PERFOMANCE ANALYSIS OF SEAMLESS VERTICAL HANDOVER IN 4G NETWOKS

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This Project is dedicated to my beloved family and friends, without their staying power, patience, understanding, for their endless support and encouragement, the conclusion of this work would not have been possible.

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ABSTRACT

Next generation 4G wireless networks is envisioned as a convergence of different wireless access technologies providing the user with the best anywhere, anytime connection and improving the system resource utilization. However the study of evaluation mobile communication system, mobility management in heterogeneous network, mobility management classification, seamless mobility and handover strategies. In the wireless heterogeneous environment, the majority of problems in the case of handovers stem from the issue of uncertainty in the prediction of network coverage and the duration of availability of network services. The objective of this thesis is to analyze the integration between Universal Mobile Telecommunication System (UMTS) and Wireless Location Area Network (WLAN) during handover process. And then evaluate the impact of seamless vertical handover on the system performance in terms of delay, throughput and packet loss. The simulation tool to achieve the objectives is OPNET 14.5 Modular; we have designed two integration scenarios for Open and Loose coupling scheme and then compared that two integration schemes however result shows that loose coupling architecture is better than open coupling architecture. The results also shows when the user move between two different technology networks shows that loose coupling architecture is better than open coupling architecture in terms of delay, throughput and packet loss. Furthermore the analytical framework extends to multiple radio network environments and the possibilities of the use of Experimental enhance handover operation.

ABSTRAK

Generasi seterusnya bagi 4G rangkaian tanpa wayar adalah digambarkan sebagai suatu tumpuan daripada teknologi akses tanpa wayar yang berbeza yang menyediakan pengguna dengan sambungan yang terbaik dimana-mana, pada bila-bila masa dan memperbaiki penggunaan sumber sistem. Bagaimanapun, kajian berkenaan penilaian sistem komunikasi telefon mudah alih, pengurusan kebolehmudahalihan dalam pelbagai rangkaian, pengurusan kebolehmudahalihan pengelasan, kebolehmudahalihan kelancaran dan strategi penyerahan. Dalam persekitaran pelbagai rangkaian, masalah yang utama dalam kes penyerahan berpunca daripada isu ketidakpastian dalam meramal liputan rangkaian dan tempoh kemudahan rangkaian yang tersedia. Objektif tesis ini adalah untuk menganalisis kesepaduan antara Sistem Telekomunikasi Mudah Alih Universal (UMTS) dan *Wireless Locatioan Area Network* (WLAN) semasa proses penyerahan. Kemudian, menilai kesan kelancaran penyerahan menegak ke atas prestasi sistem dalam bentuk penangguhan, hasil dan kehilangan paket. Perkakas simulasi untuk mencapai objektif adalah OPNET 14.5 Modular; kami telah mereka 2 senario bersepadu untuk skema gandingan Open dan Loose dan kemudian membandingkan dua skema bersepadu tersebut. Bagaimanapun keputusan menunjukkan, seni bina gandingan Loose adalah lebih baik berbanding seni bina gandingan Open Keputusan menunjukkan apabila pengguna beralih diantara dua rangkaian teknologi yang berbeza, senibina gandingan Loose adalah lebih baik daripada senibina gandingan Open dari aspek penangguhan, hasil dan kehilangan paket.Selain itu, rangka kerja analisis boleh dikembangkan kepada pelbagai persekitaran rangkaian radio dan mempunyai peluang untuk digunakan bagi Eksperimen mengembangkan operasi penyerahan.

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1G	-	First Generation.
2G	-	Second Generation.
3G	-	Third Generation.
4G	-	Four Generation.
AMPS	-	Advance Mobile Phone Service.
AP	-	Access Point.
BMC	-	Broadcast and Multicast Sub layer.
BS	-	Base Station.
BSS	-	Basic Service Set.
BTS	-	Base Transceiver Station
CA	-	Collision Avoidance.
CDMA	-	Code Division Multiple Access.
CPCH	-	Common Packet Channel
CRC	-	Cyclic Redundancy Check.
CS	-	Circuit Switch.
CSMA	-	Carrier Sense Multiple Access Technique.
DCF	-	Distributed Coordination Function
DCH	-	Dedicated Channel.
DPDCH	-	Dedicated Physical Control Channel.
DS	-	Distributed Service.
DS-CDMA	-	Direct-sequence Code Division Multiple Access
DT	-	Discovery Time.
ESS	-	Extended Service Set.
ESSID	-	Extended Service Set ID
		.
FDD	-	Frequency Division Duplex
FDMA	-	Frequency Division Multiple Access.

GPRS	-	General Packet Radio Service.
GSM	-	Global System for Mobile Communication.
HCC	-	Handover Control Center
HE	-	Handover Execute.
HIPER LAN	-	High Performance Radio Local Area Network.
HSPA	-	High Speed Downlink Packet Access
IBSS	-	Independent Basic Service Set
IR	-	Infra red.
ITU	-	International Telecommunication Union.
MAC	-	Medium Access Control.
MD	-	Mobile Download
MN	-	Mobile Node
NIC	-	Network Interface Card.
OFDM	-	Orthogonal Frequency Division Multiplexing
OFDMA	-	Orthogonal Frequency Division Multiple Access
OSI	-	Open System Interconnect.
PC	-	Power Consumption.
PCF	-	Point Coordination Function.
PDCP	-	Packet Data Convergence Protocol
PE	-	Power Emission
PSTN	-	Public Service Telephone Network
PS	-	Packet Switch
QOS	-	Quality of Service.
RLC	-	Radio Link Control
RNC	-	Radio Network Controller.
RNSP	-	Radio Network Subsystem Application Part
RRC	-	Radio Resource Control
RSS	-	Relative Signal Strength.
SM	-	System Monitor
SH	-	Substantial Security Holder
UE	-	User Equipment.
UMTS	-	Universal Mobile Telecommunication System.

UPCH	-	Uplink Packet Channel
USCH	-	Uplink Shared Channel
USHA	-	Universal Seamless Handover Architecture.
UTRAN	-	UMTS Terrestrial Radio Access Network.
WAP	-	Wireless Access Point
WEP	-	Wired Encryption Protocol.
WIFI	-	Wireless Fidelity

CHAPTER 1

PROJECT OVEREVIEW

1.1 Introduction

Fourth Generation (4G) stands for one integrated, IP-based background for all telecommunication as well as voice, video, broadcasting media and internet that utilizes both fixed and wireless networks. The commercial proliferation of cellular voice and data service has placed a new challenge for mobile communication systems.

Next-generation wireless systems are envisioned to have an all-IP-based infrastructure with the support of heterogeneous access technologies. However, with the advent of new value-added services and novel concept introduced into Long Term Evolution (LTE) architecture of the 4 Generation (4G) networks, provisioning efficient mobility management with quality of service guarantees and seamless handoff feature becomes even more important for next-generation wireless network design.

In 4G, the user is the central meeting point. By means of intelligent terminals, the user can get simple broadband access to a range of services that take into account his Personal preferences and context. Even without interrupting the ongoing conversation, work or video viewing, the user can change terminals or switch noticeably between the underlying fixed and mobile networks (UMTS, WLAN, etc.). This extraordinary vision regarding 4G networks and services is a natural extension of the current development of broadband Internet and 3G mobile networks like UMTS.

However, Vertical handovers in Heterogeneous networks. Due to a lot of benefits presented by both the third generation Mobile phone networks and WLANs, it is popular to integrate both of these networks. While studies specifying common integration architectures are abundant, few or no studies are committed for application performance over such heterogeneous networks.

The goal of 4G will be to replace the entire core of cellular network with a single worldwide cellular network completely standardized based on the IP for video, voice over IP (VOIP) and multimedia service.

1.2 Problem Statement

In the wireless heterogeneous environment, the majority of problems in the case of handovers stems from the issue of uncertainty in the prediction of network coverage and the duration of availability of network services.

Although the importance of this issue has been acknowledged by the wireless community, the implications for overall system performance in terms of delay, packet loss and Throughput have not been explored.

1.3 Project Objectives

The objective of this study will be described in the following points:-

1. To analyze the integration between UMTS and WLAN during handover process.
2. To evaluate the impact of seamless vertical handover on the system performance in terms of the Delay, Throughput and Packet loss.

1.4 Scope of the Project

Scopes of the study are the coming points:

The scope of the work will be based on the performance of seamless vertical handover between UMTS and WLAN.

First part of the project will be considered a literature review of seamless vertical handover.

Secondly the work will be focus on Loose and Open Coupling Schemes as the ingeneration between (UMTS) and (WLAN) during seamless vertical handover process.

Thirdly evaluating handover the impact integration of UMTS and WLAN on system performance in terms of delay, throughput and packet loss.

Finally the Simulation Tool that will be used to achieve the objectives is OPNET Modeler.

1.5 Thesis Organization

This thesis is organized into five chapters:

The first chapter provides the project work by talking about the background of seamless vertical handover in 4G networks. Besides that, is also discusses the problem statement, project objectives, scope the study and thesis organization.

The second chapter presents background and literature review of mobility management in 4G wireless heterogeneous network and brief discussion on the issue of seamless vertical handover in 4G wireless heterogeneous network.

The third chapter describes on project methodology, which provides a full discussion about the flow of this work. This includes Analyze different Integration Scenarios between UMTS and WLAN.

The fourth chapter evaluating handover the impact integration of UMTS and WLAN on system performance in terms of delay, throughput and packet loss using OPNET Modular.

The fifth chapter is the conclusion of overall chapters and future works in the related area of Seamless vertical handover will be discussed. This includes recommendations for further study.

1.6 Summary

Handover is a major criterion for testing the ability of the core heterogeneous network to handle the movement of user ongoing calls. Seamless vertical handover is the future wireless environment will not consist simply of one radio access technology such as current cellular system (e.g. UMTS, WLAN, WIMAX WIFI and etc.) But will integrate multiple access networks adding complexity to mobility management systems. Network selection is very important in future highly included pervasive 4G networking environment. We presented the importance of next-generation wireless systems are predicted to have an all-IP-based communications with the support of heterogeneous access technologies.

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