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Title	**Fault Management Procedure and Primitives**	
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Re:	Contribution on comments to IEEE 802.16g	
Abstract	In this contribution, we describe the fault management procedure and service primitives that could be exchanged between the BS and the NCMS entities.	
Purpose	Adoption	
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Fault Management Procedure and Primitives

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1. Problem Statement

The purpose of this contribution is to describe the fault management procedure and primitives that could be exchanged between the BS and the NCMS entities. This proposal makes it possible to perform the fault management as specified in the remainder of this document.

2. Summary of the Proposed Remedy

In this contribution, we define 5 primitives to support fault management between BS and NCMS which are described briefly in the following table.

Primitive	Direction	Primitive Contents
Fault_Information	BS -> NCMS	MS/BS ID, Fault message
Fault_List_Request	BS <- NCMS	MS/BS ID, Request
Fault_List _Response	BS -> NCMS	MS/BS ID, Fault message
Fault_Control_Request	BS <- NCMS	MS/BS ID, Request
Fault_Control_Reponse	BS -> NCMS	MS/BS ID, Fault message

Figure1 shows the fault management procedure.

1. An MS may inform a BS of fault alarm event to indicate which MS has generated fault and what is the context of the fault alarm event. The ways an MS used to inform of a BS can be the MAC management message or the Trap message through SNMP protocol.
2. When a BS receives a MS's fault message, it will inform an NCMS entity as a Fault_Information primitive.
3. Also, a BS may raise a fault alarm event, when it occurs, the BS will inform of an NCMS entity as a Fault_Information primitive.
4. When a NCMS query about an MS or a BS, it will inform of the BS as a Fault_List_Request primitive.
5. When a BS receives a Fault_List_Request from the NCMS, it should send the MS a MAC management message for request if the NCMS's message indicates the target is a MS, and if the target is BS, the BS should feed back the fault message to the NCMS via a Fault_List_Response primitive.
6. When a NCMS operates an MS or a BS for controlling the fault, it should inform of the BS as a Fault_Control_Request primitive.
7. When a BS receives a Fault_Control_Request from the NCMS, it should send the MS a MAC management message for controlling operation if the NCMS's message indicates the target is a MS, and if the target is BS, the BS should feed back the result of operating to the NCMS via a Fault_Control_Response primitive.

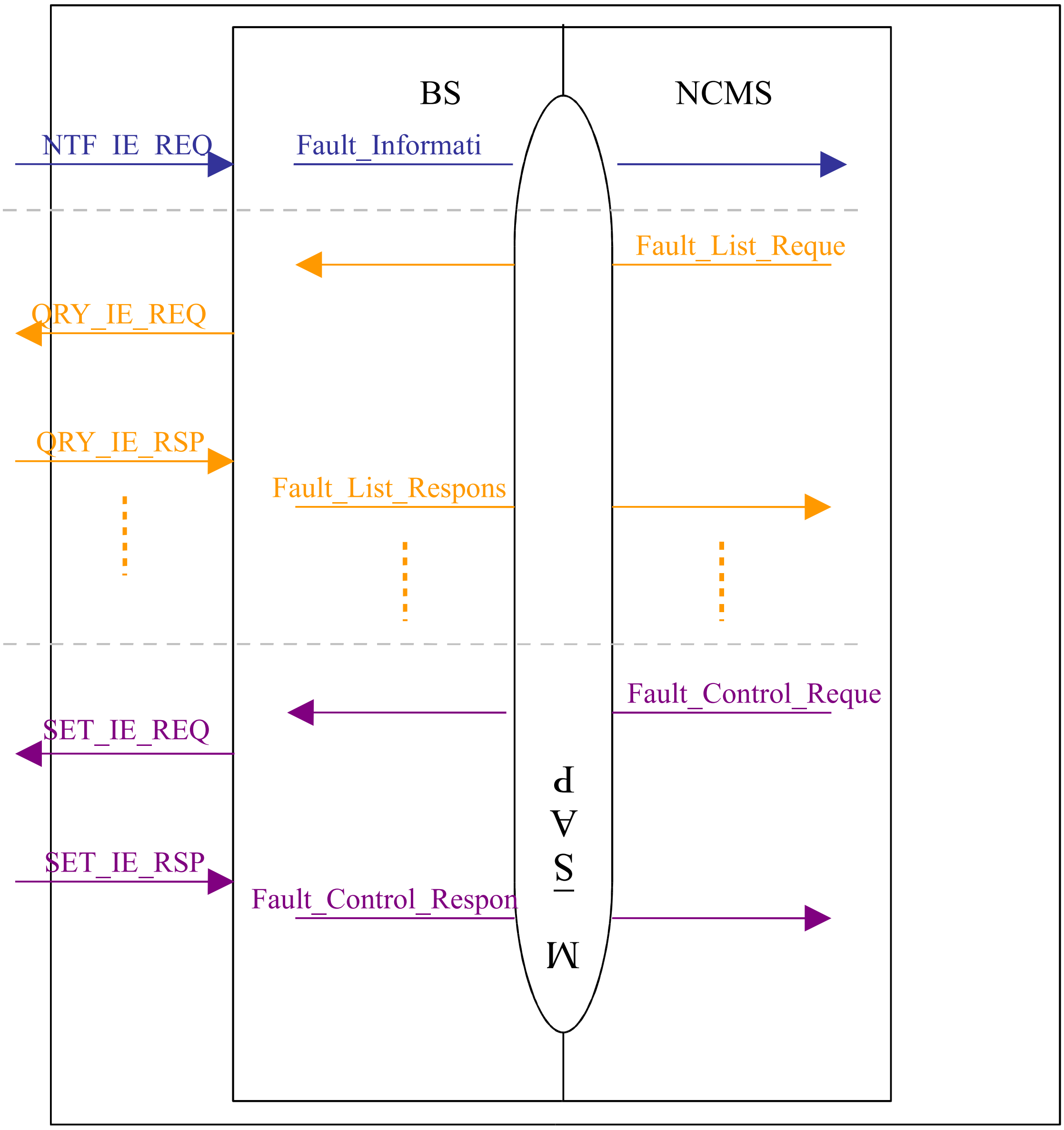

Figure 1. fault management procedure

3. Proposed Text Changes

[*Insert section 14.5.1.1 as follow*]

14.5.1.1 Fault management Procedure

An MS may inform a BS of fault alarm event to indicate which MS has generated fault and what is the context of the fault alarm event. The ways an MS used to inform of a BS can be the MAC management message named NTF_IE_REQ.

When a BS receives a MS's fault message, it should inform of an NCMS entity as a Fault_Information primitive.

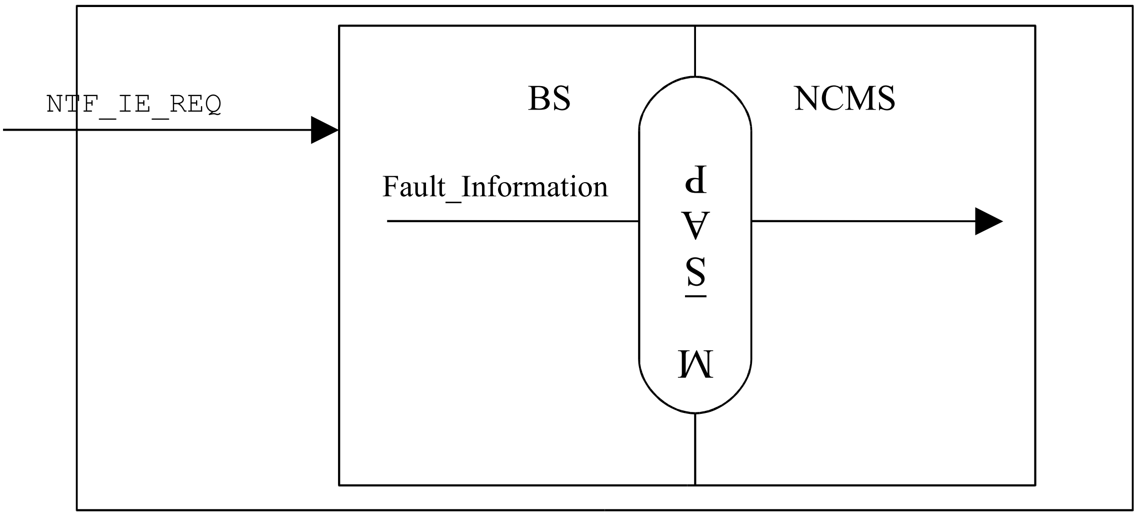

Figure X1. fault management procedure

Also, a BS may raise a fault alarm event, when it occurs, the BS should inform of an NCMS entity as a Fault_Information primitive.

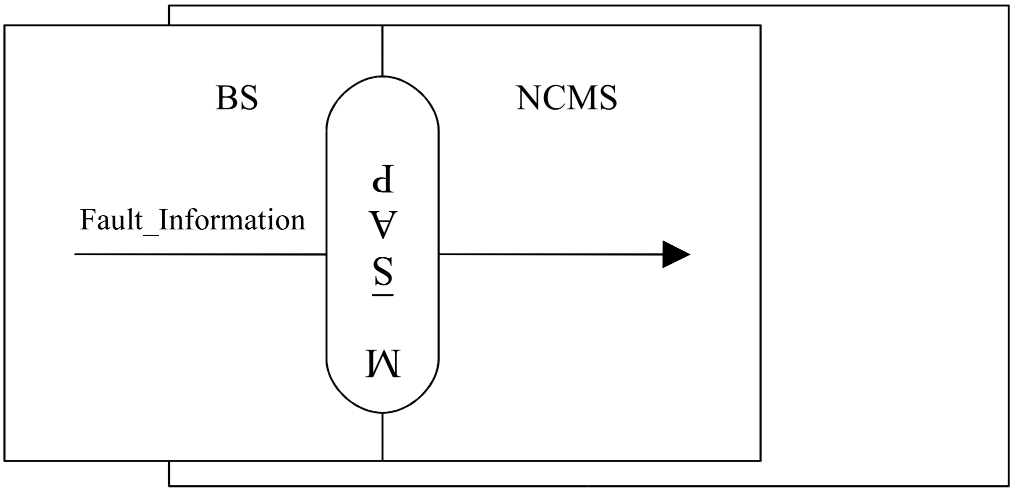

Figure X1. fault management procedure

When a NCMS query about an MS or a BS, it will inform of the BS as a Fault_List_Request primitive.

When a BS receives a Fault_List_Request from the NCMS and the request if for a MS, it should send the corresponding MS a MAC management message named QRY_IE_REQ.

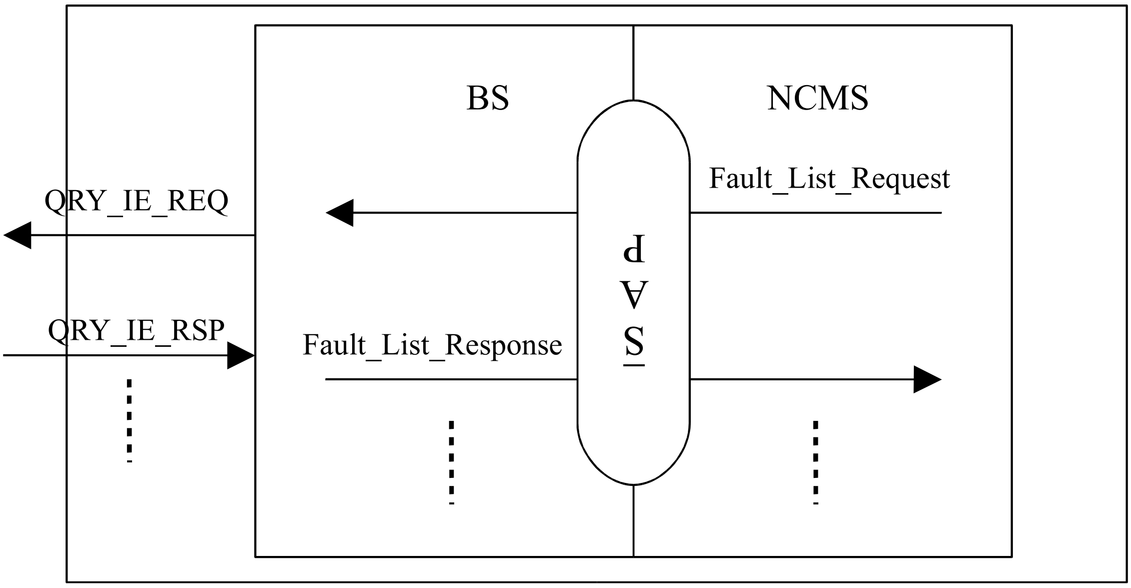

Figure X1. fault management procedure

When a NCMS query about an BS, it will inform of the BS as a Fault_List_Request primitive.

When a BS receives a Fault_List_Request from the NCMS, if the target is BS, the BS should feed back the fault message to the NCMS via a Fault_List_Response primitive.

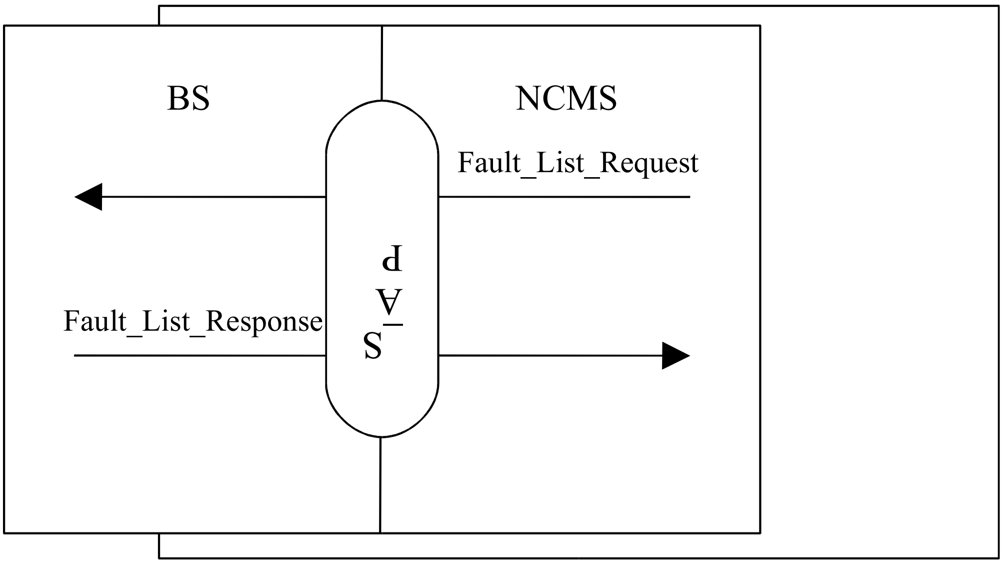

Figure X1. fault management procedure

When a NCMS operates an MS or a BS for controlling the fault, it should inform of the BS as a Fault_Control_Request primitive.

When a BS receives a Fault_Control_Request from the NCMS and the control request is for MS, it should send the corresponding MS a MAC management message named SET_IE_REQ or SNMP message for controlling operation.

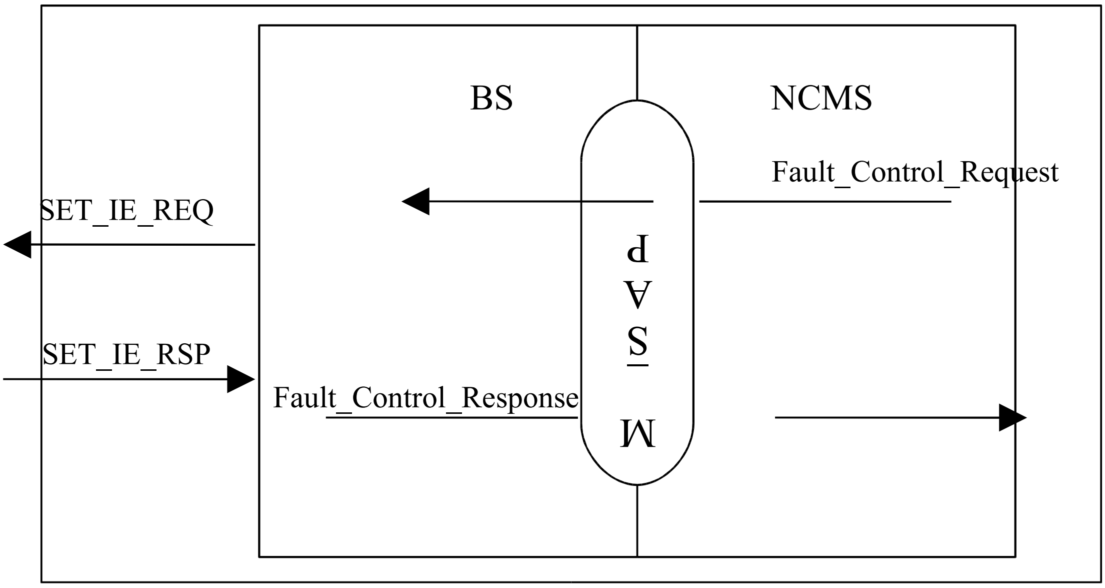

Figure X1. fault management procedure

When a NCMS operates an BS for controlling the fault, it should inform of the BS as a Fault_Control_Request primitive.
When a BS receives a Fault_Control_Request from the NCMS, if the NCMS's message indicates the target is a BS, the BS should feed back the result of operating to the NCMS via a Fault_Control_Response primitive.

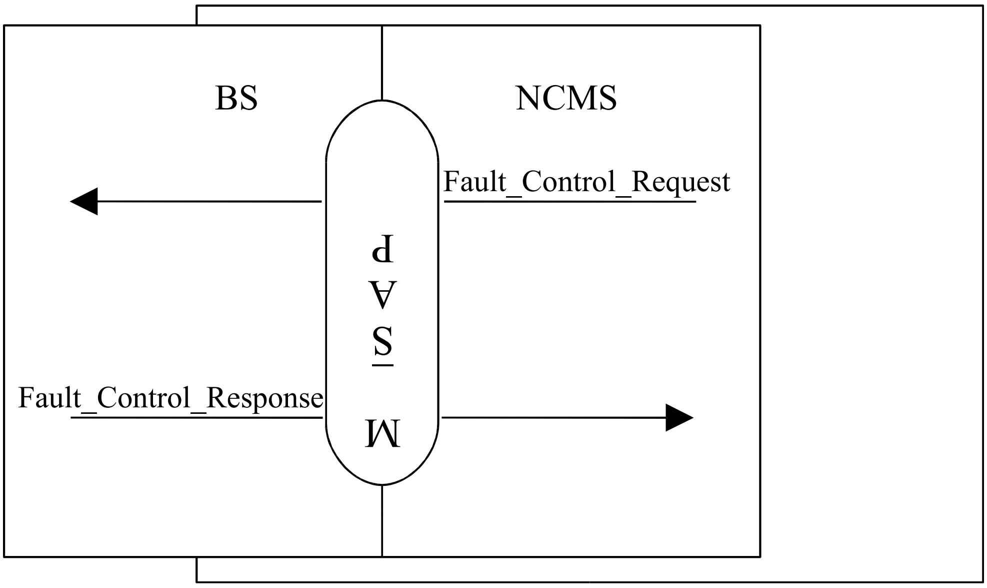

Figure X1. fault management procedure

14.5.1.1.1 Service Primitives

14.5.1.1.1.1 Fault_Information

14.5.1.1.1.1.1 Function

This primitive inform a network management entity in NCMS that an MS or BS has generated a fault or alarm event.

14.5.1.1.1.1.2 Semantics of the Service Primitives

The parameters of the primitives are as follows:

Fault_Information

{
MS/BS ID
Transaction ID
AlarmId
AlarmType
AlarmSequenceNo
AlarmSeverityLevel
AlarmProbableCause
AlarmState
AlarmRaisedTime
}

MS/BS ID

48-bit unique identifier used for user identification between a BS and an NCMS

Transaction ID

A unique sequential identifier of the transaction set by the BS.

AlarmId

A unique sequential identifier corresponding to a fault description.

AlarmType

A unique sequential number representation the type of an alarm:
0: Communications Alarm
1: Processing Error Alarm
2: Environmental Alarm
3: Quality Of Service Alarm
4: Equipment Alarm

AlarmSequenceNo

A unique sequential number of the alarm set by the BS.

AlarmSeverityLevel

A number representation the severity level of the alarm:
0: Critical
1: Major
2: Minor
3: Warning
4: Indeterminate
5: Cleared

AlarmProbableCause

The probable cause of the alarm. It qualifies alarm and provides further information than alarmType.

AlarmState

A number representation the state of the alarm:
0: Cleared and Acknowledged alarm
1: Uncleared and Acknowledged alarm
2: Cleared and Unacknowledged alarm
3: Uncleared and Unacknowledged alarm

AlarmRaisedTime

It indicates the date and time when the alarm is first raised by the alarmed resource.

14.5.1.1.1.1.3 When generated

This primitive is generated when the BS raised a fault or alarm event and the BS received an alarm event from the MS. The MS could notify the alarm event to the BS via the MAC management message.

14.5.1.1.1.1.3 Effect of receipt

This primitive is generated when the BS raised alarm event and the BS received an alarm event from the MS. Upon receiving this primitive, NCMS will be notified for corresponding BS or MS alarms.

14.5.1.1.1.2 Fault_List_Request

14.5.1.1.1.2.1 Function

This primitive inform of an MS or BS that a network management entity in NCMS has raised a fault query.

14.5.1.1.1.2.2 Semantics of the Service Primitives

The parameters of the primitives are as follows:

Fault_List_Request
{
MS/BS ID
Transaction ID
BeginTime
EndTime
}

MS/BS ID

48-bit unique identifier used for user identification between a BS and an NCMS

Transaction ID

A unique sequential identifier of the transaction set by the NCMS.

BeginTime

The begin time for request.

EndTime

The end time for request.

14.5.1.1.1.2.3 When generated

This primitive is originated by NCMS when it needs to list BS or MS alarms.

14.5.1.1.1.2.3 Effect of receipt

BS or MS will send corresponding alarms which meets the query condition to NCMS.

14.5.1.1.1.3 Fault_List_Response

14.5.1.1.1.3.1 Function

This primitive return an MS's or BS's fault message to a network management entity in NCMS.

14.5.1.1.1.3.2 Semantics of the Service Primitives

The parameters of the primitives are as follows:

Fault_List_Response
{
MS/BS ID

Transaction ID
AlarmSequenceNo
AlarmType
AlarmSeverityLevel
Alarm ProbableCause
AlarmState
AlarmRaisedTime
}

MS/BS ID

48-bit unique identifier used for user identification between a BS and an NCMS

Transaction ID

A unique sequential identifier of the transaction set by the NCMS.

AlarmType

A unique sequential number representation the type of an alarm:
0: Communications Alarm
1: Processing Error Alarm
2: Environmental Alarm
3: Quality Of Service Alarm
4: Equipment Alarm

AlarmSeverityLevel

A number representation the severity level of the alarm:
0: Critical
1: Major
2: Minor
3: Warning
4: Indeterminate
5: Cleared

AlarmProbableCause

The probable cause of the alarm.

AlarmState

A number representation the state of the alarm:
0: Cleared and Acknowledged alarm
1: Uncleared and Acknowledged alarm
2: Cleared and Unacknowledged alarm
3: Uncleared and Unacknowledged alarm

AlarmRaisedTime

The time when the alarm raised.

14.5.1.1.1.3.3 When generated

This primitive is generated when BS or MS responds to NCMS for list alarms request.

14.5.1.1.1.3.4 Effect of receipt

NCMS will be notified the corresponding BS or MS alarms which meets the query condition.

14.5.1.1.1.4 Fault_Control_Request

14.5.1.1.1.4.1 Function

This primitive handles MS's or BS's fault message with NCMS.

14.5.1.1.1.4.2 Semantics of the Service Primitives

The parameters of the primitives are as follows:

Fault_Control_Request
{
MS/BS ID
Transaction ID
AlarmSequenceNo
AlarmType
AlarmSeverityLevel
AlarmProbableCause
AlarmAction
}

MS/BS ID

48-bit unique identifier used for user identification between a BS and an NCMS

Transaction ID

A unique sequential identifier of the transaction set by the NCMS.

AlarmType

A unique sequential number representation the type of an alarm:
0: Communications Alarm
1: Processing Error Alarm
2: Environmental Alarm
3: Quality Of Service Alarm
4: Equipment Alarm

AlarmSeverityLevel

A number representation the severity level of the alarm:
0: Critical
1: Major
2: Minor
3: Warning
4: Indeterminate
5: Cleared

AlarmProbableCause

The probable cause of the alarm.

AlarmAction

A number representation the Operator Action for the corresponding alarms:
0: Clear Alarm
1: Acknowledge Alarm

14.5.1.1.1.4.3 When generated

This primitive is originated by NCMS and it is needed when NCMS handles the alarms raised by BS or MS. The possible handling action could be “Clear Alarms” and “Acknowledge Alarms”.

14.5.1.1.1.4.4 Effect of receipt

BS or MS will execute the corresponding action when this primitive request is received.

14.5.1.1.1.5 Fault_Control_Response

14.5.1.1.1.5.1 Function

This primitive return an MS's or BS's alarm handling response message to a network management entity in NCMS.

14.5.1.1.1.5.2 Semantics of the Service Primitives

The parameters of the primitives are as follows:

Fault_Control_Reponse
{
MS/BS ID
Transaction ID
AlarmSequenceNo
AlarmType
AlarmSeverityLevel
AlarmProbableCause
AlarmState
AlarmActionTime
}

MS/BS ID

48-bit unique identifier used for user identification between a BS and an NCMS

Transaction ID

A unique sequential identifier of the transaction set by the NCMS.

AlarmSeverityLevel

A number representation the severity level of the alarm:
0: Critical
1: Major
2: Minor
3: Warning
4: Indeterminate
5: Cleared

AlarmType

A unique sequential number representation the type of an alarm:
0: Communications Alarm
1: Processing Error Alarm
2: Environmental Alarm
3: Quality Of Service Alarm
4: Equipment Alarm

AlarmProbableCause

The probable cause of the alarm.

AlarmState

A number representation the state of the alarm:
0: Cleared and Acknowledged alarm
1: Uncleared and Acknowledged alarm
2: Cleared and Unacknowledged alarm
3: Uncleared and Unacknowledged alarm

AlarmActionTime

The time when the corresponding alarm action performed successfully.

14.5.1.1.1.5.3 When generated

This primitive is generated after BS or MS complete execution of alarm handling action from NCMS, will cause the corresponding alarm state change upon the action executed.

14.5.1.1.1.5.3 Effect of receipt

NCMS will be notified with the result of corresponding handling action.

References
[1] 802.16g-05_008r1.pdf
[2] IEEE-Std 802.16-2004
[3] IEEE 802.16e/D10