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| Re: | IEEE 802.16j-06/027: "Call for Technical Proposals regarding IEEE Project P802.16j" | |
| Abstract | This proposal clarifies the service flow management in MR with distributed RS. | |
| Purpose | Discuss and adopt proposed text. | |
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Amendment to Service Flow Management in MR Network with Distributed Scheduling

1. Introduction

The service flow management procedure defined in baseline document describes the general admission control procedure in the MR networks. However, there are three aspects that are not correctly addressed. This contribution identifies these three aspects and proposes amendment to the related text.

- The DSx*-REQ/ACK messages are sent from the MR-BS to all the RSs on a path. With the scheme defined in the baseline document, these messages are first sent from MR-BS to the first RS on the path using its basic CID, and then that RS sends the message to its subordinate neighbouring RS using its subordinate neighbour's basic CID. However, with embedded path management scheme, a RS doesn't know the basic CID of its subordinate neighbour. To solve this problem, we propose to construct and route the DSx*-REQ/ACK messages in the following way: the DSx*-REQ/ACK is sent from MR-BS to the access RS using the basic CID of the access RS. Such DSx*-REQ/ACK message is processed by every RS on the path, and then forwarded to its subordinate neighbour until the access RS is reached.
- In order to obtain the admission control decision from all the RSs on the path that a service flow will traverse, the DSx*-REQ/ACK messages should follow the same path as the service flow. However, current baseline document doesn't provide mechanism to ensure this. To solve this problem, we propose to include the following information in the DSx*-REQ/ACK, depending on different path management scheme.
 - o With explicit path management scheme, a path id that the MR-BS choose to route the service flow is included in the DSA*-REQ and DSA*-ACK. The intermediate RSs should use path id to decide the next hop to forward the DSA*-REQ and DSA*-ACK.
 - o With embedded path management scheme, the following two cases apply:
 - With systematic CID scheme, the intermediate RSs should use the systematic CID carried in the service flow parameters to determine the next hop to route the DSA*-REQ and DSA*-ACK, until the access RS is reached.
 - When CID encapsulation scheme is used, MR-BS should include a complete path information in the DSA*-REQ and DSA*-ACK. The intermediate RSs should use the included path information carried in path-info TLV to decide the next hop to forward the DSA*-REQ and DSA*-ACK.
- When an intermediate RS receives a DSA* or DSC*-REQ, but cannot support the minimum requirement of the service flow (e.g., the minimum bit rate), there is no need for forwarding the message to the next hop. It can directly send a response back to the MR-BS. However, the current baseline document doesn't provide such mechanism. We propose to add this process into the service management procedure.

2. Specific Text Change

6.3.2.3.10 DSA-REQ message

[Change the first two paragraph in 6.3.2.3.10 as following:]

Insert the following text after the second paragraph at the end of 6.3.2.3.10:

Before admitting a service flow, the MR-BS shall send a DSA*-REQ to ~~all~~ the access RSs on the path. This DSA*-REQ is processed by all the intermediate RSs on the path, in order to obtain the admission control decision from all the associated RS. The CID associated with the service flow ~~needs to be~~ is included in the Service Flow CID TLV field in ~~the~~ is DSA*-REQ message, ~~and The CID~~ could be a transport CID for an individual MS or a tunnel CID. The CID used on the MAC header is the basic CID of the access RS.

The DSA*-REQ shall contain the following TLVs:

Service Flow Parameters (see 11.3)

Specification of the service flow's traffic characteristics and scheduling requirements

HMAC/CMAC Tuple (see 11.1.2)

The HMAC/CMAC Tuple attribute contains a keyed message digest (to authenticate the sender). The HMAC/CMAC Tuple attribute shall be the final attribute in the DSA* message's attribute list.

The DSA*-REQ message may contain the following TLV, if explicit path management is used:

Path ID (see 11.22.4)

Specification of the id of the path that the service flow will traverse

The DSA*-REQ message may contain the following TLV, if CID encapsulation is used with embedded path management scheme:

Path Info (see 11.22.10)

Specification of the detailed path information

6.3.2.3.11 DSA-RSP message

[Change the first two paragraphs in 6.3.2.3.11 as following:]

Insert the following text after the second paragraph at the end of 6.3.2.3.11:

Upon receiving a DSA*-REQ from MR-BS, ~~an intermediate RS or~~ the access RS ~~may reply~~ ies with a DSA*-RSP directly to MR-BS using its basic CID. The DSA*-RSP follows the same structure of the DSA-RSP except that the CID used in the MAC header is the basic CID of the RS.

6.3.2.3.12 DSA-ACK message

[Change the first two paragraphs in 6.3.2.3.12 as following:]

Insert the following text after the second paragraph at the end of 6.3.2.3.12:

Upon receiving a DSA*-RSP from an access RS, the MR-BS may send a DSA*-ACK to ~~all the access RSs on the path.~~ This DSA*-ACK is processed by each intermediate RS on the path, in order to distribute the admitted service flow parameter. The CID associated with the service flow ~~needs to be~~ is included in the Service Flow CID TLV field in this DSA*-ACK message together with the admitted service flow parameter. The CID could be the transport CID for an individual MS or a tunnel CID. The CID used in the MAC header is the basic CID of the access RS.

The DSC*-ACK shall contain the following TLVs:

Service Flow Parameters (see 11.3)

Specification of the traffic characteristics and scheduling requirements of the admitted service flow

HMAC/CMAC Tuple (see 11.1.2)

The HMAC/CMAC Tuple attribute contains a keyed message digest (to authenticate the sender). The HMAC/CMAC Tuple attribute shall be the final attribute in the DSA* message's attribute list.

6.3.2.3.13 DSC-REQ message

[Change the first two paragraphs in 6.3.2.3.13 as following:]

Insert the following text after the second paragraph at the end of 6.3.2.3.13:

Before admitting changes to a service flow, the MR-BS ~~shall~~ may send a DSC*-REQ to ~~all~~ the access RSs. This DSC*-REQ is processed by each RS on the path. The CID associated with the service flow ~~needs to be is~~ included in the Service Flow CID TLV field in this DSC*-REQ message, ~~and. The CID~~ could be the transport CID for an individual MS or a tunnel CID. The CID used in the MAC header is the basic CID of the access RS.

The DSC*-REQ shall contain the following TLVs:

Service Flow Parameters (see 11.3)

Specification of the service flow's traffic characteristics and scheduling requirements

HMAC/CMAC Tuple (see 11.1.2)

The HMAC/CMAC Tuple attribute contains a keyed message digest (to authenticate the sender). The HMAC/CMAC Tuple attribute shall be the final attribute in the DSC* message's attribute list.

The DSC*-REQ message may contain the following TLVs, if explicit path management is used:

Path ID (see 11.22.4)

Specification of the id of the path that the service flow will traverse

The DSC*-REQ message may contain the following TLV, if CID encapsulation is used with embedded path management:

Path Info (see 11.22.10)

Specification of the detailed path information

6.3.2.3.14 DSC-RSP message

[Change the first two paragraphs in 6.3.2.3.14 as following:]

Insert the following text after the second paragraph at the end of 6.3.2.3.14:

Upon receiving DSC*-REQ from MR-BS, an intermediate RS or the access RS may replies with a DSC*-RSP directly to MR-BS using its basic CID. The DSC*-RSP follows the same structure of DSC-RSP except that the CID used in the MAC header is the basic CID of the RS.

6.3.2.3.15 DSC-ACK message

[Change the first two paragraphs in 6.3.2.3.15 as following:]

Insert the following text after the second paragraph at the end of 6.3.2.3.15:

Upon receiving a DSC*-RSP from an access RS, the MR-BS may send a DSC*-ACK to ~~all~~ the access RSs. This DSC*-ACK is processed by each intermediate RS on the path, in order to obtain the admitted modified service flow parameter. The CID associated with the service flow ~~needs to be~~ included in the Service Flow CID TLV field in this DSC*-ACK message together with the admitted service flow parameter, and. ~~The CID could be the transport CID for an individual MS or a tunnel CID. The CID used in the MAC header is the basic CID of the access RS.~~

The DSC*-ACK shall contain the following TLVs:

Service Flow Parameters (see 11.3)

Specification of the traffic characteristics and scheduling requirements of the admitted changed service flow

HMAC/CMAC Tuple (see 11.1.2)

The HMAC/CMAC Tuple attribute contains a keyed message digest (to authenticate the sender). The HMAC/CMAC Tuple attribute shall be the final attribute in the DSC* message's attribute list.

6.3.2.3.16 DSD-REQ message

[Change the first two paragraphs in 6.3.2.3.16 as following:]

Insert the following text after the second paragraph at the end of 6.3.2.3.16:

While deleting a service flow, the MR-BS shall also send a DSD*-REQ to ~~all~~ the access RS. This DSD*-REQ is processed by each intermediate RSs on the path between the MR-BS and the MS. The CID associated with the service flow needs to be included in the Service Flow CID TLV field in this DSD*-REQ message. The DSD*-REQ follows the same structure of the DSD-REQ except that the CID used in the MAC header is the basic CID of the access RS.

In addition to the TLVs defined for DSD-REQ, the DSD*-REQ message may contain the following TLVs, if explicit path management scheme is used:

Path ID (see 11.22.4)

Specification of the id of the path that the service flow will traverse

In addition to the TLVs defined for DSD-REQ, the DSD*-REQ message may contain the following TLV, if CID encapsulation is used with embedded path management:

Path Info (see 11.22.10)

Specification of the detailed path information

6.3.2.3.17 DSD-RSP message

[Change the first two paragraphs in 6.3.2.3.17 as following:]

Insert the following text after the second paragraph at the end of 6.3.2.3.17:

Upon receiving DSD*-REQ from MR-BS, the access RS replies with a DSD*-RSP directly to MR-BS using its basic CID. The DSD*-RSP follows the same structure of the DSD-RSP, except that the CID used in the MAC header is the basic CID of the access RS.

6.3.14.9.3 DSA

6.3.14.9.3.1 SS-initiated DSA

[Change the first subclause in 6.3.14.9.3.1 in 80216j-06/026r4 as following]

In MR network with distributed scheduling, before MR-BS admitting the service flow and sending DSA-RSP to the requesting station which could be an MS or ~~an access~~-RS, the MR-BS ~~shall~~may send a DSA*-REQ to ~~all~~the access RSs, which is processed by each intermediate RS on the path, in order to obtain admission control decision from the intermediate RSs. Upon receiving the DSA*-REQ, Such DSA*-REQ is first sent from MR-BS to its subordinate RS using its basic CID. If its resource condition cannot support the requested SF parameter, the RS process the request in the following ways.

- The RS ~~it~~ may update the SF parameter with the one it can support. It then ~~sends~~forwards the DSA*-REQ to its subordinated neighboring RS ~~using the basic CID of the subordinate RS~~. This procedure is repeated by each RS, until the DSA*-REQ reaches the access RS. After processing the DSA*-REQ, the access RS replies with a DSA*-RSP using its own basic CID directly to the MR-BS.
- The RS may directly send a DSA*-RSP back to MR-BS indicating that it cannot support the requested SF without forwarding the DSA*-REQ further to its subordinate RS.

In order to ensure that the DSA*-REQ messages from MR-BS to the RSs follow the same path as the packet associated with the tunnel or individual MS transport connection, the following information is included in the DSA*-REQ depending on different path management scheme.

- With explicit path management scheme, a Path Id TLV identifying the path that the MR-BS choose to route the connection is included in the DSA*-REQ. The intermediate RSs should use path id to decide the next hop to forward the DSA*-REQ.
- With embedded path management scheme, the following two cases apply:
 - o With systematic CID scheme, the intermediate RSs should use the systematic CID carried in the service flow parameters to determine the next hop to route the DSA*-REQ, until the access RS is reached.
 - o With CID encapsulation scheme, MR-BS should include a complete path information in the Path Info TLV in the DSA*-REQ. The intermediate RSs should use the included path information to decide the next hop to forward the DSA*-REQ.

If MR-BS receives DSA*-RSP from the access RS within T48, it shall send DSA-RSP to the requesting station. Meanwhile MR-BS shall also send a DSA*-ACK with the admitted service flow parameter to ~~all~~the access RSs, which is processed by each intermediate RS on the path, if the embedded routing scheme is used. The path used to route the DSA*-ACK should be the same as the path used to route the corresponding DSA*-REQ.

6.3.14.9.3.2 BS-initiated DSA

[Change the first subclause in 6.3.14.9.3.2 in 80216j-06/026r4 as following:]

In MR network with distributed scheduling, before MR-BS sends DSA-REQ to an MS or ~~an access~~-RS to initiate a service flow establishment, the MR-BS shall send DSA*-REQ to ~~all~~the access RSs on the path, which is processed by each intermediate RS on the path, in order to obtain the admission control decision from the intermediate RSs. The procedures of sending and processing the DSA*-REQ and DSA*-RSP are the same as those defined for MS-initiated DSA procedure as defined in section 6.3.14.9.3.1.

~~Such DSA*-REQ is first sent from MR-BS to its subordinate RS using its basic CID. If its resource condition cannot support the requested SF parameter, it updates the SF parameter with the one it can~~

~~support. It then sends the DSA*-REQ to its subordinated neighboring RS. This procedure is repeated by each RS, until the DSA*-REQ reaches the access RS. After processing the DSA*-REQSP, the access RS replies with a DSA-RSP using its own basic CID directly to the MR-BS. The MR-BS then shall send DSA-REQ to the MS or access-RS to initiate a service flow establishment. Meanwhile MR-BS shall~~may also send a DSA*-ACK with the admitted service flow parameter to all the RSs on the path, ~~if the embedded routing scheme is used. The processing procedures of DSA*-ACK message on each RS are the same as those for the DSA*-REQ as described above. The path used to route the DSA*-ACK should be the same as the path used to route the corresponding DSA*-REQ.~~

6.3.14.9.4.1 SS-initiated DSC

[Change the first subclause in 6.3.14.9.4.1 in 80216j-06/026r4 as following:]

In MR network with distributed scheduling, before MR-BS admitting the changes and sending DSC-RSP to the requesting station which could be an MS or ~~an access~~ RS, the MR-BS shall send DSC*-REQ to ~~all~~ the access RSs, which is processed by each intermediate RS on the path in order to obtain the admission control decisions from the intermediate RSs. Such DSC*-REQ is ~~first~~ sent from MR-BS to ~~its subordinate~~ the access RS using its basic CID. Upon receiving such DSC*-REQ, if its resource condition cannot support the requested modified SF parameter, the RS processes the request in the following ways.

~~- The RS may~~ updates the SF parameter with the one it can support. It then ~~sendforwards~~ the DSC*-REQ to its subordinated neighboring RS. This procedure is repeated by each RS, until the DSC*-REQ reaches the access RS. After processing the DSC*-REQ, the access RS replies with a DSC*-RSP using its own basic CID directly to the MR-BS.

~~- The RS may directly send a DSC*-RSP back to MR-BS indicating that it cannot support the requested modified SF, without further forwarding it to the next hop.~~

In order to ensure that the DSC*-REQ messages from MR-BS to the RSs follow the same path as the packet associated with the tunnel or individual MS transport connection, the same procedure as defined for SS initiated DSA as defined in section 6.3.14.9.3.1 is applied.

If MR-BS receives DSC*-RSP from the access RS within T48, it shall send DSC-RSP to the requesting station. Meanwhile MR-BS ~~shall~~may also send a DSC*-ACK with the admitted service flow parameter to ~~all~~ the access RSs, which is processed by each intermediate RS on the path, if the embedded routing scheme is used. The processing procedures of DSC*-ACK message on each RS are the same as those for the DSC*-REQ as described above. The path used to route the DSC*-ACK should be the same as the path used to route the corresponding DSC*-REQ.

6.3.14.9.4.2 BS-initiated DSC

[Change the first subclause in 6.3.14.9.4.2 in 80216j-06/026r4 as following:]

In MR network with distributed scheduling, before MR-BS sending DSC-REQ to an MS or ~~an access~~ RS to modify an existing service flow, the MR-BS ~~shall~~may ~~first~~ send DSC*-REQ to ~~all~~ the access RSs, which is processed by each RSs on the path to obtain the admission control decision from the intermediate RSs. The procedures of sending and processing the DSC*-REQ and the responding DSC*-RSP are the same as those defined for MS-initiated DSC procedure as defined in section 6.3.14.9.4.1. After receiving DSC*-RSP from the access RS, the MR-BS then shall send DSC-REQ to the MS or access-RS to modify an existing SF. Meanwhile MR-BS shallmay also send a DSC*-ACK with the admitted modified service flow parameter to ~~all~~ the access RSs, which is processed by each intermediate RSs on the path, if the embedded routing scheme is used. The processing procedures of DSC*-ACK

message on each RS are the same as those for the DSC*-REQ as described above. The path used to route the DSC*-ACK should be the same as the path used to route the corresponding DSC*-REQ.

6.3.14.9.5 Connection release

6.3.14.9.5.1 SS-initiated DSD

[Change the first subclause in 6.3.14.9.5.1 in 80216j-06/026r4 as following:]

In MR network with distributed scheduling, upon receiving a DSD-REQ from an MS or ~~an access RS for an~~ existing service flow, the MR-BS shall delete the service flow on relay link (~~MR-BS-RS~~) as well as the access link (~~RS-SS~~). The MR-BS shall send DSD*-REQ to all the RSs on the path. Such DSD*-REQ is ~~first~~ sent from MR-BS to ~~its subordinate the access~~ RS using its basic CID. ~~Each intermediate~~ The RS processes it and forwards it to its subordinate neighboring RS. This procedure is repeated by each RS, until the DSD*-REQ reaches the access RS. After processing the DSD*-REQ, the access RS replies with a DSD-RSP using its own basic CID directly to the MR-BS.

In order to ensure that the DSD*-REQ messages from MR-BS to the RSs follow the same path as the packet associated with the tunnel or individual MS transport connection, the same procedure as defined for SS initiated DSA as defined in section 6.3.14.9.3.1 is applied here.

6.3.14.9.5.2 BS-initiated DSD

[Change the first subclause in 6.3.14.9.5.2 in 80216j-06/026r4 as following:]

In MR network with distributed scheduling, the MR-BS shall delete the service flow on relay link (~~MR-BS-RS~~) as well as the access link (~~RS-SS~~). In addition to sending DSD-REQ to the MS or RS, the MR-BS shall also send DSD*-REQ to all the access RSs, which is processed by each intermediate RS on the path. Such DSD* REQ is first sent from MR-BS to its subordinate RS using its basic CID. The RS processes it and forwards it to its subordinate neighboring RS. This procedure is repeated by each RS, until the DSD*-REQ reaches the access RS. After processing the DSD* REQ, the access RS replies with a DSD-RSP using its own basic CID directly to the MR-BS. The procedures of sending and processing the DSD*-REQ and the responding DSD*-RSP are the same as those defined for MS-initiated DSD procedure as defined in section 6.3.14.9.5.1.

Insert new subclause 11.22.10

11.22.10 Path-Info TLV

This field contains a compound attribute whose subattributes identifies the direction of the path, the number of RSs on the path and an ordered list of RSs on the path as listed in Table S1.

| <u>Type</u> | <u>Length</u> | <u>Value</u> | <u>Scope</u> |
|-------------|-----------------|-----------------|---------------------------|
| <u>TBD</u> | <u>variable</u> | <u>Compound</u> | <u>DSA*-REQ, DSC*-REQ</u> |

Table S1 – Path-Info Subattributes

| <u>Attribute</u> | <u>Content</u> |
|-----------------------|---|
| <u>Path Direction</u> | <u>The direction of the path</u> |
| <u>Number of RS</u> | <u>The number of RSs in the ordered list of RSs</u> |

| | |
|----------------------------|---|
| <u>Ordered list of RSs</u> | <u>An ordered basic CID list of RSs that identifies the path in the case of non-presence of the Existing Path ID; or a ordered list of RSs that identifies the difference between the new path and the existing path in the case of presence of the Existing Path ID.</u> |
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