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Encouraging the use of DNS IN-ADDR Mapping
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Abstract

Mapping of addresses to names has been a feature of DNS. Many sites, implement it, many others don't. Some applications attempt to use it as a part of a security strategy. The goal of this document is to encourage proper deployment of address to name mappings, and provide guidance for their use.

1. Introduction

The Domain Name Service has provision for providing mapping of IP addresses to host names. It is common practice to ensure both name to address, and address to name mappings are provided for networks. This practice, while documented, has never been documented as a requirement placed upon those who control address blocks. This

document fills this gap.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [RFC2119].

2. Discussion

From the early days of the Domain Name Service [RFC 883] a special domain has been set aside for resolving mappings of IP addresses to domain names. This was refined in [RFC1035], describing the .IN-ADDR.ARPA in use today.

The assignment of blocks of IP Address space was delegated to three regional registries. Guidelines for the registries are specified in [RFC2050], which requires regional registries to maintain IN-ADDR records on the large blocks of space issued to ISPs and others.

ARIN's policy requires ISPs to maintain IN-ADDR for /16 or larger allocations. For smaller allocations, ARIN can provide IN-ADDR for /24 and shorter prefixes. [ARIN]. APNIC provides methods for ISPs to update IN-ADDR, however the present version of its policy document for IPv4 [APNIC] dropped the IN-ADDR requirements that were in draft copies of this document. As of this writing, it appears APNIC has no actual policy on IN-ADDR. RIPE appears to have the strongest policy in this area [ripe-185] indicating Local Internet Registries are required to perform IN-ADDR services, and delegate those as appropriate when address blocks are delegated.

As we can see, the regional registries have their own policies for requirements for IN-ADDR maintenance. It should be noted, however, that many address blocks were allocated before the creation of the regional registries, and thus it is unclear whether any of the policies of the registries are binding on those who hold blocks from that era.

Registries allocate address blocks on CIDR [RFC1519] boundaries. Unfortunately the IN-ADDR zones are based on classful allocations. Guidelines [RFC2317] for delegating on non-octet-aligned boundaries exist, but are not always implemented.

3. Effects of missing IN-ADDR

Many applications use DNS lookups for security checks. To ensure validity of claimed names, some applications will look up IN-ADDR records to get names, and then look up the resultant name to see if it maps back to the address originally known. Failure to resolve matching names is seen as a potential security concern.

Some popular FTP sites will flat-out reject users, even for anonymous FTP, if the IN-ADDR lookup fails or if the result of the IN-ADDR lookup when itself resolved, does not match. Some Telnet servers also implement this check.

Web sites are in some cases using IN-ADDR checks to verify whether the client is located within a certain geopolitical entity. This is being employed for downloads of crypto software, for example, where export of that software is prohibited to some locales. Credit card anti-fraud systems also use these methods for geographic placement purposes.

The popular TCP Wrappers program found on most Unix and Linux systems has options to enforce IN-ADDR checks and to reject any client that does not resolve.

Wider-scale implementation of IN-ADDR on dialup, CDPD and other such client-oriented portions of the Internet would result in lower latency for queries (due to lack of negative caching), and lower name server load and DNS traffic.

Some anti-spam (anti junk email) systems use IN-ADDR to verify return addresses before accepting email.

Many web servers look up the IN-ADDR of visitors to be used in log analysis. This adds to the server load, but in the case of IN-ADDR unavailability, it can lead to delayed responses for users.

Traceroutes with descriptive IN-ADDR naming proves useful when debugging problems spanning large areas. When this information is missing, the traceroutes take longer, and it takes additional steps to determine that network is the cause of problems.

4. Requirements

4.1 Delegation Requirements

Regional Registries and any Local Registries to whom they delegate SHOULD establish and convey a policy to those to whom they delegate blocks that IN-ADDR mappings are required. Policies SHOULD require those receiving delegations to provide IN-ADDR service and/or delegate to downstream customers.

Network operators SHOULD define and implement policies and procedures which delegate IN-ADDR to their clients who wish to run their own IN-ADDR DNS services, and provide IN-ADDR services for those who do not have the resources to do it themselves. Delegation mechanisms MUST permit the downstream customer to implement and comply with IETF

recommendations application of IN-ADDR to CIDR [RFC2317].

All IP address space assigned and in use SHOULD be resolved by IN-ADDR records. All PTR records MUST use canonical names.

All IP addresses in use within a block SHOULD have an IN-ADDR mapping. Those addresses not in use, and those that are not valid for use (zeros or ones broadcast addresses within a CIDR block) need not have mappings.

It should be noted that due to CIDR, many addresses that appear to be otherwise valid host addresses may actually be zeroes or ones broadcast addresses. As such, attempting to audit a site's degree of compliance can only be done with knowledge of the internal routing structure of the site. However, any host that originates an IP packet necessarily will have a valid host address, and must therefore have an IN-ADDR mapping.

4.2 Application Requirements

Applications SHOULD NOT rely on IN-ADDR for proper operation. The use of IN-ADDR, sometimes in conjunction with a lookup of the name resulting from the PTR record provides no real security, can lead to erroneous results and generally just increases load on DNS servers. Further, in cases where address block holders fail to properly configure IN-ADDR, users of those blocks are penalized.

5. Security Considerations

This document has no negative impact on security. While it could be argued that lack of PTR record capabilities provides a degree of anonymity, this is really not valid. Trace routes, whois lookups and other sources will still provide methods for discovering identity.

By recommending applications avoid using IN-ADDR as a security mechanism this document points out that this practice, despite its use by many applications, is an ineffective form of security. Applications should use better mechanisms of authentication.

6. References

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[RFC2119] S. Bradner, "Key words for use in RFCs to Indicate Requirement Levels", RFC 2119, BCP 14, March 1997.

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[RIPE185] "European Internet Registry Policies and Procedures," ripe-185, October 26, 1998. http://www.ripe.net/docs/ripe-185.html

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