A RESTful Web Service for Whois

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My Background on Whois

- Prototyped an LDAP alternative to Whois (RFC 3663)
- Principal author of CRISP (IRIS) documents – RFC 3707, RFC 3981, RFC 3983, RFC 4698, RFC 4991, RFC 4992, RFC 4993, RFC 5144
- Worked with principal authors of Rwhois and Whois++ at VeriSign
- Most recently – driver behind ARIN’s Whois RESTful Web Service
Basics of All Protocols

- Control
  - Framing, Security, etc...

- Data
  - What Users See
LDAP

The Control part heavily dictates the Data part.
IRIS

The Control part is specific to the Data part.
WHOIS/NICNAME

The Control part specifies nothing about the Data part.
RESTful Web Services

The Control part enables richness in the Data part.
Why a RESTful Web Service?

• I18N support
• referrals
• security
• ... see (RFC 3707)

• Leads to the following conclusion...
We Need to go beyond Port 43

The thin veneer of the NICNAME/WHOIS protocol does not allow for much expansion without a lot of work and complexity.
Non-Port 43 Solutions

- **Rwhois**
  - Problem specific technology
  - Only used by a subset of the ARIN community

- **Whois++**
  - Focuses on distributed indexes

- **LDAP**
  - Widely used in Intranets, not the Internet

- **IRIS**
  - Requirements by lawyers, design by committee

- **RESTful Web Services (RWS)**
  - Simple reuse of web technologies
What is REST?

• Representation State Transfer

• As applied to web services
  – defines a pattern of usage with HTTP to create, read, update, and delete (CRUD) data
  – “Resources” are addressable in URLs

• Very popular protocol model
  – Amazon S3, Yahoo & Google services, …
How is this Useful to WHOIS?

- POC, ORG, NET, ASN resources have URLs that you can cut & paste
- Gives a very simple programmatic API into WHOIS data
- Compared to NICNAME TCP/43:
  - Better inputs and queries
  - More meaningful array of outputs
- Uses HTTP infrastructure (e.g. caches)
Where can more information on REST be found?

- RESTful Web Services
  - O’Reilly Media
  - Leonard Richardson
  - Sam Ruby
Applicability to ICANN Whois

• This is a “framework” useful to ICANN/Registries/Registrars
  – Not an out-of-the-box solution
  – Somebody has to decide how it is used

• But...
  – Well within the mainstream of modern Internet communications (i.e. not hard to find programmers who understand it)
  – As the RIRs are showing, it is easy to apply to the Internet Infrastructure space
Status of Services

- **ARIN**
  - Full Production as of July 2010
  - Our RESTful provisioning service goes operational in a few days

- **RIPE NCC**
  - Announced their RESTful proxy to Whois March 2010
  - Now in production

- **APNIC**
  - Has been using RESTful services internally for years
The BIG Advantage of REST

• Easily understood
  – Any modern programmer can incorporate it
  – Can look like web pages

• Re-uses HTTP in a simple manner
  – Many, many clients
  – Other HTTP advantages

• This is why it is very, very popular with Google, Amazon, Yahoo, Twitter, Facebook, YouTube, Flickr, …
What does it look like?

Where the data is.

What type of data it is.

The ID of the data.

http://whois.arin.net/rest/poc/KOSTE-ARIN

It is a standard URL.
Go ahead, put it into your browser.
Addressable URLs

• Mark Kosters
  http://whois.arin.net/rest/poc/KOSTE-ARIN

• ARIN (the organization)
  http://whois.arin.net/rest/org/ARIN

• ARIN’s autonomous systems numbers
  http://whois.arin.net/rest/org/ARIN/asns

• ARIN’s POCs
  http://whois.arin.net/rest/org/ARIN/pocs

• ARIN-HOSTMASTER’s networks
  http://whois.arin.net/rest/poc/ARIN-HOSTMASTER/nets
Searches

• Same capabilities as port 43, but they can be refined

• Organizations by name
  http://whois.arin.net/rest/orgs;name=ARIN

• Organizations starting with “ARIN”
  http://whois.arin.net/rest/orgs;name=ARIN*

• Mark Kosters by first and last name
  http://whois.arin.net/rest/pocs;first=Mark;last=Kosters
Outputs

• XML
  – Computers can easily digest XML
  – With stylesheets, you can transform XML to pretty, user-friendly web pages

• JSON

• (your choice here)
Machine Readable & Pretty

ARIN
American Registry for Internet Numbers

ARIN Online

WHOIS-RWS

Point of Contact
Name: Kosters, Mark
Handle: KOSTE-ARIN
Company: ARIN
Street: 3635 Concorde Parkway
City: Chantilly
State/Province: VA
Postal Code: 20151
Country: US
Registration Date: 2009-10-02
Last Updated: 2010-06-26
Comments: I'm really MAK21-ARIN
Phone: +1-703-227-9870 (Office)
Email: markk@bjmk.com
RESTful Link: http://whois.arin.net/rest/poc/KOSTE-ARIN
Clients are Ubiquitous

- One of the problems with a non-port 43 solution is “Who will write the client software?”
- With RWS, your web browser is a client.
- Command line clients:
  - Curl, wget, xmllint, etc…
- Embedded clients:
  - Libcurl, libraries for Perl, PHP, Java, etc…”
Applying RESTful Web Services to Whois simply re-uses all the web infrastructure we have been using for years.
The Future Enabled: Caching

- Addressable URLs make HTTP caching work with WHOIS data
- Useful for automated security analysis

- For ARIN, 99% of WHOIS queries are IP address lookups
The Future Enabled: Referrals

- Not just for Orgs
  - Nets
  - POCs
  - Etc…

NetName: ARIN-2610
NetHandle: NET6-2610-1
NetType: Allocated to Big Network Provider
RegDate: 2005-11-17
Updated: 2009-09-14
CIDR: 2620::/23
Ref: http://arin.net/rest/net/NET6-2610-1
HolderRef: http://example.com/rest/net/NET6-2610-1

NetHandle: NET6-2610-1
NetType: Allocated to Customer
CIDR: 2620::/23
Comment: Problems?
Commnet: Contact our NOC +1-202-555-1212
The Future Enabled: Auth*

- Authentication allows tiered Authorization
  - Policies no longer need to assume all or nothing
The Future Enabled: Versioning

- With standard HTTP headers, we can version our output
  - Changes the data model with as little disruption as possible

GET /rest/poc/DUDE1-ARIN HTTP/1.0
Accept: application/arin.whoisrws-v1+xml

- You always get the latest if you don’t specify
What Would It Take?

• Just saying “do RWS” is not enough.
• A “standard” is needed
  – Define the proper URL patterns
  – Define extensible output
    • DREG could be used as a starting point
    • Make it more flexible
    • Switch to RelaxNG or other schema language
  – Define pattern for referrals
    • HTTP referrals and/or embedded links
REST is Easy

• Re-use the web technologies
• Define patterns
• Use definitions you already have

• Done!
What We Set Out To Do

• ARIN’s problem wasn’t with Whois.
• We needed a fundamental change in our data model to accommodate better zone delegation management and DNSSEC in the reverse DNS.
  – Our legacy Whois would need to be completely rewritten.
  – So we felt if it had to be completely rewritten, then we should do more than a simple rewrite.
Technical Approach

- We wanted to reuse our new web infrastructure
  - Original RWS technology demonstrator took me a couple of weeks to implement as a side project

- Our Port 43 server would be a proxy into the RWS
Level of Effort

- Once greenlighted
  - Single senior developer for a couple of months
  - Then a small team for a couple of months
- But we had non-protocol problems to solve as well
  - Added in a new near-realtime replication system
  - Developed geometric search system to add CIDR search capabilities
  - Non-trivial amount of time was spent trying to make Port 43 service as backward compatible as possible
Adoption

• Before we even got to production...
  – Several people started using the public pilot to reconcile their records with ours programmatically
  – Somebody wrote a Flash application against our service

• After release...
  – Hard to tell what real adoption of RWS is because right after release our query rates skyrocketed
  – We added a pseudo-resource called “PFT” to help web browser users
    • Our previous stats indicated little use of port 80 Whois
  – Demand now for a RESTful provisioning interface… to be released real soon now
Conclusion

• ARIN’s Whois-RWS:
  – [http://whois.arin.net](http://whois.arin.net)
  – Technical questions for all our services can be directed to [arin-tech-discuss@arin.net](mailto:arin-tech-discuss@arin.net).

• Q&A