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The Post-.COM Internet:

**Toward Regular and Objective
Procedures for Internet Governance**

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Abstract
The Post-COM Internet:
Toward Regular and Objective Procedures for Internet Governance

Milton L. Mueller & Lee W. McKnight

This paper makes the case for using regular and objective procedures to assign new Internet top-level domain names (TLDs) instead of the unscheduled, irregular, discretionary and *ad hoc* processes and criteria currently used by the Internet Corporation for Assigned Names and Numbers (ICANN). Adopting a regularized process is past due: after 5 years of existence, ICANN has yet to define a method for managing TLD additions to the root. Yet, the root of the DNS is an important international resource, and handling applications for new TLDs is one of ICANN's most significant policy responsibilities. The paper shows that ICANN's current approach to TLD additions is anti-competitive and fosters rent-seeking, political strife, and the potential if not the reality for corruption. At the least it perpetuates the perception of ICANN as operating with irregular and subjective procedures. This is a disservice both to ICANN and to the broader Internet community.

The paper proposes a procedure for adding 40 top-level domains to the Internet domain name system on an annual basis. It puts forward a process for doing so that is predictable in timing and procedure, rule-driven, and economically efficient. Separate rounds would be held for commercial and noncommercial applicants, with 10 noncommercial TLDs and 30 commercial ones being added yearly.

The paper analyzes the technical constraints on TLD additions and shows that the DNS (Domain Name System) protocol imposes only two significant limitations: the number of additions should be set at a low enough level to retain the hierarchical structure of the name space, and the rate of change in the root zone should not exceed the capacity of the root zone manager to accurately and reliably update and distribute the root zone file. In response to these constraints, we propose capping TLD additions at 40 per year. The specific number is admittedly arbitrary; in fact, any number between 30 and 100 would be acceptable according to many experts. For the sake of procedural simplicity and business certainty we argue that it makes sense to fix the number at a known level. We also show that root server load is not a serious factor limiting TLD additions.

The paper argues that there is now and likely always will be demand for TLD additions. The paper suggests that ICANN's role is not to second-guess the marketplace by choosing which of these TLDs are "good ideas" or most likely to succeed, but simply to coordinate TLD assignments. Consumers and suppliers interacting in the marketplace should determine which ones succeed. The paper concludes by anticipating and attempting to answer arguments that might be advanced against the proposed procedure.

Critics charge that it [ICANN] is the De Beers of the Internet: an organization that, like the diamond cartel, has created an artificial scarcity to protect a few established players. --Simson Garfinkle, Technology Review, March 2003

1. Managing the Domain Name System (DNS) Name Space: Time for a new policy

ICANN, the Internet Corporation for Assigned Names and Numbers, was created to manage the root of the Internet's global domain name system (DNS). As the quotation above suggests, ICANN suffers from an image problem in spite of the arcane nature of its tasks and functions. One of the most important aspects of that function is to make policy decisions about how top-level domain names (TLDs) are added.¹ Before a top-level domain name registry such as .com or .info can function, it must be entered into the root zone file of the DNS. ICANN is the gatekeeper of the commonly accepted DNS root. It has the authority to decide what names are added to it, what pace they can be added at, what criteria will be used to determine who gets the available name assignments, and who gets to operate the registries. Policy conflict over adding new TLDs is one of the issues that led to the creation of ICANN in the first place.²

ICANN's decisions about TLDs have an *economic* as well as a technical dimension. By controlling the addition of top-level domains, ICANN controls the supply of a valued resource (domain names) as well as the degree of differentiation in the market (which names exist).³ Adding TLDs also determines how much competition there is in the market for domain name registration services, because it expands the supply of names and can also increase the number of firms offering services to the public. Restricting the number of TLDs limits competitive entry into the market and limits consumer choices.

¹ An earlier draft of this paper was released as a white paper entitled "The Post-.COM Internet. A Five Step Process for Top Level Domain Additions" by Syracuse University's School of Information Studies Digital Convergence Center in March 2003, and presented formally and informally to several groups at ICANN's Rio meeting, March 23-27, 2003. That version is available at www.digital-convergence.info. Intellectual contributions and support for the research contributing to the views expressed in the white paper from Bob Frankston, Simson Garfinkle, Marengo Research LLC, Paul Mockapetris, Nokia, and Stefaan Verhulst of the Markle Foundation, are gratefully acknowledged. However, the views expressed both in the white paper and in this paper are those of the authors, and do not necessarily represent the views of the School of Information Studies, Syracuse University, or any other institution with which the authors are affiliated.

² "The new corporation ultimately should have the authority to manage and perform a specific set of functions related to coordination of the domain name system, including the authority necessary to: ...3) oversee policy for determining the circumstances under which new TLDs are added to the root system." U.S. Department of Commerce, NTIA, "Management of Names and Addresses," Statement of Policy (The White Paper), Docket Number: 980212036-8146-02, June 5, 1998. See also Mueller, *Ruling the Root*, (MIT Press, 2002) Chapter 6.

³ We assume that the reader is familiar with what a domain name is and with the hierarchical structure of the domain name space. For more information, see Mueller, 2002.

Significant attention has been given to the debates over ICANN's governance structure and its attempts to change that structure.⁴ This paper is *not* about those debates. It is a long-overdue look at the single most important area of substantive policy under ICANN's jurisdiction, namely the addition of new TLDs. This paper identifies a policy vacuum around TLD additions that has been allowed to exist for too long. It proposes a new policy approach that would make room for innovation and improve the fairness, efficiency, and competitiveness of DNS management. The authors believe that these policies should be adopted regardless of how ICANN makes its decisions, or what methods it uses to select its Board and develop its policies.

Does anybody care about new TLDs? For a few years in the late 1990s, top-level domains were assumed to be licenses to print money. Domain names at any level were assumed to have enormous power to attract Internet traffic. Those expectations have been deflated by the Internet bust of the new Millennium, and by greater sophistication among users. It is noteworthy, however, that the overall market for domain names declined by only about 10 percent in late 2001 and the first half of 2002, and then resumed its global growth. Certainly, the domain name land rush and the hysteria of the Internet boom period are things of the past. Does this mean that the issue of new TLDs is moot, and that there is no pressing need to address the issue? No. That perspective is as superficial and wrong as the overblown expectations of the boom years. It is like saying that the slowdown in 3G wireless development means that we don't need to worry about how the radio spectrum is managed anymore.

The domain name space is still a valuable resource and we still need to manage it properly. The market for domain name related services is a significant part of the Internet, representing about US\$ 3 billion in annual revenues. A new standard for internationalized domain names (IDN) has been created by the Internet Engineering Task Force, allowing domain names to be written in non-ASCII scripts and thereby creating the potential for a dramatic expansion in the market. There are now and will continue to be legitimate requests for the addition of new TLDs, which we discuss in the next section. At least a dozen companies who applied to ICANN for the right to operate a TLD registry in 2000 but were turned down are still willing and able to operate a registry. New names (e.g., .blog or .enum) that identify new communities or services have come into being. Last, but by no means least, we must not forget that at the registry level, the market for generic TLD registration services is still highly concentrated, with one operator (VeriSign) controlling over 85 percent of the market.⁵ That level of market concentration could be remedied over time with new entry and new, meaningful TLDs.

The basic points we wish to make are these:

- ICANN needs to define routine, sensible procedures to add TLDs.

⁴ H. Klein (ed.), 2001; NAIS, 2001; Fromkin, 2000; Mueller, 1999.

⁵ As of the 3rd Quarter of 2002, there were a total of 30.5 million domain names registered in the generic top-level domains (.com, .net, .org, .info, .biz, .name, .cc, .tv, .ws). VeriSign owns and operates .com (21.4 million registrations), .net (3.62 million registrations), .tv (475,000 registrations) and .cc (581,000 registrations).

- Those procedures should work regardless of whether the market is booming or in decline.
- ICANN’s procedures for adding TLDs should be demand-driven, light handed, and focused on coordinating the technical parameters of DNS rather than regulation and restriction of the market.
- Users and suppliers interacting in the market, not ICANN, should decide whether specific TLDs are valuable or not.

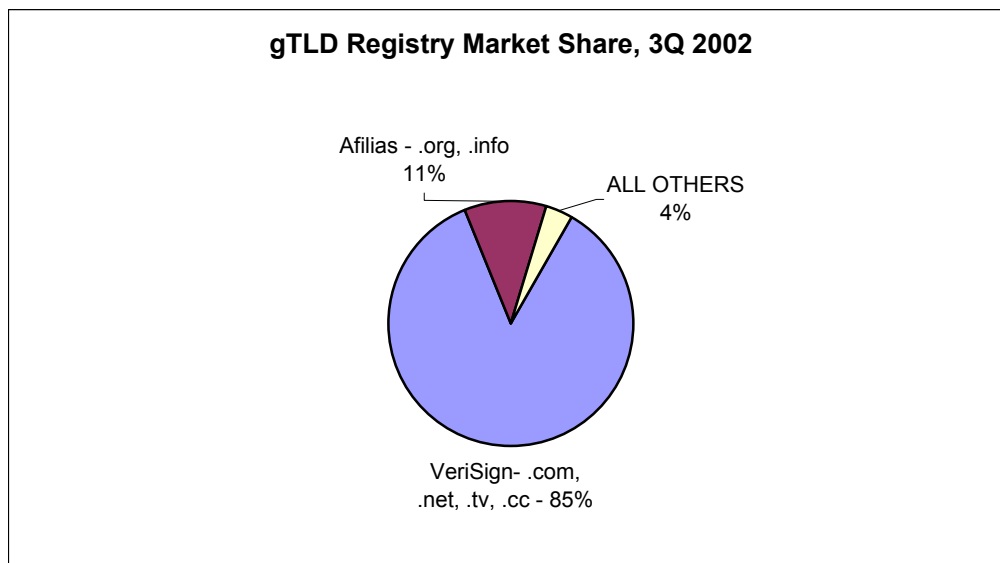


Figure 1: gTLD Market Share

(source: State of the Domain 3Q 2002 Report)

1.1 The continuing need for new competition

One of ICANN’s most widely acknowledged successes was the creation of retail-level competition for the registration of .com, .net, and .org domain names. This was done by imposing, by regulatory fiat, a vertical separation between the wholesale “registry” functions, and retail “registrar” functions. In the major generic TLDs regulated by ICANN, these “retail” functions of registrars must be separated from the “wholesale” registry functions of maintaining the zone files.⁶

⁶ In essence, registries operate public databases that exclusively assign second-level names under TLDs and provide, in real time, the name resolution data needed to use the names for communication over the Internet. Registrars, on the other hand, directly interact with customers to perform the functions of accepting customer orders for specific names, maintaining customer accounts, billing customers, accepting changes from customers, notifying them of expiration, and so on.

In the registrar market, ICANN has implemented a simple accreditation process that allows any business meeting certain qualifications to enter the market and compete.⁷ This approach has worked beautifully at making the retail market competitive. It has driven down prices and improved service. In contrast to the registrar market, ICANN has failed to create sufficient competition in the registry market. There is no reason why the registry market could not be as competitive as the registrar market. In this paper, we propose a basic accreditation scheme for registries and a basic limit on the number of new TLDs added per year that would make the registry market open and competitive as well.

It is important to understand the importance of competition at the registry level. Registries are the critical infrastructure of the domain name system. Registrars are just intermediary services built on top of that infrastructure. Ultimately, effective competition in domain services requires open entry and robust competition at both the registry and registrar segments of the market. If there is insufficient competition in the registry market, the whole domain name services industry is not sufficiently competitive. For example, the continued dominance of .com means that the secondary market for domain names, which now constitutes one of the most profitable and important aspects of the entire domain name market, is controlled almost entirely by VeriSign because of its control of the dominant .com top-level domain.

1.2 The Pathologies of ICANN's TLD Addition Process

Why has ICANN been unable to successfully produce competition at the registry level? The answer is simple and is entrenched in current ICANN processes (or the lack thereof): ICANN has not defined a routine method for adding top level domain names and for authorizing new registries to operate them.

At present, ICANN has defined no uniform criteria for evaluating applications. It has fixed no regular timetable for accepting and deciding upon applications. No one knows when ICANN will add new TLDs. No one knows upon what basis it might choose to do so or refuse to do so. When it does decide to add new TLDs, as it recently did at its June 2003 Montreal meeting, its staff has to make up a new set of criteria and rules, basically from scratch. This policy vacuum has made the addition of new domains a painfully slow, unpredictable, and entirely discretionary process. The effect has been to substantially raise the costs of entry into the domain name registry market, and to make insider politics rather than economic value the chief determinant of who gets to participate.⁸ The delays and costs of this non-policy have taken a terrible toll on the

⁷ ICANN's registrar accreditation policies are posted here: <http://www.icann.org/registrars/accreditation.htm>. As of July 21, 2003, there were 168 accredited registrars from more than 20 countries.

⁸ For example, one of the driving factors in the current round of "sponsored" TLD additions is insider lobbying. The proponents of a .travel TLD retained a well-liked and -respected former ICANN Board member, Ken Fockler, to promote their case for a new round of sponsored TLD additions to the Board. We wish to make it clear that we are not accusing Mr. Fockler of unethical behavior. Our point, rather, is that ICANN's lack of a procedure makes it virtually impossible for new TLD additions to occur in any other way than through applicant lobbying of the Board and management.

domain name industry. They have prolonged the dominance of a few well-entrenched players for years and led to the destruction of several innovative businesses that attempted to compete as domain name registries.⁹ The authors believe that that failure negatively affects competition and undermines ICANN's quest for global legitimacy.

One can get a better idea of how dilatory ICANN's TLD addition process has become by examining the timetable chart on the next page. See Figure 1. The first round of TLD additions began in August 1999, with the formation of a Domain Name Supporting Organization Working Group. Not until July of 2003 did the last of the seven TLDs added in that round actually become operational. But technically, the process of round one is still not concluded. ICANN's overly cautious approach to TLD additions defined the addition of seven TLDs in 2000 as an "experiment" or "proof of concept" which was supposed to be followed by an "evaluation study." Although July 2003 was the projected date for completion of the Evaluation, this deadline assumed that, by *September 2002*, an RFP for the evaluation would be drafted by staff and approved by the board, an evaluator selected, and the evaluation launched. As of July 2003, however, no such RFP had been issued. Thus, the process is at least 10 months behind schedule, and the completion date would have to be pushed back to May 2004 at the *earliest*. Based on the foregoing analysis, it is apparent that, left to its own devices, it will take ICANN *over five years* to complete all aspects of the first round of TLD additions. At the end of that process, it still will not have developed a routine method of adding TLDs; it will only have an assessment or evaluation of the first seven additions – a number and process it would still consider "experimental."

Luckily for consumers and businesses, this state of affairs is unnecessary and can be remedied with a few simple reforms. ICANN's restrictive approach to DNS regulation has no basis in the technical requirements of managing the system. The Domain Name System is a highly flexible protocol that could support many new names and a great deal of diversity and competition among TLD registries. Adding TLDs to the domain name system is a simple process technically and, within reasonable constraints, poses no technical risks to the operation of DNS or the Internet. It is not difficult to define operational requirements for a TLD registry that will avoid significant negative technical externalities from adding a TLD. Indeed, revenues generated by new registry fees could be used to finance major improvements in ICANN's administration and in the root zone servers.

1.3 Overview of the Proposal for Reform

In response to the pressing need for a regular and objective procedure, this paper advances a detailed proposal. It calls upon ICANN to define an annual procedure to add TLD names to the root. TLD names should be proposed by applicants who perceive a

⁹ Name.space, an innovative registry that supported nearly 500 generic top-level domain names, and Image Online Design, which has attempted to develop a <.web> TLD since 1995 have been held in abeyance for nearly 6 years now. RegistryPro, although a winner of the <.pro> domain in the year 2000 TLD additions, has been hampered by burdensome registry contract obligations. Neustar's (.biz) financial viability was harmed by the over-investment that is typical of limited markets allocated through beauty contests, where applicants have a strong incentive to promise more than they can deliver.

commercial, technical, or social need for them. The paper proposes to cap the number of TLDs added per year at 40, a number that is technically and operationally safe. There would be two rounds of additions each year. In the first round, ten (10) slots would be open for noncommercial, sponsored domains and Lesser Developed Countries (LDCs). In the second round, thirty (30) TLD slots would be open for commercial applicants. Applicants would know in advance the technical and operational criteria they would have to meet to qualify; there would be a registry accreditation process that would become as basic and routine as registrar accreditation.¹⁰ Applicants would have to pay fees that would cover the administrative and maintenance costs of the TLD addition process. If there were too many applicants for the 10 noncommercial and LDC slots, a random selection process would be held to determine the winners. If there were more than 30 applicants for the commercial slots the applicants would have to engage in auctions to determine the selections.

The proposal is outlined in more detail in Section 4 below. A flow chart describing the process (Figure 2) is shown in section 4 as well.

(Figure 1)

2. Who Needs New TLDs?

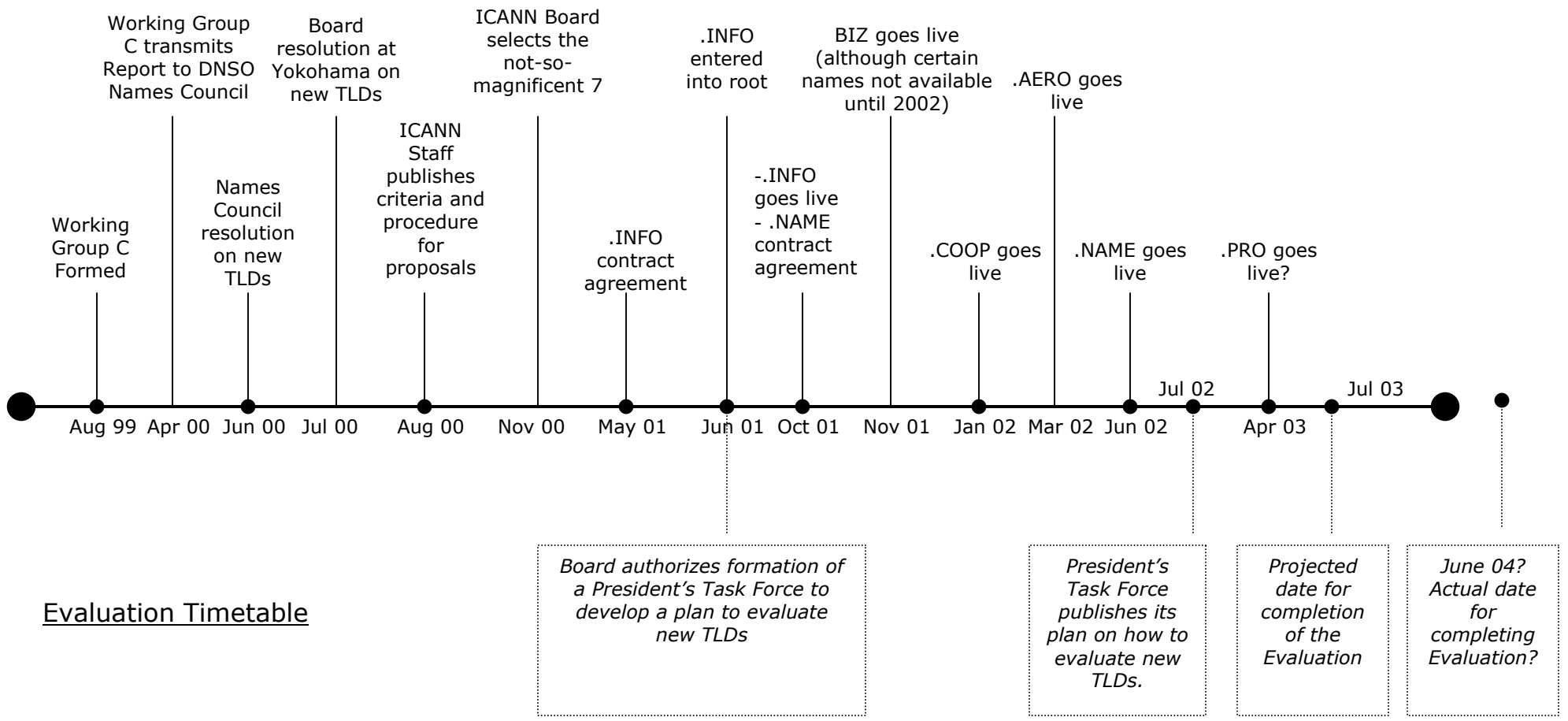
Our reform proposal is intended to make TLD additions responsive to consumer demand and supplier capabilities. In this section we discuss the sources of demand for new Top Level Domains.

It must be noted at the outset that the call for a TLD addition policy does not derive from a “shortage” of domain names as such. The current DNS name space, using existing TLDs and the restricted-ASCII set, is virtually infinite.¹¹ But this is like saying that the world’s automotive needs could all be met by one color of car. TLD additions can be ignored only if one ignores user preferences, human factors issues, competition, and important legal and economic issues about who controls and customizes a domain registry. The debate over new top-level domains is really a debate about the degree to which DNS administration should respond to human factors, user demand and competition policy concerns. It’s a question of who is in charge: users or the DNS administrator.

¹⁰ A registrar spokesperson prominent in ICANN has proposed a registry accreditation process here: http://r.tucows.com/archives/2003/03/13/new_gtlds_part_ii.html

¹¹ If users didn’t care about who managed their domain, or about price and service competition, there would be no need for additional TLDs. If users were willing to register meaningless identifiers such as *ghfhjj-u0-99wwvery.net*, or if they were satisfied with names that went into deeper and deeper levels of the naming hierarchy, such as *nuts.to.this.name.syr.edu*, the DNS could easily accommodate all conceivable future registrations without any change.

Figure 1: Timetable for new TLD intro



As we show below, namespace expansion would give users choices of identifiers that conform more closely to their preferences. Adding new TLDs would also provide an opportunity for new companies to enter the industry and try out new service concepts. It is important to emphasize the following point: *It does not really matter whether a new, open policy toward TLD additions results in one hundred successful new names and registries over the next five years, or only one or two successful new names and registries.* The point is that the market would be able to respond to consumer demand and supplier innovation. The resulting market structure would better be able to discover and respond to what people want and need. The other benefit is that ICANN's processes would be relieved of the unsavory politicking that currently accompanies discretionary awards of TLDs.

2.1 The demand for new top-level domain names

One can identify at least six distinct sources of demand for new top-level domains.

1. **A choice of more desirable names.** Given a choice between a meaningless domain name and a meaningful, catchy one, most users prefer the latter. Users may want more choices regarding the identity they project online. They may want the domain name they use, either as an email addresses or web site URL, to make a particular kind of statement. Thus, while the current top-level names provide only a handful of generic strings such as *.com*, *.net*, *.org*, or *.info*, end users might prefer additional options, such as *.shop*, *.zone*, *.free*, *.blog*, *.sucks*, etc. Bear in mind that to someone who reads Chinese characters and not English, *business.com* is as meaningless as *ghfhjj-u0-99wwofrz.com*. The demand for incorporating new language scripts into the DNS is derived from the same economic and human factors as the demand for new top-level domains. It is clear that real demand for a wider choice of names exists. The first two new open TLDs created by ICANN, *.biz* and *.info*, generated approximately a million paid registrations each after a year of operation. It took Network Solutions more than five years to register a million *.com* names. Even the new TLD names offered by alternative root system operator New.net have received tens of thousands of registrations, despite the severe handicap of being invisible to many users of the Internet.
2. **A more persistent and portable name.** Users who have an email address under their Internet Service Provider's name (e.g., *user@aol.com*) may want to expand their service options by obtaining their own domain (e.g., *me@myname.tld*). Controlling your own domain has several desirable consequences. The email address is likely to be more memorable and to match more closely the preferences of the user. A user-owned email address is also likely to be more persistent than one associated with an ISP or a third-party provider's email service. If an ISP goes out of business, raises its prices or offers poor service, users would be forced to change providers. If their domain name or email address is derived from their

- ISP, it will have to be changed when they switch providers.¹² Registering a domain name gives the user a form of address portability. A user's email address can remain constant when using different ISPs. This lowers consumers' switching costs and makes the ISP market more competitive, just as number portability does in the voice telephony market.
3. **Shorter names.** Given a choice between a longer and/or deeply hierarchical domain name and a shorter, flatter one, users will probably prefer the shorter one. Users may want to move up the DNS hierarchy; i.e., they may want a second-level domain instead of a third-level domain, or a top-level domain instead of a second-level domain. Moving up the hierarchy shortens the name, making it more easily usable.
 4. **More control over the name.** Moving up the hierarchy also increases the consumer's legal, economic and technical control over the administration of the name. In a hierarchical name space, an identifier is dependent upon the registrants above them in the hierarchy. Organizations higher-up in the contractual chain must operate the name servers pointing to lower levels in the hierarchy. The "higher-ups" have the leverage to impose policies regarding use, prices, name selection etc. on people lower down in the hierarchy. To escape these constraints, end users may want to move up the hierarchy. As an analogy, many companies heavily dependent on networks may choose to "in-source" their network operation and management functions and avoid dependence on telecommunication service vendors. Likewise, some companies may prefer to in-source their DNS by operating a TLD, thereby minimizing reliance on external registry firms. A corporation to whom online identity is essential, such as AOL or Amazon.com, may decide that it wants to "in-source" its DNS management functions completely and eliminate its dependence on VeriSign.
 5. **Verifying identity.** Some groups of organizations may want to establish a controlled name space, analogous to <.edu> for US universities, to promote authenticity of online identity. Control of a top-level domain gives one the authority to impose authentication or conduct rules on those within the name space.
 6. **Competition.** Market competition may induce companies to enter markets to compete for registration business already served inadequately by other businesses. For example, the <.name> TLD is targeted at personalized domain names, but their business model and policy restrictions are unattractive to many registrants, and they have not won the support of registrars. As a consequence, the number of registrations in the <.name> TLD is fairly low, and the important market for

¹² Hundreds of thousands of Internet users were reminded of the need for this when AT&T Broadband was forced to stop using the domain name <mediaone.net> as part of a legal settlement. Around 630,000 end users had to suffer the inconvenience of changing their email addresses and web page URLs as a result. Indeed, ownership and other domain name changes at AT&T Broadband forced some users to go through 3 different email address changes in 60 days. Users incur sunk costs in the form of paid-for business cards and advertising expenses, as well as additional costs related to the confusion and missed communications engendered by the change.

individual registrations is being poorly served. An alternative TLD for personal names would add competition and choice to the market. Many policy advocates within ICANN's process speak of "cloned" name spaces as if it is self-evident that duplicating the constituency served by one registry/name is necessarily a bad thing. But competition is all about overlapping services that give consumers choices. No one believes that Burger King should not be allowed to exist because McDonald's already serves the market for fast-food burgers.

In sum, adding top-level domains will have a major impact on a) the variety and usability of identifiers, b) competition, c) the ability of firms to control their digital identity services, and d) technical innovation.

2.2 The Importance of Time

If it is to maximize competition, ICANN needs to act quickly. One of the well-known economic features of the domain name registration services market is that once consumers have registered a name under one TLD, they cannot easily switch to another one. Switching costs on the demand side are high, because consumers who use domain names to identify web sites or as email addresses establish value and equity in a name that is sacrificed if its is given up. For example, if a registrant succeeds in establishing a steady stream of valuable traffic to her web site at www.domainname.com, she is not going to give up that name just to get a slightly more desirable name or slightly lower price under a new .foo top-level domain. Thus, competition in the DNS market is fundamentally competition for *new registrations*. (FTC, 1998) By freezing TLD additions at a time when VeriSign (then Network Solutions) dominated the market, the U.S. Commerce Department and ICANN practically institutionalized the .com monopoly and made it increasingly difficult for new entrants to achieve the same size and scale. The longer we delay in creating a TLD addition procedure, the more constrained and locked in the market becomes.

3. Technical constraints

Technical risks are often cited as one reason for extreme caution in the addition of new top-level domains. However, these concerns are founded largely on ignorance of the technical workings of the domain name system. Regular additions of a fixed, modest number of top-level domains to the root each year pose no technical risks to the Internet.

As a distributed open system, the Internet has many sources of instability. Some of the problems are intentional, such as the antics of script kiddies, criminal break-ins, spam, and organized denial of service attacks. Others are unintentional, stemming from poorly configured routers, congestion, poorly designed or badly implemented DNS software, inter-software incompatibilities, hardware breakdowns, and so on. All act to negatively affect the response times and connectivity of ordinary users. Given the broad range of problems that can and do afflict the Internet's daily operation, changes in the number of top level domain names is, we will show, a vanishingly small part of the total picture. Of all the problems faced by the Internet at this point in time of terrorism and organized denial of service attacks, TLD additions are not what we need to worry about.

Having additional TLDs may even decrease the impact of various intentional or unintentional problems because new registries may bring a new set of service sites and nodes to cope with problem situations.

It is noteworthy that respected technical experts have never voiced doubts about the ability of Internet technology to handle the addition of a finite number of new TLDs. Jon Postel, one of the original designers of the DNS protocol and for many years the manager of the root, proposed adding 50 new top level domains annually over a three to six year period in 1996.¹³ Paul Vixie, one of the developers of the dominant BIND software used by DNS name servers, went on record in an ICANN Working Group saying that “A million names under [the root] isn't fundamentally harder to write code or operate computers for than are a million names under COM.”¹⁴ Paul Mockapetris, author of the basic RFCs defining the DNS protocol, wrote “I'd feel safe adding a bunch of new TLDs, 10s or maybe 100s.”¹⁵

Doubts about the technical risks of TLD additions have been voiced primarily for political and economic reasons. Some incumbent registries or registrars are concerned about facing additional competition.¹⁶ Some trademark holders would like to prevent the creation of new spaces where name speculation or cyber-squatting might occur. In both cases, however, the objections are based on economic policy preferences, not technical risk.

Whatever the merits of placing regulatory or economic restraints on TLD additions, we must clearly distinguish between restraints based on technical factors and those based on economic protectionism or regulatory control. If willing buyers and willing suppliers of new services are being deprived of the right to enter a market, sound public policy dictates that we correctly identify and openly debate the real reasons why.

In this section, we show that there is no ambiguity whatsoever about the technical capability of the DNS to support TLD additions at the rate we propose. To make this case we need to back up and describe some basic technical features of the DNS.

¹³ Draft-postel 1996. The proposal is archived here: <http://www.ripe.net/ripe/mail-archives/dns-wg/1996/msg00055.html>. While this plan was rejected, its failure was not due to technical concerns about expansion of the root zone.

¹⁴ Vixie's message was sent to the ICANN DNSO Working Group on new Top-level domains, (Working Group C), 15 December 1999. <http://www.dns0.org/wgroups/wg-c/Arc01/msg00203.html>

¹⁵ Paul Mockapetris to Jon Weinberg, and reposted to Working Group C, Dec 15, 1999. In response to an earlier draft of this paper, Mockapetris added, “while you quote me as saying adding 10s or 100s was safe, you should understand that the quote was in the context of recommending a conservative course, and not to dispute the million delegation remarks of Vixie, merely to start slow toward the million (assuming that turned out to be a useful place to go).” (email communication, date....)

¹⁶ Roland LaPlante, Chief Marketing Officer of Afilias, was quoted in a news report as cautioning against introducing any significant new TLDs in the near future. The reason? “[W]e must allow adequate time... [so] that their introduction does not negatively crowd or disrupt the current registration marketplace by offsetting the existing supply versus demand structure.” See ICANN Blog, <http://icann.blog.us/2002/10/23.html>

3.1 The Root Zone File

The domain name system is a distributed database. It allows users anywhere on the Internet to submit a query (a domain name) and receive the right information in return: the IP address of the queried domain, or other records. The DNS as a total system responds to billions of queries every hour.

The DNS name space is organized hierarchically. The root only contains information about the very top level of the hierarchy. Information about the lower levels is held by a network of local, national, or global name servers. Most of the real work of DNS is done by *these* name servers, not by the centralized root. There are more than half a million name servers around the world, and they are operated by individuals, small organizations, large enterprises, ISPs, and the major domain name registries and registrars. Information about how to resolve domain names is cached (stored) locally, so that most users' queries can be answered locally and never go to the root.

The DNS root is just a set of 13 name servers at the top of the naming hierarchy. It contains the authoritative list of top level domains, and associates each TLD name with second-level name servers that hold authoritative information about second-level names under each TLD. The root's authoritative list of TLDs is called the *root zone file*.

The root zone file is a simple ASCII text file. At the beginning of 2003, it contained records for 258 TLDs. 243 of them are country codes drawn from the ISO-3166-1 list. Fifteen of them are so-called "generic" or global names such as .info or .com. For each TLD, there is an average of ten (10) records in the root zone file. As noted above, these records provide the information needed to direct queries to the proper name servers of second-level domain registries. Thus, there are a total of only 2573 records in the root zone. The whole file consumes only 100 kilobytes of storage. It is much smaller than a one page letter written in MS Word software. Ten copies of the root zone could be stored on a 3½ inch floppy disk.

The U.S. Commerce Department holds ultimate policy authority over the content of the root zone file. The U.S. Commerce Department has delegated to ICANN the responsibility for handling requests for changes to the root zone and working out the policies that govern how and why those changes are made. Thus, any changes to the root zone must first be approved by ICANN and then go to the U.S. Department of Commerce for final approval.

Once changes are made, they must be distributed across all 13 of the Internet's root servers. Operationally, VeriSign Global Registry Services administers the primary root server (the so-called "A" root), which is the most current and authoritative version of the root zone file. All authorized updates and changes to the root zone file start at the A root and are distributed to the other 12 servers at least twice daily.

3.2 Technical constraints on new TLDs

There are three possible ways in which TLD additions might impact technical stability:

- The need for a finite limit on the number of TLDs
- Root zone file flux

- Root server load

By “need for a finite limit” we mean that the DNS is a hierarchical name space, a tree structure the design of which presumes there are fewer names at the top of the tree and more names as one goes down into the branches. If TLDs were added in a way that allowed or encouraged *all* names to be registered at the root, then the hierarchical structure of the name space would be defeated. That would undermine the robust, distributed nature of the Internet and make it far too dependent on a single point of failure (the root).

By “root zone file flux,” we refer to the rate at which the content of the root zone file changes. If the root zone file must be changed frequently, the updates distributed too often and there are large numbers of changes, there is a greater risk that errors will be made.

By “root server load,” we refer to the rate at which the root servers are queried by computers connected to the Internet. If the query load exceeds the capacity of the root server system, then the performance of the DNS system as a whole would be impaired.

Below, we show that first two issues can be easily addressed by simply fixing the number of TLD additions at a safe pace and number. We also show that TLD addition at the recommended pace (40 per year) is unlikely to have any discernable effect on root server load.

3.2.1 Finite Limit

It is a simple matter to address the first potential problem. One need only specify a finite limit to the number of TLDs that can be added over time. There is no precise way to define what this limit should be, so the choice of a specific number is necessarily somewhat arbitrary. But if the purpose is to retain the hierarchical nature of the name space, it is clear that with tens of millions of second-level domain names one could add hundreds of TLDs annually and still retain a hierarchical structure. In this paper, we have proposed making it possible to add 40 new TLDs annually. (Note well that we are talking about accommodating a *maximum* of 40 applications – if there were fewer than 40 qualifying applications in a year there would be fewer than 40 additions.) This is a quite conservative number. It would take more than six years of additions at the limit for the number of TLDs to double.

3.2.1 Root zone flux

Adding TLDs has linear effects on the size of the root zone file; it neither increases nor decreases the number of records required by each TLD. Thus, if the maximum of 40 TLDs were added each year, it would take a decade for the zone file to double in size to 218 kilobytes. By contemporary standards, this is still a very small file. The processing power required to search it to match queries would not increase appreciably.

Senior figures within the Internet technical community, such as Paul Vixie and Karl Auerbach, have pointed out that the root servers use the same technology as the name servers for the top-level domains. In that respect, the root zone file is no different from any other DNS zone file. There are millions of functioning registrations in the *.com*,

.net, .org, .de, and .uk zone files, and changes, deletions and additions occur on a minute-by-minute basis. Those zones work reliably. Hence, from a purely operational standpoint one might reasonably conclude that there could be millions of top-level domains.

There is one important difference about the root zone, however: errors or corrupted files at the root level could have more damaging consequences for Internet users than mistakes that occur lower in the hierarchy. An erroneous root zone file could result in the inaccessibility of entire TLDs, containing thousands or even millions of user identities, until the problem was fixed. The effects of a corrupted TLD zone file, on the other hand, would be limited to second-level names and hence the bad effects would be more localized (although here, too, a major second-level domain name such as <aol.com> could affect millions of users). Thus, there is a valid technical concern about limiting the *rate at which the root zone changes* in order to minimize the risk of propagating errors in the root zone. (In this regard, the size of the <.com> zone has been a problem; in the past Network Solutions has experienced sporadic trouble updating and distributing it properly, although for the most part it works remarkably reliably given the rate at which it changes.)

Some Internet technologists believe that root zone changes could and should be automated. More conservative engineers, on the other hand, believe that the root zone must continue to be altered by hand and subject to human inspection before being released and propagated to the root servers. Even the adherents of this most conservative view, however, believe that 20 – 100 additions and changes in the root zone file made in batch mode at a specific periodic rate, such as annually or every six months, are safe. Thus, with regard to the rate at which the root zone can change there are no serious technical objections to the addition of 40 or so new TLDs being added annually to the root zone. Indeed, that number comes in below the middle of the safe spectrum.

There is no doubt about the ability of the root servers to handle this level of addition:

- *It has already been proposed by experts.* As noted earlier, the original root administrator and one of the designers of the DNS, the late Dr. Jon Postel, proposed adding 50 new TLDs a year for three years in a row back in 1996. More recently, Paul Hoffman, chair of an IETF working group on a DNS-related standard, publicly proposed adding 25 every six months.¹⁷
- *We have already done it.* During the early and mid-1990s, as country code TLDs were being delegated, the root zone was expanding by 10-20 TLDs or more per year for nearly a decade. From 1994 to 1996, 40 or more TLDs were added each year. At that time the root zone file was managed by the equivalent of one full-time person. Moreover, the technology has become more powerful. Thus, there is no factual basis for viewing the proposed rate of addition as a technical risk.

¹⁷ Paul Hoffman, "Reforming the Administration of the DNS Root," April 25, 2002. <http://www.proper.com/ICANN-notes/dns-root-admin-reform.html>

3.2.2 Root server load

The only other technical concern raised by the addition of new TLDs is how TLD additions affect the query load on the root servers. Root server load is a topic on which a great deal of measurement and research has taken place in the last three years. In particular, a number of studies carried out by the Cooperative Association for Internet Data Analysis (CAIDA)¹⁸ from 2000 to the present have examined the number and type of queries received by the root servers, as well as the response times of the root servers.¹⁹ These studies make it clear that, relative to other dominating factors, the number of top-level domains in the root zone file could have only a miniscule effect on the overall load of the servers.

Currently, the most active root servers receive around 3000 queries per second, totaling 250-300 million per day for each server. The query load has increased steadily as the Internet has grown. Most of the growth occurred when no TLDs were added, from 1996 to 2001, making it clear that usage, not the number of TLDs as such, is the key factor. Hardware and software upgrades have enabled the servers to keep up.

Although the number of IP addresses assigned to root name servers is limited to thirteen, the number of computers that can be linked to each address is not restricted. Thus, root name servers can be implemented on several machines. In the Fall of 2002, the ability of root servers to expand their capacity was dramatically improved by application of the “BGP anycast” technique, which has allowed mirror copies of the F root server to be established in Spain and the Asia-Pacific region. Measurements conducted by Rob Thomas’s “DNS Data” web site show a dramatic improvement in the response times of the F root server since these changes were made.²⁰ The M root server in Japan is also taking steps to expand its capacity in the same way. These new configurations make it unlikely that the query load will exceed computing capacity of the root name servers any time soon.

Studies of the composition of the queries that go to the root servers make it even clearer that root server load is not a constraint on the number of TLDs, provided that additions are kept to a reasonable, regular pace. The CAIDA studies indicated that almost 98% of all the queries that go to the root are “bogus” requests caused by software implementation problems or other software factors. For example, one of the most serious causes of root server load is the absence of negative caching in the DNS software of a major vendor. Without negative caching, a request for a nonexistent domain can be repeated indefinitely, and some poorly designed programs will aggressively retransmit thousands of these bad requests. According to the CAIDA research, these kinds of problems account for 70 percent of current root server load. Other implementation problems account for another 28 percent of root server load. Normal, legitimate queries constituted only two percent of the root server load. Thus, even if doubling the number of

¹⁸ See <http://www.caida.org/outreach/papers/>.

¹⁹ Of particular interest is D. Wessels, “Toward Lowering the Load on DNS Root Nameservers.” Presentation before the North American Network Operators Group (NANOG), October 2002. See also N. Brownlee, kc claffy, Evi Nemeth, “DNS Root/gTLD Performance Measurements,” 2001.

²⁰ Rob’s DNS page, www.cymru.com/DNS/

TLDs over a decade-long period actually doubled the number of legitimate root server queries, it would add only two percent to the total load. Adding TLDs would not affect the software configuration and implementation problems that create most of the load.

Because the DNS relies so heavily on caching at lower levels of the name server hierarchy, there is no simple, linear relationship between adding TLDs and increasing root server load. The consensus position within IETF seems to be merely that the number of TLDs should be finite rather than infinite, so that the hierarchical character of name resolution and assignment is maintained. As IETF Chair Fred Baker put it,

If we can add one TLD (and we obviously can), we can add 1000 TLDs to the [root zone] table. How that relates to [root-server] lookups for those TLDs is indeterminate from the fact that they are there. ...The fact that we added seven TLDs does not mean that we have even *changed* the root server load, much less multiplied it by something. How much additional load we would get is a *business* question: how many new computers, with people using them (and what would they be doing, and what sites would they therefore be accessing), will be added to the Internet because this TLD is in operation?²¹

ICANN's initial addition of 7 new TLDs and the re-vitalization of the dormant <.us> TLD have led to no discernable change in root load or root server behavior. In sum, TLD additions have minor impact on what is a more fundamental question, which is how the DNS is able to scale with the growth of the Internet, and how the open Internet developers community can respond to software externalities in the Internet "commons." Poorly implemented and/or badly designed software has the greatest impact on root server load. The general growth of the Internet, and new DNS applications such as ENUM, may have an impact. The effect of TLD additions is minimal.

4. A Rational Name Space Management Regime

In this section of the paper we propose a TLD addition process that is economically efficient, pro-competitive, and supportive of the long-term sustainability of ICANN and the root server operators.

4.1 Criteria for a TLD Add Process

We begin by defining five criteria that a TLD addition process must meet. In the process, we show that ICANN's current process (or lack of a defined process) does not meet any of those criteria.

4.1.1 Predictable in timing & procedure

The first and in some way most basic criteria is that the process should be fixed and regular. TLD additions are not an "experiment" or a step into the unknown. They are a routine part of DNS management. Growth or change in zone files at any level of the DNS was always contemplated as a normal activity during the design of the protocol.

²¹ Email to author, October 11, 2002

Thus, businesses or organizations interested in offering DNS services requiring a TLD must have a known procedure for applying for one. The procedure must follow a publicly defined and reasonable schedule that ICANN adheres to. Put in the simplest terms, applicants for TLDs should know what they have to do and when they have to do it. They should be assured of either a “yes” or a “no” within a defined and reasonable time frame.

A fixed addition schedule has a number of excellent efficiency and fairness properties. For example, it prevents incumbent registries from exerting political pressure to prevent competitive entry. And it discourages exploitation of scarcity in the name space by suppliers or name speculators, making it clear that new TLDs will continue to be added and hence any business model based on exploitation of artificial scarcity will not succeed in the long term.

Finally, open entry is a prerequisite for growth and innovation. To understand this argument, imagine how the U.S. telecommunications industry would function if the U.S. Federal Communications Commission, which controls the allocation and assignment of radio frequencies, had no defined rules or procedures for requesting and assigning radio frequencies. What if the only way forward for service providers and users who needed frequency bands would be to continually lobby the FCC’s Commissioners and staff persons, in effect begging them for frequencies? The lobbying (begging) efforts would not only have to convince the FCC to award them the specific frequencies they needed; they would also have to convince them that the FCC should even consider awarding *any* new frequency assignments at all. Obviously such a process, or rather absence of process, would act as a huge barrier to entry in the relevant industries, and would smother innovation and growth in radio-related areas. A great deal of investment of mental and physical energy would have to be diverted to lobbying and away from execution.

ICANN’s current TLD addition process is not fixed, nor is it regular. No one knows when or why TLDs will be added. As noted in Section 1, its first round of additions treated the initial set of new TLDs as an “experiment” that began in 1999 and must be studied until 2005. Then, in late 2002, ICANN’s CEO suddenly declared that adding three new sponsored TLDs would be a good idea.²² This out-of-the-blue announcement did not emerge from any stable, defined process, but from insider lobbying by constituencies and applicants. In order to implement this proposal, ICANN’s staff had to develop a new set of criteria to be used in the selection of applications.²³ The criteria are only applicable to this specific round, which is arbitrarily limited to “sponsored” TLDs.²⁴ While at this point one can only express support for adding new TLDs to a long-suppressed market, ICANN’s 2003 sponsored TLD addition proposal

²² See <http://www.icann.org/amsterdam/gtld-action-plan-topic.htm>

²³ See <http://www.icann.org/tlds/new-stld-rfp/new-stld-rfp-24jun03.htm>. As is all too typical of ICANN, the criteria were proposed one day before they were to be discussed by the public at the Montreal meeting.

²⁴ “Sponsored” TLDs are supposed to be restricted to some bounded community of registrants, and managed by a sponsoring organization that ICANN deems to be representative of that community. Thus, .museum, delegated to the International Council of Museums, is a sponsored domain; registration under .museum is limited to organizations ICOM considers worthy of the label “museum.”

perpetuates the harmful idea that TLD additions are to be performed sporadically on an ad hoc basis rather than being regularized and routine.

4.1.2 Responsive to market demand

Addition of TLDs is not fundamentally a technical issue (once it takes place within the defined constraints); it is a matter of permitting supply to respond to demand. Whatever process is adopted should allow companies to respond to real or perceived needs in the marketplace. Since marketplace needs and demands change over time, the best way to assure responsiveness to demand is to make entry open to any qualifying applicant and allow market forces to determine which ideas are good and succeed, and which are not and fail. The root zone file manager should not impose artificial limits on entry or attempt to protect incumbents. New TLD names should be defined by applicants who have done the market research and are willing to invest the money and sweat equity required to get through the process. They should not be defined by central planners who think they know what names the world needs.

By way of contrast, ICANN's current process is not responsive to demand. Indeed, ICANN's former CEO Stuart Lynn openly questioned whether TLD additions should pay attention to demand.²⁵

4.1.3 Fairness (Rule-driven rather than discretionary)

The process for awarding TLDs should be governed by rules and specific criteria that are applied on a nondiscriminatory basis to all applicants. The process should not be driven by insider politics and the discretion of the ICANN Board. Insofar as possible, all relevant criteria for an award should be objective. Where human judgment is called for (e.g., trademark conflicts or issues of confusing similarity or deception) the process for resolving such disputes should be well-known (e.g., referral to an arbitration panel or alternative dispute resolution service with known rules and precedents). For those reasons, if there are more applications than available slots we propose to select from among noncommercial applicants using a random selection procedure; for commercial applicants, we propose to use auctions. Both procedures are completely objective.

ICANN's TLD addition process to date has been entirely discretionary. A variety of law and policy analysts have documented the striking parallels between ICANN's authorization of new TLDs and the Federal Communications Commission's licensing of broadcast stations.²⁶ Broadcast licensing has been based on "comparative hearings," in which applicants put before the Commission a host of promises about how they would "serve the public interest" and the Commissioners tried to discern from these promises which applicants have the most merit. The process earned the nickname "beauty contests" because choices were based more on the taste and discretion of the Commissioners than on any defined and objective criteria. By creating such wide latitude

²⁵ Lynn, in the news article cited in note 16 above, noted that "some people" don't think it is a good idea to respond to demand, and asked "Do we just respond to market demand... or do we structure the namespace according to some taxonomy, or in some third way?"

²⁶ Jonathan Weinberg (2002), Mueller (2002) chapter 10; Mannheim and Solum (2003).

for discretion, the broadcast licensing process heightened the importance of insider politics in the selection process. Lyndon Johnson's exploitation of the Commission's discretionary power over broadcast station channel allocation is an example of the kinds of abuses one can expect from an assignment system based on beauty contests.²⁷

But one need not rely on criticism of ICANN to support this point. ICANN's own Board chairman, Vint Cerf, compared ICANN's TLD selection process to the reviews of business plans conducted by a venture capital firm, and urged that ICANN find a way to "extract" itself from such nontechnical issues.²⁸

4.1.4 Efficient

A TLD addition process should be economically efficient. This means two things.

First, it should discourage rent-seeking behavior and the opportunities for legal conflict by applicants and incumbents. "Rent-seeking" refers to efforts by market participants to gain market power by investing in protectionist policies or favorable subsidies.²⁹ ICANN's current process is tantamount to an engraved invitation to engage in rent-seeking. With new entry completely subject to the whims of ICANN's management and Board, applicants and their opponents and competitors have no choice but to invest heavily in politics. Open entry according to a defined procedure dramatically reduces such unproductive activity, by eliminating discretion of the Board and hard-wiring new entry into the system.

Second, the process should make sure that the administrative and opportunity costs of an application, and the costs of actually implementing TLD additions in the root server system, are borne by those who create the costs. TLD application fees should reflect as precisely as possible the actual costs of reviewing applications for conformity to defined, objective criteria. They should not be used as a means of financing ICANN's general budget. If adding 40 TLDs a year led to costs of hiring one full-time staff to manage and review changes in the root zone file, then 1/40 of that amount should be part of the fees assigned to each successful applicant. Likewise, if adding TLDs can be projected to affect the hardware and software costs of the root server operators by a defined amount, then 1/40 of that amount should be part of the fees assigned to each successful applicant, and the monies distributed to the root server operators.

4.1.5 Technically safe

Finally, the procedure for actually adding TLDs to the zone files, and the limits placed on the number of changes each year, should fall safely within the technical

²⁷ Texas television station KTBS (Channel 7) went on the air in November 1952, after a long freeze of TV station licensing. We now know that LBJ had worked behind the scenes throughout the freeze to make sure that the FCC Order allocated only one VHF channel to Austin, and that his family would get it. <http://www.emmyonline.org/tvq/articles/32-23-10.asp>

²⁸ Quoted in Brock Meeks, "ICANN and the seven dwarves" (MSNBC News, Nov. 22, 2000).

²⁹ A more technical definition is "the expenditure of social resources to capture wealth transfers." See J.M. Buchanan, R.D. Tollison, and G. Tullock, *Toward a Theory of a Rent-Seeking Society*, College Station: Texas Tech University Press, 1980.

capabilities of the root server system. As we have shown in Section 3, this means a finite limit, somewhere in the tens of TLDs each year, on TLD addition-related changes in the root zone.

4.2 A TLD Addition Process

Below, we propose a process for TLD additions. Using this process, ICANN would add a maximum of 40 new TLDs each year. (There is nothing magic about this particular number. Technical constraints indicate that it is safest to remain in the “tens” per year, but it could be 30 or 50. One does, however, need a specific number to implement the procedure.) Our process, which could be implemented by the end of 2004, involves the following steps:

4.2.1 Call for applications (2 weeks)

ICANN would announce two distinct two-week periods each year for applicants to register their desired TLD string in ICANN’s application registry. The process would be separated into noncommercial and commercial rounds. The noncommercial round would be restricted to nonprofit organizations and Lesser Developed Countries (LDCs). (ICANN would have to carefully define the criteria for noncommercial applicants; one suggestion is to use the United Nations definition of LDCs.) The commercial round would be open to any type of applicant. Applicants would pay a modest, cost-based administrative fee (most likely around a thousand US dollars) for each name they apply for. The noncommercial round might be held in the first quarter of the year, the commercial round in the third quarter. During the application period, applicants would lay claim to any unoccupied TLD string.

The applications may want to include a fitness disclosure and a statement of financial capability showing access to the financial resources needed to operate a registry, or an affiliation with an accredited registry. But a more open system would allow brokers and resellers to apply as well.

Noncommercial/LDC applicants could only propose one TLD string. Commercial applicants could propose any number of TLD strings, but during the auction process (see step 4.2.3 below) they would only be able to win two. ICANN would allow new commercial names to be proposed by anyone: interested communities, incumbent registry operators, entrepreneurs, etc. Whether the business models proposed were “sponsored” or “unsponsored,” “restricted” or not, would be up to the applicants; it would not affect the selection procedure.

4.2.2 Noncommercial Applicants: Eligibility Check & Random Selection (2 months)

After the application registration period ends, ICANN would check for eligibility and eliminate any ineligible applications. If there were more than 10 eligible applications for noncommercial names a random selection process would be held to select the 10 qualifying applicants. To prevent abuse or possible manipulation of the random selection process, we propose that TLD delegations emerging from this process cannot be sold or transferred to commercial entities.

4.2.3 Commercial Applicants: Auctions (3 months)

In order to avoid any conflict or confusion over which TLD names were available, the noncommercial selection must be concluded before the application period opened for commercial applicants. If eligible commercial applications for more than 30 TLD strings were received, a bidding process would be triggered. ICANN would have the right to set a reservation price at the level of its costs of processing and implementing TLD additions.

We envision a simultaneous multiple round auction in which applicants would bid to get one or two of their proposed strings into the top 30. We believe this can be implemented in a web-based, eBay-type interface. To repeat, while applicants can propose any number of TLD strings (paying a separate application fee for each one), they can only win a maximum of two in the auction. In each round of the auction, the 30 TLD strings attracting the highest bids would be listed. In the next round, applicants would then decide either to bid more to push their proposed TLD into the top 30, or drop out. When the bidding stops, the final result is known. If multiple commercial applicants were after the same TLD, the top bidder for the TLD would get it.

A number of auction procedures exist and economic research on the topic is well developed enough to support the design of auction procedures for specific purposes. Any actual implementation of this plan would of course need to pay careful attention to the details of the auction design. We do suggest that when the auction is finished, each of the top 30 applicants pay the same fee as the lowest winning bidder, rather than the amount of their bid, except when there was competitive bidding for the same TLD string by multiple applicants, in which case the high bidder would pay the second-highest bid to win the name.³⁰

Proceeds of the auction would finance activities directly related to modifying and maintaining the root zone. A defined portion of the fees could be allocated to the root server operators.³¹ Of course, if less than 30 eligible commercial applications were received, no bidding process would be triggered. In that case, all qualifying applicants would simply pay ICANN's reservation price. This price, too, should include some payment to support root server operation.

4.2.4 IPR Challenge (2 months)

In both the commercial and noncommercial processes, after settling the issue of which TLD strings should be added the successful names, plus an additional 5 alternate names that were the next-highest ranked in the auction or random selection process, would be published. At that point a period set aside for intellectual property challenges would go into effect. If a TLD was confusingly similar to an existing TLD or threatened to violate a trademark, it could be challenged and subjected to a dispute resolution procedure. With some adaptation, UDRP principles provide a good basis for resolving

³⁰ Except in cases of competitive bidding over the same string, in which case the winning bidder should pay the amount they bid.

³¹ This prospect however raises issues about the contractual relationship between ICANN and the root server operators that go well beyond the scope of this paper.

TLD disputes; e.g., confusing similarity to a trademark, trade name, or trade name acronym or existing TLD; lack of a right or legitimate interest in the name; evidence of bad faith (although notions of bad faith would not be able to incorporate evidence from the way the name was used because no use has taken place yet). Clearly, the global strength of the mark in question would be a new and very important consideration. Whereas a <.aol> top-level domain might be prohibited for anyone by AOL-Time Warner, there are many companies that use “National” as a trademark, and hence a <.national> top-level domain name might pass. The IPR challenge procedure applies only to challenges to the string itself – it does not involve challenges to the procedures or policies used by the registry to assign names.

TLD strings eliminated through the IPR challenge process would be refunded their auction payment (with the costs of the challenge proceeding deducted) but not their application processing fees. The next highest-ranking alternate name that made it through the IPR challenge process would then be eligible for the next step.

4.2.5 Contracting (1 week)

After the IPR challenge period expired and disputes were resolved ICANN would present the successful remaining applicants with standard registry contracts. We emphasize that the contracts should be standardized and uniform, not developed on a case-by-case basis for each registry. As standardized contracts they would be less intrusive and less regulatory than ICANN’s current registry contracts. The contracts would require adherence to a minimal set of ICANN-defined technical specifications and conformity to established ICANN policies. This would include standards for transferring a zone file that would allow DNS to be maintained if a registry failed. This might also include, for example, a commitment to bind registrants in unrestricted, unsponsored domains to use the UDRP. We do not, however, think it necessary for the contract to require registrar-registry split, nor do we think it necessary for the contract to cap the price of services in new TLDs. New TLD operators could not possibly be dominant market actors, and no one has to register in their domain. Ergo, no price cap is necessary.

4.2.6 Entry into the Root Zone (2 weeks)

The final step would be the entry of the contracting parties’ information into the root zone. Currently this would require the approval of the U.S. Department of Commerce; whether that would be necessary and appropriate in the long term is a policy issue outside the scope of this paper.

Note that while this procedure uses auctions and random selection to ration TLD additions when there are too many applications, the procedure does not presume that rationing is necessary. If fewer than 30 commercial applications (or fewer than 10 LDC or noncommercial sponsored applications) were received, no competitive bidding (or random selection) would be required. Applicants would be added merely by paying ICANN’s application fee and its processing fee. The procedure would permit the addition of up to 40 TLDs annually for an indefinite period of time, so it is possible that the limits would not be reached some years.

5. Anticipating the Debate

In the previous section we defined a flexible, market-oriented approach to TLD additions. In this section we examine various arguments that might be made against the procedure.

5.1 Defensive registrations and IPR

The biggest objection to regular TLD additions is likely to come from major trademark holders. Many of them view new TLDs not as expansions of choice in the domain name market but as additional costs of business. They may believe that adding new name spaces under new TLDs imposes upon them the burden of registering their trademarks and brand names in new TLDs again and again, in order to protect them from name speculators and cybersquatters. The costs of these additional registrations to any individual company are perceived as small relative to the potential nuisance value of misappropriated or misused names, but the aggregate value of defensive registrations is probably around US\$ 10 – 15 million.³²

Some registrars and registries have deliberately played upon these fears, using promotional strategies designed to scare brand holders into registering the same domain names across all TLDs in order to prevent others from getting them. In the late 1990s, this led to the creation of a vicious cycle that fueled the bubble in the DNS market, as speculators and trademark owners entered into a race to register, preempt or recover millions of domain names.³³

While trademark holders' concerns are legitimate, shutting down expansion of the name space is not the solution. Moreover, it is a remedy that is out of proportion to the damage inflicted. It erases potentially hundreds of millions, possibly billions of dollars of added value in order to foreclose the possibility of a much smaller level of harm.

Name speculation and cybersquatting are business activities. As such, they hinge on two economic factors: 1) the willingness of someone else to buy the name, and 2) the ability of the name to deliver Web traffic (or some other kind of value) for the registrant. The first factor, of course, is completely dependent upon the second.

A routine TLD addition procedure attacks name speculation at its root. It makes the supply of domain names so abundant that the possession of any given character string is less important.³⁴ In a regime of domain name abundance, web sites and services will gain attention by developing reputations and offering users value – not by having a

³² Author's estimates based on registration statistics from <.com>, <.org>, and Edelman/Zittrain studies of the <.biz>, and "open ccTLD" domains.

³³ Milton Mueller, "Success by Default: A new profile of domain name trademark disputes under ICANN's UDRP," Syracuse: The Convergence Center, 2002. <http://dcc.syr.edu/reports.htm>

³⁴ It is noteworthy that in ICANN's first round of TLD additions, one of the most vocal critics of adding any new TLDs was an individual who had invested heavily in speculative registrations in the .MD top-level domain (the country code for Moldova).

scarcity value or special meaning. The domain name will be relegated to the status of a mnemonic identifier – which is all it was supposed to be all along.

The limited number of gTLDs was the initial cause of the cybersquatting problem. Perpetuating scarcity only perpetuates the economic forces that fuel the problem. An open market for TLD supply would do more to “normalize” the status of domain names than continued limits on entry. While it may cause trademark holders concern in the short term, it is really the only long-term solution to the problem.

5.1.1 Why the Dominance of COM is part of the problem

The mutually reinforcing cycle of cybersquatting and defensive registration was a product of the historical dominance of the name space by the <.com> TLD. We may not realize it now, but in the early days of the web (late 1996 and early 1997) nearly *80 percent* of all domain name registrations in the world were concentrated in <.com>.³⁵ Moreover, there were only a million or so registered domain names. Thus, common, simple domain names under <.com> had great power at that time. Many people navigated the Web by guessing the domain name and typing it directly into their browser. What gave domain names their business value was their ability, or potential, to deliver large quantities of web traffic. Well-known trademarks and brand names under <.com> were especially vulnerable to squatting, because of users’ propensity to rely on guessed names. This propensity was reinforced strongly by the web browsers’ method of automatically placing the <.com> extension at the end of any name typed into the URL window.

Under these unique – and bygone – conditions short, generic or branded second-level domain names under the <.com> gTLD were scarce and valuable commodities. Name speculation was a predictable response. By occupying large numbers of generic words or other names in the <.com> space, speculators hoped to maximize their chances of profiting from the demand of someone who wanted that particular string, or of capturing web traffic of users who typed in common generic words as a way of searching the Web.

These conditions have already changed substantially. Evidence of major change is apparent from the following facts:

- There are far too many registered domain names under the major gTLDs (nearly 30 million) to rely on guessing anymore. Users now rely primarily on search engines and portals to navigate the web.
- The most popular browser software (Internet Explorer 6) no longer appends <.com> to words typed into the URL, but acts more like a search engine, returning a list of web sites that might correspond to the desired keywords regardless of what domain name they are under.
- Search engines have improved greatly. Typing a few keywords into Google is more likely to direct users to where they want to go than guessing a domain name. Indeed, contention about how Google ranks its

³⁵ InterNIC, Network Wizards

search results have replaced domain name registration as the great preoccupation of the Internet economy.³⁶

- Reflecting the lowered value of domain names, millions of speculative and defensive registrations were not renewed in 2002, deflating the <.com> TLD by about ten million registrations, and other legacy gTLDs by a comparable percentage.
- The same decline in speculative and squatter registrations apparent in <.com> was seen in the country code domains that were converted into open TLDs and marketed as competitors to the gTLDs, such as <.cc>, <.tv>, and <.ws>.³⁷
- ICANN's Uniform Domain Name Dispute Resolution Policy process has provided trademark owners a way to recover abusive registrations, diminishing the incentives to profit from it. Moreover, the number of trademark – domain name conflicts taken to plummeted as the speculative boom in domain names has receded.³⁸

5.1.2 Realism in Trademark Protection

The new conditions have led to a more realistic attitude among many Internet-savvy trademark lawyers. Lucy Nichols, the chief trademark attorney for one of the world's most significant brand names, Nokia, observes that:

“There are over 3000 registrations that contain "Nokia" in the open gTLDs. Those registrations fall into one of four categories ...1) ones that we own; 2) inactive ones; 3) non-Nokia sites that can be considered "fair use" ...including critical sites; and 4) truly objectionable sites that involve misleading, fraudulent or dilutive commercial use of the Nokia brand. I concentrate my resources on number four. It's a waste of time and effort to focus resources on 2) and unfair with respect to 3). For registrations in category 2, I'd rather someone else pay for the registration fees and renewal fees and keep the names inactive and off the market. I don't believe that the dilution argument should be expanded to cover domain names that are not being used.”³⁹

At bottom, defensive registrations are fueled by the increasingly unrealistic fear that unless a company controls every manifestation of its name in the domain name space, it will lose customers or traffic. But it is not easy to attract large amounts of traffic

³⁶ “Google Battles ‘Optimizers,’” Wall St. Journal, Feb 26, 2003.

³⁷ “The large number of expiring registrations in .CC suggests a decrease in size of at least that ccTLD and perhaps open ccTLDs generally. One interpretation of this fact is that speculators, squatters, and warehousemen may be learning that the open ccTLD market is not as profitable as they had hoped or expected...” B. Edelman, “Registrations in Open ccTLDs.” <http://cyber.law.harvard.edu/people/edelman/open-cclds/>

³⁸ Mueller, “Success by Default” (2002), note 33 above

³⁹ Lucy Nichols, speaking at “Trademarks in Cyberspace,” INTA Conference, New York, October 23, 2002

to a web site. Under current conditions, mere registration of a domain name, no matter how appealing or generic the name, will no longer do it. Not when there are 22 million second-level names in .com alone, and 50 million domain names worldwide. Web sites must be advertised and promoted to attract attention. Today, the most serious problems associated with domain name use concern the re-registration of expired names by pornographers. Registering once-popular domain names can instantly deliver thousands of hits after making only a very small investment. The most important issues users face today have to do with protecting investments in names they are already using and have built up equity in – issues such as how domain names are renewed, deleted or transferred among registrars. Restricting the market for TLDs is a response to the problems of 1996, not the issues of 2003.

ICANN's policy toward TLD addition perpetuated artificial scarcity, and hence prolonged the problems associated with it. It chose to create only two new open, commercial TLDs (.info and .biz), thus creating a nice, fat target for speculators, cybersquatters and defensive registrations. Artificial scarcity necessitated "sunrise" procedures and other adjustments to the expected "land rush". Even so, the number of defensive registrations was much lower than expectations. Early fears were that a new TLD might attract as many as 1 or 2 million defensive registrations alone. In reality, neither TLD has managed to exceed 2 million registrations in total, and one study estimates the number of defensive registrations as about 20 percent of the total, or about 150,000.⁴⁰ At any rate, the environment created by this artificial limit on the number of new TLDs cannot be used to predict how the market or user behavior would respond to a regime of regularized open entry.

5.2 Are auctions the right assignment method?

Some criticism may focus upon auctions as an assignment method. We feel that auctions are the best way to determine who should get a commercial TLD when not all demands can be satisfied. The bids reflect the real opportunity cost of picking one applicant over another. For applicants, it is a more determinate procedure than a beauty contest. They know that their chances of success increase with every increase in the monetary value of their bid. At every round of the auction process, they can see what they need to do to get their TLD in the accepted pool. In a comparative selection process by the Board, on the other hand, applicants have no idea how much additional investment in preparation or lobbying will increase their chances of success. It is a more impartial and objective method of selection, eliminating board discretion.

We recognize various potential problems with auctions. The proposed addition of 30 commercial TLDs per year is a somewhat arbitrary number. If the real demand for TLDs far exceeded that number, auction prices could be bid up to high levels, imposing higher costs on applicants. However, our proposal that the winning bidders pay only the

⁴⁰ Ben Edelman, "Survey of Usage of the .biz TLD," June 2002.
<http://cyber.law.harvard.edu/tlds/001/>

amount of the *lowest successful bid* would do a lot to ensure that the auction prices paid would remain at reasonable levels.⁴¹

Our proposal also recognizes that market prices are not always the most appropriate way to allocate resources. Because developing countries and noncommercial applicants may have a worthy proposal but be unable to outbid commercial applicants, we have proposed a reservation (10 noncommercial TLDs) and a random selection procedure for assigning those TLDs. Of course, not all noncommercial applicants have few resources. Some may wish to enter the auction in order to achieve greater certainty in the acquisition of a TLD, and to increase their right to transfer or sell the delegation.

Some may note that in wireless telecommunications, auctions have produced what appear to be inflated prices for spectrum assignments, creating financial burdens on prospective service providers. This is not a valid criticism of our procedure for assigning domain names. The 3G auctions were a once-off deal, an auction in which all the spectrum available for 3G development was offered at once in an artificially limited number of licenses. Failure to participate in this auction meant that service companies were blocked from the 3G market forever. Many economists criticized the structure of these auctions as encouraging monopolization of the market and inflating prices for spectrum.⁴² In our procedure, the name space would be expanded continuously at a defined rate (40 new TLDs per year). This would reduce the scarcity value of bids in any given auction, and would be very unlikely to produce the kind of inflated, speculative prices associated with the 3G auctions.

Recall that ICANN's initial set of TLD applications required a US\$ 50,000 fee. That led to only 44 applications at the height of the domain name boom. It is quite possible that had our auction procedures been used back then applicants would have paid less than \$50,000 each.

Some may worry that this method of TLD addition would push the .com problem to the top level, as every company in the world tried to get its name in the top level. But a maximum of 30 commercial TLDs can be added to the root every year under the procedure we propose. At that pace, it would take 100 years to add only 3000 company names. Also, firms that are interested will have to pay cost-recovering fees and, if there is a mad rush of applicants, outbid all other applicants to be successful. Companies that

⁴¹ Bidders only have to pay the price set by the 30th-ranked bidder. For example, if the highest bidder in the auction bids \$100 million for a <.sex> TLD and the 30th-ranked bidder offers \$75,000 for a <.wine> TLD, all 30 successful applicants would pay \$75,000. However, if there were multiple bidders for .sex, an ascending bid auction would be held and the winner would have to pay the second-highest price, which could be substantial. In those cases, however, the high prices would be confined to the strings with the highest commercial value, and in those cases we think it appropriate that any winner pay the market price for it.

⁴² "The limitation of the number of national UMTS licenses to 4-6 has not been determined by spectrum scarcity, but rather by national policy decisions. Most countries could issue eight or ten licenses if they wished. And the World Radio Council (WRC) allocated even more spectrum in May 2000 for 3G assignment. This so called spectrum scarcity for 3G licenses is an artificial barrier to entry created national government policies." William Melody, "Assessing Highly Imperfect Mobile Markets," *Telecommunications Policy* 25,1 and 2 (March 2001). <http://www.tpeditor.com/editorials/2001/ed25-1+2.htm>

cannot generate substantial revenue or business value from the services derived from a TLD are not going to throw money away in an auction for a resource they don't need.

Finally, some may ask: "Who gets the money from the auctions?" Ideally, ICANN and the root server operators should split the proceeds according to a formula that reflects the relative cost burdens imposed on them by adding TLDs. We acknowledge that if TLDs prove to be unexpectedly popular and very high auction prices result, this could produce an embarrassment of riches. We welcome suggestions as to other forms of distribution of the proceeds. We also acknowledge that many non-US organizations will be less than thrilled about paying large sums to a U.S. government contractor, but this is an implied criticism of the institutional arrangement, not of the auction procedure.

5.3 Do we need a "taxonomy" of sponsored, restricted domains?

One proposal is that new TLDs should be permitted but all new TLDs would be part of a fixed, mutually exclusive set of categories defined by ICANN.⁴³ Under one variant of this proposal, all new TLDs would be sponsored and restricted, and registries will be forced to authenticate registrants "to ensure that they are registering names that are germane to their businesses and not infringing on another's intellectual property."⁴⁴ While this highly restrictive approach takes the taxonomy idea to its logical conclusion, in theory it is possible to advocate a taxonomic approach without linking it to restrictive and mutually exclusive domains. One could merely believe that ICANN should select the names and that the TLD names selected should strive to function as some kind of directory of the Internet.

Forcing all new TLDs to carefully authenticate a correspondence between the identity of a registrant and the TLD name would make all domain name registration a slow and manual process. Costs would quadruple over what users pay now. With the exception of a few very small TLDs that are noncommercial and subsidized (e.g., .edu, .mil and .museum) efforts to restrict access to domains have proven to be more difficult than expected. Both .biz and .name, for example, contain thousands of registrations that do not conform to the policy restrictions associated with the domain.

We do not oppose and may often favor the creation of new TLDs that are sponsored and restricted. But we also recognize that many users have no interest in or need for authenticated and restricted domains. That is why there are thousands of times more registrations in open domains than in restricted domains.

⁴³ "This taxonomised structure opens up a range of places where individuals, companies and organisations will find a place they want to be, and where users can easily find them. ... The ability to buy a name in a particular TLD will be restricted to those who can demonstrate they are bona fide members of the target group.

⁴⁴ BC position on new gTLDs December 2002 page 2.

As Mannheim and Solum (2003) have argued, a top-down approach to naming cannot be responsive to actual user demand and user needs.⁴⁵ It is impossible for ICANN or any central authority to predict what names or categories users will find useful and desirable. Tastes, conditions, and names of interest change over time. Names like <.blog> and <.enum>, utterly meaningless a few years ago, have entered our vocabulary and become important. Linguistic, economic, and political diversity militate against atop-down approach. A uniform categorization scheme will result in semantic conflicts; a category name in English might mean something completely different in German.

Advocates of a “taxonomic approach” believe that by grouping millions of domain names into defined categories, ICANN will make it easier for Internet users to “find things on the Internet.” This premise is incorrect. As discussed above, Internet users do not search the Internet by scanning lists of domain names. Even if a clean, intuitive “taxonomy” of TLDs could be defined, each TLD would have at minimum thousands of entries in it. The largest ones (like .com, .net, .org, .de and co.uk) would have tens of millions of entries. No one seeks content by scanning a list of registered domain names and trying to guess what services or content is stored at them. Users have a variety of far more sophisticated tools at their disposal, such as search engines, portals, and referrals.

The primary function of domain names is not to help up find things we are looking for. Domain names are not a directory and have only minimal usefulness as a search token. Domain names are just memorable identifiers. Their purpose is to assist us in easier communication of an identifier. They need to be memorable, not systematic. Most people's memory works through association rather than categorizing.

ICANN’s basic mission is simply to coordinate unique parameters to permit stable and consistent operation of the root zone. It should not attempt to tell the public what names they “ought” to adopt or what categories they “ought” to fit into.

5.4 Should names be separated from registries?

Another potential criticism of our proposal is that registries should have no control over the TLD names that they operate. Instead, ICANN will define all TLD names and assign operation of the names to “qualified” registry operators.

The fundamental difference between this proposal and ours is that name additions are not demand-driven and regular, but are imposed on the market in a top-down fashion. In that respect, the proposal is similar to the “taxonomic” idea discussed above. But separating the name from the registry has important implications for the market structure and market process of the domain name registration industry.

First, competitive entry would be discouraged by the inability of a registry operator to have any control over the name they supplied. It is noteworthy that *all* new entry into the domain name registry market since ICANN’s inception has come from specific registry operators interested in supporting specific names that they believe would attract specific user communities. The separation concept reveals a very basic lack of

⁴⁵ Karl Mannheim and Lawrence Solum, “The Case for gTLD Auctions: A Framework for Evaluating Domain Name Policy,” Loyola Law School (Los Angeles) Public Law and Legal Theory, Research Paper no. 2003-14, May 2003.

understanding as to how markets operate and how innovation and competition occur in a market economy. Consider the following questions:

- Who is going to finance and build a domain name registry when they have no idea what name, if any, they are going to operate?
- How can prospective registries construct a business plan and raise capital if they do not know whether they will be awarded something on the scale of <.com> (tens of millions of registrations) or something on the scale of <.museum> (with only two thousand registrations)?
- How can prospective registries develop effective marketing and branding concepts if they have no interest in the name per se and no prior ties to the communities served by the TLD?
- Why should a community of Internet users that invests time and money in getting a name established have no control over which operator provides them with registry service?
- Separating the name from the registry would harm technical innovation. Registries are databases. The structure and operation of a database are very sensitive to the type of data one is dealing with and the unique needs of the users of the data.

Separating the name and the registry does not make it easier or more efficient to protect the investment of registrants when a registry goes out of business. The only protection that users can have against a failing registry is that its DNS records are stored somewhere and can be transferred to a new operator willing and able to serve them. Under a normal, market-oriented regime failing registries would sell their customer base and associated records to a surviving registry. In a competitive market many operators will be happy to purchase additional customer base. In a regime where ICANN controls assignment of names to registries ICANN will, at best, ask available operators which registry wants to take over the names, and if multiple operators are interested it will hold an auction for that right. This is not much different than the effect of a market, except for the interposition of an intermediary. At worst, ICANN will simply order a registry to take over and serve the names regardless of whether it wants to or it feels it has the capacity to do so – a method unlikely to produce good service. At any rate *either* response to failure does *not* require strict separation of the name from the registry. ICANN could have the authority to order existing registries to take over the names of failing registries regardless of how names are initially proposed and assigned.

Finally, any TLD creation method that separates names from registries must determine *how* would names be initially assigned to registries. If names are assigned to registries based on *ad hoc* decisions of ICANN's Board or staff, then the assignment process is rife with opportunities for political haggling, discrimination, collusion and insider dealing (registries and registrars play a major role in selecting the Board). If names are assigned on the basis of competitive bidding, then the bids will reflect the value expected of specific names, and the results would be very close to our own proposal, which allows registries to propose their own names and bid for the right to operate them.

6.0 Conclusion

This paper has argued that ICANN can best serve Internet users, developing countries, non-governmental organizations and the domain name industry by rapidly but carefully implementing routine procedures for management of the Domain Name System. The most important conclusion of our research is that ICANN's TLD assignment procedures need to be *regularly scheduled* and *objective*. ICANN has needlessly mired itself in insider politicking and discriminatory decision making by failing to adopt objective, routine procedures for expanding the DNS name space.

We have demonstrated how ICANN's procedures for adding TLDs can be demand-driven, light handed, and focused on coordinating the technical parameters of DNS. Further, we have offered our thoughts on how users and suppliers interacting in a market can decide if specific Top Level Domains (TLDs) are valuable.

The positive benefits of adoption and implementation of the proposed reformed Internet governance processes will readily become apparent to ICANN staff, volunteer participants in its activities, firms and industries affected by ICANN's actions, as well as national governments and international organizations alike. Implementation will remove one of the major thorns in the side of all who deal with ICANN and by extension the U.S government policymakers still legally responsible for oversight of its functions.

By clearly delimiting ICANN's responsibilities as well as the responsibilities and rights of private actors as well as non-profit organizations in the governance process for allocation of top level domains, the Internet as a whole will benefit from regular and objective processes. We are confident that that will be most welcome, given the continued flux and uncertainty in so many other aspects of the Internet. Appropriate attention can be paid to those other issues, once the problem of top level domain allocation is resolved.

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