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Abstract	This contribution proposes C_SAP primitives to be adopted in IEEE 802.16g to support association procedures specified in IEEE 802.16e-2005.	
Purpose	Adopt the contribution.	
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Primitives Supporting Association Procedures

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Abstract

This contribution proposes C_SAP primitives to be adopted in IEEE 802.16g to support association procedures specified in IEEE 802.16e-2005.

Background

What is association?

Association is an initial ranging procedure occurring during scanning interval with respect to one of the neighboring BSs. The function of association is to enable the MS to acquire and record ranging parameters and service availability information for the purpose of proper selection of HO target and/or expediting a potential future handover to a target BS. Recorded ranging parameters of an associated BS may be further used for setting initial ranging values in future ranging events during actual handover.

Why is there a need for association primitives?

In order to perform association ranging effectively, the MS must know the ranging assignment from the neighboring BSs to avoid ranging collision. After ranging request, the resulting ranging parameters from the neighboring BSs can be delivered to the MS via the serving BS over the network backbone to save air interface bandwidth. Those objectives can be achieved by different levels of association.

Three levels of association are specified in 16e. Level 0 association is scanning between the MS and the neighboring BS without the coordination of the serving BS. The association is contention based and not very efficient. Level 1 association between the MS and the neighboring BS requires the coordination of the serving BS in which the neighboring BSs provide ranging information for association at a predefined rendezvous time and the serving BS also assures that the neighboring BSs do not have overlapping assignments of ranging regions. Level 2 association is the same as Level 1, except that the MS does not receive ranging parameters (RNG-RSP) from the neighboring BSs. Instead, the neighboring BSs will send ranging parameters to the serving BS over the backbone and the serving BS may aggregate all ranging information into a single message (MOB_ASC-REP). The association requires the Mobility Management services on the management layer. Hence the primitives between the BS 802.16 entity and the NCMS are required on the C_SAP.

The negotiation of the scanning type or association level is made by C-HO-REQ/REQ (HO-Scan). This is applicable to Association Level 0, 1, and 2.

The coordinated association assignments are delivered in C-HO-RSP (HO-Scan). This is applicable to Association Level 1 and 2. For Level 0, assignments are not coordinated and ranging is contention based. The coordination between the serving BS and the neighboring BSs are out of the scope.

The association parameters are delivered in the new primitive C-HO-IND (HO-Association). This is only applicable to Association Level 2. For Level 0 or 1, the parameters are delivered in RNG-RSP. The delivery of the parameters from the neighboring BSs to the serving BS is out of scope.

Why now?

The support of association procedures is optional and is not in the current system profile. However, 16g project is closing very soon and if we wait for the feature to be in the system profile, it would be too late to update 16g. Therefore we have to act now.

Proposal

[Insert this diagram after Figure 493 on Page 78]

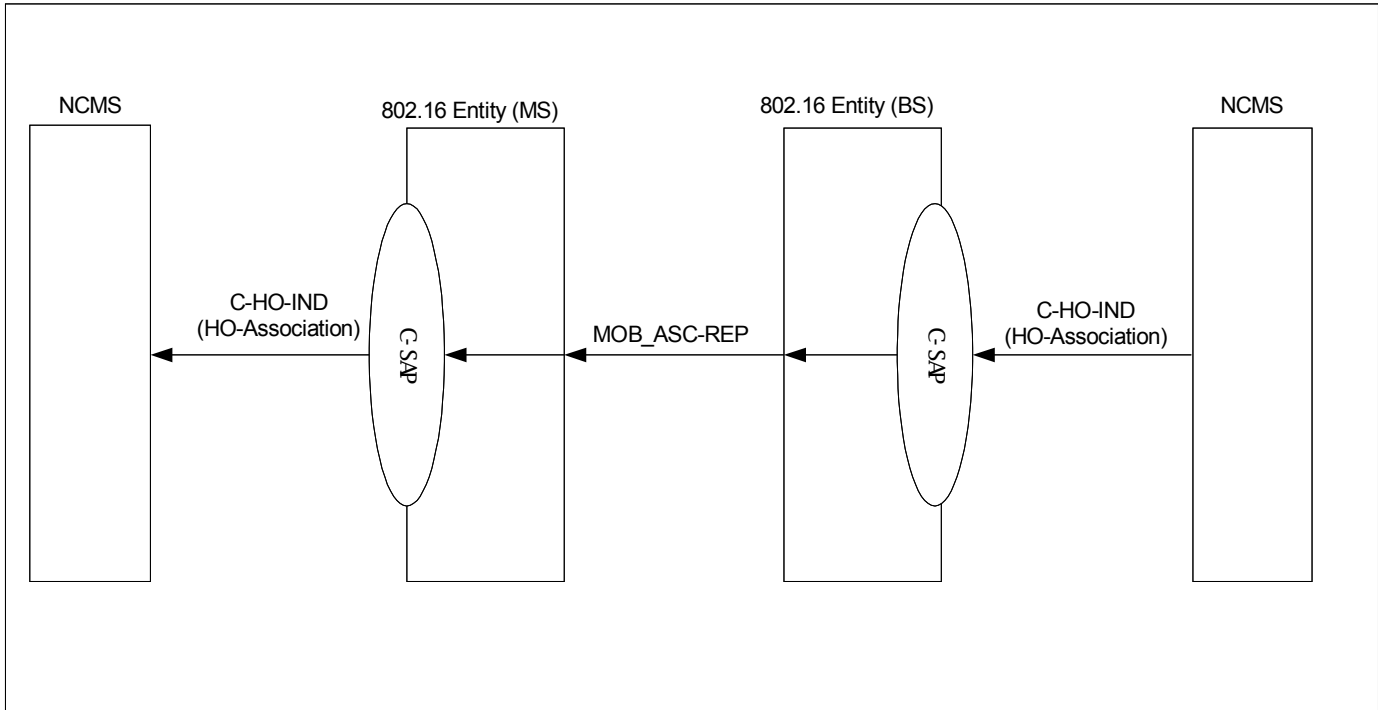


Figure 0-1 Primitives to report association ranging information

[Update the 16g text as follows starting from Page78]

14.2.5.2.1.3 C-HO-REQ(Action_Type==HO-Scan)

Function:

This primitive is issued by the Mobility Management Services entity in NCMS(BS) to request radio signal information of MSs. This primitive is also used by the Mobility Management Services entity in NCMS(SS/MS) to instruct the MS to request scanning interval, to start to scan or to report the scanning result to the NCMS(SS/MS) or to the Serving BS.

Semantics of the service primitive:

The parameters of the primitive are as follow:

C-HO-REQ

```
(
  Operation_Type(Action),
  Action_Type(HO-Scan),
  Destination(BS or MS),
  Attribute_list:
    Number of MS,
    List of MS MAC Address,
    Scan Duration,

    Link Quality Threshold,
    Link Status Report Period,
    Report Target,
    List of Scanning Type,
    List of Neighboring BS
)
```

Number of MS

Number of MSs

List of MS MAC Address

The list of MS MAC Address

Scan Duration

Scan duration time

Signal Quality Threshold

Signal Quality threshold. Scanning report shall be made when link quality goes worse than this threshold.

Link Status Report Period

Time period that the scanning report shall be made.

Report Target

This indicates the object to which report shall be made.

List of Scanning Type

List of scanning type; of 0b001, 0b010, or 0b011 which corresponds to association type of Level 0, 1, or 2, respectively. One scanning type for each neighboring BS.

List of Neighboring BS

The list of neighboring BS to which the MS would like to perform association.

...

14.2.5.2.2.3 C-HO-RSP(Action_Type==HO-Scan)

Function:

This primitive is issued by an 802.16 entity to respond to C-HO-REQ(HO-Scan)

Semantics of the service primitive:

The parameters of the primitive are as follows:

C-HO-RSP

```
(
  Operation_Type(Action),
  Action_Type(HO-Scan),
```

Destination(NCMS),
 Attribute_list:
 Number of MS,
 List of MS MAC Address,
 List of Signal information,
 Scan Duration,
 Start Frame,
 MIH Capability,
 [List of Scanning Type](#),
 [List of Neighboring BS](#),
 [List of Association Ranging Assignment](#),
 Result Code
)

Number of MS

Number of MSs

List of MS MAC Address

The list of MS MAC Address

List of Signal Information

Downlink Physical Service Level,
 Downlink RSSI mean,
 Downlink RSSI standard deviation,
 Downlink CINR mean,
 Downlink CINR standard deviation,

Scan Duration

Scan duration time

Start Frame

Scan start frame

MIH Capability

MIH capability of the current BS. This parameter carries the MIH capability field in the DCD message, if available.

[List of Scanning Type](#)

[Scanning type: 0b001, 0b010, or 0b011 which corresponds to association type of Level 0, 1, or 2, respectively.](#)

[List of Neighboring BS](#)

[The list of neighboring BS to which the MS would like to perform association.](#)

[List of Association Ranging Assignment](#)

[Rendezvous Time,](#)
[Dedication Codes,](#)
[Transmission Opportunity Offset](#)

Result Code

The result of scan report message transmission. When there is no available BS to scan, 'No Available BS' result code shall be included.

...

14.2.5.2.3 C-HO-IND

This primitive is used by [an 802.16 entity](#)BS or NCMS to notify the other entity of a handover event. The possible Event_Types for this primitive are listed in Table below:

Action Type	Description
-------------	-------------

HO-Start	Indicating the MS is ready to handover from the current serving BS to the target BS
HO-Cancel	Indicating the current HO procedure is cancelled
HO-Scan	Providing scanning result to NCMS
HO-CMPLT	Indicating MS network re-entry completion at the target BS
<u>HO-Association</u>	<u>Providing association ranging parameters to the MS.</u>

...

14.2.5.2.1.3 C-HO-IND(Action_Type==HO-Association)

Function:

This primitive is issued by the Mobility Management Services entity in NCMS (BS) to the 802.16 entity (BS) to report association ranging result from the neighboring BSs. This primitive is also issued by the 802.16 entity (MS) to the NCMS (MS) to forward the association ranging result. It is only applicable to association level 2.

Semantics of the service primitive:

The parameters of the primitive are as follow:

```

C-HO-IND
(
  Operation_Type(Action),
  Action_Type(HO-Association),
  Destination(MS or NCMS),
  Attribute_list:
    List of Association Ranging Parameters
)
List of Association Ranging ParametersResult
  PHY offset,
  CID

```

When generated:

- NCMS to 802.16 BS entity:
The service BS has collected and aggregated association ranging parameters from the neighboring BSs.
- 802.16 MS entity to NCMS:
This primitive is used when the 802.16 MS entity receives the MOB_ASC-REP message.

Effect of receipt:

- NCMS to 802.16 BS entity:
The BS will forward the ranging parameters to the MS in the MOB_ASC-REP message.
- 802.16 MS entity to NCMS:

| [The NCMS will store the result as association records.](#)