Available online at www.sciencedirect.com

SciVerse ScienceDirect

Procedia Engineering 30 (2012) 113 – 123

Procedia Engineering

www.elsevier.com/locate/procedia

International Conference on Communication Technology and System Design 2011

Survey Paper: Mobility Management in Heterogeneous Wireless Networks

B. R. Chandavarkar[a], G. Ram Mohan Reddy[b], a*

[a,b]*Department of Information Technology*
National Institute of Technology Karnataka, Surathkal, Mangalore, India

Abstract

Ever increasing user demands and development of modern communication technologies have led to the evolution of communication networks from 1st Generation (1G) network to 4G heterogeneous networks. Further, 4G with heterogeneous network environment will provide features such as, "Always Best Connected", "Anytime Anywhere" and seamless communication. Due to diverse characteristics of heterogeneous networks such as bandwidth, latency, cost, coverage and Quality of Service (QoS) etc., there are several open and unsolved issues namely mobility management, network administration, security etc. Hence, Designing proficient mobility management to seamlessly integrate heterogeneous wireless networks with all-IP is the most challenging issue in 4G networks.
Mobile IPv6 (MIPv6) developed by Internet Engineering Task Force (IETF) has mobility management for the packet-switched devices of homogeneous wireless networks. Further, mobility management of homogeneous networks depends on network related parameter i.e., Received Signal Strength (RSS). However the mobility management of heterogeneous networks, not only depends on network related parameters, but also on terminal-velocity, battery power, location information, user-user profile & preferences and service-service capabilities & QoS etc. Designing mobility management with all-IP, while, considering issues such as context of networks, terminal, user and services is the main concern of industry and researchers in the current era.

Keywords: MIPv6; Heterogeneous Network;Media Independent Handover;Vertical handoff.

1. Introduction

User's interest and demands for the better service and/or ease life is the driving force for the evolution of new technology and enhancement in the existing technology. Ever increasing demands of the users for the wireless access of the services like voice, data and video while roaming leads to the challenging issues like mobility management, QoS, increase in coverage area, reduced data transfer cost, etc. Mehmet S. Kuran et. al., [25] summarized currently exist different wireless access technologies- Wireless Local Area Network (WLAN), WiFi (Wireless Fidelity), Worldwide Interoperability for Microwave Access (WiMAX), cellular technology- Global

* B. R. Chandavarkar. Tel.: +91-9880270961; fax: +91-0824-2474060.
E-mail address: sai_srajan@yahoo.co.in.

1877-7058 © 2011 Published by Elsevier Ltd.
doi:10.1016/j.proeng.2012.01.841

System for Mobile Communications (GSM), Code Division Multiple Access (CDMA), General Packet Radio Service (GPRS), Universal Mobile Telecommunication System (UMTS), and other earlier generation networks-Public Switched Telephone Network (PSTN), Integrated Services Digital Network(ISDN) so on, provided different nature of services with the different coverage, data rates, cost etc., to the end users as shown in the Table 1.

Table 1. Wireless Access Technologies characteristics

Network	Coverage	Data Rates	Cost
Satellite	World	Max. 144 kbps	High
GSM/GPRS	≈ 35 km	9,6 kbps – 144	High
IEEE	≈ 30 km	Max. 70 Mbps	Medium
IEEE	≈ 20 km	1-9 Mbps	High
UMTS	20 km	Upto 2 Mbps	High
IEEE	50-300 m	54 Mbps	Low
IEEE	50-300 m	11 Mbps	Low
Bluetooth	10 m	Max. 700 kbps	Low

Since the evolution of 1st Generation (1G) networks to 3G networks provided the users with different wireless access technology in each generation with different bandwidth, latency, coverage and cost. Increase in the popularity of wireless LAN-802.11 because of higher data transfer with low cost compared to cellular technology-GSM, GPRS and UMTS, the development in the IP-based applications (non-real-time or real-time) to have access to IP services anywhere at anytime from any network and evolution of multiple interfaces mobile devices with the capability to access more than one wireless technology is the driving force for the Beyond 3G (B3G) i.e. 4G [5]. Integration of wireless technologies namely Bluetooth, WLAN, GSM, GPRS, UMTS and WIMAX called "heterogeneous network" with all-IP is the communication environment in 4G as shown in Fig. 1. 4G with heterogeneous all-IP networks will provide the features, "Always Best Connected (ABC)", "Anytime Anywhere" and seamless communication. 4G will differ with their presuccessor 1G, 2G and 3G networks interns of larger coverage area, faster data transfer, low latency, low data transfer cost etc. The main crucial issue for the 4G heterogeneous all-IP networks, in congregate network is the seamless mobility i.e. a flawless and proficient handoff scheme that supports the roaming of mobile devices from one wireless system to another.

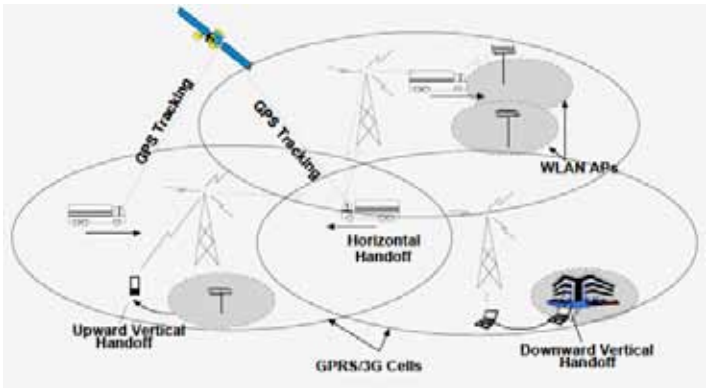

Fig. 1. Heterogeneous Network

In parallel to the evolution in cellular technology, in 1992 the Internet Engineering Task Force (IETF) working group added mobility at the network layer transparent to applications and higher level protocols like TCP resulting into Mobile IP, which is an add-on in IPv4. Mobile IPv4 (MIPv4) introduced the mobility concept at the network layer of TCP/IP by using two addressing concept for a mobile node (MN) i.e. Home Address (HoA) which is static, and is used to identify the home of a mobile node, and Care-of Address (CoA) which is the IP address to identify the MN current location in the foreign network. These two addresses are associated with Home Agent (HA) and Foreign Agent (FA) to assist the mobility management functionalities in MIPv4.