

The Definitions of Managed Objects for
the Security Protocols 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 Security Protocols on subnetwork interfaces using 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 PPP Authentication Protocols.

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 group:

PPP Security Group

The PPP Security Group contains all configuration and control variables that apply to PPP security.

Implementation of this group is optional. Implementation is optional since the variables in this group provide configuration and control for the PPP Security functions. Thus, these variables should be protected by SNMPv2 security. If an agent does not support SNMPv2 with privacy it is strongly advised that this group not be implemented. See the section on "Security Considerations" at the end of this document.

4. Definitions

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

```
IMPORTS
```

```
    Counter
```

```
        FROM RFC1155-SMI
```

```
    OBJECT-TYPE
```

```
        FROM RFC-1212
```

```
    ppp
```

```
        FROM PPP-LCP-MIB;
```

```
    pppSecurity OBJECT IDENTIFIER ::= { ppp 2 }
```

```
    pppSecurityProtocols OBJECT IDENTIFIER ::= { pppSecurity 1 }
```

```
-- The following uniquely identify the various protocols
-- used by PPP security. These OBJECT IDENTIFIERS are
-- used in the pppSecurityConfigProtocol and
-- pppSecuritySecretsProtocol objects to identify to which
-- protocols the table entries apply.
```

```
    pppSecurityPapProtocol OBJECT IDENTIFIER ::=
        { pppSecurityProtocols 1 }
```

```
    pppSecurityChapMD5Protocol OBJECT IDENTIFIER ::=
        { pppSecurityProtocols 2 }
```

```
-- PPP Security Group
-- Implementation of this group is optional.

-- This table allows the network manager to configure
-- which security protocols are to be used on which
-- link and in what order of preference each is to be tried
```

```
pppSecurityConfigTable    OBJECT-TYPE
    SYNTAX      SEQUENCE OF PppSecurityConfigEntry
    ACCESS      not-accessible
    STATUS      mandatory
    DESCRIPTION
        "Table containing the configuration and
        preference parameters for PPP Security."
    ::= { pppSecurity 2 }
```

```
pppSecurityConfigEntry    OBJECT-TYPE
    SYNTAX      PppSecurityConfigEntry
    ACCESS      not-accessible
    STATUS      mandatory
    DESCRIPTION
        "Security configuration information for a
        particular PPP link."
    INDEX       { pppSecurityConfigLink,
                  pppSecurityConfigPreference }
    ::= { pppSecurityConfigTable 1 }
```

```
PppSecurityConfigEntry ::= SEQUENCE {
    pppSecurityConfigLink
        INTEGER,
    pppSecurityConfigPreference
        INTEGER,
    pppSecurityConfigProtocol
        OBJECT IDENTIFIER,
    pppSecurityConfigStatus
        INTEGER
}
```

```
pppSecurityConfigLink    OBJECT-TYPE
    SYNTAX      INTEGER(0..2147483647)
    ACCESS      read-write
    STATUS      mandatory
    DESCRIPTION
        "The value of ifIndex that identifies the entry
```

in the interface table that is associated with the local PPP entity's link for which this particular security algorithm shall be attempted. A value of 0 indicates the default algorithm - i.e., this entry applies to all links for which explicit entries in the table do not exist."

::= { pppSecurityConfigEntry 1 }

pppSecurityConfigPreference OBJECT-TYPE

SYNTAX INTEGER(0..2147483647)

ACCESS read-write

STATUS mandatory

DESCRIPTION

"The relative preference of the security protocol identified by pppSecurityConfigProtocol. Security protocols with lower values of pppSecurityConfigPreference are tried before protocols with higher values of pppSecurityConfigPreference."

::= { pppSecurityConfigEntry 2 }

pppSecurityConfigProtocol OBJECT-TYPE

SYNTAX OBJECT IDENTIFIER

ACCESS read-write

STATUS mandatory

DESCRIPTION

"Identifies the security protocol to be attempted on the link identified by pppSecurityConfigLink at the preference level identified by pppSecurityConfigPreference. "

::= { pppSecurityConfigEntry 3 }

pppSecurityConfigStatus OBJECT-TYPE

SYNTAX INTEGER {
invalid(1),
valid(2)

}

ACCESS read-write

STATUS mandatory

DESCRIPTION

"Setting this object to the value invalid(1) has the effect of invalidating the corresponding entry in the

pppSecurityConfigTable. 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. Proper interpretation of such entries requires examination of the relevant pppSecurityConfigStatus object."

DEFVAL { valid }

::= { pppSecurityConfigEntry 4 }

-- This table contains all of the ID/Secret pair information.

pppSecuritySecretsTable OBJECT-TYPE

SYNTAX SEQUENCE OF PppSecuritySecretsEntry

ACCESS not-accessible

STATUS mandatory

DESCRIPTION

"Table containing the identities and secrets used by the PPP authentication protocols. As this table contains secret information, it is expected that access to this table be limited to those SNMP Party-Pairs for which a privacy protocol is in use for all SNMP messages that the parties exchange. This table contains both the ID and secret pair(s) that the local PPP entity will advertise to the remote entity and the pair(s) that the local entity will expect from the remote entity. This table allows for multiple id/secret password pairs to be specified for a particular link by using the pppSecuritySecretsIdIndex object."

::= { pppSecurity 3 }

pppSecuritySecretsEntry OBJECT-TYPE

SYNTAX PppSecuritySecretsEntry

ACCESS not-accessible

STATUS mandatory

DESCRIPTION

"Secret information."

INDEX { pppSecuritySecretsLink,
pppSecuritySecretsIdIndex }

::= { pppSecuritySecretsTable 1 }

```

PppSecuritySecretsEntry ::= SEQUENCE {
    pppSecuritySecretsLink
        INTEGER,
    pppSecuritySecretsIdIndex
        INTEGER,
    pppSecuritySecretsDirection
        INTEGER,
    pppSecuritySecretsProtocol
        OBJECT IDENTIFIER,
    pppSecuritySecretsIdentity
        OCTET STRING,
    pppSecuritySecretsSecret
        OCTET STRING,
    pppSecuritySecretsStatus
        INTEGER
}

```

```

pppSecuritySecretsLink    OBJECT-TYPE
    SYNTAX      INTEGER(0..2147483647)
    ACCESS      read-only
    STATUS      mandatory
    DESCRIPTION
        "The link to which this ID/Secret pair applies.
         By convention, if the value of this object is 0
         then the ID/Secret pair applies to all links."
    ::= { pppSecuritySecretsEntry 1 }

```

```

pppSecuritySecretsIdIndex OBJECT-TYPE
    SYNTAX      INTEGER(0..2147483647)
    ACCESS      read-only
    STATUS      mandatory
    DESCRIPTION
        "A unique value for each ID/Secret pair that
         has been defined for use on this link.  This
         allows multiple ID/Secret pairs to be defined
         for each link.  How the local entity selects
         which pair to use is a local implementation
         decision."
    ::= { pppSecuritySecretsEntry 2 }

```

```

pppSecuritySecretsDirection OBJECT-TYPE
    SYNTAX      INTEGER {
        local-to-remote(1),
        remote-to-local(2)
    }
    ACCESS      read-write

```

```

STATUS      mandatory
DESCRIPTION
    "This object defines the direction in which a
    particular ID/Secret pair is valid.  If this
    object is local-to-remote then the local PPP
    entity will use the ID/Secret pair when
    attempting to authenticate the local PPP entity
    to the remote PPP entity.  If this object is
    remote-to-local then the local PPP entity will
    expect the ID/Secret pair to be used by the
    remote PPP entity when the remote PPP entity
    attempts to authenticate itself to the local
    PPP entity."
 ::= { pppSecuritySecretsEntry 3 }

pppSecuritySecretsProtocol  OBJECT-TYPE
    SYNTAX      OBJECT IDENTIFIER
    ACCESS      read-write
    STATUS      mandatory
    DESCRIPTION
        "The security protocol (e.g. CHAP or PAP) to
        which this ID/Secret pair applies."
    ::= { pppSecuritySecretsEntry 4 }

pppSecuritySecretsIdentity  OBJECT-TYPE
    SYNTAX      OCTET STRING (SIZE(0..255))
    ACCESS      read-write
    STATUS      mandatory
    DESCRIPTION
        "The Identity of the ID/Secret pair.  The
        actual format, semantics, and use of
        pppSecuritySecretsIdentity depends on the
        actual security protocol used.  For example, if
        pppSecuritySecretsProtocol is
        pppSecurityPapProtocol then this object will
        contain a PAP Peer-ID.  If
        pppSecuritySecretsProtocol is
        pppSecurityChapMD5Protocol then this object
        would contain the CHAP NAME parameter."
    ::= { pppSecuritySecretsEntry 5 }

pppSecuritySecretsSecret  OBJECT-TYPE
    SYNTAX      OCTET STRING (SIZE(0..255))
    ACCESS      read-write
    STATUS      mandatory

```

DESCRIPTION

"The secret of the ID/Secret pair. The actual format, semantics, and use of pppSecuritySecretsSecret depends on the actual security protocol used. For example, if pppSecuritySecretsProtocol is pppSecurityPapProtocol then this object will contain a PAP Password. If pppSecuritySecretsProtocol is pppSecurityChapMD5Protocol then this object would contain the CHAP MD5 Secret."

::= { pppSecuritySecretsEntry 6 }

pppSecuritySecretsStatus OBJECT-TYPE

SYNTAX INTEGER {
invalid(1),
valid(2)

}

ACCESS read-write

STATUS mandatory

DESCRIPTION

"Setting this object to the value invalid(1) has the effect of invalidating the corresponding entry in the pppSecuritySecretsTable. 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. Proper interpretation of such entries requires examination of the relevant pppSecuritySecretsStatus object."

DEFVAL { valid }

::= { pppSecuritySecretsEntry 7 }

END

5. Acknowledgements

This document was produced by the PPP working group. In addition to the working group, the author wishes to thank the following individuals for their comments and contributions:

Bill Simpson -- Daydreamer
Glenn McGregor -- Merit

Jesse Walker -- DEC
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, including the PPP authentication protocols. 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.
- (4) The PPP Security Protocols MIB (this document) contains several objects which are very sensitive from a security point of view.

Specifically, this MIB contains objects that define the PPP Peer Identities (which can be viewed as "userid") and the secrets used to authenticate those Peer Identities (similar to a "password" for the "userid").

Also, this MIB contains variables which would allow a network manager to control the operation of the security features of PPP. An intruder could disable PPP security if these variables were not properly protected.

Thus, in order to preserve the integrity, security and privacy of the

PPP security features, an implementation will allow access to this MIB only via SNMPv2 and then only for parties which are privacy enhanced. Other access modes, e.g., SNMPv1 or SNMPv2 without privacy-enhancement, are very dangerous and the security of the PPP service may be compromised.

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.

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