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ADVANCE TECHNIQUE OF VERTICAL HANDOFF USING THE APPLICATION OF SPANNING TREE IN 4G

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ABSTRACT: Today mobile communication has importance in every person life for their business and non-business task. Vertical handoff is the switching process between heterogeneous wireless networks. Telecommunication companies are using handoff techniques to make proper communication in roaming or local area. But selection of network is one of the most challenging dilemmas in all available handoff techniques. The predicament arises in the selection of network for better service when user is moving from one place to another. Vertical handoff must evaluate additional factors, such as monetary cost, offered services, network conditions, and user preferences. We know that now a day's virtual handoff technique in use which is based on received signal strength comparisons. In this thesis, we propose a technique to resolving this problem using spanning tree. We can manage the network handoff by using spanning tree application when a user moves from one region to another region.

Keyword: 1G,2G,3G,4G,Wireless Communication

I. INTRODUCTION

Communication is always necessary in building relations to mankind, when two persons meet they need some medium to interchange their views but due to distance barriers some tools are required to communicate each other. At the end of 19th century, He invented first wired base telephony equipment. It was the solution for the voice communication for the people how far apart they are. After this radio based communication systems Era started. It was an extension of wired based networks.

A. First Generation (1G)

First Generation mobiles networks utilize analogue transmissions. In 1979 Nippun Telephone and Telegraph (NTT) in Japan introduces the first operational cellular networks. In North America AT&T introduces the First Generation mobile systems for the customer in 1980s. This system was named as Advanced Mobile Phone Service (AMPS). In First Generation the basic structure of Cellular communication is characterized and many problems were resolved regarding accomplishment of cellular network. In First generation mobile networks the primary ambition was the voice chat. The above stated system was operational at 40 MHz bandwidth and 800 to 900 MHz Frequency. In 1988 this range was expended up to 10 MHz called expended spectrum in AMPS [3].

B. Second Generation (2G)

At the end of 1980s Second Generation (2G) mobile network system was launched. In this system the traditional voice services and low rate data service was provided. The foremost change in this system regarding the First Generation was the switching from analogue to digital transmission, so due to digital transmission better data services and spectrum efficiency was provided. During Second Generation (2G) era the Global System for mobile communication (GSM) was developed in Europe. Using this system International roaming and seamless services was offered in Europe. In the beginning GSM operates at 900 MHz Frequency band with bandwidth of 50 MHz. Many more advancement was made in GSM during last two decades of previous century, due to these improvements GSM became 2.5 G cellular networks. GSM cellular network was implemented over 190 countries and have approximately 800 million subscribers. In 1996 a new digital cellular system with additional services and supporting more data rate, called TDMA was put into practice. At the end of 20th century Second Generation (2G) cellular system was dominated, whoever it was evolving into a new generation called 3G due to increasing rate of mobile traffic. The enhancement of GPRS in GSM enabled it to support relatively high data rate and sharing capacity between the different users. Theoretically General Packet Radio Services (GPRS) support 160 Kbps but practically it provides only 40 Kbps [4].

C. Third Generation (3G)

The unexpected success of Second Generation (2G) networks persuaded the Telecom Companies to explore more to fulfill the upcoming user requirement of larger data rate and Quality of Services (QoS). This strong driving force enabled the vendors as well as Telecom Companies to launch the new applications such as wireless internet and video telephony. The expresses the upcoming demands of users and services provided by the Telecom Companies.

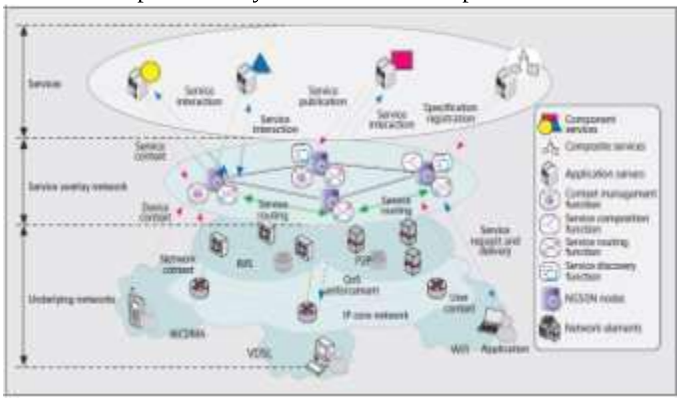


Figure: Layers of Heterogeneous Wireless Networks

D. Fourth Generation (4G)

The current standards of Telecommunication are driven to replace with 3G in upcoming years. This future cellular network is named as 4G. the objectives of 4G includes seamless communication with broad range connection with internet at any time anywhere and support of data, pictures and videos on internet. The 4G network will consist of internet protocols such as to facilitate the subscribers by enabling the selection of every application and any environment. In 4G cellular networks a high bandwidth with high data rate is required; also in 4G a quicker and optimized strategy of handover is required to make the clear and reliable communication. The 4G network system will run with the Cooperation of 2G and 3G and also will impart IP based wireless communication. The main target in 4G will be video streaming on IP based protocol, such as IP TV [7]

II. EVOLUTION OF 1G TO 4G

Table 2(a): Mobile Telephone Technologies

Technology	1G	2G	2.5G	3G	4G
Design Began	1970	1980	1985	1990	2000
Implementation	1984	1991	1999	2002	2010
Service	Analog Voice, Synchronous data to 9.6 kbps	Digital Voice, short messages	Higher capacity, packetized data	Higher capacity, broadband data upto 2 Mbps	Higher capacity, completely IP-oriented, multimedia, data to hundreds of megabits
Standards	AMPS, TACS, NMT, etc	TDMA, CDMA, GSM, PDC	GPRS, EDGE, 1xRTT	WCDMA, CDMA2000	Single Standard
Data Bandwidth	1.9 kbps	14.4 kbps	384 kbps	2 Mbps	200 Mbps
Core Network	PSTN	PSTN	PSTN, packet network	Packet network	Internet
Multiplexing	FDMA	TDMA, CDMA	TDMA, CDMA	CDMA	CDMA

Table 2(b): Wireless Network and Service Evolution

First Generation	Second Generation	Third Generation	Fourth Generation
• ? Mobile Telephone Service: Car phone	• ? Digital Voice + and Messaging -Data • Mobile Phone • ? Fixed Wireless Loop	• ? Integrated High Quality Audio, Video and Data • Narrowband and Broadband Multimedia Services + IN/IP integration	• Dynamic information access • Telepresence (virtual meetings, education, and training) • Wearable Devices
Analog Cellular Technology Macro cellular Systems	Digital Cellular Technology+ IN emergence Microcellular and Pico cellular: Capacity, quality Enhanced Cordless Technology	Broader Bandwidth CDMA Radio Transmission Information Compression Higher Frequency Spectrum Utilization IN + Network Management integration‰ IP technology	• ? Unified IP and seamless combination of • ? Broadband hot spots • ? WLAN/LAN/PAN • ? 2G/3G + 802.11 • ? Knowledge-Based Network Operations

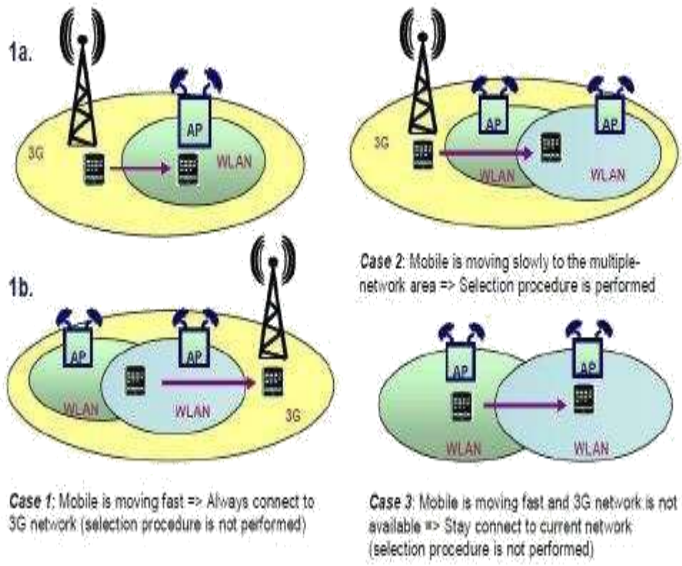
III. iPATH SYSTEM DESIGN

There are a wide range of mobility scenarios in terms of speed, available wireless coverage and available wireless media. An ideal handoff system is the system that has different handoff strategies based on moving speed of mobile host, available wireless coverage and available wireless media. Figure 2.3 shows scenarios with different moving speeds of the mobile host and available wireless media with assumed solution of each case.

1. Case 1: Mobile host is moving fast in the multiple-network area (WLANs and carrier network (e.g.,GPRS)) Mobile host always connects to the carrier network (vertical handoff selection is not performed).

2. Case 2: Mobile host is moving slowly in the multiple-network area (WLANs and carrier network (e.g.,GPRS)) Vertical handoff selection is performed.

3. Case 3: Mobile host is moving fast and no carrier network is available Handoff is triggered based on Received Signal Strength and related metrics (signal-to-noise ratio SNR, bit error rate BER).



Mobility Assumption and Handoff Strategies

In the scope of this thesis, my work focuses on mobile hosts moving slowly between wireless networks.

A. Path Property Retrieval Module

Path Property Retrieval Module collects end-to-end path properties; including available bandwidth, delay, packet loss rate and jitter, as handoff metrics (in this system, delay is represented by round-trip time (RTT)). End-to-end path properties are measured on every source and destination pair between end systems. To get the characteristics of a connection before it is really established is always difficult. Requirements for this module are:

_Reliable estimation of parameters
_Low intrusiveness
_Small measurement time.

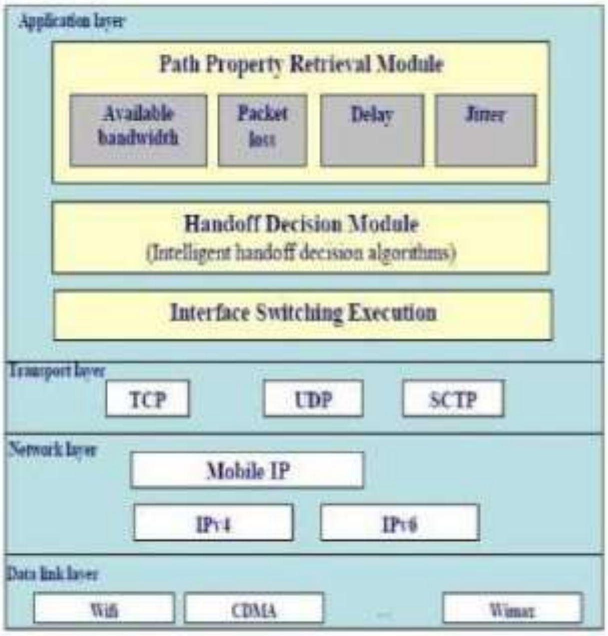


Figure: Design of iPath.

(PathChirp further degrades and it is the most inaccurate in multiple-bottleneck-link paths). To ensure the accuracy in different network situations, Pathload is adopted for our Path Retrieval Module. Operation of Pathload will be described briefly. Suppose that sender sends a periodic stream of K packets to receiver at a rate R, starting at an arbitrary time instant. The packet size is L bytes, and so packets are sent with a period of T=L/R time units. A is available bandwidth. If R > A, K packets of the periodic stream will arrive at receiver with increasing oneway delays (OWDs), while if R < A the stream packets will encounter equal OWDs. With each rate R, sender sends a fleet of N streams to have exact estimation of OWDs trend. When the calculated available bandwidth belong to a range of (Rmin, Rmax) and Rmax-Rmin ¡ defined resolution (resol),

he calculation stops.Pathload injects multiple packet streams to the measured paths. A drawback of Pathload is long measurement period. For faster measurement, we reduce the number of packets of a periodic stream (K) and the number of streams (N) of same transmission speed. In default mode, current parameters of Pathload are:

_ Packet size L=800B
_ T = packet spacing = 100us
_ Number of packets per stream K = 100 packets
_ Number of streams per fleet N = 12 streams

Pathload is modified for iPath so it can also measure RTT and packet loss rate. Jitter is inferred from RTT. iPath maintains them as path conditions in addition to the available bandwidth. The modified Pathload for Path Property Retrieval can specify the interface which it wants to measure.

IV. VERTICAL HANDOFF TECHNIQUES

The implementation of vertical handover model is based on Universal Seamless Handover Architecture (USHA), which is practical and simple solution. To access multiple wireless networks in heterogeneous wireless network, the mobile station or mobile devices will equipped with different network interfaces. To access multiple wireless networks in heterogeneous wireless network, the mobile station or mobile devices will equipped with different network interfaces. These mobile devices provide the flexible network access and connectivity to the users but to support different networks it create the stimulating problems. The process through which user maintain his call without any interruption, when he moves across one network to another network is referred to as handoff or handover process The process that is considered between the wireless networks having the same access technology is referred to as horizontal handover process. This handover technique is useless because of complexity when heterogeneous wireless networks overlapped [21]. In this situation new handover technique between networks having different access technology will be used and normally referred to as Vertical Handover Process

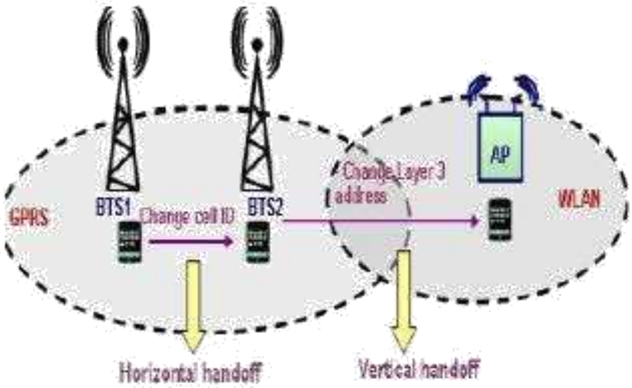


Figure Horizontal Handoff and Vertical Handoff

Hard-Handover and Soft-Handover

A hard-handover happens when the mobile node being connected to an access point, with an ongoing session, loses connectivity due to the change of access point, after that, a new Connection is established. Since communication is lost for a short period, this introduces a service interruption from the user point of view. Soft-handover allows the mobile node being connected to multiple access points in different networks, when the handover happens the connection is created in the target access point before the old access point releases the connection, making the process transparent for the user [22].

Vertical Handover process

Since the problem addressed in this thesis is the handover for the convergence of heterogeneous networks, defined as vertical handover, the process is explained in this section with some detail according to .The process can be divided into three steps:

• Network Discovery. In this initial step, the mobile node searches available wireless networks by listening service advertisements broadcasted by different technologies. In order to make this step feasible, it is assumed that the mobile node has multiple interfaces.

• Handover decision. Once the available networks are discovered, the next step is to decide, if possible, whether or not to perform the handover. Due to the differences between access technologies, the decision can be driven by many factors. Table 3.3, shows possible parameters to consider in order performing a handover

Table Possible Parameters to Consider in a Handover Decision

Handover decision parameters
Signal strength
Network Conditions
Services Provided
Cost
Application types
User Preferences

Handover Implementation. The implementation of handover considers the packets' transference of the ongoing session to the new wireless link, this requires the network to transfer routing information about the new target router to establish a new session. Owing to differences between access technologies, transfer of additional contextual information might be required [23]. This contextual information could include Quality of Service, authentication and authorization, among others. The aim of contextual transference is to minimize the impact of different access technologies and their polices to transfer different types of data on applications and services.

Kruskal's algorithm:

- Select the shortest edge in a network
- Select the next shortest edge which does not create a cycle
- Repeat step 2 until all vertices have been connected

Algorithm:

L→ Location, O_S→ Operator Service, Bs → Base Station

- Step1: Starting service.
- Step2: Connecting to current region network.
- Step3: If (L→Local)

Then "No need of handoff"
Else If (L→ Local) But OS → Not available, hence
Handoff to available desired network.

- Step4: If (L→Roaming)

Then "No need of handoff"
Else If (L→ Roaming) But OS → Not available, hence
Handoff to available desired network Using Spanning Tree.

- Step5:Connect to BS
- Step6: End

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