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Re:	Contribution on IEEE 802.16f/D5
Abstract	This contribution proposed a method to upgrade the software of BS from network management center through adding Software management entry MIB. Add this feature can greatly save operators' CAPEX and OPEX.
Purpose	Adoption
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Proposal for BS Software Management

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Introduction

Software upgrading is frequently used procedures for operators during maintenance work. And it's very common improper upgrading will easily cause the system working abnormal. As most of the upgrading is made by human being and consequently it requires professional engineers to do the upgrading work. Nonstandard upgrading operations increased the maintenance expenses and also increased the risk of operator mistakes.

Actually software upgrading procedures will only contain two steps. One is downloading the new software version to devices, another is activating the corresponding software version. It's a very easy and common way for operator to understand and follow. These two steps are steps shown to operators. The complex internal processing should be encapsulated for vendor specific implementation.

Also the download and activate progress are also very important information for operators to know what's going on during the upgrading.

Software Management feature for BS becomes more and more important when network expanding. It's very useful and convenient for the remote operation from network management center. Not need to go site by site to perform the upgrading operation, especially when the BS sites are scattered located. It will save CAPEX and OPEX for operators. Also, based on this feature, from the network management system, bulk upgrading can be made and greatly shorten the upgrading time during the whole system upgrading procedures.

This contribution proposes to add Software management MIB definition in the current 802.16f MIB, the new added MIB entry can be used for software management entry to upgrade BS from network manager locally or remotely.

Proposed Text Changes

1. [Change the text in section 13. 2 wmanDevMib as the following]
1.1 Add Node wmanDevBsSoftwareManagement in Figure 15—wmanDevMib Structure, keep the previous structure definition intact.

wmanDevMib (1.0.8802.16.1)
1.2 Add new section 13.2.1.2 wmanDevBsSoftwareManagement:

13.2.1.2 ~~wmanDevBsSoftwareManagement~~
Figure 17 shows the structure of wmanDevBsSoftwareManagement subtree that contains BS managed objects related to software management.

wmanDevBsSoftwareManagement(1.0.8802.16.1.1.2)
Figure 17 wmanDevBsSoftwareManagement Structure

13.2.1.2.1 wmanDevBsConfigFileEncodingTable

wmanDevBsConfigFileEncodingTable contains configuration file information about the base station such as manufacturer, hardware model, and software or firmware revision.

~~13.2.1.2.1 wmanDevBsSwmFtpConfigTable~~

~~This table contains FTP configuration parameters for BS, including FTP server IP address, FTP user name , FTP password and filename.~~

~~13.2.1.2.2 wmanDevBsSWVersionTable~~

~~This table contains BS software version information. Each entry of the table contains BS vendor id , BS software versions and activation indication. And only one activation indication can be true.~~

~~13.2.1.2.3 wmanDevBsHWVersionTable~~

~~This table contains BS hardware version information. Each entry of the table contains hardware description and corresponding hardware version information.~~

13.2.1.2.~~4~~ 2 wmanDevBsDownloadTable

This table contains BS software download information.

13.2.1.2.~~5~~ 3 wmanDevBsActivateTable

This table contains BS software activation information.

ASN.1 Definitions:

```
~~wmanDevBsSoftwareManagement OBJECT IDENTIFIER ::= { wmanDevBsObjects 2 }~~

~~wmanDevBsSwmFtpConfigTable OBJECT IDENTIFIER ::= { wmanDevBsSoftwareManagement 2 }~~

~~wmanDevBsSWVersionTable OBJECT-TYPE~~
~~    SYNTAX SEQUENCE OF WmanDevBsSWVersionEntry~~
~~    MAX-ACCESS not-accessible~~
~~    STATUS current~~
~~    DESCRIPTION~~
~~        "This table contains BS software version information. Each entry of the table contains BS vendor id , BS software versions and activation indication. And only one activation indication can be true."~~
~~    ::= { wmanDevBsSoftwareManagement 3 }~~

~~wmanDevBsHWVersionTable OBJECT-TYPE~~
~~    SYNTAX SEQUENCE OF WmanDevBsHWVersionEntry~~
~~    MAX-ACCESS not-accessible~~
~~    STATUS current~~
~~    DESCRIPTION~~
~~        "This table contains BS hardware version information. Each entry of the table contains BS vendor id , BS software versions and activation indication."~~
~~    ::= { wmanDevBsSoftwareManagement 4 }~~

~~wmanDevBsDownloadTable OBJECT IDENTIFIER ::= { wmanDevBsSoftwareManagement 5 }~~
~~wmanDevBsActivateTable OBJECT IDENTIFIER ::= { wmanDevBsSoftwareManagement 6 }~~
```

~~wmanDevBsSwmFtpServer OBJECT-TYPE~~
~~SYNTAX InetAddress~~
~~MAX-ACCESS read-only~~
~~STATUS current~~
~~DESCRIPTION~~
~~"Server IP address contains the BS software."~~
~~::= { wmanDevBsSwmFtpConfigTable 1 }~~

~~wmanDevBsSwmFtpUserName OBJECT-TYPE~~
~~SYNTAX OCTET STRING~~
~~MAX-ACCESS read-only~~
~~STATUS current~~
~~DESCRIPTION~~
~~"FTP User name information."~~
~~::= { wmanDevBsSwmFtpConfigTable 2 }~~

~~wmanDevBsSwmFtpPassword OBJECT-TYPE~~
~~SYNTAX OCTET STRING~~
~~MAX-ACCESS read-only~~
~~STATUS current~~
~~DESCRIPTION~~
~~"FTP password corresponding to the wmanDevBsSwmFtpUserName."~~
~~::= { wmanDevBsSwmFtpConfigTable 3 }~~

~~wmanDevBsSwmFileName OBJECT-TYPE~~
~~SYNTAX OCTET STRING~~
~~MAX-ACCESS read-only~~
~~STATUS current~~
~~DESCRIPTION~~
~~"Software file information which includes directory information."~~
~~::= { wmanDevBsSwmFtpConfigTable 4 }~~

~~wmanDevBsSWVersionEntry OBJECT-TYPE~~
~~SYNTAX WmanDevBsSWVersionEntry~~
~~MAX-ACCESS not-aeeessible~~
~~STATUS current~~

~~DESCRIPTION~~
~~"This table is indexed by wmanDevBsSWVersion."~~
~~INDEX { wmanDevBsSWVersion }~~
~~::= { wmanDevBsSWVersionTable 1 }~~

~~wmanDevBsVendorId OBJECT-TYPE~~
~~SYNTAX OCTET STRING~~
~~MAX-ACCESS read-only~~
~~STATUS current~~
~~DESCRIPTION~~
~~"This value identifies the BS vendor to which the~~
~~software upgrade is to be applied."~~
~~::= { wmanDevBsSWVersionEntry 1 }~~

~~wmanDevBsSWVersion OBJECT-TYPE~~
~~SYNTAX OCTET STRING~~
~~MAX-ACCESS read-only~~
~~STATUS current~~
~~DESCRIPTION~~
~~"This value identifies the BS software version."~~
~~::= { wmanDevBsSWVersionEntry 2 }~~

~~wmanDevBsSWVersionIndication OBJECT-TYPE~~
~~SYNTAX OCTET STRING~~
~~MAX-ACCESS read-only~~
~~STATUS current~~
~~DESCRIPTION~~
~~"This value identifies the activation status of BS software versions."~~
~~::= { wmanDevBsSWVersionEntry 3 }~~

~~wmanDevBsHWVersionEntry OBJECT-TYPE~~
~~SYNTAX WmanDevBsHWVersionEntry~~
~~MAX-ACCESS not-accessible~~
~~STATUS current~~
~~DESCRIPTION~~
~~"This table is indexed~~
~~by wmanDevBsHWVersion."~~

~~INDEX { wmanDevBsHWVersion }~~
~~::= { wmanDevBsHWVersionTable 1 }~~

~~wmanDevBsHWDescription OBJECT-TYPE~~
~~SYNTAX OCTET STRING~~
~~MAX-ACCESS read-only~~
~~STATUS current~~
~~DESCRIPTION~~
~~"This value identifies the BS hardware information."~~
~~::= { wmanDevBsHWVersionEntry 1 }~~

~~wmanDevBsHWVersion OBJECT-TYPE~~
~~SYNTAX OCTET STRING~~
~~MAX-ACCESS read-only~~
~~STATUS current~~
~~DESCRIPTION~~
~~"This value identifies the BS hardware version."~~
~~::= { wmanDevBsHWVersionEntry 2 }~~

~~wmanDevBsDownloadSW OBJECT-TYPE~~
~~SYNTAX Integer32~~
~~MAX-ACCESS read-write~~
~~STATUS current~~
~~DESCRIPTION~~
~~"This object is used to enable BS software download action."~~
~~::= { wmanDevBsDownloadTable 1 }~~

~~wmanDevBsDownloadSWProgress OBJECT-TYPE~~
~~SYNTAX Integer32~~
~~MAX-ACCESS read-only~~
~~STATUS current~~
~~DESCRIPTION~~
~~"This value identifies the BS software download progress information. "~~
~~::= { wmanDevBsDownloadTable 2 }~~

~~wmanDevBsActivateSW OBJECT-TYPE~~
~~SYNTAX Integer32~~

~~MAX-ACCESS read-only~~
~~STATUS current~~
~~DESCRIPTION~~
~~"This object is used to enable BS software activation action."~~
~~::= { wmanDevBsActivateTable 1 }~~

~~wmanDevBsActivateSWProgress OBJECT-TYPE~~
~~SYNTAX Integer32~~
~~MAX-ACCESS read-only~~
~~STATUS current~~
~~DESCRIPTION~~
~~"This value identifies the BS software activation progress information. "~~
~~::= { wmanDevBsActivateTable 2 }~~

wmanDevBsSoftwareManagement OBJECT IDENTIFIER ::= { wmanDevBsObjects 2 }

wmanDevBsConfigFileEncodingTable OBJECT-TYPE
SYNTAX SEQUENCE OF WmanDevBsConfigFileEncodingEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"This table contains configuration file encoding information of the BS."
REFERENCE
"Section 11.2 in IEEE 802.16-2004"
::= { wmanDevBsSoftwareManagement 1 }

wmanDevBsConfigFileEncodingEntry OBJECT-TYPE
SYNTAX WmanDevBsConfigFileEncodingEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"This table may have multiple entries, and is indexed by ifIndex. There should be only one entry in this table which the corresponding manDevBsSWVersionIndication can be 'true'."
INDEX { wmanDevBsDeviceIndex }
::= { wmanDevBsConfigFileEncodingTable 1 }

WmanDevBsConfigFileEncodingEntry ::= SEQUENCE {
wmanDevBsDeviceIndex Integer32,
wmanDevBsVendorId OCTET STRING,
wmanDevBsHwId OCTET STRING,
wmanDevBsSwVersion OCTET STRING,
wmanDevBsUpgradeFileName OCTET STRING,
wmanDevBsSWVersionIndication TruthValue}

wmanDevBsDeviceIndex OBJECT-TYPE
SYNTAX Integer32
MAX-ACCESS not-accessible
STATUS current

```
        DESCRIPTION
                "An arbitrary index."
                ::= { wmanDevBsConfigFileEncodingEntry 1 }

        wmanDevBsVendorId OBJECT-TYPE
        SYNTAX OCTET STRING (SIZE (3))
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
                "This value identifies the managed BS vendor to which the software upgrade is to be
                applied."
                ::= { wmanDevBsConfigFileEncodingEntry 10 }

        wmanDevBsHwId OBJECT-TYPE
        SYNTAX OCTET STRING
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
                "This value identifies the hardware version to which the software upgrade is to be
                applied."
                ::= { wmanDevBsConfigFileEncodingEntry 11 }

        wmanDevBsSwVersion OBJECT-TYPE
        SYNTAX OCTET STRING
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
                "This value identifies the software version of the software upgrade file. The value is
                administered by the vendor identifed in the Vendor ID field. It should be defined by the
                vendor to be unique with respect to a given hardware ID."
                ::= { wmanDevBsConfigFileEncodingEntry 12 }

        wmanDevBsUpgradeFileName OBJECT-TYPE
        SYNTAX OCTET STRING
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
                "The filename is a fully qualified directory path
                name ."
                ::= { wmanDevBsConfigFileEncodingEntry 13 }

        wmanDevBsSWVersionIndication OBJECT-TYPE
        SYNTAX TruthValue
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
                "This value identifies the activation status of BS software versions."
        DEFVAL { false }
                ::= { wmanDevBsConfigFileEncodingEntry 14 }

        wmanDevBsDownloadTable OBJECT IDENTIFIER ::= { wmanDevBsSoftwareManagement 5 }

        wmanDevBsDownloadSW OBJECT-TYPE
        SYNTAX Integer32
        MAX-ACCESS read-write
```

```
        STATUS current
        DESCRIPTION
                "This object is used to enable BS software download action."
                ::= { wmanDevBsDownloadTable 1 }

        wmanDevBsDownloadSWProgress OBJECT-TYPE
        SYNTAX Integer32
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
                "This value identifies the BS software download progress information. "
                ::= { wmanDevBsDownloadTable 2 }

        wmanDevBsActivateTable OBJECT IDENTIFIER ::= { wmanDevBsSoftwareManagement 6 }

        wmanDevBsActivateSW OBJECT-TYPE
        SYNTAX Integer32
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
                "This object is used to enable BS software activation action."
                ::= { wmanDevBsActivateTable 1 }

        wmanDevBsActivateSWProgress OBJECT-TYPE
        SYNTAX Integer32
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
                "This value identifies the BS software activation progress information. "
                ::= { wmanDevBsActivateTable 2 }
```