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RADIUS Authentication Client MIB

Status of this Memo

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Abstract

This memo defines a set of extensions which 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.

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 authentication clients.

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

2. The SNMP Management Framework

The SNMP Management Framework presently consists of five major components:

- An overall architecture, described in RFC 2571 [1].
- 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 16, 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].
- 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].
- 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].
- 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 authentication protocol, described in [16], 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 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.

3.1. Selected objects

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

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

Each entry in the RADIUS Authentication Server Table includes fifteen columns presenting a view of the activity of the RADIUS authentication client.

4. 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
       MODULE-COMPLIANCE, OBJECT-GROUP  FROM SNMPv2-CONF;

radiusAuthClientMIB MODULE-IDENTITY
       LAST-UPDATED "9906110000Z" -- 11 Jun 1999
       ORGANIZATION "IETF RADIUS Working Group."
       CONTACT-INFO
              " Bernard Aboba
                Microsoft
```

```
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                Redmond, WA  98052
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        DESCRIPTION
              "The MIB module for entities implementing the client
               side of the Remote Access Dialin User Service (RADIUS)
               authentication protocol."
        REVISION "9906110000Z"    -- 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
      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."
      ::= { radiusAuthClient 2 }

radiusAuthServerTable OBJECT-TYPE
      SYNTAX     SEQUENCE OF RadiusAuthServerEntry
      MAX-ACCESS not-accessible
```

```
      STATUS     current
      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     current
      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     current
      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     current
      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 current
      DESCRIPTION
            "The UDP port the client is using to send requests to
             this server."
      ::= { radiusAuthServerEntry 3 }

radiusAuthClientRoundTripTime  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."
      ::= { 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
      MAX-ACCESS read-only
      STATUS current
      DESCRIPTION
            "The number of RADIUS Access-Request packets sent
             to this server. This does not include retransmissions."
      ::= { radiusAuthServerEntry 5 }

radiusAuthClientAccessRetransmissions OBJECT-TYPE
```

```
      SYNTAX Counter32
      MAX-ACCESS read-only
      STATUS current
      DESCRIPTION
            "The number of RADIUS Access-Request packets
             retransmitted to this RADIUS authentication server."
      ::= { radiusAuthServerEntry 6 }

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

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

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

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

radiusAuthClientMalformedAccessResponses OBJECT-TYPE
      SYNTAX Counter32
      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
             Signature attributes or unknown types are not
```

```
              included as malformed access responses."
       ::= { radiusAuthServerEntry 10 }

radiusAuthClientBadAuthenticators OBJECT-TYPE
       SYNTAX Counter32
       MAX-ACCESS read-only
       STATUS current
       DESCRIPTION
              "The number of RADIUS Access-Response packets
               containing invalid authenticators or Signature
               attributes received from this server."
       ::= { radiusAuthServerEntry 11 }

radiusAuthClientPendingRequests OBJECT-TYPE
       SYNTAX Gauge32
       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 Acess-Accept, Access-Reject or
               Access-Challenge, a timeout or retransmission."
       ::= { radiusAuthServerEntry 12 }

radiusAuthClientTimeouts OBJECT-TYPE
      SYNTAX Counter32
      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."
       ::= { radiusAuthServerEntry  13 }

radiusAuthClientUnknownTypes 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 authentication port."
       ::= { radiusAuthServerEntry  14 }
```

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


-- conformance information

radiusAuthClientMIBConformance
             OBJECT IDENTIFIER ::= { radiusAuthClientMIB 2 }
radiusAuthClientMIBCompliances
             OBJECT IDENTIFIER ::= { radiusAuthClientMIBConformance 1 }
radiusAuthClientMIBGroups
             OBJECT IDENTIFIER ::= { radiusAuthClientMIBConformance 2 }


-- compliance statements

radiusAuthClientMIBCompliance MODULE-COMPLIANCE
     STATUS  current
     DESCRIPTION
           "The compliance statement for authentication clients
            implementing the RADIUS Authentication Client MIB."
     MODULE  -- this module
            MANDATORY-GROUPS { radiusAuthClientMIBGroup }

     ::= { radiusAuthClientMIBCompliances 1 }


-- units of conformance

radiusAuthClientMIBGroup OBJECT-GROUP
     OBJECTS { radiusAuthClientIdentifier,
               radiusAuthClientInvalidServerAddresses,
               radiusAuthServerAddress,
               radiusAuthClientServerPortNumber,
               radiusAuthClientRoundTripTime,
               radiusAuthClientAccessRequests,
               radiusAuthClientAccessRetransmissions,
               radiusAuthClientAccessAccepts,
               radiusAuthClientAccessRejects,
               radiusAuthClientAccessChallenges,
               radiusAuthClientMalformedAccessResponses,
```

```
                radiusAuthClientBadAuthenticators,
                radiusAuthClientPendingRequests,
                radiusAuthClientTimeouts,
                radiusAuthClientUnknownTypes,
                radiusAuthClientPacketsDropped
              }
      STATUS  current
      DESCRIPTION
            "The basic collection of objects providing management of
             RADIUS Authentication Clients."
      ::= { radiusAuthClientMIBGroups 1 }

END
```

5. References

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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., Rubens, A., Simpson W. and S. Willens, "Remote Authentication Dial In User Service (RADIUS)", RFC 2138, 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:

radiusAuthServerAddress
: 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.

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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