Survey of different Solutions for Simultaneous Mobility Problem using mSCTP Protocol

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ABSTRACT
Next generation wireless network need the support of all the advances on new architectures, standards, protocols. Mobility management is an important issue in the area of mobile communication. Mobility management is divided into two parts, first one is Location management and second one is Handoff Management. Again Handoff management is divided into two parts, Horizontal handoff and Vertical handoff.

In today's mobile communication era, in case of simultaneous mobility, achieving seamless handoff is very important task. In this article we surveyed different simultaneous mobility issues using mSCTP protocol with different solutions.

Keywords
Simultaneous Mobility, mSCTP, Handoff Management, Location Management, Seamless handoff, Binding updates.

1. INTRODUCTION
In last few years, number of mobile devices as well as access technologies have increased. The devices are increases with growing speed. The access technologies are converging into one heterogeneous networks where different access technologies with different parameters complement each other. Heterogeneous networks bring out some benefits for user. In this paper mobility management architecture for seamless handover of mobile users in heterogeneous networks is given.

Seamless mobility with quality of service and the proper handoff and location management contributes to the real time application of mobile communication. The simultaneous mobility problem occurs when there are two mobile nodes in a communications session are in normal state, and they both move such that the binding updates that they send to each other are both lost through the late arrival, and such that the communications session never returns from interrupted state to normal state, but is ended. In the case of simultaneous mobility however, the probability of broken association may become high because both endpoints may suffer from losing address binding update. One of the most emerging techniques in recent research for mobility management is mobile Stream Transmission Control Protocol (mSCTP). It is works well in the case of non-simultaneous mobility where the SCTP association is established between a mobile endpoint and a stationary one. When simultaneous handover occurs, alternative scheme is designed to minimize handover latency between two different networks with location management support. To achieve improved seamless performance the multi-homing feature of Stream Control Transmission Protocol (SCTP) and dynamic address reconfiguration (DAR) extension of SCTP are applied to solution.

1.1 Simultaneous Mobility Problem
The simultaneous mobility problem is very important problem currently. It may cause communication between the MNs to break or even cannot be resumed, which will affect the normal function of the network. To solve simultaneous mobility problem, fast mobility must taken into consideration. When the simultaneous mobility problem occurs, it results in the loss of a binding update from a Mobile Host because it is sent to a previous address of the other Mobile Host that is also moving at around the same time. Binding update is the act of MN to update its new Care of Address. It is between Mobile node and Home Agent and between Mobile node and Correspondent Node. But in case of simultaneous mobility both end points are mobile. So the Binding Updates between them is as shown in Fig.1. Both BU's may get lost in this case because of belated arrivals. The simultaneous mobility problem does not occur if the binding update from the node that moved earlier reaches to the other node before that node moves.

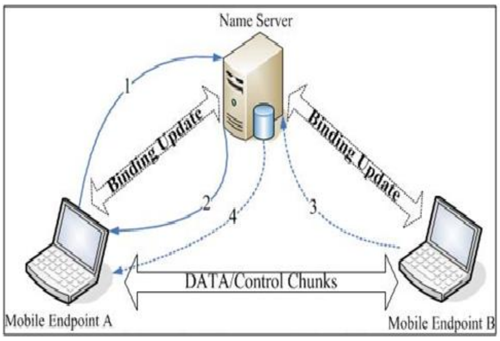

Fig. 1: Binding Update[3]

1.2 Seamless Handoff
Seamless handoff [1], provides end-to-end IP continuity without failures in the communication. Seamless handover is a fundamental concern in any system with mobility. It is the attempt to provide a given QoS also during the process of migration from one domain to another. Seamless handover is a fundamental issue in mobility management, and it faces many challenges, include in-order packet delivery, no packet replication, no packet loss, low signaling overhead and minimum handover latency. A seamless handover is the handover that has both smooth (with no or very little packet loss) and fast (low latency) features. Most of the current mobility management protocols such as the mobile IPv4 or mobile IPv6 and its variants standardized by the IETF do not support global seamless handover. This is because they require comprehensive changes in the existing network. Seamless handoff provides end-to-end IP continuity without

failures in the midst of a download activity due to link outages or handovers. What this means is that a user or application that is connected to a handoff server could seamlessly and transparently switch back and forth between different internet technologies, without compromising any communication activity. Seamless handover ensures successful data transfer even when the underlying link connections are damaged or disrupted due to device mobility. Furthermore, it guarantees this lossless Quality-of-Service when a mobile user or application passes through different alternative technologies.

2. SOLUTIONS TO SIMULTANEOUS MOBILITY PROBLEM

2.1 LS enabled Simultaneous Mobility Management

In [2], the analysis of simultaneous mobility issues in seamless handover using mSCTP protocol is done. Ibrahim Chowdhury and Mohammad Iqbal have proposed an alternate solution based on simultaneous mobility model with independent location server i.e. LS. The researchers further analyze the handover latency of mSCTP in simultaneous mobility and seamless handover by reducing the handover latency with the help of LS. The multi-homing feature of Stream Control Transmission Protocol (SCTP) and dynamic address reconfiguration (DAR) extension of SCTP are applied in the proposed solution to achieve improved seamless performance. In this paper, researchers used an additional Location Server (LS) as shown in fig.2 to ensure location management between simultaneously moving mobile nodes (MNs) while simultaneous handover occurs. This research is dedicated to design a new model of simultaneous mobility based on `Step length ' and the implementation of the model i.e. mSCTP with LS to solve the simultaneous mobility issues. `Step length ' is random distance travelled by the simultaneously moving MNs in each step when location changes. This approach has improved performance in reducing handover delay as well as handling simultaneous mobility issues in seamless handover.

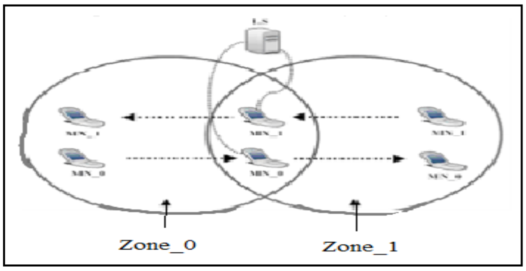

Fig.2 Location Management by using Location server [2]

2.2 Simultaneous Mobility with mSCTP

In [3], the researchers discuss about the solution for simultaneous mobility issues in seamless handover with mSCTP. Simultaneous mobility is the case when both hosts are mobile nodes and they move at about the same time. Seamless handover is a fundamental issue in mobility management, and it faces many challenges, include in-order packet delivery, no packet replication, no packet loss, low signaling overhead and minimum handover latency. A seamless handover is the handover that has both smooth (with no or very little packet loss) and fast (low latency) features. There are several standard and non-standard solutions for making the handover seamless such as HMIPv6, FMIPv6, S-MIP. These solutions obviously improve the handover performance, especially the latency, but in practice the handover delay is still very high for time-sensitive services. To enhance the mSCTP handling the simultaneous mobility problem, the researchers advances a new solution combining AHF, SMDF and NS, as shown in Fig. 3.

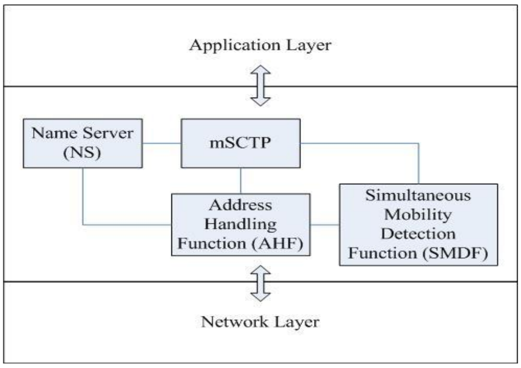

Fig. 3. mSCTP protocol[3]

2.3 Multi-binding Solution for Simultaneous Mobility of MIPv6

In [4], researchers analyzes simultaneous mobility problem for MIPv6 and proposes multi-binding solution based on home agent. Simultaneous mobility problem is an urgent problem currently. It may cause communications between the MNs to break or even can't be resumed, which will affect the normal function of the network. To solve simultaneous mobility problem, consecutive fast mobility must be taken into consideration. This would be when a MN moves to a new network and begins registrations, however, before these procedures complete, the MN moves again to a new network. At the same time, improving handoff performance must be taken into consideration, too. In this paper, researchers assume that a MN always moves in several range limited networks, then propose a scheme to solve MIPv6 simultaneous mobility problem and improve the MNs' handoff performance on this assumption. This paper analyses several procedure possibly lead to message lost, and based on the existing solutions, proposes a new scheme. The scheme is multi-binding based on HA. The disadvantage of this solution is it cannot evaluate complex simulations and improve our scheme according to the simulation results.

2.4 Simultaneous Mobility in MIPv6

Mobile IPv6 (MIPv6) includes a procedure for route optimization, which allows packets from the correspondent host to go directly to the mobile host. However, the way route optimization is implemented makes it vulnerable to problems with simultaneous mobility, which can occur when two mobile hosts are communicating with each other. In this paper, researchers suggest ways to change MIPv6 to reduce its vulnerability to the simultaneous mobility problem. They introduced and discussed three possible solutions in this paper [9]. First one is Forwarding Mechanisms from Previous Network, Second one is Stationary Proxies. And the third one is Signaling to Home Address. In comparing the solutions, researchers found that the third solution, "signaling to the home address" is the best. It is efficient and keeps the spirit and flavor of MIPv6, requiring only small modifications to home agents and MNs.

2.5 Features of mSCTP and SCTP protocol

This article[5] introduces the main features of SCTP, and discusses the state of the art in SCTP research and development activities. The main features of SCTP are Multihoming, Multistreaming, Congestion Control and Security. Multihoming allows an association between two endpoints span across multiple IP addresses or network interface cards. Multistreaming allows data from the upper layer application to be multiplexed onto one channel (called association in SCTP Sequencing of data is done within a stream; if a segment belonging to a certain stream is lost, segments (from that stream) following the lost one will be stored in the receiver's stream buffer until the lost segment is retransmitted from the source. However, data from other streams can still be passed to the upper-layer application. SCTP congestion control is based on the well proven rate-adaptive window-based congestion control scheme of TCP. This ensures that SCTP will reduce its sending rate during network congestion and prevent congestion collapse in a shared network. SCTP provides reliable transmission and detects lost, reordered, duplicate, or corrupt packets. It provides reliability by retransmitting lost or corrupt packets. Because a transport protocol could carry sensitive information like billing data or critical signaling messages, the developers of SCTP paid attention to the security mechanisms of the protocol. SCTP identified the following two security objectives: The service availability of reliable and timely data transport and The integrity of the user-to-user information carried by SCTP. There are many differences between SCTP and TCP protocol discussed in this article. And many applications of SCTP protocol are described here.

Table1. Comparison Between Network Layer Protocol and mSCTP

Features	MIP	HMIPv6	FMIPv6	mSCTP
Operating Layer	Network	Network	Network	Transport
IP Connections	one	one	one	More than one
Packets Reordering	Very Low	Very Low	Minimum	required
Concurrent multi-path transfer	Not possible	Not possible	Not possible	possible
Type of Handover	Hard	Hard	Hard	Soft
Packet Loss	High	High	High	Least in comparison
Handover Latency	Bad	Moderate	Very Good	Very Good
Impact of speed of MN on Throughput	Bad	Bad	Very Bad	Least in comparison
Location Managemen t	Provided	Provided	Provided	Not Provided

The host mobility problem may be attacked from many layers. Link layer support is mandatory in any case, but can do very little to either preserve higher layer connections or provide location management when movement is across administrative domains. The common network layer solution is Mobile IP, which, has several limitations. Most of Mobile IP's problems can be tackled by a higher transport or session layer approach. Due to cultural unacceptance of a session layer, the transport layer approaches to mobility are likely the strongest, despite requiring modifications to well established protocols like TCP. By deploying mobility-enabled TCP implementations, applications that use TCP may transparently gain mobility support just as they do with Mobile IP, with fewer potential problems. Although the question of at what layer mobility should properly be provided is largely an open one, researchers suggest the transport layer as the strongest candidate and have presented common strengths and weaknesses of approaches at various levels.

3. DISCUSSION AND REMARK

Many researchers have worked or working on Simultaneous Mobility problem. Many of them introduced many techniques to achieve seamless handoff in case of Simultaneous mobility. They achieve Location Management by using location server , handoff management by doing low handover delay. Someone add new functions like name server(NS), Address Handling Function (AHF) and Simultaneous mobility detection Function(SMDF) to mSCTP protocol architecture.

4. CONCLUSION

Mobility is becoming a crucial component for the future Internet. As IP-based networks were originally designed for fixed IP nodes, mobility solutions have a most important part to play in the future envisaged heterogeneous network environment. As the migration becomes important to everyone the need for simultaneous mobility also increasing. So providing seamless mobility for everyone and everywhere is the aim of this research. This solution aims at maximizing the end-users perceive quality and minimize the handover Latency. In the future work the location management problem in case of mSCTP protocol must be handled.

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