Performance Analysis of user Mobility & Packet Size in Heterogeneous Network

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Abstract— The fourth generation of wireless communications is expected to integrate a potentially large number of heterogeneous wireless technologies in what could be considered a huge step forward toward universal seamless access. One of the main challenges for seamless mobility is the availability of reliable horizontal and vertical handoff schemes. Heterogeneous networks provide large number of connection and data transmission path for users. Designed system focuses on vertical handoff possibility and mobility of users. Here radio access technologies (RATs) are considered as LTE, WLAN, UMTS, WiFi & WiMax. The designed system consists of vertical handoff (VHO) mechanism; plays a major role in handling seamless data transfer Vertical Handoff decision is based upon Received Signal Strength (RSS) measurements. The main goal is to reduce the processing overhead in the mobile terminal by handoff metrics for best network selection.

Key words: LTE, WLAN, UMTS

I. INTRODUCTION

The main aim of next generation wireless networks is to integrate various heterogeneous access technologies. Heterogeneous Wireless Networks are the networks which are having different access technologies, coverage, network architecture, transport protocols, routing and mobility management etc. Also different operator offers different services to mobile users According to ABC (Always Best Connected) and Anywhere Any time internet connectivity the user should be able to take advantage of the best available access network at any point in time .The IEEE 802.21 standard or Media Independent Handover (MIH) is a first step which allow mobile devices to successfully make a Hand-Over (HO) between networks of different technologies, such as Wi-MAX, Wi-Fi, UMTS, Bluetooth, or Ethernet[1].

A. Handoff:

A handoff is the process where the Mobile Node (MN) changes radio transmitter or access media used to provide the bearer services, while maintaining a defined bearer QoS. There are two types of handoff

1) Horizontal Handoff:
When there is a handover between same technologies (Homogeneous Networks) it is called as Horizontal Handoff.

2) Vertical Handoff:
When there is a handover between different types of network technologies (Heterogeneous Network) it is called Vertical Handoff.

B. Vertical Handoff Processes:

Vertical handoff between two networks access points, which are usually using different network connection technologies (LTE, WLAN, UMTS, WiFi & WiMax)

1) Handoff Information Gathering:
This phase is used to collect all information necessary to identify the need of handoff and which is the moment when they should be initiated.

2) Handoff Decision:
This phase is used to determine when and where to make the handoff process by selecting the appropriate access network.

3) Handoff Execution:
This phase is used to change channels according to the details required during the decision phase. These networks may also advertise the supported data rates and Quality of Service (QoS) parameters.

In VHO decision phase, the mobile terminal determines whether the connections should continue using the current network or be switched to another network. The decision may depend on various parameters or metrics including the type of the application, minimum bandwidth and delay required by the application, access cost, transmit power, security and the user's preferences. During the VHO execution phase, the connections in the mobile terminal are rerouted from the existing network to the new network in a seamless manner [2]

II. LITERATURE SURVEY

One of the goals of Next Generation Wireless Networks (NGWNs) refers to the ability of supporting heterogeneous wireless access technologies. The objective is to provide a diverse range of seamlessly provide high-data rate multimedia services across different wireless networks. To achieve this, we must rely on seamless vertical handoff techniques. In this paper distributed Simple Additive Weighting (SAW)-based vertical handoff mechanism is used. & the main goal is to reduce the processing overhead in the mobile terminal by delegating the calculation of handoff metrics for network selection to the Visiting Networks i.e. WiFi. Distributed Vertical Handoff Decision (DVHD) DVHD, delegates the handoff calculation to the VN rather than on the mobile terminal, as some approaches propose. Furthermore, DVHD also takes into account: bandwidth, the VoIP call dropping probability, and the cost (in money) as evaluation metrics to select heuristically a suitable VN. These metrics are gathered as a Multiple Attribute Decision Making (MADM) access selection function. Once the mobile terminal identifies potential VNs for the handoff, it broadcasts a handoff request message. This request message includes the terminal required handoff metrics with their respective weights[3].

A smart handoff decision mechanism is proposed in [4], authors propose two phases to accomplish the handoff decision: priority phase and normal phase, in priority phase a list of available networks is created, while in the normal phase a score function is used, in order to choose the best available network from the list, the function consists

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of three criteria: link capacity, cost and power consumption. In [5], the vertical handoff decision is evaluated via a handoff cost function and a handoff threshold function which can be adapted to changes in the network environment dynamically. All of these approaches mainly focused on the handoff decision, assuming that the calculation of the handoff decision criteria is performed on the mobile terminal side. Such calculation requires a non-negligible amount of resource that can impact on the mobile terminal performance in terms of processing delay when calculating handoff metrics for more than 2 available networks. Through this paper we call such schemes: Centralized Vertical Handoff Decision (CVHD).

Tein-Yaw David Chung and Kuan-Hui Lee[6] has suggested that packet loss aware NDMD algorithm (PLA-NDMD) to do network discovery in a heterogeneous wireless network environment. PLA-NDMD utilizes a cross-layer design between physical, data link and transport layer. It exploits RSS samples from the physical layer, based on which the motion of a MT (Mobile Terminal) is detected, just like NDMD. The NDMD[8] algorithm obtains an MT's moving information in a wireless environment without any assistance of a positing system and uses a set of rules to make handoff decision. NDMD calculates two smoothed received signal strength (SRSS). One is an agile SRSS and the other is a stable SRSS. To achieve best performance, MT needs to switch or handoff its connection between different or similar types of wireless networks.

A handoff process can be divided into three stages handoff initiation, network selection and handoff execution. In the first stage, an MT turns on all its wireless interfaces to discover which wireless networks are available. This process consumes much battery power. After that, the MT can obtain a list of available networks. Then, at the second stage, the MT needs to select the best access network. The network evaluation and selection method is the key work in this stage. In the third stage, the MT executes a handoff process to switch its connection so that the connection can remain un-interrupted.

III. PROPOSED SYSTEM

To solve the problem of vertical handoff, the designed solution analyses the handoff performance in Heterogeneous Network using user mobility & packet size, PDR etc. The designed solution also focuses on the smooth vertical handoff, so that the seamless connectivity between different network architecture will be formed. As the name implies heterogeneous network is a network architecture consisting of network components from different vendors using variety of operating systems and/or protocols. It can communicate with different types of network like, LTE, WLAN, UMTS, WiF i& WiMax. Designed systems consist of are three modules. Module I: Simulation of Existing Default Method, Module II: Simulation of designed system Method for Best network Selection, Module III: Comparative Study of existing system and designed systems.

Figure 1 shows the Designed System Flowchart In this, first the User makes a call, if the direction of user is known feed it & it will check the past history of user, if the call is regular call then network will be allotted without calculations else if the call is not the regular call calculate the utility factor along with the application.

U.F (Utility Factor): Data Rate + Cost + Bandwidth + Power Consumption + Delay -- (1)

Finally, Handover will do with the network which will have the maximum utility factor sequentially.

Vertical Handoff Algorithm Steps are as follows:

- Step 1: User makes a call
- Step 2: If the direction of user is known feed it
- Step 3: Past history of user will be checked
- Step 4: If the call is regular call then network will be allotted without calculations
- Step 5: Else if the call is not the regular call calculate the utility factor along with the application
- Step 6: U.F (Utility Factor): Data Rate + Cost + Bandwidth + Power Consumption + Delay
- Step 7: Handover to the network with maximum utility factor sequentially

Above vertical handoff algorithm steps are introduced in below flowchart. Figure 1 show the designed methodology used in for selection of best network in wireless heterogeneous networks.

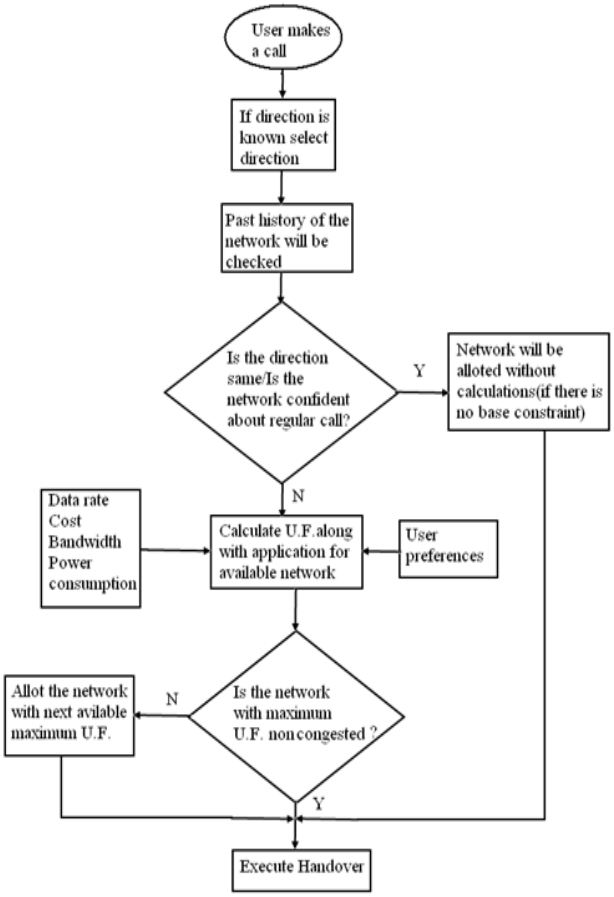

Fig. 1: Designed System Flowchart

IV. PERFORMANCE METRICS

Different performance metrics are used in the evaluation of routing protocols. They represent different characteristics of the overall network performance. The metrics considered are Handover Delay, average throughput Average jitter, Average end-to-end delay.

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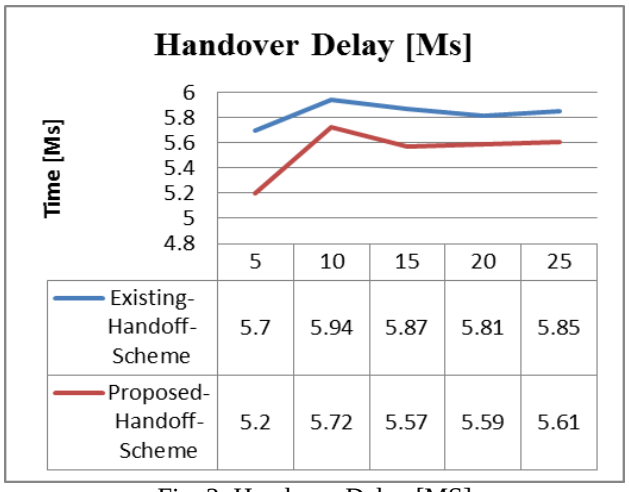

Fig. 2: Handover Delay [MS]

Above figure 2 shows the handover delays in existing. Delay defined as the average delay in transmission of a packet between two nodes. It uses result of existing system & designed system & it shows that existing system having large delay as compare to designed system.

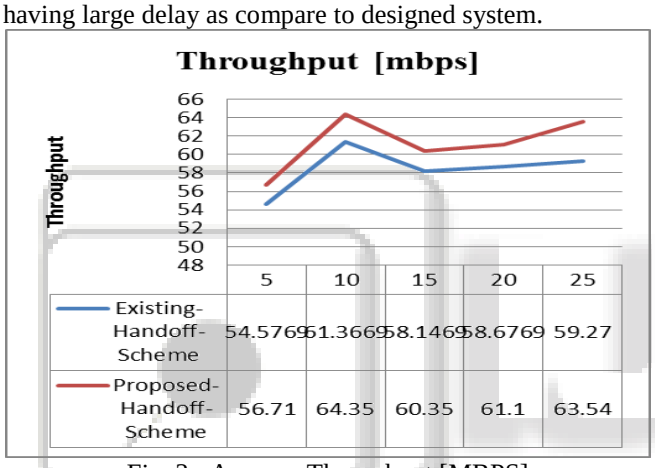

Fig. 3: Average Throughput [MBPS]

Throughput is a number of packets passing through the network in a unit of time. The throughput of a communication system may be affected by various factors, including the limitations of underlying analog physical medium, available processing power of the system components, and end-user behavior. Above figure 3 shows the higher throughput in designed system as compare to existing.

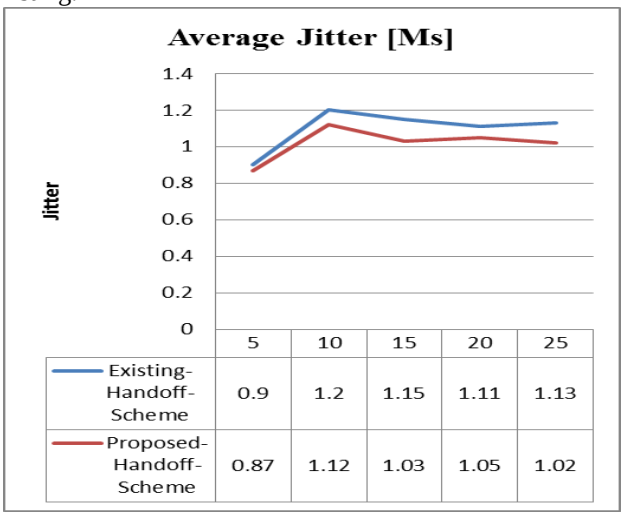

Fig. 4: Average Jitter

Jitter is the variation in the time between packets arriving, caused by network congestion, timing drift, or route changes. Figure 4 having less jitter in designed system as compare to existing systems.

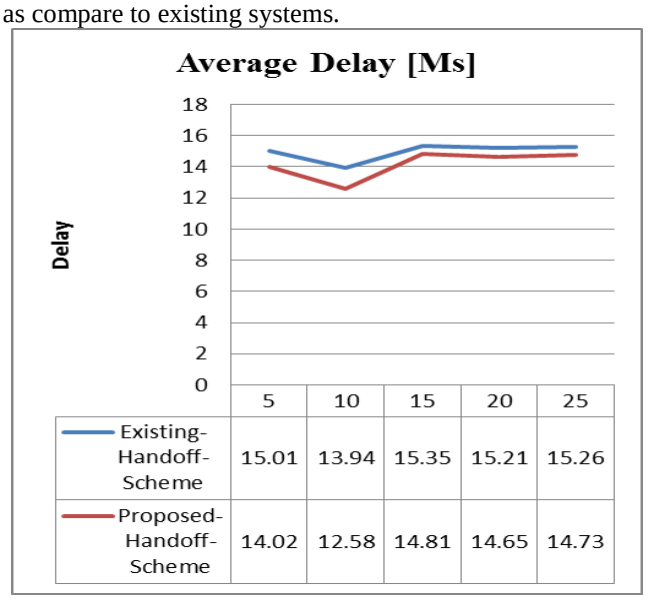

Fig. 5: Average End to End Delay

Figure 5 show the comparison of end to end delays in designed & existing system. The mobile station moves from one cell to another. It is composed of average propagation delay & average processing delay. To increases the performance of system delay must be low.

V. Conclusion & Future Work

In this paper, we investigate the performance of vertical handoff scheme for heterogeneous networks. For that purpose it uses utility factor which contents the Data Rate, Cost, Bandwidth, Power Consumption, Delay, which can increase lots of average data rate than the existing vertical handoff scheme. Simulation results show the comparison of designed system & existing system. It also shows that designed scheme exhibited better performance in terms of processing delay, handoff blocking rate and throughput, than the existing scheme. Moreover, the designed system provide the seamless connectivity as future research work, we are planning its experimental validation in real test beds.

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