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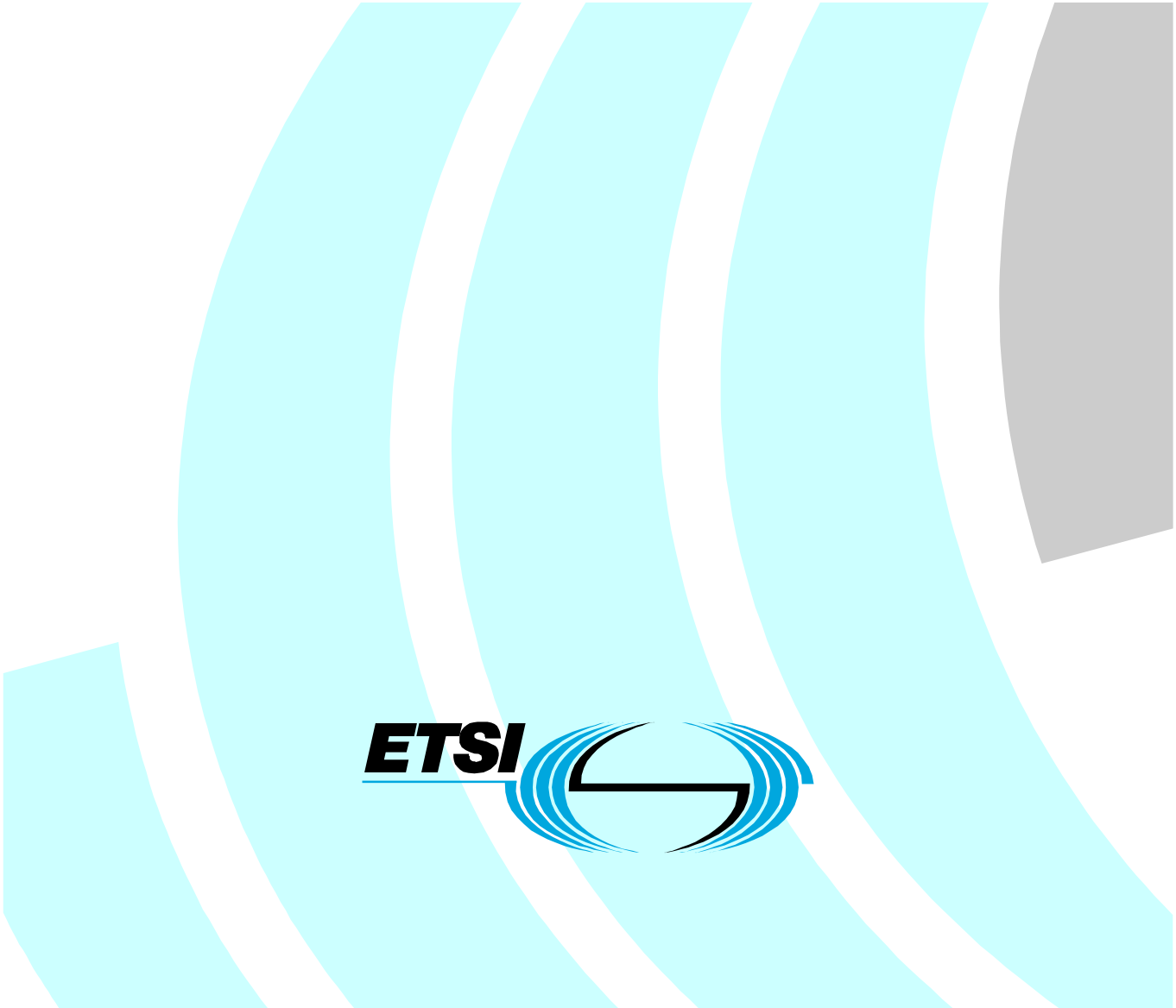
Technical Specification

Digital Broadband Cable Access to the Public Telecommunications Network; IP Multimedia Time Critical Services; Part 22: Management Event Messages



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Contents

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Access and Terminals (AT).

The present document is part 22 of a multi-part deliverable covering Digital Broadband Cable Access to the Public Telecomunications Network; IP Multimedia Time Critical Services. Full details of the entire series can be found in part 1 [1].

The present document defines the Management Event Mechanism that IPCablecom elements can use to report asynchronous events that indicate malfunction situations and notification about important non-fault situation.

Events are defined in the present document as conditions requiring the reporting of information to management systems and/or local log.

A goal of IPCablecom is to maintain consistency with the Cable Modem event reporting mechanisms.

Annex A, contains the specific IPCablecom management event identifiers.

Introduction

The cable industry in Europe and across other Global regions has already deployed broadband cable television Hybrid Fibre/Coax (HFC) data networks running the Cable Modem Protocol. The Cable Industry is in the rapid stages of deploying IP Voice and other time critical multimedia services over these broadband cable television networks.

The cable Industry has recognized the urgent need to develop ETSI Technical Specifications aimed at developing interoperable interface specifications and mechanisms for the delivery of end to end advanced real time IP multimedia time critical services over bi-directional broadband cable networks.

IPCablecom is a set of protocols and associated element functional requirements developed to deliver Quality of Service (QoS) enhanced secure IP multimedia time critical communications services using packetized data transmission technology to a consumer's home over the broadband cable television Hybrid Fibre/Coaxial (HFC) data network running the Cable Modem protocol. IPCablecom utilizes a network superstructure that overlays the two-way data-ready cable television network. While the initial service offerings in the IPCablecom product line are anticipated to be Packet Voice, the long-term project vision encompasses packet video and a large family of other packet-based services.

The Cable Industry is a global market and therefore the ETSI standards are developed to align with standards either already developed or under development in other regions. The ETSI Specifications are consistent with the CableLabs/PacketCable set of specifications as published by the SCTE. An agreement has been established between ETSI and SCTE in the US to ensure, where appropriate, that the release of PacketCable and IPCablecom set of specifications are aligned and to avoid unnecessary duplication. The set of IPCablecom ETSI specifications also refers to ITU-SG9 draft and published recommendations relating to IP Cable Communication.

The whole set of multi-part ETSI deliverables to which the present document belongs specify a Cable Communication Service for the delivery of IP Multimedia Time Critical Services over a HFC Broadband Cable Network to the consumers home cable telecom terminal. 'IPCablecom' also refers to the ETSI working group program that shall define and develop these ETSI deliverables.

1 Scope

The present set of documents specifies IPCablecom, a set of protocols and associated element functional requirements. These have been developed to deliver Quality of Service (QoS), enhanced secure IP multimedia time critical communication services, using packetized data transmission technology to a consumer's home over a cable television Hybrid Fibre/Coaxial (HFC) data network.

NOTE 1: IPCablecom set of documents utilize a network superstructure that overlays the two-way data-ready cable television network, e.g. as specified within ES 201 488 [5] and ES 200 800 [6].

While the initial service offerings in the IPCablecom product line are anticipated to be Packet Voice and Packet Video, the long-term project vision encompasses a large family of packet-based services. This may require in the future, not only careful maintenance control, but also an extension of the present set of documents.

NOTE 2: The present set of documents aims for global acceptance and applicability. It is therefore developed in alignment with standards either already existing or under development in other regions and in International Telecommunications Union (ITU).

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

[1] ETSI TS 101 909-1: "Access and Terminals (AT); Digital Broadband Cable Access to the Public Telecommunications Network; IP Multimedia Time Critical Services; Part 1: General".

[2] ITU-T Recommendation M.3100: "Generic network information model".

[3] ITU-T Recommendation X.733: "Information technology - Open Systems Interconnection - Systems Management: Alarm reporting function".

[4] IETF RFC 2573: "SNMP Applications".

[5] ETSI ES 201 488: "Data-Over-Cable Service Interface Specifications Radio Frequency Interface Specification".

[6] ETSI ES 200 800: "Digital Video Broadcasting (DVB); DVB interaction channel for Cable TV distribution systems (CATV)".

[7] ITU-T Recommendation J.164: "Event message requirements for the support of real-time services over cable television networks using cable modems".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

Access Node (AN): layer two termination device that terminates the network end of the ITU-T Recommendation J.112 connection

NOTE: It is technology specific. In ITU-T Recommendation J.112 (see bibliography), annex A it is called the INA while in annex B it is the CMTS.

IPCablecom: ETSI working group project that includes an architecture and a series of specifications that enable the delivery of real time services (such as telephony) over the cable television networks using cable modems

Cable Modem: layer two termination device that terminates the customer end of the J.112 connection

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AN	Access Node
CMS	Call Management Server
FQDN	Fully Qualified Domain Name
IANA	Internet Assigned Numbered Authority
MAC	Media Access Control
MGC	Media Gateway
MIB	Management Information Base
MTA	Media Terminal Adapter
SNMP	Simple Network Management Protocol

4 Void

5 Background

The IPCablecom architecture is an end-end broadband architecture that supports voice, video, and other multimedia services. The individual components that compose the IPCablecom architecture are defined in ITU-T Recommendation J.160 (see bibliography).

The OSS back office contains business, service, and network management components supporting the core business processes.

The IPCablecom set of specifications defines a limited set of OSS functional components and interfaces to support MTA device provisioning, Event Messaging to carry billing information, and the Management Event Mechanism defined in the present document to carry fault and other data.

In addition to the Management Event Mechanism, the IPCablecom architecture supports the following additional reporting mechanism:

- ITU-T Recommendation J.164 [7] IPCablecom event messages. This reporting mechanism uses the RADIUS transport protocol, a pre-defined set of Event Message attributes (e.g. BillingCorrelationID, CalledPartyNumber, TrunkGroupID, etc.), and the IPCablecom Event Messages data format to carry per-call information between IPCablecom network elements (CMS, AN, MGC) and a Record Keeping Server (RKS). For each call, the RKS combines all associated Event Messages into a single Call Detail Record (CDR) which may be sent to a back office billing, fraud detection or other system. Vendor-proprietary data attributes may be included along with the IPCablecom-defined set of attributes in an IPCablecom Event Message.

- *Other Reporting Methods*. It is possible that IPCablecom elements implement reporting methods specified in Cable Modem MIBs, IPCablecom MIBs or other standard MIBs. It is possible that IPCablecom elements implement methods such as SNMPv3, CMIP, TL1. These event-reporting mechanisms are not defined in the present document.

6 IPCablecom management event mechanism functional requirements

The functional requirements addressed by the message event mechanism specification are as follows:

1) An event report SHALL provide the MAC address.

2) The event report SHALL provide either the FQDN or IP address of the reporting device.

3) The IPCablecom management event reporting mechanism SHALL support 2 types of events: pre-defined and programmable. Examples of programmable events are the Primary Line telemetry events. Both IPCablecom-specific and vendor-specific pre-defined events SHALL be supported.

4) The management event reporting mechanism SHALL support the provisioning and viewing of the programmable events.

5) The IPCablecom management event reporting mechanism SHALL support SYSLOG.

6) The management event reporting mechanism SHALL support SNMPv3 Traps, SNMPv3 Informs.

7) The management event reporting mechanism SHALL be to able to integrate with the notification MIBS in RFC 2573 [4] since these MIBs provide the mechanism for distributing SNMPv3 traps and informs. The elements SHALL support a mechanism to allow the element management system to map each event to a reported notification mechanism(s). For example: none, local, SYSLOG, SNMPv3 Trap, SNMPv3 INFORM.

8) Each event SHALL be uniquely identifiable to the point of origin such as a specific endpoint on an MTA.

9) The capability SHOULD exist to map event IDs to priorities in the back office.

10) IPCablecom elements SHALL send a timestamp with each management event.

11) IPCablecom elements SHALL send a Severity level with each management event. Elements MAY use the Severity level within the network element to determine the order in which events are sent.

12) The severity level of management events generated by the network element SHALL be modifiable on the IPCablecom element by the management system.

13) The display string of programmable management events generated by the IPCablecom element SHALL be modifiable on the network element by the management system.

14) A default notification mechanism SHALL be associated with each event.

15) IPCablecom-specific event definitions SHOULD contain a NULL display string in order to reduce memory requirements on the IPCablecom element.

16) Programmable event definitions SHALL contain a display string.

17) Vendor-specific event definitions MAY contain a NULL display string in order to reduce memory requirements on the IPCablecom element.

18) Event throttling mechanism SHALL be configurable by the management system.

19) All events are uniquely identified by vendor through the IANA assigned enterprise number. IPCablecom events use the IPCablecom IANA assigned enterprise number

20) An event SHALL provide the Event ID of the event.

7 Management event reporting mechanism

The Management Event Mechanism and the associated Management Event Mechanism MIB SHALL be implemented on the MTA.

The Management Event Mechanism and the associated Management Event Mechanism MIB MAY be implemented on any IPCablecom element such as the CMS, MGC, and others.

7.1 IPCablecom management event format

The format of an IPCablecom Management Event is made up of the following information:

- Event Counter - indicator of event sequence.
- Event Time - time of occurrence.
- Event severity - severity of condition as defined in clause 7.1.
- Event Enterprise number - Vendor specific enterprise number.
- Event ID - determines event function.
- Event Text - describes the event in human readable form.
- Mac Address - describes the MAC address of the device.
- FQDN/Endpoint ID - describes the device FQDN and the specific endpoint associated with the event.

7.2 IPCablecom management event access method

The IPCablecom event access methods is defined through the use of SNMPv3 in the case of local log access and trap or inform access. The SYSLOG uses UDP packets to convey the event data.

For local event log access, an EMS MAY send SNMP GET, GET-NEXT or GET-BULK requests to the IPCablecom element, accessing rows of the local event table. Each row SHALL contain the event data in the format as defined in clause 7.1.

The SYSLOG method of accessing events involves sending the events to a SYSLOG server via the UDP protocol to the UDP SYSLOG port as defined in ITU-T Recommendation J.167. This event data SHALL follow the event data format as defined in clause 7.1.

The SNMPv3 Trap and Inform access methods involve defining a notification within the IPCablecom MGMTEVENT MIB. The notification SHALL contain the event data in the format as defined in clause 7.4.

Any notification SHALL be generated according to the entries in the associated SNMPv3 tables described in RFC 2573 [4] in a vendor dependent manner. These provide the ability to address one or more management systems, the option to send traps or informs, and specify the security requirements for each management system.

7.3 Management event ID

IPCablecom management events are defined in an appendix of IPCablecom specifications. Not all IPCablecom specifications define management events. Each management event described in the appendix of an IPCablecom specification is assigned an IPCablecom Event ID. For a list of IPCablecom Event IDs, refer to annex A.

7.4 Management Event Severities

Each event is assigned an initial (default) IPCablecom MultiMedia-centric Severity. The definitions for the IPCablecom MultiMedia-centric severities are loosely based on ITU-T Recommendation M.3100 [2] and OSI System Management Alarm Reporting Function X.733. IPCablecom expands on the definitions to include the following list:

- critical(1): A service-affecting condition that requires immediate corrective action.
- major(2): A service-affecting condition that requires urgent corrective action.
- minor(3): A non-service-affecting fault condition which warrants corrective action in order to avoid a more serious fault.
- warning(4): A potential or impending condition which can lead to a fault; diagnostic action is suggested.
- information(5): Normal event meant to convey information.

Events, if they need to be cleared, SHALL be cleared by other events.

Each application (e.g. Cable Modem, IPCablecom) has its own event space. There is no predetermined relationship of event severity defined or enforced between applications.

When managing events that affect multiple applications two scenarios are possible. They are as follows:

1) A particular application is considered the master. The master application sends the multiple destination events to its element manager. The application's element manages then broadcasts that event to all other element managers that are interested in that event. Severity translation is vendor dependent.
2) When an event occurs, every application interested in that event has its own event notification data template defined. An event is then sent out by each interested application according to its event notification data template.

Event vendor in conjunction with the cable operators will implement its mechanism based on one of the scenarios described above.

7.4.1 Changing default event severities

The default event severity SHALL be changeable to a different value for each given event via the SNMP interface.

7.5 Programmable events

7.5.1 Description

A programmable event is an event that looks at stimulus within or external to an element. The stimulus does not necessarily have a predefined definition among all cable operators or sites. The programming of these events is operator dependent and SHALL have a display string that defines what occurs, such as "power fail". For example, the MTA MAY support a programmable event with event ID of SNMP TELEMETRY_EV1, default display string of "AC Power Fail" and a default Severity of Critical.

7.5.2 Default display string change mechanism

The default display string text SHALL be changeable via the SNMP interface.

7.6 Notification mechanism

The notification mechanism for each event SHALL be programmable via the SNMP interface.

Each event SHALL be able to be sent to one or more notification mechanisms.

The notification mechanism definitions are as follows:

- Local: The event is stored locally on the device in which it is generated. The event can be retrieved via polling from the SNMP agent interface.
- Trap: The event is sent via the SNMPv3 TRAP mechanism to the targeted management systems. Due to the unacknowledged nature of the SNMPv3 TRAP mechanism, these event notifications are not guaranteed to be delivered to the targeted management systems.
- Inform: The event is sent via the SNMPv3 INFORM mechanism to the targeted management systems. Since the SNMPv3 INFORM mechanism is acknowledged, these events will be reliably transmitted to the targeted management systems.
- Syslog: The event is sent to the SYSLOG server.
- None: No reporting action is taken, this is the equivalent of disabling the event. If "none" is specified, the other notification mechanism choices SHALL be ignored.

7.7 Local log of events

The local log SHALL be accessed via SNMP using the objects defined in the MGMTEVENT MIB. A vendor may provide alternative access procedures.

7.8 Event throttling

Throttling is implemented globally through a rate based threshold mechanism, as defined in the IPCablecom MGMTEVENT MIB.

Control of the throttling mechanism is through a MIB object that specifies one of four states.

- Event generation inhibited - events defined through the event mechanism are no longer sent via syslog, traps, or informs.
- Throttling inhibited - events are sent without any throttling.
- Dynamic thresholding enabled - threshold based throttling is enabled.
- Manual thresholding enabled - manual intervention is required to resume event generation after crossing the initial threshold halts event generation.

Manual intervention through setting a MIB object is used to resume event generation when manual thresholding is enabled.

Inhibiting the generation of events SHALL be handled through the use of the MIB objects, one to specify a number of events, and one to specify a time period over which those events are generated. The default frequency is defined as 2 events per second in the MGMTEVENT MIB. When event generation exceeds this rate, no more events are sent via SYSLOG, traps, or informs. The throttling of Local logging of events is vendor specific.

Dynamic thresholding requires setting MIB objects to resume events. One object specifies the number of events, and the other is the time period object specified above. The default frequency is defined as 1 event per second. This defines the rate at which event generation is resumed.

Threshold settings are not persistent, and SHALL be reinitialized when the IPCablecom element reboots.

In addition to this mechanism, vendors may support other throttling mechanisms.

7.9 Severity and priority definition

Severity is the degree of failure related to a specific event by a reporting device. Three degrees of severity are commonly used:

- Critical: Used to indicate a severe, service-affecting condition has occurred and that immediate corrective action is imperative, regardless of the time of day or day of the week.
- Major: Used for hardware and software conditions that indicate a serious disruption of service or the malfunctioning or failure of important circuits. These troubles require the immediate attention and response of a craftsperson to restore or maintain system capability. The urgency is less than in critical situations because of a lesser immediate or impending effect on service or system performance.
- Minor: Used for troubles that do not have a serious effect on service to customers or for troubles in circuits that are not essential to Network Element operation.

Priority is the precedence established by order of importance or urgency. The back office manages the priority of how and when a particular event is serviced based on the severity of the reported event. The following priority sequences for trouble notifications shall prevail:

- Critical alarms have the highest priority and shall be serviced before any major or minor alarms.
- Major alarms have higher priority than minor alarms and shall be serviced before any minor alarms.
- Minor alarms shall be serviced before non-alarmed trouble notifications.

8 IPCablecom management event data template

In order to ensure multi-vendor interoperability of network management functionality, the specific meaning of IPCablecom management events are defined. Because the IPCablecom management events are based on conditions identified in IPCablecom specifications, management events are defined in the appendix of the appropriate IPCablecom specifications.

Table 1 shows the data required to describe the meaning of IPCablecom management events. The data contained in this table is for informational purposes only, table 1 will contain specific data when added to the appendix of an IPCablecom specification.

Table 1

Example management Event Data						
Enterprise Number	**Event Name**	**Default Severity for event raises**	**Default Display String**	**Comments**	**Programmable/ Pre-Defined**	**Associated Events**
4491	PL-EV-1	Minor	"AC Power Fail"	Telemetry pin 1 has been asserted.	Programmable	PL-EV-2
4491	PL-EV-2	Minor	"AC Power Restore"	Telemetry pin 1 has been de-asserted.	Programmable	PL-EV-1
4491	PROV-EV-1	Major	"MTA Missing Name"	The MTA was not provisioned with an FQDN.	Pre-defined	None

Annex A (informative): Management event identifiers

A.1 Introduction

IPCablecom elements generate OSS events to indicate an alarm or other noteworthy condition and may report these events using the IPCablecom Management Event Mechanism Specification. Events reported using the IPCablecom OSS Event Reporting mechanism must be identified by an EventID assigned in the present document.

All events delivered by (event mechanism document) fit into two main categories: IPCablecom-specific and vendor-specific. The exact meaning of IPCablecom-specific events is defined in the individual IPCablecom specifications. The exact meaning of vendor-specific events is out of the scope of the IPCablecom project.

A.2 Event ID assignments

- The EventID is a 32-bit unsigned integer.
  IPCablecom-specific EventIDs must be defined in the range of 0x00000000 (decimal 0) to 0xFFFFFFFF (decimal 4 294 967 295). It is expected that this range is sufficiently large to accommodate both IPCablecom-specific pre-defined EventIDs and IPCablecom-specific programmable EventIDs.

- For IPCablecom-specific pre-defined events, the EventID for the first event must be 0x00000000 and the EventID must be incremented by one for each additional event EventID assigned.

- For IPCablecom-specific programmable events, the EventID for the first event must be 0xFFFFFFFF and the EventID must be decremented by one for each additional EventID assigned.

- Vendor-specific EventIDs must be defined in the range of 0x00000000 (decimal 0) to 0xFFFFFFFF (decimal 4 294 967 295). It is expected that this range is sufficiently large to accommodate both vendor-specific pre-defined EventIDs and vendor-specific programmable EventIDs.

- Vendor-specific EventIDs must be unique for a particular vendor's enterprise number in *sysObjectID.*

- For vendor-specific pre-defined events, the EventID for the first event must be 0x00000000 and the EventID must be incremented by one for each additional EventID assigned.

- For IPCablecom programmable events, the EventID for the first event must be 0xFFFFFFFF and the EventID must be decremented by one for each additional EventID assigned.

A.2.1 IPCablecom-specific pre-defined event IDs

None defined at this time.

A.2.2 IPCablecom-specific programmable event IDs

Table A.1

IPCablecom-specific Programmable Event IDs			
Enterprise Number	**IPCablecom Event ID**	**Event Name**	**IPCablecom Specification that defines the event**
4491	65,535	PL-EV-1	J.PL
4491	65,534	PL-EV-2	J.PL
4491	65,533	PL-EV-3	J.PL
4491	65,532	PL-EV-4	J.PL
4491	65,531	PL-EV-5	J.PL
4491	65,530	PL-EV-6	J.PL
4491	65,529	PL-EV-7	J.PL
4491	65,528	PL-EV-8	J.PL

A.2.3 Vendor-specific pre-defined event IDs

None defined at this time.

A.2.4 Vendor-specific programmable event IDs

None defined at this time.

Annex B (informative): Bibliography

ETSI TS 101 909-10: "Access and Terminals (AT); Digital Broadband Cable Access to the Public Telecommunications Network; IP Multimedia Time Critical Services; Part 10: Event Message Requirements for the Provision of Real Time Services over Cable Television Networks using Cable Modems".

ETSI TS 101 909-6: "Access and Terminals (AT); Digital Broadband Cable Access to the Public Telecommunications Network; IP Multimedia Time Critical Services; Part 6: Media Terminal Adapter (MTA) device provisioning".

ETSI TS 101 909-2: "Access and Terminals (AT); Digital Broadband Cable Access to the Public Telecommunications Network; IP Multimedia Time Critical Services; Part 2: Architectural framework for the delivery of time critical services over cable Television networks using cable modems".

ETSI TS 101 909-8: "Access and Terminals (AT); Digital Broadband Cable Access to the Public Telecommunications Network; IP Multimedia Time Critical Services; Part 8: Media Terminal Adapter (MTA) Management Information Base (MIB)".

ETSI TS 101 909-7: "Access and Terminals (AT); Digital Broadband Cable Access to the Public Telecommunications Network; IP Multimedia Time Critical Services; Part 7: Management Information Base (MIB) Framework".

IETF RFC 2670: "Radio Frequency (RF) Interface Management Information Base for MCNS/DOCSIS compliant RF interfaces".

ITU-T Recommendation J.112: "Transmission systems for interactive cable television services".

ITU-T Recommendation J.160: "Architectural framework for the delivery of time critical services over cable television networks using cable modems".

History

Document history		
V1.1.1	February 2002	Publication