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RADIUS Authentication Client MIB for IPv6

Status of This Memo

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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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