# Live-Video Service using Multicast in Wireless Network

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***Abstract***

*This paper presents a live-video service using multicast in wireless network. The switching/multicast agent (SMA) in this system provides multicast for effective use of network resources in WLAN and reduces the load of video server and access points(AP). Also, the SMA and AP support a handover mechanism for moving mobile nodes(MN) using identification number(ID#) of AP (AP_#) that the MNs are visiting while they move within WLAN. The AP_# is added to IP address assigned from the first accessed AP. Except the MN receives multicast group address(MGA) from SMA, this IP address never changes even if the MN moves among other APs. The overhead for handover using AP_# is negligible in video service. The proposed live-video system using multicast provides a seamless video service by adding AP_# only without reassigning of IP address from a new AP when MN moves one AP to another.*

***Keywords:*** *Multicast, Handover, Multimedia, Access Point*

## 1. Introduction

In WLAN, the one of the most popular services for mobile devices is video services. The video services are increasing continually according to the development of high-speed Internet. Many researchers have studied to overcome many problems for smooth video services because they have lots of data in comparison with text one[1,2,3,4]. Especially in WLAN, some of important problems are insufficient network bandwidth, reconnection and cutoff of service according to reassigning IP address as the mobile devices movement.

This paper deals with a seamless live-video service technique in WLAN. It adopts multicast technique to solve the problems for insufficient network bandwidth and the load of video server on Internet, and handover mechanism that use 2-byte long AP_# as IP header to prevent cutoff service and reconnection to video server according to the mobile devices movement.

As mobile nodes (MNs) enter the transmission range of an AP in WLAN, the AP assigns IP address to MNs. The MN can be serviced from the video server on Internet while it stays within the range. But when the MN is out of range of the AP or visits other AP, the connection breaks, and the MN has to reconnect to server after reassigned another IP address from visited AP. Also, MNs suffer from congestion when the requests of video are more [5, 6, 7]. This paper solves these problems using multicast and a seamless handover mechanism.

The rest of this paper is as follows: Section 2 describes the structure of a seamless live-video system using multicast in WLAN. Section 3 explains the operation of

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proposed system and analysis of the results for proposed system. Finally, we discuss our conclusion.

## 2. The Structure of a Seamless Live-Video System using Multicast in WLAN

The structure of the proposed a seamless live-video system using multicast in WLAN as shown in Figure 1 consists of a video server, a switching/multicast agent (SMA), some access points (AP) and a number of mobile nodes (MN) just like in reference paper 9.

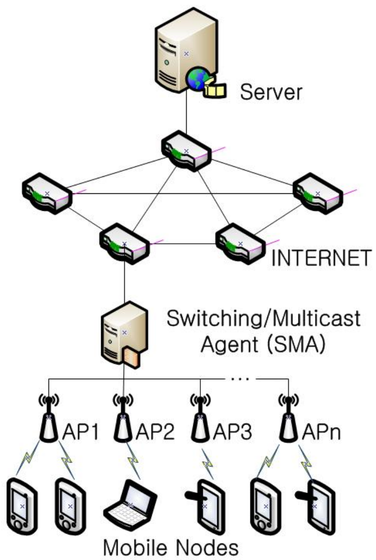


**Figure 1. The Structure of the Proposed Seamless Live-video System using Multicast in WLAN**

The SMA provides handover mechanism as MN moves to other AP's boundary and multicast technique applying when many MNs request the same live-video items such as news, television program and the televising of sporting events. Thus, multicast technique can gather a single group the same live-video requests [8, 9]. In this paper, the SMA generates multicast group address (MGA) for a group and transmits it to all MNs within the group. And the SMA has a mapping table that manages the relationship of MNs and APs. Using this mapping table the SMA can switch the flow of live-video and multicasting streams according to MNs movement [10]. The SMA can change overwrite bit 0 to 1 and it operates to protect that 2-byte long IP header have to expanded when MN moves among 3 APs more. And as mentioned above, the SMA's mapping table indicates that a specific MN is controlled by a certain AP. Also, the SMA has a multicast group table to indicate that multicast groups are servicing.

The AP generates 2-byte long ID# of AP (AP_#) as an IP header in addition to the usual IP address under the traditional method. The AP_# fields are classified 3-AP_#s [5, 10]. The 1st AP_# and the usual IP address assigned from the first AP when MN enters WLAN for the first time do not change while MN exists this WLAN except receiving multicast group address(MGA) from the SMA. Thus MN changes the usual IP to MGA after receive it from the SA. The next 2-AP_#s indicate APs accessed as MN moves among APs. Therefore AP adds only AP_# whenever it moves among APs. And AP can notify to SA that MN's position using this AP_#.

This proposed system adopts multicast technique to solve insufficient network bandwidth in WLAN and the load of video server. The core part of multicast technique not video server but switching/multicast agent (SMA). Thus, multicast grouping is accomplished in SMA when a number of MNs request the same video item. As a result, multicast for live-video operates only in WLAN.

The SMA generates a MGA as soon as it receives the same requests from other MNs when the requested video is servicing, and it sends multicast address to MNs requesting service. Then the SA retransmits successive live-video streams to APs using MGA, next the APs transmit these streams to the multicast group.

## 3. The Operation for a Seamless Live-Video Service using Multicast in WLAN

As mentioned in Section 2, the proposed multicast transmission and handover mechanism are simple and effective techniques for live-video service in WLAN. The proposed techniques are capable of service that reduces the load of video server and number of channel using multicast and delay without cutoff and reconnection according to the MNs' movement. In section 3, we present the operation for a seamless live-video service using multicast in WLAN.

The Figure 2 shows the structure of a new IP header for multicast and handover. The Figure 2(a) indicates IP header format for handover, it consists of 4-parts as 2-byte long IP header that has 3-AP_# and 1-bit overwrite bit(ob) [10].

In the Figure 2, IP_1 address does not change when the MN stays in this WLAN except that the MN receives multicast group address (MGA) from SMA. It indicates a specific MNi receives an IP_1 address from AP3 for the first time when it enters WLAN. At this time SMA saves that AP3 assigned IP address (IP_1) to MNi. The Figure 2(b) shows MNi is moved to AP5 and AP9 sequentially.

The Figure 2(c) shows MGA is issued by SMA. It means SMA grouped a number of requests for the same video to a single multicast group. The SMA retransmits video packets to this multicast group. And a number of MNs receive multicast packet with joining this MGA.

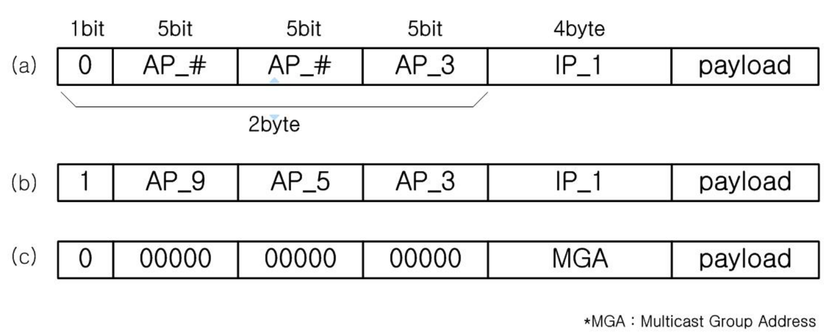


**Figure 2. The Structure of IP Header**

The Figure 3 compares the number of channels required for live-video services when they serviced through unicast and multicast according to the service request rate(λ= 5 to

50). As shown Figure 3, we can confirm that the number of channel is decreased when the service requests are increasing as adopting multicast technique

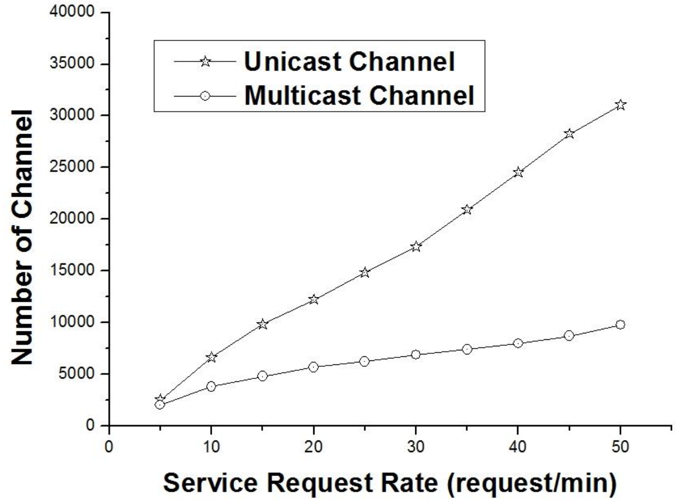


**Figure 3. The Comparison of Number of Channel Required According to Service Request Rate**

The Figure 4 compares total delay time of the proposed service mechanism and traditional one according to the service request rates (λ= 5 to 50). The Figure 3 and 4 show that the number of channels and total delay time of the proposed system are more decrease when the service request rates increase

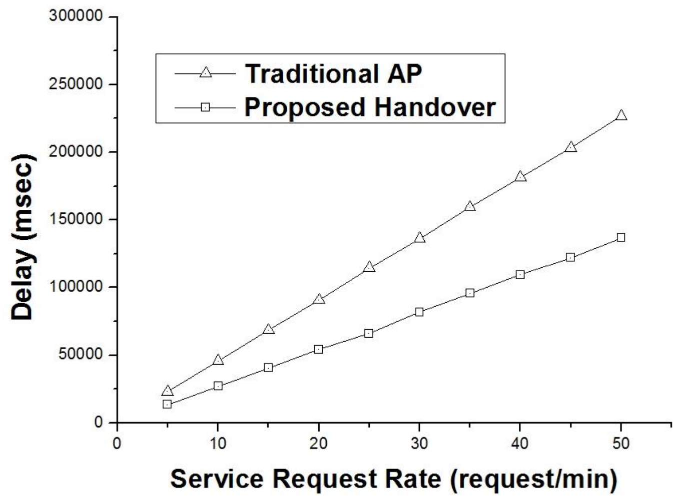


**Figure 4. The Comparison of Delay According to Service Request Rate**

# 4. Conclusion

For providing a seamless live-video (news, TV sports events and programs) service in wireless network, this paper adopts a combined method of multicast transmission technique and handover mechanism. They solve insufficient network bandwidth and prevent cutoff service and reconnection to video server in wireless network. To achieve a smooth service we adopt switching/multicast agent(SMA) that generate a multicast group address for the same live-video requests, and support a seamless service without cutoff and reconnection when MNs moves among APs. The delay time is short because multicast technique is not achieved on video server but on SMA. The overhead for 2-byte long AP_# used in handover mechanism is negligible in comparison with video data transmitting in wireless network. And the proposed system confirmed achieving a smooth handover without cutoff and reconnection using AP_#, and low delay in the process of handover. Also, it can decrease effectively the number of channel for live-video service.

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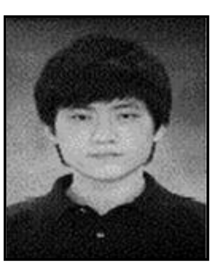

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