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Re:	Contribution on comments to IEEE 802.16g/D2	
Abstract	In this contribution, we propose to define some primitives for Neighbor BS Management.	
Purpose	Adoption	
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# Restructuring and Renaming of Scanning and HO Primitives in section 14.2.9

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## 1. Introduction

In the current draft, primitives which used to control HO are defined in Section 14.2.7.2 Handover Control Procedures. But, similar primitives are also defined in Section 14.2.9 Management Primitives.

For the clarification, we propose to merge some primitives in Section 14.2.9 with primitives in Section 14.2.7.2.

## 2. Summary of Changes

The following table summarizes the proposed changes in this contribution.

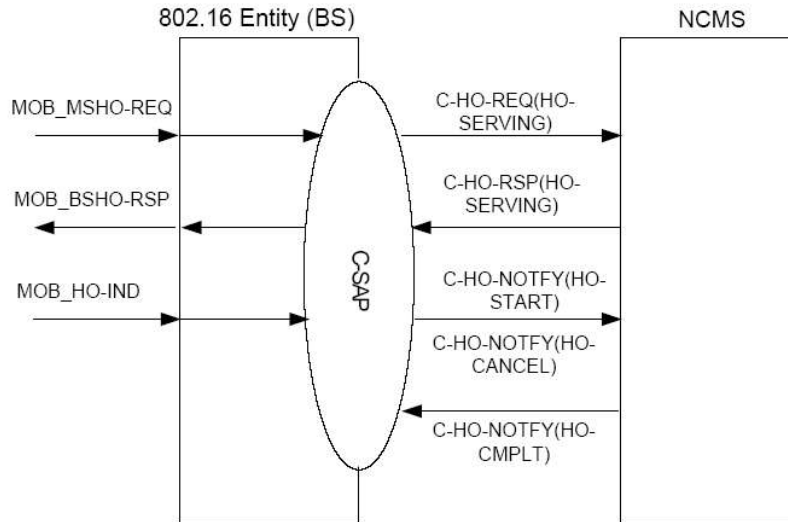
Before Change	After Change
14.2.9.4 M_ScanScheduling	Merged with C-HO-REQ (HO-Scan) and C-HO-RSP (HO-Scan)
14.2.9.5 M_Scanning	Merged with C-HO-REQ (HO-Scan) and C-HO-RSP (HO-Scan)
14.2.9.6 M_ScanReport	Merged with C-HO-REQ (HO-Scan) and C-HO-RSP (HO-Scan)
14.2.9.7 M_MACHandover	Merged with primitives defined in Section 14.2.7.2
14.2.9.8 M_HOIND	Merged with C-HO-NOTIFY (HO-Start) and C-HO-NOTIFY (HO-Cancel)
14.2.9.10 MIH Control Protocol Procedures	Section number is changed from 14.2.10 to 14.2.7.3

## 3. Proposed Text Changes

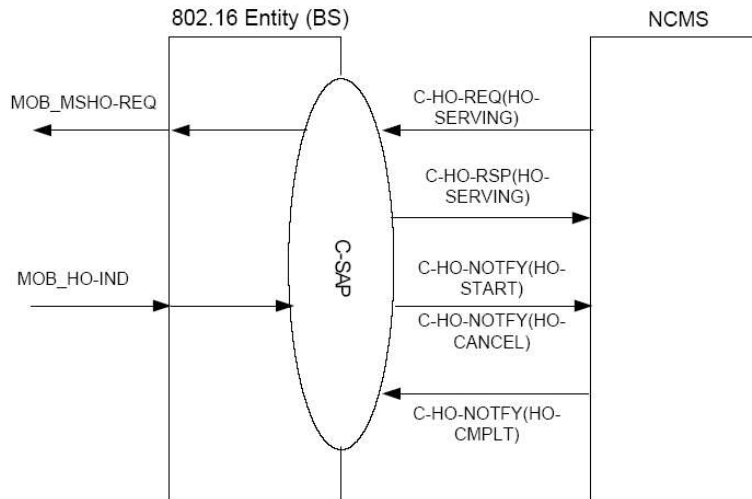
*[Modify section 14.2.7.2 as follow]*

### 14.2.7.2 Handover Control Protocol Procedures

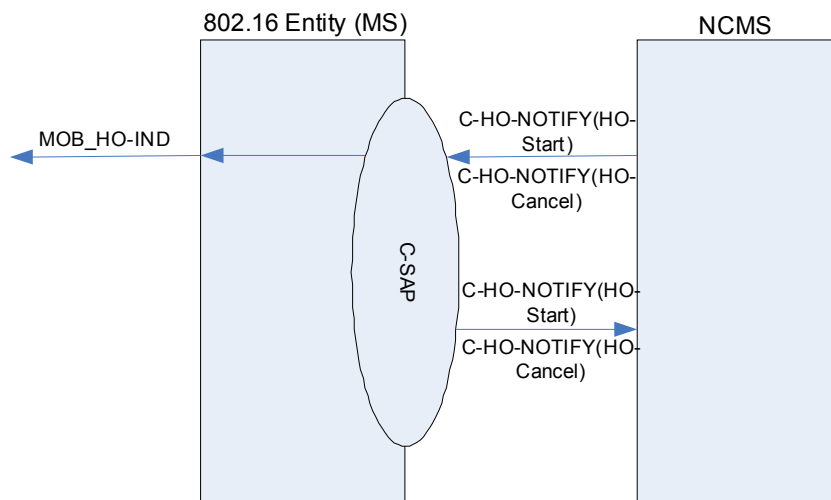
The HO Control Primitives are a set of primitives for supporting HO procedure between 802.16 Entity and NCMS. They are defined for access to the Mobility Control entity to support handovers.



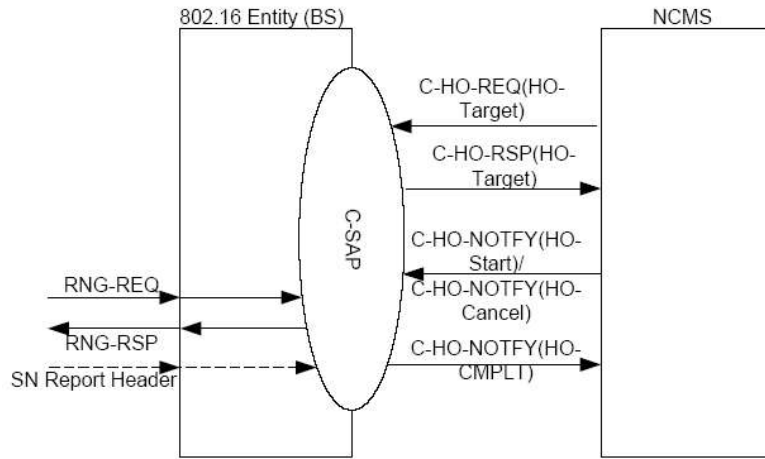
**Figure 497 – HO Primitives flow between Serving BS and NCMS, BS initiated**



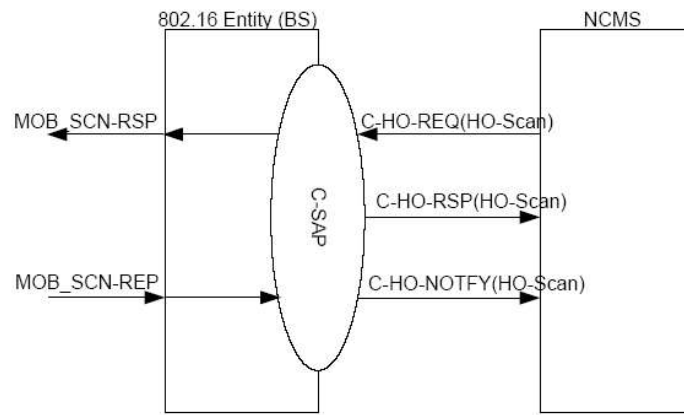
**Figure 498 – HO Primitives flow between Serving BS and NCMS, NCMS initiated**



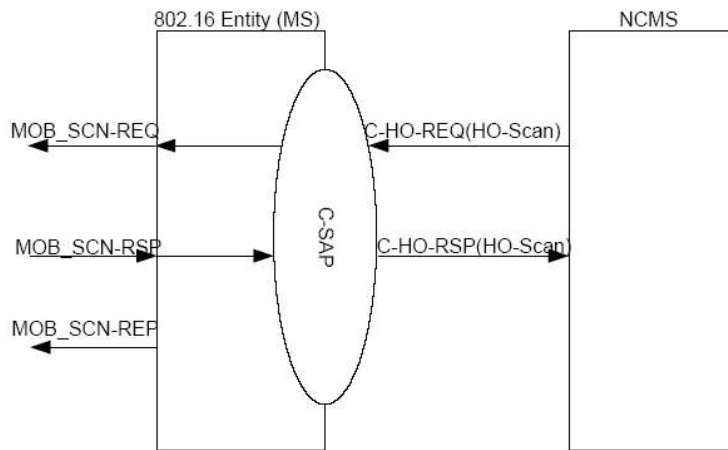
**Figure xxx – HO primitives flow between 802.16 MS entity and NCMS**

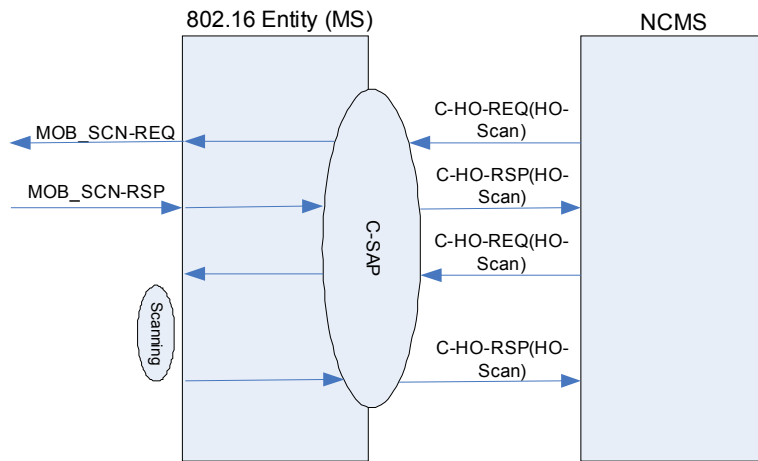


**Figure 499 – HO Primitives flow between Target BS and NCMS**

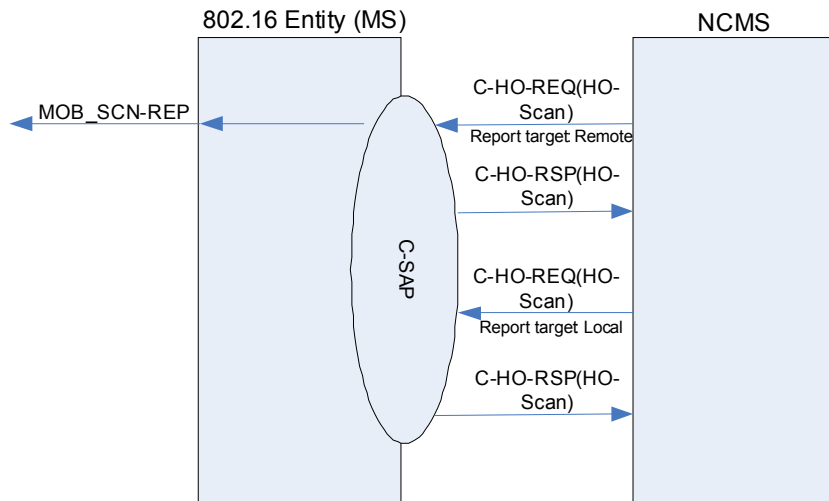


**Figure 500 – HO Primitives flow between 802.16 BS Entity and NCMS for Scanning**





**Figure 501 – HO Primitives flow between 802.16 MS Entity and NCMS for Scanning**



**Figure xxx – HO primitives flow between 802.16 MS Entity and NCMS for Scanning Report**

**14.2.7.2.1 C-HO-REQ**

This primitive is used by a BS or NCMS to trigger a handover procedure. The Action Type included in this primitive defines the type of handover procedure to be performed. The possible Action Types for this primitive are listed in Table below:

Action Type	Description
HO-Serving	Handover procedure between current serving BS and NCMS.
HO-Target	Handover procedure between target BS and NCMS.
HO-Scan	Neighbor BS scanning procedure

The following sub-sections define the primitive when its action type is set to a specific action.

**14.2.7.2.1.1 C-HO-REQ(Action\_Type==HO-Serving)**

14.2.7.2.1.1.1 Function

This primitive is used by a serving BS or the mobility control entity in NCMS to start an HO procedure. The primitive is only used by 802.16 BS entity and NCMS at BS side.

#### 14.2.7.2.1.1.2 Semantics of the service primitive

The following parameters are included in this primitive.

```
C-HO-REQ
(
  Message_id,
  Operation_Type(Action),
  Action_Type(HO-Serving),
  Object_id(BS_ID or NCMS),
  Attribute_list:
    Serving BS ID
    MS ID
    HO Type
    Mode
    Candidate target BS list
    Service flow information
    CS parameter information
)
```

##### Serving BS ID

Base station unique identifier (Same number as that broadcasted on the DL-MAP message).

##### MS ID

48-bit unique identifier used by MS.

##### HO Type

Indication of HO types; HO or SHO/FBSS.

##### Mode

Various modes in Anchor BS update or Active Set Update.

##### Candidate target BS list

For BS generated primitive, this is the list of BSs which are recommended for a target BS or an active BS by the MS. Additional HO quality information such as Service Level Prediction also can be included in this list. For NCMS generated primitive, this is the list of recommended target BSes by the mobility control entity. The BSs in the list may be the candidate target BSs for HO or an Anchor BS or Active BSs for SHO/FBSS according to the value of HO type and Mode MS Access Information, Newly Allocation Information, and HO Quality Information can be included in this list.

##### Service flow Information

Information of all the service flows that have been established between the MS and the serving BS.

##### CS parameter information

Approved IP filter rules of a service flow such as packet classification rule and IPv6 flow label.

#### 14.2.7.2.1.1.3 When generated

##### 14.2.7.2.1.1.3.1 802.16 BS Entity to NCMS

This primitive is generated when the BS receives a MOB\_MSHO-REQ message from the MS

##### 14.2.7.2.1.1.3.2 NCMS to 802.16 BS Entity

This primitive is used when the mobility control entity in NCMS instructs the BS to start handover procedure for a particular MS.

#### 14.2.7.2.1.1.4 Effect of receipt

##### 14.2.7.2.1.1.4.1 802.16 BS Entity to NCMS

The mobility control entity in NCMS processes the information from this primitive. And it may trigger a handover procedure to one or more target BS.

##### 14.2.7.2.1.1.4.2 NCMS to 802.16 BS Entity

The BS processes the information from this primitive and shall send MOB\_BSHO-REQ to the MS to start the handover procedure.

#### 14.2.7.2.1.2 C-HO-REQ(Action\_Type==HO-Target)

##### 14.2.7.2.1.2.1 Function

This primitive is used by the mobility control entity in NCMS to inform target BSEs of the pending HO. The primitive is only used by 802.16 BS entity and NCMS at BS side.

##### 14.2.7.2.1.2.2 Semantics of the service primitive

It delivers the following parameters.

#### C-HO-REQ

```
(
  Message_id,
  Operation_Type(Action),
  Action_Type(HO-Target),
  Object_id(BS_ID),

  Attribute_list:
    Serving BS ID
    MS ID
    HO Type
    Mode
    Service flow information
    HO Quality Information
    CS parameter information
)
```

#### Serving BS ID

Base station unique identifier (Same number as that broadcasted on the DL-MAP message)

#### MS ID

48-bit unique identifier used by MS

#### HO Type

Indication of HO types; HO or SHO/FBSS

#### Mode

Various modes in Anchor BS update or Active Set Update

#### Service flow Information

Information of all the service flows that have been established between the MS and the serving BS

#### HO Quality Information



Information related with quality of HO procedure; Service Level Prediction, HO Optimization Flag, Arrival Time Difference, etc.

CS parameter information

Approved IP filter rules of a service flow such as packet classification rule and IPv6 flow label

#### 14.2.7.2.1.2.3 When generated

When the mobility control entity in NCMS determines a target BS for a MS to handover to, the NCMS generates this primitive to start the handover process at the target BS.

#### 14.2.7.2.1.2.4 Effect of receipt

The target BS prepares for the MS handover for pre-allocating resources to the MS and sends response to the NCMS.

### 14.2.7.2.1.3 C-HO-REQ(Action\_Type==HO-Scan)

#### 14.2.7.2.1.3.1 Function

This primitive is issued by the mobility management entity in NCMS to request radio signal information of MSs. This primitive is also used by the mobility management entity in NCMS to instruct the MS to request scanning interval, to start to scan or to report the scanning result to the NCMS or to the Serving BS.

#### 14.2.7.2.1.3.2 Semantics of the service primitive

The parameters of the primitive are as follow:

```
C-HO-REQ
(
  Message_id,
  Operation_Type(Action),
  Action_Type(HO-Scan),
  Object_id(BS_ID or MS_ID),
  Attribute_list:
    Number of MS,
    List of MS ID,
    Scan Duration,
    Link Quality Threshold,
    Link Status Report Period,
    Report Target
)
```

Number of MS

Number of MSs

List of MS ID

The list of MS ID

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.

#### 14.2.7.2.1.3.3 When generated

##### 14.2.7.2.1.3.3.1 NCMS to 802.16 BS Entity

This primitive is generated when the mobility management entity in NCMS decides MS should perform scanning of neighbor BSs and report the scanning result to NCMS. In this case, attributes included in Attribute\_list are number of MS and list of MS ID.

##### 14.2.7.2.1.3.3.2 NCMS to 802.16 MS Entity

This primitive is generated when the mobile management entity in NCMS decides that MS should send MOB-SCN-REQ for a request of scanning interval, perform scanning, MOB\_SCAN-REPORT message to BS or report the scanning result to NCMS.

#### 14.2.7.2.1.3.4 Effect of receipt

##### 14.2.7.2.1.3.4.1. NCMS to 802.16 BS Entity

When the primitive is received by a 802.16 BS entity, the 802.16 BS entity shall transmit MOB\_SCAN-RSP to the MS to trigger the scanning procedure at the MS and generates C-HO-RSP (HO-Scan) to respond to NCMS. ~~When the primitive is received by the 802.16 MS entity, the 802.16 MS entity shall transmit MOB\_SCAN-REQ to the BS.~~

##### 14.2.7.2.1.3.4.1. NCMS to 802.16 MS Entity

When the primitive is received by the 802.16 MS entity, the MS shall perform scanning or scanning report procedure according to the parameters included in Attribute\_list. If Report Target is not included in Attribute\_list, the MS sends MOB\_SCAN-REQ message to the serving BS or starts to scan. If the report conditions defined by Link Quality Threshold and Link Status Report Period are satisfied, then the MS shall report the scanning result to NCMS.

If only Report Target is included in Attribute\_list, MS shall report the scanning result according to the value of Report Target. If Report Target is remote, the scanning report is made remotely to the BS using MOB\_SCAN-REP message. If Report Target is local, the scanning report is made locally to NCMS.

The coexistence of Report Target and other attributes in Attribute\_list is not allowed.

#### **14.2.7.2.2 C-HO-RSP**

This primitive is used by a 802.16 entity or NCMS to respond a handover request. The Action Type included in this primitive defines the type of handover procedure to be performed. The possible Action Types for this primitive are listed in Table below:

<b>Action Type</b>	<b>Description</b>
HO-Serving	Handover procedure between current serving BS and NCMS.
HO-Target	Handover procedure between target BS and NCMS.
HO-Scan	Neighbor BS scanning procedure

The following sub-sections define the primitive when its action type is set to a specific action.

##### **14.2.7.2.2.1 C-HO-RSP(Action\_Type==HO-Serving)**

#### 14.2.7.2.2.1.1 Function

This primitive is generated by mobility control entity in NCMS or the serving 802.16 BS Entity with the list of recommended target BSes. This primitive is sent in reply to the C-HO-RSP(HO-Serving) primitive.

#### 14.2.7.2.2.1.2 Semantics of the service primitive

The following parameters are included in this primitive.

```
C-HO-RSP
(
  Message_id,
  Operation_Type(Action),
  Action_Type(HO-Serving),
  Object_id(BS_ID or NCMS),
  Attribute_list:
    MS ID
    HO Type
    Mode
    Recommended target BS list
)
```

##### MS ID

48-bit unique identifier used by MS

##### HO Type

Indication of HO types; HO or SHO/FBSS

##### Mode

Various modes in Anchor BS update or Active Set Update

##### Recommended target BS list

The list must be a subset of the candidate target BS list from the corresponding HO request. The recommended target BS list is to be delivered to the MS in the MOB\_BSHO-RSP. The BSes in the list may be the candidate target BSes for HO or an Anchor BS or Active BSes for SHO/FBSS according to the value of HO type and Mode. MS Access Information, Newly Allocation Information, and HO Quality Information can be included in this list.

#### 14.2.7.2.2.1.3 When generated

##### 14.2.7.2.2.1.3.1 802.16 BS Entity to NCMS

This primitive is generated to respond to C-HO-REQ(HO-Serving) primitive from NCMS.

##### 14.2.7.2.2.1.3.2 NCMS to 802.16 BS Entity

This primitive is used when the mobility control entity in NCMS accepts or rejects the HO request from the MS. This primitive includes a list of recommended target BSs from NCMS.

#### 14.2.7.2.2.1.4 Effect of receipt

##### 14.2.7.2.2.1.4.1 802.16 BS Entity to NCMS

The mobility control entity in NCMS processes the information contained in the primitive.

##### 14.2.7.2.2.1.4.2 NCMS to 802.16 BS Entity

The BS processes the information from this primitive and shall send MOB\_BSHO-RSP to the MS.

#### 14.2.7.2.2.2 C-HO-RSP(Action\_Type==HO-Target)

##### 14.2.7.2.2.2.1 Function

This primitive is used by the target 802.16 BS entity responding to the C-HO-REQ(HO-Target) primitive from mobility control entity in NCMS.

##### 14.2.7.2.2.2.2 Semantics of the service primitive

The following parameters are included in this primitive.

```

C-HO-RSP
(
  Message_id,
  Operation_Type(Action),
  Action_Type(HO-Target),
  Object_id(NCMS),
  Attribute_list:
    MS ID
    Target BS ID
    Result Flag
    HO Type
    Mode
    MS Access Information
    Newly Allocated Information
    HO Quality Information
)

```

##### Target BS ID

Base station unique identifier of the target BS

##### MS ID

48-bit unique identifier used by MS

##### Result Flag

##### HO Type

Indication of HO types; HO or SHO/FBSS

##### Mode

Various modes in Anchor BS update or Active Set Update

##### MS Access Information

Information needed by MS to access the target BS; HO ID, CQI CH Information, HO Authorization Policy Information

##### Newly Allocated Information

Newly allocated information for the MS or each service flow; SAID, CID

##### HO Quality Information

Information related with quality of HO procedure; HO Optimization Flag, Service Level Prediction

##### 14.2.7.2.2.2.3 When generated

When the target 802.16 BS entity generates this primitive to respond to the C-HO-REQ(HO-Target) primitive from the NCMS.

##### 14.2.7.2.2.2.4 Effect of receipt

The mobility control entity in NCMS processes the information contained in this primitive and may generate a primitive to the serving 802.16 BS entity to proceed in the HO procedure.

### 14.2.7.2.2.3 C-HO-RSP(Action\_Type==HO-Scan)

#### 14.2.7.2.2.3.1 Function

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

#### 14.2.7.2.2.3.2 Semantics of the service primitive

The parameters of the primitive are as follows:

```

C-HO-RSP
(
  Message_id,
  Operation_Type(Action),
  Action_Type(HO-Scan),
  Object_id(NCMS),
  Attribute_list:
    Number of MS,
    List of MS ID,
    List of Signal information,
    Scan Duration,
    Start Frame,
    MIH Capability,
    Result Code
)

```

Number of MS

Number of MSs

List of MS ID

The list of MS ID

Number of BS

Number of BSs

List BS ID

The list of BS ID

List of Signal Information

TBD.

Scan Duration

Scan duration time

Start Frame

Scan start frame

MIH Capability

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.

#### 14.2.7.2.2.3.3 When generated

##### 14.2.7.2.2.3.3.1 802.16 BS Entity to NCMS

For a 802.16 BS entity, this primitive is generated when the BS receives C-HO-REQ(HO-Scan). ~~For a 802.16 MS entity, this primitive is generated when the MS receives MOB\_SCN-RSP message.~~

##### 14.2.7.2.2.3.3.2 802.16 MS Entity to NCMS

For a 802.16 MS entity, this primitive is generated when one of following events are occurred.

- The MS receives MOB-SCN-RSP message
- One of conditions for scanning report defined C-HO-REQ(HO-Scan) is satisfied.
- The MS receives C-HO-REQ(Scan) primitive with Report Target = remote and sends MOB\_SCN-REP message to BS.
- The MS receives C-HO-REQ(Scan) primitive with Report Target = local

#### 14.2.7.2.2.3.4 Effect of receipt

##### 14.2.7.2.2.3.4.1 802.16 BS Entity to NCMS

The mobility management entity in NCMS may decide the specific MS and its potential target BS for BS-initiated HO based on the reported signal quality in the C-HO-RSP(HO-Scan) primitive.

##### 14.2.7.2.2.3.4.2 802.16 MS Entity to NCMS

The mobility management entity in NCMS may instruct MS to start to scan or to handover to the selected BS based on the information from C-HO-RSP(HO-Scan).

#### 14.2.7.2.3 C-HO-NOTFY

This primitive is used by a 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

The following sub-sections define the primitive when its event type is set to a specific action.

##### **14.2.7.2.3.1 C-HO-NOTFY(Event\_Type==HO-Start)**

###### 14.2.7.2.3.1.1 Function

In case of HO, this primitive is used to indicate the starting of the actual HO. In case of SHO/FBSS, it can be used to update Anchor BS or to add a new Active BS to the current Active set. Both of the serving 802.16 BS entity and the mobility control entity in NCMS can use this primitive to inform the 802.16 target BS entity or the mobility control entity in NCMS of the starting of the actual HO. In addition, the mobility control entity in NCMS at MS side can use this primitive to inform the 802.16 MS entity of the starting of the actual HO.

###### 14.2.7.2.3.1.2 Semantics of the service primitive

The following parameters are included in this primitive.

```

C-HO-NOTFY
(
  Message_id,
  Event_Type(HO-Start),
  Object_id(BS_ID, MS_ID or NCMS),
  Attribute_list:
    MS ID

```

```

        HO Type
        Mode
        Target BS ID
    )

MS ID
    48-bit unique identifier used by MS
HO Type
    Indication of HO types; HO or SHO/FBSS
Mode
    Various modes in Anchor BS update or Active Set Update
Target BS ID
    Base station unique identifier to which the MS attempts the actual HO

```

#### 14.2.7.2.3.1.3 When generated

##### 14.2.7.2.3.1.3.1 802.16 BS Entity to NCMS

This primitive is generated when MOB\_HO-IND is received from the MS.

##### 14.2.7.2.3.1.3.2 NCMS to 802.16 BS Entity

This primitive is used by the mobility control entity in NCMS to inform the target 802.16 BS entity the start of the MS handover.

#### 14.2.7.2.3.1.4 Effect of receipt

##### 14.2.7.2.3.1.4.1 802.16 BS Entity to NCMS

The mobility control entity in NCMS processes the information contained in the primitive and may generate C-HO-NOTFY(HO-Start) to the target 802.16 BS entity.

##### 14.2.7.2.3.1.4.2 NCMS to 802.16 BS Entity

The target 802.16 BS entity prepares for the MS handover as indicated in this primitive.

#### 14.2.7.2.3.2 C-HO-NOTFY(Event\_Type==HO-Cancel)

##### 14.2.7.2.3.2.1 Function

In case of HO, this primitive indicates the cancellation of the pending HO. In case of SHO/FBSS, it can be used to cancel anchor BS update or Active set update, or to remove a target BS from the current active set. Both of the serving 802.16 BS entity and the mobility control entity in NCMS can use this primitive.

##### 14.2.7.2.3.2.2 Semantics of the service primitive

This primitive conveys the following parameters.

```

C-HO-NOTFY
(
    Message_id,
    Event_Type(HO-Start),
    Object_id(BS_ID, MS_ID or NCMS),
    Attribute_list:
        MS ID

```

```

        HO Type
        Mode
    )

MS ID
    48-bit unique identifier used by MS
HO Type
    Indication of HO type; HO and SHO/FBSS
Mode
    It is valid for SHO/FBSS and cancels Anchor BS update or Active set update.
    In addition, it may indicate removal of the target BS from the current active set.

```

#### 14.2.7.2.3.2.3 When generated

##### 14.2.7.2.3.2.3.1 802.16 BS Entity to NCMS

This primitive is generated when MOB\_HO-IND is received from the MS.

##### 14.2.7.2.3.2.3.2 NCMS to 802.16 BS Entity

This primitive is used by the mobility control entity in NCMS to inform the target 802.16 BS entity the HO procedure is cancelled.

#### 14.2.7.2.3.2.4 Effect of receipt

##### 14.2.7.2.3.2.4.1 802.16 BS Entity to NCMS

The mobility control entity in NCMS processes the information contained in the primitive and may generate C-HO-NOTFY(HO-Cancel) to the target 802.16 BS entity.

##### 14.2.7.2.3.2.4.2 NCMS to 802.16 BS Entity

The target 802.16 BS entity shall release all resources related to the MS handover.

#### **14.2.7.2.3.3 C-HO-NOTFY(Event\_Type==HO-Scan)**

##### 14.2.7.2.3.3.1 Function

This 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.

##### 14.2.7.2.3.3.2 Semantics of the service primitive

The following parameters are included in this primitive.

```

C-HO-NOTFY
(
    Message_id,
    Event_Type(HO-Scan),
    Object_id(NCMS),
    Attribute_list:
        MS ID
        RF Signal information
)

```



MS ID  
 48-bit unique identifier used by MS  
 RF Signal Information  
 TBD.

#### 14.2.7.2.3.3.3 When generated

This primitive is generated by 802.16 BS Entity when it receives a MOB\_SCAN-REP.

#### 14.2.7.2.3.3.4 Effect of receipt

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

### 14.2.7.2.3.4 C-HO-NOTIFY(Event\_Type==HO-CMPLT)

#### 14.2.7.2.3.4.1 Function

This primitive is used by both BS and NCMS to notify the handover process is completed.

#### 14.2.7.2.3.4.2 Semantics of the service primitive

It delivers the following parameters.

```
C-HO-NOTIFY
(
  Message_id,
  Event_Type(HO-CMPLT),
  Object_id(NCMS or 802.16 Entity),
  Attribute_list:
    Target BS ID
    MS ID
    Result Flag
    List of Last received SDU SNs
)
```

Target BS ID  
 Base station unique identifier of the target BS

MS ID  
 48-bit unique identifier used by MS

Result Flag  
 List of Last received SDU SNs

```
(
  SFID
  Last received SDU SN
)
```

The sequence number of the last MAC SDU which the MS received before handover to the target BS. The connection associated with the SDU SN is identified by SFID when SDU SN feedback is enabled.

#### 14.2.7.2.3.4.3 When generated

##### 14.2.7.2.3.4.3.1 802.16 BS Entity to NCMS

This primitive is generated by target 802.16 BS Entity when the MS completes network re-entry at the target BS. If SDU SN feedback is enabled, the target 802.16 BS Entity shall generate this primitive after it has received SN report header.

#### 14.2.7.2.3.4.3.2 NCMS to 802.16 BS Entity

This primitive is generated by NCMS after finishing handover process in NCMS side. It is used to inform serving BS to release its corresponding resource.

#### 14.2.7.2.3.4.4 Effect of receipt

##### 14.2.7.2.3.4.4.1 802.16 BS Entity to NCMS

NCMS completes handover procedure.

##### 14.2.7.2.3.4.4.2 NCMS to 802.16 BS Entity

BS releases its resource for MS accordingly.

***[Delete section 14.2.9.4]***

***[Delete section 14.2.9.5]***

***[Delete section 14.2.9.6]***

***[Delete section 14.2.9.7]***

***[Delete section 14.2.9.8]***

***[Change section 14.2.9.10 to 14.2.7.3 and change the prefix of its subsection from 14.2.9.10 to 14.2.7.3]***