RADIUS Authentication Client MIB for IPv6

Status of This Memo

Copyright Notice

Abstract

   This memo defines a set of extensions that instrument RADIUS
   authentication 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
   authentication clients.

   This memo obsoletes RFC 2618 by deprecating the MIB table containing
   IPv4-only address formats and defining a new table to add support for
   version-neutral IP address formats. The remaining MIB objects from
   RFC 2618 are carried forward into this document. The memo also adds
   UNITS and REFERENCE clauses to selected objects.

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1. Introduction

   This memo defines a portion of the Management Information Base (MIB)
   for use with network management protocols in the Internet community.
   The objects defined within this memo relate to the Remote
   Authentication Dial-In User Service (RADIUS) Authentication Client as
   defined in RFC 2865 [RFC2865].

2. Terminology

   The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT",
   "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this
   document are to be interpreted as described in RFC 2119 [RFC2119].

   This document uses terminology from RFC 2865 [RFC2865].

   This document uses the word "malformed" with respect to RADIUS
   packets, particularly in the context of counters of "malformed
   packets". While RFC 2865 does not provide an explicit definition of
   "malformed", malformed generally means that the implementation has
   determined the packet does not match the format defined in RFC 2865.
   Some implementations may determine that packets are malformed when
   the Vendor Specific Attribute (VSA) format does not follow the RFC
   2865 recommendations for VSAs. Those implementations are used in
   deployments today, and thus set the de facto definition of
   "malformed".

3. The Internet-Standard Management Framework

   For a detailed overview of the documents that describe the current
   Internet-Standard Management Framework, please refer to section 7 of
   RFC 3410 [RFC3410].

   Managed objects are accessed via a virtual information store, termed
   the Management Information Base or MIB. MIB objects are generally
   accessed through the Simple Network Management Protocol (SNMP).
   Objects in the MIB are defined using the mechanisms defined in the
   Structure of Management Information (SMI). This memo specifies a MIB
   module that is compliant to the SMIv2, which is described in STD 58,
   RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580
   [RFC2580].

4. Scope of Changes

   This document obsoletes RFC 2618 [RFC2618], RADIUS Authentication
   Client MIB, by deprecating the radiusAuthServerTable table and adding
   a new table, radiusAuthServerExtTable, containing
   radiusAuthServerInetAddressType, radiusAuthServerInetAddress, and

radiusAuthClientServerInetPortNumber. The purpose of these added MIB
objects is to support version-neutral IP addressing formats. The
existing table containing radiusAuthServerAddress and
radiusAuthClientServerPortNumber is deprecated. The remaining MIB
objects are carried forward from RFC 2618 into this document. This
memo also adds UNITS and REFERENCE clauses to selected objects.

RFC 4001 [RFC4001], which defines the SMI Textual Conventions for
IPv6 addresses, contains the following recommendation.

'In particular, when revising a MIB module that contains IPv4
specific tables, it is suggested to define new tables using the
textual conventions defined in this memo [RFC4001] that support all
versions of IP. The status of the new tables SHOULD be "current",
whereas the status of the old IP version specific tables SHOULD be
changed to "deprecated". The other approach, of having multiple
similar tables for different IP versions, is strongly discouraged.'

5. Structure of the MIB Module

The RADIUS authentication protocol, described in RFC 2865 [RFC2865],
distinguishes between the client function and the server function.
In RADIUS authentication, clients send Access-Requests, and servers
reply with Access-Accepts, Access-Rejects, and Access-Challenges.
Typically, Network Access Server (NAS) devices implement the client
function, and thus would be expected to implement the RADIUS
authentication client MIB, while RADIUS authentication servers
implement the server function, and thus would be expected to
implement the RADIUS authentication server MIB.

However, it is possible for a RADIUS authentication entity to perform
both client and server functions. For example, a RADIUS proxy may
act as a server to one or more RADIUS authentication clients, while
simultaneously acting as an authentication client to one or more
authentication servers. In such situations, it is expected that
RADIUS entities combining client and server functionality will
support both the client and server MIBs. The client MIB is defined
in this document, and the server MIB is defined in [RFC4669].

This MIB module contains two scalars as well as a single table, the
RADIUS Authentication Server Table, which contains one row for each
RADIUS authentication server with which the client shares a secret.
Each entry in the RADIUS Authentication Server Table includes sixteen
columns presenting a view of the activity of the RADIUS
authentication client.

This MIB imports from [RFC2578], [RFC2580], [RFC3411], and [RFC4001].

6. Deprecated Objects

   The deprecated table in this MIB is carried forward from RFC 2618
   [RFC2618]. There are two conditions under which it MAY be desirable
   for managed entities to continue to support the deprecated table:

   1. The managed entity only supports IPv4 address formats.

   2. The managed entity supports both IPv4 and IPv6 address formats,
       and the deprecated table is supported for backwards compatibility
       with older management stations. This option SHOULD only be used
       when the IP addresses in the new table are in IPv4 format and can
       accurately be represented in both the new table and the
       deprecated table.

   Managed entities SHOULD NOT instantiate row entries in the deprecated
   table, containing IPv4-only address objects, when the RADIUS server
   address represented in such a table row is not an IPv4 address.
   Managed entities SHOULD NOT return inaccurate values of IP address or
   SNMP object access errors for IPv4-only address objects in otherwise
   populated tables. When row entries exist in both the deprecated
   IPv4-only table and the new IP-version-neutral table that describe
   the same RADIUS server, the row indexes SHOULD be the same for the
   corresponding rows in each table, to facilitate correlation of these
   related rows by management applications.

7. Definitions

   RADIUS-AUTH-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
           InetAddressType, InetAddress,
           InetPortNumber   FROM INET-ADDRESS-MIB
           MODULE-COMPLIANCE, OBJECT-GROUP   FROM SNMPv2-CONF;

   radiusAuthClientMIB MODULE-IDENTITY
           LAST-UPDATED "200608210000Z" -- 21 August 2006
           ORGANIZATION "IETF RADIUS Extensions Working Group."
           CONTACT-INFO
                   " Bernard Aboba
                     Microsoft
                     One Microsoft Way
                     Redmond, WA 98052

```
                    US
                     Phone: +1 425 936 6605
                     EMail: bernarda@microsoft.com"
            DESCRIPTION
                 "The MIB module for entities implementing the client
                  side of the Remote Authentication Dial-In User Service
                  (RADIUS) authentication protocol.  Copyright (C) The
                  Internet Society (2006).  This version of this MIB
                  module is part of RFC 4668; see the RFC itself for
                  full legal notices."
            REVISION "200608210000Z"  --  21 August 2006
            DESCRIPTION
                 "Revised version as published in RFC 4668.  This
                  version obsoletes that of RFC 2618 by deprecating
                  the MIB table containing IPv4-only address formats
                  and defining a new table to add support for version
                  neutral IP address formats.  The remaining MIB objects
                  from RFC 2618 are carried forward into this version."
            REVISION "199906110000Z"    -- 11 Jun 1999
            DESCRIPTION "Initial version as published in RFC 2618."
            ::= { radiusAuthentication 2 }

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

    radiusAuthentication  OBJECT IDENTIFIER ::= {radiusMIB 1}

    radiusAuthClientMIBObjects  OBJECT IDENTIFIER
             ::= { radiusAuthClientMIB 1 }

    radiusAuthClient  OBJECT IDENTIFIER
             ::= { radiusAuthClientMIBObjects 1 }

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

    radiusAuthClientIdentifier OBJECT-TYPE
           SYNTAX SnmpAdminString
```

```
          MAX-ACCESS read-only
          STATUS current
          DESCRIPTION
                "The NAS-Identifier of the RADIUS authentication client.
                 This is not necessarily the same as sysName in MIB II."
          REFERENCE "RFC 2865 section 5.32"
          ::= { radiusAuthClient 2 }

   radiusAuthServerTable OBJECT-TYPE
          SYNTAX      SEQUENCE OF RadiusAuthServerEntry
          MAX-ACCESS not-accessible
          STATUS      deprecated
          DESCRIPTION
                "The (conceptual) table listing the RADIUS authentication
                 servers with which the client shares a secret."
          ::= { radiusAuthClient 3 }

   radiusAuthServerEntry OBJECT-TYPE
          SYNTAX      RadiusAuthServerEntry
          MAX-ACCESS not-accessible
          STATUS      deprecated
          DESCRIPTION
                "An entry (conceptual row) representing a RADIUS
                 authentication server with which the client shares
                 a secret."
          INDEX      { radiusAuthServerIndex }
          ::= { radiusAuthServerTable 1 }

   RadiusAuthServerEntry ::= SEQUENCE {
          radiusAuthServerIndex                       Integer32,
          radiusAuthServerAddress                     IpAddress,
          radiusAuthClientServerPortNumber            Integer32,
          radiusAuthClientRoundTripTime               TimeTicks,
          radiusAuthClientAccessRequests              Counter32,
          radiusAuthClientAccessRetransmissions       Counter32,
          radiusAuthClientAccessAccepts               Counter32,
          radiusAuthClientAccessRejects               Counter32,
          radiusAuthClientAccessChallenges            Counter32,
          radiusAuthClientMalformedAccessResponses    Counter32,
          radiusAuthClientBadAuthenticators           Counter32,
          radiusAuthClientPendingRequests              Gauge32,
          radiusAuthClientTimeouts                    Counter32,
          radiusAuthClientUnknownTypes                Counter32,
          radiusAuthClientPacketsDropped              Counter32
   }

   radiusAuthServerIndex OBJECT-TYPE
          SYNTAX      Integer32 (1..2147483647)
```

```
        MAX-ACCESS not-accessible
        STATUS      deprecated
        DESCRIPTION
               "A number uniquely identifying each RADIUS
               Authentication server with which this client
               communicates."
        ::= { radiusAuthServerEntry 1 }

   radiusAuthServerAddress OBJECT-TYPE
        SYNTAX      IpAddress
        MAX-ACCESS read-only
        STATUS      deprecated
        DESCRIPTION
               "The IP address of the RADIUS authentication server
               referred to in this table entry."
        ::= { radiusAuthServerEntry 2 }

   radiusAuthClientServerPortNumber  OBJECT-TYPE
        SYNTAX Integer32 (0..65535)
        MAX-ACCESS read-only
        STATUS deprecated
        DESCRIPTION
               "The UDP port the client is using to send requests to
                this server."
        REFERENCE "RFC 2865 section 3"
        ::= { radiusAuthServerEntry 3 }

   radiusAuthClientRoundTripTime  OBJECT-TYPE
        SYNTAX TimeTicks
        MAX-ACCESS read-only
        STATUS deprecated
        DESCRIPTION
               "The time interval (in hundredths of a second) between
                the most recent Access-Reply/Access-Challenge and the
                Access-Request that matched it from this RADIUS
                authentication server."
        ::= { radiusAuthServerEntry 4 }

   -- Request/Response statistics
   --
   -- TotalIncomingPackets = Accepts + Rejects + Challenges +
   -- UnknownTypes
   --
   -- TotalIncomingPackets - MalformedResponses -
   -- BadAuthenticators - UnknownTypes - PacketsDropped =
   -- Successfully received
   --
   -- AccessRequests + PendingRequests + ClientTimeouts =
```

    -- Successfully received
    --
    --

    radiusAuthClientAccessRequests OBJECT-TYPE
          SYNTAX Counter32
          UNITS "packets"
          MAX-ACCESS read-only
          STATUS deprecated
          DESCRIPTION
                "The number of RADIUS Access-Request packets sent
                 to this server. This does not include retransmissions."
          REFERENCE "RFC 2865 section 4.1"
          ::= { radiusAuthServerEntry 5 }

    radiusAuthClientAccessRetransmissions OBJECT-TYPE
          SYNTAX Counter32
          UNITS "packets"
          MAX-ACCESS read-only
          STATUS deprecated
          DESCRIPTION
                "The number of RADIUS Access-Request packets
                 retransmitted to this RADIUS authentication server."
          REFERENCE "RFC 2865 sections 2.5, 4.1"
          ::= { radiusAuthServerEntry 6 }

    radiusAuthClientAccessAccepts OBJECT-TYPE
          SYNTAX Counter32
          UNITS "packets"
          MAX-ACCESS read-only
          STATUS deprecated
          DESCRIPTION
                "The number of RADIUS Access-Accept packets
                 (valid or invalid) received from this server."
          REFERENCE "RFC 2865 section 4.2"
          ::= { radiusAuthServerEntry 7 }

    radiusAuthClientAccessRejects OBJECT-TYPE
          SYNTAX Counter32
          UNITS "packets"
          MAX-ACCESS read-only
          STATUS deprecated
          DESCRIPTION
                "The number of RADIUS Access-Reject packets
                 (valid or invalid) received from this server."
          REFERENCE "RFC 2865 section 4.3"
          ::= { radiusAuthServerEntry 8 }

    radiusAuthClientAccessChallenges OBJECT-TYPE
          SYNTAX Counter32
          UNITS "packets"
          MAX-ACCESS read-only
          STATUS deprecated
          DESCRIPTION
                "The number of RADIUS Access-Challenge packets
                 (valid or invalid) received from this server."
          REFERENCE "RFC 2865 section 4.4"
          ::= { radiusAuthServerEntry 9 }

    -- "Access-Response" includes an Access-Accept, Access-Challenge
    -- or Access-Reject

    radiusAuthClientMalformedAccessResponses OBJECT-TYPE
          SYNTAX Counter32
          UNITS "packets"
          MAX-ACCESS read-only
          STATUS deprecated
          DESCRIPTION
                "The number of malformed RADIUS Access-Response
                 packets received from this server.
                 Malformed packets include packets with
                 an invalid length. Bad authenticators or
                 Message Authenticator attributes or unknown types
                 are not included as malformed access responses."
          ::= { radiusAuthServerEntry 10 }

    radiusAuthClientBadAuthenticators OBJECT-TYPE
          SYNTAX Counter32
          UNITS "packets"
          MAX-ACCESS read-only
          STATUS deprecated
          DESCRIPTION
                "The number of RADIUS Access-Response packets
                 containing invalid authenticators or Message
                 Authenticator attributes received from this server."
          REFERENCE "RFC 2865 section 3, RFC 2869 section 5.14"
          ::= { radiusAuthServerEntry 11 }

    radiusAuthClientPendingRequests OBJECT-TYPE
          SYNTAX Gauge32
          MAX-ACCESS read-only
          STATUS deprecated
          DESCRIPTION
                "The number of RADIUS Access-Request packets
                 destined for this server that have not yet timed out
                 or received a response. This variable is incremented

                    when an Access-Request is sent and decremented due to
                    receipt of an Access-Accept, Access-Reject,
                    Access-Challenge, timeout, or retransmission."
             REFERENCE "RFC 2865 section 2"
              ::= { radiusAuthServerEntry 12 }

      radiusAuthClientTimeouts OBJECT-TYPE
            SYNTAX Counter32
            UNITS "timeouts"
            MAX-ACCESS read-only
            STATUS deprecated
            DESCRIPTION
                    "The number of authentication 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 a Request as well as a timeout."
                     REFERENCE "RFC 2865 section 2, RFC 2869 section 2.3.2"
              ::= { radiusAuthServerEntry 13 }

      radiusAuthClientUnknownTypes OBJECT-TYPE
            SYNTAX Counter32
            UNITS "packets"
            MAX-ACCESS read-only
            STATUS deprecated
            DESCRIPTION
                    "The number of RADIUS packets of unknown type that
                     were received from this server on the authentication
                     port."
              ::= { radiusAuthServerEntry 14 }

      radiusAuthClientPacketsDropped OBJECT-TYPE
            SYNTAX Counter32
            UNITS "packets"
            MAX-ACCESS read-only
            STATUS deprecated
            DESCRIPTION
                    "The number of RADIUS packets that were
                     received from this server on the authentication port
                     and dropped for some other reason."
              ::= { radiusAuthServerEntry 15 }

      -- New MIB Objects in this revision

      radiusAuthServerExtTable OBJECT-TYPE
            SYNTAX   SEQUENCE OF RadiusAuthServerExtEntry

```
        MAX-ACCESS not-accessible
        STATUS      current
        DESCRIPTION
              "The (conceptual) table listing the RADIUS authentication
               servers with which the client shares a secret."
        ::= { radiusAuthClient 4 }

   radiusAuthServerExtEntry OBJECT-TYPE
        SYNTAX      RadiusAuthServerExtEntry
        MAX-ACCESS not-accessible
        STATUS      current
        DESCRIPTION
              "An entry (conceptual row) representing a RADIUS
               authentication server with which the client shares
               a secret."
        INDEX      { radiusAuthServerExtIndex }
        ::= { radiusAuthServerExtTable 1 }

   RadiusAuthServerExtEntry ::= SEQUENCE {
        radiusAuthServerExtIndex                  Integer32,
        radiusAuthServerInetAddressType           InetAddressType,
        radiusAuthServerInetAddress               InetAddress,
        radiusAuthClientServerInetPortNumber      InetPortNumber,
        radiusAuthClientExtRoundTripTime          TimeTicks,
        radiusAuthClientExtAccessRequests         Counter32,
        radiusAuthClientExtAccessRetransmissions  Counter32,
        radiusAuthClientExtAccessAccepts          Counter32,
        radiusAuthClientExtAccessRejects          Counter32,
        radiusAuthClientExtAccessChallenges       Counter32,
        radiusAuthClientExtMalformedAccessResponses  Counter32,
        radiusAuthClientExtBadAuthenticators      Counter32,
        radiusAuthClientExtPendingRequests        Gauge32,
        radiusAuthClientExtTimeouts               Counter32,
        radiusAuthClientExtUnknownTypes           Counter32,
        radiusAuthClientExtPacketsDropped         Counter32,
        radiusAuthClientCounterDiscontinuity      TimeTicks
   }

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

```
    radiusAuthServerInetAddressType OBJECT-TYPE
          SYNTAX       InetAddressType
          MAX-ACCESS read-only
          STATUS       current
          DESCRIPTION
                "The type of address format used for the
                 radiusAuthServerInetAddress object."
          ::= { radiusAuthServerExtEntry 2 }

    radiusAuthServerInetAddress OBJECT-TYPE
          SYNTAX       InetAddress
          MAX-ACCESS read-only
          STATUS       current
          DESCRIPTION
                "The IP address of the RADIUS authentication
                 server referred to in this table entry, using
                 the version-neutral IP address format."
          ::= { radiusAuthServerExtEntry 3 }

    radiusAuthClientServerInetPortNumber  OBJECT-TYPE
          SYNTAX InetPortNumber ( 1..65535 )
          MAX-ACCESS read-only
          STATUS current
          DESCRIPTION
                "The UDP port the client is using to send requests
                 to this server.  The value of zero (0) is invalid."
          REFERENCE "RFC 2865 section 3"
          ::= { radiusAuthServerExtEntry 4 }

    radiusAuthClientExtRoundTripTime  OBJECT-TYPE
          SYNTAX TimeTicks
          MAX-ACCESS read-only
          STATUS current
          DESCRIPTION
                "The time interval (in hundredths of a second) between
                 the most recent Access-Reply/Access-Challenge and the
                 Access-Request that matched it from this RADIUS
                 authentication server."
          REFERENCE "RFC 2865 section 2"
          ::= { radiusAuthServerExtEntry 5 }

    -- Request/Response statistics
    --
    -- TotalIncomingPackets = Accepts + Rejects + Challenges +
    -- UnknownTypes
    --
    -- TotalIncomingPackets - MalformedResponses -
    -- BadAuthenticators - UnknownTypes - PacketsDropped =
```

       -- Successfully received
       --
       -- AccessRequests + PendingRequests + ClientTimeouts =
       -- Successfully received
       --
       --

    radiusAuthClientExtAccessRequests OBJECT-TYPE
          SYNTAX Counter32
          UNITS "packets"
          MAX-ACCESS read-only
          STATUS current
          DESCRIPTION
                "The number of RADIUS Access-Request packets sent
                 to this server. This does not include retransmissions.
                 This counter may experience a discontinuity when the
                 RADIUS Client module within the managed entity is
                 reinitialized, as indicated by the current value of
                 radiusAuthClientCounterDiscontinuity."
          REFERENCE "RFC 2865 section 4.1"
          ::= { radiusAuthServerExtEntry 6 }

    radiusAuthClientExtAccessRetransmissions OBJECT-TYPE
          SYNTAX Counter32
          UNITS "packets"
          MAX-ACCESS read-only
          STATUS current
          DESCRIPTION
                "The number of RADIUS Access-Request packets
                 retransmitted to this RADIUS authentication server.
                 This counter may experience a discontinuity when
                 the RADIUS Client module within the managed entity
                 is reinitialized, as indicated by the current value
                 of radiusAuthClientCounterDiscontinuity."
          REFERENCE "RFC 2865 sections 2.5, 4.1"
          ::= { radiusAuthServerExtEntry 7 }

    radiusAuthClientExtAccessAccepts OBJECT-TYPE
          SYNTAX Counter32
          UNITS "packets"
          MAX-ACCESS read-only
          STATUS current
          DESCRIPTION
                "The number of RADIUS Access-Accept packets
                 (valid or invalid) received from this server.
                 This counter may experience a discontinuity when
                 the RADIUS Client module within the managed entity
                 is reinitialized, as indicated by the current value

```
                of radiusAuthClientCounterDiscontinuity."
          REFERENCE "RFC 2865 section 4.2"
          ::= { radiusAuthServerExtEntry 8 }

  radiusAuthClientExtAccessRejects OBJECT-TYPE
        SYNTAX Counter32
        UNITS "packets"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
              "The number of RADIUS Access-Reject packets
               (valid or invalid) received from this server.
               This counter may experience a discontinuity when
               the RADIUS Client module within the managed
               entity is reinitialized, as indicated by the
               current value of
               radiusAuthClientCounterDiscontinuity."
        REFERENCE "RFC 2865 section 4.3"
        ::= { radiusAuthServerExtEntry  9 }

  radiusAuthClientExtAccessChallenges OBJECT-TYPE
        SYNTAX Counter32
        UNITS "packets"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
              "The number of RADIUS Access-Challenge packets
               (valid or invalid) received from this server.
               This counter may experience a discontinuity when
               the RADIUS Client module within the managed
               entity is reinitialized, as indicated by the
               current value of
               radiusAuthClientCounterDiscontinuity."
        REFERENCE "RFC 2865 section 4.4"
        ::= { radiusAuthServerExtEntry 10 }

  -- "Access-Response" includes an Access-Accept, Access-Challenge,
  -- or Access-Reject

  radiusAuthClientExtMalformedAccessResponses OBJECT-TYPE
        SYNTAX Counter32
        UNITS "packets"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
              "The number of malformed RADIUS Access-Response
               packets received from this server.
               Malformed packets include packets with
```

                    an invalid length. Bad authenticators or
                    Message Authenticator attributes or unknown types
                    are not included as malformed access responses.
                    This counter may experience a discontinuity when
                    the RADIUS Client module within the managed entity
                    is reinitialized, as indicated by the current value
                    of radiusAuthClientCounterDiscontinuity."
              REFERENCE "RFC 2865 sections 3, 4"
              ::= { radiusAuthServerExtEntry 11 }

      radiusAuthClientExtBadAuthenticators OBJECT-TYPE
              SYNTAX Counter32
              UNITS "packets"
              MAX-ACCESS read-only
              STATUS current
              DESCRIPTION
                    "The number of RADIUS Access-Response packets
                    containing invalid authenticators or Message
                    Authenticator attributes received from this server.
                    This counter may experience a discontinuity when
                    the RADIUS Client module within the managed entity
                    is reinitialized, as indicated by the current value
                    of radiusAuthClientCounterDiscontinuity."
              REFERENCE "RFC 2865 section 3"
              ::= { radiusAuthServerExtEntry 12 }

      radiusAuthClientExtPendingRequests OBJECT-TYPE
              SYNTAX Gauge32
              UNITS "packets"
              MAX-ACCESS read-only
              STATUS current
              DESCRIPTION
                    "The number of RADIUS Access-Request packets
                    destined for this server that have not yet timed out
                    or received a response. This variable is incremented
                    when an Access-Request is sent and decremented due to
                    receipt of an Access-Accept, Access-Reject,
                    Access-Challenge, timeout, or retransmission."
              REFERENCE "RFC 2865 section 2"
              ::= { radiusAuthServerExtEntry 13 }

      radiusAuthClientExtTimeouts OBJECT-TYPE
              SYNTAX Counter32
              UNITS "timeouts"
              MAX-ACCESS read-only
              STATUS current
              DESCRIPTION
                    "The number of authentication 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 a Request as well as a timeout.
               This counter may experience a discontinuity when the
               RADIUS Client module within the managed entity is
               reinitialized, as indicated by the current value of
               radiusAuthClientCounterDiscontinuity."
          REFERENCE "RFC 2865 sections 2.5, 4.1"
          ::= { radiusAuthServerExtEntry 14 }

    radiusAuthClientExtUnknownTypes OBJECT-TYPE
          SYNTAX Counter32
          UNITS "packets"
          MAX-ACCESS read-only
          STATUS current
          DESCRIPTION
               "The number of RADIUS packets of unknown type that
               were received from this server on the authentication
               port. This counter may experience a discontinuity
               when the RADIUS Client module within the managed
               entity is reinitialized, as indicated by the current
               value of radiusAuthClientCounterDiscontinuity."
               REFERENCE "RFC 2865 section 4"
          ::= { radiusAuthServerExtEntry 15 }

    radiusAuthClientExtPacketsDropped OBJECT-TYPE
          SYNTAX Counter32
          UNITS "packets"
          MAX-ACCESS read-only
          STATUS current
          DESCRIPTION
               "The number of RADIUS packets that were
               received from this server on the authentication port
               and dropped for some other reason. This counter may
               experience a discontinuity when the RADIUS Client
               module within the managed entity is reinitialized,
               as indicated by the current value of
               radiusAuthClientCounterDiscontinuity."
          ::= { radiusAuthServerExtEntry 16 }

    radiusAuthClientCounterDiscontinuity OBJECT-TYPE
          SYNTAX TimeTicks
          UNITS "centiseconds"
          MAX-ACCESS read-only
          STATUS current
          DESCRIPTION

```
                "The number of centiseconds since the last discontinuity
                 in the RADIUS Client counters.  A discontinuity may
                 be the result of a reinitialization of the RADIUS
                 Client module within the managed entity."
           ::= { radiusAuthServerExtEntry 17 }



   -- conformance information

   radiusAuthClientMIBConformance OBJECT IDENTIFIER
          ::= { radiusAuthClientMIB 2 }


   radiusAuthClientMIBCompliances OBJECT IDENTIFIER
          ::= { radiusAuthClientMIBConformance 1 }


   radiusAuthClientMIBGroups OBJECT IDENTIFIER
          ::= { radiusAuthClientMIBConformance 2 }



   -- compliance statements

   radiusAuthClientMIBCompliance MODULE-COMPLIANCE
       STATUS  deprecated
       DESCRIPTION
             "The compliance statement for authentication clients
              implementing the RADIUS Authentication Client MIB.
              Implementation of this module is for IPv4-only
              entities, or for backwards compatibility use with
              entities that support both IPv4 and IPv6."
       MODULE  -- this module
             MANDATORY-GROUPS { radiusAuthClientMIBGroup }

        ::= { radiusAuthClientMIBCompliances 1 }

   radiusAuthClientExtMIBCompliance MODULE-COMPLIANCE
       STATUS  current
       DESCRIPTION
             "The compliance statement for authentication
              clients implementing the RADIUS Authentication
              Client IPv6 Extensions MIB.  Implementation of
              this module is for entities that support IPv6,
              or support IPv4 and IPv6."
       MODULE  -- this module
             MANDATORY-GROUPS { radiusAuthClientExtMIBGroup }

       OBJECT radiusAuthServerInetAddressType
       SYNTAX InetAddressType { ipv4(1), ipv6(2) }
       DESCRIPTION
```

                "An implementation is only required to support
                 IPv4 and globally unique IPv6 addresses."

          OBJECT radiusAuthServerInetAddress
          SYNTAX InetAddress (SIZE (4|16))
          DESCRIPTION
                "An implementation is only required to support
                 IPv4 and globally unique IPv6 addresses."
          ::= { radiusAuthClientMIBCompliances 2 }

    -- units of conformance

    radiusAuthClientMIBGroup OBJECT-GROUP
         OBJECTS { radiusAuthClientIdentifier,
                   radiusAuthClientInvalidServerAddresses,
                   radiusAuthServerAddress,
                   radiusAuthClientServerPortNumber,
                   radiusAuthClientRoundTripTime,
                   radiusAuthClientAccessRequests,
                   radiusAuthClientAccessRetransmissions,
                   radiusAuthClientAccessAccepts,
                   radiusAuthClientAccessRejects,
                   radiusAuthClientAccessChallenges,
                   radiusAuthClientMalformedAccessResponses,
                   radiusAuthClientBadAuthenticators,
                   radiusAuthClientPendingRequests,
                   radiusAuthClientTimeouts,
                   radiusAuthClientUnknownTypes,
                   radiusAuthClientPacketsDropped
                 }
         STATUS deprecated
         DESCRIPTION
                "The basic collection of objects providing management of
                 RADIUS Authentication Clients."
         ::= { radiusAuthClientMIBGroups 1 }

    radiusAuthClientExtMIBGroup OBJECT-GROUP
         OBJECTS { radiusAuthClientIdentifier,
                   radiusAuthClientInvalidServerAddresses,
                   radiusAuthServerInetAddressType,
                   radiusAuthServerInetAddress,
                   radiusAuthClientServerInetPortNumber,
                   radiusAuthClientExtRoundTripTime,
                   radiusAuthClientExtAccessRequests,
                   radiusAuthClientExtAccessRetransmissions,
                   radiusAuthClientExtAccessAccepts,

```
                    radiusAuthClientExtAccessRejects,
                    radiusAuthClientExtAccessChallenges,
                    radiusAuthClientExtMalformedAccessResponses,
                    radiusAuthClientExtBadAuthenticators,
                    radiusAuthClientExtPendingRequests,
                    radiusAuthClientExtTimeouts,
                    radiusAuthClientExtUnknownTypes,
                    radiusAuthClientExtPacketsDropped,
                    radiusAuthClientCounterDiscontinuity
                 }
        STATUS   current
        DESCRIPTION
              "The collection of extended objects providing
               management of RADIUS Authentication Clients
               using version-neutral IP address format."
        ::= { radiusAuthClientMIBGroups 2 }

    END
```

8. 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.

Some of the readable objects in this MIB module (i.e., objects with a MAX-ACCESS other than not-accessible) may be considered sensitive or vulnerable in some network environments. It is thus important to control even GET and/or NOTIFY access to these objects and possibly to even encrypt the values of these objects when sending them over the network via SNMP. These are the tables and objects and their sensitivity/vulnerability:

radiusAuthServerIPAddress
   This can be used to determine the address of the RADIUS
   authentication server with which the client is communicating.
   This information could be useful in mounting an attack on the
   authentication server.

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

   radiusAuthServerInetAddress
      This can be used to determine the address of the RADIUS
      authentication server with which the client is communicating.
      This information could be useful in mounting an attack on the
      authentication server.

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

   SNMP versions prior to SNMPv3 did not include adequate security.
   Even if the network itself is secure (for example by using IPsec),
   even then, 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 module.

   It is RECOMMENDED that implementers consider the security features as
   provided by the SNMPv3 framework (see [RFC3410], section 8),
   including full support for the SNMPv3 cryptographic mechanisms (for
   authentication and privacy).

   Further, deployment of SNMP versions prior to SNMPv3 is NOT
   RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to
   enable cryptographic security. It is then a customer/operator
   responsibility to ensure that the SNMP entity giving access to an
   instance of this MIB module is properly configured to give access to
   the objects only to those principals (users) that have legitimate
   rights to indeed GET or SET (change/create/delete) them.

9. References

9.1. Normative References

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Appendix A. Acknowledgements

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Acknowledgement