



WHOIS Accuracy Reporting System (ARS)

Phase 2 Cycle 5 Report: Syntax and Operability Accuracy
Global Domains Division | 19 December 2017

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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. Whereas 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.

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 approximately 200,000 WHOIS records. The 12,000 records were then evaluated using criteria based on requirements from the 2009 RAA, which acts as a 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

¹ See <https://www.icann.org/resources/pages/aoc-2012-02-25-en>.

subsample 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 interval² 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 5 findings indicate that 98 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 no contact information that met either email or phone operability requirements.

Operability Accuracy

The operability accuracy analysis finds that approximately 94 percent of email addresses, 67 percent of telephone numbers, and 98 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 63 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	93.8% ± 0.4%	66.9% ± 0.8%	98.4% ± 0.3%	63.4% ± 0.9%

Syntax Accuracy

The syntax accuracy analysis finds that approximately 99 percent of email addresses, 90 percent of telephone numbers, and 89 percent of postal addresses 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 81 percent for the gTLD population as a whole. Table Ex2 provides the accuracy breakdown by contact mode, presented as 95 percent confidence intervals.

² This means that if the population is sampled repeatedly, 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>.

Table Ex2: Overall³ gTLD Accuracy to 2009 RAA Syntax Requirements by Mode

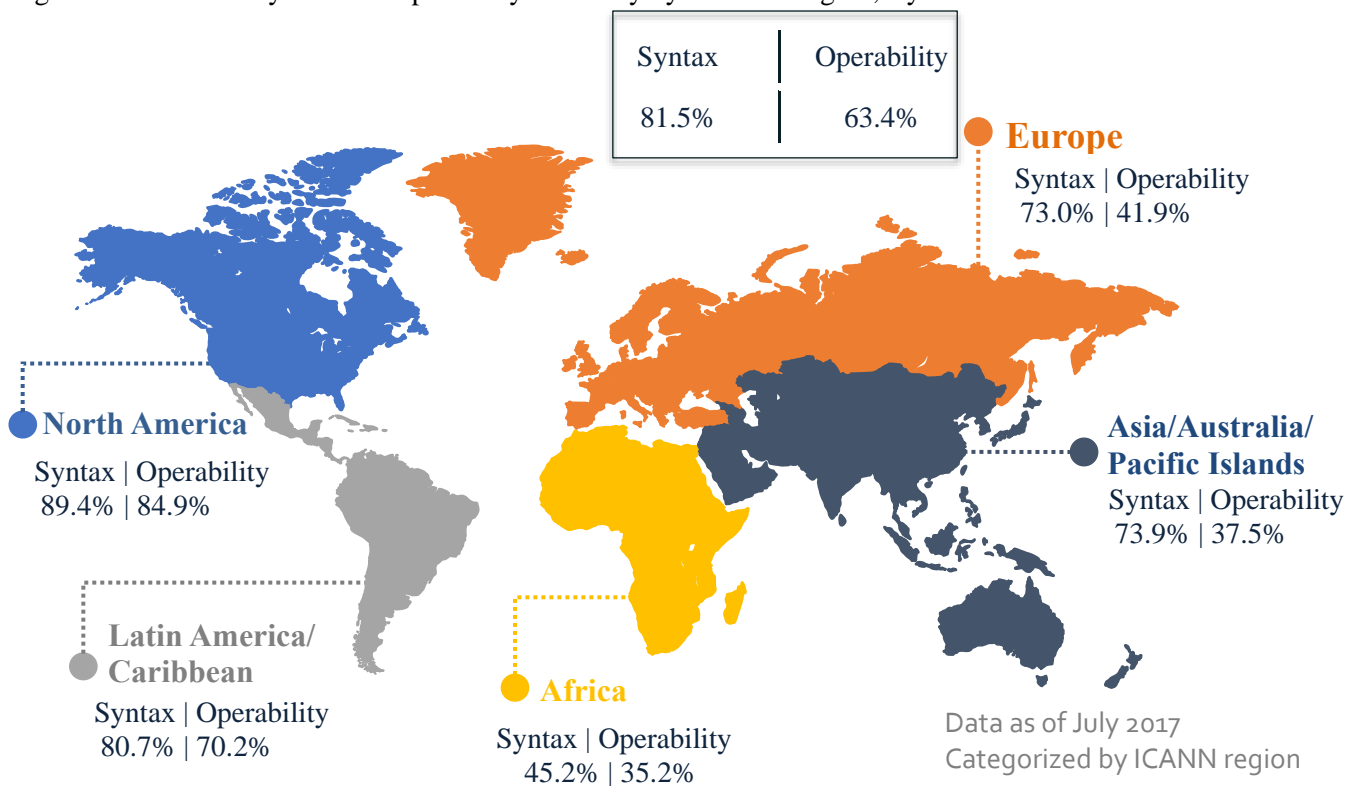
	Email	Telephone	Postal Address	All Three Accurate
All Three Contacts Accurate	99.6% ± 0.1%	90.2% ± 0.5%	88.9% ± 0.6%	81.5% ± 0.7%

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 the section [Regional Findings](#), other regional metrics of accuracy and reasons for error can be found.

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



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.

³ “Overall accuracy” refers to the entire population of domains. See Note 2 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 4 to Cycle 5](#), and differences between [New and Prior gTLDs](#).

Lessons Learned

We have continually sought ways to improve the ARS, and are always looking ahead to subsequent cycles. As noted in previous reports, postal address testing poses challenges for numerous reasons. For example, the rules for syntax accuracy in a given country (i.e., country formatting requirements) can have multiple exceptions or deviations. 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.

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.⁴ 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.

⁴ The process of reviewing and reporting WHOIS ARS test results is time consuming, such that in previous cycles it has taken between four and five months before ICANN Contractual Compliance could begin processing the ARS-discovered inaccuracies. This lag time can result in outdated WHOIS ARS inaccuracies provided to Compliance. For Cycle 5, the ARS team was able to reduce that lag time to 3 months. With each new WHOIS ARS cycle, the ARS and ICANN Contractual Compliance teams continue to seek ways to reduce this lag time.

Phase 2 Results

ICANN Contractual Compliance began processing inaccuracy complaints from Phase 2 Cycle 5 in October 2017, and continues to work with Registries and Registrars to resolve identified issues. Metrics for the WHOIS ARS are presented in the ICANN Contractual Compliance Performance Reports (see <https://features.icann.org/compliance>) and at ICANN Public Meetings. ICANN 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 6

As noted above, Phase 2 is cyclical with a new report published every 6 months. Cycle 6 will begin January 2018, with a report expected in June 2018.

Background: Sample and Market Information

Brief Overview

In Cycle 5, we first selected a sample of 200,000 WHOIS records from the zone files of 1,235 gTLDs (explained below in the Sample Design section). The contact information from a subsample of 12,000 records is first tested for accuracy against syntax standards (e.g., values and formats) based on requirements stipulated within the domain-applicable Registrar Accreditation Agreement (RAA), and was then tested for accuracy against operability standards (e.g., 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 40 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). 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

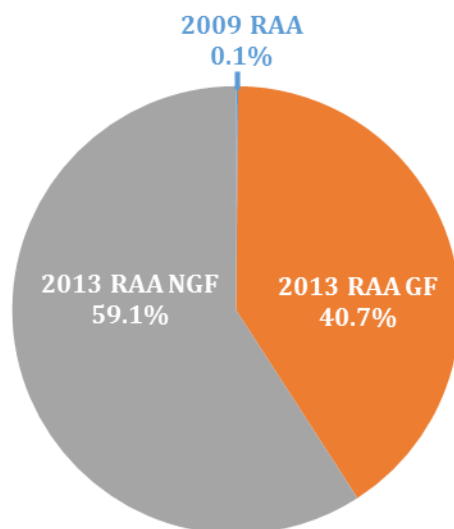
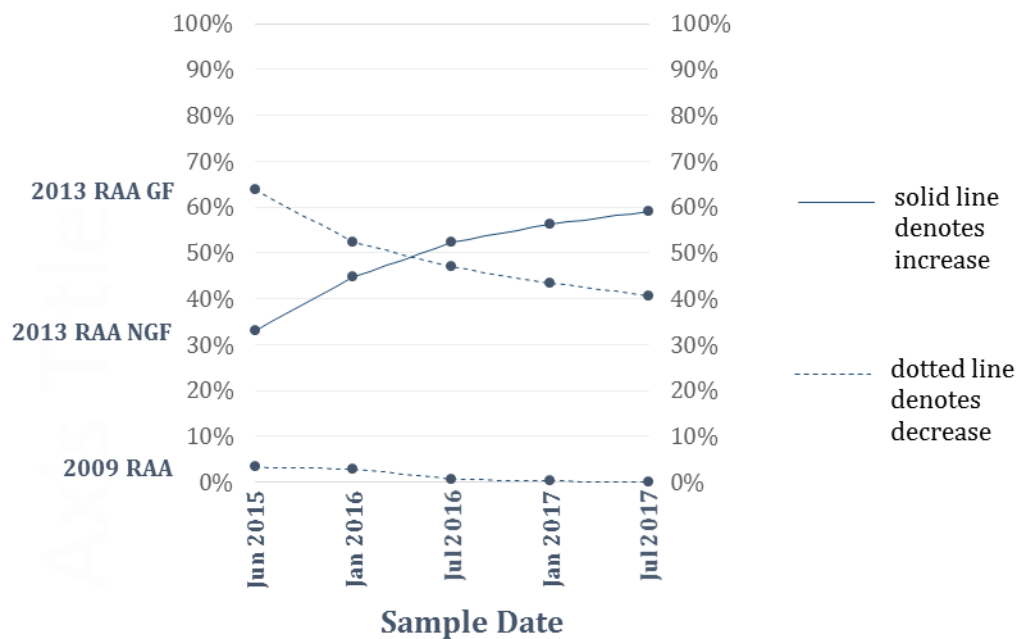


Table 1 shows the shares of the different RAA types, and Graph 2 show the change in distribution over time. Between Cycle 4 and Cycle 5, the 2009 RAA share decreased from 0.2% to 0.1%.

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%
July 2017 (Cycle 5)	0.1%	40.7%	59.1%

Graph 2: Change in Distribution of RAA Type, by Sample Date⁵



⁵ 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 July 2016 to July 2017 there was a substantial drop in the number of domains in the 2009 RAA, and the number of New gTLD domains also dropped slightly.⁶

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
July 2017 (Cycle 5)	23.4	162	0.2	74	107	186

Note: The Total gTLDs column represents the actual sum of all gTLDs. The total can be obtained by summing New and Prior gTLDs. The RAA 2009, RAA 2013 GF, and RAA 2013 NGF numbers are estimates.

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.

⁶ The decrease in total New gTLD domains during this period may be associated with, among other things, the expiration of registration promotions on a handful of high-volume registries.

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 5, in July 2017, there were about 186 million domains names spread across 1,235 gTLDs. Approximately 87 percent of the 186 million domains were registered in one of the 18 Prior gTLDs, slightly higher than in January 2017, when data was collected for Cycle 4 (see Table 2). Almost 13 percent of domains in July 2017 were registered in New gTLDs, a slight drop from the previous cycle. The overall number of New gTLDs available continued to rise, increasing from 1,213 in January 2017 to 1,217 in July 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
July 2017 (Phase 2 Cycle 5)	18	1,217	1,235

Out of the 1,217 New gTLDs, 844 had at least one domain (373 New gTLDs did not yet have any domains), 79 had exactly one domain (these were excluded from our sample since it is typically an administrative domain for the gTLD) and the remaining 765 others had at least two domains. Adding together the 18 prior gTLDs and the 765 New gTLDs described above, the initial sample represented a total of 783 gTLDs. Similar to the previous WHOIS ARS⁷ study samples, our Cycle 5 sample design oversampled New gTLDs so that 25 percent of the initial sample was from New gTLDs.

⁷ Previous WHOIS ARS studies include the [Pilot Study](#), the [Phase 1 study](#), the [Phase 2 Cycle 1 study](#), the [Phase 2 Cycle 2 study](#), the [Phase 2 Cycle 3 study](#), and the [Phase 2 Cycle 4 study](#).

Of the initial sample of 200,000, WHOIS data was gathered and parsed successfully for 194,772 records (97.4% of the initial sample, as shown in Table 4).⁸

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	35	7	151	51	0	244
2013 GF	364	9,956	15,183	1,835	40,435	157	67,930
2013 NGF	810	50,518	19,378	8,349	47,447	96	126,598
TOTAL	1,174	60,509	34,568	10,335	87,933	253	194,772

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 Type.

Table 5: Analyzed Subsample Sizes by Region and RAA Type

RAA Type	Africa	Asia Pacific	Europe	Latin America and Caribbean	North America	Unknown	TOTAL
2009	0	35	7	151	51	0	244
2013 GF	364	1,100	1,150	800	1,548	4	4,966
2013 NGF	810	1,902	1,350	1,100	1,625	3	6,790
TOTAL	1,174	3,037	2,507	2,051	3,224	7	12,000

⁸ Included in this number are a small number of domains that did not contain a listed registrar and were excluded from subsampling. Domains without a registrar are typically instances of registries acting as registrars, either for reserved domains or for Conficker-type-virus related preemptive registrations. Prior to Cycle 4, these records would have been identified as domains on the 2009 RAA, however because of the small number of such domains, very few were likely subsampled for previous analysis. Thus, prior cycles' accuracy results were not affected by these domains.

Table 6 compares the sample sizes by RAA type in the initial sample of 194,772 and the analyzed subsample of 12,000.

Table 6: Sample Sizes by RAA Type

RAA Type	Initial Sample	Percentage of Initial Sample	Analyzed Subsample	Percentage of Subsample
2009 RAA	244	0.1%	244	2.0%
2013 RAA GF	67,930	34.9%	4,966	41.4%
2013 RAA NGF	126,598	65.0%	6,790	56.6%
TOTAL	194,772	100.0%	12,000	100.0%

Accounting for Common Data across Contact Types

For all three contact modes (email, telephone and postal address), around 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 Mode⁹

Commonality	Email	Telephone	Postal Address
All Three Exactly Same	80.6% ± 0.7%	83.8% ± 0.7%	81.1% ± 0.7%
Exactly Two the Same, One Different	17.2% ± 0.7%	15.2% ± 0.6%	17.4% ± 0.6%
All Three Different	2.2% ± 0.3%	1.0% ± 0.2%	1.6% ± 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 2.2% 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.

⁹ 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 type¹⁰ (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](#).¹¹

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 baseline¹². 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-eight percent of postal addresses, 67 percent of telephone numbers and 94 percent of email addresses met all operability requirements of the 2009 RAA. Sixty-three 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 a 4 percent drop from Cycle 4 findings.
 - Regional variations of operability accuracy are greatest for telephone, which ranges from 38 percent accurate (Africa) to 89 percent accurate (North America).
- The contact mode with the highest rate of passing all operability tests was postal address, with 98 percent passing all tests. The mode with the lowest rate of passing all operability tests was telephone numbers, with 67 percent passing all tests.

¹⁰ 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., each contact passed all accuracy tests.

¹¹ 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.

¹² The 2009 RAA was chosen as a baseline against which all 12,000 of the subsample records were analyzed, because not all domains are required to meet the 2013 RAA requirements, which are stricter than the 2009 requirements, build from, and thus encompass, 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.

- ❑ The majority of email operability errors occurred when an email address bounced (97 percent of errors), compared to the error of a missing email address (3 percent of errors).
- ❑ The majority of telephone operability errors were from invalid numbers (80 percent), while most of the remaining errors were from disconnected telephone numbers (12 percent) and telephone numbers that did not connect at all (6 percent). Only one percent were missing entirely.

Syntax Accuracy:

- More than 90 percent of telephone numbers met all syntax requirements of the 2009 RAA, increasing from Cycle 4 (89 percent).
 - ❑ Regional variations of syntax accuracy were greatest for postal address, which ranges from 67 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 5 the 2009 RAA group had the highest percentage of records in which all three contact modes were accurate. This is a change from Cycle 4, where the 2013 NGF RAA group had the highest percentage of records in which all three contact modes were accurate.

Operability Accuracy – 2009 RAA Requirements

The following section reviews the results of the operability accuracy tests against 2009 requirements¹³ 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 12,000 domains. For operability, accuracy rates are highest for postal addresses, as shown in Graph 3 and Table 8.

¹³ Conformance to 2013 RAA Requirements can be found in [Appendix C](#).

Graph 3: Overall Accuracy – 2009 RAA Operability Requirements

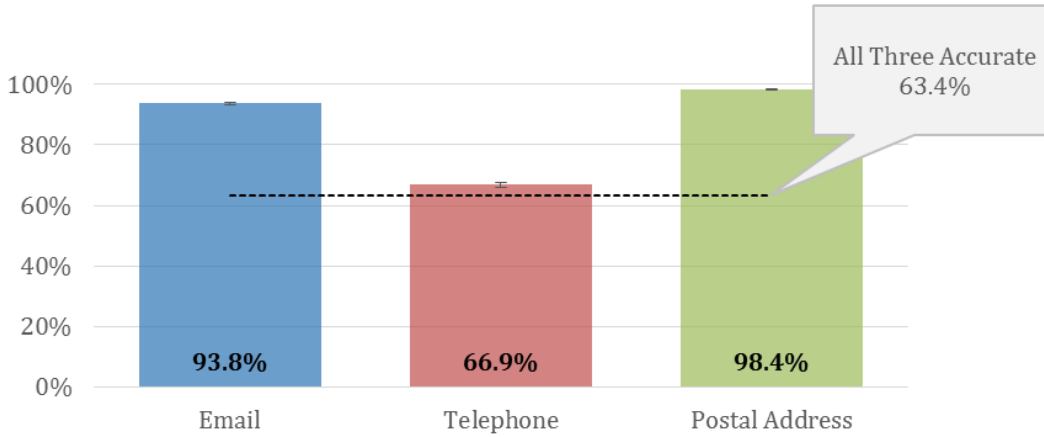


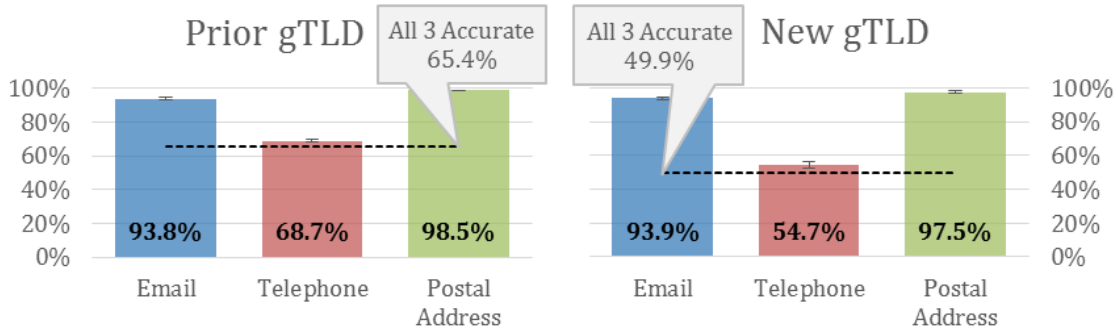
Table 8: Overall Accuracy by Contact Type and Mode – 2009 RAA Operability Requirements

	Email	Telephone	Postal Address	All Three Accurate
Registrant	95.0% ± 0.4%	69.0% ± 0.8%	98.8% ± 0.2%	65.6% ± 0.8%
Administrative	94.6% ± 0.4%	69.1% ± 0.8%	98.6% ± 0.2%	65.6% ± 0.8%
Technical	95.1% ± 0.4%	70.5% ± 0.8%	98.6% ± 0.2%	67.3% ± 0.8%
Overall	93.8% ± 0.4%	66.9% ± 0.8%	98.4% ± 0.2%	63.4% ± 0.9%

Operability Accuracy by Prior vs. New gTLD

Graph 4 and Table 9 show that Prior gTLDs have higher¹⁴ operability accuracy than New gTLDs on telephone number while postal address and email address accuracy is about the same.

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



¹⁴ 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.

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

	Email	Telephone	Postal Address	All Three Accurate
Prior gTLD	93.8% ± 0.5%	68.7% ± 0.9%	98.5% ± 0.2%	65.4% ± 1.0%
New gTLD	93.9% ± 0.9%	54.7% ± 1.9%	97.5% ± 0.6%	49.9% ± 1.9%
Overall	93.8% ± 0.4%	66.9% ± 0.8%	98.4% ± 0.2%	63.4% ± 0.9%

Operability Accuracy by RAA Status

Next, we look at accuracy by RAA status. Graph 5 and Table 10 show that the 2013 RAA GF group has the lowest email accuracy, while the lowest telephone and postal accuracy rates are that of the 2009 RAA group.

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

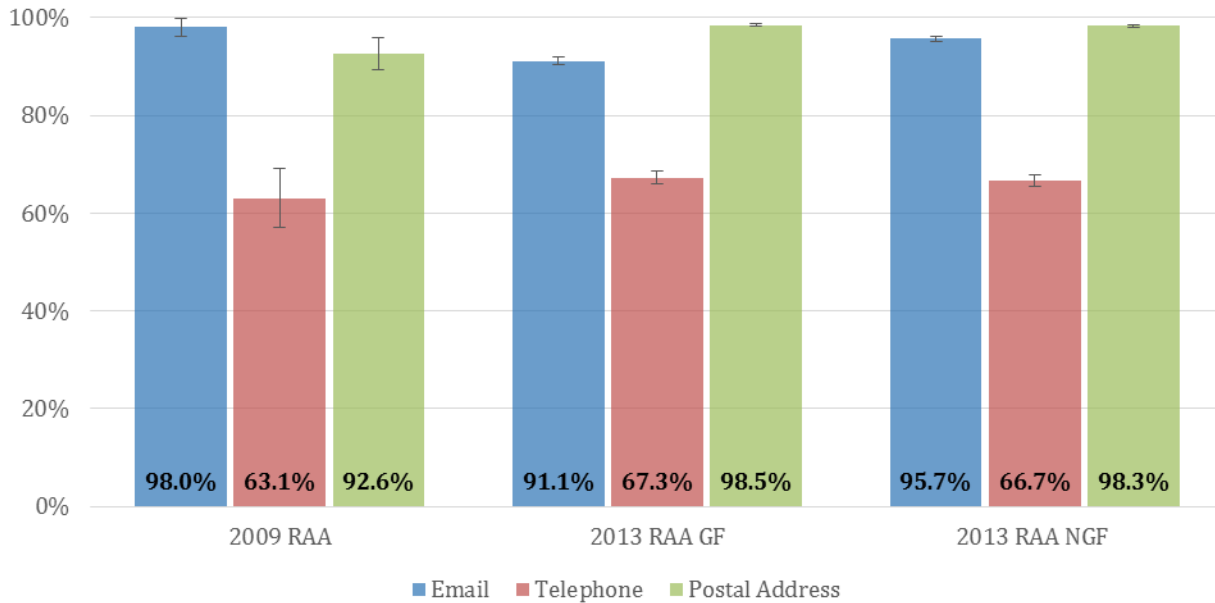


Table 10: Accuracy by RAA Status – 2009 RAA Operability Requirements

	Email	Telephone	Postal Address	All Three Accurate
2009 RAA	98.0% ± 1.8%	63.1% ± 6.1%	92.6% ± 3.3%	62.3% ± 6.1%
2013 RAA GF	91.1% ± 0.8%	67.3% ± 1.3%	98.5% ± 0.3%	63.1% ± 1.3%
2013 RAA NGF	95.7% ± 0.5%	66.7% ± 1.1%	98.3% ± 0.3%	63.6% ± 1.1%
Overall	93.8% ± 0.4%	66.9% ± 0.8%	98.4% ± 0.2%	63.4% ± 0.9%

Operability Accuracy by ICANN Region

Finally, 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 while Asian-Pacific and European 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

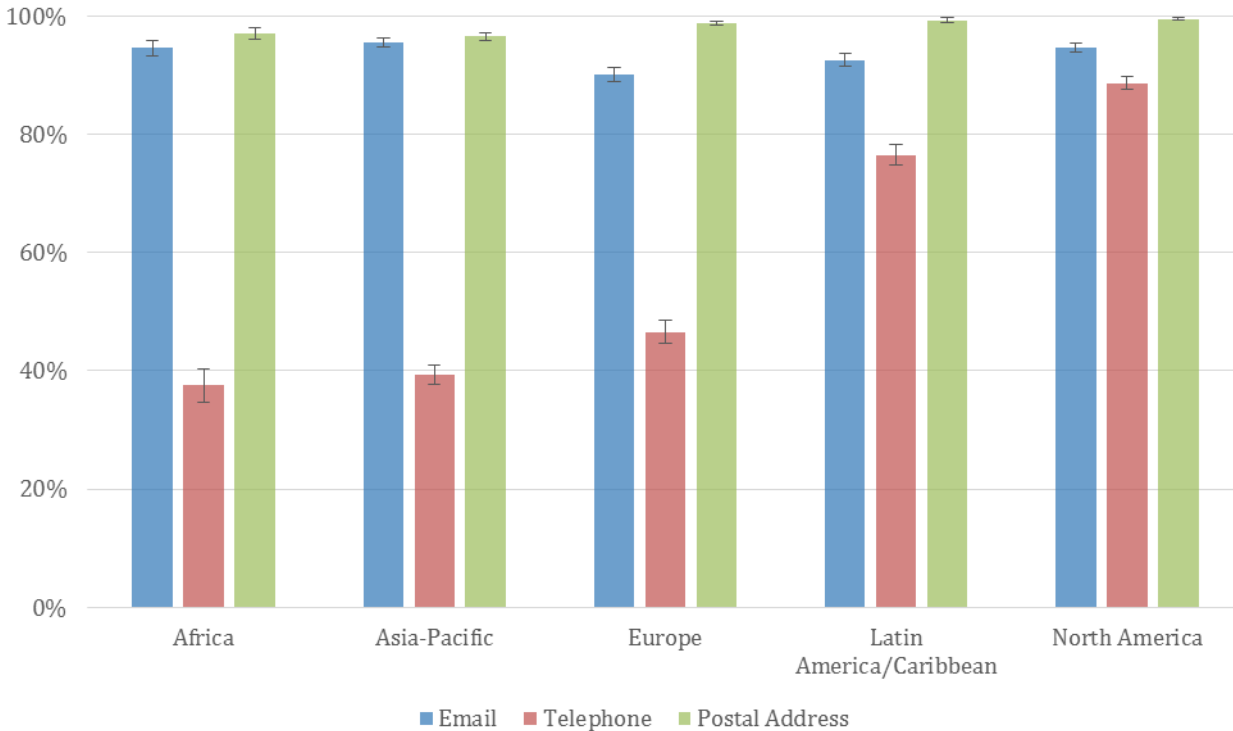


Table 11: Accuracy by ICANN Region – 2009 RAA Operability Requirements

	Email	Telephone	Postal Address	All Three Accurate
Africa	94.6% ± 1.3%	37.5% ± 2.8%	97.0% ± 1.0%	35.2% ± 2.7%
Asia-Pacific	95.5% ± 0.7%	39.3% ± 1.7%	96.5% ± 0.7%	37.5% ± 1.7%
Europe	90.0% ± 1.2%	46.6% ± 2.0%	98.8% ± 0.4%	41.9% ± 1.9%
Latin America/Caribbean	92.5% ± 1.1%	76.5% ± 1.8%	99.3% ± 0.4%	70.2% ± 2.0%
North America	94.7% ± 0.8%	88.6% ± 1.1%	99.5% ± 0.2%	84.9% ± 1.2%
Overall	93.8% ± 0.4%	66.9% ± 0.8%	98.4% ± 0.2%	63.4% ± 0.9%

Reasons for Error – 2009 RAA Operability Requirements¹⁵

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 97 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 three 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

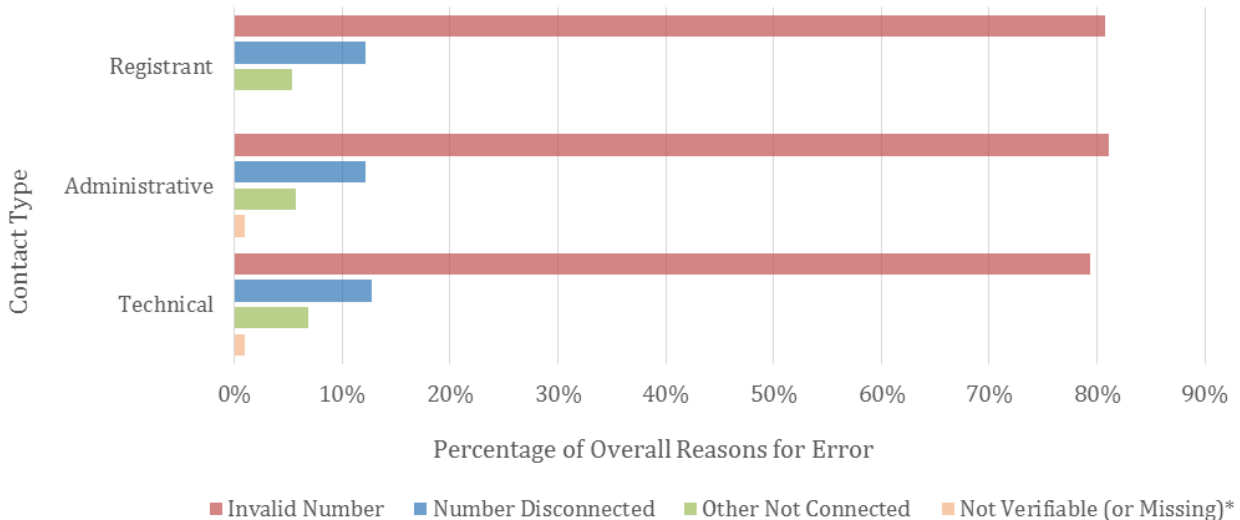
	Registrant	Administrative	Technical	Total
Passed All Accuracy Tests	11,322	11,289	11,351	33,962
Not Verifiable (or Missing)	58*	25	26	52
Email Bounced	677	686	623	1,986
Total	12,000	12,000	12,000	36,000

* Registrant email is not required under the 2009 RAA.

Telephone Numbers

Graph 7 and Table 13 show that approximately 80 percent of telephone errors were from invalid numbers, another 12 percent of errors were from disconnected telephone numbers, and another six 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



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

¹⁵ 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	8,070	8,105	8,318	24,493
Not Verifiable (or Missing)	68*	39	38	145
Number Disconnected	479	475	469	1,423
Invalid Number	3,174	3,159	2,924	9,257
Other Not Connected	209	222	251	682
Total	12,000	12,000	12,000	36,000

* 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. Graph 8 shows addresses that were found to be inoperable even after manual processing, and Table 14 includes data findings from the manual verification of addresses. It shows that 94 percent of addresses initially labeled as P2 errors (might not be deliverable) and 84 percent of addresses labeled P1 (probably not deliverable) during initial testing were determined to be operable after manual verification.

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

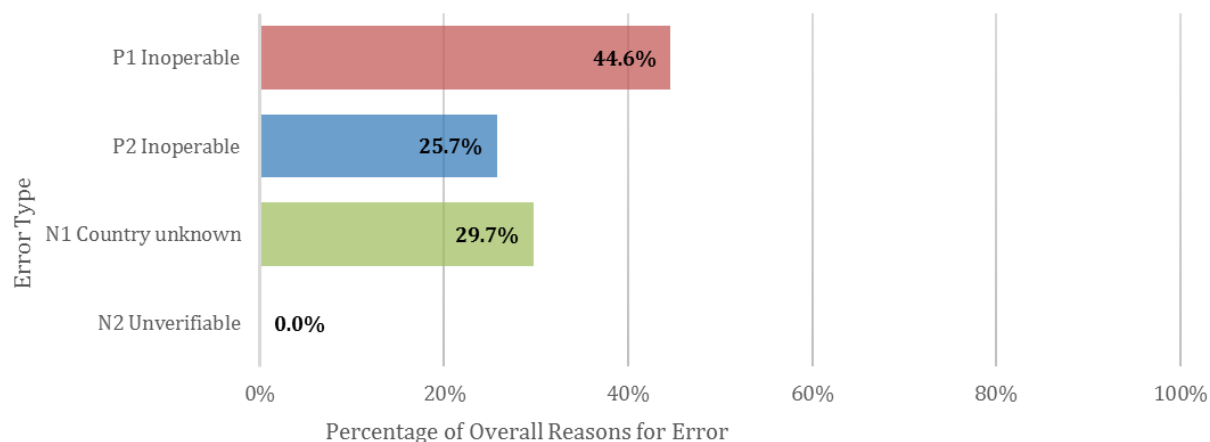


Table 14: Postal Address Errors by Contact Type – 2009 RAA Operability Requirements

	Registrant	Administrative	Technical	Total
Operable	10,655	10,653	10,647	31,955
Operable P2	725	723	755	2,203
Operable P1	448	436	402	1,286
TOTAL OPERABLE	11,828	11,812	11,804	35,444
Inoperable P2	47	49	47	143
Inoperable P1	87	83	78	248
N1, Country unknown	38	56	71	165
N2, Unverifiable	0	0	0	0
TOTAL INOPERABLE	172	188	196	556
OVERALL TOTAL	12,000	12,000	12,000	36,000

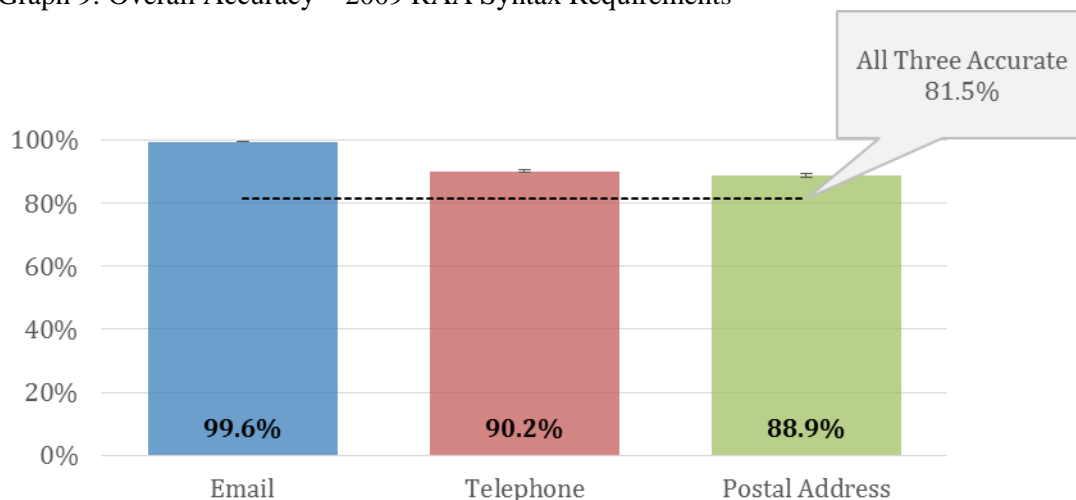
Syntax Accuracy – 2009 RAA Requirements¹⁶

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 12,000 domains in the analyzed subsample. The dotted black line in Graph 9 shows that around 82 percent of domains can be said to be completely syntactically accurate.

Graph 9: Overall Accuracy – 2009 RAA Syntax Requirements



¹⁶ 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%	91.7% ± 0.5%	90.9% ± 0.5%	84.1% ± 0.7%
Administrative	99.6% ± 0.1%	91.0% ± 0.5%	89.7% ± 0.5%	82.7% ± 0.7%
Technical	99.6% ± 0.1%	91.6% ± 0.5%	90.2% ± 0.5%	83.8% ± 0.7%
Overall	99.6% ± 0.1%	90.2% ± 0.5%	88.9% ± 0.6%	81.5% ± 0.7%

Syntax Accuracy by Prior vs. New gTLDs

Graph 10 and Table 16 show that New gTLDs have higher accuracy on telephone numbers (and for having all three contact fields accurate). In Cycle 4, New gTLDs also had 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

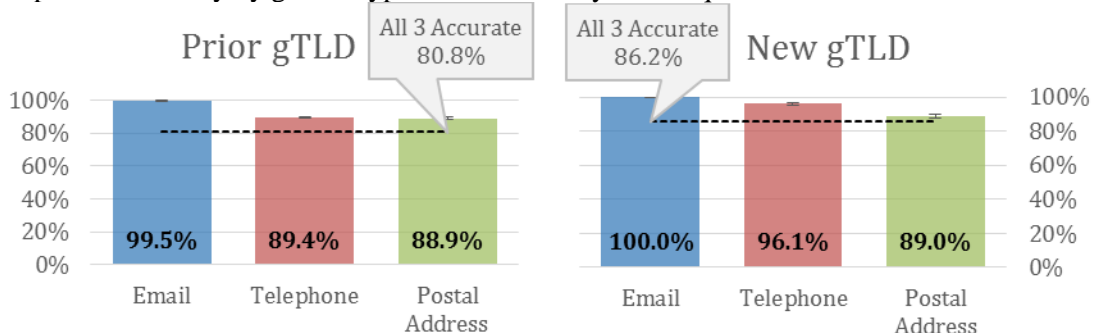


Table 16: Accuracy by gTLD Type – 2009 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Three Accurate
Prior gTLD	99.5% ± 0.1%	89.4% ± 0.6%	88.9% ± 0.6%	80.8% ± 0.8%
New gTLD	100.0% ± 0.0%	96.1% ± 0.7%	89.0% ± 1.2%	86.2% ± 1.3%
Overall	99.6% ± 0.1%	90.2% ± 0.5%	88.9% ± 0.6%	81.5% ± 0.7%

Syntax Accuracy by RAA Status

Next, we look at accuracy rates by RAA status. In Cycle 5, the 2009 RAA group had the highest percentage of records in which all three contact modes were accurate (see Table 17). The 2009 RAA group also had the highest percentage in Cycle 3, but in Cycle 4 the 2013 RAA NGF 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

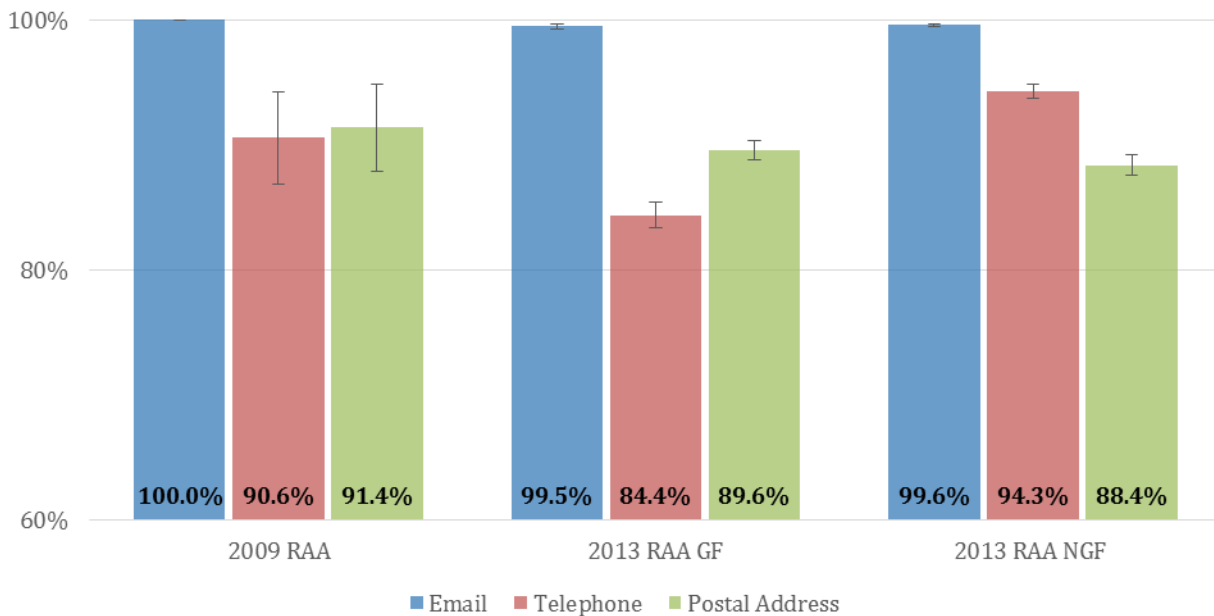


Table 17: Accuracy by RAA Status – 2009 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Three Accurate
2009 RAA	100.0% ± 0.0%	90.6% ± 3.7%	91.4% ± 3.5%	88.9% ± 3.9%
2013 RAA GF	99.5% ± 0.2%	84.4% ± 1.0%	89.6% ± 0.8%	76.9% ± 1.2%
2013 RAA NGF	99.6% ± 0.1%	94.3% ± 0.6%	88.4% ± 0.8%	84.7% ± 0.9%
Overall	99.6% ± 0.1%	90.2% ± 0.5%	88.9% ± 0.6%	81.5% ± 0.7%

Syntax Accuracy by ICANN Region

Finally, we look at accuracy by ICANN region. North America shows the highest overall accuracy while Africa shows 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

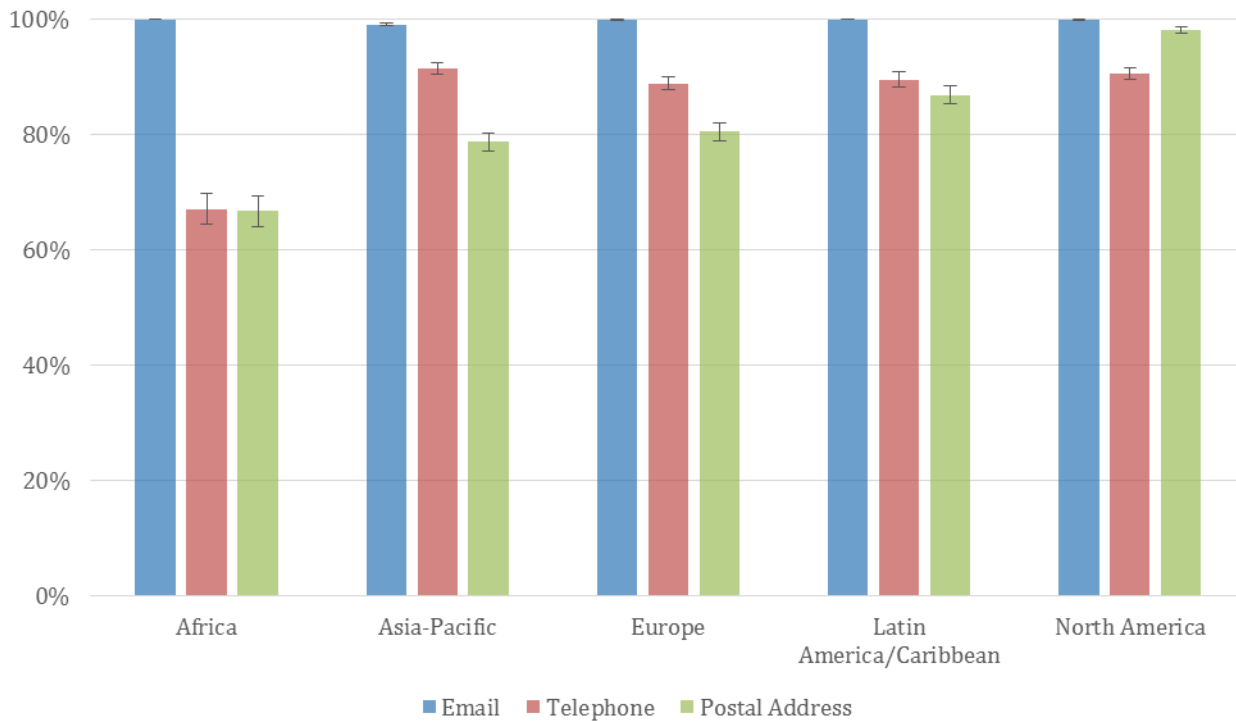


Table 18: Accuracy by ICANN Region – 2009 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Three Accurate
Africa	100.0% ± 0.0%	67.1% ± 2.7%	66.7% ± 2.7%	45.2% ± 2.8%
Asia-Pacific	99.1% ± 0.3%	91.5% ± 1.0%	78.7% ± 1.5%	73.9% ± 1.6%
Europe	99.9% ± 0.1%	88.9% ± 1.2%	80.5% ± 1.6%	73.0% ± 1.7%
Latin America/Caribbean	100.0% ± 0.0%	89.5% ± 1.3%	86.9% ± 1.5%	80.7% ± 1.7%
North America	99.9% ± 0.1%	90.6% ± 1.0%	98.1% ± 0.5%	89.4% ± 1.1%
Overall	99.6% ± 0.1%	90.2% ± 0.5%	88.9% ± 0.6%	81.5% ± 0.7%

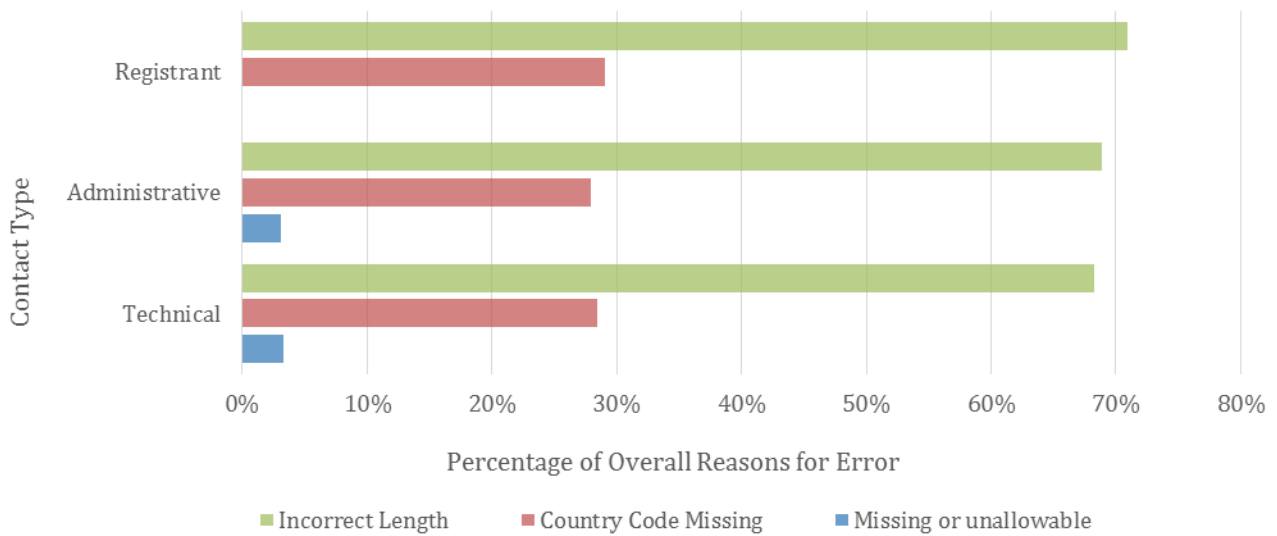
Reasons for Error – 2009 RAA Syntax Requirements

We report here on the major reasons for failure for telephone numbers and postal addresses separately. We do not show the major reasons for email addresses because of the low error rate (0.4 percent).

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 4, the largest source of errors among telephone numbers was having an incorrect length for the applicable country (around seven percent of all telephone numbers tested).

Graph 13: Reasons for Telephone Number Error – 2009 RAA Syntax Requirements

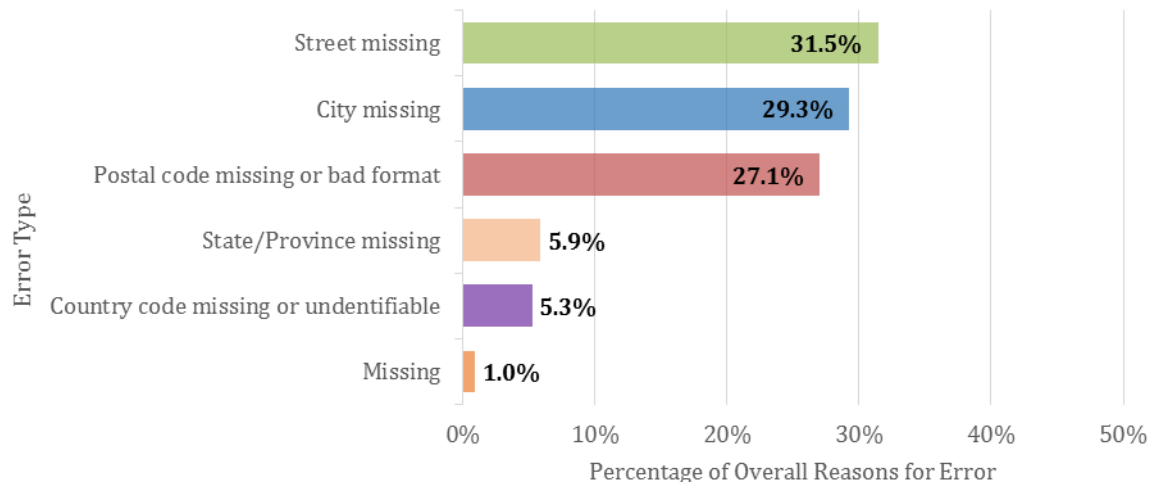


*Note: 2009 RAA does not require presence of a telephone number for the registrant contact type.

Postal Addresses

Graph 14 shows the reasons for postal address errors as a percentage of total errors (unlike for telephone numbers, there can be more than one error for a postal address). Similar to Cycle 4, the majority of postal address syntax errors (95.4%) were due to a missing address component¹⁷, such as a missing street (31.5%), city (29.3%), postal code (27.1%), or state/province (5.9%). Fewer country codes were missing or unidentifiable (5.3%) and few postal addresses were completely missing (1.0%).

Graph 14: Reasons for Postal Address Error Across All Contact Types – 2009 RAA Syntax Requirements



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 (6.2% 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.

¹⁷ 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.

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

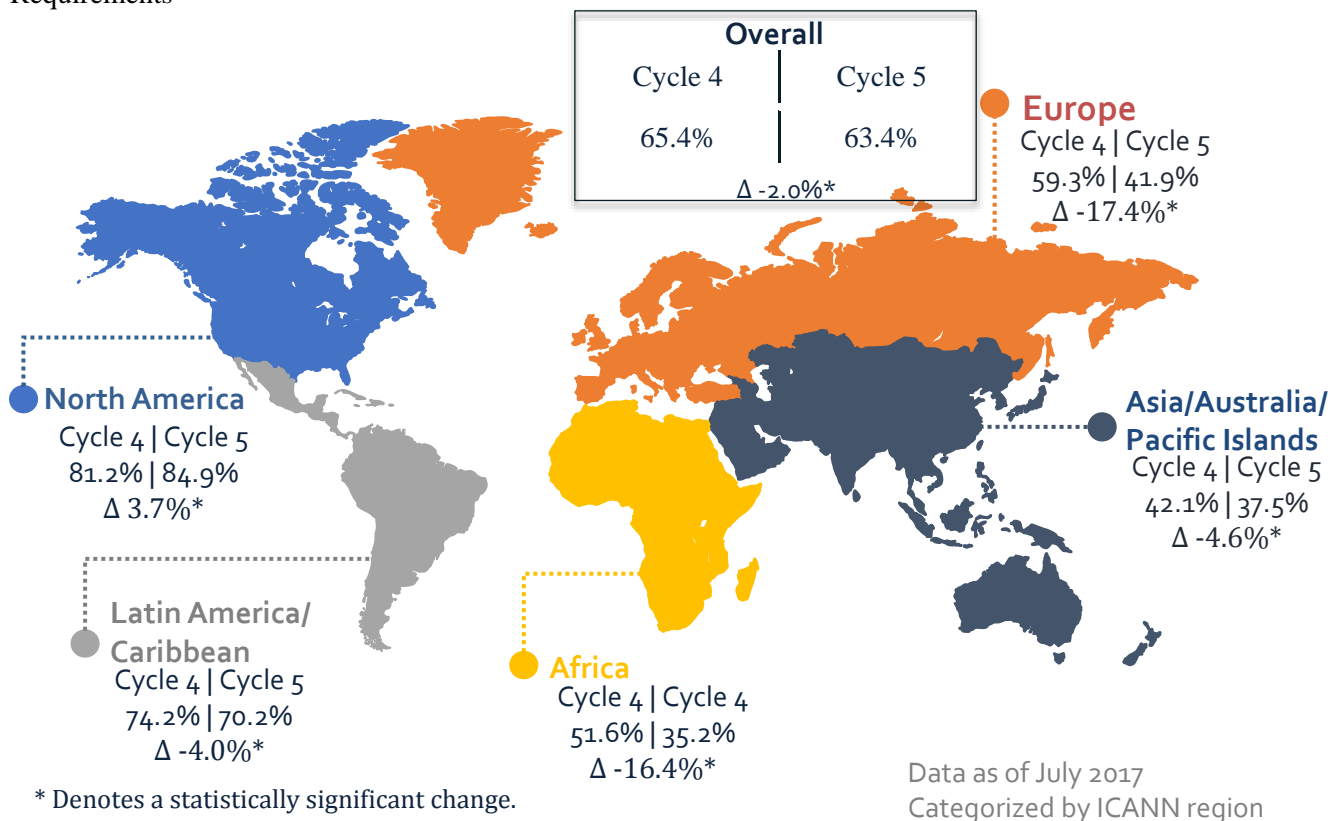
Here we provide an analysis of changes in overall syntax and operability accuracy by region between Cycle 4 and Cycle 5, as well as reasons for error.

Changes in Overall Accuracy by Region

Operability Accuracy

Overall operability accuracy decreased between Cycle 4 and Cycle 5, from 65.4% to 63.4%. Chart 1 shows that the decrease occurred in every region except North America, which increased nearly 4 percent.¹⁸

Chart 1: Change in Overall Operability Accuracy for ICANN Regions, Cycles 4 and 5 – 2009 RAA Requirements

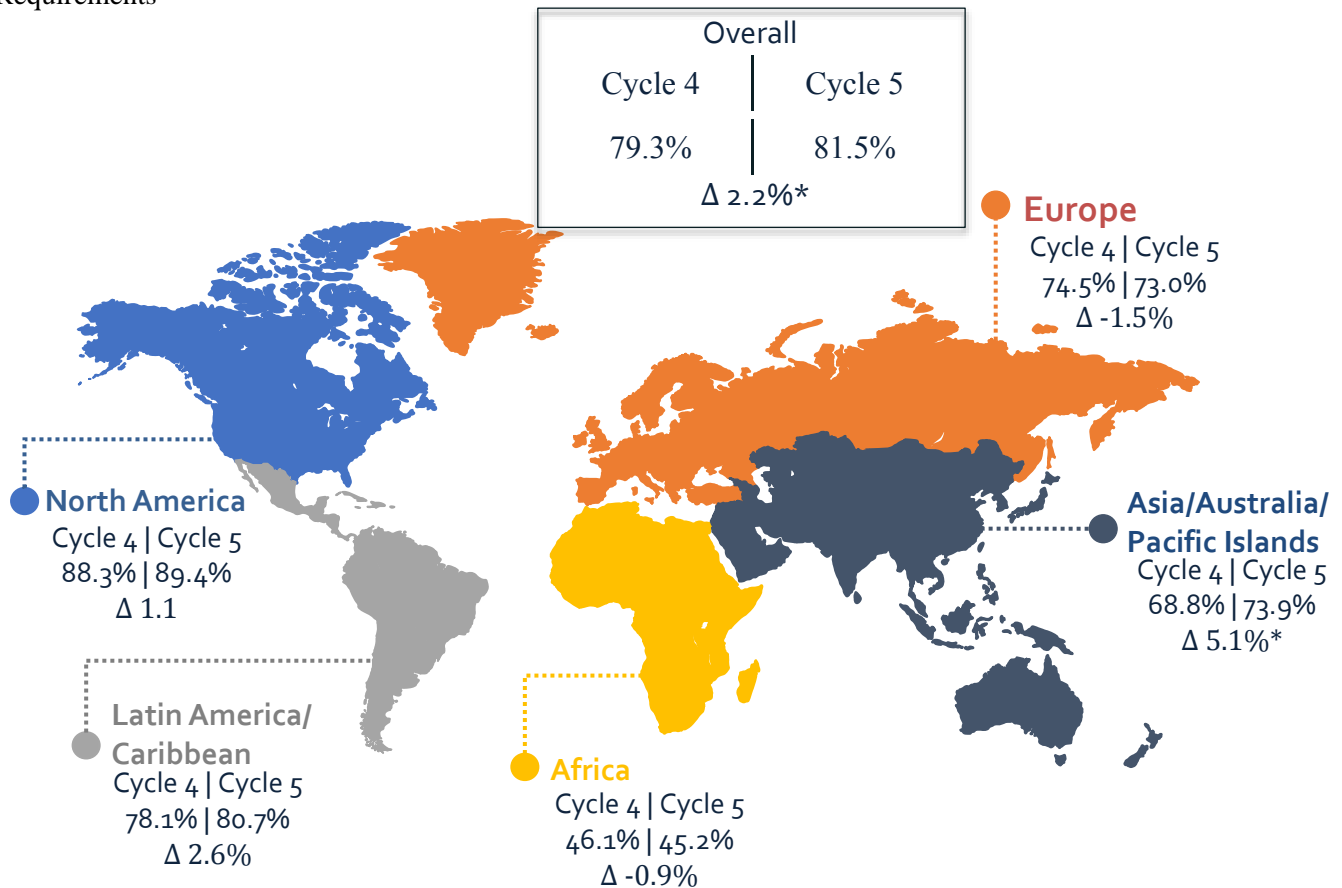


¹⁸ Due to the significant changes in operability for the African and European regions, testing processes and outcomes were reviewed to ensure integrity of the results.

Syntax Accuracy

Chart 2 shows that changes in syntax accuracy from Cycle 4 to Cycle 5 were most pronounced in the Asia/Pacific region, which increased by 5.1%. Overall syntax accuracy across all regions increased from Cycle 4 to Cycle 5 by 2.2%.

Chart 2: Change in Overall Syntax Accuracy for ICANN Regions, ARS Cycles 4 and 5 – 2009 RAA Requirements



Data as of July 2017
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 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%	0.5%	9.5%	1.1%	100.0%	2.6%
Email Bounced	100.0%	100.0%	99.5%	90.5%	98.9%	0.0%	97.4%
Overall Accuracy for Region – Email Operability	94.6% ± 1.3%	95.5% ± 0.7%	90.0% ± 1.2%	92.5% ± 1.1%	94.7% ± 0.8%	N/A	93.8% ± 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 for email addresses 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%	93.8%	0.0%	100.0%	87.0%
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%	0.0%	100.0%	0.0%	9.3%
Not Resolvable	0.0%	0.0%	0.0%	6.3%	0.0%	0.0%	3.7%
Overall Accuracy for Region – Email Syntax	100.0% ± 0.0%	99.1% ± 0.3%	99.9% ± 0.1%	100.0% ± 0.0%	99.9% ± 0.1%	N/A	99.6% ± 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 the main cause of telephone operability error was an invalid number. In all regions except for Latin America/Caribbean, the second most common cause was a disconnected number.

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)	0.4%	0.6%	0.7%	1.5%	3.1%	100.0%	1.3%
Number Disconnected	13.6%	18.6%	12.2%	5.0%	35.6%	0.0%	12.4%
Invalid Number	84.8%	80.1%	86.9%	79.3%	57.9%	0.0%	80.4%
Other Not Connected	1.2%	0.7%	0.3%	14.2%	3.3%	0.0%	5.9%
Overall Accuracy for Region – Telephone Operability	37.5% ± 2.8%	39.3% ± 1.7%	46.6% ± 2.0%	76.5% ± 1.8%	88.6% ± 1.1%	N/A	66.9% ± 0.8%

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

Table 22 shows that 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	81.0%	77.2%	77.2%	68.5%	40.1%	0.0%	69.4%
Country Code Missing	18.8%	22.2%	22.0%	25.6%	58.0%	0.0%	28.5%
Missing or Not Allowed	0.2%	0.6%	0.9%	5.9%	2.0%	100.0%	2.1%
Overall Accuracy for Region – Telephone Syntax	67.1% ± 2.7%	91.5% ± 1.0%	88.9% ± 1.2%	89.5% ± 1.3%	90.6% ± 1.0%	N/A	90.2% ± 0.5%

See note in Table 19 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 North America. 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 Inoperable¹⁹	64.6%	75.6%	48.3%	35.1%	25.0%	0.0%	44.6%
P2 Inoperable	34.6%	22.0%	15.0%	23.2%	57.1%	0.0%	25.7%
N1 Country Unknown	0.8%	2.4%	36.7%	41.7%	17.9%	100.0%	29.7%
N2 Unverifiable	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Overall Accuracy for Region – Postal Operability	97.0% ± 1.0%	96.5% ± 0.7%	98.8% ± 0.4%	99.3% ± 0.4%	99.5% ± 0.2%	N/A	98.4% ± 0.2%

See note in Table 19 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, or a missing state/province. When the region was unknown, the most common syntax error was that the entire set of address fields was left blank.

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	0.0%	0.0%	0.2%	1.6%	0.0%	100.0%	1.0%
Country Code Missing	0.4%	0.3%	18.7%	4.2%	4.8%	0.0%	5.3%
Street Missing	44.8%	21.2%	17.4%	35.8%	19.9%	0.0%	31.5%
Postal Code Missing or Bad Format	10.0%	58.4%	8.9%	34.7%	28.3%	0.0%	27.1%
City Missing	27.0%	14.3%	53.7%	23.7%	45.2%	0.0%	29.3%
State/Province Missing	17.8%	5.8%	1.1%	0.0%	1.8%	0.0%	5.9%
Overall Accuracy for Region – Postal Syntax	66.7% ± 2.7%	78.7% ± 1.5%	80.5% ± 1.6%	86.9% ± 1.5%	98.1% ± 0.5%	N/A	88.9% ± 0.6%

¹⁹ 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

Change in Overall Accuracy

Table 25 and Graph 16 show that Cycle 5 had higher accuracy rates for postal address, but lower email and telephone accuracy rates than Cycle 4.²⁰ The rate of records with all modes accurate decreased slightly between Cycle 4 and Cycle 5.

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

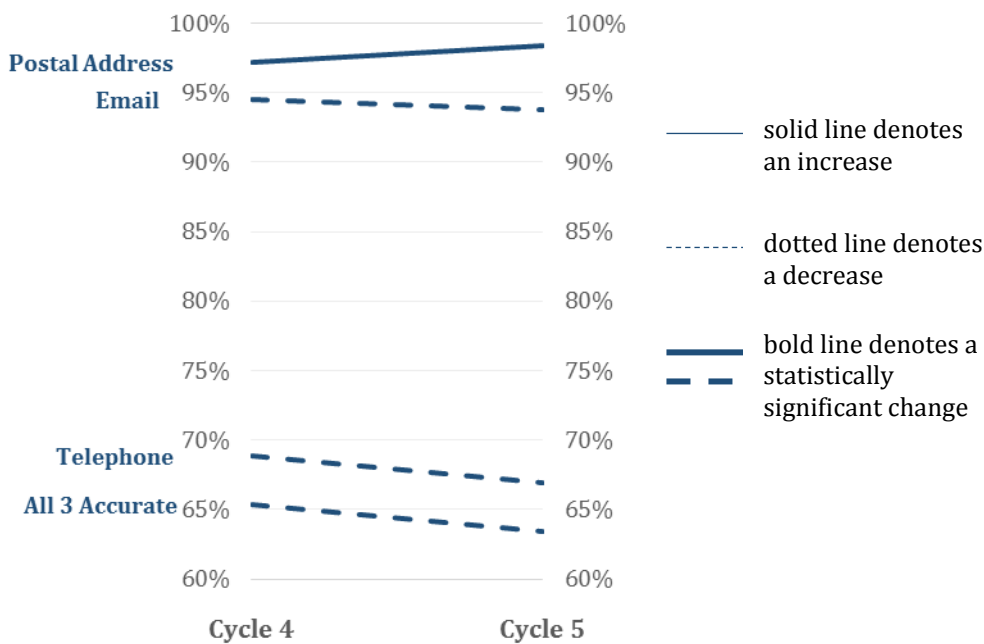


Table 25: Overall Accuracy by Cycle – 2009 RAA Operability Requirements

	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%
Cycle 5	93.8% ± 0.4%	66.9% ± 0.8%	98.4% ± 0.2%	63.4% ± 0.9%
Change (C5–C4)	-0.7% ± 0.6%	-1.9% ± 1.2%	1.2% ± 0.4%	-2.0% ± 1.2%

²⁰ Due to the unexpected decrease in telephone operability accuracy, testing processes and results were re-reviewed to ensure integrity.

For Prior gTLDs, we also see an increase in accuracy for postal address, but a decrease for email and telephone accuracy. The rate of records with all modes accurate decreased between Cycle 4 and 5.

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

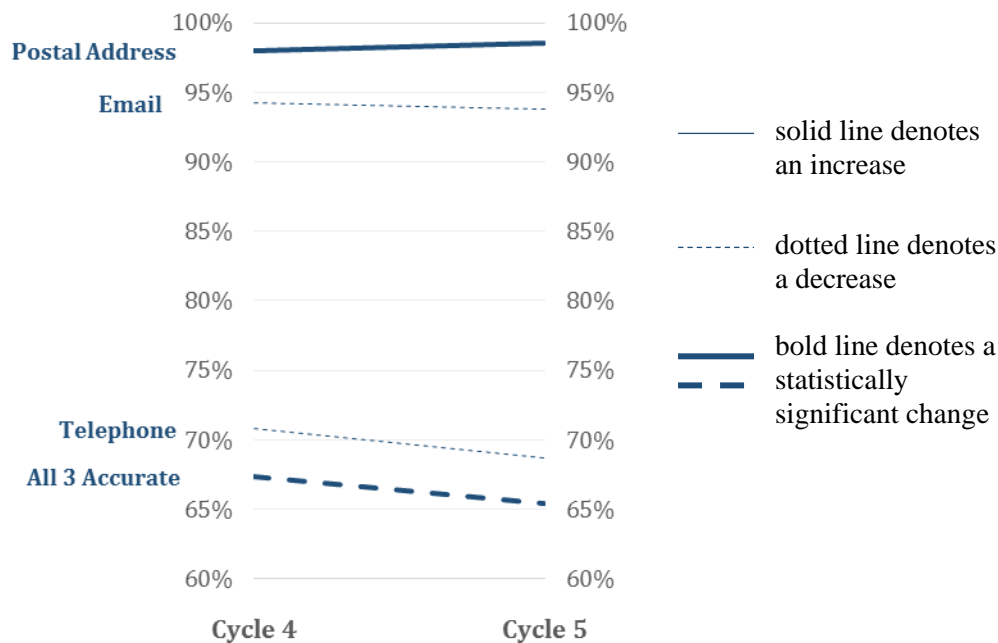


Table 26: Prior gTLDs Accuracy by Cycle – 2009 RAA Operability Requirements

	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%
Cycle 5	93.8% ± 0.5%	68.7% ± 0.9%	98.5% ± 0.2%	65.4% ± 1.0%
Change (C5–C4)	-0.4% ± 0.7%	-2.1% ± 1.3%	0.6% ± 0.4%	-2.1% ± 1.4%

Table 27 and Graph 18 show patterns for the New gTLDs. Postal address accuracy increased between Cycle 4 and Cycle 5, while email and telephone accuracy decreased. The rate of records with all modes accurate decreased between Cycle 4 and Cycle 5.

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

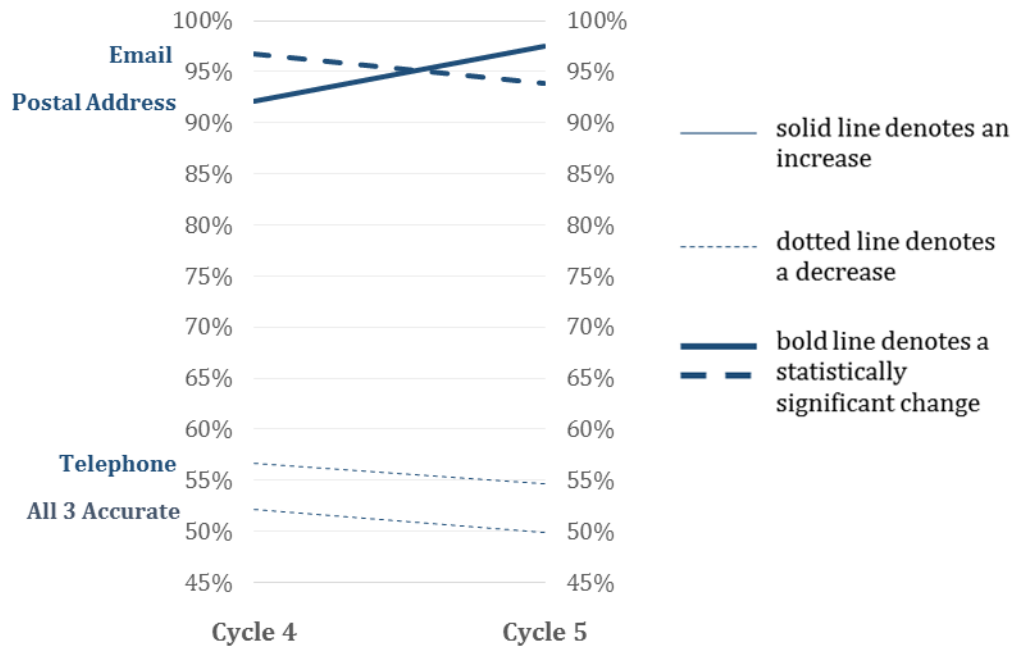


Table 27: New gTLDs Accuracy by Cycle – 2009 RAA Operability Requirements

	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%
Cycle 5	93.9% ± 0.9%	54.7% ± 1.9%	97.5% ± 0.6%	49.9% ± 1.9%
Change (C5–C4)	-2.8% ± 1.2%	-2.0% ± 2.7%	5.4% ± 1.2%	-2.2% ± 2.8%

Comparisons of Accuracy Between Cycles – 2009 RAA Syntax Requirements

In [Main Findings](#), we presented syntax accuracy of records against 2009 RAA Requirements for Cycle 5. Here, we compare the Cycle 5 syntax accuracy results to the results from Cycle 4.

Change in Overall Accuracy

Table 28 and Graph 19 show that email syntax accuracy rates were similar across Cycles 4 and 5, but that telephone and postal address accuracy increased in Cycle 5. The rate of records with all modes accurate increased between Cycle 4 and Cycle 5.

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

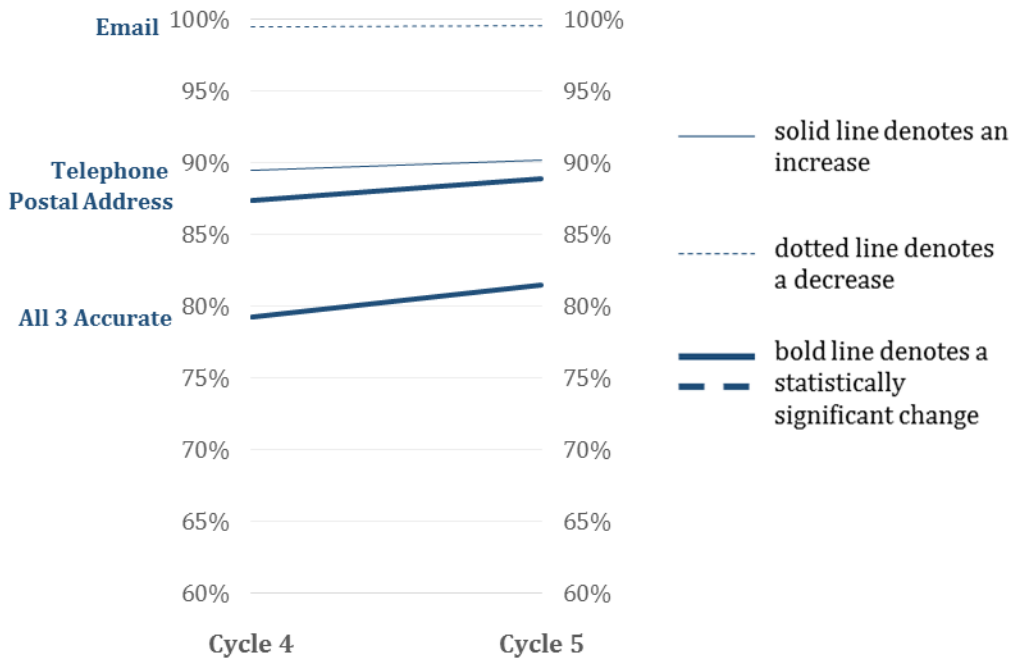


Table 28: Overall Accuracy by Cycle – 2009 RAA Syntax Requirements

	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%
Cycle 5	99.6% ± 0.1%	90.2% ± 0.5%	88.9% ± 0.6%	81.5% ± 0.7%
Change (C5–C4)	-0.1% ± 0.2%	0.7% ± 0.8%	1.5% ± 0.8%	2.2% ± 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 email address accuracy was about the same.

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

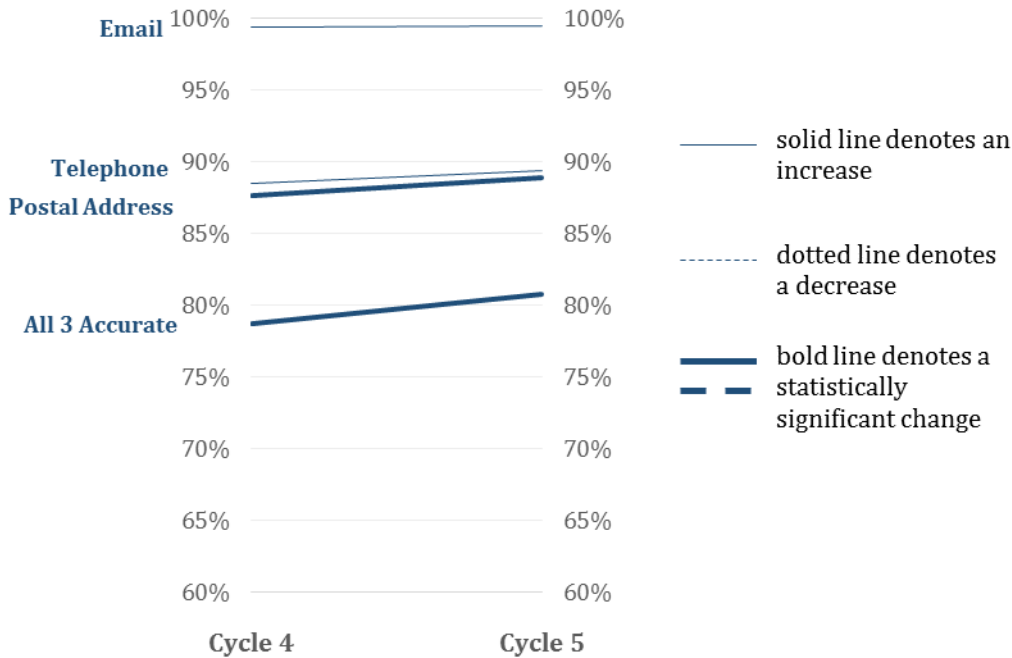


Table 29: Prior gTLDs Accuracy by Cycle – 2009 RAA Syntax Requirements

	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%
Cycle 5	99.5% ± 0.1%	89.4% ± 0.6%	88.9% ± 0.6%	80.8% ± 0.8%
Change (C5–C4)	0.1% ± 0.2%	0.9% ± 0.9%	1.2% ± 0.9%	2.1% ± 1.2%

Change in New gTLDs

In Table 30 and Graph 21, New gTLDs showed an increase in syntax accuracy for All 3 modes and for postal addresses. Accuracy rates for email and telephone increased slightly between Cycles 4 and 5.²¹

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

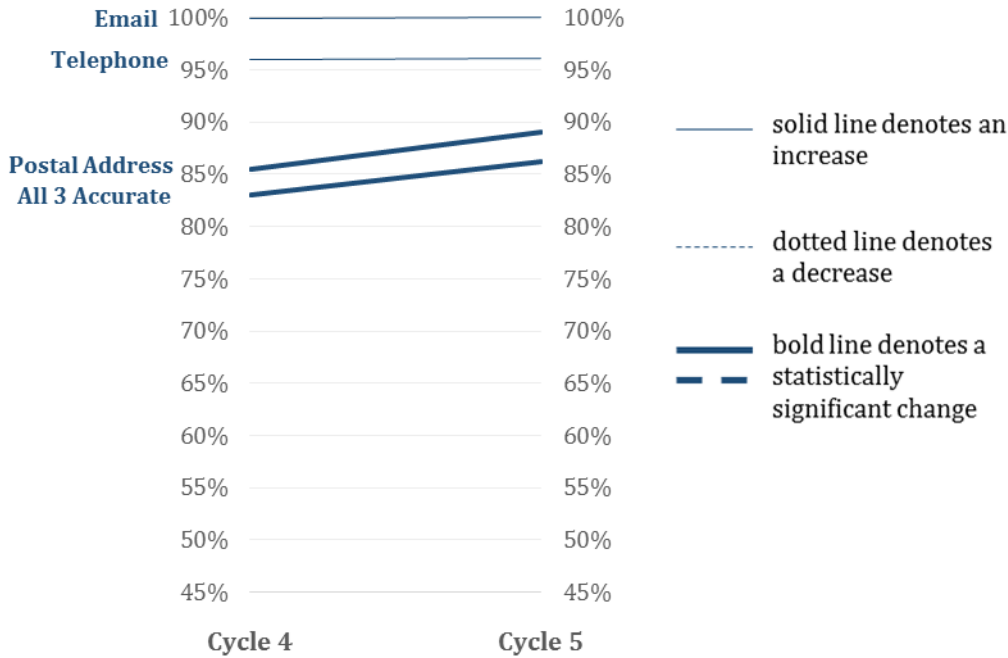


Table 30: New gTLDs Accuracy by Cycle – 2009 RAA Syntax Requirements

	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%
Cycle 5	100.0% ± 0.0%	96.1% ± 0.7%	89.0% ± 1.2%	86.2% ± 1.3%
Change (C5–C4)	0.0% ± 0.1%	0.0% ± 1.1%	3.5% ± 1.8%	3.2% ± 2.0%

²¹ 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	80.6% ± 0.7%	83.8% ± 0.7%	81.1% ± 0.7%
Registrant=Administrative	10.6% ± 0.6%	10.4% ± 0.5%	10.3% ± 0.5%
Registrant=Technical	0.4% ± 0.1%	0.4% ± 0.1%	0.5% ± 0.1%
Administrative=Technical	6.2% ± 0.4%	4.4% ± 0.4%	6.6% ± 0.4%
All Three Different	2.2% ± 0.3%	1.0% ± 0.2%	1.6% ± 0.2%

2009 RAA Reasons for Operability Error in Cycle 4 and Cycle 5

The [Main Findings](#) section contains the ARS Cycle 5 results, but below we also present results from ARS Cycle 4 results.

Table B2: Total Email Address Errors by Contact Type (2009 RAA) – Cycle 4

	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.

Table B3: Total Email Address Errors by Contact Type (2009 RAA) – Cycle 5

	Registrant	Administrative	Technical	Total
Passed All Accuracy Tests	11,322	11,289	11,351	33,962
Not Verifiable (or Missing)	58*	25	26	52
Email Bounced	677	686	623	1,986
Total	12,000	12,000	12,000	36,000

* Registrant email is not required under the 2009 RAA.

Table B4: Total Telephone Number Errors by Contact Type (2009 RAA) – Cycle 4

	Registrant	Administrative	Technical	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.

Table B5: Total Telephone Number Errors by Contact Type (2009 RAA) – Cycle 5

	Registrant	Administrative	Technical	Total
Passed all accuracy tests	8,070	8,105	8,318	24,493
Not Verifiable (or Missing)	68*	39	38	145
Number Disconnected	479	475	469	1,423
Invalid Number	3,174	3,159	2,924	9,257
Other Not Connected	209	222	251	682
Total	12,000	12,000	12,000	36,000

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

Table B6: Total Postal Address Errors by Contact Type (2009 RAA) – Cycle 4

	Registrant	Administrative	Technical	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, No Country	42	75	79	196
N2, Unverifiable	1	1	1	3

Table B7: Total Postal Address Errors by Contact Type (2009 RAA) – Cycle 5

	Registrant	Administrative	Technical	Total
Operable	10,655	10,653	10,647	31,955
Operable P2	725	723	755	2,203
Operable P1	448	436	402	1,286
Total Operable	11,828	11,812	11,804	35,444
Inoperable P2	47	49	47	143
Inoperable P1	87	83	78	248
N1, No Country	38	56	71	165
N2, Unverifiable	0	0	0	0

Additional Comparisons of Operability 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 4	95.0% ± 1.2%	55.3% ± 2.8%	96.9% ± 1.0%	51.6% ± 2.8%
Cycle 5	94.6% ± 1.3%	37.5% ± 2.8%	97.0% ± 1.0%	35.2% ± 2.7%
Change (C5–C4)	-0.4% ± 1.8%	-17.8% ± 3.9%	0.1% ± 1.4%	-16.4% ± 3.9%

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 4	95.1% ± 0.8%	45.6% ± 1.8%	92.4% ± 1.0%	42.1% ± 1.8%
Cycle 5	95.5% ± 0.7%	39.3% ± 1.7%	96.5% ± 0.7%	37.5% ± 1.7%
Change (C5–C4)	0.4% ± 1.1%	-6.3% ± 2.5%	4.1% ± 1.2%	-4.6% ± 2.5%

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 4	90.8% ± 1.2%	65.0% ± 1.9%	99.1% ± 0.4%	59.3% ± 2.0%
Cycle 5	90.0% ± 1.2%	46.6% ± 2.0%	98.8% ± 0.4%	41.9% ± 1.9%
Change (C5–C4)	-0.7% ± 1.7%	-18.4% ± 2.8%	-0.3% ± 0.6%	-17.4% ± 2.8%

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 4	98.2% ± 0.6%	74.8% ± 1.9%	99.5% ± 0.3%	74.2% ± 1.9%
Cycle 5	92.5% ± 1.1%	76.5% ± 1.8%	99.3% ± 0.4%	70.2% ± 2.0%
Change (C5–C4)	-5.7% ± 1.3%	1.7% ± 2.7%	-0.2% ± 0.5%	-4.0% ± 2.8%

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 4	95.5% ± 0.7%	84.0% ± 1.3%	99.6% ± 0.2%	81.2% ± 1.4%
Cycle 5	94.7% ± 0.8%	88.6% ± 1.1%	99.5% ± 0.2%	84.9% ± 1.2%
Change (C5–C4)	-0.8% ± 1.1%	4.6% ± 1.7%	-0.1% ± 0.3%	3.7% ± 1.9%

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 4	96.0% ± 2.0%	73.3% ± 4.5%	93.5% ± 2.5%	71.2% ± 4.6%
Cycle 5	98.0% ± 1.8%	63.1% ± 6.1%	92.6% ± 3.3%	62.3% ± 6.1%
Change (C5–C4)	2.0% ± 2.7%	-10.2% ± 7.5%	-0.9% ± 4.1%	-8.9% ± 7.6%

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 4	92.2% ± 0.7%	69.6% ± 1.3%	98.2% ± 0.4%	65.4% ± 1.3%
Cycle 5	91.1% ± 0.8%	67.3% ± 1.3%	98.5% ± 0.3%	63.1% ± 1.3%
Change (C5–C4)	-1.2% ± 1.1%	-2.3% ± 1.8%	0.3% ± 0.5%	-2.4% ± 1.9%

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 4	96.3% ± 0.5%	68.3% ± 1.2%	96.3% ± 0.5%	65.3% ± 1.2%
Cycle 5	95.7% ± 0.5%	66.7% ± 1.1%	98.3% ± 0.3%	63.6% ± 1.1%
Change (C5–C4)	-0.6% ± 0.7%	-1.6% ± 1.6%	2.0% ± 0.6%	-1.7% ± 1.6%

Appendix C: Additional Analyses – Accuracy to 2013 RAA Requirements

Domains registered in the 2013 RAA (and not grandfathered to 2009 RAA standards) now represent nearly 56 percent of all domains. As stated previously in this report, the 2009 RAA was chosen as a baseline against which all 12,000 of the analyzed subsample records were analyzed. In this appendix, we look at accuracy rates for all 12,000 records based on 2013 RAA requirements. 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, of course.

Graph C1: Overall Accuracy – 2013 RAA Operability Requirements

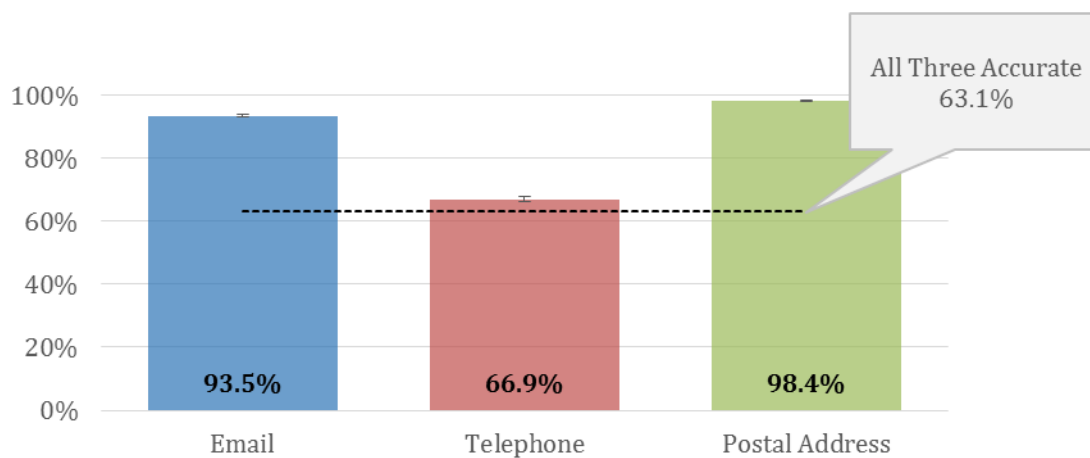


Table C1: Overall Accuracy by Contact Type and Mode – 2013 RAA Operability Requirements

	Email	Telephone	Postal Address	All Three Accurate
Registrant	94.4% ± 0.4%	69.0% ± 0.8%	98.8% ± 0.2%	65.3% ± 0.9%
Administrative	94.6% ± 0.4%	69.1% ± 0.8%	98.6% ± 0.2%	65.6% ± 0.8%
Technical	95.1% ± 0.4%	70.5% ± 0.8%	98.6% ± 0.2%	67.3% ± 0.8%
Overall	93.5% ± 0.4%	66.9% ± 0.8%	98.4% ± 0.2%	63.1% ± 0.9%

Subgroup Accuracy – 2013 RAA Operability Requirements

Next, we look at subgroups in Cycle 5, 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 Operability Requirements

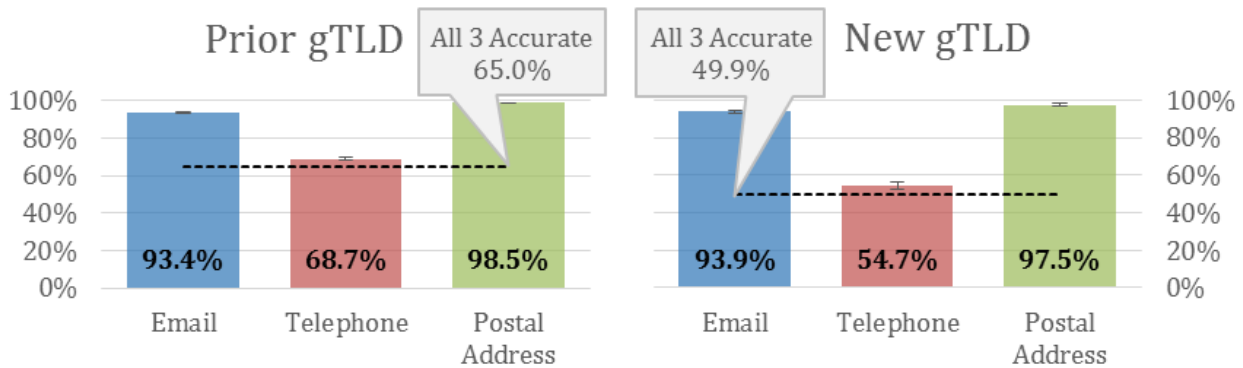


Table C2a shows that while Prior and New gTLDs were close on email and postal address, New gTLDs had lower accuracy for telephone and for all three contact modes.

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

	Email	Telephone	Postal Address	All Three Accurate
Prior gTLD	93.4% ± 0.5%	68.7% ± 0.9%	98.5% ± 0.2%	65.0% ± 1.0%
New gTLD	93.9% ± 0.9%	54.7% ± 1.9%	97.5% ± 0.6%	49.9% ± 1.9%
Overall	93.5% ± 0.4%	66.9% ± 0.8%	98.4% ± 0.2%	63.1% ± 0.9%

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

	Email	Telephone	Postal Address	All Three Accurate
Prior gTLD	93.4% ± 0.5%	70.5% ± 0.9%	98.0% ± 0.3%	66.6% ± 1.0%
2009 RAA	90.0% ± 3.1%	71.4% ± 4.6%	93.5% ± 2.5%	69.3% ± 4.7%
2013GF RAA	91.6% ± 0.8%	69.1% ± 1.3%	98.2% ± 0.4%	64.6% ± 1.3%
2013NGF RAA	95.3% ± 0.7%	71.9% ± 1.4%	97.7% ± 0.5%	68.6% ± 1.5%
New gTLD*	96.7% ± 0.7%	56.7% ± 2.0%	92.1% ± 1.1%	52.1% ± 2.0%
Overall	93.9% ± 0.4%	68.6% ± 0.8%	97.2% ± 0.3%	64.6% ± 0.9%

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 Operability Requirements

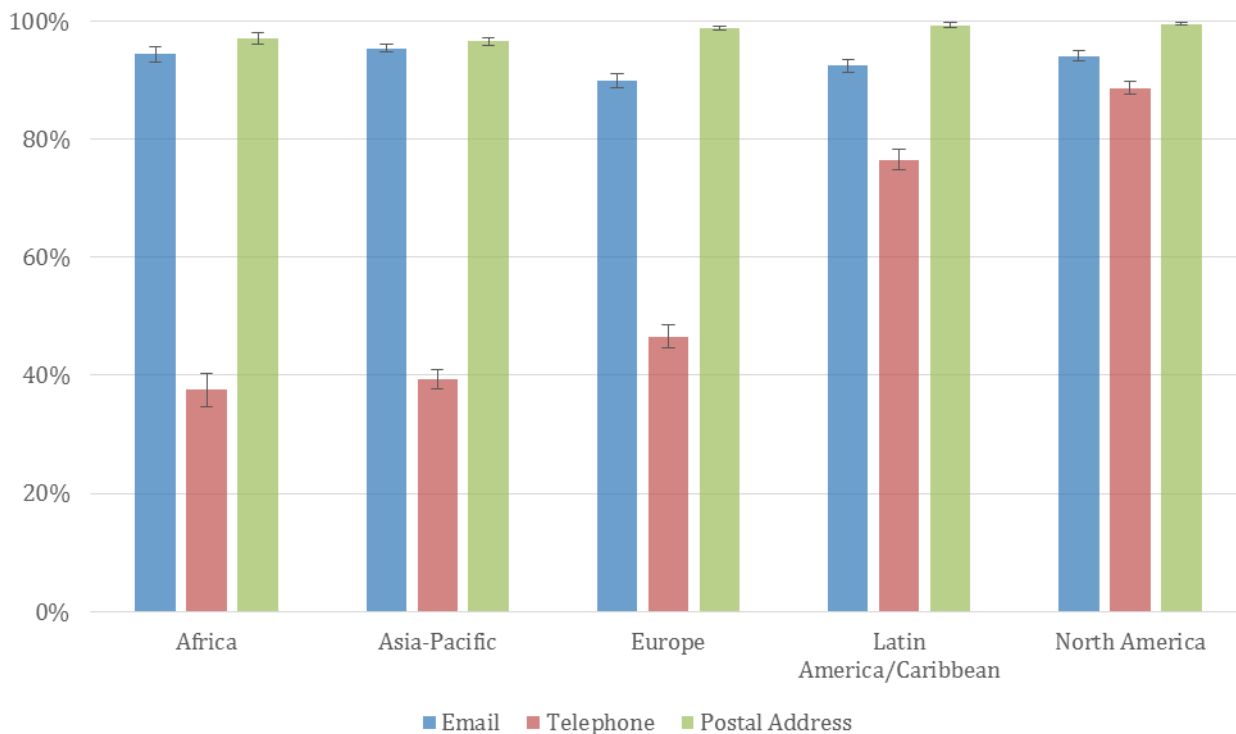


Table C3: Accuracy by ICANN Region – 2013 RAA Operability Requirements

	Email	Telephone	Postal Address	All Three Accurate
Africa	94.4% ± 1.3%	37.5% ± 2.8%	97.0% ± 1.0%	35.2% ± 2.7%
Asia-Pacific	95.4% ± 0.7%	39.3% ± 1.7%	96.5% ± 0.7%	37.5% ± 1.7%
Europe	89.9% ± 1.2%	46.6% ± 2.0%	98.8% ± 0.4%	41.9% ± 1.9%
Latin America/Caribbean	92.4% ± 1.1%	76.5% ± 1.8%	99.3% ± 0.4%	70.2% ± 2.0%
North America	94.1% ± 0.8%	88.6% ± 1.1%	99.5% ± 0.2%	84.2% ± 1.3%
Overall	93.5% ± 0.4%	66.9% ± 0.8%	98.4% ± 0.2%	63.1% ± 0.9%

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 Operability Requirements

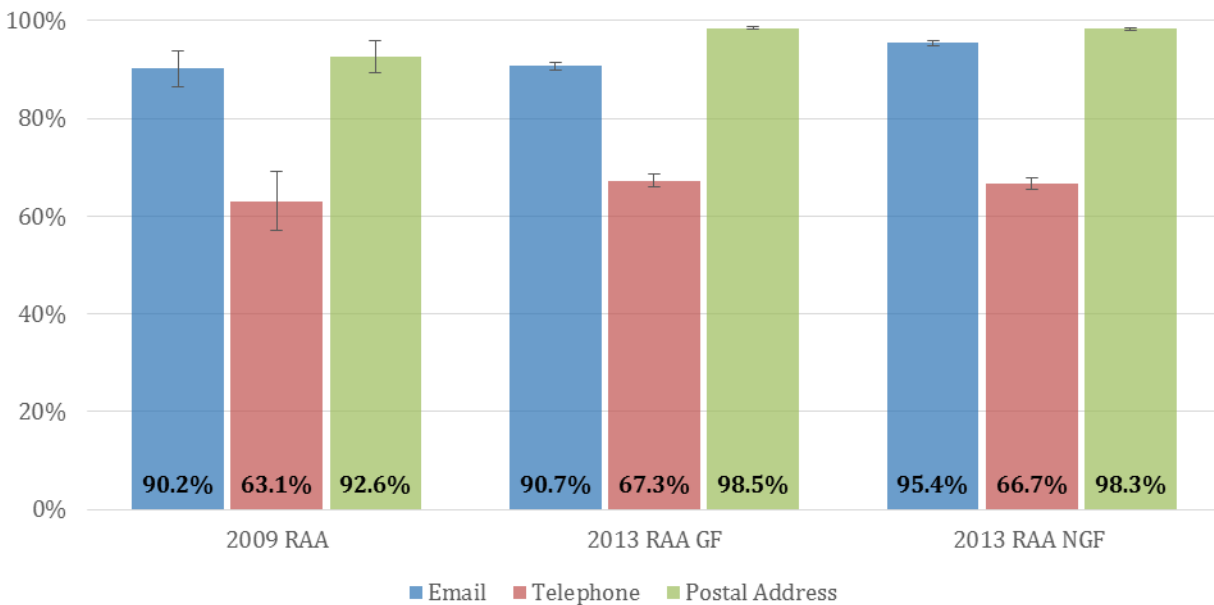


Table C4: Accuracy by RAA Status – 2013 RAA Operability Requirements

	Email	Telephone	Postal Address	All Three Accurate
2009 RAA	90.2% ± 3.7%	63.1% ± 6.1%	92.6% ± 3.3%	62.3% ± 6.1%
2013 RAA GF	90.7% ± 0.8%	67.3% ± 1.3%	98.5% ± 0.3%	62.8% ± 1.3%
2013 RAA NGF	95.4% ± 0.5%	66.7% ± 1.1%	98.3% ± 0.3%	63.3% ± 1.1%
Overall	93.5% ± 0.4%	66.9% ± 0.8%	98.4% ± 0.2%	63.1% ± 0.9%

Comparisons between Cycles – 2013 RAA Syntax Requirements

Above, we presented the operational accuracy to 2013 RAA requirements for Cycle 5 for all 12,000 records. Here, we compare the Cycle 4 syntax results to those from Cycle 5 for only the 6,790 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 4	98.8% ± 0.3%	92.8% ± 0.6%	80.8% ± 1.0%	75.4% ± 1.1%
Cycle 5	99.3% ± 0.2%	93.9% ± 0.6%	84.0% ± 0.9%	80.0% ± 1.0%
Change (C5–C4)	0.4% ± 0.3%	1.1% ± 0.9%	3.2% ± 1.3%	4.6% ± 1.4%

Prior vs. New gTLDs

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 4	98.5% ± 0.4%	91.8% ± 0.9%	82.8% ± 1.2%	76.5% ± 1.3%
Cycle 5	99.1% ± 0.3%	93.3% ± 0.8%	84.4% ± 1.1%	80.0% ± 1.2%
Change (C5–C4)	0.6% ± 0.5%	1.5% ± 1.2%	1.5% ± 1.6%	3.5% ± 1.8%

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 4	99.9% ± 0.1%	96.0% ± 0.8%	74.4% ± 1.7%	71.9% ± 1.8%
Cycle 5	100.0% ± 0.0%	96.1% ± 0.7%	82.6% ± 1.4%	80.1% ± 1.5%
Change (C5–C4)	0.0% ± 0.1%	0.0% ± 1.1%	8.3% ± 2.3%	8.2% ± 2.4%

ICANN Regions

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 4	100.0% ± 0.0%	72.5% ± 3.1%	53.8% ± 3.5%	39.6% ± 3.4%
Cycle 5	100.0% ± 0.0%	70.0% ± 3.2%	54.0% ± 3.4%	37.5% ± 3.3%
Change (C5–C4)	0.0% ± 0.0%	-2.6% ± 4.4%	0.2% ± 4.9%	-2.1% ± 4.8%

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 4	98.9% ± 0.5%	92.9% ± 1.2%	63.7% ± 2.2%	60.1% ± 2.2%
Cycle 5	99.2% ± 0.4%	93.4% ± 1.1%	71.6% ± 2.0%	69.0% ± 2.1%
Change (C5–C4)	0.3% ± 0.6%	0.5% ± 1.6%	8.0% ± 3.0%	8.9% ± 3.0%

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 4	99.9% ± 0.2%	91.7% ± 1.6%	78.9% ± 2.3%	74.3% ± 2.5%
Cycle 5	100.0% ± 0.0%	92.0% ± 1.5%	76.7% ± 2.3%	71.5% ± 2.4%
Change (C5–C4)	0.1% ± 0.2%	0.3% ± 2.1%	-2.2% ± 3.2%	-2.8% ± 3.5%

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 4	100.0% ± 0.0%	93.5% ± 1.6%	87.9% ± 2.1%	83.1% ± 2.4%
Cycle 5	100.0% ± 0.0%	93.3% ± 1.5%	88.4% ± 1.9%	84.9% ± 2.1%
Change (C5–C4)	0.0% ± 0.0%	-0.1% ± 2.2%	0.5% ± 2.9%	1.8% ± 3.2%

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 4	98.4% ± 0.7%	93.8% ± 1.2%	97.8% ± 0.8%	90.5% ± 1.5%
Cycle 5	99.2% ± 0.4%	95.6% ± 1.0%	96.6% ± 0.9%	92.1% ± 1.3%
Change (C5–C4)	0.9% ± 0.8%	1.8% ± 1.6%	-1.2% ± 1.2%	1.6% ± 2.0%

RAA Status

Finally, Tables C13 through C15 show the changes from Cycle 4 to Cycle 5 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 4	93.8% ± 2.5%	63.8% ± 4.9%	68.2% ± 4.7%	53.7% ± 5.1%
Cycle 5	92.2% ± 3.4%	54.9% ± 6.2%	71.7% ± 5.7%	52.9% ± 6.3%
Change (C5–C4)	-1.5% ± 4.2%	-8.9% ± 7.9%	3.5% ± 7.4%	-0.8% ± 8.1%

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 4	98.7% ± 0.3%	80.2% ± 1.1%	86.9% ± 0.9%	70.7% ± 1.3%
Cycle 5	99.0% ± 0.3%	81.7% ± 1.1%	86.2% ± 1.0%	71.8% ± 1.3%
Change (C5–C4)	0.3% ± 0.4%	1.6% ± 1.5%	-0.7% ± 1.3%	1.0% ± 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 4	98.8% ± 0.3%	92.8% ± 0.6%	80.8% ± 1.0%	75.4% ± 1.1%
Cycle 5	99.3% ± 0.2%	93.9% ± 0.6%	84.0% ± 0.9%	80.0% ± 1.0%
Change (C5–C4)	0.4% ± 0.3%	1.1% ± 0.9%	3.2% ± 1.3%	4.6% ± 1.4%

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 4, and also show the same data for Cycle 5.

Email Addresses

Table C16: 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
Unallowed Characters	0	0	0	0
@ Missing	0	0	0	0
Not Resolvable	0	0	0	0
Total	6,224	6,224	6,224	18,672

Table C17: Total Email Address Errors by Contact Type (2013 RAA) – Cycle 5

	Registrant	Administrative	Technical	Total
Passed all accuracy tests	6,777	6,778	6,779	20,334
Missing	13	12	11	36
Unallowed Characters	0	0	0	0
@ Missing	0	0	0	0
Not Resolvable	0	0	0	0
Total	6,790	6,790	6,790	20,370

Telephone Numbers

Table C18: 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.

Table C19: Total Telephone Number Errors by Contact Type (2013 RAA) – Cycle 5

	Registrant	Administrative	Technical	Total
Passed All Accuracy Tests	6,277	6,263	6,285	18,825
Not Present	8	16	16	40
Country Code Missing	88	87	86	261
<i>Country Code Format</i>	35	36	36	107
Incorrect Length	381	387	366	1,134
Characters Not Allowed	1	1	1	3
Total	6,790	6,790	6,790	20,370

Note: Italics indicate new 2013 RAA requirements.

Postal Addresses

Table C20: 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
<i>Country in Wrong Field</i>	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
<i>Postal Code in Wrong Field</i>	0	0	0	0
State/Province Missing	81	79	65	225
<i>State/Province in Wrong Field</i>	20	16	7	43
<i>State/Province Format</i>	80	81	75	236
City Missing	314	331	334	979
<i>City in Wrong Field</i>	250	254	269	773
Street Missing	450	439	404	1,293
<i>Street in Wrong Field</i>	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.

Table C21: Total Postal Address Errors by Contact Type (2013 RAA) – Cycle 5

	Registrant	Administrative	Technical	Total
Passed All Accuracy Tests	5,625	5,575	5,627	16,827
Missing	3	12	11	26
Country Code Missing	2	2	2	6
Country Not Identifiable	33	34	34	101
<i>Country in Wrong Field</i>	89	89	89	267
Country Not ISO Alpha 2	0	0	0	0
Postal Code Missing	246	272	260	778
Postal Code Format	0	0	0	0
<i>Postal Code in Wrong Field</i>	0	0	0	0
State/Province Missing	76	74	64	214
<i>State/Province in Wrong Field</i>	12	11	7	30
<i>State/Province Format</i>	68	68	64	200
City Missing	309	333	319	961
<i>City in Wrong Field</i>	155	155	160	470
Street Missing	418	403	382	1,203
<i>Street in Wrong Field</i>	52	53	52	157
TOTAL	6,790	6,790	6,790	20,370
Total Errors	1,463	1,506	1,444	4,413

Note: Italics indicate new 2013 RAA requirements.