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ABSTRACT

The world is rapidly getting more and more connected, and people are becoming increasingly mobile. Because of this, there is enormous increase in demand for efficient wireless communication networks. One approach to answer the growing demand of efficient network services is to integrate various wireless and mobile systems currently existing. This integration will empower mobile users to be "always connected" by using best available access networks, thereby generating a set of heterogeneous environment for mobile users and service providers.

The heterogeneous networks represent a new era in communications where voice, data and multimedia are offered over a common medium comprising all necessary underlying technologies for service support, authentication, security and billing. Quality of Service (QoS) in communication networks is the ability of various components, devices and also of service providers to offer some level of assurance so that service requirements are satisfied. Thus, the success of next generation especially fourth generation (4G) wireless communication networks will depend on the ability to provide seamless and adaptive QoS in a heterogeneous environment.

The recent advances in wireless communication technology and the unprecedented growth of the internet have paved the way for wireless networking and IP mobility. Mobile IP version 4 protocols have been developed within the Internet Engineering Task Force (IETF) to allow a mobile user to roam anywhere on the internet. The IPv4 protocol has been successfully used for the past two decades to provide network connectivity between the various fixed computers on the Internet. However, the mobility of the devices between different homogeneous or heterogeneous networks raises many issues, which cannot be handled by IPv4.

Thus, IPv4 was extended to include support for Mobile IP i.e. Mobile IPv6 that updates the current version of the Internet protocol (IPv4) to allow a virtually limitless number of

IP addresses, removing restrictions on the number of users or devices that can be accessed over the Internet in the future. MIPv6 enables, "routing optimization" and solves the "Triangular Routing Problem of Mobile IPv4". Though Mobile IPv6 reduces many drawbacks of Mobile IPv4 still it faces many issues like latencies, signaling load, HA failures etc.

These issues can be solved with the introduction of HMIPv6 protocol. Main aim for the development of HMIPv6 for 4G networks is to provide optimal route along with fast transition performance, maximum coverage, reduced signaling load during handoff by performing registrations locally, best audio quality, minimize delay, packet loss, Micro-mobility and macro-mobility concepts with the introduction of new entity MAP, maximum accessibility, and provision for provide other QoS parameters according to the requirements of users, but it adds complexity to the network management entity and has some bottlenecks such as frequent handoffs, signaling cost, and packet process cost etc., that influences its efficiency.

Having stated the above mentioned problems, the objectives of this research are to propose architectures which select the next best possible MAP based various attributes of MN viz. speed, history pattern, type of mobility and direction. This research focuses on QoS parameters in 4G heterogeneous wireless networks. The advancement in technology demands more and more QoS in the communication networks, thereby becoming a thrust area for recent research. This thesis builds upon by presenting the details about 1G, 2G, 3G and 4G wireless networks along with QoS issues, comprehensive discussions about Mobile IPv4, Mobile IPv6, functional model of HMIPv6 and their respective QoS issues. Finally, two novel architectures named **3 U**ser **ATT**ribute (3UATT) and **4 U**ser **ATT**ribute (4UATT) are proposed which result in providing efficient QoS parameters such as minimizing handoff latency, location update cost, signaling overhead, packet loss, and load on higher level of MAPs. Proposed **S**peed, **H**istory pattern, and **M**obility type followed by MN **MAP SEL**ection (SHMAPSEL) algorithm is simulated with the help of OMNeT++ simulator in order to validate the contributions. The significant achievements of the proposed scheme includes reduction in handoff initialization delay, effective dynamic load distribution on higher MAPs, decreased number of location updates to HA, reduction in packet delivery delay.