

Handovers using ring network composed of ring node equipment including lower MAC address memory, and top equipment

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SUMMARY I propose Ethernet handover in one large domain of ring network with L2, L3 switch function covered by transferring Ethernet frame from mobile nodes to a router via base station and ring network. I clarified handover behavior using the ring network that has some packet's add, drop and passing equipment including packet dropping lower MAC address memory, packet passing address table and short time packet dropping address table, realizing layer 2 switch function. Also, I investigated handover method that old BS that sends certification packet to new BS when the old BS receives request packet from handover mobile node for sending certification packet for handover mobile node, and then, new BS sets mobile channel for handover mobile node. I moreover clarified new lower MAC address memory structure. As IPv6 address case, I clarified that MAC address part of IPv6 address needs to be used as MAC address of MAC packet.
key words: lower address memory, packet passing address table, packet dropping address table, ring network

1. Introduction

In mobile services, there are telephone, cloud-tablet communication, and internet services and so on. Recently, mobile IPv6 handover has been widely investigated in mobile network [1-3]. Mobile IPv6 handover realizes rapid handover by using FBU (Fast Biding Update between old access router and mobile node). The handover is complicated because of using new access router and CoA (Care of address in BS (base station)). This increases delay in handover. It is a solution to reduce the opportunity of using CoA. IPv6 gives NIC MAC address to BS. If IP address between old BS and new BS does not change, Access Router may not be connected to some mobile nodes in a subnet. In the mobile network of this paper, one large domain of Ethernet is used. If service provider server that is exit of mobile network in contact with internet, does not discover destination IP address of packet from mobile node in corresponding table between private source IP address of packet from mobile node and source IP address of packet from internet, the sever must use CoA of the sever IPv6 address for the mobile node packet. Different between mobile IPv6 handover and proposal handover is size of subnet and use of ring handover technique. Proposal network system concentrates all ring mobile node packet transfer routes on top equipment connected to the router, of ring network by using special MAC address structure. This network structure enables

use of lower MAC address storing memory in ring node equipment. Large subnet is cost effective and needs particular hard. The hard ware is proposal lower MAC address memory. Legacy MAC address table can't memorize many MAC addresses. Large domain handover need not change MAC address and IP address in more case of handover. There are many techniques in ring handover. In this method, when a mobile node moves from old BS to new BS, erroneous lower address agreement between aim MAC address and aimless MAC address happens in lower MAC address memory of a ring node equipment. This problem can be avoided by using small number address table with one side MAC address for distinguishing lower address of aim MAC address from lower address of the other side MAC address when two lower addresses are not unique. For solution of the problem for the movement of mobile node, there is moreover necessity of using extra memory such as short time packet passing lower address memory or short time packet dropping address table or by packet waiting means of router for waiting packets that have same lower address of destination MAC address of packets going to ring network from sever, corresponding lower address of source MAC address of packet of mobile node that moved from old BS to new BS, for the method using packet passing address table (address table that designates packet passage through ring node equipment) and packet dropping lower address memory.

Under consideration of congestion, MN's receiving consequent packets from maker cloud and handover delay, method having short time packet passing lower address memory or short time packet dropping address table is best.

This paper is organized as follows: Section 2 describes proposal network structure, Section 3 describes proposal packet's add, drop and pass equipment used in ring network system, Section 4 describes a proposal of ring handover techniques, Section 5 describes conclusion.

2. Proposal network structure

2.1 Handover network structure using Ethernet address

Proposal network structure using Ethernet is shown in

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Fig.1. This structure has one domain of MAC address between mobile nodes and a router connected to top equipment via ring node equipment(packet's add, drop and passage equipment) connected to some base stations by L2,L3 switch, IPv6 for maintenance and national private home IPv4 address or home IPv6 address is used between mobile nodes and service provider server. The top equipment has ring port cutting packets except OAM packet and packet with loop back bit in ring restoration, from clockwise ring not to pass packets except packet having loop back bit through.

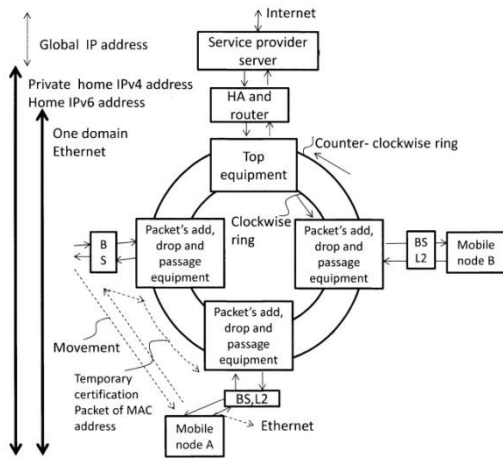


Fig.1 Handover network structure using Ethernet for address transferring packet in mobile network

Home agent function and ARP table for MAC address and IP address of mobile nodes are included in the router. Destination IP address of packet transferring from mobile node to service provider server is global IP address. TCP protocol of mobile node has retransmission function during receiving packets from server. UDP packet and sound packet both must use ring handover techniques because fixed UDP packet transfer route is influenced by call packet or handover of sound packet. When mobile node moves from old BS to new BS, mobile node send request packet for temporary certification packet of MAC address of the mobile node to old base station. The packet having old BS source MAC address and new BS destination MAC address and including MAC address of the mobile node in option field of IPv4 header is sent from old BS to new BS via ring. This packet sets MAC address and IP address of moving mobile node to ARP table of new BS.

2.2 Handover network structure using source MAC address of home IPv6

Handover network structure using source MAC address part of home IPv6 as MAC address of MAC packet

has one domain between mobile nodes and a router connected to top equipment via ring node equipment(access layer 2,3 switch)connected to some base stations by L2,L3 switch and home IPv6 address occupying from mobile nodes to new BS and CoA IPv6 address occupying from new BS to corresponding node is used in handover. When mobile node moves from old BS to new BS, mobile node send request packet for temporary certification packet of MAC address of the mobile node to old station.

The top equipment has ring port cutting packets except OAM packet from clockwise ring not to pass packets though.

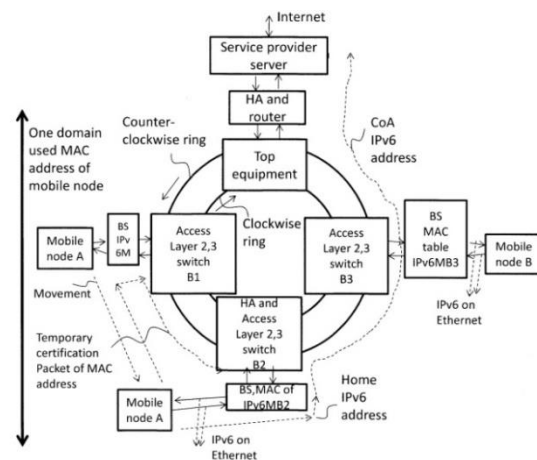


Fig. 2 Handover network structure using source MAC address part of home IPv6 as source MAC address of MAC packet transferred in mobile network.

3. Packet's add, drop and pass equipment

Memory system of packet's add, drop and passage equipment enabled for common use in Fig1 and Fig.2 is composed by using single bit memorizing memory. This single bit memory idea is opened in reference [4]. As base structure of lower MAC address memory using the idea, memory module using data memorized domain as lower address of IP address is described in previous studies [5-6]. A packet's add, drop and pass equipment using the base structure is shown in Fig.3. This example uses three external SRAMs connected to ASIC. The three SRAMs are lower address memory, packet passing address table and packet drop assistant address table. The ASIC is composed by logic circuit of decoding signal of lower side of lower MAC address, bit0 writing signal and latch signal of one selected external SRAM output data, one systematic signal of sequencers for packet headers from ADD line, counter-clockwise ring and clockwise ring, controlling SRAMs and the logic circuit. The ASIC may have CPU for stack of erase packet order

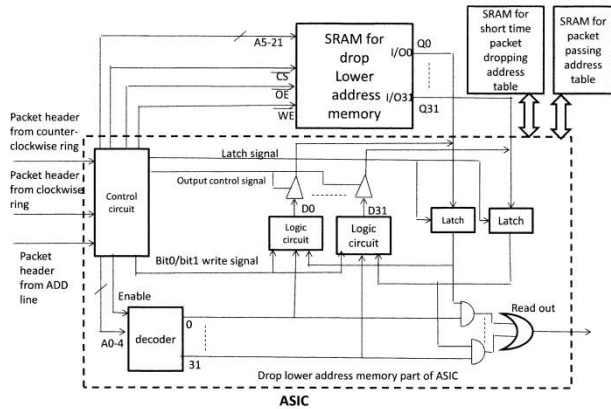


Fig. 3 Proposal memory system with ASIC connected to 3 SRAMs for packet dropping lower address memory, packet passing address table and short time packet dropping address table

erasing lower address of mobile node MAC address from lower address memory of packet’s add, drop and pass equipment belonged by previous BS requested for erasing lower address of mobile node MAC address by the handover mobile node. Lower address memory can memorize a great many lower addresses of MAC address because lower address memory is one bit memorizing memory. But effect memorizing lower address number is about 10%. The example of SRAM with 17 bit memory address length and 32bits data (5bits lower side of lower address of MAC address) width can memorize nominal 400 million lower addresses. Lower address memory is needed for testing memory bits. Because test of all memory bits needs high consume power, test of memory bits of memorized bit 1 may be only examined softly. This case is lower exhausted power than MAC address table that memorizes 48 bits plus port number. MAC address number memorized in the packet passing address table of Fig.3 is about 3 in the case (mobile node number of packets from ADD line: 1000, mobile node number of packets on ring: 50000, and lower address memory bit number: 24bits)

4. Proposals of ring handover techniques

4.1 Handover method using short time packet dropping address table as measures for erroneous packet dropping

Proposal handover system is composed by ring network having some ring node equipment(packet’s add, drop and pass equipment) with lower address memory and packet passing address table and short time packet drop address table, a router and a server. This system handover method is shown in Fig.4. This system behaves as follows: (a), In case that ring node equipment receives packet from base station, lower address of source MAC address of the packet is memorized into lower address

memory dropping packet from ring((1)of Fig.4). In this case, when ring node equipment received first packet sent from handover mobile node via new BS that had new downward mobile channel set ((5) of Fig.4) for the handover mobile node by new BS’s receiving certification packet from old BS, source MAC address of the packet is temporarily memorized into short time packet dropping address table and lower address of the source MAC address of the packet is memorized into packet dropping lower address memory ((7) of Fig.4).

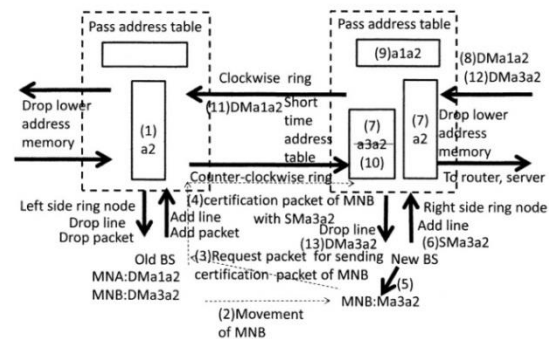


Fig. 4 Handover method using packet’s add, drop and passing equipment including packet dropping lower address memory, packet passing address table and short time packet dropping address table

(b),In case that the ring node equipment receives packet from counter-clockwise ring, if lower address of source MAC address of the packet is memorized into lower address memory for dropping packet from ring, source MAC address of the packet is memorized into packet passing address table. (c),In case that ring node equipment receives packet from clockwise ring, if destination MAC address of the packet is memorized in packet passing address table, the packet passes to clockwise ring and if destination MAC address of the packet is memorized in short time packet dropping address table, the packet is dropped from ring and if destination MAC address of the packet is not memorized in both packet passing address table and short time packet dropping address table and lower address of destination MAC address of the packet and lower address of MAC address memorized in short time packet dropping address table is same, the packet passes to clockwise ring and destination MAC address of the packet is memorized into packet passing address table and the MAC address of short time packet dropping address table is erased((9)(10) of Fig.4). In case except abovementioned cases, if lower address of destination MAC address of the packet is memorizing in packet dropping lower address memory, the packet is dropped

from ring and if lower address of destination MAC address of the packet is not memorizing in packet dropping lower address memory, the packet passes to clockwise ring.

4.2 Handover method using short time packet passing lower address memory as measures for erroneous packet dropping

Proposal other ring handover technique is shown in Fig.5. This system behaves as follows:(a),when ring node equipment receives packet from base station, lower address of source MAC address of the packet is memorized into lower address memory for dropping packet from ring((1)in Fig.5). In this case, when ring node equipment received first packet sent from new BS that had set new downward mobile channel using OFDM ((6)in Fig.5) for the handover mobile node by new BS's receiving certification packet from old BS, lower address of source MAC address of the packet is memorized into both short time packet passing address memory and packet dropping lower address memory ((8)in Fig.5). (b),In case that the ring node equipment receives packet from counter-clockwise ring, if lower address of source MAC address of the packet is memorized into lower address memory for dropping packet from ring, source MAC address of the packet is memorized into packet passing address table.(c),In case that ring node equipment receives packet from clockwise ring, if destination MAC address of the packet is memorized into packet passing address table, the packet passes to clockwise ring and if destination MAC address of the packet is not memorized into packet passing address table and lower address of destination MAC address of the packet is memorized in both packet dropping lower address memory and short time packet passing lower address memory, the packet is copied and copy packet of the packet go through clockwise ring, having copy bit, the other packet of copy packet drops from ring((10)in Fig.5). If abovementioned packet having copy bit drops from ring to BS and if destination MAC address of the packet is memorized except MAC address of mobile node that had request packet of BS's sending certification packet toward new BS, sent to old BS, in MAC address table of the BS, the packet is copied and copy packet (called packet transfer route repair packet) of the packet, that had destination MAC address of the packet put on source MAC address field of the packet, is sent on counter-clockwise ring toward top equipment((13)in Fig.5). When the repair packet reaches packet's add, drop and passing equipment in which lower address of source MAC address of the packet is memorized in both packet dropping lower address memory and short time packet passing lower address memory, source MAC address of the packet is memorized into packet passing address table and the lower MAC address of short time packet passing address memory is erased ((14),(15)in Fig.5) .

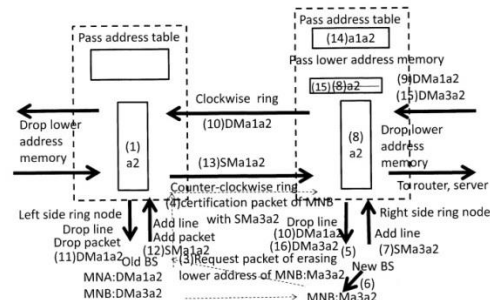


Fig. 5 Handover method using packet's add, drop and passing equipment including packet dropping lower address memory, packet passing address table and short time packet passing lower address memory

5. Conclusion

I proposed Ethernet handover techniques in one large domain stretched from mobile nodes to a router via base station and ring network having some packet's add, drop and passing equipment including packet dropping lower MAC address memory, packet passing address table and short time packet dropping address table. This handover technique uses certification packet from old BS to new BS and is strong for congestion despite of difficulty in looking for the lower address of MAC address of short time packet dropping address table, corresponding lower address of destination MAC address of the packet from clockwise ring. Also, I proposed new lower MAC address memory structure. .

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