Board Resolution 2017.06.24.19
Implementation Recommendations for SSAC Advice Documents SAC062, SAC063, SAC064, SAC065, SAC070, and SAC073 (08 June 2017)

Advice Item	Description	ICANN Organization Statement of Understanding	ICANN Organization Implementation Recommendation	Background on Issue	Proposed Solution
SAC062: SSAC Advisory Concerning the Mitigation of Name Collision Risk (Recommendation 1) 7 Nov 2013	ICANN should work with the wider Internet community, including at least the IAB and the IETF, to identify (1) what strings are appropriate to reserve for private namespace use and (2) what type of private namespace use is appropriate (i.e., at the TLD level only or at any additional lower level).	*SAC062 Recommendation 1 did not go through this phase of the Board Advice pilot process.*	Implementation is recommended and in progress.	Problem: Domain name strings with documented evidence of broad and significant private usage should be considered for permanent reservation for internal use to reduce security and stability issues, as well as to provide a stable namespace for parties using other strings to migrate to if they do not use fully-qualified domain names (FQDNs). Board Resolution (21 Nov 2013): The ICANN Board passed a resolution that "directs ICANN's President and CEO to have the advice provided in SAC062 evaluated" (see https://www.icann.org/resources/board-material/resolutions-2013-11-21-en#2.d).	The Office of the CTO Research group will continue its work (already in progress), including providing data and analysis to the community, the IAB, and the IETF DNSOP (DNS Operations) Working Group, to inform discussions relating to the process of reserving "special use" names. These special-use domain names correspond to the "strings [. . .] appropriate to reserve for private namespace use" in the recommendation from SAC062 that is the focus of this document.

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SAC063: SSAC Advisory on DNSSEC Key Rollover in the Root Zone (Recommendation 2) 7 Nov 2013	ICANN staff should lead, coordinate, or otherwise encourage the creation of a collaborative, representative testbed for the purpose of analyzing behaviors of various validating resolver implementations, their versions, and their network environments (e.g., middle boxes) that may affect or be affected by a root KSK rollover, such that potential problem areas can be identified, communicated, and addressed.	This recommendation is understood to mean ICANN organization should arrange for a resolver testbed to be created that will allow for the analysis of validating resolvers in a variety of network environments and that the testbed should be open for collaborative use. The ICANN organization further understands the goal of this particular testbed is to identify potential problem areas associated with validating resolvers handling the keyroll such that those problems can be communicated to those responsible for addressing those problems.	Implementation is recommended and in progress.	Problem: DNSSEC validators will be affected by the root KSK rollover project. ICANN should understand how specific validators behave so that any anomalous behavior can be reported to the software's authors. Understanding validator behavior will also allow root server traffic to be analyzed for signs of distress immediately after the actual rollover event. Board Resolution (21 Nov 2013): "In the instances where ICANN recommends that the advice be accepted, the Board directs ICANN's President and CEO to have the feasibility and costs of implementing the advice evaluated, and to provide an implementation plan with timelines and high-level milestones for review by the Board, no later than 120 days from the adoption of this resolution" (see https://www.icann.org/resources/board-material/resolutions-2013-11-21-en#2.e).	The Office of the CTO (OCTO) Research group will continue its work, already in progress as part of the root KSK rollover project implementation, to set up a resolver testbed to study the behavior of DNSSEC validator behavior under various operational conditions. In order to make the testbed open for collaborative use, additional resources will be necessary and the testbed would need to be migrated from the OCTO lab to the Information Technology (IT) department for production use. IT, working with OCTO, will need to provide cost estimates.

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SAC063: SSAC Advisory on DNSSEC Key Rollover in the Root Zone (Recommendation 5) 7 Nov 2013	ICANN staff should lead, coordinate, or otherwise encourage the collection of as much information as possible about the impact of a KSK rollover to provide input to planning for future rollovers.	The ICANN organization understands recommendation 5 of SAC063 to indicate staff should collect as much information as possible about the impact of the KSK rollover so that data can be analyzed by DNS experts and made available to the community to facilitate planning for future rollovers. This recommendation is understood to mean that data about the events surrounding the roll of the trust anchor must be collected and should be archived to facilitate planning for future rollovers.	Implementation is recommended and in progress.	Problem: The root zone KSK has never been rolled (changed) before, so it will be a major undertaking with significant opportunity for disruption. SSAC wants ICANN organization and the larger community to learn as much as possible from the undertaking to improve the process when the KSK is rolled again in the future. Board Resolution (21 Nov 2013): "In the instances where ICANN recommends that the advice be accepted, the Board directs ICANN's President and CEO to have the feasibility and costs of implementing the advice evaluated, and to provide an implementation plan with timelines and high-level milestones for review by the Board, no later than 120 days from the adoption of this resolution" (see https://www.icann.org/resources/board-material/resolutions-2013-11-21-en#2.e).	The Office of the CTO (OCTO) Research group and IANA staff have planned and are now implementing the project to roll the root zone's KSK. The project plan already includes steps to monitor the effects of the rollover. The OCTO Research group is already collecting traffic to multiple root name servers and will continue to do so through the duration of the project. OCTO Research is also gathering and analyzing other relevant data, such as RSSAC002 statistics reported by most root operators. Portions of data collected will be made available. The OCTO Research and Public Technical Identifier (PTI) staff anticipate writing a report at the conclusion of the project documenting experiences, including observations regarding the impact of the rollover, to aid in planning future rollovers.

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SAC064: SSAC Advisory on DNS "Search List" Processing (Recommendation 2) 13 Feb 2014	The SSAC recommends ICANN staff to work with the DNS community and the IETF to encourage the standardization of search list processing behavior. Such an effort should begin with ICANN staff submitting an Internet-Draft to the IETF, and advocating for its standardization within the IETF process. The effort should update RFC 1535 and other applicable RFCs to address the Findings and Recommendations in this document.	Our understanding of SAC064 R-2 is that the SSAC recommends that ICANN organization work with the DNS community and the IETF to encourage the standardization of search list processing behavior, beginning with the submission of an Internet-Draft to the IETF and advocating for its standardization within the IETF process. Updates to RFC 1535 and other RFCs related to this topic should be included within the Internet-Draft.	While it is certainly possible to write an Internet-Draft encouraging the standardization of search list processing, it is not clear that the existence of such a document would necessarily make a significant impact on client behavior any time soon, if ever. Resources in Office of the CTO (OCTO) Research to undertake IETF work such as writing Internet-Drafts are limited. It is recommended that the OCTO Research team be given the discretion to discuss the feasibility and impact of the suggested document, and prioritize writing it against the other work on its research agenda.	Problem: DNS clients, called stub resolvers, typically implement a "search list", which is a list of domains that are appended to a user's input of a partial domain name to form a fully qualified domain name. Improper search list behavior can cause excessive queries for non-existent names. When these non-existent names are in non-existent TLDs, the queries end up at the root servers. Queries for these non-existent TLDs could eventually conflict or "collide" with a potential new gTLD. SSAC reasons that by improving search list behavior, the number of queries for non-existent TLDs can be reduced, and thus the potential for name collisions also reduced. 17 Nov 2014 Board Resolution (17 Nov 2014): "In the instances where ICANN recommends that the advice be accepted, the Board directs ICANN's President and CEO to have the feasibility and costs of implementing the advice evaluated, and to provide an implementation plan with timelines and high-level milestones for review by the Board, no later than 120 days from the adoption of this resolution" (see https://www.icann.org/resources/board-material/resolutions-2014-11-17-en#1.c).	The ICANN organization will work with the DNS community and the IETF to develop an Internet Draft that encourages standardization of searchless process behavior. Costs for this solution would include significant interaction with the IETF and DNS community as well as additional staff resources to pursue this standardization.

| SAC064: SSAC Advisory on DNS "Search List" Processing (Recommendation 3)

13 Feb 2014	In the context of mitigating name collisions, ICANN should consider the following steps to address search list processing behavior. a. Commission additional research studies to further understand the cause of invalid queries to the root zone and the significance of search list processing as a contributor to those queries. b. Communicate to system administrators that search list behaviors currently implemented in some operating systems will cause collision with names provisioned under the newly delegated top-level domains. Such communication should complement the current ICANN effort in this area with findings and recommendations from this report.	Our understanding of SAC064 R-3 is that the SSAC recommends that in the context of mitigating name collisions, ICANN should consider the following steps to address search list processing behavior: a. ICANN should consider whether to commission additional studies to further understand the cause of invalid queries to the root zone and the significance of search list processing as a contributor to those queries. b. ICANN should communicate to system administrators that search list behaviors currently implemented in some operating systems will cause collision with names delegated as new gTLDs from the 2012 application round for the New gTLD Program.	Implementation is recommended.	Problem: DNS clients, called stub resolvers, typically implement a "search list", which is a list of domains that are appended to a user's input of a partial domain name to form a fully qualified domain name. Improper search list behavior can cause excessive queries for non-existent names. When these non-existent names are in non-existent TLDs, the queries end up at the root servers. Queries for these non-existent TLDs could eventually conflict or "collide" with a potential new gTLD. SSAC suggests a study to determine the causes of queries for non-existent domains to the root zone and, specifically, to understand the extent to which search list processing contributes to those queries. We do know that some existing search list behavior contributes to name collisions, and SSAC suggests that ICANN publicize this behavior and its impact of new gTLDs from the 2012 application round to system administrators. Board Resolution (17 Nov 2014): "In the instances where ICANN recommends that the advice be accepted, the Board directs ICANN's President and CEO to have the feasibility and costs of implementing the advice evaluated, and to provide an implementation plan with timelines and high-level milestones for review by the Board, no later than 120 days from the adoption of this resolution" (see	There are two parts to the advice and a separate recommendation is provided for addressing each: a) The issue of analyzing the causes of queries for non-existent TLDs to the root has been referred to the Office of the CTO (OCTO) Research team for further study and to determine the appropriate next steps with the suggested study. b) ICANN undertook a communications effort to publicize searchless behaviors currently implemented in some operating systems that could cause collision with names delegated as new gTLDs from the 2012 application round for the New gTLD Program. No further action with regard to this portion of the advice is warranted. The Communications department and OCTO would need to work together to develop a plan. Costs associated with the technical portion of this plan would need to be developed by OCTO. Additional resources may be needed to facilitate this project.

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				https://www.icann.org/resources/board-material/resolutions-2014-11-17-en#1.c).	

| SAC065: SSAC Advisory on DDoS Attacks Leveraging DNS Infrastructure (Recommendation 1)

18 Feb 2014 | ICANN should help facilitate an Internet-wide community effort to reduce the number of open resolvers and networks that allow network spoofing.

This effort should involve measurement efforts and outreach and cooperation in relevant technical fora involving network operators worldwide, but will not have an operational component. ICANN should support this effort with adequate staffing and funding. Such a program should cover at least the following topics:

a. Collect, create, and organize material that will assist in the implementation of recommendations 2-5 below. This would include:
  i. On an annual basis, publish and widely disseminate a report on the number and extent of open recursive DNS servers.
  ii. On an annual basis, publish and widely disseminate a report on the extent of networks that allow network spoofing.
  iii. Create and maintain an information portal with links to educational material, to be complemented by ICANN staff and community | Our understanding of SAC065 R-1 is that ICANN should help to facilitate an Internet-wide community effort to reduce the number of open resolvers and networks that allow network spoofing. This initiative, which should involve measurement efforts and outreach, should be supported by ICANN with appropriate staffing and funding to promote the recommendations made in SAC065 Recommendations 2-5. | Implementation is recommended. | Problem: DDoS attacks using DNS infrastructure can use open resolvers and spoofed source addresses. These attacks would be harder to implement if the number of open resolvers was reduced and if more ISPs implemented BCP38 (which would prevent customers of those ISPs to launch attacks using spoofed source addresses). This resolution encourages ICANN to help reduce the number of open resolvers and increase the number of ISPs implementing BCP38.

Board Resolution (17 Nov 2014): "In the instances where ICANN recommends that the advice be accepted, the Board directs ICANN's President and CEO to have the feasibility and costs of implementing the advice evaluated, and to provide an implementation plan with timelines and high-level milestones for review by the Board, no later than 120 days from the adoption of this resolution" (see https://www.icann.org/resources/board-material/resolutions-2014-11-17-en#1.c). | Upon the creation of an Internet-wide community effort, ICANN anticipates providing measurement and outreach support and allocating appropriate staffing and funding. |

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	subject-matter expert contributions. iv. Inform how certain products (e.g., CPE devices) can play a significant role in DNS amplification attacks. v. Publish a regular (at least annual) advisory/report on the state-of-the art-mechanisms to identify or otherwise prevent amplification and reflection attacks, and ensure that such an advisory/report is widely disseminated in the Internet community. vi. Provide an annual report on the work accomplished. b. Coordinate with the Internet community to popularize and support recommendations 2-5 below. This coordination should include exploration of whether operational requirements regarding open resolvers and the prevention of network spoofing can be incorporated into regulatory compliance frameworks and certification regimes.				

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SAC070: Advisory on the Use of Static TLD / Suffix Lists (Recommendation 3) 28 May 2015	To close the knowledge gap between registries and popular PSL maintainers, ICANN and the Mozilla Foundation should collaboratively create informational material that can be given to TLD registry operators about the Mozilla PSL.	This recommendation is understood to mean that ICANN, in concert with the Mozilla Foundation, prepare educational materials on the Mozilla PSL covering the meaning of the resource and the impact of the resource.	Further Community consultation is needed before the ICANN organization can make a recommendation on implementation.	Problem: In an effort to identify DNS names that are in public namespace but have been delegated by the registry to be administered by a different entity, such as gov.uk, co.za, etc. Being able to accurately track the boundary of these spaces could be important for security, privacy and usability. A Public Suffix List (PSL) is a file that lists all (or some) of the known public suffixes. Board Resolution (25 June 2015): "In instances where it is recommended that the SSAC advice be accepted, the Board directs the President and CEO, or his designee(s), to evaluate the feasibility and cost of implementing the advice, and provide an implementation plan with timelines and high-level milestones for review by the Board, no later than 120 days from the adoption of this resolution […] The Board encourages registries, registrars, the Universal Acceptance Initiative, and other entities such as the IETF, to consider the recommendations in SAC070 and work collaboratively to improve the situation with the growing use of Public Suffix Lists" (see https://www.icann.org/resources/board-material/resolutions-2015-06-25-en#1.c).	The Office of the CTO will consult with the Mozilla Foundation and the larger ICANN community as to the desirability of educational materials on the Mozilla PSL. If desirable, then the Office of the CTO would have to consider prioritization into its project load, cost, and other factors.

SAC070: Advisory on the Use of Static TLD / Suffix Lists (Recommendation 4a) 28 May 2015	The Internet community should standardize the current approach to PSLs. Specifically: Recommendation 4a: ICANN, as part of its initiatives on universal acceptance, should encourage the software development community (including the open source community) to develop and distribute programming and operating system libraries implementing robust (i.e. authenticated, timely, secure, accountable) distribution mechanisms for PSLs. These libraries should be written across all common platforms and operating systems in a way as to ensure consistent and standard interpretation of a given PSL across all platforms.	The ICANN organization understands SAC070 R-4a to mean that ICANN should request that the UASG encourage the development of software resources enabling or enhancing the effective use of the Mozilla PSL, with attention towards software developers. As part of this initiative, ICANN should provide funding for this initiative and monitor whether the UASG's effort is successful. ICANN notes that more specific description of this audience (beyond merely including open source) would further the ability to evaluate the effectiveness of the promotion effort.	Implementation is addressed in UASG007, which recommends that TLDs are validated, where necessary, from authoritative tables.	Problem: Software that processes domain names, such web browsers, sometimes needs to know whether a domain name ends in a "public suffix", i.e., a domain typically open for registration, such as .com or .co.uk. "Public suffix lists" (PSLs), most notably the one maintained by Mozilla, attempt to list all such public suffix domains. Software uses this list for various purposes, such as quickly validating a TLD without requiring a DNS query, highlighting the public portion of a domain name in a browser's address bar, or determining if one domain is able to set a cookie for another (which is not allowed if the domains are unrelated, which is the case if they are peers under the same public suffix). There is no standard mechanism for software developers to process the Mozilla PSL, which SSAC asserts makes it less likely that the Mozilla PSL be used correctly and effectively. Board Resolution (25 June 2015): "In instances where it is recommended that the SSAC advice be accepted, the Board directs the President and CEO, or his designee(s), to evaluate the feasibility and cost of implementing the advice, and provide an implementation plan with timelines and high-level milestones for review by the Board, no later than 120 days from the adoption of this resolution [...] The Board encourages registries, registrars, the	The Universal Acceptance Steering Group, in their comprehensive Introduction to Universal Acceptance (UASG007), already recommends that TLDs are validated, where necessary, from authoritative tables including http://www.internic.net/domain/root.zone and http://data.iana.org/TLD/tlds-alpha-by-domain.txt. In this same section of the document the UASG also references SAC070. The UASG does not recommend the use of the Mozilla PSL because the UASG does not have confidence that the Mozilla PSL is authoritative. Should it become authoritative the UASG will consider including the Mozilla PSL as a source for validation.

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				Universal Acceptance Initiative, and other entities such as the IETF, to consider the recommendations in SAC070 and work collaboratively to improve the situation with the growing use of Public Suffix Lists." https://www.icann.org/resources/board-material/resolutions-2015-06-25-en#1.c	

SAC070: Advisory on the Use of Static TLD / Suffix Lists (Recommendation 5) 28 May 2015	IANA should host a PSL containing information about the domains within the registries with which IANA has direct communication. Such a PSL would be authoritative for those domains. Such a list should include, at a minimum, all TLDs in the IANA root zone.	The ICANN organization understands recommendation 5 of SAC070 as directing IANA staff to host an authoritative PSL containing information about the domains within the registries with which IANA has direct communication. This list should at least include all TLDs in the root zone. This recommendation appears to suggest an action for IANA that is usually the result of direction from the IETF, that is, something like a protocol registry established for a specific purpose. This also seems to recommend the transfer of responsibility of the Mozilla-run PSL to IANA, which seems like an action that is best requested through Mozilla as the current responsible party. If Mozilla wanted to transition the PSL maintenance, operating such a registry would represent a new role for IANA.	Further Community consultation is needed before the ICANN organization can make a recommendation on implementation.	Problem: Software that processes domain names, such web browsers, sometimes needs to know whether a domain name ends in a "public suffix", i.e., a domain typically open for registration, such as .com or .co.uk. "Public suffix lists" (PSLs), most notably the one maintained by Mozilla, attempt to list all such public suffix domains. Software uses this list for various purposes, such as quickly validating a TLD without requiring a DNS query, highlighting the public portion of a domain name in a browser's address bar, or determining if one domain is able to set a cookie for another (which is not allowed if the domains are unrelated, which is the case if they are peers under the same public suffix). ICANN is in a position to create a public suffix list that could represent an authoritative list of TLDs and potentially subdomains of those TLDs that are known to be public suffixes. Board Resolution (25 June 2015): "In instances where it is recommended that the SSAC advice be accepted, the Board directs the President and CEO, or his designee(s), to evaluate the feasibility and cost of implementing the advice, and provide an implementation plan with timelines and high-level milestones for review by the Board, no later than 120 days from the adoption of this resolution […] The Board encourages registries, registrars, the	Community consultation should observe that the Mozilla PSL is already the most widely used PSL and it's not clear that there is benefit in creating a separate PSL maintained by ICANN focused on TLDs. However, ICANN could still potentially assist in maintaining the Mozilla PSL, since it is fundamentally a registry, which is an area of expertise for ICANN. ICANN will ask the web browser development community if ICANN should assist Mozilla with or assume responsibility for maintaining the Mozilla PSL. ICANN should abide by the consensus of this community if no assistance is desired.

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				Universal Acceptance Initiative, and other entities such as the IETF, to consider the recommendations in SAC070 and work collaboratively to improve the situation with the growing use of Public Suffix Lists" (see https://www.icann.org/resources/board-material/resolutions-2015-06-25-en#1.c).	

| SAC070: Advisory on the Use of Static TLD / Suffix Lists (Recommendation 6)

28 May 2015 | | The ICANN organization understands recommendation 6 of SAC070 as encouraging those parties working on universal acceptance such as the UASG to explicitly include the use of a PSL and actions related to a PSL as part of their work. | Implementation is addressed in UASG007, which recommends that TLDs are validated, where necessary, from authoritative tables. | Problem: Software that processes domain names sometimes needs to know whether a domain name ends in a "public suffix", i.e., a domain typically open for registration, such as .com or .co.uk. "Public suffix lists" (PSLs), most notably the one maintained by Mozilla, attempt to list all such public suffix domains. To encourage the correct and effective use of PSLs, the SSAC has requested that ICANN encourage parties working on universal acceptance to explicitly include the use of a PSL as part of their work.

Board Resolution (25 June 2015): "In instances where it is recommended that the SSAC advice be accepted, the Board directs the President and CEO, or his designee(s), to evaluate the feasibility and cost of implementing the advice, and provide an implementation plan with timelines and high-level milestones for review by the Board, no later than 120 days from the adoption of this resolution [...] The Board encourages registries, registrars, the Universal Acceptance Initiative, and other entities such as the IETF, to consider the recommendations in SAC070 and work collaboratively to improve the situation with the growing use of Public Suffix Lists" (see https://www.icann.org/resources/board-material/resolutions-2015-06-25-en#1.c). | The UASG, in their comprehensive Introduction to Universal Acceptance (UASG007), already recommends that TLDs are validated, where necessary, from authoritative tables including http://www.internic.net/domain/root.zone and http://data.iana.org/TLD/tlds-alpha-by-domain.txt. In this same section of the document the UASG also references SAC070.

The UASG does not recommend the use of the Mozilla PSL because the UASG does not have confidence that the Mozilla PSL is authoritative. Should it become authoritative the UASG will consider including the Mozilla PSL as a source for validation. |

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SAC073: SSAC Comments on Root Zone Key Signing Key Rollover Plan 5 Oct 2015	In this Advisory the Security and Stability Advisory Committee (SSAC) addresses the following topics: • Terminology and definitions relating to DNSSEC key rollover in the root zone; • Key management in the root zone; • Motivations for root zone KSK rollover; • Risks associated with root zone KSK rollover; • Available mechanisms for root zone KSK rollover; • Quantifying the risk of failed trust anchor update; and • DNS response size considerations.	SAC073 duplicates the advice sent by the SSAC in SAC063. There is one distinct recommendation in SAC073, which is as follows: To help the broader community to have a higher level of confidence in the anticipated success of this planned activity, and for ICANN Board to discharge its responsibilities with respect to recommendations from the SSAC, the SSAC would like to see the final report respond directly to each of the recommendations in SAC 063, and note in each case how the recommendation has been appropriately addressed in the proposed design, or in those cases where the recommendation is not specifically addressed, the rationale for this design decision.	Implementation of proposed solution(s) is recommended.	Problem: SSAC would like a report indicating how its advice in SAC063 regarding the root KSK rollover project has been followed or, if not, why not.	Office of the CTO Research and Public Technical Identifiers (PTI) are jointly responsible for planning and executing the root KSK rollover project and a report as requested in SAC73. They have been tasked with writing the report requests in SAC073 that describes how the recommendations in SAC063 related to this project were addressed.