IEEE 802.16 MMR 시스템 기반의 복수 단말들을 위한 메시지 압축 전송 방안

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Message Compression Scheme for Overhead Reduction In IEEE 802.16 MMR System

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요 약

Recently, IEEE 802.16 mobile multi-hop relay(MMR) system is significantly considered for throughput improvement and coverage extension in wireless communications[1][2]. Relay station(RS) plays an important role for the aims. However, network topology has been changed when RS newly joins. Therefore, some modifications in overall system are required for enabling RS operation. Message delivery scheme is a part of that. In this paper, we propose an efficient message delivery scheme for IEEE 802.16 MMR system. Our proposed scheme reduces control message overhead without the degradation of system performance.

I. Introduction

IEEE 802.16 MMR aims at achieving throughput enhancement and/or coverage extension in IEEE 802.16 system through backward compatible relaying technologies. In conventional IEEE 802.16 standard, mobility is not considered. However, IEEE 802.16 MMR should be able to support mobile stations(MSs). Recently, related study items are actively discussed in many communication areas to make the new network system work satisfactorily under existing structure and access control procedures of IEEE 802.16-2004 and IEEE 802.16e standards.

In order to improve throughput, a link between two nodes which has a long distance can be broken up into two links that have relatively short distances. Therefore, we can get better channel quality. This makes it possible that higher level of modulation and coding rate can be used for throughput improvement.

Coverage extension is also possible. For coverage extension, RS should forward not only data packets but also control messages to MSs which are out of direct communication range from BS. These MSs can communicate with BS only through the RS. But, the relay of control message may make multi-hop system complicated when backward compatibility is considered. Moreover, amount of control message is inevitably to be increased because of relaying.

Some modifications in the system are required for enabling the RS operation because network topology is changed due to newly joining of the RS into the network. Nevertheless, the system should have transparency from the MS's perspective. That means, MSs does not care of existence of RS. MSs existing in conventional 802.16 system should be still available in 802.16 MMR system.

One of the most significant modifications for MMR system is message delivery process. Sometimes, messages are not relayed by RS when the purpose of the relay system is only throughput increase. In this case, only data are relayed. Control messages are directly delivered to MSs from BS. That is because message transmission is somehow bothersome than data traffic. If we intend to concentrate on throughput enhancement, this scheme would be better. But all MSs should be inside of BS의 coverage in that case.

However, if we want to extend cell coverage through multi-hop relay system, relaying message is essential. In this case, MSs which are out of the BS의 coverage can receive signaling information and communicate with BS through RS. It results in coverage extension.

In this paper, we assume control messages are also relayed in the multi-hop relay system. Here we propose an efficient message delivery scheme for multi-hop relay system by using message concatenation. Our proposed scheme reduces control message overhead without the degradation of system performance.

A brief description of conventional message delivery scheme of IEEE 802.16 MMR system, which is inefficient in terms of resource saving, is given in Section II. In Section III, the proposed message delivery scheme is described in detail. Furthermore, efficiency of the scheme will be shown in Section IV. Finally, some conclusions and further works are explained in Section V.

II. Conventional Scheme

In multi-hop system, MSs receive messages for some signaling procedures. When they are able to directly communicate BS, messages are transmitted between BS and MS just like in the manner of single-hop system.

However, if some MSs are not in that situation, all the data and messages should be relayed by RS. So, the RS relays a message from BS to MS in order for a bunch of signaling process. BS firstly send a message to RS, and then RS send the message to MS again. This causes that an exactly same message should be transmitted twice between the two links, namely BS to RS, and RS to MS.