Verisign/ ICANN Final Report on Parallel Testing of Post-Transition Root Zone Management System

August 2016

Introduction

On March 14, 2014, the U.S. National Telecommunications and Information Administration (NTIA) announced its intent to transition stewardship of Internet domain name functions to the global multi-stakeholder community. On March 4, 2015, NTIA officially requested that ICANN and Verisign work together to develop a proposal on how best to transition the NTIA administrative role associated with root zone management in a manner that maintains the security and stability of the Internet's domain name system. In response to NTIA's request, Verisign in its role as Root Zone Maintainer (RZM) and ICANN in its role as IANA Functions Operator (IFO) submitted a proposal[1] in August 2015 that provided for changes to the existing Root Zone Management System (RZMS) that would remove NTIA's existing role as the Root Zone Administrator (RZA). To test these changes, a modified system was created to run in parallel with the existing system for a 90-day period (the "parallel operations period"). During the parallel operations period, Verisign and ICANN monitored the systems to ensure there were no unexplained differences between the production RZMS and the parallel test version of the RZMS.

Parallel Operations

To implement the RZA removal approach, ICANN and Verisign replicated the production RZMS as it functions today without the RZA to create a parallel test version of the RZMS ("parallel RZMS"). ICANN replicated the TLD manager change requests by entering the same change requests in the parallel RZMS that were entered into the production RZMS.

During the parallel operations period, 208 root zone change requests were processed. Each of these change requests were processed through two distinct process flows:

[1] https://www.ntia.doc.gov/files/ntia/publications/root_zone_administrator_proposal-relatedtoiana_functionsste-final.pdf

a) Through the existing production RZMS. ICANN received, processed and validated change requests from TLD managers. Upon completion of this processing, the change requests were transmitted to Verisign and to NTIA to seek RZA authorization. Upon RZA authorization by NTIA, Verisign implemented the authorized change to the root zone and, twice daily, published an updated signed root zone file.

b) Through the parallel RZMS. ICANN replicated all TLD manager requests from the production system to the parallel RZMS automatically. Upon completion of the processing by ICANN, the parallel change requests were transmitted only to Verisign (not to NTIA for authorization). Verisign then implemented the changes in the parallel RZMS. Subsequently, the parallel RZMS generated a signed root zone file. Verisign then compared the root zone file generated from the parallel RZMS to the root zone file generated from the production RZMS.

To facilitate signed root zone file comparison, an automated method for comparing the signed root zone file from each system was developed. An automated method for reviewing and publishing the comparison results was also created, and the comparison results for each signed root zone file were published daily[2]. In addition, three monthly reports were posted summarizing the daily analysis and providing additional explanations[3].

During the parallel operations period only the signed root zone file from the production RZMS was published, while the signed root zone from the parallel RZMS was used only for comparison.

Following the successful completion of the parallel operations period, the IFO and RZM continue to operate both systems in parallel to maintain readiness for the transition.

Parallel Testing Results

The 90-day parallel operations period commenced on 6 April 2016[4] and concluded successfully on 5 July 2016.

Verisign and ICANN jointly reviewed and discussed the comparison results periodically during the parallel operations period. For all 208 root zone change requests processed during the parallel operations period, the resulting two root zone files and their changes produced by the two systems were identical. (cf. Appendix: Monthly Comparison Reports)

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[2] http://www.verisign.com/rzms-parallel-ops/index.html

[3] https://www.icann.org/en/stewardship-implementation/root-zone-management-system-parallel-testing

[4] https://www.icann.org/news/announcement-2016-04-08-en

Conclusion and Next Steps

Testing and evaluation during the parallel operations period was successful and there were no unexplained differences between the production RZMS and the parallel testing RZMS.

During the parallel operations period, the parallel RZMS behaved as would be expected in a future post-transition environment. ICANN and Verisign have concluded the parallel RZMS is production-ready and suitable for deployment to support the post-transition workflow with the NTIA (RZA authorization) role removed.

At the time the IANA Functions Contract is ended, the following steps should occur:

- IFO suspends the transmittal of root zone changes to the RZM to allow the RZMS to become quiescent for the duration of the deployment period.
- RZM performs database maintenance to synchronize authoritative data and historical data.
- IFO and RZM validate production connectivity to the newly deployed RZMS.
- The newly deployed RZMS becomes the authoritative production system.
- Simultaneously, IFO begins using only the authoritative production RZMS for transmittal of TLD change information to the RZM, and RZM begins using only the authoritative production RZMS for creating the authoritative signed root zone and for publishing the signed root zone.
- IFO resumes transmittal of root zone changes to the RZM.

Appendix: Monthly Comparison Reports

05 April 2016 – 05 May 2016 Report (https://www.icann.org/iana_imp_docs/23-1st-rzms-parallel-testing-monthly-report-v-06may16)

RZMS Parallel Testing Monthly Report			
From 04/05/2016 To 05/05/2016	**Production (RZA)**	**Parallel System (RZA2)**	**Parallel Comparison**
Total Change Requests:	75	75	No differences found
Successful Change Requests:	75	75	No differences found
Failed Change Requests:	0	0	No differences found
Withdrawn Change Requests:	0	0	No differences found
Current Number of TLD(s):	1310	1310	No differences found
Current Number of Host(s):	3442	3442	No differences found
Explanations of differences found:			
No differences found.			

06 May 2016 – 05 June 2016 Report (https://www.icann.org/iana_imp_docs/55-rzms-parallel-testing-monthly-report-2-v-06jun16)

RZMS Monthly Report			
From 05/05/2016 To 06/05/2016	**Production (RZA)**	**Parallel System (RZA2)**	**Parallel Comparison**
Total Change Requests:	59	60	No differences found
Successful Change Requests:	59	60	No differences found
Failed Change Requests:	0	0	No differences found
Withdrawn Change Requests:	0	0	No differences found
Current Number of TLD(s):	1338	1338	No differences found
Current Number of Host(s):	3535	3535	No differences found
Explanations of differences found:			
The current production system treats an initial request and all subsequent modifications to that request as a single request. In the parallel system, the original request and any subsequent modifications are treated as distinct requests. As a consequence, there was a discrepancy in the number of requests counted by each system, but the root zone files produced by each system were identical.			

06 June 2016 – 05 July 2016 Report (https://www.icann.org/iana_imp_docs/77-rzms-parallel-testing-monthly-report-3-v-06jul16)

RZMS Monthly Report

From 06/05/2016 To 07/05/2016	Production (RZA)	Parallel System (RZA2)	Parallel Comparison
Total Change Requests:	73	73	No differences found
Successful Change Requests:	72	72	No differences found
Failed Change Requests [1]:	1	1	No differences found
Withdrawn Change Requests:	0	0	No differences found
Current Number of TLD(s):	1384	1384	No differences found
Current Number of Host(s):	3693	3693	No differences found

Explanations of differences found:

(1) Failed change requests are those that are not implemented in the root zone due to an issue identified while processing the request. Failed change requests are rare, but may happen during the normal course of processing change requests and have no relationship to parallel testing.