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Abstract	Section clean up for 14.5.9.4-14.5.9.7.
Purpose	Adoption
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Clean Up Section 14.5.9.4 -14.5.9.7

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1. Introduction

In response to the clause editing action item assigned in IEEE 802.16 session #40, this contribution includes text changes for section 14.5.9. This clean up includes the naming convention modification based on contribution C80216g-05_052r4 which was accepted in session #40.

As part of the modification for the primitives' names, the following are defined:

- SAP
  - C – Control plane SAP
  - M – Management plane SAP
- Function
  - SMC – Secondary Management Connection
  - SFM – Service Flow Management
- Operation
  - REQ – Request
  - RSP – Response to the REQ message
  - ACK – Acknowledgement to the reception of RSP or NOTFY message
  - NOTFY – Event Notification

2. Proposed Solution

The following changes are made in section 14.5.9.4-14.9.5.7:

1. Rename Primitives. The following table provides a mapping between the old and new names of the primitives:

Existing Primitives	New Primitives
HO request (Source BS to NCMS)	C-HO-REQ(Op==Action, Action_Type==HO-Serving)
HO indication (NCMS to Target BS)	C-HO-REQ (Op==Action, Action_Type==HO-Target)
HO response (NCMS to Source BS)	C-HO-RSP(Op==Action, Action_Type==HO-Serving)
HO confirmation (Target BS to NCMS)	C-HO-RSP (Op==Action, Action_Type==HO-Target)
HO start	C-HO-NOTFY(Event_Type==HO_Start)
HO cancel	C-HO-NOTFY(Event_Type==HO_Cancel)
HO Directive (NCMS to Source BS)	C-HO-REQ(Op==Action, Action_Type==HO-Serving)

Scanning.request	C-HO-REQ(Op==Action, Action_Type==Scan)
Scanning.response	C-HO-RSP(Op==Action, Action_Type==Scan)

2. Due to the renaming and merging of some primitives, the section is re-arranged. However, the content of the primitives are kept same except for some additional fields due of adopted changes in contribution C80216g-05_052r4.

3. Use of 802.16 Entity instead of BS. An 802.16Entity can be either a BS or MS. When a primitive is defined for both BS and MS unless specified otherwise.

4. Primitive diagrams are modified according to contribution C80216g-05_052r4 and also the introducing of 802.16 Entity

5. Most of the text modification shown is due to re-arranging of the section. Only minor text modification is introduced.

3. Detail Text Changes

[*Modify section 14.5.9.4-14.9.7 as the following*]

14.5.9.4 MS Handover Management

<Section Note: How an MS handles its handover functions>

14.5.9.5 Inter BS Handover Management

<Section Note: How a BS handles its handover functions with neighboring BSes>

14.5.9.6 Macro Diversity Management

<Section Note: How a BS along with the NCMS entities handles macro diversity>

14.5.9.7 Handover Control Protocol Procedures

~~**14.5.9.7.1 HO Control Primitives**~~

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

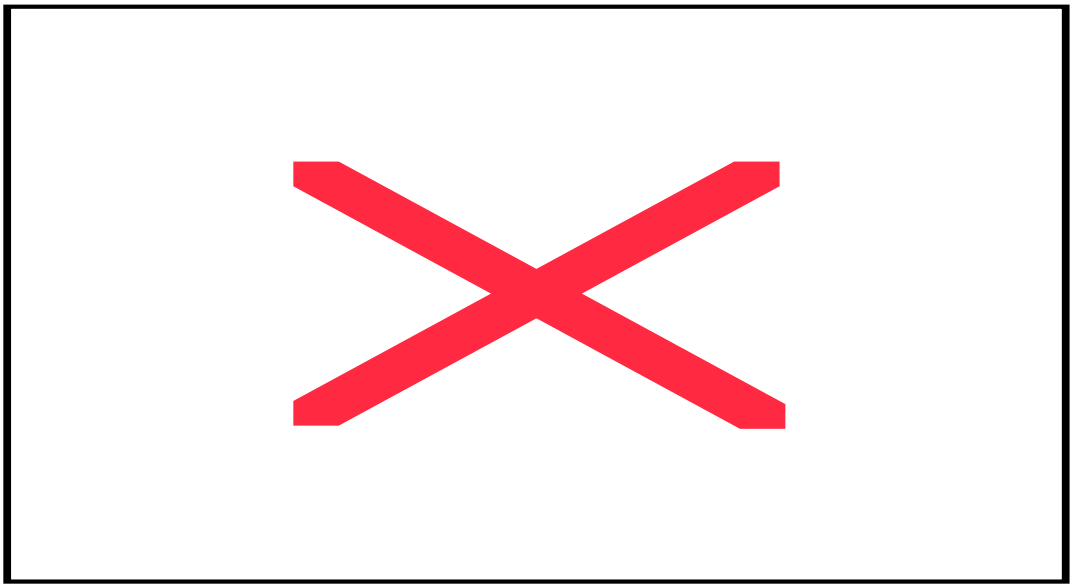

Figure xxx HO primitives flow between Serving BS and NCMS, BS initiated

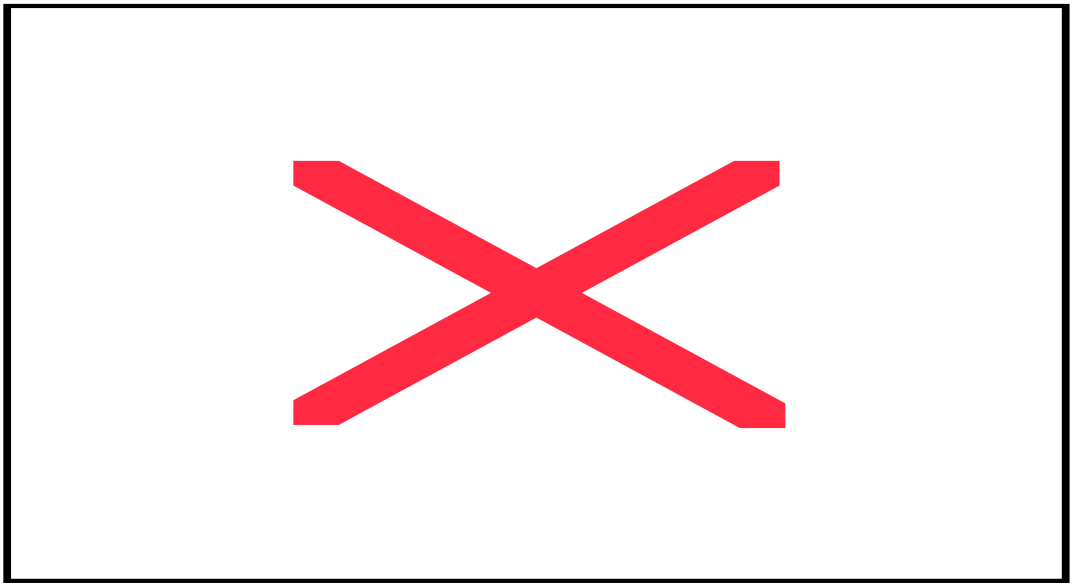

Figure xxx HO primitives flow between Serving BS and NCMS, NCMS initiated

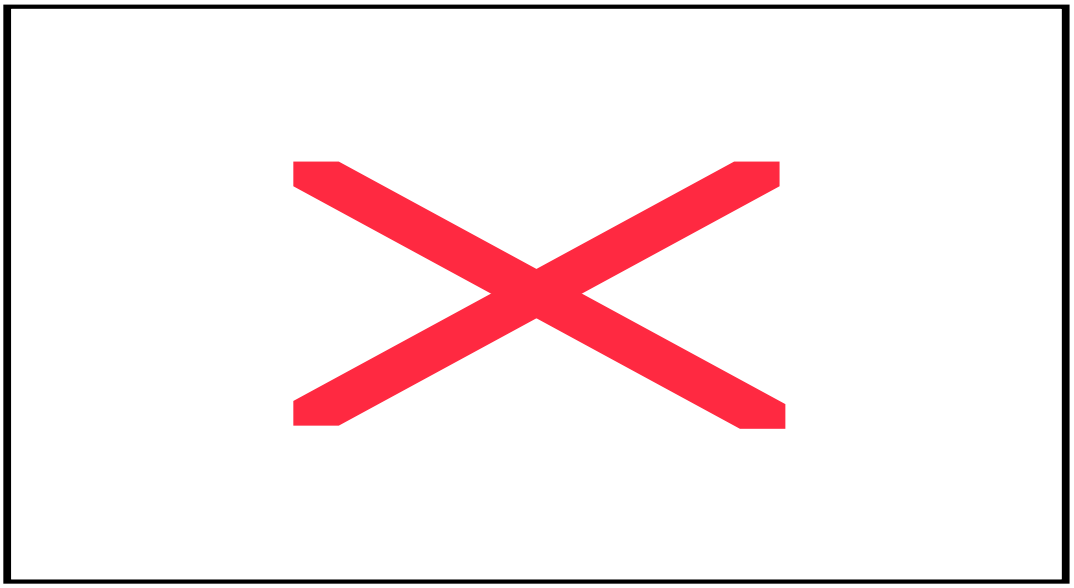

Figure xxx HO primitives flow between Target BS and NCMS

14.5.9.7.1 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 xxx

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..

14.5.9.7.1.1 ~~HO request~~C-HO-REQ(Action_Type==HO-Serving)

14.5.9.7.1.1.1 Function

This primitive is used by a serving BS ~~to inform~~or the mobility control entity in NCMS ~~of~~ to start an ~~incoming~~ HO ~~request from an MS~~ procedure.

14.5.9.7.1.1.2 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 BSes 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. TheBSs 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.

14.5.9.7.1.1.3 When generated

14.5.9.7.1.1.3.1 BS to NCMS

This primitive is generated when the BS receives a MOB_MSHO-REQ message from the MS

14.5.9.7.1.1.3.2 NCMS to BS

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

14.5.9.7.1.1.4 Effect of receipt

14.5.9.7.1.1.4.1 BS to NCMS

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

14.5.9.7.1.1.4.2 NCMS to BS

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

14.5.9.7.1.2 C-HO-REQ(Action_Type==HO-Target)~~HO indication~~

14.5.9.7.1.2.1 Function

This primitive is used by the mobility control entity in NCMS to inform target BSes of the pending HO.

14.5.9.7.1.2.2 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

14.5.9.7.1.2.3 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.

14.5.9.7.1.2.4 Effect of receipt

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

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

14.5.9.7.1.3.1 Function

This primitive is issued by the mobility management entity in NCMS to request radio signal information of MSs.

14.5.9.7.1.38.2 Semantics of the service primitive

The parameters of the primitive are as follow:

~~Scanning.reques~~**C-HO-REQ(Action_Type==HO-Scan)t**
(
Message_id,
Operation_Type(Action),
Action_Type(HO-Scan),
Object_id(BS_ID),

Attribute_list:
Number of MS,
List of MS ID
)

Number of MS
Number of MSs
List of MS ID
The list of MS ID

14.5.9.7.1.38.3 When generated

This primitive is generated when the mobility management entity in NCMS decides that BS-initiated HO should be occurred because the BS is about to be overloaded.

14.5.9.7.1.38.4 Effect of receipt

The BS shall response to the scanning.request primitive using scanning.response primitive.

14.5.9.7.2 C-HO-RSP

This primitive is used by a BS 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 xxx

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..

14.5.9.7.21.13 HO responseC-HO-RSP(Action_Type==HO-Serving)

The Mobility Control entity in NCMS responds to the serving BS with the list of recommended target BSes. This primitive is always sent in reply to the HO request primitive.

The following parameters are included in this primitive.

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

14.5.9.7.21.24 HO confirmationC-HO-RSP(Action_Type==HO-Target)

This primitive is used by the target BS to responds to the HO indication primitive from the serving BS or the mobility control entity in NCMS. It delivers the following parameters.

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

14.5.9.7.21.39 ~~Scanning.response~~C-HO-RSP(Action_Type==HO-Scan)

14.5.9.7.21.39.1 Function

This primitive is issued by the BS to respond to scanning.request

14.5.9.7.21.39.2 Semantics of the service primitive

The parameters of the primitive are as follows:

~~Scanning.confirmation~~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
)

Number of MS

Number of MSs

List of MS ID

The list of MS ID

List of Signal Information

TBD.

14.5.9.7.~~1.9~~2.3.3 When generated

This primitive is generated when the receives ~~scanning.request~~C-HO-REQ(HO-Scan)

14.5.9.7.21.39.4 Effect of receipt

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 ~~scanning.response~~ C-HO-RSP(HO-Scan)primitive.

14.5.9.7.3 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 xxx

Event Type	Description
HO-Start	
HO-Cancel	

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

14.5.9.7.3.1~~1.5 HO start~~C-HO-NOTFY(Event_Type==HO-Start)

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 BS and the mobility control entity in NCMS can use this primitive to inform the target BS or the mobility control entity in NCMS of the starting of the actual HO. The following parameters are included in this primitive.

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

14.5.9.7.3.1~~1~~.2~~6 HO cancel~~C-HO-NOTFY(Event_Type==HO-Cancel)

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 BS and the mobility control entity in NCMS can use this primitive. This primitive conveys the following parameters.

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.

~~**14.5.9.7.1.7 HO Directive**~~

~~This primitive is generated by the Mobility Control entity in NCMS to induce the handover of a particular MS. Transmission of MOB_BSHO-REQ message is triggered by this primitive.~~

~~**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

This is the list of recommended target BSes by the mobility control entity. 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

14.5.9.7.1.8 Scanning.request

14.5.9.7.1.8.1 Function

This primitive is issued by the mobility management entity in NCMS to request radio signal information of MSs.

14.5.9.7.1.8.2 Semantics of the service primitive

The parameters of the primitive are as follow:

Scanning.request
(
Number of MS,
List of MS ID
)
Number of MS
Number of MSs
List of MS ID
The list of MS ID

14.5.9.7.1.8.3 When generated

This primitive is generated when the mobility management entity in NCMS decides that BS-initiated HO should be occurred because the BS is about to be overloaded.

14.5.9.7.1.8.4 Effect of receipt

The BS shall response to the scanning.request primitive using scanning.response primitive.

14.5.9.7.1.9 Scanning.response

14.5.9.7.1.9.1 Function

This primitive is issued by the BS to respond to scanning.request

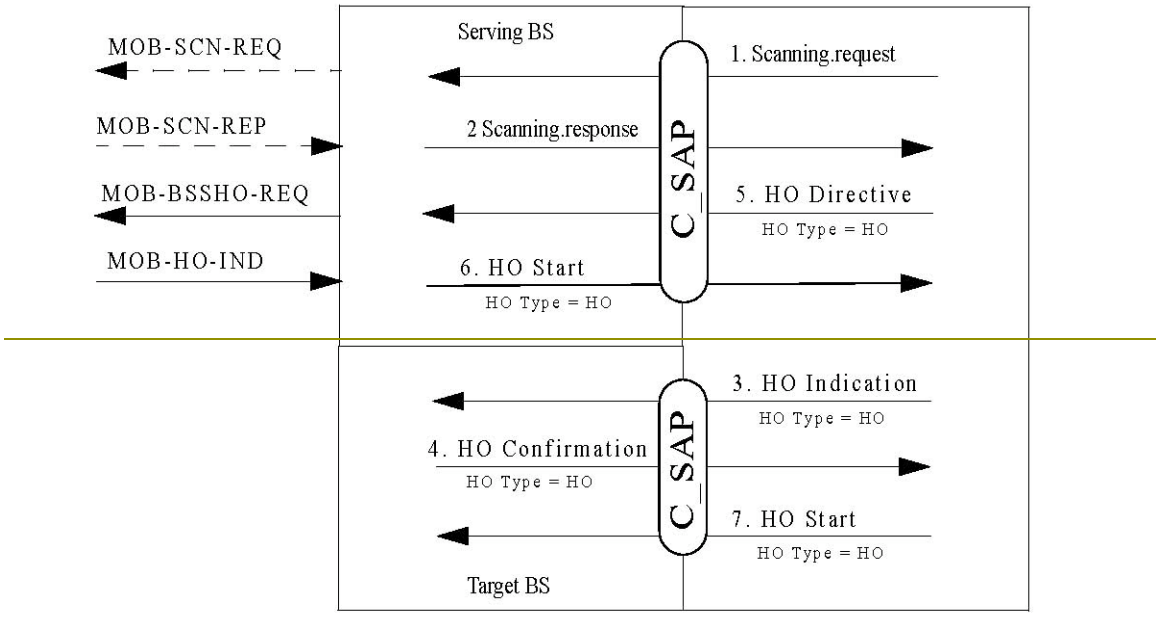

Figure 325—Example Primitive Flow of HO initiated by BS

~~**14.5.9.7.1.9.2 Semantics of the service primitive**~~

~~The parameters of the primitive are as follows:~~

~~**Scanning.confirmation**~~
~~(~~
~~Number of MS,~~
~~List of MS ID,~~
~~List of Signal information~~
~~)~~

~~**Number of MS**~~
~~Number of MSs~~
~~**List of MS ID**~~
~~The list of MS ID~~
~~**List of Signal Information**~~
~~TBD.~~

~~**14.5.9.7.1.9.3 When generated**~~

~~This primitive is generated when the receives scanning.request~~

~~**14.5.9.7.1.9.4 Effect of receipt**~~

~~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 scanning.response primitive.~~

<Note to Editor: Move the following sections into Annex G>

~~14.5.9.7.2 Hard Handoff Procedures~~

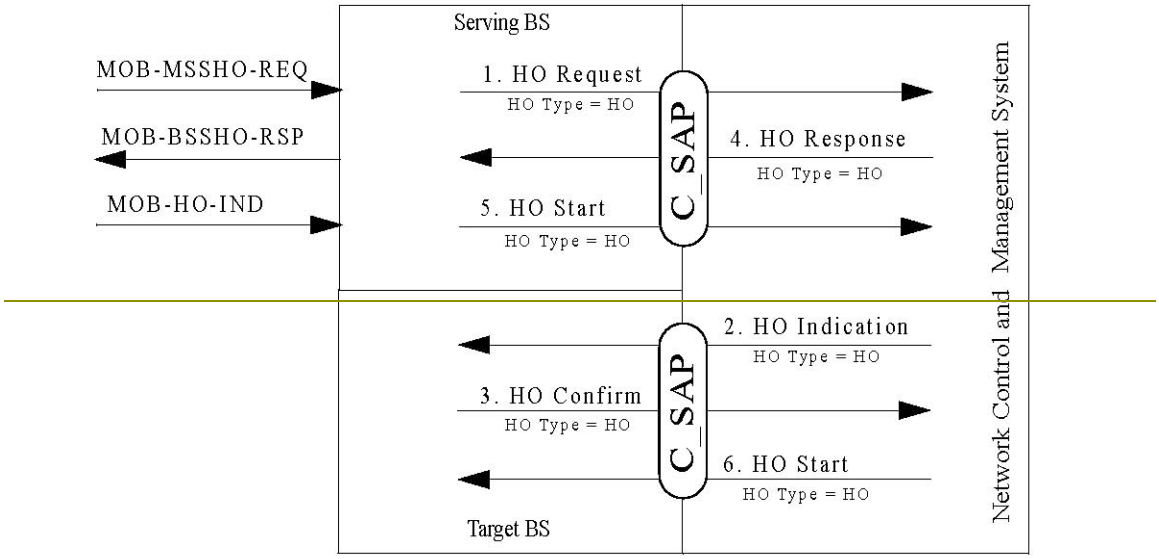

Figure 326—Example Primitive Flow of HO Initiated by MS

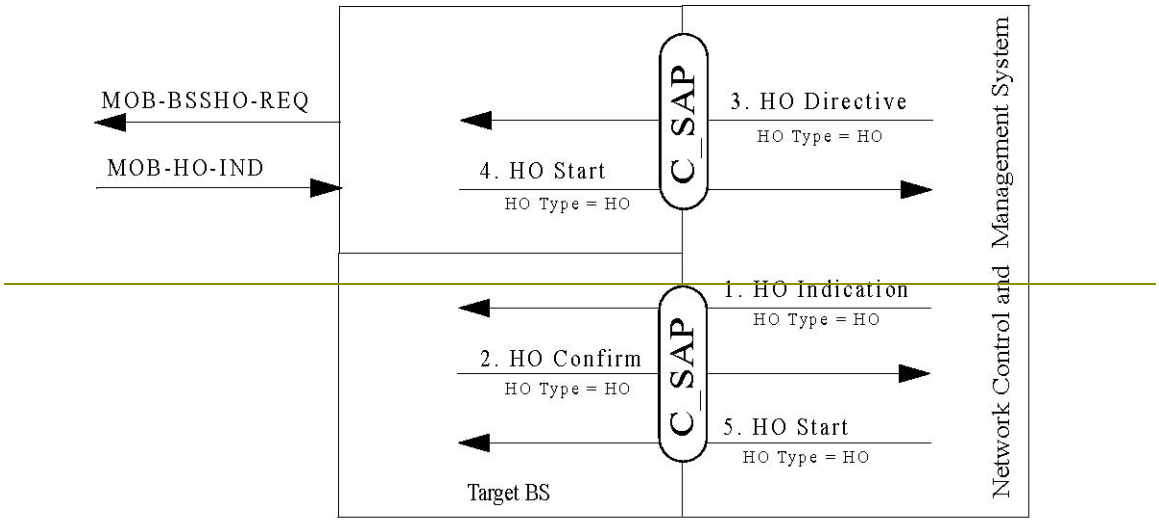

Figure 327—Example Primitive Flow of HO Initiated by BS

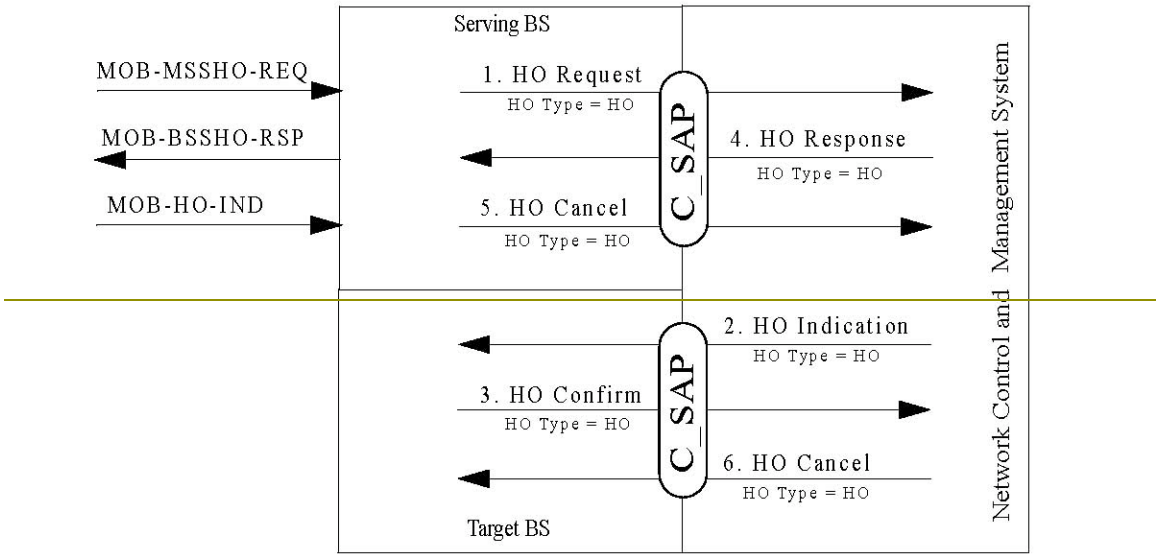

Figure 328—Example Primitive Flow of HO Cancel

~~**14.5.9.7.3 Fast Base Station Switching Procedures**~~

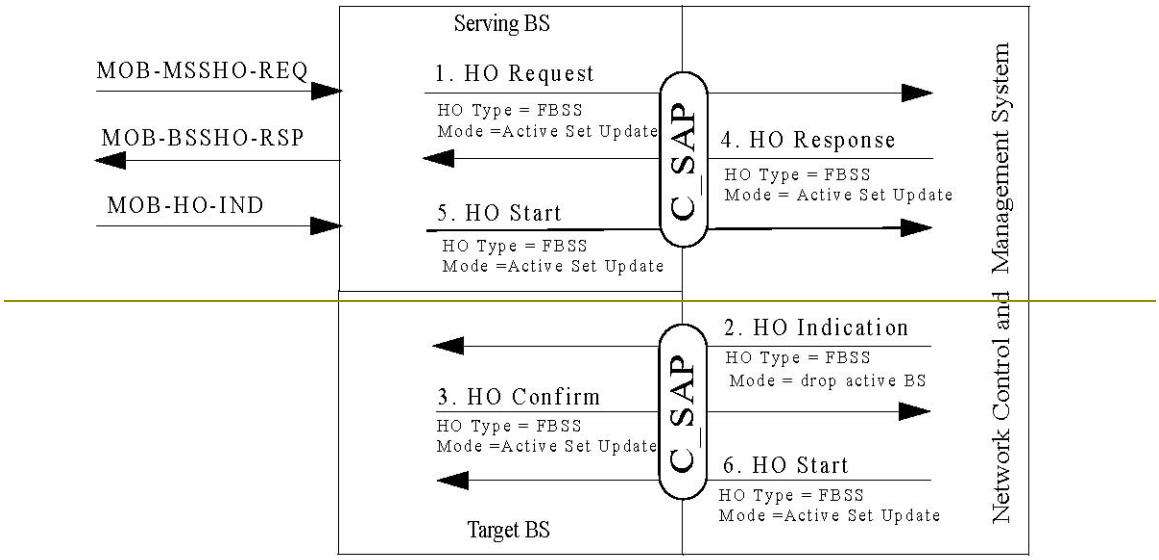

Figure 329—Example Primitive Flow of Active Set Update (Add)

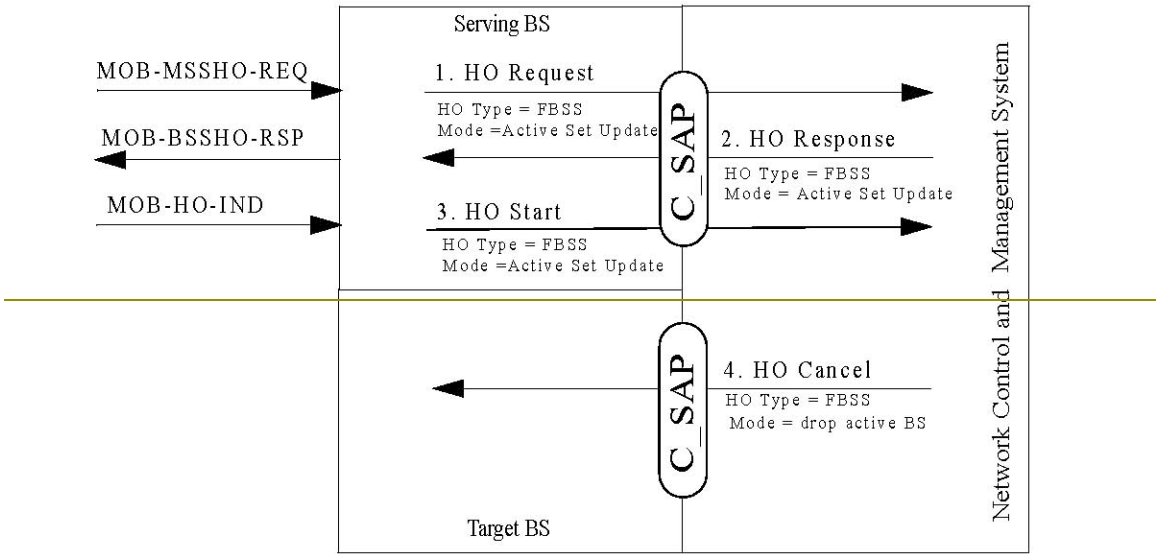

Figure 330—Example Primitive Flow of Active Set Update (Drop)

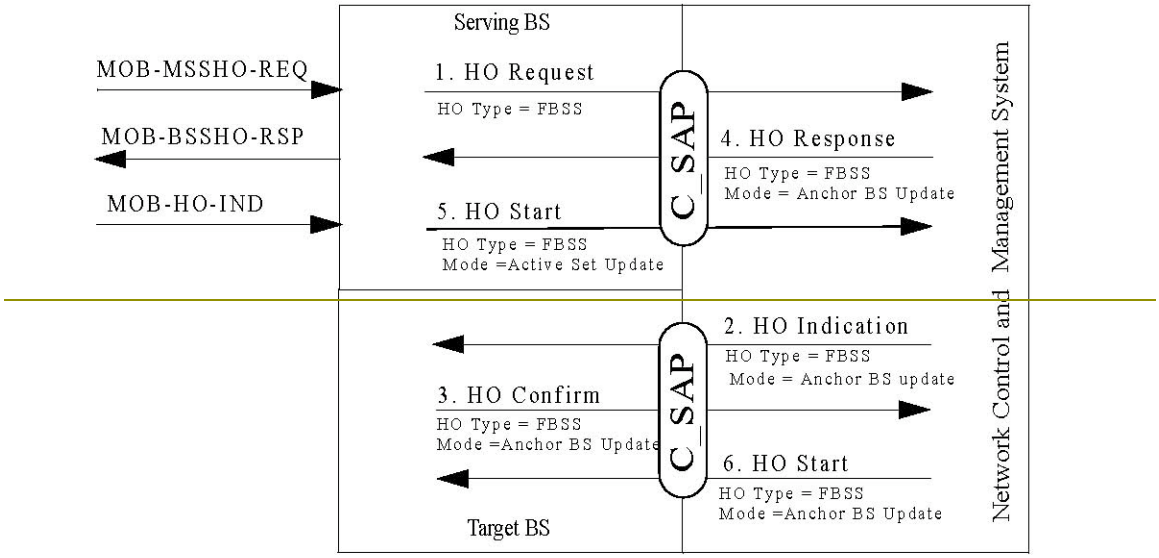

Figure 331—Example Primitive Flow of Anchor BS Update (Using MAC messages)

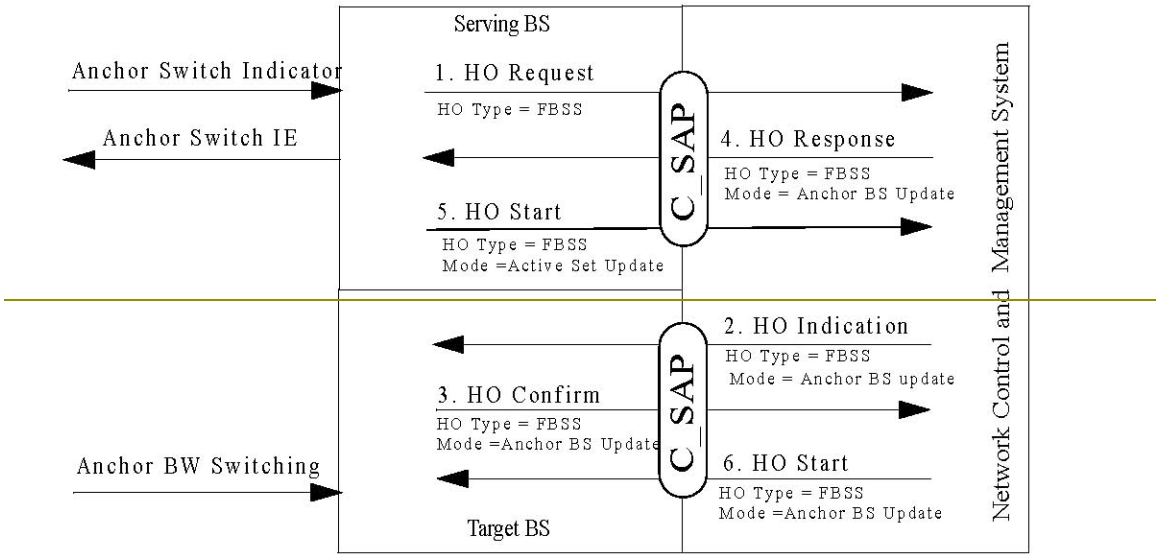

Figure 332—Example Primitive Flow of Anchor BS Update (Using selection feedback mechanism)

~~**14.5.9.7.4 Soft Handoff Procedures**~~

~~SHO procedures are the same as FBSS procedures except that the primitives may have different parameter values.~~