Significance of communication sharing between the Saudi universities using Long Term Evaluation Technology: Evaluation proposal based on Jazan University

Prakash Kuppuswamy[1], Saleh Mohammed Al-Turki[2]

Abstract

Long Term Evaluation, is a standard for wireless communication of high-speed data for data transaction terminal and mobile technology. LTE is to provide an extremely high performance radio-access technology that offers full vehicular speed mobility and that can readily coexist with High Speed Packet Access and earlier networks. LTE technology commonly agreed upon, both by industry and academia, and hence conceived to be an unwritten standard. Saudi Government giving more importance for promoting the Educational standards. Every year, Saudi government spending millions of money for the growth of Educational sector. Almost all the Saudi Universities are interconnecting with various community colleges on Region based. This paper first discusses the suitability of LTE and related technologies for interconnecting colleges for communication service provisioning. Next, it discuss the argument that the most plausible future scenarios to deliver the increasingly data-intensive applications demanded by the colleges. We are trying to obtain best evaluation benefits of interconnecting colleges under Jazan University, Kingdom of Saudi Arabia.

Keywords

LTE, e-UTRAN, Wireless, Radio communication, Mobile network, 4G Technology.

1. Introduction

The fourth generation of wireless cellular systems has been a topic of interest for quite a long time, probably since the formal definition of third generation systems was officially completed by the International

Telecommunications Union Radio communication Sector (ITU-R) in 1997.

A set of requirements was specified by the ITU-R regarding minimum peak user data rates in different environments through what is known as the International Mobile Telecommunications 2000 project. The requirements included 2048 kbps for an indoor office, 384 kbps for outdoor to indoor pedestrian environments, 144 kbps for vehicular connections, and 9.6 kbps for satellite connections [1].

LTE is an all-IP network standardized by 3 Generation Partnership Project (3GPP) in Release 8 which uses new multiple access schemes on the air interface. Orthogonal Frequency Division Multiple Access (OFDMA) is used in the downlink and Single Carrier Frequency Division Multiple Access (SC-FDMA) is used in the uplink to fulfil all the ambitious requirements for data rate, spectrum efficiency, latency, and capacity. Another important technique used is Multiple-Input-Multiple-Output (MIMO) that involves using multiple transmitters and receivers to achieve higher bit rates and improved coverage [4] [5].

Table 1: LTE providers in KSA and bandwidth

Operator	Frequency(MHz)	Band	Duplex mode	Launch date
Mobily	1800	3	FDD	Feb 2013
Mobily	2600	38	TDD	Sept 2011
STC	1800	3	FDD	Feb 2013
STC	2300	40	TDD	Sept 2011
Zain	1800	3	FDD	June 2012
Zain	2600	38	TDD	Sept 2011
Sources from www.wikipedia.org				

A diverse range of data, imaging, and multimedia applications is currently in demand within the PPDR

community. The demand is being driven by changes in working practices, requiring access to a far wider range of multimedia sources (textual, images, and video). Some examples of mobile data applications being demanded are video on location, mobile office applications and online database enquiry [2][6].

The paper is structured as follows. Section II presents the studies done by researchers regarding LTE studies, analysis and benefits in various applications etc., Section III describes about the indispensable of making better communication under the Jazan Univesity colleges. Section IV presents the proposed mapping scheme followed by benefits of the implementation in Section V. Conclusions are offered in Section VI.
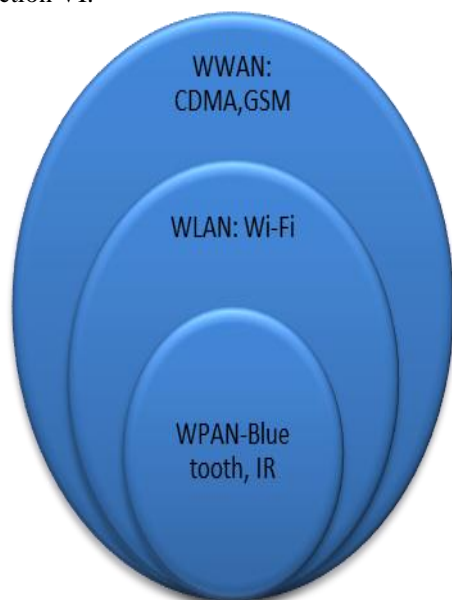

Figure 1: Wireless network technologies

2. Review of Literature

Ian F. Akyildiz, David M. Gutierrez-Estevez, Elias Chavarria Reyes (2010) this paper provides an in-depth view on the technologies being considered for Long Term Evolution-Advanced. The new network architecture developed by the Third Generation Partnership Project (3GPP), which supports the integration of current and future radio access technologies, is highlighted [1].

V.H. Muntean, M. Otesteanu, G.-M. Muntean (2010) this paper proposes a method of mapping the LTE QoS parameters in order to improve the quality of experience of the end-user when an e-learning

application that uses Dynamic Quality Oriented Adaptive Scheme and generates a traffic mix, is deployed over a Long Term Evolution network. This method offers improved results compared to the normal mapping scheme used in LTE [5].

Ferrus, R. Sallen, O. Baldini, G. Goratti, L. (2013) they proposes a system architecture solution for PPDR service provisioning that enables PPDR service access through dedicated and commercial networks in a secure and interoperable manner and ensures proper allocation of the networks' capacity to PPDR applications through the dynamic management of prioritization policies [2].

Monika rani, Anil Rose, Mridul Chawla (2011) new technologies are evolving each day to facilitate human beings. From analog communication to 2G, 2G TO 3G and now they are heading towards Wimax, telecommunications protocol that provides fixed and fully mobile internet access. They propose some possible security improvements and solutions to eliminate the vulnerabilities using public key cryptography in RSA [3].

3. Significance of Research

The communication gap is one of the primary elements of affecting any kind of Institutional and organization growth. Practically we have seen developed countries are very strong in communication technology, which leads the country's development. So, it is essential to establish strong communication to get the better growth of our educational system.

Jazan University was one of the most remarkable academic events in 2006 in Jazan Province. The emergence of JU was a significant further step to provide the local communities in Jazan Province with unique educational opportunities with 16 colleges, 10 Deanships and 5 Institutes. JU offers a number of highly demanded majors through many academic departments and centers. The total enrolment of male and female students in current academic year around 50,000. Campuses: Jazan , Sabya , Abu Arish , Farasan , Ad-darb, Samtah, Al-Daer, and Al-Ardah.

Wireless broadband can be affected by a number of things, even the weather. It might not work in every room of your house or could see a huge drop in speed when used indoors. Landlines are solid, cheaper, come with larger data plans, work wherever you wire

them to with equal effectiveness and most of all they're proven. We're all for adopting new technologies, but when it comes to choosing between two options for home use that have relatively the same speed but one is cheaper and has a history of working then we'll go with the old school every time. As described earlier, public safety organizations primarily use their communications networks for mission critical voice and often use a separate network for transmitting data, typically a commercial or unlicensed wireless broadband network. Nokia Siemens Networks believes LTE can be a single unified communication network that can support both mission critical voice and public safety data.

4. LTE Initiatives and Integration Method

Long Term Evaluation technology is not expensive; it is Simple migration from 2G or 3G to 4G without a complete equipment upgrade - in a single common core platform. Also, It provides smooth transition to Evolved Packet Core (EPC), an all-IP core network that supports higher throughput, lower latency, and mobility between 3GPP and non-3GPP radio access technologies. We can use Core network solution that optimizes backhaul to increase the bandwidth and multimedia services. The colleges under the Jazan University can choose any access technology without a complete overhaul of existing IP core or IP core overlay.

The proposed architecture model is a suggestion of implementing LTE 4G technology connects the Jazan University Colleges for increasing rapid communication purpose. The proposed model is not an entire architecture. The purpose of this research evaluation is to find out the maximum benefits by the proposed Long Term Evaluation technology.

The Jazan University has IP/NW (Internet Service Provider Network).The new SAEGW (System Architecture Evolution Gateway) network is based upon the GSM / WCDMA core networks to enable simplified operations and easy deployment. Despite this, the SAE network brings in some major changes, and allows far more efficient and effect transfer of data. It support for higher throughput and lower latency radio access networks (RANs). Also, It support for, and mobility between, multiple heterogeneous access networks, including e-UTRAN (Evolved Universal Terrestrial Radio Access Network). e-UTRAN is the air

interface of 3GPP's LTE upgrade path for mobile networks. e-UTRAN is the initials of Evolved UMTS Terrestrial Radio Access Network and is the combination of e-UTRAN, UEs and eNodeBs. Functional definition eNodeB as WLAN access points providing Modulation and de-modulation. Channel coding and de-coding. Besides, the eNodeB includes additional features, Base Station controllers in the e-UTRAN architecture.
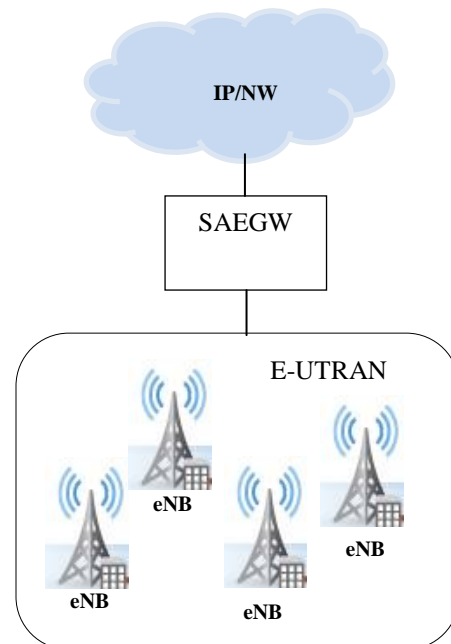

Figure 2: LTE Architecture model connecting various Jazan University colleges

5. Discussion and Implications

As a greater variety of services and user types across the wireless network, it is critical to increase network and subscriber intelligence. Through this intelligence, including quality of service and policy enforcement, LTE operators will better understand individual users and their transactions and be able to shape the service experience and optimize network efficiency. In order to deliver the enhanced performance of LTE effectively, the network will need to be simplified and flattened, with a reduction of elements involved in data processing and transport. It is very important to deploy a core network solution that is flexible enough to offer smooth migration from centralized to distributed core network nodes. Some operational benefits of LTE application in Jazan university were as follows:-

❖ Large file, data, books, material transfer among the colleges.
❖ Rapid workplace set-up by interconnecting various colleges of Jazan University
❖ Rich machine to machine and remote monitoring applications
❖ Videoconferencing, tele-presence for personal meeting and others
❖ Remote access applications to the colleges
❖ Offers easier access and use with greater security and privacy
❖ Dramatically improves speed and latency communication
❖ Delivers enhanced real-time video and multimedia for a better overall experience
❖ Enables high-performance mobile computing between the colleges
❖ Reduces cost per bit through improved spectral efficiency
❖ Accelerated time to interconnecting Administrator, Staff, Faculties and students
❖ Decreased network operations and maintenance costs
❖ Strengthened in-University technical expertise and reduced reliance on external people.

6. Conclusion

LTE is the future of the Wireless network technology. This technology will allow Wireless to offer more application such as Multimedia, Voip and Secured Data transaction of according to the user requirement, which is unleashed mobility. Also, LTE will support more of the products and services in use today, because of its backward compatibility to 3GPP networks. Wireless is fully committed to LTE mobile technology and improving its wireless network. To that end, the user's actively participates in the development of technology standards to ensure that future standards will greatly help to all the administration department and e-learning centre in Jazan University. Wireless networks technologies believes in the viability of the LTE standard and its future potential, having spent countless hours researching and testing 4G technologies to determine the best fit for its network. For these reasons, we are proposing model structure of Wireless network chose LTE as the technology to get the maximum level of services and applications to Jazan university colleges and e-learning centre.

References

[1] Ian F. Akyildiz, David M. Gutierrez-Estevez, Elias Chavarria Reyes, "The evolution to 4G cellular systems: LTE-Advanced, Elsevier publication", Physical Communication 3, 217–244, 2010.

[2] Ramon Ferrús, Oriol Sallent, "LTE: The Technology Driver for Future Public Safety Communications, IEEE Communications Magazine • Volume 51, Issue 10, October 2013.

[3] Monika rani, Anil Rose, Mridul Chawla, "Review of Public Key Cryptography on Wimax using RSA Algorithm", Journal of Engineering Research and Studies E-ISSN0976-7916, JERS/Vol. II/ Issue IV/October-December, 2011.

[4] B. Furht and S. Ahson, "Long Term Evolution – 3GPP LTE Radio and Cellular Technology", CRC Press, 2009.

[5] V.H. Muntean, M. Otesteanu, G.-M. Muntean, "QoS Parameters Mapping for the E-learning Traffic Mix in LTE Networks", IEEE International Joint Conferences on Computational Cybernetics and Technical Informatics, Romania, May 27-29, 2010.

[6] Lewp-Rceg, (Radio Communication Expert Group of the Law Enforcement Working Party of the European Council), "Draft PPDR Applications Catalogue",available at http://www.cept.org /Documents/fm 49/4618 /FM49(12) 001 PPDR-applications-catalogue.

Prakash Kuppuswamy, Lecturer, Computer Engineering & Networks Department in Jazan University, KSA. He is research Scholar-Doctorate Degree yet to be awarded by Dravidian University'. He has published 25 International Research journals /Technical papers and participated in many international Conferences in Maldives, Libya and Ethiopia. His research area includes Cryptography, Bio-informatics and E-commerce security etc.

Dr. Saleh Mohammed Al-Turki, Vice Dean for Quality and Development at Jazan University, Also Chairman of the IS department at King Faisla University. He published many International Research Articles & Journals. Also he invited as a Reviewer and Special guest in many international conference. Ph.D studied in 'University of Leicester' United Kingdom. His research area Information System security, E-Governance, Cloud Computing etc.