

## **RADIUS Accounting Client MIB**

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### **Abstract**

This memo defines a set of extensions which instrument RADIUS accounting client functions. These extensions represent a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. Using these extensions IP-based management stations can manage RADIUS accounting clients.

### **1. Introduction**

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes managed objects used for managing RADIUS accounting clients.

Today a wide range of network devices, including routers and NASes, act as RADIUS accounting clients in order to provide accounting services. As a result, the effective management of RADIUS accounting clients is of considerable importance.

### **2. The SNMP Management Framework**

The SNMP Management Framework presently consists of five major components:

- o An overall architecture, described in RFC 2571 [1].
- o Mechanisms for describing and naming objects and events for the purpose of management. The first version of this Structure of Management Information (SMI) is called SMIV1 and described in

STD 15, RFC 1155 [2], STD 16, RFC 1212 [3] and RFC 1215 [4]. The second version, called SMiv2, is described in STD 58, RFC 2578 [5], RFC 2579 [6] and RFC 2580 [7].

- o Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPv1 and described in STD 15, RFC 1157 [8]. A second version of the SNMP message protocol, which is not an Internet standards track protocol, is called SNMPv2c and described in RFC 1901 [9] and RFC 1906 [10]. The third version of the message protocol is called SNMPv3 and described in RFC 1906 [10], RFC 2572 [11] and RFC 2574 [12].
- o Protocol operations for accessing management information. The first set of protocol operations and associated PDU formats is described in STD 15, RFC 1157 [8]. A second set of protocol operations and associated PDU formats is described in RFC 1905 [13].
- o A set of fundamental applications described in RFC 2573 [14] and the view-based access control mechanism described in RFC 2575 [15].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the mechanisms defined in the SMI.

This memo specifies a MIB module that is compliant to the SMiv2. A MIB conforming to the SMiv1 can be produced through the appropriate translations. The resulting translated MIB must be semantically equivalent, except where objects or events are omitted because no translation is possible (use of Counter64). Some machine readable information in SMiv2 will be converted into textual descriptions in SMiv1 during the translation process. However, this loss of machine readable information is not considered to change the semantics of the MIB.

### 3. Overview

The RADIUS accounting protocol, described in [16], distinguishes between the client function and the server function. In RADIUS accounting, clients send Accounting-Requests, and servers reply with Accounting-Responses. Typically NAS devices implement the client function, and thus would be expected to implement the RADIUS accounting client MIB, while RADIUS accounting servers implement the server function, and thus would be expected to implement the RADIUS accounting server MIB.

However, it is possible for a RADIUS accounting entity to perform both client and server functions. For example, a RADIUS proxy may act as a server to one or more RADIUS accounting clients, while simultaneously acting as an accounting client to one or more accounting servers. In such situations, it is expected that RADIUS entities combining client and server functionality will support both the client and server MIBs.

### 3.1. Selected objects

This MIB module contains two scalars as well as a single table:

- (1) the RADIUS Accounting Server Table contains one row for each RADIUS server that the client shares a secret with.

Each entry in the RADIUS Accounting Server Table includes thirteen columns presenting a view of the activity of the RADIUS client.

## 4. Definitions

RADIUS-ACC-CLIENT-MIB DEFINITIONS ::= BEGIN

### IMPORTS

```
MODULE-IDENTITY, OBJECT-TYPE, OBJECT-IDENTITY,
Counter32, Integer32, Gauge32,
IpAddress, TimeTicks, mib-2          FROM SNMPv2-SMI
SnmpAdminString                     FROM SNMP-FRAMEWORK-MIB
MODULE-COMPLIANCE, OBJECT-GROUP     FROM SNMPv2-CONF;
```

radiusAccClientMIB MODULE-IDENTITY

LAST-UPDATED "9906110000Z" -- 11 Jun 1999

ORGANIZATION "IETF RADIUS Working Group."

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DESCRIPTION

"The MIB module for entities implementing the client side of the Remote Access Dialin User Service (RADIUS) accounting protocol."

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DESCRIPTION "Initial version as published in RFC 2620"

::= { radiusAccounting 2 }

```
radiusMIB OBJECT-IDENTITY
    STATUS current
    DESCRIPTION
        "The OID assigned to RADIUS MIB work by the IANA."
    ::= { mib-2 67 }

radiusAccounting OBJECT IDENTIFIER ::= {radiusMIB 2}

radiusAccClientMIBObjects OBJECT IDENTIFIER ::=
    { radiusAccClientMIB 1 }

radiusAccClient OBJECT IDENTIFIER ::= { radiusAccClientMIBObjects 1 }

radiusAccClientInvalidServerAddresses OBJECT-TYPE
    SYNTAX Counter32
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The number of RADIUS Accounting-Response packets
        received from unknown addresses."
    ::= { radiusAccClient 1 }

radiusAccClientIdentifier OBJECT-TYPE
    SYNTAX SnmpAdminString
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The NAS-Identifier of the RADIUS accounting client. This
        is not necessarily the same as sysName in MIB II."
    ::= { radiusAccClient 2 }

radiusAccServerTable OBJECT-TYPE
    SYNTAX SEQUENCE OF RadiusAccServerEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "The (conceptual) table listing the RADIUS accounting
        servers with which the client shares a secret."
    ::= { radiusAccClient 3 }

radiusAccServerEntry OBJECT-TYPE
    SYNTAX RadiusAccServerEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "An entry (conceptual row) representing a RADIUS
        accounting server with which the client shares a secret."
    INDEX { radiusAccServerIndex }
```

```
::= { radiusAccServerTable 1 }
```

```
RadiusAccServerEntry ::= SEQUENCE {
    radiusAccServerIndex          Integer32,
    radiusAccServerAddress        IPAddress,
    radiusAccClientServerPortNumber Integer32,
    radiusAccClientRoundTripTime  TimeTicks,
    radiusAccClientRequests       Counter32,
    radiusAccClientRetransmissions Counter32,
    radiusAccClientResponses      Counter32,
    radiusAccClientMalformedResponses Counter32,
    radiusAccClientBadAuthenticators Counter32,
    radiusAccClientPendingRequests Gauge32,
    radiusAccClientTimeouts       Counter32,
    radiusAccClientUnknownTypes   Counter32,
    radiusAccClientPacketsDropped Counter32
}
```

```
radiusAccServerIndex OBJECT-TYPE
    SYNTAX      Integer32 (1..2147483647)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "A number uniquely identifying each RADIUS
        Accounting server with which this client
        communicates."
    ::= { radiusAccServerEntry 1 }
```

```
radiusAccServerAddress OBJECT-TYPE
    SYNTAX      IPAddress
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The IP address of the RADIUS accounting server
        referred to in this table entry."
    ::= { radiusAccServerEntry 2 }
```

```
radiusAccClientServerPortNumber OBJECT-TYPE
    SYNTAX Integer32 (0..65535)
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The UDP port the client is using to send requests to
        this server."
    ::= { radiusAccServerEntry 3 }
```

```
radiusAccClientRoundTripTime OBJECT-TYPE
    SYNTAX TimeTicks
```

MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The time interval between the most recent  
    Accounting-Response and the Accounting-Request that  
    matched it from this RADIUS accounting server."  
::= { radiusAccServerEntry 4 }

-- Request/Response statistics  
--  
-- Requests = Responses + PendingRequests + ClientTimeouts  
--  
-- Responses - MalformedResponses - BadAuthenticators -  
-- UnknownTypes - PacketsDropped = Successfully received

radiusAccClientRequests OBJECT-TYPE  
    SYNTAX Counter32  
    MAX-ACCESS read-only  
    STATUS current  
    DESCRIPTION  
        "The number of RADIUS Accounting-Request packets  
        sent. This does not include retransmissions."  
    ::= { radiusAccServerEntry 5 }

radiusAccClientRetransmissions OBJECT-TYPE  
    SYNTAX Counter32  
    MAX-ACCESS read-only  
    STATUS current  
    DESCRIPTION  
        "The number of RADIUS Accounting-Request packets  
        retransmitted to this RADIUS accounting server.  
        Retransmissions include retries where the  
        Identifier and Acct-Delay have been updated, as  
        well as those in which they remain the same."  
    ::= { radiusAccServerEntry 6 }

radiusAccClientResponses OBJECT-TYPE  
    SYNTAX Counter32  
    MAX-ACCESS read-only  
    STATUS current  
    DESCRIPTION  
        "The number of RADIUS packets received on the  
        accounting port from this server."  
    ::= { radiusAccServerEntry 7 }

radiusAccClientMalformedResponses OBJECT-TYPE  
    SYNTAX Counter32  
    MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of malformed RADIUS Accounting-Response packets received from this server. Malformed packets include packets with an invalid length. Bad authenticators and unknown types are not included as malformed accounting responses."

::= { radiusAccServerEntry 8 }

radiusAccClientBadAuthenticators OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of RADIUS Accounting-Response packets which contained invalid authenticators received from this server."

::= { radiusAccServerEntry 9 }

radiusAccClientPendingRequests OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of RADIUS Accounting-Request packets sent to this server that have not yet timed out or received a response. This variable is incremented when an Accounting-Request is sent and decremented due to receipt of an Accounting-Response, a timeout or a retransmission."

::= { radiusAccServerEntry 10 }

radiusAccClientTimeouts OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of accounting timeouts to this server. After a timeout the client may retry to the same server, send to a different server, or give up. A retry to the same server is counted as a retransmit as well as a timeout. A send to a different server is counted as an Accounting-Request as well as a timeout."

::= { radiusAccServerEntry 11 }

radiusAccClientUnknownTypes OBJECT-TYPE

SYNTAX Counter32

```
MAX-ACCESS read-only
STATUS current
DESCRIPTION
    "The number of RADIUS packets of unknown type which
    were received from this server on the accounting port."
 ::= { radiusAccServerEntry 12 }
```

```
radiusAccClientPacketsDropped OBJECT-TYPE
    SYNTAX Counter32
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The number of RADIUS packets which were received from
        this server on the accounting port and dropped for some
        other reason."
    ::= { radiusAccServerEntry 13 }
```

-- conformance information

```
radiusAccClientMIBConformance
    OBJECT IDENTIFIER ::= { radiusAccClientMIB 2 }
radiusAccClientMIBCompliances
    OBJECT IDENTIFIER ::= { radiusAccClientMIBConformance 1 }
radiusAccClientMIBGroups
    OBJECT IDENTIFIER ::= { radiusAccClientMIBConformance 2 }
```

-- compliance statements

```
radiusAccClientMIBCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "The compliance statement for accounting clients
        implementing the RADIUS Accounting Client MIB."
    MODULE -- this module
        MANDATORY-GROUPS { radiusAccClientMIBGroup }

    ::= { radiusAccClientMIBCompliances 1 }
```

-- units of conformance

```
radiusAccClientMIBGroup OBJECT-GROUP
    OBJECTS { radiusAccClientIdentifier,
              radiusAccClientInvalidServerAddresses,
              radiusAccServerAddress,
              radiusAccClientServerPortNumber,
              radiusAccClientRoundTripTime,
              radiusAccClientRequests,
```



```
        radiusAccClientRetransmissions,
        radiusAccClientResponses,
        radiusAccClientMalformedResponses,
        radiusAccClientBadAuthenticators,
        radiusAccClientPendingRequests,
        radiusAccClientTimeouts,
        radiusAccClientUnknownTypes,
        radiusAccClientPacketsDropped
    }
    STATUS current
    DESCRIPTION
        "The basic collection of objects providing management of
        RADIUS Accounting Clients."
    ::= { radiusAccClientMIBGroups 1 }
```

END

## 5. References

- [1] Harrington, D., Presuhn, R., and B. Wijnen, "An Architecture for Describing SNMP Management Frameworks", RFC 2571, April 1999.
- [2] Rose, M., and K. McCloghrie, "Structure and Identification of Management Information for TCP/IP-based Internets", STD 16, RFC 1155, May 1990.
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- [5] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Structure of Management Information Version 2 (SMIv2)", STD 58, RFC 2578, April 1999.
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- [8] Case, J., Fedor, M., Schoffstall, M., and J. Davin, "Simple Network Management Protocol", STD 15, RFC 1157, May 1990.

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- [12] Blumenthal, U., and B. Wijnen, "User-based Security Model for Version 3 of the Simple Network Management Protocol (SNMPv3)", RFC 2574, April 1999.
- [13] Case, J., McCloghrie, K., Rose, M., and S. Waldbusser, "Protocol Operations for Version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1905, January 1996.
- [14] Levi, D., Meyer, P., and B. Stewart, "SNMP Applications", RFC 2573, April 1999.
- [15] Wijnen, B., Presuhn, R., and K. McCloghrie, "View-based Access Control Model for the Simple Network Management Protocol (SNMP)", RFC 2575, April 1999.
- [16] Rigney, C., "RADIUS Accounting", RFC 2139, April 1997.

## 6. Security Considerations

There are no management objects defined in this MIB that have a MAX-ACCESS clause of read-write and/or read-create. So, if this MIB is implemented correctly, then there is no risk that an intruder can alter or create any management objects of this MIB via direct SNMP SET operations.

There are a number of managed objects in this MIB that may contain sensitive information. These are:

**radiusAccServerAddress**

This can be used to determine the address of the RADIUS accounting server with which the client is communicating. This information could be useful in mounting an attack on the accounting server, which may contain sensitive financial data.

**radiusAccClientServerPortNumber** This can be used to determine the port number on which the RADIUS accounting client is sending. This information could be useful in impersonating the client in order to send fraudulent data to the accounting server.

It is thus important to control even GET access to these objects and possibly to even encrypt the values of these object when sending them over the network via SNMP. Not all versions of SNMP provide features for such a secure environment.

SNMPv1 by itself is not a secure environment. Even if the network itself is secure (for example by using IPsec), there is no control as to who on the secure network is allowed to access and GET/SET (read/change/create/delete) the objects in this MIB.

It is recommended that the implementers consider the security features as provided by the SNMPv3 framework. Specifically, the use of the User-based Security Model RFC 2574 [12] and the View-based Access Control Model RFC 2575 [15] is recommended. Using these security features, customer/users can give access to the objects only to those principals (users) that have legitimate rights to GET or SET (change/create/delete) them.

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