

Study on VLSI Technology for Processor Architecture of Cellphones: A Review

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Abstract-Cellphones are vital component of our life. From old to teenagers all are interested in it and wanted their own. Earlier cellphones were totally different from the ones which we are using today, we even can't imagine the change and revolution which had come in the cellphone industry and communication sector due to different generations of communication. A lot of transformation had come in few years from heavy and strong brick like cellphones to stylish and slim with light weight. Change in the pattern of cellphones at a fast pace is the issue of our study. Everyone is eager today to know what up next is coming which Processor it will be, how fast new cell phone will be, what will be the ram in it and last but not the least what kind of cellphones will be in future. Processors are changing rapidly with each generation and this is possible with the help of VLSI technologies SOC (System on Chip). So goal of our paper is to review this technological change and to light on all 1G to 5G technologies.

KEYWORDS – 1G , 2G , 3G , 4G , 5G , VLSI SOC,

1. INTRODUCTION

In the last few years mobile industry have seen a remarkable change. The first generation mobile came into 1980's and only do calls. In India, commercial cell phones and services were launched in 1995 but in reality on grounds it came near about 1998 which was turning point for the country. The early manufacturers which came to India were NOKIA, SONY ERICSSON, SAMSUNG which were quite popular too at that time. Then came second generation (2G) it supports text messaging with calling. The (3G) third generation technology was little changed from earlier ones by giving it high data transmission rate and providing multimedia supports. Then came (4G) fourth generation which is different from third generation as it supports VOLTE technology voice Over LTE. And last is 5G which is yet to come where user will be experiencing advance features and unbelievable technology.

Cellphone hardware consists of application processor, RAM, DSP, CPU. Processors mainly focus on cost, market and low power. To meet the requirement according to generations technology has been architecture with the multiple coprocessors. SOC have been latest designed single IC chip processors which are currently used in today's cellphones technology.

2. EVOLUTION

A. FIRST GENERATION (1G)

In 1980s it was introduced working on analog system. It uses voice services and based on (AMPS) Advanced Mobile Phone System. It replaced the technologies like (MTS) Mobile Telephone System, (AMTS) Advanced Mobile Telephone System, (IMTS) Improved Mobile Telephone Services and (PTT) Push to Talk.

The first cellphone was demonstrated by Motorola in 1973. The first generation mobiles were large in size with pretty long antenna, similar to cordless phones. Later the antennas were shortened and were modified. Example is Nokia 9000. Later on antennas were vanished in 1997 but there were still some of them which retained antennas. Cellphones were given more compact look.

B. SECOND GENERATION (2G)

In Finland in 1991 2G was launched. It is second generation wireless cellphones most commonly known as GSM. The benefits of 2G over 1G were text messaging and security. All data were digitally encrypted which makes the security for the sender and receiver. It uses TDMA and CDMA technology where TDMA divides signal in time slots while CDMA allocates the user a special code to communicate over a multiplex physical channel.

In it 2.5G is (GPRS) General Packet Radio Service.

Similarly 2.75G is (EDGE) Enhanced Data Rates for GSM Evolution.

In 2000s color displays come and old boring black and white displays were old fashioned now. It had backgrounds of different colors. Example Nokia X2

C. THIRD GENERATION (3G)

3G is third generation of cellphone technology. It is based on (ITU) International Telecommunication Union. 3G offers users a wide range of services with high network capacity.

3.5G – (HSDPA) High Speed Downlink Packet Access, it provides smooth path for UMTS based 3G networks. It gives uplink speed upto 20Mbps.

3.75G – (HSUPA) High Speed Uplink Packet Access, it enhances the uplink speed upto 1.4Mbps and later to 5.8 Mbps.

Now time came of stylish gadgets with the 3G launch .High sped processors were needed. In 2007 apple iphone was launched and was agreat success due to its touch screen and hardware and software combination. Example Samsung S7

D. FOURTH GENERATION (4G)

4G Stands for 4th generation technology known as LTE. The speed of data transfer is 0-100Mbps in it.4G is similar to 3G with addition to of VOLTE voice over LTE.

Now days 4G handsets are trendy which came of multiprocessing at the same time with dual volte connection, all this is possible due to latest hardware. The latest processors made of SOC technology had bring the revolution in the cellphone industries.

Example Samsung S9 and S10 series.

E. FIFTH GENERATION (5G)

It is the technology which is yet to come in the coming years expected in 2020. At present testing is going on this technology. It is expected that it will revolutionize the cellphone world after its launch because most advance features through network provider and cellphone manufacturer will be provided till now.

Table -1: TABLE COMPRISING FEATUERES OF ALL GENERATION TECHNOLOGY

TECHNOLOGY	1G	2G	3G	4G	5G
	Allows voice calls only in 1 country	Allows calls, messages, emails, web browsing	called smart phones	Known as LTE	Termed as WWW wireless world wide web
	Use analog signals	Use digital signals	Increased bandwidth and data transfer rate to use web based applications	High quality streaming video	Faster data transmission
	Poor voice quality	Provides better quality	Provides faster communication	Combinati on of wifi and wimax	Hd clarity

FEATURES	Poor battery life	Camera phones	Tv streaming/ video calls	Battery use is more	More effective
	Large phone size	Data speed upto 64 kbps	Expensive 3G cellphones and data speed upto 2MBPS	Need complicated hardware and speeds upto 10 mbps to 1 gbps	Large phone memory and speed more than 100gbps
	Poor security	Unable to handle complex data	Challenge to build 3g infrastructure	High security	Support voice , multimedia, internet, streaming video

Table -2: COMPARISON OF ALL GENERATIONS OF TECHNOLOGIES

GENERATION	1G	2G	3G	4G	5G
DEPLOYMENT	1970-1989	1991-2005	2006-2014	2015-NOW	SOON
SPEED	2KBPS	64KBPS	2MBPS	1GBPS	More Than 1 GBPS
TECHNOLOGY	Analog	Digital	UMTS, CDMA 2000	WI MAX,WIFI, LTE	WWW
CORE NETWORK	PSTN	PSTN	Packet N/W	INTERNET	INTERNET
MULTIPLEXING	FDMA	TDMA / CDMA	CDMA	CDMA	CDMA
PRIMARY ROLE	Phone calls	Phone calls and messaging	Phone calls, Messaging and Data	All IP Services	HIGH SPEED , And providing large broadcasting of data in Gbps
WEAK POINT	Spectral efficiency poor and security issue	Difficult to support demand of internet	On grounds it performance fails	Battery is more consumed and expensive hardware requirement	

4. CONCLUSIONS

All top brands are working on evolution of latest technology called 5G with aiming in mind that it will consume less amount of power and give high speed of data. With 5G cellphones new software will arise and new hardware with high end processors will come into the market.

Future SOC'S will bring new Processors, GPU, more cores ultimately a power pack SmartPhone. Considering in mind of future aspects only cellphones will be designed for the 5G architecture with the help of VLSI technology. Both VLSI and 5G technology have come together to bring new researches and technologies to the world. There will be huge competition for low power usage, user performance and especially a lot will be dependent on time taken by brands to come into the market.

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