

Multi-Band Communication and Effective Spectrum Utilization using SRAN Technology

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ABSTRACT: This paper is dealt with packet delivery ratio and packet loss in an SRAN environment i.e., we address the signaling impact results of various mobile bands and its spectrum utilization, resource utilization for high speed. Considering this, there exist a trade-off between the number of additional bands that are required and the costs of moving through the mobile field for the purpose of spectrum usage. Using the same idea [1] is to achieve 2G, 3G and LTE communication using a single old rectangular antenna. It considers about the energy consumption used by base station. Single RAN combines all the three technologies into one in software form and controls it. The performance can be shown in graphical model.

KEYWORDS: Packet delivery ratio, Effective Resource Sharing, SRAN technology.

I. INTRODUCTION

In [1], an old rectangular antenna is used to support GSM, UMTS, and LTE technology using universal baseband processing technology. Reconfigurable antenna can be used for mobile terminals for extended band coverage but the antenna structure is permanently matched for higher frequency bands. In [3], using the concept of SDR (Software Defined Radio) the hardware can be controlled using software. SRAN (Single Radio Access Network) uses the same concept. In SRAN environment, the hardware equipment are controlled using software defined programs. With the beginning of SRAN technologies different changes occurred in telecommunication networks.

II. SRAN

Driving the evolution of wireless broadband technology customers' increasing expectations for speed, and global access. Customers want more information, such as business and consumer applications, and entertainment available through their mobile devices, but with greater speeds. For wireless carriers to achieve greater speeds and pervasive connectedness, their networks need to start behaving more like landline IP-based networks. This line of thinking represents a fundamental shift in perspective from mobile services to broadband connections for customers and service providers alike enter the fourth-generation (4G) wireless network. Unlike earlier wireless standards, 4G technology is based on TCP/IP, the core protocol of the Internet. TCP/IP enables wireless networks to deliver higher-level services such as video and multimedia, while supporting the devices and applications of the future. Due to increased demand of mobile broadband, LTE is emerging faster than expected. In order to avoid more equipments and power at the base station side as well as to minimize hardware failures SRAN solution is used. The fundamental principle behind Single RAN, the introduction of multi-standard platforms for all mobile network services, is decisive for the reduction of investment costs. To put it simply, the deployed system technology has the capability to realize a number of different mobile network services simultaneously. Single RAN provides cost advantages over the use of hardware specific and for the deployment, commissioning, and integration in the existing networks to each mobile network service through

the joint use of the same system technology. This multi-standard platform does not require as much space and has lower energy demands in comparison with the separate solutions.

III. PRINCIPLE OF OPERATION

Using figure 2 in [1], packet delivery ratio and packet loss is calculated in this paper. As mentioned in [1], in real world radio unit is connected to common GSM antenna via diplexer. Then the radio unit is connected to base-band board through optical connection. The combination of different band function is done on a single board using SRAN solution via UBBPD6 card. From base-band board it gets connected to SRAN. SRAN separates the different technologies according to band function and then it is connected to different gateway. The basic blocks involved are: Rectangular antenna, RRU, Diplexer, UBBPd6 card, Optical cables and connectors. The working functions of each block is explained in [1].

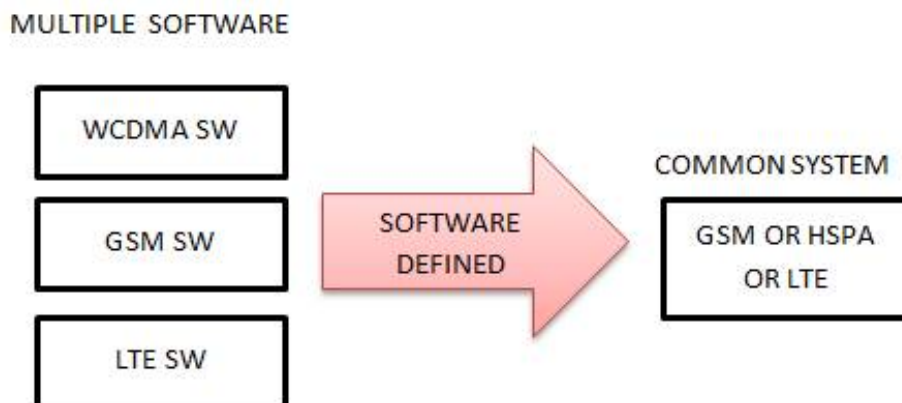


Fig 1: Multiple baseband

SRAN solution addresses three critical sitedevelopment criteria: broader, closer, and greener. SRAN solution addresses three critical sitedevelopment criteria: broader, closer, and greener. SRAN also allows operators to distance themselves from the technology and equipment layers and consider network development strategies in terms of true endtoend O&Mefficiency. SRAN's "broader" features, operators are able to more easily meet the challenge of rapidly increasing data rates."Greener" means lowering the power consumption of sites from year to year through technical solutions. It enables the coordination and operation of different RATs in a unified way, as well as being able to use existing RATs to bring the best performance by coordinating their advantages. Modularity is a key enabler, allowing capacity to be scaled up in line with demand, and new and existing spectrum to be used more efficiently. In addition, operational efficiency can be improved through network sharing, energy efficiency of the radio network will be raised, and software can be used to define the functions of the hardware for ultimate flexibility, performance and cost effectiveness. Using the same existing GSM frequencies with LTE and HSPA offers great savings and expanded business opportunities for operators, and the network becomes much simpler with SRAN. In [4], particularly implementing an additional HSPA RF module into the 900 MHz band instead of the 2100 MHz band may reduce the number of required base station sites by 70%. Single RAN to deliver a variety of benefits including:

- Efficient use of spectrum and re-farming
- Efficient shared use of hardware
- Smooth evolution of GSM, HSPA and LTE
- Simplified network architecture
- Reduced energy consumption
- Converged planning, operations and management

- Simplified, fully IP-based transport
- Automated 3GPP compliant security
- Lower costs and growth in top line.

Packet loss and packet delivery ratio

Packet loss=generated packets-received packets

Packet delivery ratio=(received packets/ generated packets)*100% i.e., Packet delivery ratio is defined as the ratio of data packets received by the destinations to those generated by the sources.

IV. SIMULATION RESULTS

With reference to [1], Considering

- Nodes 0,1,2,3 act as base station (BS) & nodes 4,5,6,7,8,9 act as users.
- Node 0 & 2 supports GSM technology. Node 1 supports UMTS/LTE technology. Node 3 supports GSM/UMTS/LTE technology.
- Users (7,8,9) requires 2G communication.
- Nodes(5,6) requires 3G/LTE communication.
- Node(4) requires 2G/3G/LTE communication.

The packet delivery ratio is calculated from the simulation result.

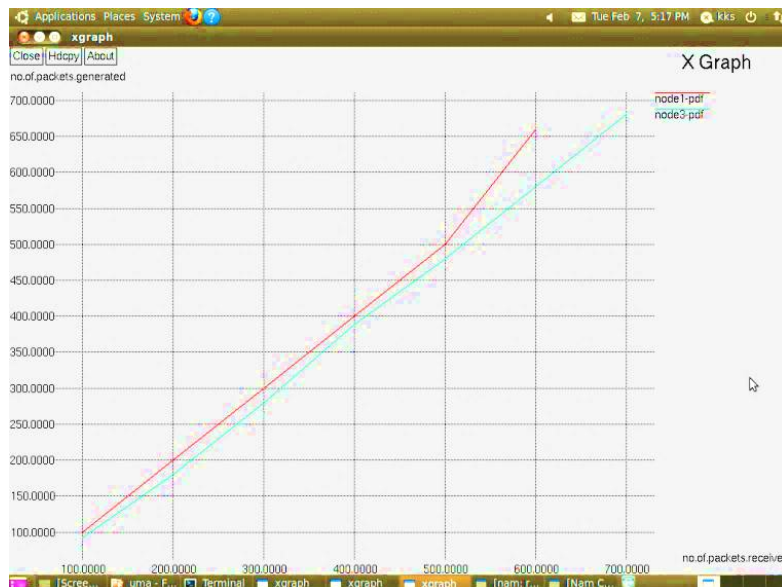


Fig 2: Packet Delivery Ratio

V. CONCLUSION AND FUTURE WORK

The simulation result in figure 2 shows the packet delivery ratio (PDR) of SRAN network. The PDR of node 3 (base station) is 94% (approx.) and the packet loss is about 15-20 (approx.) packets at node 3 (basestation).If

node 7 enters node 1 (BS), it will not be supported. But every user will be supported entering node 3(BS)area. In future, the network throughput should be increased by covering more area.

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