



# WHOIS Accuracy Reporting System (ARS)

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Phase 2 Cycle 3 Report: Syntax and Operability Accuracy  
Global Domains Division | 12 December 2016

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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).<sup>1</sup> 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.

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 contains additional findings (e.g., reasons for error). 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 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 subsample

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

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<sup>2</sup> 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

Ninety-seven percent of records had at least one email or phone meet all operability requirements, which implies that nearly all records contain information that can be used to establish immediate contact. Only three percent of records had contact information that met neither email nor or phone operability requirements.

### Operability Accuracy

The operability accuracy analysis finds that approximately 90 percent of email addresses, 72 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. Compared to Cycle 2, this was approximately a 5 percent decrease. Table Ex1 provides the accuracy breakdown by contact mode as well as the changes from Cycle 2 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
<b>All Three Contacts Accurate</b>	90.1% ± 0.5%	72.4% ± 0.8%	96.8% ± 0.3%	65.1% ± 0.9%
<b>Change (C3-C2)</b>	-1.2% ± 0.7%	-3.6% ± 1.1%	-0.8% ± 0.4%	-5.0% ± 1.2% <sup>3</sup>

### Syntax Accuracy

The syntax accuracy analysis finds that approximately 99 percent of email addresses, 89 percent of telephone numbers and 75 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 67 percent for the gTLD population as a whole. Compared to Cycle 2, this was approximately a 1 percent decrease. Table Ex2 provides the accuracy breakdown by contact mode as well as the changes from Cycle 2, presented as 95 percent confidence intervals.

<sup>2</sup> 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>.

<sup>3</sup> This change is statistically significant. One possible reason, in addition to natural sample variation, is changes in the market and increase of domains in certain regions. See the section [Background: Sample and Market Information](#), [Regional Findings](#), and [Comparisons between Cycles](#) for more information.

Table Ex2: Overall<sup>4</sup> gTLD Accuracy to 2009 RAA Syntax Requirements by Mode

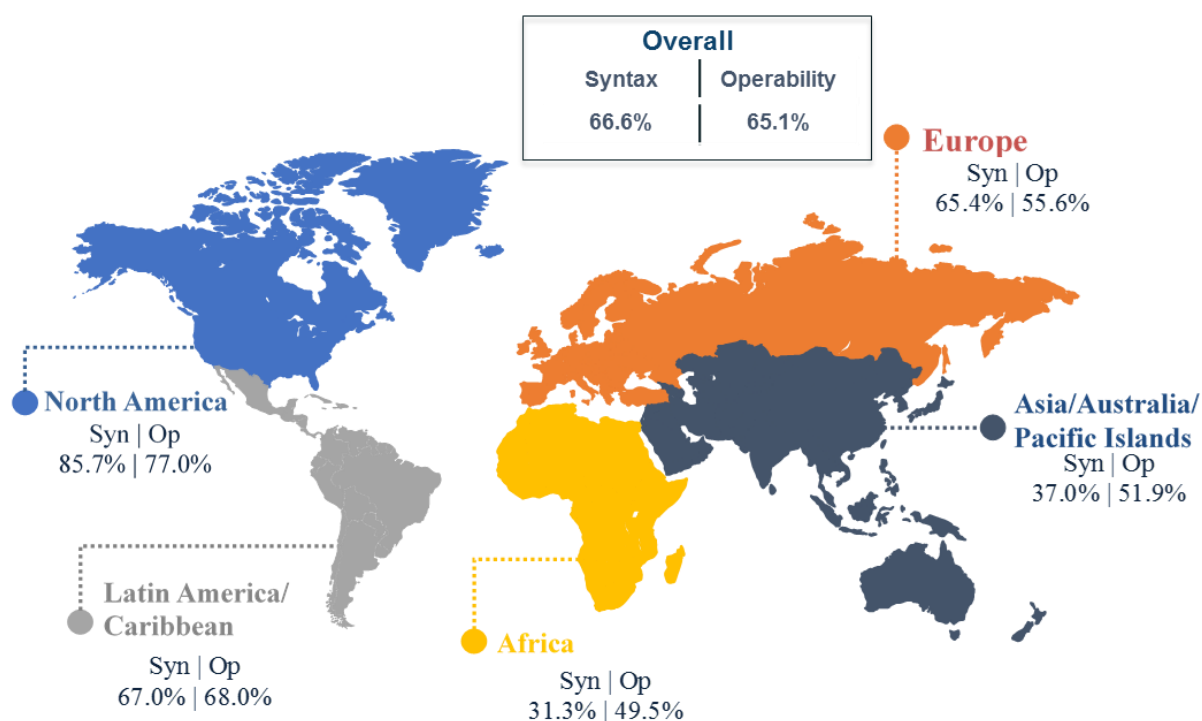
	Email	Telephone	Postal Address	All Three Accurate
<b>All Three Contacts Accurate</b>	99.6% ± 0.1%	88.5% ± 0.6%	74.7% ± 0.8%	66.6% ± 0.8%
<b>Change (C3-C2)</b>	0.4% ± 0.2%	3.2% ± 0.9%	-2.8% ± 1.1%	-0.8% ± 1.2% <sup>5</sup>

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.*

<sup>4</sup> “Overall accuracy” refers to the entire population of domains. See note 12 on confidence intervals and population.

<sup>5</sup> This change is not statistically significant. See the section [Comparisons between Cycles](#) for more information.

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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. 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 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 the country is also flexible with its postal addressing rules.

## ICANN Contractual Compliance

As indicated above, one major goal 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.

### 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. WHOIS format errors will not be forwarded to 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. While format issues may not require contact with registered name holders, 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. 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.

### Phase 2 Results

Compliance continues to present metrics for WHOIS ARS in the Compliance Quarterly Reports (see <https://www.icann.org/resources/pages/compliance-reports-2016-04-15-en>) and will provide additional information when metrics are generated for the fourth quarter of 2016. Additionally, metrics will be provided at ICANN Public Meetings, and included in updates published in the Compliance Outreach Activities (<https://www.icann.org/resources/compliance/outreach>).

## Next Steps

### Phase 2 Cycle 3

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](http://icann.org) with

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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 4**

As noted above, Phase 2 is cyclical with a new report published every 6 months. Cycle 4 will begin in January 2017 with a report expected in June 2017.

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# Background: Sample and Market Information

## Brief Overview

In Cycle 3 we first selected a sample of 200,000 WHOIS records from the zone files of 664 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 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 50 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). Thus, 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

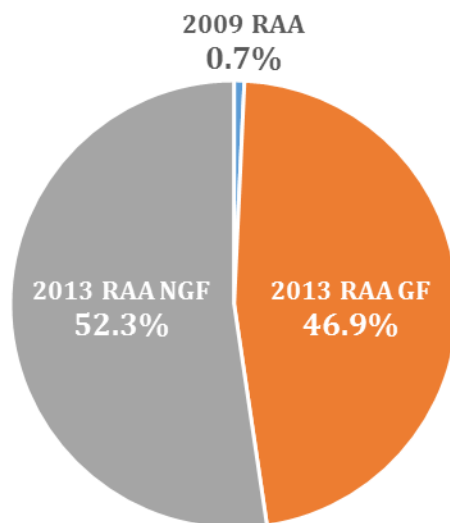




Table 1 shows the shares of the different RAA types, and Graph 2 show the change in distribution over time. Between Cycle 2 and Cycle 3, the 2009 RAA share decreased from 2.4% to 0.8%.

Table 1: Distribution of RAA Type, by Sample Date

	2009 RAA	2013 GF RAA	2013 NGF RAA
<b>June 2015 (Cycle 1)</b>	3.3%	63.7%	33.0%
<b>January 2016 (Cycle 2)</b>	2.9%	52.4%	44.7%
<b>July 2016 (Cycle 3)</b>	0.7%	46.9%	52.3%

Graph 2: Change in Distribution of RAA Type, by Sample Date<sup>6</sup>

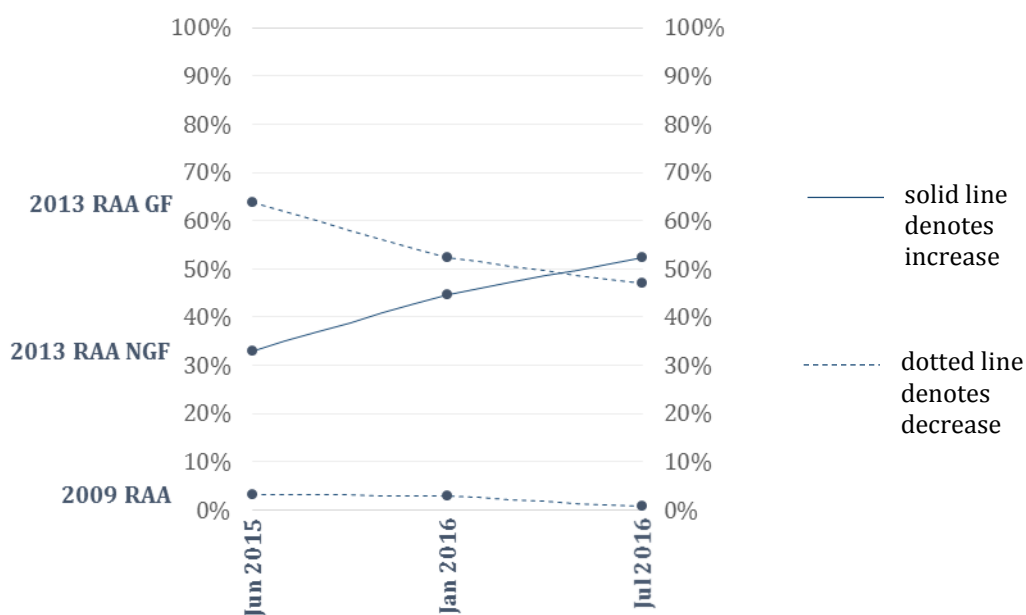


Table 2 shows the number of domains by RAA type over time, as well as the number of domains in New and Prior gTLDs and number of domains by Region. From June 2015 to June 2016 there was a substantial drop in the number of domains in the 2009 RAA, and a substantial increase in the number of New gTLD domains. In terms of regions, the Asia Pacific region saw the highest increase in total domains.

<sup>6</sup> The pilot study sample has not been included here because the pilot did not sample from all domains available at the time.

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

Sample Date	gTLD Type		RAA Type			Region						Total
	New gTLD	Prior gTLD	RAA 2009	RAA 2013 GF	RAA 2013 NGF	AF	AP	EUR	LAC	NA	Unkn own	
June 2015 (Cycle 1)	5.8	152	5.5	104	49	1.12	34.7	30.3	6.25	84.4	1.15	158
January 2016 (Cycle 2)	10.9	159	5.0	89	76	1.16	43.7	31.3	7.05	85.5	1.26	170
July 2016 (Cycle 3)	21.4	162	1.3	86	95	1.27	52.8	33.2	8.31	88.0	0.493	184

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 3, in July 2016, there were about 181 million domains names spread across 1,074 gTLDs. Approximately 88 percent of the 181 million domains were registered in one of the 18 Prior gTLDs, as compared to 94 percent in January 2016, when data was collected for Cycle 2 (see Table 1). Almost 12 percent of domains in July 2016 were registered in New gTLDs, marking a dramatic increase from the 6 percent registered in January 2016. The overall number of New gTLDs also grew substantially, increasing from 888 in January 2016 to 1,056 in July 2016.

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
<b>April 2015 (Phase 1)</b>	18	592	<b>610</b>
<b>June 2015 (Phase 2 Cycle 1)</b>	18	660	<b>678</b>
<b>January 2016 (Phase 2 Cycle 2)</b>	18	870	<b>888</b>
<b>July 2016 (Phase 2 Cycle 3)</b>	18	1,056	<b>1,074</b>

Out of the 1,056 New gTLDs, only 698 had at least one domain (358 New gTLDs did not yet have any domains), 52 had exactly one domain (these were excluded from our sample since it is typically an administrative domain for the gTLD) and the remaining 646 others had at least two domains. Adding together the 18 prior gTLDs and the 646 New gTLDs described above, the initial sample represented a total of 664 gTLDs. Similar to the previous WHOIS ARS<sup>7</sup> study samples, our Cycle 3 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 197,164 records (98.6% of the initial sample, as shown in Table 4).

Table 4: Initial Sample Sizes by Region and RAA

RAA Type	Africa	Asia Pacific	Europe	Latin America and Caribbean	North America	Unknown	TOTAL
<b>2009</b>	1	122	182	201	694	34	<b>1,234</b>
<b>2013 GF</b>	468	13,466	16,910	2,036	45,362	295	<b>78,537</b>
<b>2013 NGF</b>	798	51,635	19,066	7,626	38,146	122	<b>117,393</b>
<b>TOTAL</b>	<b>1,267</b>	<b>65,223</b>	<b>36,158</b>	<b>9,863</b>	<b>84,202</b>	<b>451</b>	<b>197,165</b>

### 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.

<sup>7</sup> 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](#)

Table 5: Analyzed Subsample Sizes by Region and RAA

RAA Type	Africa	Asia Pacific	Europe	Latin America and Caribbean	North America	Unknown	TOTAL
<b>2009</b>	1	122	182	201	671	33	<b>1,210</b>
<b>2013 GF</b>	468	1,003	1,000	801	1,550	10	<b>4,832</b>
<b>2013 NGF</b>	798	1,819	1,027	902	1,408	4	<b>5,958</b>
<b>TOTAL</b>	<b>1,267</b>	<b>2,944</b>	<b>2,209</b>	<b>1,904</b>	<b>3,629</b>	<b>47</b>	<b>12,000</b>

Table 6 compares the sample sizes by RAA type in the initial sample of 196,262 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
<b>2009 RAA</b>	1,234	0.6%	1,210	<b>10.1%</b>
<b>2013 RAA GF</b>	78,538	39.8%	4,832	<b>40.3%</b>
<b>2013 RAA NGF</b>	117,393	59.5%	5,958	<b>49.7%</b>
<b>TOTAL</b>	<b>197,165</b>	<b>100.0%</b>	<b>12,000</b>	<b>100.0%</b>

### 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<sup>8</sup>

Commonality	Email	Telephone	Postal Address
<b>All Three Exactly Same</b>	80.1% ± 0.7%	82.8% ± 0.7%	81.0% ± 0.7%
<b>Exactly Two the Same, One Different</b>	17.6% ± 0.7%	12.6% ± 0.7%	17.1% ± 0.7%
<b>All Three Different</b>	2.3% ± 0.3%	0.9% ± 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 2.3% 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](#).

<sup>8</sup> An expanded version of Table 7 can be found as Table B1 in [Appendix B](#).

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# 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<sup>9</sup> (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](#).<sup>10</sup>

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.<sup>11</sup> 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 conformance to 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-seven percent of records had at least one email or telephone number 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 three percent of records had contact information that met neither email nor telephone operability requirements.

### *Operability Accuracy*

- Ninety-seven percent of postal addresses, 72 percent of telephone numbers and 90 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 about five percent less than Cycle 2.
  - Regional variations of operability accuracy are greatest for telephone, which ranges from 60 percent accurate (Asia-Pacific) to 83 percent accurate (North America).
- The contact mode with the highest rate of passing all operability tests was postal address. The mode with the lowest rate of passing all operability tests was telephone numbers.

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<sup>9</sup> 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 of the accuracy tests.

<sup>10</sup> 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.

<sup>11</sup> The 2009 RAA was chosen as a baseline against which all 12,000 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 the small numbers of postal addresses that failed operability testing, about 50 percent of those did not have an identifiable or easily deduced country.
- For operability errors for email addresses, about 10 percent of the email addresses bounced, while less than one percent of the records were missing the email address.

*Syntax Accuracy:*

- More than 88 percent of telephone numbers met all syntax requirements of the 2009 RAA, increasing from Cycle 2 (85 percent). The reasons for syntax errors had very similar distributions to those in Cycle 2.
  - ❑ Regional variations of syntax accuracy were greatest for postal address, which ranges from 41 percent accurate (Asia-Pacific) to 97 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.

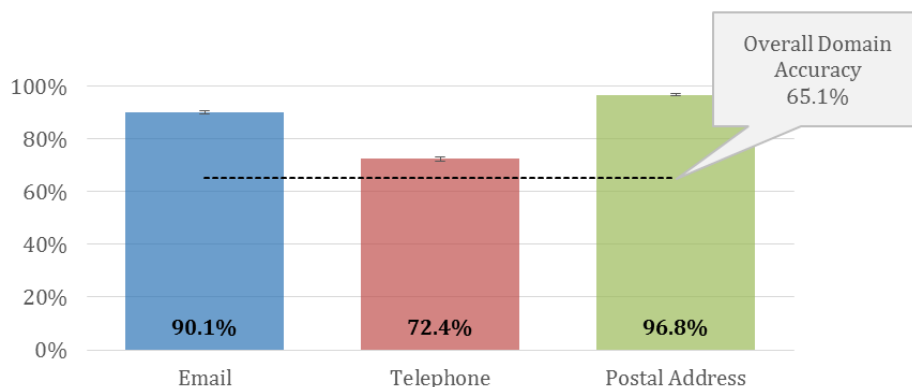
## Operability Accuracy – 2009 RAA Requirements<sup>12</sup>

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 12,000 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



<sup>12</sup> 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
<b>Registrant</b>	91.4% ± 0.5%	76.5% ± 0.8%	97.2% ± 0.3%	<b>68.9% ± 0.8%</b>
<b>Administrative</b>	91.2% ± 0.5%	75.8% ± 0.8%	97.0% ± 0.3%	<b>68.7% ± 0.8%</b>
<b>Technical</b>	91.9% ± 0.5%	74.9% ± 0.8%	97.1% ± 0.3%	<b>68.5% ± 0.8%</b>
<b>Overall</b>	<b>90.1% ± 0.5%</b>	<b>72.4% ± 0.8%</b>	<b>96.8% ± 0.3%</b>	<b>65.1% ± 0.9%</b>

### Operability Accuracy by Prior vs. New gTLD

Graph 4 and Table 9 show that Prior gTLDs have lower operability accuracy on email and postal addresses, but higher accuracy on telephone numbers. These results are similar to the findings of Cycle 2.

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

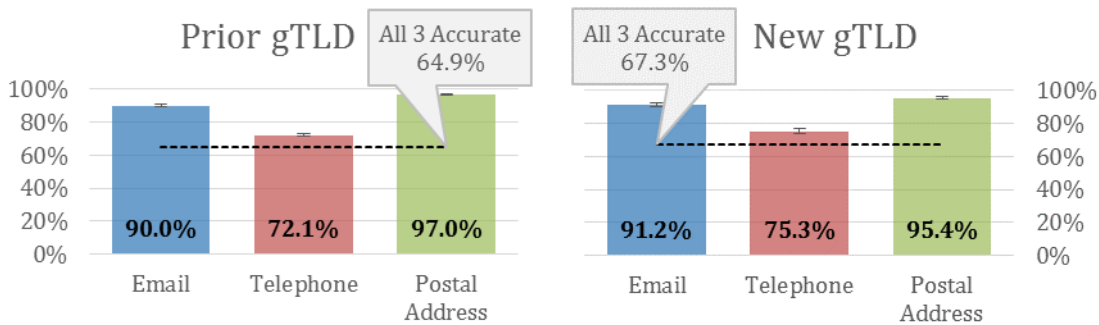


Table 9: Accuracy by gTLD Type – 2009 RAA Operability Requirements

	Email	Telephone	Postal Address	All Three Accurate
<b>Prior gTLD</b>	90.0% ± 0.6%	72.1% ± 0.9%	97.0% ± 0.3%	<b>64.9% ± 1.0%</b>
<b>New gTLD</b>	91.2% ± 1.1%	75.3% ± 1.7%	95.4% ± 0.8%	<b>67.3% ± 1.9%</b>
<b>Overall</b>	<b>90.1% ± 0.5%</b>	<b>72.4% ± 0.8%</b>	<b>96.8% ± 0.3%</b>	<b>65.1% ± 0.9%</b>

### 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, while 2013 RAA GF had the highest postal address accuracy but the lowest telephone accuracy.

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

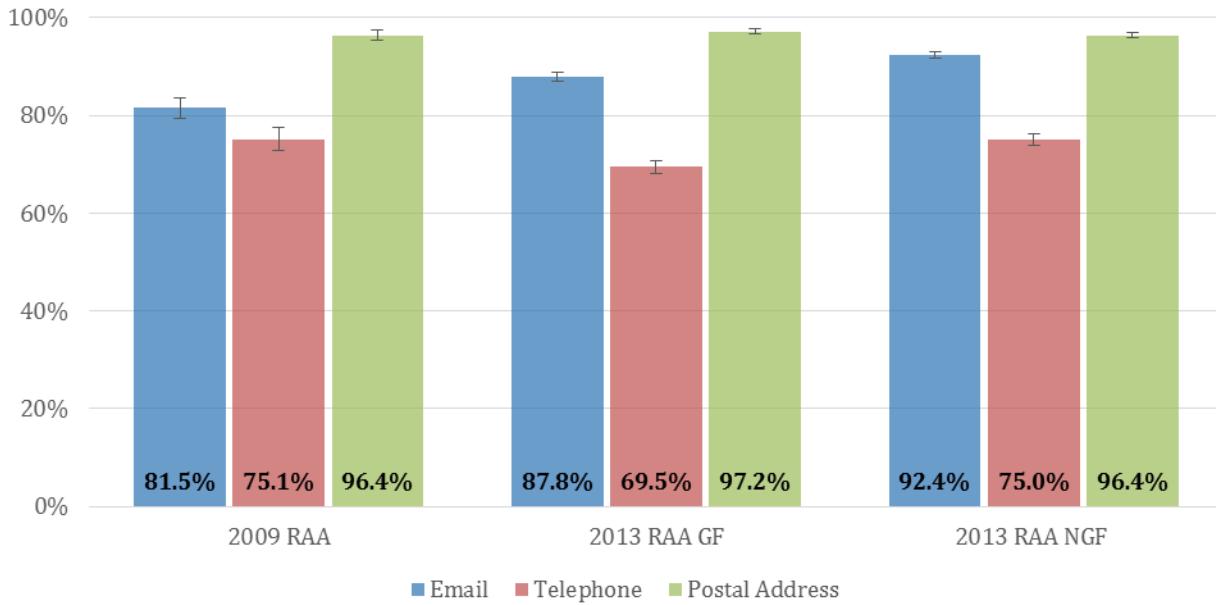


Table 10: Accuracy by RAA Status – 2009 RAA Operability Requirements

	Email	Telephone	Postal Address	All Three Accurate
<b>2009 RAA</b>	81.5% ± 2.2%	75.1% ± 2.4%	96.4% ± 1.1%	<b>58.6% ± 2.8%</b>
<b>2013 RAA GF</b>	87.8% ± 0.9%	69.5% ± 1.3%	97.2% ± 0.5%	<b>61.9% ± 1.4%</b>
<b>2013 RAA NGF</b>	92.4% ± 0.7%	75.0% ± 1.1%	96.4% ± 0.5%	<b>68.1% ± 1.2%</b>
<b>Overall</b>	<b>90.1% ± 0.5%</b>	<b>72.4% ± 0.8%</b>	<b>96.8% ± 0.3%</b>	<b>65.1% ± 0.9%</b>

### 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

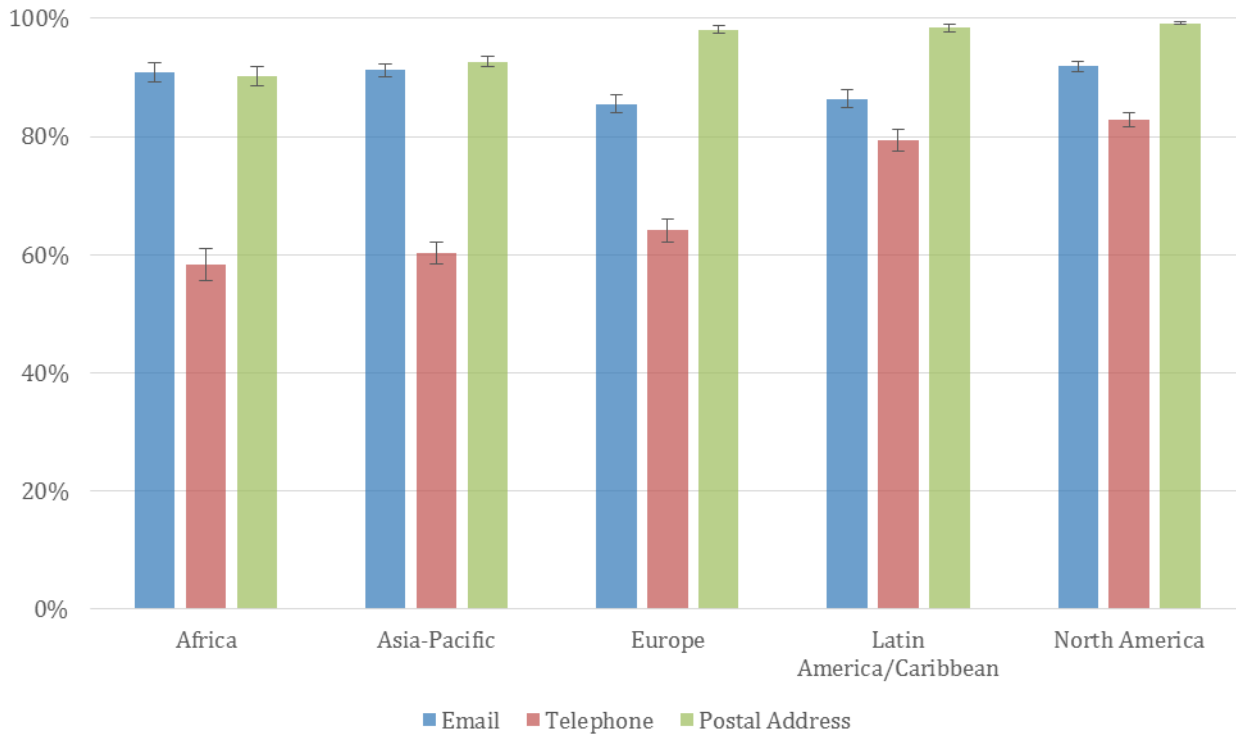


Table 11: Accuracy by ICANN Region – 2009 RAA Operability Requirements

	Email	Telephone	Postal Address	All Three Accurate
<b>Africa</b>	90.9% ± 1.6%	58.4% ± 2.7%	90.2% ± 1.6%	<b>49.5% ± 2.8%</b>
<b>Asia-Pacific</b>	91.2% ± 1.0%	60.3% ± 1.8%	92.7% ± 0.9%	<b>51.9% ± 1.8%</b>
<b>Europe</b>	85.5% ± 1.5%	64.1% ± 2.0%	98.1% ± 0.6%	<b>55.6% ± 2.1%</b>
<b>Latin America/Caribbean</b>	86.4% ± 1.5%	79.4% ± 1.8%	98.4% ± 0.6%	<b>68.0% ± 2.1%</b>
<b>North America</b>	91.9% ± 0.9%	82.8% ± 1.2%	99.2% ± 0.3%	<b>77.0% ± 1.4%</b>
<b>Overall</b>	<b>90.1% ± 0.5%</b>	<b>72.4% ± 0.8%</b>	<b>96.8% ± 0.3%</b>	<b>65.1% ± 0.9%</b>

### Reasons for Error – 2009 RAA Operability Requirements<sup>13</sup>

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 10.1 percent of the records received a “bounced back” email, revealing that the email address was not operable. The required emails were not provided only about 0.2 percent of the time for the administrative and technical contact fields.

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

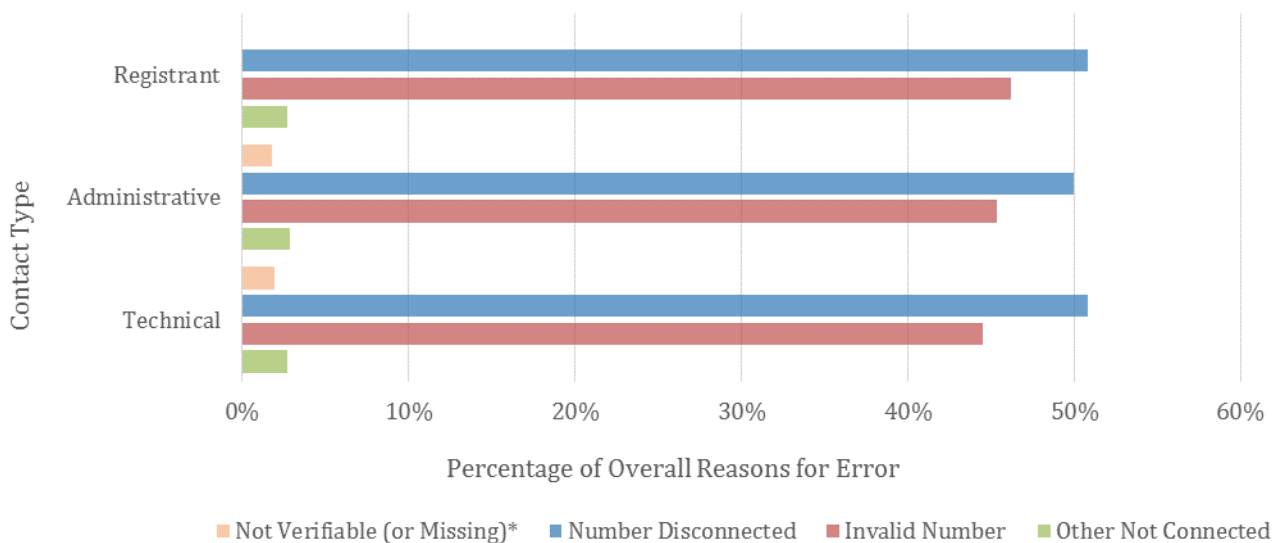
	Registrant	Administrative	Technical	Total
<b>Passed All Accuracy Tests</b>	10,751	10,725	10,812	<b>32,288</b>
<b>Not Verifiable (or Missing)</b>	97*	35	36	<b>71</b>
<b>Email Bounced</b>	1,249	1,240	1,152	<b>3,641</b>
<b>Total</b>	<b>12,000</b>	<b>12,000</b>	<b>12,000</b>	<b>36,000</b>

\* Registrant email is not required under the 2009 RAA.

#### Telephone Numbers

Graph 7 and Table 13 show that approximately 13.0 percent of errors were from disconnected telephone numbers, another 11.7 percent were from invalid number and another 0.7 percent did not connect at all. Less than 1 percent of required telephone numbers were missing.

Graph 7: Telephone Number Errors by Contact Type – 2009 RAA Operability Requirements



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

<sup>13</sup> 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
<b>Passed All Accuracy tests</b>	8,975	8,895	8,853	<b>26,723</b>
<b>Not Verifiable (or Missing)</b>	115*	55	61	<b>121</b>
<b>Number Disconnected</b>	1,538	1,551	1,599	<b>4,688</b>
<b>Invalid Number</b>	1,399	1,409	1,401	<b>4,209</b>
<b>Other Not Connected</b>	83	90	86	<b>259</b>
<b>Total</b>	<b>12,000</b>	<b>12,000</b>	<b>12,000</b>	<b>36,000</b>

\* 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 only those addresses still determined to be inoperable after this manual process. Table 14 shows that 70.6 percent of the P2 addresses and 75.6 percent of the P1 addresses were determined to be operable using a 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

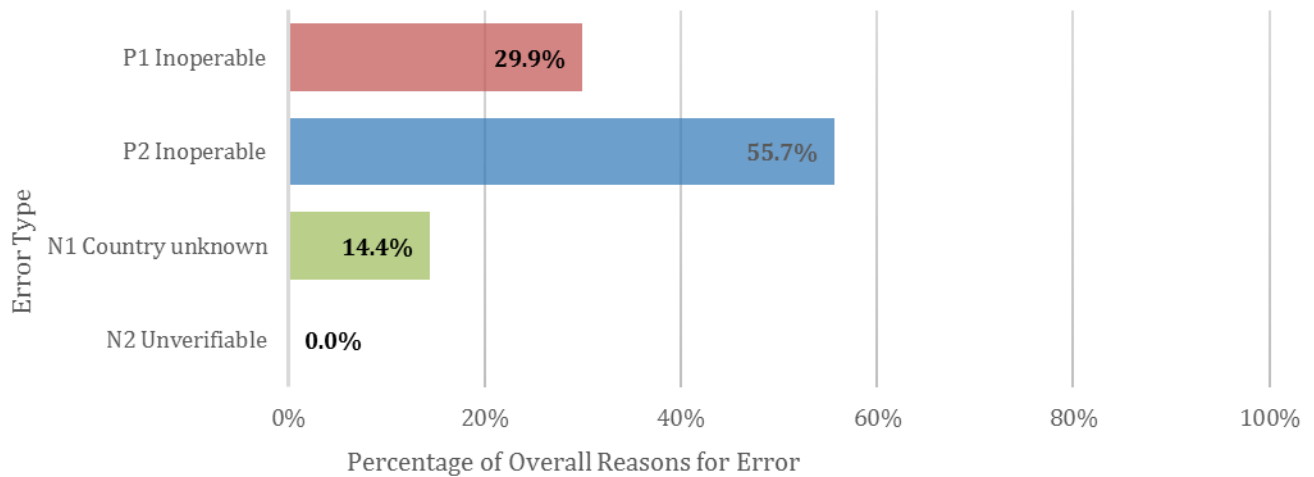


Table 14: Postal Address Errors by Contact Type – 2009 RAA Operability Requirements

	Administrative	Technical	Registrant	Total
<b>Operable</b>	10,514	10,519	10,509	<b>31,542</b>
<b>Operable P2</b>	603	595	634	<b>1,832</b>
<b>Operable P1</b>	427	423	411	<b>1,261</b>
<b>TOTAL OPERABLE</b>	<b>11,544</b>	<b>11,537</b>	<b>11,554</b>	<b>34,635</b>
<b>Inoperable P2</b>	264	254	242	<b>760</b>
<b>Inoperable P1</b>	137	138	133	<b>408</b>
<b>N1, Country unknown</b>	55	71	71	<b>197</b>
<b>N2, Unverifiable</b>	0	0	0	<b>0</b>
<b>TOTAL INOPERABLE</b>	<b>456</b>	<b>463</b>	<b>446</b>	<b>1,365</b>
<b>OVERALL TOTAL</b>	<b>12,000</b>	<b>12,000</b>	<b>12,000</b>	<b>36,000</b>

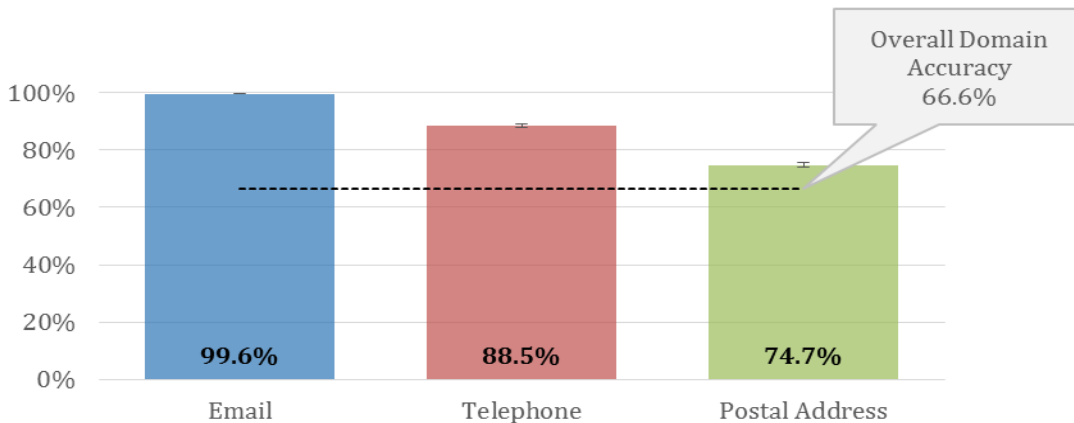
## Syntax Accuracy – 2009 RAA Requirements<sup>14</sup>

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 67 percent of domains can be said to be syntactically accurate.

Graph 9: Overall Accuracy – 2009 RAA Syntax Requirements



<sup>14</sup> 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
<b>Registrant</b>	100.0% ± 0.0%	90.0% ± 0.5%	75.9% ± 0.8%	<b>68.5% ± 0.8%</b>
<b>Administrative</b>	99.6% ± 0.1%	89.3% ± 0.6%	75.8% ± 0.8%	<b>68.2% ± 0.8%</b>
<b>Technical</b>	99.6% ± 0.1%	89.8% ± 0.5%	77.8% ± 0.7%	<b>70.5% ± 0.8%</b>
<b>Overall</b>	<b>99.6% ± 0.1%</b>	<b>88.5% ± 0.6%</b>	<b>74.7% ± 0.8%</b>	<b>66.6% ± 0.8%</b>

### Syntax Accuracy by Prior vs. New gTLDs

Graph 10 and Table 16 show that Prior gTLDs have lower<sup>15</sup> accuracy on email addresses and telephone numbers, but higher accuracy on postal addresses. Prior gTLDs also have a higher rate of having all three contact fields accurate.

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

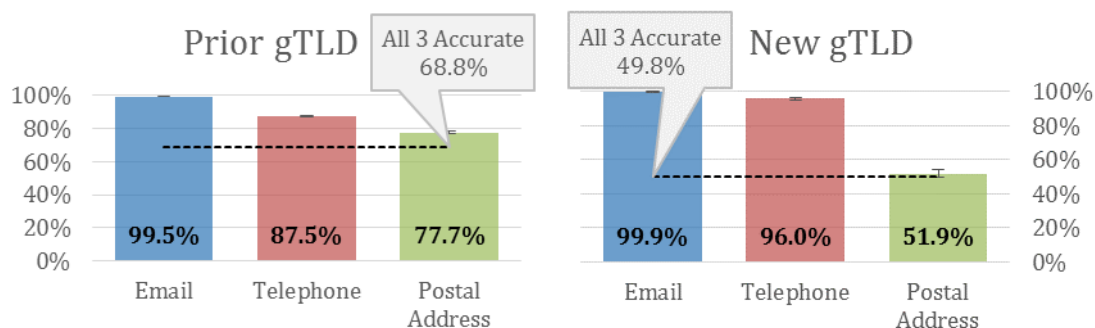


Table 16: Accuracy by gTLD Type – 2009 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Three Accurate
<b>Prior gTLD</b>	99.5% ± 0.1%	87.5% ± 0.7%	77.7% ± 0.8%	<b>68.8% ± 0.9%</b>
<b>New gTLD</b>	99.9% ± 0.1%	96.0% ± 0.8%	51.9% ± 2.0%	<b>49.8% ± 2.0%</b>
<b>Overall</b>	<b>99.6% ± 0.1%</b>	<b>88.5% ± 0.6%</b>	<b>74.7% ± 0.8%</b>	<b>66.6% ± 0.8%</b>

<sup>15</sup> 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. The 2009 RAA group has the highest percentage of records in which all three contact modes were accurate.

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

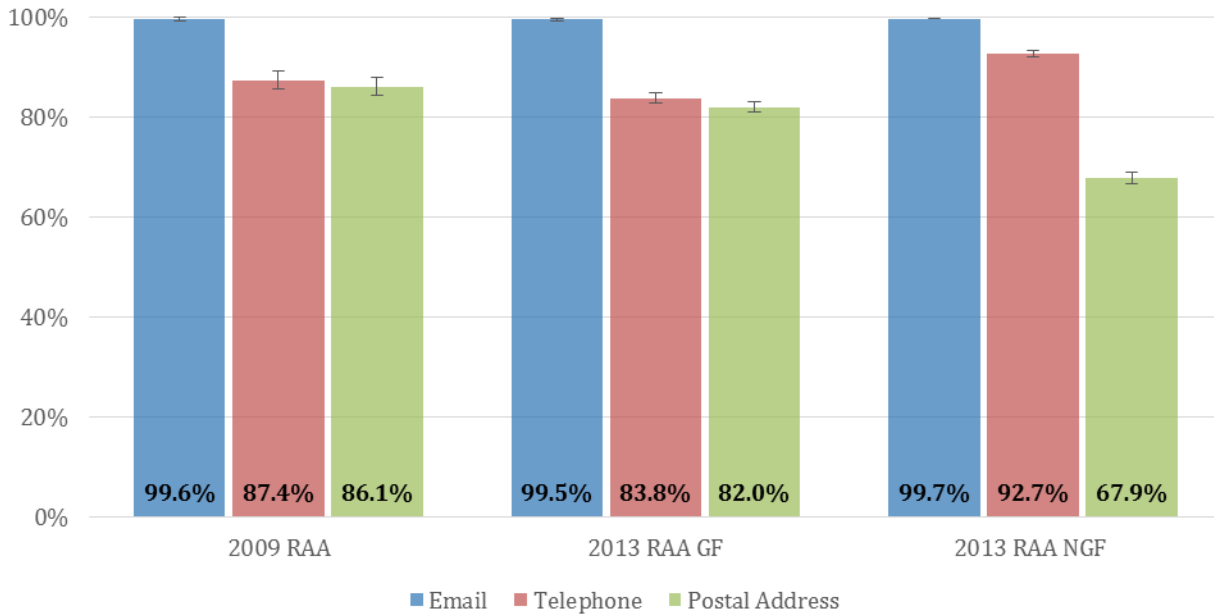


Table 17: Accuracy by RAA Status – 2009 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Three Accurate
<b>2009 RAA</b>	99.5% ± 0.4%	87.2% ± 1.9%	86.1% ± 1.9%	<b>77.3% ± 2.4%</b>
<b>2013 RAA GF</b>	99.5% ± 0.2%	83.8% ± 1.0%	82.1% ± 1.1%	<b>69.8% ± 1.3%</b>
<b>2013 RAA NGF</b>	99.7% ± 0.1%	92.7% ± 0.7%	67.9% ± 1.2%	<b>63.6% ± 1.2%</b>
<b>Overall</b>	<b>99.6% ± 0.1%</b>	<b>88.5% ± 0.6%</b>	<b>74.7% ± 0.8%</b>	<b>66.6% ± 0.8%</b>

### 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

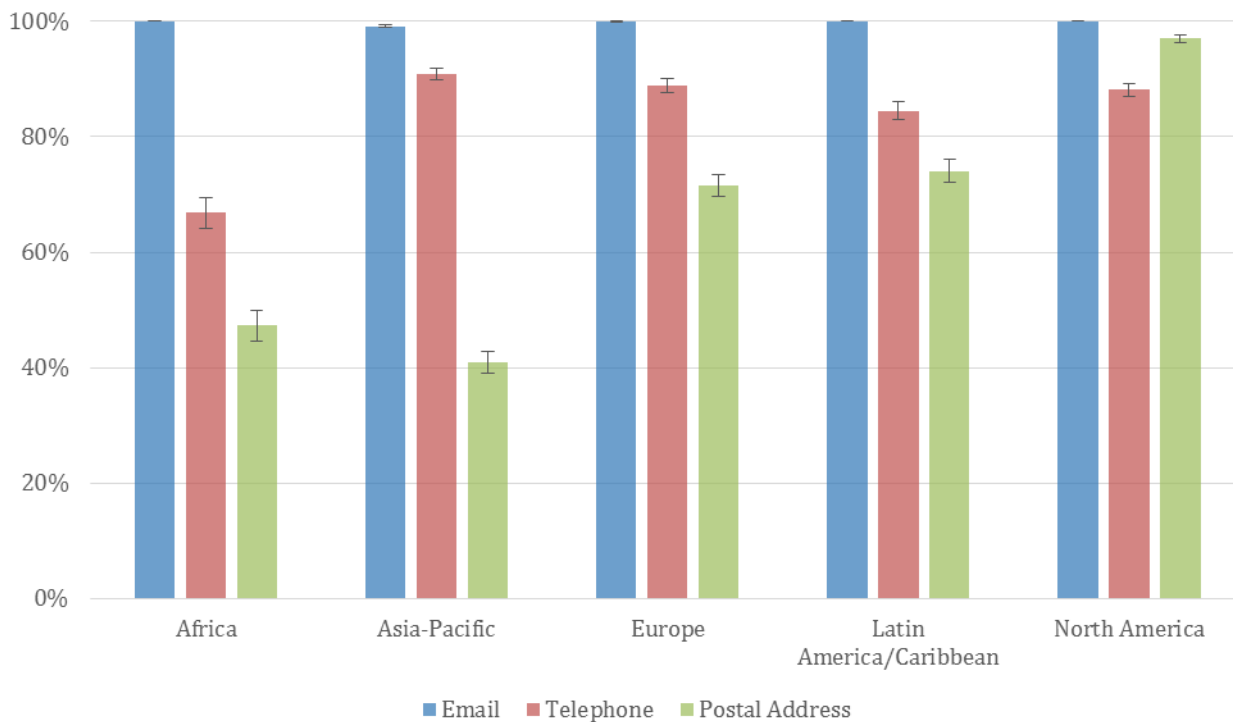


Table 18: Accuracy by ICANN Region – 2009 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Three Accurate
<b>Africa</b>	100.0% ± 0.0%	66.8% ± 2.6%	47.3% ± 2.7%	<b>31.3% ± 2.6%</b>
<b>Asia-Pacific</b>	99.2% ± 0.3%	90.8% ± 1.0%	40.9% ± 1.8%	<b>37.0% ± 1.7%</b>
<b>Europe</b>	99.9% ± 0.1%	88.9% ± 1.3%	71.5% ± 1.9%	<b>65.4% ± 2.0%</b>
<b>Latin America/Caribbean</b>	100.0% ± 0.0%	84.5% ± 1.6%	74.1% ± 2.0%	<b>67.0% ± 2.1%</b>
<b>North America</b>	100.0% ± 0.0%	88.1% ± 1.1%	97.0% ± 0.6%	<b>85.7% ± 1.1%</b>
<b>Overall</b>	<b>99.6% ± 0.1%</b>	<b>88.5% ± 0.6%</b>	<b>74.7% ± 0.8%</b>	<b>66.6% ± 0.8%</b>

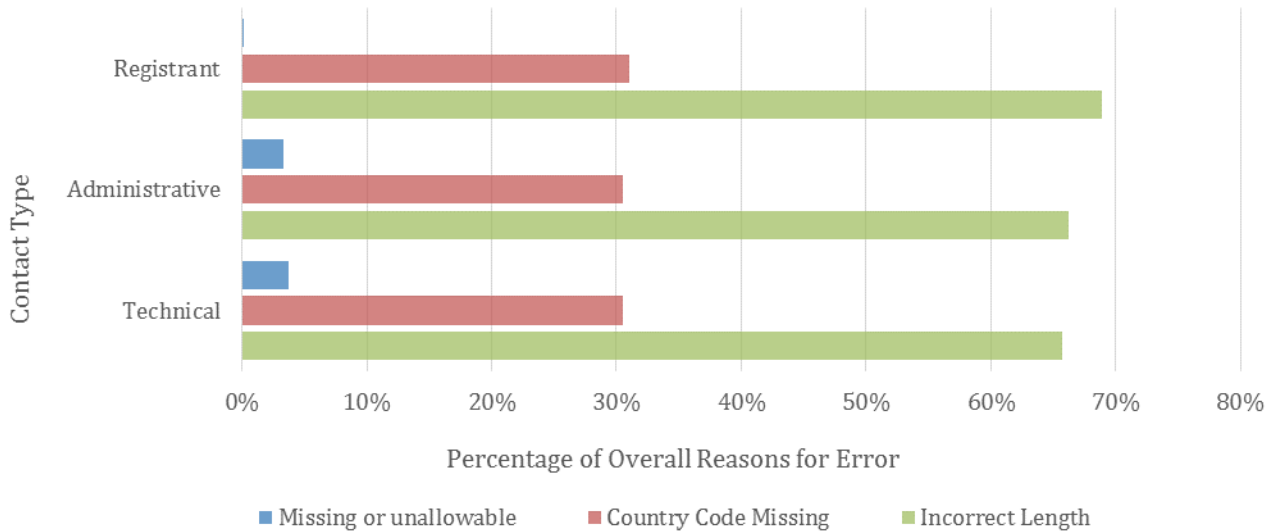
### Reasons for Error – 2009 RAA Syntax Requirements

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 8.6 percent of all telephone numbers tested).

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

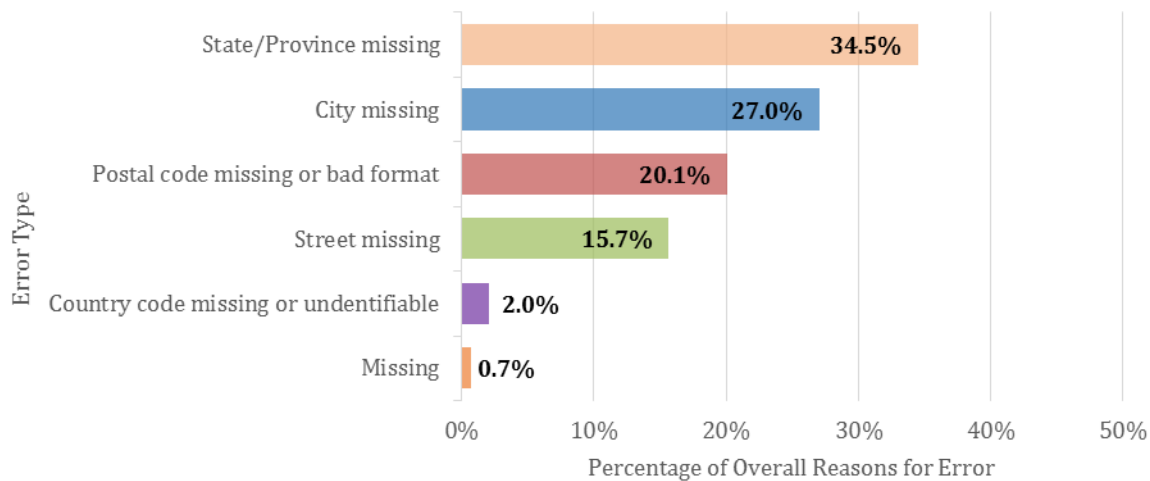


\*Note: 2009 RAA does not require presence of a telephone number for the registrant contact type.

*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 (97.2%) were due to a missing address component, such as a missing state/province (34.5%)<sup>16</sup>, city (27.0%), postal code (20.1%) and/or street (15.7 percent). Fewer country codes were missing (2.0%) and few postal addresses were completely missing (0.7%).

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



<sup>16</sup> 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.



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## 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., no email address would 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 (9.9% 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

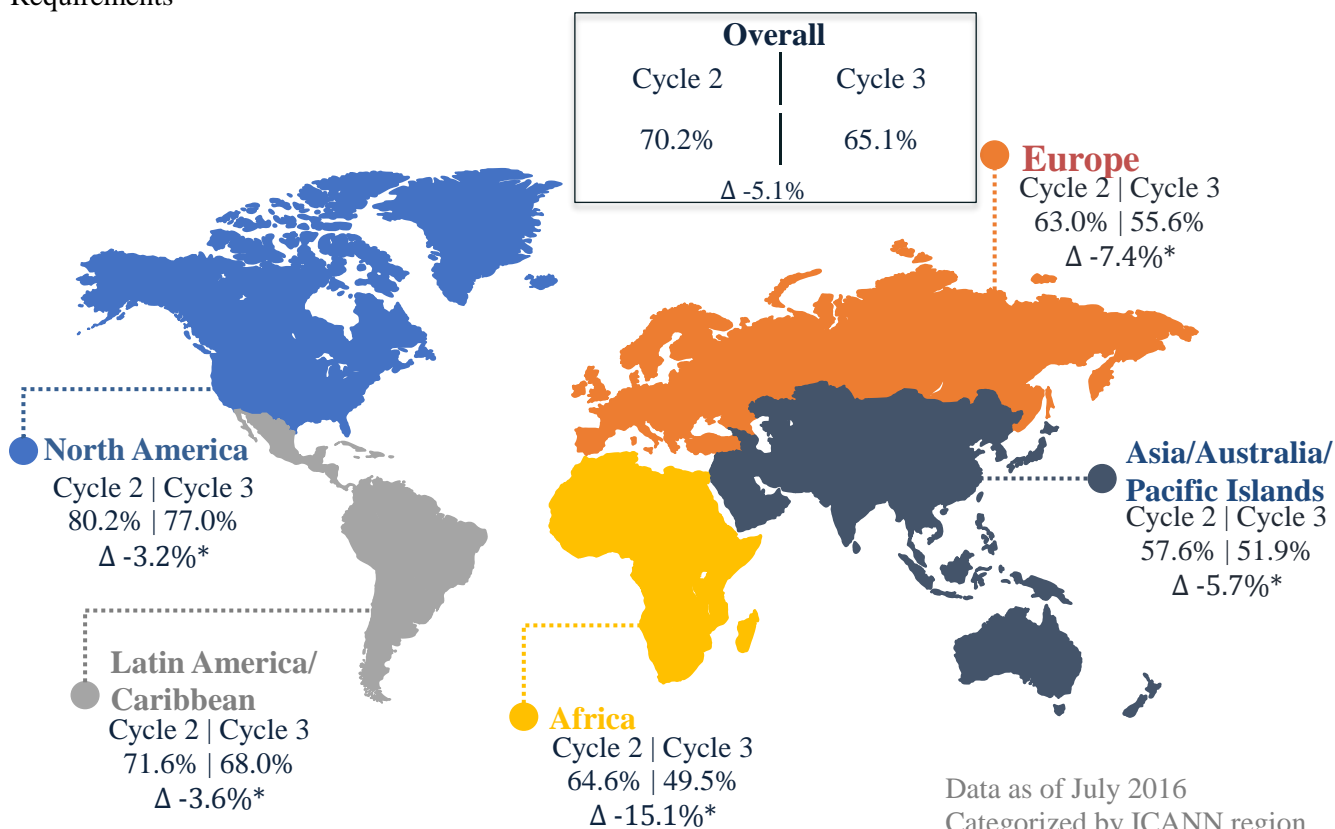
Here we report on changes in overall syntax and operability accuracy between Cycle 2 and 3 by region, and reasons for syntax and operability errors in Cycle 3 by region.

## Changes in Overall Accuracy by Region

### Operability Accuracy

Chart 1 shows that operability accuracy decreased in every region, ranging from a 15.1% decrease in the Africa region to a 3.2% decrease in the North America region. Across all regions, overall operability accuracy decreased between Cycle 2 and Cycle 3 by about 5.0% to 65.1%. Although natural sample variation is one reason for a change in accuracy rates, another reason might be the growth of domains in regions that generally have lower accuracy rates. See [Background: Sample and Market Information](#) for more information on what regions saw a growth in domains.

Chart 1: Change in Overall Operability Accuracy for ICANN Regions, Cycles 2 and 3 – 2009 RAA Requirements



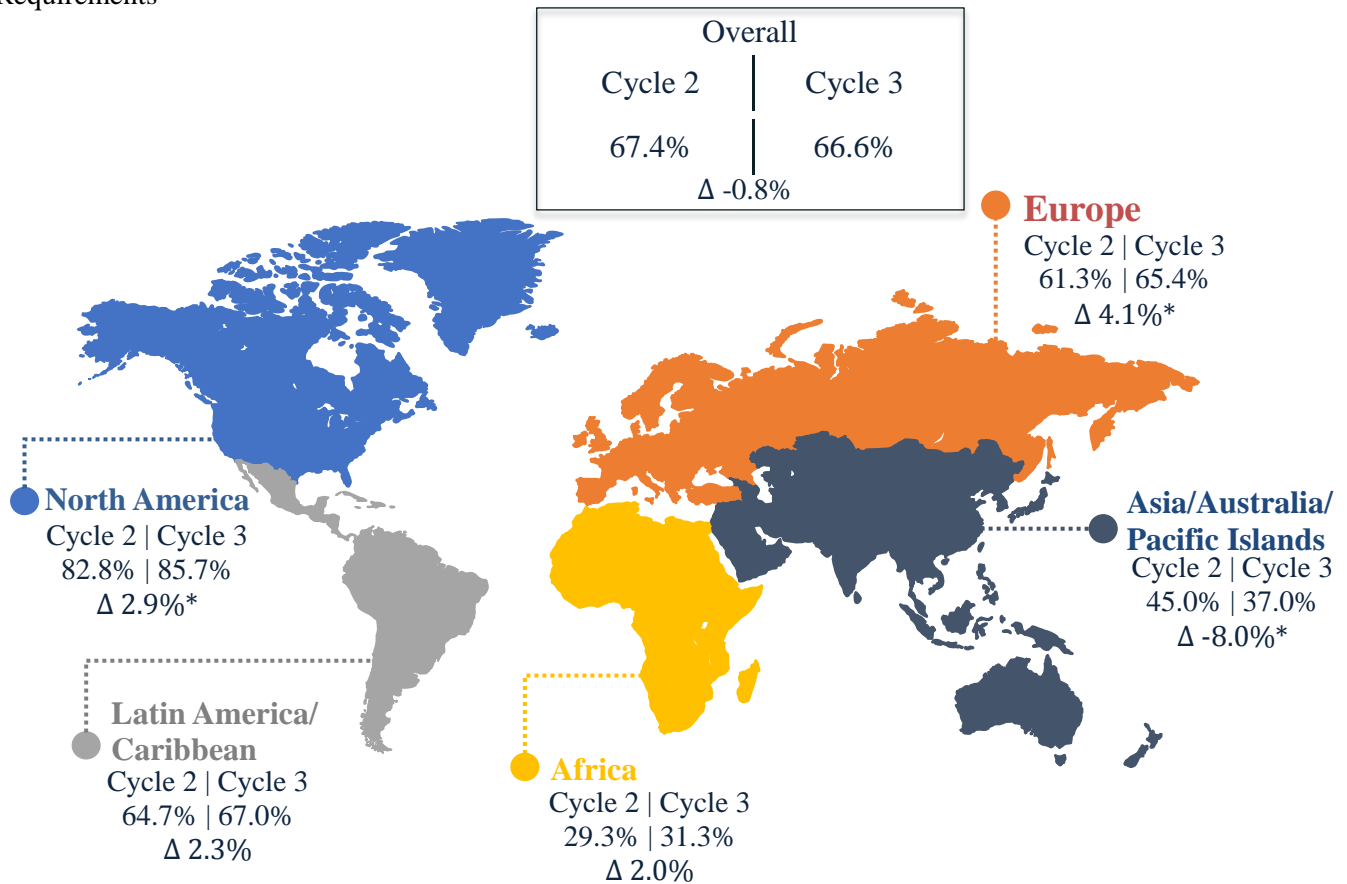
Data as of July 2016  
Categorized by ICANN region

\* 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 Asia-Pacific region, which increased by 8.0%, respectively. Overall syntax accuracy across all regions decreased from Cycle 2 to Cycle 3 by 0.8% to 66.6%.

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



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
<b>Not Verifiable (or Missing)</b>	0.0%	0.0%	0.2%	5.2%	0.1%	85.7%	1.9%
<b>Email Bounced</b>	100.0%	100.0%	99.8%	94.8%	99.9%	14.3%	98.1%
<b>Overall Accuracy for Region – Email Operability</b>	90.9% ± 1.6%	91.2% ± 1.0%	85.5% ± 1.5%	86.4% ± 1.5%	91.9% ± 0.9%	N/A	90.1% ± 0.5%

*Note: This table should be read as follows: Of the errors in X region, Y% were for Z reason. The “Overall ... 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
<b>Missing</b>	0.0%	0.0%	0.0%	95.0%	100.0%	100.0%	89.6%
<b>Characters Not Allowed</b>	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<b>@ Symbol Missing</b>	0.0%	0.0%	50.0%	0.0%	0.0%	0.0%	3.9%
<b>Not Resolvable</b>	0.0%	0.0%	50.0%	5.0%	0.0%	0.0%	6.5%
<b>Overall Accuracy for Region – Email Syntax</b>	100.0% ± 0.0%	99.2% ± 0.3%	99.9% ± 0.1%	100.0% ± 0.0%	100.0% ± 0.0%	N/A	99.6% ± 0.1%

*See table 19 for notes on how to read this table.*

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

Table 21 shows that the regions did not differ much in their distributions of telephone operability. Between 0.1% and 1.6% of the inoperable telephone numbers were missing or unverifiable for each region, between 41.7% and 54.6% were disconnected, between 22.9% and 34.1% were invalid numbers and the remaining 33.9% to 56.7% of the inoperable telephone numbers failed to connect for another reason.

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
<b>Not Verifiable (or Missing)</b>	0.1%	0.2%	0.8%	1.6%	0.7%	100.0%	1.3%
<b>Number Disconnected</b>	49.6%	41.7%	49.7%	54.6%	52.2%	0.0%	50.5%
<b>Invalid Number</b>	45.2%	53.2%	48.2%	41.1%	46.2%	0.0%	45.4%
<b>Other Not Connected</b>	5.1%	5.0%	1.4%	2.7%	0.9%	0.0%	2.8%
<b>Overall Accuracy for Region – Telephone Operability</b>	58.4% ± 2.7%	60.3% ± 1.8%	64.1% ± 2.0%	79.4% ± 1.8%	82.8% ± 1.2%	N/A	<b>72.4% ± 0.8%</b>

See table 19 for notes on how to read this table.

Table 22 shows that when the region is unknown, telephone syntax errors were due to information that was missing or not allowed. Among the regions, North America had the largest percentage of missing country codes, while the Asia-Pacific region had the largest percentage of missing or telephone numbers that are not allowed.

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
<b>Incorrect Length</b>	77.0%	67.7%	75.1%	75.8%	48.1%	16.1%	66.9%
<b>Country Code Missing</b>	22.9%	32.0%	23.2%	17.5%	51.0%	42.5%	30.7%
<b>Missing or Not Allowed</b>	0.2%	0.2%	1.6%	6.6%	0.8%	41.4%	2.4%
<b>Overall Accuracy for Region – Telephone Syntax</b>	66.8% ± 2.6%	90.8% ± 1.0%	88.9% ± 1.3%	84.5% ± 1.6%	88.1% ± 1.1%	N/A	<b>88.5% ± 0.6%</b>

See table 19 for notes on how to read this table.

*Reasons for Postal Address Error by Region – 2009 RAA*

Table 23 shows that almost all of the postal address operability errors are coded as P1 (probably not deliverable) in the Africa region and the Latin America and Caribbean region. Excluding the “unknown” region cases, the Asia-Pacific and Europe regions have the highest percentages of N1 “country unknown” errors.

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
<b>P1 Inoperable<sup>17</sup></b>	45.2%	51.9%	50.0%	21.6%	21.2%	0.0%	29.9%
<b>P2 Inoperable</b>	54.0%	48.1%	40.4%	71.5%	75.8%	0.0%	55.7%
<b>N1 Country Unknown</b>	0.8%	0.0%	9.6%	6.9%	3.0%	100.0%	14.4%
<b>N2 Unverifiable</b>	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<b>Overall Accuracy for Region – Postal Operability</b>	90.2% ± 1.6%	92.7% ± 0.9%	98.1% ± 0.6%	98.4% ± 0.6%	99.2% ± 0.3%	N/A	<b>96.8% ± 0.3%</b>

See table 19 for notes on 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 city or 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
<b>Missing</b>	0.1%	0.0%	0.0%	0.6%	0.3%	26.3%	0.7%
<b>Country Code Missing</b>	0.1%	0.1%	10.2%	0.0%	2.7%	35.5%	2.0%
<b>Street Missing</b>	25.8%	12.2%	12.1%	13.9%	14.8%	2.6%	15.7%
<b>Postal Code Missing or Bad Format</b>	22.0%	46.2%	14.2%	14.5%	17.5%	0.0%	20.1%
<b>City Missing</b>	27.5%	19.2%	35.1%	26.0%	38.5%	35.5%	27.0%
<b>State/Province Missing</b>	24.5%	22.3%	28.4%	45.0%	26.1%	0.0%	34.5%
<b>Overall Accuracy for Region – Postal Syntax</b>	47.3% ± 2.7%	40.9% ± 1.8%	71.5% ± 1.9%	74.1% ± 2.0%	97.0% ± 0.6%	N/A	<b>74.7% ± 0.8%</b>

See table 19 for notes on how to read this table.

<sup>17</sup> 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 2 and Cycle 3 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 15 show that Cycle 2 has lower overall email and telephone accuracy rates than Cycle 3, but that postal address accuracy rates are very similar between the cycles. The rate of records with all modes accurate decreased between Cycle 2 and Cycle 3. Although natural sample variation is one reason for a change in accuracy rates, another reason might be the growth of domains in regions that generally have lower accuracy rates. See [Background: Sample and Market Information](#) as well as [Regional Findings](#) for more information on what regions saw a growth in domains versus overall rates of accuracy.

Graph 15: Overall Accuracy by Cycle – 2009 RAA Operability Requirements

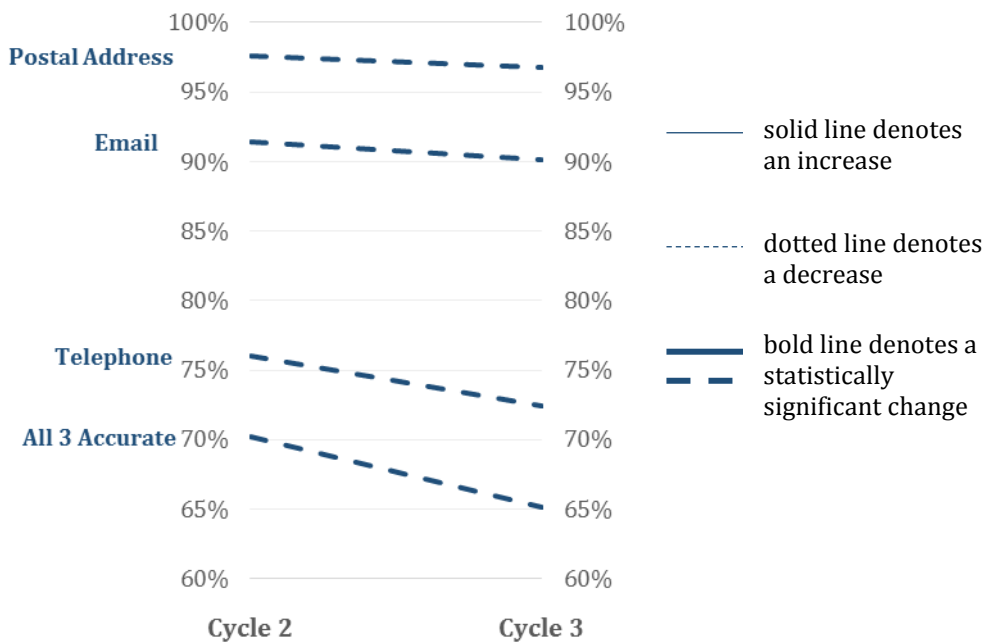


Table 25: Overall Accuracy by Cycle – 2009 RAA Operability Requirements

	Email	Telephone	Postal Address	All Modes Accurate
<b>Cycle 1</b>	87.1% ± 0.7%	74.0% ± 0.9%	98.0% ± 0.3%	64.7% ± 0.9%
<b>Cycle 2</b>	91.4% ± 0.5%	76.0% ± 0.8%	97.6% ± 0.3%	70.2% ± 0.8%
<b>Cycle 3</b>	90.1% ± 0.5%	72.4% ± 0.8%	96.8% ± 0.3%	65.1% ± 0.9%
<b>Change (C3-C2)</b>	<b>-1.2% ± 0.7%</b>	<b>-3.6% ± 1.1%</b>	<b>-0.8% ± 0.4%</b>	<b>-5.0% ± 1.2%</b>

The same decreases in overall accuracy between Cycles 2 and 3 that were observed for email, telephone and all-mode accuracy can be seen in the data below for Prior gTLDs. Similarly, postal address accuracy showed no change between cycles.

Graph 16: Prior gTLDs Accuracy by Cycle – 2009 RAA Operability Requirements

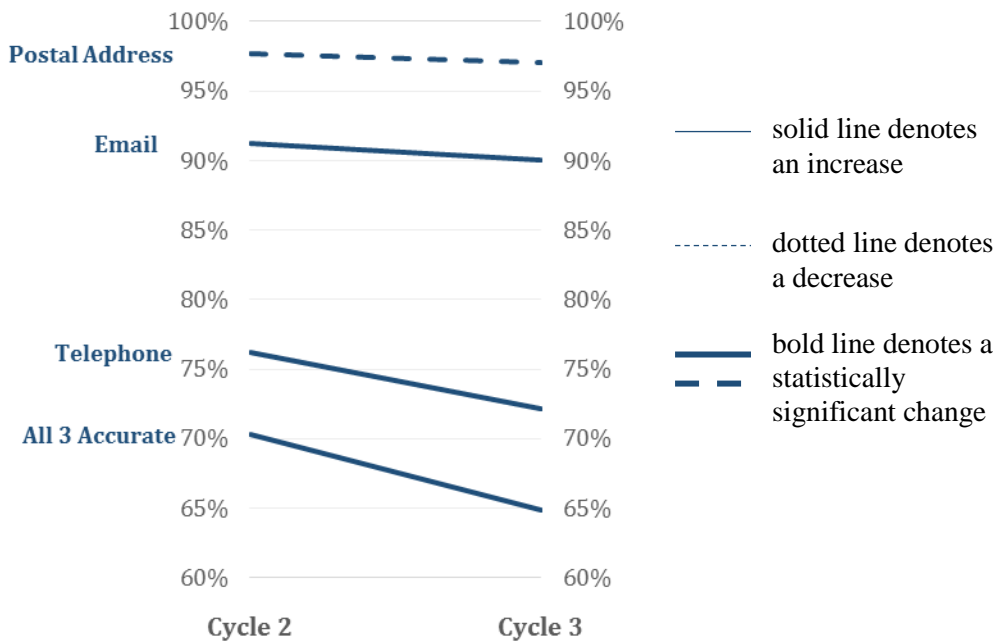


Table 26: Prior gTLDs Accuracy by Cycle – 2009 RAA Operability Requirements

	Email	Telephone	Postal Address	All Modes Accurate
<b>Cycle 1</b>	86.9% ± 0.7%	74.3% ± 1.0%	98.0% ± 0.3%	64.9% ± 1.0%
<b>Cycle 2</b>	91.2% ± 0.6%	76.2% ± 0.8%	97.7% ± 0.3%	70.3% ± 0.9%
<b>Cycle 3</b>	90.0% ± 0.6%	72.1% ± 0.9%	97.0% ± 0.3%	64.9% ± 1.0%
<b>Change (C3-C2)</b>	<b>-1.3% ± 0.8%</b>	<b>-4.1% ± 1.2%</b>	<b>-0.7% ± 0.5%</b>	<b>-5.4% ± 1.3%</b>



Table 27 and Graph 17 show patterns for the New gTLDs. Email accuracy shows a decrease between Cycles 2 and 3, while, telephone accuracy increases and postal accuracy slightly decrease. These changes are not statistically significant.<sup>18</sup>

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

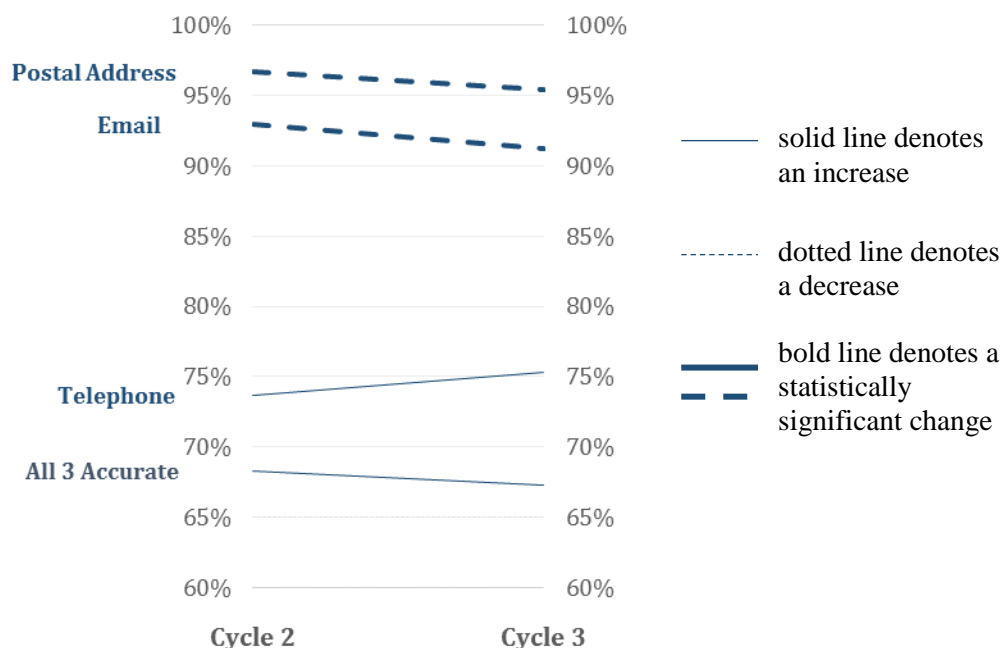


Table 27: New gTLDs Accuracy by Cycle – 2009 RAA Operability Requirements

	Email	Telephone	Postal Address	All Modes Accurate
<b>Cycle 1</b>	92.0% ± 1.2%	66.7% ± 2.1%	97.8% ± 0.7%	61.3% ± 2.2%
<b>Cycle 2</b>	93.0% ± 1.0%	73.7% ± 1.8%	96.7% ± 0.7%	68.3% ± 1.9%
<b>Cycle 3</b>	91.2% ± 1.1%	75.3% ± 1.7%	95.4% ± 0.8%	67.3% ± 1.9%
<b>Change (C3-C2)</b>	<b>-1.8% ± 1.5%</b>	<b>1.6% ± 2.5%</b>	<b>-1.4% ± 1.1%</b>	<b>-1.0% ± 2.7%</b>

### Comparisons of Accuracy Between Cycles – 2009 RAA Syntax Requirements

In [Main Findings](#), we presented syntax accuracy of records against 2009 RAA Requirements for Cycle 2. Here, we compare the Cycle 3 syntax accuracy results to the results from Cycle 2.

#### Change in Overall Accuracy

Table 28 and Graph 18 show that email accuracy rates are very similar across phases, but that telephone accuracy was higher and postal address accuracy is lower in the Cycle 3.

<sup>18</sup> See [Appendix B](#) for more information on results, especially by region.

Graph 18: Overall Accuracy by Cycle – 2009 RAA Syntax Requirements

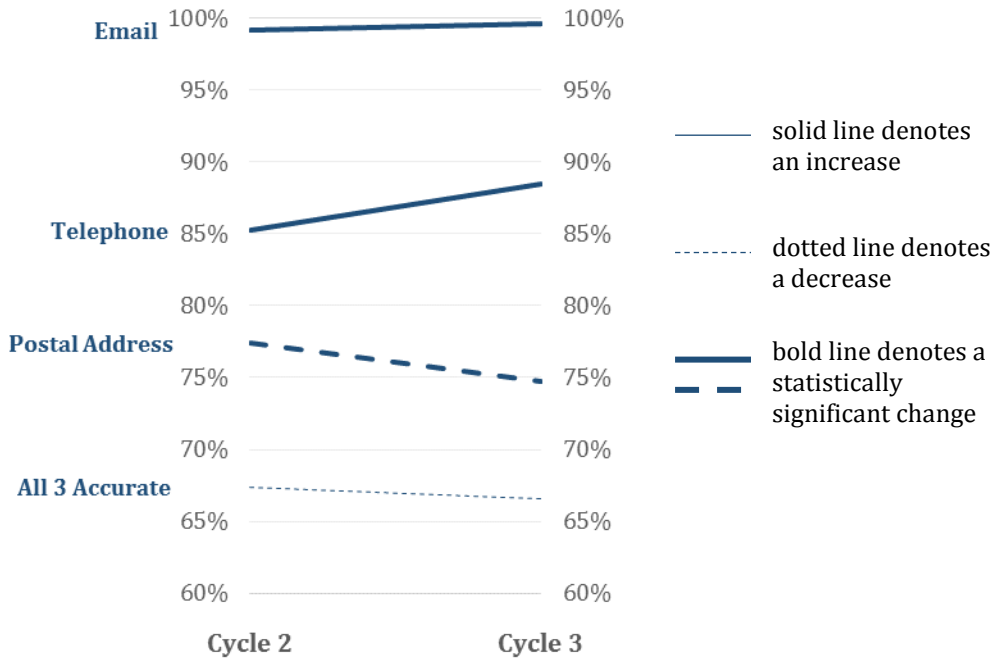


Table 28: Overall Accuracy by Cycle – 2009 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Modes Accurate
<b>Cycle 1</b>	99.1% ± 0.2%	83.3% ± 0.7%	80.4% ± 0.8%	68.0% ± 0.9%
<b>Cycle 2</b>	99.2% ± 0.2%	85.3% ± 0.6%	77.4% ± 0.7%	<b>67.4% ± 0.8%</b>
<b>Cycle 3</b>	99.6% ± 0.1%	88.5% ± 0.6%	74.7% ± 0.8%	<b>66.6% ± 0.8%</b>
<b>Change (C3-C2)</b>	<b>0.4% ± 0.2%</b>	<b>3.2% ± 0.9%</b>	<b>-2.8% ± 1.1%</b>	<b>-0.8% ± 1.2%</b>

*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 19 are similar to the pattern for overall accuracy rates that appear above in Table 28. That is, the data for Prior gTLDs shows the same increase in overall accuracy of Cycle 3 telephone numbers and decrease in Cycle 3 postal addresses. Similarly, there was no change in email accuracy.

Graph 19: Prior gTLDs Accuracy by Cycle – 2009 RAA Requirements

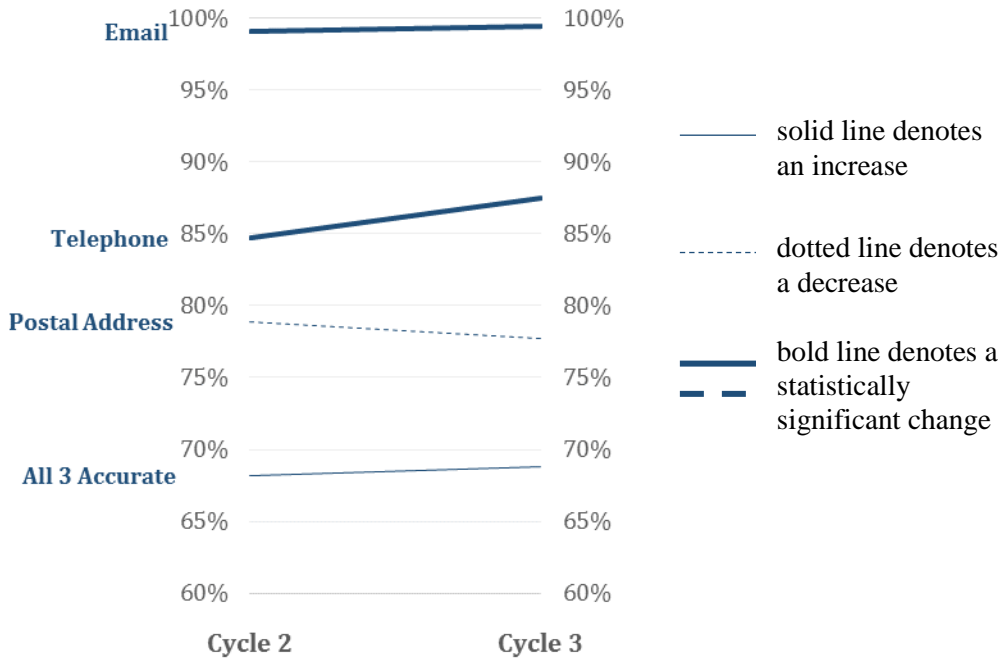


Table 29: Prior gTLDs Accuracy by Cycle – 2009 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Modes Accurate
<b>Cycle 1</b>	99.1% ± 0.2%	83.0% ± 0.8%	80.9% ± 0.9%	68.2% ± 1.0%
<b>Cycle 2</b>	99.1% ± 0.2%	84.7% ± 0.7%	78.9% ± 0.8%	68.2% ± 0.9%
<b>Cycle 3</b>	99.5% ± 0.1%	87.5% ± 0.7%	77.7% ± 0.8%	68.8% ± 0.9%
<b>Change (C3-C2)</b>	<b>0.4% ± 0.2%</b>	<b>2.8% ± 1.0%</b>	<b>-1.2% ± 1.2%</b>	<b>0.6% ± 1.3%</b>

*Change in New gTLDs*

In Table 30 and Graph 20, the New gTLDs show the same pattern as Prior gTLDs. Again, there is no change for email addresses, while the rates for telephone accuracy increased across cycles, and the rates for postal address accuracy decreased across cycles. The percentage of domains in New gTLDs that pass all accuracy tests for all nine contacts also decreased across cycles.<sup>19</sup>

<sup>19</sup> See [Appendix B](#) report for more information on results, especially by region.

Graph 20: New gTLDs Accuracy by Cycle – 2009 RAA Syntax Requirements

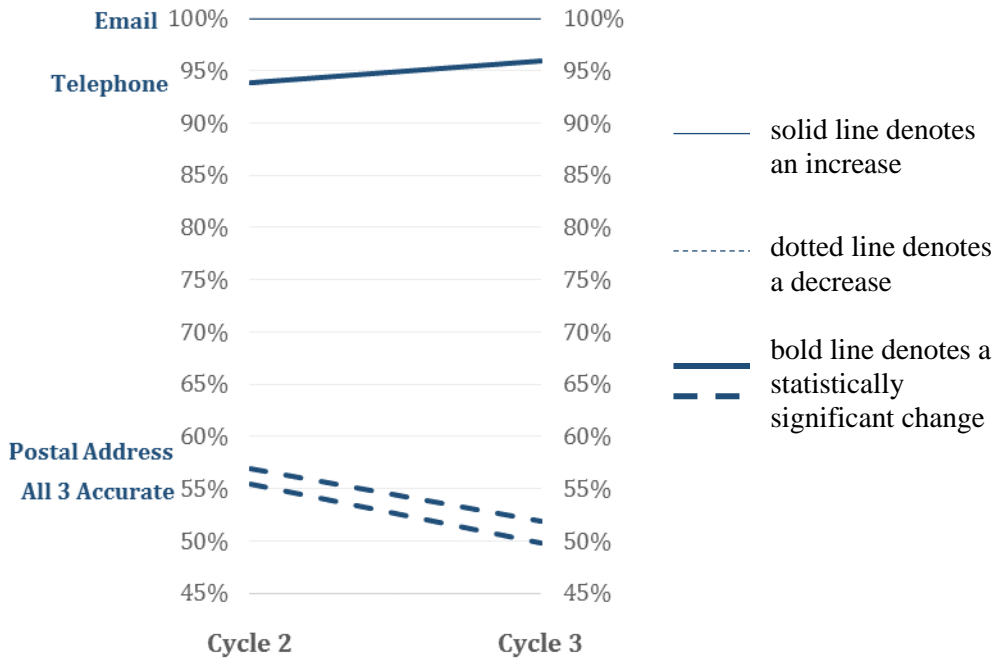


Table 30: New gTLDs Accuracy by Cycle – 2009 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Modes Accurate
<b>Cycle 1</b>	99.9% ± 0.1%	89.4% ± 1.4%	68.4% ± 2.1%	65.2% ± 2.1%
<b>Cycle 2</b>	99.9% ± 0.1%	93.9% ± 1.0%	56.9% ± 2.0%	55.4% ± 2.0%
<b>Cycle 3</b>	99.9% ± 0.1%	96.0% ± 0.8%	51.9% ± 2.0%	49.8% ± 2.0%
<b>Change (C3-C2)</b>	<b>0.0% ± 0.1%</b>	<b>2.1% ± 1.2%</b>	<b>-5.0% ± 2.8%</b>	<b>-5.6% ± 2.8%</b>

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# 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
<b>All Three Exactly the Same</b>	80.1% ± 0.7%	82.8% ± 0.7%	81.0% ± 0.7%
<b>Registrant=Administrative</b>	12.1% ± 0.6%	12.0% ± 0.6%	11.6% ± 0.6%
<b>Registrant=Technical</b>	0.4% ± 0.1%	0.2% ± 0.1%	0.3% ± 0.1%
<b>Administrative=Technical</b>	5.1% ± 0.4%	4.0% ± 0.4%	5.2% ± 0.4%
<b>All Three Different</b>	2.3% ± 0.3%	0.9% ± 0.2%	1.9% ± 0.2%

## 2009 RAA Reasons for Syntax Error in Cycle 2 and Cycle 3

The [Main Findings](#) section contains the ARS Cycle 3 results, but below we also present results from ARS Cycle 2 results.

Table B2: Total Email Address Errors by Contact Type (2009 RAA) – Cycle 2

	Registrant	Administrative	Technical	Total
<b>Passed All Accuracy Tests</b>	11,994	11,947	11,945	<b>35,886</b>
<b>Missing*</b>	128*	48	51	<b>99</b>
<b>@ Symbol Missing</b>	2	1	0	<b>3</b>
<b>Not Resolvable</b>	4	4	4	<b>12</b>
<b>Total</b>	<b>12,000</b>	<b>12,000</b>	<b>12,000</b>	<b>36,000</b>

\* Registrant email is not required under the 2009 RAA.

Table B3: Total Email Address Errors by Contact Type (2009 RAA) – Cycle 3

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

\* Registrant email is not required under the 2009 RAA.

Table B4: Total Telephone Number Errors by Contact Type (2009 RAA) – Cycle 2

	Registrant	Administrative	Technical	Total
<b>Passed All Accuracy Tests</b>	10,398	10,224	10,316	<b>30,938</b>
<b>Missing*</b>	182*	107	113	<b>220</b>
<b>Country Code Missing</b>	538	577	584	<b>1,699</b>
<b>Incorrect Length</b>	1,062	1,090	986	<b>3,138</b>
<b>Characters Not Allowed</b>	2	2	1	<b>5</b>
<b>Total</b>	<b>12,000</b>	<b>12,000</b>	<b>12,000</b>	<b>36,000</b>

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

Table B5: Total Telephone Number Errors by Contact Type (2009 RAA) – Cycle 3

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

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

Table B6: Total Postal Address Errors by Contact Type (2009 RAA) – Cycle 2

	Registrant	Administrative	Technical	Total
<b>Passed All Accuracy Tests</b>	8,431	8,401	8,836	<b>25,668</b>
<b>Missing</b>	43	52	57	<b>152</b>
<b>Country Code Missing</b>	71	58	53	<b>182</b>
<b>Country Not Identifiable</b>	65	70	64	<b>199</b>
<b>Postal Code Missing</b>	953	1,039	920	<b>2,912</b>
<b>Postal Code Format</b>	23	21	20	<b>64</b>
<b>State/Province Missing</b>	1,642	1,670	1,433	<b>4,745</b>
<b>City Missing</b>	1,388	1,401	1,225	<b>4,014</b>
<b>Street Missing</b>	786	764	662	<b>2,212</b>
<b>TOTAL</b>	<b>12,000</b>	<b>12,000</b>	<b>12,000</b>	<b>36,000</b>
<b>Total Errors</b>	<b>4,971</b>	<b>5,075</b>	<b>4,434</b>	<b>14,480</b>
<b>Total Domains with Errors</b>	<b>3,569</b>	<b>3,599</b>	<b>3,164</b>	<b>10,332</b>

Table B7: Total Postal Address Errors by Contact Type (2009 RAA) – Cycle 3

	Registrant	Administrative	Technical	Total
<b>Passed All Accuracy Tests</b>	8,475	8,475	8,728	<b>25,678</b>
<b>Missing</b>	21	40	41	<b>102</b>
<b>Country Code Missing</b>	35	31	29	<b>95</b>
<b>Country Not Identifiable</b>	58	64	68	<b>190</b>
<b>Postal Code Missing</b>	903	960	899	<b>2,762</b>
<b>Postal Code Format</b>	31	24	24	<b>79</b>
<b>State/Province Missing</b>	1,667	1,678	1,543	<b>4,888</b>
<b>City Missing</b>	1,298	1,300	1,228	<b>3,826</b>
<b>Street Missing</b>	767	755	697	<b>2,219</b>
<b>TOTAL</b>	<b>12,000</b>	<b>12,000</b>	<b>12,000</b>	<b>36,000</b>
<b>Total Errors</b>	<b>4,780</b>	<b>4,852</b>	<b>4,529</b>	<b>14,161</b>
<b>Total Domains with Errors</b>	<b>3,525</b>	<b>3,525</b>	<b>3,272</b>	<b>10,322</b>



## 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 2	99.9% ± 0.2%	64.6% ± 2.6%	44.6% ± 2.7%	29.3% ± 2.5%
Cycle 3	100.0% ± 0.0%	66.8% ± 2.6%	47.3% ± 2.7%	31.3% ± 2.6%
<b>Change (C3-C2)</b>	<b>0.1% ± 0.2%</b>	<b>2.2% ± 3.7%</b>	<b>2.7% ± 3.9%</b>	<b>2.0% ± 3.6%</b>

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 2	99.4% ± 0.3%	88.9% ± 1.1%	49.8% ± 1.8%	45.0% ± 1.8%
Cycle 3	99.2% ± 0.3%	90.8% ± 1.0%	40.9% ± 1.8%	37.0% ± 1.7%
<b>Change (C3-C2)</b>	<b>-0.2% ± 0.4%</b>	<b>2.0% ± 1.6%</b>	<b>-8.9% ± 2.5%</b>	<b>-8.0% ± 2.5%</b>

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 2	99.9% ± 0.1%	85.1% ± 1.4%	69.4% ± 1.8%	61.3% ± 1.9%
Cycle 3	99.9% ± 0.1%	88.9% ± 1.3%	71.5% ± 1.9%	65.4% ± 2.0%
<b>Change (C3-C2)</b>	<b>-0.0% ± 0.2%</b>	<b>3.8% ± 1.9%</b>	<b>2.2% ± 2.6%</b>	<b>4.0% ± 2.7%</b>

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 2	99.9% ± 0.1%	84.3% ± 1.6%	71.0% ± 2.0%	64.7% ± 2.1%
Cycle 3	100.0% ± 0.0%	84.5% ± 1.6%	74.1% ± 2.0%	67.0% ± 2.1%
<b>Change (C3-C2)</b>	<b>0.1% ± 0.1%</b>	<b>0.2% ± 2.3%</b>	<b>3.1% ± 2.8%</b>	<b>2.2% ± 3.0%</b>

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
Cycle 2	100.0% ± 0.0%	85.1% ± 1.2%	96.7% ± 0.6%	82.8% ± 1.3%
Cycle 3	100.0% ± 0.0%	88.1% ± 1.1%	97.0% ± 0.6%	85.7% ± 1.1%
<b>Change (C3-C2)</b>	<b>0.0% ± 0.0%</b>	<b>3.0% ± 1.6%</b>	<b>0.4% ± 0.8%</b>	<b>3.0% ± 1.7%</b>

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
<b>Cycle 2</b>	99.3% ± 0.3%	90.8% ± 1.2%	85.2% ± 1.5%	80.9% ± 1.6%
<b>Cycle 3</b>	99.6% ± 0.3%	87.4% ± 1.7%	86.1% ± 1.8%	77.5% ± 2.2%
<b>Change (C3-C2)</b>	<b>0.3% ± 0.5%</b>	<b>-3.4% ± 2.1%</b>	<b>0.9% ± 2.3%</b>	<b>-3.4% ± 2.7%</b>

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
<b>Cycle 2</b>	99.4% ± 0.2%	80.0% ± 1.1%	82.2% ± 1.1%	66.9% ± 1.3%
<b>Cycle 3</b>	99.5% ± 0.2%	83.8% ± 1.0%	82.0% ± 1.1%	69.8% ± 1.3%
<b>Change (C3-C2)</b>	<b>0.1% ± 0.3%</b>	<b>3.8% ± 1.5%</b>	<b>-0.1% ± 1.5%</b>	<b>2.9% ± 1.9%</b>

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
<b>Cycle 2</b>	98.9% ± 0.3%	91.1% ± 0.8%	71.4% ± 1.2%	67.0% ± 1.3%
<b>Cycle 3</b>	99.7% ± 0.1%	92.7% ± 0.7%	67.9% ± 1.2%	63.6% ± 1.2%
<b>Change (C3-C2)</b>	<b>0.8% ± 0.3%</b>	<b>1.7% ± 1.0%</b>	<b>-3.5% ± 1.7%</b>	<b>-3.4% ± 1.8%</b>

# Appendix C: Additional Analyses – Accuracy to 2013 RAA Requirements

Domains registered in the 2013 RAA now represent nearly 50 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 12,000 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

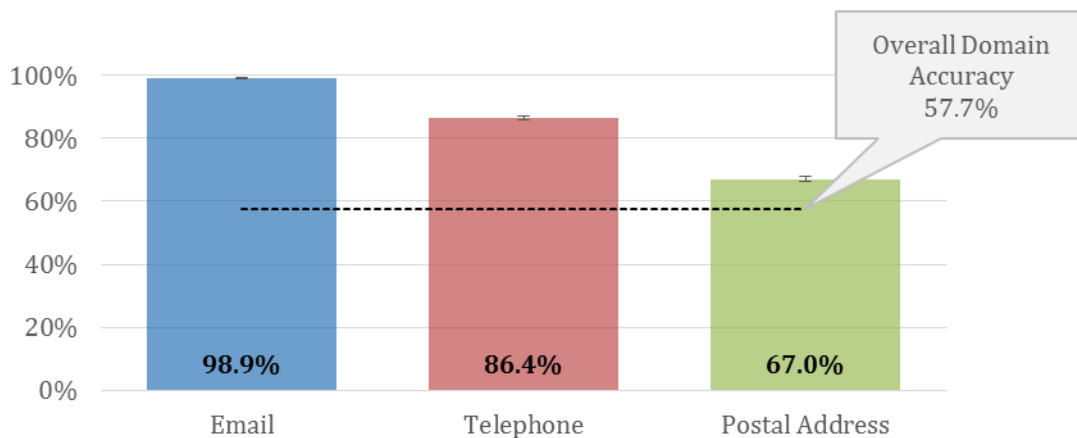


Table C1: Overall Accuracy by Contact Type and Mode – 2013 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Three Accurate
<b>Registrant</b>	99.1% ± 0.2%	87.6% ± 0.6%	68.3% ± 0.8%	<b>59.4% ± 0.9%</b>
<b>Administrative</b>	99.6% ± 0.1%	87.6% ± 0.6%	68.3% ± 0.8%	<b>60.0% ± 0.9%</b>
<b>Technical</b>	99.6% ± 0.1%	87.9% ± 0.6%	68.8% ± 0.8%	<b>60.7% ± 0.9%</b>
<b>Overall</b>	<b>98.9% ± 0.2%</b>	<b>86.4% ± 0.6%</b>	<b>67.0% ± 0.8%</b>	<b>57.7% ± 0.9%</b>

### Subgroup Accuracy – 2013 RAA Syntax Requirements

Next, we look at subgroups in Cycle 2, 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

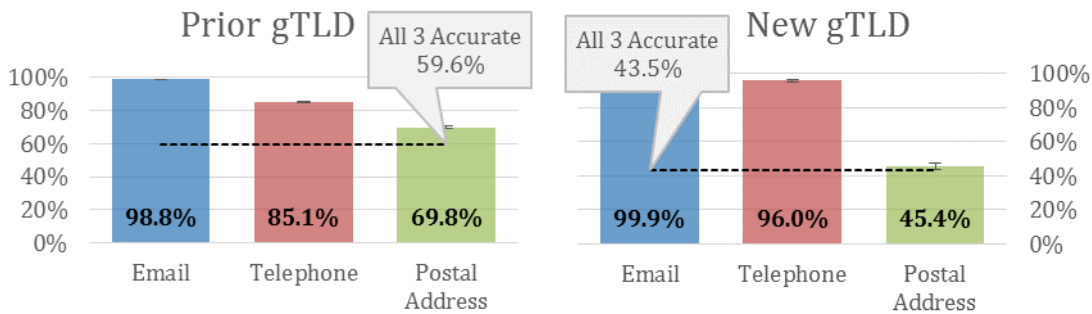


Table C2a shows that the New gTLDs have higher email and telephone syntax accuracy, but lower postal address syntax accuracy.

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

	Email	Telephone	Postal Address	All Three Accurate
<b>Prior gTLD</b>	98.8% ± 0.2%	85.1% ± 0.7%	69.8% ± 0.9%	<b>59.6% ± 1.0%</b>
<b>New gTLD</b>	99.9% ± 0.1%	96.0% ± 0.8%	45.4% ± 2.0%	<b>43.5% ± 2.0%</b>
<b>Overall</b>	<b>98.9% ± 0.2%</b>	<b>86.4% ± 0.6%</b>	<b>67.0% ± 0.8%</b>	<b>57.7% ± 0.9%</b>

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

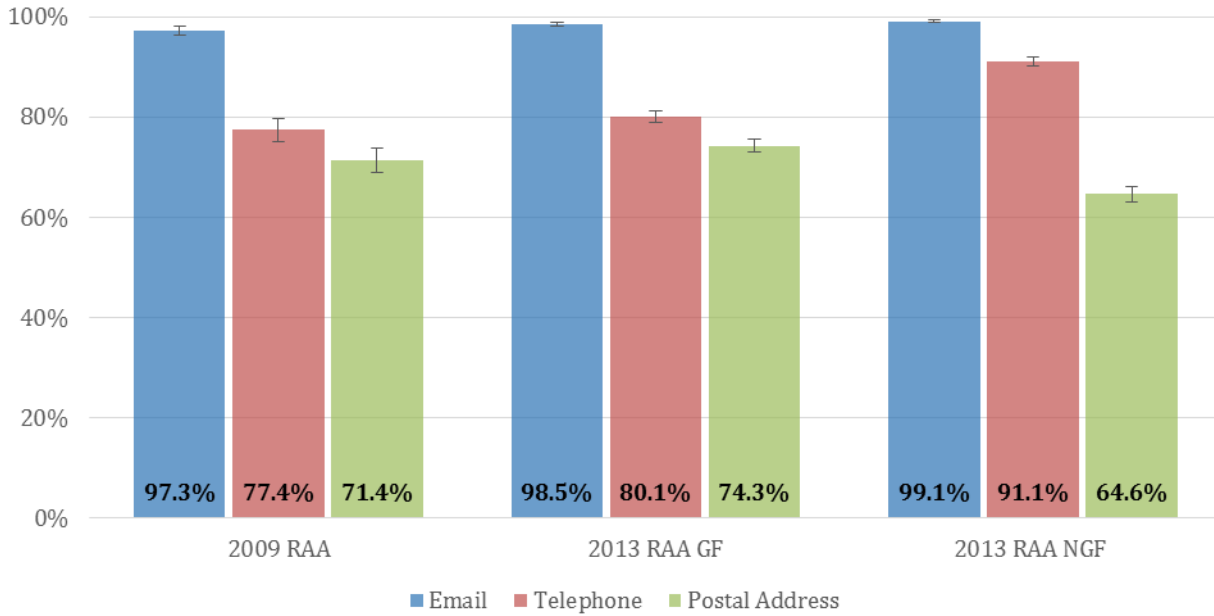


Table C2b: Accuracy by gTLD Type, with Prior gTLD Stratified by RAA Type – 2013 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Three Accurate
Prior gTLD	98.8% ± 0.2%	85.1% ± 0.7%	69.8% ± 0.9%	59.6% ± 1.0%
2009 RAA	97.3% ± 0.9%	77.4% ± 2.4%	71.4% ± 2.5%	60.2% ± 2.8%
2013GF RAA	98.5% ± 0.3%	80.1% ± 1.1%	74.3% ± 1.2%	59.9% ± 1.4%
2013NGF RAA	99.1% ± 0.3%	91.1% ± 0.9%	64.6% ± 1.6%	59.3% ± 1.6%
New gTLD*	99.9% ± 0.1%	96.0% ± 0.8%	45.4% ± 2.0%	43.5% ± 2.0%
<b>Overall</b>	<b>98.9% ± 0.2%</b>	<b>86.4% ± 0.6%</b>	<b>67.0% ± 0.8%</b>	<b>57.7% ± 0.9%</b>

*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

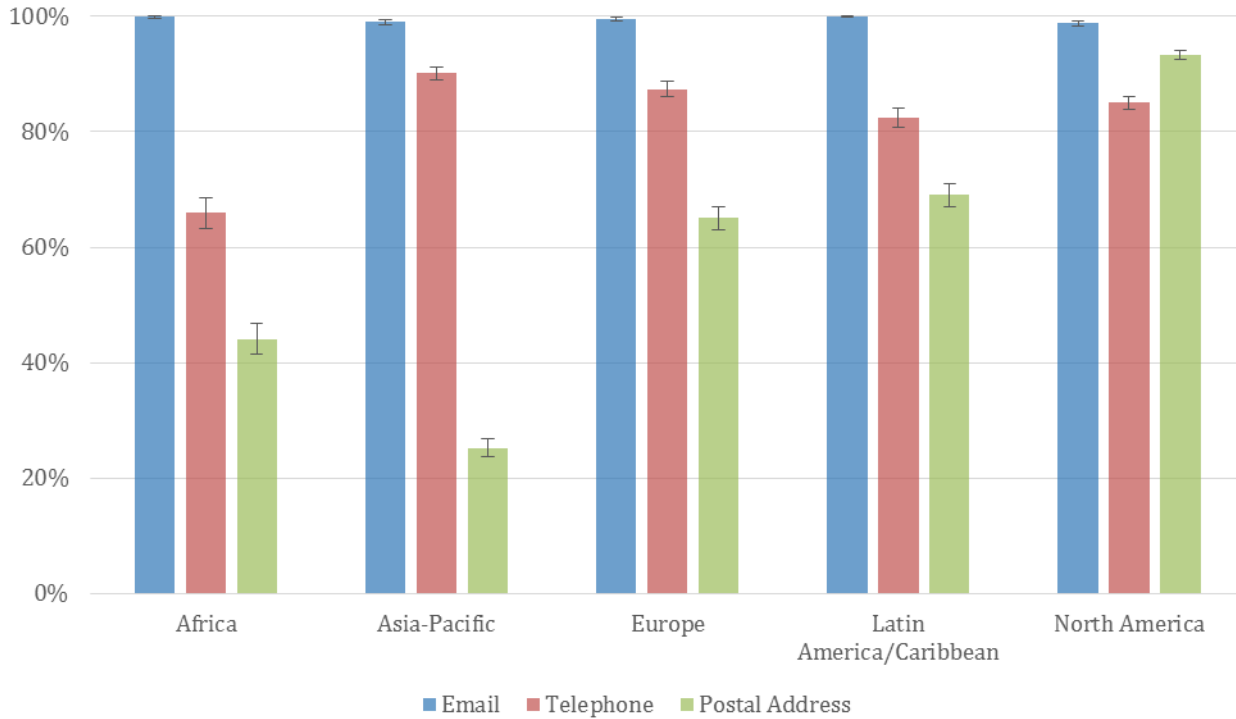


Table C3: Accuracy by ICANN Region – 2013 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Three Accurate
<b>Africa</b>	99.9% ± 0.2%	65.9% ± 2.6%	44.1% ± 2.7%	<b>28.9% ± 2.5%</b>
<b>Asia-Pacific</b>	99.0% ± 0.4%	90.1% ± 1.1%	25.2% ± 1.6%	<b>22.5% ± 1.5%</b>
<b>Europe</b>	99.6% ± 0.3%	87.4% ± 1.4%	65.1% ± 2.0%	<b>59.4% ± 2.0%</b>
<b>Latin America/Caribbean</b>	99.9% ± 0.1%	82.4% ± 1.7%	69.0% ± 2.1%	<b>62.2% ± 2.2%</b>
<b>North America</b>	98.8% ± 0.4%	85.0% ± 1.2%	93.3% ± 0.8%	<b>78.5% ± 1.3%</b>
<b>Overall</b>	<b>98.9% ± 0.2%</b>	<b>86.4% ± 0.6%</b>	<b>67.0% ± 0.8%</b>	<b>57.7% ± 0.9%</b>

*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 accuracy.

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

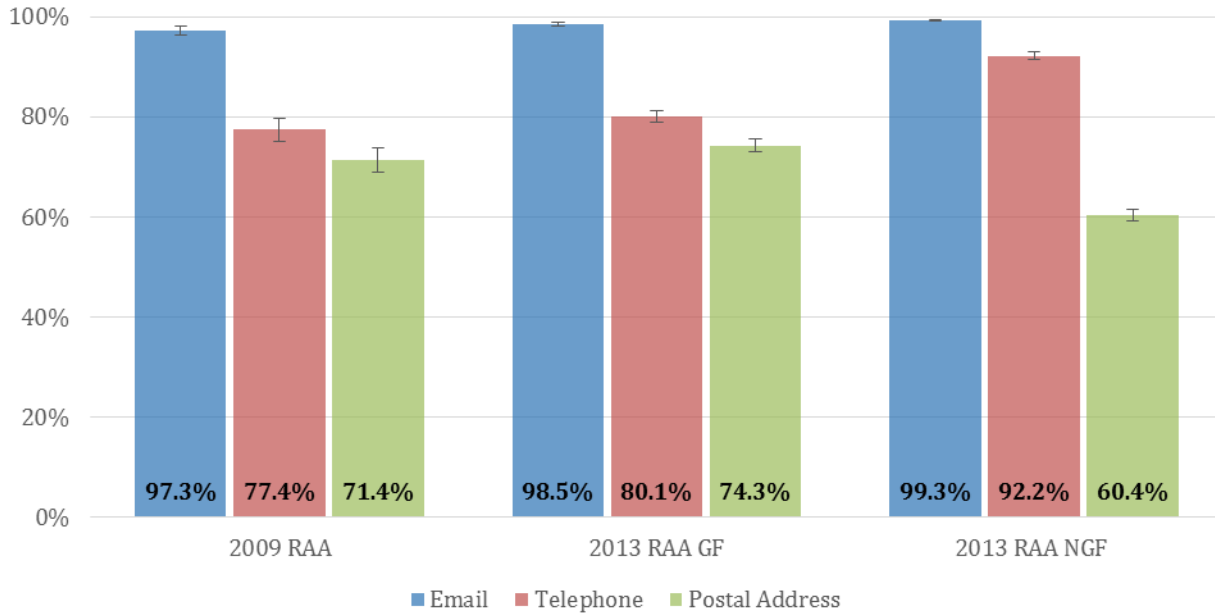


Table C4: Accuracy by RAA Status – 2013 RAA Syntax Requirements

	Email	Telephone	Postal Address	All Three Accurate
<b>2009 RAA</b>	97.3% ± 0.9%	77.4% ± 2.4%	71.4% ± 2.5%	<b>60.2% ± 2.8%</b>
<b>2013 RAA GF</b>	98.5% ± 0.3%	80.1% ± 1.1%	74.3% ± 1.2%	<b>59.9% ± 1.4%</b>
<b>2013 RAA NGF</b>	99.3% ± 0.2%	92.2% ± 0.7%	60.4% ± 1.2%	<b>55.8% ± 1.3%</b>
<b>Overall</b>	<b>98.9% ± 0.2%</b>	<b>86.4% ± 0.6%</b>	<b>67.0% ± 0.8%</b>	<b>57.7% ± 0.9%</b>

## Comparisons between Cycles – 2013 RAA Syntax Requirements

Above, we presented the syntax accuracy to 2013 RAA requirements for Cycle 3. Here, we compare the Cycle 3 results to those from Cycle 2 for the 5,737 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
<b>Cycle 2</b>	98.3% ± 0.4%	89.2% ± 0.9%	63.0% ± 1.3%	57.2% ± 1.4%
<b>Cycle 3</b>	99.3% ± 0.2%	92.2% ± 0.7%	60.3% ± 1.3%	55.7% ± 1.3%
<b>Change (C3-C2)</b>	<b>1.0% ± 0.4%</b>	<b>3.0% ± 1.1%</b>	<b>-2.7% ± 1.8%</b>	<b>-1.5% ± 1.9%</b>

### Prior vs. New gTLDs

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
<b>Cycle 2</b>	98.0% ± 0.5%	88.4% ± 1.2%	65.5% ± 1.7%	58.9% ± 1.8%
<b>Cycle 3</b>	99.1% ± 0.3%	91.1% ± 1.0%	64.6% ± 1.6%	59.2% ± 1.7%
<b>Change (C3-C2)</b>	<b>1.1% ± 0.6%</b>	<b>2.7% ± 1.5%</b>	<b>-0.9% ± 2.4%</b>	<b>0.3% ± 2.4%</b>

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
<b>Cycle 2</b>	99.9% ± 0.1%	93.9% ± 1.0%	48.5% ± 2.1%	47.3% ± 2.1%
<b>Cycle 3</b>	99.9% ± 0.1%	96.0% ± 0.8%	45.4% ± 2.0%	43.5% ± 2.0%
<b>Change (C3-C2)</b>	<b>0.0% ± 0.2%</b>	<b>2.1% ± 1.3%</b>	<b>-3.0% ± 2.9%</b>	<b>-3.8% ± 2.9%</b>

### ICANN Regions

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
<b>Cycle 2</b>	99.8% ± 0.3%	69.2% ± 3.3%	36.3% ± 3.4%	24.8% ± 3.1%
<b>Cycle 3</b>	100.0% ± 0.0%	73.7% ± 3.1%	39.4% ± 3.4%	30.5% ± 3.2%
<b>Change (C3-C2)</b>	<b>0.2% ± 0.3%</b>	<b>4.5% ± 4.5%</b>	<b>3.1% ± 4.8%</b>	<b>5.7% ± 4.4%</b>



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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
<b>Cycle 2</b>	99.5% ± 0.4%	90.8% ± 1.5%	28.0% ± 2.3%	25.6% ± 2.3%
<b>Cycle 3</b>	99.5% ± 0.3%	93.3% ± 1.2%	21.5% ± 1.9%	19.8% ± 1.9%
<b>Change (C3 - C2)</b>	<b>-0.0% ± 0.5%</b>	<b>2.6% ± 1.9%</b>	<b>-6.5% ± 3.0%</b>	<b>-5.9% ± 2.9%</b>

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
<b>Cycle 2</b>	100.0% ± 0.0%	90.2% ± 1.8%	60.2% ± 3.0%	56.8% ± 3.1%
<b>Cycle 3</b>	100.0% ± 0.0%	91.6% ± 1.7%	65.4% ± 2.9%	61.9% ± 3.0%
<b>Change (C3-C2)</b>	<b>0.0% ± 0.0%</b>	<b>1.4% ± 2.5%</b>	<b>5.2% ± 4.2%</b>	<b>5.1% ± 4.3%</b>

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
<b>Cycle 2</b>	100.0% ± 0.1%	91.3% ± 2.0%	74.3% ± 3.0%	72.4% ± 3.1%
<b>Cycle 3</b>	100.0% ± 0.0%	89.8% ± 2.0%	76.5% ± 2.8%	72.2% ± 2.9%
<b>Change (C3-C2)</b>	<b>0.0% ± 0.1%</b>	<b>-1.5% ± 2.8%</b>	<b>2.2% ± 4.1%</b>	<b>-0.2% ± 4.3%</b>

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
<b>Cycle 2</b>	98.5% ± 0.7%	89.7% ± 1.8%	95.2% ± 1.3%	84.9% ± 2.1%
<b>Cycle 3</b>	98.9% ± 0.6%	92.4% ± 1.4%	95.8% ± 1.1%	88.0% ± 1.8%
<b>Change (C3-C2)</b>	<b>0.4% ± 0.9%</b>	<b>2.7% ± 2.3%</b>	<b>0.6% ± 1.7%</b>	<b>3.0% ± 2.8%</b>

*RAA Status*

Finally, Tables C13 through C15 show the changes from Cycle 2 to Cycle 3 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
<b>Cycle 2</b>	98.1% ± 0.6%	68.8% ± 1.9%	41.6% ± 2.1%	20.2% ± 1.7%
<b>Cycle 3</b>	97.0% ± 0.9%	78.5% ± 2.1%	72.4% ± 2.3%	61.5% ± 2.5%
<b>Change (C3-C2)</b>	<b>-1.1% ± 1.0%</b>	<b>9.7% ± 2.9%</b>	<b>30.8% ± 3.1%</b>	<b>41.3% ± 3.0%</b>

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
<b>Cycle 2</b>	99.0% ± 0.3%	74.9% ± 1.2%	76.3% ± 1.2%	57.8% ± 1.4%
<b>Cycle 3</b>	98.5% ± 0.3%	80.1% ± 1.1%	74.3% ± 1.2%	59.9% ± 1.4%
<b>Change (C3-C2)</b>	<b>-0.5% ± 0.4%</b>	<b>5.2% ± 1.7%</b>	<b>-1.9% ± 1.7%</b>	<b>2.1% ± 2.0%</b>

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

Cycle	Email	Telephone	Postal Address	All Modes Accurate
<b>Cycle 2</b>	98.3% ± 0.4%	89.2% ± 0.9%	63.0% ± 1.3%	57.2% ± 1.4%
<b>Cycle 3</b>	99.3% ± 0.2%	92.2% ± 0.7%	60.3% ± 1.3%	55.7% ± 1.3%
<b>Change (C3-C2)</b>	<b>1.0% ± 0.4%</b>	<b>3.0% ± 1.1%</b>	<b>-2.7% ± 1.8%</b>	<b>-1.5% ± 1.9%</b>

### 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 2, and also show the same data for Cycle 3.

#### Email Addresses

Table C16: Total Email Address Errors by Contact Type (2013 RAA) – Cycle 2

	Registrant	Administrative	Technical	Total
<b>Passed All Accuracy Tests</b>	5,083	5,095	5,095	<b>15,273</b>
<b>Missing</b>	35	23	23	<b>81</b>
<b>Not Resolvable</b>	1	1	1	<b>3</b>
<b>Total</b>	<b>5,119</b>	<b>5,119</b>	<b>5,119</b>	<b>15,357</b>

Table C17: Total Email Address Errors by Contact Type (2013 RAA) – Cycle 3

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

Telephone Numbers

Table C18: Total Telephone Number Errors by Contact Type (2013 RAA) – Cycle 2

	Registrant	Administrative	Technical	Total
<b>Passed All Accuracy Tests</b>	4,606	4,590	4,586	<b>13,782</b>
<b>Not Present</b>	60	62	63	<b>185</b>
<b>Country Code Missing</b>	87	86	100	<b>273</b>
<i>Country Code Format</i>	53	56	67	<b>176</b>
<b>Incorrect Length</b>	313	325	303	<b>941</b>
<b>Characters Not Allowed</b>	0	0	0	<b>0</b>
<b>Total</b>	<b>5,119</b>	<b>5,119</b>	<b>5,119</b>	<b>15,357</b>

Note: Italics indicate new 2013 RAA requirements.

Table C19: Total Telephone Number Errors by Contact Type (2013 RAA) – Cycle 3

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

Note: Italics indicate new 2013 RAA requirements.

Postal Addresses

Table C20: Total Postal Address Errors by Contact Type (2013 RAA) – Cycle 2

	Registrant	Administrative	Technical	Total
<b>Passed All Accuracy Tests</b>	3,041	3,037	3,093	<b>9,171</b>
<b>Missing</b>	23	25	25	<b>73</b>
<b>Country Code Missing</b>	1	1	1	<b>3</b>
<b>Country Not Identifiable</b>	33	33	32	<b>98</b>
<i>Country in Wrong Field</i>	61	61	61	<b>183</b>
<b>Country Not ISO Alpha 2</b>	0	0	0	<b>0</b>
<b>Postal Code Missing</b>	362	389	386	<b>1,137</b>
<b>Postal Code Format</b>	12	11	11	<b>34</b>
<i>Postal Code in Wrong Field</i>	0	0	0	<b>0</b>
<b>State/Province Missing</b>	893	914	805	<b>2,612</b>
<i>State/Province in Wrong Field</i>	45	44	42	<b>131</b>
<i>State/Province Format</i>	96	98	116	<b>310</b>
<b>City Missing</b>	568	582	538	<b>1,688</b>
<i>City in Wrong Field</i>	389	386	483	<b>1,258</b>
<b>Street Missing</b>	425	415	386	<b>1,226</b>
<i>Street in Wrong Field</i>	109	108	95	<b>312</b>
<b>TOTAL</b>	<b>5,119</b>	<b>5,119</b>	<b>5,119</b>	<b>15,357</b>
<b>Total Errors</b>	<b>3,017</b>	<b>3,067</b>	<b>2,981</b>	<b>9,065</b>

Table C21: Total Postal Address Errors by Contact Type (2013 RAA) – Cycle 3

	Registrant	Administrative	Technical	Total
<b>Passed All Accuracy Tests</b>	3,374	3,375	3,419	<b>10,168</b>
<b>Missing</b>	3	9	9	<b>21</b>
<b>Country Code Missing</b>	3	2	2	<b>7</b>
<b>Country Not Identifiable</b>	34	35	36	<b>105</b>
<i>Country in Wrong Field</i>	61	61	61	<b>183</b>
<b>Country Not ISO Alpha 2</b>	0	0	0	<b>0</b>
<b>Postal Code Missing</b>	408	433	424	<b>1,265</b>
<b>Postal Code Format</b>	11	10	9	<b>30</b>
<i>Postal Code in Wrong Field</i>	0	0	0	<b>0</b>
<b>State/Province Missing</b>	1,101	1,112	1,035	<b>3,248</b>
<i>State/Province in Wrong Field</i>	36	35	30	<b>101</b>
<i>State/Province Format</i>	103	103	105	<b>311</b>
<b>City Missing</b>	619	635	618	<b>1,872</b>
<i>City in Wrong Field</i>	396	393	450	<b>1,239</b>
<b>Street Missing</b>	470	464	443	<b>1,377</b>
<i>Street in Wrong Field</i>	120	118	109	<b>347</b>
<b>TOTAL</b>	<b>5,737</b>	<b>5,737</b>	<b>5,737</b>	<b>17,211</b>
<b>Total Errors</b>	<b>3,365</b>	<b>3,410</b>	<b>3,331</b>	<b>10,106</b>

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 very repetitive, and are thus 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	1,258	423	666
	Arabic	0	0	0
	Chinese (Hanzi)	0	0	0
	Korean (Hangul)	0	0	0
	Diacritical Marking	9	5	3

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	2,903	1,094	1,607
	Arabic	1	0	1
	Chinese (Hanzi)	32	15	16
	Korean (Hangul)	1	0	0
	Diacritical Marking	6	3	3

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	2,126	1,463	1,339
	Arabic	0	0	0
	Chinese (Hanzi)	0	0	0
	Korean (Hangul)	0	0	0
	Diacritical Marking	83	58	50

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	1,888	1,266	1,263
	Arabic	0	0	0
	Chinese (Hanzi)	0	0	0
	Korean (Hangul)	0	0	0
	Diacritical Marking	16	6	6

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	3,629	3,222	2,860
	Arabic	0	0	0
	Chinese (Hanzi)	0	0	0
	Korean (Hangul)	0	0	0
	Diacritical Marking	0	0	0