Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**BS and SS Event Log for wmanIfMib**
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Re:	
Abstract	Event logging provides a standard and centralized way to record important software and hardware events. It is instrumental to fault mitigation, system debugging, and the monitoring of the system operation, performance. This contribution proposed the BS and SS event log MIB to be included wmanIfMib in IEEE P802.16f/D1.
Purpose	Adoption
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1. Introduction

Event logging provides a standard and centralized way to record important software and hardware events. Event Log MIB records the transient information associated with an event against the possibility that the Notification message can be lost. It is instrumental to fault mitigation, system debugging, and the monitoring of the system operation, performance. This contribution proposed the BS and SS event log MIB to be included in wmanIfMib in IEEE P802.16f/D1.

2. Event Log Requirements

The Event Log consists of the following requirements:

- Event log uses the wrap-around buffers to store events. When the buffer is full, the oldest entry will be removed to make room for the new entry.
- The sizes of the buffers are configurabale.
- Events in the log have a lifespan that is also configurable..
- The content of each entry will be retained after the power reset.
- Certain events can trigger notifications that will be sent to NMS.
- It is flexible to add vencor specific events or WiMAX certification events

Each entry consists of the following objects:

- wmanIfSsEventIdentifier – the event ID.
- wmanIfSsEventLoggedTime – the time when the event occurred.
- wmanIfSsEventDescription – a string description of the event.
- wmanIfSsEventSeverity – the severity of the event.
    - **Emergency –** Reserved for vendor-specific 'fatal' hardware or software errors that prevents normal system operation and causes reporting system to reboot. Vendors may define their own set of emergency events.
    - **Alert –** A serious failure, which causes reporting system to reboot but it is not caused by hardware or software malfunctioning. After recovering from the critical event, the system MUST send a cold/warm start notification. The alert event could not be reported as a Trap or SYSLOG message and MUST be stored in the internal log file. The code of this event MUST be saved in non-volatile memory and reported later.
    - **Critical –** A serious failure that requires attention and prevents the device from transmitting data but could be recovered without rebooting the system. After recovering from the error event SS MUST send the Link Up notification. Critical events could not be reported as a Trap or SYSLOG message and MUST be stored in the internal log file. The code of this event MUST be reported later.

  - **Error –** A failure occurred that could interrupt the normal data flow but will not cause the SS to re-register. Error events could be reported in real time by using the trap or SYSLOG mechanism.
  - **Warning –** A failure occurred that could interrupt the normal data flow but will not cause the SS to re-register. 'Warning' level is assigned to events both SS and BS have information about. To prevent sending the same event both from the SS and the BS, the trap and Syslog reporting mechanism is disabled by default for this level.
  - **Notice –** The event is important, but is not a failure and could be reported in real time by using the trap or SYSLOG mechanism.
  - **Informational –** The event is of marginal importance, and is not failure, but could be helpful for tracing the normal modem operation.
  - **Debug –** Reserved for vendor-specific non-critical events.

- wmanIfSsEventNotification – a Boolean value determines if a trap should be reported.
- wmanIfSsEventNotificationOid – the object identifier of the event.

3. Event Log ASN.1 Definition

```

WmanIfEventSeverity ::= TEXTUAL-CONVENTION
        STATUS      current
        DESCRIPTION
            "WmanIfEventSeverity defines the alarm Severity of an
             event."
        SYNTAX      INTEGER {emergency(1),
                             alert(2),
                             critical(3),
                             error(4),
                             warning(5),
                             notice(6),
                             informational(7),
                             debug(8)}

WmanIfBsEventId ::= TEXTUAL-CONVENTION
        STATUS      current
        DESCRIPTION
            "WmanIfBsEventId defines the identifier of BS events."
        SYNTAX      INTEGER {
--          Event Id                                       Severity Trap
-- Synchronization, and UL/DL acquisition

-- Initial ranging and periodic ranging
            initRangRecv(0100),   -- Initial RNG-REQ w MAC address
                                  -- received              notice    no

-- SBC


-- Authorization, authentication


-- Registration


-- Dynamic Services Add, Change, and Delete
           dsxFailed(0500),       -- DSx operation failed  critical  yes
                                  -- wmanBsSsDynamicServiceFailTrap

-- Environment
           powerStatChange(0600), -- Primary / secondary power ON or OFF
                                  --                       critical  yes
                                  -- wmanBsPowerStatusChangeTrap
           fanStstChange(0601),   -- Fan ON or OFF status change
                                  --                       critical  yes
                                  -- wmanBsFanStatusTrap
           tempatureChange(0602), -- Temperature change across
                                  -- high / low threshold  critical  yes
                                  -- wmanBsTemperatureChangeTrap

-- Radio
           rssiStatChange(0700)   -- RSSI change across high / low
                                  -- threshold             critical  yes
                                  -- wmanBsSsRssiStatusChangeTrap
-- Vendor specific events

-- WiMAX certification events
            }

WmanIfSsEventId ::= TEXTUAL-CONVENTION
        STATUS      current
        DESCRIPTION
            "WmanIfSsEventId defines the identifier of SS events."
        SYNTAX      INTEGER {
--          Event Id                                       Severity Trap
-- Synchronization, and UL/DL acquisition
            lostDlMap(0001),      -- No DL-MAP received within 'Lost
                                  -- DL-MAP Interval',     critical, no
            lostUlMap(0002),      -- No UL-MAP received within 'Lost
                                  -- UL-MAP Interval',     critical, no
            lostUcd(0003),        -- No UCD received within
                                  -- 'UCD Interval'        critical, no
            invlaidUcd(0004),     -- Invalid UCD received,
                                  --                       error,    no
            ucdTimeout(0005),     -- No DCD received within T12,
                                  --                       critical  no
            lostDcd(0006)         -- No DCD received within
                                  -- 'DCD Interval'        critical, no
            invalidDcd(0007),     -- Invalid DCD received,
                                  --                       error,    no
            dcdTimeout(0008),     -- No DCD received within T1,
                                  --                       critical  no
            syncCompleted(0009),  -- Sync completed        notice    no
```

```
-- Initial ranging and periodic ranging
            rcvBcRangOpp(0100),   -- Received broadcast ranging
                                  -- opportunity           notice    no
            rcvUcRangOpp(0101),   -- Received unicast ranging
                                  -- opportunity           notice    no
            bcRangTimeout(0102),  -- Broadcast ranging timeout (T2)
                                  --                       warning   no
            rangRspTimeout(0103), -- RNG-RSP timeout (T3)
                                  --                       warning   no
            contRangRetry(0104),  -- Exceed the number of 'Contention
                                  -- Ranging Retry         critical  no
            invRangRetry(0105),   -- Exceed the number of 'Invited
                                  -- Ranging Retry'        critical  no
            noUcRangOpp(0106),    -- No unicast ranging opportunity
                                  -- within T4             critical  no
            initRangAbort(0107),  -- Initial ranging aborted
                                  --                       error     no
            initRangSucc(0108),   -- Initial ranging succeed
                                  --                       notice    no
            periodRangSucc(0109), -- Periodic ranging succeed
                                  --                       notice    no
            periodRangFail(0110), -- Periodic ranging failed
                                  --                       critical  no
-- SBC
            sbcRspTimeout(0200),  -- SBC-RSP not received within T18
                                  --                       critical  no
            sbcReqRetry(0201),    -- Exceed the number of 'SBC Request
                                  -- Retries'              critical  no
            sbcRspFail(0202),     -- SBC-RSP failed        critical  no
            sbcRspSucc(0203),     -- SBC-RSP succeed       notice    no

-- Authorization, authentication
            authReqTimeout(0300), -- Auth request timeout  warning   no
            reauthTimeout(0301),  -- Reauth REQ timeout    warning   no

-- Registration
            regRspTimeout(0400),  -- REG-RSP not received within T6
                                  --                       critical  no
            regReqRetry(0401),    -- Exceed the number of 'Registration
                                  -- Request Retries'      critical  no
            regCompleted(0402),   -- Registration completed
                                  --                       notice    yes
                                  -- wmanBsSsRegisterTrap
            regUnmanagedSs(0403), -- Unmanaged SS          notice    no
            regFailed(0404),      -- Registration failed   critical  no
            regInvalidHmac(0405), -- Invalid HMAC in REG   critical  no
            regIpUnsupport(0406), -- IP version in REG not supported
                                  --                       error     no

-- Dynamic Services Add, Change, and Delete
            ssDsxFailed(0500),    -- DSx operation failed  critical  yes
                                  -- wmanSsDynamicServiceFailTrap
-- Radio
            ssRssiChange(0700)    -- RSSI change across high / low
                                  -- threshold            critical  yes
                                  -- wmanSsRssiStatusChangeTrap
-- Vendor specific events

-- WiMAX certification events
            }


-- Base station Event Log Group
--
wmanIfBsEventLog OBJECT IDENTIFIER ::= { wmanIfBsObjects  5 }

--
-- BS Event log configuration
--
wmanIfBsEventLogEntryLimit    OBJECT-TYPE
        SYNTAX      INTEGER
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "The maximum number of event entries that may be held
             in wmanIfBsEventLogTable. If an application changes
             the limit while there are events in the log, the
             oldest events must be discarded to bring the log down
             to the new limit."
        DEFVAL      { 200 }
        ::= { wmanIfBsEventLog  1 }

wmanIfBsEventLifeTimeLimit    OBJECT-TYPE
        SYNTAX      INTEGER
        UNITS       "minutes"
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "The number of minutes an event should be kept in the log
             before it is automatically removed. If an application
             changes the value of wmanIfBsEventLifeTimeLimit, events
             that are older than the new time may be discarded to meet
             the new lifetime. A value of 0 means lifetime limit."
        DEFVAL      { 1440 }
        ::= { wmanIfBsEventLog  2 }

wmanIfBsEventLogTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF WmanIfBsEventLogEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "This is the Syslog table that is used to store Bs local
             events. This table should reside in the non-volatile
             memory that should presist after power cycle or reboot.
             The number of entries in this table is determined by
             wmanIfBsEventLogEntryLimit. It is a wrap around buffer.
             When the buffer is full, the oldest entry will be removed
             to make room for the newest entry."
        ::= { wmanIfBsEventLog 3 }

wmanIfBsEventLogEntry OBJECT-TYPE
        SYNTAX      WmanIfBsEventLogEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "Entries appear in this table when events occur, and are
             removed to make ways for new entries when buffer is full,
             the entry passes the lifetime limit. This table is
             indexed by wmanIfBsEventIndex."
        INDEX       { wmanIfBsEventIndex }
        ::= { wmanIfBsEventLogTable 1 }

WmanIfBsEventLogEntry ::= SEQUENCE {
        wmanIfBsEventIndex                      Unsigned32,
        wmanIfBsEventIdentifier                 WmanIfBsEventId,
        wmanIfBsEventLoggedTime                 TimeStamp,
        wmanIfBsEventDescription                SnmpAdminString,
        wmanIfBsEventSeverity                   WmanIfEventSeverity,
        wmanIfBsEventNotification               TruthValue,
        wmanIfBsEventNotificationOid            OBJECT IDENTIFIER}

wmanIfBsEventIndex OBJECT-TYPE
        SYNTAX      Unsigned32 (1..4294967295)
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "A monotonically increasing integer for the sole purpose
             of indexing entries within the event log. When it
             reaches the maximum value, the agent wraps the value
             back to 1."
        ::= { wmanIfBsEventLogEntry 1 }

wmanIfBsEventIdentifier OBJECT-TYPE
        SYNTAX      WmanIfBsEventId
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The identifier of a BS event."
        ::= { wmanIfBsEventLogEntry 2 }

wmanIfBsEventLoggedTime OBJECT-TYPE
        SYNTAX      TimeStamp
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The value of sysUpTime when the entry was placed in the
             log. If the entry occurred before the most recent
             management system initialization this object value must
             be set to zero."
        ::= { wmanIfBsEventLogEntry 3 }
```

```
wmanIfBsEventDescription  OBJECT-TYPE
        SYNTAX      SnmpAdminString
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "This object describes the event."
        ::= { wmanIfBsEventLogEntry 4 }

wmanIfBsEventSeverity  OBJECT-TYPE
        SYNTAX      WmanIfEventSeverity
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "This object describes the severity of such event."
        ::= { wmanIfBsEventLogEntry 5 }

wmanIfBsEventNotification  OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "An event notification will be reported when it is
             True (1)."
        ::= { wmanIfBsEventLogEntry 6 }

wmanIfBsEventNotificationOid OBJECT-TYPE
        SYNTAX      OBJECT IDENTIFIER
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The NOTIFICATION-TYPE object identifier of the event
             that occurred."
        ::= { wmanIfBsEventLogEntry 7 }

-- Subscriber station Event Log Group
--
wmanIfSsEventLog OBJECT IDENTIFIER ::= { wmanIfSsObjects  4 }

--
-- SS Event log configuration
--
wmanIfSsEventLogEntryLimit    OBJECT-TYPE
        SYNTAX      INTEGER
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "The maximum number of event entries that may be held
             in wmanIfSsEventLogTable. If an application changes
             the limit while there are events in the log, the
             oldest events must be discarded to bring the log down
             to the new limit."
        DEFVAL      { 100 }
        ::= { wmanIfSsEventLog  1 }
```

```
wmanIfSsEventLifeTimeLimit    OBJECT-TYPE
        SYNTAX      INTEGER
        UNITS       "minutes"
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "The number of minutes an event should be kept in the log
             before it is automatically removed. If an application
             changes the value of wmanIfSsEventLifeTimeLimit, events
             that are older than the new time may be discarded to meet
             the new lifetime. A value of 0 means lifetime limit."
        DEFVAL      { 1440 }
        ::= { wmanIfSsEventLog  2 }

wmanIfSsEventLogTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF WmanIfSsEventLogEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "This is the Syslog table that is used to store SS local
             events. This table should reside in the non-volatile
             memory that should presist after power cycle or reboot.
             The number of entries in this table is determined by
             wmanIfSsEventLogEntryLimit. It is a wrap around buffer.
             When the buffer is full, the oldest entry will be removed
             to make room for the newest entry."
        ::= { wmanIfSsEventLog 3 }

wmanIfSsEventLogEntry OBJECT-TYPE
        SYNTAX      WmanIfSsEventLogEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "Entries appear in this table when events occur, and are
             removed to make ways for new entries when buffer is full,
             the entry passes the lifetime limit. This table is
             indexed by wmanIfSsEventIndex."
        INDEX       { wmanIfSsEventIndex }
        ::= { wmanIfSsEventLogTable 1 }

WmanIfSsEventLogEntry ::= SEQUENCE {
        wmanIfSsEventIndex                      Unsigned32,
        wmanIfSsEventIdentifier                 WmanIfSsEventId,
        wmanIfSsEventLoggedTime                 TimeStamp,
        wmanIfSsEventDescription                SnmpAdminString,
        wmanIfSsEventSeverity                   WmanIfEventSeverity,
        wmanIfSsEventNotification               TruthValue,
        wmanIfSsEventNotificationOid            OBJECT IDENTIFIER}

wmanIfSsEventIndex OBJECT-TYPE
        SYNTAX      Unsigned32 (1..4294967295)
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "A monotonically increasing integer for the sole purpose
             of indexing entries within the event log. When it
             reaches the maximum value, the agent wraps the value
             back to 1."
        ::= { wmanIfSsEventLogEntry 1 }

wmanIfSsEventIdentifier OBJECT-TYPE
        SYNTAX      WmanIfSsEventId
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The identifier of a SS event."
        ::= { wmanIfSsEventLogEntry 2 }

wmanIfSsEventLoggedTime OBJECT-TYPE
        SYNTAX      TimeStamp
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The value of sysUpTime when the entry was placed in the
             log. If the entry occurred before the most recent
             management system initialization this object value must
             be set to zero."
        ::= { wmanIfSsEventLogEntry 3 }

wmanIfSsEventDescription  OBJECT-TYPE
        SYNTAX      SnmpAdminString
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "This object describes the event."
        ::= { wmanIfSsEventLogEntry 4 }

wmanIfSsEventSeverity  OBJECT-TYPE
        SYNTAX      WmanIfEventSeverity
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "This object describes the severity of such event."
        ::= { wmanIfSsEventLogEntry 5 }

wmanIfSsEventNotification  OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "An event notification will be reported when it is
             True (1)."
        ::= { wmanIfSsEventLogEntry 6 }

wmanIfSsEventNotificationOid OBJECT-TYPE
        SYNTAX      OBJECT IDENTIFIER
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The NOTIFICATION-TYPE object identifier of the event
             that occurred."
        ::= { wmanIfSsEventLogEntry 7 }
```