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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 by C-HO-IND (HO-Scan). 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.

<u>Why now?</u>

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
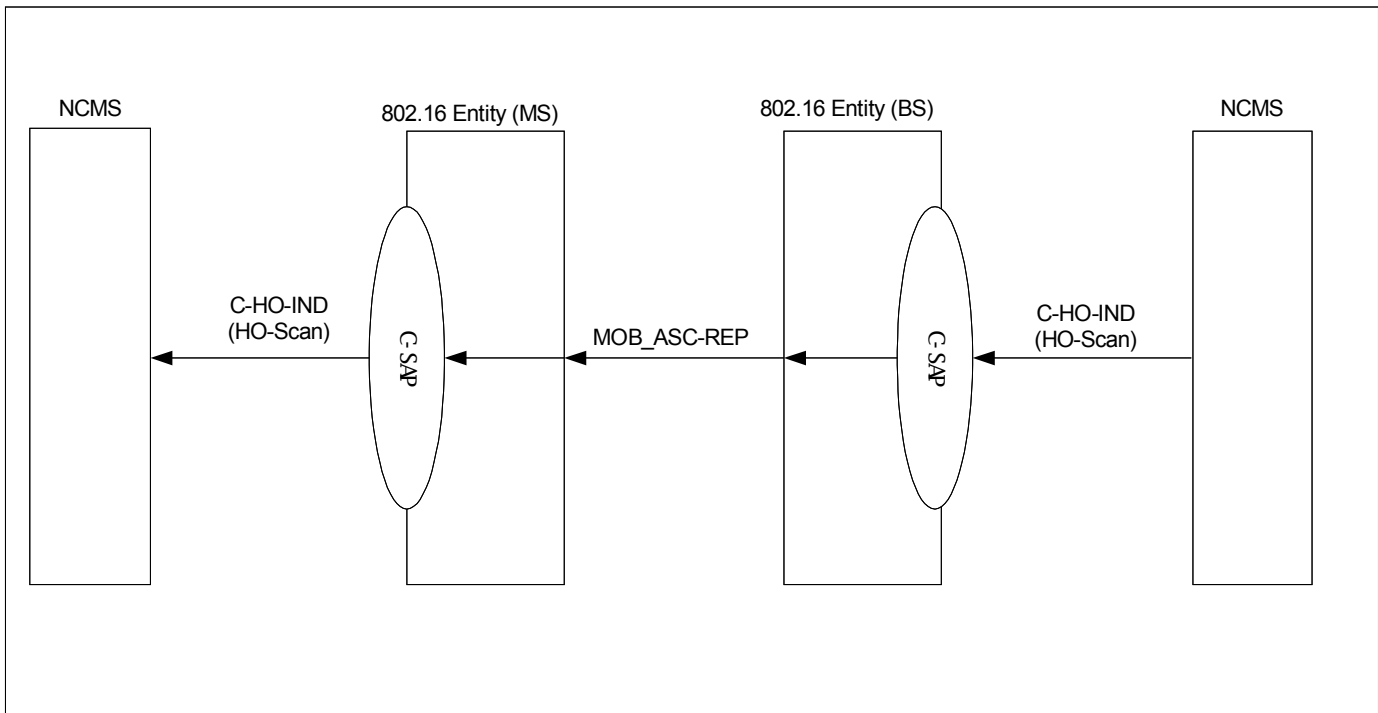
[Insert this diagram after Figure 493 on Page 78]

Figure 0-1 Primitives for association ranging report

[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 Neighboring BS
                        List of Scanning Type,
)
         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 Neighboring BS
                 The list of neighboring BS to which the MS would like to perform association.
         List of Scanning Type
                 List of scanning type, 0b001, 0b010, or 0b011 corresponds to association type Level 0, 1, or 2, respectively.
          One scanning type for each neighboring BS.

…

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 Neighboring BS,
>> List of Scanning Type,
>> 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 Neighboring BS
> The list of neighboring BS to which the MS may perform association

.List of Scanning Type
> Scanning type; 0b001, 0b010, or 0b011 corresponds to association type Level 0, 1, or 2, respectively.

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.

...

14.2.5.2.3.3 C-HO-IND (Event_Type==HO-Scan)

Function:

On the uplink, t~T~his primitive is used to indicate the reception of MOB_SCN-REP message from the MS. The 802.16 BS entity uses this primitive to report MS radio information to the NCMS.

On the downlink, this primitive is used by the NCMS to forward the ranging parameters to the 802.16 entity (BS) in order to trigger the MOB_ASC-REP message, and by the 802.16 entity (MS) to forward the ranging parameters to the NCMS.

Semantics of the service primitive:

The following parameters are included in this primitive.

```
                        C-HO-IND
                        (
                        Event_Type(HO-Scan),
                        Destination(NCMS, MS),
                        Attribute _list:
                                MS MAC Address
                                RF Signal information
                                List of Neighboring BS,
                                List of Association Ranging Parameters
                        )

            MS MAC Address
                        48-bit unique identifier used by MS
            RF Signal Information
                        TBD.
            List of Neighboring BS
                         The list of neighboring BS reporting association ranging parameters.
            List of Association Ranging Parameters
                        PHY offset (Timing adjust, power level adjust, SLP, etc.)
                        CID
```

When generated:
802.16 BS entity to NCMS:

    This primitive is generated by 802.16 BS entity when it receives a MOB_SCAN-REP.

NCMS to 802.16 BS entity:

This primitive may be generated by the NCMS of the 802.16 entity (serving BS) after it has collected and aggregated association ranging parameters from the neighboring BSs,

802.16 MS entity to NCMS:

This primitive is generated by the 802.16 entity (MS) to forward the ranging parameters to the NCMS.

Effect of receipt:

802.16 BS entity to NCMS:

NCMS processes the information and may decide to trigger a BS-initiated handover.

NCMS to 802.16 BS entity:

This primitive will trigger the 802.16 entity (BS) to trigger the MOB_ASC-REP message.

802.16 MS entity to NCMS:

The NCMS (MS) will store the ranging parameters as association records.