Chapter 15
Cognitive Social Exchange: A Case Study

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ABSTRACT

This book chapter presents the role of telecommunications network in voice and data transmission. Switching, signaling and transmission are the technologies used to carry out this process. In landline call establishment, calls are routed from subscriber handset to a remote switching unit (RSU), a main switching unit (MSU), and to the internet protocol trunk automated exchange (IPTAX). Then, it is directed to the National Internet Backbone (NIB). On the receiver side, the IPTAX receives this signal from the NIB and directs to it to the MSU and RSU, respectively. The receiver side RSU delivers the information to the destination subscriber. In order to transmit the information from one place to other, it undergoes various process like modulation, demodulation, line coding, equalization, error control, bit synchronization and multiplexing, digitizing an analog message signal, and compression. This chapter also discusses the various services provided by BSNL and agencies governing the internet. Finally, it focuses on the National Internet Backbone facility of BSNL, India.

INTRODUCTION

Telecommunication networks have been evolving in the last 150 years and would continue to evolve to provide wider services in a more convenient form in the coming century. We seem to be entering an era of 'Sophisticated' telecommunications. The term Telecommunications means long-distance connection. In 1876, Alexander Graham Bell demonstrated his own telephone set and the possibility of long-distance communication.

Initially this is suitable for both long-distance telephone network and to the television industry's worldwide network. But these two networks use very different technologies to transmit voice or video. Now, it has been expanded to data transmission due to INTERNET revolution. In 1989, the tele-density in India is only 0.6% and it is moved to 2.8% in 1999. It leads to 700 million active mobile phone connections as of October 2012 which increases the telecom penetration rate from less than 3% in 1999 to over 70% in 2012.

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According to Global Sector Leader for Telecommunications Mr. Prashant Singhal in August 2016, out-off 2,355 megahertz (MHz) total spectrum, only 40% of the spectrum got sold. But there was no activity seen in 700MHz and 900MHz band. Telecom operators utilize this band especially for 4G services.

The ubiquitous aim of telecommunications network is to transmit user information to another user of the network. The technologies required to carry out this transmission are

1. Switching & Signaling
2. Transmission

LITERATURE SURVEY

The authors Chih-Hsiu Zeng and Kwang-Cheng Chen estimated the clustering coefficient for eqiping the network nodes along with topological cognition (Zeng & Chen, 2018). If Multiple-Input-Multiple-Output (MIMO) radar and a Full-Duplex (FD) MIMO cellular communication system with FD Base Station (BS) which simultaneously serves multiple downlink and uplink are collocated, the spectrum sharing between them is discussed by Keshav Singh et.al (2018). They designed a transceiver required for cellular BS. To maximize the radar detection probability of uplink users they developed power allocation vectors. Beibei Wang and K.J. Ray Liu (2018) surveyed about spectrum sharing of cognitive radio network and also discussed how the spectrum is allocated dynamically.

Thanh-Dat Le and Oh-Soon Shin (2016) proposed a relay selection scheme by considering the harvested energy and also analyzed the power shut down probability in wireless sensor networks. Oluwatayo Y. Kolawole et al. (2017) investigated the function of cognitive satellite terrestrial network with multi-beam. The primary satellite network shares resources with a mobile terrestrial system. In a multi-hop cooperative relay network, if the distance between source and destination is too long, a topology based on clustering mechanism is proposed by Javad Zeraatkar Moghaddam et al. (2018). They analyzed the issues related to power allocation and relay selection in different secondary units of different clusters (Javad Zeraatkar Moghaddam, 2018).

Alireza Shams Shafigh (2017) proposed a Semi-Cognitive Radio Network (SCRN) paradigm which allow the primary user to use all free channels until occupying the channels which is currently used by secondary user. They adopted game-theoretic analysis and derived adaptive algorithms to control the process (Shafigh, 2017). Satyam Agarwal and Swades De (2016) proposed a model called Cognitive Multihoming (CM), in which the licensed cellular band is used by cognitive radio (CR)-enabled base station for simultaneous transmission.

SWITCHING AND SIGNALLING

In telecommunication networks connectivity is achieved through switching systems. In olden days, the switches were manual and operator oriented. Then the automatic switching systems came into existence. The primary function of a switching system is to establish an electrical path between a given inlet-outlet pair. The station which maintains this switching system is called as an Exchange. These Exchanges are operating at -48 volts. The reason for giving more negative voltage is to protect the system from lightning. The Exchanges are classified as