

Directory Server Monitoring MIB

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Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. This memo obsoletes [RFC 1567](#) "X.500 Directory Monitoring MIB". This memo extends that specification to a more generic MIB for monitoring one or more directory servers each of which may support multiple access protocols. The MIB defined in this memo will be used in conjunction with the NETWORK-SERVICES-MIB [[19](#)] for monitoring Directory Servers.

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1. The SNMP Network Management Framework

The SNMP Network Management Framework presently consists of five major components:

- o An overall architecture, described in [RFC 2271](#) [1].
- o Mechanisms for describing and naming objects and events for the purpose of management. The first version of this Structure of Management Information (SMI) is called SMIV1 and described in [RFC 1155](#) [2], [RFC 1212](#) [3] and [RFC 1215](#) [4]. The second version, called SMIV2, is described in [RFC 1902](#) [5], [RFC 1903](#) [6] and [RFC 1904](#) [7].
- o Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPv1 and described in [RFC 1157](#) [8]. A second version of the SNMP message protocol, which is not an Internet standards track protocol, is called SNMPv2c and described in [RFC 1901](#) [9] and [RFC 1906](#) [10]. The third version of the message protocol is called SNMPv3 and described in [RFC 1906](#) [10], [RFC 2272](#) [11] and [RFC 2274](#) [12].
- o Protocol operations for accessing management information. The first set of protocol operations and associated PDU formats is described in [RFC 1157](#) [8]. A second set of protocol operations and associated PDU formats is described in [RFC 1905](#) [13].
- o A set of fundamental applications described in [RFC 2273](#) [14] and the view-based access control mechanism described in [RFC 2275](#) [15].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the mechanisms defined in the SMI.

This memo specifies a MIB module that is compliant to the SMIV2. A MIB conforming to the SMIV1 can be produced through the appropriate translations. The resulting translated MIB must be semantically equivalent, except where objects or events are omitted because no translation is possible (use of Counter64). Some machine readable information in SMIV2 will be converted into textual descriptions in SMIV1 during the translation process. However, this loss of machine readable information is not considered to change the semantics of the MIB.

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2. The Directory Services Model.

The Directory comprises of a set of servers (Directory Servers). Clients or Directory User Agents (DUA) are provided access to the Directory which maybe local or distributed, by the Directory Servers. The server maybe a X.500 Directory System Agent (DSA) [16] running over the OSI suite of protocols or, a (C)LDAP[17,18] frontend to the X.500 Directory System Agent or, a native LDAP Directory Server running directly over TCP or other protocols, or a database acting as a backend to another server, or any other application protocol, or any combination of the above. A Directory Server has one or more application protocol interfaces. Through these interfaces the Directory Server interacts with the DUA and with the peer Directory Servers.

Fig. 1 shows the case of a Directory Server that receives requests and sends back responses in some protocol. Fig. 2 shows one possible scenario where the Directory Server speaks multiple protocols.

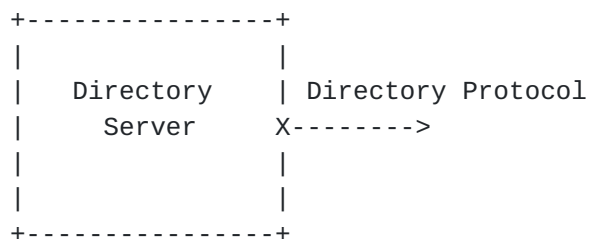


FIG. 1.

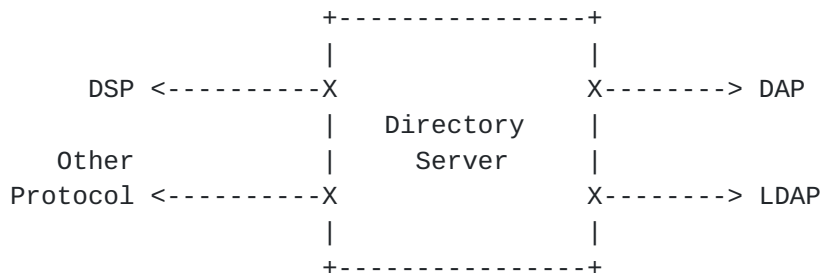


FIG. 2.

The Directory contains information in the form of entries. An entry is a collection of attributes and is uniquely identified by a name, the Distinguished Name (DN). The entries are arranged in a

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hierarchical tree-like structure called the Directory Information Tree (DIT).

A DUA requests a Directory Server to perform some operation on the Directory. The Directory Server is responsible for performing the operation and after completing its effort to carry out the request, returns a response to the DUA.

A Directory Server may use information stored in its local database or interact with (chain the request to) other Directory Servers to service the DUA request. Alternatively, a Directory Server may return a reference to another Directory Server (referral).

The local database of a Directory Server consists of the part of the Directory that is mastered by the Directory Server, the part of the Directory for which it keeps slave copies and cached information that is gathered during the operation of the Directory Server.

In the connection oriented mode a DUA "binds" to a Directory Server with a particular identification. The Directory Server may authenticate the identity of the DUA. In the connectionless mode as is employed in CLDAP no binding and/authentication is carried out between the DUA and the Directory Server. The following type of operations are carried out by the Directory Server : Read, Compare, Addition of an Entry (AddEntry), Modification of an Entry (ModifyEntry), Modification of a DN (ModifyRDN), Deletion of an Entry (RemoveEntry), List, Search, Abandon. Some Directory Servers do not support some type of operations. For example CLDAP does not support AddEntry, ModifyEntry, ModifyRDN, RemoveEntry etc. In response to requests results and/or errors are returned by the Directory Server.

In the distributed Directory data is often replicated to enhance performance and for other advantages. The data to be replicated is transferred from the "Supplier" Directory Server to the "Consumer" Directory Server according to the replication agreement between the supplier and the receiver.

3. MIB Model for Directory Management.

A Directory manager should be able to monitor all the Directory Servers in his/her domain of management. The Directory Servers may be running on one or more hosts and, multiple Directory Servers may be running on the same host.

The manager may wish to monitor several aspects of the operational Directory Servers. He/she may want to know the process related

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aspects- the resource utilization of an operational Directory Server; the network service related aspects e.g. inbound-associations, outbound-associations, operational status, and finally the information specific to the Directory Server application- its operations and performance.

The MIB defined in this document covers the portion which is specific to Directory services. The network service related part of the MIB, and the host-resources related part of the MIB, as well as other parts of interest to a Manager monitoring the Directory services, are covered in separate documents [[19](#)][[20](#)].

The MIB will cover a group of Directory Servers. The grouping will be done on some logical basis by the administrator/manager. In all cases, the grouping will be reflected in the pertinent NETWORK-SERVICES-MIB which will have an entry corresponding to each Directory Server in the group.

4. MIB design.

The basic principle has been to keep the MIB as simple as possible. The Managed objects included in the MIB are divided into three tables- dsTable, dsApplIfOpsTable, and dsIntTable.

- The dsTable contains a list of Directory Servers. The list contains a description of the Directory Servers as well as summary statistics on the entries held by and the cache performance of each Directory Server. The group of servers on this list is likely to contain a part of, if not all, the Directory Servers in the management domain.
- The dsApplIfOpsTable provides summary statistics on the accesses, operations and errors for each application protocol interface of a Directory Server.
- The dsIntTable provides some useful information on the interaction of the monitored Directory Servers with peer Directory Servers.

There are references to the Directory itself for static information pertaining to the Directory Server. These references are in the form of "Directory Distinguished Name" [[21](#)] of the corresponding object. It is intended that Directory management applications will use these references to obtain further information on the objects of interest.

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5. The Directory Server Monitoring MIB.

```
DIRECTORY-SERVER-MIB DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```
    MODULE-IDENTITY, Counter32, Gauge32, OBJECT-TYPE
        FROM SNMPv2-SMI
    mib-2 FROM RFC1213-MIB
    DisplayString, TimeStamp
        FROM SNMPv2-TC
    MODULE-COMPLIANCE, OBJECT-GROUP
        FROM SNMPv2-CONF
    ZeroBasedCounter32
        FROM RMON2-MIB
    applIndex, DistinguishedName, URLString

        FROM NETWORK-SERVICES-MIB;
```

```
dsMIB MODULE-IDENTITY
```

```
    LAST-UPDATED "9811070000Z" -- 7th November 1998
    ORGANIZATION "IETF Mail and Directory Management Working
        Group"

    CONTACT-INFO
    "
        Glenn Mansfield
        Postal: Cyber Solutions Inc.
        6-6-3, Minami Yoshinari
        Aoba-ku, Sendai, Japan 989-3204.

        Tel: +81-22-303-4012
        Fax: +81-22-303-4015
        E-mail: glenn@cysols.com
    Working Group E-mail: ietf-madman@innosoft.com
        To subscribe: ietf-madman-request@innosoft.com"
```

```
DESCRIPTION
```

```
    " The MIB module for monitoring Directory Services."
```

```
-- revision information
```

```
REVISION "9811070000Z" -- 7th November 1998
```

```
DESCRIPTION
```

```
    "This revision obsoletes RFC 1567. It is incompatible with
    the original MIB and so it has been renamed from dsaMIB
    to dsMIB."
```

```
REVISION "9311250000Z" -- 25th November 1993
```

```
DESCRIPTION
```

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"The original version of this MIB was published in [RFC 1567](#)."

::= { mib-2 NN } -- to be assigned by IANA

dsTable OBJECT-TYPE

SYNTAX SEQUENCE OF DsTableEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

" The table holding information related to the Directory
Servers."

::= {dsMIB 1}

dsTableEntry OBJECT-TYPE

SYNTAX DsTableEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

" Entry containing summary description for a Directory
Server."

INDEX { applIndex }

::= {dsTable 1}

-- General description of the Directory Server application will be
-- available in the applTable of the NETWORK-SERVICES-MIB indexed by
-- applIndex.

DsTableEntry ::= SEQUENCE {

dsServerType

BITS,

dsServerDescription

DisplayString,

-- Entry statistics/Cache performance

dsMasterEntries

Gauge32,

dsCopyEntries

Gauge32,

dsCacheEntries

Gauge32,

dsCacheHits

Counter32,

dsSlaveHits

Counter32

}

dsServerType OBJECT-TYPE

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```
SYNTAX BITS {
    frontEndDirectoryServer(0),
    backEndDirectoryServer(1)
}
MAX-ACCESS read-only
STATUS current
DESCRIPTION
    "This object indicates whether the server is
    a frontend or, a backend or, both. If the server
    is a frontend, then the frontEndDirectoryServer
    bit will be set. Similarly for the backend."
::= {dsTableEntry 1}

dsServerDescription OBJECT-TYPE
    SYNTAX DisplayString
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "A text description of the application. This information
        is intended to identify and briefly describe the
        application in a status display."
    ::= {dsTableEntry 2}

-- A (C)LDAP frontend to the X.500 Directory will not have
-- MasterEntries, CopyEntries; the following counters will
-- be inaccessible for LDAP/CLDAP frontends to the X.500
-- directory: dsMasterEntries, dsCopyEntries, dsSlaveHits.

dsMasterEntries OBJECT-TYPE
    SYNTAX Gauge32
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        " Number of entries mastered in the Directory Server."
    ::= {dsTableEntry 3}

dsCopyEntries OBJECT-TYPE
    SYNTAX Gauge32
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        " Number of entries for which systematic (slave)
        copies are maintained in the Directory Server."
    ::= {dsTableEntry 4}
```


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dsCacheEntries OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" Number of entries cached (non-systematic copies) in the Directory Server. This will include the entries that are cached partially. The negative cache is not counted."

::= {dsTableEntry 5}

dsCacheHits OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" Number of operations that were serviced from the locally held cache."

::= {dsTableEntry 6}

dsSlaveHits OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" Number of operations that were serviced from the locally held object replications (copy-entries)."

::= {dsTableEntry 7}

dsApplIfOpsTable OBJECT-TYPE

SYNTAX SEQUENCE OF DsApplIfOpsEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

" The table holding information related to the Directory Server operations."

::= {dsMIB 2}

dsApplIfOpsEntry OBJECT-TYPE

SYNTAX DsApplIfOpsEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

" Entry containing operations related statistics for a Directory Server."

INDEX { applIndex, dsApplIfProtocolIndex }

::= {dsApplIfOpsTable 1}

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```
DsApplIfOpsEntry ::= SEQUENCE {

    dsApplIfProtocolIndex
        INTEGER,
    dsApplIfProtocol
        OBJECT IDENTIFIER,

-- Bindings

    dsApplIfUnauthBinds
        Counter32,
    dsApplIfSimpleAuthBinds
        Counter32,
    dsApplIfStrongAuthBinds
        Counter32,
    dsApplIfBindSecurityErrors
        Counter32,

-- In-coming operations

    dsApplIfInOps
        Counter32,
    dsApplIfReadOps
        Counter32,
    dsApplIfCompareOps
        Counter32,
    dsApplIfAddEntryOps
        Counter32,
    dsApplIfRemoveEntryOps
        Counter32,
    dsApplIfModifyEntryOps
        Counter32,
    dsApplIfModifyRDNOps
        Counter32,
    dsApplIfListOps
        Counter32,
    dsApplIfSearchOps
        Counter32,
    dsApplIfOneLevelSearchOps
        Counter32,
    dsApplIfWholeSubtreeSearchOps
        Counter32,

-- Out going operations

    dsApplIfReferrals
        Counter32,
    dsApplIfChainings
```

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```
        Counter32,

-- Errors

        dsApplIfSecurityErrors
            Counter32,
        dsApplIfErrors
            Counter32,

-- replications

        dsApplIfReplicationUpdatesIn
            Counter32,
        dsApplIfReplicationUpdatesOut
            Counter32,

-- Traffic Volume

        dsApplIfInBytes
            Counter32,
        dsApplIfOutBytes
            Counter32
    }

-- CLDAP does not use binds; for the CLDAP interface of a Directory
-- Server the bind related counters will be inaccessible.
--
-- CLDAP and LDAP implement "Read" and "List" operations
-- indirectly via the "search" operation; the following
-- counters will be inaccessible for the CLDAP and LDAP interfaces of
-- Directory Servers: dsApplIfReadOps, dsApplIfListOps
--
-- CLDAP does not implement "Compare", "Add", "Remove",
-- "Modify", "ModifyRDN"; the following counters will be
-- inaccessible for the CLDAP interfaces of Directory Servers:
-- dsApplIfCompareOps, dsApplIfAddEntryOps, dsApplIfRemoveEntryOps,
-- dsApplIfModifyEntryOps, dsApplIfModifyRDNops.
--
-- CLDAP Directory Servers do not return Referrals
-- the following fields will remain inaccessible for
-- CLDAP interfaces of Directory Servers: dsApplIfReferrals.

dsApplIfProtocolIndex OBJECT-TYPE
    SYNTAX INTEGER (1..2147483647)
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "An index to uniquely identify an entry corresponding to a
```

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application-layer protocol interface. This index is used for lexicographic ordering of the table."
::= {dsApplIfOpsEntry 1}

dsApplIfProtocol OBJECT-TYPE
SYNTAX OBJECT IDENTIFIER
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"An identification of the protocol being used by the application on this interface. For an OSI Application, this will be the Application Context. For Internet applications, the IANA maintains a registry[22] of the OIDs which correspond to well-known applications. If the application protocol is not listed in the registry, an OID value of the form {applTCPProtoID port} or {applUDPProtoID port} are used for TCP-based and UDP-based protocols, respectively. In either case 'port' corresponds to the primary port number being used by the protocol. The OIDs applTCPProtoID and applUDPPProtoID are defined in NETWORK-SERVICES-MIB"
::= {dsApplIfOpsEntry 2}

dsApplIfUnauthBinds OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
" Number of unauthenticated/anonymous bind requests received."
::= {dsApplIfOpsEntry 3}

dsApplIfSimpleAuthBinds OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
" Number of bind requests that were authenticated using simple authentication procedures like password checks. This includes the password authentication using SASL mechanisms like CRAM-MD5."
::= {dsApplIfOpsEntry 4}

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dsApplIfStrongAuthBinds OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" Number of bind requests that were authenticated using TLS and X.500 strong authentication procedures. This includes the binds that were authenticated using external authentication procedures."

::= {dsApplIfOpsEntry 5}

dsApplIfBindSecurityErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" Number of bind requests that have been rejected due to inappropriate authentication or invalid credentials."

::= {dsApplIfOpsEntry 6}

dsApplIfInOps OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" Number of requests received from DUAs or other Directory Servers."

::= {dsApplIfOpsEntry 7}

dsApplIfReadOps OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" Number of read requests received."

::= {dsApplIfOpsEntry 8}

dsApplIfCompareOps OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" Number of compare requests received."

::= {dsApplIfOpsEntry 9}

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dsApplIfAddEntryOps OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" Number of addEntry requests received."

::= {dsApplIfOpsEntry 10}

dsApplIfRemoveEntryOps OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" Number of removeEntry requests received."

::= {dsApplIfOpsEntry 11}

dsApplIfModifyEntryOps OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" Number of modifyEntry requests received."

::= {dsApplIfOpsEntry 12}

dsApplIfModifyRDNOps OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" Number of modifyRDN requests received."

::= {dsApplIfOpsEntry 13}

dsApplIfListOps OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" Number of list requests received."

::= {dsApplIfOpsEntry 14}

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dsApplIfSearchOps OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" Number of search requests- baseObject searches,
oneLevel searches and whole subtree searches,
received."

::= {dsApplIfOpsEntry 15}

dsApplIfOneLevelSearchOps OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" Number of oneLevel search requests received."

::= {dsApplIfOpsEntry 16}

dsApplIfWholeSubtreeSearchOps OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" Number of whole subtree search requests received."

::= {dsApplIfOpsEntry 17}

dsApplIfReferrals OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" Number of referrals returned in response
to requests for operations."

::= {dsApplIfOpsEntry 18}

dsApplIfChainings OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" Number of operations forwarded by this Directory Server
to other Directory Servers."

::= {dsApplIfOpsEntry 19}

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dsApplIfSecurityErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" Number of requests received
which did not meet the security requirements. "

::= {dsApplIfOpsEntry 20}

dsApplIfErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" Number of requests that could not be serviced
due to errors other than security errors, and
referrals.
A partially serviced operation will not be counted
as an error.
The errors include naming-related, update-related,
attribute-related and service-related errors."

::= {dsApplIfOpsEntry 21}

-- Replication operations**dsApplIfReplicationUpdatesIn OBJECT-TYPE**

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" Number of replication updates fetched or received from
supplier Directory Servers."

::= {dsApplIfOpsEntry 22}

dsApplIfReplicationUpdatesOut OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" Number of replication updates sent to or taken by
consumer Directory Servers."

::= {dsApplIfOpsEntry 23}

dsApplIfInBytes OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

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```
" Incoming traffic, in bytes, on the interface.
  This will include requests from DUAs as well
  responses from other Directory Servers."
 ::= {dsApplIfOpsEntry 24}
```

dsApplIfOutBytes OBJECT-TYPE

```
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
  " Outgoing traffic in bytes on the interface.
    This will include responses to DUAs and Directory
    Servers as well as requests to other Directory Servers."
 ::= {dsApplIfOpsEntry 25}
```

```
-- The dsIntTable contains statistical data on the peer
-- Directory Servers with which the monitored Directory
-- Server interacts or, attempts to interact. This table is
-- expected to provide a useful insight into the effect of
-- neighbours on the Directory Server's performance.
-- The table keeps track of the last "N" Directory Servers
-- with which the monitored Directory has interacted
-- (attempted to interact), where "N" is a locally-defined
-- constant.
-- For a multi-protocol server, statistics for each protocol
-- are kept separately.
```

dsIntTable OBJECT-TYPE

```
SYNTAX SEQUENCE OF DsIntEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
  " Each row of this table contains some details
    related to the history of the interaction
    of the monitored Directory Server with its
    peer Directory Servers."
 ::= { dsMIB 3 }
```

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dsIntEntry OBJECT-TYPE

SYNTAX DsIntEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

" Entry containing interaction details of a Directory Server with a peer Directory Server."

INDEX { applIndex, dsIntEntIndex, dsApplIfProtocolIndex }

::= { dsIntTable 1 }

DsIntEntry ::= SEQUENCE {

dsIntEntIndex

INTEGER,

dsIntEntDirectoryName

DistinguishedName,

dsIntEntTimeOfCreation

TimeStamp,

dsIntEntTimeOfLastAttempt

TimeStamp,

dsIntEntTimeOfLastSuccess

TimeStamp,

dsIntEntFailuresSinceLastSuccess

Gauge32,

dsIntEntFailures

ZeroBasedCounter32,

dsIntEntSuccesses

ZeroBasedCounter32,

dsIntEntURL

URLString

}

dsIntEntIndex OBJECT-TYPE

SYNTAX INTEGER (1..2147483647)

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

" Together with applIndex and dsApplIfProtocolIndex, this object forms the unique key to identify the conceptual row which contains useful info on the (attempted) interaction between the Directory Server (referred to by applIndex) and a peer Directory Server using a particular protocol."

::= {dsIntEntry 1}

dsIntEntDirectoryName OBJECT-TYPE

SYNTAX DistinguishedName

MAX-ACCESS read-only

STATUS current

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DESCRIPTION

" Distinguished Name of the peer Directory Server to which this entry pertains."

::= {dsIntEntry 2}

dsIntEntTimeOfCreation OBJECT-TYPE

SYNTAX TimeStamp

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" The value of sysUpTime when this row was created. If the entry was created before the network management subsystem was initialized, this object will contain a value of zero."

::= {dsIntEntry 3}

dsIntEntTimeOfLastAttempt OBJECT-TYPE

SYNTAX TimeStamp

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" The value of sysUpTime when the last attempt was made to contact the peer Directory Server. If the last attempt was made before the network management subsystem was initialized, this object will contain a value of zero."

::= {dsIntEntry 4}

dsIntEntTimeOfLastSuccess OBJECT-TYPE

SYNTAX TimeStamp

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" The value of sysUpTime when the last attempt made to contact the peer Directory Server was successful. If there have been no successful attempts this entry will have a value of zero. If the last successful attempt was made before the network management subsystem was initialized, this object will contain a value of zero."

::= {dsIntEntry 5}

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dsIntEntFailuresSinceLastSuccess OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" The number of failures since the last time an attempt to contact the peer Directory Server was successful. If there has been no successful attempts, this counter will contain the number of failures since this entry was created."

::= {dsIntEntry 6}

-- note this gauge has a maximum value of 4294967295 and,

-- it does not wrap.[\[5\]](#)

dsIntEntFailures OBJECT-TYPE

SYNTAX ZeroBasedCounter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" Cumulative failures in contacting the peer Directory Server since the creation of this entry."

::= {dsIntEntry 7}

dsIntEntSuccesses OBJECT-TYPE

SYNTAX ZeroBasedCounter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" Cumulative successes in contacting the peer Directory Server since the creation of this entry."

::= {dsIntEntry 8}

dsIntEntURL OBJECT-TYPE

SYNTAX URLString

MAX-ACCESS read-only

STATUS current

DESCRIPTION

" URL of the peer Directory Server."

::= {dsIntEntry 9}

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```
-- Conformance information

dsConformance OBJECT IDENTIFIER ::= { dsMIB 4 }

dsGroups      OBJECT IDENTIFIER ::= { dsConformance 1 }
dsCompliances OBJECT IDENTIFIER ::= { dsConformance 2 }

-- Compliance statements

dsEntryCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "The compliance statement for SNMP entities
        which implement the DIRECTORY-SERVER-MIB for
        a summary overview of the Directory Servers ."

    MODULE -- this module
        MANDATORY-GROUPS { dsEntryGroup }

    ::= { dsCompliances 1 }

dsOpsCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "The compliance statement for SNMP entities
        which implement the DIRECTORY-SERVER-MIB for monitoring
        Directory Server operations, entry statistics and cache
        performance."

    MODULE -- this module
        MANDATORY-GROUPS { dsEntryGroup, dsOpsGroup }

    ::= { dsCompliances 2 }

dsIntCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        " The compliance statement for SNMP entities
        which implement the DIRECTORY-SERVER-MIB for monitoring
        Directory Server operations and the interaction of the
        Directory Server with peer Directory Servers."

    MODULE -- this module
        MANDATORY-GROUPS { dsEntryGroup, dsIntGroup }

    ::= { dsCompliances 3 }

dsOpsIntCompliance MODULE-COMPLIANCE
```

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STATUS current

DESCRIPTION

" The compliance statement for SNMP entities
which implement the DIRECTORY-SERVER-MIB for monitoring
Directory Server operations and the interaction of the
Directory Server with peer Directory Servers."

MODULE -- this module

MANDATORY-GROUPS { dsEntryGroup, dsOpsGroup, dsIntGroup }

::= { dsCompliances 4 }

-- Units of conformance

```
dsEntryGroup    OBJECT-GROUP
  OBJECTS {dsServerType,          dsServerDescription,
           dsMasterEntries,       dsCopyEntries,
           dsCacheEntries,       dsCacheHits,
           dsSlaveHits}
  STATUS current
  DESCRIPTION
    " A collection of objects for a summary overview of the
      Directory Servers."
  ::= { dsGroups 1 }
```

```
dsOpsGroup      OBJECT-GROUP
  OBJECTS {
    dsApplIfProtocolIndex,      dsApplIfProtocol,
    dsApplIfUnauthBinds,        dsApplIfSimpleAuthBinds,
    dsApplIfStrongAuthBinds,    dsApplIfBindSecurityErrors,
    dsApplIfInOps,              dsApplIfReadOps,
    dsApplIfCompareOps,         dsApplIfAddEntryOps,
    dsApplIfRemoveEntryOps,     dsApplIfModifyEntryOps,
    dsApplIfModifyRDNOps,       dsApplIfListOps,
    dsApplIfSearchOps,          dsApplIfOneLevelSearchOps,
    dsApplIfWholeSubtreeSearchOps, dsApplIfReferrals,
    dsApplIfChainings,          dsApplIfSecurityErrors,
    dsApplIfErrors,             dsApplIfReplicationUpdatesIn,
    dsApplIfReplicationUpdatesOut, dsApplIfInBytes,
    dsApplIfOutBytes            }
  STATUS current
  DESCRIPTION
    " A collection of objects for monitoring the Directory
      Server operations."
  ::= { dsGroups 2 }
```

```
dsIntGroup      OBJECT-GROUP
  OBJECTS {
    dsIntEntDirectoryName,      dsIntEntTimeOfCreation,
    dsIntEntTimeOfLastAttempt,   dsIntEntTimeOfLastSuccess,
    dsIntEntFailuresSinceLastSuccess, dsIntEntFailures,
    dsIntEntSuccesses,          dsIntEntURL}
  STATUS current
  DESCRIPTION
    " A collection of objects for monitoring the Directory
      Server's interaction with peer Directory Servers."
  ::= { dsGroups 3 }
```

END

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6. Intellectual Property

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6. Changes from [RFC1567](#).

A more general Directory model in which, several Directory protocols coexist, has been adopted for the purpose of the MIB design. The result is a generic Directory Server Monitoring MIB.

7. Acknowledgements

This draft is the product of discussions and deliberations carried out in the Mail and Directory Management Working Group (ietf-madman-wg).

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Security Considerations

There are no management objects defined in this MIB that have a MAX-ACCESS clause of read-write and/or read-create. So, if this MIB is implemented correctly, then there is no risk that an intruder can alter or create any management objects of this MIB via direct SNMP SET operations.

However, the information itself may partly reveal the configuration of the directory system and passively increase its vulnerability. The information could also be used to analyze network usage and traffic patterns.

Therefore, it may be important in some environments to control read access to these objects and possibly to even encrypt the values of these object when sending them over the network via SNMP. Not all versions of SNMP provide features for such a secure environment.

SNMPv1 by itself is such an insecure environment. 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 (read) the objects in this MIB.

It is recommended that the implementors consider the security features as provided by the SNMPv3 framework. Specifically, the use of the User-based Security Model [RFC 2274](#) [12] and the View-based Access Control Model [RFC 2275](#) [15] is recommended.

It is then a customer/user responsibility to ensure that the SNMP entity giving access to an instance of this MIB, is properly configured to give access to those objects only to those principals (users) that have legitimate rights to access them.

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