

The Definitions of Managed Objects for
the Link Control Protocol of
the Point-to-Point Protocol

Status of this Memo

This RFC specifies an IAB standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "IAB Official Protocol Standards" for the standardization state and status of this protocol. Distribution of this memo is unlimited.

Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in TCP/IP-based internets. In particular, it describes managed objects used for managing the Link Control Protocol and Link Quality Monitoring on subnetwork interfaces that use the family of Point-to-Point Protocols [8, 9, 10, 11, & 12].

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1. The Network Management Framework

The Internet-standard Network Management Framework consists of three components. They are:

STD 16/RFC 1155 which defines the SMI, the mechanisms used for describing and naming objects for the purpose of management. STD 16/RFC 1212 defines a more concise description mechanism, which is wholly consistent with the SMI.

STD 17/RFC 1213 which defines MIB-II, the core set of managed objects for the Internet suite of protocols.

STD 15/RFC 1157 which defines the SNMP, the protocol used for network access to managed objects.

The Framework permits new objects to be defined for the purpose of experimentation and evaluation.

2. Objects

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the subset of Abstract Syntax Notation One (ASN.1) [3] defined in the SMI. In particular, each object type is named by an OBJECT IDENTIFIER, an administratively assigned name. The object type together with an object instance serves to uniquely identify a specific instantiation of the object. For human convenience, we often use a textual string, termed the descriptor, to refer to the object type.

2.1. Format of Definitions

Section 4 contains the specification of all object types contained in this MIB module. The object types are defined using the conventions defined in the SMI, as amended by the extensions specified in [5,6].

3. Overview

3.1. Object Selection Criteria

To be consistent with IAB directives and good engineering practice, an explicit attempt was made to keep this MIB as simple as possible. This was accomplished by applying the following criteria to objects proposed for inclusion:

- (1) Require objects be essential for either fault or configuration management. In particular, objects for

which the sole purpose was to debug implementations were explicitly excluded from the MIB.

- (2) Consider evidence of current use and/or utility.
- (3) Limit the total number of objects.
- (4) Exclude objects which are simply derivable from others in this or other MIBs.

3.2. Structure of the PPP

This section describes the basic model of PPP used in developing the PPP MIB. This information should be useful to the implementor in understanding some of the basic design decisions of the MIB.

The PPP is not one single protocol but a large family of protocols. Each of these is, in itself, a fairly complex protocol. The PPP protocols may be divided into three rough categories:

Control Protocols

The Control Protocols are used to control the operation of the PPP. The Control Protocols include the Link Control Protocol (LCP), the Password Authentication Protocol (PAP), the Link Quality Report (LQR), and the Challenge Handshake Authentication Protocol (CHAP).

Network Protocols

The Network Protocols are used to move the network traffic over the PPP interface. A Network Protocol encapsulates the datagrams of a specific higher-layer protocol that is using the PPP as a data link. Note that within the context of PPP, the term "Network Protocol" does not imply an OSI Layer-3 protocol; for instance, there is a Bridging network protocol.

Network Control Protocols (NCPs)

The NCPs are used to control the operation of the Network Protocols. Generally, each Network Protocol has its own Network Control Protocol; thus, the IP Network Protocol has its IP Control Protocol, the Bridging Network Protocol has its Bridging Network Control Protocol and so on.

This document specifies the objects used in managing one of these protocols, namely the Link Control Protocol and Link Quality Monitoring Protocol.

3.3. MIB Groups

Objects in this MIB are arranged into several MIB groups. Each group is organized as a set of related objects.

These groups are the basic unit of conformance: if the semantics of a group are applicable to an implementation then all objects in the group must be implemented.

The PPP MIB is organized into several MIB Groups, including, but not limited to, the following groups:

- o The PPP Link Group
- o The PPP LQR Group
- o The PPP LQR Extensions Group
- o The PPP IP Group
- o The PPP Bridge Group
- o The PPP Security Group

This document specifies the following groups:

The PPP Link Group

This group represents the lowest "level" of the PPP protocol.

This group contains two tables, one containing status information and the other configuration information. The configuration table is split off of the status so that it may be placed in a separate MIB View for security purposes.

Implementation of this group is mandatory for all PPP implementations.

The PPP LQR Group

This group provides the basic MIB variables that apply to the PPP LQR Protocol. This group provides MIB access to the information required for LQR processing. This group contains two tables, one containing status information and the other configuration information. The configuration table is split off of the status so that it may be placed in a separate MIB View for security purposes.

Implementation of the PPP LQR Group is mandatory for all PPP implementations that implement LQR.

The PPP LQR Extensions Group

The PPP LQR Extensions group contains the most recently received LQR packet, as well as the "save" fields that are "logically appended" [12] to received LQR packets. This is done in order to

facilitate external implementations of the Link Quality Monitoring policies.

It is not practical to examine the relevant MIB objects which are used to generate LQR packets since LQR policies may require synchronization of the values of all data used to determine Link Quality; i.e., the values of the relevant counters must all be taken at the same instant in time. Thus, by recording the last received LQR packet, a synchronized record of the relevant data is available.

As this information may not be efficiently maintained on all PPP implementations, implementation of this group is optional.

3.4. Relationship to Interface and Interface Extensions Groups

The PPP Mib is a medium-specific extension to the standard MIB-2 interface group [2] and to the Interface Extensions MIB [7]. This section discusses certain components of these groups when the interface is a PPP interface.

The PPP interface represents a single interface in the sense used in [2] and thus has a single entry in the ifTable.

Furthermore, the PPP interface may be operating over a lower layer hardware interface (such as an RS-232 port). It is important to capture the relationship between the PPP interface and the lower-layer interface over which it operates. This MIB presumes that the lower-layer interface has an ifEntry associated with it. The lower-layer ifEntry is identified via the pppLinkStatusPhysicalIndex object, which contains the value of ifIndex for the lower-layer ifEntry.

For example, suppose that you run PPP over a RS-232 port. This would use two entries in the ifTable. Let's suppose that entry number 123 is for the PPP "interface" and entry number 987 is for the RS-232 port. So, ifSpecific.123 would contain the ppp OBJECT IDENTIFIER, pppLinkStatusPhysicalIndex.123 would contain 987, and ifSpecific.987 would contain the rs_232 OBJECT IDENTIFIER (or whatever it is).

All PPP packets are defined in [8] as being broadcast packets. Thus, the packets are counted as non-unicast packets in the ifTable (ifInNUcastPkts and ifOutNUcastPkts) and as broadcasts in the ifExtnsTable (ifExtnsBroadcastsReceivedOks and ifExtnsBroadcastsTransmittedOks).

ifSpecific

Contains the OBJECT IDENTIFIER ppp.

ifAdminStatus

Setting this object to up will inject an administrative open event into the LCP's finite state machine. Setting this object to down will inject an administrative close event into the LCP's finite state machine.

The use of the testing value is beyond the scope of this document.

ifOperStatus

Represents the state of the LCP Finite State Machine. If the Finite State Machine is in the Opened state then the value of ifOperStatus is up, otherwise the value of ifOperStatus is down.

The meaning of the testing value is beyond the scope of this document.

Per the SNMP Protocol Specification [13], the linkUp and linkDown traps apply to the PPP Protocol entity. When the LCP's Finite State Machine attains the Opened state, a linkUp trap should be sent. When the Finite State Machine leaves the Opened state, a linkDown trap should be sent.

Some tests for the link are defined in this document. Execution of these tests does not place the link's ifOperStatus in the testing state as these tests do not prevent normal data transmission from occurring over the link.

4. Definitions

```
PPP-LCP-MIB DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```
    Counter
```

```
        FROM RFC1155-SMI
```

```
    ifIndex, transmission
```

```
        FROM RFC1213-MIB
```

```
    OBJECT-TYPE
```

```
        FROM RFC-1212;
```

```
--   PPP MIB
```

```
ppp OBJECT IDENTIFIER ::= { transmission 23 }
```

```
pppLcp OBJECT IDENTIFIER ::= { ppp 1 }
```

```

-- The individual groups within the PPP-LCP-MIB

pppLink      OBJECT IDENTIFIER ::= { pppLcp 1 }
pppLqr       OBJECT IDENTIFIER ::= { pppLcp 2 }
pppTests     OBJECT IDENTIFIER ::= { pppLcp 3 }

-- 4.1.  PPP Link Group

--
-- The PPP Link Group. Implementation of this
-- group is mandatory for all PPP entities.
--

-- The following object reflect the values of the option
-- parameters used in the PPP Link Control Protocol
-- pppLinkStatusLocalMRU
-- pppLinkStatusRemoteMRU
-- pppLinkStatusLocalToPeerACCMAP
-- pppLinkStatusPeerToLocalACCMAP
-- pppLinkStatusLocalToRemoteProtocolCompression
-- pppLinkStatusRemoteToLocalProtocolCompression
-- pppLinkStatusLocalToRemoteACCompression
-- pppLinkStatusRemoteToLocalACCompression
-- pppLinkStatusTransmitFcsSize
-- pppLinkStatusReceiveFcsSize
--
-- These values are not available until after the PPP Option
-- negotiation has completed, which is indicated by the link
-- reaching the open state (i.e., ifOperStatus is set to
-- up).
--
-- Therefore, when ifOperStatus is not up
-- the contents of these objects is undefined. The value
-- returned when accessing the objects is an implementation
-- dependent issue.

pppLinkStatusTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF PppLinkStatusEntry
    ACCESS      not-accessible
    STATUS      mandatory
    DESCRIPTION
        "A table containing PPP-link specific variables
        for this PPP implementation."
    ::= { pppLink 1 }

```

```

pppLinkStatusEntry    OBJECT-TYPE
    SYNTAX      PppLinkStatusEntry
    ACCESS      not-accessible
    STATUS      mandatory
    DESCRIPTION
        "Management information about a particular PPP
         Link."
    INDEX       { ifIndex }
    ::= { pppLinkStatusTable 1 }

```

```

PppLinkStatusEntry ::= SEQUENCE {
    pppLinkStatusPhysicalIndex
        INTEGER,
    pppLinkStatusBadAddresses
        Counter,
    pppLinkStatusBadControls
        Counter,
    pppLinkStatusPacketTooLongs
        Counter,
    pppLinkStatusBadFCSS
        Counter,
    pppLinkStatusLocalMRU
        INTEGER,
    pppLinkStatusRemoteMRU
        INTEGER,
    pppLinkStatusLocalToPeerACCTMap
        OCTET STRING,
    pppLinkStatusPeerToLocalACCTMap
        OCTET STRING,
    pppLinkStatusLocalToRemoteProtocolCompression
        INTEGER,
    pppLinkStatusRemoteToLocalProtocolCompression
        INTEGER,
    pppLinkStatusLocalToRemoteACCompression
        INTEGER,
    pppLinkStatusRemoteToLocalACCompression
        INTEGER,
    pppLinkStatusTransmitFcsSize
        INTEGER,
    pppLinkStatusReceiveFcsSize
        INTEGER
}
pppLinkStatusPhysicalIndex    OBJECT-TYPE
    SYNTAX      INTEGER(0..2147483647)
    ACCESS      read-only
    STATUS      mandatory
    DESCRIPTION

```


"The value of ifIndex that identifies the lower-level interface over which this PPP Link is operating. This interface would usually be an HDLC or RS-232 type of interface. If there is no lower-layer interface element, or there is no ifEntry for the element, or the element can not be identified, then the value of this object is 0. For example, suppose that PPP is operating over a serial port. This would use two entries in the ifTable. The PPP could be running over 'interface' number 123 and the serial port could be running over 'interface' number 987. Therefore, ifSpecific.123 would contain the OBJECT IDENTIFIER ppppppLinkStatusPhysicalIndex.123 would contain 987, and ifSpecific.987 would contain the OBJECT IDENTIFIER for the serial-port's media-specific MIB."

```
::= { pppLinkStatusEntry 1 }
```

pppLinkStatusBadAddresses OBJECT-TYPE

SYNTAX Counter

ACCESS read-only

STATUS mandatory

DESCRIPTION

"The number of packets received with an incorrect Address Field. This counter is a component of the ifInErrors variable that is associated with the interface that represents this PPP Link."

REFERENCE

"Section 3.1, Address Field, of RFC1331."

```
::= { pppLinkStatusEntry 2 }
```

pppLinkStatusBadControls OBJECT-TYPE

SYNTAX Counter

ACCESS read-only

STATUS mandatory

DESCRIPTION

"The number of packets received on this link with an incorrect Control Field. This counter is a component of the ifInErrors variable that is associated with the interface that represents this PPP Link."

REFERENCE

"Section 3.1, Control Field, of RFC1331."

```
::= { pppLinkStatusEntry 3 }
```

```
pppLinkStatusPacketTooLongs    OBJECT-TYPE
```

```
    SYNTAX      Counter
```

```
    ACCESS      read-only
```

```
    STATUS      mandatory
```

```
    DESCRIPTION
```

```
        "The number of received packets that have been
        discarded because their length exceeded the
        MRU. This counter is a component of the
        ifInErrors variable that is associated with the
        interface that represents this PPP Link. NOTE,
        packets which are longer than the MRU but which
        are successfully received and processed are NOT
        included in this count."
```

```
::= { pppLinkStatusEntry 4 }
```

```
pppLinkStatusBadFCSS    OBJECT-TYPE
```

```
    SYNTAX      Counter
```

```
    ACCESS      read-only
```

```
    STATUS      mandatory
```

```
    DESCRIPTION
```

```
        "The number of received packets that have been
        discarded due to having an incorrect FCS. This
        counter is a component of the ifInErrors
        variable that is associated with the interface
        that represents this PPP Link."
```

```
::= { pppLinkStatusEntry 5 }
```

```
pppLinkStatusLocalMRU    OBJECT-TYPE
```

```
    SYNTAX      INTEGER(1..2147483648)
```

```
    ACCESS      read-only
```

```
    STATUS      mandatory
```

```
    DESCRIPTION
```

```
        "The current value of the MRU for the local PPP
        Entity. This value is the MRU that the remote
        entity is using when sending packets to the
        local PPP entity. The value of this object is
        meaningful only when the link has reached the
        open state (ifOperStatus is up)."
```

```
::= { pppLinkStatusEntry 6 }
```

```
pppLinkStatusRemoteMRU    OBJECT-TYPE
```

```
    SYNTAX      INTEGER(1..2147483648)
```

```

ACCESS      read-only
STATUS      mandatory
DESCRIPTION
    "The current value of the MRU for the remote
    PPP Entity. This value is the MRU that the
    local entity is using when sending packets to
    the remote PPP entity. The value of this object
    is meaningful only when the link has reached
    the open state (ifOperStatus is up)."
 ::= { pppLinkStatusEntry 7 }

```

```

pppLinkStatusLocalToPeerACCTMap  OBJECT-TYPE
    SYNTAX      OCTET STRING (SIZE (4))
    ACCESS      read-only
    STATUS      mandatory
    DESCRIPTION
        "The current value of the ACC Map used for
        sending packets from the local PPP entity to
        the remote PPP entity. The value of this object
        is meaningful only when the link has reached
        the open state (ifOperStatus is up)."
    ::= { pppLinkStatusEntry 8 }

```

```

pppLinkStatusPeerToLocalACCTMap  OBJECT-TYPE
    SYNTAX      OCTET STRING (SIZE (4))
    ACCESS      read-only
    STATUS      mandatory
    DESCRIPTION
        "The ACC Map used by the remote PPP entity when
        transmitting packets to the local PPP entity.
        The value of this object is meaningful only
        when the link has reached the open state
        (ifOperStatus is up)."
    ::= { pppLinkStatusEntry 9 }

```

```

pppLinkStatusLocalToRemoteProtocolCompression
    OBJECT-TYPE
    SYNTAX      INTEGER {
                    enabled(1),
                    disabled(2)
                }
    ACCESS      read-only
    STATUS      mandatory
    DESCRIPTION
        "Indicates whether the local PPP entity will

```

```

        use Protocol Compression when transmitting
        packets to the remote PPP entity. The value of
        this object is meaningful only when the link
        has reached the open state (ifOperStatus is
        up)."
```

::= { pppLinkStatusEntry 10 }

pppLinkStatusRemoteToLocalProtocolCompression

OBJECT-TYPE

```

SYNTAX      INTEGER {
                enabled(1),
                disabled(2)
            }
```

ACCESS read-only

STATUS mandatory

DESCRIPTION

"Indicates whether the remote PPP entity will use Protocol Compression when transmitting packets to the local PPP entity. The value of this object is meaningful only when the link has reached the open state (ifOperStatus is up)."

::= { pppLinkStatusEntry 11 }

pppLinkStatusLocalToRemoteACCompression OBJECT-TYPE

```

SYNTAX      INTEGER {
                enabled(1),
                disabled(2)
            }
```

ACCESS read-only

STATUS mandatory

DESCRIPTION

"Indicates whether the local PPP entity will use Address and Control Compression when transmitting packets to the remote PPP entity. The value of this object is meaningful only when the link has reached the open state (ifOperStatus is up)."

::= { pppLinkStatusEntry 12 }

pppLinkStatusRemoteToLocalACCompression OBJECT-TYPE

```

SYNTAX      INTEGER {
                enabled(1),
                disabled(2)
            }
```

```

ACCESS      read-only
STATUS      mandatory
DESCRIPTION
    "Indicates whether the remote PPP entity will
    use Address and Control Compression when
    transmitting packets to the local PPP entity.
    The value of this object is meaningful only
    when the link has reached the open state
    (ifOperStatus is up)."
```

::= { pppLinkStatusEntry 13 }

```

pppLinkStatusTransmitFcsSize  OBJECT-TYPE
    SYNTAX      INTEGER (0..128)
    ACCESS      read-only
    STATUS      mandatory
    DESCRIPTION
        "The size of the Frame Check Sequence (FCS) in
        bits that the local node will generate when
        sending packets to the remote node. The value
        of this object is meaningful only when the link
        has reached the open state (ifOperStatus is
        up)."
```

::= { pppLinkStatusEntry 14 }

```

pppLinkStatusReceiveFcsSize  OBJECT-TYPE
    SYNTAX      INTEGER (0..128)
    ACCESS      read-only
    STATUS      mandatory
    DESCRIPTION
        "The size of the Frame Check Sequence (FCS) in
        bits that the remote node will generate when
        sending packets to the local node. The value
        of this object is meaningful only when the link
        has reached the open state (ifOperStatus is
        up)."
```

::= { pppLinkStatusEntry 15 }

```

pppLinkConfigTable  OBJECT-TYPE
    SYNTAX      SEQUENCE OF PppLinkConfigEntry
    ACCESS      not-accessible
    STATUS      mandatory
    DESCRIPTION
        "A table containing the LCP configuration
        parameters for this PPP Link. These variables
        represent the initial configuration of the PPP
```

Link. The actual values of the parameters may be changed when the link is brought up via the LCP options negotiation mechanism."

```
::= { pppLink 2 }
```

```
pppLinkConfigEntry    OBJECT-TYPE
    SYNTAX      PppLinkConfigEntry
    ACCESS      not-accessible
    STATUS      mandatory
    DESCRIPTION
        "Configuration information about a particular
         PPP Link."
    INDEX       { ifIndex }
    ::= { pppLinkConfigTable 1 }
```

```
PppLinkConfigEntry ::= SEQUENCE {
    pppLinkConfigInitialMRU
        INTEGER,
    pppLinkConfigReceiveACCTMap
        OCTET STRING,
    pppLinkConfigTransmitACCTMap
        OCTET STRING,
    pppLinkConfigMagicNumber
        INTEGER,
    pppLinkConfigFcsSize
        INTEGER
}
```

```
pppLinkConfigInitialMRU    OBJECT-TYPE
    SYNTAX      INTEGER(0..2147483647)
    ACCESS      read-write
    STATUS      mandatory
    DESCRIPTION
        "The initial Maximum Receive Unit (MRU) that
         the local PPP entity will advertise to the
         remote entity. If the value of this variable is
         0 then the local PPP entity will not advertise
         any MRU to the remote entity and the default
         MRU will be assumed. Changing this object will
         have effect when the link is next restarted."
    REFERENCE
        "Section 7.2, Maximum Receive Unit of RFC1331."
    DEFVAL      { 1500 }
    ::= { pppLinkConfigEntry 1 }
```

pppLinkConfigReceiveACCTMap OBJECT-TYPE

SYNTAX OCTET STRING (SIZE (4))

ACCESS read-write

STATUS mandatory

DESCRIPTION

"The Asynchronous-Control-Character-Map (ACC) that the local PPP entity requires for use on its receive side. In effect, this is the ACC Map that is required in order to ensure that the local modem will successfully receive all characters. The actual ACC map used on the receive side of the link will be a combination of the local node's pppLinkConfigReceiveACCTMap and the remote node's pppLinkConfigTransmitACCTMap. Changing this object will have effect when the link is next restarted."

REFERENCE

"Section 7.3, page 4, Async-Control-Character-Map of RFC1331."

DEFVAL { 'ffffffff'h }

::= { pppLinkConfigEntry 2 }

pppLinkConfigTransmitACCTMap OBJECT-TYPE

SYNTAX OCTET STRING (SIZE (4))

ACCESS read-write

STATUS mandatory

DESCRIPTION

"The Asynchronous-Control-Character-Map (ACC) that the local PPP entity requires for use on its transmit side. In effect, this is the ACC Map that is required in order to ensure that all characters can be successfully transmitted through the local modem. The actual ACC map used on the transmit side of the link will be a combination of the local node's pppLinkConfigTransmitACCTMap and the remote node's pppLinkConfigReceiveACCTMap. Changing this object will have effect when the link is next restarted."

REFERENCE

"Section 7.3, page 4, Async-Control-Character-Map of RFC1331."

DEFVAL { 'ffffffff'h }

::= { pppLinkConfigEntry 3 }

```

pppLinkConfigMagicNumber    OBJECT-TYPE
    SYNTAX      INTEGER {false (1), true (2)}
    ACCESS      read-write
    STATUS      mandatory
    DESCRIPTION
        "If true(2) then the local node will attempt to
        perform Magic Number negotiation with the
        remote node. If false(1) then this negotiation
        is not performed. In any event, the local node
        will comply with any magic number negotiations
        attempted by the remote node, per the PPP
        specification. Changing this object will have
        effect when the link is next restarted."
    REFERENCE
        "Section 7.6, Magic Number, of RFC1331."
    DEFVAL      { false }
    ::= { pppLinkConfigEntry 4 }

```

```

pppLinkConfigFcsSize        OBJECT-TYPE
    SYNTAX      INTEGER (0..128)
    ACCESS      read-write
    STATUS      mandatory
    DESCRIPTION
        "The size of the FCS, in bits, the local node
        will attempt to negotiate for use with the
        remote node. Regardless of the value of this
        object, the local node will comply with any FCS
        size negotiations initiated by the remote node,
        per the PPP specification. Changing this object
        will have effect when the link is next
        restarted."
    DEFVAL      { 16 }
    ::= { pppLinkConfigEntry 5 }

```

-- 4.2. PPP LQR Group

```

--
-- The PPP LQR Group.
-- Implementation of this group is mandatory for all
-- PPP implementations that implement LQR.
--

```

```

pppLqrTable                  OBJECT-TYPE
    SYNTAX      SEQUENCE OF PppLqrEntry
    ACCESS      not-accessible

```



```

STATUS      mandatory
DESCRIPTION
    "Table containing the LQR parameters and
    statistics for the local PPP entity."
 ::= { pppLqr 1 }

pppLqrEntry  OBJECT-TYPE
    SYNTAX   PppLqrEntry
    ACCESS   not-accessible
    STATUS   mandatory
    DESCRIPTION
        "LQR information for a particular PPP link. A
        PPP link will have an entry in this table if
        and only if LQR Quality Monitoring has been
        successfully negotiated for said link."
    INDEX    { ifIndex }
    ::= { pppLqrTable 1 }

PppLqrEntry ::= SEQUENCE {
    pppLqrQuality
        INTEGER,
    pppLqrInGoodOctets
        Counter,
    pppLqrLocalPeriod
        INTEGER,
    pppLqrRemotePeriod
        INTEGER,
    pppLqrOutLQRs
        Counter,
    pppLqrInLQRs
        Counter
}

pppLqrQuality  OBJECT-TYPE
    SYNTAX      INTEGER {
        good(1),
        bad(2),
        not-determined(3)
    }
    ACCESS      read-only
    STATUS      mandatory
    DESCRIPTION
        "The current quality of the link as declared by
        the local PPP entity's Link-Quality Management
        modules. No effort is made to define good or
        bad, nor the policy used to determine it. The

```

not-determined value indicates that the entity does not actually evaluate the link's quality. This value is used to disambiguate the 'determined to be good' case from the 'no determination made and presumed to be good' case."

::= { pppLqrEntry 1 }

pppLqrInGoodOctets OBJECT-TYPE

SYNTAX Counter

ACCESS read-only

STATUS mandatory

DESCRIPTION

"The LQR InGoodOctets counter for this link."

REFERENCE

"Section 2.2, Counters, of RFC1333."

::= { pppLqrEntry 2 }

pppLqrLocalPeriod OBJECT-TYPE

SYNTAX INTEGER(1..2147483648)

ACCESS read-only

STATUS mandatory

DESCRIPTION

"The LQR reporting period, in hundredths of a second that is in effect for the local PPP entity."

REFERENCE

"Section 2.5, Configuration Option Format, of RFC1333."

::= { pppLqrEntry 3 }

pppLqrRemotePeriod OBJECT-TYPE

SYNTAX INTEGER(1..2147483648)

ACCESS read-only

STATUS mandatory

DESCRIPTION

"The LQR reporting period, in hundredths of a second, that is in effect for the remote PPP entity."

REFERENCE

"Section 2.5, Configuration Option Format, of RFC1333."

::= { pppLqrEntry 4 }

```

pppLqrOutLQRs    OBJECT-TYPE
    SYNTAX      Counter
    ACCESS      read-only
    STATUS      mandatory
    DESCRIPTION
        "The value of the OutLQRs counter on the local
         node for the link identified by ifIndex."
    REFERENCE
        "Section 2.2, Counters, of RFC1333."
    ::= { pppLqrEntry 5 }

```

```

pppLqrInLQRs     OBJECT-TYPE
    SYNTAX      Counter
    ACCESS      read-only
    STATUS      mandatory
    DESCRIPTION
        "The value of the InLQRs counter on the local
         node for the link identified by ifIndex."
    REFERENCE
        "Section 2.2, Counters, of RFC1333."
    ::= { pppLqrEntry 6 }

```

```

--
-- The PPP LQR Configuration table.
--

```

```

pppLqrConfigTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF PppLqrConfigEntry
    ACCESS      not-accessible
    STATUS      mandatory
    DESCRIPTION
        "Table containing the LQR Configuration
         parameters for the local PPP entity."
    ::= { pppLqr 2 }

```

```

pppLqrConfigEntry OBJECT-TYPE
    SYNTAX      PppLqrConfigEntry
    ACCESS      not-accessible
    STATUS      mandatory
    DESCRIPTION
        "LQR configuration information for a particular
         PPP link."
    INDEX      { ifIndex }
    ::= { pppLqrConfigTable 1 }

```

```

PppLqrConfigEntry ::= SEQUENCE {
    pppLqrConfigPeriod
        INTEGER,
    pppLqrConfigStatus
        INTEGER
}

```

```

pppLqrConfigPeriod    OBJECT-TYPE
    SYNTAX      INTEGER(0..2147483647)
    ACCESS      read-write
    STATUS      mandatory
    DESCRIPTION
        "The LQR Reporting Period that the local PPP
        entity will attempt to negotiate with the
        remote entity, in units of hundredths of a
        second. Changing this object will have effect
        when the link is next restarted."
    REFERENCE
        "Section 2.5, Configuration Option Format, of
        RFC1333."
    DEFVAL      { 0 }
    ::= { pppLqrConfigEntry 1 }

```

```

pppLqrConfigStatus    OBJECT-TYPE
    SYNTAX      INTEGER {disabled (1), enabled (2)}
    ACCESS      read-write
    STATUS      mandatory
    DESCRIPTION
        "If enabled(2) then the local node will attempt
        to perform LQR negotiation with the remote
        node. If disabled(1) then this negotiation is
        not performed. In any event, the local node
        will comply with any magic number negotiations
        attempted by the remote node, per the PPP
        specification. Changing this object will have
        effect when the link is next restarted.
        Setting this object to the value disabled(1)
        has the effect of invalidating the
        corresponding entry in the pppLqrConfigTable
        object. It is an implementation-specific matter
        as to whether the agent removes an invalidated
        entry from the table. Accordingly, management
        stations must be prepared to receive tabular
        information from agents that corresponds to
        entries not currently in use."
    REFERENCE
        "Section 7.6, Magic Number, of RFC1331."

```

```

DEFVAL      { enabled }
 ::= { pppLqrConfigEntry 2 }

```

-- 4.3. PPP LQR Extensions Group

```

--
-- The PPP LQR Extensions Group.
-- Implementation of this group is optional.
--
-- The intent of this group is to allow external
-- implementation of the policy mechanisms that
-- are used to declare a link to be "bad" or not.
--
-- It is not practical to examine the MIB objects
-- which are used to generate LQR packets since
-- LQR policies tend to require synchronization of
-- the values of all data used to determine Link
-- Quality; i.e. the values of the relevant counters
-- must all be taken at the same instant in time.
--

```

```

pppLqrExtnsTable    OBJECT-TYPE
    SYNTAX      SEQUENCE OF PppLqrExtnsEntry
    ACCESS      not-accessible
    STATUS      mandatory
    DESCRIPTION
        "Table containing additional LQR information
         for the local PPP entity."
    ::= { pppLqr 3 }

```

```

pppLqrExtnsEntry    OBJECT-TYPE
    SYNTAX      PppLqrExtnsEntry
    ACCESS      not-accessible
    STATUS      mandatory
    DESCRIPTION
        "Extended LQR information for a particular PPP
         link. Assuming that this group has been
         implemented, a PPP link will have an entry in
         this table if and only if LQR Quality
         Monitoring has been successfully negotiated for
         said link."
    INDEX       { ifIndex }
    ::= { pppLqrExtnsTable 1 }

```

```

PppLqrExtnsEntry ::= SEQUENCE {

```

```

    pppLqrExtnsLastReceivedLqrPacket
        OCTET STRING(SIZE(68))
}

pppLqrExtnsLastReceivedLqrPacket    OBJECT-TYPE
    SYNTAX      OCTET STRING(SIZE(68))
    ACCESS      read-only
    STATUS      mandatory
    DESCRIPTION
        "This object contains the most recently
        received LQR packet.  The format of the packet
        is as described in the LQM Protocol
        specification.  All fields of the packet,
        including the 'save' fields, are stored in this
        object.

        The LQR packet is stored in network byte order.
        The LAP-B and PPP headers are not stored in
        this object; the first four octets of this
        variable contain the Magic-Number field, the
        second four octets contain the LastOutLQRs
        field and so on.  The last four octets of this
        object contain the SaveInOctets field of the
        LQR packet."

    REFERENCE
        "Section 2.6, Packet Format, of RFC1333"
    ::= { pppLqrExtnsEntry 1 }

-- 4.4.  PPP Tests

-- The extensions to the interface table in RFC1229 define a
-- table through which the network manager can instruct the
-- managed object to perform various tests of the interface. This
-- is the ifExtnsTestTable.

-- The PPP MIB defines two such tests.

-- 4.4.1.  PPP Echo Test

-- The PPP Echo Test is defined as

    pppEchoTest    OBJECT IDENTIFIER ::= { pppTests 1 }

-- Invoking this test causes a PPP Echo Packet to be sent on the
-- line.  ifExtnsTestResult returns success(2) if the echo
-- response came back properly.  It returns failed(7) if the
-- response did not properly return.  The definition of "proper"

```

-- in this context is left to the discretion of the implementor.

-- 4.4.2. PPP Discard Test

-- The PPP Discard Test is defined as

pppDiscardTest OBJECT IDENTIFIER ::= { pppTests 2 }

-- Invoking this test causes a PPP Discard Packet to be sent on
-- the line. ifExtnsTestResult returns success(2) if the discard
-- packet was successfully transmitted and failed(7) if an error
-- was detected on transmission. The definition of "transmission
-- error" in this context is left to the discretion of the
-- implementor.

END

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Chris Gunner -- DEC

6. Security Considerations

The PPP MIB affords the network operator the ability to configure and control the PPP links of a particular system. This represents a security risk.

These risks are addressed in the following manners:

- (1) All variables which represent a significant security risk are placed in separate, optional, MIB Groups. As the MIB Group is the quantum of implementation within a MIB, the implementor of the MIB may elect not to implement these groups.
- (2) The implementor may choose to implement the variables which present a security risk so that they may not be written, i.e., the variables are READ-ONLY. This method still presents a security risk, and is not recommended, in that the variables, specifically the PPP Authentication Protocols' variables, may be easily read.

- (3) Using SNMPv2, the operator can place the variables into MIB views which are protected in that the parties which have access to those MIB views use authentication and privacy protocols, or the operator may elect to make these views not accessible to any party. In order to facilitate this placement, all security-related variables are placed in separate MIB Tables. This eases the identification of the necessary MIB View Subtree.

7. References

- [1] Rose M., and K. McCloghrie, "Structure and Identification of Management Information for TCP/IP-based internets", STD 16, RFC 1155, Performance Systems International, Hughes LAN Systems, May 1990.
- [2] McCloghrie K., and M. Rose, Editors, "Management Information Base for Network Management of TCP/IP-based internets", STD 17, RFC 1213, Performance Systems International, March 1991.
- [3] Information processing systems - Open Systems Interconnection - Specification of Abstract Syntax Notation One (ASN.1), International Organization for Standardization, International Standard 8824, December 1987.
- [4] Information processing systems - Open Systems Interconnection - Specification of Basic Encoding Rules for Abstract Notation One (ASN.1), International Organization for Standardization, International Standard 8825, December 1987.
- [5] Rose, M., and K. McCloghrie, Editors, "Concise MIB Definitions", STD 16, RFC 1212, Performance Systems International, Hughes LAN Systems, March 1991.
- [6] Rose, M., Editor, "A Convention for Defining Traps for use with the SNMP", RFC 1215, Performance Systems International, March 1991.
- [7] McCloghrie, K., "Extensions to the Generic-Interface MIB", RFC 1229, Hughes LAN Systems, Inc., May 1991.
- [8] Simpson, W., "The Point-to-Point Protocol for the Transmission of Multi-protocol Datagrams over Point-to-Point Links, RFC 1331, Daydreamer, May 1992.
- [9] McGregor, G., "The PPP Internet Protocol Control Protocol", RFC 1332, Merit, May 1992.

- [10] Baker, F., "Point-to-Point Protocol Extensions for Bridging", RFC 1220, ACC, April 1991.
- [11] Lloyd, B., and W. Simpson, "PPP Authentication Protocols", RFC 1334, L&A, Daydreamer, October 1992.
- [12] Simpson, W., "PPP Link Quality Monitoring", RFC 1333, Daydreamer, May 1992.
- [13] Case, J., Fedor, M., Schoffstall, M., and J. Davin, "Simple Network Management Protocol", STD 15, RFC 1157, SNMP Research, Performance Systems International, Performance Systems International, MIT Laboratory for Computer Science, May 1990.

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