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An Architecture for Mobility Management and Performance Evaluation

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Abstract— In wireless network, the mobility management performs mobile related operations in Universal Mobile Telecommunication system (UMTS) and Global System for mobile communications. Mobile Internet Protocol (MIP) is used for mobility in IP networks and evaluates the performance parameters such as handoff delay analysis, packet loss analysis and signalling cost analysis. Mobility Management have been propose an integrated model, to reduce the handover latency and packet loss during handover, jitter, reducing the signalling traffic related to Mobile Terminal(MT) with Home Agents(HA).This technique conclude the better approach for its future research

Keywords— Mobile IP, Mobility Management, Performance evaluation, UMTS, IMS

I. INTRODUCTION

During the past few years, advances in mobile communication theory have enabled the development of different wireless access technology .In wireless access technologies, advances in wireless access devices (such as laptops, palmtops, and cell phones) , we have seen a rapid growth in cellular mobile telecommunications[12] and Internet. Another important trend over the past few years is the emergence of the Voice over IP (VoIP) services and its rapid growth [13]. The natural evolution of these technologies is towards a wireless Internet. This sets the platform for high-speed mobile communications that provide high-speed data and both real and non-real time multimedia to mobile users. Today's wireless world uses several communication devices such as Bluetooth for personal area, IEEE 802.11 for local area, Universal Mobile Telecommunication System (UMTS) for wide area [1-2] and satellite networks for global network and Code-Division Multiple Access 2000 (CDMA 2000) [5].These networks are designed independently for some special service needs of mobile users and vary widely in terms of their service parameters. Mobile users are demanding anywhere and anytime access to high speed data, real and non-real time multimedia services from next generation wireless systems.

II. IMS BASED SESSION MANAGEMENT

IMS is the control plane of the 3rd Generation Partnership Project (3GPP) architecture for its next generation telecommunications network [3-4]. It provide a wide range of real-time, packet-based services and use for both traditional packet or time-based charging and service-based charging.IMS provide the services such as mixed voice and video calls, multi-media messaging, web integration, push-to-talk and Video-on-Demand. The initial release of 3GPP2-IMS was further updated by 3GPP's original IMS specification.IMS consists of two major components such as IMS Database Management System (IMS DB) and the IMS Transaction Management System (IMS TM). In IMS DB, the data is organized into a hierarchy. IMS TM controls I/O processing, provides formatting and recovery of messages that maintains communications security, and oversees the scheduling and execution of programs as summarized as below:

- *3GPP-IMS:* The 3rd Generation Partnership Project (3GPP) is a relationship between groups of telecommunications associations are known as the Organizational Partners. It was originally designed by the wireless standards for 3GPP for evolving mobile networks beyond GSM.
- *3GPP2-IMS:* 3rd Generation Partnership Project 2 (3GPP2) which specifies standards for another 3G technology based on CDMA, commonly known as CDMA2000. *3*GPP2 has capability authority to define, publish and set standards within the 3GPP.

III. MIP Mobility approaches CELLULAR INTERWORKING

To presenting the cellular interworking framework, the underlying architectural considerations will be outlined.

A. Architectural Considerations

When a common interworking platform for 3G cellular networks is considered many challenges lie ahead. Choosing the appropriate IP version and defining a mobility management Platform, which is common for both 3GPP and 3GPP2 are some such challenges. As defined by 3GPP2, if IPv4[6] is deployed, the Packet Data Switching Node (PDSN) of the CDMA2000 home network may act as the MIP Home Agent (HA) or Foreign Agent (FA) as the Mobile Node (MN) moves. In the event when MIPv6 is implemented, direct peer-to-peer communications may be established through its route optimization operation. Since 3GPP2's IMS does not fully support inter-PDSN mobility for IPv6 [7], the proposed design will be primarily based on MIPv4. Other reasons for using MIPv4 are as follows: it eliminates the complexity of

managing two IP addresses and enables IP mobility management transparently to the layers [10]. In each FA can act either as an FA or GFA according to the user mobility. The basic structure, which consists in the connection in a regional network, is distributed among the FAs. The number of FAs attached to a GFA is adjusted for each MT. Thus, the regional network boundary varies for each MT.

B.Interworking Architecture

The internetworking architecture is illustrated.

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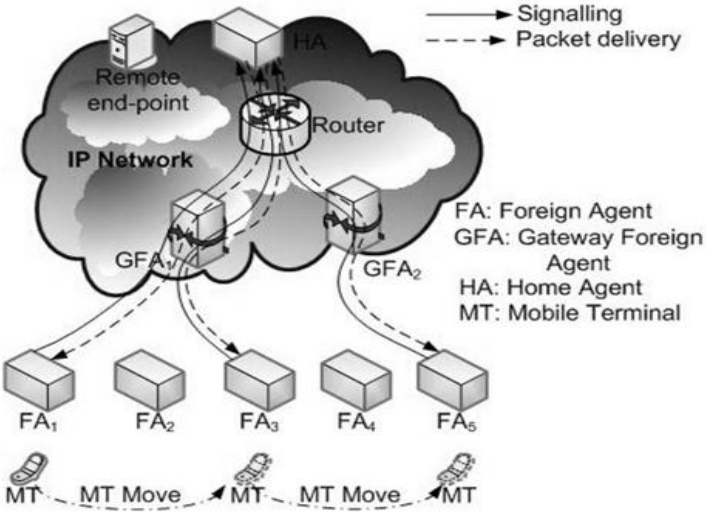

Figure1: MIP mobility architecture

The analytic models are proposed to compute the total signalling traffic for location update and packet delivery is transferred with minimal network resource and low delay. This approach requires that each FA is able to act as an FA and a GFA. Moreover, it adds processing load on the MT to estimate the average packet arrival rate and the subnet residence time. Hence, the main advantage of this approach is the system robustness enhancement since the GFA failure affects only the packets routing to MTs belonging to this GFA. The disadvantages are the system infrastructure and MTs costs which could be high. The data flow is routed from source to destination bypassing the home network. Only Following the UMTS system acquisition, setting up the data pipeline takes place. The IP address allocation for the MN is initiated by sending the MIPv4 registration request to HA via the GGSN (MIP-FA).

C. Broadcasting Approaches in the mobility management and performance evaluation

The following broadcasting approaches are there in mobility management and evaluate the performance as:

i. *Unicasting*: In this message or data is sent from source to a single destination.
ii. *Multicasting*: In this message or data is sent from source to a set of destinations at proper locations.
iii. *Broadcasting*: In this the message is flooded from source to all other nodes in a specified network.
iv. *Geocasting*: In this message is sent from source to all other nodes in a specified geographical network.

D. Characteristics of architecture of mobility management

- Economical
- Scalable
- Transparency to heterogeneous access technologies
- Efficient use of network resources
- Seamless Mobility Support
- Movable device
- Limited security
- Enhanced scalability, reliability, robustness

IV. PERFORMANCE MODELING

An analytical model is derived for evaluating the performance of mobility management for proposed scheme. It support of personal, service and terminal mobility such that it allow user to access network services anywhere, and continue their ongoing communication. It access network services anywhere using one's own mobile terminal .It supports both real-time and non-real-time multimedia services such as Mobile Telephony, mobile web access, and mobile data services in a way that their prices and performances are comparable.

A. Handoff Delay Analysis

On the other hand, handoff management is the process by which a user keeps its connection active when it moves from one base station (BS) to another [7-8].There exist efficient location management techniques. It has minimum handoff latency and low packet loss and limited packet failure. The handoff is two types:

a) Horizontal Handoff: Horizontal handoff is handoff between two BSs of the same system. Horizontal handoff can be further classified such as:
   - *Link-Layer Handoff*: Horizontal handoff between two BSs that are under the same foreign agent (FA).
   - *Intra-System Handoff*: Horizontal handoff between two BSs that belong to two different FAs and both the FAs belong to the same system.

b) Vertical Handoff: Handoff between two BSs that belong to two different systems and hence to two different GFAs. There are three logical levels of hand-off [14-15] procedure:

- *Cell Hand-off*: It allows an MS to move from a cell to another in a subnet within an administrative domain. One subnet may consist of multiple cells. IP address of the mobile host remains same in this case.
- *Subnet hand-off:* It allows an MS to move from a cell within a subnet to an adjacent cell within another subnet that belongs to the same administrative domain.
- *Domain hand-off*: It allows an MS to move from one subnet within an administrative domain to another in a different administrative domain.

B. Packet Loss Analysis

The total packet loss during a session can be defined as the sum of all lost packets during a handoff while the MN is receiving downlink data packets. It is assumed that the packet loss begins when handoff is detected and all in-flight packets are lost during the vertical handoff time.

C. Signalling Cost Analysis

The resultant signalling cost of mobility management during a vertical handoff can be analysed as the accumulative traffic load on exchanging signalling messages during the MN's communication session.

V. APPLICATION OF MOBILITY MANAGEMENT

Application of mobility managements involves mobility tiers. The proposed mobility management scheme needs to provide means of terminal, session and service, and personal mobility such as:

a) *Terminal mobility:* Multimedia traffic is categorized as real-time or non-real-time traffic and is mostly characterized by delay and loss factors. Most of the real-time traffic is carried over UDP where as non-real-time traffic is carried over TCP. Terminal mobility provides means of cell, subnet and domain hand-off while the session is in progress.
b) *Terminal Mobility for Real-Time application:* For multimedia applications which are typically UDP based, delay and loss are of packets concern. Hence it is paramount to decrease the latency as much as possible. Handoff is an important factor for terminal mobility for multimedia calls which would determine the latency.
c) *Non-Real-time application:* It maintains a current record of Mobile's ongoing TCP connections identifiers within the MS.This approach can also be used to forward any transits data from a router.
d) *Service Mobility:* Service mobility refers to the end user's ability to maintain ongoing sessions and obtain services in a transparent manner regardless of the end user's point of attachment. The service mobility includes the ability of the service home provider to either maintain control of the services.
e) *Personal Mobility:* Personal mobility refers to the ability of end users to originate and receive calls. They access the subscribed network services on any terminal in any location in a transparent manner, and the ability of the network to identify end users as they move across administrative domains.

VI. CHALLENGES FOR MOBILITY MANAGEMENT AND PERFORMANCE EVALUATION

Regardless the attractive potential, there are some challenges as well which mobility management and performance evaluation faces. These are as given below

i. Asymmetric design of applications and protocols.
ii. The use of network-based proxies which perform complex functions on behalf of mobile users.
iii. The use of pre-fetching and caching of critical data. We examine how these techniques have been applied to several systems and present results in an attempt to quantify their relative effectiveness.

VII. CONCLUSION

In this paper, architecture of Mobility Management in 3G Cellular networks and evaluates its performance parameters such as no of handoff delay, packet loss and signalling cost analysis. The requirements and issues are involved with the architecture of MIP and approaches for mobility management .The analytical modelling vertical handoff performance metrics such as delay, transient packet loss, jitter, and signalling cost. In which we discuss the performance evaluation

modelling and challenger and application of mobility management. Both end-to-end delay and jitter parameters for the considered scenarios for real-time VoIP communications.

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