WHOIS Accuracy Reporting System (ARS)

Phase 2 Cycle 4 Report: Syntax and Operability Accuracy
Global Domains Division | 12 June 2017

Contents

Introduction and Summary

Subject of This Report

The WHOIS Accuracy Reporting System (ARS) is a system designed to meet recommendations from the 2012 WHOIS Review Team convened under the Affirmation of Commitments (AOC).[1] Based on these recommendations, on 8 November 2012, the ICANN Board approved a series of improvements to the manner in which ICANN carries out its oversight of the WHOIS Program. The WHOIS ARS was created as part of these improvements and to address Governmental Advisory Committee (GAC) concerns on WHOIS accuracy.

The WHOIS ARS has been designed in phases to enable the ICANN community to influence its development. A pilot phase was completed in April 2015, and Phase 1 was completed in August 2015. Phase 2 is ongoing with a new report published every 6 months. Where Phase 1 examined only syntax accuracy, Phase 2 reports examine both the syntax and operability accuracy of WHOIS records. This report details the leading types of nonconformance, trends and comparisons of WHOIS accuracy across regions, Registrar Accreditation Agreement (RAA) versions and generic top-level domain (gTLD) types. The results of each report are provided to ICANN Contractual Compliance for review and investigation and, as needed, follow-up with registrars regarding potentially inaccurate records. More information about Compliance follow-up efforts are available at https://whois.icann.org/en/whoisars-contractual-compliance-metrics.

Full details on the WHOIS ARS background, as well as results, can be found in previous ARS reports at https://whois.icann.org/whoisars-reporting.

How to Read This Report

The report provides an estimate of the overall accuracy of WHOIS records based on a sample selection. The charts and tables included in this report provide statistics on the following: overall domain accuracy (i.e., accuracy of the entire population of domains); accuracy rates by gTLD Type (i.e., accuracy of New vs. Prior gTLD domains); accuracy rates by RAA Type (i.e., accuracy of domains obligated to the 2009 vs. 2013 RAA); and, accuracy rates by geographic region (i.e., how does accuracy differ from North America to Asia to Europe, etc.). While this introduction contains the top level findings regarding overall syntax and operability accuracy, the Main Findings section also contains a summary of additional findings. For those more interested in regional differences in accuracy, see the section Regional Findings. Finally, to see how accuracy has changed across reports, see the section on Comparisons between Cycles.

Study Design

A subsample of 12,000 records was taken from an initial sample of 200,000 WHOIS records. The 12,000[2] records were then evaluated using criteria based on requirements from the 2009 RAA, which acts as a

---

[1] *See* https://www.icann.org/resources/pages/aoc-2012-02-25-en.
[2] Of the initial subsample of 12,000, 498 records were discarded from further evaluation. Therefore, a sample of 11,502 records was used for this cycle. Please see the Sample Design section for details.

baseline to assess the overall accuracy of WHOIS records in gTLDs. As noted above, Phase 2 reports focus on rates of syntax and operability accuracy by contact mode (email address, telephone number and postal address) to the requirements of RAAs (2009 RAA or 2013 RAA). The results from the analyzed subsample testing are then used to estimate the results for the entire gTLD population or the particular subgroup of interest. These data are presented in this report at a 95 percent confidence interval[3] with an estimated percentage plus or minus approximately two standard errors. Based on sampling error, there is a 95 percent chance that the true parameter is within the confidence interval.

Findings

Ability to Establish Contact

Phase 2 Cycle 4 findings indicate that 98.6 percent of records had at least one email or phone record meet all operability requirements, which implies that nearly all records contain information that can be used to establish immediate contact. Less than two percent of records had contact information that met neither email nor or phone operability requirements.

Operability Accuracy

The operability accuracy analysis finds that approximately 94 percent of email addresses, 68 percent of telephone numbers, and 97 percent of postal addresses were found to be operable for all three contacts (administrative, technical, and registrant). Full operability accuracy of an entire WHOIS record was approximately 65 percent for the gTLD population as a whole. The results for full operability are in line with the findings of previous cycles of Phase 2, and appear to be holding steady. For a comparison across cycles, please see Table 25. Table Ex1 provides the accuracy breakdown by contact mode, presented as 95 percent confidence intervals.

Table Ex1: Overall gTLD Accuracy to 2009 RAA Operability Requirements by Mode

	Email	Telephone	Postal Address	All Three Accurate
All Three Contacts Accurate	94.5% ± 0.5%	68.9% ± 0.8%	97.2% ± 0.3%	65.4% ± 0.9%

Syntax Accuracy

The syntax accuracy analysis finds that approximately 99 percent of email addresses, 90 percent of telephone numbers, and 87 percent of postal addresses[4] met all of the baseline syntax requirements of the 2009 RAA for all three contacts. Full syntax accuracy of an entire WHOIS record to the requirements of the 2009 RAA was approximately 79 percent for the gTLD population as a whole. Table Ex2 provides the accuracy breakdown by contact mode, presented as 95 percent confidence intervals.

---

[3] This means that if the population is sampled again, the confidence intervals would bracket the subgroup or parameter (e.g., accuracy by region) in approximately 95 percent of the cases. For more information on confidence intervals, *see*: http://www.itl.nist.gov/div898/handbook/prc/section1/prc14.htm.

[4] Syntax accuracy address criteria were updated between Cycles 3 and 4 to reflect improved understanding of various exceptions. For more information see "Lessons Learned" on Pg. 5.

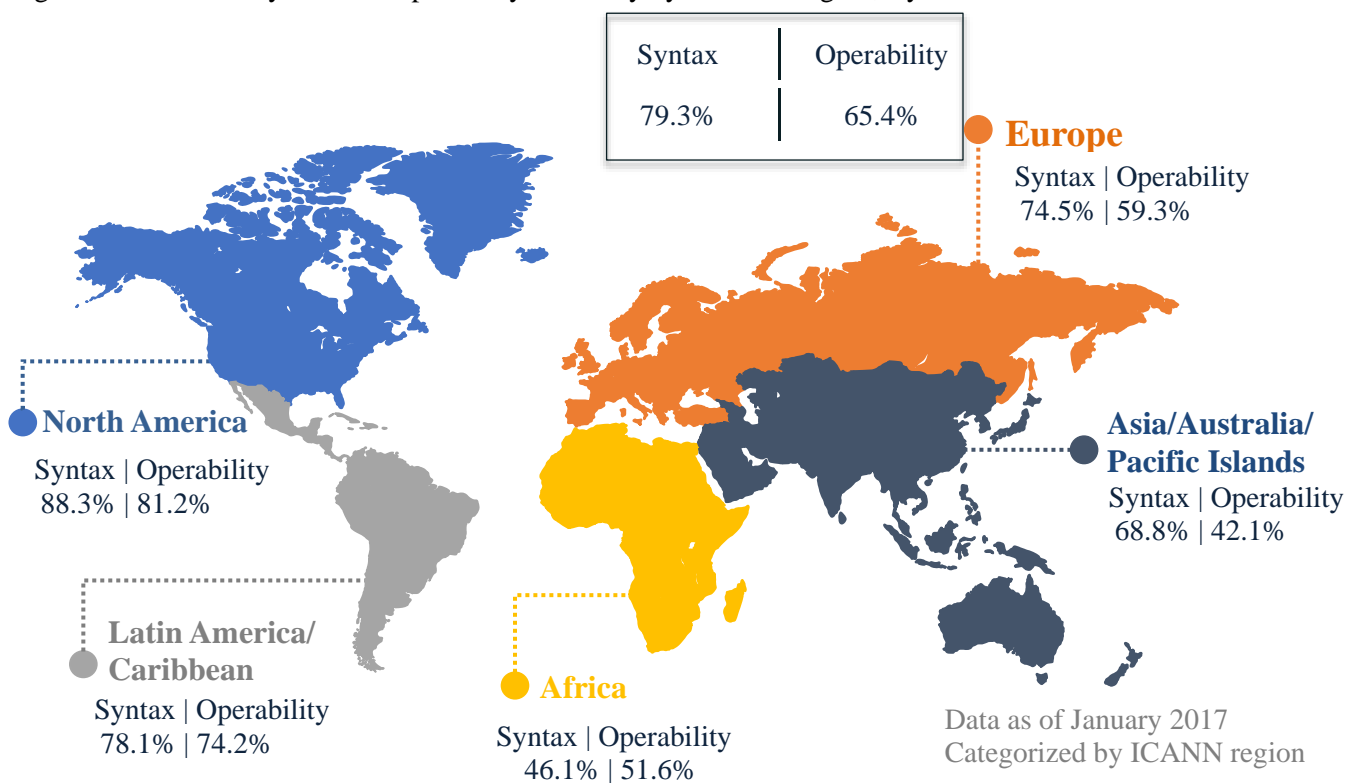Table Ex2: Overall[5] gTLD Accuracy to 2009 RAA Syntax Requirements by Mode

	Email	Telephone	Postal Address	All Three Accurate
All Three Contacts Accurate	99.5% ± 0.1%	89.5% ± 0.6%	87.4% ± 0.8%	79.3% ± 0.8%

The leading causes of syntax and operability nonconformance in the various subgroups are examined and explained in Main Findings and in Appendix B and Appendix C.

Regional Accuracy

The map in Figure Ex1 shows the overall syntax and operability accuracy of WHOIS records based on ICANN domain region, with syntax accuracy figures on the left, and operability on the right. In Additional Findings, under the heading Regional Analyses, other regional metrics of accuracy and reasons for error can be found.

Figure Ex1: Overall Syntax and Operability Accuracy by ICANN Region, Cycle 2

Syntax	Operability
79.3%	65.4%

Europe
Syntax | Operability
74.5% | 59.3%

North America
Syntax | Operability
88.3% | 81.2%

Asia/Australia/ Pacific Islands
Syntax | Operability
68.8% | 42.1%

Latin America/ Caribbean
Syntax | Operability
78.1% | 74.2%

Africa
Syntax | Operability
46.1% | 51.6%

Data as of January 2017
Categorized by ICANN region

Note: For each region, syntax and operability accuracy figures are displayed in the format: syntax | operability. Accuracy rates shown are the percentage of records with accurate information in all three contact types, for all three contact modes.

[5] "Overall accuracy" refers to the entire population of domains. *See* Note 3 above on confidence intervals and population.

The main body and appendices of the report include additional sub-analyses relating to accuracy rates under the 2013 RAA, trends from Cycle 2 to Cycle 3, differences between New and Prior gTLDs, and also analysis of the scripts used to register domains.

Lessons Learned

We have continually sought ways to improve the ARS and are always looking ahead to subsequent ARS reports. As noted in previous reports, postal address testing poses challenges for numerous reasons. One reason is that the rules for syntax accuracy in a country (i.e., country formatting requirements) can have various exceptions. With each new cycle, we continue to receive feedback regarding such exceptions. When we receive such feedback, it is incorporated into the postal address testing for the subsequent cycle. Our intent is to be flexible where a country is also flexible with its postal addressing rules. To this end, between Cycles 3 and 4 the Universal Postal Union (UPU) and ICANN Contractual Compliance completed an extensive review of the ruleset and identified a significant number of newly-identified exceptions, leading to significantly higher rates of syntax accuracy than in previous reports.[6]

ICANN Contractual Compliance

As indicated above, one of the major goals of the ARS project is the ability to pass to ICANN Contractual Compliance any potential inaccuracies that the registrars can investigate and follow up on. Compliance may use this data to identify registrars for targeted outreach and as part of the selection criteria for the registrar audit program.

Syntax Inaccuracy Follow-Up
WHOIS ARS complaints may be classified as WHOIS format errors if the error indicates non-compliance with the format requirements of the 2013 RAA, but the information is otherwise valid and contactable (e.g., a missing +1 county code for a registrant located in the United States). Where the error renders the contact unreachable (e.g., a missing postal address), the WHOIS ARS complaint will be processed as a WHOIS inaccuracy complaint. Because the 2009 RAA does not include format requirements, WHOIS format errors are not considered for registrars under the 2009 RAA.

Operability Inaccuracy Follow-Up
WHOIS ARS complaints that are generated due to failures of operability will be processed as WHOIS inaccuracy complaints. Operability failures indicate substantive inaccuracies that require registrars to take reasonable steps to investigate, and where applicable, correct the alleged inaccuracies under the 2009 and 2013 RAAs.[7] Additionally, the WHOIS Accuracy Program Specification (WAPS) of the 2013 RAA has additional requirements. These requirements include validating format requirements and suspending a domain name for failure of the registrant to respond in a timely manner to the WHOIS inaccuracy complaint.

---

[6] For consistency, the newly identified exceptions were retroactively applied to address data from Phase 2, Cycles 1-3, and are incorporated into cycle-to-cycle comparisons throughout this report.

[7] The process of reviewing and reporting WHOIS ARS test results is time consuming such that it takes anywhere from four to five months before ICANN Contractual Compliance can begin processing the WHOIS ARS. This lag can result in outdated WHOIS ARS test results. However, with each new WHOIS ARS test cycle, the WHOIS ARS and ICANN Contractual Compliance teams are working to reduce this lag time.

Phase 2 Results

ICANN Contractual Compliance began processing inaccuracy complaints from Phase 2 Cycle 4 in May 2017, and continues to work with Registries and Registrars to resolve identified issues. Metrics for the WHOIS ARS are presented in the Compliance Quarterly Reports (see https://www.icann.org/resources/pages/compliance-reports-2017) and at ICANN Public Meetings. In response to ICANN community requests, ICANN now publishes additional metrics on the WHOIS ARS Contractual Compliance Metrics page (see https://whois.icann.org/en/whoisars-contractual-compliance-metrics).

Next Steps

Phase 2 Cycle 4

Following publication of this report, ICANN will be holding a webinar to discuss the findings and give the community an opportunity to provide feedback. An announcement will be published on icann.org with details on how to participate. Additionally, you may find materials from past webinars (and reports) here: https://whois.icann.org/en/whoisars-reporting.

Phase 2 Cycle 5

As noted above, Phase 2 is cyclical with a new report published every 6 months. Cycle 5 will begin July 2017, with a report expected in December 2017.

Background: Sample and Market Information

Brief Overview

In Cycle 4, we first selected a sample of 200,000 WHOIS records from the zone files of 1,231 gTLDs (explained below in the Sample Design section). The contact information from a subsample of these records was then tested for accuracy against syntax standards (e.g., values and formats) based on requirements stipulated within the domain-applicable Registrar Accreditation Agreement (RAA), and also tested for accuracy against operability standards (e.g., if the information can be used to establish contact). The resulting data were analyzed to produce statistics of syntax and operability accuracy for WHOIS contact information across subgroups such as gTLD Type (Prior or New), ICANN region and RAA type. Though an estimated 99 percent of domain names are registered through registrars which operate under the 2013 RAA, over 55 percent of domains with registrars on the 2013 RAA are obligated to meet only the WHOIS requirements of the 2009 RAA based on when the domain itself was registered; we refer to such domains as 2013 RAA grandfathered (2013 RAA GF). [8] Domains with registrars on 2013 RAA that are obligated to meet the WHOIS requirements of the 2013 RAA are referred to as 2013 RAA non-grandfathered (2013 RAA NGF). Analyses considered three RAA types (2009, 2013 GF and 2013 NGF), the distribution for which can be seen in Graph 1.

Graph 1: Proportion of All Registrations in gTLDs, by RAA Status

2009 RAA 0.2%
2013 RAA NGF 56.3%
2013 RAA GF 43.5%

---
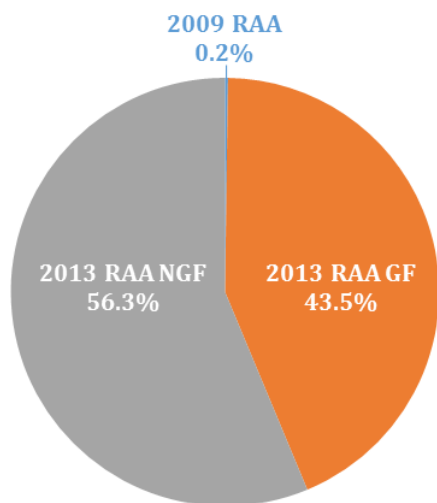
[8] The WHOIS record "Created Date" is used for grandfathering purposes, rather than the "Updated Date," because some changes that result in a WHOIS record update do not trigger a WHOIS Accuracy Program Specification (WAPS) requirement under the 2013 RAA (ie. change of nameserver or domain status change). For more information see the WAPS Specification.

Table 1 shows the shares of the different RAA types, and Graph 2 show the change in distribution over time. Between Cycle 3 and Cycle 4, the 2009 RAA share decreased from 0.7% to 0.2%.

Table 1: Distribution of RAA Type, by Sample Date

	2009 RAA	2013 GF RAA	2013 NGF RAA
June 2015 (Cycle 1)	3.3%	63.7%	33.0%
January 2016 (Cycle 2)	2.9%	52.4%	44.7%
July 2016 (Cycle 3)	0.7%	46.9%	52.3%
January 2017 (Cycle 4)	**0.2%**	**43.5%**	**56.3%**

Graph 2: Change in Distribution of RAA Type, by Sample Date[9]

---
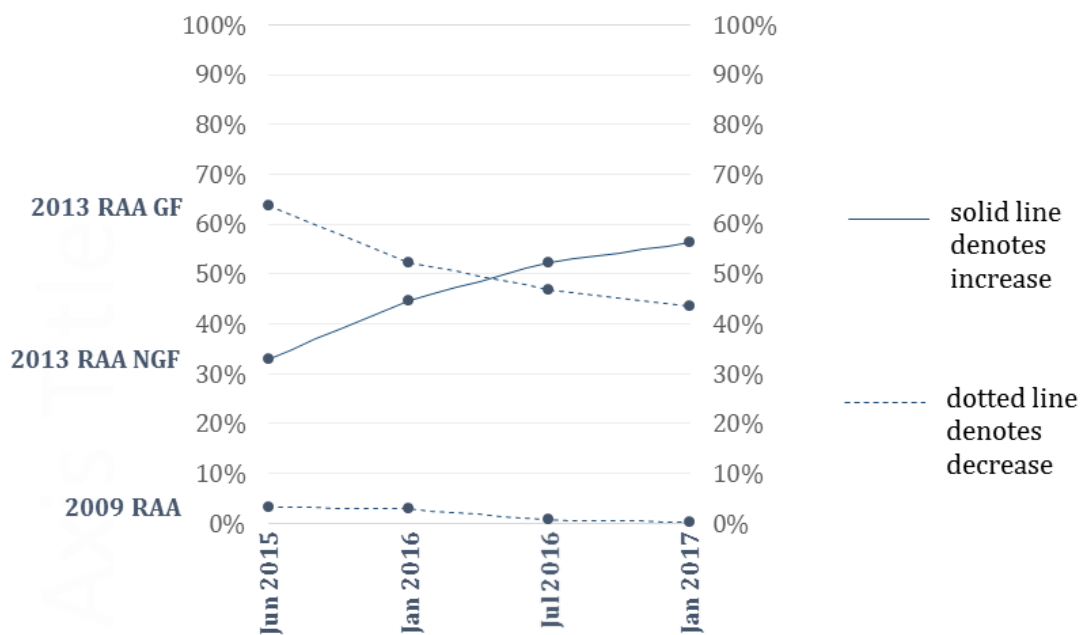
[9] The pilot study sample has not been included here because the pilot did not sample from all domains available at the time.

Table 2 shows the number of domains by RAA type over time, as well as the number of domains in New and Prior gTLDs. From January 2016 to January 2017 there was a substantial drop in the number of domains in the 2009 RAA, and a substantial increase in the number of New gTLD domains.

Table 2: RAA Type Population Estimates, by Sample Date (in millions of domains)

	New gTLD	Prior gTLD	RAA 2009	RAA 2013 GF	RAA 2013 NGF	Total gTLDs
June 2015 (Cycle 1)	5.8	152	5.5	104	49	**158**
January 2016 (Cycle 2)	10.9	159	5.0	89	76	**170**
July 2016 (Cycle 3)	21.4	162	1.3	86	95	**184**
January 2017 (Cycle 4)	24.8	161	0.4	80	103	**186**

*Note: The Total gTLDs column represents the sum of all gTLDs. The total can be obtained by summing New and Prior gTLDs: **OR**, by summing RAA 2009, RAA 2013 GF, and RAA 2013 NGF; **OR**, by summing the regions.*

Sample Design

Study data consisted of an initial sample of 200,000 records from gTLD zone files, and an analyzed subsample of 12,000 records. This two-stage sample was designed to provide a large enough sample to reliably estimate subgroups of interest, given the technical limitations of collecting study data.

Initial Sample

To select the initial sample of 200,000 records, we reviewed the zone file summary data, which indicates how many domains are in each gTLD. At the time of the initial sample for Cycle 4, in January 2017, there were about 186 million domains names spread across 1,231 gTLDs. Approximately 87 percent of the 186 million domains were registered in one of the 18 Prior gTLDs, as compared to 88 percent in July 2016, when data was collected for Cycle 3 (see Table 1). Almost 13 percent of domains in January 2017 were registered in New gTLDs, marking a slight increase from the 12 percent registered in July 2016. The overall number of New gTLDs continued to rise, increasing from 1,056 in July 2016 to 1,213 in January 2017.

Table 3 shows the total number of delegated gTLDs and how many of these gTLDs were Prior vs. New gTLDs at each of the WHOIS ARS sample dates.

Table 3: Total Delegated, Prior and New gTLDs, by Sample Date

	Prior gTLDs	New gTLDs	Total Delegated gTLDs
April 2015 (Phase 1)	18	592	**610**
June 2015 (Phase 2 Cycle 1)	18	660	**678**
January 2016 (Phase 2 Cycle 2)	18	870	**888**
July 2016 (Phase 2 Cycle 3)	18	1,056	**1,074**
January 2017 (Phase 2 Cycle 4)	18	1,213	**1,231**

Out of the 1,213 New gTLDs, only 779 had at least one domain (434 New gTLDs did not yet have any domains), 61 had exactly one domain (these were excluded from our sample since it is typically an administrative domain for the gTLD) and the remaining 718 others had at least two domains. Adding together the 18 prior gTLDs and the 718 New gTLDs described above, the initial sample represented a total of 736 gTLDs. Similar to the previous WHOIS ARS[10] study samples, our Cycle 4 sample design oversampled New gTLDs so that 25 percent of the initial sample was from New gTLDs.

Of the initial sample of 200,000, WHOIS data were gathered and parsed successfully for 197,444 records (98.7% of the initial sample, as shown in Table 4).

Accounting for Records not linked to a Registrar

A small percentage of records could not be linked to a registrar, and therefore could not be categorized by RAA type.[11] Of the initial sample of 197,444 successfully parsed records, 498 such records were identified. All 498 of these records were initially chosen for the subsample of 12,000 to ensure that a sufficient number of these newly-classified records were included. However, upon investigation into the nature of the records it was determined that they were by and large registry-reserved domains (RRD) and should be excluded from the analyzed subsample.[12] Therefore, these records are not included in the analysis and findings of the ARS report. This is reflected in tables below, which show the total number of records of the analyzed

---

[10] Previous WHOIS ARS studies include the Pilot Study, the Phase 1 study, the Phase 2 Cycle 1 study and the Phase 2 Cycle 2 study, and the Phase Cycle 3 study.

[11] For previous cycles, RAA categorization occurred by identifying registrars on the 2013 RAA, with all others assumed to be on the 2009 RAA. For Cycle 4, we used a comprehensive list of registrars that identified the RAA as either 2009 or 2013.

[12] ICANN determined that records without a registrar in the listing were mostly instances of registries acting as registrars, either for reserved domains or for Conficker-virus-related preemptive registrations. A small portion were due to issues related to the initial data pull. In past cycles, these records would have been identified as domains on the 2009 RAA (*see* Note 11 above), but because the number of such domains is very small, very few of them were likely subsampled for previous analysis. Thus, prior cycles' accuracy results were not affected by these domains.

subsample at 11,502 records (12,000 total records minus 498). For future cycles, these domains will not be included in the analysis subsample.

Table 4: Initial Sample Sizes by Region and RAA

RAA Type	Africa	Asia Pacific	Europe	Latin America and Caribbean	North America	Unknown	TOTAL
2009	0	65	17	194	77	17	370
2013 GF	429	11,807	16,228	1,978	43,613	249	74,304
2013 NGF	827	53,118	18,572	7,975	42,113	165	122,770
TOTAL	1,256	64,990	34,817	10,147	85,803	431	197,444

Analyzed Subsample

ICANN defined the subgroups of interest for this report as: records with 2009 RAA registrars, records with 2013 RAA registrars, records in New gTLDs, records in Prior gTLDs and records from each of the five ICANN regions. Table 5 shows the sizes of the analyzed subsample by Region and RAA.

Table 5: Analyzed Subsample Sizes by Region and RAA

RAA Type	Africa	Asia Pacific	Europe	Latin America and Caribbean	North America	Unknown	TOTAL
2009	0	65	17	194	77	17	370
2013 GF	429	1,000	1,100	850	1,520	9	4,908
2013 NGF	800	1,850	1,200	900	1,468	6	6,224
TOTAL	1,229	2,915	2,317	1,944	3,065	32	11,502

Table 6 compares the sample sizes by RAA type in the initial sample of 197,444 and the analyzed subsample of 11,502.

Table 6: Sample Sizes by RAA Type

RAA Type	Initial Sample	Percentage of Initial Sample	Analyzed Subsample	Percentage of Subsample
2009 RAA	370	0.2%	370	3.2%
2013 RAA GF	74,304	37.6%	4,908	42.7%
2013 RAA NGF	122,770	62.2%	6,224	54.1%
TOTAL	197,444	100.0%	11,502	100.0%

Accounting for Common Data across Contact Types

For all three contact modes (email, telephone and postal address), over 80 percent of the domains have the same contact information for all three contact types (registrant, administrative and technical). Table 7 shows the full distribution of how often the contact information is the same for each contact type.

Table 7: Frequency of Common Data across Contact Type and Mode[13]

Commonality	Email	Telephone	Postal Address
All Three Exactly Same	80.4% ± 0.7%	83.4% ± 0.7%	80.9% ± 0.7%
Exactly Two the Same, One Different	17.7% ± 0.7%	15.6% ± 0.7%	17.2% ± 0.7%
All Three Different	1.9% ± 0.3%	1.0% ± 0.2%	1.9% ± 0.2%

The commonality figures in Table 7 indicate that there will not be significant differences between accuracy for the registrant, administrative and technical contacts because they so often contain the same information. All three contacts are different no more than 1.9% of the time. Therefore, while we test and report on all three contact types, it will often be sufficient to simply look at the rates for which all three contact types are accurate. An expanded version of Table 7 can be found as Table B1 in Appendix B.

---

[13] An expanded version of Table 7 can be found as Table B1 in Appendix B.

Main Findings

This section of the report includes a summary of the key findings, followed by a detailed statistical analysis of the syntax and operability test outcomes. These statistics are organized by contact type[14] (registrant, administrative and technical) within contact mode (email address, telephone number and postal address), overall and across the subgroups of New vs. Prior gTLDs, RAA type and ICANN region. Further detail on the findings, including analysis tables, can be found in Appendix B.[15]

Because the 2009 and 2013 RAA versions have different requirements for valid syntax, we created separate analysis tables for each set of requirements (2009 and 2013), with the 2009 requirements serving as a baseline[16]. Since operability results are similar across RAA versions, separate analysis tables for each set of requirements would be largely redundant. Analysis tables presenting the outcomes of syntax tests for 2013 RAA requirements can be found in Appendix C.

Summary of Findings

We present here the key takeaways from the findings:

Ability to Establish Immediate Contact
- Ninety-eight percent of records had at least one email or phone meet all operability requirements of the 2009 RAA, which implies that nearly all records contain information that can be used to establish immediate contact. Only two percent of records had contact information that met neither email nor or phone operability requirements.

Operability Accuracy
- Ninety-seven percent of postal addresses, 69 percent of telephone numbers and 95 percent of email addresses met all operability requirements of the 2009 RAA. Sixty-five percent of domains passed all operability tests for all contact types (registrant, administrative and technical) and contact modes (email, telephone and postal address), which is around the same as Cycle 3 findings.
  - Regional variations of operability accuracy are greatest for telephone, which ranges from 46 percent accurate (Asia-Pacific) to 84 percent accurate (North America).

  - The contact mode with the highest rate of passing all operability tests was postal address, with 97 percent passing all tests. The mode with the lowest rate of passing all operability tests was telephone numbers, with 69 percent passing all tests.

---

[14] Because the numbers for the registrant, administrative and technical contacts are so similar, we present here subgroup accuracy only for "All Three Accurate", i.e., the registrant, administrative and technical contacts all passed all accuracy tests.
[15] In the interest of condensing the findings in this section, many of the analysis tables discussed herein are stored in Appendix B and Appendix C of the report.
[16] The 2009 RAA was chosen as a baseline against which all 11,502 of the analyzed subsample records were analyzed. The 2013 RAA requirements are stricter than the 2009 requirements, building from, and thus encompassing, the 2009 requirements. For example, the 2009 RAA requires an address for each contact, while the 2013 RAA requires the address for each contact to be formatted per the applicable Universal Postal Union S42 template for a particular country. Any contact field that meets the 2013 RAA requirements would also meet 2009 requirements. For this reason, the 2009 requirements serve as a baseline against which all records can be compared.

☐ For operability errors for email addresses, the vast majority of errors were from an email address bounced (95% of errors), compared to the error of a missing email address (5% of errors).

Syntax Accuracy:
■ More than 89 percent of telephone numbers met all syntax requirements of the 2009 RAA, increasing from Cycle 3 (88 percent). The reasons for telephone syntax errors had very similar distributions to those in Cycle 3.
☐ Regional variations of syntax accuracy were greatest for postal address, which ranges from 66 percent accurate (Africa) to 98 percent accurate (North America).
☐ The most common reason for telephone syntax error in most regions was incorrect length, but in North America the most common reason for error was a missing country code.
☐ For postal addresses, the vast majority of errors in each study have consistently been due to missing fields that were required, such as city, state/province, postal code or street.
■ In Cycle 4 the 2013 RAA NGF group had the highest percentage of records in which all three contact modes were accurate. This is a change from Cycle 3, where the 2009 RAA group had the highest percentage of records in which all three contact modes were accurate.

Operability Accuracy – 2009 RAA Requirements[17]

The following section reviews the results of the operability accuracy tests against 2009 requirements by first looking at overall accuracy, then subgroup accuracy, followed by the reasons for error. It is important to note here that the only difference between 2013 and 2009 RAA operability requirements is that the 2009 RAA requirements do not require that information be present in the registrant email or telephone number fields, while 2013 RAA requirements do require the presence of information in these fields.

Overall Operability Accuracy
First, we look at accuracy to 2009 RAA requirements for all 11,502 domains. For operability, accuracy rates are highest for postal addresses, as shown in Graph 3 and Table 8.

Graph 3: Overall Accuracy – 2009 RAA Operability Requirements

---
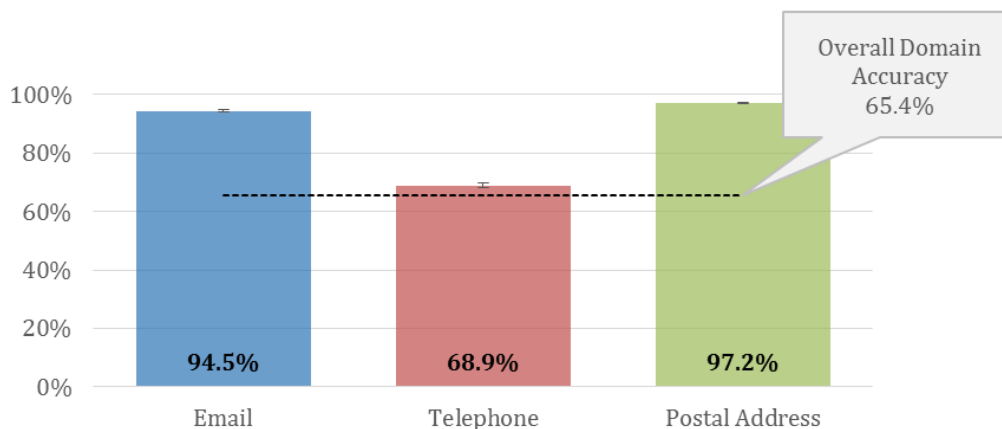
[17] Conformance to 2013 RAA Requirements can be found in Appendix C.

Table 8: Overall Accuracy by Contact Type and Mode – 2009 RAA Operability Requirements

	Email	Telephone	Postal Address	All Three Accurate
Registrant	95.6% ± 0.4%	72.0% ± 0.8%	97.7% ± 0.3%	**68.5% ± 0.8%**
Administrative	95.0% ± 0.4%	71.5% ± 0.8%	97.3% ± 0.3%	**68.1% ± 0.9%**
Technical	95.5% ± 0.4%	71.6% ± 0.8%	97.4% ± 0.3%	**68.5% ± 0.8%**
Overall	**94.5% ± 0.4%**	**68.9% ± 0.8%**	**97.2% ± 0.3%**	**65.4% ± 0.9%**

Operability Accuracy by Prior vs. New gTLD

Graph 4 and Table 9 show that Prior gTLDs have lower operability accuracy on email addresses, but higher accuracy on telephone numbers. This is in contrast to Cycle 3, when Prior gTLDs had lower operability accuracy on email and postal addresses, but higher accuracy on telephone numbers.

Graph 4: Accuracy by gTLD Type – 2009 RAA Operability Requirements
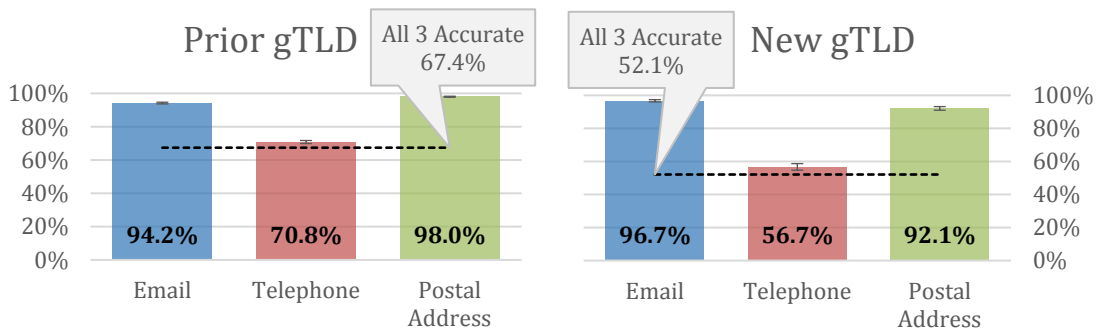
Table 9: Accuracy by gTLD Type – 2009 RAA Operability Requirements

	Email	Telephone	Postal Address	All Three Accurate
Prior gTLD	94.2% ± 0.5%	70.8% ± 0.9%	98.0% ± 0.3%	**67.4% ± 1.0%**
New gTLD	96.7% ± 0.7%	56.7% ± 2.0%	92.1% ± 1.1%	**52.1% ± 2.0%**
Overall	**94.5% ± 0.4%**	**68.9% ± 0.8%**	**97.2% ± 0.3%**	**65.4% ± 0.9%**

Operability Accuracy by RAA Status

Finally, we look at accuracy by RAA status. Graph 5 and Table 10 show that the 2013 RAA NGF group has the highest email accuracy, but has lower telephone and postal accuracy that the 2013 RAA GF group.

Graph 5: Accuracy by RAA Status – 2009 RAA Operability Requirements
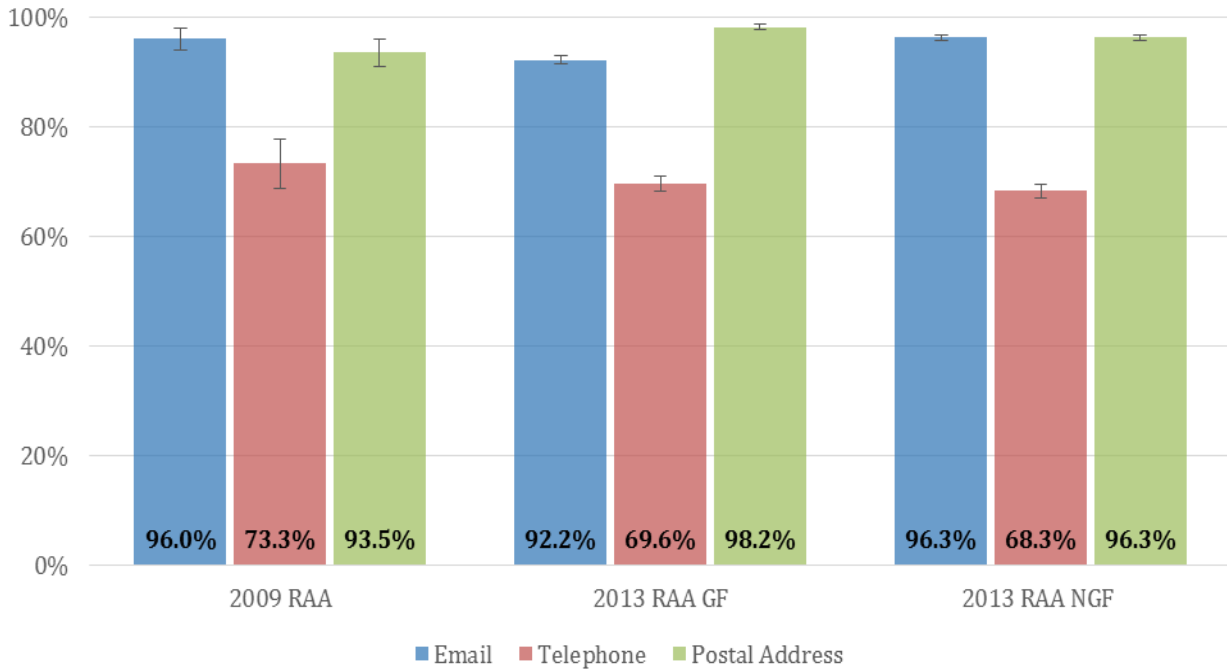
Table 10: Accuracy by RAA Status – 2009 RAA Operability Requirements

	Email	Telephone	Postal Address	All Three Accurate
2009 RAA	96.0% ± 2.0%	73.3% ± 4.5%	93.5% ± 2.5%	**71.2% ± 4.6%**
2013 RAA GF	92.2% ± 0.7%	69.6% ± 1.3%	98.2% ± 0.4%	**65.4% ± 1.3%**
2013 RAA NGF	96.3% ± 0.5%	68.3% ± 1.2%	96.3% ± 0.5%	**65.3% ± 1.2%**
Overall	**94.5% ± 0.4%**	**68.9% ± 0.8%**	**97.2% ± 0.3%**	**65.4% ± 0.9%**

Operability Accuracy by ICANN Region

Next, we look at accuracy by ICANN region. Graph 6 and Table 11 show that with regard to all nine contacts passing all accuracy tests, Latin American/Caribbean and North American domains have higher rates, and Asian-Pacific domains have a lower rate. More information on regional accuracy statistics and reasons for error by region, see the section Regional Findings.

Graph 6: Accuracy by ICANN Region – 2009 RAA Operability Requirements
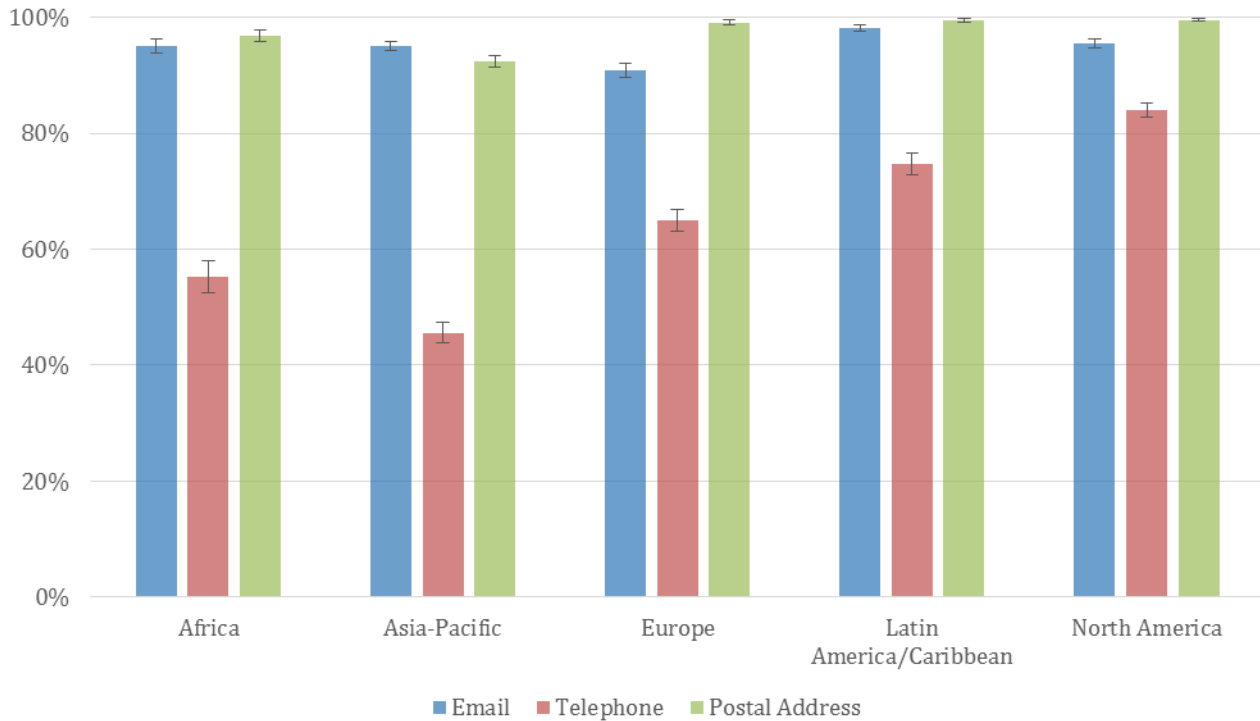
Table 11: Accuracy by ICANN Region – 2009 RAA Operability Requirements

	Email	Telephone	Postal Address	All Three Accurate
Africa	95.0% ± 1.2%	55.3% ± 2.8%	96.9% ± 1.0%	**51.6% ± 2.8%**
Asia-Pacific	95.1% ± 0.8%	45.6% ± 1.8%	92.4% ± 1.0%	**42.1% ± 1.8%**
Europe	90.8% ± 1.2%	65.0% ± 1.9%	99.1% ± 0.4%	**59.3% ± 2.0%**
Latin America/Caribbean	98.2% ± 0.6%	74.8% ± 1.9%	99.5% ± 0.3%	**74.2% ± 1.9%**
North America	95.5% ± 0.7%	84.0% ± 1.3%	99.6% ± 0.2%	**81.2% ± 1.4%**
Overall	**94.5% ± 0.4%**	**68.9% ± 0.8%**	**97.2% ± 0.3%**	**65.4% ± 0.9%**

Reasons for Error – 2009 RAA Operability Requirements[18]

For operability, the reasons for error were straightforward because the tests for email addresses, telephone numbers and postal addresses were all sequential. If a test failed, operability failed. If a test succeeded, the contact information passed onto the next test.

Email Addresses

Table 12 shows that around 95 percent of email errors were due to a "bounced back" email, revealing that the email address was not operable. For the administrative and technical contact fields, around five percent of email errors were due to an email address which was missing or otherwise not verifiable.

Table 12: Email Address Errors by Contact Type – 2009 RAA Operability Requirements

	Registrant	Administrative	Technical	Total
Passed All Accuracy Tests	10,983	10,950	11,015	**32,948**
Not Verifiable (or Missing)	80*	41	43	**85**
Email Bounced	518	511	444	**1,473**
Total	**11,502**	**11,502**	**11,502**	**34,506**

* Registrant email is not required under the 2009 RAA.

Telephone Numbers

Graph 7 and Table 13 show that approximately 49 percent of telephone errors were from invalid numbers, another 33 percent of errors were from disconnected telephone numbers, and another 17 percent of errors were from telephone numbers that did not connect at all. Around one percent of errors were due to the telephone number not being present in the record.

Graph 7: Telephone Number Errors by Contact Type – 2009 RAA Operability Requirements
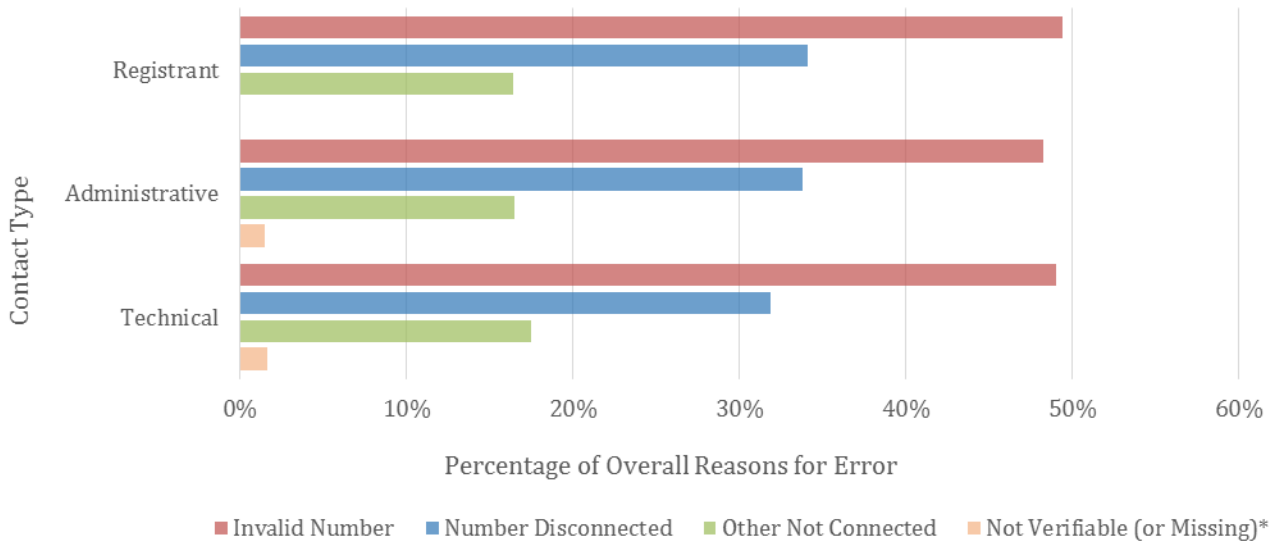
*Note: Registrant telephone number is not required under the 2009 RAA.

---

[18] To find more information on how the tests were conducted and how the errors map to the tests, *see* Appendix A or the WHOIS ARS webpage: https://whois.icann.org/en/whoisars-validation.

Table 13: Telephone Number Errors by Contact Type – 2009 RAA Operability Requirements

	Administrative	Technical	Registrant	Total
Passed All Accuracy tests	7,930	7,879	7,924	**23,733**
Not Verifiable (or Missing)	95*	54	57	**115**
Number Disconnected	1,217	1,224	1,141	**3,582**
Invalid Number	1,764	1,748	1,755	**5,267**
Other Not Connected	587	597	625	**1,809**
Total	**11,502**	**11,502**	**11,502**	**34,506**

* Registrant telephone number is not required under the 2009 RAA.

Postal Addresses

Finally, Graph 8 and Table 14 show the postal address errors for operability. Table 14 shows that 85 percent of the P2 addresses and 70 percent of the P1 addresses were determined to be operable using a manual process. [19] Graph 8 shows only those addresses still determined to be inoperable after this manual process. Table 14 shows more detail, including how many in each code were determined to be operable by the manual process.

Graph 8: Postal Address Errors Across All Contact Types – 2009 RAA Operability Requirements

---
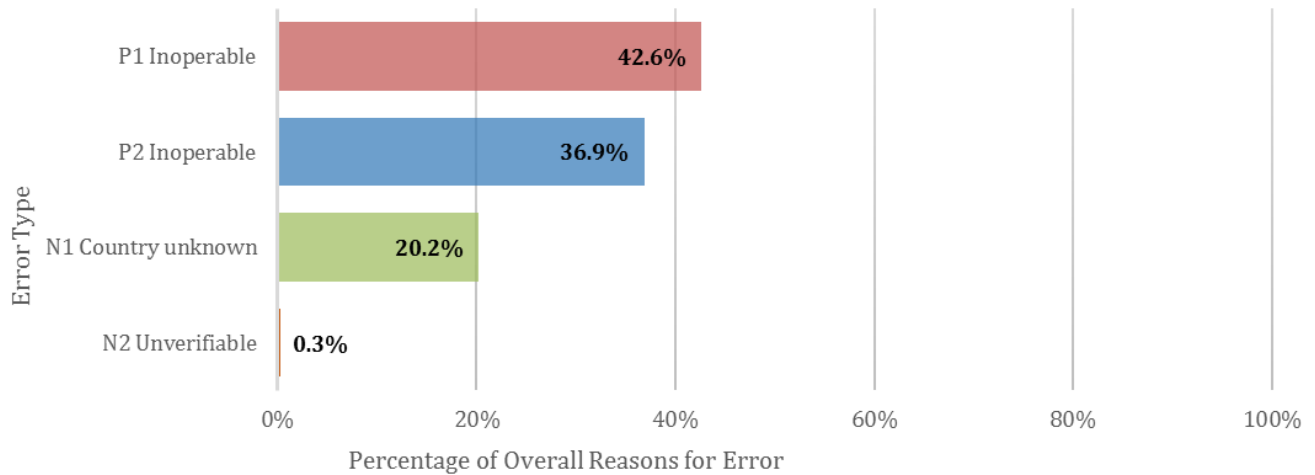
[19] P1 and P2 errors are the classification codes for records of questionable operability as determined by the automated tool used to deliver results. These errors are then manually inspected to determine operability or inoperability, the results of which are detailed in Table 14.

Table 14: Postal Address Errors by Contact Type – 2009 RAA Operability Requirements

	Administrative	Technical	Registrant	Total
Operable	9,954	9,943	9,940	**29,837**
Operable P2	783	759	783	**2,325**
Operable P1	464	461	448	**1,373**
TOTAL OPERABLE	11,202	11,164	11,172	**33,538**
Inoperable P2	120	120	118	**358**
Inoperable P1	138	143	133	**414**
N1, Country unknown	42	75	79	**196**
N2, Unverifiable	1	1	1	**3**
TOTAL INOPERABLE	301	339	331	**971**
OVERALL TOTAL	**11,503**	**11,503**	**11,503**	**34,509**

Syntax Accuracy – 2009 RAA Requirements[20]

The following section reviews the results of the syntax accuracy tests against 2009 requirements by first looking at overall accuracy, then subgroup accuracy, and finally, by reasons for error.

Overall Syntax Accuracy

First, we look at accuracy to 2009 RAA requirements for all 11,502 domains in the analyzed subsample. The dotted black line in Graph 9 shows that around 79 percent of domains can be said to be syntactically accurate.

Graph 9: Overall Accuracy – 2009 RAA Syntax Requirements

---
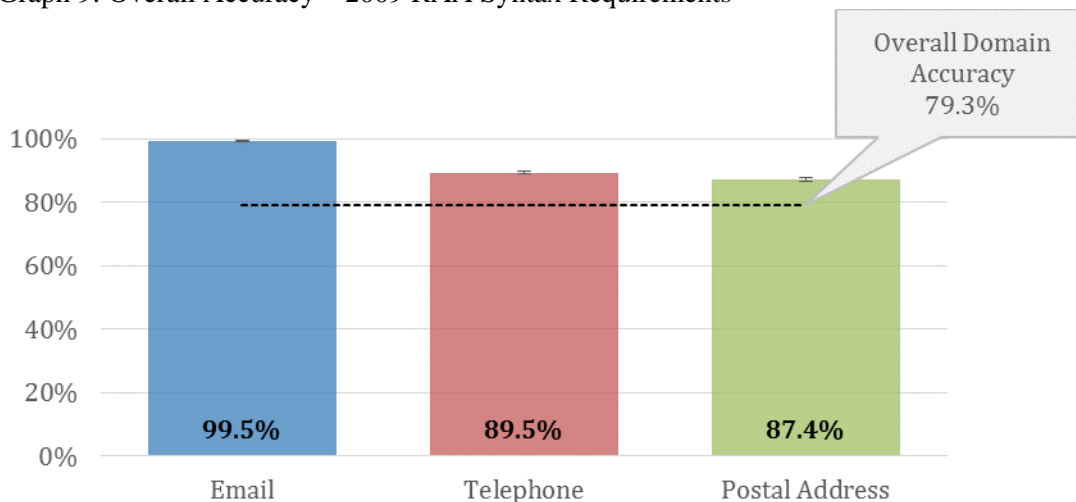
[20] Conformance to 2013 RAA Requirements can be found in Appendix C.

Table 15 shows a more detailed breakdown of the data by contact type. The bottom row of this table shows the rate for which the registrant, administrative and technical contacts all passed syntax tests for a given contact mode (email, telephone or postal address). We will focus on the percentages for all three contact modes passing all accuracy tests (the "All Three Accurate row") in the subgroup analyses.

Table 15: Overall Accuracy by Contact Type and Mode – 2009 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Three Accurate
Registrant	100.0% ± 0.0%	91.0% ± 0.5%	89.2% ± 0.6%	**81.7% ± 0.7%**
Administrative	99.5% ± 0.1%	90.4% ± 0.5%	88.1% ± 0.6%	**80.6% ± 0.7%**
Technical	99.5% ± 0.1%	90.5% ± 0.5%	88.8% ± 0.6%	**81.5% ± 0.7%**
Overall	**99.5% ± 0.1%**	**89.5% ± 0.6%**	**87.4% ± 0.6%**	**79.3% ± 0.7%**

Syntax Accuracy by Prior vs. New gTLDs

Graph 10 and Table 16 show that New gTLDs have higher[21] accuracy on email addresses and telephone numbers, but lower accuracy on postal addresses. In Cycle 4, New gTLDs also have a higher rate than Prior gTLDs for having all three contact fields accurate, while in Cycle 3 New gTLDs had a slightly lower rate of having all three contact fields accurate.

Graph 10: Accuracy by gTLD Type – 2009 RAA Syntax Requirements
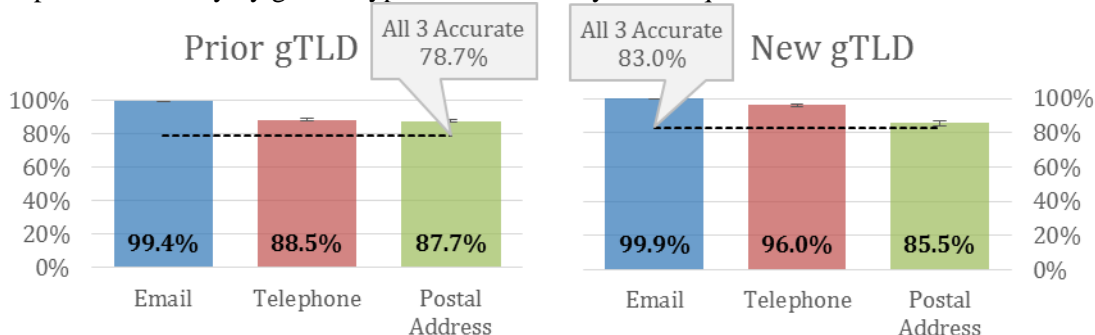
Table 16: Accuracy by gTLD Type – 2009 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Three Accurate
Prior gTLD	99.4% ± 0.2%	88.5% ± 0.7%	87.7% ± 0.7%	**78.7% ± 0.8%**
New gTLD	99.9% ± 0.1%	96.0% ± 0.8%	85.5% ± 1.4%	**83.0% ± 1.5%**
Overall	**99.5% ± 0.1%**	**89.5% ± 0.6%**	**87.4% ± 0.6%**	**79.3% ± 0.7%**

---

[21] Here "higher" and "lower" refer not only to sheer numbers, but also statistical significance. This latter phrase has been left out of most of the narrative for ease of reading.

Syntax Accuracy by RAA Status

Next, we look at accuracy rates by RAA status. In Cycle 4 the 2013 RAA NGF group had the highest percentage of records in which all three contact modes were accurate (see Table 17). This is a change from Cycle 3, where the 2009 RAA group had the highest percentage of records in which all three contact modes were accurate.

Graph 11: Accuracy by RAA Status – 2009 RAA Syntax Requirements
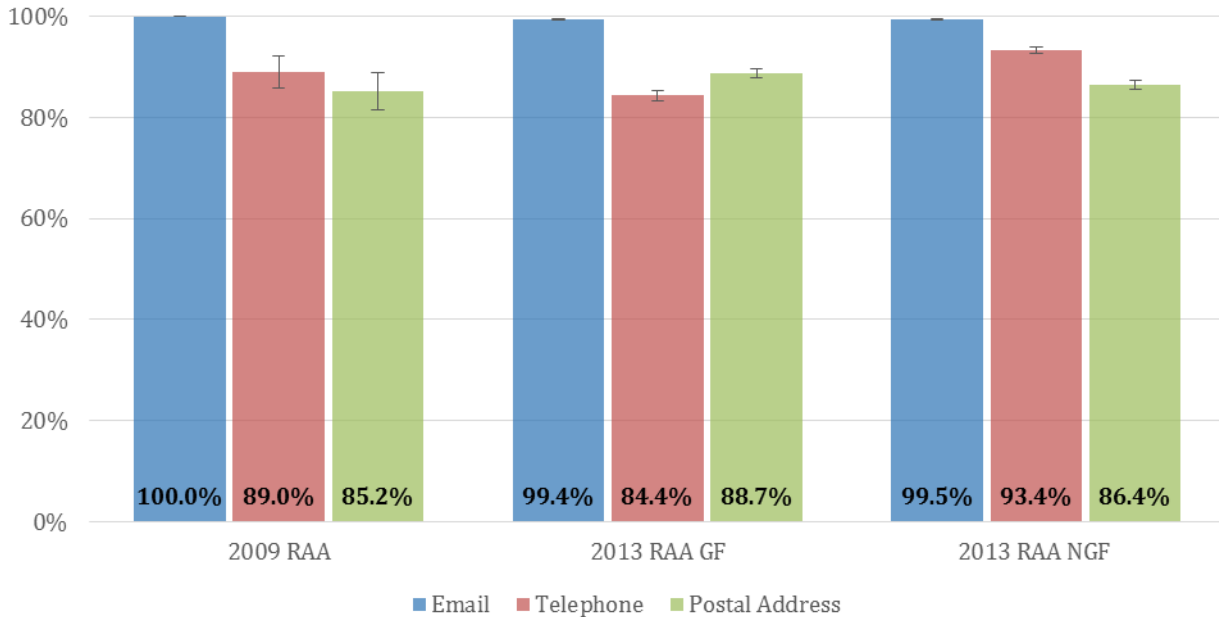
Table 17: Accuracy by RAA Status – 2009 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Three Accurate
2009 RAA	100.0% ± 0.0%	89.0% ± 3.2%	85.2% ± 3.6%	**79.7% ± 4.1%**
2013 RAA GF	99.4% ± 0.2%	84.4% ± 1.0%	88.7% ± 0.9%	**76.0% ± 1.2%**
2013 RAA NGF	99.5% ± 0.2%	93.4% ± 0.6%	86.4% ± 0.9%	**81.8% ± 1.0%**
Overall	**99.5% ± 0.1%**	**89.5% ± 0.6%**	**87.4% ± 0.6%**	**79.3% ± 0.7%**

Syntax Accuracy by ICANN Region

Finally, we look at accuracy by ICANN region. North America shows the highest overall accuracy while Africa and Asia-Pacific show the lowest overall accuracy. More information on regional accuracy statistics and reasons for error by region, see the section Regional Findings.

Graph 12: Accuracy by ICANN Region – 2009 RAA Syntax Requirements
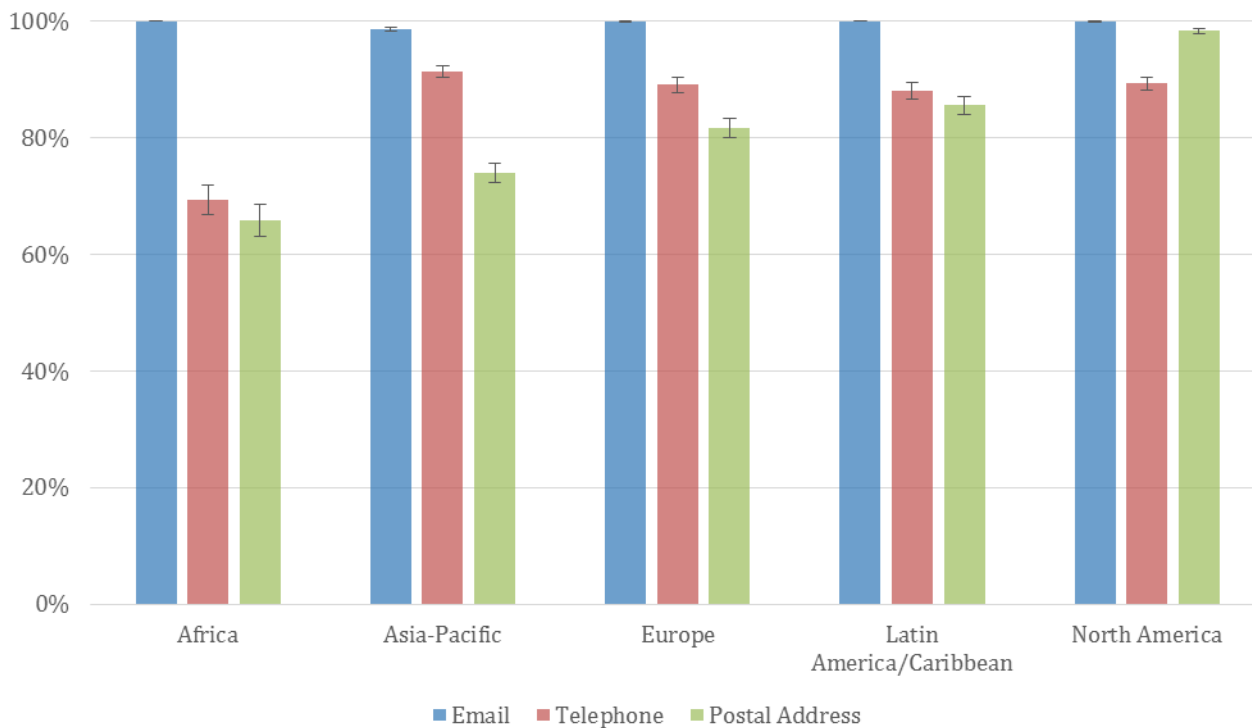
Table 18: Accuracy by ICANN Region – 2009 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Three Accurate
Africa	100.0% ± 0.0%	69.4% ± 2.6%	65.9% ± 2.7%	**46.1% ± 2.8%**
Asia-Pacific	98.7% ± 0.4%	91.3% ± 1.0%	74.0% ± 1.6%	**68.8% ± 1.7%**
Europe	100.0% ± 0.1%	89.1% ± 1.3%	81.7% ± 1.6%	**74.5% ± 1.8%**
Latin America/Caribbean	100.0% ± 0.0%	88.1% ± 1.4%	85.6% ± 1.6%	**78.1% ± 1.8%**
North America	100.0% ± 0.1%	89.4% ± 1.1%	98.4% ± 0.4%	**88.3% ± 1.1%**
Overall	**99.5% ± 0.1%**	**89.5% ± 0.6%**	**87.4% ± 0.6%**	**79.3% ± 0.7%**

Reasons for Error – 2009 RAA Syntax Requirements
We report here on the major reasons for failure for each contact mode separately (email address, telephone number and postal address).

Telephone Numbers
Graph 13 shows the reasons for telephone number errors as a percentage of all telephone number errors, by contact type. Similar to Cycle 2, the largest source of errors among telephone numbers was having an incorrect length for the applicable country (around eight percent of all telephone numbers tested).

Graph 13: Reasons for Telephone Number Error – 2009 RAA Syntax Requirements
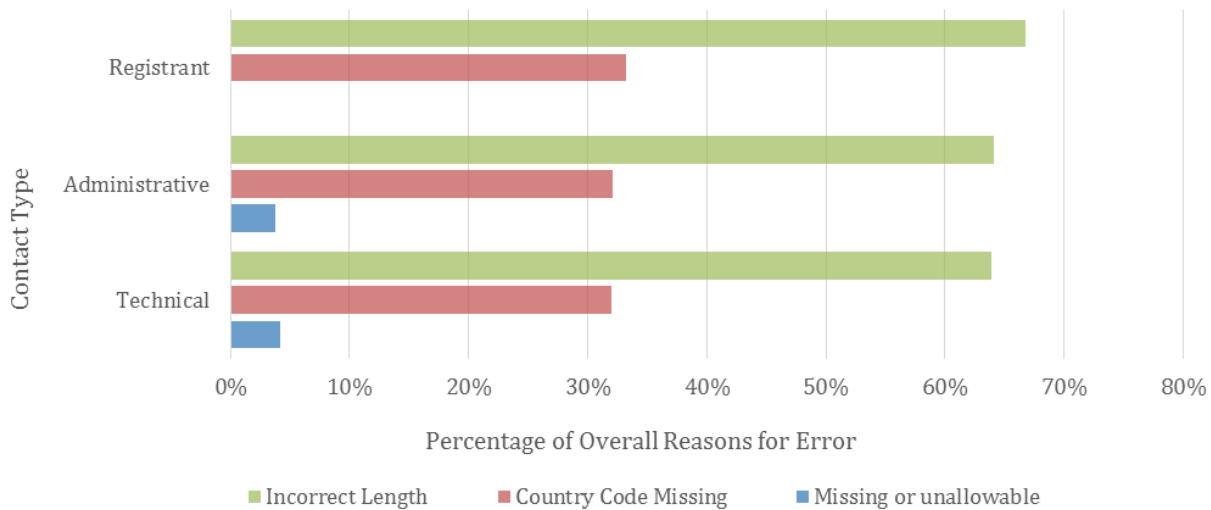
*Note: 2009 RAA does not require presence of a telephone number for the registrant contact type.

Postal Addresses

Graph 14 shows the reasons for postal address errors as a percentage of all postal address errors. Similar to Cycle 2, the majority of postal address syntax errors (93.2%) were due to a missing address component[22], such as a missing street (31.7%), city (28.2%), postal code (26.9%), or state/province (6.4%). Fewer country codes were missing or unidentifiable (4.7%) and few postal addresses were completely missing (1.7%).

Graph 15: Reasons for Postal Address Error Across All Contact Types – 2009 RAA Syntax Requirements

---
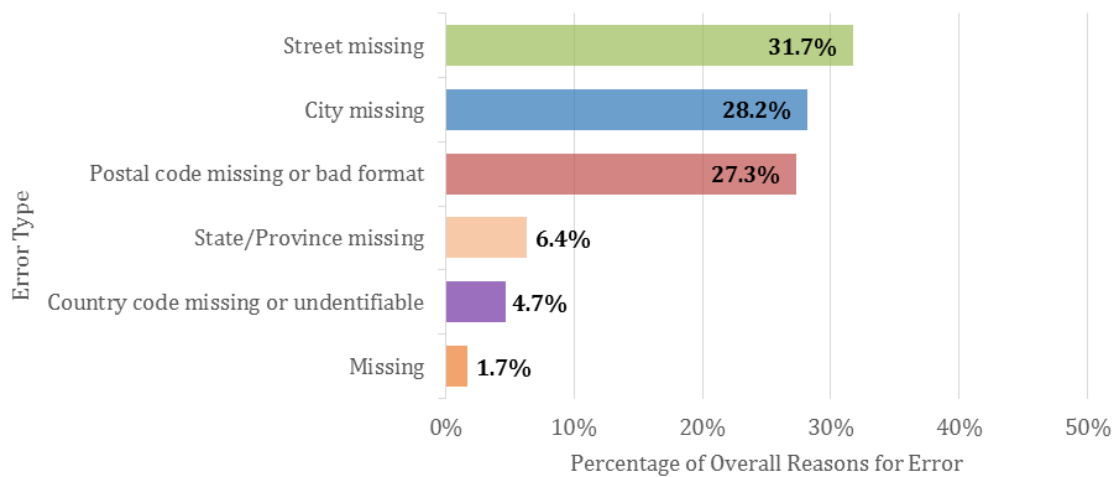
[22] It should be noted that after the completion of each cycle, should ICANN GDD Operations receives feedback from ICANN Contractual Compliance that particular address components may have different standards within a country than the standards used by the Universal Postal Union (ICANN's vendor for postal address testing), ICANN GDD Operations incorporates this feedback into the next cycle of testing.

Relationship between Syntax and Operability Accuracy

The relationship between syntax and operability accuracy against 2009 RAA standards examines the rate at which records that pass one of the two testing methods would also pass the other testing method (e.g., what percentage of records that pass operability testing also pass syntax testing, and vice versa). We present here some key takeaways of this analysis:

Email Address Syntax and Operability Accuracy
- Email addresses that do not pass the syntax accuracy tests also fail the operability accuracy test (i.e., zero percent fail syntax and then pass operability accuracy tests) because certain syntax failures – for example, an email address missing the "@" symbol – also indicate that the email address is not operable.
- The opposite is true for email addresses that fail operability accuracy tests (4.9% of all domains); most of these email addresses actually pass the syntax accuracy tests. This is because certain operability failures – for example, email bounce-backs resulting from an email address that is no longer in use – will occur even when the syntax is accurate.

Telephone Number Syntax and Operability Accuracy
- Unlike for email, failing syntax is not always an indicator that a telephone number will fail operability – there are some telephone numbers that can fail syntax testing, but pass operability testing. However, of the telephone numbers that do fail the syntax accuracy tests, most also fail the operability test.

Postal Address Syntax and Operability Accuracy
- Postal addresses that fail operability accuracy tests also fail the syntax test (i.e., zero percent fail operability accuracy tests, but pass syntax accuracy tests). However, of the postal addresses that fail syntax accuracy tests most pass the operability accuracy tests. This is because mail can be deliverable even if syntactically inaccurate.

Regional Findings – Analysis of Accuracy and Reasons for Error by Region

Here we report on additional regional statistics, such as changes in overall syntax and operability accuracy between Cycle 3 and Cycle 4 by region, and reasons for syntax and operability errors in Cycle 4 by region.

Changes in Overall Accuracy by Region

Operability Accuracy
Chart 1 shows that operability accuracy increased in every region except Asia-Pacific, which had a decrease of around 10 percent. Overall operability accuracy had a slight increase between Cycle 3 and Cycle 4, from 65.1% to 65.4%.

Chart 1: Change in Overall Operability Accuracy for ICANN Regions, Cycles 3 and 4 – 2009 RAA Requirements
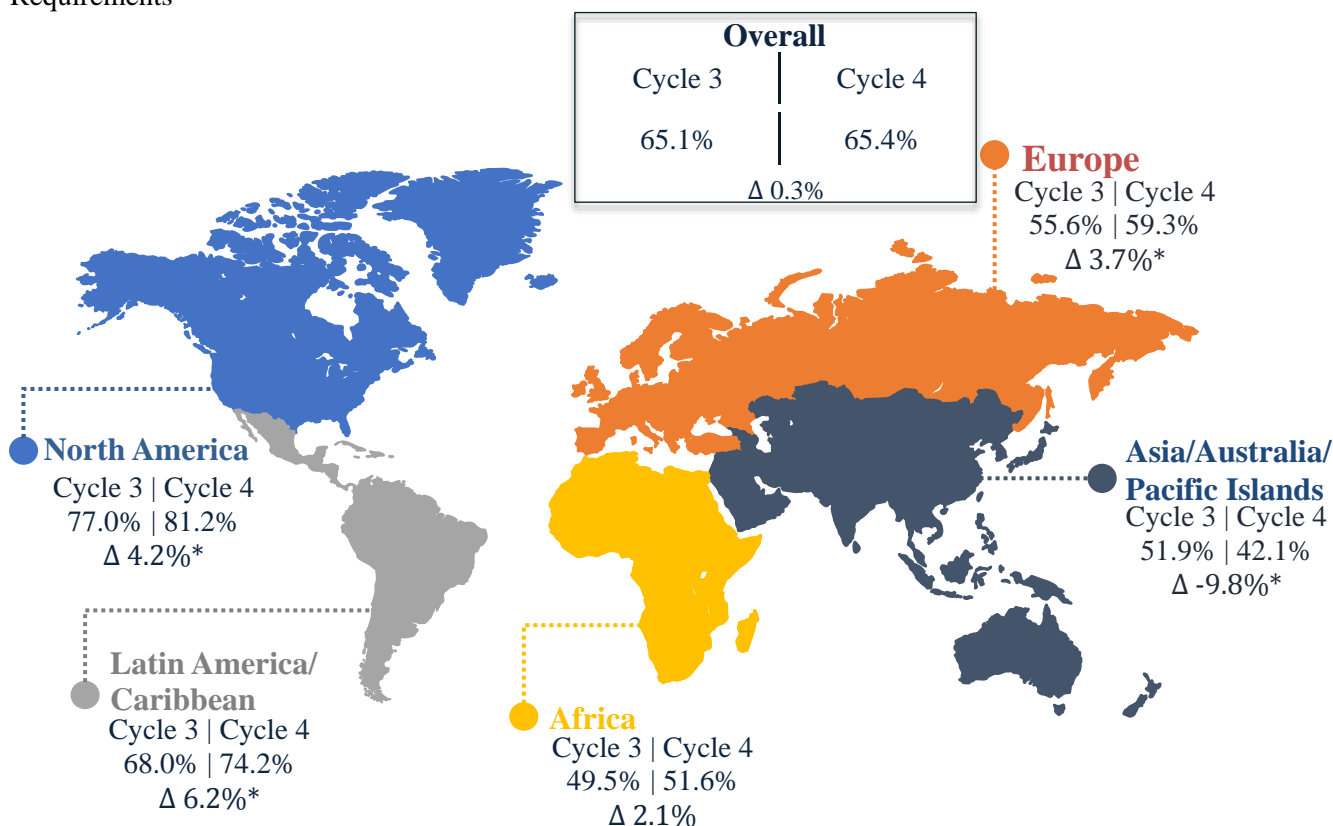
Overall

Cycle 3	Cycle 4
65.1%	65.4%
Δ 0.3%	

Europe
Cycle 3 | Cycle 4
55.6% | 59.3%
Δ 3.7%*

North America
Cycle 3 | Cycle 4
77.0% | 81.2%
Δ 4.2%*

Asia/Australia/Pacific Islands
Cycle 3 | Cycle 4
51.9% | 42.1%
Δ -9.8%*

Latin America/Caribbean
Cycle 3 | Cycle 4
68.0% | 74.2%
Δ 6.2%*

Africa
Cycle 3 | Cycle 4
49.5% | 51.6%
Δ 2.1%

Data as of January 2017
Categorized by ICANN region

* Denotes a statistically significant change.

Syntax Accuracy

Chart 2 shows that changes in syntax accuracy from Cycle 2 to Cycle 3 were most pronounced in the Africa region, which increased by 2.2%. Overall syntax accuracy across all regions increased from Cycle 3 to Cycle 4 by 1.3%.

Chart 2: Change in Overall Syntax Accuracy for ICANN Regions, ARS Cycles 3 and 4 – 2009 RAA Requirements

Overall

Cycle 3	Cycle 4
78.0%	79.3%

Δ 1.3%*

Europe
Cycle 3 | Cycle 4
74.5% | 74.5%
Δ 0.0%

North America
Cycle 3 | Cycle 4
86.7% | 88.3%
Δ 1.6*

Asia/Australia/ Pacific Islands
Cycle 3 | Cycle 4
67.4% | 68.8%
Δ 1.4%

Latin America/ Caribbean
Cycle 3 | Cycle 4
76.2% | 78.1%
Δ 1.9%

Africa
Cycle 3 | Cycle 4
43.9% | 46.1%
Δ 2.2%
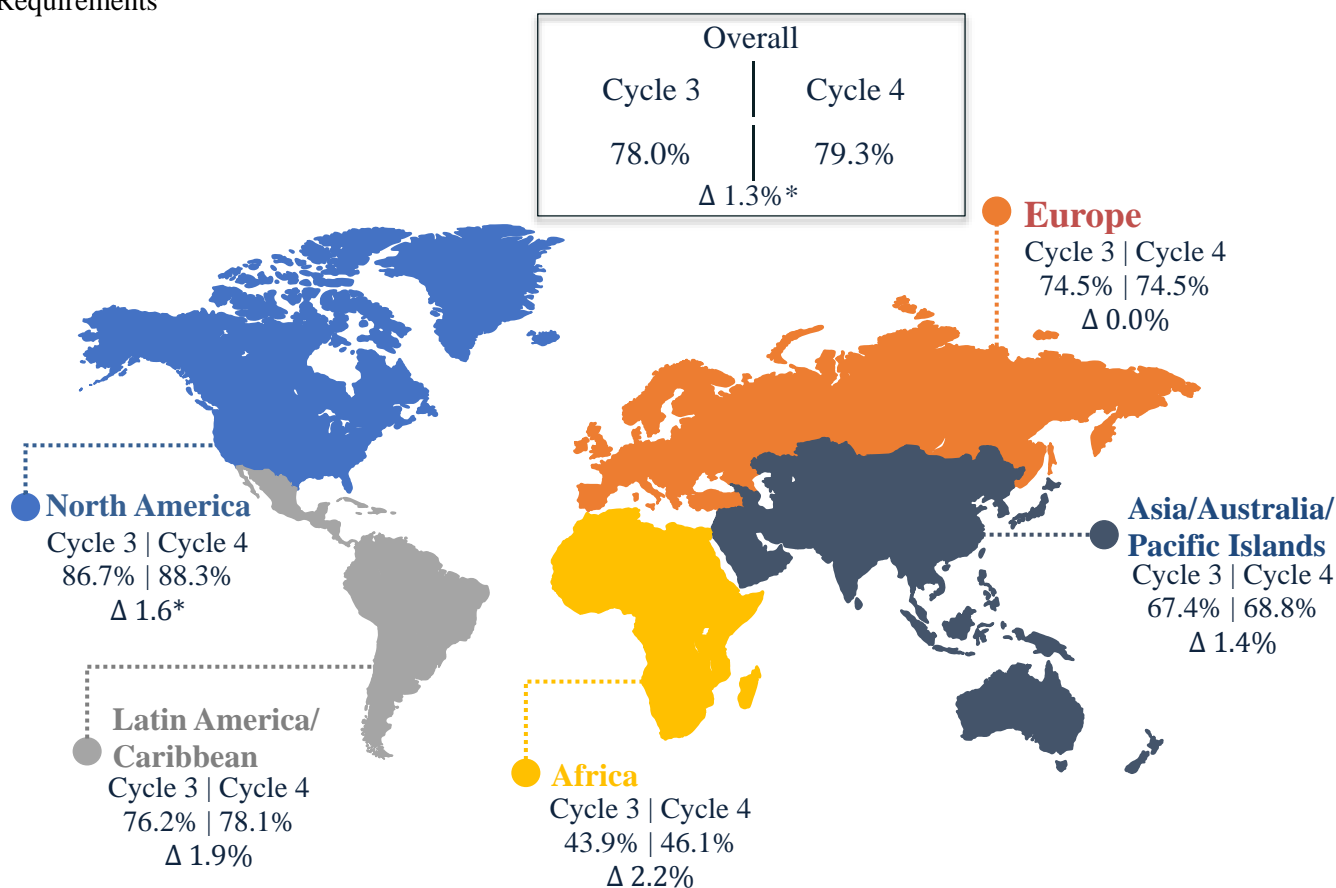
Data as of July 2016
Categorized by ICANN region

* Denotes a statistically significant change.

Reasons for Error by Region

We report here the major reasons for syntax and operability testing errors by region, separated by contact mode (email address, telephone number and postal address). For email addresses and telephone numbers, we report the first test failed. Because postal addresses require multiple fields, multiple errors were possible.

Reasons for Email Syntax and Operability Error by Region – 2009 RAA

The operability errors in Table 19 show that email addresses have two main categories of operability errors: missing/non-verifiable, or an email address that bounces. In every region, email errors were largely due to bounced emails, but when the region was unknown, almost all errors were due to missing or unverifiable information.

Table 19: Reasons for Email Operability Error by Region – 2009 RAA Requirements

Error	Africa	Asia Pacific	Europe	Latin America and Caribbean	North America	Unknown	All Regions
Not Verifiable (or Missing)	0.0%	0.0%	0.6%	16.9%	0.3%	90.9%	5.5%
Email Bounced	100.0%	100.0%	99.4%	83.1%	99.7%	9.1%	94.5%
Overall Accuracy for Region – Email Operability	95.0% ± 1.2%	95.1% ± 0.8%	90.8% ± 1.2%	98.2% ± 0.6%	95.5% ± 0.7%	N/A	94.5% ± 0.4%

Note: This table should be read as follows: Of the errors in X region, Y% were for Z reason (e.g., of the reasons for syntax error among email addresses from Africa, 100% of the errors were due to a non-resolvable address). The "Overall Email Syntax Accuracy for Region" is not a total of the percentages above it, but is included rather to provide additional context for the errors.

The syntax errors in Table 20 show significant variability by region. However, it is important to remember that the actual number of syntax errors for email addresses is very small. Most of the errors are the result of missing email addresses.

Table 20: Reasons for Email Syntax Error by Region – 2009 RAA Requirements

Error	Africa	Asia Pacific	Europe	Latin America and Caribbean	North America	Unknown	All Regions
Missing	0.0%	0.0%	100.0%	95.2%	100.0%	100.0%	96.6%
Characters Not Allowed	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
@ Symbol Missing	0.0%	0.0%	0.0%	1.6%	0.0%	0.0%	1.1%
Not Resolvable	0.0%	0.0%	0.0%	3.2%	0.0%	0.0%	2.3%
Overall Accuracy for Region – Email Syntax	100.0% ± 0.0%	98.7% ± 0.4%	100.0% ± 0.1%	100.0% ± 0.0%	100.0% ± 0.1%	N/A	99.5% ± 0.1%

See note in Table 19 for how to read this table.

Reasons for Telephone Syntax and Operability Error by Region – 2009 RAA

Table 21 shows some regional variation in the distributions of telephone operability error. In every region except Asia-Pacific, the main cause of telephone operability error was an invalid number, and the second most common cause was a disconnected number. In Asia-Pacific these categories were reversed, with disconnected numbers being the main cause of telephone operability error and invalid numbers being the second most common cause of error.

Table 21: Reasons for Telephone Operability Error by Region – 2009 RAA Requirements

Error	Africa	Asia Pacific	Europe	Latin America and Caribbean	North America	Unknown	All Regions
Not Verifiable (or Missing)	0.5%	0.2%	0.4%	1.4%	0.4%	44.4%	1.1%
Number Disconnected	34.5%	51.2%	34.9%	23.5%	42.4%	28.6%	33.2%
Invalid Number	62.0%	46.5%	60.4%	39.2%	55.9%	27.0%	48.9%
Other Not Connected	3.0%	2.1%	4.3%	35.9%	1.3%	0.0%	16.8%
Overall Accuracy for Region – Telephone Operability	55.3% ± 2.8%	45.6% ± 1.8%	65.0% ± 1.9%	74.8% ± 1.9%	84.0% ± 1.3%	N/A	68.9% ± 0.8%

See note in Table 18 for how to read this table.

Table 22 shows that the when the region is unknown, the main cause of telephone syntax errors were due to information that was missing or not allowed. In every region except North America, telephone syntax errors were largely due to the telephone number having an incorrect length, while in the North American region the most common error was a missing country code.

Table 22: Reasons for Telephone Syntax Error by Region – 2009 RAA Requirements

Error	Africa	Asia Pacific	Europe	Latin America and Caribbean	North America	Unknown	All Regions
Incorrect Length	78.0%	67.2%	78.9%	70.1%	38.5%	17.2%	64.9%
Country Code Missing	21.4%	32.5%	20.2%	19.9%	61.2%	34.5%	32.4%
Missing or Not Allowed	0.6%	0.2%	0.9%	10.0%	0.2%	48.3%	2.7%
Overall Accuracy for Region – Telephone Syntax	69.4% ± 2.6%	91.3% ± 1.0%	89.1% ± 1.3%	88.1% ± 1.4%	89.4% ± 1.1%	N/A	89.5% ± 0.6%

See note in Table 18 for how to read this table.

Reasons for Postal Address Error by Region – 2009 RAA
Table 23 shows that the most common postal address operability errors are coded as P1 (probably not deliverable) in all regions except Latin America/Caribbean. When the region was unknown, all postal operability errors were coded as N1 (country unknown).

Table 23: Reasons for Postal Address Operability Error by Region – 2009 RAA Requirements

Error	Africa	Asia Pacific	Europe	Latin America and Caribbean	North America	Unknown	All Regions
P1 Inoperable[23]	85.6%	86.5%	52.1%	36.6%	63.9%	0.0%	42.6%
P2 Inoperable	9.3%	8.1%	18.8%	51.3%	25.0%	0.0%	36.9%
N1 Country Unknown	5.1%	5.4%	29.2%	11.6%	11.1%	100.0%	20.2%
N2 Unverifiable	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.3%
Overall Accuracy for Region – Postal Operability	96.9% ± 1.0%	92.4% ± 1.0%	99.1% ± 0.4%	99.5% ± 0.3%	99.6% ± 0.2%	N/A	97.2% ± 0.3%

See note in Table 18 for how to read this table.

Table 24 shows that across all regions the majority of postal address syntax errors were due to missing address components such as a missing city, missing street name, or a missing state/province.

Table 24: Reasons for Postal Address Syntax Error by Region – 2009 RAA Requirements

Error	Africa	Asia Pacific	Europe	Latin America and Caribbean	North America	Unknown	All Regions
Missing	0.3%	0.0%	0.4%	2.5%	0.4%	28.0%	1.7%
Country Code Missing	0.3%	0.5%	19.6%	0.6%	1.7%	36.0%	4.7%
Street Missing	40.5%	24.3%	23.0%	36.8%	19.0%	0.0%	31.7%
Postal Code Missing or Bad Format	7.8%	51.1%	19.8%	33.9%	31.6%	0.0%	27.3%
City Missing	30.2%	15.8%	36.9%	26.3%	45.5%	36.0%	28.2%
State/Province Missing	21.0%	8.4%	0.3%	0.0%	1.7%	0.0%	6.4%
Overall Accuracy for Region – Postal Syntax	65.9% ± 2.7%	74.0% ± 1.6%	81.7% ± 1.6%	85.6% ± 1.6%	98.4% ± 0.4%	N/A	87.4% ± 0.6%

See note in Table 18 for how to read this table.

---

[23] For a description of the reasons for postal address operability errors, *see* the section of the Main Findings titled Reasons for Error - 2009 RAA Operability Requirements, and locate the subsection for Postal Address errors.

Comparisons between Cycles

Statistical comparisons of syntax and operability accuracy can be made between Cycle 3 and Cycle 4 findings. We present the comparisons below for informational purposes, and to explore what general observations can be made about the relationship between syntax and operability accuracy.

Comparisons of Accuracy between Cycles – 2009 RAA Operability Requirements

Change in Overall Accuracy
Table 25 and Graph 16 show that Cycle 4 had higher accuracy rates for email and postal address, but lower telephone accuracy rates than Cycle 3. The rate of records with all modes accurate increased slightly between Cycle 3 and Cycle 4.

Graph 16: Overall Accuracy by Cycle – 2009 RAA Operability Requirements
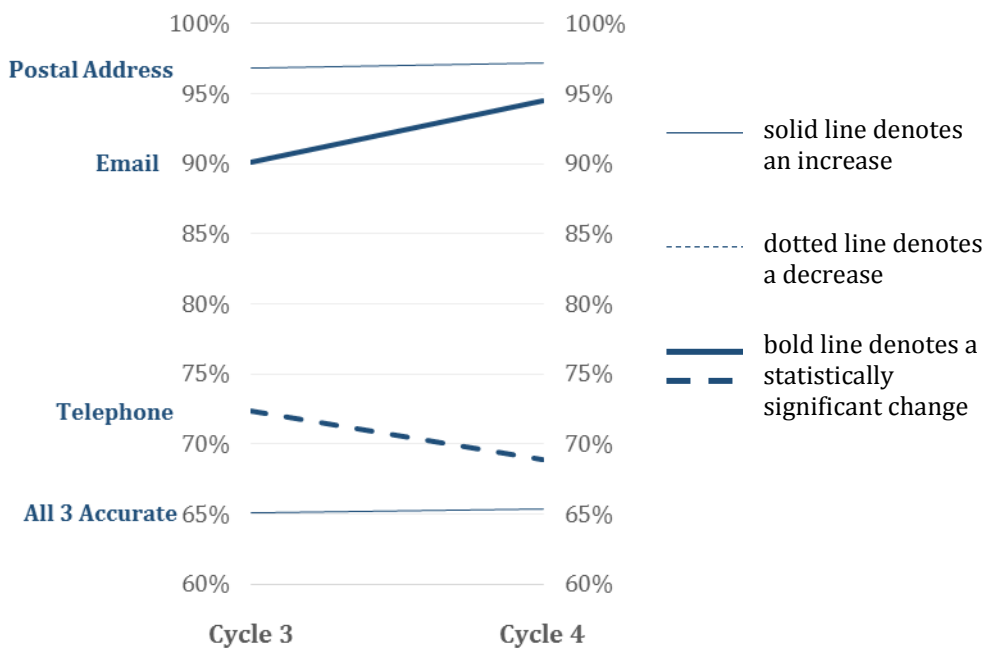
Table 25: Overall Accuracy by Cycle – 2009 RAA Operability Requirements

	Email	Telephone	Postal Address	All Modes Accurate
Cycle 1	87.1% ± 0.7%	74.0% ± 0.9%	98.0% ± 0.3%	64.7% ± 0.9%
Cycle 2	91.4% ± 0.5%	76.0% ± 0.8%	97.6% ± 0.3%	70.2% ± 0.8%
Cycle 3	90.1% ± 0.5%	72.4% ± 0.8%	96.8% ± 0.3%	65.1% ± 0.9%
Cycle 4	94.5% ± 0.4%	68.9% ± 0.8%	97.2% ± 0.3%	65.4% ± 0.9%
Change (C4–C3)	**4.4% ± 0.7%**	**-3.6% ± 1.2%**	**0.4% ± 0.4%**	**0.2% ± 1.2%**

For Prior gTLDs, we also see an increase in accuracy for email and postal address, but a decrease for telephone accuracy. Similarly, the rate of records with all modes accurate increased slightly between Cycle 3 and Cycle 4.

Graph 17: Prior gTLDs Accuracy by Cycle – 2009 RAA Operability Requirements
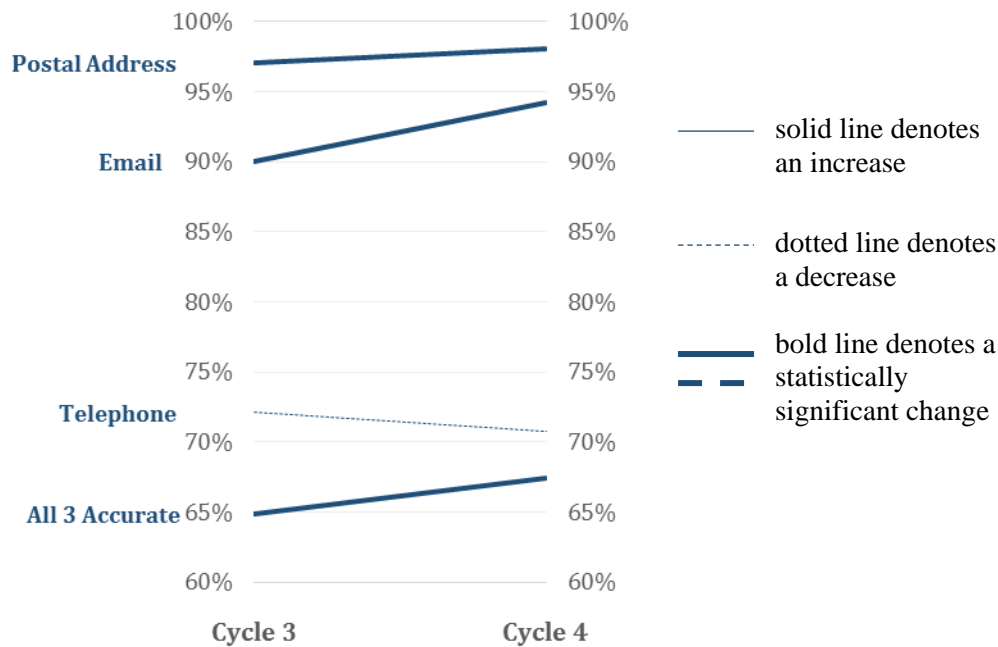
Table 26: Prior gTLDs Accuracy by Cycle – 2009 RAA Operability Requirements

	Email	Telephone	Postal Address	All Modes Accurate
Cycle 1	86.9% ± 0.7%	74.3% ± 1.0%	98.0% ± 0.3%	64.9% ± 1.0%
Cycle 2	91.2% ± 0.6%	76.2% ± 0.8%	97.7% ± 0.3%	70.3% ± 0.9%
Cycle 3	90.0% ± 0.6%	72.1% ± 0.9%	97.0% ± 0.3%	64.9% ± 1.0%
Cycle 4	94.2% ± 0.5%	70.8% ± 0.9%	98.0% ± 0.3%	67.4% ± 1.0%
Change (C4–C3)	4.2% ± 0.8%	-1.3% ± 1.3%	1.0% ± 0.4%	2.6% ± 1.4%

Table 27 and Graph 18 show patterns for the New gTLDs. Email accuracy increased between Cycles 3 and 4, while, telephone accuracy increases and postal accuracy decreased.

Graph 18: New gTLDs Accuracy by Cycle – 2009 RAA Operability Requirements
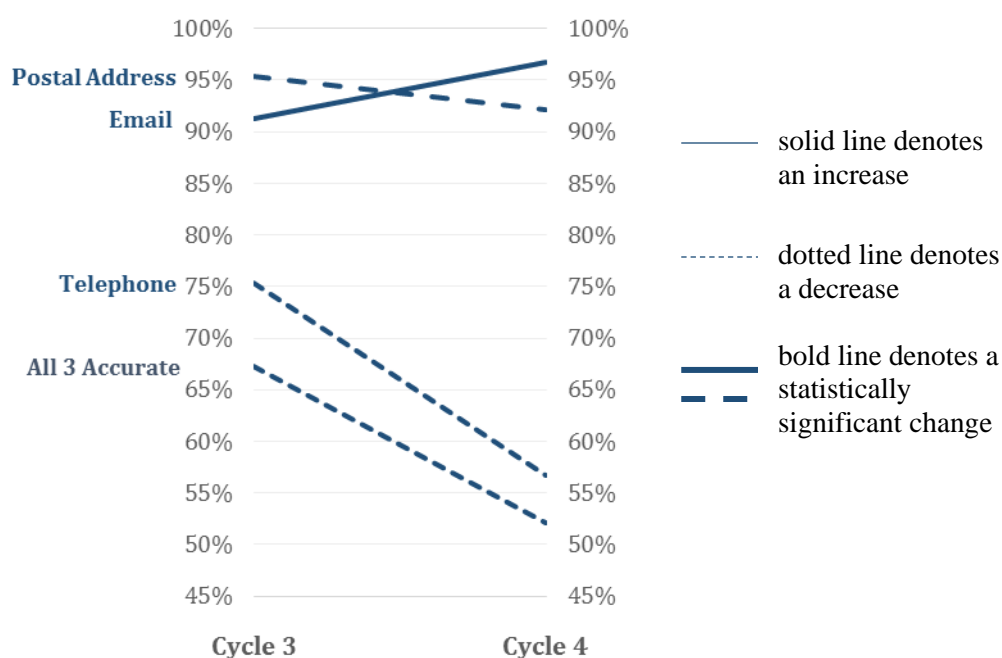
Table 27: New gTLDs Accuracy by Cycle – 2009 RAA Operability Requirements

	Email	Telephone	Postal Address	All Modes Accurate
Cycle 1	92.0% ± 1.2%	66.7% ± 2.1%	97.8% ± 0.7%	61.3% ± 2.2%
Cycle 2	93.0% ± 1.0%	73.7% ± 1.8%	96.7% ± 0.7%	68.3% ± 1.9%
Cycle 3	91.2% ± 1.1%	75.3% ± 1.7%	95.4% ± 0.8%	67.3% ± 1.9%
Cycle 4	96.7% ± 0.7%	56.7% ± 2.0%	92.1% ± 1.1%	52.1% ± 2.0%
Change (C4–C3)	5.5% ± 1.3%	-18.6% ± 2.6%	-3.3% ± 1.4%	-15.1% ± 2.7%

Comparisons of Accuracy Between Cycles – 2009 RAA Syntax Requirements
In Main Findings, we presented syntax accuracy of records against 2009 RAA Requirements for Cycle 4. Here, we compare the Cycle 4 syntax accuracy results to the results from Cycle 4.

Change in Overall Accuracy
Table 28 and Graph 19 show that email and postal address syntax accuracy rates were similar across Cycles 3 and 4, but that telephone accuracy and overall accuracy was higher in Cycle 4.

Graph 19: Overall Accuracy by Cycle – 2009 RAA Syntax Requirements
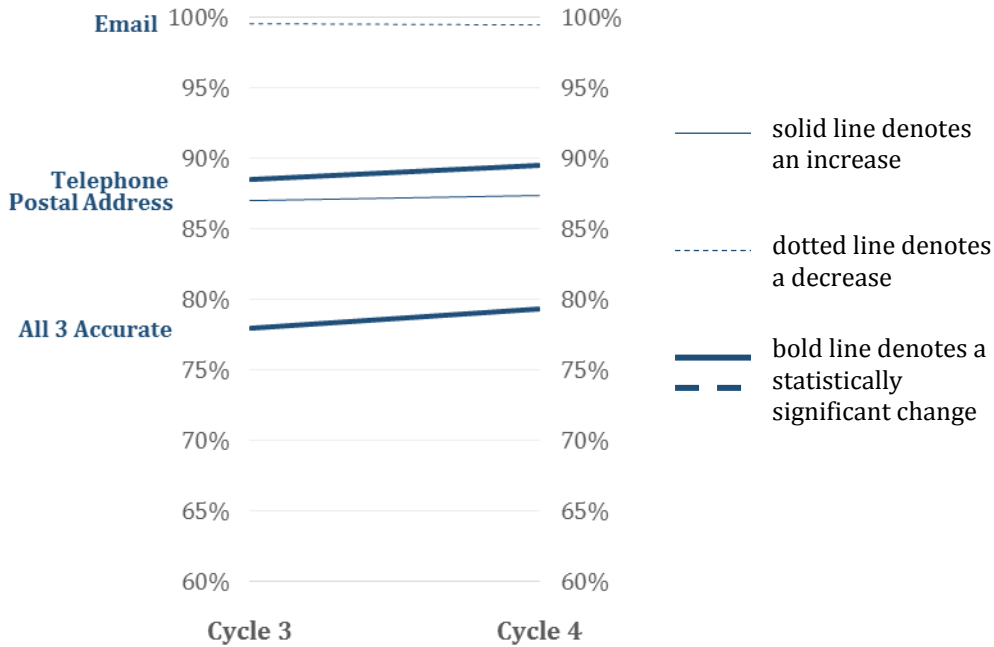
Table 28: Overall Accuracy by Cycle – 2009 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Modes Accurate
Cycle 1	99.1% ± 0.2%	83.3% ± 0.7%	86.5% ± 0.7%	73.1% ± 0.9%
Cycle 2	99.2% ± 0.2%	85.3% ± 0.6%	86.3% ± 0.6%	75.3% ± 0.8%
Cycle 3	99.6% ± 0.1%	88.5% ± 0.6%	87.0% ± 0.6%	78.0% ± 0.7%
Cycle 4	99.5% ± 0.1%	89.5% ± 0.6%	87.4% ± 0.6%	79.3% ± 0.7%
Change (C4–C3)	-0.1% ± 0.2%	1.0% ± 0.8%	0.4% ± 0.9%	1.3% ± 1.0%

Change in Prior gTLDs
Since most of the domains in the domain universe are from Prior gTLDs, the patterns for the Prior gTLDs seen in Table 29 and Graph 20 are similar to the pattern for overall accuracy rates that appear above in Table 28. That is, the data for Prior gTLDs shows increases in accuracy for telephone numbers, postal addresses, and the rate of All 3 accurate, and a slight decrease in Cycle 4 email addresses.

Graph 20: Prior gTLDs Accuracy by Cycle – 2009 RAA Requirements
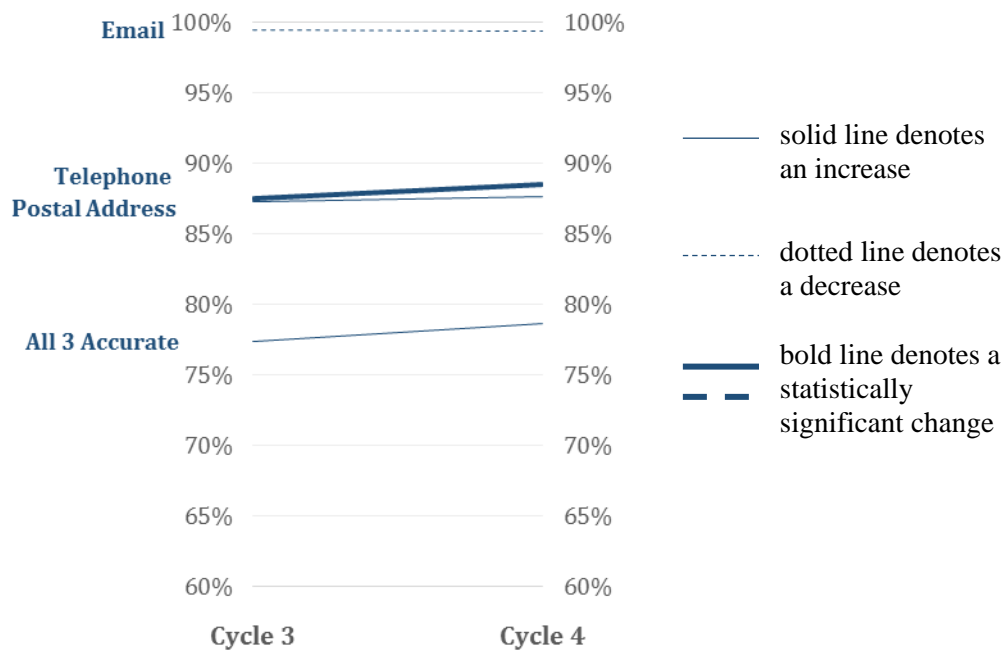
Table 29: Prior gTLDs Accuracy by Cycle – 2009 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Modes Accurate
Cycle 1	99.1% ± 0.2%	83.0% ± 0.8%	86.6% ± 0.7%	72.9% ± 1.0%
Cycle 2	99.1% ± 0.2%	84.7% ± 0.7%	86.4% ± 0.7%	74.8% ± 0.9%
Cycle 3	99.5% ± 0.1%	87.5% ± 0.7%	87.3% ± 0.7%	77.4% ± 0.8%
Cycle 4	99.4% ± 0.2%	88.5% ± 0.7%	87.7% ± 0.7%	78.7% ± 0.8%
Change (C4–C3)	-0.2% ± 0.2%	1.0% ± 0.9%	0.4% ± 1.0%	1.2% ± 1.2%

Change in New gTLDs

In Table 30 and Graph 21, New gTLDs showed a slight increase in syntax accuracy for All 3 modes and for postal addresses. Accuracy rates for email and telephone showed no change between Cycles 3 and 4.[24]

Graph 21: New gTLDs Accuracy by Cycle – 2009 RAA Syntax Requirements
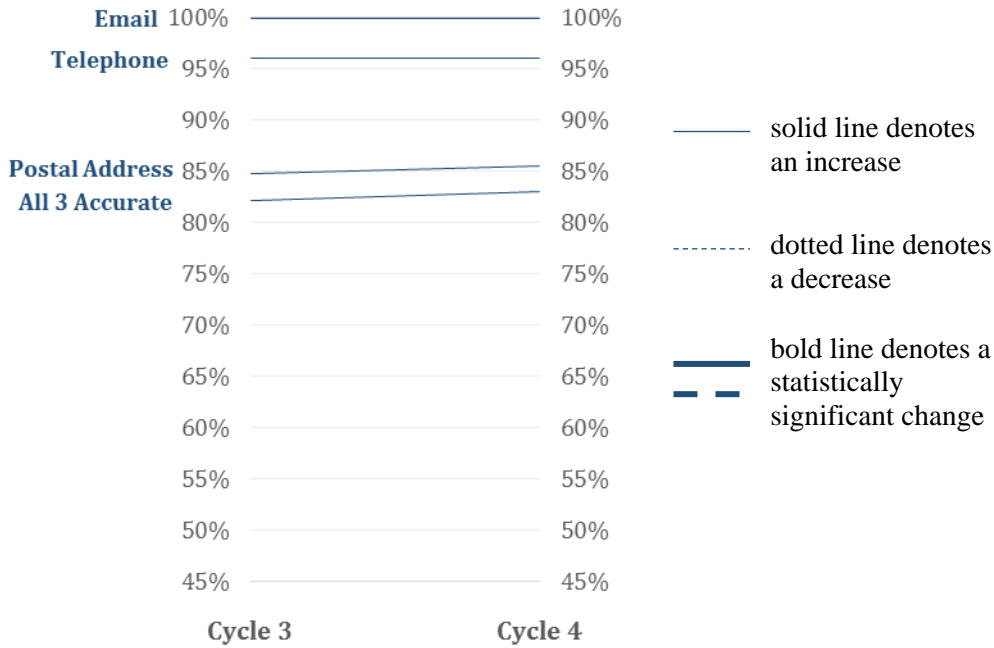
Table 30: New gTLDs Accuracy by Cycle – 2009 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Modes Accurate
Cycle 1	99.9% ± 0.1%	89.4% ± 1.4%	84.7% ± 1.6%	78.1% ± 1.9%
Cycle 2	99.9% ± 0.1%	93.9% ± 1.0%	85.4% ± 1.4%	82.2% ± 1.6%
Cycle 3	99.9% ± 0.1%	96.0% ± 0.8%	84.8% ± 1.4%	82.1% ± 1.5%
Cycle 4	99.9% ± 0.1%	96.0% ± 0.8%	85.5% ± 1.4%	83.0% ± 1.5%
Change (C4–C3)	0.0% ± 0.1%	-0.0% ± 1.1%	0.7% ± 2.0%	0.9% ± 2.1%

---

[24] *See* Appendix B report for more information on results, especially by region.

Appendix A: Accuracy Testing Criteria

ICANN has attempted to align the accuracy testing criteria with the contractual obligations of the Registrar Accreditation Agreements (RAA) and applicable Internet Engineering Task Force Requests for Comments. Currently, there are two predominant versions of the RAA in use in the gTLD space, the 2009 version and the 2013 version. Each version of the RAA has requirements for presence, format and operability of specific elements of contact information for the registrant, the technical contact and the administrative contact for each domain name. Each record (i.e., domain name) will be assessed against the criteria of the registrar's agreement at the time the domain was created. ICANN will account for "grandfathered" records, which are those records that were created prior to the effective date of the 2013 RAA for that Registrar. For example:

Record Created	05 Feb 2013
Registrar's 2013 RAA Effective Date	01 Jan 2014
Validation criteria to be in testing	2009 RAA Requirements

Record Created	20 Apr 2014
Registrar's 2013 RAA Effective Date	01 Jan 2014
Validation criteria to be in testing	2013 RAA Requirements

You can find an overview of criteria for syntax and operability accuracy testing for email addresses, telephone numbers and postal addresses at https://whois.icann.org/en/whoisars-validation. The criteria listed there were used by the validation vendors supporting the WHOIS ARS project.

Appendix B: Additional Analyses - Accuracy to 2009 RAA Requirements

Commonality of Contact Data

Table B1 shows that when two of the three contact types are identical (and one is different), it is most likely to be the registrant and administrative contact that match, and least likely to be the registrant and technical contact that match.

Table B1: Frequency of Common Contact Information Across Contact Type and Mode

Commonality	Email	Telephone	Postal Address
All Three Exactly the Same	80.4% ± 0.7%	83.4% ± 0.7%	80.9% ± 0.7%
Registrant=Administrative	11.2% ± 0.6%	10.9% ± 0.6%	10.6% ± 0.6%
Registrant=Technical	0.3% ± 0.1%	0.3% ± 0.1%	0.3% ± 0.1%
Administrative=Technical	6.2% ± 0.4%	4.4% ± 0.4%	6.3% ± 0.4%
All Three Different	1.9% ± 0.3%	1.0% ± 0.2%	1.9% ± 0.2%

2009 RAA Reasons for Syntax Error in Cycle 3 and Cycle 4

The Main Findings section contains the ARS Cycle 4 results, but below we also present results from ARS Cycle 4 results.

Table B2: Total Email Address Errors by Contact Type (2009 RAA) – Cycle 3

	Registrant	Administrative	Technical	Total
Passed All Accuracy Tests	11,997	11,963	11,963	35,923
Missing*	96*	34	35	69
@ Symbol Missing	1	1	1	3
Not Resolvable	2	2	1	5
Total	12,000	12,000	12,000	36,000

* Registrant email is not required under the 2009 RAA.

Table B3: Total Email Address Errors by Contact Type (2009 RAA) – Cycle 4

	Registrant	Administrative	Technical	Total
Passed All Accuracy Tests	11,500	11,460	11,459	34,419
Missing*	79*	41	43	84
@ Symbol Missing	1	0	0	1
Not Resolvable	1	1	0	2
Total	11,502	11,502	11,502	34,506

* Registrant email is not required under the 2009 RAA.

Table B4: Total Telephone Number Errors by Contact Type (2009 RAA) – Cycle 3

	Registrant	Administrative	Technical	Total
Passed All Accuracy Tests	10,481	10,412	10,488	31,381
Missing*	110*	51	55	106
Country Code Missing	471	485	462	1,418
Incorrect Length	1,047	1,051	994	3,092
Characters Not Allowed	1	1	1	3
Total	12,000	12,000	12,000	36,000

* Registrant telephone number is not required under the 2009 RAA.

Table B5: Total Telephone Number Errors by Contact Type (2009 RAA) – Cycle 4

	Registrant	Administrative	Technical	Total
Passed All Accuracy Tests	10,179	10,104	10,149	30,432
Missing*	91*	52	55	107
Country Code Missing	439	449	433	1,321
Incorrect Length	883	896	864	2,643
Characters Not Allowed	1	1	1	3
Total	11,502	11,502	11,502	34,506

* Registrant telephone number is not required under the 2009 RAA.

Table B6: Total Postal Address Errors by Contact Type (2009 RAA) – Cycle 3

	Registrant	Administrative	Technical	Total
Passed All Accuracy Tests	10,065	10,005	10,134	30,204
Missing	21	40	41	102
Country Code Missing	35	31	29	95
Country Not Identifiable	58	64	68	190
Postal Code Missing	699	754	709	2,162
Postal Code Format	30	23	23	76
State/Province Missing	141	138	119	398
City Missing	640	654	613	1,907
Street Missing	767	755	697	2,219
TOTAL	12,000	12,000	12,000	36,000
Total Errors	2,391	2,459	2,299	7,149
Total Domains with Errors	1,935	1,995	1,866	5,796

Table B7: Total Postal Address Errors by Contact Type (2009 RAA) – Cycle 4

	Registrant	Administrative	Technical	Total
Passed All Accuracy Tests	7,245	7,234	7,579	22,058
Missing	41	54	63	158
Country Code Missing	59	53	52	164
Country Not Identifiable	23	27	30	80
Postal Code Missing	853	901	768	2,522
Postal Code Format	28	32	30	90
State/Province Missing	1,105	1,114	949	3,168
City Missing	1,076	1,064	938	3,078
Street Missing	690	669	574	1,933
TOTAL	10,000	10,000	10,000	30,000
Total Errors	3,875	3,914	3,404	11,193
Total Domains with Errors	2,755	2,766	2,421	7,942

Additional Comparisons of Syntax Accuracy between Cycles (by Region and RAA Group)

Table B8: African Domains Accuracy by Cycle – 2009 RAA Syntax Requirements

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 3	100.0% ± 0.0%	66.8% ± 2.6%	65.8% ± 2.6%	43.9% ± 2.7%
Cycle 4	100.0% ± 0.0%	69.4% ± 2.6%	65.9% ± 2.7%	46.1% ± 2.8%
Change (C4–C3)	0.0% ± 0.0%	2.6% ± 3.7%	0.1% ± 3.7%	2.2% ± 3.9%

Table B9: Asia-Pacific Domains Accuracy by Cycle – 2009 RAA Syntax Requirements

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 3	99.2% ± 0.3%	90.8% ± 1.0%	73.0% ± 1.6%	67.4% ± 1.7%
Cycle 4	98.7% ± 0.4%	91.3% ± 1.0%	74.0% ± 1.6%	68.8% ± 1.7%
Change (C4–C3)	-0.5% ± 0.5%	0.5% ± 1.5%	1.0% ± 2.3%	1.3% ± 2.4%

Table B10: European Domains Accuracy by Cycle – 2009 RAA Syntax Requirements

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 3	99.9% ± 0.1%	88.9% ± 1.3%	82.2% ± 1.6%	74.5% ± 1.8%
Cycle 4	100.0% ± 0.1%	89.1% ± 1.3%	81.7% ± 1.6%	74.5% ± 1.8%
Change (C4–C3)	0.1% ± 0.2%	0.2% ± 1.8%	-0.5% ± 2.2%	0.0% ± 2.5%

Table B11: Latin/Caribbean Domains Accuracy by Cycle – 2009 RAA Syntax Requirements

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 3	100.0% ± 0.0%	84.5% ± 1.6%	85.2% ± 1.6%	76.2% ± 1.9%
Cycle 4	100.0% ± 0.0%	88.1% ± 1.4%	85.6% ± 1.6%	78.1% ± 1.8%
Change (C4–C3)	0.0% ± 0.0%	3.6% ± 2.2%	0.4% ± 2.2%	1.9% ± 2.7%

Table B12: North American Domains Accuracy by Cycle – 2009 RAA Syntax Requirements

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 3	100.0% ± 0.0%	88.1% ± 1.1%	98.2% ± 0.4%	86.7% ± 1.1%
Cycle 4	100.0% ± 0.1%	89.4% ± 1.1%	98.4% ± 0.4%	88.3% ± 1.1%
Change (C4–C3)	-0.0% ± 0.1%	1.3% ± 1.5%	0.2% ± 0.6%	1.6% ± 1.6%

Table B13: 2009 RAA Domains Accuracy by Cycle – 2009 RAA Syntax Requirements

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 3	99.6% ± 0.3%	87.4% ± 1.7%	84.1% ± 1.9%	75.0% ± 2.2%
Cycle 4	100.0% ± 0.0%	89.0% ± 3.2%	85.2% ± 3.6%	79.7% ± 4.1%
Change (C4–C3)	0.4% ± 0.3%	1.7% ± 3.6%	1.1% ± 4.1%	4.7% ± 4.7%

Table B14: 2013 RAA GF Domains Accuracy by Cycle – 2009 RAA Syntax Requirements

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 3	99.5% ± 0.2%	83.8% ± 1.0%	88.3% ± 0.9%	75.0% ± 1.2%
Cycle 4	99.4% ± 0.2%	84.4% ± 1.0%	88.7% ± 0.9%	76.0% ± 1.2%
Change (C4–C3)	-0.0% ± 0.3%	0.7% ± 1.5%	0.4% ± 1.3%	1.0% ± 1.7%

Table B15: 2013 RAA NGF Domains Accuracy by Cycle – 2009 RAA Syntax Requirements

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 3	99.7% ± 0.1%	92.7% ± 0.7%	85.8% ± 0.9%	80.7% ± 1.0%
Cycle 4	99.5% ± 0.2%	93.4% ± 0.6%	86.4% ± 0.9%	81.8% ± 1.0%
Change (C4–C3)	-0.2% ± 0.2%	0.7% ± 0.9%	0.5% ± 1.2%	1.1% ± 1.4%

Appendix C: Additional Analyses – Accuracy to 2013 RAA Requirements

Domains registered in the 2013 RAA now represent nearly 56 percent of all domains. In this appendix, we look at accuracy rates based on 2013 RAA requirements. As stated previously in this report, the 2009 RAA was chosen as a baseline against which all 11,502 of the analyzed subsample records were analyzed. The 2013 RAA requirements are stricter than the 2009 requirements, building from, and thus encompassing, the 2009 requirements. For example, the 2009 RAA requires an address for each contact, while the 2013 RAA requires the address for each contact to be formatted per the applicable Universal Postal Union S42 template for a particular country. Any contact field that meets the 2013 RAA requirements would also meet 2009 requirements, and for this reason, the 2009 requirements serve as a baseline against which all records can be compared.

Graph C1: Overall Accuracy – 2013 RAA Syntax Requirements
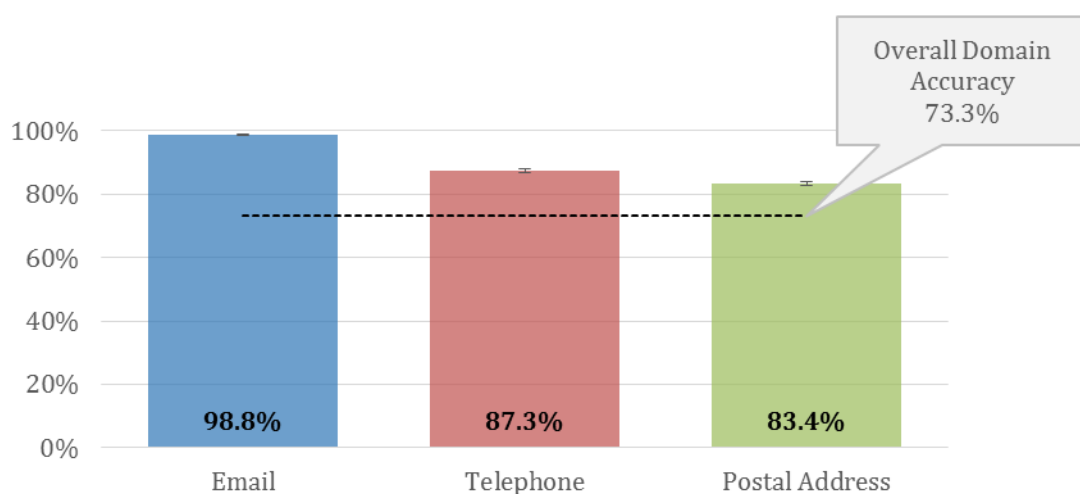
Table C1: Overall Accuracy by Contact Type and Mode – 2013 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Three Accurate
Registrant	99.1% ± 0.2%	88.5% ± 0.6%	85.3% ± 0.6%	**75.6% ± 0.8%**
Administrative	99.5% ± 0.1%	88.4% ± 0.6%	84.4% ± 0.7%	**75.5% ± 0.8%**
Technical	99.5% ± 0.1%	88.5% ± 0.6%	85.2% ± 0.6%	**76.4% ± 0.8%**
Overall	**98.8% ± 0.2%**	**87.3% ± 0.6%**	**83.4% ± 0.7%**	**73.3% ± 0.8%**

Subgroup Accuracy – 2013 RAA Syntax Requirements

Next, we look at subgroups in Cycle 4, starting with Prior vs. New gTLDs. Since the numbers for registrant, administrative and technical contacts are so similar (since they have the same information more than three-quarters of the time), we present subgroup accuracy for the registrant, administrative and technical contacts that all passed the accuracy tests.

Subgroup 1: Prior vs. New gTLD

Graph C2a: Accuracy by gTLD Type – 2013 RAA Syntax Requirements
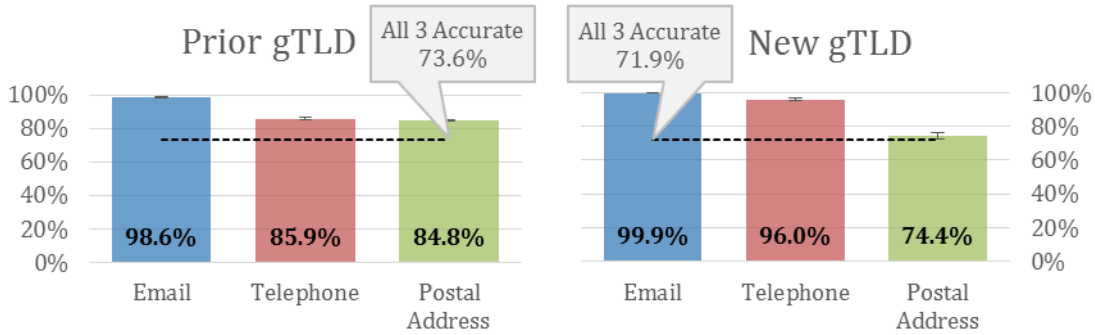
Table C2a shows that New gTLDs had higher email and telephone syntax accuracy, but lower postal address syntax accuracy.

Table C2a. Accuracy by gTLD Type – 2013 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Three Accurate
Prior gTLD	98.6% ± 0.2%	85.9% ± 0.7%	84.8% ± 0.7%	**73.6% ± 0.9%**
New gTLD	99.9% ± 0.1%	96.0% ± 0.8%	74.4% ± 1.7%	**71.9% ± 1.8%**
Overall	**98.8% ± 0.2%**	**87.3% ± 0.6%**	**83.4% ± 0.7%**	**73.3% ± 0.8%**

Graph C2b: Accuracy by gTLD Type, with Prior gTLD Stratified by RAA Type – 2013 RAA Syntax Requirements
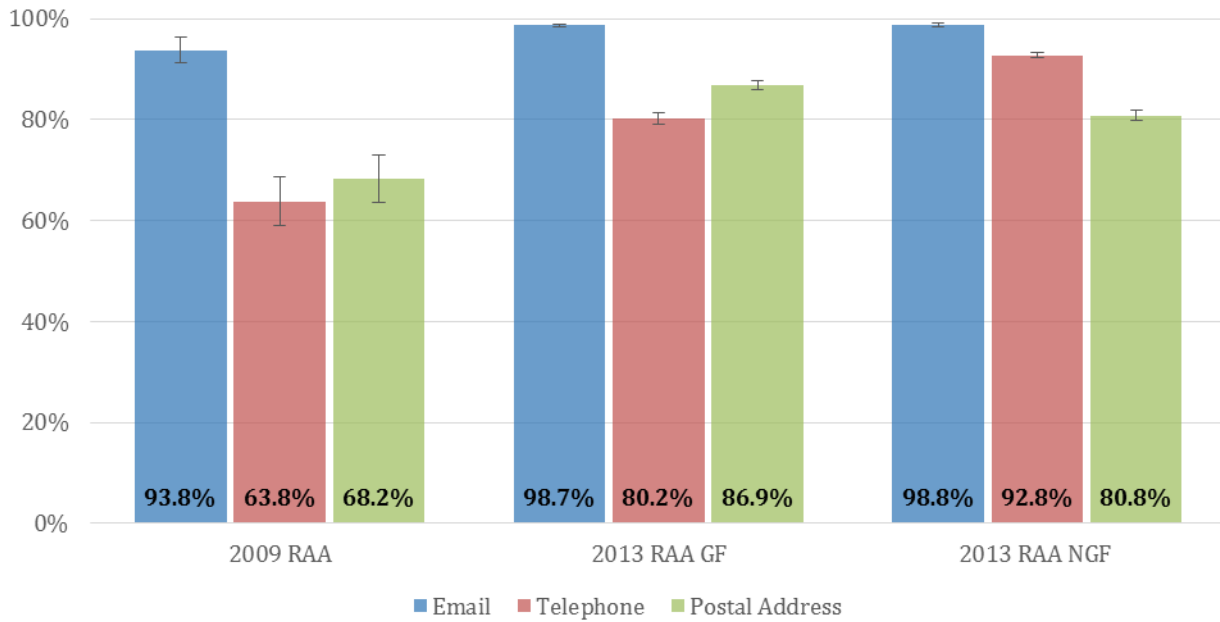
Table C2b: Accuracy by gTLD Type, with Prior gTLD Stratified by RAA Type – 2013 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Three Accurate
Prior gTLD	98.5% ± 0.2%	85.9% ± 0.7%	84.8% ± 0.7%	73.5% ± 0.9%
2009 RAA	*93.8% ± 2.5%*	*63.8% ± 4.9%*	*68.2% ± 4.7%*	*53.7% ± 5.1%*
2013GF RAA	*98.7% ± 0.3%*	*80.2% ± 1.1%*	*86.9% ± 0.9%*	*70.7% ± 1.3%*
2013NGF RAA	*98.5% ± 0.4%*	*91.8% ± 0.9%*	*82.8% ± 1.2%*	*76.5% ± 1.3%*
New gTLD*	99.9% ± 0.1%	96.0% ± 0.8%	74.4% ± 1.7%	71.9% ± 1.8%
Overall	**98.7% ± 0.2%**	**87.2% ± 0.6%**	**83.4% ± 0.7%**	**73.3% ± 0.8%**

Subgroup 2: ICANN Region

Next, we look at accuracy by ICANN region. Again, we present subgroup accuracy for the registrant, administrative and technical contacts that all passed the accuracy tests.

Graph C3   : Accuracy by ICANN Region – 2013 RAA Syntax Requirements
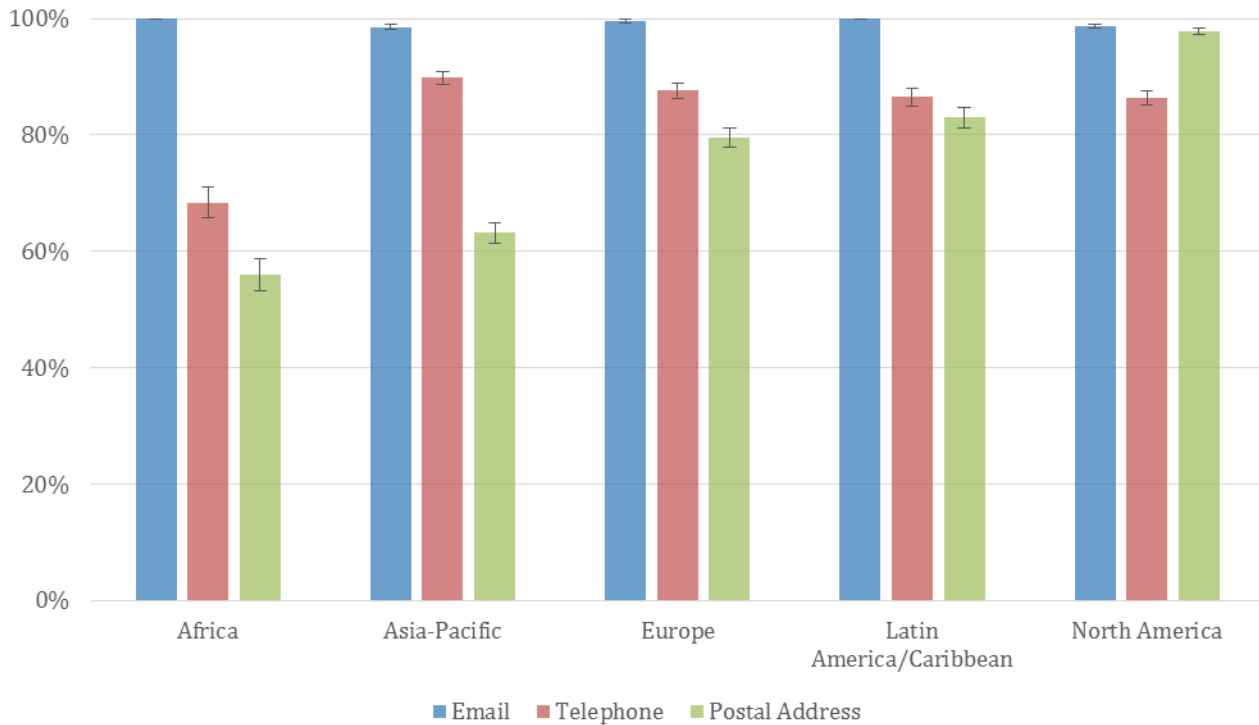
Table C3: Accuracy by ICANN Region – 2013 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Three Accurate
Africa	100.0% ± 0.0%	68.4% ± 2.6%	56.0% ± 2.8%	**38.3% ± 2.7%**
Asia-Pacific	98.6% ± 0.4%	89.8% ± 1.1%	63.2% ± 1.8%	**57.7% ± 1.8%**
Europe	99.6% ± 0.3%	87.6% ± 1.3%	79.5% ± 1.6%	**71.8% ± 1.8%**
Latin America/Caribbean	100.0% ± 0.0%	86.5% ± 1.5%	83.0% ± 1.7%	**75.0% ± 1.9%**
North America	98.7% ± 0.4%	86.4% ± 1.2%	97.8% ± 0.5%	**84.0% ± 1.3%**
Overall	**98.8% ± 0.2%**	**87.3% ± 0.6%**	**83.4% ± 0.7%**	**73.3% ± 0.8%**

Subgroup: RAA Status
Finally, we look at accuracy by RAA status. Only the 2013 RAA NGF group is required to meet the standards of the 2013 RAA, so we should expect that this group has the highest overall accuracy.

Graph C4: Accuracy by RAA Status – 2013 RAA Syntax Requirements
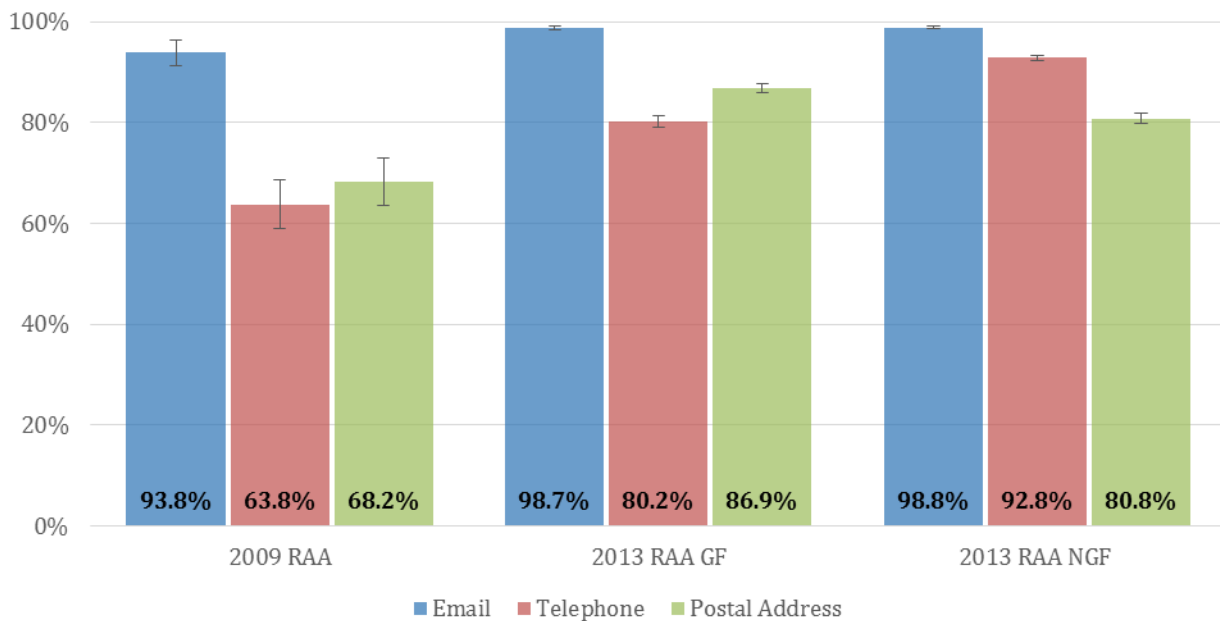
Table C4: Accuracy by RAA Status – 2013 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Three Accurate
2009 RAA	93.8% ± 2.5%	63.8% ± 4.9%	68.2% ± 4.7%	**53.7% ± 5.1%**
2013 RAA GF	98.7% ± 0.3%	80.2% ± 1.1%	86.9% ± 0.9%	**70.7% ± 1.3%**
2013 RAA NGF	98.8% ± 0.3%	92.8% ± 0.6%	80.8% ± 1.0%	**75.4% ± 1.1%**
Overall	**98.8% ± 0.2%**	**87.3% ± 0.6%**	**83.4% ± 0.7%**	**73.3% ± 0.8%**

Comparisons between Cycles – 2013 RAA Syntax Requirements

Above, we presented the syntax accuracy to 2013 RAA requirements for Cycle 4. Here, we compare the Cycle 3 results to those from Cycle 4 for the 6,224 domains required to conform to these requirements.

Overall Accuracy

Table C5: Overall Accuracy by Cycle – 2013 RAA Syntax Requirements

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 3	99.3% ± 0.2%	92.2% ± 0.7%	79.4% ± 1.0%	73.8% ± 1.1%
Cycle 4	98.8% ± 0.3%	92.8% ± 0.6%	80.8% ± 1.0%	75.4% ± 1.1%
Change (C4–C3)	-0.5% ± 0.3%	0.6% ± 0.9%	1.4% ± 1.4%	1.7% ± 1.6%

Prior vs. New gTLDs

Table C6: Prior gTLDs Accuracy by Cycle – 2013 RAA Syntax Requirements

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 3	99.1% ± 0.3%	91.1% ± 0.9%	80.7% ± 1.3%	74.3% ± 1.5%
Cycle 4	98.5% ± 0.4%	91.8% ± 0.9%	82.8% ± 1.2%	76.5% ± 1.3%
Change (C4–C3)	-0.6% ± 0.5%	0.7% ± 1.3%	2.1% ± 1.8%	2.3% ± 2.0%

Table C7: New gTLDs Accuracy by Cycle – 2013 RAA Syntax Requirements

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 3	99.9% ± 0.1%	96.0% ± 0.8%	74.7% ± 1.8%	72.0% ± 1.8%
Cycle 4	99.9% ± 0.1%	96.0% ± 0.8%	74.4% ± 1.7%	71.9% ± 1.8%
Change (C4–C3)	0.0% ± 0.1%	0.1% ± 1.1%	-0.4% ± 2.5%	-0.1% ± 2.5%

ICANN Regions

Table C8: African Domains Accuracy by Cycle – 2013 RAA Syntax Requirements

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 3	100.0% ± 0.0%	73.7% ± 3.1%	53.3% ± 3.5%	40.3% ± 3.4%
Cycle 4	100.0% ± 0.0%	72.5% ± 3.1%	53.8% ± 3.5%	39.6% ± 3.4%
Change (C4–C3)	0.0% ± 0.0%	-1.2% ± 4.4%	0.5% ± 4.9%	-0.7% ± 4.8%

Table C9: Asia-Pacific Domains Accuracy to 2013 RAA Syntax Requirements by Cycle

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 3	99.5% ± 0.3%	93.3% ± 1.2%	62.0% ± 2.3%	58.5% ± 2.3%
Cycle 4	98.9% ± 0.5%	92.9% ± 1.2%	63.7% ± 2.2%	60.1% ± 2.2%
Change (C4 - C3)	-0.5% ± 0.6%	-0.4% ± 1.7%	1.6% ± 3.2%	1.7% ± 3.2%

Table C10: European Domains Accuracy to 2013 RAA Syntax Requirements by Cycle

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 3	100.0% ± 0.0%	91.6% ± 1.7%	78.7% ± 2.5%	74.2% ± 2.7%
Cycle 4	99.9% ± 0.2%	91.7% ± 1.6%	78.9% ± 2.3%	74.3% ± 2.5%
Change (C4–C3)	-0.1% ± 0.2%	0.1% ± 2.3%	0.2% ± 3.4%	0.1% ± 3.7%

Table C11: Latin/Caribbean Domains Accuracy to 2013 RAA Syntax Requirements by Cycle

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 3	100.0% ± 0.0%	89.8% ± 2.0%	87.4% ± 2.2%	81.6% ± 2.5%
Cycle 4	100.0% ± 0.0%	93.5% ± 1.6%	87.9% ± 2.1%	83.1% ± 2.4%
Change (C4–C3)	0.0% ± 0.0%	3.6% ± 2.6%	0.4% ± 3.0%	1.4% ± 3.5%

Table C12: North American Domains Accuracy to 2013 RAA Syntax Requirements by Cycle

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 3	98.9% ± 0.6%	92.4% ± 1.4%	96.8% ± 1.0%	88.8% ± 1.7%
Cycle 4	98.4% ± 0.7%	93.8% ± 1.2%	97.8% ± 0.8%	90.5% ± 1.5%
Change (C4–C3)	-0.5% ± 0.9%	1.3% ± 1.9%	1.0% ± 1.2%	1.6% ± 2.3%

RAA Status

Finally, Tables C13 through C15 show the changes from Cycle 3 to Cycle 4 by contact mode and RAA group.

Table C13: 2009 RAA Domains Accuracy to 2013 RAA Syntax Requirements by Cycle

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 3	97.0% ± 0.9%	78.5% ± 2.1%	76.9% ± 2.2%	63.8% ± 2.5%
Cycle 4	93.8% ± 2.5%	63.8% ± 4.9%	68.2% ± 4.7%	53.7% ± 5.1%
Change (C4–C3)	-3.2% ± 2.6%	-14.7% ± 5.3%	-8.7% ± 5.2%	-10.1% ± 5.7%

Table C14: 2013 RAA GF Domains Accuracy to 2013 RAA Syntax Requirements by Cycle

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 3	98.5% ± 0.3%	80.1% ± 1.1%	82.6% ± 1.1%	66.5% ± 1.3%
Cycle 4	98.7% ± 0.3%	80.2% ± 1.1%	86.9% ± 0.9%	70.7% ± 1.3%
Change (C4–C3)	0.2% ± 0.5%	0.1% ± 1.6%	4.3% ± 1.4%	4.3% ± 1.8%

Table C15: 2013 RAA NGF Domains Accuracy to 2013 RAA Syntax Requirements by Cycle

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 3	99.3% ± 0.2%	92.2% ± 0.7%	79.4% ± 1.0%	73.8% ± 1.1%
Cycle 4	98.8% ± 0.3%	92.8% ± 0.6%	80.8% ± 1.0%	75.4% ± 1.1%
Change (C4–C3)	-0.5% ± 0.3%	0.6% ± 0.9%	1.4% ± 1.4%	1.7% ± 1.6%

2013 RAA Reasons for Syntax Error

In all prior WHOIS ARS studies we showed which accuracy tests were failed by each contact. We repeat these tables from Cycle 3, and also show the same data for Cycle 4.

Email Addresses

Table C16: Total Email Address Errors by Contact Type (2013 RAA) – Cycle 3

	Registrant	Administrative	Technical	Total
Passed All Accuracy Tests	5,721	5,728	5,729	17,178
Missing	15	8	8	31
Not Resolvable	1	1	0	2
Total	5,737	5,737	5,737	17,211

Table C17: Total Email Address Errors by Contact Type (2013 RAA) – Cycle 4

	Registrant	Administrative	Technical	Total
Passed All Accuracy Tests	6,199	6,205	6,206	18,610
Missing	25	19	18	62
Not Resolvable	0	0	0	0
Total	6,224	6,224	6,224	18,672

Telephone Numbers

Table C18: Total Telephone Number Errors by Contact Type (2013 RAA) – Cycle 3

	Registrant	Administrative	Technical	Total
Passed All Accuracy Tests	5,214	5,206	5,231	15,651
Not Present	8	12	15	35
Country Code Missing	100	98	92	290
Country Code Format	48	47	46	141
Incorrect Length	367	374	353	1,094
Characters Not Allowed	0	0	0	0
Total	5,737	5,737	5,737	17,211

Note: Italics indicate new 2013 RAA requirements.

Table C19: Total Telephone Number Errors by Contact Type (2013 RAA) – Cycle 4

	Registrant	Administrative	Technical	Total
Passed All Accuracy Tests	5,709	5,692	5,706	17,107
Not Present	10	25	24	59
Country Code Missing	112	112	112	336
Country Code Format	46	48	48	142
Incorrect Length	347	347	334	1,028
Characters Not Allowed	0	0	0	0
Total	6,224	6,224	6,224	18,672

Note: Italics indicate new 2013 RAA requirements.

Postal Addresses
Table C20: Total Postal Address Errors by Contact Type (2013 RAA) – Cycle 3

	Registrant	Administrative	Technical	Total
Passed All Accuracy Tests	4,448	4,427	4,469	13,344
Missing	3	9	9	21
Country Code Missing	3	2	2	7
Country Not Identifiable	34	35	36	105
Country in Wrong Field	61	61	61	183
Country Not ISO Alpha 2	0	0	0	0
Postal Code Missing	228	248	242	718
Postal Code Format	11	10	9	30
Postal Code in Wrong Field	0	0	0	0
State/Province Missing	76	75	65	216
State/Province in Wrong Field	15	13	10	38
State/Province Format	67	68	62	197
City Missing	324	340	331	995
City in Wrong Field	222	219	229	670
Street Missing	470	464	443	1,377
Street in Wrong Field	120	118	109	347
TOTAL	5,737	5,737	5,737	17,211
Total Errors	1,634	1,662	1,608	4,904

Note: Italics indicate new 2013 RAA requirements.

Table C21: Total Postal Address Errors by Contact Type (2013 RAA) – Cycle 4

	Registrant	Administrative	Technical	Total
Passed All Accuracy Tests	4,925	4,892	4,930	14,747
Missing	6	23	22	51
Country Code Missing	0	0	0	0
Country Not Identifiable	42	42	39	123
Country in Wrong Field	28	28	28	84
Country Not ISO Alpha 2	0	0	0	0
Postal Code Missing	228	249	243	720
Postal Code Format	5	6	6	17
Postal Code in Wrong Field	0	0	0	0
State/Province Missing	81	79	65	225
State/Province in Wrong Field	20	16	7	43
State/Province Format	80	81	75	236
City Missing	314	331	334	979
City in Wrong Field	250	254	269	773
Street Missing	450	439	404	1,293
Street in Wrong Field	101	87	81	269
TOTAL	6,224	6,224	6,224	18,672
Total Errors	1,605	1,635	1,573	4,813

Note: Italics indicate new 2013 RAA requirements.

Analysis by Subgroup: Accuracy to 2013 RAA Requirements – Operability

For operability, the only additional requirement for the 2013 RAA is that registrant email addresses and telephone numbers became required fields. Results for Accuracy to 2013 RAA requirements for operability would be repetitive, and so they are not presented in this report.

Appendix D: Additional Analyses – Count of Script Languages by Region

The tables below show for records in the analyzed subsample counts of the script languages found in the postal address field of the registrant contact information. The "Count" column shows the total of count of records for a given script language, and the syntax and operability columns show the count of accurate record for the given script language. It is important to note that a single record can have more than one script type. For the Latin script type, a record was counted only when all of the registrant postal address fields contained only Latin script.

Table D1: Africa Region Script Languages, Total Count and Counts of Accurate Syntax and Operability

	Script Language	Total Count	Accurate Syntax Count	Accurate Operability Count
Registrant	**Only Latin**	1,213	592	671
	Arabic	0	0	0
	Chinese (Hanzi)	0	0	0
	Korean (Hangul)	0	0	0
	Diacritical Marking	16	11	7

Table D2: Asia-Pacific Region Script Languages, Total Count and Counts of Accurate Syntax and Operability

	Script Language	Total Count	Accurate Syntax Count	Accurate Operability Count
Registrant	**Only Latin**	2,879	2,093	1,301
	Arabic	1	0	1
	Chinese (Hanzi)	29	18	7
	Korean (Hangul)	0	0	0
	Diacritical Marking	5	3	1

Table D3: Europe Region Script Languages, Total Count and Counts of Accurate Syntax and Operability

	Script Language	Total Count	Accurate Syntax Count	Accurate Operability Count
Registrant	**Only Latin**	2,217	1,763	1,535
	Arabic	0	0	0
	Chinese (Hanzi)	0	0	0
	Korean (Hangul)	0	0	0
	Diacritical Marking	100	79	63

Table D4: Latin America and Caribbean Region Script Languages, Total Count and Counts of Accurate Syntax and Operability

	Script Language	Total Count	Accurate Syntax Count	Accurate Operability Count
Registrant	**Only Latin**	1,923	1,474	1,396
	Arabic	0	0	0
	Chinese (Hanzi)	0	0	0
	Korean (Hangul)	0	0	0
	Diacritical Marking	21	10	11

Table D5: North America Region Script Languages, Total Count and Counts of Accurate Syntax and Operability

	Script Language	Total Count	Accurate Syntax Count	Accurate Operability Count
Registrant	**Only Latin**	3,064	2,728	2,525
	Arabic	0	0	0
	Chinese (Hanzi)	0	0	0
	Korean (Hangul)	0	0	0
	Diacritical Marking	1	0	1