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Definitions of Managed Objects
for Remote Ping, Traceroute, and Lookup Operations

Status of This Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

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Abstract

This memo defines Management Information Bases (MIBs) for performing ping, traceroute, and lookup operations at a host. When managing a network, it is useful to be able to initiate and retrieve the results of ping or traceroute operations when they are performed at a remote host. A lookup capability is defined in order to enable resolution of either an IP address to a DNS name or a DNS name to an IP address at a remote host.

Currently, there are several enterprise-specific MIBs for performing remote ping or traceroute operations. The purpose of this memo is to define a standards-based solution to enable interoperability.

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1. Introduction

This document defines standards-based MIB modules for performing specific remote operations. The remote operations defined by this document consist of the ping, traceroute, and lookup functions.

Ping and traceroute are two very useful functions for managing networks. Ping is typically used to determine whether a path exists between two hosts, whereas traceroute shows an actual path.

Both ping and traceroute yield round-trip times measured in milliseconds. These times can be used as a rough approximation for network transit time.

The lookup functions considered in this document are the equivalents of name to address conversion functions such as `gethostbyname()`/`gethostbyaddr()` and `getaddrinfo()`/`getnameinfo()`.

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].

1.1. Ping

Ping is usually implemented using the Internet Control Message Protocol (ICMP) "ECHO" facility. It is also possible to implement a ping capability using alternate methods, including the following:

- o Using the UDP echo port (7), if supported.

This is defined by RFC 862 [RFC862].

- o Timing a Simple Network Management Protocol (SNMP) query.
- o Timing a TCP connect attempt.

In general, almost any request/response flow can be used to generate a round-trip time. Often, many of the non-ICMP ECHO facility methods stand a better chance of yielding a good response (not timing out, for example) since some routers don't honor Echo Requests (timeout situation) or are handled at lower priority, thus possibly giving false indications of round trip times.

Note that almost any of the various methods used for generating a round-trip time can be considered a form of system attack when used excessively. Sending a system request too often can negatively effect its performance. Attempting to connect to what is supposed to be an unused port can be very unpredictable. There are tools that attempt to connect to a range of TCP ports to test that any receiving server can handle erroneous connection attempts.

It is also important to a management application using a remote ping capability to know which method is being used. Different methods will yield different response times, since the protocol and resulting processing will be different. It is RECOMMENDED that the ping capability defined within this memo be implemented using the ICMP Echo Facility.

1.2. Traceroute

Traceroute is usually implemented by transmitting a series of probe packets with increasing time-to-live values. A probe packet is a UDP datagram encapsulated into an IP packet. Each hop in a path to the target (destination) host rejects the probe packet (probe's TTL too small) until its time-to-live value becomes large enough for the probe to be forwarded. Each hop in a traceroute path returns an ICMP message that is used to discover the hop and to calculate a round trip time. Some systems use ICMP probes (ICMP Echo request packets) instead of UDP ones to implement traceroute. In both cases traceroute relies on the probes being rejected via an ICMP message to discover the hops taken along a path to the final destination. Both probe types, UDP and ICMP, are encapsulated into an IP packet and thus have a TTL field that can be used to cause a path rejection.

Implementations of the remote traceroute capability as defined within this memo SHOULD be done using UDP packets to a (hopefully) unused port. ICMP probes (ICMP Echo Request packets) SHOULD NOT be used. Many PC implementations of traceroute use the ICMP probe method, which they should not, since this implementation method has been known to have a high probability of failure. Intermediate hops become invisible when a router either refuses to send an ICMP TTL expired message in response to an incoming ICMP packet or simply tosses ICMP echo requests altogether.

The behavior of some routers not to return a TTL expired message in response to an ICMP Echo request is due in part to the following text extracted from RFC 792 [RFC792]:

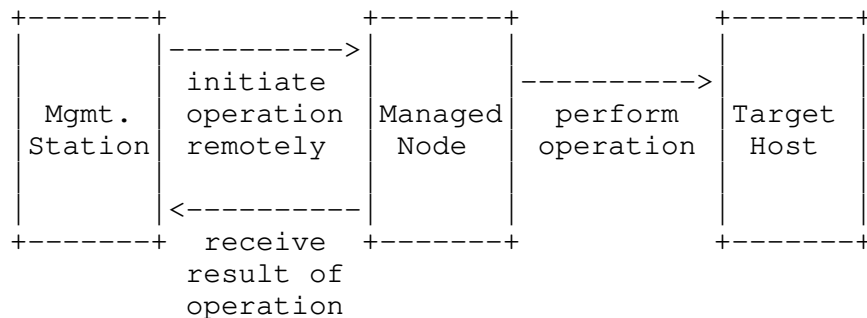
"The ICMP messages typically report errors in the processing of datagrams. To avoid the infinite regress of messages about messages etc., no ICMP messages are sent about ICMP messages."

1.3. Lookup

The Lookup operation enables remote lookup of addresses for a symbolic name as it is, for example, performed by functions `getnameinfo()` or `gethostbyaddr()` and lookup of symbolic names for an address as it is, for example, performed by functions `getaddrinfo()` or `gethostbyname()`. Note that whatever lookup function is chosen, results are not necessarily consistent with the results of a pure Domain Name Service (DNS) lookup, but may be influenced by local lookup tables or other sources of information. The lookup capability can be used to determine the symbolic name of a hop in a traceroute path. Also, the reverse lookup can be used, for example, for analyzing name lookup problems.

1.4. Remote Operations

The MIB modules defined in this document allow a management station to initiate ping, traceroute, and lookup operations remotely. The basic scenario is illustrated by the following diagram.



A management station is the local host from which the remote ping, traceroute, or Lookup operation is initiated using an SNMP request. The managed node is a remote host where the MIBs defined by this memo are implemented. It receives the remote operation via SNMP and performs the actual ping, traceroute, or lookup function.

2. 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].

3. Structure of the MIBs

This document defines three MIB modules:

- o DISMAN-PING-MIB
Defines a ping MIB.
- o DISMAN-TRACEROUTE-MIB
Defines a traceroute MIB.
- o DISMAN-NSLOOKUP-MIB

Provides access to lookup functions for symbolic names and addresses at a remote host provided, for example, by functions `getaddrinfo()/getnameinfo()` and `gethostbyname()/gethostbyaddr()`.

The ping and traceroute MIBs are structured to allow creation of ping or traceroute tests that can be set up to issue a series of operations periodically and to generate NOTIFICATIONS to report on test results. Many network administrators have in the past written UNIX shell scripts or command batch files to operate in a fashion similar to the functionality provided by the ping and traceroute MIBs defined within this memo. The intent of this document is to acknowledge the importance of these functions and to provide a standards-based solution.

3.1. Ping MIB

The DISMAN-PING-MIB consists of the following components:

- o `pingMaxConcurrentRequests`
- o `pingCtlTable`
- o `pingResultsTable`
- o `pingProbeHistoryTable`

3.1.1. pingMaxConcurrentRequests

The object `pingMaxConcurrentRequests` enables control of the maximum number of concurrent active requests that an agent implementation supports. It is permissible for an agent either to limit the maximum upper range allowed for this object or to implement this object as read-only with an implementation limit expressed as its value.

3.1.2. pingCtlTable

A remote ping test is started by setting `pingCtlAdminStatus` to `enabled(1)`. The corresponding `pingCtlEntry` MUST have been created, and its `pingCtlRowStatus` set to `active(1)`, prior to starting the test. A single SNMP PDU can be used to create and start a remote ping test. Within the PDU, `pingCtlTargetAddress` should be set to the target host's address (`pingCtlTargetAddressType` will default to `ipv4(1)`), `pingCtlAdminStatus` to `enabled(1)`, and `pingCtlRowStatus` to `createAndGo(4)`.

The first index element, `pingCtlOwnerIndex`, is of type `SnmpAdminString`, a textual convention that allows for use of the SNMPv3 View-Based Access Control Model (RFC 3415 [RFC3415], VACM) and that allows a management application to identify its entries. The second index, `pingCtlTestName` (also an `SnmpAdminString`), enables the same management application to have multiple requests outstanding.

Using the maximum value for the parameters defined within a `pingEntry` can result in a single remote ping test's taking at most 15 minutes (`pingCtlTimeOut` times `pingCtlProbeCount`), plus whatever time it takes to send the ping request and to receive its response over the network from the target host. Use of the defaults for `pingCtlTimeOut` and `pingCtlProbeCount` yields a maximum of 3 seconds to perform a "normal" ping test.

A management application can delete an active remote ping request by setting the corresponding `pingCtlRowStatus` object to `destroy(6)`.

The contents of the `pingCtlTable` are preserved across reIPLs (Initial Program Loads) of its agent according the values of each of the `pingCtlStorageType` objects.

3.1.3. pingResultsTable

An entry in the `pingResultsTable` is created for a corresponding `pingCtlEntry` once the test defined by this entry is started.

3.1.4. pingProbeHistoryTable

The results of past ping probes are stored in this table on a per-pingCtlEntry basis. This table is initially indexed by pingCtlOwnerIndex and pingCtlTestName so that the results of a probe relate to the pingCtlEntry that caused it. The maximum number of entries stored in this table per pingCtlEntry is determined by the value of pingCtlMaxRows.

An implementation of this MIB will remove the oldest entry in the pingProbeHistoryTable of the corresponding entry in the pingCtlTable to allow the addition of a new entry once the number of rows in the pingProbeHistoryTable reaches the value specified by pingCtlMaxRows for the corresponding entry in the pingCtlTable. An implementation MUST start assigning pingProbeHistoryIndex values at 1 and wrap after exceeding the maximum possible value, as defined by the limit of this object ('ffffffff'h).

3.2. Traceroute MIB

The DISMAN-TRACEROUTE-MIB consists of the following components:

- o traceRouteMaxConcurrentRequests
- o traceRouteCtlTable
- o traceRouteResultsTable
- o traceRouteProbeHistoryTable
- o traceRouteHopsTable

3.2.1. traceRouteMaxConcurrentRequests

The object traceRouteMaxConcurrentRequests enables control of the maximum number of concurrent active requests that an agent implementation supports. It is permissible for an agent either to limit the maximum upper range allowed for this object or to implement this object as read-only with an implementation limit expressed as its value.

3.2.2. traceRouteCtlTable

A remote traceroute test is started by setting traceRouteCtlAdminStatus to enabled(1). The corresponding traceRouteCtlEntry MUST have been created, and its traceRouteCtlRowStatus set to active(1), prior to starting the test. A single SNMP PDU can be used to create and start a remote traceroute

test. Within the PDU, `traceRouteCtlTargetAddress` should be set to the target host's address (`traceRouteCtlTargetAddressType` will default to `ipv4(1)`), `traceRouteCtlAdminStatus` to `enabled(1)`, and `traceRouteCtlRowStatus` to `createAndGo(4)`.

The first index element, `traceRouteCtlOwnerIndex`, is of type `SnmpAdminString`, a textual convention that allows for use of the SNMPv3 View-Based Access Control Model (RFC 3415 [RFC3415], VACM) and that allows a management application to identify its entries. The second index, `traceRouteCtlTestName` (also an `SnmpAdminString`), enables the same management application to have multiple requests outstanding.

Traceroute has a much longer theoretical maximum time for completion than ping: basically, 42 hours and 30 minutes (the product of `traceRouteCtlTimeOut`, `traceRouteCtlProbesPerHop`, and `traceRouteCtlMaxTtl`) plus some network transit time! Use of the defaults defined within an `traceRouteCtlEntry` yields a maximum of 4 minutes and 30 seconds for a default traceroute operation. Clearly, 42 plus hours is too long to wait for a traceroute operation to be completed.

The maximum Time to Live (TTL) value in effect for traceroute determines how long the traceroute function will keep increasing the TTL value in the probe it transmits, hoping to reach the target host. The function ends whenever the maximum TTL is exceeded or the target host is reached. The object `traceRouteCtlMaxFailures` was created in order to impose a throttle for how long traceroute continues to increase the TTL field in a probe without receiving any kind of response (timeouts). It is RECOMMENDED that agent implementations impose a time limit for how long it allows a traceroute operation to take, relative to how the function is implemented. For example, an implementation that can't process multiple traceroute operations at the same time SHOULD impose a shorter maximum allowed time period.

A management application can delete an active remote traceroute request by setting the corresponding `traceRouteCtlRowStatus` object to `destroy(6)`.

The contents of the `traceRouteCtlTable` are preserved across reIPLs (Initial Program Loads) of its agent according to the values of each of the `traceRouteCtlStorageType` objects.

3.2.3. `traceRouteResultsTable`

An entry in the `traceRouteResultsTable` is created upon determining the results of a specific traceroute operation. Entries in this table relate back to the `traceRouteCtlEntry` that caused the

corresponding traceroute operation to occur. The objects `traceRouteResultsCurHopCount` and `traceRouteResultsCurProbeCount` can be examined to determine how far the current remote traceroute operation has reached.

3.2.4. `traceRouteProbeHistoryTable`

The results of past traceroute probes can be stored in this table on a per-`traceRouteCtlEntry` basis. This table is initially indexed by `traceRouteCtlOwnerIndex` and `traceRouteCtlTestName` so that the results of a probe relate to the `traceRouteCtlEntry` that caused it. The number of entries stored in this table per `traceRouteCtlEntry` is determined by the value of `traceRouteCtlMaxRows`.

An implementation of this MIB will remove the oldest entry in the `traceRouteProbeHistoryTable` of the corresponding entry in the `traceRouteCtlTable` to allow the addition of a new entry once the number of rows in the `traceRouteProbeHistoryTable` reaches the value of `traceRouteCtlMaxRows` for the corresponding entry in the `traceRouteCtlTable`. An implementation MUST start assigning `traceRouteProbeHistoryIndex` values at 1 and wrap after exceeding the maximum possible value, as defined by the limit of this object ('ffffffff'h).

3.2.5. `traceRouteHopsTable`

The current traceroute path can be stored in this table on a per-`traceRouteCtlEntry` basis. This table is initially indexed by `traceRouteCtlOwnerIndex` and `traceRouteCtlTestName` so that a traceroute path relates to the `traceRouteCtlEntry` that caused it. A third index, `traceRouteHopsHopIndex`, enables keeping one `traceRouteHopsEntry` per traceroute hop. Creation of `traceRouteHopsTable` entries is enabled by setting the corresponding `traceRouteCtlCreateHopsEntries` object to `true(1)`.

3.3. Lookup MIB

The DISMAN-NSLOOKUP-MIB consists of the following components:

- o `lookupMaxConcurrentRequests` and `lookupPurgeTime`
- o `lookupCtlTable`
- o `lookupResultsTable`

3.3.1. lookupMaxConcurrentRequests and lookupPurgeTime

The object lookupMaxConcurrentRequests enables control of the maximum number of concurrent active requests that an agent implementation is structured to support. It is permissible for an agent either to limit the maximum upper range allowed for this object or to implement this object as read-only with an implementation limit expressed as its value.

The object lookupPurgeTime provides a method for entries in the lookupCtlTable and lookupResultsTable to be automatically deleted after the corresponding operation is completed.

3.3.2. lookupCtlTable

A remote lookup operation is initiated by performing an SNMP SET request on lookupCtlRowStatus. A single SNMP PDU can be used to create and start a remote lookup operation. Within the PDU, lookupCtlTargetAddress should be set to the entity to be resolved (lookupCtlTargetAddressType will default to ipv4(1)) and lookupCtlRowStatus to createAndGo(4). The object lookupCtlOperStatus can be examined to determine the state of a lookup operation. A management application can delete an active remote lookup request by setting the corresponding lookupCtlRowStatus object to destroy(6).

An lookupCtlEntry is initially indexed by lookupCtlOwnerIndex, which is a type of SnmpAdminString, a textual convention that allows for use of the SNMPv3 View-Based Access Control Model (RFC 3415 [RFC3415],

VACM) and that also allows for a management application to identify its entries. The lookupCtlOwnerIndex portion of the index is then followed by lookupCtlOperationName. The lookupCtlOperationName index enables the same lookupCtlOwnerIndex entity to have multiple outstanding requests.

The value of lookupCtlTargetAddressType determines which lookup function to perform. Specification of dns(16) as the value of this index implies that a function such as getaddrinfo() or gethostbyname() should be performed to determine the numeric addresses associated with a symbolic name via lookupResultsTable entries. Use of a value of either ipv4(1) or ipv6(2) implies that a function such as getnameinfo() or gethostbyaddr() should be performed to determine the symbolic name(s) associated with a numeric address at a remote host.

3.3.3. lookupResultsTable

The lookupResultsTable is used to store the results of lookup operations. Results to be reported here SHOULD be results of a lookup function that is commonly used by applications at the managed node. This implies that results are not necessarily consistent with the results of a pure DNS lookup at the managed node, but may be influenced by local lookup tables or other sources of information, depending on the configuration of the managed node.

The lookupResultsTable is initially indexed by the same index elements that the lookupCtlTable contains (lookupCtlOwnerIndex and lookupCtlOperationName) but has a third index element, lookupResultsIndex (Unsigned32 textual convention), in order to associate multiple results with the same lookupCtlEntry.

A remote host can be multi-homed and can have multiple symbolic (DNS) names. Therefore, a lookup operation can return multiple IP addresses and multiple symbolic names.

If the lookup operation was performed for a certain address by using getnameinfo() or gethostbyaddr(), for example, then entries in the lookupResultsTable MUST be made for each host name returned. If the lookup operation identifies one hostname as the host's 'official host name', then this name MUST be assigned a lookupResultsIndex of 1.

If a lookup operation was performed for a certain symbolic name by using getaddrinfo() or gethostbyname(), for example, then entries in the lookupResultsTable MUST be made for each address returned. The entries MUST be stored in the order that they are retrieved. Values assigned to lookupResultsIndex MUST start at 1 and increase in order.

An implementation SHOULD NOT retain SNMP-created entries in the lookupResultsTable across reIPLs (Initial Program Loads) of its agent, since management applications need to see consistent behavior with respect to the persistence of the table entries that they create.

3.4. Conformance

Each of the three MIB modules defined in this document has two current compliance statements, one for full compliance and one for minimum compliance. The minimum compliance statements are intended to be applied to implementation for devices with very limited resources. The main difference between full and minimum compliance is that for minimum compliance, dynamic creation and deletion of table entries is not required, whereas it is required for full compliance.

In addition, the DISMAN-PING-MIB module and the DISMAN-TRACEROUTE-MIB modules each have a deprecated compliance statement that was current in RFC 2925. Semantically, the new full compliance statements are identical to the deprecated ones. But some of the object groups used in the old compliance statements needed to be split in order to support the new minimal compliance statements.

4. Definitions

The following MIB modules import from [RFC2863], [RFC3411], and [RFC4001]. They also use the REFERENCE clause to reference [RFC1812], [RFC2474], and [RFC3260].

4.1. DISMAN-PING-MIB

DISMAN-PING-MIB DEFINITIONS ::= BEGIN

IMPORTS

```

    MODULE-IDENTITY, OBJECT-TYPE, Integer32,
    Unsigned32, Gauge32, mib-2,
    NOTIFICATION-TYPE, OBJECT-IDENTITY
        FROM SNMPv2-SMI                -- RFC2578
    TEXTUAL-CONVENTION, RowStatus,
    StorageType, DateAndTime, TruthValue
        FROM SNMPv2-TC                -- RFC2579
    MODULE-COMPLIANCE, OBJECT-GROUP,
    NOTIFICATION-GROUP
        FROM SNMPv2-CONF                -- RFC2580
    InterfaceIndexOrZero                -- RFC2863
        FROM IF-MIB
    SnmpAdminString
        FROM SNMP-FRAMEWORK-MIB        -- RFC3411
    InetAddressType, InetAddress
        FROM INET-ADDRESS-MIB;        -- RFC4001

```

```

pingMIB MODULE-IDENTITY
    LAST-UPDATED "200606130000Z"        -- 13 June 2006
    ORGANIZATION "IETF Distributed Management Working Group"
    CONTACT-INFO
        "Juergen Quittek

        NEC Europe Ltd.
        Network Laboratories
        Kurfuersten-Anlage 36
        69115 Heidelberg
        Germany

        Phone: +49 6221 4342-115

```

Email: quittek@netlab.nec.de"

DESCRIPTION

"The Ping MIB (DISMAN-PING-MIB) provides the capability of controlling the use of the ping function at a remote host.

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-- Revision history

REVISION "200606130000Z" -- 13 June 2006

DESCRIPTION

"Updated version, published as RFC 4560.

- Correctly considered IPv6 in DESCRIPTION clause of pingCtlDataSize
- Replaced references to RFC 2575 by RFC 3415
- Replaced references to RFC 2571 by RFC 3411
- Replaced references to RFC 2851 by RFC 4001
- Added DEFVAL { {} } to definition of pingCtlTrapGeneration
- Changed DEFVAL of object pingCtlDescr from DEFVAL { '00'H } to DEFVAL { ''H }
- Changed DEFVAL of object pingCtlSourceAddressType from DEFVAL { ipv4 } to DEFVAL { unknown }
- Extended DESCRIPTION clause of pingResultsTable describing re-initialization of entries
- Changed SYNTAX of pingResultsProbeResponses and pingResultsSentProbes from Unsigned32 to Gauge32
- Changed status of pingCompliance to deprecated
- Added pingFullCompliance and pingMinimumCompliance
- Changed status of pingGroup and pingTimeStampGroup to deprecated
- Added pingMinimumGroup, pingCtlRowStatusGroup, and pingHistoryGroup"

REVISION "200009210000Z" -- 21 September 2000

DESCRIPTION

"Initial version, published as RFC 2925."

::= { mib-2 80 }

-- Textual Conventions

OperationResponseStatus ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"Used to report the result of an operation:

responseReceived(1) - Operation is completed successfully.
 unknown(2) - Operation failed due to unknown error.
 internalError(3) - An implementation detected an error
 in its own processing that caused an operation
 to fail.
 requestTimedOut(4) - Operation failed to receive a
 valid reply within the time limit imposed on it.
 unknownDestinationAddress(5) - Invalid destination
 address.
 noRouteToTarget(6) - Could not find a route to target.
 interfaceInactiveToTarget(7) - The interface to be
 used in sending a probe is inactive, and an
 alternate route does not exist.
 arpFailure(8) - Unable to resolve a target address to a
 media-specific address.
 maxConcurrentLimitReached(9) - The maximum number of
 concurrent active operations would have been exceeded
 if the corresponding operation was allowed.
 unableToResolveDnsName(10) - The DNS name specified was
 unable to be mapped to an IP address.
 invalidHostAddress(11) - The IP address for a host
 has been determined to be invalid. Examples of this
 are broadcast or multicast addresses."

```
SYNTAX INTEGER {
    responseReceived(1),
    unknown(2),
    internalError(3),
    requestTimedOut(4),
    unknownDestinationAddress(5),
    noRouteToTarget(6),
    interfaceInactiveToTarget(7),
    arpFailure(8),
    maxConcurrentLimitReached(9),
    unableToResolveDnsName(10),
    invalidHostAddress(11)
}
```

-- Top level structure of the MIB

```
pingNotifications          OBJECT IDENTIFIER ::= { pingMIB 0 }
pingObjects                OBJECT IDENTIFIER ::= { pingMIB 1 }
pingConformance           OBJECT IDENTIFIER ::= { pingMIB 2 }
```

-- The registration node (point) for ping implementation types

```
pingImplementationTypeDomains OBJECT IDENTIFIER ::= { pingMIB 3 }
```

```
pingIcmpEcho OBJECT-IDENTITY
```

```
    STATUS      current
```

```
    DESCRIPTION
```

```
        "Indicates that an implementation is using the Internet  
        Control Message Protocol (ICMP) 'ECHO' facility."
```

```
    ::= { pingImplementationTypeDomains 1 }
```

```
pingUdpEcho OBJECT-IDENTITY
```

```
    STATUS      current
```

```
    DESCRIPTION
```

```
        "Indicates that an implementation is using the UDP echo  
        port (7)."
```

```
    REFERENCE
```

```
        "RFC 862, 'Echo Protocol'."
```

```
    ::= { pingImplementationTypeDomains 2 }
```

```
pingSnmpQuery OBJECT-IDENTITY
```

```
    STATUS      current
```

```
    DESCRIPTION
```

```
        "Indicates that an implementation is using an SNMP query  
        to calculate a round trip time."
```

```
    ::= { pingImplementationTypeDomains 3 }
```

```
pingTcpConnectionAttempt OBJECT-IDENTITY
```

```
    STATUS      current
```

```
    DESCRIPTION
```

```
        "Indicates that an implementation is attempting to  
        connect to a TCP port in order to calculate a round  
        trip time."
```

```
    ::= { pingImplementationTypeDomains 4 }
```

```
-- Simple Object Definitions
```

```
pingMaxConcurrentRequests OBJECT-TYPE
```

```
    SYNTAX      Unsigned32
```

```
    UNITS       "requests"
```

```
    MAX-ACCESS  read-write
```

```
    STATUS      current
```

```
    DESCRIPTION
```

```
        "The maximum number of concurrent active ping requests  
        that are allowed within an agent implementation. A value  
        of 0 for this object implies that there is no limit for  
        the number of concurrent active requests in effect."
```

The limit applies only to new requests being activated.
 When a new value is set, the agent will continue processing
 all the requests already active, even if their number
 exceeds the limit just imposed."

```
DEFVAL { 10 }
::= { pingObjects 1 }
```

-- Ping Control Table

pingCtlTable OBJECT-TYPE

SYNTAX SEQUENCE OF PingCtlEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Defines the ping Control Table for providing, via SNMP,
 the capability of performing ping operations at
 a remote host. The results of these operations are
 stored in the pingResultsTable and the
 pingProbeHistoryTable."

```
::= { pingObjects 2 }
```

pingCtlEntry OBJECT-TYPE

SYNTAX PingCtlEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Defines an entry in the pingCtlTable. The first index
 element, pingCtlOwnerIndex, is of type SnmpAdminString,
 a textual convention that allows for use of the SNMPv3
 View-Based Access Control Model (RFC 3415, VACM)
 and that allows a management application to identify its
 entries. The second index, pingCtlTestName (also an
 SnmpAdminString), enables the same management
 application to have multiple outstanding requests."

```
INDEX {
    pingCtlOwnerIndex,
    pingCtlTestName
}
```

```
::= { pingCtlTable 1 }
```

PingCtlEntry ::=

SEQUENCE {

pingCtlOwnerIndex	SnmpAdminString,
pingCtlTestName	SnmpAdminString,
pingCtlTargetAddressType	InetAddressType,
pingCtlTargetAddress	InetAddress,
pingCtlDataSize	Unsigned32,
pingCtlTimeout	Unsigned32,

```

    pingCtlProbeCount          Unsigned32,
    pingCtlAdminStatus         INTEGER,
    pingCtlDataFill            OCTET STRING,
    pingCtlFrequency           Unsigned32,
    pingCtlMaxRows             Unsigned32,
    pingCtlStorageType         StorageType,
    pingCtlTrapGeneration      BITS,
    pingCtlTrapProbeFailureFilter Unsigned32,
    pingCtlTrapTestFailureFilter Unsigned32,
    pingCtlType                OBJECT IDENTIFIER,
    pingCtlDescr               SnmpAdminString,
    pingCtlSourceAddressType    InetAddressType,
    pingCtlSourceAddress        InetAddress,
    pingCtlIfIndex             InterfaceIndexOrZero,
    pingCtlByPassRouteTable     TruthValue,
    pingCtlDSField             Unsigned32,
    pingCtlRowStatus            RowStatus
}

```

pingCtlOwnerIndex OBJECT-TYPE

SYNTAX SnmpAdminString (SIZE(0..32))

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"To facilitate the provisioning of access control by a security administrator using the View-Based Access Control Model (RFC 2575, VACM) for tables in which multiple users may need to create or modify entries independently, the initial index is used as an 'owner index'. Such an initial index has a syntax of SnmpAdminString and can thus be trivially mapped to a securityName or groupName defined in VACM, in accordance with a security policy.

When used in conjunction with such a security policy, all entries in the table belonging to a particular user (or group) will have the same value for this initial index. For a given user's entries in a particular table, the object identifiers for the information in these entries will have the same subidentifiers (except for the 'column' subidentifier) up to the end of the encoded owner index. To configure VACM to permit access to this portion of the table, one would create vacmViewTreeFamilyTable entries with the value of vacmViewTreeFamilySubtree including the owner index portion, and vacmViewTreeFamilyMask 'wildcarding' the column subidentifier. More elaborate configurations are possible."

```
::= { pingCtlEntry 1 }
```

pingCtlTestName OBJECT-TYPE
SYNTAX SnmpAdminString (SIZE(0..32))
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
 "The name of the ping test. This is locally unique, within
 the scope of a pingCtlOwnerIndex."
 ::= { pingCtlEntry 2 }

pingCtlTargetAddressType OBJECT-TYPE
SYNTAX InetAddressType
MAX-ACCESS read-create
STATUS current
DESCRIPTION
 "Specifies the type of host address to be used at a remote
 host for performing a ping operation."
DEFVAL { unknown }
 ::= { pingCtlEntry 3 }

pingCtlTargetAddress OBJECT-TYPE

SYNTAX InetAddress
MAX-ACCESS read-create
STATUS current
DESCRIPTION
 "Specifies the host address to be used at a remote host for
 performing a ping operation. The host address type is
 determined by the value of the corresponding
 pingCtlTargetAddressType.

 A value for this object MUST be set prior to transitioning
 its corresponding pingCtlEntry to active(1) via
 pingCtlRowStatus."
DEFVAL { ''H }
 ::= { pingCtlEntry 4 }

pingCtlDataSize OBJECT-TYPE
SYNTAX Unsigned32 (0..65507)
UNITS "octets"
MAX-ACCESS read-create
STATUS current
DESCRIPTION
 "Specifies the size of the data portion to be
 transmitted in a ping operation, in octets. Whether this
 value can be applied depends on the selected
 implementation method for performing a ping operation,
 indicated by pingCtlType in the same conceptual row.
 If the method used allows applying the value contained

in this object, then it MUST be applied. If the specified size is not appropriate for the chosen ping method, the implementation SHOULD use whatever size (appropriate to the method) is closest to the specified size.

The maximum value for this object was computed by subtracting the smallest possible IP header size of 20 octets (IPv4 header with no options) and the UDP header size of 8 octets from the maximum IP packet size. An IP packet has a maximum size of 65535 octets (excluding IPv6 Jumbograms)."

```
DEFVAL { 0 }
::= { pingCtlEntry 5 }
```

```
pingCtlTimeOut OBJECT-TYPE
    SYNTAX      Unsigned32 (1..60)
    UNITS       "seconds"
    MAX-ACCESS   read-create
    STATUS      current
    DESCRIPTION
        "Specifies the time-out value, in seconds, for a
         remote ping operation."
    DEFVAL { 3 }
```

```
::= { pingCtlEntry 6 }
```

```
pingCtlProbeCount OBJECT-TYPE
    SYNTAX      Unsigned32 (1..15)
    UNITS       "probes"
    MAX-ACCESS   read-create
    STATUS      current
    DESCRIPTION
        "Specifies the number of times to perform a ping
         operation at a remote host as part of a single ping test."
    DEFVAL { 1 }
    ::= { pingCtlEntry 7 }
```

```
pingCtlAdminStatus OBJECT-TYPE
    SYNTAX      INTEGER {
                                enabled(1), -- test should be started
                                disabled(2) -- test should be stopped
                            }
    MAX-ACCESS   read-create
    STATUS      current
    DESCRIPTION
        "Reflects the desired state that a pingCtlEntry should be
         in:"
```

enabled(1) - Attempt to activate the test as defined by this pingCtlEntry.
 disabled(2) - Deactivate the test as defined by this pingCtlEntry.

Refer to the corresponding pingResultsOperStatus to determine the operational state of the test defined by this entry."

DEFVAL { disabled }
 ::= { pingCtlEntry 8 }

pingCtlDataFill OBJECT-TYPE

SYNTAX OCTET STRING (SIZE(0..1024))

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The content of this object is used together with the corresponding pingCtlDataSize value to determine how to fill the data portion of a probe packet. The option of selecting a data fill pattern can be useful when links are compressed or have data pattern sensitivities. The contents of pingCtlDataFill should be repeated in a ping packet when the size of the data portion of the ping packet is greater than the size of pingCtlDataFill."

DEFVAL { '00'H }
 ::= { pingCtlEntry 9 }

pingCtlFrequency OBJECT-TYPE

SYNTAX Unsigned32

UNITS "seconds"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The number of seconds to wait before repeating a ping test as defined by the value of the various objects in the corresponding row.

A single ping test consists of a series of ping probes. The number of probes is determined by the value of the corresponding pingCtlProbeCount object. After a single test is completed the number of seconds as defined by the value of pingCtlFrequency MUST elapse before the next ping test is started.

A value of 0 for this object implies that the test as defined by the corresponding entry will not be repeated."

DEFVAL { 0 }

```
::= { pingCtlEntry 10 }
```

```
pingCtlMaxRows OBJECT-TYPE
```

```
SYNTAX      Unsigned32
```

```
UNITS       "rows"
```

```
MAX-ACCESS  read-create
```

```
STATUS      current
```

```
DESCRIPTION
```

"The maximum number of corresponding entries allowed in the pingProbeHistoryTable. An implementation of this MIB will remove the oldest corresponding entry in the pingProbeHistoryTable to allow the addition of a new entry once the number of corresponding rows in the pingProbeHistoryTable reaches this value.

Old entries are not removed when a new test is started. Entries are added to the pingProbeHistoryTable until pingCtlMaxRows is reached before entries begin to be removed.

A value of 0 for this object disables creation of pingProbeHistoryTable entries."

```
DEFVAL      { 50 }
```

```
::= { pingCtlEntry 11 }
```

```
pingCtlStorageType OBJECT-TYPE
```

```
SYNTAX      StorageType
```

```
MAX-ACCESS  read-create
```

```
STATUS      current
```

```
DESCRIPTION
```

"The storage type for this conceptual row. Conceptual rows having the value 'permanent' need not allow write-access to any columnar objects in the row."

```
DEFVAL { nonVolatile }
```

```
::= { pingCtlEntry 12 }
```

```
pingCtlTrapGeneration OBJECT-TYPE
```

```
SYNTAX      BITS {
                    probeFailure(0),
                    testFailure(1),
                    testCompletion(2)
                }
```

```
MAX-ACCESS  read-create
```

```
STATUS      current
```

```
DESCRIPTION
```

"The value of this object determines when and whether to generate a notification for this entry:

probeFailure(0) - Generate a pingProbeFailed notification subject to the value of pingCtlTrapProbeFailureFilter. The object pingCtlTrapProbeFailureFilter can be used to specify the number of consecutive probe failures that are required before a pingProbeFailed notification can be generated.

testFailure(1) - Generate a pingTestFailed notification. In this instance the object pingCtlTrapTestFailureFilter can be used to determine the number of probe failures that signal when a test fails.

testCompletion(2) - Generate a pingTestCompleted notification.

By default, no bits are set, indicating that none of the above options is selected."

DEFVAL { {} } -- no bits set.
 ::= { pingCtlEntry 13 }

pingCtlTrapProbeFailureFilter OBJECT-TYPE

SYNTAX Unsigned32 (0..15)

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The value of this object is used to determine when to generate a pingProbeFailed NOTIFICATION.

Setting BIT probeFailure(0) of object pingCtlTrapGeneration to '1' implies that a pingProbeFailed NOTIFICATION is generated only when

a number of consecutive ping probes equal to the value of pingCtlTrapProbeFailureFilter fail within a given ping test. After triggering the notification, the probe failure counter is reset to zero."

DEFVAL { 1 }

::= { pingCtlEntry 14 }

pingCtlTrapTestFailureFilter OBJECT-TYPE

SYNTAX Unsigned32 (0..15)

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The value of this object is used to determine when to generate a pingTestFailed NOTIFICATION.

Setting BIT testFailure(1) of object

pingCtlTrapGeneration to '1' implies that a pingTestFailed NOTIFICATION is generated only when a number of consecutive ping tests equal to the value of pingCtlTrapProbeFailureFilter fail. After triggering the notification, the test failure counter is reset to zero."

```
DEFVAL { 1 }  
::= { pingCtlEntry 15 }
```

pingCtlType OBJECT-TYPE

SYNTAX OBJECT IDENTIFIER

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The value of this object is used either to report or to select the implementation method to be used for calculating a ping response time. The value of this object MAY be selected from pingImplementationTypeDomains.

Additional implementation types SHOULD be allocated as required by implementers of the DISMAN-PING-MIB under their enterprise-specific registration point and not beneath pingImplementationTypeDomains."

```
DEFVAL { pingIcmpEcho }  
::= { pingCtlEntry 16 }
```

pingCtlDescr OBJECT-TYPE

SYNTAX SnmpAdminString

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The purpose of this object is to provide a descriptive name of the remote ping test."

```
DEFVAL { ''H }
```

```
::= { pingCtlEntry 17 }
```

pingCtlSourceAddressType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Specifies the type of the source address, pingCtlSourceAddress, to be used at a remote host when a ping operation is performed."

```
DEFVAL { unknown }  
::= { pingCtlEntry 18 }
```

pingCtlSourceAddress OBJECT-TYPE

SYNTAX InetAddress

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Use the specified IP address (which must be given in numeric form, not as a hostname) as the source address in outgoing probe packets. On hosts with more than one IP address, this option can be used to select the address to be used. If the IP address is not one of this machine's interface addresses, an error is returned and nothing is sent. A zero-length octet string value for this object disables source address specification.

The address type (InetAddressType) that relates to this object is specified by the corresponding value of pingCtlSourceAddressType."

DEFVAL { ''H }

::= { pingCtlEntry 19 }

pingCtlIfIndex OBJECT-TYPE

SYNTAX InterfaceIndexOrZero

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Setting this object to an interface's ifIndex prior to starting a remote ping operation directs the ping probes to be transmitted over the specified interface. A value of zero for this object means that this option is not enabled."

DEFVAL { 0 }

::= { pingCtlEntry 20 }

pingCtlByPassRouteTable OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The purpose of this object is to enable optional bypassing the route table. If enabled, the remote host will bypass the normal routing tables and send directly to a host on an attached network. If the host is not on a directly attached network, an error is returned. This option can be used to perform the ping operation to a local host through an interface that has no route defined (e.g., after the interface was dropped by the routing daemon at the host)."

```
DEFVAL { false }  
::= { pingCtlEntry 21 }
```

pingCtlDSField OBJECT-TYPE

SYNTAX Unsigned32 (0..255)

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Specifies the value to store in the Type of Service (TOS) octet in the IPv4 header or in the Traffic Class octet in the IPv6 header, respectively, of the IP packet used to encapsulate the ping probe.

The octet to be set in the IP header contains the Differentiated Services (DS) Field in the six most significant bits.

This option can be used to determine what effect an explicit DS Field setting has on a ping response. Not all values are legal or meaningful. A value of 0 means that the function represented by this option is not supported. DS Field usage is often not supported by IP implementations, and not all values are supported. Refer to RFC 2474 and RFC 3260 for guidance on usage of this field."

REFERENCE

"Refer to RFC 1812 for the definition of the IPv4 TOS octet and to RFC 2460 for the definition of the IPv6 Traffic Class octet. Refer to RFC 2474 and RFC 3260 for the definition of the Differentiated Services Field."

```
DEFVAL { 0 }  
::= { pingCtlEntry 22 }
```

pingCtlRowStatus OBJECT-TYPE

SYNTAX RowStatus

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object allows entries to be created and deleted in the pingCtlTable. Deletion of an entry in this table results in the deletion of all corresponding (same pingCtlOwnerIndex and pingCtlTestName index values) pingResultsTable and pingProbeHistoryTable entries.

A value MUST be specified for pingCtlTargetAddress prior to acceptance of a transition to active(1) state.

When a value for pingCtlTargetAddress is set,

the value of object pingCtlRowStatus changes from notReady(3) to notInService(2).

Activation of a remote ping operation is controlled via pingCtlAdminStatus, not by changing this object's value to active(1).

Transitions in and out of active(1) state are not allowed while an entry's pingResultsOperStatus is active(1), with the exception that deletion of an entry in this table by setting its RowStatus object to destroy(6) will stop an active ping operation.

The operational state of a ping operation can be determined by examination of its pingResultsOperStatus object."

REFERENCE

"See definition of RowStatus in RFC 2579, 'Textual Conventions for SMIV2.'"

::= { pingCtlEntry 23 }

-- Ping Results Table

pingResultsTable OBJECT-TYPE

SYNTAX SEQUENCE OF PingResultsEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Defines the Ping Results Table for providing the capability of performing ping operations at a remote host. The results of these operations are stored in the pingResultsTable and the pingProbeHistoryTable.

An entry is added to the pingResultsTable when an pingCtlEntry is started by successful transition of its pingCtlAdminStatus object to enabled(1).

If the object pingCtlAdminStatus already has the value enabled(1), and if the corresponding pingResultsOperStatus object has the value completed(3), then successfully writing enabled(1) to object pingCtlAdminStatus re-initializes the already existing entry in the pingResultsTable. The values of objects in the re-initialized entry are the same as the values of objects in a new entry would be.

An entry is removed from the pingResultsTable when its corresponding pingCtlEntry is deleted."

```

 ::= { pingObjects 3 }

pingResultsEntry OBJECT-TYPE
    SYNTAX      PingResultsEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Defines an entry in the pingResultsTable. The
        pingResultsTable has the same indexing as the
        pingCtlTable so that a pingResultsEntry
        corresponds to the pingCtlEntry that caused it to
        be created."
    INDEX {
        pingCtlOwnerIndex,
        pingCtlTestName
    }
 ::= { pingResultsTable 1 }

PingResultsEntry ::=
    SEQUENCE {
        pingResultsOperStatus      INTEGER,
        pingResultsIpTargetAddressType InetAddressType,
        pingResultsIpTargetAddress  InetAddress,
        pingResultsMinRtt           Unsigned32,
        pingResultsMaxRtt           Unsigned32,
        pingResultsAverageRtt       Unsigned32,
        pingResultsProbeResponses   Gauge32,
        pingResultsSentProbes       Gauge32,
        pingResultsRttSumOfSquares  Unsigned32,
        pingResultsLastGoodProbe    DateAndTime
    }

pingResultsOperStatus OBJECT-TYPE
    SYNTAX      INTEGER {
                                enabled(1),    -- test is in progress
                                disabled(2),   -- test has stopped
                                completed(3)   -- test is completed
                            }
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Reflects the operational state of a pingCtlEntry:

        enabled(1)    - Test is active.
        disabled(2)   - Test has stopped.
        completed(3)  - Test is completed."
 ::= { pingResultsEntry 1 }

```

pingResultsIpTargetAddressType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object indicates the type of address stored in the corresponding pingResultsIpTargetAddress object."

DEFVAL { unknown }

::= { pingResultsEntry 2 }

pingResultsIpTargetAddress OBJECT-TYPE

SYNTAX InetAddress

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object reports the IP address associated with a pingCtlTargetAddress value when the destination address is specified as a DNS name. The value of this object should be a zero-length octet string when a DNS name is not specified or when a specified DNS name fails to resolve."

The address type (InetAddressType) that relates to this object is specified by the corresponding value of pingResultsIpTargetAddressType."

DEFVAL { ''H }

::= { pingResultsEntry 3 }

pingResultsMinRtt OBJECT-TYPE

SYNTAX Unsigned32

UNITS "milliseconds"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The minimum ping round-trip-time (RTT) received. A value of 0 for this object implies that no RTT has been received."

::= { pingResultsEntry 4 }

pingResultsMaxRtt OBJECT-TYPE

SYNTAX Unsigned32

UNITS "milliseconds"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The maximum ping round-trip-time (RTT) received. A value of 0 for this object implies that no RTT has been received."

```
 ::= { pingResultsEntry 5 }

pingResultsAverageRtt OBJECT-TYPE
    SYNTAX      Unsigned32
    UNITS       "milliseconds"
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The current average ping round-trip-time (RTT)."
```

```
 ::= { pingResultsEntry 6 }

pingResultsProbeResponses OBJECT-TYPE
    SYNTAX      Gauge32
    UNITS       "responses"
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Number of responses received for the corresponding
        pingCtlEntry and pingResultsEntry. The value of this object
        MUST be reported as 0 when no probe responses have been
        received."
```

```
 ::= { pingResultsEntry 7 }

pingResultsSentProbes OBJECT-TYPE
    SYNTAX      Gauge32
    UNITS       "probes"
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The value of this object reflects the number of probes sent
        for the corresponding pingCtlEntry and pingResultsEntry.
        The value of this object MUST be reported as 0 when no probes
        have been sent."
```

```
 ::= { pingResultsEntry 8 }

pingResultsRttSumOfSquares OBJECT-TYPE
    SYNTAX      Unsigned32
    UNITS       "milliseconds"
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "This object contains the sum of the squares for all ping
        responses received. Its purpose is to enable standard
        deviation calculation. The value of this object MUST
        be reported as 0 when no ping responses have been
        received."
```

```
 ::= { pingResultsEntry 9 }
```

```
pingResultsLastGoodProbe OBJECT-TYPE
    SYNTAX      DateAndTime
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Date and time when the last response was received for
        a probe."
    ::= { pingResultsEntry 10 }
```

-- Ping Probe History Table

```
pingProbeHistoryTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF PingProbeHistoryEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Defines a table for storing the results of ping
        operations. The number of entries in this table is
        limited per entry in the pingCtlTable by the value
        of the corresponding pingCtlMaxRows object.

        An entry in this table is created when the result of
        a ping probe is determined. The initial 2 instance
        identifier index values identify the pingCtlEntry
        that a probe result (pingProbeHistoryEntry) belongs
        to. An entry is removed from this table when
        its corresponding pingCtlEntry is deleted.

        An implementation of this MIB will remove the oldest
        entry in the pingProbeHistoryTable of the
        corresponding entry in the pingCtlTable to allow
        the addition of a new entry once the number of rows
        in the pingProbeHistoryTable reaches the value
        specified by pingCtlMaxRows for the corresponding
        entry in the pingCtlTable."
    ::= { pingObjects 4 }
```

```
pingProbeHistoryEntry OBJECT-TYPE
    SYNTAX      PingProbeHistoryEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Defines an entry in the pingProbeHistoryTable.
        The first two index elements identify the
        pingCtlEntry that a pingProbeHistoryEntry belongs
        to. The third index element selects a single
        probe result."
    INDEX {
```

```

        pingCtlOwnerIndex,
        pingCtlTestName,
        pingProbeHistoryIndex
    }
    ::= { pingProbeHistoryTable 1 }

PingProbeHistoryEntry ::=
    SEQUENCE {
        pingProbeHistoryIndex          Unsigned32,
        pingProbeHistoryResponse       Unsigned32,
        pingProbeHistoryStatus         OperationResponseStatus,
        pingProbeHistoryLastRC         Integer32,
        pingProbeHistoryTime           DateAndTime
    }

pingProbeHistoryIndex OBJECT-TYPE
    SYNTAX      Unsigned32 (1..'ffffffff'h)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An entry in this table is created when the result of
        a ping probe is determined. The initial 2 instance
        identifier index values identify the pingCtlEntry
        that a probe result (pingProbeHistoryEntry) belongs
        to.

        An implementation MUST start assigning
        pingProbeHistoryIndex values at 1 and wrap after
        exceeding the maximum possible value as defined by
        the limit of this object ('ffffffff'h')."
    ::= { pingProbeHistoryEntry 1 }

pingProbeHistoryResponse OBJECT-TYPE
    SYNTAX      Unsigned32
    UNITS       "milliseconds"
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The amount of time measured in milliseconds from when
        a probe was sent to when its response was received or
        when it timed out. The value of this object is reported
        as 0 when it is not possible to transmit a probe."
    ::= { pingProbeHistoryEntry 2 }

pingProbeHistoryStatus OBJECT-TYPE
    SYNTAX      OperationResponseStatus
    MAX-ACCESS  read-only
    STATUS      current

```

DESCRIPTION

"The result of a particular probe done by a remote host."

::= { pingProbeHistoryEntry 3 }

pingProbeHistoryLastRC OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The last implementation-method-specific reply code received.

If the ICMP Echo capability is being used, then a successful probe ends when an ICMP response is received that contains

the code ICMP_ECHOREPLY(0). The ICMP codes are maintained

by IANA. Standardized ICMP codes are listed at

<http://www.iana.org/assignments/icmp-parameters>.

The ICMPv6 codes are listed at

<http://www.iana.org/assignments/icmpv6-parameters>."

::= { pingProbeHistoryEntry 4 }

pingProbeHistoryTime OBJECT-TYPE

SYNTAX DateAndTime

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Timestamp for when this probe result was determined."

::= { pingProbeHistoryEntry 5 }

-- Notification Definition section

pingProbeFailed NOTIFICATION-TYPE

OBJECTS {
 pingCtlTargetAddressType,
 pingCtlTargetAddress,
 pingResultsOperStatus,
 pingResultsIpTargetAddressType,
 pingResultsIpTargetAddress,
 pingResultsMinRtt,
 pingResultsMaxRtt,
 pingResultsAverageRtt,
 pingResultsProbeResponses,
 pingResultsSentProbes,
 pingResultsRttSumOfSquares,
 pingResultsLastGoodProbe
 }

STATUS current

DESCRIPTION

"Generated when a probe failure is detected, when the

corresponding pingCtlTrapGeneration object is set to probeFailure(0), subject to the value of pingCtlTrapProbeFailureFilter. The object pingCtlTrapProbeFailureFilter can be used to specify the number of consecutive probe failures that are required before this notification can be generated."

```
::= { pingNotifications 1 }
```

pingTestFailed NOTIFICATION-TYPE

```
OBJECTS {
    pingCtlTargetAddressType,
    pingCtlTargetAddress,
    pingResultsOperStatus,
    pingResultsIpTargetAddressType,
    pingResultsIpTargetAddress,
    pingResultsMinRtt,
    pingResultsMaxRtt,
    pingResultsAverageRtt,
    pingResultsProbeResponses,
    pingResultsSentProbes,
    pingResultsRttSumOfSquares,
    pingResultsLastGoodProbe
}
```

STATUS current

DESCRIPTION

"Generated when a ping test is determined to have failed, when the corresponding pingCtlTrapGeneration object is set to testFailure(1). In this instance, pingCtlTrapTestFailureFilter should specify the number of probes in a test required to have failed in order to consider the test failed."

```
::= { pingNotifications 2 }
```

pingTestCompleted NOTIFICATION-TYPE

```
OBJECTS {
    pingCtlTargetAddressType,
    pingCtlTargetAddress,
    pingResultsOperStatus,
    pingResultsIpTargetAddressType,
    pingResultsIpTargetAddress,
    pingResultsMinRtt,
    pingResultsMaxRtt,
    pingResultsAverageRtt,
    pingResultsProbeResponses,
    pingResultsSentProbes,
    pingResultsRttSumOfSquares,
    pingResultsLastGoodProbe
}
```

```
    }
    STATUS current
    DESCRIPTION
        "Generated at the completion of a ping test when the
        corresponding pingCtlTrapGeneration object has the
        testCompletion(2) bit set."
    ::= { pingNotifications 3 }

-- Conformance information

-- Compliance statements

pingCompliances OBJECT IDENTIFIER ::= { pingConformance 1 }
pingGroups      OBJECT IDENTIFIER ::= { pingConformance 2 }

-- Compliance statements

pingFullCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "The compliance statement for SNMP entities that
        fully implement the DISMAN-PING-MIB."
    MODULE -- this module
        MANDATORY-GROUPS {
            pingMinimumGroup,
            pingCtlRowStatusGroup,
            pingHistoryGroup,
            pingNotificationsGroup
        }

    OBJECT pingMaxConcurrentRequests
    MIN-ACCESS read-only
    DESCRIPTION
        "The agent is not required to support set
        operations to this object."

    OBJECT pingCtlStorageType
    MIN-ACCESS read-only
    DESCRIPTION
        "Write access is not required."

    OBJECT pingCtlType
    MIN-ACCESS read-only
    DESCRIPTION
        "Write access is not required. In addition, the only
        value that MUST be supported by an implementation is
        pingIcmpEcho."
```

OBJECT pingCtlSourceAddressType
SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2) }
MIN-ACCESS read-only
DESCRIPTION
 "Write access to this object is not required by implementations that are not capable of binding the send socket with a source address. An implementation is only required to support IPv4 and IPv6 addresses."

OBJECT pingCtlSourceAddress
SYNTAX InetAddress (SIZE(0|4|16))
MIN-ACCESS read-only

DESCRIPTION
 "Write access to this object is not required by implementations that are not capable of binding the send socket with a source address. An implementation is only required to support IPv4 and IPv6 addresses."

OBJECT pingCtlIfIndex
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required. If write access is not supported, return a 0 as the value of this object. A value of 0 means that the function represented by this option is not supported."

OBJECT pingCtlByPassRouteTable
MIN-ACCESS read-only
DESCRIPTION
 "Write access to this object is not required by implementations that are not capable of its implementation. The function represented by this object is implementable if the setsockopt SOL_SOCKET SO_DONTROUTE option is supported."

OBJECT pingCtlDSField
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required. If write access is not supported, return a 0 as the value of this object. A value of 0 means that the function represented by this option is not supported."

OBJECT pingResultsIpTargetAddressType
SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2) }
DESCRIPTION
 "An implementation is only required to

support IPv4 and IPv6 addresses."

OBJECT pingResultsIpTargetAddress

SYNTAX InetAddress (SIZE(0|4|16))

DESCRIPTION

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

OBJECT pingResultsLastGoodProbe

DESCRIPTION

"This object is mandatory for implementations that have access to a system clock and that are capable of setting the values for DateAndTime objects. It is RECOMMENDED that when this object is not supported its values be reported as '0000000000000000'H."

OBJECT pingProbeHistoryTime

DESCRIPTION

"This object is mandatory for implementations that have access to a system clock and that are capable of setting the values for DateAndTime objects. It is RECOMMENDED that when this object is not supported its values be reported as '0000000000000000'H."

::= { pingCompliances 2 }

pingMinimumCompliance MODULE-COMPLIANCE

STATUS current

DESCRIPTION

"The minimum compliance statement for SNMP entities that implement the minimal subset of the DISMAN-PING-MIB. Implementors might choose this subset for small devices with limited resources."

MODULE -- this module

MANDATORY-GROUPS { pingMinimumGroup }

GROUP pingCtlRowStatusGroup

DESCRIPTION

"A compliant implementation does not have to implement the pingCtlRowStatusGroup."

GROUP pingHistoryGroup

DESCRIPTION

"A compliant implementation does not have to implement the pingHistoryGroup."

GROUP pingNotificationsGroup

DESCRIPTION

"A compliant implementation does not have to implement

the pingNotificationsGroup."

OBJECT pingMaxConcurrentRequests

MIN-ACCESS read-only

DESCRIPTION

"The agent is not required to support set operations to this object."

OBJECT pingCtlDataFill

MIN-ACCESS read-only

DESCRIPTION

"The agent is not required to support set operations to this object."

OBJECT pingCtlFrequency

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. If write access is not supported, return a 0 as the value of this object. A value of 0 means that the function represented by this option is not supported."

OBJECT pingCtlMaxRows

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. If the pingHistoryGroup is not implemented, then write access to this object MUST be disabled, and the object MUST return a value of 0 when retrieved."

OBJECT pingCtlStorageType

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required."

OBJECT pingCtlTrapGeneration

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. If the pingNotificationsGroup is not implemented, then write access to this object MUST be disabled, and the object MUST return a value with no bit set when retrieved. No bit set indicates that not notification is generated."

OBJECT pingCtlTrapProbeFailureFilter

MIN-ACCESS read-only

DESCRIPTION

"If write access to pingCtlTrapGeneration is not supported, then write access to this object must also not be supported. In this case, return 0 as the value of this object."

OBJECT pingCtlTrapTestFailureFilter

MIN-ACCESS read-only

DESCRIPTION

"If write access to pingCtlTrapGeneration is not supported, then write access to this object must also not be supported. In this case, return 0 as the value of this object."

OBJECT pingCtlType

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. In addition, the only value that MUST be supported by an implementation is pingIcmpEcho."

OBJECT pingCtlDescr

MIN-ACCESS read-only

DESCRIPTION

"The agent is not required to support set operations to this object."

OBJECT pingCtlSourceAddressType

SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2) }

MIN-ACCESS read-only

DESCRIPTION

"Write access to this object is not required by implementations that are not capable of binding the send socket with a source address. An implementation is only required to support IPv4 and IPv6 addresses."

OBJECT pingCtlSourceAddress

SYNTAX InetAddress (SIZE(0|4|16))

MIN-ACCESS read-only

DESCRIPTION

"Write access to this object is not required by implementations that are not capable of binding the send socket with a source address. An implementation is only required to support IPv4 and IPv6 addresses."

OBJECT pingCtlIfIndex

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. If write access is

not supported, return a 0 as the value of this object.
A value of 0 means that the function represented by
this option is not supported."

OBJECT pingCtlByPassRouteTable

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. If write access is
not supported, return false(2) as the value of this
object. A value of false(2) means that the function
represented by this option is not supported."

OBJECT pingCtlDSField

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. If write access is
not supported, return a 0 as the value of this object.
A value of 0 means that the function represented by
this option is not supported."

OBJECT pingResultsIpTargetAddressType

SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2) }

DESCRIPTION

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

OBJECT pingResultsIpTargetAddress

SYNTAX InetAddress (SIZE(0|4|16))

DESCRIPTION

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

OBJECT pingResultsLastGoodProbe

DESCRIPTION

"This object is mandatory for implementations that have
access to a system clock and that are capable of setting
the values for DateAndTime objects. It is RECOMMENDED
that when this object is not supported its values
be reported as '0000000000000000'H."

OBJECT pingProbeHistoryTime

DESCRIPTION

"If the pingHistoryGroup is implemented, then this
object is mandatory for implementations that have
access to a system clock and that are capable of setting
the values for DateAndTime objects. It is RECOMMENDED
that when this object is not supported its values

be reported as '0000000000000000'H."

::= { pingCompliances 3 }

pingCompliance MODULE-COMPLIANCE

STATUS deprecated

DESCRIPTION

"The compliance statement for the DISMAN-PING-MIB. This compliance statement has been deprecated because the group pingGroup and the pingTimeStampGroup have been split and deprecated. The pingFullCompliance statement is semantically identical to the deprecated pingCompliance statement."

MODULE -- this module

MANDATORY-GROUPS {

pingGroup,
pingNotificationsGroup
}

GROUP pingTimeStampGroup

DESCRIPTION

"This group is mandatory for implementations that have access to a system clock and that are capable of setting the values for DateAndTime objects. It is RECOMMENDED that when this group is not supported the values for the objects in this group be reported as '0000000000000000'H."

OBJECT pingMaxConcurrentRequests

MIN-ACCESS read-only

DESCRIPTION

"The agent is not required to support set operations to this object."

OBJECT pingCtlStorageType

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. It is also allowed that implementations support only the volatile StorageType enumeration."

OBJECT pingCtlType

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. In addition, the only value that MUST be supported by an implementation is pingIcmpEcho."

OBJECT pingCtlByPassRouteTable

MIN-ACCESS read-only

DESCRIPTION

"This object is not required by implementations that are not capable of its implementation. The function represented by this object is implementable if the setsockopt SOL_SOCKET SO_DONTROUTE option is supported."

OBJECT pingCtlSourceAddressType

SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2) }

MIN-ACCESS read-only

DESCRIPTION

"This object is not required by implementations that are not capable of binding the send socket with a source address. An implementation is only required to support IPv4 and IPv6 addresses."

OBJECT pingCtlSourceAddress

SYNTAX InetAddress (SIZE(0|4|16))

MIN-ACCESS read-only

DESCRIPTION

"This object is not required by implementations that are not capable of binding the send socket with a source address. An implementation is only required to support IPv4 and globally unique IPv6 addresses."

OBJECT pingCtlIfIndex

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. When write access is not supported, return a 0 as the value of this object. A value of 0 means that the function represented by this option is not supported."

OBJECT pingCtlDSField

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. When write access is not supported, return a 0 as the value of this object. A value of 0 means that the function represented by this option is not supported."

OBJECT pingResultsIpTargetAddressType

SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2) }

DESCRIPTION

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

```
OBJECT pingResultsIpTargetAddress
SYNTAX InetAddress (SIZE(0|4|16))
DESCRIPTION
```

```
    "An implementation is only required to
    support IPv4 and globally unique IPv6 addresses."
 ::= { pingCompliances 1 }
```

```
-- MIB groupings
```

```
pingMinimumGroup OBJECT-GROUP
```

```
  OBJECTS {
    pingMaxConcurrentRequests,
    pingCtlTargetAddressType,
    pingCtlTargetAddress,
    pingCtlDataSize,
    pingCtlTimeOut,
    pingCtlProbeCount,
    pingCtlAdminStatus,
    pingCtlDataFill,
    pingCtlFrequency,
    pingCtlMaxRows,
    pingCtlStorageType,
    pingCtlTrapGeneration,
    pingCtlTrapProbeFailureFilter,
    pingCtlTrapTestFailureFilter,
    pingCtlType,
    pingCtlDescr,

    pingCtlByPassRouteTable,
    pingCtlSourceAddressType,
    pingCtlSourceAddress,
    pingCtlIfIndex,
    pingCtlDSField,
    pingResultsOperStatus,
    pingResultsIpTargetAddressType,
    pingResultsIpTargetAddress,
    pingResultsMinRtt,
    pingResultsMaxRtt,
    pingResultsAverageRtt,
    pingResultsProbeResponses,
    pingResultsSentProbes,
    pingResultsRttSumOfSquares,
    pingResultsLastGoodProbe
  }
```

```
STATUS current
```

```
DESCRIPTION
```

```
    "The group of objects that constitute the remote ping
    capability."
```

```
 ::= { pingGroups 4 }

pingCtlRowStatusGroup OBJECT-GROUP
  OBJECTS {
    pingCtlRowStatus
  }
  STATUS current
  DESCRIPTION
    "The RowStatus object of the pingCtlTable."
    ::= { pingGroups 5 }

pingHistoryGroup OBJECT-GROUP
  OBJECTS {
    pingProbeHistoryResponse,
    pingProbeHistoryStatus,
    pingProbeHistoryLastRC,
    pingProbeHistoryTime
  }
  STATUS current
  DESCRIPTION
    "The group of objects that constitute the history
    capability."
    ::= { pingGroups 6 }

pingNotificationsGroup NOTIFICATION-GROUP
  NOTIFICATIONS {
    pingProbeFailed,
    pingTestFailed,
    pingTestCompleted
  }

  STATUS current
  DESCRIPTION
    "The notification that are required to be supported by
    implementations of this MIB."
    ::= { pingGroups 3 }

pingGroup OBJECT-GROUP
  OBJECTS {
    pingMaxConcurrentRequests,
    pingCtlTargetAddressType,
    pingCtlTargetAddress,
    pingCtlDataSize,
    pingCtlTimeOut,
    pingCtlProbeCount,
    pingCtlAdminStatus,
    pingCtlDataFill,
    pingCtlFrequency,
```

```
        pingCtlMaxRows,
        pingCtlStorageType,
        pingCtlTrapGeneration,
        pingCtlTrapProbeFailureFilter,
        pingCtlTrapTestFailureFilter,
        pingCtlType,
        pingCtlDescr,
        pingCtlByPassRouteTable,
        pingCtlSourceAddressType,
        pingCtlSourceAddress,
        pingCtlIfIndex,
        pingCtlDSField,
        pingCtlRowStatus,
        pingResultsOperStatus,
        pingResultsIpTargetAddressType,
        pingResultsIpTargetAddress,
        pingResultsMinRtt,
        pingResultsMaxRtt,
        pingResultsAverageRtt,
        pingResultsProbeResponses,
        pingResultsSentProbes,
        pingResultsRttSumOfSquares,
        pingProbeHistoryResponse,
        pingProbeHistoryStatus,
        pingProbeHistoryLastRC
    }
    STATUS deprecated
    DESCRIPTION
        "The group of objects that constitute the remote ping
        capability."
    ::= { pingGroups 1 }

pingTimeStampGroup OBJECT-GROUP

    OBJECTS {
        pingResultsLastGoodProbe,
        pingProbeHistoryTime
    }
    STATUS deprecated
    DESCRIPTION
        "The group of DateAndTime objects."
    ::= { pingGroups 2 }

END
```

4.2. DISMAN-TRACEROUTE-MIB

DISMAN-TRACEROUTE-MIB DEFINITIONS ::= BEGIN

IMPORTS

```

MODULE-IDENTITY, OBJECT-TYPE, Integer32,
Gauge32, Unsigned32, mib-2,
NOTIFICATION-TYPE,
OBJECT-IDENTITY
    FROM SNMPv2-SMI                -- RFC2578
RowStatus, StorageType,
TruthValue, DateAndTime
    FROM SNMPv2-TC                -- RFC2579
MODULE-COMPLIANCE, OBJECT-GROUP,
NOTIFICATION-GROUP
    FROM SNMPv2-CONF              -- RFC2580
SnmpAdminString
    FROM SNMP-FRAMEWORK-MIB        -- RFC3411
InterfaceIndexOrZero
    FROM IF-MIB                   -- RFC2863
InetAddressType, InetAddress
    FROM INET-ADDRESS-MIB         -- RFC4001
OperationResponseStatus
    FROM DISMAN-PING-MIB;         -- RFC4560

```

traceRouteMIB MODULE-IDENTITY

```

LAST-UPDATED "200606130000Z"      -- 13 June 2006
ORGANIZATION "IETF Distributed Management Working Group"
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```

```

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```

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```

DESCRIPTION

"The Traceroute MIB (DISMAN-TRACEROUTE-MIB) provides access to the traceroute capability at a remote host.

Copyright (C) The Internet Society (2006). This version of this MIB module is part of RFC 4560; see the RFC itself for full legal notices."

-- Revision history

REVISION "200606130000Z" -- 13 June 2006

DESCRIPTION

"Updated version, published as RFC 4560.

- Correctly considered IPv6 in DESCRIPTION clause of object traceRouteCtlDataSize
- Replaced references to RFC 2575 by RFC 3415
- Replaced references to RFC 2571 by RFC 3411
- Replaced references to RFC 2851 by RFC 4001
- Clarified DESCRIPTION clause of object traceRouteResultsLastGoodPath
- Changed range of object traceRouteCtlInitialTtl from (0..255) to (1..255)
- Extended DESCRIPTION clause of traceRouteResultsTable describing re-initialization of entries
- Changed SYNTAX of traceRouteResultsTestAttempts and traceRouteResultsTestSuccesses from Unsigned32 to Gauge32
- Changed status of traceRouteCompliance to deprecated
- Added traceRouteFullCompliance and traceRouteMinimumCompliance
- Changed status of traceRouteGroup and traceRouteTimeStampGroup to deprecated
- Added traceRouteMinimumGroup, traceRouteCtlRowStatusGroup, and traceRouteHistoryGroup
- Changed DEFVAL of object traceRouteCtlTargetAddressType from { ipv4 } to { unknown }
- Changed DEFVAL of object traceRouteCtlDescr from { '00'H } to { ''H }
- Added DEFVAL for object traceRouteCtlTrapGeneration of DEFVAL { { } }

REVISION "200009210000Z" -- 21 September 2000

DESCRIPTION

"Initial version, published as RFC 2925."

::= { mib-2 81 }

-- Top level structure of the MIB

```
traceRouteNotifications OBJECT IDENTIFIER ::= { traceRouteMIB 0 }
traceRouteObjects       OBJECT IDENTIFIER ::= { traceRouteMIB 1 }
traceRouteConformance   OBJECT IDENTIFIER ::= { traceRouteMIB 2 }
```

-- The registration node (point) for traceroute implementation types

```
traceRouteImplementationTypeDomains OBJECT IDENTIFIER
::= { traceRouteMIB 3 }
```

```

traceRouteUsingUdpProbes OBJECT-IDENTITY
    STATUS      current
    DESCRIPTION
        "Indicates that an implementation is using UDP probes to
        perform the traceroute operation."
    ::= { traceRouteImplementationTypeDomains 1 }

```

-- Simple Object Definitions

```

traceRouteMaxConcurrentRequests OBJECT-TYPE
    SYNTAX      Unsigned32
    UNITS       "requests"
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "The maximum number of concurrent active traceroute requests
        that are allowed within an agent implementation. A value
        of 0 for this object implies that there is no limit for
        the number of concurrent active requests in effect.

        The limit applies only to new requests being activated.
        When a new value is set, the agent will continue processing
        all the requests already active, even if their number
        exceeds the limit just imposed."
    DEFVAL { 10 }
    ::= { traceRouteObjects 1 }

```

-- Traceroute Control Table

```

traceRouteCtlTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF TraceRouteCtlEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Defines the Remote Operations Traceroute Control Table for
        providing the capability of invoking traceroute from a remote
        host. The results of traceroute operations can be stored in
        the traceRouteResultsTable, traceRouteProbeHistoryTable, and
        the traceRouteHopsTable."
    ::= { traceRouteObjects 2 }

```

```

traceRouteCtlEntry OBJECT-TYPE
    SYNTAX      TraceRouteCtlEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION

```

"Defines an entry in the traceRouteCtlTable. The first index element, traceRouteCtlOwnerIndex, is of type SnmpAdminString, a textual convention that allows for use of the SNMPv3 View-Based Access Control Model (RFC 3415, VACM) and that allows a management application to identify its entries. The second index, traceRouteCtlTestName (also an SnmpAdminString), enables the same management application to have multiple requests outstanding."

```
INDEX {
    traceRouteCtlOwnerIndex,
    traceRouteCtlTestName
}
::= { traceRouteCtlTable 1 }
```

TraceRouteCtlEntry ::=

```
SEQUENCE {
    traceRouteCtlOwnerIndex      SnmpAdminString,
    traceRouteCtlTestName        SnmpAdminString,
    traceRouteCtlTargetAddressType InetAddressType,
    traceRouteCtlTargetAddress   InetAddress,
    traceRouteCtlByPassRouteTable TruthValue,
    traceRouteCtlDataSize        Unsigned32,
    traceRouteCtlTimeOut         Unsigned32,
    traceRouteCtlProbesPerHop    Unsigned32,
    traceRouteCtlPort            Unsigned32,
    traceRouteCtlMaxTtl          Unsigned32,
    traceRouteCtlDSField         Unsigned32,
    traceRouteCtlSourceAddressType InetAddressType,
    traceRouteCtlSourceAddress   InetAddress,
    traceRouteCtlIfIndex         InterfaceIndexOrZero,
    traceRouteCtlMiscOptions     SnmpAdminString,
    traceRouteCtlMaxFailures     Unsigned32,
    traceRouteCtlDontFragment    TruthValue,
    traceRouteCtlInitialTtl      Unsigned32,
    traceRouteCtlFrequency       Unsigned32,
    traceRouteCtlStorageType     StorageType,
    traceRouteCtlAdminStatus     INTEGER,
    traceRouteCtlDescr           SnmpAdminString,
    traceRouteCtlMaxRows         Unsigned32,
    traceRouteCtlTrapGeneration  BITS,
    traceRouteCtlCreateHopsEntries TruthValue,
    traceRouteCtlType            OBJECT IDENTIFIER,
    traceRouteCtlRowStatus       RowStatus
}
```

traceRouteCtlOwnerIndex OBJECT-TYPE

```
SYNTAX      SnmpAdminString (SIZE(0..32))
```

MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION

"To facilitate the provisioning of access control by a security administrator using the View-Based Access Control Model (RFC 3415, VACM) for tables in which multiple users may need to create or modify entries independently, the initial index is used as an 'owner index'. Such an initial index has a syntax of SnmpAdminString and can thus be trivially mapped to a securityName or groupName defined in VACM, in accordance with a security policy.

When used in conjunction with such a security policy, all entries in the table belonging to a particular user (or group) will have the same value for this initial index. For a given user's entries in a particular table, the object identifiers for the information in these entries will have the same subidentifiers (except for the 'column' subidentifier) up to the end of the encoded owner index. To configure VACM to permit access to this portion of the table, one would create vacmViewTreeFamilyTable entries with the value of vacmViewTreeFamilySubtree including the owner index portion, and vacmViewTreeFamilyMask 'wildcarding' the column subidentifier. More elaborate configurations are possible."

::= { traceRouteCtlEntry 1 }

traceRouteCtlTestName OBJECT-TYPE

SYNTAX SnmpAdminString (SIZE(0..32))
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION

"The name of a traceroute test. This is locally unique, within the scope of a traceRouteCtlOwnerIndex."

::= { traceRouteCtlEntry 2 }

traceRouteCtlTargetAddressType OBJECT-TYPE

SYNTAX InetAddressType
 MAX-ACCESS read-create
 STATUS current
 DESCRIPTION

"Specifies the type of host address to be used on the traceroute request at the remote host."

DEFVAL { unknown }

::= { traceRouteCtlEntry 3 }

`traceRouteCtlTargetAddress OBJECT-TYPE``SYNTAX InetAddress``MAX-ACCESS read-create``STATUS current``DESCRIPTION`

"Specifies the host address used on the traceroute request at the remote host. The host address type can be determined by examining the value of the corresponding traceRouteCtlTargetAddressType.

A value for this object MUST be set prior to transitioning its corresponding traceRouteCtlEntry to active(1) via traceRouteCtlRowStatus."

`::= { traceRouteCtlEntry 4 }``traceRouteCtlByPassRouteTable OBJECT-TYPE``SYNTAX TruthValue``MAX-ACCESS read-create``STATUS current``DESCRIPTION`

"The purpose of this object is to enable optional bypassing the route table. If enabled, the remote host will bypass the normal routing tables and send directly to a host on an attached network. If the host is not on a directly attached network, an error is returned. This option can be used to perform the traceroute operation to a local host through an interface that has no route defined (e.g., after the interface was dropped by the routing daemon at the host)."

`DEFVAL { false }``::= { traceRouteCtlEntry 5 }``traceRouteCtlDataSize OBJECT-TYPE``SYNTAX Unsigned32 (0..65507)``UNITS "octets"``MAX-ACCESS read-create``STATUS current``DESCRIPTION`

"Specifies the size of the data portion of a traceroute request, in octets. If the RECOMMENDED traceroute method (UDP datagrams as probes) is used, then the value contained in this object MUST be applied. If another traceroute method is used for which the specified size is not appropriate, then the implementation SHOULD use whatever size (appropriate to the method) is closest to the specified size.

The maximum value for this object was computed by subtracting the smallest possible IP header size of 20 octets (IPv4 header with no options) and the UDP header size of 8 octets from the maximum IP packet size. An IP packet has a maximum size of 65535 octets (excluding IPv6 Jumbograms)."

DEFVAL { 0 }

::= { traceRouteCtlEntry 6 }

traceRouteCtlTimeOut OBJECT-TYPE

SYNTAX Unsigned32 (1..60)

UNITS "seconds"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Specifies the time-out value, in seconds, for a traceroute request."

DEFVAL { 3 }

::= { traceRouteCtlEntry 7 }

traceRouteCtlProbesPerHop OBJECT-TYPE

SYNTAX Unsigned32 (1..10)

UNITS "probes"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Specifies the number of times to reissue a traceroute request with the same time-to-live (TTL) value."

DEFVAL { 3 }

::= { traceRouteCtlEntry 8 }

traceRouteCtlPort OBJECT-TYPE

SYNTAX Unsigned32 (1..65535)

UNITS "UDP Port"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Specifies the (initial) UDP port to send the traceroute request to. A port needs to be specified that is not in use at the destination (target) host. The default value for this object is the IANA assigned port, 33434, for the traceroute function."

DEFVAL { 33434 }

::= { traceRouteCtlEntry 9 }

traceRouteCtlMaxTtl OBJECT-TYPE

SYNTAX Unsigned32 (1..255)

UNITS "time-to-live value"

MAX-ACCESS read-create
STATUS current
DESCRIPTION
 "Specifies the maximum time-to-live value."
DEFVAL { 30 }
::= { traceRouteCtlEntry 10 }

traceRouteCtlDSField OBJECT-TYPE
SYNTAX Unsigned32 (0..255)
MAX-ACCESS read-create
STATUS current

DESCRIPTION
 "Specifies the value to store in the Type of Service (TOS) octet in the IPv4 header or in the Traffic Class octet in the IPv6 header, respectively, of the IP packet used to encapsulate the traceroute probe.

 The octet to be set in the IP header contains the Differentiated Services (DS) Field in the six most significant bits.

 This option can be used to determine what effect an explicit DS Field setting has on a traceroute response. Not all values are legal or meaningful. A value of 0 means that the function represented by this option is not supported. DS Field usage is often not supported by IP implementations, and not all values are supported. Refer to RFC 2474 and RFC 3260 for guidance on usage of this field."

REFERENCE
 "Refer to RFC 1812 for the definition of the IPv4 TOS octet and to RFC 2460 for the definition of the IPv6 Traffic Class octet. Refer to RFC 2474 and RFC 3260 for the definition of the Differentiated Services Field."
DEFVAL { 0 }
::= { traceRouteCtlEntry 11 }

traceRouteCtlSourceAddressType OBJECT-TYPE
SYNTAX InetAddressType
MAX-ACCESS read-create
STATUS current
DESCRIPTION
 "Specifies the type of the source address, traceRouteCtlSourceAddress, to be used at a remote host when a traceroute operation is performed."
DEFVAL { unknown }
::= { traceRouteCtlEntry 12 }

traceRouteCtlSourceAddress OBJECT-TYPE

SYNTAX InetAddress

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Use the specified IP address (which must be given as an IP number, not a hostname) as the source address in outgoing probe packets. On hosts with more than one IP address, this option can be used to select the address to be used. If the IP address is not one of this machine's interface addresses, an error is returned, and nothing is sent. A zero-length octet string value for this object disables source address specification. The address type (InetAddressType) that relates to this object is specified by the corresponding value of traceRouteCtlSourceAddressType."

DEFVAL { ''H }

::= { traceRouteCtlEntry 13 }

traceRouteCtlIfIndex OBJECT-TYPE

SYNTAX InterfaceIndexOrZero

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Setting this object to an interface's ifIndex prior to starting a remote traceroute operation directs the traceroute probes to be transmitted over the specified interface. A value of zero for this object implies that this option is not enabled."

DEFVAL { 0 }

::= { traceRouteCtlEntry 14 }

traceRouteCtlMiscOptions OBJECT-TYPE

SYNTAX SnmpAdminString

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Enables an application to specify implementation-dependent options."

DEFVAL { ''H }

::= { traceRouteCtlEntry 15 }

traceRouteCtlMaxFailures OBJECT-TYPE

SYNTAX Unsigned32 (0..255)

UNITS "timeouts"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The value of this object indicates the maximum number of consecutive timeouts allowed before a remote traceroute request is terminated. A value of either 255 (maximum hop count/possible TTL value) or 0 indicates that the function of terminating a remote traceroute request when a specific number of consecutive timeouts are detected is disabled."

DEFVAL { 5 }

::= { traceRouteCtlEntry 16 }

traceRouteCtlDontFragment OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object enables setting of the don't fragment flag (DF) in the IP header for a probe. Use of this object enables a manual PATH MTU test is performed."

DEFVAL { false }

::= { traceRouteCtlEntry 17 }

traceRouteCtlInitialTtl OBJECT-TYPE

SYNTAX Unsigned32 (1..255)

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The value of this object specifies the initial TTL value to use. This enables bypassing the initial (often well known) portion of a path."

DEFVAL { 1 }

::= { traceRouteCtlEntry 18 }

traceRouteCtlFrequency OBJECT-TYPE

SYNTAX Unsigned32

UNITS "seconds"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The number of seconds to wait before repeating a traceroute test, as defined by the value of the various objects in the corresponding row.

After a single test is completed the number of seconds as defined by the value of traceRouteCtlFrequency MUST elapse before the next traceroute test is started.

A value of 0 for this object implies that the test as defined by the corresponding entry will not be

```

        repeated."
    DEFVAL { 0 }
    ::= { traceRouteCtlEntry 19 }

traceRouteCtlStorageType OBJECT-TYPE
    SYNTAX      StorageType
    MAX-ACCESS   read-create
    STATUS      current
    DESCRIPTION
        "The storage type for this conceptual row.
        Conceptual rows having the value 'permanent' need not
        allow write-access to any columnar objects in the row."
    DEFVAL { nonVolatile }
    ::= { traceRouteCtlEntry 20 }

traceRouteCtlAdminStatus OBJECT-TYPE
    SYNTAX      INTEGER {
                                enabled(1), -- operation should be started
                                disabled(2) -- operation should be stopped
                            }
    MAX-ACCESS   read-create
    STATUS      current
    DESCRIPTION
        "Reflects the desired state that an traceRouteCtlEntry
        should be in:

            enabled(1) - Attempt to activate the test as defined by
                        this traceRouteCtlEntry.
            disabled(2) - Deactivate the test as defined by this
                        traceRouteCtlEntry.

        Refer to the corresponding traceRouteResultsOperStatus to
        determine the operational state of the test defined by
        this entry."
    DEFVAL { disabled }
    ::= { traceRouteCtlEntry 21 }

traceRouteCtlDescr OBJECT-TYPE
    SYNTAX      SnmpAdminString
    MAX-ACCESS   read-create
    STATUS      current
    DESCRIPTION
        "The purpose of this object is to provide a
        descriptive name of the remote traceroute
        test."
    DEFVAL { ''H }
    ::= { traceRouteCtlEntry 22 }

```

traceRouteCtlMaxRows OBJECT-TYPE

SYNTAX Unsigned32

UNITS "rows"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The maximum number of corresponding entries allowed in the traceRouteProbeHistoryTable. An implementation of this MIB will remove the oldest corresponding entry in the traceRouteProbeHistoryTable to allow the addition of a new entry once the number of corresponding rows in the traceRouteProbeHistoryTable reaches this value.

Old entries are not removed when a new test is started. Entries are added to the traceRouteProbeHistoryTable until traceRouteCtlMaxRows is reached before entries begin to be removed. A value of 0 for this object disables creation of traceRouteProbeHistoryTable entries."

DEFVAL { 50 }

::= { traceRouteCtlEntry 23 }

traceRouteCtlTrapGeneration OBJECT-TYPE

SYNTAX BITS {
 pathChange(0),
 testFailure(1),
 testCompletion(2)
}

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The value of this object determines when and whether to generate a notification for this entry:

pathChange(0) - Generate a traceRoutePathChange notification when the current path varies from a previously determined path.

testFailure(1) - Generate a traceRouteTestFailed notification when the full path to a target can't be determined.

testCompletion(2) - Generate a traceRouteTestCompleted notification when the path to a target has been determined.

The value of this object defaults to an empty set, indicating that none of the above options has been selected."

```

DEFVAL { { } }
::= { traceRouteCtlEntry 24 }

```

traceRouteCtlCreateHopsEntries OBJECT-TYPE

```

SYNTAX      TruthValue
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "The current path for a traceroute test is kept in the
    traceRouteHopsTable on a per-hop basis when the value of
    this object is true(1)."
```

```

DEFVAL { false }
::= { traceRouteCtlEntry 25 }

```

traceRouteCtlType OBJECT-TYPE

```

SYNTAX      OBJECT IDENTIFIER
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "The value of this object is used either to report or to
    select the implementation method to be used for
    performing a traceroute operation. The value of this
    object may be selected from
    traceRouteImplementationTypeDomains."
```

Additional implementation types should be allocated as required by implementers of the DISMAN-TRACEROUTE-MIB under their enterprise specific registration point, not beneath traceRouteImplementationTypeDomains."

```

DEFVAL { traceRouteUsingUdpProbes }
::= { traceRouteCtlEntry 26 }

```

traceRouteCtlRowStatus OBJECT-TYPE

```

SYNTAX      RowStatus
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "This object allows entries to be created and deleted
    in the traceRouteCtlTable. Deletion of an entry in
    this table results in a deletion of all corresponding (same
    traceRouteCtlOwnerIndex and traceRouteCtlTestName
    index values) traceRouteResultsTable,
    traceRouteProbeHistoryTable, and traceRouteHopsTable
    entries."
```

A value MUST be specified for traceRouteCtlTargetAddress prior to acceptance of a transition to active(1) state.

When a value for pingCtlTargetAddress is set, the value of object pingCtlRowStatus changes from notReady(3) to notInService(2).

Activation of a remote traceroute operation is controlled via traceRouteCtlAdminStatus, and not by transitioning of this object's value to active(1).

Transitions in and out of active(1) state are not allowed while an entry's traceRouteResultsOperStatus is active(1), with the exception that deletion of an entry in this table by setting its RowStatus object to destroy(6) will stop an active traceroute operation.

The operational state of an traceroute operation can be determined by examination of the corresponding traceRouteResultsOperStatus object."

REFERENCE

"See definition of RowStatus in RFC 2579, 'Textual Conventions for SMIV2.'"

::= { traceRouteCtlEntry 27 }

-- Traceroute Results Table

traceRouteResultsTable OBJECT-TYPE

SYNTAX SEQUENCE OF TraceRouteResultsEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Defines the Remote Operations Traceroute Results Table for keeping track of the status of a traceRouteCtlEntry.

An entry is added to the traceRouteResultsTable when an traceRouteCtlEntry is started by successful transition of its traceRouteCtlAdminStatus object to enabled(1).

If the object traceRouteCtlAdminStatus already has the value enabled(1), and if the corresponding traceRouteResultsOperStatus object has the value completed(3), then successfully writing enabled(1) to the object traceRouteCtlAdminStatus re-initializes the already existing entry in the traceRouteResultsTable. The values of objects in the re-initialized entry are the same as the values of objects in a new entry would be.

An entry is removed from the traceRouteResultsTable when

its corresponding traceRouteCtlEntry is deleted."
 ::= { traceRouteObjects 3 }

traceRouteResultsEntry OBJECT-TYPE

SYNTAX TraceRouteResultsEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Defines an entry in the traceRouteResultsTable. The traceRouteResultsTable has the same indexing as the traceRouteCtlTable so that a traceRouteResultsEntry corresponds to the traceRouteCtlEntry that caused it to be created."

INDEX {
 traceRouteCtlOwnerIndex,
 traceRouteCtlTestName
 }
 ::= { traceRouteResultsTable 1 }

TraceRouteResultsEntry ::=

SEQUENCE {
 traceRouteResultsOperStatus INTEGER,
 traceRouteResultsCurHopCount Gauge32,
 traceRouteResultsCurProbeCount Gauge32,
 traceRouteResultsIpTgtAddrType InetAddressType,
 traceRouteResultsIpTgtAddr InetAddress,
 traceRouteResultsTestAttempts Gauge32,
 traceRouteResultsTestSuccesses Gauge32,
 traceRouteResultsLastGoodPath DateAndTime
 }

traceRouteResultsOperStatus OBJECT-TYPE

SYNTAX INTEGER {
 enabled(1), -- test is in progress
 disabled(2), -- test has stopped
 completed(3) -- test is completed
 }

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Reflects the operational state of an traceRouteCtlEntry:

 enabled(1) - Test is active.
 disabled(2) - Test has stopped.
 completed(3) - Test is completed."

::= { traceRouteResultsEntry 1 }

traceRouteResultsCurHopCount OBJECT-TYPE

SYNTAX Gauge32
UNITS "hops"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "Reflects the current TTL value (from 1 to
 255) for a remote traceroute operation.
 Maximum TTL value is determined by
 traceRouteCtlMaxTtl."
::= { traceRouteResultsEntry 2 }

traceRouteResultsCurProbeCount OBJECT-TYPE
SYNTAX Gauge32
UNITS "probes"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "Reflects the current probe count (1..10) for
 a remote traceroute operation. The maximum
 probe count is determined by
 traceRouteCtlProbesPerHop."
::= { traceRouteResultsEntry 3 }

traceRouteResultsIpTgtAddrType OBJECT-TYPE
SYNTAX InetAddressType

MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "This object indicates the type of address stored
 in the corresponding traceRouteResultsIpTgtAddr
 object."
::= { traceRouteResultsEntry 4 }

traceRouteResultsIpTgtAddr OBJECT-TYPE
SYNTAX InetAddress
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "This object reports the IP address associated
 with a traceRouteCtlTargetAddress value when the
 destination address is specified as a DNS name.
 The value of this object should be a zero-length
 octet string when a DNS name is not specified or
 when a specified DNS name fails to resolve."
::= { traceRouteResultsEntry 5 }

traceRouteResultsTestAttempts OBJECT-TYPE

```

SYNTAX      Gauge32
UNITS       "tests"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The current number of attempts to determine a path
    to a target.  The value of this object MUST be started
    at 0."
 ::= { traceRouteResultsEntry 6 }

```

traceRouteResultsTestSuccesses OBJECT-TYPE

```

SYNTAX      Gauge32
UNITS       "tests"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The current number of attempts to determine a path
    to a target that have succeeded.  The value of this
    object MUST be reported as 0 when no attempts have
    succeeded."
 ::= { traceRouteResultsEntry 7 }

```

traceRouteResultsLastGoodPath OBJECT-TYPE

```

SYNTAX      DateAndTime
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The date and time when the last complete path
    was determined.  A path is complete if responses
    were received or timeout occurred for each hop on
    the path; i.e., for each TTL value from the value
    of the corresponding traceRouteCtlInitialTtl object
    up to the end of the path or (if no reply from the
    target IP address was received) up to the value of
    the corresponding traceRouteCtlMaxTtl object."
 ::= { traceRouteResultsEntry 8 }

```

-- Trace Route Probe History Table

traceRouteProbeHistoryTable OBJECT-TYPE

```

SYNTAX      SEQUENCE OF TraceRouteProbeHistoryEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "Defines the Remote Operations Traceroute Results Table
    for storing the results of a traceroute operation."

```

An implementation of this MIB will remove the oldest

entry in the traceRouteProbeHistoryTable of the corresponding entry in the traceRouteCtlTable to allow the addition of a new entry once the number of rows in the traceRouteProbeHistoryTable reaches the value specified by traceRouteCtlMaxRows for the corresponding entry in the traceRouteCtlTable."

```
 ::= { traceRouteObjects 4 }
```

traceRouteProbeHistoryEntry OBJECT-TYPE

```
SYNTAX      TraceRouteProbeHistoryEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "Defines a table for storing the results of a traceroute
    operation. Entries in this table are limited by
    the value of the corresponding traceRouteCtlMaxRows
    object.
```

The first two index elements identify the traceRouteCtlEntry that a traceRouteProbeHistoryEntry belongs to. The third index element selects a single traceroute operation result. The fourth and fifth indexes select the hop and the probe for a particular traceroute operation."

```
INDEX {
    traceRouteCtlOwnerIndex,
    traceRouteCtlTestName,
    traceRouteProbeHistoryIndex,
    traceRouteProbeHistoryHopIndex,
    traceRouteProbeHistoryProbeIndex
}
```

```
 ::= { traceRouteProbeHistoryTable 1 }
```

TraceRouteProbeHistoryEntry ::=

```
SEQUENCE {
    traceRouteProbeHistoryIndex      Unsigned32,
    traceRouteProbeHistoryHopIndex   Unsigned32,
    traceRouteProbeHistoryProbeIndex Unsigned32,
    traceRouteProbeHistoryHAddrType  InetAddressType,
    traceRouteProbeHistoryHAddr      InetAddress,
    traceRouteProbeHistoryResponse   Unsigned32,
    traceRouteProbeHistoryStatus      OperationResponseStatus,
    traceRouteProbeHistoryLastRC      Integer32,
    traceRouteProbeHistoryTime        DateAndTime
}
```

traceRouteProbeHistoryIndex OBJECT-TYPE

SYNTAX Unsigned32 (1..'ffffffff'h)
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "An entry in this table is created when the result of a traceroute probe is determined. The initial 2 instance identifier index values identify the traceRouteCtlEntry that a probe result (traceRouteProbeHistoryEntry) belongs to. An entry is removed from this table when its corresponding traceRouteCtlEntry is deleted.

An implementation MUST start assigning traceRouteProbeHistoryIndex values at 1 and wrap after exceeding the maximum possible value, as defined by the limit of this object ('ffffffff'h')."

::= { traceRouteProbeHistoryEntry 1 }

traceRouteProbeHistoryHopIndex OBJECT-TYPE

SYNTAX Unsigned32 (1..255)
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "Indicates which hop in a traceroute path the probe's results are for. The value of this object is initially determined by the value of traceRouteCtlInitialTtl."
 ::= { traceRouteProbeHistoryEntry 2 }

traceRouteProbeHistoryProbeIndex OBJECT-TYPE

SYNTAX Unsigned32 (1..10)
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "Indicates the index of a probe for a particular hop in a traceroute path. The number of probes per hop is determined by the value of the corresponding traceRouteCtlProbesPerHop object."
 ::= { traceRouteProbeHistoryEntry 3 }

traceRouteProbeHistoryHAddrType OBJECT-TYPE

SYNTAX InetAddressType
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "This objects indicates the type of address stored in the corresponding traceRouteProbeHistoryHAddr object."
 ::= { traceRouteProbeHistoryEntry 4 }

`traceRouteProbeHistoryHAddr OBJECT-TYPE``SYNTAX InetAddress``MAX-ACCESS read-only``STATUS current``DESCRIPTION`

"The address of a hop in a traceroute path. This object is not allowed to be a DNS name. The value of the corresponding object, `traceRouteProbeHistoryHAddrType`, indicates this object's IP address type."

`::= { traceRouteProbeHistoryEntry 5 }``traceRouteProbeHistoryResponse OBJECT-TYPE``SYNTAX Unsigned32``UNITS "milliseconds"``MAX-ACCESS read-only``STATUS current``DESCRIPTION`

"The amount of time measured in milliseconds from when a probe was sent to when its response was received or when it timed out. The value of this object is reported as 0 when it is not possible to transmit a probe."

`::= { traceRouteProbeHistoryEntry 6 }``traceRouteProbeHistoryStatus OBJECT-TYPE``SYNTAX OperationResponseStatus``MAX-ACCESS read-only``STATUS current``DESCRIPTION`

"The result of a traceroute operation made by a remote host for a particular probe."

`::= { traceRouteProbeHistoryEntry 7 }``traceRouteProbeHistoryLastRC OBJECT-TYPE``SYNTAX Integer32``MAX-ACCESS read-only``STATUS current``DESCRIPTION`

"The last implementation-method-specific reply code received.

Traceroute is usually implemented by transmitting a series of probe packets with increasing time-to-live values. A probe packet is a UDP datagram encapsulated into an IP packet. Each hop in a path to the target (destination) host rejects the probe packets (probe's TTL too small, ICMP reply) until either the maximum TTL is exceeded or the target host is received."

`::= { traceRouteProbeHistoryEntry 8 }`

```

traceRouteProbeHistoryTime OBJECT-TYPE
    SYNTAX      DateAndTime
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Timestamp for when this probe's results were determined."
    ::= { traceRouteProbeHistoryEntry 9 }

-- Traceroute Hop Results Table

traceRouteHopsTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF TraceRouteHopsEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Defines the Remote Operations Traceroute Hop Table for
         keeping track of the results of traceroute tests on a
         per-hop basis."
    ::= { traceRouteObjects 5 }

traceRouteHopsEntry OBJECT-TYPE
    SYNTAX      TraceRouteHopsEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Defines an entry in the traceRouteHopsTable.
         The first two index elements identify the
         traceRouteCtlEntry that a traceRouteHopsEntry
         belongs to. The third index element,
         traceRouteHopsHopIndex, selects a
         hop in a traceroute path."
    INDEX {
        traceRouteCtlOwnerIndex,
        traceRouteCtlTestName,
        traceRouteHopsHopIndex
    }

    ::= { traceRouteHopsTable 1 }

TraceRouteHopsEntry ::=
    SEQUENCE {
        traceRouteHopsHopIndex          Unsigned32,
        traceRouteHopsIpTgtAddressType  InetAddressType,
        traceRouteHopsIpTgtAddress      InetAddress,
        traceRouteHopsMinRtt            Unsigned32,
        traceRouteHopsMaxRtt            Unsigned32,
        traceRouteHopsAverageRtt        Unsigned32,
        traceRouteHopsRttSumOfSquares   Unsigned32,

```

```

        traceRouteHopsSentProbes      Unsigned32,
        traceRouteHopsProbeResponses  Unsigned32,
        traceRouteHopsLastGoodProbe   DateAndTime
    }

```

traceRouteHopsHopIndex OBJECT-TYPE

```

SYNTAX      Unsigned32 (1..'ffffffff'h)
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION

```

"Specifies the hop index for a traceroute hop. Values for this object with respect to the same traceRouteCtlOwnerIndex and traceRouteCtlTestName MUST start at 1 and be given increasing values for subsequent hops. The value of traceRouteHopsHopIndex is not necessarily the number of the hop on the traced path.

The traceRouteHopsTable keeps the current traceroute path per traceRouteCtlEntry if enabled by setting the corresponding traceRouteCtlCreateHopsEntries to true(1).

All hops (traceRouteHopsTable entries) in a traceroute path MUST be updated at the same time when a traceroute operation is completed. Care needs to be applied when a path either changes or can't be determined. The initial portion of the path, up to the first hop change, MUST retain the same traceRouteHopsHopIndex values. The remaining portion of the path SHOULD be assigned new traceRouteHopsHopIndex values."

```
 ::= { traceRouteHopsEntry 1 }
```

traceRouteHopsIpTgtAddressType OBJECT-TYPE

```

SYNTAX      InetAddressType
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION

```

"This object indicates the type of address stored in the corresponding traceRouteHopsIpTgtAddress object."

```
 ::= { traceRouteHopsEntry 2 }
```

traceRouteHopsIpTgtAddress OBJECT-TYPE

```

SYNTAX      InetAddress
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION

```

"This object reports the IP address associated with

the hop. A value for this object should be reported as a numeric IP address, not as a DNS name.

The address type (InetAddressType) that relates to this object is specified by the corresponding value of pingCtlSourceAddressType."

::= { traceRouteHopsEntry 3 }

traceRouteHopsMinRtt OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The minimum traceroute round-trip-time (RTT) received for this hop. A value of 0 for this object implies that no RTT has been received."

::= { traceRouteHopsEntry 4 }

traceRouteHopsMaxRtt OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The maximum traceroute round-trip-time (RTT) received for this hop. A value of 0 for this object implies that no RTT has been received."

::= { traceRouteHopsEntry 5 }

traceRouteHopsAverageRtt OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The current average traceroute round-trip-time (RTT) for this hop."

::= { traceRouteHopsEntry 6 }

traceRouteHopsRttSumOfSquares OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object contains the sum of the squares of all round-trip-times received for this hop. Its purpose is to enable standard deviation calculation."

::= { traceRouteHopsEntry 7 }

traceRouteHopsSentProbes OBJECT-TYPE

```

SYNTAX      Unsigned32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION

```

"The value of this object reflects the number of probes sent for this hop during this traceroute test. The value of this object should start at 0."

```
 ::= { traceRouteHopsEntry 8 }
```

```
traceRouteHopsProbeResponses OBJECT-TYPE
```

```

SYNTAX      Unsigned32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION

```

"Number of responses received for this hop during this traceroute test. This value of this object should start at 0."

```
 ::= { traceRouteHopsEntry 9 }
```

```
traceRouteHopsLastGoodProbe OBJECT-TYPE
```

```

SYNTAX      DateAndTime
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION

```

"Date and time at which the last response was received for a probe for this hop during this traceroute test."

```
 ::= { traceRouteHopsEntry 10 }
```

```
-- Notification Definition section
```

```
traceRoutePathChange NOTIFICATION-TYPE
```

```

OBJECTS {
    traceRouteCtlTargetAddressType,
    traceRouteCtlTargetAddress,
    traceRouteResultsIpTgtAddrType,
    traceRouteResultsIpTgtAddr
}

```

```
STATUS current
```

```
DESCRIPTION
```

"The path to a target has changed."

```
 ::= { traceRouteNotifications 1 }
```

```
traceRouteTestFailed NOTIFICATION-TYPE
```

```

OBJECTS {
    traceRouteCtlTargetAddressType,
    traceRouteCtlTargetAddress,
    traceRouteResultsIpTgtAddrType,
    traceRouteResultsIpTgtAddr
}

```

```

    }
    STATUS current
    DESCRIPTION
        "Could not determine the path to a target."
    ::= { traceRouteNotifications 2 }

traceRouteTestCompleted NOTIFICATION-TYPE
    OBJECTS {
        traceRouteCtlTargetAddressType,
        traceRouteCtlTargetAddress,
        traceRouteResultsIpTgtAddrType,
        traceRouteResultsIpTgtAddr
    }
    STATUS current
    DESCRIPTION
        "The path to a target has just been determined."
    ::= { traceRouteNotifications 3 }

-- Conformance information
-- Compliance statements

traceRouteCompliances OBJECT IDENTIFIER
    ::= { traceRouteConformance 1 }
traceRouteGroups      OBJECT IDENTIFIER
    ::= { traceRouteConformance 2 }

-- Compliance statements

traceRouteFullCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "The compliance statement for SNMP entities that
        fully implement the DISMAN-TRACEROUTE-MIB."
    MODULE -- this module
        MANDATORY-GROUPS {
            traceRouteMinimumGroup,
            traceRouteCtlRowStatusGroup,
            traceRouteHistoryGroup
        }

    GROUP traceRouteHopsTableGroup
    DESCRIPTION
        "This group lists the objects that make up a
        traceRouteHopsEntry. Support of the traceRouteHopsTable
        is optional."

    GROUP traceRouteNotificationsGroup
    DESCRIPTION

```

"This group defines a collection of optional notifications."

OBJECT traceRouteMaxConcurrentRequests

MIN-ACCESS read-only

DESCRIPTION

"The agent is not required to support SET operations to this object."

OBJECT traceRouteCtlByPassRouteTable

MIN-ACCESS read-only

DESCRIPTION

"Write access to this object is not required by implementations that are not capable of its implementation. The function represented by this object is implementable if the setsockopt SOL_SOCKET SO_DONTROUTE option is supported."

OBJECT traceRouteCtlDSField

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. If write access is not supported, return a 0 as the value of this object. A value of 0 implies that the function represented by this option is not supported."

OBJECT traceRouteCtlSourceAddressType

SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2) }

MIN-ACCESS read-only

DESCRIPTION

"Write access to this object is not required by implementations that are not capable of binding the send socket with a source address. An implementation is only required to support IPv4 and IPv6 addresses."

OBJECT traceRouteCtlSourceAddress

SYNTAX InetAddress (SIZE(0|4|16))

MIN-ACCESS read-only

DESCRIPTION

"Write access to this object is not required by implementations that are not capable of binding the send socket with a source address. An implementation is only required to support IPv4 and IPv6 addresses."

OBJECT traceRouteCtlIfIndex

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. If write access is

not supported, return a 0 as the value of this object. A value of 0 implies that the function represented by this option is not supported."

OBJECT traceRouteCtlMiscOptions

MIN-ACCESS read-only

DESCRIPTION

"Support of this object is optional. If not supporting, do not allow write access and return a zero-length octet string as the value of the object."

OBJECT traceRouteCtlStorageType

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. It is also allowed that implementations support only the volatile(2) StorageType enumeration."

OBJECT traceRouteCtlType

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. In addition, the only value that is RECOMMENDED to be supported by an implementation is traceRouteUsingUdpProbes."

OBJECT traceRouteResultsIpTgtAddrType

SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2) }

DESCRIPTION

"An implementation should only support IPv4 and globally unique IPv6 address values for this object."

OBJECT traceRouteResultsIpTgtAddr

SYNTAX InetAddress (SIZE(0|4|16))

DESCRIPTION

"An implementation should only support IPv4 and globally unique IPv6 address values for this object."

OBJECT traceRouteResultsLastGoodPath

DESCRIPTION

"If the traceRouteHopsTableGroup is implemented, then this object is mandatory for implementations that have access to a system clock and that are capable of setting the values for DateAndTime objects. It is RECOMMENDED that when this object is not supported its values be reported as '0000000000000000'H."

OBJECT traceRouteProbeHistoryHAddrType

SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2) }

DESCRIPTION

"An implementation should only support IPv4 and globally unique IPv6 address values for this object."

OBJECT traceRouteProbeHistoryHAddr

SYNTAX InetAddress (SIZE(0|4|16))

DESCRIPTION

"An implementation should only support IPv4 and globally unique IPv6 address values for this object."

OBJECT traceRouteProbeHistoryTime

DESCRIPTION

"This object is mandatory for implementations that have access to a system clock and that are capable of setting the values for DateAndTime objects. It is RECOMMENDED that when this object is not supported its values be reported as '0000000000000000'H."

OBJECT traceRouteHopsIpTgtAddressType

SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2) }

DESCRIPTION

"An implementation should only support IPv4 and globally unique IPv6 address values for this object."

OBJECT traceRouteHopsIpTgtAddress

SYNTAX InetAddress (SIZE(0|4|16))

DESCRIPTION

"An implementation should only support IPv4 and globally unique IPv6 address values for this object."

OBJECT traceRouteHopsLastGoodProbe

DESCRIPTION

"This object is mandatory for implementations that have access to a system clock and that are capable of setting the values for DateAndTime objects. It is RECOMMENDED that when this object is not supported its values be reported as '0000000000000000'H."

::= { traceRouteCompliances 2 }

traceRouteMinimumCompliance MODULE-COMPLIANCE

STATUS current

DESCRIPTION

"The minimum compliance statement for SNMP entities which implement the minimal subset of the DISMAN-TRACEROUTE-MIB. Implementors might choose this subset for small devices with limited resources."

MODULE -- this module

MANDATORY-GROUPS { traceRouteMinimumGroup }

GROUP traceRouteCtlRowStatusGroup

DESCRIPTION

"A compliant implementation does not have to implement the traceRouteCtlRowStatusGroup."

GROUP traceRouteHistoryGroup

DESCRIPTION

"A compliant implementation does not have to implement the traceRouteHistoryGroup."

GROUP traceRouteHopsTableGroup

DESCRIPTION

"This group lists the objects that make up a traceRouteHopsEntry. Support of the traceRouteHopsTable is optional."

GROUP traceRouteNotificationsGroup

DESCRIPTION

"This group defines a collection of optional notifications."

OBJECT traceRouteMaxConcurrentRequests

MIN-ACCESS read-only

DESCRIPTION

"The agent is not required to support SET operations to this object."

OBJECT traceRouteCtlByPassRouteTable

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. If write access is not supported, return a false(2) as the value of this object. A value of false(2) means that the function represented by this option is not supported."

OBJECT traceRouteCtlDSField

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. If write access is not supported, return a 0 as the value of this object. A value of 0 implies that the function represented by this option is not supported."

OBJECT traceRouteCtlSourceAddressType

SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2) }

MIN-ACCESS read-only

DESCRIPTION

"Write access to this object is not required by implementations that are not capable of binding the send socket with a source address. An implementation is only required to support IPv4 and IPv6 addresses."

OBJECT traceRouteCtlSourceAddress

SYNTAX InetAddress (SIZE(0|4|16))

MIN-ACCESS read-only

DESCRIPTION

"Write access to this object is not required by implementations that are not capable of binding the send socket with a source address. An implementation is only required to support IPv4 and IPv6 addresses."

OBJECT traceRouteCtlIfIndex

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. If write access is not supported, return a 0 as the value of this object. A value of 0 implies that the function represented by this option is not supported."

OBJECT traceRouteCtlMiscOptions

MIN-ACCESS read-only

DESCRIPTION

"Support of this object is optional. If not supporting, do not allow write access, and return a zero-length octet string as the value of the object."

OBJECT traceRouteCtlDontFragment

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. If write access is not supported, return a false(2) as the value of this object. A value of false(2) means that the function represented by this option is not supported."

OBJECT traceRouteCtlInitialTtl

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. If write access is not supported, return a 1 as the value of this object."

OBJECT traceRouteCtlFrequency

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. If write access is not supported, return a 0 as the value of this object. A value of 0 implies that the function represented by this option is not supported."

OBJECT traceRouteCtlStorageType

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. It is also allowed that implementations support only the volatile(2) StorageType enumeration."

OBJECT traceRouteCtlDescr

MIN-ACCESS read-only

DESCRIPTION

"The agent is not required to support set operations to this object."

OBJECT traceRouteCtlMaxRows

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. If the traceRouteHistoryGroup is not implemented, then write access to this object MUST be disabled, and the object MUST return a value of 0 when retrieved."

OBJECT traceRouteCtlTrapGeneration

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. If the traceRouteNotificationsGroup is not implemented, then write access to this object MUST be disabled, and the object MUST return a value with no bit set when retrieved. No bit set indicates that no notification is generated."

OBJECT traceRouteCtlCreateHopsEntries

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. If the traceRouteHopsTableGroup is not implemented, then write access to this object MUST be disabled, and the object MUST return a value of false(2) when retrieved."

OBJECT traceRouteCtlType

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. In addition, the only

value that is RECOMMENDED to be supported by an implementation is traceRouteUsingUdpProbes."

OBJECT traceRouteResultsIpTgtAddrType

SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2) }

DESCRIPTION

"An implementation should only support IPv4 and globally unique IPv6 address values for this object."

OBJECT traceRouteResultsIpTgtAddr

SYNTAX InetAddress (SIZE(0|4|16))

DESCRIPTION

"An implementation should only support IPv4 and globally unique IPv6 address values for this object."

OBJECT traceRouteResultsLastGoodPath

DESCRIPTION

"This object is mandatory for implementations that have access to a system clock and that are capable of setting the values for DateAndTime objects. It is RECOMMENDED that when this object is not supported its values be reported as '0000000000000000'H."

OBJECT traceRouteProbeHistoryHAddrType

SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2) }

DESCRIPTION

"An implementation should only support IPv4 and globally unique IPv6 address values for this object."

OBJECT traceRouteProbeHistoryHAddr

SYNTAX InetAddress (SIZE(0|4|16))

DESCRIPTION

"An implementation should only support IPv4 and globally unique IPv6 address values for this object."

OBJECT traceRouteProbeHistoryTime

DESCRIPTION

"If the traceRouteHistoryGroup is implemented, then this object is mandatory for implementations that have access to a system clock and that are capable of setting the values for DateAndTime objects. It is RECOMMENDED that when this object is not supported its values be reported as '0000000000000000'H."

OBJECT traceRouteHopsIpTgtAddressType

SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2) }

DESCRIPTION

"An implementation should only support IPv4 and

globally unique IPv6 address values for this object."

OBJECT traceRouteHopsIpTgtAddress

SYNTAX InetAddress (SIZE(0|4|16))

DESCRIPTION

"An implementation should only support IPv4 and globally unique IPv6 address values for this object."

OBJECT traceRouteHopsLastGoodProbe

DESCRIPTION

"If the traceRouteHopsTableGroup is implemented, then this object is mandatory for implementations that have access to a system clock and that are capable of setting the values for DateAndTime objects. It is RECOMMENDED that when this object is not supported its values be reported as '0000000000000000'H."

::= { traceRouteCompliances 3 }

traceRouteCompliance MODULE-COMPLIANCE

STATUS deprecated

DESCRIPTION

"The compliance statement for the DISMAN-TRACEROUTE-MIB. This compliance statement has been deprecated because the traceRouteGroup and the traceRouteTimeStampGroup have been split and deprecated. The traceRouteFullCompliance is semantically identical to the deprecated traceRouteCompliance statement."

MODULE -- this module

MANDATORY-GROUPS {

traceRouteGroup

}

GROUP traceRouteTimeStampGroup

DESCRIPTION

"This group is mandatory for implementations that have access to a system clock and that are capable of setting the values for DateAndTime objects."

GROUP traceRouteNotificationsGroup

DESCRIPTION

"This group defines a collection of optional notifications."

GROUP traceRouteHopsTableGroup

DESCRIPTION

"This group lists the objects that make up a traceRouteHopsEntry. Support of the traceRouteHopsTable is optional."

OBJECT traceRouteMaxConcurrentRequests

MIN-ACCESS read-only

DESCRIPTION

"The agent is not required to support SET operations to this object."

OBJECT traceRouteCtlByPassRouteTable

MIN-ACCESS read-only

DESCRIPTION

"This object is not required by implementations that are not capable of its implementation. The function represented by this object is implementable if the setsockopt SOL_SOCKET SO_DONTROUTE option is supported."

OBJECT traceRouteCtlSourceAddressType

SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2) }

MIN-ACCESS read-only

DESCRIPTION

"This object is not required by implementations that are not capable of binding the send socket with a source address. An implementation is only required to support IPv4 and IPv6 addresses."

OBJECT traceRouteCtlSourceAddress

SYNTAX InetAddress (SIZE(0|4|16))

MIN-ACCESS read-only

DESCRIPTION

"This object is not required by implementations that are not capable of binding the send socket with a source address. An implementation is only required to support IPv4 and globally unique IPv6 addresses."

OBJECT traceRouteCtlIfIndex

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. When write access is not supported, return a 0 as the value of this object. A value of 0 implies that the function represented by this option is not supported."

OBJECT traceRouteCtlMiscOptions

MIN-ACCESS read-only

DESCRIPTION

"Support of this object is optional. When not supporting, do not allow write access, and return a zero-length octet string as the value of the object."

OBJECT traceRouteCtlStorageType

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. It is also allowed that implementations support only the volatile StorageType enumeration."

OBJECT traceRouteCtlDSField

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. When write access is not supported, return a 0 as the value of this object. A value of 0 implies that the function represented by this option is not supported."

OBJECT traceRouteCtlType

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required. In addition, the only value that is RECOMMENDED to be supported by an implementation is traceRouteUsingUdpProbes."

OBJECT traceRouteResultsIpTgtAddrType

SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2) }

DESCRIPTION

"An implementation should only support IPv4 and globally unique IPv6 address values for this object."

OBJECT traceRouteResultsIpTgtAddr

SYNTAX InetAddress (SIZE(0|4|16))

DESCRIPTION

"An implementation should only support IPv4 and globally unique IPv6 address values for this object."

OBJECT traceRouteProbeHistoryHAddrType

SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2) }

DESCRIPTION

"An implementation should only support IPv4 and globally unique IPv6 address values for this object."

OBJECT traceRouteProbeHistoryHAddr

SYNTAX InetAddress (SIZE(0|4|16))

DESCRIPTION

"An implementation should only support IPv4 and globally unique IPv6 address values for this object."

OBJECT traceRouteHopsIpTgtAddressType

SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2) }

DESCRIPTION

"An implementation should only support IPv4 and globally unique IPv6 address values for this object."

OBJECT traceRouteHopsIpTgtAddress

SYNTAX InetAddress (SIZE(0|4|16))

DESCRIPTION

"An implementation should only support IPv4 and globally unique IPv6 address values for this object."

::= { traceRouteCompliances 1 }

-- MIB groupings

traceRouteMinimumGroup OBJECT-GROUP

OBJECTS {

traceRouteMaxConcurrentRequests,
traceRouteCtlTargetAddressType,
traceRouteCtlTargetAddress,
traceRouteCtlByPassRouteTable,
traceRouteCtlDataSize,
traceRouteCtlTimeOut,
traceRouteCtlProbesPerHop,
traceRouteCtlPort,
traceRouteCtlMaxTtl,
traceRouteCtlDSField,
traceRouteCtlSourceAddressType,
traceRouteCtlSourceAddress,
traceRouteCtlIfIndex,
traceRouteCtlMiscOptions,
traceRouteCtlMaxFailures,
traceRouteCtlDontFragment,
traceRouteCtlInitialTtl,
traceRouteCtlFrequency,
traceRouteCtlStorageType,
traceRouteCtlAdminStatus,
traceRouteCtlMaxRows,
traceRouteCtlTrapGeneration,
traceRouteCtlDescr,
traceRouteCtlCreateHopsEntries,
traceRouteCtlType,
traceRouteResultsOperStatus,
traceRouteResultsCurHopCount,
traceRouteResultsCurProbeCount,
traceRouteResultsIpTgtAddrType,
traceRouteResultsIpTgtAddr,
traceRouteResultsTestAttempts,
traceRouteResultsTestSuccesses,
traceRouteResultsLastGoodPath

```
    }
    STATUS current
    DESCRIPTION
        "The group of objects that constitute the remote traceroute
        operation."
    ::= { traceRouteGroups 5 }

traceRouteCtlRowStatusGroup OBJECT-GROUP
    OBJECTS {
        traceRouteCtlRowStatus
    }
    STATUS current
    DESCRIPTION
        "The RowStatus object of the traceRouteCtlTable."
    ::= { traceRouteGroups 6 }

traceRouteHistoryGroup OBJECT-GROUP
    OBJECTS {
        traceRouteProbeHistoryHAddrType,
        traceRouteProbeHistoryHAddr,
        traceRouteProbeHistoryResponse,
        traceRouteProbeHistoryStatus,
        traceRouteProbeHistoryLastRC,
        traceRouteProbeHistoryTime
    }

    STATUS current
    DESCRIPTION
        "The group of objects that constitute the history
        capability."
    ::= { traceRouteGroups 7 }

traceRouteNotificationsGroup NOTIFICATION-GROUP
    NOTIFICATIONS {
        traceRoutePathChange,
        traceRouteTestFailed,
        traceRouteTestCompleted
    }
    STATUS current
    DESCRIPTION
        "The notifications that are required to be supported by
        implementations of this MIB."
    ::= { traceRouteGroups 3 }

traceRouteHopsTableGroup OBJECT-GROUP
    OBJECTS {
        traceRouteHopsIpTgtAddressType,
        traceRouteHopsIpTgtAddress,
```

```
        traceRouteHopsMinRtt,
        traceRouteHopsMaxRtt,
        traceRouteHopsAverageRtt,
        traceRouteHopsRttSumOfSquares,
        traceRouteHopsSentProbes,
        traceRouteHopsProbeResponses,
        traceRouteHopsLastGoodProbe
    }
    STATUS      current
    DESCRIPTION
        "The group of objects that constitute the
        traceRouteHopsTable."
    ::= { traceRouteGroups 4 }

traceRouteGroup OBJECT-GROUP
    OBJECTS {
        traceRouteMaxConcurrentRequests,
        traceRouteCtlTargetAddressType,
        traceRouteCtlTargetAddress,
        traceRouteCtlByPassRouteTable,
        traceRouteCtlDataSize,
        traceRouteCtlTimeOut,
        traceRouteCtlProbesPerHop,
        traceRouteCtlPort,
        traceRouteCtlMaxTtl,
        traceRouteCtlDSField,
        traceRouteCtlSourceAddressType,
        traceRouteCtlSourceAddress,
        traceRouteCtlIfIndex,
        traceRouteCtlMiscOptions,
        traceRouteCtlMaxFailures,
        traceRouteCtlDontFragment,
        traceRouteCtlInitialTtl,
        traceRouteCtlFrequency,
        traceRouteCtlStorageType,
        traceRouteCtlAdminStatus,
        traceRouteCtlMaxRows,
        traceRouteCtlTrapGeneration,
        traceRouteCtlDescr,
        traceRouteCtlCreateHopsEntries,
        traceRouteCtlType,
        traceRouteCtlRowStatus,
        traceRouteResultsOperStatus,
        traceRouteResultsCurHopCount,
        traceRouteResultsCurProbeCount,
        traceRouteResultsIpTgtAddrType,
        traceRouteResultsIpTgtAddr,
        traceRouteResultsTestAttempts,
```

```

        traceRouteResultsTestSuccesses,
        traceRouteProbeHistoryHAddrType,
        traceRouteProbeHistoryHAddr,
        traceRouteProbeHistoryResponse,
        traceRouteProbeHistoryStatus,
        traceRouteProbeHistoryLastRC
    }
    STATUS deprecated
    DESCRIPTION
        "The group of objects that constitute the remote traceroute
        operation."
    ::= { traceRouteGroups 1 }

traceRouteTimeStampGroup OBJECT-GROUP
    OBJECTS {
        traceRouteResultsLastGoodPath,
        traceRouteProbeHistoryTime
    }
    STATUS deprecated
    DESCRIPTION
        "The group of DateAndTime objects."
    ::= { traceRouteGroups 2 }

END

```

4.3. DISMAN-NSLOOKUP-MIB

DISMAN-NSLOOKUP-MIB DEFINITIONS ::= BEGIN

IMPORTS

```

    MODULE-IDENTITY, OBJECT-TYPE,
    Unsigned32, mib-2, Integer32
        FROM SNMPv2-SMI -- RFC2578
    RowStatus
        FROM SNMPv2-TC -- RFC2579
    MODULE-COMPLIANCE, OBJECT-GROUP
        FROM SNMPv2-CONF -- RFC2580
    SnmpAdminString
        FROM SNMP-FRAMEWORK-MIB -- RFC3411
    InetAddressType, InetAddress
        FROM INET-ADDRESS-MIB; -- RFC4001

```

lookupMIB MODULE-IDENTITY

```

    LAST-UPDATED "200606130000Z" -- 13 June 2006
    ORGANIZATION "IETF Distributed Management Working Group"
    CONTACT-INFO
        "Juergen Quittek

```

NEC Europe Ltd.
 Network Laboratories
 Kurfuersten-Anlage 36
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Phone: +49 6221 4342-115
 Email: quittek@netlab.nec.de"

DESCRIPTION

"The Lookup MIB (DISMAN-NSLOOKUP-MIB) enables determination of either the name(s) corresponding to a host address or of the address(es) associated with a host name at a remote host.

Copyright (C) The Internet Society (2006). This version of this MIB module is part of RFC 4560; see the RFC itself for full legal notices."

-- Revision history

REVISION "200606130000Z" -- 13 June 2006

DESCRIPTION

"Updated version, published as RFC 4560.

- Replaced references to RFC 2575 by RFC 3415
- Replaced references to RFC 2571 by RFC 3411
- Replaced references to RFC 2851 by RFC 4001
- Added value enabled(1) to SYNTAX clause of lookupCtlOperStatus
- Added lookupMinimumCompliance
- Defined semantics of value 0 for object lookupPurgeTime
- Added DEFVAL { unknown } to object lookupCtlTargetAddressType OBJECT-TYPE"

REVISION "200009210000Z" -- 21 September 2000

DESCRIPTION

"Initial version, published as RFC 2925."

::= { mib-2 82 }

-- Top level structure of the MIB

lookupObjects OBJECT IDENTIFIER ::= { lookupMIB 1 }
 lookupConformance OBJECT IDENTIFIER ::= { lookupMIB 2 }

-- Simple Object Definitions

lookupMaxConcurrentRequests OBJECT-TYPE

SYNTAX Unsigned32
 UNITS "requests"
 MAX-ACCESS read-write
 STATUS current
 DESCRIPTION

"The maximum number of concurrent active lookup requests that are allowed within an agent implementation. A value of 0 for this object implies that there is no limit for the number of concurrent active requests in effect.

The limit applies only to new requests being activated. When a new value is set, the agent will continue processing all the requests already active, even if their number exceed the limit just imposed."

DEFVAL { 10 }
 ::= { lookupObjects 1 }

lookupPurgeTime OBJECT-TYPE

SYNTAX Unsigned32 (0..86400)
 UNITS "seconds"
 MAX-ACCESS read-write
 STATUS current
 DESCRIPTION

"The amount of time to wait before automatically deleting an entry in the lookupCtlTable and any dependent lookupResultsTable entries after the lookup operation represented by a lookupCtlEntry has been completed. A lookupCtEntry is considered complete when its lookupCtlOperStatus object has a value of completed(3).

A value of 0 indicates that automatic deletion of entries is disabled."

DEFVAL { 900 } -- 15 minutes as default
 ::= { lookupObjects 2 }

-- Lookup Control Table

lookupCtlTable OBJECT-TYPE

SYNTAX SEQUENCE OF LookupCtlEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION

"Defines the Lookup Control Table for providing the capability of performing a lookup operation for a symbolic host name or for a host address from a remote host."

```
::= { lookupObjects 3 }
```

```
lookupCtlEntry OBJECT-TYPE
```

```
SYNTAX          LookupCtlEntry
```

```
MAX-ACCESS      not-accessible
```

```
STATUS          current
```

```
DESCRIPTION
```

"Defines an entry in the lookupCtlTable. A lookupCtlEntry is initially indexed by lookupCtlOwnerIndex, which is a type of SnmpAdminString, a textual convention that allows for the use of the SNMPv3 View-Based Access Control Model (RFC 3415, VACM) and that also allows a management application to identify its entries. The second index element, lookupCtlOperationName, enables the same lookupCtlOwnerIndex entity to have multiple outstanding requests. The value of lookupCtlTargetAddressType determines which lookup function to perform."

```
INDEX {
```

```
    lookupCtlOwnerIndex,
    lookupCtlOperationName
```

```
}
```

```
::= { lookupCtlTable 1 }
```

```
LookupCtlEntry ::=
```

```
SEQUENCE {
```

lookupCtlOwnerIndex	SnmpAdminString,
lookupCtlOperationName	SnmpAdminString,
lookupCtlTargetAddressType	InetAddressType,
lookupCtlTargetAddress	InetAddress,
lookupCtlOperStatus	INTEGER,
lookupCtlTime	Unsigned32,
lookupCtlRc	Integer32,
lookupCtlRowStatus	RowStatus

```
}
```

```
lookupCtlOwnerIndex OBJECT-TYPE
```

```
SYNTAX          SnmpAdminString (SIZE(0..32))
```

```
MAX-ACCESS      not-accessible
```

```
STATUS          current
```

```
DESCRIPTION
```

"To facilitate the provisioning of access control by a security administrator using the View-Based Access Control Model (RFC 2575, VACM) for tables in which multiple users may need to create or modify entries independently, the initial index is used as an 'owner index'. Such an initial index has a syntax of SnmpAdminString and can thus be trivially mapped to a

securityName or groupName defined in VACM, in accordance with a security policy.

When used in conjunction with such a security policy all entries in the table belonging to a particular user (or group) will have the same value for this initial index. For a given user's entries in a particular table, the object identifiers for the information in these entries will have the same subidentifiers (except for the 'column' subidentifier) up to the end of the encoded owner index. To configure VACM to permit access to this portion of the table, one would create vacmViewTreeFamilyTable entries with the value of vacmViewTreeFamilySubtree including the owner index portion, and vacmViewTreeFamilyMask 'wildcarding' the column subidentifier. More elaborate configurations are possible."

```
::= { lookupCtlEntry 1 }
```

lookupCtlOperationName OBJECT-TYPE

SYNTAX SnmpAdminString (SIZE(0..32))

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The name of a lookup operation. This is locally unique, within the scope of an lookupCtlOwnerIndex."

```
::= { lookupCtlEntry 2 }
```

lookupCtlTargetAddressType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Specifies the type of address for performing a lookup operation for a symbolic host name or for a host address from a remote host.

Specification of dns(16) as the value for this object means that a function such as, for example, getaddrinfo() or gethostbyname() should be performed to return one or more numeric addresses. Use of a value of either ipv4(1) or ipv6(2) means that a functions such as, for example, getnameinfo() or gethostbyaddr() should be used to return the symbolic names associated with a host."

DEFVAL { unknown }

```
::= { lookupCtlEntry 3 }
```

lookupCtlTargetAddress OBJECT-TYPE

SYNTAX InetAddress

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Specifies the address used for a resolver lookup at a remote host. The corresponding lookupCtlTargetAddressType objects determines its type, as well as the function that can be requested.

A value for this object MUST be set prior to transitioning its corresponding lookupCtlEntry to active(1) via lookupCtlRowStatus."

::= { lookupCtlEntry 4 }

lookupCtlOperStatus OBJECT-TYPE

SYNTAX INTEGER {

enabled(1), -- operation is active

notStarted(2), -- operation has not started

completed(3) -- operation is done

}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Reflects the operational state of an lookupCtlEntry:

enabled(1) - Operation is active.

notStarted(2) - Operation has not been enabled.

completed(3) - Operation has been completed.

An operation is automatically enabled(1) when its lookupCtlRowStatus object is transitioned to active(1) status. Until this occurs, lookupCtlOperStatus MUST report a value of notStarted(2). After the lookup operation is completed (success or failure), the value for lookupCtlOperStatus MUST be transitioned to completed(3)."

::= { lookupCtlEntry 5 }

lookupCtlTime OBJECT-TYPE

SYNTAX Unsigned32

UNITS "milliseconds"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Reports the number of milliseconds that a lookup operation required to be completed at a remote host. Completed means operation failure as well as

```

        success."
 ::= { lookupCtlEntry 6 }

```

lookupCtlRc OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The system-specific return code from a lookup operation. All implementations MUST return a value of 0 for this object when the remote lookup operation succeeds. A non-zero value for this objects indicates failure. It is recommended that implementations return the error codes that are generated by the lookup function used."

```
 ::= { lookupCtlEntry 7 }

```

lookupCtlRowStatus OBJECT-TYPE

SYNTAX RowStatus

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object allows entries to be created and deleted in the lookupCtlTable.

A remote lookup operation is started when an entry in this table is created via an SNMP set request and the entry is activated. This occurs by setting the value of this object to CreateAndGo(4) during row creation or by setting this object to active(1) after the row is created.

A value MUST be specified for lookupCtlTargetAddress prior to the acceptance of a transition to active(1) state. A remote lookup operation starts when its entry first becomes active(1). Transitions in and out of active(1) state have no effect on the operational behavior of a remote lookup operation, with the exception that deletion of an entry in this table by setting its RowStatus object to destroy(6) will stop an active remote lookup operation.

The operational state of a remote lookup operation can be determined by examination of its lookupCtlOperStatus object."

REFERENCE

```
"See definition of RowStatus in RFC 2579,  
'Textual Conventions for SMIV2.'"
 ::= { lookupCtlEntry 8 }
```

-- Lookup Results Table

lookupResultsTable OBJECT-TYPE

SYNTAX SEQUENCE OF LookupResultsEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Defines the Lookup Results Table for providing the capability of determining the results of a operation at a remote host.

One or more entries are added to the lookupResultsTable when a lookup operation, as reflected by an lookupCtlEntry, is completed successfully. All entries related to a successful lookup operation MUST be added to the lookupResultsTable at the same time that the associating lookupCtlOperStatus object is transitioned to completed(2).

The number of entries added depends on the results determined for a particular lookup operation. All entries associated with an lookupCtlEntry are removed when the lookupCtlEntry is deleted.

A remote host can be multi-homed and have more than one IP address associated with it (returned by lookup function), or it can have more than one symbolic name (returned by lookup function).

A function such as, for example, getnameinfo() or gethostbyaddr() is called with a host address as its parameter and is used primarily to determine a symbolic name to associate with the host address. Entries in the lookupResultsTable MUST be made for each host name returned. If the function identifies an 'official host name,' then this symbolic name MUST be assigned a lookupResultsIndex of 1.

A function such as, for example, getaddrinfo() or gethostbyname() is called with a symbolic host name and is used primarily to retrieve a host address. The entries

MUST be stored in the order that they are retrieved from the lookup function. lookupResultsIndex 1 MUST be assigned to the first entry."

```
::= { lookupObjects 4 }
```

```
lookupResultsEntry OBJECT-TYPE
    SYNTAX      LookupResultsEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Defines an entry in the lookupResultsTable. The
        first two index elements identify the
        lookupCtlEntry that a lookupResultsEntry belongs
        to. The third index element selects a single
        lookup operation result."
    INDEX {
        lookupCtlOwnerIndex,
        lookupCtlOperationName,
        lookupResultsIndex
    }
    ::= { lookupResultsTable 1 }
```

```
LookupResultsEntry ::=
    SEQUENCE {
        lookupResultsIndex      Unsigned32,
        lookupResultsAddressType InetAddressType,
        lookupResultsAddress     InetAddress
    }
```

```
lookupResultsIndex OBJECT-TYPE
    SYNTAX      Unsigned32 (1..'ffffffff'h)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Entries in the lookupResultsTable are created when
        the result of a lookup operation is determined.

        Entries MUST be stored in the lookupResultsTable in
        the order that they are retrieved. Values assigned
        to lookupResultsIndex MUST start at 1 and increase
        consecutively."
    ::= { lookupResultsEntry 1 }
```

```
lookupResultsAddressType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
```

```

        "Indicates the type of result of a remote lookup
        operation. A value of unknown(0) implies either that
        the operation hasn't been started or that
        it has failed."
 ::= { lookupResultsEntry 2 }

lookupResultsAddress OBJECT-TYPE
    SYNTAX      InetAddress
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "Reflects a result for a remote lookup operation
        as per the value of lookupResultsAddressType.

        The address type (InetAddressType) that relates to
        this object is specified by the corresponding value
        of lookupResultsAddress."

 ::= { lookupResultsEntry 3 }

-- Conformance information
-- Compliance statements

lookupCompliances OBJECT IDENTIFIER ::= { lookupConformance 1 }
lookupGroups      OBJECT IDENTIFIER ::= { lookupConformance 2 }

-- Compliance statements

lookupCompliance MODULE-COMPLIANCE
    STATUS      current
    DESCRIPTION
        "The compliance statement for SNMP entities that
        fully implement the DISMAN-NSLOOKUP-MIB."
    MODULE      -- this module
        MANDATORY-GROUPS { lookupGroup }

        OBJECT lookupMaxConcurrentRequests
        MIN-ACCESS   read-only
        DESCRIPTION
            "The agent is not required to support set
            operations to this object."

        OBJECT lookupPurgeTime
        MIN-ACCESS   read-only
        DESCRIPTION
            "The agent is not required to support a set
            operation to this object."

```

```
 ::= { lookupCompliances 1 }

lookupMinimumCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "The minimum compliance statement for SNMP entities
        that implement the minimal subset of the
        DISMAN-NSLOOKUP-MIB. Implementors might choose this
        subset for small devices with limited resources."
    MODULE -- this module
        MANDATORY-GROUPS { lookupGroup }

        OBJECT lookupMaxConcurrentRequests
        MIN-ACCESS read-only
        DESCRIPTION
            "The agent is not required to support set
            operations to this object."

        OBJECT lookupPurgeTime
        MIN-ACCESS read-only
        DESCRIPTION
            "The agent is not required to support a set
            operation to this object."

        OBJECT lookupCtlRowStatus
        MIN-ACCESS read-only
        DESCRIPTION
            "Write access is not required. If write access is
            not supported, then at least one entry in the
            lookupCtlTable MUST be established already when the SNMP
            agent starts offering access to the NSLOOKUP-MIB module.
            If, in such a case, only a single entry is offered, then
            it is RECOMMENDED that this entry use strings with a
            length of 0 for both of its two index objects."
    ::= { lookupCompliances 2 }

-- MIB groupings

lookupGroup OBJECT-GROUP
    OBJECTS {
        lookupMaxConcurrentRequests,
        lookupPurgeTime,
        lookupCtlOperStatus,
        lookupCtlTargetAddressType,
        lookupCtlTargetAddress,
        lookupCtlTime,
        lookupCtlRc,
        lookupCtlRowStatus,
```

```

        lookupResultsAddressType,
        lookupResultsAddress
    }
    STATUS current
    DESCRIPTION
        "The group of objects that constitute the remote
        Lookup operation."
        ::= { lookupGroups 1 }

END

```

5. Security Considerations

There are a number of management objects defined in the three MIB modules with 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. These are the tables and objects and their sensitivity/vulnerability:

- o pingMaxConcurrentRequests
 - o traceRouteMaxConcurrentRequests
 - o lookupMaxConcurrentRequests
- The MIB modules limit their maximum numbers of concurrent requests by the values of these objects. Unauthorized access to them may lead to an overload of the managed node and to a disruption of other functions of the managed node.
- o pingCtlTable
 - o traceRouteCtlTable
 - o lookupCtlTable
- All objects in entries of these tables (except index objects) have a MAX-ACCESS clause of read-create. Unauthorized access to these objects can disturb the measurements controlled by the tables. Also, the functions offered by the MIB modules can be misused for illegal data retrieval and for attacking other systems by floods of ping probes, traceroute probes or lookup requests, respectively.

In general, all three, the ping, traceroute, and lookup functions, when used excessively are considered a form of system attack. In the case of ping, sending a system request too often can negatively effect its performance and attempting to connect to what is supposed to be an unused port can be very unpredictable. Excessive use of the traceroute capability can, like ping, negatively affect system performance. The same applies to excessive use of the lookup service, particularly if the lookup cannot be resolved locally. In

insecure environments, it is RECOMMENDED that the MIBs defined within this memo not be supported.

- o lookupPurgeTime

Unauthorized access to this object can lead to the deletion of results of lookup operations before they are read by a management system, if the object is set to 0 or small values close to 0. If the object is set to very high values, unauthorized access can lead to a high consumption of resources for storing lookup results.

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. However, the only information that can be disclosed without encryption is the configuration and results of measurements that are performed by implementations of the MIB modules.

To facilitate the provisioning of access control by a security administrator using the View-Based Access Control Model (VACM), defined in RFC 3415 [RFC3415], for tables in which multiple users may need to create or modify entries independently, the initial index is used as an "owner index." Such an initial index has a syntax of SnmpAdminString and can thus be trivially mapped to a securityName or groupName defined in VACM, in accordance with a security policy.

All entries in related tables belonging to a particular user will have the same value for this initial index. For a given user's entries in a particular table, the object identifiers for the information in these entries will have the same subidentifiers (except for the "column" subidentifier) up to the end of the encoded owner index. To configure VACM to permit access to this portion of the table, one would create vacmViewTreeFamilyTable entries with the value of vacmViewTreeFamilySubtree including the owner index portion, and vacmViewTreeFamilyMask 'wildcarding' the column subidentifier. More elaborate configurations are possible. The VACM access control mechanism described above provides control.

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.

6. Acknowledgements

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7. References

7.1. Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.
- [RFC2578] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M., and S. Waldbusser, "Structure of Management Information Version 2 (SMIv2)", STD 58, RFC 2578, April 1999.
- [RFC2579] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M., and S. Waldbusser, "Textual Conventions for SMIv2", STD 58, RFC 2579, April 1999.
- [RFC2580] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M., and S. Waldbusser, "Conformance Statements for SMIv2", STD 58, RFC 2580, April 1999.
- [RFC2863] McCloghrie, K. and F. Kastenholtz, "The Interfaces Group MIB", RFC 2863, June 2000.

- [RFC3411] Harrington, D., Presuhn, R., and B. Wijnen, "An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks", STD 62, RFC 3411, December 2002.
- [RFC4001] Daniele, M., Haberman, B., Routhier, S., and J. Schoenwaelder, "Textual Conventions for Internet Network Addresses", RFC 4001, February 2005.

7.2. Informative References

- [RFC792] Postel, J., "Internet Control Message Protocol", STD 5, RFC 792, September 1981.
- [RFC862] Postel, J., "Echo Protocol", STD 20, RFC 862, May 1983.
- [RFC1812] Baker, F., "Requirements for IP Version 4 Routers", RFC 1812, June 1995.
- [RFC2474] Nichols, K., Blake, S., Baker, F., and D. Black, "Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers", RFC 2474, December 1998.
- [RFC3260] Grossman, D., "New Terminology and Clarifications for Diffserv", RFC 3260, April 2002.
- [RFC3410] Case, J., Mundy, R., Partain, D. and B. Stewart, "Introduction and Applicability Statements for Internet-Standard Management Framework", RFC 3410, December 2002.
- [RFC3415] Wijnen, B., Presuhn, R., and K. McCloghrie, "View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)", STD 62, RFC 3415, December 2002.

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