

IETF
Internet-Draft
Intended status: Standards Track
Expires: September 3, 2015

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March 2, 2015

Additional Reserved Top Level Domains
draft-chapin-additional-reserved-tlds-02

Abstract

The Internet Domain Name System (DNS) defines a tree of names starting with root, ".", immediately below which are top level domain (TLD) names such as ".com" and ".us". In June 1999 [RFC2606] reserved a small number of TLD names for use in documentation examples, private testing, experiments, and other circumstances in which it is desirable to avoid conflict with current or future actual TLD names in the DNS.

There has been significant evolution of Internet engineering and operation practices since [RFC2606] was published. In February 2013 [RFC6761] defined criteria and procedures for reserving a domain name for special use, and established an IANA registry for such names. This document reserves three domain name labels for special use in accordance with the criteria and procedures of [RFC6761]: home, corp, and mail.

It is important to note that TLD names may be reserved, in other contexts, for policy, political, or other reasons that are distinct from the IETF's concern with Internet engineering and operations. This document reserves TLD names only for operational and engineering reasons.

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1. Introduction

The Internet Domain Name System is documented in [RFC1034], [RFC1035], [RFC1591] and numerous additional Requests for Comment. It defines a tree of names starting with root, ".", immediately below which are top level domain names such as ".com" and ".us". Below top level domain names there are normally additional levels of names.

[RFC2606] reserves a small number of TLD names which can be used for private testing of existing DNS related code, examples in documentation, DNS related experimentation, invalid DNS names, or other similar uses without fear of conflicts with current or future actual top-level domain names in the global DNS. [RFC2606] also notes that the Internet Assigned Numbers Authority (IANA) reserves the label "example" at the second level below the TLDs .com, .net, and .org.

Since [RFC2606] was published in 1999, Internet engineering and operation practices have evolved in ways that led to the publication in February 2013 of [RFC6761], which defined criteria and procedures for reserving a domain name for special use and established an IANA registry to which additional reserved special use names might be added as new requirements arose.

This document follows [RFC6761] to add three reserved top-level domain name labels to the IANA special-use names registry. It is prompted by the impending advent of new TLDs which might, in the absence of the reservations for which this document provides, introduce TLD labels that could create engineering and operational problems for root server operators and other DNS infrastructure providers.

It is important to note that TLD names may be reserved, in other contexts, for policy, political, or other reasons that are distinct from the IETF's concern with Internet engineering and operations. This document reserves TLD names only for operational and engineering reasons.

2. Requirements Language

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 [RFC2119].

In this document, these words will appear with that interpretation only when in ALL CAPS. Lower case uses of these words are not to be interpreted as carrying [RFC2119] significance.

3. New top-level domain name reservations

In its report [SAC045] of a quantitative study of queries to the DNS root servers entitled "Invalid Top Level Domain Queries at the Root Level of the Domain Name System" [SAC045] ICANN's Security and Stability Advisory Committee "calls attention to the potential problems that may arise should a new TLD applicant use a string that has been seen with measurable (and meaningful) frequency in a query for resolution by the root system and the root system has previously generated a response."

Of particular concern is the case in which a string "has been queried and a root name server has responded to the query with a non-existent domain (NXDOMAIN) result, i.e., the string has not been delegated but has been queried." [SAC045] reports the results of a CAIDA measurement study [RSSAC_DNS] which found that "NXDOMAIN responses account for more than 25 percent of the total responses from root name servers observed in the study, and the top ten such strings account for 10 percent of the total query load."

[SAC045] describes in detail the engineering and operational problems that would ensue from the delegation, as new valid TLD names, of previously invalid labels that have frequently appeared in queries to the root: "If the [new TLD label] were to be approved and the TLD included in the root zone, queries to the root level of the DNS for a string that hitherto returned NXDOMAIN would begin to return positive responses containing name servers of the new TLD."

Recommendation (2) of [SAC045] calls for the community to develop principles for "prohibiting the delegation of strings in addition to those already identified in [RFC2606]." As the first step in that process, based on the data reported by [SAC045], this document adds to the list of names that may not be used for top-level domains the following labels:

- o home
- o corp

These two top-level domain labels are to be added to the "Special-Use Domain Names" registry created by [RFC6761], as described in the IANA Considerations section of this document.

In addition, [SAC062] describes the risks associated with delegating a name in the root of the public DNS that is also used in privately defined namespaces (in which it is also syntactically valid). Users, software, or other functions in the private domain may confuse the private and public instances of the same name. This risk, referred to as "name collision," results in potential harm to enterprise networks that use previously undelegated names at the root of a private namespace when the name is delegated in the public root.

Research conducted by Interisle Consulting Group [INTERISLE] indicates that another name, in addition to those identified by [SAC045], presents a particularly high risk of name collision. This document therefore also adds the following string to the "Special-Use Domain Names" registry:

- o mail

Further resesarch, conducted by JAS Advisors on behalf of ICANN [JAS_MITIGATION] shows that the names .corp, .home and .mail are clear and significant risks for name collision. In that report the following recommendation is made: "The TLDs .corp, .home, and .mail be permanently reserved for internal use and receive RFC 1918-like protection/treatment, potentially via RFC 6761."

The three names that are reserved by this document are those on which all three studies (by SSAC, Interisle and JAS Advisors) agree.

4. Security Considerations

The name reservations specified in this document are intended to reduce the risk of harmful collision between names that are in well-established common use as TLDs in private namespaces and syntactically identical names that could otherwise be delegated as TLDs in the global DNS.

The security concerns associated with name collision are well presented in [SAC045], [SAC062], the Interisle report [INTERISLE], and the ICANN report "Name Collision Identification and Mitigation for IT Professionals" [ICANN_MITIGATION].

5. IANA Considerations

This document specifies three new labels to be added to the "Special-Use Domain Names" registry maintained by IANA pursuant to [RFC6761]. The labels are to be added to the registry in the following way:

Name	Reference
home	[RFC-to-be]
corp	[RFC-to-be]
mail	[RFC-to-be]

Figure 1

5.1. Domain Name Reservation Considerations for home

5.1.1. Users

Are human users expected to recognize these names as special and use them differently? In what way?

The reservations provided in this document are intended to reduce spurious queries at the root of the DNS and avoid potential collisions between resolutions of names in private name spaces and the public DNS. Users do not have to know that these names are special.

5.1.2. Application Software

Are writers of application software expected to make their software recognize these names as special and treat them differently? In what way? (For example, if a human user enters such a name, should the application software reject it with an error message?)

These names are being added to the Special-Use Domain Name registry, in part, because some application software implementations have long used these names for special purposes in private networks. Developers of new applications do not need to filter or test for the names. Instead, the intent is to reserve the names for local use and avoid unnecessary queries in the public DNS.

5.1.3. Name Resolution APIs and Libraries

Are writers of name resolution APIs and libraries expected to make their software recognize these names as special and treat them differently? If so, how?

Authors of name resolution APIs and libraries SHOULD restrict these names to local resolution and SHOULD NOT allow queries for strings that use these Special-Use Domain Names to be forwarded to the public DNS for resolution.

5.1.4. Caching DNS Servers

Are developers of caching domain name servers expected to make their implementations recognize these names as special and treat them differently? If so, how?

Authors of caching domain name server software SHOULD restrict these names to local resolution and SHOULD NOT allow queries for strings that use these Special-Use Domain Names to be forwarded to the public DNS for resolution.

5.1.5. Authoritative DNS Servers

Are developers of authoritative domain name servers expected to make their implementations recognize these names as special and treat them differently? If so, how?

Authors of authoritative domain name server software SHOULD restrict these names to local resolution and SHOULD NOT allow queries for strings that use these Special-Use Domain Names to be forwarded to the public DNS for resolution.

5.1.6. DNS Server Operators

Does this reserved Special-Use Domain Name have any potential impact on DNS server operators? If they try to configure their authoritative DNS server as authoritative for this reserved name, will compliant name server software reject it as invalid? Do DNS server operators need to know about that and understand why? Even if the name server software doesn't prevent them from using this reserved name, are there other ways that it may not work as expected, of which the DNS server operator should be aware?

The intent of the reservations in this IANA Considerations section is to prevent spurious and potentially problematic queries from appearing in the public DNS. DNS server operators SHOULD always treat strings with the Special-Use Domain Names in section 5 as names for local resolution.

Since these strings are intended to have local use, it is quite possible that DNS operators would configure an authoritative DNS server as authoritative for these reserved names in a private network. This would be consistent with the goal of having these

names resolved locally rather than on the public Internet. Compliant name server software MUST NOT reject these names as invalid. Instead, name server software SHOULD allow for local resolution of the name and SHOULD NOT transmit a query for resolution into the public DNS.

5.1.7. DNS Registries/Registrars

How should DNS Registries/Registrars treat requests to register this reserved domain name? Should such requests be denied? Should such requests be allowed, but only to a specially-designated entity? (For example, the name "www.example.org" is reserved for documentation examples and is not available for registration; however, the name is in fact registered; and there is even a web site at that name, which states circularly that the name is reserved for use in documentation and cannot be registered!)

Requests to register any names added to the Special-Use Domain Name registry as part of the IANA Considerations section of this document MUST be denied.

5.2. Domain Name Reservation Considerations for corp

5.2.1. Users

Are human users expected to recognize these names as special and use them differently? In what way?

The reservations provided in this document are intended to reduce spurious queries at the root of the DNS and avoid potential collisions between resolutions of names in private name spaces and the public DNS. Users do not have to know that these names are special.

5.2.2. Application Software

Are writers of application software expected to make their software recognize these names as special and treat them differently? In what way? (For example, if a human user enters such a name, should the application software reject it with an error message?)

These names are being added to the Special-Use Domain Name registry, in part, because some application software implementations have long used these names for special purposes in private networks. Developers of new applications do not need to filter or test for the names. Instead, the intent is to reserve the names for local use and avoid unnecessary queries in the public DNS.

5.2.3. Name Resolution APIs and Libraries

Are writers of name resolution APIs and libraries expected to make their software recognize these names as special and treat them differently? If so, how?

Authors of name resolution APIs and libraries SHOULD restrict these names to local resolution and SHOULD NOT allow queries for strings that use these Special-Use Domain Names to be forwarded to the public DNS for resolution.

5.2.4. Caching DNS Servers

Are developers of caching domain name servers expected to make their implementations recognize these names as special and treat them differently? If so, how?

Authors of caching domain name server software SHOULD restrict these names to local resolution and SHOULD NOT allow queries for strings that use these Special-Use Domain Names to be forwarded to the public DNS for resolution.

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Are developers of authoritative domain name servers expected to make their implementations recognize these names as special and treat them differently? If so, how?

Authors of authoritative domain name server software SHOULD restrict these names to local resolution and SHOULD NOT allow queries for strings that use these Special-Use Domain Names to be forwarded to the public DNS for resolution.

5.2.6. DNS Server Operators

Does this reserved Special-Use Domain Name have any potential impact on DNS server operators? If they try to configure their authoritative DNS server as authoritative for this reserved name, will compliant name server software reject it as invalid? Do DNS server operators need to know about that and understand why? Even if the name server software doesn't prevent them from using this reserved name, are there other ways that it may not work as expected, of which the DNS server operator should be aware?

The intent of the reservations in this IANA Considerations section is to prevent spurious and potentially problematic queries from appearing in the public DNS. DNS server operators SHOULD always

treat strings with the Special-Use Domain Names in section 5 as names for local resolution.

Since these strings are intended to have local use, it is quite possible that DNS operators would configure an authoritative DNS server as authoritative for these reserved names in a private network. This would be consistent with the goal of having these names resolved locally rather than on the public Internet. Compliant name server software MUST NOT reject these names as invalid. Instead, name server software SHOULD allow for local resolution of the name and SHOULD NOT transmit a query for resolution into the public DNS.

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How should DNS Registries/Registrars treat requests to register this reserved domain name? Should such requests be denied? Should such requests be allowed, but only to a specially-designated entity? (For example, the name "www.example.org" is reserved for documentation examples and is not available for registration; however, the name is in fact registered; and there is even a web site at that name, which states circularly that the name is reserved for use in documentation and cannot be registered!)

Requests to register any names added to the Special-Use Domain Name registry as part of the IANA Considerations section of this document MUST be denied.

5.3. Domain Name Reservation Considerations for mail

5.3.1. Users

Are human users expected to recognize these names as special and use them differently? In what way?

The reservations provided in this document are intended to reduce spurious queries at the root of the DNS and avoid potential collisions between resolutions of names in private name spaces and the public DNS. Users do not have to know that these names are special.

5.3.2. Application Software

Are writers of application software expected to make their software recognize these names as special and treat them differently? In what way? (For example, if a human user enters such a name, should the application software reject it with an error message?)

These names are being added to the Special-Use Domain Name registry, in part, because some application software implementations have long used these names for special purposes in private networks. Developers of new applications do not need to filter or test for the names. Instead, the intent is to reserve the names for local use and avoid unnecessary queries in the public DNS.

5.3.3. Name Resolution APSS and Libraries

Are writers of name resolution APIs and libraries expected to make their software recognize these names as special and treat them differently? If so, how?

Authors of name resolution APIs and libraries SHOULD restrict these names to local resolution and SHOULD NOT allow queries for strings that use these Special-Use Domain Names to be forwarded to the public DNS for resolution.

5.3.4. Caching DNS Servers

Are developers of caching domain name servers expected to make their implementations recognize these names as special and treat them differently? If so, how?

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reserved name, are there other ways that it may not work as expected, of which the DNS server operator should be aware?

The intent of the reservations in this IANA Considerations section is to prevent spurious and potentially problematic queries from appearing in the public DNS. DNS server operators SHOULD always treat strings with the Special-Use Domain Names in section 5 as names for local resolution.

Since these strings are intended to have local use, it is quite possible that DNS operators would configure an authoritative DNS server as authoritative for these reserved names in a private network. This would be consistent with the goal of having these names resolved locally rather than on the public Internet. Compliant name server software MUST NOT reject these names as invalid. Instead, name server software SHOULD allow for local resolution of the name and SHOULD NOT transmit a query for resolution into the public DNS.

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Requests to register any names added to the Special-Use Domain Name registry as part of the IANA Considerations section of this document MUST be denied.

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