

IMPLEMENTATION ASPECTS OF COMMUNICATION SYSTEM STANDARDS USING SDR-SOFTWARE DEFINED RADIO CONCEPT

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ABSTRACT: Wireless communications are virtually omnipresent today. SDR- Software Defined Radio is radio communication systems that have been typically implemented in hardware (ex. - mixers, filters, amplifier, modulators/demodulators, detectors etc.) are also implemented by means of software on a personnel computer or embedded system. Recent is the world of technology upgradation. The most recent problem that found today is configurability. Most of the system is not reconfigurable so that if one have design new system and to use this system they have to change existing hardware. If it is possible that designing a software that has reconfigurability in software then don't need to change entire hardware but only change to do is configure the software. Here one of the solutions is that by using software radio software is reconfigurable. In this paper how SDR is useful in communication system in which way is described. SDR is used to switch between 2G, 2.5G, 3G etc. here one of the software uses is LabVIEW. SDR is used to switches between different 802.11 WLAN standards. SDR uses cognitive radio technique.

KEYWORDS: SDR-Software Defined Radio, 2G-3G technology, Wireless LAN Standard, Cognitive radio

I: INTRODUCTION

Software radio technology is leading technology with regard to telecommunication industry. SDR consist of programmable hardware. An aim of SDR is to use these programmable hardware modules to build open architecture based radio system software.

II: MOST RECENT PROBLEMS OF TODAY'S TECHNOLOGY

Today technology is updated at very high speed. The problem faces is that these technology has no backward compatibility means that for the use of new technology for efficient performance result entire hardware need to be changed. Commercial wireless communication industry is currently facing problems due to constant evolution of link-layer protocol standards (2.5G, 3G, and 4G). One possible solution of these problems is SDR (software defined radio) concept.

III: ARCHITECTURE OF IDEAL SOFTWARE RADIO

Architecture:

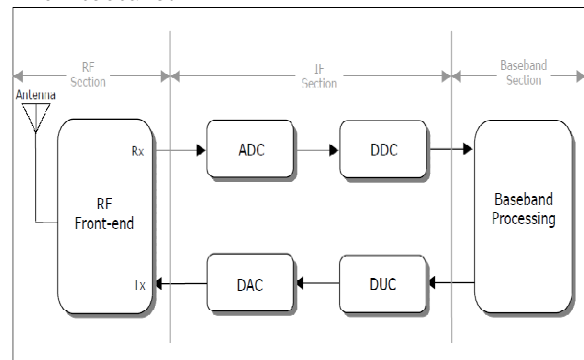


Fig.1 block diagram of SDR

The block diagram consists of three main functional blocks^[4]

1. RF section
2. IF section
3. Baseband section

The RF section (also called as RF front-end) is responsible for transmitting/receiving the radio frequency (RF) signal from the antenna.

In IF section these analog receives signal is converted to digital as SDR is digital technology. Then digital signal is down converted and given to baseband processing.

The baseband section performs baseband operations (connection setup, equalization, Frequency hopping, timing recovery, correlation etc).opposite process is performed on other end. All the function is performed on baseband processing. When upgradation is needed parameter of the software need to be changed entire hardware changes is not require.

IV: SDR IS USED IN COMMUNICATION SYSTEM

Today 3G technology is widely used and before that 2.5G and 2G is used. Basic difference between these technologies is data rate and speed. In 3G data rate is high as compared to 2G and 2.5G and data rate up to 2MBPS is achieved in 3G. To increase data rate number of bits transmitted per second increases. If data rate increase then speed also increase. Speed graph of 2G, 2.5G and 3G is shown in below figure.

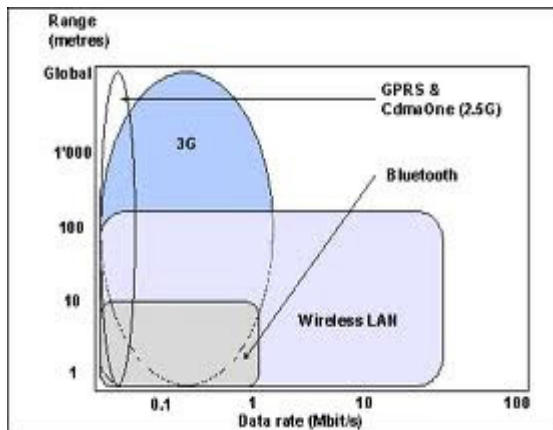


Fig.2 range vs. data rate graph of different communication system

One of the most useful digital modulation technique used in mobile communication system is QAM modulation technique. To increase data rate higher order of QAM is used. In 3G 64 QAM or even higher 128QAM is used. If in 2.5G 32QAM is used and one can use 3G which uses 64 QAM for that entire hardware need to be changed. By using software radio it is possible to update parameter at run time. Switch between 32QAM to 64QAM is possible with the help of software radio. This is most important application of software radio is useful for communication industry. So that entire

hardware need not be changed only need to update the software. LabVIEW is software which provides runtime parameter update facility. LabVIEW stands for **L**aboratory **V**irtual **I**nstrument **E**ngineering **W**orkbench. LabVIEW is a graphical programming language which allows drags and drop facility^[7].

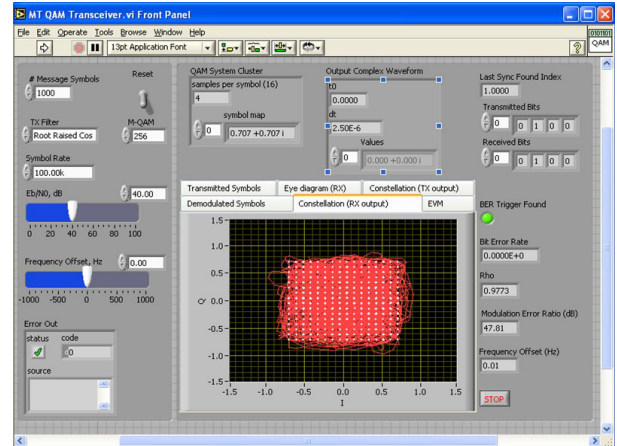


Fig. 3 Front panel of the M-QAM transceiver simulation software^[5]

Our main focus on this simulation result is how updation of parameter at run time is possible. This provides software update facility. For that consider the figure given below.

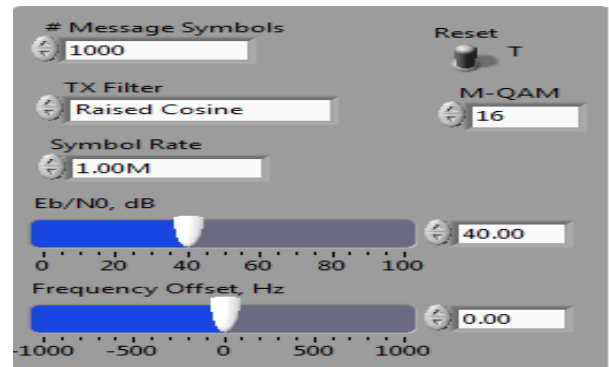


Fig. 4 portion of figure 2 for parameter updatability Figure 4 shows that how parameter is change at run time. Here what is symbol rate, M-QAM, value of Eb/N0, frequency offset all these parameters is set by user at run time and accordingly system work.

V. SDR IS USED IN COMMUNICATION STANDARD

There are different standards of wireless communication system. 802.11 is a Wireless LAN standard. Different types of WLAN standards are 802.11a, 802.11b, 802.11g, 802.11n etc. The differences between these standards are modulation/demodulation technique they use, range and data rate. The following table shows basic difference between these standards.

Technology	WLAN (IEEE)			
	802.11 Legacy	802.11a	802.11b	802.11g
Standard	802.11 Legacy	802.11a	802.11b	802.11g
Release year	1997	1999	1999	2003
Frequency Band	2.4GHz	5.8GHz	2.4GHz	2.4GHz
Maximum Range	~70 meters	~100 meters	~100 meters	~110 meters
Maximum data rate	2Mbps	54Mbps	11Mbps	54Mbps
Access Method	DSSS, FHSS	OFDM	DSSS, CCK	OFDM
Modulation Method	GFSK, BPSK, DBPSK, DQPSK	BPSK, QPSK, 16-QAM, 64-QAM	DPSK, DBPSK, DQPSK	BPSK, QPSK, 16-QAM, 64-QAM and DBPSK, DQPSK

Table 1: differences between different 802.11 standards

If one have to change one standard to another standard for better performance parameter update is required. Parameter updatability at run time allows switching from one standard to another. These can be done by using software radio. By changing modulation technique switches from one standard to another standard. As LabVIEW provides run time parameter changes switches between modulations is also achieved by LabVIEW software. If implementation of 802.11a standard which uses 64-QAM modulation and at run time one have to change this standard to 802.11b standard for efficient performance which uses DBPSK modulation. By using SDR concept switching between modulations is possible. Figure-6 shows that with the help of LabVIEW software how modulation technique and other parameter of the software are changed for update.

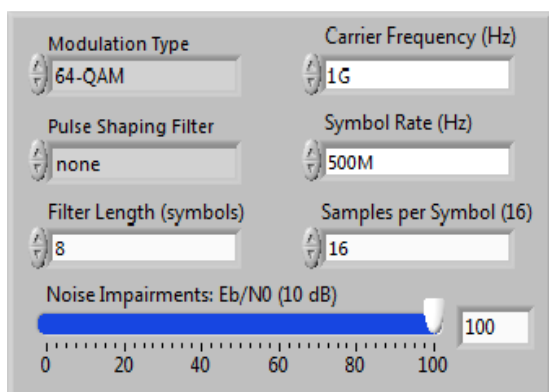


Fig. 5 LabVIEW front panel for different modulation

Figure shows that the software allows updatability at run time here modulation type performs different types of modulation like QAM, PAM, PSK, OFDM, CCK, QPSK, DQPSK, DBPSK etc. thus

software defined radio works better for communication standards also.

VI: COGNITIVE RADIO CONCEPT

SDR uses antenna for transmit/receive. This antenna is based on cognitive radio technique. Cognitive radio is a mechanism in which each radio measures the spectrum in use and communicates that information to other cooperating radios, so that transmitters can avoid interference by selecting unused frequencies. In today’s environment main as the rapid increase the use of wireless communication system main problem facing is spectrum allocation. Therefore cognitive radio is used to utilize the available spectrum in licensed and unlicensed band. Cognitive radio is implemented on SDR system that can reconfigure their analog RF output and that incorporate “self-awareness” and knowledge of transmission protocol. Conceptually, the amount of spectrum is infinite, but practically, propagation and other reason the spectrum is finite. In the finite spectrum efficient utilization of this spectrum is growing concept. Cognitive Radio solves this problem with the help of SDR and efficient utilization of the spectrum is done without any interference^[8].

VII: CONCLUSION

SDR is a useful concept and widely used with communication system in different way. By using SDR concept better performance can be obtained by only software update entire hardware need not changed. Therefore cost is less if new hardware for new technology is not required and hence cost efficient

VIII: REFERENCES

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