Study Regarding the New IANA SLE Reporting Metrics and its Mapping to the Current IANA RZM System

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2016-02-08

1 Introduction

This document summarizes a study of the current IANA Root Zone Management System (RZMS) and Request Tracker (RT) systems used for the Root Zone management by IANA. The « SLE Working Group Report on Service Level Expectation for IANA Root Zone Management (Post-Transition) », approved September 10th 2015, lists 11 required SLE metrics. The study analyzed those metrics and their possible mappings to the current IANA RZMS and RT systems. This document provides statistics on those mapped metrics, which were approximated based on heuristics.

2 Methodology

ICANN provided a secured remote access to a clone of the IANA RT4 system (web interface and database) and a clone of the IANA RZMS database in a virtual machine hosted at ICANN. The snapshot of the RZMS/RT system was done on December 18th 2015. ICANN staff was available for clarification questions and we had a few communications. ICANN staff also provided some engineering documentation on the system.

All statistics presented in the study were done by programming scripts querying the RZMS and RT databases. Random sampling of the tickets and spot checks were used to manually verify the output.

3 Considerations and Limitations

To avoid latest tickets that may be still unstable (even after being closed), we decided not to include any ticket closed later than November 30th 2015. The study was also limited to the tickets that have been fully completed (instead of withdrawn or admin closed). Since the analysis often required manual verification of tickets and the study deadline was very tight, we limited the total number of tickets to those opened after January 1st 2012. Since the RZM system was put in place in April 2011, our scripts would only work from that time.

The study did not look at Category 5 requests (« Other change requests»), since they require almost systematic detailed manual analysis and exhibit a variety of states that would make the approximated metrics almost meaningless.

The RZM/RT systems were not designed to classify the tickets in the 5 proposed categories. While with some heuristics one can classify most tickets with good reliability, the study have found that many are complicated cases, especially when there are combination of categories in the same request. To minimize the risk of wrongly classifying the tickets and therefore adding unreliability to the statistics, the study do not provide approximated metrics per category. However, some metrics were sub-divided into 2 or 3 sub-metrics to group the data in a meaningful way. These sub-metrics are sometimes related to specific categories or group of categories.

The study also excluded the requests related to the Root servers themselves, as they are very special in nature and require a different process than TLDs.

Only the 11 reporting metrics, labelled RM1-RM11 herein, were analyzed. No dashboard requirement was analyzed.

The current system does not distinguish between ccTLD and gTLDs. Therefore, we have not found a way to distinguish IDN ccTLDs from IDN gTLDs, as there is no specific consistent tagging of these in the system. While it could be possible to do with some manual work, we punt it for now given tight deadlines. Therefore, the statistics of the IDN ccTLDs will be bundled in the gTLDs in this report. The non-IDN ccTLDs are not affected and are treated as is.

We have found many instances where multiple tickets were merged together, for various reasons. This creates a more complex situation to analyze since each original ticket has its own thread of actions and when they are merged, these

threads become mangled all together, at least from a programming standpoint. Therefore, for those cases, the statistics will not be as reliable.

It is also possible that we have mis-understood the semantics of the various requested metrics. For some metrics, ICANN staff had a different interpretation. Therefore, we provide a detailed description of our understanding of each metric. The numerical results are based on that description.

A single request may contain both root zone change and contact change. These requests are classified by the system as category 1 (impacting Root Zone file). Therefore, the two kinds of changes are not separated. The metrics related to contact changes couldn't be easily extracted since they are intertwined. Moreover, some of the metrics statistics related to the root zone change may also include the durations related to the contact changes.

Email submission introduces a lot of variability in heuristics for SLE measurements.

Delegation and Redelegation requests (category 3 and 4) are typically complex processes with documents requests, exchanges with requestors, clarifications, changes in the requests themselves, etc. A random walk of some of these tickets shows clearly that any statistics out of these tickets should be taken with a lot of warnings and a careful detailed study of each ticket should be done before drawing significant conclusion. This study tries to do its best to find reliable statistics, but they are pretty limited in relevance.

No timestamps in the current system have a resolution smaller than 1 second.

The detailed study of RZMS showed that while on the surface RZMS looks simple, it is pretty complex in order to handle all possible cases, states, inputs, … . Moreover, that complexity is significantly increased by the additional input of emails threads into the system. This complexity means that the study required assistance of ICANN staff to confirm our assumptions on the system behavior, specially for corner cases.

ICANN staff provided the RZMS Engineering/Design document. The document is very good, but as any evolving system, it may not be always updated. This is pretty typical in software development, but for the study, it creates additional challenges.

4 Definitions

- Request Categories from CWG document :
  - C1 : Routine updates impacting Root Zone File
  - C2 : Routine updates not impacting Root Zone File
  - C3 : Creating or Transferring a gTLD
  - C4 : Creating or Transferring a ccTLD

- C5 : Other change requests

- Reporting metrics :
  - RMX where X = 1-11 are the reporting metrics requested in the SLE Report.
- AC/TC : Administrative and technical contacts

5 Reporting Metrics

In the following sections, our understanding of each proposed Reporting metric(RM) is presented together with a simplification of the current logic of the RZMS/RT system. This will show timing of RZMS/RT actions and how we used heuristics to map the RM with those actions. Scripts querying the RT and RZMS databases were implemented for those heuristics. Statistics of the relevant tickets are presented.

Given the difficulty to reliably categorize tickets into the 5 categories, we did not use the categories. However, for some metrics, we grouped tickets in sub-groups based on some characteristics that would have important influence to the statistics. Therefore, the number of tickets for each metric is typically different.

5.1 RM1 : Time for ticket to be sent to requester following receipt of change request via automated submission interface

5.1.1 Our Understanding of the Current System

The following describes the relevant RZMS/RT events regarding this metric :

- T1 : Requestor submit the request form through the web interface of RZMS
- T2 : RZMS creates its own new transaction record
- T3 : RZMS creates a ticket into RT and displays it to the user as the output of the submission
- T4 : **No** email is sent to the requestor with an acknowledgement of the ticket.
- If the request is of category 1, 3 or 4,
  - T5.A1 : RZMS starts a technical check.
  - T5.A2 : RZMS finish the technical check
  - If technical check succeeds, then
    - T5.A3 RZMS sends email to AC/TC to confirm the request
  - Else (technical check fails), then
    - T5.A3 sends email to AC/TC reporting technical check issues
    - T5.A4 continue periodic checking
- Else (category 2)
  - T5.B1: RZMS sends email to AC/TC to confirm the request

5.1.2 Discussion

There is currently no email sent when a ticket is entered via the RZMS web interface. Therefore, if the intent of RM1 is the difference between T4 and T1, then there is no such T4 action (i.e. sending confirmation email when entering ticket through RZMS web interface) currently in the system.

It is expected that T3 =~ T2 =~ T1 since it is done by the same process in typically less than one second. Our analysis of the system logs confirms this.

Therefore, the best approximation of RM1 is either:

- A) internal timing of the process
  - RM1A = T3 – T1
- B) includes the technical check time for Category 1,3 and 4.
  - For category 1,3 and 4,
    - RM1B = T5.A3 – T1 depending on the success of the first technical check
    - In this case, RM1 includes the time of the technical check, which is not desired.
  - For category 2,
    - RM1C = T5.B1 –T1

It is worth noting that, unless exceptional cases, the email travel time from the ICANN servers to the requestor will likely be much more longer than the time between the ICANN internal systems (RZMS and RT), such as RM1A.

5.1.3 Applying the Metric to Past Requests

The current set of timestamps in RZMS/RT provides T3 – T2, which shall be almost identical to RM1A = T3 – T1. T3 – T2 tickets are divided as follows :

Duration (RM1A = T3 – T2)	**Number of tickets**
Below 2 seconds	2666
Between 2 and 3 seconds	6
1097 seconds (~18 minutes)	17
Total number of tickets	*2689*

Investigation of the 17 tickets taking 1097 seconds (~18 minutes) showed that all happened within a window of 4 days at the end of January 2014. We have not investigated with ICANN about this specific event, but we guess as either an internal hiccup between the systems or the time stamping was done wrong for other reasons.

For RM1C, we use T5.B1 – T2. The RZMS-RT current machinery sends the emails to TC/AC and after changes its state to « Pending Confirmation of AC/TC », which is what we measured below. Therefore, the real time when the email is sent is lower than what is shown below.

Duration (RM1C = T5.B1 – T2)	Number of tickets
Below 5 seconds	573
Between 5 and 8 seconds	8
65 seconds	1
Total number of tickets	*582*

We have looked at the details of the 65 seconds ticket and found no obvious reason. We have not investigated with ICANN about the ticket. We conjecture that it is a case of a « normal exception » of probably some accidental and unusual load.

For RM1B, the statistics would include the tech-check time, which is, to our understanding, not the purpose of this metric, so we did not try to quantify it.

5.2 RM2 : Time for lodgment of change request into RZMS by ICANN staff on behalf of request sent by email

5.2.1 Our understanding

The following describes the relevant events regarding this metric :

- T1 : Requestor submit the request by email to root-mgmt@iana.org
- T2 : RT creates a ticket
- T3 : RT sends an acknowlegdement email to the requestor
- T4 : IANA staff manually review the ticket and classify it with the right attributes in RT
- T5 : IANA staff creates a new RZMS ticket for this request
- T6 : RZMS updates the RT ticket with various meta information.

It is our understanding that :

- For category 1,2, 3 and 4, RM2 = T5 – T1

5.2.2 Discussion

It is expected that T3 =~ T2 =~ T1 since it is done by the same process in typically less than one second. Our analysis of the system logs confirms this.
The manual review done by IANA staff at T4 may involve various interactions with the requestor and or third parties. Our investigation of those requests shows a wide variety of requests and special issues that need to be handled. Therefore, this metric will show a large spectrum of durations. Many special cases make this metric not very meaningful.

5.2.3 Applying the Metric to Past Requests

Given large variations, the following table provides statistics of the approximated metric.

Total number of tickets	218
Minimal duration (seconds)	247
Maximal duration (seconds)	15472813 (~6 months)

Average duration (seconds)	315392 (~3.5 days)
Median duration (seconds)	29512 (~8 hours)
Standard Deviation of durations (seconds)	1301964 (~2 weeks)

Half of the tickets were done within one working day.
The worst ticket in duration from T1 to T5 is a continuation of another ticket about a redelegation where one of the existing contact rejected the request (i.e. refusing the redelegation to happen). This ticket then went into multiple back and forth with requestor and IANA for missing appropriate documents, verifying the various requirements for the sponsorship organization with a review of the ICANN board and also missing appropriate contact information. It is only when the whole request was complete that IANA staff created a RZMS ticket. So this ticket spent months into the T4 stage. Staff could have created a tentative RZMS ticket way before, but given the overall unstability and lack of clarity of the request, they did not. At least, that is our conjecture.
Another ticket took about 4 days before reaching state T5. It started with a question to IANA on what appeared after a few exchanges a misunderstanding of the requestor on how to submit NS requests through email or web interface. It started on a thrusday, then it was handled by IANA staff and on the next Monday the requestor was still struggling on what to do. This ticket also resulted in a merge with two other tickets. On Tuesday, 4 days after the initiating email, IANA staff created the RZMS ticket since the request was more clear then.

Another ticket was a contact request change, but it was sent simultaneously to a root zone change for the same TLD which was held because of tech check error, so this contact request change was then put on hold too. RZMS of the contact request change was initiated much later, 6 days after the initial email.

Another ticket was created by IANA staff because of a postal mail return for bad address of an AC. After multiple exchanges of emails, it appeared that the address was missing the « suite 2 » after the street address… This finding then changed the ticket to a contact change and then RZMS was triggered.

Our investigation of many of these tickets shows that there are so many exchanges before the request comes to a state that makes sense to input into RZMS.

5.3 RM3 : Time to return results for technical checks following submission of request via automated submission interface

5.3.1 Our understanding

Since technical checks are only done for Root zone changes, then this metric is irrelevant for category 2 and some non root zone changing requests of category 3 and 4.

The following describes the relevant events regarding this metric :

- T1 : Requestor submit the request form through the web interface of RZMS
- T2 : RZMS creates its own transaction record
- T3 : RZMS creates a ticket into RT and displays the number to the user as the output of the submission
- T4 : No email is sent to the requestor with an acknowledgement of the ticket.
- T5 : RZMS starts a technical check.
- T6 : RZMS finish the technical check
- If technical check fails, then
    - T7.1 sends email to AC/TC reporting technical check issues
    - T7.2 continue periodic checking until success (or timeout)
- T8: RZMS sends email to AC/TC to confirm the request

It is our understanding that when the technical check (either the first one, or any subsequent) succeeds, the system currently just move to the next state, without sending a specific confirmation email to the AC/TC that the technical tests have succeeded.

Therefore, the closest approximation would be:

- For category 1,3 and 4,
    - If first technical check succeeds, then RM3A = T8 – T1
    - Else RM3B= T7.1 – T1

5.3.2 Discussion

Our scripts combine both cases (RM3A and RM3B) into one (RM3).

5.3.3 Applying the Metric to Past Requests

Total number of tickets	2097
Minimal duration (seconds)	5
Maximal duration (seconds)	202392 (~2.5 days)
Average duration (seconds)	2676 (~45 minutes)
Median duration (seconds)	236 (~4 minutes)
Standard Deviation of durations (seconds)	8896 (~2 hours)

The median shows that half of the tickets are completed in less than 4 minutes for this metric. We conjecture that the technical checks are probably done within one or two minutes, so this result makes sense. Investigation of the maximal duration ticket does not provide any clue of why it took that time.
There were many tickets around June 2015 that exhibits those metric of many hours. Investigation of these tickets shows that there was an AS (Autonomous System, aka Internet BGP routing) issue during the technical checks that required manual intervention of IANA staff to move forward the ticket. These many tickets contribute significantly to the average duration and standard deviation of this metric.

5.4 RM4 : Time to return results for subsequent performance of technical checks during retesting due to earlier failed tests

5.4.1 Our understanding

Since technical checks are only done for Root zone changes, then this metric is irrelevant for category 2 and some non root zone changing requests of category 3 and 4.

The following describes the relevant events regarding this metric :

- T1 : RZMS starts the first technical check.
- T2 : RZMS finish the technical check
- T3 : technical check fails
- T4: sends email to AC/TC reporting technical check issues
- T5 : wait for some time (typically 6 hours)
- T6 : RZMS starts the second technical check.
- T7: RZMS finish the technical check
- If technical check fails, then
    - T8.1 sends email to AC/TC reporting technical check issues
    - T8.2 continue periodic checking until technical check succeed
        - If never succeed after some period of time (typically 14 days), then cancel the request and notify AC/TC by email
    - T8.3 RZMS starts the technical check that eventually succeeded
    - T8.4 RZMS finish the technical check which succeeded
- T9: RZMS sends email to AC/TC to confirm the request

It is our understanding that when the technical check (either the first one, or any subsequent) succeeds, the system currently just move to the next state, without sending a specific confirmation email to the AC/TC that the technical tests have succeeded.

Therefore, the closest approximation would be:

- For category 1,3 and 4,
    - if second tech check succeeds (no T8.X steps), then RM4 = T9 – T7
    - else RM4 = T9 – T8.4

The statistics below combine both cases.

5.4.2 Applying the Metric to Past Requests

Total number of tickets	738
Minimal duration (seconds)	0
Maximal duration (seconds)	5
Average duration (seconds)	1

Median duration (seconds)	1
Standard Deviation of durations (seconds)	1

Since this metric process is mostly automatic within RMZS, it is not surprising that this takes in the order of 1 second for most cases.

5.5 RM5: Time for authorization contacts to be asked to approve change request after completing previous process phase

5.5.1 Our understanding

The following describes the relevant events regarding this metric :

- T1 : RZMS creates the transaction
- T2 : Various steps before sending AC/TC to confirm the request
- T3 : Last step terminates successfully before sending AC/TC to confirm the request
- T4: RZMS sends email to AC/TC to confirm the request

It is our understanding that :

- RM5 = T4 – T3

5.5.2 Applying the Metric to Past Requests

Total number of tickets	2238
Minimal duration (seconds)	0
Maximal duration (seconds)	123 (~2 minutes)
Average duration (seconds)	2
Median duration (seconds)	1
Standard Deviation of durations (seconds)	3

Since this metric process is mostly automatic within RMZS, it is not surprising that this takes in the order of 1-2 second for most cases. We have not investigated the ticket with maximal duration.

5.6 RM6: Time for response to be affirmed by IANA

5.6.1 Our understanding

The following describes the relevant events regarding this metric :

- T1: RZMS sends email to AC/TC to confirm the request
- T2 : first contact confirms the request
- T3 : last contact confirms the request
- T4 : IANA starts the manual review
- T5 : if review ok, then sends email to third party authorization

It is our understanding that :

- RM6 = T4 – T3

5.6.2 Discussion

Contacts can confirm the request using RZMS web interface and by email. By email, while IANA ask for a specific reply template (reply starting with ' I ACCEPT'). However, random inspection of tickets showed that people have been replying with various forms of positive acknowledgements, such as "I Agree", "please proceed", etc in a single line, or within a sentence. Therefore, these had to be manually processed by IANA staff and are also difficult to reliably parse with our scripts.

5.6.3 Applying the Metric to Past Requests

Total number of tickets	1330
Minimal duration (seconds)	1
Maximal duration (seconds)	2501497 (~28 days)
Average duration (seconds)	125617 (~1.5 days)
Median duration (seconds)	20894 (~ 6 hours)
Standard Deviation of durations (seconds)	291512 (~3 days)

The inspection of the maximal duration ticket showed that the AC/TC never responded to the request confirmation emails sent multiple times by IANA over almost one month. A manual process was used to move forward the ticket, which then made the script algorithm not properly identifying the duration. This is an example of the fact the current system does not tag specifically the acknowledgements so the parsing heuristics may interpret wrongly. We have not investigated further the large durations tickets, since we suspect these to be similar. We could certainly improve the scripts with more heuristics.

5.7 RM7: Time to complete all other validations and reviews by IANA Functions Operator and release request for implementation

5.7.1 Our understanding

The following describes the relevant events regarding this metric :

- T1: RZMS sends email to AC/TC to confirm the request
- T2 : first contact confirms the request
- T3 : last contact confirms the request
- T4 : IANA starts the manual review
- T5 : IANA terminates the review
- T6 : RZMS sends email to NTIA for authorization

It is our understanding that :

- RM7 = T6 – T4
- In case of redelegation, there is an additional evaluation step done by IANA. Therefore we distinguish RM7A for non-delegation tickets and RM7B for delegation tickets

5.7.2 Discussion

It should be noted that for many requests we have seen, the IANA review includes many back and forth with the requestor or with other parties. These interactions are pretty difficult to parse automatically. Therefore, the durations shown below do include all these interactions, which means also the time IANA was waiting for an answer from the party.

5.7.3 Applying the Metric to Past Requests

RM7A tickets (non-redelegation):

Total number of tickets	2888
Minimal duration (seconds)	2
Maximal duration (seconds)	8290430 (~13 weeks)
Average duration (seconds)	207401 (~2.5 days)
Median duration (seconds)	124270 (~ 1.5 days)
Standard Deviation of durations (seconds)	316891 (~3.5 days)

For non-redelegation tickets, half of the tickets were done in less than 2 days. Investigation of the longest duration ticket shows that the delay was due to waiting for documents from the requestor.

RM7B tickets (redelegation):

Total number of tickets	17
Minimal duration (seconds)	1295279 (~15 days)
Maximal duration (seconds)	21418463 (~35 weeks)
Average duration (seconds)	9535532 (~15 weeks)
Median duration (seconds)	6833034 (~11 weeks)
Standard Deviation of durations (seconds)	5173796 (~8 weeks)

Investigation of many of these redelegation tickets shows that the evaluation time counts for >90% of the duration.

5.8 RM8: Time for third-party review of request (e.g. by Board of Directors and other verification parties)

5.8.1 Our understanding

The following describes the relevant events regarding this metric :

- T1: RZMS sends email to third party for authorization
- T2 : RZMS receives confirmation from third party to proceed

It is our understanding that :

- RM8 = T2 – T1

5.8.2 Discussion

We were not able to find a way to parse the tickets and get a reliable approximated metric. It appears that many of these interactions are not fully logged into the

RZMS/RT systems, or when logged, are done with email chats that are difficult to automatically parse.

5.8.3 Applying the Metric to Past Requests

We were not able to provide any statistics for this metric.

5.9 RM9: Time to return results for performance of technical checks during Supplemental Technical Checks

5.9.1 Our understanding

Since technical checks are only done for Root zone changes, then this metric is irrelevant for category 2 and some non root zone changing requests of category 3 and 4.

The following describes the relevant events regarding this metric :

- T1 : RZMS starts the first supplemental technical check.
- T2 : RZMS finish the supplemental technical check
- If technical check fails, then
    - T3.1 sends email to AC/TC reporting supplemental technical check issues
    - T3.2 continue periodic checking until supplemental technical check succeed
        - If never succeed after some period of time (typically 14 days), then cancel the request and notify AC/TC by email
    - T3.3 RZMS starts the supplemental technical check that eventually succeeded
    - T3.4 RZMS finish the supplemental technical check which succeeded
- T4: RZMS sends email to NTIA for authorization

It is our understanding that :

- RM9 = T4 – T2 or T4 – T3.4

5.9.2 Discussion

It is worth noting that currently the supplemental technical check happens before the NTIA authorization, while the SLE document seems to imply after.

5.9.3 Applying the Metric to Past Requests

Total number of tickets	2238
Minimal duration (seconds)	0
Maximal duration (seconds)	45327 (~12.5 hours)
Average duration (seconds)	22
Median duration (seconds)	2
Standard Deviation of durations (seconds)	958 (16 minutes)

The median shows that half of the tickets were done within 2 seconds. The largest duration (45327 seconds) ticket inspection shows issues on the requestor DNS systems, an exception state of the root zone maintainer systems and some SQL manual work of the ticket system. By removing this ticket to the set, the average goes down to ~3 seconds and the new maximal duration is 25 seconds.

5.10 RM10: Time for the root zone changes to be published following completion of validations and reviews by IANA Functions Operator

5.10.1 Our understanding

Root zone changes are irrelevant for category 2 and some non root zone changing requests of category 3 and 4.

The following describes the relevant events regarding this metric :

- T1: RZMS receives confirmation from NTIA to proceed
- T2 : IANA pushes the request to the Root zone maintainer
- T3 : Root zone maintainer confirms the scheduling of the change in the root zone.
- T4 : RZMS receives a confirmation from the Root zone maintainer that the request has been implemented in the root zone.

It is our understanding that :

- RM10 = T4-T1

5.10.2 Applying the Metric to Past Requests

Total number of tickets	2232
Minimal duration (seconds)	1
Maximal duration (seconds)	92520 (~25 hours)
Average duration (seconds)	15263 (~4 hours)
Median duration (seconds)	11880 (~ 3 hours)
Standard Deviation of durations (seconds)	13594 (~3.5 hours)

The median shows that half of the tickets were done within 3 hours.

5.11 RM11: Time to notify request of change completion following publication of requested changes

5.11.1 Our understanding

The following describes the relevant events regarding this metric :

- For root zone changing tickets (ns, ds and delegation/redelegation that have ns changes)
    - T1: RZMS receives a confirmation from the Root zone maintainer that the request has been implemented in the root zone.
    - T2 : confirmation email is sent to AC/TC of request implemented.

It is our understanding that :

- RM11 = T2 – T1

5.11.2 Discussion

Currently, we have only worked on root zone change since the non root zone changing tickets were more complicated to parse to achieve reliable metric.

5.11.3 Applying the Metric to Past Requests

There is a large variation of the durations. The statistics are as follows:

Total number of tickets	1920
Minimal duration (seconds)	1
Maximal duration (seconds)	595790 (~7 days)
Average duration (seconds)	25622 (~7 hours)
Median duration (seconds)	7219 (~ 2 hours)
Standard Deviation of durations (seconds)	56160 (~15 hours)

Random inspection of large duration tickets shows a pattern where T1 is just before office closing hours and T2 happens at working hours. For instance, the maximal one (~7 days) happened at T1 = December 30th and T2 = January 6th. Our theory is that the email confirmation to AC/TC is triggered manually by IANA staff after reviewing the zone publication message. We haven't verified this theory with IANA staff. However, the median shows that half of the tickets were confirmed by email within 2 hours of zone publication.

6 Summary

This study took a deep look at the IANA RZM/RT systems to map the requested SLE metrics with the data currently available and approximate the metrics based on various heuristics. It is based on our understanding of the metrics, which we described in details.

The following summaries the findings regarding the approximations:

- Unable to meaningfully approximate: RM8
- Large variation of durations: RM2, RM6, RM7
- Large variation but with a few exceptional cases: RM3, RM9, RM10, RM11
- Not much variation: RM1, RM4, RM5.

Variations of durations are not a measure of the reliability of the approximation. In some cases, it is the inherent property of the task (ex: manual reviews duration).

This study draws the following conclusions:

- The IANA RZM/RT systems are not currently designed to report the SLE metrics requested by the community.
- Implemented heuristics provided relatively good approximations for most metrics. For some metrics, the approximation is less conclusive.
- We are pretty sure that further work on more complex heuristics could improve the approximations of the metrics.
- RZM/RT systems have a good level of complexity to support all cases.
- Interactions using email creates much more difficulties for parsing and heuristics. Patent examples are when contacts confirms a request with a large variety of positive/negative answers such as 'I accept, I agree, please proceed, ok, …'.