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                      ROOT ZONE PROTOCOL
              Some thoughts on a proposed change to DNS

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Abstract

 The changing structure and size of today's Internet has taxed the
 existing name services and their architecture to the breaking
 point. The DNS system of today was unfortunately architected to
 have a single root zone and limited set of Top Level Domains. This
 is defined usually in the set of root servers any resolving
 request uses to lookup an address.

 This proposal then is an attempt to lessen the impact on end-users
 and registrars and to allow IP owners a greater freedom in
 representing namespace to their customers.

 The elevator description is that this I-D proposes the
 restructuring of domain names more fully along the lines of a
 telephone number by creating a ROOT ZONE PROTOCOL as an addition
 to multiply the existing DNS services times the number of ROOT
 ZONES.

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1. Document Scope
   This document addresses a method or reducing the Intellectual
   property 'collisions', the confusion, pain and suffering with
   allocating names in DNS land, and does so by creating a discovery
   protocol for what has until now been a static part of the DNS
   infrastructure. The DNS Root Zone Tables.

   The Intent of the Root Zone Protocol (RZP) is to allow for the
   dynamic mapping of DNS Root Zones at the DNS Server Level and it
   identifies most all the components that the new Syntax Model would
   affect as well.

   This document is a very high level document and will require a
   number of iterations and the support of other documents to
   implement its proposed technology including but not limited to a
   modified version of RFC1034 and 3538 to support its changes at the
   very least, and likely some changes to the email world to make use
   of these capabilities.

1.1 Document Audience
    I assume you know the history of Names and Hostfile formats as per
    the original works starting at RFC608 and proceeding onward from
    there. I also assume you know Mockapetris' work on the basic DNS
    RFC's (starting with RFC1034 and others) and their evolution
    through what is in place today.

    I also assume that you understand how zone management works and
    how DNS is globally administered by the Internet Registrars and
    how the current Zone Tables are managed OOB.

2. Conventions used in this document

2.1 Key Words
    The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL
    NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and
    "OPTIONAL" in this document are to be interpreted as described in
    RFC-2119 [2].

2.2 Special terms
    The following TERMS are coined in this Document:

2.2.1   ZONE's
    One specific change is the difference in the use of the term ZONE
    relative to RFC-2136's use. Their use of the term ZONE refers to
    which zone within any given root hierarchy. Our use of the term
    ZONE here is particular to which the Root Hierarchy is being used
    to resolve any domain name in question.

    Zones at the use level are represented by Root Tags. The Root tag
    may be a string of up to 24 characters allowing for the creation
    of 26 ^^ 24 instances of possible zone names.

2.2.2 ZONE Publication
    All registrar's supporting Multi-Root operations will make
    available online an accurate representation of the ROOT ZONES they
    publish domains in. For each ZONE they add, the registrar and the
    registrars alone will be responsible for maintaining the accuracy
    of the Internet's Zone Mapping table(s).

    Further, this ROOT ZONE publication table will be made available
    in whatever form the implementation of this protocol extensions
    demands including through active LDAP lookup or just a simple
    recursive DNS type model.

2.2.3 Globally Qualified Domain Name (GQDN)
   The GQDN is a "root zone" enhanced notation model using what was
   known as a Fully Qualified Domain Name and adding the root zone
   tag as a prefix to the domain name.

2.2.4 Locally Qualified Domain Name (LQDN)
   The Locally Qualified Domain Name is identical to what we were
   calling the Fully Qualified Domain Name. It is called locally
   qualified since it is assumed to be a part of the system's default
   root zone.

2.2.5 Registrars ZONE TABLES
   A locally produced DB.CACHE file and listing of all the ZONES this
   registrar resolves for.

2.2.6 Zone-Lookup
   The Zone Lookup is the process of querying the master ZONE TABLE
   SERVER or a Registrar's local ZONE TABLES for an associated set of
   ROOT ZONES for any supported set of ZONES.

   The Operating Authority and all the ZONE-Enabled Registrars
   maintain ZONE Tables.

2.2.7 Zone-Failure
   The Failure of the ZONE SERVER to have the correct lookup tables
   for the requested ZONE(s). It is Zone-Failure that causes the
   local server to start a ZONE RESOLUTION transaction with the
   master ZONE TABLE Server.

2.3 DNS ROOT Servers
   This list of servers defines all of the representations and who
   will resolve them for this "DNS Hierarchy". Traditionally this is
   distributed as the DB.CACHE file that BIND uses at boot time.
   Other Named implementations place it in various other places
   including as a part of the Active Directory in Microsoft Land.

2.3.1 Single DNS Root
   This refers to the first implementation rounds at the DNS
   protocol. It was extended to conform to any number of lookup and
   record transmittal models all based on the defined hostname and
   Domain Name structures. In the original DNS service models there
   is only one root zone and it defines the scope of what DNS can and
   can't define.

2.3.2 Root Zone Database (RZDB)
   The RZDB is a local database maintained by the DNS Server
   regarding which roots it knows how to resolve addresses from. The
   ROOT ZONE DB or RZDB is a policy centric cache of locally stored
   DNS ROOT SERVER lists.

   The Lists are stored locally in textual form and are flushed on a
   DNS Policy Timeout basis as defined in the ROOT-CACHE-LIFE
   parameter being added to the Config file (named.boot).

3. Goals of this I-D
   The goal of this I-D is to propose a new system for the dynamic
   exchange of ROOT SERVER Data and thus the opening for the ICANN
   Registrars to support any number of roots. We clearly acknowledge
   that there are other ways to accomplish aspects of what the Root
   Zone Protocol enables, but not all of the features can be
   reproduced through other methods so it is considered a real
   potential

   This new system and nomenclature for representing DNS addresses in
   textual form with the addition of a ZONE or "Root Server"
   resolution protocol will increase the number of available DOMAIN
   NAMES in a common format such that any Domain Name can take on a
   more simple and easier to understand format.

   The net effect of this will be the increasing of the potential
   number of ROOT ZONES, ad infinitum. This author feels that this is
   the best way to meet the commercial expansion of the Internet.

4. Existing DNS constraints – the starting point.
   Existing DNS services are architected around a common root set of
   name servers. These common servers act as an anchor, but
   specifically limits the root instance to that of the original
   ARPA. Root's. Today's ROOT Server Lists are maintained by the
   various Registrars and distributed to their clients out of band.

   This means that at this time, for the totality of the public
   Internet, that there is only one of any given name and that the
   names are parsed from the bottom up (See RFC608. RFC810, and
   RFC1033/1034, RFC2308, RFC2826 and RFC3258 for more detail).

4.1 Domain Names, IP and the UDRP Issues
   This facility it is felt will greatly relieve the IP Congestion
   that today's "One and Only Naming Convention" put in place.

This document acknowledges that there are Intellectual Property
(IP) similarities between textual, network addresses and the
absolute or ASCII representation of the text inside a registered
trade or service mark, but that at this time (06/2002), the law
surrounding this is still somewhat vague and untested, and as such
that the ICANN's UDRP (Uniform domain Dispute Resolution Protocol)
was developed to protect ICANN and the registrars from IP suits.

To date the UDRP hasn't worked to well, but much of the need for
it is based in the "there can only be one of any network name" and
for the most part this is based on that there is only one dot com,
net or org… We hope to address that.

The other issue is which parts of the domain names are allowed by
design to carry any customer definable content, and that is at the
Second Level Domain Name (SLDN) only. So this further restricts
the possible combinations from "phrase style identity tags" to the
current resolving structures.

4.2 RFC2826 and its limitations
    THE IAB published a document in May of 2000 complaining of the
    problems of addressing the dynamic ROOT management of the
    Internet. Thy cited three cause why this was not doable today, and
    these were:

        1) The need to maintain a common naming and nomenclature
           standard
        2) The complexity of the NAME ZONE update processes
        3) And finally that traditional ROOT TABLES were poorly
           maintained and were distributed in the existing DNS mode
           out-of-band (OOB).

    None of these are insurmountable problems and in fact the second
    one has no bearing on the issues of ROOT ZONE MANAGEMENT.

4.3 Need to service a more compartmentalized Internet
    Nowadays, and for whatever reason, the Internet is becoming more
    and more compartmentalized. This may be due to concepts like
    eBorders and jurisdictional dilemmas being resolved in this
    manner, or that the economics of the Internet are directly tied to
    the economic outlook of the world and that since the slowdown of
    last year and 9/11 that drastic changes in what the Internet
    physically consists of are now in play. Even the Internet
    Architecture Board in their report of May 2000 criticized the
    existence of only a single DNS root [rfc-2826].

4.4 The limitations of existing naming conventions
   The real issue with textual name space is how small the usable
   portion of it is. There are two key constraints defining the scope
   of the namespace that is relevant in the current model and that is
   the totality of the second level domain names. There is no way for
   the Domain Client to define the Top Level domains, and since these
   are the same for all Registrars pretty much, this means that the
   totality for the space they can sell is that of the 2nd level
   domains.

   Inside of this Second Level Domain envelope is the further
   limitation of that relatively very few of the possible
   combinations of letters actually form words or symbols that are
   identifiable, further constricting the totality of the number of
   realistically representable names that and TLD can support.

   And when you compound that with existing domain name needs, there
   is a meltdown coming of available names.

5. The New proposal – ROOT ZONE Extended DNS Services.
   This new proposal for bringing ROOT ZONE MANAGEMENT under the
   scope of what is provided from common DNS Services, and through
   the dynamic opening of ROOT TAG SPACE, will address the creation
   of a more wide-open namespace.

   The new DNS Nomenclature proposal is based around the addition of
   a ROOT ZONE TAG or RZT's as a zone identifier code, which is
   prepended like an Area Code, to the front of the existing FQDN.

   This system supports the existing FQDN name resolution, but as the
   default set of ROOT SERVERS that the DNS SERVER uses to resolve
   queries to it.

   The Globally Qualified Domain Name (GQDN) will be constructed as
   follows:

   <[ROOT ZONE TAG]><LQDN>.

   And the LQDN (a.k.a. the FQDN) is deconstructed as follows:

   <Hostname>.<second level domain>.<TLD>.

   o- Where [ROOT ZONE TAG] is the optional bracket enclosed text
      string indicating which group of ROOT ZONE servers to use for
      this query.
   o- Where Hostname = any reasonable RFC compliant Hostname

    o- Where Second Level Domain = the existing settable or user
       definable portion of the FQDN, and;
    o- Where the final root of the name is the anchoring TLD or DNS
       Zone Table

  5.1 LQDN based processing
     The LQDN structure is parsed and processed exactly as the FQDN is
     today. The name is sent to the NAME SERVER for resolution and the
     name server's parser will see that it is a LQDN and so this name
     server will use its Default Set of ROOT SERVERS.

  5.2 GQDN based processing
     If a ROOT ZONE TAG (RTZ) is prepended onto the Host name, the DNS
     Server will process that tag to see if it is either the default
     tag name or that of an already known root zone. For any root zone
     it already "knows" there will be a local copy of that root zone in
     the DNS Server's ROOT ZONE Database.

  6. Software Affected by the proposed changes
     It is important to understand that this change and new requirement
     may break some existing resolver/parser code since they may be
     hardwired to the existing domain structure. But any good
     programmer knows that it is easy to create a secondary footprint
     and set of parsing rules such that if there is a ROOT ZONE TAG
     (RZT) detected in the host's domain address specification, that it
     would be resolvable.

     The following Services are expected to require some work to
     address this new set of ZONE management facilities.

  6.1   End-User Clients and their local client-side Resolvers
     Depending on how much parsing the client side applications do,
     there may be some trivial extending of the parsers to accept the
     bracket delimited "[ROOT ZONE TAG]" as the prepended extension to
     the LQDN's address.

     But in many instances it is more likely that the OS's resolver is
     the totality of what the application uses and the apps just pass
     text strings to the local resolver input. Therefore extending it
     to support the "[ROOT ZONE TAG]" extensions is not such a big
     deal, especially since it is easily cut in as an optional feature
     in most all Resolvers.

6.2   DNS Servers and their local server-side Resolvers
   DNS Resolvers themselves may be there largest part of the recoding
   effort, but this next generation syntax support can be rolled
   within a major BIND release, so this will not be such a painful
   effort. Once at least one generation of RZP enhanced DNS is
   released the rest of the infrastructure will be deployed as well.

6.2.1 Changing sets of Root Servers dynamically
   The key issues with the DNS Servers that needs to be upgraded to
   support root ZONE management is the process within a running DNS
   server of changing its root pointers.

   Most DNS Servers' root pointers are currently read from static
   files as text strings, and in most instances, at least UNIX ones,
   there is a need to create a dynamic set of pointer indirections
   that the actual values pointed to by the ROOT SERVER Template, can
   be mapped in and out of at will (and without a hang-up or HUP
   signal).

   This is easily accomplished by creating a dummy list, or template
   as a global and then loading the named selected ROOT SERVER
   Entries into it at will.

6.2.2 Need to add the Root Zone Database (RZDB)… and it's processing.
   Somehow the local server needs to create a ROOT CACHE for each
   ROOT ZONE it is to resolve for. These zones can remain pretty
   static or expire depending on who and what. The only real reasons
   that they would change once downloaded would be that registrar was
   significantly changing their service topology or going out of
   business. So its no big deal to cache the zone tables at any DNS
   server for 6 months at a time or more;

6.2.3 Other TOOLS for DNS management - Dig, nslookup, etc.
   This is the real heartbreaker. For tools that do not rely on the
   OS's underlying resolver but supply their own, there is a
   significant amount of recoding here at the toolsmith level to deal
   with the expanded namespace and ROOT ZONE resolution.

   Oh well, that's life is my only response here. We as a culture
   need the ROOT SPACE too much to not suffer whatever pain this
   causes.

6.3 How this all fits together…
    The Use Models…   Client requests the resolving of a GQDN's
    address from the Name Server. The server parses the ROOT ZONE TAG
    (RZT) from the GQGN and looks up in its local ROOT ZONE TAG Cache
    to see if the TAG and its equates exist there. If so - Then the
    server checks the expiry of the equate list to make sure it can
    use the entry. If the expiry is still good then it resolves the
    name and passes the address back to the client's Application
    Otherwise ZONE FAIL occurs.

    ROOT ZONE FAILs can be addressed through policy in a number of
    manners, and as a default mode, we propose that the server
    attempts to recover a new copy of the ZONE TABLE from the master
    server or from the previous supplier of this ZONE TABLE, which was
    also cached locally in the Server. If the ZONE recovery is
    completed then the DNS Server caches the updated ZONE Table entry,
    updates its ZONE EXPIRY and continues to process the name
    resolution.

    To continue, with the new ZONE TABLE's list of root servers, the
    DNS Server looks up the address and assuming a successful
    response, sends the address onward into the client. If there is a
    lookup failure then the user is told that there was a standard DNS
    resolution error, or the process times out and the client barfs
    appropriately, just as with today's SINGLE ROOT service model.

    If the ZONE TABLE transfer fails then the DNS server has the
    choice of continuing to use the old table if it works and
    continuing the attempt to resolve the name.

7. Interim Operations
    The problem with Interim operations is that there may be name
    collisions between ROOT 'a' and ROOT 'b' such that addresses that
    exist in both are never reached in the second ROOT because those
    in the first root will take precedence.

    To this end we see ROOT ZONES and the fact that there are now
    several mutually exclusive ones up and functioning on the Internet
    as a serious problem without this bridge process to allow for
    selective ROOT ZONE management.

8. Security Considerations
   There are no real security considerations with this change or
   augmentation of existing DNS Services.

9. References

    [RFC-830]   Z. Su, "A Distributed System for Internet Name
                       Service", IETF RFC-830, Network Information
                       Center, SRI International, October 1982.
                       Contains early thoughts on the design of the
                       domain system.

    [RFC-882]   P. Mockapetris, "Domain names - Concepts and
                       Facilities," RFC-882, USC/Information Sciences
                       Institute, November 1983.

    [RFC-883]   P. Mockapetris, "Domain names - Implementation and
                       Specification," RFC-883, USC/Information
                       Sciences Institute, November 1983.

    [RFC-920]   J. Postel and J. Reynolds, "Domain Requirements",
                       RFC-920, USC/Information Sciences Institute,
                       October 84.

    [RFC-952]   K. Harrenstien, M. Stahl, E. Feinler, "DoD
    Internet
                       Host Table Specification", RFC-952, SRI, October
    85.

    [RFC -1033]   M. Lottor, DOMAIN ADMINISTRATORS OPERATIONS GUIDE
                       SRI, International, November 1987

    [RFC-1034}   P. Mockapetris DOMAIN NAMES - CONCEPTS AND
                       FACILITIES, ISI November 1987

    [RFC 2136]   Vixie, Et al., DNS Update, April 1997

    [RFC 2308]   M. Andrews, DNS NCACHE (Negative Caching of DNS),
                       March 1998

    [RFC-2782]   A. Gulbrandsen, P. Vixie, L. Esibov, DNS SRV
    Resource
                       Records, February 2000

    [RFC-2826]   IAB Technical Comment on the Unique DNS Root, May

                    2000

    [RFC-3258]   Distributing Authoritative Name Servers April 2002

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