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Abstract

This memo defines a set of extensions which instrument RADIUS authentication server 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 servers.

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 servers.

RADIUS authentication servers are today widely deployed by dialup Internet Service Providers, in order to provide authentication services. As a result, the effective management of RADIUS authentication servers 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 fourteen scalars as well as a single table:

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

Each entry in the RADIUS Authentication Client Table includes twelve columns presenting a view of the activity of the RADIUS authentication server.

4. Definitions

RADIUS-AUTH-SERVER-MIB DEFINITIONS ::= BEGIN

IMPORTS
MODULE-IDENTITY, OBJECT-TYPE, OBJECT-IDENTITY,
Counter32, Integer32,
IpAddress, TimeTicks, mib-2 FROM SNMPv2-SMI
SnmpAdminString FROM SNMP-FRAMEWORK-MIB

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

radiusAuthServMIB MODULE-IDENTITY
LAST-UPDATED "9906110000Z"
ORGANIZATION "IETF RADIUS Working Group."
CONTACT-INFO
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    Microsoft

Zorn & Aboba Standards Track [Page 3]
The MIB module for entities implementing the server side of the Remote Access Dialin User Service (RADIUS) authentication protocol.

REVISION "9906110000Z" -- 11 Jun 1999
DESCRIPTION "Initial version as published in RFC 2619"
 ::= { radiusAuthentication 1 }

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

radiusAuthentication OBJECT IDENTIFIER ::= {radiusMIB 1}

radiusAuthServMIBObjects OBJECT IDENTIFIER ::= 
 { radiusAuthServMIBObjects 1 }

radiusAuthServ OBJECT IDENTIFIER ::= { radiusAuthServMIBObjects 1 }

radiusAuthServIdent OBJECT-TYPE
 SYNTAX SnmpAdminString
 MAX-ACCESS read-only
 STATUS current
DESCRIPTION
 "The implementation identification string for the
 RADIUS authentication server software in use on the
 system, for example; ‘FNS-2.1’"
 ::= {radiusAuthServ 1}

radiusAuthServUpTime OBJECT-TYPE
 SYNTAX TimeTicks
 MAX-ACCESS read-only
 STATUS current
DESCRIPTION
 "If the server has a persistent state (e.g., a process),
 this value will be the time elapsed (in hundredths of a
 second) since the server process was started.
 For software without persistent state, this value will
 be zero."
 ::= {radiusAuthServ 2}
radiusAuthServResetTime OBJECT-TYPE
SYNTAX      TimeTicks
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
 "If the server has a persistent state (e.g., a process) and supports a 'reset' operation (e.g., can be told to re-read configuration files), this value will be the time elapsed (in hundredths of a second) since the server was 'reset.' For software that does not have persistence or does not support a 'reset' operation, this value will be zero."
 ::= {radiusAuthServ 3}

radiusAuthServConfigReset OBJECT-TYPE
SYNTAX INTEGER { other(1),
  reset(2),
  initializing(3),
  running(4) }
MAX-ACCESS read-write
STATUS      current
DESCRIPTION
 "Status/action object to reinitialize any persistent server state. When set to reset(2), any persistent server state (such as a process) is reinitialized as if the server had just been started. This value will never be returned by a read operation. When read, one of the following values will be returned:
  other(1) - server in some unknown state;
  initializing(3) - server (re)initializing;
  running(4) - server currently running."
 ::= {radiusAuthServ 4}

-- New Stats proposed by Dale E. Reed Jr (daler@iea-software.com)

radiusAuthServTotalAccessRequests OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The number of packets received on the authentication port."
 ::= {radiusAuthServ 5}

radiusAuthServTotalInvalidRequests OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of RADIUS Access-Request packets
received from unknown addresses."
::= { radiusAuthServ 6 }

radiusAuthServTotalDupAccessRequests OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of duplicate RADIUS Access-Request
packets received."
::= { radiusAuthServ 7 }

radiusAuthServTotalAccessAccepts OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of RADIUS Access-Accept packets sent."
::= { radiusAuthServ 8 }

radiusAuthServTotalAccessRejects OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of RADIUS Access-Reject packets sent."
::= { radiusAuthServ 9 }

radiusAuthServTotalAccessChallenges OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of RADIUS Access-Challenge packets sent."
::= { radiusAuthServ 10 }

radiusAuthServTotalMalformedAccessRequests OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of malformed RADIUS Access-Request
packets received. Bad authenticators
and unknown types are not included as
malformed Access-Requests."
::= { radiusAuthServ 11 }
radiusAuthServTotalBadAuthenticators OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of RADIUS Authentication-Request packets which contained invalid Signature attributes received."
::= { radiusAuthServ 12 }

radiusAuthServTotalPacketsDropped OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of incoming packets silently discarded for some reason other than malformed, bad authenticators or unknown types."
::= { radiusAuthServ 13 }

radiusAuthServTotalUnknownTypes OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of RADIUS packets of unknown type which were received."
::= { radiusAuthServ 14 }

-- End of new

radiusAuthClientTable OBJECT-TYPE
SYNTAX SEQUENCE OF RadiusAuthClientEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The (conceptual) table listing the RADIUS authentication clients with which the server shares a secret."
::= { radiusAuthServ 15 }

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

RadiusAuthClientEntry ::= SEQUENCE {
  radiusAuthClientIndex                           Integer32,
  radiusAuthClientAddress                         IpAddress,
  radiusAuthClientID                        SnmpAdminString,
  radiusAuthServAccessRequests                    Counter32,
  radiusAuthServDupAccessRequests                 Counter32,
  radiusAuthServAccessAccepts                     Counter32,
  radiusAuthServAccessRejects                     Counter32,
  radiusAuthServAccessChallenges                  Counter32,
  radiusAuthServMalformedAccessRequests           Counter32,
  radiusAuthServBadAuthenticators                 Counter32,
  radiusAuthServPacketsDropped                    Counter32,
  radiusAuthServUnknownTypes                      Counter32
}

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

radiusAuthClientAddress OBJECT-TYPE
SYNTAX     IpAddress
MAX-ACCESS read-only
STATUS     current
DESCRIPTION
  "The NAS-IP-Address of the RADIUS authentication client
   referred to in this table entry."
::= { radiusAuthClientEntry 2 }

radiusAuthClientID OBJECT-TYPE
SYNTAX     SnmpAdminString
MAX-ACCESS read-only
STATUS     current
DESCRIPTION
  "The NAS-Identifier of the RADIUS authentication client
   referred to in this table entry. This is not necessarily
   the same as sysName in MIB II."
::= { radiusAuthClientEntry 3 }

-- Server Counters
-- Responses = AccessAccepts + AccessRejects + AccessChallenges
-- Requests - DupRequests - BadAuthenticators - MalformedRequests -
-- UnknownTypes - PacketsDropped - Responses = Pending
-- Requests - DupRequests - BadAuthenticators - MalformedRequests -
-- UnknownTypes - PacketsDropped = entries logged

radiusAuthServAccessRequests OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of packets received on the authentication
port from this client."
::= { radiusAuthClientEntry 4 }

radiusAuthServDupAccessRequests OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of duplicate RADIUS Access-Request
packets received from this client."
::= { radiusAuthClientEntry 5 }

radiusAuthServAccessAccepts OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of RADIUS Access-Accept packets
sent to this client."
::= { radiusAuthClientEntry 6 }

radiusAuthServAccessRejects OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of RADIUS Access-Reject packets
sent to this client."
::= { radiusAuthClientEntry 7 }

radiusAuthServAccessChallenges OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of RADIUS Access-Challenge packets
sent to this client."
::= { radiusAuthClientEntry  8 }

radiusAuthServMalformedAccessRequests OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of malformed RADIUS Access-Request
packets received from this client.  
Bad authenticators and unknown types are not included as
malformed Access-Requests."
::= { radiusAuthClientEntry  9 }

radiusAuthServBadAuthenticators OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of RADIUS Authentication-Request packets
which contained invalid Signature attributes received
from this client."
::= { radiusAuthClientEntry  10 }

radiusAuthServPacketsDropped OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of incoming packets from this
client silently discarded for some reason other
than malformed, bad authenticators or
unknown types."
::= { radiusAuthClientEntry  11 }

radiusAuthServUnknownTypes OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of RADIUS packets of unknown type which
were received from this client."
::= { radiusAuthClientEntry  12 }
-- conformance information

radiusAuthServMIBConformance
OBJECT IDENTIFIER ::= { radiusAuthServMIB 2 }

radiusAuthServMIBCompliances
OBJECT IDENTIFIER ::= { radiusAuthServMIBConformance 1 }

radiusAuthServMIBGroups
OBJECT IDENTIFIER ::= { radiusAuthServMIBConformance 2 }

-- compliance statements

radiusAuthServMIBCompliance MODULE-COMPLIANCE
STATUS current
DESCRIPTION "The compliance statement for authentication servers implementing the RADIUS Authentication Server MIB."

MODULE -- this module
MANDATORY-GROUPS { radiusAuthServMIBGroup }

OBJECT radiusAuthServConfigReset
WRITE-SYNTAX INTEGER { reset(2) }
DESCRIPTION "The only SETable value is ‘reset’ (2)."

::= { radiusAuthServMIBCompliances 1 }

-- units of conformance

radiusAuthServMIBGroup OBJECT-GROUP
OBJECTS {radiusAuthServIdent, radiusAuthServUpTime, radiusAuthServResetTime, radiusAuthServConfigReset, radiusAuthServTotalAccessRequests, radiusAuthServTotalInvalidRequests, radiusAuthServTotalDupAccessRequests, radiusAuthServTotalAccessAccepts, radiusAuthServTotalAccessRejects, radiusAuthServTotalAccessChallenges, radiusAuthServTotalMalformedAccessRequests, radiusAuthServTotalBadAuthenticators, radiusAuthServTotalPacketsDropped, radiusAuthServTotalUnknownTypes, radiusAuthClientAddress, radiusAuthClientID, radiusAuthServAccessRequests, radiusAuthServDupAccessRequests, radiusAuthServAccessAccepts,
radiusAuthServAccessRejects,
radiusAuthServAccessChallenges,
radiusAuthServMalformedAccessRequests,
radiusAuthServBadAuthenticators,
radiusAuthServPacketsDropped,
radiusAuthServUnknownTypes
}
STATUS current
DESCRIPTION
"The collection of objects providing management of
a RADIUS Authentication Server."
::= { radiusAuthServMIBGroups 1 }

END

5. References


6. Security Considerations

There are a number of management objects defined in this MIB that have a MAX-ACCESS clause of read-write and/or read-create. Such objects may be considered sensitive or vulnerable in some network environments. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations.

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

radiusAuthClientAddress
This can be used to determine the address of the RADIUS authentication client with which the server is communicating. This information could be useful in impersonating the client.

radiusAuthClientID
This can be used to determine the client ID of the authentication client with which the server is communicating. This information could be useful in
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.

7. Acknowledgments

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