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RE-IMPLEMENT INCENTIVE MECHANISMS THE GLOBAL WIRELESS VILLAGE

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By

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Thesis Submitted to the School of Graduate Student, University Putra Malaysia, in Fulfillment of the Requirements for the Degree of Master of Computer Science

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DEDICATION

I dedicate this work to my parents, my husband, my sisters, and my brothers. Without their endless encouragement and support this work with not have been possible.

Abstract of thesis presented to Senate of University Putra Malaysia in fulfillment of the requirements for the degree of Master of Computer Science

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Faculty: Computer Science And Information Technology

Wireless Community Network (WCN) can be viewed as a modern mechanical development. Community networks can possibly offer high data rate wireless Internet access for mobile users, one of the central point that added to their development was the low penetration of broadband access technologies in few nations .Currently the larger part of ISPs do not permit connection sharing for their subscribers, which is the most critical problem in the way of establishing a global wireless community. Furthermore, motivating mechanisms for both users and ISPs are not duly designed in global wireless community networks. However, key ingredients of creating a global wireless village, both user collaboration and Internet Service Providers (ISP) support. In this paper we re-implement the economic interactions in global wireless community networks based on users, ISPs and community providers (Biczoket al, 2011). We found that in addition to the roaming cost, revenue share and the method of distribution of income, the cost of entry have a significant impact on stimulating the user to participate in the community. The analytical result of this work, which carried out in MATLAB2013a tool, show that in fact a really global wireless community network emergence is possible.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
Sebagai memenuhi keperluan untuk ijazah Master Sains

RE-MELAKSANAKAN MEKANISME INSENTIF GLOBAL WIRELESS VILLAGE

Oleh

RAWDA T S AKI

Jun 2015

Pengerusi: Dr. Zurina Binti Mohd Hanapi

Fakulti: Sains Komputer dan Teknologi Maklumat

Rangkaian Komuniti tanpa wayar (WCN) boleh dilihat sebagai perkembangan mekanikal moden. Rangkaian komuniti mungkin boleh menawarkan capaian internet tanpa wayar bagi kadar data yang tinggi untuk pengguna mudah alih, salah satu titik pusat yang ditambah kepada pembangunannya adalah penembusan teknologi capaian jalur lebar yang rendah di beberapa negara. Buat masa ini sebahagian besar ISP, tidak membenarkan perkongsian sambungan bagi para pelanggan mereka, dimana ini merupakan masalah yang paling kritikal untuk mengukuhkan komuniti tanpa wayar secara global. Tambahan pula, pendekatan motivasi untuk kedua-duanya diantara pengguna dan ISP tidak direka dengan sempurna dalam rangkaian wayarles masyarakat global. Walau bagaimanapun, bahan-bahan utama untuk mewujudkan sebuah kampung tanpa wayar global ialah kerjasama daripada kedua-dua pihak iaitu kerjasama pengguna dan sokongan Pembekal Perkhidmatan Internet (ISP). Dalam kertas kerja ini kita melaksanakan semula interaksi ekonomi dalam rangkaian tanpa wayar bagi masyarakat global berdasarkan pengguna, ISP dan pembekal masyarakat (Biczoket al, 2011). Kami mendapati bahawa sebagai tambahan kepada kos perayauan, berkongsi hasil dan kaedah pengagihan pendapatan, kos kemasukan memberi kesan besar kepada usaha merangsang pengguna untuk mengambil bahagian dalam masyarakat. Hasil kajian analisis yang telah dijalankan menggunakan perisian MATLAB2013a ini, menunjukkan bahawa kemunculan rangkaian tanpa wayar global tidak mustahil untuk berlaku.

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APPROVAL SHEET

This thesis submitted to the faculty of Computer Science and Information Technology of University Putra Malaysia and has been accepted as partial fulfillment of the requirements for the degree of Master of Computer Science.

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DECLARATION

I declare that the thesis is my original work except for quotation and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at University Putra Malaysia or other institution.

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RAWDA T S AKI

Date**:** _____

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LIST OF ABBREVIATIONS

AA	Adopter Adopter
AD	Adopter Defector
AP	Access Point
AWMN	Athens Wireless Metropolitan Network
BT	British Telecom
CDMA	Code Division Multiple Access
CNs	Community Networks
CWS	Community Wireless Service
DA	Defector Adopter
DC	Development Countries
DD	Defector Defector
DSSS	Direct Sequence Spread Spectrum
ESS	Evolutionarily Stable Strategy
FDMA	Frequency Division Multiple Access
FON	Fiber Optic Network
GPRS	General Packet Radio Services
GSM	Global System for Mobiles
HANs	Home Area Networks
HSPA	High-Speed Downlink Packet Access
HSUPA	High-Speed Uplink Packet Access
IMT	International Mobile Telecommunications
ISP	Internet Service Provider
ITUR	International Telecommunication Union Radio communication Sector
LANs	local Area Networks
MIMO	Multiple Input Multiple Output
PANs	Personal Area Networks
P2PWNC	Peer To Peer Wireless Network Community
SCO	Social Community Operator

TDMA	Time Division Multiple Access
WCNs	Wireless Community Networks
WLANs	Wireless local Area Networks

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Recently, the stock of user-provided networking has faced remarkable increase. Although this might seem interesting to some, it is only a moderately feasible alternative to the traditional ISP-centric model. Some others believe it can prompt a complete shift in the patterns of Internet communication and create a platform for future wireless Internet. The working prototype of such a global wireless community network, known as FON WiFi system already exists (Wong et al, 2010). FON refers to Fiber Optic Network which is a company that operates a system of dual access wireless networks. community members of FON is called Foneros which agree to share a part of their bandwidth as a Wi-Fi signal and can easily access free WiFi at any other locations which provide it. The users can be classified to three groups: Linus, Bill, and Alien. The router of a Linus is a “La Fonera” WiFi, with free roaming possibility at any FON spot and sharing WiFi. In addition, a Bill has the same rights of a Linus and can receive an extra 50% of the revenues once a visitor purchases a FON pass at her FON Spot. Whereas an Alien is not able to share an Internet connection, but purchasing short-term passes allows the user to accesses FON Spots. FON has also claimed that it has over 300,000 sharing enabled routers which are used by over a million users around the world. However, the achievement of FON and

any other (global) wireless community networking frameworks basically depends on well-designed incentive system which can persuade users' participation and ISPs' cooperation. At present, most of ISPs do not allow their subscribers to share connection. This is a huge obstacle in creating a global wireless community.

Keeping in mind the end goal to use the network a user needs an agreement with one of the ISPs. Each of the ISPs builds a network, which are then associated with each other. The ISPs make an assertion that their users can use one another's networks. Users can then roam in the coverage area of the whole network. ISPs are not prone to endorse a client sharing the connection with different clients, as the network traffic may increase considerably. Nevertheless, there is additionally a rising group of so called wireless-friendly ISPs (Juutilainen et al, 2002), allowing their users to share their fixed network connections to the wireless. From ISP's perspective, this can be seen as a reasonable method for spreading the Internet connection and reaching new users. From this point, the principle idea of community networks generally is that anybody can join the network and offer services to different users. Anybody can also act as an ISP and provide a connection onwards to the Internet or some other area. Hence, the wireless community networking can show a great promise in achieving a global status.

1.2 PROBLEM STATEMENT

Currently the majority of ISPs do not allow connection sharing for their subscribers, which is the most significant obstacle in the way of creating a global wireless community. Users and ISPs do not join under different technology penetration regimes, in other word, incentive mechanisms for both users and ISPs are not properly designed in global wireless community networks. Those many methods have been developed (Manshaei et al, 2008), (Mazloumian et al, 2008) and the author base work (Biczok et al, 2009) to improve that particular issues. However, the method (Biczok et al, 2009) ,which gives a first impression about the subject using good assumptions and a limited analysis, do not solve the problem of incorporate the economic interactions of both users and ISPs into a global wireless community networking framework accurately.

1.3 OBJECTIVE

Re-implement incentive mechanisms for both users and ISPs in order to improve the problem of incorporate the economic interactions of both users and ISPs into a global wireless community networking by community provider dynamically adjusts revenue shares to determining the payment structure.

1.4 RESEARCH SCOPE

With the growing popularity and development of wireless technology and WLAN standards, WCNs began to grow. However, the limited use of broadband access technologies in some countries helped to increase the popularity of WCN among users. In the present study, it is assumed that the user game could have different pure and mixed strategy Nash equilibrium which depends on the actual parameters in homogeneous payment distribution with regard to the heterogeneous payment structure.

In the following we will discuss how relevance-users can receive by showing how a user's income is proportional to home relevance. Moreover, the game between ISPs will be explained in further details and their equilibrium properties will be calculated too. The calculations will be made through MATLAB simulation scripts which is the calculation platform of choice presently used in engineering, science, and many other technical business domains (Lopez et al, 2014). Thus for the purpose of the current study, Matlab-2013 will be downloaded from the website of the BME Network Economics Group. The model will be analyzed and the results will help the users to decide whether it worth joining the community, and whether it is beneficial for the ISPs contemplating to support access sharing, and it finally helps the community provider to design an efficient mechanism by setting reward and prices.

1.5 THESIS ORGANIZATION

This thesis is divided into five chapters, including this chapter that introduces the background information about the WCNs and presents the problem statement, objective and scope of this research. The fundamental idea of remaining chapters can be as follows:

Chapter 2: discuss the accouchement, characteristics, services, opportunities and challenges of WCNs. It also discusses game theory in wireless networks and their related to our work. At the end brief detail of related work is discussed here.

Chapter 3: describes the analytical model design and how to implement it in MATHLAB. The simulation parameters, their value and assumptions are discussed.

Chapter 4: The result of the simulation with different parameters is analyzed in this chapter. The performance of global wireless community compared in different term performance metrics such as heterogeneous versus homogeneous payment structure, Expected revenue for users, and Expected revenue for ISPs.

Chapter 5: This chapter summarizes the conclusion generally this research, primarily discuss the performance of this work. The future possible works based on this research are also stated in the end of this chapter.

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