International Journal of Electrical, Electronics and Computer Engineering **3**(2): 164-168(2014)

ISSN No. (Online): 2277-2626

High Performance in Wireless Mobile Network Improving Network Capacity and Communication Efficiency

Shrawan Kumar Singh and PK Pandey
Department of Electronics & Communication,
Sai Nath University Ranchi, Jharkhand

(Corresponding author: Shrawan Kumar Singh)
(Received 05 October, 2014 Accepted 28 November, 2014)

ABSTRACT: Next generation networks will certainly face requesting access from different parts of the network. The heterogeneity of communication and application software's changing situations in the environment, from the users, the operators, the business requirements as well as the technologies. Users will be more and more mobile, protocols, etc. will increase and render the network more complex to manage. Opportunistic communication has emerged as a new communication paradigm to cope with these problems. Opportunistic networks exploits the variation of channel conditions, provides an additional degree of freedom in the time domain and increase network performance. The limited spectrum and the inefficiency in the spectrum usage require such a new communication to exploit the existing wireless spectrum opportunistically by allocation of spectrum based on best opportunity among all possibilities.

Key Words: *Wireless communication, Mobile technology, Internet, Bluetooth oWiFi,*

I. INTRODUCTION

Continuous developments of mobile technologies and use of devices such as smart phones in everyday life increase need to be continuously connected to others through WiFi and to the Internet, anywhere and at any time. In mobile environments user connectivity is mainly affected by wireless communications constraints and mobility of user. These boundary conditions do not allow us to design communication environments based on unique and fixed connected networks or assume a stable path between each pair of source and destination. [7] Any mobile node can exchange information opportunistically during their periods of contact with any other node, fixed or mobile. Network protocols are designed to be extremely resilient to events such as long partitions, node disconnections, etc, which are very features of this type of self-organizing, self adaptable mobile social networks. This is achieved by temporarily storing messages at intermediate nodes, waiting for future opportunities to forward messages towards their destination. The mobility of users plays an important role in [9] opportunistic networks as mobility can increase the capacity of wireless networks through opportunistic communications. [1]A new paradigm and a new technology of opportunistic networks or oppnets to enable integration of the diverse wireless communication, computation, mobile social applications, mobile advertising, media sharing and location-based services, sensing, storage and other devices and resources that surrounds us more and more. As communication and computing systems are becoming more and more pervasive, the related privacy and security challenges also become complex to manage. The advantages of opportunistic communications include potentially [7] high capacity, low cost, localized communications, fully decentralized operation and independence of any infrastructure. These benefits are directly related to the varying capabilities of the available networking technologies. Cellular data today is often slowing, expensive (especially when roaming) and not even always available (rural areas, underground transportation, popular mass events, disaster situations to name a few examples). Bluetooth or WiFi can both offer always available, essentially free, local connectivity. In addition, WiFi offers higher bandwidths compared to the available cellular networks. [5] Consequently, there is a huge opportunity and unused network capacity available in opportunistic encounters that are exploit efficiently. Due to advancement of wireless technology and the proliferation of 802.11[1] based hand-held wireless terminals, recent years have witnessed an ever-increasing popularity of wireless networks, ranging from Wireless Local Area Networks (WLANs) to Mobile Adhoc Networks (MANETs) [2-4]. In integrated WAN + LAN + 3G cellular systems, data and multimedia communications are carried end to end over the existing Internet infrastructure. In WLANs (Wi- Fi technology using 802.11) mobile hosts communicate with an Access Point (AP) or a Base

Station (BS) that is connected to the wired networks. Visibly, only one hop wireless link is needed for communications between a Mobile Host (MH) and a stationary Fixed Host (FH) in wired networks. Most of the data traffic over the WLAN is TCP traffic, including traffic generated by web accesses, e-mails, bulk data transfers, remote terminals, etc [3-6]. However, TCP/IP needs to meet the challenges introduced by the wireless portion of the network in order to make it compatible with the wired network for providing efficient Internet services. When TCP packet loss occurs at a congested link, recovery mechanism is triggered at sender TCP either on arrival of Duplicate Acknowledgements or expiration of sender's Retransmission timer [7]. To relieve the link congestion, TCP transmits at a lower rate by shrinking its transmission window or congestion window Thus TCP's loss recovery mechanism is unconditionally coupled with congestion control mechanism. Such TCP behaviour works fairly well in wired networks, where packet losses are almost caused by link congestion; and packet loss due to the random Bit Error Rate.

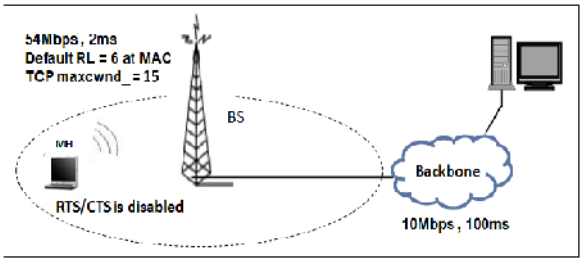

Fig. 1. Wireless Network Scenario.

Opportunistic mobile networks consist of human carried mobile devices such as smart phones that communicate with each other in a "store-carry-forward" fashion, reduce the corresponding communication[1] over head without any infrastructure. Opportunistic mobile networks present distinct challenges compared to classical fixed networks, such as the Internet, that assumes the availability of a contemporaneous, reasonably low propagation delay, low packet loss rate path between the two end points that communicate. In opportunistic networks, disconnections and highly variable delays caused by mobility of mobile devices moving into wireless range are the norm. Another major challenge in opportunistic communication arises from the small form factor of mobile devices that introduces resource limitations compared to static computing systems. Moreover, implementation [1] and deployment of actual opportunistic mobile networks, systems and applications is challenging, very often expensive and time-consuming as mobility itself is a significant problem in mobile networking. Opportunistic mobile networks can be seen as a generalization of DTNs (Delay Tolerant Networks). Specifically, in opportunistic mobile networks such as in DTNs, mobile social applications and location-based services not a prior knowledge is assumed about the possible points of disconnections, nor the existence of separate Internet like sub networks is assumed. Opportunistic mobile networks are formed by individual nodes, that are possibly is connected for long time intervals, and that opportunistically exploit any contact with other nodes to forward messages using routing protocols, [8] such as DSR (Dynamic Source Routing). The routing approach between conventional DTNs and opportunistic mobile networks is therefore quite different. As in DTNs,continuous end-to-end connectivity may never be available as it is concerned with interconnecting highly heterogeneous networks, the possible points of disconnections (and, sometime, the duration of disconnections) are known, routing can be performed along the same lines used for conventional Internet protocols, considering the duration of the disconnections as an additional cost of the links.

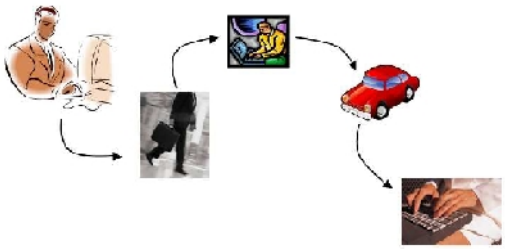

Fig. 2. Opportunistic mobile networking concept .

Since opportunistic mobile networks do not assume the same knowledge about the network evolution, routes are computed dynamically while the messages are being forwarded from the source towards the destination, which is essential to handle frequent routing changes and to reduce the corresponding communication overhead. [13] Each intermediate node evaluates the Suitability of encountered nodes to be a good next hop towards the destination during their periods of contact. Opportunistic mobile networks share the idea of delay and disruption tolerance of DTN but are designed with the assumption of more unpredictable mobility. [14] Thus, they can be considered as a generalization of DTNs [5].

Device discovery is essentially the first step of communication. For example, as shown in Figure 1, the user at the desktop opportunistically exchanges information, via a WiFi ad hoc link or through Bluetooth, a message for a friend to a user passing nearby, "hoping" that this user will carry the information closer to the destination. This user passes close to a train station, using Dynamic Source Routing(DSR) and forwards the message to a traveler going to the same city where the destination user works. At the train station of the destination city a car driver is going in the same neighborhood of the destination's working place facilitate message forwarding. The driver meets the destination desktop useron his way, and the message is finally delivered from source. [1]For efficient opportunistic communications use of Bluetooth and WiFi is there. Commonly use Bluetooth for a very practical reason of battery lifetime, however, for contact discovery and power on the higher power radio (e.g. WiFi) only on demand when more capacity or faster transmission is required.

II. MOBILENETWORKS

The goal for opportunistic mobile networks is to use opportunistic algorithms for maximizing the throughput that can be provided by opportunistic algorithms. The global knowledge of network including context information would enable optimal routing. The opportunistic mobile networks goals can be realized by alleviating first of all the communication problems including bottlenecks and gaps in spectrum utilization that are often the root causes of resource shortages. [10] The another goal of opportunistic mobile networks is analysis of human mobility like time user spend at specific locations, node mobility information, history of node behavior as dynamic routing of information is used in opportunistic communication.Opportunistic mobile network's performance Topology control has been proposed as a promising technique to achieve energy and power efficiency in wireless mobile social networks. Existing fixed topology control algorithms used in wireless communication assume that wireless links are static, either connected or disconnected. Taking advantage of the time and frequency[12]varying characteristics of wireless communication links, the energy-efficient opportunistic topology control problem, which exploits opportunistic communication to maximize energy-efficiency as well as to satisfy given network performance requirement by dynamic routing of context information. Opportunistic communication exploits the time-varying characteristic of wireless communication links to improve network performance of wireless mobile social network. Since every coordinator always turns on its radio, opportunistically leverage time diversity of channel conditions among multiple coordinators rather than relying on single coordinator. As shown in Figure, when node F transmits a packet of data to its neighboring coordinator C, there is a small probability that coordinator A or B can overhear the packet even link qualities of link FA and FB are bad. Since link AO has higher quality than link CO, the packet has a higher probability to reach O if node A successfully receives and forwards the packet. [4] Furthermore, if link FA and FB can congregate to provide the same probability for a packet from node F to reach sink O as the topology in Figure , which save more energy by switching node C to a non-coordinator without sacrificing the end-to-end network performance from node F to sink O. [4] An adaptive device discovery protocol for reducing energy and power consumption in different communication environments such as Bluetooth or WiFi of Smartphone-based opportunistic communications are also used.

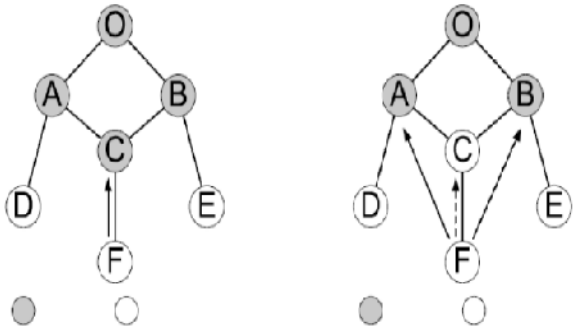

Fig. 3. Energy efficient control.

Opportunistic networks applied to interdisciplinary projects focusing on wildlife monitoring. Usually, small monitoring devices are attached to animals, and an opportunistic network is ormed to gather information and carry it to a few base stations based on the best opportunity possibly connected to the Internet. Contacts among animals are exploited to aggregate data, store and carry them closer and closer to the base stations. This is a reliable, cost-effective and nonintrusive [14]. The use of opportunistic communication to bring Internet connectivity to rural areas. In developing countries and rural areas deploying the infrastructure required to enable conventional Internet connectivity is typically not cost-effective as fixed routing in conventional Internet connections.

However, Internet connectivity is seen as one of the main booster to bridge the digital divide. Opportunistic networks represent an easy-to-deploy and extremely cheap solution for Internet connectivity to rural areas. Typically, [2] rural villages are equipped with a few collection points that temporarily store messages, which are addressed to the Internet for wireless mobile social networking communication. Simple devices mounted on food court, bus, bicycles joggers

III. MOVING VEHICLES

Opportunistic communication is to allow access to the Internet from moving vehicles such as for smart phones, the most popular mobile devices [8]. Such vehicles could gain access to the Internet from roadside wireless access points. Symmetrically, content created by the user of a mobile device could be placed into the infrastructure. By avoiding onerous charges for data transfer imposed by cellular providers, this mode of transfer makes it possible for device users to access rich multimedia content at low cost. This communication is opportunistic because vehicles l In wireless communication systems multiple antennas at transmitter side and receiver side increase the transmission capacity (or bit rates) and improving the spectrum efficiency. [13] Orthogonal Frequency Division Multiplexing can be applied in a multiuser applications leading to a highly flexible, efficient communications system.OFDM is a multicarrier multiplexing technique that divides an OFDM signal which is a sum of several sinusoids channel with a higher relative data rate into several orthogonal sub-channels with a lower data rate and has become one of the standard choices for high-speed data and multiuser transmission. [6]ose connectivity as they move past the access point. A communication system comprising **Nt**transmit (TX) and **Nr** receive (RX) antennas will be considered with MAPU = Multi Antenna Processing Unit. Fast and efficient algorithms are used to determine the optimal selection of antennas opportunistically at transmitter and receiving side. Opportunistic communication forming MIMO links gives advantage of multiuser diversity.

IV. CONCLUSION

The continuous growth in wireless mobile networks connectivity, together with the increasing number of networked computational pocket devices equipped with wireless communication capabilities (e.g. WiFi, Bluetooth) populating among the global population, call for a deep rethinking of traditional communication systems and service architectures. It gives a strong background for developing in opportunistic networks in which any mobile node can communicate opportunistically with any other node, fixed or mobile. Opportunistic mobile social networks are a novel communication paradigm that exploits opportunistic encounters between human carried devices and social networks for mobile social networking as opportunistic communication is implemented to obtain a more efficient utilization of the limited available radio spectrum gives overall high throughput. Wireless mobile social networking in opportunistic communication provides energy and power efficiency as well as privacy and network security by using different routing protocols and topologies even it targets environments where mobile or fixed nodes wish to communicate are highly dynamic and of unpredictable topology.

REFERENCES

[1] G. E. Moore, “Cramming more components onto integrated circuits,” *Electronics*, vol. **38**, no. 8, pp. 114–117, Apr. 1965.

[2] K. Lahiri, A. Raghunathan, S. Dey, and D. Panigrahi, “Battery-driven system design: A new frontier in low power design,” in *Proc. Intl. Conf. on VLSI Design*, Bangalore, India, Jan. 2002, pp. 261–267.

[3] R. Mangharam, R. Rajkumar, S. Pollin, F. Catthoor, B. Bougard, L.Van der Perre, and I. Moeman, “Optimal fixed and scalable energy management for wireless networks,” in Proc. IEEE INFOCOM 2005, vol. 1, Mar. 2005, pp. 114–125.

[4] Dell, “Dell truemobile 1400 wan card.” [Online]. Available: http://
support.ap.dell.com/docs/network/p44970/en/specs.htm

[5] A. Anand, C. Manikopoulos, Q. Jones, and C. Borcea, “A quantitative analysis of power consumption for location-aware applications on smart phones,” in *Proc. IEEE ISIE 2007*, June 2007, pp. 1986–1991.

[6] M. Pedram, “Power optimization and management in embedded systems,” in *Proc. ASP-DAC 2001, Yokohama, Japan, Feb. 2001*, pp. 239–244.

[7] L. Benini, A. Bogliolo, G. De Micheli, “A survey of design techniques for system-level dynamic power management,” *IEEE Trans. VLSI Syst*., vol. **8**, no. 3, pp. 299–316, June 2000.

[8] A. Raghunathan, N. Jha, S. Dey, High-level power analysis and optimization. Norwell, MA: Kluwer Academic Publishers, 1998.

[9] C. Schurgers, "Energy-aware wireless communications," Ph.D. dissertation, University of California Los Angeles, 2002.

[10] IEEE, "Ieee 802.16e-2004, part 16: air interface for fixed and mobile broadband wireless access systems - amendment for physical and medium access control layers for combined fixed and mobile operation in licensed bands," Nov. 2004.

[11] Y. Xiao, "Energy saving mechanism in the ieee 802.16e wireless man," *IEEE Commun. Let.*, vol. **9**, no. 7, pp. 595–597, July 2005.

[12] C. E. Jones, K. M. Sivalingam, P. Agrawal and J. C. Chen, "A survey energy efficient network protocols for wireless networks," Wireless Networks, vol. 7, no. 4, pp. 343–358, July 2001.

[13] A.J. Goldsmith and S.B. Wicker , "Design challenges for energyconstrained ad hoc wireless networks," *IEEE Wireless Commun.*, vol. **9**, no. 4, pp. 8–27, Aug. 2002.

[14] A. Ephremides, "Energy concerns in wireless networks," *IEEE Wireless Commun*., vol. **9**, no. 4, pp. 48–59, Aug. 2002.