Implementation of Route Optimization Mobile IP to Analyze the TCP Performance during Handoff

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Abstract: ***Mobile Internet Protocol (MIP) is developed by Internet Engineering Task Force (IETF) which maintains the network connectivity in the internet when the mobile node changes their current network to another network without changing their IP addresses. One of the main problems in the original mobile internet protocol is the triangle routing problem. Triangle routing problem appears when the packet is sent from Correspond Node to Mobile node through the home agent of its home network. This paper proposes a new technique to improve the Performance of the original MIP during the handoff. This proposed new technique can also reduce end to end packet delay and number of packet loss during handoff which improves TCP performance. In this paper, complete survey on mobile IP for route optimization is discussed.***

Keywords: Mobile Internet Protocol (MIP), Correspond Node (CN), Home Agent (HA), Foreign Agent (FA).

1. Introduction

Mobile IP (MIP) is an Internet Engineering Task Force (IETF) standard protocol which allows users to carry on their own IP addresses even though they move from one network to the other. Users can use their local IP addresses permanently regardless of having a link-layer point of connection. Mobile IP supports a present Internet Protocol in both wired and Wireless networks. There is no need to make an adjustment for other nodes in order to converse with the nodes with Mobile IP functionality.

Original MIP has many evils such as home agent faults tolerance [1], HA overloading and triangle routing problem. Triangle routing problem is considered as one of the main Problems facing the completion of MIP. When a Corresponding Node (CN) sends packet to the MN, the packet gets first to the HA, which encapsulates this packet and tunnels it to the FA. The FA de-tunnels the packet and delivers it to the MN. The route taken by this traffic is Triangular in nature and the most extreme case of routing can be observed when the CN and the MN are in the same subnet [2, 3].

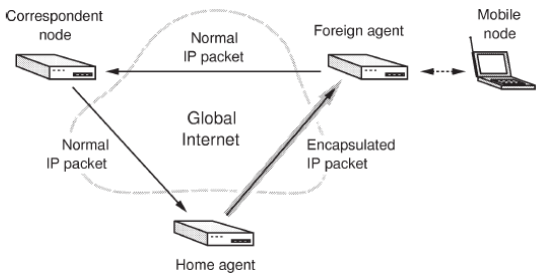

Figure 1: Overview of the basic mobile IP

MIP supports mobility by clearly binding the home address of the MN with its COA some devoted routers known as mobility agents maintain this mobility binding. Mobility Agents are of two types - home agents and foreign agent and basic three operations such as agent discovery, agent mobility registration and agent mobility tunneling to send packet CN TO MN.

Agent discovery are used to find whether the MN is in a home or foreign network. This process is done by either the gent Advertisement or Agent Solicitation communication process [11,1]. Usually, the FA from time to time broadcasts the Internet Router Discovery Protocol (IRDP) message [11] in its own network to let the visited MN know the FA is here and what services the FA provides (Agent Advertisement). Thus, the MN knows which network it belongs to. In case the MN does not receive this message, it can request the service by sending a solicitation message to inform the FA directly (Agent Solicitation). If there is no answer back during a limited time, the MN attempts to use the Dynamic Host Configuration Protocol (DHCP) to acquire a new IP address. [11].

Agent registration process in MIP is to inform the mobility agent with a mobile node's new IP address and update the binding information between home address of the mobile node and its COA and correspondent nodes to communicate with mobile nodes directly. Once a mobile node has a COA, it registers its COA with its home agent so that the home agent knows where to forward its packets on the network Configuration, the mobile node could either register directly or indirectly.

Agent Tunneling operation is to deliver packets from the MN to the HA and vice versa, either the FA or the MN has to do tunneling to stay away from the route propagation problem. After the tunnel is established, it is considered as just only one hop end-to-end from either the FA or the MN to the HA. Basically, there are three kinds of encapsulation

technique. First, a traditional IP-in-IP encapsulation [3], Second, Perkins proposed the idea of the Minimal Encapsulation [4]. Third, The Generic routing encapsulation (GRE) [15] is another tunneling protocol, which supports various kinds of transport protocols over IP network. In Section 2 includes Literature Survey, Section 3 describes Proposed Methodology, Section 4 gives the Proposed Outcome, & Section 5 briefly describes the conclusion & future work.

2. Literature Review

Different technique have been invented to solve the triangle routing problem, such as surrogate HA (SHA) Technique [16], Mobile IP Border Gateway (MBG) [10], Reverse Routing [12],location register[13] forward tunneling and, the smooth handoff technique [6], binding cache [4], bidirectional route Optimization [5],a virtual home agent [7], and a port Address translation based route optimization scheme [8]. Also, Kumar et to overcome the triangle routing problem and reduce packet loss during handoff.

This paper proposes a new technique for solving the triangle routing problem in Mobile IP and reducing the delay and all the packets transferred between the CN and the MN. In this technique, apply the Genetic algorithm to find the optimal best path at Correspondent node (CN) in a hierarchical network To evaluate the performance of the proposed technique, a simulation is carried out using NS-2 simulator on Linux platform .

3. Proposed Methodology

In this proposed technique to solve the triangle routing problem of MIP to reduce the handoff delay, packet loss and Improve, TCP performance during handoff. A MN initiates a handoff Whenever a mobile node change their current network to other network an area of a mobility agent different from its current area.

During a handoff, MN is unreachable and packets may be lost if no buffering scheme is used. A hierarchical network is considered for the new technique, in which the routers and nodes are arranged logically in the form of parents and children.

The network is divided into domains clubbed together to form higher level domains and so on till one reaches at the top, which is known as the root. The hierarchical network helps in organizing and managing the network. It represents an idealized Internet where optimal paths are used. Our hierarchical network contains the HA, FAs, MN, and standard IPv4 nodes without mobility support. The addressing system used in this network model consists of multi levels of hierarchy.

In the proposed technique as the MN moves away from its HN, it registers a new COA with the HA. The HA forwards the new COA and all information related to the MN to a CN .The packets destined for MN is tunneled at that router instead of the HA node, which saves the transmission time.

4. Proposed Outcome

In this we present our proposed outcome of the original MIP, the proposed technique Simulations are conducted to investigate three serious performance issues, i.e. end to end packet delay, packet loss during handoffs and TCP performance . The simulations are run using the open source NS2 simulator .which is widely used in the networking community to study IP networks.

In the network model, it is assumed that all the routers have mobility support and the router in CN can keep the current position of mobile in its routing table. It is also assumed that the multi level above the home agent is capable of performing the encapsulation (IP in IP). The random mobility pattern's movement scenario for our simulations were generated using the steeds utility of NS2, with one MN, the grid area, the maximum speed, traffic type, link delay, transmitter range, bandwidth, packet rate, packet size, and simulation time as its parameters.

Implementation of Route Optimization Mobile IP will provide shortest route to deliver the packet CN to MN, Improve TCP performance, Reduce end to and delay, Reduce packet loss during handoff.

5. Conclusion

The implementation of Route Optimization varies with different underlying operating Systems. We chose Linux as platform because of consideration to keep consistency with the implementation platform of basic Mobile IP as well as its various advantages such as Open source code, Unix API, and popularity. Route Optimization can present effective evidence to the choice between Mobile IP with Route Optimization and basic Mobile IP.

Our conclusion is that the efficiency gain in Route Optimization is influenced by network conditions but it is considerable in most situations.

We proposed an efficient approach to deal with triangle routing problem in Mobile IP. Unlike the conventional MIP, tunneling process of the proposed approach occurs in CN using GA algorithm in a hierarchical network, the proposed mechanism can reduce end to end delay, packet loss during handoff, improve TCP performance unlike original MIP.

6. Future Work

Another important feature of Route Optimization is smooth handoff. Packets on the fly will be received by the previous foreign agent and forwarded to the new foreign agent when a mobile node is moving from one network to another network.

Smooth handoff will reduce the packet loss during the movement. However, more work such as creating the visiting list in a foreign agent and handling the Binding Update message from the new foreign agent to the previous foreign agent, is necessary. The performance of smooth handoff needs to be evaluated to decide whether smooth

handoff is worthy being added to Route Optimization. In this GA algorithm is discussed. The performance of the TCP needs be evaluated in the future.

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