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| Project | **IEEE 802.16 Broadband Wireless Access Working Group <**<http://ieee802.org/16>**>** |
| Title | **Primitives to Support BS Power Saving Mechanism** |
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| Re: | Call for Contributions: Multi-tier Networks (16-13-0064-01-000q) |
| Abstract | This contribution defines some service primitives to support BS Power saving mechanism |
| Purpose | To discuss and adopt the proposed texts in IEEE P802.16q AWD |
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# Service Primitives to Support BS Power Saving Mechanism

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# Introduction

This contribution contains some service primitives and relevant procedures to support BS power management. Detailed BS operation related to the service primitives proposed in this contribution has been proposed in other contributions (IEEE 802.16-13-0087-00-000q and IEEE 802.16-13-0088-00-000q).

In this contribution, we have defined 3 service primitives to support BS power saving mechanism as shown in the table below. Detailed contents and operations of each primitive need to be developed further. However, our intention is to use these primitives for standby mode as well as duty-cycled mode by including different parameters in the service primitives.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | SAP | Source | Destination | Purpose |
| M-BPM-REQ | M-SAP | NCMS | BS | * Configuration of BS power management function
* Change of configuration parameters
* Request to change operation mode
 |
| M-BPM-RSP | M-SAP | BS | NCMS | * Response to the request from NCMS
 |
| M-BPM-IND | M-SAP | BS | NCMS | * Notification of a completion of mode transition at BS
 |

# Proposed Texts

----------------- Start of the text proposal --------------------------------------------------------------------------------------

[*Remedy 1: Change subclause 14.1 as follows:*]

**14. Management interface and procedures**

This subclause defines the service primitives for use at C-SAP and M-SAP at BS and MS side of the radio interface. The specific mapping of service primitives to protocol messages in the backhaul network is out of scope of this standard.

***Change subclause 14.1 as indicated:***

**14.1 Service primitive template**

**14.1.1 Universal naming schema for SAP service primitive**

The primitive name defined on the SAP consists of three fields—SAP, Function, and Operation:

SAP

C—Control plane SAP

M—Management plane SAP

Function

ACM—Accounting Management

HO—Handover

IMM—Idle Mode Management

LBS—Location Based Services

MBS—Multicast Broadcast Service

NEM—Network Entry Management

RRM—Radio Resource Management

SFM—Service Flow Management

SM—Security Management

SMC—Secondary Management Connection

SSM—Subscriber Station Management

BPM – BS Power Management

Operation

REQ—Request

RSP—Response to the REQ message

ACK—Acknowledgment to the reception of REQ or RSP or IND message

IND—Event Notification

These primitives are symmetrical between the IEEE 802.16 entity and the NCMS. That is, both the IEEE 802.16 entity (SS/MS or BS) and the NCMS can send these primitives depending on the functional behavior defined for M-SAP and C-SAP. ACK shall only be supported across the C-SAP.

* A service primitive of type REQ is used whenever a response to the primitive is solicited. If there is a REQ message on the radio interface, it is generally mapped to a REQ on C-SAP/M-SAP.
* A service primitive of type RSP is used in response to a REQ primitive. Moreover, if there is a RSP message on the radio interface, it is generally mapped to a RSP on C-SAP/M-SAP.
* A service primitive of type IND is used at C-SAP or M-SAP for event notification if a response to this primitive is not solicited, and if the primitive is not sent in response to a REQ primitive.
* A service primitive of type ACK can be used to acknowledge the receipt of a C-SAP primitive of type REQ, RSP, or IND.

The specific usage of these operation types for the respective control and management functions is specified in the subsequent subclauses.

The IEEE 802.16 entity shall support the primitives that are delivered through C-SAP or M-SAP interfacing with NCMS.

**14.1.2 SAP service primitive object format**

There are two types of services: M-SAP/C-SAP operation service primitive and M-SAP/C-SAP notification service primitive. The REQ and RSP operations shall use the operation service primitive and the IND operation shall use the notification service primitive. The ACK operation shall use the same primitive format as the primitive it acknowledges.

**14.1.2.1 M-SAP/C-SAP operation service primitive**

This primitive is defined as Primitive\_name () with a parameter list.

The format shall be:

Primitive\_name

(

Operation\_Type,

Action\_Type,

Destination,

Attribute\_list

)

The parameters shall be described briefly in Table 14-1.

**Table 14-1 – M-SAP/C-SAP Operation Types**

|  |  |  |
| --- | --- | --- |
| Parameter name | Mandatory/Optional |  |
| Operation\_Type | M | Create, Delete, Get, Set, Action |
| Action\_Type | O | When Operation\_Type is Action, valid values for Action\_Type are:  Certificate\_Verification, Context\_Transfer, Idle\_Mode\_Initiation, Network\_Re-Entry\_from\_Idle\_Mode, HO-Serving, HO-Target, HO-Mobile, Spare Capacity Report, PHY Report, Ranging,  Registration, SS Basic Capability, Power On, Power Down, Reset,  Hold,  Normal, Deregistration, Location Update, BPM Configuration, Duty-cycled mode, Standby mode |
| Destination | M | This indicates the destination of the primitive. Allowed values are: SS or MS, BS, NCMS. |
| Attribute\_list |  | Array of pair (Attribute\_ID, Attribute\_value). In Get request operation, Attribute\_value is Null |

**14.1.2.2 M-SAP/C-SAP notification service primitive:**

This primitive shall be defined as Primitive\_name () with a parameter list.

The format shall be:

Primitive\_name

(

Event\_Type,

Destination,

Attribute\_List

)

The parameters are described briefly in Table 14-2.

**Table 14-2 – M-SAP/C-SAP Event Types**

|  |  |  |
| --- | --- | --- |
| Parameter name | Mandatory/Optional |  |
| Event\_Type | M | Specify the type of occurring event, valid values for Event\_Type are:  Accounting, EAP\_Start, EAP\_Transfer, Certificate\_Information, SMC\_PAYLOAD, IP\_ALLOCATION, Paging\_Announce,  HO-Start,  HO-Cancel, HO-Scan,  HO-CMPLT, MIH-IND, Spare Capacity Report, Neighbor-BS Radio Resource Stations Update, NBR\_BS\_Update,  Network\_attached,  Location\_Update\_CMPLT,  Reset,  Hold,  Normal,  MBS Portion Layout,  LBS,  Standby\_Mode\_CMPLT |
| Destination | M | This indicates the destination of the primitive. Allowed values are: SS or MS, BS, NCMS. |
| Attribute\_list |  | Array of pair (Attribute\_ID, Attribute\_value) |

**14.1.3 SAP service primitive flow diagram template**

Four typical handshake scenarios shown in Figure 14-1. The procedures are applicable to BS and SS side.



**Figure 14-1 – SAP service primitive Flow Diagram template**

The figure is illustrative only and provides an example of correct formatting of primitive figures.

[*Remedy 2: Insert the following subclause on page 18 as follows:*]

**14.2 Management and control functions**

***Insert new subclause 14.2.12 as indicated:***

**14.2.12 BS power management**

The BS power management primitives are a set of primitives for supporting BS power management between IEEE 802.16 entity and NCMS. BS power management uses BS power management Services in the NCMS.



Figure 14-xxx Primitive for configuration of BS power management



Figure 14-xxx Primitive flow for duty-cycled mode transition



Figure 14-xxx Primitive flow for NCMS-initiated standby mode transition



Figure 14-xxx Primitive flow for BS-initiated standby mode transition

**14.2.12.1 M-BPM-REQ**

This primitive is used by the NCMS to config operation parameters required for BS power management operation or request the IEEE 802.16 entity (BS) to change its operation mode. The possible Action\_Types for this primitive are listed in table below:

|  |  |
| --- | --- |
| Action\_Type | Description |
| BPM Configuration | Configuration procedure between BS and NCMS for BS power management. |
| Duty-cycled mode | Duty-cycled mode transition procedure between BS and NCMS. |
| Standby mode | Standby mode transition procedure between BS and NCMS |

**14.2.12.2 M-BPM-RSP**

This primitive is used by the IEEE 802.16 entity(BS) in response to M-BPM-REQ primitive for BS power management. The possible Action\_Types for this primitive are listed in table belew:

|  |  |
| --- | --- |
| Action\_Type | Description |
| BPM Configuration | Configuration procedure between BS and NCMS for BS power management. |
| Duty-cycled mode | Duty-cycled mode transition procedure between BS and NCMS. |
| Standby mode | Standby mode transition procedure between BS and NCMS |

**14.2.12.3 M-BPM-IND**

This primitive is used by the IEEE 802.16 (BS) to inform the NCMS of the completion of standby mode transition. The possible Event\_Types for in this primitive are listed in table below:

|  |  |
| --- | --- |
| Event\_Type | Description |
| Standby\_Mode\_CMPLT | Indicating the completion of standby mode transition at the BS. |

[*Remedy 3: Insert the following new clause on page 22 as follows:*]

**Annex R**

(informative)

**BS operation mode transition diagram**



Figure R-1 BS operation mode transition

----------------- Start of the text proposal --------------------------------------------------------------------------------------