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The DNS Is Not Classy: DNS Classes Considered Useless
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Abstract

Domain Name System Resource Records are identified in part by their class. The class field is not effective, and it is not used the way it appears to have been intended. This memo closes the DNS class registry and requires those defining new RRTYPEs to define them for all classes.

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[1.](#) Classes in the Domain Name System

The Domain Name System (DNS) [[RFC1034](#)] [[RFC1035](#)] includes two types of division: one by class, and one by "cuts". As [[RFC1034](#)] says,

The database for any class is organized, delegated, and maintained separately from all other classes. Since, by convention, the name spaces are the same for all classes, the separate classes can be thought of as an array of parallel namespace trees. Note that the data attached to nodes will be different for these different parallel classes. The most common reasons for creating a new class are the necessity for a new data format for existing types or a desire for a separately managed version of the existing name space.

As of this writing, there are only three "ordinary" classes assigned. Class 1 is the Internet or IN class. Class 3 is the Chaos or CH class. Class 4 is the Hesiod or HS class. Class 2 is noted in [[RFC1035](#)] as the CSNET or CS class, but the current registry (at

<<http://www.iana.org/assignments/dns-parameters/dns-parameters.xml#dns-parameters-2>>) no longer includes the assignment.

There are two other assigned classes; these have special purposes. Class 255, ANY or *, matches any class [[RFC1035](#)]. Class 254, NONE,

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is used in [[RFC2136](#)] to specify certain kinds of operations on RRsets.

Of the ordinary classes, only IN is found in common use on the Internet. Class CH is now sometimes used to carry certain kinds of name server metadata. It seems new classes might have been useful for a number of features that have been delivered in some other way. Yet classes have not been used, which might suggest that classes are less useful than they otherwise appear to be. (It is also worth observing that classes divide the database, and not the namespace itself. In other words, classes are part of the implementation of the DNS and not a natural feature of domain names as such.)

Nevertheless, from time to time someone comes up with a suggestion for why a new class would solve some problem or other. The purpose of this memo is to offer some considerations for those contemplating such innovation.

[2.](#) Why classes are not as useful as they might be

There are four problems that make classes less useful than they might be. First, the rules for name matching are independent of the class. Second, specification of resource record types has not always attended to the handling of types across classes; this makes new classes of (at best) uncertain utility. Third, the DNS RRTYPE registry does not have a way of indicating significant differences in meaning for the same type among different classes.

Apart from those technical problems, there is an administrative problem. The Internet name space starts from a common root, which means that any resolver needs to start from the same bootstrap mechanism no matter what classes it uses. But in order for that to work, any new class would need to be delegated from the existing root name servers, or else a new set of policies about how to select the alternative roots would be required.

[2.1.](#) Matching rules are class-independent

As noted in [Section 1](#), classes are intended to divide the DNS into separate trees. The class field does not, however, affect the matching rules for names, so as a practical matter the namespace is primary.

The issue is made plain by considering the matching algorithm for name servers, described in [\[RFC1034\] section 4.3.2](#). Suppose there are two (imaginary) classes, EG and IE. Imagine, further, that the same name has different RDATA in each class:

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example.com EG CNAME example.net

example.com IE CNAME example.org

In principle, the above should work because, as noted in [Section 1](#), each class is supposed to be "delegated separately". Therefore, when the name server for example.com in class EG receives the query for example.com, it already knows which class database to search; similarly for example.com in class IE.

Yet while the class delegations are defined to be separate, there is no way to ensure that the NS record RDATA for example.com in class IE, and the NS record RDATA for example.com in class EG, are always different. Indeed, if the different classes of name space are truly managed separately, but the name space is by convention parallel, it would not be surprising that some name server ended up authoritative for the same name in different classes. In [\[RFC1034\], section 3.6.1](#), there is an example that appears to contain two classes from the same master file and for the same name. This illustrates the principle that the same name server could be authoritative for the same name in different classes. Note that the example might be a mistake, since according to [\[RFC1035\], section 5.2](#), all entries in a master file for a zone should have the same class. In any case, it is plain that the name is primary, and having matched the name one can then select data according to the class. But this means that the matching rules for names cannot differ across classes, and that makes classes less useful for extending DNS capabilities than they might at first seem.

Once one describes the resolution pattern this way, and given that

the IN class is so widely used and other classes so rarely, it is not too surprising that some naive implementations simply assume IN for every resource record. That assumption, of course, makes the class division in the DNS again less useful.

2.1.1. Really parallel trees

It appears that the notion of "parallel namespace trees" is stronger than one might have hoped if one wanted to use classes to do something new in the DNS. When one considers how classes are treated in [[RFC1034](#)] and [[RFC1035](#)] and their predecessors, that parallelism becomes less surprising. The examples are all of alternative networking systems to the Internet. Moreover, [[RFC1034](#)] says, "Because we want the name space to be useful in dissimilar networks and applications, we provide the ability to use the same name space with different protocol families or management."

If one thinks of classes as simply the way to resolve the same name depending on which sort of networking technology is being used, a

strong expectation of completely parallel trees is not surprising. Indeed, in an environment of many different networking and internetworking technologies, it would have been surprising if, when one changed network technologies, a name referred to a completely different target system.

Since the time when the DNS was defined, Internet technology has largely won out over other network technologies. In addition, the last time a fundamentally new networking technology was introduced to the Internet (with IPv6 in [[RFC1883](#)]), the designers treated it as just another part of the IN class (and introduced the AAAA record, in [[RFC1886](#)]). So, the reason for the class field in the first place has withered away; and, when the opportunity came to use classes in their originally intended way, the designers of the technology decided not to use them.

2.2. Not all RRTYPEs are careful about class

RRTYPEs can either be class-independent, or else they can return very different data depending on the class in question. Not every RRTYPE specification is clear about its definition under various classes. For instance, the specification of type 55, HIP, appears not to state

the class(es) for which it is defined [[RFC5205](#)]. The specification of LOC, type 29 (in [[RFC1876](#)]), says that the type is defined for classes other than IN, but also says, "The semantics of such use are not defined by this memo."

One might argue that this issue is resolved by [[RFC3597](#)], because it specifies that an unknown class and type combination is to be handled as unknown. Formally, of course, that means that every type can be handled regardless of class. But it would appear to reduce the utility of classes yet further, by increasing the probability that every RR in every class except IN will be treated as unknown. For the purposes of resolution, that might not matter. But administrators and users will be reluctant to embrace a class that does not have good input and validation tools.

2.3. The DNS RRTYPE registry and meaning

Some RRTYPEs are defined in a class-dependent way. For instance, the A record (type 1) is defined in [[RFC1035](#)] to be for class IN only. In [[RFC1034](#)], [section 3.6](#), the A record is also defined for class CH. Perhaps unfortunately, the IANA registry for RRTYPEs (at <http://www.iana.org/assignments/dns-parameters/dns-parameters.xml#dns-parameters-4>) does not include an indicator for the class(es) in which the RRTYPE is defined.

It appears, therefore, that the "meaning" field of an RRTYPE definition is required to be class-independant, even though the RDATA for a given type may vary dramatically. For instance, in the case of the A record the RDATA is either a 32-bit IPv4 address or else a domain name and a 16-bit octal address. Across classes, even the number of fields may differ for the same type.

This appears to be yet more evidence for the "strict parallelism" explanation in [Section 2.1.1](#). At the same time, [[RFC1034](#)] is not perfectly clear that a data type must have the same meaning in every class, and [[RFC6895](#)] does not contain clear instructions on the topic. Moreover, given the vastly different RDATA allowable for the same type across classes it is hard to be certain what is entailed by says that they all "have the same meaning", unless there is a strict requirement that a class only ever differs based on the underlying

network technology.

Therefore, if classes were to be used for purposes other than alternative low-level network technologies, the RRTYPE registry ought to be altered to indicate the meaning of a type in each class for which the type is defined. Such an alteration appears to be of questionable value given the overwhelming dominance of the IN class.

2.4. A new class requires new delegations

The Internet's DNS system is part of the common name space of the Internet, and that common name space starts from a common root (see [\[RFC2826\]](#) for the arguments about why this must be true). In order to provide for the resolution of a new class, the root name servers would need to respond to resolution requests for that class and provide the delegation data. Current policies about domain name delegation in the root zone appear to apply to the IN class, and it is not clear where responsibility would lie for the policies about a new class. At the very least, a new policy of this sort would need to be worked out.

Alternatively, it is possible to imagine resolvers using a different set of root servers for different classes of query. Such a solution merely moves the policy problem around, for it would be necessary to develop policies about root server systems for new classes.

3. DNS classes are effectively vestigial

Given the considerations above, it is plain [TM] DNS classes are unlikely to be useful in the future. Accordingly, the DNS CLASS registry (at <http://www.iana.org/assignments/dns-parameters/dns-parameters.xhtml#dns-parameters-2>) is hereby closed. New class definitions henceforth will require standards action.

Designers of new name systems should consider the design of classes in the DNS. If a similar feature is desirable, its design needs to be different in order to be useful. Given the the way the DNS has managed to thrive without really using classes, however, it would be worth asking whether the feature is useful at all.

4. New RRTYPEs are for all classes

New RRTYPE allocations will henceforth be class-independent.

5. Security considerations

This memo creates no new security issues. It might be argued that it could in principle reduce security issues by eliminating a potential source for confusion on the Internet, but classes are so little used that there is probably no improvement in practice.

6. IANA Considerations

IANA is hereby requested to update the Domain Name System (DNS) Parameters registry as follows:

- o Update the DNS CLASSes sub-registry reference to refer to this document.
- o Update the DNS CLASSes sub-registry Registration Procedures field to "Standards Action" for decimal classes 1-65279 inclusive.
- o Add this document to the Resource Record (RR) TYPEs sub-registry references.

7. Acknowledgements

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[Appendix A](#). Discussion Venue

This Internet-Draft is discussed on the IAB Internet Names and Identifiers Program public list: inip-discuss@iab.org.

[Appendix B](#). Change History

00:

- * Initial version

01:

- * Clarify the distinction between database and domain names as such
- * Address question of closing registry
- * Minor fixes of text

02:

- * Eliminate argument from class position in message
- * Sharpen argument from primacy of matching rules
- * Note network-technology history of class.
- * Change to status: update 6895 and close class registry

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