



New Generic Top-Level
Domains

Pre-Delegation Testing

Whois Test Plan

Version PE9 (draft)

DRAFT

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2015-07-16	PE1-8	Lennart Bonnevier, Mats Dufberg	Aligned PDT requirements to the Whois response formats defined in the Registry Agreement and the Advisory dated 2015-04-27. IPv4 and IPv6 CLI TC are merged. All addresses are to be tested. Some IPv6 test cases are removed and a few added. Whois format specification incorporated. Information on enforcement and transition added. Removed deprecated requirements from requirements list.
2015-07-16	PE9	Mats Dufberg	Document prepared for public comments. This is still a draft version.

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1. Introduction

This Level Test Plan focuses on the Whois service of the new gTLDs.

1.1 Scope

The Pre-Delegation Testing Provider will test the Whois service over port 43 (Whois) and 80/443 (HTTP/HTTPS), and verify the response format. 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.

1.2 References

1.2.1 External

- IEEE 829-2008
- ICANN gTLD Applicant Guidebook, Version 2012-06-04
- Advisory, "Advisory: Clarifications to the Registry Agreement, and the 2013 Registrar Accreditation Agreement (RAA) regarding applicable Registration Data Directory Service (Whois) Specifications", 2015-04-27, <https://www.icann.org/resources/pages/registry-agreement-raa-rdds-2015-04-27-en>
- Registry Agreement, "Base Registry Agreement", Updated 09 January 2014, <http://newgtlds.icann.org/sites/default/files/agreements/agreement-approved-09jan14-en.pdf>
- AWIP, "Additional Whois Information Policy", <https://www.icann.org/resources/pages/policy-awip-2014-07-02-en>

1.2.2 Standards

- RFC791, "Internet Protocol. Darpa Internet Program Protocol Specification", <https://tools.ietf.org/html/rfc791>
- RFC952, "DOD Internet Host Table Specification", <https://tools.ietf.org/html/rfc952>
- RFC1123, "Requirements for Internet Hosts -- Application and Support", <https://tools.ietf.org/html/rfc1123>
- RFC 2119, "Key words for use in RFCs to Indicate Requirement Levels", <https://tools.ietf.org/html/rfc2119>
- RFC3339, "Date and Time on the Internet: Timestamps", <https://tools.ietf.org/html/rfc3339>
- RFC3915, "Domain Registry Grace Period Mapping for the Extensible Provisioning Protocol (EPP) ", <https://tools.ietf.org/html/rfc3915>
- RFC4291, "IP Version 6 Addressing Architecture", <https://tools.ietf.org/html/rfc4291>
- RFC5322, "Internet Message Format", <https://tools.ietf.org/html/rfc5322>
- RFC5730, "Extensible Provisioning Protocol (EPP)", <https://tools.ietf.org/html/rfc5730>
- RFC5731, "Extensible Provisioning Protocol (EPP) Domain Name Mapping", <https://tools.ietf.org/html/rfc5731>
- RFC5732, "Extensible Provisioning Protocol (EPP) Host Mapping", <https://tools.ietf.org/html/rfc5732>

- RFC5733, "Extensible Provisioning Protocol (EPP) Contact Mapping", <https://tools.ietf.org/html/rfc5733>
- RFC5734, "Extensible Provisioning Protocol (EPP) Transport over TCP", <https://tools.ietf.org/html/rfc5734>
- RFC5890, "Internationalized Domain Names for Applications (IDNA): Definitions and Document Framework", <https://tools.ietf.org/html/rfc5890>
- RFC7230, "Hypertext Transfer Protocol (HTTP/1.1): Message Syntax and Routing", <https://tools.ietf.org/html/rfc7230>
- XML Schema, "XML Schema Part 2: Datatypes Second Edition", <http://www.w3.org/TR/xmlschema-2/>

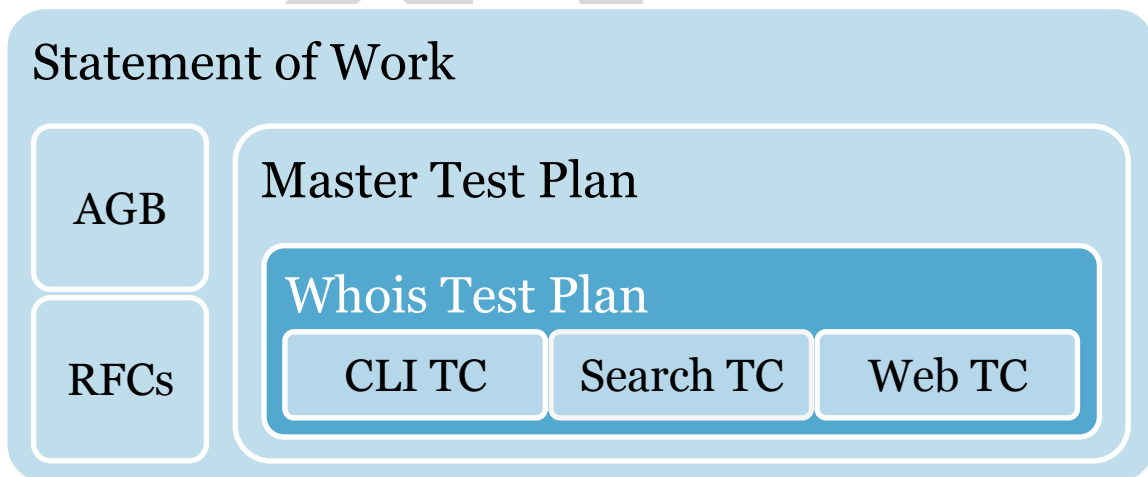
1.2.3 Other references

- Dot-Decimal, "Dot-decimal notation", https://en.wikipedia.org/wiki/Dot-decimal_notation
- ISO3166-1-ISO, "ISO 3166-1 Country Code list" can be searched at <https://www.iso.org/>
- ISO3166-1-Wikipedia, "ISO 3166-1", https://en.wikipedia.org/wiki/ISO_3166-1

1.2.4 Internal

- Pre-Delegation Testing, Statement of Work
- Pre-Delegation Testing, Master Test Plan
- Pre-Delegation Testing, Documentation Test Plan
- Pre-Delegation Testing, Whois CLI Test Cases
- Pre-Delegation Testing, Whois Search Test Cases
- Pre-Delegation Testing, Whois Web Test Cases

1.2.5 Document Hierarchy



1.3 Level in the overall sequence

This Test Plan and the associated Test Cases can be run in parallel with the other Level Test Plans.

1.4 Test classes and overall test conditions

The Whois service of the gTLD is available over IPv4/IPv6 via TCP port 43 and via a web interface. Both reachability and response format will be tested with positive test cases. Valid test data is provided by the applicant. In case of an IDN-TLD, the ASCII-compatible form (A-Label) must be used.

1.5 Enforcement

This version of this document (version E) is enforced at 2015-11-02. Prior to that date, see the previous version of this document.

1.6 Special rules during transition period

This Test Plan will be fully applied from January 31, 2016. Before that date, any deviation from the format requirements in the Registry Agreement and the Advisory will result in WARN. A WARN is still a PASS and will not prevent the Registry from passing PDT.

During the transition period (before January 31, 2016) any deviation that would have resulted in a FAIL in version D of this Test Plan or a FAIL according to the listed versions of the accompanied Test Case documents will continue to result in a FAIL.

The following versions of the Test Case documents are referring to version D of this Test Plan and are fully replaced with new version at the end of the transition period.

- Whois CLI Test Cases, version E
- Whois Web Test Cases, version E
- Whois Search Test Cases, version F

2. Details for this level of test plan

2.1 Test items and their identifiers

2.1.1 Statement of Work

The main requirement for testing the Whois service is found in the Statement of Work:

- [R11]** Test the applicant's Whois interface for compliance with the requirements described in the Section 5.2 of the AGB, including response format and review of the data mining detection and mitigation control functions.

Only the first part of the requirement is handled within this test plan. The review of the data mining detection and mitigation control functions are handled as part of the Documentation Test Plan.

2.1.2 Applicant Guidebook

Section 5.2 of the AGB states the following requirements:

Whois support -- Applicant must provision Whois services for the anticipated load. ICANN will verify that Whois data is accessible over IPv4 and IPv6 via both TCP port 43 and via a web interface and review self-certification documentation regarding Whois transaction capacity. Response format according to Specification 4 of the registry agreement and access to Whois (both port 43 and via web) will be tested by ICANN remotely from various points on the Internet over both IPv4 and IPv6.

Self-certification documents shall describe the maximum number of queries per second successfully handled by both the port 43 servers as well as the web interface, together with an applicant-provided load expectation.

Additionally, a description of deployed control functions to detect and mitigate data mining of the Whois database shall be documented.

The following requirements have been identified from the text above. Note that the requirements on Self-certification documents are handled by the Documentation Test Plan.

- [AGB1]** Whois data MUST be accessible over IPv4 via TCP port 43
- [AGB2]** Whois data MUST be accessible over IPv6 via TCP port 43
- [AGB3]** Whois data MUST be accessible over IPv4 via a web interface
- [AGB4]** Whois data MUST be accessible over IPv6 via a web interface

The AGB also states there are no requirements related to IDN.

Requirements related to IDN for Whois are being developed. After these requirements are developed, prospective registries will be expected to comply with published IDN-related Whois requirements as part of predelegation testing.

2.1.3 Specification 4

Specification 4 of the registry agreement will not be fully cited here, but a number of requirements have been identified. Optional requirements have been removed.

- [REG1]** Registry Operator MUST operate a WHOIS service available via port 43 in accordance with RFC 3912 at <whois.nic.TLD>
- [REG2]** Registry Operator MUST operate a web-based Directory Service at <whois.nic.TLD>
- [REG3]** MUST provide free public query-based access to at least the following elements:
 - [REG3.1]** Domain Name Data
 - [REG3.2]** Registrar Data
 - [REG3.3]** Nameserver Data
- [REG8]** Offering searchability capabilities on the Directory Services is OPTIONAL but if offered by the Registry Operator it MUST comply with this specification:
 - [REG8.1]** Offer searchability on the web-based Directory Service
 - [REG8.2]** Offer partial match capabilities, at least, on the following fields: domain name, contacts and registrant's name, and contact and registrant's postal address, including all the sub-fields described in EPP (e.g., street, city, state or province, etc.).
 - [REG8.3]** Offer exact-match capabilities, at least, on the following fields: registrar id, name server name, and name server's IP address (only applies to IP addresses stored by the registry, i.e., glue records).
 - [REG8.4]** Offer Boolean search capabilities supporting, at least, the following logical operators to join a set of search criteria: AND, OR, NOT
 - [REG8.5]** Search results will include domain names matching the search criteria.
 - [REG8.6]** Implement appropriate measures to avoid abuse of this feature (e.g., permitting access only to legitimate authorized users)

[REG4-7] in the previous version of this document have been replaced by [Advisory1].

Furthermore, the Registry Agreement states *"ICANN reserves the right to specify alternative formats and protocols, and upon such specification, the Registry Operator will implement such alternative specification as soon as reasonably practicable"*. There is a newer alternative to Whois, Registration Data Access Protocol (RDAP). RDAP is not taken into consideration for these tests.

2.1.4 Advisory

The 2015-04-27 Advisory (see link in reference list) clarifies the interpretation of the Registry Agreement when it comes to valid Whois responses. The Appendix in section 5 of this document gives a detailed specification of a valid Whois response.

- [Advisory1]** The WHOIS service must meet the requirements as specified in the Advisory and the appendix in section 5 of this document.

2.1.5 EPP

The requirements state that domain status, individual and organizational names, address, street, city, state/province, postal code, country, telephone and fax numbers, email addresses, date and times MUST conform to the mappings specified in EPP RFCs 5730-5734 and 3915. Below is a listing of the corresponding requirements from those RFCs;

- [EPP1]** The domain object MUST have at least one of the following status values: clientDeleteProhibited, serverDeleteProhibited, clientHold, serverHold, clientRenewProhibited, serverRenewProhibited, clientTransferProhibited, serverTransferProhibited, clientUpdateProhibited, serverUpdateProhibited, inactive, ok, pendingCreate, pendingDelete, pendingRenew, pendingTransfer, pendingUpdate, addPeriod, autoRenewPeriod, renewPeriod, transferPeriod, redemptionPeriod, pendingRestore, pendingDelete.
- [EPP2]** Names associated with a contact are represented using character strings.
- [EPP3]** Contact street, city, and state or province information is represented using character strings.
- [EPP4]** Contact postal codes are represented using character strings.
- [EPP5]** Contact country identifiers are represented using two-character identifiers specified in [ISO3166-1].
- [EPP6]** Telephone numbers described in this mapping are character strings that MUST begin with a plus sign ("+", ASCII value 0x002B), followed by a country code defined in [ITU.E164.2005], followed by a dot (".", ASCII value 0x002E), followed by a sequence of digits representing the telephone number. An optional "x" attribute is provided to note telephone extension information.
- [EPP7]** Email address syntax is defined in [RFC5322].
- [EPP8]** Date and time attribute values MUST be represented in Universal Coordinated Time (UTC) using the Gregorian calendar. The extended date-time form using upper case "T" and "Z" characters defined in [W3C.REC-xmlschema-2-20041028] MUST be used to represent date-time values.

2.1.6 RFC

Finally, RFC 3912 has a set of requirements on top of those mentioned before:

- [RFC1]** Each line in the response MUST be ended with ASCII CR and then ASCII LF.
- [RFC2]** The WHOIS server closes its connection as soon as the output is finished. The closed TCP connection is the indication to the client that the response has been received.

2.2 Test Traceability Matrix

This table describes the different test cases and their mapping to the requirements. They will be documented in three different test case documents, Whois CLI, Whois Web, and Whois Search, respectively.

Test ID	Description	Requirement Point
Whois CLI 01	Make IPv4 and IPv6 TCP connections on port 43 for all addresses. Query for a known domain name. Verify format of the response.	R11, AGB1, REG1, REG3.1, RFC1, RFC2, Advisory1
Whois CLI 02	Make IPv4 and IPv6 TCP connections on port 43 for all addresses. Query for a known registrar. Verify format of the response.	R11, AGB1, REG1, REG3.2, RFC1, RFC2, Advisory1
Whois CLI 03	Make IPv4 and IPv6 TCP connections on port 43 for all addresses. Query for a known name server. Verify format of the response.	R11, AGB1, REG1, REG3.3, RFC1, RFC2, Advisory1
Whois CLI 04	(Removed. Test over IPv6 merged into Whois CLI 01.)	
Whois CLI 05	(Removed. Test over IPv6 merged into Whois CLI 02.)	
Whois CLI 06	(Removed. Test over IPv6 merged into Whois CLI 03.)	
Whois Web 01	Make an IPv4 HTTP(S) connection to Whois. Verify that there is a successful connection.	R11, ABG3, REG2
Whois Web 02	Make an IPv6 HTTP(S) connection to Whois. Verify that there is a successful connection.	R11, ABG4, REG2
Whois Web 03	Visit the web-based Whois over IPv4. Query for a known domain name. Verify format of the response.	R11, AGB3, REG2, REG3.1, Advisory1
Whois Web 04	Visit the web-based Whois over IPv4. Query for a known registrar. Verify format of the response.	R11, AGB3, REG2, REG3.2, Advisory1
Whois Web 05	Visit the web-based Whois over IPv4. Query for a known name server. Verify format of the response.	R11, AGB3, REG2, REG3.3, Advisory1
Whois Web 06	(Removed)	
Whois Web 07	(Removed)	
Whois Web 08	(Removed)	
Whois Web 09	Visit the web-based Whois over IPv6. Query for a known domain name. Verify that a Whois response is received.	R11, AGB4, REG2, REG3.3
Whois Search 00	Verify support for Searchable Whois. Verify information on how to use Searchable Whois.	AGB, Registry Agreement
Whois Search 01	Visit the web-based Whois over IPv4. Verify abuse protection.	R11, AGB3, REG2, REG8.6
Whois Search 02	Visit the web-based Whois over IPv4. Perform partial match queries. Verify that the response contains the expected result.	R11, AGB3, REG2, REG8.1, REG8.2, REG8.5

Test ID	Description	Requirement Point
Whois Search 03	Visit the web-based Whois over IPv4. Perform exact-match queries. Verify that the response contains the expected result.	R11, AGB3, REG2, REG8.1, REG8.3, REG8.5
Whois Search 04	Visit the web-based Whois over IPv4. Perform boolean queries. Verify that the response contains the expected result.	R11, AGB3, REG2, REG8.1, REG8.4, REG8.5
Whois Search 05	(Removed)	
Whois Search 06	(Removed)	
Whois Search 07	(Removed)	
Whois Search 08	(Removed)	
Whois Search 09	Visit the web-based Whois over IPv6. Perform a search query. Verify that a response to the search is received.	R11, AGB4, REG2, REG8.1

2.3 Features to be tested

The following features of the Whois service will be tested:

- Service on TCP port 43 and HTTP(S) using host <whois.nic.TLD>
- Availability over IPv4 and IPv6
- Queries for known domain names, registrars, and name servers
- Response format as specified in Specification 4 and as interpreted in Advisory
- Searchability is tested if the feature is claimed to be supported
- Search queries based on the requirements in Specification 4

2.4 Features not to be tested

- Values not specified in the specification in the Appendix in section 5 of this document
- IDN - tested domains must have the ASCII-compatible form (A-Label)
- RDAP
- Data mining protection, as it is part of the Documentation Test Plan.

2.5 Approach

The connectivity tests are fully automated. To the extent possible, the test script also validates the response format. Some of the Test Cases do however require manual verification by the Test Officer.

The IPv4 and IPv6 addresses for the hostname <whois.nic.TLD> will be resolved using the delegation data from the DNS tests. If the hostname resolves to more than one IPv4 or IPv6 address, all the IP addresses will be tested.

2.6 Item pass/fail criteria

The test will pass if an expected response was received from the Whois service. It will however fail if it is not following the requirements.

The Service Level Requirement in Specification 10 of the registry agreement states that “If the RTT is 5-times or more the corresponding SLR, the RTT will be considered undefined”. The requirement for Whois is set to two seconds. A test can thus be failed if it takes longer than 10 seconds to get an answer from the service.

2.7 Suspension criteria and resumption requirements

The only suspension criteria for the test would be if there were external network problems outside the control of the applicant or the PDT tester.

2.8 Test deliverables

The Whois test level will produce:

- Level Test Logs (LTL)
- Anomaly Report (AR) in case of error
- Level Test Report (LTR)

3. Test management

The goal of these documents is to describe the test cases and how the new gTLDs are tested. This is just a part of a larger project and defining test management is not part of this subproject. However, some information can be found in the Master Test Plan.

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4. General

4.1 Glossary

The glossary is available in the Master Test Plan.

4.2 Document change procedures

Document change procedures are documented in the Master Test Plan.

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5. Appendix: Format Specification

This appendix defines valid Whois replies from a PDT point of view. This specification has been derived from Registry Agreement, Advisory and AWIP listed in the reference list above. All references found below are found in the reference list above.

5.1 Terminology

The terms "MAY", "MUST", "SHOULD" and "MUST NOT" are used to indicate the requirement level in accordance to RFC 2119.

5.2 Limitation

This specification is limited to what is relevant for the PDT Whois TCs, the format of the Whois port 43 output and the format of Web whois port 80/443 output.

Requirements on the output not tested by the PDT TCs are not included in the specification below.

This appendix does not replace the Test Case document that in detail defines which types of queries are issued, what the query string is and what data, in contrast to format, expected to be found in the reply.

5.3 Overview

At a low level the Whois output is interpreted as a sequence of characters that make up a sequence of lines. Line structure is described in detail in the "Characters and line structure" chapter.

At a high level the Whois output is interpreted as a tree where the leaves are lines and nodes are called "sections". The "Section types" chapter defines all valid "section types". The "Line types" chapter defines all valid "line types".

The entire Whois output **MUST** conform syntactically to a top-level section type. Additionally, there is a single semantic rule that the Whois output **MUST** follow, and this rule is defined together with the U-label data type in the "Data types" chapter.

5.4 Characters and line structure

The Whois port 43 output **SHOULD** be limited to the ASCII (US-ASCII) character set and **SHOULD** be encoded in ASCII (US-ASCII).

If the Whois port 43 output contains any character (code point) outside the ASCII character set, then the output **SHOULD** be encoded in UTF-8.

The Web whois port 80/443 output **MUST** follow the same conventions as Whois port 43 output except for the limitation of the character set and character encoding.

The Web whois port 80/443 output MUST follow the standards of HTTP and HTML for how to declare character set and character encoding.

When rendered using a modern web browser the Web whois port 80/443 output MUST contain a section corresponding to the Whois port 43 output that can be copied as a single unit and pasted into a text file.

The Whois output is a sequence of CRLF terminated lines (i.e. Unicode sequence "U+000D U+000A".) The line terminator is not considered to be part of the line.

Spaces (U+0020) MAY be present within a line. Any other whitespace characters (e.g. Character Tabulation (U+0009)) MUST NOT be present within a line.

Up to nine characters of leading space MAY be present at the beginning of a line. Leading space is not considered to be part of the line.

Trailing space MUST NOT be present at the end of a line.

5.5 Section types

A *section* is a sequence of lines.

A *section type* is a section that matches a certain "section description".

A *section description* is an ordered list of "named field" specifications and "subsection" specifications.

A *subsection* is a section within another section. A "subsection" is specified using the format "(section name) [quantifier]" where:

- "section name" refers to a specific line type or section type
- "quantifier" is described in the "Quantifiers" chapter below

A *named field* is a "field" or an "empty field" where the "field key" value exactly matches a specific string. A "named field" is specified using the format "Key: [quantifier; data type]" where:

- "Key" is the string that the "field key" value MUST match (case sensitively)
- "quantifier" is described in the "Quantifiers" chapter below
- "data type" is reference to the format the "field value" MUST conform to

The terms "field" and "empty field" are defined in the "Line types" chapter, and all data types are defined in the "Data types" chapter – sometimes referring to other specifications.

5.5.1 Whois output

5.5.1.1 Domain Name Object queries

The Whois output in reply to Domain Name Object queries MUST in its entirety conform to the following top-level section type:

- (Domain name reply) [required]

5.5.1.2 Name Server Object queries

The Whois output in reply to Name Server Object queries MUST in its entirety conform to one of the following top-level section types:

- (Name server reply type 1) [required]
- (Name server reply type 2) [required]

5.5.1.3 Registrar Object queries

The Whois output in reply to Registrar Object queries MUST in its entirety conform to the following top-level section type:

- (Registrar reply) [required]

5.5.1.4 Other queries

In PDT, no other query types will be issued.

5.5.2 Registrar reply

1. (Registrar details section) [required]
2. (Subsequent registrar details section) [optional repeatable]
3. (Last update footer) [required]
4. (Legal disclaimer) [required]

5.5.3 Domain name reply

1. (Domain name details section) [required]
2. (Subsequent domain name details section) [optional repeatable]
3. (Last update footer) [required]
4. (AWIP footer) [required]
5. (Legal disclaimer) [required]

5.5.4 Name server reply type 1

1. (Name server details section) [required]
2. (Subsequent name server details section) [optional repeatable]
3. (Last update footer) [required]
4. (Legal disclaimer) [required]

5.5.5 Name server reply type 2

1. (Multiple name servers section) [required]
2. (Last update footer) [required]
3. (Legal disclaimer) [required]

5.5.6 Subsequent registrar details section

1. (Empty line) [required]
2. (Registrar details section) [required]

5.5.7 Registrar details section

1. Registrar Name: [required; type "postal line"]
2. Street: [required; type "postal line"]
3. City: [required; type "postal line"]
4. State/Province: [optional; type "postal line"]

5. Postal Code: [optional; type "postal code"]
6. Country: [required; type "country code"]
7. Phone Number: [required; type "phone number"]
8. Phone Ext: [optional; type "token"]
9. (Fax number section) [optional]
10. Email: [required; type "email address"]
11. WHOIS Server: [optional; type "hostname"]
12. Referral URL: [required; type "http url"]
13. (Admin contact section) [optional repeatable]
14. (Technical contact section) [optional repeatable]

5.5.8 Admin contact section

1. Admin Contact: [required; type "postal line"]
2. Phone Number: [required; type "phone number"]
3. Phone Ext: [optional; type "token"]
4. (Fax number section) [optional]
5. Email: [required; type "email address"]

5.5.9 Technical contact section

1. Technical Contact: [required; type "postal line"]
2. Phone Number: [required; type "phone number"]
3. Phone Ext: [optional; type "token"]
4. (Fax number section) [optional]
5. Email: [required; type "email address"]

5.5.10 Fax number section

1. Fax Number: [required; type "phone number"]
2. Fax Ext: [optional; type "token"]

5.5.11 Subsequent domain name details section

1. (Empty line) [required]
2. (Domain name details section) [required]

5.5.12 Domain name details section

1. Domain Name: [required; type "hostname"]
2. Internationalized Domain Name: [optional; type "u-label"]
3. Domain ID: [required; type "roid"]
4. WHOIS Server: [optional; type "hostname"]
5. Referral URL: [required; type "http url"]
6. Updated Date: [optional; type "time stamp"]
7. Creation Date: [required; type "time stamp"]
8. Registry Expiry Date: [required; type "time stamp"]
9. Sponsoring Registrar: [required; type "token"]
10. Sponsoring Registrar IANA ID: [required; type "positive integer"]
11. Domain Status: [repeatable; type "domain status"]
12. Registrant ID: [required; type "roid"]
13. Registrant Name: [required; type "postal line"]
14. Registrant Organization: [optional; type "postal line"]
15. Registrant Street: [repeatable max 3 times; type "postal line"]

16. Registrant City: [required; type "postal line"]
17. Registrant State/Province: [optional; type "postal line"]
18. Registrant Postal Code: [optional; type "postal code"]
19. Registrant Country: [required; type "country code"]
20. Registrant Phone: [required; type "phone number"]
21. Registrant Phone Ext: [optional; type "token"]
22. Registrant Fax: [optional; type "phone number"]
23. Registrant Fax Ext: [optional; type "token"]
24. Registrant Email: [required; type "email address"]
25. Admin ID: [required; type "roid"]
26. Admin Name: [required; type "postal line"]
27. Admin Organization: [optional; type "postal line"]
28. Admin Street: [repeatable max 3 times; type "postal line"]
29. Admin City: [required; type "postal line"]
30. Admin State/Province: [optional; type "postal line"]
31. Admin Postal Code: [optional; type "postal code"]
32. Admin Country: [required; type "country code"]
33. Admin Phone: [required; type "phone number"]
34. Admin Phone Ext: [optional; type "token"]
35. Admin Fax: [optional; type "phone number"]
36. Admin Fax Ext: [optional; type "token"]
37. Admin Email: [required; type "email address"]
38. Tech ID: [required; type "roid"]
39. Tech Name: [required; type "postal line"]
40. Tech Organization: [optional; type "postal line"]
41. Tech Street: [repeatable max 3 times; type "postal line"]
42. Tech City: [required; type "postal line"]
43. Tech State/Province: [optional; type "postal line"]
44. Tech Postal Code: [optional; type "postal code"]
45. Tech Country: [required; type "country code"]
46. Tech Phone: [required; type "phone number"]
47. Tech Phone Ext: [optional; type "token"]
48. Tech Fax: [optional; type "phone number"]
49. Tech Fax Ext: [optional; type "token"]
50. Tech Email: [required; type "email address"]
51. Billing ID: [optional; type "roid"]
52. Billing Name: [optional; type "postal line"]
53. Billing Organization: [optional; type "postal line"]
54. Billing Street: [optional repeatable max 3 times; type "postal line"]
55. Billing City: [optional; type "postal line"]
56. Billing State/Province: [optional; type "postal line"]
57. Billing Postal Code: [optional; type "postal code"]
58. Billing Country: [optional; type "country code"]
59. Billing Phone: [optional; type "phone number"]
60. Billing Phone Ext: [optional; type "token"]
61. Billing Fax: [optional; type "phone number"]
62. Billing Fax Ext: [optional; type "token"]
63. Billing Email: [optional; type "email address"]

64. (Name server section) [optional repeatable]
65. DNSSEC: [required; type "dnssec"]
66. (Additional fields section) [optional]

5.5.13 Name server section

1. Name Server: [required; type "hostname"]
2. IP Address: [optional; type "ip address"]

5.5.14 Multiple name servers section

1. (Multiple name servers line) [required]
2. (Roid line) [required]
3. (Roid line) [repeatable]

5.5.15 Subsequent name server details section

1. (Empty line) [required]
2. (A name server details section) [required]

5.5.16 Name server details section

1. Server Name: [required; type "hostname"]
2. IP Address: [repeatable; type "ip address"]
3. Registrar: [optional; type "postal line"]
4. WHOIS Server: [optional; type "hostname"]
5. Referral URL: [optional; type "http url"]

5.5.17 Additional fields section

1. (Additional field) [repeatable]

5.5.18 Additional field

Either one of:

- (Field) [required]
- (Empty field) [required]

5.5.19 Last updated footer

1. (Empty line) [optional repeatable max 3 times]
2. (Last updated line) [required]

5.5.20 AWIP footer

1. (Empty line) [repeatable max 3 times]
2. (AWIP line) [required]

5.5.21 Legal disclaimer

1. (Empty line) [repeatable max 3 times]
2. (Non-empty line)
3. (Empty line or Non-empty line) [repeatable]

5.6 Line types

5.6.1 Empty line

An *empty line* is a line that consists of the empty string. Note: Empty lines with leading space are still considered empty.

5.6.2 Non-empty line

A *non-empty line* is a line that consists of one or more non-space characters.

5.6.3 Field

A *field* is a line that consists of the following parts:

1. A string matching type "field key"
2. The empty string or a string of type "translation clause"
3. The exact string ":" (U+003A U+0020)
4. A non-empty string – referred to as the *field value*

Example:

Domain Name: EXAMPLE.TLD

See the "Data types" chapter for definitions of "field key" and "translation clause".

5.6.4 Empty field

An *empty field* is a line that consists of the following parts:

1. A string matching type "field key"
2. The empty string or a string matching type "translation clause"
3. The exact string ":" (U+003A)

Example:

Name Server:

See the "Data types" chapter for definitions of "field key" and "translation clause".

5.6.5 Multiple name servers line

A *multiple name servers line* consists of the following parts:

1. The exact string "Query matched more than one name server:"

5.6.6 ROID line

A *roid line* is a line that consists of the following parts:

1. A string matching type "roid"
2. The exact string "(" (U+0020 U+0028)
3. A string matching type "hostname"
4. The exact string ")" (U+0029)

Example:

roid1abc-examplerep (ns1.foo.example)

5.6.7 Last update line

A *last update line* is a line that consists of the following parts:

1. The exact string ">>> Last update of Whois database: "

2. A string matching type "time stamp"
3. The exact string "<<<"

Example:

>>> Last update of Whois database: 2014-11-14T12:58:01Z <<<

See the "Data types" chapter for definitions of "time stamp".

5.6.8 AWIP line

An *AWIP line* is a line that consists of the following part:

1. The exact string "For more information on Whois status codes, please visit <https://icann.org/epp>"

5.7 Quantifiers

5.7.1 Required

If a "section description" element is declared *required*, a sequence of lines conforming to the given section description **MUST** appear at that position.

5.7.2 Optional

If a "section" is declared *optional*, a sequence of lines conforming to the description of the given section **MAY** appear once at that position.

If a "named field" is declared *optional*, one of the following formats **MUST** be used:

- 1) An "empty field" with the given "field key" value **MUST** appear at that position.
- 2) A "field" with the given "field key" value **MUST NOT** appear at that position.
- 3) A "field" with the given "field key" value and a "field value" of the specified data type **MUST** appear at that position.

Optional fields of formats 1 and 2 **MUST NOT** be mixed in the same Whois output (i.e. either all instances of optional fields where the value is empty are left completely left out or all instances of optional fields where the value is empty are kept with key and empty value.)

5.7.3 Repeatable

If a "section description" element is declared *repeatable*, a sequence of lines conforming to the given section description **MUST** appear one or more times the given position. The number of occurrences **MUST** conform to the upper bound if one is specified.

5.7.4 Optional repeatable

If a "section description" element is declared *optional repeatable*, a sequence of lines conforming to the given section description quantified as either *optional* or *repeatable* **MUST** appear at that position.

5.8 Data types

5.8.1 Translation clause

A *translation clause* consists of the following parts:

1. the exact string " (" (U+0020 U+0028)

2. a key translation [type "key translation"]
3. one or more translations separated by "/" (U+002F)
4. the exact string ")" (U+0029)

5.8.2 Key translation

A *key translation* is a string that MUST NOT begin or end with a space (U+0020) and MUST NOT contain any parentheses (U+0028, U+0029).

5.8.3 Field key

A *field key* is a case sensitive string that MUST NOT contain ":" (U+003A).

5.8.4 roid

A *roid* MUST follow the definition of "roidType" in RFC5730, section 4.2, p. 58.

5.8.5 Hostname

A *hostname* (see RFC952 and RFC1123) is an ASCII-compatible A-Label as defined in DNS and matching the following Perl compatible Regular Expression:

```
'^([a-zA-Z0-9]([a-zA-Z0-9]*[a-zA-Z0-9])*\.){1,}[a-zA-Z]([a-zA-Z0-9]*[a-zA-Z0-9])\.\?$',
```

Example:

```
ns1.xn--caf-dma.example
ns1.example.example.
```

The *hostname* in an email address MUST NOT have the optional trailing dot.

5.8.6 Time stamp

A *Time stamp* MUST be as defined in RFC3339.

5.8.7 U-label

A *U-label* MUST follow the definition in RFC5890, section 2.3.2.1, p. 12.

The "Internationalized Domain Name" field value and the "Domain Name" field value in a "Domain name details section" MUST be equivalent according to RFC5890.

5.8.8 HTTP URL

An *http url* is a URL for HTTP or HTTPS and MUST be given as defined in RFC7230, sections 2.7.1 and 2.7.2, respectively.

5.8.9 Token

A *Token* MUST be defined in XML Schema, section 3.4.2.

5.8.10 Positive integer

A *Positive integer* is a string matching the following Perl compatible Regular Expression:

```
'^[1-9][0-9]*$',
```

A *positive integer* is a decimal number.

5.8.11 Domain status

A *domain status* consists of the following parts:

- 1) a domain status code [type "domain status code"]

- 2) at least one and no more than nine spaces (U+0020)
- 3) the exact string "https://icann.org/epp#"
- 4) the same domain status code as in step 1 above

Example:

ok https://icann.org/epp#ok

5.8.12 Domain status code

A *domain status code* MUST be one of the EPP status codes listed in type "statusValueType" in RFC5731 (section 4, p. 38) or as "Status Values" in RFC3915 (section 3.1, p. 6), also listed here:

- addPeriod
- autoRenewPeriod
- clientDeleteProhibited
- clientHold
- clientRenewProhibited
- clientTransferProhibited
- clientUpdateProhibited
- inactive
- ok
- pendingCreate
- pendingDelete
- pendingRenew
- pendingRestore
- pendingTransfer
- pendingUpdate
- redemptionPeriod
- renewPeriod
- serverDeleteProhibited
- serverHold
- serverRenewProhibited
- serverTransferProhibited
- serverUpdateProhibited
- transferPeriod

5.8.13 Postal line

A *Postal line* MUST follow the definition for "postalLineType" in RFC5733, section 4, p. 30.

5.8.14 Postal code

A *Postal code* MUST follow the definition for "pcType" in RFC5733, section 4, p. 30.

5.8.15 Country code

A *country code* is a two-letter string that MUST match the following Perl compatible Regular Expression:

`^[a-z]{2}$`

Informational: The codes in ISO 3166-1, alpha-2 list, are used as country codes. See ISO3166-1-ISO and ISO3166-1-Wikipedia for details.

5.8.16 Phone number

See "e164StringType" in RFC5733, section 4, p. 30.

5.8.17 Email address

An "email address" as the strict definition of email address for Internet mail by RFC5322:

email_address	=	localpart "@" domain
localpart	=	atext * ("." atext)
atext	=	as defined in RFC5322, sec 3.2.3, p. 13
domain	=	hostname as defined in this document

The hostname part MUST be without the trailing dot.

5.8.18 DNSSEC

One of the following exact strings:

- signedDelegation
- unsigned

5.8.19 IP address

An *ip address* is either one *IPv4 address* or one *IPv6 address*.

5.8.20 IPv4 address

IPv4 addresses are represented as four decimal octets separated with single dots, in dot-decimal notation. The IPv4 address representation contains decimal digits and dots only. See also RFC791 and Dot-Decimal.

The IPv4 address MUST match the following definition:

IPv4 address	=	octett "." octett "." octett "." octett
octett	=	octett-zero / octett-positive
octett-zero	=	"0"
octett-positive	=	<i>Positive integer < 256</i>

Positive integer is defined in this document.

Example:

- 192.0.2.3

5.8.21 IPv6 address

IPv6 addresses MUST be represented as described in RFC4291, section 2.2.

Example:

- 2001:db8::5