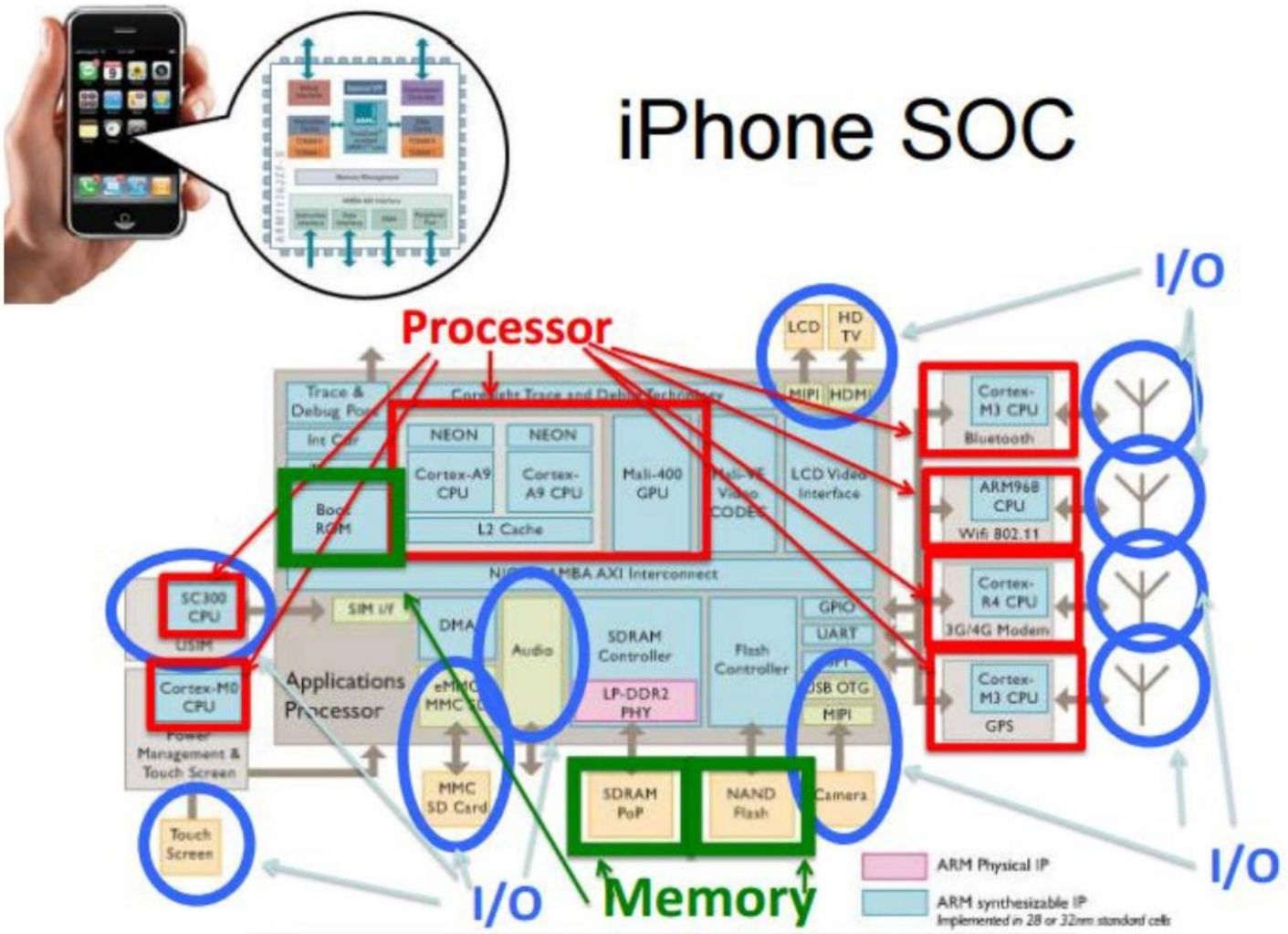
12 bit dual ISP with Imagiq 2.0
16MP+16MP Dual Camera Zoom
Real time 3A-CCU

New Vision Processor
Vision P5 by Tensilica

Cortex M4
Open DSP architecture

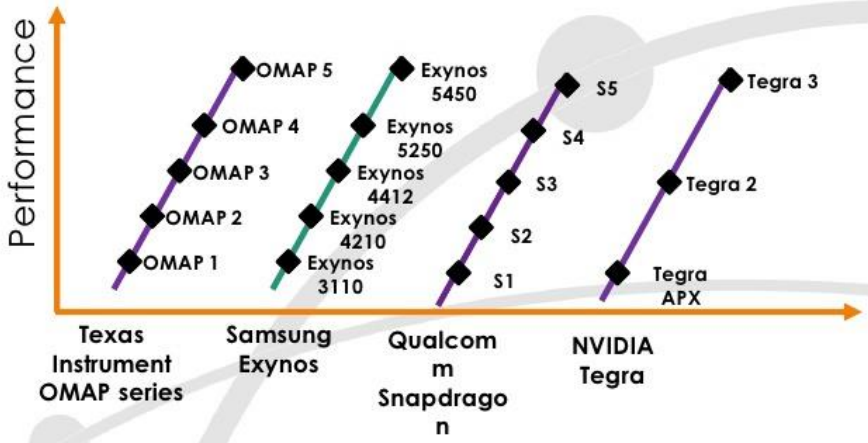
UFS 2.1
Or eMMC 5.1

iPhone SOC

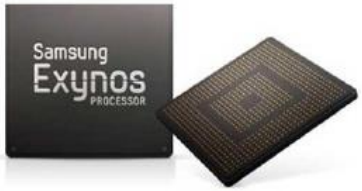


Source: UC Berkeley

•Current Mobile SOCs



Samsung Exynos PROCESSOR



Operating System

Feature	Android	iOS	Tizen	Sailfish OS	Ubuntu Touch
Developed by	Google, Open Handset Alliance	Apple Inc.	Linux Foundation, Tizen Association, Samsung, Intel	Sailfish Alliance, Mer, Jolla and Sailfish community contributors	UBports and Ubuntu community contributors (previously Canonical Ltd.)
Market share[1][2]	70.92%	26.53%	0.22%	N/A	N/A
Current version	11	14.3	4.0.0.7	4.0.1.48	16.04 OTA-11
Development version	12	15.0	5.5 M1	Unknown	Unknown
Current version release dates	September 8, 2020; 5 months ago	December 14, 2020; 2 months ago	November 16, 2018; 2 years ago	October 13, 2020; 4 months ago[3]	May 13, 2020; 9 months ago[4]
License	Base system is Free and open-source, but usually bundled with proprietary apps and drivers, which provide an increasing amount of the functionality.[7]	Proprietary	Partial; both proprietary and open-source components, assorted licenses	Free and open-source, but the UI and the SDK are proprietary and closed source	Free and open-source, mainly the GPL[8]
OS family	Modified Linux kernel based	Darwin	Linux (based on Combination of Linux MeeGo and Samsung Bada)	Linux	Linux (based on Ubuntu)
Supported CPU architecture	ARM (32-bit ARMv7-A and 64-bit ARMv8-A only), x86, x86-64[9]	64-bit ARMv8-A only	ARM, x86, x86-64	ARM, x86-64	ARM, x86-64

Android

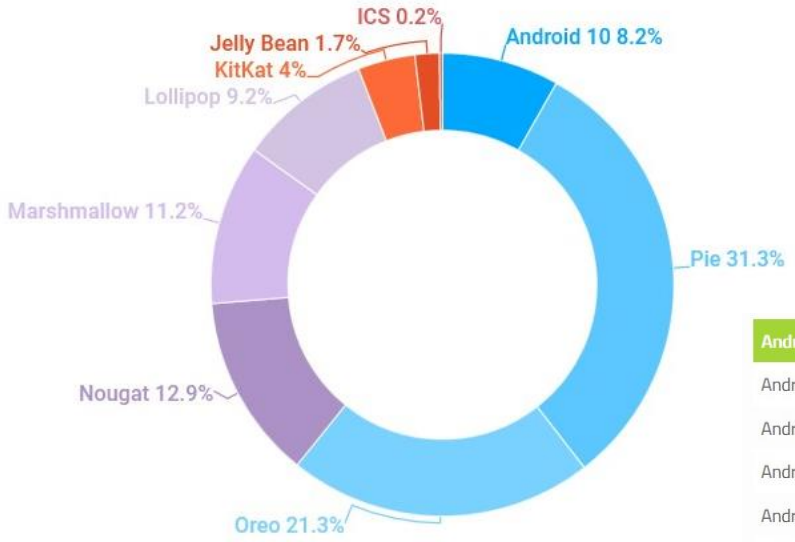
- Android is the Software platform from Google and the Open Handset Alliance
- Android Inc. was founded in Palo Alto, California, in October 2003 by Andy Rubin, Rich Miner, Nick Sears, and Chris White
- The early intentions of the company were to develop an advanced operating system for digital cameras
- July 2005, Google acquired Android, Inc.
- November 2007, Open Handset Alliance formed to develop open standards for mobile devices
- October 2008, Android available as open source
- December 2008, 14 new members joined Android project

Update History

Name	Version number(s)	Initial stable release date	Supported (security fixes)	API level
No official codename	1.0	September 23, 2008	No	1
	1.1	February 9, 2009	No	2
Cupcake	1.5	April 27, 2009	No	3
Donut	1.6	September 15, 2009	No	4
Eclair	2.0 – 2.1	October 26, 2009	No	5 – 7
Froyo	2.2 – 2.2.3	May 20, 2010	No	8
Gingerbread	2.3 – 2.3.7	December 6, 2010	No	9 – 10
Honeycomb	3.0 – 3.2.6	February 22, 2011	No	11 – 13
Ice Cream Sandwich	4.0 – 4.0.4	October 18, 2011	No	14 – 15
Jelly Bean	4.1 – 4.3.1	July 9, 2012	No	16 – 18
KitKat	4.4 – 4.4.4	October 31, 2013	No	19 – 20
Lollipop	5.0 – 5.1.1	November 12, 2014	No	21 – 22
Marshmallow	6.0 – 6.0.1	October 5, 2015	No	23
Nougat	7.0 – 7.1.2	August 22, 2016	No	24 – 25
Oreo	8.0	August 21, 2017	No[31]	26
	8.1	December 5, 2017	Yes	27
Pie	9	August 6, 2018	Yes	28
Android 10	10	September 3, 2019	Yes	29
Android 11	11	September 8, 2020	Yes	30
Android 12	12	TBA	Presupported	31

Version & Distribution

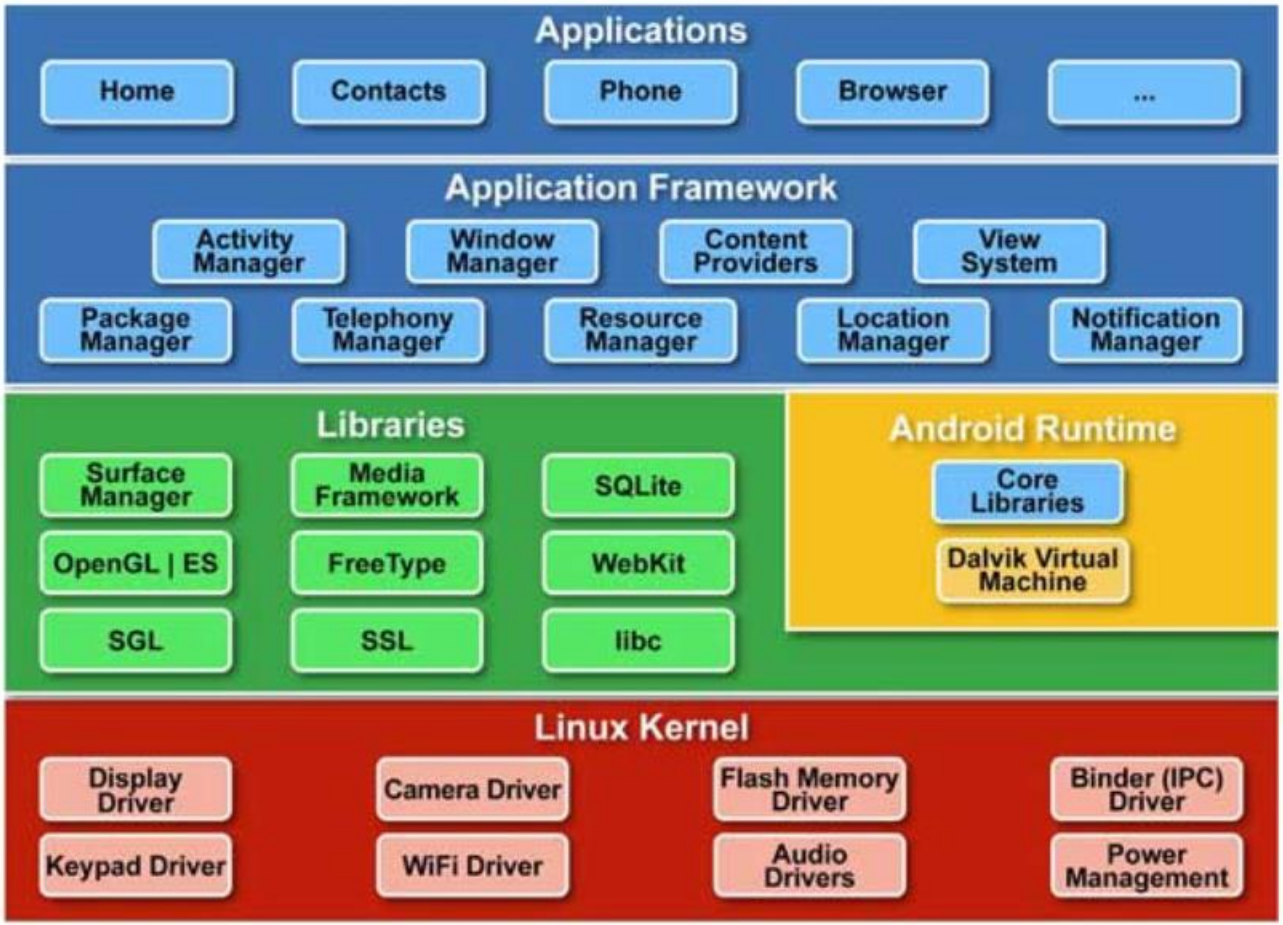
Android 10 Distribution (Android Studio - May 2020)



Android Platform Version (API Level)	Distribution (as of April 10, 2020)
Android 4.0 "Ice Cream Sandwich" (15)	0.2%
Android 4.1 "Jelly Bean" (16)	0.6%
Android 4.2 "Jelly Bean" (17)	0.8%
Android 4.3 "Jelly Bean" (18)	0.3%
Android 4.4 "KitKat" (19)	4%
Android 5.0 "Lollipop" (21)	1.8%
Android 5.1 "Lollipop" (22)	7.4%
Android 6.0 "Marshmallow" (23)	11.2%
Android 7.0 "Nougat" (24)	7.5%
Android 7.1 "Nougat" (25)	5.4%
Android 8.0 "Oreo" (26)	7.3%
Android 8.1 "Oreo" (27)	14%
Android 9 "Pie" (28)	31.3%
Android 10 (29)	8.2%

Data on 2020

The Android Architecture



TERIMA KASIH