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WHOIS++ templates

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Abstract

WHOIS++ is a simple Internet search and retrieval protocol, specified in [1], which allows clients and servers to exchange structured data objects known as templates. In the interests of interoperability it is desirable to have a common base schema for these templates. This document suggests a schema drawn from implementation and deployment experience to date with WHOIS++.

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1. Purpose and motivation

The goal of this document is to stimulate discussion on the issue of templates for WHOIS++ [1] databases.

In particular we would like to recommend a few typical templates and a set of attributes for them. By recommending the use of particular templates, we hope to standardize WHOIS++ databases and thus make them easier to search.

Of course we cannot demand that everyone use the same templates, but it is still a good idea to recommend that people derive their own templates from well known exemples. Amongst other things this allows clients to behave rationally for all fields in a "base class".

2.. Scope of this document

Note that we are not trying to describe all possible information that could be put in a database but rather to cover common and useful elements.

3. What we did

We looked at IETF drafts, the content of deployed WHOIS++ servers, other White and Yellow Pages servers, and at the work of the Dublin Core group [2] on cataloguing on-line document-like objects.

The proposed templates are a mix of all these things but are most strongly influenced by the templates defined by the IAFA working group of the IETF [3]. In fact some of the text in this document is taken verbatim from IAFA documents.

We should also mention that wherever we thought it was necessary we tried improving on existing ways of doing things, in particular we tried to improve on the consistency of attribute naming and of the general nomenclature.

4. Templates and clusters

To ease the understanding of how the templates are defined, consider that each template is defined by attributes and clusters. Each cluster is in turn also defined by attributes and clusters. This clustering principle is only used in this specification to make it easier to describe what attributes should be grouped together, and

what attributes are required in a template.

One can see the clustering principle we use in this document as a sort of grammar.

As an example, one can have the following cluster definition:

```
  Cluster INGREDIENTS

    Name:
    Color:
    Weight:
    Volume:
```

If the template definition then is

```
  Template DESSERT

    Dessert:
    Ingredients-(INGREDIENTS*):
```

Then the following record is legal:

```
    Dessert: Chocolate Mousse
    Ingredients-Name: Chocolate
    Ingredients-Color: Brown
    Ingredients-Weight: 150g
    Ingredients-Name: Cream
    Ingredients-Color: White
    Ingredients-Weight: 2.5dl
```

Each attribute may be repeated within one record (as you can see above).

It is important to note that the WHOIS++ protocol imposes ordering on the attributes within the templates. For example - if there were two INGREDIENTS clusters included in a DESSERT template, the attributes from each INGREDIENTS cluster would be grouped together.

In the tables of attributes which follow, the "Rec. ?" heading is used to indicate whether an attribute is recommended. All attributes are essentially optional, e.g. the Volume attribute in the INGREDIENTS cluster above, but templates will typically need to contain at least the recommended attributes in order to be useful.

5. Cluster definitions

ADDRESS cluster

This cluster describes the physical address of an object.

If any of the more detailed Address-* attributes are specified, they should mirror the content of the Address attribute which should always be specified.

Name	Rec. ?	Description
Address:	R	Full address
Address-Type:		Type of address, e.g. Work or Home
Address-City:	R	City
Address-Country:	R	Country
Address-Room:		Room
Address-State:		State, county or province
Address-Street:		Street
Address-Zip-Code:		Zip code
Address-Locality:		Geographic region

CERTNAME cluster

This cluster is used to describe the name of an organization issuing a certificate, Certificate Revocation List (CRL) or the name of a certificate holder.

Name	Rec. ?	Description
Country:	R	Country
Name:	R	Organization name
Department:		Organizational unit
CommonName:		Common name

CERTVALID cluster

This cluster is used to describe validity period of a certificate/CRL.

Name	Rec. ?	Description
Date-Valid-NotBefore:	R	Start of validity period
Date-Valid-NotAfter:	R	End of validity period

EMAIL cluster

This cluster describes the email address of an object.

Separate forms are given for Internet and X.400/MHS style email addresses, so as to avoid confusion between the two.

Name	Rec. ?	Description
Email:		Electronic mail address
Email-X400:		X.400 mail address

NAME cluster

This cluster may be used to describe a person's name. Several permutations are provided, to cater for the various approaches to writing names in different cultures.

If any of the more detailed Name-* attributes are specified, they should mirror the content of the Name attribute which should always be specified.

Name	Rec. ?	Description
Name:	R	Full name
Name-First:		First name
Name-Last:		Last name
Name-Middle:		Middle name or initial
Name-Prefix:		Includes idenfitiers such as Dr., Ms., Prof.
Name-Suffix:		Includes identifiers such as Jr., Sr., ...

ORGANIZATION cluster

This cluster is used to describe an organization in a particular template.

Name	Rec. ?	Description
(ADDRESS*)		Address of organization
(EMAIL*)		Electronic mail address(es) of organization
Name:	R	Name of organization
(PHONE*)		Telephone number(s) of organization
Type:		Type of organization (University, commercial, etc.)
URI:		Uniform Resource Identifier of

```
|           |        |   organization                       |
+-----------+--------+--------------------------------------+
```

ORG-PERSON cluster

This adds information about the organization the person is associated with, for use with the PERSON cluster.

```
+-----------------------------+--------+-----------------------------+
|Name                         | Rec. ? | Description                 |
+-----------------------------+--------+-----------------------------+
|Department:                  | R      | Department to which person  |
|                             |        |   belongs in organization   |
|Organization-(ORGANIZATION*) | R      | Information about the       |
|                             |        |   organization where person |
|                             |        |   works                     |
|Title:                       |        | Title of person within      |
|                             |        |   organization              |
+-----------------------------+--------+-----------------------------+
```

PERSON cluster

This cluster is used to describe Homo Sapiens.

```
      +--------------+--------+-------------------------------+
      |Name          | Rec. ? | Description                   |
      +--------------+--------+-------------------------------+
      |(EMAIL*)      |        | Electronic mail address(es)   |
      |              |        |   of person                   |
      |(ADDRESS*)    |        | Address of person             |
      |(PHONE*)      |        | Telephone contact information |
      |              |        |   of person                   |
      |(NAME*)       | R      | Name of person                |
      |(ORG-PERSON*) | R      | Organization related          |
      |              |        |   personal contact            |
      |              |        |   information                 |
      |Homepage-URI: |        | Uniform Resource              |
      |              |        |   Identifier of person's      |
      |              |        |   home page                   |
      |Picture-URI:  |        | Uniform Resource              |
      |              |        |   Identifier of person's      |
      |              |        |   picture                     |
      |Language-pref:|        | Person's language of          |
      |              |        |   preference                  |
      +--------------+--------+-------------------------------+
```

PHONE cluster

This cluster is used to hold telephone contact details for an object.

Name	Rec. ?	Description
Phone-Type:		Type of phone, e.g. Work or Home
Cellular:		Cellular telephone number
Fax:		Fax telephone number
Pager:		Pager telephone number
Phone:		Telephone number

Note that we recommend that full international format be used for telephone numbers for portability - e.g. +44 1509 228237. See Appendix A for more information.

PGP-PUBLIC-KEY cluster

This cluster is used to include or refer to a PGP [4] public key.

If included directly, the PGP public key should be base64 encoded ("ASCII armored") for portability.

Name	Rec. ?	Description
PGP-Version:		PGP version, e.g. 2.6.3i
PGP-Key-Length:	R	Public key length, e.g. 1024
PGP-Key-ID:	R	Public key ID, e.g. FB5E1519
PGP-Key-Name:	R	Name associated with key e.g. Patrik Faltstrom <paf@swip.net>
PGP-Fingerprint:		Public key checksum, e.g. 2C E2 6F...
PGP-Public-Key:	R	PGP key in "ASCII Armour"
PGP-Public-Key-URI:		Uniform Resource Identifier of public key

RECORD cluster

This cluster is used to hold administrative information about a record.

Name	Rec. ?	Description
Record-Creation-Contact-(PERSON*)		Contact information for person who created this

			record
Record-Creation-Date:			The date this record was created
Record-Last-Modified-Contact-(PERSON*)			Contact information for person who last modified this record
Record-Last-Modified-Date:			The date this record was last modified
Record-Last-Verified-Contact-(PERSON*)			Contact information for person who last verified this record
Record-Last-Verified-Date:			The date this record was last verified

6. Template definitions

DOCUMENT template

This template is used to hold information about document-like objects.

Note that an expanded set of attributes may be used to fully represent Dublin Core objects, as per Appendix B. At the time of writing these were still under development.

Name	Rec. ?	Description
Title:		The name of the resource
Creator:		The person(s) primarily responsible for the intellectual content of the resource
Creator-(PERSON*)		See Creator:
Subject:		The topic addressed by the resource or a set of appropriate keywords
Description:		A plain text description or abstract about the resource
Publisher:		The agent or agency responsible for making the resource available
Publisher-(ORGANIZATION*)		See Publisher:
Contributors:		The person(s), such as editors and transcribers, who have made other significant intellectual contributions to the work

Contributors-(PERSON*)		See Contributors:
Date:		The date of publication
Type:		The genre of the resource, such as novel, poem, or dictionary
Format:		The physical manifestation of the resource, such as Postscript file or Windows executable file
Identifier:		String or number used to uniquely identify the resource
Source:		Resources, either print or electronic, from which this resource is derived, if applicable
Language:		Language of the intellectual content
Relation:		Relationship to other resources
Coverage:		The spatial locations and temporal durations characteristic of the resource
Rights:		Information concerning the intellectual property rights that are being exercised over the resource (including access terms)
(RECORD*)		Record information

ORGANIZATION template

This template is used to hold details about an organization. In practice both spellings - "ORGANISATION" and "ORGANIZATION" - may be in use. We recommend that ORGANIZATION be given preference to avoid confusion.

Name	Rec. ?	Description
Keywords:		Any keywords which might facilitate finding this record
Internet-Domain:		Organization's Internet domain name
Domain-Contact-(PERSON*):		Admin contact for this domain
(ORGANIZATIION*)		Actual organization information
(RECORD*)		Record information

ORG-ROLE template

This template is used to hold details about a particular role within an organization. These roles (like "president", "front desk", "service counter") may or may not be associated with a person or

persons. This template will contain necessary contact information for the role irrespective of the (current) incumbent person, if any.

Name	Rec. ?	Description
Keywords:		Any keywords which might facilitate finding this record
Org-Role:	R	Name of the role
(EMAIL*)		E-mail contact info for role
(PHONE*)		Phone contact info for role
Organization-(ORGANIZATION*)		The organization to which this role belongs
(NAME*)		Name of person in role
(PGP-PUBLIC-KEY*)		The role's PGP public key(s)
(RECORD*)		Record information

SERVICE template

This template is used to describe an on-line service.

Name	Rec. ?	Description
Title:	R	Title of object
Category:		Type of object
Short-Title:		Summary title
Alternative-Title:		An alternative to the Title or Short-Title fields
Source:		Information as to the definitive version
Discussion:		Appropriate discussion forums
Language:		The language of the object
ISSN:		International Standard Serial Number if appropriate
URI:	R	Uniform Resource Identifier
Admin-(USER*)		Admin contact information
Owner-(ORGANIZATION*)		The organization sponsoring the service
Sponsoring-(ORGANIZATION*)		The sponsoring organization
Publisher-(ORGANIZATION*)		The organization publishing the service
Description:	R	Free text description
Authentication:		Authentication information
Registration:		How to register for this service
Charging-Policy:		Description of any charging mechanism in place
Access-Policy:		Policies and restrictions for using this service
Access-Times:		Time ranges for mandatory

			or preferred access
Keywords:	R	Keywords appropriate for	describing this service
Subject-Descriptor-Scheme:		Name of	classification scheme
Subject-Descriptor:		A classification	mark for this resource
To-Be-Reviewed-Date:		Date on which the	resource is to be re-assessed
Comments:		Comments by the template	creators
Destination:		Which database the	template is destined for
(PGP-PUBLIC-KEY*)		PGP public key(s)	
(RECORD*)		Record information	

USER template

This template is used to hold details about a person.

The IDS Working Group of the IETF has proposed an abstract schema for Internet white pages services [11]; the details of how that abstract schema can be represented in a WHOIS++ USER template are provided in Appendix C.

Name	Rec. ?	Description	
Keywords:		Any keywords which might facilitate	finding this record
(PERSON*)		Actual user information	
(PGP-PUBLIC-KEY*)		Their PGP public	key(s)
X509-CERT-URI		URI for the USER's X.509 certificate	(May be a Whois++ URI for the appropriate X509-CERT template)
(RECORD*)		Record information	

X509-CERT template

This template is used to describe an X.509 [5] certificate.

Name	Rec. ?	Description
X509-Version:		Certificate version number
SerialNumber:	R	Certificate serial number
Signature:		Signature of issuer
Issuer-(CERTNAME*)	R	Issuer of certificate

|(CERTVALID*)	|	| Validity period of certificate |
|Subject-(CERTNAME*)	|	| Subject of certificate |
|Subject-PublicKey:	|	| Public key of subject |
|Certificate:	| R	| The certificate |
|(RECORD*)	|	| Record information |

X509-CRL template.

This template is used to describe a Certificate Revocation List.

Name	Rec. ?	Description
|Signature:	|	| Signature of issuer |
|Issuer-(CERTNAME*)	|	| Issuer of CRL |
|(CERTVALID*)	|	| Validity period of CRL |
|CRL:	| R	| The CRL |
|(RECORD*)	|	| Record information |

7. System templates

CONSTRAINT template

This template is used by the "constraints" command to list valid constraints supported by the server.

Name	Rec. ?	Description
|Default:	| R	| The default value for this constraint |
|Constraint:	| R	| The constraint described |
|Range:	|	| A list of values supported by the server |
|(RECORD*)	|	| Record information |

HELP template

This template is used by the "help" command to access a simple help subsystem giving information about the available commands.

Name	Rec. ?	Description
|Command:	| R	| Command name |
|Description:	| R	| Description of the command |
|Topic:	| R	| Command category |
|Usage:	| R	| Command usage |

|(RECORD*) | | Record information |		

SERVERHANDLE template

This template describes a WHOIS++ server.

Name	Rec. ?	Description
|Administrator-(PERSON*)		Contact information about the person administering the server
|City:		City where the server resides
|Country:		Country where the server resides
|Description:		Human readable information about the server
|Host-Name:	R	Host name
|Host-Port:	R	Port name used by server
|Organization-(ORGANIZATION*)		Organization responsible for the server
|Server-Handle:	R	Registered server handle
|State:		State, or province where the server resides
|(PGP-PUBLIC-KEY*)		Server's PGP key
|(RECORD*)		Record information

VERSION template

This template is used by the "version" command to obtain the current version of the WHOIS++ protocol supported by the server.

Name	Rec. ?	Description
|Database-Name:		Name of the underlying database program
|Database-Version:		Version of the underlying database program
|Program-Author-(PERSON*)		Information about the server programmer
|Program-Name:		Name of the server program
|Program-Version:		Version of the server program
|Version:	R	Version of the WHOIS++ protocol
|(RECORD*)		Record information

8. Security considerations

A WHOIS++ server is only serving the data that is stored in the server itself. Neither the storage, the movement into the server nor the fetching of the data can be seen as secure operations. Because of that, data that is stored in a WHOIS++ server have to be controlled for correctness by an out of band mechanism. For example, public keys stored in a WHOIS++ server have to be signed when stored there. A key checksum of a public key when stored in a WHOIS++ server cannot be treated as correct because of this. It is just there for information.

A directory service hands out information, but does not guarantee the correctness of any information.

One of the main uses to which WHOIS++ templates are expected to be put is in the cataloguing of externally produced information. Implementations which manipulate this should treat it with caution - for example, to avoid buffer overrun problems and unexpected evaluation of metacharacters.

9. Conclusions

This document has outlined a number of template definitions which it is appropriate to use within a WHOIS++ based system. Whilst it is not going to be possible to satisfy everyone's requirements in a single schema, we believe that the above templates cater for the majority of cases.

Further discussion of this work is directed to the WHOIS++ schema mailing list - whoispp-schema@bunyip.com. Send mail to majordomo@bunyip.com with the message body "subscribe whoispp-schema" to join the list.

10. Acknowledgements

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APPENDIX A: Description of elementary attribute values

The IAFA draft and RFC822 [6] already define formats for:

- email addresses
- hostnames
- IP addresses
- numeric values
- dates
- times
- time ranges
- telephone numbers
- latitude and longitudes
- person names

Here is a reminder of what those elementary data elements should look like according to IAFA:

All electronic mail (Email addresses must be as defined in RFC 822, Section 6. Names and comments may be included in the Email address. For example, both "John Doe" <jd@ftp.bar.org> and jd@ftp.bar.org are valid email addresses.

All hostnames are to be given as Fully Qualified Domain Names as defined in RFC 1034, Section 3. For example: "foo.bar.com"

All host IP addresses are given in "dotted-quad" (or "dotted-decimal") notation. For example: "127.0.0.1"

All numeric values are in decimal unless otherwise stated.

Dates/times must be given as defined in RFC 822, Section 5.1 and modified in RFC 1123 [7], Section 5.2.14:

```
date-time   =  [ day "," ] date [time]
day         =  "Mon"  / "Tue" /  "Wed"  / "Thu"
            /  "Fri"  / "Sat" /  "Sun"
date        = 1*2DIGIT month 2*4DIGIT
```

```
                                    ; day month year
                                    ;  e.g. 20 Jun 1982
month       =  "Jan"  /  "Feb" /  "Mar"  /  "Apr"
                    /  "May"  /  "Jun" /  "Jul"  /  "Aug"
                    /  "Sep"  /  "Oct" /  "Nov"  /  "Dec"
time        =  hour zone                ; ANSI
hour        =  2DIGIT ":" 2DIGIT [":" 2DIGIT]
                                    ; 00:00:00 - 23:59:59
zone        =  "UT"  / "GMT"            ; Universal Time
                                    ; North American : UT
            /  "EST" / "EDT"            ;  Eastern:  - 5/ - 4
            /  "CST" / "CDT"            ;  Central:  - 6/ - 5
            /  "MST" / "MDT"            ;  Mountain: - 7/ - 6
            /  "PST" / "PDT"            ;  Pacific:  - 8/ - 7
                                    ;
            / ( ("+" / "-") 4DIGIT )    ; Local differential
                                    ;  hours+min. (HHMM)
```

For example the string "Sat, 18 Jun 1993 12:36:47 -0500" is a valid date, and the string "12:36:47 GMT" is a valid time. Quoting from RFC 1123, Section 5.2.14: "There is a strong trend towards the use of numeric timezone indicators, and implementations SHOULD use numeric timezones instead of timezone names. However, all implementations MUST accept either notation. If timezone names are used, they MUST be exactly as defined in RFC 822."

Time ranges (or periods) must be specified as pairs of time values (as defined above in note (5)), separated by a "/". Multiple time ranges are separated by whitespace. All times in a range should be specified with the same timezone. For example 12:00 GMT / 05:45 GMT.

"whitespace" is defined as one or more blank (hex 0x20) and/or tab (octal 11) ASCII characters.

References to "UT" mean Universal Time (also known as Greenwich Mean Time or "GMT").

All telephone numbers are to be given as a minimum in full, with a leading '+' and country and routing codes without non-space separators. The number should be given assuming someone calling internationally (without local access codes). The number given in the local convention may optionally be specified in brackets. For example, Telephone: +44 71 732 8011 or Telephone: +1 514 875 8189 (0514-875-8611).

Latitude and longitude are specified in that order as CDD.MM.SS/CDD.MM.SS where

  DD is in degrees
  MM is in minutes
  SS is in seconds
  C is the direction designator which is for latitude

"+" is north of the equator and "-" is south of the equator. For longitude "+" is west of the Greenwich meridian and "-" is east of the Greenwich meridian. The double quotes (") are not part of the desig-

nator, but are used here to delimit the symbols.

Person name fields should conform to a particular format (based on BibTeX [8]), so that they can be parsed into parts. A name can have four parts: first, von, last, junior, each of which can consist of more than one word. For example, "John Paul von Braun, Jr." has "John Paul" as the first part, "von" as the von part, "Braun" as the last part, and "Jr." as the junior part Use one of these formats for a name:

```
First von Last
von Last, First
von Last, Junior, First
```

The last part is assumed to be one word, or all the words after the von part. Anything in braces will be treated as one word, so use braces to surround last names that contain more than one word. The von part is recognized by looking for words that begin with lowercase letters. When possible, enter the full first name(s). Actually, the rules for isolating the name parts are a bit more complicated, so they do the right thing for names like "de la Grand Round, Chuck". If there are multiple authors or editors, they should all be separated by the word and.

APPENDIX B: Representing Dublin Core in WHOIS++

The Dublin Core is a simple resource description format which arose out of a loose grouping of "librarians, archivists, humanities scholars and geographers, as well as standards makers in the Internet, Z39.50 and Standard Generalized Markup Language (SGML) communities" [2].

This document proposes a mapping from the abstract model of the Dublin Core to WHOIS++. We suggest that the Dublin Core element set [9] (with the concrete syntax given in the DOCUMENT template above) be used as WHOIS++ attributes, and that the template type "DOCUMENT" be used to represent a WHOIS++ template which uses the Dublin Core element set. For example, a "Title" element which had the value "Cities of The Red Night" would be represented within WHOIS++ as the attribute/value pair:

```
Title: Cities of The Red Night
```

One aspect of the Dublin Core does not translate directly to WHOIS++ - each element may have additional qualifiers such as "scheme" associated with it. This provides the creator of the record with a way of indicating additional semantics, e.g. the classification scheme being used in the "Subject" element.

Since WHOIS++, like most Internet based search and retrieval protocols, is attribute/value oriented, it is necessary to find a place to put this extra information. We propose that it be placed in an additional attribute/value pair which precedes the main information about the element. For example, if the subject classification for the above book were 813 in the Dewey Decimal system, the resulting Dublin

Core elements expressed via WHOIS++ might look like this:

```
  Subject-Scheme: DDC
  Subject: 813
```

Since the order of the attribute/value pairs in a WHOIS++ record is significant, this provides a simple and easily implemented mechanism for grouping together elements and their qualifying information.

Needless to say, scheme information should only appear in the WHOIS++ record if the attribute it qualifies also appears!

It is important to note that the Dublin Core element set is intended for use in describing document-like objects, and not as a means of describing arbitrary objects. Furthermore, the number of elements is strictly limited in the interests of interoperability.

Work is ongoing on the Warwick Framework [10], which attempts to provide a mechanism for packaging together collections of descriptive information. It is envisaged that this would be used in cases where the Dublin Core element set did not provide enough descriptive capability. This is a subject for further study and is beyond the scope of this specification.

APPENDIX C: Representing the Internet Whitepages Schema (IWPS) in WHOIS++

The IETF's IDS working group has defined a standardized abstract schema for "a simple Internet Whitepages Service". The reader is referred to the documentation describing that schema ([11]) for details on the expected syntax, precise content and length limitations for individual attributes.

IWPS Field	WHOIS++ USER Template Attribute
Email	Email or Email-X400
Cert	(* see below)
Home Page	Homepage-URI
Common Name	Name
Given Name	Name-First
Surname	Name-Last
Organization	Organization-Name
Locality	Address-Locality
Country	Address-Country
Language Spoken	Language-Pref
Personal Phone	Phone
Personal Fax	Fax
Personal Mobile Phone	Cellular
Personal Pager Number	Pager
Personal Postal Address	Address
Description	Picture-URI
Title	Title
Office Phone	Organization-Phone
Office Fax	Organization-Fax
Office Mobile Phone	Organization-Cellular

Office Pager	Organization-Page
Office Postal Address	Organization-Address
Creation Date	Record-Creation-Date
Creator Name	Record-Creation-Contact-Name
Modified Date	Record-Last-Modified-Date
Modifier Name	Record-Last-Modified-Contact-Name

The "Cert" attribute, as described by the IWPS document, is as follows:

> "The certificate field is intended to hold any kind of certificate; X.509 certificates are one example. A specific implementation will specify how to indicate the type of certificate when describing the mapping of the IWPS schema onto the implementation schema."

As the Whois++ USER certificate is set up to accommodate both PGP keys and X.509 pointers, this one IWPS field is defined to conditionally be mapped to the appropriate fields for each technology:

PGP-Version
PGP-Key-Length
PGP-Key-ID
PGP-Fingerprint
PGP-Public-Key

and/or

PGP-Public-Key-URI

and/or

X509-CERT-URI

with appropriate attendant information (e.g. PGP-NAME, etc) as appropriate.