

Pre-Delegation Testing

Whois Test Plan

Version I

File name: PDT_Whois_TP.docx
Last saved: 2016-01-29

Copyright (c) 2013 Internet Corporation For Assigned Names and Numbers. All rights reserved.

Document control

Document information and security

Made by	Responsible for fact	Responsible for document
Rickard Bellgrim	Mats Dufberg	Mats Dufberg

Security class	File name
External	PDT_Whois_TP.docx

Revisions

Date	Version	Name	Description
2013-01-05	PA1	Rickard Bellgrim	Initial document
2013-04-08	B	Staffan Hagnell	Delivery D2 for production
2013-05-03	C	Amar Andersson	Released
2013-07-08	PD1	Ulrika Ahlgren	Added test case for Whois Search 00.
2013-07-09	D	Mats Dufberg	Released.
2015-09-28	E	Mats Dufberg	Aligned PDT requirements to the Whois response formats defined in the Registry Agreement and advisories. IPv4 and IPv6 CLI TC are merged. Updates on other TCs. All addresses are to be tested. Whois format specification incorporated. Information on enforcement and transition added. This version is enforced at 2015-11-02.
2015-10-01	F	Mats Dufberg	Corrected specification for <i>last update line</i> in section 5.6.7. This version is enforced at 2015-11-02.
2015-12-16	G	Mats Dufberg	Contact IDs have been changed from ROID to token to correctly match the requirement of the EPP RFC. Optional fields have been split into two categories with different constraints to correctly match the requirement of the RDDS-Advisory. Adjustments of some fields to correctly match the requirement of the RDDS-Advisory.
2016-01-25	H	Mats Dufberg	Clarified definitions and corrected typos. Corrected definition of "Fax Number", "Phone Number" and "Email" in Registrar object and "Name Server" in Domain name object, respectively, to correctly match Advisory. Added black listing of disallowed field names in "additional fields". Created section types, quantifiers and data types as a result of the above changes. Minor editorial changes.

Date	Version	Name	Description
2016-01-29	I	Mats Dufberg	Changed end-of-transition date. Corrected typo. Minor editorial changes.

LIST OF CONTENTS

1. INTRODUCTION	7
1.1 SCOPE	7
1.2 REFERENCES	7
1.2.1 External.....	7
1.2.2 Standards.....	7
1.2.3 Repositories.....	8
1.2.4 Other references.....	8
1.2.5 Internal	8
1.2.6 Document Hierarchy	9
1.3 LEVEL IN THE OVERALL SEQUENCE.....	9
1.4 TEST CLASSES AND OVERALL TEST CONDITIONS.....	9
1.5 SPECIAL RULES DURING TRANSITION PERIOD.....	9
2. DETAILS FOR THIS LEVEL OF TEST PLAN	10
2.1 TEST ITEMS AND THEIR IDENTIFIERS	10
2.1.1 Statement of Work.....	10
2.1.2 Applicant Guidebook	10
2.1.3 Specification 4.....	11
2.1.4 RDDS-Advisory andROID-Advisory	11
2.1.5 EPP	12
2.1.6 RFC.....	12
2.2 TEST TRACEABILITY MATRIX	12
2.3 FEATURES TO BE TESTED.....	14
2.4 FEATURES NOT TO BE TESTED.....	14
2.5 APPROACH	14
2.6 ITEM PASS/FAIL CRITERIA	15
2.7 SUSPENSION CRITERIA AND RESUMPTION REQUIREMENTS	15
2.8 TEST DELIVERABLES	15
3. TEST MANAGEMENT.....	16
4. GENERAL	17
4.1 GLOSSARY	17
4.2 DOCUMENT CHANGE PROCEDURES	17
5. APPENDIX: FORMAT SPECIFICATION.....	18
5.1 TERMINOLOGY	18
5.2 LIMITATION.....	18
5.3 OVERVIEW	18
5.4 CHARACTERS AND LINE STRUCTURE	18
5.5 SECTION TYPES	19
5.5.1 Whois output.....	20
5.5.2 Registrar reply.....	20
5.5.3 Domain name reply	20
5.5.4 Name server reply type 1.....	20
5.5.5 Name server reply type 2	21
5.5.6 Subsequent registrar details section.....	21
5.5.7 Registrar details section.....	21
5.5.8 Admin contact section	21
5.5.9 Technical contact section.....	21
5.5.10 Phone number section	21
5.5.11 Fax number section.....	21
5.5.12 Fax number section type A	22
5.5.13 Fax number section type B	22
5.5.14 Fax number section type C	22
5.5.15 Subsequent domain name details section.....	22

5.5.16	Domain name details section	22
5.5.17	Billing contact section.....	23
5.5.18	Name server section	23
5.5.19	Name server section type A.....	24
5.5.20	Name server section type B.....	24
5.5.21	Name server section type C.....	24
5.5.22	IP Address section.....	24
5.5.23	Multiple name servers section.....	24
5.5.24	Subsequent name server details section	24
5.5.25	Name server details section	24
5.5.26	Registrar object additional fields section	24
5.5.27	Registrar object additional field	24
5.5.28	Domain name object additional fields section	24
5.5.29	Domain name object additional field.....	25
5.5.30	Name server object additional fields section.....	25
5.5.31	Name server object additional field.....	25
5.5.32	Last updated footer.....	25
5.5.33	AWIP footer.....	25
5.5.34	Legal disclaimer.....	25
5.6	LINE TYPES.....	25
5.6.1	Empty line	25
5.6.2	Non-empty line	25
5.6.3	Non-empty field	25
5.6.4	Empty field	26
5.6.5	Multiple name servers line	26
5.6.6	ROID line.....	26
5.6.7	Last update line	26
5.6.8	AWIP line	27
5.7	QUANTIFIERS	27
5.7.1	Required	27
5.7.2	Optional-constrained	27
5.7.3	Empty-constrained	27
5.7.4	Omitted-constrained.....	27
5.7.5	Special restrictions on "constrained"	27
5.7.6	Optional-free	28
5.7.7	Optional-not-empty	28
5.7.8	Repeatable.....	28
5.7.9	Optional-repeatable	28
5.8	DATA TYPES.....	28
5.8.1	Translation clause	28
5.8.2	Key translation	29
5.8.3	Field key	29
5.8.4	ROID.....	29
5.8.5	ROID Suffix	29
5.8.6	Hostname	29
5.8.7	Time stamp	29
5.8.8	U-label.....	29
5.8.9	HTTP URL.....	30
5.8.10	Token	30
5.8.11	Positive integer	30
5.8.12	Domain status.....	30
5.8.13	Domain status code	30
5.8.14	Postal line	31
5.8.15	Postal code	31
5.8.16	Country code	31
5.8.17	Phone number	31
5.8.18	Email address	31
5.8.19	DNSSEC.....	31
5.8.20	IP address.....	31

5.8.21	IPv4 address.....	31
5.8.22	IPv6 address.....	32
5.8.23	Void.....	32
5.8.24	Forbidden Registrar object additional field names	32
5.8.25	Forbidden Domain name object additional field names.....	32
5.8.26	Forbidden Name server object additional field names.....	34

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
- RDDS-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>
- ROID-Advisory, "gTLD Registry Advisory: Correction of non-compliant ROIDs", 2015-08-26, <https://www.icann.org/resources/pages/correction-non-compliant-roids-2015-08-26-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 Repositories

- IANA-Repository, "Extensible Provisioning Protocol (EPP) Repository Identifiers", <https://www.iana.org/assignments/epp-repository-ids/epp-repository-ids.xhtml>

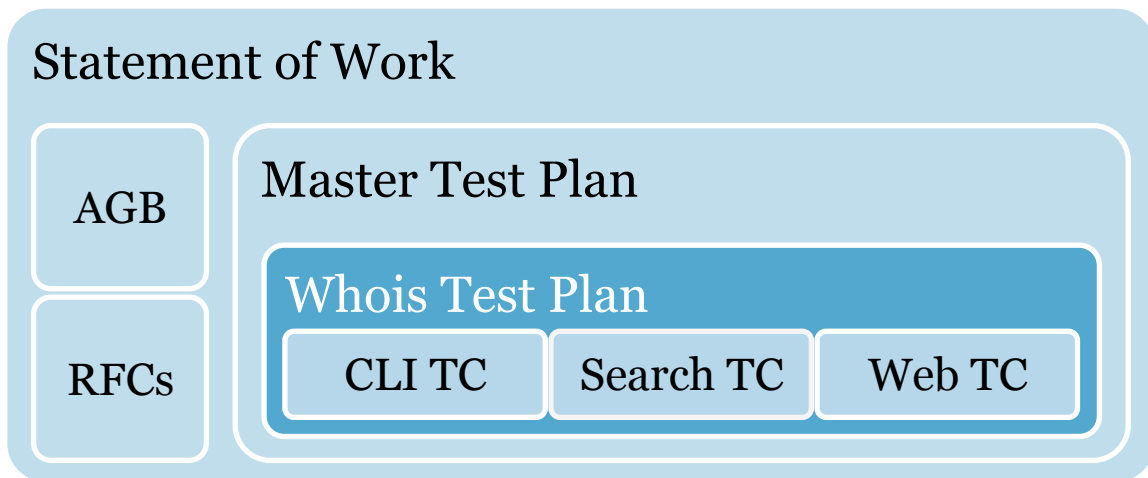
1.2.4 Other references

- 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

1.2.5 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

1.2.6 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 Special rules during transition period

This Test Plan will be fully applied from February 29, 2016. Before that date, any deviation from the format requirements in **RDDS-Advisory** and **ROID-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 February 29, 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 [RDDS-Advisory].

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 RDDS-Advisory andROID-Advisory

The 2015-04-27 RDDS-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.

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

The 2015-08-26ROID-Advisory (see link in reference list) clarifies the requirements forROIDs in a valid Whois response.

[ROID-Advisory] The WHOIS service must meet the requirements as specified in the ROID-Advisory. See 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, RDDS-Advisory, ROID-Advisory
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, RDDS-Advisory, ROID-Advisory
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, RDDS-Advisory, ROID-Advisory
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, RDDS-Advisory, ROID-Advisory
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, RDDS-Advisory, ROID-Advisory
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, RDDS-Advisory, ROID-Advisory
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

Test ID	Description	Requirement Point
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
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 RDDS-Advisory andROID-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 receive 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.

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.

5. Appendix: Format Specification

This appendix defines valid Whois replies from a PDT point of view. This specification has been derived from **Registry-Agreement**, **RDDS-Advisory**, **AWIP** and **ROID-Advisory** listed in the reference list above. All references found below (in bold face) 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 **RFC2119**.

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 "non-empty 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 "non-empty 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. (AWIP footer) [optional-free]
5. (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. (AWIP footer) [optional-free]
5. (Legal disclaimer) [required]

5.5.5 Name server reply type 2

1. (Multiple name servers section) [required]
2. (Last update footer) [required]
3. (AWIP footer) [optional-free]
4. (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: [repeatable; type "postal line"]
3. City: [required; type "postal line"]
4. State/Province: [optional-constrained; type "postal line"]
5. Postal Code: [optional-constrained; type "postal code"]
6. Country: [required; type "country code"]
7. (Phone number section) [repeatable]
8. (Fax number section) [required]
9. Email: [repeatable; type "email address"]
10. WHOIS Server: [optional-constrained; type "hostname"]
11. Referral URL: [required; type "http url"]
12. (Admin contact section) [optional-repeatable]
13. (Technical contact section) [optional-repeatable]
14. (Registrar object additional fields section) [optional-free]

5.5.8 Admin contact section

1. Admin Contact: [required; type "postal line"]
2. (Phone number section) [repeatable]
3. (Fax number section) [required]
4. Email: [repeatable; type "email address"]

5.5.9 Technical contact section

1. Technical Contact: [required; type "postal line"]
2. (Phone number section) [repeatable]
3. (Fax number section) [required]
4. Email: [repeatable; type "email address"]

5.5.10 Phone number section

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

5.5.11 Fax number section

Either one of:

- (Fax number section type A) [repeatable]
- (Fax number section type B) [required]

- (Fax number section type C) [required]

5.5.12 Fax number section type A

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

5.5.13 Fax number section type B

1. Fax Number: [empty-constrained; type "void"]
2. Fax Ext: [optional-free; type "token"]

5.5.14 Fax number section type C

1. Fax Number: [omitted-constrained; type "void"]

5.5.15 Subsequent domain name details section

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

5.5.16 Domain name details section

1. Domain Name: [required; type "hostname"]
2. Internationalized Domain Name: [optional-free; type "u-label"]
3. Domain ID: [required; type "ROID"]
4. WHOIS Server: [optional-constrained; type "hostname"]
5. Referral URL: [required; type "http url"]
6. Updated Date: [optional-constrained; 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 "token"]
13. Registrant Name: [required; type "postal line"]
14. Registrant Organization: [optional-constrained; type "postal line"]
15. Registrant Street: [repeatable; type "postal line"]
16. Registrant City: [required; type "postal line"]
17. Registrant State/Province: [optional-constrained; type "postal line"]
18. Registrant Postal Code: [optional-constrained; type "postal code"]
19. Registrant Country: [required; type "country code"]
20. Registrant Phone: [required; type "phone number"]
21. Registrant Phone Ext: [optional-constrained; type "token"]
22. Registrant Fax: [optional-constrained; type "phone number"]
23. Registrant Fax Ext: [optional-constrained; type "token"]
24. Registrant Email: [required; type "email address"]
25. Admin ID: [required; type "token"]
26. Admin Name: [required; type "postal line"]
27. Admin Organization: [optional-constrained; type "postal line"]
28. Admin Street: [repeatable; type "postal line"]
29. Admin City: [required; type "postal line"]

30. Admin State/Province: [optional-constrained; type "postal line"]
31. Admin Postal Code: [optional-constrained; type "postal code"]
32. Admin Country: [required; type "country code"]
33. Admin Phone: [required; type "phone number"]
34. Admin Phone Ext: [optional-constrained; type "token"]
35. Admin Fax: [optional-constrained; type "phone number"]
36. Admin Fax Ext: [optional-constrained; type "token"]
37. Admin Email: [required; type "email address"]
38. Tech ID: [required; type "token"]
39. Tech Name: [required; type "postal line"]
40. Tech Organization: [optional-constrained; type "postal line"]
41. Tech Street: [repeatable; type "postal line"]
42. Tech City: [required; type "postal line"]
43. Tech State/Province: [optional-constrained; type "postal line"]
44. Tech Postal Code: [optional-constrained; type "postal code"]
45. Tech Country: [required; type "country code"]
46. Tech Phone: [required; type "phone number"]
47. Tech Phone Ext: [optional-constrained; type "token"]
48. Tech Fax: [optional-constrained; type "phone number"]
49. Tech Fax Ext: [optional-constrained; type "token"]
50. Tech Email: [required; type "email address"]
51. (Billing contact section) [optional-free]
52. (Name server section) [required]
53. DNSSEC: [required; type "dnssec"]
54. (Domain name object additional fields section) [optional-free]

5.5.17 Billing contact section

1. Billing ID: [required; type "token"]
2. Billing Name: [required; type "postal line"]
3. Billing Organization: [optional-free; type "postal line"]
4. Billing Street: [repeatable; type "postal line"]
5. Billing City: [required; type "postal line"]
6. Billing State/Province: [optional-free; type "postal line"]
7. Billing Postal Code: [optional-free; type "postal code"]
8. Billing Country: [required; type "country code"]
9. Billing Phone: [required; type "phone number"]
10. Billing Phone Ext: [optional-free; type "token"]
11. Billing Fax: [optional-free; type "phone number"]
12. Billing Fax Ext: [optional-free; type "token"]
13. Billing Email: [required; type "email address"]

5.5.18 Name server section

Either one of:

- (Name server section type A) [repeatable]
- (Name server section type B) [required]
- (Name server section type C) [required]

5.5.19 Name server section type A

1. Name Server: [required; type "hostname"]
2. (IP Address section) [repeatable]

5.5.20 Name server section type B

1. Name Server: [empty-constrained; type "void"]

5.5.21 Name server section type C

1. Name Server: [omitted-constrained; type "void"]

5.5.22 IP Address section

1. IP Address: [optional-not-empty; type "ip address"]

5.5.23 Multiple name servers section

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

5.5.24 Subsequent name server details section

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

5.5.25 Name server details section

1. Server Name: [required; type "hostname"]
2. IP Address: [optional-repeatable; type "ip address"]
3. Registrar: [optional-constrained; type "postal line"]
4. WHOIS Server: [optional-constrained; type "hostname"]
5. Referral URL: [optional-constrained; type "http url"]
6. (Name server object additional fields section) [optional-free]

5.5.26 Registrar object additional fields section

1. (Registrar object additional field) [repeatable]

5.5.27 Registrar object additional field

Either one of:

- (Non-empty field) [required]
- (Empty field) [required]

The "field key" in such field MUST NOT match any of the field key strings listed in "Forbidden Registrar object additional field names".

5.5.28 Domain name object additional fields section

1. (Domain name object additional field) [repeatable]

5.5.29 Domain name object additional field

Either one of:

- (Non-empty field) [required]
- (Empty field) [required]

The "field key" in such field MUST NOT match any of the field key strings listed in "Forbidden Domain name object additional field names".

5.5.30 Name server object additional fields section

1. (Name server object additional field) [repeatable]

5.5.31 Name server object additional field

Either one of:

- (Non-empty field) [required]
- (Empty field) [required]

The "field key" in such field MUST NOT match any of the field key strings listed in "Forbidden Name server object additional field names".

5.5.32 Last updated footer

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

5.5.33 AWIP footer

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

5.5.34 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 Non-empty field

A *non-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 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:"

5.6.6ROID 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-example (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 "
2. The exact string "Whois" or the exact string "WHOIS"
3. The exact string " database: "
4. A string matching type "time stamp"
5. The exact string "<<<"

Two examples:

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

1. The exact string "For more information on Whois status codes, please visit <https://icann.org/epp>"
2. The exact string "For more information on Whois status codes, please visit <https://www.icann.org/resources/pages/epp-status-codes-2014-06-16-en>"

Also see **AWIP**.

5.7 Quantifiers

5.7.1 Required

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

If a "named field" is declared as *required*, one "non-empty field" with the given "field key" value and a "field value" of the specified data type **MUST** appear at that position.

5.7.2 Optional-constrained

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

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

"Named fields" declared *optional-constrained* are subject to the restriction defined in "Special restrictions on 'constrained'".

5.7.3 Empty-constrained

If a "named field" is declared *empty-constrained*, the following format **MUST** be used:

- 1) One "empty field" with the given "field key" value **MUST** appear at that position (EMPTY).

"Named fields" declared *empty-constrained* are subject to the restriction defined in "Special restrictions on 'constrained'".

5.7.4 Omitted-constrained

If a "named field" is declared *omitted-constrained*, the following format **MUST** be used:

- 1) A "field" with the given "field key" value **MUST NOT** appear at that position (OMITTED).

"Named fields" declared *omitted-constrained* are subject to the restriction defined in "Special restrictions on 'constrained'".

5.7.5 Special restrictions on "constrained"

It is not permitted to mix "empty fields" (EMPTY) with omitted (OMITTED) fields for "named fields" declared as optional-constrained, empty-constrained or omitted-constrained in the same Whois output.

5.7.6 Optional-free

If a "subsection" is declared *optional-free*, 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-free*, one of the following formats MUST be used:

- 1) One "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) One "non-empty field" with the given "field key" value and a "field value" of the specified data type MUST appear at that position.

Optional-free fields may, in contrast to *optional-constrained* fields, mix formats 1 and 2 in the same Whois output.

5.7.7 Optional-not-empty

If a "named field" is declared *optional-not-empty*, one of the following formats MUST be used:

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

5.7.8 Repeatable

If a "subsection" 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.

If a "named field" is declared as *repeatable*, one or more instances of "non-empty field" with the given "field key" value and a "field value" of the specified data type MUST appear at that position. The number of occurrences MUST conform to the upper bound if one is specified.

5.7.9 Optional-repeatable

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

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

1. The "named field" is treated as declared *optional-free*.
2. The "named field" is treated as declared *repeatable*.

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.

The requirement of the *ROID Suffix* **MUST** be met.

5.8.5 ROID Suffix

A *ROID* is split in two parts by the single, mandatory HYPHEN (U+002D). The string after the HYPHEN is here defined as *ROID Suffix*.

The *ROID Suffix* **MUST** be a registered *EPP Repository Identifier* found in **IANA-Repository** (see **ROID-Advisory**).

5.8.6 Hostname

A *hostname* (see **RFC952** and **RFC1123**) **MUST** match 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])\.[?]'
```

A *label* within a *hostname* **MUST NOT** exceed 63 characters, where the *labels* are defined as the strings resulting from splitting the *hostname* by the dots.

The total length of a *hostname* **MUST NOT** exceed 254 characters excluding any final dot.

Example:

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

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

5.8.7 Time stamp

A *Time stamp* **MUST** be defined as "date-time" in **RFC3339** (section 5.6, p. 8) and "time-offset" **MUST** be "Z".

5.8.8 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**.

5.8.9 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.

5.8.10 Token

A *Token* MUST be as defined in **XML-Schema**, section 3.3.2.

5.8.11 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.

5.8.12 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

5.8.13 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

5.8.14 Postal line

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

5.8.15 Postal code

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

5.8.16 Country code

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

```
'^[a-zA-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.

5.8.17 Phone number

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

5.8.18 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.

5.8.19 DNSSEC

One of the following exact strings:

- signedDelegation
- unsigned

5.8.20 IP address

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

5.8.21 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	=	octet "." octet "." octet "." octet
--------------	---	-------------------------------------

octet	=	octet-zero / octet-positive
octet-zero	=	"0"
octet-positive	=	<i>Positive integer < 256</i>

Positive integer is defined in this document.

Example:

- 192.0.2.3

5.8.22 IPv6 address

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

Example:

- 2001:db8::5

5.8.23 Void

This is a placeholder for data type when a *named field* is defined to be an "empty field" or an "empty line".

5.8.24 Forbidden Registrar object additional field names

The following field names are forbidden in Registrar object additional fields:

- Registrar Name
- Street
- City
- State/Province
- Postal Code
- Country
- Phone Number
- Email
- WHOIS Server
- Referral URL
- Admin Contact
- Technical Contact
- Fax Number

5.8.25 Forbidden Domain name object additional field names

The following field names are forbidden in Domain name object additional fields:

- Domain Name
- Domain ID
- WHOIS Server
- Referral URL
- Updated Date
- Creation Date
- Registry Expiry Date

- Sponsoring Registrar
- Sponsoring Registrar IANA ID
- Domain Status
- Registrant ID
- Registrant Name
- Registrant Organization
- Registrant Street
- Registrant City
- Registrant State/Province
- Registrant Postal Code
- Registrant Country
- Registrant Phone
- Registrant Phone Ext
- Registrant Fax
- Registrant Fax Ext
- Registrant Email
- Admin ID
- Admin Name
- Admin Organization
- Admin Street
- Admin City
- Admin State/Province
- Admin Postal Code
- Admin Country
- Admin Phone
- Admin Phone Ext
- Admin Fax
- Admin Fax Ext
- Admin Email
- Tech ID
- Tech Name
- Tech Organization
- Tech Street
- Tech City
- Tech State/Province
- Tech Postal Code
- Tech Country
- Tech Phone
- Tech Phone Ext
- Tech Fax
- Tech Fax Ext
- Tech Email
- DNSSEC
- Name Server
- IP Address

5.8.26 Forbidden Name server object additional field names

The following field names are forbidden in Name server object additional fields:

- Server Name
- IP Address
- Registrar
- WHOIS Server
- Referral URL