DNS MIB Extensions

2–September–1992

DNS Working Group

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Status of this Memo

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This draft document will be submitted to the RFC editor as a proposed extension to the SNMP MIB. Distribution of this document is unlimited. Please send comments or corrections to the editor.

Abstract

This memo defines a set of DNS (Domain Name System) extensions that have been created for the Internet MIB. When used in conjunction with the Structure of Management Information (RFC 1155), the Management Information Base for Network Management of TCP/IP-based internets (RFC 1213) and the Simple Network Management Protocol (RFC 1157), it will be possible to provide integrated network management of DNS client and server software in standard TCP/IP based environments. This document was produced by the DNS working group.

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CONTENTS

1 Introduction 1

2 Selected Objects 1

3 Objects 2
3.1 Format of Definitions 2
3.2 Textual Conventions 2

4 Object Definitions 2

5 Acknowledgements 34

6 References 34

1 Introduction

With the adoption of The Simple Network Management Protocol (RFC 1157), the Management Information Base for network management of TCP/IP-based internets (RFC 1213), and the Structure of Management Information (RFC 1155) by the Internet, and a large number of vendor implementations of these standards in commercially available products, it became possible to provide a higher level of effective network management in TCP/IP-based internets than previously available. With the growth in the use of these standards, it has become possible to consider the management of other elements of the infrastructure beyond the basic TCP/IP protocols. A key element of the TCP/IP infrastructure is the DNS.

Up to this point there has been no mechanism to integrate the management of the DNS with SNMP-based managers. This memo provides the mechanisms by which IP-based management stations can effectively manage DNS client and server software in an integrated fashion through the use of the standard Internet SMI, MIB and Simple Network Management Protocol.

New DNS MIB objects have been defined to be used in conjunction with the Internet MIB to allow access and control of the DNS via SNMP by the Internet community.

2 Selected Objects

The objects included in this memo have been created from information contained in the relevant DNS related RFCs which include: Domain Administrators Guide (RFC 1032), Domain Administrators Operations Guide (RFC 1033) Domain Names - Concepts and Facilities (RFC 1034), Domain Names - Implementation and Specification (RFC 1035), and Requirements for Internet Hosts - Application and Support (RFC 1123). In addition, objects have been created based on expected operational need and from the example of existing DNS specific tools. These objects have be ordered into groups as follows:

- General Configuration Group
- Resolver Configuration Group
- Server Configuration Group
- Resolver Counter Group
- Server Counter Group
- Records Group
- Resolver Cache Group
- Resolver Negative Cache Group
- Resolver Statistics Group
- Server Management Group

Many of the objects defined in this memo have been created from information contained in existing configuration files used by many DNS implementations. This information has been converted into a standard form using the Internet Standard SMI defined in RFC 1155.

3 Objects

The objects in this memo are described using the standard Internet SMI and BER of RFC 1155. Each object description includes the objects name, its syntax and encoding. Just as with objects supported in the MIB (RFC 1156), an object name is identified with an object identifier which has been administratively assigned. This identifies an Object Type. When an object type is combined with a specific instance - the particular object is uniquely identified. Use of Object Descriptors in this memo is consistent with that of RFC 1156 - meaning that they are text strings meant to be read by humans. The descriptors have been created from a variety of sources. For the most part, the descriptions are influenced by by the DNS related RFCs noted above. For example, the descriptors for counters used for the various types of queries of DNS records are influenced by the definitions used for the various record types found in Domain Names - Implementation and Specification RFC 1035.

3.1 Format of Definitions

An object in this memo is specified by five fields of information: Object, Syntax, Description, Access, and Status.

The OBJECT is a textual name (OBJECT DESCRIPTOR) for that object type combined with an administratively obtained OBJECT IDENTIFIER.

SYNTAX : For each object type, its abstract syntax is presented using the ASN.1 specified in RFC 1155.

DESCRIPTION: A general description of the object type.

ACCESS : The standard access keywords supported in RFC 1156 are used. The keywords used in this MIB are: read-only, read-write, and, not-accessible.

STATUS : The status field is used to describe with a single keyword whether the object type is mandatory or optional. Status keywords of obsolete and deprecated are not used in this memo since this is the first version of the DNS MIB.

3.2 Textual Conventions

Several datatypes have been introduced as a textual conventions in this DNS MIB document. These additions will facilitate the common understanding of information used by the DNS. No changes to the SMI or the SNMP are necessary to support these conventions which are described in 4.0 (Object Definitions).

4 Object Definitions

```
        RFCxxxx-dnsMIB

        DEFINITIONS ::= BEGIN

        IMPORTS
            mgmt, OBJECT-TYPE, NetworkAddress, IpAddress,
            Counter, Gauge, TimeTicks
              FROM RFC1155-SMI
            DisplayString
              FROM RFC1213;

    -- DNS MIB
```

```
     dns             OBJECT IDENTIFIER ::= { experimental 9999 }

-- textual conventions

DnsDate ::= DisplayString
-- This data type is intended to provide a consistent
-- method of reporting date information.  The first four
-- octets represent the year, the next two month of the year
-- expressed numerically, the next four octets represent the day
-- followed by hour of the day using a 24 hour clock followed by a
-- decimal point.  The next two octets represent tenths and
-- hundreths of a second.  The final 5 octets provide a mechanism
-- to relate the host's time to Coordinated Universal Time.  Tuesday
-- May 26, 1992 at 1:30 PM EDT would be represented as:
-- 199205261330.00-400.

DnsName ::= OCTET STRING
-- A DNS name is a sequence of octets with internal length encoding.
-- While it is often the case that the printed form of a DNS name is
-- a dotted-format Internet hostname, this is not always the case.
-- All occurrences of DNS names in this MIB us the internal format
-- used by the DNS protocols embedded within an OCTET STRING.

DnsClass ::= INTEGER (0..65535)
-- This data type is used to represent the class values which appear
-- in Resource Records in the DNS.  A 16-bit unsigned integer is
-- used to allow room for new classes records to be defined.
-- Existing classes are listed in RFC 1035.

DnsType ::= INTEGER (0..65535)
-- This data type is used to represent the type values which appear
-- in Resource Records in the DNS.  A 16-bit unsigned integer is
-- used to allow room for new record types to be defined.
-- Existing types are listed in RFC 1035.

DnsQClass ::= INTEGER (0..65535)
-- This data type is used to represent the QClass values which appear
-- in Resource Records in the DNS.  A 16-bit unsigned integer is
-- used to allow room for new QClass records to be defined.  Existing
-- Q classes are listed in RFC 1035.

DnsQType ::= INTEGER (0..65535)
-- This data type is used to represent the QType values which appear
-- in Resource Records in the DNS.  A 16-bit unsigned integer is
-- used to allow room for new QType records to be defined.
-- Existing QTypes are listed in RFC 1035.

DnsTime ::= INTEGER
-- DnsTime values are 32-bit unsigned integers which measure time in
-- seconds.

DnsValid ::= INTEGER { valid (1), clear (2) }
-- Many of the tables in this MIB have as one of their columns, an
-- object which can be set to a value of 2 to delete that
-- row of the table.  If a read operation is performed on this
-- object, a value of 1 is returned to indicate a valid row in the
-- table.

DnsOpCode ::= INTEGER (0..15)
-- This data type is used to represent the DNS OPCODE used in the
-- header section of DNS messages.  Existing OPCODE vales are listed
-- in RFC 1035.

DnsRespCode ::= INTEGER (0..15)
-- This data type is used to represent the DNS RCODE value in response
-- messages.  Existing RCODE valeus are listed in RFC 1035.

-- groups in the dns mib
```

```
       dnsGenConfig               OBJECT IDENTIFIER ::= { dns 1 }
       dnsResConfig               OBJECT IDENTIFIER ::= { dns 2 }
       dnsServerConfig            OBJECT IDENTIFIER ::= { dns 3 }
       dnsResCounter              OBJECT IDENTIFIER ::= { dns 4 }
       dnsServCounter             OBJECT IDENTIFIER ::= { dns 5 }
       dnsRec                     OBJECT IDENTIFIER ::= { dns 6 }
       dnsResCache                OBJECT IDENTIFIER ::= { dns 7 }
       dnsResNCache               OBJECT IDENTIFIER ::= { dns 8 }
       dnsResStats                OBJECT IDENTIFIER ::= { dns 9 }
       dnsMgmt                    OBJECT IDENTIFIER ::= { dns 10 }

-- General Configuration Group

-- The implementation of the General Configuration group is
-- mandatory for all systems.

dnsGenConfigDnsUse OBJECT-TYPE
     SYNTAX  INTEGER {
          primary (1),
          not-primary (2),
          not-used (3)
     }
     ACCESS  read-write
     STATUS  mandatory
     DESCRIPTION
             "A value of 1 indicates that the DNS is used as the
             primary mechanism for name resolution on this system.
             A 2 indicates that some other mechanism is used as the
             primary mechanism for name resolution and that the DNS
             is used as a back-up.  A value of 3 indicates that DNS
             is not used for name resolution."
     ::= { dnsGenConfig 1 }

-- Resolver Configuration Group

-- The implementation of the Resolver Configuration group is
-- mandatory for all systems which implement any resolver software
-- functions.

dnsResConfigId OBJECT-TYPE
     SYNTAX  DisplayString
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
          "Name and version identification of DNS resolver software."
     ::= { dnsResConfig 1 }

dnsResConfigService OBJECT-TYPE
     SYNTAX  INTEGER {
          recursive-only (1),
          iterative-only (2),
          recursive-and-iterative (3)
     }
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
          "Kind of DNS resolution service provided.
          RECURSIVE-ONLY is a stub resolver.
          ITERATIVE-ONLY is a normal full service resolver.
          RECURSIVE-AND-ITERATIVE is a full service resolver which
          performs a mix of recursive and iterative queries."
     ::= { dnsResConfig 2 }
```

```
dnsResConfigMaxCnames OBJECT-TYPE
     SYNTAX  INTEGER
     ACCESS  read-write
     STATUS  mandatory
     DESCRIPTION
          "Limit on how many CNAMEs the resolver should allow before
          deciding that there's a CNAME loop.  Zero means that
          resolver has no explicit CNAME limit."
     ::= { dnsResConfig 3 }

-- DNS Resolver Seat Belt Table

dnsResConfigSeatBeltTable OBJECT-TYPE
     SYNTAX  SEQUENCE OF DnsResConfigSeatBeltEntry
     ACCESS  not-accessible
     STATUS  mandatory
     DESCRIPTION
          "Table of safety belt information used by the resolver
          when it hasn't got any better idea of where to send a
          query, such as when the resolver is booting."
     ::= { dnsResConfig 4 }

dnsResConfigSeatBeltEntry  OBJECT-TYPE
     SYNTAX  DnsResConfigSeatBeltEntry
     ACCESS  not-accessible
     STATUS  mandatory
     DESCRIPTION
      "An entry in the resolver's seatbelt table."
     INDEX { dnsResConfigSeatBeltAddr,
             dnsResConfigSeatBeltSubTree,
             dnsResConfigSeatBeltClass }
     ::= { dnsResConfigSeatBeltTable 1 }

DnsResConfigSeatBeltEntry ::=
     SEQUENCE {
        dnsResConfigSeatBeltAddr
            IpAddress,
        dnsResConfigSeatBeltName
            DnsName,
        dnsResConfigSeatBeltSvc
            INTEGER,
        dnsResConfigSeatBeltPref
            INTEGER,
        dnsResConfigSeatBeltSubTree
            DnsName,
        dnsResConfigSeatBeltClass
            DnsClass,
        dnsResConfigSeatBeltFile
            OCTET STRING,
        dnsResConfigSeatBeltDate
            DnsDate,
        dnsResConfigSeatBeltValid
            DnsValid
     }
dnsResConfigSeatBeltAddr OBJECT-TYPE
     SYNTAX  IpAddress
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "IP address of a SeatBelt name server."
     ::= { dnsResConfigSeatBeltEntry 1 }
```

```
dnsResConfigSeatBeltName OBJECT-TYPE
     SYNTAX  DnsName  --  OCTET STRING
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "DNS name of a SeatBelt nameserver, if known, otherwise
             it is null."
     ::= { dnsResConfigSeatBeltEntry 2 }

dnsResConfigSeatBeltSvc OBJECT-TYPE
     SYNTAX  INTEGER {
          iterative (1),
          recursive (2)
     }
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Type-Of-Service resolver expects from seatbelt
             nameserver.  ITERATIVE indicates that resolver will be
             directing iterative queries to this name server (RD
             bit turned off), while RECURSIVE indicates that
             resolver will be directing recursive queries to this
             name server (RD bit turned on)."
     ::= { dnsResConfigSeatBeltEntry 3 }

dnsResConfigSeatBeltPref OBJECT-TYPE
     SYNTAX  INTEGER
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "This value identifies the preference for the server
             identified in this row of the table.  The lower the
             value, the more desirable the particular server is
             considered."
     ::= { dnsResConfigSeatBeltEntry 4 }

dnsResConfigSeatBeltSubTree OBJECT-TYPE
     SYNTAX  DnsName  --  OCTET STRING
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "The DNS sub tree name for queries sent to the name
             server identified by dnsResConfigSeatBeltName."
     ::= { dnsResConfigSeatBeltEntry 5 }

dnsResConfigSeatBeltClass OBJECT-TYPE
     SYNTAX  DnsClass -- INTEGER (0..65535)
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "The class of DNS queries that will be sent to the
             server identified by dnsResConfigSeatBeltName."
     ::= { dnsResConfigSeatBeltEntry 6 }

dnsResConfigSeatBeltFile OBJECT-TYPE
     SYNTAX  DisplayString
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "The name of the source file which contains information
             read by the resolver at initialization."
     ::= { dnsResConfigSeatBeltEntry 7 }
```

```
dnsResConfigSeatBeltDate OBJECT-TYPE
     SYNTAX  DnsDate -- DisplayString
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "This is the date information found in
             dnsResConfigSeatBeltFile was last changed."
     ::= { dnsResConfigSeatBeltEntry 8 }

dnsResConfigSeatBeltValid OBJECT-TYPE
     SYNTAX  DnsValid
     ACCESS  read-write
     STATUS  mandatory
     DESCRIPTION
             "Setting this variable to CLEAR deletes this SeatBelt
             server."
     ::= { dnsResConfigSeatBeltEntry 9 }

-- Server Configuration Group

-- The implementation of the Server Configuration Group is
-- mandatory for all systems which implement DNS server software
-- functions.

dnsServerConfigImplementIdent OBJECT-TYPE
     SYNTAX  DisplayString
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "The implementation identification string for the DNS
             software in use on the system, for example; FNS2.1"
    ::= { dnsServerConfig 1 }

dnsServerConfigRecurs  OBJECT-TYPE
     SYNTAX  INTEGER {
          available (1),
          restricted (2),
          unavailable (3)
     }
     ACCESS  read-write
     STATUS  mandatory
     DESCRIPTION
             "This represents the recursion status of requests made
             to this server.  The possible values are: available -
             performs recursion on requests from clients.
             Restricted - recursion is performed on requests from
             clients which are on an access control list.
             Unavailable - recursion is not available."
     ::= { dnsServerConfig 2 }

-- Resolver Counters Group

-- The implementation of the Resolver Counters Group is mandatory for
-- all systems which implement resolver functions

dnsResCounterUpTime OBJECT-TYPE
     SYNTAX  DnsTime
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "If the resolver has a persistent state, e.g., a
             process; this value will be the time elapsed since it
             started.  For software that does not have persistence,
             this value will be 0."
    ::= { dnsResCounter 1 }
```

```
dnsResCounterResetTime OBJECT-TYPE
     SYNTAX  DnsTime
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Elapsed time since cache was reloaded."
    ::= { dnsResCounter 2 }

dnsResCounterInUpkts OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of UDP packets received by the resolver
              process(s)."
    ::= { dnsResCounter 3 }

dnsResCounterOutUPkts OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of UDP packets sent by the resolver
              process(s)."
    ::= { dnsResCounter 4 }

dnsResCounterTCPInitiatns OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of attempts to initiate TCP connections with
             servers."
     ::= { dnsResCounter 5 }

dnsResCounterInTCPMesgs OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of received DNS messages over TCP by the
             resolver process."
    ::= { dnsResCounter 6 }

dnsResCounterOutTCPMesgs OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of out bound DNS messages sent over TCP by the
             resolver."
    ::= { dnsResCounter 7 }

-- Resolver Counter Table

dnsResCounterTable OBJECT-TYPE
     SYNTAX  SEQUENCE OF DnsResCounterTableEntry
     ACCESS  not-accessible
     STATUS  mandatory
     DESCRIPTION
             "Table of the current count of resolver queries and
             answers."
    ::= { dnsResCounter 8 }
```

```
dnsResCounterTableEntry OBJECT-TYPE
     SYNTAX  DnsResCounterTableEntry
     ACCESS  not-accessible
     STATUS  mandatory
     DESCRIPTION
             "Entry in the resolver counter table.  Entries are
             indexed by dns OpCode."
     INDEX { dnsResCounterOpCode }
     ::= { dnsResCounterTable 1 }

DnsResCounterTableEntry ::=
     SEQUENCE {
         dnsResCounterOpCode
              DnsOpCode,
         dnsResCounterQueries
              Counter,
         dnsResCounterResponses
              Counter
     }
dnsResCounterOpCode OBJECT-TYPE
     SYNTAX  DnsOpCode -- INTEGER (0..15)
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "The index to this table.  The OpCodes that have
             already been defined are found in RFC1035."
     ::= { dnsResCounterTableEntry 1 }

dnsResCounterQueries OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of queries [total] that have sent out by the
             resolver since initialization for the OpCode which is
             the index to this row of the table."
     ::= { dnsResCounterTableEntry 2 }

dnsResCounterResponses OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of responses [total] that have been received
             by the resolver since initialization for the OpCode
             which is the index to this row of the table."
     ::= { dnsResCounterTableEntry 3 }

-- Resolver Response Code Counter Table

dnsResResponseTable OBJECT-TYPE
     SYNTAX  SEQUENCE OF DnsResResponseTableEntry
     ACCESS  not-accessible
     STATUS  mandatory
     DESCRIPTION
             "Table of the current count of responses to resolver
             queries."
    ::= { dnsResCounter 9 }
```

```
dnsResResponseTableEntry OBJECT-TYPE
     SYNTAX  DnsResResponseTableEntry
     ACCESS  not-accessible
     STATUS  mandatory
     DESCRIPTION
             "Entry in the resolver response table.  Entries are
             indexed by DNS response code."
     INDEX { dnsResResponseCode }
     ::= { dnsResResponseTable 1 }

DnsResResponseTableEntry ::=
     SEQUENCE {
         dnsResResponseCode
              DnsRespCode,
         dnsResResponses
              Counter
     }
dnsResResponseCode OBJECT-TYPE
     SYNTAX  DnsRespCode -- INTEGER (0..15)
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "The index to this table.  The Response Codes that have
             already been defined are found in RFC1035."
     ::= { dnsResResponseTableEntry 1 }

dnsResResponses OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of responses the resolver has received for the
             response code value which identifies this row of the
             table."
     ::= { dnsResResponseTableEntry 2 }

-- Additional DNS Resolver Counter Objects

dnsResCounterNonAuthDataResps OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of requests made by the resolver for which a
             non-authoritative answer (cached data) was received."
     ::= { dnsResCounter 10 }

dnsResCounterNonAuthNoDataResps OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of requests made by the resolver for which a
             non-authoritative answer - no such data response
             (empty answer) was received."
     ::= { dnsResCounter 11 }

dnsResCounterMartians OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of responses received which were received from
             servers that the resolver does not think it asked."
     ::= { dnsResCounter 12 }
```

```
dnsResCounterRecdResponses OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of responses received to all queries."
     ::= { dnsResCounter 13 }

dnsResCounterDuplicates OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of responses received which were duplicates and
             ignored by the resolver."
     ::= { dnsResCounter 14 }

dnsResCounterUnparseResps OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of responses received which were unparseable."
     ::= { dnsResCounter 15 }

dnsResCounterRootAttempts OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of attempts made by the resolver to connect
             with root servers."
     ::= { dnsResCounter 16 }

dnsResCounterReferals OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of responses which were received from
             servers redirecting query to another server."
     ::= { dnsResCounter 17 }

dnsResCounterRetrans OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number requests retransmitted for all reasons."
     ::= { dnsResCounter 18 }

dnsResCounterNoResponses OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of queries that were retransmitted because of
             no response."
     ::= { dnsResCounter 19 }

dnsResCounterRootRetrans OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of queries that were retransmitted that were to
             root servers."
     ::= { dnsResCounter 20 }
```

```
dnsResCounterInternals OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of requests internally generated by the
             resolver."
     ::= { dnsResCounter 21 }

dnsResCounterInternalTimeOuts OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of requests internally generated which timed
             out."
     ::= { dnsResCounter 22 }

-- Server Counter Group

-- The implementation of the Server Counter Group is mandatory for
-- all systems which offer either recursive or non recursive server
-- software functions.

-- Several of the objects in this group make distinctions between
-- queries which originate with the local host, within the same
-- zone as the local host or come from outside the zone of the
-- server.  The purpose of these distinctions is to allow for
-- implementations to group queries and responses on this basis.
-- One way in which servers may make these distinctions is by
-- looking at the source IP address of the DNS query.  If the
-- source of the query is 'your own' then the query should be
-- counted as 'yourself' - local host.  If the source of the query
-- matches an 'access list' - the the query came from a friend,
-- that is; within the local zone.  What constitutes an 'access
-- list' is implementation dependent and could be as simple as all
-- hosts on the same IP network as the DNS server are classed as in
-- the local zone and are 'friends'.  In order to avoid double
-- counting, the following rules apply:

-- 1.  No host is in more than one of the three groups defined above.
-- 2.  All queries from the local host are always counted in the
--     'yourself' group regardless of what the access list, if any,
--     says.
-- 3.  The access list should not define 'your friends' in such a way
--     that it includes all hosts, that is 'not everybody is your
--     friend'.

dnsServCounterUTime OBJECT-TYPE
     SYNTAX  DnsTime
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "If the server has a persistent state,  e.g., a
             process; this value will be the time elapsed since it
             started.  For software that does not have persistence,
             this value will be 0."
    ::= { dnsServCounter 1 }

dnsServCounterInUPkts OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number [total] of UDP packets received by the server."
    ::= { dnsServCounter 2 }
```

```
dnsServCounterOutUPkts OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number [total] of UDP packets sent by the server."
    ::= { dnsServCounter 3 }

dnsServCounterTCPConns OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of TCP connections received by the server."
    ::= { dnsServCounter 4 }

dnsServCounterTCPInitiatns OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of attempt to initiate TCP connections with
             other servers."
    ::= { dnsServCounter 5 }

dnsServCounterInTCPMesgs OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of received DNS messages over TCP by the server."
    ::= { dnsServCounter 6 }

dnsServCounterOutTCPMesgs OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of out bound DNS messages over TCP sent by the
             server."
    ::= { dnsServCounter 7 }

dnsServCounterSelfAuthAns OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of requests the server has processed with
             authoritative data which originated from a resolver
             on the same host."
     ::= { dnsServCounter 8 }

dnsServCounterSelfAuthNoNames OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of requests the server has processed which
             originated from a resolver on the same host for which
             there has been an authoritative no such name answer
             given."
     ::= { dnsServCounter 9 }
```

```
dnsServCounterSelfAuthNoDataReqsts OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of requests the server has processed which
             originated from a resolver on the same host for which
             there has been an authoritative no such data answer
             (empty answer) made."
     ::= { dnsServCounter 10 }

dnsServCounterSelfNonAuthDataReqsts OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of requests the server has processed which
             originated from a resolver on the same host for which
             a non-authoritative answer (cached data) was made."
     ::= { dnsServCounter 11 }

dnsServCounterSelfNonAuthNoDataReqsts OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of requests the server has processed which
             originated from a resolver on the same host for which
             a non-authoritative answer - no such data response was
             made (empty answer)."
     ::= { dnsServCounter 12 }

dnsServCounterSelfCAnyReqsts OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of requests the server has processed which
             originated from a resolver on the same host which
             were answers to class=* queries."
     ::= { dnsServCounter 13 }

dnsServCounterSelfIAnsReqsts OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of inverse queries the server has processed which
             originated from a resolver on the same host."
     ::= { dnsServCounter 14 }

dnsServCounterSelfRefs OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of queries the server has processed
             which originated from a resolver on the same
             host and were referred to other servers."
     ::= { dnsServCounter 15 }
```

```
dnsServCounterSelfErrors OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of requests the server has processed which
             originated from a resolver on the same host which
             have been answered with errors (RCODE values other
             than 0).  RCODE values are defined in RFC1035."
     ::= { dnsServCounter 16 }

dnsServCounterSelfRelNames OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of requests received for names that are only
             1 label long (text form - no internal dots) the
             server has processed which originated from a resolver
             on the same host."
     ::= { dnsServCounter 17 }

dnsServCounterFriendsAuthAns OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of queries originating from friends which
             were authoritatively answered.  The definition of
             friends is a locally defined matter."
     ::= { dnsServCounter 18 }

dnsServCounterFriendsNoSuchNames OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of queries originating from friends, for
             which authoritative no such name (NXDOMAIN) responses
             were made.  The definition of friends is a locally
             defined matter."
     ::= { dnsServCounter 19 }

dnsServCounterFriendsZoneNoDataResps OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of queries originating from friends for
             which authoritative no such data (empty answer)
             responses were made.  The definition of friends is
             a locally defined matter."
     ::= { dnsServCounter 20 }

dnsServCounterFriendsNonAuthDatas OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of queries originating from friends which
             were non-authoritatively answered (cached data).
             The definition of friends is a locally defined matter."
     ::= { dnsServCounter 21 }
```

```
dnsServCounterFriendsNonAuthNoDatas OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of queries originating from friends which
             were non-authoritatively answered with no such data
             (empty answer)."
     ::= { dnsServCounter 22 }

dnsServCounterFriendsCAnys OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of answers to class=* queries which originated
             from friends.  The definition of friends is a locally
             defined matter."
     ::= { dnsServCounter 23 }

dnsServCounterFriendsInverses OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of responses to inverse queries which originated
             from friends. The definition of friends is a locally
             defined matter."
     ::= { dnsServCounter 24 }

dnsServCounterFriendsRefs OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of requests which originated from friends
             that were forwarded to other servers.  The definition
             of friends is a locally defined matter."
     ::= { dnsServCounter 25 }

dnsServCounterFriendsErrors OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of requests the server has processed which
             originated from friends and were answered with errors
             (RCODE values other than 0).  RCODE values are defined
             in RFC1035.  The definition of friends is a locally
             defined matter."
     ::= { dnsServCounter 26 }

dnsServCounterFriendsRels OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of requests received for names from friends
             that are only 1 label long (text form - no internal
             dots) the server has processed."
     ::= { dnsServCounter 27 }
```

```
dnsServCounterRemoteAuthAns OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of queries originating from systems which have
             not been defined as friends, which were
             authoritatively answered."
     ::= { dnsServCounter 28 }

dnsServCounterRemoteNoNames OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of queries originating from systems which
             have not been defined as friends, for which
             authoritative no such name responses were made."
     ::= { dnsServCounter 29 }

dnsServCounterRemoteNoDataResps OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of queries originating from systems which
             have not been defined as friends, for which
             authoritative no such data (empty answer)
             responses were made."
     ::= { dnsServCounter 30 }

dnsServCounterRemoteNonAuthDatas OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of queries originating from systems which
             have not been defined as friends, which were
             non-authoritatively answered (cached data)."
     ::= { dnsServCounter 31 }

dnsServCounterRemoteNonAuthNoDatas OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of queries originating from systems which
             have not been defined as friends, which were
             non-authoritatively answered with no data
             (empty answer)."
     ::= { dnsServCounter 32 }

dnsServCounterRemoteCAnyResps OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of answers to class=* queries which originated
             from systems which have not been defined as friends."
     ::= { dnsServCounter 33 }
```

```
dnsServCounterRemoteInverses OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of answers to inverse queries which originated
             from systems which have not been defined as friends."
     ::= { dnsServCounter 34 }

dnsServCounterRemoteRefs OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of requests which originated from systems which
             have not been defined as friends that were forwarded to
             other servers."
     ::= { dnsServCounter 35 }

dnsServCounterRemoteErrors OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of requests the server has processed which
             originated from systems which have not been defined as
             friends that were answered with errors (RCODE values other
             than 0).  RCODE values are defined in RFC1035."
     ::= { dnsServCounter 36 }

dnsServCounterRemoteRelNames OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of requests received by the server which originated
             from systems which have not been defined as friends for
             names that are only 1 label long (text form - no
             internal dots)."
     ::= { dnsServCounter 37 }

dnsServCounterReqRefs OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of DNS requests refused by the server process."
     ::= { dnsServCounter 38 }

dnsServCounterReqUnparses OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of requests received which were unparseable."
     ::= { dnsServCounter 39 }

dnsServCounterLocalErrors OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of requests which were aborted for other
             (local) server errors."
     ::= { dnsServCounter 40 }
```

```
dnsServCounterDuplicates OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of duplicate requests which were received and
             not forwarded."
     ::= { dnsServCounter 41 }

dnsServCounterRelRemotes OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of requests received for names that are only
             1 label long (text form - no internal dots) the
             server has processed relative names from hosts
             outside of the server zone."
     ::= { dnsServCounter 42 }

-- DNS Server Counter Table

dnsServCounterTable OBJECT-TYPE
     SYNTAX  SEQUENCE OF DnsServCounterEntry
     ACCESS  not-accessible
     STATUS  mandatory
     DESCRIPTION
             "Counter information based on DNS class and
             record type."
    ::= { dnsServCounter 43 }

dnsServCounterEntry OBJECT-TYPE
     SYNTAX  DnsServCounterEntry
     ACCESS  not-accessible
     STATUS  mandatory
     DESCRIPTION
             "This table contains count information for each DNS
             record and class type known to the server.  The index
             allows management software to to create indices to the
             table to get the specific information desired, e.g.,
             number or A record queries over UDP which came to this
             server from a specific IP address."
    INDEX  { dnsServCounterOpCode, dnsServCounterQClass,
             dnsServCounterQueryType, dnsServCounterQuerySource,
             dnsServCounterTransport }
    ::= { dnsServCounterTable 1 }

DnsServCounterEntry ::=
    SEQUENCE {
        dnsServCounterOpCode
            DnsOpCode,
        dnsServCounterQClass
            DnsClass,
        dnsServCounterQueryType
            DnsType,
        dnsServCounterQuerySource
            INTEGER,
        dnsServCounterTransport
            INTEGER,
        dnsServCounterNumbers
            Counter,
        dnsServCounterResponses
            Counter
        }
dnsServCounterOpCode OBJECT-TYPE
     SYNTAX  DnsOpCode -- INTEGER (0..15)
     ACCESS  read-only
```

```
        STATUS  mandatory
        DESCRIPTION
                "The DNS OpCode which applies to this row of the table."
        ::= { dnsServCounterEntry 1 }

    dnsServCounterQClass OBJECT-TYPE
        SYNTAX  DnsClass -- INTEGER (0..65535)
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The QCLASS of the record type being counted in
                this row the table."
        ::= { dnsServCounterEntry 2 }

    dnsServCounterQueryType OBJECT-TYPE
        SYNTAX DnsType -- INTEGER (0..65535)
        ACCESS read-only
        STATUS mandatory
        DESCRIPTION
                "The type of record which is being counted in this row
                in the table."
        ::= { dnsServCounterEntry 3 }

    dnsServCounterQuerySource OBJECT-TYPE
        SYNTAX  INTEGER {
            self (1),
            friend (2),
            remote (3)
        }
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The source of the queries being counted in this row of
                the table.  A value of 1 indicates that the queries reported
                on this row came from a resolver which resides on the same
                system as the server.  A value of 2 indicates the
                queries originated from friends of the server - the
                definition of friends is a locally defined matter.  A
                value of 3 indicates that the queries counted on this
                row of the table came from systems which have not been
                defined as friends."
        ::= { dnsServCounterEntry 4 }

    dnsServCounterTransport OBJECT-TYPE
        SYNTAX  INTEGER {
           udp (1),
           tcp (2),
           other (3)
        }
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "A value of 1 indicates that the queries reported on
                this row were sent using UDP.  A value of 2 indicates
                that TCP was used.  3 is for any transport other than
                TCP or UDP."
        ::= { dnsServCounterEntry 5 }

    dnsServCounterNumbers OBJECT-TYPE
        SYNTAX  Counter
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "Number of queries that have been recorded in this row
                of the table."
        ::= { dnsServCounterEntry 6 }
```

```
dnsServCounterResponses OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of responses made by the server since
             initialization for the type of query identified
             on this row of the table."
     ::= { dnsServCounterEntry 7 }

-- Records Group

-- The implementation of the Records Group is mandatory for all
-- systems which implement DNS server software functions.

-- Records Table

-- The records table contains information about records that the
-- the DNS software reads at initialization.

dnsRecTable OBJECT-TYPE
     SYNTAX  SEQUENCE OF DnsRecEntry
     ACCESS  not-accessible
     STATUS  mandatory
     DESCRIPTION
             "Configuration information about all RR records for the
             DNS software."
    ::= { dnsRec 1 }

dnsRecEntry  OBJECT-TYPE
     SYNTAX  DnsRecEntry
     ACCESS  not-accessible
     STATUS  mandatory
     DESCRIPTION
             "This table contains Resource Record configuration
             information."
     INDEX { dnsRecZoneName, dnsRecZoneClass, dnsRecName,
             dnsRecType, dnsRecIndex }
     ::= { dnsRecTable 1 }

DnsRecEntry ::=
    SEQUENCE {
        dnsRecZoneName
            DnsName,
        dnsRecZoneClass
            DnsClass,
        dnsRecName
            DnsName,
        dnsRecType
            DnsType,
        dnsRecTTL
            INTEGER,
        dnsRecData
            OCTET STRING,
        dnsRecIndex
            INTEGER,
        dnsRecHits
            Counter
        }
dnsRecZoneName OBJECT-TYPE
     SYNTAX DnsName  --  OCTET STRING
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "The DNS name of the zone which contains the authoritative
             record described by this row of the table."
     ::= { dnsRecEntry 1 }
```

```
dnsRecZoneClass OBJECT-TYPE
     SYNTAX  DnsClass -- INTEGER (0..65535)
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "The class of the zone contained in this row.  For
             classes defined in RFC 1035, the values are the same."
     ::= { dnsRecEntry 2 }

dnsRecName OBJECT-TYPE
     SYNTAX DnsName  --  OCTET STRING
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "The name of the owner of the resource record described
             in this row of the table.  This will be the name of the
             node, about which this resource record applies."
     ::= { dnsRecEntry 3 }

dnsRecType OBJECT-TYPE
     SYNTAX  DnsType -- INTEGER (0..65535)
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "The type of the record contained in this row.  For
             types defined in RFC 1035, the values are the same."
     ::= { dnsRecEntry 4 }

dnsRecTTL OBJECT-TYPE
     SYNTAX  INTEGER
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "The default Time to Live value for this record which
             is read in on initialization."
     ::= { dnsRecEntry 5 }

dnsRecData OBJECT-TYPE
     SYNTAX  OCTET STRING
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Variable length of octets.  Type and Class information
             provided in this row of the table along with this data
             tell the management station how to interpret the Record.
             For information on the details of DNS Resource Records
             and their formats, see RFC1035."
     ::= { dnsRecEntry 6 }

dnsRecIndex OBJECT-TYPE
     SYNTAX  INTEGER
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "A unique index value which identifies each entry in
             this table."
     ::= { dnsRecEntry 7 }

dnsRecHits OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of hits the server has had on the resource record
             defined in this row of the table."
     ::= { dnsRecEntry 8 }
```

```
-- Resolver Cache Group

-- The implementation of the Resolver Cache Group is mandatory for
-- all systems which implement a cache.

dnsResCacheStatus OBJECT-TYPE
     SYNTAX  INTEGER {
          enabled (1),
          disabled (2)
     }
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Status of the resolver's cache.
             ENABLED means that the use of the cache is allowed.
             DISABLED means that the cache is not being used."
     ::= { dnsResCache 1 }

dnsResCacheValid OBJECT-TYPE
     SYNTAX  DnsValid
     ACCESS  read-write
     STATUS  mandatory
     DESCRIPTION
             "Setting this to CLEAR deletes the resolver's entire
             cache."
     ::= { dnsResCache 2 }

dnsResCacheMaxTTL OBJECT-TYPE
     SYNTAX  INTEGER
     ACCESS  read-write
     STATUS  mandatory
     DESCRIPTION
             "Maximum Time-To-Live for RRs in this cache.  If the
             resolver does not implement a TTL ceiling, the value of
             this field should be hexadecimal FFFFFFFF."
     ::= { dnsResCache 3 }

-- Resolver Cache Table

-- The Resolver Cache Table contains information about Resource
-- Records currently in the resolver's cache.

dnsResCacheTable OBJECT-TYPE
     SYNTAX  SEQUENCE OF DnsResCacheEntry
     ACCESS  not-accessible
     STATUS  mandatory
     DESCRIPTION
             "The entire contents of the resolver's cache."
    ::= { dnsResCache 4 }

dnsResCacheEntry OBJECT-TYPE
     SYNTAX  DnsResCacheEntry
     ACCESS  not-accessible
     STATUS  mandatory
     DESCRIPTION
             "A single entry in the resolvers's cache."
     INDEX { dnsResCacheRRName, dnsResCacheRRClass,
             dnsResCacheRRType, dnsResCacheRRIndex  }
     ::= { dnsResCacheTable 1 }
```

```
DnsResCacheEntry ::=
     SEQUENCE {
         dnsResCacheRRName
             DnsName,
         dnsResCacheRRClass
             DnsClass,
         dnsResCacheRRType
             DnsType,
         dnsResCacheRRTTL
             DnsTime,
         dnsResCacheRRElapsedTTL
             DnsTime,
         dnsResCacheRRSource
             IpAddress,
         dnsResCacheRRRData
             OCTET STRING,
         dnsResCacheRRValid
             DnsValid,
         dnsResCacheRRIndex
             INTEGER
     }
dnsResCacheRRName OBJECT-TYPE
     SYNTAX  DnsName  --  OCTET STRING
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Owner name of the Resource Record in the cache which
             is identified in this row of the table.  As described
             in RFC1034, the owner of the record is the domain name
             were the RR is found."
     ::= { dnsResCacheEntry 1 }

dnsResCacheRRClass OBJECT-TYPE
     SYNTAX  DnsClass -- INTEGER (0..65535)
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "DNS class of the  Resource Record in the cache which
             is identified in this row of the table."
     ::= { dnsResCacheEntry 2 }

dnsResCacheRRType OBJECT-TYPE
     SYNTAX  DnsType -- INTEGER (0..65535)
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "DNS type of the Resource Record in the cache which
             is identified in this row of the table."
     ::= { dnsResCacheEntry 3 }

dnsResCacheRRTTL OBJECT-TYPE
     SYNTAX  DnsTime
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Time-To-Live of RR in DNS cache.  This is the initial
             TTL value which was received with the RR when it was
             originally received."
     ::= { dnsResCacheEntry 4 }
```

```
dnsResCacheRRElapsedTTL OBJECT-TYPE
     SYNTAX  DnsTime
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Elapsed seconds since RR was received."
     ::= { dnsResCacheEntry 5 }

dnsResCacheRRSource OBJECT-TYPE
     SYNTAX  IpAddress
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Host from which RR was received, 0.0.0.0 if unknown."
     ::= { dnsResCacheEntry 6 }

dnsResCacheRRRData OBJECT-TYPE
     SYNTAX  OCTET STRING
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "RDATA portion of a cached RR."
     ::= { dnsResCacheEntry 7 }

dnsResCacheRRValid OBJECT-TYPE
     SYNTAX  DnsValid
     ACCESS  read-write
     STATUS  mandatory
     DESCRIPTION
             "Set to CLEAR to delete this RR entry from the
             cache table."
     ::= { dnsResCacheEntry 8 }

dnsResCacheRRIndex OBJECT-TYPE
     SYNTAX  INTEGER
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "A unique index value which indentifies each entry in
             this table."
     ::= { dnsResCacheEntry 9 }

-- Resolver Negative Cache Group

-- The implementation of the Resolver Negative Cache group is
-- mandatory for all systems which implement negative a negative
-- cache function.

dnsResNCacheStatus OBJECT-TYPE
     SYNTAX  INTEGER {
          enabled (1),
          disabled (2)
     }
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Status of the resolver's negative cache.
             ENABLED means that the use of the negative cache is
             allowed.
             DISABLED means that the negative caching is not being
             used."
     ::= { dnsResNCache 1 }
```

```
dnsResNCacheValid OBJECT-TYPE
     SYNTAX  DnsValid
     ACCESS  read-write
     STATUS  mandatory
     DESCRIPTION
             "Setting this to CLEAR deletes the resolver's entire
             negative response cache."
     ::= { dnsResNCache 2 }

dnsResNCacheMaxTTL OBJECT-TYPE
     SYNTAX  INTEGER
     ACCESS  read-write
     STATUS  mandatory
     DESCRIPTION
             "Maximum Time-To-Live for cached authoritative errors.
             If the resolver does not implement a TTL ceiling, the
             value of this field should be hexadecimal FFFFFFFF."
     ::= { dnsResNCache 3 }

-- Resolver Negative Cache Table

-- The Resolver Negative Cache Table contains information about
-- Resource Records currently in the resolver's cache.

dnsResNCacheTable OBJECT-TYPE
     SYNTAX  SEQUENCE OF DnsResNCacheEntry
     ACCESS  not-accessible
     STATUS  mandatory
     DESCRIPTION
             "The resolver's negative response cache."
     ::= { dnsResNCache 4 }

dnsResNCacheEntry OBJECT-TYPE
     SYNTAX  DnsResNCacheEntry
     ACCESS  not-accessible
     STATUS  mandatory
     DESCRIPTION
             "An entry in the resolver's negative response cache."
     INDEX { dnsResNCacheErrQName, dnsResNCacheErrQClass,
             dnsResNCacheErrQType, dnsResNCacheIndex  }
     ::= { dnsResNCacheTable 1 }

DnsResNCacheEntry ::=
     SEQUENCE {
         dnsResNCacheErrQName
             DnsName,
         dnsResNCacheErrQClass
             DnsQClass,
         dnsResNCacheErrQType
             DnsQType,
         dnsResNCacheErrTTL
             DnsTime,
         dnsResNCacheErrElapsedTTL
             DnsTime,
         dnsResNCacheErrSource
             IpAddress,
         dnsResNCacheErrCode
             INTEGER,
         dnsResNCacheErrValid
             DnsValid,
         dnsResNCacheIndex
             INTEGER
     }
dnsResNCacheErrQName OBJECT-TYPE
     SYNTAX  DnsName  --  OCTET STRING
     ACCESS  read-only
     STATUS  mandatory
```

```
     DESCRIPTION
             "QNAME associated with a cached authoritative error."
     ::= { dnsResNCacheEntry 1 }

dnsResNCacheErrQClass OBJECT-TYPE
     SYNTAX  DnsQClass -- INTEGER (0..65535)
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
            "DNS QCLASS associated with a cached authoritative error."
     ::= { dnsResNCacheEntry 2 }

dnsResNCacheErrQType OBJECT-TYPE
     SYNTAX  DnsQType -- INTEGER (0..65535)
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "DNS QTYPE associated with a cached authoritative error."
     ::= { dnsResNCacheEntry 3 }

dnsResNCacheErrTTL OBJECT-TYPE
     SYNTAX  DnsTime
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Time-To-Live of a cached authoritative error.
             This should be the TTL as copied from the MINIMUM
             field of the SOA that accompanied the authoritative
             error."
     ::= { dnsResNCacheEntry 4 }

dnsResNCacheErrElapsedTTL OBJECT-TYPE
     SYNTAX  DnsTime
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Elapsed seconds since authoritative error was received."
     ::= { dnsResNCacheEntry 5 }

dnsResNCacheErrSource OBJECT-TYPE
     SYNTAX  IpAddress
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Host which sent the authoritative error, 0.0.0.0 if
             unknown."
     ::= { dnsResNCacheEntry 6 }

dnsResNCacheErrCode OBJECT-TYPE
     SYNTAX  INTEGER {
         nonexistantName (1),
         noData (2),
         other (3)
     }
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
            "The authoritative error that has been cached.
             NonexistantName indicates a cached authoritative name
             error.  NoData indicates a cached authoritative
             response with no error and no relevant data."
     ::= { dnsResNCacheEntry 7 }
```

```
dnsResNCacheErrValid OBJECT-TYPE
     SYNTAX  DnsValid
     ACCESS  read-write
     STATUS  mandatory
     DESCRIPTION
            "Set to CLEAR to delete this cached error."
     ::= { dnsResNCacheEntry 8 }

dnsResNCacheIndex OBJECT-TYPE
     SYNTAX  INTEGER
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "A unique index value which indentifies each entry in
             the Negative Cache table."
     ::= { dnsResNCacheEntry 9 }

-- Resolver Statistics Group

-- The implementation of the Resolver Statistics Group is
-- mandatory for all systems which implement resolver functions.

dnsResStatGoodCaches OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of RRs the resolver has cached successfully."
     ::= { dnsResStats 1 }

dnsResStatBadCaches OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of RRs the resolver has refused to cache
              because they appear to be dangerous or irrelevant.
              Eg, RRs with suspiciously high TTLs, unsolicited root
              information, or that just don't appear to be relevant
              to the question the resolver asked."
     ::= { dnsResStats 2 }

dnsResStatGoodNCaches OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of authoritative errors the resolver has cached
              successfully."
     ::= { dnsResStats 3 }

dnsResStatBadNCaches OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Number of authoritative errors the resolver would
              have liked to cache but was unable to because the
              appropriate SOA RR was not supplied or looked
              suspicious."
     ::= { dnsResStats 4 }

-- Lame Delegation Table
```

```
dnsResLameDelegationTable OBJECT-TYPE
     SYNTAX  SEQUENCE OF DnsResLameDelegationEntry
     ACCESS  not-accessible
     STATUS  mandatory
     DESCRIPTION
            "Table of name servers returning lame delegations."
     ::= { dnsResStats 5 }

dnsResLameDelegationEntry OBJECT-TYPE
     SYNTAX  DnsResLameDelegationEntry
     ACCESS  not-accessible
     STATUS  mandatory
     DESCRIPTION
         "Entry in lame delegation table."
     INDEX { dnsResLameDelegationSource,
             dnsResLameDelegationName,
             dnsResLameDelegationClass }
     ::= { dnsResLameDelegationTable 1 }

DnsResLameDelegationEntry ::=
     SEQUENCE {
         dnsResLameDelegationSource
             IpAddress,
         dnsResLameDelegationName
             DnsName,
         dnsResLameDelegationClass
             DnsClass,
         dnsResLameCountDelegations
             Counter,
         dnsResLameDelegationValid
             DnsValid
     }
dnsResLameDelegationSource OBJECT-TYPE
     SYNTAX  IpAddress
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Source of lame delegation."
     ::= { dnsResLameDelegationEntry 1 }

dnsResLameDelegationName OBJECT-TYPE
     SYNTAX  DnsName
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "DNS name for which lame delegation was received."
     ::= { dnsResLameDelegationEntry 2 }

dnsResLameDelegationClass OBJECT-TYPE
     SYNTAX  DnsClass -- INTEGER (0..65535)
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "DNS class of received lame delegation."
     ::= { dnsResLameDelegationEntry 3 }

dnsResLameCountDelegations OBJECT-TYPE
     SYNTAX  Counter
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "How many times this lame delegation has been received."
     ::= { dnsResLameDelegationEntry 4 }
```

```
dnsResLameDelegationValid OBJECT-TYPE
     SYNTAX  DnsValid
     ACCESS  read-write
     STATUS  mandatory
     DESCRIPTION
            "Set to CLEAR to delete this lame delegation entry."
     ::= { dnsResLameDelegationEntry 5 }

-- Server Management Group

-- The implementation of the Server Management Group is mandatory
-- for all systems which implement DNS server software functions.

dnsMgmtVersion OBJECT-TYPE
     SYNTAX  DisplayString
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Name and version information for name server software."
     ::= { dnsMgmt 1 }

dnsMgmtReload OBJECT-TYPE
     SYNTAX  INTEGER {
          reload (1),
          other (2)
     }
     ACCESS  read-write
     STATUS  mandatory
     DESCRIPTION
             "This read-write variable is used to force a database
             reload with a restart of the name server process
             When set to the values above, the following actions
             are taken: reload - Reload and restart name server
             process(s).  Other is returned when a read operation
            is performed on this object."
     ::= { dnsMgmt 2 }

-- DNS Managment Zone Configuration Table

dnsMgmtZoneTable OBJECT-TYPE
     SYNTAX  SEQUENCE OF DnsMgmtZoneEntry
     ACCESS  not-accessible
     STATUS  mandatory
     DESCRIPTION
             "Table of zones for which this name server is
             configured.  If name server doesn't load any zones,
             this table is empty."
     ::= { dnsMgmt 3 }

dnsMgmtZoneEntry OBJECT-TYPE
     SYNTAX  DnsMgmtZoneEntry
     ACCESS  not-accessible
     STATUS  mandatory
     DESCRIPTION
             "An entry in the name server zone table."
     INDEX { dnsMgmtZoneMName,
             dnsMgmtZoneClass }
     ::= { dnsMgmtZoneTable 1 }
```

```
DnsMgmtZoneEntry ::=
     SEQUENCE {
         dnsMgmtZoneMName
             DnsName,
         dnsMgmtZoneRName
             DnsName,
         dnsMgmtZoneLoad
             DisplayString,
         dnsMgmtZoneDate
             DnsDate,
         dnsMgmtZoneClass
             DnsClass,
         dnsMgmtZoneLastReload
             DnsTime,
         dnsMgmtZoneLastReloadAttempt
             DnsTime,
         dnsMgmtZoneLastSource
             IpAddress,
         dnsMgmtZoneSerial
             INTEGER,
         dnsMgmtZoneRefresh
             DnsTime,
         dnsMgmtZoneRetry
             DnsTime,
         dnsMgmtZoneExpire
             DnsTime,
         dnsMgmtZoneMin
             INTEGER,
         dnsMgmtZoneValid
             DnsValid
     }
dnsMgmtZoneMName OBJECT-TYPE
     SYNTAX  DnsName
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "DNS name of the server that was the original or
             primary source of the data for this zone - see RFC
             1035 for details of teh SOA RDATA format.."
     ::= { dnsMgmtZoneEntry 1 }

dnsMgmtZoneRName OBJECT-TYPE
     SYNTAX  DnsName
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "The mailbox address of the person who is responsible
             for the administration of the zone specified in this
             row of the table.  Note that the format of the address
             follows the domain-name format as in
             postman.server.acme.com."
     ::= { dnsMgmtZoneEntry 2 }

dnsMgmtZoneLoad OBJECT-TYPE
     SYNTAX  DisplayString
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "This is the name of the file that is read in for the
             initial load of zone information on startup."
    ::= { dnsMgmtZoneEntry 3 }
```

```
dnsMgmtZoneDate OBJECT-TYPE
     SYNTAX  DnsDate -- DisplayString
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "This is the date that the information found in
             dnsMgmtZoneLoad was last changed."
    ::= { dnsMgmtZoneEntry 4 }

dnsMgmtZoneClass OBJECT-TYPE
     SYNTAX  DnsClass -- INTEGER (0..65535)
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "DNS class of the RRs in this zone."
     ::= { dnsMgmtZoneEntry 5 }

dnsMgmtZoneLastReload OBJECT-TYPE
     SYNTAX  DnsTime
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Elapsed seconds since last successful reload of
              this zone."
     ::= { dnsMgmtZoneEntry 6 }

dnsMgmtZoneLastReloadAttempt OBJECT-TYPE
     SYNTAX  DnsTime
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "Elapsed seconds since last attempted reload of
             this zone."
     ::= { dnsMgmtZoneEntry 7 }

dnsMgmtZoneLastSource OBJECT-TYPE
     SYNTAX  IpAddress
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "IP address of host from which most recent reload of
              this zone was received.  If unknown or irrelevant,
              value should be 0.0.0.0."
     ::= { dnsMgmtZoneEntry 8 }

dnsMgmtZoneSerial OBJECT-TYPE
     SYNTAX  INTEGER
     ACCESS  read-write
     STATUS  mandatory
     DESCRIPTION
             "The current serial number of the SOA record in the
             file specified by dnsServMgmtZoneLoad."
     ::= { dnsMgmtZoneEntry 9 }

dnsMgmtZoneRefresh OBJECT-TYPE
     SYNTAX  DnsTime
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "REFRESH interval for zone.  This is the REFRESH field
              of the zone's SOA RR, if known, otherwise whatever
              value the name server is using in place of the SOA
              REFRESH value."
     ::= { dnsMgmtZoneEntry 10 }
```

```
dnsMgmtZoneRetry OBJECT-TYPE
     SYNTAX  DnsTime
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "RETRY interval for zone.  This is the RETRY field of
              the zone's SOA RR, if known, otherwise whatever value
              the name server is using in place of the SOA RETRY
              value."
     ::= { dnsMgmtZoneEntry 11 }

dnsMgmtZoneExpire OBJECT-TYPE
     SYNTAX  DnsTime
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "EXPIRE interval for zone.  This is the EXPIRE field of
              the zone's SOA RR, if known, otherwise whatever value
              the name server is using in place of the SOA EXPIRE
              value."
     ::= { dnsMgmtZoneEntry 12 }

dnsMgmtZoneMin OBJECT-TYPE
     SYNTAX  INTEGER
     ACCESS  read-write
     STATUS  mandatory
     DESCRIPTION
             "This value is the TTL field which will be exported
             with any RR from this zone and is specified in the SOA
             record identified by dnsServMgmtZoneLoad."
    ::= { dnsMgmtZoneEntry 13 }

dnsMgmtZoneValid OBJECT-TYPE
     SYNTAX  DnsValid
     ACCESS  write-only
     STATUS  mandatory
     DESCRIPTION
             "Set to CLEAR to delete this zone entry."
     ::= { dnsMgmtZoneEntry 14 }

-- DNS Management Server Table

dnsMgmtServTable OBJECT-TYPE
     SYNTAX  SEQUENCE OF DnsMgmtServEntry
     ACCESS  not-accessible
     STATUS  mandatory
     DESCRIPTION
             "Table of IP addresses of name server hosts from which
              this name server might obtain particular zones.
              Typically this indicates the addresses of the primary
              name servers of zones for which the SNMP agent's host
              is a secondary name server."
     ::= { dnsMgmt 4 }

dnsMgmtServEntry OBJECT-TYPE
     SYNTAX  DnsMgmtServEntry
     ACCESS  not-accessible
     STATUS  mandatory
     DESCRIPTION
             "An entry in the name server server (sic) table."
     INDEX { dnsMgmtServName,
             dnsMgmtServClass,
             dnsMgmtServAddr }
     ::= { dnsMgmtServTable 1 }
```

```
DnsMgmtServEntry ::=
     SEQUENCE {
         dnsMgmtServName
             DnsName,
         dnsMgmtServClass
             DnsClass,
         dnsMgmtServAddr
             IpAddress
     }

dnsMgmtServName OBJECT-TYPE
     SYNTAX  DnsName
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "DNS name of the zone to which this entry applies."
     ::= { dnsMgmtServEntry 1 }

dnsMgmtServClass OBJECT-TYPE
     SYNTAX  DnsClass -- INTEGER (0..65535)
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "DNS class of zone to which this entry applies."
     ::= { dnsMgmtServEntry 2 }

dnsMgmtServAddr OBJECT-TYPE
     SYNTAX  IpAddress
     ACCESS  read-only
     STATUS  mandatory
     DESCRIPTION
             "IP address of name server host from which this zone
             might be obtainable."
     ::= { dnsMgmtServEntry 3 }
END
```

5 Acknowledgements

This document is the result of work undertaken the by DNS working group. Special thanks are due to Rob Austein of Epilogue Technology for the major contributions he has made in the organization of the MIB as well as authoring many of the objects. In addition, the contributions and comments of the following members are also specially acknowledged:

Win Treese, Digital Equipment Corporation
Philip Almquist, Computer Communication consultant
Joe Peck, Digital Equipment Corporation

6 References

J. Reynolds and J. Postel, Assigned Numbers. Internet Working Group Request for Comments 1010. Network Information Center, SRI International, Menlo Park, California, (May, 1987).

M. Stahl, Domain Administrators Guide. Internet Working Group Request for Comments 1032. Network Information Center, SRI International, Menlo Park, California, (November, 1987).

M. Lottor, Domain Administrators Operations Guide, Internet Working Group Request for Comments 1033. Network Information Center, SRI International, Menlo Park, California, (November, 1987).

P. Mockapetris, Domain Names - Concepts and Facilities, Internet Working Group Request for Comments 1034. Network Information Center, SRI International, Menlo Park, California, (November, 1987).

P. Mockapetris, Domain Names - Implementation and Specification, Internet Working Group Request for Comments 1035. Network Information Center, SRI International, Menlo Park, California, (November, 1987).

V. Cerf, IAB Recommendations for the Development of Internet Network Management Standards. Internet Working Group Request for Comments 1052. Network Information Center, SRI International, Menlo Park, California, (April, 1988).

R. Braden (editor) Requirements for Internet Hosts—Application and Support, Internet Working Group Request for Comments 1123. Network Information Center, SRI International,Menlo Park, California, (October, 1989).

M.T. Rose and K. McCloghrie, Structure and Identification of Management Information for TCP/IP-based internets, Internet Working Group Request for Comments 1155. Network Information Center, SRI International, Menlo Park, California, (May, 1990).

K. McCloghrie and M.T. Rose, Management Information Base for Network Management of TCP/IP-based internets, Internet Working Group Request for Comments 1156, Network Information Center, SRI International, Menlo Park, California, (May, 1990).

J.D. Case, M.S. Fedor, M.L. Schoffstall, and J.R. Davin, Simple Network Management Protocol, Internet Working Group Request for Comments 1157. Network Information Center, SRI International, Menlo Park, California, (May, 1990).

M.T. Rose, The Open Book, A Practical Perspective on OSI. Prentice Hall, Englewood Cliffs, New Jersey, (1990).

M.T. Rose and K. McCloghrie (editors) Concise MIB Definitions, Internet Working Group Request for Comments 1212, Network Information Center, SRI International, Menlo Park, California, (March, 1991).

K. McCloghrie and M.T. Rose (editors), Management Information Base for Network Management of TCP/IP-based internets: MIB-II, Internet Working Group Request for Comments 1213. Network Information Center, SRI International, Menlo Park, California, (March, 1991).