

ICANN Board-GAC Consultation: Root Zone Scaling

EXPLANATION OF ISSUE/HISTORY

Root zone growth to date (measured by numbers and rates of delegations) has been modest, driven by small increases in the number of delegated gTLDs and ccTLDs. Applications processed under the new gTLD programme is expected to result in a significantly higher growth rate. The GAC has repeatedly expressed concern that this growth be managed so as to safeguard the security and stability of the root server system.

The GAC is aware¹ of concern expressed in various venues by root server operators about the implications of unbounded growth of the root zone on the security and stability of the root server system. ICANN is aware that other parties have also expressed this concern. In order to address these concerns, ICANN has committed² to limit the number of TLDs that will be delegated to 1000 per year (and expects that number to be in the range of 215-240 delegations annually).

SSAC published a report³ on root scaling in August 2009. The study indicated that controlled delegation rates, rather than total number of delegations, were a key aspect in maintaining root zone stability.

Other pressures on the size of the root zone (measured by number of resource records) are the deployment of DNSSEC and the growth in the number of nameservers reachable over IPv6. The GAC is concerned⁴ about the combinatorial effect these other growth pressures will have.

ICANN published a report⁵ in September 2009 which provided a quantitative model of the root zone which was used to simulate scenarios relevant to root scaling.

¹ Letter from GAC Chair to ICANN Chair on 18 August 2009,
<http://www.icann.org/en/correspondence/karklins-to-dengate-thrush-18aug09-en.pdf>

² <http://www.icann.org/en/minutes/resolutions-25sep10-en.htm#2.3>,
<http://www.icann.org/en/minutes/resolutions-10dec10-en.htm#2>

³ "Scaling the Root – Report on the Impact on the DNS Root System of Increasing the Size and Volatility of the Root Zone", 31 August 2009,
<http://www.icann.org/en/committees/security/sac046.pdf>

⁴ Letter from GAC Chair to ICANN Chair on 10 March 2010,
<http://www.icann.org/en/correspondence/karklins-to-dengate-thrush-10mar10-en.pdf>

⁵ "Root Scaling Study: Description of the DNS Root Scaling Model", 1 October 2009,
<http://www.icann.org/en/committees/dns-root/root-scaling-model-description-29sep09-en.pdf>

TLDs with IDN-script labels were added to the root zone in May 2010⁶. No harmful effects of these labels have been observed by ICANN, or reported to ICANN.

DNSSEC was deployed in the root zone of the Internet in July 2010⁷. No harmful effects of the deployment have been observed by ICANN, or reported to ICANN.

The GAC advocates⁸ the deployment of a technical early-warning system to allow the overall security and stability of the root system to be monitored as new gTLDs are approved and deployed, together with measures which will allow new gTLD deployment to halt if the root server system begins to show signs of weakness.

In September 2010, the GAC wrote, “[w]ith regard to the technical impacts and in particular the ‘root scaling’ issues which continue to be a paramount concern for governments in the expectation that ICANN will continue to guarantee the security and stability of the root zone as its top priority, the GAC notes your expectation that ‘the rate of growth of the root zone would remain linear.’ The GAC would be grateful for sight of the analysis in support of this statement in your letter, together with a definition of how many TLDs which ICANN expects to be able to add within this parameter of linear growth of the root zone.”

ICANN published a study in October 2010 stating that delegation rates were process limited.⁹ The study indicated that expected delegation rates were 215-240 per year but in no case, would delegation rates exceed 1000 TLDs per year. The conclusions were based upon careful study of operational capacities, spans of control, and quality requirements.

ICANN published a study in October 2010 analysing the projected effects of recent and projected events on root zone stability.¹⁰ The study indicates that anticipated coincident introduction of IPv6, DNSSEC, IDN and new gTLD has not occurred, that IPv6, DNSSEC, and IDNs have been introduced without incident and the effects of new gTLD introduction can be weighed on their own. The paper indicates that, at projected delegation rates, that root zone stability will not be denegated by the delegation and operation of new gTLDs.

⁶ <http://www.icann.org/en/announcements/announcement-05may10-en.htm>

⁷ <http://www.root-dnssec.org/2010/07/16/status-update-2010-07-16/>

⁸ Letter from GAC Chair to ICANN Chair on 18 August 2009,
<http://www.icann.org/en/correspondence/karklins-to-dengate-thrush-18aug09-en.pdf>

⁹ <http://www.icann.org/en/topics/new-gtlds/delegation-rate-scenarios-new-gtlds-06oct10-en.pdf>

¹⁰ <http://www.icann.org/en/topics/new-gtlds/summary-of-impact-root-zone-scaling-06oct10-en.pdf>

The ICANN Board consulted root server operators in September 2010¹¹ and was informed that all root servers (and related DNS provisioning infrastructure) are capable of accommodating 1000 new gTLDs per year.

SSAC published a report¹² on root scaling in December 2010 that includes five recommendations for the process ICANN might follow in the future if it is considered necessary to increase the rate at which new gTLD delegations are accepted. SSAC declined to express an opinion about the stability implications of adding up to 1000 new gTLDs to the root zone per year, deferring to RSSAC.

The GAC is concerned¹³ that estimates of the rate of growth of the root zone (measured by number of delegations) might be low due to the desire by some new gTLD operators to request delegations in multiple scripts.

The GAC observes¹⁴ that no existing TLD has a controversial name, and that it is to be expected that some new gTLD labels will be controversial in at least some jurisdictions. The GAC believes it is possible that such controversy will be mediated by some form of blocking, and that such blocking would constitute harm to the security and stability of the root server system.

REMAINING AREAS OF DIFFERENCE:

The GAC position is highlighted in bold¹⁵, and discussion of the area of difference follows:

- **The GAC seeks confirmation from RSSAC that the application processing threshold of 1000 new gTLDs per year is reasonable and justifiable before the first round of applications is launched.**

RSSAC provided such confirmation in a letter from Jun Murai as RSSAC chair to the ICANN board on 25 November 2010. This letter is unfortunately not yet posted on the ICANN web page, but the relevant text is as follows: “In the case of the

¹¹ “Adopted Board Resolutions, Trondheim, Norway”, ICANN Board of Directors, 25 September 2010, <http://www.icann.org/en/minutes/resolutions-25sep10-en.htm#2.3>

¹² SAC 046, “Report of the Security and Stability Advisory Committee on Root Scaling”, 6 December 2010, <http://www.icann.org/en/committees/security/sac046.pdf>

¹³ Letter from GAC Chair to ICANN Chair on 23 September 2010, <http://www.icann.org/en/correspondence/dryden-to-dengate-thrush-23sep10-en.pdf>

¹⁴ Letter from GAC Chair to ICANN Chair on 4 August 2010, <http://www.icann.org/en/correspondence/gac-to-dengate-thrush-04aug10-en.pdf>

¹⁵ Note that earlier concerns such as the combined impact of deploying DNSSEC in the root zone whilst simultaneously launching the new gTLD programme have been overtaken by events.

proposed gradual expansion of no more than 1000 entries per year for the next several years, RSSAC expects the system to remain stable and robust.”

- **The GAC advocates the development of a measurement strategy, and the corresponding deployment of systems and processes to allow key metrics of the root server system to be collected and analysed systematically.**

ICANN has committed¹⁶ to develop a systematic measurement system for the root server system before the launch of the new gTLD programme, although no such measurement system is deployed today. However, even at the maximum anticipated delegation rate, the effects of these changes will be slow compared to our ability to monitor root zone behaviour and react to changes. ICANN will use relationships and expertise, described below, to ensure systems are in place to monitor and react to changes in root zone behaviour.

ICANN maintains close relations with operator communities through forums such as the IETF, RIPE, APRICOT, NZNOG, AusNOG, NANOG, RIPE, PACNOG, LACNOG, TRNOG, SANOG and DNS-OARC, both by active participation in organised conferences and using mailing lists. An example of the level of participation can be found in the outreach and solicitation of feedback carried out as part of the deployment of DNSSEC in the root zone¹⁷. Whilst ICANN expects to become rapidly aware of dramatic changes to the performance of the root server system through this ongoing dialogue, it does not necessarily expect signs of strain to result in direct feedback.

ICANN maintains close operational relationships with all root server operators, and participates in a regular and open dialogue on issues relating to the root system’s DNS infrastructure.

ICANN monitors the results of performance measurement platforms operated by other organisations¹⁸ closely for the purposes of effective technical operations, but does not summarise or analyse the results for trend analysis in any systematic way.

ICANN facilitated a symposium on measuring the health of the DNS in February 2010¹⁹.

¹⁶ <http://www.icann.org/en/minutes/resolutions-10dec10-en.htm#2>

¹⁷ <http://www.root-dnssec.org/presentations/>

¹⁸ e.g. “RIPE NCC DNS Monitoring Services”, <http://dnsmon.ripe.net/dns-servmon/>, “RIPE Atlas”, <http://labs.ripe.net/atlas>, “Team Cymru DNS Name Server Status Summary”, <http://www.cymru.com/monitoring/dnssumm/index.html>

¹⁹ “Measuring the health of the Domain Name System”, 3 February 2010, <http://www.icann.org/en/topics/ssr/dns-ssr-symposium-report-1-3feb10-en.pdf>

- **The GAC recommends that mechanisms be introduced to allow new gTLD application processing to be halted in the event that the root zone system shows signs of stress, and that the corresponding processes be documented in the Applicant Guidebook.**

ICANN agrees. As stated above, even at the maximum anticipated delegation rate, the effects of these changes will be slow compared to our ability to monitor root server system behaviour and react to changes. If the root server system behaviour, in the opinion of root server operators or other competent authorities, indicates that delegations should be halted, the process is sufficiently slow that they can be halted in a sufficiently timely manner that root zone stability is preserved.

- **The GAC recommends that the second round of applications should not be processed until an in-depth evaluation of the impact on root zone stability following the first round is complete, and that the evaluation should be opened for public comment.**

ICANN agrees that a report containing analysis of measurements of the root server system over the period coinciding with the first round of applications would be useful, and undertakes to publish such a report. ICANN notes that “in-depth” is somewhat subjective, but agrees that a comprehensive treatment of the results of measurement is appropriate.

ICANN agrees that the second round of applications should not open if the analysis suggests that further growth of the root zone is likely to cause harm.

- **The GAC is concerned that estimates of the rate of growth of the root zone (measured by number of delegations) might be non-linear or low due to the desire by some new gTLD operators to request delegations in multiple scripts.**

ICANN has committed to deploying no more than 1000 new gTLDs per year;²⁰ and that commitment is based on the number of delegations rather than the number of applicants. (The expected range of delegations is 215-240 annually.)

The potential for gTLDs of global interest to each result in multiple delegations hence provides little additional concern.

- **The GAC is concerned that ICANN’s operations may come under strain due to processing of applications, and requests more detail on ICANN’s plan to scale its operations to cope.**

ICANN commissioned a manpower study from KPMG to determine the resource requirements for processing new gTLD applications, and based the decision to process applications in batches of 500 with a ceiling of 1000 per year on a

²⁰ <http://www.icann.org/en/topics/new-gtlds/delegation-rate-scenarios-new-gtlds-06oct10-en.pdf>

resource requirement that was achievable. The application process has been modelled²¹ in some detail.

In addition, key departments within ICANN including IANA have been the subject of operational readiness studies to ensure that resources are available to meet maximum application load.

RELEVANT GUIDEBOOK SECTIONS AND OTHER PAPERS

Applicant Guidebook—Proposed Final Version

The Applicant Guidebook's audience consists of prospective TLD operators, and whilst consideration is given to ensuring the technical stability and security of TLD registry and DNS infrastructure, the Guidebook does not specify ICANN's strategy with respect to root zone scaling.

Important papers published are:

- [Summary of the Impact of Root Zone Scaling](#) (6 Oct 10)
- [Delegation Rate Scenarios for New gTLDs](#) (6 Oct 10)
- [Draft Delegation Rate Scenarios for New gTLDs](#)
- [Root Scaling Study Terms of Reference](#)
 - [Analysis of Root Zone Scaling Terms of Reference Comments](#) (Oct 09)
- ["L" Root Server Scaling Report Released](#) (Oct 09)
- [Release of Interisle and TNO reports on Root Scaling](#) (Oct 09)

²¹ <http://www.icann.org/en/topics/new-gtlds/delegation-rate-scenarios-new-gtlds-06oct10-en.pdf>

REFERENCE DOCUMENTS: ROOT ZONE SCALING

- **SUMMARY OF ACTIONS TAKEN RESPONDING TO GAC AND PUBLIC COMMENTS**

- **CHRONOLOGICAL LISTING OF GAC ADVICE AND COMMENTS ON NEW GTLDS AND RESPONSES PROVIDED BY ICANN AND KEY DOCUMENTS PUBLISHED ON THE TOPICS**

SUMMARY OF ACTIONS TAKEN RESPONDING TO GAC AND PUBLIC COMMENTS

Root Zone Scaling

- ICANN commissioned a study on the possible effects on root zone stability of the coincident implementation of IDNs, DNSSEC, IPv6, and New gTLDs.
- ICANN completed a study of L-Root server data to inform the root scaling model.
- ICANN completed study and analysis on delegation rates. This led to the conclusion that processing constraints will limit delegation rates to a steady state even in the event of extremely high application volume. Expected annual delegation rates are in the range of 215-240 and a maximum delegation rate of 1000 per year, regardless of application volume, were established. The Guidebook was updated to reflect this commitment and ensure that applicants are aware of the necessary limitations.
- ICANN initiated communications with root server operators regarding readiness for a maximum 1000 per year growth rate, and received unanimous positive responses that existing root servers could accommodate that growth rate.
- ICANN has also committed to establishing root server communications and monitoring systems to detect degradation in root server performance that would merit braking or tolling delegations.
- ICANN commissioned a follow-up report to analyze the impact on the root following implementation or deployment of IPv6, DNSSEC, and IDNs, and found that these changes had caused no significant harmful impact. Looking forward using the maximum scaling estimates, the report indicated that normal operational upgrade cycles and resource allocations will be sufficient to ensure that scaling of the root, both in terms of new technologies as well as new content, would have no significant impact on the stability of the root system.

THIS TABLE PROVIDES A CHRONOLOGICAL LISTING OF GAC ADVICE AND COMMENTS ON NEW GTLDS AND RESPONSES PROVIDED BY ICANN AND KEY DOCUMENTS PUBLISHED ON THE TOPICS

Root Zone Scaling

GAC Advice and Comments	ICANN responses and key documents
<p>27 March 2007: GAC Principles regarding New gTLDs</p> <p>2.6 It is important that the selection process for new gTLDs ensures the security, reliability, global interoperability and stability of the Domain Name System (DNS) and promotes competition, consumer choice, geographical and service-provider diversity.</p> <p>2.10 A new gTLD operator/registry should undertake to implement practices that ensure an appropriate level of security and stability both for the TLD itself and for the DNS as a whole, including the development of best practices to ensure the accuracy, integrity and validity of registry information.</p>	<p>ICANN mapping of GNSO Policy Recommendations</p> <p>2.6) is addressed by multiple GNSO Principles and Recommendations, as follows:</p> <p>GNSO Principle A: "New generic top-level domains (gTLDs) must be introduced in an orderly, timely and predictable way."</p> <p>GNSO Principle C: "The reasons for introducing new top-level domains include that there is demand from potential applicants for new top-level domains in both ASCII and IDN formats.</p> <p>In addition the introduction of new top-level domain application process has the potential to promote competition in the provision of registry services, to add to consumer choice, market differentiation and geographical and service-provider diversity."</p> <p>GNSO Principle D: "A set of technical criteria must be used for assessing a new gTLD registry applicant to minimise the risk of harming the operational stability, security and global interoperability of the Internet."</p> <p>GNSO Recommendation 4: " Strings must not cause any technical instability."</p> <p>GNSO Recommendation 7: "Applicants must be able to demonstrate their technical capability to run a registry operation for the purpose that the applicant sets out."</p> <p>In the current implementation planning phase, proposed sets of technical and operational capability criteria are being developed, to be explained fully to the applicants in the Request For Proposal (RFP).</p> <p>2.10) is addressed by GNSO Recommendation 7: " Applicants must be able to demonstrate their technical capability to run a registry operation for the purpose that the applicant sets out." and further in GNSO Recommendation 8: "Applicants must be able to demonstrate their financial and organisational operational capability." Undertakings for new gTLD registries will also be part of a base contract, required according to GNSO Recommendation 10: "There must be a base contract provided to applicants at the beginning of the application process." The comments provided under 2.6 are also relevant in this context.</p>

<p>10 March 2009: Comments on V1 of APPLICANT GUIDEBOOK The GAC's main concern is to ensure that the careful expansion of the DNS does not cause any threat to the stability and security of the Internet. This is a strategic issue for the future of the DNS and its contribution to the global information society.</p>	<p>24 October 2008: Applicant Guidebook Version 1 http://www.icann.org/en/topics/new-gtlds/draft-rfp-24oct08-en.pdf</p> <p>18 February 2009, version 1 Public Comments Analysis Report http://www.icann.org/en/topics/new-gtlds/agv1-analysis-public-comments-18feb09-en.pdf</p>
<p>24 June 2009: Communiqué Sydney</p> <p>The GAC discussed the Draft Applicant Guidebook version 2 and feels that it does not yet respond to all the concerns that governments have. The GAC notes that considerable work is underway seeking to address several critical yet outstanding issues but the GAC remains concerned about a number of important issues:</p> <ul style="list-style-type: none"> - Root scalability and stability; <p>----</p> <p>The GAC welcomes the detailed briefings from the SSAC and RSSAC on DNSSEC and the signing of the root, the Root Zone Scaling Study and SSAC advisory on the problems associated with the use of wildcards. The GAC is particularly mindful that the introduction of new gTLDs and IDN ccTLDs has to be seen in the wider context of other major changes being implemented in the Domain Name System, including, for example, the introduction of IPv6 and DNSSEC. For this reason, the GAC is concerned about the cumulative impact of such major changes on the stability and security of the DNS and the Internet in general, and looks forward to the conclusions of the report of the Root Scaling Study.</p>	
	<p>18 February 2009: Applicant Guidebook Version 2 http://www.icann.org/en/topics/new-gtlds/draft-rfp-clean-18feb09-en.pdf</p> <p>17 February 2009: Explanatory Memo—DNS Stability—Additional Technical Criteria, Including IDNs http://www.icann.org/en/topics/new-gtlds/update-dns-stability-18feb09-en.pdf</p> <p>31 May 2009, Summary and analysis of public comments on version 2 http://www.icann.org/en/topics/new-gtlds/agv2-analysis-public-comments-31may09-en.pdf</p>
<p>18 August 2009: Comments on V2 of Applicant Guidebook The GAC is aware that many root server operators have raised concerns about the</p>	<p>22 September 2009: Reply from ICANN Chairman http://www.icann.org/en/correspondence/dengate-thrush-to-karklins-22sep09-</p>

effect that a major expansion of the gTLD space would have on the stability of the Internet. The GAC considers that a controlled and prudent expansion of the DNS space is of primary importance for safeguarding the stability, security and interoperability of the Internet on which the global economy and social welfare relies so much.

The GAC notes that the SSAC and RSSAC have been asked to prepare a report on the scalability of the root zone and the impact of the potential simultaneous introduction of new gTLDs, DNSSEC, IPv6 glue, and IDNs into the root zone, which will be published in August. The GAC will look to this report to provide reassurance that the scaling up of the root will not impair the stability of the Internet and that the technical safeguards are sufficient. The GAC is hopeful the report will stress the importance of developing an alert or warning system, as well as the need for a process for halting the adoption of new top level domains should the root zone begin to show signs of breach or weakness. It should be noted that although the GAC is encouraged this study is underway there is some concern as to why the proper analysis did not occur earlier.

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In February 2009, with Resolution 2009-02-03-04, the ICANN Board requested the Root Server System Advisory Committee (RSSAC), the Security and Stability Advisory Committee (SSAC), and the ICANN staff, including the IANA team, to study the potential issues regarding the addition of IDNs, IPv6 addresses, DNSSEC and substantial numbers of new TLDs to the root zone. The Terms of Reference for this study are at:

<http://www.icann.org/en/committees/dns-root/root-scaling-study-tor-05may09-en.htm>.

We note the GAC's concern that the analysis of the scalability of the root zone should have been undertaken earlier, at the time the new gTLD PDP was being undertaken, and confirm that it was the opinion of the technical community that the DNS could scale to accommodate an unlimited number of TLDs, including IDNs. (See: www.icann.org/en/topics/dns-stability-draft-paper-06feb08.pdf.)

The more recent advent of DNSSEC and IPv6 glue and their potential simultaneous impact on the scalability of the DNS, in addition to new TLDs, has resulted in the current study being undertaken to ascertain, if these combined effects will have an adverse effect on the DNS.

Interisle was selected to perform this study. In the course of their study, they recommended that a modeling effort be undertaken with the assistance of TNO. TNO produced a model and a companion report. The Interisle report was posted for public along with a covering note from the joint RSSAC/SSAC/ICANN staff steering group for this study on 18 September 2009, <http://www.icann.org/en/announcements/announcement-2-18sep09-en.htm>. The TNO model and simulation system is undergoing verification and will be released soon along with the companion report. The Interisle report addresses the interactions between potential changes that would impact the root zone and the inherently adaptable nature of the root system as the fundamental aspect of considering the implications of these changes. The report also does stress the need for an early warning system as a means for understanding emerging risks to enable effective planning in response. The SSAC and RSSAC along with the study steering group will be evaluating the report against the Terms of Reference and preparing recommendations for the Board and the public related to establishment of an early warning system and approaches to addressing concerns raised in the report.

	<p>In addition and as part ICANN's ongoing efforts to ensure the stability of the DNS, ICANN staff contracted with the DNS Operations, Analysis and Research Center (https://www.dns-oarc.net/) as independent and well-respected experts to provide an analysis of the impact of adding IPv6, DNSSEC, and additional top-level domains to the ICANN-operated L root server.</p> <p>This study, while independent of the Root Server System Root Scaling Study and focused specifically on the impact to the ICANN-operated L root server, has been used as input in the more comprehensive study undertaken by the Root Scaling Study Group.</p> <p>The final report of the DNS-OARC study has now been published at http://www.icann.org/en/topics/ssr/root-zone-augmentation-analysis-17sep09-en.pdf.</p>
<p>28 October 2009: Communiqué Seoul The GAC welcomes the detailed briefings from the SSAC, RSSAC and VeriSign on DNSSEC and the signing of the root, the Root Zone Scaling Study and SSAC advisory on the problems associated with the use of wildcards.</p> <p>The GAC regrets that an assessment of the impact of changes to the root zone file was not made much earlier in the launching of initiatives such as new gTLDs, IDNs, IPv6 and DNSSEC. This has regrettably created a high degree of uncertainty. Moreover, many stakeholders have already made significant investments in respect to these initiatives. They have a legitimate right to expect a more predictable environment in which to make important investment and operational decisions which is not helped by the current uncertainty.</p>	
<p>10 March 2010: Communiqué Nairobi Following discussions in Seoul however, both between GAC members and with other stakeholders, the GAC feels that many of its concerns remain outstanding, related in particular to:</p> <ul style="list-style-type: none"> - the need to take full account of the security, stability and resiliency issues including those identified in the recent root scaling reports. These concerned the potential cumulative effects of changes resulting from the introduction and implementation of DNSSEC, IDNs, new gTLDs and IPv6; 	
	<p>4 October 2009: Applicant Guidebook Version 3 http://www.icann.org/en/topics/new-gtlds/draft-rfp-clean-04oct09-en.pdf</p>

	<p>15 February 2010, Summary and analysis comments version 3 http://www.icann.org/en/topics/new-gtlds/summary-analysis-agv3-15feb10-en.pdf</p>
<p>10 March 2010: Comments on V3 of Applicant Guidebook The root scaling implications arising from the scale and rate of change of any introduction of new gTLDs at the same time as other changes - notably deployment of DNSSEC in the root, the introduction of IDNs and IPv6 transition - and the rate of these changes, must have no negative impact on the resilience, security and stability of the DNS. Each round of applications should encompass an appropriate number of strings that will not raise any concern in that regard.</p> <p>More action must be taken to ensure that the introduction of new gTLDs does not lead to a concomitant increase in malicious conduct and abuse of the DNS. Improvements in ICANN's post-delegation monitoring and enforcement of the commitments made by delegated operator registries and registrars are warranted.</p>	<p>5 August 2010: Reply from ICANN Chairman http://www.icann.org/en/correspondence/dengate-thrush-to-dryden-05aug10-en.pdf</p> <p>ICANN supports the principle that the scale and rate of changes must not negatively impact the resilience, security and stability of the DNS. In February 2009, the ICANN Board requested the Root Server System Advisory Committee (RSSAC), the Security and Stability Advisory Committee (SSAC), and the ICANN staff (including ICANN Staff members dealing with technical issues and the IANA functions) to study the potential issues regarding the addition of IDNs, IPv6 addresses, DNSSEC and substantial numbers of new TLDs to the root zone. This study was completed in August 2009 and posted for comment at http://www.icann.org/en/committees/dns-root/root-scaling-study-report-31aug09-en.pdf. A complementary report (http://www.icann.org/en/committees/dns-root/root-scaling-model-description-29sep09-en.pdf) describes the characteristics of the quantitative model developed by TNO for dynamic analysis of root scaling issues.</p> <p>In addition, and as part of ongoing efforts to ensure the stability of the DNS, ICANN contracted with the DNS Operations, Analysis and Research Center (https://www.dns-oarc.net/) as independent and well-respected experts to provide an analysis of the impact of adding IPv6, DNSSEC, and additional top-level domains to the ICANN-operated L root server. This study, while independent of the Root Server System Root Scaling study and focused specifically on the impact to the ICANN-operated L root server, has been used as input in the more comprehensive study undertaken by the Root Scaling Study Group. The final report of the DNS-OARC study was published at http://www.icann.org/en/topics/ssr/root-zone-augmentation-analysis-17sep09-en.pdf.</p> <p>Regarding the number of strings in an application round, this was considered in the analysis and model for anticipated new gTLD delegation rates published by staff, and is available at http://www.icann.org/en/announcements/announcement-03mar10-en.htm. This analysis indicates that processing constraints will limit delegation rates to a steady state even in the event of extremely large numbers of applications, so that even in a scenario where there are very many applications for</p>

	<p>new gTLDs, the rate of growth of the root zone would remain linear.</p> <p>The SSAC and RSSAC are considering the data and analysis in each of these reports and are expected to prepare recommendations for the Board on concrete steps (such as any limitations or emergency removal procedures) to be implemented prior to the initial gTLD application round.</p>
<p>23 June 2010: Communiqué Brussels</p> <p>The GAC welcomes the update by ICANN staff regarding ICANN Strategic Initiatives for Security, Stability and Resiliency as well as the SSAC update on root scaling issues.</p> <p>The GAC welcomes information about the "Global DNS-CERT Business Case" and the initiative to launch a global strategy concerning the medium-long term planning about security of the DNS presented in the recently published documents "Proposed Initiatives for Improved DNS Security and Resiliency".</p> <p>Concerning the DNS CERT, the GAC recommends that ICANN informs the relevant GAC Representatives about its consultations with national and regional CERTs and is concerned about possible duplication of efforts.</p> <p>The GAC notes progress on the analysis of the factors that provoke the expansion of the root zone file.</p> <p>In the context of scaling the root, the increasing adoption of DNSSEC will be the major factor; an important milestone will be July 2010 with the anticipated signing of the root going live.</p> <p>In particular the GAC notes that, in the context of the root scaling issue, —anycastI related questions have been identified as an additional element to be considered.</p>	
	<p>28 May 2010: Applicant Guidebook Version 4 http://www.icann.org/en/topics/new-gtlds/draft-rfp-clean-28may10-en.pdf</p> <p>12 November 2010: Summary and analysis of comments version 4 http://www.icann.org/en/topics/new-gtlds/summary-analysis-agv4-12nov10-en.pdf</p>
<p>23 September 2010: Comments on V4 of Applicant Guidebook</p> <p>With regard to the technical impacts and in particular the “root scaling” issues which continue to be a paramount concern for governments in the expectation that ICANN will continue to guarantee the security and stability of the root zone as</p>	<p>23 November 2010: Reply from ICANN Chairman http://www.icann.org/en/correspondence/dengate-thrush-to-dryden-23nov10-en.pdf</p> <p>On 6 October 2010, staff published two root server scaling reports for public</p>

its top priority, the GAC notes your expectation that “the rate of growth of the root zone would remain linear”. The GAC would be grateful for sight of the analysis in support of this statement in your letter, together with a definition of how many TLDs which ICANN expects to be able to add within this parameter of linear growth of the root zone.

Given the unpredictability of the number of applications for new gTLDs, the GAC asks that consideration be given to creating a procedure, akin to a control or brake mechanism. This procedure should be used by ICANN to prevent the root from growing too rapidly and allow ICANN to mitigate any strain on the overall domain name system caused by the new gTLD programme at a time when it is expected that the rate of adding internationalized domain names (IDNs) to the root is expected to increase significantly.

There is clearly a need to avoid root change congestion at the operational level and the potential problems that might flow from resource demands on the root operators already faced with extra strings being to be added to the root to accommodate IDNs. It is quite conceivable for example that a major commercial gTLD such as a “dot.bank” would require labels in up to 20 scripts. The ability of the root operators to keep in step with the number of IDN labels and at what rate of addition will need careful assessment. The GAC considers that this would further justify a control procedure in the rate of gTLD delegations that would serve to keep all the actors in line including the root operators as well as ensuring that the system remains properly integrated.

This control mechanism would of course require carefully designed and clearly understood public policy criteria to be established in the applicant guidebook before implementation.

comment.

- The *Delegation Rate Scenarios for New gTLDs*
<http://www.icann.org/en/topics/new-gtlds/delegation-rate-scenarios-new-gtlds-06oct10-en.pdf>
- The *Summary of the Impact of Root Zone Scaling*
<http://www.icann.org/en/topics/new-gtlds/summary-of-impact-root-zone-scaling-06oct10-en.pdf>

In the analysis done in the “Delegation Rate Scenarios for New gTLDs”, ICANN staff estimates that the expected rate of new TLDs entering the root will be of the order of 200 to 300. The same paper indicates that regardless of the number of applications, there will be a process-imposed limit in the addition of new TLDs of less than a maximum of 1000 new gTLDs per year. In addition, advice from the root zone operators indicates that delegation rates of up to 1000 can be accommodated.

Based on this analysis, and taking into consideration the results of the studies into the effects of scaling the root summarized in “Summary of the Impact of Root Zone Scaling,” ICANN believes that projected growth of the root zone will be well within what the root server system and the DNS as a whole can accept. However, with that said, a recommendation documented in “Summary of the Impact of Root Zone Scaling” is the establishment of a monitoring system to ensure that changes relating to scaling of the root management systems don’t go unnoticed prior to those changes becoming an issue. ICANN staff is currently evaluating the monitoring system and alerting mechanisms necessary to meet this recommendation.

Avoidance of congestion at the operational level is a requirement for moving forward with the new gTLD program; however, as documented in “*Root Zone Augmentation and Impact Analysis*”, a reasonably configured root server can easily support several orders of magnitude more IDN and generic top-level domains than are projected to be added in the foreseeable future. As discussed in the “*Summary of the Impact of Root Zone Scaling*”, scaling effects are much more likely to be felt within the context of internal ICANN systems, such as application processing, legal review, IANA processes, etc. ICANN staff will be carefully monitoring these internal systems to ensure resources are applied appropriately to meet demand.

25 September 2010: Board meeting in Trondheim

<http://www.icann.org/en/minutes/resolutions-25sep10-en.htm>

Board Briefing Materials:

[One](#) [PDF, 3.23 MB]

[Two](#) [PDF, 2.03 MB]

[Three](#) [PDF, 816 KB]

[Four](#) [PDF, 240 KB]

[Five](#) [PDF, 546 KB]

“...Whereas, on 23 September 2010, the Governmental Advisory Committee (GAC) provided comments on version 4 of the draft Applicant Guidebook. Resolved (2010.09.25.__), staff is directed to determine if the directions indicated by the Board below are consistent with GAC comments, and recommend any appropriate further action in light of the GAC's comments.”

Root Zone Scaling

Real-world experience in root zone scaling has been gained as a result of the implementation of IPv6, DNSSEC and IDNs and the hard work of RSSAC and SSAC members in tackling the underlying stability question. Staff is directed to publish its analysis of the impact of IPv6, DNSSEC and IDN deployment on the root zone so far. Staff has also developed a model and a rationale for the maximum rate of applications that can be processed over the next few years. Staff is directed to publish this model and rationale and to seek Board support for the judgments embodied in this model, thereby providing a firm basis for limiting the rate of new delegations. Based on the discussions to date, this limit is expected to be in the range of 1,000 new delegations per year, with this number to be defined precisely in the publication.

The Board notes that an initial survey of root server operators' ability to support this rate of growth has been conducted successfully, and directs staff to revisit the estimate on a regular basis and consider whether a further survey should be repeated .

Further, ICANN will periodically consult with root zone operators regarding a procedure to define, monitor and publish data on root zone stability. As part of the regular interaction with the root server operators, ICANN will invite inputs from the root server operators and other interested parties regarding any signs of stress in the system and advice as to what actions or changes in process might be appropriate.

	<p>Finally, in the event that the number of applications exceeds the maximum rate, an objective method for determining the order of application processing that conforms to the limited delegation rate (not relying primarily on time-stamping) will be defined in the Applicant Guidebook.</p>
	<p>12 November 2010: Proposed Final Applicant Guidebook http://www.icann.org/en/topics/new-gtlds/draft-rfp-clean-12nov10-en.pdf</p>
<p>22 November 2010: Interim comments relating to new gTLDs Due to uncertainties regarding the effectiveness of ICANN’s review and objection procedures, a country may feel compelled to block a new gTLD at the national level that it considers either objectionable or that raises national sensitivities. To date, there do not appear to be controversial top level domains that have resulted in significant or sustained blocking by countries. The GAC believes it is imperative that the impact on the continued security, stability and universal resolvability of the domain name system of the potential blocking at the national level of new gTLD strings that are considered to be either objectionable or that raise national sensitivities be assessed prior to introducing new gTLDs. In this regard, the GAC is pleased to inform the Board that it intends to seek advice from the technical community on this important issue.</p>	
<p>9 December 2010: Communiqué Cartagena That the GAC will provide the Board at the earliest opportunity with a list or "scorecard" of the issues which the GAC feels are still outstanding and require additional discussion between the Board and the GAC. These include:</p> <ul style="list-style-type: none"> • Root Zone Scaling <p>----</p> <p>The GAC and members of the technical community held a constructive and informative exchange regarding universal resolvability of the DNS in the context of controversial gTLDs. The GAC appreciates and welcomes future exchanges on these important issues. The discussion covered the fact that blocking access to resources and information already could occur at many other different layers in the Internet architecture. Based on the exchange, the GAC understands that DNSSEC is not designed to accommodate blocking and that collateral damage and unintended results are likely to be caused if TLDs are not universally resolvable.</p>	<p>10 December 2010, Board meeting</p> <p>New gTLD Remaining Issues http://www.icann.org/en/minutes/resolutions-10dec10-en.htm#2</p> <p>Resolved (2010.12.10.21), the Board:</p> <ol style="list-style-type: none"> 1. Appreciates the GAC's acceptance of the Board's invitation for an inter-sessional meeting to address the GAC's outstanding concerns with the new gTLD process. The Board anticipates this meeting occurring in February 2011, and looks forward to planning for this meeting in consultation and cooperation with the GAC, and to hearing the GAC's specific views on each remaining issue. 2. Directs staff to make revisions to the guidebook as appropriate based on the comments received during the public comment period on the Proposed Final Applicant Guidebook and comments on the New gTLD Economic Study Phase II Report. 3. Invites the Recommendation 6 Community Working Group to provide final

	<p>written proposals on the issues identified above by 7 January 2011, and directs staff to provide briefing materials to enable the Board to make a decision in relation to the working group's recommendations.</p> <ol style="list-style-type: none">4. Notes the continuing work being done by the Joint Applicant Support Working Group, and reiterates the Board's 28 October 2010 resolutions of thanks and encouragement.5. Directs staff to synthesize the results of these consultations and comments, and to prepare revisions to the guidebook to enable the Board to make a decision on the launch of the new gTLD program as soon as possible.6. Commits to provide a thorough and reasoned explanation of ICANN decisions, the rationale thereof and the sources of data and information on which ICANN relied, including providing a rationale regarding the Board's decisions in relation to economic analysis.7. Thanks the ICANN community for the tremendous patience, dedication, and commitment to resolving these difficult and complex issues.
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