Pre-Delegation Testing

DNS DNSSEC Test Cases

Version H

File name: PDT_DNS_TC_DNSSEC.docx
Last saved: 2015-03-16

Document control

Document information and security

Made by	Responsible for fact	Responsible for document
Patrik Wallström	Patrik Wallström	Patrik Wallström

Security class	File name
External	PDT_DNS_TC_DNSSEC.docx

Revisions

Date	Version	Name	Description
2013-01-24	PA1	Patrik Wallström	Initial document
2013-01-24	PA2	Rickard Bellgrim	Update text after review
2013-02-06	PA3	Rickard Bellgrim	Add Document Hierarchy and final chapter
2013-02-08	PA4	Patrik Wallström	Anycast updates
2013-02-25	PA5	Patrik Wallström	Updated input parameters
2013-04-04	PA6	Patrik Wallström	Added new test cases from updated SOW
2013-04-08	PA7	Patrik Wallström	Clarified DNSKEY algorithm statement
2013-04-08	B	Staffan Hagnell	Delivery D2 for production
2013-05-03	C	Mats Dufberg	Released
2013-05-27	(P)D1	Patrik Wallström	Updated document to reflect the new Distributed test cases (DNS16 and DNS17 moved to TC Distributed)
2013-06-04	D	Mats Dufberg	Released
2013-07-18	PE1	Mats Dufberg	Minor update of wording.
2013-07-25	E	Mårten Frosth	Released.
2013-09-17	PF1	Mats Dufberg	Updates of DNS25. Lowered WARN level. Added FAIL levels.
2013-09-18	PF2	Mats Dufberg	Clarification of the outcome of DNS15.
2013-09-19	F	Mårten Frosth	Released.
2014-03-17	PG1	Mats Dufberg	DNS15 updated with warning for non-KSK keys.
2014-04-14	G	Mats Dufberg	Minor text update. Released.
2015-03-16	H	Einar Lönn	DNS36 added, DNSSEC-validation of SOA.

LIST OF CONTENTS

1. Introduction

1.1 Scope

The Pre-Delegation Testing Provider will test the DNS service for the designated zone and verify the resulting answers. The test case described in this document is done using a program for testing the DS records supplied against the DNSKEY records for all the supplied authoritative name servers for the designated zone.

1.2 References

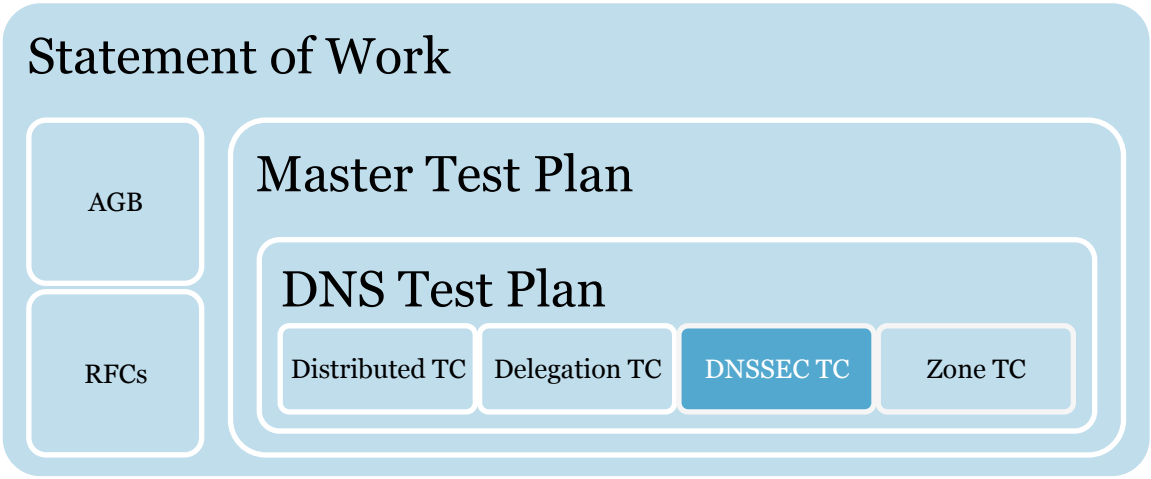
1.2.1 External

- IEEE 829-2008
- ICANN gTLD Applicant Guidebook, Version 2012-06-04
- Placing TLD delegation signer information in the root zone[1]

1.2.2 Internal

- Pre-Delegation Testing, Statement of Work
- Pre-Delegation Testing, Master Test Plan
- Pre-Delegation Testing, DNS Test Plan

1.2.3 Document Hierarchy



1.3 Context

All tests are to be performed over IPv4 and IPv6 from at least five points on the Internet. At least one probe node should be located in every ICANN region.

1.4 Notation for description

Each test case for the DNS service is described in their own section. The test procedures are described directly in the test case.

[1] http://www.iana.org/procedures/root-dnssec-records.html

2. Legal values for the DS hash digest algorithm

2.1 Test case identifier

DNS14 Legal values for the DS hash digest algorithm

2.2 Objective

For the hash digest, ICANN supports two types — SHA1 (value 1), and SHA256 (value 2). The DnsKeyDigestType for the supplied DS records must match one of those type values.

This test case fulfills the DNSSEC and Anycast requirements 5.2.2 in the gTLD Application Handbook, Module 5 and the tests described in the "Placing TLD delegation signer information in the root zone" document.

2.3 Inputs

The following information will be needed as input for this test case:

Id	Description	Type
TLD	The ASCII compatible name of the TLD	String
DnsKeyDigest-[1..n]	The digest (DS) of the DNSKEY	String
DnsKeyTag-[1..n]	The key tag of the DNSKEY	Number
DnsKeyAlgorithm-[1..n]	The algorithm number of the DNSKEY	Number
DnsKeyDigestType-[1..n]	The digest type number of the DS	Number
DnsNameServer-[1..n]	FQDN of authoritative name server	String
DnsGlueRecord-[1..n]	All IPv4 or IPv6 addresses for auth NS	String

The above input parameters are not the name server delegation data, but the name of the designated zone and a list of DS records that is to be published in the root zone.

2.4 Outcome(s)

All submitted DS records must have a valid DS hash algorithm digest type; the value must be either 1 or 2. (There are more valid DS hash algorithms, but these are not at the moment allowed for publication in the root zone.)

2.5 Environmental needs

This test has no environmental needs.

2.6 Special procedural requirements

This test has no special procedural requirements.

2.7 Intercase dependencies

This test has no intercase dependencies.

2.8 Ordered description of steps to be taken to execute the test case

The test program is executed with all of the input parameters described in section 2.3. The DnsKeyDigestType input number is compared with the values 1 and 2, where it must match either.

3. DS must match a DNSKEY in the designated zone

3.1 Test case identifier

DNS15 DS must match a DNSKEY in the designated zone

3.2 Objective

There must be a DNSKEY that matches the DS record present in the child zone.

This test case fulfills the anycast requirements 5.2.2 in the gTLD Application Handbook, Module 5 and the tests described in the "Placing TLD delegation signer information in the root zone" document.

3.3 Inputs

See section 2.3 for all input parameters.

3.4 Outcome(s)

All submitted DS records must match a DNSKEY that is published on all the authoritative name servers for the designated zone, or else the test will emit a failure. If the matched DNSKEY is a ZSK, and not a KSK, then a warning will be emitted.

3.5 Environmental needs

All authoritative name servers listed in the inputs section 2.3 should be authoritative for the designated zone.

3.6 Special procedural requirements

If a top-level domain operator has a situation where all DS records does not match a DNSKEY, and this is by design and can be demonstrated not to affect the stability of the TLD or the root zone, it is possible to request that the DS records be "listed" regardless. This test case will give a notify message as the result of the test after discussing with the domain operator.

(Note: At least one DS must always match a DNSKEY.)

This is the same procedure as for the final publication of the DS records in the root zone.

3.7 Intercase dependencies

This test has no intercase dependencies.

3.8 Ordered description of steps to be taken to execute the test case

The test program is executed with all of the input parameters described in section 2.3.

For each DS record from the input parameters do:

- Send a query for DNSKEY to all specified authoritative name servers.
- Verify that there is a matching DNSKEY in the answer section for all queries made.

- If a matching DNSKEY does not have the Secure Entry Point flag set, emit a warning.

4. Check for too many NSEC3 iterations

4.1 Test case identifier

DNS25 NSEC3 Iterations

4.2 Objective

The number of NSEC3 Iterations must meet the requirements of RFC 5155, section 10.3 and RFC 6781, section 5.3.2.

This test case is an addition to the Statement of Work; see section 2.1.2 in the DNS Test Plan document.

4.3 Inputs

See section 2.3 in this document.

4.4 Outcome(s)

If the NSEC3 Iterations value is greater than 100 this test emits a warning (RFC 6781). If the NSEC3 Iterations is greater what is stated in RFC 5155 (section 10.3), depending on key size, then this test emits an failure. The limits for failure are based on the size of the smallest key, rounded up to the nearest table value or rounded down if the key is larger than the largest table value (table from RFC 5155):

Key size	Iterations
1024	150
2048	500
4096	2500

4.5 Environmental needs

This test has no environmental requirements.

4.6 Special procedural requirements

This test has no procedural requirements.

4.7 Intercase dependencies

This test has no intercase dependencies.

4.8 Ordered description of steps to be taken to execute the test case

The test program is executed with all of the input parameters described in section 2.3.

1. The Iterations value from the NSEC3PARAM is retrieved from all specified authoritative name servers.
2. The DNSKEY set is retrieved, and the smallest key size is selected.
3. The number of iterations is compared to the value 100.
4. If the number is higher than 100, it is compared to the values stated in RFC 5155 (see table above).

5. Check for too short or too long RRSIG lifetimes

5.1 Test case identifier

DNS26 RRSIG Lifetimes

5.2 Objective

Check that RRSIG lifetimes are not too short (12 hours) or too long (180 days).

This test case is an addition to the Statement of Work; see section 2.1.2 in the DNS Test Plan document.

5.3 Inputs

See section 2.3 for all input parameters.

5.4 Outcome(s)

If any of the RRSIG lifetimes are lower than 12 hours or higher than 180 days, the test emits a warning.

5.5 Environmental needs

All authoritative name servers listed in the inputs section 2.3 should be authoritative for the designated zone.

5.6 Special procedural requirements

This test has no special procedural requirements.

5.7 Intercase dependencies

This test has no intercase dependencies.

5.8 Ordered description of steps to be taken to execute the test case

The test program is executed with all of the input parameters described in section 2.3.

The RRSIG records are retrieved as described in section **Fel! Hittar inte referenskälla.Fel! Hittar inte referenskälla.**4.8. The signature lifetimes covering the DNSKEY and the SOA records are then matched against the lower value of 12 hours and the upper value 180 days, and if the lifetimes are out of this range the test emits a warning.

6. Check for invalid DNSKEY algorithms

6.1 Test case identifier

DNS27 DNSKEY Algorithms

6.2 Objective

Check that there are no invalid DNSKEY algorithms used by any DNSKEY in the designated zone.

This test case is an addition to the Statement of Work; see section 2.1.2 in the DNS Test Plan document.

6.3 Inputs

See section 2.3 for all input parameters.

6.4 Outcome(s)

If any of the DNSKEY algorithm numbers does not match the IANA defined DNSKEY algorithm types, the test emits a warning.

6.5 Environmental needs

All authoritative name servers listed in the inputs section 2.3 should be authoritative for the designated zone.

6.6 Special procedural requirements

This test has no special procedural requirements.

6.7 Intercase dependencies

This test has no intercase dependencies.

6.8 Ordered description of steps to be taken to execute the test case

The test program is executed with all of the input parameters described in section 2.3.

All DNSKEY records are retrieved from the designated zone. The DNSKEY algorithm number is derived from the DNSKEY record and compared to the list of valid DNSKEY algorithms as defined by IANA.[2]

[2] http://www.iana.org/assignments/dns-sec-alg-numbers/dns-sec-alg-numbers.xml

7. RRSIG(SOA) must validate with supplied DS record

7.1 Test case identifier

DNS36 RRSIG(SOA) must validate with supplied DS record

7.2 Objective

Confirm that any of the supplied DS records are actually used, directly as ZSK or indirectly as KSK, for signing the zones' SOA record.

7.3 Inputs

See section 2.3 for all input parameters.

7.4 Outcome(s)

If none of the signatures over the SOA-record validate when using the supplied DS-record as a trust anchor, this test case fails.

7.5 Environmental needs

All authoritative name servers listed in the inputs section 2.3 should be authoritative for the designated zone.

7.6 Special procedural requirements

This test has no special procedural requirements.

7.7 Intercase dependencies

This test has no intercase dependencies.

7.8 Ordered description of steps to be taken to execute the test case

1. Load all supplied DS records into a DNSSEC-validating resolver.
2. Retrieve the SOA RR set from the child zone.
3. Retrieve the RRSIG of the SOA RR set from the child zone.
4. Retrieve the DNSKEY RR set from the child zone.
5. Retrieve the RRSIG of the DNSKEY RR set from the child zone.
6. Do a cryptographic validation of the SOA record using the DS records or DS record as trust anchor.
7. The TC ends with pass if it is possible to validate the SOA record using at least one DS record as trust anchor.

8. Global

8.1 Glossary

The glossary is available in the Master Test Plan.

8.2 Document change procedures

Document change procedures are documented in the Master Test Plan.